



# 2009 Geely EC718 , EC718RV and EC715, EC715RV Workshop Manual

This workshop manual provides model year 2009 EC718/EC718RV and EC715/EC715RV models specification, diagnostic and service information.

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# Preface

This is EC718/EC718RV and EC715/EC715RV workshop manual. Please refer to the index to retrieve the section you need.

Models	EC718/EC718RV and EC715/EC715RV
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Please note that the following publication is also for the related components and systems maintenance. "

Manual Name	Publication Number
EC718/EC718RV and EC715/EC715RV Wiring Diagram	

All the information in this manual is based on the latest products available at the time of publishing. The specifications and the repair procedures may change without prior notice.

It is recommended that you contact Geely Automotive Co., Ltd. to obtain the information about the products, part numbers or special tools referred in this manual.

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# Warnings

This manual does not include all the repair information required. It is for experienced and qualified personnel. A non-professional or non-qualified technician using the manual or not having the appropriate equipment and tools for repair, it may cause serious personal injury or damage to the vehicle.

To prevent personal injury or damage to the vehicles, please make sure follow the instructions below.

- Carefully read through this manual. Fully understanding of "Warnings and Notices" in the "Overview" section is particularly important.
- Repair procedures described in this manual is helpful for the repair work. When following the repair procedures in this manual, make sure use the recommended tools. If using tools other than recommended or not following the repair procedures, prior to commencing repair, ensure the safety of technical personnel and prevent personal injury or damage to customer vehicles.
- When replacing parts, please use parts approved by Geely Automotive Co., Ltd. with the same part numbers. Do not use inferior parts.
- To reduce the risk of causing bodily harm and to reduce the possibilities of causing vehicle damage, please strictly follow all the warnings and notes. It is also important to realize that the "Warning" and the "Note" are not exaggerated. Non-compliance may lead to dangerous consequences.
- Before repairing the airbag system components or working in the vicinity of airbag system, please refer to the "Airbag system component Locator" in the "Safety" section and the "Wiring Harness Routing Views" in the Wiring Diagram. Understand the airbag system components locations on a vehicle. Strictly follow all of the contents in the "Warnings and Notices". Violating these will result in airbag deployment, personal injury or to unnecessary airbag system repair.

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## 1 Vehicle Overview

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## 1.1 Warnings and Notices

### 1.1.1 Description and Operation

#### 1.1.1.1 Warnings and Notices

##### Definition of the "Warning", "Notice" and "Note"

Diagnostic and repair procedures include general and specific, two types of "Warning", "Notice" and "Note". Geely is committed to provide information to assist service technicians with diagnostic and repair and to restore the vehicle to normal running condition. However, if the technician does not follow the recommended procedures, certain procedures may cause danger to the technician.

"Warning", "Notice" and "Note" are to prevent the occurrence of such danger. Not all risks are foreseeable. They are at apparent locations in the workshop manual. This information is prepared to prevent the following cases:

- Severe personal injury
- Vehicle damage
- Unnecessary vehicle repair
- Unnecessary replacement of parts
- Improper vehicle repair or part replacement

##### Definition of "Warning"

A "Warning" means a procedure must be taken or a prohibited procedure. If a "warning" is ignored, it may have the following consequences:

- Severe personal injury
- If a vehicle is not properly repaired, it may cause severe personal injury to the driver and / or passengers.

##### Definition of "Notice"

"Notice" requires to pay special attention to a must taken procedure or a prohibited procedure. If a "Notice" is ignored, it may have the following consequences:

- Vehicle damage
- Unnecessary vehicle repair
- Unnecessary replacement of parts
- Improper operation of the repaired systems or components
- Damage to related systems or components
- Damaged to fasteners, tools or special tools
- Engine coolant, lubricants, or other fluid leak

##### Definition of "Note"

"Note" states the importance of a diagnostic procedure or the need". The purpose of the "Note" is as following:

- Clarify the procedures
- Provide additional information for completing a procedure
- Clarify the recommended procedures for operational reasons
- Provide help for technicians to complete the repair more efficiently
- Provide experience to technicians to complete the repair more easily

### Vehicle Lifting Warning

Warning: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

### ABS Component Handling Warning

Warning: Certain components in the Anti-lock Brake System (ABS) are not intended to be serviced individually. Attempting to remove or disconnect certain system components may result in personal injury and/or improper system operation. Only those components with approved removal and installation procedures should be serviced.

### Approved Equipment for Collision Repair Warning

Warning: To avoid personal injury when exposed to welding flashes or to galvanized (Zinc Oxide) metal toxic fumes while grinding/cutting on any type of metal or sheet molded compound, you must work in a properly ventilated area, wearing an approved respirator, eye protection, earplugs, welding gloves, and protective clothing.

### Assistant Driving Warning

Warning: An assistant should drive the vehicle while the technician checks for the location of the reported condition. Otherwise, personal injury could result.

### Battery Disconnect Warning

Warning: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

Warning: If repair an airbag, the battery negative cable must be disconnected at least 90s before carry out operations.

### Brake Dust Warning

Warning: Avoid taking the following actions when you service wheel brake parts:

- Do not grind brake linings.
- Do not sand brake linings.
- Do not clean wheel brake parts with a dry brush or with compressed air.

Warning: Some models or aftermarket brake parts may contain fibers which can become airborne in dust. Breathing dust with fibers may cause serious bodily harm. Use a water-dampened cloth in order to remove any dust on brake parts. Equipment is available commercially in order to perform this washing function. These wet methods prevent fibers from becoming airborne.

### Brake Fluid Warning

Warning: Do not use fluid from an open container that may be contaminated with water. Incorrect or contaminated fluid could result in system failure, loss of vehicle control and personal injury.

### Brake Fluid Irritant Warning

Warning: Brake fluid may be irritating to the skin or eyes. In case of contact, take the following actions:

- Eye contact--rinse eyes thoroughly with water.
- Skin contact--wash skin with soap and water.

### Brake Pipe Replacement Warning

Warning: Carefully route and retain replacement brake pipes. Always use the correct fasteners and in the original location for replacement brake pipes. Failure to properly route and retain brake pipes may cause damage to the brake pipes and brake system resulting in personal injury.

### Breathing R-134a Warning

Warning: Avoid breathing the A/C Refrigerant 134a (R-134a) and the lubricant vapor or the mist. Exposure may irritate the eyes, nose, and throat. Work in a well ventilated area. In order to remove R-134a from the A/C system, use service equipment that is certified to meet the requirements of SAEJ2210 (R-134a recycling equipment). If an accidental system discharge occurs, ventilate the work area before continuing service. Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

### Clutch Dust Warning

Warning: When servicing clutch parts, do not create dust by grinding or sanding the clutch disc or by cleaning parts with a dry brush or with compressed air. A water-dampened cloth--NOT SOAKED--should be used. The clutch disc may contain fibers which can become airborne if dust is created during servicing. Breathing dust with fibers may cause serious bodily harm.

### Collision Sectioning Warning

Warning: Sectioning should be performed only in the recommended areas. Failure to do so may compromise the structural integrity of the vehicle and cause personal injury if the vehicle is in a collision.

### Cracked Window Warning

Warning: If a window is cracked but still intact, crisscross the window with masking tape in order to reduce the risk of damage or personal injury.

### Exhaust Service Warning

Warning: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

### Express Window Down Warning

Warning: Disconnect the power window switch when working inside the driver door. When operated, the Express Up/Down Feature allows the door window to move very quickly, without stopping, which could cause personal injury.

### Eye Protection Warning

Warning: Approved safety glasses and gloves should be worn when performing this procedure to reduce the chance of personal injury.



## Foam Sound Deadener Warning

Warning: Foam sound deadener must be removed from areas within 152.4 mm (6 in) of where flame is to be used for body repairs. When reinstalling foam sound deadener, avoid inhaling fumes as bodily injury may result.

## Fuel and Evaporative Emission Pipe Warning

Warning: In order to reduce the risk of fire and personal injury observe the following items:

- Replace all nylon fuel pipes that are nicked, scratched or damaged during installation, do not attempt to repair the sections of the nylon fuel pipes.
- Do not hammer directly on the fuel harness body clips when installing new fuel pipes. Damage to the nylon pipes may result in a fuel leak.
- Always cover nylon vapor pipes with a wet towel before using a torch near them. Also, never expose the vehicle to temperatures higher than 115°C (239°F) for more than one hour, or more than 90°C (194°F) for any extended period.
- Apply a few drops of clean engine oil to the male pipe ends before connecting fuel pipe fittings. This will ensure proper reconnection and prevent a possible fuel leak. (During normal operation, the O-rings located in the female connector will swell and may prevent proper reconnection if not lubricated.)

## Fuel Gage Leak Warning

Warning: Wrap a shop towel around the fuel pressure connection in order to reduce the risk of fire and personal injury. The towel will absorb any fuel leakage that occurs during the connection of the fuel pressure gage. Place the towel in an approved container when the connection of the fuel pressure gage is complete.

## Fuel Pipe Fitting Warning

Warning: Always apply a few drops of clean engine oil to the male pipe ends before connecting the fuel pipe fittings in order to reduce the risk of fire and personal injury. This will ensure proper reconnection and prevent a possible fuel leak. During normal operation, the O-rings located in the female connector will swell and may prevent proper reconnection if not lubricated.

## Fuel Storage Warning

Warning: Do not drain the fuel into an open container. Never store the fuel in an open container due to the possibility of a fire or an explosion.

## Fuel Vapors in Evaporative Emission Components Warning

Warning: Do not breathe the air through the EVAP component tubes or hoses. The fuel vapors inside the EVAP components may cause personal injury.

## Gasoline/Gasoline Vapors Warning

Warning: Gasoline or gasoline vapors are highly flammable. A fire could occur if an ignition source is present. Never drain or store gasoline or diesel fuel in an open container, due to the possibility of fire or explosion. Have a dry chemical (Class B) fire extinguisher nearby.

## Glass and Sheet Metal Handling Warning

Warning: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

## Halogen Bulb Warning

Warning: Halogen bulbs contain gas under pressure. Handling a bulb improperly could cause it to shatter into flying glass fragments. To help avoid personal injury:

- Turn off the lamp switch and allow the bulb to cool before changing the bulb.
- Leave the lamp switch OFF until the bulb change is complete.
- Always wear eye protection when changing a halogen bulb.
- Handle the bulb only by its base. Avoid touching the glass.
- Keep dirt and moisture off the bulb.
- Properly dispose of the used bulb.
- Keep halogen bulbs out of the reach of children.

## Lower O-Ring Removal Warning

Warning: Verify that the lower (small) O-ring of each injector does not remain in the lower manifold in order to reduce the risk of fire and personal injury.

Warning: If the O-ring is not removed with the injector, the replacement injector with new O-rings will not seat properly in the injector socket. Improper seating could cause a fuel leak.

## Moving Parts and Hot Surfaces Warning

Warning: Avoid contact with moving parts and hot surfaces while working around a running engine in order to prevent physical injury.

## Protective Goggles and Glove Warning

Warning: Approved safety glasses and gloves should be worn when performing this procedure to reduce the chance of personal injury.

## Radiator Cap Removal Warning

Warning: To avoid being burned, do not remove the radiator cap or surge tank cap while the engine is hot. The cooling system will release scalding fluid and steam under pressure if radiator cap or surge tank cap is removed while the engine and radiator are still hot.

## Cooling System Repair Warning

Warning: The cooling system is pressurized. The fluid is hotter than boiled water. If open the cap when the engine is not cooled and the pressure is still very high, the engine coolant will boil immediately and may spray onto the operators body, causing serious burns.

## Relieving Fuel Pressure Warning

Warning: Remove the fuel tank cap and relieve the fuel system pressure before servicing the fuel system in order to reduce the risk of personal injury. After you relieve the fuel system pressure, a small amount of fuel may be released when servicing the fuel lines, the fuel injection pump, or the connections. In order to reduce the risk of personal injury, cover the fuel system components with a shop towel before disconnection. This will catch any fuel that may leak out. Place the towel in an approved container when the disconnection is complete.

## Road Test Warning

Warning: Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

## Safety Goggles and Fuel Warning

Warning: Always wear safety goggles when working with fuel in order to protect the eyes from fuel splash.

## SIR Warning

Warning: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:

- Airbag deployment

- Personal injury
- Unnecessary SIR system repairs

Warning: In order to avoid the above conditions, observe the following guidelines:

- Refer to SIR Component Views in order to determine if you are performing service on or near the SIR components or the SIR wiring.
- If you are performing service on or near the SIR components or the SIR wiring, disable the SIR system.

## SIR Deployed Inflator Modules Are Hot Warning

Warning: After deployment, the metal surfaces of the SIR component may be very hot. To help avoid a fire or personal injury:

- Allow sufficient time for cooling before touching any metal surface of the SIR component.
- Do not place the deployed SIR component near any flammable objects.

## SIR Inflator Module Coil Warning

Warning: Improper routing of the wire harness assembly may damage the inflatable restraint steering wheel module coil. This may result in a malfunction of the coil, which may cause personal injury.

## SIR Inflator Module Disposal Warning

Warning: In order to prevent accidental deployment and the risk of personal injury, do not dispose of an undeployed inflator module as normal shop waste. Undeployed inflator modules contain substances that could cause severe illness or personal injury if their sealed containers are damaged during disposal. Use the following deployment procedures to safely dispose of an undeployed inflator module. Failure to observe the following disposal methods may be a violation of federal, state, or local laws.

## SIR Inflator Module Handling and Storage Warning

Warning: When carrying an undeployed inflator module:

- Do not carry the inflator module by the wires or connector.
- Make sure the air bag opening points away from you and others.

Warning: When storing an undeployed inflator module, make sure the airbag opening point away from the surface on which the inflator module rests. Do not point the airbag opening to the ground. Do not place any items onto the airbag module. Provide free space for the airbag to expand in case of an accidental deployment.

Do not have the undeployed airbag module soaked in water or come into contact with other liquids.

Do not place the undeployed airbag module near the fire source or a high-temperature area. Prevent personal injury caused by accidental airbag deployment.

### Airbag Collision Sensor Handling Warning

Warning: Do not hit or shake airbag system collision sensors. Before supply power to the collision sensors, ensure the collision sensors firmly tightened. Failure to follow the correct procedures may cause airbag accidental deployment or inoperative, resulting in personal injury.

### Adding Fluid to the Brake System Notice

Notice: When adding fluid to the brake master cylinder reservoir, use DOT-4 brake fluid from a clean, sealed brake fluid container. The use of any type of fluid other than the recommended type of brake fluid may cause contamination which could result in damage to the internal rubber seals and/or rubber linings of hydraulic brake system components.

### Anti-Corrosion Materials Notice

Notice: If the power steering system has been serviced, an accurate fluid level reading cannot be obtained unless air is bled from the steering system. The air in the fluid may cause pump cavitation noise and may cause pump damage over a period of time.

### Belt Dressing Notice

Notice: Do not use belt dressing on the drive belt. Belt dressing causes the breakdown of the composition of the drive belt. Failure to follow this recommendation will damage the drive belt.

### Brake Caliper Notice

Notice: Support the caliper with a piece of wire to prevent damage to the brake line.

### Brake Fluid Effects on Paint and Electrical Components Notice

Notice: Avoid spilling brake fluid onto painted surfaces, electrical connections, wiring, or cables. Brake fluid will

damage painted surfaces and cause corrosion to electrical components. If any brake fluid comes in contact with painted surfaces, immediately flush the area with water. If any brake fluid comes in contact with electrical connections, wiring, or cables, use a clean shop cloth to wipe away the fluid.

### Damage to Fuel Tank Straps Notice

Notice: Do not bend the fuel tank straps. Bending the fuel tank straps may damage the straps.

### Engine Emissions Notice

Notice: Modifications made to the engine or exhaust system can effect the vehicle's emission controls and may cause the Malfunction Indicator Lamp (MIL) or Check Engine Lamp to illuminate.

- Engine
- Transmission
- Exhaust System
- Fuel System

Notice: Replacement tires that do not meet the same Tire Performance Criteria (TPC) of the original tire can also affect the vehicle's emission controls. This may also cause the Malfunction Indicator Lamp (MIL) or Check Engine lamp to illuminate.

Notice: Modifications to these systems or the installation of incorrect the TPC tire could lead to repairs that are covered by the manufacturer's warranty. This may also cause a required Emission Inspection/Maintenance test to fail.

### Engine Lifting Notice

Notice: When raising or supporting the engine for any reason, do not use a jack under the oil pan, any sheet metal, or the crankshaft pulley. Lifting the engine in an unapproved manner may cause component damage.

### Engine Mounting Notice

Notice: Broken engine mountings can cause misalignment of certain drive-train components. Misalignment of drive-train components causes eventual destruction of the drive-train components.

Notice: If one engine mount breaks, the rest of the engine mounts will have increased stress put on them. This could cause the rest of the engine mounts to break.

### Excessive Adhesive on Flywheel Bolts Notice

Notice: Apply the proper amount of the sealant to the fastener when assembling this component. Excessive use of the sealant can prohibit the component from being assembled properly or allow the fastener to loosen. A component or fastener that is not assembled properly can loosen or fall off leading to extensive engine damage.

### Excessive Force and Oxygen Sensor Notice

Notice: The oxygen sensor may be difficult to remove when the engine temperature is above 48°C (120°F). Excessive force may damage threads in the exhaust manifold or the exhaust pipe.

### Exhaust System Inspection Notice

Notice: When inspecting or replacing exhaust system components, make sure there is adequate clearance from all points on the under-body to prevent overheating of the floor pan and possible damage to the passenger compartment insulation and trim materials.

### Torque Reaction Against Timing Drive Chain Notice

Notice: A wrench must be used on the hex of the camshaft when loosening or tightening in order to prevent component damage. Failure to prevent the torque reaction against the timing drive chain can lead to timing drive chain failure.

### Exterior Trim Emblem Removal Notice

Notice: Use a plastic, flat-bladed tool to prevent paint damage when removing an emblem/name plate.

### Fastener Notice

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

### Fuel Pressure Notice

Notice: Do not allow the fuel pressure to exceed the specified value because damage to the fuel pressure regulator or the fuel pressure gage may result.

### Handling Electrostatic Discharge Sensitive Parts Notice

Notice: Electrostatic discharge (ESD) can damage many solid-state electrical components. ESD susceptible components may or may not be labeled with the ESD symbol. Handle all electrical components carefully. Use the following precautions in order to avoid ESD damage:

- Touch a metal ground point in order to remove your body's static charge before servicing any electronic component; especially after sliding across the vehicle seat.
- Do not touch exposed terminals. Terminals may connect to circuits susceptible the ESD damage.
- Do not allow tools to contact exposed terminals when servicing connectors.
- Do not remove components from their protective packaging until required to do so.
- Avoid the following actions unless required by the diagnostic procedure:
  - Jumping or grounding of the components or connectors.
  - Connecting test equipment probes to components or connectors. Connect the ground lead first when using test probes.

Ground the protective packaging of any component before opening. Do not rest solid-state components on metal workbenches, or on top of TVs, radios, or other electrical devices.

### Heated Oxygen and Oxygen Sensor Notice

Notice: Do not remove the pigtail from either the heated oxygen sensor (HO2S) or the oxygen sensor (O2S). Removing the pigtail or the connector will affect sensor operation.

Notice: Handle the oxygen sensor carefully. Do not drop the HO2S. Keep the in-line electrical connector and the louvered end free of grease, dirt, or other contaminants. Do not use cleaning solvents of any type.

Notice: Do not repair the wiring, connector or terminals. Replace the oxygen sensor if the pigtail wiring, connector, or terminal is damaged.

Notice: This external clean air reference is obtained by way of the oxygen sensor signal and heater wires. Any attempt to repair the wires, connectors, or terminals could result in the obstruction of the air reference and degraded sensor performance.

Notice: The following guidelines should be used when servicing the heated oxygen sensor:

- Do not apply contact cleaner or other materials to the sensor or vehicle harness connectors. These materials may get into the sensor causing poor performance.
- Do not damage the sensor pigtail and harness wires in such a way that the wires inside are exposed. This could provide a path for foreign materials to enter the sensor and cause performance problems.
- Ensure the sensor or vehicle lead wires are not bent sharply or kinked. Sharp bends or kinks could block the reference air path through the lead wire.
- Ensure that the peripheral seal remains intact on the vehicle harness connector in order to prevent damage due to water intrusion.

### Ignition OFF When Disconnecting Battery Notice

Notice: Always turn the ignition OFF when connecting or disconnecting battery cables, battery chargers, or jumper cables. Failing to do so may damage the Power Train Control Module (PCM) or other electronic components.

### Installing Hoses without Twists or Bends Notice

Notice: The inlet and outlet hoses must not be twisted during installation. Do not bend or distort the inlet or outlet hoses to make installation easier. Failure to follow these procedures could result in component damage.

### Machined Surface Damage Notice

Notice: Do not nick, scratch or damage the sealing surface. The sealing surface is a machined surface. Damage to the machined surface can cause leakage.

### Power Train Control Module and Electrostatic Discharge Notice

Notice: Do not touch the connector pins or soldered components on the circuit board in order to prevent possible electrostatic discharge (ESD) damage to the PCM.

### Power Steering Hose Disconnected Notice

Notice: Do not start the vehicle with any power steering gear inlet or outlet hoses disconnected. When disconnected, plug or cap all openings of components. Failure to do so could result in contamination or loss of power steering fluid and damage to the system.

### Ring Gear Removal Notice

Notice: Do not pry the ring gear from the differential case. Prying the ring gear from the differential case may cause damage to the ring gear and/or the differential case.

### Sealant Notice

Notice: Do not allow the RTV sealant to enter any blind threaded hole. RTV sealant that is allowed to enter a blind threaded hole can cause hydraulic lock of the fastener when the fastener is tightened. Hydraulic lock of a fastener can lead to damage to the fastener and/or the components. Hydraulic lock of a fastener can also prevent the proper clamping loads to be obtained when the fastener is tightened. Improper clamping loads can prevent proper sealing of the components allowing leakage to occur. Preventing proper fastener tightening can allow the components to loosen or separate leading to extensive engine damage.

### Scan Tool Usage Notice

Notice: Before perform vehicle diagnostic, pay attention to the following, otherwise it may cause damage to the engine control module.

- The scan tool and the software must be up to date.
- Vehicle battery must be fully charged, battery voltage should be between 12-14 V.
- Scan tool terminals must be firmly connected.
- When programming the engine control module, do not connect the battery to the charger.

### Steering Wheel in the Full Turn Position Notice

Notice: Do not hold the steering wheel in the full turn position longer than 5 seconds, as damage to the steering pump may result.



### Test Probe Notice

Notice: Do not insert test equipment probes (DMM etc.) into any connector or fuse block terminal. The diameter of the test probes will deform most terminals. A deformed terminal will cause a poor connection, which will result in a system failure. Always use approved terminal test kit in order to front probe terminals. Do not use paper clips or other substitutes to probe terminals.

Notice: When using the approved terminal test kit, ensure the terminal test adapter choice is the correct size for the connector terminal. Do not visually choose the terminal test adapter because some connector terminal cavities may appear larger than the actual terminal in the cavity. Using a larger terminal test adapter will damage the terminal.

### Using Proper Power Steering Fluid Notice

Notice: When adding fluid or making a complete fluid change, always use DEXRONIII Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

### Window Edge Damage Notice

Notice: Avoid damage to the window from impacting objects due to an exposed edge. The window must be 1 mm (0.025 in) below the surface of the sheet metal to avoid window damage.

## 1.2 Vehicle Inspection

### 1.2.1 Description and Operation

#### 1.2.1.1 Inspection Items Before Operating The Vehicle

##### Horn Operation

Occasionally press the horn to ensure the speaker is working properly, check all the button positions.

##### Brake System Operation

Be aware of any abnormal noise when braking, brake pedal travel increase and repeatedly occurred wheel slip when braking. In addition, if the brake warning light illuminates or flashes, it indicates a fault in the brake system.

##### Exhaust System Operation

Be aware of the sound change in the exhaust system and odors. These indicate that the system may be leaking or overheating. Check the system immediately and repair if necessary.

##### Tire and Wheel Alignment

Be aware of the steering wheel and seats vibration when traveling under normal conditions. It indicates that there may be a need to balance the wheels. In addition, the wheel slip on even roads indicates that there may be a need for tire pressure adjustment or wheel alignment.

##### Steering System Operation

Be aware of the change in steering effort. When steering becomes hard, the steering wheel free travel is great or when there is abnormal sound while turning and parking, the steering system needs to be checked. Occasionally inspect the lighting pattern of the headlamp. If the headlamp lighting pattern is not correct, it should be adjusted.

#### 1.2.1.2 Inspection Items Before Each Time Filling Fuel

Any system fluid leak(except the windshield washer) indicates that the system may be faulty. Check the system immediately and repair if necessary.

##### Engine Oil Level

Add engine oil if necessary, preferably when engine oil is warm.

1. When the engine is shut down, engine oil will flow back to the bottom of the oil pan after a few minutes.
2. Pull out the dipstick.

3. Wipe clean the dipstick and then insert it back.
4. Pull out the dipstick and inspect the oil level.
5. If necessary, add engine oil, so that the oil level maintained between MIN (minimum) line and the MAX (maximum) line. Do not fill an excessive amount of engine oil, otherwise it may cause damage to the engine.
6. After reading the engine oil level, reinstall the dipstick to the engine. If inspecting the engine oil level when the engine is cold, do not start the cold engine. The cold engine oil will not quickly return to the oil pan, thus the correct oil level reading will not be obtained.

##### Engine Coolant Level and Conditions

Add engine coolant if necessary. Check the engine coolant, replace the dirty engine coolant.

##### Windshield Washer Fluid Level

Inspect the washer fluid level and add fluid if necessary.

#### 1.2.1.3 Monthly Inspection Items

##### Wheels, Tires and Tire Pressure

Inspect for abnormal tire wear or damage. Inspect the wheels for damage. Inspect the tire pressure when cold, also inspect the spare tire. Maintain tire pressure as recommended on the label.

##### Vehicle Lamp Operation

Inspect the license plate lamps, headlamps (including the high-beam lamps), parking lamps, fog lamps, tail lamps, brake lamps, turn lamps and indicators, reversing lamps and hazard warning lamps operation.

##### Oil and Fluid Leaks

When the vehicle is parked, regularly inspect whether there is water, engine oil, fuel or other liquids on the ground underneath the car. Water dripping from air-conditioning system after use is normal. If oil leaks or smoke is found, identify the reason and repair if necessary.

#### 1.2.1.4 Inspection Items At Least Twice A Year

##### Power Steering System Fluid Level

Inspect power steering fluid surface to maintain the correct power steering fluid level.

### Brake Master Cylinder Fluid Level

Inspect the brake fluid level and maintain the correct fluid level. If the fluid level is too low, it indicates that the brake pads have been worn and need repair. Inspect the vent lid to ensure that no dirt and air path blockage.

### Clutch Pedal Free Travel

Inspect the clutch pedal free travel. Adjust if necessary. Without the clutch pedal being pressed, measure the distance between the clutch pedal center and the floor. Then, press the clutch pedal all the way and measure the distance between the pedal center and the floor. The difference between the two measurements must be greater than 130 mm (5.19 in).

### Doors and Windows Seals Lubrication

With a clean cloth to apply a layer of silicon grease coated film.

## 1.2.1.5 Inspection Items When Changing Engine Oil

### Manual Transmission Drive Axle

Inspect transmission fluid. Add transmission fluid if necessary.  
[3.3.8.1 Transmission Fluid Level Inspection.](#)

### Brake System

Special attention: Low brake fluid level may indicate that disc brake pads have been worn and need repair. In addition, if the brake system warning lamp is always on, the brake system may be faulty. If the anti-lock brake system warning lamp is always on, the anti-lock braking system may be faulty. Inspect the ABS system when wheel removal and rotation is carried out. Inspect the pipe and hose connections are correct, and whether there are catching, leakage, cracks, or scratches. Inspect for the disc brake pads worn. Inspect brake disc surface conditions at the same time inspecting other brake system components, including brake wheel cylinders, park brake etc. Inspect the park brake adjustment. If the driving habits and driving conditions require frequent braking, brake inspection interval should be shortened.

### Steering Systems, Suspension and Front Drive Axle Shields and Seals

Inspect front and rear suspension and steering system for component damage, loose or missing. Inspect for signs of wear or lack of lubrication. Inspect whether power steering system, pipe and hose is connected properly, and whether there are catching, leakage, cracks, or scratches. Clean the drive axle jacket and seals and inspect for damage, cracking or leakage, if necessary, replace the seals.

### Exhaust System

Inspect the entire exhaust system, including the catalytic converter. Inspect vehicle body near the exhaust system, to refer to whether there are parts broken, damaged, missing or misaligned. Inspect whether there are cracks, holes or loose connections. Inspect other causes for poor floor heat ventilation. Inspect the cause for exhaust heat entering into the luggage compartment or passenger compartment.

### Throttle Linkage

Inspect the throttle linkage to refer to whether there are scratch, parts damaged or missing. Apply the appropriate grease lubrication at all joints, the middle throttle shaft bearings, throttle valve assembly spring on the accelerator pedal and the pedal surface. Inspect for throttle linkage free movement.

### Engine Drive Belt

Inspect the drive belt for cracking, wear and proper tension. If necessary, adjust or replace the drive belt.

### Hood Locking Latch Operation

Open the hood. Observe the operation of auxiliary locking latch. when the main lock latch is released, the auxiliary locking latch should be able to prevent the hood fully open. The hood must be able to fully closed.

## 1.2.1.6 Inspection Items At Least Once A Year

### The Condition and Operation Of Seat Belts

Inspect seat belt system, including the woven belt, buckle, release button, retractor, guide ring and fixtures.

### Spare Tire and Jack Storage

Be aware of the rattle sound from the rear of vehicle. Spare tire, all the jacking equipment and tools must always be well fixed. Each time after use, lubricate ratchet jack or screw mechanism with the engine oil .

### Key Lock Maintenance

Lubricate key cylinder.

### Body Lubrication

Lubricate all door hinges, including the hood, the fuel filler door, luggage compartment (hatchback) hinges and locking latch, glove box, console door and any folding seat parts.



### Wash The Vehicle Underbody


Firstly, loose deposited dust, and then rinse the bottom of the vehicle body with water. In winter, wash the bottom of the vehicle body at least once a year. Washing the bottom of the vehicle body can remove snow, ice and dust-proof corrosive substances.

### Engine Cooling System

#### Warning!

When working around the running engine, avoid contact with moving parts and hot surfaces to prevent injuries.

Check the engine coolant. If the engine coolant is too dirty or rusty, drain the engine coolant. Flush the engine cooling system and refill the new engine coolant. Maintain an appropriate concentration of engine coolant in order to ensure the correct antifreeze, anti-boiled, anti-corrosion properties and engine operating temperature. Check the hoses. Replace the cracked, expanded, or aged hoses. Inspect fastening clip, cleaning radiators and air-conditioning system condenser outside. Clean filler cap and filler neck tube. Test the pressure in the cooling system and cover to ensure that the system operate properly.



## 1.3 Lifting and Jacking the Vehicle

### 1.3.1 Description and Operation

#### 1.3.1.1 Lifting and Jacking the Vehicle

##### Warning!

Refer to "Vehicle Lifting Notice" in "Warnings and Notices".

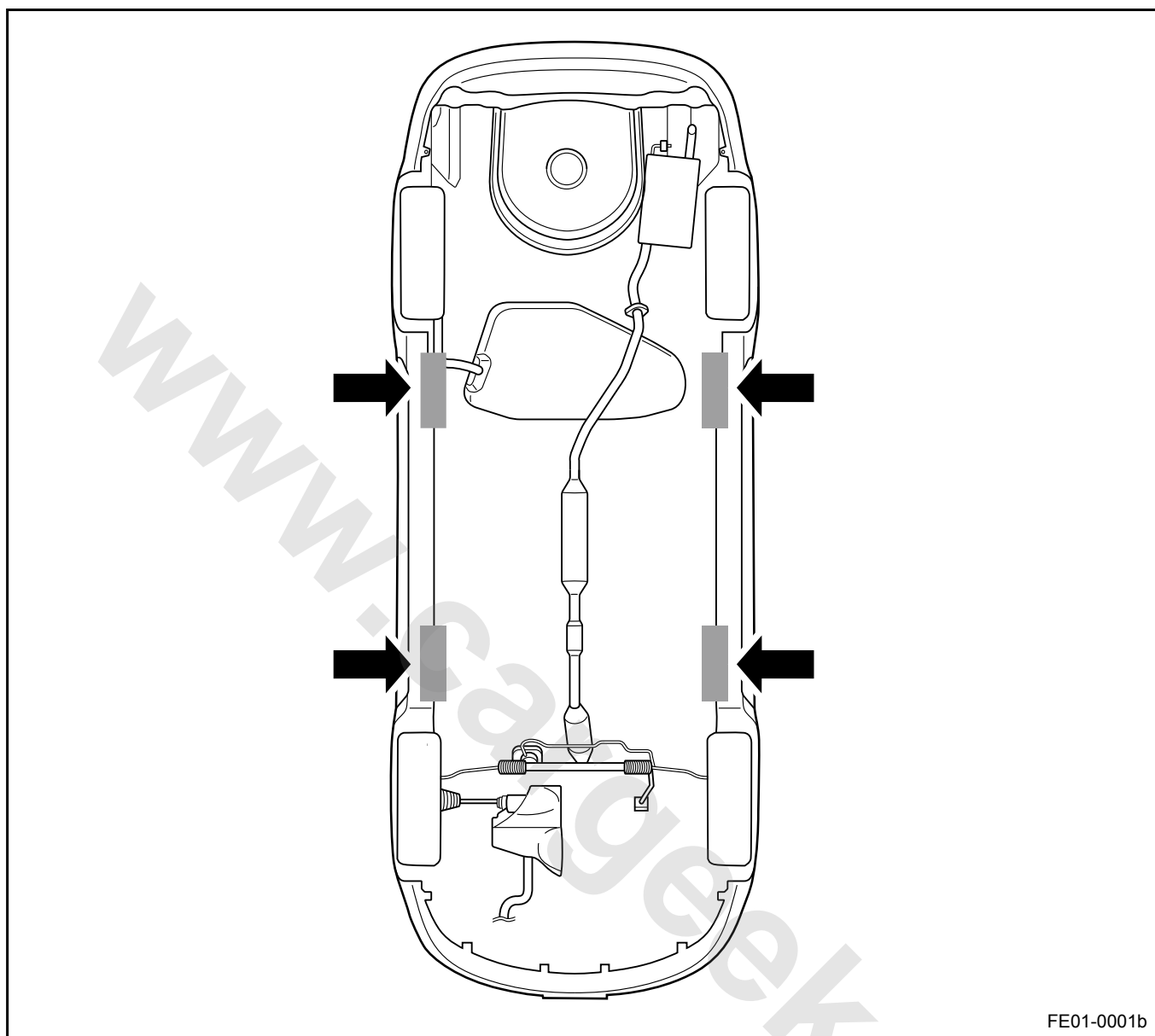
To help avoid personal injury, always use jack stands when you are working on or under any vehicle that is supported only by a jack.

##### Note

When you are jacking or lifting a vehicle at the frame side rails or other prescribed lift points, be certain that the lift

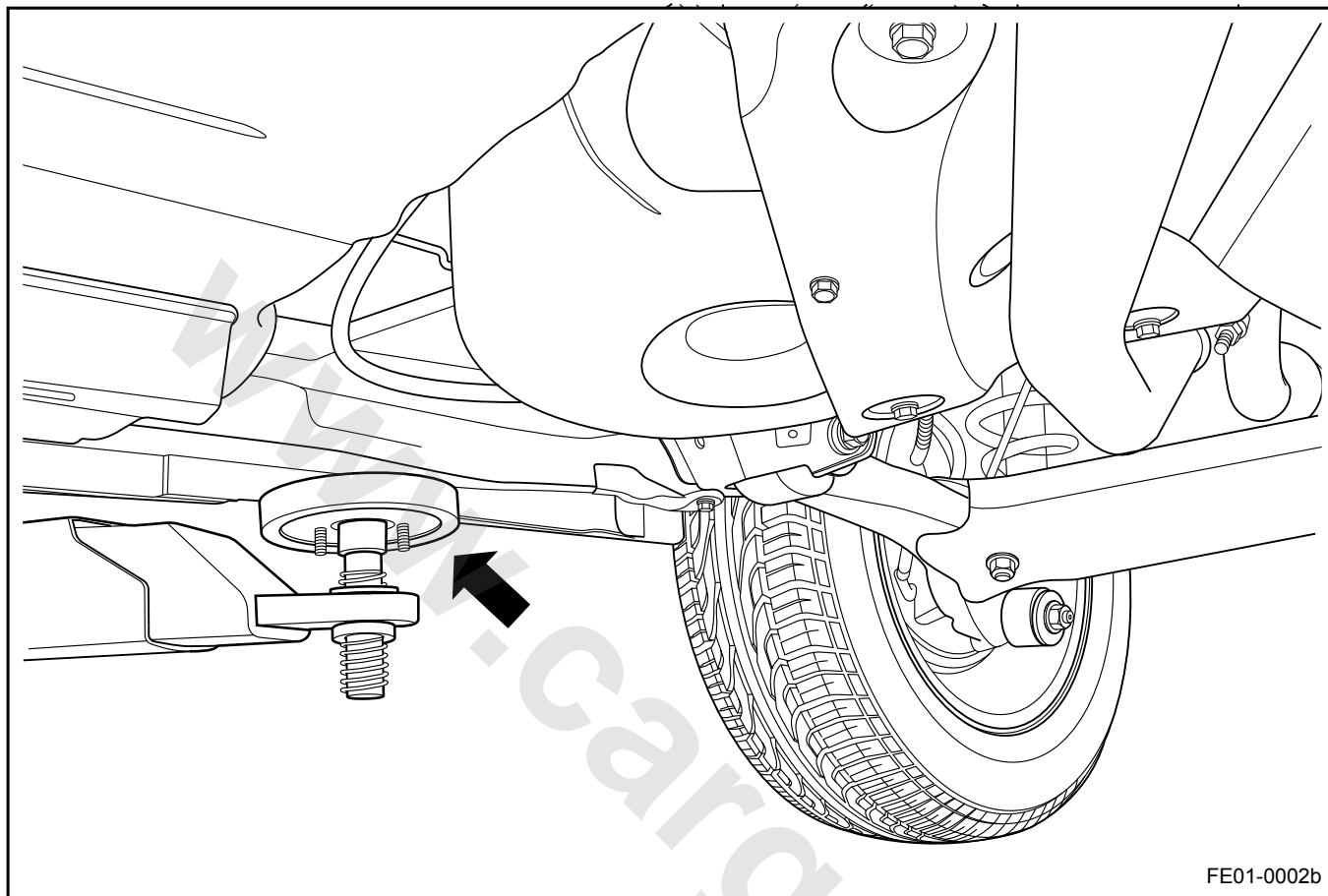
pads do not contact the catalytic converter, the brake pipes or the fuel lines. If such contact occurs, vehicle damage or unsatisfactory vehicle performance may result. Before you begin any lifting procedure, be sure the vehicle is on a clean, hard, level surface. Be sure all the lifting equipment meets weight standards and is in good working order. Be sure all the vehicle loads are equally distributed and secure. If you are only supporting the vehicle at the frame side rails, make sure the lifting equipment does not put too much stress on or weaken the frame side rails.

Vehicle Jacking Locations



## Vehicle Lifting - Frame Contact Hoist

Rear Hoist Pads

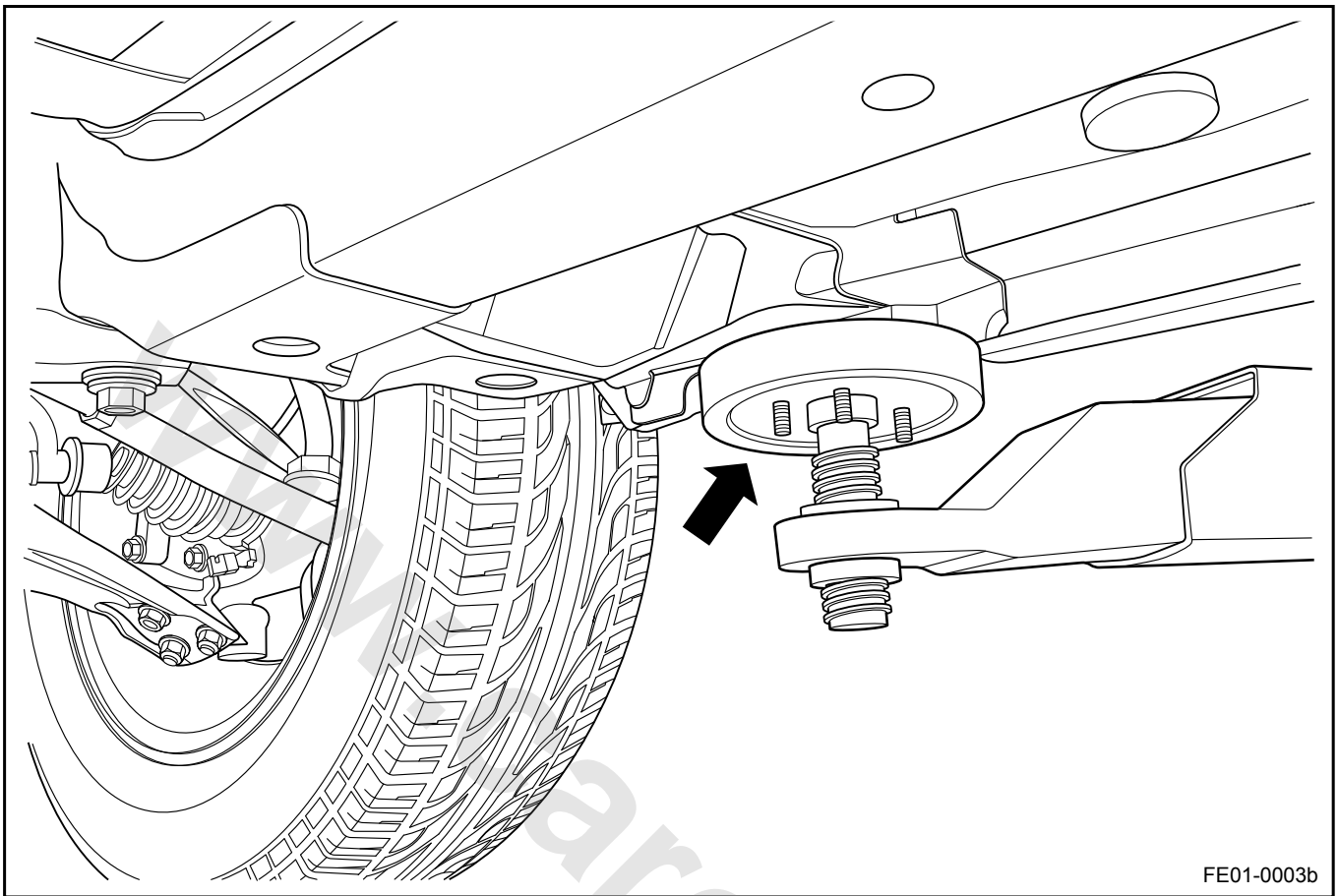
**Note**

The rear hoist pads and arms must not contact the rocker panels to the outside of the side frame rails or the floor pan.

Position the rear hoist pads as follows:

- Under the junction between the rear frame rails and the side frame rails.

## Front Hoist Pads

**Note**

The front hoist pads and arms must not contact the rocker panels, the front mud guards, or the floor pan.

Position the front hoist pads as follows:

- Under the front frame box section.

## 1.4 Maintenance

### 1.4.1 Specifications

#### 1.4.1.1 Oil and Fluid Capacity

Application	Specification
Brake Fluid and Clutch Fluid	0.68 L (1.20 pt)
Engine Oil (JLy4G18-D)	4 L (7.04 pt)
Engine Coolant (JLy4G18-D)	6.5 L (11.44 pt)
Manual Transmission Fluid	2.2 L (3.87 pt)
Power Steering Fluid	0.9 L (1.58 pt)
Refrigerant	620 ± 20 g (1.37 ± 0.04 b)
Washer Fluid	2 L (3.52 pt)

#### 1.4.1.2 Recommended Oil and Lubricants

Application	Oil / Lubricant
Brake Fluid and Clutch Fluid	DOT4
Clutch Linkage Pivot Grease	Universal Lithium Grease
Engine Coolant	Comply with SH0521 (the freezing point $\leq -40^{\circ}\text{C}$ / $-40^{\circ}\text{F}$ )
Engine Oil	Comply with GB11121, API quality grade SJ-class, exports to the EU SL-class, viscosity: SAE 5W-30, 10W-30, 10W-40, 15W-40
Floor Shift Linkage Grease	Universal Lithium Grease
Hood and Truck Hinges, Fuel Filler Door Hinges, Luggage Compartment Door Hinge	Universal Lithium Grease
Manual Transmission Fluid	Comply with GB13895, API quality grade GL-4, Viscosity: SAE 75W-90, 80W-90, 85W-90
Power Steering Fluid	DEXRON III
Doors and Windows Sealing Strip Grease	Silicon Grease
Air-Condition Refrigerant	R134a

## 1.4.2 Description and Operation

### 1.4.2.1 Oil Maintenance Schedule

#### Note

- \* 1 Refer to the harsh conditions maintenance Schedule.

- \* 2 Only use "Genuine Geely ultra-long-effective type engine coolant" or the same level of high-quality ethylene glycol based engine coolant. Do not use ordinary clean water.

No.	Oil Name	Maintenance Mileage (Whichever comes first)	Notes
1	Engine Oil * 1	first 5,000 km or 4 months, thereafter every 7,500 km or 6 months	API SJ grade or above, replace the oil filter * 1 at the same time.
2	Automotive Gear Oil	First 5,000 km, thereafter every 2 years or 40,000 km	-
3	Power Steering Oil	Every 2 years or 40,000 km	-
4	Brake Fluid	Every 2 years or 30,000 km	-
5	Engine Coolant * 2	Every 2 years or 40,000 km	-

### 1.4.2.2 Normal Driving Condition Service Schedule

#### Service:

#### Note

- I: Inspect and adjust or replace as needed.
- R: Replace.
- \* 1 Inspect valve noise and engine vibration. Adjust if necessary.
- \* 2 80,000 km or 48 months later, every 20,000 km or 12 months, check again.
- \* 3 Inspect radiators and condensers for blockage by leaves, dust or insects. Clean hose connections.
- \* 4 80,000 km or 48 months later, every 20,000 km or 12 months, check again.
- \* 5 Replace after first 60,000 km, then replace every 30,000 km.
- \* 6 Only use engine coolant in accordance with SH0521 (freezing point  $\leq -40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$ )).

Maintenance Schedule (Odometer readings or the number of months, whichever comes first)	Odometer readings × 1,000 km	7.5	15	22.5	30	37.5	45	53.5	60	67.5	75	82.5	90	97.5	105	112.5	120	127.5	Months
Engine Components																			
1. Valve Clearance * 1		.	.	.	I	.	.	.	I	.	.	.	I	.	.	.	I	.	96
2. Drive Belt		.	I	.	I	.	I	.	I	.	I	.	I	.	I	.	I	.	24
3. Engine Oil * 2		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	12
4. Oil Filter * 2		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	12

Maintenance Schedule (Odometer readings or the number of months, whichever comes first)	Odometer readings × 1,000 km	7.5	15	22.5	30	37.5	45	53.5	60	67.5	75	82.5	90	97.5	105	112.5	120	127.5	Months
5. Cooling and Heating System Hoses and Connectors * 2 * 3		.	.	.	I	.	.	.	I	.	.	.	I	.	.	I	.	I	24
6. Engine coolant * 5 * 6		.	I	I	I	I	R	I	I	I	I	I	R	I	R	I	I	I	-
7.VVT oil filters * 4		.	I	.	R	.	I	.	R	.	I	.	R	.	I	.	R	.	-
8. Exhaust Pipes and Mountings		.	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	12
Ignition System																			
9. Spark Plug		.	.	.	R	.	.	.	R	.	.	.	R	.	.	.	R	.	-
10. Battery		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	12
Fuel and Exhaust Systems																			
11. Fuel Filter		.	.	.	R	.	.	.	R	.	.	.	R	.	.	.	R	.	-
12. Air Filter		I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	I: 6R: 24
13. Fuel Tank Cap, Fuel Pipes, Fuel Evaporation Control Valve * 4		.	.	.	I	.	.	.	I	.	.	.	I	.	.	.	I	.	24
14. Evaporative Emission Canister		.	.	.	.	.	.	.	I	.	.	.	I	.	.	.	I	.	60
Chassis and Body																			
15. Brake Pedal and Park Brake		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	6
16. Brake Pads and Brake Disc		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	6
17. Brake Fluid		I	I	I	R	I	I	I	R	I	I	I	R	I	I	I	R	I	I: 6R: 24
18. Brake Pipes and Hoses		.	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	12
19. Power Steering Fluid		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	6



Maintenance Schedule (Odometer readings or the number of months, whichever comes first)	Odometer readings × 1,000 km	7.5	15	22.5	30	37.5	45	53.5	60	67.5	75	82.5	90	97.5	105	112.5	120	127.5	Months
20. Steering Wheel, Steering Linkage		.																	12
21. Drive Shaft Dust Cover																			24
22. Ball Joints and Dust Cover		.																	12
23. Transmission Fluid		.			R	.			R	.			R	.			R	.	24
24. Front and Rear Suspension																			12
25. Tires and Tire Pressure																			6
26. Lamps, Horns, Wipers and Washers																			6
27. Air Conditioning Filter		.	.	R	.	.	R	.	.	R	.	.	R	.	R	.	.	R	12
28. Air-Conditioning System / Refrigerant		.		.		.		.		.		.		.		.		.	12

### 1.4.2.3 Harsh Driving Condition Service Schedule

— For unlisted conditions, refer to the [1.4.2.2 Normal Driving Condition Service Schedule](#).

- Harsh driving conditions are listed in the following table.  
Increase the frequency of service.

Inspection Items	Time or Odometer Reading
A-1: Driving on uneven, muddy, or melting snow road	
- Check brake pads and brake disc	Every 5,000 km or 3 months
- Check brake pipes and hoses	Every 10,000 km or 6 months
- Check ball joints and dust cover	Every 10,000 km or 6 months
- Check the drive shaft dust cover	Every 10,000 km or 12 months
- Check the steering wheel, steering rod and the transmission fluid	Every 5,000 km or 3 months
- Check front and rear suspensions	Every 10,000 km or 6 months
A-2: Driving on dusty roads	

Inspection Items	Time or Odometer Reading
<ul style="list-style-type: none"> <li>- Replace engine oil</li> <li>- Replace oil filter</li> <li>- Check or replace the air cleaner filter</li> <li>- Check brake pads and brake disc</li> <li>- Replace air conditioning filter</li> </ul>	Every 5,000 km or 6 months Every 5,000 km or 6 months I: Every 2,500 km or 3 months R: Every 1,000 km or 6 months Every 5,000 km or 3 months Every 15,000 km
B-1: Towing or roof mounting	
<ul style="list-style-type: none"> <li>- Replace engine oil</li> <li>- Replace oil filter</li> <li>- Check brake pads and brake disc</li> <li>- Check or replace gearbox oil</li> <li>- Check front and rear suspensions</li> <li>- Check chassis and body retaining bolts and nuts</li> </ul>	Every 5,000 km or 6 months Every 5,000 km or 6 months Every 5,000 km or 3 months Every 60,000 km or 24 months Every 10,000 km or 6 months Every 10,000 km or 6 months
B-2: Repetitive trips less than 8 km in the temperature below 0 °C	
<ul style="list-style-type: none"> <li>- Replace engine oil</li> <li>- Replace oil filter</li> </ul>	Every 5,000 km or 6 months Every 5,000 km or 6 months
B-3: Extended period of idle or low-speed long-distance driving, such as used as police vehicles, taxi or door to door delivery vehicles	
<ul style="list-style-type: none"> <li>- Replace engine oil</li> <li>- Replace oil filter</li> <li>- Check the PCV valve and pipeline</li> <li>- Check brake pads and brake disc</li> </ul>	Every 5,000 km or 6 months Every 5,000 km or 6 months Every 5,000 km or 6 months Every 5,000 km or 3 months
B-4: Frequent high speed driving for more than 2h (80% of the maximum vehicle speed)	
<ul style="list-style-type: none"> <li>- Replace Transmission Fluid</li> </ul>	Every 20,000 km or 12 months
B-5: Extended period of idle, low speed and frequent acceleration and deceleration, such as a driving training vehicle.	
<ul style="list-style-type: none"> <li>- Replace engine oil</li> <li>- Replace oil filter</li> <li>- Check the PVC valve and pipeline</li> </ul>	Every 3,000 km or 3 months Every 3,000 km or 3 months Every 3,000 km or 3 months

#### 1.4.2.4 Regular Service Instructions

##### Normal Use of the Vehicle

Service Schedule assumes that the vehicle is used for the following purposes:

- Transporting passengers and cargo according to the tire label at the edge of driver's door.
- Driving within the limits of the proper operation on suitable roads.

##### Service Schedule Description

Service items are explained in more details below. When servicing, make sure replace all the parts and complete all necessary repairs before drive the vehicle. Make sure use the suitable oil, fluids and lubricants.

##### Drive Belt Inspection

Inspect the drive belt for cracking, wear and tear as well as the proper tension force. If necessary, adjust or replace the drive belt.

## Engine Oil and Oil Filter Replacement

Make sure use the API grade engine oil, SJ grade engine oil or above.

### Engine Oil Viscosity

#### Note

Using engine oil other than the recommended ones will damage the engine.

Engine oil viscosity (consistency) will affect the fuel economy and operations in cold weather. The lower the engine oil viscosity, the better the vehicle's fuel economy and the better cold weather performance. In high temperatures, engine oil with higher viscosity must be used to achieve the desired lubricating effect. Using engine oil other than the recommended ones will damage the engine.

### Cooling System Service

Drain, rinse the cooling system and refill the new engine coolant. Refer to [1.4.1.2 Recommended Oil and Lubricants](#).

### Fuel Filter Replacement

Every

Replace fuel filter every 30,000 km. The fuel filter is located at the bottom of the rear end of the vehicle, close to the canister.

### Air Cleaner Filter Replacement

Every

Replace air cleaner filter every 15,000 km. Under dusty conditions, reduce the air filter replacement intervals.

### Spark Plug Replacement

Use only genuine Geely parts for replacements. Refer to [1.4.2.2 Normal Driving Condition Service Schedule](#).

### Spark Plug Wire Replacement

Clean up the spark plug wire and inspect for burnt, cracking or other damage. Make sure the spark plug wire is installed directly on the ignition system module and the spark plug. If necessary, replace the spark plug wire.

### Brake System Service

Inspect the disc brake pads every 7,500 km or 7 months. Double-check the thickness of brake pads. If the brake pads

can not last until the next scheduled service, they should be replaced. Check the brake fluid tank lid vent to ensure that there is no dirt and the path is unblocked.

### Differential Service

Inspect differential oil every 20,000 km or 12 months. Replace differential oil every 40,000 km or 24 months.

### Tire and Wheel Inspection and Tire Rotation

Inspect whether there is abnormal tire wear or damage. To make tire wear evenly and to extend tire life, rotate the tire positions. If there is abnormal or premature wear, wheel alignment should be checked, and then check the wheels for damage.

#### 1.4.2.5 Tire Rotation Description

##### Note

If there is obviously uneven tire wear, the cause for this should be eliminated.

When rotating the tires, it is recommended at the same time check the tire and wheel assembly balancing.

1. It is recommended that tire rotation be carried out when brake inspections are performed, as per the service schedule outlined in the Owner's Handbook, or when: Difference in tread depth between front and rear tires exceed 1.55 mm(0.08 in).

2. Lifting and support vehicles. Refer to [1.3.1.1 Lifting and Jacking the Vehicle](#).

##### Note

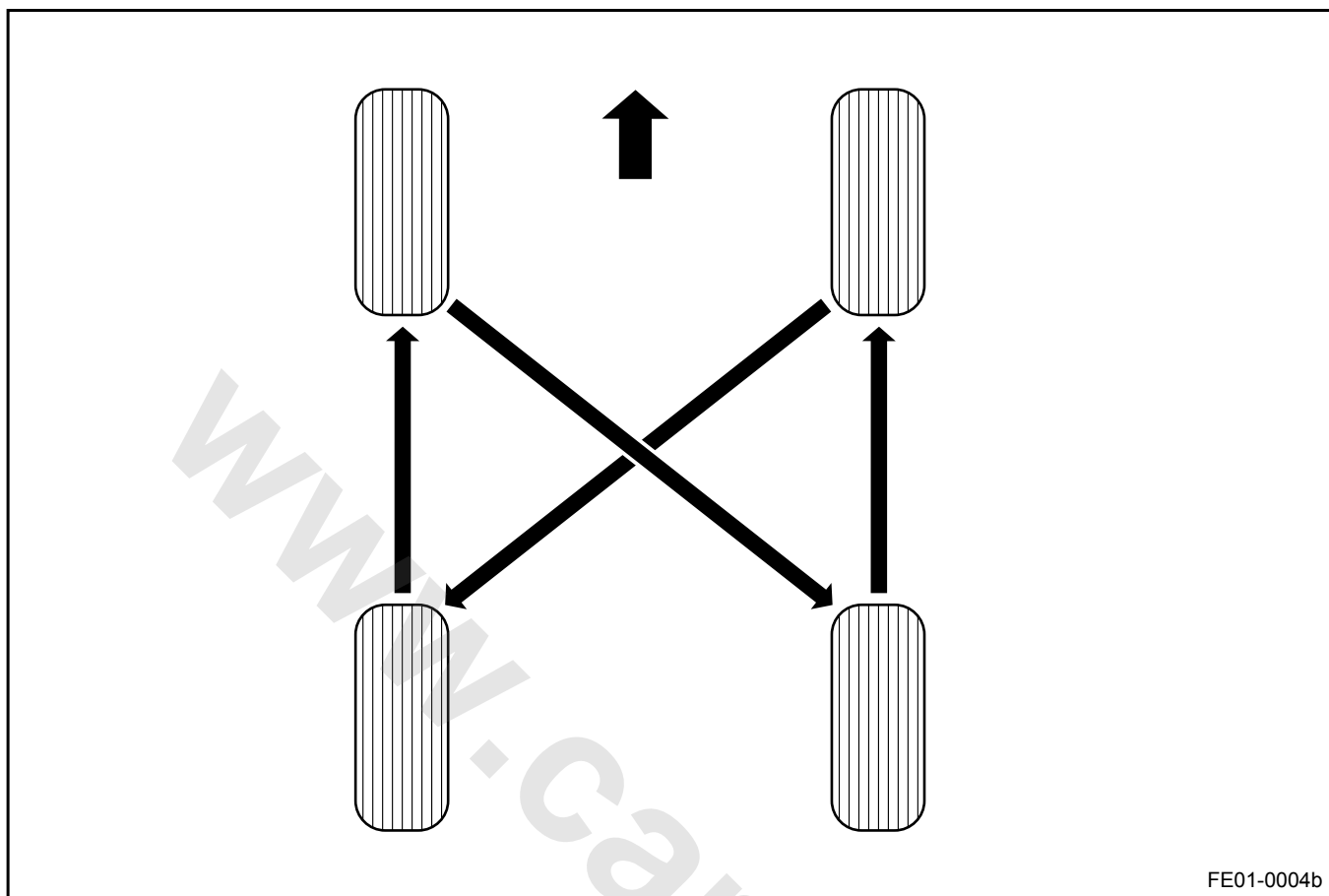
Note the location of each tire and wheel assembly in relation to the original position on the vehicle.

3. Remove the tire and wheel assembly. Refer to [4.4.5.1 Wheel Replacement](#).

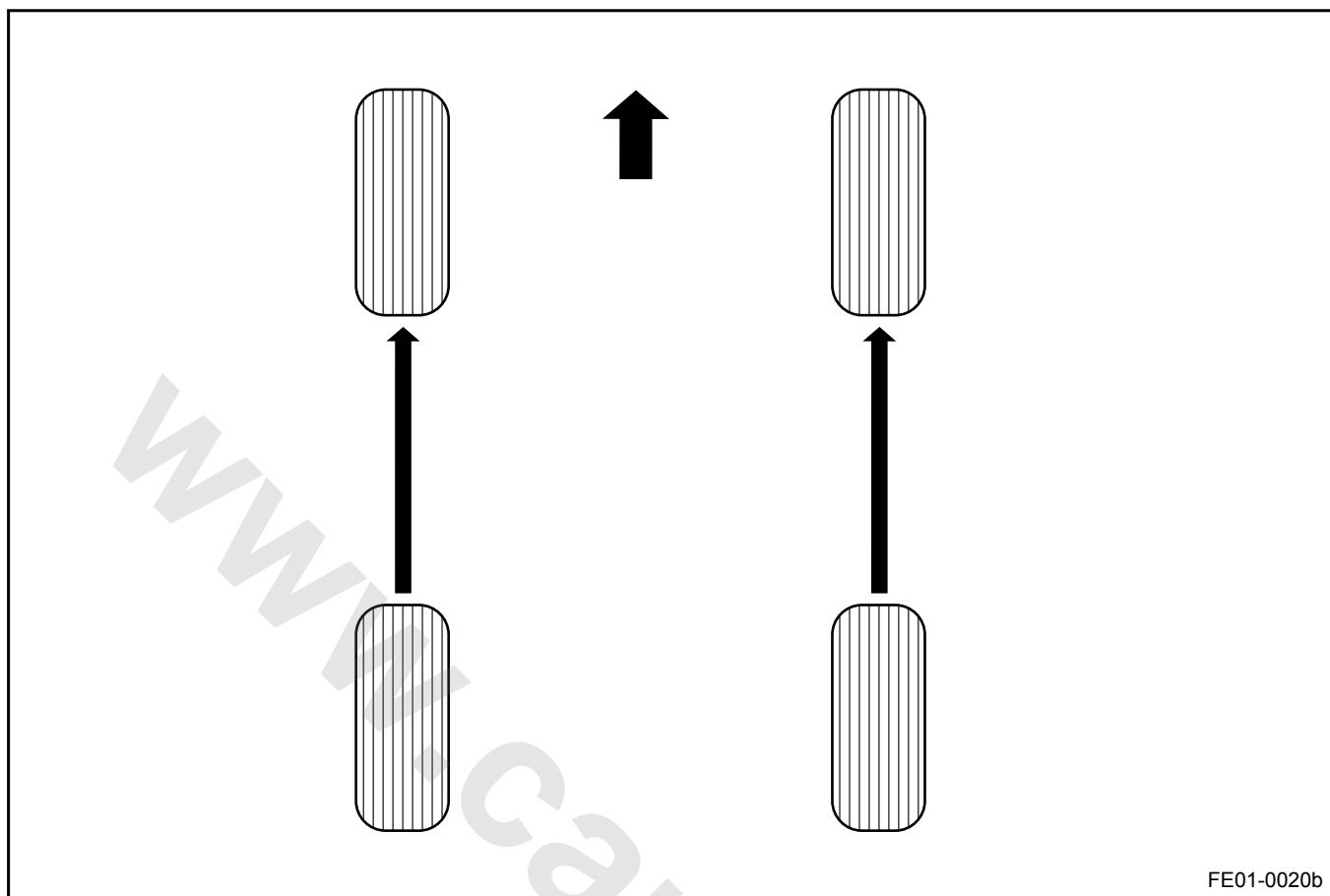
4. Rotate the tire and wheel assemblies as shown in the following diagrams.

##### Note

For 'Non Directional' tires carry out rotation as shown below.

**Note**

For 'Directional' tires carry out rotation as shown below.



5. Install the tire and wheel assemblies. Refer to [4.4.5.1 Wheel Replacement](#).

6. Remove the safety stands.

7. Lower the vehicle.

8. Check and adjust the tire inflation pressure.

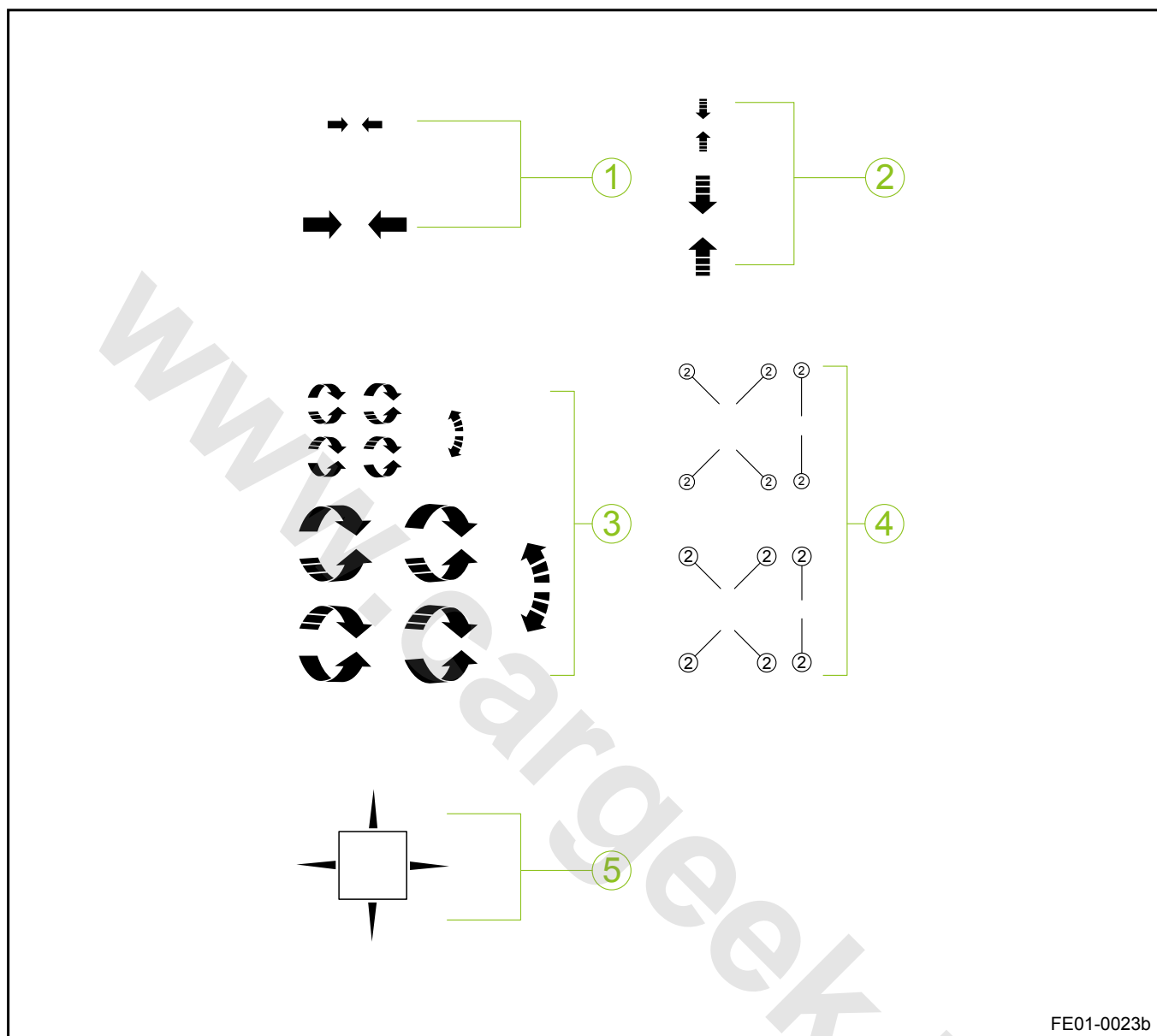
## 1.5 Service Information System

### 1.5.1 Description and Operation

#### 1.5.1.1 Abbreviations Used In This Manual

Abbreviations	Description
ABS	Anti-lock Brake Control System
ACU	Airbag Control Module
BCM	Body Control Module
CAN	Controller Area Network
CKP	Crankshaft Position Sensor
CMP	Camshaft Position Sensor
DLC	Data Link Connector
ECM	Engine Control Module
ECT	Engine Coolant Temperature Sensor
EVAP	Evaporative Emission Canister Purge Solenoid Valve
HO <sub>2</sub> S	Heated Oxygen Sensor
IAC	Idle Air Control
IP (Cluster)	Instrument Panel Cluster
KS	Knock Sensor
TPS	Throttle Position Sensor
VSS	Vehicle Speed Sensor
PAID	Rear Park Aid Module
HVAC	Heating-Ventilation-Air Conditioning
HECU	Hydraulic Electronic Control Unit
IMMO	Engine Immobilizer Module

## 1.5.1.2 Arrows and Symbols Description



## Legend

1. Arrow
2. Motion or Direction
3. Rotation Direction of the Arrow
4. Part Number
5. Enlarged Area

## 1.6 Health and Safety

### 1.6.1 Description and Operation

#### 1.6.1.1 Description

Many service and maintenance operations may have impact on personal health and safety. This section lists some of the hazardous operations, materials and equipment, and sets out rules to avoid endangering safety.

This section does not include all the health and safety issues, so that all operations, procedures, and material handling should be carried out, provided that safety and health is to be ensured. Prior to the use of any product, inspect the manufacturer or supplier product instructions.

#### 1.6.1.2 Acid and Alkali

Refer to [1.6.1.8 Battery Acid Fluid](#).

For example, battery has a corrosive sodium carbonate, sulfuric acid.

Batteries and other materials cleaning agent.

Battery has irritation and/or erosion affect on the eyes, skin, nose and throat. It may cause burns in human body and damage to normal clothing.

To avoid battery acid fluid splashing in the eyes, skin and clothing, always wear appropriate protective clothing, gloves and goggles to prevent inhaling acid fog.

Washing equipment such as: eye wash bottles, nozzle, as well as soap, etc. must be in the vicinity to facilitate in the event of splash, and be ready to assist treatment.

Prominently mark eye danger sign.

#### 1.6.1.3 Airbag

Refer to [1.6.1.15 Fire](#) and [1.6.1.10 Chemical Materials](#).

For highly flammable and explosive - to comply with the smoking ban.

Airbags are installed in the steering wheel, in the front passenger seat and inside the instrument panel in front of the front passenger as well as the A pillar, B pillar, C pillar as a supplementary safety system.

Airbag expansion device contains a high-energy propellant which will produce gas with extremely high temperatures (2500 °C/4532 °F).

This propellant is stored in airtight sealed components and fills the airbag when the airbag is deployed. It is prohibited to open airbags during maintenance, as this would lead to dangerous

contact with the propellant. If the gas containers happen to break, wear full protective clothing when handling the overflow materials.

After deploying airbags, wear safety goggles and gloves when handling the airbags.

Deployed airbags must be handled according to the relevant local laws.

If come into direct contact with gas derivatives, you must:

- Wash off the contacted parts with fresh water thoroughly.
- Seek medical assistance.

Airbag - handling procedures (For your safety, please wear protective equipment. When removing airbags, the vehicle ignition switch must be turned to "LOCK" position. Unplug the key. Disconnect the battery negative cable. Wait for 90s before proceed.)

- Store airbag components with upright position.
- Store airbag components in a dry place.
- When carrying airbag components, do not touch the electrode and keep the airbag away from body as far as possible.
- Place airbag cover upward.
- Carefully check airbag components for damage.
- Disconnect the battery negative before connect airbags cable. Wait 60s, standing beside airbag components.
- Accurately calibrate and service all equipments.
- After deploying an airbag, make sure wash your hands.

Airbag - operations to be avoided

- Do not store flammable materials and components together with gas generator.
- Do not immerse the airbag assembly in water or let airbag assembly contact with other liquids.
- Do not store gas generators in a temperature higher than 80 °C/176 °F environment.
- Do not store equipments upside down.
- Do not try to open the gas generator casing.
- Do not expose the gas generator to flame or heat.
- Do not place other items on the components cover.
- Do not use components that have been damaged.



- Do not touch the component or the gas generator within 10 min of airbag being deployed.
- Do not use electrical probe in the return circuit.

#### 1.6.1.4 Air-Conditioning Refrigerant

Refer to [1.6.1.10 Chemical Materials](#).

Skin contact may cause frostbite.

Must comply with the instructions provided by the manufacturer to avoid the exposed lights. Wear suitable goggles and protective gloves.

If refrigerant come into contact with skin or eyes, you should immediately wash the contacted area with water. Apply the appropriate cleaning solution and rinse the eyes. Do not rub, as the case may need to seek medical assistance.

Air-Conditioning Refrigerant - Operations to be Avoided

- Do not store refrigerant at a place with direct sunlight or heat sources.
- When filling, the refrigerant bottles must not be upright. Keep valves down.
- Do not expose refrigerant to frost or snow.
- Do not drop the refrigerant bottle.
- Do not, in any case, directly discharge refrigerant to the atmosphere.
- Do not mix refrigerants, such as the R12 (dichlorodifluoromethane) and R134a (tetrafluoroethane).

#### 1.6.1.5 Adhesives and Sealants

Refer to [1.6.1.15 Fire](#) and [1.6.1.10 Chemical Materials](#).

Flammable Materials - Comply with the smoking ban.

Flammable Materials should normally be kept in no-smoking areas. When using, keep surrounding areas clean, by using such as disposable paper to cover and protect the seat cover. Make use of the brush and the container, including the reused container. Label the container properly.

#### 1.6.1.6 Engine Coolant

Refer to [1.6.1.15 Fire](#).

For example, isopropyl alcohol, ethylene glycol, ethylene glycol, methanol.

Highly flammable flammable.

Used in the vehicle engine coolant circulation system, windshield washer fluid.

When heated, engine coolant (ethylene glycol) may produce steam. Avoid inhaling the vapor.

After direct contact with engine coolant through the skin, directly absorbed dose may reach toxic or harmful dose. If swallowing engine coolant, it may be life-threatening. The person must be taken to hospital and seek medical treatment immediately.

These products must not be used in conjunction with the ordinary food processing or connected with the drinking water supply system.

#### 1.6.1.7 Asbestos

Inhaling asbestos dust likely to cause lung damage, and even cause cancer.

Asbestos waste should be wet before handling. Place in sealed containers and mark clearly at the surface of the container to facilitate safe handling. If you need to try to cut or drill materials containing asbestos, you should make the materials wet first, and only use low-speed hand tools or power tools.

#### 1.6.1.8 Battery Acid Fluid

Refer to [1.6.1.2 Acid and Alkali](#).

The gas released when charging is explosive. Do not conduct fire operations near a charging battery or a recently charged battery.

Maintain good ventilation.

#### 1.6.1.9 Brake Fluid

Refer to [1.6.1.15 Fire](#).

It is a little irritating when comes into contact with the skin and eyes. Avoid the brake fluid coming to contact with eyes, skin. The risk of inhaling brake fluid at room temperature is not high, because its pressure is very low.

#### 1.6.1.10 Chemical Materials

Pay attention, when using, storing and handling chemical material, such as, solvents, sealants, adhesives, coatings, resin foam, battery acid, engine coolant, brake fluid, fuel, lubricating oil and grease. They may be toxic, harmful, corrosive, and irritating or highly flammable, and there is a high risk of odor and dust.

The impact of long term exposure to chemicals may be acute or chronic, temporary or permanent, cumulative, life-threatening, or may affect life expectancy.

Chemical Materials - Operations to be performed

- Carefully read and follow the warnings on the containers of raw materials and any accompanying leaflets, posters or other instructions. Raw materials health and safety information forms can be obtained from the manufacturer.
- After coming in contact with chemical materials, remove it from the skin and clothing as soon as possible. Immediately replace soiled clothing, and clean thoroughly.
- Strictly follow instructions. Wear protective clothing, in order to avoid direct contact with skin and eyes.
- When handling with chemical materials before a break, diet, smoking, or using toilet facilities must wash hands.
- Keep work area clean, tidy and non-chemical material spill.

#### Chemical Materials - Operation to be Avoided

- Unless there is manufacturer's instruction, do not mix chemical materials. Certain chemicals mixture will form other toxic or harmful chemical substances. When mixing, other toxic and harmful gases may be released and it may cause an explosion and other accidents.
- Do not spray chemical materials in a closed environment.
- Unless there is manufacturer's instruction, do not heat chemical materials. Some chemicals are highly flammable and others may release toxic and harmful gases.
- Do not keep chemical materials containers open. Emitted gas, may accumulate to a toxic, hazardous or explosive level. Some gases are heavier than air and they will accumulate in a closed space.
- Do not store chemical materials in an unlabeled container.
- Do not use chemical materials clean hands and clothing. Chemicals, especially solvents and fuel will make the skin dry. It may cause allergies, skin infection. Chemicals direct contact with the skin will affect human health.
- Unless the empty container has been cleaned under supervision, do not use the container to store other chemical materials.
- Do not smell chemical materials. Short-term exposure to high concentrations of gas may still have the possibility of poisoning or hurt.

#### 1.6.1.11 Dust

Powder and dust may be irritating, harmful or toxic. Avoid inhaling the chemical material powder stirred up dry friction. If the ventilation is poor, wear a breathing mask protective equipment in order to prevent inhaling dust.

Flammable fine dust may cause explosion. Keep them away from an explosion or a fire.

#### 1.6.1.12 Electrical Shock

Fail to follow instructions when using electrical equipment or misuse of the equipment in good condition, may cause electrical shock.

Service electrical equipments within the specified time and run regular tests. Failure of equipment should be noted. Move the failed equipment out of working area.

Do not use wires, cables, plugs and sockets that are wear, tear, kink, cut, broken or damaged. Do not let electrical equipment and wiring contact with water.

Make sure the electrical equipment protected the correct fuse.

Do not misuse electrical equipment. Do not use any faulty equipment, which may affect personal safety.

Make sure mobile electrical equipment cable not be damaged.

Must provide first aid training to the specialized electrical equipment operator.

In the event of electrical shock:

- Switch off the power supply before contact with the victim.
- If the power can not be switched off, use dry insulation material to insulate the victim.
- If you have received a special first-aid training, provide on-site first aid immediately.
- Seek medical assistance.

#### 1.6.1.13 Exhaust

Exhaust contains toxic and hazardous chemicals, such as carbon oxides, nitrogen oxides, acetaldehyde, lead and aromatic hydrocarbon type material. Only run the engine at a place with good ventilation or an open space.

#### 1.6.1.14 Fiber Isolation

Refer to [1.6.1.11 Dust](#).

Used to isolate the noise and sound.

The surface of the fiber substance and the sharp edges can cause skin irritations.

During operating procedures, follow instructions and wear gloves to avoid excessive skin contact with the fibers.

### 1.6.1.15 Fire

Many materials related to vehicle maintenance are extremely flammable. Some materials will produce toxic and harmful gases after burnt.

When storing and handling flammable materials or solvents, follow the fire safety rules, especially near the electrical equipment or the welding operation areas.

Before use electric welding equipment, make sure there is no fire hazard.

When conducting welding or using a heating equipment, always have an appropriate fire extinguisher ready in the area around the job.

### 1.6.1.16 First Aid

Not only comply with the law, but also have first aid trained personnel ready in the work area.

If the eyes are splashed, rinse eyes with fresh water for at least 10 min.

If the skin is contaminated, you need to use soap and fresh water to clean the contaminated area.

If you get frostbite, immerse the frostbite body part in ice water or cold water.

If a staff inhaled toxic gases, that staff should be immediately transported to a place with fresh air. If that staff still has symptoms of inhaling toxic gases, the staff should be immediately taken to a hospital for medical treatment.

If you accidentally swallow the liquid, inform the doctor the information marked on the container label. Unless there are instructions on the label, the affected person can not be guided vomit.

### 1.6.1.17 Foam - Polyurethane

Refer to [1.6.1.15 Fire](#).

Cured foam is used for seat cushion with the decoration.

Comply with manufacturers instructions.

Components that are not treated through chemical reactions may be irritating. They may be harmful to the skin and eyes. Wear gloves and goggles when operating.

Staff with chronic respiratory diseases, asthma, bronchial problems, or suffering from hereditary allergies should not deal with or come close to the uncured substances.

Certain spare parts, steam or spray may cause allergy. They may be toxic and harmful.

#### Remember

Do not inhale vapor or spray. These materials must be used at a well ventilated place or with respiratory protection measures. Do not immediately remove the mask after spraying. Wait for the steam and the spray completely dissipated.

Uncured components and cured foam will produce toxic and harmful gases, during the bubble operation. Unless the steam and the spray has been completely removed, do not smoke or use fire and electrical equipment. Any foam material or special foam cutting should be carried out at a well-ventilated place.

### 1.6.1.18 Fuel

Minimize direct contact with the skin of fuel. Immediately wash the skin with soap and clean water after direct contact with fuel.

#### Gasoline

Highly Flammable - Comply with the smoking ban.

If swallowed, gasoline can cause irritation to the mouth and throat. If absorbed in stomach, gasoline can lead to weakness and unconsciousness. Only a small amount of gasoline will affect the lives of children. If the gasoline enters into the lungs, it is very dangerous.

Gasoline will cause dry skin. Prolonged or frequent contact with gasoline will cause skin allergies and skin infection. Gasoline entering the eye will cause severe eye pain.

Motor vehicle used gasoline contains a large amount of benzene. Inhaling gasoline can cause poisoning. The concentration of gasoline vapor must be kept at low. High concentration of gasoline vapor can cause eye, nose and throat irritation as well as nausea, headache, depression, physical discomfort and drunken behavior. High concentration of gasoline vapor will lead to rapid loss of consciousness.

When handling gasoline, we must maintain good ventilation, with special attention to operate in a confined space. Avoid splashing when pouring gasoline to reduce the risk caused by inhaling gasoline vapor.

Pay special attention when cleaning and carry out maintenance of gas storage equipment.

Gasoline can not be used as cleaning agents to use. Do not suck gasoline.

### 1.6.1.19 Gas Cylinder

Refer to [1.6.1.15 Fire](#).

Oxygen, acetylene, argon and propane-like gas, is usually stored under 13.8 Mp (2,001 psi) pressure in the gas cylinder. When handling these cylinders, you must be really careful. Avoid mechanical damage to the cylinder or valve. Clearly mark the label with the gas filled inside the cylinder.

Cylinders should be stored in well ventilated areas and avoid placing in snow or under direct sunlight. Fuel gases, such as acetylene and propane should not be stored together with oxygen cylinders.

Pay special attention to the leakage from gas cylinders or pipeline. Avoid a fire source.

Only professionally trained personnel can carry out the gas cylinder related work.

### 1.6.1.20 General Workshop Tools and Equipment

Always keep all of the tools and equipment in good working order. It is also very important that operate correctly.

Do not use tools or equipment for unintended purposes. Do not make cranes, jacks, axles and chassis frames or sling-like device to withstand more than its maximum load. The damage caused by overload is not necessarily immediately apparent, but it can cause a serious accident next time in use.

Do not use damaged or improperly worked tools or equipment, especially in certain high-speed devices such as: grinding wheel. Damaged wheel will be broken without a warning and can cause serious injury.

When using a grinding wheel, a chisel or a sand blasting equipment, wear proper eye protection devices.

When using a blasting equipment to handle asbestos-containing materials or using spray equipment, wear the appropriate breathing mask.

There must be an equipment that can control dust, spray and dust content.

### 1.6.1.21 Lubricants and Grease

Avoid prolonged and repeated contact with mineral oils. All the oil and grease, are irritate to eyes and the skin.

#### Used Engine Oil

Prolonged and repeated contact with mineral oils will cause the loss of the natural skin oils, causing dry, irritation and skin diseases. In addition, used engine oil is very likely to contain harmful substances that can lead to skin cancer. Make sure use the skin protective equipment and be equipped with adequate washing facilities.

Do not be used engine oil as a lubricant, or any other purpose that has direct contact with the skin.

#### Health and Safety Rules

- Avoid prolonged and repeated contact with engine oil, especially the used engine oil.
- Wear protective clothing, including impermeable gloves.
- Do not put the cleaning cloth stained with engine oil into the pocket.
- Prevent engine oil contaminating clothing, especially clothing next to the skin.
- Do not wear engine oil contaminated clothing and footwear. Clothes must be cleaned regularly and kept clean.
- Immediate treatment to open wounds.
- Put protective cream on the skin to avoid skin direct contact with the engine oil.
- Wash with soap and fresh water to remove all of the engine oil. Apply the protective agent containing Lanolin will help replace the skin's natural oils.
- If a skin disease occurs, you should immediately seek medical treatment.
- Remove grease before commencing work.
- If there is a possibility of direct eye contact with chemicals, wear goggles, such as chemical goggles or face masks. Eye wash equipment should also be equipped.

#### Environment Warning

Used or waste engine oil and oil filter should be recycled by authorized or licensed waste disposal companies. If in doubt, please contact your local authorities.

Pouring used or waste engine oil directly into the ground, sewer or drainage facilities, or into water pipe is illegal.

### 1.6.1.22 Noise

Operating certain equipments will produce high-decibel noise and may cause hearing damage. You should wear appropriate hearing protection devices.

## 1.7 Standards and Metrics

### 1.7.1 Description and Operation

#### 1.7.1.1 Equivalent - Decimal and Metric

Fraction (in)	Decimal (in)	Metric (mm)
1 / 64	0.015625	0.39688
1 / 32	0.03125	0.79375
3 / 64	0.046875	1.19062
1 / 16	0.0625	1.5875
5 / 64	0.078125	1.98437
3 / 32	0.09375	2.38125
7 / 64	0.109375	2.77812
1 / 8	0.125	3.175
9 / 64	0.140625	3.57187
5 / 32	0.15625	3.96875
11/64	0.171875	4.36562
3 / 16	0.1875	4.7625
13/64	0.203125	5.15937
7 / 32	0.21875	5.55625
15/64	0.234375	5.95312
1 / 4	0.25	6.35
17/64	0.265625	6.74687
9 / 32	0.28125	7.14375
19/64	0.296875	7.54062
5 / 16	0.3125	7.9375
21/64	0.328125	8.33437
11/32	0.34375	8.73125
23/64	0.359375	9.12812
3 / 8	0.375	9.525
25/64	0.390625	9.92187
13/32	0.40625	10.31875
27/64	0.421875	10.71562
7 / 16	0.4375	11.1125
29/64	0.453125	11.50937

Fraction (in)	Decimal (in)	Metric (mm)
15/32	0.46875	11.90625
31/64	0.484375	12.30312
1 / 2	0.5	12.7
33/64	0.515625	13.09687
17/32	0.53125	13.49375
35/64	0.546875	13.89062
9 / 16	0.5625	14.2875
37/64	0.578125	14.68437
19/32	0.59375	15.08125
39/64	0.609375	15.47812
5 / 8	0.625	15.875
41/64	0.640625	16.27187
21/32	0.65625	16.66875
43/64	0.671875	17.06562
11/16	0.6875	17.4625
45/64	0.703125	17.85937
23/32	0.71875	18.25625
47/64	0.734375	18.65312
3 / 4	0.75	19.05
49/64	0.765625	19.44687
25/32	0.78125	19.84375
51/64	0.796875	20.24062
13/16	0.8125	20.6375
53/64	0.828125	21.03437
27/32	0.84375	21.43125
55/64	0.859375	21.82812
7 / 8	0.875	22.225
57/64	0.890625	22.62187
29/32	0.90625	23.01875
59/64	0.921875	23.41562
15/16	0.9375	23.8125
61/64	0.953125	24.20937

Fraction (in)	Decimal (in)	Metric (mm)
31/32	0.96875	24.60625
63/64	0.984375	25.00312
1	1.0	25.4

### 1.7.1.2 US English/Metric Units Conversion

US English	Multiply / Divide	Metric
US English measurement units calculation, divided by the number in the middle column .		
Metric measurement units calculation, multiplied by the number in the middle column .		
Length		
Inch (in)	25.4	Millimeter (mm)
Foot (ft)	0.3048	Meter (m)
Yard (yd)	0.9144	Meter (m)
Mile (mil)	1.609	Kilometer (km)
Area		
Square Inch (in <sup>2</sup> )	645.2	Square Millimeter (mm <sup>2</sup> )
Square Inch (in <sup>2</sup> )	6.45	Square Centimeter (cm <sup>2</sup> )
Square Feet (ft <sup>2</sup> )	0.0929	Square Meter (m <sup>2</sup> )
Square Yard (yd <sup>2</sup> )	0.8361	Square Meter (m <sup>2</sup> )
Volume		
Cubic Inch (in <sup>3</sup> )	16,387.0	Cubic Millimeter (mm <sup>3</sup> )
Cubic Inch (in <sup>3</sup> )	16.387	Cubic Centimeter (cm <sup>3</sup> )
Pint (pt)	0.5680	L (L)
Quart (quart)	0.9464	Cubic Meter (m <sup>3</sup> )
Gallon (Vsgal)	3.7854	Cubic Meter (m <sup>3</sup> )
Cubic Yard (yd <sup>3</sup> )	0.764	Cubic Meter (m <sup>3</sup> )
Weight		
Pound (lb)	0.4536	Kilogram (kg)
United Kingdom t	907.18	Kilograms (kg)
United Kingdom t	0.907	T (t)
Force		
Kilogram Force (kgf)	9.807	Newton (N)
Ounce Force (ozf)	0.2780	Newton (N)



US English	Multiply / Divide	Metric
Pound Force (lbf)	4.448	Newton (N)
Acceleration		
ft / sec <sup>2</sup> (ft / s <sup>2</sup> )	0.3048	m / sec <sup>2</sup> (m / s <sup>2</sup> )
ft / sec <sup>2</sup> (ft / s <sup>2</sup> )	0.0254	m / sec <sup>2</sup> (m / s <sup>2</sup> )
Torque		
Pound Inch (lb-in)	0.11298	Newton • meter (Nm)
lb ft (lb-ft)	1.3558	Newton • meter (Nm)
Power		
Horsepower (hp)	0.745	Kilowatt (kw)
Pressure (stress)		
inch ft (in-ft <sub>2</sub> o)	0.2488	KPa (kPa)
Pound / Square Inch (lb-in <sup>2</sup> )	6.895	KPa (kPa)
Energy (Power)		
US English Thermal Unit (Btu)	1,055.0	Joules (1 Joule=1 watt second) J (1J=1ws)
lb ft (lb-ft)	1.3558	Joule (1 Joule=1 watt second) J (1J=1ws)
Kilowatt-Hour (kWh)	3,600,000.0	Joule (1 Joule=1 watt second) J (1J=1ws)
Light		
Foot-Candle (fc)	10.764	lm / m <sup>2</sup> (lm / m <sup>2</sup> )
Speed		
Mile / Hour (mil / h)	1.6093	Km / Hour (km/h)
Temperature		
(° F-32) * 5 / 9	=	° C
° F	=	(9 / 5 * ° C +32)

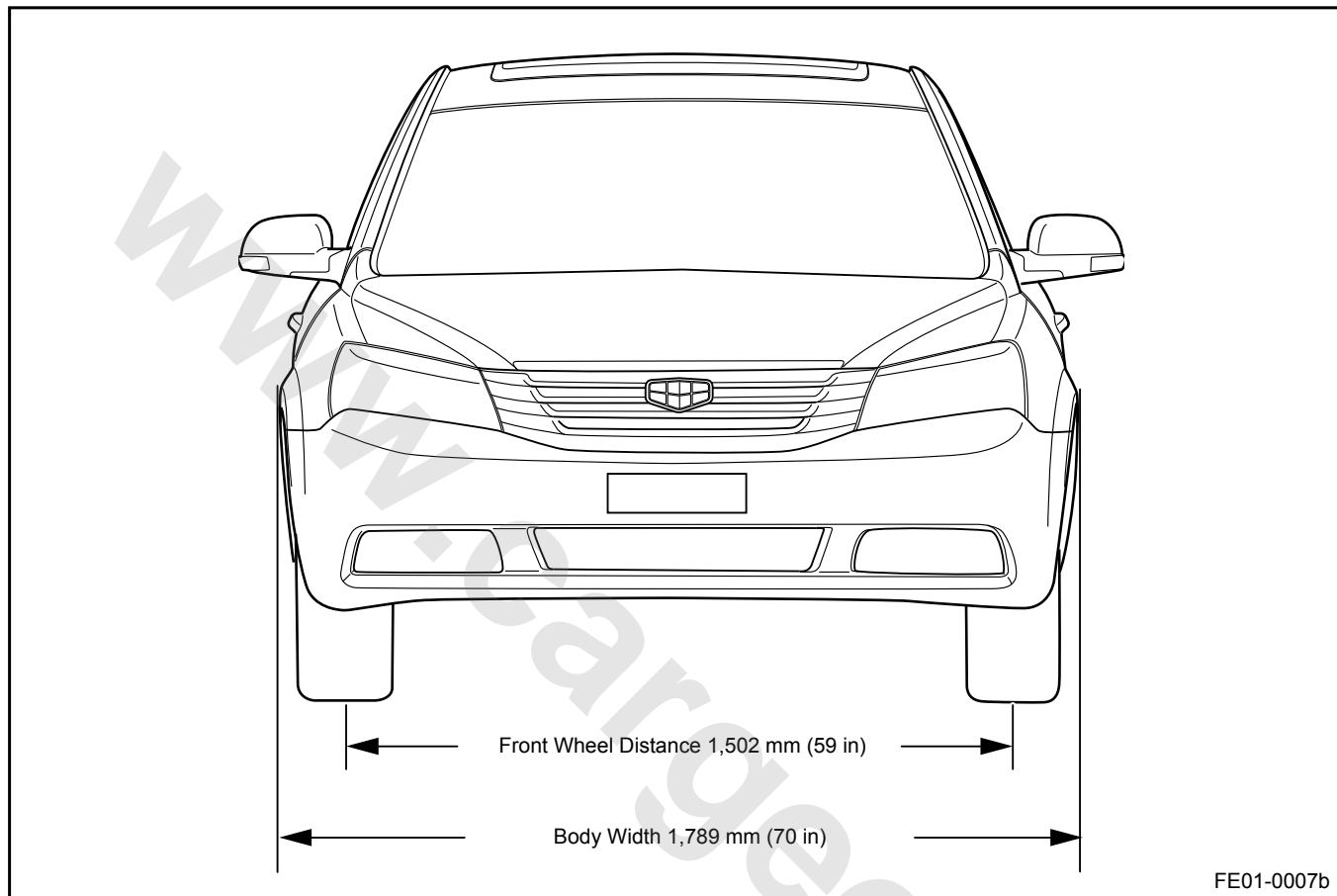


## 1.8 Vehicle Specifications

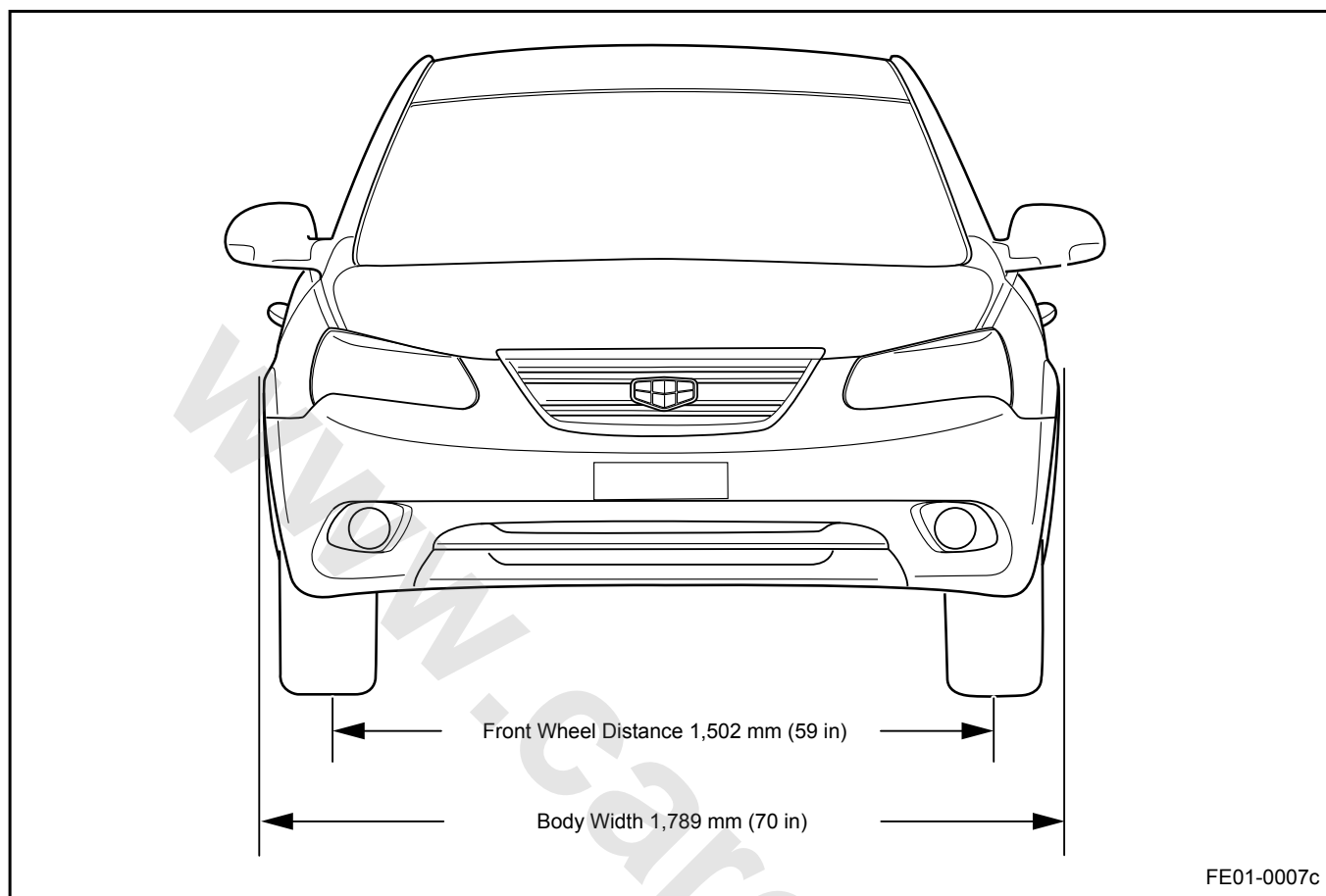
### 1.8.1 Specifications

#### 1.8.1.1 Body Size

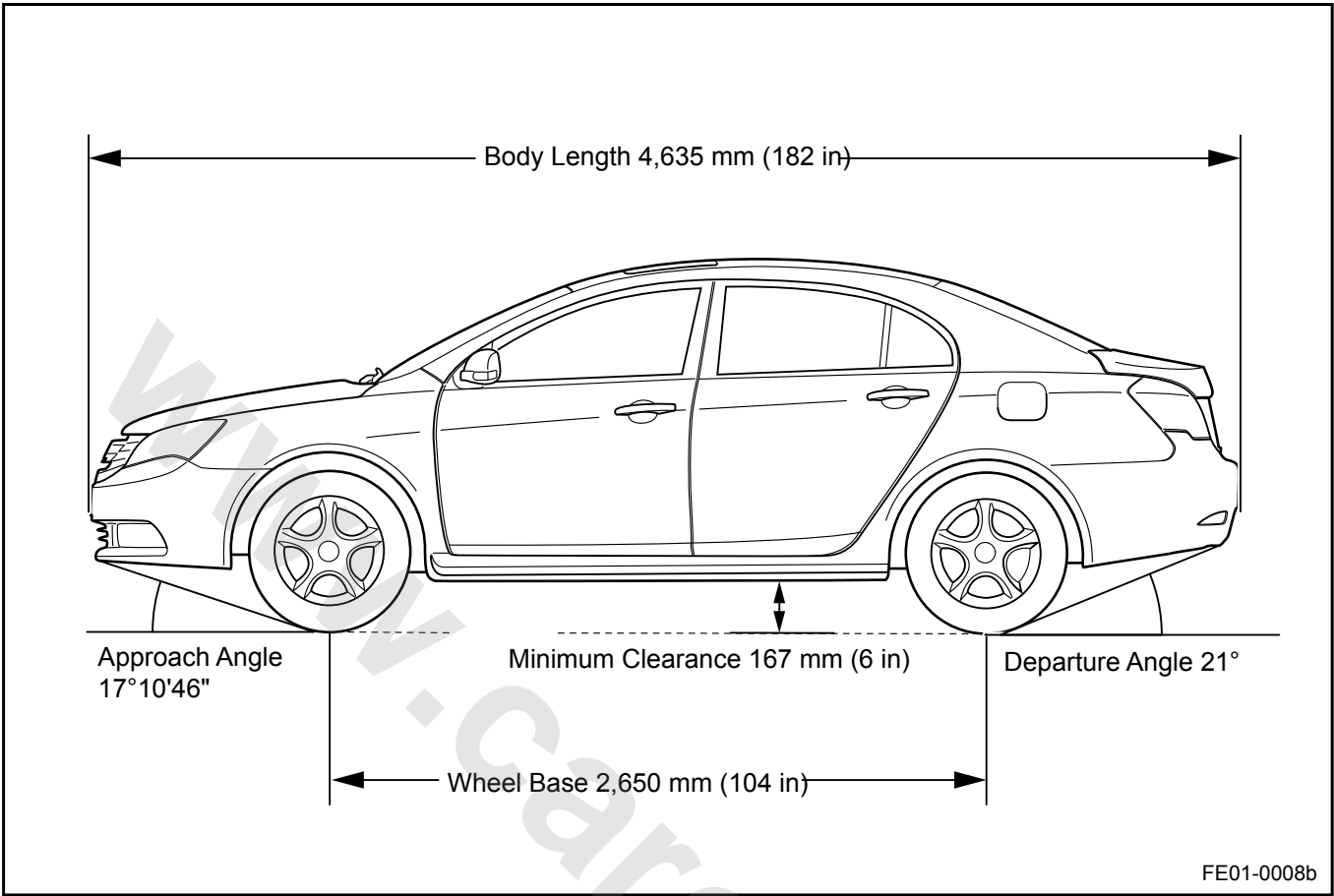
Front View (Sedan)



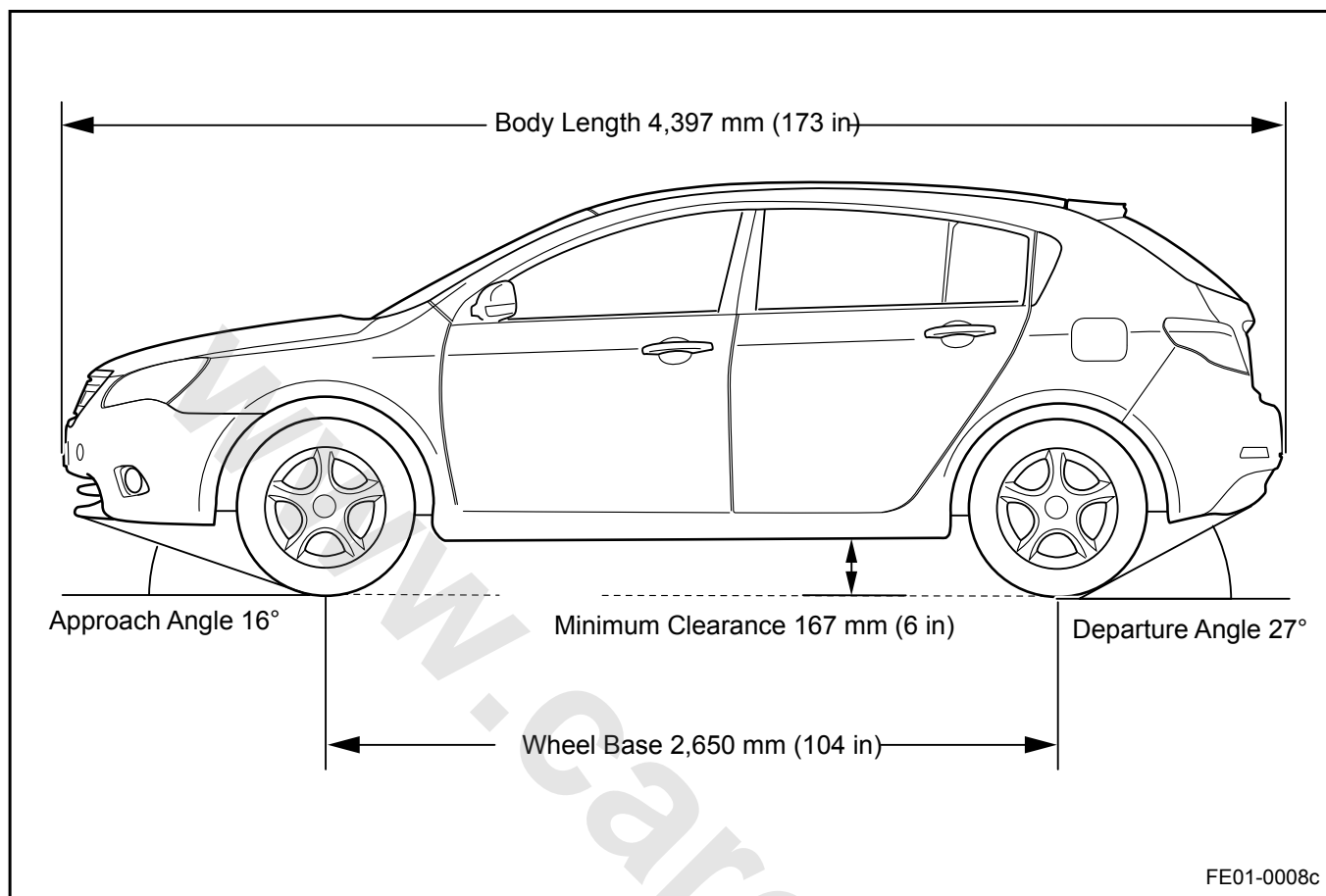
Front View (Hatchback)



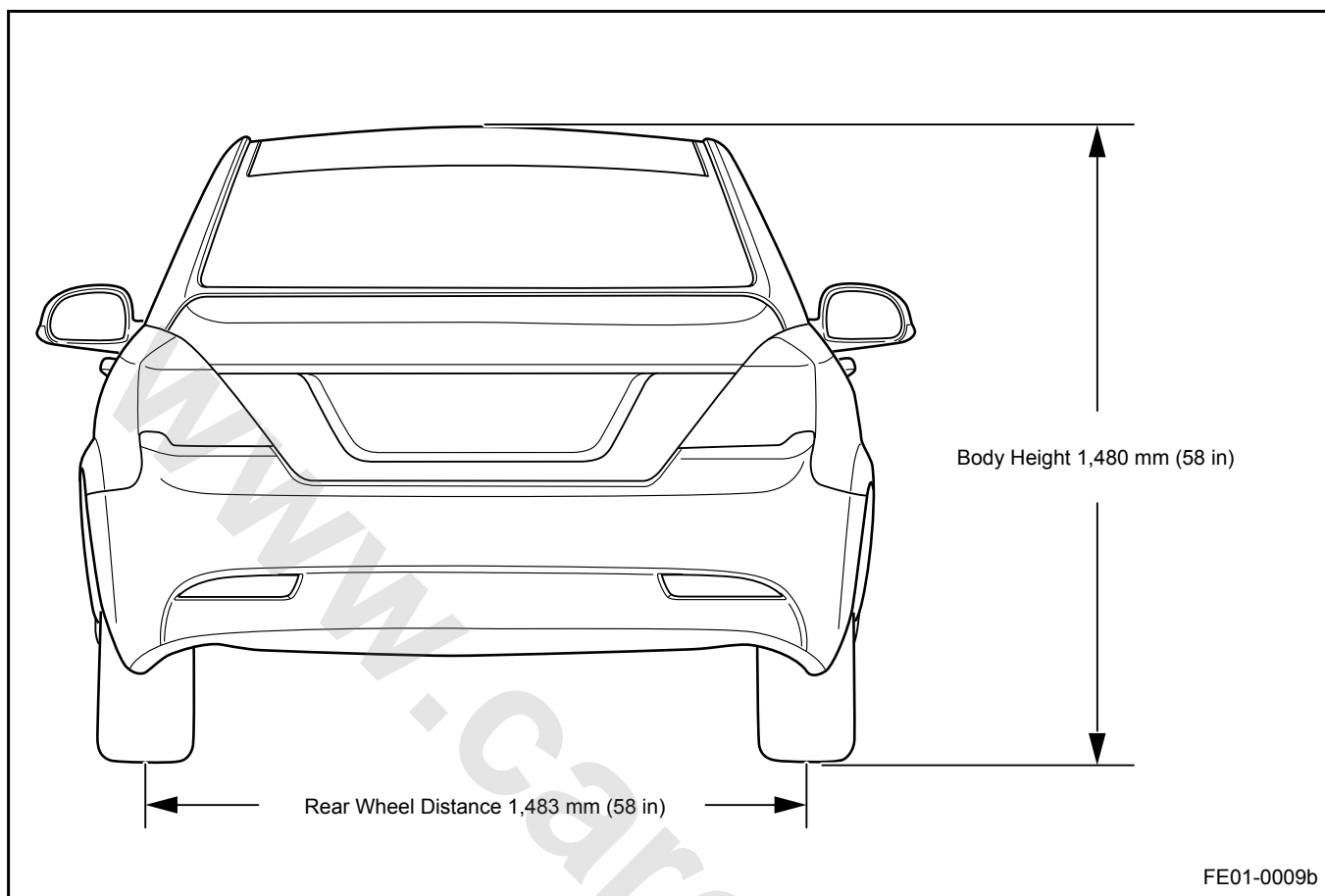
Side View (Sedan)



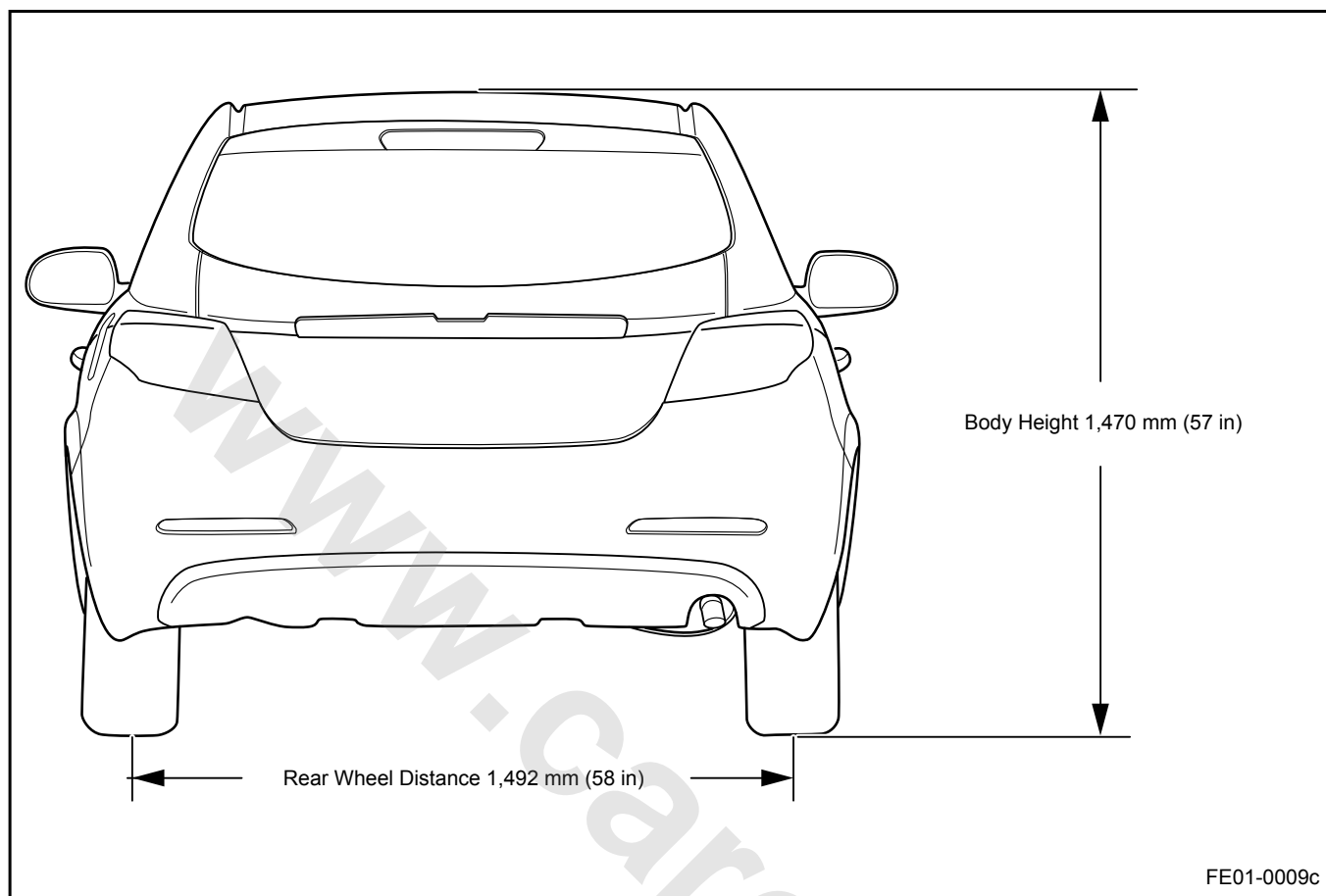
Side View (Hatchback)



Rear View (Sedan)

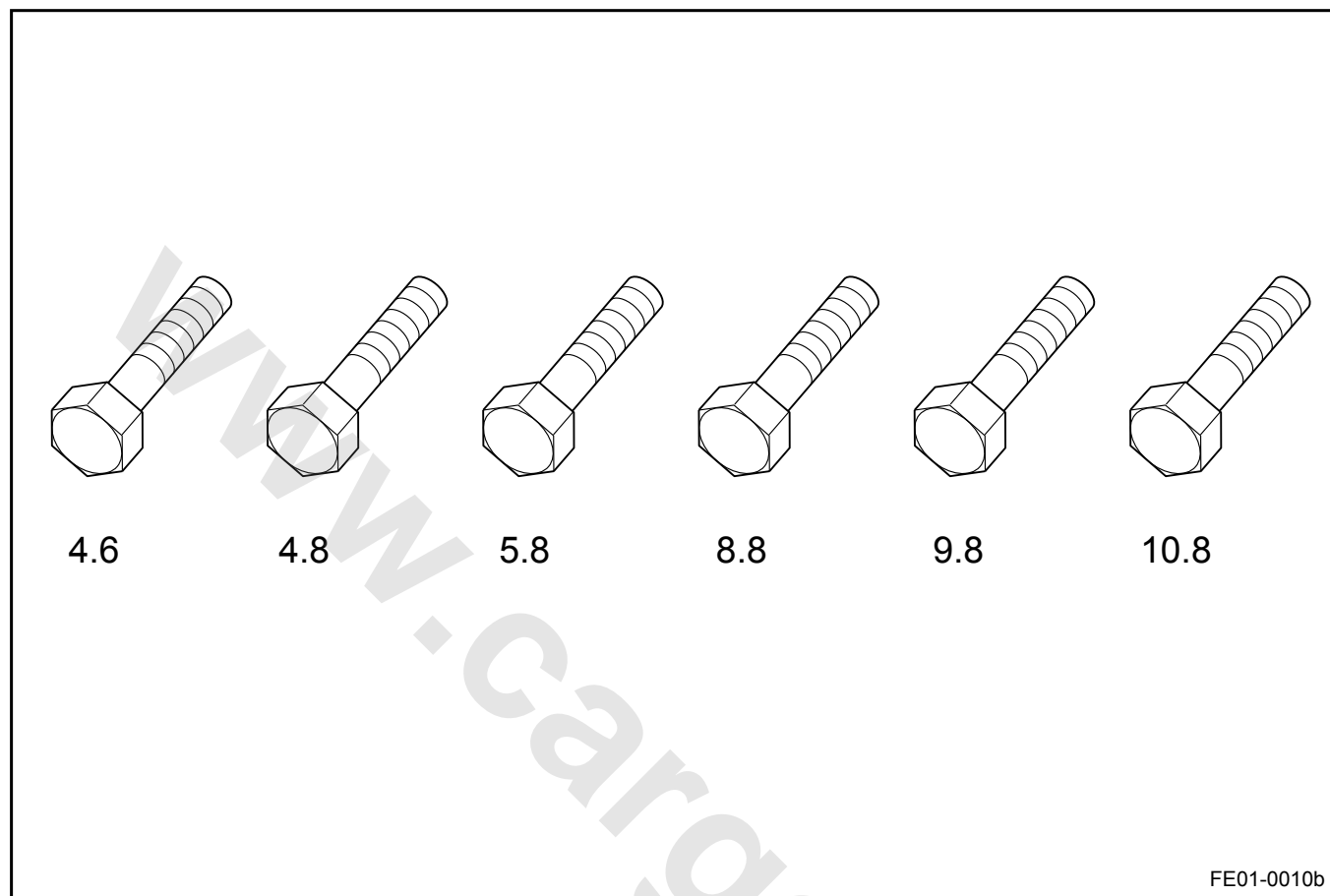


Rear View (Hatchback)



### 1.8.1.2 Fastener Specifications

Fastener Specifications Table



Geely Automotive engineering standards have adopted some parts of the definition of the standard ISO metric fastener size, aimed at reducing the number of different size fasteners used,

while maintaining the best thread quality for each size. As Metric bolts shown above, the intensity level increases with the number.

#### Vehicle Fasteners Specifications

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hex Head Bolt and Washer Assembly	Connecting ECM and ECM Bracket	M6 × 20	7-9	5.2-6.6
Hexagon Flange Bolts	Fixed ECM Bracket	M6 × 20	8-10	5.9-7.4
Hex Head Bolt and Washer Assembly	Speed Sensor	M6 × 20	7-9	5.2-6.6
Hex Head Bolt and Spring Washer Assembly	Starter	M10 × 1.25 × 80	38-45	28-33.2

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hex Head Bolt and Spring Washer Assembly	Starter	M10 × 1.25 × 60	38-45	28-33.2
Hexagon Flange Bolts	Connecting the Engine and Gearbox	M12 × 1.25 × 55	96-110	70.8-81.1
Hex Head Bolt, Spring Washer and Washer Assembly	Connecting the Engine and Gearbox	M10 × 1.25 × 45	53-65	39.1-47.9
Hex Head Bolt, Spring Washer and Washer Assembly	Connecting the Engine and Gearbox	M10 × 1.25 × 40	53-65	39.1-47.9
Hexagon Flange Bolts	Clutch Cylinder	M8 × 1.25 × 25	18-22	13.3-16.2
Hex Head Bolt, Spring Washer and Washer Assembly	Clutch Cylinder Tubing Bracket	M8 × 1.25 × 16	18-22	13.3-16.2
Hex Head Bolt, Spring Washer and Washer Assembly	Engine Cooling System	M6 × 1.25 × 20	8-12	5.9-8.9
Hex Head Bolt, Spring Washer and Washer Assembly	Engine Cooling System	M8 × 1.25 × 20	22-26	16.2-19.2
Hexagon Flange Bolts	Engine Cooling System	M8 × 1.25 × 20	20-26	14.8-19.2
Hex Head Bolt, Spring Washer and Washer Assembly	Exhaust	M12 × 1.25 × 45	47-57	34.7-42
Hexagon Flange Nut	Exhaust	M12	47-57	34.7-42
Hexagon Nut With a Flower-Shaped Washer Assembly	Exhaust	M6	8-12	5.9-8.9
Hex Head Bolt Washer Assembly	Air Filter Intake Manifold Assembly	M6 × 12	8-12	5.9-8.9
Hex Head Bolt Washer Assembly	Air Filter Resonant Tank Assembly	M6 × 20	8-12	5.9-8.9
Hexagon Flange Nut	Air Filter Resonant Tank Assembly	M6	8-12	5.9-8.9
Hex Head Bolt Washer Assembly	Air Filter Resonant Tank Assembly	M6 × 16	8-12	5.9-8.9



Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hex Head Bolt Washer Assembly	Air Cleaner Assembly	M6 × 30	8-12	5.9-8.9
Hex Head Bolt Washer Assembly	Fuel Tank	M10 × 1.25 × 30	38-46	28-33.9
Cross Slot Pockets Hexagon Head Bolts, Washer and Spring Washer Assembly	Canister Ventilation Filter Mounting Brackets to the Body; Canister Brackets to the Engine Control Valve Assembly	M6 × 1.25 × 20	7-9	5.2-6.6
Hex Head Bolt and Washer Assembly	Fuel Filter Mounting Brackets	M6 × 1.25 × 16	8-10	5.9-7.4
Hex Head Bolt and Washer Assembly	Canister Assembly	M6 × 1.25 × 20	8-10	5.9-7.4
Hex Head Bolt and Pad Assembly	Refueling Tube	M8 × 1.25 × 15	20-24	14.8-17.7
Hex Head Bolt and Washer Assembly	Refueling Tube	M8 × 1.25 × 20	20-24	14.8-17.7
Hexagon Flange Bolts	Power Train Suspension	M10 × 1.25 × 100	47-57	34.7-42
Hexagon Flange Bolts	Power Train Suspension	M10 × 1.25 × 22	47-57	34.7-42
Hexagon Flange Bolts	Power Train Suspension	M10 × 1.25 × 45	50-60	36.9-44.3
Hexagon Flange Bolts	Power Train Suspension	M10 × 1.25 × 65	70-86	51.6-63.4
Hexagon Flange Bolts	Power Train Suspension	M10 × 1.25 × 90	47-57	34.7-42
Hexagon Flange Bolts	Power Train Suspension	M8 × 1.25 × 16	47-57	34.7-42
Hexagon Flange Nut	Power Train Suspension	M10	47-57	34.7-42
Hexagon Flange Bolts	Power Train Suspension	M12 × 1.25 × 100	70-90	51.6-66.4
Thick Hexagon Flange Nut	Power Train Suspension	M10	47-57	34.7-42
Hexagon Flange Nut	Power Train Suspension	M12	47-57	34.7-42
Hexagon Flange Bolts	Manual Shift	M8 × 40	16-26	11.8-19.2
Hexagon Flange Nut	Election Shift Shaft Assembly	M6	6-12	4.4-8.9
Hex Head Bolt and Washer Assembly	Throttle Bracket	M6 × 20	6-12	4.4-8.9
Hex Head Bolt, Spring Washer and Pad Washer Assembly	Accelerator Pedal Assembly, Throttle Assembly	M6 × 30	8-12	5.9-8.9

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Cross Slot Pockets Hexagon Head Bolts and Washer Assembly	Brake and Clutch Pedal Mounting Bracket	M8 × 16	16-26	11.8-19.2
Screw Driving Double Steel Wire Hoop	Master Cylinder	φ17	-	-
Hex Head Bolt, Spring Washer and Washer Assembly	Single Tube	M6 × 16	6-12	4.4-8.9
Hexagon Flange Nut	Clutch Master Cylinder Assembly	M8	16-26	11.8-19.2
Hexagon Flange Nut	Brake and Clutch Pedal Mounting Bracket	M8	16-26	11.8-19.2
Hex Head Bolt, Spring Washer and Washer Assembly	Park Brake Control Mechanism Assembly	M8 × 25	19-24	14-17.7
Hex Head Bolt and Washer Assembly	Park Brake	M6 × 14	16-26	11.8-19.2
Wheel Nut	Wheel Rim and Brake	M12	105-115	77.4-84.8
Hex Head Bolt and Washer Assembly	Wheel Speed Sensor Wiring Harness	M6 × 18	19	14
Hex Head Bolt, Spring Washer and Washer Assembly	Single-Tube Clip	M6 × 30	19	14
Hexagon Bolt, Spring Washer and Washer Assembly	HECU Controller Assembly	M8 × 20	35	25.8
Bolt and Washer Assembly	Steering Column Separation Stand	M8 × 30	35	25.8
Hexagon Flange Bolts	Column Brackets and Beams	M8 × 55	25	18.4
Steering Column Universal Joint Bolts	Universal Fork	M8	42-58	31-42.8
Hexagon Flange Bolts	Steering and Sub-frame	M12 × 33	125	92.2
Hexagon Flange Bolt and Pad Assembly	Steering and Sub-frame	M12 × 58	125	92.2
Hex Slotted Nut (Dacromet)	Outer End of Steering Horizontal Bar and The Steering Knuckle Ball	M12 × 1.25	33	24.3

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hex Head Bolt and Washer Assembly	Body and Sub-frame	M6 × 14	26-32	19.2-23.6
Hex Head Bolt and Washer Assembly	Body	M6 × 30	26-32	19.2-23.6
Hex Head Bolt and Washer Assembly	Power Steering Pump Assembly	M6 × 20	26-32	19.2-23.6
Hexagon Flange Bolts	Power Steering Pump and The Engine	M10 × 1.25 × 122	42-58	31-42.8
Hexagon Flange Nut	Power Steering Pump and The Engine	M10 × 1.25	42-58	31-42.8
Hexagon Flange Bolts	Main Beam Rear Axle and Rear Stabilizer Bar Assembly	M12 × 55	135-165	99.6-121.7
Hexagon Flange Nut	Main Beam Rear Axle and Rear Stabilizer Bar Assembly	M12	135-165	99.6-121.7
Hex Head Bolt and Pad Assembly	Body and The Rear Axle Assembly	M12 × 135	130-160	95.9-118
Hexagon Flange Nut	Body and The Shock Absorber	M10	75-85	55.3-62.7
Hexagon Flange Nut	Shock Absorber and The Rear Axle	M14	135-165	99.6-121.7
Slotted Hex Flange Nut	Body and The Rear Axle Assembly	M12	130-160	95.9-118
Hexagon Flange Bolts	Body and The Shock Absorber	M10 × 25	75-85	55.3-62.7
Hexagon Flange Nut	Stabilizer Clips With The Front Sub-frame	M12	69-79	50.9-58.3
Hex Head Bolt and Washer Assembly	Stabilizer Clips With The Front Sub-frame	M8 × 25	69-79	50.9-58.3
Hexagon Flange Bolts	Arm Welding Assembly and The Ball Pin Assembly	M12 × 16	130-160	95.9-118
Hexagon Flange Nut	Arm Welding Assembly and The Ball Pin Assembly	M12	130-160	95.9-118
Hex Head Bolt and Pad Assembly	Lower Control Arm With The Front Sub-frame	M14 × 95	160-200	118-147.5

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hex Head Bolt and Washer Assembly	Body	M10 × 18	65-85	47.9-62.7
Hexagon Flange Bolt	Front Shock Absorber and Steering Knuckle	M14 × 55	32-38	23.6-28
Hexagon Flange Bolt and Washer Assembly	Front Sub-frame and Body	M14 × 55	160-200	118-147.5
Hexagon Flange Bolt and Washer Assembly	Front Sub-frame and Body	M14 × 95	160-200	118-147.5
Thick Hexagon Flange Nut	Front Shock Absorber and Body	M8	36-42	26.6-31
Hexagon Flange Nut	Lower Control Arm and Front Sub-frame	M14	160-200	118-147.5
Hexagon Flange Nut	Front Shock Absorber and Steering Knuckle	M14	32-38	23.6-28
Hexagon Slotted Nut	Control Arm Assembly and Steering Knuckle	M14	131-159	96.6-117.3
Hexagon Flange Bolt	Control Arm Welding Assembly and Ball Pin Assembly	M12 × 16	131-159	96.6-117.3
Hexagon Flange Nut	Control Arm Welding Assembly and Ball Pin Assembly	M12	131-159	96.6-117.3
I Type Non-metallic Insert Hex Lock Nut	Shock Absorber Piston Rod	M14	60-80	44.4-59.2
I Type Non-metallic Insert Hex Lock Nut	Shock Absorber Piston Rod	M14	60-80	44.4-59.2
Hexagon Flange Bolt	Body	M6 × 16	9-12	6.6-8.9
Hexagon Flange Nut	Body	M6	9-12	6.6-8.9
Hexagon Flange Bolt	Body	M6 × 16	9-12	6.6-8.9
Hexagon Flange Nut	Body	M6	9-12	6.6-8.9
Hexagon Bolt and Washer Assembly	Body	M6 × 20	9-12	6.6-8.9
Hexagon Flange Nut	Body	M6	9-12	6.6-8.9
Hexagon Flange Bolt	Body	M8 × 20	29-35	21.4-25.8
Hexagon Flange Bolt	Body	M8 × 20	29-35	21.4-25.8
Hexagon Flange Bolt	Body	M8 × 20	29-35	21.4-25.8

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hexagon Flange Nut	Body	M8	23-26	17-19.2
Hexagon Flange Bolt	Body	M8 × 20	29-35	21.4-25.8
Hexagon Flange Nut	Body	M8	23-26	17-19.2
Hexagon Flange Bolt	Body	M8 × 20	23-26	17-19.2
Hexagon Flange Nut	Body	M10	59-75	43.5-55.3
Hexagon Head Bolt, Spring Washer and Washer Assembly	Body	M10 × 25	59-75	43.5-55.3
Hexagon Head Bolt, Spring Washer and Washer Assembly	Body	M6 × 20	9-12	6.6-8.9
Hexagon Head Bolt and Pad Assembly	Body	M12 × 30	95-110	70.1-81.1
Hexagon Flange Bolt	Left Front Door Assembly	M8 × 23	23-26	17-19.2
Hexagon Flange Bolt	Right Front Door Assembly	M8 × 23	23-26	17-19.2
Hexagon Flange Bolt	Left Rear Door Assembly	M8 × 23	23-26	17-19.2
Hexagon Flange Bolt	Right Rear Door Assembly	M8 × 23	23-26	17-19.2
Cross Slot Countersunk Head Screw	Left Rear Door Assembly	M5 × 8	1-3	0.7-2.2
Cross Slot Countersunk Head Screw	Right Rear Door Assembly	M5 × 8	1-4	0.7-3
Hexagon Flange Bolt	Left Rear Door Assembly	M6 × 10	9-12	6.6-8.9
Hexagon Flange Bolt	Right Rear Door Assembly	M6 × 10	9-12	6.6-8.9
Hexagon Flange Nut	Hood Assembly	M8	23-26	17-19.2
Hexagon Flange Bolt	Trunk Assembly	M8 × 35	23-26	17-19.2
Hexagon Head Bolt	Left Instrument Panel Shield Assembly	M6 × 12	8-12	5.9-8.9
Cross-Slot Pan Head Screw and Washer Assembly	Instrument Panel	ST4.8 × 16	4-6	3-4.4

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hexagon Flange Bolt	Instrument Panel	M8 × 100	8-12	5.9-8.9
Hexagon Head Bolt	Instrument Panel	M8 × 22	8-12	5.9-8.9
Hexagon Flange Nut	Instrument Panel Subassembly	M8	8-12	5.9-8.9
Cross-Slot Pan Head Screw	Instrument Panel Assembly	ST4.2 × 9.5	4-6	3-4.4
Cross-Slot Pan Head Screw	Left Instrument Panel Shield Assembly	ST4.2 × 13	4-6	3-4.4
Cross-Slot Pan Head Screw	Right Instrument Panel Shield Assembly	ST4.2 × 13	4-6	3-4.4
Cross-Slot Pan Head Screw	Glove Box Assembly	ST4.2 × 15	4-6	3-4.4
Hexagon Head Bolt	Instrument Panel Cluster Assembly	M6 × 16	8-12	
Hexagon Head Bolt	Instrument Panel Cluster Assembly	M8 × 12	8-12	
Cross-Slot Pan Head Screw	Instrument Panel Cluster Assembly	ST4.8 × 16	4-6	3-4.4
Cross-Slot Pan Head Screw	Instrument Panel Assembly	ST4.2 × 16	4-6	3-4.4
Cross Slot Countersunk Head Screw	Storage Lid on Instrument Panel assembly	ST4.2 × 16	4-6	3-4.4
Cross Slot Pan Head Screw	Steering Column Decorative Cover	M4 × 12	4-6	3-4.4
Plastic Clip	Left Front Door Trim Panel Assembly	9 × 9	-	-
Plastic Clip	Right Front Door Trim Panel Assembly	9 × 9	-	-
Plastic Clip	Left Rear Door Trim Panel Assembly	9 × 9	-	-
Plastic Clip	Right Rear Door Trim Panel Assembly	9 × 9	-	-
Cross Slot Pan Head Screw	Left Front Door Trim Panel Assembly	ST4.8 × 1.6	5.5-6.3	4.1-4.7
Cross Slot Pan Head Screw	Right Front Door Trim Panel Assembly	ST4.8 × 1.6	5.5-6.3	4.1-4.7

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Cross Slot Pan Head Screw	Left Rear Door Trim Panel Assembly	ST4.8 × 1.6	5.5-6.3	4.1-4.7
Cross Slot Pan Head Screw	Right Rear Door Trim Panel Assembly	ST4.8 × 1.6	5.5-6.3	4.1-4.7
Cross Slot Pan Head Screw and Washer Assembly	Left Front Door Trim Panel Components	ST4.2 × 9.5	5.5-6.3	4.1-4.7
Cross Slot Pan Head Screw and Washer Assembly	Right Front Door Trim Panel Components	ST4.2 × 9.5	5.5-6.3	4.1-4.7
Cross Slot Pan Head Screw and Washer Assembly	Left Rear Door Trim Panel Components	ST4.2 × 9.5	5.5-6.3	4.1-4.7
Cross Slot Pan Head Screw and Washer Assembly	Right Rear Door Trim Panel Components	ST4.2 × 9.5	5.5-6.3	4.1-4.7
Cross Slot Pan Head Screw and Washer Assembly	Left Front Door Trim Panel Components	ST4.2 × 9.5	5.5-6.3	4.1-4.7
Cross Slot Pan Head Screw and Washer Assembly	Right Front Door Trim Panel Components	ST4.2 × 9.5	5.5-6.3	4.1-4.7
Cross Slot Pan Head Screw and Washer Assembly	Left Rear Door Trim Panel Components	ST4.2 × 9.5	5.5-6.3	4.1-4.7
Cross Slot Pan Head Screws and Washer Assembly	Right Rear Door Trim Panel Components	ST4.2 × 9.5	5.5-6.3	4.1-4.7
Cross Slot Countersunk Head Screw	Left Front Inside Door Handle Assembly	ST4.2 × 13	5.5-6.3	4.1-4.7
Cross Slot Countersunk Head Screw	Right Front Inside Door Handle Assembly	ST4.2 × 14	5.5-6.3	4.1-4.7
Cross Slot Countersunk Head Screw	Left Rear Inside Door Handle Assembly	ST4.2 × 15	5.5-6.3	4.1-4.7
Cross Slot Countersunk Head Screw	Right Rear Inside Door Handle Assembly	ST4.2 × 16	5.5-6.3	4.1-4.7
Cross Slot Head Screw and Washer Assembly	Left center Pillar Upper Trim Panel	M6 × 16	5-7	3.7-5.2

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Cross Slot Head Screw and Washer Assembly	Right center Pillar Upper Trim Panel	M6 × 16	3.5-5.5	3-4.4
Cross Slot Head Screw and Washer Assembly	Left Quarter Upper Trim Panel	M6 × 16	3.5-5.5	3-4.4
Cross Slot Head Screw and Washer Assembly	Right Quarter Upper Trim Panel	M6 × 16	3.5-5.5	3-4.4
Hexagon Flange Nut	left Windshield Garnish Molding	M6	9-12	6.7-8.9
Hexagon Flange Nut	Right Windshield Garnish Molding	M6	9-12	6.7-8.9
Hexagon Flange Nut	Left Footrest	M6	39.3-45.6	29-33.6
Plastic Clip	Rear Compartment Trim Panel Assembly	9 × 9	5-6.3	4-4.7
Cross Slot Pan Head Screw	Rear Compartment Trim Panel Assembly	ST4.2 × 16	5-6.3	4-4.7
Hexagon Flange Nut	Front Bumper	M6	3.5-5.5	3-4.1
Cross Slot Hexagon Head Screw and Washer Assembly	Front bumper, Left / Right Mounting Brackets	ST6.3 × 19	3.5-5.5	3-4.1
Cross Slot Hexagon Head Screw and Washer Assembly	Front Bumper	ST4.8 × 16	3.5-5.5	3-4.4
Cross Slot Hexagon Head Bolt and Spring Washer Assembly	Front Bumper	M6 × 16	8-10	5.9-7.4
Cross Slot Hexagon Head Screw and Washer Assembly	Rear Bumper	ST4.8 × 16	3.5-5.5	3-4.1
Hexagon Head Bolt and Washer Assembly	Rear Bumper	M6 × 16	8-10	5.9-7.4
Cross Slot Hexagon Head Bolt and Spring Washer Assembly	Rear Bumper	M6 × 12	8-10	5.9-7.4
Cross Slot Hexagon Head Screw and Washer Assembly	Left/Right Rocker Panel	ST6.3 × 19	4-6	3-4.4
Hexagon Flange Nut	Rear Compartment Trim Assembly	M6	3.5-5.5	2.6-4.1



Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hexagon Flange Nut	Hood Assembly	M6	3.5-5.5	2.6-4.1
Cross Slot Pan Head Screw	Front Fender	ST4.8 × 16	4-6	3-4.4
Cross Slot Pan Head Screw	Rear Wheelhouse Liner	ST4.8 × 16	4-6	3-4.4
Cross Slot Pan Head Screw	Front Fender	ST4.8 × 19	4-6	3-4.4
Cross Slot Pan Head Screw	Rear Wheelhouse Liner	ST4.8 × 19	4-6	3-4.4
Cross Slot Hexagon Head Screw and Washer Assembly	Engine Mounting	ST6.3 × 19	3.5-5.5	2.6-4.1
Plastic Clip	Front Bumper	9 × 9	-	-
Plastic Clip	Rear Bumper	9 × 9	-	-
G-type Buckle	Ventilation Assembly	Φ5	-	-
Plastic Clip	Left Rocker Panel	20 × 9	-	-
Plastic Clip	Right Rocker Panel	20 × 9	-	-
Plastic Clip	Engine Bottom Left Shield	8.2 × 8.2	-	-
Plastic Clip	Engine Bottom Right Shield	8.2 × 8.2	-	-
Plastic Clip	Left Front Fender	8.2 × 8.2	-	-
Plastic Clip	Right Front Fender	8.2 × 8.2	-	-
Plastic Clip	Left Rear Wheelhouse Liner	8.2 × 8.2	-	-
Plastic Clip	Right Rear Wheelhouse Liner	8.2 × 8.2	-	-
Cross Slot Hexagon Head Bolt, Washer and Spring Washer Assembly	Fire Extinguisher Bracket	M6 × 21	5-7	3.7-5.2
Cross Slot Pan Head Screw and Washer Assembly	Inside Door Handle Assembly	ST4.8 × 16	4-5	3-4
Hexagon Head Bolt, Spring Washer and Washer Assembly	Hood Latch	M6 × 16	9-12	6.7-8.9

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hexagon Head Bolt and Washer Assembly	Front Seat	M10 × 36	44-58	32.6-43
Hexagon Flange Bolt	Rear Seat	M8 × 20	22-29	16.3-21.5
Hexagon Flange Bolt 7 / 1620	Child Seat Hook	Inch 7 / 16 × 20	30-34	22.1-25.1
Hexagon Bolt and Washer Assembly	Rear Seat	M10 × 22	44-58	32.6-43
Hexagon Bolt and Washer Assembly	Rear Seat	M6 × 14	9-12	6.7-8.9
Hexagon Flange Bolt	Trunk Lock Assembly	M6 × 12	9-12	6.7-8.9
Hexagon Countersunk Head Screw	Trunk Lock Assembly	M6 × 12	9-12	6.7-8.9
Cross Slot Pan Head Screw and Washer Assembly	Escape Door Handle Assembly	4.8 × 16	4-5	3-4
Hexagon Head Screw	Door Lock	M6 × 12	22-29	16.3-21.5
Hexagon Countersunk Head Screw	Door Lock	M8 × 16	22-29	16.3-21.5
Hexagon Flange Nut	Outside Rear-view Mirror	M6	8	5.9
Hexagon Flange Bolt	Sunroof Assembly	M6 × 12	7-9	5.2-6.7
Hexagon Flange Nut	Door Window Assembly	M6	7-9	5.2-6.7
Hexagon Flange Nut	Door Window Assembly	M6 × 10	7-9	5.2-6.7
Hexagon Flange Bolt	Door Assembly	M8 × 16	24-26	17.8-19.2
Hexagon Head Bolt and Washer Assembly	Door Assembly	M6 × 16	8-10	5.9-7.4
Cross Slot Pan Head Screw	Glass Seal	4.2 × 9	-	-
Hexagon Flange Bolt	Assist Handle Bracket	M6 × 12	9-12	6.7-8.9
Cross Slot Pan Head Screw	Assist Handle	M5 × 35	5-7	3.7-5.2
Countersunk Head Screw	Sunshade	M6 × 20	5-7	3.7-5.2
Hex Head Bolt, Spring Washer and Washer Assembly	Fuel Filler Cap and Pull Handle Assembly	M6 × 20	8-10	5.9-7.4

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hexagon Head Nut and Conical Washer Assembly	Rear Compartment Lid Hinge	M6	8-11	5.9-8.1
Hexagon Head Bolt and Washer Assembly	Instrument Panel	M8 × 16	9-12	6.6-8.9
Hexagon Head Bolt and Washer Assembly	Instrument Panel	M6 × 16	8-11	5.9-8.1
Hexagon Head Bolt and Washer Assembly	Audio	M6 × 20	8-11	5.9-8.1
Cross Slot Pan Head Screw	GPS Antenna	ST4.2 × 16	3-4	2.2-3
Hexagon Cross Slot Head Screw and Washer Assembly	Rear Speaker	ST4.8 × 16	3-4	2.2-3
Cross Slot Pan Head Screw and Washer Assembly	Front Tweeter	ST4.2 × 9.5	3-4	2.2-3
Hexagon Head Bolt, Spring Washer and Washer Assembly	Radio Antenna	M6 × 16	8-11	5.9-8.1
Hexagon Head Bolt, Spring Washer and Washer Assembly	Driver seat	M6 × 16	8-11	5.9-8.1
Hexagon Head Bolt, Spring Washer and Washer Assembly	Shift Control	M6 × 16	8-11	5.9-8.1
Cross Slot Head Screw	Instrument Panel	ST4.8 × 13	2-4	1.5-3
Cross Slot Pan Head Screw and Washer Assembly	Instrument Panel	ST4.2 × 9.5	2-4	1.5-3
Hexagon Head Bolt, Spring Washer and Washer Assembly	Left Side of the Body	M6 × 16	8-11	5.9-8.1
Hexagon Flange Screw	Condenser	M6 × 20	10-12	7.4-8.9
Cross Slot Hexagon Head Screw and Washer Assembly	Air-Conditioning Assembly	ST6.3 × 19	5-7	3.7-5.2
Hexagon Nut and Washer Assembly	Air-Conditioning Assembly	M6	5-7	3.7-5.2

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Hexagon Nut and Washer Assembly	Air-Conditioning Inlet Pipe	M6	5-7	3.7-5.2
Hexagon Nut and Washer Assembly	Air-Conditioning Assembly	M6 × 20	8-10	5.9-7.4
Hexagon Flange Bolt	Compressor	M8 × 1.25 × 80	23-27	17-19.9
Hexagon Flange Bolt	Compressor Suction Hose Assembly	M6 × 30	10-12	7.4-8.9
Hexagon Flange Bolt	Compressor Suction Hose Assembly	M6 × 30	10-12	7.4-8.9
Hexagon Flange Bolt	Compressor Suction Hose Assembly	M6 × 25	8-10	5.9-7.4
Hexagon Flange Bolt	Air Pressure Pipe Assembly	M6 × 25	8-10	5.9-7.4
Hexagon Head Bolt and Washer Assembly	Air Pressure Pipe Bracket	M6 × 12	7-8	5.2-5.9
Cross Slot Countersunk Head Screw	Air-Conditioning Control Panel Assembly	M5 × 16	7-8	5.2-5.9
Hexagon Flange Nut	Suction Hose Bracket Assembly	M6	7-8	5.2-5.9
Hexagon Head Bolt and Washer Assembly	Left/Right Headlamp Assembly	M6 × 20	3-5	2.2-3.7
Hexagon Flange Nut M5	Left/Right Headlamp Assembly	M5	3-5	2.2-3.7
Cross Slot Pan Head Screws and Washer Assembly	Left/Right Front Fog Lamp Assembly	M6 × 16	3-5	2.2-3.7
Cross Slot Pan Head Screw ST4.2 × 19	Left/Right Rear Fog Lamp Assembly	ST4.2 × 19	3-4	2.2-3
Hex Head Bolt, Spring Washer and Washer Assembly	Dome Lamp Mounting Bracket Assembly	M6 × 16	4-5	3-3.7
Hex Head Bolt, Spring Washer and Washer Assembly	Dome Lamp With Sunroof Switch Mounting Bracket Assembly	M6 × 16	4-5	3-3.7
Cross Slot Pan Head Screw	Dome lamp Assembly	M5 × 8	3-4	2.2-3

Part name	Application	Specifications	Torque Range	
			Metric (Nm)	US English (lb-ft)
Cross Slot Pan Head Screw	Dome lamp With Sunroof Assembly	M5 × 8	3-4	2.2-3
Cross Slot Pan Head Screw	Dome lamp Assembly	M5 × 8	3-4	2.2-3
Cross Slot Pan Head Screw and Washer Assembly	Center High Mounted Brake Lamp Assembly	ST3.5 × 9	3-4	2.2-3
Hexagon Flange Bolt	Center Channel Front	M6 × 18	6.8-9.2	5.1-6.8
Hexagon Flange Bolt	Center Channel Front	M6 × 20	6.8-9.2	5.1-6.8
Hexagon Flange Bolt	Center Channel Front	M6 × 20	6.8-9.2	5.1-6.8
Hexagon Flange Bolt	Center Channel Front	M6 × 20	6.8-9.2	5.1-6.8
Hexagon Flange Nut	Steering Wheel and Steering Column	M12X1.2	41-49	30.2-36.1
Hexagon Flange Bolt	Passenger Airbag and Instrument Panel Beam	M6 × 16	7-9	5.2-6.6
Hexagon Head Bolt, Spring Washer and Washer Assembly	Curtain Airbag	M6 × 16	7-10	5.2-7.4
-	Side Airbag	M6 × 16	4-4.5	3.0-3.2
M6 Bolt (Non-Standard)	Driver Airbag	M6 × 16	8.5-9.5	6.3-7.0
Hexagon Head Bolt and Washer Assembly	Side Collision Sensor	M6 × 20	7-9	5.2-6.6
Hexagon Head Bolt and Washer Assembly	Front Collision Sensor	M6 × 20	7-9	5.2-6.6
Hexagon Flange Bolt	Airbag Electronic Control Unit (4/8 loop)	M6 × 20	7-9	5.2-6.6
Hexagon Flange Bolt	Airbag Electronic Control Unit Bracket	M6 × 20	7-9	5.2-6.6

## 1.9 Vehicle Identification Number

### 1.9.1 Description and Operation

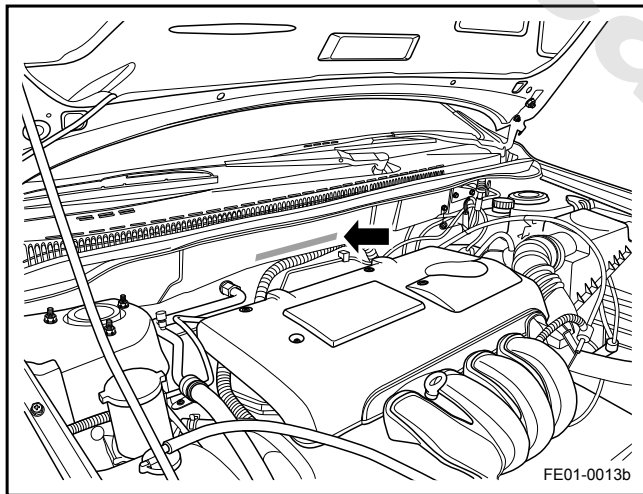
#### 1.9.1.1 Vehicle Identification

Vehicle Identification Number



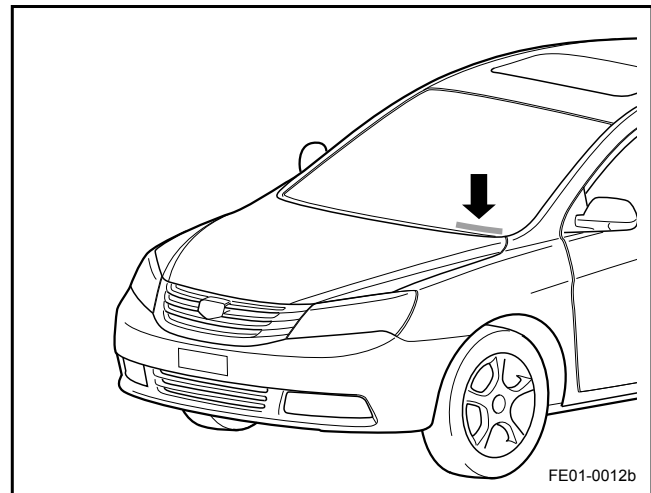
Vehicle identification number (VIN) plate is a statutory marker.

Vehicle Identification Number (VIN) Body Stamping



A vehicle identification number (VIN) is stamped on the top right of the firewall.

Label Location

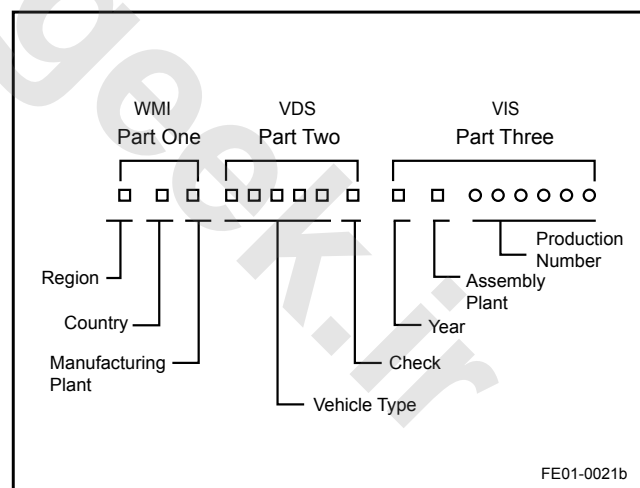


A vehicle identification number (VIN) plate is located at the upper left corner of the dashboard, viewed through the windshield.

#### 1.9.1.2 Vehicle Identification Number (VIN) Description

The vehicle identification number is consisted of:

World's manufacturer identification code (WMI), vehicle description section (VDS) and vehicle parts instructions (VIS) three parts (17 bit), as shown below:



Vehicle identification number L6T7844S68N138894, for example, the meaning of each figure represents the following table:

Position	Description	Number/Letter	Meaning
1-3	Worldwide Manufacturer Identification Code	L6T	Zhejiang Geely Automotive Co., Ltd.

Position	Description	Number/Letter	Meaning
4	Vehicle Category Code	7	Passenger Car
5	Vehicle Main Specification Code	8	Vehicle Longer than 4.6-4.8m
6	Engine Type	4	Front Positioned Petrol Engine, Displacement 1.7-1.9 L
7	Body Types	4	Sedan / 4 Door
		2	Hatchback / 5 Door
8	Drive Type	S	Front Drive, Manual Transmission
9	Check Number	6	VIN Check Code
10	Model Year Code	8	2008
11	Manufacturer Code	N	Geely Automotive Co., Ltd.
12-17	Manufacturer Plant Code	138894	Plant Sequence Number

Worldwide Manufacturing Identification code (WMI)

LJU - Shanghai Huapu Automotive Co., Ltd.

First part (first - third digit) of vehicle identification number, of which:

LB3 - Zhejiang Haoqing Automotive Manufacturing Co., Ltd.

L6T - Zhejiang Geely Automotive Co., Ltd.

The Fourth-Digit

Serial Number	Vehicle Type		Code
1	Chassis (Non-complete Vehicle)		0
2	Truck		1
3	Special Purpose Vehicle		5
4	Bus		6
5	Passenger Car	Wheelbase<2.5 m	7
6		Wheelbase>2.5-2.7 m	8
7		Wheelbase>2.7 m	9

The Fifth-Digit

Passenger Car / Bus				Truck / Special Purpose Vehicle			
Vehicle Length, m	Code	Vehicle Length, m	Code	Total Weight, kg	Code	Total Weight, kg	Code
≤3.5	0	>4.0-4.2	5	≤1,000	K	>3,000-3,500	R
>3.5-3.6	1	>4.2-4.4	6	>1,000-1,500	L	>3,500-4,000	S
>3.6-3.7	2	>4.4-4.6	7	>1,500-2,000	M	>4,000-4,500	T

Passenger Car / Bus				Truck / Special Purpose Vehicle			
>3.7-3.8	3	>4.6-4.8	8	>2,000-2,500	N	>4,500-5,000	U
>3.8-4.0	4	>4.8	9	>2,500-3,000	P	>5,000	V

## The Sixth-Digit

Serial Number	Engine Location	Fuel	Engine Displacement, L	Code
1	Front	Gasoline	≤1	0
2			>1-1.3	1
3	Front	Gasoline	>1.3-1.5	2
4			>1.5-1.7	3
5			>1.7-1.9	4
6			>1.9-2.1	5
7			>2.1	6
8		Diesel	≤1.3	A
9			>1.3-2.5	B
10			>2.5	C
11		Gasoline	≤1	L
12		Gasoline	>1.1-1.3	M
13			>1.3	N
14	Rear	Diesel	≤1.3	T
15			>1.3-2.5	U
16			>2.5	V

Serial Number	Power Source		Engine Displacement, L	Code
1	Hybrid		≤1.3	E
2			>1.3-3.0	F
3	Dual-Fuel	Petrol / Liquefied Petroleum Gas (LPG)	≤1.3	G
4			>1.3-3.0	H
5		Gasoline / Compressed Natural Gas (CNG)	≤1.3	J
6			>1.3-3.0	K



## The Seventh-Digit

Serial Number	Bearing type	Body Type / Door Number	Roof	Open Roof	Code
1	Load Type	Hatchback / 2 Door	-	-	1
2		Hatchback / 5 Door	-	-	2
3		Hatchback / 4 Door	-	-	3
4		Sedan / 4 Door	-	-	4
5		Hatchback / 2 Door	1	-	A
6		Hatchback / 5 Door	1	-	B
7		Hatchback / 4 Door	1	-	C
8		Sedan / 4 Door	1	-	D
9	Load Type	Hatchback / 2 Door	-	1	R
10		Hatchback / 5 Door	-	1	S
11		Hatchback / 4 Door	-	1	T
12		Sedan / 4 Door	-	1	U
13	Non-Load-Type	Hatchback / 2 Door	-	-	6
14		Hatchback / 5 Door	-	-	7
15		Hatchback / 4 Door	-	-	8
16		Sedan / 4 Door	-	-	9
17		Hatchback / 2 Door	1	-	F
18		Hatchback / 5 Door	1	-	G
19		Hatchback / 4 Door	1	-	H
20		Sedan / 4 Door	1	-	J
21		Hatchback / 2 Door	-	1	L
22		Hatchback / 5 Door	-	1	M
23		Hatchback / 4 Door	-	1	N
24		Sedan / 4 Door	-	1	P

Note: "1" indicates YES. "-" indicates NO.

## Cabin, Body Type Table

Serial Number	Cabin Type	Body Type	Code
1	Flat	With End-Gate	1
2		Van	3
3	Long Head	With End-Gate	5

Serial Number	Cabin Type	Body Type	Code
4	Long Head	Van	7

## The Eighth-Digit

Serial Number	Drive Type	Transmission Type	Code
1	Front Drive	Manual Transmission	S
2	Front Drive	Automatic Transmission	Z
3	Rear Drive	Manual Transmission	A
4	Rear Drive	Automatic Transmission	B

## The Ninth-Digit

It may be any number from 0 to 9 or letter "X" and used to verify the authenticity of a VIN code. It is used to ensure a VIN code is unique and effective.

## The Tenth-Digit

It is used to distinguish the year. The code is used according to Table 11 (Repeat in a 30-year cycle).

Year	Code	Year	Code	Year	Code	Year	Code
2001	1	2011	B	2021	M	2031	1
2002	2	2012	C	2022	N	2032	2
2003	3	2013	D	2023	P	2033	3
2004	4	2014	E	2024	R	2034	4
2005	5	2015	F	2025	S	2035	5
2006	6	2016	G	2026	T	2036	6
2007	7	2017	H	2027	V	2037	7
2008	8	2018	J	2028	W	2038	8
2009	9	2019	K	2029	X	2039	9
2010	A	2020	L	2030	Y	2040	A

## The 11th-Digit

It is used to distinguish different assembly plants.

Serial Number	Name	Code
1	Zhejiang Haoqing Automotive Manufacturing Co., Ltd.	H
2	Zhejiang Haoqing Automotive Manufacturing Co., Ltd (Bridge Branch)	L
3	Geely Automotive Co., Ltd.	N
4	Huapu Automotive Co., Ltd.	S
5	Cixi Branch	C

Serial Number	Name	Code
6	Zhejiang Haoqing Automotive Manufacturing Co., Ltd. (Xiangtan Branch)	X
7	Lanzhou, Gansu Branch	G

### The 12th to The 17th Digits

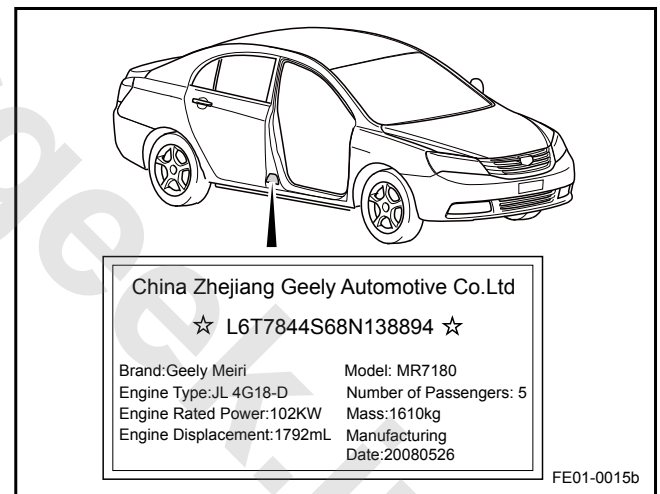
It is used as vehicle production numbers. According to the sequence of vehicles manufactured in the same year, it starts

from 000001 on-wards. The 12th digit of VIN can also be used as the month code.

Refer to the following table:

Serial Number	Month	Code	Serial Number	Month	Code
1	1	1	7	7	7
2	2	2	8	8	8
3	3	3	9	9	9
4	4	4	10	10	0
5	5	5	11	11	A
6	6	6	12	12	B

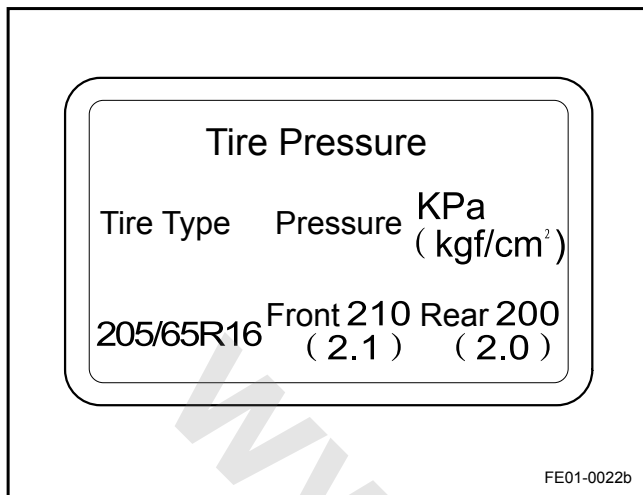
### 1.9.1.3 Compliance Label



The Compliance Label is located at the side of the driver's side B pillar.

1. Vehicle Identification Number (VIN)
2. Brand
3. Category of Vehicle
4. Number of Passenger
5. Vehicle Weight
6. Date of Manufacture
7. Engine Model
8. Engine Power
9. Engine Displacement

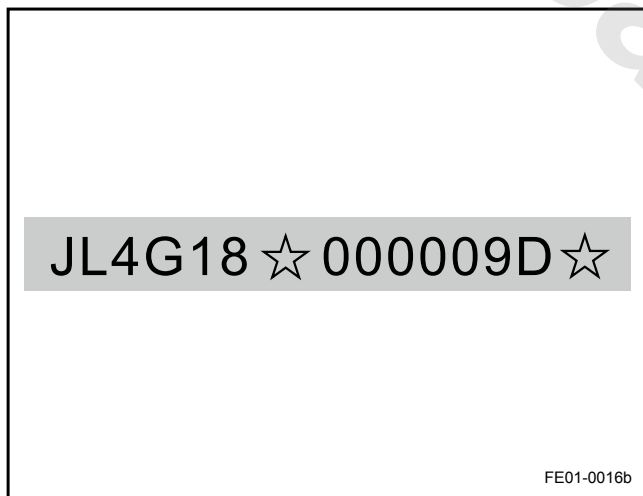
### 1.9.1.4 Tire Placard



Tire placard is located on the vehicle body surface under the driver door striker. For tire information, please refer to tire placard. Wheel and tire sizes, inflation pressures and load capacity are specified on a tire placard.

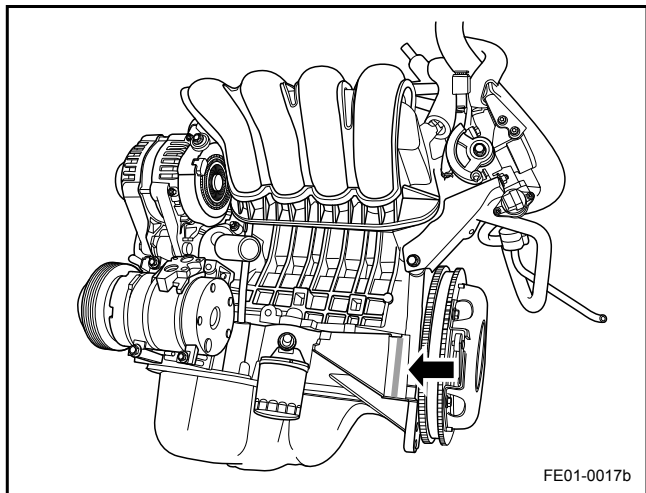
### 1.9.1.5 Engine Serial Number and its Location

Engine Serial Number (JLy4G18-D)



- JL: Company Code
- 4: The Number of Cylinders
- G: Characteristics Code
- 18: Engine Displacement
- 000009D: Serial Number

### The Engine Serial Number Location



The engine serial number is stamped on the left hand side at the rear of the engine cylinder block, near engine fly wheel.

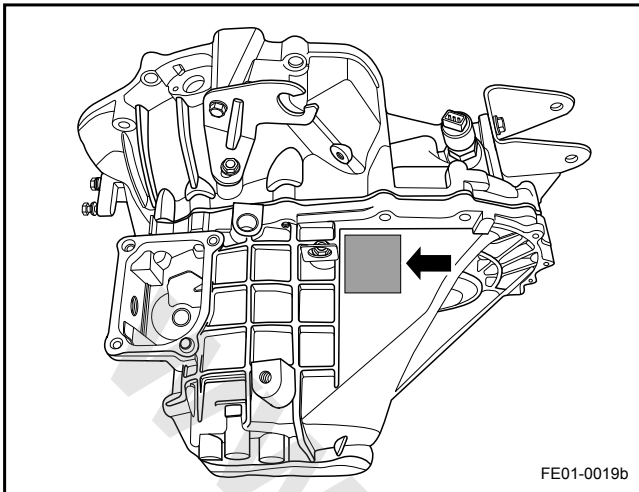
### 1.9.1.6 Manual Transmission Serial Number and its Location

Manual Transmission Serial Number Label (JL-S170B)



1. JL: Company Code
2. S: Control Type
3. 170: Torque
4. B: Update Code

Manual Transmission Drive Axle Identification Number  
Location



## 1.10 Noise, Vibration and Abnormal Sound

### 1.10.1 Description and Operation

#### 1.10.1.1 Diagnostic Information and Procedures

##### Wind Noise/Air Sound

##### Warning!

Refer to "Assistant Driving Warning" in "Warnings and Notices".

##### Note

**Warning:** An assistant should drive the vehicle while the technician checks for the location of the reported condition. Otherwise, personal injury could result.

A test drive is needed in order to identify the location of wind noise. In general, the wind noise includes major leaks and minor leaks. If the repair process does not fix all the leaks, it will only reduce wind noise, but not completely eliminate the wind noise.

A technician must bring the following tools to help diagnose the specific location of wind noise:

- Stethoscope
- Masking Tape
- Seal
- Marker
- Screwdriver

A road test should be carried out as following:

- Select a even and straight road, with a east, a south, a west and a north exit.
- Select a road with minimal traffic and noise in order to avoid affecting the test.
- Test the vehicle at the speed when the noise is most obviously heard. Do not speed above speed limit.
- The noise can be identified as external wind noise, under the following conditions,:
  - As soon as lowering the windows of the running vehicle, the wind noise can be heard.
  - When tapes posted on various decorative seals and gaps, the wind noise immediately disappears.

- Internal wind noise is caused by air escaping from the car. The repair should take the following approaches:
  - When trying to determine the leak location, attach tapes to the body pressure relief valve. Air pressure will be introduced inside the vehicle, which will increase wind noise.
  - Use stethoscope to identify the leak location.
  - Use masking tapes for temporary repair.
  - Continue the road test to confirm whether all the wind noise has been eliminated or there are still leaks at other parts.
  - Return to workshop after having identified all the leaks during road test. Use specialized methods and sealing material to carry out permanent repair.

##### Vibration

Most of the high-speed vibrations are due to lack of wheel dynamic balance. If there still is vibration after balancing the wheels, the reasons are:

- Tire Wear
- Rim Wear
- Difference between tires toughness

Measuring the amount of free jumping of tires and wheels can not determine all the reasons leading to vibration. The above mentioned three reasons are known as the radial load. You must use known good tires and wheels to replace the old ones and carry out the repair.

The low-speed vibration occurred at the speed of 64 km/h is usually caused by free jumping. The high-speed vibration occurring at the speed higher than 64 km/h is usually caused by imbalances or free jumping.

##### Correct Uneven tires

There are usually two ways to correct the wheels with right balance but still with tire vibration. One way is to use automatic machine tools. Install the tire onto a tire machine. Grind a small amount of rubber off from the high point of the tire. This method is permanent. If following the operation instructions, it will not affect the tire appearance and tire tread life. Correction using a blade is not recommended, since this method will shorten the tire life and can not fundamentally solve the issue.

Another method is to remove the tire and turn the tire 180 ° on the rim. Use this method only after tire and wheel assembly have been confirmed as the cause of vibration. This is because this method may result vibration with good tires.

**Abnormal Sound**

At high engine speed, inspect whether the insulation shield comes into contact with the bottom of the body.

- Lift the vehicle and perform visual inspection.
- Slightly bent insulation panels to create a gap between the panels and the bottom of the vehicle.

Squeak sound from the front of the vehicle in cold weather

Inspect the front stabilizer bar isolation sleeve.

- Test drive the vehicle when engine is cold and make the front suspension reach the maximum travel limit.
- Remove the front stabilizer bar isolation sleeve, wrap tapes around the bar and install the front stabilizer bar isolation sleeve.

Abnormal sound from the rear of the vehicle when the vehicle is bumping

Check whether the spare tire is properly secured.

- Opening the rear compartment and check the spare tire and the jacking tools.
- Secure the spare tire and the jacking tools.
- Road test the vehicle and check whether the abnormal sound is eliminated.

The rear window percussion sound when driving on rough roads

Check whether the rear door lock is adjusted properly

- Road test the vehicle to verify the issue.
- Loose the rear door lock nut and adjust the lock.

**Door squish**

Check whether the door panel wiring harness connector has the squish sound.

- Tap the trim plate and carefully observe whether squish sound is heard.
- Remove the door trim panel and wrap foam pad to around the wiring harness connector.

**Door squeak**

Check whether the door hinge is lack of lubrication.

- Operate the door back and forth and listen carefully to the door whether there is squeak sound.
- Use smear grease to lubricated the door hinge.

Manual transmission shift squeak (in the cold weather or when the engine is cold)

Check the manual shift assembly.

- Switch between gears and verify the squeak.
- Remove the floor console shift lever, lubricate it and install it.

**1.10.1.2 Repair****Wind Noise/Air Sound****External Wind Noise**

The wind noise leak repair is very similar to that of water leaking. Refer to [1.11.1.1 Diagnostic Information and Procedures](#). The actual repair procedures depend on the type of seals.

**Vibration****Tire and Wheel Balancing (On-Vehicle)**

Carry out the balancing on the electronic wheel balancing machine. Dynamic balancing machine is easy to use and can be used both for static balance and dynamic balance. Unlike the balancing on vehicle, the off vehicle balancing can not correct the brake disc imbalance. However, the accuracy of the off vehicle balancing can overcome this issue. Make a cone through the center hole on the back, rather than through the wheel nut holes.

**Tire and Wheel Balancing (Off-Vehicle)**

On-Vehicle tire and wheel balancing can correct the imbalance caused by disc brake vibration.

**Warning!**

**Support the control arm at the normal position to avoid damage to drive axle. When the wheels travel to the maximum low position, do not shift the gear lever.**

1. Do not remove the balance weights during on vehicle tire and wheel balancing.
2. If the balance weight is more than 25g (1lb), divide it into two blocks and install one onto the inner wheel rim and the other onto the outer wheel rim.
3. Engine driven gear and gear assembly.

**Tires and Wheels Installation**

Tires and wheels are installed at the factory. with the radial tires thicker parts (also known as the high point) pointing to the minimum radius wheels (also known as low points).

Red paint marks or labels are at high points along the outer of the tires.

Valve at the lower position of the wheel

Before remove the tire, mark the position of the valve to make sure it can be installed back to the original position.

### Abnormal Sound

#### Abnormal Sound Repair

Abnormal sound mainly comes from parts that should not have relative motion. To repair abnormal sound, there are three ways:

- Tighten the fasteners, so that there is no relative motion.
- Separate parts, so that components do not contact.
- Isolated parts, so that there is no abnormal noise when parts moving. Even low friction surfaces can be used to eliminate viscosity between the sliding parts.



## 1.11 Water Leaks

### 1.11.1 Description and Operation

#### 1.11.1.1 Diagnostic Information and Procedures

##### Water Leaks Diagnosis

###### Note

Identify all water leaking parts before repair. Random repair may only be a temporary solution and could lead to more difficult repair in the future. Continue testing to identify all water leaking parts.

To repair water leaks, proper testing and diagnosis is needed. Adjust the position of the incorrectly positioned parts and use proper materials to carry out the repair. Firstly, determine in what circumstances there is water leaks. For example: only when the vehicle remain in the slope there is water leaks. Secondly, if the water leaks area has been found, use water hose to locate exact position where water leaks. If water leaks is not obvious, use a water leaks testing machine to identify specific locations. Removal certain parts may be required to identify the specific location of water leaks.

##### Water Leaks Test Preparation

- The vehicle is designed for running under normal conditions.
- The sealing materials and components design has taken into account the natural environment to achieve the seal strength. However, there are other factors affecting seals.
- Water leaks test is related to the natural environment and can be used to determine the vehicle driving performance under normal conditions.
- The first step of the diagnosis process is to determine water leaks occurred under what conditions. If you can determine the approximate water leaks area, you can use a water hose water to isolate the exact location. To repair water leaks, you may need to remove certain parts of the decorative panels or components.
- If the water leaks appears in the door, trunk door or window, it is not necessary that the water leaks is created by sealing strip. Adjust these parts might correct the water leaks.

##### Testing With A Water Hose

###### Note

Do not use water hose with a nozzle.

1. Let an assistant inside the vehicle to confirm the exact location of water leaks.
2. Start testing from the bottom of the window or the windshield.
3. Move the hose slowly upward, until cover the entire roof.

##### Ventilation Hose Test

###### Note

Ventilation hose test can only be used for completely cured the adhesive. Otherwise, the usage of this method will damage the adhesive layer, leaving increased water leaks spots.

1. Pour liquid cleaning agent into a spray bottle according to a certain percentage, then spray it to window edge. Spray from the bottom, gradually upward and through the entire roof.

###### Note

The pressure of compressed air can not exceed 205 kPa (29.75 psi).

2. Let an assistant bring the air hose into the vehicle.
3. Let the assistant use the compressed air targeting suspected leaking area. If there is leakage, air bubbles will appear.

#### 1.11.1.2 Repair

##### Body Leaking Repair

Depending on the location of water leaks, certain parts may need to be removed.

1. From the inside or outside the vehicle, slit open the seam adhesive.
2. Clean and remove all the old adhesive residue from the leaking area.
3. Apply body and joint sealant on the cleaned area.
4. Wait for several hours so that the sealant is fully cured.
5. Inspect whether there are water leaks.
6. Reinstall parts.

##### Fixed Window Water Leaks Repair

Depending on the location of water leaks, certain parts may need to be removed.

1. Determine the specific location of water leaks.
2. If the windshield edge leaks, use a dedicated seam adhesive to repair or replace the windshield.

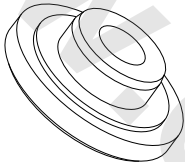
3. If it is fixed windows side-leakage, use a dedicated seam adhesive to repair or replace the windshield.

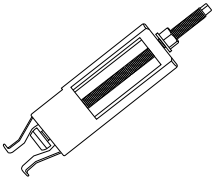
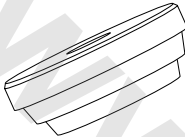
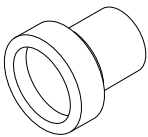
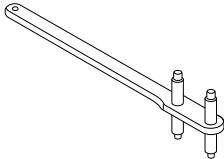
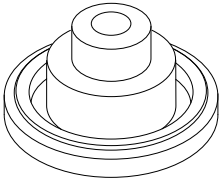
[www.cargeek.ir](http://www.cargeek.ir)

## 1.12 Special Tools

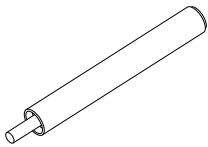
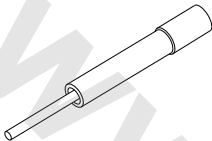
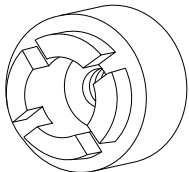
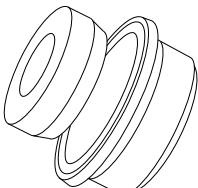
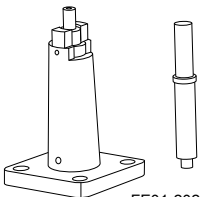
### 1.12.1 Special Tools and Equipment

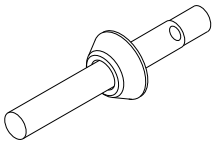
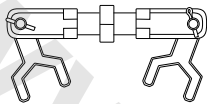
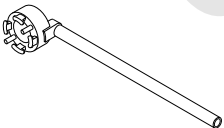
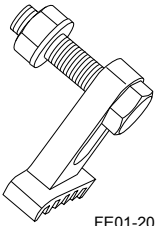
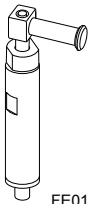
#### 1.12.1.1 Power Train Special Tools

Serial Number	Illustration	Tool Number	Description
1	 <p>FE01-2001b</p>	GL201-001	Input Shaft Holding Fixture
2	 <p>FE01-2002b</p>	GL201-002	Input Shaft Seal Installer
3	 <p>FE01-2003b</p>	GL201-003	Input and Output Shaft Parts Installer
4	 <p>FE01-2004b</p>	GL201-004	Transmission Input Shaft Bearing Remover

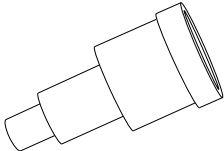
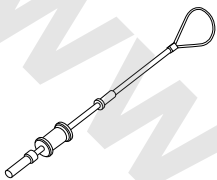
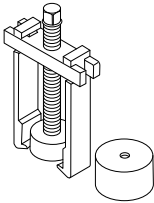
Serial Number	Illustration	Tool Number	Description
5	 <p>FE01-2005b</p>	GL201-005	Output Shaft Bearing Cup Remover
6	 <p>FE01-2006b</p>	GL201-006	Output Shaft Bearing Cup Installer
7	 <p>FE01-2007b</p>	GL201-007	Output Shaft Bearing Remover
8	 <p>FE01-2008b</p>	GL201-008	Output Shaft Adjuster
9	 <p>FE01-2009b</p>	GL201-009	Differential Clutch Housing Oil Seal Remover

Serial Number	Illustration	Tool Number	Description
10	 <p>FE01-2010b</p>	GL201-010	Differential Gearbox Housing Oil Seal Remover
11	 <p>FE01-2011b</p>	GL201-011	Differential Bearing Remover
12	 <p>FE01-2028b</p>	GL201-014	Manual Shift Assembly Oil Seal Installer
13	 <p>FE01-2014b</p>	GT301-002	Driver Handle
14	 <p>FE01-2015b</p>	GT301-006	Valve Oil Seal Remover

Serial Number	Illustration	Tool Number	Description
15	 FE01-2016b	GT301-008	Valve Oil Seal Installer
16	 FE01-2017b	GT301-009	Valve Tube Remover
17	 FE01-2018b	GT301-013	Crankshaft Front Oil Seal Installer
18	 FE01-2019b	GT301-015	Crankshaft Rear Oil Seal Installer
19	 FE01-2020b	GT301-016	Piston Pin Remover

Serial Number	Illustration	Tool Number	Description
20	 <p>FE01-2021b</p>	GT301-017	Clutch Installer
21	 <p>FE01-2022b</p>	GT301-018	Camshaft Positioning Tool
22	 <p>FE01-2029b</p>	GT301-020	Camshaft Locking Tool
23	 <p>FE01-2023b</p>	GT301-021	Flywheel Holding Tool
24	 <p>FE01-2024b</p>	GT301-022	Timing Chain Retention Tool

## 1.12.1.2 Chassis and Body Special Tools

Serial Number	Illustration	Tool Number	Description
1	 <p>FE01-2025b</p>	GL401-001	Front Axle Wheel Hub Bearing Remover
2	 <p>FE01-2026b</p>	GL401-002	Drive Shaft Ball Bearing Remover
3	 <p>FE01-2027b</p>	GL401-003	Rear Axle Sleeve Remover



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## 2.1 Warnings and Notices

### 2.1.1 Warnings and Notices

#### Battery Disconnect Warning

##### Warning!

Warning: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

#### Exhaust Service Warning

##### Warning!

Warning: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

#### Fuel and Evaporative Emission Pipe Warning

##### Warning!

Warning: In order to reduce the risk of fire and personal injury observe the following items:

- Replace all fuel pipes that are nicked, scratched or damaged during installation, do not attempt to repair the sections of the fuel pipes
- Do not hammer directly on the fuel harness body clips when installing new fuel pipes.
- Always cover vapor pipes with a wet towel before using a torch near them. Also, never expose the vehicle to temperatures higher than 115°C (239°F) for more than one hour, or higher than 90°C (194°F) for any extended period.
- Apply a few drops of clean engine oil to the male pipe ends before connecting fuel pipe fittings. This will ensure proper reconnection and prevent a possible fuel leak. (During normal operation, the O-rings located in the female connector will swell and may prevent proper reconnection if not lubricated.)

#### Fuel Gage Leak Warning

##### Warning!

Warning: Wrap a shop towel around the fuel pressure connection in order to reduce the risk of fire and personal injury. The towel will absorb any fuel leakage that occurs during the connection of the fuel pressure gage. Place the towel in an approved container when the connection of the fuel pressure gage is complete.

#### Fuel Pipe Fitting Warning

##### Warning!

Warning: Always apply a few drops of clean engine oil to the male pipe ends before connecting the fuel pipe fittings in order to reduce the risk of fire and personal injury. This will ensure proper reconnection and prevent a possible fuel leak. During normal operation, the O-rings located in the female connector will swell and may prevent proper reconnection if not lubricated.

#### Fuel Storage Warning

##### Warning!

Warning: Do not drain the fuel into an open container. Never store the fuel in an open container due to the possibility of a fire or an explosion.

#### Fuel vapors in Evaporative Emission Components Warning

##### Warning!

Warning: Do not breathe the air through the EVAP component tubes or hoses. The fuel vapors inside the EVAP components may cause personal injury.

#### Gasoline/Gasoline vapors Warning

##### Warning!

Warning: Gasoline or gasoline vapors are highly flammable. A fire could occur if an ignition source is present. Never drain or store gasoline or diesel fuel in an open container, due to the possibility of fire or explosion. Have a dry chemical fire extinguisher nearby.

#### Lower O-Ring Removal Warning

##### Warning!

Warning: Verify that the lower (small) O-ring of each injector does not remain in the lower manifold in order to reduce the risk of fire and personal injury. If the O-ring is not removed with the injector, the replacement injector with new O-rings will not seat properly in the injector socket. Unreasonable seating could cause a fuel leak. When replacing the injector, replace the lower O-ring together.

#### Radiator Cap Removal Warning

##### Warning!

Warning: To avoid being burned, do not remove the radiator cap while the engine is hot. The cooling system will release scalding fluid and steam under pressure if radiator cap is removed while the engine and radiator are still hot.

#### Cooling System Service Warning

##### Warning!

Warning: If pressure cap is removed while the engine is still hot and under pressure during service, the cooling coolant will boil immediately and spray into the operators body, causing serious burns.

#### Relieving Fuel Pressure Warning

##### Warning!

Warning: Remove the fuel tank cap and relieve the fuel system pressure before servicing the fuel system in order to reduce the risk of personal injury. After you relieve the fuel system pressure, a small amount of fuel may be released when servicing the fuel circuit, the fuel injection pump, or the connections. In order to reduce the risk of personal injury, cover the fuel system components with a shop towel before disconnection. This will catch any fuel that may leak out. Place the towel in an approved container when the disconnection is complete.

#### Road Test Warning

##### Warning!

Warning: Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

## 2.2 Control System JL4G18-D

### 2.2.1 Specifications

#### 2.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Camshaft Position Sensor Retaining Bolts	M6X14	8-10	6.0-7.4
Crankshaft Position Sensor Retaining Bolts	M6X12	8-10	6.0-7.4
Ignition Coil Retaining Bolts	M6X35	7-11	5.2-7.8
Engine Control Module Retaining Bolts	M6X16	8-10	6.0-7.4
Engine Coolant Temperature Sensor Bolts	M12 × 1.5 × 6	15	11
Evaporative Emissions Canister	M6X20	7-9	5.2-6.7
Evaporative Emissions Canister Solenoid Valve Bracket Retaining Bolts	M6X20	7-9	5.2-6.7
Fuel Filter Mounting Bracket Assembly Retaining Bolts	M6X16	8-10	6.0-7.4
Fuel Filter Mounting Bracket Retaining Bolts	M6X16	8-10	6.0-7.4
Fuel Rail Retaining Bolts	M6X20	10	7
Fuel Tank Retaining Bolts	M10X30	38-46	28.1-34.0
Idle Air Control Valve Retaining Bolts	M4X10	2-3	1.5-2.2
Knock Sensor Retaining Bolts	M8X30	15-22	10.7-16.0
Intake Manifold Absolute Pressure and Temperature Sensor Retaining Bolts	M6X12	8-10	6.0-7.4
Oxygen Sensor Retaining Bolts	M18X8	44	32.6
Air-Conditioning Compressor Mounting Bolts	M8X80	25	18.2
Spark Plug Retaining Bolts	M14 × 1.25 × 22	20-30	14.8-22.2
Throttle Body Retaining Bolts	M8	20-25	14.8-18.5

#### 2.2.1.2 Temperature Sensor Temperature and Resistance Correlation

Temperature (°C) / ( °F)	Resistance (Ω)
-30/-22	26,000
-25/-13	19,000
-20/-4	15,000
-15/5	11,800
-10/14	9,000

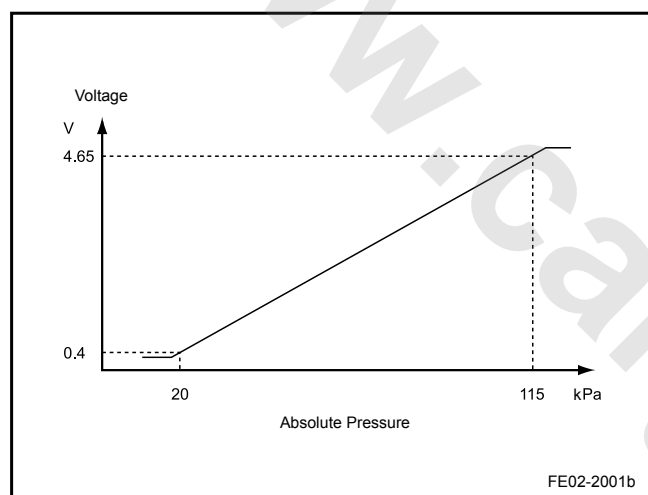
Temperature (°C) / ( °F)	Resistance (Ω)
-5/23	7,000
0/32	5,600
5/41	4,600
10/50	3,600
15/59	3,000
20/68	2,400
25/77	2,000
30/86	1,700
35/95	1,400
40/104	1,180
45/113	950
50/122	800
55/131	700
60/140	600
65/149	510
70/158	425
80/176	320
90/194	240
100/212	180
110/230	140
120/248	110
130/266	90

### 2.2.1.3 Altitude and Atmospheric Pressure Correlation

Altitude (m)/(ft)	Atmospheric Pressure (kPa)/(psi)
4,200/13,780	55/8
3,900/12,795	58/8.4
3,600/11,811	61/8.8
3,300/10,827	64/9.3
3,000/9,843	66/9.6
2,700/8,858	69/10
2,400/7,874	71/10.3

Altitude (m)/(ft)	Atmospheric Pressure (kPa)/(psi)
2,100/6,890	74/10.7
1,800/5,906	77/11.2
1,500/4,921	80/11.6
1,200/3,937	83/12
900/2,953	87/12.6
600/1,969	90/13.1
300/984	93/13.5
0	100/14.5

#### 2.2.1.4 Intake Air Pressure Sensor Voltage and Pressure Diagram



## 2.2.2 Description and Operation

### 2.2.2.1 Overview

The engine use an electronic control system manufactured by UAES(United Automotive Electronic Systems Co., Ltd.). It consists of the engine control module (ECM), ECM working circuit, system input and output parts. ECM is located at the right side of the Air-Conditioning blower and is the engine control system control center. It continues to monitor the signals from various sensors and controls the various systems performance. Engine control module also performs system diagnostics, it can identify the operational malfunction and through the malfunction indicator light (MIL) to remind the driver and store DTC codes in order to facilitate maintenance personnel for maintenance.

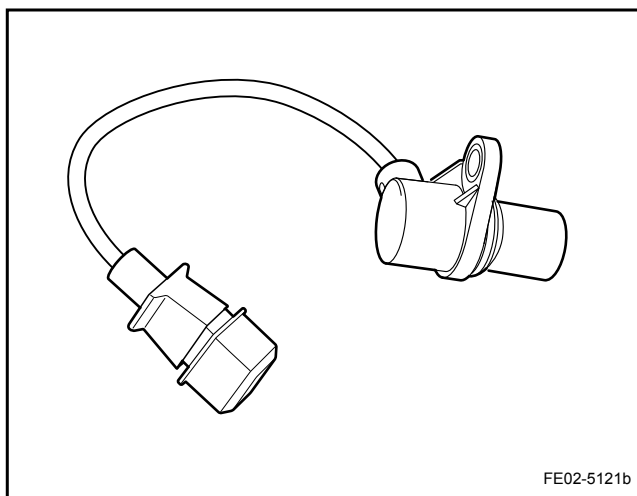
If the engine control module is damaged, there is no single spare part within the module can be repaired. ECM must be replaced as a whole.

Input components: crankshaft position sensor (CKP), camshaft position sensor (CMP), intake air pressure and temperature sensors [intake air pressure sensor (MAP), with intake air temperature sensor (IAT)], knock sensor (KS), throttle position sensor (TPS), evaporation tank surface temperature sensor, engine coolant temperature sensor (ECT), vehicle speed sensor (VSS), pre-catalytic heated oxygen sensor (HO<sub>2</sub>S), post-catalytic heated oxygen sensor (HO<sub>2</sub>S), air conditioning pressure switch, power steering switch, defrost heating enable input, CAN information input, serial data bus input.

Output components: idle speed control valve (IAC), 1-2-3-4-cylinder fuel injectors, ignition coils, variable valve timing solenoid valve (VVT), canister solenoid valve (EVAP), the main relay, pump relay and oil pump, cooling fan low speed relay, cooling fan high speed relay, air-conditioning compressor relay, CAN information output, serial data bus out.

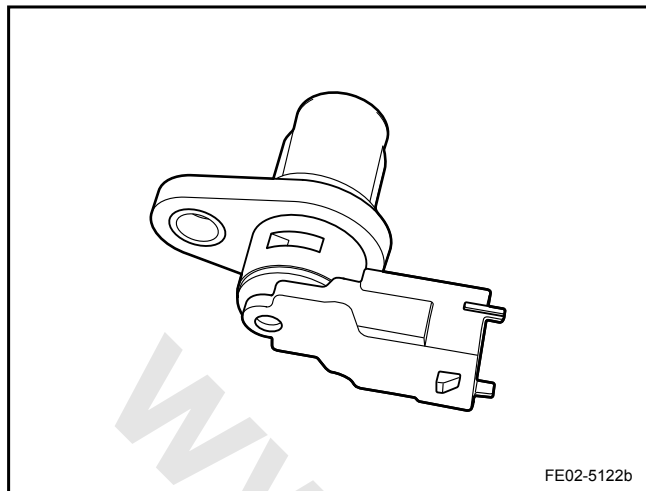
### 2.2.2.2 Input Components

#### 1. Crankshaft Position Sensor (CKP)



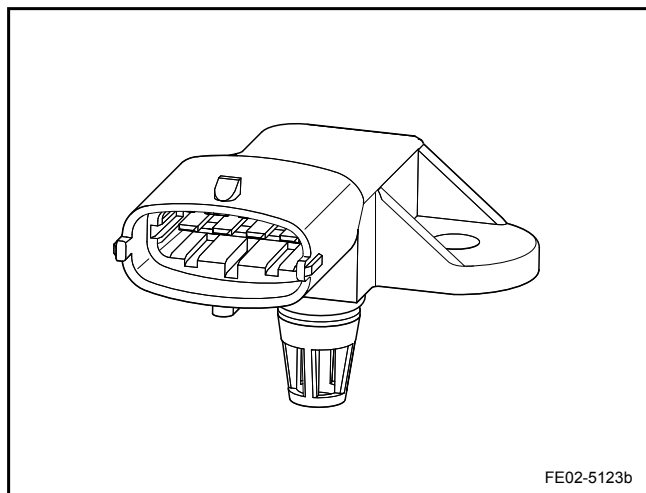
The crankshaft position sensor output can be used to determine crankshaft position and rotation speed. Crankshaft position sensor is a magnetic-electric sensor, which is installed in the front end of the transmission housing, and tightened with bolts, below the coolant temperature sensor. Flywheel signal plate and the crankshaft sensor is an integrated part. The sensor extends out through the bearing. The gap between the sensor and the signal plate teeth is below 1.2mm. The signal plate has 58 machined slots, of which 57 slots have a 6 ° interval. The last tooth slot is wider, used to generate synchronization pulses. When the crankshaft rotates, the sensor plate slot will change the sensor magnetic field, resulting in an induced voltage pulse. The 58th slot pulse is longer and can be used to identify a specific direction of the crankshaft, so that the engine control module (ECM) may at any time determine the direction of the crankshaft. Engine control module uses this information to generate the ignition timing and fuel injection pulse, and then controls the ignition coil and fuel injectors. Sensor signals pass through ECM harness connector EN01 terminal No.46,47 to ECM, if the engine control module detects the sensor signals erratic or incorrect, it will record DTC code P0321, P0322. and DTC code P0016 will be recorded when the camshaft relative position is not correct.

## 2. Camshaft Position Sensor (CMP)



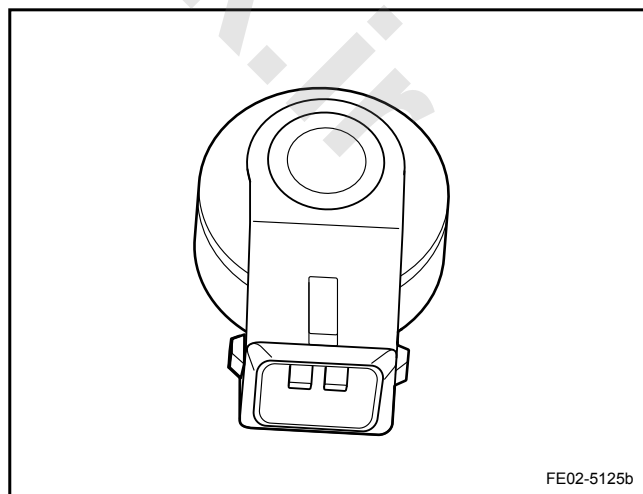
Engine control module receives this signal as a sync pulse, according to an appropriate sequence to trigger the fuel injectors. Engine control module uses the camshaft position sensor signals to instruct cylinder No.1 piston position during power stroke. Engine control module then calculates the actual fuel injection sequence. If when the engine is running, the camshaft position sensor signal is lost, the fuel injection system will be converted to a fuel injection pulse based on the previous calculation of the fuel injection model, while the engine will continue to run. Even if the fault exists, the engine can be restarted. Sensor signals pass through ECM harness connector EN01 terminal No.42 to ECM. When the engine is running if the control module detects an incorrect camshaft position sensor signal, it will record DTC code P0340, P0341, P0342, P0343. DTC code P0016 will be recorded when the crankshaft relative position is incorrect.

## 3. Intake Air Pressure and Temperature Sensor



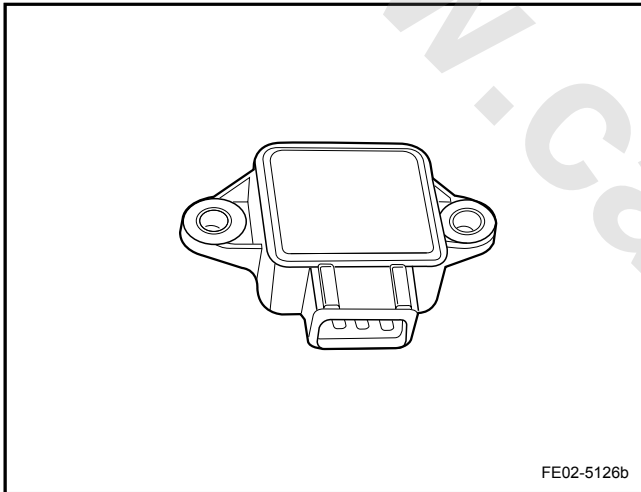
Intake air pressure and temperature sensor has an intake pressure sensing element and a thermistor. When the engine is working, the engine intake pressure sensing element produces the intake air pressure signal, negative temperature coefficient thermistor produces intake air temperature signal. This sensor detects intake manifold pressure change caused by engine load and speed changes. These changes will be converted to the voltage output. When the engine decelerates, the throttle body closes resulting in a relatively low intake manifold absolute pressure output. Intake manifold absolute pressure and vacuum degree is opposite. When the manifold pressure is high, the vacuum is low. MAP sensor is also used to measure atmospheric pressure. This measurement is calculated as part of the MAP calculation. When the ignition switch is turned on and the engine is not running, the engine control module reads atmospheric pressure as the intake manifold pressure, and adjusts the Air-Fuel ratio accordingly. With this kind of altitude compensation, the system can maintain a low emissions while maintaining maneuverability. Sensor signal passes through ECM harness connector EN01 terminal No.19 to ECM. When MAP sensor and its circuit malfunction occurs, DTC P0105, P0106, P0107, P0108 will be recorded. DTC code P0105, P0106, P0107, P0108 will be recorded when MAP sensor and its circuit have malfunctions. Engine control module provides 5V voltage to the thermistor and measure the voltages change to determine the intake air temperature. The engine control module obtains the intake air temperature by measuring the voltage. ECM uses this signal to adjust the injector pulse width and ignition timing. Sensor signals pass through ECM harness connector EN01 terminal No.25 to ECM. DTC code P0112, P0113 will be recorded when there is a circuit malfunction.

## 4. Knock Sensor (KS)



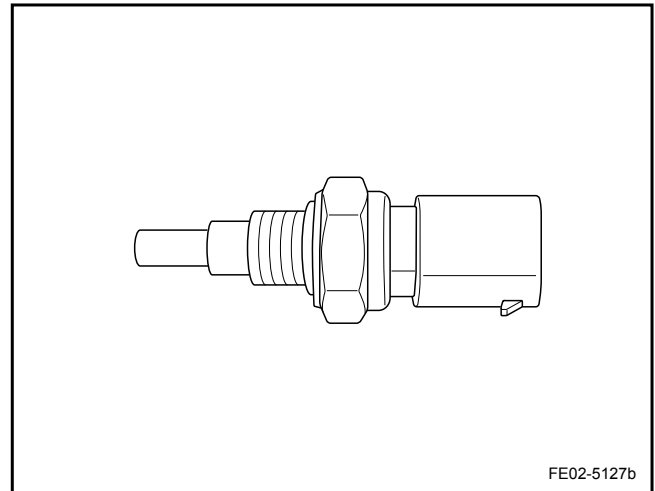
Knock sensor is a frequency response sensor, installed in the engine block the most sensitive to knocking part, the lower intake manifold. ECM uses knock sensor to detect knock intensity, and then to adjust the ignition advance angle, to effectively control knocking and optimize the engine power, fuel economy and emission levels. If the engine knocking occurs, ECM will receive the signal, filter out the non-knock signals and determine engine cycle calculated by camshaft and crankshaft position sensor signals. ECM determines the cylinder in which the knock occurs and will delay the ignition advance angle for this cylinder until the knock disappears. Then ECM advances the ignition advance angle until the ignition angle is best suited for the operating conditions at that time. Sensor signals pass through ECM harness connector EN01 terminal No.30,31 to ECM. DTC code P0327, P0328 will be recorded by ECM where there is a KS sensor malfunction.

#### 5. Throttle Position Sensor (TPS)



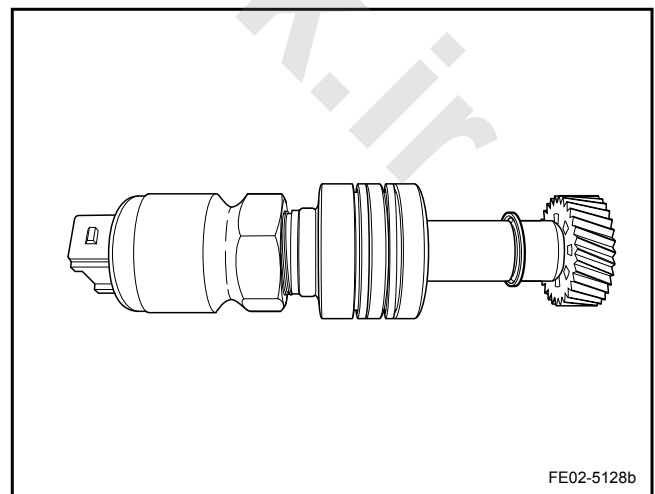
Throttle position sensor is installed on the throttle body connected with the throttle shaft. Within the sensor, it is actually a sliding variable resistor, with a 5 V reference voltage and a ground provided by ECM. Engine control module monitors the signal voltage to calculate the throttle position. Because it is connected with the throttle shaft, so the output signal changes as the movement of the accelerator pedal. When the throttle is closed, the sensor output voltage is low, about 0.3-0.9 V. With the throttle opening the output voltage increases, when the throttle is fully open, the output voltage is about 4.5 V. Sensor signals pass through ECM harness connector EN01 terminal No.26 to ECM, ECM adjusts fuel injection amount based on this signal. DTC code P0122, P0123 will be recorded when there is a sensor circuit malfunction.

#### 6. Engine Coolant Temperature Sensor (ECT)



Engine coolant temperature (ECT) sensor is a thermistor and its resistance changes as the temperature changes. It is installed in the engine coolant flow. When the coolant temperature is low, the resistance is high. At  $-30^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$ ) the resistance is  $26,000\ \Omega$ ; at  $130^{\circ}\text{C}$  ( $266^{\circ}\text{F}$ ), the resistance is  $90\ \Omega$ . ECM provides a 5 V voltage to the sensor. When the engine is cold, the voltage is high. When the engine is hot, the voltage is low. The coolant temperature signal is important to the ignition timing and fuel injection adjustment, while the signal is also transmitted to the instrument panel (IP) through the CAN network, used to display the current engine working temperature. Sensor signals pass through ECM harness connector EN01 terminal No.41 to ECM. DTC code P0117, P0118 will be recorded when there is a sensor or circuit malfunction.

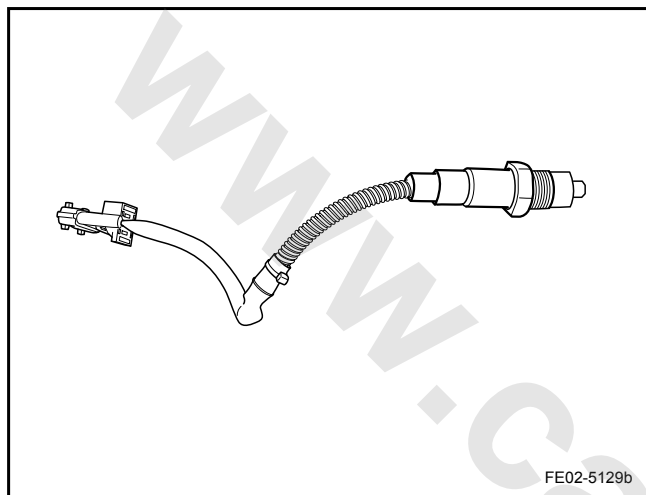
#### 7. Vehicle Speed Sensor (VSS)





The vehicle speed sensor is installed in the front transmission case, connected with differential speed sensor drive gear. Speed sensor is a Hall-style. The main relay controlled by ECM provides the sensor working power. When the vehicle is driving, the sensor output is a rectangular pulse signal. Sensor signals pass through ECM harness connector EN01 terminal No.57 to ECM. DTC code P0501 will be recorded when there is a sensor or wiring malfunction.

#### 8. Pre-Catalytic Heated Oxygen Sensor (HO<sub>2</sub>S)



Pre-Catalytic oxygen sensor is installed in the exhaust manifold, the three-way catalytic converter front-end, detecting the oxygen content of exhaust gas and sending ECM the indirect mixture concentration. ECM adjusts fuel injection pulse width, to make sure that the mixture ratio is close to the theoretical value of about 14.7. Oxygen sensor has a sensing element, which is a porous ceramic tube, the outer wall surrounded by the engine exhaust and inside connecting to the atmosphere. Sensing ceramic wall is a solid electrolyte containing an electric heating tube. When the sensor ceramic tube temperature reaches 350°C (662 °F), it has a solid electrolyte properties. Oxygen sensors work by converting ceramic oxygen ion concentration difference between inside and outside into a voltage signal output. The output voltage level is due to movement caused internal electronic ceramic tubes. If the mixture is rich, then the ceramic oxygen ion concentration difference between inside and outside is high, electrical potential difference is high, a large number of oxygen ions move from the inside to the outside, the output voltage is high (close to 800mV). If the mixture is lean, then the ceramic oxygen ion concentration difference between inside and outside is low, electrical potential difference is low, only a small amount of oxygen ions move from inside to outside, the output voltage is low (close to 200mV). Signal voltage suddenly

changes near the theoretical Air-Fuel ratio ( $\lambda=1$ ). Sensor signals pass through ECM harness connector EN01 terminal No.45 to ECM. DTC code P0030, P0031, P0032, P0053, P0130, P0131, P0132, P0133, P0134, P2195, P2196 will be recorded when there is a sensor, wire or circuit malfunction.

#### 9. Post-Catalytic Heated Oxygen Sensor (HO<sub>2</sub>S)

Post-Catalytic oxygen sensor is installed on the three-way catalytic converter rear end. Its working principle is the same as the Pre-Catalytic oxygen sensor. If the three-way catalytic converter is working properly, fuel control system is in close-loop control, the sensor output voltage is stable at 0.45V. Sensor signals pass through ECM harness connector EN01 terminal No.29 to ECM. DTC code P0036, P0037, P0038, P0054, P0136, P0137, P0138, P0140, P2270, P2271 will be recorded if there is a sensor, signal or circuit malfunction. DTC code P0420 will be recorded if the Post-Catalytic oxygen sensor detects that three-way catalytic converter is not working properly.

#### 10. Air-Conditioning Pressure Switch

Air-Conditioning pressure switch is installed in the Air-Conditioning high pressure side pipeline, mainly for Air-Conditioning system control. ECM command the compressor control relay only when correct signal is received, so that the electromagnetic compressor clutch pull-in. Switching signals pass through ECM harness connector EN01 terminal No.10, 44 to ECM. DTC code will not be recorded when there is a switch or circuit malfunction.

#### 11. Power Steering Switch

Power steering switch is installed on the power steering pump. When the steering wheel is operated, power steering pump oil pressure changes due to increased power steering pump load. If at this point, the engine is in idle state, it will cause the engine idle fluctuate. In order to make the engine run smooth, after ECM receives the signal, it will increase the engine's torque. A typical way is to increase the fuel injection amount. Switching signals pass through ECM harness connector EN01 terminal No.12 to ECM. DTC code will not be recorded when there is a switch or circuit malfunction.

## 12. Defrost Heating Enable Input

The signal is provided by the BCM through a dedicated circuit and is a voltage signal. The rear defrosting heating block is essentially a resistance wire with fairly high heating power. The power consumption is relatively high. When the rear defrost heating starts, the generator load increases, causing the engine speed fluctuate. In order to make the engine run smoother, after ECM receives the signal, it increase the engine's torque output. Switching signals pass through ECM harness connector EN01 terminal No.24 to ECM. when the signal fails, ECM does not record the relevant DTC code.

## 13. CAN Information Input

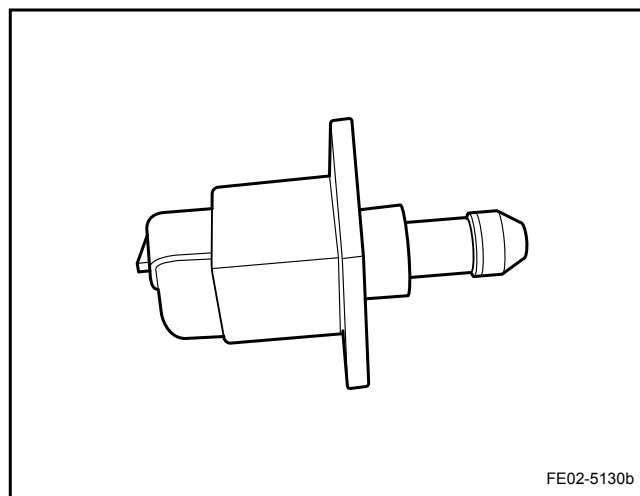
ECM downloads signals via CAN from the network for its own needs. The most typical signals are: brake switch signal, ABS's work status. CAN\_HI signal circuit connects to other CAN network modules through ECM harness connector EN01 terminal No.33. CAN\_LO signal circuit connects to other CAN network modules through ECM harness connector EN01 terminal No.34. If ECM fails to communicate with other modules, it will record DTC code U0001, U0121, U0140, U0151, P1523.

## 14. Serial Data Bus Input

When the ignition switch is turned on, the Anti-theft ignition coil identifies whether the inserted key is an illegal key. The signal is transmitted by the security module to ECM. ECM determines whether to activate the engine Anti-theft locking system based on this signal, such as cutting off the ignition, fuel injection, start the circuit. ECM harness connector EN01 terminals No.15,23 are for serial data communication. The immobilizer system-related failures DTC codes are P1610, P1611, P1612, P1613, P1614.

## 2.2.2.3 Output Components

### 1. Idle Speed Control Valve (IAC)



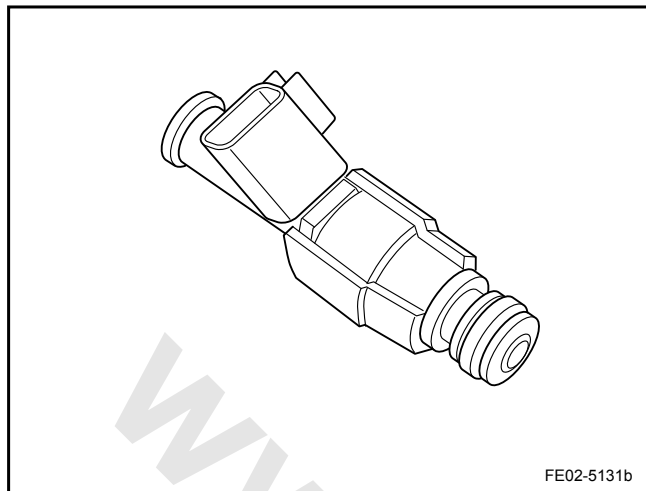
#### Note

A. Do not to push and pull IAC valve core shaft, otherwise it will damage the internal valve components.

B. When washing the IAC valve carbon residue, do not let any cleaning agent enter the IAC valve inside, otherwise it will damage IAC valve.

IAC valve is installed on the throttle body. ECM controls the spool extended the amount to control the idle speed. Engine sends the control module voltage pulses to the IAC valve motor windings, so that IAC valve core shaft moves to the inside or outside a certain distance (step or a count) with each pulse. Shaft movement controls the air flow amount bypass the throttle, and then controls the engine idle speed. The expected idle speeds of all engine running conditions are programmed and set in the ECM calibration program. These settings includes engine speed based on engine coolant temperature, speed, battery voltage, and Air-Conditioning system pressure. Engine control module reads the correct IAC valve position to meet the expectations of stable, warm-up idle speed under different conditions. This information is stored in the engine read-only memory, even after the ignition switch is switched off, the information will not be cleared. If the engine control module power supply is disconnect, it will lead to an incorrect idle speed control. When starting, press the accelerator pedal half way until the engine control module learns idle speed control. ECM controls IAC valve through ECM harness connector EN01 terminals No.21,22,35,36. If the idle speed control valve position does not match the actual ECM required location, DTC code P0506, P0507 will be recorded. If idle speed control valve circuit has a malfunction, DTC code P0508, P0509, P0511 will be recorded.

## 2. Cylinder No.1,2,3,4 Fuel Injectors



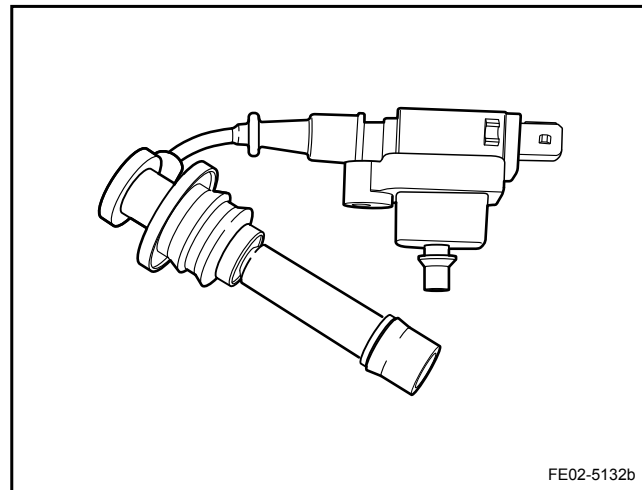
Fuel injector is installed on the cylinder cover, in front of intake valve. Based on ECM's instructions, it injects fuel during specific period of time, to provide engine the fuel atomized fuel. It also plays a role of storing high-pressure fuel to eliminate fuel pump resonance caused by pumping fuel. The fuel pressure remains stable. Fuel injector is an electromagnetic controlled nozzle. The return spring inside the shell compresses needle valve and seal the exit. During injection, the electronic controller gives control signal, electromagnetic coil obtains power, producing the magnetic field to overcome the return spring pressure, needle gravity, friction, etc. lift the needle valve. Under the pressure fuel sprays out. As the needle valve only has rising and falling only two states, needle lift travel can not be adjusted. As long as the pressure difference is constant, fuel injection quantity only depends on the needle valve opening time that is opening electrical pulse width.

### Note

When the fuel injector is blocked or not closed tight, the engine malfunction lamp may be lit. The detected DTC code is: oxygen sensor distortion, signal erratic or Air-Fuel ratio is not normal etc. At this point, carefully diagnose the component fault. Because when the fuel injector is blocked, the fuel injection amount is not controlled by ECM fuel injection pulse width. The oxygen sensor mixture concentration signal feedback to ECM will very different from the theoretical value. ECM will determine the oxygen sensor is not working properly. The system can not determine whether it is the oxygen sensor itself faulty or other associated components faulty. Pay attention to determine the failure component when diagnose such a fault.

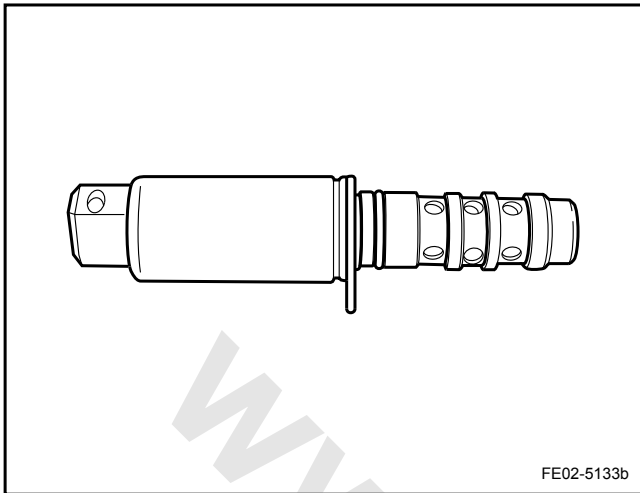
ECM controls the fuel injectors through ECM harness connector EN01 terminals No.50,63,49,64. If a fuel injector or circuit is fault, DTC code P0201, P0202, P0203, P0204, P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271 will be recorded.

## 3. Ignition Coil



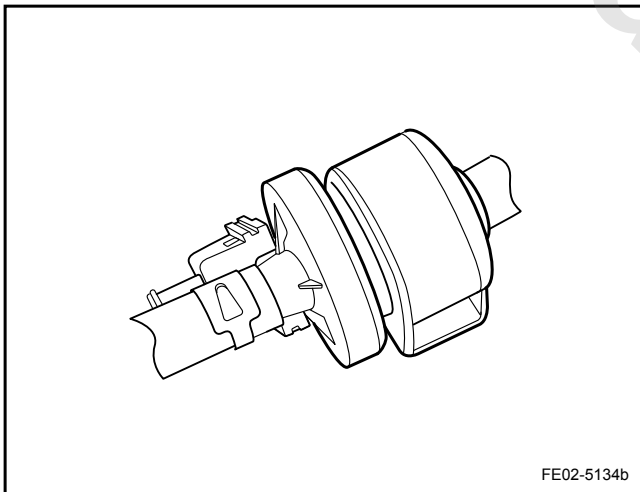
Cylinder No.1,4 ignition coil is located at top of the cylinder No. 4. Cylinder No.2,3 ignition coil is located at top of the cylinder No.2. Ignition coil primary winding low voltage will be transformed into the secondary winding high voltage. The spark plug discharges spark, igniting the air and fuel mixture inside the cylinder. Ignition coil consists of a primary winding, a secondary winding, iron core, shell and other components. When the primary winding is connected to ground, it will be charged. Once ECM cuts off the primary winding circuit, then charging will be terminated, while a high voltage induced in the secondary winding, so that spark plug discharges. Different from the ignition coil with a distributor, the ignition coil secondary winding is connected to a spark plug at each end, so the two spark plug discharge at the same time. ECM controls the ignition coil through ECM harness connector EN01 terminals No.3,7. When an ignition related fault occurs, DTC code P0300, P0301, P0302, P0303, P0304 will be recorded.

#### 4. Variable Valve Timing Solenoid Valve (VVT)



VVT solenoid valve is located at the engine intake manifold side near the front. VVT magnetic valve is a 4-bit 4-pass solenoid valve, the working power supplied from main relay controlled by ECM. ECM controls VVT solenoid valve ground with a pulse width modulation signal. ECM controls VVT solenoid valve through ECM harness connector EN01 terminal No.2.

#### 5. Canister Solenoid Valve (EVAP)



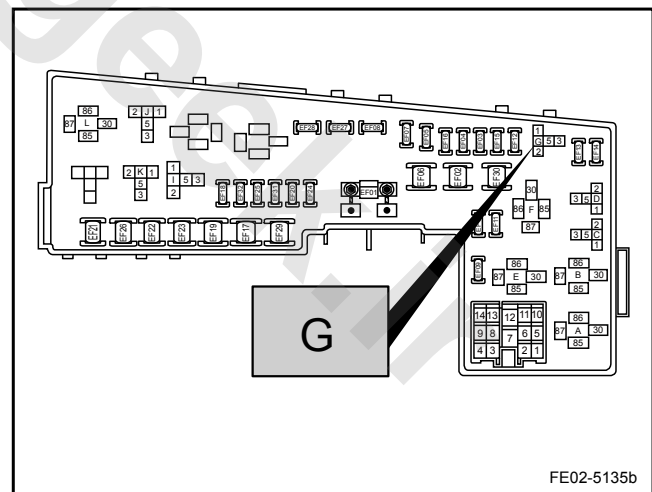
Canister control valve is located in the engine cylinder head cover side (transmission side) and is used to control the Canister clean air flow. ECM controls Canister valve according to engine load, engine temperature, speed and a series of signals. Through an integrated calculation, ECM gives electrical pulse duration and frequency (i.e. duty cycle) to control EVAP. Accumulated fuel vapor in the Canister, can cause environmental pollution once leaking. Canister solenoid valve is opened at the right time, so that the excessive fuel vapor after mixing with air entering into the intake manifold to

participate in combustion. Canister control valve consists of the electromagnetic coils, armature and valves. Canister inlet port has a filter. On one hand, air flow through the Canister control valve is related to ECM to the Canister control valve output electrical pulse duty cycle, on the other hand, it is related to the pressure difference between the Canister inlet port and outlet port. When there is no electrical pulse, the Canister control valve is closed. According to the engine sensors provided signals, ECM controls the Canister solenoid valve power-on time, indirectly controls the air flow amount. When the engine coolant temperature, engine working hours, engine load, etc. meet the preset requirements, ECM will command Canister solenoid valve work. Under the following conditions, Canister will not work:

- Engine cold start.
- Engine coolant temperature is relatively low.
- Engine idling.
- Engine heavy load.
- Important system sensor malfunction.

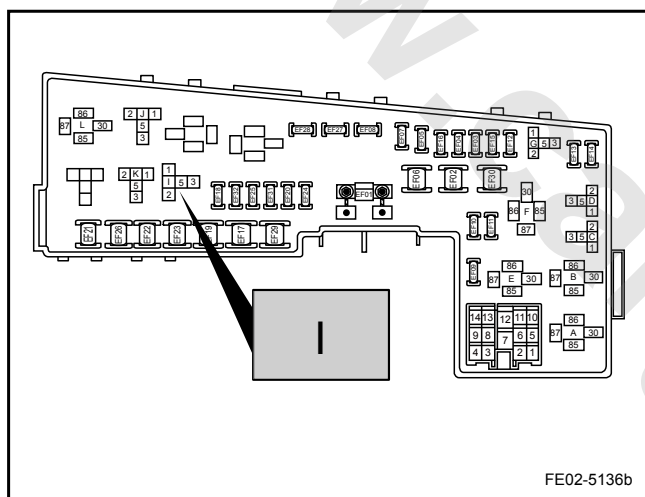
ECM controls Canister solenoid valve through ECM harness connector EN01 terminal No.37. When the EVAP solenoid valve and circuit are faulty, DTC code P0444, P0458 , P0459 will be recorded.

#### 6. Main Relay



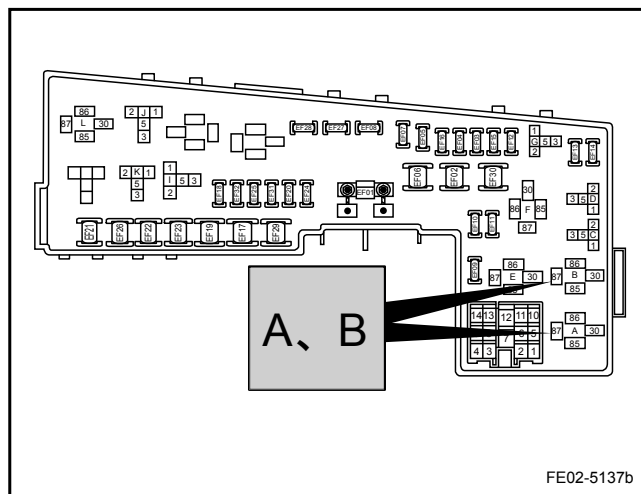
Main relay is controlled by ECM, when turning the ignition switch to "ON" position, battery voltage passes through the ignition switch to ECM 10 A fuse, and finally to ECM harness connector EN01 terminal No.17. ECM detects the terminal voltage, then controls the EN01 terminal No.32 to connect to ground. The main relay starts work and provides power to the Air-Conditioning compressor relay, cooling fan low speed relay, cooling fan high speed relay, pump relay, ECM wiring harness connector EN01 terminals No. 8 and 51, Canister solenoid valve, VVT solenoid valve, ignition coil, fuel injectors, Pre-Catalytic oxygen sensor heating, Post-Catalytic oxygen sensor heating and vehicle speed sensor. So when the main relay is not working properly, the engine will not work. ECM controls the main relay through ECM harness connector EN01 terminal No.32. ECM will not record the main relay associated DTC code.

#### 7. Pump Relay (I) and Fuel Pump



Pump relay is located in the underhood fuse box. fuel pump is installed in the fuel tank. ECM controls fuel pump relay closing and the fuel pump work. The fuel pump and the motor are installed on the same axle inside the housing, and surrounded by fuel, cooled and lubricated by fuel. As the pump relay pulls in, battery provides power through fuel pump relay to fuel pump. Only when fuel pump relay is working and the engine is running, the electric fuel pump circuit is connected. When the engine stops running due to an accident, the fuel pump automatically stops. The electric fuel pump export maximum pressure is determined by the pressure relief valve installed on the fuel pump. The export maximum pressure is between 450 kPa and 650 kPa. Fuel system uses "no-return pipe system", which stabilize fuel pressure at around 400 kPa. ECM controls fuel pump relay through ECM harness connector EN01 terminal No.61. If the pump relay and its circuit are faulty, DTC code P0627, P0628, P0629 will be recorded.

#### 8. High-Speed Cooling Fan Relay (A), Low-Speed Cooling Fan Relay (B)



Two cooling fan relays are in underhood fuse box, mainly used to control the high-low speed cooling fan operation. ECM controls the Low-Speed cooling fan relay through ECM harness connector EN01 terminal No.62. ECM controls the High-Speed cooling fan relay through ECM harness connector EN01 terminal No.52. when the cooling fan relay and the circuit are faulty, DTC code P0480, P0481, P0691, P0692, P0694 will be recorded.

#### 9. Air-Conditioning Compressor Relay

Air-Conditioning compressor relay is located in I/P fuse box, and is an internal integrated type. It is mainly used to control the electromagnetic compressor clutch work. ECM controls Air-Conditioning compressor relay through ECM harness connector EN01 terminal No.60. when the Air-Conditioning compressor relay and the circuit are faulty, DTC code P0645, P0646, P0647 will be recorded. If the relay is damaged, only replace the I/P fuse box.

#### 10. CAN Information Output

ECM sends information to other modules with CAN signals through the CAN network, to achieve network sharing, the most typical signals are: TPS, ECT, engine speed signals and so on. CAN\_H signal communicates with other CAN network modules through ECM harness connector EN01 terminal No.33. CAN\_L signal communicates with other CAN network modules through ECM harness connector EN01 terminal No.34. If ECM communication with other modules fails, DTC code U0001, U0121, U0140, U0151, P1523 will be recorded.

### 11. Serial Data Cable Output

The most typical serial data cable output application is the information exchange with the Anti-theft module. Scan tool diagnosis, data flow reading and other operations are also through the serial data cable. ECM harness connector EN01 terminals No.15,23 are for serial data communication.

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## 2.2.3 System Working Principle

### 2.2.3.1 System Working Principle

ECM calculates the basic fuel injection duration, Air-Fuel ratio close to the ideal mixture for the engine, and controls engine operation based on the engine's intake air quantity and engine speed signal. For example, in cold start, according to related signals, ECM increases the fuel injection and controls idle speed control valve actuator, to achieve a smooth start and controls the engine idle speed. In addition, ECM also has the fault self-diagnosis and protection function, when the engine fails, ECM can automatically diagnose and preserve the DTC code and, sends a warning through the fault indicator light. The stored code can appear again in certain trigger conditions. Once the sensor or actuator fail, ECM automatically start the backup system, to ensure the safety of the vehicle, maintain the vehicle driving ability. ECM can also communicate with scan tool. Scan tool can be used to read the stored DTC code and scan the current ECM operating system parameters, that is the data stream. Scan tool can also be used to drive the control system actuators for test, which provides a great convenience to diagnostic.

### 2.2.3.2 Fuel Injection Quantity Adjustment

At Startup, ECM calculates fuel injection time based on the engine speed, engine coolant temperature signal. After startup, ECM determines the basic fuel injection quantity based on the intake manifold absolute pressure sensor. After determining the basic fuel injection quantity, according to the different engine operating conditions, ECM adjusts the fuel injection as following:

- Start Up-Enrich Mixture: Starting condition is when the engine speed is below the specified value, the ignition switch is ON. Especially in the low temperature, in order to improve startup performance, ECM increases fuel injection time, and enriches the mixture.
- After Start-Enrich Mixture: The engine has just started, in order to maintain its running stability, ECM increases fuel injection amount according to the engine coolant temperature.
- Warm Up-Enrich Mixture: The engine temperature is low, gasoline evaporation is poor, ECM provides rich mixture. ECM increases fuel injection amount according to the engine coolant temperature.
- Heavy Load-Enrich Mixture: The engine power output is maximum, in order to ensure the engine work properly, ECM increases fuel injection duration according to throttle position, engine speed, air flow, engine coolant temperature signal. Increased fuel amount is up to 8% -30% of normal fuel injection amount.
- Acceleration-Enrich Mixture: When the engine is accelerating, for it to have dynamic, enrich the mixture. ECM increase the fuel injection amount according to air flow, engine speed, vehicle speed, throttle position (change rate), the engine coolant temperature sensor signal.
- Intake Air Temperature Adjustment: Air density changes as the temperature changes. In order to maintain a more accurate Air-Fuel ratio, ECM uses air density at 20°C (68 °F) as the standard value. ECM adjusts fuel injection according to measured intake air temperature signal. At low temperature, ECM increases fuel injection amount. At high temperature, ECM decreases fuel injection amount. The adjustment is up to 10%.
- idle Stability Adjustment: In the engine control system, when the intake manifold pressure increase, the idle speed drops. ECM adjusts fuel injection amount according to throttle position, engine speed, intake manifold absolute pressure sensor signal.
- Air-Fuel Ratio Feedback Adjustment: ECM adjusts fuel injection amount according to oxygen sensor signal. When engine starts, the mixture will be enriched. With heavy load, the engine coolant temperature below the set temperature and fuel supply cut off operating conditions, ECM is in close-loop control mode.
- Cut Off Fuel Supply: In order to achieve good fuel economy, lower emissions pollution, when the engine is in forced idle state, ECM cut off fuel supply temporarily according to throttle position, engine speed, engine coolant temperature sensor signal. During emergency deceleration, engine over speed, vehicle over speed, fuel supply will also be cut off temporarily.
- Voltage Adjustment: Power supply voltage affects fuel injection amount. When voltage is low, the actual injection duration is shorter than normal and the mixture is lean. It needs to be adjusted. ECM adjusts fuel injection amount according to high or low voltage. Power supply voltage signal is from the battery.

### 2.2.3.3 Fault Self-Diagnostic and Protection Function

In order to discover the engine electronically controlled gasoline injection system fault in time, and maintain the vehicle basic driving ability when a fault occurs, ECM has a fault diagnostic and self-protection function. ECM is equipped with a dedicated self-diagnostic circuit. When the engine is running, ECM continuously monitors various parts. Once ECM detects an abnormal situation, it will store the fault signal in memory, and displays DTC code.

In order to prevent vehicle can not be driven due to the sensor malfunction. ECM uses pre-stored sensor signals to continue to control engine operation.

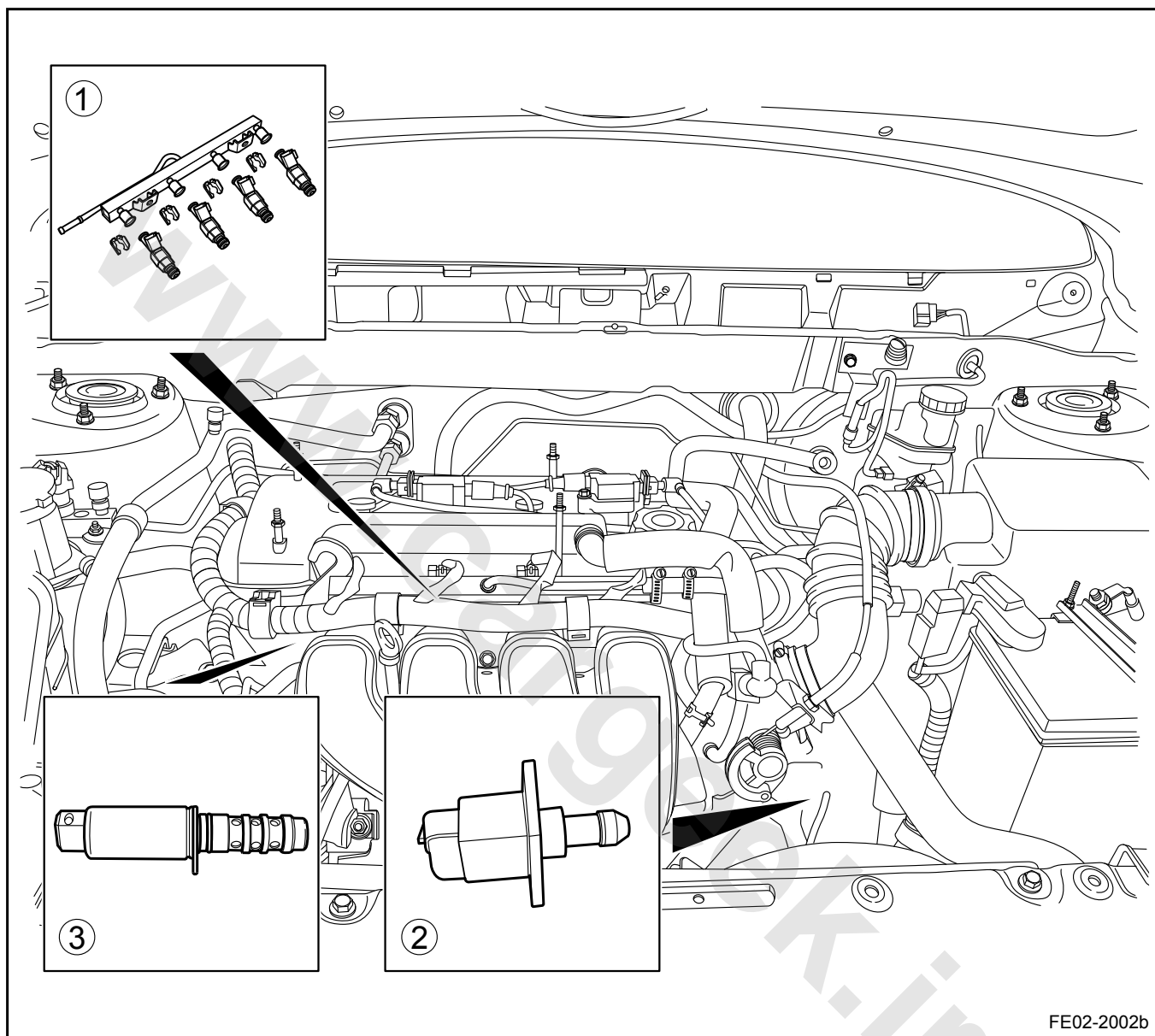
For actuators, in order to prevent their failure affect safety, ECM can take measures to ensure the engine safety. At this point, ECM will send out warning signals and stop fuel injection.

In addition, ECM is also equipped with an emergency circuit. When the emergency control circuit receives an abnormal signal, ECM will enable the backup program. The fuel injection amount and ignition timing will be controlled according to the original set-up program, to maintain the vehicle basic driving ability.



## 2.2.4 Component Locator

### 2.2.4.1 Fuel Injector, Idle Speed Control Valve and VVT Solenoid Valve

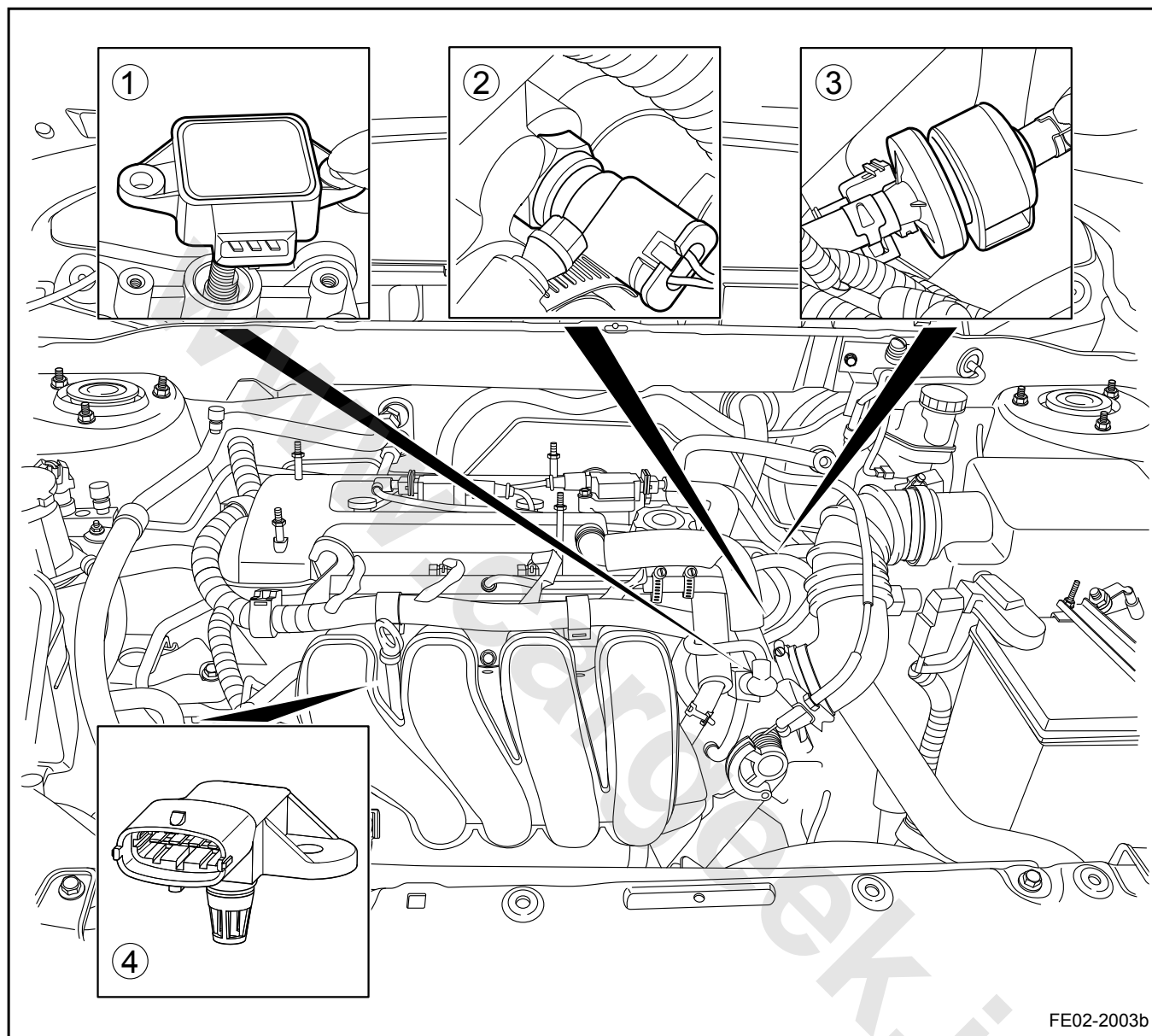


#### Legend

- 1. Fuel Rail Injector Subassembly
- 2. Idle Speed Control Valve

- 3. VVT Solenoid Valve

## 2.2.4.2 Throttle Position Sensor, Engine Coolant Temperature Sensor, Canister Solenoid Valve and Intake Air Pressure and Temperature Sensor



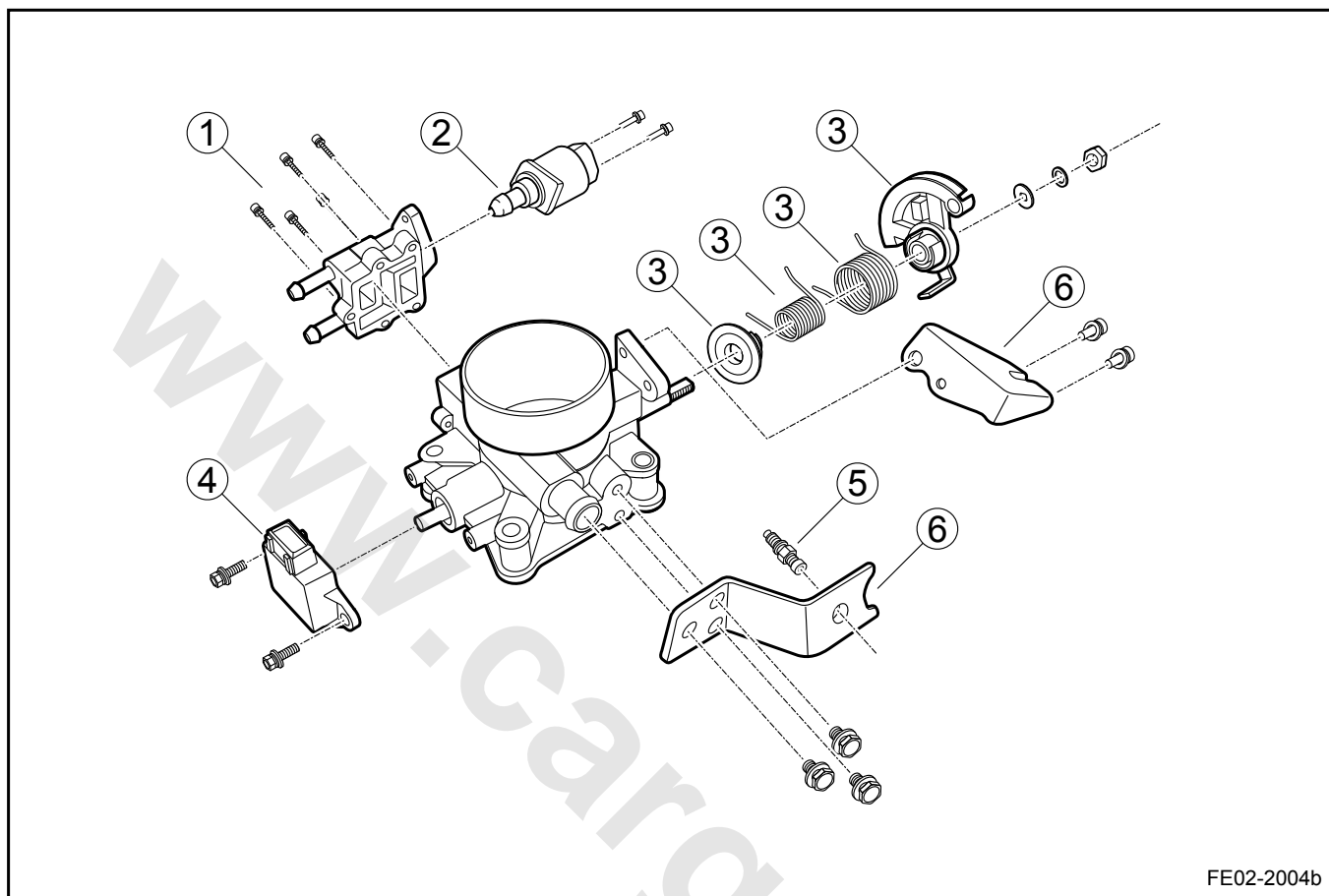
FE02-2003b

### Legend

- |                                      |   |
|--------------------------------------|---|
| 1. Throttle Position Sensor          | 4. Intake Air Pressure and Temperature Sensor |
| 2. Engine Coolant Temperature Sensor |   |
| 3. Canister Solenoid Valve           |   |

## 2.2.5 Disassemble View

### 2.2.5.1 Throttle Body Assembly



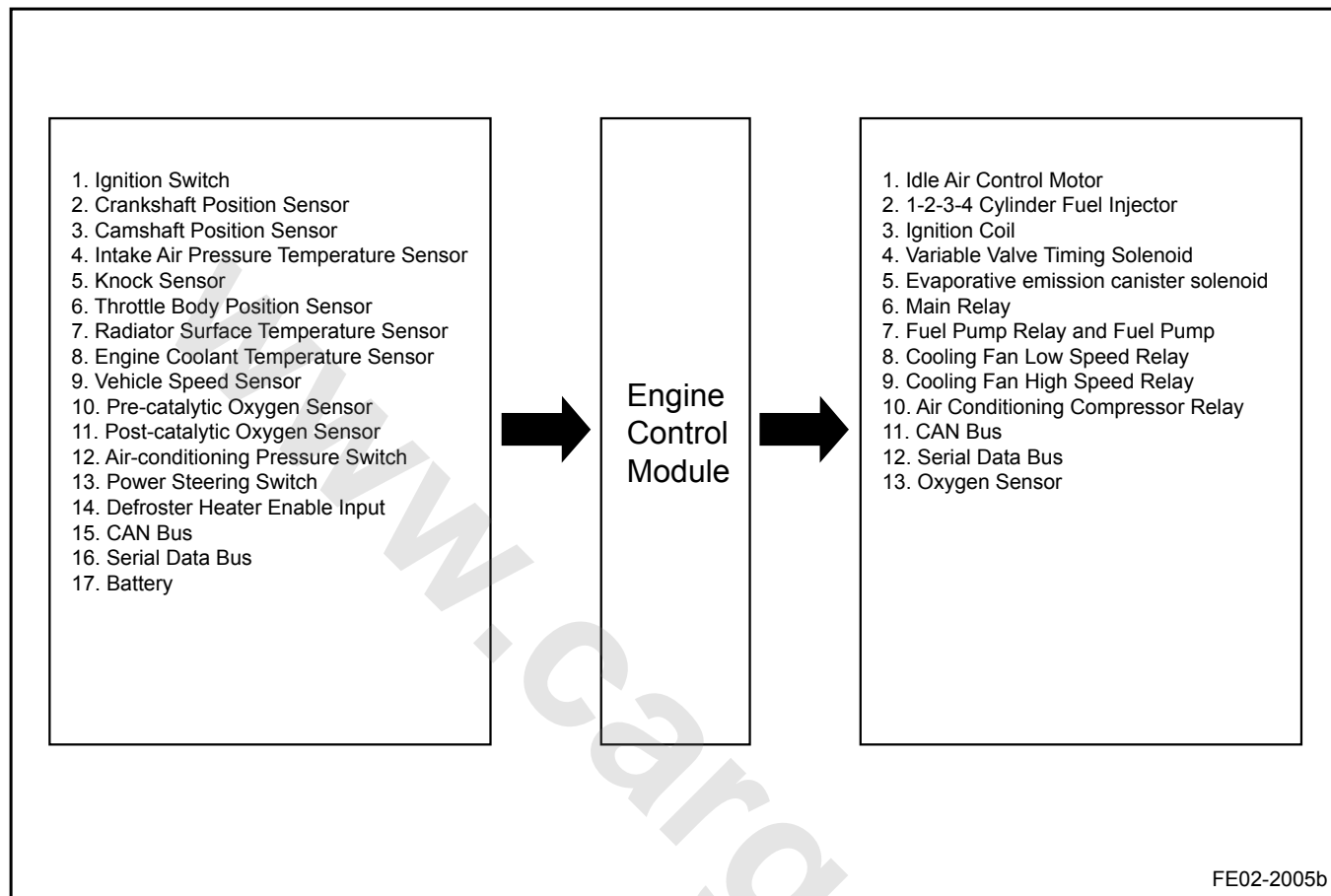
#### Legend

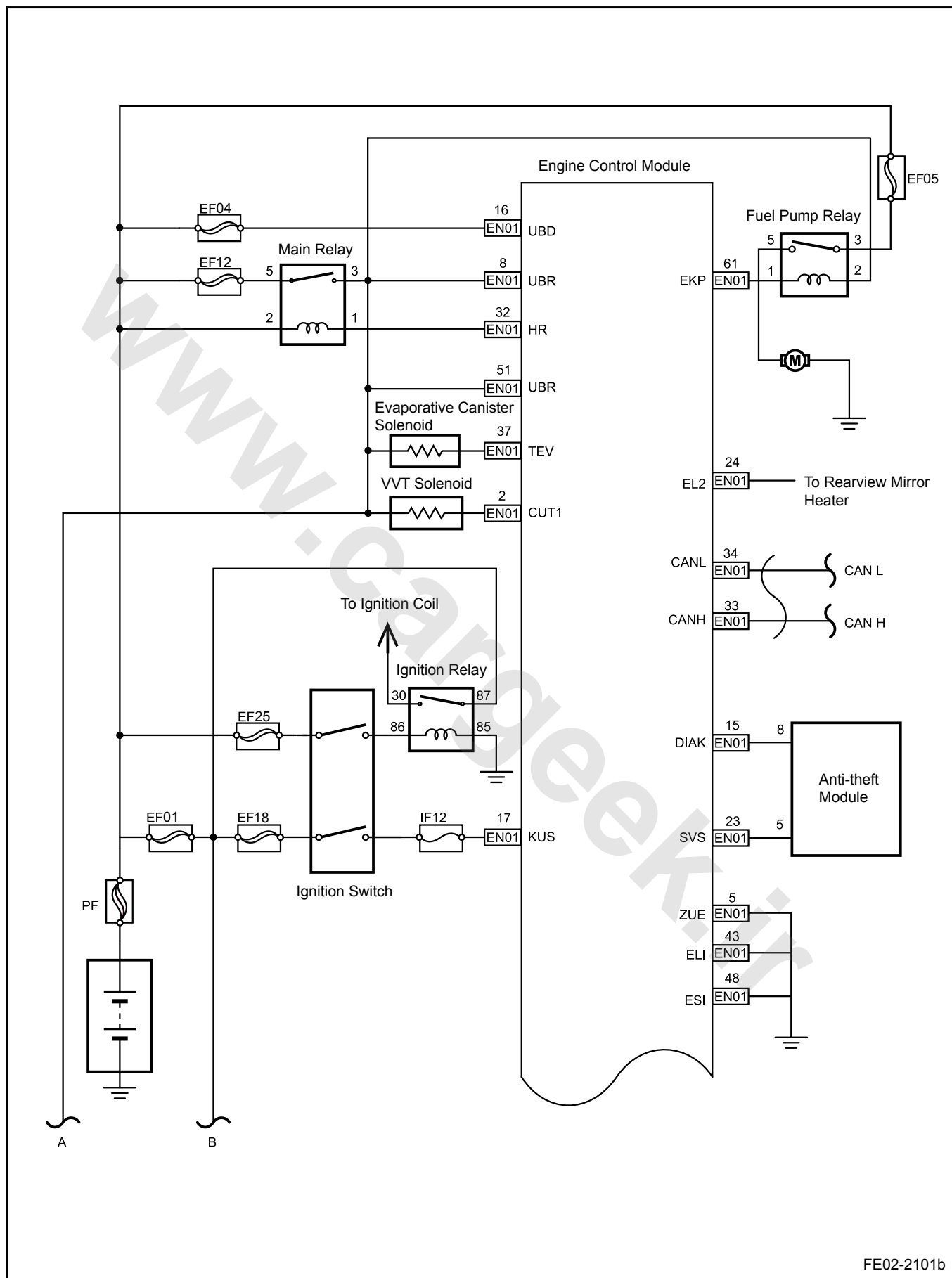
- 1. Idle Air Intake Channel
- 2. Idle Speed Control Valve
- 3. Throttle Butterfly Valve Control Components
- 4. Throttle Position Sensor

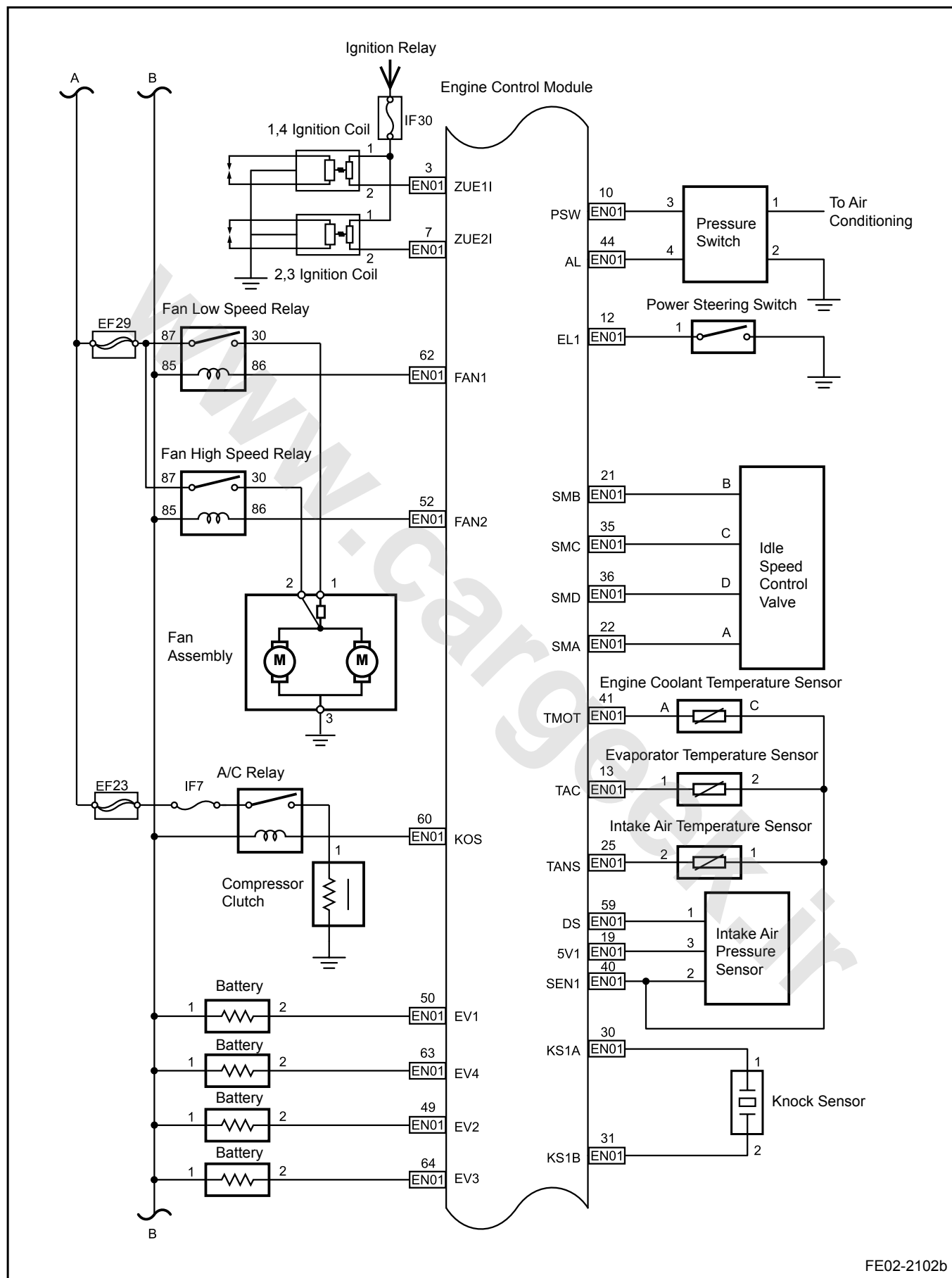
- 5. Throttle Limit Screw
- 6. Throttle Cable Mounting Bracket

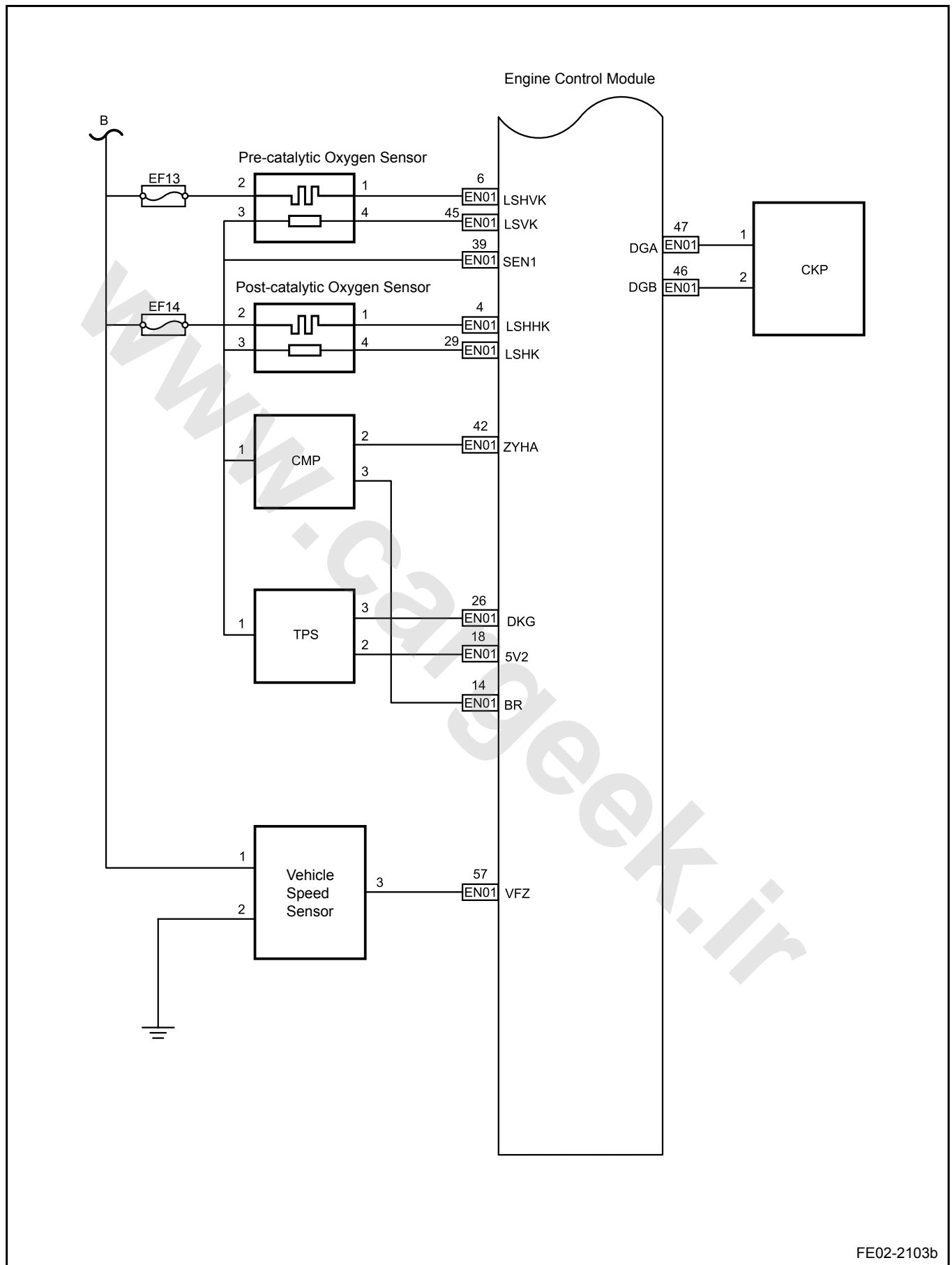
## 2.2.6 Schematic

### 2.2.6.1 Schematic









## 2.2.7 Diagnostic Information and Procedures

### 2.2.7.1 Diagnostic Description

Before diagnose the control system, please refer to [2.2.2.1 Overview](#) and [2.2.3.1 System Working Principle](#). Understand and become familiar with control system working principle and then start systematic diagnosis, so that in the event of faults it will help determine the correct Diagnostic Steps, more importantly, it will also help to determine whether the customer described situation is normal or not.

Any control system fault diagnosis should start with "Control System Check" as a starting point. "Control System Check" will guide the service personnel to take the next logical step to diagnose the fault. Understand and the correct use of diagnostic flow charts can reduce diagnostic time and avoid misjudging a component.

### 2.2.7.2 Control System Check

Before the control system check, please do following preliminary checks:

1. Check the battery terminal voltage to ensure an adequate power supply and a stable voltage.
2. Check the battery cables, clean and tighten.
3. Check the easy to access system components whether there are obvious damages that may cause the symptoms, such as vacuum tube damage and the reliability of wiring harness connectors connection.
4. Check control module and battery ground points whether there are copper oxidizing or signs of loosening.
5. Check control system whether it is likely to affect the normal system operation after the installation of aftermarket equipments.

Diagnostic Steps:

Step 1	Verify customer described faults.
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Next</div>	
Step 2	Connect a scan tool.
(a) Install the scan tool. (b) Turn on the scan tool. Is the scan tool connected?	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Go to step 11</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: 100px; margin: 0 auto;">Yes</div>	
Step 3	Start communication between the scan tool and the engine control module.
(a) Turn the ignition switch to "ON", but do not Start the engine. (b) Try to establish communication between the scan tool and engine control module (ECM) . Can the scan tool communicate with engine control module?	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Go to step 14</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: 100px; margin: 0 auto;">Yes</div>	
Step 4	Start the engine and run at idle speed. Can the engine start?



No

Refer to [2.11.7.4 Engine Can Not Start](#)

Yes

Step 5 Select engine control module DTC code reading function. Is there any system DTC code?

No

Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 6 Record and clear the DTC code.

Next

Step 7 Verify fault symptoms.

Results

To Step

Fault does not appear.

Yes

Fault appears.

No

No

Go to step 9

Yes

Step 8 Simulate fault symptoms.

Next

Step 9 Check control system whether there is a DTC code.

Results

To Step

DTC Code

Yes

No DTC Code

No

No

Refer to [2.5.7.6 Fault Symptom Table](#)

Yes

Step 10 Repair according to the DTC code. Refer to [2.2.7.11 DTC Code Index](#).

Step 11 Connect the scan tool to a proper operated vehicle. Can the scan tool be turned on?

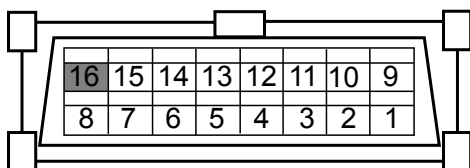
No

The scan tool failed. Replace the scan tool.

Yes

Step 12 Check datalink connector power supply circuit.

Datalink Connector IP12



FE02-5000b

- (a) Turn the ignition switch to "ON" position.
- (b) Measure the voltage between datalink connector IP12 terminal 16 and a reliable ground.

Standard Voltage: 11-14 V

Is the voltage normal?

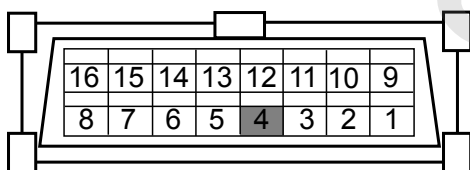
No

Check if the circuit between terminal 16 and the IF21 fuse open.

Yes

Step 13 Check datalink connector ground circuit.

Datalink Connector IP12



FE02-5001b

- (a) Turn the ignition switch to "OFF" position.
- (b) Measure the voltage between datalink connector IP12 terminal 4 and a reliable ground.

Standard Resistance: Less than 1  $\Omega$ 

No

Check if the circuit between terminal 4 and the ground open.

Yes

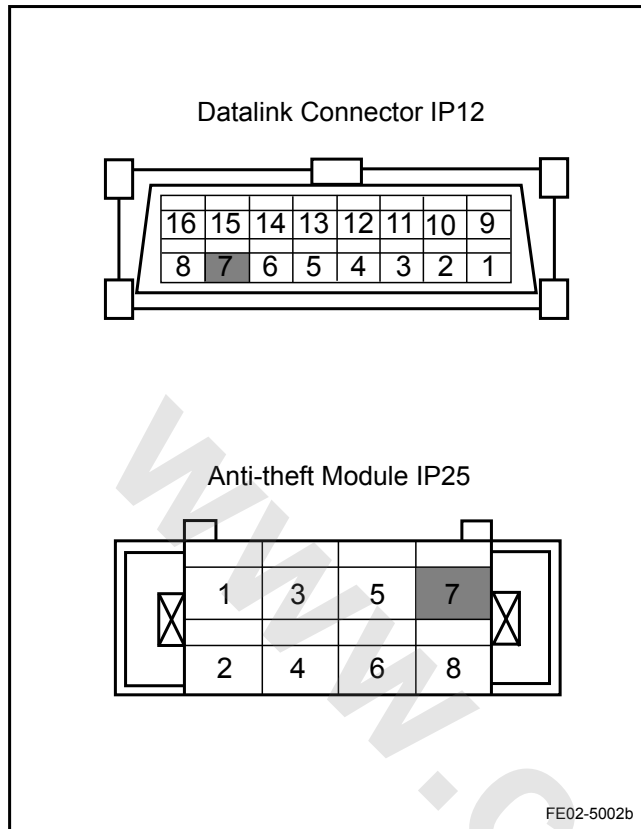
Step 14 Is the engine running properly?

No

Engine immobilizer control module and ECM communication failure, check and repair the relevant components. Refer to [2.5.7.12 Engine Anti-theft Warning Lamp Flashing, Vehicle Can Not Start](#)

Yes

Step 15 Terminal continuity check.



- (a) Disconnect engine immobilizer control module IP25 wiring harness connector.
- (b) Test the terminal continuity using an ohmmeter.

Connecting Multimeter	Standard Value
IP12(7) - IP25(7)	Less than 1 $\Omega$

- (c) Reconnect the engine immobilizer control module IP25 wiring harness connector.

Normal?

No

Repair or replace the wiring harness connector.

Yes

Step 16 Test to confirm.

Next

Step 17 End.

### 2.2.7.3 Intermittent Fault Check

#### Note

1. Clear DTC.
2. Carry out simulation tests.
3. Inspect and shake the wiring harnesses, connectors and terminals.

When DTC checks can not identify the fault, the fault occurs only occasionally in use. At this point you should test and confirm all circuits and components that can possibly lead to the fault. In many cases, carrying out the basic checks flow chart shown in the following can quickly and efficiently identify the Repair the faulty part. especially for harness connector poor contact.

Fault Definition: The fault currently does not appear, but the historical record indicates that the fault has appeared before. Or a customer reported the fault and had it repaired, but because the fault is not relevant to the DTC code, the fault symptoms do not appear.

#### Diagnostic Steps:

Step 1	Is the battery voltage normal?
--------	--------------------------------

- (a) Turn the ignition switch to "OFF" position.
- (b) Measure the battery voltage with a multimeter.

According to the Measure value, choose the appropriate diagnostic step.

Results	To Step
11 V or higher	Yes
Less than 11 V	No

No

Check the battery. Refer to [2.11.2.1 Battery Description and Operation](#)

Yes

Step 2 Check visually and physically.

This step is an important method to initially identify the fault location:

- (a) Check wiring harness for damage, wear and tear.
- (b) Check whether the wiring harness routed properly. Do not place wiring harness near a device with high voltage or high current running through:
  - Such as start motor, generator and other motor components. When these components are working, they will introduce great electromagnetic interference, thus affecting the proper signal transmission, resulting in system not working properly.
  - Ignition coil, ignition wires and other components.
- (c) Check whether there is a vacuum hose cracking, damage or distortion. Confirm the hoses correct connection and routing.
- (d) Check whether there is air intake system leak, for example, throttle body installation surface, idle speed control valve, intake manifold sealing surface and so on.
- (e) Check the engine control module (ECM) ground and the body ground whether there is oxidation, loose, incorrect position. The control system ground can not be changed at will, as this will affect the proper operation of the control system .
- (f) Check whether the battery positive and negative cable connections are reliable, whether there is loose, oxidation, corrosion and so on.

Next

Step 3 Check wiring harnesses and connectors.

- (a) Many intermittent faults are caused by vibration, distortion, uneven roads, improper operation of components or connectors dislocation.
- (b) If the circuit resistance is too high, it may result in components not working properly. Use a scan tool to drive the actuators, if not working, check whether the resistance in the circuit is too high or other faults.

Next

Step 4 Reproduce the fault and use instruments to record engine control module data.

- (a) Connect a scan tool and use the data record function to record road test data. After pressing the vehicle data recorder button, the scan tool can record engine control module data in the event of intermittent fault occurring, and then the data can be used to identify the fault location.
- (b) Another diagnostic method is when the vehicle is driven connect a digital multimeter to the suspicious circuit. Digital multimeter abnormal readings may indicate the fault location.

Next

Step 5 Intermittent malfunction indicator light, but a DTC code is not set in the system.

Following conditions may cause intermittent malfunction indicator light, but the system does not set the DTC codes:

- (a) Relay working abnormally, the engine control module controlled electromagnetic valves or switches causing electromagnetic interference.
- (b) Non-original or aftermarket accessories, such as a phone, alarm, lights or radio equipment, not installed properly.
- (c) Intermittent malfunction indicator light control circuit short to ground.
- (d) Engine control module ground loose.

Next

Step 6 Other checks.

- (a) Test whether Air-Conditioning compressor clutch diodes at both ends and other diodes are in open circuit.
- (b) Check charging system whether there are following conditions existing:
  - Generator rectifier fault within the electrical system may result in the communication signal interference.
  - Generator output voltage is correct or not. If the generator output voltage is lower than 9V or higher than 18V, repair the charging system.

Next

Step 7 Refer to fault symptom table.

### 2.2.7.4 Fault Symptom Table

If a fault occurred, but no DTC code stored within ECM, or the fault cause can not be identified in the basic checks, you should diagnose or exclude the fault based on the sequence listed in the following table.

Symptoms	Suspected Fault Items	Relevant Sections
Engine does not run.	1. Battery	"Starting/Charging System" in the <a href="#">2.11.7 Diagnostic Information and Procedures</a> .

Symptoms	Suspected Fault Items	Relevant Sections
Fault Definition: When the ignition switch in the "ST" position, the engine crankshaft is not rotating.	2. Starter	"Engine Immobilizer System" in the <a href="#">2.5.7 Diagnostic Information and Procedures</a> .
	3. Start Relay	
	4. Ignition Switch	
	5. BCM	
	6. Engine Immobilizer System	
Engine does not start, no sign of the vehicle starting. Fault Definition: When ignition switch in the "ST" position, the engine crankshaft rotates, but no sign of the vehicle starting.	1. ECM Power Supply Circuit	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	2. Crankshaft Position Sensor	This section <a href="#">2.2.7.29 DTC P0321 P0322</a> .
	3. Camshaft Position Sensor	This section <a href="#">2.2.7.31 DTC P0340-P0343</a> .
	4. Ignition System	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	5. Fuel Pump Control Circuit	"Fuel System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	6. Fuel Injector Working Circuit	
	7. ECM	This section <a href="#">2.2.8.8 Engine Control Module Replacement</a> .
Engine difficult to start Fault Definition: The engine crankshaft rotation is normal, but the vehicle can not be started in a long time. The engine is eventually started, but it may stop immediately.	1. ECM Power Supply Circuit	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	2. Engine Coolant Temperature Sensor	This section <a href="#">2.2.8.6 Engine Coolant Temperature Sensor Replacement</a> .
	3. Idle Air Control Valve (IAC) System	This section <a href="#">2.2.8.1 Idle Air Control Valve Replacement</a> .
	4. Fuel Pump Relay, Fuel Pump, Fuel Injector, Fuel Contamination	"Fuel System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	5. Ignition System: Ignition Wire, Spark Plug, Ignition Coil	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	6. Excessive Engine Oil in Combustion Chamber and Valve Seal Leakage	"Mechanical System" in the <a href="#">2.6.7 Diagnostic Information and Procedures</a> .
	7. Excessive Carbon Residue in Combustion Chamber	
	8. Incorrect Assembly	
	9. Incorrect Cylinder Compression Pressure	
Poor idle, Unstable, Inaccurate or Stall Fault Definition: Engine running unstable during idle. In extreme cases, the engine or the vehicle will tremble. With the throttle opening at a certain	1. ECM Power Supply Circuit	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	2. Air Cleaner Filter Blocked	---
	3. Fuel Pressure Abnormal	"Fuel System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	4. Fuel Contamination	
	5. Injector Working Abnormal	

Symptoms	Suspected Fault Items	Relevant Sections
degree the engine idle speed may fluctuate. Any of above circumstance is likely serious enough to make the engine stall.	6. Idle Air Control Valve	This section <a href="#">2.2.8.1 Idle Air Control Valve Replacement</a> .
	7. Crankcase Ventilation Valve	"Auxiliary Emissions Control Device" in the <a href="#">2.4.6 Diagnostic Information and Procedures</a> .
	8. Evaporative Emission (EVAP) Canister Solenoid Valve	"Auxiliary Emissions Control Device" in the <a href="#">2.4.6 Diagnostic Information and Procedures</a> .
	9. Knock Sensor (KS) System Ignition Delay	Ignition System "in the <a href="#">2.10.7 Diagnostic Information and Procedures</a>
	10. Spark Plug: Incorrect thermal value, damp, crack, incorrect gap, excessive erosion, excessive carbon residue and contaminated by fuel	
	11. Spark Plug Wire Damage	
	12. Ignition Coil Damage	
	13. Crankshaft Position Sensor	This section <a href="#">2.2.7.29 DTC P0321 P0322</a> .
	14. Excessive Engine Oil in Combustion Chamber or Valve Seals Leakage	"Mechanical System" in the <a href="#">2.6.7 Diagnostic Information and Procedures</a> .
	15. Incorrect cylinder compression pressure	
	16. Valve Stagnant or Leaking, Valve Spring Broken, Incorrect Valve Timing	
	17. Excessive Carbon Residue in Combustion Chamber	---
	18. Electromagnetic interference (EMI) in voltage circuit may lead to engine Misfire. Use the scan tool to monitor the engine speed to detect electromagnetic interference. Engine speed parameter sudden increase while the actual engine speed is almost no change indicates presence of electromagnetic interference. If there is fault, check whether there is a high voltage part in the vicinity of the ignition control circuit.	
	19. Check engine mountings.	"Engine Mechanical System" in the <a href="#">2.6.8.7 Engine Mount Replacement</a> .
Engine stalls only when Air-Conditioning is working. Fault Definition: when Air-Conditioning is working,	1. Air-Conditioning signal circuit	"Air-Conditioning System" in the <a href="#">8.2.7 Diagnostic Information and Procedures</a> .
	2. Idle Air Control Valve Stagnant	This section <a href="#">2.2.8.1 Idle Air Control Valve Replacement</a> .

Symptoms	Suspected Fault Items	Relevant Sections
engine speed is not stable or engine stall.	3.ECM	This section <a href="#">2.2.8.8 Engine Control Module Replacement</a> .
Back fire, Pinging Fault Definition: Unburned gases from the combustion chamber entering into the intake manifold or exhaust system, ignited, producing a very loud pinging sound.	1.ECM Power Supply Circuit	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	2. Fuel Pressure Abnormal	"Fuel System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	3. Fuel Contamination	
	4. Injector Working Abnormal	
	5. Air leakage in intake system and crankcase	"Auxiliary Emissions Control Devices" in the <a href="#">2.4.6 Diagnostic Information and Procedures</a> .
	6. Crankcase Ventilation Valve	
	7. Knock sensor (KS) system ignition delay too great	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	8. Spark Plug: Thermal Value Incorrect, Damp, Crack, Gap Incorrect, Excessive Erosion, Excessive Carbon Residue, Contaminated by Fuel	
	9. Spark Plug Wire Damage	
	10. Ignition Coil Damage	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	11. Engine coolant level too low, thermostat failure	"Engine Cooling System" in the <a href="#">2.8.7 Diagnostic Information and Procedures</a> .
High Fuel Consumption, Poor Fuel Economy Fault Definition: The actual road test fuel consumption is significantly higher than expected. In addition, the fuel consumption is also significantly higher than the previous road test.	1.ECM Power Supply Circuit	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	2. <ul style="list-style-type: none"> <li>Air-Conditioning or Defroster Always On</li> <li>Tire Pressure Incorrect</li> <li>Vehicle Overload</li> <li>Accelerate too fast, too frequent</li> </ul>	---
	3. Air Cleaner Filter Blocked	---
	4. Poor Fuel Quality, Fuel Contamination	"Fuel System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	5. Fuel Pressure Abnormal	
	6. Injector Working Abnormal	
	7. Throttle Body Dirty	"Engine Mechanical System" in the <a href="#">2.6.8.5 Throttle Body Assembly Replacement</a> .
	8. Rich Gas and Air Mixture	This section <a href="#">2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196</a> .



Symptoms	Suspected Fault Items	Relevant Sections
	9. Air Leakage In Intake System and Crankcase System	"Auxiliary Emissions Control Devices" in the <a href="#">2.4.6 Diagnostic Information and Procedures</a> .
	10. Crankcase Ventilation Valve Stagnant	
	11. Knock Sensor (KS) system ignition delay too great	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	12. Spark Plug: Thermal Value Incorrect, Damp, Crack, Gap Incorrect, Excessive Erosion, Excessive Carbon Residue, Contaminated by Fuel	
	13. Spark Plug Wire Damage	
	14. Ignition Coil Damage	
	15. Engine coolant level too low, thermostat failure	"Engine Cooling System" in the <a href="#">2.8.7 Diagnostic Information and Procedures</a> .
	16. Excessive engine oil in combustion chamber or valve seals leak	"Engine Mechanical System" in the <a href="#">2.6.7 Diagnostic Information and Procedures</a> .
	17. Cylinder Compression Pressure Incorrect	
	18. Valve stagnant or leak, broken valve spring, valve timing incorrect	
	19. Excessive Carbon Residue in Combustion Chamber	
	20. Vacuum Hose Cracking or Kink, Connection Unreliable	
	21. Exhaust not Smooth: Three-way Catalytic Converter Plug, Muffler Internal Damage	"Engine Exhaust System" in the <a href="#">2.7.5 Diagnostic Information and Procedures</a> .
	22. Braking System Dragging or Operation Abnormal	"Braking System" in the <a href="#">6.4.4 Diagnostic Information and Procedures</a> .
	23. Electromagnetic Interference (EMI) in the voltage circuit may lead to engine Misfire. Use the scan tool to monitor the engine speed to detect electromagnetic interference. Engine speed parameters sudden increase while the actual engine speed is almost no change indicates the presence of electromagnetic interference. If there is a fault, check whether there is a high voltage part in the vicinity of the ignition control circuit.	---

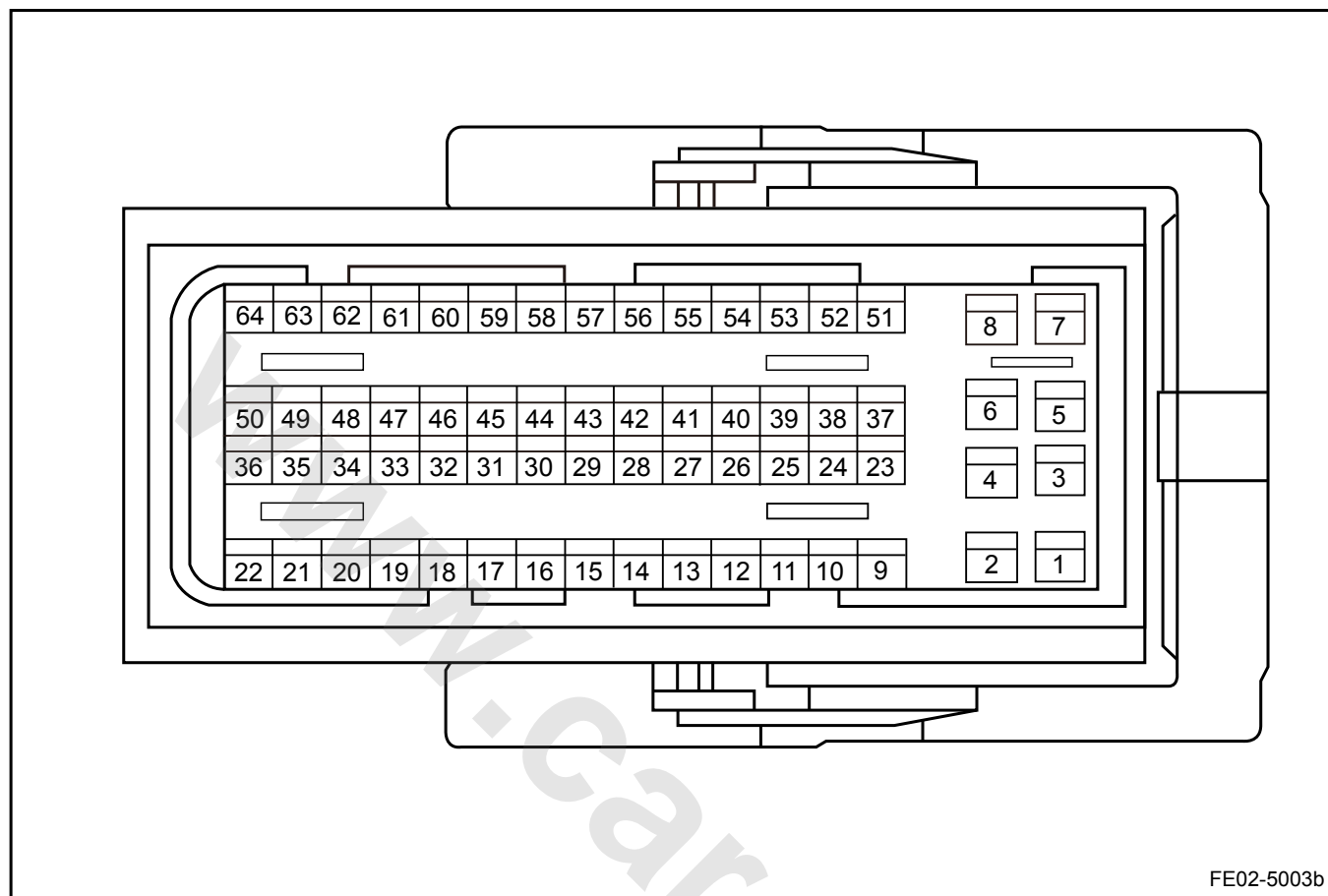
Symptoms	Suspected Fault Items	Relevant Sections
<b>Surge</b> Fault Definition: When the throttle position is stable the engine power changes. It feels as if the vehicle speed will rise and fall when there is no accelerator pedal position change.	1. ECM Power Supply Circuit	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	2. Air-conditioner Compressor	"Air-Conditioning System" in the <a href="#">8.2.7 Diagnostic Information and Procedures</a> .
	3. Heated Oxygen Sensor Abnormal	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	4. Poor Fuel Quality, Fuel Contamination	"Fuel System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	5. Fuel Pressure Abnormal	
	6. Injector Working Abnormal	
	7. The Air-Fuel Mixture Too Rich	This section <a href="#">2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196</a> .
	8. The Air-Fuel Mixture Too Lean	This section <a href="#">2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196</a> .
	9. Spark Plug: Thermal Value Incorrect, Damp, Crack, Gap Incorrect, Excessive Erosion, Excessive Carbon Residue, Contaminated by Fuel	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	10. Spark Plug Wire Damage	
	11. Ignition Coil Damage	
	12. Intelligent Variable Valve Timing System	"Engine Mechanical System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	13. Vacuum Hose Cracking or Kink, Connection Unreliable	
<b>Power Shortage, Accelerate Pedal Stagnant or Soft to Press</b> Fault Definition: The engine power output is lower than expected. When half-pressing the accelerator pedal, the vehicles accelerates a little or does not accelerate at all.	1. ECM Power Supply Circuit	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	2. Air Cleaner Filter Blocked	---
	3. Poor Fuel Quality, Fuel Contamination	"Fuel System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	4. Fuel Pressure Abnormal	
	5. Injector Working Abnormal	
	6. The Air-Fuel Mixture Too Rich	This section <a href="#">2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196</a> .
	7. The Air-Fuel Mixture Too Lean	
	8. Knock Sensor (KS) System Ignition Delay Too Great	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	9. Spark Plug: Thermal Value Incorrect, Damp, Crack, Gap Incorrect, Excessive Erosion, Excessive Carbon Residue, Contaminated by Fuel	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	10. Spark Plug Wire Damage	
	11. Ignition Coil Damage	

Symptoms	Suspected Fault Items	Relevant Sections
	12. Crankshaft Position Sensor	This section <a href="#">2.2.7.29 DTC P0321 P0322</a> .
	13. Excessive Engine Oil in Combustion Chamber or Valve Seals Leakage	"Engine Mechanical System" in the <a href="#">2.6.7 Diagnostic Information and Procedures</a> .
	14. Cylinder Compression Pressure Incorrect	
	15. Valve Stagnant, Valve Spring Broken, Valve Timing Incorrect	
	16. Excessive Carbon Residue in Combustion Chamber	
	17. Intelligent Variable Valve Timing System	
	18. Exhaust Not Smooth: Three-way Catalytic Converter Plug, Muffler Internal Damage	"Engine Exhaust System" in the <a href="#">2.7.5 Diagnostic Information and Procedures</a> .
Pinging, Knocking Fault Definition: The knocking sound increases during acceleration. With the throttle opening changes, the engine will produce a sharp metal knocking sound.	1. ECM Power Supply Circuit	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	2. Wrong Fuel Used	"Fuel System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	3. Fuel Pressure Abnormal	
	4. Injector Working Abnormal	
	5. The Air-Fuel Mixture Too Lean	This section <a href="#">2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196</a> .
	6. Knock Sensor (KS) System Ignition Advance Too Great	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	7. Spark Plug Thermal Value Incorrect	
	8. Engine Cooling System: Engine coolant level is too low. The engine coolant is not the correct type. The engine coolant leaks. The cooling fan is not running.	"Engine Cooling System" in the <a href="#">2.8.7 Diagnostic Information and Procedures</a> .
	9. Excessive Engine Oil in Combustion Chamber and Valve Seal Leakage	"Engine Mechanical System" in the <a href="#">2.6.7 Diagnostic Information and Procedures</a> .
	10. Cylinder Compression Pressure Too High	
	11. Excessive Carbon Residue in Combustion Chamber	
	12. Camshaft, Cylinder Head, Piston, Connecting Rod and Bearing Abnormal	

Symptoms	Suspected Fault Items	Relevant Sections
Retardation, Engine Speed Decrease, Engine Speed Instable Fault Definition: When pressing the accelerator pedal, there is no immediate response. This fault may occur at any vehicle speed. The vehicles first starts (for example, after stopping off hours), this fault is usually more pronounced. In severe cases, this fault may lead to engine stall.	1. ECM Power Supply Circuit	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	2. Intake Manifold Absolute Pressure (MAP) Sensor	This section <a href="#">2.2.7.17 DTC P0105 P0106 P0107 P0108</a> .
	3. Fuel Pressure Abnormal	"Fuel System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	4. Injector Working Abnormal	
	5. The Air-Fuel Mixture Too Rich	This section <a href="#">2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196</a> .
	6. The Air-Fuel Mixture Too Lean	
	7. Ignition System: Spark Plug Abnormal, Ignition Wire Abnormal	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	8. Knock Sensor (KS) System Ignition Delay Too Great	
	9. Crankshaft Position Sensor	This section <a href="#">2.2.7.29 DTC P0321 P0322</a> .
	10. Thermostat Abnormal	"Engine Cooling System" in the <a href="#">2.8.7 Diagnostic Information and Procedures</a> .
	11. Generators Working Abnormal	"Starting/Charging System" in the <a href="#">2.11.7 Diagnostic Information and Procedures</a> .
Lack of Fuel Supply, Misfire Fault Definition: After the engine speed increases, there is continuous pulsation, or jitter, usually even more noticeable with the engine load increases. When the engine speed is above 1,500 rpm, the fault does not appear.	1. ECM Power Supply Circuit	This section <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
	2. Air Cleaner Filter Blocked	---
	3. Fuel Pressure Abnormal	"Fuel System" in the <a href="#">2.3.7 Diagnostic Information and Procedures</a> .
	4. Injector Working Abnormal	
	5. Idle Air Control Valve	This section <a href="#">2.2.8.1 Idle Air Control Valve Replacement</a> .
	6. The Air-Fuel Mixture Too Rich or Too Lean	This section <a href="#">2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196</a> .
	7. Knock Sensor (KS) System Ignition Delay Too Great	"Ignition System" in the <a href="#">2.10.7 Diagnostic Information and Procedures</a> .
	8. Spark Plug: Thermal Value Incorrect, damp, Crack, Gap Incorrect, Excessive Erosion, Excessive Carbon Residue, Contaminated by Fuel	
	9. Spark Plug Wire Damage	
	10. Ignition Coil Damage	
	11. Crankshaft Position Sensor	This section <a href="#">2.2.7.29 DTC P0321 P0322</a> .
	12. Excessive Engine Oil in Combustion Chamber or Valve Seals Leakage	"Engine Mechanical System" in the <a href="#">2.6.7 Diagnostic Information and Procedures</a> .

Symptoms	Suspected Fault Items	Relevant Sections
<p>Lack of Fuel Supply, Misfire</p> <p>Fault Definition: After the engine speed increases, there is continuous pulsation, or jitter, usually even more noticeable with the engine load increases. When the engine speed is above 1,500 rpm, the fault does not appear.</p>	13. Cylinder Compression Pressure Incorrect	
	14. Valve Stagnant or Leakage	
	15. Camshaft Convex Corner Wear	
	16. Valve Timing Incorrect	
	17. Valve Spring Broken	
	18. Excessive Carbon Residue in Combustion Chamber	
	19. Camshaft, Cylinder Head, Piston, Connecting Rod and Bearing Abnormal	<p>"Engine Exhaust System" in the <a href="#">2.7.5 Diagnostic Information and Procedures</a>.</p>
	20. Exhaust Not Smooth: Three-way Catalytic Converter Plug, Muffler Internal Damage	
	21. Electromagnetic Interference (EMI) in the voltage circuit may lead to engine Misfire. Use the scan tool to monitor the engine speed to detect electromagnetic interference. Engine speed parameters sudden increase while the actual engine speed is almost no change indicates the presence of electromagnetic interference. If there is a fault, check whether there is a high voltage part in the vicinity of the ignition control circuit.	---

## 2.2.7.5 ECM Connector Terminal Table



FE02-5003b

## Note:

1. UB represents the battery voltage.
2. If there is no instructions, GND is 0 V or close to 0 V.

Terminal Number	Name	Wire	Terminal Description	Status	Specified Condition
1	-	-	-	-	-
2	AT-CVVT1	0.85 W/L	Intake Variable Cam Timing (Intake)	Idle	GND (<0.85 V)-UB of The PWM Wave
3	A-P-ZUE1I	0.85 W	Ignition Coil 1, Cylinder 4 Control	Idle	GND (<1.8 V)-UB of The PWM Wave clamping voltage (nominal) 400 V
4	AS-LSHHK	0.85 G/B	Post-Catalytic Heated Oxygen Sensor Control	When Heated	GND-UB of The PWM Wave
5	MM-ZUE	1.5 B	Ground (Ignition Ground)	All Status	0 Ω
6	AS-LSHVK	0.85 B/O	Pre-Catalytic Heated Oxygen Sensor Control	When Heated	GND-UB of The PWM Wave

Terminal Number	Name	Wire	Terminal Description	Status	Specified Condition
7	AP-ZUE2I	0.85 Y	Ignition Coil 2, Cylinder 3 Control	Idle	GND (<1.8 V)-UB of The PWM Wave, Clamping Voltage (Nominal) 400 V
8	U-U-UBR	1.5 B/R	Power Supply Controlled by The Main Relay	Ignition Switch "ON"	UB
9	-	-	-	-	-
10	E-S-PSW	0.5 W/V	Air-Conditioning Medium Voltage Switch	On or Off	GND or UB
11	-	-	-	-	-
12	E-S-EL1	0.5 Br/R	Power Steering Switch	On or Off	GND or UB
13	-	-	-	-	-
14	E-S-BR	0.5 G	Sensor Reference Voltage	Ignition Switch "ON"	5 V
15	B-D-DIAK	0.5 B/W	Diagnostic Wire K/Anti-theft Wire W	Sometimes	PWM Wave
16	U-U-UBD	0.5 R	Continuous Power Supply	All Status	UB
17	E-S-KL15	0.5 W/Y	Ignition Switch	Ignition Switch "ON"	UB
18	A-U-5V2	0.5 G	5V Power Supply 2	Ignition Switch "ON"	5 V
19	A-U-5V1	0.5 Br/Y	5V Power Supply 1	Ignition Switch "ON"	5 V
20	-	-	-	-	-
21	A-T-SMB	0.5 O	Idle Air Control Valve Phase B	Sometimes	ND (<0.45 V)-UB of The PWM Wave
22	A-T-SMA	0.5 G/Br	Idle Air Control Valve Phase A	Sometimes	GND (<0.45V)-UB of The PWM Wave
23	AS-SVS	0.5 P	SVS Anti-theft Wire R	When Lights On	<0.85 V
24	E-S-EL2	0.5 L	Air-Conditioning Control Module	Driver Instruction	GND or UB
25	E-A-TANS	0.5 Gy/R	Intake Air Temperature Sensor	Ignition Switch "ON"	0-5 V
26	E-A-DKG	0.5 G/Y	Throttle Body Position Sensor	Idle	
27	-	-	-	-	-
28	-	-	-	-	-
29	E-A-LSHK	0.5 L/Y	Post-Catalytic Heated Oxygen Sensor Control	Idle	
30	E-A-KS1A	0.5 L	Knock Sensor A-Side	Idle	PWM Wave, AB Conjugate Signal

Terminal Number	Name	Wire	Terminal Description	Status	Specified Condition
31	E-A-KS1B	0.5 L/W	Knock Sensor B-Side	Idle	
32	A-S-HR	0.5 B/R	Main Relay	Ignition Switch "ON"	<1.8 V
33	B-D-CANH	0.5 L/R	CAN Bus Interface		
34	B-D-CANL	0.5 Y/R	CAN Bus Interface		
35	A-T-SMC	0.5 L	Idle Air Control Valve Phase C	Sometimes	GND (<0.45 V)-UB of The PWM Wave
36	A-T-SMD	0.5 V/O	Idle Air Control Valve Phase D	Sometimes	GND (<0.45 V)-UB of The PWM Wave
37	A-T-TEV	0.5 B/Y	Canister Valve	Sometimes	GND (<0.85 V)-UB of The PWM Wave
38	-	-	-	-	-
39	M-R-SEN1	0.5 O/G	Sensor Ground 1		
40	M-R-SEN2	0.5 Gr	Sensor Ground 2		
41	E-A-TMOT	0.5 V	Engine Coolant Temperature Sensor Signal	Ignition Switch "ON"	0-5 V
42	E-S-ZYHA	0.5 R/B	Phase Sensor Signal		GND-UB of The PWM Wave
43	M-M-EL1	0.5 B	Ground (Electronics Ground)	All Status	0 $\Omega$
44	E-S-AC	0.5 V/W	Air-Conditioning Switch	Driver Instruction	GND or UB
45	E-A-LSVK	0.5 L/R	Post-Catalytic Heated Oxygen Sensor Control	Ignition Switch "ON"	
46	E-F-DGB	0.5 Gy	Engine Speed Sensor B-Side	Magnetic-electric, Engine Running	Sin/Cos Wave, AB Conjugate Signal
47	E-F-DGA	0.5 G	Engine Speed Sensor A-Side		
48	M-M-ES1	0.5 B	Ground (Power Ground)	All Status	0 $\Omega$
49	A-T-EV2	0.5 Y/V	Injector 3 (Cylinder No.3) Control	When Engine Running	GND (<0.9 V)-UB of The PWM Wave clamping voltage (nominal) 69 V
50	A-T-EV1	0.5 G/L	Injector 1 (Cylinder No.1) Control	When Engine Running	
51	U-U-UBR	0.5 B/R	Power Supply Controlled by The Main Relay	Ignition Switch "ON"	UB



Terminal Number	Name	Wire	Terminal Description	Status	Specified Condition
52	A-S-FAN2	0.5 Lg/R	High-Speed Fan Relay Control	The water temperature reaches the temperature that turns on High-Speed fan.	GND or UB
53	-	-	-	-	-
54	-	-	-	-	-
55	-	-	-	-	-
56	-	-	-	-	-
57	E-F-vfZ	0.5 Y	Vehicle Speed Signal	When the Vehicle is Driven	GND-UB of The PWM Wave
58	-	-	-	-	-
59	E-A-DS	0.5 L/B	Intake Air Pressure Sensor Signal	Ignition Switch "ON"	GND-UB
60	A-S-KOS	0.5 Y/R	Air-Conditioning Compressor Relay Control	ECM Command	GND (<2 V) or UB
61	A-S-EKP	0.5 G/R	Fuel Pump Relay Control	Ignition Switch "ON"	GND (2 V) or the UB
62	A-S-FAN1	0.5 Lg	Low-Speed Fan Relay Control	The water temperature teaches the temperature that turns on Low-Speed fan.	GND (1.35 V) or the UB
63	A-T-EV4	0.5 Y/B	Injector 2 (Cylinder No.2) Control	Engine Running	GND (<0.9 V)-UB of The PWM Wave clamping voltage (nominal) 69 V
64	A-T-EV3	0.5 B/L	Injector 4 (Cylinder No.4) Control	Engine Running	GND (<0.9 V)-UB of The PWM Wave clamping voltage (nominal) 69 V

#### 2.2.7.6 DTC Code Type Definition

Fault Type	Definition
Type 2	Fire-related troubleshooting is generally defined as type 2. For cause of damage to catalytic converters Misfire MIL flashing lights to warn the driver immediately. With the emission deterioration fault caused by misfire, if the corresponding level of misfire is fully detected in three consecutive driving cycles, the MIL lamp is lit. The fault will be deleted after 40 continuous trouble-free warmed-up driving cycles.
Type 3	If a fault is detected in consecutive three driving cycles, the MIL lamp is lit. If the fault has been repaired after 3 consecutive driving cycles, the MIL lamp will be off. The fault will be deleted after 40 continuous trouble-free warmed-up driving cycles.

Type 4	The MIL lamp will be lit in 2.5s when a fault occurs. If the fault has been repaired after 3 consecutive driving cycles, the MIL lamp will be off. The fault will be deleted after 40 continuous trouble-free warmed-up driving cycles.
Type 5	A fault is confirmed after it is detected in 3 consecutive driving cycles, and the fault lamp will not be lit. If the fault is detected as repaired after 3 consecutive driving cycles, the fault has been repaired. The fault will be deleted after 40 continuous trouble-free warmed-up driving cycles.
Type 6	The fault is confirmed as soon as it occurs. The fault will be deleted after 40 continuous trouble-free warmed-up driving cycles. This type of fault does not trigger any lamp and is not readable by a universal scan tool.
Type 7	External testing tools activate the external fuel supply system fault diagnosis path. It is generally used in offline inspection or in a repair station. This type of fault does not trigger any lamp and is not readable by a universal scan tool.
Type 11	It is dedicated to fuel supply system diagnostic path. If a fault has been detected in 3 continuous driving cycles, the MIL lamp will be lit. If the fault is detected as repaired after 4 consecutive driving cycles, the MIL lamp will be off. The fault will be deleted after 40 continuous trouble-free warmed-up driving cycles.
Type 35	To identify and repair the fault is through timing. To remove the fault from the memory needs 20 driving cycle. It is generally readable for a universal scan tool and triggers flashing MIL lamp.
Type 38	To identify and repair the fault is through timing. Removal of the fault from memory is triggered by time. It is generally readable for a universal scan tool

#### 2.2.7.7 DTC Code (DTC) list

DTC Code	Description	Type	Fault Lamp
P000A	Intake VVT Slow Response	5	OFF
P0010	VVT Intake Control Solenoid Valve Open Circuit	3	ON
P0012	The intake VVT is not at the default location when starting.	5	OFF
P0016	Improper Relative Installation Positions Between Camshaft and Crankshaft	3	ON
P0030	Pre-Catalytic Heated Oxygen Sensor Control Circuit Open	3	ON
P0031	Pre-Catalytic Heated Oxygen Sensor Control Circuit Short to Ground	3	ON
P0032	Pre-Catalytic Heated Oxygen Sensor Control Circuit Short to Power Supply	3	ON
P0036	Post-Catalytic Heated Oxygen Sensor Control Circuit Open	3	ON
P0037	Post-Catalytic Heated Oxygen Sensor Control Circuit Short to Ground	3	ON
P0038	Post-Catalytic Heated Oxygen Sensor Control Circuit Short to Power Supply	3	ON
P0053	Pre-Catalytic Heated Oxygen Sensor Internal Resistance Unreasonable	3	ON

DTC Code	Description	Type	Fault Lamp
P0054	Post-Catalytic Heated Oxygen Sensor Internal Resistance Unreasonable	3	ON
P0105	Intake Air Pressure Sensor Signal No Change (Frozen)	3	ON
P0106	Intake Air Pressure Sensor Malfunction	3	ON
P0107	Intake Air Pressure Sensor Circuit Short to Ground	3	ON
P0108	Intake Air Pressure Sensor Circuit Short to Power Supply	3	ON
P0112	Intake Air Pressure Sensor Circuit Voltage Too Low	3	ON
P0113	Intake Air Pressure Sensor Circuit Voltage Too High	3	ON
P0117	Engine Coolant Temperature Sensor Circuit Voltage Too Low	3	ON
P0118	Engine Coolant Temperature Sensor Circuit Voltage Too High	3	ON
P122	Throttle Position Sensor Circuit Voltage Lower Than Minimum Limit	3	ON
P123	Throttle Position Sensor Circuit Voltage Higher Than Maximum Limit	3	ON
P130	Pre-Catalytic Heated Oxygen Sensor Signal Unreasonable	3	ON
P131	Pre-Catalytic Heated Oxygen Sensor Signal Circuit Voltage Too Low	3	ON
P132	Pre-Catalytic Heated Oxygen Sensor Signal Circuit Voltage Too High	3	ON
P0133	Pre-Catalytic Heated Oxygen Sensor Aging	3	ON
P0134	Pre-Catalytic Heated Oxygen Sensor Signal Malfunction	3	ON
P0136	Post-Catalytic Heated Oxygen Sensor Signal Unreasonable	3	ON
P0137	Post-Catalytic Heated Oxygen Sensor Signal Circuit Voltage Too Low	3	ON
P0138	Post-Catalytic Heated Oxygen Sensor Signal Circuit Voltage Too High	3	ON
P0140	Post-Catalytic Heated Oxygen Sensor Signal Circuit Malfunction	3	ON
P0170	Air-Fuel Ratio After Catalyst Unreasonable Comparing to Closed-loop Control Self Learn	7	OFF
P0171	Air-Fuel Ratio After Catalyst Too Lean Comparing to Closed-loop Control Self Learn	7	OFF
P0172	Air-Fuel Ratio After Catalyst Too Rich Comparing to Closed-loop Control Self Learn	7	OFF
P0201	Cylinder No.1 Fuel Injector Control Circuit Open	3	ON
P0202	Cylinder No.2 Fuel Injector Control Circuit Open	3	ON

DTC Code	Description	Type	Fault Lamp
P0203	Cylinder No.3 Fuel Injector Control Circuit Open	3	ON
P0204	Cylinder No.4 Fuel Injector Control Circuit Open	3	ON
P0261	Cylinder No.1 Fuel Injector Control Circuit Short to Ground	3	ON
P0262	Cylinder No.1 Fuel Injector Control Circuit Short to Power Supply	3	ON
P0264	Cylinder No.2 Fuel Injector Control Circuit Short to Ground	3	ON
P0265	Cylinder No.2 Fuel Injector Control Circuit Short to Power Supply	3	ON
P0267	Cylinder No.3 Fuel Injector Control Circuit Short to Ground	3	ON
P0268	Cylinder No.3 Fuel Injector Control Circuit Short to Power Supply	3	ON
P0270	Cylinder No.4 Fuel Injector Control Circuit Short to Ground	3	ON
P0271	Cylinder No.4 Fuel Injector Control Circuit Short to Power Supply	3	ON
P0300	Multiple Cylinder Misfire	2	ON
P0301	Cylinder No.1 Misfire	2	ON
P0302	Cylinder No.2 Misfire	2	ON
P0303	Cylinder No.3 Misfire	2	ON
P0304	Cylinder No.4 Misfire	2	ON
P0321	Speed Reference Point Malfunction	3	ON
P0322	No Crankshaft Position Sensor Pulse Signal (Open or Short Circuit)	3	ON
P0327	Knock Sensor Signal Circuit Voltage Too Low	3	ON
P0328	Knock Sensor Signal Circuit Voltage Too High	3	ON
P0340	Camshaft Position Sensor Unreasonably Installed	3	ON
P0341	Camshaft Position Sensor Poor Connection	3	ON
P0342	Camshaft Position Sensor Circuit Short to Ground	3	ON
P0343	Camshaft Position Sensor Circuit Short to Ground Power Supply	3	ON
P0420	Catalytic Converter Oxygen Storage Capacity Aging (Emission Over the Limit)	3	ON
P0444	Canister Control Valve Control Circuit Open	3	ON
P0458	Canister Control Valve Control Circuit Voltage Too Low	3	ON
P0459	Canister Control Valve Control Circuit Voltage Too High	3	ON
P0480	Cooling Fan Relay Control Circuit Open (Low Speed)	5	OFF
P0481	Cooling Fan Relay Control Circuit Malfunction (High Speed)	5	OFF
P0501	Vehicle Speed Sensor Signal Unreasonable	3	ON
P0506	Idle Control Speed Lower Than Target	3	ON

DTC Code	Description	Type	Fault Lamp
P0507	Idle Control Speed Higher Than Target	3	ON
P0508	Stepper Motor Driver Pin Short to Ground	3	ON
P0509	Stepper Motor Driver Pin Short to Power Supply	3	ON
P0511	Stepper Motor Driver Pin Open Circuit	3	ON
P0560	System Battery Voltage Signal Unreasonable	5	OFF
P0562	Battery Voltage Too Low	5	OFF
P0563	Battery Voltage Too High	5	OFF
P0602	Electronic Control Unit Code Malfunction	3	ON
P0627	Fuel Pump Relay Control Circuit Open	3	ON
P0628	Fuel Pump Relay Control Circuit Short to Ground	3	ON
P0629	Fuel Pump Relay Control Circuit Short to Power Supply	3	ON
P0645	A/C Compressor Relay Control Circuit Open	5	OFF
P0646	A/C Compressor Relay Control Circuit Short to Ground	5	OFF
P0647	A/C Compressor Relay Control Circuit Short to Power Supply	5	OFF
P0650	MIL Lamp Driver Circuit Malfunction	3	ON
P0691	Cooling Fan Relay Control Circuit Short to Ground (Low Speed)	5	OFF
P0692	Cooling Fan Relay Control Circuit Short to Power Supply (Low Speed)	5	OFF
P0694	Cooling Fan Relay Control Circuit Short to Power Supply (High speed)	5	OFF
P1523	Airbag to ECU Signal Interrupted or Incorrect	5	OFF
P1610	Anti-theft Malfunction	38	Blink
P1611	Anti-theft Malfunction	38	Blink
P1612	Anti-theft Malfunction	35	Blink
P1613	Anti-theft Malfunction	35	Blink
P1614	Anti-theft Malfunction	35	Blink
P2088	VVT Intake Control Solenoid Valve Circuit Short to Ground	3	ON
P2089	VVT Intake Control Solenoid Valve Circuit Short to Power Supply	3	ON
P2177	Air-Fuel Ratio Closed-loop Self Learn Higher Than Maximum Limit	11	ON
P2178	Air-Fuel Ratio Closed-loop Self Learn Lower Than Minimum Limit	11	ON
P2187	Air-Fuel Ratio Closed-loop Self Learn Higher Than Maximum Limit (Low Load Zone)	11	ON
P2188	Air-Fuel Ratio Closed-loop Self Learn Lower Than Minimum Limit (Low Load Zone)	11	ON

DTC Code	Description	Type	Fault Lamp
P2195	Pre-Catalytic Oxygen Sensor Aging (Too Lean)	3	ON
P2196	Pre-Catalytic Oxygen Sensor Aging (Too Rich)	3	ON
P2270	Post-Catalytic Oxygen Sensor Aging (Too Lean)	3	ON
P2271	Post-Catalytic Oxygen Sensor Aging (Too Rich)	3	ON
U0001	CAN High-Speed Data Communication Cable Malfunction	6	OFF
U0121	Communication with ABS Controller Interrupted	6	OFF
U0140	Communication with BCM Interrupted	6	OFF
U0151	Communication with airbag control module Interrupted	6	OFF

### 2.2.7.8 DTC Fail-Safe Table

DTC code	Component	Fail-Safe Operation	Fail-Safe Lifting Condition
P0105, P0106, P0107 and P0108	Intake Manifold Pressure Sensor	ECM Alternative Pressure 1,013 kPa	Eligible Requirements Detected
P0112 and P0113	Intake Manifold Temperature Sensor	ECM Alternative Temperature 20.3°C (68.54 °F)	Eligible Requirements Detected
P0117 and P0118	Engine Coolant Temperature Sensor	ECM Alternative Water Temperature and Load-related Calculations, Up to 90°C (194 °F)	Eligible Requirements Detected
P0560, P0562 and P0563	Battery Voltage	Unreasonable fault occurs, ECM alternative voltage 14V	Eligible Requirements Detected
P0501	Vehicle Speed Sensor	No diagnose for idle, battery voltage, speed reference point	Eligible Requirements Detected
P0321	Speed Sensor Reference Point Signal	When a fault occurs, stop the misfire diagnostics.	Eligible Requirements Detected
P0322	Speed Sensor	NLDG Working	Eligible Requirements Detected
P0122 and P0123	Throttle Position Sensor	Stop fuel self learn and the catalytic converter diagnosis.	Eligible Requirements Detected
P0340, P0341, P0342 and P0343	Phase Sensor	Stop fuel self learn, oxygen sensor diagnosis and speed aging diagnosis.	Eligible Requirements Detected
P0506 and P0507	Idle Stepper Motor	Stop stepper motor self learn.	Eligible Requirements Detected
P1523	Airbag Controller Signal to ECU	Airbag Signal to Stop Fuel Supply Disabled	Eligible Requirements Detected

DTC code	Component	Fail-Safe Operation	Fail-Safe Lifting Condition
P0262, P0261, P0201, P0268, P0267, P0203, P0271, P0270, P0204, P0265, P0264, P0202	Injectors 1,2,3,4	Prolonged Fault, Misfire	Eligible Requirements Detected
P0030, P0031 and P0032	Pre-Catalytic Oxygen Sensor Circuit	Oxygen Sensor Internal Resistance Diagnosis Stop	Eligible Requirements Detected
P0036, P0037 and P0038	Post-Catalytic Oxygen Sensor Circuit	Oxygen Sensor Internal Resistance Diagnosis Stop	Eligible Requirements Detected
P0480, P0481, P0691, P0692 and P0694	High and Low-Speed Cooling Fan Relay	N/A	N/A
P0645, P0646 and P0647	Air-Conditioning Relay	N/A	N/A
P0627, P0628 and P0629	Fuel Pump Relay	Engine Can Not Start	
P0650	MIL Lamp Circuit	N/A	N/A
P0508, P0509, P0511	Stepper Motor Driver Stage Circuit	N/A	N/A
P0444, P0458 and P0459	Canister Driver Stage Circuit	Close Post-Catalytic Oxygen Sensor Control	Eligible Requirements Detected
U0140	BCM and ECM Communication	N/A	N/A
U0121	ABS and ECM Communication	N/A	N/A
U0151	Airbag Controller and ECM Communication	N/A	N/A
U0001	CAN	N/A	N/A
P0606	Electronic Control Unit Code Fault	N/A	N/A
P1610, P1611, P1612, P1613, P1614	Anti-theft Controller	Engine Can Not Start	Turn On Power, Anti-theft Authentication Successful
P0300, P0301, P0302, P10303, P0304	Spark Plug, Fuel Injector, Ignition Coil, etc.	One or More Cylinder Misfire	Restart
P0328, P0327	Knock Sensor	Ignition Angle Delay	Fault Repair, Knock Sensor Working Properly
P000A	VVT	Calculate the basic ignition angle when the camshaft adjustment is no longer considered.	Eligible Requirements Detected
P0012	VVT	Calculate the basic ignition angle when the camshaft adjustment is no longer considered.	Eligible Requirements Detected

DTC code	Component	Fail-Safe Operation	Fail-Safe Lifting Condition
P0016	Crankshaft and Camshaft Relative Installation Position	Misfire cylinder can not be determined. Cylinder group fuel injection.	Eligible Requirements Detected
P0010, P2088, P2089	VVT Circuit	Stop VVT diagnosis.	Eligible Requirements Detected
P0420	Catalytic Converter Oxygen Storage Capacity Aging (Emission Over Limit)	Stop catalytic converter related self learn.	Replace new three-way catalytic converter.
P0053	Pre-Catalytic Heated Oxygen Sensor Internal Resistance Unreasonable	Stop some diagnosis.	Check circuit fault or replace Pre-Catalytic heated oxygen sensor.
P0054	Post-Catalytic Heated Oxygen Sensor Internal Resistance Unreasonable	Stop some diagnosis.	Check circuit fault or replace Post-Catalytic heated oxygen sensor
P0130, P0131, P0132, P0134	Pre-Catalytic Heated Oxygen Sensor Signal Unreasonable	Entering Into Open-loop Control	Check circuit fault or replace Pre-Catalytic heated oxygen sensor.
P0133, P2195, P2196	Pre-Catalytic Heated Oxygen Sensor Aging	No	Replace Pre-Catalytic heated oxygen sensor.
P0136, P0137, P0138, P0140	Check Post-Catalytic heated oxygen sensor signal circuit.	Disconnect the Post-Catalytic heated oxygen sensor.	Check circuit fault or replace the Post-Catalytic heated oxygen sensor.
P2270, P2271	Post-Catalytic Heated Oxygen Sensor Aging	Disconnect the Post-Catalytic heated oxygen sensor.	Replace the Post-Catalytic heated oxygen sensor.
P2177	Air-Fuel ratio close-loop control self learn value is higher than maximum limit.	No Protection Needed	Check fuel line fault.
P2178	Air-Fuel ratio close-loop control self learn value is lower than minimum limit.	No Protection Needed	Check fuel line fault.
P2187	Air-Fuel ratio close-loop control self learn value is higher than maximum limit (Low-Load Zone).	No Protection Needed	Check fuel line fault.
P2188	Air-Fuel ratio close-loop control self learn value is lower than minimum limit (Low-Load Zone).	No Protection Needed	Check fuel line fault.



### 2.2.7.9 Data Stream List

By reading the "Data Stream List" on the scan tool, you can check switches, sensors, actuators working state without removing any parts. Before the control system diagnosis, observing and analyzing data is the first step, so that the diagnose time could be shortened.

#### Note

Data under normal conditions is listed in the following table for reference only. Do not determine whether a part is faulty solely based on these reference values. Under normal circumstances you can compare the vehicle that needs to be repaired with a normal working vehicle in the same state to determine the current vehicle diagnostic data is normal or not.

1. Run the engine to reach normal working temperature.
2. Turn the ignition switch to "OFF" position.
3. Connect the scan tool.
4. Turn the ignition switch to "ON" position.
5. Select "Engine"/"Read data stream".
6. Refer to the table and check all the data.

Data Stream Name	Ignition Switch "ON"	Idle Speed	2,500 rpm When	Diagnosis Description
Battery Voltage	12.04 V	13.51 V	13.72 V	ECM monitors the current charging system working conditions.
Engine Speed	0 rpm	800 rpm	2,500 rpm	The scan tool shows the current actual engine speed calculated by ECM through the crankshaft position sensor input.
Target Idle Speed (No Compensation)	800 rpm	800 rpm	1,500 rpm	The scan tool shows the target idle speed set by ECM and the current actual idle speed, said ECM instructions. ECM-based engine coolant temperature sensors signal and compensation signals for various engine loads in order to maintain desired engine idle speed.
Target Idle Speed (With Compensation)	800 rpm	800 rpm	800 rpm	
Vehicle Speed	0 km	0 km	0 km	-
Engine Coolant Temperature Sensor Voltage	0.5 V	0.5 V	0.4 V	The scan tool shows -40°C (-40 °F) to 130°C (266 °F). After heating, sensor (internal resistance decreases) voltage signal reduces. ECM will interpret the reduced voltage signal as engine warmed up. This signal is one of the conditions used to determine whether to activate the closed-loop fuel system control, and also an important injection timing reference signal.
Engine Coolant Temperature	91°C (196 °F)	89°C (192 °F)	94°C (201 °F)	
Intake Air Temperature Sensor	2.5 V	2.5 V	3.0 V	Sensor voltage is the value actually received by ECM. The intake air temperature is calculated by ECM using the received voltage signal according to the program. ECM apply the intake air temperature to adjust the fuel delivery and

Data Stream Name	Ignition Switch "ON"	Idle Speed	2,500 rpm When	Diagnosis Description
Intake Air Temperature	23°C (73.4 °F)	23°C (73.4 °F)	14°C (57.2 °F)	ignition timing according to the air density. The intake air temperature is also compared with the ECT to identify the start up of the heating wire of the heated oxygen sensor and diagnosis of evaporative emissions from cold start.
Ambient Temperature	10°C (50 °F)	10°C (50 °F)	10°C (50 °F)	Varies as the ambient temperature changes.
The Actual Intake Manifold Pressure Sensor Voltage	4.02 V	1.0 V	0.71 V	1. Equal to atmospheric pressure when engine is turned off. 2. Voltage first reduced and then increased when pressing the acceleration pedal hard. 3. After engine is turned off, the data stream shows the pressure is close to atmospheric pressure, voltage close to 5 V.
The Actual Intake Manifold Pressure	1,020 kPa (148 psi)	340 kPa (49 psi)	260 kPa (38 psi)	
Intake Air Mass	0.0 g/s	10.2 g/s	29.4 g/s	
Stepper Motor Target Location	69 step	40 step	93 step	After engine is turned off, it shows 110 steps. Warmed vehicle idling state, it is typically about 30 to 45 steps. The number of steps increases as the load increases like Air-Conditioning turned on, up to 70 steps. With the increase in vehicle mileage, the stepper motor opening will increase. After cleaning the stepper motor and the intake air channel next to the throttle body, the steps will not decrease during the startup. But the engine speed will increase.
Throttle Angle ADC Signal	0.55 V	0.56 V	0.70 V	Throttle position sensor voltage is the voltage Measure by ECM. While the angle is calculated according to voltage. When at idle, the voltage is 0.3-0.9V. With full-throttle the voltage is 4.25-4.7V. The voltage increases as the throttle opening increases. The self learn value will become larger and larger when the throttle body is dirty and move up the zero value. After cleaning the throttle, the computer will automatically re-learn.
Calculating Throttle Position and Angle Signal	11.1%	11.23%	14.06%	
Calculating Throttle Position	0%	0%	2%	
Charging Time	3.6 ms	3.0 ms	3.0 ms	-

Data Stream Name	Ignition Switch "ON"	Idle Speed	2,500 rpm When	Diagnosis Description
Average Injector Pulse Width	0.0 ms	3.2 ms	2.4 ms	Scan tool shows 0-16ms. It indicates that in each engine cycle, the number of the engine control module command connected to each injector. The greater the fuel injector pulse width, the more the fuel is injected. Injector pulse width (PWM) increases as the engine load increases. If the engine receives increasing torque signal, it will increase the injection time. Many factors affect the fuel injection time, such as engine coolant temperature sensor, intake air temperature sensor, power supply voltage and fuel pressure.
Cylinder No.1 Spark Advance Angle	0°	6°	33.5°	At normal idle speed, the current ignition system advance angle is 7° ahead of TDC. This value is for repair reference only.
Knock Sensor Signal 1	0 V	0 V	0 V	ECM detects knock sensors amplitude and frequency to control the ignition timing. Ignition timing is placed in the position close to knocking to get the maximum torque.
Knock Sensor Signal 2	0 V	0 V	0 V	
Cylinder No.1 Ignition Delay	0.0°	0.0°	0.0°	ECM calculates according to knock sensor signals. If the knocking is detected, ECM controls the ignition advance angle delay.
Cylinder No.2 Ignition Delay	0.0°	0.0°	0.0°	
Cylinder No.3 Ignition Delay	0.0°	0.0°	0.0°	
Cylinder No.4 Ignition Delay	0.0°	0.0°	0.0°	
Group 1 Oxygen Sensor Integral Value (Short-Term Correction)	1.00	0.99	1.02	Based on feedback from oxygen sensor, increase or decrease the basic injection duration with a temporary value. It is useful only in the closed-loop control. When it is a positive value, ECM will increase the amount of fuel injected by increasing the injection duration. When it is a negative value, ECM will decrease the injection duration. When the short-term value is continuously lower or higher than the theoretical value, ECM will add this value to the long-term fuel value or deduct it from the long-term fuel value, in order to achieve optimum Air-Fuel ratio control.

Data Stream Name	Ignition Switch "ON"	Idle Speed	2,500 rpm When	Diagnosis Description
Group 1 Oxygen Sensor Voltage 1 (Pre-Catalytic Oxygen Sensor)	0.4 V	0.1-0.7 V	0.1-0.7 V	Under normal operating conditions, HO <sub>2</sub> S output is 0.1-0.9V voltage. ECM receives this voltage signal and measures whether the Air-Fuel ratio is lean or rich. If ECM input signal voltage is lower than 0.45V, the Air-Fuel ratio is lean; if the input signal voltage is above 0.45V, the Air-Fuel ratio is rich. In the closed-loop control, ECM continuously detects HO <sub>2</sub> S output signal to reduce or increase the fuel injection control pulse width to adjust.
Group 1 Oxygen Sensor Voltage 2 (Post-Catalytic Oxygen Sensor)	0.6 V	0.7 V	0.7 V	The Post-Catalytic oxygen sensor is installed after the catalytic converter or in exhaust pipe. The Post-Catalytic oxygen sensor output voltage is between 0 V-1V. Use the Post-Catalytic oxygen sensor signal to detect the catalytic converter efficiency. If the conversion efficiency of catalytic converters is good, the Post-Catalytic oxygen sensor signal is stable. If the catalytic converter is aging, toxic or Misfire and so on, the conversion efficiency of catalytic converters will decrease. The Post-Catalytic oxygen sensor signal will be similar to the Pre-Catalytic oxygen sensor signal.
Group 1 Oxygen Sensor Integral Value (Long-Term Adjustments)	1.0	1.0	1.0	The long-term fuel adjustment value is stored in ECM memory, because it is calculated as part of the basic injection duration. It will not be deleted when ignition switch is OFF. It affects the closed-loop control and open-loop control injection duration. ECM uses the short-term adjustment value to modify the long-term fuel adjustment value. It can not respond quickly to the instant changes. It only changes when ECM decides to use the short-term fuel adjustment value to adjust the long-term fuel adjustment value. Like the short-term fuel value adjustment, when the long-term value is 0%, it indicates that the basic injection duration does not need adjustment. Positive percentage indicates the fuel injection increase; while a negative percentage indicates the fuel injection decrease. The long-term value is for engine to control the entire range of injection duration. It is divided into two categories; long-term idle and long-term under load. When is engine speed is lower than 920 rpm and the air volume is 24kg/h, it monitors long-term idle. Because the relatively small amount of intake air,

Data Stream Name	Ignition Switch "ON"	Idle Speed	2,500 rpm When	Diagnosis Description
Ultimate Long-term Adjustment Factor	2.2%	2.2%	2.2%	adding more fuel or decrease fuel amount is need to control idle speed. Different from long-term idle, when the engine load is 30-75% and the air volume is 40-200kg/h, it monitors the long-term engine load and uses multiple-tuning to control idle speed.
Intake Camshaft PWM Control	5.86%	5.86%	5.8%	VVT intake camshaft position actuator current actual opening changes from 0% to 100%. The largest advance position is 100% and the maximum lag position is 0%.
Intake Valve Opening (As Opposed to LWOT)	8°	8°	8°	
Camshaft Overlap Angle	494°	494°	494°	
Idle Torque, Self Learn	1.8%	1.8%	1.3%	-
Idle Speed Control Target Torque Adjustment	0.0%	-0.3%	0%	-
Engine Relative Load	100%	18.2%	14.7%	-
Run-Time After a Speed Fault	0 min	0 min	0 min	-
Canister Control to Fuel Injection Amount	0%	0%	1.2%	Using Canister solenoid valve opening duty cycle control, the control signal is the pulse waveform and can be detected with an oscilloscope. This

Data Stream Name	Ignition Switch "ON"	Idle Speed	2,500 rpm When	Diagnosis Description
Canister Control Valve Duty Cycle	0%	0%	100%	parameter shows the evaporative emission control module commands (EVAP) solenoid valve Canister clean-up power supply time or duty cycle. 0% indicates that no clean-up carried out and 100% indicates always clean-up.
Canister Purification Rate	0%	0%	0.1%	Fuel evaporative emission control system prevents hydrocarbons (HC) overflow from the fuel tank into the atmosphere, polluting the environment. Collect the fuel vapor into the Canister. ECM controls solenoid valve (EVAP) to remove Canister collected fuel vapor steam and make it into the engine for combustion. In the actual repair work, compare the data stream to the actual solenoid valve opening. If a leak occurs, it is necessary to know how to determine. Note that only when the engine reaches the normal temperature, the data stream will increase from a small value. When idling or engine cold, the EVAP will not open.
Canister Load	1	3.2	0.7	

### 2.2.7.10 Action Test Table

By reading the "Action Test Table" on the scan tool, you can check switches, sensors, actuators working state without removing any parts. Before the control system diagnosis, carrying out action test is a prerequisite, so that the diagnose time could be shortened.

#### Note

Data under normal conditions is listed in the following table for reference only. Do not determine whether a part is faulty solely based on these reference values. Under normal circumstances you can compare the vehicle that needs to be repaired with a normal working vehicle in the same state to determine the current vehicle diagnostic data is normal or not.

1. Run the engine to reach normal working temperature.
2. Turn the ignition switch to "OFF" position.
3. Connect scan tool.
4. Turn the ignition switch to "ON" position.
5. Select "engine"/"action test".
6. Refer to the following table to test.

Scan Tool Display Item	Test Component	Control Range	Diagnosis Description
Fault Indicator	Enable the engine fault indicator.	ON/OFF	When the engine is running (or) the ignition switch is turned on, with the signal accepted, the engine control module will request the fault indicator to light through the CAN bus. The fault indicator will be on or off in 3-5s.

Scan Tool Display Item	Test Component	Control Range	Diagnosis Description
Fuel Pump Relay	Enable the fuel pump relay.	ON/OFF	<p><b>Note</b></p> <p>This test can only be carried out when the vehicle speed is equal to zero and vehicle speed sensor has no fault.</p> <p>This function can control the fuel pump relay. Fuel pump relay will be on or off within 3-5s.</p>
Canister Control Valve	Enable the Canister solenoid valve.	ON/OFF	<p>When the command is "ON" the solenoid valve will be on or off within 3-5s.</p>
Fan 1	Enable the Low-Speed cooling fan.	ON/OFF	<p><b>Note</b></p> <p>Carry out this test only when the engine coolant temperature is below 100°C (212 °F) and Air-Conditioning is not switched on.</p> <p>This function controls the Low-Speed cooling fan relay. When the instruction is received, the cooling fan will be on at high speed for 5s.</p>
Fan 2	Enable High-Speed cooling fan	ON/OFF	<p><b>Note</b></p> <p>Carry out this test only when the engine coolant temperature is below 100°C (212 °F) and Air-Conditioning is not switched on.</p> <p>This function controls the High-Speed cooling fan relay. When the instruction is received, the cooling fan will be on at high speed for 5s.</p>
Air-Conditioning Clutch	Enable the Air-Conditioning compressor clutch.	ON/OFF	<p><b>Note</b></p> <p>Carry out this test only when the ignition switch is at "ON" position and the engine is not running.</p> <p>This function controls Air-Conditioning compressor relay. When the instruction is "ON", the Air-Conditioning compressor relay will be on or off in 3-5s.</p>
Fuel Injection Disable	Disable the fuel injection.	ON/OFF	<p><b>Note</b></p> <p>This function will not close the two fuel injectors at the same time. perform the test only when the vehicle speed is zero, the speed sensor without fault and oxygen sensor signal indicating a lean Air-Fuel ratio.</p> <p>Disable fuel injectors and test fuel injectors sealing state.</p>

Scan Tool Display Item	Test Component	Control Range	Diagnosis Description
Ignition Delay	Delay the ignition advance angle.	---	---
Idle Speed Control	Control engine speed to the required speed.	<ul style="list-style-type: none"> <li>• 600 rpm</li> <li>• 700 rpm</li> <li>• 800 rpm</li> <li>• 900 rpm</li> <li>• 1,000 rpm</li> <li>• 2,000 rpm</li> </ul>	Control engine speed to the required speed.
Stepper Motor Actuator Test	Test idle control valve to open a few steps.	---	<p><b>Note</b></p> <p>Carry out this test only when the engine is not running and the ignition switch is at "ON" position.</p>

### 2.2.7.11 DTC Code Index

DTC Code	Description	Diagnostic Procedures
P000A	Intake VVT Slow Response	Refer to <a href="#">2.2.7.13 DTC P000A P0012</a> .
P0010	VVT Intake Control Solenoid Valve Circuit Open	Refer to <a href="#">2.2.7.12 DTC P0010 P2088 P2089</a> .
P0012	VVT Not At the Default Location During Intake Process	Refer to <a href="#">2.2.7.13 DTC P000A P0012</a> .
P0016	Unreasonable Camshaft and Crankshaft Relative Installation Position	Refer to <a href="#">2.2.7.14 DTC P0016</a> .
P0030	Pre-Catalytic Heated Oxygen Sensor Heating Control Circuit Open	Refer to <a href="#">2.2.7.15 DTC P0030 P0031 P0032 P0053</a> .
P0031	Pre-Catalytic Heated Oxygen Sensor Heating Control Circuit Short to Ground	
P0032	Pre-Catalytic Heated Oxygen Sensor Heating Control Circuit Short to Power Supply	
P0036	Post-Catalytic Heated Oxygen Sensor Heating Control Circuit Open	Refer to <a href="#">2.2.7.16 DTC P0036 P0037 P0038 P0054</a> .
P0037	Post-Catalytic Heated Oxygen Sensor Heating Control Circuit Short to Ground	
P0038	Post-Catalytic Heated Oxygen Sensor Heating Control Circuit Short to Power Supply	



DTC Code	Description	Diagnostic Procedures
P0053	Pre-Catalytic Heated Oxygen Sensor Internal Heating Resistance Unreasonable	Refer to <a href="#">2.2.7.15 DTC P0030 P0031 P0032 P0053</a> .
P0054	Post-Catalytic Heated Oxygen Sensor Internal Heating Resistance Unreasonable	Refer to <a href="#">2.2.7.16 DTC P0036 P0037 P0038 P0054</a> .
P0105	Intake Air Pressure Sensor Signal No Change (Frozen)	Refer to <a href="#">2.2.7.17 DTC P0105 P0106 P0107 P0108</a> .
P0106	Intake Air Pressure Sensor Unreasonable	
P0107	Intake Air Pressure Sensor Circuit Short to Ground	
P0108	Intake Air Pressure Sensor Circuit Short to Power Supply	
P0112	Intake Air Temperature Sensor Circuit Voltage Too Low	Refer to <a href="#">2.2.7.18 DTC P0112 P0113</a> .
P0113	Intake Air Temperature Sensor Circuit Voltage Too High	
P0117	Engine Coolant Temperature Sensor Circuit Voltage Too Low	Refer to <a href="#">2.2.7.19 DTC P0117 P0118</a> .
P0118	Engine Coolant Temperature Sensor Circuit Voltage Too High	
P0122	Throttle Position Sensor Circuit Voltage Lower Than Minimum	Refer to <a href="#">2.2.7.20 DTC P0122 P0123</a> .
P0123	Throttle Position Sensor Circuit Voltage Higher Than Maximum	
P0130	Pre-Catalytic Heated Oxygen Sensor Signal Unreasonable	Refer to <a href="#">2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196</a> .
P0131	Pre-Catalytic Heated Oxygen Sensor Circuit Voltage Too Low	
P0132	Pre-Catalytic Heated Oxygen Sensor Circuit Voltage Too High	
P0133	Pre-Catalytic Heated Oxygen Sensor Aging	
P0134	Pre-Catalytic Heated Oxygen Sensor Circuit Malfunction	
P0136	Oxygen Sensor Signal Unreasonable	Refer to <a href="#">2.2.7.22 DTC P0136 P0137 P0138 P0140 P2270 P2271</a> .
P0137	Post-Catalytic Heated Oxygen Sensor Circuit Voltage Too Low	
P0138	Post-Catalytic Heated Oxygen Sensor Circuit Voltage Too High	

DTC Code	Description	Diagnostic Procedures
P0140	Post-Catalytic Heated Oxygen Sensor Signal Malfunction	
P0170	Post-Catalytic Air-Fuel Ratio Closed-loop Control self learn Unreasonable	
P0171	Post-Catalytic Air-Fuel Ratio Closed-loop Control self learn Too Lean	Refer to <a href="#">2.2.7.23 DTC P0170 P0171 P0172 P2177 P2178 P2187 P2188</a> .
P0172	Post-Catalytic Air-Fuel Ratio Closed-loop Control self learn Too Rich	
P0201	Cylinder No.1 Fuel Injection Control Circuit Open	Refer to <a href="#">2.2.7.24 DTC P0201 P0261 P0262</a> .
P0202	Cylinder No.2 Fuel Injection Control Circuit Open	Refer to <a href="#">2.2.7.25 DTC P0202 P0264 P0265</a> .
P0203	Cylinder No.3 Fuel Injection Control Circuit Open	Refer to <a href="#">2.2.7.26 DTC P0203 P0267 P0268</a> .
P0204	Cylinder No.4 Fuel Injection Control Circuit Open	Refer to <a href="#">2.2.7.27 DTC P0204 P0270 P0271</a> .
P0261	Cylinder No.1 Fuel Injection Control Circuit Short to Ground	Refer to <a href="#">2.2.7.24 DTC P0201 P0261 P0262</a> .
P0262	Cylinder No.1 Fuel Injection Control Circuit Short to Power Supply	
P0264	Cylinder No.2 Fuel Injection Control Circuit Short to Ground	Refer to <a href="#">2.2.7.25 DTC P0202 P0264 P0265</a> .
P0265	Cylinder No.2 Fuel Injection Control Circuit Short to Power Supply	
P0267	Cylinder No.3 Fuel Injection Control Circuit Short to Ground	Refer to <a href="#">2.2.7.26 DTC P0203 P0267 P0268</a> .
P0268	Cylinder No.3 Fuel Injection Control Circuit Short to Power Supply	
P0270	Cylinder No.4 Fuel Injection Control Circuit Short to Ground	Refer to <a href="#">2.2.7.27 DTC P0204 P0270 P0271</a> .
P0271	Cylinder No.4 Fuel Injection Control Circuit Short to Power Supply	
P0300	Multi-Cylinder Misfire	Refer to <a href="#">2.2.7.28 DTC P0300-P0304</a> .
P0301	Cylinder No.1 Misfire	
P0302	Cylinder No.2 Misfire	
P0303	Cylinder No.3 Misfire	
P0304	Cylinder No.4 Misfire	

DTC Code	Description	Diagnostic Procedures
P0321	Speed Reference Point Fault	Refer to <a href="#">2.2.7.29 DTC P0321 P0322</a> .
P0322	No CKP sensor Pulse Signal (Open or Short Circuit)	
P0327	Knock Sensor Signal Circuit Voltage Too Low	Refer to <a href="#">2.2.7.30 DTC P0327 P0328</a> .
P0328	Knock Sensor Signal Circuit Voltage Too High	
P0340	Improper Camshaft Position Sensor Installation Location	Refer to <a href="#">2.2.7.31 DTC P0340-P0343</a> .
P0341	Camshaft Position Sensor Poor Connection	
P0342	Camshaft Position Sensor Circuit Short to Ground	
P0343	Camshaft Position Sensor Circuit Short to Power Supply	
P0420	Three-way Catalytic Converter Oxygen Storage Capacity Aging (Emission Over Limit)	Refer to <a href="#">2.2.7.32 DTC P0420</a> .
P0444	Canister Control Valve Control Circuit Open	Refer to <a href="#">2.2.7.33 DTC P0444 P0458 P0459</a> .
P0458	Canister Control Valve Control Circuit Voltage Too Low	
P0459	Canister Control Valve Control Circuit Voltage Too High	
P0480	Cooling Fan Relay Control Circuit Open (Low Speed)	Refer to <a href="#">2.2.7.34 DTC P0480 P0481 P0691 P0692 P0693 P0694</a> .
P0481	Cooling Fan Relay Control Circuit Malfunction (High Speed)	
P0501	Vehicle Speed Sensor Signal Unreasonable	Refer to <a href="#">2.2.7.35 DTC P0501</a> .
P0506	Idle Control Speed Lower Than Target Idle Speed	Refer to <a href="#">2.2.7.36 DTC P0506-P0509 P0511</a> .
P0507	Idle Control Speed Higher Than Target Idle Speed	
P0508	Stepper Motor Driver Pin Circuit Short to Ground	
P0509	Stepper Motor Driver Pin Circuit Short to Power Supply	
P0511	Stepper Motor Driver Pin Circuit Open	Refer to <a href="#">2.2.7.37 DTC P0560 P0562 P0563</a> .
P0560	System Battery Voltage Signal Unreasonable	

DTC Code	Description	Diagnostic Procedures
P0562	System Battery Voltage Too Low	
P0563	System Battery Voltage Too High	
P0602	Electronic Control Unit Code Fault	Refer to <a href="#">2.2.7.38 DTC P0602</a> .
P0627	Pump Relay Control Circuit Open	Refer to <a href="#">2.2.7.39 DTC P0627 P0628 P0629</a> .
P0628	Pump Relay Control Circuit Short to Ground	
P0629	Pump Relay Control Circuit Short to Power Supply	
P0645	A/C Compressor Relay Control Circuit Open	Refer to <a href="#">2.2.7.40 DTC P0645-P0647</a> .
P0646	A/C Compressor Relay Control Circuit Short to Ground	
P0647	A/C Compressor Relay Control Circuit Short to Power Supply	
P0650	MIL Lamp Driver Circuit Malfunction	Refer to <a href="#">2.2.7.41 DTC P0650</a> .
P0691	Cooling Fan Relay Control Circuit Short to Ground (Low Speed)	Refer to <a href="#">2.2.7.34 DTC P0480 P0481 P0691 P0692 P0693 P0694</a> .
P0692	Cooling Fan Relay Control Circuit Short to Power Supply (Low Speed)	
P0693	Cooling Fan Control Circuit Short to Ground (High Speed)	
P0694	Cooling Fan Control Circuit Short to Power Supply (High Speed)	
P1523	Airbag to ECU Signal Interrupted or Incorrect	Refer to <a href="#">2.2.7.43 DTC P1523 U0001 U0121 U0140 U0151</a> .
P1610	Anti-theft Malfunction	Refer to <a href="#">2.2.7.42 DTC P1610-P1614</a> .
P1611	Anti-theft Malfunction	
P1612	Anti-theft Malfunction	
P1613	Anti-theft Malfunction	
P1614	Anti-theft Malfunction	
P2088	VVT Intake Control Solenoid Valve Circuit Short to Ground	Refer to <a href="#">2.2.7.12 DTC P0010 P2088 P2089</a> .
P2089	VVT Intake Control Solenoid Valve Circuit Short to Power Supply	Refer to <a href="#">2.2.7.12 DTC P0010 P2088 P2089</a> .
P2177	Air-Fuel Ratio Closed-loop Control self learn Higher Than Maximum Limit	Refer to <a href="#">2.2.7.23 DTC P0170 P0171 P0172 P2177 P2178 P2187 P2188</a> .
P2178	Air-Fuel Ratio Closed-loop Control self learn Lower Than Minimum Limit	

DTC Code	Description	Diagnostic Procedures
P2187	Air-Fuel Ratio Closed-loop Control self learn Higher Than Maximum Limit (Low-Load Zone)	Refer to <a href="#">2.2.7.23 DTC P0170 P0171 P0172 P2177 P2178 P2187 P2188</a> .
P2188	Air-Fuel Ratio Closed-loop Control self learn Lower Than Minimum Limit (Low-Load Zone)	
P2195	Pre-Catalytic Oxygen Sensor Aging (Too Lean)	Refer to <a href="#">2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196</a> .
P2196	Pre-Catalytic Oxygen Sensor Aging (Too Rich)	
P2270	Post-Catalytic Oxygen Sensor Aging (Too Lean)	Refer to <a href="#">2.2.7.22 DTC P0136 P0137 P0138 P0140 P2270 P2271</a> .
P2271	Post-Catalytic Oxygen Sensor Aging (Too Rich)	
U0001	CAN High-Speed Communication Bus Malfunction	Refer to <a href="#">2.2.7.43 DTC P1523 U0001 U0121 U0140 U0151</a> .
U0121	Communication With ABS Controller Interrupted	
U0140	Communication With BCM Interrupted	
U0151	Communication With airbag control module Interrupted	

### 2.2.7.12 DTC P0010 P2088 P2089

#### 1. DTC Descriptor:

DTC	P0010	VVT Intake Control Solenoid Valve Circuit Open
DTC	P2088	VVT Intake Control Solenoid Valve Circuit Short to Ground
DTC	P2088	VVT Intake Control Solenoid Valve Circuit Short to Power Supply

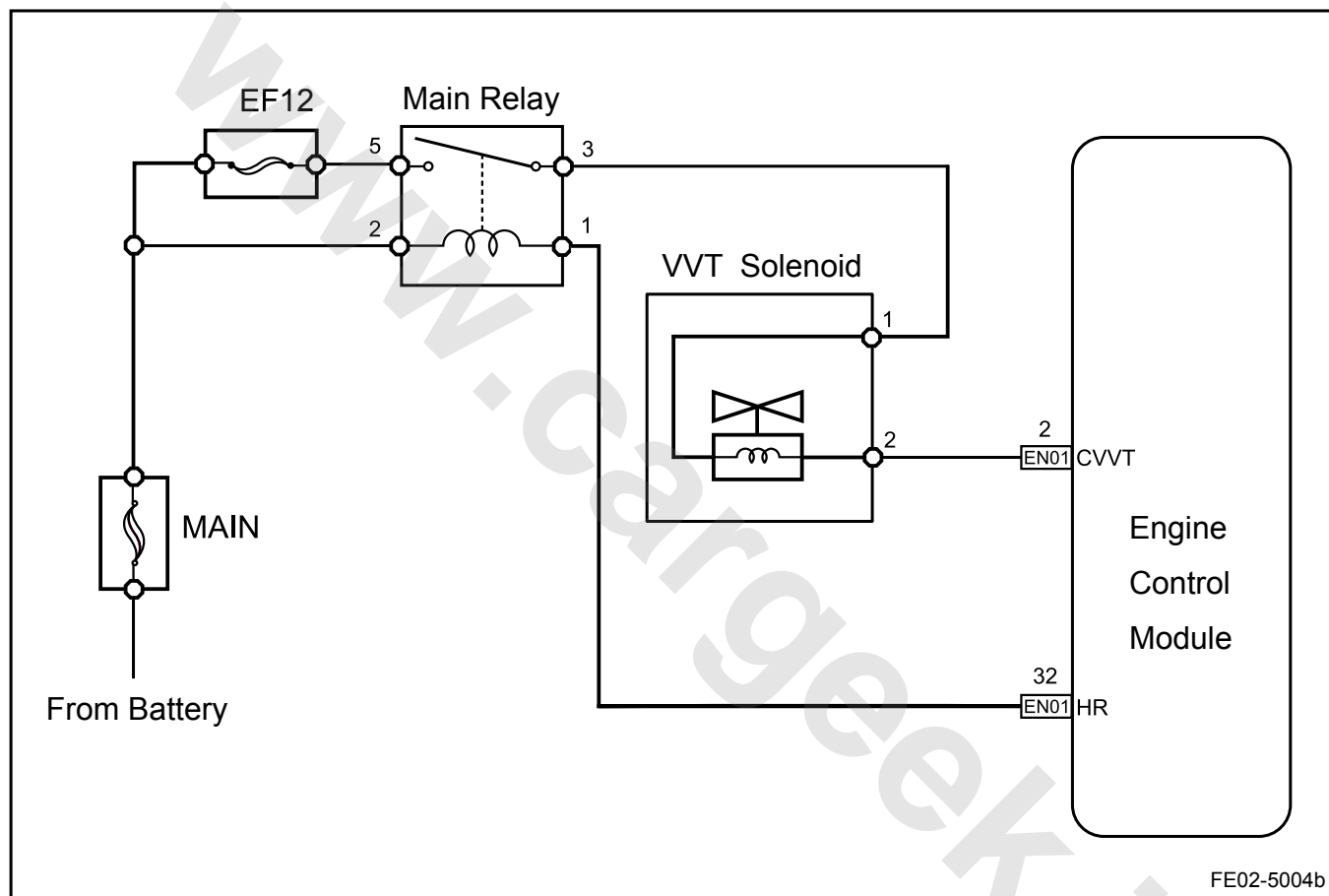
The intake camshaft position actuator is connected to the intake camshaft and operated by hydraulic pressure. The hydraulic pressure is provided by the engine oil pump in order to change the intake camshaft to the crankshaft relative position (CKP ) angle. The intake VVT solenoid valve power supply is provided by The Main Relay. ECM modulates the pulse-width to control signal ground, thus controlling the camshaft position actuator engine oil flow. Engine oil pressure moves the camshaft position actuator slide valve at the front of the camshaft. When the safety slide valve is operated, the engine oil is imported into the camshaft position actuator, so that camshaft rotates. The intake camshaft cam actuator can change the camshaft working angle up to 50°.

ECM controls the solenoid valve internal ground by ECM harness connector EN01 terminal No.2. There is a feedback circuit within ECM. ECM monitors the feedback signals to determine whether there is an open control circuit, or a short to ground circuit or a short to power supply circuit. If ECM detects the control circuit voltage is within a predetermined range, when being disconnected, this DTC code is set.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0010 P2088 P2089	Hardware Circuit Checks	1. Circuit Open. 2. Circuit Short to Ground. 3. Circuit Short to Power Supply.	1. Solenoid Valve Circuit 2. Solenoid Valve 3. ECM

## 3. Schematic:

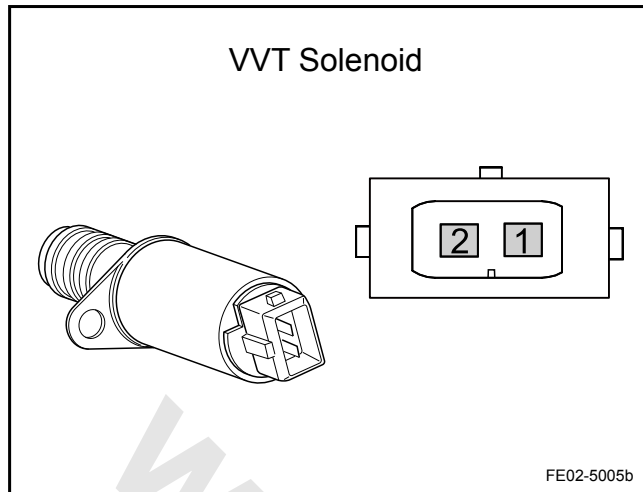


## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Measure VVT solenoid valve assembly resistance.
--------	---



- (a) Disconnect VVT solenoid valve wiring harness connector EN10.
- (b) Measure VVT solenoid valve resistance between the two terminals.

Standard Resistance: 9.4-10.6  $\Omega$  (68 °F) when 20°C

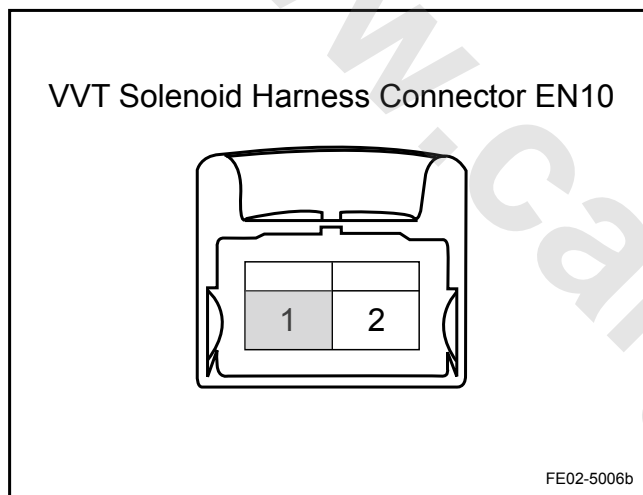
- (c) Connect VVT solenoid valve wiring harness connector.

No

Replace VVT solenoid valve assembly. Go to step 6

Yes

Step 2 Measure VVT solenoid valve working power supply voltage.



- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect VVT solenoid valve wiring harness connector EN10.
- (c) Turn the ignition switch to "ON" position.
- (d) Use multimeter to measure EN10 harness connector terminal No.1.

Standard Voltage: 11-14 V

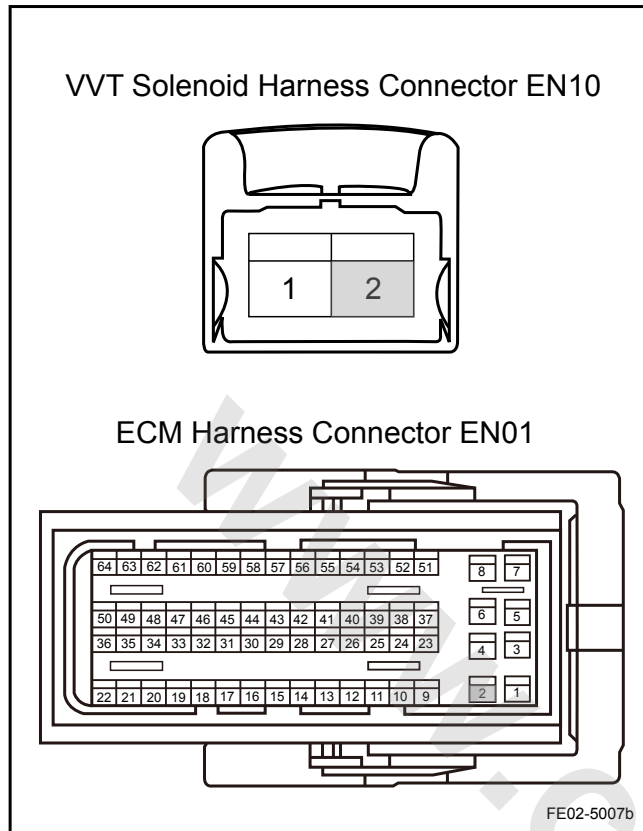
- (e) Reconnect VVT solenoid valve wiring harness connector EN10.

No

Check open circuit between EN10 solenoid valve wiring harness connector terminal No.1 and the main relay terminal No.3 or short to ground.

Yes

Step 3 Check VVT solenoid valve control circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect VVT solenoid valve wiring harness connector EN10.
- Disconnect ECM harness connector EN01.
- Use multimeter to measure the resistance between VVT solenoid valve wiring harness connector EN10 terminal No. 2 and ECM harness connector EN01 terminal No.2. For the Standard Value. Refer to the table below.
- Use multimeter to measure the resistance between VVT solenoid valve wiring harness connector EN10 terminal No. 2 and the ground. For the Standard Value. Refer to the table below.
- Turn the ignition switch to "ON" position, (Note: At this time EN01 and EN10 connectors must be disconnected.) Use multimeter to measure the voltage between the VVT solenoid valve wiring harness connector EN10 No.2 terminal and the ground. For the Standard Value. Refer to the table below.

Test Connection	Standard Value
Resistance Between EN10 (2) and EN01 (2)	Less than 1 $\Omega$
Resistance Between EN10 (2) and Ground	10 k $\Omega$ or higher
Voltage Between EN10 (2) and Ground	0 V

All normal?

No

Repair or replace wiring harness connectors.

Yes

Step 4 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 5 Replace ECM.

Next

Step 6 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up engine for at least 5 min.



- (e) Road test the vehicle for at least 10 min.  
 (f) Read DTC control system code again to confirm that there is no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 7 Diagnostic completed.

### 5. Repair Instructions:

Replace VVT solenoid valve. Refer to [2.2.8.4 VVT Solenoid Valve Replacement and Filter Cleaning](#).

### 2.2.7.13 DTC P000A P0012

#### 1. DTC Descriptor:

DTC	P000A	Intake VVT Slow Response
DTC	P0012	VVT is not at the default location during air intake process.

The intake camshaft position actuator is connected to the intake camshaft and operated by hydraulic pressure. The hydraulic pressure is provided by the engine oil pump in order to change the intake camshaft to the crankshaft relative position (CKP ) angle. The intake VVT solenoid valve power supply is provided by The Main Relay. ECM modulates the pulse-width to control signal ground, thus controlling the camshaft position actuator engine oil flow. Engine oil pressure moves the camshaft position actuator slide valve at the front of the camshaft. When the safety slide valve is operated, the engine oil is imported into the camshaft position actuator, so that camshaft rotates. The intake camshaft cam actuator can change the camshaft working angle up to 50°.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P000A	VVT actual angle and target angle difference is too great.	<ol style="list-style-type: none"> <li>VVT actual angle and target angle difference is too great.</li> <li>Camshaft completed self learn.</li> <li>Engine oil temperature is between -40°C (-40 °F) and 120°C (248 °F).</li> <li>Engine coolant temperature is between 0°C (32 °F) and 105°C (221 °F ).</li> <li>Engine speed is between 600 rpm to 6,000 rpm.</li> <li>No VVT circuit fault.</li> </ol>	<ol style="list-style-type: none"> <li>Valve Timing Chain</li> <li>VVT Solenoid Valve</li> <li>Solenoid Valve Filter</li> <li>VVT Actuator Assembly</li> <li>ECM</li> </ol>

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0012	VVT actual angle is not at the default location.	<ol style="list-style-type: none"> <li>1. VVT actual angle and target angle difference is greater than or equal to 20°.</li> <li>2. Camshaft completed self learn.</li> <li>3. The engine running time is less than or equal to 1.5 s.</li> <li>4. The engine oil temperature is between -40°C (-40 °F) and 120°C (248 °F) .</li> <li>5. The engine coolant temperature is between 0°C (32 °F) and 105°C (221 °F) .</li> <li>6. Engine speed is between 600 rpm to 6,000 rpm.</li> <li>7. No VVT circuit fault.</li> </ol>	

## 3. Schematic:

Refer to [2.2.7.12 DTC P0010 P2088 P2089](#).

## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Check control system whether there are DTC codes other than DTC P0010, P2088, P2089, P000A, P0012.
--------	--

- Connect scan tool to datalink connector.
- Turn the ignition switch to "ON" position.
- Press the scan tool power button.
- Select the following menu items: Engine/Read DTC codes.
- Read DTC codes.

DTC Codes Shown	To Step
DTC P0010, P2088, P2089	Yes
DTC Other Than DTC P0010, P2088, P2089	No

No

Refer to [2.2.7.11 DTC Code Index](#)

Yes

Step 2	Check the following items.
--------	----------------------------

- Engine oil viscosity and clean circuits are normal.

- (b) Check engine oil level. The engine oil level should be within the range.
- (c) Check if engine oil needs to be replaced or contains additives or engine oil viscosity is not correct.

All normal?

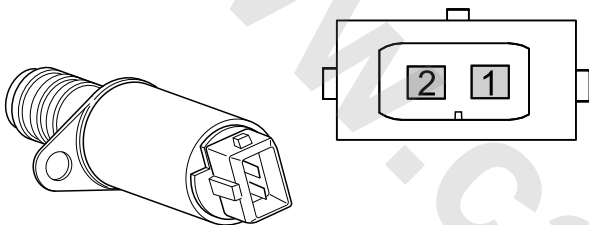
No

Replace the engine oil and oil filter, when necessary, clean the engine lubrication system.

Yes

Step 3 Check VVT solenoid valve resistance.

VVT Solenoid



FE02-5005b

- (a) Disconnect VVT solenoid valve wiring harness connector EN10.
- (b) Measure VVT solenoid valve resistance between the two terminals.

Standard Resistance: 9.4-10.6  $\Omega$  (68 °F) when 20°C

No

Replace VVT solenoid valve. Refer to [2.2.8.4 VVT Solenoid Valve Replacement and Filter Cleaning](#). Go to step 8

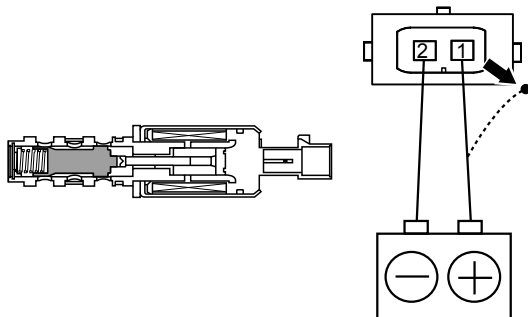
Yes

#### Note

Connecting two wires directly is strictly prohibited in the testing process, as it might cause an explosion, fire and other dangers.

Step 4 Check VVT solenoid valve operation.

VVT Solenoid



FE02-5138b

- (a) Connect the battery positive terminal with the VVT solenoid valve terminal No.1 and the negative terminal with the VVT solenoid valve terminal No.2.

- (b) Check the spool operation.

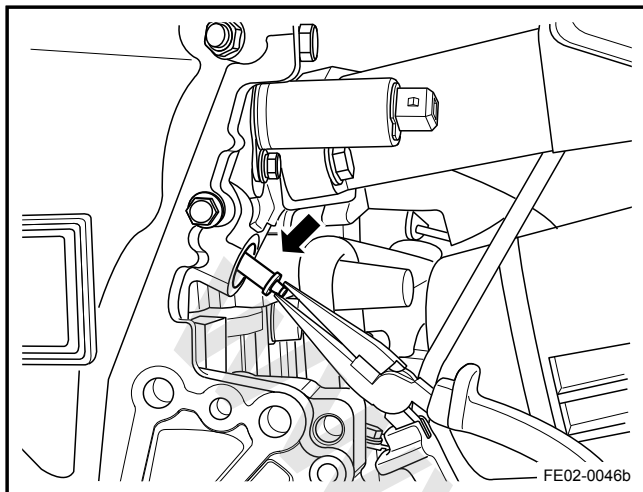
Spool activated?

No

Replacement VVT solenoid valve. Refer to [2.2.8.4 VVT Solenoid Valve Replacement and Filter Cleaning](#)

Yes

Step 5 Check VVT solenoid valve filter.



- Remove VVT solenoid valve filter.
- Check whether filter is blocked.
- Check whether filter is damaged.
- Re-install VVT solenoid valve filter.

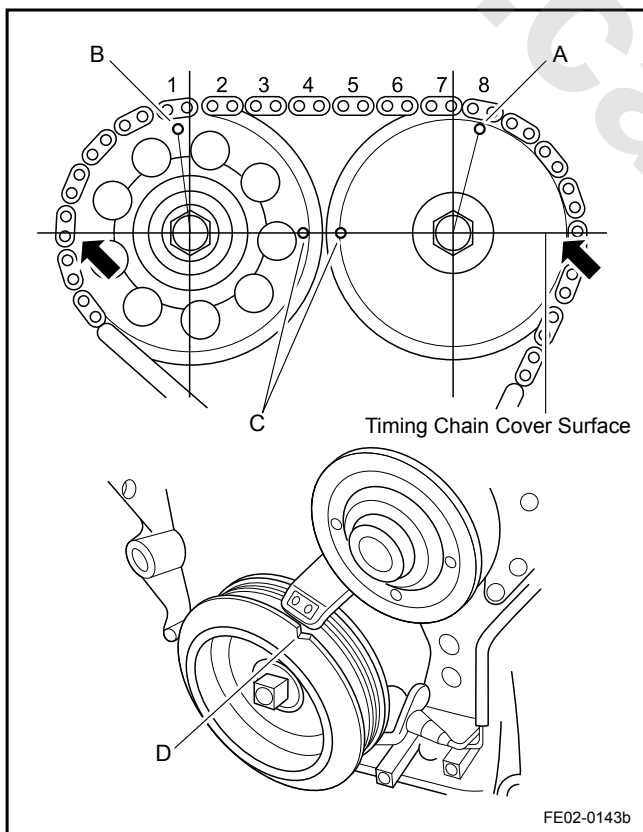
Does VVT solenoid valve filter work properly?

No

Clean VVT solenoid valve filter, if necessary, replace the VVT solenoid valve filter.

Yes

Step 6 Check whether timing system is normal.



- Remove the cylinder head cover.
- Align point D, rotate crankshaft pulley, so that timing mark on the pulley aligned with the marked "0" on the timing chain cover.
- Check point C, make sure the camshaft timing gear timing mark as shown in the graphic aligned with horizontal position.
- Check points A, B point, make sure the distance between intake and exhaust camshaft gear timing marks A and B is 8 timing chain section.
- Re-install the cylinder head cover.

Are timing marks shown as in above graphics?

No

Adjust the valve timing.

Yes

Step 7 Replace VVT actuator assembly.

Next

Step 8	Check control system DTC code.
--------	--------------------------------

- (a) Connect scan tool to datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Are there DTC codes?

No

Intermittent Fault. Refer to [2.2.7.4 Fault Symptom Table](#)

Yes

Step 9	Diagnostic completed.
--------	-----------------------

### 5. Repair Instructions:

The intake VVT actuator assembly is only replaced as an assembly. Do not repair its disassembled components. For VVT actuator replacement, refer to [2.6.8.12 Camshaft Replacement](#).

### 2.2.7.14 DTC P0016

#### 1. DTC Descriptor:

DTC	P0016	Unreasonable Camshaft and Crankshaft Relative Installation Position
-----	-------	---

Engine Control Module (ECM) uses crankshaft position sensor (CKP) and camshaft position sensor (CMP) pulse signals to monitor the correlation between crankshaft position and camshaft position. Crankshaft variable reluctance rotor has 60 teeth, of which two missing teeth were used as a reference gap. Each tooth spaces 6° evenly, except the reference gap with a 12° interval. Camshaft signal plate has 4 teeth, 2 narrow teeth and 2 wide ones. Each tooth trailing edge evenly spaces at 90°.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0016	The difference between crankshaft and camshaft synchronization learn value and reference value	<ol style="list-style-type: none"> <li>When camshaft and crankshaft angle difference is greater than 20°, the DTC code is set. When the angle is greater than 25°, the camshaft and the crankshaft adaptive is activated.</li> <li>The camshaft and crankshaft angle difference is greater than the negative 25°.</li> </ol>	<ol style="list-style-type: none"> <li>Timing Chain Tensioner</li> <li>Timing Chain</li> <li>Crank Sprocket</li> <li>Exhaust Sprocket</li> <li>VVT Actuator</li> <li>ECM</li> </ol>

#### 3. Schematic:

Refer to [2.2.7.29 DTC P0321 P0322](#).

## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Check valve timing system.
<p>(a) Check whether camshaft, crankshaft and timing chain is correct.</p> <p>(b) Check whether timing chain tensioning force is normal.</p>	
<p>Yes</p> <p>No</p> <p>Go to step 4</p>	
Step 2	Check ECM power supply circuit.
<p>(a) Check whether ECM power supply circuit is normal.</p> <p>(b) Check whether ECM ground circuit is normal.</p>	
<p>Yes</p> <p>No</p> <p>Repair the faulty part.</p>	
Step 3	Replace ECM.
<p>Next</p> <p>Go to step 5</p>	

## Note

Use of Lubrication system cleaner is not recommended. Such cleaning agents contain strong solvent and may have side effects on seals and other engine components.

Step 4	Adjust and repair the mechanical timing system.
<p>(a) Read the vehicle service records and identify whether recent services included the timing chain, camshaft or crankshaft, and whether engine oil change intervals are too long.</p> <p>(b) If the engine oil is contaminated or contains impurities, the reasons should be identified. Remove timing chain, camshaft position actuators and the sprocket. Refer to <a href="#">2.6.8.10 Timing Chain Replacement</a>. Remove VVT solenoid valve that filters the engine oil provided to the intake camshaft actuator. Refer to <a href="#">2.2.8.4 VVT Solenoid Valve Replacement and Filter Cleaning</a>. Check filters and oil channel whether there are impurities. Clean filters and replace the filter if necessary.</p> <p>(c) If the engine oil pressure is too low, identify causes and carry out necessary repairs.</p>	
<p>Next</p>	
Step 5	Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.

- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Road test the vehicle for at least 5 min.
- (f) Read control system DTC code again to confirm that the system has no DTC code.

Next

Step 6	Diagnostic completed.
--------	-----------------------

### 2.2.7.15 DTC P0030 P0031 P0032 P0053

#### 1. DTC Descriptor:

DTC	P0030	Pre-Catalytic oxygen sensor heating control circuit open
DTC	P0031	Pre-Catalytic oxygen sensor heating control circuit short to ground
DTC	P0032	Pre-Catalytic oxygen sensor heating control circuit short to power supply

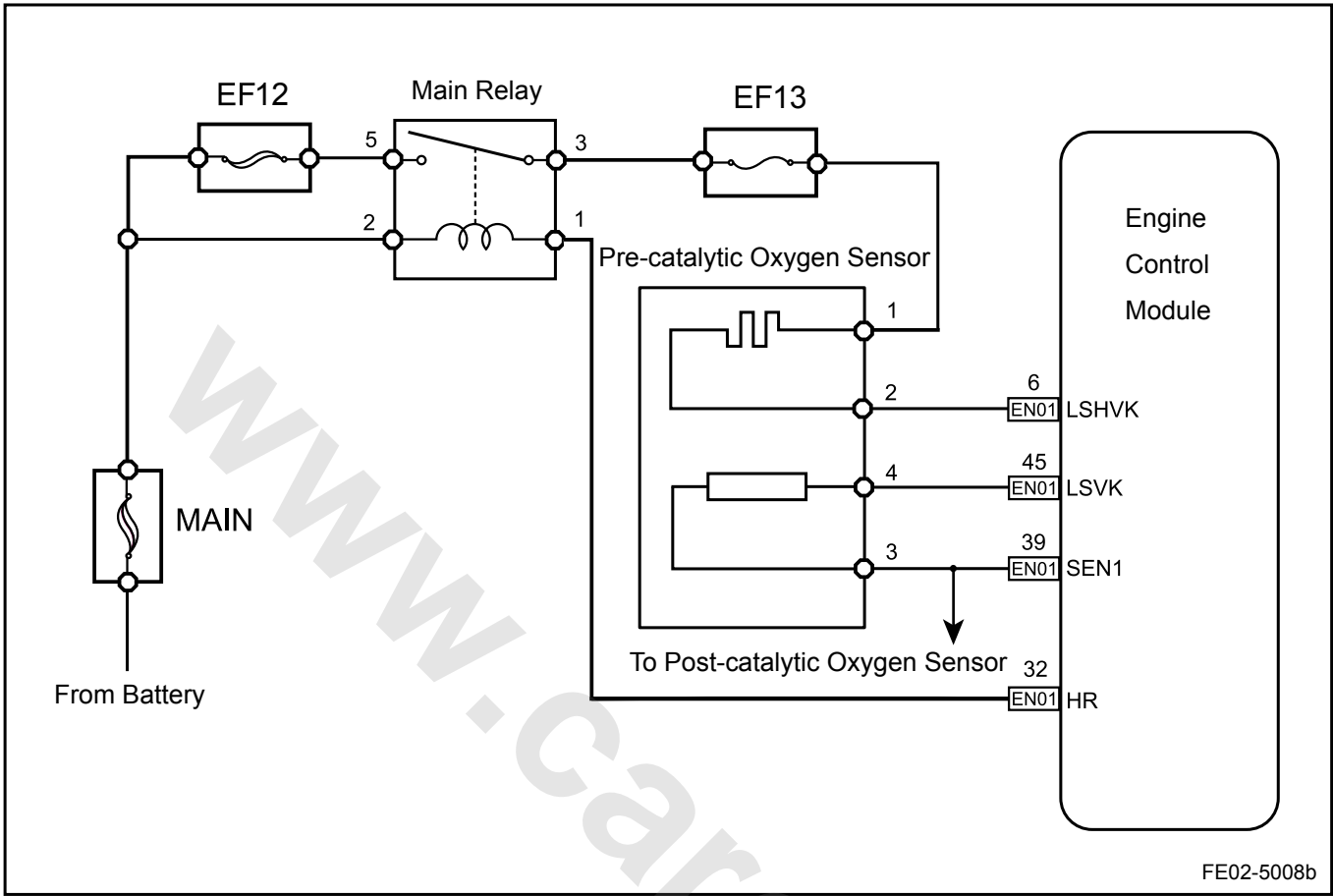
The Pre-Catalytic heated oxygen sensor (HO<sub>2</sub>S) is used for fuel control. The sensor compares the oxygen content in ambient air with the oxygen content in exhaust flow. Each heated oxygen sensor has an internal heating element for sensor heating. ECM controls the heated oxygen sensor heating control circuit. This makes the system enter into the closed-loop control mode earlier, so that ECM can calculate Air-Fuel ratio earlier. ECM commands heater control module switched on or off, so that heated oxygen sensor works within the specified working temperature range. Engine control module detects the temperature by Measure the heater current.

The Pre-Catalytic heated oxygen sensor heating coil voltage is provided by The Main Relay, which is controlled by ECM. When the ignition switch is turned to "ON" position, harness connector EN02 terminal No.1 voltage is provided by the battery. ECM controls heater working time through ECM harness connector EN01 terminal No.6.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0030 P0031 P0032	Hardware Circuit Checks	1. Circuit Open. 2. Circuit Short to Ground. 3. Circuit Short to Power Supply.	1. Sensor Circuit 2. Sensor 3. ECM
P0053	Resistance is greater than the set value.	1. The current Pre-Catalytic oxygen sensor internal resistance is greater than 1500 Ω. 2. The current exhaust gas temperature is between 200°C (392 °F) and 550°C (1,022 °F).	

3. Schematic:



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial inspection.
--------	---------------------

Check the existence of following factors that will affect the heated oxygen sensor working status:

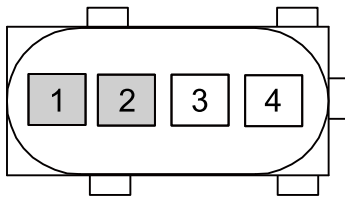
- (a) Exhaust system leaks or blockage.
- (b) Water entering into the heated oxygen sensor connector.
- (c) After engine working in high temperatures, whether exhaust pipes are too hot.

Next

Step 2	Check the Pre-Catalytic oxygen sensor heater resistance.
--------	--



## Pre-catalytic Oxygen Sensor



FE02-5009b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect oxygen sensor wiring harness connector.
- (c) Measure heater resistance between the Pre-Catalytic oxygen sensor terminal No.1 and terminal No.2.

Standard Resistance:  $9\ \Omega$  (68 °F) at 20°C

- (d) Connect the Pre-Catalytic oxygen sensor wiring harness connector.

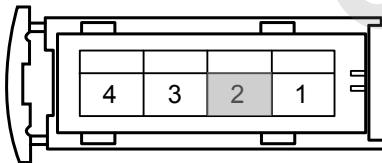
Is resistance the specified value?

No

Replace the Pre-Catalytic oxygen sensor.  
Refer to [2.4.7.2 Pre-Catalytic Oxygen Sensor Replacement](#)

Yes

Step 3 Check the terminal No.2 to ground voltage.

Pre-catalytic Oxygen Sensor Harness Connector  
EN02

FE02-5010b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the Pre-Catalytic oxygen sensor wiring harness connector.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure the Pre-Catalytic oxygen sensor wiring harness connector EN02 terminal No.1 to ground voltage.

Standard Voltage Value: Voltage between the EN02 terminal No.1 and the ground is 11-14 V.

- (e) Connect the Pre-Catalytic oxygen sensor wiring harness connector.

Is voltage the specified values?

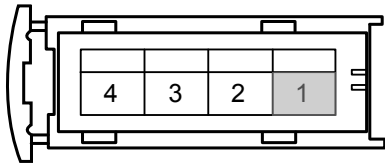
No

Pre-Catalytic Oxygen Sensor Power Supply  
Circuit Fault

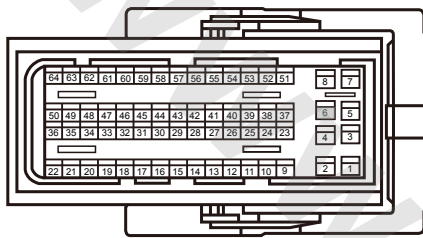
Yes

Step 4 Check the Pre-Catalytic oxygen sensor terminal heating control signal continuity.

### Pre-catalytic Oxygen Sensor Harness Connector EN02



### ECM Harness Connector EN01



FE02-5011b

- Turn the ignition switch to "OFF" position.
- Disconnect the Pre-Catalytic oxygen sensor wiring harness connector EN02.
- Disconnect ECM harness connector EN01.
- Test continuity between the Pre-Catalytic oxygen sensor wiring harness connector EN02 terminal No.2 and ECM harness connector EN01 terminal No.6.

Standard Resistance: Less than 1  $\Omega$ 

- Connect ECM harness connector EN01.
- Connect the Pre-Catalytic oxygen sensor wiring harness connector EN02.

Is resistance the specified value?

No

ECM control circuit malfunction

Yes

Step 5 Check ECM working circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuits is normal.

No

Repair the faulty part.

Yes

Step 6 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Next

Step 7 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 8	Diagnostic completed.
--------	-----------------------

## 5. Repair Instructions:

Replace the Pre-Catalytic oxygen sensor. Refer to [2.4.7.2 Pre-Catalytic Oxygen Sensor Replacement](#).

## 2.2.7.16 DTC P0036 P0037 P0038 P0054

## 1. DTC Descriptor:

DTC	P0036	Post-Catalytic Oxygen Sensor Heating Control Circuit Open
DTC	P0037	Post-Catalytic Oxygen Sensor Heating Control Circuit Short to Ground
DTC	P0038	Post-Catalytic Oxygen Sensor Heating Control Circuit Short to Power Supply
DTC	P0054	Post-Catalytic Oxygen Sensor Heating Resistance Unreasonable

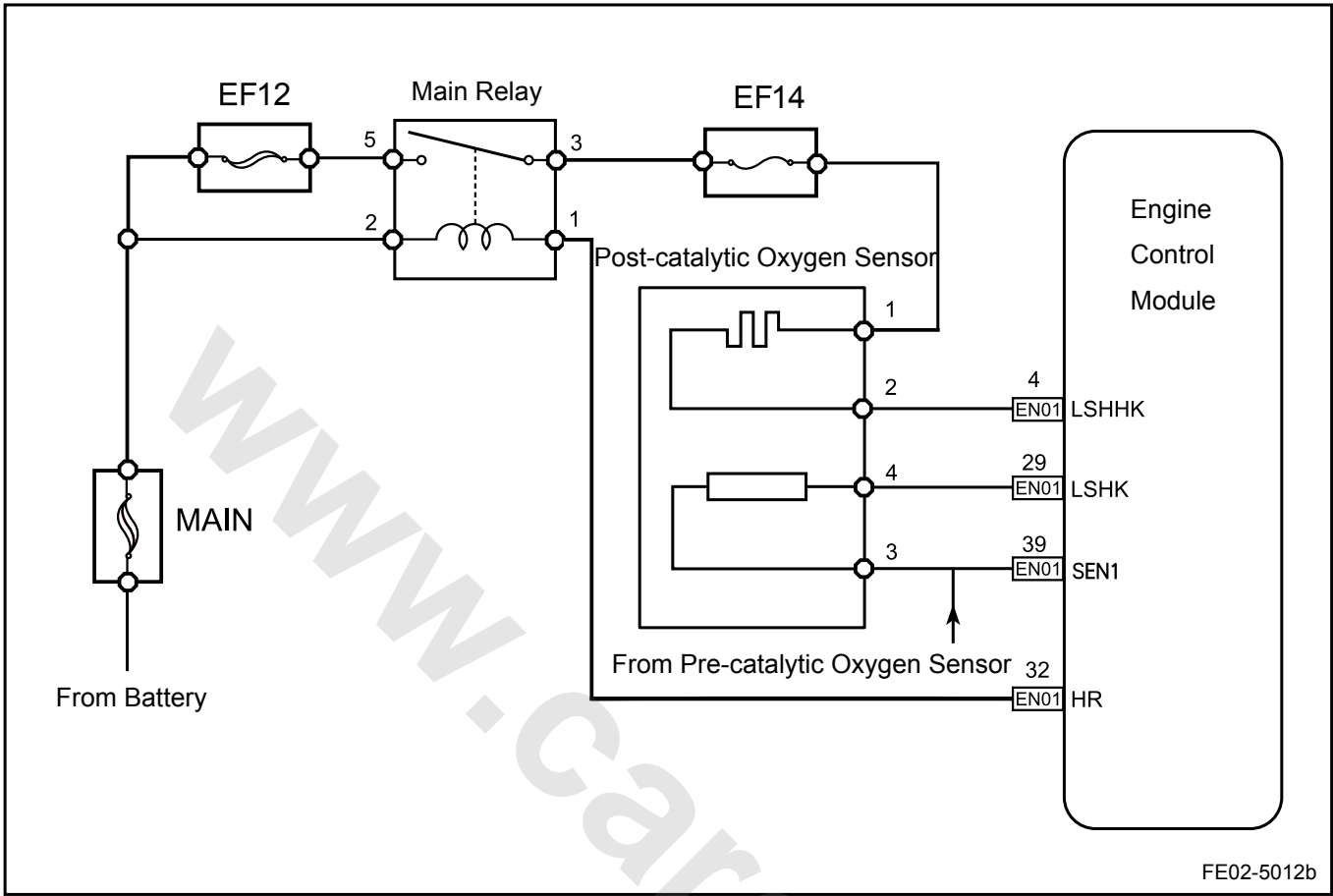
The Post-Catalytic heated oxygen sensor (HO<sub>2</sub>S) is used for monitoring three-way catalytic converter working status. The sensor compares the oxygen content in ambient air with the oxygen content in exhaust flow. Each heated oxygen sensor has an internal heating element for sensor heating. ECM controls the heated oxygen sensor heating control circuit. This makes the system enter into the closed-loop control mode earlier, so that ECM can calculate Air-Fuel ratio earlier. ECM commands heater control module switched on or off, so that heated oxygen sensor works within the specified working temperature range. Engine control module detects the temperature by Measure the heater current.

The Post-Catalytic heated oxygen sensor heating coil voltage is provided by The Main Relay, which is controlled by ECM. When the ignition switch is turned to "ON" position, the Post-Catalytic oxygen sensor harness connector EN03 terminal No.1 voltage is provided by the battery. ECM controls heater working time through ECM harness connector EN01 terminal No.4.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0036 P0037 P0038	Hardware Circuit Checks	<ol style="list-style-type: none"> <li>1. Circuit Open</li> <li>2. Circuit Short to Ground</li> <li>3. Circuit Short to Power Supply</li> </ol>	<ol style="list-style-type: none"> <li>1. Sensor Circuit</li> <li>2. Sensor</li> <li>3. ECM</li> </ol>
P0054	The current resistance is greater than the set value.	<ol style="list-style-type: none"> <li>1. The oxygen sensor current internal resistance is greater than 1700 Ω.</li> <li>2. The current exhaust gas temperature is between 200°C (392 °F) and 550°C (1,022 °F).</li> </ol>	

3. Schematic:



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

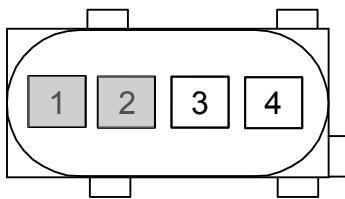
Check the existence of following factors that will affect the oxygen sensor working status:

- (a) Exhaust system leaks or blockage.
- (b) Water entering into heated oxygen sensor connector.
- (c) After engine worked in high temperatures, check whether exhaust pipes are too hot.

Next

Step 2	Check the Post-Catalytic oxygen sensor heater resistance.
--------	---

## Post-catalytic Oxygen Sensor



FE02-5013b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the post-catalytic oxygen sensor wiring harness connector.
- (c) Measure the Post-Catalytic oxygen sensor heater resistance. Standard Resistance: Between connector No.1 and No.2, 9  $\Omega$  (68 °F) at 20°C
- (d) Connect the post-catalytic oxygen sensor wiring harness connector.

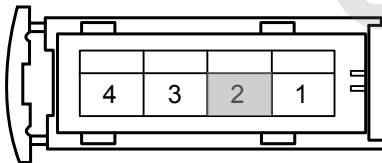
Is the resistance the specified value?

No

Replace oxygen sensor. Refer to [2.4.7.1 Post-Catalytic Oxygen Sensor Replacement](#)

Yes

Step 3 Check the terminal No.2 to ground voltage.

Post-catalytic Oxygen Sensor  
Harness Connector EN03

FE02-5014b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the post-catalytic oxygen sensor wiring harness connector.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure the Post-Catalytic oxygen sensor harness connector EN03 terminal No.1 to ground voltage. Standard Voltage: 11-14 V

- (e) Connect the post-catalytic oxygen sensor wiring harness connector EN03.

Is voltage the specified values?

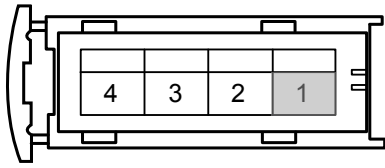
No

The Post-Catalytic oxygen sensor heater power supply circuit malfunction.

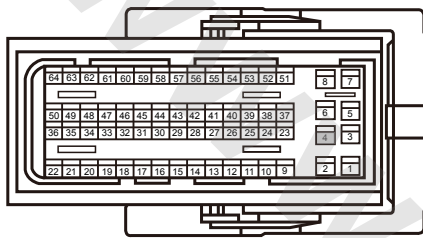
Yes

Step 4 Check the Post-Catalytic oxygen sensor heater control terminal continuity.

### Post-catalytic Oxygen Sensor Harness Connector EN03



### ECM Harness Connector EN01



FE02-5015b

- Turn the ignition switch to "OFF" position.
- Disconnect the post-catalytic oxygen sensor wiring harness connector EN03.
- Disconnect ECM harness connector EN01.
- Measure the continuity between the post-catalytic oxygen sensor wiring harness connector EN03 terminal No.2 and ECM harness connector EN01 terminal No.4.

Standard Resistance: Less than 1 Ω

- Connect ECM harness connector EN01.
- Connect the post-catalytic oxygen sensor wiring harness connector EN03.

Is resistance the specified value?

No

ECM control circuit malfunction

Yes

Step 5 Check ECM working circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 6 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Next

Step 7 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 8	Diagnostic completed.
--------	-----------------------

## 5. Repair Instructions:

Replace the post-catalytic oxygen sensor. Refer to [2.4.7.1 Post-Catalytic Oxygen Sensor Replacement](#).

## 2.2.7.17 DTC P0105 P0106 P0107 P0108

## 1. DTC Descriptor:

DTC	P0105	Intake Air Pressure Sensor Signal No Change (Frozen)
DTC	P0106	Intake Air Pressure Sensor Unreasonable
DTC	P0107	Intake Air Pressure Sensor Circuit Short to Ground
DTC	P0108	Intake Air Pressure Sensor Circuit Short to Power Supply

Intake Air Pressure Sensor responds to the pressure changes within the intake manifold. Pressure varies according to engine load. The sensor circuit consists of the following:

- 5V Reference Voltage Circuit
- Low Reference Voltage Circuit
- Sensor Signal Circuit

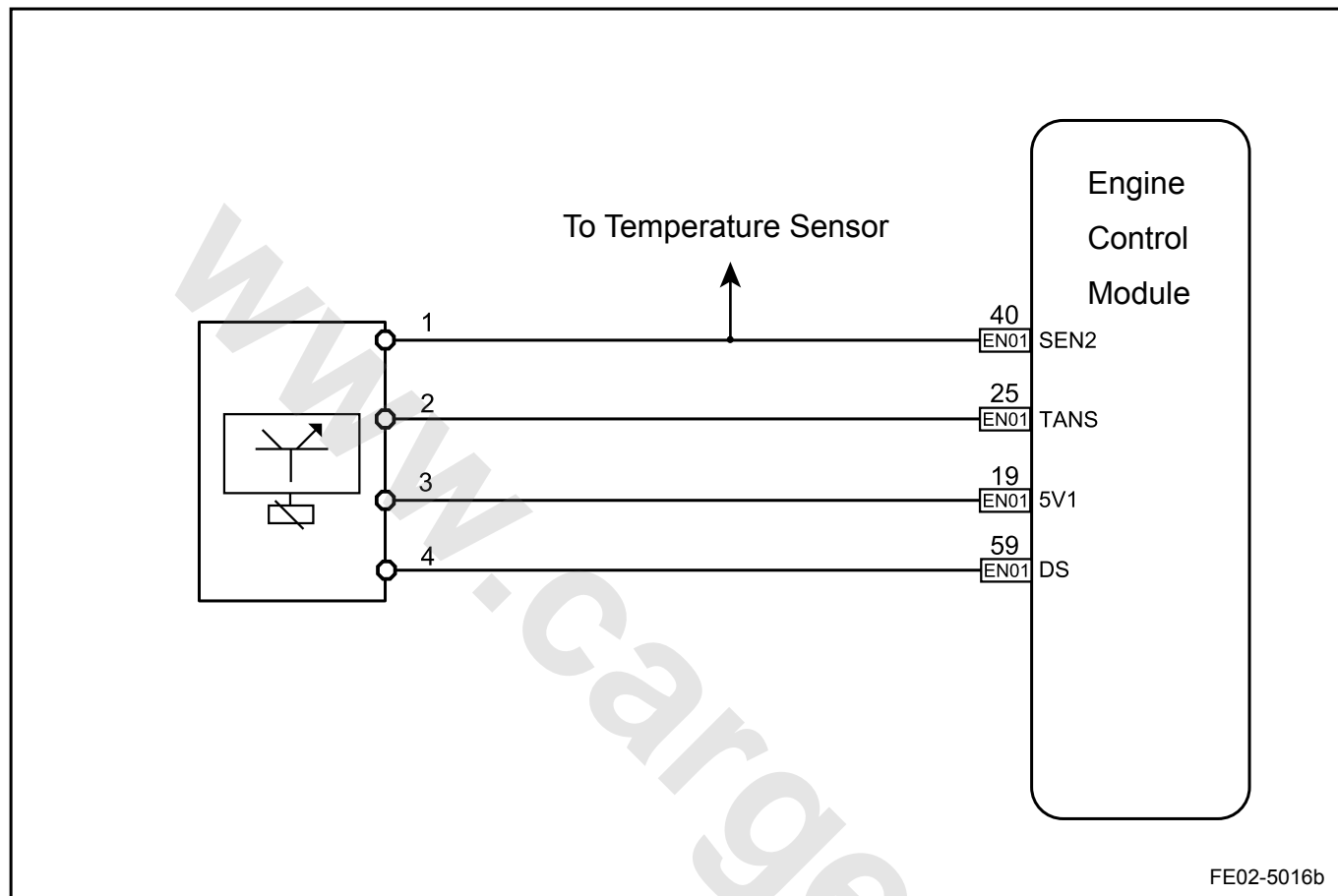
ECM provides EN16 5 V reference voltage through ECM harness connector EN01 terminal No.19 to the sensor harness connector EN16 terminal No.3. At the same time ECM provides a low reference voltage through EN01 terminal No.40 to the sensor harness connector EN16 terminal No.1. The sensor provides a signal through EN16 terminal No.4 to ECM harness connector EN01 terminal No.59, and the signal is related to the intake manifold pressure change. When the intake manifold absolute pressure is low, ECM detected signal voltage will be low, such as at idle or during deceleration. When the intake manifold absolute pressure is high, ECM detected signal voltage will be high, such as when the ignition switch is turned on and the engine is turned off, or when the throttle fully open. Sensors are also used to determine the atmospheric pressure such as When the ignition switch is turned on and the engine is turned off. As long as the engine running with the throttle fully open, atmospheric pressure readings will also be updated. ECM monitors sensor signals in order to determine whether the voltage is beyond the normal range.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0105	Signal Inspection: The pressure does not decrease after starting.	1. The pressure drop is less than 2 kPa after starting. 2. Engine speed is greater than 800 rpm.	1. Sensor Circuit 2. Sensor 3. ECM
P0106	Signal Unreasonable	Pressure Sensor Displayed Pressure.	
P0107	Circuit Inspection, Over the Maximum Limit	Pressure sensor voltage is less than 0.1 V.	

P0108	Circuit Inspection, Lower Than the Maximum Limit	Pressure sensor voltage is greater than 4.9 V.	
-------	--	--	--

## 3. Schematic:



## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

Check the existence of the following conditions:

- (a) Sensor Housing Damage, Broken Vacuum Tubes.
- (b) Sensor Seal Damage.
- (c) Sensor Loose or Not Properly Installed.
- (d) Sensor Tube blockage.

Next

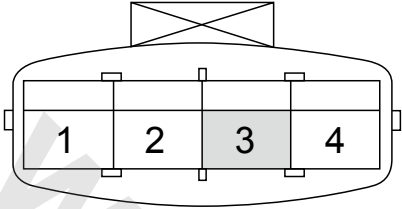
## Note

It is not allowed to connect intake manifold absolute pressure sensor 5 V reference voltage circuit and other components of the vehicle, as this will damage the sensors and ECM.



Step 2	Measure intake manifold absolute pressure sensor 5 V reference voltage.
--------	---

Intake Air Pressure Temperature Sensor Harness Connector EN16



FE02-5017b

(a) Turn the ignition switch to "OFF" position.

(b) Disconnect intake manifold absolute pressure sensor wiring harness connector EN16.

(c) Turn the ignition switch to "ON" position.

(d) Measure intake manifold absolute pressure sensor wiring harness connector EN16 terminal No.3 to a reliable ground voltage.

Standard Voltage: 4.5V-5.5V

(e) Connect intake manifold absolute pressure sensor wiring harness connector EN16.

Is voltage the specified value?

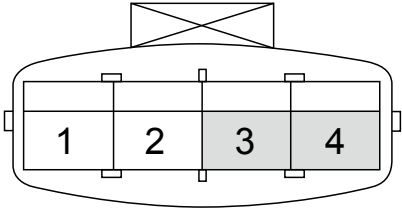
No

Go to step 6

Yes

Step 3	Measure sensor signal circuit.
--------	--------------------------------

Intake Air Pressure Temperature Sensor Harness Connector EN16



FE02-5018b

(a) Turn the ignition switch to "OFF" position.

(b) Disconnect intake manifold absolute pressure sensor wiring harness connector EN16.

(c) Turn the ignition switch to "ON" position.

(d) Between EN16 terminal No.3 and No.4, connect a 5A fuse wire. Use scan tool to read "the actual intake manifold absolute pressure sensor voltage" parameter.

Standard Parameter: 4.5V-5.5V

(e) Connect intake manifold absolute pressure sensor wiring harness connector EN16.

Is data normal?

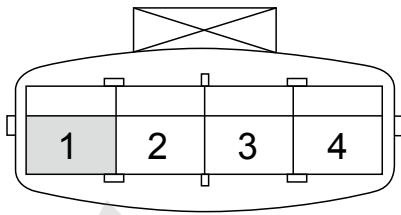
No

Go to step 7

Yes

Step 4	Measure intake manifold absolute pressure sensor ground circuit.
--------	--

### Intake Air Pressure Temperature Sensor Harness Connector EN16



FE02-5019b

- Turn the ignition switch to "OFF" position.
- Disconnect intake manifold absolute pressure sensor wiring harness connector EN16.
- Turn the ignition switch to "ON" position.
- Measure resistance between intake manifold absolute pressure sensor wiring harness connector EN16 terminal No. 1 and a reliable ground.

Standard Value: Less than 3  $\Omega$ 

- Connect intake manifold absolute pressure sensor wiring harness connector EN16.

Is resistance normal?

No

Go to step 8

Yes

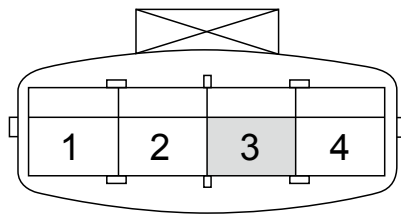
Step 5 Replace intake manifold absolute pressure sensor.

Next

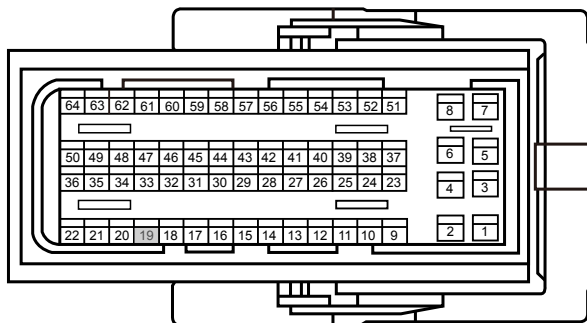
Go to step 10

Step 6 Check sensor 5 V reference voltage circuit.

### Intake Air Pressure Temperature Sensor Harness Connector EN16



ECM Harness Connector EN01



FE02-5020b

- Turn the ignition switch to "OFF" position.
- Disconnect intake manifold absolute pressure sensor wiring harness connector EN16.
- Disconnect ECM harness connector EN01.
- Measure the resistance between intake manifold absolute pressure sensor harness connector EN16 terminal No.3 and ECM harness connector terminal No.19. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure the resistance between intake manifold absolute pressure sensor wiring harness connector EN16 terminal No. 3 and a reliable ground. Check whether there is a circuit short to ground . If there is no short circuit, repair the faulty part.
- Measure the voltage value between intake manifold absolute pressure sensor wiring harness connector EN16 terminal No. 3 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

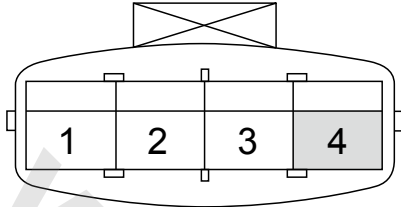
Test Items	Standard Value
Resistance Between EN16 (3) and EN01 (19)	Less than 1 $\Omega$
Resistance Between EN16 (3) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN16 (3) and A Reliable Ground	0 V

Next

Go to step 9

Step 7	Check sensor signal circuit.
--------	------------------------------

### Intake Air Pressure Temperature Sensor Harness Connector EN16



### ECM Harness Connector EN01



FE02-5021b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect intake manifold absolute pressure sensor wiring harness connector EN16.
- (c) Disconnect ECM harness connector EN01.
- (d) Measure resistance between intake manifold absolute pressure sensor harness connector EN16 terminal No.4 and ECM harness connector terminal No.59. Check whether the circuit is open. If there is no open circuit, repair faulty part.
- (e) Measure resistance between intake manifold absolute pressure sensor harness connector EN16 terminal No.4 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair faulty part.
- (f) Measure voltage between intake manifold absolute pressure sensor harness connector EN16 terminal No.4 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair faulty part.

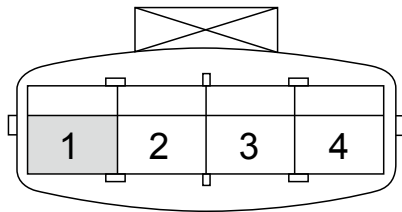
Test Items	Standard Value
Resistance Between EN16 (4) and EN01 (59)	Less than 1 $\Omega$
Resistance Between EN16 (4) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN16 (4) and A Reliable Ground	0 V

Normal

Go to step 9

Step 8	Check sensor ground circuit.
--------	------------------------------

### Intake Air Pressure Temperature Sensor Harness Connector EN16



ECM Harness Connector EN01



FE02-5022b

- Turn the ignition switch to "OFF" position.
- Disconnect intake manifold absolute pressure sensor wiring harness connector EN16.
- Disconnect ECM harness connector EN01.
- Measure resistance between intake manifold absolute pressure sensor harness connector EN16 terminal No.1 and ECM harness connector terminal No.40. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure voltage between intake manifold absolute pressure sensor harness connector EN16 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN16 (1) and EN01 (40)	Less than 1 $\Omega$
Voltage Between EN16 (1) and A Reliable Ground	0 V

Execute next step as per normal.

Next

Step 9 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 10 Replace ECM.

Next

Step 11 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 12	Diagnostic completed.
---------	-----------------------

## 5. Repair Instructions:

Replace the MAP sensor. Refer to [2.2.8.7 Intake Air Pressure and Temperature Sensor Replacement](#).

Refer to [2.2.8.8 Engine Control Module Replacement](#) Replace ECM.

## 2.2.7.18 DTC P0112 P0113

## 1. DTC Descriptor:

DTC	P0112	Intake Air Temperature Sensor Signal Voltage Too Low
DTC	P0113	Intake Air Temperature Sensor Signal Voltage Too High

The sensor is an integrated part of the engine intake pressure sensor for Measure the temperature of air entering the engine. ECM provides 5 V reference voltage through ECM harness connector EN01 terminal No.25 to the intake air pressure and temperature sensor wiring harness connector EN16 terminal No.2. At the same time it provides ECM internal low reference voltage through EN01 terminal No.40 to intake air pressure and temperature sensor EN16 terminal No.1. When the intake air pressure and temperature sensors is cold, the thermistor value used to measure temperature is high. When the air temperature rises, the resistance decreases. When the resistance is higher, ECM will detect the signal circuit with a higher voltage. With the decrease of resistance, ECM detected intake air temperature signal circuit voltage also decreases.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0112 P0113	1. More Than the Upper Limit 2. Less than the Lower Limit	1. Short to ground. Intake air temperature is higher than 138°C (280.4 °F). 2. Short to power supply. Intake air temperature is less than -38.3°C (-36.9 °F). 3. Startup time more than 240 s. 4. Engine idle.	1. Sensor Circuit 2. Sensor 3. ECM

## 3. Schematic:

Refer to [2.2.7.17 DTC P0105 P0106 P0107 P0108](#) in schematics.

## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

Check the existence of the following conditions:

- (a) Sensor Housing Damage
- (b) Sensor Loose or Not Properly Installed

## (c) Sensor Wiring Harness Connector Loose

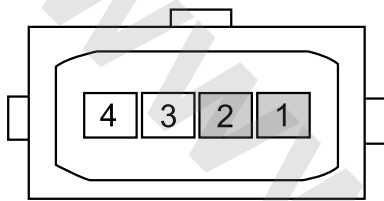
Next

## Note

It is not allowed to connect intake manifold absolute pressure sensor 5 V reference voltage circuit and other components of the vehicle, as this will damage the sensors and ECM.

Step 2 Measure intake air temperature sensor resistance.

Intake Air Temperature/Pressure Sensor



FE02-5024b

- Turn the ignition switch to "OFF" position.
- Disconnect intake air pressure and temperature sensor wiring harness connector EN16.
- Measure intake air temperature sensor resistance.  
Standard Resistance (Refer to the specific parameters [2.2.1.2 Temperature Sensor Temperature and Resistance Correlation](#)): 20°C (68 °F) 2,400 Ω
- Connect intake air pressure and temperature sensor wiring harness connector EN16.

Is resistance the specified value?

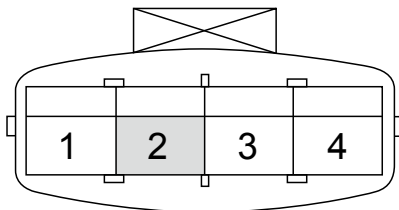
No

Replace intake air pressure and temperature sensor. Go to step 9

Yes

Step 3 Measure intake air temperature sensor signal.

Intake Air Pressure Temperature Harness Connector EN16



FE02-5025b

- Turn the ignition switch to "OFF" position.
- Disconnect intake air pressure and temperature sensor wiring harness connector EN16.
- Turn the ignition switch to "ON" position.
- Measure voltage between intake air pressure and temperature sensor wiring harness connector EN16 terminal No.2 and a reliable ground.

Standard Voltage: 4.7-5.5 V

- Connect intake air pressure and temperature sensors connector EN16.

Is voltage normal?

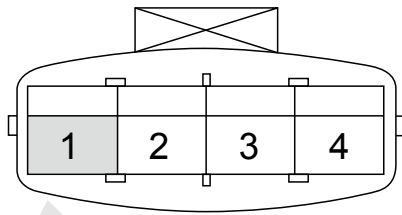
No

Go to step 5

Yes

Step 4 Measure intake air temperature sensor to ground circuit.

### Intake Air Pressure Temperature Harness Connector EN16



FE02-5026b

- Turn the ignition switch to "OFF" position.
- Disconnect intake air pressure and temperature sensor wiring harness connector EN16.
- Turn the ignition switch to "ON" position.
- Measure resistance between intake air pressure and temperature sensor wiring harness connector EN16 terminal No.1 and a reliable ground.

Standard Resistance: Less than 3  $\Omega$ 

- Connect intake air pressure and temperature sensors wiring harness connector EN16.

Is resistance normal?

No

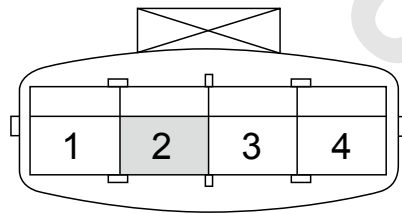
Go to step 6

Yes

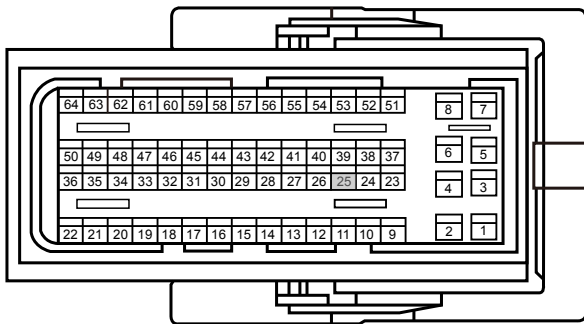
Go to step 7

Step 5 Check intake air temperature sensor signal circuit.

### Intake Air Pressure Temperature Harness Connector EN16



### ECM Harness Connector EN01



FE02-5027b

- Turn the ignition switch to "OFF" position.
- Disconnect intake air pressure and temperature sensor wiring harness connector EN16.
- Disconnect ECM harness connector EN01.
- Measure resistance between intake air pressure and temperature sensor wiring harness connector EN16 terminal No.2 and ECM harness connector terminal No.25. Check whether the circuit is open.
- Measure resistance between intake air pressure and temperature sensor wiring harness connector EN16 terminal No.2 and a reliable ground. Check whether the circuit is short to ground.
- Measure voltage between intake air pressure and temperature sensor wiring harness connector EN16 terminal No.2 and a reliable ground. Check whether the circuit is short to power supply.

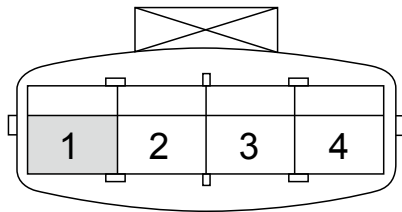
Test Items	Standard Value
Resistance Between EN16 (2) and EN01 (25)	Less than 1 $\Omega$
Resistance Between EN16 (2) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN16 (2) and a Reliable Ground	0 V

Next

Go to step 7

Step 6 Check intake air temperature sensor ground circuit.

### Intake Air Pressure Temperature Harness Connector EN16



### ECM Harness Connector EN01



FE02-5028b

- Turn the ignition switch to "OFF" position.
- Disconnect intake air pressure and temperature sensor wiring harness connector EN16.
- Disconnect ECM harness connector EN01.
- Measure resistance between intake air pressure and temperature sensor wiring harness connector EN16 terminal No.1 and ECM harness connector terminal No.40. Check whether the circuit is open. If there is no open circuit,repair the faulty part.
- Measure voltage between intake air pressure and temperature sensor wiring harness connector EN16 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit,repair the faulty part.

Test Items	Standard Value
Resistance Between EN16 (1) and EN01 (40)	Less than 1 $\Omega$
Voltage Between EN16 (1) and a Reliable Ground	0 V

Execute next step as per normal.

Next

Step 7 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)



Yes

Step 10	Diagnostic completed.
---------	-----------------------

## 5. Repair Instructions:

Replace intake air pressure and temperature sensor. Refer to [2.2.8.7 Intake Air Pressure and Temperature Sensor Replacement](#).

## 2.2.7.19 DTC P0117 P0118

## 1. DTC Descriptor:

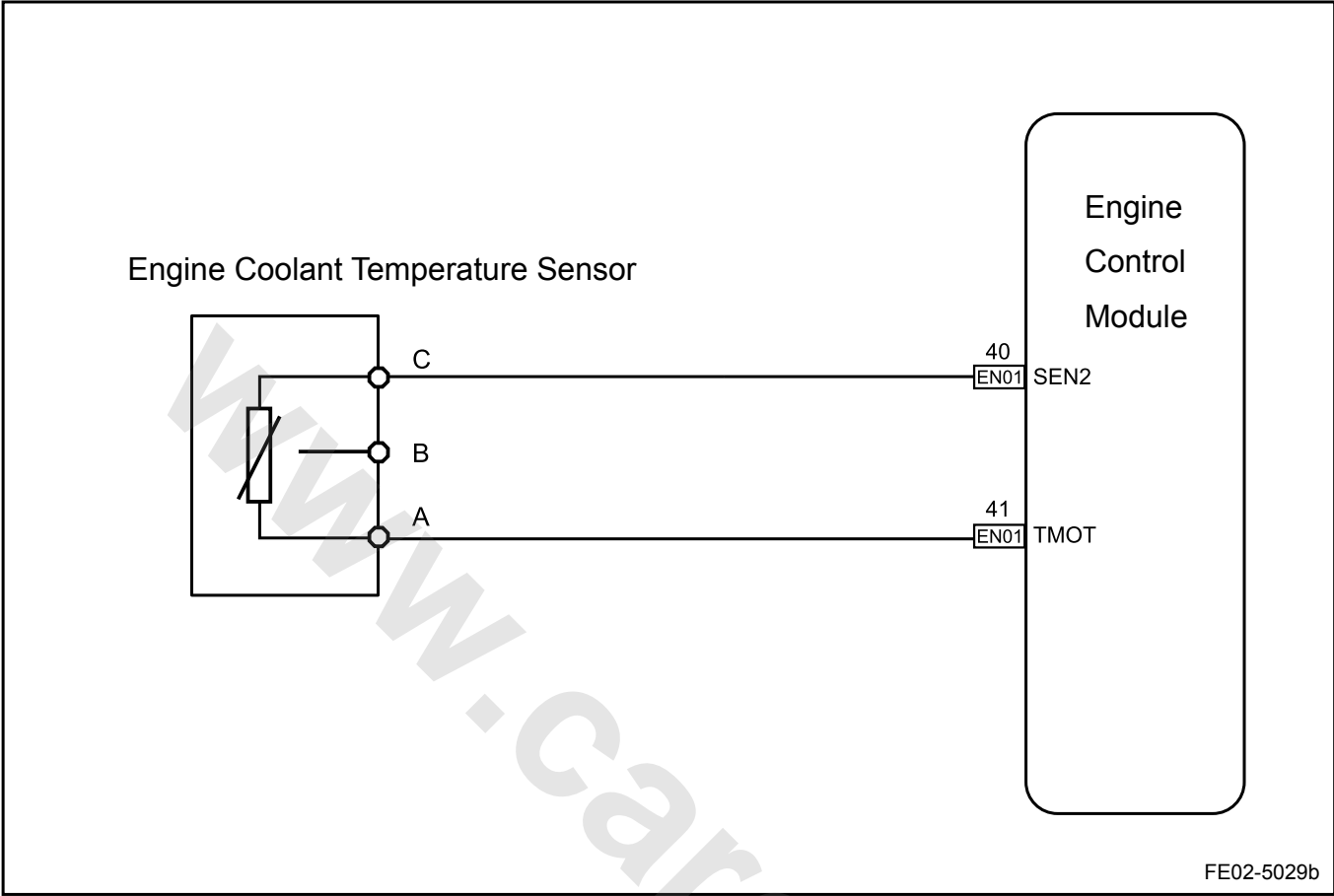
DTC	P0117	Engine Coolant Temperature Sensor Circuit Voltage Too Low
DTC	P0118	Engine Coolant Temperature Sensor Circuit Voltage Too High

ECT sensor is a variable resistor with negative temperature coefficient and is used to measure engine coolant temperature. ECM provides 5V voltage through ECM harness connector EN01 terminal No.41 ECT sensor harness connector EN23 terminal A. It also provides a low reference voltage through EN01 terminal No.40 to the ECT sensor connector EN23 terminal C. ECM will always record the length of time the ignition switch off. When starting if it reaches the set ignition switch off time, the engine control module will compare the engine coolant temperature and intake air temperature in order to determine whether the temperature difference is within the normal working range.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0117 P0118	1. More Than the Upper Limit  2. Lower Than the Lower Limit	1. Short to Ground. The engine coolant temperature is higher than 140°C (284 °F).  2. Short to power supply. The engine coolant temperature is lower than -37.5°C (-35.5 °F).	1. Sensor Circuit 2. Sensor 3. ECM

3. Schematic:



4. Diagnostic Steps:

Warning!

Refer to "Cooling System Servicing Warning" in "Warnings and Notices".

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Note

It is not recommended at any time to use flammable anti-freezer, such as alcohol. Combustible anti-freezer can cause serious fires.

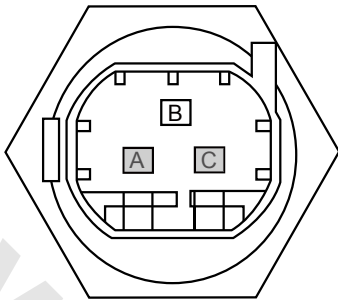
Step 1	Initial Inspection
--------	--------------------

- (a) Check the engine coolant temperature sensor whether there is evidence of corrosion, as well as the engine coolant leaking through the sensor.
- (b) Check the cooling system whether the engine coolant level is correct.

Next

Step 2	Measure engine coolant temperature sensor resistance.
--------	---

## Engine Coolant Temperature



FE02-5030b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the engine coolant temperature sensor wiring harness connector EN23.
- (c) Measure engine coolant temperature sensor resistance. Standard Resistance (Refer to the specific parameters [2.2.1.2 Temperature Sensor Temperature and Resistance Correlation](#)): 2400  $\Omega$  (68 °F) at 20°C
- (d) Connect the engine coolant temperature sensor wiring harness connector EN23.

Is resistance the specified value?

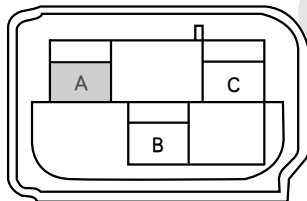
No

Replace the engine coolant temperature sensor. Go to step 9

Yes

Step 3 Measure engine coolant temperature sensor signal circuit.

## Engine Coolant Temperature Sensor Harness Connector EN23



FE02-5031b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the engine coolant temperature sensor wiring harness connector EN23.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between engine coolant temperature sensor EN23 terminal A and a reliable ground.

Standard Voltage: 4.7-5.5 V

- (e) Connect the engine coolant temperature sensor wiring harness connector EN23.

Is voltage normal?

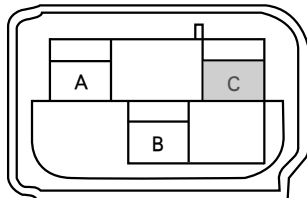
No

Go to step 5

Yes

Step 4 Measure engine coolant temperature sensor ground circuit.

## Engine Coolant Temperature Sensor Harness Connector EN23



FE02-5032b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the engine coolant temperature sensor wiring harness connector EN23.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure resistance between engine coolant temperature sensor wiring harness connector EN23 terminal No.C and a reliable ground.

Standard Resistance: Less than 3  $\Omega$ 

- (e) Connect the engine coolant temperature sensor wiring harness connector EN23.

Is resistance normal?

No

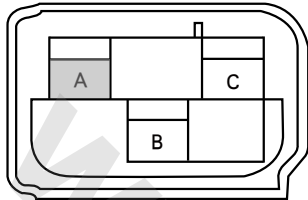
Go to step 6

Yes

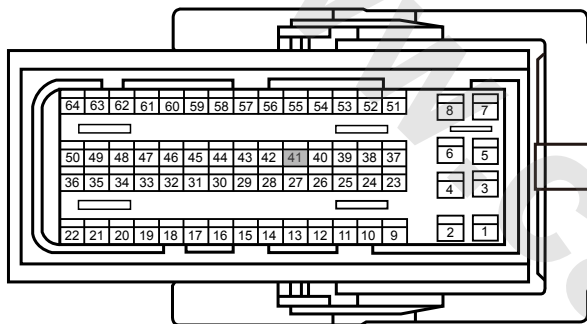
Go to step 7

Step 5 Check the engine coolant temperature sensor signal circuit.

Engine Coolant Temperature Sensor  
Harness Connector EN23



ECM Harness Connector EN01



FE02-5033b

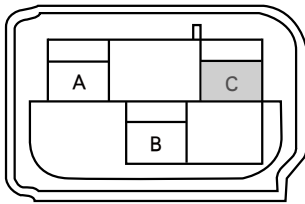
- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the engine coolant temperature sensor wiring harness connector EN23.
- (c) Disconnect ECM harness connector EN01.
- (d) Measure resistance between engine coolant temperature sensor wiring harness connector EN23 terminal A and ECM harness connector terminal No.41. Check whether the circuit is open.
- (e) Measure resistance between engine coolant temperature sensor wiring harness connector EN23 terminal A and a reliable ground. Check whether the circuit is short to ground.
- (f) Measure voltage between engine coolant temperature sensor wiring harness connector EN23 terminal A and a reliable ground. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN23 (A) and EN01 (41)	Less than 1 $\Omega$
Resistance Between EN23 (A) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN23 (A) and a Reliable Ground	0 V

Next

Go to step 7

Step 6 Check the engine coolant temperature sensor ground circuit.

Engine Coolant Temperature Sensor  
Harness Connector EN23

ECM Harness Connector EN01



FE02-5034b

- Turn the ignition switch to "OFF" position.
- Disconnect the engine coolant temperature sensor wiring harness connector EN23.
- Disconnect ECM harness connector EN01.
- Measure resistance between engine coolant temperature sensor wiring harness connector EN23 terminal C and ECM harness connector terminal No.40. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure voltage between engine coolant temperature sensor wiring harness connector EN23 terminal C and a reliable ground. Check whether there is a short circuit. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN23 (C) and EN01 (40)	Less than 1 Ω
Voltage Between EN23 (C) and a Reliable Ground	0 V

Execute next step as per normal.

Next

Step 7 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 10	Diagnostic completed.
---------	-----------------------

## 5. Repair Instructions:

Replace the engine coolant temperature sensor. Refer to [2.2.8.6 Engine Coolant Temperature Sensor Replacement](#).

## 2.2.7.20 DTC P0122 P0123

## 1. DTC Descriptor:

DTC	P0122	Throttle Position Sensor Circuit Voltage Lower Than Minimum
DTC	P0123	Throttle Position Sensor Circuit Voltage Higher Than Maximum

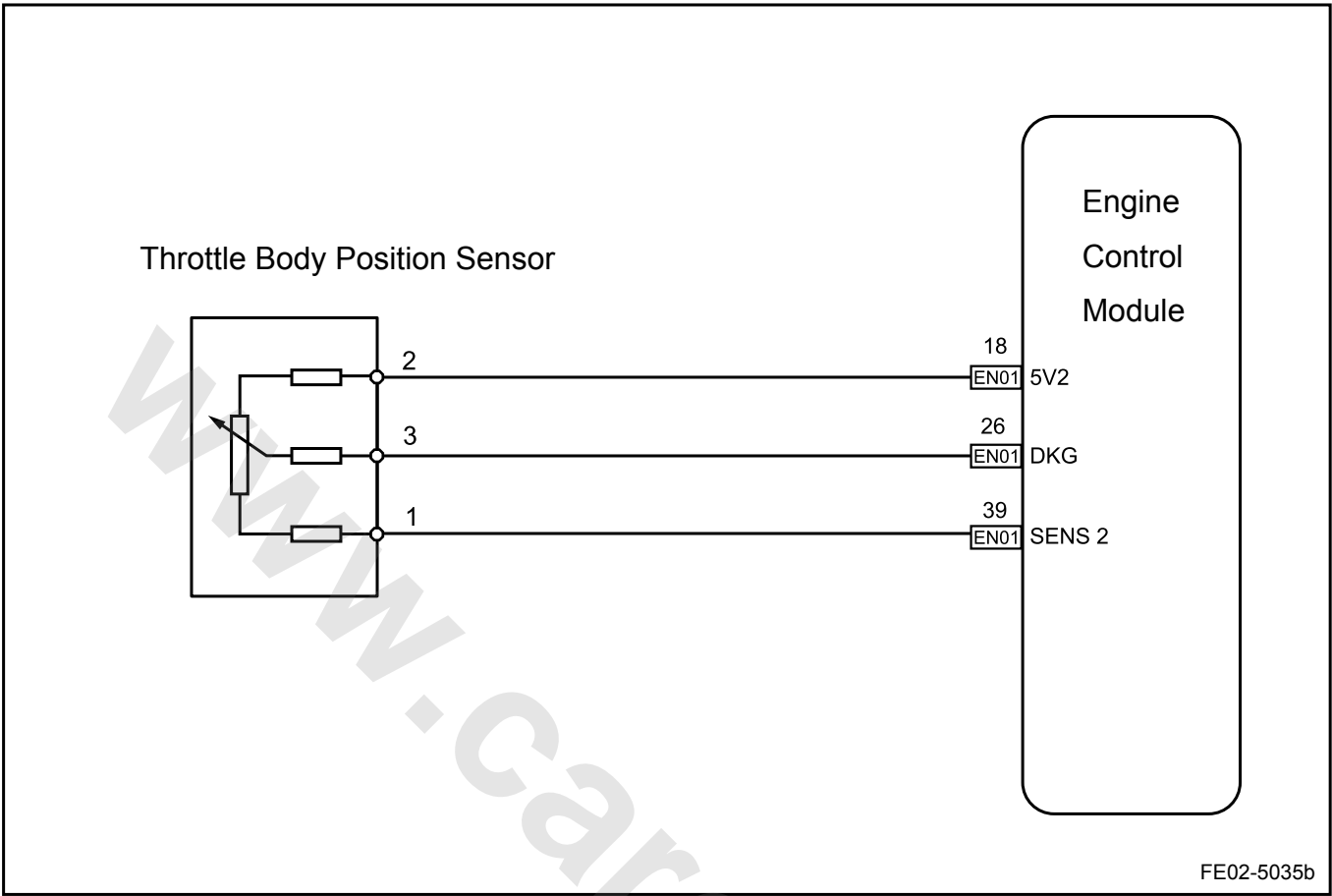
The actual throttle position will be compared with throttle position determined by the engine load. Engine Control Module (ECM) detects the engine load by intake manifold absolute pressure sensor (MAP) signal. After further comparison, ECM determines whether there is a sensor fault and set the corresponding DTC codes.

- ECM provides 5 V reference voltage through ECM harness connector EN01 terminal No.39 to TPS sensor harness connector EN27 terminal No.1.
- TPS provides sensor signal voltage through EN27 terminal No.3 to ECM harness connector EN01 terminal No.26.
- ECM provides low reference voltage through ECM harness connector EN01 terminals No.14 and No.18 to TPS sensor harness connector EN27 terminal No.2.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0122 P0123	1. Higher Than Throttle Position and Angle Signals Maximum Limit 2. Lower Than Throttle Position and Angle Signals Minimum Limit	1. Throttle Position angle signal is greater than 99%. 2. Throttle Position angle signal is less than 1.2%. 3. Engine speed is greater than 800 rpm.	1. Sensor Circuit 2. Sensor 3. ECM

3. Schematic:



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

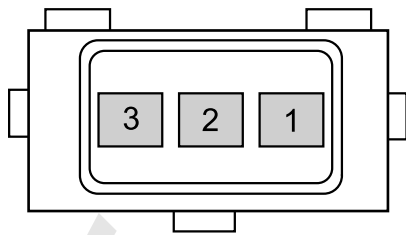
Step 1	Initial Inspection
--------	--------------------

- (a) Check whether there is a loose sensor wiring harness connector.
- (b) Check whether a damages sensor.

Next

Step 2	Measure throttle position sensor resistance.
--------	--

## Throttle Body Position Sensor



FE02-5036b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect throttle position sensor wiring harness connector EN27.
- (c) Measure throttle position sensor resistance.

Test Items	Standard Resistance Value
Terminal 1 and Terminal 2	3,000 $\Omega$
Terminal 2 and Terminal 3	Changes between 1,300 $\Omega$ and 2,900 $\Omega$

- (d) Connect throttle position sensor wiring harness connector EN27.

Is resistance the specified value?

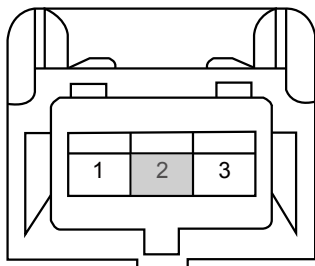
No

Replace throttle position sensor. Go to step 11

Yes

Step 3 Measure throttle position sensor 5 V reference voltage.

## Throttle Body Position Sensor Harness Connector EN27



FE02-5037b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect throttle position sensor wiring harness connector EN27.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between throttle position sensor EN27 terminal No.2 and a reliable ground.

Standard Voltage: 4.5-5.5 V

- (e) Connect throttle position sensor wiring harness connector EN27.

Is voltage the specified value?

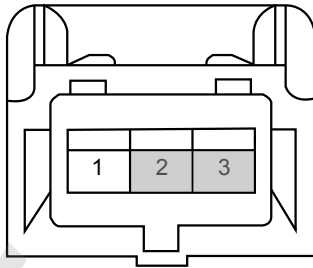
No

Go to step 6

Yes

Step 4 Measure throttle position sensor signal circuit.



Throttle Body Position Sensor  
Harness Connector EN27

FE02-5038b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect throttle position sensor wiring harness connector EN27.
- (c) Turn the ignition switch to "ON" position.
- (d) Connect a 5A fuse between EN27 terminal No.2 and No.3. Use scan tool to read "the actual throttle position sensor voltage" parameter.

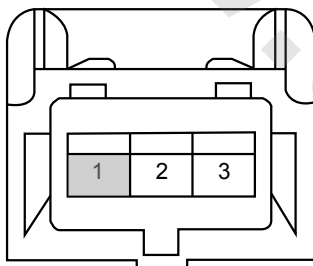
Standard Voltage: 4.5-5.5 V

- (e) Connect throttle position sensor wiring harness connector EN27.

Is data normal?

No

Go to step 7

**Step 5** Measure throttle position sensor ground circuit.Throttle Body Position Sensor  
Harness Connector EN27

FE02-5039b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect throttle position sensor wiring harness connector EN27.
- (c) Measure resistance between throttle position sensor wiring harness connector EN27 terminal No.1 and a reliable ground.

Standard Resistance: Less than 1  $\Omega$ 

- (d) Connect throttle position sensor wiring harness connector EN27.

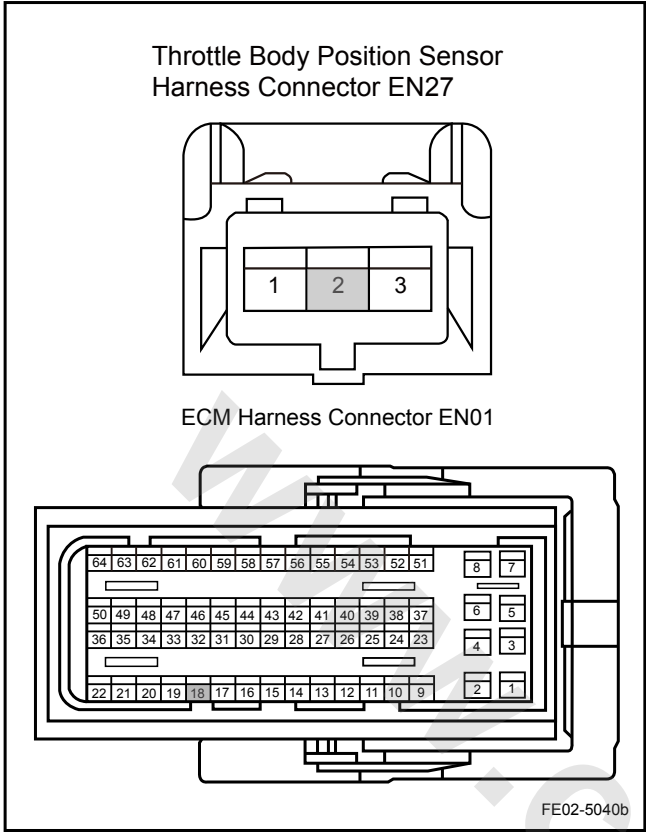
No

Go to step 8

Yes

Go to step 9

**Step 6** Check throttle position sensor 5 V reference voltage circuit.

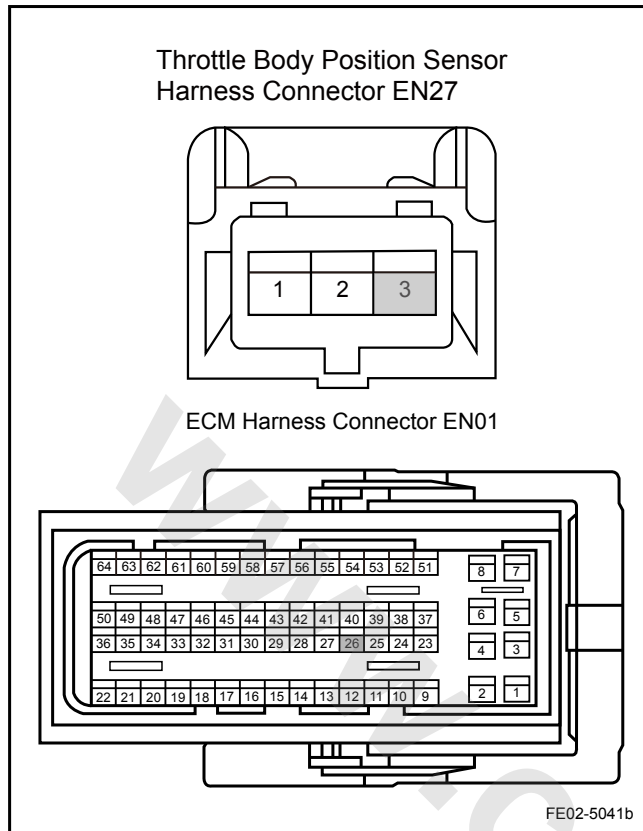


- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect throttle position sensor wiring harness connector EN27.
- (c) Disconnect ECM harness connector EN01.
- (d) Measure resistance between throttle position sensor wiring harness connector EN27 terminal No.2 and ECM harness connector terminal No.18. check whether there is open circuit. If there is no open circuit, repair the faulty part.
- (e) Measure resistance between throttle position sensor wiring harness connector EN27 terminal No.2 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair the faulty part.
- (f) Measure voltage between throttle position sensor wiring harness connector EN27 terminal No.2 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN27 (2) and EN01 (18)	Less than 1 $\Omega$
Resistance Between EN27 (2) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN27 (2) and a Reliable Ground	0 V

Normal	Go to step 9
--------	--------------

Step 7	Check throttle position sensor signal circuit.
--------	--



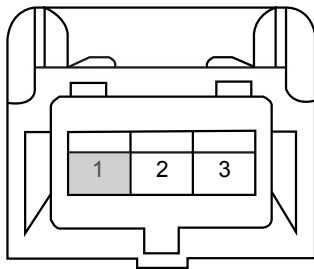
- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect throttle position sensor wiring harness connector EN27.
- (c) Disconnect ECM harness connector EN01.
- (d) Measure resistance between throttle position sensor wiring harness connector EN27 terminal No.3 and ECM harness connector terminal No.26. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- (e) Measure resistance between throttle position sensor wiring harness connector EN27 terminal No.3 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair the faulty part.
- (f) Measure voltage between throttle position sensor wiring harness connector EN27 terminal No.3 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN27 (3) and EN01 (26)	Less than 1 $\Omega$
Resistance Between EN27 (3) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN27 (3) and a Reliable Ground	0 V

Normal

Go to step 9

Step 8	Check throttle position sensor ground circuit.
--------	--

Throttle Body Position Sensor  
Harness Connector EN27

ECM Harness Connector EN01



FE02-5042b

- Turn the ignition switch to "OFF" position.
- Disconnect throttle position sensor wiring harness connector EN27.
- Disconnect ECM harness connector EN01.
- Measure resistance between throttle position sensor wiring harness connector EN27 terminal No.1 and ECM harness connector terminal No.39. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure voltage between throttle position sensor wiring harness connector EN27 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN27 (3) and EN01 (39)	Less than 1 Ω
Voltage Between EN27 (3) and a Reliable Ground	0 V

Execute next step as per normal.

Next

Step 9 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 10 Replace ECM.

Next

Step 11 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 12	Diagnostic completed.
---------	-----------------------

## 5. Repair Instructions:

Replace throttle position sensor. Refer to [2.2.8.3 Throttle Position Sensor Replacement](#).

## 2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196

## 1. DTC Descriptor:

DTC	P0130	Pre-Catalytic Oxygen Sensor Signal Unreasonable
DTC	P0131	Pre-Catalytic Oxygen Sensor Circuit Voltage Too Low
DTC	P0132	Pre-Catalytic Oxygen Sensor Circuit Voltage Too High
DTC	P0133	Pre-Catalytic Oxygen Sensor Aging
DTC	P0134	Pre-Catalytic Oxygen Sensor Malfunction
DTC	P2195	Pre-Catalytic Oxygen Sensor Aging (Too Lean)
DTC	P2196	Pre-Catalytic Oxygen Sensor Aging (Too Rich)

After the vehicle is started, the control module works in the open-loop mode and ignores pre-catalytic oxygen sensor signal voltage when calculating air-fuel ratio. The control module provides approximately 450mV reference voltage to the pre-catalytic oxygen sensor. When the engine starts running, the pre-catalytic oxygen sensor will be heated and begin to generate a 0-0.1 V voltage. This voltage fluctuates. Once the control module detects that the pre-catalytic oxygen sensor voltage exceeds a threshold voltage, it will immediately enter into the closed-loop mode. Control module determines the Air-Fuel ratio using the received pre-catalytic oxygen sensor voltage signal. If the pre-catalytic oxygen sensor voltage increases to over the reference voltage (tend to 1 V), it indicates that the air fuel mixture is too rich. If the pre-catalytic oxygen sensor voltage decreases to below the reference voltage (tend to 0 mV), it indicates that the air fuel mixture is too lean.

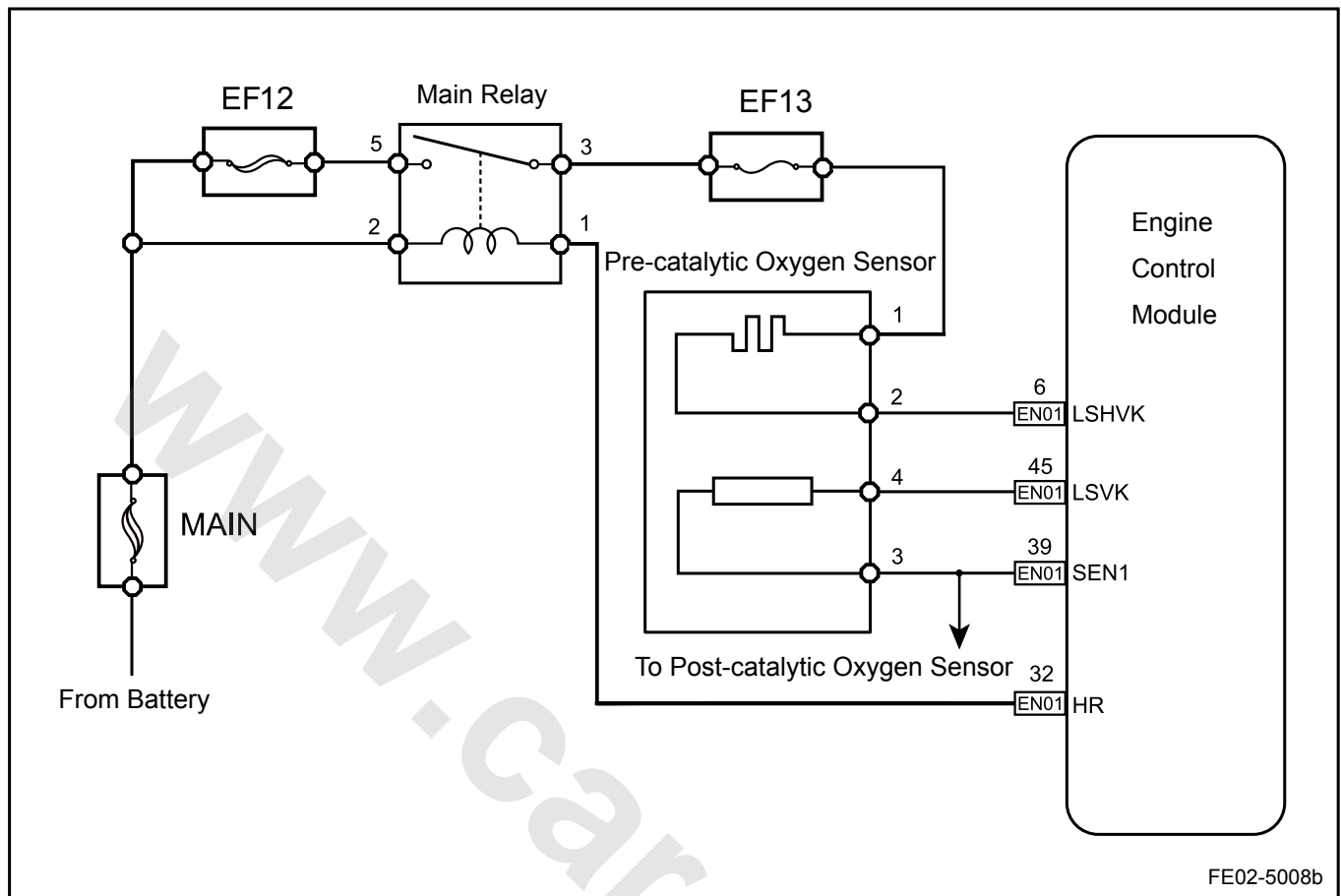
ECM provides a signal through ECM harness connector EN01 terminal No.45 to pre-catalytic oxygen sensor wiring harness connector EN02 terminal No.4; a low internal reference voltage through ECM harness connector EN01 terminal No.39 to Pre-Catalytic oxygen sensor wiring harness connector EN02 terminal No.3.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0130	<ol style="list-style-type: none"> <li>Pre-Catalytic Oxygen Sensor Voltage Too Low In an Extended Period of Time</li> <li>Short to Ground When Cold</li> <li>Pre-Catalytic Oxygen Sensor Voltage Leakage</li> </ol>	<ol style="list-style-type: none"> <li>Pre-Catalytic oxygen sensor output voltage is between 0.06-0.40 V.</li> <li>Pre-Catalytic oxygen sensor output voltage is less than 0.06 V.</li> <li>Pre-Catalytic oxygen sensor output voltage is greater than 0.611 V and less than 1.5 V and Post-Catalytic oxygen sensor output voltage is 0.099 V.</li> </ol>	<ol style="list-style-type: none"> <li>Sensor Circuit</li> <li>Sensor</li> <li>ECM</li> </ol>

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0131 P0132	1. Pre-Catalytic Sensor Voltage Too High 2. Pre-Catalytic Sensor Voltage Too Low	1. Pre-Catalytic oxygen sensor output voltage is greater than 1.5 V. 2. Pre-Catalytic oxygen sensor output voltage is less than 0.06 V. 3. Battery voltage is greater than 10.98 V. 4. Engine speed is greater than 25 rpm. 5. Exhaust temperature is less than the upper limit 800°C (1,472 °F). 6. Exhaust is hot enough.	
P0134	1. Signal circuit open. 2. Pre-Catalytic Oxygen Sensor High Resistance At High Temperature	1. Sensor voltage is between 0.401 V and 0.601 V. 2. Sensor resistance is greater than 20,000 Ω. 3. Oxygen sensor is hot enough, lasting for 100 s.	
P0133 P2195 P2196	1. Post-Catalytic oxygen sensor control integral value is over maximum limit. 2. Post-Catalytic oxygen sensor control integral value is lower than minimum limit. 3. Filtered Pre-Catalytic oxygen sensor signal is greater than specified value.	1. Post-Catalytic oxygen sensor control integral value is greater than 1.0 s. 2. Post-Catalytic oxygen sensor control integral value is less than -1.0 s. 3. Diagnostic function is switched on. 4. Filtered pre-catalytic oxygen sensor signal cycle is more than 3.3 s. 5. Effective cycle count value is greater than 20. 6. Target excess air coefficient is equal to 1. 7. No pressure sensor malfunction. 8. No coolant temperature sensor malfunction. 9. No intake air temperature sensor malfunction. 10. No diagnosis preventing conditions. 11. Speed is between 1,600 rpm and 2,600 rpm. 12. Load is between 25 and 50. 13. Exhaust temperature model value is greater than 500. 14. No pre-catalytic oxygen sensor malfunction. 15. No three-way catalytic converter malfunction.	1. Sensor Circuit 2. Sensor 3. Mixture Too Rich 4. Mixture Too Lean 5. ECM

## 3. Schematic:



## 4. Diagnostic Steps:

Step 1	Connect scan tool.
Next	
Step 2	Start engine and turn on the scan tool.
Next	
Step 3	Maintain engine speed at 2,500 rpm for more than 2 min to warm up the engine, until the engine coolant temperature reaches 80°C (176 °F).
Next	
Step 4	Select on scan tool: Engine/Read data stream/group 1 oxygen sensor voltage 1 (Pre-Catalytic oxygen sensors).
Next	
Step 5	Observe the oxygen sensor output voltage, the data should fluctuate within 0.1-0.8 V.

Yes

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

No

Step 6 Test the oxygen sensor signal.

- (a) If the voltage data is consistently below 0.45 V (mixture too lean), then carry out inspection steps as following:
- Spray proper amount of propane gas into the intake port.
  - Inspect whether the pre-catalytic oxygen sensor voltage data has a significant change, in which case the signal voltage will increase rapidly.
- (b) If the voltage data is consistently higher than 0.45 V (mixture too rich), then carry out inspection steps as following:
- Put gear into Neutral.
  - Apply hand brake.
  - Press the accelerator pedal so the engine speed suddenly increases to 4,000 rpm and then quickly release the accelerator pedal.
  - Repeat the previous steps more than 3 times.
  - Inspect whether the pre-catalytic oxygen sensor voltage data has a significant change, in which case the signal voltage will decrease rapidly.

During the above test, the pre-catalytic oxygen sensor signal voltage should change significantly.

Is voltage changed significantly?

Yes

Inspect the cause for engine air-fuel ratio too lean/too rich. Refer to [2.2.7.4 Fault Symptom Table](#).

No

Step 7 Check and confirm no other control system DTC codes.

- (a) Connect scan tool to a datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC codes other than P0030, P0031, P0032, P0053	No
P0030, P0031, P0032, P0053	Yes

No

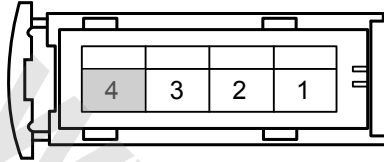
Refer to [2.2.7.11 DTC Code Index](#)



Yes

Step 8 Measure pre-catalytic oxygen sensor signal circuit.

### Pre-catalytic Oxygen Sensor Harness Connector EN02



FE02-5043b

- Turn the ignition switch to "OFF" position.
- Disconnect oxygen sensor wiring harness connector EN02.
- Turn the ignition switch to "ON" position.
- Measure voltage between Pre-Catalytic oxygen sensor wiring harness connector EN02 terminal No.4 and a reliable ground.

Standard Voltage: 0.35-0.5 V

- Connect the pre-catalytic oxygen sensor wiring harness connector EN02.

Is voltage the specified value?

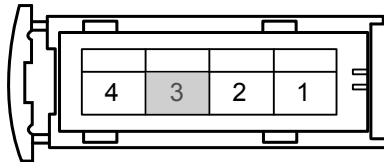
No

Go to step 11

Yes

Step 9 Measure the pre-catalytic oxygen sensor ground circuit.

### Pre-catalytic Oxygen Sensor Harness Connector EN02



FE02-5044b

- Turn the ignition switch to "OFF" position.
- Disconnect oxygen sensor wiring harness connector EN02.
- Turn the ignition switch to "ON" position.
- Measure resistance between pre-catalytic oxygen sensor connector EN02 terminal No.3 and a reliable ground.

Standard Resistance: Less than 1  $\Omega$

- Connect pre-catalytic oxygen sensor wiring harness connector EN02.

Is resistance the specified value?

No

Go to step 12

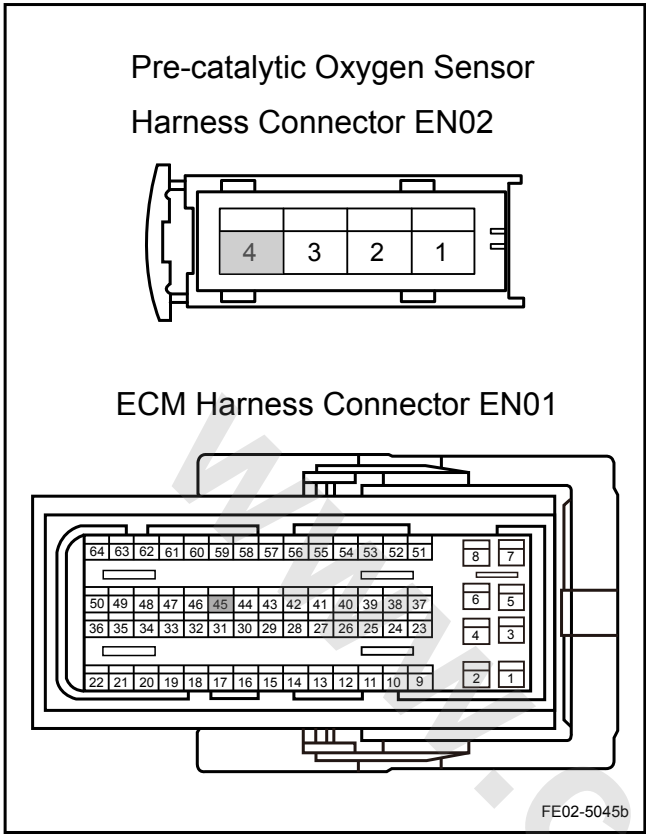
Yes

Step 10 Replace the pre-catalytic oxygen sensor. Refer to [2.4.7.2 Pre-Catalytic Oxygen Sensor Replacement](#).

Next

Go to step 15

Step 11 Check the pre-catalytic oxygen sensor signal circuit.



- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect oxygen sensor wiring harness connector EN02.
- (c) Disconnect ECM harness connector EN01.
- (d) Measure resistance between pre-catalytic oxygen sensor wiring harness connector EN02 terminal No.4 and ECM harness connector terminal No.45. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- (e) Measure resistance between pre-catalytic oxygen sensor wiring harness connector EN02 terminal No.4 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair the faulty part.
- (f) Measure voltage between Pre-Catalytic oxygen sensor wiring harness connector EN02 terminal No.4 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

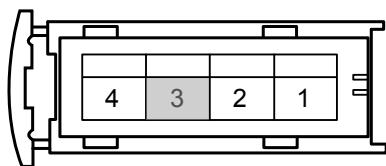
Test Items	Standard Value
Resistance Between EN02 (4) and EN01 (45)	Less than 1 $\Omega$
Resistance Between EN02 (4) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN02 (4) and a Reliable Ground	0 V

Normal

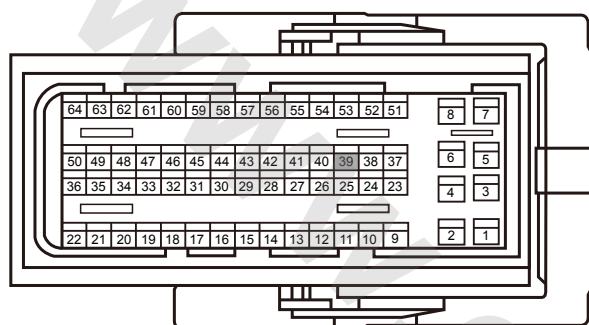
Go to step 15

Step 12	Check the pre-catalytic oxygen sensor ground circuit.
---------	---

Pre-catalytic Oxygen Sensor  
Harness Connector EN02



ECM Harness Connector EN01



FE02-5046 b

- Turn the ignition switch to "OFF" position.
- Disconnect oxygen sensor wiring harness connector EN02.
- Disconnect ECM harness connector EN01.
- Measure resistance between the oxygen sensor wiring harness connector EN02 terminal No.3 and ECM harness connector terminal No.39. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure resistance between pre-catalytic oxygen sensor wiring harness connector EN02 terminal No.3 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair the faulty part.
- Measure voltage between pre-catalytic oxygen sensor wiring harness connector EN02 terminal No.3 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN02 (3) and EN01 (39)	Less than 1 $\Omega$
Resistance Between EN02 (3) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN02 (3) and a Reliable Ground	0 V

Execute next step as per normal.

Next

Step 13 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 14 Replace ECM.

Next

Step 15 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 16 Diagnostic completed.

## 5. Repair Instructions:

Replace the pre-catalytic oxygen sensor. Refer to [2.4.7.2 Pre-Catalytic Oxygen Sensor Replacement](#).

## 2.2.7.22 DTC P0136 P0137 P0138 P0140 P2270 P2271

## 1. DTC Descriptor:

DTC	P0136	Post-Catalytic Oxygen Sensor Unreasonable
DTC	P0137	Post-Catalytic Oxygen Sensor Circuit Voltage Too Low
DTC	P0138	Post-Catalytic Oxygen Sensor Circuit Voltage Too High
DTC	P0140	Post-Catalytic Oxygen Sensor Circuit Malfunction
DTC	P2270	Post-Catalytic Oxygen Sensor Aging (Too Lean)
DTC	P2271	Post-Catalytic Oxygen Sensor Aging (Too Rich)

After the vehicle is started, the control module works in the open-loop mode and ignores heated oxygen sensor signal voltage when calculating air-fuel ratio. The control module provides approximately 450mV reference voltage to the heated oxygen sensor. When the engine starts running, the heated oxygen sensor will be heated and begin to generate a 0-0.1V voltage. This voltage fluctuates. Once the control module detects that the heated oxygen sensor voltage exceeds a threshold voltage, it will immediately enter into the closed-loop mode. Control module determines the air-fuel ratio using the received heated oxygen sensor voltage signal. If the heated oxygen sensor voltage increases to over the reference voltage (tend to 1V), it indicates that the air fuel mixture is too rich. If the heated oxygen sensor voltage decreases to below the reference voltage (tend to 0mV), it indicates that the air fuel mixture is too lean.

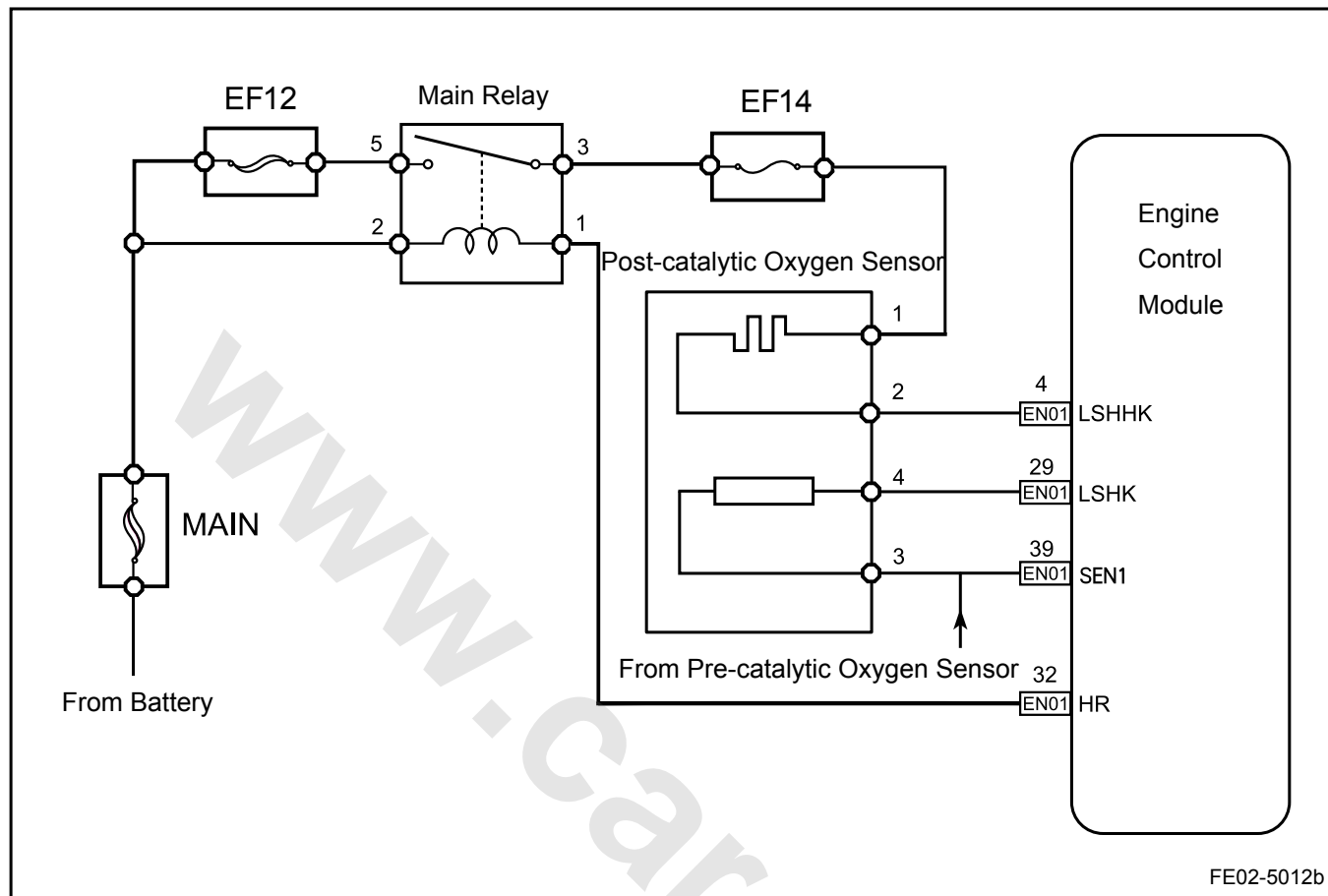
- ECM provides a signal through ECM harness connector EN01 terminal No.29 to post-catalytic oxygen sensor wiring harness connector EN03 terminal No.4.
- ECM provides a low reference voltage through ECM harness connector EN01 terminal No.39 to pre-catalytic oxygen sensor wiring harness connector EN03 terminal No.3.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0136 P0137	Short to Ground When Cold	<ol style="list-style-type: none"> <li>Post-Catalytic oxygen sensor voltage is less than 0.06 V.</li> <li>Post-Catalytic oxygen sensor reaches the normal working temperature.</li> </ol>	<ol style="list-style-type: none"> <li>Sensor Circuit</li> <li>Sensor</li> <li>Mixture Too Rich</li> <li>Mixture Too Lean</li> </ol>

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0138	Post-Catalytic Oxygen Sensor Voltage Too High	<ol style="list-style-type: none"> <li>1. Post-Catalytic oxygen voltage signal is greater than 1.5 V.</li> <li>2. Battery voltage is greater than 10.98 V.</li> <li>3. Engine speed is greater than 25 rpm.</li> <li>4. Target excess air coefficient is equal to 1.</li> <li>5. Three-way catalytic converter temperature is higher than 320°C (608 °F).</li> <li>6. Battery voltage is greater than 10.98 V.</li> <li>7. Post-Catalytic oxygen sensor reaches the normal working temperature.</li> </ol>	<ol style="list-style-type: none"> <li>5. Three-way Catalytic Converter</li> <li>6. ECM</li> </ol>
P0140	<ol style="list-style-type: none"> <li>1. Oxygen Sensor Signal Circuit Open</li> <li>2. Oxygen Sensor With High Resistance at High Temperature</li> </ol>	<ol style="list-style-type: none"> <li>1. Post-Catalytic oxygen sensor voltage is between 0.42 V and 0.5 V.</li> <li>2. Post-Catalytic oxygen sensor resistance is greater than 40,000 Ω.</li> <li>3. Post-Catalytic oxygen sensor reaches the normal working temperature.</li> </ol>	<ol style="list-style-type: none"> <li>1. Sensor Circuit</li> <li>2. Sensor</li> <li>3. Mixture Too Rich</li> <li>4. Mixture Too Lean</li> </ol>
P2270 P2271	<ol style="list-style-type: none"> <li>1. Post-Catalytic oxygen sensor voltage is continuously low.</li> <li>2. Post-Catalytic oxygen sensor voltage is continuously high.</li> </ol>	<ol style="list-style-type: none"> <li>1. Post-Catalytic oxygen sensor voltage is less than 0.6 V.</li> <li>2. Post-Catalytic oxygen sensor voltage is greater than 0.6 V.</li> <li>3. Post-Catalytic oxygen sensor reaches the normal working temperature.</li> </ol>	<ol style="list-style-type: none"> <li>5. Three-way Catalytic Converter</li> <li>6. ECM</li> </ol>

## 3. Schematic



## 4. Diagnostic Steps:

Step 1	Connect scan tool.
Next	
Step 2	Start engine and turn on the scan tool.
Next	
Step 3	Maintain the engine speed at 2,500 rpm for more than 2 min to warm up the engine, until the engine coolant temperature reaches 80°C (176 °F).
Next	
Step 4	Select on scan tool: Engine/Read data flow/Group 1 Oxygen sensor voltage 2 (Post-Catalytic oxygen sensors).
Next	
Step 5	Observe oxygen sensor output voltage, the data should be within 0.6-0.7V unchanged.

Yes

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

No

Step 6	Test the oxygen sensor signal.
--------	--------------------------------

- (a) If the voltage data is consistently below 0.45 V (mixture too lean), carry out steps as following:
- Spray proper amount of propane gas into the intake.
  - Check whether the Post-Catalytic oxygen sensor voltage data has a significant change, as it will cause signal voltage rise rapidly.
- (b) If the voltage data is consistently above 0.45 V (mixture too rich), carry out steps as following:
- Put gear into Neutral.
  - Apply hand brake.
  - Press the accelerator pedal so that the engine speed suddenly increases to 4,000 rpm and then quickly release the accelerator pedal.
  - Repeat the previous step more than 3 times.
  - Check whether the Post-Catalytic oxygen sensor voltage data has a significant change, as it will cause signal voltage decrease rapidly.

During the test, the oxygen sensor signal voltage should have significant changes.

Does voltage have a significant change?

Yes

Check the cause for engine Air-Fuel ratio too lean/too rich. Refer to <a href="#">2.2.7.4 Fault Symptom Table</a> .
---

No

Step 7	Check whether there are other control system DTC codes.
--------	---

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC code other than P0136, P0137, P0138, P0140, P2270, P2271DTC, P0136, P0137, P0138, P0140, P2270, P2271	No

DTC Codes Shown	To Step
P0136, P0137, P0138, P0140, P2270, P2271DTC, P0136, P0137, P0138, P0140, P2270, P2271	Yes

No

Refer to [2.2.7.11 DTC Code Index](#)

Yes

Step 8 Inspect the exhaust system seal.

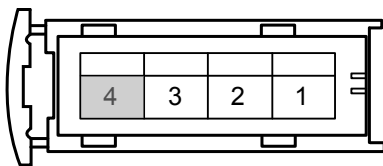
- (a) Check the three-way catalytic converter appearance (signs of excessive heat, gasket missing, etc.).
- (b) Check whether the exhaust pipe is intact and whether gasket is intact.

No

Replace the damaged parts. Go to step 16

Step 9 Measure oxygen sensor signal circuit.

### Post-Catalytic Oxygen Sensor Harness Connector EN03



FE02-5047b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the oxygen sensor wiring harness connector EN03.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between oxygen sensor wiring harness connector EN03 terminal No.4 and a reliable ground.  
Standard Voltage: 0.35-0.5 V
- (e) Connect the oxygen sensor wiring harness connector EN03.  
Is voltage the specified value?

No

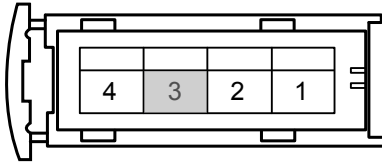
Go to step 12

Yes

Step 10 Measure the post-catalytic oxygen sensor ground circuit.



### Post-Catalytic Oxygen Sensor Harness Connector EN03



FE02-5048b

- Turn the ignition switch to "OFF" position.
- Disconnect the oxygen sensor wiring harness connector EN03.
- Turn the ignition switch to "ON" position.
- Measure resistance between Post-Catalytic oxygen sensor connector EN03 terminal No.3 and a reliable ground.

Standard Resistance: Less than 1  $\Omega$ 

- Connect the post-catalytic oxygen sensor wiring harness connector EN03.

Is resistance the specified value?

No

Go to step 13

Yes

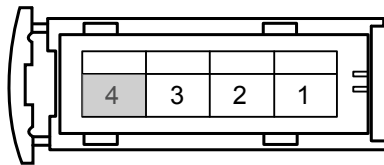
Step 11 Replace the post-catalytic oxygen sensor.

Next

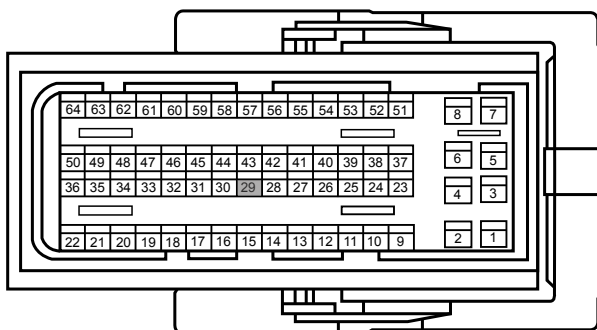
Go to step 16

Step 12 Check the post-catalytic oxygen sensor signal circuit.

### Post-Catalytic Oxygen Sensor Harness Connector EN03



### ECM Harness Connector EN01



FE02-5049b

- Turn the ignition switch to "OFF" position.
- Disconnect the post-catalytic oxygen sensor wiring harness connector EN03.
- Disconnect ECM harness connector EN01.
- Measure resistance between post-catalytic oxygen sensor wiring harness connector EN03 terminal No.4 and ECM harness connector terminal No.29. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure resistance between post-catalytic oxygen sensor wiring harness connector EN03 terminal No.4 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair the faulty part.
- Measure voltage between post-catalytic oxygen sensor wiring harness connector EN03 terminal No.4 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

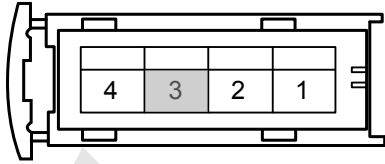
Test Items	Standard Value
Resistance Between EN03 (4) and EN01 (29)	Less than 1 $\Omega$
Resistance Between EN03 (4) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN03 (4) and a Reliable Ground	0 V

Normal

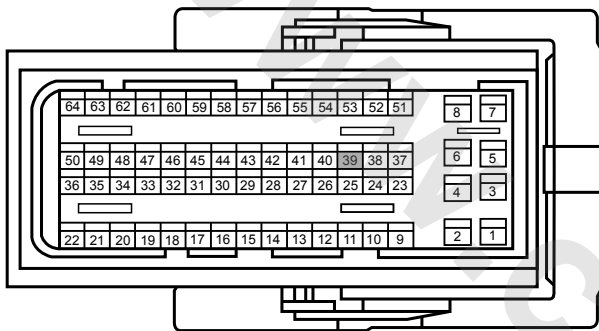
Go to step 16

Step 13 Check oxygen sensor ground circuit.

Post-Catalytic Oxygen Sensor  
Harness Connector EN03



ECM Harness Connector EN01



FE02-5050b

- Turn the ignition switch to "OFF" position.
- Disconnect the oxygen sensor wiring harness connector EN03.
- Disconnect ECM harness connector EN01.
- Measure resistance between post-catalytic oxygen sensor wiring harness connector EN03 terminal No.3 and ECM harness connector terminal No.39. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure resistance between post-catalytic oxygen sensor wiring harness connector EN03 terminal No.3 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair the faulty part.
- Measure voltage between post-catalytic oxygen sensor wiring harness connector EN03 terminal No.3 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN03 (3) and EN01 (39)	Less than 1 $\Omega$
Resistance Between EN03 (3) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN03 (3) and a Reliable Ground	0 V

Execute next step as per normal.

Next

Step 14 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 15 Replace ECM.

Next

Step 16 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.

- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 17 Diagnostic completed.

#### 5. Repair Instructions:

Replace post-catalytic oxygen sensor. Refer to [2.4.7.1 Post-Catalytic Oxygen Sensor Replacement](#).

### 2.2.7.23 DTC P0170 P0171 P0172 P2177 P2178 P2187 P2188

#### 1. DTC Descriptor:

DTC	P0170	Close-Loop Control Down Stream Air-Fuel Ratio Self Learn Unreasonable
DTC	P0171	Close-Loop Control Down Stream Air-Fuel Ratio Self Learn Too Lean
DTC	P0172	Close-Loop Control Down Stream Air-Fuel Ratio Self Learn Too Rich
DTC	P2177	Close-Loop Control Down Stream Air-Fuel Ratio Self Learn Value Higher Than Maximum
DTC	P2178	Close-Loop Control Down Stream Air-Fuel Ratio Self Learn Value Lower Than Minimum
DTC	P2187	Close-Loop Control Down Stream Air-Fuel Ratio Self Learn Value Higher Than Maximum (Low-Load Zone)
DTC	P2188	Close-Loop Control Down Stream Air-Fuel Ratio Self Learn Value Lower Than Minimum (Low-Load Zone)

Engine Control Module (ECM) controls the close-loop Air-Fuel ratio Measure system that achieves optimal combination of performance, fuel economy and emissions control. In the close-loop mode, the engine control module monitors heated oxygen sensor (HO<sub>2</sub>S) signal voltage and adjusts fuel supply according to the signal. Changes in fuel supply will change the value of long-term and short-term fuel supply adjustment. Short-term fuel supply adjustment will respond to heated oxygen sensor signal voltage and rapidly change. These changes will fine tune the fuel supply. Long-term fuel supply adjustment will respond to the trend in short-term fuel supply adjustment. Long-term fuel adjustment adjusts the fuel supply in order to return to the center of the short-term fuel adjustment value and controls the short-term fuel adjustment. The ideal fuel adjustment value is around 0%. A positive value indicates that engine control module is increasing fuel supply to compensate the lean Air-Fuel mixture. A negative value indicates that engine control module is decreasing fuel supply to compensate the rich Air-Fuel mixture.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0170 P0171 P0172 P2177 P2178 P2187 P2188	1. Fuel Adjustment Value Higher Than Maximum Limit 2. Fuel Adjustment Value Lower Than Minimum Limit 3. Fuel Adjustment Value Higher Than Maximum Limit (Low-Load Zone) 4. Fuel Adjustment Value Lower Than Minimum Limit (Low-Load Zone)	1. Excessive air coefficient is higher than the standard value 1.23. 2. Excessive air coefficient is higher than the standard value 0.77. 3. With engine speed at 1,640-3,200 rpm, throttle opens 20% -60%. 4. With engine speed at 1,640-3,200 rpm, throttle opens 20% -60%.	1. Fuel Injectors 2. Canister 3. MAP 4. TPS 5. Pre-Catalytic Oxygen Sensor

## 3. Schematic:

Refer to [2.2.6.1 Schematic](#).

## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Check there are no other control system DTC codes.
--------	--

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Press the scan tool power button.
- Select the following menu items: Engine/Read DTC codes.
- Read DTC codes.

Are there DTC codes other than P0170, P0171, P0172, P2177, P2178, P2187, P2188?

Yes

Refer to [2.2.7.11 DTC Code Index](#)

No

Step 2	Read the intake manifold absolute pressure sensor data.
--------	---

- Turn the ignition switch to "OFF" position and connect scan tool.
- Start the vehicle.
- Read the intake manifold absolute pressure sensor data.
- Read the scan tool for atmospheric pressure value, and compare it with table [2.2.1.3 Altitude and Atmospheric Pressure Correlation](#).

Is scan tool atmospheric pressure reading normal?

No

Refer to [2.2.7.17 DTC P0105 P0106 P0107 P0108](#)

Yes

Step 3	Read the throttle position sensor data.
--------	---

- (a) Start the vehicle.
  - (b) Warm up the engine with normal idle speed and throttle opening is less than 10%.
  - (c) Use scan tool to read throttle position sensor data.
- Is throttle position sensor data normal?

No

Refer to [2.2.7.20 DTC P0122 P0123](#)

Yes

Step 4	Read the pre-catalytic oxygen sensor data.
--------	--

- (a) Start the vehicle.
  - (b) Warm up the engine with normal idle speed.
  - (c) Read the pre-catalytic oxygen sensor data.
- Pre-Catalytic oxygen sensor standard value: 0.2-0.8 V
- Is pre-catalytic oxygen sensor data is normal?

No

Refer to [2.2.7.21 DTC P0130 P0131 P0132 P0133 P0134 P2195 P2196](#)

Yes

Step 5	Observe the long-term fuel adjustment parameter.
--------	--

- (a) Start the vehicle.
  - (b) Warm up the engine.
  - (c) Observe the long-term fuel adjustment parameter.
- Is the long-term fuel adjustment parameter normal?

Yes

System normal.

No

Step 6	Check engine and its components.
--------	----------------------------------

- (a) Turn the ignition switch to "OFF" position.
- (b) Check the vacuum hose crack, kink or connections.
- (c) Check the intake manifold, throttle body and fuel injector vacuum leakage.
- (d) Check the crankshaft ventilation system leakage.
- (e) Check fuel contamination.
- (f) Check the fuel system working at air-fuel ratio too lean.
- (g) Check injector nozzle spray fuel too lean.
- (h) Check the fuel system working at air-fuel ratio too rich.
- (i) Check injector spray fuel too rich.
- (j) Check intake manifold collapse or obstruction.

- (k) Check whether there is excessive fuel in the crankcase.
  - (l) Check evaporative emission control systems working condition.
  - (m) Check other fault lights in I/P working condition.
- Is engine System normal?

Yes

System normal

No

Step 7 Repair engine and its components.

Next

Step 8 System normal.

### 5. Repair Instructions:

Replace fuel injectors. Refer to [2.2.8.2 Fuel Injector Replacement](#).

Replace Canister solenoid valve. Refer to [2.4.7.3 Canister Solenoid Valve Replacement](#).

### 2.2.7.24 DTC P0201 P0261 P0262

#### 1. DTC Descriptor:

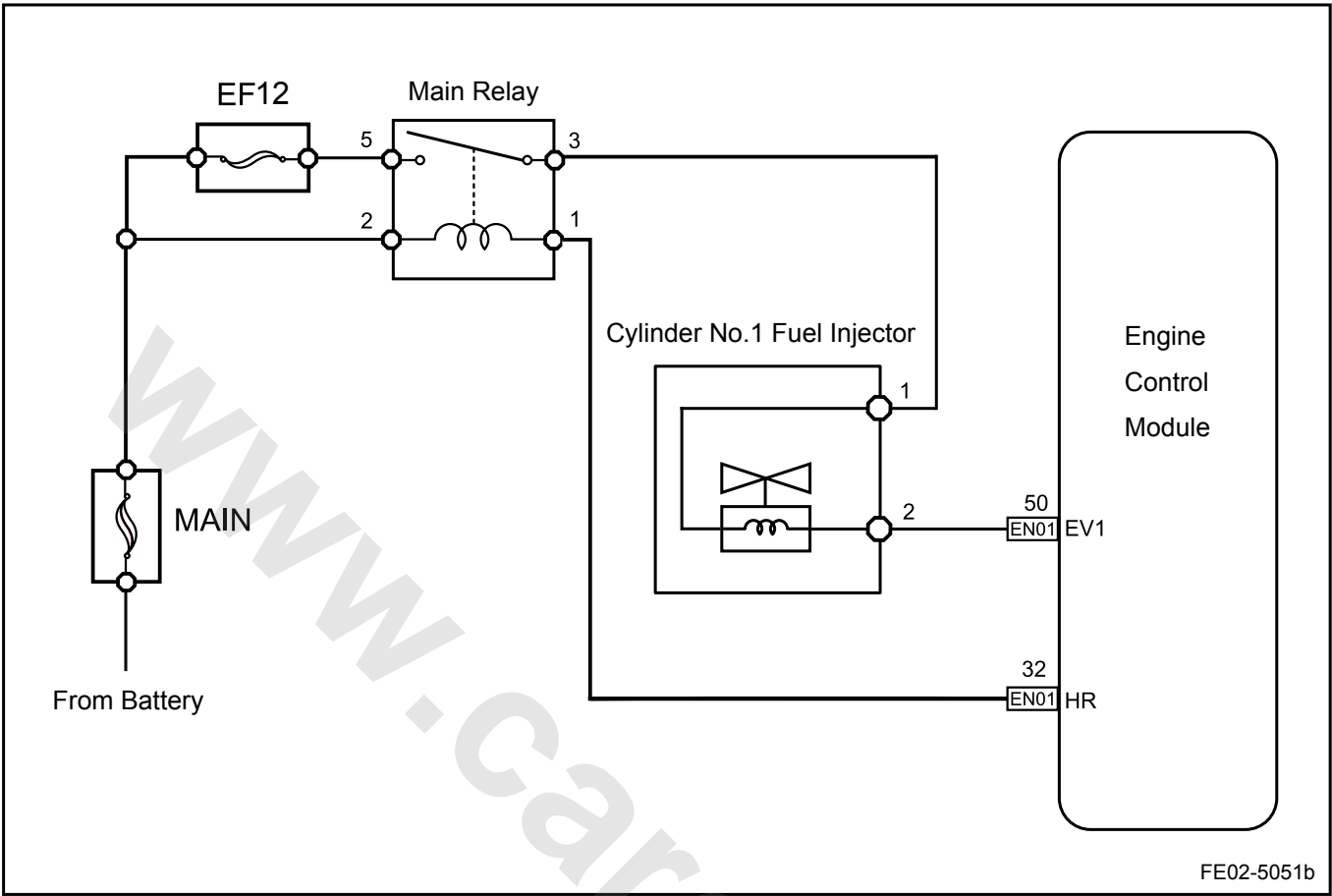
DTC	P0201	Cylinder No.1 Fuel Injection Control Circuit Open
DTC	P0261	Cylinder No.1 Fuel Injector Control Circuit Short to Ground
DTC	P0262	Cylinder No.1 Fuel Injector Control Circuit Short to Power Supply

Fuel injector operating voltage is provided by The Main Relay which is controlled by ECM. Battery voltage passes through the main relay terminal No.3 to all fuel injector wiring harness connectors terminal No.1. ECM controls fuel injector ground circuit by ECM harness connector EN01 terminal No.50. ECM monitors all fuel injector driver circuit status, if ECM detects driving circuit corresponding voltage is incorrect, ECM will set up a fuel injector control circuit fault DTC code.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0201 P0261 P0262	Hardware Circuit Checks	1. Circuit Open. 2. Circuit Short to Ground. 3. Circuit Short to Power Supply.	1. Sensor Circuit 2. Sensor 3. ECM

3. Schematic:



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

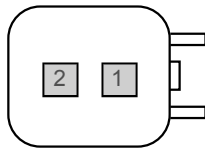
Step 1	Initial Inspection
--------	--------------------

- (a) Check the fuel injector wiring harness connector for damage, poor connection, aging or signs of loosening.

Next

Step 2	Measure the resistance of fuel injector assembly.
--------	---

Cylinder No.1 Fuel Injector



FE02-5052b

- (a) Disconnect the fuel injector wiring harness connector EN11.
- (b) Measure resistance between the two fuel injector terminals.  
Standard Resistance: 20°C (68 °F) 11.5-12.5 Ω
- (c) Connect the fuel injector wiring harness connector EN11.

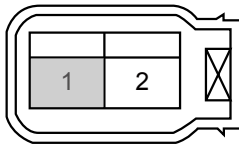
No

Replace fuel injector assembly. Refer to  
[2.2.8.2 Fuel Injector Replacement](#)

Yes

### Step 3 Measure fuel injectors working power supply.

Cylinder No.1 Fuel Injector Harness Connector EN11



FE02-5053b

- (a) Turn the ignition switch to "OFF" position.
  - (b) Disconnect cylinder No.1 fuel injector wiring harness connector EN11.
  - (c) Turn the ignition switch to "ON" position.
  - (d) Measure voltage between cylinder No.1 fuel injector wiring harness connector EN11 No.1 terminal and a reliable ground.  
Standard Voltage :11-14 V
  - (e) Connect cylinder No.1 fuel injector wiring harness connector EN11.
- Is voltage normal?

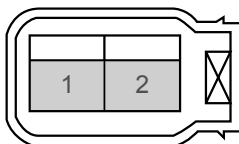
No

Go to step 5

Yes

### Step 4 Check the fuel injector control circuit.

Cylinder No.1 Fuel Injector Harness Connector EN11



FE02-5054b

- (a) Turn the ignition switch to "OFF" position.
  - (b) Disconnect cylinder No.1 fuel injector wiring harness connector EN11.
  - (c) Connect test lamp made from light-emitting diodes to the fuel injector wiring harness connector EN11 terminal No.1 and No.2.
  - (d) Start the engine.
  - (e) Check whether the test lamp is flashing as per normal.
- Is test lamp flashing as per normal?

No

Go to step 6

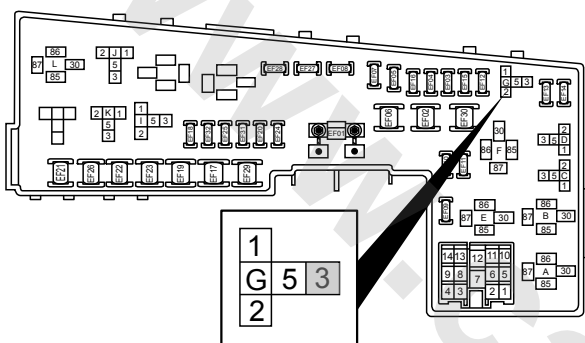
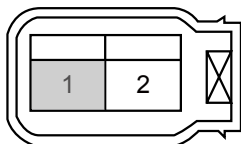
Yes

Go to step 7



Step 5 Check and repair cylinder No.1 fuel injector power supply circuit.

Cylinder No.1 Fuel Injector Harness  
Connector EN11



FE02-5055b

- Turn the ignition switch to "OFF" position.
- Disconnect the fuel injector wiring harness connector EN11.
- Remove the engine main relay.
- Measure resistance between cylinder No.1 fuel injector wiring harness connector EN11 terminal No.1 and engine main relay terminal No.3.
- Measure resistance between cylinder No.1 fuel injector wiring harness connector EN11 terminal No.1 and a reliable ground.

Test Items	Standard Value
EN11 (1) and Main Relay Terminal No.3	Less than 1 $\Omega$
EN11 (1) and a Reliable Ground	10 k $\Omega$ or higher

- Install the engine main relay.
- Connect cylinder No.1 fuel injector wiring harness connector EN11.

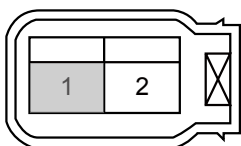
Exclude the fuel injector power supply circuit fault.

Next

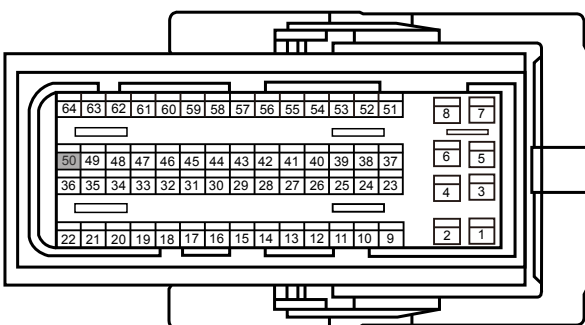
Go to step 9

Step 6 Check cylinder No.1 fuel injector control circuit.

Cylinder No.1 Fuel Injector Harness  
Connector EN11



ECM Harness Connector EN01



FE02-5056b

- Turn the ignition switch to "OFF" position.
- Disconnect cylinder No.1 fuel injector wiring harness connector EN11.
- Disconnect ECM harness connector EN01.
- Measure resistance between cylinder No.1 fuel injector wiring harness connector EN11 terminal No.1 and ECM harness connector terminal No.50. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure resistance between cylinder No.1 fuel injector wiring harness connector EN11 terminal No.1 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair the faulty part.
- Measure voltage between cylinder No.1 fuel injector wiring harness connector EN11 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN11 (1) and EN01 (50)	Less than 1 $\Omega$
Resistance Between EN11 (1) and a Reliable Ground	10 k $\Omega$ or higher

Voltage Between EN11 (1) and a Reliable Ground	0 V
--	-----

Execute next step as per normal.

Next

Step 7	Check ECM power supply circuit.
--------	---------------------------------

- (a) Check whether ECM power supply circuit is normal.  
 (b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8	Replace ECM.
--------	--------------

Next

Step 9	Use scan tool to confirm whether the DTC code is stored again.
--------	--

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Road test the vehicle for at least 10 min.  
 (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 10	Diagnostic completed.
---------	-----------------------

**5. Repair Instructions:**Replace the fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).**2.2.7.25 DTC P0202 P0264 P0265****1. DTC Descriptor:**

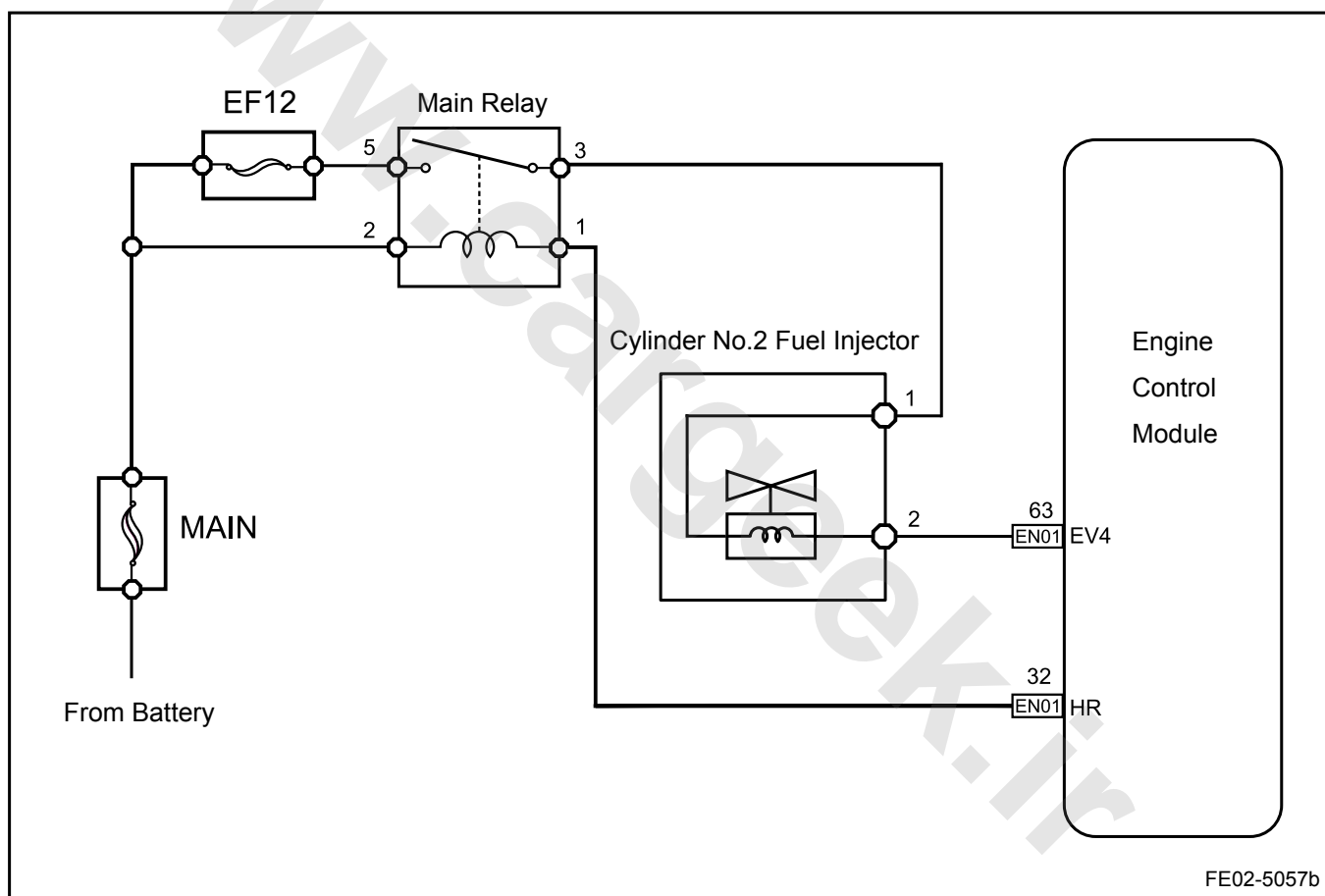
DTC	P0202	Cylinder No.2 Fuel Injector Control Circuit Open
DTC	P0264	Cylinder No.2 Fuel Injector Control Circuit Short to Ground
DTC	P0265	Cylinder No.2 Fuel Injector Control Circuit Short to Power Supply

Fuel injector operating voltage is provided by The Main Relay which is controlled by ECM. Battery voltage passes through the main relay terminal No.3 to all fuel injector wiring harness connectors terminal No.1. ECM controls fuel injector ground circuit by ECM harness connector EN01 terminal No.63. ECM monitors all fuel injector driver circuit status, if ECM detects driving circuit corresponding voltage is incorrect, ECM will set up a fuel injector control circuit fault DTC code.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0202 P0264 P0265	Hardware Circuit Checks	1. Circuit Open. 2. Circuit Short to Ground. 3. Circuit Short to Power Supply.	1. Sensor Circuit 2. Sensor 3. ECM

## 3. Schematic:



## 4. Diagnostic Steps:

### Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

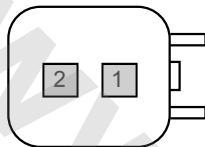
Step 1	Initial Inspection
--------	--------------------

- (a) Check the fuel injector wiring harness connector for damage, poor connection, aging or signs of loosening.

Next

Step 2 Measure the resistance of fuel injector assembly.

Cylinder No.2 Fuel Injector



FE02-5058b

- (a) Disconnect the fuel injector wiring harness connector EN12.  
(b) Measure resistance between the two fuel injector terminals.  
Standard Resistance: 20°C (68 °F) 11.5-12.5 Ω  
(c) Connect the fuel injector wiring harness connector EN12.

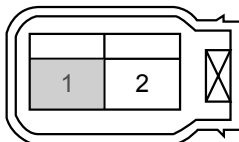
No

Replace fuel injector assembly. Refer to [2.2.8.2 Fuel Injector Replacement](#)

Yes

Step 3 Measure fuel injectors working power supply.

Cylinder No.2 Fuel Injector Harness Connector EN12



FE02-5059b

- (a) Turn the ignition switch to "OFF" position.  
(b) Disconnect cylinder No.1 fuel injector wiring harness connector EN12.  
(c) Turn the ignition switch to "ON" position.  
(d) Measure voltage between cylinder No.2 fuel injector wiring harness connector EN12 No.1 terminal and a reliable ground.  
Standard Voltage: 11-14 V

- (e) Connect cylinder No.2 fuel injector wiring harness connector EN12.

Is voltage normal?

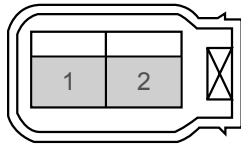
No

Go to step 5

Yes

Step 4 Check the fuel injector control circuit.

### Cylinder No.2 Fuel Injector Harness Connector EN12



FE02-5060b

- Turn the ignition switch to "OFF" position.
  - Disconnect cylinder No.1 fuel injector wiring harness connector EN12.
  - Connect test lamp made from light-emitting diodes to the fuel injector wiring harness connector EN12 terminal No.1 and No.2.
  - Start the engine.
  - Check whether the test lamp is flashing as per normal.
- Is test lamp flashing as per normal?

No

Go to step 6

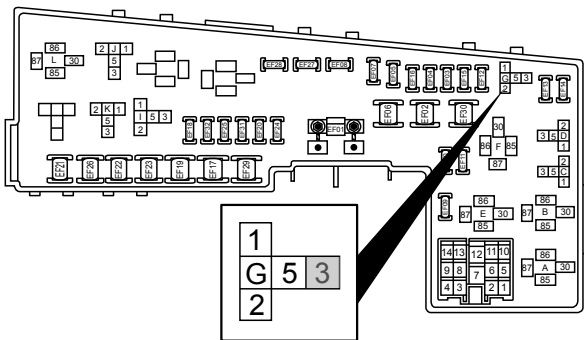
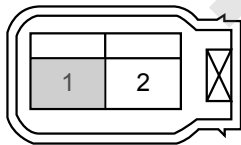
Yes

Go to step 7

#### Step 5

Check and repair cylinder No.2 fuel injector power supply circuit.

### Cylinder No.2 Fuel Injector Harness Connector EN12



FE02-5061b

- Turn the ignition switch to "OFF" position.
- Disconnect the fuel injector wiring harness connector EN12.
- Remove the engine main relay.
- Measure resistance between cylinder No.2 fuel injector wiring harness connector EN12 terminal No.1 and engine main relay terminal No.3.
- Measure resistance between cylinder No.2 fuel injector wiring harness connector EN12 terminal No.1 and a reliable ground.

Test Items	Standard Value
EN12 (1) and Main Relay Terminal No.3	Less than 1 $\Omega$
EN12 (1) and a Reliable Ground	10 k $\Omega$ or higher

- Install the engine main relay.
- Connect cylinder No.2 fuel injector wiring harness connector EN12.

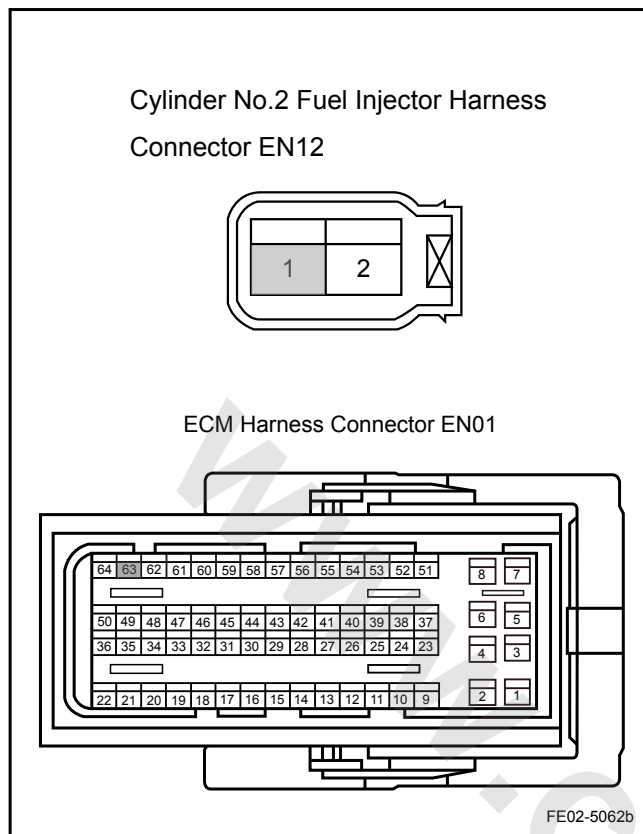
Exclude the fuel injector power supply circuit fault.

Next

Go to step 9

#### Step 6

Check cylinder No.2 fuel injector control circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect cylinder No.2 fuel injector wiring harness connector EN12.
- Disconnect ECM harness connector EN01.
- Measure resistance between cylinder No.2 fuel injector wiring harness connector EN12 terminal No.1 and ECM harness connector terminal No.63. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure resistance between cylinder No.2 fuel injector wiring harness connector EN12 terminal No.1 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair the faulty part.
- Measure voltage between cylinder No.2 fuel injector wiring harness connector EN12 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN12 (1) and EN01 (63)	Less than 1 $\Omega$
Resistance Between EN12 (1) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN12 (1) and a Reliable Ground	0 V

Execute next step as per normal.

Next

Step 7 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 10 Diagnostic completed.

## 5. Repair Instructions:

Replace the fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).

## 2.2.7.26 DTC P0203 P0267 P0268

## 1. DTC Descriptor:

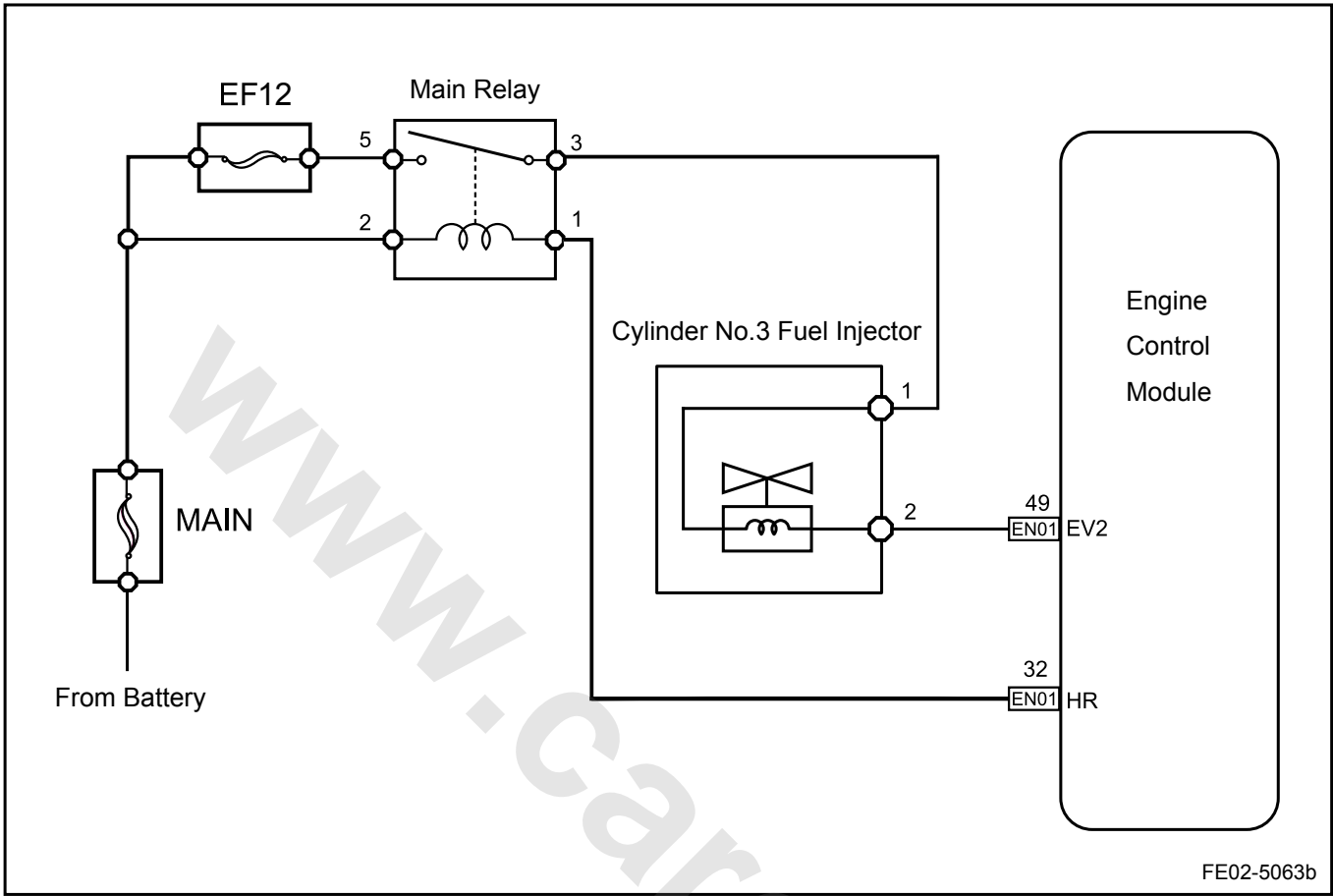
DTC	P0203	Cylinder No.3 Fuel Injection Control Circuit Open
DTC	P0267	Cylinder No.3 Fuel Injector Control Circuit Short to Ground
DTC	P0268	Cylinder No.3 Fuel Injector Control Circuit Short to Power Supply

Fuel injector operating voltage is provided by the main relay which is controlled by ECM. Battery voltage passes through the main relay terminal No.3 to all fuel injector wiring harness connectors terminal No.1. ECM controls fuel injector ground circuit by ECM harness connector EN01 terminal No.49. ECM monitors all fuel injector driver circuit status, if ECM detects driving circuit corresponding voltage is incorrect, ECM will set up a fuel injector control circuit fault DTC code.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0203 P0267 P0268	Hardware Circuit Checks	1. Circuit Open. 2. Circuit Short to Ground. 3. Circuit Short to Power Supply.	1. Sensor Circuit 2. Sensor 3. ECM

3. Schematic



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

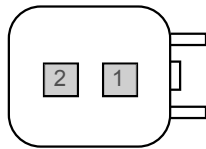
- (a) Check the fuel injector wiring harness connector for damage, poor connection, aging or signs of loosening.

Next

Step 2	Measure the resistance of fuel injector assembly.
--------	---



Cylinder No.3 Fuel Injector



FE02-5064b

- (a) Disconnect the fuel injector wiring harness connector EN13.
- (b) Measure resistance between the two fuel injector terminals.  
Standard Resistance: 20°C (68 °F) 11.5-12.5 Ω
- (c) Connect the fuel injector wiring harness connector EN13.

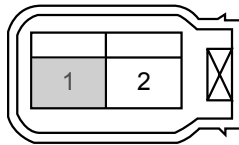
No

Replace fuel injector assembly. Refer to  
[2.2.8.2 Fuel Injector Replacement](#)

Yes

Step 3 Measure fuel injectors working power supply.

Cylinder No.3 Fuel Injector Harness Connector EN13



FE02-5065b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect cylinder No.3 fuel injector wiring harness connector EN13.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between cylinder No.3 fuel injector wiring harness connector EN13 No.1 terminal and a reliable ground.  
Standard Voltage: 11-14 V
- (e) Connect cylinder No.3 fuel injector wiring harness connector EN13.

Voltage normal?

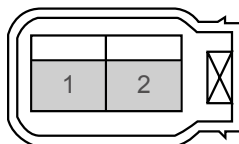
No

Go to step 5

Yes

Step 4 Check the fuel injector control circuit.

Cylinder No.3 Fuel Injector Harness Connector EN13



FE02-5066b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect cylinder No.3 fuel injector wiring harness connector EN13.
- (c) Connect test lamp made from light-emitting diodes to the fuel injector wiring harness connector EN13 terminal No.1 and No.2.
- (d) Start the engine.
- (e) Check whether the test lamp is flashing as per normal.  
Is test lamp flashing as per normal?

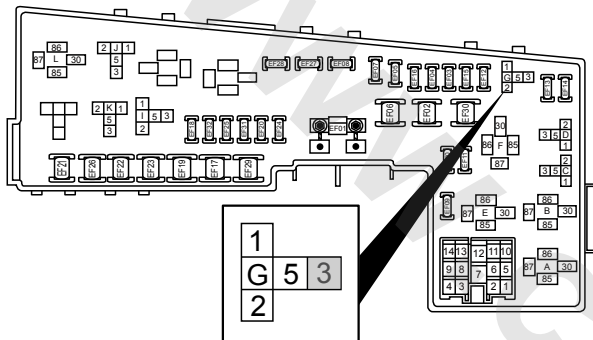
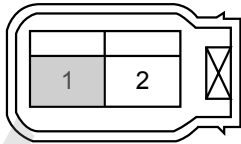
No

Go to step 6

Yes

Go to step 7

**Step 5** Check and repair cylinder No.3 fuel injector power supply circuit.

 Cylinder No.3 Fuel Injector Harness  
Connector EN13


FE02-5067b

- Turn the ignition switch to "OFF" position.
- Disconnect the fuel injector wiring harness connector EN13.
- Remove the engine main relay.
- Measure resistance between cylinder No.3 fuel injector wiring harness connector EN13 terminal No.1 and engine main relay terminal No.3.
- Measure resistance between cylinder No.3 fuel injector wiring harness connector EN13 terminal No.1 and a reliable ground.

Test Items	Standard Value
EN13 (1) and Main Relay Terminal No.3	Less than 1 $\Omega$
EN13 (1) and a Reliable Ground	10 k $\Omega$ or higher

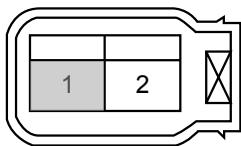
- Install the engine main relay.
- Connect cylinder No.3 fuel injector wiring harness connector EN13.

Exclude the fuel injector power supply circuit fault.

Next

Go to step 9

**Step 6** Check 3-cylinder fuel injector control circuit.

 Cylinder No.3 Fuel Injector Harness  
Connector EN13


ECM Harness Connector EN01



FE02-5068b

- Turn the ignition switch to "OFF" position.
- Disconnect cylinder No.3 fuel injector wiring harness connector EN13.
- Disconnect ECM harness connector EN01.
- Measure resistance between cylinder No.3 fuel injector wiring harness connector EN13 terminal No.1 and ECM harness connector terminal No.49. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure resistance between cylinder No.3 fuel injector wiring harness connector EN13 terminal No.1 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair the faulty part.
- Measure voltage between cylinder No.3 fuel injector wiring harness connector EN13 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN13 (1) and EN01 (49)	Less than 1 $\Omega$
Resistance Between EN13 (1) and a Reliable Ground	10 k $\Omega$ or higher

Voltage Between EN13 (1) and a Reliable Ground	0 V
--	-----

Execute next step as per normal.

Next

Step 7	Check ECM power supply circuit.
--------	---------------------------------

- (a) Check whether ECM power supply circuit is normal.  
 (b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8	Replace ECM.
--------	--------------

Next

Step 9	Use scan tool to confirm whether the DTC code is stored again.
--------	--

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Road test the vehicle for at least 10 min.  
 (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 10	Diagnostic completed.
---------	-----------------------

**5. Repair Instructions:**Replace the fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).**2.2.7.27 DTC P0204 P0270 P0271****1. DTC Descriptor:**

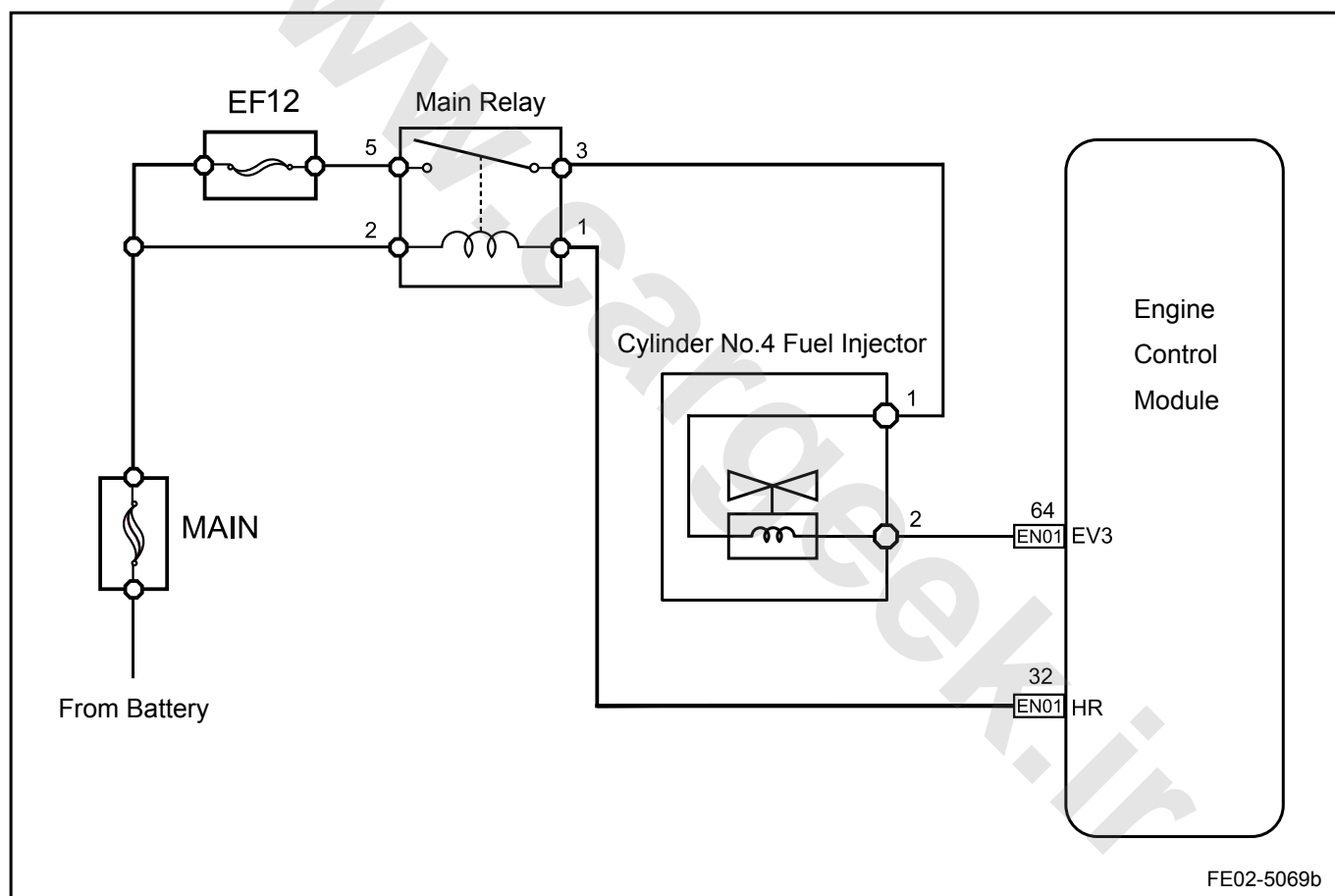
DTC	P0204	Cylinder No.4 Fuel Injection Control Circuit Open
DTC	P0270	Cylinder No.4 Fuel Injector Control Circuit Short to Ground
DTC	P0271	Cylinder No.4 Fuel Injector Control Circuit Short to Power Supply

Fuel injector operating voltage is provided by The Main Relay which is controlled by ECM. Battery voltage passes through the main relay terminal No.3 to all fuel injector wiring harness connectors terminal No.1. ECM controls fuel injector ground circuit by ECM harness connector EN01 terminal No.64. ECM monitors all fuel injector driver circuit status, if ECM detects driving circuit corresponding voltage is incorrect, ECM will set up a fuel injector control circuit fault DTC code.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0204 P0270 P0271	Hardware Circuit Checks	1. Circuit Open. 2. Circuit Short to Ground. 3. Circuit Short to Power Supply.	1. Sensor Circuit 2. Sensor 3. ECM

## 3. Schematic:



## 4. Diagnostic Steps:

### Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

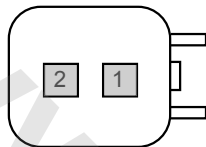
Step 1	Initial Inspection
--------	--------------------

- (a) Check the fuel injector wiring harness connector for damage, poor connection, aging or signs of loosening.

Next

Step 2 Measure the resistance of fuel injector assembly.

Cylinder No.4 Fuel Injector



FE02-5070b

- (a) Disconnect the fuel injector wiring harness connector EN14.  
(b) Measure resistance between the two fuel injector terminals.  
Standard Resistance: 20°C (68 °F) 11.5-12.5 Ω  
(c) Connect the fuel injector wiring harness connector EN14.

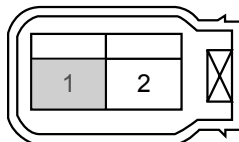
No

Replace fuel injector assembly. Refer to [2.2.8.2 Fuel Injector Replacement](#)

Yes

Step 3 Measure fuel injectors working power supply.

Cylinder No.4 Fuel Injector Harness Connector EN14



FE02-5071b

- (a) Turn the ignition switch to "OFF" position.  
(b) Disconnect cylinder No.4 fuel injector wiring harness connector EN14.  
(c) Turn the ignition switch to "ON" position.  
(d) Measure voltage between cylinder No.4 fuel injector wiring harness connector EN14 No.1 terminal and a reliable ground.  
Standard Voltage: 11-14 V  
(e) Connect cylinder No.4 fuel injector wiring harness connector EN14.

Is voltage normal?

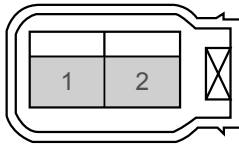
No

Go to step 5

Yes

Step 4 Check the fuel injector control circuit.

### Cylinder No.4 Fuel Injector Harness Connector EN14



FE02-5072b

- Turn the ignition switch to "OFF" position.
  - Disconnect cylinder No.1 fuel injector wiring harness connector EN14.
  - Connect test lamp made from light-emitting diodes to the fuel injector wiring harness connector EN14 terminal No.1 and No.2.
  - Start the engine.
  - Check whether the test lamp is flashing as per normal.
- Is test lamp flashing as per normal?

No

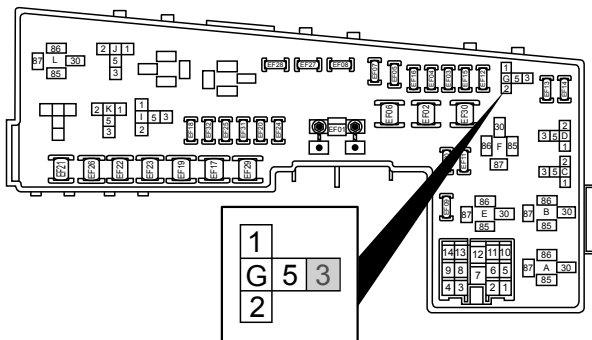
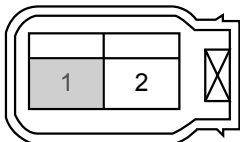
Go to step 6

Yes

Go to step 7

Step 5 Check and repair cylinder No.4 fuel injector power supply circuit.

### Cylinder No.4 Fuel Injector Harness Connector EN14



FE02-5073b

- Turn the ignition switch to "OFF" position.
- Disconnect the fuel injector wiring harness connector EN14.
- Remove the engine main relay.
- Measure resistance between cylinder No.4 fuel injector wiring harness connector EN14 terminal No.1 and engine main relay terminal No.3.
- Measure resistance between cylinder No.4 fuel injector wiring harness connector EN14 terminal No.1 and a reliable ground

Test Items	Standard Value
EN14 (1) and Main Relay Terminal No.3	Less than 1 $\Omega$
EN14 (1) and a Reliable Ground	10 k $\Omega$ or higher

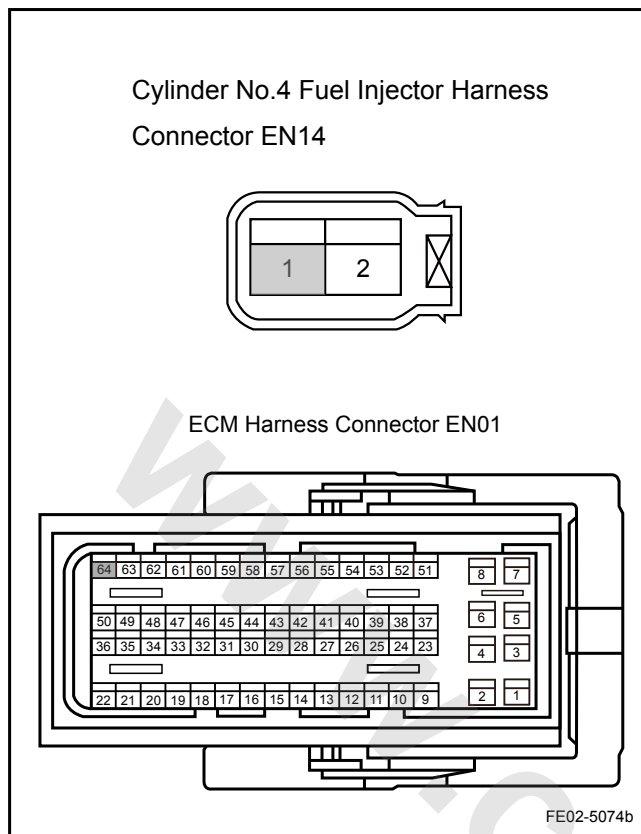
- Install the engine main relay.
- Connect cylinder No.4 fuel injector wiring harness connector EN14.

Exclude the fuel injector power supply circuit fault.

Next

Go to step 9

Step 6 Check cylinder No.4 fuel injector control circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect cylinder No.4 fuel injector wiring harness connector EN14.
- Disconnect ECM harness connector EN01.
- Measure resistance between cylinder No.4 fuel injector wiring harness connector EN14 terminal No.1 and ECM harness connector terminal No.64. Check whether the circuit is open. If there is no open circuit, repair the faulty part.
- Measure resistance between cylinder No.4 fuel injector wiring harness connector EN14 terminal No.1 and a reliable ground. Check whether the circuit is short to ground. If there is no short circuit, repair the faulty part.
- Measure voltage between cylinder No.4 fuel injector wiring harness connector EN14 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. If there is no short circuit, repair the faulty part.

Test Items	Standard Value
Resistance Between EN14 (1) and EN01 (64)	Less than 1 $\Omega$
Resistance Between EN14 (1) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN14 (1) and a Reliable Ground	0 V

Execute next step as per normal.

Next

Step 7	Check ECM power supply circuit.
--------	---------------------------------

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8	Replace ECM.
--------	--------------

Next

Step 9	Use scan tool to confirm whether the DTC code is stored again.
--------	--

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 10 Diagnostic completed.

## 5. Repair Instructions:

Replace the fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).

## 2.2.7.28 DTC P0300-P0304

## 1. DTC Descriptor:

DTC	P0300	Multi-Cylinder Misfire
DTC	P0301	Cylinder No.1 Misfire
DTC	P0302	Cylinder No.2 Misfire
DTC	P0303	Cylinder No.3 Misfire
DTC	P0304	Cylinder No.4 Misfire

The engine control module (ECM) uses information from the crankshaft position (CKP) sensor and the camshaft position (CMP) sensors to determine when an engine misfire is occurring. By monitoring variations in the crankshaft rotation speed for each cylinder ECM is able to detect individual misfire events. When a misfire happens, unburnt mixture will be discharged into the exhaust system and burnt in the exhaust system. A misfire rate that is high enough can cause 3-way catalytic converter damage. The malfunction indicator lamp (MIL) will flash ON and OFF when the conditions for catalytic converter damage are present. A DTC will be set.

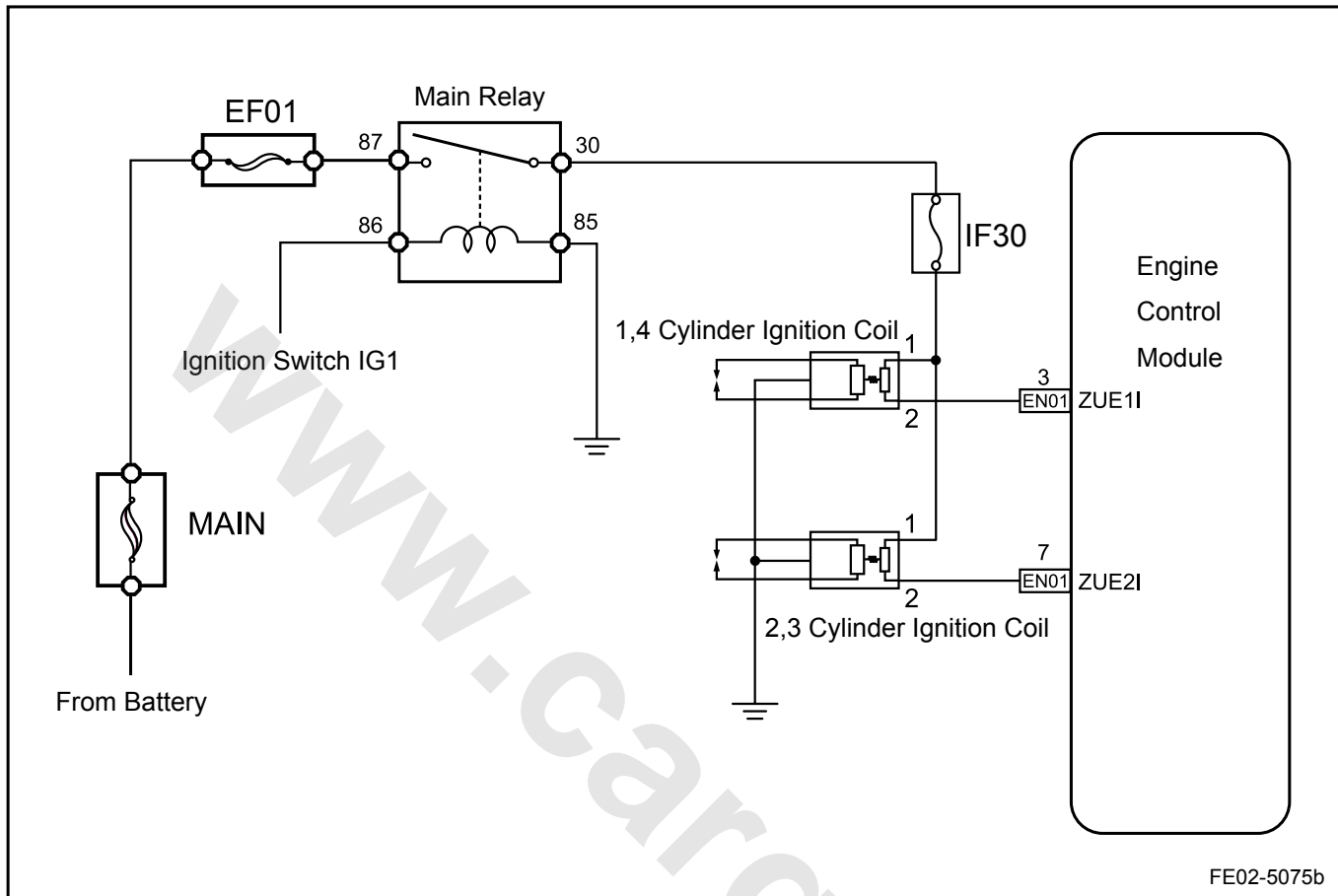


## 2. DTC Code Set Up and Removal Conditions:

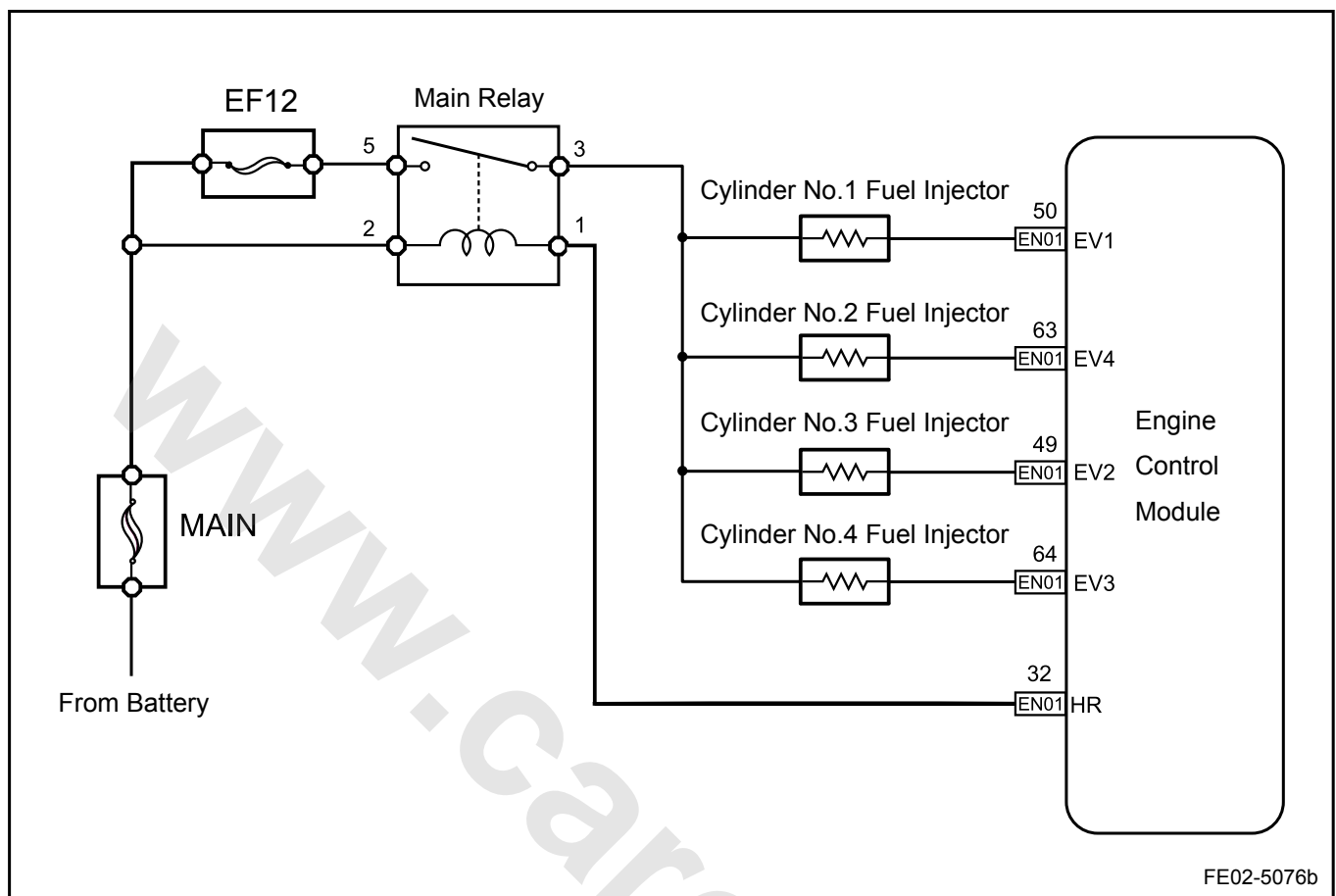
DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0300 P0301 P0302 P0303 P0304	1. A Misfire Rate Sufficient to Cause Damage to Catalytic Converters 2. A Misfire Rate Sufficient to Cause the Emission Deterioration 3. Doubtful Error	1. Each Cylinder Catalytic Converter Damage Related Misfire Counters. 2. Catalytic Converter Damage Misfire Rate More Than 4.5% -20%. 3. Four Emissions Related All Cylinder Misfire Counts In One Driving Cycle. 4. Misfire Rate Causing Emission Deterioration More Than 3.0%. 5. After Starting Each Cylinder Emission Related Misfire Counts During a Count Cycle. 6. Undetected Bad Circuit. 7. Fuel Control Inactivated. 8. Torque Intervention Inactivated. 9. Engine speed is greater than 600 rpm and less than 5,000 rpm. 10. Intake air temperature is greater than -30°C (-22 °F).	1. Connector Loose or Poor Connection 2. Vacuum Tube Hose Broken or Loose 3. Ignition System 4. Fuel Injectors 5. Fuel Pressure 6. Intake Air Pressure Sensor 7. Engine Coolant Temperature Sensor 8. Cylinder Compression Pressure 9. Valve Clearance and Timing 10. Evaporative Emission Control System 11. Purged Crankcase Ventilation System 12. Intake System 13. Poor Exhaust System Ventilation 14. ECM

## 3. Schematic:

Ignition System



## Fuel Injector



## 4. Diagnostic Steps:

## Note

- If the control system stores DTC other than misfire, diagnose these DTC first and eliminate the faults.
- If the vehicle does not have a misfire when sent to a service station, road test the vehicle, so that the misfire will occur again. Use scan tool to record ECM data when misfire is occurring, in order to facilitate analyzing the cause of the fault.
- If after a long period road test, ECM does not store any misfire associated DTC codes, then the fault may be due to the following reasons:
  - Overfill fuel tank and fuel enters into the evaporative emission control system, so that the mixture is too rich and causes misfire.
  - Use improper fuel caused poor combustion and misfire.
  - Contaminated spark plug causes the ignition failure and misfire.
  - Carry out basic checks at fault locations identified by DTC codes.
- Road test the vehicle after repair to confirm no DTC is stored.

Step 1	Initial inspection.
--------	---------------------

- (a) Check the wiring harness connector for damage, poor connection, aging or signs of loosening.

- (b) Check the vacuum tube for damaged, loose, leakage and so on.

Next

Step 2 Check for other DTC codes.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Press the scan tool power button.  
 (d) Select the following menu items: Engine/Read DTC codes.  
 (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC Codes Other Than DTC P0300-P0304	No
DTC P0300-P0304	Yes

No

Refer to [2.2.7.11 DTC Code Index](#)

Yes

Step 3 Check valves and air intake system.

- (a) Check vacuum solenoid valve Canister connection is correct or not and leakage.  
 (b) Check the vacuum brake booster vacuum tube connection is correct or not and leakage.  
 (c) Check the intake tube pressure sensor connection is correct or not and leakage.  
 (d) Check purged crankcase ventilation valve, ventilation pipe connection is correct or not and leakage.  
 (e) Check whether there is intake leakage.

Is there above mentioned fault?

Yes

Fault location. Go to step 17

No

Step 4 Check the Spark Plug.

- (a) Remove the spark plug from the misfire cylinder.  
 (b) Check whether the spark plug gap is too large or too small.  
 Standard Gap: 0.8-0.9 mm (0.031-0.035 in)  
 (c) Check the existence of spark plug electrode erosion, damage.  
 (d) Check whether the spark plug and the electrode part skirt is wet or not and check the existence of a serious gasoline leakage.  
 (e) Reinstall the spark plug.  
 Is there above mentioned fault?

Yes

Replace the spark plug. Refer to [2.10.8.4 Spark Plug Replacement](#). Go to step 8

No

**Note**

Prior to the implementation of this program, the following conditions must be met:

1. Disconnect all fuel injector connectors.
2. Engine running time must not be longer than 5 s.

Step 5	Check whether the spark plug arcing is normal.
--------	--

- (a) Test the spark.
  - (b) Remove misfire cylinder ignition wires.
  - (c) Disconnect all fuel injector cylinder connectors.
  - (d) Install the ignition wires to the spark plug.
  - (e) Run the engine (the engine running time no longer than 5 s) and check the arcing.
  - (f) Reconnect all cylinder fuel injector connectors.
  - (g) Install the ignition wires.
- Is spark plug arcing normal?

No

Go to step 9

Yes

Step 6	Check the misfire cylinder compression pressure.
--------	--

- (a) For detailed steps. Refer to
- Is cylinder compression pressure normal?

Yes

Go to step 10

No

Step 7	Check the cause of cylinder compression pressure too low. Refer to the "Engine Mechanical System" in the <a href="#">2.6.7 Diagnostic Information and Procedures</a> .
--------	--

Step 8	Check fuel and misfire cylinder fuel injectors.
--------	---

- (a) Check whether there is fuel injectors leakage and stagnate.
  - (b) Check fuel quality.
- Is there above mentioned fault?

Yes

Repair the faulty part. Go to step 17

No

**Note**

Prior to the implementation of this test, the following conditions must be met:

1. Disconnect all fuel injector connectors.

## 2. Run the engine for no longer than 5s.

Step 9	Use a properly working spark plug and check whether there is misfire cylinder arcing.
--------	---

(a) Replace the installed spark plug with a spark plug that works properly.

(b) Test spark plug.

(c) Remove misfire cylinder ignition wires.

(d) Disconnect all fuel injector cylinder connectors.

(e) Install the ignition wires to the spark plug.

(f) Run the engine (the engine running time no longer than 5 s) and check the arcing.

(g) Reconnect all cylinder fuel injector connectors.

(h) Install the ignition wires.

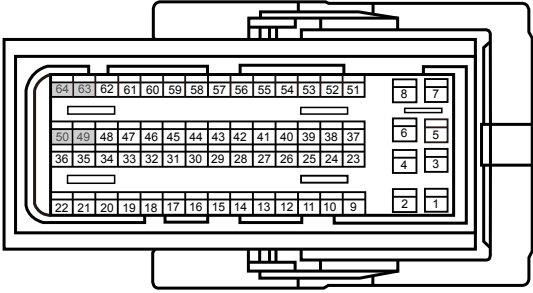
Is spark plug arcing normal?

No → Check the ignition coil and ignition wire. Go to step 17

Yes → Replace the spark plug. Refer to [2.10.8.4 Spark Plug Replacement](#). Go to step 17

Step 10	Check ECM connector terminal voltage of the misfire cylinder fuel injector.
---------	---

ECM Harness Connector EN01



FE02-5077b

(a) Turn the ignition switch to the "ON" position.

(b) Connect ECM harness EN01.

(c) Measure ECM harness connector EN01 terminal voltage according to the following table.

Connector Terminal	Standard Value
EN01 (49)	9-14 V
EN01 (50)	
EN01 (63)	
EN01 (64)	

Is voltage the specified value?

No → Check the fuel injector circuit. Refer to [2.2.7.24 DTC P0201 P0261 P0262](#)

Yes

Step 11	Check the misfire cylinder valve gap.
---------	---------------------------------------

(a) Refer to the "Engine Mechanical System" in the [2.6.8.20 Valve Clearance Adjustments](#). Is valve clearance normal?

No → Adjust the valve clearance. Go to step 17

Yes

Step 12 Check valve timing system.

- (a) Refer to the "Engine Mechanical System" in the [2.6.8.9 Timing Chain Cover Replacement](#), Is valve timing normal?

No

Adjust the valve timing. Go to step 17

Yes

Step 13 Check the fuel pressure.

- (a) Refer to "Fuel System" in the [2.3.7.7 Fuel Pressure Testing Procedure](#), Is fuel pressure normal?

No

Check fuel system: fuel pump, fuel filter, fuel pipe circuit and fuel pressure regulator. Go to step 17

Yes

Step 14 Check whether the data in the data stream table is normal.

- (a) Check intake air pressure sensor data.  
(b) Check engine coolant temperature sensor data.  
(c) Check throttle position sensor.

Are these components normal?

No

Replace the damaged components. Go to step 17

Yes

Step 15 Check ECM power supply circuit.

- (a) Check whether ECM power supply circuit is normal.  
(b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 16 Replace ECM.

Next

Step 17 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.  
(b) Turn the ignition switch to "ON" position.  
(c) Clear DTC code.  
(d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
(e) Road test the vehicle for at least 10 min.  
(f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 18 Diagnostic completed.

## 5. Repair Instructions:

Replace the spark plug. Refer to [2.10.8.4 Spark Plug Replacement](#).

## 2.2.7.29 DTC P0321 P0322

## 1. DTC Descriptor:

DTC	P0321	Speed Reference Point Fault
DTC	P0322	No CKP Sensor Pulse Signal (Open or Short Circuit)

CKP sensor signal provides ECM with current crankshaft speed and position. CKP sensor produces an alternating voltage with changing amplitude and frequency. Frequency depends on the crankshaft speed and the AC output voltage depends on the CKP. CKP sensor works with a fixed 58X variable reluctance rotor on the crankshaft. ECM calculates the ignition timing, injection timing and controls knock ignition according to CKP sensor and camshaft position sensor input signal. CKP sensor is also used to detect misfire and tachometer display. ECM uses CAN network to send the engine speed signal to the instrument panel.

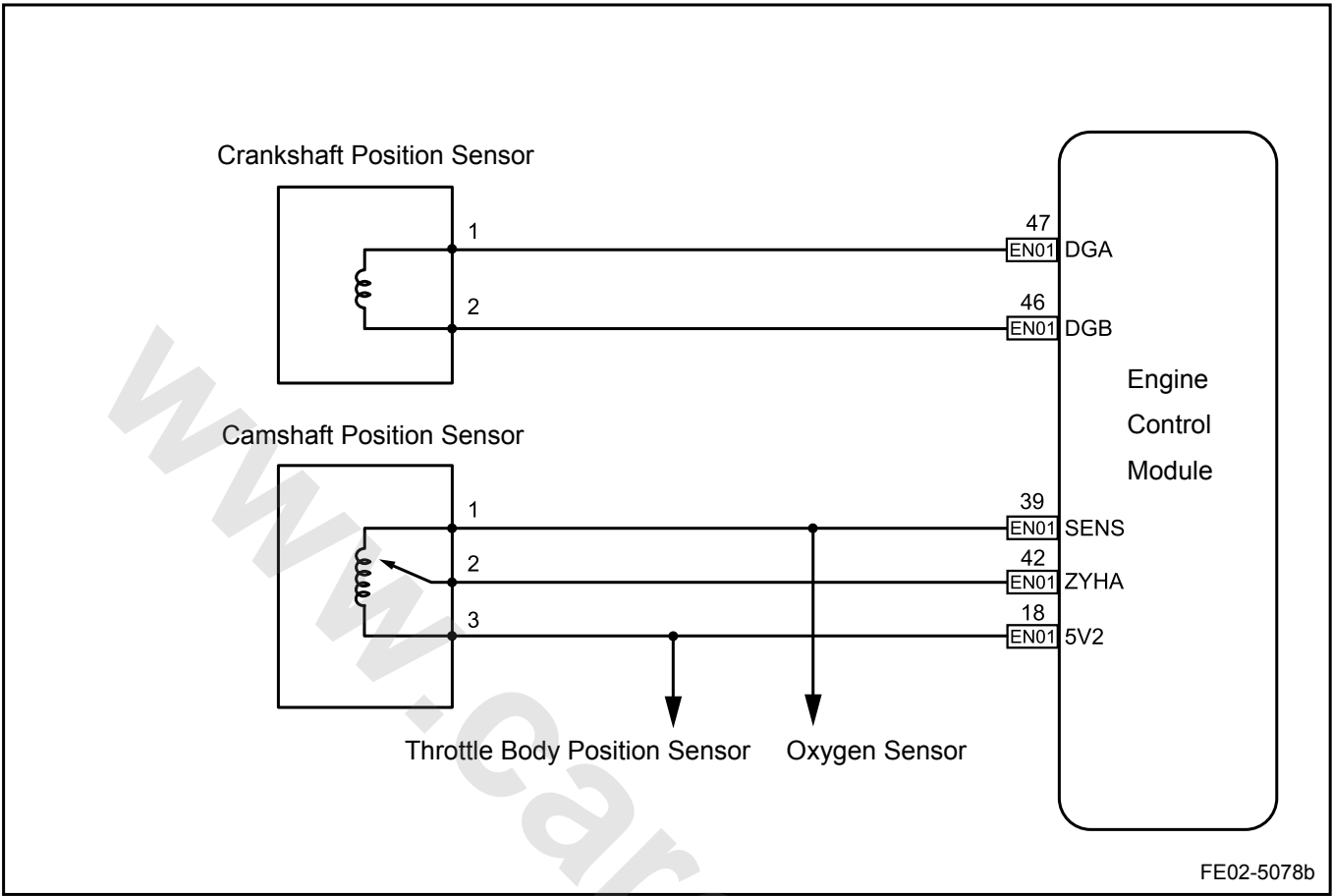
CKP sensor signal passes through the CKP sensor harness connector EN26 terminal No.1 and No.2 to ECM harness connector EN01 terminal No.47 and 46.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0321	Hardware Circuit Checks	<ol style="list-style-type: none"> <li>1. Frequently add teeth to adjust.</li> <li>2. Frequently reduce teeth to adjust.</li> <li>3. Speed sensor signal exists but there is no reference.</li> <li>4. Frequently lose the reference.</li> </ol>	<ol style="list-style-type: none"> <li>1. The count of adding a tooth is greater than 250 times.</li> <li>2. The count of reducing a tooth is greater than 250 times.</li> <li>3. The count of no record of the teeth missing is more than 6 times.</li> <li>4. The count of losing the missing teeth is greater than 2000 times.</li> </ol>
P0322	Hardware Circuit Checks	No speed sensor signal is monitored after a certain number of phases.	<ol style="list-style-type: none"> <li>1. Phase signal transition count is greater than 18 times.</li> <li>2. A low engine speed.</li> </ol>



3. Schematic:



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

- (a) Check the sensor wiring harness connector EN26 whether there is loose or poor connection and so on.
- (b) Check whether the sensor is installed correctly.
- (c) Check whether the sensor gap is normal.

No Fault location. Go to step 10

Yes

Step 2	Read the engine data (engine speed) on the scan tool.
--------	---

- (a) Connect scan tool to datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Select "Engine"/"Reading Data"/"Engine Speed."
- (d) Start the engine.
- (e) With the engine running, read the engine data on the scan tool.

Standard Value: Normal data. Refer to [2.2.7.9 Data Stream List](#)

- (f) If the engine does not start, check the data with the engine running.
- (g) If the engine speed is shown as "0", it indicates the circuit between the crankshaft position sensor and ECM wiring harness open or short.

Yes

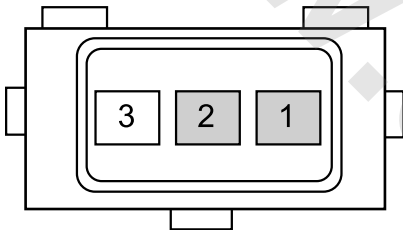
Go to step 4

No

Step 3 Intermittent Fault. Refer to [2.2.7.4 Fault Symptom Table](#).

Step 4 Check the sensor.

Crankshaft Position Sensor



FE02-5079b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the crankshaft position sensor wiring harness connector EN26.
- (c) Measure crankshaft position sensor resistance.  
Standard Resistance: 774-946  $\Omega$  at 23°C (73.4 °F)
- (d) Connect the crankshaft position sensor wiring harness connector EN26.

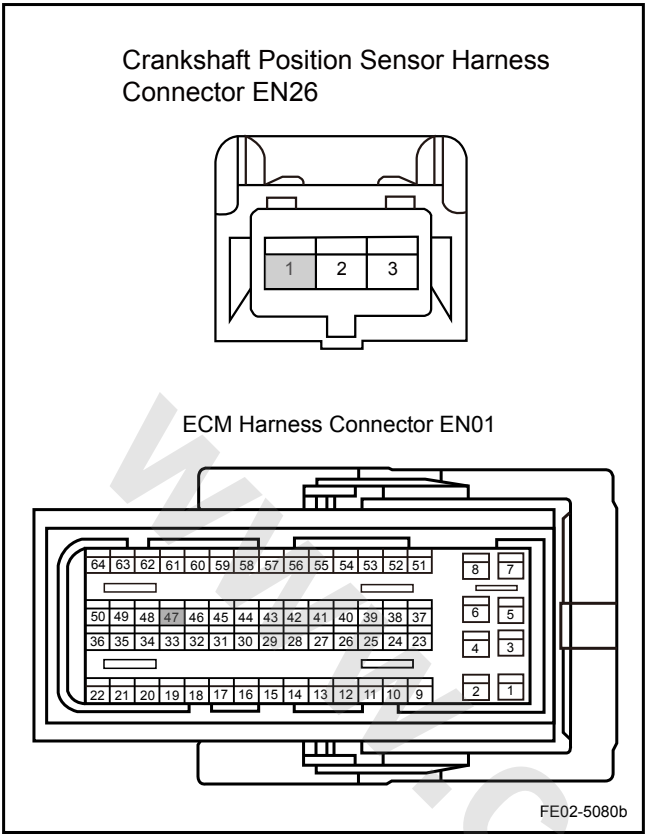
Is resistance normal?

No

Replace the crankshaft position sensor. Refer to [2.10.8.2 Crankshaft Position Sensor Replacement](#). Go to step 10

Yes

Step 5 Check sensor terminal No.1 circuit.



- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the crankshaft position sensor wiring harness connector EN26.
- (c) Disconnect ECM harness connector EN01.
- (d) Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal No.1 and ECM harness connector EN01 terminal No.47. Check whether the circuit is open.
- (e) Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal No.1 and a reliable ground. Check whether the circuit is short to ground.
- (f) Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal No.1 and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN26 (1) and EN01 (47)	Less than 1 Ω
Resistance Between EN26 (1) and a Reliable Ground	10 kΩ or higher
Voltage Between EN26 (1) and a Reliable Ground	0 V

Are the values specified values?

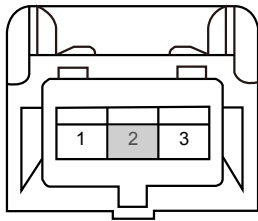
No

Repair the faulty part. Go to step 10

Yes

Step 6	Check sensor terminal No.2 circuit.
--------	-------------------------------------

Crankshaft Position Sensor Harness Connector EN26



ECM Harness Connector EN01



FE02-5081b

- Turn the ignition switch to "OFF" position.
- Disconnect the crankshaft position sensor wiring harness connector EN26.
- Disconnect ECM harness connector EN01.
- Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal No.2 and ECM harness connector EN01 terminal No.46. Check whether the circuit is open.
- Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal No.2 and a reliable ground. Check whether the circuit is short to ground.
- Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal No.2 and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN26 (2) and EN01 (46)	Less than 1 $\Omega$
Resistance Between EN26 (2) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN26 (2) and a Reliable Ground	0 V

Are the values the specified values?

No

Repair the faulty part. Go to step 10

Yes

Step 7 Check sensor signal plate.

- Check whether the sensor signal plate is damaged, missing and so on.
- Check whether the sensor signal plate is installed correctly.

No

Repair the faulty part. Go to step 10

Yes

Step 8 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 9 Replace ECM.

Next

Step 10 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Road test the vehicle for at least 10 min.
- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 11 Diagnostic completed.

### 5. Repair Instructions:

Replace crankshaft position sensor. Refer to [2.10.8.2 Crankshaft Position Sensor Replacement](#).

### 2.2.7.30 DTC P0327 P0328

#### 1. DTC Descriptor:

DTC	P0327	Knock sensor signal circuit voltage is too low
DTC	P0328	Knock sensor signal circuit voltage is too high

KS sensor to ECM feedback signal helps ECM control the ignition timing to achieve the optimal operation and the ignition system to achieve the best performance, as well as to prevent damage to the engine by a potential knock. KS sensor is located below the intake manifold on the cylinder. KS sensor voltage changes with the AC signal generated by the vibration with running engine. Engine control module adjusts spark timing according to KS sensor signal amplitude and frequency.

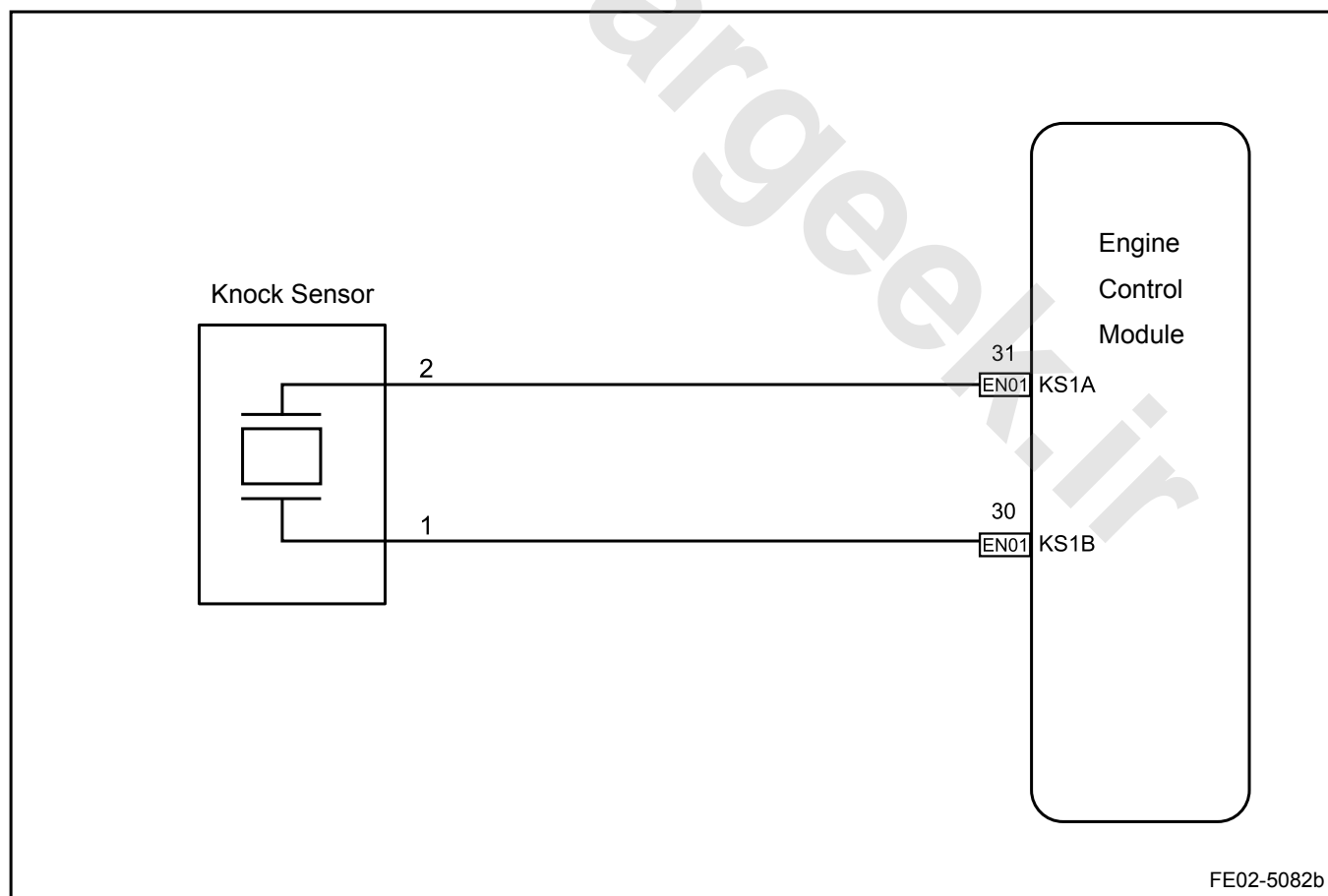
ECM receives signals from KS sensor harness connector EN08 terminal No.1 and 2 through ECM harness connector EN01 terminal No.30 and 31.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
----------	------------------------	---	-----------------

P0327	Signal Range Too Low	<ol style="list-style-type: none"> <li>Knock identification reference voltage is 0.35-0.60 V.</li> <li>It occurs for more than 30 times successively.</li> <li>Engine coolant temperature is greater than 40°C (104 °F).</li> <li>Engine speed is greater than 2,600 rpm.</li> <li>Cylinder No.1 can be identified.</li> </ol>	<ol style="list-style-type: none"> <li>Sensor Circuit</li> <li>Sensor</li> </ol>
P0328	Signal Range Too Low	<ol style="list-style-type: none"> <li>Knock identification reference voltage is 36-150 V.</li> <li>It occurs more than 30 times successively.</li> <li>Knock control circuit has no malfunction.</li> <li>Jolt-limited feature is not activated.</li> <li>Engine load is greater than 39.8%.</li> </ol>	<ol style="list-style-type: none"> <li>ECM</li> </ol>

## 3. Schematic:



## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

- (a) Check whether there is KS sensor physical damage.
- (b) Check whether KS sensor is installed correctly. Torque is set too tight or too loose will trigger DTC codes.
- (c) Check KS sensor installation surface whether there are glitches, casting flash and foreign matter.
- (d) Knock sensor must be kept away from hoses, brackets and engine wires.

Are above mentioned parts normal?

No

Repair the faulty part. Go to step 9

Yes

Step 2	Read the engine data (engine speed) on the scan tool.
--------	---

- (a) Connect scan tool to datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Select "Engine"/"Read Data"/"Knock Sensor Signal 1".
- (d) Start and run the engine at normal working temperature.
- (e) Road test the vehicle and read the engine speed data on the scan tool.

Is data normal?

Standard Value: Normal data. Refer to [2.2.7.9 Data Stream List](#)

No

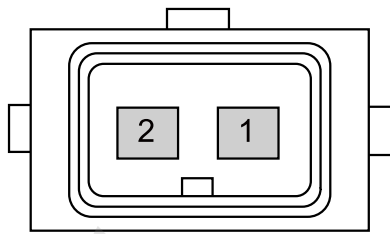
Go to step 4

Yes

Step 3	Intermittent Fault. Refer to <a href="#">2.2.7.4 Fault Symptom Table</a> .
--------	--

Step 4	Check the knock sensor.
--------	-------------------------

## Knock Sensor



FE02-5083b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect Knock Sensor harness connector EN08.
- (c) Measure knock sensor resistance.

Standard Resistance: 49 kΩ at 20°C (68 °F)

- (d) Connect Knock Sensor harness connector EN08.

Is resistance normal?

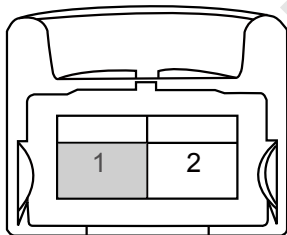
No

Replace the knock sensor. Refer to [2.10.8.5 Knock Sensor Replacement](#). Go to step 9

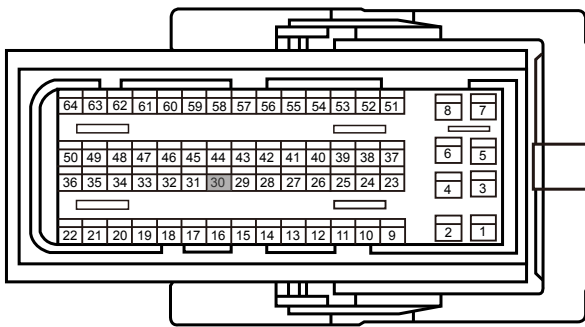
Yes

Step 5 Check sensor terminal No.1 circuit.

## Knock Sensor Harness Connector EN08



## ECM Harness Connector EN01



FE02-5084b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect Knock Sensor harness connector EN08.
- (c) Disconnect ECM harness connector EN01.
- (d) Measure resistance between knock sensor harness connector EN08 terminal No.1 and ECM harness connector EN01 terminal No.30. Check whether the circuit is open.
- (e) Measure resistance between knock sensor harness connector EN08 terminal No.1 and a reliable ground. Check whether the circuit is short to ground.
- (f) Measure voltage between knock sensor harness connector EN08 terminal No.1 and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN08 (1) and EN01 (30)	Less than 1 Ω
Resistance Between EN08 (1) and a Reliable Ground	10 kΩ or higher
Voltage Between EN08 (1) and a Reliable Ground	0 V

Are the values specified values?

No

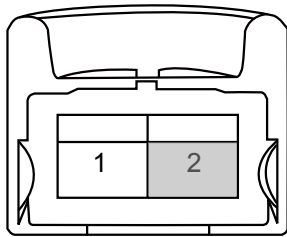
Repair the faulty part. Go to step 9

Yes

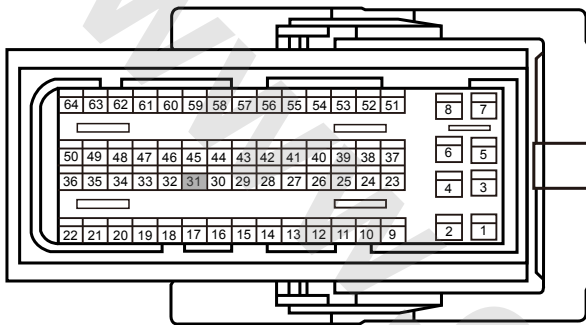
Step 6 Check sensor terminal No.2 circuit.



Knock Sensor Harness Connector EN08



ECM Harness Connector EN01



FE02-5085b

- Turn the ignition switch to "OFF" position.
- Disconnect Knock sensor harness connector EN08.
- Disconnect ECM harness connector EN01.
- Measure resistance between knock sensor harness connector EN08 terminal No.2 and ECM harness connector EN01 terminal No.31. Check whether the circuit is open.
- Measure resistance between knock sensor harness connector EN08 terminal No.2 and a reliable ground. Check whether the circuit is short to ground.
- Measure voltage between knock sensor harness connector EN08 terminal No.2 and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN08 (2) and EN01 (31)	Less than 1 $\Omega$
Resistance Between EN08 (2) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN08 (2) and a Reliable Ground	0 V

Are the values specified values?

No

Repair the faulty part. Go to step 9

Yes

Step 7 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 10	Diagnostic completed.
---------	-----------------------

## 5. Repair Instructions:

Replaced the knock sensor. Refer to [2.10.8.5 Knock Sensor Replacement](#).

## 2.2.7.31 DTC P0340-P0343

## 1. DTC Descriptor:

DTC	P0340	Camshaft Position Sensor Incorrectly Installed
DTC	P0341	Camshaft Position Sensor Poor Connection
DTC	P0342	Camshaft Position Sensor Circuit Short to Ground
DTC	P0343	Camshaft Position Sensor Circuit Short to Power Supply

CMP links the crankshaft position to the camshaft position, so that ECM calculates cylinder No.1 compression TDC and determines at what time to which cylinder spray fuel.

Camshaft position sensor circuit includes the following:

- Reference Voltage: ECM provides a reference voltage to CMP sensor harness connector EN15 terminal No.1 via ECM harness connector EN01 terminal No.39.
- Signal Circuit: ECM receives signal voltage from CMP sensor harness connector EN15 terminal No.2 via ECM harness connector EN01 terminal No.42.

ECM Low Reference Voltage Circuit: ECM provides a low reference voltage to CMP sensor harness connector EN15 terminal No. 3 via ECM harness connector EN01 terminal No.14 and 18.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0340	Poor Connection	1. Phase signal register value is equal to 255, or equal to 0. 2. Phase signal transition count is greater than 4.	1. Sensor Circuit 2. Sensor 3. ECM
P0341	Poor Connection	Phase signal register value is greater than 0 and less than 255 at the same time does not equal 170 and 85.	
P0342	Short to Ground	Phase signal register value is equal to 0.	
P0343	Short to Power Supply	Phase signal register value is equal to 255.	

## 3. Schematic:

Refer to [2.2.7.29 DTC P0321 P0322](#).

## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

(a) Check the sensor wiring harness connector EN15 whether there is loose or poor connection and so on.

(b) Check whether the sensor is installed correctly.

(c) Check whether the sensor gap is normal.

Are above mentioned parts normal?

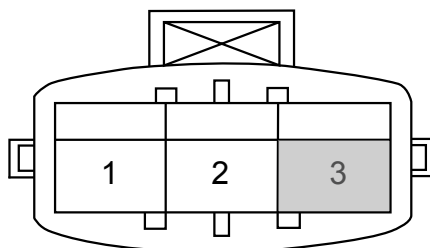
Yes

No

Repair the faulty part. Go to step 12

Step 2	Measure sensor 5 V reference voltage.
--------	---------------------------------------

Camshaft Position Sensor Harness Connector EN15



FE02-5086b

(a) Turn the ignition switch to "OFF" position.

(b) Disconnect camshaft position sensor wiring harness connector EN15.

(c) Turn the ignition switch to "ON" position.

(d) Measure voltage between camshaft position sensor wiring harness connector EN15 terminal No.3 and a reliable ground.

Standard Voltage: 4.5-5.5 V

(e) Connect camshaft position sensor wiring harness connector EN15.

Is the value specified value?

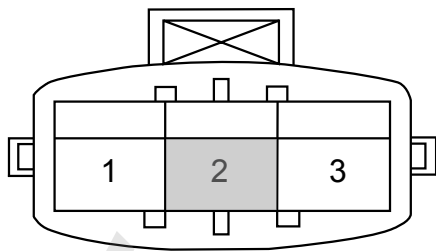
Yes

No

Go to step 6

Step 3	Measure the sensor signal circuit.
--------	------------------------------------

Camshaft Position Sensor Harness Connector EN15



FE02-5087b

- Turn the ignition switch to "OFF" position.
- Disconnect camshaft position sensor wiring harness connector EN15.
- Turn the ignition switch to "ON" position.
- Measure voltage between camshaft position sensor wiring harness connector EN15 terminal No.2 and a reliable ground.  
Standard Voltage: 4.5-5.5 V
- Connect camshaft position sensor wiring harness connector EN15.

Is the value specified value?

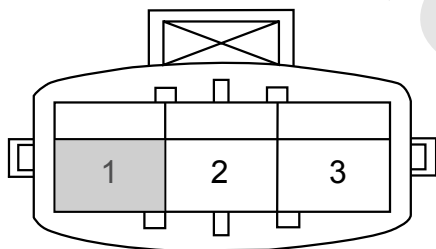
No

Go to step 7

Yes

**Step 4** Test ECM internal low reference circuit.

Camshaft Position Sensor Harness Connector EN15



FE02-5088b

- Turn the ignition switch to "OFF" position.
- Disconnect camshaft position sensor wiring harness connector EN15.
- Turn the ignition switch to "ON" position.
- Measure voltage between camshaft position sensor wiring harness connector EN15 terminal No.1 and a reliable ground.  
Standard Resistance: Less than 3  $\Omega$
- Connect camshaft position sensor wiring harness connector EN15.

Is the value specified value?

No

Go to step 8

Yes

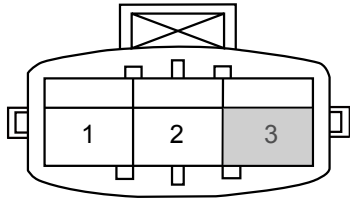
**Step 5** Replace the camshaft position sensor. Refer to [2.10.8.1 Camshaft Position Sensor Replacement](#).

Next

Go to step 12

**Step 6** Check the sensor 5 V reference voltage circuit.

Camshaft Position Sensor Harness Connector EN15



ECM Harness Connector EN01



FE02-5089b

- Turn the ignition switch to "OFF" position.
- Disconnect camshaft position sensor wiring harness connector EN15.
- Disconnect ECM harness connector EN01.
- Measure resistance between camshaft position sensor harness connector EN015 terminal No.3 and ECM harness connector EN01 terminal No.18. Check whether the circuit is open.
- Measure resistance between camshaft position sensor harness connector EN015 terminal No.3 and a reliable ground. Check whether there is short to ground circuit.
- Measure voltage between camshaft position sensor harness connector EN015 terminal No.3 and power supply. Check whether there is short to power supply circuit.

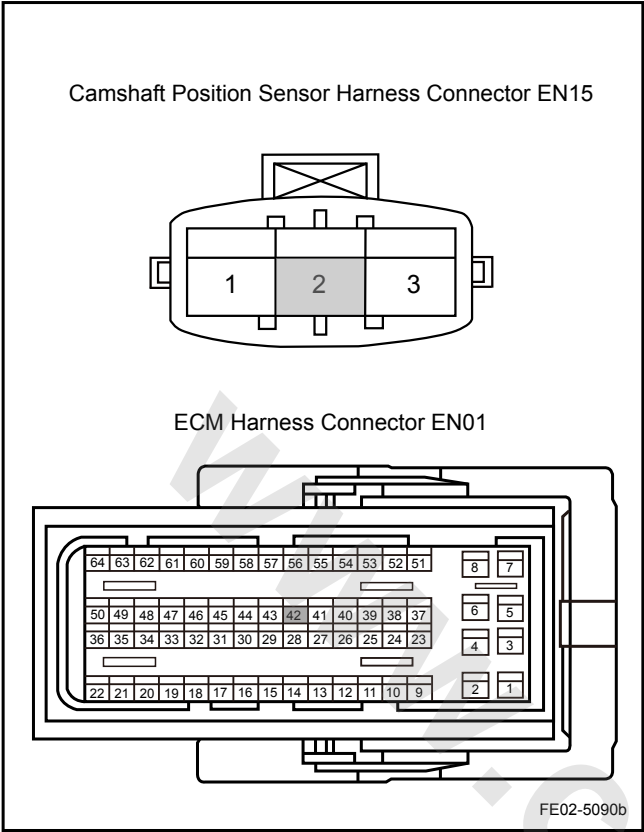
Test Items	Standard Value
Resistance Between EN15 (3) and EN01 (18)	Less than 1 $\Omega$
Resistance Between EN15 (3) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN15 (3) and a Reliable Ground	0 V

Execute next step as per normal.

Next

Repair the faulty part. Go to step 12

Step 7	Check sensor signal circuit.
--------	------------------------------



- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect camshaft position sensor wiring harness connector EN15.
- (c) Disconnect ECM harness connector EN01.
- (d) Measure resistance between camshaft position sensor harness connector EN015 terminal No.2 and ECM harness connector EN01 terminal No.42. Check whether the circuit is open.
- (e) Measure resistance between camshaft position sensor harness connector EN015 terminal No.2 and a reliable ground. Check whether the circuit is short to ground.
- (f) Measure resistance between camshaft position sensor harness connector EN015 terminal No.2 and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN15 (2) and EN01 (42)	Less than 1 $\Omega$
Resistance Between EN15 (2) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN15 (2) and a Reliable Ground	0 V

Are the values specified values?

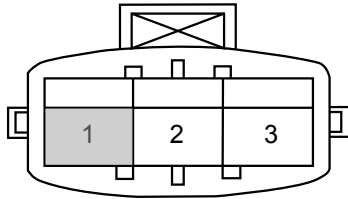
No

Repair the faulty part. Go to step 12

Yes

Step 8	Check ECM internal low reference circuit.
--------	---

Camshaft Position Sensor Harness Connector EN15



ECM Harness Connector EN01



FE02-5091b

- Turn the ignition switch to "OFF" position.
- Disconnect camshaft position sensor wiring harness connector EN15.
- Disconnect ECM harness connector EN01.
- Measure resistance between camshaft position sensor wiring harness connector EN15 terminal No.1 and ECM harness connector EN01 terminal No.39. Check whether the circuit is open.
- Measure voltage between camshaft position sensor wiring harness connector EN15 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN15 (1) and EN01 (39)	Less than 1 $\Omega$
Voltage Between EN15 (1) and a Reliable Ground	0 V

Execute next step as per normal.

Next

Step 9 Check whether camshaft signal plate is normal.

No

Repair the faulty part. Go to step 12

Yes

Step 10 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 11 Replace ECM.

Next

Step 12 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 13 Diagnostic completed.

## 5. Repair Instructions:

Replace the CMP sensor. Refer to [2.10.8.1 Camshaft Position Sensor Replacement](#).

## 2.2.7.32 DTC P0420

## 1. DTC Descriptor:

DTC	P0420	Three-way Catalytic Converter Oxygen Storage Capacity Aging (Emission Over the Limit)
-----	-------	---

ECM uses two oxygen sensors (Pre-Catalytic oxygen sensor and Post-Catalytic oxygen sensor) installed before and after the three-way catalytic converters to monitor the conversion efficiency of the three-way catalytic converter (TWC). ECM uses Pre-Catalytic oxygen sensor for Air-Fuel ratio close-loop control and monitors oxygen content in the exhaust gas not purified by TWC. The Post-Catalytic oxygen sensor sends voltage signal to ECM indicating the oxygen content in the exhaust gas purified by the TWC. ECM compares signals from the two sensors to determine whether the TWC is currently under normal working condition. If the calculated TWC conversion efficiency is too low, the fault lamp will be lit and the DTC code will be set.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0420	Exceed the Maximum Limit	<ol style="list-style-type: none"> <li>After adjustment, the post-catalytic oxygen sensor signal is greater than the average amplitude, which is 0.48 V.</li> <li>Catalytic converter monitoring activation time is greater than 70 s.</li> </ol>	<ol style="list-style-type: none"> <li>Pre-Catalytic Oxygen Sensor</li> <li>Post-Catalytic Oxygen Sensor</li> <li>Three-way Catalytic Converter</li> <li>Exhaust Leakage</li> </ol>

## 3. Schematic:

Refer to [2.2.6.1 Schematic](#)

## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1 Check whether there are control system DTC codes other than DTC P0420.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Press the scan tool power button.
- Select the following menu items: Engine/Read DTC codes.
- Read DTC codes.



DTC Codes Shown	To Step
DTC P0420	Yes
DTC Code Other Than DTC P0420	No

No

Refer to [2.2.7.11 DTC Code Index](#)

Yes

Step 2 Start the engine and turn on the scan tool.

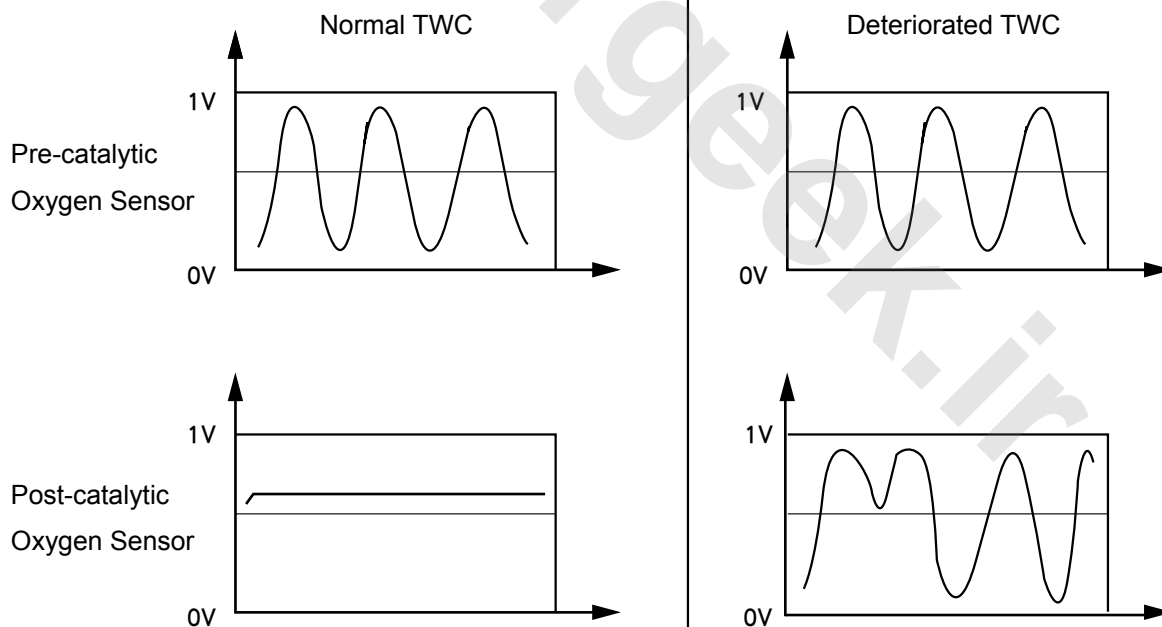
Next

Step 3 Keep the engine speed at 2,500 rpm for more than 2 min to warm up the engine, until the engine coolant temperature reaches 80°C (176 °F).

Next

Step 4 Select on the scan tool: Engine/Read data/Group 1 oxygen sensor voltage 1 (Pre-Catalytic oxygen sensor), Group 1 oxygen sensor voltage 2 (Post-Catalytic oxygen sensor)

Next



FE02-5092b

Step 5	Observe Pre-Catalytic oxygen sensor and Post-Catalytic oxygen sensor output voltages.
--------	---

Whether Pre-Catalytic oxygen sensor and Post-Catalytic oxygen sensor signal voltage is matching "Normal TWC" in the figure?

Yes

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

No

### Warning!

Propane gas is a flammable gas. It is strictly prohibited to operate propane gas near a fire, otherwise it will cause a fire.

Step 6	Test the oxygen sensor signal.
--------	--------------------------------

(a) If the voltage data is consistently below 0.45 V (mixture too lean), carry out the steps as following:

- Spray proper amount of propane gas into the intake.
- Inspect whether the sensor voltage data changes significantly, as the signal voltage will increase rapidly.

Pre-Catalytic Oxygen Sensor Signal Voltage	Post-Catalytic Oxygen Sensor Signal Voltage	To Step
Obvious Change	No Change	A
No Change	Obvious Change	B
Obvious Change	No Change	C
No Change	No Change	D

B

Replace the pre-catalytic oxygen sensor. Refer to [2.4.7.2 Pre-Catalytic Oxygen Sensor Replacement](#). Go to step 11

C

Go to step 9

D

Check the cause for engine air-fuel ratio too lean/too rich. Refer to [2.2.7.4 Fault Symptom Table](#)

A

Step 7	Check whether there is exhaust leakage.
--------	---

Yes

Repair the faulty part. Go to step 11

No

Step 8	Replace the three-way catalytic converter. Refer to <a href="#">2.7.6.2 Three-way Catalytic Converter Replacement</a> .
--------	---

Next

Go to step 11

Step 9	Check whether there is exhaust leakage.
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 2px 10px;">Yes</div> </div>	
<div style="border: 1px solid black; padding: 5px; display: inline-block;">Repair the faulty part. Go to step 11</div>	
<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">No</div>	
Step 10	Replace the post-catalytic oxygen sensor. Refer to <a href="#">2.4.7.1 Post-Catalytic Oxygen Sensor Replacement</a> .
<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">Next</div>	
Step 11	Use scan tool to confirm whether the DTC code is stored again.
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>(a) Connect scan tool to the datalink connector.</p> <p>(b) Turn the ignition switch to "ON" position.</p> <p>(c) Clear DTC code.</p> <p>(d) Start and run the engine at idle speed to warm up the engine for at least 5 min.</p> <p>(e) Road test the vehicle for at least 10 min.</p> <p>(f) Read control system DTC code again to confirm that the system has no DTC code.</p> </div> <div style="width: 50%;"> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">No</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">Intermittent Fault. Refer to <a href="#">2.2.7.3 Intermittent Fault Check</a></div> </div> </div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">Yes</div>	
Step 12	Diagnostic completed.

### 2.2.7.33 DTC P0444 P0458 P0459

#### 1. DTC Descriptor:

DTC	P0444	Canister Control Valve Control Circuit Open
DTC	P0458	Canister Control Valve Control Circuit Voltage Too Low
DTC	P0459	Canister Control Valve Control Circuit Voltage Too High

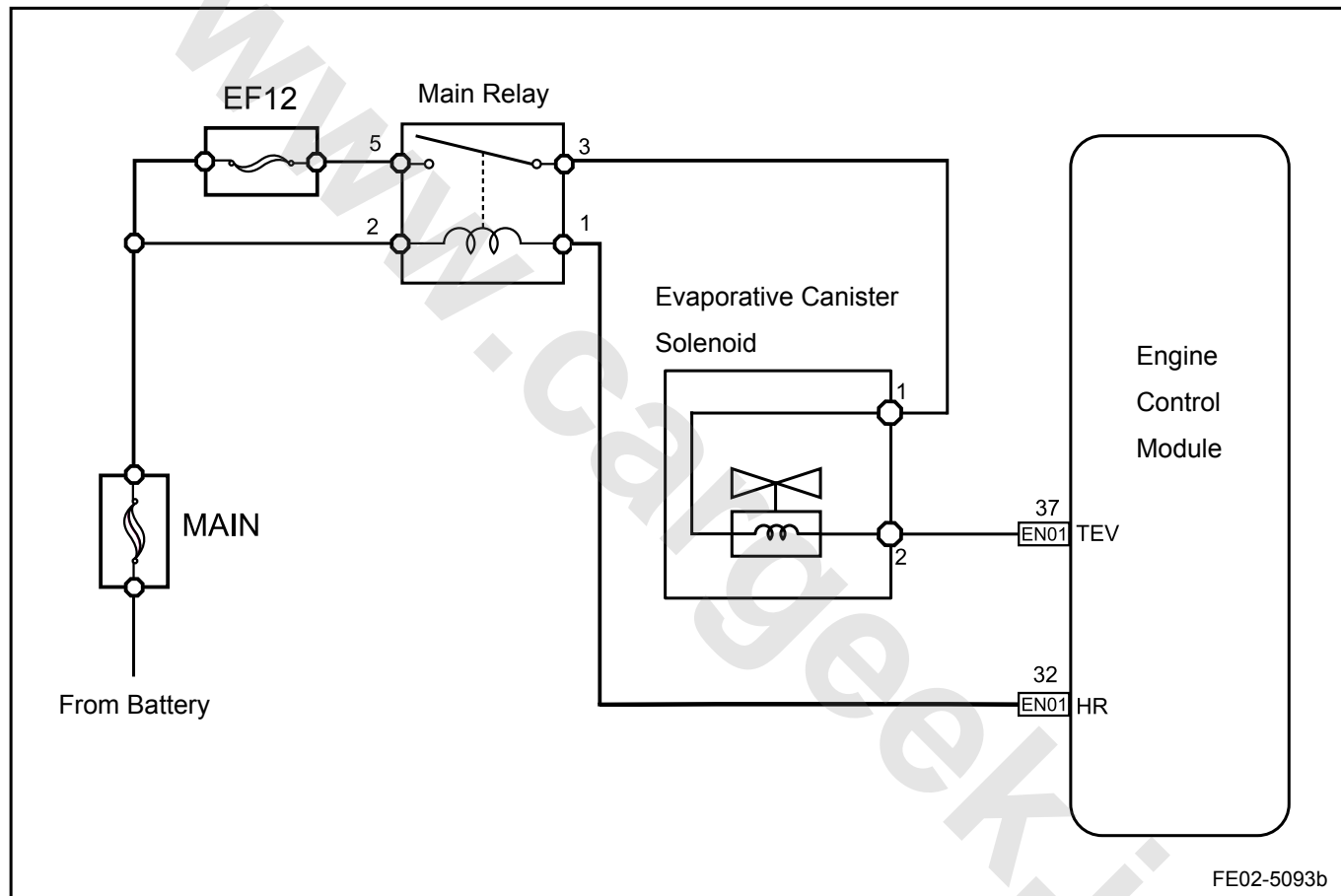
EVAP solenoid valve absorbs fuel vapor from the evaporative emission canister to the intake manifold. EVAP solenoid valve is controlled by the pulse width modulation (PWM). The circuit consists of:

- Operating Voltage: Battery voltage passes through ECM controlled main relay terminal No.3 to reach EVAP solenoid harness connector EN24 terminal No.1.
- ECM control circuit: EVAP solenoid valve wiring harness connector EN24 terminal No.2 is connected to ECM harness connector EN01 terminal No.37. ECM has an internal driver circuit to control the solenoid valve ground. Driver circuit is equipped with a ECM feedback circuit. ECM monitors the feedback voltage to determine whether the control circuit is open, short to ground or short to power supply.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0444 P0458 P0459	Hardware Circuit Checks	1. Circuit Open. 2. Circuit Short to Ground. 3. Circuit Short to Power Supply.	1. Canister Solenoid Valve Circuit 2. Solenoid Valve 3. ECM

## 3. Schematic:



## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Test the Canister solenoid valve with a scan tool.
--------	--

- Connect scan tool to the "Data Link Connector".
- Disconnect the Canister solenoid valve to the Canister vacuum tubes.
- Start engine and turn on the scan tool.

- (d) Select the following menu: "Engine"/"Action Test"/"Canister Solenoid Valve".
- (e) Use scan tool to enable the use of "Canister Control Valve". Place a finger over the vacuum port solenoid valve and check whether there is suction.

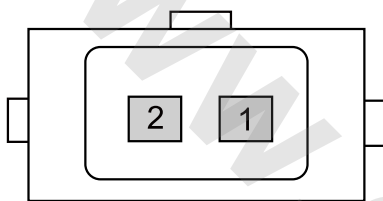
Yes

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

No

Step 2 Measure canister solenoid valve resistance.

Evaporative Canister Solenoid



FE02-5094b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect canister solenoid valve harness connector EN24.
- (c) Measure resistance between the canister solenoid valve two terminals.

Standard Resistance: 25  $\Omega$  at 20°C (68 °F)

- (d) Connect canister solenoid valve harness connector EN24.
- Is the value specified value?

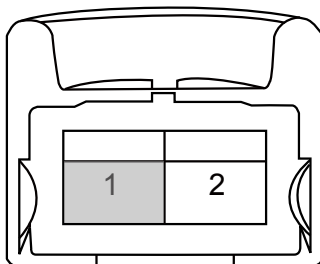
No

Replace the canister solenoid valve. Refer to [2.4.7.3 Canister Solenoid Valve Replacement](#). Go to step 7

Yes

Step 3 Measure canister solenoid valve working power supply.

Evaporative Canister Solenoid Harness Connector EN24



FE02-5095b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect canister solenoid valve harness connector EN24.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between canister solenoid valve wiring harness connector EN24 terminal No.1 and a reliable ground.

Standard Voltage: 11-14 V

- (e) Connect canister solenoid valve harness connector EN24.
- Is the value specified value?

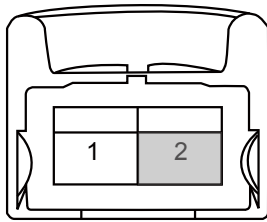
No

Check whether there is an open circuit or a circuit short to ground between solenoid valve wiring harness connector EN10 terminal No. 1 and main relay terminal No.3. Repair the faulty part. Go to step 7

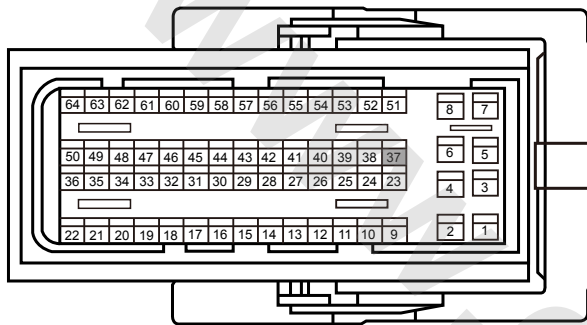
Yes

Step 4 Check canister solenoid valve control circuit.

Evaporative Canister Solenoid Harness Connector EN24



ECM Harness Connector EN01



FE02-5096b

- Turn the ignition switch to "OFF" position.
- Disconnect canister solenoid valve harness connector EN24.
- Disconnect ECM harness connector EN01.
- Measure resistance between canister solenoid valve wiring harness connector EN24 terminal No.2 and ECM harness connector EN01 terminal No.37. Check whether the circuit is open.
- Measure resistance between canister solenoid valve wiring harness connector EN24 terminal No.2 and a reliable ground. Check whether the circuit is short to ground.
- Measure voltage between canister solenoid valve wiring harness connector EN24 terminal No.2 and a reliable ground. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN24 (2) and EN01 (37)	Less than 1 $\Omega$
Resistance Between EN24 (2) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN24 (2) and a Reliable Ground	0 V

Are the values specified values?

No

Repair or replace the wiring harness connectors. Go to step 7

Yes

Step 5 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 6 Replace ECM.

Next

Step 7 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 8 Diagnostic completed.

## 5. Repair Instructions:

Replace EVAP solenoid valve. Refer to [2.4.7.3 Canister Solenoid Valve Replacement](#).

## 2.2.7.34 DTC P0480 P0481 P0691 P0692 P0693 P0694

## 1. DTC Descriptor:

DTC	P0480	Cooling Fan Relay Control Circuit Open (Low Speed)
DTC	P0482	Cooling Fan Relay Control Circuit Malfunction (High Speed)
DTC	P0691	Cooling Fan Relay Control Circuit Short to Ground (Low Speed)
DTC	P0692	Cooling Fan Relay Control Circuit Short to Power Supply (Low Speed)
DTC	P0693	Cooling Fan Relay Control Circuit Short to Ground (High Speed)
DTC	P0694	Cooling Fan Relay Control Circuit Short to Power Supply (High Speed)

High or low speed cooling fan relay coil power is provided by ECM controlled main relay. ECM controls the relay via ECM harness connector EN01 terminal No.52 and 62. ECM has an internal driver circuit that controls the relay coil ground. Drive circuit is equipped with a feedback circuit to ECM. ECM monitors the feedback voltage control circuit to determine whether the control circuit is open, short to ground or short to ground.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0480	Hardware Circuit Checks	Circuit Open.	1. Relay Circuit 2. Relay 3. ECM
P0481	Hardware Circuit Checks	Circuit Open.	
P0691	Hardware Circuit Checks	Circuit Short to Ground.	
P0692	Hardware Circuit Checks	Circuit Short to Power Supply.	
P0693	Hardware Circuit Checks	Circuit Short to Ground.	
P0694	Hardware Circuit Checks	Circuit Short to Power Supply.	

## 3. Schematic:

Refer to [2.8.6.1 Schematic](#).

## 4. Diagnostic Steps:

Refer to [2.8.7.2 Cooling Fan Circuit Diagnosis](#).

## 5. Repair Instructions:

Replace the cooling fan. Refer to [2.8.8.3 Cooling Fan Replacement](#).

## 2.2.7.35 DTC P0501

## 1. DTC Descriptor:

DTC	P0501	Unreasonable Vehicle Speed Sensor Signal
-----	-------	--

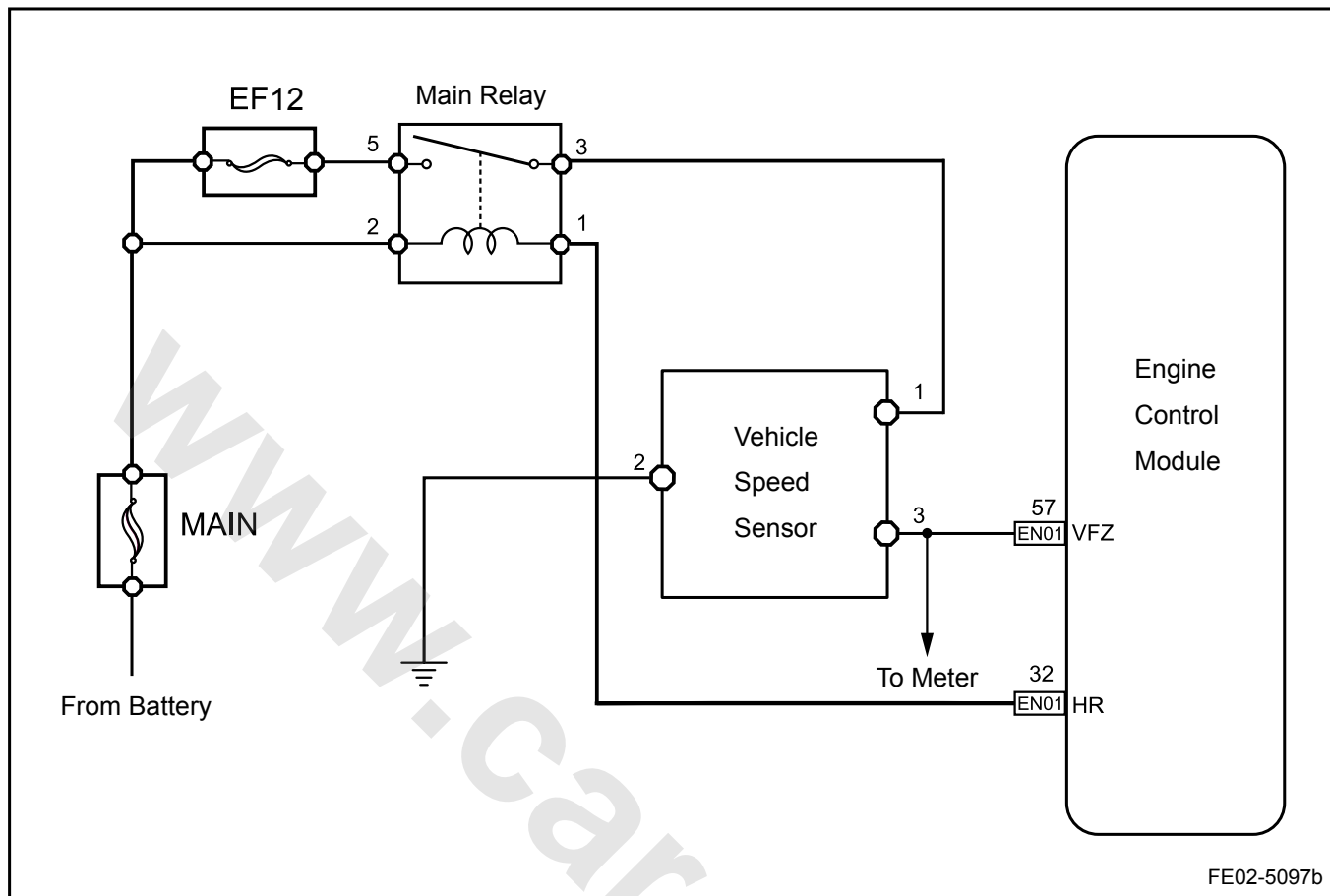
The vehicle speed signal is used to monitor the vehicle speed. The vehicle speed signal is one of the fuel control reference signals during an urgent deceleration. The vehicle speed sensor working voltage is provided by The Main Relay which is controlled by ECM via ECM harness connector EN01 terminal No.57. The vehicle speed sensor signal is sent to the instrument panel used for the vehicle speed display.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0501	Low Limit for Stopping Fuel Supply	<ol style="list-style-type: none"> <li>1. The vehicle speed is less than 5 km/h.</li> <li>2. Stopping Fuel Supply Enabled.</li> <li>3. Engine coolant temperature is higher than 64.5°C. (148.1 °F) .</li> <li>4. Engine speed is greater than 1,520 rpm and less than 4,000 rpm.</li> </ol>	<ol style="list-style-type: none"> <li>1. Vehicle Speed Sensor Circuit</li> <li>2. Vehicle Speed Sensor</li> <li>3. ECM</li> </ol>



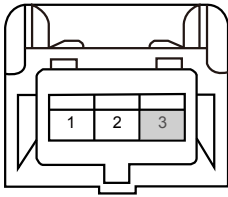
## 3. Schematic:



## 4. Diagnostic Steps:

Step 1	Road test the vehicle. Is the vehicle speed meter display working properly?
<p>(a) If the instrument panel displays the vehicle speed as per normal, the vehicle speed sensor is working correctly.</p> <p>(b) If the instrument panel displays the vehicle speed abnormally, the vehicle speed sensor or the circuit may be faulty.</p>	
<p>Yes</p> <p>No</p> <p>Go to step 3</p>	
Step 2	Check the vehicle speed signal circuit.

Vehicle Speed Sensor Harness Connector EN21



ECM Harness Connector EN01



FE02-5098b

- Turn the ignition switch to "OFF" position.
- Disconnect speed sensor wiring harness connector EN21.
- Disconnect ECM harness connector EN01.
- Measure resistance between the vehicle speed sensor harness connector EN21 terminal No.3 and ECM harness connector EN01 terminal No.57. Check whether the circuit is open.
- Measure resistance between the vehicle speed sensor harness connector EN21 terminal No.3 and a reliable ground. Check whether the circuit is short to ground.
- Measure voltage between the vehicle speed sensor harness connector EN21 terminal No.3 and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN21 (2) and EN01 (57)	Less than 1 $\Omega$
Resistance Between EN21 (2) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN21 (2) and a Reliable Ground	0 V

Are the values specified values?

No

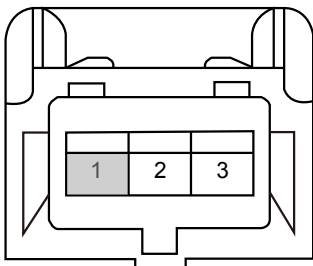
Repair or replace the wiring harness connector. Go to step 8

Yes

Go to step 6

Step 3 Check the vehicle speed sensor power supply circuit.

Vehicle Speed Sensor Harness Connector EN21



FE02-5099b

- Turn the ignition switch to "OFF" position.
- Disconnect speed sensor wiring harness connector EN21.
- Turn the ignition switch to "ON" position.
- Measure voltage between vehicle speed sensor harness connector EN21 terminal No.1 and a reliable ground.

Standard Voltage: 11-14 V

- Connect vehicle speed sensor harness connector EN21. Is the value specified value?

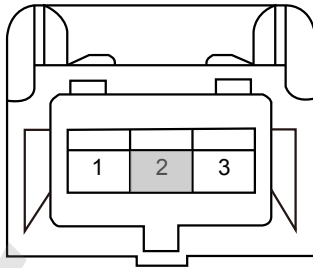
No

Check whether there is a short circuit between the vehicle speed sensor terminal No.3 and the main relay terminal No.87. Repair the faulty part.

Yes

Step 4 Check the vehicle speed sensor ground circuit.

Vehicle Speed Sensor Harness Connector EN21



FE02-5100b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect speed sensor wiring harness connector EN21.
- (c) Measure resistance between vehicle speed sensor harness connector EN21 terminal No.2 and a reliable ground. Check whether the circuit is short to ground.

Standard Resistance: Less than 1  $\Omega$ 

Is the value specified value?

No

Check whether there is an open circuit between the vehicle speed sensor terminal No.2 and a reliable ground. Repair the faulty part.

Yes

Step 5 Replace the vehicle speed sensor.

Next

Go to step 8

Step 6 Check ECM power supply circuit.

- (a) Check whether ECM power supply circuit is normal.
- (b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 7 Replace ECM.

Next

Step 8 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 9 Diagnostic completed.

## 2.2.7.36 DTC P0506-P0509 P0511

## 1. DTC Descriptor:

DTC	P0506	Controlled Idle Speed Lower Than Target Idle Speed
DTC	P0507	Controlled Idle Speed Higher Than Target Idle Speed
DTC	P0508	Stepper Motor Driver Pin Short to Ground
DTC	P0509	Stepper Motor Driver Pin Short to Power Supply
DTC	P0511	Stepper Motor Driver Pin Circuit Open

ECM controls the engine idle speed by regulating the IAC valve core shaft position. IAC valve's two internal coils are driven by the stepper motors. idle air control valve's move is controlled by 4 circuits. ECM's driver controls idle air control valve two wires polarity via these circuits. ECM commands the IAC valve stepper motor rotate clockwise or counterclockwise. IAC valve motor is connected to the idle air control spool shaft through the driver screw. ECM sends electrical pulses to the IAC valve coils to allow the core shaft stretch into or contract out of the throttle body channel. Through the core shaft, air flow increases, so the engine speed increases. When the pivotal stretches, the air flow decreases, therefore the engine speed is reduced. If the engine control module detects the engine speed is not in the expected range, the DTC codes will be set.

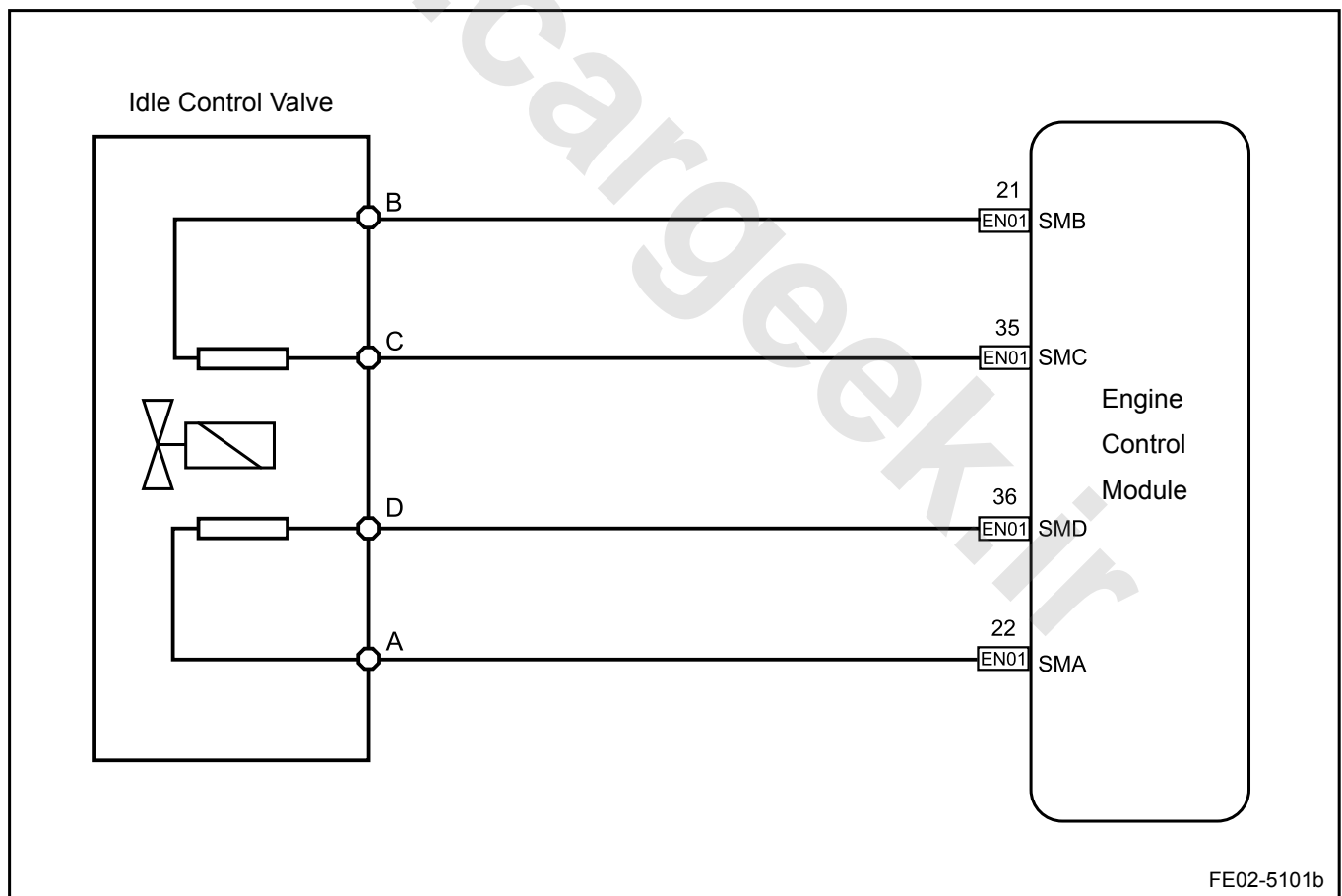
ECM harness connector EN01 terminals No. 21,22,35,36 are connected to IAC valve harness connector EN17 terminals B, A, C, D.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0506	Idle actuator stays at a small opening position.	<ol style="list-style-type: none"> <li>Static target idle speed and the actual idle speed difference is less than 200 rpm.</li> <li>Idle speed integral part is equal to the minimum.</li> <li>Canister solenoid valve opening is less than 100%.</li> <li>The engine is at idle speed.</li> <li>The vehicle speed is equal to 0.</li> <li>Engine coolant temperature is higher than 80.3°C (176.5 °F) .</li> <li>Intake air temperature is higher than 20.3°C (68.5 °F).</li> </ol>	<ol style="list-style-type: none"> <li>Idle Air Control Valve Circuit</li> <li>Idle Speed Control Valve</li> <li>Intake System</li> <li>ECM</li> </ol>

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0507	Idle actuator stays at a big opening position.	<ol style="list-style-type: none"> <li>1. Static target idle speed and the actual idle speed difference is less than 100 rpm.</li> <li>2. Idle speed integral part is equal to the maximum.</li> <li>3. Canister solenoid valve opening is less than 100%.</li> <li>4. The engine is at idle speed.</li> <li>5. The vehicle speed is equal to 0.</li> <li>6. Engine coolant temperature is higher than 80.3°C (176.5 °F) .</li> <li>7. Intake air temperature is higher than 20.3°C (68.5 °F).</li> </ol>	
P0508	Hardware Circuit Checks	One stepper motor pin is short to ground.	
P0509		One stepper motor pin is short to battery positive cable.	
P0511		One stepper motor pin is in an open circuit.	

## 3. Schematic:



## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Use scan tool to carry out idle air control valve action test.
--------	--

- (a) Connect scan tool to the datalink connector.
- (b) Start engine and turn on the scan tool.
- (c) Select the following: the "Engine"/"Action Test"/"Idle Speed Control".
- (d) Use scan tool "Function Test" command to enable IAC valve opening. Increase the speed up to 1,800 rpm and decrease to 800 rpm, and then increase to 1,800 rpm.

Whether the engine speed follows the instructions rise and fall steadily?

Yes

Intermittent Fault. Refer to [2.2.7.4 Fault Symptom Table](#)

No

Step 2	Check the following items.
--------	----------------------------

- (a) Throttle body damage or blockage.
- (b) Is idle air control channel blocked?
- (c) Is there too much residue on the throttle?
- (d) Is there too much residue on the throttle?
- (e) Is there too much residue on the idle air control core shaft?
- (f) Is intake blocked?

Any above mentioned fault?

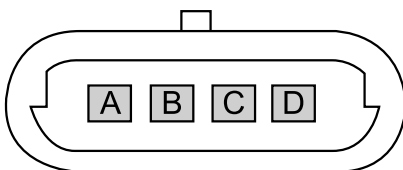
Yes

Repair the faulty parts. Go to step 10

No

Step 3	Check idle speed control valve.
--------	---------------------------------

Idle Control Valve



FE02-5102b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect idle speed control valve wiring harness connector EN17.
- (c) Measure idle speed control valve resistance.

Tester Connection	Standard Value
AD, BC	40-50 $\Omega$
AC, BD	10 k $\Omega$ or higher

- (d) Connect idle speed control valve wiring harness connector EN17.

Voltage normal?

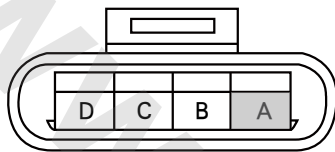
No

Replace idle speed control valve. Refer to [2.2.8.1 Idle Air Control Valve Replacement](#).  
Go to step 10

Yes

Step 4 Check idle speed control Valve terminal A circuit.

Idle Control Valve Harness Connector EN17



ECM Harness Connector EN01



FE02-5103b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect idle speed control valve wiring harness connector EN17.
- (c) Disconnect ECM harness connector EN01.
- (d) Measure resistance between idle speed control valve wiring harness connector EN17 terminal A and ECM harness connector EN01 terminal No.22. The standard value parameter is in the table below.
- (e) Measure resistance between idle speed control valve wiring harness connector EN17 terminal A and a reliable ground. The standard value parameter is in the table below.
- (f) Measure voltage between idle speed control valve wiring harness connector EN17 terminal A and a reliable ground. The standard value parameter is in the table below.

Test Items	Standard Value
Resistance Between EN17 (A) and EN01 (22)	Less than 1 $\Omega$
Resistance Between EN17 (A) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN17 (A) and a Reliable Ground	0 V

Are the values specified values?

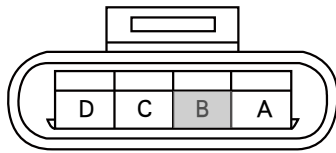
No

Repair or replace the wiring harness connector. Go to step 10

Yes

Step 5 Check idle speed control valve terminal B circuit.

Idle Control Valve Harness Connector EN17



ECM Harness Connector EN01



FE02-5104b

- Turn the ignition switch to "OFF" position.
- Disconnect idle speed control valve wiring harness connector EN17.
- Disconnect ECM harness connector EN01.
- Measure resistance between idle speed control valve wiring harness connector EN17 terminal B and ECM harness connector EN01 terminal No.21. The standard value parameter is in the table below.
- Measure resistance between idle speed control valve wiring harness connector EN17 terminal B and a reliable ground. The standard value parameter is in the table below.
- Measure voltage between idle speed control valve wiring harness connector EN17 terminal B and a reliable ground. The standard value parameter is in the table below.

Test Items	Standard Value
Resistance Between EN17 (B) and EN01 (21)	Less than 1 $\Omega$
Resistance Between EN17 (B) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN17 (B) and a Reliable Ground	0 V

Are the values specified values?

No

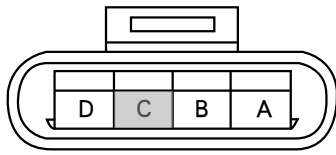
Repair or replace the wiring harness connector. Go to step 10

Yes

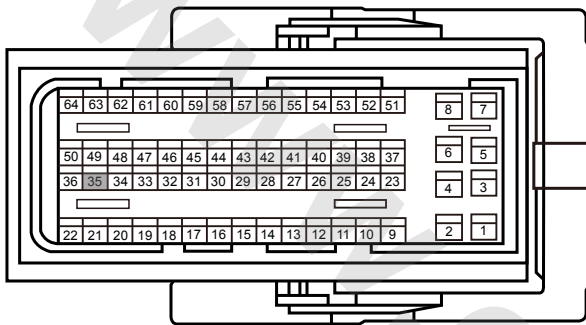
Step 6 Check idle speed control valve terminal C circuit.



Idle Control Valve Harness Connector EN17



ECM Harness Connector EN01



FE02-5105b

- Turn the ignition switch to "OFF" position.
- Disconnect idle speed control valve wiring harness connector EN17.
- Disconnect ECM harness connector EN01.
- Measure resistance between idle speed control valve wiring harness connector EN17 terminal C and ECM harness connector EN01 terminal No.35. The standard value parameter is in the table below.
- Measure resistance between idle speed control valve wiring harness connector EN17 terminal C and a reliable ground. The standard value parameter is in the table below.
- Measure voltage between idle speed control valve wiring harness connector EN17 terminal C and a reliable ground. The standard value parameter is in the table below.

Test Items	Standard Value
Resistance Between EN17 (C) and EN01 (35)	Less than 1 $\Omega$
Resistance Between EN17 (C) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN17 (C) and a Reliable Ground	0 V

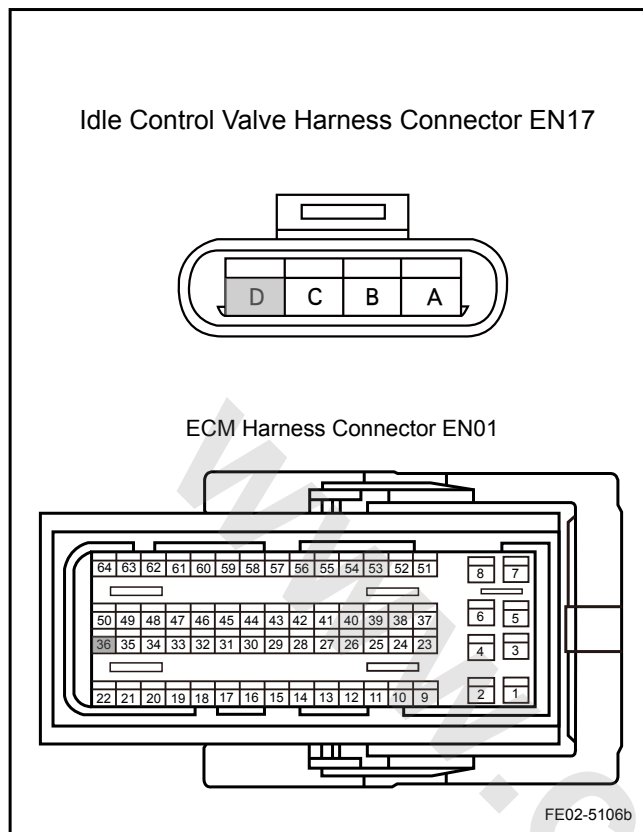
Are the values specified values?

No

Repair or replace the wiring harness connector. Go to step 10

Yes

Step 7 Check idle speed control valve terminal D circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect idle speed control valve wiring harness connector EN17.
- Disconnect ECM harness connector EN01.
- Measure resistance between idle speed control valve wiring harness connector EN17 terminal D and ECM harness connector EN01 terminal No.36. The standard value parameter is in the table below.
- Measure resistance between idle speed control valve wiring harness connector EN17 terminal D and a reliable ground. The standard value parameter is in the table below.
- Measure voltage between idle speed control valve wiring harness connector EN17 terminal D and a reliable ground. The standard value parameter is in the table below.

Test Items	Standard Value
Resistance Between EN17 (D) and EN01 (36)	Less than 1 $\Omega$
Resistance Between EN17 (D) and a Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN17 (D) and a Reliable Ground	0 V

Are the values specified values?

No

Repair or replace the wiring harness connector. Go to step 10

Yes

Step 8 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 9 Replace ECM.

Next

Step 10 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.

- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 11 Diagnostic completed.

#### 5. Repair Instructions:

Replace idle speed control valve. Refer to [2.2.8.1 Idle Air Control Valve Replacement](#).

### 2.2.7.37 DTC P0560 P0562 P0563

#### 1. DTC Descriptor:

DTC	P0560	System Battery Voltage Signal Unreasonable
DTC	P0562	System Battery Voltage Too Low
DTC	P05673	System Battery Voltage Too High

ECM power supply circuit consists of the following:

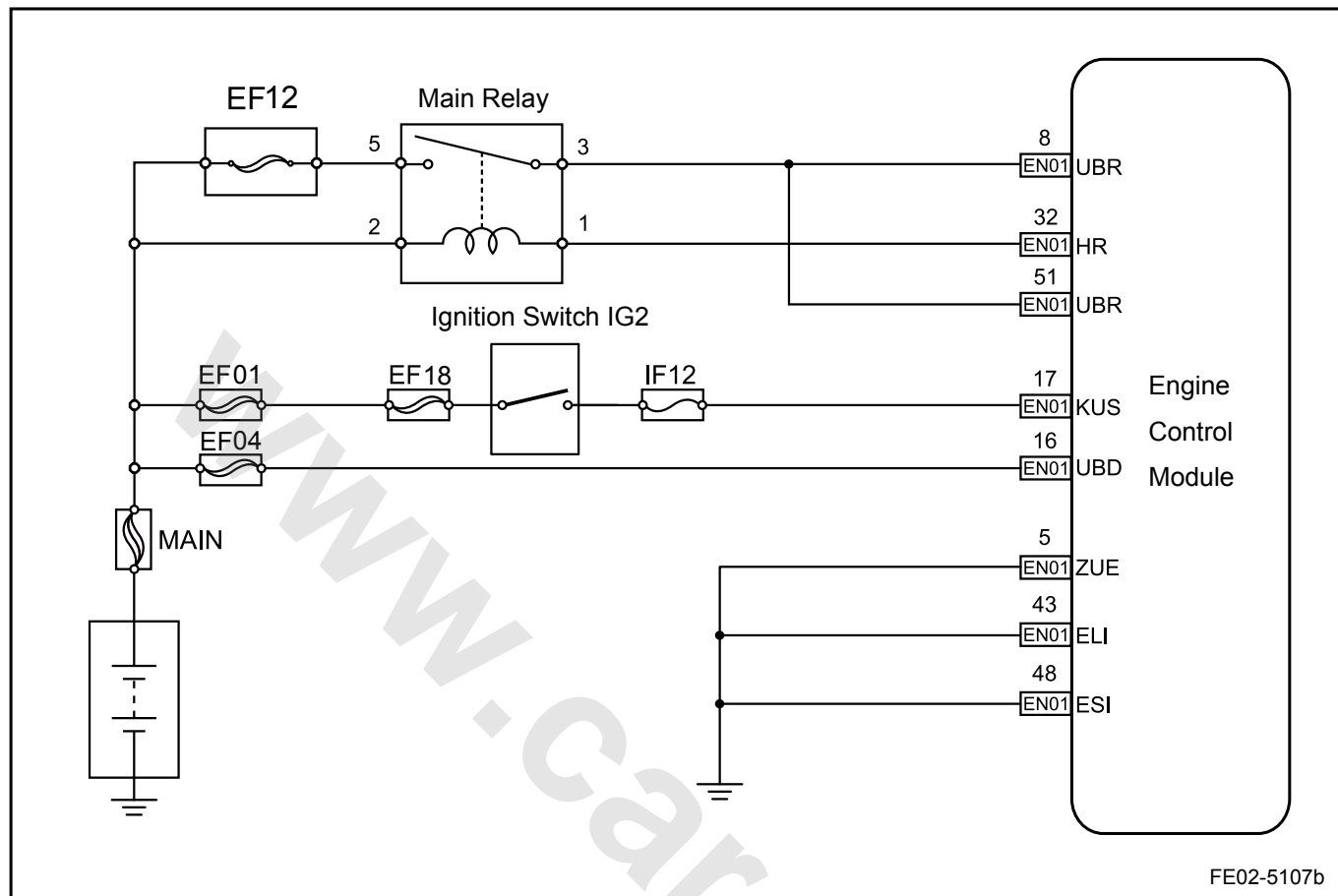
- Battery power passes through ECM KAPWR fuse 10 A to ECM harness connector EN01 terminal No.16.
- When the ignition switch is turned to "ON" position, battery power passes through the ignition switch wiring harness connector IP23 terminal No.6, to ECM fuse 10 A and finally to ECM harness connector EN01 terminal No.17.
- When ECM detects that ECM harness connector EN01 terminal No.17 has battery voltage, ECM controls EN01 terminal No.32 connected to internal ground. Because EN01 terminal No.32 is connected to the main relay terminal No.1, the main relay pulls in.

After the main relay pulls in, the battery power passes through the main relay terminal No.3 to ECM harness connector EN01 terminals No.8 and 51.

#### 2. Conditions For Setting DTC and The Fault Location:

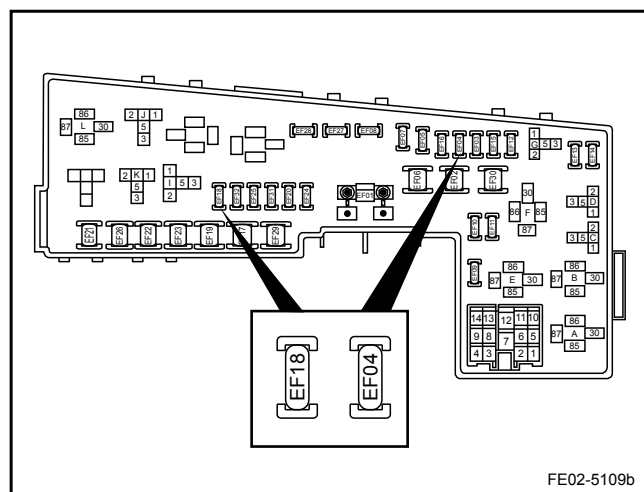
DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0560	System check	Battery voltage is lower than 2.5 V.	1. ECM Power Supply Circuit 2. Generator 3. ECM
P0562	Lower Than the Lower Limit	1. Battery voltage is lower than 10.02 V. 2. Start time is longer than 180 s.	
P0563	Battery Voltage ADC Value	1. Battery voltage is higher than 17.02 V. 2. Vehicle speed is greater than 25 km/h. 3. Start time is longer than 180 s.	

## 3. Schematic:



## 4. Diagnostic Steps:

Step 1	Check ECM fuses EF04 and EF18.
--------	--------------------------------



- Turn the ignition switch to "OFF" position.
- Remove fuses EF04, EF18 from the I/P fuse block.
- Use multimeter to measure whether there is conduction between the two terminals.

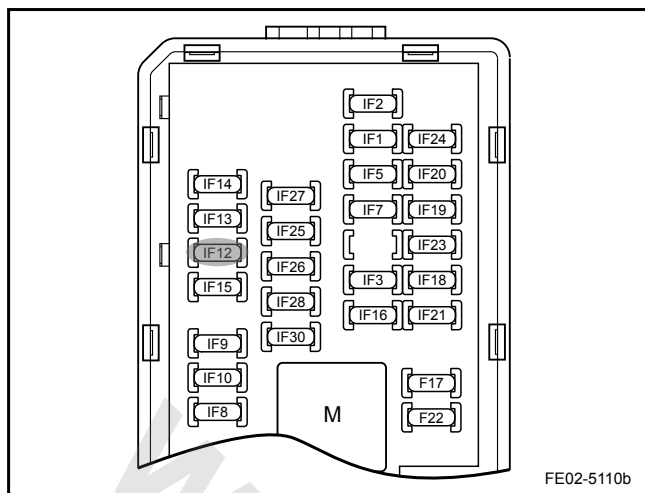
Conducted?

No

Check whether there are short circuits.  
Replace the fuses.

Yes

Step 2	Check I/P fuse block ECM fuse IF12.
--------	-------------------------------------



- Turn the ignition switch to "OFF" position.
- Remove IF12 from the I/P fuse block.
- Use multimeter to measure whether there is conduction between the two terminals.

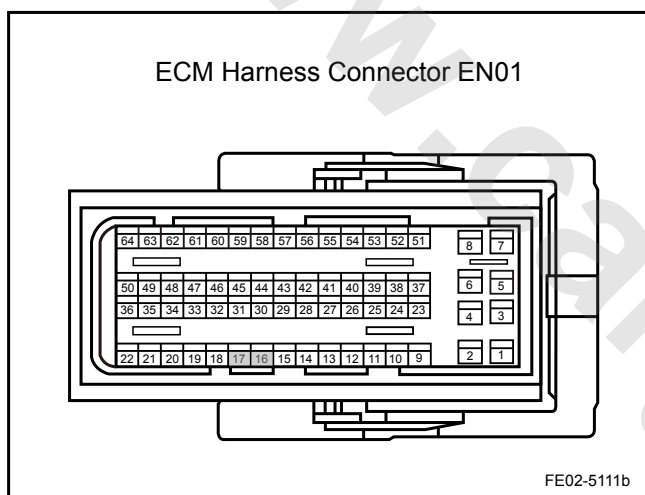
Conducted?

No

Check whether there are short circuits.  
Replace the fuses.

Yes

Step 3 Check ECM power supply voltage.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Turn the ignition switch to "ON" position.
- Measure voltage between ECM harness connector EN01 terminal No.16 and a reliable ground.
- Measure voltage between ECM harness connector EN01 terminal No.17 and a reliable ground.

Standard Voltage: 11-14 V

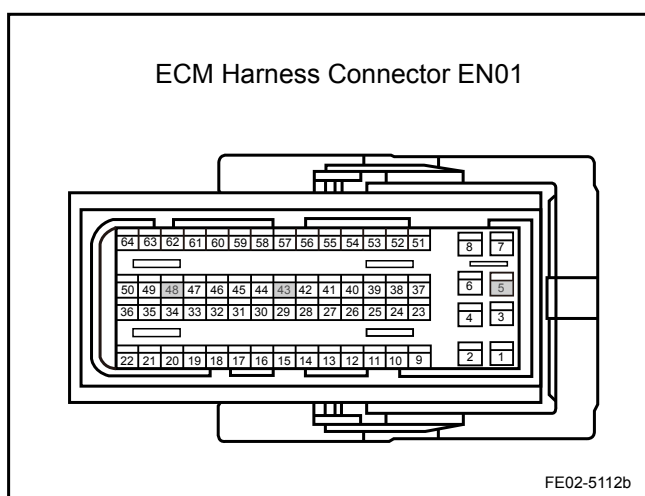
Voltage normal?

No

Go to step 5

Yes

Step 4 Check ECM ground circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Measure resistance between ECM harness connector EN01 terminal No.5 and a reliable ground.
- Measure resistance between ECM harness connector EN01 terminal No.43 and a reliable ground.
- Measure resistance between ECM harness connector EN01 terminal No.48 and a reliable ground.

Standard Resistance: Less than 1  $\Omega$ 

Resistance normal?

No

ECM ground circuit is faulty. Repair the faulty part.

Yes

Step 5 Check charging system.

(a) Check the battery voltage.

Standard Voltage: 11-14 V

(b) Check the generator charging voltage.

Standard Resistance: 11.5-14.5 V

Normal?

No

Repair the faulty part.

Yes

Go to step 8

Step 6 Check EF04 fuse to ECM circuit.

(a) Turn the ignition switch to "OFF" position.

(b) Disconnect ECM harness connector EN01.

(c) Measure continuity between ECM harness connector EN01 terminal No.16 and the fuse No.EF04.

(d) Measure resistance between ECM harness connector EN01 terminal No.16 and A reliable ground.

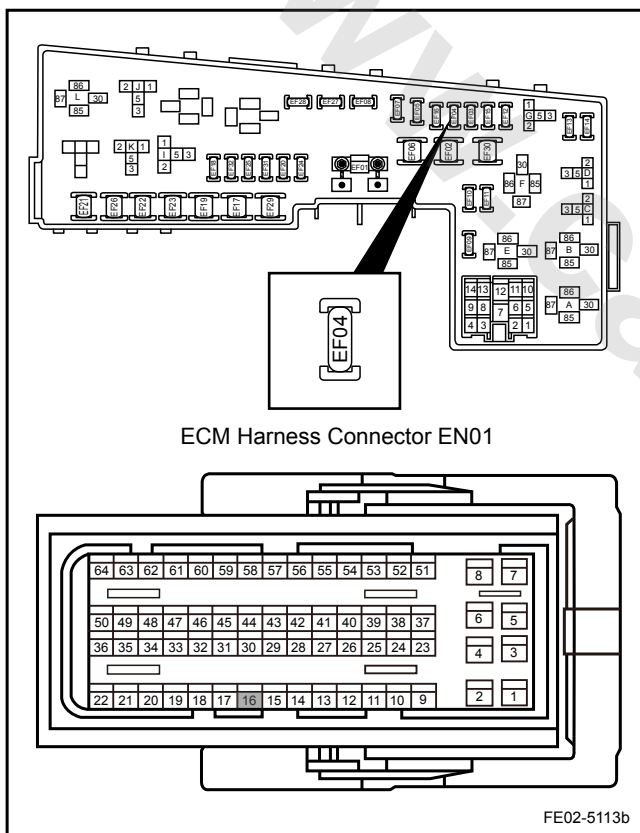
Standard Value:

Test Items	Specified Value
Continuity Between EN01 (16) and EF04	Conducted
Resistance Between EN01 (16) and a Reliable Ground	10 kΩ or higher

Normal?

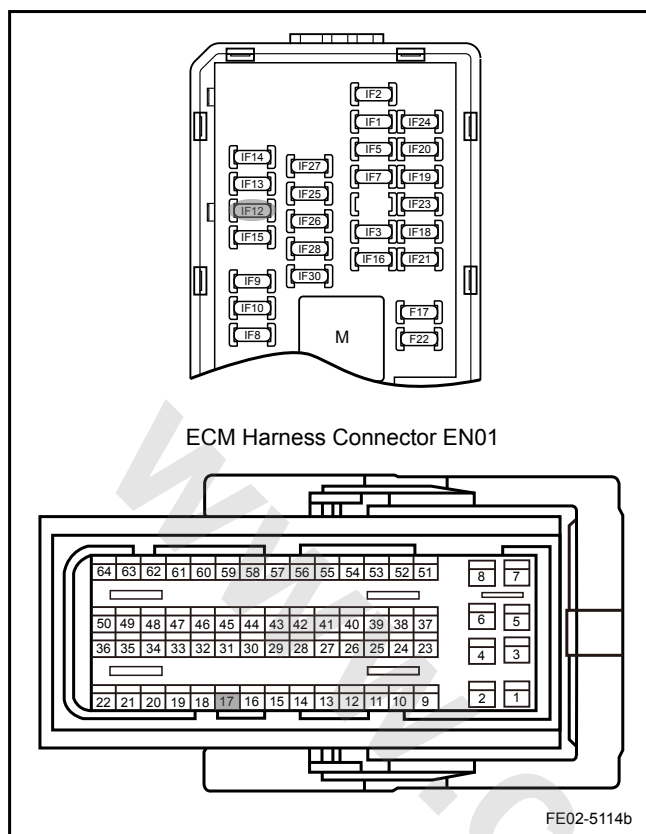
No

The wiring harness is faulty. Repair or replace the wiring harness.



Yes

Step 7 Check circuit between fuse IF12 and ECM.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Measure continuity between ECM harness connector EN01 terminal No.17 and fuse IF12.
- Measure resistance between ECM harness connector EN01 terminal No.17 and A reliable ground.

Standard Value:

Test Items	specified value
Continuity Between EN01 (17) and IF12	turn
Resistance Between EN01 (17) and a Reliable Ground	10 kΩ or higher

Normal?

No

The wiring harness is faulty. Repair or replace the wiring harness.

Yes

Step 8 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 9 Replace ECM.

### 2.2.7.38 DTC P0602

1. DTC Descriptor:

DTC	P0602	Electronic Control Module DTC Codes Error
-----	-------	---

ECM Internal Process Errors

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0602	ECM Internal Monitoring	---	ECM

## 4. Diagnostic Steps:

Step 1	Check whether there is control system DTC code other than DTC P0602.
--------	--

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC P0602	Yes
DTC Codes Other Than DTC P0602	No

No

Refer to [2.2.7.11 DTC Code Index](#)

Yes

Step 2	Replace ECM.
--------	--------------

## 2.2.7.39 DTC P0627 P0628 P0629

## 1. DTC Descriptor:

DTC	P0627	Fuel Pump Relay Control Circuit Open
DTC	P0628	Fuel Pump Relay Control Circuit Short to Ground
DTC	P0629	Fuel Pump Relay Control Circuit Short to Power Supply

Fuel pump relay coil power is provided by the main relay under the control of ECM. ECM controls pump relay terminal No.1 to the internal ground by ECM harness connector EN01 terminal No.61 and so the fuel pump relay pulls in. ECM has an internal driver circuit that controls relay coil ground. The driver circuit is equipped with a feedback circuit to ECM. ECM monitors the feedback voltage control circuit to determine whether there is an open circuit, a circuit short to ground or power supply.

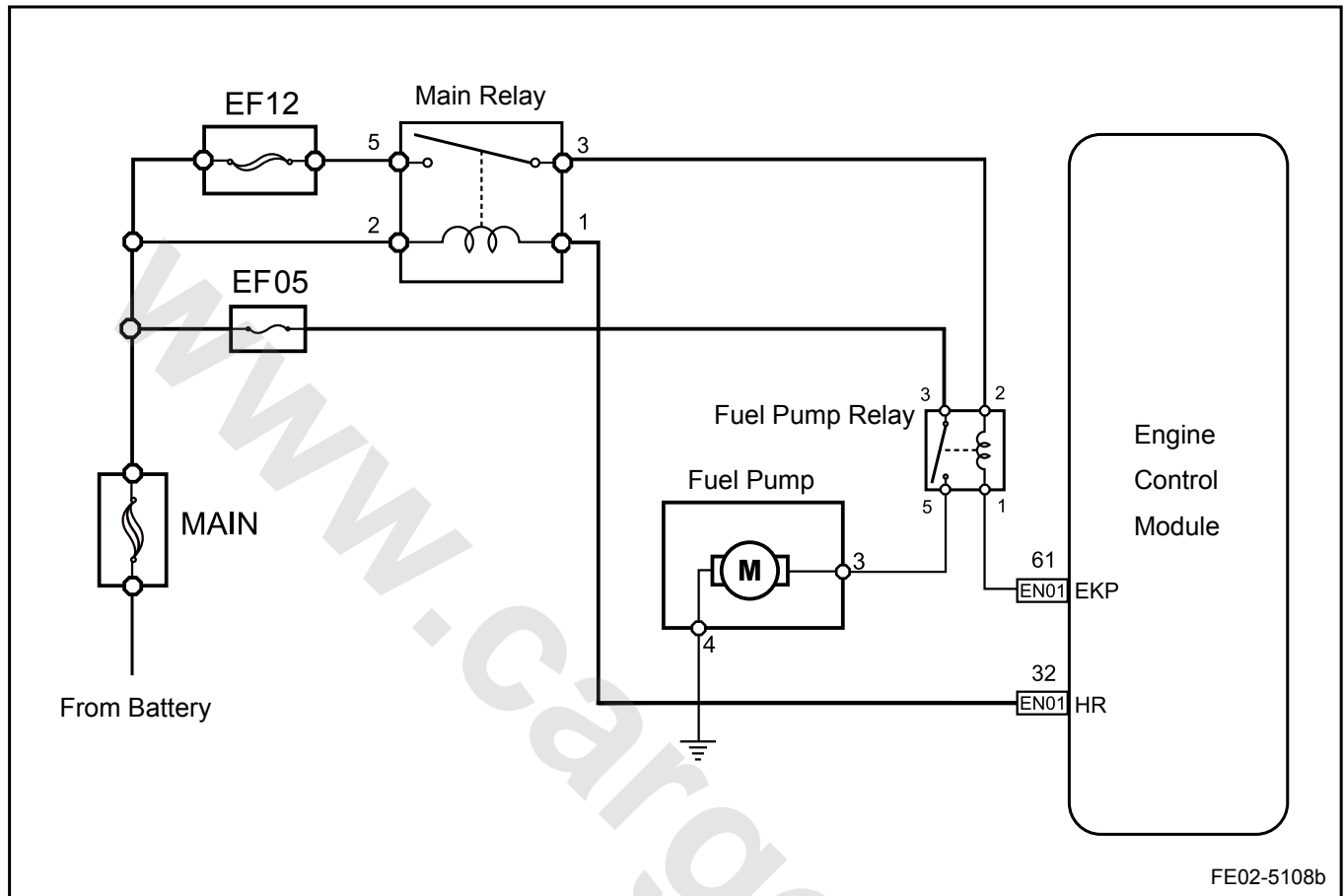
## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0627	Hardware Circuit Checks	Circuit Open.	1. Relay Circuit
P0628		Circuit Short to Ground.	2. Relay 3. ECM



P0629		Circuit Short to Power Supply.	
-------	--	--------------------------------	--

## 3. Schematic:



## 4. Diagnostic Steps:

Check fuel pump relay circuit. Refer to [2.3.7.3 Fuel Pump Inoperative](#).

## 2.2.7.40 DTC P0645-P0647

## 1. DTC Descriptor:

DTC	P0645	A/C Compressor Relay Control Circuit Open
DTC	P0646	A/C Compressor Relay Control Circuit Short to Ground
DTC	P0647	A/C Compressor Relay Control Circuit Short to Power Supply

The Air-Conditioning compressor relay working voltage is provided by the main relay controlled by ECM. ECM controls air-conditioning compressor relay internal ground by ECM harness connector EN01 terminal No.60, so relay pulls in. ECM has a driver circuit that controls relay coil ground. The driver circuit is equipped with a feedback circuit to ECM. ECM monitors the feedback voltage control circuit to determine whether there is an open circuit or a circuit short to ground or power supply.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0645 P0646 P0647	Hardware Circuit Checks	1. Circuit Open. 2. Circuit Short to Ground. 3. Circuit Short to Power Supply.	1. Air-Conditioning Relay 2. ECM

## 3. Schematic:

Refer to [8.2.6.2 Air-conditioning System Circuit Schematic](#).

## 4. Diagnostic Steps:

Refer to [8.2.7.6 Air-conditioning Clutch Inoperative](#).

## 2.2.7.41 DTC P0650

## 1. DTC Descriptor:

DTC	P0650	MIL Lamp Driver Malfunction
-----	-------	-----------------------------

CAN network is used in vehicles. Fault lamps are controlled via the instrument panel circuit. When ECM DTC code is set to light fault lamps, ECM sends a "Light the fault lamp" signal through the CAN network the instrument panel. The instrument panel internal circuit light the fault lamp indicating engine fault after receiving the instruction from ECM.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0650	Hardware Circuit Checks	1. Circuit Open. 2. Circuit Short to Ground. 3. Circuit Short to Power Supply.	1. Instrument Panel 2. CAN Bus

## 3. Diagnostic Steps:

Refer to [2.2.7.44 Engine Fault Lamp \(MIL\)/Check Vehicle Lamp Malfunction](#).

## 2.2.7.42 DTC P1610-P1614

## 1. DTC Descriptor:

DTC	P1610	Anti-theft Malfunction
DTC	P1611	Anti-theft Malfunction
DTC	P1612	Anti-theft Malfunction
DTC	P1613	Anti-theft Malfunction

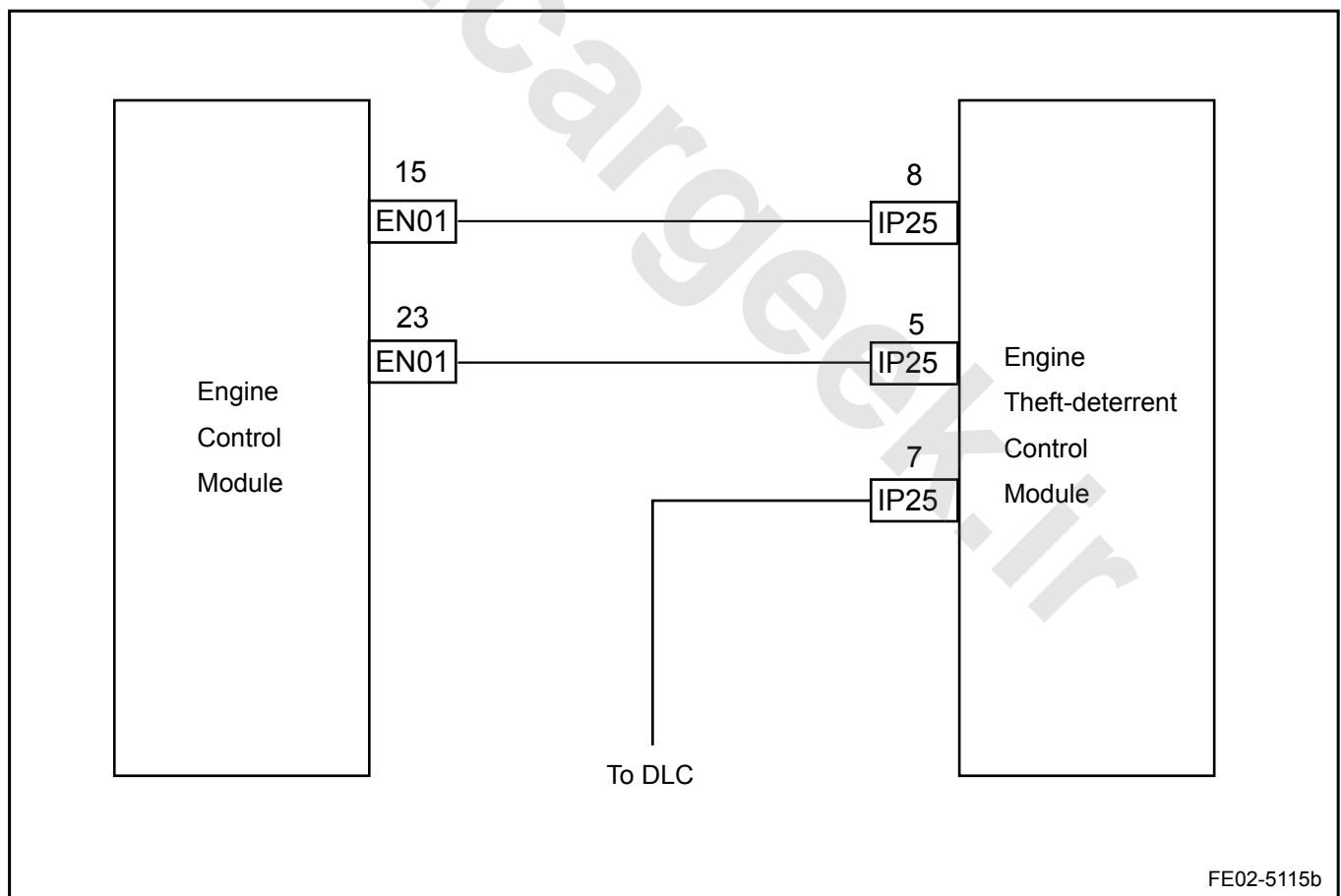
DTC	P1614	Anti-theft Malfunction
-----	-------	------------------------

ECM communicates with the anti-theft control module via ECM harness connector EN01 terminal No.15 W-LIN and terminal No.23 R-LIN-line. For working details. Refer to.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P1610	Security keys and security codes are not programmed.	Turn the ignition switch to "ON".	1. Ignition Key 2. Ignition Key Coil 3. ECM 4. Chip Anti-theft Module 5. Data circuit (W-LIN circuit, R-LIN-line)
P1611	Security Code Error		
P1612	Security Request Not Accepted		
P1613	Security Code Request Services Not Accepted		
P1614	Anti-theft Transceiver Fails to Respond, Damaged or Malfunction		

## 3. Schematic:



## 4. Diagnostic Steps:

Refer to [2.5.7.12 Engine Anti-theft Warning Lamp Flashing, Vehicle Can Not Start.](#)

## 5. Repair Instructions:

Repair the anti-theft system. Refer to [2.5.7 Diagnostic Information and Procedures](#).

## 2.2.7.43 DTC P1523 U0001 U0121 U0140 U0151

## 1. DTC Descriptor:

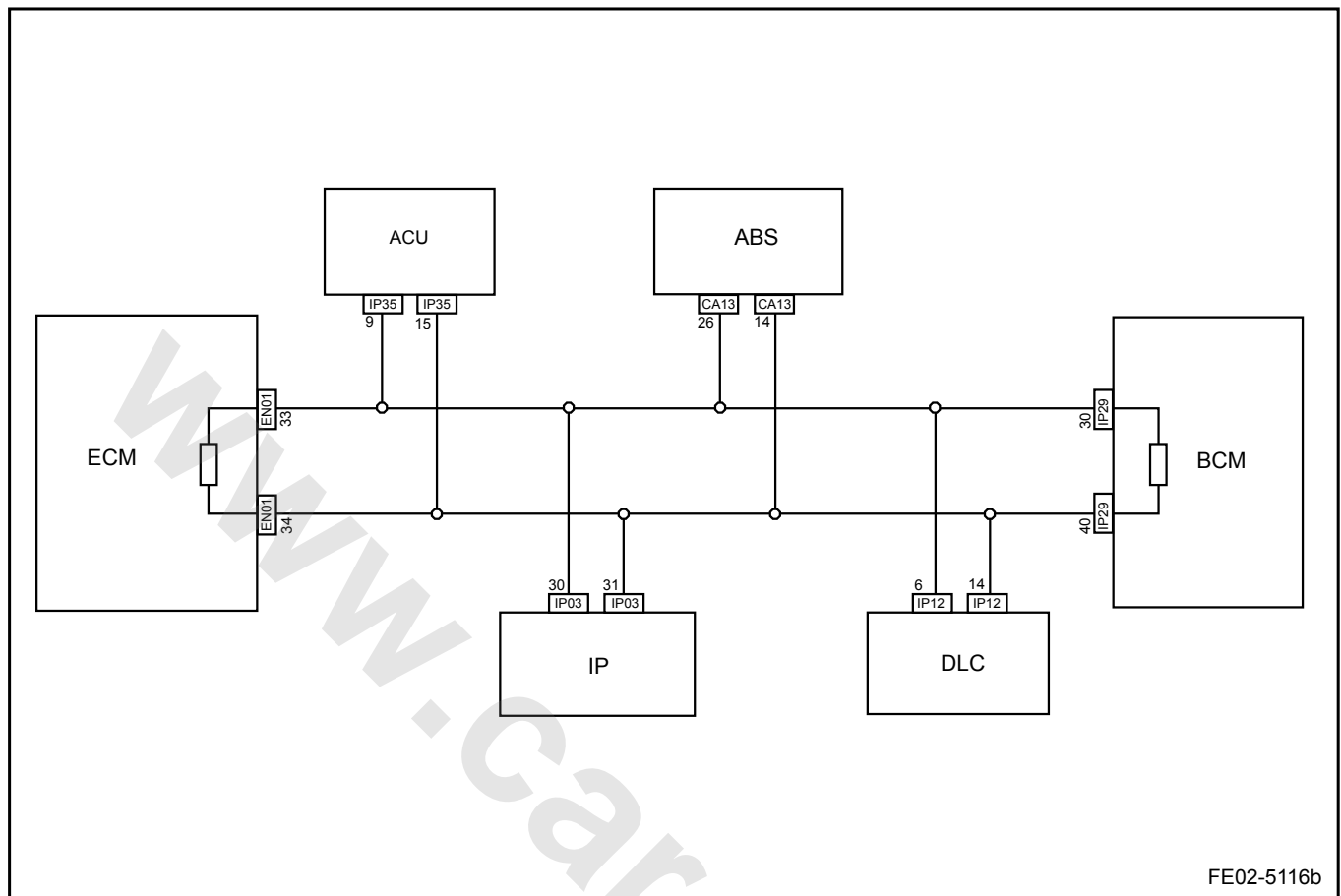
DTC	P1523	airbag control module to ECU Signals Interrupted or Incorrect
DTC	U0001	CAN High-Speed Line Fault
DTC	U0121	Communications with ABS Controller Interrupted
DTC	U0140	Communications with BCM Controller Interrupted
DTC	U0151	Communications with airbag control module Controller Interrupted

In this vehicle, anti-lock brake system control module, airbag control module, body control module, engine control module and the instrument cluster are connected to the CAN bus, consisting a linear connection. The terminal resistors are set within the BCM and ECM.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P1523 U0001 U0121 U0140 U0151	Hardware Circuit Checks	Communication signal loss, signal logic error.	1. Airbag control module, BCM (Body Control Module), ECM (Engine Control Module) 2. CAN Bus

## 3. Schematic:



## 4. Diagnostic Steps:

Refer to [11.17.7.6 CAN Bus Signal Diagnostic](#).

## 2.2.7.44 Engine Fault Lamp (MIL)/Check Vehicle Lamp Malfunction

## Description:

CAN network is used in vehicles. Fault lamps are controlled via the instrument panel circuit. When ECM DTC code is set to light fault lamps, ECM sends a "Light the fault lamp" signal through the CAN network the instrument panel. The instrument panel internal circuit light the fault lamp indicating engine fault after receiving the instruction from ECM.

## Diagnostic Steps:

Step 1	Check other fault lamps in the instrument cluster.
<p>(a) Turn the ignition switch to "ON" position.</p> <p>Other fault lamps normal?</p> <p>Yes → Go to step 3</p> <p>No →</p>	
Step 2	Repair instrument cluster circuits.

(a) Repair instrument cluster power supply circuit. Refer to [11.7.6.7 DTC U129C U129D](#).

- (b) Repair instrument cluster ground circuit. Refer to [11.7.6.7 DTC U129C U129D](#).

Fault solved?

Yes

System normal

No

Step 3 Check the instrument DTC codes.

- (a) Connect scan tool.  
(b) Turn the ignition switch to "ON" position.  
(c) Scan instrument DTC.

Is there DTC U1430?

Yes

Go to step 5

No

Step 4 Test the fault indicator lamp.

- (a) Connect scan tool.  
(b) Turn the ignition switch to "ON" position.  
(c) Select on the scan tool "Fault indicator lamp test" menu within the "Function Test".

Is the fault indicator lamp lit?

Yes

Go to step 6

No

Step 5 Replace the instrument cluster.

- (a) Turn off the ignition switch and remove the ignition key.  
(b) Disconnect the battery negative cable.  
(c) Replace the instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#).

Fault solved?

Yes

System normal

No

Step 6 Repair the instrument cluster and ECM network communication.

- (a) Repair the instrument cluster and ECM network communication. Refer to [11.17.7.4 CAN Bus Integrity Diagnosis](#).

Fault solved?

Yes

System normal

No

Step 7	Repair ECM power supply circuit.
--------	----------------------------------

- (a) Repair ECM power supply circuit. Refer to [2.2.7.37 DTC P0560 P0562 P0563](#).

Fault solved?

Yes

System normal

No

Step 8	Replace ECM.
--------	--------------

- (a) Connect scan tool.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Scan ECM DTC codes, identify ECM fault. If necessary, Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).  
 (d) Clear DTC code.

Next

Step 9	System normal.
--------	----------------

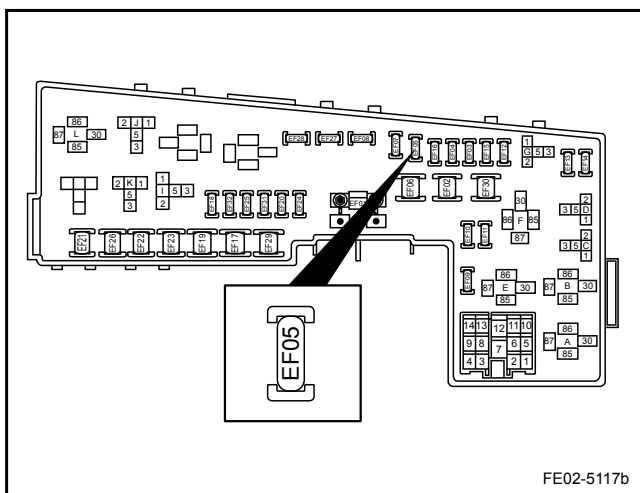
### 2.2.7.45 Crankshaft rotates, but the engine can not start.

#### Note

Before carry out this step, make sure the engine oil is comply with the manufacturer requirements, the fuel tank has sufficient fuel and battery has enough power for starting engine. Observe the scan tool data list, analyze the accuracy of the data, as these will facilitate diagnostic.

#### Diagnostic Steps:

Step 1	Check fuel pump fuse.
--------	-----------------------



- (a) Check whether the fuel pump fuse is faulty.  
 (b) Repair fuel pump fuse power circuit.  
 (c) If necessary, replace the faulty fuel pump fuse.

Fault solved?

Yes

System normal

No

Step 2	Scan ECM for DTC codes.
--------	-------------------------

- (a) Connect scan tool.
  - (b) Turn the ignition switch to "ON" position.
  - (c) Scan ECM for DTC codes.
  - (d) Check DTC P0627 and any fuel system related DTC codes and repair the faulty part. Refer to [2.2.7.11 DTC Code Index](#).
  - (e) Clear ECM DTC codes.
- Start the engine, fault solved?

Yes

System normal

No

Step 3	Check fuel pump relay.
--------	------------------------

- (a) Connect scan tool.
  - (b) Turn the ignition switch to "ON" position.
  - (c) Select scan tool "Fuel Pump Relay" in the "Action Test" to drive the fuel pump relay.
- Is fuel pump relay working properly?

Yes

Go to step 6

No

Step 4	Replace the fuel pump relay.
--------	------------------------------

- (a) Refer to "Fuel System" in the [2.3.7.3 Fuel Pump Inoperative](#).
  - (b) Replace the fuel pump relay.
  - (c) Inspect fuel pump relay circuits and repair the faulty part.
- Start the engine, fault solved?

Yes

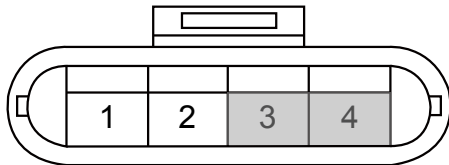
System normal

No

Step 5	Check the fuel pump circuit.
--------	------------------------------



Fuel Pump Harness Connector SO29



FE02-5119b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect fuel pump harness connector SO29.
- (c) Connect scan tool.
- (d) Turn the ignition switch to "ON" position.
- (e) Select scan tool "Fuel Pump Relay" in the "Action Test" to drive the fuel pump relay.
- (f) Connect SO29 terminal 3 and 4 with a test lamp.

Is test lamp lit properly?

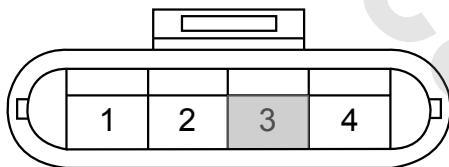
Yes

Go to step 8

No

Step 6 Repair the fuel pump circuit.

Fuel Pump Harness Connector SO29



FE02-5120b

- (a) Turn the ignition switch to "ON" position.
- (b) Check the fuel pump working circuits. Repair the fuel pump relay open circuit fault between SO29 terminal No.3 and No. 5.

Start the engine, fault solved?

Yes

System normal

No

Step 7 Check the fuel pressure.

- (a) Turn the ignition switch to "OFF" position.
- (b) Install fuel pressure gage and connect scan tool.
- (c) Turn the ignition switch to "ON" position.
- (d) On the scan tool, select scan tool "Fuel Pump Relay" in the "Action Test" to drive the fuel pump relay.

Standard Fuel Pressure Value: 400 kPa

Is fuel pressure normal?

Yes

Go to step 9

No

Step 8 Replace the fuel pump.

- (a) Turn off the ignition switch and remove the ignition key.

- (b) Replace fuel pump assembly. Refer to [2.3.8.3 Fuel Pump Assembly Replacement](#).

Start the engine, fault solved?

Yes

System normal

No

Step 9 Inspect (repair) fuel injectors.

- (a) Inspect (repair) fuel injectors. Refer to the DTC code [2.2.7.24 DTC P0201 P0261 P0262](#) in the repair procedures. If necessary, replace the faulty fuel injectors.

Start the engine, fault solved?

Yes

System normal

No

Step 10 Check the ignition coil.

- (a) Turn the ignition switch to "OFF" position.  
 (b) Remove the cylinder ignition wire. Connect a new wire connect the spark plug to a reliable ground.  
 (c) Remove the fuel pump fuse.  
 (d) Start the engine.

Is spark plug ignition normal?

Yes

Go to step 13

No

Step 11 Replace the ignition coil.

- (a) Turn off the ignition switch and remove the ignition key.  
 (b) Replace the ignition coil. Refer to [2.10.8.3 Ignition Coil Replacement](#).

Start the engine, fault solved?

Yes

System normal

No

Step 12 Check crankshaft position sensor and circuit.

- (a) Check crankshaft position sensor. Refer to [2.2.7.29 DTC P0321 P0322](#).  
 (b) Measure the crankshaft position sensor resistance with a multimeter.  
 Standard Resistance: 870  $\Omega$   
 (c) Inspect the sensor circuit. Repair the faulty part. If necessary, replace the crankshaft position sensor. Refer to [2.10.8.2 Crankshaft Position Sensor Replacement](#).

Start the engine, fault solved?

		Yes	System normal
		No	
Step 13	Test the cylinder pressure.		
<p>(a) Test the cylinder pressure. Refer to the "Engine Mechanical System" in the.</p> <p>Standard Cylinder Pressure: 800 kPa</p> <p>All cylinders compression pressure equal to or higher than the specified value?</p>			
		Yes	Go to step 16
		No	
Step 14	Timing Chain Inspection.		
<p>(a) Turn off the ignition switch and remove the ignition key.</p> <p>(b) For timing chain inspection. Refer to "Engine Mechanical System" in the <a href="#">2.6.8.11 Timing Chain Inspection</a>.</p> <p>Is timing chain positioned properly?</p>			
		Yes	Go to step 16
		No	
Step 15	Install the timing chain.		
<p>(a) Turn off the ignition switch and remove the ignition key.</p> <p>(b) Reinstall the timing chain. Refer to "Engine Mechanical System" in the <a href="#">2.6.8.10 Timing Chain Replacement</a>.</p> <p>Start the engine, fault solved?</p>			
		Yes	System normal
		No	
Step 16	Check mechanical parts inside the engine.		
<p>(a) Remove the engine.</p> <p>(b) Check the mechanical parts inside the engine. If necessary, repair the damaged parts inside the engine.</p> <p>(c) identify the damaged parts repair has been completed.</p>			
		Next	
Step 17	Diagnostic completed.		

### 2.2.7.46 Idle Speed Reading Procedure

Must carry out this procedure if any of the following occurs:

- Disconnect battery cables.

- Engine control module is disconnected or replaced.
- The fuse between the ignition voltage IGN1 or battery positive voltage and the engine control module is removed.
- The idle air control valve has been removed or replaced.
- idle air control system malfunction.

Read in procedure:

Step 1	Run the engine until the engine coolant temperature exceeds 90°C(194 °F).
Next	
Step 2	Run the engine at idle speed for 5min.
Next	
Step 3	Turn off the ignition switch.
Next	
Step 4	Read in procedure completed. Restart the engine and confirm that the engine idle speed is normal.

## 2.2.8 Removal and Installation

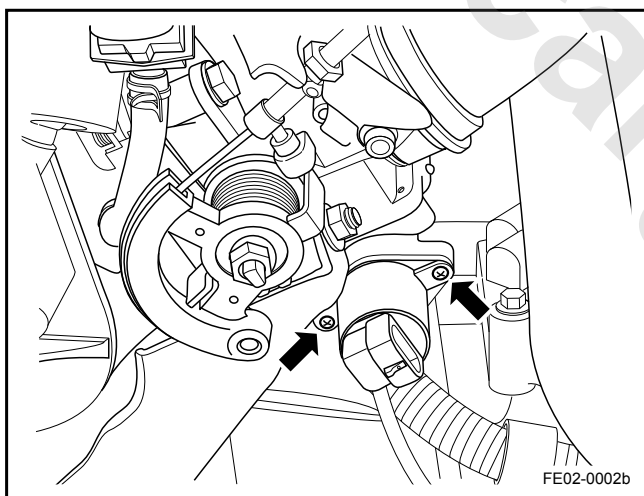
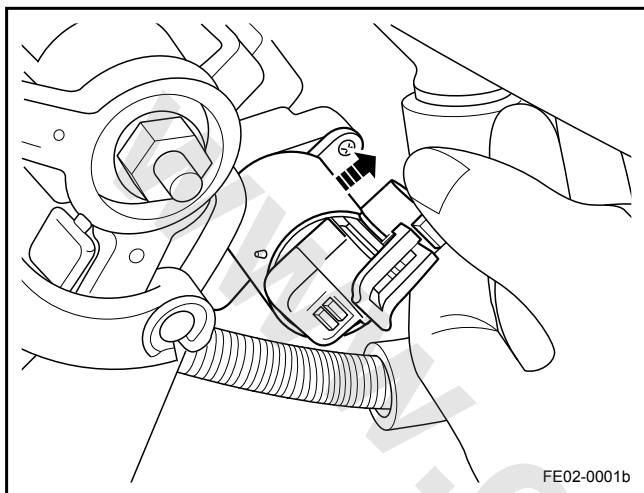
### 2.2.8.1 Idle Air Control Valve Replacement

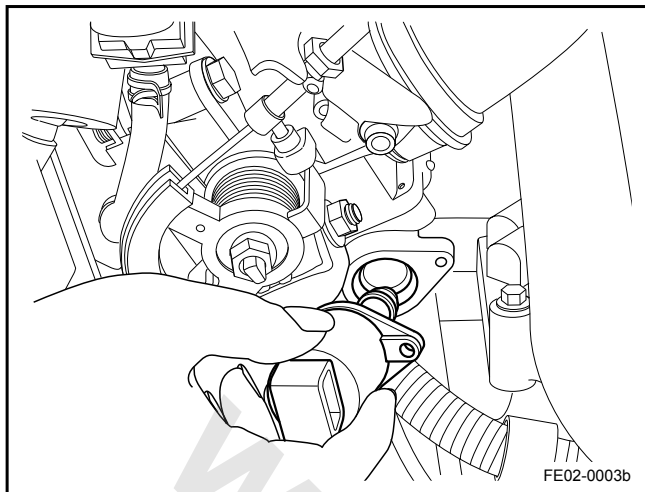
Removal Procedure:

#### Note

Refer to "Battery Disconnection Warning" in the "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect idle speed control valve wiring harness connector.
3. Remove the idle speed control valve retaining bolts from the throttle body.

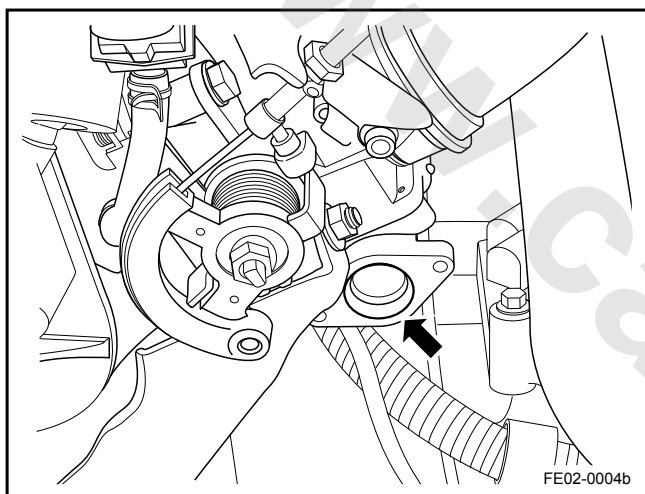




4. Remove the idle speed control valve from the throttle body.

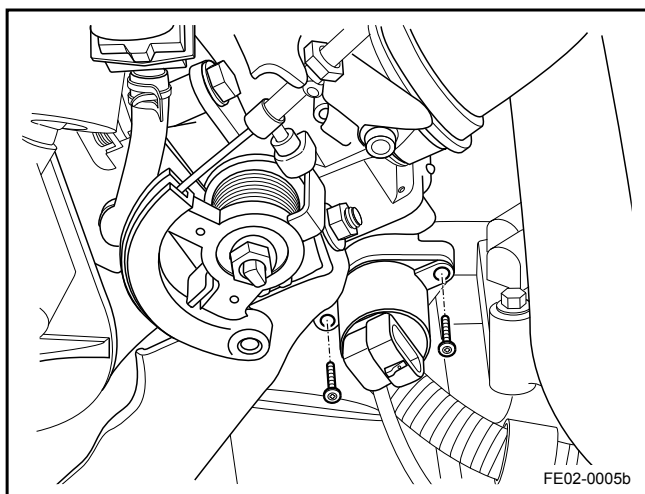
**Note**

Do not drop the idle speed control valve O-ring.



**Installation Procedure:**

1. Clean carbon residue in the throttle body idle speed control valve air bypass.

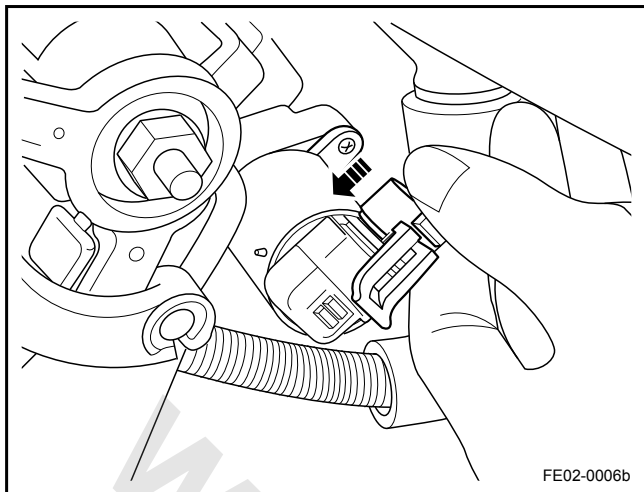


2. Install and tighten idle speed control valve retaining bolts.

**Note**

Check the idle speed control valve O-ring is installed in good conditions.

Torque: 2.5 Nm (Metric) 1.85 lb-ft (US English)



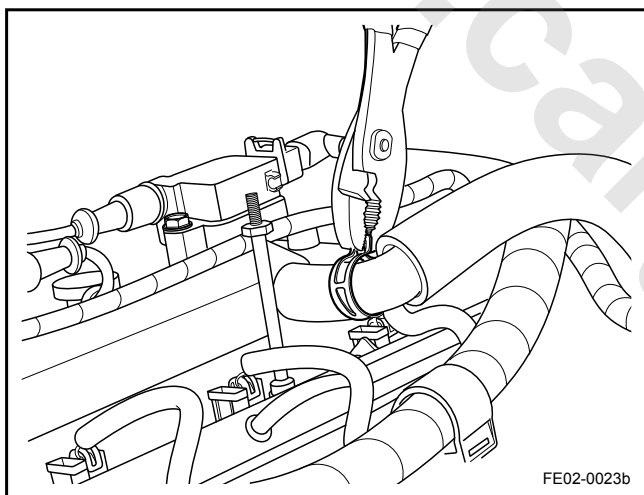
3. Connect the idle speed control valve wiring harness connector.
4. Connect the battery negative cable.

### 2.2.8.2 Fuel Injector Replacement

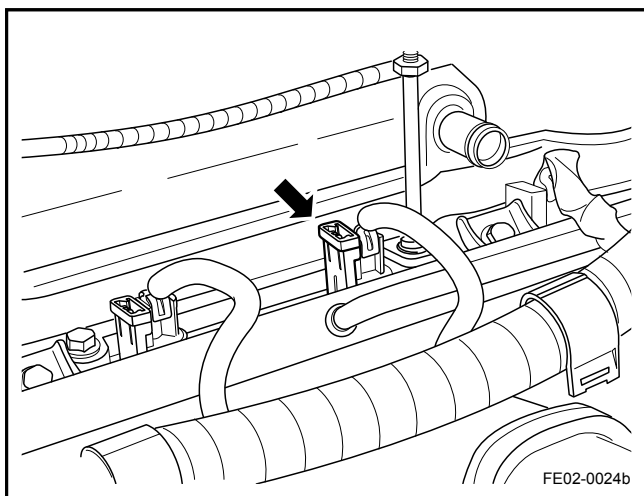
Removal Procedure:

**Warning!**

Refer to "Battery Disconnection Warning" in the "Warnings and Notices".



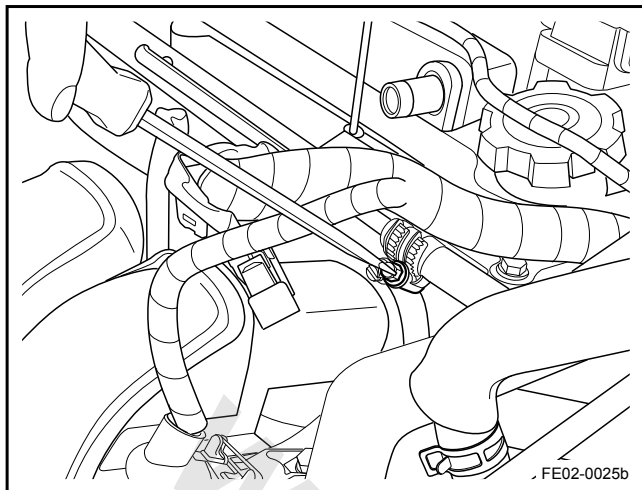
1. Release fuel system pressure. Refer to [2.3.8.1 Fuel Pressure Release Procedure](#).
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Remove the hood. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
4. Disconnect the crankcase ventilation tube.



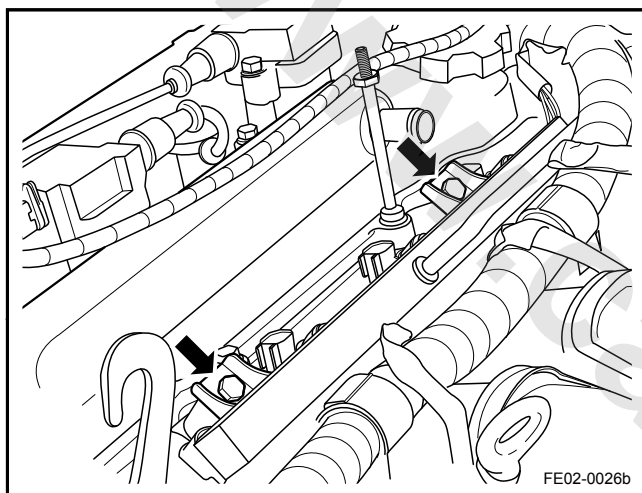
5. Disconnect the fuel injector wiring harness connector.

**Note**

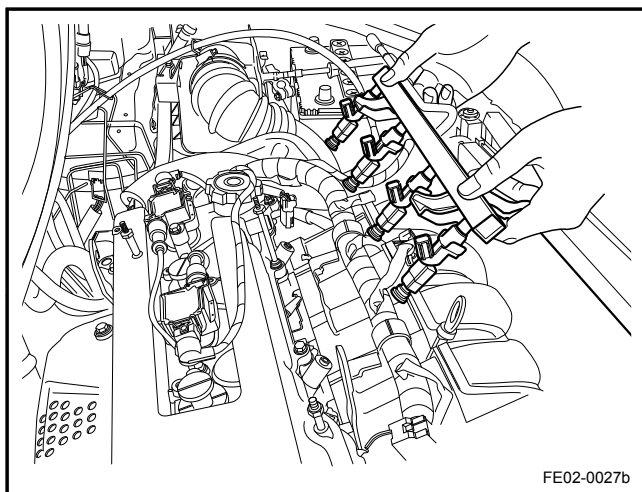
Pull up the connector gray part of the self-locking device, and then press down to Disconnect the connector.



6. Remove the fuel pipe from the fuel rail.



7. Remove the fuel rail retaining bolts.

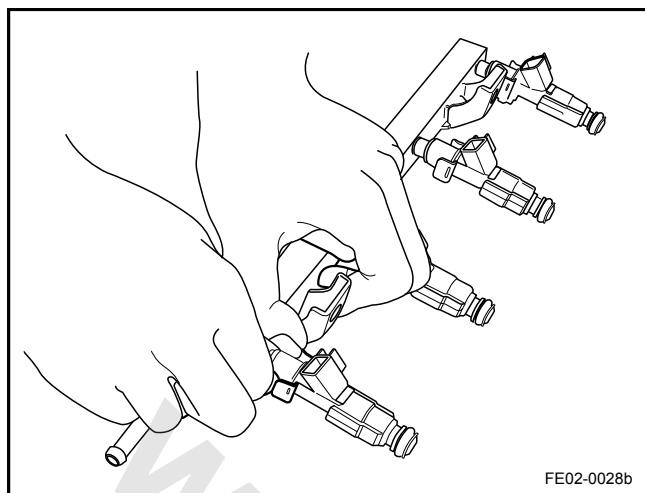


8. Remove the fuel rail and fuel injector assembly.

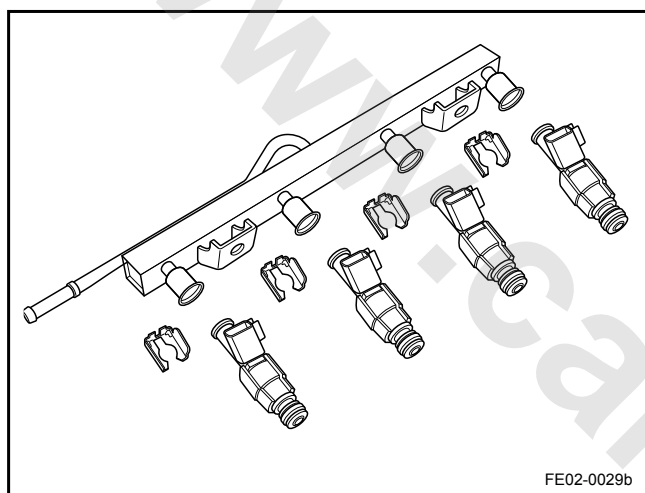
**Note**

Plug four fuel injector holes immediately after removal to prevent debris falling into the cylinder causing engine damage.

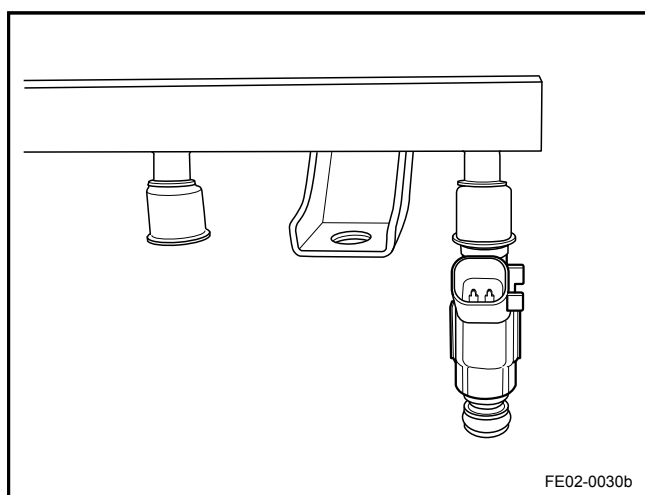




9. Remove fuel injectors retaining clips.



10. Pull fuel injectors out of the fuel rail.

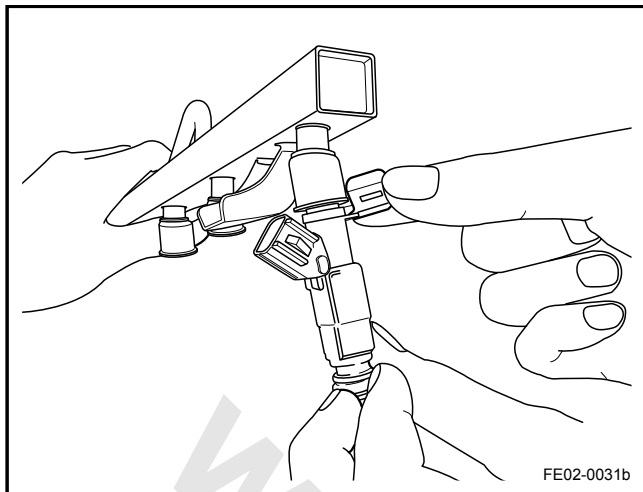


#### Installation Procedure:

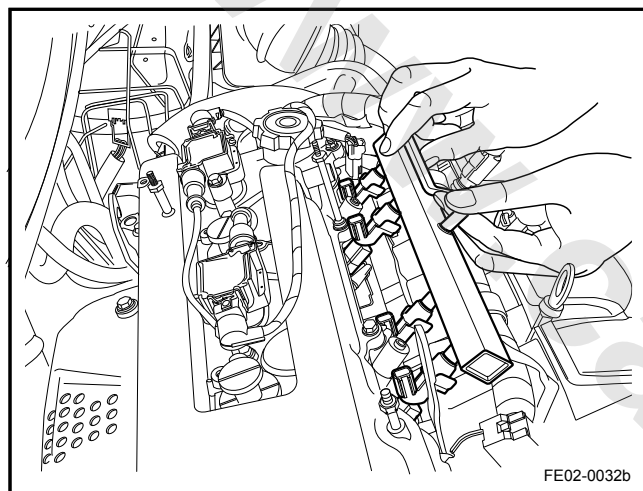
1. Apply a small amount of engine oil to lubricate the fuel injector O-ring.
2. Install the fuel injectors to the fuel rail.

#### Note

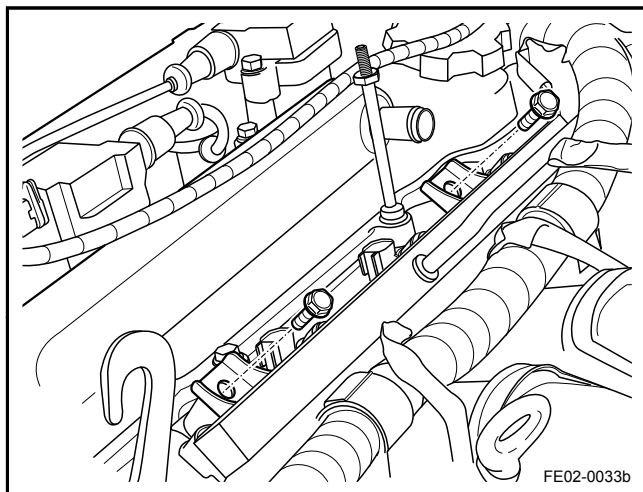
The fuel injector terminals should face outside.



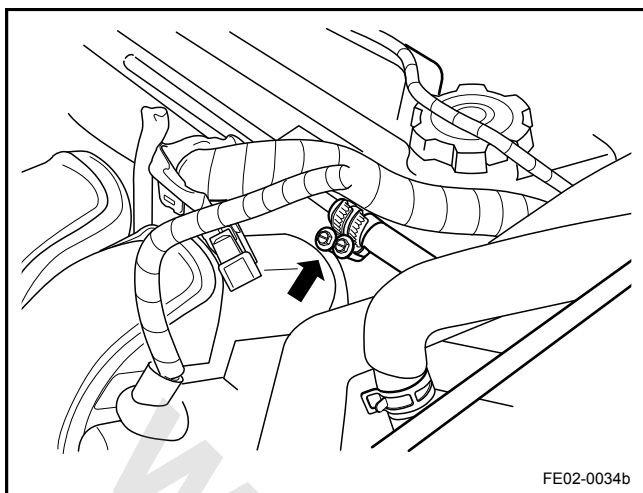
3. Install fuel injector retaining clips to ensure that the fuel injector wiring harness connector and the fuel rail mounting hole are in the same direction.



4. Install the fuel rail.



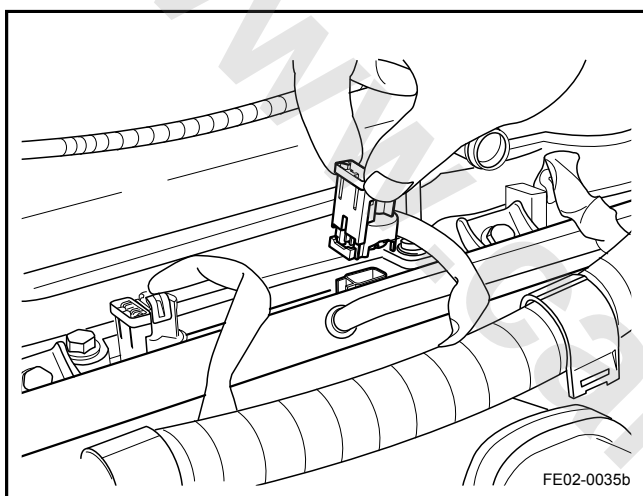
5. Install the fuel rail retaining bolts.  
Torque: 9 Nm (Metric) 6.66 lb-ft (US English)



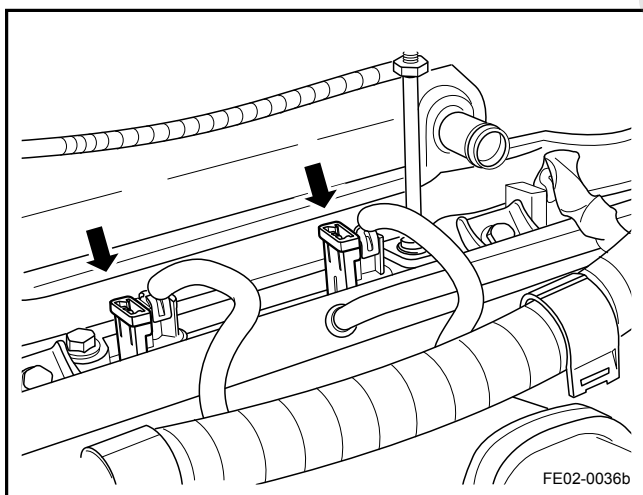
6. Connect the fuel pipe.

**Note**

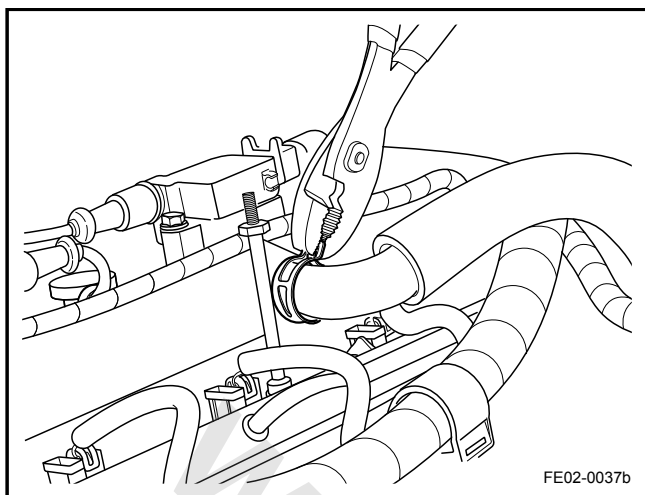
The fuel pipe must be inserted into the fuel rail after the second boss and then tightened with the clips.



7. Connect the fuel injector wiring harness connector.



8. Restore the self-locking device.



9. Install the crankcase ventilation tube.
10. Connect the battery negative cable.

#### Note

Start the engine. Check fuel and fuel injectors for fuel leaks and vacuum leaks.

11. Install the engine hood.

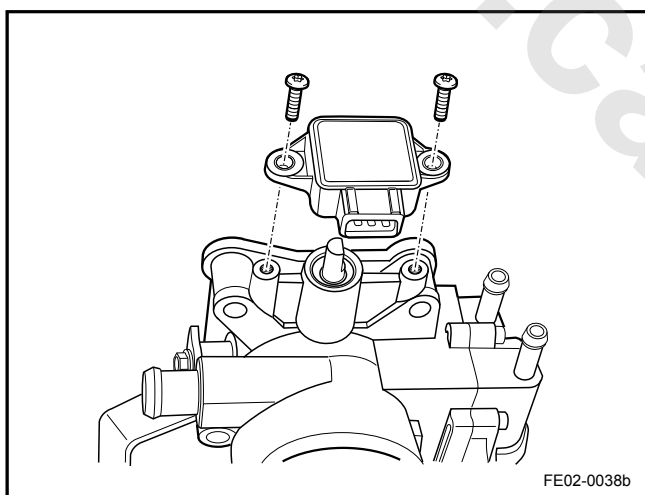
### 2.2.8.3 Throttle Position Sensor Replacement

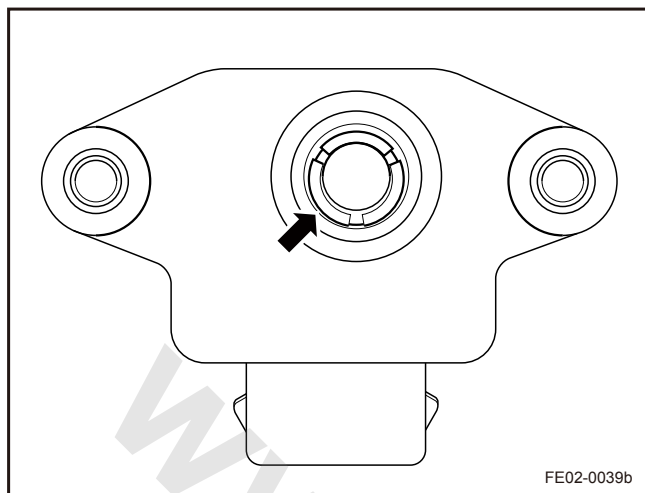
Removal Procedure:

#### Note

Refer to "Battery Disconnection Warning" in the "Warnings and Important Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the throttle body assembly. Refer to [2.6.8.5 Throttle Body Assembly Replacement](#).
3. Remove the throttle position sensor retaining bolts.



**Installation Procedure:**

1. Install and tighten the throttle position sensor retaining bolts.

**Note**

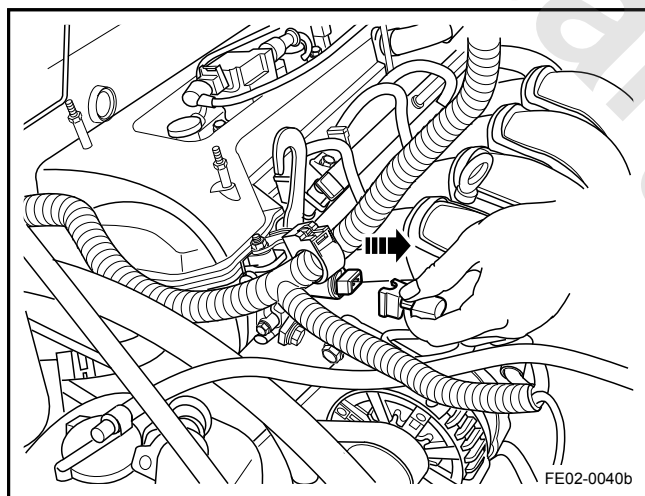
During the installation procedure align the throttle shaft groove with the sensor boss.

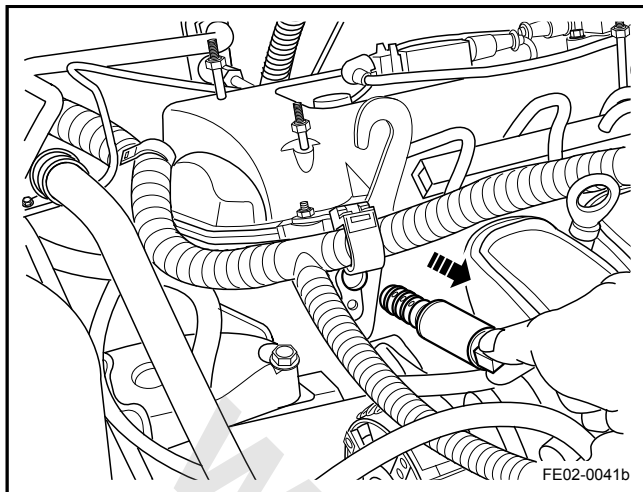
2. Install the throttle body assembly.
3. Connect the battery negative cable.

**2.2.8.4 VVT Solenoid Valve Replacement and Filter Cleaning****Removal Procedure:****Warning!**

Refer to "Battery Disconnection Warning" in the "Warnings and Important Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the hood. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
3. Disconnect VVT solenoid valve wiring harness connector.





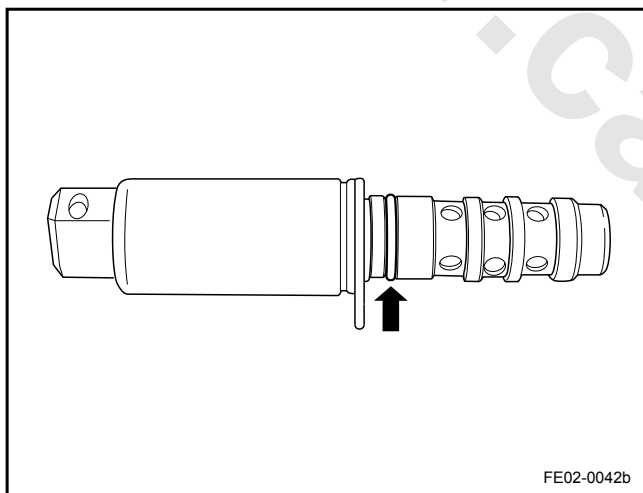
4. Remove VVT solenoid valve retaining bolts and remove the VVT solenoid valve.

#### Installation Procedure:

##### Note

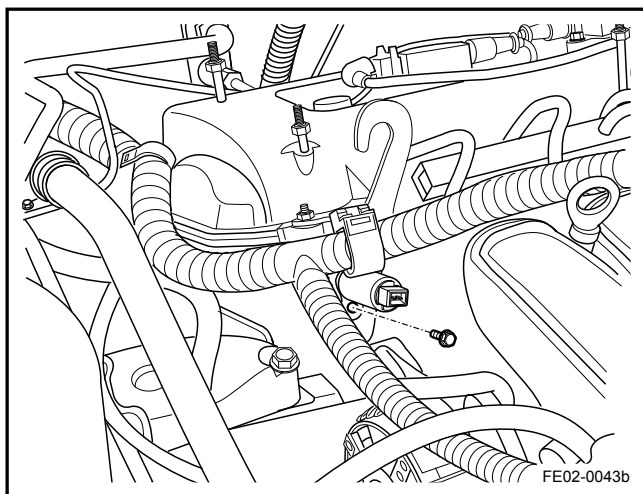
After replacing the VVT solenoid valve, you must carry out the "Clean Solenoid Valve Filter" procedure, other it cause electromagnetic valve damage.

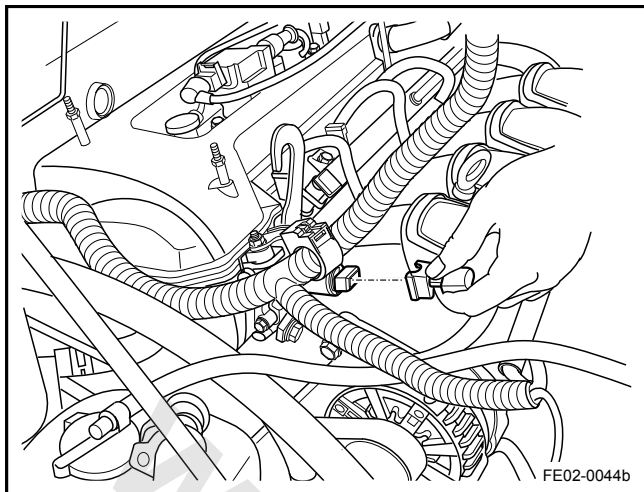
1. Make sure the new VVT solenoid valve seals are intact. Apply a small amount of engine oil on the seal.



2. Install the VVT solenoid valve and fasten the retaining bolts.

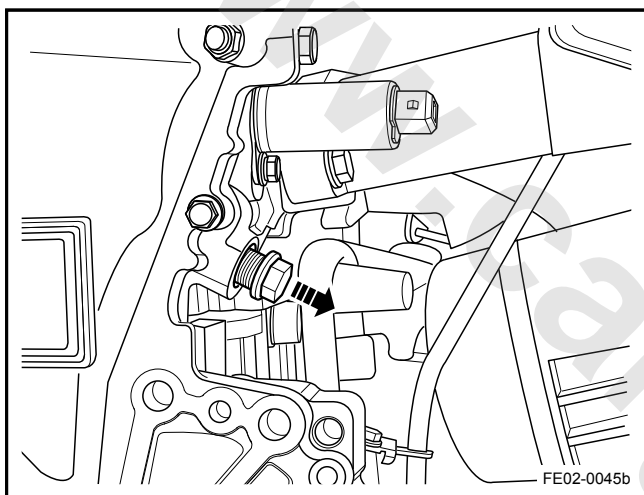
Torque: 8 Nm (Metric) 6 lb-ft (US English)



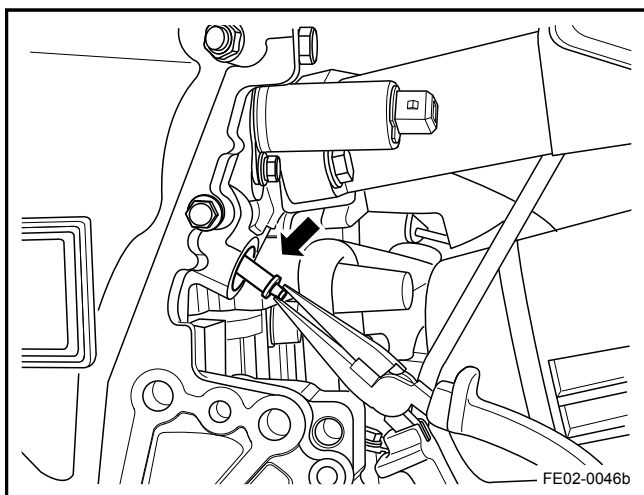


3. Connect the VVT solenoid valve wiring harness connector.

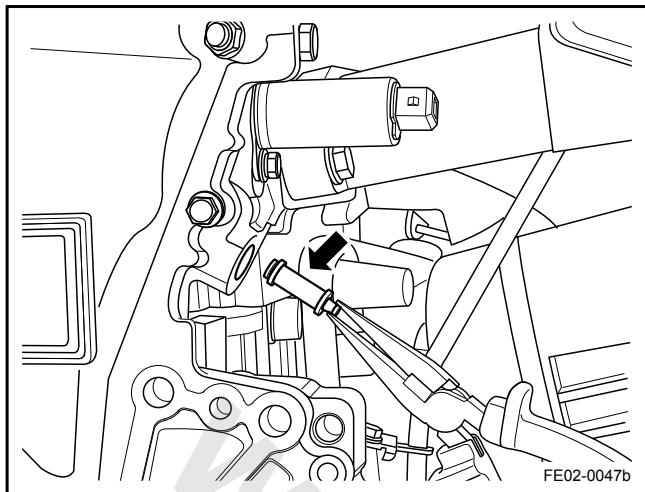
Clean the solenoid valve filter:



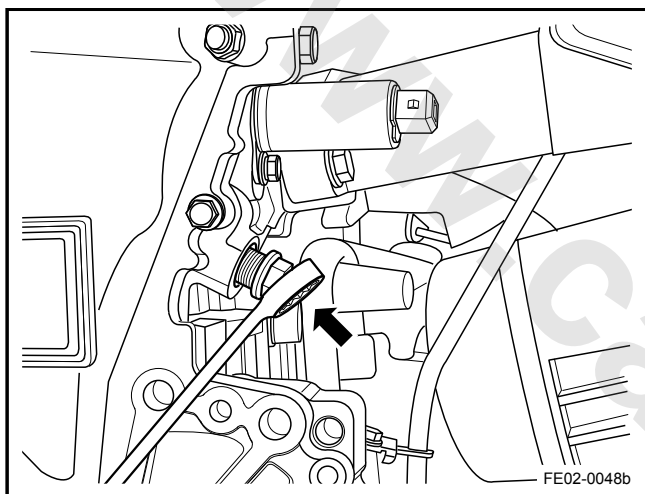
1. Remove the generator. Refer to [2.11.8.3 Generator Replacement](#).
2. Remove the VVT solenoid valve filter sealing bolts.



3. Remove the VVT solenoid valve filter with a plier.



4. Clean the filter and make sure the solenoid valve is not damaged or deformed, otherwise it must be replaced.
5. Install the VVT solenoid valve filter.



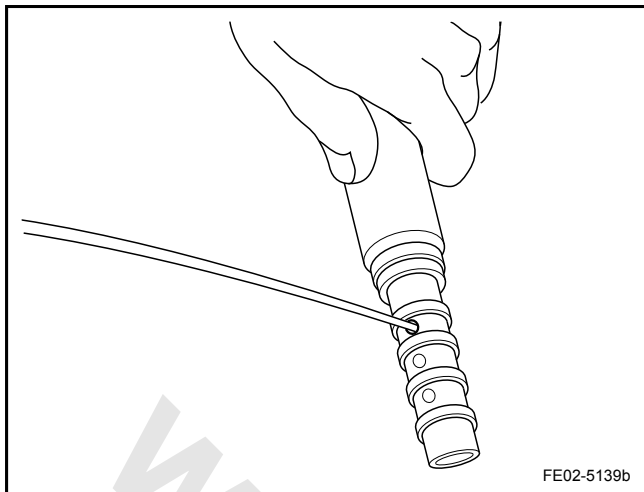
6. Install the solenoid valve filter and tighten the bolts.  
Torque: 16.5 Nm (Metric) 12.2 lb-ft (US English)
7. Install the generator.
8. Connect the battery negative cable.

### 2.2.8.5 VVT Solenoid Valve Cleaning

#### Note

- A. Inoperative near at high temperatures or near a fire to avoid cleaning agents being ignited or exploded.
- B. The length of wire should be more than 3m. It is recommended to install the wire relay.
- C. During the cleaning process, do not scratch the O-ring, scratch or knock the surface of the valve or drop the valve..
- D. After repair, reinstall the valve VVT and tightening the bolt to 10 Nm.
- E. Replace repeatedly cleaned VVT valve.

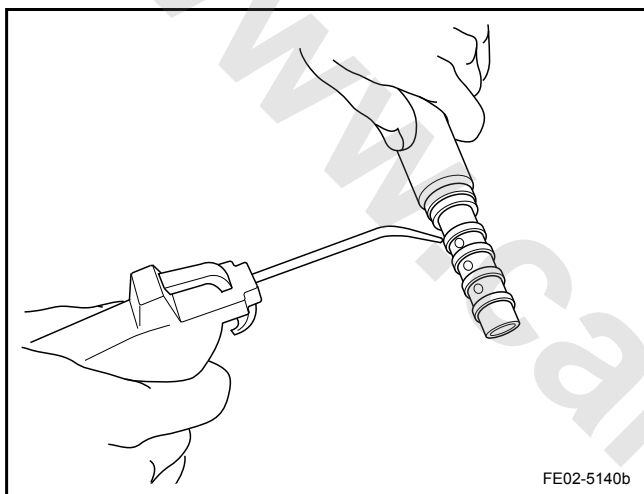




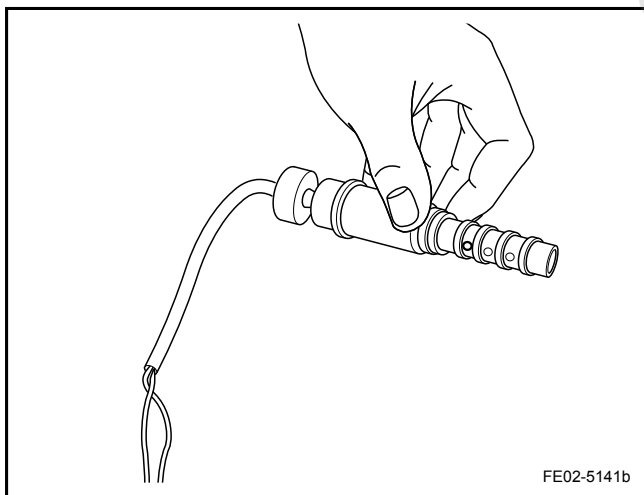
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove VVT solenoid valve. Refer to [2.2.8.4 VVT Solenoid Valve Replacement and Filter Cleaning](#).
3. Clean the VVT solenoid valve hole, return hole, the chamber.

#### Note

During the cleaning process, keep the VVT solenoid valve and wiring harness connector upright, otherwise the cleaning agent will easily enter the VVT solenoid valve and cause internal damage.



4. Use an air gun to clean the VVT valve hole and oil chamber. Clean up the cleaning agent residue.



5. Switch on and off the VVT solenoid valve. Clean the valve with an air gun and repeat 2-3 times.

#### Note

Each time switch the valve on no longer than the 2 s, otherwise the VVT solenoid valve may be damaged.

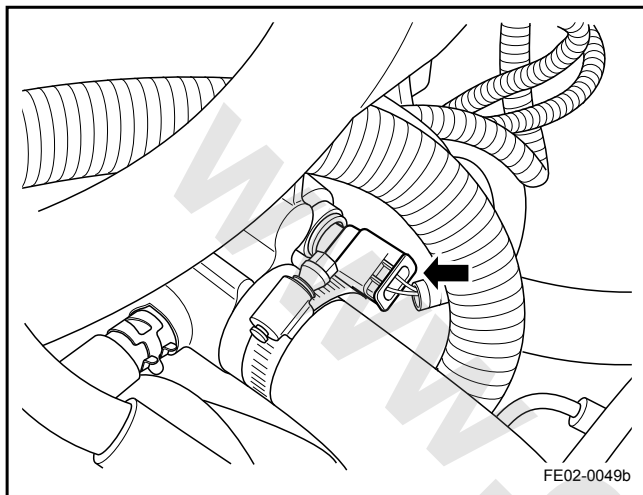
### 2.2.8.6 Engine Coolant Temperature Sensor Replacement

Removal Procedure:

#### Warning!

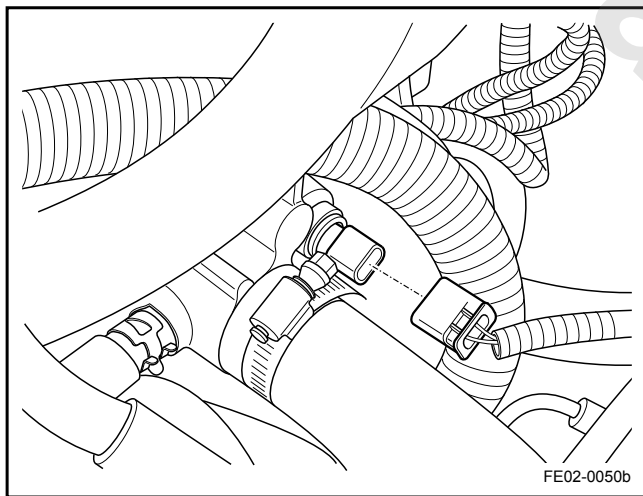
Refer to "Cooling System Service Warning" in "Warnings and Notices".

1. Release cooling system pressure.
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Disconnect the engine coolant temperature sensor wiring harness connector.
4. Remove the engine coolant temperature sensor.



Installation Procedure:

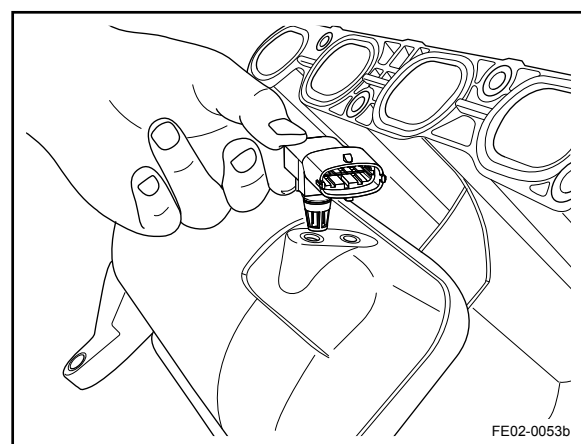
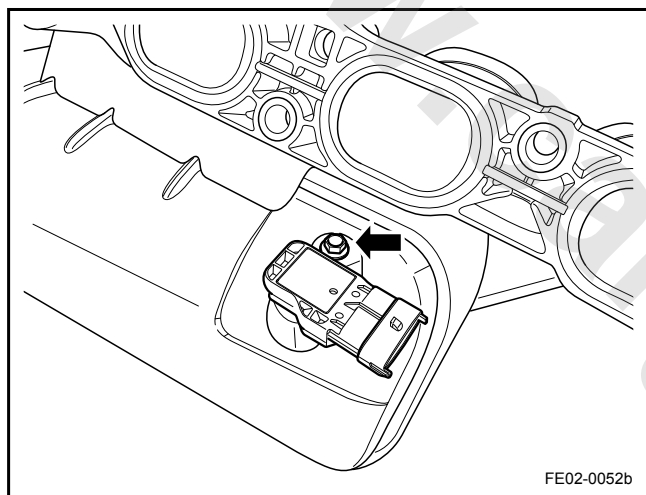
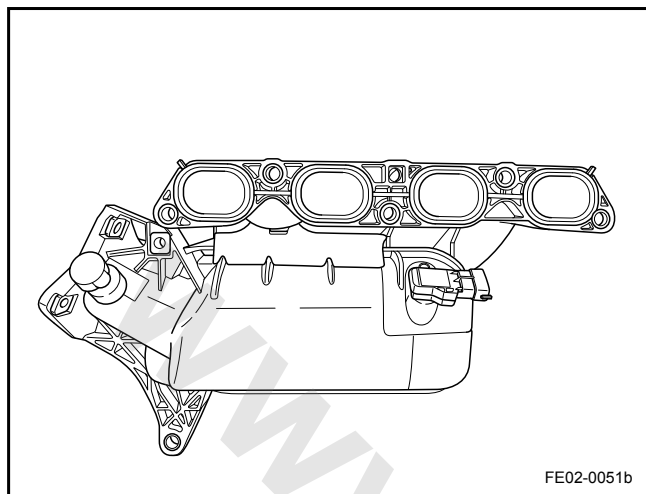
1. Apply sealant on the engine coolant temperature sensor thread.
2. Install the engine coolant temperature sensor.
3. Tighten the engine coolant temperature sensor.  
Torque: 15 Nm (Metric) 11 lb-ft (US English)
4. Connect engine coolant temperature sensor wiring harness connector.
5. Fill the engine coolant.
6. Connect the battery negative cable.



### 2.2.8.7 Intake Air Pressure and Temperature Sensor Replacement

#### Removal Procedure:

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect intake air pressure and temperature sensor wiring harness connector.
3. Remove the intake manifold assembly. Refer to [2.6.8.6 Intake Manifold Assembly Replacement](#).



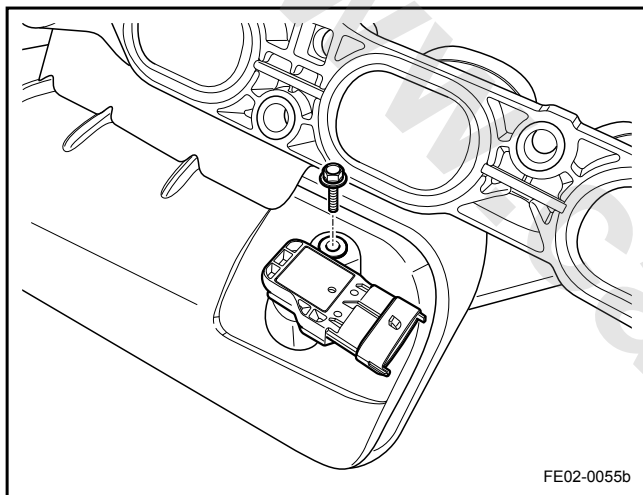
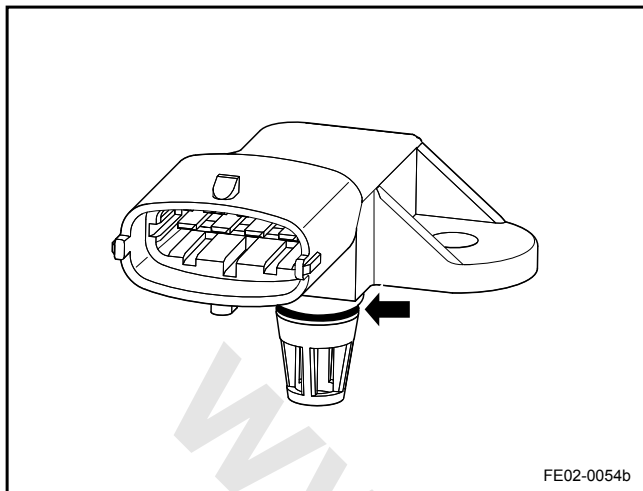
4. Remove the sensor retaining bolts.
5. Pull out the intake air pressure and temperature sensor.

## Installation Procedure:

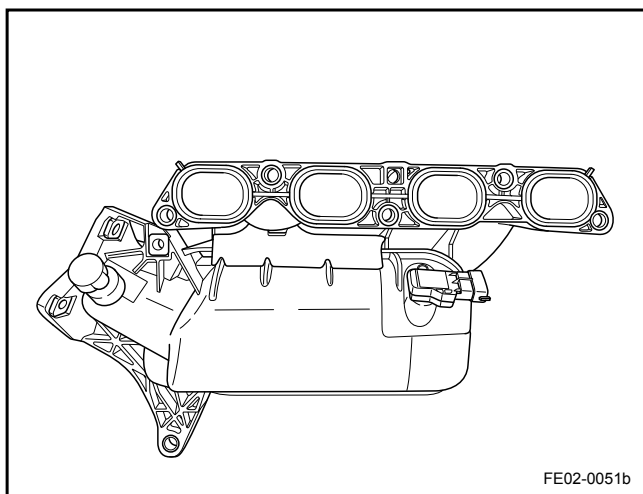
1. Clean the intake air pressure and temperature sensor installation position and apply new seals.

**Note**

The seal is single used only. After removal, a new seal must be installed.



2. Install the sensor retaining bolt.  
Torque: 9 Nm (Metric) 6.66 lb-ft (US English)



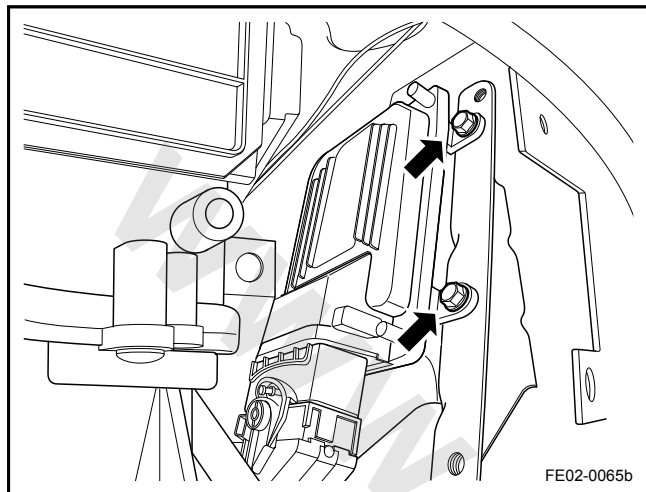
3. Install the intake manifold assembly.
4. Connect the intake air pressure and temperature sensors wiring harness connector.
5. Connect the battery negative cable.

### 2.2.8.8 Engine Control Module Replacement

Removal Procedure:

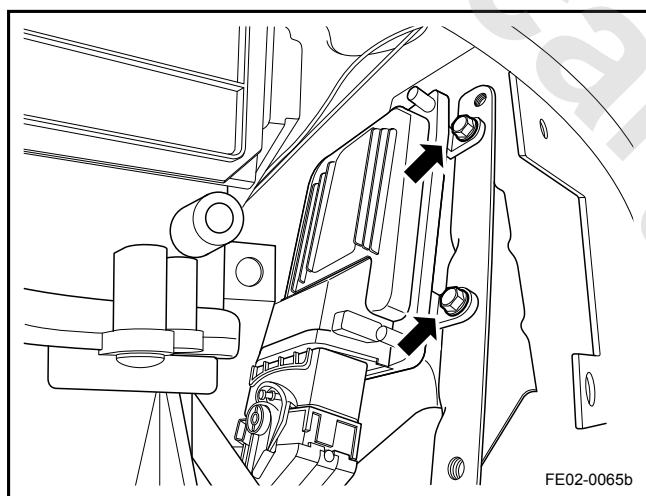
**Warning!**

Refer to "Battery Disconnection Warning" in "Warnings and Notices"



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the glove box. Refer to [12.8.3.2 Glove Box Replacement](#).
3. Disconnect the engine control module wiring harness connector.
4. Remove the engine control module retaining bolts.

Installation Procedure:



1. Install the engine control module retaining bolts.  
Torque: 9 Nm (Metric) 6.66 lb-ft (US English)
2. Connect the engine control module wiring harness connector.
3. Install the glove box.
4. Connect the battery negative cable.

## 2.3 Fuel System JL4G18-D

### 2.3.1 Specifications

#### 2.3.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Fuel Tank Retaining Bolt	M10 × 1.25 × 30	38-46	28.2-34.0
Fuel Filter Mounting Bracket Retaining Bolt	M6 × 16	8-10	6.0-7.4
Fuel Pipe Retaining Bolts	M8 × 15	20-24	14.8-17.8
	M8 × 20	20-24	14.8-17.8
Fuel Rail Retaining Bolt	M6 × 20	8-10	6.0-7.4

## 2.3.2 Description and Operation

### 2.3.2.1 Description and Operation

The fuel supply system provides a suitable amount of fuel to the engine in a variety of operating conditions. The fuel is sprayed into the engine through the fuel injectors. Fuel tank stores fuel. An electric fuel pump is installed in the fuel tank and it will pump fuel into the fuel rail assembly. Fuel pump provided fuel pressure exceeds the pressure needed by fuel injectors. Fuel pressure regulator is part of the fuel pump assembly, which keeps fuel supplied to the fuel injectors is under specified pressure. This vehicle fuel system has no fuel return system.

#### 1. Fuel Tank

Fuel tank is made from high-density polypropylene vinyl and other materials. The fuel tank is tightened by the two connected metal support brackets at the underbody, and it has a fuel vapor ventilation valve with roll-over protection function.

#### 2. Fuel Tank Filling Cap

##### Note

In the need for replacing the fuel tank filler cap, use a fuel tank filler cap with the same function as the original one. If the fuel tank filler cap is not correctly installed, it could cause serious fuel system faults.

The fuel tank filling tube filler cover is equipped with a screw thread structure, which allows air coming in once it is turned loose. It uses the structure of the ratchet in order to prevent over-tightening. Ventilation function means the fuel tank internal pressure can be released before remove the cap from the vehicle. Instructions are attached to the cap. The filler cap also integrates a security vacuum pressure limiting valve.

#### 3. Fuel Pump

Electric fuel pump is a modular fuel turbo pump located inside the fuel tank. Electric fuel pump is controlled by the engine control module (ECM) through the fuel pump relay. Electric fuel pump will start providing fuel 2s in advance to ensure that the fuel pressure achieve the requirements of the normal system operation. The fuel pump resistance range is 0.2-3.0  $\Omega$ . This model comes with electric fuel pump fuel storage in order to prevent the fuel level too low or provide fuel supply in harsh operating conditions.

#### 4. Fuel Pressure Regulator

Fuel pressure regulator is integrated in the fuel pump assembly. Fuel pressure regulator main function is to regulate

the fuel pipe fuel flow and to control the fuel injectors pressure. When the ignition switch is at ON position and the engine is shut down, the system fuel pressure should be about 400 kPa.

#### 5. Electric Fuel Pump Filter

As a coarse filter, the filter has the following features:

- Filters the pollutants.
- Improves the electric pump service life.

If the pump output pressure is found too low, clean or replace the filter.

#### 6. Fuel Filter Assembly

Fuel Filter Assembly is located in front of the rear suspension, fixed on the vehicle chassis. Filter consists of a paper filter. It can filter out the particles that may damage the fuel system. Fuel filter can withstand maximum fuel system pressure, temperature changes and fuel additive effect.

#### 7. Fuel Level Sensor

Fuel level sensor consists of a fuel level float, a wire arm harness assembly, engineering plastics, a variable resistance chip assembly and detachable nylon sliding chip. Variable resistance plastic film is connected to the retained to the fuel tank plastic bracket. The fork with a brush metal contact is connected to the detachable nylon sliding chip. According to the location, the sliding chip provides variable resistance to the instrument cluster circuit. The resistance range is 40-300  $\Omega$ . Circuit wiring harness leads from the variable resistance film and extends to and fuel pump harness connector.

#### 8. Fuel Rail

Fuel rail consists of the following:

- Fuel Delivery Pipes To Each Fuel Injector
- 4 Independent Fuel Injectors

Fuel rail is installed in the intake manifold, and provides fuel to each cylinder through the respective fuel injectors.

## 9. Fuel Injectors

Fuel injector is a solenoid valve device controlled by the engine control module. When the engine control module provides power supply to the fuel injector coil, normally closed ball valve opens, allowing fuel flow through the diffuser plate to fuel injector outlet. Diffuser plate has a hole, used to control fuel flow and form a double cone-shaped fine spray of fuel at the fuel injector outlet. The fuel is sprayed into the two intake valve channel from the fuel injectors, so that the fuel will be further atomized before entering the combustion chamber. If the fuel injectors have the following conditions, it will lead to various vehicle dynamic performance malfunction:

- If the fuel injector can not be opened.
- If the fuel injector is stuck at the opening position.
- If the fuel injector leaks.
- If the fuel injector coil resistance is too low. The normal resistance range is: 11.6-12.4  $\Omega$ .

## 10. Fuel Pipe O-ring

O-ring seals fuel system screw joints. Fuel System O-ring is made from a special material.

### Note

The fuel pipe O-ring is not a serviceable part.



### 2.3.3 System Working Principle

#### 2.3.3.1 System Working Principle

Intake manifold absolute pressure sensor senses and measures intake manifold vacuum. When the fuel demand is high, the intake manifold absolute pressure is in a low-vacuum state, such as the throttle fully open. Engine control module uses this information to enrich the mixture, thereby increasing the fuel injector opening time and injecting the correct amount of fuel. When the engine decelerates, the intake manifold absolute pressure sensor detects increase in the vacuum degree, the engine control module requests to shorten the fuel injector opening time, reducing the amount of fuel injection according to the change.

#### 1. Startup Mode

When the ignition switch is turned on, the engine control module connects to the fuel pump relay 2 s. Then, the fuel pump fuel pressure is established. Engine control module also checks the engine coolant temperature sensor and throttle position sensor to determine the most appropriate Air-Fuel ratio to start the engine. Engine control module controls the fuel supply by changing the fuel injectors opening and closing time. This is achieved by controlling the fuel injectors with very short pulses.

#### 2. Acceleration Mode

Engine control module responds to throttle position and the rapid changes in airflow and provides additional fuel.

#### 3. Deceleration Mode

Engine control module responds to throttle position and gas flow rate changes and reduces the fuel amount. When the speed rapidly decreases, the engine control module can completely cut off fuel supply.

#### 4. Battery Voltage Calibration Mode

When the battery voltage is too low, the engine control module uses the following methods to compensate for a weak ignition spark:

- Increase fuel injector pulse width.
- Increase idle speed.
- Increase the ignition duration.

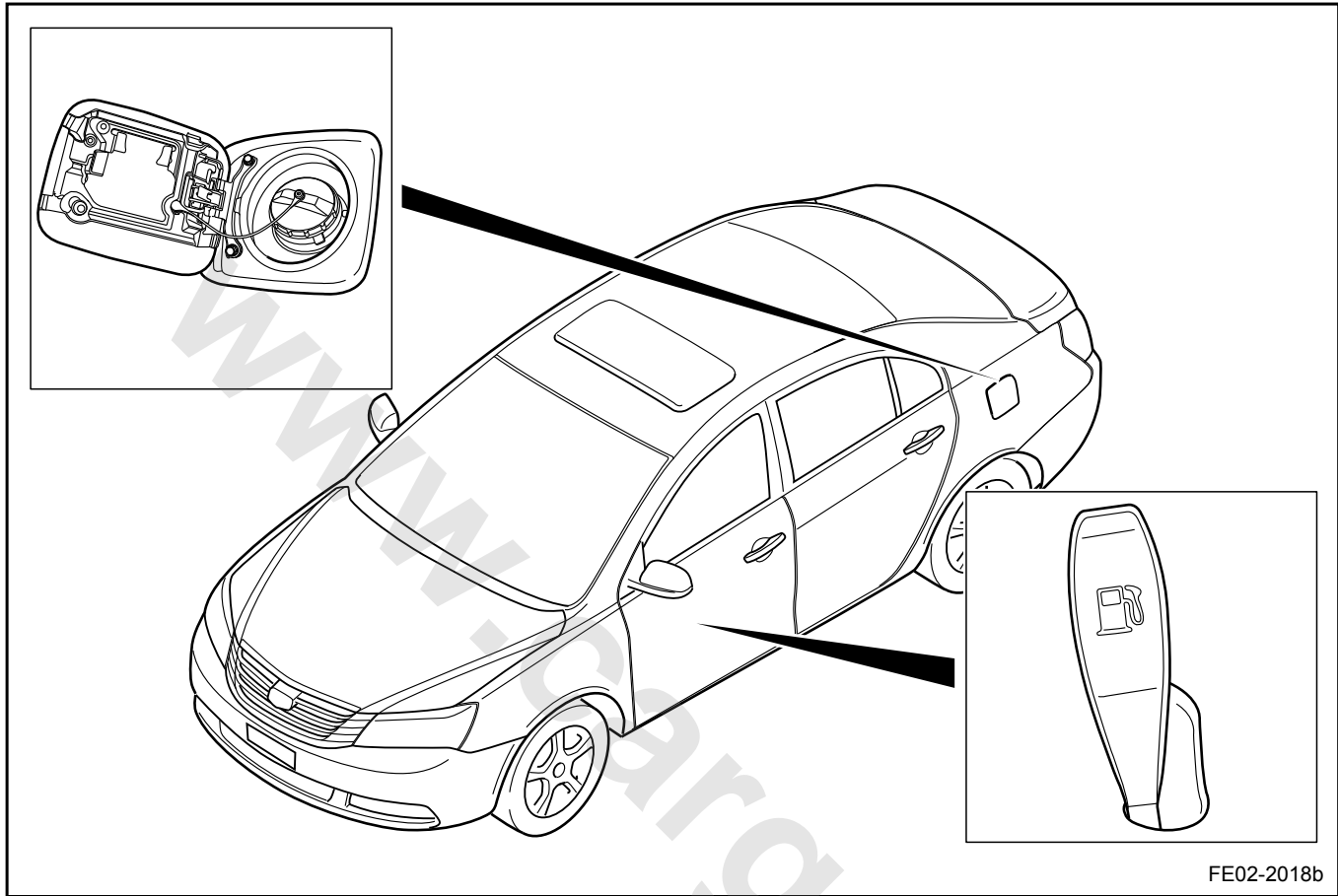
#### 5. Stop Fuel Supply

When the ignition switch is turned off, the fuel injector will not provide fuel. This prevents the continued combustion or engine

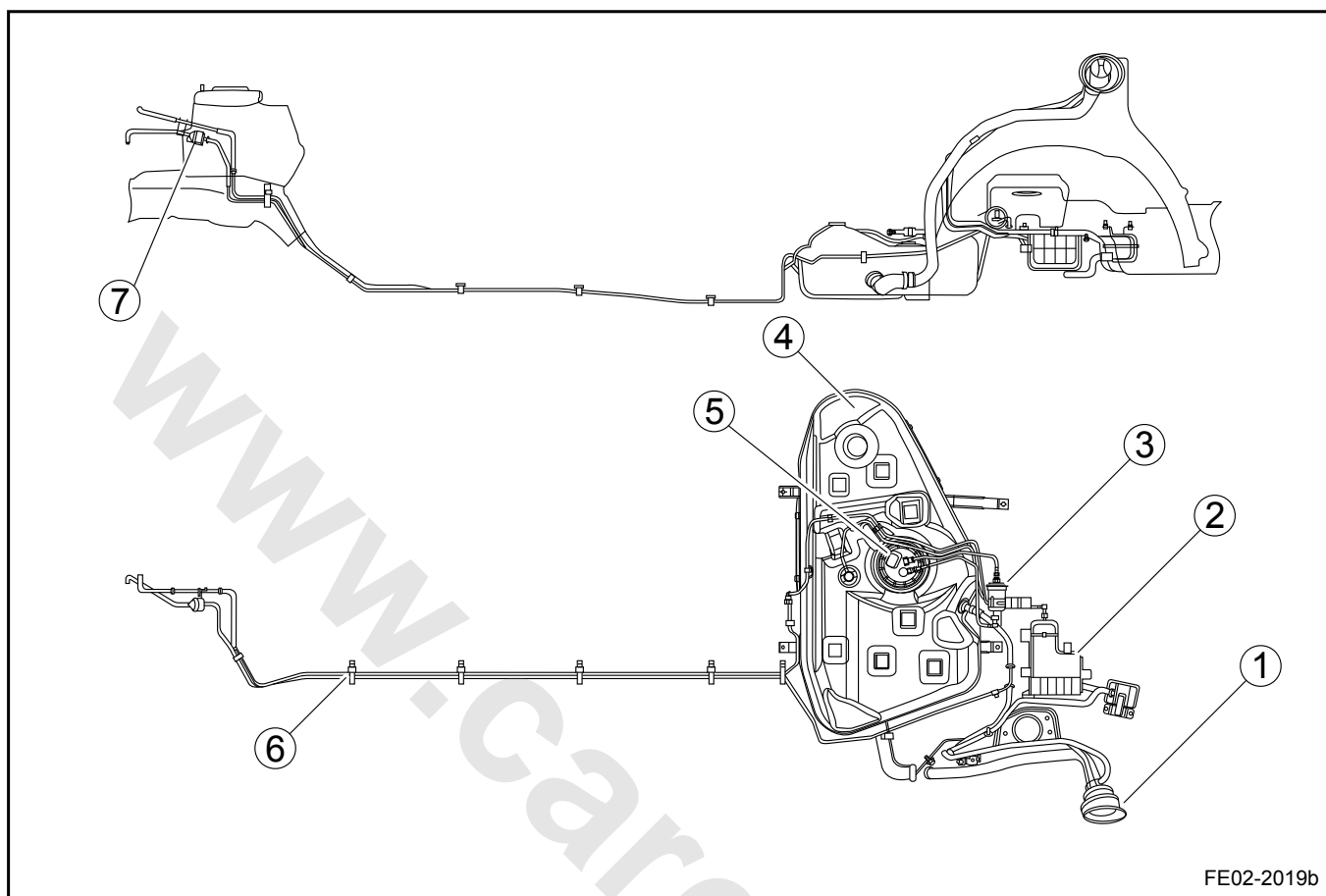
can not shut down. In addition, if the reference pulse is not received, there will be no fuel supply, in order to prevent fuel overflow.

### 2.3.4 Component Locator

#### 2.3.4.1 Fuel Filler



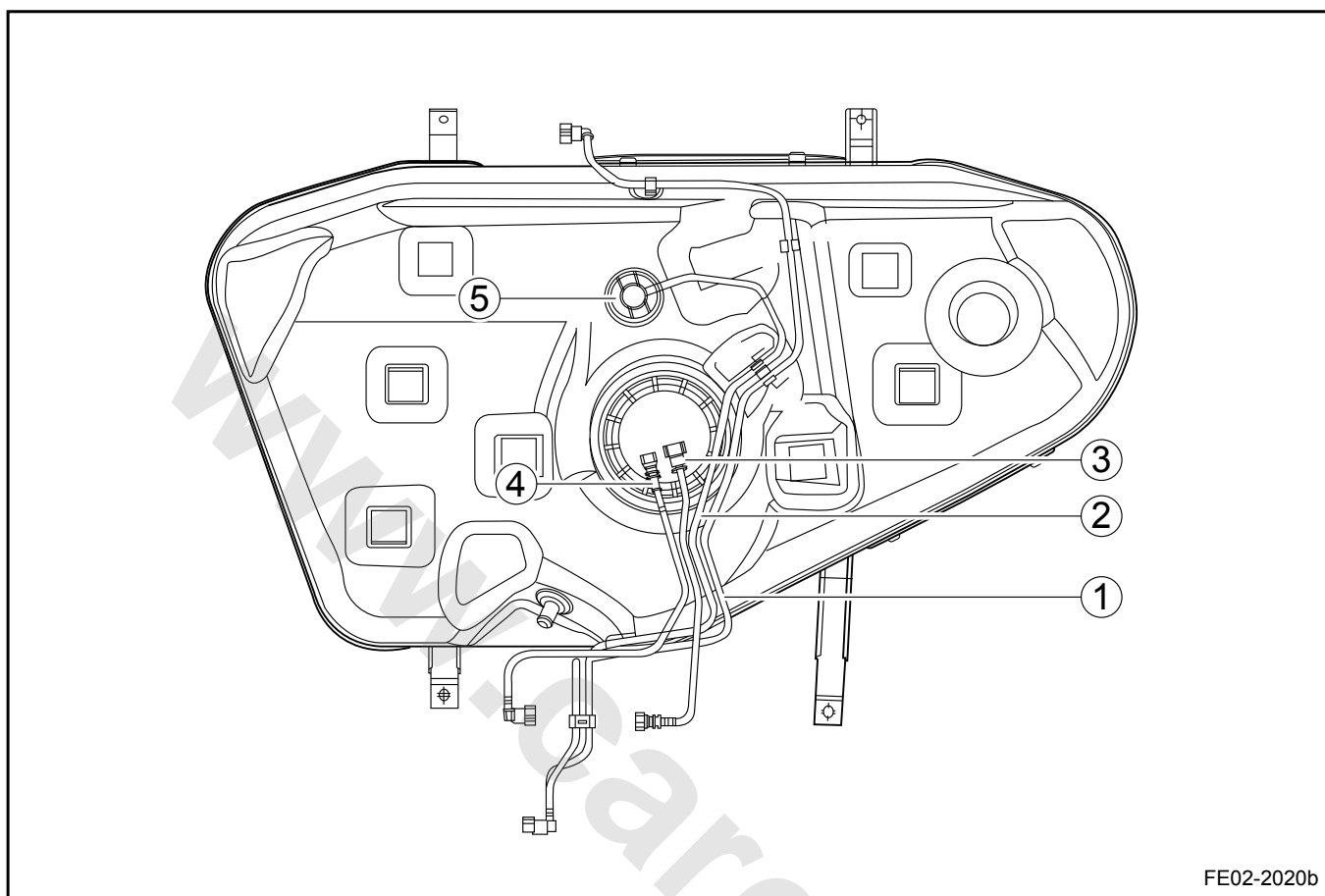
## 2.3.4.2 Fuel Supply System



## Legend

- |  |                                   |
|--|-----------------------------------|
| 1. Filling Tube                          | 6. Fuel Pipe and Evaporative Pipe |
| 2. Canister                              | 7. Canister Solenoid Valve        |
| 3. Filter                                |                                   |
| 4. Tank                                  |                                   |
| 5. Fuel Pump With a Fuel Sensor Assembly |                                   |

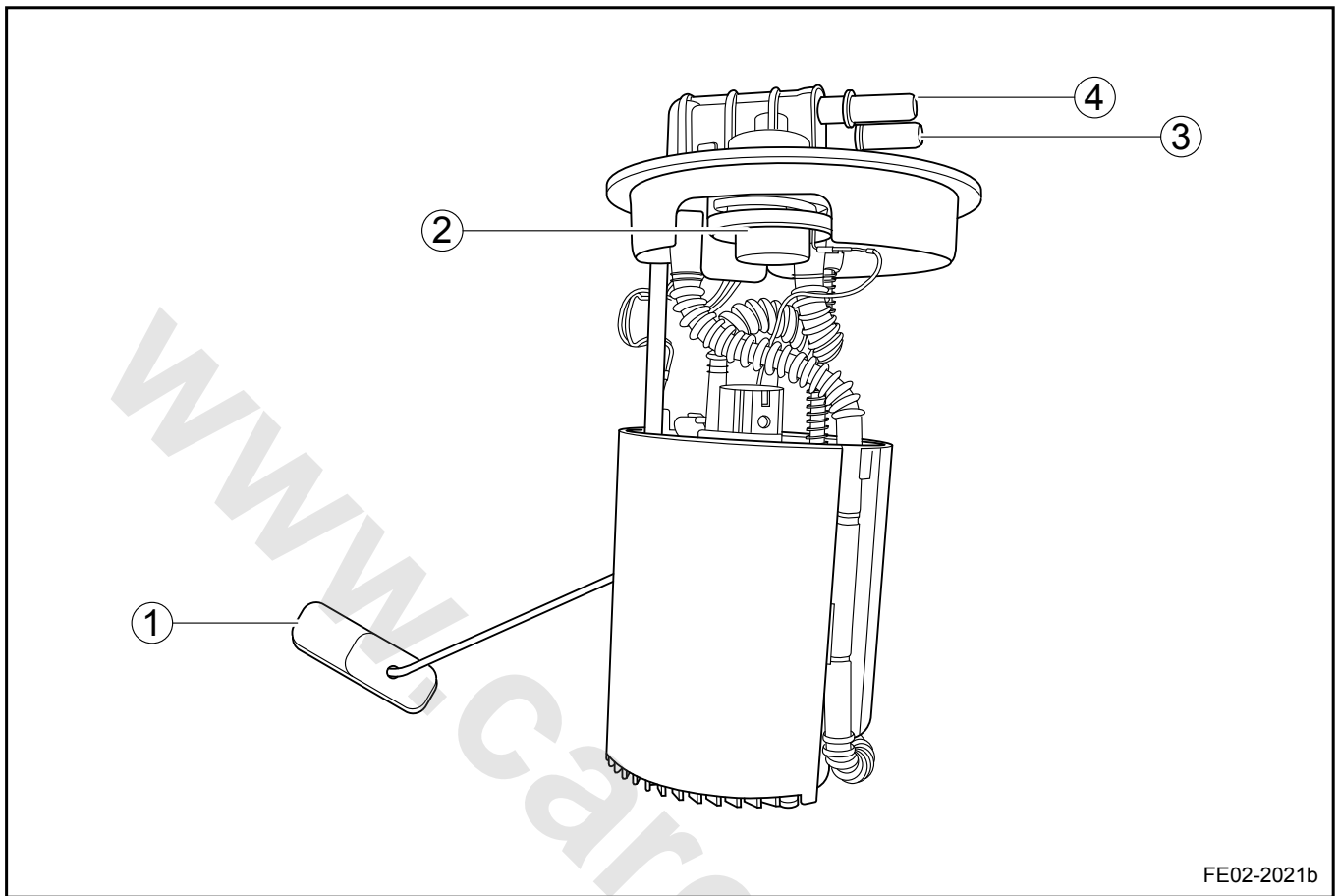
## 2.3.4.3 Fuel Tank Assembly



## Legend

- |                           |                                 |
|---------------------------|---------------------------------|
| 1. Fuel Vapor Vacuum Hose | 5. Fuel Vapor Ventilation Valve |
| 2. EVAP Hose              |                                 |
| 3. Fuel Pump Outlet Pipe  |                                 |
| 4. Fuel Pump Return Pipe  |                                 |

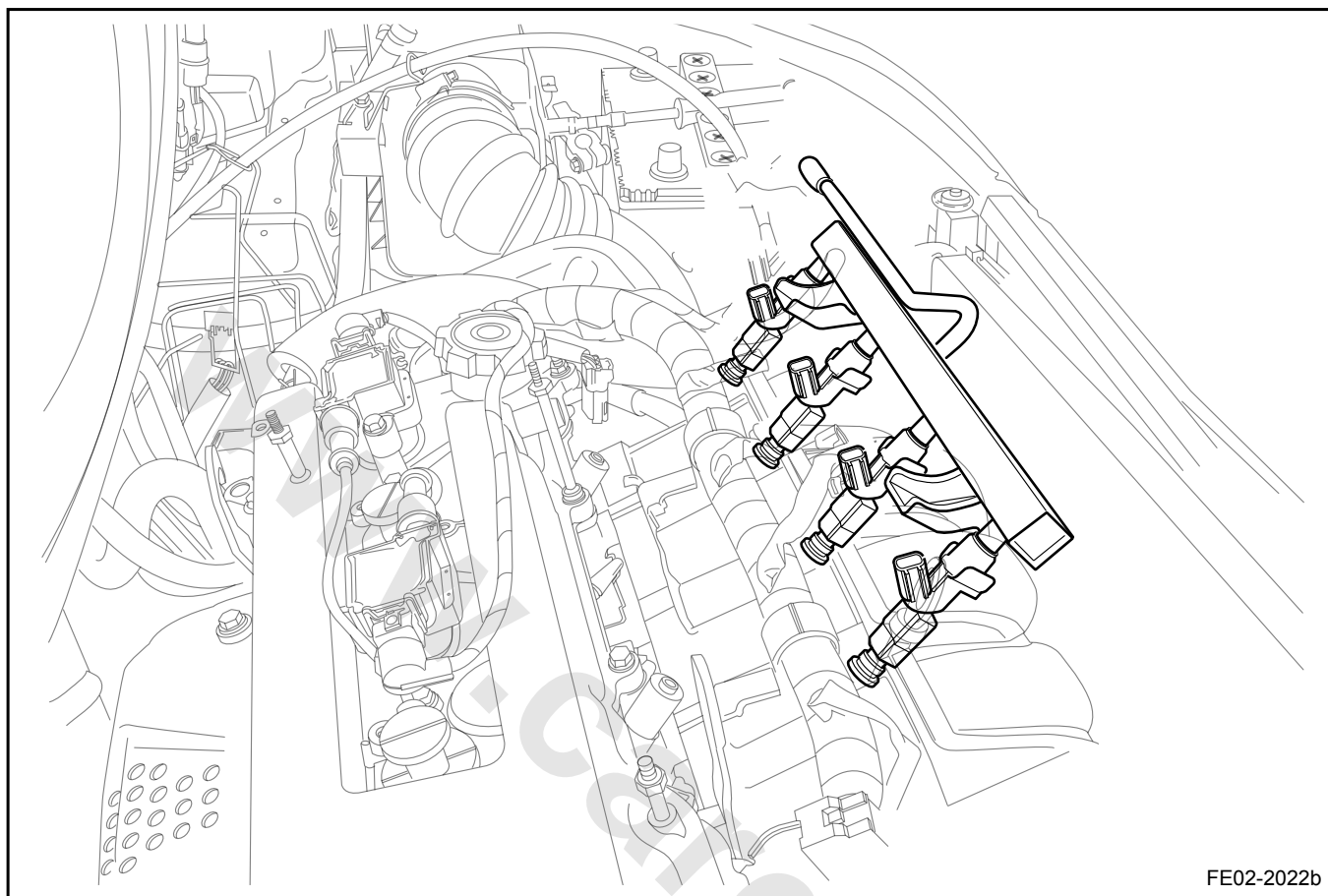
## 2.3.4.4 Fuel Pump Assembly



## Legend

- |                            |                          |
|----------------------------|--------------------------|
| 1. Fuel Level Sensor       | 4. Fuel Pump Return Port |
| 2. Fuel Pressure Regulator |                          |
| 3. Fuel Pump Outlet Port   |                          |

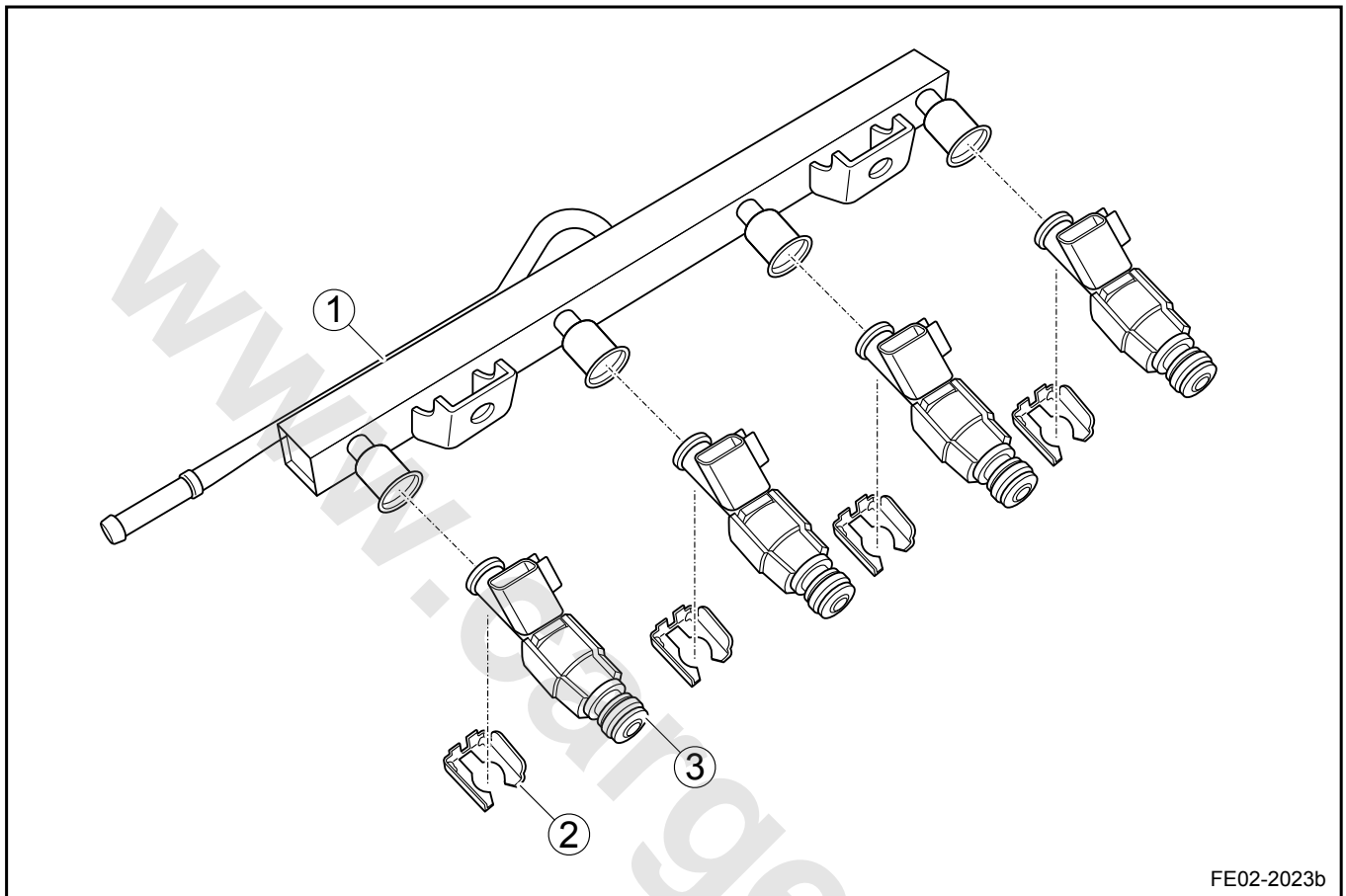
### 2.3.4.5 Fuel Injectors



### 2.3.5 Disassemble View

#### 2.3.5.1 Disassemble View

Oil Rail and Jet Assembly Disassemble View



FE02-2023b

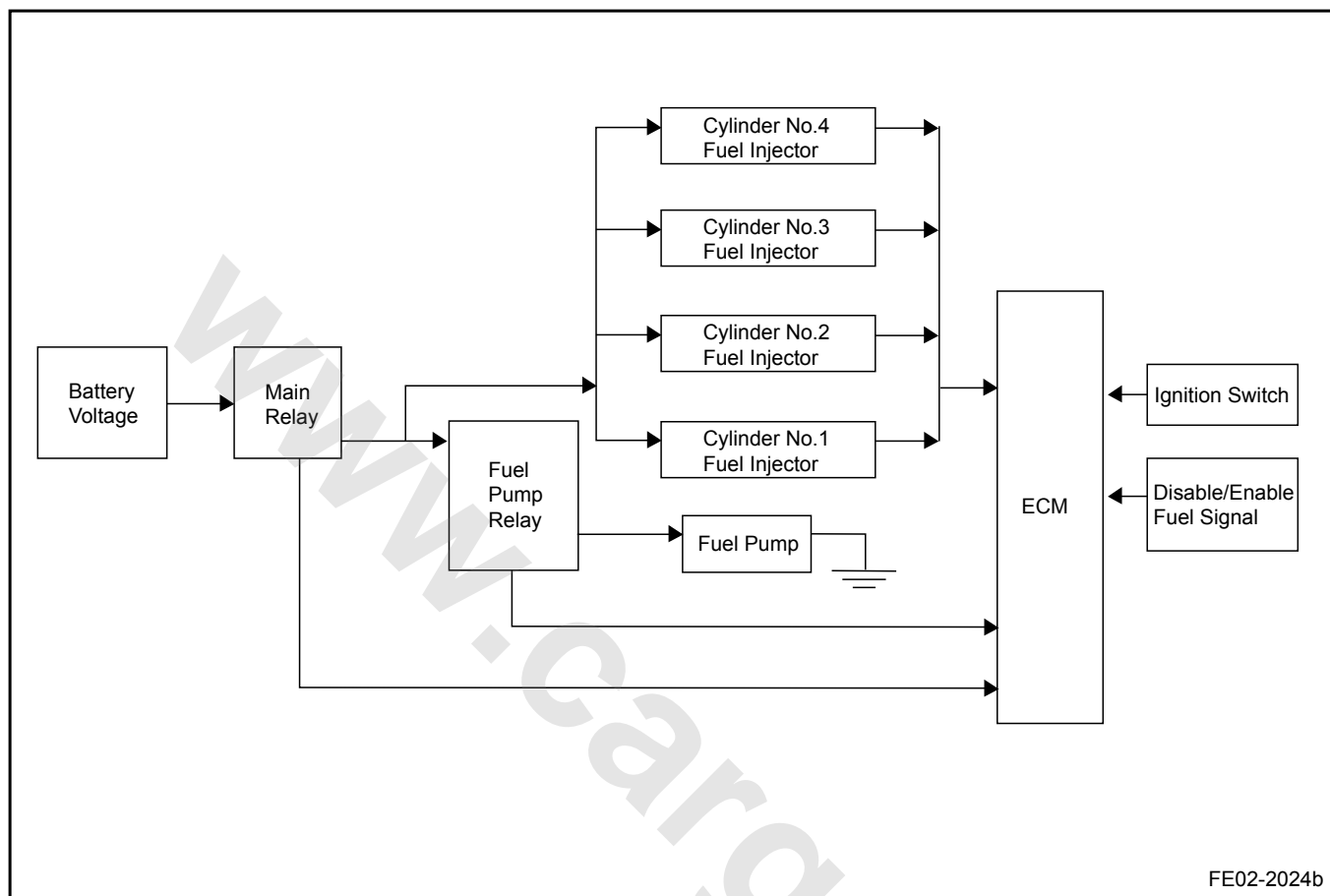
#### Legend

- 1. Fuel Rail
- 2. Fuel Injectors

- 3. Spring Clip

## 2.3.6 Schematic

## 2.3.6.1 Schematic





## 2.3.7 Diagnostic Information and Procedures

### 2.3.7.1 Diagnostic Descriptions

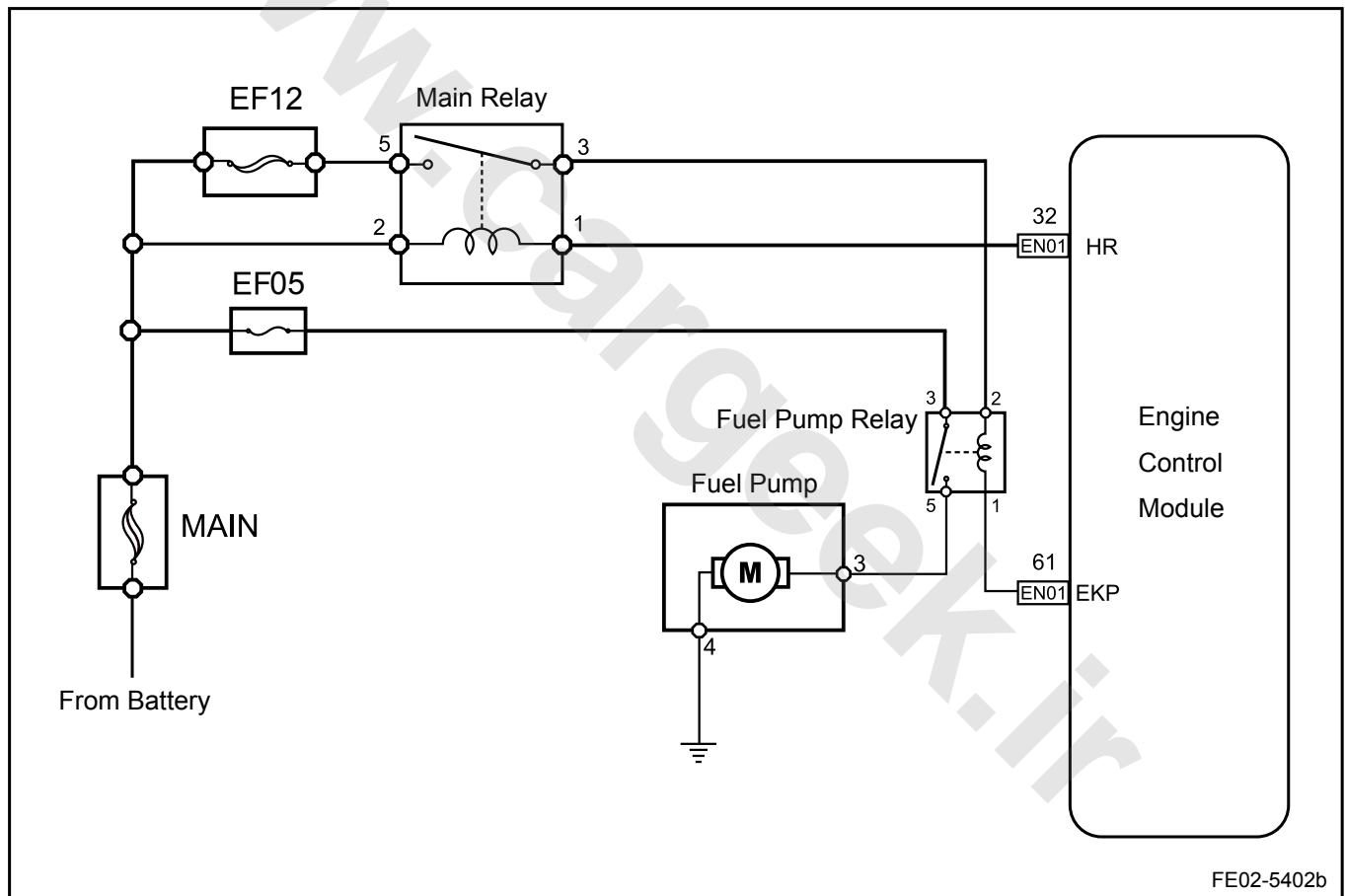
Refer to [2.3.2.1 Description and Operation](#) Get familiar with the system functions and operations before start system diagnostics, so that it will help to determine the correct diagnostic steps in the event of fault, more importantly, it will also help to determine whether the customer described situations are normal.

### 2.3.7.2 Visual Inspection

- Check installed aftermarket equipment that may affect the fuel system operation.
- Check system components that are easy to access to identify whether there is an obvious damage or external leakage.
- Check whether the recommended fuel is used and add sufficient fuel.

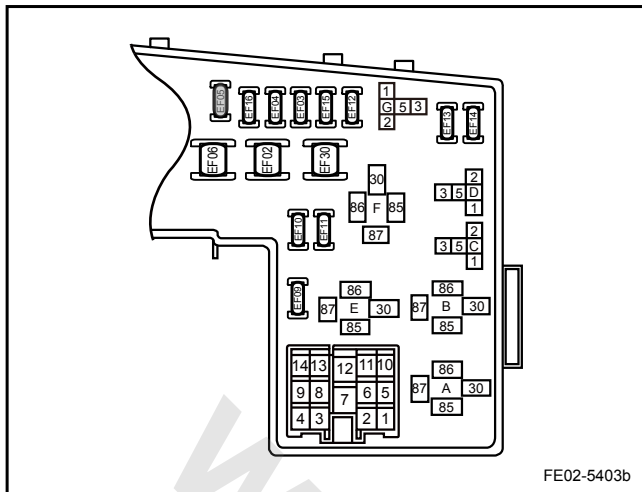
### 2.3.7.3 Fuel Pump Inoperative

Schematic:



Diagnostic Steps:

Step 1	Check fuel pump fuse EF05.
--------	----------------------------



Is the fuel pump fuse EF05 blown?

No

Go to step 3

Yes

Step 2 Repair fuel pump fuse EF05 circuit.

- (a) Check fuel pump fuse EF05 circuit.
- (b) Repair fuel pump power circuit short to ground fault.
- (c) Replace the fuse EF05.

Fuse Rating: 15 A

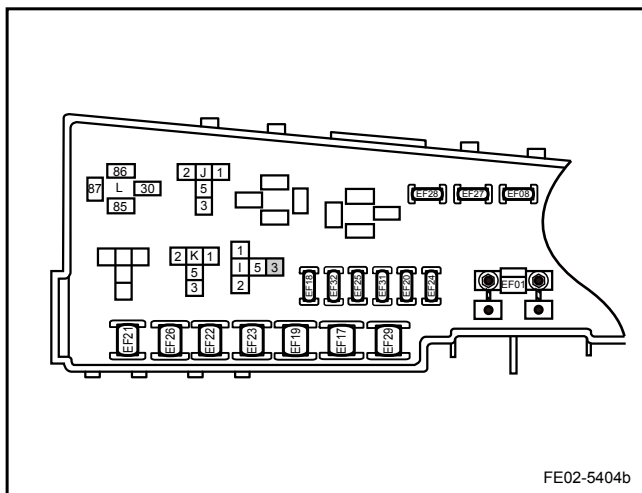
Is fuel pump working properly?

Yes

System normal

No

Step 3 Check fuel pump relay terminal 3 voltage.



- (a) Turn on the ignition switch.
- (b) At the same time, check the voltage of fuel pump relay terminal 3 with a multimeter.

Standard Voltage: 11-14 V

Is voltage the Standard Value?

Yes

Go to step 5

No

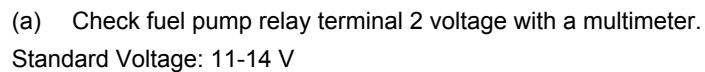
Step 4 Repair fuel pump relay terminal 3 and the fuel pump fuse EF05 circuit open fault.

- (a) Repair fuel pump relay terminal 3 and the fuel pump fuse EF05 open circuit fault.

Is fuel pump working properly?

System normal

Check fuel pump relay terminal 2 voltage.



Go to step 7

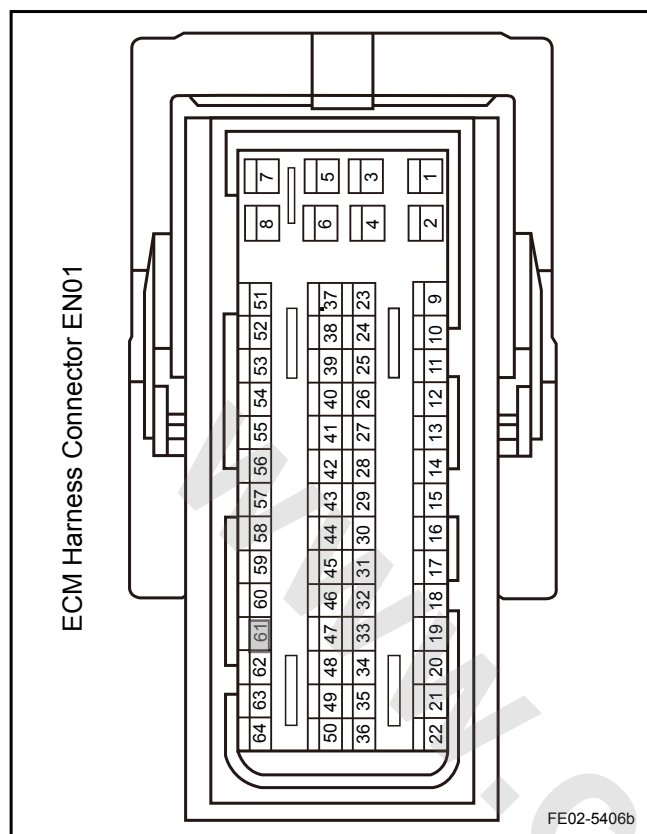
Repair the main relay circuit fault.

(a) Repair the main relay circuit fault. Refer to [2.2.7.37 DTC P0560 P0562 P0563](#).

Is fuel pump working properly?

System normal

Check continuity between ECM harness connector EN01 terminal 61 and ground.



- Turn on the ignition switch.
  - Connect a test lamp between ECM harness connector EN01 terminal 61 and the body ground circuit.
  - Use scan tool to carry out pump relay "Action Test".
- Is test lamp lit?

No

Go to step 9

Yes

Step 8 Replace ECM.

- Replace ECM. Refer to [2.2.8 Engine Control Module Replacement](#).

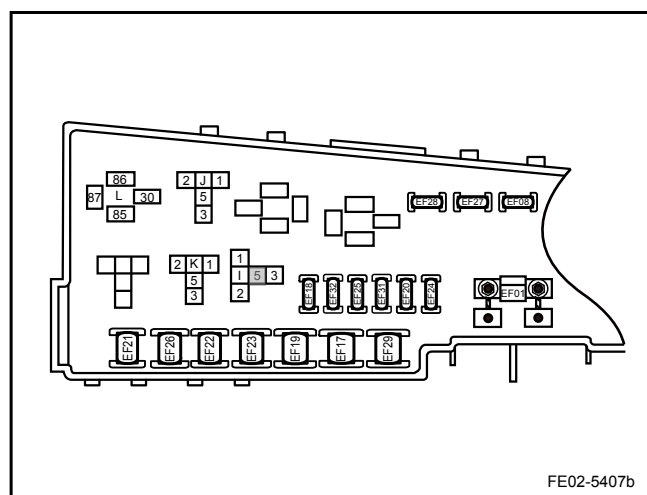
Is fuel pump working properly?

Yes

System normal

No

Step 9 Check the pump relay terminal 5 voltage.



- Check the pump relay terminal 5 voltage with a multimeter.  
Standard Voltage: 11-14 V
- Standard Voltage?

Yes

Go to step 11

No

Step 10 Replace the fuel pump relay.

(a) Replace the fuel pump relay.

Is fuel pump working properly?

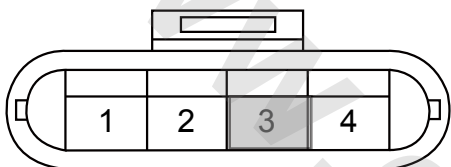
Yes

System normal

No

Step 11 Check the fuel pump wiring harness connector SO29 terminal 3 voltage.

Fuel Pump Harness Connector SO29



FE02-5408b

(a) Check the fuel pump wiring harness connector SO29 terminal 3 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage standard value?

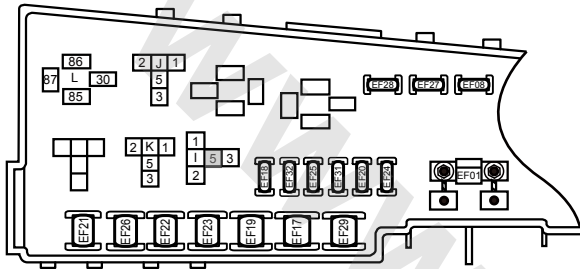
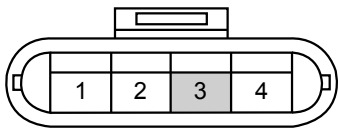
Yes

Go to step 13

No

Step 12 Repair the circuit between fuel pump wiring harness connector SO29 terminal 3 and the fuel pump relay terminals 5.

Fuel Pump Harness Connector SO29



FE02-5409b

- (a) Check circuit between fuel pump wiring harness connector SO29 terminal 3 and the fuel pump relay terminals 5.
- (b) Repair open circuit fault between fuel pump wiring harness connector SO29 terminal 3 and the fuel pump relay terminals 5.

Is fuel pump working properly?

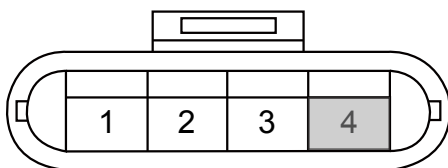
Yes

System normal

No

Step 13 Check the fuel pump wiring harness connector SO29 terminal 4 and the body ground circuit.

Fuel Pump Harness Connector SO29



FE02-5410b

- (a) Check resistance between fuel pump wiring harness connector SO29 terminal 4 and the body ground with a multimeter to confirm the ground circuit continuity.  
Resistance Standard Value: Less than 1  $\Omega$

Is fuel pump ground circuit normal?

Yes

Go to step 15

No

Step 14 Repair fuel pump wiring harness connector SO29 terminal 4 and the body ground circuit.

- (a) Repair fuel pump wiring harness connector terminal 4 and the body SO29 ground circuit open fault.

Is fuel pump working properly?

Yes

System normal

No

Step 15	Replace the fuel pump.
---------	------------------------

(a) Replace the fuel pump. Refer to [2.3.8.3 Fuel Pump Assembly Replacement](#).

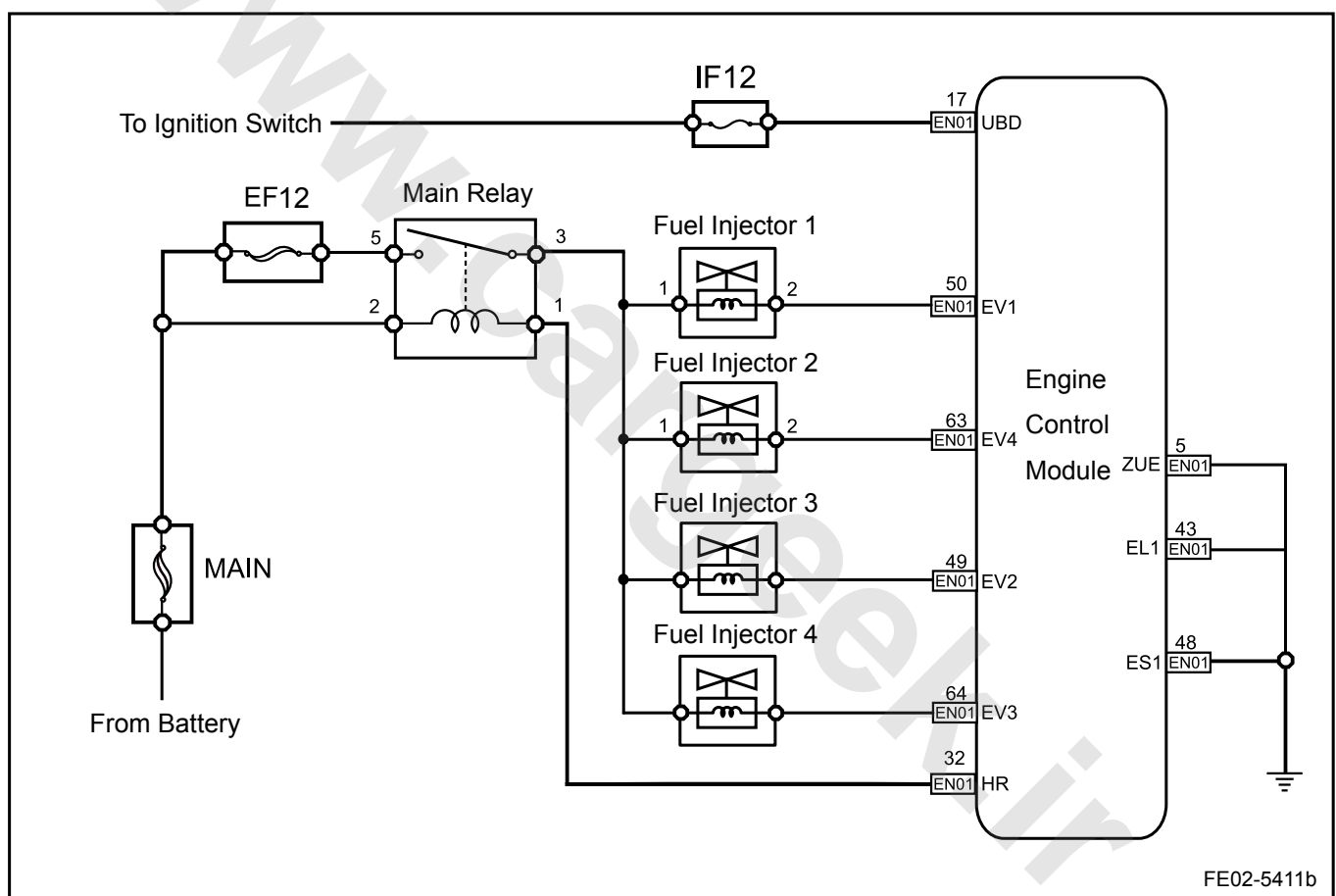
Confirm repair completed.

Next

Step 16	System normal.
---------	----------------

#### 2.3.7.4 All Fuel Injectors Inoperative

Schematic:



Diagnostic Steps:

Step 1	Check whether the engine anti-theft system is activated.
--------	--

Does the engine warning lamp flash?

No

Go to step 3
--------------

Yes

**Step 2** Repair the engine anti-theft system.

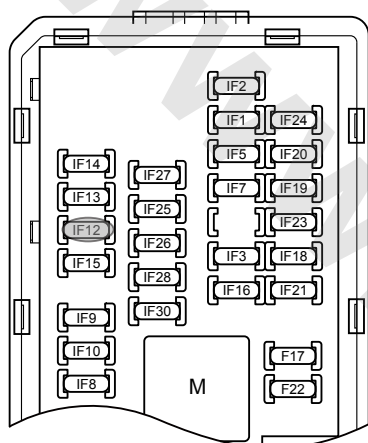
(a) Repair the engine anti-theft system. Refer to [2.5.7.12 Engine Anti-theft Warning Lamp Flashing, Vehicle Can Not Start](#).

Is fuel injector working properly?

Yes

System normal

No

**Step 3** Check ECM fuse.

Is ECM fuse IF12 blown?

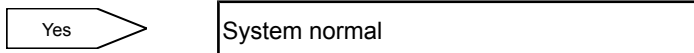
No

Go to step 6

Yes

**Step 4** Repair ECM power supply circuit.





FE02-5413b

No

Yes System normal

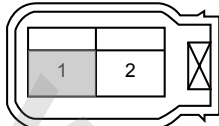


FE02-5414b

No

**Step 6** Check the fuel injector wiring harness connector terminal 1 voltage.

Cylinder No.1 Fuel Injector Harness Connector EN11



FE02-5415b

- (a) Turn on point switch.
- (b) Measure fuel injectors wiring harness connector terminal 1 voltage with a multimeter .

Standard Voltage: 11-14 V

Is voltage the Standard Value?

Yes

Go to step 8

No

**Step 7** Repair the main relay circuit.

- (a) Repair the main relay circuit. Refer to this section [2.2.7.37 DTC P0560 P0562 P0563](#).

Is fuel injector working properly?

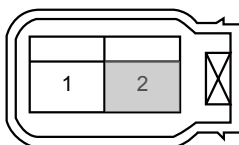
Yes

System normal

No

**Step 8** Check the fuel injector wiring harness connector terminal 2 low voltage periodic waveform.

Cylinder No.1 Fuel Injector Harness Connector EN11



FE02-5416b

- (a) Turn on the ignition switch and try to start the engine.
- (b) At the same time, check the fuel injectors harness connector terminal 2 low-voltage periodic waveform with an oscilloscope.

Does it produce a low-voltage periodic waveform?

Yes

Go to step 10

No

**Step 9** Replace ECM.

- (a) Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Is fuel injector working properly?

Yes	System normal
-----	---------------

No
----

Step 10	Replace the fuel injector.
---------	----------------------------

- (a) Replace the fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).

Confirm repair completed.

Next
------

Step 11	System normal.
---------	----------------

### 2.3.7.5 Fuel Gage Inaccurate

Refer to [11.7.6.6 DTC U1303 U1304](#).

### 2.3.7.6 Surge diagnostic

**Fault Definition:** When the accelerator pedal position remains unchanged, the engine power changes causing speed increase or decrease.

#### Note

Prior to this diagnostic, make sure the engine control system has no DTC code.

Step 1	Initial Inspection
--------	--------------------

- (a) Check vacuum hoses, whether there is cracking, kinks and so on.
- (b) Check engine ECM ground whether there is oxidation, loose, incorrect location and so on.
- (c) Check whether sensor wiring harness connector is correctly connected, and the existence of loose, poor connection and so on.

Next
------

Step 2	Check whether the intake air pressure sensor is normal?
--------	---

Refer to the "Control System" in the [2.2.7.17 DTC P0105 P0106 P0107 P0108](#).

No	Repair the faulty part.
----	-------------------------

Yes
-----

Step 3	Is the engine coolant temperature sensor working properly?
--------	--

Refer to the "Control System" in the [2.2.7.19 DTC P0117 P0118](#).

No	Repair the faulty part.
----	-------------------------

Yes

Step 4 Check the fuel pressure, is it normal?

Refer to [2.3.7.7 Fuel Pressure Testing Procedure](#).

No

Check whether the pipeline is blocked, if necessary, replace the failed component.

Yes

Step 5 Use the scan tool "Fuel Injector Cleaning and Testing Machine" function, test the performance of the cylinder fuel injector. Check whether the fuel injectors are normal?

No

Replace damaged fuel injectors.

Yes

is

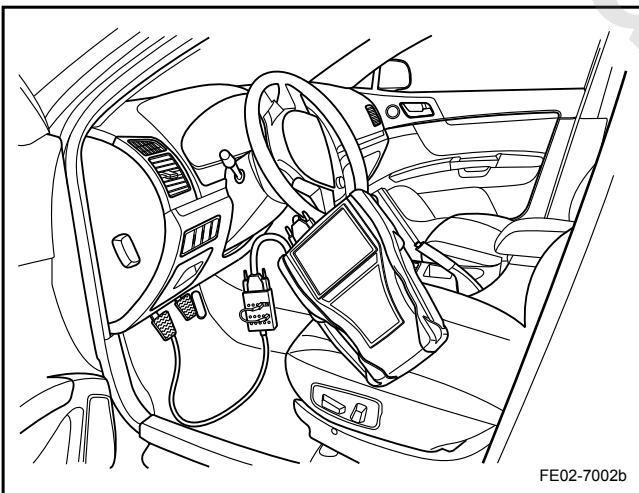
Step 6 Check whether fuel quality is normal, is the fuel contaminated?

Yes

Replace with good quality fuel.

No

Step 7 Connect scan tool, check the pre-catalytic oxygen sensor signal.



- (a) Connect scan tool.
- (b) Start engine and turn on the scan tool.
- (c) Keep the engine speed at 2,500 rpm for more than 2 min to warm up the engine, until the engine coolant temperature reaches 80°C (176 °F).
- (d) Select on the scan tool: Engine / Read Data Flow / Group 1 Oxygen Sensor Voltage 1 (Pre-Catalytic Oxygen Sensors).
- (e) Observe the pre-catalytic oxygen sensor output voltage. The data flow should fluctuate within 0.1-0.8 V.
- (f) If the voltage data is consistently below 0.45 V (mixture too lean), carry out the steps as following:
  - Spray proper amount of propane gas into the intake.
  - Observe whether there is a significant change in the pre-catalytic oxygen sensor voltage data, as the signal voltage will increase rapidly.
- (g) If the voltage data is always higher than 0.45 V (mixture too rich), carry out the following steps:
  - Put gear into neutral.
  - Apply hand brake.
  - Press the accelerator pedal so the engine speed suddenly increases to 4,000 rpm and then quickly release the accelerator pedal.
  - Repeat the previous steps more than 3 times.

- Observe whether there is a significant change in the pre-catalytic oxygen sensor voltage data, as the signal voltage will increase rapidly.

During the above test, the oxygen sensor signal voltage should have a significant change.

Significant voltage change?

Signal Voltage No Response	A
Signal Voltage Remains High	B
Signal Voltage Remains Low	C
Signal Voltage Normal	D

A	Replace the pre-catalytic oxygen sensor.
B	Go to step 13
C	Go to step 14

D

Step 8	Check whether the spark plug is normal?
--------	---

- (a) Refer to "Ignition System" in the [2.10.7.6 Spark Plug Diagnostic](#).

No	Replace with the correct type of spark plug.
----	--

Yes

Step 9	Check whether the high-voltage resistance is normal?
--------	--

- (a) Check whether the high-voltage resistance connection is solid, not damaged and so on.

No	Repair the faulty part. If necessary, replace with a new high-voltage resistor.
----	---

Yes

Step 10	Check whether the crankshaft position sensor signal tooth is correctly installed?
---------	---

- (a) Check whether the crankshaft position sensor signal tooth installation is solid. The signal tooth can not be missing, wear and tear and so on.

No	Diagnose the faulty part. If necessary, replace the faulty parts.
----	---

Yes

Step 11	Check whether air-conditioning system is working correctly?
---------	---

- (a) Check the compression clutch engagement. Air-Conditioning system pressure can not be too high. Check whether the air-conditioning compressor is working properly. Refer to the

"Air-Conditioning System" in the [8.2.7 Diagnostic Information and Procedures](#).

No

Repair the faulty part.

Yes

Step 12 Check whether the exhaust system is normal?

(a) Inspect the exhaust system for blocking. Refer to the "Engine Exhaust System" in the [2.7.5.3 Exhaust System Blockage](#).

No

Repair the faulty part.

Yes

Go to step 15

Step 13 Check the cause for the mixture too rich.

- (a) Check whether the canister solenoid valve is normally turned on.
- (b) Check whether there is fuel injectors leakage.
- (c) Check whether the air filter is blocked.
- (d) Check whether there is intake manifold clogging or deformation.
- (e) Check whether the engine oil is contaminated by fuel.
- (f) Check whether the fuel pressure is too high.
- (g) Check whether the intake manifold absolute pressure sensor is normal.
- (h) Check whether the engine coolant temperature sensor is normal.

The existence of the above faults?

No

Go to step 15

Yes

Repair the faulty part.

Step 14 Check the cause for the mixture too lean.

- (a) Check whether there is a vacuum leak.
- (b) Check the existence of broken tubes.
- (c) Check whether the fuel injectors is blocked.
- (d) Check whether intake manifold absolute pressure sensor is abnormal.
- (e) Check whether the engine coolant temperature sensor is abnormal.
- (f) Check whether the fuel is contaminated.

The existence of the above faults?

Yes

Repair the faulty part.

No

Step 15 Road test the vehicle to confirm that the fault has been ruled out.

### 2.3.7.7 Fuel Pressure Testing Procedure

#### Warning!

Gasoline and gasoline vapor is highly flammable. In order to avoid fire or explosion, please select keep away from a fire. It is prohibited to use mobile phones during this procedure. Do not use open containers to store gasoline exhaust emissions. Before carrying out this procedure, please prepare a dry-chemical fire extinguisher.

#### Warning!

Wrap a cloth around the fuel pressure gage and fuel rail joints to absorb leaked fuel when you connect the fuel pressure gage to reduce the risk of fire and injury. Upon completion of testing, place the cloth into the designated containers. Clean pipe joints before removal.

#### Warning!

It is prohibited to pour or store fuel in an open container, otherwise it will cause a fire.

Step 1	Install fuel pressure gage in the fuel rail intake.
Next	
Step 2	Place the fuel pressure gage exhaust hose into a specified gasoline container.
Next	
Step 3	Open the valve on the fuel pressure gage to discharge the air from the gage.
Next	
Step 4	Turn the ignition switch to "ON" position.
Next	
Step 5	Use scan tool "Function Test" drive fuel pump fuel pump relay, until all the air expelled from pressure gage.
Next	
Step 6	Turn off the exhaust valve on the fuel pressure gage.
Next	
Step 7	Use scan tool to connect the fuel pump to check whether there is fuel leakage and the leakage location.
Next	
Step 8	When there is no leakage in the pipeline, start the engine and the fuel pressure should be 400 kPa (58.01 psi).
Next	
Step 9	Turn the ignition switch to "OFF" position. under normal circumstances the system should maintain residual pressure above 250 kPa (36.26 psi). If the fuel pressure continues to drop, check the fuel pump or fuel pressure regulator.

Next

Step 10 End.

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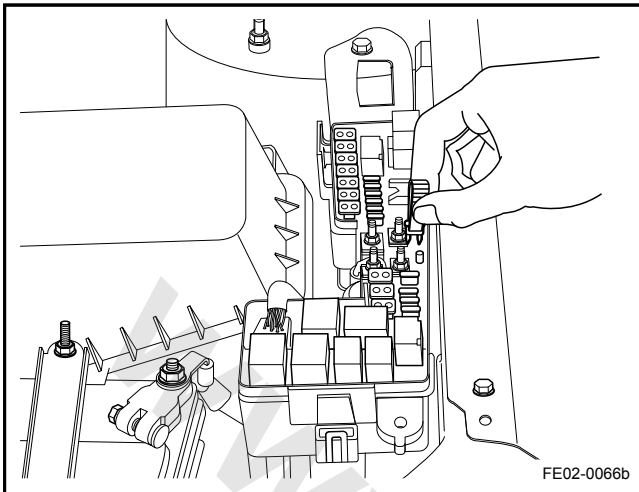
## 2.3.8 Removal and Installation

### 2.3.8.1 Fuel Pressure Release Procedure

1. Open the fuel tank cap.
2. Open the hood, pull out fuel pump fuse EF05 (15 A).
3. Start the engine until the engine stops running automatically.
4. Start the engine again, so that the crankshaft continues to rotate about 10 s.

#### Note

If you want to remove any fuel system components, wrap pipe joints with plastic bags to prevent fuel leakage and prevent the entry of foreign matter.



### 2.3.8.2 Fuel Filter Replacement

Removal Procedure:

#### Warning!

Refer to "Release Fuel Pressure Warning" in "Warnings and Notices".

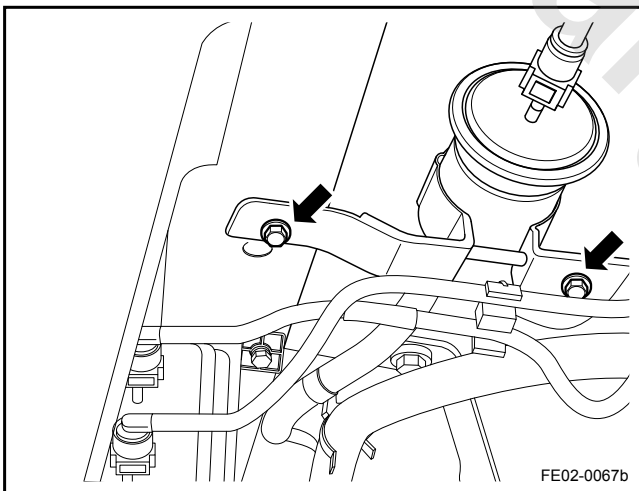
1. Release fuel system pressure. Refer to [2.3.8.1 Fuel Pressure Release Procedure](#).
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).

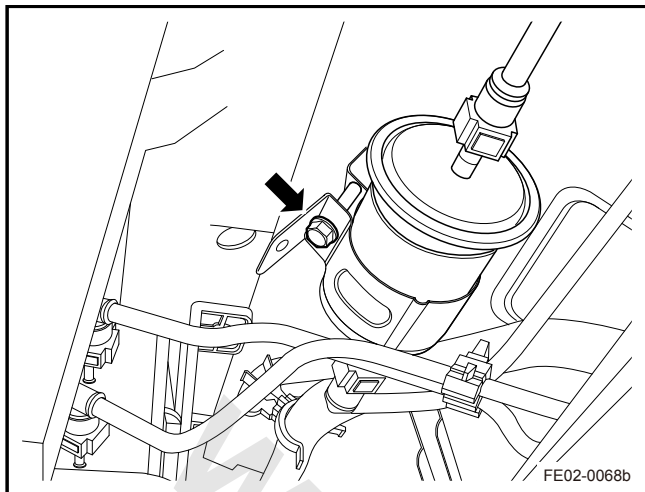
3. Lift the vehicle.

#### Warning!

Refer to "Vehicle lifting Warning" in "Warnings and Notices".

4. Remove the fuel filter bracket bolts.

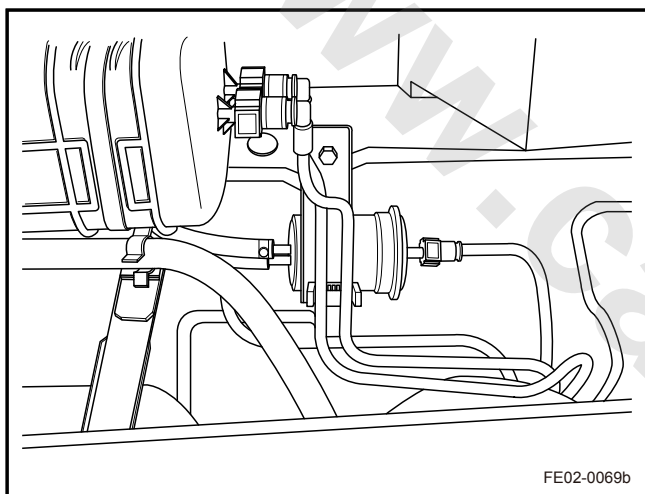




5. Loosen filter retaining bolts on the bracket.
6. Disconnect the fuel inlet and outlet pipes.

#### Note

If sand enters into the pipe joints, removal may become difficult. With a wood handle gently knock the filter housing to remove the sand, and then push the pipe toward the filter direction. Press the lock to Disconnect the pipe.



#### Installation Procedure:

1. Install the fuel filter to the bracket and pay attention to the direction of the filter.
2. Connect the fuel inlet and outlet pipes.
3. Tighten the filter retaining bolts.
4. Install fuel filter bracket bolts.  
Torque: 9 Nm (Metric) 6.66 lb-ft (US English)
5. Connect the battery negative cable.

### 2.3.8.3 Fuel Pump Assembly Replacement

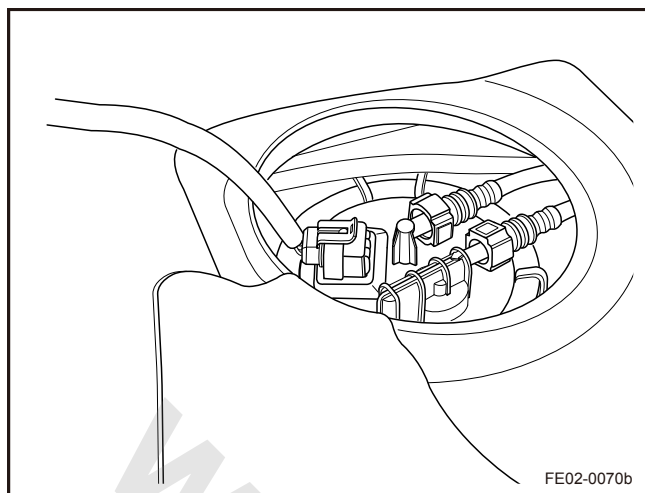
#### Removal Procedure:

##### Warning!

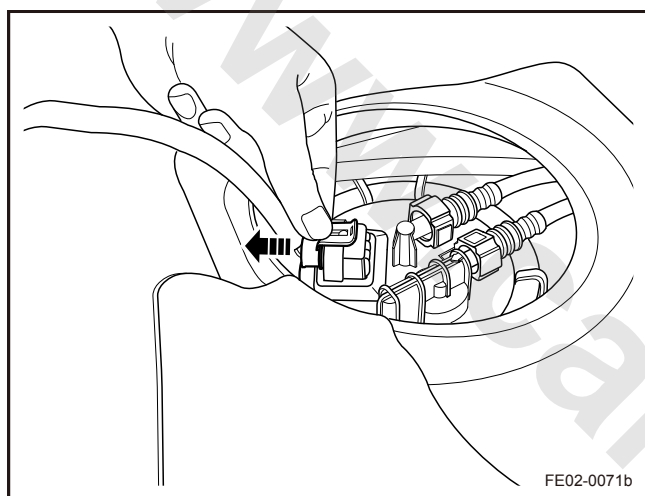
Refer to "Release Fuel Pressure Warning" in "Warnings and Notices".

##### Warning!

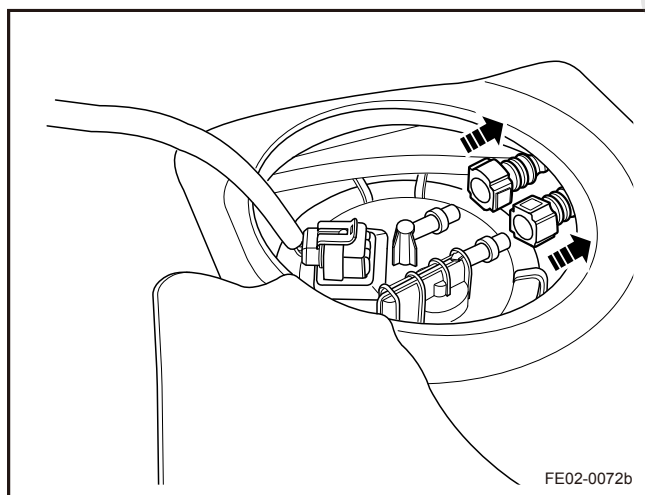
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



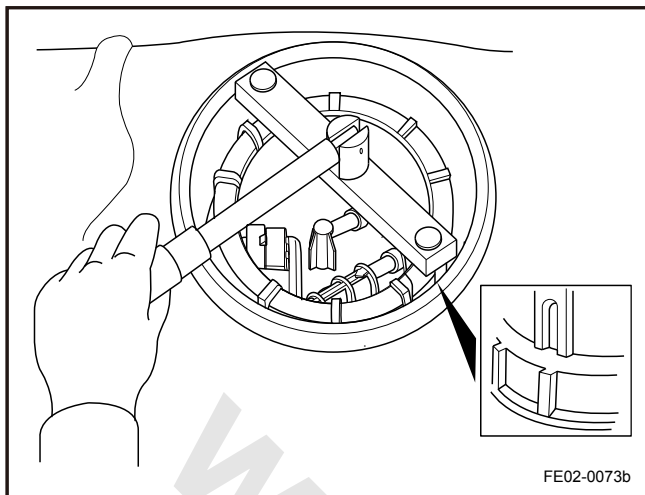
1. Release fuel pressure. Refer to [2.3.8.1 Fuel Pressure Release Procedure](#).
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Remove the rear seat cushion. Refer to [12.7.3.4 Rear Seat Cushion Replacement](#).
4. Remove fuel pump inspection cover.



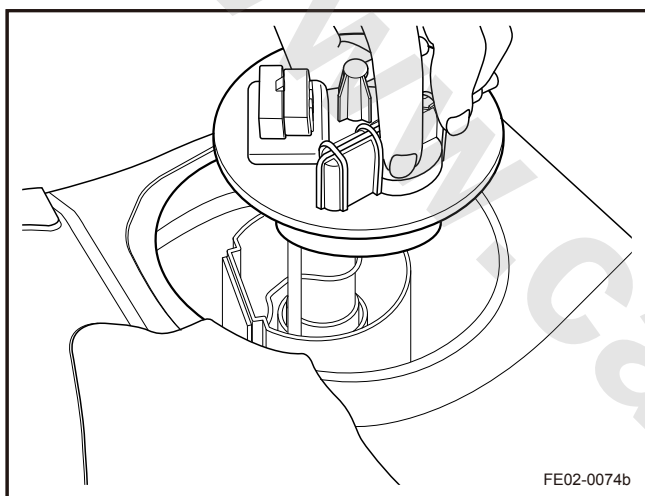
5. Disconnect fuel pump harness connector.



6. Disconnect the fuel pump inlet and outlet pipes.



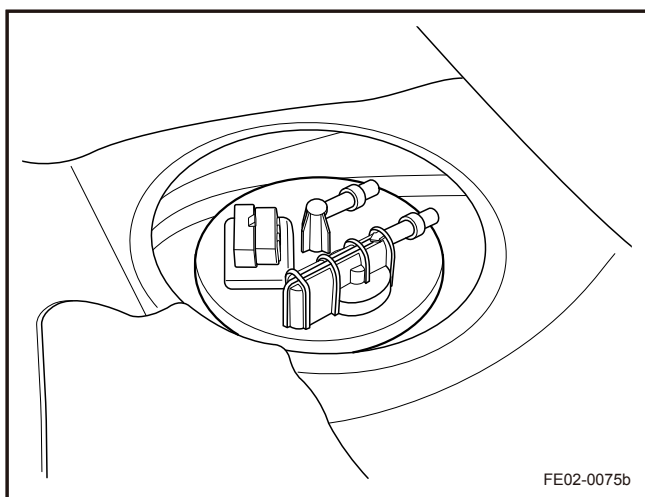
7. Unscrew counter-clockwise and remove the fuel pump lock ring.



8. Remove fuel pump assembly.

#### Note

Pay attention to not to drop gasoline on the floor and the interior, otherwise it will corrode sealant and the interior.

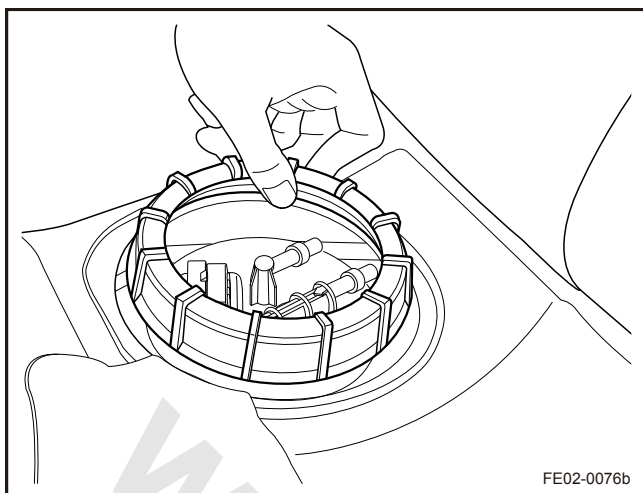


#### Installation Procedure:

1. Clean fuel pump seals and tank mating surface.
2. Install new fuel pump seals.
3. Install fuel pump assembly.

#### Note

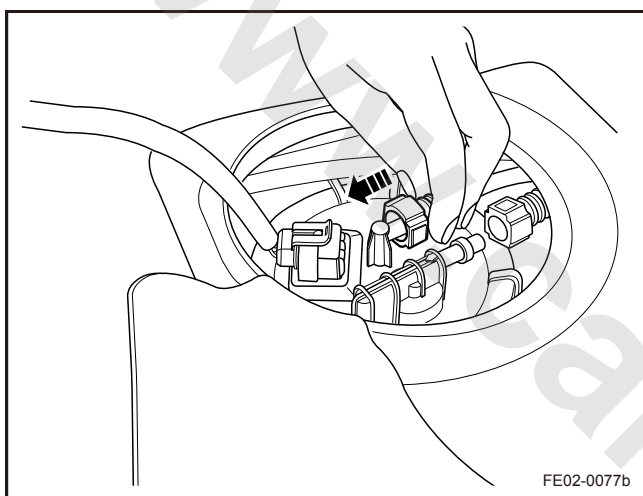
During installation, make ensure the outlet pipe and return pipe face the rear of the vehicle body, otherwise the pipes can not be installed.



4. Install fuel pump clockwise to tighten fuel pump lock ring.

**Note**

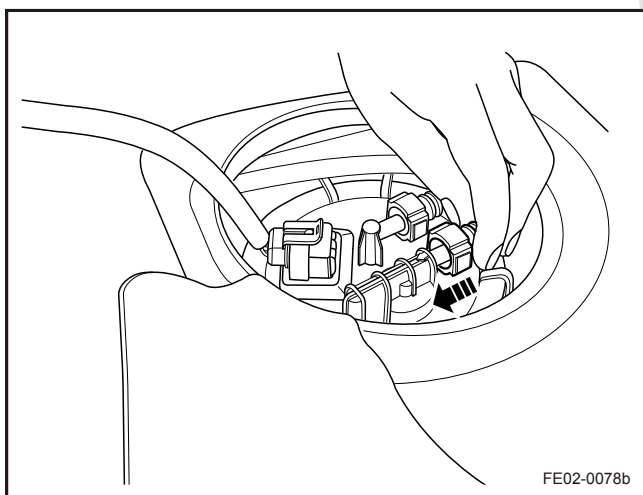
During installation, make ensure the outlet pipe and return pipe face the rear of the vehicle body.



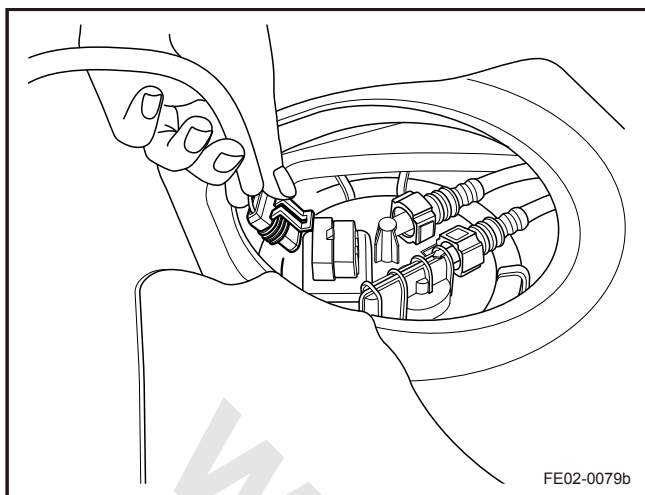
5. Connect the fuel pump outlet pipe.

**Warning!**

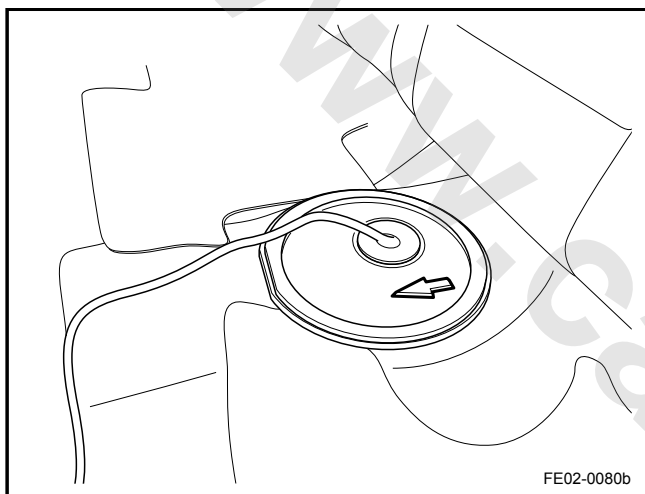
Refer to "Fuel Pipe Joints Warning" in "Warnings and Notices".



6. Connect the fuel pump return pipe.



7. Connect the fuel pump wiring harness connector.



8. Install fuel pump inspection cover, note that the arrow is pointing to the vehicle body front.

9. Install the rear seat.

10. Connect the battery negative cable.

#### 2.3.8.4 Fuel Level Sensor Replacement

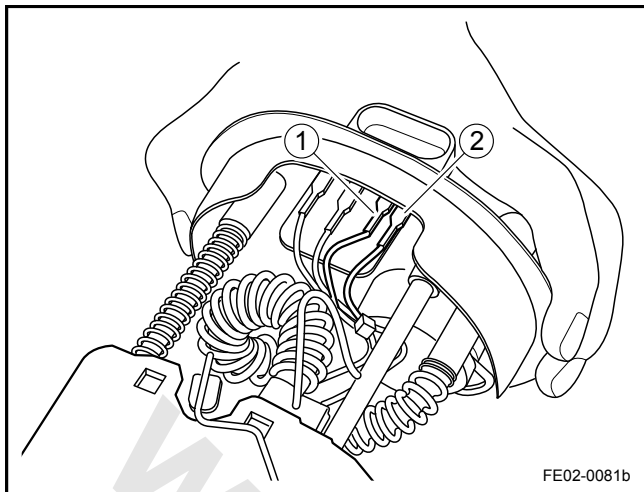
Removal Procedure:

Warning!

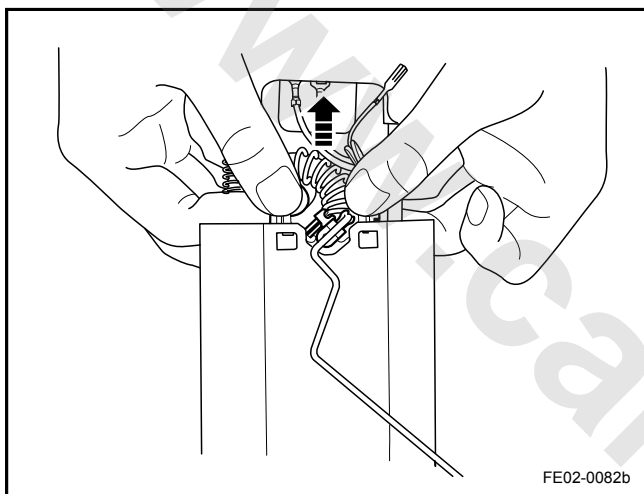
Refer to "Release Fuel Pressure Warning" in "Warnings and Notices".

Warning!

Refer to "Battery Disconnection Warning" in "Warnings and Notices".



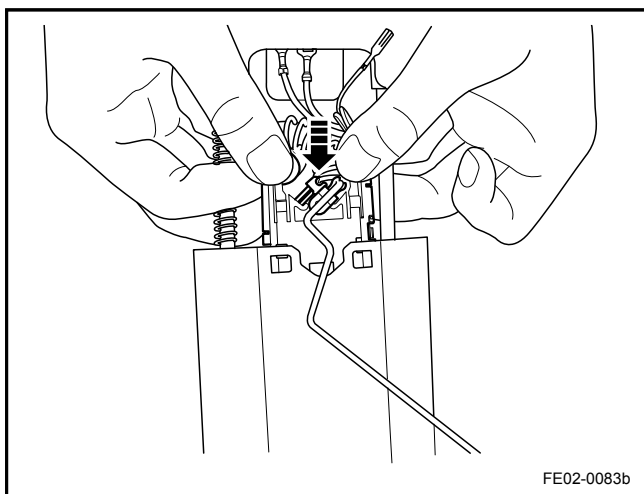
1. Release fuel system pressure. Refer to [2.3.8.1 Fuel Pressure Release Procedure](#).
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Remove the rear seat cushion. Refer to [12.7.3.4 Rear Seat Cushion Replacement](#).
4. Remove fuel pump assembly. Refer to [2.3.8.3 Fuel Pump Assembly Replacement](#).
5. Disconnect the fuel level sensor wires (1) and (2).

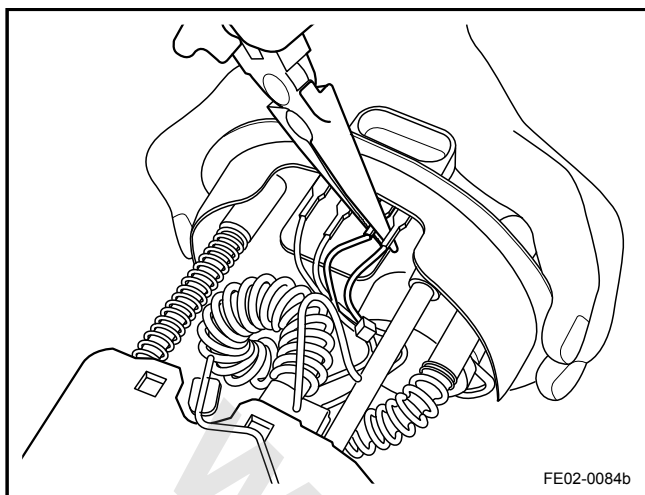


6. Disconnect the fuel level sensor wiring harness cable tie.
7. Hold the fuel level sensor buckle upward and remove the fuel level sensor.

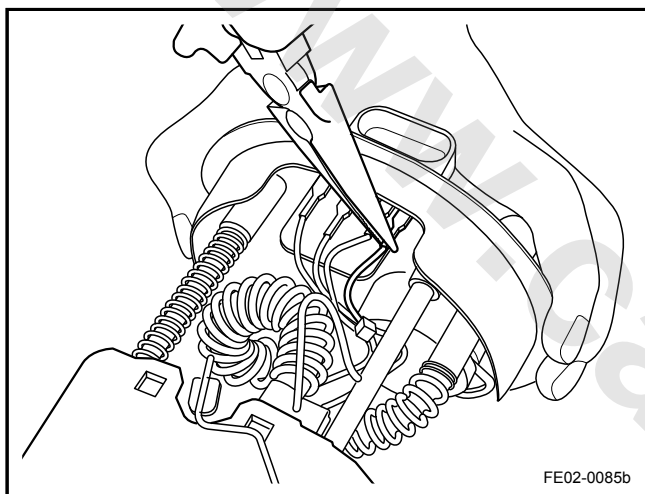
#### Installation Procedure:

1. Install the fuel level sensor to the fuel pump assembly.





2. Connect the black wires to the fuel level sensor.



3. Connect the black wires to the fuel level sensor.
4. Fix the fuel gage wiring harness with a cable tie.
5. Install the fuel pump.
6. Install the rear seat cushion.
7. Connect the battery negative cable.



## 2.4 Auxiliary Emission Control JL4G18-D

### 2.4.1 Specifications

#### 2.4.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Canister Ventilation Filter Mounting Bracket Retaining Bolt	M6 × 1.25 × 20	7-9	5.2-6.7
Canister Solenoid Valve Bracket Retaining Bolts	M6 × 1.25 × 20	7-9	5.2-6.7
Canister Assembly Retaining Bolts	M6 × 1.25 × 20	8-10	6.0-7.4

## 2.4.2 Description and Operation

### 2.4.2.1 Heated Oxygen Sensor (HO<sub>2</sub>S)

Heated Oxygen Sensors (HO<sub>2</sub>S) are installed before and after the three-way catalytic converter. Heated oxygen sensor sends signals to the engine control module (ECM) indicating oxygen content in the exhaust. The engine control module controls the fuel injectors to change the engine Air-Fuel ratio. The ideal Air-Fuel ratio is 14.7:1, at this time the catalytic converters is most efficient. As the fuel injection system continuously measures and adjusts Air-Fuel ratio, it is called "closed loop" control.

#### 1. Open-loop

When the engine has just started and the speed is higher than 400 rpm, the system enter "open loop" operation. In the open-loop mode, the engine control module (ECM) ignores the signal from the heated oxygen (HO<sub>2</sub>S) signal and according to signals from the engine coolant temperature sensor (ECT) and intake pressure temperature sensor to calculate the Air-Fuel ratio. Sensors will remain in the "open loop" mode, until the following conditions are met:

- Heated oxygen sensor voltage output changes, showing that the temperature is high enough and the system can enter the normal operation.
- Engine coolant temperature sensor in higher than the specified temperature.
- The engine has been started for the specified period of time.

#### 2. Closed-loop

In the above mentioned situation, the specific values depend on different engines and are stored in electrically erasable programmable read-only memory (EEPROM). When these conditions are met, the system enters into "closed loop" operation. In the "closed loop", the engine control module calculates Air-Fuel ratio according to oxygen sensor signals (ie, fuel injector connected timing), so that the Air-Fuel ratio is always very close to 14.7:1.

#### Note

Once the engine control module confirms oxygen sensor faulty, the system will be immediately in "open loop" control, that is the Air-Fuel ratio is no longer adjusted according to the oxygen sensor signals.

### 2.4.2.2 Evaporative Emission Control System

Evaporative emission control system uses the basic principle of Canister storage method. This method transfers fuel vapor from fuel tank to the carbon storage devices in order to save the steam when the vehicle is not running. When the engine is running, the fuel vapor is sucked out from the Canister and burnt in the normal combustion process. Gasoline vapor from the fuel tank flows into the fuel vapor recovery pipe. The vapor is absorbed by the Canister. After the engine runs the required time, the engine control module provides a ground circuit, so that evaporative Canister clean-up solenoid valve is turned on and the air is drawn into the Canister and mixed with vapor. The mixture is then sucked into the intake manifold. The evaporative canister clean-up is controlled by the pulse-width modulated solenoid valve (PWM) signal to open or close. According to the operating conditions determined by air flow, fuel adjustment and intake air temperature, evaporative Canister PWM duty cycle changes.

The following conditions can cause poor idling, stalling and poor performance:

- Canister Solenoid Valve Inoperative
- Canister Damage
- Hose Disconnected, Cracking, Improperly Connected To The Pipeline

Evaporative canister is an emission control device containing active carbon particles. Evaporative Canister is used to store fuel vapor from fuel tank. When certain conditions are met, the engine control module will provide the Canister solenoid valve power, so that the fuel will be sucked into the engine cylinder and burnt off.

#### 2.4.2.3 Purged Crankcase Ventilation (PCV) System

Compressed combustion gases fleeing into the crankcase through the piston rings is known as channeling gas. Channeling gas contains nitrogen oxides, carbon monoxide and hydrocarbons. Crankcase ventilation system prevents the channeling gas entering into the atmosphere. Crankcase ventilation system will force the channeling gas crankshaft back into the intake system and the combustion chamber. Crankcase ventilation system consists of the following components:

- Purged Crankcase Ventilation Valve
- Crankcase Ventilation Tube
- Hose and Connectors

## 1. Operation

The main control device is the crankcase ventilation (PCV) valve. Purged crankcase ventilation valve calculates the channeling air flow according to manifold vacuum signal. Lower crankcase ventilation valve parts below the O-ring are exposed to a vacuum in the intake manifold, parts located between the lower and upper O-ring are exposed to the crankcase gases. Purged crankcase ventilation valve allows some internal vacuum pressure through the valve orifice, and forms the low-pressure condition inside the crankcase. The channeling crankcase gas is then sucked into the intake system and burnt in the normal combustion process. The channeling gas entering into the intake manifold must be accurately controlled in order to maintain idle quality. Must use the correct and proper calibration of the crankcase ventilation valve. Relationship between the Channeling air flow and engine manifold vacuum is shown in the table below:

Manifold Vacuum	Purged Crankcase Ventilation Valve Opening	Channeling Air Flow
Low	Large	High
High	Small	Low

## 2. The Consequences Of Abnormal Operation

Valve or hose blockage may lead to the following conditions:

- Poor engine idling.
- Engine stalls or engine idle speed is too low.
- Engine crankcase pressure is too high.
- Engine oil leaks.
- Engine oil enters into the air filter.
- Engine has sludge.
- Engine oil consumption is high.
- Excessive exhaust emissions.

### 2.4.3 System Working Principle

#### 2.4.3.1 Heated Type Oxygen Sensor Working Principle

- Oxygen sensor's sensing element is a porous ceramic tube, the outer wall surrounded by the engine exhaust and inside exposed to atmosphere. Sensing ceramic wall is a solid electrolyte containing an electric heating tube. When the sensor ceramic tube temperature reaches 350°C (662 °F ), it will have a solid electrolyte properties.
- Oxygen sensor's senses ceramic oxygen ion concentration inside and outside difference and sends it out as a voltage signal.
- The output voltage level is due to internal electronic ceramic tubes movement.
- Meet EOBD vehicles self inspect whether the sensor information is accurate.
- Heated resistor resistance at room temperature is 2.5-4.9 Ω.

#### Note

- During the oxygen sensor repair procedure, it is prohibited to use cleaning agent, oily liquids or volatile solids.
- After the replacement of oxygen sensor, apply a layer of anti-rust oil to oxygen sensor threads to prevent rust. Oxygen sensors have electrical cables. The other end of electrical cable is a connector. The external packaging is anti-fire sleeve. A new oxygen sensor will be coated with anti-rust oil on the threads, during installation do not remove these anti-rust oil.

#### 2.4.3.2 Canister Solenoid Valve Working Principle

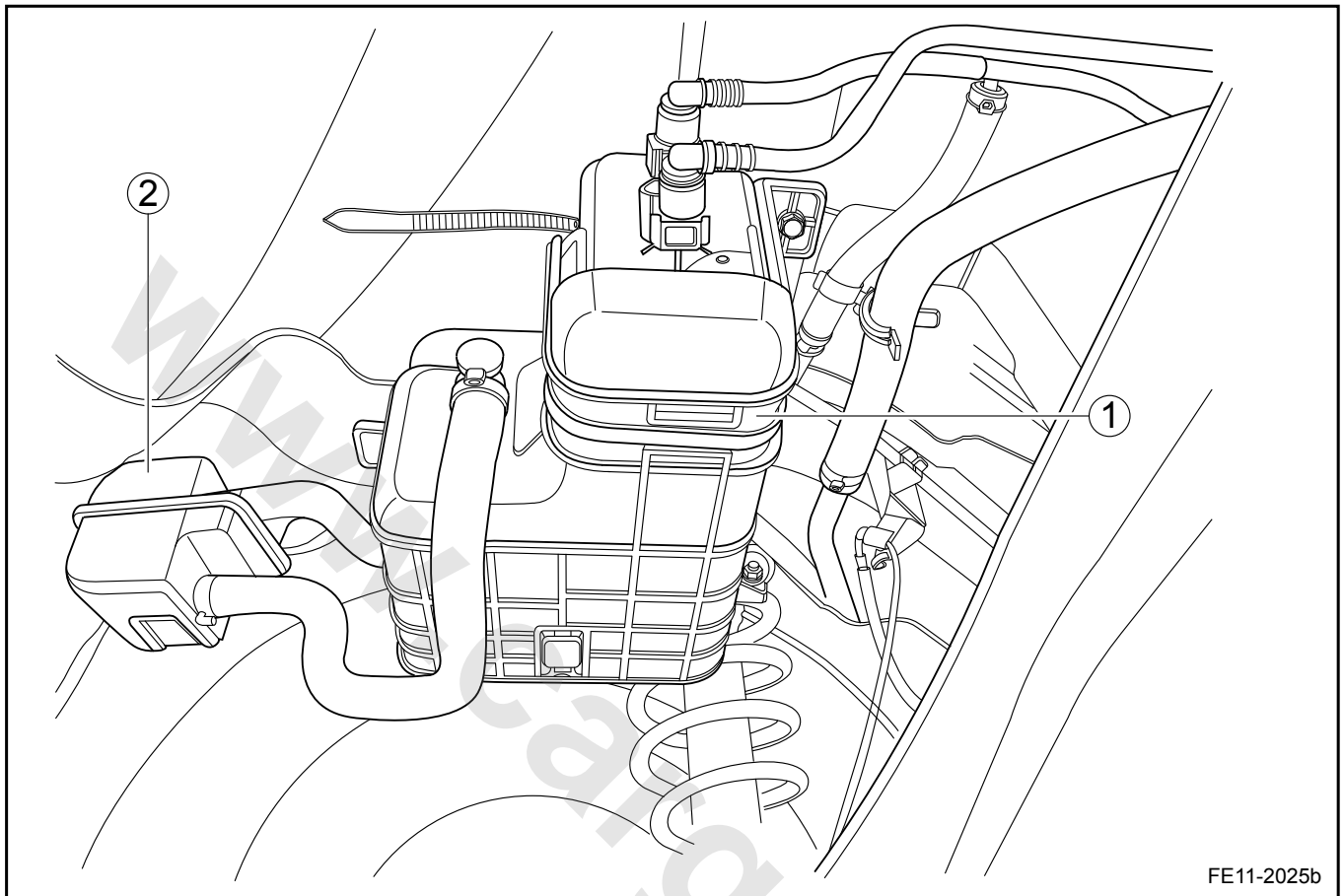
1. Canister solenoid valve consists of the electromagnetic coil, armature and valves so on. Inlet port has a filter.
2. On one hand, air flow through the Canister solenoid valve is related to ECM output to the Canister solenoid valve electrical pulse duty cycle; on the other hand, it is related to the pressure difference between the Canister solenoid valve inlet port and outlet port. When there is no electrical pulses, the Canister solenoid valve will be turned off.
3. ECM provides signals to control the Canister solenoid valve power according to various engine sensor signals, and indirectly controls the flow of the clean air.

4. When the engine coolant temperature, engine running time and engine load etc. meet the preset requirements, ECM will instruct Canister solenoid valve to start working. In the following situations canister solenoid valve will not work:

- Engine cold start.
- Engine coolant temperature is relatively low.
- Engine idle.
- Engine load is high.
- Important sensor system faults.

## 2.4.4 Component Locator

### 2.4.4.1 Canister Location

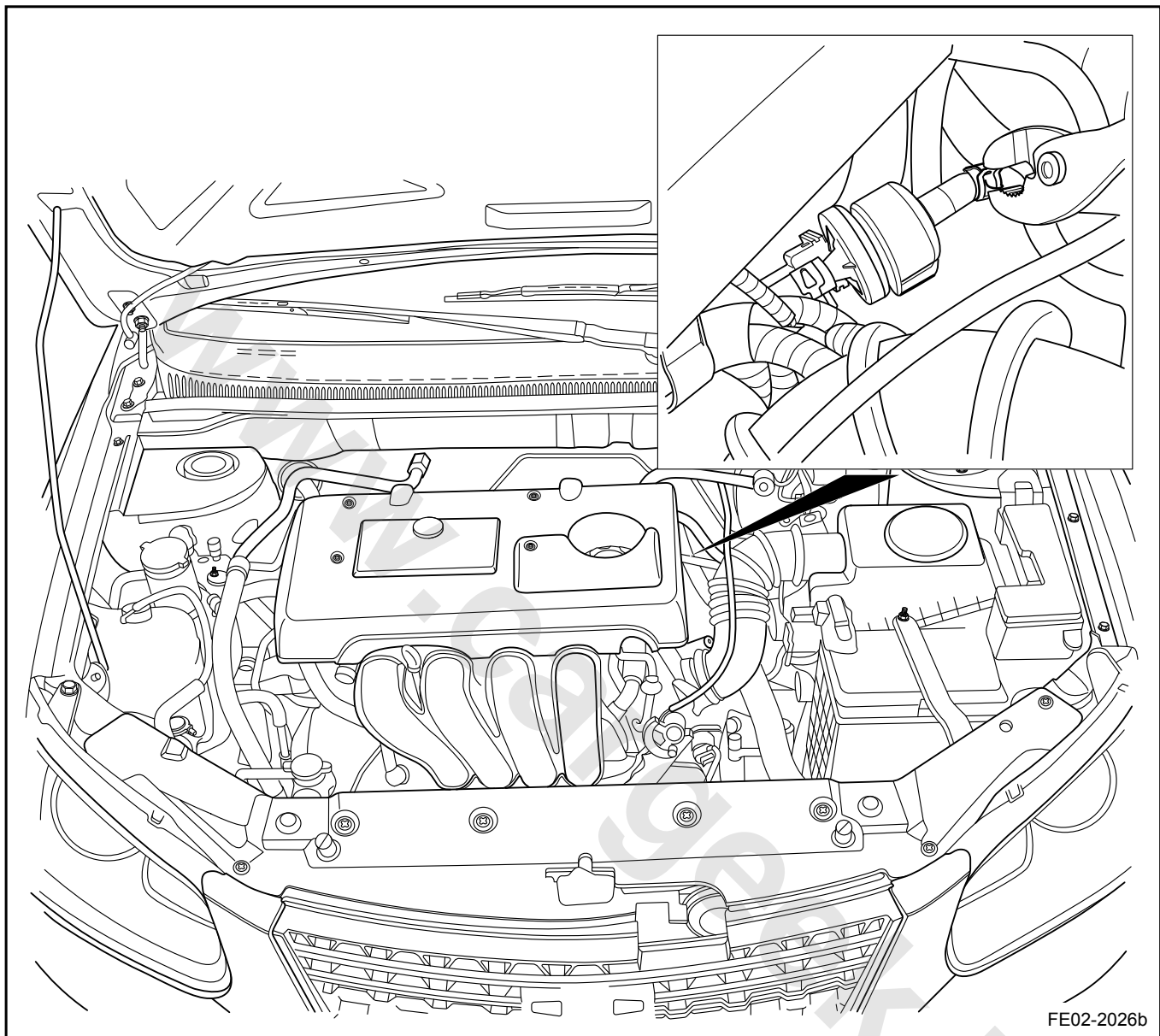


#### Legend

1. Canister Assembly

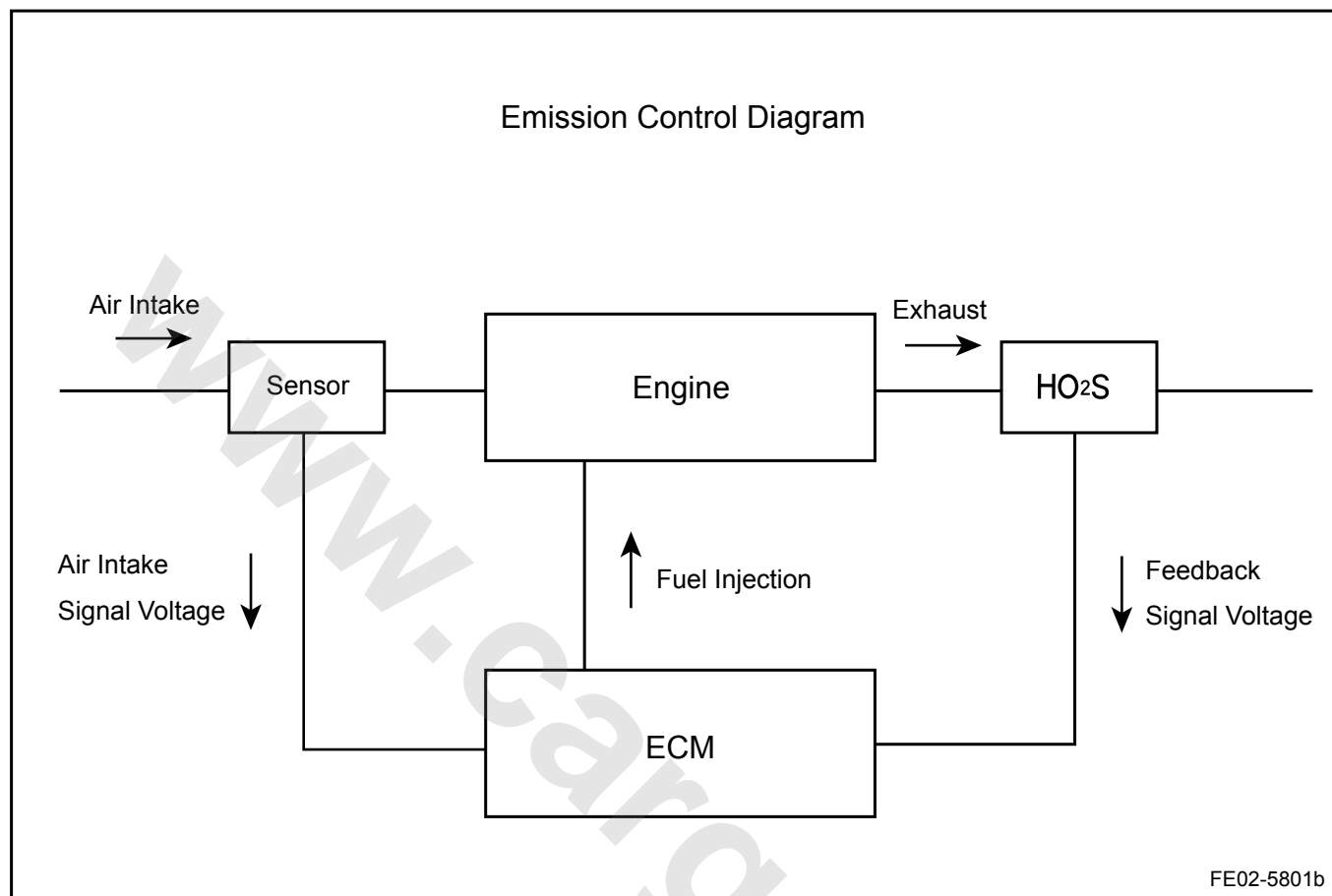
2. Canister Ventilation Filter

#### 2.4.4.2 Canister Solenoid Valve Location



## 2.4.5 Schematic

## 2.4.5.1 Schematic



## 2.4.6 Diagnostic Information and Procedures

### 2.4.6.1 Diagnostic Description

Refer to [2.4.2 Description and Operation](#) get familiar with the system functions and operations then start system diagnostics, so that it will help with the correct diagnostic steps, more importantly, it will also help to determine whether the customer described the situation is normal.

Canister solenoid valve repair notes:

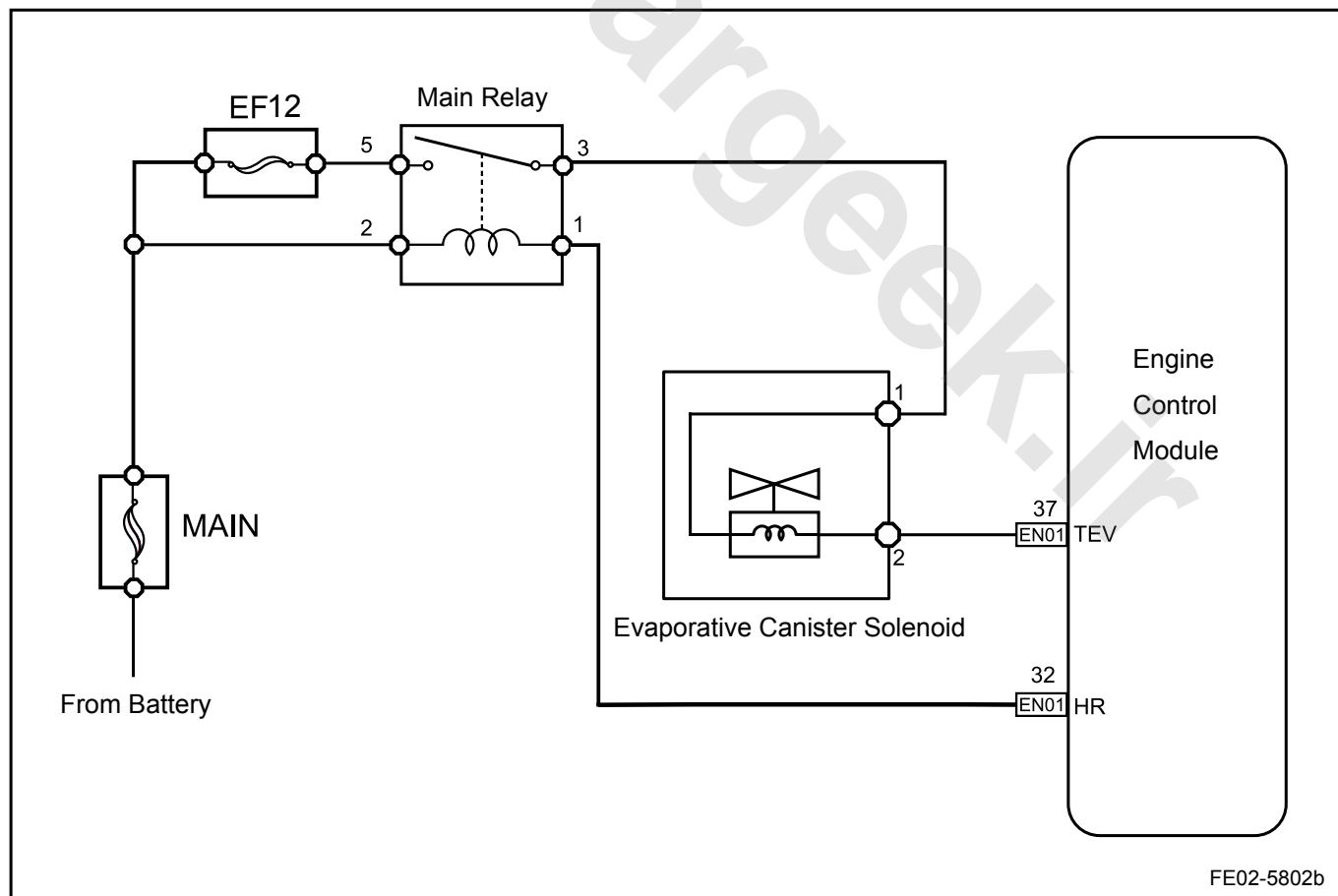
1. Make sure airflow direction comply with specifications.
2. When particles inside the valve body causing the control valve failure, replace canister solenoid valve and check the canister status.
3. During maintenance procedure, avoid water, oil and liquid entering into the valve.

### 2.4.6.2 Visual Inspection

- Check installed after market equipment that may affect auxiliary emission control devices operation.
- Check the easy to access system components to identify whether there is significant damage or the existence of an external leakage.
- Check whether the fuel is the recommended type and fill up the fuel tank.

### 2.4.6.3 Canister Solenoid Valve Inoperative

Schematic:





## Diagnostic Steps:

Step 1	Check engine emission malfunction warning lamp.
--------	---

(a) Start the engine.  
Check whether the engine emission malfunction warning lamp is lit.

Yes  No

Go to step 3

Yes

Step 2	Repair the engine control system fault.
--------	---

(a) Repair the engine control system fault. Refer to [2.2.7.33 DTC P0444 P0458 P0459](#).

Is canister solenoid valve working properly?

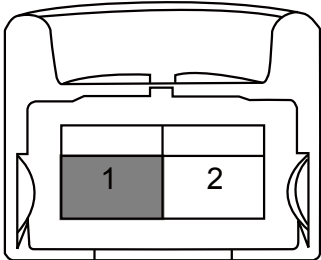
Yes  No

System normal

No

Step 3	Check canister solenoid valve power supply circuit.
--------	---

Evaporative Canister Solenoid Harness Connector EN24



FE02-5803b

(a) Turn on the ignition switch.  
(b) Measure the canister solenoid valve EN24 terminal No.1 voltage with a multimeter.  
Standard Voltage: 11-14 V

Yes  No

Go to step 5

No

Step 4	Repair the main relay.
--------	------------------------

(a) Turn off the ignition switch.  
(b) Repair the main relay circuit. Refer to [2.2.7.37 DTC P0560 P0562 P0563](#).

Is canister solenoid valve working properly?

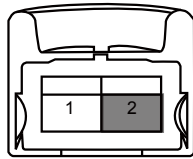
Yes  No

System normal

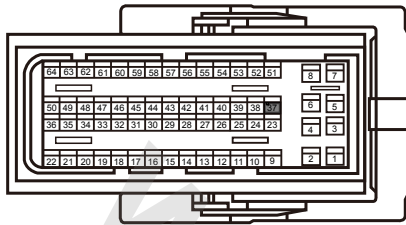
No

Step 5	Check canister solenoid valve wiring harness connector and ECM harness connector circuit.
--------	---

Evaporative Canister Solenoid Harness Connector EN24



ECM Harness Connector EN01



FE02-5804b

- Turn off the ignition switch.
- Check resistance between solenoid valve wiring harness connector EN24 terminal 2 and ECM harness connector EN01 terminal No.37 with the multimeter and confirm the circuit continuity.

Standard Resistance Value: Less than 1  $\Omega$ 

Is the resistance standard?

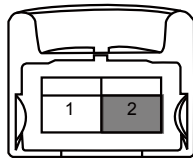
Yes

Go to step 7

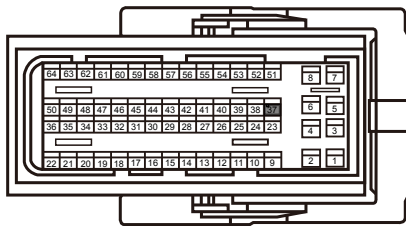
No

**Step 6** Repair Canister solenoid valve wiring harness connector and ECM harness connector.

Evaporative Canister Solenoid Harness Connector EN24



ECM Harness Connector EN01



FE02-5804b

- Turn off the ignition switch.
- Repair open circuit fault between Canister solenoid valve wiring harness connector EN24 terminal No.2 and ECM harness connector EN01 terminal No.37.

Is canister solenoid valve working properly?

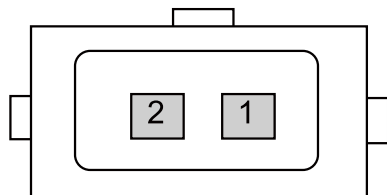
Yes

System normal

No

**Step 7** Check canister solenoid valve.

Evaporative Canister Solenoid



FE02-5805b

- Turn off the ignition switch.
- Check canister solenoid valve resistance.

Standard Resistance Value: 26  $\Omega$ /20°C(68 °F)

Is the canister solenoid valve resistance standard?

Yes

System normal

No

Step 8	Replace the canister solenoid valve.
--------	--------------------------------------

- (a) Turn off the ignition switch.
- (b) Replace the canister solenoid valve. Refer to [2.4.7.3 Canister Solenoid Valve Replacement](#).

Confirm the repairs completed.

Next

Step 9	System normal.
--------	----------------

#### 2.4.6.4 Crankcase Ventilation (PCV) System Check / Diagnostic

Step 1	Check crankcase ventilation hose whether there is a vacuum. vacuum should be present in the Hose. If not, check whether the hose is blocked, leaking or ventilation tube connector blocked.
--------	---

Next

Step 2	With the engine running, plug the vacuum hose end. When the hose end plugged, check whether there is collapse in all parts of the hose. If hose collapses, the hose should be replaced.
--------	---

Next

Step 3	If the engine oil gathered in the intake manifold, check whether there are following situations.
--------	--

- (a) Crankcase vacuum hole blocked.
- (b) Crankcase ventilation hood blocked .
- (c) Crankcase pressure or channeling gas beyond the acceptable tolerance range. Refer to [2.9.7.3 Abnormal Engine Oil Consumption Diagnostic](#).

Next

Step 4	Check other parts.
--------	--------------------

- (a) Fresh air ventilation or vent hose assembly connector blocked or leaking.
- (b) Throttle body channel blocked.
- (c) O-ring missing or damaged.
- (d) Check cylinder head covers, oil pan gasket and other sealing parts for leaking.

Next

Step 5	End.
--------	------

The consequences of not working correctly

1. If the crankcase ventilation hose is blocked, it will cause the following faults:

- idle instable.

- Engine stalls or idle speed is too low.
- Engine oil leakd.
- Engine oil enters the intake.
- Engine sludges.

2. Ventilation hood or hose leak may lead to the following faults:

- Poor idle.
- Engine stall.

## 2.4.7 Removal and Installation

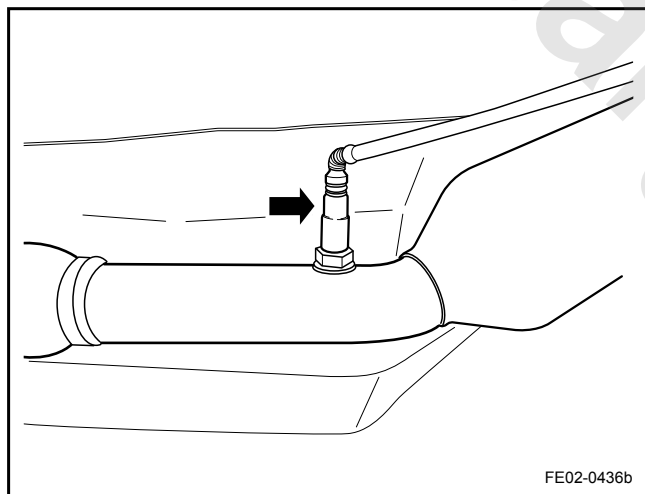
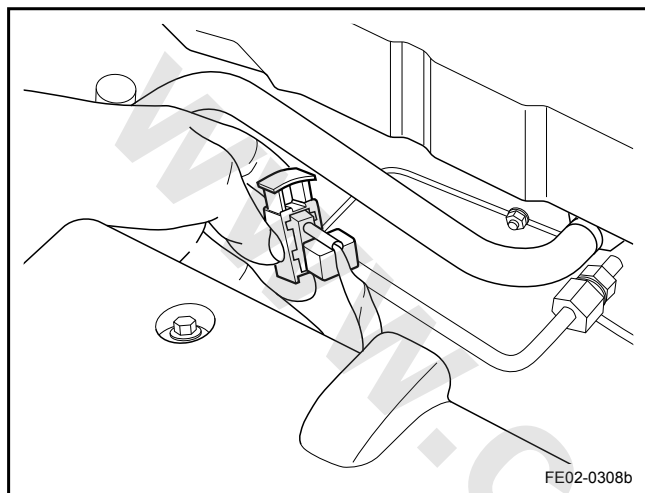
### 2.4.7.1 Post-Catalytic Oxygen Sensor Replacement

Removal Procedure:

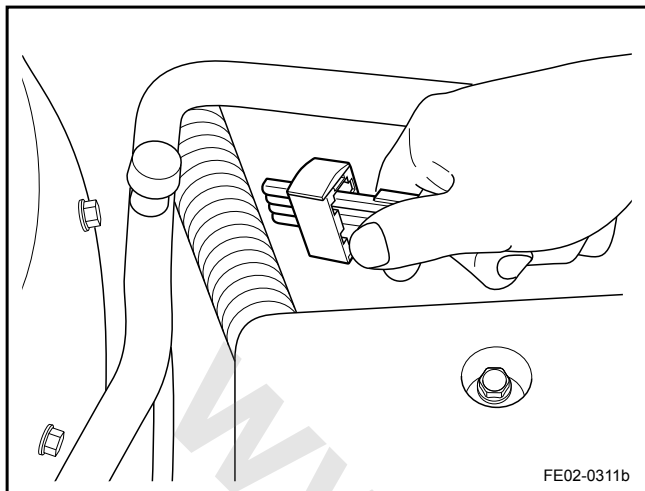
**Warning!**

Refer to "Exhaust Service Warning", and "Vehicle Lifting Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect the post-catalytic oxygen sensor wiring harness connector.



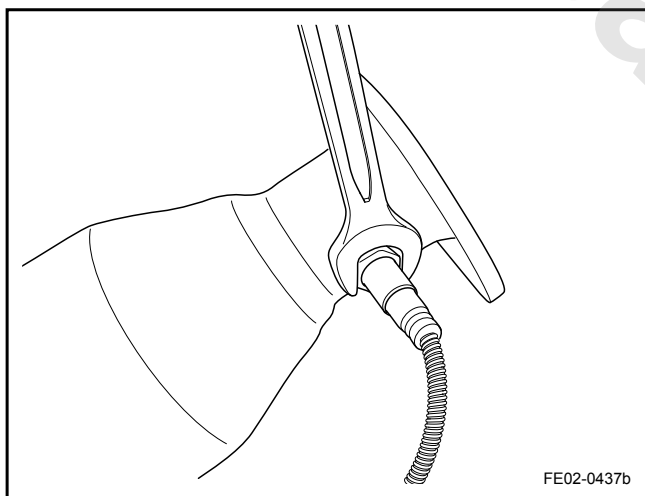
3. Lift the vehicle.
4. Remove the heated post-catalytic oxygen sensor.

**Installation Procedure:**

1. Install the heated post-catalytic oxygen sensor.
2. Lower the vehicle.
3. Connect the post-catalytic oxygen sensor wiring harness connector.
4. Connect the battery negative cable.

**2.4.7.2 Pre-Catalytic Oxygen Sensor Replacement****Removal Procedure:****Warning!**

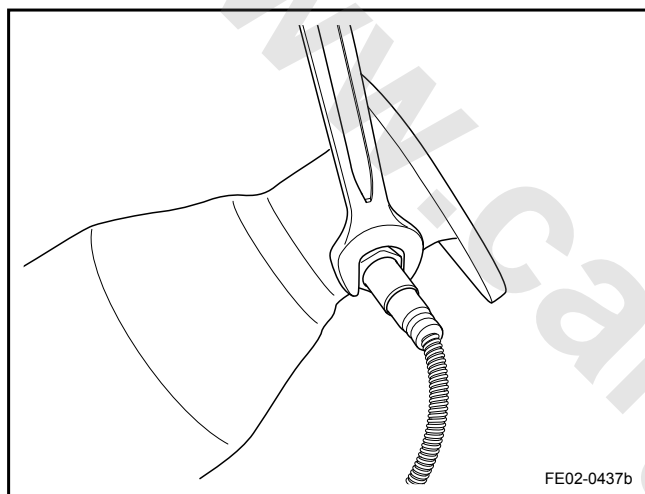
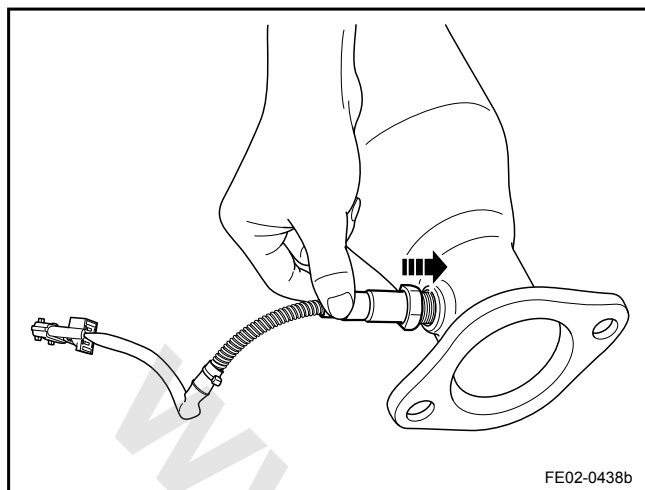
Refer to "Exhaust Service Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the three-way catalytic converter. Refer to [2.7.6.2 Three-way Catalytic Converter Replacement](#).
3. Remove the heated Pre-Catalytic oxygen sensor.

## Installation Procedure:

1. Install the heated pre-catalytic oxygen sensor.



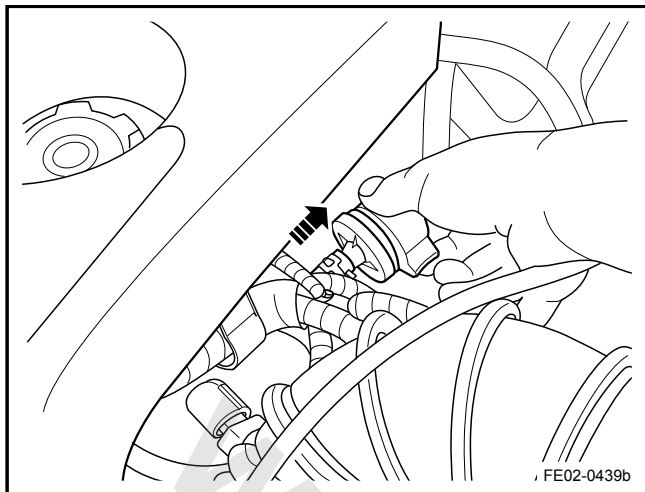
2. Tighten the heated pre-catalytic oxygen sensor.
3. Install the three-way catalytic converter.
4. Connect the battery negative cable.

### 2.4.7.3 Canister Solenoid Valve Replacement

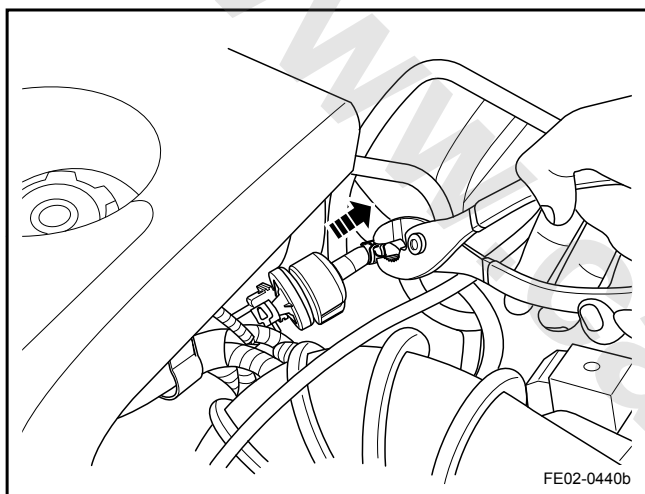
## Removal Procedure:

**Warning!**

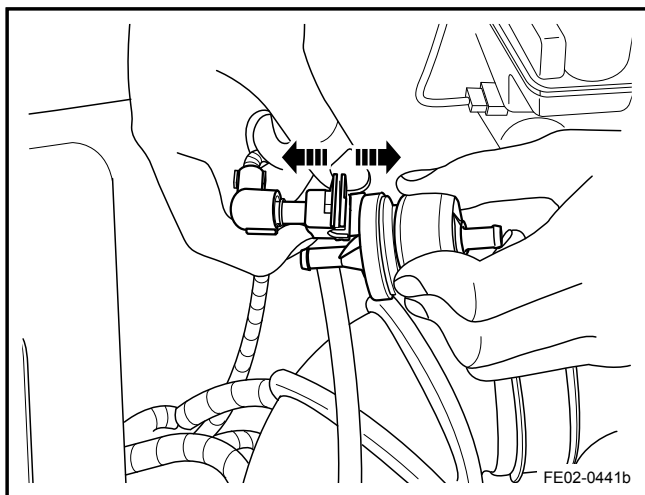
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the canister solenoid valve from the mounting bracket.



3. Disconnect the canister solenoid valve vacuum tube.

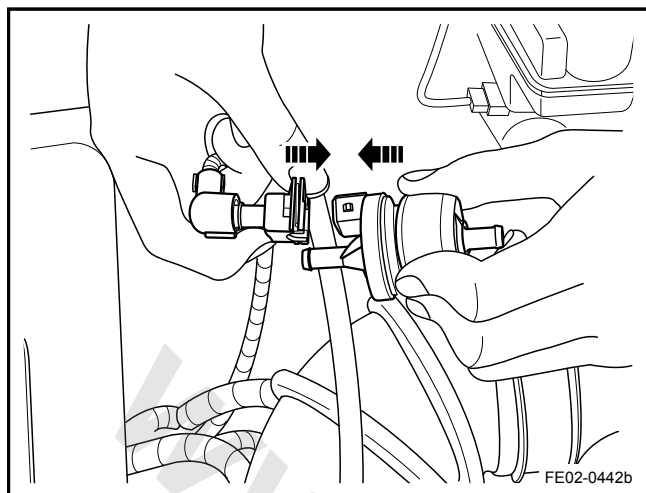


4. Disconnect canister solenoid valve wiring harness connector.

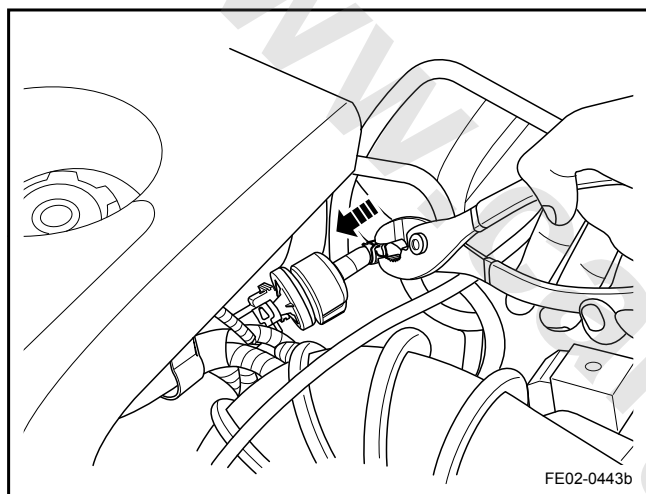


## Installation Procedure:

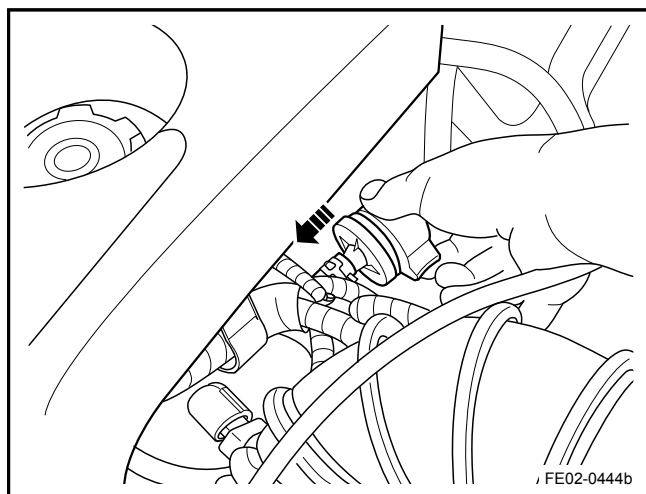
1. Connect canister solenoid valve wiring harness connector.



2. Connect canister solenoid valve vacuum tube.



3. Install the canister solenoid valve to the mounting bracket.
4. Connect the battery negative cable.



## 2.5 Engine Anti-theft System JL4G18-D

### 2.5.1 Specifications

#### 2.5.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Engine Anti-theft System Control Module Bracket Bolts	M6	8-10	6-7.4

## 2.5.2 Description and Operation

### 2.5.2.1 Description and Operation

Engine Anti-theft system feature is realized by the engine control module (IMMO) and the engine control module (ECM). Engine anti-theft system components are listed below:

- Anti-theft system Engine Control Module (IMMO)
- Engine Control Module (ECM)
- Body Control Module (BCM)
- Electronic Anti-theft Coil (Motor Anti-theft System, Antennas)
- Ignition Key (Transponder)
- Engine Trouble Indicator Light (MIL)

#### 1. Ignition Key (Transponder)

Inside the plastic key cover of the ignition key there is a transponder. The information contained in the transponder is fixed and can not be changed. Vehicle anti-theft system uses the engine ignition key transponder information to determine whether the key used to start the vehicle ignition is valid. In addition to the ignition key, it can open the door lock system and also has a launch vehicle feature.

#### 2. Electronic Anti-theft Coil (Engines Antenna Anti-theft System)

The electronic Anti-theft ignition coil is installed in the cylinder. When the ignition key is inserted into the ignition cylinder ON position, the electronic Anti-theft ignition coil will generate electromagnetic fields to stimulate the transponder keys to send out a signal. Electronic anti-theft transponder coil detects this signal and sends it to the engine control module anti-theft system.

Integrated on the electronic anti-theft coil there is a light-emitting diode lighting circuit controlled by the interior light circuit in order to facilitate the driver to locate the ignition cylinder.

#### 3. Engine Anti-theft System Control Module

The engine control module anti-theft system is installed in the driver's side below the instrument platform, when it receives a signal from the electronic anti-theft transponder coil. The engine control module anti-theft system compares this signal with key information in the memory to send the fuel engine control module enable / disable instruction.

#### Note

If the anti-theft system can not get the ignition key transponder information, it will not send any signal to the engine control module.

#### 4. Engine Control Module

Engine control module is installed under the passenger side of instrument panel, near the air-conditioning blower. Based on the signal received from the engine control module anti-theft system, it sends instruction to enable / disable fuel injection.

Based on the instruction received from the engine control module anti-theft system, engine control module will decide whether to send the engine control module to the body lock / unlock status information.

Based on the instruction received from the engine control module anti-theft system, engine control module will decide whether to send to the instrument cluster the "Light the engine anti-theft system warning lamp" request.

#### 5. Body Control Module

Body control module is installed in the driver's side instrument panel left side bottom. it receives engine lock / unlock status information from the engine control module.

If it receives the engine unlocked information, the starter will get power and the vehicle will start.

If it receives the engine unlocked information, it will disconnect the starter power supply, thus prohibiting the engine running. At the same time body control module will activate the remote control alarm system.

#### 6. Engine Failure Warning Light (MIL)

When the instrument cluster receives a "Light the engine anti-theft system warning lamp" request from the engine control module, it will enable engine malfunction indicator light flashing, until the ignition is off.

## 2.5.3 System Working Principle

### 2.5.3.1 System Working Principle

When the ignition key is inserted into the ignition cylinder and ignition switch is at ON position, the transponder will be excited by electronic Anti-theft ignition cylinder coil. the transponder will send a signal containing its own information. the signal is received by the engine anti-theft system antenna and sent to the engine control module Anti-theft system. Engine control module Anti-theft system compares this value with the value stored in memory. If the ignition key is recognized as valid, the engine anti-theft system control module will send the enable fuel instruction to the engine control module through the serial data line; if the transponder information is not correct, the engine anti-theft system control module will send the disable fuel instruction to the engine control module.

#### Note

When the engine control module receives the instruction to disable fuel, ECM will also send to the BCM disable starter instruction through the CAN bus. So the starter will also be locked to prevent the engine running; At the same time, BCM will also activate alarm (if the remote control anti-theft system is not in silent mode) and trigger turning indicators start flashing.

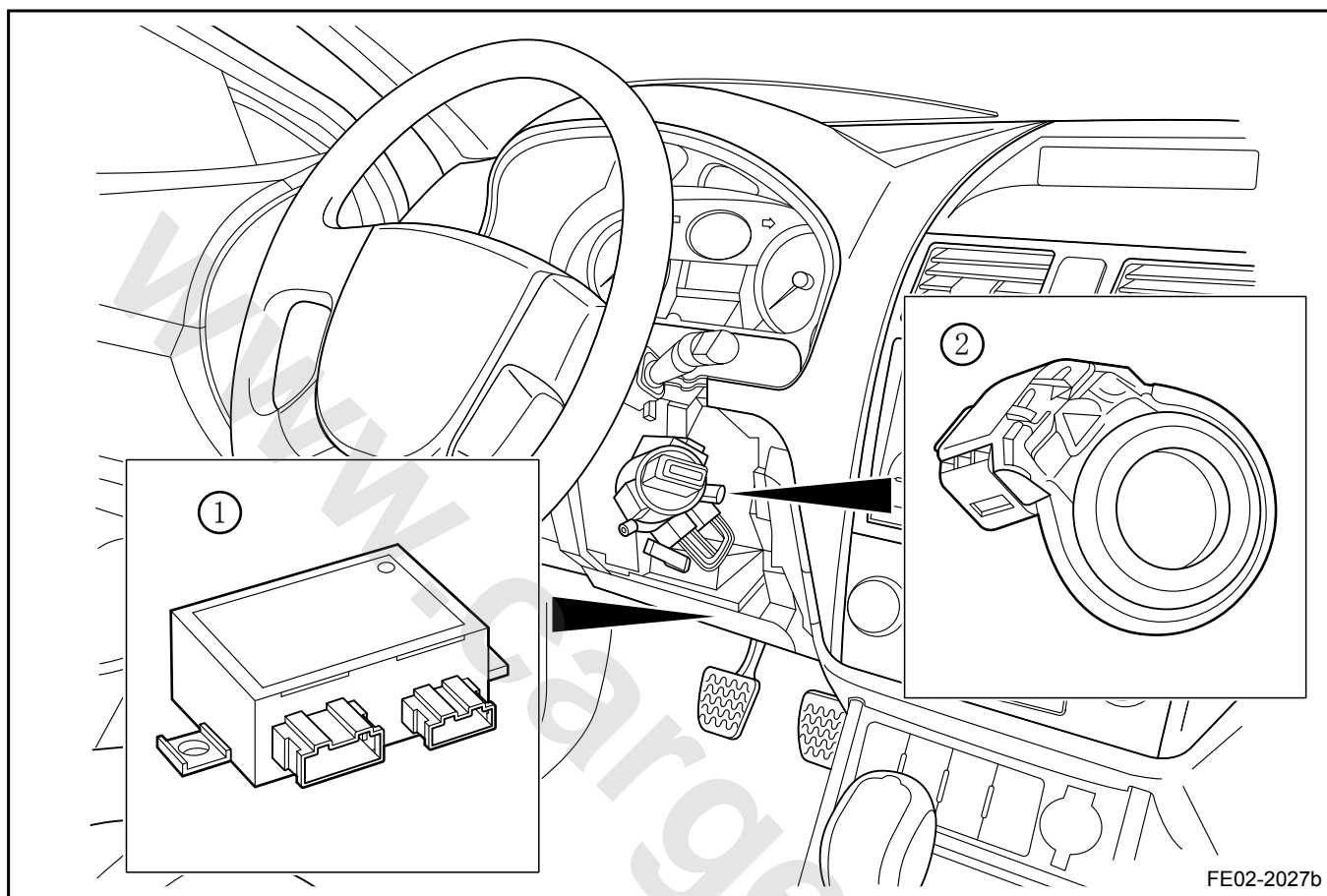
#### Warning!

If use the invalid ignition key and if the ignition switch is turned too fast, before the anti-theft engine control module sends instruction to disable the fuel, the starter is still possible to run even start. At this point, it is likely to cause injury to engine repair personnel.

## 2.5.4 Component Locator

### 2.5.4.1 Component Locator

#### Electronic Anti-theft Coil, Engine Anti-theft System Control Module



#### Legend

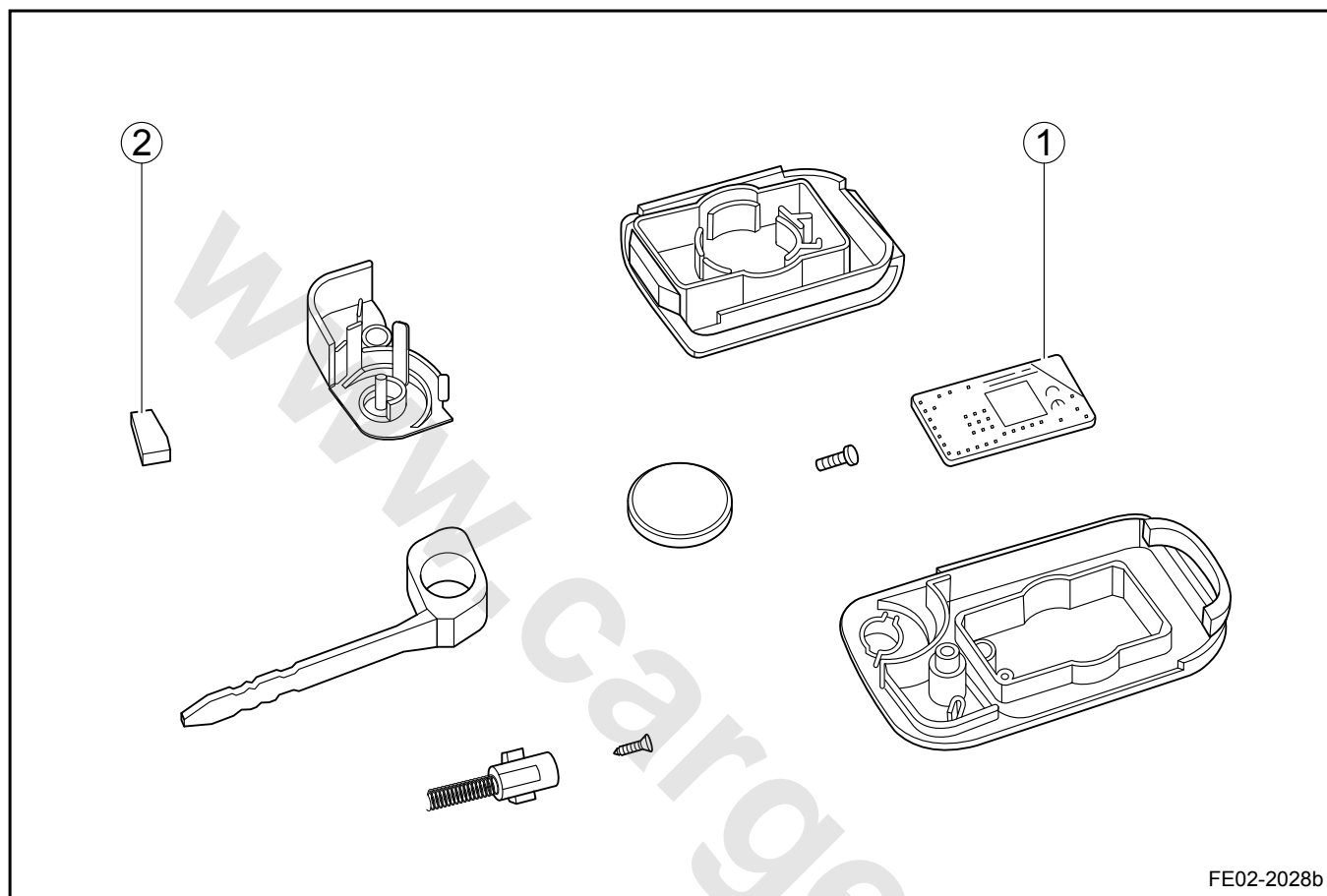
1. Engine Anti-theft System Control Module

2. Electronic Anti-theft Coil

## 2.5.5 Disassemble View

### 2.5.5.1 Disassemble View

#### Repeater



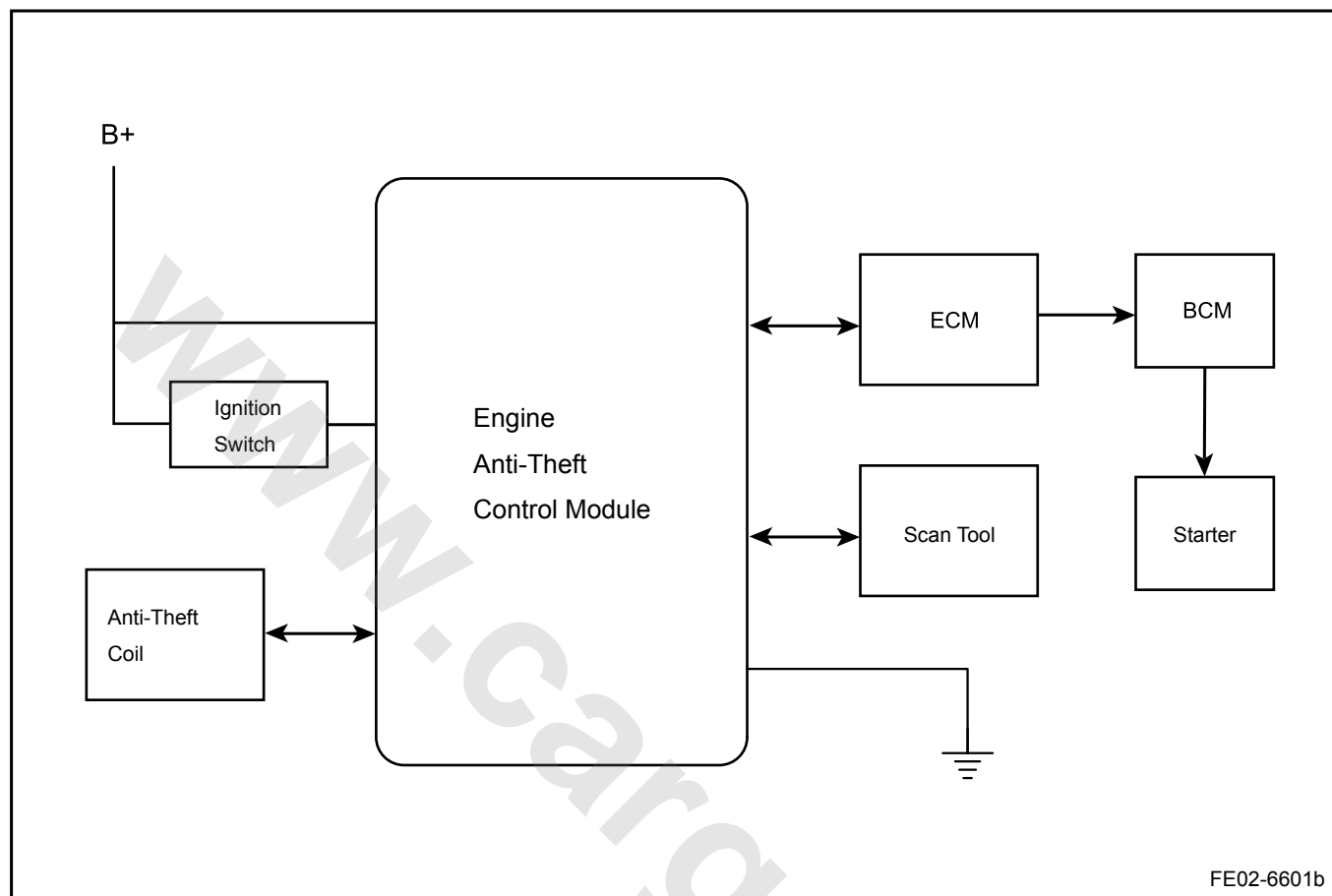
#### Legend

1. Remote Keyless Entry Transmitter

2. Transponder

## 2.5.6 Schematic

### 2.5.6.1 Schematic



## 2.5.7 Diagnostic Information and Procedures

### 2.5.7.1 Diagnosis Description

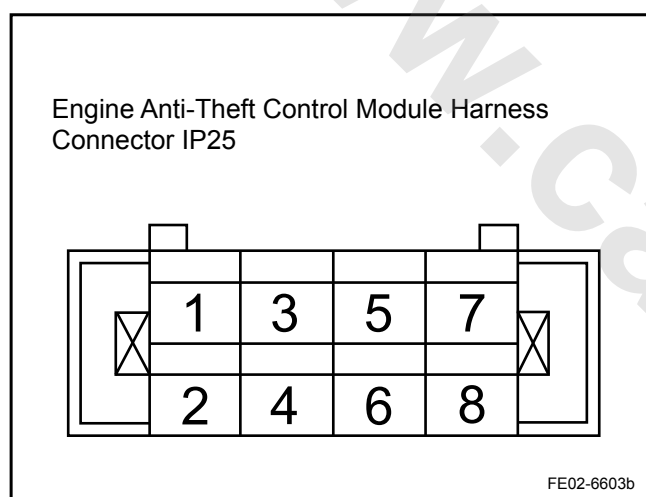
Refer to [2.5.2.1 Description and Operation](#) get familiar with the system functions and operations then start system diagnostics, so that it will help with the correct diagnostic steps, more importantly, it will also help to determine whether the customer described the situation is normal.

### 2.5.7.2 Visual Inspection

- Check installed after market equipment that may affect the engine anti-theft system operation.
- Check the easy to access system components to identify whether there is a significant damage that may lead to the fault.
- If the system shows the engine is locked, prior to the fault diagnostic check and confirm whether the ignition key completed self learn, otherwise carry out the ignition key learn process. Refer to the [2.5.7.7 Replaced Key Programming](#).

### 2.5.7.3 Anti-theft Engine Control Module Connector List

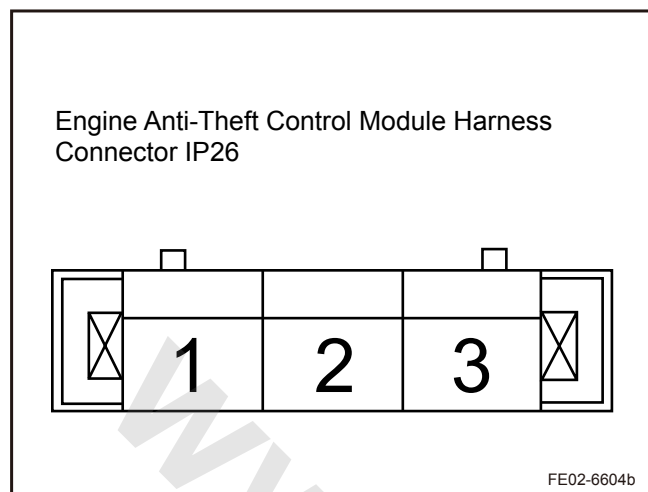
Anti-theft Engine Control Module Connector 1



Terminal ID	Terminal Definition	Wire	Rated Working Voltage	Working Current	Terminal Descriptions
1	to B +	R/O	12 V	Less than 200 mA	Less than 50 mA
2	Ground	B	0 V	Less than 200 mA	Ground
3	-	-	-	-	-
4	to IG1	G/R	12 V	Less than 50 mA	Ignition Switch Signal
5	To R-Line	Gr/W	12 V	Less than 50 mA	Engine Control Module Request Signal
6	Ground	B	0 V	Less than 200 mA	Ground
7	To K-Line	Gr/P	12 V	Less than 100 mA	Diagnostic Information
8	W-Line	Gr/P	12 V	Less than 100 mA	Communication With The Engine Control Module



## Anti-theft Engine Control Module Wiring Harness Connector 2



Terminal ID	Terminal Definition	Wire	Rated Working Voltage	Working Current	Terminal Instructions
1	Coil Connector 1	W/G	125 KHz Modulation Waveform	-	Antenna Signal
2	Coil Connector 2	Gr/O	125 KHz Modulation Waveform	-	Antenna Signal
3	-	-	-	-	-

## 2.5.7.4 DTC code (DTC) list

DTC	Descriptions	Recorded Before		Output Sequence
		Yes	NO	
B1000	Antenna Failure (Only When Read Anti-theft Transponder, Not Received During Continuous Test).		X	1
B3040	Encryption and Decryption Validation Errors In The W Line (Set When Ending Communication Without "Responding To End Communication").	X		7
B3042	W wire short to ground (If the EMS communication was set to the low bit).	X		5
B3043	W line short to power supply (when the anti-theft device sends wake-up low voltage signal and detected set to continuous high-bit).	X		6
B3045	LED line is short to ground or open, or LED-line damage.	X		11
B3048	LED short to power supply.	X		12
B3055	No anti-theft transponder modulation signal or no anti-theft transponders.	X		8
B3056	no programmed anti-theft transponder idE		X	2
B3057	no programmed security code.		X	3
B3059	No engine EFI request (set when the last time the ignition signal was received but R-line signal was not received.).		X	4

B3060	Anti-theft transponder verification failed.	X		9
B3061	EFI controller verification failed.	X		10

**Note**

DTC (DTC code) is set based on the above-mentioned output sequence. But at the same time it only shows a maximum of 7 DTC.

**Note**

DTC code history is code recorded before shown by the scan tool. If a DTC code has no historical features, it only shows the current status. If there are historical features it can display the status up to 20 ignition cycles.

**2.5.7.5 Data Flow Table**

Serial Number	Name	Data
1	Ignition Switch Position	At ON Position
2	Anti-theft Controller Hardware Malfunction	No Fault
3	Coil Malfunction	No Fault
4	Anti-theft Transponder	Yes
5	The Current Key Match	Have matched
6	The Current Key Position	Position 3
7	Key Storage Position 1	Not Stored
8	Key Storage Position 2	Not Stored
9	Key Storage Position 3	Stored
10	Key Storage Position 4	Stored
11	Key Storage Position 5	Stored
12	Security Certification	Passed
13	Anti-theft Verification	Yes
14	Password Settings	Yes
15	Password Lock	No
16	Remaining Numbers Of Times Entering The Password	10

**2.5.7.6 Fault Symptom Table**

Symptoms	Suspect Part	Refer to Page
Engine Anti-theft Indicator Always On	Instrument Panel	Refer to <a href="#">11.7.7.1 Instrument Cluster Replacement</a> .
Engine Anti-theft warning lamp flashes frequently, the engine can not start.	1. the key	Refer to <a href="#">2.5.7.12 Engine Anti-theft Warning Lamp Flashing, Vehicle Can Not Start</a> .
	2. Anti-theft Coil	

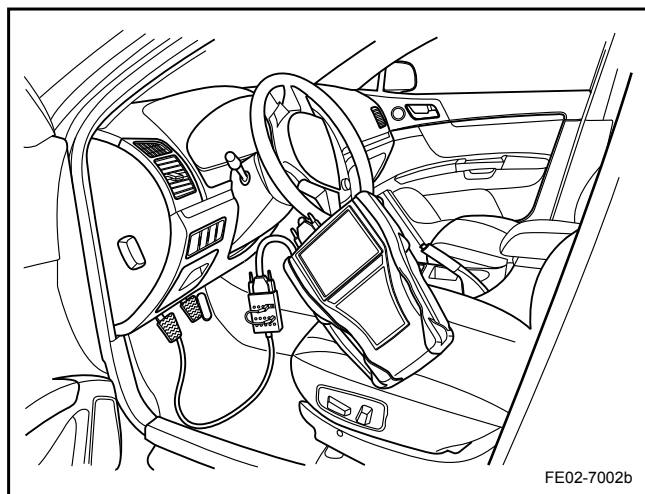
Symptoms	Suspect Part	Refer to Page
	3. Anti-theft Module	
	4. ECM	
	5. Instrument Cluster	
	6. Wiring Harness Connector	
Anti-theft system can not detect the valid key.	1. Anti-theft Coil	-
	2. Anti-theft Module	-
Keys do not match	1. Anti-theft Coil	-
	2. Anti-theft Module	-
	3. Key	-
ECM always detects Anti-theft malfunction	1. Wiring Harness and Connector	Refer to <a href="#">2.5.7.12 Engine Anti-theft Warning Lamp Flashing, Vehicle Can Not Start.</a>
	2. Anti-theft Module	
	3. ECM	

### 2.5.7.7 Replaced Key Programming

#### Note

Refer to [2.5.7.12 Engine Anti-theft Warning Lamp Flashing, Vehicle Can Not Start.](#)

Step 1	Insert a new key.
Next	
Step 2	Turn the ignition switch to "ON" position.
Next	
Step 3	Enter into the anti-theft system.



[Next](#)**Note**

Before enter the security code please contact the manufacturers technical department, as the Anti-theft computer will be locked after the wrong security code entered seven consecutive times.

Step 4	Enter the security code.
--------	--------------------------

[Next](#)

Step 5	Learn the key.
--------	----------------

[Next](#)

Step 6	Key programming.
--------	------------------

[Next](#)

Step 7	Place the ignition switch at "OFF" position and wait about 5 min or so.
--------	---

[Next](#)

Step 8	New key learn successful.
--------	---------------------------

**2.5.7.8 Ignition Key Erase**

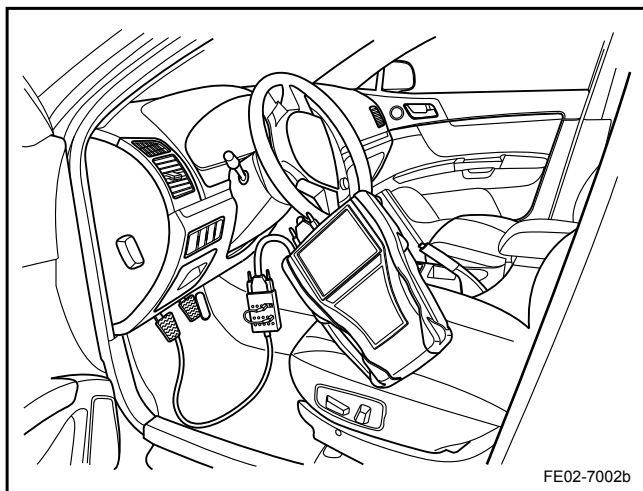
Step 1	Insert a new key.
--------	-------------------

[Next](#)

Step 2	Turn the ignition switch to "ON" position.
--------	--

[Next](#)

Step 3	Enter into the anti-theft system.
--------	-----------------------------------



Next

Step 4 Enter the security code.

Next

Step 5 Erase the key: select the recorded key location and erase. If you select all, all the keys will be removed.

Next

Step 6 Place the ignition switch at "OFF" position and wait about 5min or so.

Next

Step 7 Key erase successful .

### 2.5.7.9 Replaced Security Module Programming

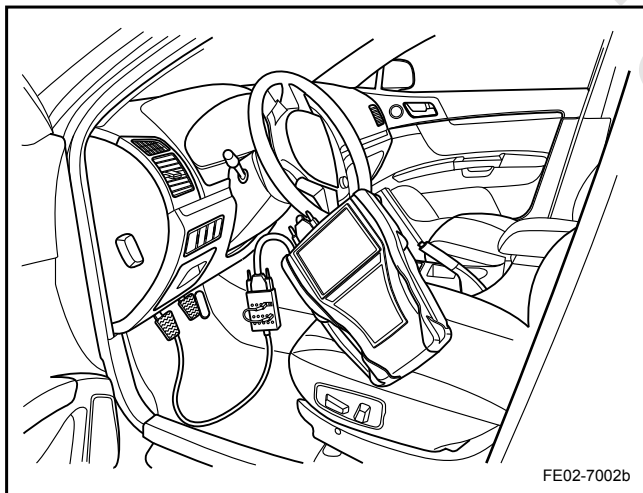
Step 1 Insert a new key.

Next

Step 2 Turn the ignition switch to "ON" position.

Next

Step 3 Enter into the anti-theft system.



Next

Step 4 Set security code.

Next

Step 5 Enter the security code (preset the four-digit security code).

[Next](#)

Step 6 Read the security module from ECM.

[Next](#)

Step 7 Reprogram the keys. Refer to [2.5.7.7 Replaced Key Programming](#).

### 2.5.7.10 Replaced ECM Programming

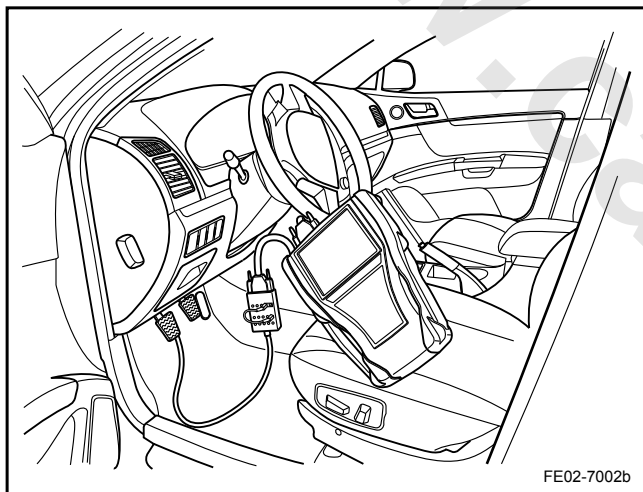
Step 1 Insert a new key.

[Next](#)

Step 2 Turn the ignition switch to "ON" position.

[Next](#)

Step 3 Enter into the anti-theft system.

[Next](#)

Step 4 Enter the security code.

[Next](#)

Step 5 Read the anti-theft module to ECM.

### 2.5.7.11 Replaced Anti-theft Module and ECM Programming

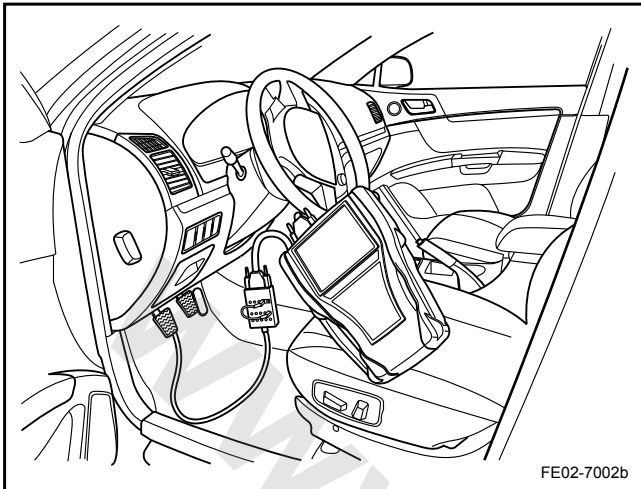
Step 1 Insert a new key.

[Next](#)

Step 2 Turn the ignition switch to "ON" position.

Next

Step 3 Enter into the anti-theft system.



Next

Step 4 Set security code (Provided that the anti-theft module is new and without preset security code).

Next

Step 5 Enter the security code (preset the four-digit security code).

Next

Step 6 Read anti-theft module to ECM.

Next

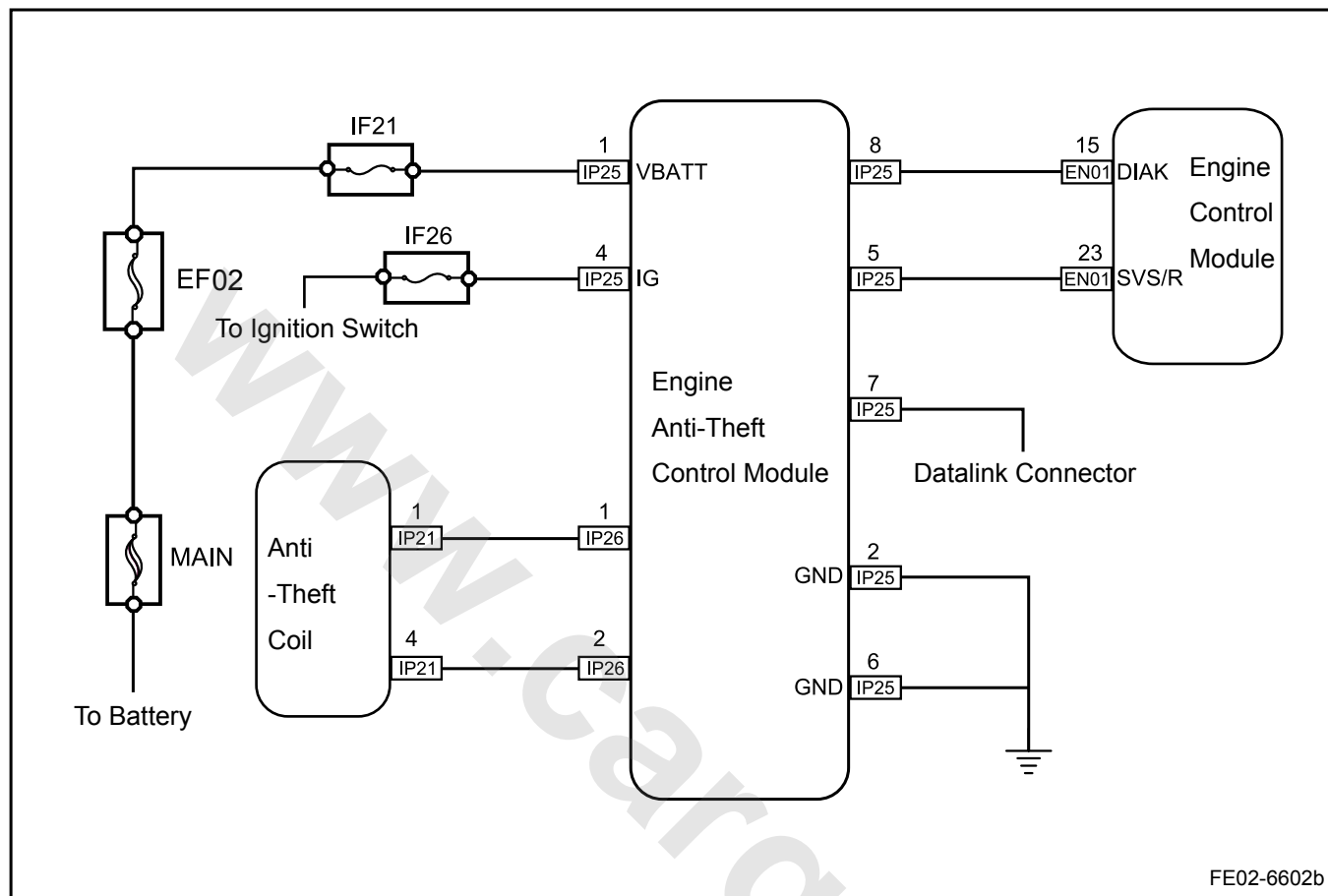
Step 7 Read ECM to the security module.

Next

Step 8 Reprogram the key. Refer to [2.5.7.7 Replaced Key Programming](#).

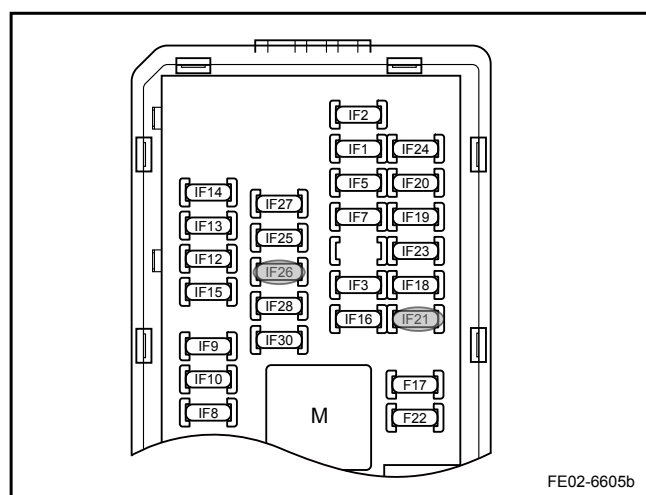
## 2.5.7.12 Engine Anti-theft Warning Lamp Flashing, Vehicle Can Not Start

Schematic:



Diagnostic Steps:

Step 1	Check the fuses IF26 and IF21.
--------	--------------------------------



(a) Check whether the fuses IF26 and IF21 are blown.  
Fuse Rating: IF26 rating is 10 A and IF21 rating is 10 A.

No

Go to step 3



Yes

Step 2 Repair fuse IF26 and IF21 circuits.

- (a) Check the fuse IF26 circuit and repair the short circuit fault.
- (b) Check the fuse IF21 circuit and repair the short circuit fault.
- (c) Replace the fuse.

Can the vehicle start as per normal?

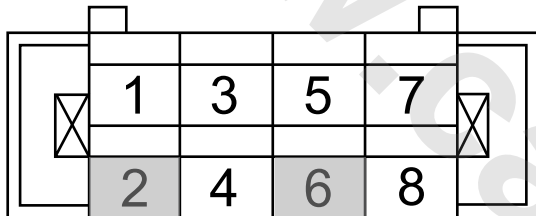
Yes

System normal

No

Step 3 Check engine anti-theft system control module ground status.

Engine Anti-theft Control Unit 1 Harness  
Connector IP25



FE02-6606b

- (a) Measure resistance between engine anti-theft system control module IP25 terminal No.2 or terminal No.6 and the body ground with a multimeter and determine the circuit continuity.  
Standard Resistance Value: Less than 1  $\Omega$ .

Is the resistance standard?

Yes

Go to step 5

No

Step 4 Repair the engine anti-theft system control module ground circuit.

- (a) Repair the open circuit between engine anti-theft system control module IP25 terminals No.2 and No.6 and the body ground.

Can the vehicle start as per normal?

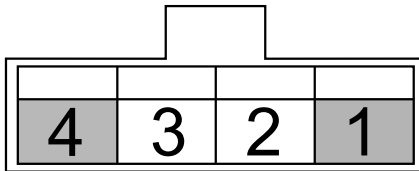
Yes

System normal

No

Step 5 Check EAS coil.

## Engine Anti-Theft Coil



FE02-6609b

- (a) Disconnect the electronic anti-theft coil harness connector.  
 (b) Measure coil resistance with a multimeter.  
 Standard Resistance Value: 5  $\Omega$  at room temperature 20°C(68 °F)

Is EAS coil resistance the standard value?

Yes

Go to step 7

No

Step 6 Replace the electronic anti-theft coil.

- (a) Replace the electronic anti-theft coil. Refer to "[2.5.8.1 EAS Coil Replacement](#)."

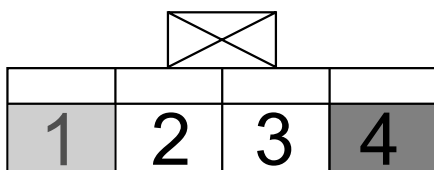
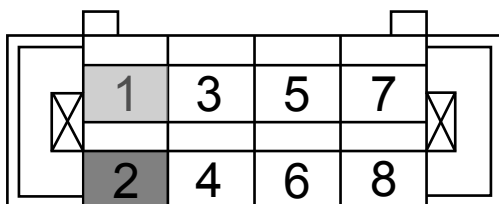
Can the vehicle start as per normal?

Yes

System normal

No

Step 7 Check the circuit between EAS coil harness connector terminal and engine anti-theft system control module harness connector terminal.

Engine Anti-Theft Coil Harness  
Connector IP21Engine Anti-Theft Control Unit 1 Harness  
Connector IP25

FE02-6607b

- (a) Measure the resistance between the anti-theft coil harness connector IP21 terminal No.1 and engine anti-theft system control module wiring harness connector IP25 terminal No.1 with a multimeter to determine circuit continuity.

Standard Resistance Value: Less than 1  $\Omega$ 

- (b) Measure the resistance between the anti-theft coil harness connector IP21 terminal No.4 and engine anti-theft system control module wiring harness connector IP25 terminal No.2 with a multimeter to determine circuit continuity.

Standard Resistance Value: Less than 1  $\Omega$ 

Is resistance the standard value?

Yes

Go to step 9

No

Step 8

Repair the circuit fault between electronic anti-theft wiring harness connector coil and engine anti-theft system control module wiring harness connector.

- (a) Repair the open circuit between the anti-theft coil harness connector IP21 terminal No.1 and engine anti-theft system control module wiring harness connector IP26 terminal No.1.
- (b) Repair the open circuit between the anti-theft coil harness connector IP21 terminal No.4 and engine anti-theft system control module wiring harness connector IP26 terminal No.2.

Can the vehicle start as per normal?

Yes

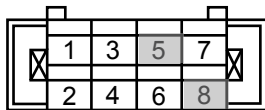
System normal

No

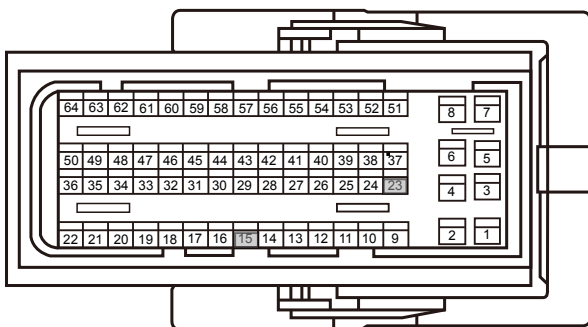
Step 9

Check the serial communication circuit between the engine anti-theft system control module and engine control module.

Engine Anti-Theft Control Unit 1 Harness  
Connector IP25



ECM Harness Connector EN01



FE02-6608b

- (a) Check the serial communication circuit resistance between engine anti-theft system control module connector IP25 terminal No.5 and the engine control module connector EN01 terminal No.23 to determine the circuit continuity.

Standard Resistance Value: Less than 1  $\Omega$

- (b) Check the serial communication circuit resistance between engine anti-theft system control module connector IP25 terminal No.8 and the engine control module connector EN01 terminal No.15 to determine the circuit continuity.

Standard Resistance Value: Less than 1  $\Omega$

Is the resistance standard?

Yes

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

No

Step 10

Repair the serial communication circuit between engine control module anti-theft system and engine control module.

- (a) Repair the serial communication open circuit between engine anti-theft system control module connector IP25 terminal No.

5 and the engine control module connector EN01 terminal No.23.

- (b) Repair the serial communication open circuit between engine anti-theft system control module connector IP25 terminal No. 8 and the engine control module connector EN01 terminal No.15.

Can the vehicle start as per normal?

Yes

System normal

No

Step 11 Replace the anti-theft system control module.

- (a) Replace the anti-theft system control module. Refer to [2.5.8.2 Anti-theft System Control Module Replacement](#).  
 (b) Carry out the engine anti-theft system programming. Refer to [2.5.7.9 Replaced Security Module Programming](#).

Yes

System normal

No

Step 12 Replace the engine control module.

- (a) Replace the engine control module. Refer to [2.2.8.8 Engine Control Module Replacement](#).  
 (b) Carry out the engine anti-theft system programming. Refer to [2.5.7.10 Replaced ECM Programming](#).

Confirm the repair completed.

Next

Step 13 System normal.

## 2.5.8 Removal and Installation

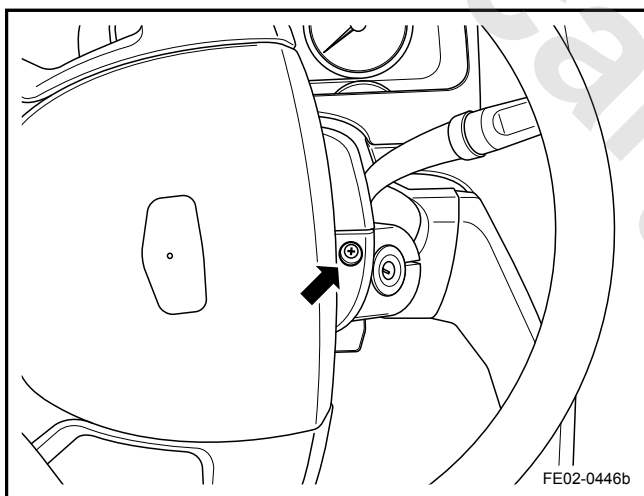
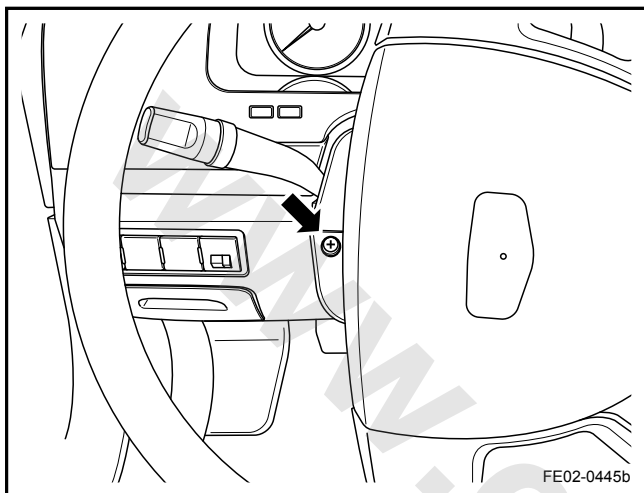
### 2.5.8.1 EAS Coil Replacement

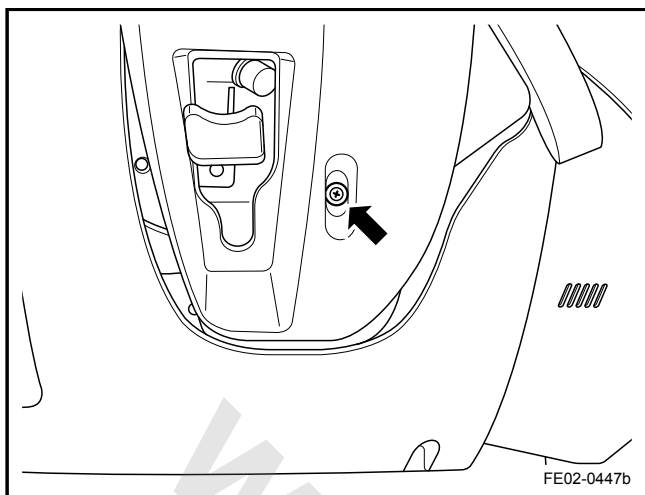
Removal Procedure:

#### Warning!

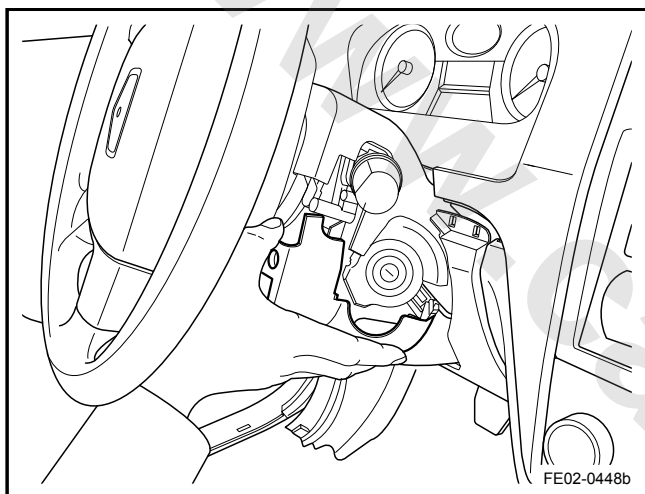
Refer to "Battery Disconnection Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Turn the steering wheel to the left 90 ° and remove the left upper steering column shield retaining screw.
3. Turn the steering wheel to the right 90 ° and remove the right upper steering column shield retaining screw.

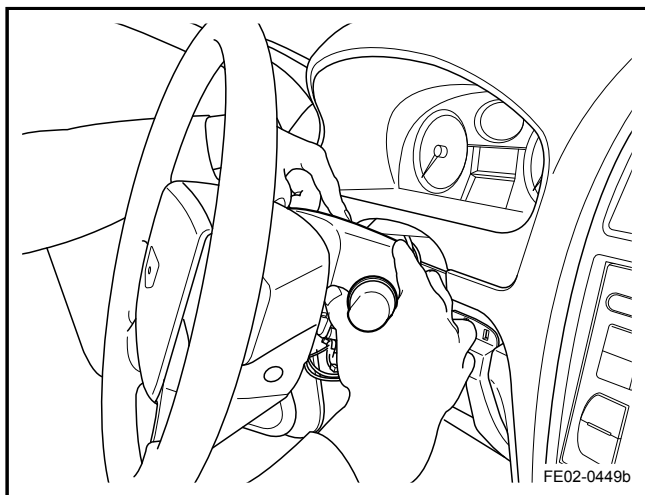




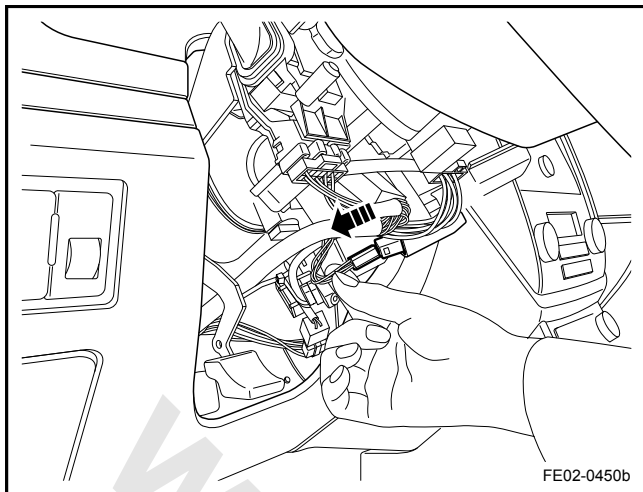
4. Remove the lower steering column shield screw.



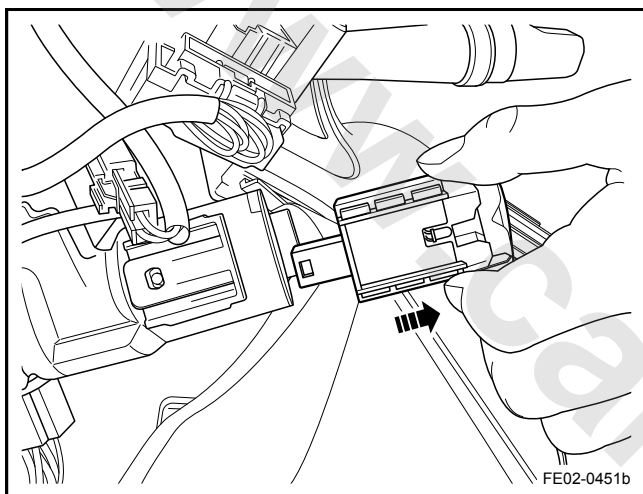
5. Remove the lower steering column shield.



6. Remove the upper steering column shield.



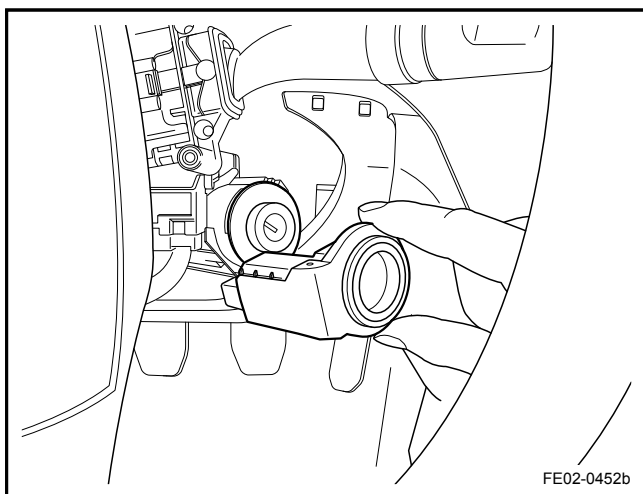
7. Disconnect the electronic anti-theft wiring harness coil connector.

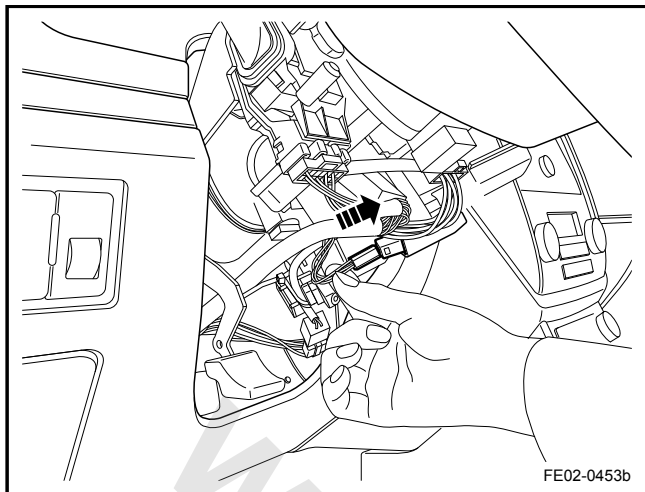


8. Remove the electronic anti-theft engine coil.

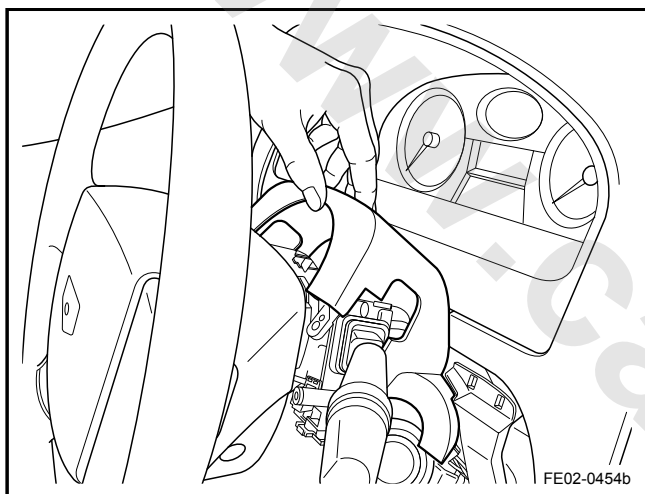
#### Installation Procedure:

1. Install the electronic anti-theft engine coil.

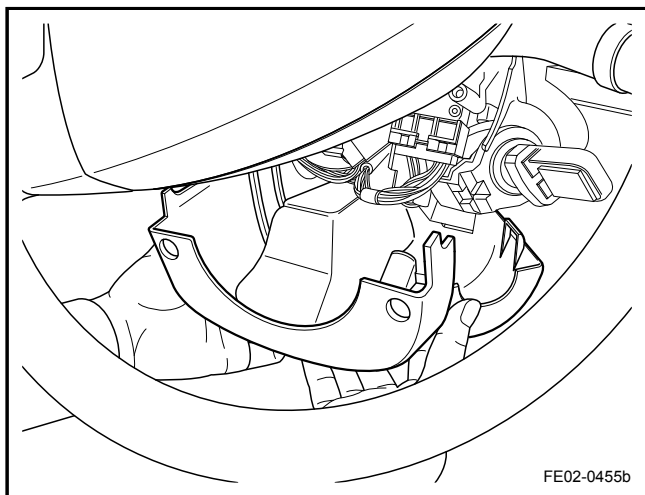




2. Connect the electronic anti-theft wiring harness coil connector.



3. Install the upper steering column shield.



4. Install the lower steering column shield.
5. Install and tighten the left upper steering column shield retaining screw.  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)
6. Install and tighten the right upper steering column shield retaining screw.  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)
7. Install and tighten the lower steering column shield retaining screw.  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)
8. Connect the battery negative cable.



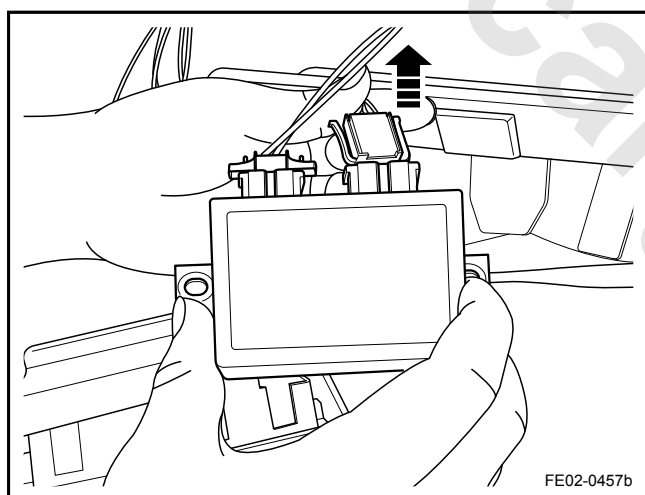
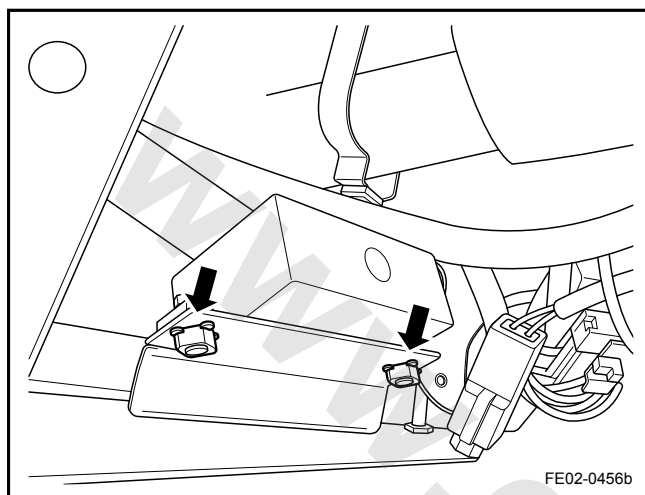
### 2.5.8.2 Anti-theft System Control Module Replacement

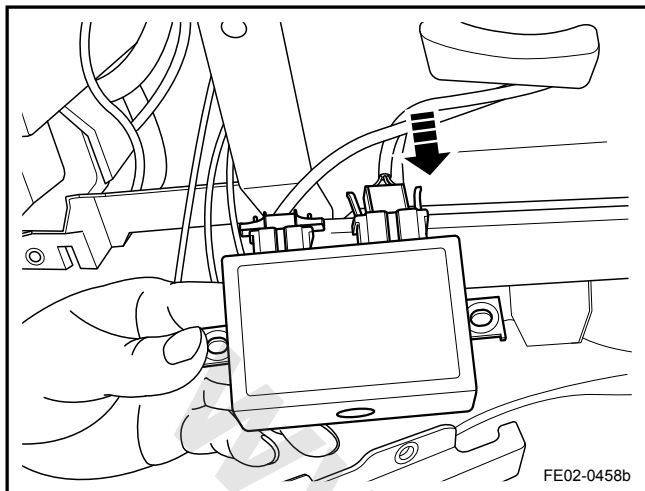
Removal Procedure:

**Warning!**

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove instrument panel trim under the driver's side. Refer to [11.10.8.1 BCM Replacement](#).
3. Remove the anti-theft system control module retaining bolts.
4. Disconnect anti-theft system control module wiring harness connector.





Installation Procedure:

1. Install the anti-theft system control module.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
2. Connect anti-theft system control module wiring harness connector.
3. Install instrument panel trim under the driver's side.
4. Connect the battery negative cable.

## 2.6 Engine Mechanical System JL4G18-D

### 2.6.1 Specifications

#### 2.6.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Spark Plug Bolt	M14 × 1.25	20-30	14.8-22.2
Cylinder Head Cover (Short Bolt)	M6	7-11	5.2-8.2
Cylinder Head Cover (Long Bolts, Nuts, Special Bolts)	M6	9-13	6.7-9.6
Knock Sensor Bolt	M8 × 30	14.4-21.6	10.7-16
Cylinder Head Bolts	M10 × 1.25	First Pass 46-52	First Pass 34-38.5
		Second Pass 76-84	Second Pass 56-62.2
VVT Actuator Mounting Bolt	M12 × 1.25	59-81	43.7-60
Intake Manifold Mounting Bolt	M8	24-36	17.8-26.7
Crankcase Mounting Bolt	M8	14.4-21.6	10.7-16
Exhaust Pipe Mounting Bolt	M8	20-30	14.8-22.2
Main Bearing Cap Installation Bolt	M10 × 1.25	First Pass 42-46	First Pass 31-34
		Second Pass 54-66	Second Pass 40-48.9
Flywheel Mounting Bolt	M10 × 1.25	83-93	61.4-68.8
Engine Water Pump Short Mounting Bolt	M6 × 25	8-10	6-7.4
Engine Water Pump Long Mounting Bolt	M6 × 35	9-13	6.7-9.6
Fuel Rail Bolt	M6 × 20	7.2-10.8	5.3-8
Connecting Rod Cap Bolt	M8 × 1	First Pass 19-21	First Pass 14-15.5
		Second Pass 50-52	Second Pass 37-38.5
Camshaft Bearing Cap Bolt	M8 M6	21.6-24.5	16-18.2
		12.2-13.8	9-10.2
Oil Pan Bolt	M6	7.2-10.8	5.3-8
Oil Filter Mounting Bolt	M6	7.2-10.8	5.3-8
Engine Oil Pressure Alarm Bolt	R1 / 8	10.5-19.5	7.8-14.4
Oil Filter Pipe Joint Bolt	M28 × 1.5	16-24	11.8-17.8
Oil Filter - Pipe Fittings Bolt	UNF3 / 4 "-16	33-37	24.4-27.4
Crankshaft Pulley Mounting Bolt	M12 × 1.25	129.7-146.3	96-108.3

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Generator Screw	M10 × 1.25 × 72	43.2-64.8	32-48
Generator Bolt	M8 × 30	20-30	14.8-22.2
Clutch Assembly Mounting Bolt	M8	21.6-32.4	16-24
Coolant Valve Bolt	M10	25 and Above	18.5 and Above
Oil Pump Mounting Bolt	M6	7.2-10.8	5.3-8
Timing Chain Cover Bolt	M8	14.4-21.6	10.7-16
Timing Chain Cover Bolt	M6	8.8-13.2	6.5-9.8
Right Engine Mounting Bracket Bolt	M10 × 55	37.6-56.4	27.8-41.7
Drive Belt Tensioner Bolt	M12	55.2-82.8	40.8-61.3
Drive Belt Tensioner Nut	M8	23.2-34.8	17.2-25.8
Exhaust Camshaft Timing Sprocket Mounting Bolt	M10	43.2-64.8	32-48
Oil Pan Oil Discharge Bolt	M12	25-35	18.5-25.9

### 2.6.1.2 Mechanical System Specification

Items	Specifications
Bore (mm/in)	79/3.11
Stroke (mm/in)	91.5/3.6
Displacement (L)	1.792
Compression Ratio	10:1
Power (km/rpm)	102/6,000-6,200
Torque (Nm/rpm)	172/4,100-4,300
Idle Speed (rpm)	800 ± 50 (Air Conditioning A/CON 1,000 ± 50)
ASM Emissions (g/km)	CO is less than 2.3; CH is less than 0.2; NO <sub>x</sub> is less than 0.15
Ignition Sequence	1-3-4-2 (cylinder No.1,4 and cylinder No.2,3 group ignition)
Constant Driving Speed Fuel Consumption (90 km/h) (L/100 km)	Less than 6.5
Fuel	RON93 Unleaded Gasoline or Above
Engine Coolant Capacity (L/pt)	6.5/11.44
Engine Oil Capacity (L/pt)	4.0/7.04
Engine Coolant Specifications / Grades	Line SH0521 (Freezing Point ≤ -40°C (-40 °F))

Items	Specifications
Lubricant Specification / Grades	Meet GB11121 standard, API quality grade SJ-class, SL-class exports to the EU statement, viscosity: SAE5W-30, 10W-30, 10W-40, 15W-40
Spark Plug Type	K6RTC
Spark Plug Gap (mm/in)	1.0-1.1/0.03-0.04
Dry Mass (kg/lb)	Without starter, with the engine oil, coolant, with wiring harness, with the clutch $117 \pm 2/257.94 \pm 4.41$
Overall Dimension (LxWxH) mm/in	631 × 610 × 620/24.84 × 24.02 × 24.41
Cam	
Journal Diameter (mm/in)	23/0.91
Camshaft Axial Clearance (mm/in)	0.05-0.12/0.0020-(-0.0047)
Intake Valve Clearance (mm/in)	$0.23 \pm 0.03/0.0091 \pm 0.0011$
Exhaust Valve Clearance (mm/in)	$0.32 \pm 0.03/0.0126 \pm 0.0011$
Intake VVT Adjustment Range	$\pm 25^\circ$
Valve Timing	
Intake Valve Open	$19^\circ$ Before TDC
Intake Valve Close	$73^\circ$ After BDC
Exhaust Valve Open	$53^\circ$ Before BDC
Exhaust Valve Close	$16.5^\circ$ After TDC
Crank Pin	
Connecting Rod Bearing Clearance (mm/in)	0.020-0.044/0.0007-0.0017
Connecting Rod Bearing Axial Clearance (mm/in)	0.16-0.342/0.006-0.0135
Crankshaft	
Axial Clearance (mm/in)	0.04-0.24/0.0015-0.0094
Main Bearing Clearance - All (mm/in)	0.015-0.033/0.0006-0.0013
Spindle Collar Diameter - All (mm/in)	47.982-48/1.8891-1.8898
Body Top Surface Flatness (mm/in)	0.05/0.0019
Crankshaft Main Journal Roundness (mm/in)	0.003/0.0001
Crankshaft Main Journal Round Beating Degree (mm/in)	0.02/0.0008
Cylinder Head	
Minimal Height After Machining (mm/in)	115-0.05/4.53-0.0019
Overall Height (mm/in)	115 +0.05 / 4.53 +0.0019
Valve Guide Hight (mm/in)	34.5/1.36

Items	Specifications
Pistons	
Gap With The Cylinder (mm/in)	0.060-0.083/0.0023-0.0033
Diameter (mm/in)	78.9/3.11
Piston Pin	
Gap With The Piston (mm/in)	0.005-(-0.001) / 0.0002-(-0.00003)
Gap With The Rod (mm/in)	0.005-0.011/0.0002-0.0004
Diameter (mm/in)	20/0.787
Length (mm/in)	50/1.969
Piston Pin Offset - Thrust (mm/in)	0.6/0.0236
Oil Pump	
Safety Valve Opening Pressure (kPa/psi)	500/72.52
Piston Ring	
Oil Ring End Gap (mm/in)	0.20-0.70/0.0079-0.0276
Second Compression Ring End Gap (mm/in)	0.40-0.55/0.0157-0.0217
First Compression Ring End Gap (mm/in)	0.25-0.35/0.0098-0.0138
Sealants and Adhesives	
Cylinder Head Covers Mat Sealant	Kesaisi New 1596 Flat Silicone Rubber Sealants
Engine Oily Road Cones	Kesaisi New 1243 Anaerobic Thread Locking Sealant
Oil Pan and Crank Box Joints	Kesaisi New 1596 Flat Silicone Rubber Sealants
Crankcase With The Cylinder Block Joints	Kesaisi New 1596 Flat Silicone Rubber Sealants
Flywheel Bolt	Letai 204 Anaerobic Sealant
Valve System	
Intake Valve Diameter (mm/in)	31/1.2
Exhaust Valve Diameter (mm/in)	26 / 1
Valve Tube Diameter (mm/in)	5.5/0.22
Valve Stem Diameter - Intake Valve (mm/in)	5.5/0.22
Valve Stem Diameter - Exhaust Valve (mm/in)	5.5/0.22

### 2.6.1.3 Intake and Exhaust Valves Lifter Specifications Table

Packet No.	Thickness (mm/in)	Packet No.	Thickness (mm/in)
06	5.06 (0.1992)	42	5.42 (0.2134)
08	5.08 (0.2000)	44	5.44 (0.2142)

Packet No.	Thickness (mm/in)	Packet No.	Thickness (mm/in)
10	5.10 (0.2008)	46	5.46 (0.2150)
12	5.12 (0.2016)	48	5.48 (0.2157)
14	5.14 (0.2024)	50	5.50 (0.2165)
16	5.16 (0.2031)	52	5.52 (0.2173)
18	5.18 (0.2039)	54	5.54 (0.2181)
20	5.20 (0.2047)	56	5.56 (0.2189)
22	5.22 (0.2055)	58	5.58 (0.2197)
24	5.24 (0.2063)	60	5.60 (0.2205)
26	5.26 (0.2071)	62	5.62 (0.2213)
28	5.28 (0.2079)	64	5.64 (0.2220)
30	5.30(0.2087)	66	5.66(0.2236)
32	5.32(0.2094)	68	5.68(0.2236)
34	5.34(0.2102)	70	5.70(0.2252)
36	5.36(0.2110)	72	5.72(0.2260)
38	5.38(0.2118)	74	5.74(0.2260)
40	5.40(0.2126)		

#### 2.6.1.4 Intake and Exhaust Valves Lifter Selection Table

## Intake Valve Selection Table

																												Lifter No. and Thickness (mm/in)		Gap (mm/in)																																				
5.74(0.2260)	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.000-0.030(0.0000-0.0012)																																		
5.72(0.2260)	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.031-0.050(0.0012-0.0020)																																	
5.70(0.2252)	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.051-0.070(0.0020-0.0028)																																
5.68(0.2236)	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.071-0.090(0.0028-0.0035)																															
5.66(0.2236)	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.091-0.110(0.0036-0.0043)																														
5.64(0.2220)	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.111-0.130(0.0044-0.0051)																													
5.62(0.2213)	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.131-0.150(0.0052-0.0059)																												
5.60(0.2205)	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.151-0.170(0.0059-0.0067)																											
5.58(0.2197)	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.171-0.190(0.0067-0.0075)																										
5.56(0.2189)	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	08	06							0.191-0.199(0.0075-0.0078)																									
5.54(0.2181)		74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10							0.261-0.280(0.0103-0.0110)																									
5.52(0.2173)			74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.281-0.300(0.0111-0.0118)																								
5.50(0.2165)				74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.301-0.320(0.0119-0.0125)																							
5.48(0.2157)					74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.321-0.340(0.0126-0.0134)																						
5.46(0.2150)						74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.341-0.360(0.0134-0.0142)																					
5.44(0.2142)							74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.361-0.380(0.0142-0.0150)																				
5.42(0.2134)								74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.381-0.400(0.0150-0.0157)																			
5.40(0.2126)									74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.401-0.420(0.0158-0.0165)																		
5.38(0.2118)										74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.421-0.440(0.0166-0.0173)																	
5.36(0.2110)											74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.441-0.460(0.0174-0.0181)																
5.34(0.2102)												74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.461-0.480(0.0181-0.0189)															
5.32(0.2094)													74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.481-0.500(0.0189-0.0197)														
5.30(0.2087)														74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.501-0.520(0.0197-0.0205)													
5.28(0.2079)															74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.521-0.540(0.0205-0.0213)												
5.26(0.2071)																74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.541-0.560(0.0213-0.0220)											
5.24(0.2063)																	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.561-0.580(0.0221-0.0228)										
5.22(0.2055)																		74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.581-0.600(0.0229-0.0236)									
5.20(0.2047)																			74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.601-0.620(0.0237-0.0244)								
5.18(0.2039)																				74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.621-0.640(0.0244-0.0252)							
5.16(0.2031)																					74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.641-0.660(0.0252-0.0260)						
5.14(0.2024)																						74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.661-0.680(0.0260-0.0268)					
5.12(0.2016)																							74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12							0.681-0.700(0.0268-0.0276)					
5.10(0.2008)																								74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.701-0.720(0.0276-0.0283)			
5.08(0.2000)																									74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12									0.721-0.740(0.0284-0.0291)	
5.06(0.1992)																										74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.741-0.760(0.0292-0.0299)	
																											74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12								0.761-0.780(0.0300-0.0307)
																												74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	2														



Exhaust Valve Selection Table

5.74(0.2260) 5.72(0.2260) 5.70(0.2252) 5.68(0.2236) 5.66(0.2236) 5.64(0.2220) 5.62(0.2213) 5.60(0.2205) 5.58(0.2197) 5.56(0.2189) 5.54(0.2181) 5.52(0.2173) 5.50(0.2165) 5.48(0.2157) 5.46(0.2150) 5.44(0.2142) 5.42(0.2134) 5.40(0.2126) 5.38(0.2118) 5.36(0.2110) 5.34(0.2102) 5.32(0.2094) 5.30(0.2087) 5.28(0.2079) 5.26(0.2071) 5.24(0.2063) 5.22(0.2055) 5.20(0.2047) 5.18(0.2039) 5.16(0.2031) 5.14(0.2024) 5.12(0.2016) 5.10(0.2008) 5.08(0.2000) 5.06(0.1992)																																Lifter No. and Thickness (mm/in) Gap (mm/in)		
44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06															0.000-0.030(0.0000-0.0012)
46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06														0.031-0.050(0.0012-0.0020)
48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06													0.051-0.070(0.0020-0.0028)
50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06												0.071-0.090(0.0028-0.0035)
52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06											0.091-0.110(0.0036-0.0043)
54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06										0.111-0.130(0.0044-0.0051)
56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06									0.131-0.150(0.0052-0.0059)
58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06								0.151-0.170(0.0059-0.0067)
60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.171-0.190(0.0067-0.0075)
62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06						0.191-0.210(0.0075-0.0083)
64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06					0.211-0.230(0.0083-0.0091)
66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06				0.231-0.250(0.0091-0.0098)
68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06			0.251-0.270(0.0099-0.0106)
70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06		0.271-0.289(0.0107-0.0114)
	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	/	36	34	32	30	28	26	24	22	20	18	16	14	12	10	0.351-0.370(0.0138-0.0146)
		74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	0.371-0.390(0.0146-0.0154)
			74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	0.391-0.410(0.0154-0.0161)
				74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	0.411-0.430(0.0162-0.0169)
					74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	0.431-0.450(0.0170-0.0177)
						74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	/	26	24	22	20	0.451-0.470(0.0178-0.0185)
							74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	0.471-0.490(0.0185-0.0193)
								74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	0.491-0.510(0.0193-0.0201)
									74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	0.511-0.530(0.0201-0.0209)
										74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	0.531-0.550(0.0209-0.0217)
											74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	0.551-0.570(0.0217-0.0224)
												74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	0.571-0.590(0.0225-0.0232)
													74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	0.591-0.610(0.0233-0.0240)
														74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	0.611-0.630(0.0241-0.0248)
															74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	0.631-0.650(0.0248-0.0256)
																74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	0.651-0.670(0.0256-0.0264)
																	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	0.671-0.690(0.0264-0.0272)
																		74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	0.691-0.710(0.0272-0.0280)
																			74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	0.711-0.730(0.0280-0.0287)
																				74	72	70	68	66	64	62	60	58	56	54	52	50	48	0.731-0.750(0.0288-0.0295)
																					74	72	70	68	66	64	62	60	58	56	54	52	50	0.751-0.770(0.0296-0.0303)
																						74	72	70	68	66	64	62	60	58	56	54	52	0.771-0.790(0.0304-0.0311)
																							74	72	70	68	66	64	62	60	58	56	54	0.791-0.810(0.0311-0.0319)
																								74	72	70	68	66	64	62	60	58	56	0.811-0.830(0.0319-0.0327)
																									74	72	70	68	66	64	62	60	58	0.831-0.850(0.0327-0.0335)
																										74	72	70	68	66	64	62	60	0.851-0.870(0.0335-0.0343)
																											74	72	70	68	66	64	62	0.871-0.890(0.0343-0.0350)
																												74	72	70	68	66	64	0.891-0.910(0.0351-0.0358)
																													74	72	70	68	66	0.911-0.930(0.0359-0.0366)
																														74				

## 2.6.2 Description and Operation

### 2.6.2.1 Description and Operation

#### 1. Cylinder Head

Cylinder head is made from aluminum alloy casting process. cylinder valve stem is a mechanical system. valve clearance can not be automatically adjust, which is very important. The cylinder valve is an integrated part. OEMs can offer 38 different sizes to choose from. During the repair, required quite tube thickness can be calculated according to the formula. For specific information. Refer to [2.6.8.20 Valve Clearance Adjustments](#). With Double overhead camshaft layout, in the drive sprocket on the intake camshaft there is also a VVT actuator for adjusting the intake valve timing. For the detailed working principle. Refer to [2.6.3.1 System Working Principle](#).

#### 2. Timing Chain

Dual overhead camshafts are driven by a timing chain. Timing chain must be replaced every 120,000 kilometers. Timing chain system consists of timing chain, timing chain guide rails, timing chain tensioner rail and the timing chain tensioner. Timing chain tensioner tensioning is provide by the pressure from the oil pump to ensure the timing chain tensioner maintain a constant intensity. Timing chain lubrication is provided by the oil pump nozzles. Refer to [2.6.8.11 Timing Chain Inspection](#) for specific information.

#### 3. Intake Manifold

Intake manifold has four independent long ports, using inertia to improve the engine torque at low speed.

#### 4. Camshaft

Dual overhead camshaft (DOHC) has two camshafts. A camshaft controls the intake valves, the other camshaft controls the exhaust valves. The camshaft is located in the journal in the cylinder head on the top of the engine and fixed with camshaft cover. The cylinder head camshaft journal drilling is used for engine oil channel. Engine oil flows to the camshaft under pressure, lubrication each camshaft journal. Engine oil flows through the cylinder lid to return to oil sump. Cam convex corner is formed by machining, at the right time, according to the appropriate amount, accurately open and close intake and exhaust valves. Cam convex is lubricated by high-pressure oil escaped from the engine camshaft.

## 2.6.3 System Working Principle

### 2.6.3.1 System Working Principle

#### 1. Reciprocating Piston Engine Working Principle:

- **Intake Stroke:** the crankshaft driven piston moves from TDC to BDC. At this point exhaust valve closes, intake valve opens. In the piston moving process, the cylinder volume gradually increased and the vacuum is formed within the cylinder. ECM controlled fuel injectors spray fuel into the intake pipe. At this time the intake valves open, air and fuel mixture sucked through the intake valve into cylinder and forms a combustible mixture.
- **Compression Stroke:** At the end of the intake stroke, crankshaft continues to drive the piston from the BDC to the TDC. intake and exhaust valves are closed. With the piston moving up, the cylinder volume became smaller and smaller. Because gas is compressed, the temperature of the compressed gas rose rapidly.
- **Power Stroke:** At the end of compression stroke, ECM controlled ignition coil primary coil circuit is disconnected and the secondary sensor produces a high voltage, which passes rapid through the cylinder head to the top of the spark plug, and finally the high-voltage breaks through the spark plug gap to generate electric spark, igniting the combustible mixture within the cylinder. Fire spreads rapidly inside the combustion chamber, while releasing a large number of heat. Combustion gases rapid expands, the pressure and temperature is also increased, swelling force acting on the piston top, prompting the piston from the TDC moving to the BDC, and through the connecting rod to change piston reciprocating motion into rotary movement. At this point, intake and exhaust valves are still closed.
- **Exhaust Stroke:** At the beginning of the exhaust stroke, exhaust valve opens, intake valve is still closed. the crankshaft connecting rod drives the piston from the BDC to the TDC. After burning the expanded gas residue will be discharged through the exhaust valve to outside the cylinder by its own pressure and the piston movement. When the piston reaches the TDC, the exhaust stroke ends and exhaust valve closes.

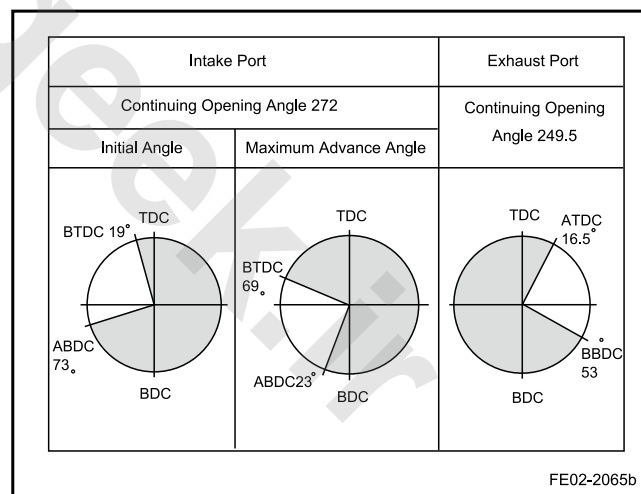
But in the actual process, the intake valve opens before the TDC and closes after BDC. This design is intended to draw more air into cylinder and reduce the power consumed in the intake process. In the exhaust process, the exhaust valve opens before BDC and closes after TDC. The aim is to reduce

the mixture within the cylinder and reduce the power consumed in the intake process. Because intake and exhaust valves have a certain overlap angles, namely, at a certain crank angle intake and exhaust valves open at the same time. At this time the gas discharged through the exhaust valve forms a certain amount of inertia and draws the mixture into the cylinder. This will draw more air into the cylinder. But the valve overlap angle is not the bigger the better. In different operating conditions, the valve overlap angle requirements vary, therefore, in this engine there is intake valve variable valve timing, which aims to meet the engine intake valve opening angle requirements at different operating conditions. this function is achieved through the VVT system.

#### 2. VVT System Working Principle

VVT stands for Variable Valve Timing, referring to the variable valve timing system. Where there is mass, there is inertia. The air drawn into the engine cylinders also has inertia, after the intake process the air tends to keep entering into the cylinder. At this time if the valve closing time is delayed, more air will be drawn into the cylinder, so that volumetric efficiency will be improved. As a result, the longer the delay in valve closing time, the better the High-Speed performance; On the contrary the more advanced valve closing, the better performance and the more torque at the Low-Speed.

##### (1). With A Body-Valve VVT Valve Timing Diagram



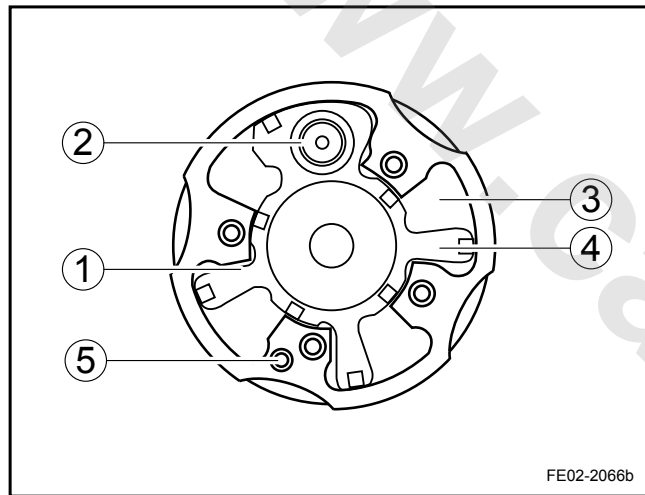
#### Legend

1. TDC: Top Dead Center
2. BDC: Bottom Dead Center
3. ATDC: After TDC
4. BTDC: Before TDC
5. ABDC: After BDC
6. BBDC: Before BDC

## (2). VVT Control Strategy

Driving Conditions	Intake Valve Timing	Cause
Low-Load	Lag	Steady Combustion
High Load, High Speed	Lag	Increased Output Characteristics
High Load, Low Speed	Advance	Increased Torque
Medium-Speed Condition	Advance	Improved Fuel Consumption

## (3). Advance Process



## Legend

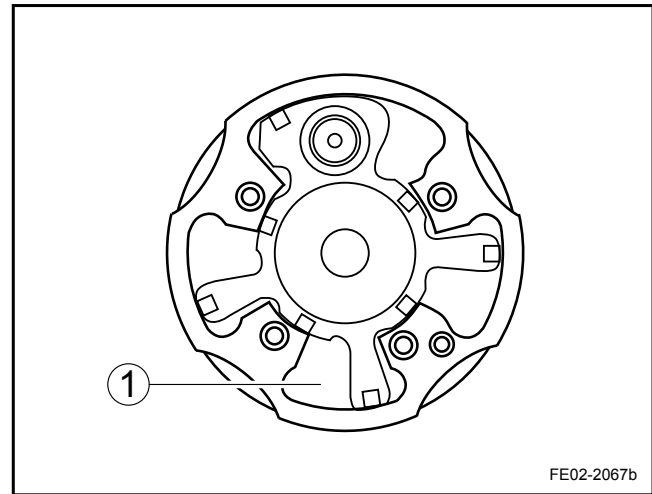
1. Lag Chamber
2. Locking Pin
3. Advance Chamber
4. Rotor Blade
5. Bracket

In normal operation condition, the oil pump generated engine oil pressure applies on the VVT solenoid valves. ECM controls the VVT solenoid valve by pulse-width modulation. When ECM needs VVT to adjust the intake valve to the maximum advance position, ECM controlled the VVT solenoid valve opening is 100%. At this point the engine oil pressure applies to the advance chamber, VVT rotor blades move in the opposite direction relative to the crank angle and eventually stay at the maximum position.

idling without load VVT actuator position will generally remain at the 8 ° or so, due to intake valve mechanical opening angle

is 5 °, so the intake valve opens at idle with actual angle of 13 °.

## (4). Lag Process



## Legend

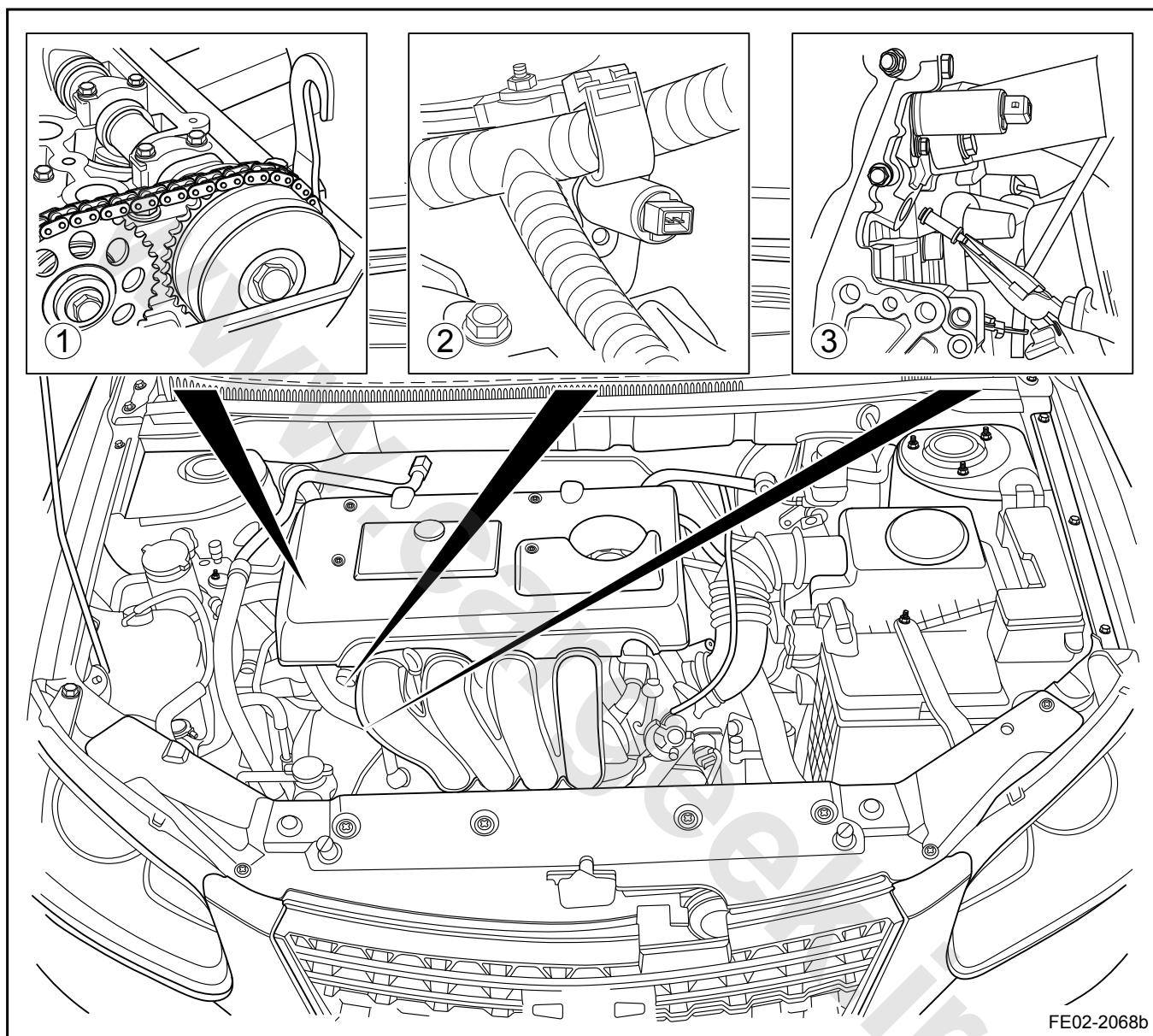
1. Lag Chamber

In normal operation condition, the oil pump generated engine oil pressure applies on the VVT solenoid valves. ECM controls the VVT solenoid valve by pulse-width modulation. When ECM needs VVT to adjust the intake valve to the maximum lag position, ECM controlled the VVT solenoid valve opening is 0%. At this point the engine oil pressure applies to the lag chamber, VVT rotor blades move in the same direction relative to the crank angle and eventually stay at the maximum position.

## 2.6.4 Component Locator

### 2.6.4.1 Component Locator

#### VVT System Component Locator

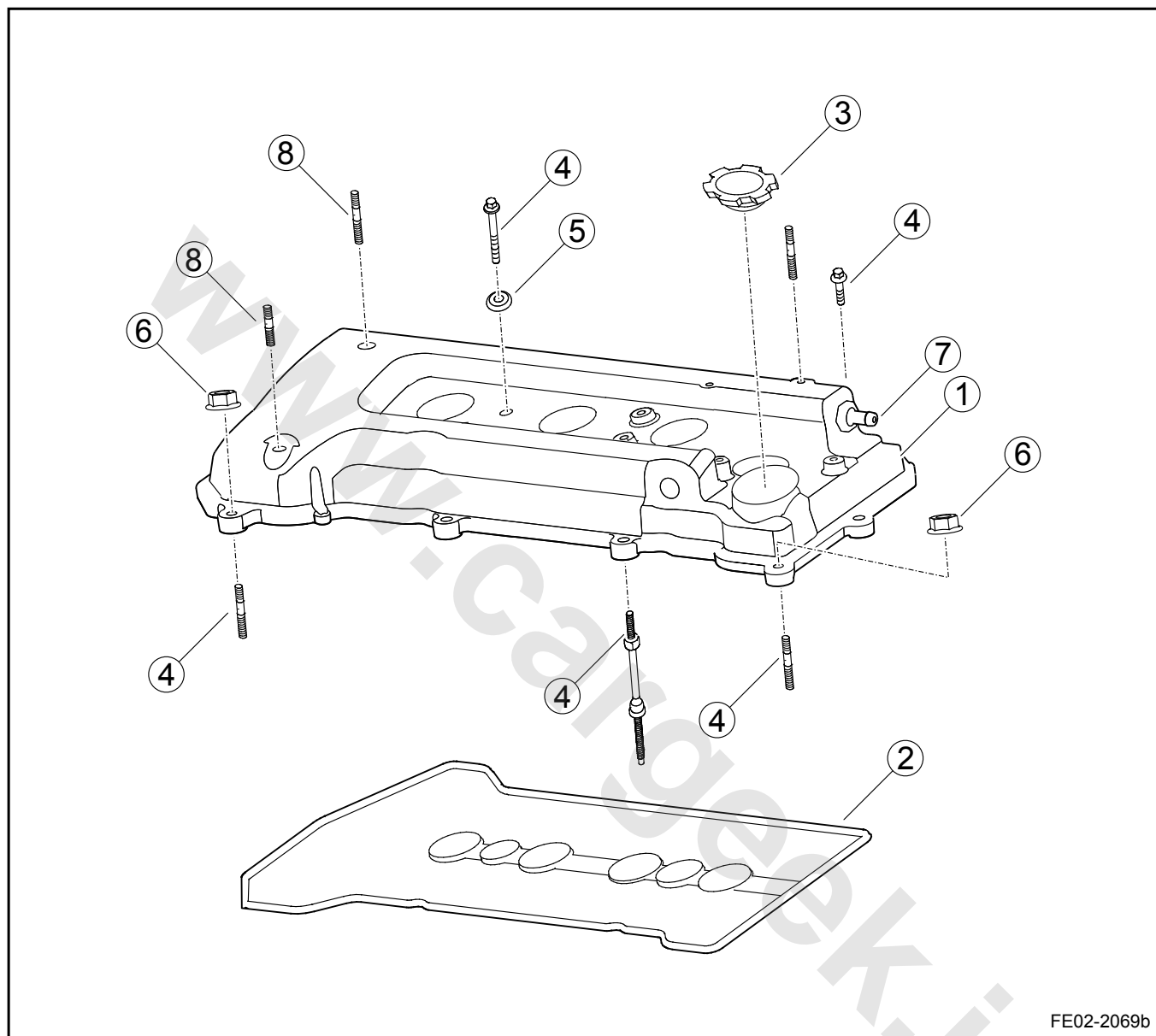


#### Legend

- 1. VVT Actuator
- 2. VVT Solenoid Valve
- 3. VVT Solenoid Valve Filter

## 2.6.5 Disassemble View

## 2.6.5.1 Cylinder Head Covers



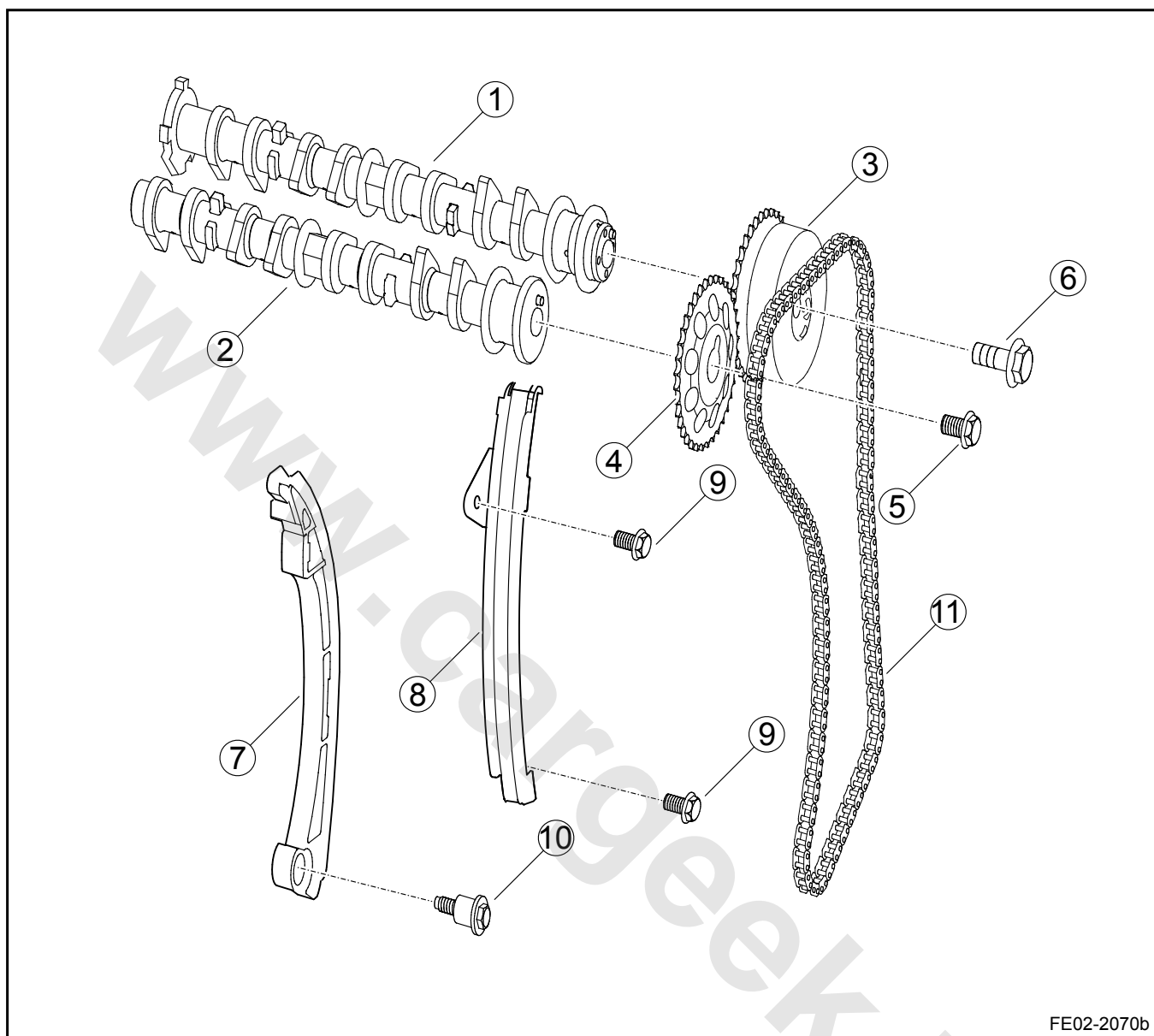
FE02-2069b

## Legend

- |                                     |                                       |
|-------------------------------------|---------------------------------------|
| 1. Cylinder Head Covers             | 6. Cylinder Head Covers Retaining Nut |
| 2. Cylinder Head Cover Gasket       | 7. Purged Crankcase Ventilation Valve |
| 3. Engine Oil Cap                   | 8. Hood Retaining Bolts               |
| 4. Cylinder Head Cover Bolts        |                                       |
| 5. Cylinder Head Cover Bolts Washer |                                       |



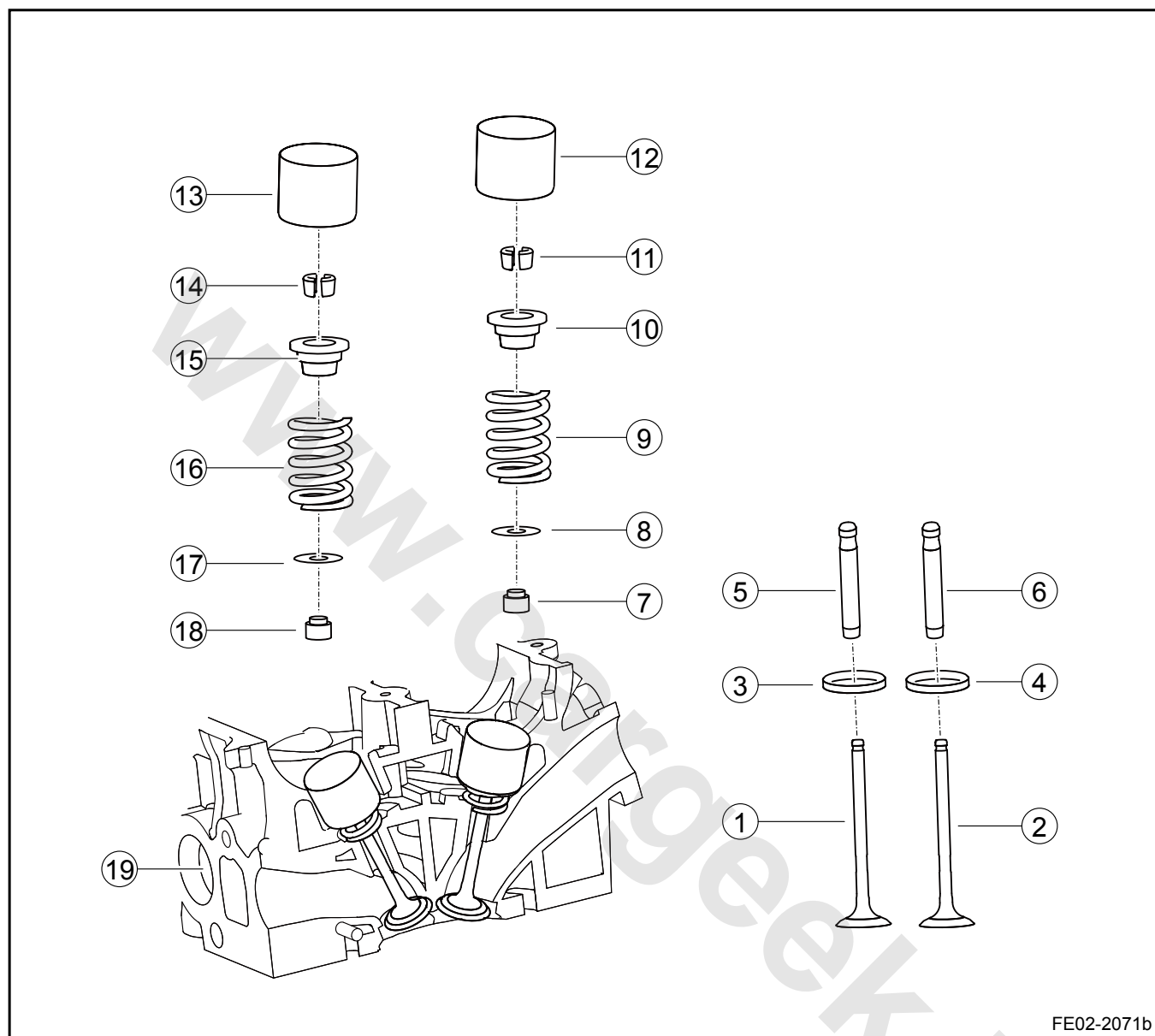
## 2.6.5.2 Camshaft and Accessories



## Legend

- |  |  |
|--|--|
| 1. Intake Camshaft                                       | 8. Timing Chain Guide Rail                 |
| 2. Exhaust Camshaft                                      | 9. Timing Chain Guide Rail Retaining Bolts |
| 3. VVT Actuator  | 10. Timing Chain Tensioner Rail Bolt       |
| 4. Exhaust Camshaft Drive Sprocket                       | 11. Timing Chain                           |
| 5. Exhaust Camshaft Drive Chain Sprocket Tightening Bolt |  |
| 6. VVT Actuator Tightening Bolt                          |  |
| 7. Timing Chain Tensioner Guide                          |  |

## 2.6.5.3 Cylinder Head



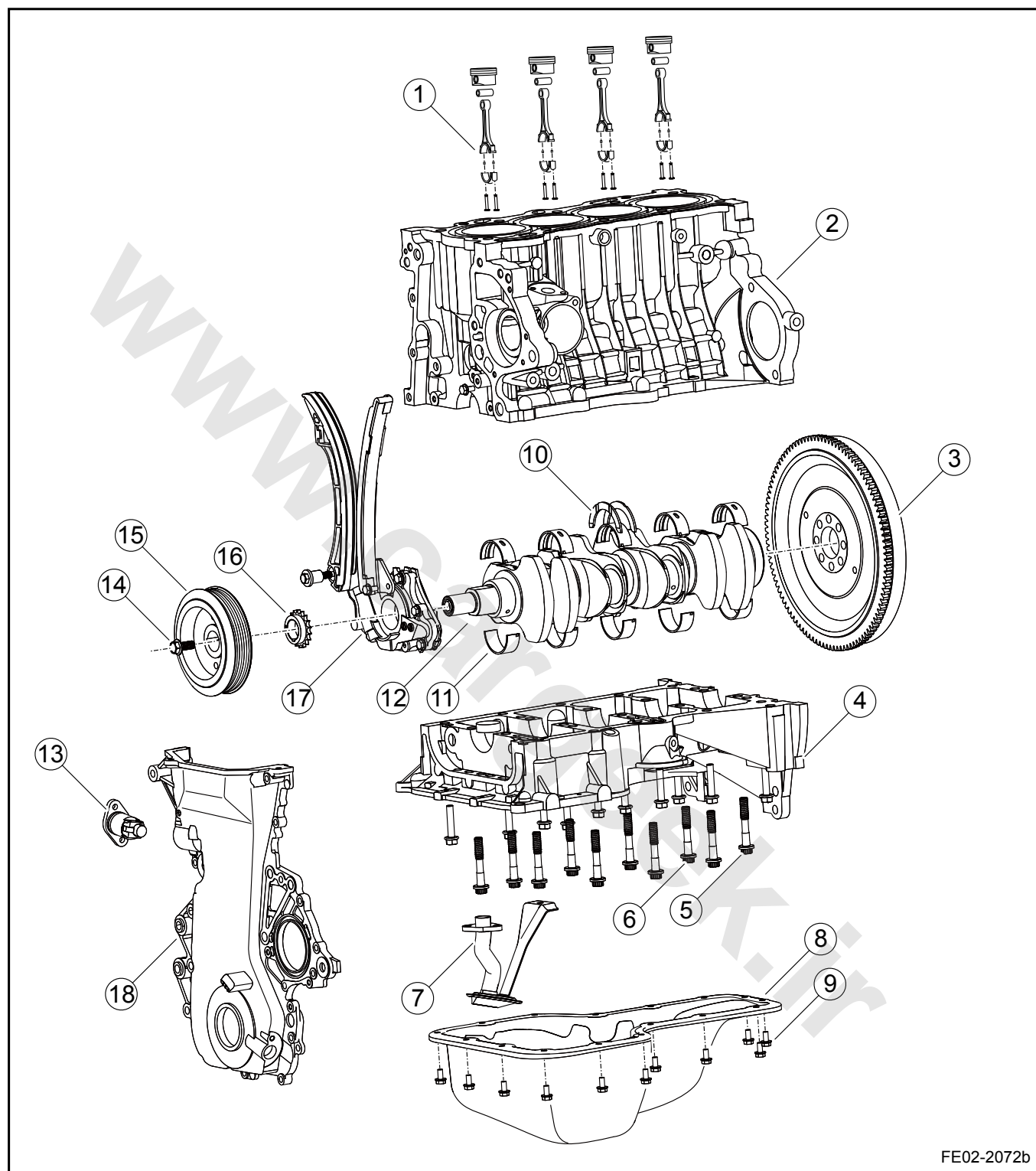
FE02-2071b

## Legend

- |                               |                                 |
|-------------------------------|---------------------------------|
| 1. Exhaust Valve              | 12. Intake Valve Lifter         |
| 2. Intake Valve               | 13. Exhaust Valve Lifter        |
| 3. Exhaust Valve Seating Ring | 14. Exhaust Locking Piece       |
| 4. Intake Valve Seating Ring  | 15. Exhaust Valve Spring Seat   |
| 5. Exhaust Valve Tube         | 16. Exhaust Valve Spring        |
| 6. Intake Valve Tube          | 17. Exhaust Valve Spring Washer |
| 7. Intake Valve Seals         | 18. Exhaust Valve Seals         |
| 8. Intake Valve Spring Washer | 19. Cylinder Head               |
| 9. Intake Valve Spring        |                                 |
| 10. Intake Valve Spring Seat  |                                 |
| 11. Intake Locking Piece      |                                 |



## 2.6.5.4 Cylinder Block



## Legend

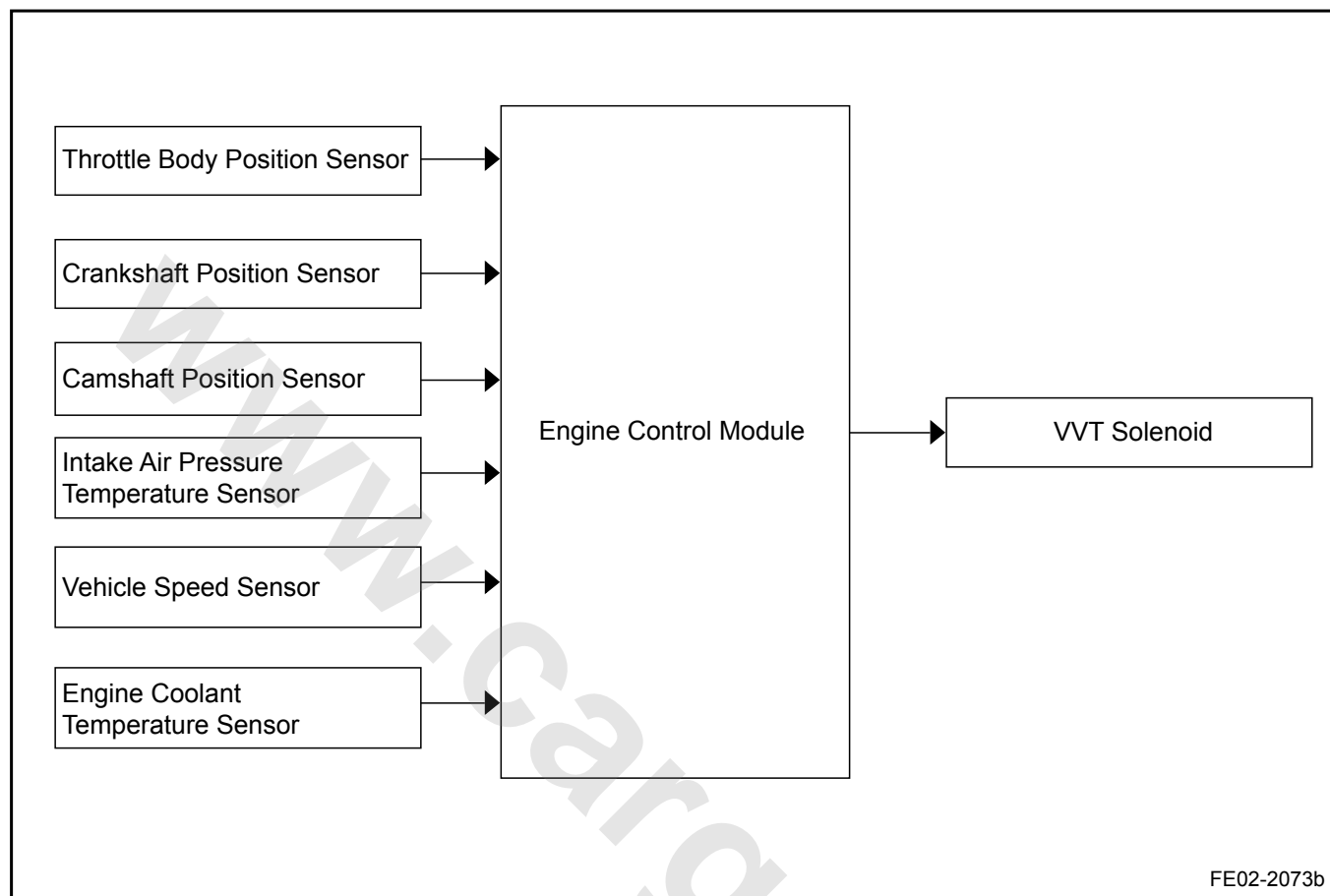
- |                         |                                       |
|-------------------------|---------------------------------------|
| 1. Piston Rod Component | 5. Crankcase Bolt                     |
| 2. Cylinder Block       | 6. Crankshaft Bearing Tightening Bolt |
| 3. Flywheel             | 7. Filters                            |
| 4. Crankcase            | 8. Oil Sump                           |

- |                                     |                                |
|-------------------------------------|--------------------------------|
| 9. Oil Pan Bolts                    | 15. Crankshaft Belt Drive      |
| 10. Crankshaft Thrust               | 16. Crankshaft Timing Sprocket |
| 11. Crankshaft Bearings             | 17. Engine Oil Pump            |
| 12. Crankshaft                      | 18. Timing Chain Cover         |
| 13. Timing Chain Tensioner          |                                |
| 14. Crankshaft Belt Tightening Bolt |                                |

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## 2.6.6 Schematic

### 2.6.6.1 Schematic



## 2.6.7 Diagnostic Information and Procedures

### 2.6.7.1 Diagnosis Description

Refer to [2.6.3.1 System Working Principle](#) Get familiar with the system functions and operations before start system diagnostics, so that it will facilitate the correct diagnostic steps, more importantly, it will also help to determine whether the customer described the situation is normal.

### 2.6.7.2 Visual Inspection

- Check installed aftermarket equipment that may affect the mechanical systems performance.
- Check easy to access system components to identify whether there is a significant damage that may lead to the fault.
- Confirm whether the engine oil level is normal and whether the engine oil viscosity is normal.
- Record engine speed, ambient temperature and other specific factors.
- Compare with a known good engine to check whether the current engine status is normal.

### 2.6.7.3 Comprehensive Engine Inspections

1. Check engine coolant.

Refer to [2.8.8.1 Engine Coolant Discharge and Filling](#).

2. Check engine oil.

Refer to [2.9.7.4 Engine Oil Pressure Diagnostic and Test](#).

3. Check the battery.

Refer to [2.11.2.3 Charging System Description and Operation](#).

4. Check the spark plug.

Refer to [2.10.7.6 Spark Plug Diagnostic](#).

5. Check the air filter.

Refer to [2.11.2.3 Charging System Description and Operation](#).

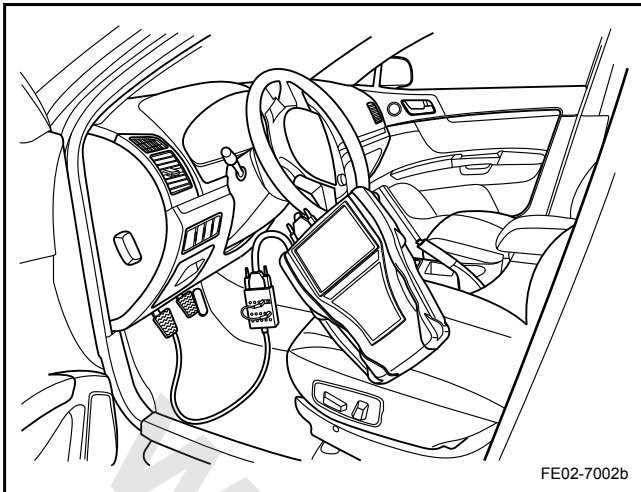
6. Check the ignition timing.

Check the ignition timing. The following conditions must be met:

- Engine reaches normal working temperature.

(1). Use scan tool to test methods:

Step 1	Connect scan tool.
--------	--------------------



- (a) Turn the ignition switch to "OFF" position.
- (b) Connect scan tool to the datalink connector.
- (c) Start and run the engine to normal working temperature.
- (d) Turn off A/C switch.
- (e) Select in sequence: Engine / Data List / Cylinder No.1 ignition advance angle.

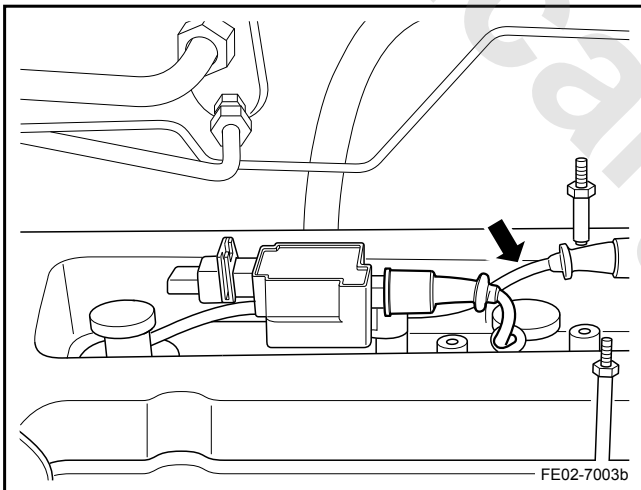
Standard Timing: Standard idling  $8^{\circ}$  -  $14^{\circ}$  before TDC.

(2). Use the timing light to test:

Step 1	Remove the engine hood cover.
--------	-------------------------------

Next

Step 2	Pull out cylinder No.1 high-pressure resistor wire.
--------	---



As shown, the lights are connected to cylinder No.1 high-pressure resistor wire.

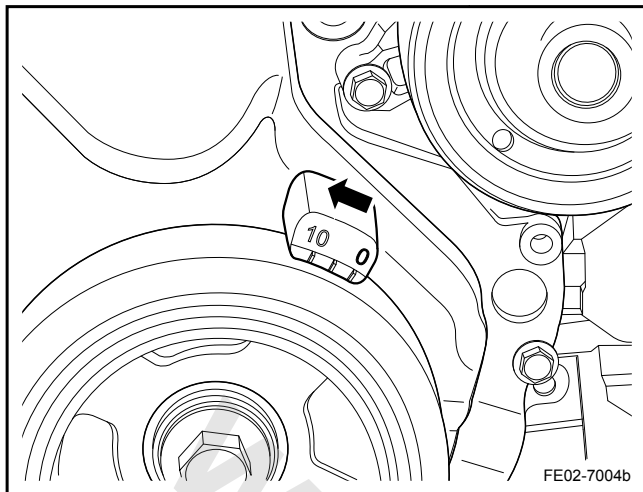
Next

Step 3	Check the ignition timing when idling.
--------	--

Standard Timing: Standard idling  $8^{\circ}$  -  $14^{\circ}$  before TDC.

Next

Step 4	Check the ignition timing during acceleration.
--------	--



Accelerate the engine, observe the engine ignition timing, which should be moving ahead as shown.

Next

Step 5 Remove the timing light to restore high-voltage resistor wire.

Next

Step 6 End of the test.

### 7. Cylinder Compression Test

#### Note

Remove EF12 fuses. Fuel and ignition systems can not work. After the test clear the DTC code with a scan tool.

Before the compression test is done, the following conditions must be met:

- Engine reaches normal working temperature.
- Full throttle
- Remove all four cylinder spark plugs.
- Battery fully charged.

#### Note

During the start up test, the ignition switch can not remain at the "ST" position for more than 15 s, otherwise it will damage the starter.

Step 1 Test pressure of each cylinder, pressure drop may be due to valve closure or piston ring wear.

Next

Step 2 Spray proper amount of engine oil into each cylinder

Next

Step 3 Install the cylinder pressure test gage to the spark plug installation port.

Next

Step 4 Turn the ignition switch to the "ST" position, so that each cylinder runs 4 to 5 compression strokes.

Next

Step 5 Individual cylinder pressure readings should not be less than 75% of the maximum and any cylinder pressure gage reading should not be less than 750 kPa.

Next

Step 6 Check the pressure gage readings for each cylinder, after the completion of four compression stroke. Readings is explained as follows:

- (a) Normal Conditions: The cylinder pressure rapidly increases and reaches the required uniform pressure value.
- (b) Piston Ring Fault: The first stroke pressure is low, increasing in the following strokes, but the pressure has not reached normal levels. Add engine oil in the cylinder, the pressure increased significantly.
- (c) Valve Fault: The first stroke pressure is low, and can not be increased in the following strokes. Add engine oil in the cylinder, the pressure is not increased.

Next

Step 7 End of the test.

#### 2.6.7.4 Engine Noise Diagnosis

Engine vibration is actually referring to the engine resonance noise. When the engine's vibration frequency is the same as the vibration frequency of a fault, the noise will be perceived. Severe vibrating usually generates big noise, and it is generated by internal parts fracture or serious engine wear and tear. A slight vibration can be heard, but the sound is not big. Slight vibration is due to the engine internal parts wear, loose or engine external components broken and it can lead to serious or slight vibration. In the engine noise diagnostic, the resonance noise cause must be found in order to eliminate the fault.

#### 2.6.7.5 Noisy when there is engine load

Step 1 Check whether drive belt tensioner is too tight or wear?

Yes

Replace/ adjust the drive belt tensioner to the specified value. Confirm whether the fault is fixed.

No

Step 2 Check the exhaust system. Whether the system is interfered with the other body components or scraping to ground?

Yes

Relocate and install the exhaust system to confirm whether the fault is fixed.

No

Step 3 Check the existence of the flywheel cracking, deformation and other components intervention. Is the flywheel normal?

Yes

Replace the flywheel assembly. Confirm whether the fault is fixed.

No

Step 4 Check whether the main bearing clearance is too large. Does it exceed the specified value?

Standard Value: 0.006-0.022 mm (0.0002-0.0008 in)

Yes

Replace the main bearings. Confirm whether the fault is fixed.

No

Step 5 Check connecting rod bearing clearance. Does it exceed the specified value?

Standard Value: 0.020-0.044 mm (0.0007-0.0017 in)

Yes

Replace the connecting rod bearings. Confirm whether the fault is fixed.

No

Step 6 Confirm diagnostic completed.

#### 2.6.7.6 Slight vibration when engine is warming up.

Step 1 Use scan tool to read the "Knock" related data. Is the engine knocking?

Yes

Check the engine timing systems and fuel quality. Repair the faulty part.

No

Step 2 Check whether there is exhaust manifold leakage?

Yes

Replace the exhaust pipe pad and tighten the exhaust pipe.

No

Step 3 Check connecting rod bearing clearance, Does it exceed the specified value?

Standard Value: 0.020-0.044 mm (0.0007-0.0017 in)

Yes

Replace the connecting rod bearings. Confirm whether the fault is fixed.



No

Step 4 Confirm diagnostic completed.

### 2.6.7.7 Vibration at idle and when engine is warming up

Step 1 Check drive belt tension. Is it too loose or worn. Any fault?

Yes

If necessary, replace the drive belt. Confirm whether the fault is fixed.

No

Step 2 check whether engine oil and oil viscosity is normal?

Yes

Refill engine oil suitable for the current season temperature. Confirm whether the fault is fixed.

No

Step 3 check whether the generator and air-conditioning compressor is working properly. Any abnormal sound?

Yes

Replace failed parts. Confirm whether the fault is fixed.

No

Step 4 Check the valve, valve spring and other valve components. Any fault?

Yes

Replace failed parts. Confirm whether the fault is fixed.

No

Step 5 Check the piston pin gap. Does it exceed the specified value?

Standard Value: 0.005-0.011 mm (0.0002-0.0004 in)

Yes

Replace failed parts. Confirm whether the fault is fixed.

No

Step 6 Check whether the connecting rod is bent?

Yes

Replace failed parts. Confirm whether the fault is fixed.

No

Step 7 Check piston to cylinder gap value. Does it exceed the specified value?

Standard Value: 0.060-0.083 mm (0.0023-0.0033 in)

Yes

Replace failed parts. Confirm whether the fault is fixed.

No

Step 8 Check the piston pin offset. Does it exceed the specified value?

Standard Value: 0.6 mm (0.0236 in)

Yes

Replace failed parts. Confirm whether the fault is fixed.

No

Step 9 Confirm diagnostic completed.

### 2.6.7.8 Misfire Accompanied By Abnormal Engine Noise

Step 1 Use scan tool to check the engine control system DTC code.

Yes

According to the DTC code, repair the faulty part. Refer to the [2.2.7.11 DTC Code Index](#)

No

Step 2 Use scan tool to check the engine "Knock" data, compared with the normal vehicle data. Is it normal?

Yes

Check whether the fuel is normal. Check whether the timing system is normal. Repair the faulty part. Confirm whether the fault is fixed.

No

Step 3 Check valve spring whether it is too soft and broken?

Yes

Repair the faulty part. Refer to [2.6.8.15 Cylinder Head Assembly Removal and Installation](#)

No

Step 4 Check valve whether there is catching and bending?

Yes

Repair faulty parts. Refer to [2.6.8.15 Cylinder Head Assembly Removal and Installation](#)

No

Step 5 Check valve whether it is stretched, stagnant or worn.

Yes

Repair the faulty part. Refer to [2.6.8.15 Cylinder Head Assembly Removal and Installation](#)

No

Step 6 Check whether there are excessive cam wear or obvious faults?

Yes

Repair the faulty part. Refer to  
[2.6.8.12 Camshaft Replacement](#)

No

Step 7 Check valve for the existence of cracks, excessive wear and tear and other faults?

Yes

Repair the faulty part. Refer to  
[2.6.8.15 Cylinder Head Assembly Removal and Installation](#)

No

Step 8 Check valve spring seating and the valve spring washer. Is the installation incorrect?

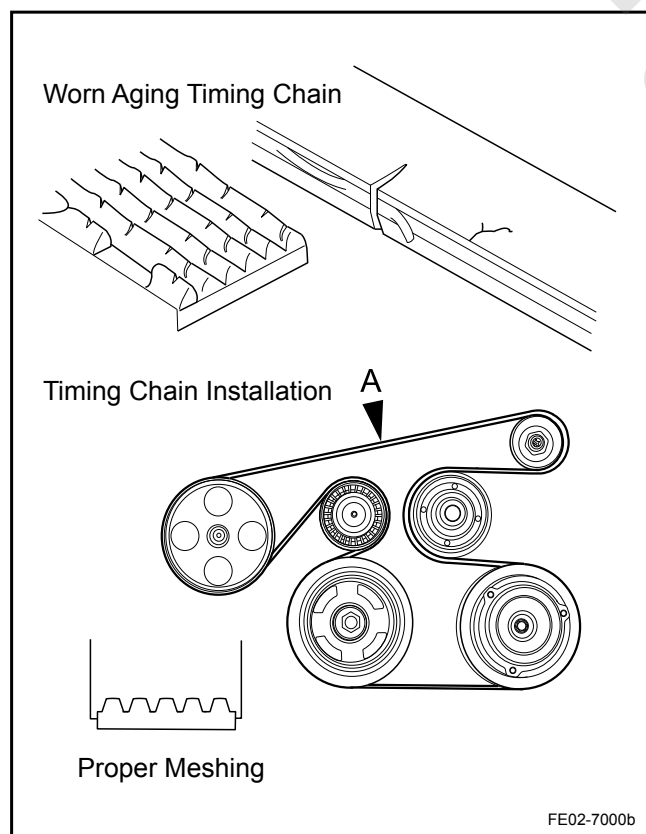
Yes

Repair the faulty part. Refer to  
[2.6.8.15 Cylinder Head Assembly Removal and Installation](#)

No

Step 9 Confirm whether the fault is fixed.

### 2.6.7.9 Drive Belt Inspection



1. Inspect when the engine is cool or has been turned off for 30 min.
2. Visual Inspect whether there is V-drive belt excessive wear or cord wear. If faults are found, replace the V-drive belt.
3. Visual Inspect whether there is drive belt inner or outer damage, wear and cracks. If faults are found, replace the drive belt.
4. If no faults are found in steps 2 and 3, measure the drive belt tension: rotate crankshaft pulley two laps clockwise and measure whether the tension is even along the drive belt tensioner pulley.
5. Use sound pressure meter (General Maintenance Tools) to measure drive belt tension and frequency at the marked point A.

	New Drive Belt	Old Drive Belt
Drive Belt Tension (N / lb)	400-500/89.9-112.4	300-400/67.4-89.9

- a. Replace with new drive belt. Rotate the crankshaft two laps clockwise, so that the drive belt completely runs through the drive pulley. Measure the tension at marked position A. Refer to the table and replace the drive belt if the measurement is beyond the scope of the table.
- b. If the used drive belt tension is beyond the scope of the table, replace it with a new drive belt.
- c. During the drive belt installation, please make sure the correct installation to the drive pulley groove.
- d. Do not drop engine oil or engine coolant onto the drive belt.
- e. Do not over-wind or bend the drive belt.

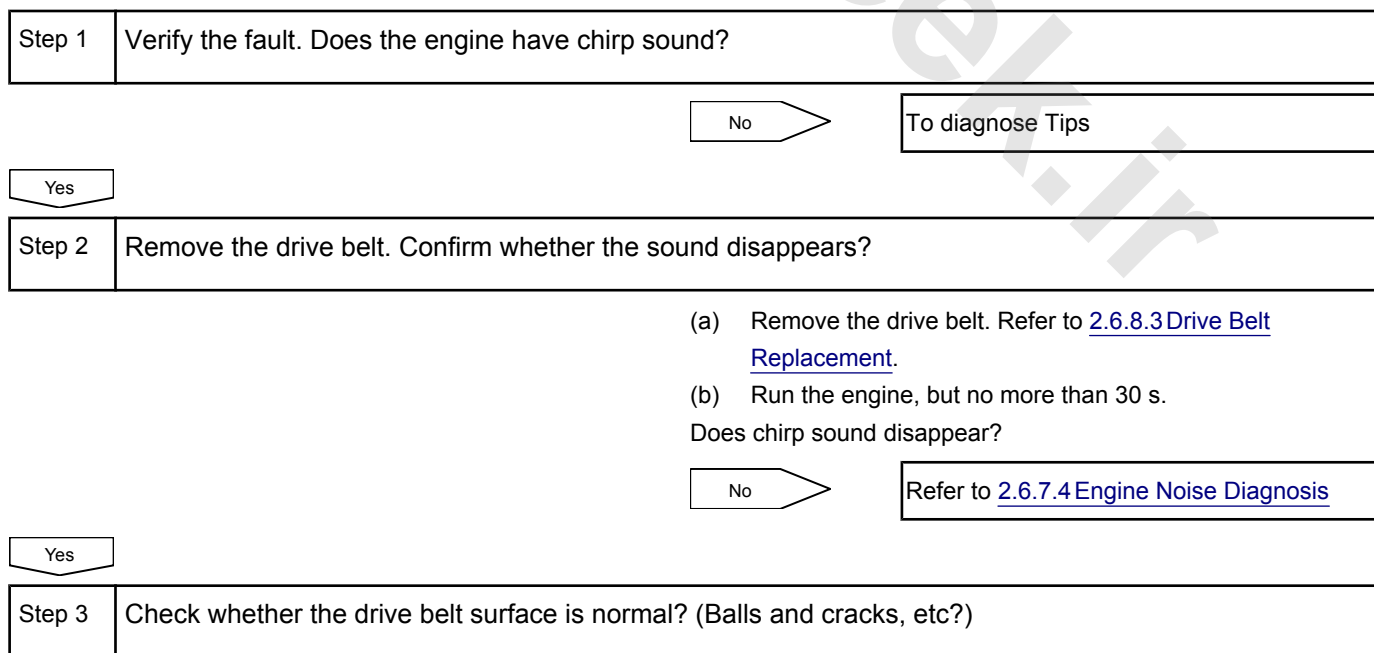
### 2.6.7.10 Drive Belt Chirp Sound Diagnostic

#### Diagnostic Tips:

The symptom may be due to wet drive belt or pulley and may be an intermittent fault. Drive belt may need to spray a small amount of water to reproduce customer reported fault. If the symptom reoccurs after spraying water, then clean the pulley. Body parts, suspension parts or other vehicle parts loose or unreasonable installation can also cause the chirp sound.

**Fault Definition:** The following conditions are the drive belt chirp sound symptoms

- A chirp jack noise can be heard once rotate the drive belt a lap.
- Noise often happens on a rainy day or in a cold morning.



Refer to [2.6.7.9 Drive Belt Inspection](#)

No

Replace the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#)

Yes

Step 4 Check whether the drive pulley is installed correctly? (Misaligned, etc?)

No

Reinstall the drive pulley, if necessary, replace the drive belt.

Yes

Step 5 Check whether the drive pulley is normal?

Check whether the pulley is bent, twisted and so on.

No

Replace the failed pulley.

Yes

Step 6 Check whether all fasteners associated with the drive belt are normal?

No

Tighten loosen fasteners.

Yes

Step 7 Replace the drive belt. Confirm the fault is fixed.

### 2.6.7.11 Drive Belt Scream Diagnostic

#### Diagnostic Tips:

Body, suspension and other components loose or unreasonable installation may cause screams. If there is intermittent noise, check the attached parts by changing the engine load. Check whether the air-conditioning system is over filled, power steering hose is clamped, the power steering fluid is correct or whether the generator is faulty.

Fault Definition: The following conditions are the drive belt screams symptoms

- Drive belt screams due to slippage.
- Noise appears when a big load added to the drive belt, such as air-conditioning system compressor starting, the running engine with the throttle quickly opening or drive belt skidding in a drive component.

Step 1 Verify the fault. Does the engine scream?

No

To diagnose Tips

Yes

Step 2 Remove the drive belt. Confirm that the scream disappears?

(a) Remove the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#).

(b) Run the engine, but no more than 30 s.

Does the scream disappear?

No

Refer to [2.6.7.4 Engine Noise Diagnosis](#)

Yes

Step 3 Check whether all attached drive pulley bearings are normal?

Pulley bearings do not appear stuck, loose and so on.

No

Replace the damaged pulley or bearing.

Yes

Step 4 Check whether drive belt tensioner device is working properly?

Tensioner pulley bearing device does not appear stuck, loose.  
Tensioner device does not appear loose and other damages.

No

Replace the drive belt tensioner assembly.  
Refer to the [2.6.8.4 Drive Belt Tensioner Replacement](#)

Yes

Step 5 Check whether the correct drive belt is used?

Check whether the drive belt is stretched. Refer to [2.6.7.9 Drive Belt Inspection](#).

No

Replace the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#)

Yes

Step 6 Check all fasteners associated with the drive belt are normal?

No

Tighten loose fasteners.

Yes

Step 7 Check whether drive pulley is normal?

Check whether the pulley is bent, twisted and so on.

No

Replace the failed pulley.

Yes

Step 8 To diagnostic tips.

### 2.6.7.12 Drive Belt Hum Sound Diagnostic

#### Diagnostic Tips:

Drive belt should not produce hum sound. If there is an intermittent noise, check the attached parts by changing the load. Make sure that components run until the maximum load. These conditions may be due to (but are not limited to) over filling the air-conditioning system, power steering system blocked or steering fluid incorrect, as well as the generator failure.

Fault Definition: Sustained High-Frequency Noise

Step 1	Verify the fault. Does the engine hum appear?
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div> <div>Yes</div> <div>No</div> </div> <div> <div>To diagnose Tips</div> </div> </div>
Step 2	Remove the drive belt. Confirm whether the hum sound disappears?
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div> <div>Yes</div> <div>No</div> </div> <div> <div>           (a) Remove the drive belt. Refer to <a href="#">2.6.8.3 Drive Belt Replacement</a>.            (b) Run the engine, but no more than 30 s.            Does the hum sound disappear?  <div> <div>Yes</div> <div>No</div> </div> </div> <div> <div>Refer to <a href="#">2.6.7.4 Engine Noise Diagnosis</a></div> </div> </div> </div>
Step 3	Check whether all attached drive pulley bearings are normal?
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div> <div>Yes</div> <div>No</div> </div> <div> <div>           Pulley bearings should not appear stuck, loose and so on.  <div> <div>Yes</div> <div>No</div> </div> </div> <div> <div>Replace the damaged pulley or bearing.</div> </div> </div> </div>
Step 4	To diagnostic tips.

### 2.6.7.13 Drive Belt Off Diagnostics

#### Diagnostic Tips:

If the drive belt falls off from the pulley repeatedly, the reason may be the pulley misalignment. If the attachment drive belt driving components cause the load fluctuates, it may cause drive belt fall off from the pulley. Test whether accessories driving parts are working correctly. If the drive belt's length is not proper, drive belt tensioner will not be able to maintain a suitable drive belt tension.

Fault Definition: Drive belt falls off from the pulley, or incorrectly installed on the pulley.

Step 1	Check the drive belt for damage. If necessary, replace the drive belt.
	<div>Next</div>
Step 2	Check whether the pulley is misaligned. Repair the faulty part.

Next

Step 3 Check whether the pulley is bent or depressed. Repair the faulty part.

Next

Step 4 Check whether the drive belt tensioner device bracket is bent or cracked. Repair the faulty part.

Next

Step 5 Check whether the drive belt tensioner device is working properly. Repair the faulty part.

Next

Step 6 Check whether the attached fasteners loose. Repair the faulty part.

Next

Step 7 Confirm that fault has been fixed.

#### 2.6.7.14 Drive Belt Excessive Wear

##### Diagnostic Tips:

Drive belt excessive wear and tear is usually due to unreasonable installation or the use of the wrong drive belt. Drive pulley slight misalignment will not cause excessive wear and tear, but it could lead to drive belt noise or loss. Drive pulley misalignment can cause excessive wear and can also lead to drive belt fall off.

Fault Definition: The drive belt is not properly installed which led to the drive belt outer edges worn.

Step 1 Check whether there are frictions between drive belt and brackets, wiring harness, hoses and other components?

Yes

Repair the faulty part.

No

Step 2 Check all attachments drive pulley whether there are abnormal scratches on the surface, edges and corners and other abnormal conditions?

Yes

Repair the faulty part. If necessary, replace the drive pulley

No

Step 3 Check whether the installed drive belt model is correct?

Yes

Replace the drive belt with a correct type.

No

Step 4 To diagnostic tips.

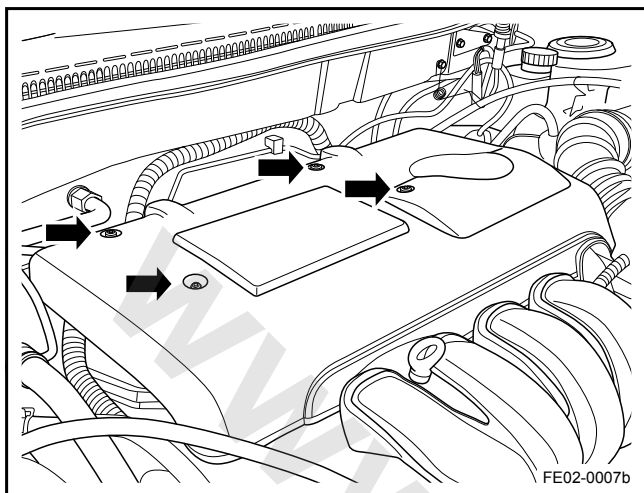


## 2.6.8 Removal and Installation

### 2.6.8.1 Plastic Engine Shield Replacement

Removal Procedure:

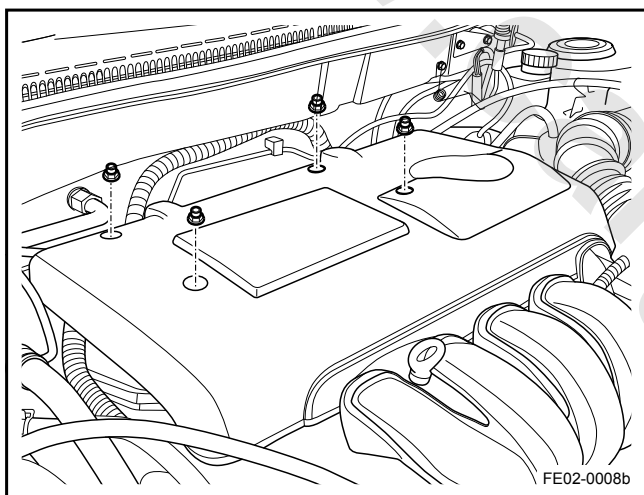
1. Remove the engine plastic shield retaining nuts.
2. Remove the plastic engine shield.



Installation Procedure:

1. Install the engine plastic shield retaining nuts onto the engine plastic shield.
2. Tighten the engine plastic shield retaining nuts.

Torque: 7 Nm (Metric) 5.2 lb-ft (US English)

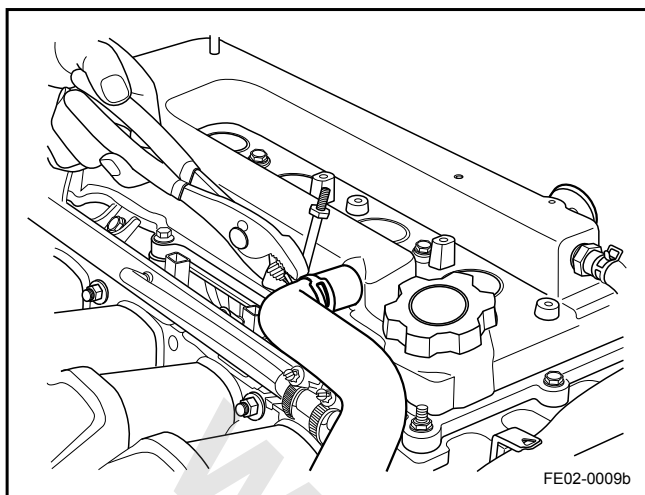


### 2.6.8.2 Cylinder Head Cover Replacement

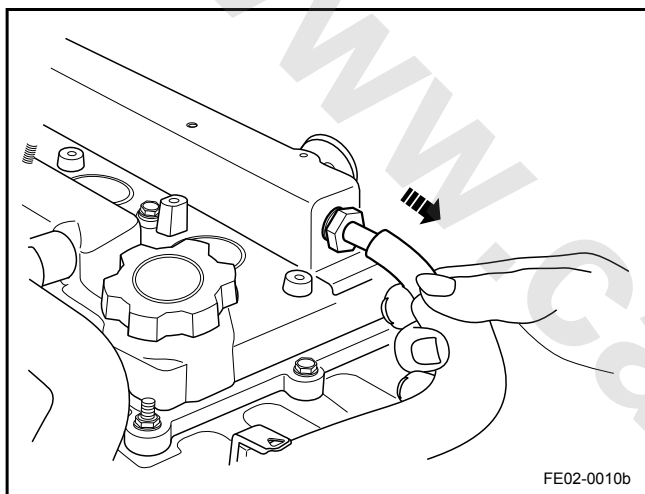
Removal Procedure:

**Warning!**

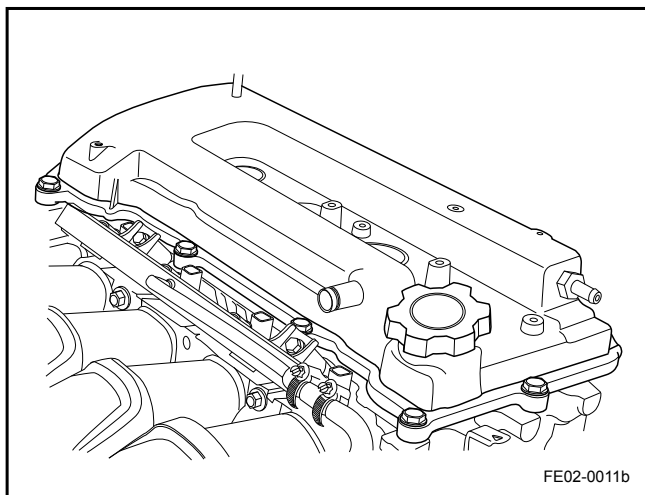
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



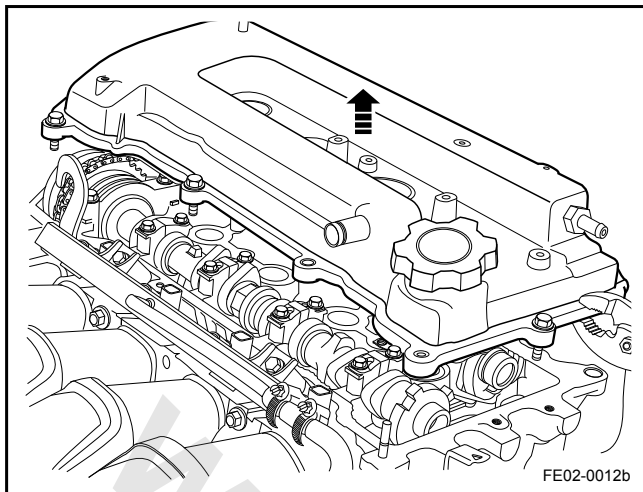
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the engine plastic shield. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
3. Remove the ignition coil and ignition wire. Refer to [2.10.8.3 Ignition Coil Replacement](#).
4. Remove the crankcase ventilation tube.



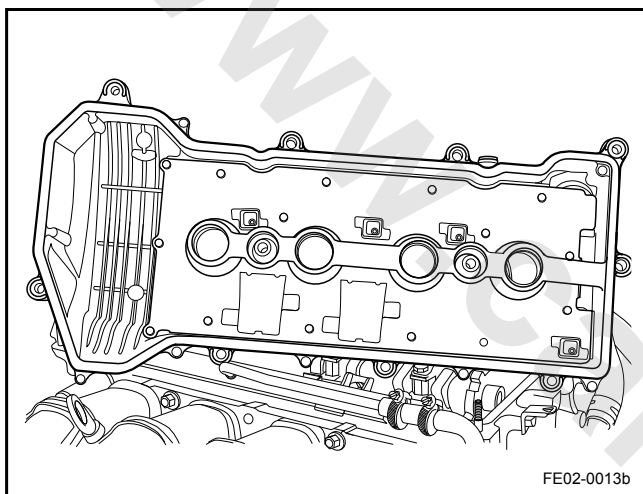
5. Remove the crankcase ventilation vacuum tube.



6. Remove cylinder head cover bolts and nuts.



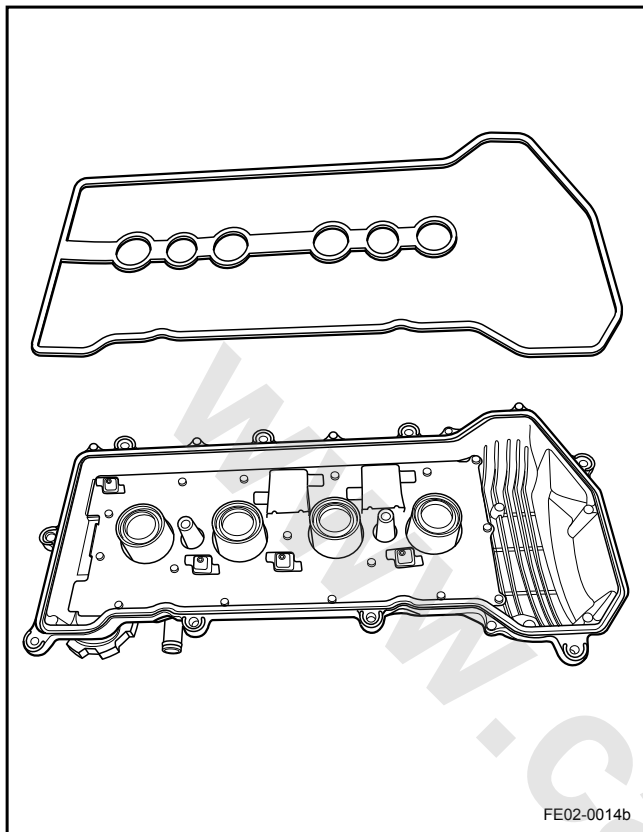
7. Remove the cylinder head cover.



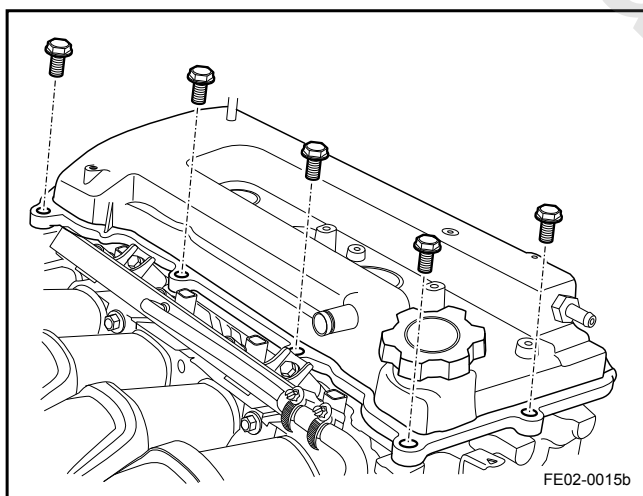
8. Remove the cylinder head gasket from the cylinder head cover.

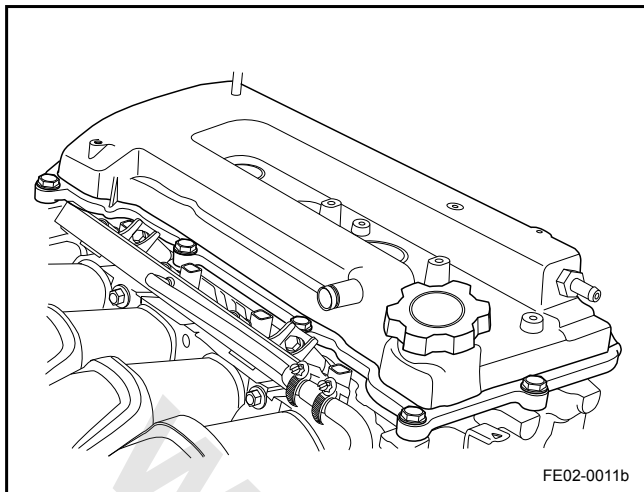
Installation Procedure:

1. Install the cylinder head cover gasket.



2. Apply sealant evenly in the cylinder head gasket.
3. Install the cylinder head cover.





4. Tighten the cylinder head cover bolts.

**Note**

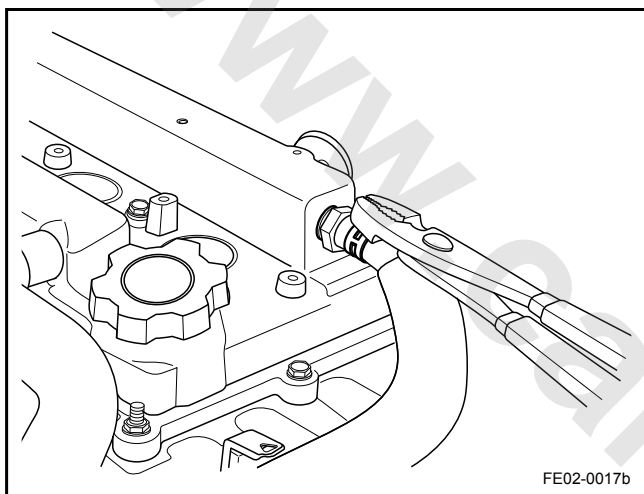
When tightening, tighten a single bolt several times, in accordance with the specified torque.

**Short Bolts:**

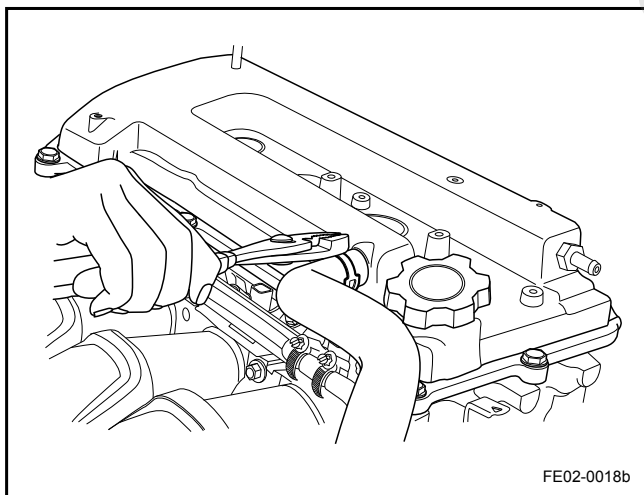
Torque: 9 Nm (Metric) 6.7 lb-ft (US English)

**Long Bolts, Nuts, Special Bolts:**

Torque: 11 Nm (Metric) 8.2 lb-ft (US English)



5. Install the crankcase ventilation vacuum tube.



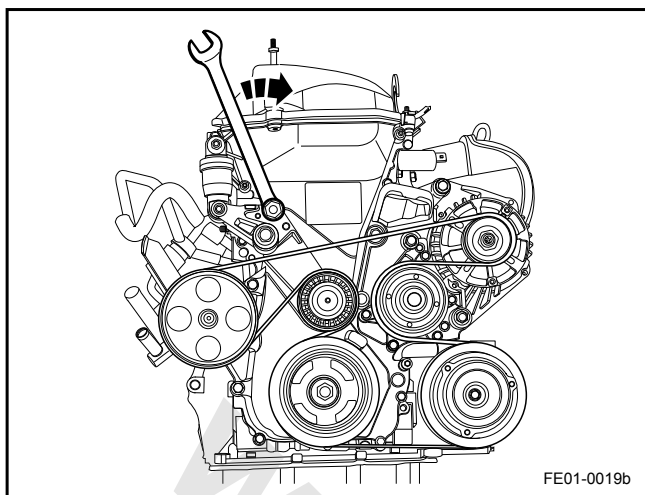
6. Install the crankcase ventilation tube.
7. Install ignition coil and ignition wire.
8. Install the engine plastic shield.
9. Connect the battery negative cable.

### 2.6.8.3 Drive Belt Replacement

Removal Procedure:

**Warning!**

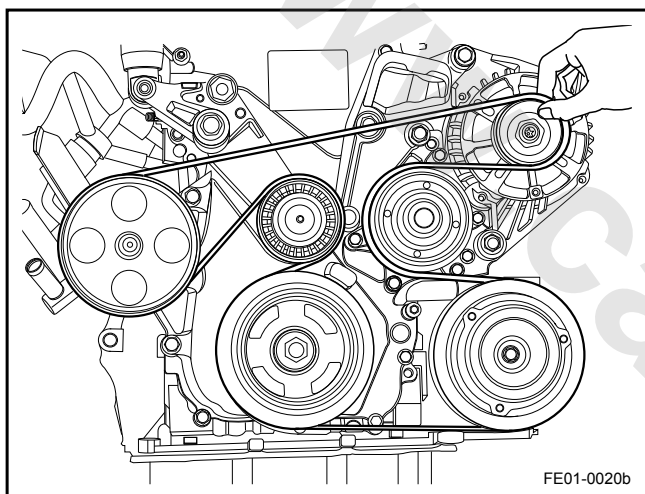
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



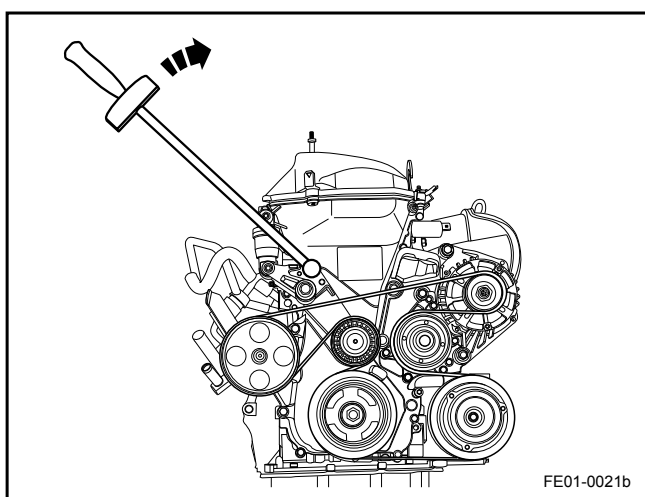
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Rotate the drive belt tensioner anti-clockwise with a wrench to remove the drive belt.

**Note**

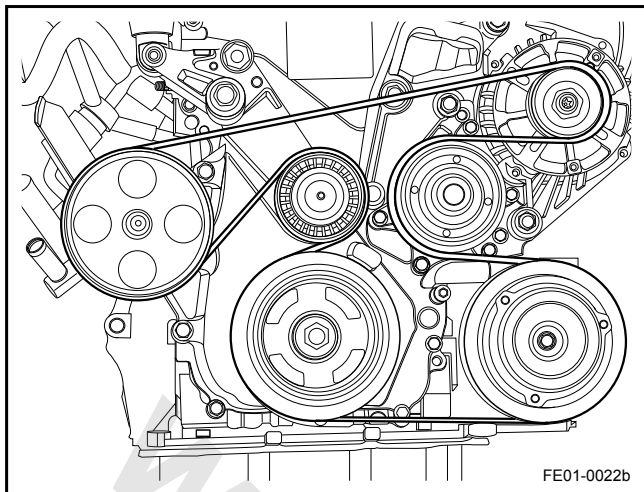
In the removal process, prevent the wrench slipping causing injury to the operator.

**Installation Procedure:**

1. Wrap the drive belt as shown.



2. Rotate the drive belt tensioner clockwise with a wrench to install the drive belt.



3. Release the Drive Belt Tensioner device to the normal position.

**Note**

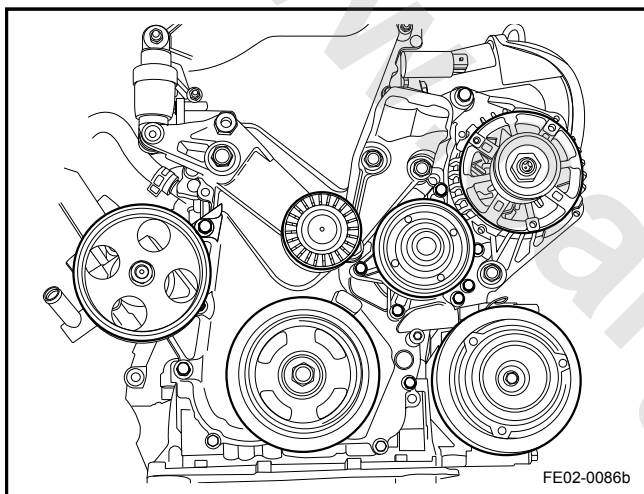
Before releasing the tensioner device, confirm the drive belt aligned drive pulley groove, otherwise the drive belt may be damaged.

4. Connect the battery negative cable.

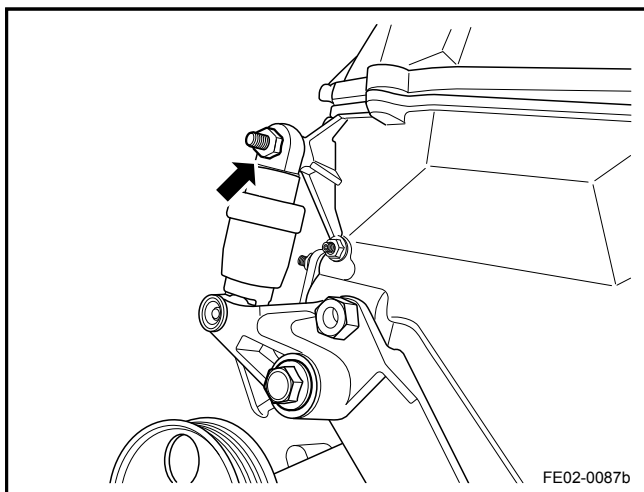
### 2.6.8.4 Drive Belt Tensioner Replacement

**Removal Procedure:**

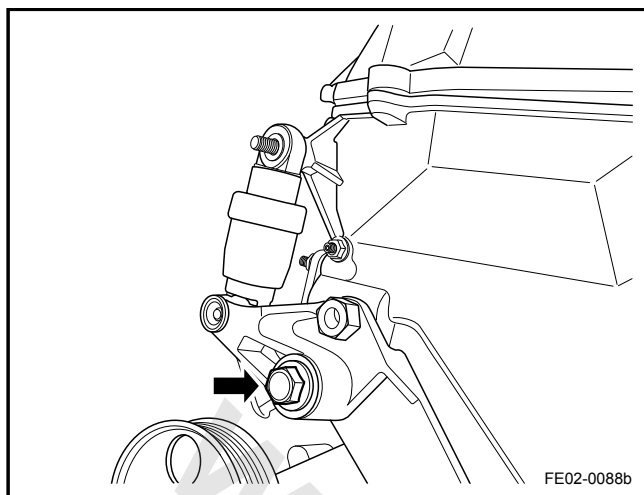
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the hood. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
3. Remove the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#).



4. Remove the drive belt tensioner retaining nut.





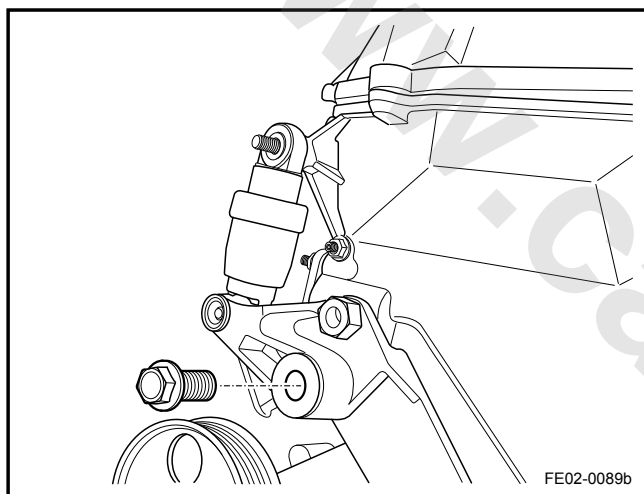


5. Remove the drive belt tensioner pulley bracket bolt.

Installation Procedure:

1. Install drive belt tensioner bracket bolts.

Torque: 69 Nm (Metric) 51.1 lb-ft (US English)



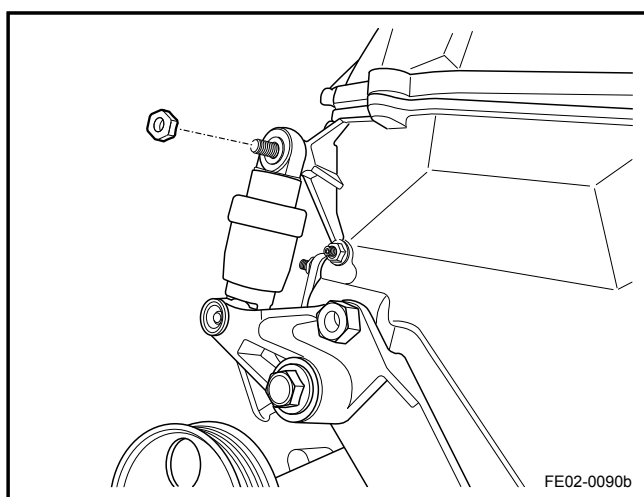
2. Install drive belt tensioner bracket retaining nut.

Torque: 29 Nm (Metric) 21.5 lb-ft (US English)

3. Install the drive belt.

4. Install the engine hood.

5. Connect the battery negative cable.





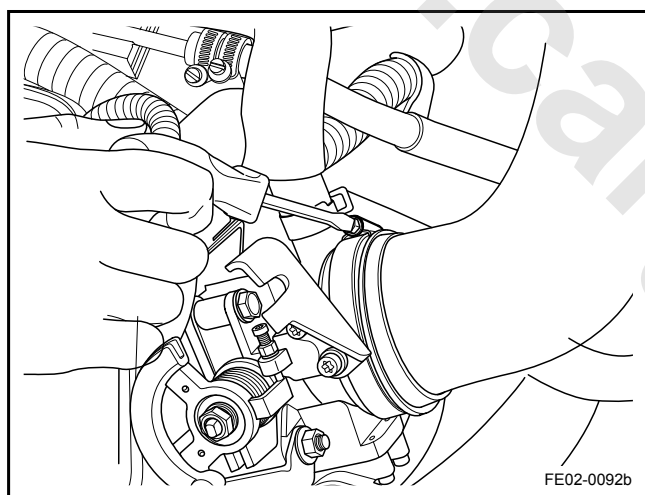
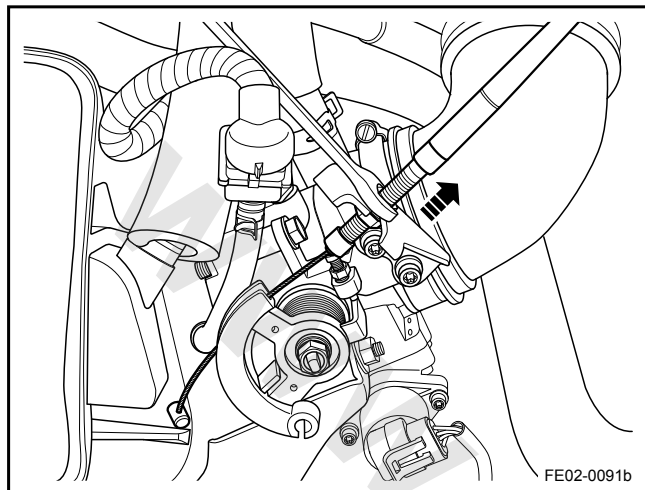
### 2.6.8.5 Throttle Body Assembly Replacement

Removal Procedure:

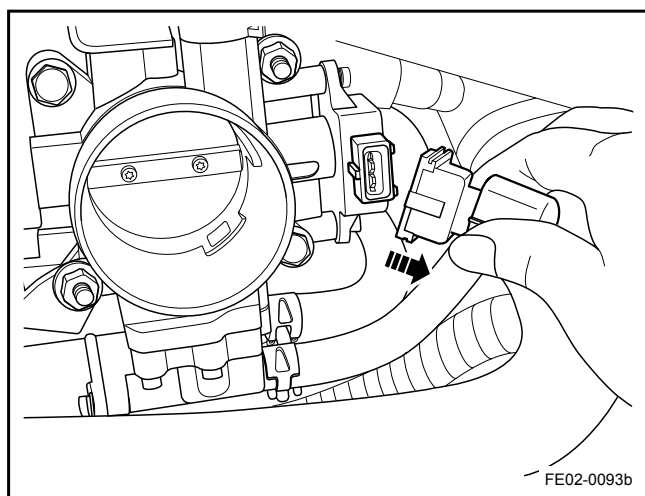
**Warning!**

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

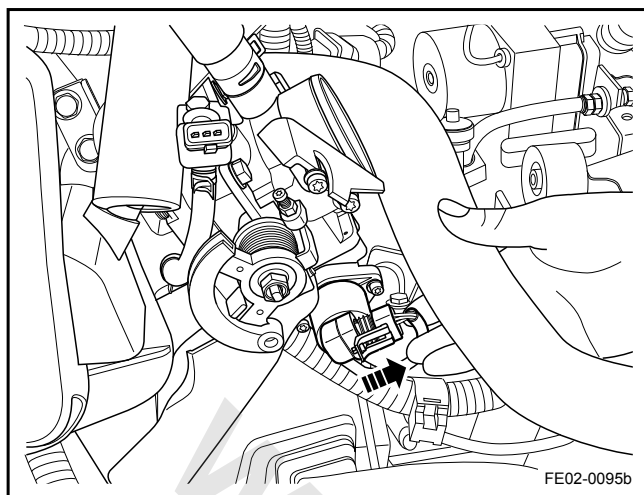
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the throttle pull cable.



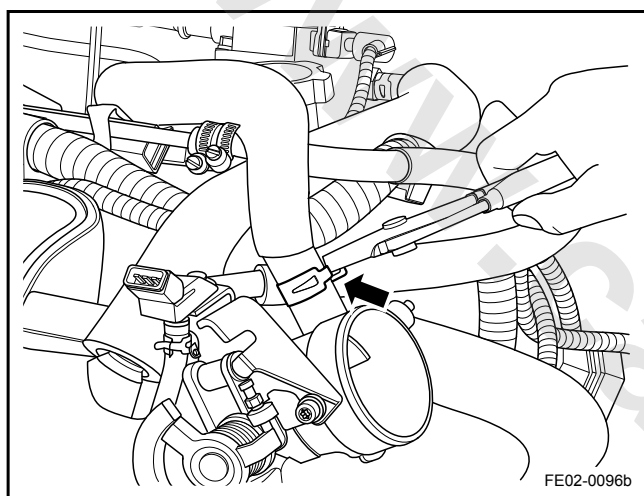
3. Remove the throttle body from the intake manifold.



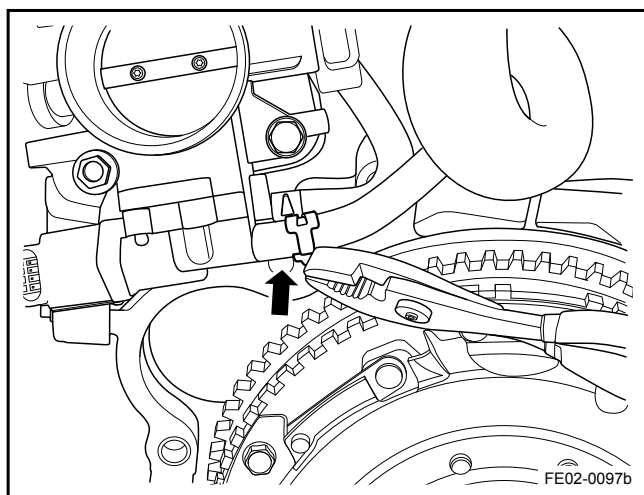
4. Disconnect throttle position sensor wiring harness connector.



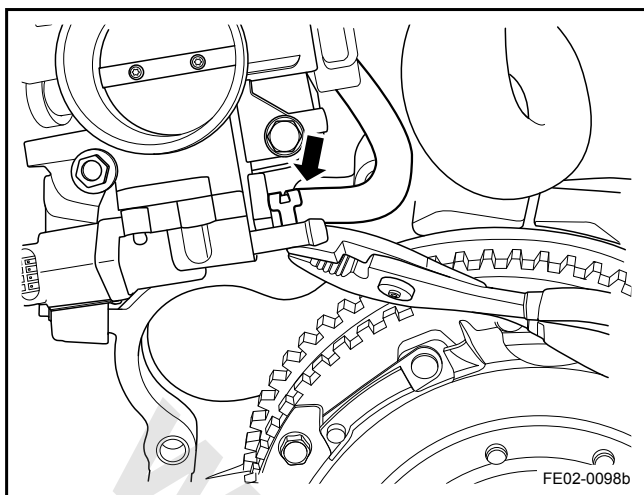
5. Disconnect idle speed control valve wiring harness connector.



6. Remove the crankcase ventilation hose.



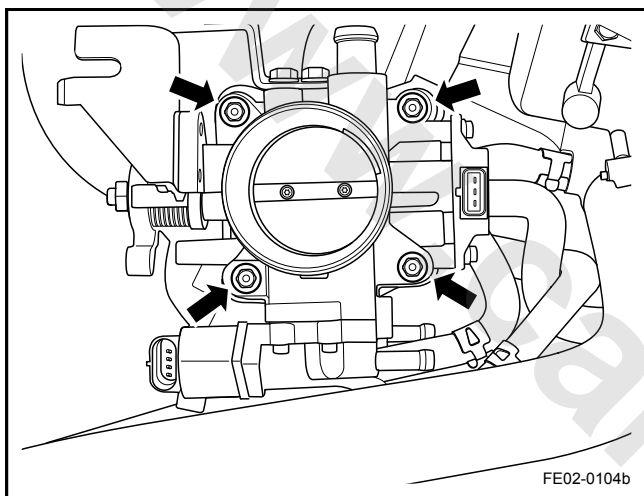
7. Remove throttle body preheated water inlet pipe.



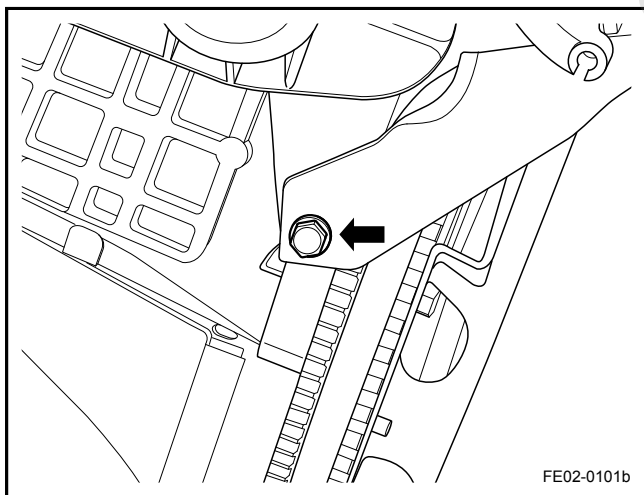
8. Remove throttle body preheated water outlet pipe.

**Warning!**

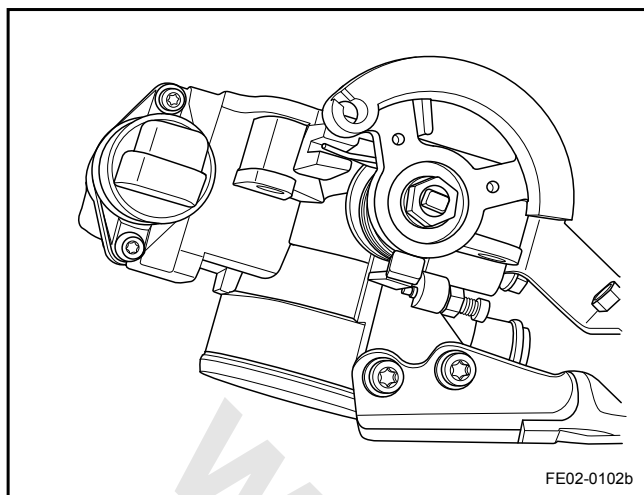
When the engine temperature is high, prevent the engine coolant spray, causing burns in the removal procedure.



9. Remove throttle body retaining nut from the intake manifold.

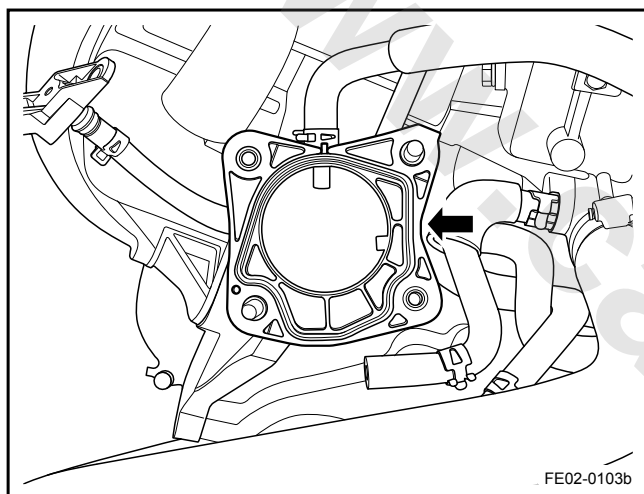


10. Remove throttle body bracket bolts.

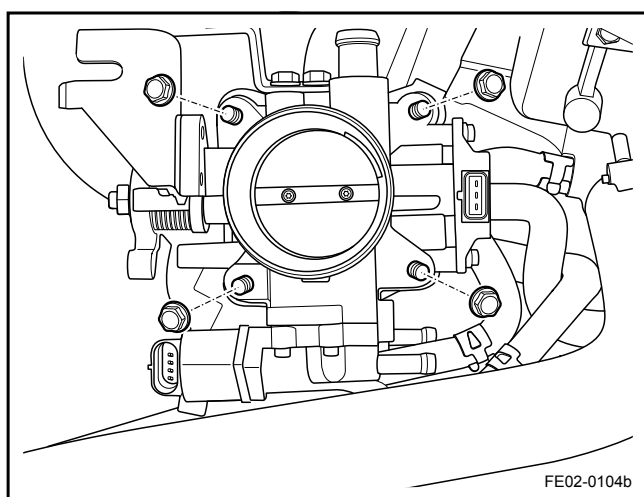


11. Remove the throttle body assembly from the intake manifold and complete the removal procedure.

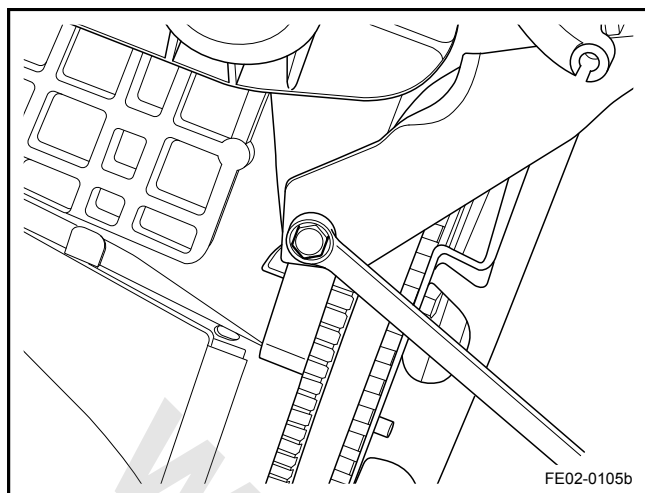
Installation Procedure:



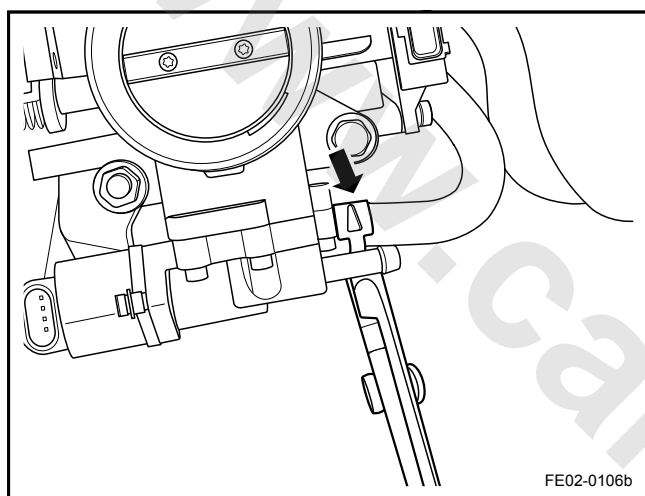
1. Clean the engine throttle body and the engine intake manifold mating surface and replace the seals.



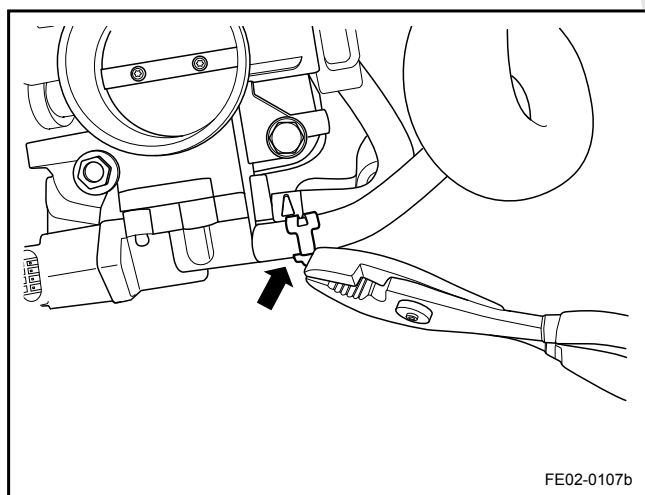
2. Install the throttle body to the intake manifold and tighten the retaining nut.



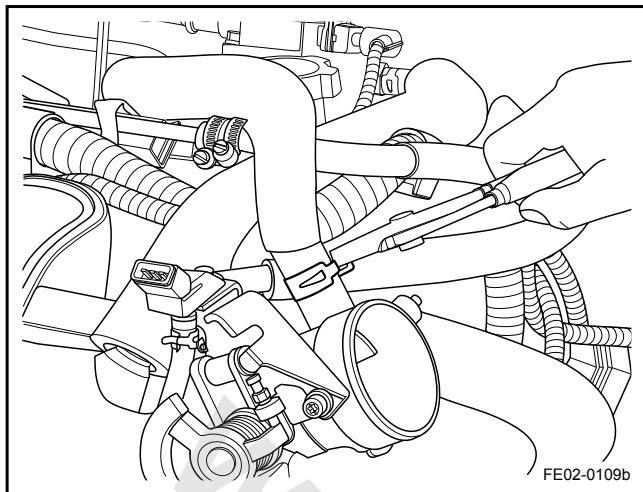
3. Install throttle body bracket and tighten the bolts.



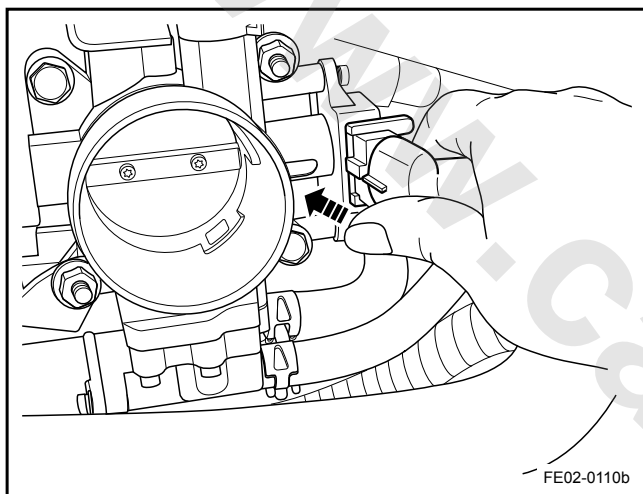
4. Install the throttle preheated water inlet pipe.



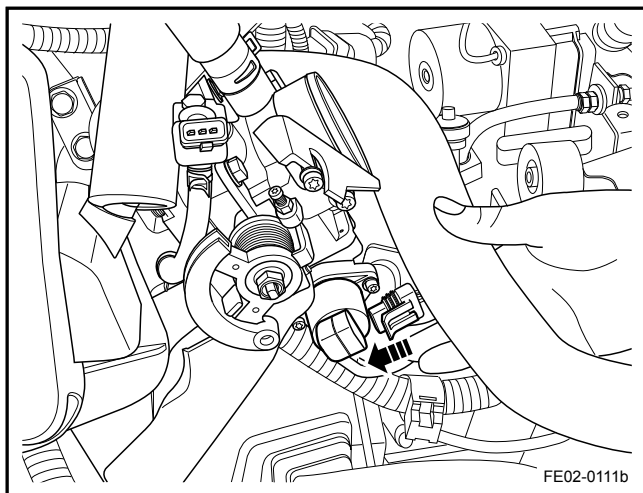
5. Install the throttle preheated water outlet pipe.



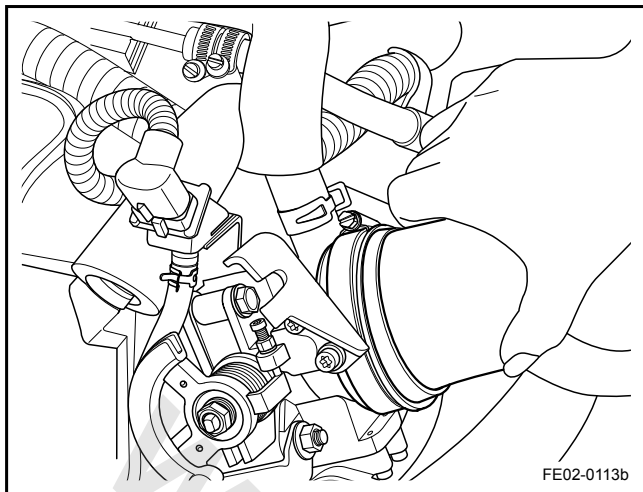
6. Install the crankcase ventilation hose.



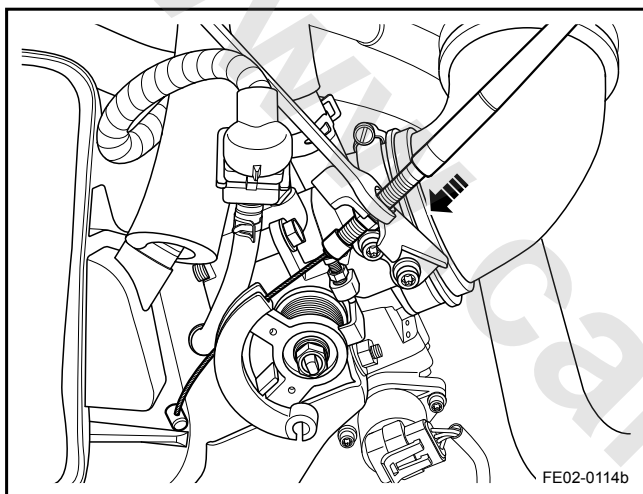
7. Connect the throttle position sensor wiring harness connector.



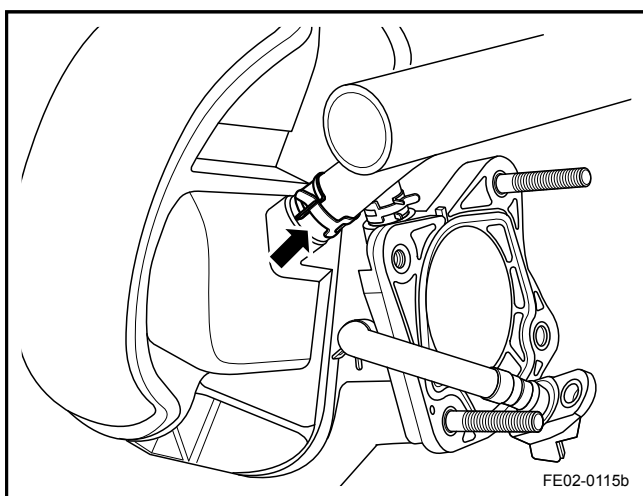
8. Connect the idle speed control valve wiring harness connector.



9. Install and tighten the intake manifold clamp.



10. Install the throttle pull cable.
11. Connect the battery negative cable.

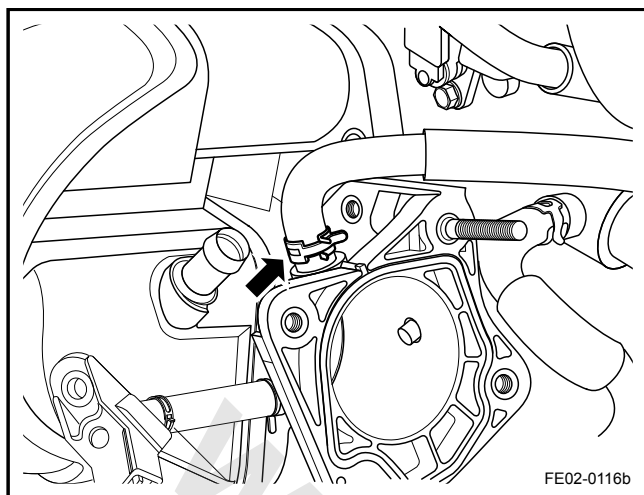


#### 2.6.8.6 Intake Manifold Assembly Replacement

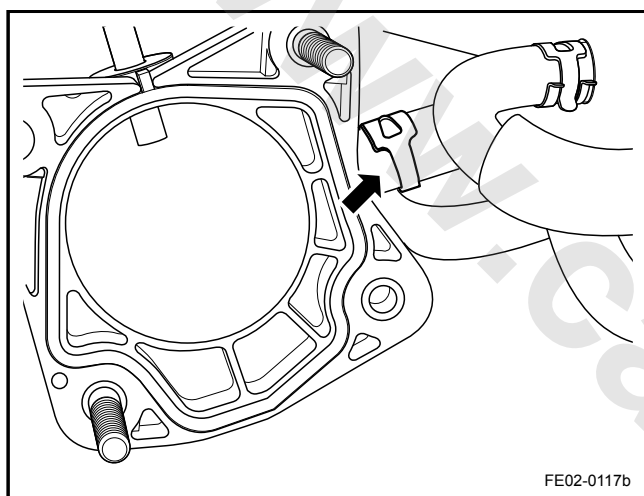
##### Removal Procedure:

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the hood. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
3. Remove throttle body. Refer to [2.6.8.5 Throttle Body Assembly Replacement](#).
4. Remove the crankcase ventilation vacuum tube.

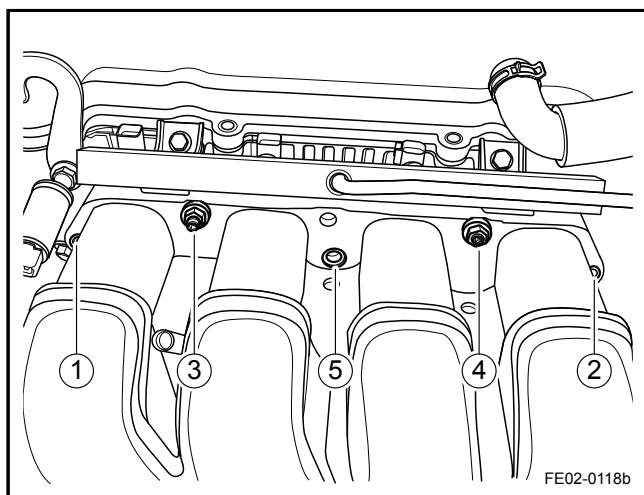




5. Remove the canister solenoid valve vacuum tube.



6. Remove the vacuum booster vacuum tubes.

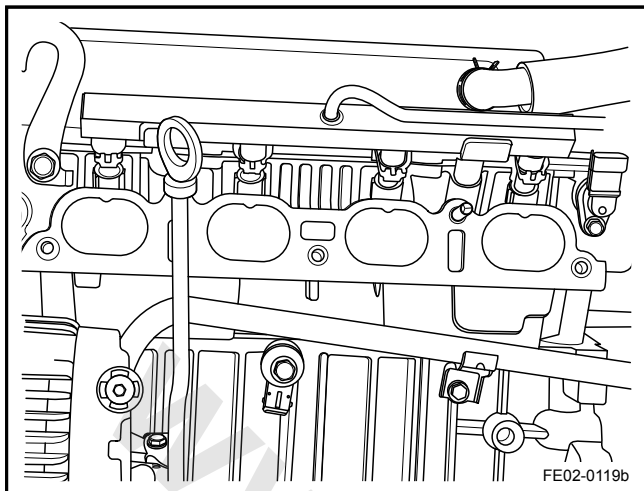


7. Remove the intake manifold retaining bolts and nuts in the sequence shown in the graphic.

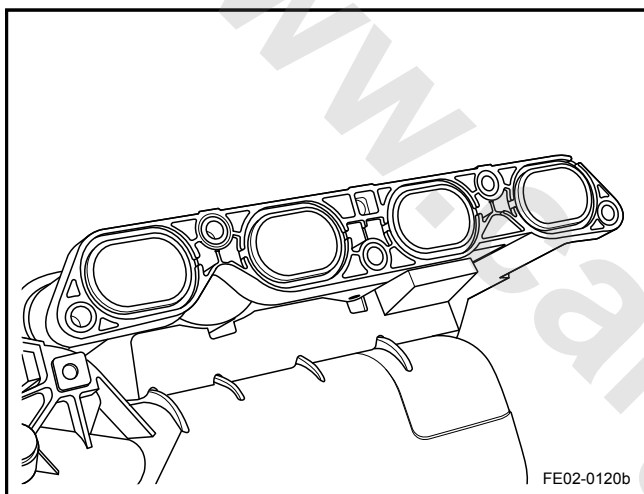


## Installation Procedure:

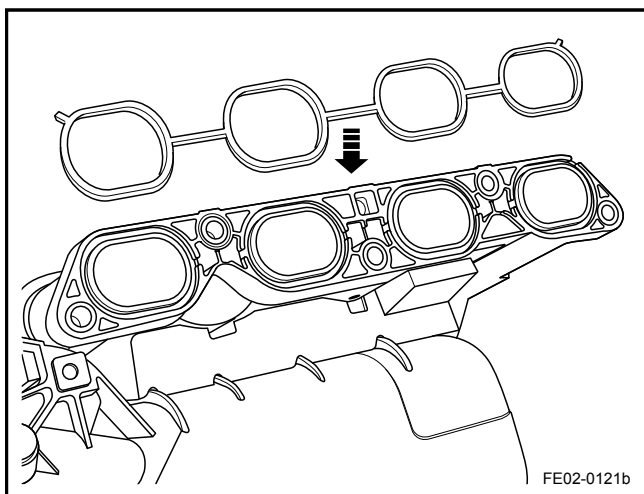
1. Clean the cylinder head intake manifold installation surface.

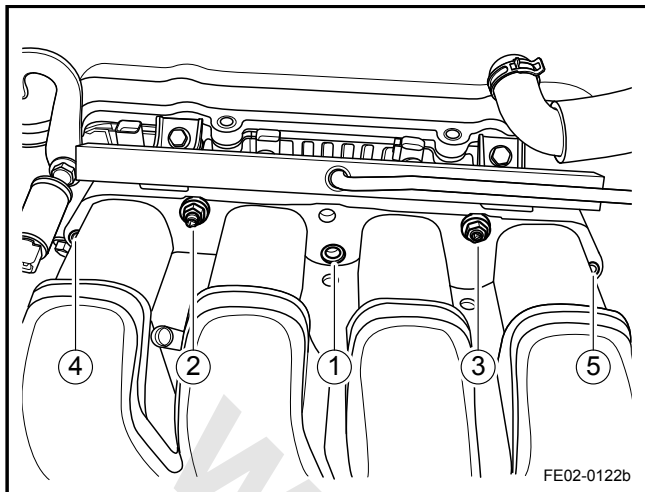


2. Clean the intake manifold installation surface.



3. Install the intake manifold seals.



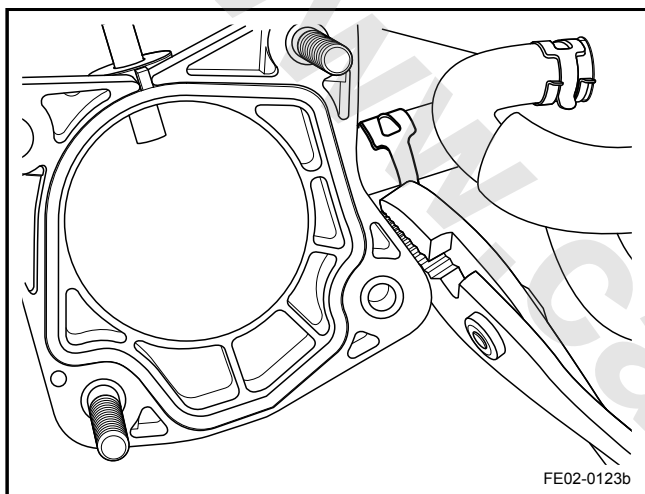


4. Tighten the intake manifold retaining bolts and nuts in the sequence shown in the graphic.

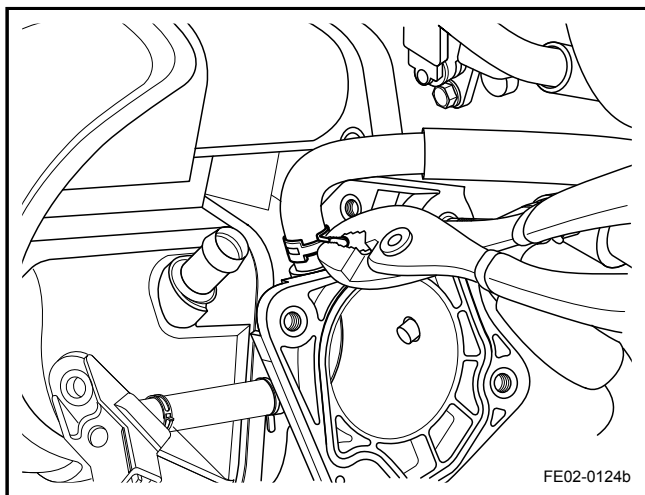
**Note**

The bolts and nuts can not tighten to the specified torque at once, otherwise it will result in the intake manifold leakage. They should be tightened at several stages to the specified torques.

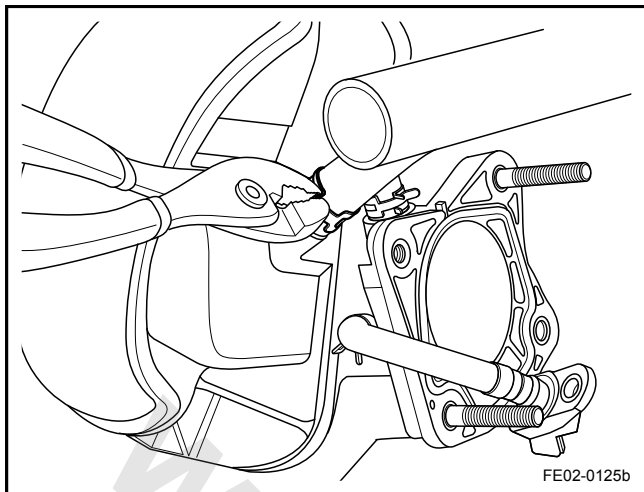
Torque: 30 Nm (Metric) 22.3 lb-ft (US English)



5. Install the vacuum booster vacuum tube.



6. Install the canister solenoid valve vacuum tube.



7. Install the crankcase ventilation tube.
8. Install the throttle body.
9. Install the engine hood.
10. Install the battery negative cable.

### 2.6.8.7 Engine Mount Replacement

Removal Procedure:

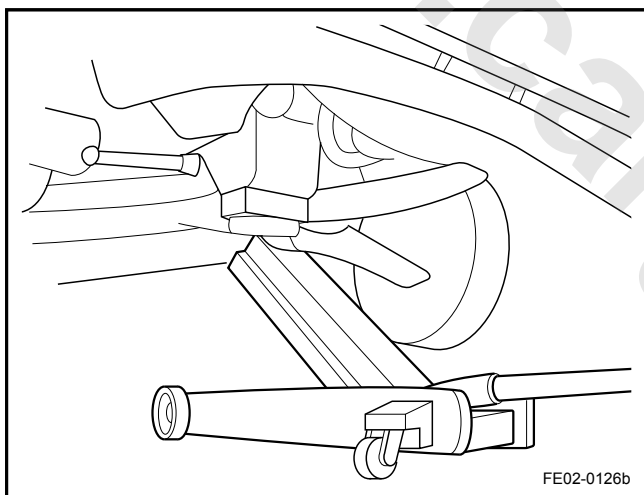
#### Warning!

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

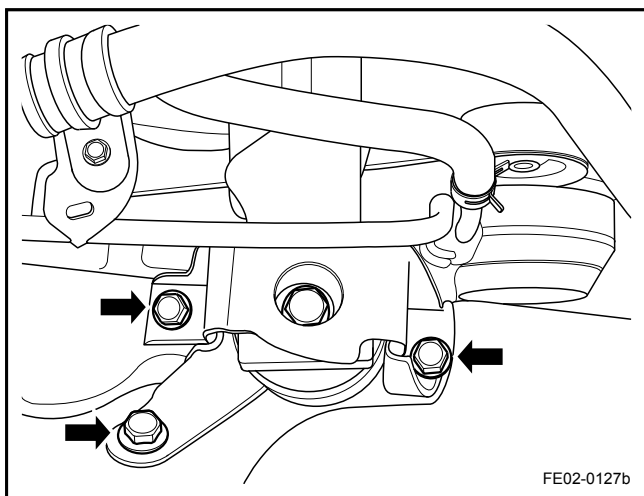
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the engine hood. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
3. Support the engine assembly with a jack.

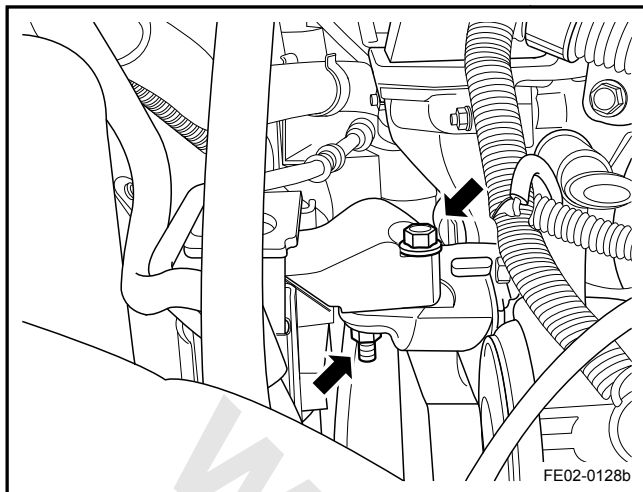
#### Note

Before jacking the engine, place a piece of wood between the jack and the engine oil pan, otherwise it will damage the engine oil pan.

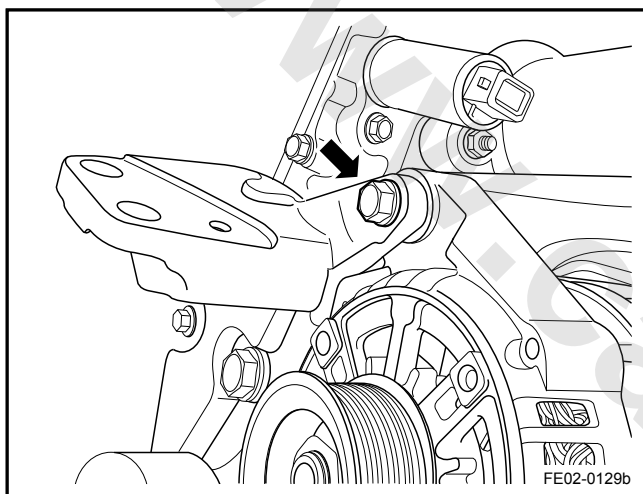


4. Remove the engine to body right mount bolts.

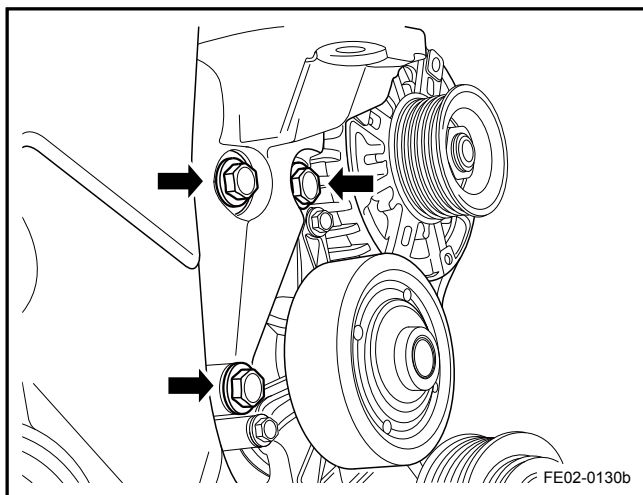




5. Remove the engine mount to engine right retaining bolts and nuts.



6. Remove the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#).
7. Remove the drive belt tensioner. Refer to [2.6.8.4 Drive Belt Tensioner Replacement](#).
8. Remove the generator bracket bolts.

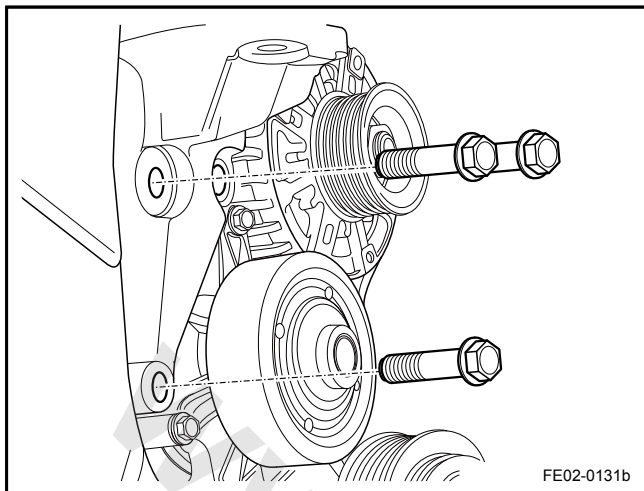


9. Remove the engine mount retaining bolts and remove the engine mount.

## Installation Procedure:

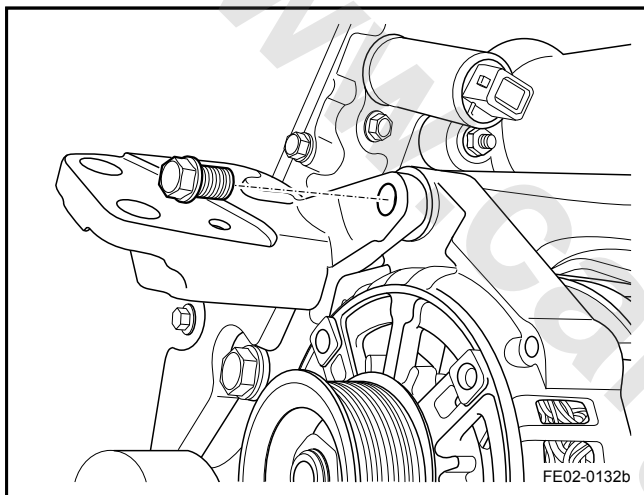
1. Install and tighten the engine mount retaining bolts to the specified torque.

Torque: 47 Nm (Metric) 34.8 lb-ft (US English)



2. Install the generator bracket bolts.

Torque: 47 Nm (Metric) 34.8 lb-ft (US English)



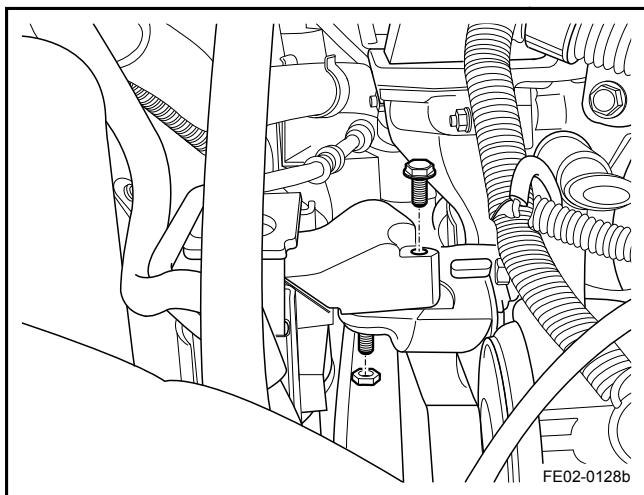
3. Install the drive belt tensioner.
4. Install the drive belt.
5. Install and tighten the right engine mount to the engine retaining bolts and nuts.

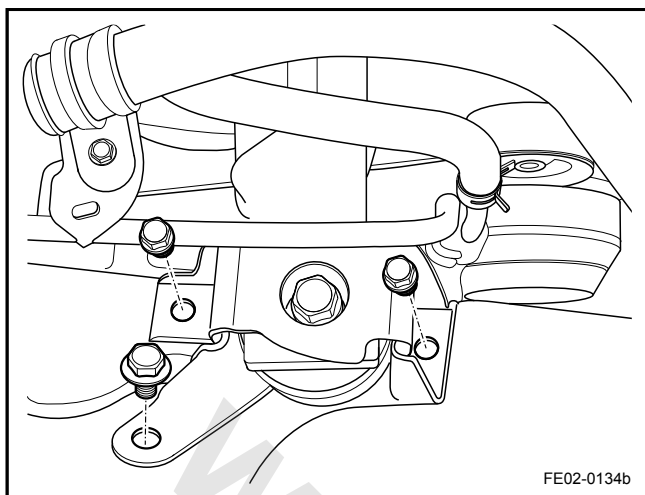
**Bolts**

Torque: 52 Nm (Metric) 38.5 lb-ft (US English)

**Nuts**

Torque: 52 Nm (Metric) 38.5 lb-ft (US English)





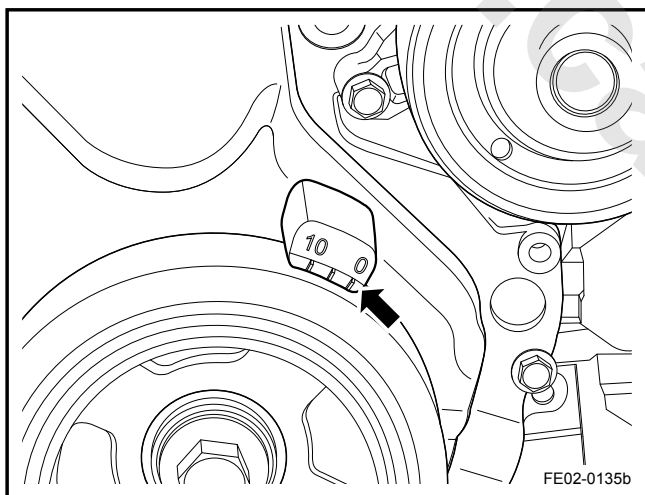
6. Install and tighten the right engine mount to the body bolts.  
Torque: 52 Nm (Metric) 38.5 lb-ft (US English)
7. Remove the supporting jack.
8. Install the engine hood.
9. Install the battery negative cable.

### 2.6.8.8 Timing Chain Tensioner Replacement

Removal Procedure:

**Warning!**

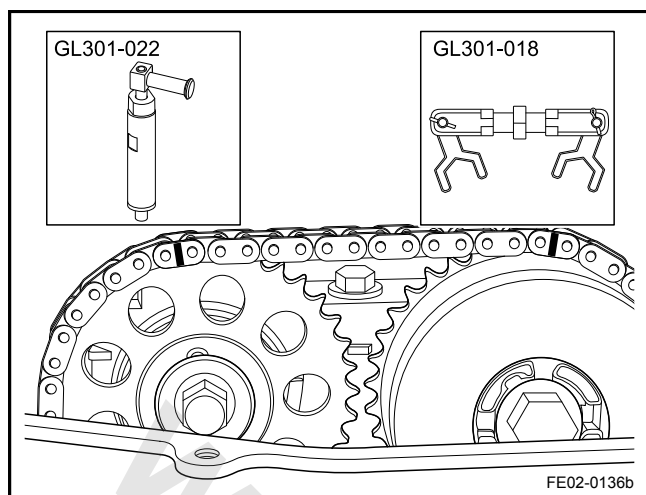
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



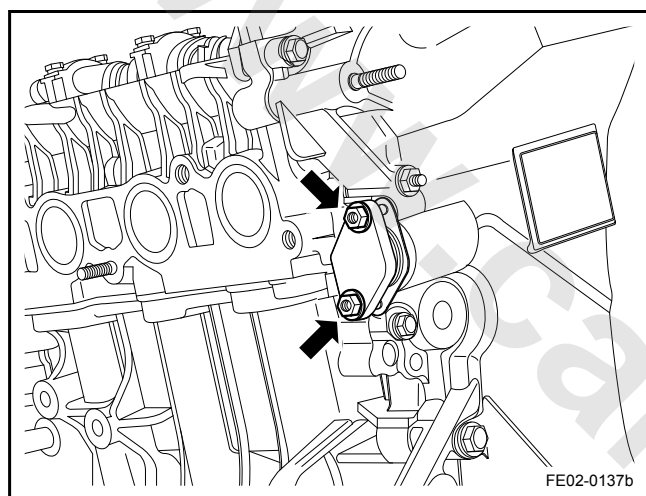
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the engine hood. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
3. Remove the ignition coil. Refer to [2.10.8.3 Ignition Coil Replacement](#).
4. Remove the cylinder head cover. Refer to [2.6.8.2 Cylinder Head Cover Replacement](#).
5. Rotate the crankshaft and make sure the cylinder No.1 is at TDC position.

**Note**

Crankshaft timing mark is aligned with the timing chain cast scale line "0".



6. As shown in the graphic, mark on the intake and exhaust sprocket timing with a marker and use a special tool GL301-022 to fix the timing chain and special tool GL301-018 to fix the camshaft.



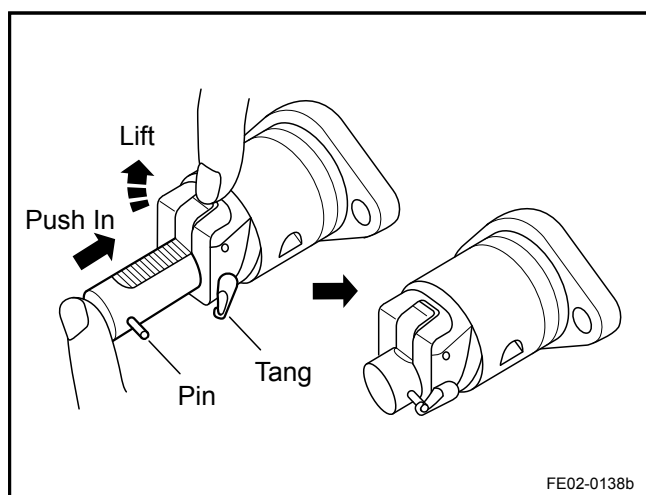
7. Remove Timing Chain Tensioner Assembly.

#### Note

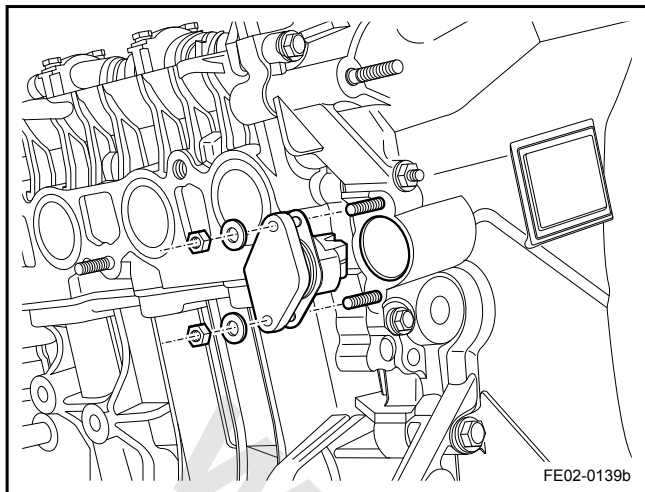
At this time do not rotate the crankshaft in order to prevent the timing chain teeth rolling.

#### Installation Procedure:

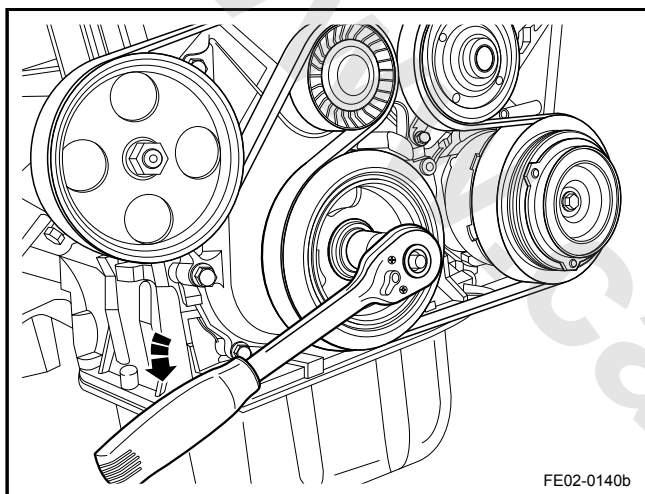
1. Press the timing chain tensioner device as shown to enter the self-locking state.







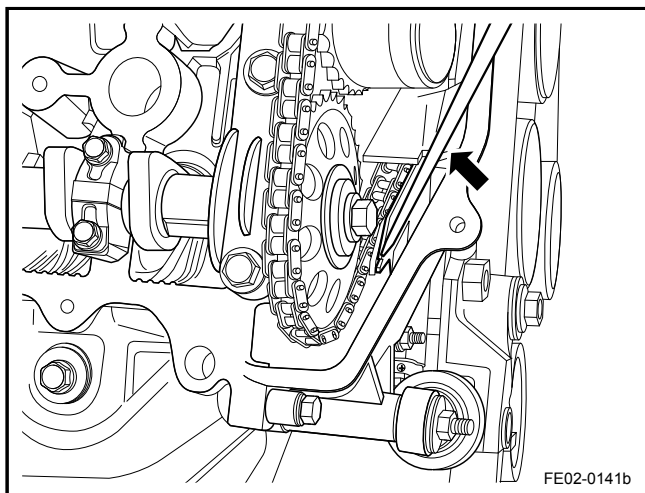
2. Install the timing chain tensioner and tighten the nuts.  
Torque: 29 Nm (Metric) 21.5 lb-ft (US English)



3. Rotate the crankshaft pulley counter clockwise to unlock the self-locking device and pop up the handle.

**Note**

Rotating process should be even, otherwise it may cause the timing chain teeth skidding.



4. Confirm the tensioner unlocked and the tensioner guide is firmly pressed by the handle.

**Note**

If not properly unlocked, use a screwdriver to push tensioner in the opposite direction to unlock the guide.

5. Install the valve chamber cover.
6. Install the ignition coil.
7. Install the engine hood.
8. Connect the battery negative cable.

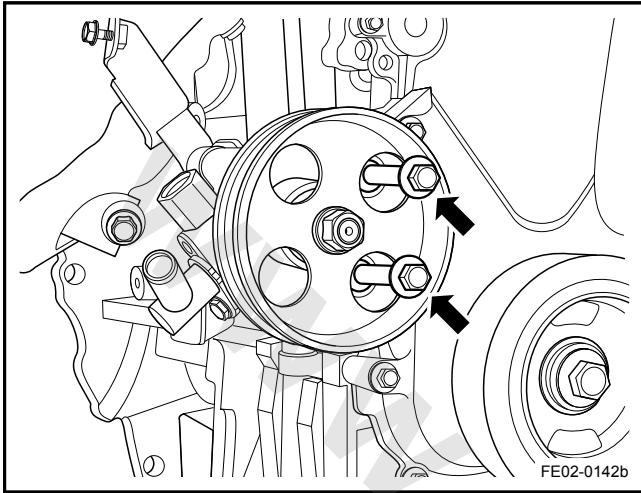


### 2.6.8.9 Timing Chain Cover Replacement

Removal Procedure:

**Warning!**

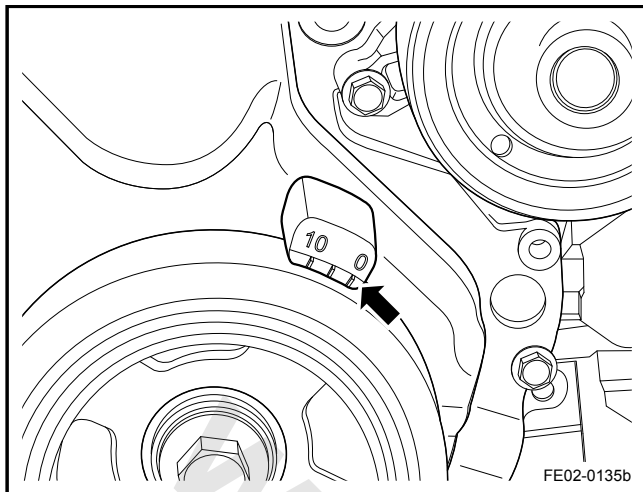
Refer to "Battery Disconnection Warning" and "Cooling System Service Warning" in "Warnings and Notices".



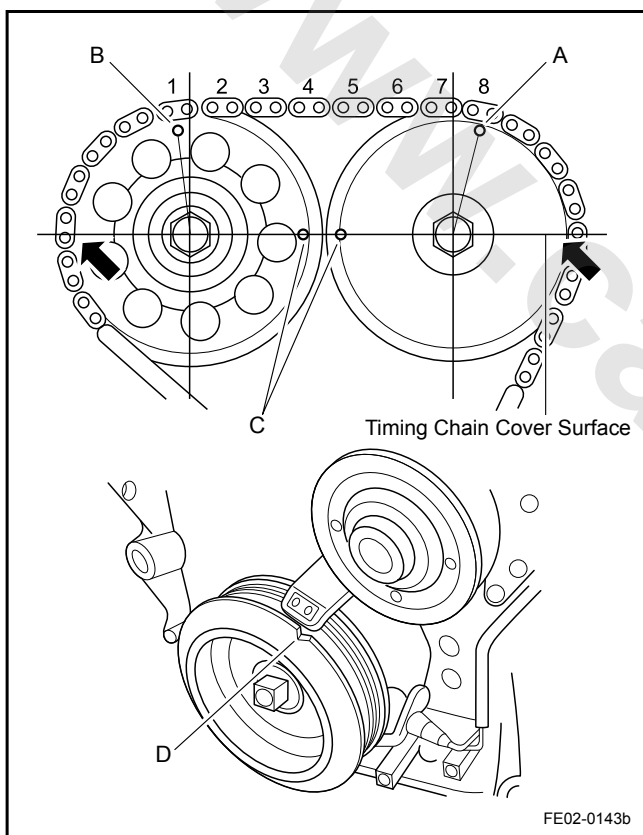
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Discharge the engine coolant. Refer to [2.8.8.1 Engine Coolant Discharge and Filling](#).
3. Remove the engine plastic shield. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
4. Remove the ignition coil. Refer to [2.10.8.3 Ignition Coil Replacement](#).
5. Remove the cylinder head cover. Refer to [2.6.8.2 Cylinder Head Cover Replacement](#).
6. Remove the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#).
7. Remove the drive belt tensioner. Refer to [2.6.8.4 Drive Belt Tensioner Replacement](#).
8. Remove the generator. Refer to [2.11.8.3 Generator Replacement](#).
9. Remove the water pump. Refer to [2.8.8.6 Water Pump Replacement](#).
10. Remove the engine mounting. Refer to [2.6.8.7 Engine Mount Replacement](#).
11. Remove power steering pump bolts.

**Note**

In the confined operating space, lower the jack to facilitate the operation.



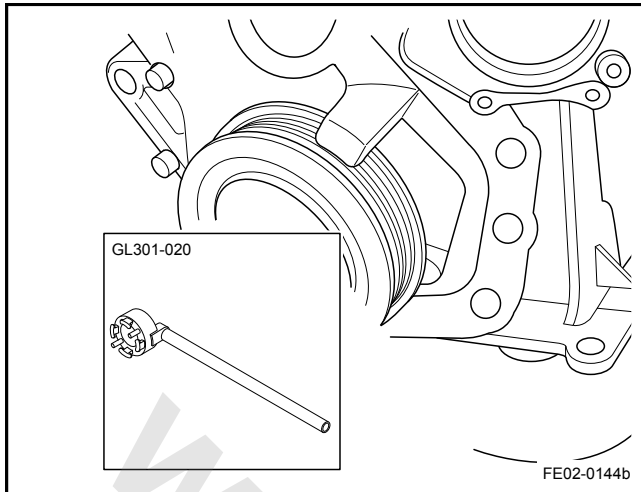
12. Rotate the crankshaft, so that the crankshaft pulley timing mark is aligned with calibration line No.0, as shown.



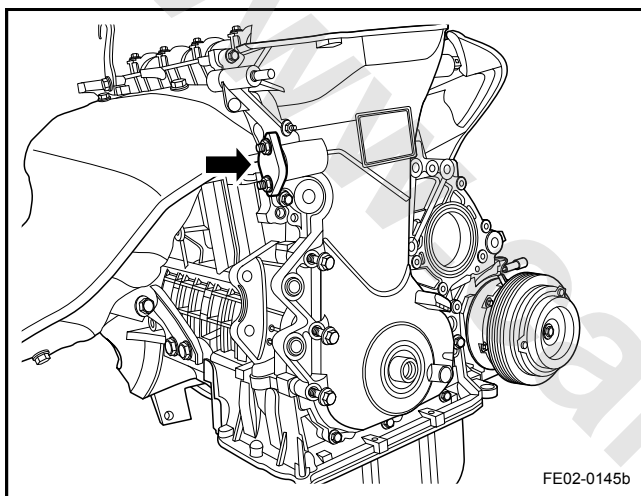
13. Make sure intake and exhaust VVT sprocket sprocket timing mark location is as shown in order to ensure that the cylinder No.1 is at TDC position. If the location is not correct, repeat steps 12 until the intake and exhaust sprocket timing mark is at the correct position and mark on the sprocket with a marker.

#### Note

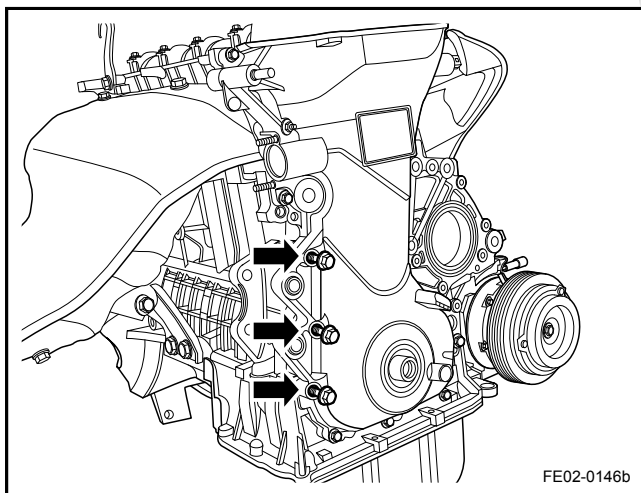
Exhaust sprocket has three marked positions, with two-point upward. VVT sprocket has three marked positions. Grooves on the aluminum alloy body are upward, in the alignment process, the yellow section of the chain may not be aligned with the mark-point. During the removal procedure, make sure two sprocket timing marks at the top location, single-point mark on the sprocket at the level of linear position.



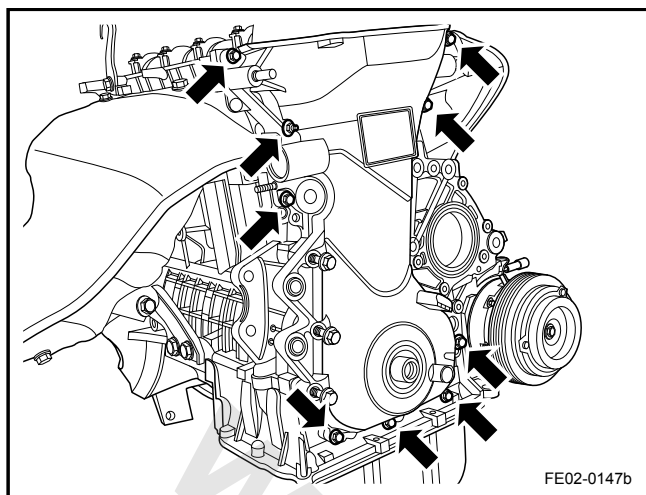
14. Use special tool GL301-020 to remove the crankshaft pulley.



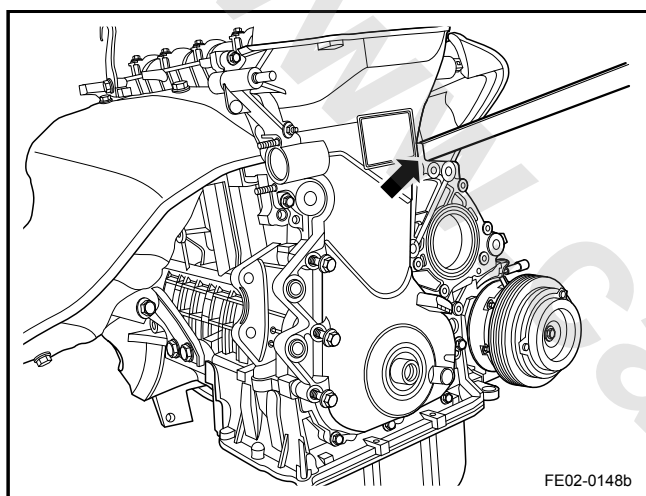
15. Remove the timing chain tensioner.



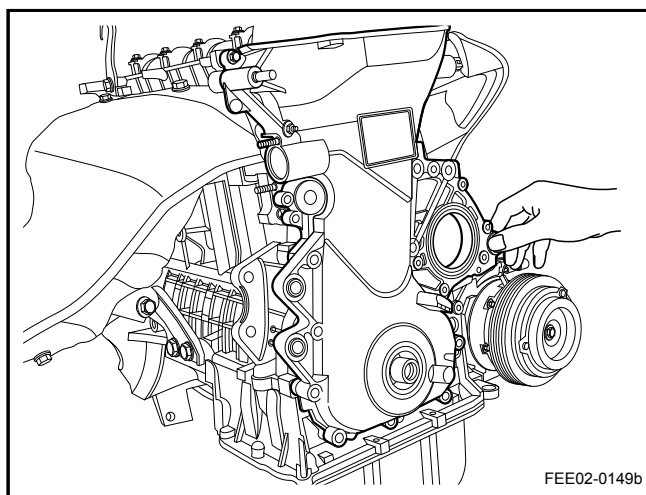
16. Remove the timing chain cover M8 tightening bolts.



17. Remove the timing chain cover M6 tightening bolts and nuts.



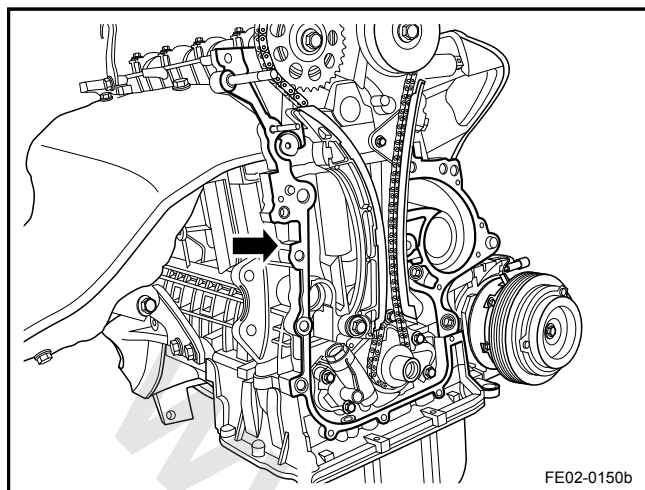
18. Pry groove position with a bar to loosen the timing chain cover.



19. Remove the timing chain cover.

## Installation Procedure:

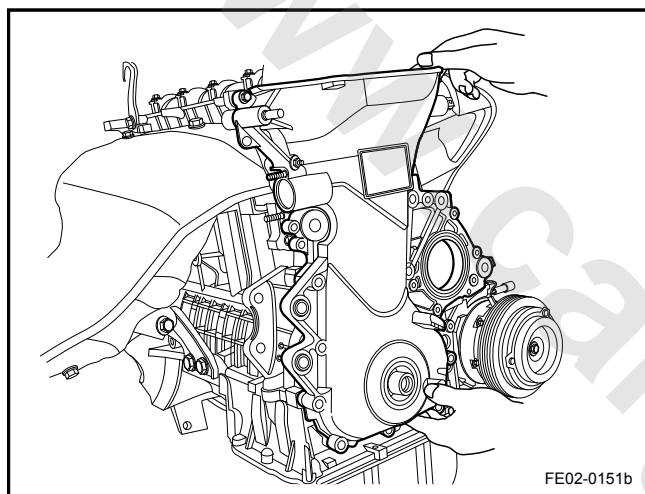
1. Clean the residual sealant on the timing chain cover and cylinder.



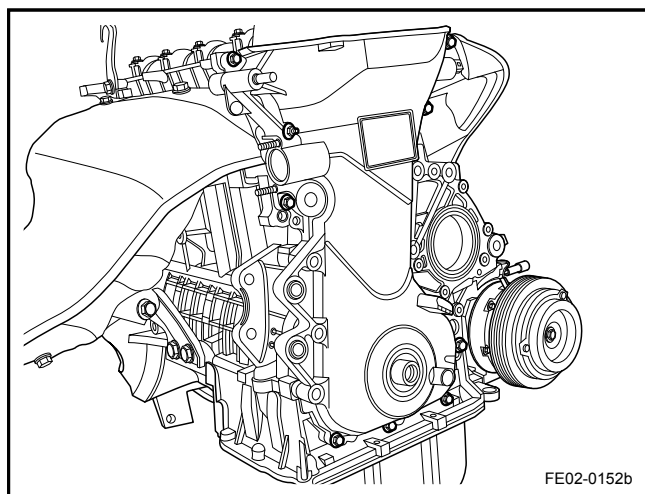
2. Apply special sealant on the timing chain cover and cylinder block mounting surface evenly and install the timing chain cover.

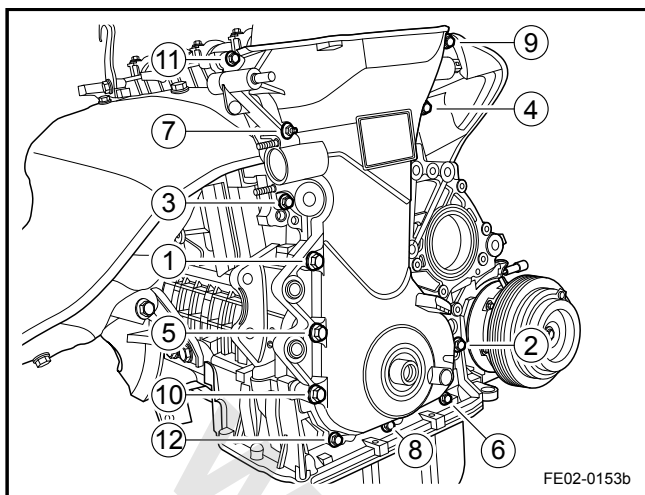
**Note**

Before installing the timing chain cover, pay attention to check the timing chain marks made above are consistent. If there is bias, please re-install the timing chain. Refer to [2.6.8.10 Timing Chain Replacement](#).



3. Install M6 timing chain cover tightening bolts and nuts, but do not tighten at this stage.





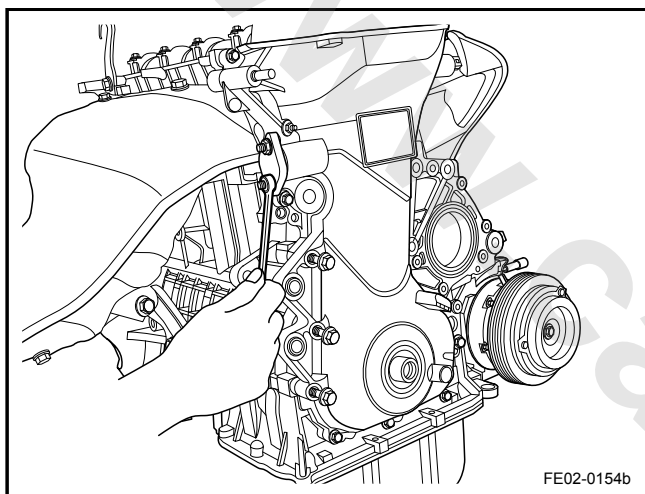
4. Install M8 timing chain cover tightening bolts and tighten timing chain cover tightening bolts and nuts, total of 12, according to the sequence shown in the graphic.

M6 Bolts and Nuts:

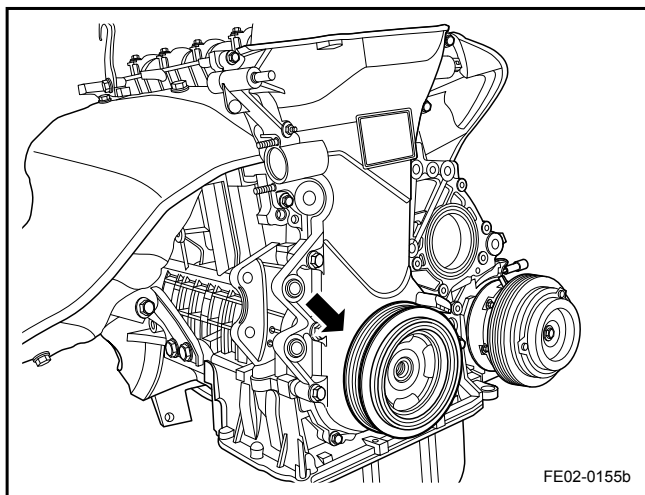
Torque: 12 Nm (Metric) 8.2 lb-ft (US English)

M8 Bolt:

Torque: 18 Nm (Metric) 13.4 lb-ft (US English)

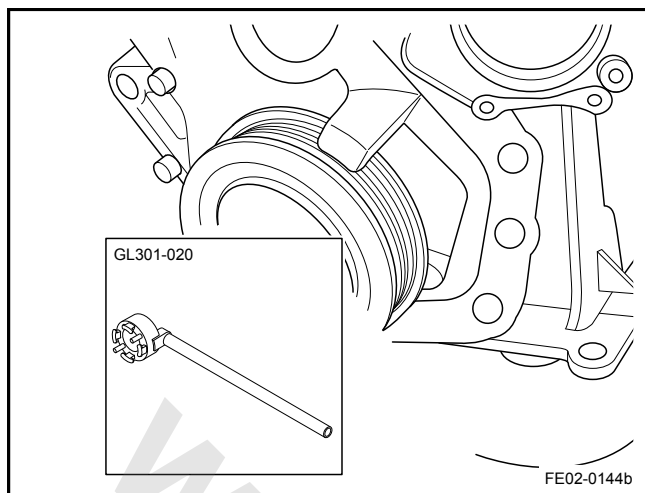


5. Install the timing chain tensioner. Refer to [2.6.8.8 Timing Chain Tensioner Replacement](#).

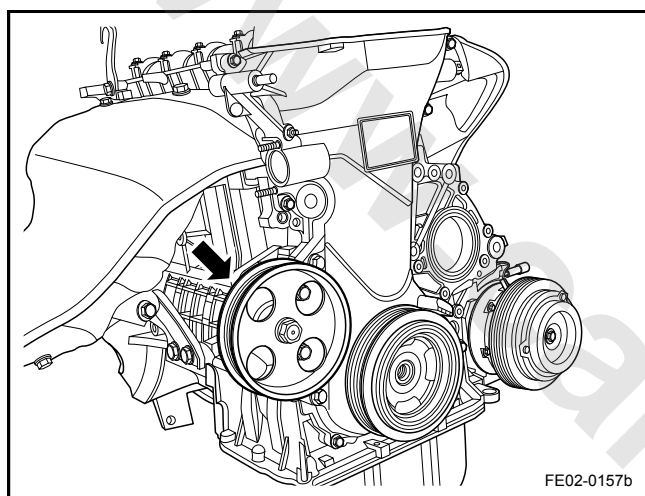


6. Install the crankshaft belt sprocket.





7. Use a special tool GL301-020 to install the crankshaft bolt.  
Torque: 138 Nm (Metric) 102.2 lb-ft (US English)

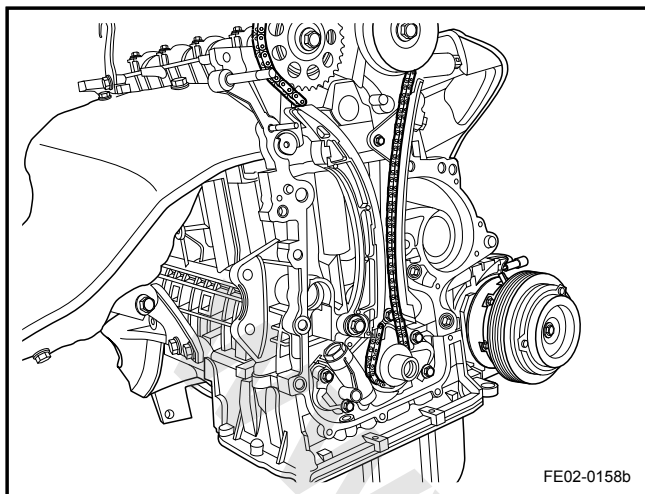


8. Install power steering pump.
9. Install the engine mounting.
10. Install the water pump.
11. Install the generator.
12. Install the drive belt tensioner.
13. Install the drive belt.
14. Install the cylinder head cover.
15. Install the ignition coil.
16. Install the engine plastic shield.
17. Fill the engine coolant.
18. Connect the battery negative cable.

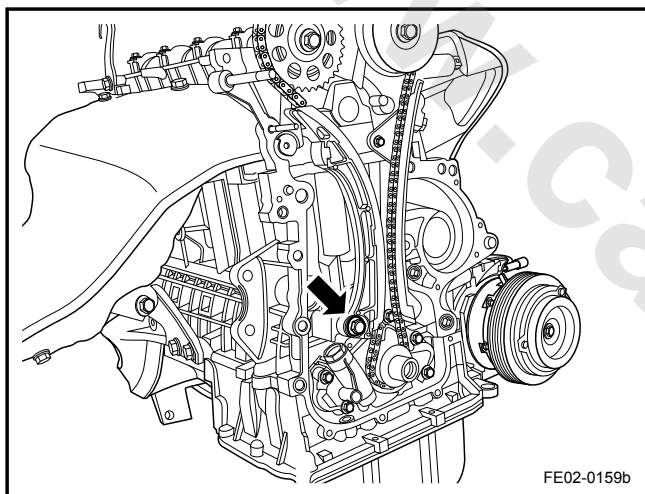
### 2.6.8.10 Timing Chain Replacement

#### Removal Procedure:

1. Rotate the crankshaft so that the cylinder No.1 is at TDC position. Remove the timing chain cover. Refer to the [2.6.8.9 Timing Chain Cover Replacement](#).



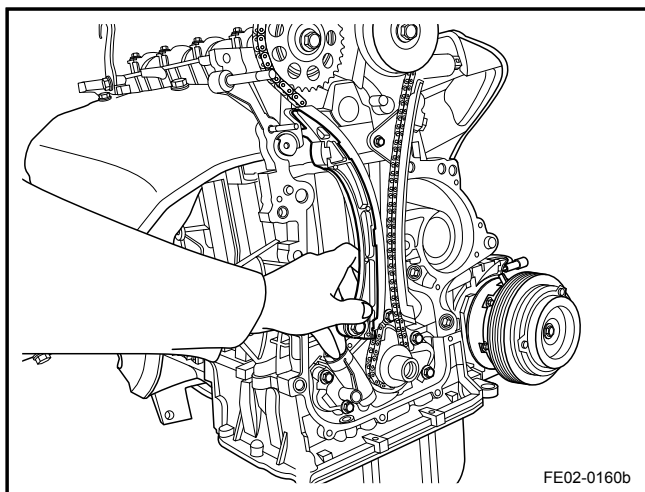
2. Remove the timing chain tensioner rail components retaining bolts.



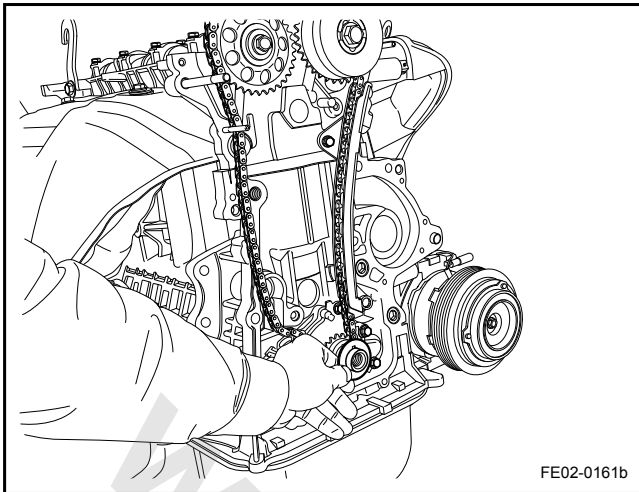
3. Remove the timing chain tensioner rail component.

#### Note

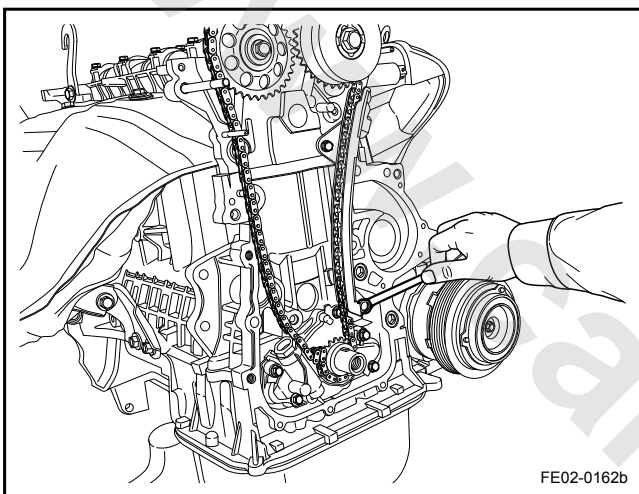
Do not drop the tensioner device shoe during removal, otherwise it is likely to cause damage to the tensioner hoof block.



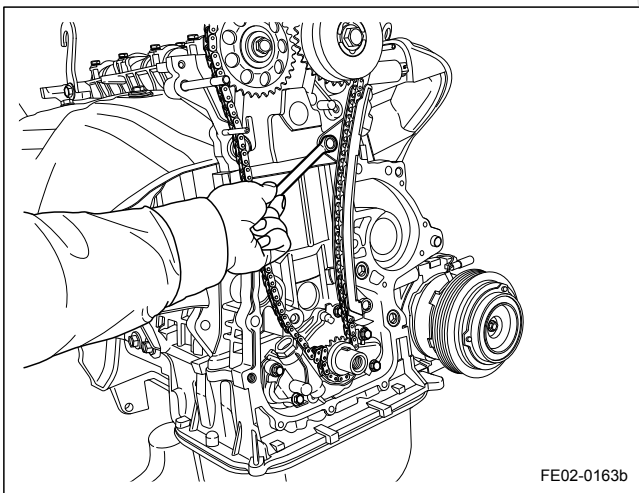




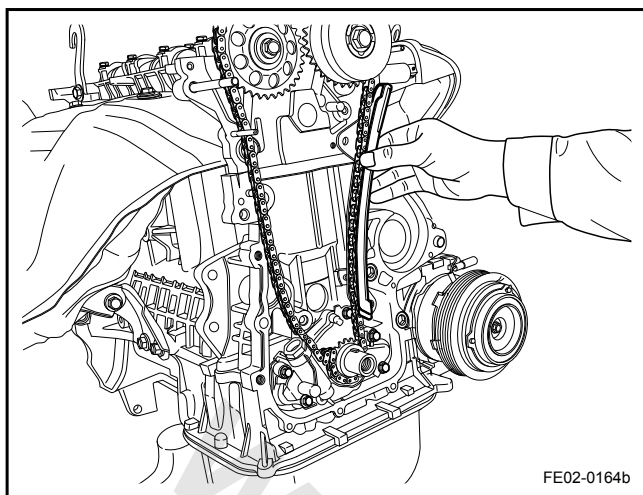
4. Remove the crankshaft sprocket Collar.



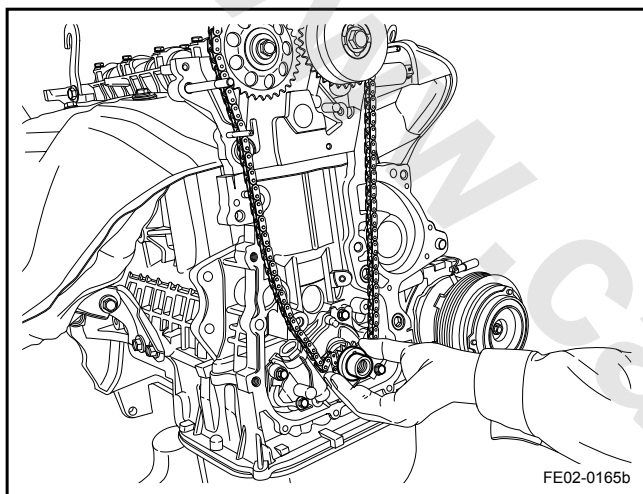
5. Remove the timing chain guide rail lower retaining bolts.



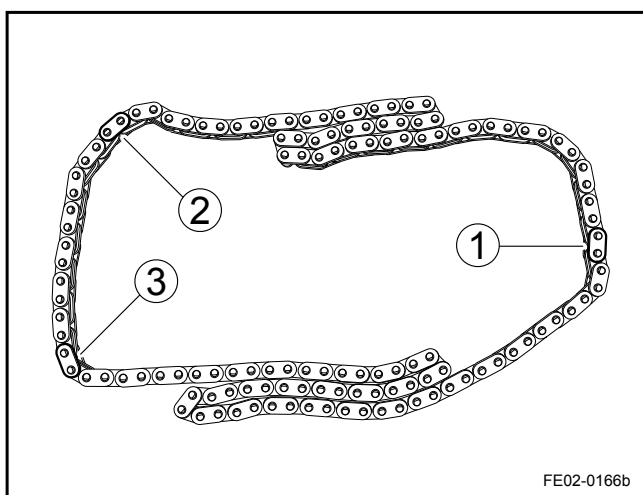
6. Remove the timing chain guide rail upper retaining bolt.



7. Remove the timing chain guide rail.

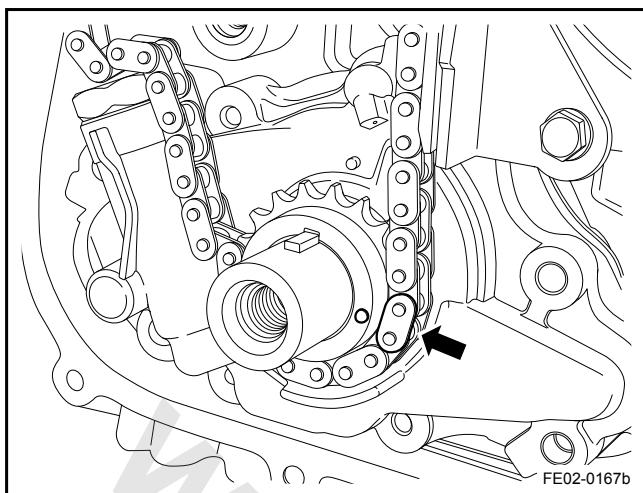


8. Remove the timing chain and crankshaft sprocket.



#### Installation Procedure:

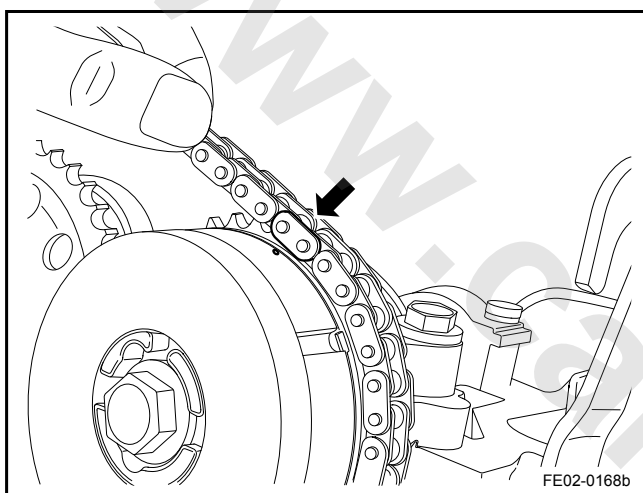
1. Confirm the timing chain three yellow sections.



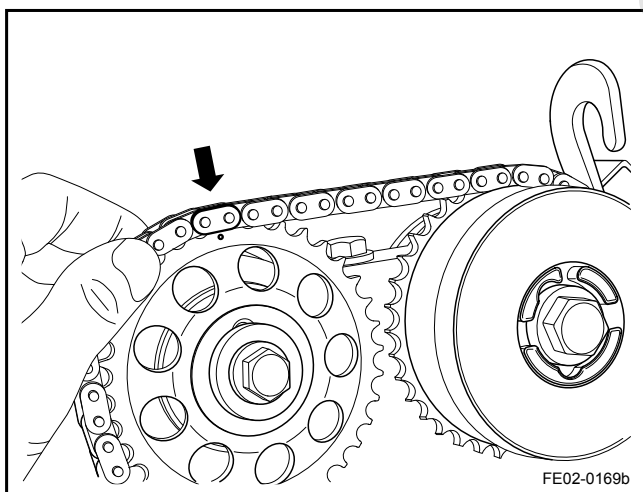
2. Install timing chain and crankshaft sprocket and align the first yellow chain section with the crankshaft sprocket timing mark.

#### Note

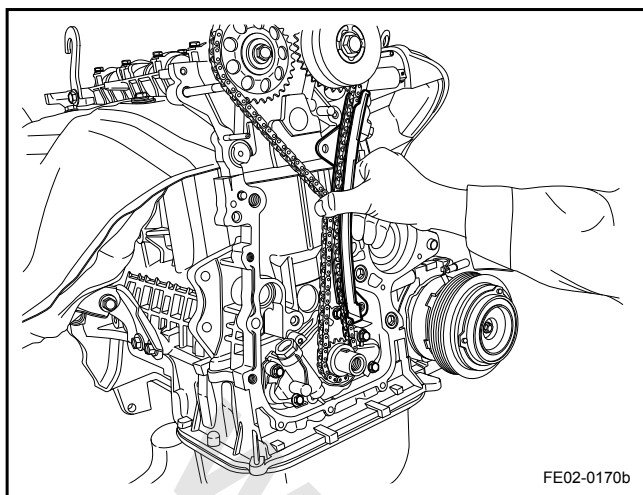
There are total three yellow sections on the timing chain, including two yellow chain section (a difference of 6 links between the sections) and aligned with the intake and exhaust camshaft sprocket timing marks.



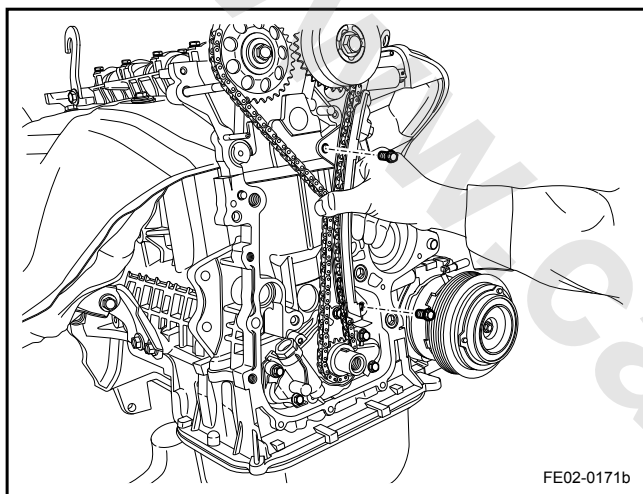
3. Align the second yellow chain section with the intake cam VVT actuator sprocket timing mark.



4. Align the third yellow chain section with the exhaust sprocket timing mark.

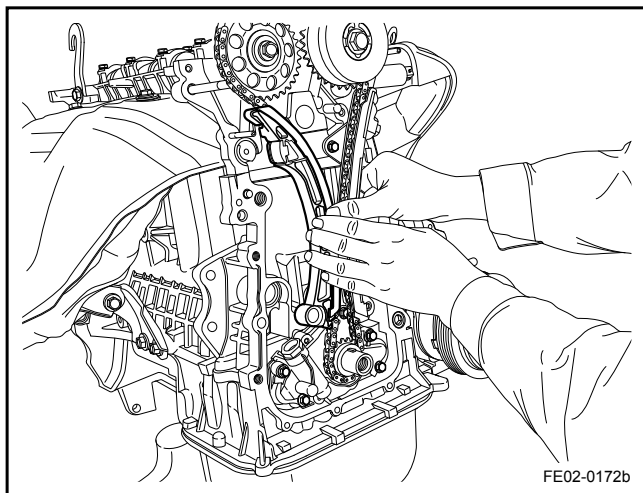


5. Install the timing chain guide rail components.

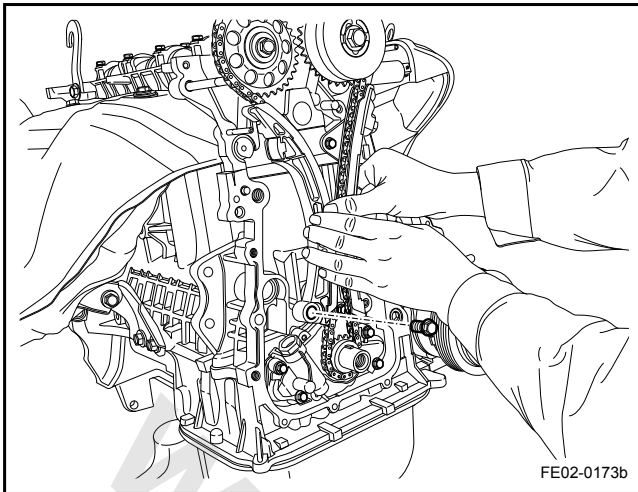


6. Install the timing chain guide rail components retaining bolts.

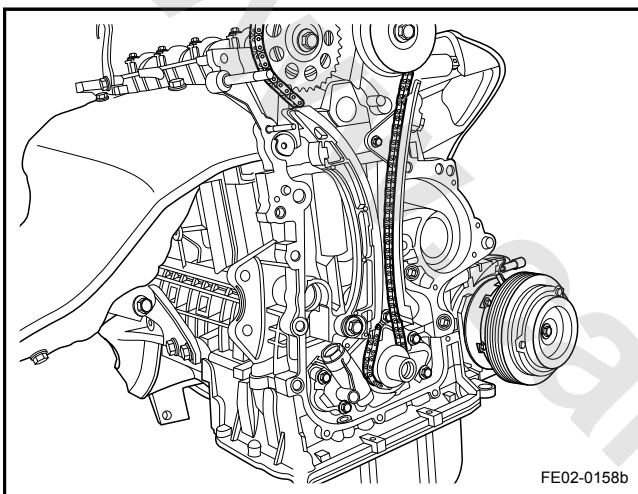
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)



7. Install the tensioner rail components.



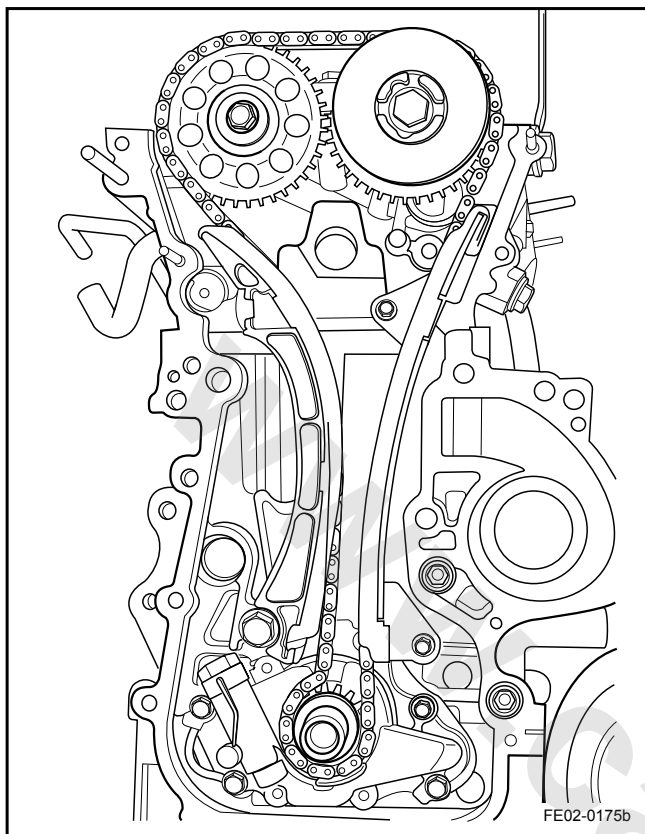
8. Install the tensioner rail components retaining bolts.  
Torque: 19 Nm (Metric) 14 lb-ft (US English)



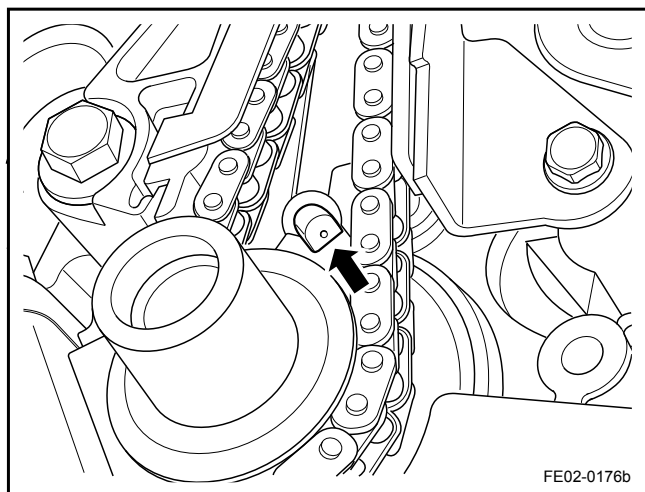
9. Install the crankshaft sprocket.
10. Install the timing chain cover and accessories.



### 2.6.8.11 Timing Chain Inspection



1. Remove the timing chain cover. Refer to [2.6.8.9 Timing Chain Cover Replacement](#).
2. Remove the timing chain. Refer to [2.6.8.10 Timing Chain Replacement](#).
3. Inspect timing chain guide rail component for cracking, wear and tear.
4. If the timing chain guide rail components surface wear is deeper than 1 mm (0.04 in) then replace the timing chain guide rail components.
5. Inspect timing chain tensioner rail component for wear and tear.
6. If the timing chain guide rail components surface wear is deeper than 1 mm (0.04 in) then replace the timing chain guide rail components.
7. Inspect timing chain and sprocket for VVT actuator wear.
8. Inspect the exhaust camshaft sprocket teeth and the VVT actuator sprocket teeth and chain for excessive wear, damage or stuck.
9. Inspect the crankshaft timing sprocket teeth and chain for excessive wear, damage, or stuck.
10. Inspect timing chain tensioner for damaged and gasket intact. If damaged, replace the timing chain tensioner and the gasket.
11. Inspect timing chain lubrication nozzles. If necessary, remove the oil pump assembly. Check the oil channel. Refer to [2.9.8.1 Oil Pump Replacement](#).



### 2.6.8.12 Camshaft Replacement

#### Removal Procedure:

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the engine plastic shield. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
3. Remove the cylinder head cover. Refer to [2.6.8.2 Cylinder Head Cover Replacement](#).
4. Remove the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#).
5. Remove the timing chain cover. Refer to [2.6.8.9 Timing Chain Cover Replacement](#).
6. Remove the timing chain. Refer to [2.6.8.10 Timing Chain Replacement](#).
7. Remove the intake camshaft VVT actuator.

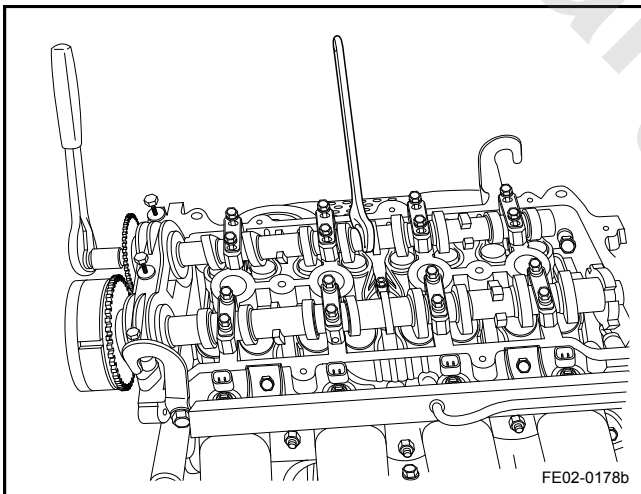
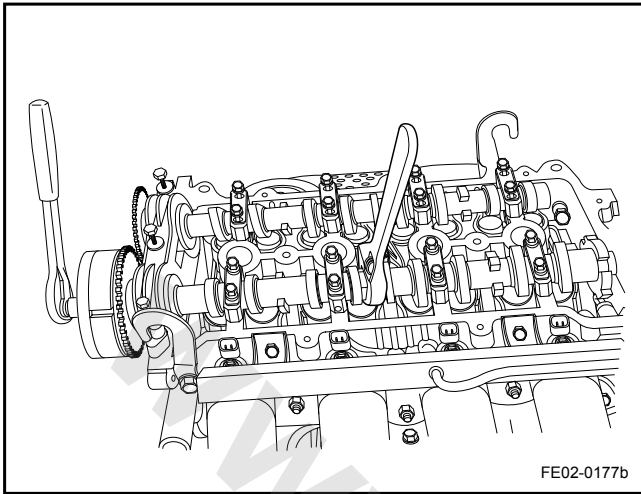
#### Note

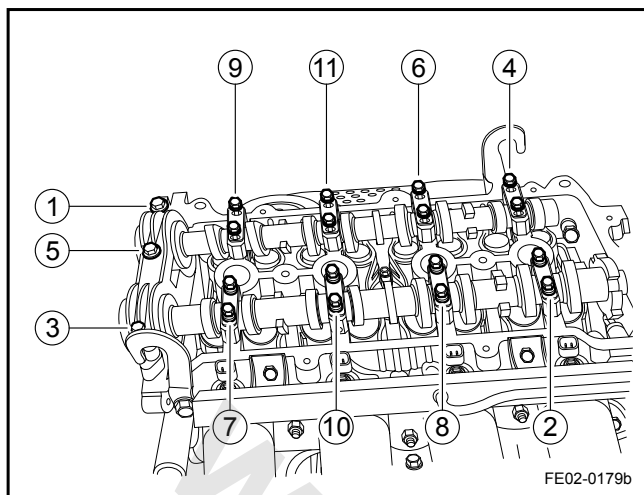
Remove the camshaft VVT actuator tightening bolt with a wrench holding the camshaft.

8. Remove the exhaust camshaft sprocket.

#### Note

Remove the camshaft sprocket tightening bolts with a wrench holding the camshaft.

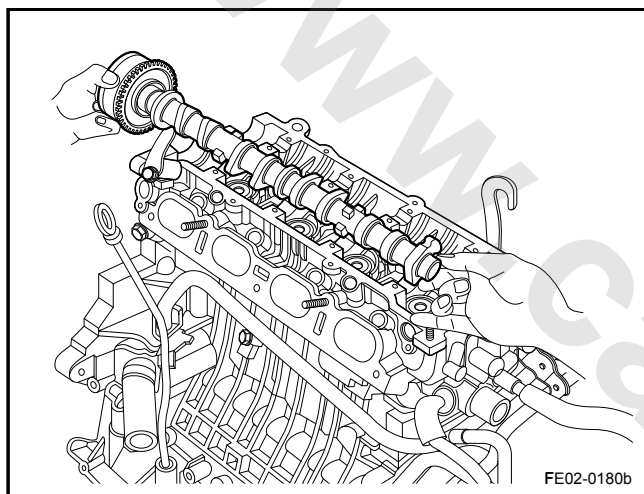




9. As shown in the graphic, gradually release the camshaft bearing cap bolts, rotate half a circle to a whole circle each time.

#### Note

Be careful when remove the camshaft. Avoid abrasions, scratches or damage to the camshaft surface or bearing surface.



10. Remove the camshaft.

#### Note

Camshaft must be withdraw from the bearing in order to avoid abrasions, scratches or damage to the camshaft surface or bearing surface.

11. Inspect for the camshaft and bearing wear. If necessary, replace.

#### Installation Procedure:

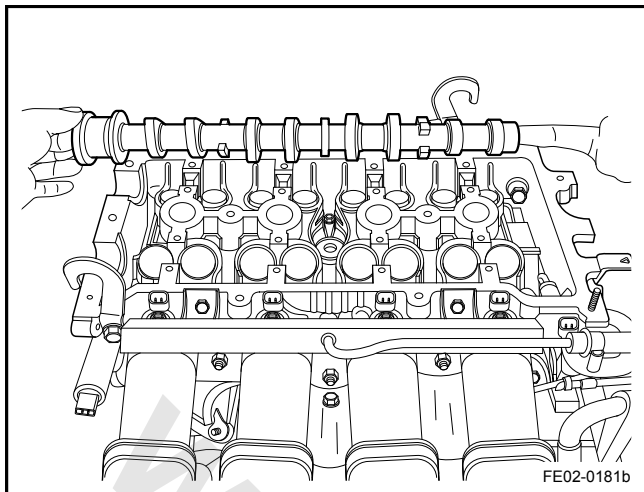
#### Note

Be careful when install the camshaft. Avoid abrasions, scratches or damage to the camshaft surface or bearing surface.

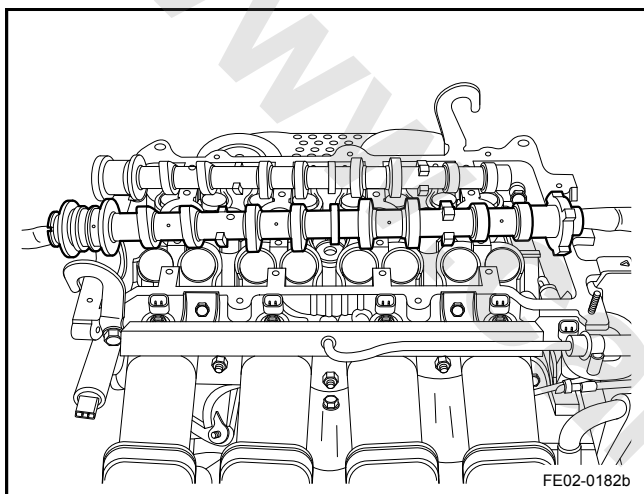
#### Note

Before installation apply engine oil to the camshaft and the seal contacting surface.

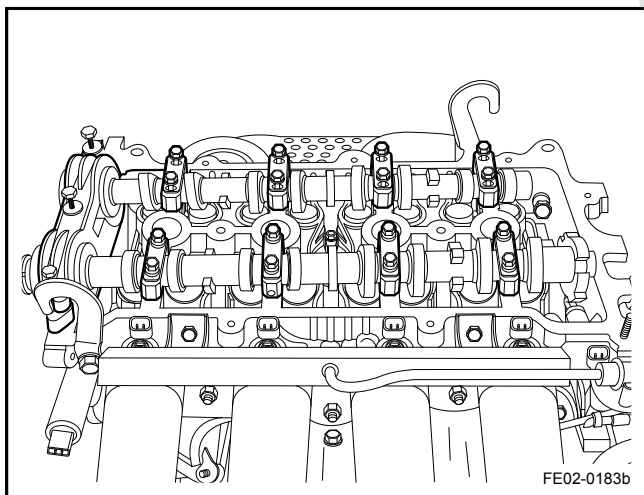




1. Apply a small amount of engine oil to lubricate the journal and camshaft cap.
2. Install the exhaust camshaft.



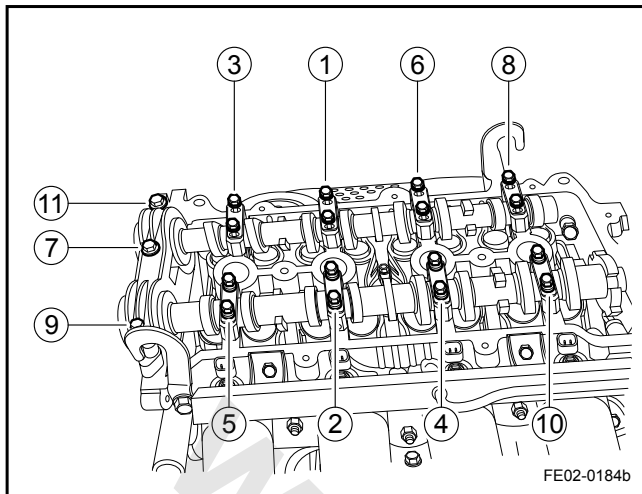
3. Install the intake camshaft.



4. Install the intake and exhaust camshaft cover.

#### Note

There are letters on the camshaft cover. Avoid installation errors. For example, "I ↑ 2" indicates that the camshaft cover is the No.2 intake camshaft cover. The arrow is toward the direction of timing chain. "E ↑ 2 indicates the No.2 exhaust camshaft cover. The arrow is toward the direction of timing chain.



5. Gradually tighten the camshaft cover bolts according to the sequence as shown in the graphic.

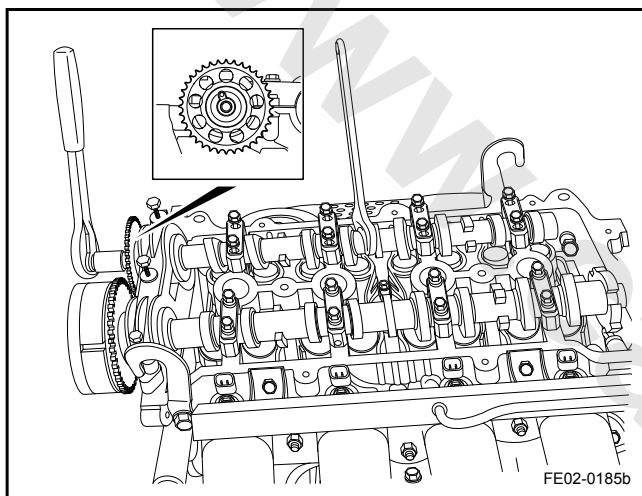
#### Note

Tighten the bolts during several stages. Do not tighten at once which may damage the camshaft and the camshaft cover.

Torque:

M6 Bolts 13 Nm (Metric) 10 lb-ft (US English)

M8 Bolts 23 Nm (Metric) 17 lb-ft (US English)

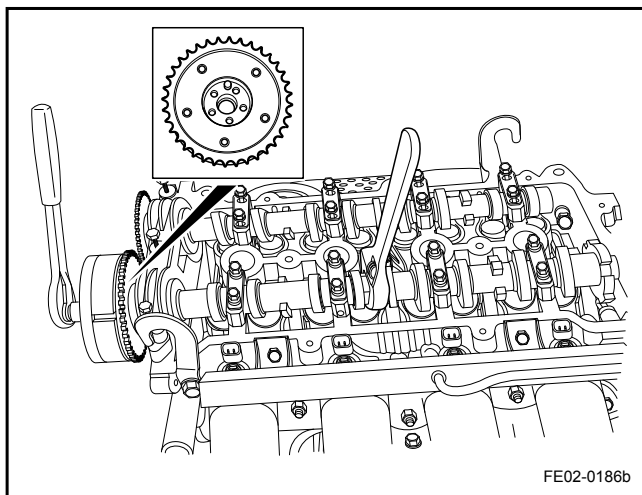


6. Install the exhaust camshaft sprocket.

#### Note

Check for the sprocket pin wear. IF there is wear, replace the sprocket pin. Hold the camshaft with a wrench and then tighten the VVT actuator bolts.

Torque: 55 Nm (Metric) 41 lb-ft (US English)



7. Install the intake camshaft VVT actuator.

#### Note

Check for the sprocket pin wear. Hold the camshaft with a wrench and then tighten the sprocket bolts.

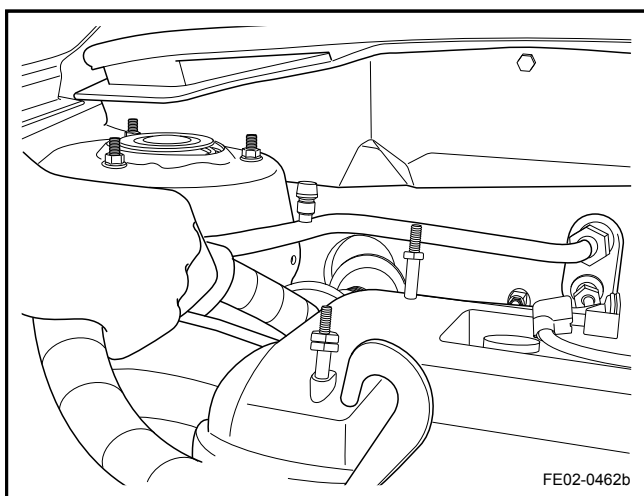
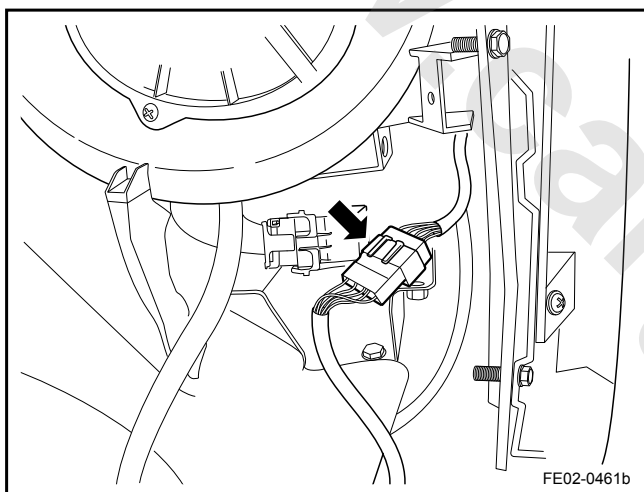
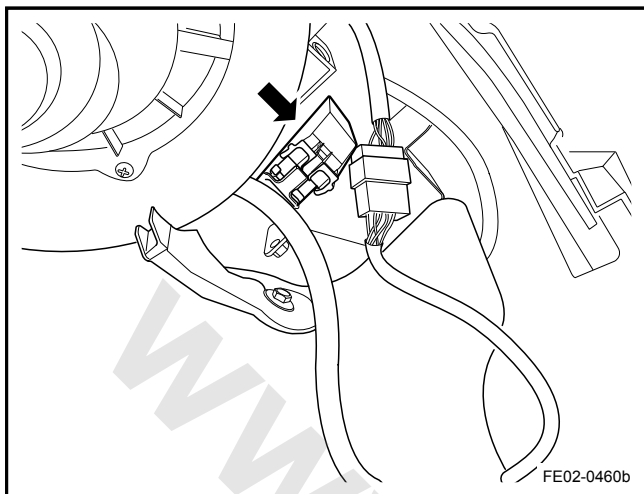
Torque: 70 Nm (Metric) 52 lb-ft (US English)

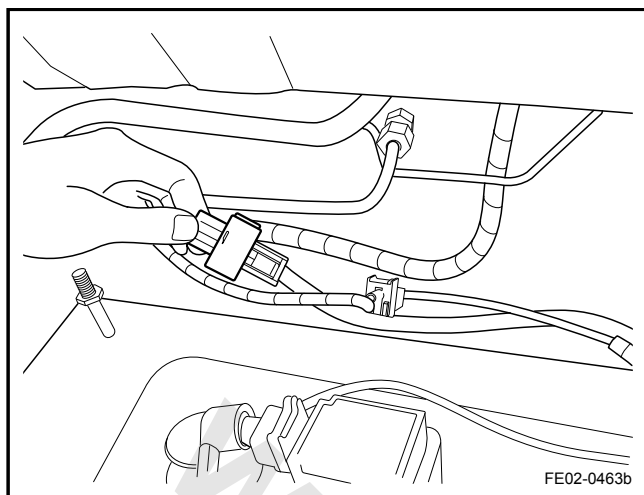
8. Install the timing chain.
9. Install the timing chain cover.
10. Install the drive belt
11. Install the cylinder head cover.
12. Install the engine plastic shield.
13. Connect the battery negative cable.

### 2.6.8.13 Engine Replacement

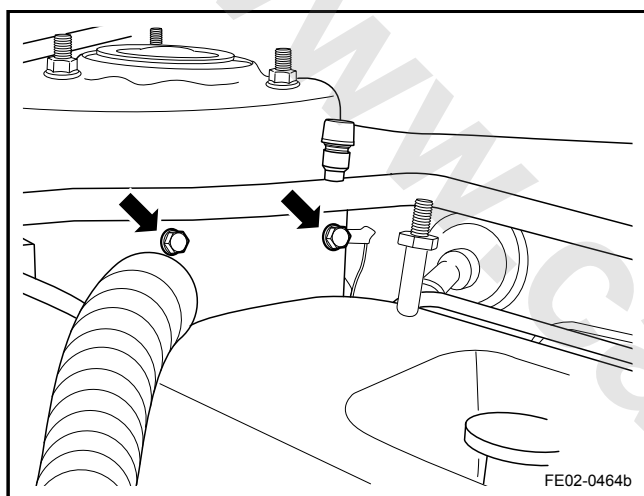
#### Removal Procedure:

1. Remove the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Release the fuel pressure. Refer to [2.3.8.1 Fuel Pressure Release Procedure](#).
3. Discharge the engine coolant. Refer to [2.8.8.1 Engine Coolant Discharge and Filling](#).
4. Recover the air-conditioning refrigerant. Refer to [8.2.7.10 Air-conditioning Refrigerant Recovery and Filling](#).
5. Remove the battery bracket. Refer to [2.11.8.2 Battery Replacement](#).
6. Disconnect ECM harness connector.
7. Disconnect the engine wiring harness connector and the floor harness connector.
8. Pull the engine wiring harness out of the firewall.

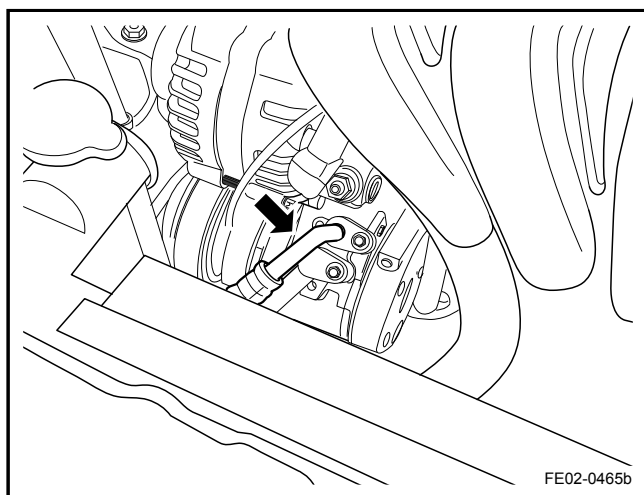




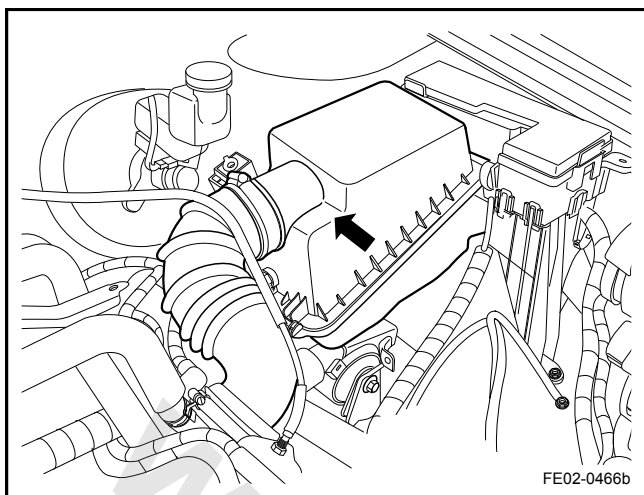
9. Disconnect pre-catalytic and post-catalytic oxygen sensor wiring harness connectors.



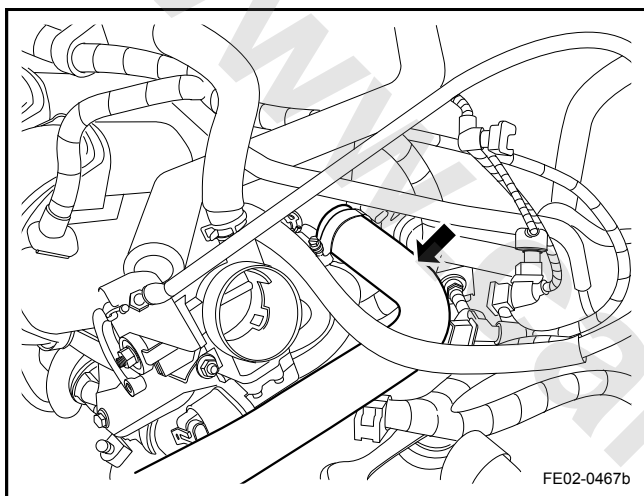
10. Remove the engine wiring harness ground cable bolts.



11. Remove the air-conditioning compressor high and low pressure connecting tubes.



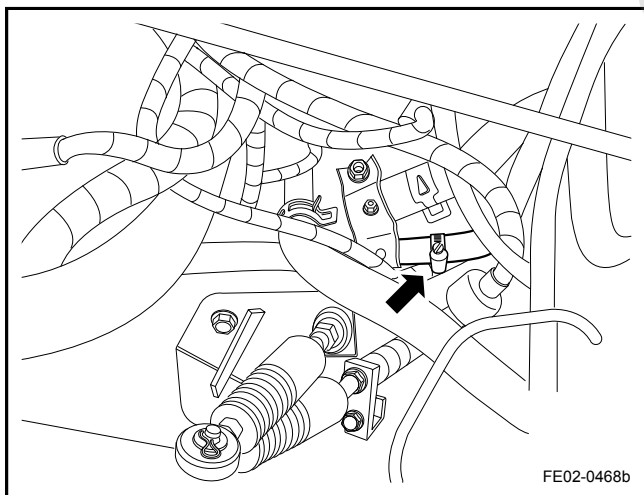
12. Remove the intake manifold assembly.



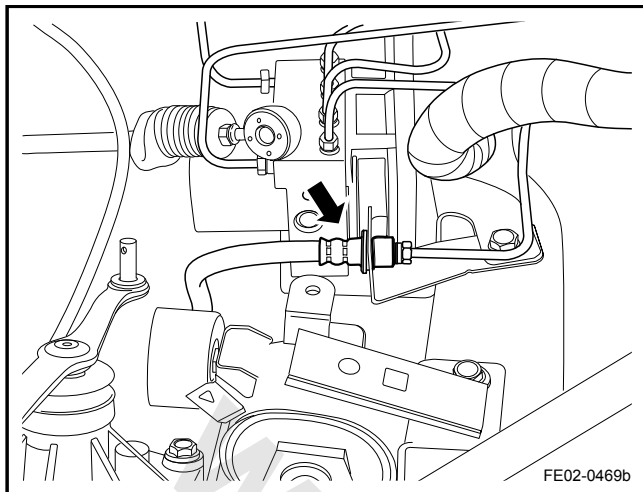
13. Removing the radiator inlet and outlet pipes.

**Warning!**

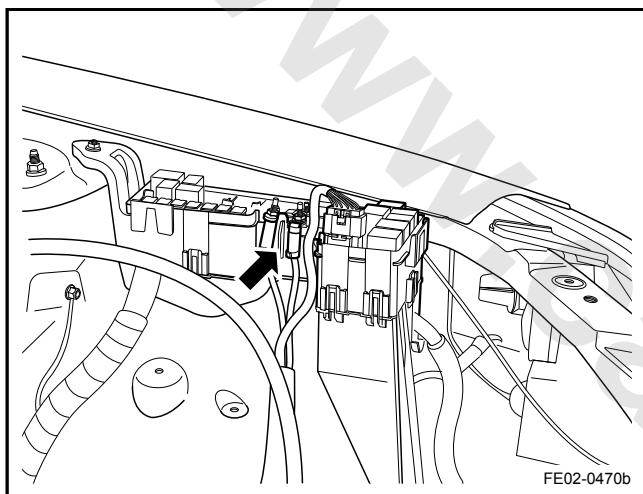
Refer to "Cooling System Service Warning" in "Warnings and Notices".



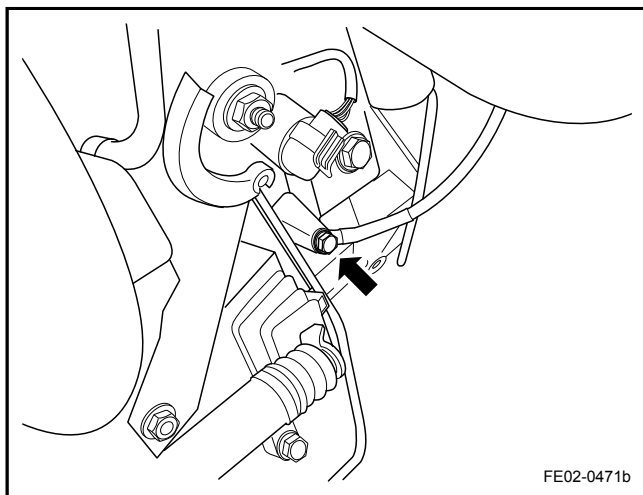
14. Remove the air filter support.
15. Remove the vacuum booster vacuum tubes.



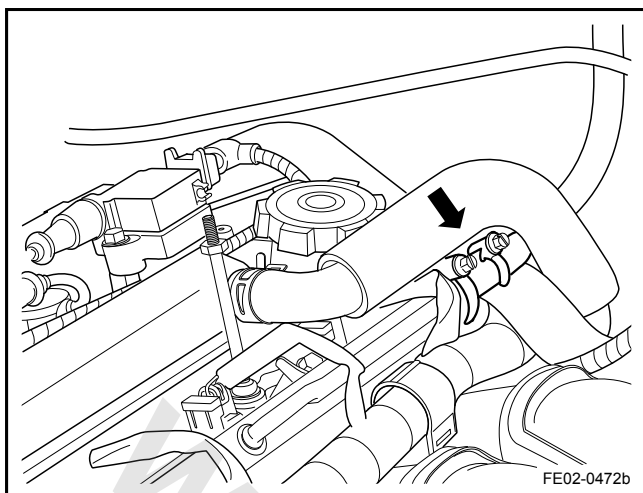
16. Remove the clutch tube.



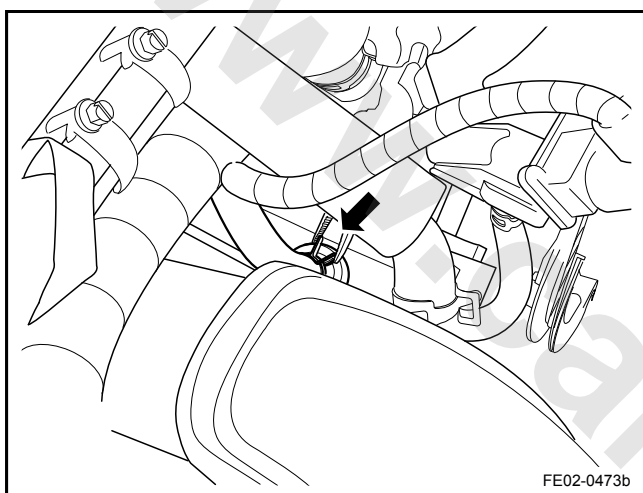
17. Disconnect the engine wiring harness to the underhood fuse and relay box cables and connectors.



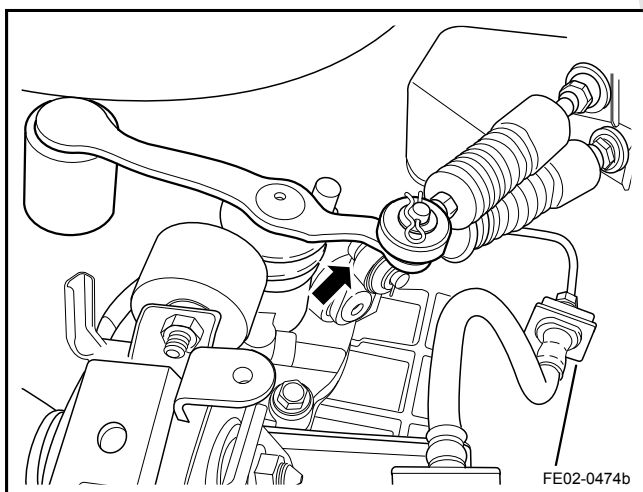
18. Remove battery negative cable gearbox shell ground cable.



19. Remove the fuel pipe.

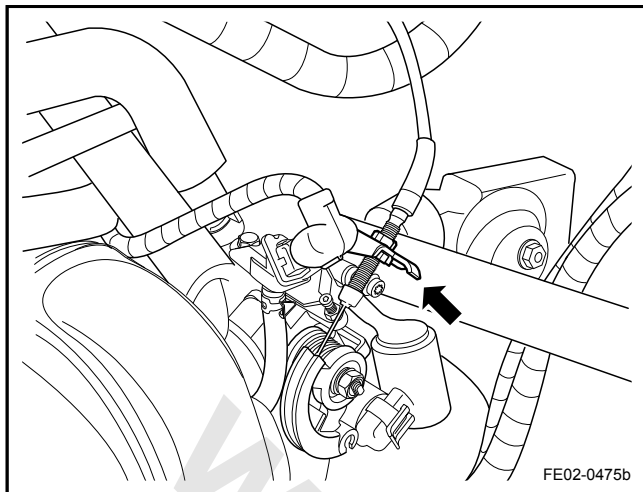


20. Remove the canister vacuum tubes.

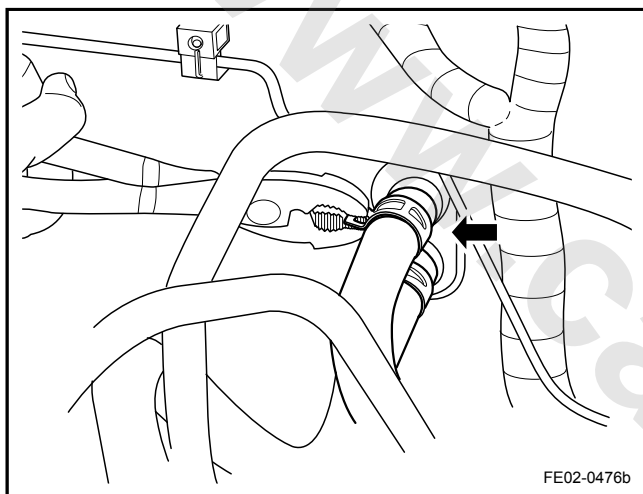


21. Remove shift lever pull cable.

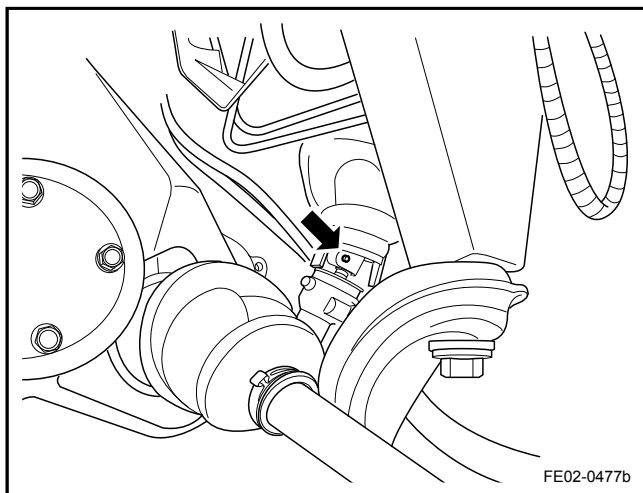




22. Remove the throttle cable.



23. Remove the heater intake and outlet pipes.



24. Remove the front wheels.

25. Lift the vehicle.

**Warning!**

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

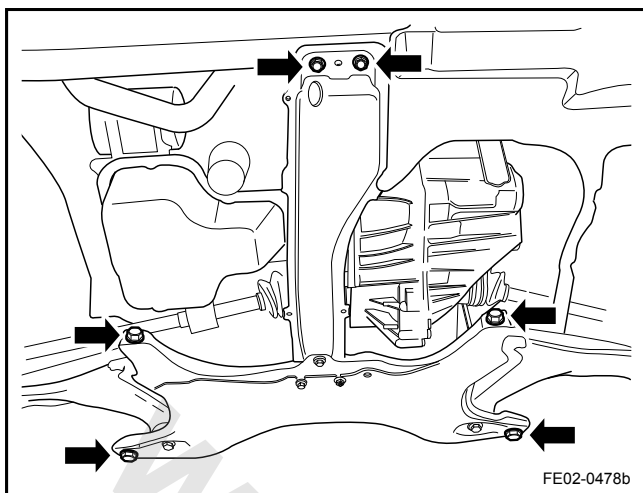
26. Remove the gearbox oil discharge bolt until all the gearbox oil is discharged and reinstall. Refer to [3.3.8.1 Transmission Fluid Level Inspection](#).

27. Remove the steering cross pin bolts.

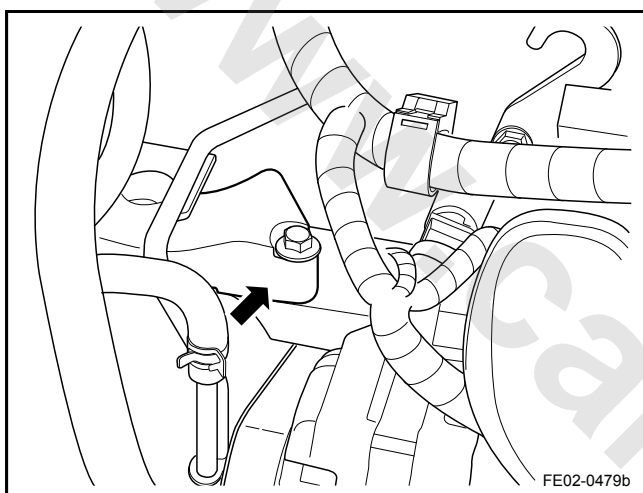
**Warning!**

Before remove the steering cross pin bolt, remove the key from the ignition switch first and turn the steering wheel to lock position. Otherwise it will damage the airbag clock spring.





28. Remove the front subframe and related components. Refer to [12.6.4.2 Subframe Replacement](#).



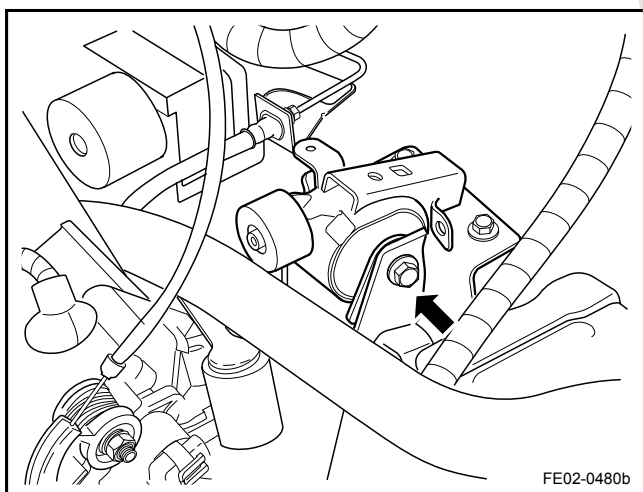
29. Remove the left and right side drive shafts. Refer to [5.3.4.1 Drive Shaft Replacement](#).

30. Place a mobile working table under the engine assembly to lower and support the powertrain assembly.

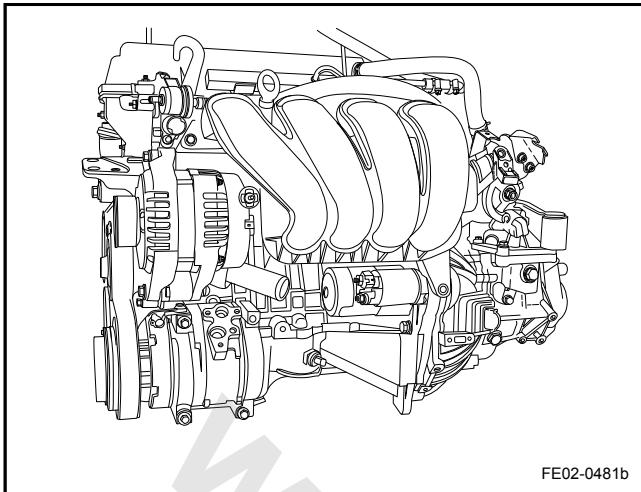
**Note**

Make sure solid contact between the working table and the powertrain assembly, otherwise it will result in bodily injury.

31. Remove the right engine mount assembly.



32. Remove the left gearbox mount assembly.



33. Slowly lift the vehicle to separate the powertrain from the vehicle body.

#### Note

In the lifting process, avoid the powertrain assembly tilt on the working table. Pay attention to the powertrain and vehicle body interference.

34. Use an engine lifting device to support the engine and then separate the engine and the gearbox. Refer to [3.3.8.3 Transmission Assembly Replacement](#).

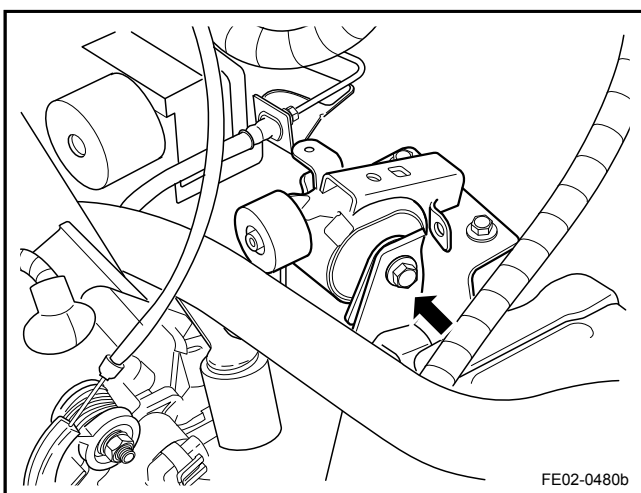
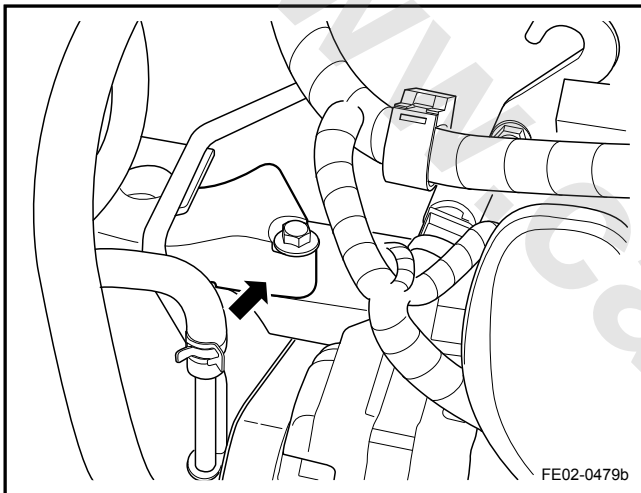
#### Installation Procedure:

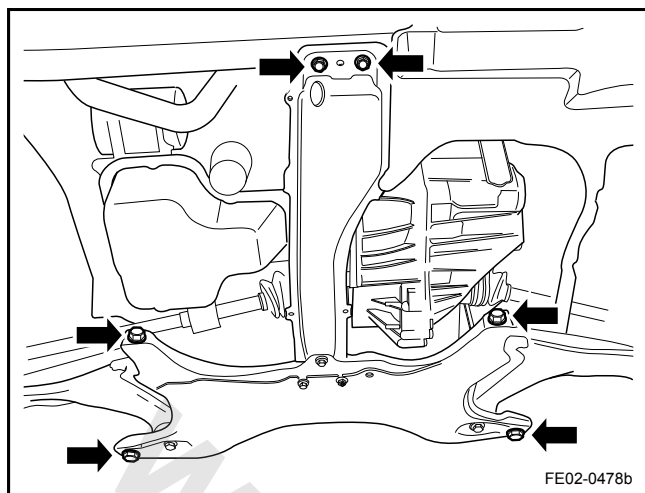
1. Use the engine lifting device to support the engine and then assemble the engine and the gearbox assembly.
2. Place the powertrain assembly on the mobile working table, lift the vehicle and move the working table so the powertrain assembly moves back into the vehicle body frame.
3. Slowly lower the vehicle. Pay attention in the lowering process, do not interfere with the vehicle body frame.

#### Note

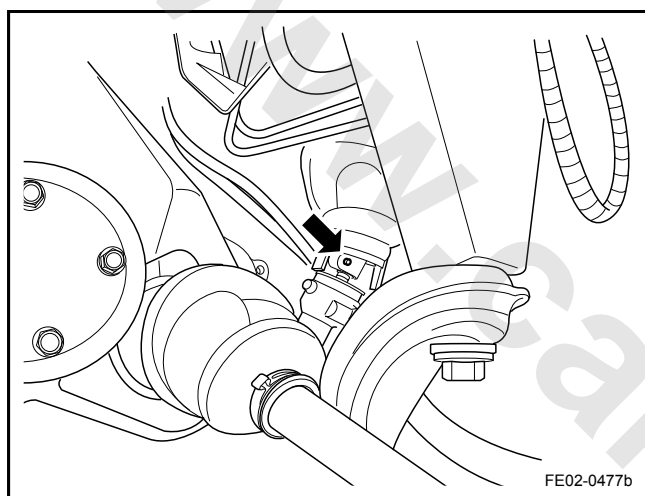
Make sure solid contact between the working table and the powertrain, otherwise it will result in bodily injury.

4. Install the right engine mount assembly.
5. Install the left gearbox mount assembly.

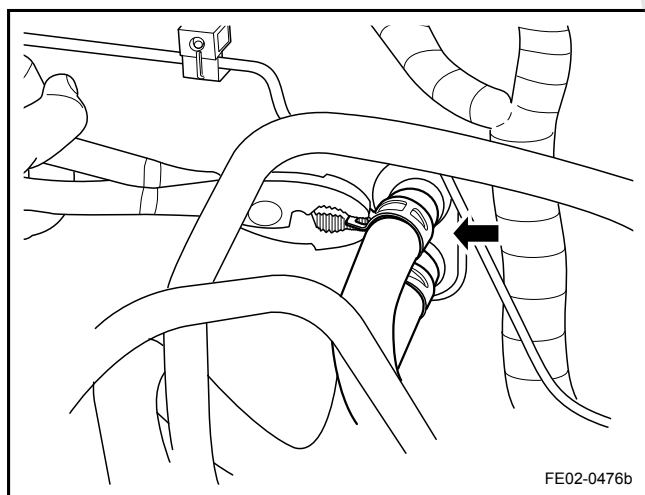




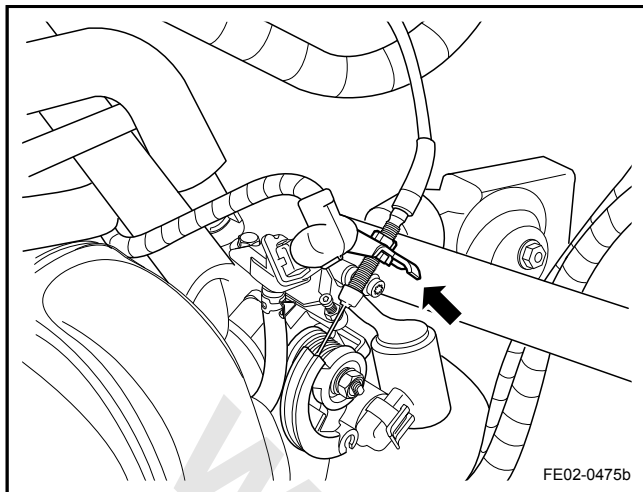
6. Lift the vehicle.
7. Install the left and right drive shafts.
8. Install the front subframes.



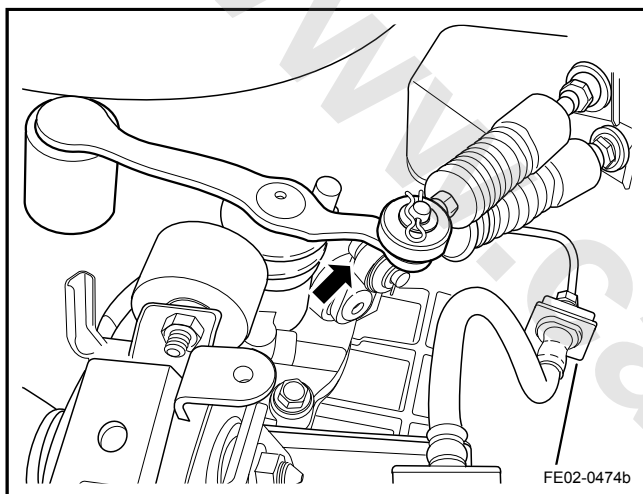
9. Install the steering cross pin bolts.



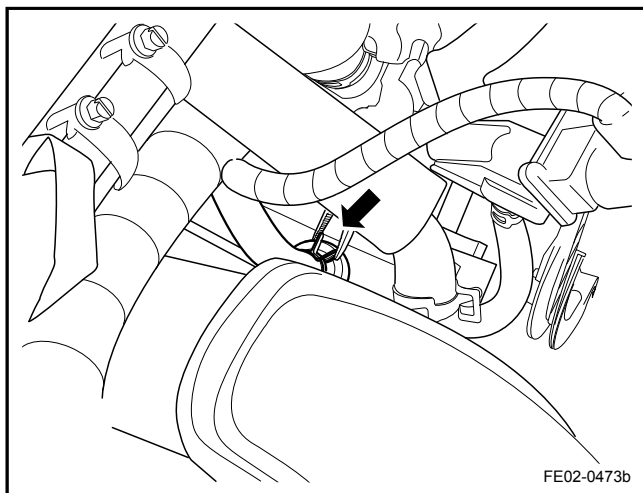
10. Tighten the gearbox oil discharge bolt and fill gearbox oil. Refer to [3.3.8.1 Transmission Fluid Level Inspection](#).
11. Lower the vehicle.
12. Install the front wheels.
13. Install the heater intake and outlet pipes.



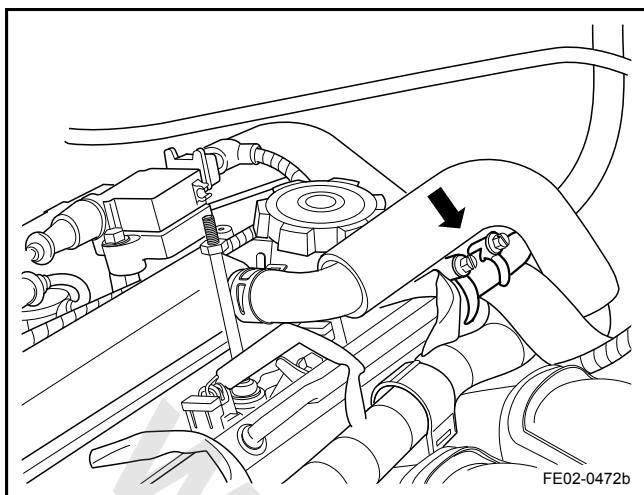
14. Install the throttle pull cable.



15. Install the gear lever pull cable.



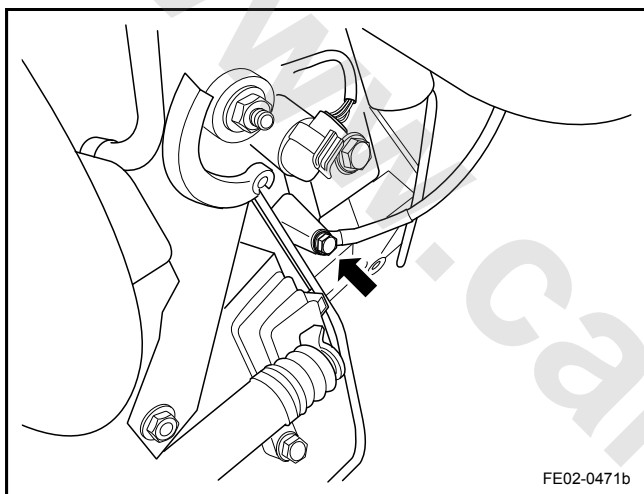
16. Install canister vacuum tubes.



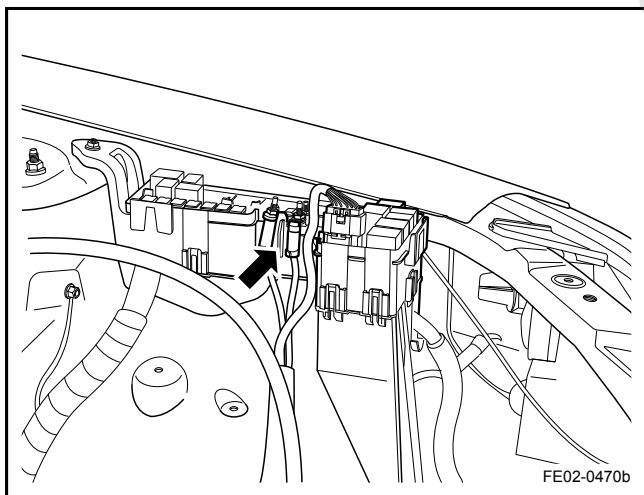
17. Install the fuel pipe.

**Note**

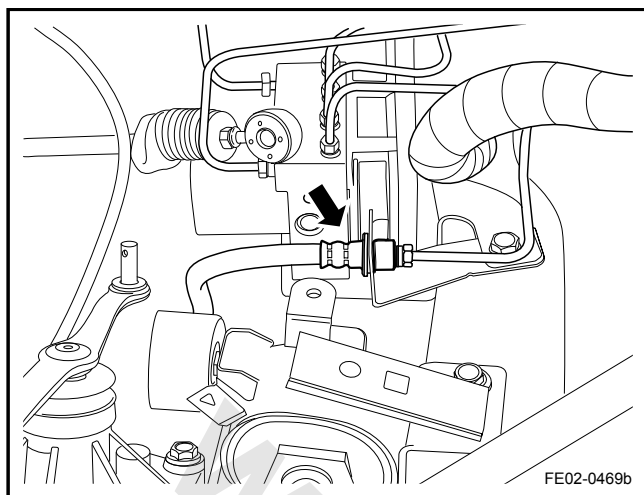
The fuel pipe must be inserted into the fuel distribution tube and then fastened after the second boss.



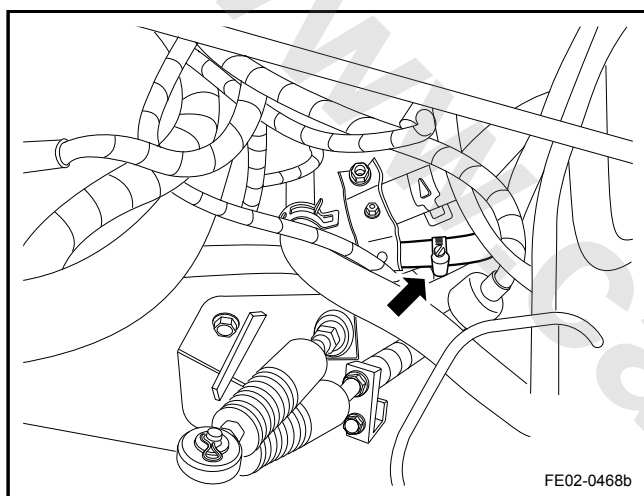
18. Connect the battery negative cable gearbox shell ground point.



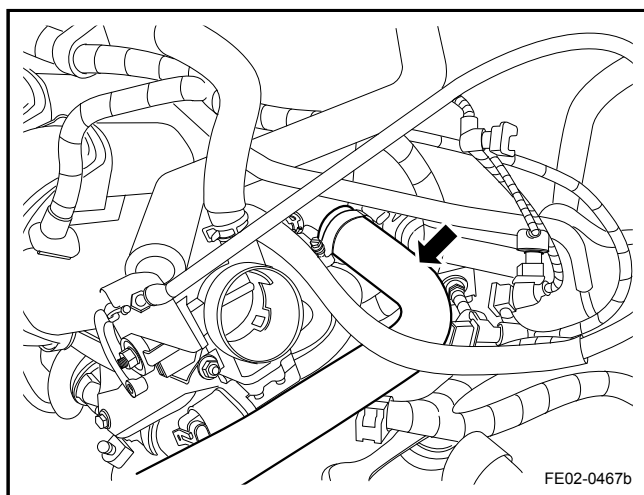
19. Connect the engine wiring harness to the underhood fuse and relay box cables and connectors.



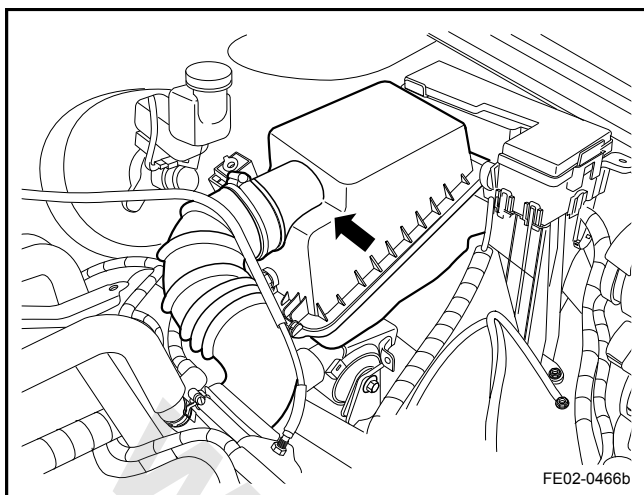
20. Install the clutch pipe and discharge the air. Refer to [3.2.6.3 Hydraulic Clutch Bleeding](#).



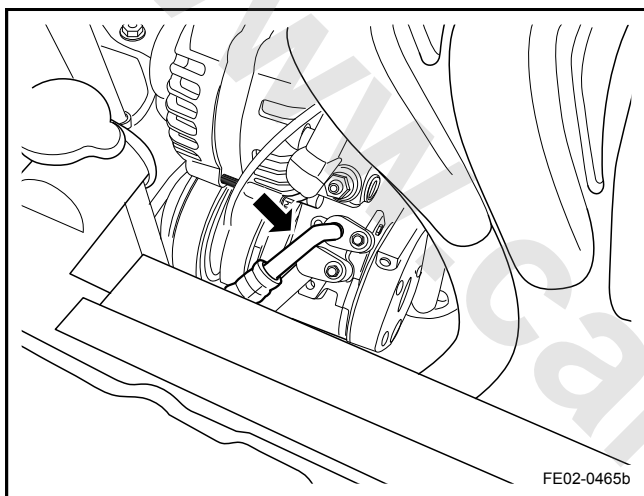
21. Install the vacuum booster vacuum tubes.



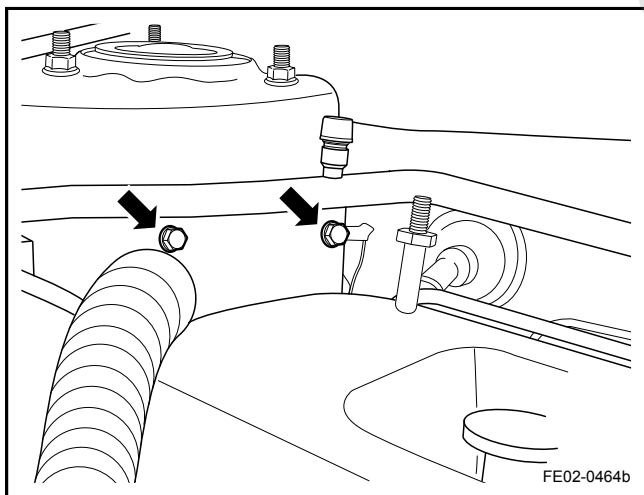
22. Install the air filter support.
23. Install the radiator inlet and outlet pipes.



24. Install the intake manifold assembly.

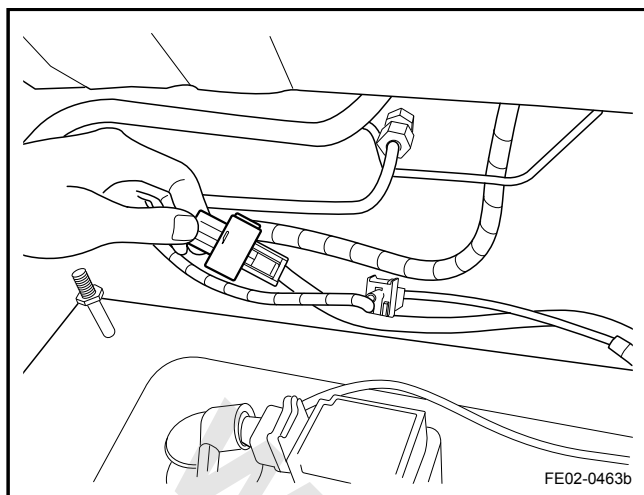


25. Install the air-conditioning compressor high and low pressure connecting pipes.

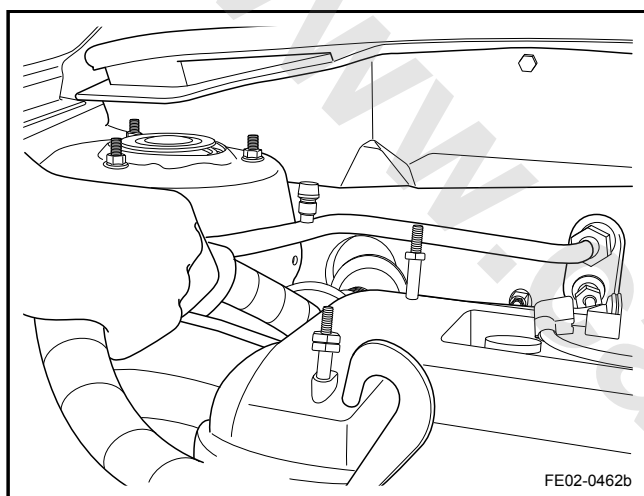


26. Install the engine wiring harness engine compartment ground cable and tightening bolt.

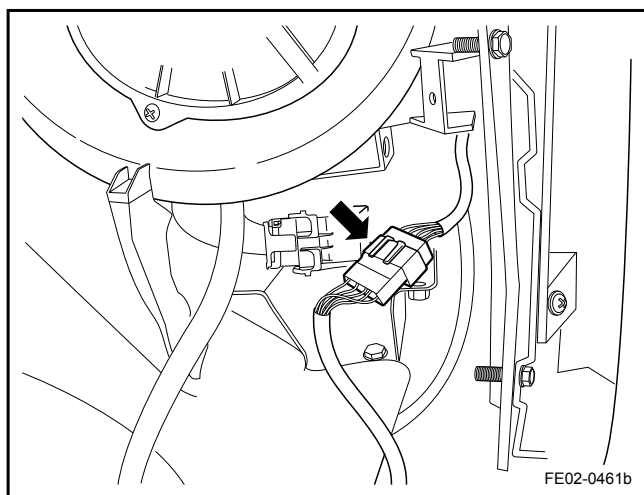




27. Connect the pre-catalytic and post-catalytic oxygen sensor wiring harness connectors.



28. Connect ECM harness connector.

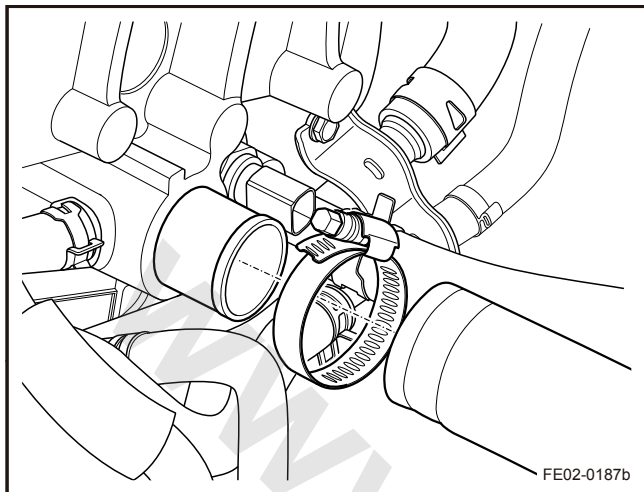


29. Connect the engine wiring harness and floor harness connectors.
30. Install the battery bracket.
31. Fill the engine coolant.
32. Fill the air-conditioning refrigerant.
33. Connect the battery negative cable.



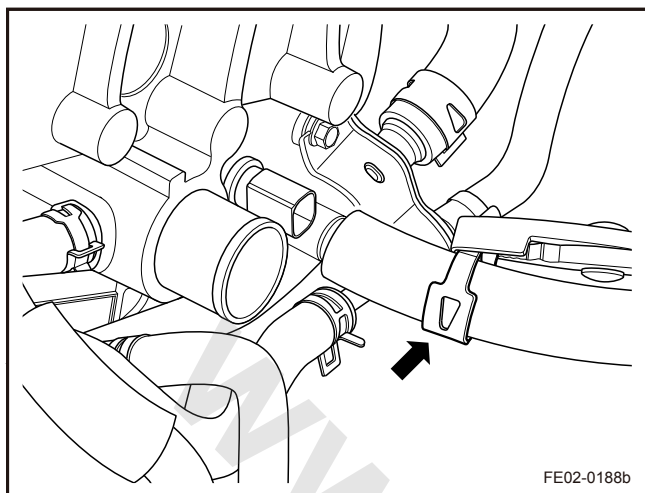
### 2.6.8.14 Cylinder Head Assembly Replacement

#### Removal Procedure:

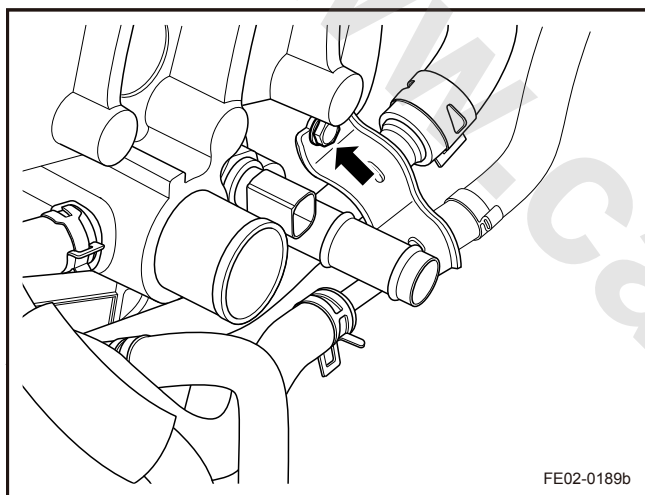


1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the engine plastic shield. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
3. Discharge the engine coolant. Refer to [2.8.8.1 Engine Coolant Discharge and Filling](#).
4. Remove the throttle body. Refer to [2.6.8.5 Throttle Body Assembly Replacement](#).
5. Remove the intake manifold assembly. Refer to [2.6.8.6 Intake Manifold Assembly Replacement](#).
6. Remove the exhaust manifold. Refer to [2.7.6.1 Exhaust Manifold Replacement](#).
7. Remove the ignition coil and ignition wire. Refer to [2.10.8.3 Ignition Coil Replacement](#).
8. Remove the cylinder head cover. Refer to [2.6.8.2 Cylinder Head Cover Replacement](#).
9. Remove the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#).
10. Remove the engine mounting. Refer to [2.6.8.7 Engine Mount Replacement](#).
11. Remove the timing chain cover. Refer to [2.6.8.9 Timing Chain Cover Replacement](#).
12. Remove the timing chain. Refer to [2.6.8.10 Timing Chain Replacement](#).
13. Remove the fuel rail. Refer to [2.2.8.2 Fuel Injector Replacement](#).
14. Disconnect the coolant temperature sensor wiring harness connector. Refer to [2.2.8.6 Engine Coolant Temperature Sensor Replacement](#).
15. Remove the camshaft position sensor. Refer to [2.10.8.1 Camshaft Position Sensor Replacement](#).
16. Remove the VVT solenoid valve. Refer to [2.2.8.4 VVT Solenoid Valve Replacement and Filter Cleaning](#).
17. Remove the camshaft. Refer to [2.6.8.12 Camshaft Replacement](#).

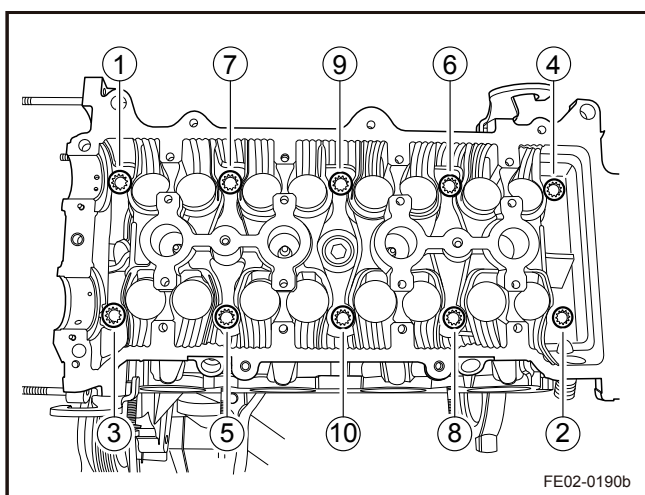
18. Remove the radiator inlet and outlet pipes.



19. Remove the heater inlet and outlet pipes.



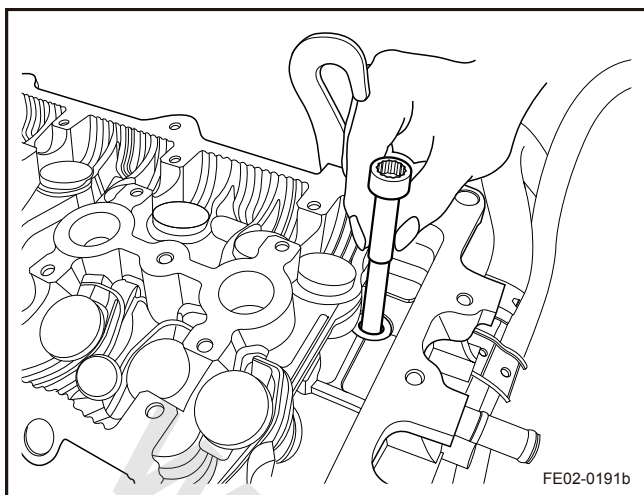
20. Remove the small cycle pipes cylinder head retaining bolts.



21. Remove the cylinder head bolts according to the sequence in the graphic.

#### Note

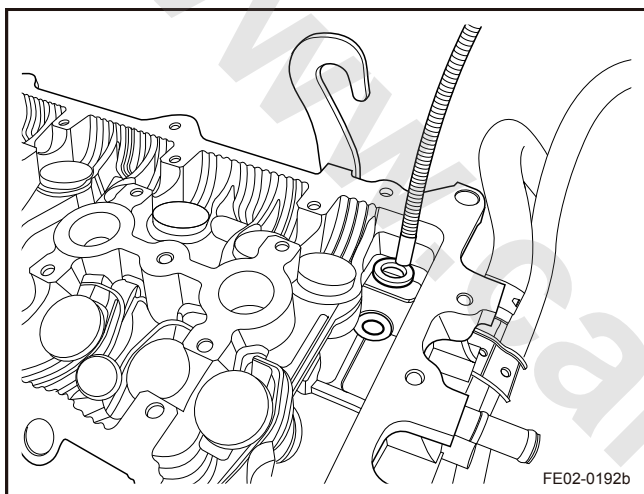
When the engine is hot, it is prohibited to remove the cylinder head, as this will cause the cylinder head distortion.



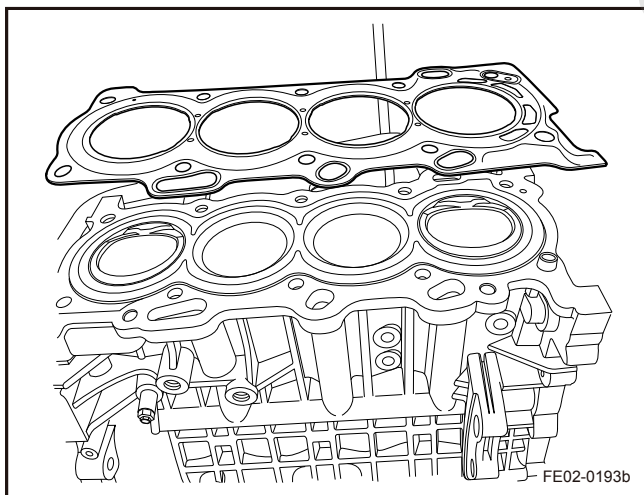
22. Remove the cylinder head bolts.

**Note**

Due to confined space, cylinder head bolts and gasket bolts can not be removed together.



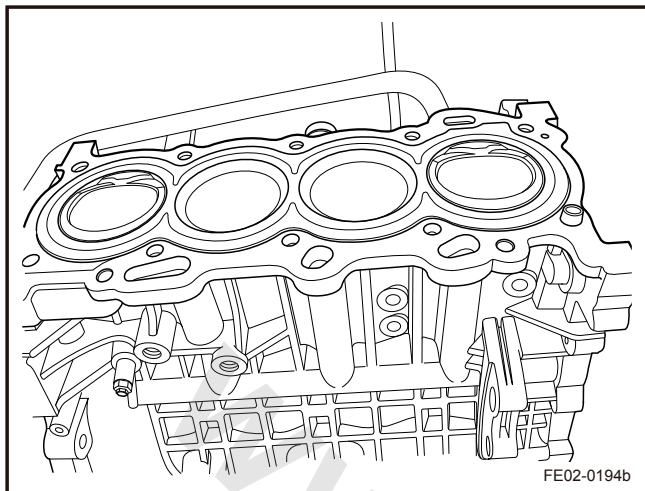
23. Remove the cylinder head bolt gasket with a magnetic stick.



24. Remove the cylinder head gasket.

## Installation Procedure:

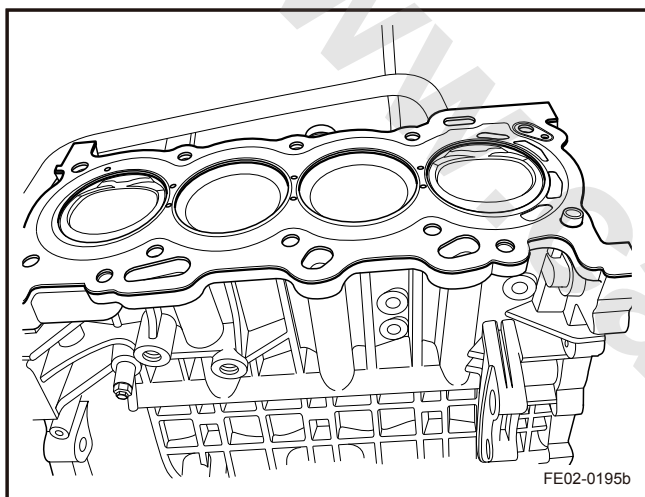
1. Clean the surface of the cylinder head and cylinder head.



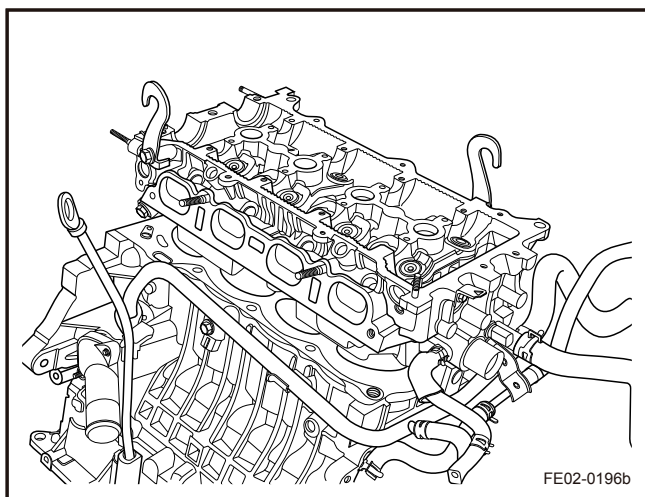
2. Install the cylinder head gasket.

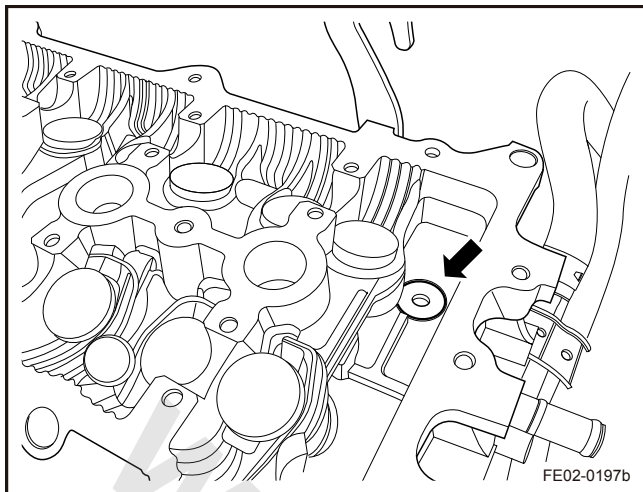
**Note**

Cylinder head gasket is a single used item and must be replaced with a new part.

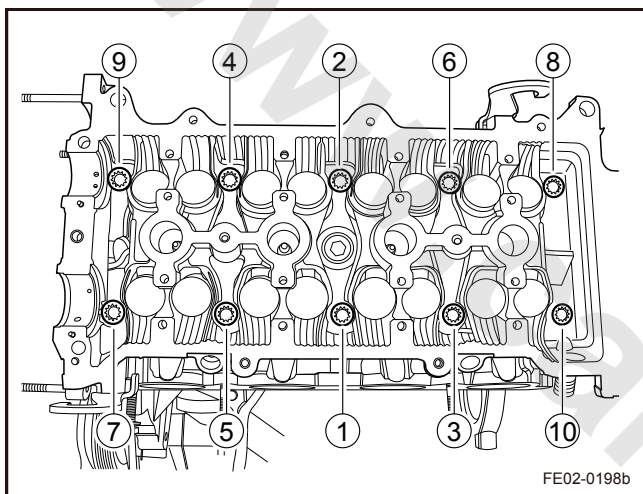


3. Install the cylinder head assembly.





4. Install the cylinder head gasket bolt washers.

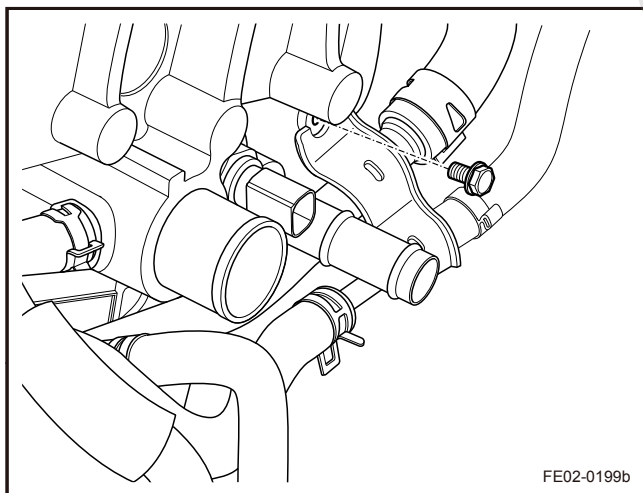


5. Install and tighten the cylinder head bolts, according to the sequence in the graphic.

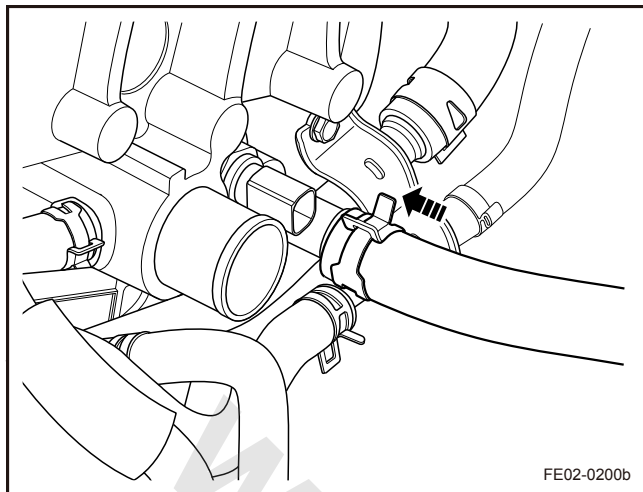
Torque:

First Pass: 49 Nm (Metric) 36.3 lb-ft (US English)

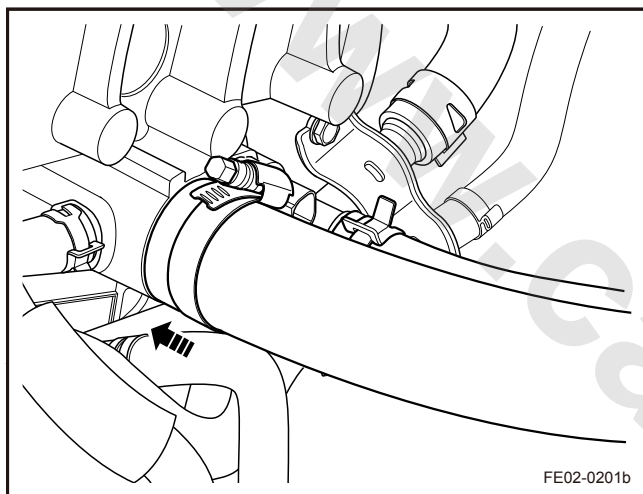
Second Pass: 80 Nm (Metric) 59.1 lb-ft (US English)



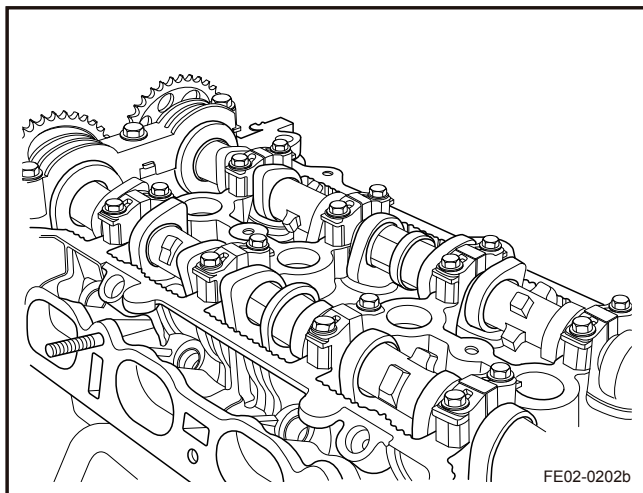
6. Install the small cycle pipes to cylinder head retaining bolts.



7. Install the heater inlet and outlet pipes.

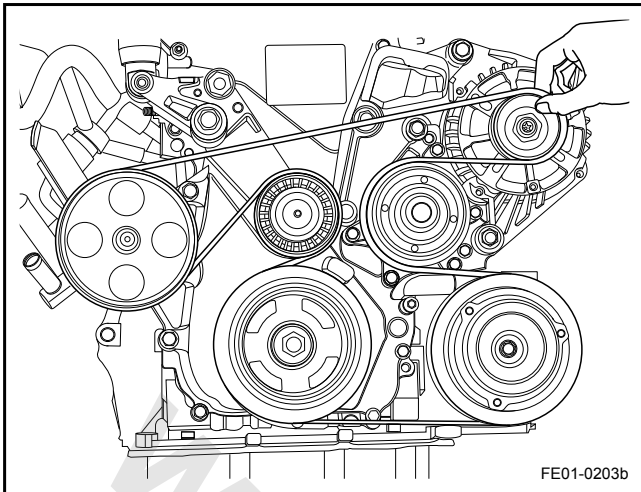


8. Install the radiator inlet and outlet pipes.



9. Install the camshaft.



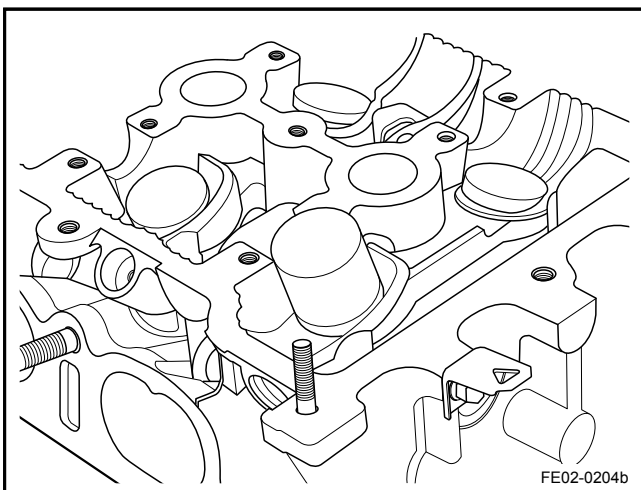


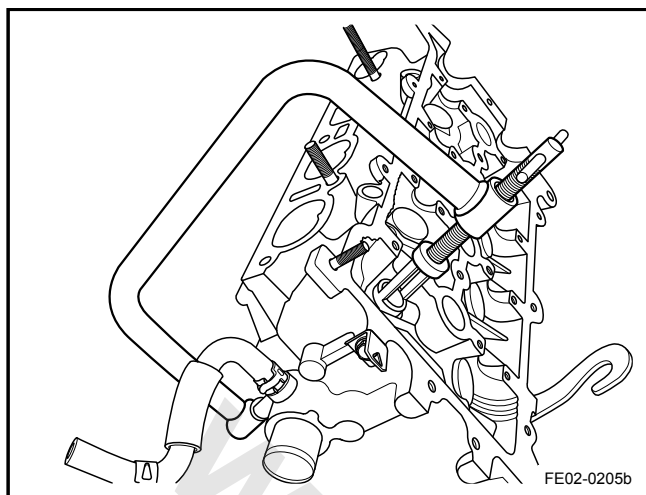
10. Install the VVT solenoid valve.
11. Install the camshaft position sensor.
12. Install the coolant temperature sensor wiring harness connector.
13. Install the fuel rail assembly.
14. Install the timing chain.
15. Install the timing chain cover.
16. Install the engine mounting.
17. Install the drive belt.
18. Install the cylinder head cover.
19. Install the ignition coil and ignition wire.
20. Install the exhaust manifold.
21. Install the intake manifold assembly.
22. Install the throttle body.
23. Fill the engine coolant.
24. Install the engine plastic shield.
25. Connect the battery negative cable.

#### 2.6.8.15 Cylinder Head Assembly Removal and Installation

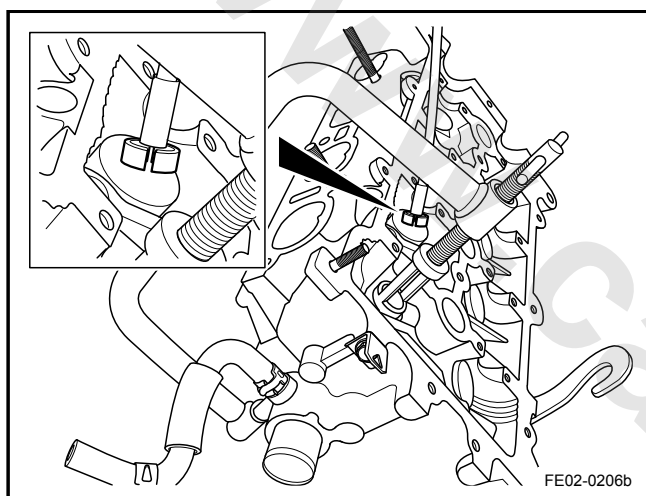
##### Removal Procedure:

1. Remove the cylinder head assembly. Refer to [2.6.8.14 Cylinder Head Assembly Replacement](#).
2. Remove the valve lifter.

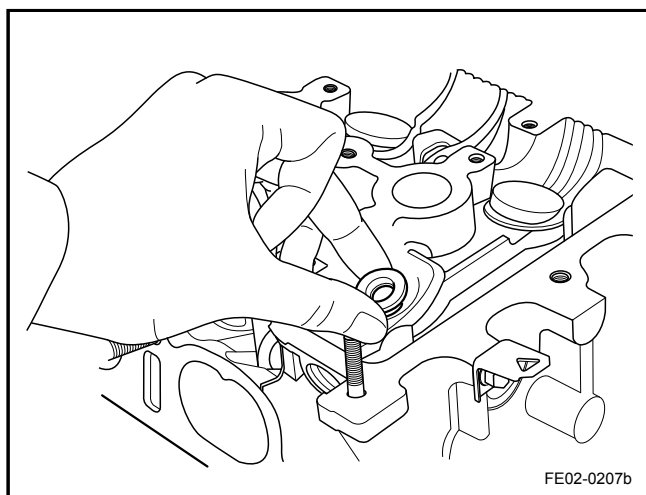




3. Use a universal tool to compress the valve springs.

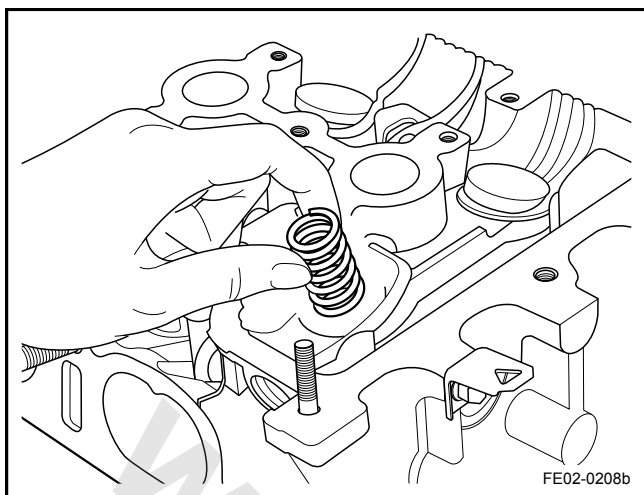


4. Remove the valve locking piece with a magnetic stick.

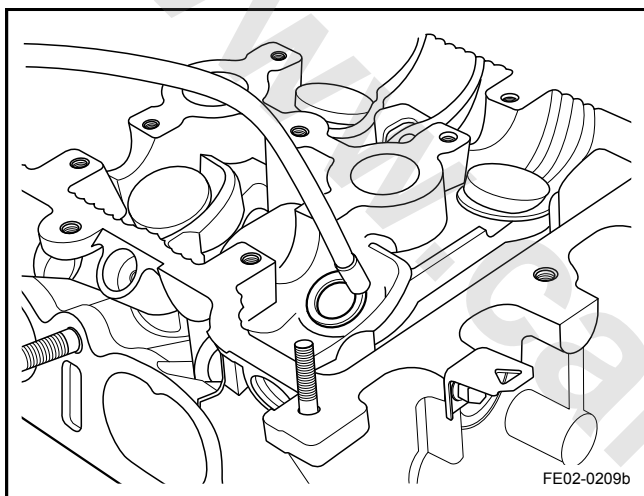


5. Remove the special tools and remove the valve spring seat.

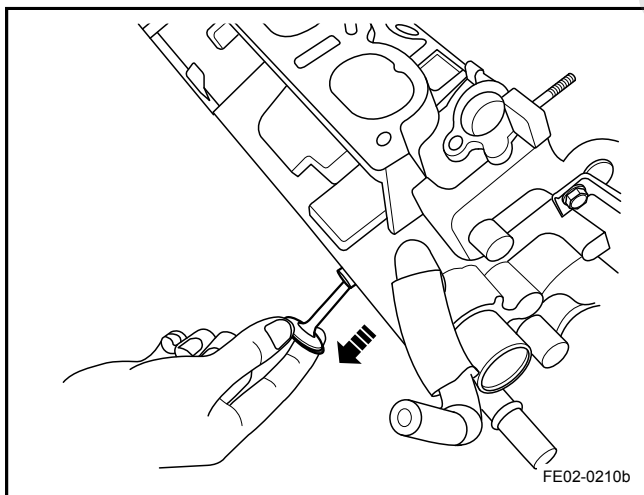




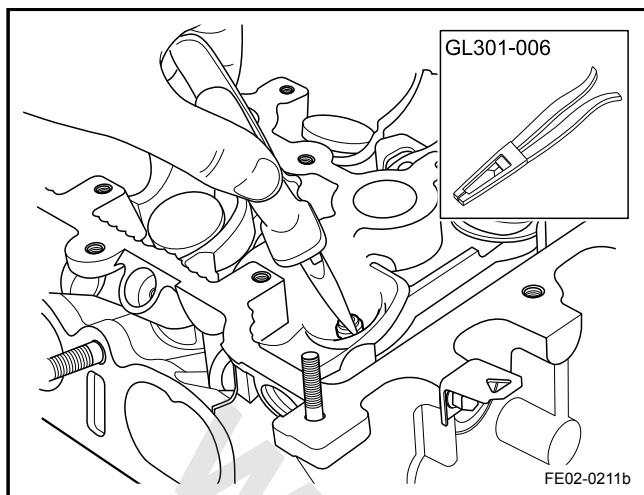
6. Remove the valve spring.



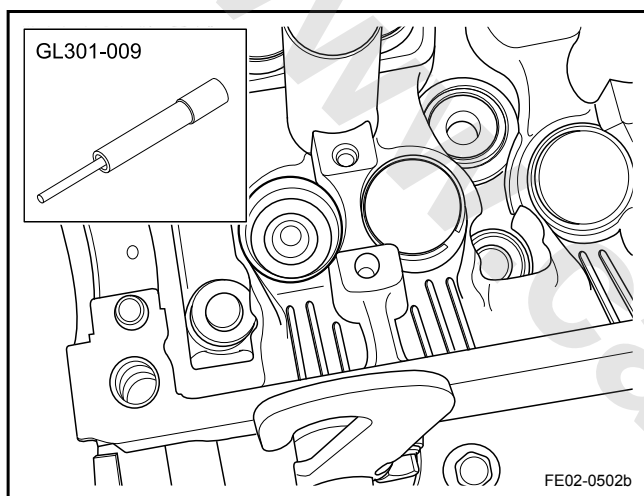
7. Remove the valve spring pads with a magnetic stick.



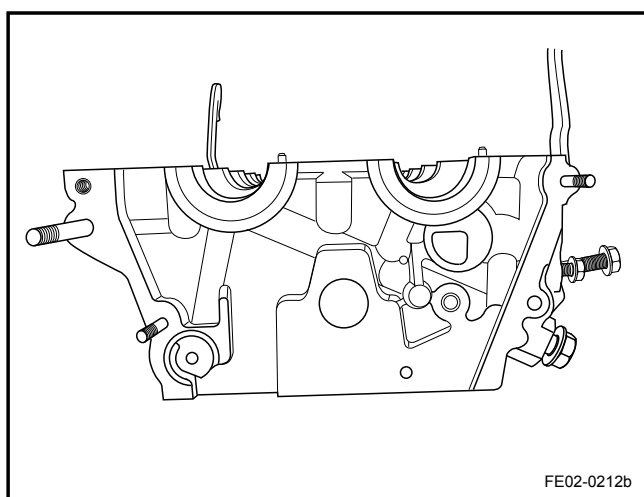
8. Remove the valve, mark the original position of the valve in order to re-install.



9. Remove the valve seals with the special tool GL301-006.



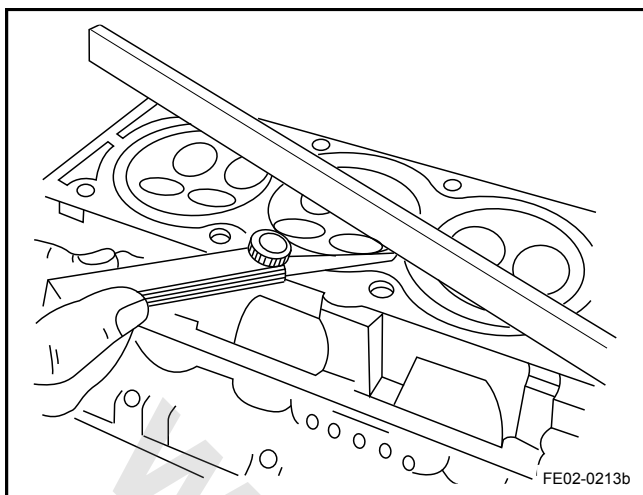
10. Remove the valve guide rod with the special tool GL301-009.



#### Cleaning:

1. Clean cylinder head and cylinder head gasket contacting surface.
2. Clean cylinder head and cylinder head cover contacting surface.
3. Inspect and confirm that the cylinder head and cylinder head gasket contacting surface has no scratches.
4. Inspect and confirm that the cylinder head gasket joints has no leakage or channeling gas.
5. Check whether there are cracks on the cylinder head.
6. Confirm that the height of the cylinder head tolerance is within the acceptable range. Refer to [2.6.1.2 Mechanical System Specification](#), if the height is lower than the standard value, replace the cylinder cover.

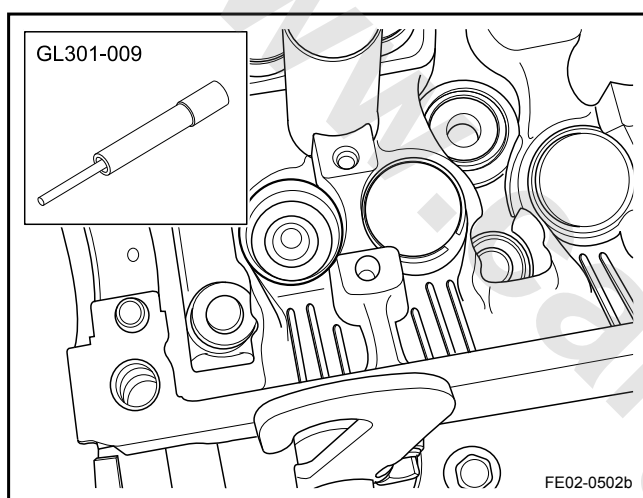
Standard Value: 114.95 mm (Metric) 4.526 in (US English)



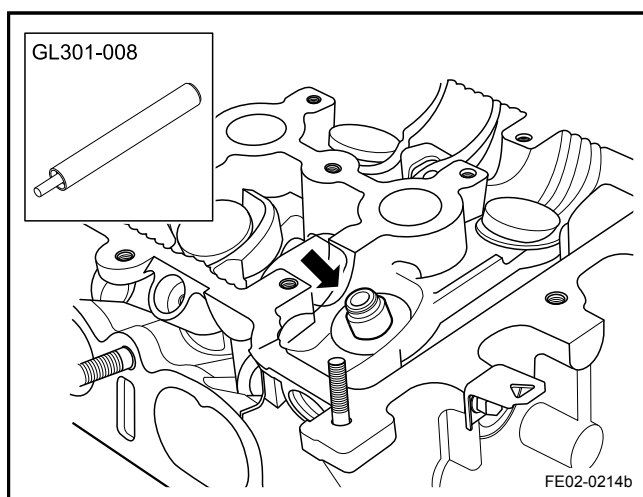
7. Inspect and confirm that the sealing surface has no distortion and warping and the cylinder head sealing surface flatness must be 0.05 mm (0.002 in).
8. Inspect and confirm that valve seat ring has no excessive wear and burnt places.

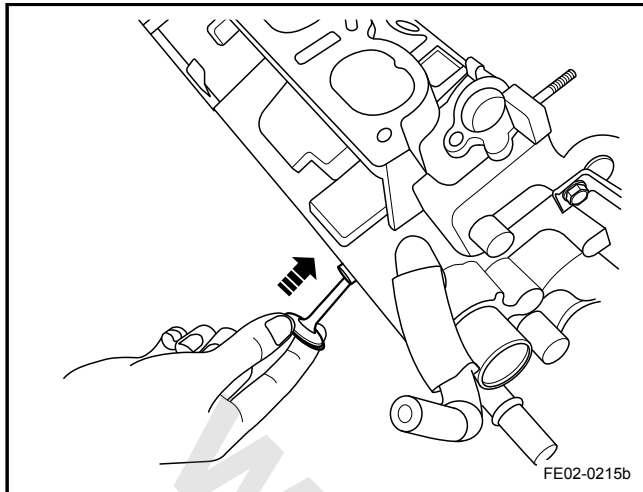
#### Installation Procedure:

1. Use a special tool GL301-009 to install the valve guide rod.

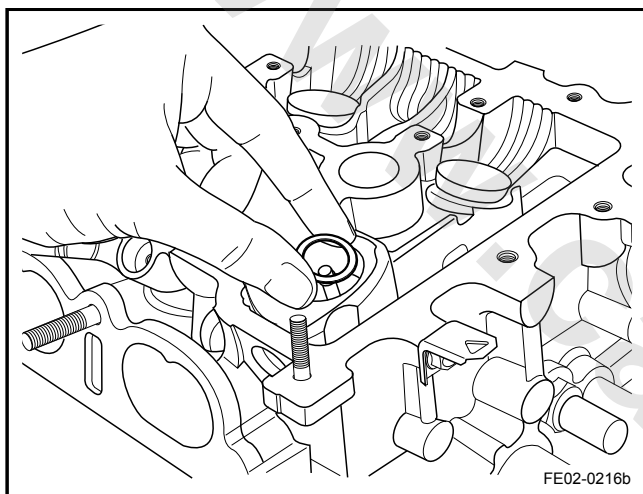


2. Use a special tool GL301-008 to install the special valve seals.

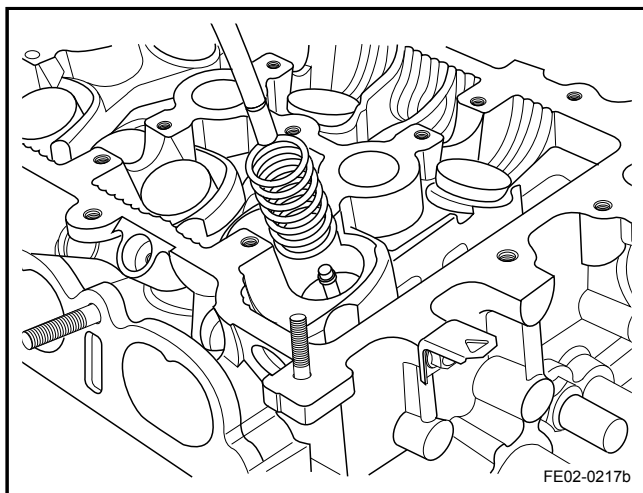




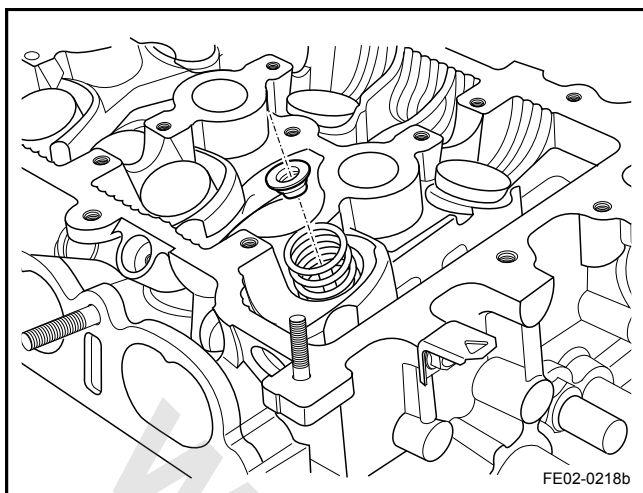
3. Install the valves.



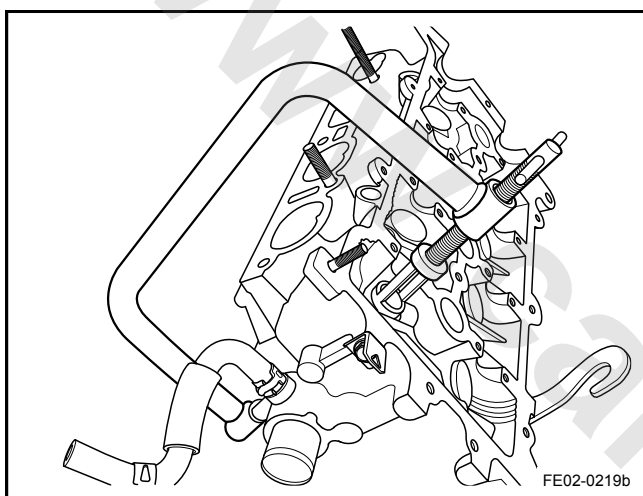
4. Install the valve spring pads.



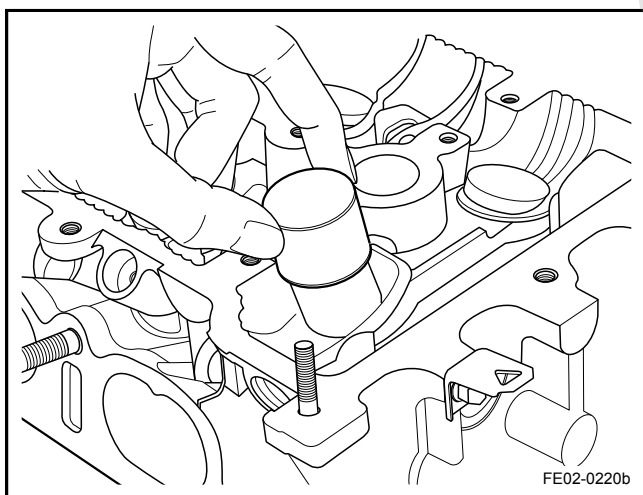
5. Install the valve springs.



6. Install the valve spring seat.



7. Use a universal tool to compress the valve springs and install the valve spring locking pieces.



8. Confirm locking pieces is in place. slowly remove the special tool with a wood hammer gently knock the valve, so that the valve is in place.

**Warning!**

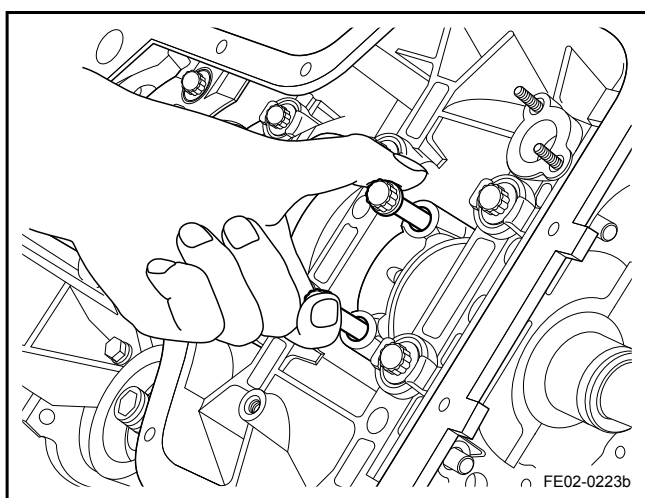
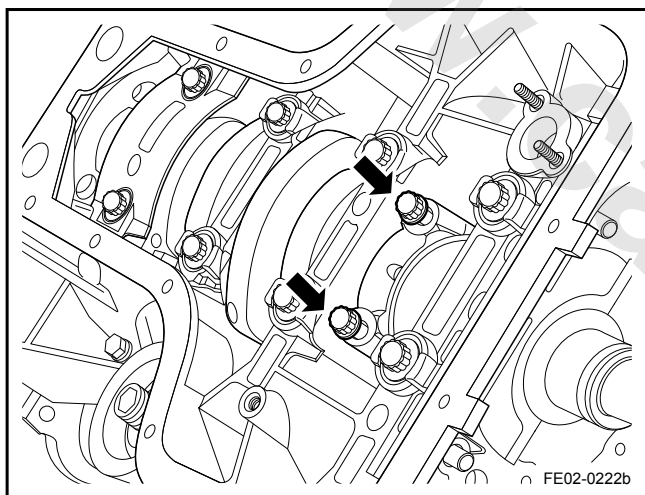
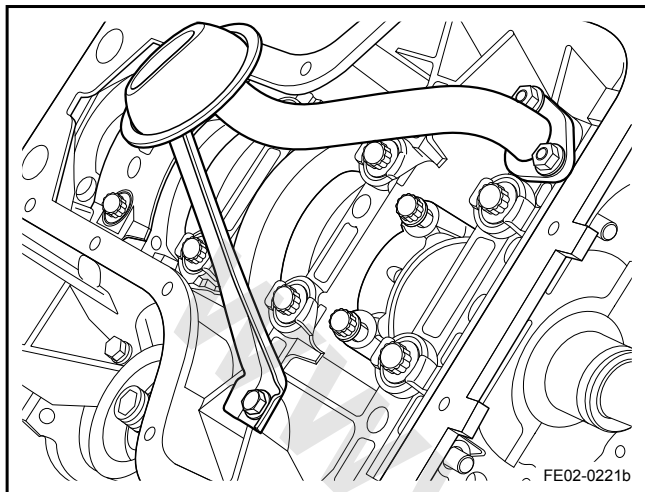
**Do not apply excessive force, otherwise the valve spring might pop up and cause personal injury.**

9. Install the valve lifter.
10. Install the cylinder head assembly.

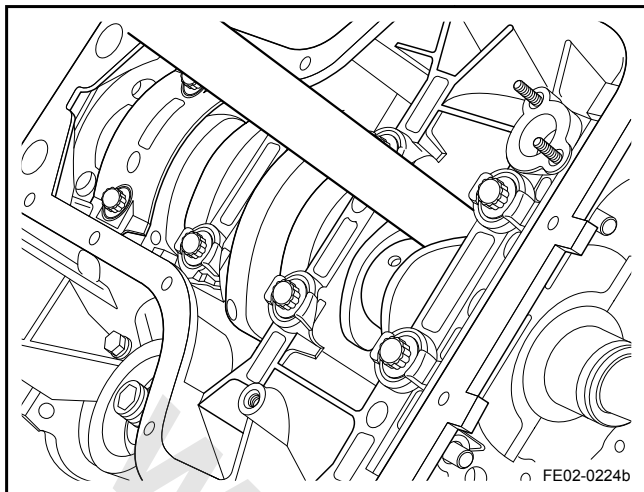
### 2.6.8.16 Piston Connecting Rod and Bearing Replacement

#### Removal Procedure:

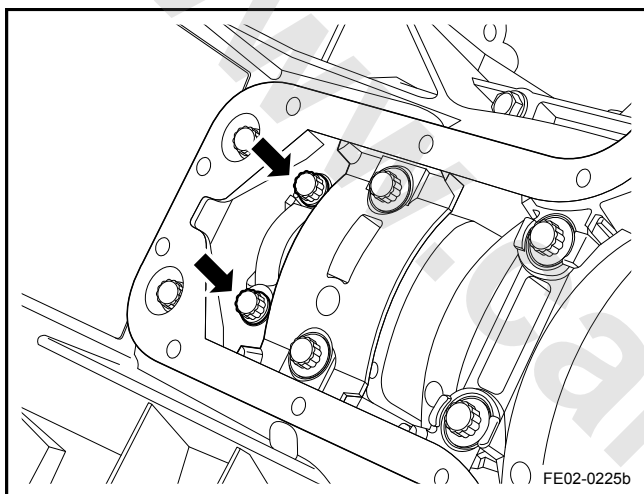
1. Remove the engine assembly. Refer to [2.6.8.13 Engine Replacement](#).
2. Remove the cylinder head cover. Refer to [2.6.8.14 Cylinder Head Assembly Replacement](#).
3. Remove the oil pan. Refer to [2.9.8.3 Oil Pan Replacement](#).
4. Remove the filters.
5. Rotate the crankshaft, so that the cylinder NO.1 and 4 are at BDC positions. Remove the cylinder NO.1 rod bearing cap bolts.
6. hold the rod bolts. Remove the cylinder NO.1 connecting rod bearing caps and mark the location of the cylinder NO. 1 on the bearing cover.



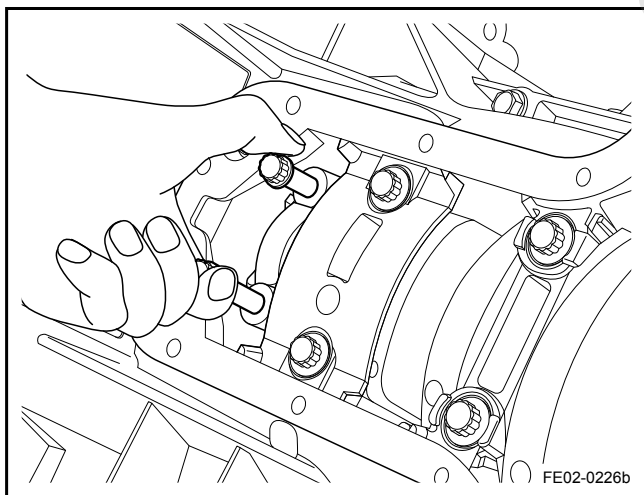




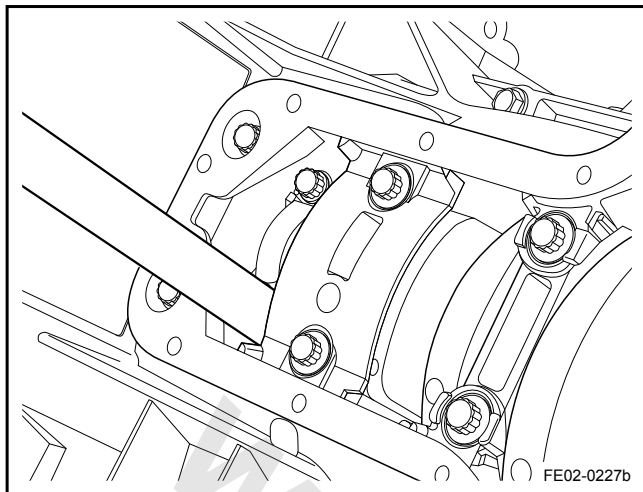
7. With a wood handle, remove cylinder No.1 piston rod and mark the location of cylinder No.1.



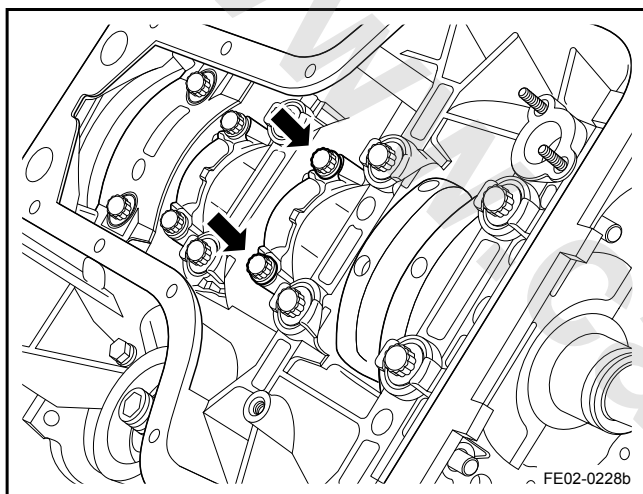
8. Remove the cylinder No.4 connecting rod bearing cap bolts.



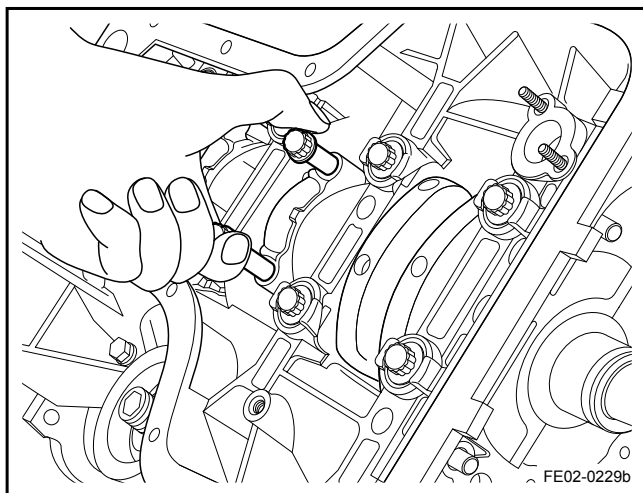
9. Hold the rod bolt, remove the cylinder No.4 connecting rod bearing caps and mark the location cylinder No.4.



10. With a wood handle, remove cylinder No.1 piston rod and mark the location of cylinder No.4.

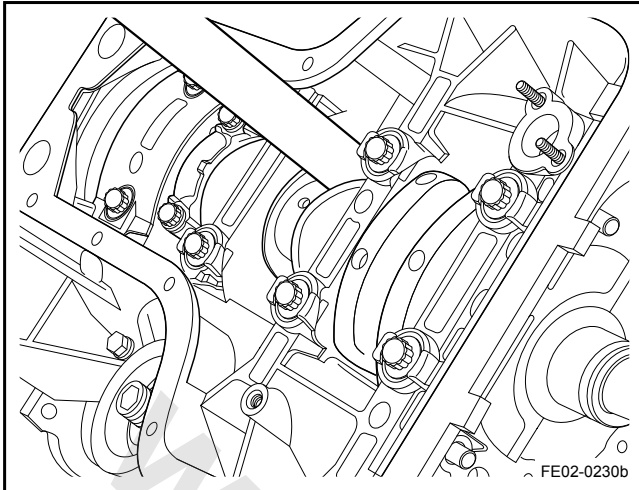


11. Rotate the crankshaft 180 °, so that the cylinder NO.2 and 3 are at BDC positions. Remove the cylinder NO.2 rod bearing cap bolts.

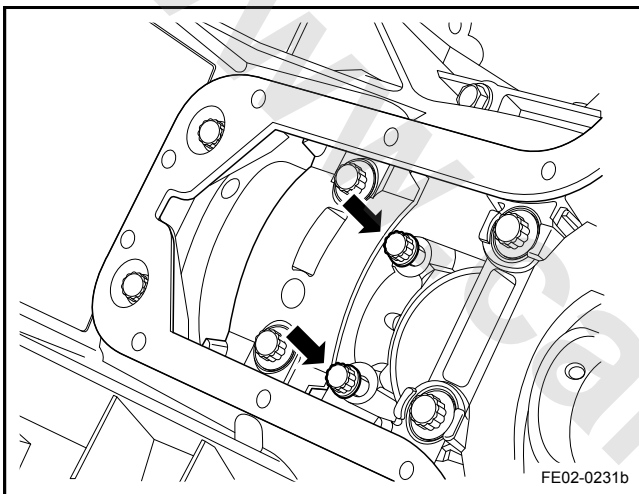


12. Hold the rod bolt, remove the cylinder No.2 connecting rod bearing caps and mark the location cylinder No.2.

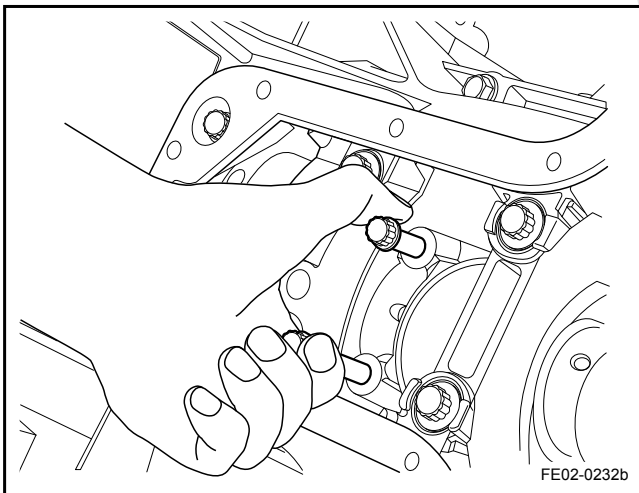




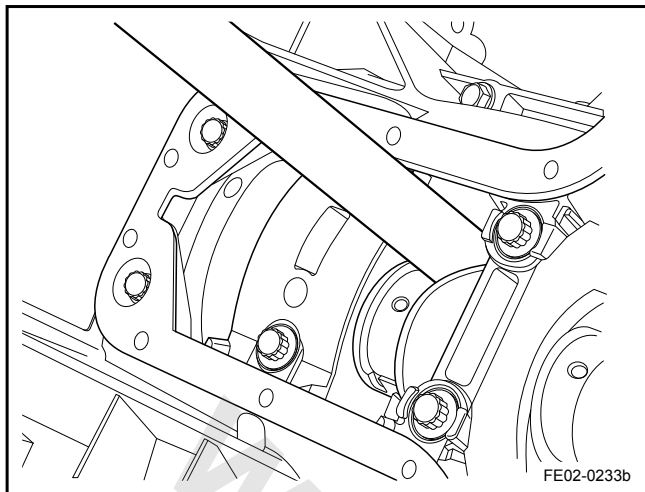
13. With a wood handle, remove cylinder No.2 piston rod and mark the location of cylinder No.2.



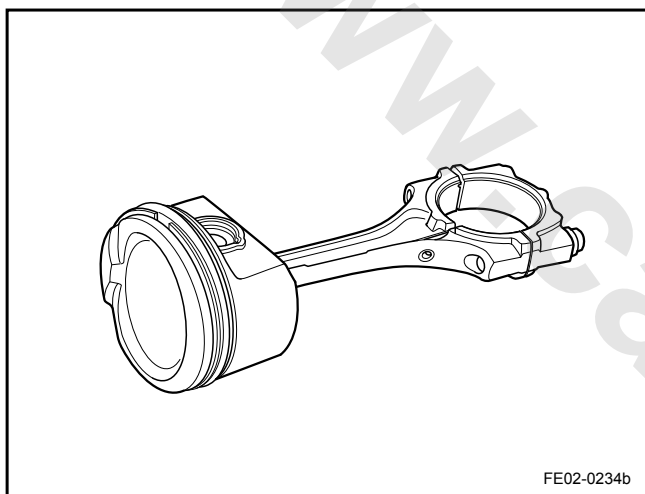
14. Remove the cylinder No.3 connecting rod bearing cap bolts.



15. Hold the rod bolt, remove the cylinder No.3 connecting rod bearing caps and mark the location of cylinder No.3.



16. With a wood handle, remove cylinder No.3 piston rod and mark the location of cylinder No.3.



#### Inspection Procedures Before Installing The Piston:

1. Check whether the rod is bent or distorted. If the rod is bent or distorted, replace the connecting rod.

Cross Degree: 0.03/100 (Metric) 0.001/3.9 (US English)

Twisted Degree: 0.05/100 (Metric) 0.002/3.9 (US English)

2. Check the connecting rod bearings.
3. Check whether the bottom rod is worn.
4. Check whether the connecting rod upper end is scratched.
5. Check whether there is the crankshaft connecting rod bearing journal wear and tear.
6. Check whether the piston is scratched, cracked and worn.
7. Check the piston and piston pin mating.

Standard Value:

0.005-(-0.001) mm (Metric) 0.0002-(-0.00004) in (US English)

8. Check piston pin and connecting rod small head hole clearance.

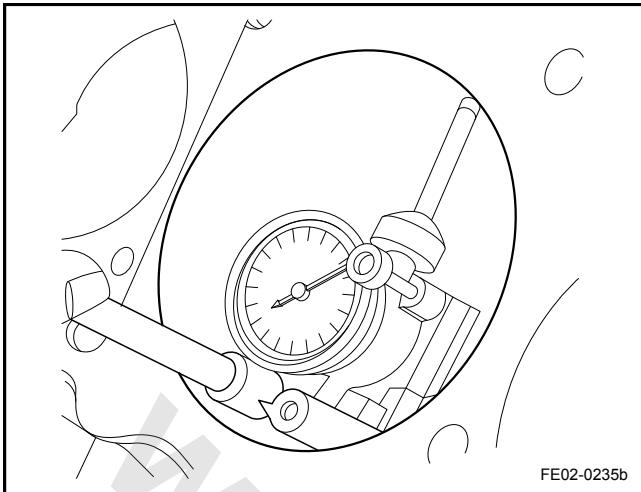
Standard Value:

0.005-0.011 mm (Metric) 0.0002-0.0004 in (US English)

9. Check piston pin and piston pin hole clearance

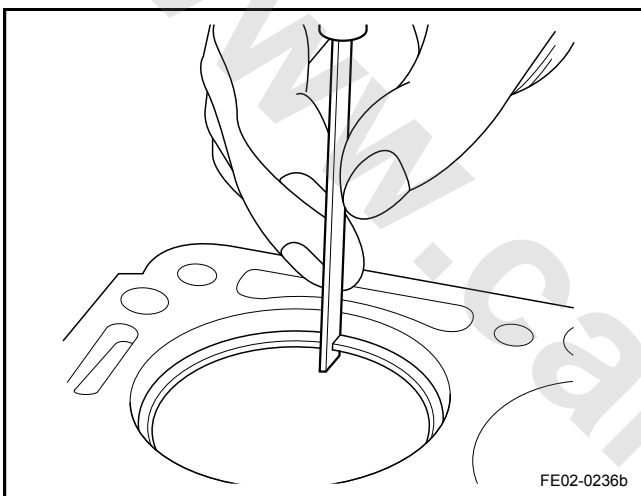
Standard Value:

(-0.001)-0.005 mm (Metric) (-0.00003)-0.0002 in (US English)



10. Check whether the engine block cylinder bore is worn, runout and taper.
11. Check whether the engine block cylinder bore is polished, if necessary, slightly polish the cylinder bore.
12. With a ruler and gap regulator, check the engine block top surface flatness.

Standard Value: 0.05 mm (Metric) 0.002 in (US English)



13. Select a new set of piston rings, use a gap regulator to measure piston ring end gap.

Oil Ring End Gap:

0.20-0.70 mm (Metric) 0.0079-0.0276 in (US English)

Second Compression Ring End Gap:

0.40-0.55 mm (Metric) 0.0157-0.0217 in (US English)

First Compression Ring End Gap:

0.25-0.35 mm (Metric) 0.0098-0.0138 in (US English)

14. Check the connecting rod bearings gap.

Standard Value:

0.020-0.044 mm (Metric) 0.0007-0.0017 in (US English)

15. check the connecting rod bearing clearance.

Standard Value:

0.16-0.342 mm (Metric) 0.006-0.0135 in (US English)

#### Installation Procedure:

1. install piston rings.

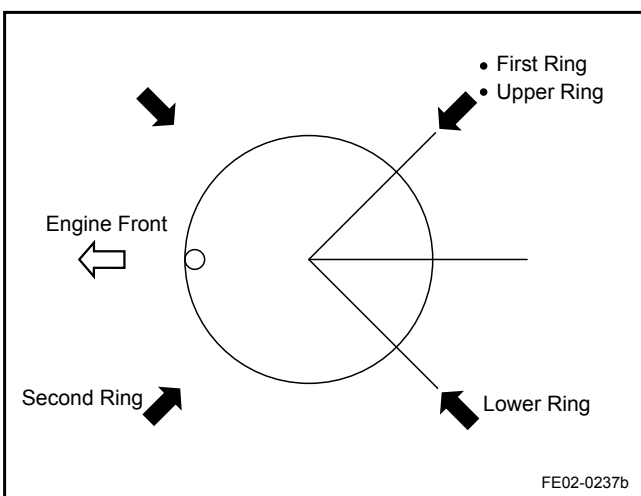
#### Note

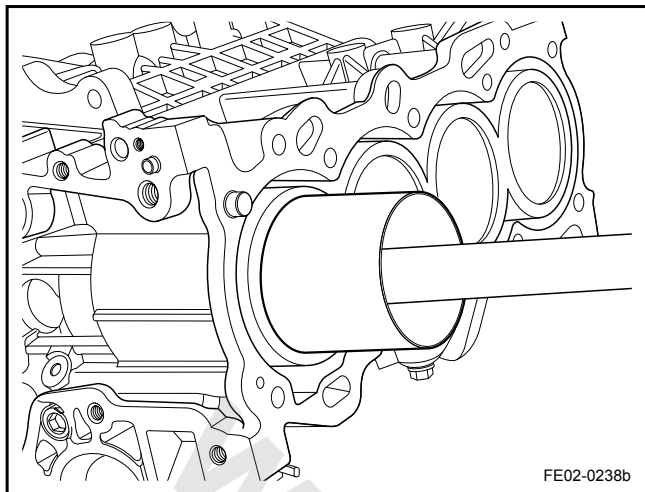
Note when installing the piston rings do not expand too much, otherwise it will break piston rings.

2. Install the piston rings to the location as shown in the graphic.

#### Note

Oil ring opening can not be parallel to the piston pin axis.

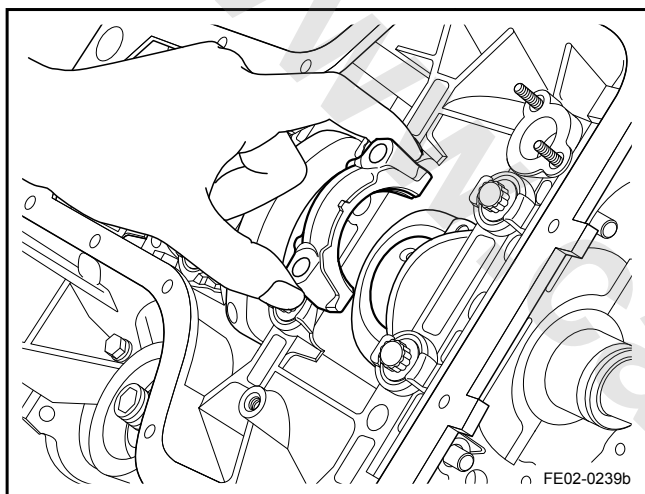




3. With the new engine oil lubricate the cylinder wall.
4. With the new engine oil lubricate the piston, use universal tools and wood handle to install cylinder No.1 piston rod components marked with cylinder No.1 location.

#### Note

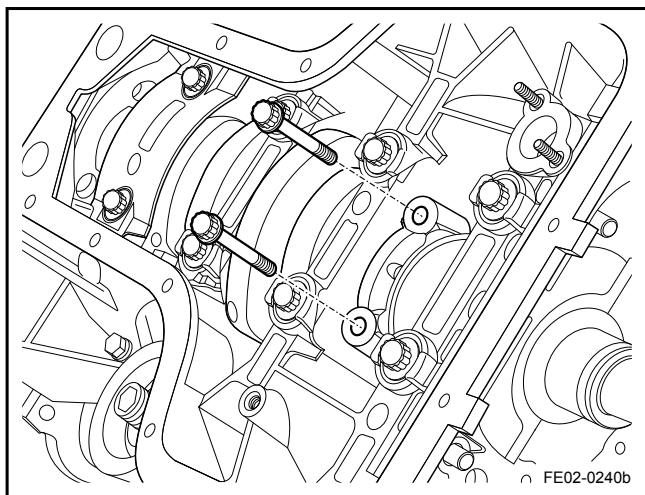
The dot mark on the piston top surface should face the engine front end. Note that during the installation process prevent the lower connecting rod hitting the crankshaft journal, causing damage.



5. Install the cylinder No.1 connecting rod bearing cap marked with cylinder No.1 location.

#### Note

The dot mark on the bearing cap should face the engine front end.

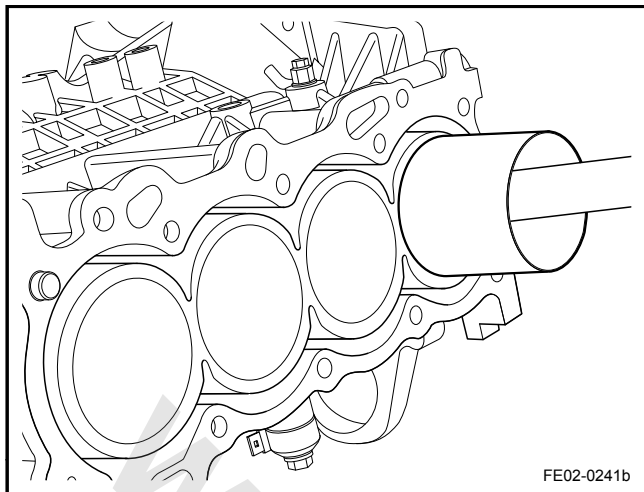


6. Install and tighten cylinder No.1 connecting rod bearing cap bolts.

#### Torque

First Pass: 20 Nm (Metric) 14.8 lb-ft (US English)

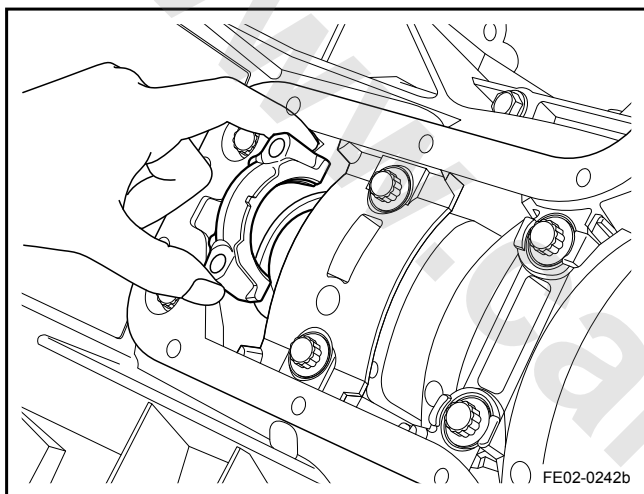
Second Pass: 51 Nm (Metric) 37.8 lb-ft (US English)



7. With a small amount of new engine oil lubricate the piston, use universal tools and a wood handle to install cylinder No.4 piston rod components marked with cylinder No.4 location.

**Note**

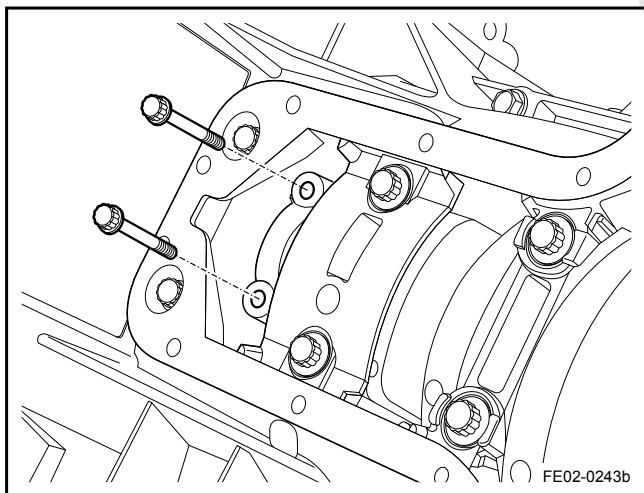
The dot mark on the piston top surface should face the engine front end. Note that during the installation process prevent the lower connecting rod hitting the crankshaft journal, causing damage.



8. Install the cylinder No.4 connecting rod bearing cap marked with cylinder No.4 location.

**Note**

The dot mark on the bearing cap should face the engine front end.

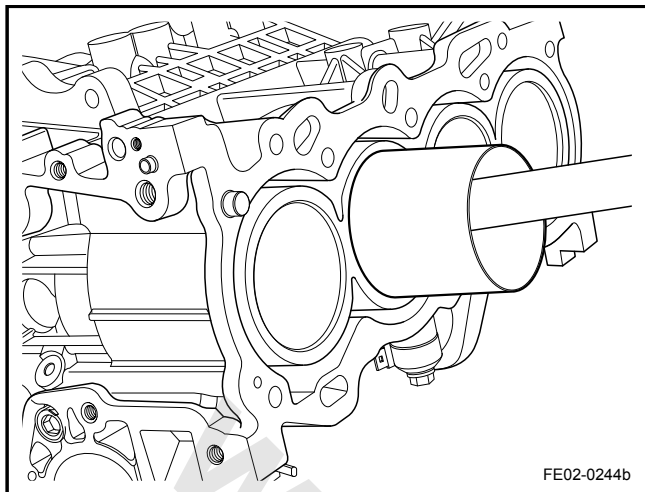


9. Install and tighten cylinder No.1 connecting rod bearing cap bolts.

**Torque**

First Pass: 20 Nm (Metric) 14.8 lb-ft (US English)

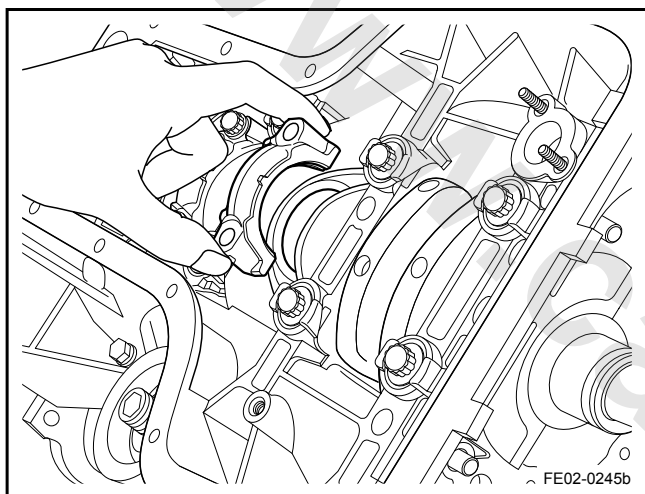
Second Pass: 51 Nm (Metric) 37.8 lb-ft (US English)



10. Rotate the crankshaft 180 °, so that cylinder No.2 and 3 are at BDC positions. With the new engine oil lubricate the piston, use universal tools and a wood handle to install cylinder No.2 piston connecting rod component marked with cylinder No.2 location.

#### Note

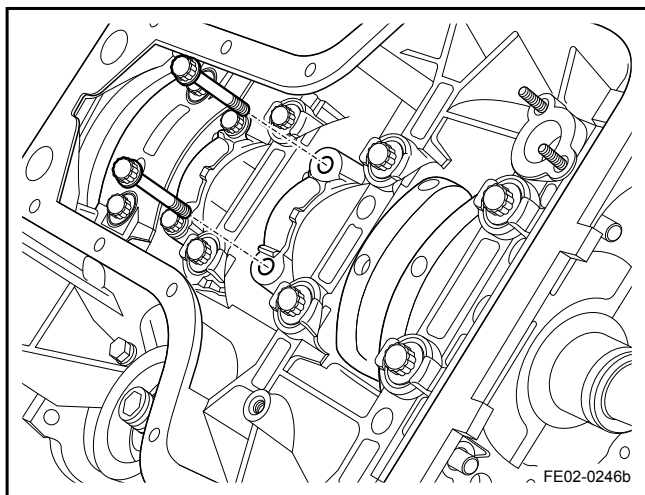
The dot mark on the piston top surface should face the engine front end. Note that during the installation process prevent the lower connecting rod hitting the crankshaft journal, causing damage.



11. Install the cylinder No.2 connecting rod bearing cap marked with cylinder No.2 location.

#### Note

The dot mark on the bearing cap should face the engine front end.



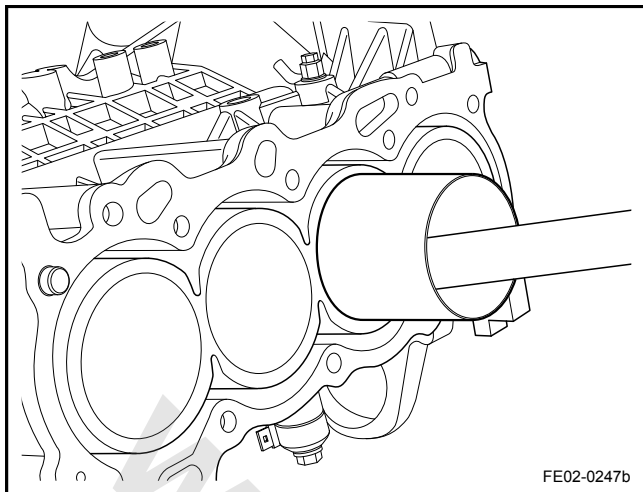
12. Install and tighten cylinder No.2 connecting rod bearing cap bolts.

#### Torque

First Pass: 20 Nm (Metric) 14.8 lb-ft (US English)

Second Pass: 51 Nm (Metric) 37.8 lb-ft (US English)

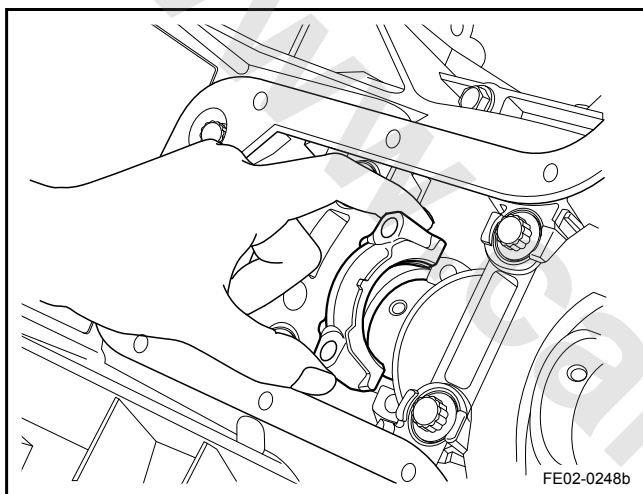




13. With the new engine oil lubricate the piston, use universal tools and a wood handle to install cylinder No.3 piston connecting rod component marked with cylinder No.3 location.

**Note**

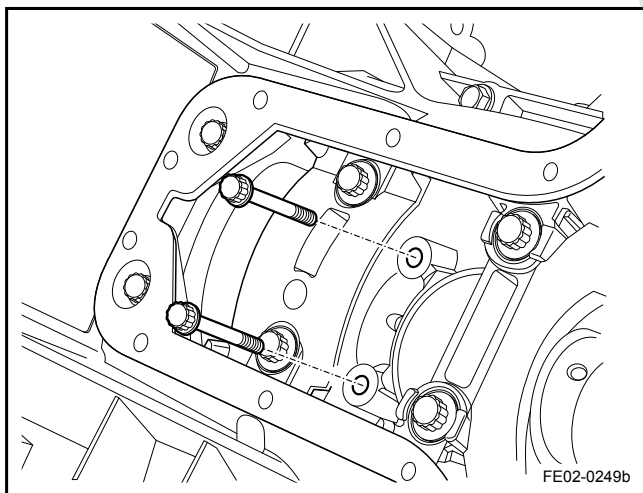
The dot mark on the piston top surface should face the engine front end. Note that during the installation process prevent the lower connecting rod hitting the crankshaft journal, causing damage.



14. Install  
Install the cylinder No.3 connecting rod bearing cap marked with cylinder No.3 location.

**Note**

The dot mark on the bearing cap should face the engine front end.

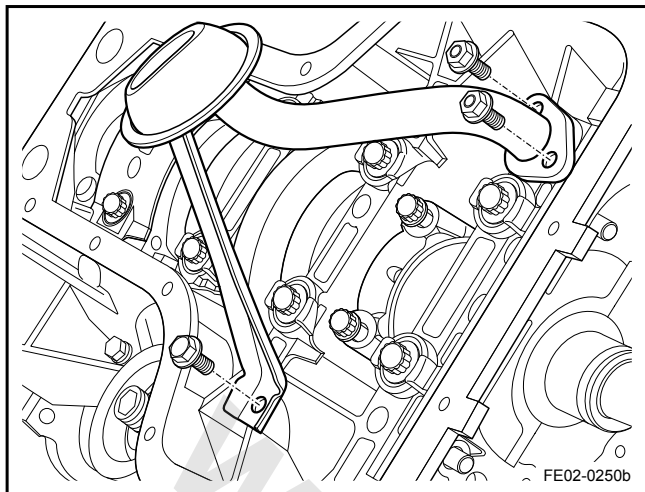


15. Install and tighten cylinder No.3 connecting rod bearing cap bolts.

**Torque**

First Pass: 20 Nm (Metric) 14.8 lb-ft (US English)

Second Pass: 51 Nm (Metric) 37.8 lb-ft (US English)



16. Install the filters.
17. Install the oil pan.
18. Install the cylinder head.
19. Install the engine assembly.

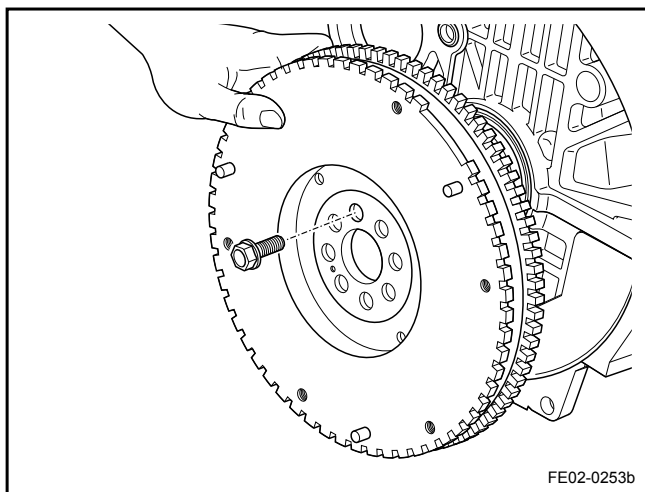
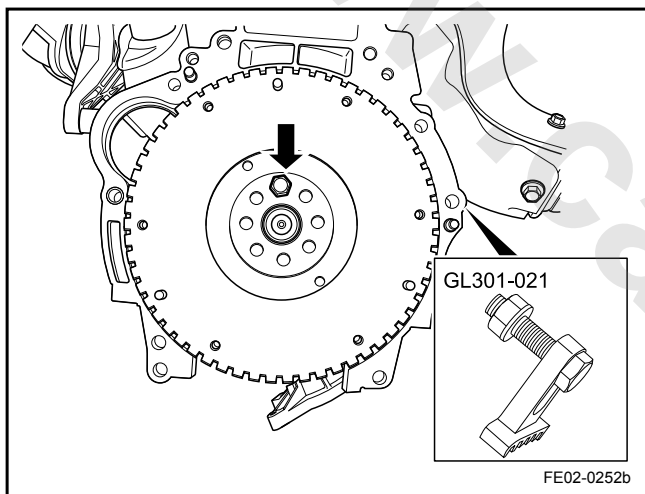
### 2.6.8.17 Flywheel Replacement

#### Removal Procedure:

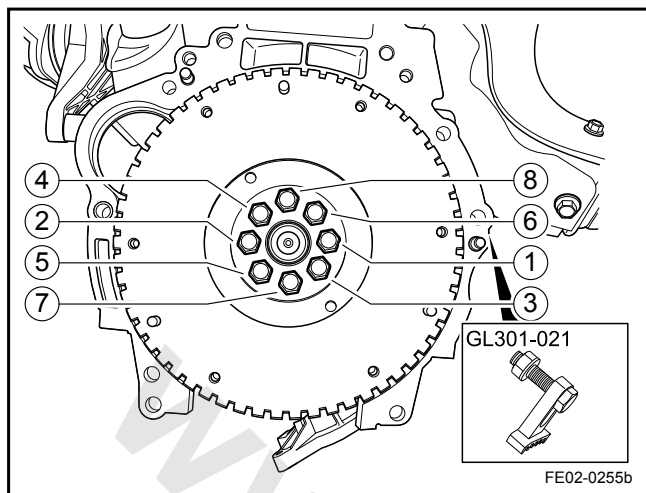
1. Remove the gearbox assembly. Refer to [3.3.8.3 Transmission Assembly Replacement](#).
2. Remove the clutch assembly. Refer to [3.2.6.5 Clutch Assembly Replacement](#).
3. Use a special tool GL301-021 to prevent the crankshaft rotation.
4. Remove the flywheel retaining bolts, leaving the last bolt at the top of the crankshaft in order to stabilize the flywheel.
5. Hold the engine flywheel and remove the last bolt.

#### Note

Be careful when remove the last bolt avoid the flywheel drop.







#### Installation Procedure:

1. Install new bolts to the engine flywheel, but do not tighten at this stage.

#### Note

Apply adhesive on the bolts.

Adhesive: Thread Locking Sealant.

2. Install a special tool GL301-021 to prevent the crankshaft rotating.
3. Install and tighten the engine flywheel bolts to the specified torque, according to the sequence in the graphic.

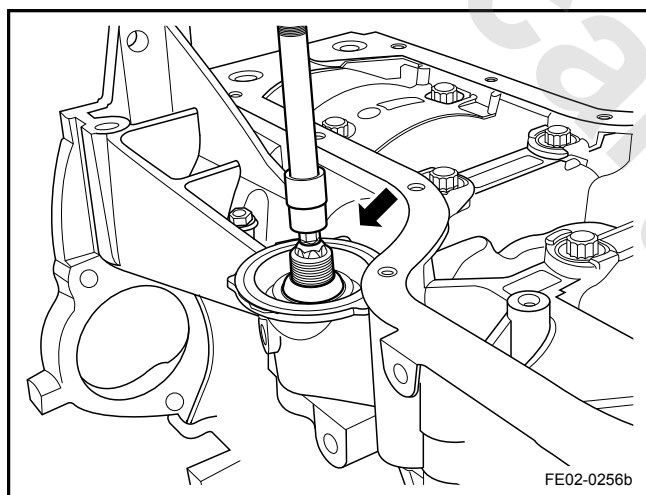
Torque: 88 Nm (Metric) 65.1 lb-ft (US English)

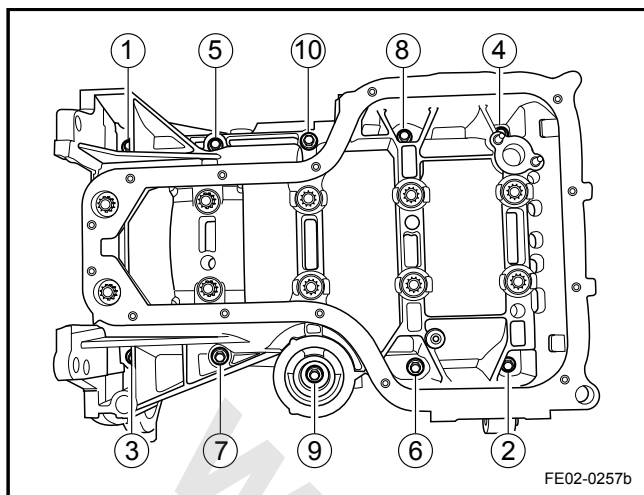
4. Install the clutch assembly.
5. Install the gearbox assembly.

### 2.6.8.18 Crankshaft Replacement

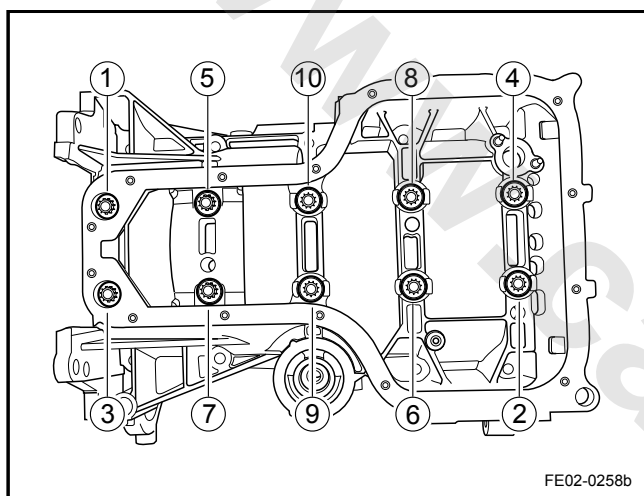
#### Removal Procedure:

1. Remove the engine. Refer to [2.6.8.13 Engine Replacement](#).
2. Remove the gearbox. Refer to [3.3.8.3 Transmission Assembly Replacement](#).
3. Remove the flywheel. Refer to [2.6.8.17 Flywheel Replacement](#).
4. Remove the crankshaft oil seals.
5. Remove the cylinder head cover. Refer to [2.6.8.14 Cylinder Head Assembly Replacement](#).
6. Remove the oil pump. Refer to [2.9.8.1 Oil Pump Replacement](#).
7. Remove the oil pan. Refer to [2.9.8.3 Oil Pan Replacement](#).
8. Remove the piston connecting rod and bearing. Refer to [2.6.8.16 Piston Connecting Rod and Bearing Replacement](#).
9. Remove the oil filter bolts.





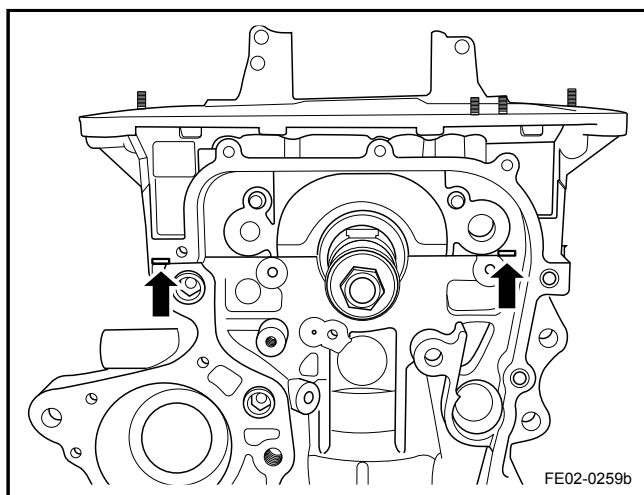
10. Remove the crankcase retaining bolts according to the sequence in the graphic.



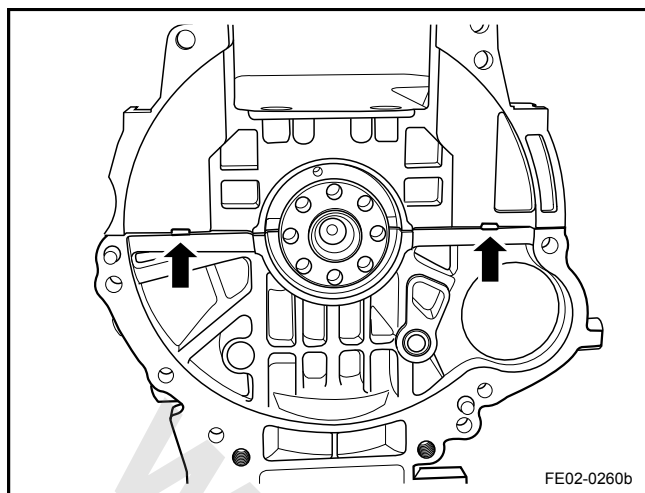
11. Remove the crankshaft bearing cap bolts according to the sequence in the graphic.

**Note**

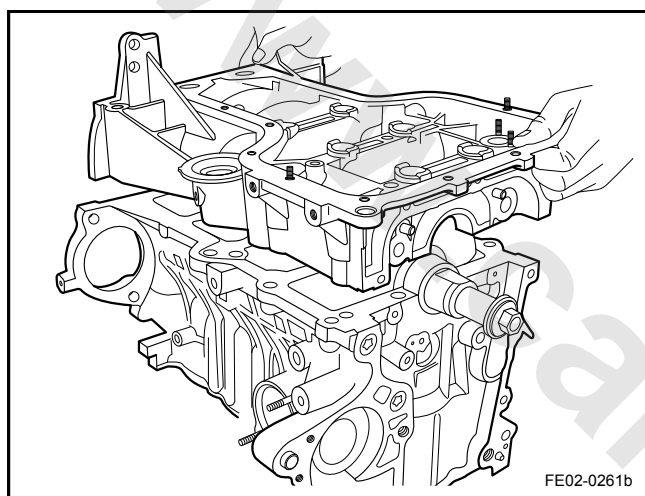
Do not loose a single bolt completely. Remove the bolt in multiple operations, otherwise it may cause damage to the crankshaft.



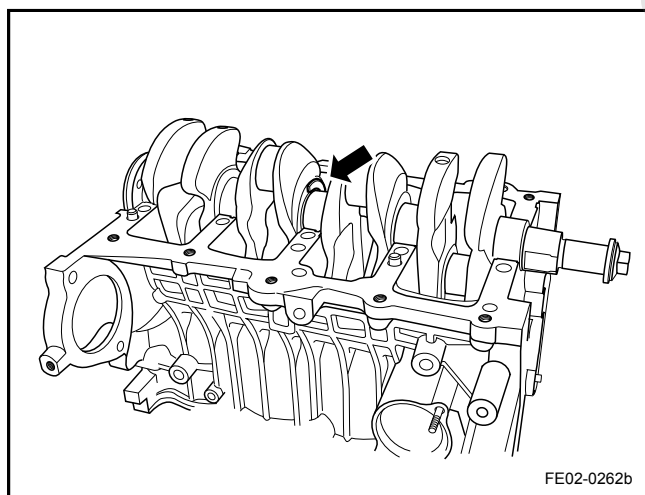
12. Insert a flat screwdriver into the position shown in the graphic and loosen the crankcase front end.



13. Insert a flat screwdriver into the position shown in the graphic and loosen the crankcase rear end.



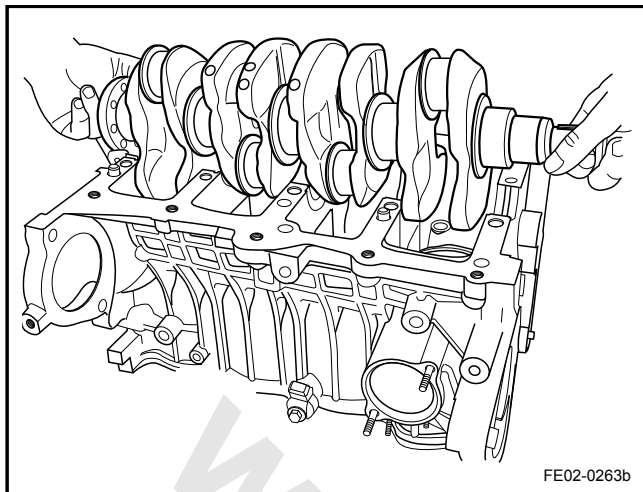
14. Remove the crankcase.



15. Remove the No.3 bearing crankshaft thrust film.

**Note**

Rotate the crankshaft, so that thrust film turns to facilitate removal.



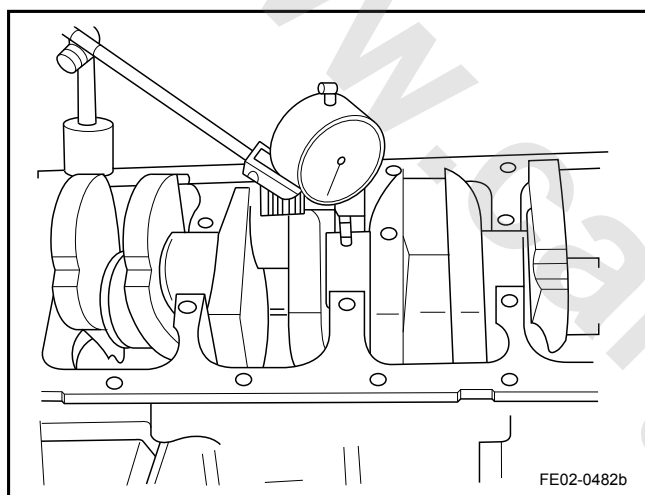
16. Remove the crankshaft.

Crankshaft inspection, the crankshaft bearing clearance matching inspection procedure:

1. Measure the main bearing bore diameter with an inner diameter micrometer and record.
2. Measure the crankshaft axis with an outside diameter micrometer and record.
3. Select the crankshaft main bearing sizes according to the recorded sizes in the following table .

Main Bearing Bore Diameter (mm/in)	Crank Spindle Diameter (mm/in)	Thickness Of The Main Bearing (mm/in)
52.005-52.011 / 2.0474-2.0477 (No.1)	47.994-48 / 1.8895-1.8898 (No.1)	$1.993 \leq t \leq 1.996$ 0.0785 $\leq t \leq 0.0786$ (No.2)
52.011-52.017 / 2.0477-2.0479 (No.2)	47.994-48 / 1.8895-1.8898 (No.1)	$1.996 \leq t \leq 1.999$ 0.0786 $\leq t \leq 0.0787$ (No.3)
52.005-52.011 / 2.0474-2.0477 (No.1)	47.988-47.994 / 1.8893-1.8895 (No.2)	$1.999 \leq t \leq 2.002$ 0.0787 $\leq t \leq 0.0788$ (No.4)
52.017-52.021 / 2.0479-2.0481 (No.3)	47.994-48 / 1.8895-1.8898 (No.1)	
52.005-52.011 / 2.0474-2.0477 (No.1)	47.982-47.988 / 1.8891-1.8893 (No.3)	

Main Bearing Bore Diameter (mm/in)	Crank Spindle Diameter (mm/in)	Thickness Of The Main Bearing (mm/in)
52.011-52.017 / 2.0477-2.0479 (No.2)	47.982-47.988 / 1.8891-1.8893 (No.3)	$2.002 \leq t \leq 2.005/0.0788 \leq t \leq 0.0789$ (No. 5)
52.017-52.021 / 2.0479-2.0481 (No.3)	47.988-47.994 / 1.8893-1.8895 (No.2)	
52.017-52.021 / 2.0479-2.0481 (No.3)	47.982-47.988 / 1.8891-1.8893 (No.3)	$2.005 \leq t \leq 2.008/0.0789 \leq t \leq 0.0791$ (No. 6)



4. Install the crankshaft bearing crankshaft and check whether the middle of the crankshaft journal has acceptable loss of roundness and the beating degree.

Standard Value:

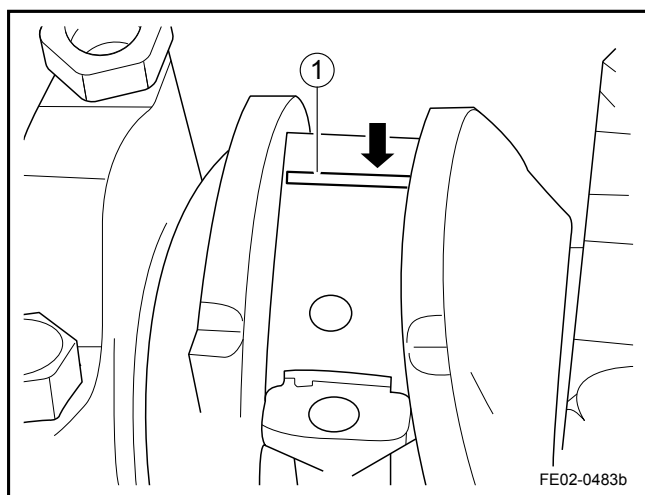
Roundness 0.003 mm (Metric) 0.0001 in (US English)

Run Out 0.02 mm (Metric) 0.0008 in (US English)

5. Check the crankshaft axial clearance.

Standard Value:

0.04-0.24 mm (Metric) 0.0015-0.0094 in (US English)

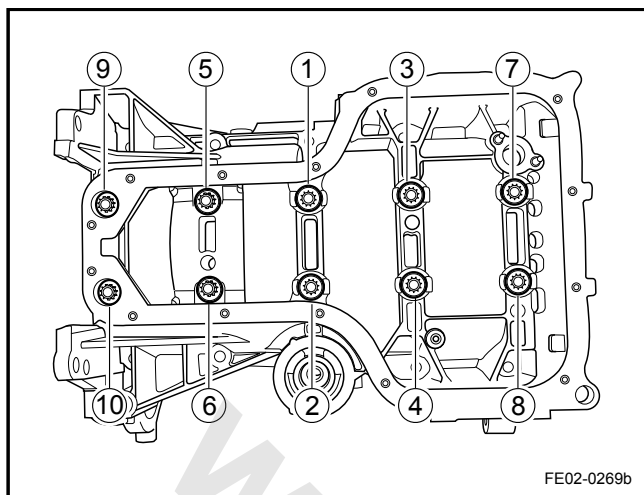


6. With a plastic gap measurement regulator, measure all the crankshaft bearings.

#### Note

Apply grease on the crankshaft journal and crankshaft bearings and lubricate slightly so the plastic gap measurement regulator will not be torn when measure the clearance of the crankshaft bearing cap.

7. According to the width of bearing 1, cut the plastic gap measurement regulator, place the plastic along the axis between the journal and the crankshaft bearings.

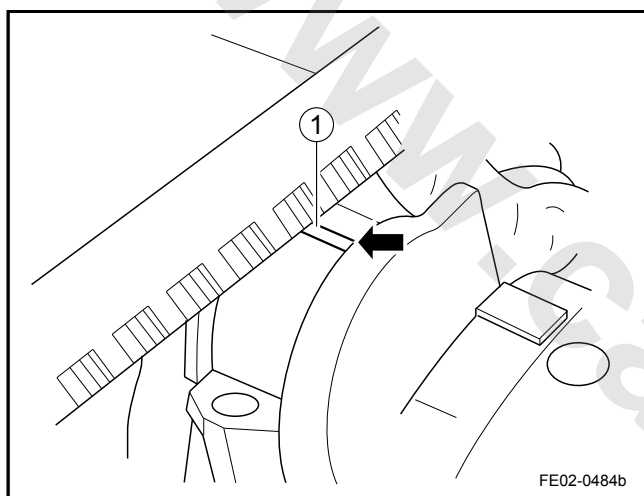


8. Install the crankcase, install and tighten the crankshaft bearing cap bolts according to the sequence shown in the graphic.

#### Torque

First Pass: 44 Nm (Metric) 32.5 lb-ft (US English)

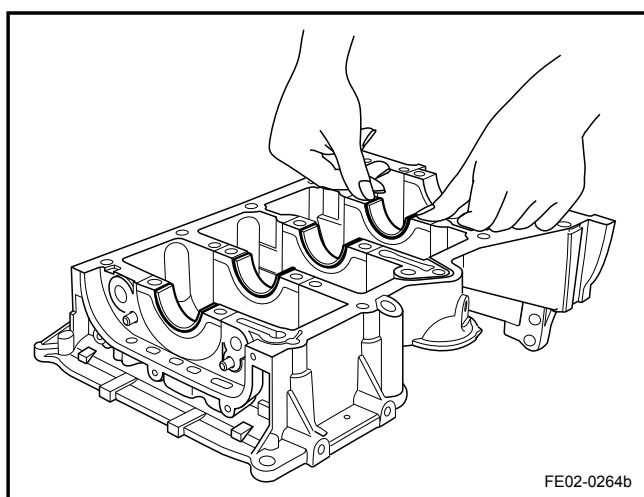
Second Pass: 60 Nm (Metric) 44.5 lb-ft (US English)

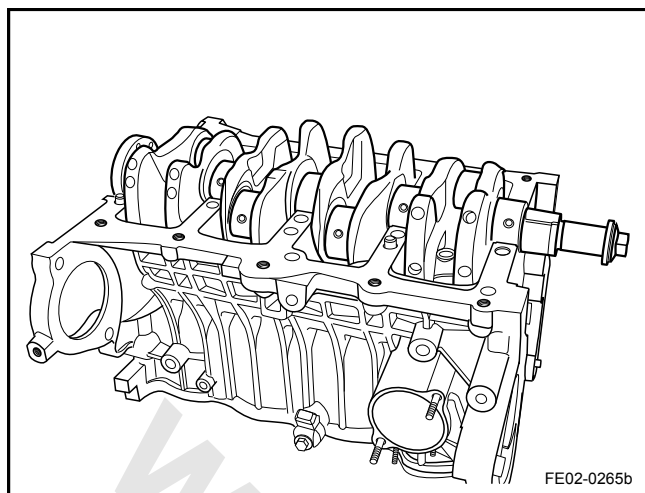


9. Remove the crankcase.
10. Measure the width of the plastic strip, check whether the value of crankshaft bearing clearance is within the following range:  
 Standard Value:  
 0.015-0.033 mm (Metric) 0.0006-0.0013 in (US English)
11. If the gap value is not within the specified range, re-adjust the crankshaft clearance. If necessary, replace the crankshaft.

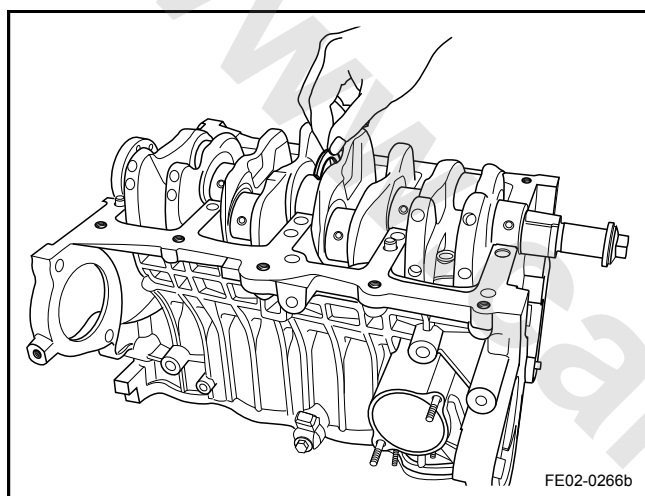
#### Installation Sequence:

1. Clean all the relevant parts.
2. Apply a small amount of engine oil to the crankshaft bearing.
3. Install the selected crankshaft bearings.





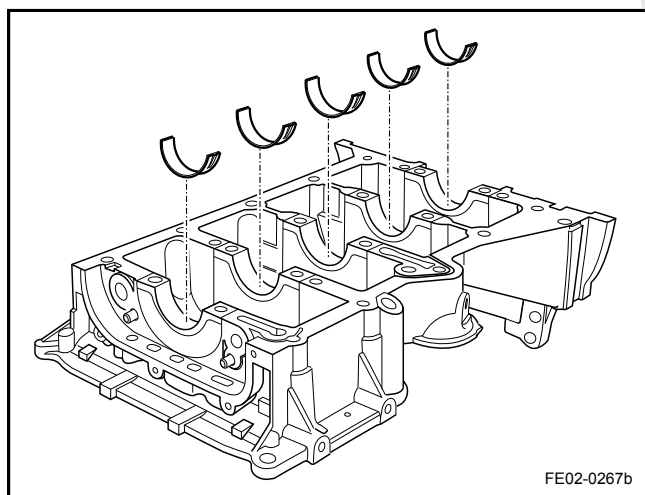
4. Install the crankshaft.



5. Install the crankshaft thrust sheet, with the grooves facing outside.
6. Check the crankshaft axial clearance, to confirm the crankshaft axial clearance is acceptable. Refer to [2.6.1.2 Mechanical System Specification](#).

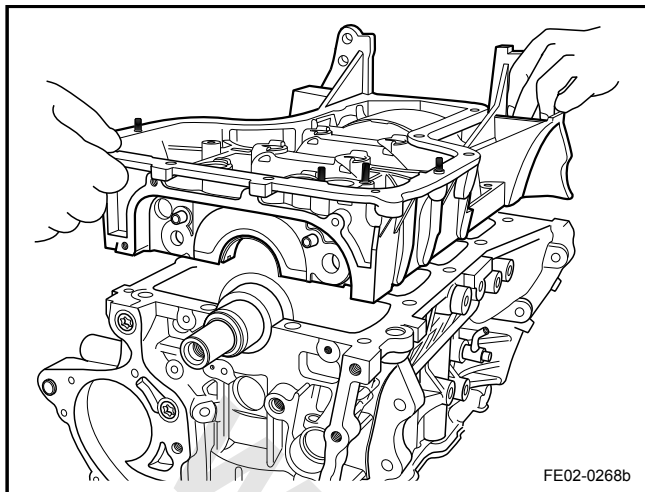
Standard Value:

0.04-0.24 mm (Metric) 0.0015-0.0094 in (US English)



7. Install the crankcase bearings.



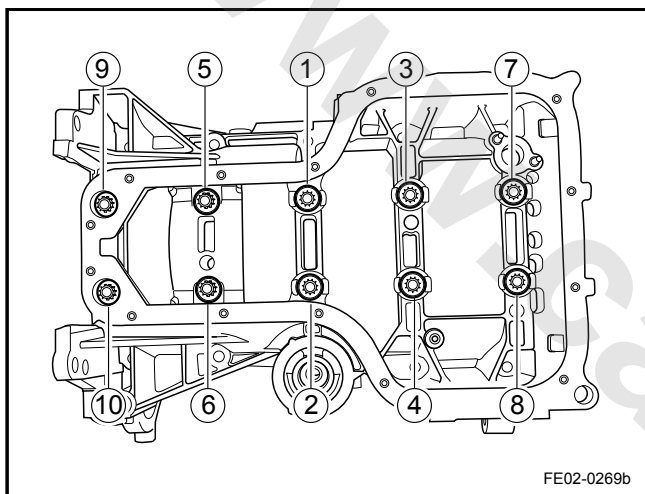


8. After installing the crankshaft in the front and rear crankshaft bearings, check whether the crankshaft journal has acceptable roundness and runout.

#### Note

Apply lubricant to the crankshaft journal and slightly lubricate the crankshaft bearings.

9. Apply sealant evenly on the crankshaft and cylinder block mating surface.
10. Install the crankcase.

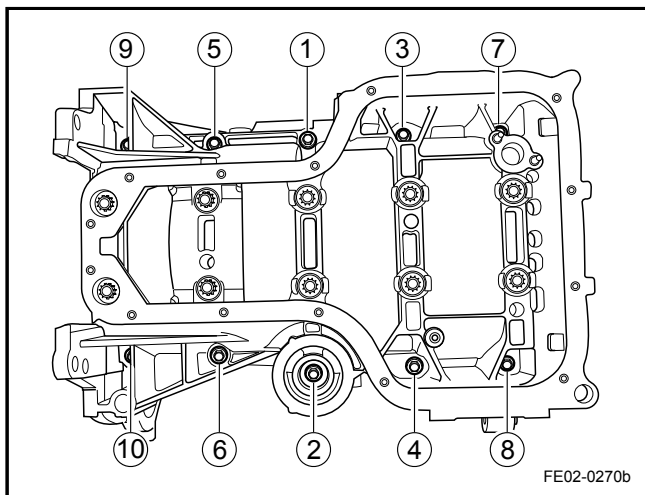


11. Install and tighten the crankshaft bearing cap bolts according to the sequence shown in the graphic.

#### Torque

First Pass: 44 Nm (Metric) 32.5 lb-ft (US English)

Second Pass: 60 Nm (Metric) 44.5 lb-ft (US English)

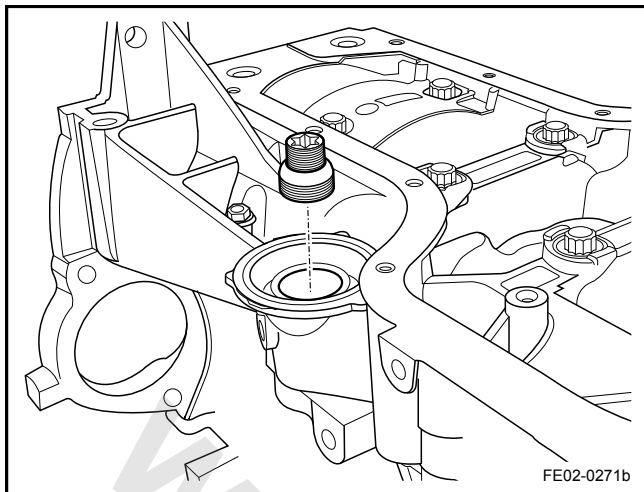


12. Install the crankcase retaining bolt.

#### Torque

18 Nm (Metric) 13.4 lb-ft (US English)



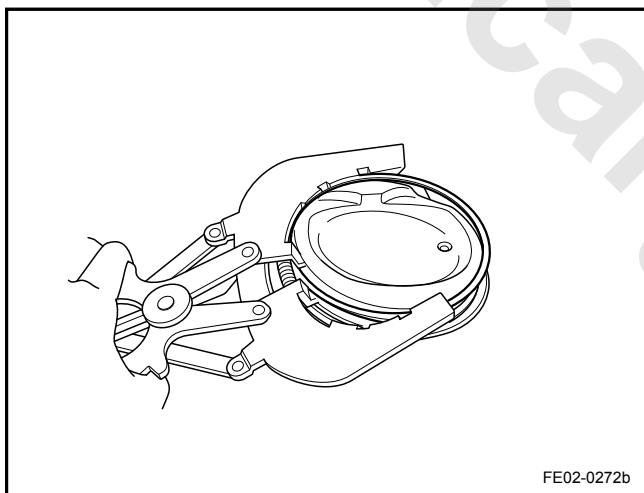


13. Install the oil filter retaining bolts.  
Torque  
20 Nm (Metric) 14.8 lb-ft (US English)
14. Install pistons, connecting rods and bearings.
15. Install sump.
16. Install the oil pan.
17. Install the cylinder head.
18. Install the crankshaft oil seals.
19. Install the flywheel.
20. Install the gearbox.
21. Install the engine.

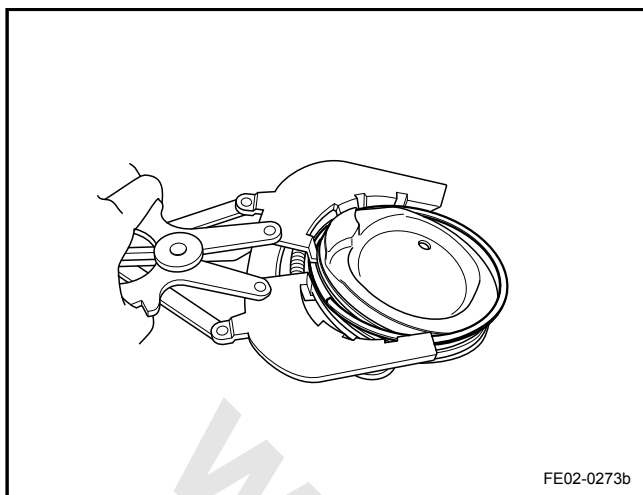
#### 2.6.8.19 Piston Rod Disassemble, Assemble and Inspection

##### Removal Procedure:

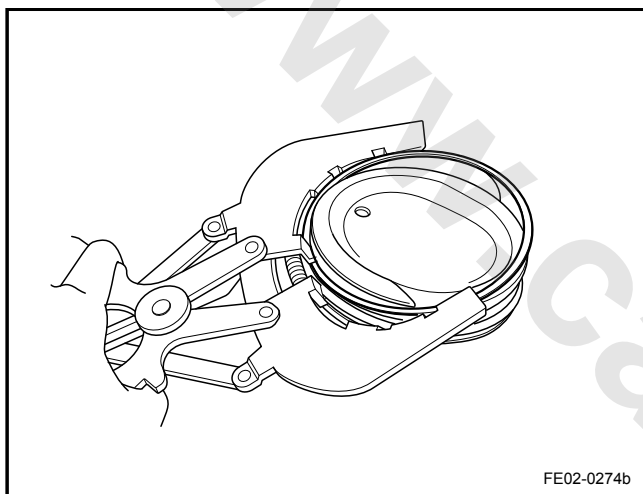
1. Remove the piston rod components. Refer to [2.6.8.16 Piston Connecting Rod and Bearing Replacement](#).
2. Remove the first gas ring.



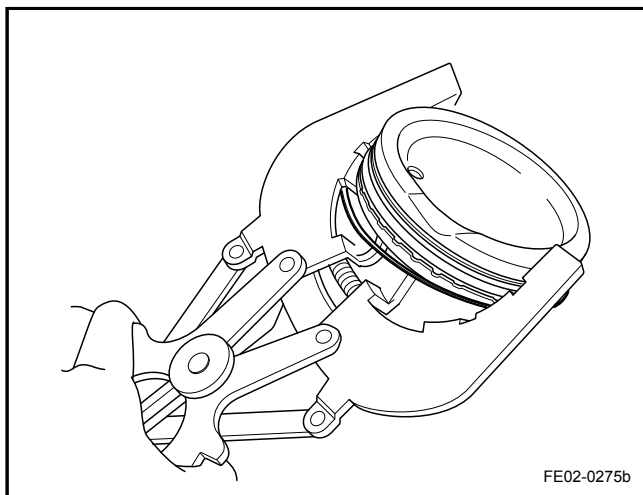
3. Remove the second air ring.

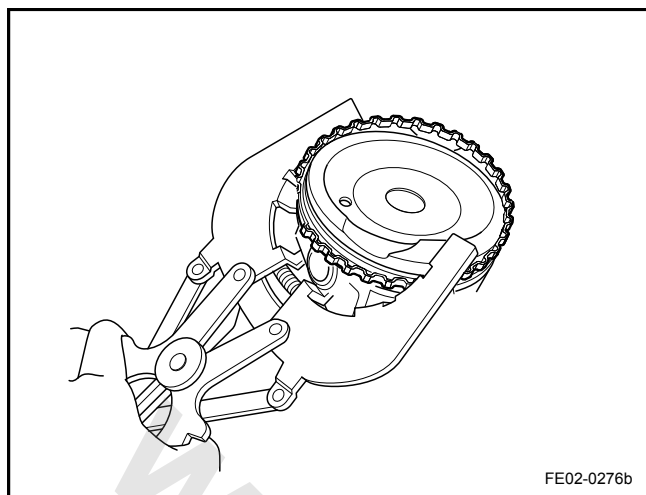


4. Remove the oil ring upper ring combination.

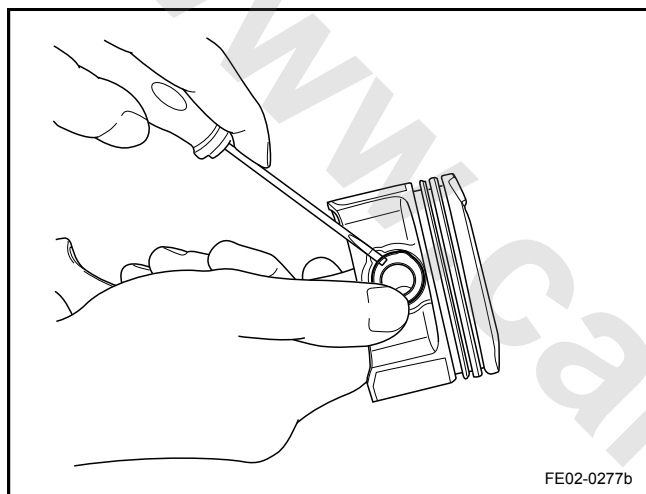


5. Remove the oil ring lower ring combination.

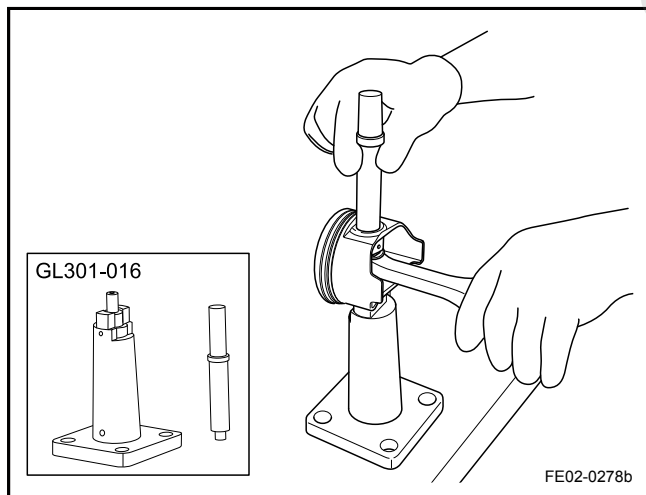




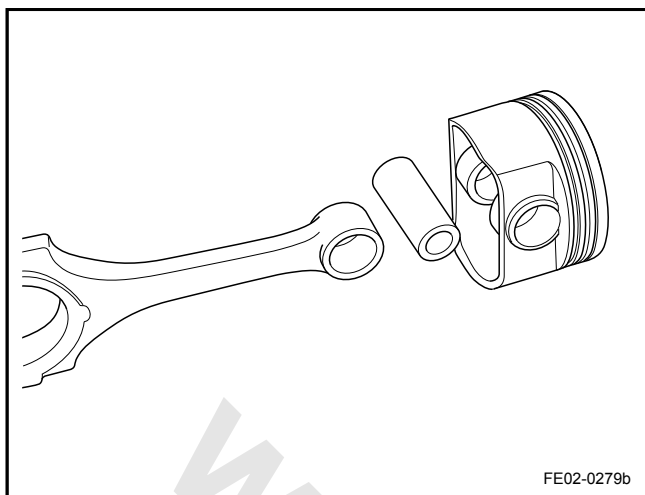
6. Remove the oil ring.



7. Remove the piston pin circlip at both ends.



8. With a special tool GL301-016 remove the piston pin.



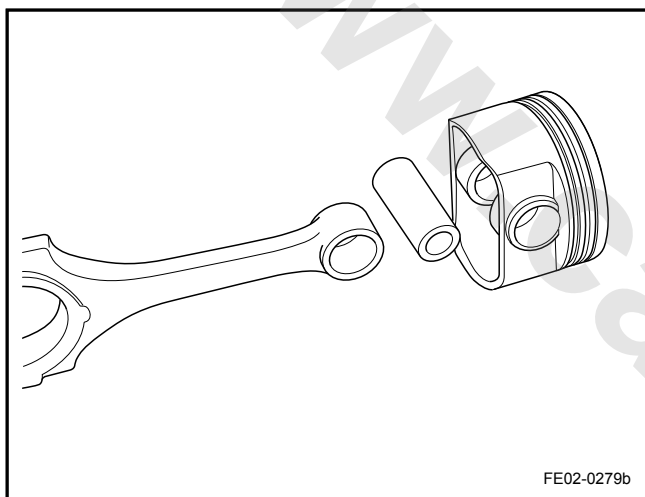
9. Disassemble connecting rod, piston pin and piston are shown in the graphic.

#### Installation Procedure:

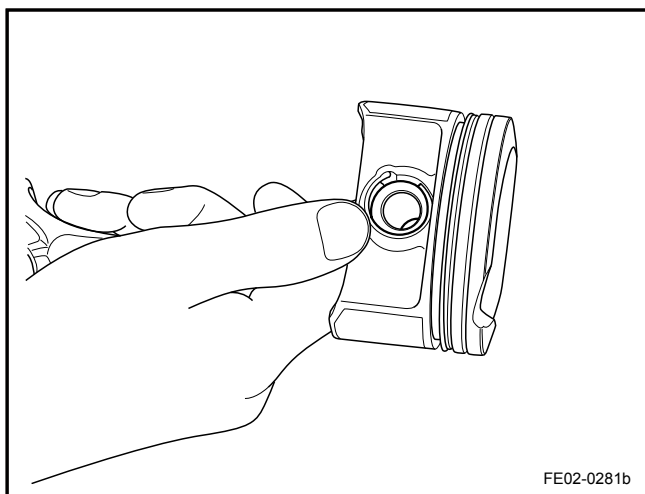
1. Install piston pin, connecting rod and piston.

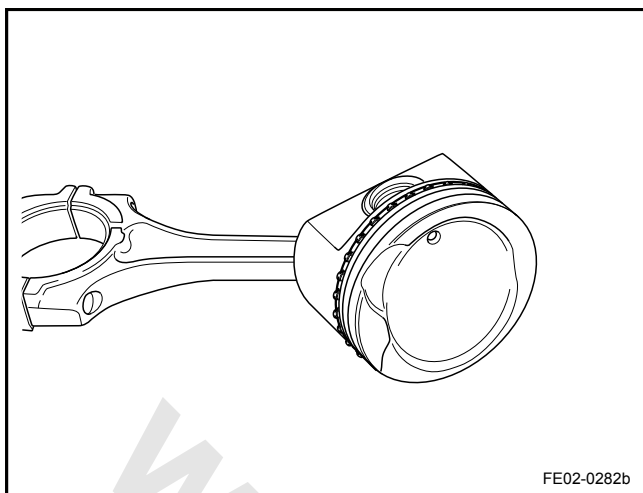
#### Note

During installation, connecting rod bearings mark and the piston mark should face the same the direction.

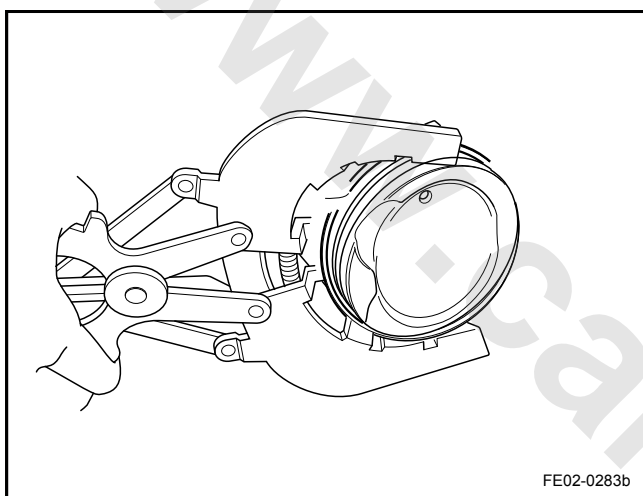


2. Install the piston pin circlip.

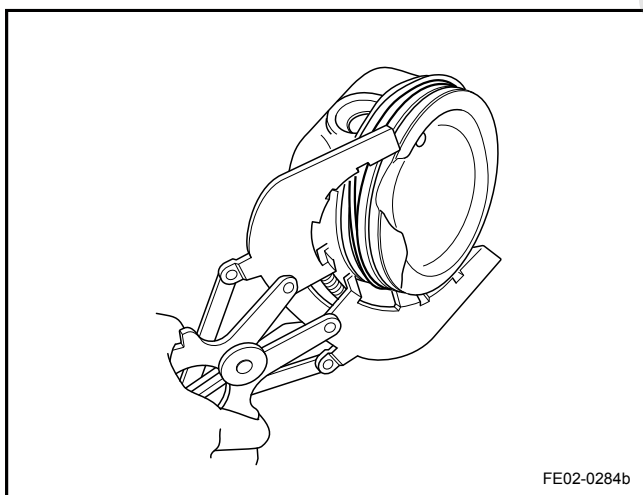




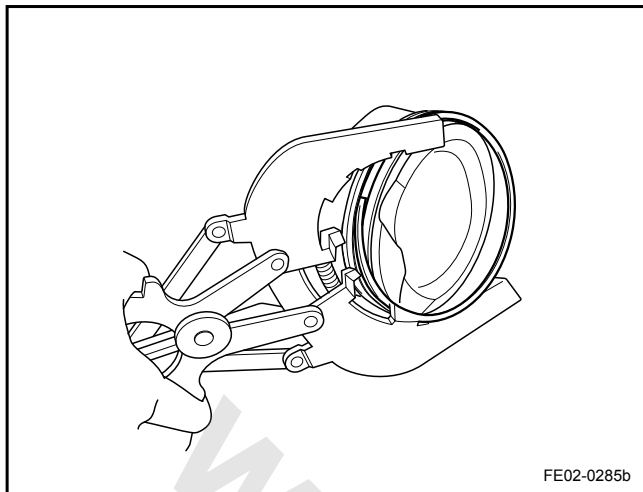
3. Confirm normal movements between the piston and rod without any interference.
4. Check piston pin and connecting rod clearance.  
Standard Value: 0.005-0.011 mm (Metric) 0.0002-0.0004 in (US English)
5. Check the piston and piston pin clearance.  
Standard Value: 0.005-(-0.001) mm (Metric) 0.0002-(-0.0003) in (US English)
6. Install the oil ring.



7. Install the oil ring lower ring combination.



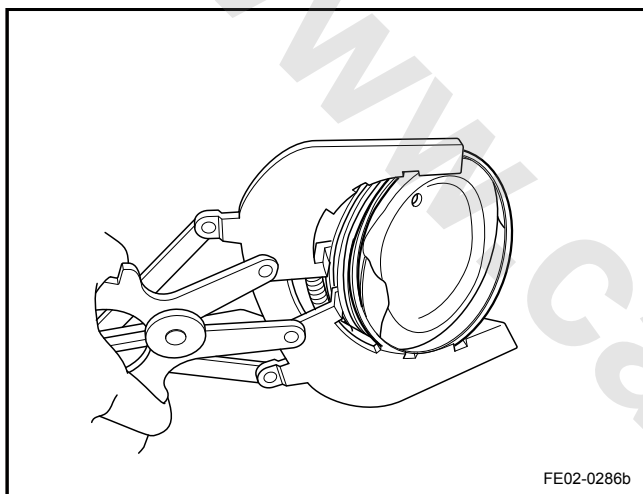
8. Install the oil ring upper ring combination.



9. Install the second air ring.

**Note**

The side with letters should face the top.



10. Install first gas ring.

**Note**

The chamfered side should face the top.

11. Apply the engine oil to the connecting rod bearings and install the connecting rod journal and the bearing cap.

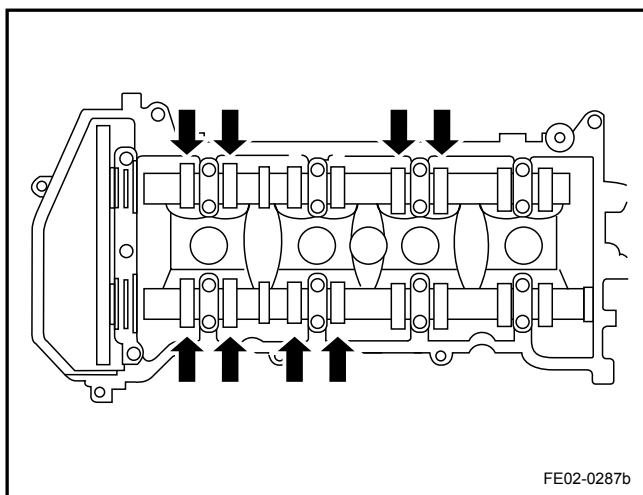
12. Install the connecting rod to the crankshaft. Check whether the bearing clearance is acceptable. Refer to [2.6.1.2 Mechanical System Specification](#).

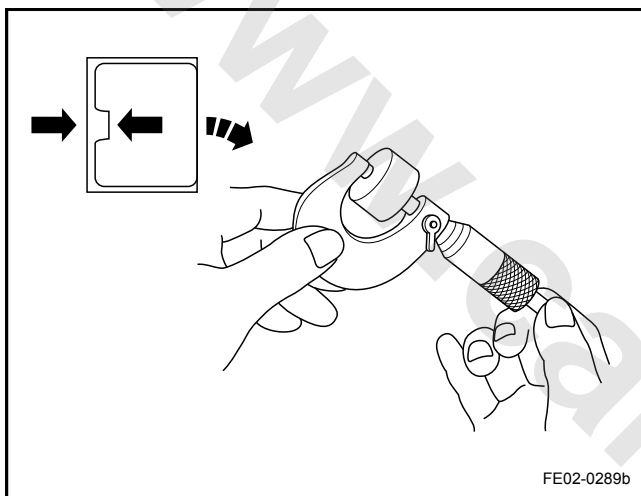
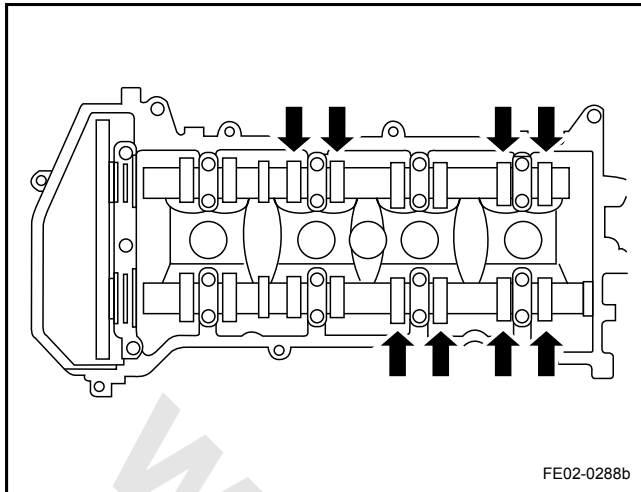
Standard Value: 0.020-0.044 mm (Metric) 0.0007-0.0017 in (US English)

13. Install the piston rod components.

### 2.6.8.20 Valve Clearance Adjustments

1. Remove the engine plastic shield. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
2. Remove the ignition coil. Refer to [2.10.8.3 Ignition Coil Replacement](#).
3. Remove the cylinder head cover. Refer to [2.6.8.2 Cylinder Head Cover Replacement](#).
4. Remove the timing chain cover, rotate the crankshaft so that cylinder No.1 is at TDC position. Refer to [2.6.8.9 Timing Chain Cover Replacement](#).
5. Check valve clearance. Use the plug gage to measure valve clearance value, as arrows shown in the graphic and record the valve location and tolerance that exceeds the tolerance.





6. Rotate the crank a circle (360 °), enable the cylinder No. 4 is at TDC position, measure the clearance as arrow pointed in the graphic and record the clearance.

7. Use a jack to support the engine. Remove the timing chain. Refer to [2.6.8.10 Timing Chain Replacement](#).
8. Remove the camshaft. Refer to [2.6.8.12 Camshaft Replacement](#).
9. Remove the valve lifter that exceeds the tolerances. Use outside diameter micrometer to measure the thickness, according to the following formula calculate the thickness of the new valve lifters.

Intake:  $A = B + C - 0.23 \text{ mm (0.01 in)}$

Exhaust:  $A = B + C - 0.32 \text{ mm (0.13 in)}$

A	New Valve Lifter Thickness
B	Old Valve Lifter Thickness
C	Measured Valve Clearance

10. Selected new valve lifters must be as close as possible to the calculated values. For specifications. Refer to the thickness of the valve lifter [2.6.1.3 Intake and Exhaust Valves Lifter Specifications Table](#).
11. Based on the measurement, according to [2.6.1.4 Intake and Exhaust Valves Lifter Selection Table](#), choose the valve lifter to meet the specifications .
12. Install intake and exhaust camshafts.
13. Install the timing chain.
14. Install the timing chain cover.
15. Install the ignition coil.
16. Install the engine plastic shield.

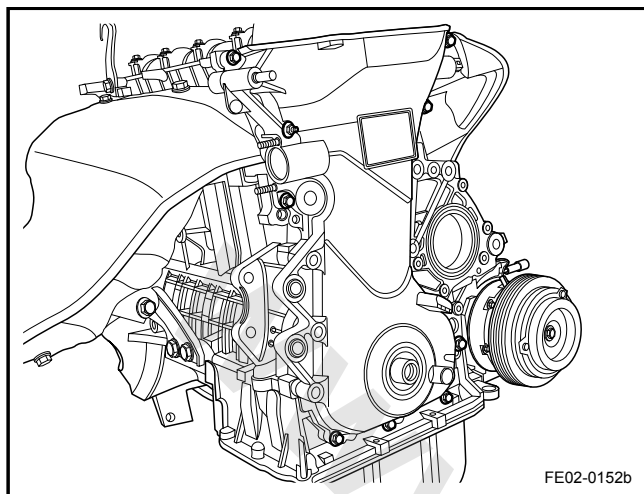
### 2.6.8.21 Crankshaft Front Oil Seal Replacement

#### Removal Procedure:

1. Remove the crankshaft belt plate. Refer to [2.6.8.9 Timing Chain Cover Replacement](#).
2. Remove the crankshaft front oil seals.

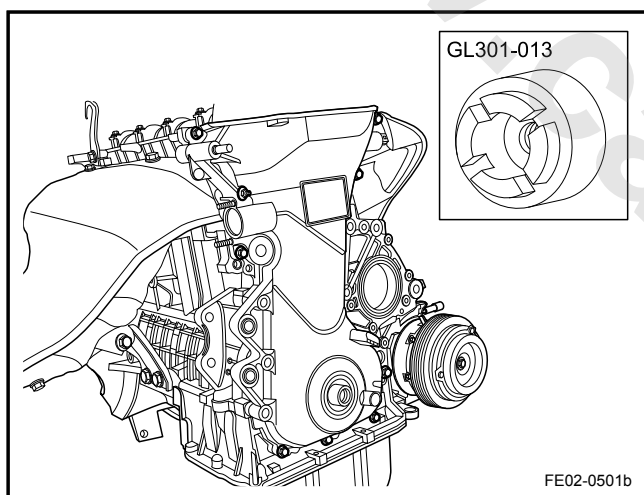
#### Note

Be careful not to damage the crankshaft journal.



#### Installation Procedure:

1. Use a special tool GL301-013 to install the crankshaft front oil seals.
2. Install the crankshaft belt plate.





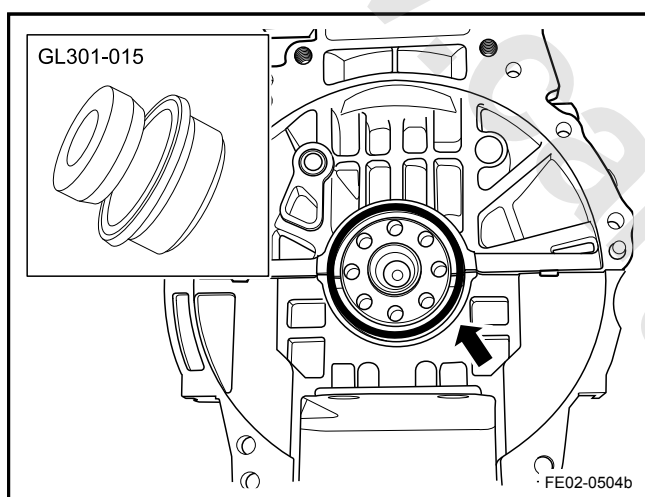
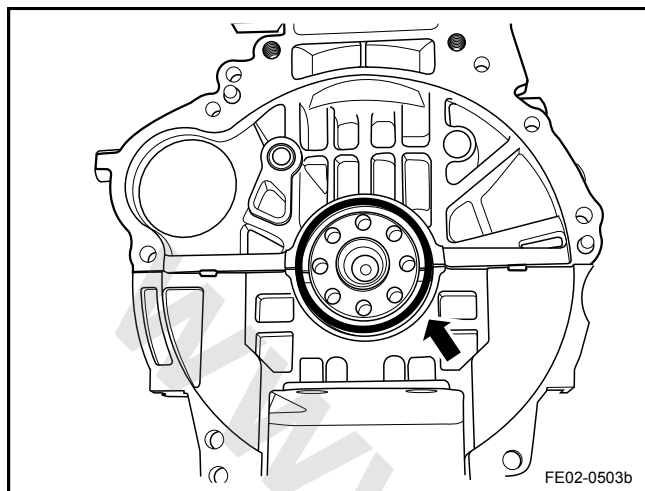
### 2.6.8.22 Crankshaft Rear Oil Seal Replacement

#### Removal Procedure:

1. Remove the flywheel. Refer to [2.6.8.17 Flywheel Replacement](#).
2. Remove the crankshaft rear oil seals.

#### Note

Be careful not to damage the crankshaft journal.

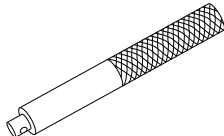
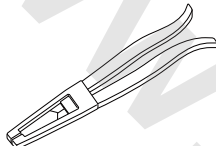
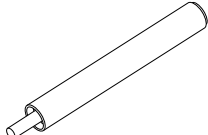
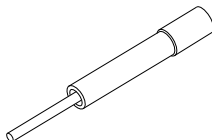


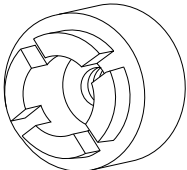
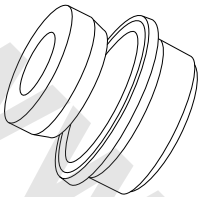
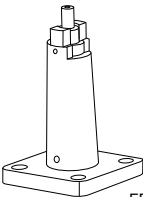
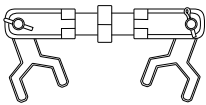
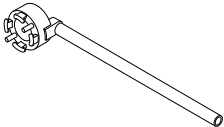
#### Installation Procedure:

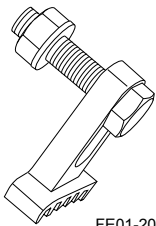
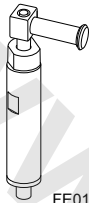
1. Use a special tool GL301-015 to install the crankcase rear oil seals.
2. Install the flywheel.

## 2.6.9 Special Tools and Equipment

## 2.6.9.1 Special Tools List

Serial Number	Illustration	Tool Number	Description
1	 FE01-2014b	GT301-002	Seal Handle
2	 FE01-2015b	GT301-006	Valve Oil Seal Removal Tool
3	 FE01-2016b	GT301-008	Valve Seal Installation Tool
4	 FE01-2017b	GT301-009	Valve Guide Removal Tool

Serial Number	Illustration	Tool Number	Description
5	 <p>FE01-2018b</p>	GT301-013	Crankshaft Front Oil Seal Installation Tool
6	 <p>FE01-2019b</p>	GT301-015	Crankshaft Rear Oil Seal Installation Tool
7	 <p>FE01-2020b</p>	GT301-016	Piston Pin Removal Tool
8	 <p>FE01-2022b</p>	GT301-018	Camshaft Locking Tool
9	 <p>FE01-2029b</p>	GT301-020	Crankshaft Drive Belt Locking Tool

Serial Number	Illustration	Tool Number	Description
10	 <p>FE01-2023b</p>	GT301-021	Flywheel Locking Tool
11	 <p>FE01-2024b</p>	GT301-022	Timing Chain Locking Tool

## 2.7 Exhaust System JL4G18-D

### 2.7.1 Specifications

#### 2.7.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Exhaust Manifold Retaining Nut	M8	20-30	14.8-22.2
Exhaust Manifold Bracket Bolts	M12 × 1.25 × 28	28-42	20.7-31.1
Heat Insulator Bolts	M8 × 25	14-22	10.4-16.3
Three-Way Catalytic Converter and Exhaust Manifold Connecting Bolts	M10 × 1.25 × 65	35-45	25.8-33.2
Three-Way Catalytic Converter With Front Muffler Connecting Bolt	M12 × 1.25 × 45	47-57	34.8-42.2
Three-Way Catalytic Converter With Front Muffler Connection Nut	M12	47-57	34.8-42.2
Front and Rear Muffler Connecting Bolt	M12 × 1.25 × 45	47-57	34.8-42.2
Front and Rear Muffler Connection Nut	M12	47-57	34.8-42.2


## 2.7.2 Description and Operation

### 2.7.2.1 Exhaust Manifold

Exhaust manifold used in this engine is a monolithic four-port manifold, which can be removed from the rear. The function of exhaust manifold is to exhaust gases after combustion with the minimum back-pressure. Pre-Oxygen sensors ( $\text{HO}_2\text{S}$ ) are installed in the three-way catalytic converter front end.

### 2.7.2.2 Three-Way Catalytic Converter

Three-Way catalytic converter is similar to the appearance of the muffler, however, inside the stainless steel shell there is honeycomb-like ceramic substrate in the direction of the exhaust gas. Ceramic liner carriers have been surrounded by the liner, which is used to retain the ceramic carrier and prevent any contact or collision. Each end of the converter has a mesh seals to prevent air pollution and the pad corrosion.




## 2.7.3 System Working Principle

### 2.7.3.1 System Working Principle

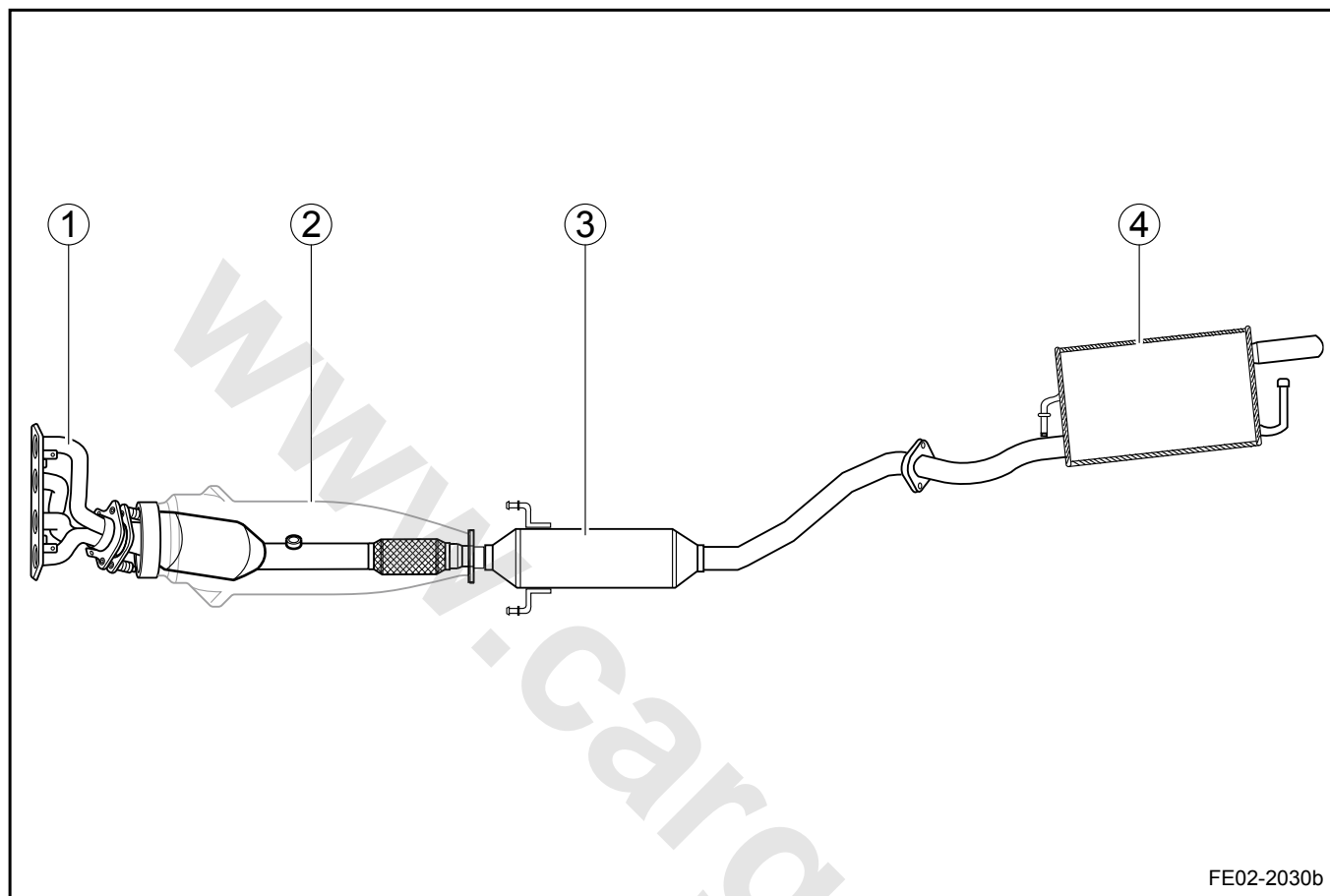
Inside the three-way catalytic converter, the ceramic substrate exposed to emissions is coated with a catalyst. Catalysts containing platinum, palladium and rhodium, three kinds of precious metals. These catalysts promote chemical reactions.

Catalyst is to accelerate the chemical reaction while remain unchanged itself. Engine exhaust contains carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxides (NO<sub>x</sub>). When the exhaust gas flows through the ceramic substrate, the chemical reactions in the three-way catalytic converter occur. Carbon monoxide and hydrocarbons is oxidized by the oxygen in the exhaust gas (O<sub>2</sub>) and turned into carbon dioxide (CO<sub>2</sub>) and water vapor (H<sub>2</sub>O). Nitrogen oxides and carbon monoxide through the reduction reaction, was converted into nitrogen (N<sub>2</sub>). This three-way catalytic converter is called three-way type, because it turns the three components (CO, HC and NO<sub>x</sub>) into harmless neutral gas at the same time.



## 2.7.4 Component Locator

### 2.7.4.1 Exhaust



FE02-2030b

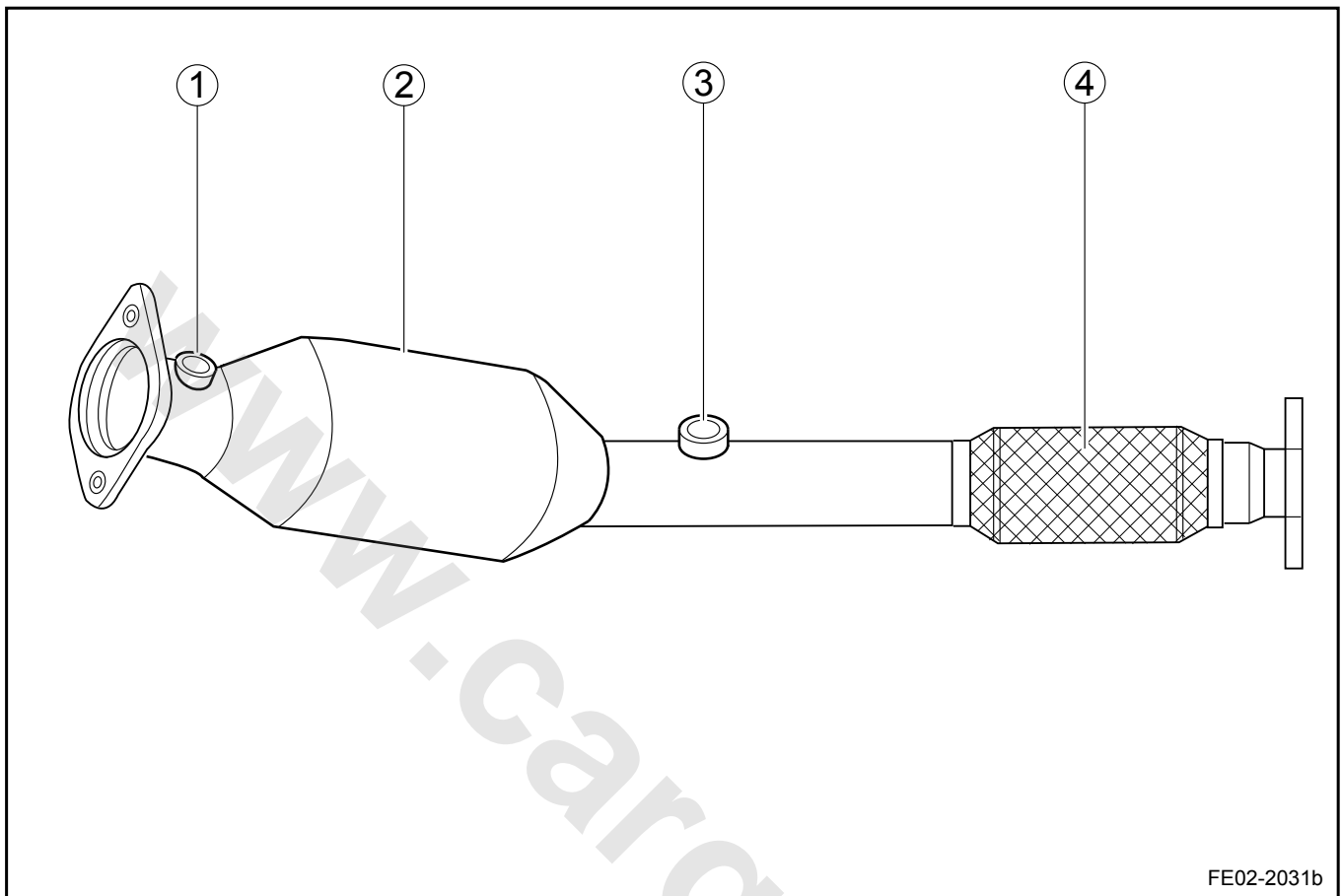
#### Legend

1. Exhaust Manifold
2. Three-Way Catalytic Converter Assembly
3. Front Muffler

4. Rear Muffler



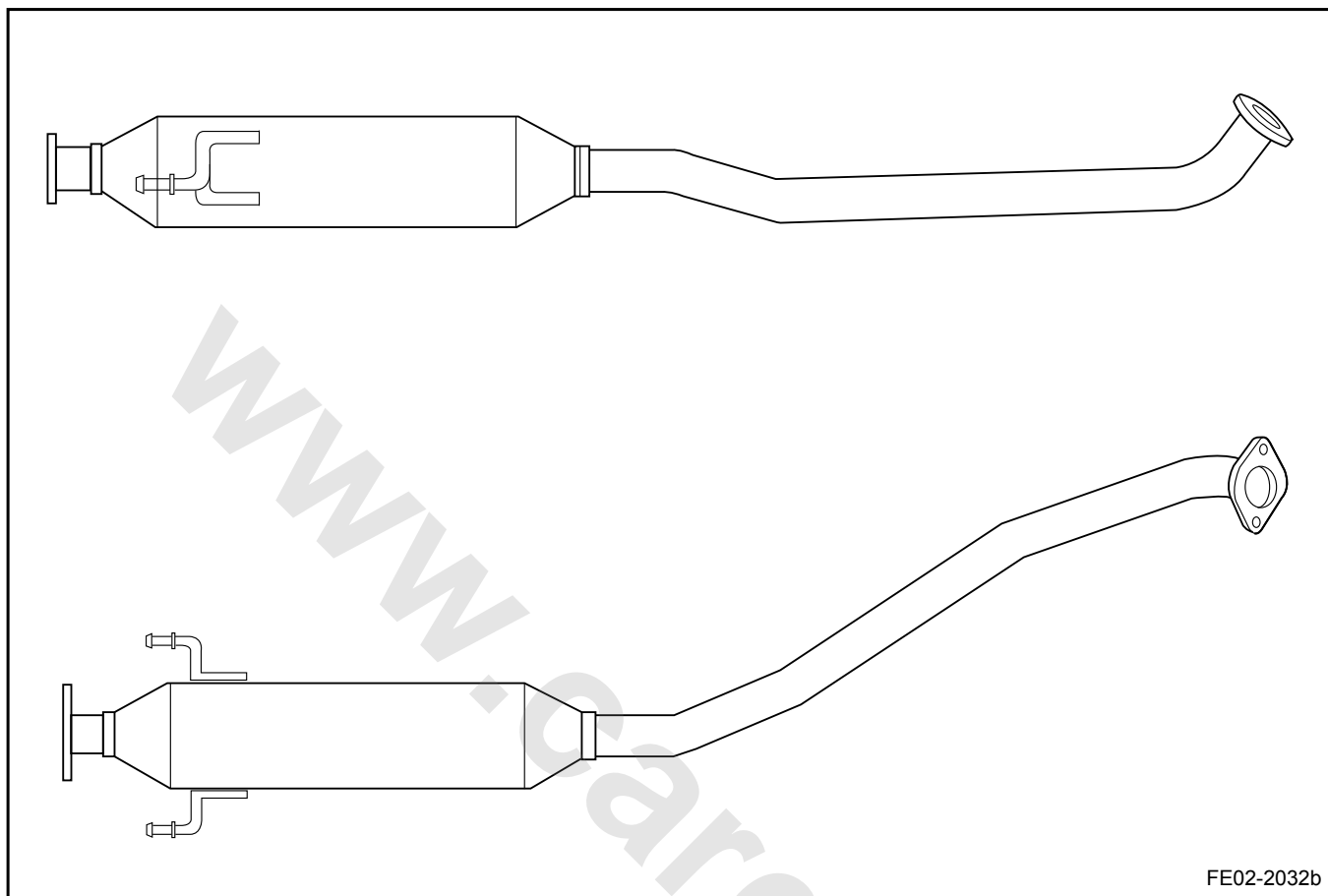
### 2.7.4.2 Three-Way Catalytic Converter Assembly



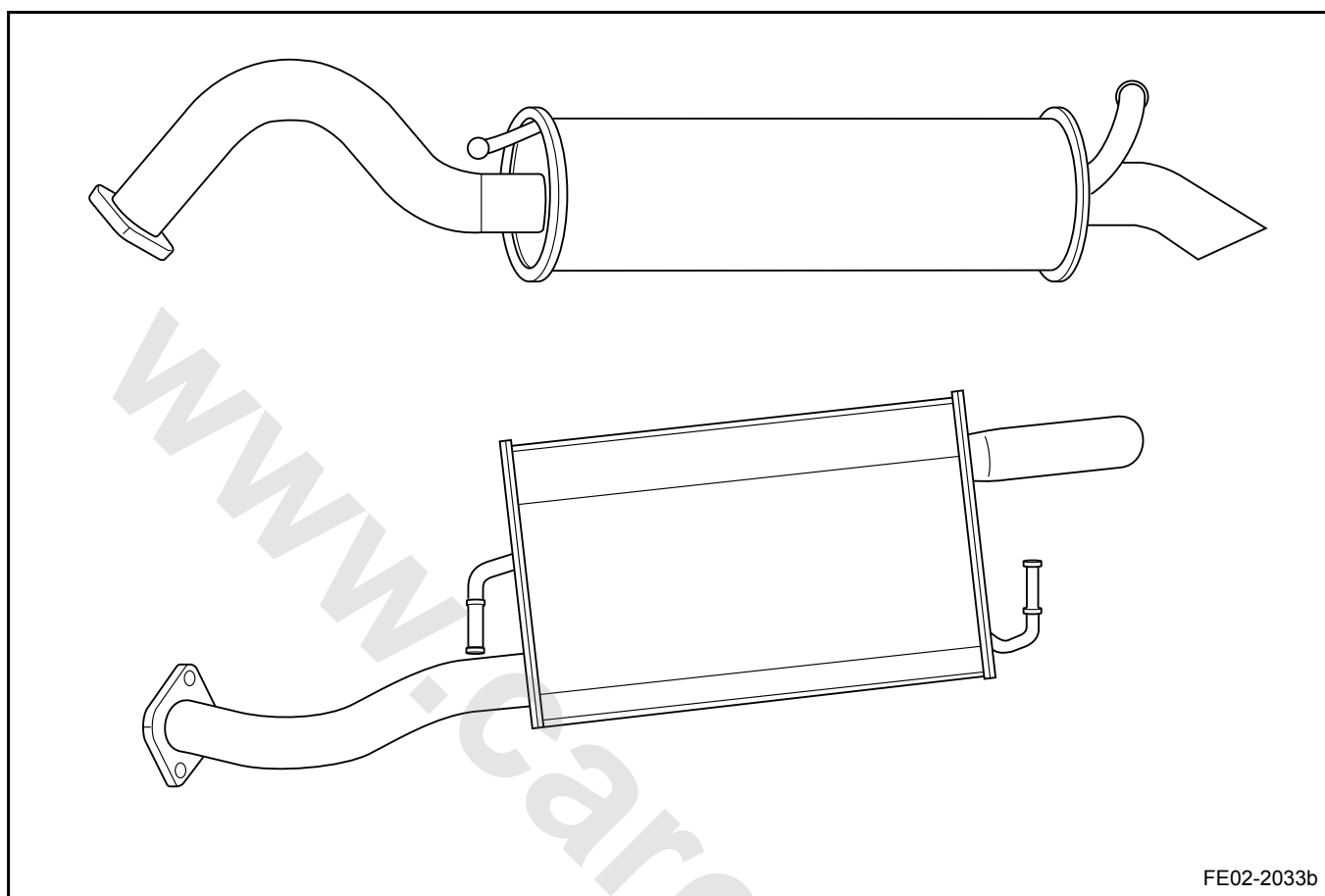
#### Legend

- 1. Pre-Catalytic Oxygen Sensor Mounting Hole
- 2. Three-Way Catalytic Converter Assembly
- 3. Post-Catalytic Oxygen Sensor Mounting Hole
- 4. Immunity Section

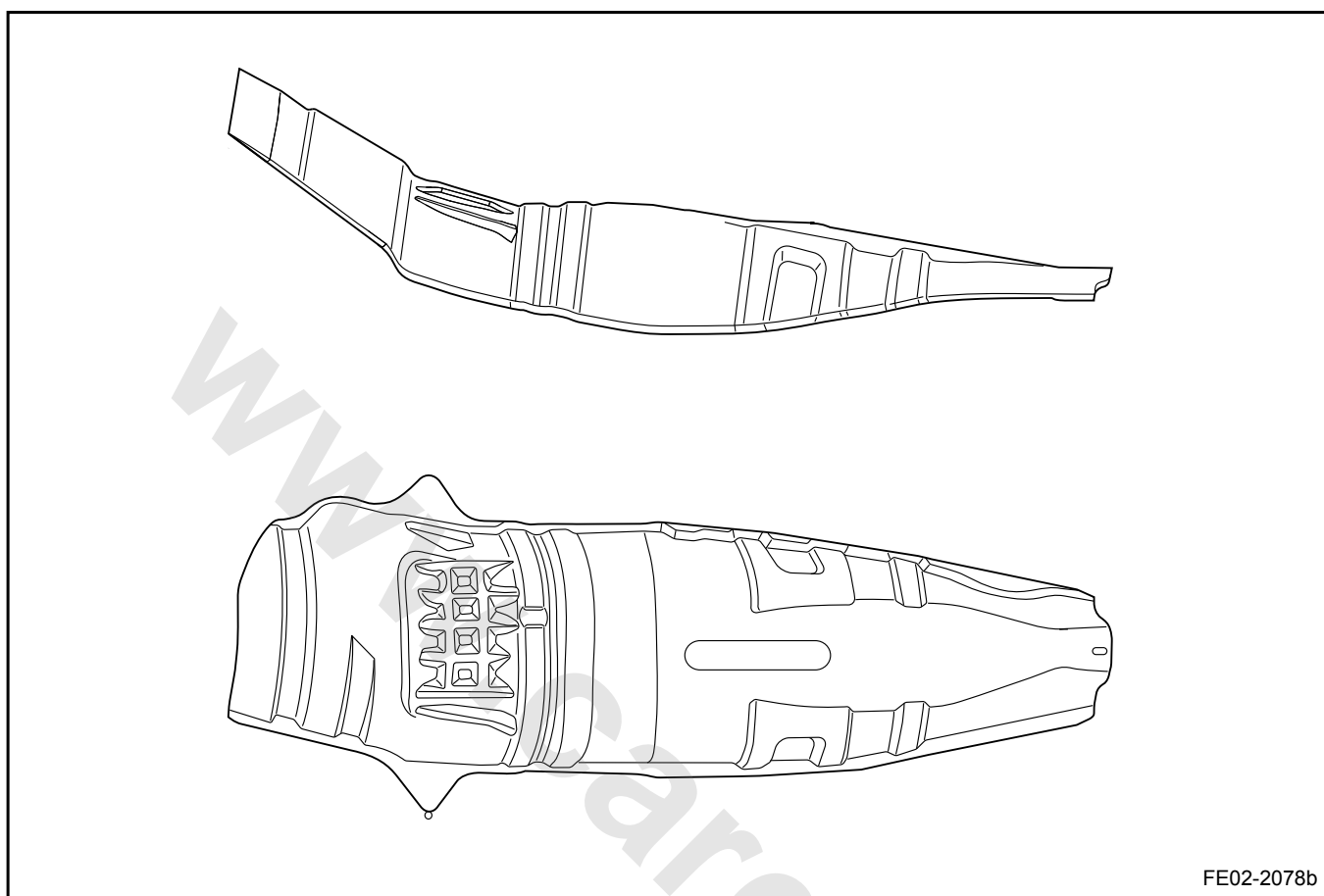
### 2.7.4.3 Front Muffler Assembly



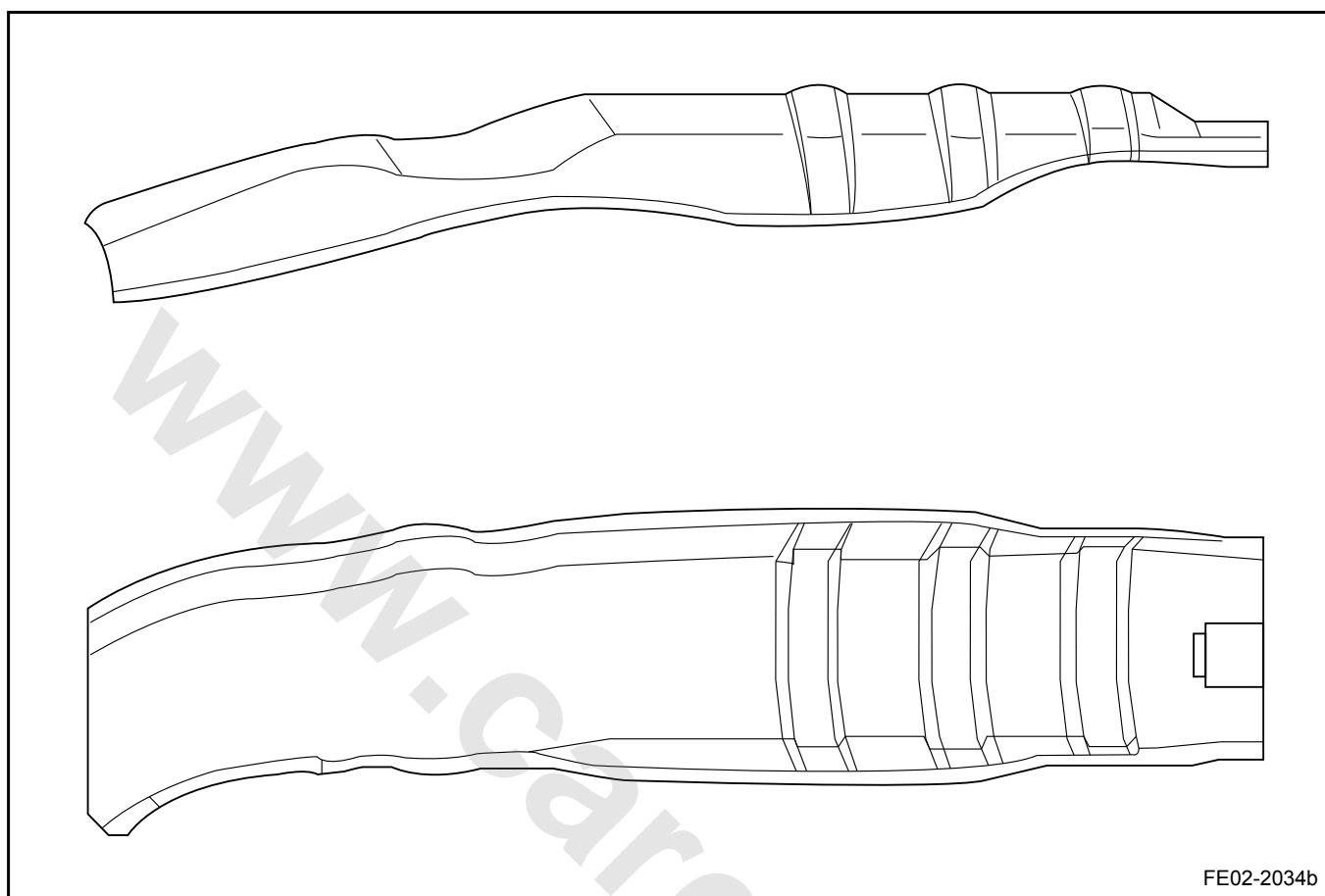
#### 2.7.4.4 Rear Muffler Assembly



#### 2.7.4.5 Front Exhaust Insulation Panel



#### 2.7.4.6 Front Muffler Heat Shield



## 2.7.5 Diagnostic Information and Procedures

### 2.7.5.1 Diagnostic Description

Refer to "Description and Operation" in the [2.7.2.1 Exhaust Manifold](#) Get familiar with the system functions and operation before start system diagnostics, as this will help with the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 2.7.5.2 Visual Inspection

- Check installed after market equipment that may affect the operation of the exhaust system.
- Check the easy to access system components to identify whether there are significant blockages or leakage.
- Check whether the color of the exhaust gas is normal.

### 2.7.5.3 Exhaust System Blockage

When the engine loses power, fuel economy becomes worse or acceleration performance is poor, check whether there is "exhaust system blockage" fault, use the exhaust back-pressure to monitor whether the back-pressure is more than 50 kPa to confirm the fault. The fault may be caused by following reasons:

- Exhaust pipe is damaged.
- There are debris in exhaust pipes.
- Muffler or resonator internal faults.
- Exhaust pipe internal corrosion blocks the rear exhaust port.

### 2.7.5.4 Exhaust System Leakage

If the engine has "hiss" or a burst sound when running, check whether there is "Exhaust System Leakage" fault, as shown in the following table:

Exhaust system components misaligned or incorrectly installed	<ul style="list-style-type: none"> <li>— Position and tighten the exhaust system components to the specified torque. Refer to "Engine Exhaust System" in the <a href="#">2.7.1.1 Fastener Tightening Specifications</a>.</li> <li>— Make sure that the exhaust pipe hook is in the right place and is not loose.</li> </ul>
Exhaust leak at the following connections: <ul style="list-style-type: none"> <li>— Exhaust manifold and the three-way catalytic converter</li> <li>— Flange</li> </ul>	Tighten the related components to the specified torque. Refer to the "Engine Exhaust System" in the <a href="#">2.7.1.1 Fastener Tightening Specifications</a> .
Seal or Gasket Leak: <ul style="list-style-type: none"> <li>— Exhaust Manifold and Cylinder Head Cover</li> <li>— Exhaust Manifold and The Three-Way Catalytic Converter</li> <li>— Three-Way Catalytic Converter and Front Muffler</li> <li>— Front Muffler and Rear Muffler</li> </ul>	Replace the leaking seals or gasket.

Flange Irregular Joints	If necessary, repair or replace the associated components.
Exhaust Manifold Cracked or Broken	Replace the exhaust manifold. Refer to <a href="#">2.7.6.1 Exhaust Manifold Replacement</a> .
Exhaust system components welded joints leakage	Replace the leaking parts.

### 2.7.5.5 Exhaust System Noise

When the engine is running, exhaust has noise or unusual sound. Check whether there is "Exhaust System Noise" fault, as shown in the following table:

Crack sound or hiss	Exhaust system leaking. Refer to <a href="#">2.7.5.4 Exhaust System Leakage</a> .
Exhaust sound too big	<ol style="list-style-type: none"> <li>1. Compare with a vehicle known in good conditions.</li> <li>2. Check the muffler for damage or malfunction. Replace the faulty muffler.</li> <li>3. Refer to <a href="#">2.7.6.3 Front Muffler Replacement</a> or <a href="#">2.7.6.4 Rear Muffler Replacement</a>.</li> </ol>
External Noise or Vibration Noise	<ol style="list-style-type: none"> <li>1. Check whether the hook is bent or loose or whether shrouds fasteners are loose.</li> <li>2. Check whether the exhaust pipe is interfered.</li> </ol>
Internal Noise	<ol style="list-style-type: none"> <li>1. With a rubber hammer knock these parts to confirm the noise.</li> <li>2. Replace the faulty three-way catalytic converter or muffler. Refer to <a href="#">2.7.6.2 Three-way Catalytic Converter Replacement</a> or <a href="#">2.7.6.3 Front Muffler Replacement</a> or <a href="#">2.7.6.4 Rear Muffler Replacement</a>.</li> </ol>

### 2.7.5.6 Exhaust System Repair Notes

**Warning!**

Refer to "Exhaust System Service Warning" in "Warnings and Notices".

**Warning!**

The broken three-way catalytic converter must be replaced. It is not allowed to remove three-way catalytic converter exhaust system, otherwise there will be serious air pollution.

**Note**

In the following conditions, three-way catalytic converter may be damaged or malfunction:

- Work outside the closed-loop mixture control system.
- Engine burns a large amount of engine oil.
- If the three-way catalytic converter exhaust temperature is too high, at more than 840°C (1544 °F).

**Note**

- Vehicles with three-way catalytic converter can not use leaded petrol. Lead will pollute the three-way catalytic converter.
- Do not drop the three-way catalytic converter, as this may damage the ceramic carrier.
- Do not allow water, engine oil or fuel enter into the converter, because this may contaminate the ceramic substrate.

- 
- Do not start the vehicle when there is engine misfire or the spark plug wire is disconnected.

[www.cargeek.ir](http://www.cargeek.ir)



## 2.7.6 Removal and Installation

### 2.7.6.1 Exhaust Manifold Replacement

Removal Procedure:

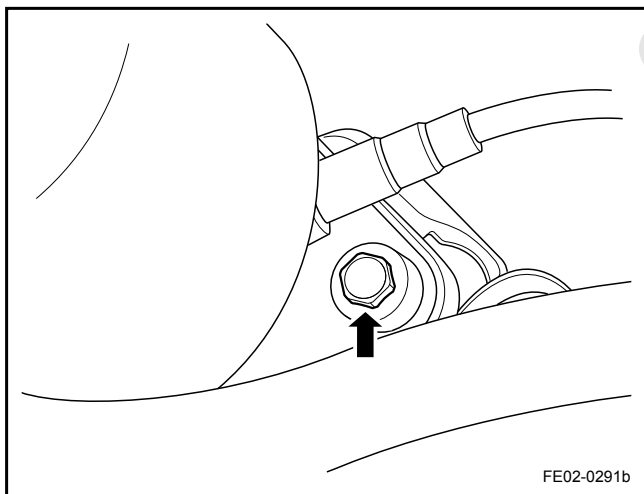
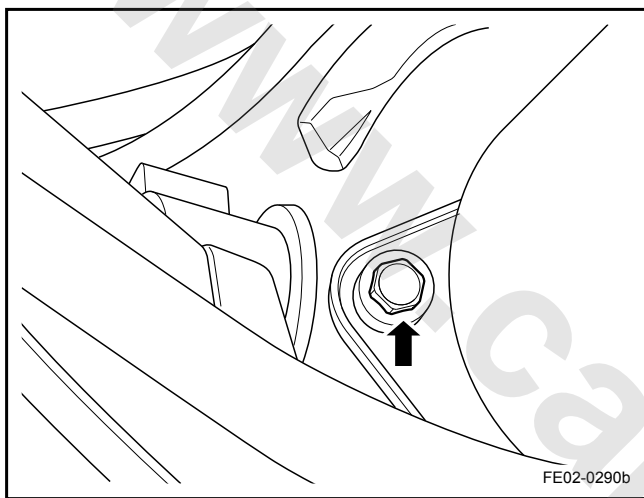
#### Warning!

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

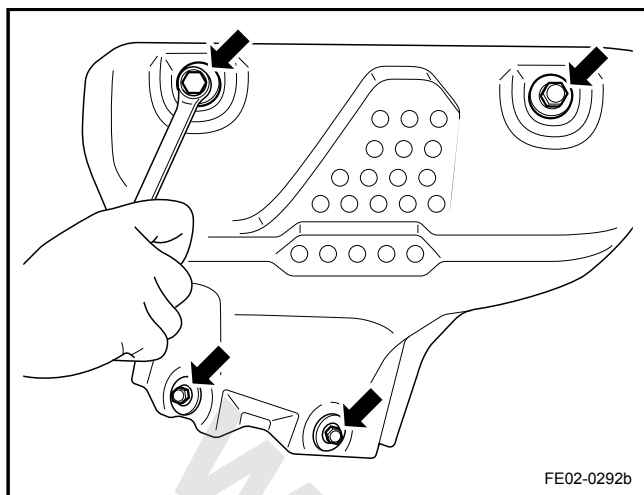
#### Note

Removing the bolt when it is hot is likely to damage the bolt or flange nuts weld on the exhaust manifold. Remove the bolt when the engine is cooled down.

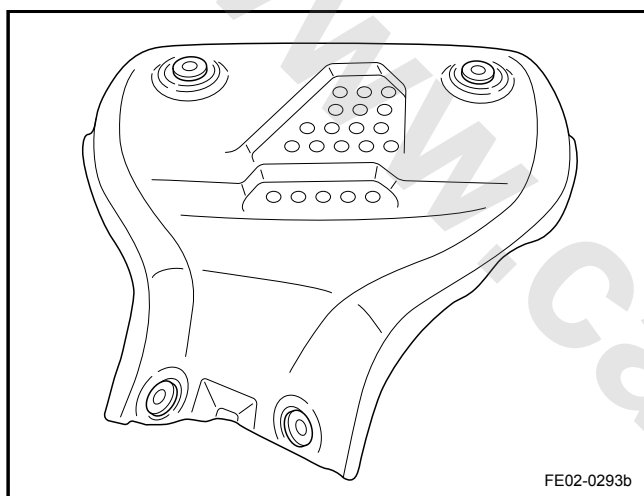
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the three-way catalytic converter left connecting bolt.



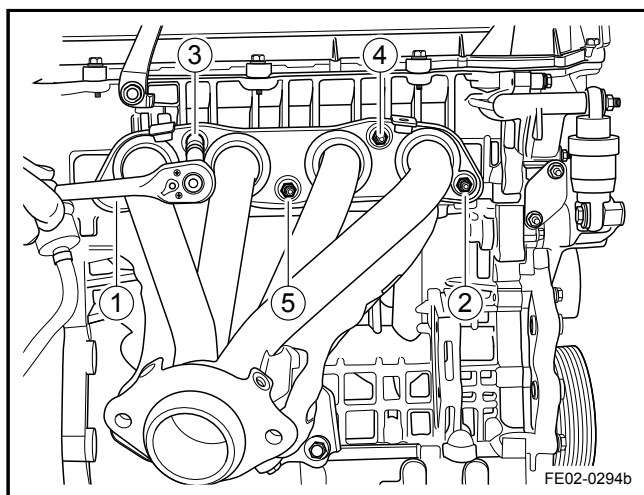
3. Remove the three-way catalytic converter right connecting bolt.



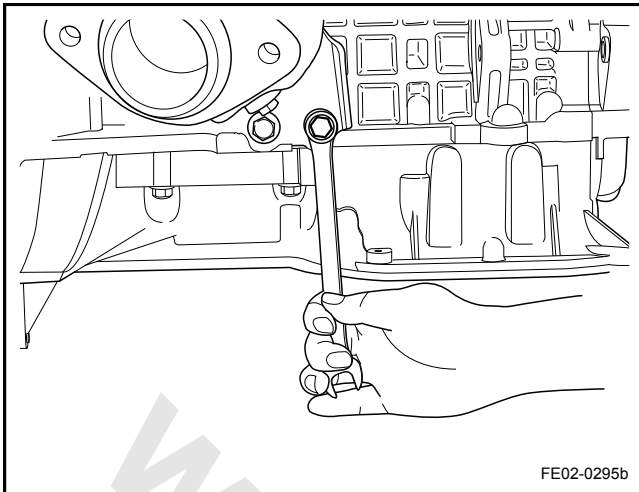
4. Remove heat shield to the exhaust manifold retaining bolts.



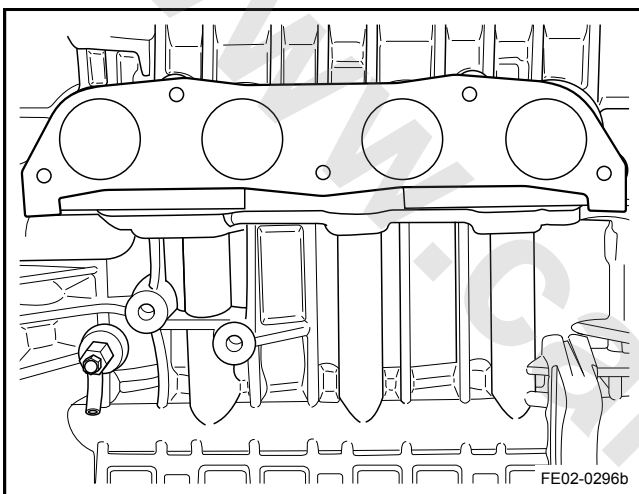
5. Remove the heat shield on the exhaust manifold.



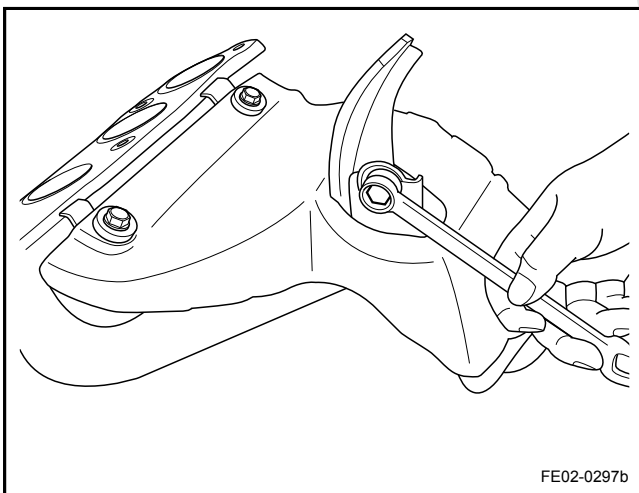
6. Remove the exhaust manifold bolts and nuts according to the sequence in the graphic.



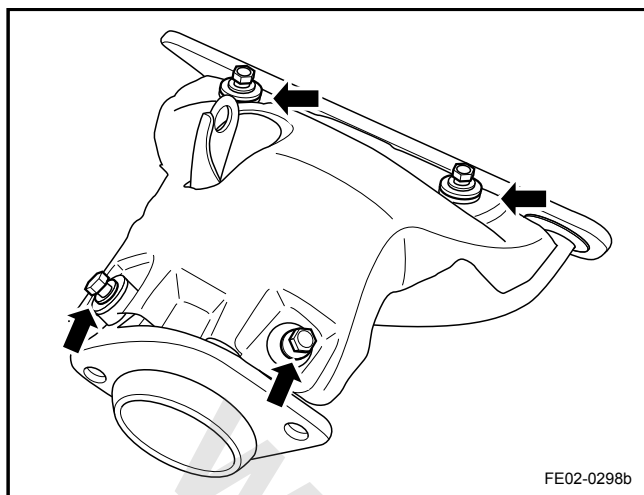
7. Remove the exhaust manifold bracket bolts.



8. Remove the exhaust manifold and exhaust manifold gasket.



9. Remove the exhaust manifold bracket bolts.

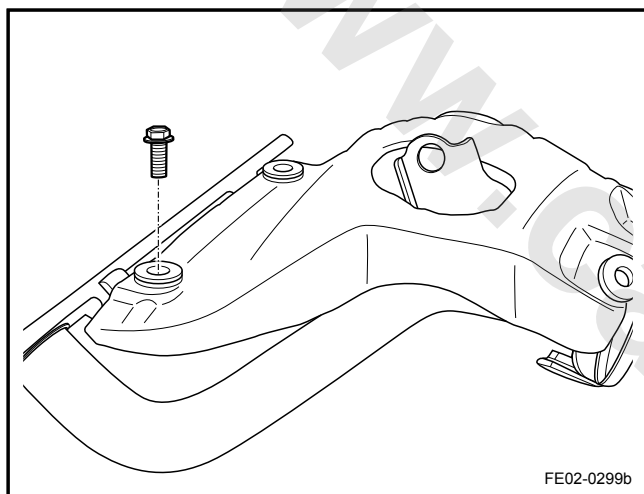


10. Remove the exhaust manifold lower heat shield retaining bolts.

Installation Procedure:

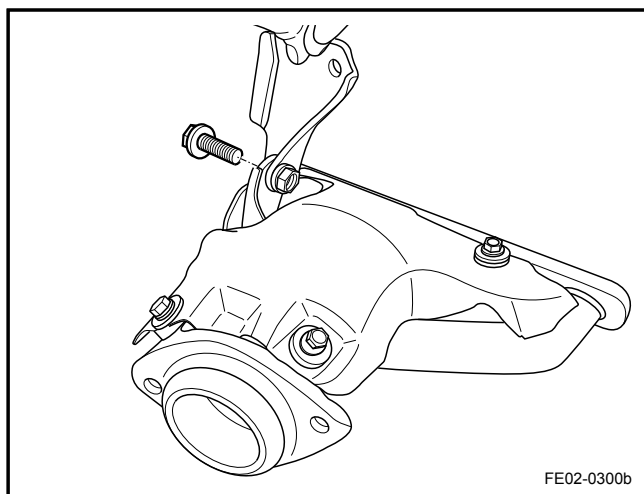
1. Install and tighten the exhaust manifold lower heat shield retaining bolts.

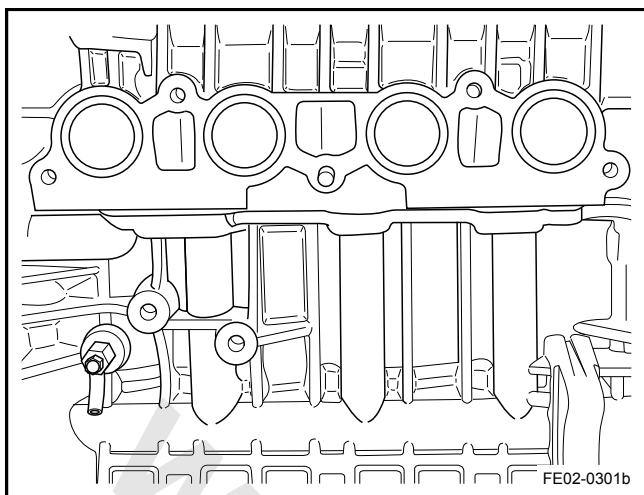
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)



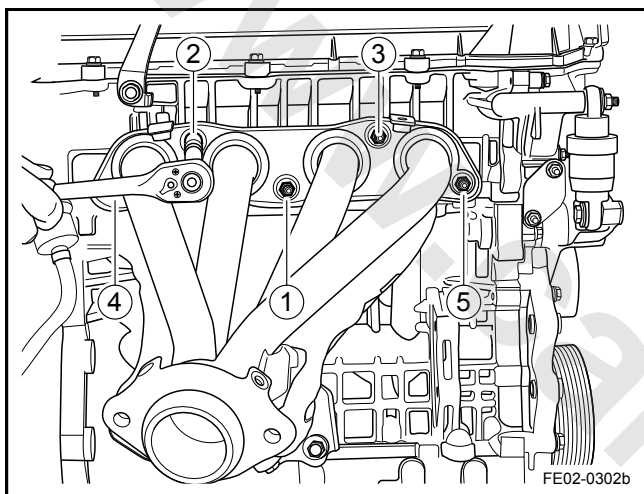
2. Install the exhaust pipe to engine bracket bolts.

Torque: 35 Nm (Metric) 25.9 lb-ft (US English)

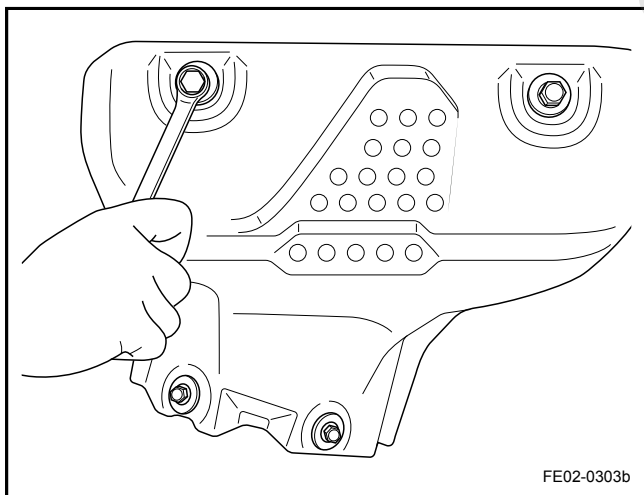




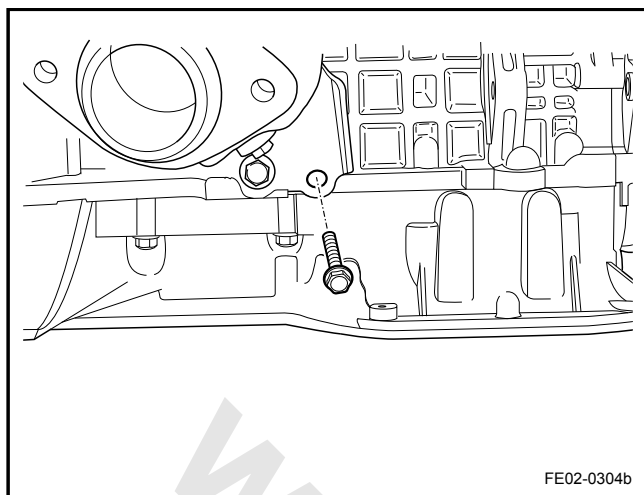
3. Clean the cylinder head cover and the exhaust manifold mating face.



4. Install the exhaust manifold, install and tighten the bolts and nuts according to the sequence in the graphic.  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)

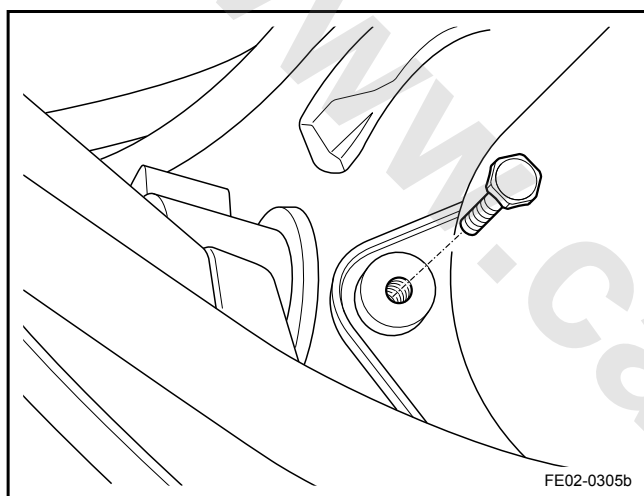


5. Install the exhaust manifold upper heat shield.



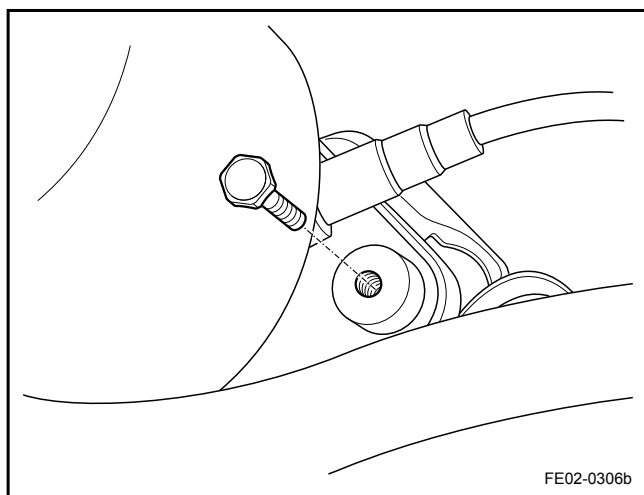
6. Install and tighten the exhaust manifold bracket retaining bolts.

Torque: 35 Nm (Metric) 25.9 lb-ft (US English)



7. Install the three-way catalytic converter left connecting bolt.

Torque: 52 Nm (Metric) 38.5 lb-ft (US English)



8. Install the three-way catalytic converter right connecting bolt.

Torque: 52 Nm (Metric) 38.5 lb-ft (US English)

9. Connect the battery negative cable.

### 2.7.6.2 Three-way Catalytic Converter Replacement

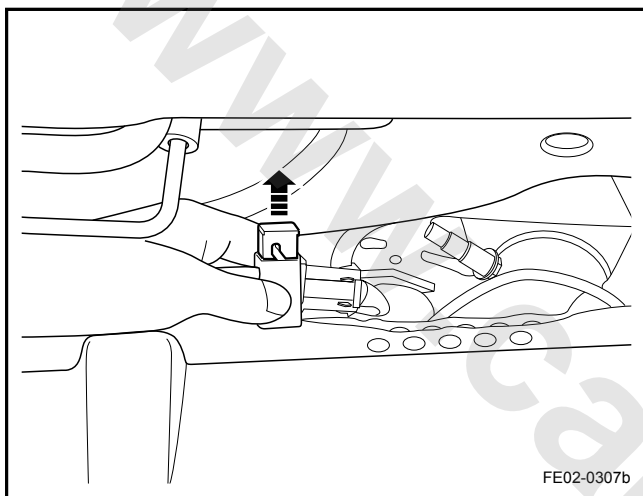
Removal Procedure:

#### Warning!

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

#### Note

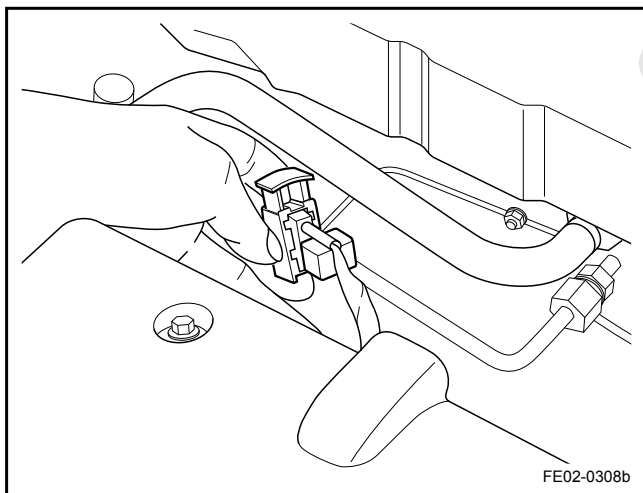
Removing the bolt when it is hot is likely to damage the bolt or flange nuts weld on the exhaust manifold. Remove the bolt when the engine is cooled down.



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect the pre-catalytic oxygen sensor wiring harness connector.

#### Note

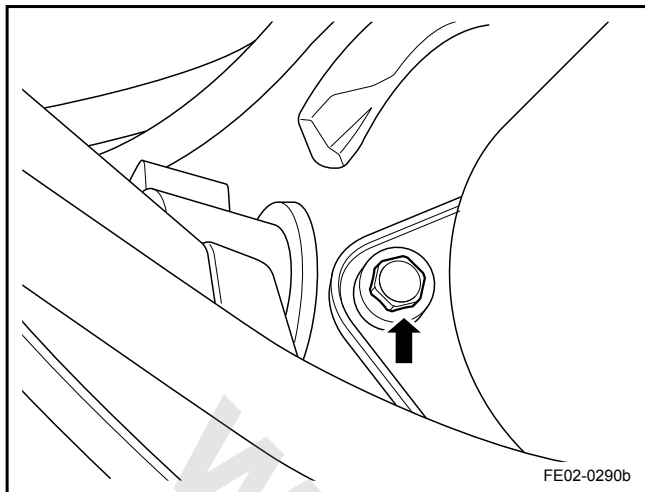
Pull out the red plug to disconnect the harness connector.



3. Disconnect the post-catalytic oxygen sensor wiring harness connector.

#### Note

Pull out the red plug to Disconnect the harness connector.

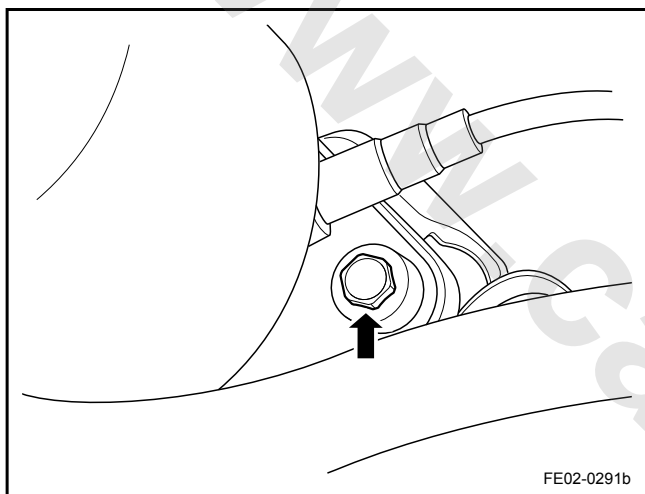


4. Lift the vehicle.

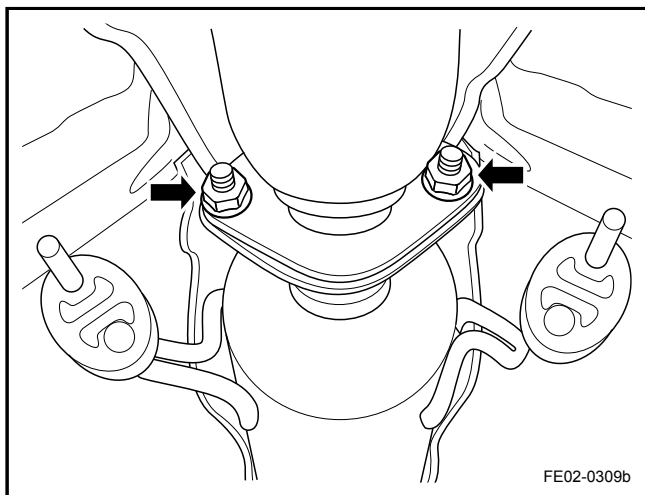
**Warning!**

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

5. Remove the three-way catalytic converter left connecting bolt.



6. Remove the three-way catalytic converter right connecting bolt.



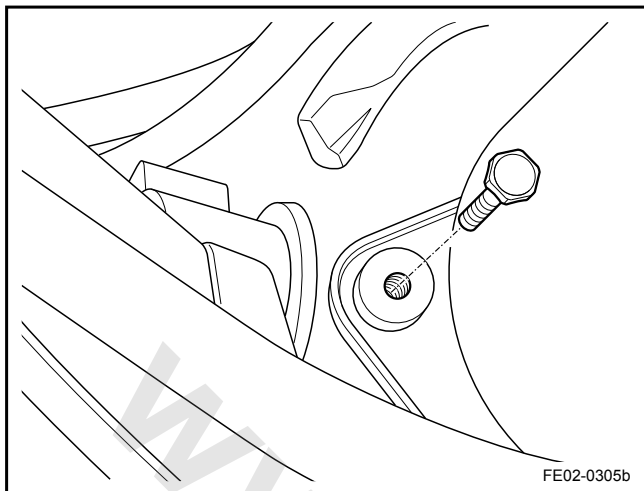
7. Remove the three-way catalytic exhaust converter connecting nuts, remove the exhaust pipe gaskets, remove the three-way catalytic converter and remove the exhaust outlet washers.

**Note**

Do not drop the three-way catalytic converter during removal.



## Installation Procedure:

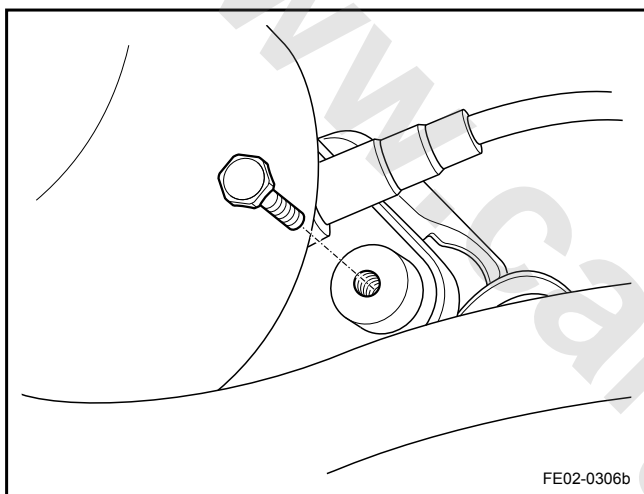


1. Use a rubber hammer and a piece of wood, tapping the exhaust pipe exports to the exhaust manifold gasket, until the surfaces are even, and then install the three-way catalytic converter, tighten the left connecting bolt.

Torque: 40 Nm (Metric) 29.6 lb-ft (US English)

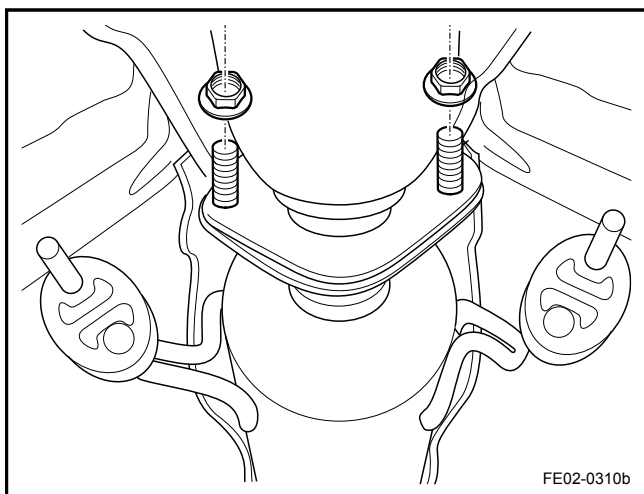
**Note**

Clean before installing the exhaust outlet gaskets and interface.



2. Install the three-way catalytic converter right connecting bolt.

Torque: 40 Nm (Metric) 29.6 lb-ft (US English)



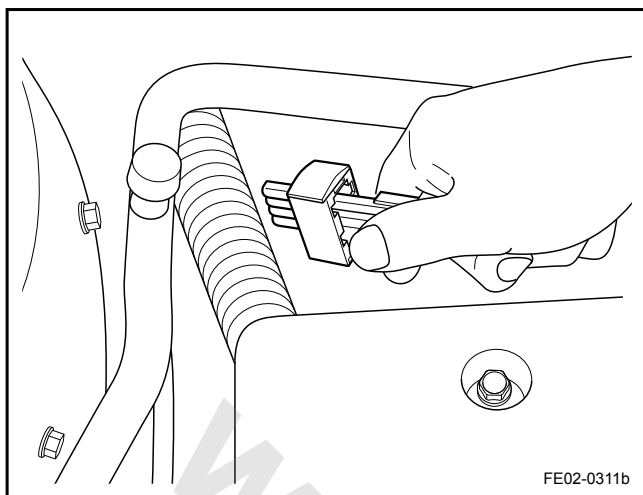
3. Install the exhaust pipe gasket.

**Note**

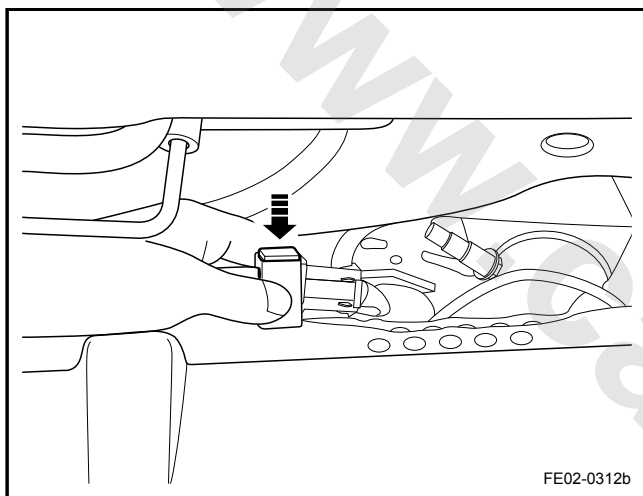
Clean before installing the exhaust pipe gaskets and interface.

4. Clean the three-way catalytic exhaust pipe connecting nuts.

Torque: 52 Nm (Metric) 38.5 lb-ft (US English)



5. Lower the vehicle.
6. Connect the post-catalytic oxygen sensor wiring harness connector.



7. Connect the pre-catalytic oxygen sensor wiring harness connector.
8. Connect the battery negative cable.

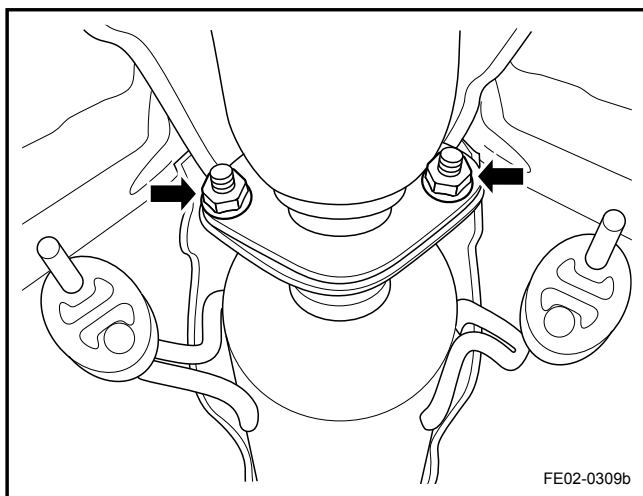
### 2.7.6.3 Front Muffler Replacement

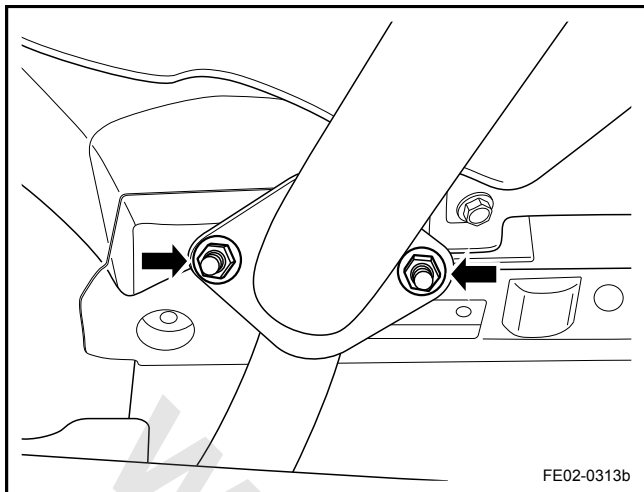
Removal Procedure:

**Warning!**

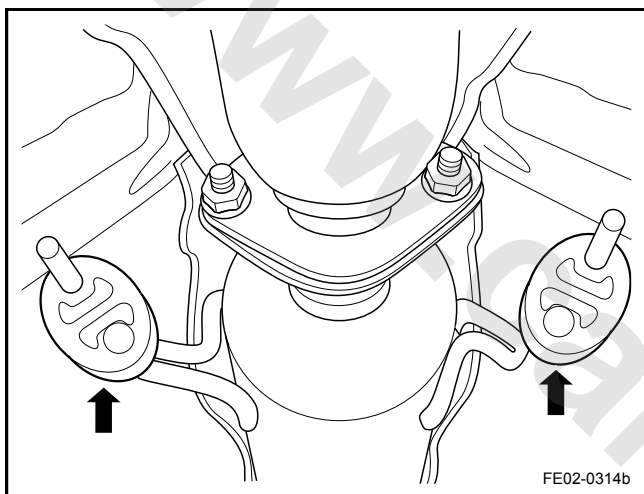
Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

1. Lift the vehicle.
2. Remove the front muffler to the three-way catalytic converter retaining nuts and the exhaust pipe gasket.

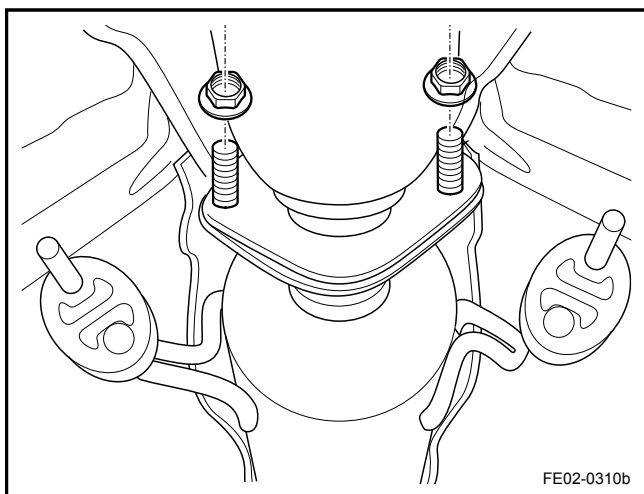




3. Remove the front and rear muffler to the rear muffler retaining nuts and the exhaust pipe gasket.



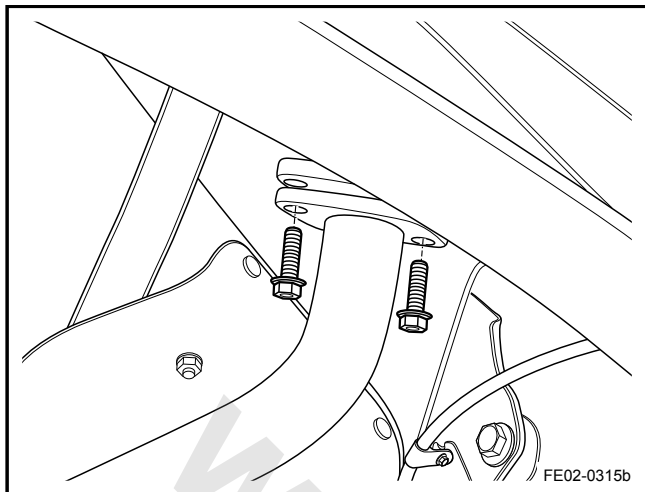
4. Remove the rubber bearings from the front muffler.
- Note**
- Do not drop the front muffler during the removal.
5. Remove the front muffler.
  6. Check whether the three-way catalytic muffler has holes, damage and cracks.



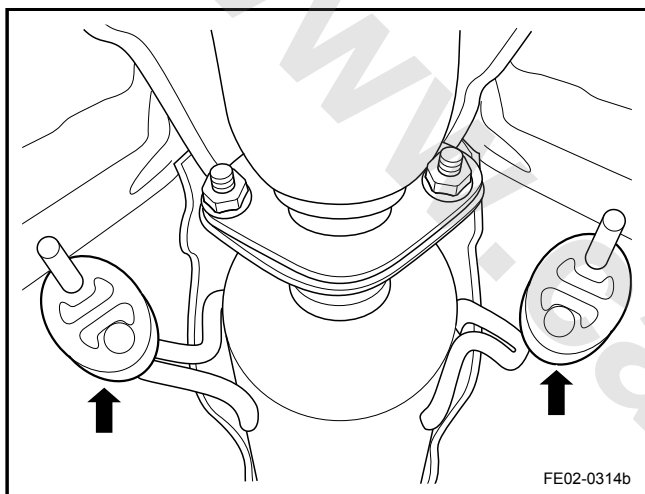
#### Installation Procedure:

1. Install the exhaust pipe gasket between the front muffler and the three-way catalytic converter.
2. Install and tighten the front muffler to the three-way catalytic converter retaining nuts.

Torque: 52 Nm (Metric) 38.4 lb-ft (US English)



3. Install the front muffler gasket.
4. Install and tighten the front and rear muffler retaining nuts.  
Torque: 52 Nm (Metric) 38.4 lb-ft (US English)



5. Install the rubber bearings on both sides of the front muffler.
6. Lower the vehicle.
7. Inspect the exhaust system leaks.

#### 2.7.6.4 Rear Muffler Replacement

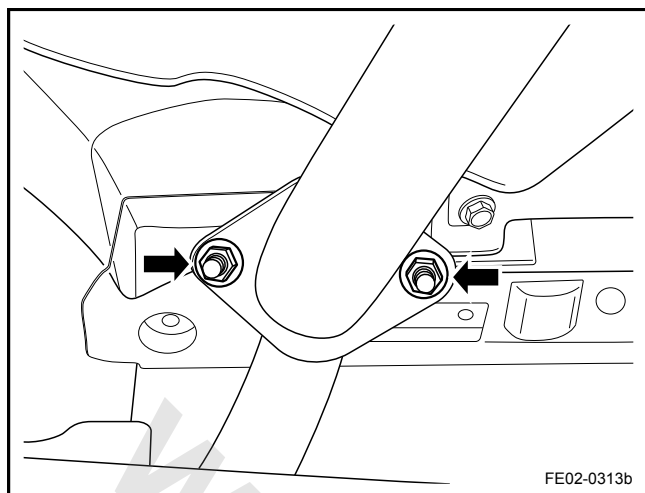
Removal Procedure:

**Warning!**

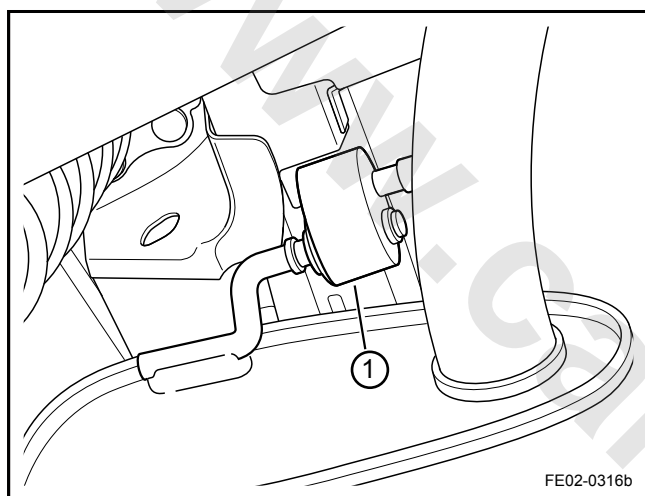
Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

**Warning!**

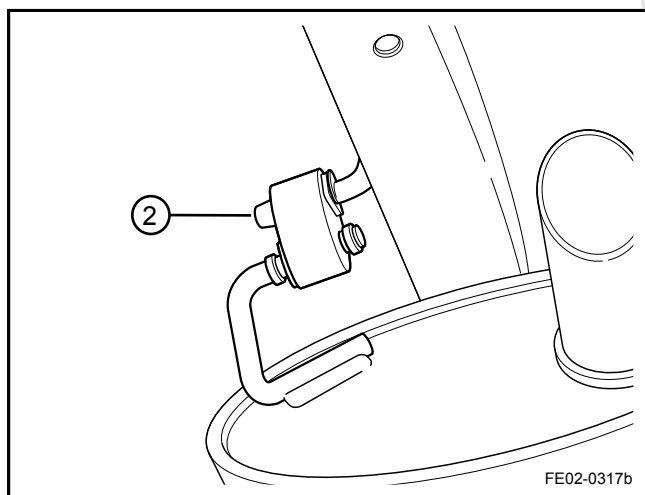
Do not carry out the removal procedure, as this may result in burns.



1. Lift the vehicle.
2. Remove the rear muffler to front muffler retaining nuts and the exhaust pipe gasket.



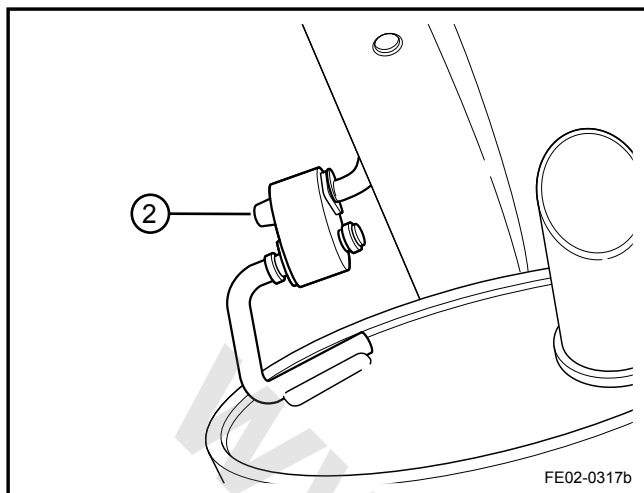
3. Remove the rear rubber bearing (1).



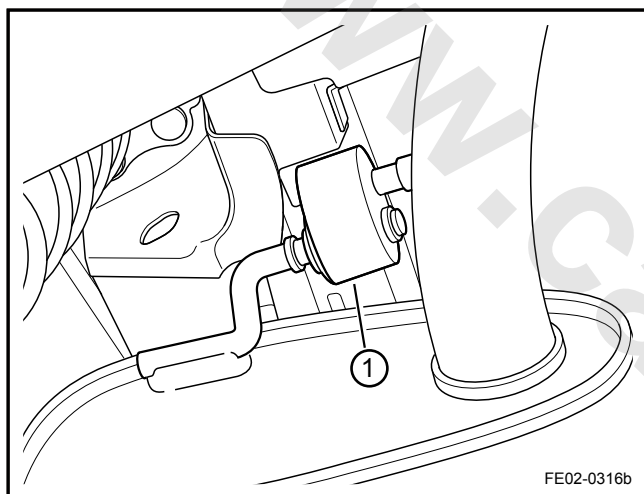
4. Remove the rear rubber bearing (2).
5. Remove rear muffler
6. Check whether there are holes, damage or cracks.

## Installation Procedure:

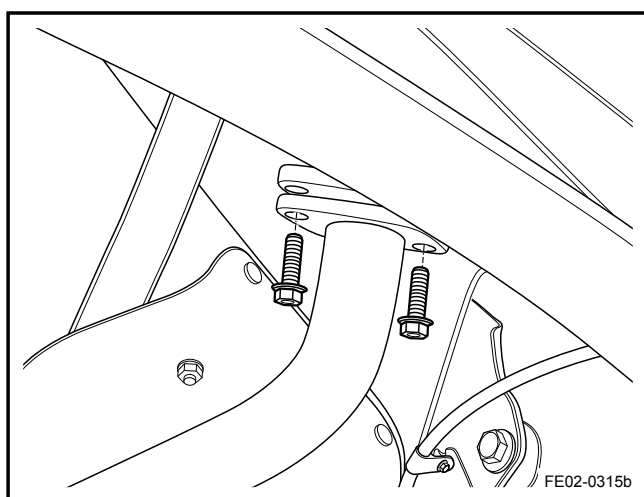
1. Install the rear rubber bearing (2).



2. Install the rear rubber bearing (1).



3. Install the exhaust pipe gasket.
4. Install the rear muffler to front muffler retaining nuts.  
Torque: 52 Nm (Metric) 38.4 lb-ft (US English)
5. Lower the vehicle.
6. Inspect the exhaust system leaks.



## 2.8 Cooling System JL4G18-D

### 2.8.1 Specifications

#### 2.8.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Long Water Pump Mounting Bolt	M6 × 35	9-13	6.7-9.6
Short Water Pump Mounting Bolt	M6 × 25	8-10	6-7.4
Engine Coolant Temperature Sensor	M12 × 1.5	16-24	12-17.7
Fan Assembly Mounting Bolt	M6 × 15	8-10	6-7.4
Fan Motor Retaining Nut	M10	10	7.4
Fan Motor Retaining Screw	M4 × 14	2.4	1.8
Radiator Retaining Bolts	M8 × 25	10-11	7.4-8.1
Coolant Recovery Reservoir Retaining Bolts	M8 × 20	25	18.5
Engine Coolant Inlet Pipe Retaining Nut	M6	9-13	6.7-9.6
Coolant Valve Component	M10 × 1	25 and above	18.5 and above
Engine Coolant Inlet Pipe Component	M6	9-13	6.7-9.6

#### 2.8.1.2 Cooling System Specifications

Applications	Specifications
Cooling	Coolant
Engine Coolant Specifications / Grades	Comply with SH0521 (Freezing Point ≤-40°C /-40 °F)
Engine Coolant Capacity (Coolant Recovery Reservoir)	6.5 L (11.44 pt)
Thermostat Type	Wax-Type Thermostat
Pump Type	Impeller
Blade Diameter	60 mm (2.36 in)
Blades	6
Thermostat Opening Temperature	82°C (179.6 °F)
Thermostat Fully Open Temperature	95°C (203 °F)
Low Speed Cooling Fan Turned On	95°C (203 °F)
Low Speed Cooling Fan Turned Off	90°C (194 °F)
High Speed Cooling Fan Turned On	102°C (215.6 °F)
High Speed Cooling Fan Turned Off	97°C (206.6 °F)

Applications	Specifications
Low Speed Cooling Fan Resistor	0.35 $\Omega$

[www.cargeek.ir](http://www.cargeek.ir)



## 2.8.2 Description and Operation

### 2.8.2.1 Description and Operation

When engine is working, the mixture combustion in the cylinder combustion chamber produces heat, which transfers through the cylinder block. If it is not cooled, the engine will not work. Inside the cylinder block, there is engine coolant path. Through the engine coolant flow, heat exchanges with the outside environment. This keeps the engine operating temperature within a certain range, so that the engine can work effectively in all operating conditions. When the engine is cooled, the cooling system controls the engine coolant flow amount through the thermostat. This makes the engine warm up quickly. Cooling system includes radiator, coolant recovery reservoir, cooling fan assembly, thermostat and housing, water pump and water pump drive belt. The water pump is driven by the accessory drive belt. Only when all the above components work properly, can the cooling system to work properly. When the engine coolant reaches the thermostat operating temperature, the thermostat opens. At this point, the engine coolant returns to the radiator and gets cooled. Cooling system guides part of the engine coolant through the pipes into the heater core, used for heating and defrost. Coolant Recovery Reservoir is connected to the radiator assembly for recycling discharged engine coolant, which is expanded due to the heat. The Coolant Recovery Reservoir is to maintain the correct engine coolant level.

Coolant Recovery Reservoir is a transparent plastic container, similar to the windshield washer tank. Coolant Recovery Reservoir connects to the engine cooling system and the radiator through two separate pipes. With the vehicle driving, the engine coolant temperature gradually increases and the coolant expands. Part of the engine coolant flows from the radiator into the coolant recovery reservoir as the result of expansion. When the engine is shut down, the engine coolant cools down and contracts, previously discharged engine coolant flows back to the radiator and the engine. This makes the engine coolant radiator maintain a suitable coolant level, and improves cooling efficiency. When the cooling system is cold, the engine coolant level should be kept between the MIN (minimum) and MAX (maximum) marks in the coolant recovery reservoir.

Cooling fan assembly is installed at the rear of the radiator in the engine compartment. It increases radiator and Air-Conditioning condenser air flow, and thus help accelerate the cooling when idling or at low speed. There are dual fans, high or low speed control modes controlled by two different motors. Master fan diameter is 310 mm (12.20 in), auxiliary fan

diameter is 270 mm (10.63 in), both have five blades. Cooling fan assembly is controlled by the engine control module (ECM) using Low-Speed cooling fan relay and high speed cooling fan relay. In the Low-Speed circuit, the series has a 0.35  $\Omega$  current-limiting resistor. When the engine coolant temperature reaches 95°C (203 °F), the engine control module enables Low-Speed cooling fan assembly operation, and when the engine coolant temperature reaches 102°C (215.6 °F), it enables the High-Speed cooling fan operation. When the temperature is back to 97°C (206.6 °F), the engine cooling fan control module will switch the cooling fan from high to low, when the temperature drops to 90°C (194 °F), the fan will be off.

#### Warning!

Even if the engine is not running, the cooling fan under the engine compartment may still start and cause injury. Keep hands, clothing and tools away from the cooling fan under the engine compartment.

#### Warning!

If there is any degree of fan blades bending or damage, do not repair or reuse the damaged parts. The bent or damaged fan blades must be replace. Damaged fan blades can not guarantee the normal balance and continuous use, and may fly off, which is very dangerous.

#### Warning!

As long as there is cooling system pressure, even though the solution in the radiator is not boiled, the solution temperature will be much higher than the water boiling point. If the engine is not cooled and the pressure is still high, and the pressure cover is opened, the engine coolant will be immediately boiled and will spray onto the engine, fenders and the person opening the radiator pressure cap.

## 2.8.3 System Working Principle

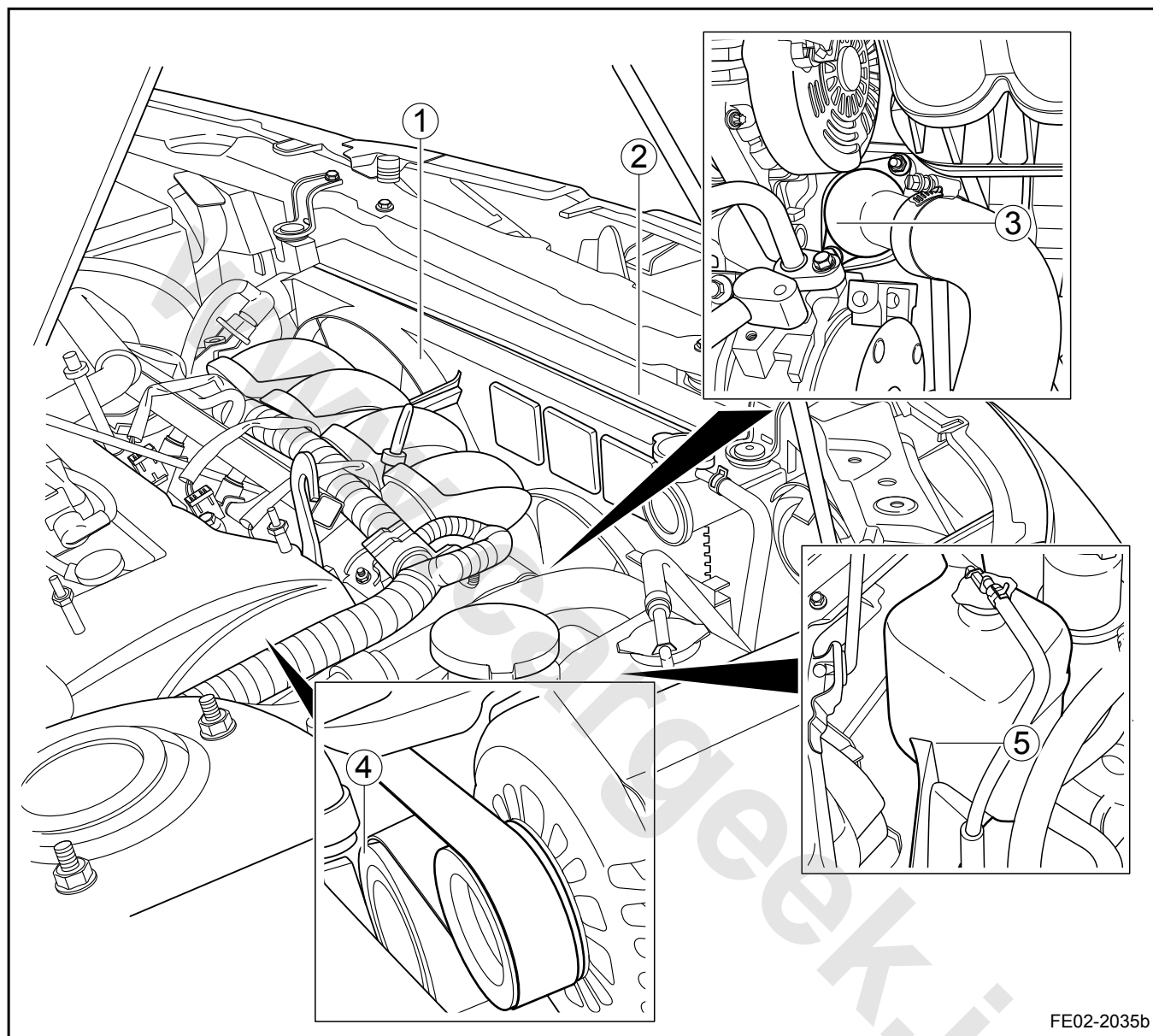
### 2.8.3.1 System Working Principle

- Cold Engine: the engine normal operating temperature is generally around 95°C (203 °F), in this temperature range, all the engine parts running status will be ideal. If the engine can not reach the ideal operating temperature in a long time, it will increase the parts wear and tear. Because of low temperature, the mixture combustion will be inadequate, and there will be excessive carbon residue. The engine heat exchange must be kept minimum so the engine can reach normal working temperatures in a short period of time. At this point the thermostat controls the engine coolant only circulates within the engine block, bringing the heat from the cylinder wall to the other engine parts, so that the temperature increases rapidly. Water pumps makes the engine coolant flow in the cylinder block, then in the engine block water jacket, throttle body and cylinder head cover. This is called "small loop".
- Engine at normal working temperature: With the engine running, the engine coolant temperature quickly increases, when the thermostat reaches 82°C (179.6 °F), the engine coolant is drawn into the engine block water jacket, intake manifolds, cylinder head and radiator by the water pump. This is called "big loop".
- Thermostat: the thermostat's role is to control engine coolant flow in the cooling system. Thermostat is installed in the front of the engine and sealed by the engine intake pipe joints components, located in the front of the cylinder head cover. Thermostat can prevent the engine coolant flow from the engine to the radiator, warm up the engine quickly and adjust the engine coolant temperature. When the engine coolant temperature is low, the thermostat in the closed position, preventing the engine coolant circulating through the radiator. At this point, it only allows the engine coolant circulates through the heater core, and thus quickly and evenly warm up the engine. When the engine is warm, the thermostat opens. The engine coolant flows through radiator and exchanges the heat. Thermostat opening and closing, allow sufficient engine coolant enter into the radiator, maintain the engine at normal operating temperature range. The wax ball inside the thermostat is sealed in a metal casing. Thermostat wax ball thermal expands when warm and contracts when cold. As the vehicle drives and the engine warms up, engine coolant temperature increases. When the engine coolant reaches the required temperature, the thermostat wax ball expands, puts pressure on the metal shell and opens the valve. This allows the engine cooling fluid flow through the engine cooling system and engine cools down, when the wax ball contracts, under the action of the spring, the valve will close. Thermostat opening temperature is 82°C (179.6 °F), and fully open temperature is 95°C (203 °F).
- Cooling Fan Low-Speed Circuit Description: Engine cooling fan circuit controls the main cooling fan and auxiliary cooling fan. Cooling fan is controlled by the engine control module (ECM) according to the engine coolant temperature sensor and air pressure switch inputs. ECM monitors conditions that meet the cooling fan Low-Speed running conditions, ECM controls the engine wiring harness connector EN01 terminal No.62 internal ground, and the Low-Speed cooling fan relay pull-in. Power passes through the low speed relay terminal No.87 to reach the cooling fan wiring harness connector CA16 terminal No.1 and then through the speed limit resistor, and finally reaches to the paralleled two fan motors. Fan motors negative is connected to the ground through the cooling fan wiring harness connector CA16 terminal No.3. Therefore, the Low-Speed fan motor starts running.

- Cooling Fan High-Speed Circuit Description: The engine control module receives the engine coolant temperature sensor and air pressure switch signals. ECM monitors conditions that meet the cooling fan how-speed running conditions, ECM controls the engine wiring harness connector EN01 terminal No.52 internal ground, and the how-speed cooling fan relay pull-in. Power passes through the how speed relay terminal No.87 to reach the cooling fan wiring harness connector CA16 terminal No.2 and then through the speed limit resistor, and finally reaches to the paralleled two fan motors. Fan motors negative is connected to the ground through the cooling fan wiring harness connector CA16 terminal No.3. Therefore, the how-speed fan motor starts running.

## 2.8.4 Component Locator

### 2.8.4.1 Component Locator



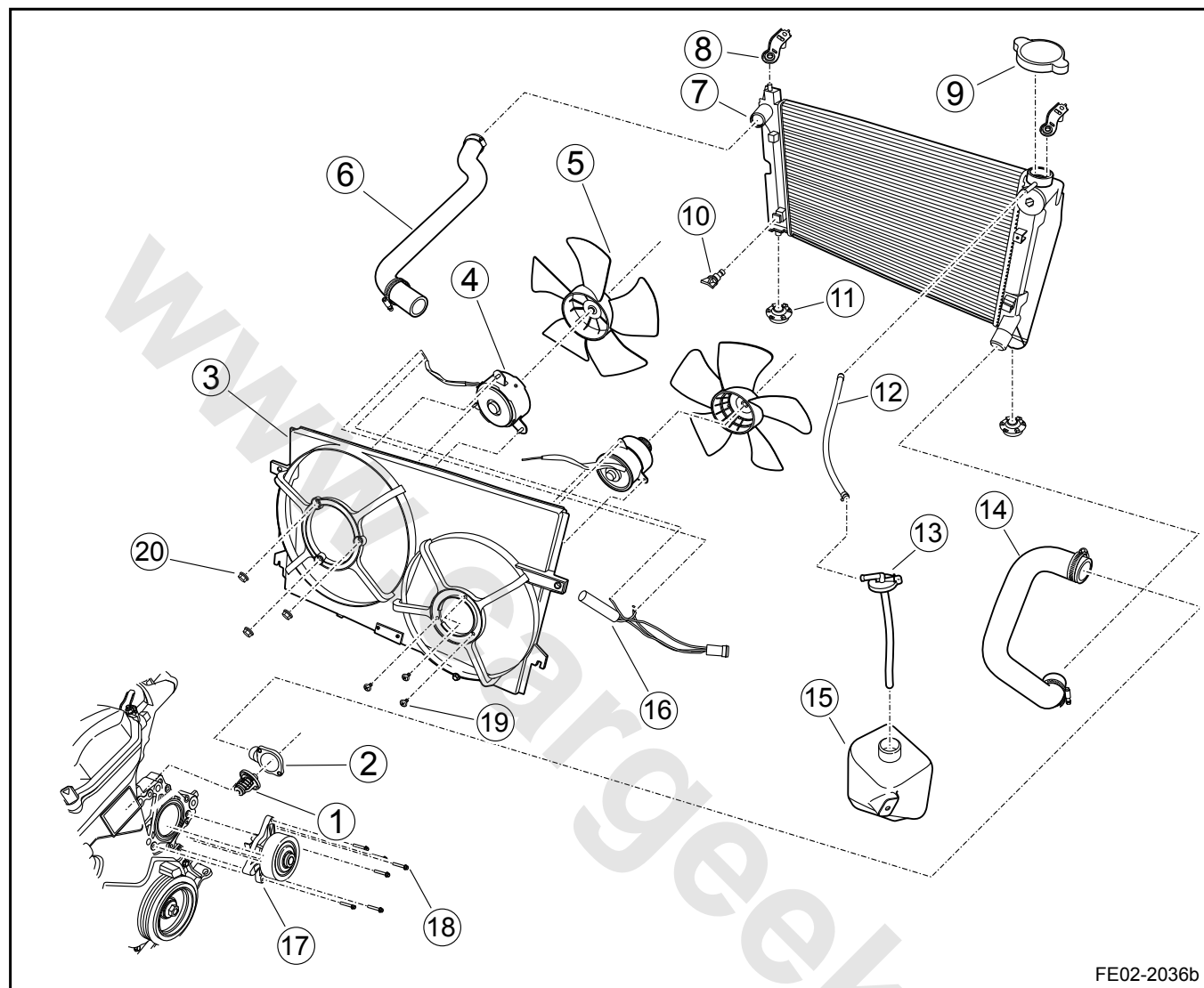
FE02-2035b

#### Legend

- |                      |                               |
|----------------------|-------------------------------|
| 1. Cooling Fan       | 5. Coolant Recovery Reservoir |
| 2. Radiator Assembly |                               |
| 3. Thermostat        |                               |
| 4. Pump              |                               |

## 2.8.5 Disassemble View

## 2.8.5.1 Disassemble View



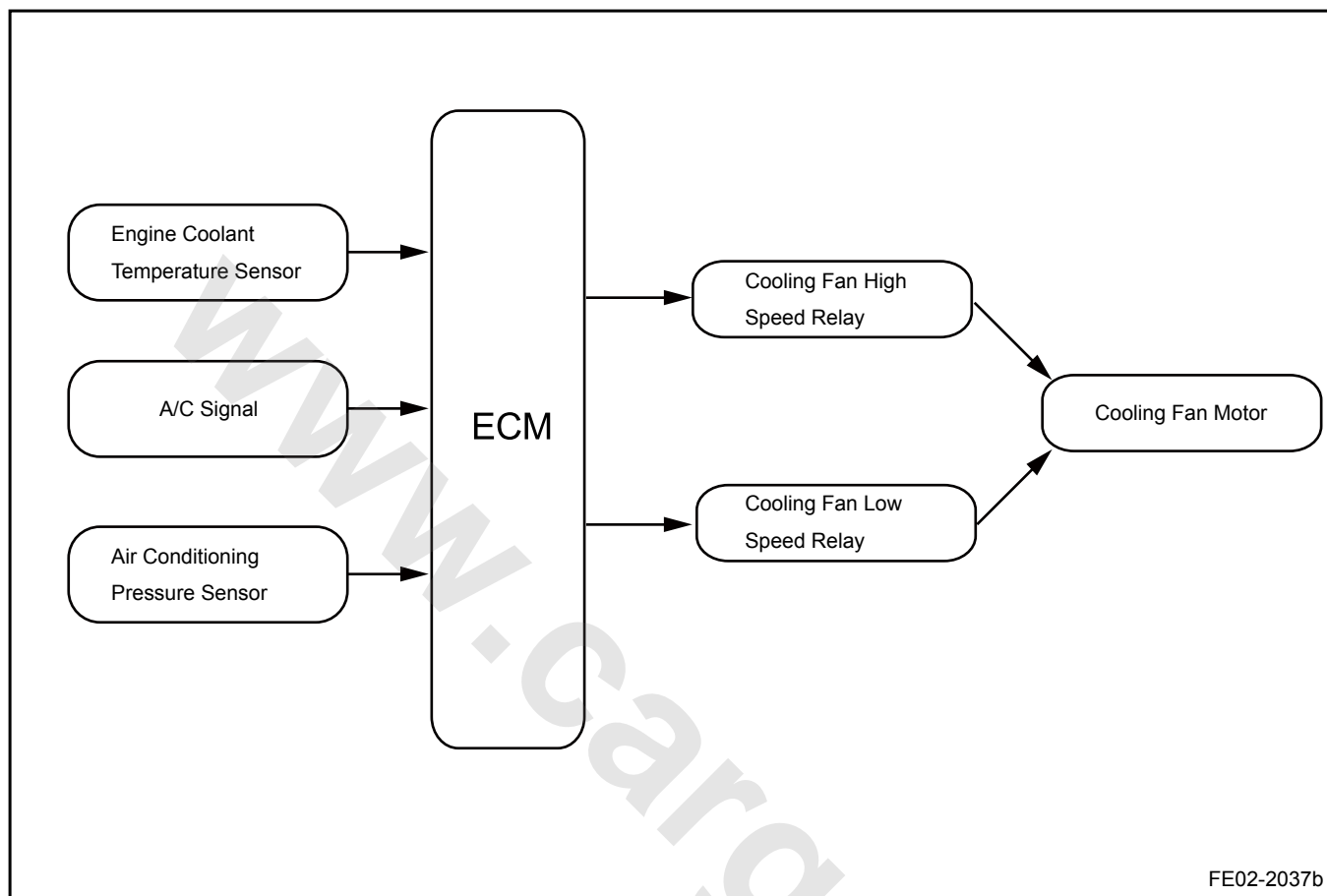
FE02-2036b

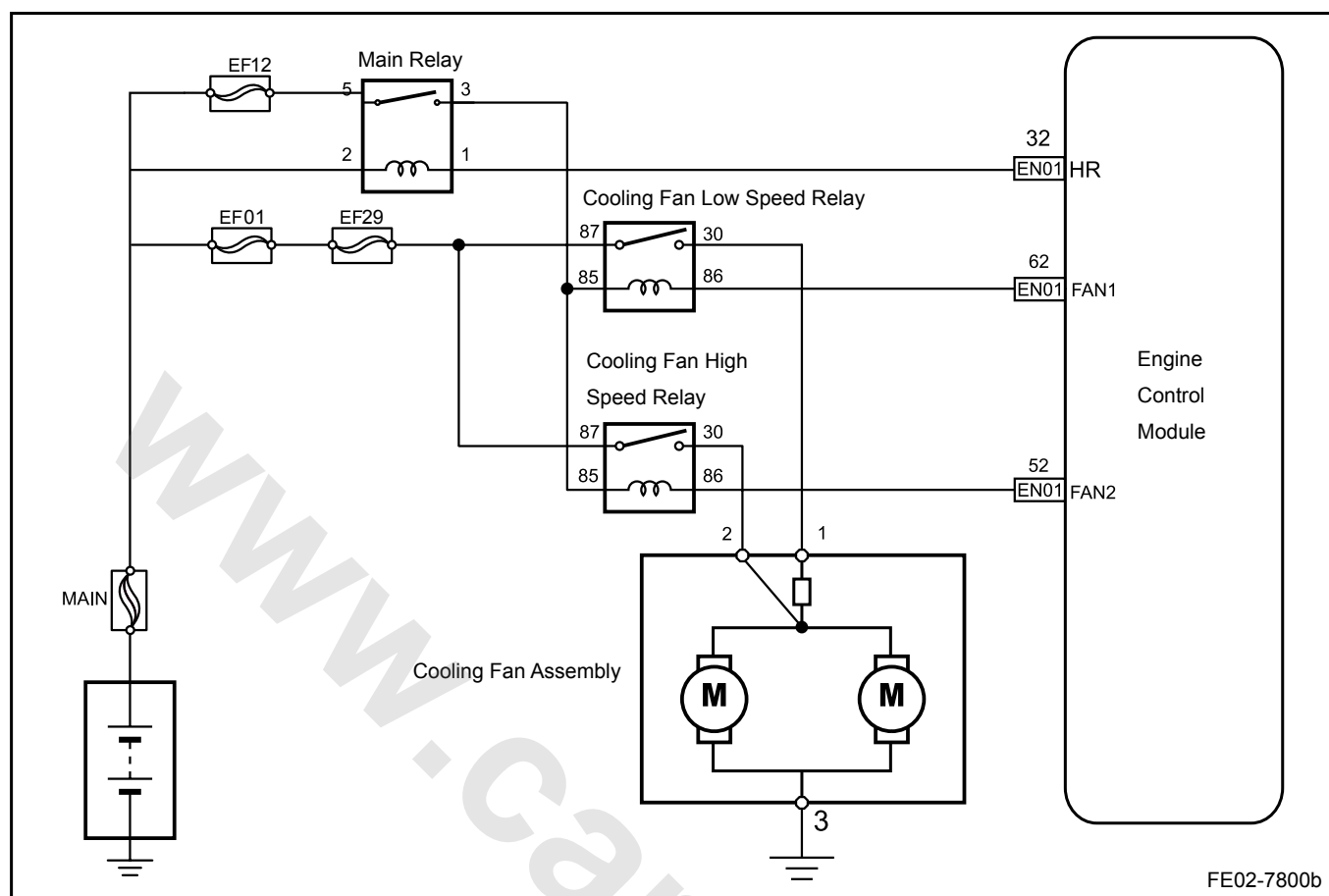
## Legend

- |                                     |   |
|-------------------------------------|---|
| 1. Thermostat                       | 12. Radiator Overflow Pipe                  |
| 2. Engine Coolant Inlet Component   | 13. Coolant Recovery Reservoir Pressure Cap |
| 3. Cooling Fan Shroud               | 14. Radiator Outlet Hose                    |
| 4. Fan Motor                        | 15. Coolant Recovery Reservoir              |
| 5. Fan Blades                       | 16. Fan Low-Speed Current-Limiting Resistor |
| 6. Radiator Inlet Hose              | 17. Water Pump                              |
| 7. Radiator                         | 18. Water Pump Bolts                        |
| 8. Radiator Upper Mounting Brackets | 19. Fan Motor Retaining Bolt                |
| 9. Radiator Cap                     | 20. Fan Motor Retaining Nut                 |
| 10. Engine Coolant Outlet Valve     |   |
| 11. Radiator Lower Vibration Pad    |   |

## 2.8.6 Schematic

## 2.8.6.1 Schematic





## 2.8.7 Diagnostic Information and Procedures

### 2.8.7.1 Diagnosis Description

Refer to [2.8.2.1 Description and Operation](#) Get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 2.8.7.2 Cooling Fan Circuit Diagnosis

#### Diagnostic Tips:

- If a customer complains an overheating fault, verify whether it is because the engine coolant boiling or the engine coolant temperature gage is indicating overheating. If the engine is overheated, but the cooling fan still runs normally, check the engine cooling system.
- If the underhood fuse EF29 fuses immediately after installation, check whether the cooling fan high and low speed relay and cooling fan motor wire is short to ground. If the fuse fuses immediately after the engine control module pull-in, then the cooling fan motor may be faulty.
- When the air-conditioning system is running, the engine control module controls the cooling fan running at low speed. When the air-conditioning high pressure reaches 1,520 kPa (220.5 psi), the engine cooling fan control module will switch the cooling fan from low to high speed. When the air-conditioning high pressure drops back to 1,450 kPa (210.3 psi), the cooling fan will return low-speed.
- Scan tool can be used in the "Function Test" to drive high or low speed cooling fan relay pull-in. Check whether the fan works normally in order to quickly determine the fault.

#### Note

Before carry out this diagnostic procedures, check whether the underhood fuse EF29 is normal and main relay is working properly. When use scan tool "Action Test", make sure the scan tool communication with ECM is normal.

Step 1	Verify the fault.		
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Next</div>			
Step 2	Confirm whether the Low-Speed cooling fan runs.		
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>(a) Turn the ignition switch to "OFF" position.</p> <p>(b) Connect scan tool to the datalink connector.</p> <p>(c) Start the engine to normal working temperature.</p> <p>(d) Turn off the A/C switch.</p> <p>(e) Select in sequence: Engine / Data List / Engine Coolant Temperature.</p> <p>(f) When the engine coolant temperature displays 95°C (203 °F) the cooling fan should be running at low speed.</p> <p>Does the low speed cooling fan run?</p> </div> <div style="width: 50%;"> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;">No</div> <div style="border: 1px solid black; padding: 5px; flex-grow: 1;"> <a href="#">Refer to 2.8.7.4 Low-Speed Cooling Fan Does Not Run</a> </div> </div> <div style="border: 1px solid black; padding: 5px; display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;">Yes</div> <div style="flex-grow: 1;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: center;">Step 3</td> <td>Confirm whether the high-speed cooling fan runs.</td> </tr> </table> </div> </div> </div> </div>		Step 3	Confirm whether the high-speed cooling fan runs.
Step 3	Confirm whether the high-speed cooling fan runs.		
<p>(a) Turn off the A/C switch.</p>			



- (b) When the engine coolant temperature displays 102°C (215.6 °F) The cooling fan should be running at high speed.

Does the high speed cooling fan run?

No

Refer to [2.8.7.3 High-Speed Cooling Fan Does Not Run](#)

Yes

Step 4 Turn on the A/C switch, confirm whether the Low-Speed cooling fan runs.

- (a) Turn the ignition switch to "OFF" position.  
 (b) Connect scan tool to a datalink connector.  
 (c) Select in sequence: Engine / Data List / Engine Coolant Temperature.  
 (d) When the engine coolant temperature is below 90°C (194 °F) Start the engine, turn on the A/C switch, cooling fan should be running at low speed.

Does the low speed cooling fan run?

No

A/C system fault. Refer to [8.2.7 Diagnostic Information and Procedures](#)

Yes

Step 5 Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

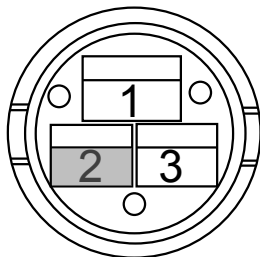
### 2.8.7.3 High-Speed Cooling Fan Does Not Run

#### Note

Before carry out this diagnostic procedures, please Refer to the [2.8.7.2 Cooling Fan Circuit Diagnosis](#), which will facilitate the Diagnostic.

Step 1 check the high-speed cooling fan power supply .

Cooling Fan Harness Connector CA16



FE02-7801b

- (a) Turn the ignition switch to "OFF" position.  
 (b) Disconnect cooling fan wiring harness connector CA16.  
 (c) Turn the ignition switch to "ON" position.  
 (d) Connect scan tool to the datalink connector.  
 (e) Select in sequence: Engine / Action Test / Fan 2.  
 (f) Make the high-speed relay work.  
 (g) Measure voltage between CA16 cooling fan wiring harness connector terminal No.2 and a reliable ground.

Standard Voltage: 11-14 V

Is the voltage specified Value?

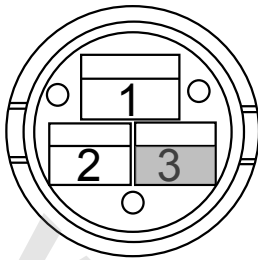
No

Go to step 4

Yes

Step 2 Check the cooling fan ground circuit.

## Cooling Fan Harness Connector CA16



FE02-7802b

- Turn the ignition switch to "OFF" position.
- Disconnect cooling fan wiring harness connector CA16.
- Measure resistance between cooling fan wiring harness connector CA16 terminal No.3 and a reliable ground.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified Value?

No

CA16 terminal No.3 poor connection to ground. inspect and repair faulty parts.

Yes

Step 3 Replace the cooling fan assembly.

Step 4 Use scan tool "Action Test" to drive the fan 2. Does the High-Speed relay work?

No

Go to step 8

Yes

Step 5 Check the high-speed relay A terminal No.87 input power supply.

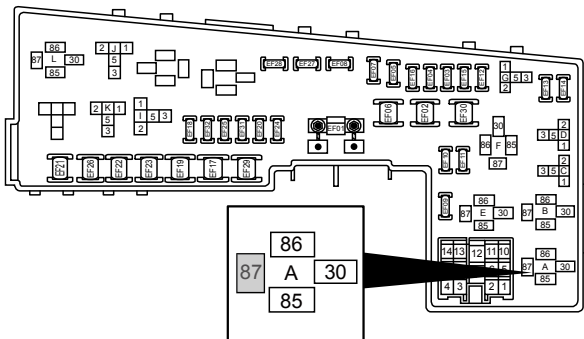
- Turn the ignition switch to "OFF" position.
- Remove the high-speed cooling fan relay A.
- Measure voltage between high-speed cooling fan relay A terminal No.87 and a reliable ground.

Standard Voltage: 11-14 V

Is the voltage specified Value?

No

Relay A terminal No.87 circuit is faulty. inspect and repair the faulty parts

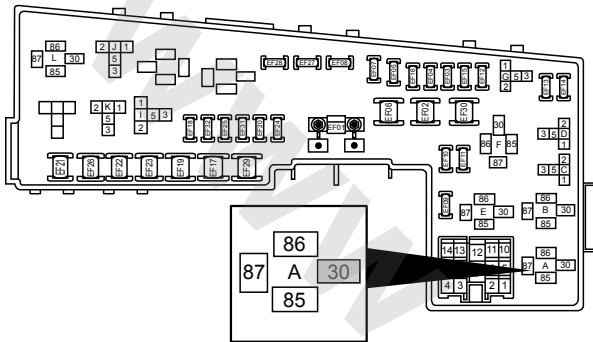
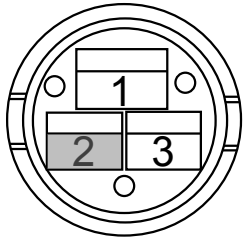


FE02-7803b

Yes

Step 6 Check the fan high-speed relay A wiring harness and cooling fan harness connector CA16 wiring harness..

Cooling Fan Harness Connector CA16

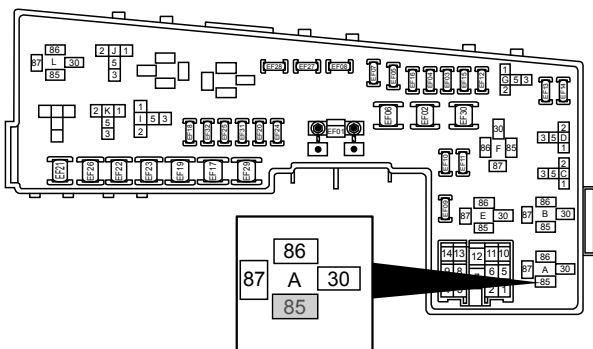


FE02-7804b

Yes

Step 7 Replace the high-speed cooling fan relay A. Confirm the fault has been fixed.

Step 8 Check high-speed relay A coil power supply.



FE02-7805b

Yes

Step 9 Check the high-speed relay A control circuit.

- Turn the ignition switch to "OFF" position.
- Remove the high-speed cooling fan relay.
- Disconnect the cooling fan wiring harness connector CA16.
- Test the continuity between the high-speed cooling fan relay A terminal No.30 and the cooling fan wiring harness connector CA16 terminal No.2.
- Measure resistance between the high-speed cooling fan relay A terminal No.30 and a reliable ground. check whether there is a short to ground circuit.

Standard Value:

Test Items	Specified Value
Relay A (30)-CA16 (2)	Less than 1 $\Omega$
Resistance Between Relay A (30) and A Reliable Ground	10 k $\Omega$ or higher

Is the measured value specified value?

No

Circuit between the relay terminal No.30 and the cooling fan wiring harness connector CA16 terminal No.2 is fault. check and Repair the faulty part.

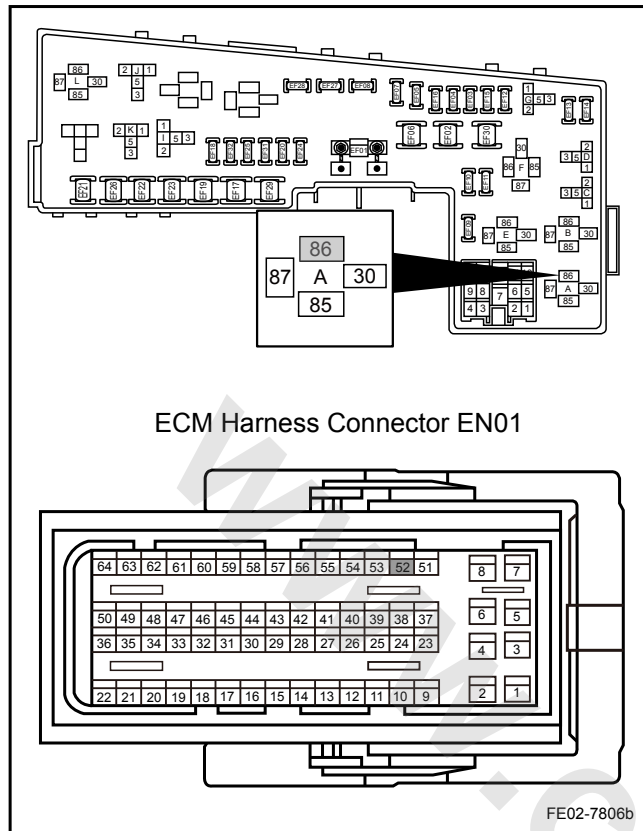
- Turn the ignition switch to "OFF" position.
- Remove the high-speed cooling fan relay A.
- Turn the ignition switch to "ON" position.
- Measure voltage between high-speed cooling fan relay 85 terminal A and a reliable ground.

Standard Voltage: 11-14 V

Is the voltage specified value?

No

Circuit between relay 85 terminals and the main relay terminal No.3 is open.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Remove the high-speed cooling fan relay A.
- Test the continuity between the high-speed cooling fan relay A. 86 terminal A and EN01 terminal No.52.
- Measure voltage between high-speed cooling fan relay 86 terminal A and a reliable ground. check whether the circuit is short to power supply.

Standard Value:

Test Items	Specified Value
Relay A (86)-EN01 (52)	Less than 1 $\Omega$
Relay A (86) - A Reliable Ground	0 V

Is the measured value specified value?

No

Circuit between Relay 86 terminal A and EN01 terminal No.52 is open. check and repair the relevant parts.

Yes

Step 10 Check ECM circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 11 Replace ECM.

Next

Step 12 Diagnostic completed.

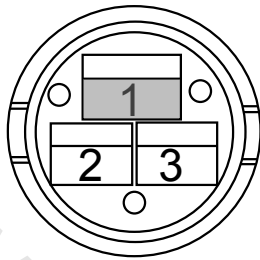
#### 2.8.7.4 Low-Speed Cooling Fan Does Not Run

##### Note

Before carry out this diagnostic procedures, please Refer to the [2.8.7.2 Cooling Fan Circuit Diagnosis](#), which will facilitate the Diagnostic.

Step 1 Check the low-speed cooling fan power supply.

Cooling Fan Harness Connector CA16



FE02-7807b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect cooling fan wiring harness connector CA16.
- (c) Turn the ignition switch to "ON" position.
- (d) Connect scan tool to the datalink connector.
- (e) Select in sequence: Engine / Action Test / Fan 1.
- (f) Make low-speed relay work.
- (g) Measure voltage between CA16 cooling fan wiring harness connector terminal No.1 and a reliable ground.

Standard Voltage: 11-14 V

Is the voltage specified value?

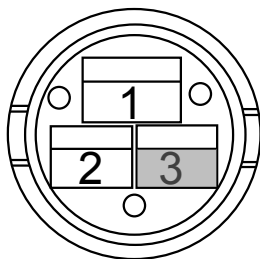
No

Go to step 4

Yes

Step 2 Check the cooling fan ground circuit.

Cooling Fan Harness Connector CA16



FE02-7802b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the cooling fan wiring harness connector CA16.
- (c) Measure resistance between cooling fan wiring harness connector CA16 terminal No.3 and a reliable ground.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

No

CA16 terminal No.3 poor connection to ground. Inspect and repair the faulty parts.

Yes

Step 3 Replace the cooling fan assembly.

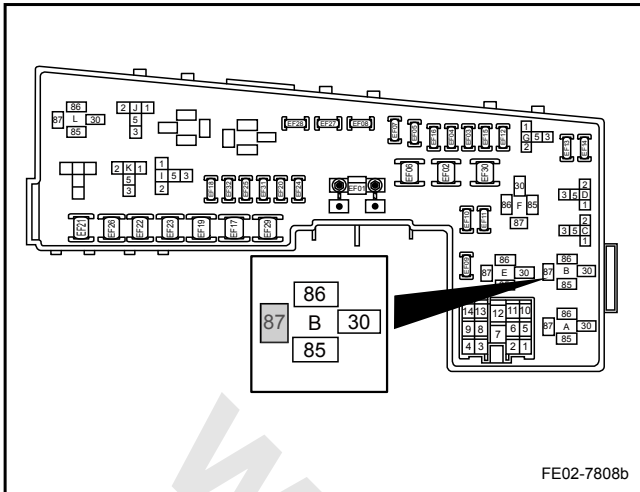
Step 4 Use scan tool "Action Test" to drive fan 1. Does the low speed relay work?

No

Go to step 8

Yes

Step 5 Check relay B terminal No.87 power supply.



- Turn the ignition switch to "OFF" position.
- Remove the low-speed cooling fan relay B.
- Measure voltage between cooling fan relay B terminal No.87 and a reliable ground.

Standard Voltage: 11-14 V

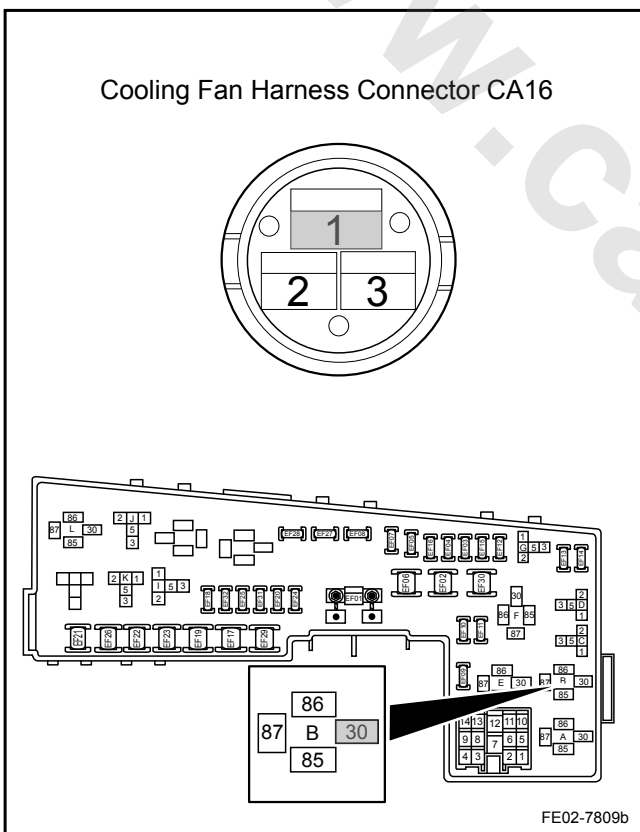
Is the voltage specified value?

No

Relay B terminal No.87 power circuit is faulty.  
Inspect and repair the faulty parts.

Yes

Step 6 Check the circuit between low-speed cooling fan relay and cooling fan wiring harness connector CA16.



- Turn the ignition switch to "OFF" position.
- Remove low-speed cooling fan relay.
- Disconnect cooling fan wiring harness connector CA16.
- Test the continuity between the Low-Speed cooling fan relay B terminal No.30 and cooling fan wiring harness connector CA16 terminal No.1.
- Measure resistance between cooling air speed relay B terminal No.30 and a reliable ground. check whether there is a short to ground circuit.

Standard Value:

Test Items	Specified Value
Relay B (30)-CA16 (1)	Less than 1 $\Omega$
Resistance Between Relay B (30) and A Reliable Ground	10 k $\Omega$ or higher

Is the voltage specified value?

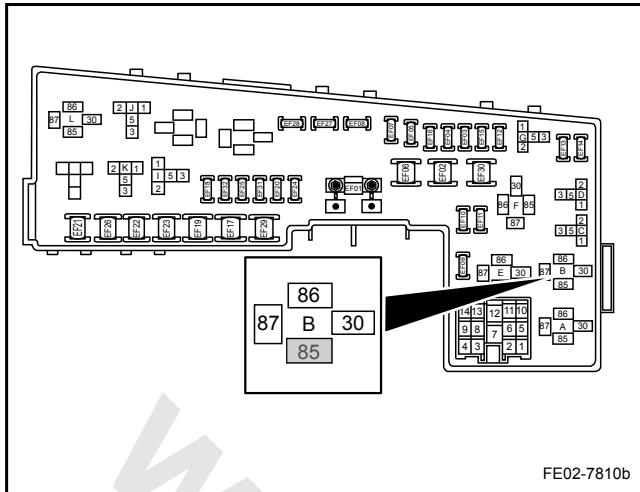
No

Circuit between the relay terminal No.30 and the cooling fan wiring harness connector CA16 terminal No.1 is faulty. Check and Repair the faulty part.

Yes

Step 7 Replace the cooling fan low speed relay B. Confirm whether the fault has been fixed.

Step 8 Check low-speed relay B coil power supply.



- Turn the ignition switch to "OFF" position.
- Remove the low-speed cooling fan relay B.
- Turn the ignition switch to "ON" position.
- Measure voltage between relay B terminal No.85 and a reliable ground.

Standard Voltage: 11-14 V

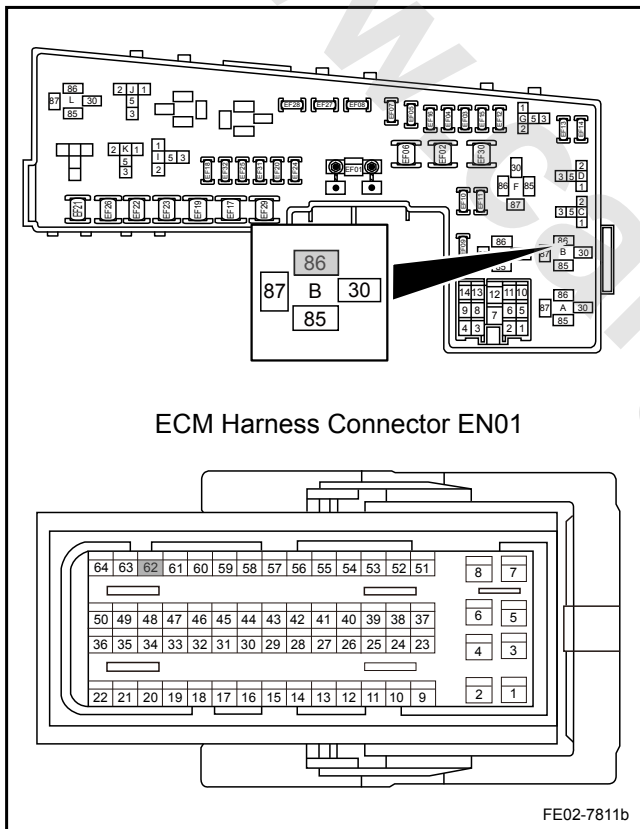
Is the voltage specified value?

No

Circuit between relay terminal No.85 and the main relay terminal No.3 is open.

Yes

Step 9 Check low-speed relay B control circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Remove the low-speed cooling fan relay B.
- Test the continuity between the cooling fan low speed relay B terminal No.86 and EN01 terminal No.62.
- Measure voltage between high-speed cooling fan relay B terminal No.86 and a reliable ground. Check whether there is a circuit short to power supply.

Standard Value:

Test Items	Specified Value
Relay B (86)-EN01 (62)	Less than 1 $\Omega$
Relay B (86) - Reliable Ground	0 V

Is the measured value specified values?

No

Circuit between relay B terminal No.86 and EN01 terminal No.62 is open.

Yes

Step 10 Check ECM circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 11 Replace ECM.

Next

Step 12 Diagnostic completed.

### 2.8.7.5 Cooling Fan Always Runs At Low Speed

#### Note

When the cooling fan always runs at low speed, it is recommended to carry out diagnostic when the engine is completely cooled down.

Step 1 Verify the fault.

Next

Step 2 Check the engine coolant temperature sensor signal.

- (a) Turn the ignition switch to "OFF" position.
- (b) Connect scan tool to the datalink connector.
- (c) Turn off the A/C switch.
- (d) Turn the ignition switch to "ON" position.
- (e) Select in sequence: Engine / Data List / Engine Coolant Temperature.
- (f) Observe the temperature measured by the engine coolant temperature sensor. When the engine is completely cooled down, this temperature should be slightly higher than the ambient temperature.

Confirm whether the measured temperature is normal.

No

Temperature sensor or circuit is faulty. Refer to the [2.2.7.19 DTC P0117 P0118](#)

Yes

Step 3 Remove and check the cooling fan low speed relay. Does the cooling fan still run?

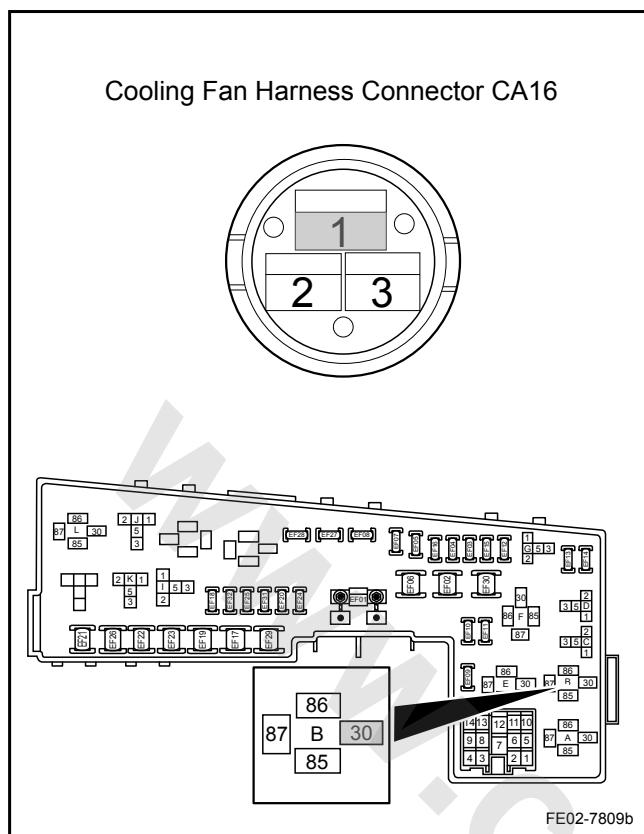
No

Go to step 5

Yes

Step 4 Check and repair the circuit between low-speed cooling fan relay and cooling fan wiring harness connector CA16.





- Turn the ignition switch to "OFF" position.
- Remove of low-speed cooling fan relay.
- Disconnect cooling fan wiring harness connector CA16.
- Check and repair circuit between relay and connector short to power supply.

Step 5 Check cooling fan low speed relay.

- Measure resistance between relay terminal No.87 and terminal No.30.

Standard Resistance: 10 kΩ or higher

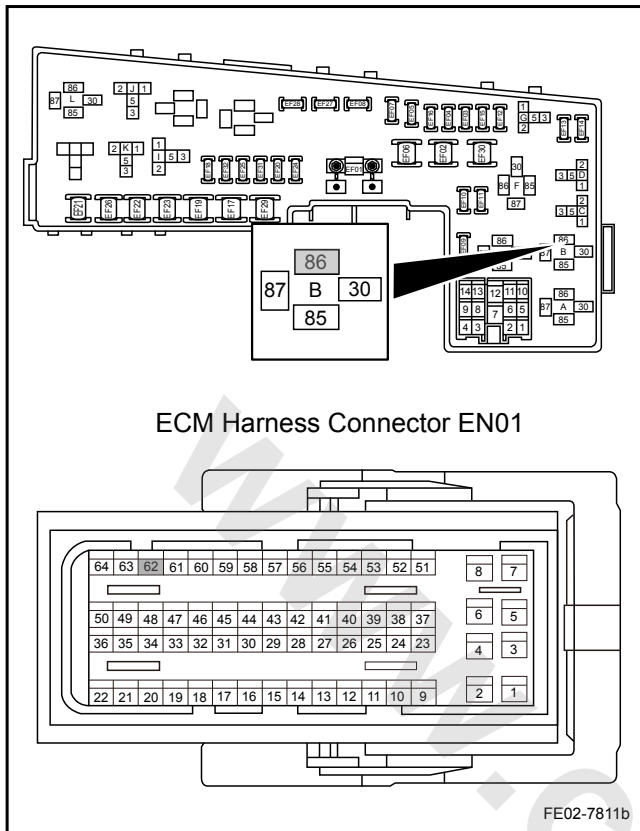
Is the resistance specified value?

No

Replace the relay.

Yes

Step 6 Check low-speed relay B control circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Remove low-speed cooling fan relay B.
- Test the continuity between cooling fan low speed relay B terminal No.86 and ECM harness connector EN01 terminal No.62.
- Measure resistance between cooling fan low speed relay B terminal No.86 and a reliable ground. check whether there is a short to ground circuit.

Standard Value:

Test Items	Specified Value
Relay B (86)-EN01 (62)	Less than 1 $\Omega$
Relay B (86) - Reliable Ground	10 k $\Omega$ or higher

Is the measured value specified Value?

No

Circuit between relay B terminal No.86 and EN01 terminal No.62 is faulty.

Yes

Step 7 Check ECM circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

Next

Step 9 Diagnostic completed.

### 2.8.7.6 Cooling Fan Always Runs At High Speed

#### Note

When the cooling fan always runs at high speed, it is recommended to carry out diagnostic when the engine is completely cooled down.

Step 1 Verify the fault.

Next

Step 2 Check the engine coolant temperature sensor signal.

- (a) Turn the ignition switch to "OFF" position.
- (b) Connect scan tool to the datalink connector.
- (c) Turn off the A/C switch.
- (d) Turn the ignition switch to "ON" position.
- (e) Select in sequence: Engine / Data List / Engine Coolant Temperature.
- (f) Observe the temperature measured by the engine coolant temperature sensor. When the engine is completely cooled down, this temperature should be slightly higher than the ambient temperature.

Confirmation shows the temperature is normal.

No

Temperature sensor or circuit is faulty. Refer to [2.2.7.19 DTC P0117 P0118](#)

Yes

Step 3 Remove and check the cooling fan high speed relay. Does the cooling fan still run?

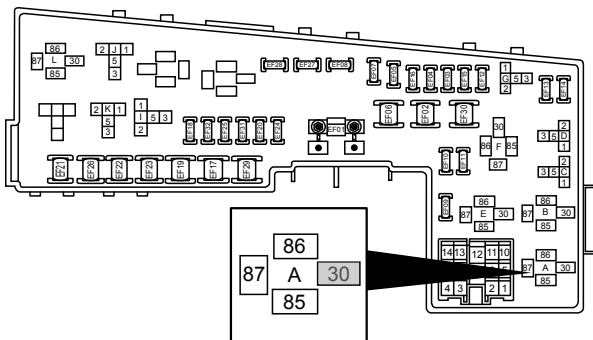
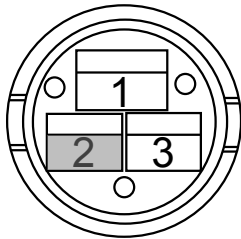
No

Go to step 5

Yes

Step 4 Check and repair the circuit between high-speed cooling fan relay and cooling fan wiring harness connector SCA16.

Cooling Fan Harness Connector CA16



FE02-7804b

- (a) Turn the ignition switch to "OFF" position.
- (b) Remove High-Speed cooling fan relay.
- (c) Disconnect cooling fan wiring harness connector CA16.
- (d) Check and repair the circuit between relay and connector short to power supply.

Step 5 check cooling fan high speed relay.

- (a) Measure resistance between relay terminal No.87 and terminal No.30.

Standard Resistance: 10 kΩ or higher

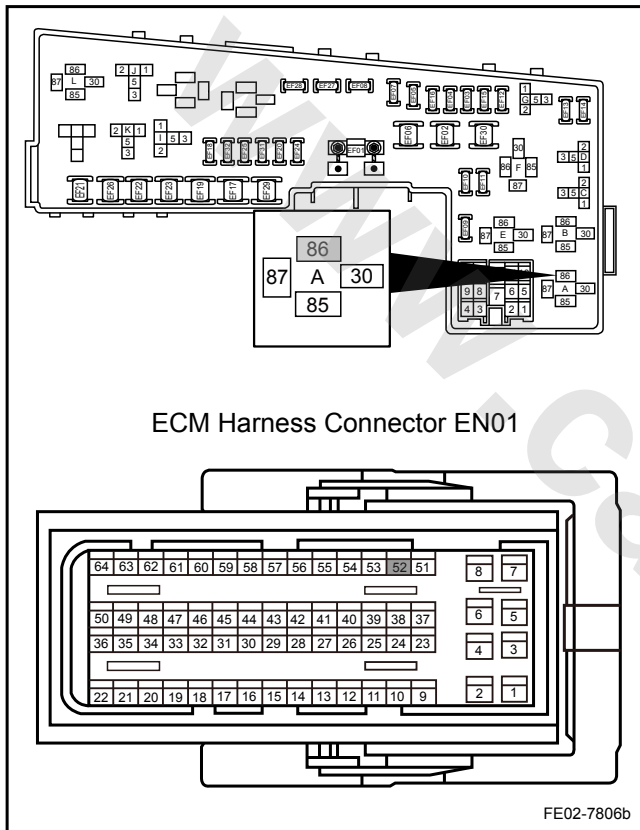
Confirm whether the measured resistance is normal.

No

Replace the relay.

Yes

Step 6 Check high-speed relay A control circuit.



- (a) Turn the ignition switch to "OFF" position.  
 (b) Disconnect ECM harness connector EN01.  
 (c) Remove high-speed cooling fan relay A.  
 (d) Test continuity between high-speed cooling fan relay A terminal No.86 and ECM harness connector EN01 terminal No.52.  
 (e) Measure resistance between high-speed cooling fan relay A terminal No.86 and a reliable ground. Check whether the circuit is short to ground.

Standard Value:

Test Items	Specified Value
Relay A (86)-EN01 (52)	Less than 1 Ω
Relay A (86) - Reliable Ground	10 kΩ or higher

Is the measured values specified value?

No

Circuit between relay A terminal No.86 and EN01 terminal No.52 is short to ground.

Yes

Step 7 Check ECM circuit.

- (a) Check whether ECM power supply circuit is normal.  
 (b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

Next

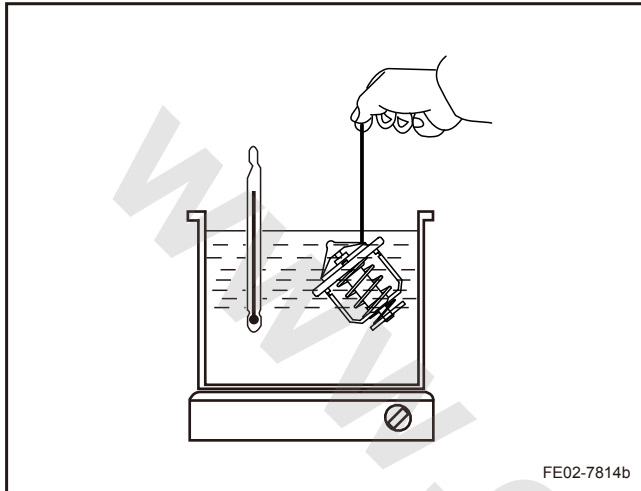
Step 9 Diagnostic completed.

## 2.8.7.7 Thermostat Diagnostic

Step 1	Remove the thermostat. Refer to <a href="#">2.8.8.4 Thermostat Replacement</a> .
--------	--

Next

Step 2	Soak the thermostat in water and heat the water.
--------	--



(a) Check the thermostat switch on temperature.

Standard Value: 82°C (179.6 °F)

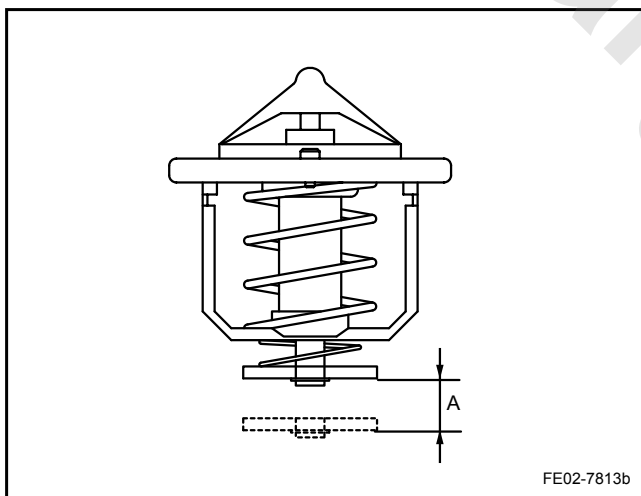
Is the thermostat switch on temperature normal?

No

Replace the thermostat. Refer to  
[2.8.8.4 Thermostat Replacement](#)

Yes

Step 3	Check the thermostat valve lift travel distance.
--------	--



Standard Valve Lift: 10 mm (0.39 in) or higher at 95°C(203 °F)

Confirm whether the valve lift is normal.

No

Replace the thermostat. Refer to  
[2.8.8.4 Thermostat Replacement](#)

Yes

Step 4	Check whether the thermostat is completely switched off at low temperature.
--------	---

When the thermostat temperature is lower than 77°C (171 °F),  
check whether the thermostat is completely switched off.

No

Replace the thermostat. Refer to  
[2.8.8.4 Thermostat Replacement](#)

Yes

Step 5 Thermostat normal.

## 2.8.7.8 Engine Overheating

## Warning!

Refer to "Cooling System Service Warning" in "Warnings and Notices".

Step 1 Is there engine coolant loss?

Yes

Add engine coolant.

No

Step 2 Is the engine coolant concentration inadequate?

Yes

Use "Geely Genuine ultra-long-acting engine coolant" or the same level of high-quality ethylene glycol base engine coolant, model or standard number: comply with SH0521.

No

Step 3 Check whether there is dust, leaves or insects and other debris at the radiator front?

Yes

Clean up the front of the radiator.

No

Step 4 Check coolant pipes, pumps, engine coolant inlet components and radiator. Check for blockage and cylinder head gasket leaking.

Yes

Replace any damaged parts.

No

Step 5 Connect scan tool, with the data flow showing the engine coolant temperature reaches 95°C (203 °F ). Check the radiator inlet and outlet hoses coolant temperature. There should be no temperature difference. Is the temperature difference big?

Yes

1. Check whether the thermostat is working properly. 2. Check whether there is radiator blockage.

No

Step 6 Use ignition timing gun to check whether the ignition is too late.

Yes

Check engine ignition timing. Carry out ECM diagnostic.

No	
Step 7	Check whether the cooling fan is working properly.
Yes	
Check the cooling fan circuit. Refer to <a href="#">2.8.7.2 Cooling Fan Circuit Diagnosis</a>	
No	
Step 8	Check whether there is water pump fault.
Yes	
Replace the water pump. Refer to <a href="#">2.8.8.6 Water Pump Replacement</a>	
No	
Step 9	Check whether radiator cap is faulty.
Yes	
Replace the faulty radiator cap.	
No	
Step 10	Check whether there is cylinder head cover and engine block cracking or blockage. Is cylinder block gasket sealing poor
Yes	
Repair the damaged cylinder head cover and engine block	
No	
Step 11	Confirm that the fault has been fixed.

### 2.8.7.9 Engine Does Not Reach Normal Operating Temperature

Step 1	Check whether coolant recovery reservoir coolant level is abnormal?
Yes	
Add engine coolant to specified level.	
No	
Step 2	Check the cooling system temperature.

- Turn the ignition switch to "OFF" position.
- Connect the scan tool to a datalink connector.
- Turn the ignition switch to "ON" position.
- Select in sequence: Engine / Data List / Engine Coolant Temperature.
- Maintain the engine speed at 2,000 rpm and observe the data flow for the engine coolant temperature.

Does the engine coolant temperature increase?

Yes

Instrument cluster is faulty. Refer to [11.7.6 Diagnostic Information and Procedures](#)

No

Step 3 Check whether the cooling fan rotates normally?

Yes

Refer to [2.8.7.5 Cooling Fan Always Runs At Low Speed](#)

No

Step 4 Check whether the thermostat is working as per normal?

- (a) Check whether the installed thermostat type is correct.
- (b) Check whether the thermostat is stuck at the open position.

Yes

Replace with the correct type of thermostat.

No

Step 5 Check whether engine coolant pipes are blocked.

Yes

Flush the cooling system or check the radiator flow.

No

Step 6 Road test vehicle. Confirm the fault has been fixed.

### 2.8.7.10 Excessive Engine Coolant Loss

Step 1 Check whether the radiator is leaking?

Yes

Replace the damaged radiator. Refer to [2.8.8.5 Radiator Replacement](#)

No

Step 2 Check for leaking at the following locations: A, Coolant Recovery Reservoir. B, Coolant Pipes.

Yes

If necessary, replace the following components: Coolant Recovery Reservoir, Plumbing.

No

Step 3 Check whether the radiator pipes and joints are loose or damaged?

Yes

Reinstall the coolant pipes or the clamp.



No

Step 4 Check whether the water pump seal is leaking.

Yes

Replace the Pump Seal.

No

Step 5 Check whether the cylinder head cover torque is appropriate.

Yes

Tighten the cylinder head gasket bolts to the specified torque. If necessary, replace the cylinder head gasket

No

Step 6 Check for leaking at the follows locations:

- (a) Intake Manifold
- (b) Cylinder Head Gasket
- (c) Cylinder Block Bolt
- (d) Heater Core
- (e) Radiator Discharge Plug

Yes

When necessary, repair or replace parts to eliminate leakage faults.

No

Step 7 Confirm that the fault has been fixed.

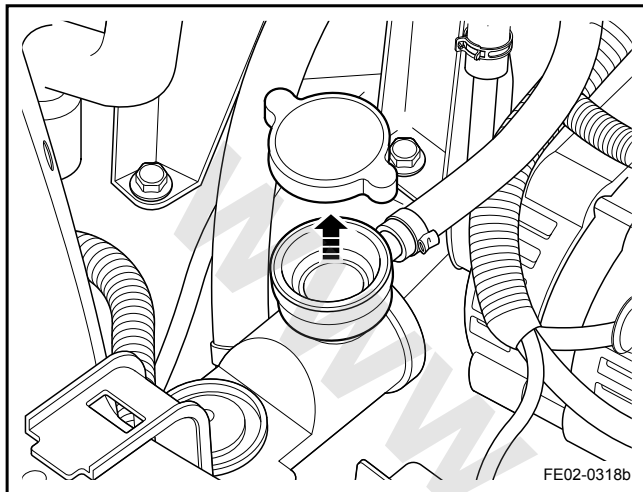
## 2.8.8 Removal and Installation

### 2.8.8.1 Engine Coolant Discharge and Filling

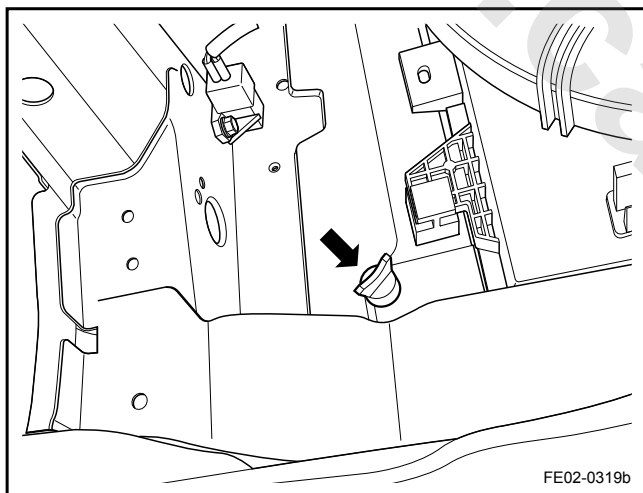
#### Warning!

Refer to "Cooling System Service Warning" in "Warnings and Notices".

1. Place a recycling container under the vehicle to contain the discharged engine coolant.
2. Remove the radiator cap.



3. Remove the engine coolant drainage valve.

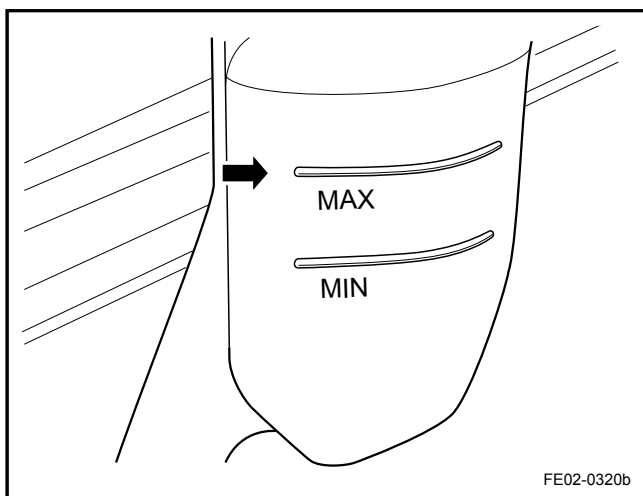


4. Contain the discharged engine coolant with the container.

#### Note

Handle the recycled old engine coolant, waiting for scrap or recycling. Do not dispose the old engine coolant into the water sewage to protect the environment.

5. Install the engine coolant drainage valve.
6. Clean the Coolant Recovery Reservoir. Refer to [2.8.8.2 Coolant Recovery Reservoir Replacement](#).



7. Slowly fill the engine coolant into the Coolant Recovery Reservoir to the standard scale, so that the air will be discharged from the cooling outlet pipe.
8. Start the engine until the thermostat switches on. When the radiator inlet and outlet pipes are hot, it can be identified that the thermostat is switched on.
9. Shut down the engine. Confirm that the engine coolant drainage valve is not leaking. (Repeat the above steps until the discharged coolant is free of bubble.)
10. Fill the engine coolant so that the engine coolant Coolant Recovery Reservoir coolant level reaches the highest scale (MAX location).

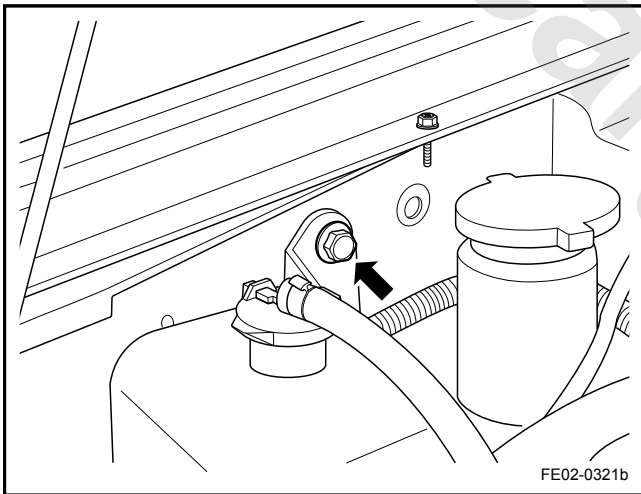
### 2.8.8.2 Coolant Recovery Reservoir Replacement

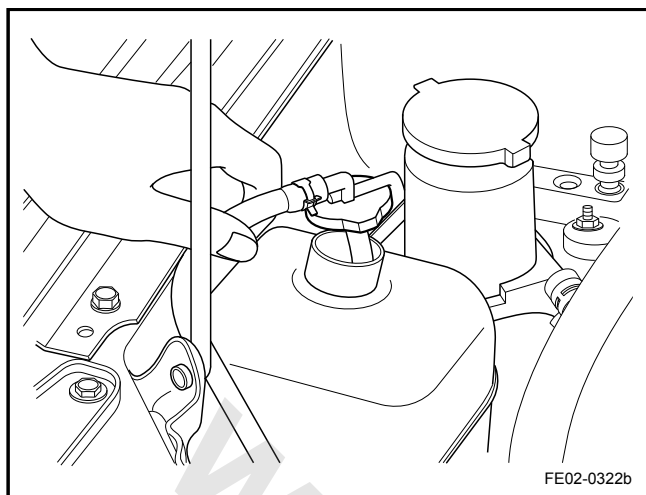
Removal Procedure:

#### Warning!

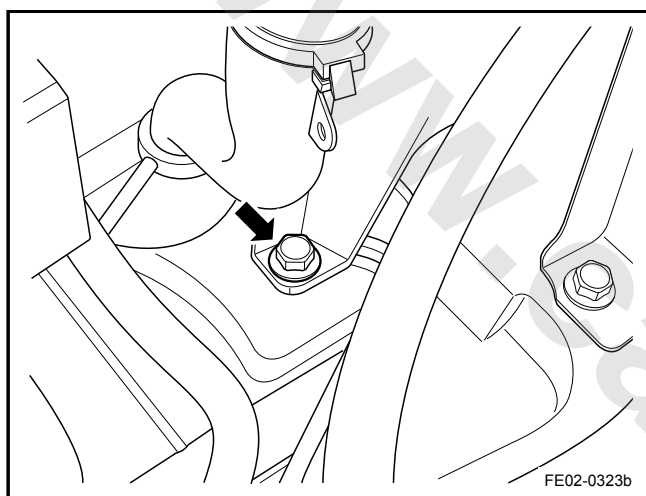
Refer to "Warnings and Notices" in the "warning on cooling system maintenance."

1. Discharge the engine coolant.
2. Remove the coolant recovery reservoir upper retaining bolt.

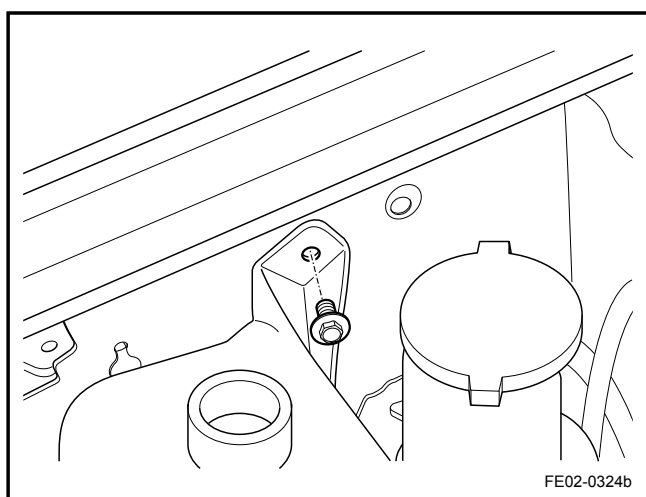




3. Remove the engine coolant overflow pipe.

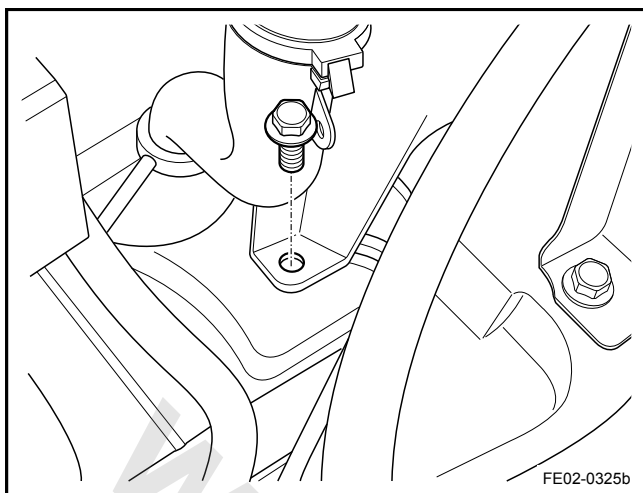


4. Remove the coolant recovery reservoir lower retaining bolt.

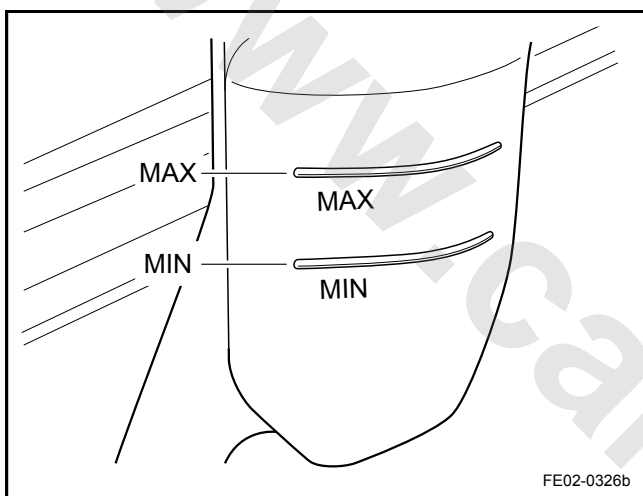


#### Installation Procedure:

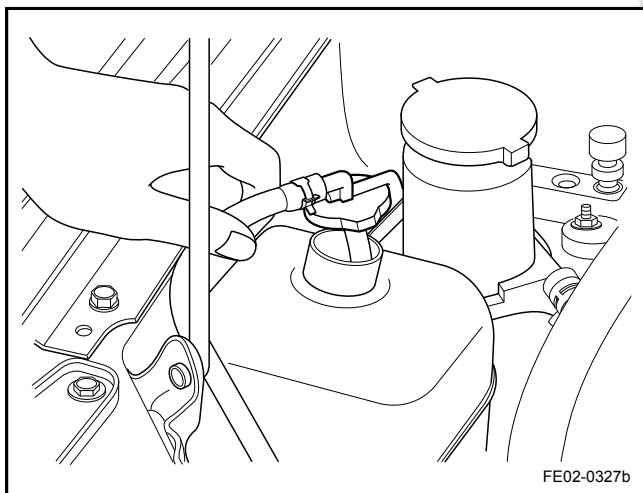
1. Install the coolant recovery reservoir upper retaining bolt.  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)



2. Install the coolant recovery reservoir lower retaining bolt.  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)



3. Fill the engine coolant to the level between the MIN and MAX.



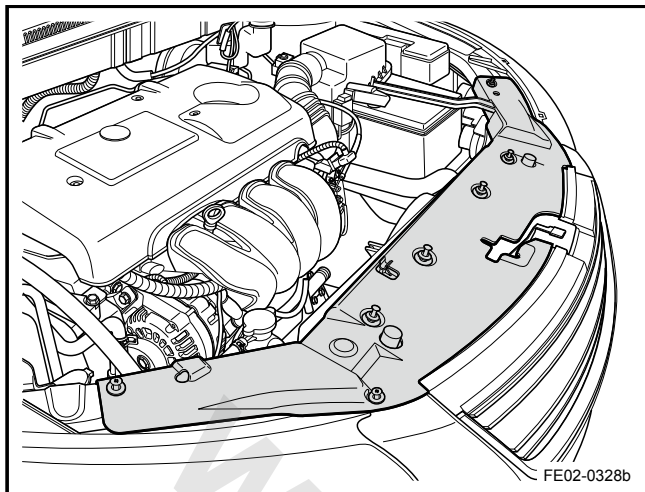
4. Install the coolant recovery reservoir cap and the engine coolant overflow pipe.

### 2.8.8.3 Cooling Fan Replacement

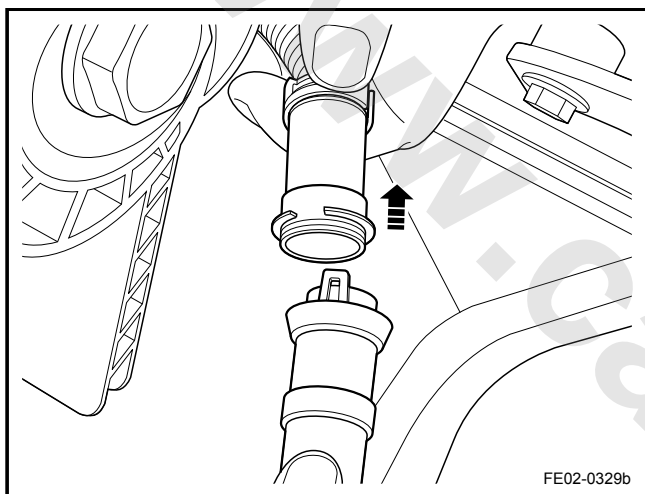
Removal Procedure:

#### Warning!

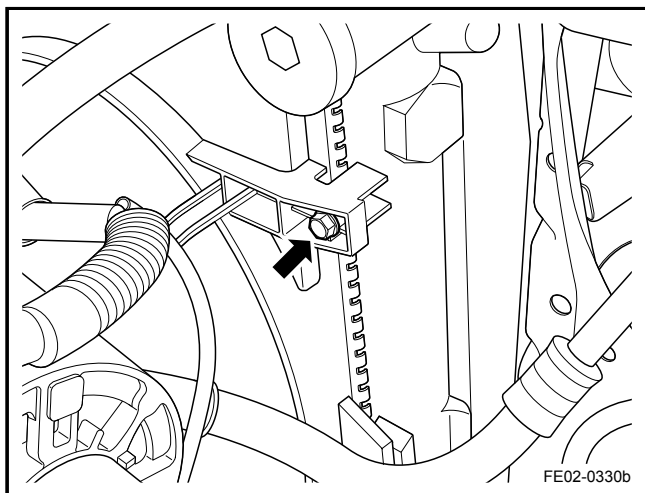
Do not place hands in between fan blades running area when the fan is not switched off.



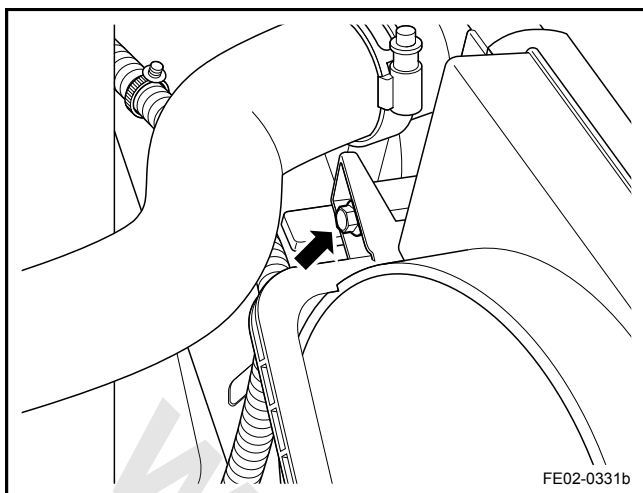
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the radiator air baffle and deflector.



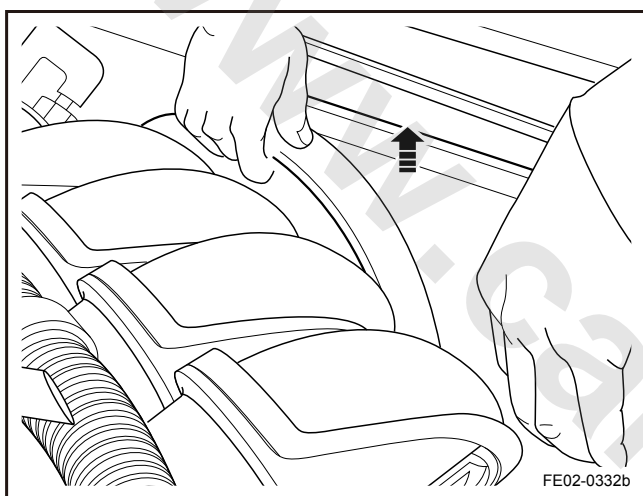
3. Disconnect the fan motor wiring harness connector.



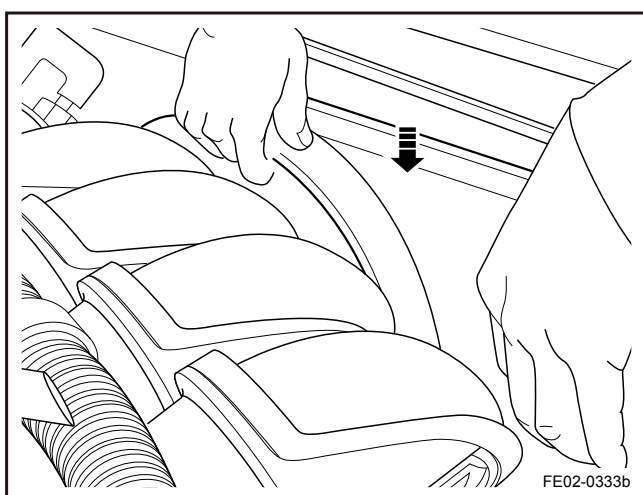
4. Remove the right side of the fan cover retaining bolt.



5. Remove the left side of the fan cover retaining bolt.

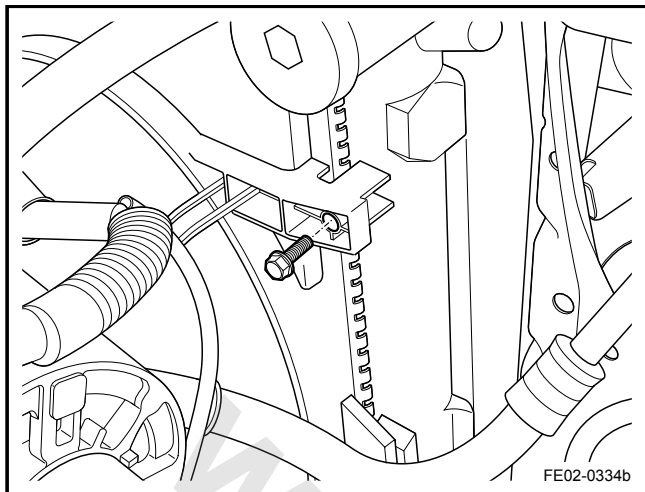


6. Remove the fan assembly from the vehicle.

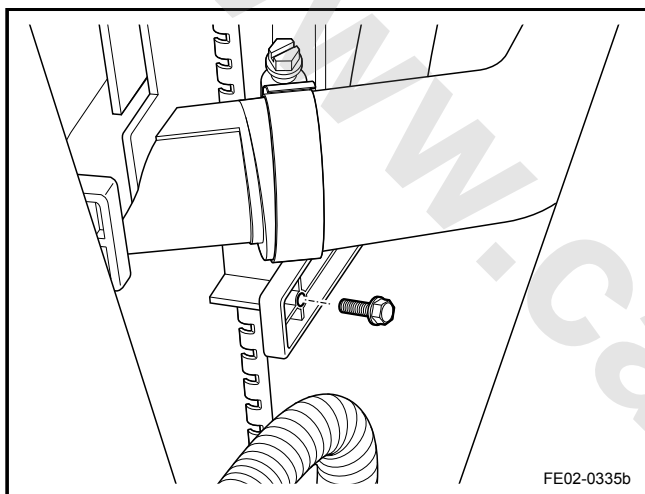


#### Installation Procedure:

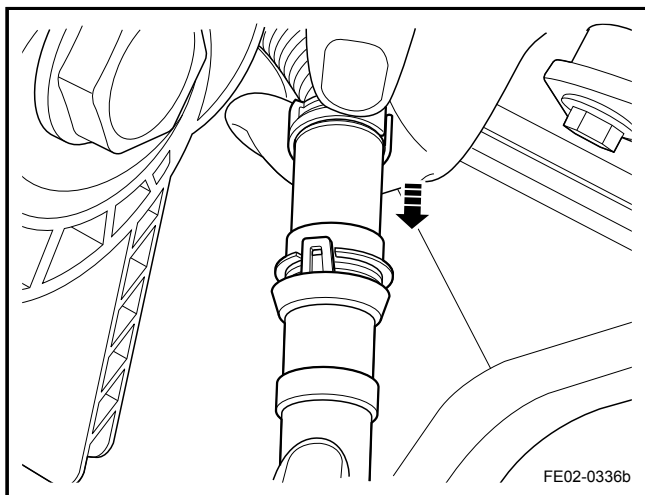
1. Install the fan assembly to the vehicle.



2. Install the right side of the fan cover retaining bolt.  
Torque: 9 Nm (Metric) 6.7 lb-ft (US English)

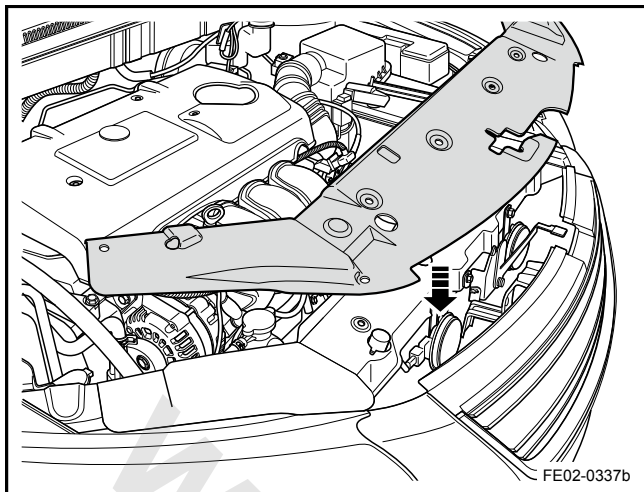


3. Install the left side of the fan cover retaining bolt.  
Torque: 9 Nm (Metric) 6.7 lb-ft (US English)



4. Connect the cooling fan motor wiring harness connector.





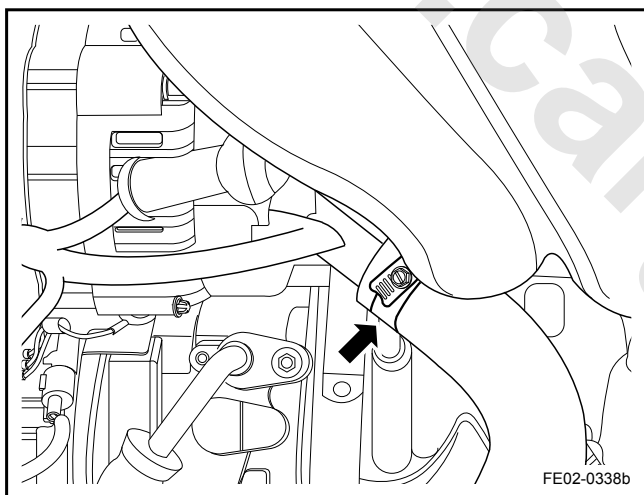
5. Install the radiator air baffle and deflector.
6. Connect the battery negative cable.

#### 2.8.8.4 Thermostat Replacement

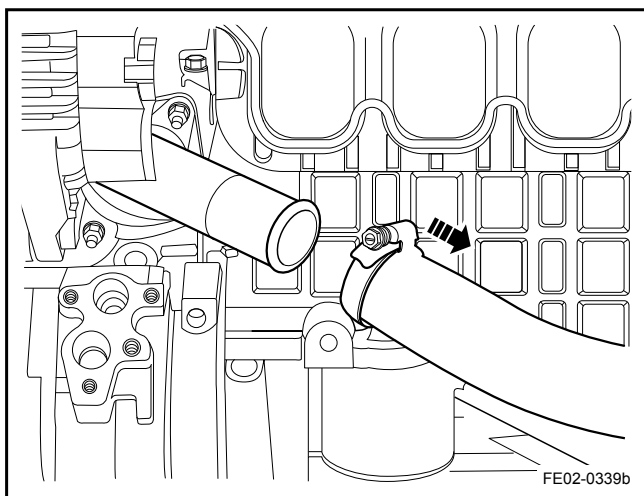
Removal Procedure:

**Warning!**

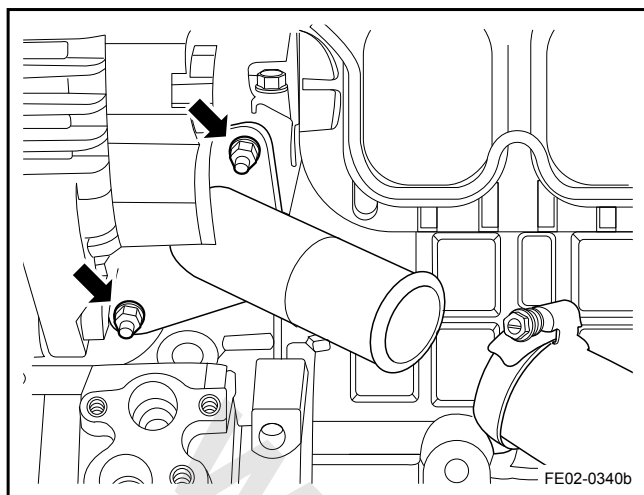
Refer to "Cooling System Service Warning" in "Warnings and Notices".



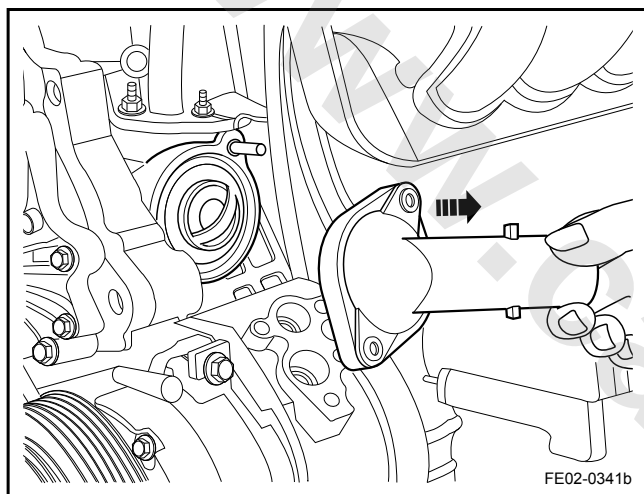
1. Discharge the engine coolant. Refer to [2.8.8.1 Engine Coolant Discharge and Filling](#).
2. Loosen the radiator outlet pipe clamp from the engine coolant inlet pipe.



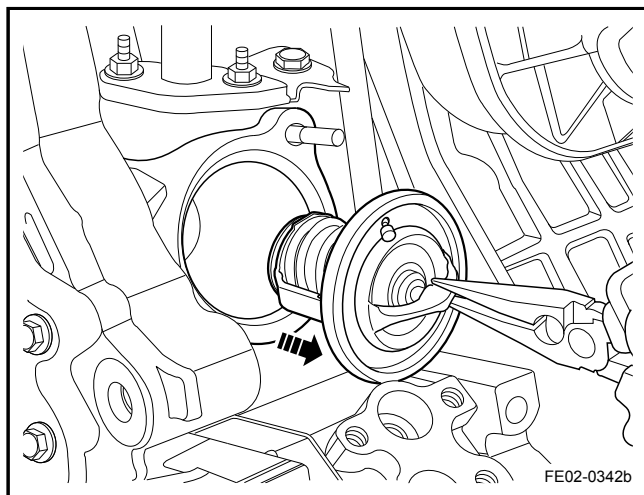
3. Disconnect the radiator outlet pipe from the engine coolant inlet pipe.



4. Remove the engine coolant inlet pipe to the cylinder block retaining nuts.



5. Remove the engine coolant inlet pipe component from the cylinder block.



6. Remove the thermostat from the cylinder block.

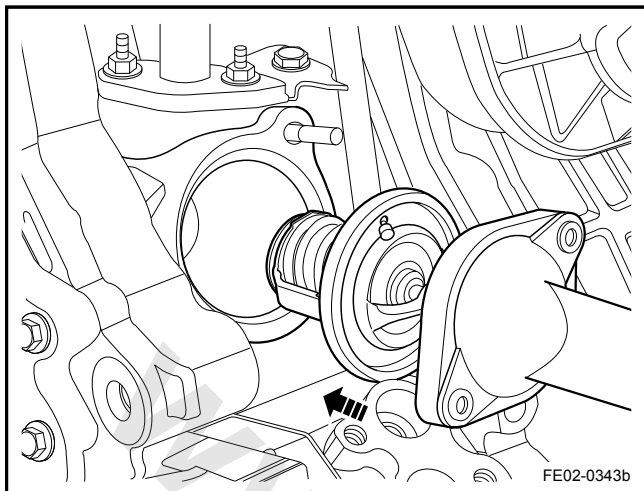
**Note**

The thermostat and seals are integrated.

7. Clean the engine coolant inlet pipe and cylinder block mating surface.

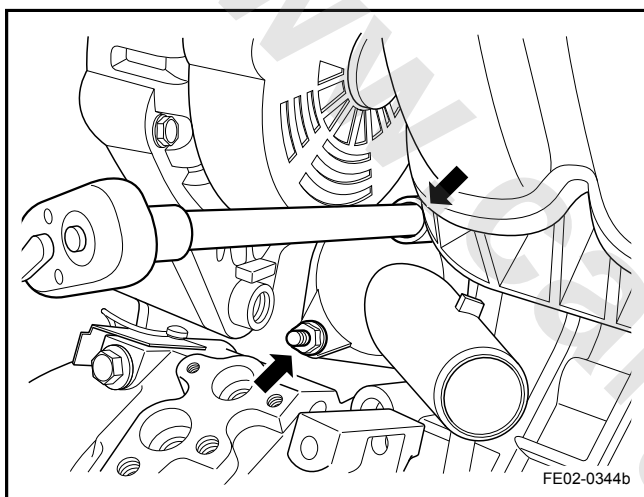
## Installation Procedure:

1. Install the thermostat to the cylinder block.
2. Install the engine coolant inlet pipe component to the cylinder block.

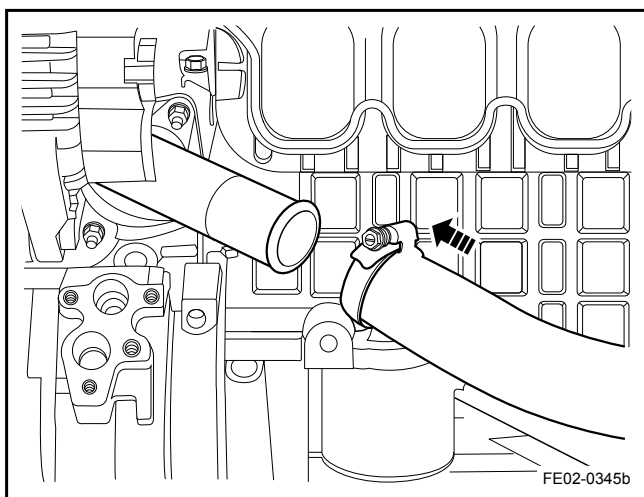


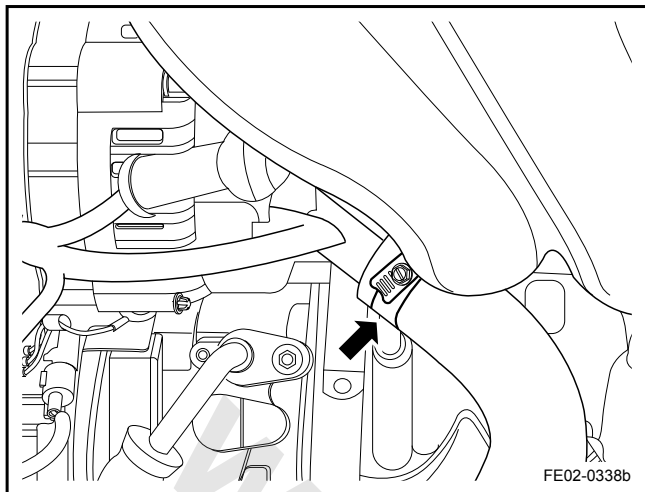
3. Install the engine coolant inlet pipe component to the cylinder block retaining nuts.

Torque: 11 Nm (Metric) 8.2 lb-ft (US English)



4. Install radiator outlet pipe to the engine coolant inlet pipe component.





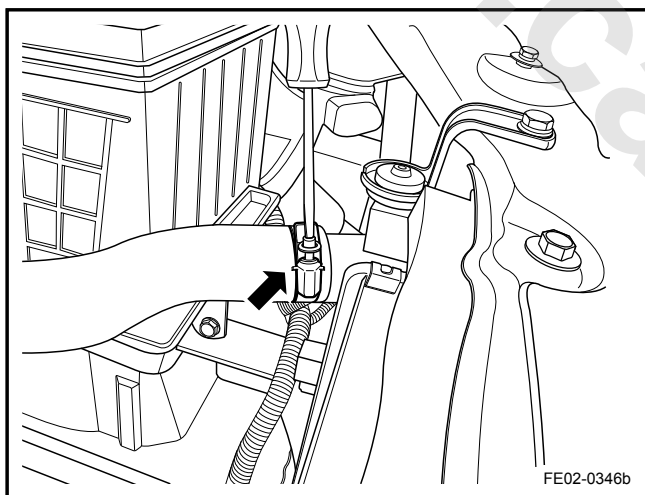
5. Tighten the radiator outlet pipe clamp.
6. Fill the engine coolant.

### 2.8.8.5 Radiator Replacement

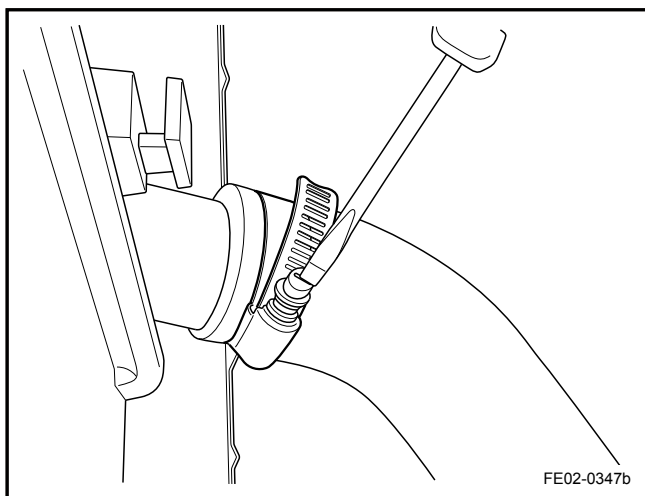
Removal Procedure:

**Warning!**

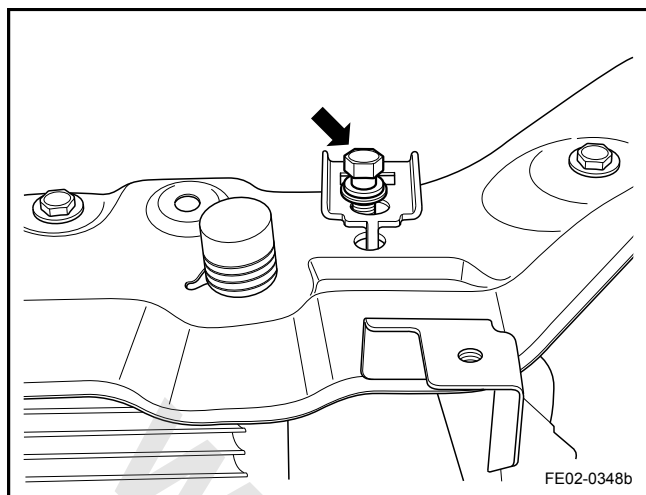
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



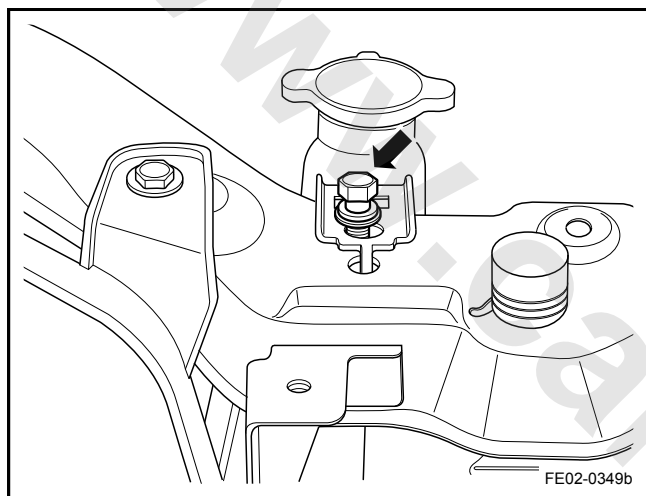
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Discharge the engine coolant. Refer to [2.8.8.1 Engine Coolant Discharge and Filling](#).
3. Remove the cooling fan. Refer to [2.8.8.3 Cooling Fan Replacement](#).
4. Remove the radiator inlet pipe clamp, disconnect the radiator inlet pipe from the radiator.



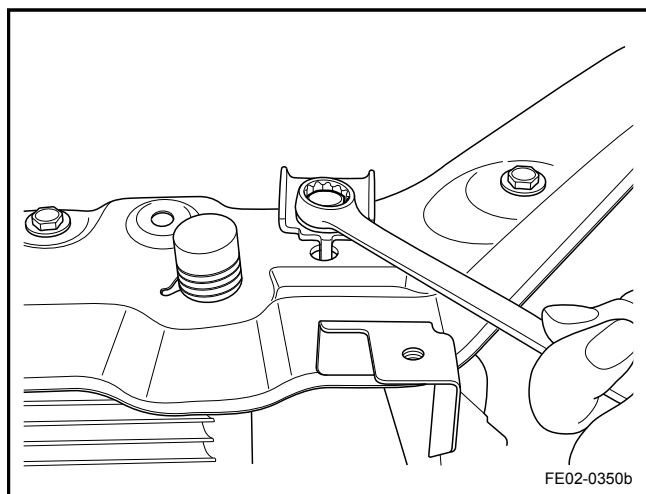
5. Remove the radiator inlet pipe clamp, disconnect the radiator outlet pipe from the radiator.



6. Remove the left side of radiator retaining bolts.



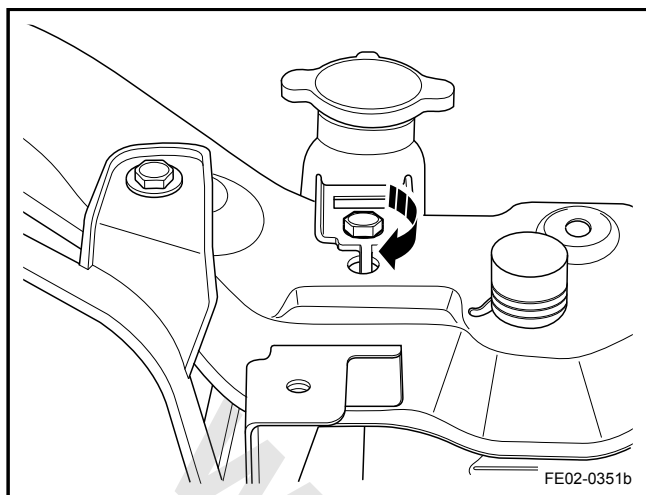
7. Remove the right side of radiator retaining bolts and remove the radiator.



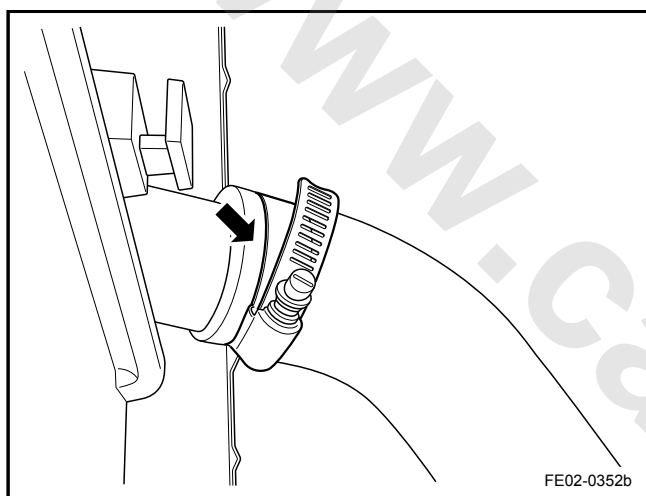
Installation Procedure:

1. Install the radiator and tighten the left side of radiator retaining bolts.

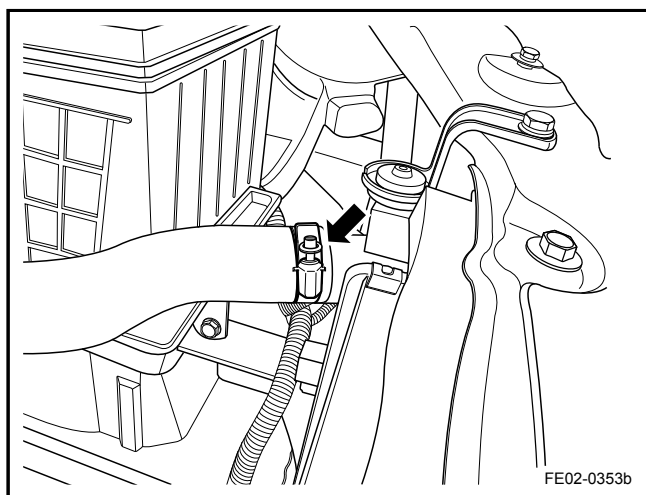
Torque: 10.5 Nm (Metric) 7.8 lb-ft (US English)



2. Install and tighten the right side of radiator retaining bolts.  
Torque: 10.5 Nm (Metric) 7.8 lb-ft (US English)



3. Install the radiator outlet pipe and tighten the clamp.



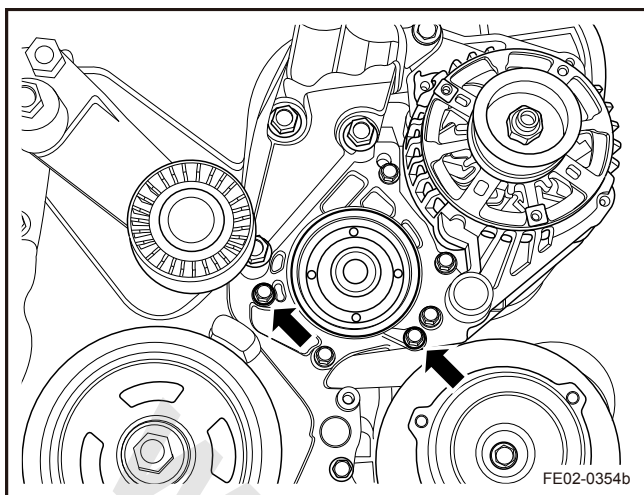
4. Install the radiator inlet pipe and tighten the clamp.
5. Install the cooling fan.
6. Fill the engine coolant.
7. Connect the battery negative cable.

### 2.8.8.6 Water Pump Replacement

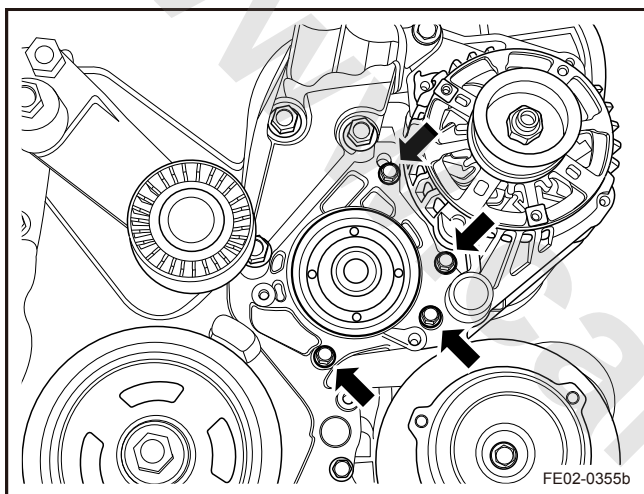
Removal Procedure:

**Warning!**

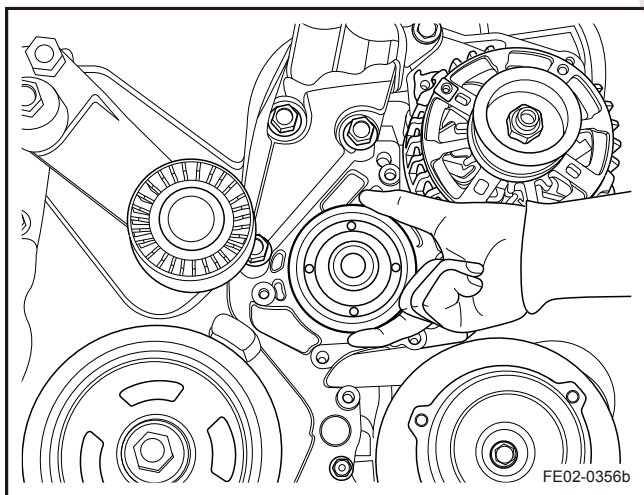
Refer to "Cooling System Service Warning" in "Warnings and Notices".



1. Discharge the engine coolant. Refer to [2.8.8.1 Engine Coolant Discharge and Filling](#).
2. Remove the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#).
3. Remove the two short water pump retaining bolts.

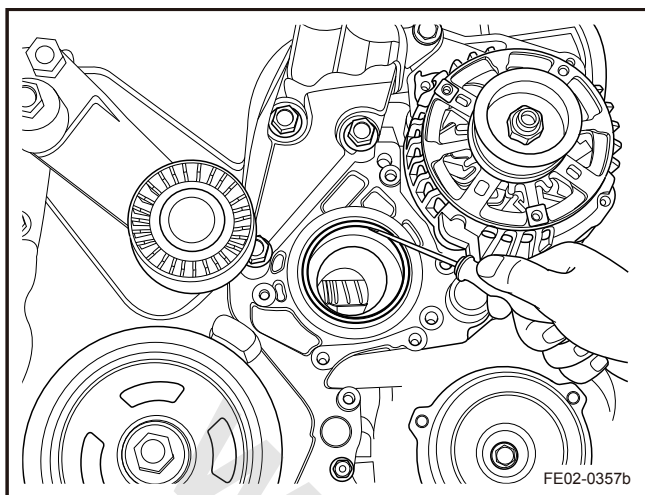


4. Remove the four long water pump retaining bolts.



5. Remove the water pump.





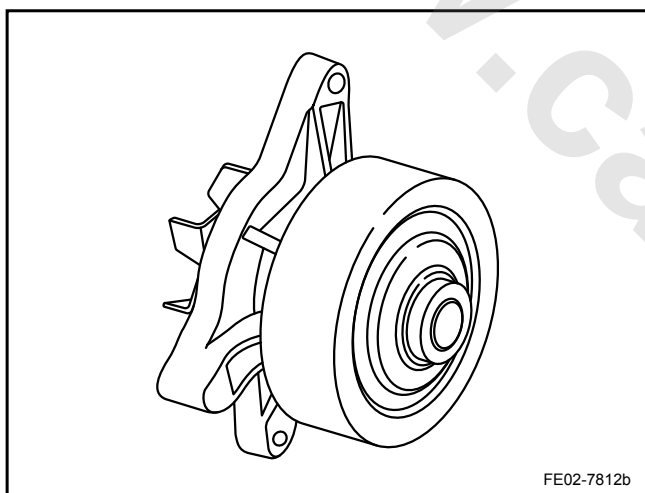
6. Remove the water pump seals.

#### Water Pump Inspection:

##### Warning!

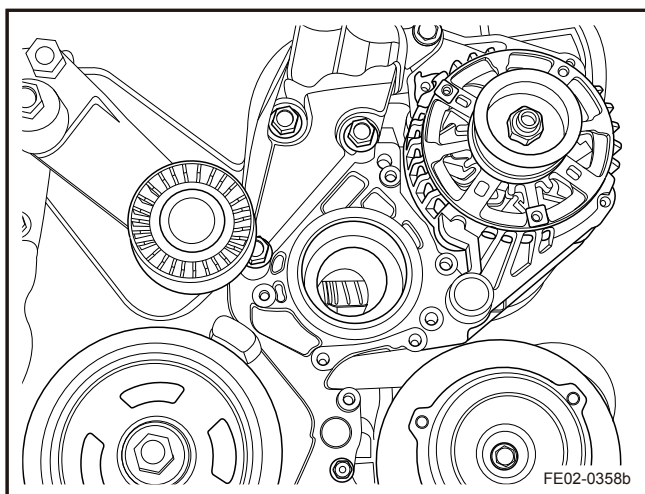
Refer to "Protective Goggles and Glove Warning" in "Warnings and Notices".

1. Check whether the pump body is cracking and leaking.
2. Check whether the water pump bearing has a gap or abnormal sound.
3. Check whether the water pump pulley has serious wear and tear. If the pump is damaged, replace the pump.

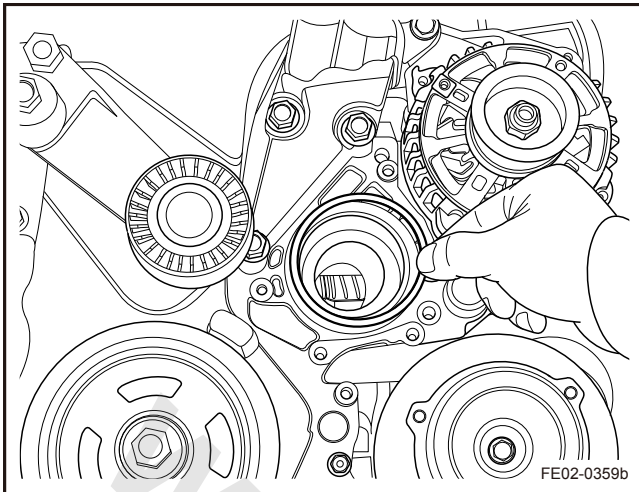


#### Installation Procedure:

1. Clean the water pump seal groove and mating surface.



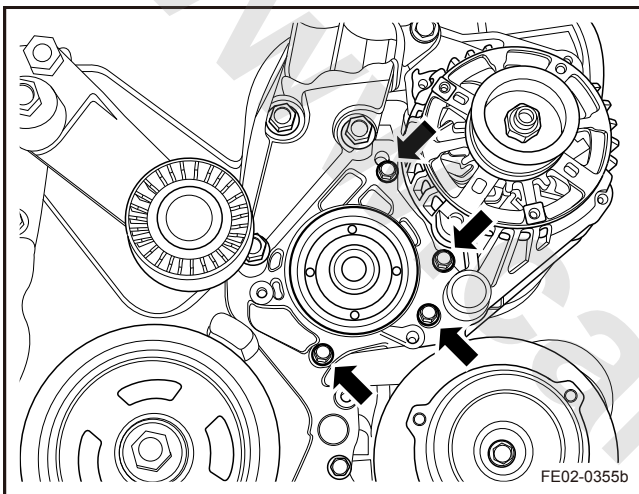




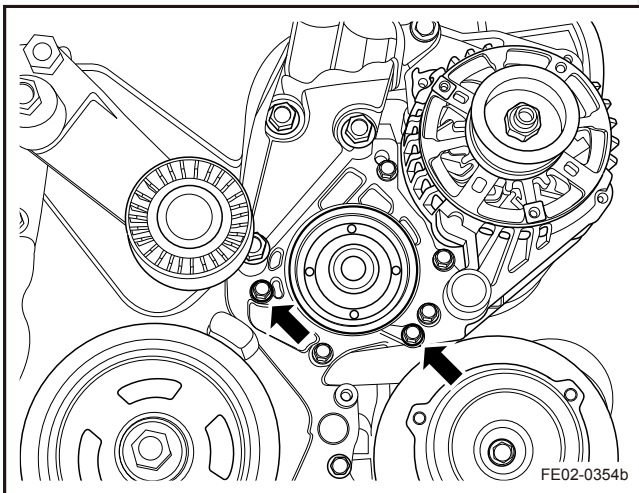
2. Install new water pump seals.

**Note**

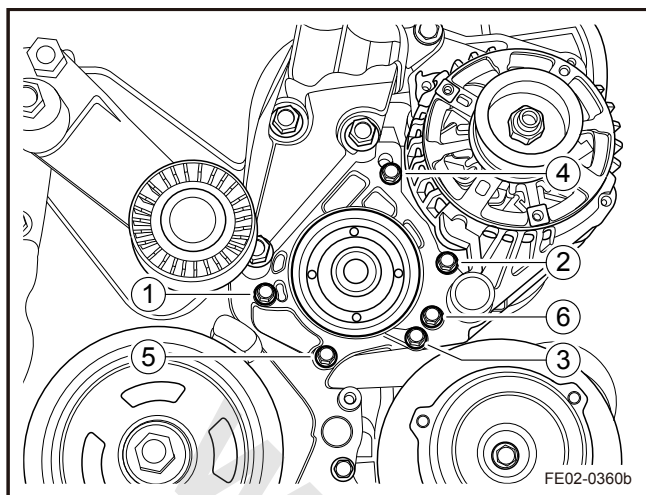
The pump seal is a single used part and must be replaced with new parts. after removal.



3. Install the four long bolts, but do not tighten at this stage.



4. Install the two short bolts, but do not tighten at this stage.



5. Tighten the water pump retaining bolts according to the sequence in the graphic.

Torque

Short Water Pump Retaining Bolts: 9 Nm (Metric) 6.7 lb-ft (US English)

Long Water Pump Retaining Bolts: 11 Nm (Metric) 8.2 lb-ft (US English)

6. Install the drive belt.
7. Fill the engine coolant.

## 2.9 Lubricating System JL4G18-D

### 2.9.1 Specifications

#### 2.9.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Oil Pan and Cylinder Block Connecting Bolts	M6	8-10	6-7.4
Oil Filters and Cylinder Block Connecting Bolts	M6	8-10	6-7.4
Oil Sensor Plug and Cylinder Block Connecting Bolts	R1 / 8	11.5-19.5	8.6-14.4
Oil Filter and The Cylinder Pipe Fittings	UNF3 / 4 "-16	16-24	11.8-17.8
Oil Filter Fittings	M28 × 1.5	33-37	24.4-27.4
Oil Pump Retaining Bolt	M6	8-10	6-7.4
Oil Pan Drain Plug	M12	25-35	18.5-25.9

#### 2.9.1.2 Oil Pump Specifications

Side Clearance	0.025-0.062 mm (0.0010-0.0024 in)
Tooth Clearance	0.030-0.099 mm (0.0012-0.0039 in)
Engine Oil Pressure Sensor Plug Pressure	≤40 kPa (≤6 psi)
Oil Pump Output Pressure	0.6 MPa (87 psi)
Oil Pump Relief Valve Opening Pressure	0.42-0.58 MPa (61-85 psi)

## 2.9.2 Description and Operation

### 2.9.2.1 Description and Operation

#### Oil Pan

The oil pan is installed at the bottom of the engine crankcase. The engine oil pump draws engine oil from the oil pan. After filtered by the oil filter, the engine oil passes through two oil paths, lubricating cylinder block and cylinder head cover respectively. In an oil path, the engine oil passes through the crankshaft oil passage to the connecting rod, and then to the piston and cylinder, finally, return to the oil pan. In the other oil path, the engine oil passes through the engine oil passage to the camshaft, through the oil path within the camshaft, lubricating valve assembly, then finally return to the oil pan.

#### Oil Pump

Oil pump draws the engine oil from the oil pan and then pump the engine oil with pressure to the various parts of the engine. Oil pump inlet has an oil filter - set filter. Set filter blockage may damage the oil pump and cause the pump oil inoperative, and the lubricating system will be unable to establish a normal oil pressure, which will cause the engine mechanical damage.

Oil pump is driven by the crankshaft concave. As long as the crankshaft rotates, the oil pump will be working. The oil pump displacement is fixed, so when the engine speed is high, the oil pump output pressure will exceed the needs of the engine lubrication system. There is a safety valve in the oil pump assembly. The safety pressure relief valve cavity is connected with the oil pump intake chamber. When the output pressure exceeds 0.5 MPa (73 psi), the security valve is open, the excess oil returns to the oil pump through the valve. With the normal oil supply, the safety valve bypass is closed.

#### Lubrication Descriptions

The oil filter seat is integrated on the crankcase. Engine oil passes through the oil filter seat bottom oil path to the oil filter. After being filtered, engine oil passes through the oil filter seat upper oil path to return to the cylinder block.

Engine oil passes through the oil path to the cylinder block front. These oil paths will supply engine oil to the cylinder head, main bearing oil path, VVT solenoid valves and camshaft position actuators.

Each cylinder head oil path introduces engine oil into the cylinder head cover and camshaft bearing journal. Engine oil passes through the main oil path to the VVT solenoid valve, VVT solenoid valve oil cavity, to the VVT actuator. VVT solenoid valve is used to control the intake camshaft position

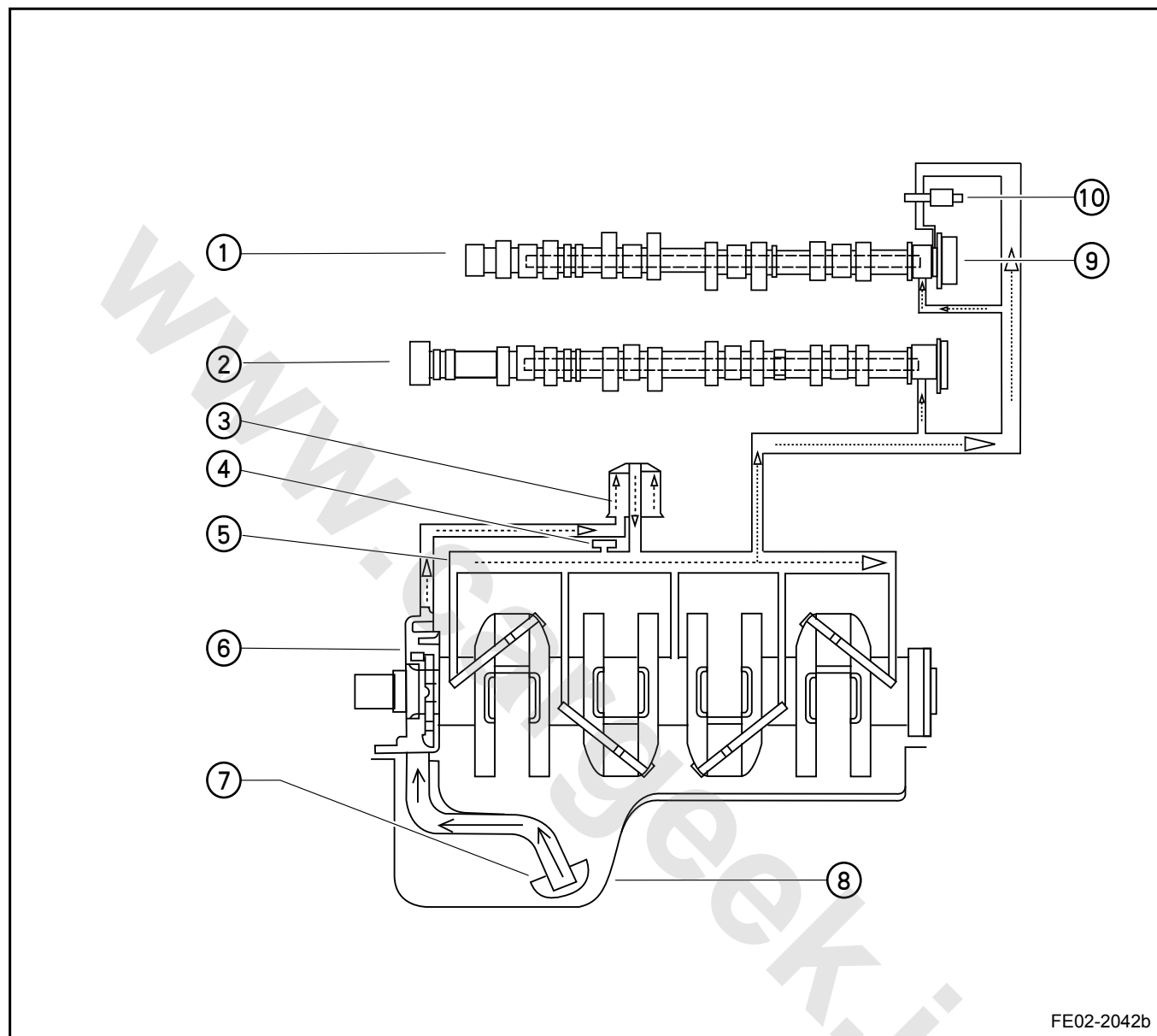
actuator. Engine Control Module (ECM) controls the VVT solenoid valve. When the engine control module provides power to the VVT solenoid valve, the solenoid valve guides the engine oil to flow through the cylinder head cover camshaft front bearing caps. Engine oil passes through the intake camshaft bearing caps into the camshaft journal drilled hole and flows to the intake camshaft front installation surface. Then, the engine oil flows to the camshaft position actuator corresponding oil path. VVT solenoid valve guides engine oil into the system corresponding oil path, so that the engine oil pressure acting on the intake camshaft position actuator internal blades. The intake camshaft (installed on the camshaft position actuator inner rotor) rotates relative to the sprocket (mounted on the intake camshaft position actuator housing). At idle, the internal pin will lock the rotor to the intake camshaft actuator housing. When starting, the cam actuator position will maintain the original position or the default position. VVT solenoid valve guides engine oil hydraulic pressure to loose the lock pin, so that the intake camshaft position actuator works.

Oil pump contains a small engine oil nozzle, which sprays the engine oil to timing chain components.

Engine oil passes through the camshaft timing chain drive belt area or cylinder head cover and cylinder block casting oil return path and returns to the oil pan.

## 2.9.3 System Working Principle

## 2.9.3.1 Lubrication Schematic



## Legend

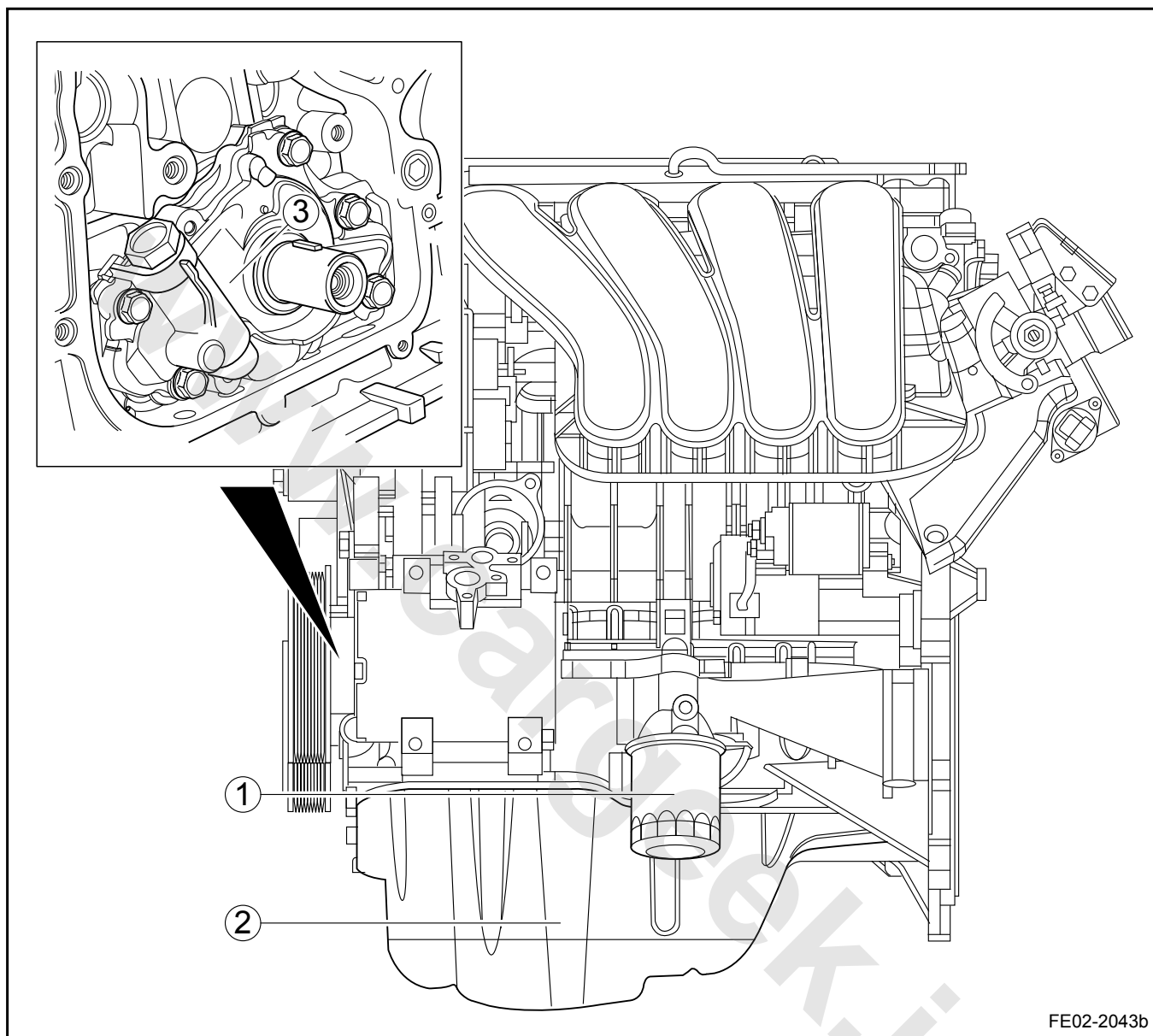
- |                             |                           |
|-----------------------------|---------------------------|
| 1. Intake Camshaft          | 7. Oil Collection Filters |
| 2. Exhaust Camshaft         | 8. Oil Pan                |
| 3. Oil Filter               | 9. VVT Actuator           |
| 4. Oil Pressure Sensor Plug | 10. VVT Solenoid Valve    |
| 5. Main Oil-Channel         |                           |
| 6. Oil Pump                 |                           |

### 2.9.3.2 Engine Oil Pressure Sensor Plug Control Principle

Engine oil pressure sensor plug is a pressure switch and is set on the oil filter. When the engine oil pressure is below the specified value, this switch is switched off and the engine oil pressure warning lamp will be on. When the car starts normally, the oil pump transfers the oil pressure to the system, so this switch is switched off and the engine oil pressure warning lamp will be off.

## 2.9.4 Component Locator

### 2.9.4.1 Component Locator



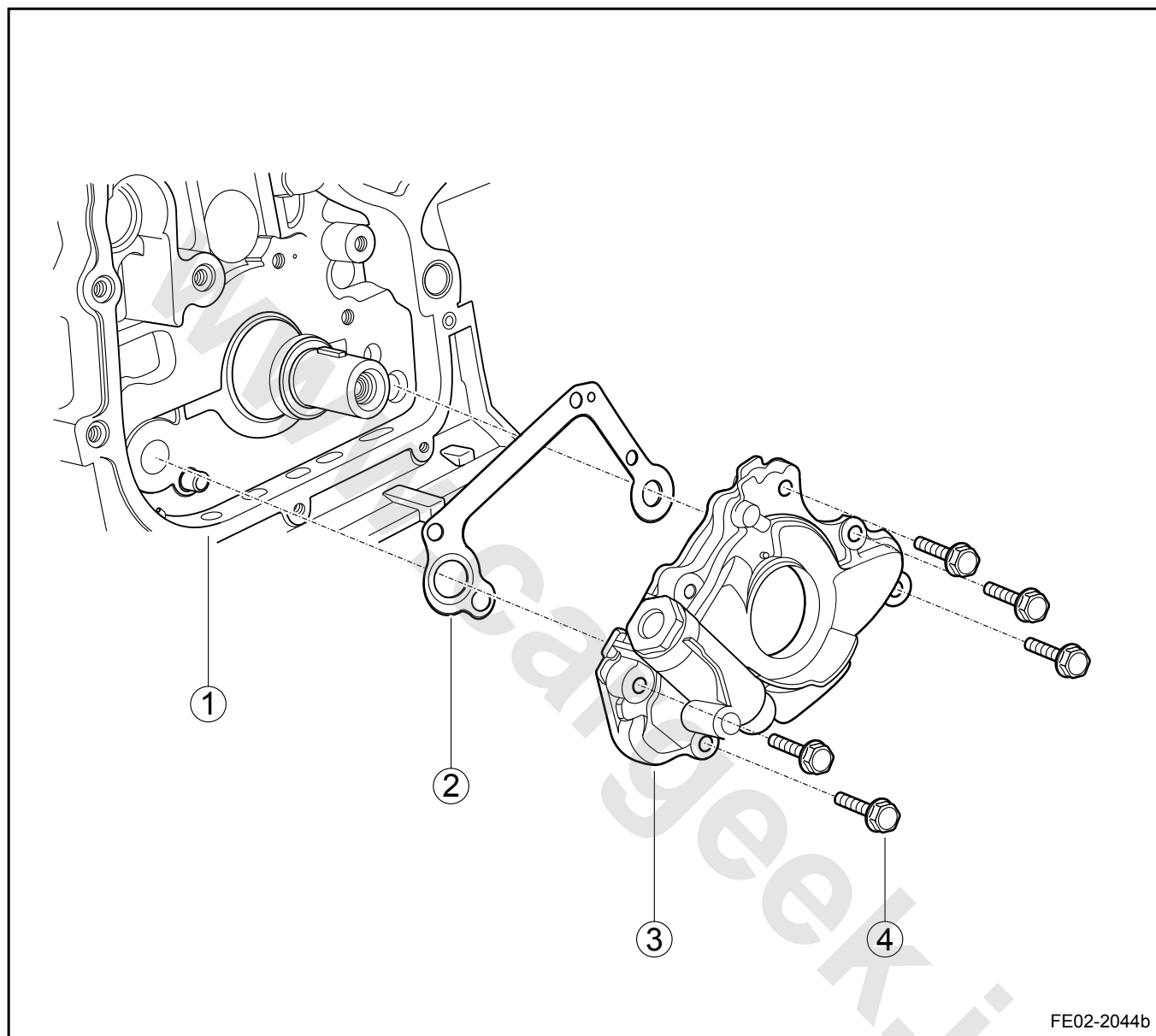
#### Legend

- 1. Oil Filter
- 2. Oil Pan

- 3. Oil Pump

## 2.9.5 Disassemble View

## 2.9.5.1 Disassemble View



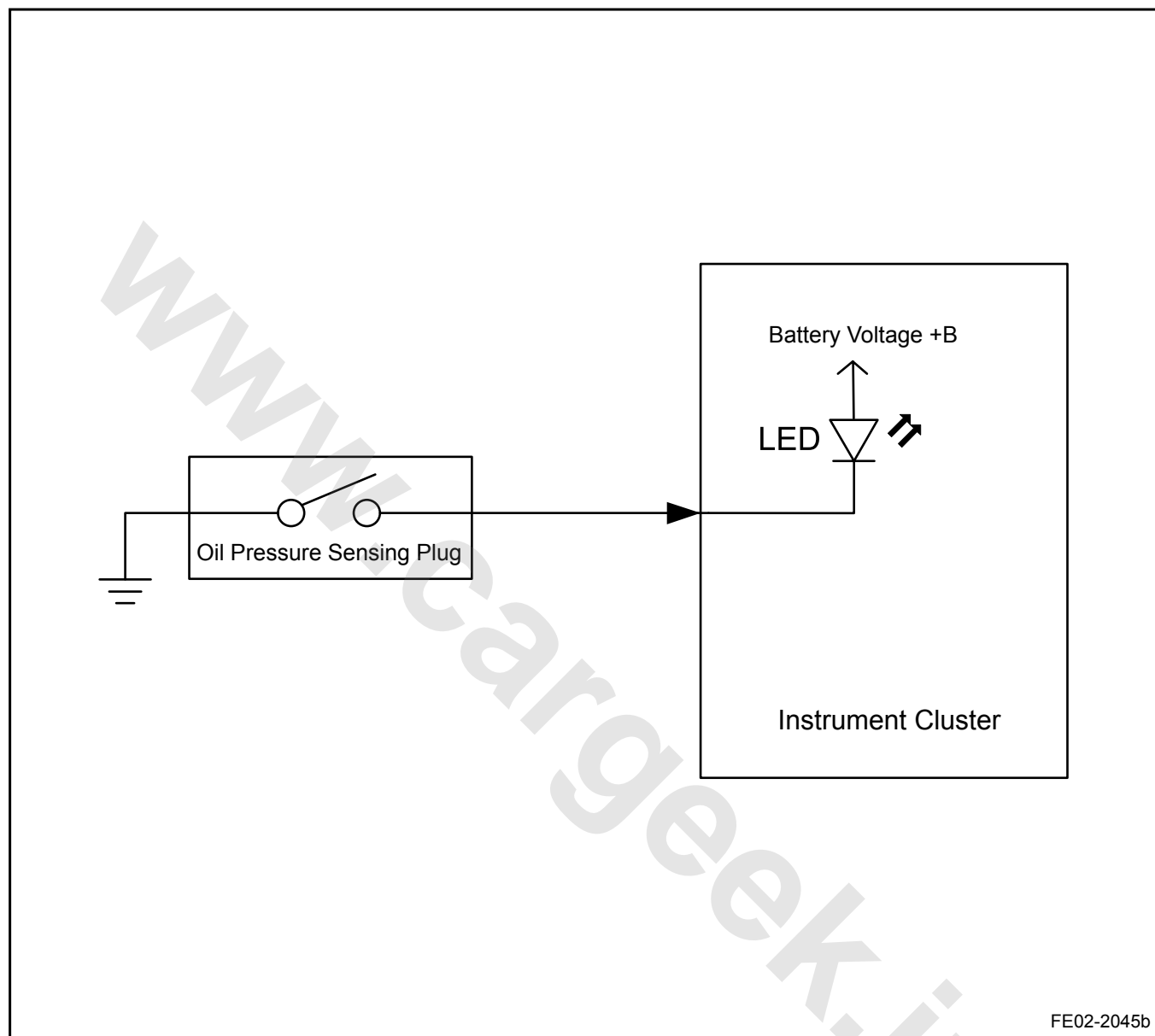
## Legend

- |                      |                   |
|----------------------|-------------------|
| 1. Engine Block      | 4. Oil Pump Bolts |
| 2. Oil Pump Gasket   |                   |
| 3. Oil Pump Assembly |                   |



## 2.9.6 Schematic

## 2.9.6.1 Schematic



## 2.9.7 Diagnostic Information and Procedures

### 2.9.7.1 Diagnosis Description

Refer to [2.9.2.1 Description and Operation](#) Get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 2.9.7.2 Visual Inspection

- Check installed aftermarket equipment that may affect the operation of the lubrication system.
- Check easy to access system components to identify whether there are significant blockages or leakage. If there is leakage, confirm whether it is engine oil leak.
- Check whether the oil filter is dirty or blocked. If necessary, replace it.

### 2.9.7.3 Abnormal Engine Oil Consumption Diagnostic

When the engine oil consumption (non-leaking) exceeds the acceptable range, abnormal engine oil consumption diagnostic must be carried out.

Step 1	Check whether there is engine oil leakage.	
	Yes	Refer to <a href="#">2.9.7.5 Engine Oil Leak Diagnostic</a>
	No	
Step 2	Check whether the engine oil viscosity is abnormal. Check whether poor quality engine oil is used.	
	Yes	Replace the oil filter and engine oil
	No	
Step 3	Check whether the vehicle sustained high speed / or excessive use.	
	Yes	Service the engine.
	No	
Step 4	Check whether the crankcase ventilation system is blocked and whether the components are working correctly.	
	Yes	Replace the faulty parts.
	No	
Step 5	Check whether the valve conduit / or the valve rod is worn, whether the valve rod oil seal is worn, missing or improperly installed.	
	Yes	Repair the faulty part.

No

Step 6 Check whether the piston and piston rings in the cylinder are improperly installed.

Yes

Repair the faulty part.

No

Step 7 Check whether there is correct piston ring seal, whether there are broken or worn piston rings. If necessary, repair the faulty part.

Next

Step 8 Confirm that the fault has been fixed.

#### 2.9.7.4 Engine Oil Pressure Diagnostic and Test

Step 1 Check whether engine oil viscosity is abnormal. Check whether poor quality engine oil is used.

Next

Step 2 Park the vehicle on a level ground and let the engine run for a few minutes, waiting for a long enough period of time (2-3 min) to let the engine oil return. Measure whether the engine oil is too low.

Next

Step 3 If necessary, add the recommended grade engine oil, until the engine oil level reaches the full scale.

Next

Step 4 Let the engine run for 10-15 s. Confirm the vehicle indicator does not show that the pressure is too low or no engine oil pressure.

Next

Step 5 Check whether there is noise or knock sound in the valve system.

Next

Step 6 Check whether there are following conditions:

- (a) Engine oil has bubbles.
- (b) Idle speed is too low.
- (c) Oil filter is blocked.
- (d) Engine oil is diluted by water or the engine coolant and so on.
- (e) Oil filter bypass valve is faulty.
- (f) Oil pressure warning lamp is incorrect or faulty.
- (g) Oil pressure sensor plug is incorrect or faulty.
- (h) Engine oil viscosity is not suitable for the expected temperatures.

Yes

Refer to the user manual, according to local temperatures, use the Geely Automobile recommended grade and viscosity engine oil

No

Step 7 Turn the ignition switch to "OFF" position, remove the oil pressure sensor plug.

Next

Step 8 Install the engine oil pressure test tool to the oil pressure sensor plug on the oil filter.

Next

Step 9 Start the engine and measure engine oil pressure.

Next

Step 10 Compare the readings with the pressure value in [2.9.1.2 Oil Pump Specifications](#). If the engine oil pressure is less than the specified value. Check whether there are one or more of the following conditions:

- (a) Oil filter bolts loose.
  - (b) Oil filter seat O-ring or seal is missing or damaged.
  - (c) Oil pump is worn or dirty.
  - (d) Oil pump to cylinder block bolts are loose.
  - (e) Oil pump filter loose, blocked or damaged.
  - (f) Oil pump filter O-ring missing or damaged.
  - (g) Oil Pump Oil Filter pipes damaged or leaking.
  - (h) Oil pump pressure regulating valve faulty.
  - (i) Engine oily channel plug missing or improperly installed.
  - (j) Camshaft intermediate shaft bolts loose.
  - (k) The following components bearing clearance exceed the acceptable tolerance range:
    - 1. Link
    - 2. Crankshaft
    - 3. Camshaft
    - 4. Camshaft Intermediate Shaft Sprocket
  - (l) Engine oil channel cracking. There are pores or blockage.
  - (m) Valve Lifter fracture.
- When necessary, repair or replace the relevant parts.

Step 11 End of the test.

### 2.9.7.5 Engine Oil Leak Diagnostic

Once a vehicle engine oil leak occurs, the following conditions must be checked:

Step 1 Check whether the engine oil level is too high.

Yes

Discharge engine oil to the specified level

No

Step 2 Check whether the engine oil pressure is too high.

Yes

Check whether the pressure oil filter or the bypass valve is blocked or malfunction.

No

Step 3 Check whether the engine ventilation system is blocked or malfunction.

Yes

Repair the faulty part.

No

Step 4 Check whether the fasteners are not fastened properly or damaged.

Yes

Replace the damaged parts, tighten the fasteners again if required.

No

Step 5 Check whether the related parts have gaps or pores.

Yes

Repair the faulty part.

No

Step 6 Check whether the sealing surface is worn. Check whether the sealing gasket is installed properly.

Yes

Repair the faulty part.

Next

Step 7 Confirm that the fault has been fixed.

## 2.9.8 Removal and Installation

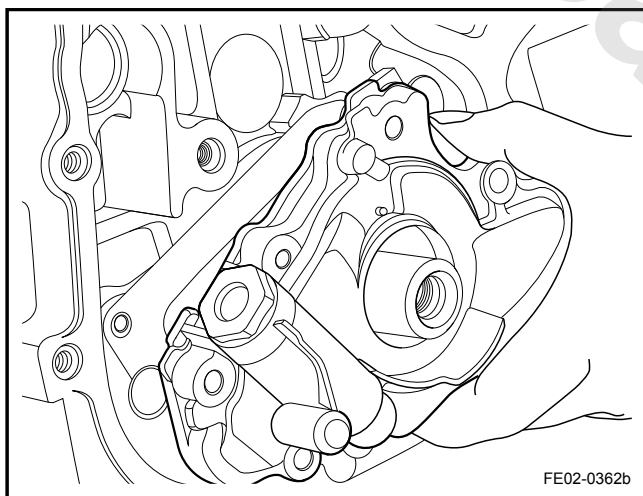
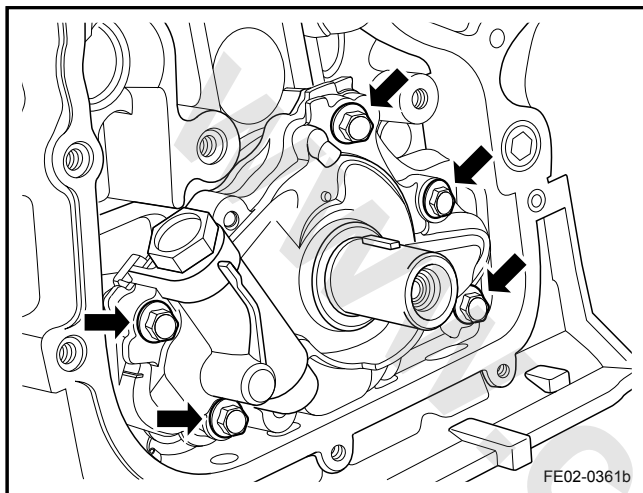
### 2.9.8.1 Oil Pump Replacement

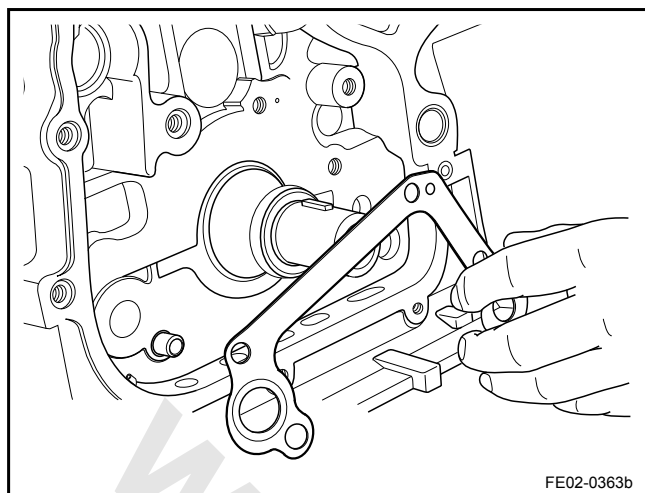
Removal Procedure:

#### Warning!

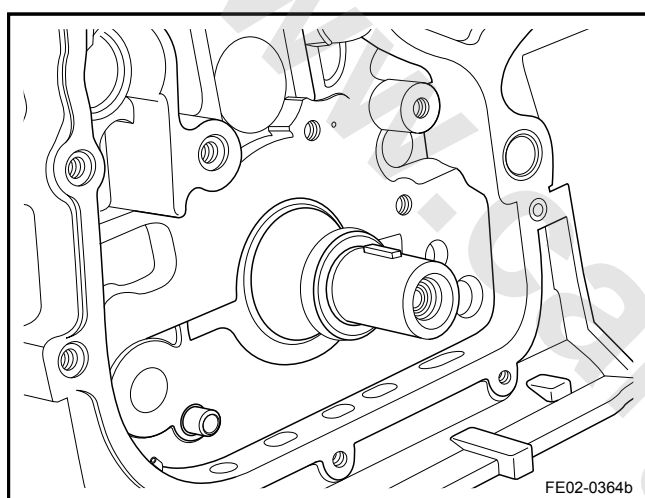
After a new oil pump is installed, the oil collection filters, must be inspected. Refer to engine oil pan replacement and oil collection filters replacement.

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the timing chain cover. Refer to [2.6.8.9 Timing Chain Cover Replacement](#).
3. Remove the timing chain. Refer to [2.6.8.10 Timing Chain Replacement](#).
4. Remove oil pump bolts.
5. Remove the oil pump from the engine block.



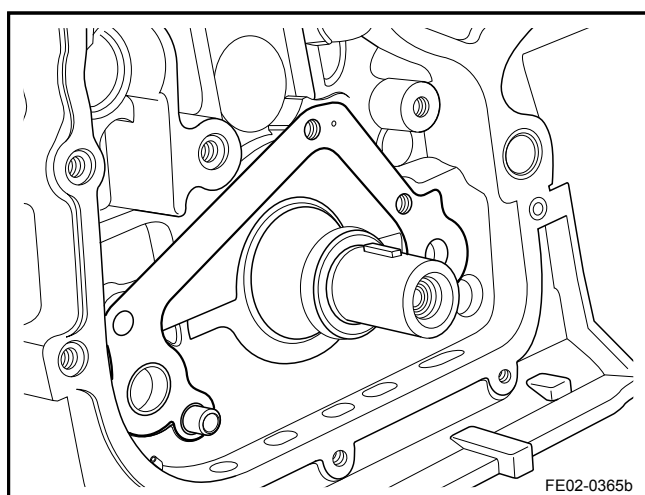


6. Remove the oil pump gasket from the engine block.



#### Installation Procedure:

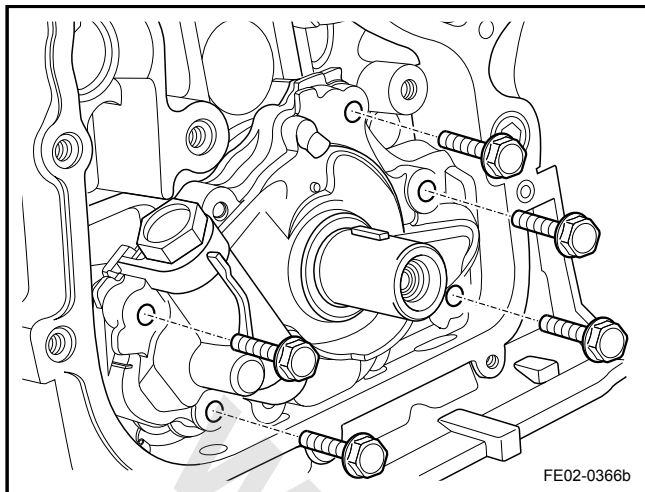
1. Before installation, clean the engine oil pan oil collection filters. Refer to [2.9.8.3 Oil Pan Replacement](#).
2. Clean engine block oil pump installation surface.



3. Install the oil pump gasket.

#### Note

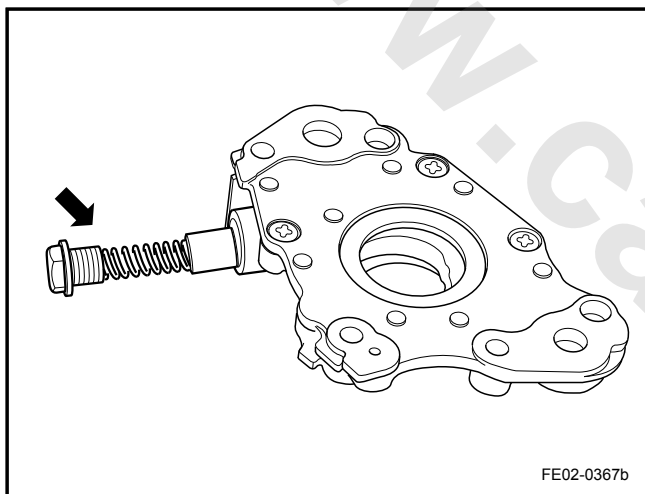
The gasket is a single used part, it must be replaced after removal.



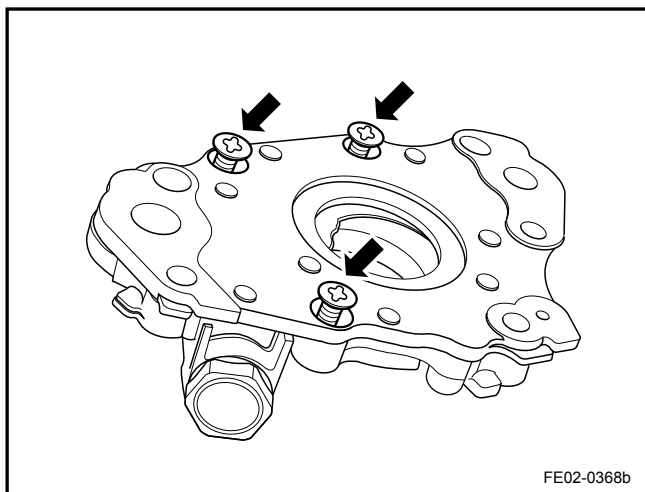
4. Install and tighten the oil pump retaining bolts.  
Torque: 9 Nm (Metric) 6.7 lb-ft (US English)
5. Install the timing chain.
6. Install the timing chain cover.
7. Connect the battery negative cable.

### 2.9.8.2 Oil Pump Cleaning and Inspection

#### Cleaning Procedures:

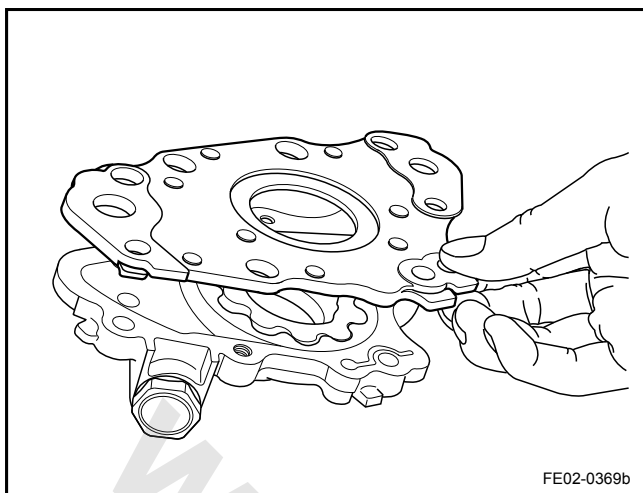


1. Oil Pump Valve Inspection:
  - a. Remove the valve safety bolts, remove the springs and the slide valve.
  - b. Check whether the surface of slide valve is worn. whether the hole wall is worn. Whether the slide valve and the inner hole clearance is normal.
  - c. Apply oil on the slide valve, install slide valves and springs, tighten valve bolts.

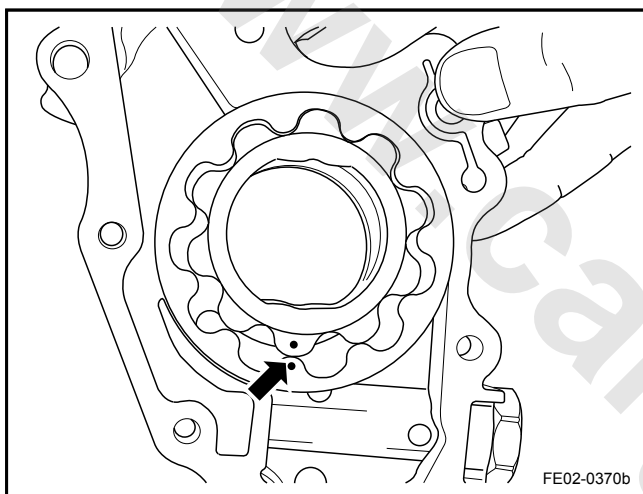


2. Remove oil pump rear cover bolts.





3. Remove the oil pump cover.
4. Clean oil pump housing and internal parts.



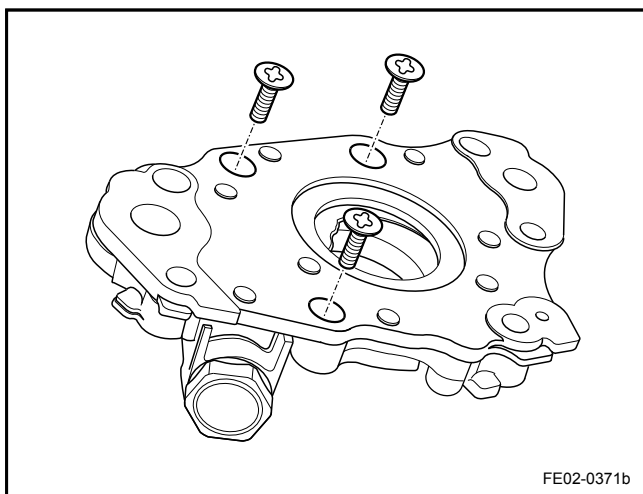
#### Inspection Procedure:

1. Check all oil pump parts for worn and torn.
2. Apply clean engine oil to all oil pump parts.

#### Note

A: Apply grease to the oil pump gear chamber in order to ensure initial oil pump lubrication.

B: Install oil pump gears so that the side with a dot faces up and align internal and external gears.



3. Install the oil pump rear cover and tighten connecting bolt.

### 2.9.8.3 Oil Pan Replacement

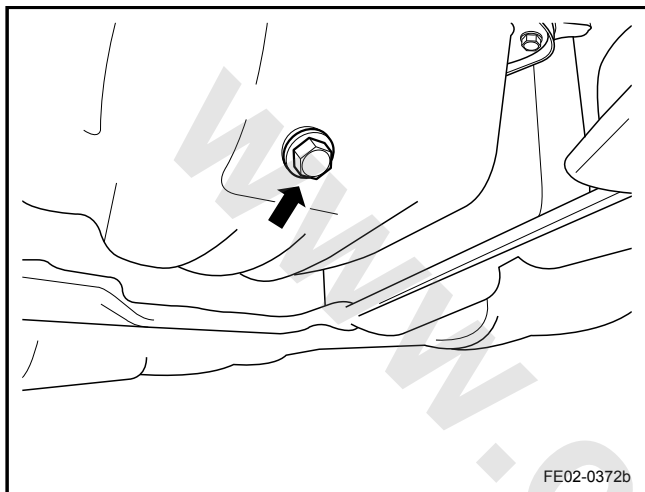
Removal Procedure:

Warning!

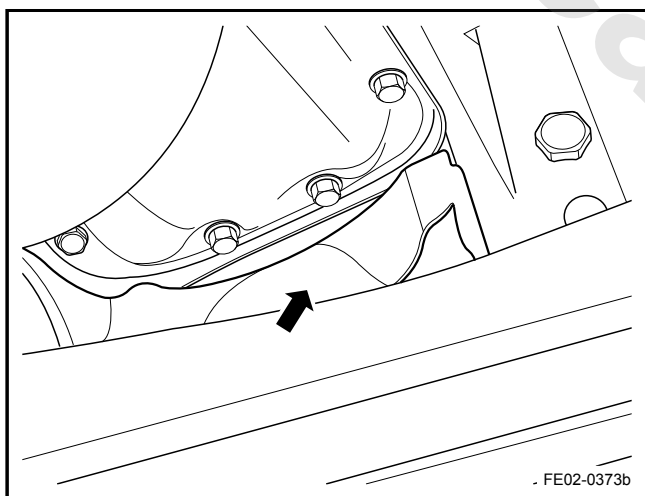
Refer to "Battery Disconnection Warning" in "Warnings and Notices".

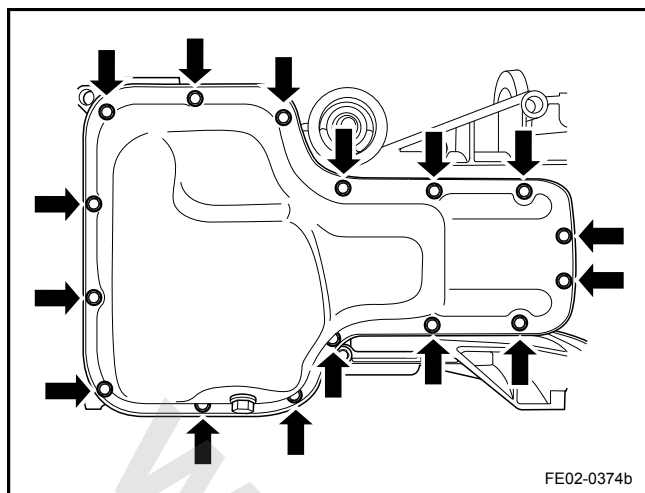
Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Lift the vehicle.
3. Release the engine oil pan oil discharge bolt, discharge the engine oil from the crankcase.

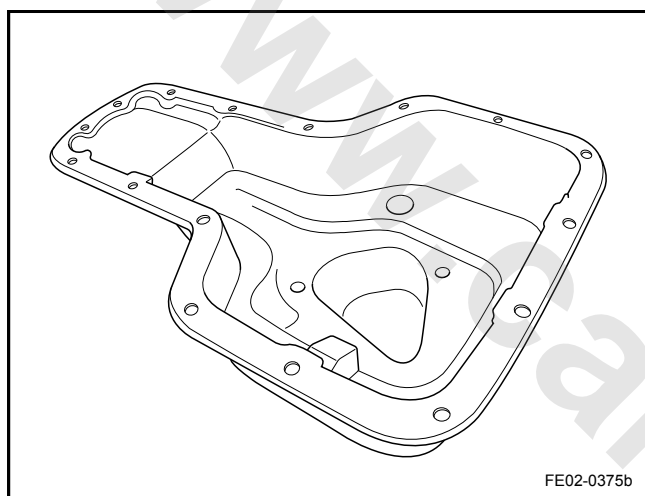


4. Remove the crankcase dust shield.





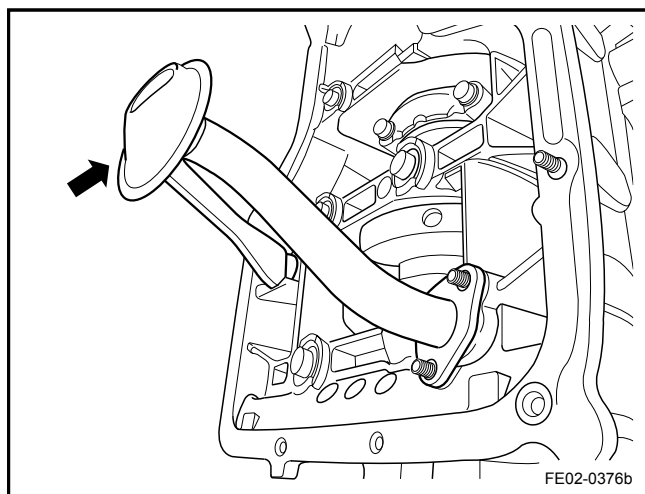
5. Remove the oil pan retaining bolts and nuts.

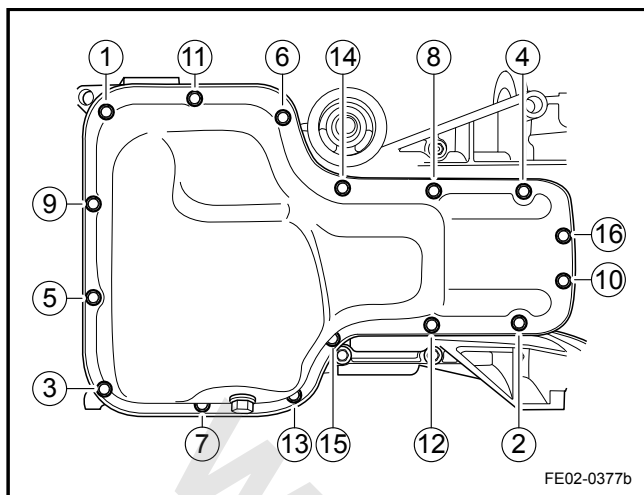


6. Remove the oil pan from the cylinder block.

#### Installation Procedure:

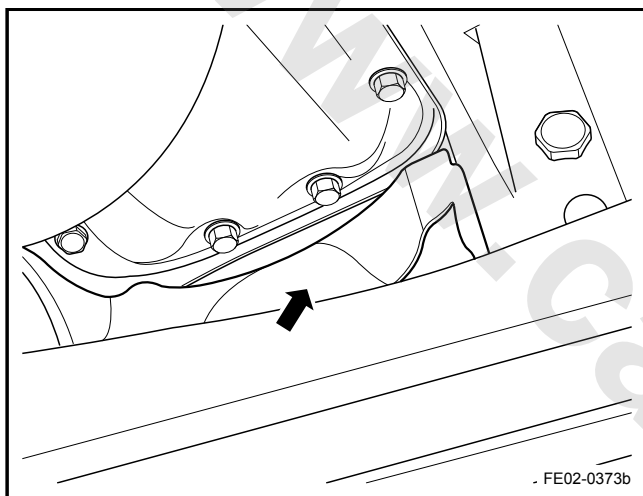
1. Inspect and clean set of filters before installing the oil pan.



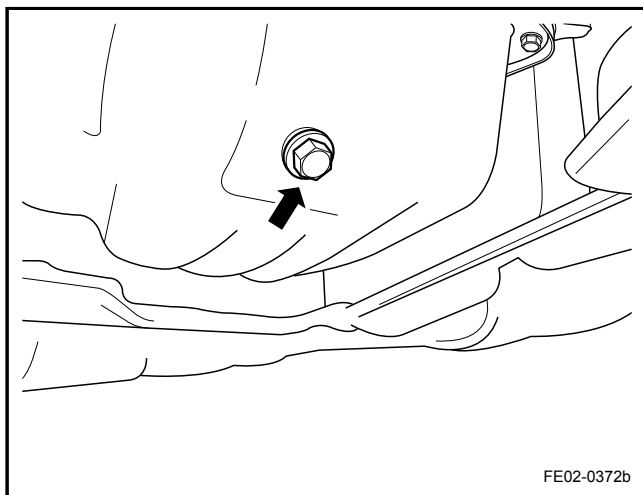


2. Clean oil pan and cylinder block mating surface.
3. Apply sealant on the new engine oil pan evenly.
4. Install the oil pan and tighten the bolts and nuts according to the sequence in the graphic.

Torque: 9 Nm (Metric) 6.7 lb-ft (US English)



5. Install the flywheel shield.



6. Install and tighten oil pan oil discharge bolts.  
Torque: 30 Nm (Metric) 22.2 lb-ft (US English)
7. Connect the battery negative cable.

## 2.10 Ignition System JL4G18-D

### 2.10.1 Specifications

#### 2.10.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Crankshaft Position Sensor Mounting Bolt	M6 × 12	8-10	6-7.4
Camshaft Position Sensor Mounting Bolt	M6 × 14	8-10	6-7.4
Ignition Coil Retaining Bolts	M6 × 35	8-10	6-7.4
Spark Plug	M14 × 1.25 × 22	20-30	14.8-22.2
Knock Sensor	M8 × 30	15-21	11-15.5

#### 2.10.1.2 Ignition System Specification

Applications	Specifications
Ignition Sequence	1-3-4-2
Ignition Timing	8 °-14 ° Before The TDC
Ignition Type	Spark Discharge
Spark Plug Gap	1.0-1.1 mm (0.04-0.043 in)
Spark Plug Manufacturer	Zhuzhou Torch Spark Plug Co., Ltd.
Spark Plug Type	K6RTC

## 2.10.2 Description and Operation

### 2.10.2.1 Description and Operation

This vehicle uses DLI ignition system igniting two cylinders at the same time. The ignition voltage is sent directly from the ignition coil to the Spark Plug. Main system components are ECM, two ignition coils, high voltage damping line, Spark Plug, crankshaft position sensor, camshaft position sensor, knock sensor etc.. This Ignition system is known as the direct ignition type. Cylinder No.1 is paired with Cylinder No.4 and Cylinder No.2 is paired with Cylinder No.3. When ECM triggers the ignition coil to ignite, spark occurs in both cylinders at the same time. At this time one cylinder is in compression stroke and the other is in exhaust stroke. For the cylinder in the exhaust stroke, because the cylinder pressure is low, the temperature is high, the spark plug only requires minimal energy to break ignition voltage gap. It is an invalid ignition, the remaining energy is used by the spark plug in the compression stroke cylinder.

As a result of using DLI Ignition System, ECM controls the best ignition timing based on a variety of load conditions, so that the engine output power, acceleration, economy and emission performance have reached the ideal situations. The ignition system voltage does not decrease as the speed increases. In the absence of mechanical components, there is mechanical error.

The ignition coil can not be repaired and it must be replaced as an assembly.

## 2.10.3 System Working Principle

### 2.10.3.1 System Working Principle

When the ignition switch is at "ON" or "ST" position, the ignition switch wiring harness connector IP23 terminal No.1 and terminal No.2 are connected, so that IG1 relay coil forms a complete circuit. Battery voltage passes through the fuses EF01, EF22, IG1 Relay, fuse IF30 to reach the ignition coil, supplies power to the ignition coil.

Crankshaft position sensor is a magnetic inductive speed sensor. Crankshaft position sensor signal plate and the flywheel is an integrated part. When the engine rotates, so does the crankshaft position sensor signal drive plate. So the sensor produces an alternating signal. This signal is transmitted to ECM. ECM calculates the current crank angle based on this signal in order to determine the piston reaches the TDC, directly affecting the accuracy of the ignition advance angle control. This sensor signal is a crucial input signal in the ignition system. When ECM can not receive the signal, the ignition system can not work. ECM harness connector EN01 terminals No.46 and No.47 receive crankshaft position sensor input. After calculation, ECM obtains the ignition advance angle. ECM harness connector EN01 terminal No.3 controls cylinders No.1 and No.4 ignition, terminal No.7 cylinders No.2 and No.3 ignition.

For crankshaft position sensor technical specifications. Refer to [2.2.1.2 Temperature Sensor Temperature and Resistance Correlation](#).

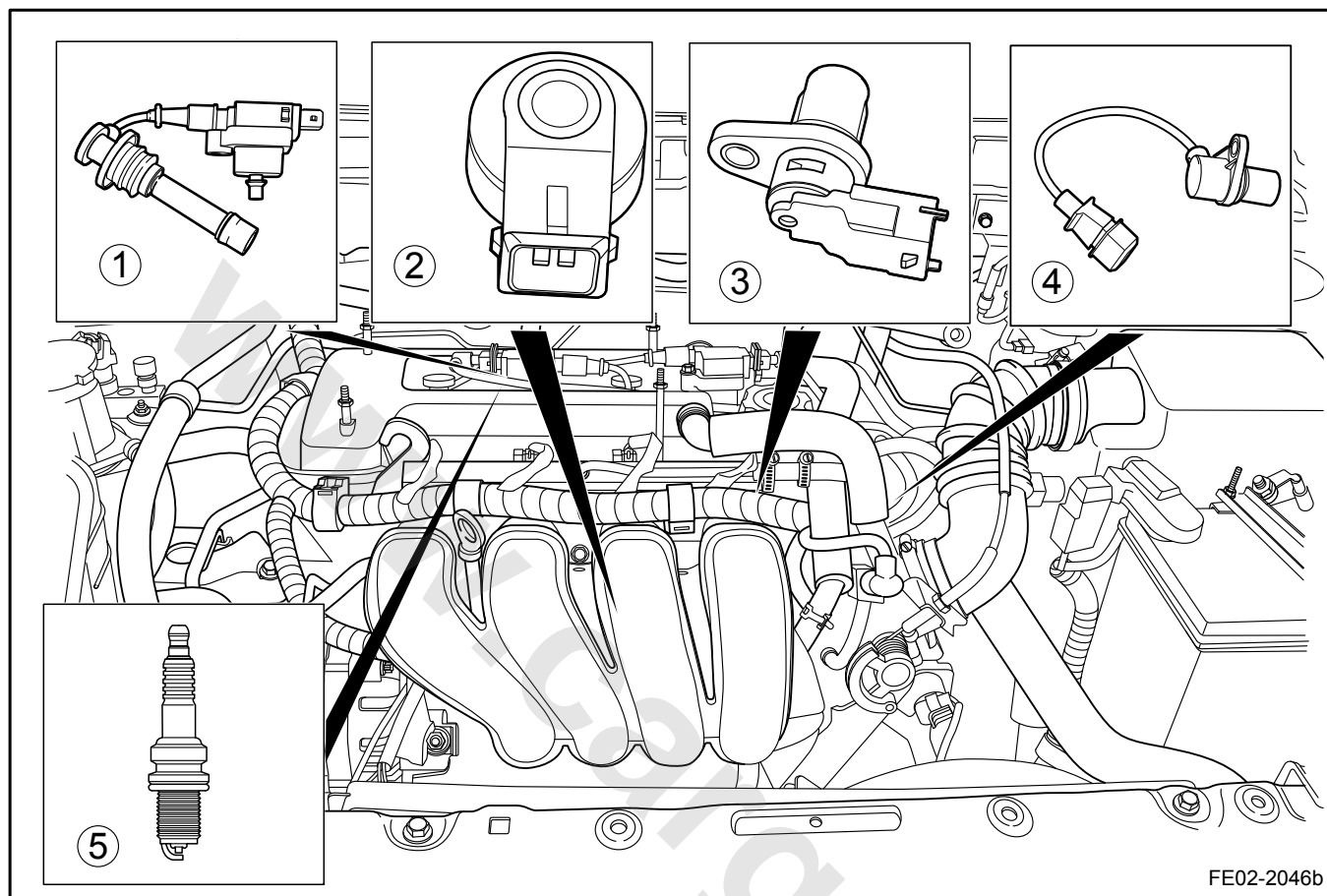
For knock Sensor technical specifications. Refer to [2.2.1.2 Temperature Sensor Temperature and Resistance Correlation](#).

#### Note

When the vehicle Anti-theft alarm system and engine anti-theft locking system are activated, ECM does not allow ignition coil to be ignited. The ignition system is inoperative at this time.

## 2.10.4 Component Locator

## 2.10.4.1 Component Locator



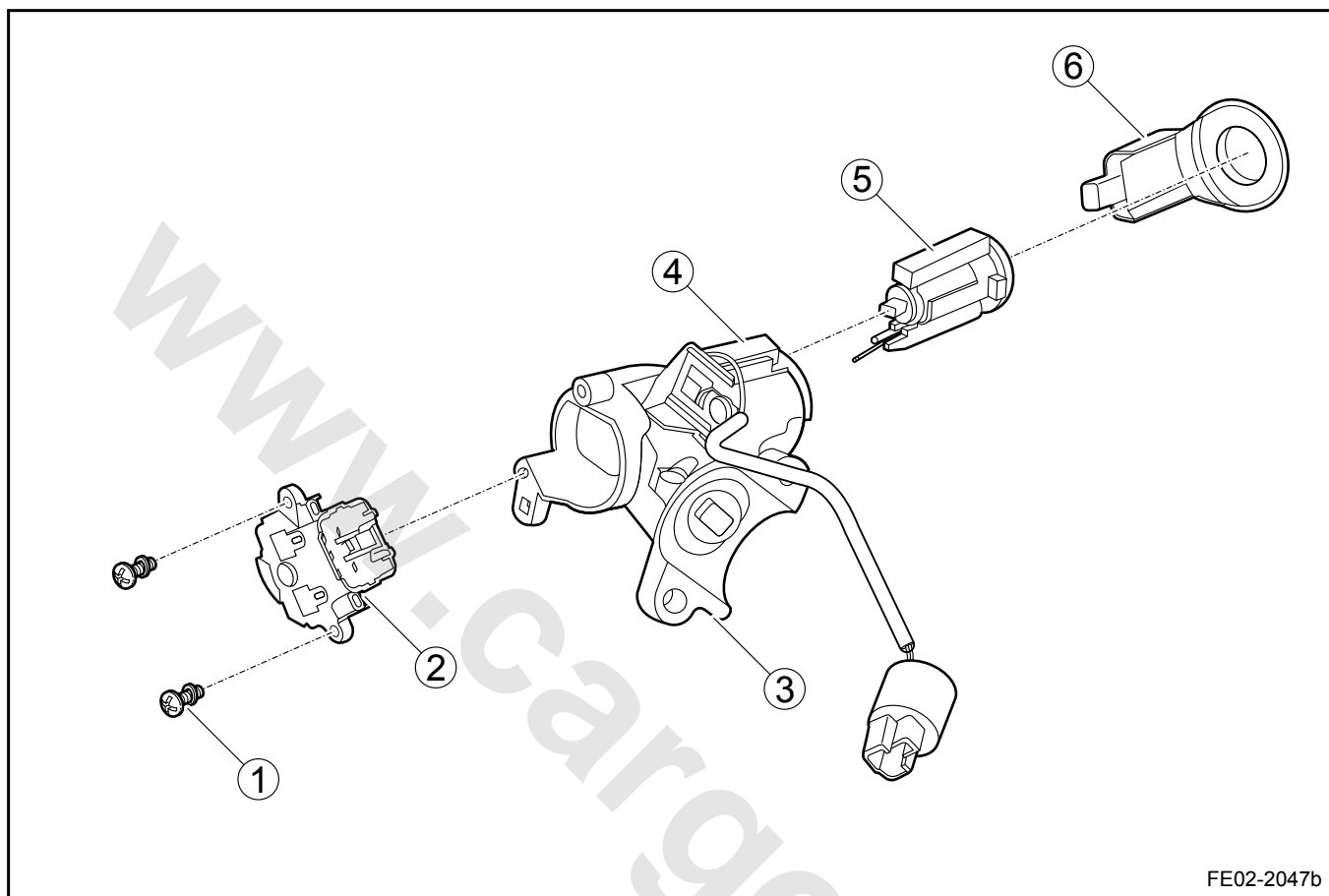
FE02-2046b

## Legend

- |  |               |
|--|---------------|
| 1. Ignition Coil and High-Voltage Damping Line | 5. Spark Plug |
| 2. Knock Sensor                                |               |
| 3. Camshaft Position Sensor                    |               |
| 4. Crankshaft Position Sensor                  |               |



## 2.10.5 Disassemble View

2.10.5.1 Ignition Cylinder Assembly  
Disassemble View

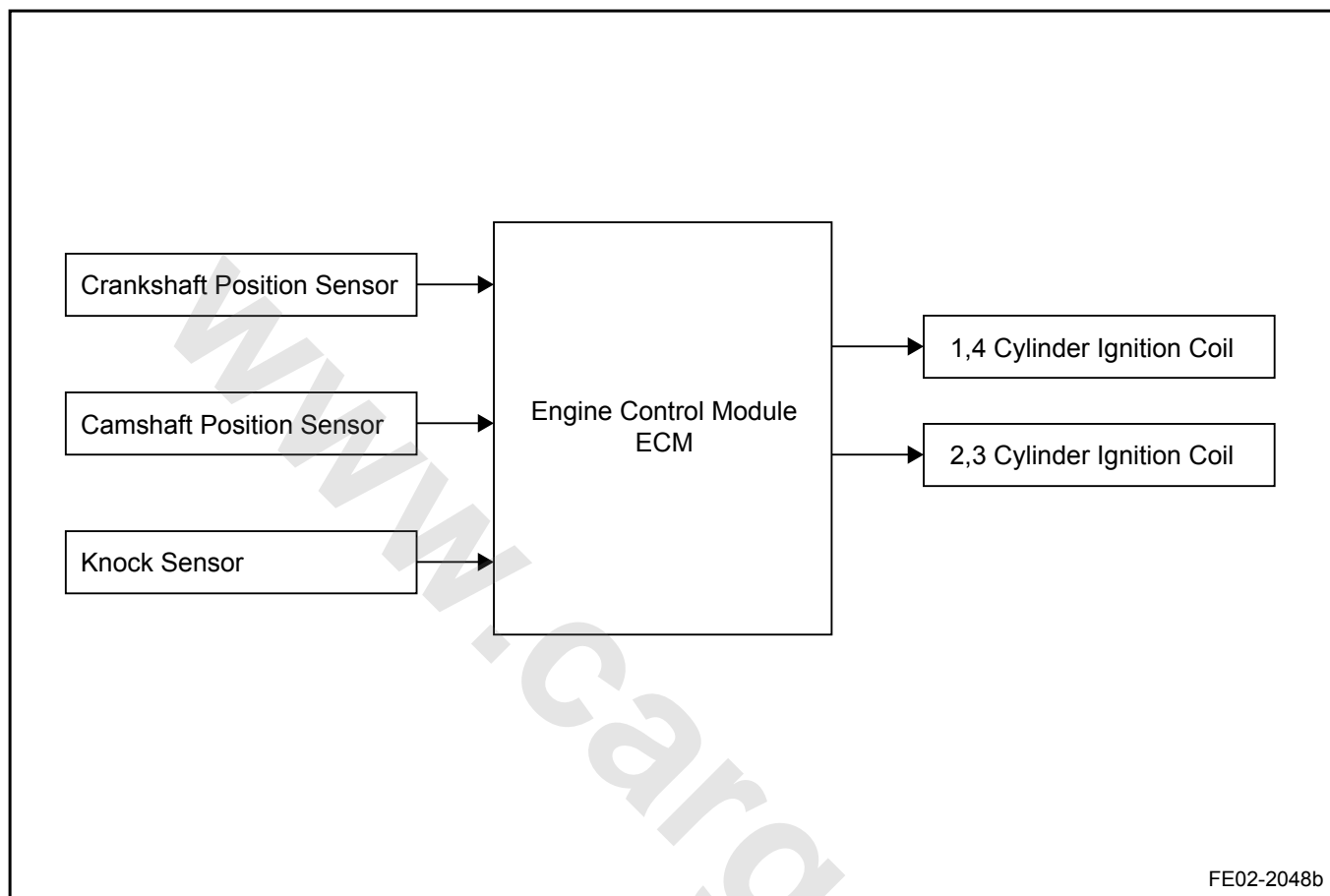
## Legend

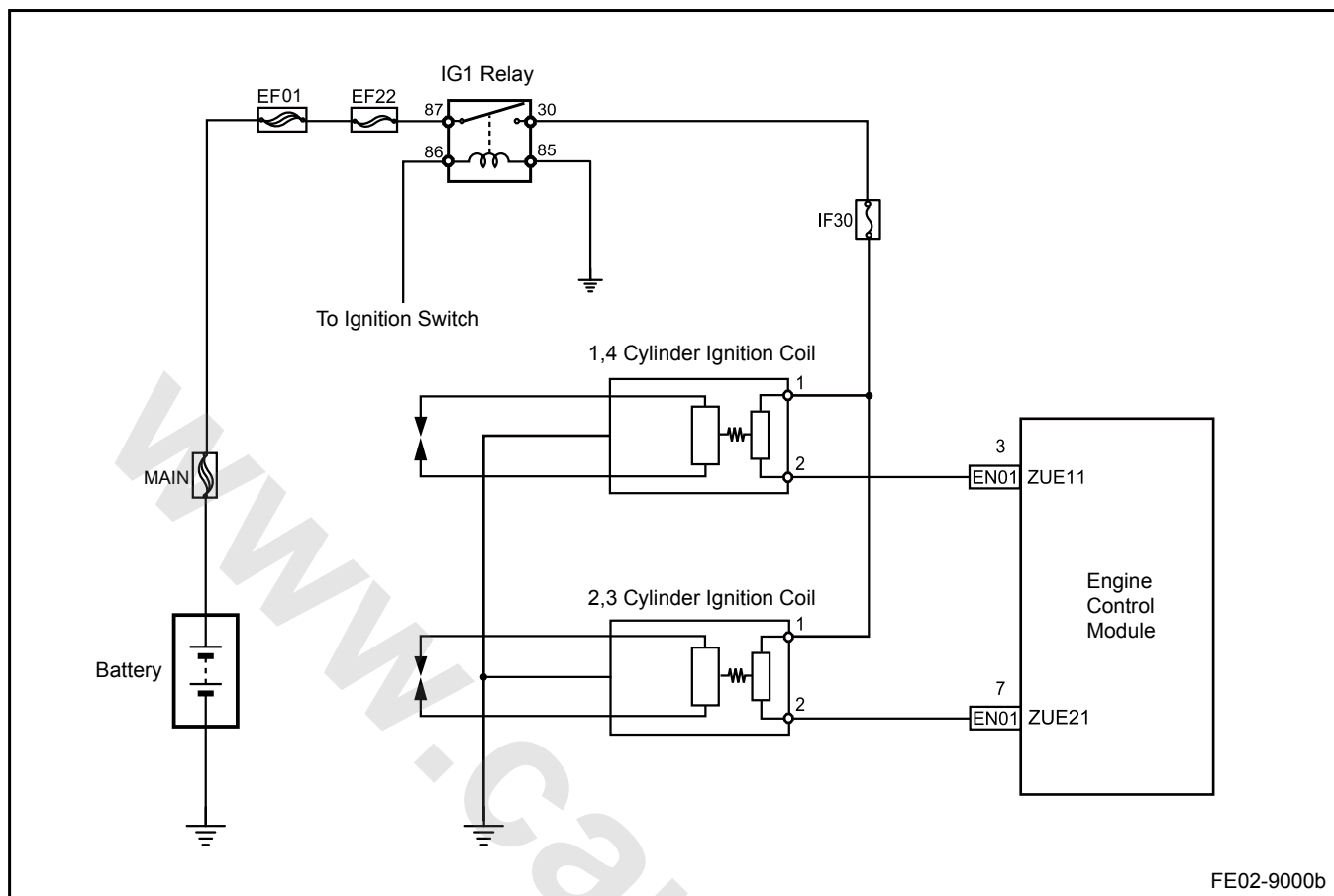
- 1. Ignition Switch Retaining Bolts
- 2. Ignition Switch Assembly
- 3. Ignition Cylinder Bracket
- 4. Ignition Key Reminder Switch

- 5. Ignition Cylinder
- 6. EAS Coil

## 2.10.6 Schematic

## 2.10.6.1 Schematic





## 2.10.7 Diagnostic Information and Procedures

### 2.10.7.1 Diagnosis Description

Refer to [2.10.2.1 Description and Operation](#) Get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct troubleshooting steps, more importantly, it will also help to determine whether the customer described situation is normal.

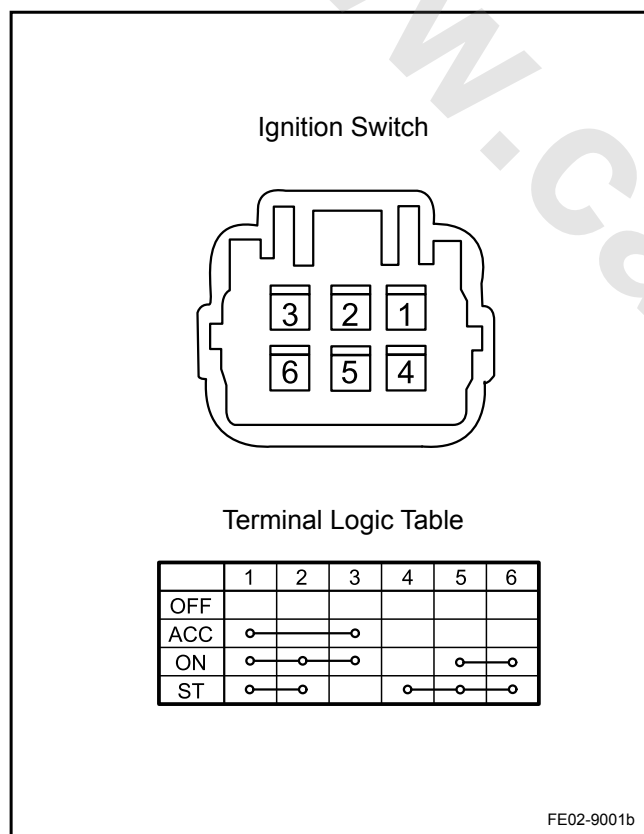
For the ignition system DTC code. Refer to the "control system diagnostic information and the steps" in the "[2.2.7.1 Diagnostic Description](#)."

### 2.10.7.2 Visual Inspection

- Check installed aftermarket equipment that may affect the ignition system performance.
- Check the easy to access system components to identify whether there is significant damage or potential faults.

### 2.10.7.3 Check Ignition Switch

Check the ignition switch terminals continuity according to the following diagram



1. Turn the ignition switch to "OFF" position.
2. Disconnect the ignition switch wiring harness connector IP23.
3. Remove the ignition switch assembly.
4. Test ignition switch terminals continuity

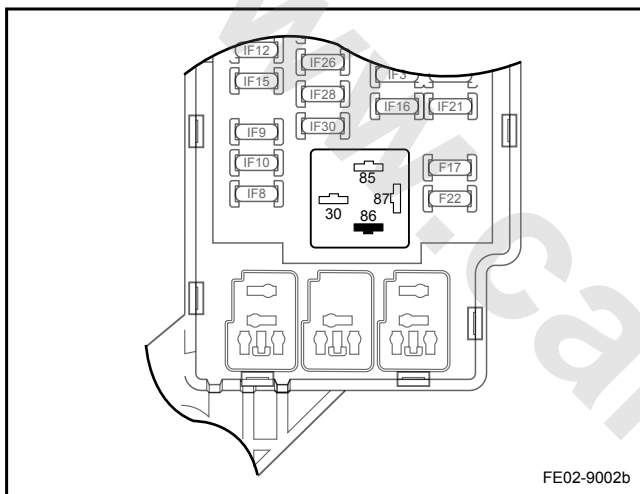
Location	Related Terminal	Standard
OFF	All Terminals	Infinity

Location	Related Terminal	Standard
ACC	1-3	Conducted
ON	1-2-3	Conducted
	5-6	
ST	1-2	Conducted
	4-5-6	

If you detect there is one item that is not complying with standards, replace the ignition switch.

#### 2.10.7.4 Ignition Relay IG1 No Power Output

Step 1	Check IG1 relay coil control power supply.
--------	--



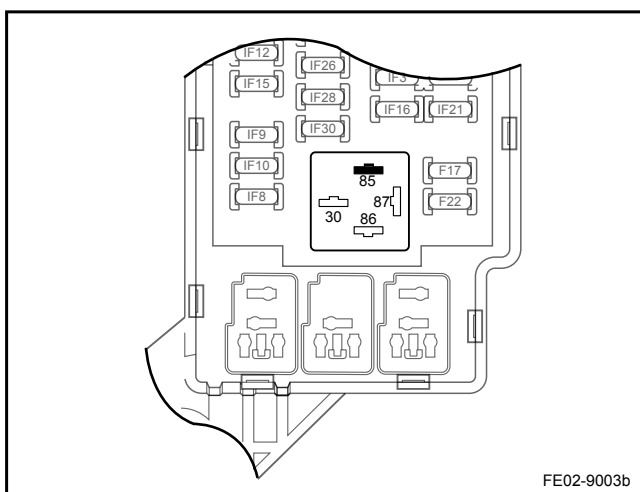
- Turn the ignition switch to "OFF" position.
- Remove the ignition relay.
- Turn the ignition switch to "ON" position.
- Measure voltage between ignition relay IG1 terminal No.86 and a reliable ground.  
Standard Voltage: 11-14 V  
Is the voltage specified value?

No

Go to step 5

Yes

Step 2	Check IG1 relay coil ground circuit.
--------	--------------------------------------



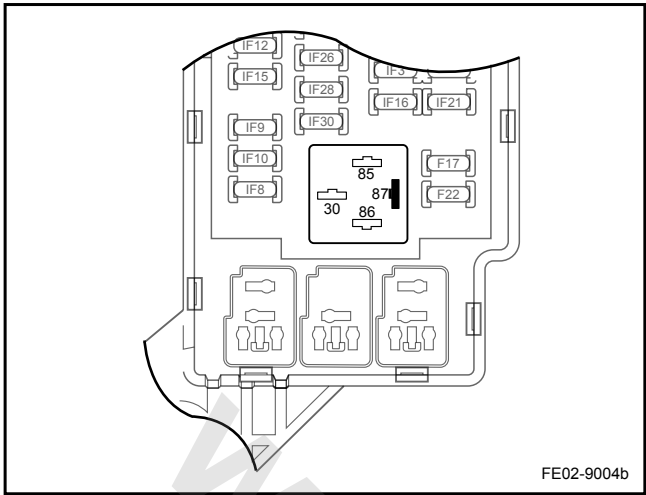
- Turn the ignition switch to "OFF" position.
- Remove the ignition relay.
- Measure resistance between ignition relay IG1 terminal No. 85 and a reliable ground.  
Standard Resistance: Less than 1  $\Omega$   
Is the resistance specified value?

No

The circuit between the relay terminal No.85 and the ground is open.

Yes

Step 3	Check the relay power input.
--------	------------------------------



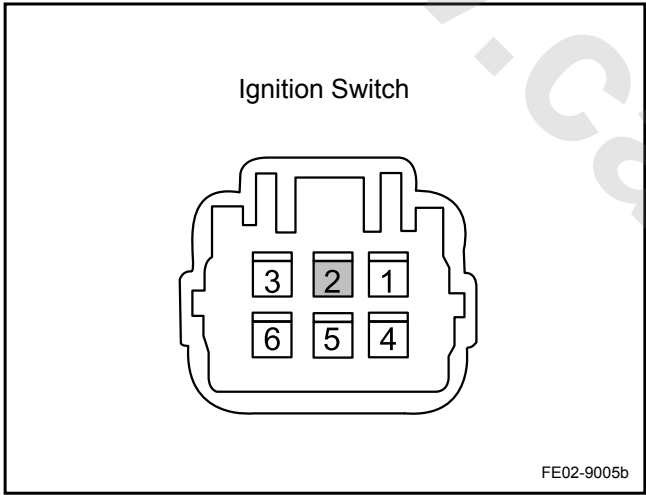
- (a) Turn the ignition switch to "OFF" position.
- (b) Remove ignition relay.
- (c) Measure voltage between ignition relay IG1 terminal No.87 and a reliable ground.  
Standard Voltage: 11-14 V  
Is the voltage specified value?

No

The circuit between the relay terminal No.87 and fuse EF22 is open.

Yes

Step 4	Replace the ignition relay IG1.
Step 5	Check ignition switch IG1 power output.



- (a) Turn the ignition switch to "ON" position.
- (b) Measure voltage between ignition switch harness connector IP23 terminal No.2 and a reliable ground. (Note: During this test, the ignition switch wiring harness connector can not be disconnected).  
Standard Voltage: 11-14 V  
Is the voltage specified value?

No

Check the ignition switch, refer to the [2.10.7.3 Check Ignition Switch](#)

Yes

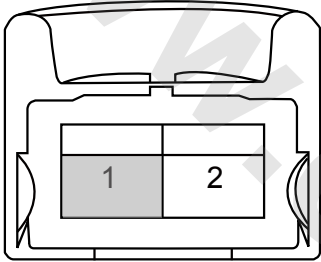
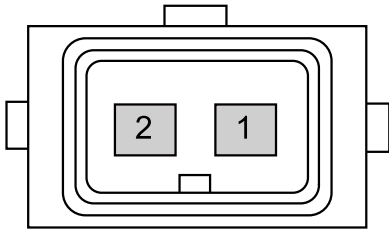
Step 6	The circuit between ignition switch wiring harness connector IP23 terminal No.2 and the ignition relay IG1 terminal No.86 is open.
Next	
Step 7	Diagnostic completed.

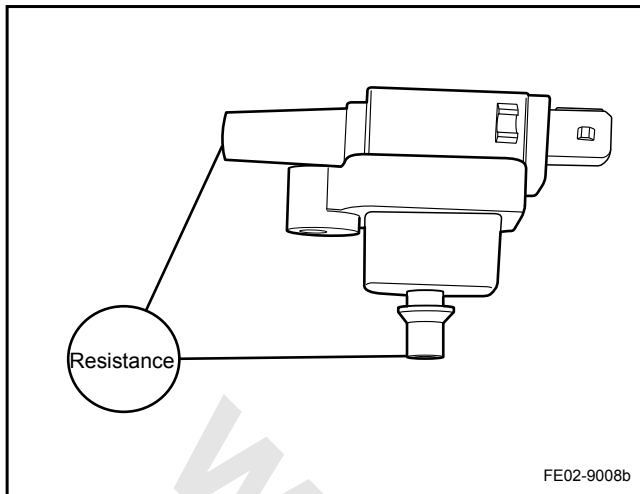
2.10.7.5 Spark Plug Does Not Arcing

Note

Before carry out the Spark Plug do not arcing diagnostic, make sure that the engine anti-theft locking system is not activated and working properly.

It is prohibited directly contact the ignition wire with the ground, as this may damage the ignition coil or the engine control module. the correct approach is to use a good spark plug with one end to connect the ignition wire, the other to a reliable ground.

Step 1	Are instruments, wiper and other electrical accessories working properly?	
		<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 100px; text-align: center;">No</div> <div style="border: 1px solid black; padding: 5px; width: 300px;">           Ignition relay IG1 is not working properly.            Refer to <a href="#">2.10.7.4 Ignition Relay IG1 No Power Output</a> </div> </div>
<div style="border: 1px solid black; padding: 5px; width: 100px; text-align: center;">Yes</div>		
Step 2	Check the ignition coil power supply.	
<div style="border: 1px solid black; padding: 10px;"> <p>Ignition Coil Harness Connector EN19 (EN20)</p>  <p style="text-align: right; font-size: small;">FE02-9006b</p> </div>		<p>(a) Turn the ignition switch to "OFF" position.</p> <p>(b) Disconnect the ignition coil harness connector EN19 (EN20).</p> <p>(c) Turn the ignition switch to "ON" position.</p> <p>(d) Measure the voltage between ignition coil harness connector EN19 (EN20) terminal No.1 and a reliable ground.</p> <p>Standard Voltage: 11-14 V</p> <p>Is the voltage specified value?</p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 100px; text-align: center;">No</div> <div style="border: 1px solid black; padding: 5px; width: 250px;">           The ignition relay IG1 terminal No.30 circuit is open.         </div> </div>
<div style="border: 1px solid black; padding: 5px; width: 100px; text-align: center;">Yes</div>		
Step 3	Measure the ignition coil primary resistance.	
<div style="border: 1px solid black; padding: 10px;"> <p>Ignition Coil</p>  <p style="text-align: right; font-size: small;">FE02-9007b</p> </div>		<p>(a) Turn the ignition switch to "OFF" position.</p> <p>(b) Disconnect the ignition coil harness connector EN19 (EN20).</p> <p>(c) Measure resistance between the ignition coil terminal No.1 and No.2.</p> <p>Standard Resistance Value: 0.7-0.9 Ω</p> <p>Is the resistance specified value?</p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 100px; text-align: center;">No</div> <div style="border: 1px solid black; padding: 5px; width: 250px;">           Replace the ignition coil. Refer to <a href="#">2.10.8.3 Ignition Coil Replacement</a> </div> </div>
<div style="border: 1px solid black; padding: 5px; width: 100px; text-align: center;">Yes</div>		
Step 4	Measure the ignition coil secondary resistance.	



- Turn the ignition switch to "OFF" position.
- Disconnect the ignition coil harness connector EN19 (EN20).
- Measure resistance between the ignition coil secondary terminals.

Standard Resistance Value: 9.68-12.32 kΩ

Is the resistance specified value?

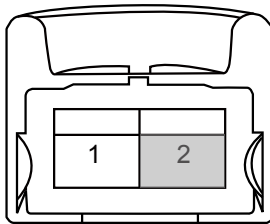
No

Replace the ignition coil. Refer to [2.10.8.3 Ignition Coil Replacement](#)

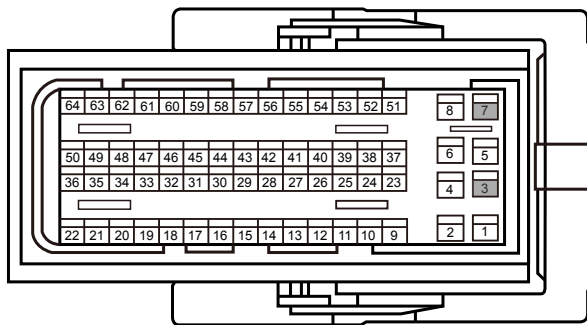
Yes

Step 5 Check the ignition coil control circuit.

Ignition Coil Harness Connector EN19 (EN20)



ECM Harness Connector EN01



FE02-9009b

- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Disconnect the ignition coil harness connector EN19 (EN20).
- Measure resistance between ECM harness connector EN01 terminal No.3(7) and the ignition coil harness connector EN19 (EN20) terminal No.2 with a multimeter.
- Measure resistance between the ignition coil harness connector EN19 (EN20) terminal No.2 and a reliable ground with a multimeter. Check whether there is short to ground circuit.
- Measure voltage between the ignition coil harness connector EN19 (EN20) terminal No.2 and a reliable ground with a multimeter. Check whether there is short to power supply circuit.

Standard Value:

Measurements	Standard Value
EN01 (3) / (7) -EN19/EN20 (2) Resistance	0 Ω
Resistance Between EN19/EN20 (2) and A Reliable Ground	10 kΩ or higher
Voltage Between EN19/EN20 (2) and A Reliable Ground	0 V

Are the measured values specified values?

No

Repair the circuit fault.

Yes

Step 6 Turn the ignition switch to the "ST" position to observe whether the instrument displays engine speed?



Note: Each time the ignition switch can not stay at the "ST" location more than 5s, otherwise it will damage the starter motor.

Note: The scan tool can also be to diagnose. Turn the ignition switch to the "ST" position to observe the scan tool data: Engine / data list / "engine speed."

Speed not shown?

No

Go to step 10

Yes

Step 7 Check the crankshaft position sensor.

For inspection steps, refer to [2.2.7.29 DTC P0321 P0322](#)

Confirm the resistance is the specified value.

No

Replace the crankshaft position sensor. Refer to [2.10.8.2 Crankshaft Position Sensor Replacement](#)

Yes

Step 8 Check the crankshaft position sensor signal circuit.

For inspection steps, refer to [2.2.7.29 DTC P0321 P0322](#)

Normal?

No

Repair the circuit fault.

Yes

Step 9 Check ECM power supply circuit.

(a) Check whether ECM power supply circuit is normal.

(b) Check whether ECM ground circuit is normal.

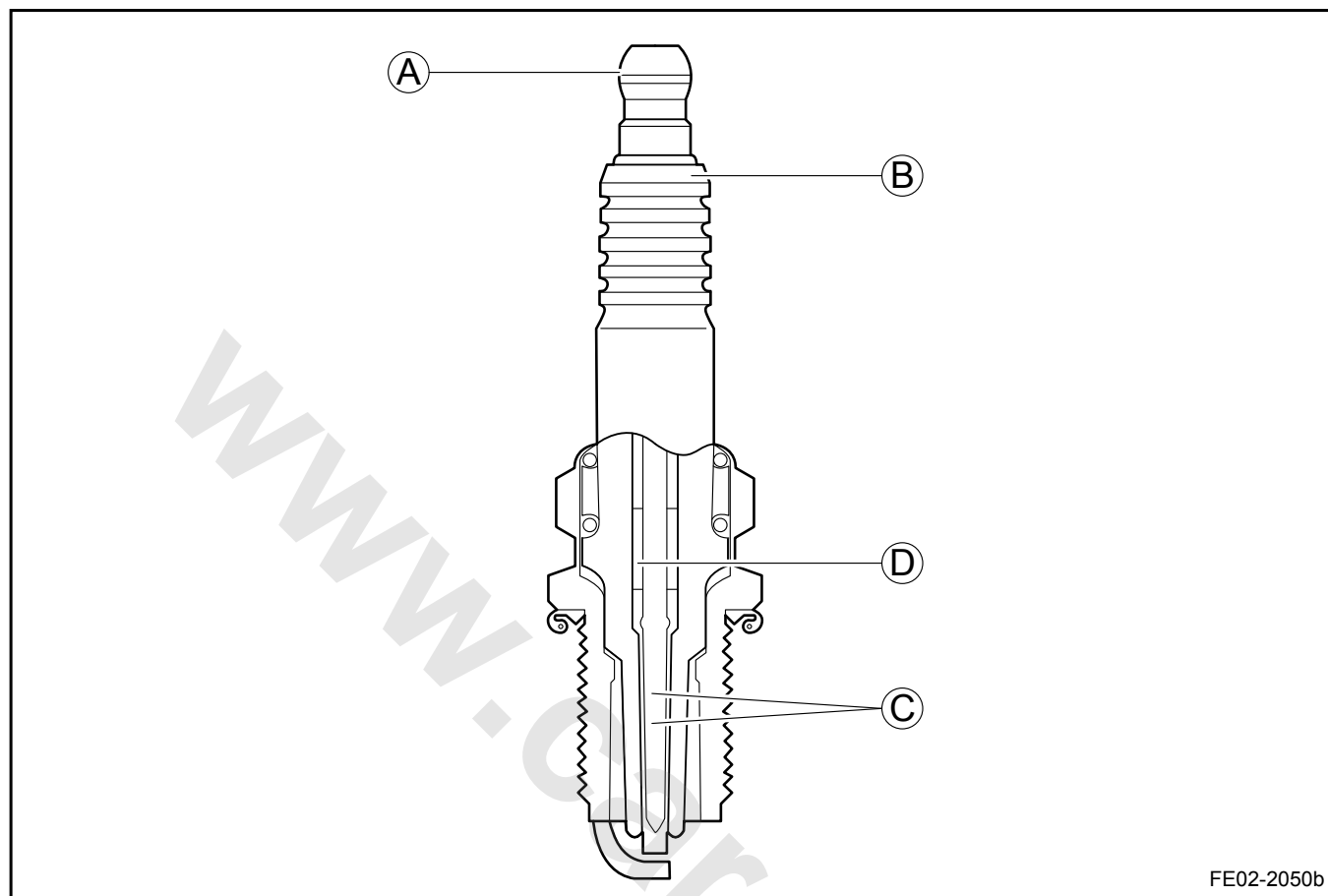
No

Repair the faulty part.

Yes

Step 10 Replace ECM.

## 2.10.7.6 Spark Plug Diagnostic



Step 1	Remove the spark plug. Refer to <a href="#">2.10.8.4 Spark Plug Replacement</a> .
--------	---

Next

Step 2	Check whether the terminal terminal A is bent or broken, pull the terminal to test whether the terminal A is loose.
--------	---

Next

Step 3	Check whether the B-insulator has arcing or signs of leakage, which is due to discharge between terminal A and terminal B two ends.
--------	---

Check whether there are following conditions:

- (a) Check the high-voltage damping line for damage.
- (b) Check whether the cylinder head spark plug groove is wet.  
Whether there is engine oil, engine coolant or water. Damped spark plug will cause arc discharge.

Next

Step 4	Check whether there is crack on the insulator B, otherwise it will cause discharge.
--------	---

Next

Step 5	Check center electrode C for signs of abnormal discharge, measure the gap between the center electrodes.
--------	--

- (a) Check whether the spark plug torque is correct, the spark plug tightening torque is the 20-30Nm (14.8-22.2lb-ft). If the torque is not adequate, the spark plug will not work correctly. If the torque is too large, it may lead to insulator B cracking.
- (b) Check for signs of leakage around the insulator tip rather than near the center electrode D.
- (c) Check for the electrode C-side fracture and worn.
- (d) Check whether the spark plug is broken, worn or loose by shaking center electrode D. If a popping sound is heard, it indicates the internal parts have been damaged. If the center electrode spark D is loose, the spark plug intensity will be reduced.
- (e) Check whether electrodes C and D are shorted. If it is the case, the residue on the electrode C will reduce or even the gap will disappear.
- (f) Check whether the electrode is too dirty.

Next

Step 6	Check the cylinder head slot for debris, otherwise it may damage the spark plug during the installation.
--------	--

#### 2.10.7.7 Common Spark Plug Malfunction

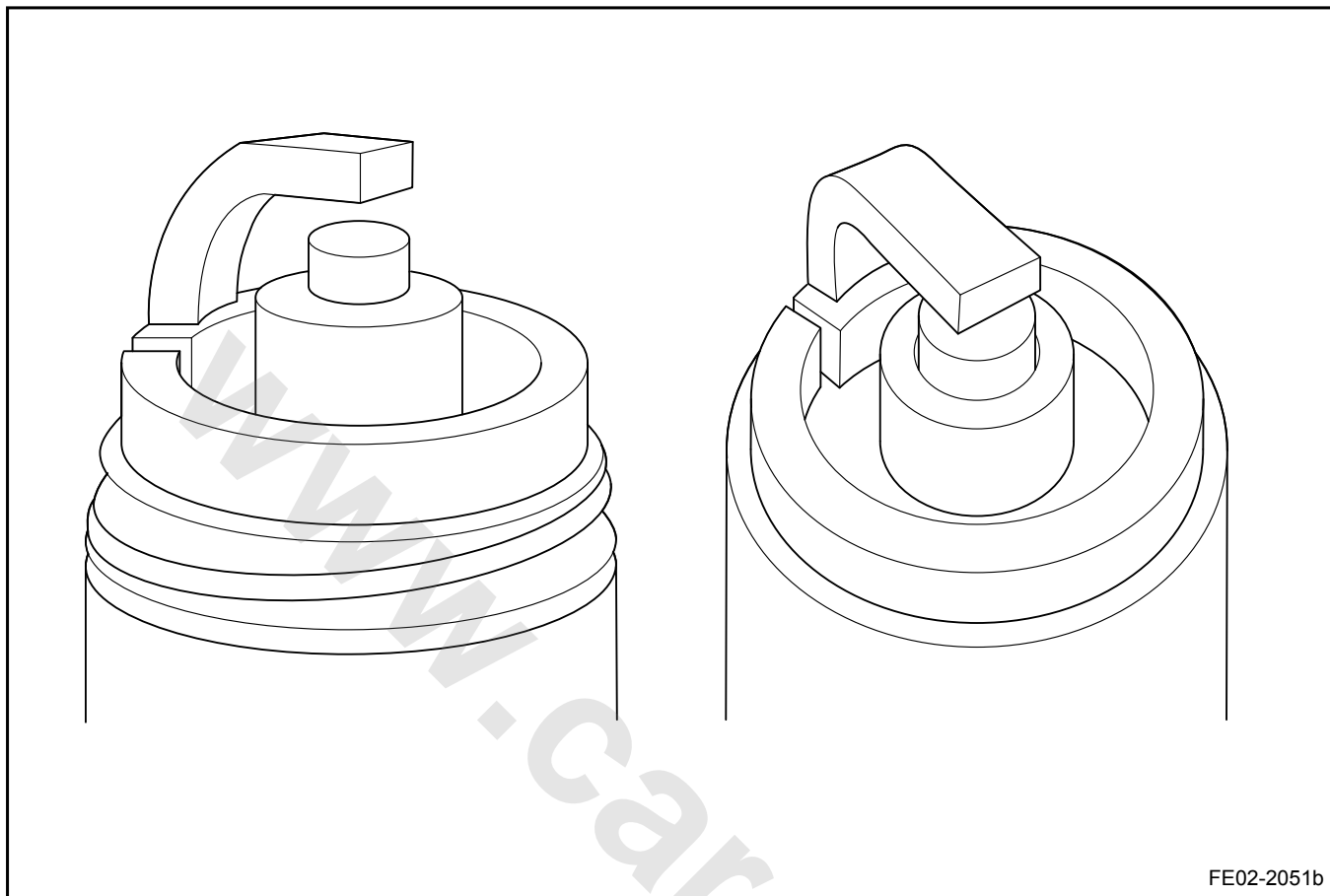
**Serious Spark Plug Burn:** Spark plug top scars, damage or electrode melting, burnt all indicate that the spark plug has been damaged and should be replaced. Check the symptoms as well as color changes when replacing the spark plug, in order to analyze the reasons for malfunction. Refer to [2.10.8.4 Spark Plug Replacement](#).

1. Electrode melting and the insulator turning white indicate that combustion chamber temperature is too high. This may be because there is too much carbon residue in the combustion chamber, so that valve clearance is too small caused by overheating or cooling malfunction. Another possible reason is that the spark plug tightening torque does not match the specified value.
2. Electrode becomes rounded and the insulator has a scar, indicating that an early engine combustion. It may be because premature ignition timing, low-octane gasoline or spark plug too hot.
3. Insulator top is broken. Knock combustion is the main reason for the insulator rupture. Premature ignition timing, low-octane gasoline or spark plug too hot may lead to engine knocking.
4. Insulator top has gray black strips, which indicate that the spark plug may have been leaking and should be replaced.

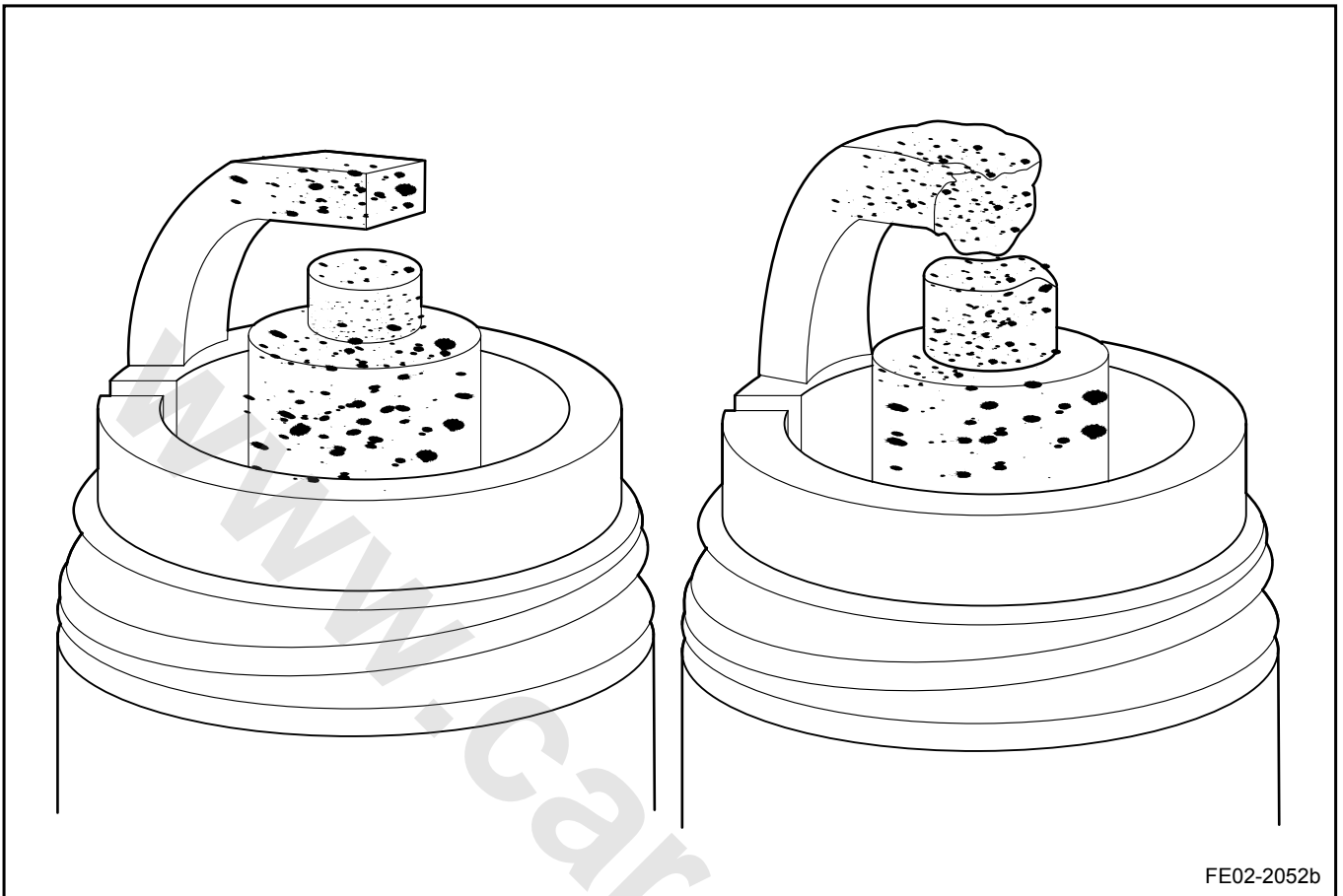
**Spark Plug Residue:** There is residue between the spark plug insulator top and the electrodes. In severe cases, it can cause the engine inoperative. Cleaning the spark plug can be a temporary solution. In order to maintain good performance, identify the root cause for the malfunction.

1. **Oily Residue.** Spark plug has oily residues, indicating that lubricating oil entering into the combustion chamber. If it only happens to an individual spark plug, the valve rod seals may be damaged. If every cylinder spark plug has oily residue, it indicates that there is cylinder channeling oil. Check whether the air filter and ventilation device is blocked.
2. **Black Residue.** There is black residue on the spark plug electrodes and inside the spark plug, indicating that the mixture is too rich. Increase the engine running speed and continue for a few minutes to burn the layer of black soot on the electrode.

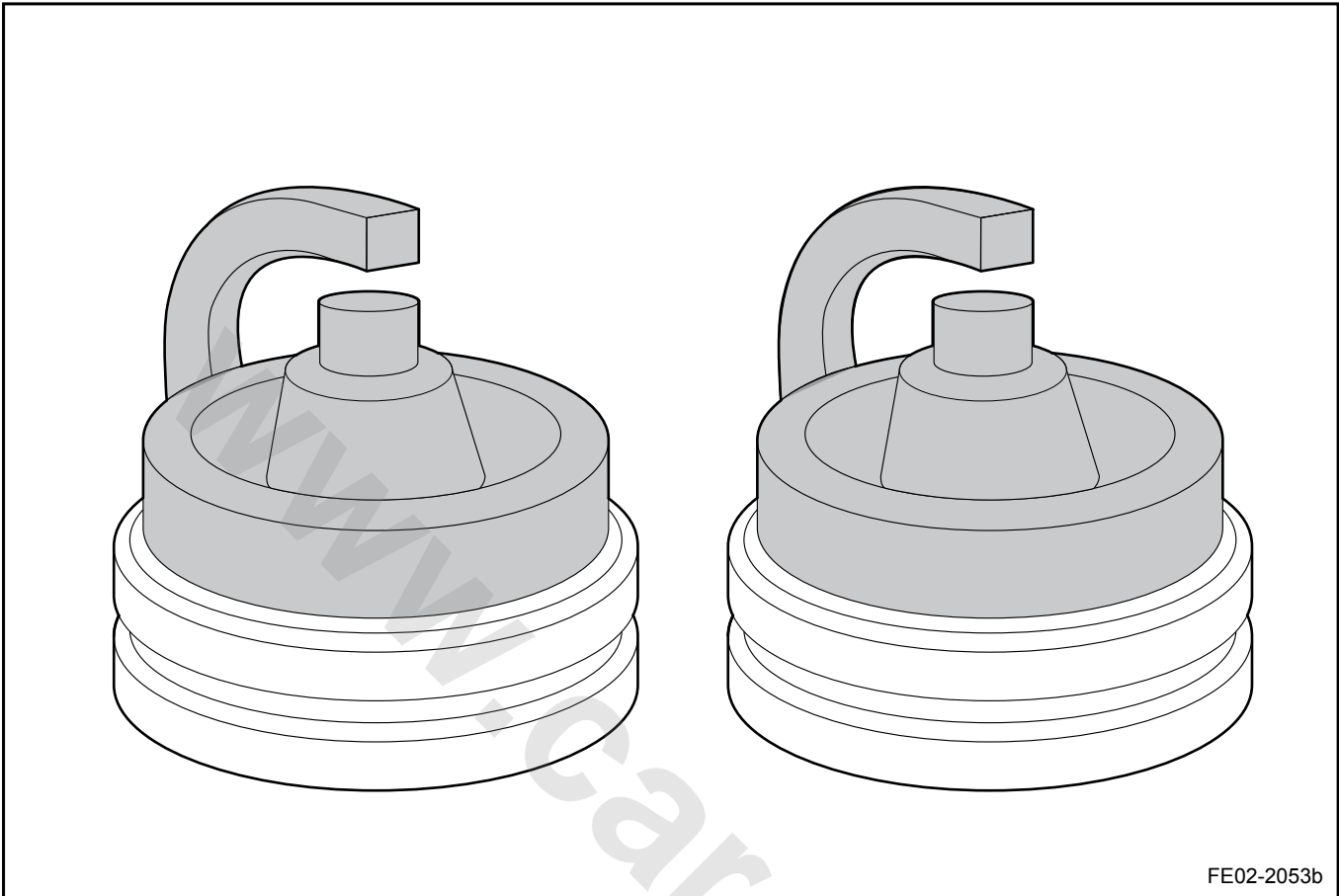
1. With normal spark plug, center electrode is gray or yellow.



2. With excessive fuel combustion, spark plug center electrode has serious corrosion.



3. With incorrect spark plug heat value or fuel system malfunction, the spark plug center electrode has excessive carbon residue.



## 2.10.8 Removal and Installation

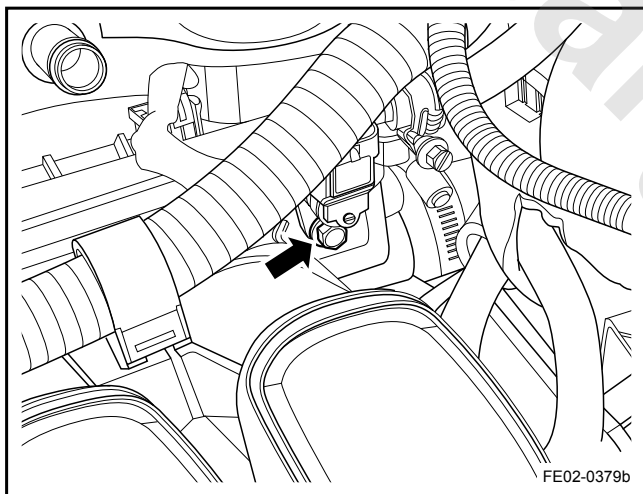
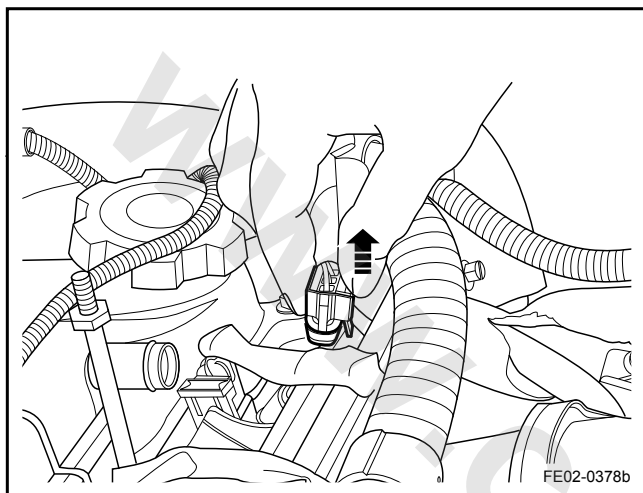
### 2.10.8.1 Camshaft Position Sensor Replacement

Removal Procedure:

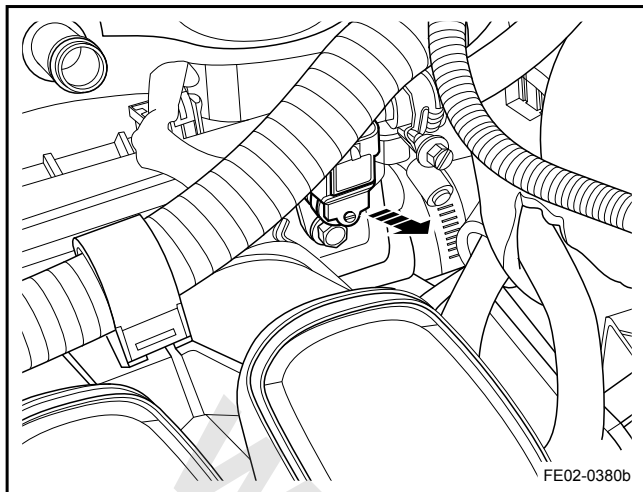
**Warning!**

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect the camshaft position sensor wiring harness connector.

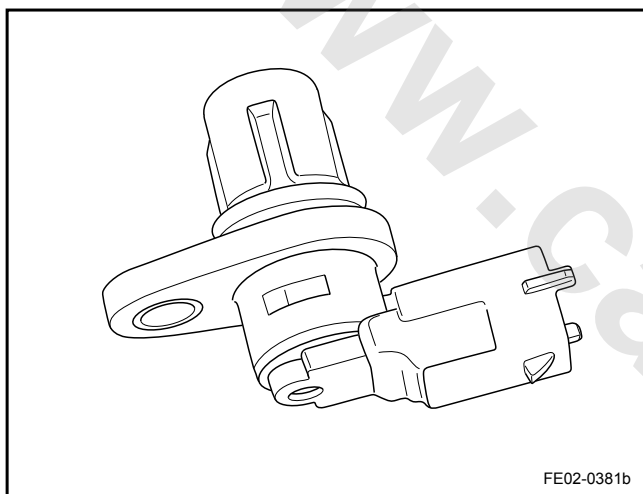


3. Remove the sensor retaining bolts.

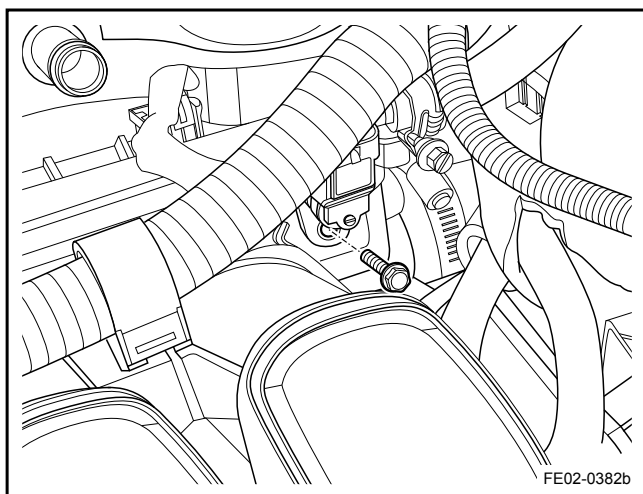


4. Remove the camshaft position sensor.

Installation Procedure:



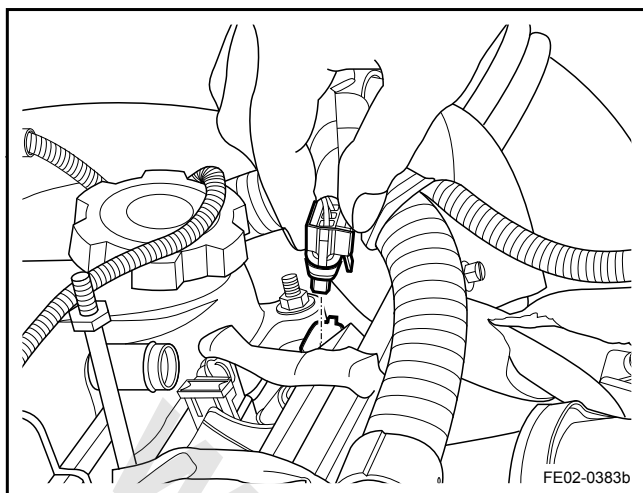
1. Check to confirm whether the camshaft position sensor seals are intact.



2. Install camshaft position sensor and tighten the retaining bolt.

Torque: 9 Nm (Metric) 6.7 lb-ft (US English)





3. Connect the camshaft position sensor wiring harness connector.
4. Connect the battery negative cable.

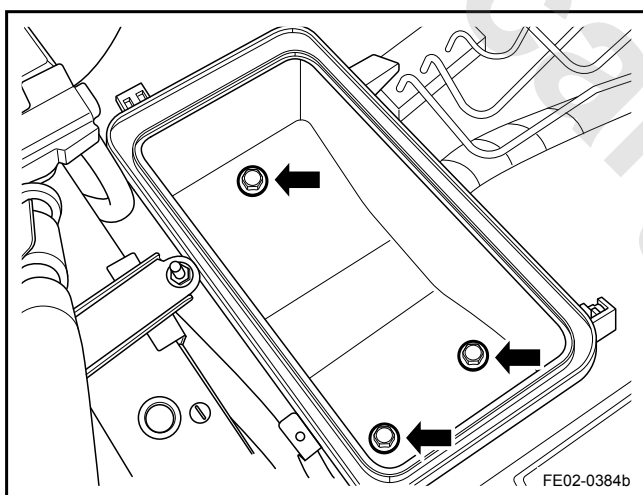
### 2.10.8.2 Crankshaft Position Sensor Replacement

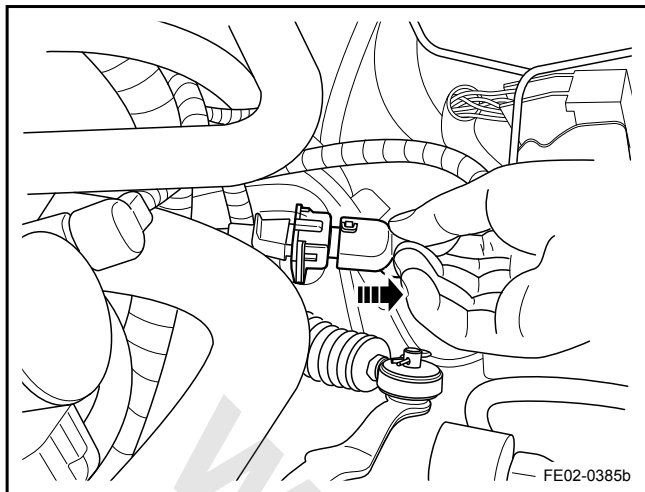
Removal Procedure:

**Warning!**

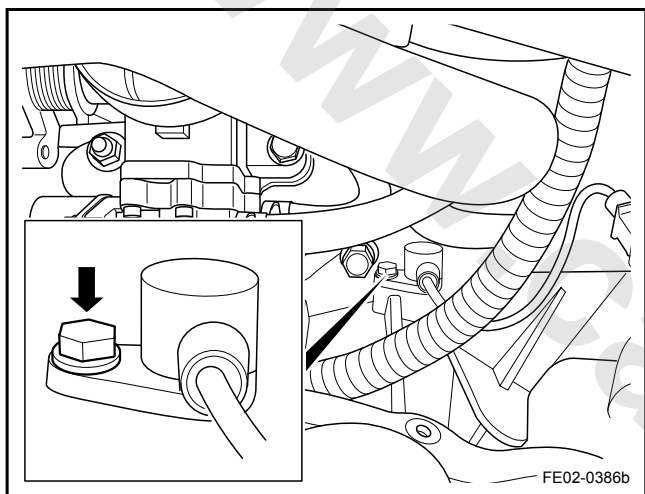
Refer to "Battery Disconnection Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the air filter.





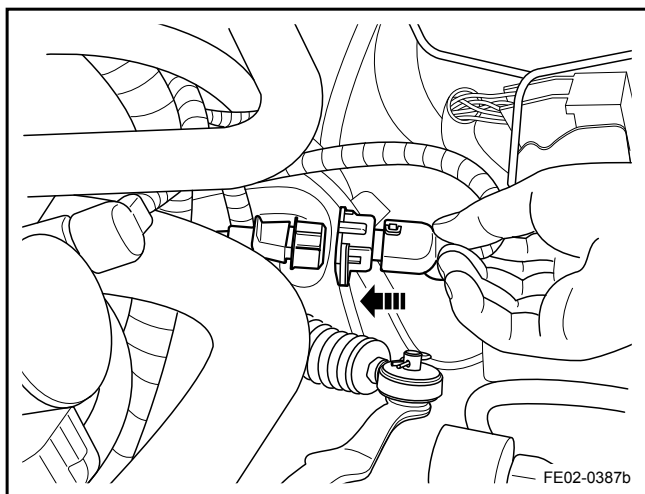
3. Disconnect the crankshaft position sensor wiring harness connector.



4. Remove the sensor retaining bolts.

**Note**

After removing the sensor, plug the sensor mounting hole to prevent debris falling into it.



**Installation Procedure:**

1. Install the sensor and tighten the retaining bolts.  
Torque: 9 Nm (Metric) 6.7 lb-ft (US English)
2. Connect the crankshaft position sensor wiring harness connector.
3. Install the air filter assembly.  
Torque: 9 Nm (Metric) 6.7 lb-ft (US English)
4. Connect the battery negative cable.

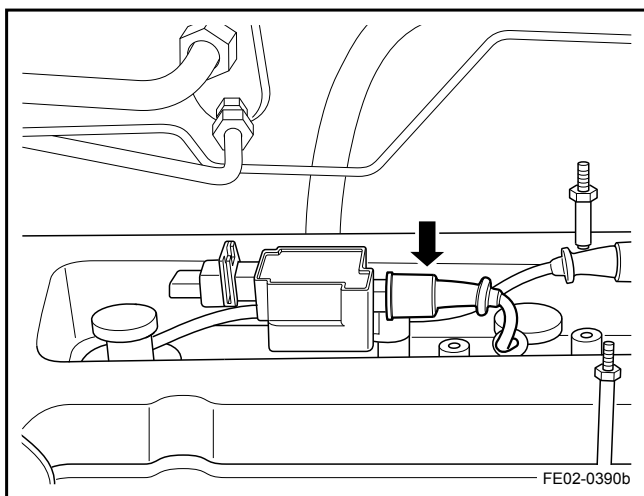
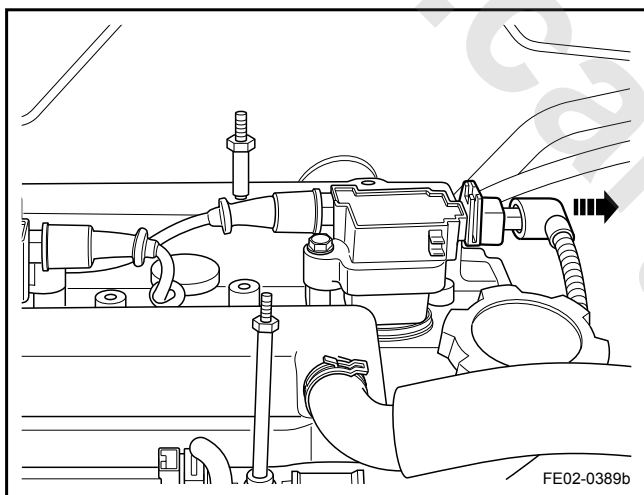
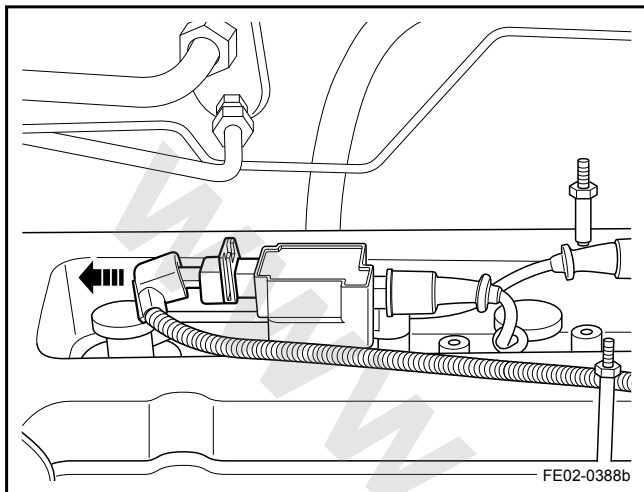
### 2.10.8.3 Ignition Coil Replacement

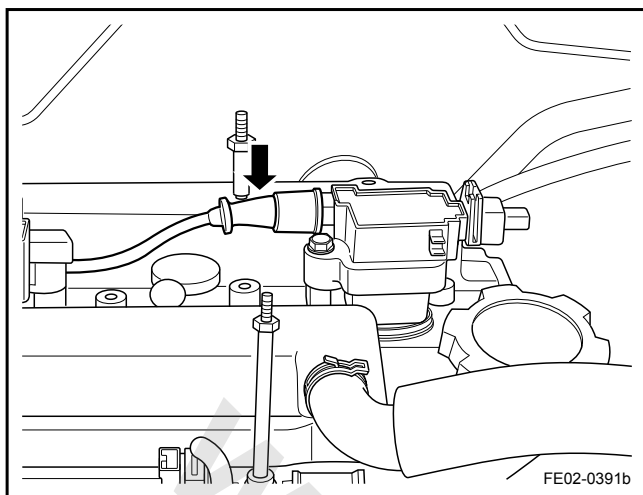
Removal Procedure:

Warning!

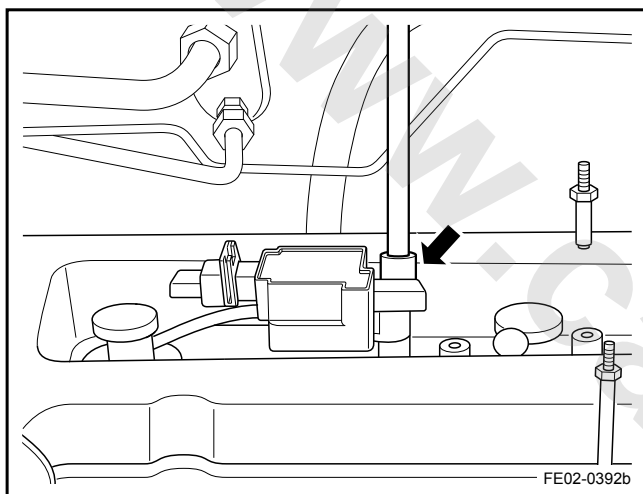
Refer to "Battery Disconnection Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the hood. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
3. Disconnect cylinder No.2 and No.3 ignition coil harness connectors.
4. Disconnect cylinder No.1 and No.4 ignition coil harness connectors.
5. Disconnect the cylinder No.3 high pressure damping line.

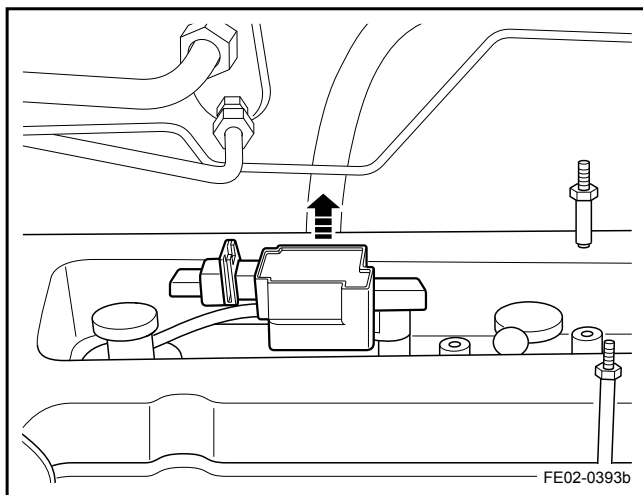




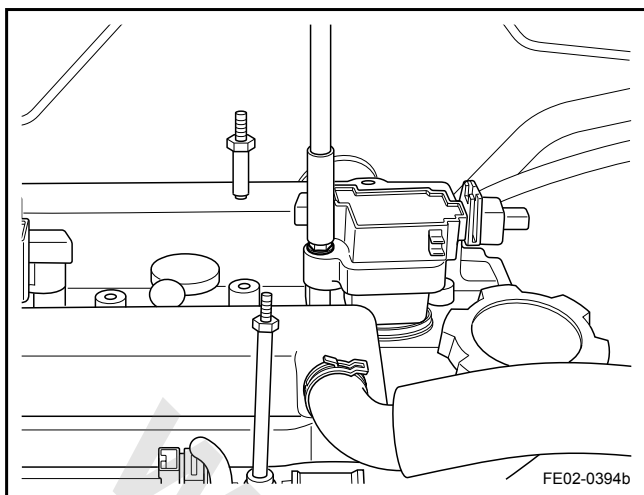
6. Disconnect the cylinder No.1 high pressure damping line.



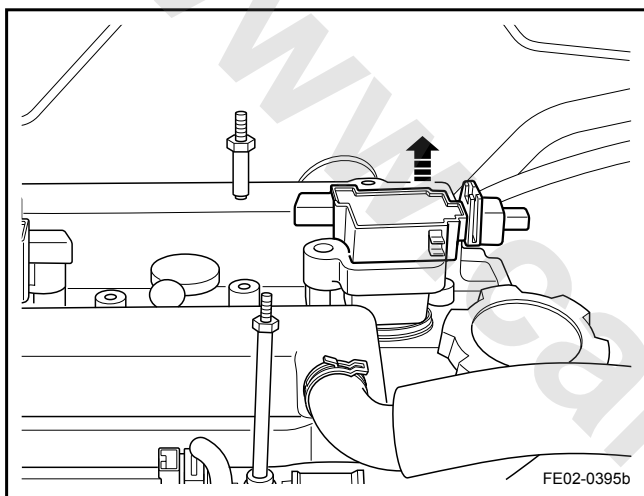
7. Remove cylinder No.2 and No.3 ignition coil retaining bolts.



8. Remove cylinder No.2 and No.3 ignition coils.



9. Remove cylinder No.1 and No.4 ignition coil retaining bolts.

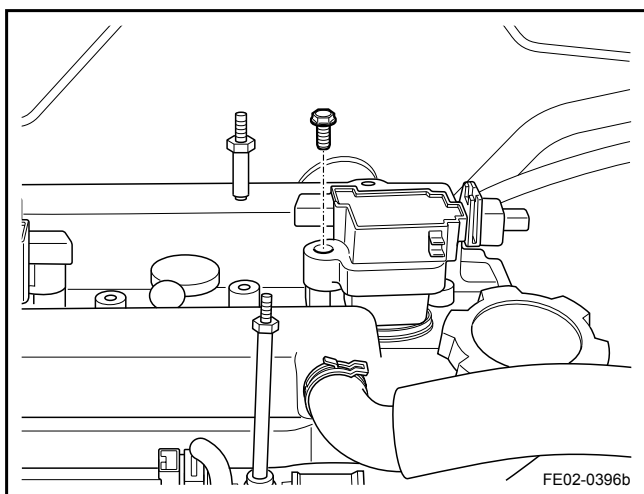


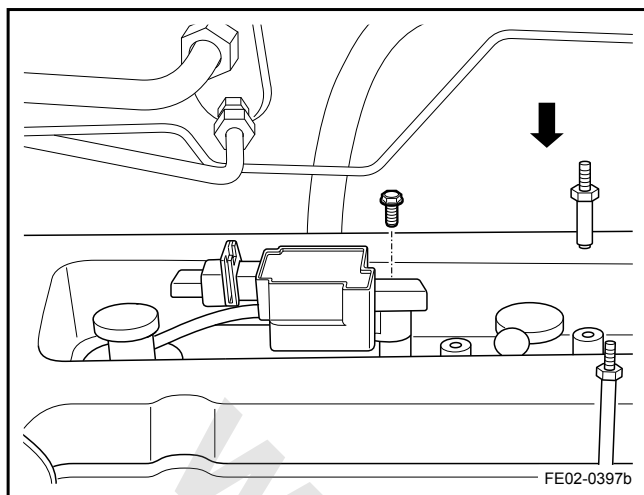
10. Remove cylinder No.1 and No.4 ignition coils.

#### Installation Procedure:

1. Install cylinder No.1 and No.4 ignition coils, and tighten the retaining bolts.

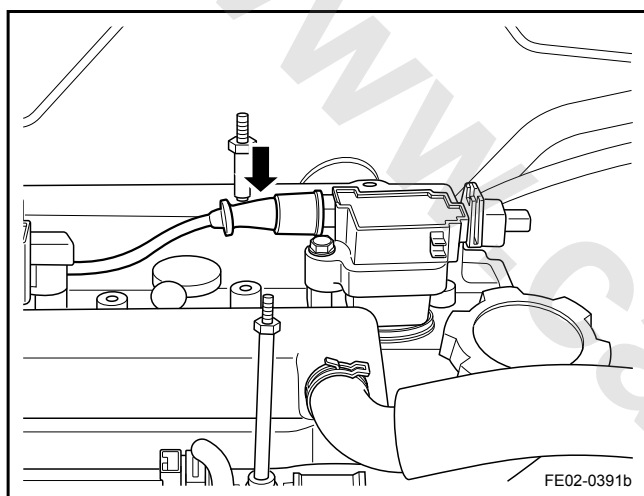
Torque: 9 Nm (Metric) 6.7 lb-ft (US English)





2. Install cylinder No.2 and No.3 ignition coils, and tighten the retaining bolts.

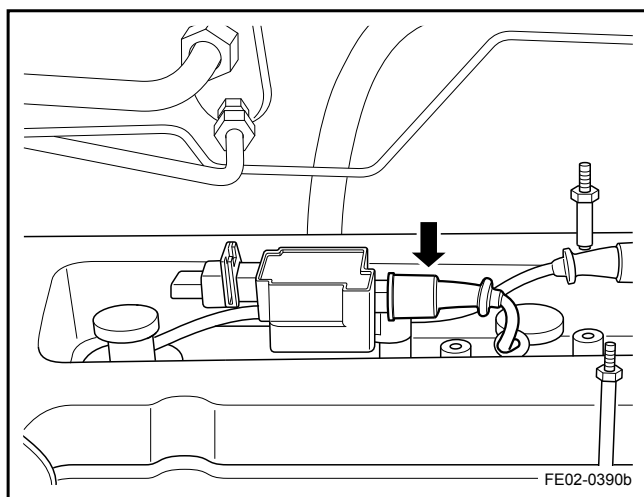
Torque: 9 Nm (Metric) 6.7 lb-ft (US English)



3. Connect the cylinder No.1 high pressure damping line.

**Note**

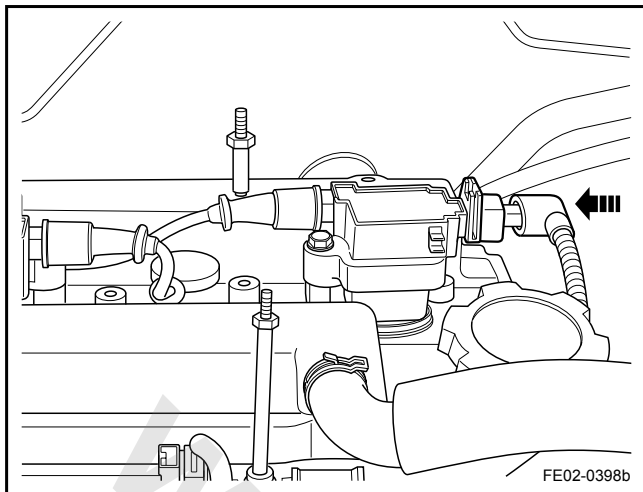
Confirm the high-pressure damping line is installed in place, otherwise it will cause a secondary arch and engine malfunction.



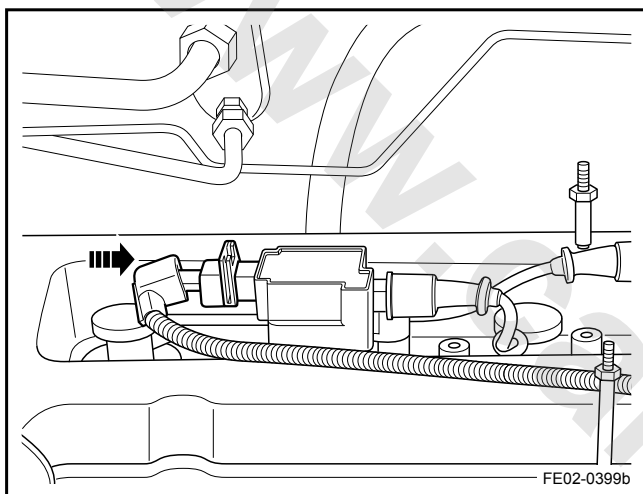
4. Connect the cylinder No.3 high pressure damping line.

**Note**

Confirm the high-pressure damping line is installed in place, otherwise it will cause a secondary arch and engine malfunction.



5. Connect cylinder No.1 and No.4 ignition coil harness connectors.



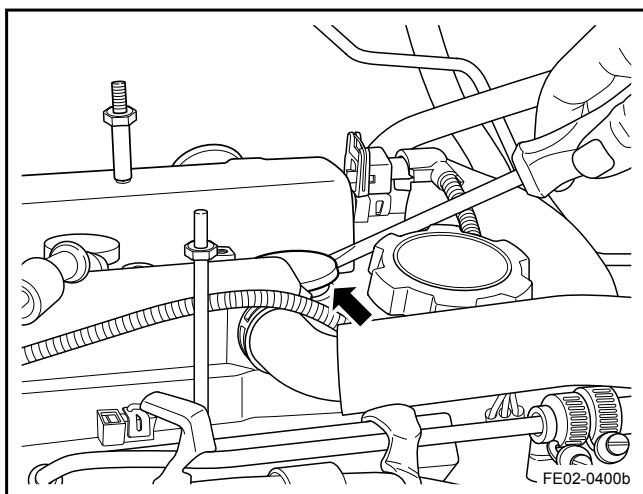
6. Connect cylinder No.2 and No.3 ignition coil harness connectors.
7. Install the engine hood.
8. Connect the battery negative cable.

#### 2.10.8.4 Spark Plug Replacement

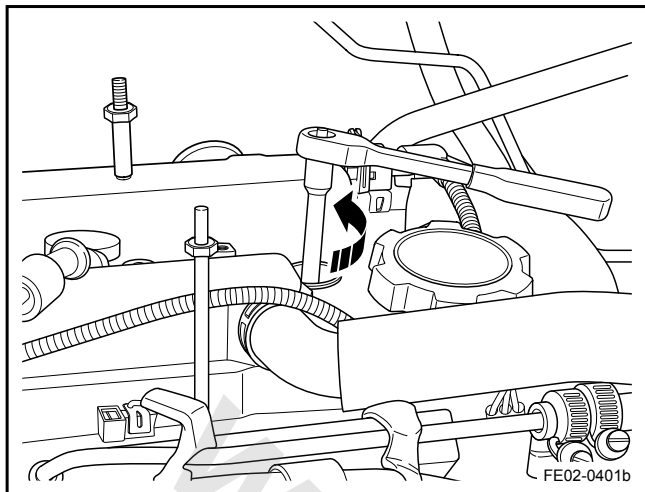
Removal Procedure:

**Warning!**

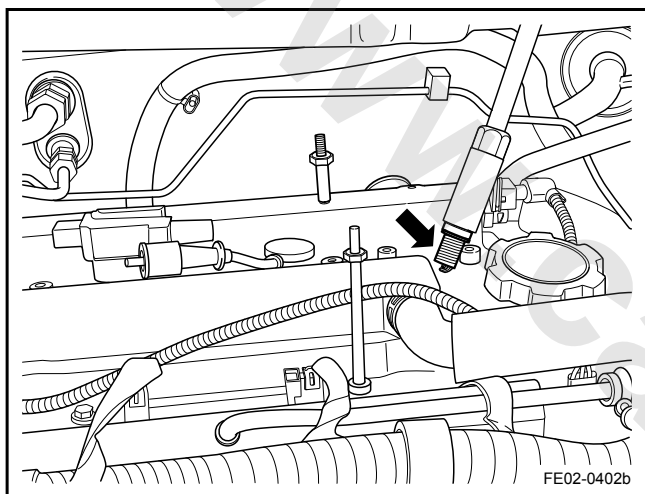
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



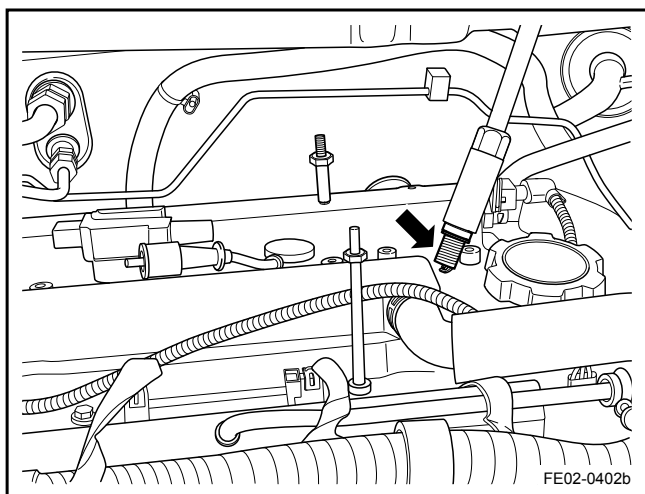
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the hood. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
3. Remove the ignition coil. Refer to [2.10.8.3 Ignition Coil Replacement](#).
4. Remove the high-voltage damping line.



5. Use spark plug socket to rotate the spark plug counterclockwise to remove the spark plug.



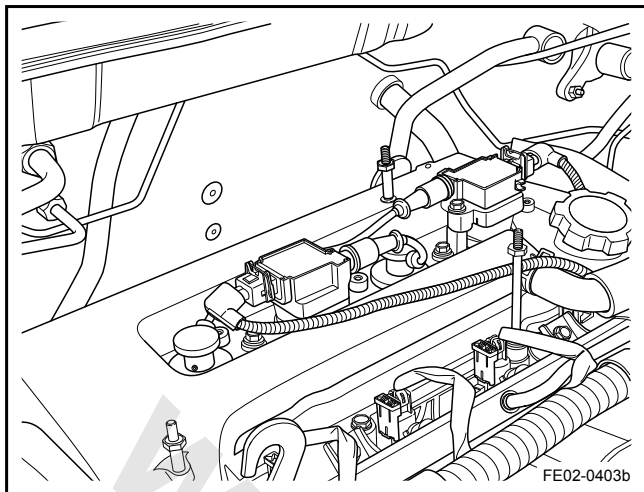
6. Remove the Spark Plug from the cylinder head .



#### Installation Procedure:

1. Clean the Spark Plug and check the spark plug electrode gap.  
Spark plug gap: 1.0-1.1 mm (Metric) 0.04-0.043 in (US English)
2. Use spark plug socket to install the spark plug into the engine.  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)





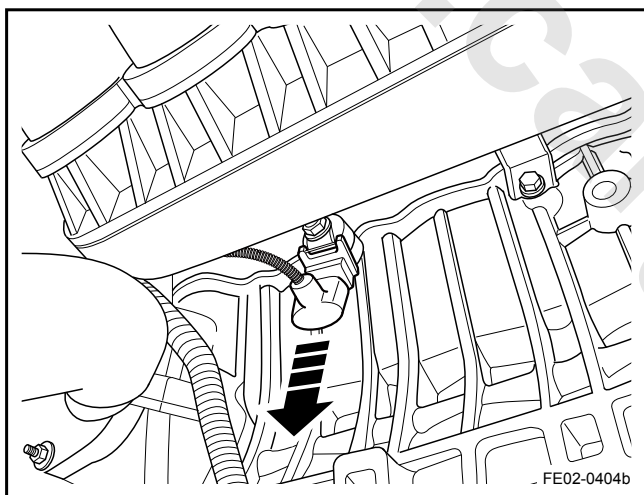
3. Install the high-voltage damping line and the spark plug.
4. Install the engine hood.
5. Connect the battery negative cable.

### 2.10.8.5 Knock Sensor Replacement

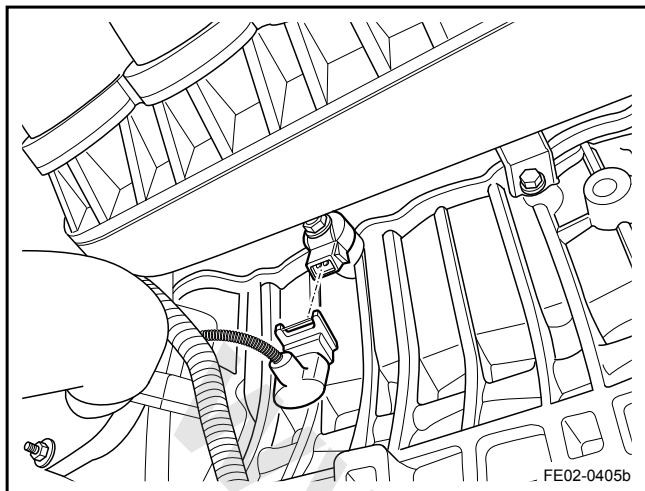
Removal Procedure:

#### Warning!

Refer to "Battery Disconnection Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the starter. Refer to [2.11.8.4 Starter Replacement](#).
3. Disconnect the knock sensor harness connector.
4. Remove the retaining bolts and the knock sensor.



Installation Procedure:

1. Install the knock sensor retaining bolts.  
Torque: 18 Nm (Metric) 13.3 lb-ft (US English)
2. Connect the knock sensor wiring harness connector.
3. Install the starter.
4. Connect the battery negative cable.

## 2.11 Starting / Charging System JL4G18-D

### 2.11.1 Specifications

#### 2.11.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Battery Cable Nut	M6	8.5-12	6.3-8.9
Battery Bracket To Battery Stud Nut	M6	7.5-10.5	5.6-7.8
Battery Terminal Bolt	M6 × 34	8.5-12	6.3-8.9
Battery Upper Bracket Bolt	M10 × 1.5 × 20	13	9.6
Generator Drive Shaft Nut	M24	100	74
Generator Upper Mounting Bolt	M8 × 30	20-30	14.8-22.2
Generator Screw	M10 × 1.25 × 72	44-64	32.6-47.4
Starter Electromagnetic Switch Assembly Screws	M6 × 28	8	5.9
Starter Solenoid Switch Terminal To Battery Cable Terminal Nut	M13	10	7.4
Starter To Engine Block Mounting Bolt	M10 × 1.25 × 60	37	27.4
Starter To Transmission Mounting Bolt	M10 × 1.25 × X80	37	27.4

#### 2.11.1.2 General Specifications

##### Battery Specifications

Applications	Specifications
Cold Start Current	400 A
Rated Capacity	60 A/h
Rated Voltage	12 V

##### Start Motor Specifications

Applications	Specifications
Starter	
No-Load Test (12.2 V )	40-90 A
No-Load Test Power Consumption	0.5 kW

Applications	Specifications
Drive Gear Speed	2,600-4,800 rpm
Solenoid	
Coil (12.2V)	35 A
Suction Coil (12.2V)	35 A

## Generator Specifications

Applications	Specifications
Current	90 A
Model	JFZ1906

## 2.11.2 Description and Operation

### 2.11.2.1 Battery Description and Operation

#### Warning!

Refer to "Battery Acid Fluid" in "Warnings and Notices".

This vehicle uses a maintenance-free battery, which is different from a conventional battery. There is no vent plug in this battery. Apart from a small vent on both sides of batteries, the battery is completely sealed. Vent holes can discharge a small amount of gas generated by the battery. The electrolyte inside the battery generates a small amount of gas after chemical reactions. If there is no exhaust vent, battery internal pressure increases as the gas pressure increases. When the pressure is over limit that the battery shell can withstand, the battery shell will break.

Compared with a conventional battery, this battery has the following advantages:

- No need to fill water during the life of the battery.
- Overcharge protection.
- Electricity leakage is less likely to happen as compared with a conventional battery.
- Lighter, smaller and capacity is larger.

In the entire electrical system, battery has main functions:

- Provide energy to the starter for starting the vehicle.
- Play a role as the electrical system voltage regulator.
- When the generator electrical system capacity can not meet the demand, the battery can provide power in a certain period of time.

Battery technical parameters explained:

1. Rated capacity: With the minimum output of electrical loads and without generator power, the time the vehicle drives at night.
2. Cold start current: Starting current when the battery temperature is  $-18^{\circ}\text{C}$ .

If the battery test is normal, but the battery voltage often appears inadequate, the vehicle can not start at night etc., consider the reasons from the following aspects:

- Electrical equipment in the vehicle remain turned on all night.
- Driving speed is low, stop and start frequently.

- Vehicle electrical load exceeds the generator output, especially if the vehicle is equipped with aftermarket equipments.
- Charging system fault, such as electrical short circuit, generators belt slipping, generator malfunction or voltage regulator malfunction.
- Improper use of the battery, including failed to maintain battery cable terminals clean and tighten, or the battery bracket is loose.
- Mechanical failure in the electrical system, such as short circuit or circuit damage.

### 2.11.2.2 Starting System Description and Operation

Starting system includes the battery, ignition switch, starter, starter relays and related circuits, all of these parts are connected by circuits. When the ignition switch is turned to "ST" position, the starter relay pull-in and provides power to starter motor magnetic switch, starter motor runs. For specific control principle. Refer to [2.11.3.1 Starting System Working Principle](#).

### 2.11.2.3 Charging System Description and Operation

Charging system includes the battery, generator, instrument cluster and relevant circuits. Generator consists of the voltage regulator, rectifier, stator and rotor, which are all installed inside the generator housing. When the engine rotates, the drive belt drives the generator to rotate. The generator rotation generates an alternating current, which is converted to a direct current by the diode rectifier and then transmitted to the charging system. Voltage regulator automatically adjusts the generator field current to control voltage output to keep it within the appropriate charging range. For detailed working principle. Refer to the [2.11.3.2 Charging System Working Principle](#).

Charging Process:

1. Remove the sealed-type battery from the vehicle and install proper adapter components. Make sure that all the charging cables are clean and firm. To achieve best results, charge the battery when the electrolyte and electrode are at room temperature. If the battery temperature is too low, the charger may not start charging after a few hours.
2. Charge the battery until the battery is full or the tested battery voltage is close to full load capacity. Check the battery every half an hour during charging.
3. Test the battery load after charging. Refer to [2.11.7.9 Battery Discharging Current Parasitic Load Test](#).

Charge a fully discharged battery (off the vehicle):

Strictly abide by the following procedure, otherwise a good battery might be mistakenly replaced .

Follow the following procedures, charge a fully discharged battery:

1. Measure the battery terminal voltage with a precision voltage meter. If the reading is less than 10 V, the charging current will be low. The battery can only be charged with more than a few mA of current after a certain period of time.
2. Set the battery charger at a high value.
3. Continue to charge the battery, with 16V charging voltage for more than 4 hours:
  - If after 4 hours, there is still no charging current. The battery should be replaced.
  - If there is charging current, then the battery intact. Continue to charge the battery until it is fully charged.

## 2.11.3 System Working Principle

### 2.11.3.1 Starting System Working Principle

When the ignition switch is at "ST" position:

- Power passes through the underhood fuse EF15 to starter relay terminal No.87.
- Power passes through the underhood fuses EF01, EF18 to the ignition switch wiring harness connector IP23 terminal No.5.
- Power passes through the ignition switch wiring harness connector IP23 terminal No.4 to starter relay terminal No. 85.
- Starter relay terminal No.86 and the BCM harness connector IP29 terminal No.11 is connected. When the engine anti-theft locking system and vehicle Anti-theft alarm system are not activated, BCM grounds the terminal No.11, relay coil is provided with power and the relay pull-in.
- After the relay pull-in, the relay provides power through terminal No.30 to the starter motor wiring harness connector EN18.
- Starter motor electromagnetic switch is closed after power provided between the battery and starter motor closed-loop. Starter motor is grounded through the engine block. When the power supply and ground conditions are met, the starter motor starts running and the engine starts.

Start motor working principle: The motor is a DC reduction motor. The stator is a permanent magnet and the rotor is coil windings located in the armature. Through the magnetic field the coil excites the windings. Solenoid core is located inside the drive cover to avoid dust, ice and splash of water. When the switch is closed, the electromagnetic switch coil power resulting a magnetic field, causing the core and fork move and driving gear and the engine flywheel ring gear meshing. When the electromagnetic switch main contacts are closed, the battery to starter motor circuit is connected. The armature rotates and through a reduction mechanism increases the torque to drive the engine to rotate. With the starter motor rotating, due to the driving gear and the engine flywheel ring gear mesh, so the engine rotates. When the engine starts, the driver gear overdrive in order to prevent the armature speed is too high to damage the starter, at this moment the return spring separates the drive gear. In order to prevent the speed is too high to damage the starter, the ignition switch should be immediately released after the engine starts.

### 2.11.3.2 Charging System Working Principle

Generator provides DC voltage to the vehicle electrical system and maintains the battery charged. The voltage output is controlled by the regulator integrated inside the generator:

- When the ignition switch is at "OFF" position: battery voltage passes through the I/P fuse EF03 to the generator harness connector EN07 terminal No.3. This voltage is the regulator working power supply.
- When the ignition switch is at "ON" position and the engine is not running:
  1. Generator harness connector EN07 terminal No.3 still has voltage. When the ignition switch is at "ON" position, it provides IG1 relay terminal No.85 voltage. The relay pull-in.
  2. Battery voltage passes through the I/P fuse EF01, EF22 to IG1 relay terminal No.87, due to relay pull-in, relay output passes the battery voltage through relay terminal No.30, to the I/P fuse IF25, and then to the generator harness connector EN07 terminal No.2. After the magnetizing coil is provided with power, this voltage produces a good magnetic field around the coil.
  3. Generator harness connector EN07 terminal No.1 is connected with the instrument cluster connector IP03 terminal No.13, so the EN07 terminal controls the generator charging indicator. When the engine is not running, the terminal provides a good ground, so the charging indicator lights.
- When the engine is running: Because the excitation coil produces a magnetic field, so the stator coil produces alternating voltage. Voltage regulator senses the voltage and controls the field current. The AC voltage is generated by the three stator coils. This AC voltage is converted to DC voltage through the built-in rectifier. Adjusted by the voltage regulator, the generator output voltage is applied to the vehicle battery and the battery terminals power circuit. With the generator working, generator harness connector EN07 terminal No.1 voltage and the charging indicators on both sides is the same, thus the charging indicator loses ground and off.

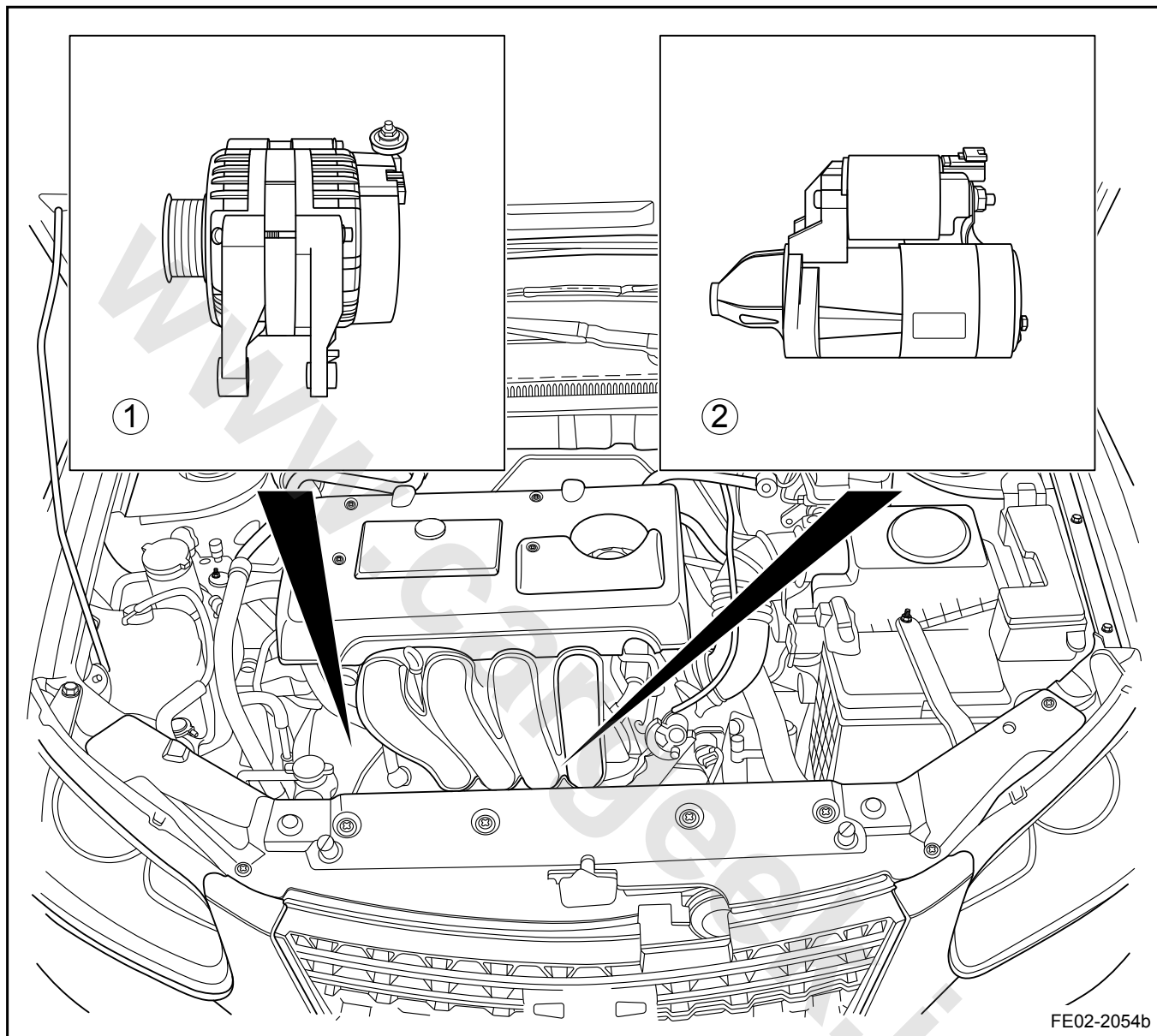
- Because the generator wiring harness connector EN07 terminal No.3 and the battery is connected, when the battery is fully charged, the regulator will reduce the magnetic field excitation current, thereby reducing the generator output voltage to prevent overcharging. When the battery discharging or load is big, the voltage regulator increases the magnetic field excitation current to increase the generator output voltage.

[www.cargeek.ir](http://www.cargeek.ir)



## 2.11.4 Component Locator

### 2.11.4.1 Generator and Starter



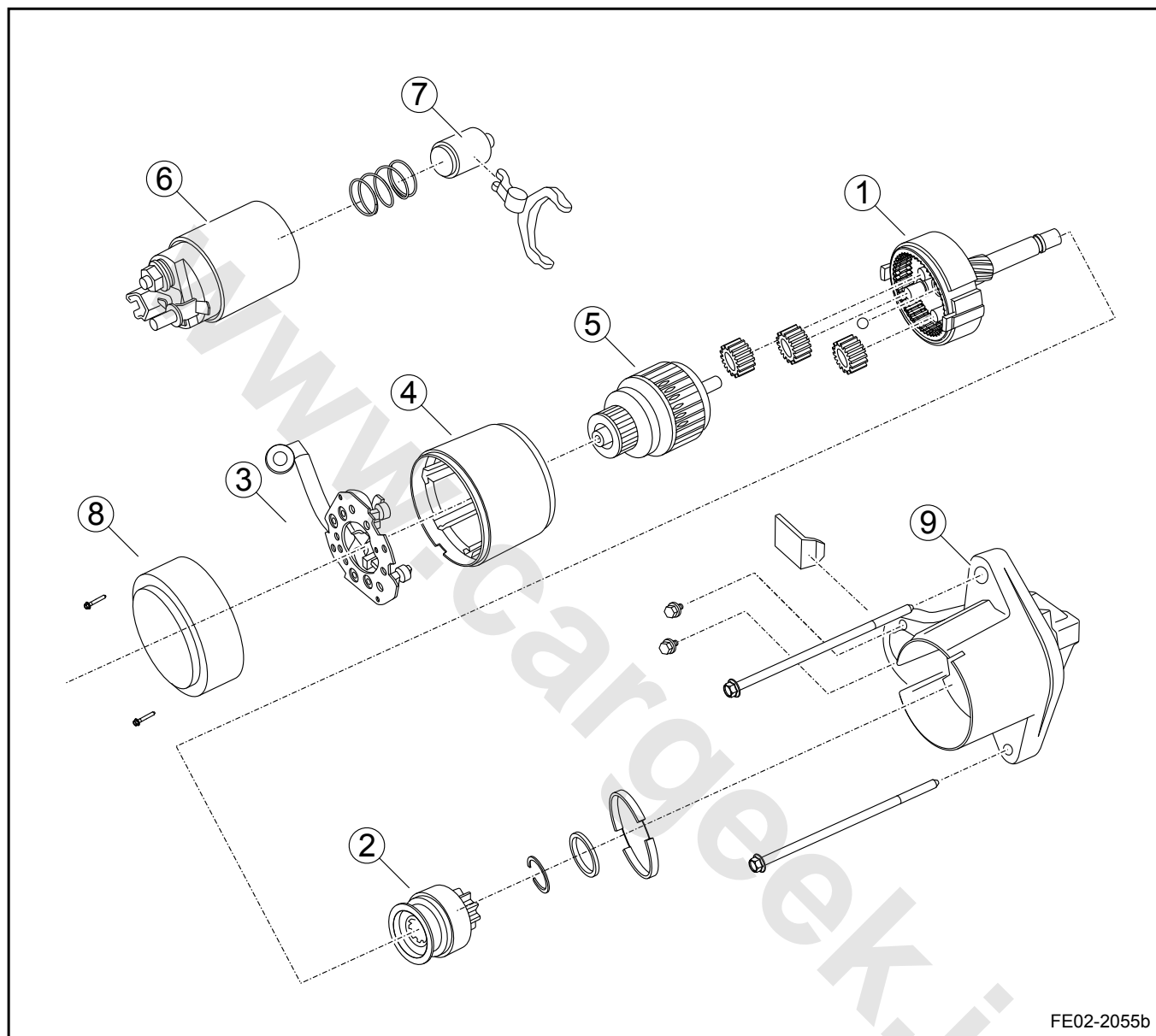
#### Legend

1. Generator

2. Starter

## 2.11.5 Disassemble View

## 2.11.5.1 Starter Disassemble View

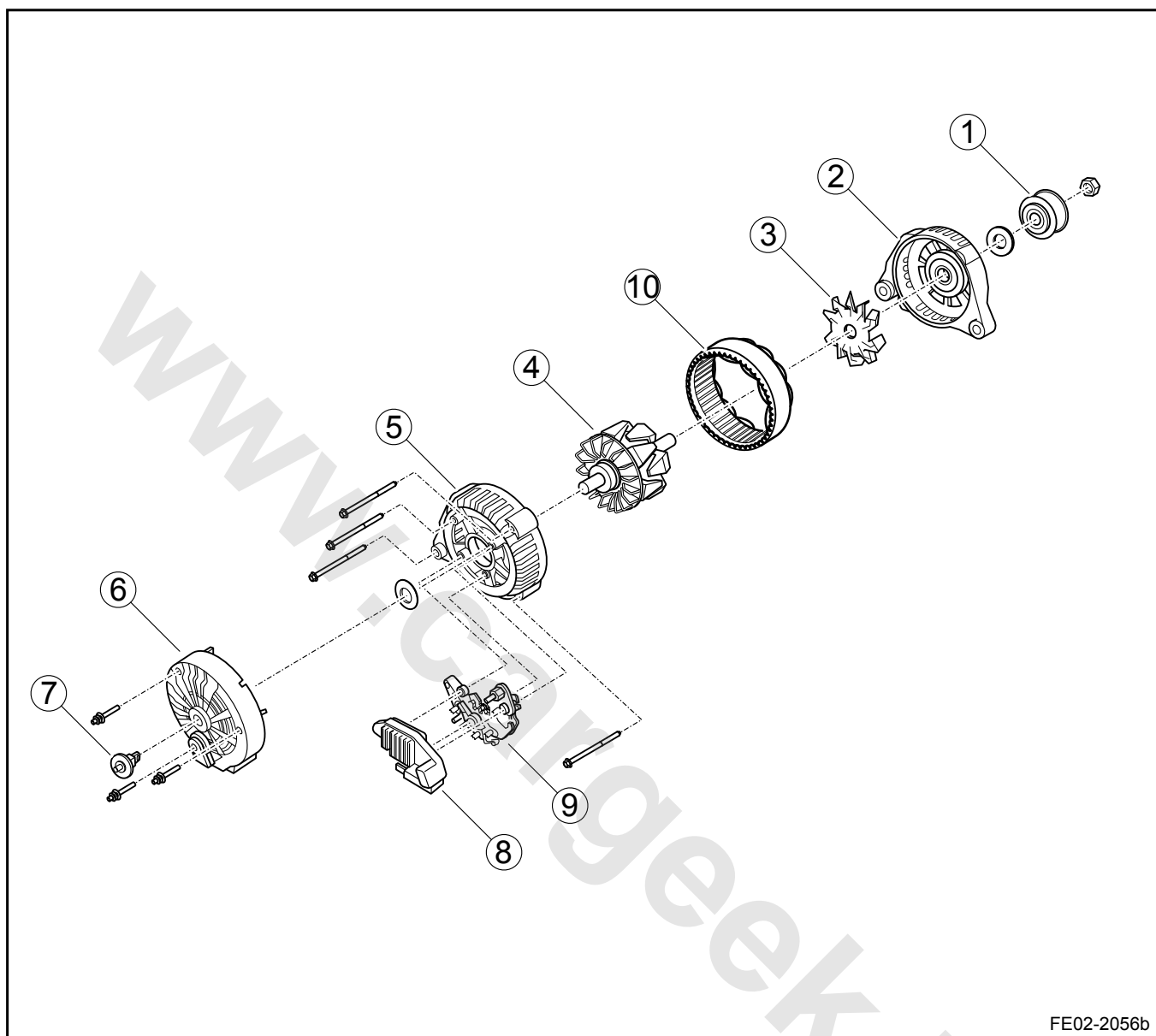


FE02-2055b

## Legend

- |                                    |                     |
|------------------------------------|---------------------|
| 1. Planetary Gear Reducer Assembly | 7. Fork             |
| 2. Drive Gear Assembly             | 8. Motor Rear Cover |
| 3. Brush Holder Assembly           | 9. Motor Shell      |
| 4. Magnetic Frame Assembly         |                     |
| 5. Armature Assembly               |                     |
| 6. Electromagnetic Switch Assembly |                     |

## 2.11.5.2 Generator Disassemble View

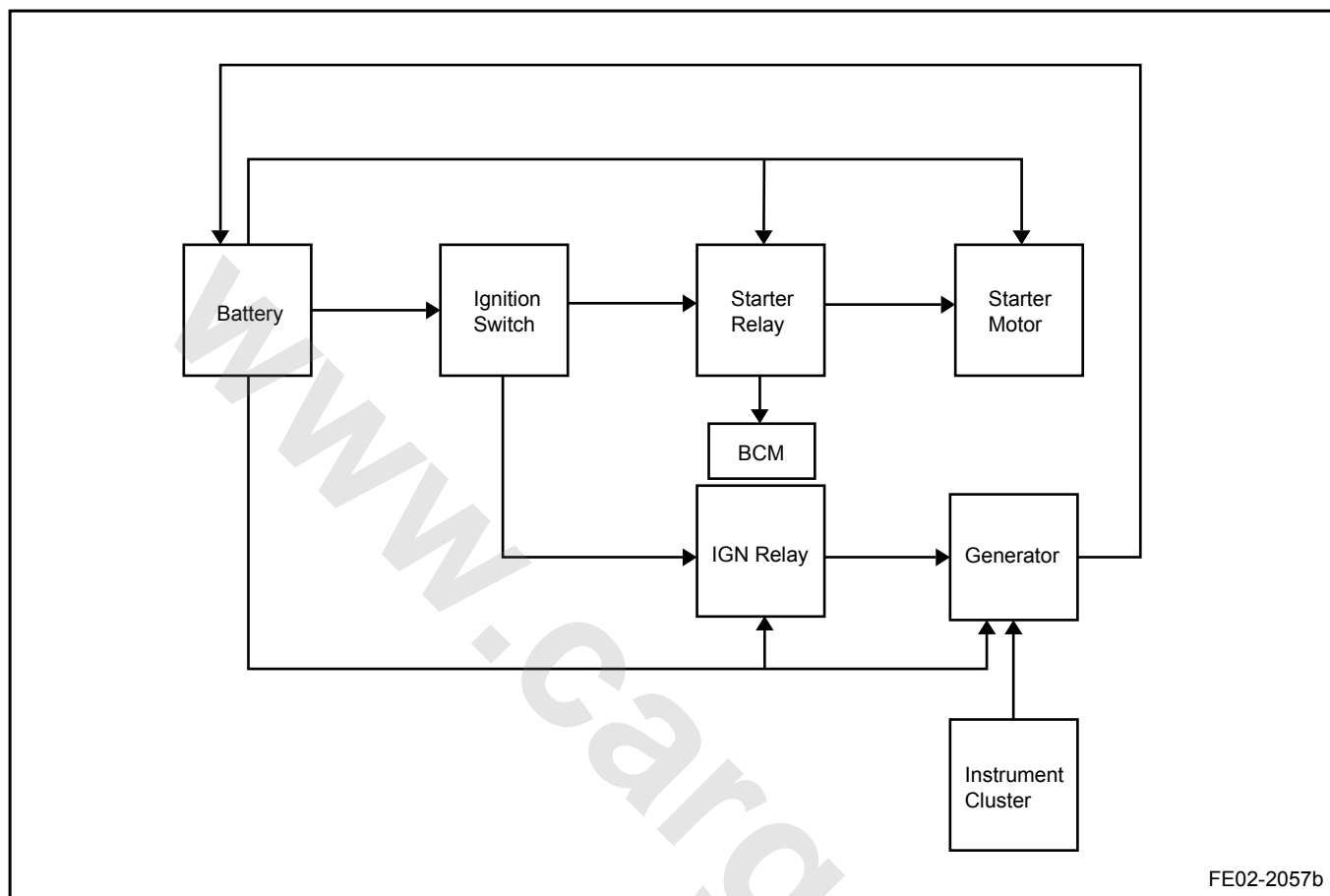


## Legend

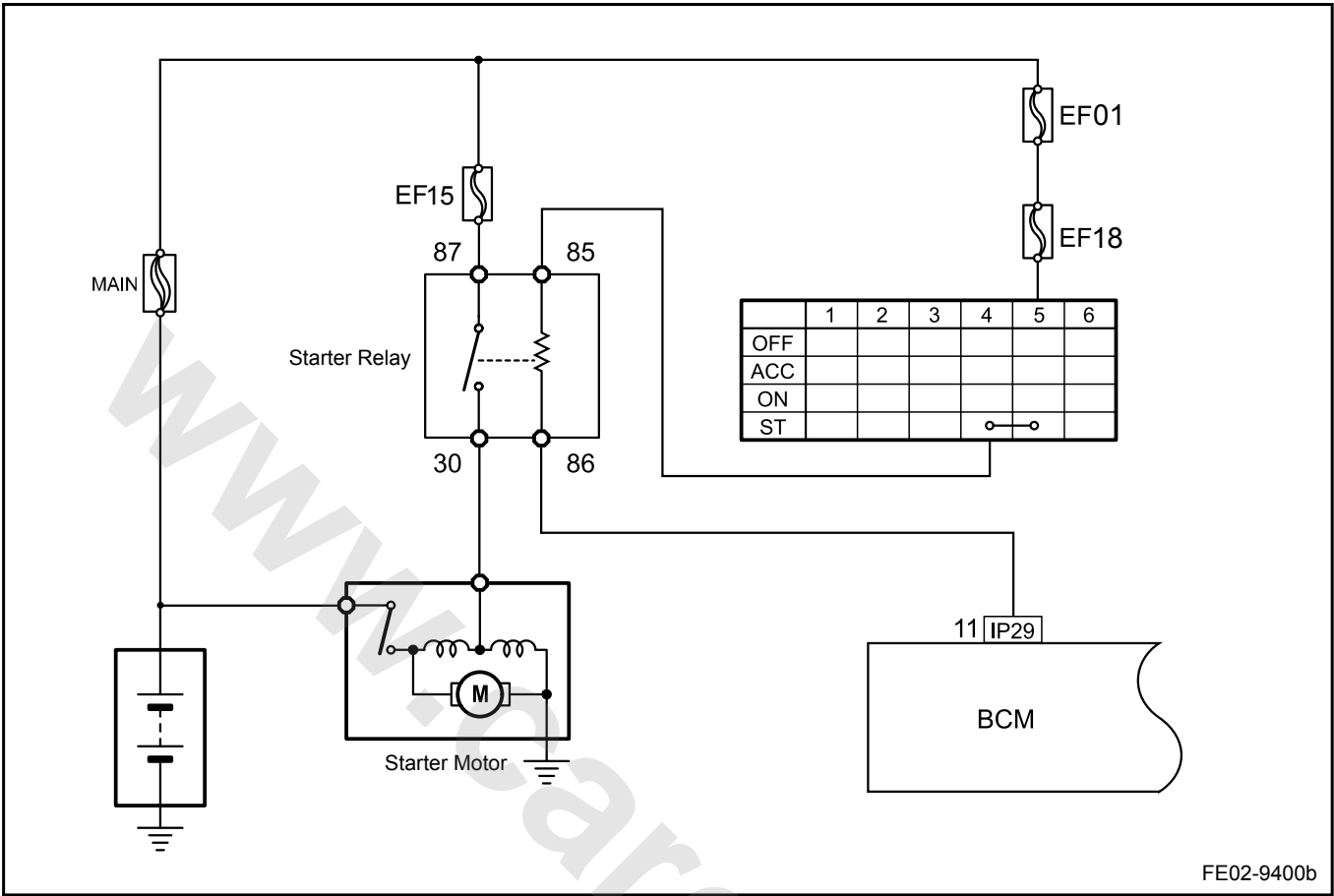
- |                          |                              |
|--------------------------|------------------------------|
| 1. Drive Belt            | 7. Generator Output Terminal |
| 2. Generator Front Cover | 8. Voltage Regulator         |
| 3. Cooling Fan           | 9. Rectifier                 |
| 4. Rotor                 | 10. Stator                   |
| 5. Generator Rear Cover  |                              |
| 6. Generator Rear Shield |                              |

## 2.11.6 Schematic

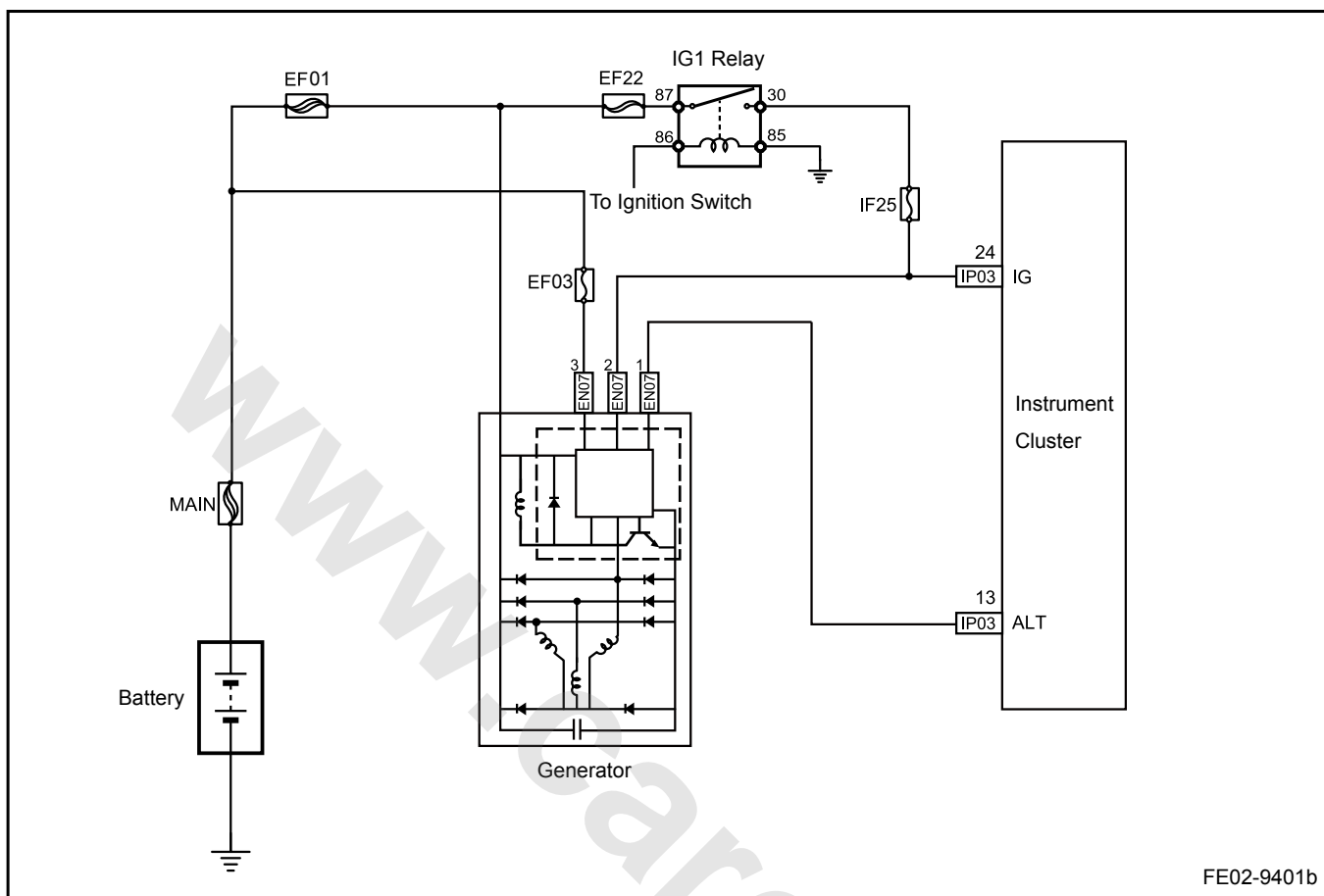
## 2.11.6.1 Schematic



Starting System Diagram



Charging System Diagram



## 2.11.7 Diagnostic Information and Procedures

### 2.11.7.1 Diagnosis Description

Refer to [2.11.2.2 Starting System Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 2.11.7.2 Visual Inspection

1. Check whether there are after market equipment that may affect the starting, charging or ignition system operations.
2. Check the easy to access system components to identify whether there is obviously damage or potential fault.
3. Check whether the battery is installed correctly.
4. Test battery status. Battery voltage is not less than 11 V.
5. Check whether there is wire damage. check starter motor, starter solenoid switches, ignition switches and the battery. Check whether all ground connections are reliable.
6. If the battery, wires and switches are normal, and motor functions are normal, remove and test the starter motor.
7. When the charging system works properly, turn the ignition switch to "ON" position, the charge indicator lamp will be on. The lamp will be off after the engine starts running.
8. Check whether the generator is loose or improperly installed, as well as the drive belt tension is normal, whether there is the possibility of slipping.

### 2.11.7.3 Starter Can Not Stop

Step 1	Make sure the ignition switch is at "OFF" position.
<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">Next</div>	
Step 2	After removal of the start motor relay, does the starter motor run?
<div style="display: flex; align-items: center; gap: 20px;"> <div style="text-align: center;"> <div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">No</div> <div style="font-size: 2em;">➤</div> </div> <div style="border: 1px solid black; padding: 5px;">Go to step 5</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; display: inline-block; width: 100px;">Yes</div>	
Step 3	Disconnect starter motor wiring harness connector.
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>(a) Disconnect the battery negative cable. Refer to <a href="#">2.11.8.1 Battery Disconnection</a>.</p> <p>(b) Disconnect starter motor wiring harness connector EN18.</p> <p>(c) Connect the battery negative cable.</p> <p>Does the starter motor run?</p> </div> <div style="width: 50%; text-align: right;"> <div style="display: flex; align-items: center; gap: 20px;"> <div style="text-align: center;"> <div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">No</div> <div style="font-size: 2em;">➤</div> </div> <div style="border: 1px solid black; padding: 5px; width: 80%;"> The circuit between starter relay terminal No. 30 and starter harness connector is short to power supply. Check and repair the faulty part. </div> </div> </div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; display: inline-block; width: 100px;">Yes</div>	
Step 4	Replace the starter motor. Confirm that the fault has been fixed.

Step 5	Ignition switch is at "ON" position, does relay 85 terminal have 12V voltage?
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Replace the starter. Confirm whether the fault has been fixed.</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px;">Yes</div>	
Step 6	Check starter relay terminal No.85 voltage
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Replace the ignition switch.</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px;">Yes</div>	
Step 7	Circuit between the ignition switch wiring harness connector IP23 and starter relay terminal No.85 is short to power supply. Repair the faulty part.
<div style="border: 1px solid black; padding: 2px 10px;">Next</div>	
Step 8	Diagnostic completed.

#### 2.11.7.4 Engine Can Not Start

Prior to the implementation of this test procedure, it is necessary to check all the starting system fuses, so that it will help with quick Diagnostic.

Step 1	Verify the fault.
<div style="border: 1px solid black; padding: 2px 10px;">Next</div>	
Step 2	Does the engine run?
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Go to step 7</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px;">Yes</div>	
Step 3	Does the engine run properly?
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Go to step 5</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px;">Yes</div>	
Step 4	Check ignition / fuel system. Refer to <a href="#">2.2.7.45 Crankshaft rotates, but the engine can not start..</a>
Step 5	Check the starter motor power supply.

Check the following:

- (a) Whether the battery capacity is normal, whether the starting voltage is lower than 10.5V, otherwise recharge the battery.



- (b) Check the battery terminal connections for existence of loose and corrosion.
- (c) Check the engine mechanical system for existence of unusual noise. Check whether the cylinder compression pressure is normal.
- All normal?

No

Repair the faulty part.

Yes

Step 6 Replace the starter motor.

Step 7 Does the starter rotate?

Yes

Replace the starter motor.

No

Step 8 Does the starter motor electromagnetic switch work?

No

Go to step 14

Yes

Step 9 Check whether the engine and drive belt system catching (engine catching, generator catching)?

Yes

Repair the catching parts.

No

Step 10 Check whether the resistance between the battery and the starter solenoid switch is too high?

Standard Resistance: &lt;0.3 Ω

Is the resistance specified value?

No

Check and repair the cable, if necessary, replace the cable.

Yes

Step 11 Check whether the resistance between the battery and the starter ground circuit is too high.

Standard Resistance: &lt;1 Ω

Is the resistance specified value?

No

Check and repair the cable, if necessary, replace the cable.

Yes

Step 12 Check whether the starter solenoid switch wiring harness connections is normal.

No

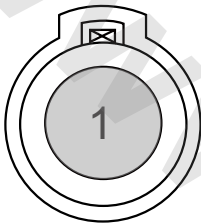
Check and repair the cable, if necessary,  
replace the cable.

Yes

Step 13 Replace the starter motor.

Step 14 Check the starter motor control power supply.

Starter Harness Connector EN18



FE02-9402b

- Turn the ignition switch to "OFF" position.
- Disconnect starter harness connector EN18.
- Turn the ignition switch to "ON" position.
- Measure starter harness connector EN18 No.1 terminal voltage.

Standard Voltage: 11-14 V

Is the voltage specified value?

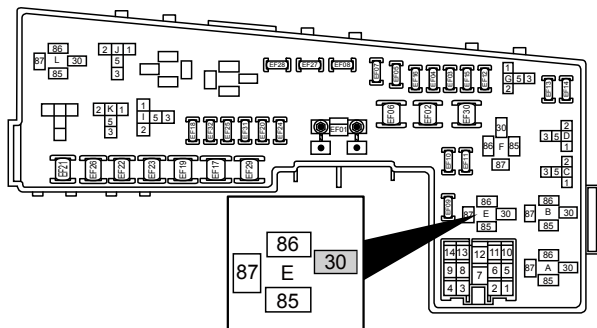
Yes

Replace the starter motor.

No

Step 15 Check the starter motor control harness connector terminal EN18 continuity.

Starter Harness Connector EN18



FE02-9403b

- Turn the ignition switch to "OFF" position.
- Measure resistance between starter relay terminal No.30 and starter harness connector EN18 terminal No.1 with a multimeter.

Standard Resistance: &lt;1 Ω

Is the resistance specified value?

No

The circuit between starter relay terminal No.  
30 and starter harness connector EN18 is  
open.

Yes

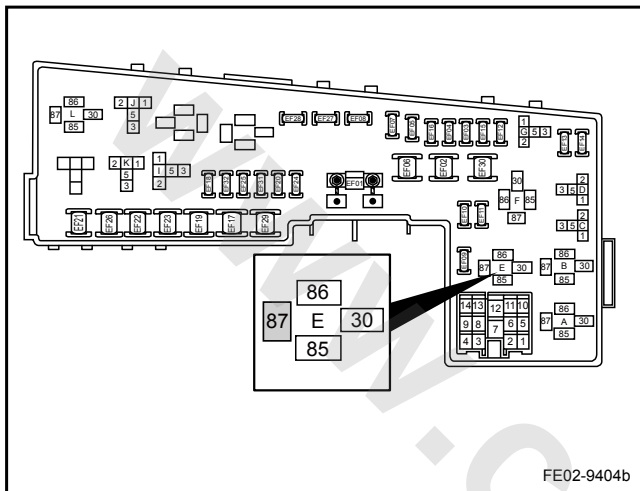
Step 16 Turn the ignition switch to the "ST" position, Does the starter relay pull-in?

No

Go to step 19

Yes

Step 17 Measure starter relay terminal No.87 power supply.



- (a) Remove the starter relay.
- (b) Measure the starter relay terminal No.87 voltage.  
Standard Voltage: 11-14 V  
Is the voltage specified value?

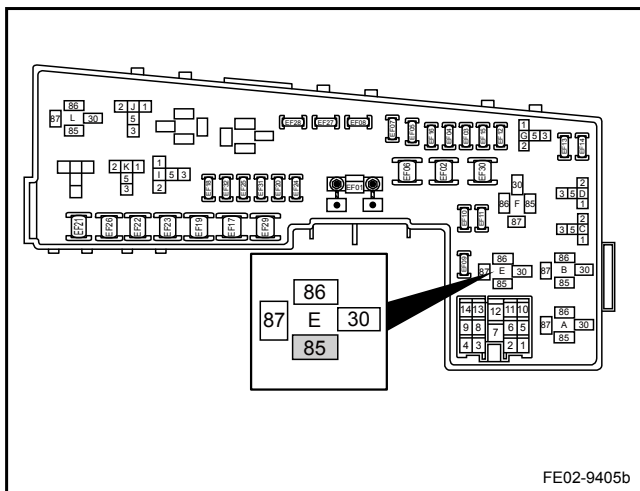
Yes

Replace the starter relay.

No

Step 18 Check whether the starter relay terminal No.87 power supply circuit is open.

Step 19 Check the starter relay terminal No.85.



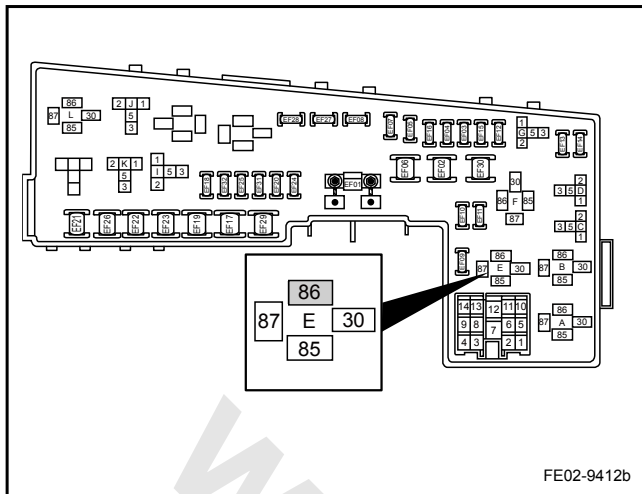
- (a) Turn the ignition switch to "OFF" position.
- (b) Remove the starter relay.
- (c) Turn the ignition switch to the "ST" position.
- (d) Measure starter relay terminal No.85 voltage.  
Standard Voltage: 11-14 V  
Is the voltage specified value?

No

Go to step 22

Yes

Step 20 Check starter relay ground resistance.



- Turn the ignition switch to "OFF" position.
- Remove the starter relay.
- Measure resistance between starter relay terminal No.86 and a reliable ground.

Standard Resistance: <1 Ω

Is the voltage specified value?

Yes

Replace the starter relay.

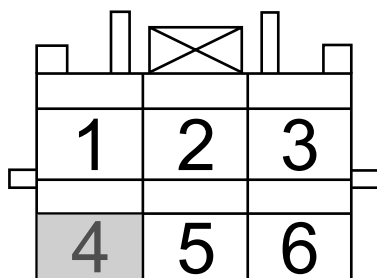
No

Step 21 Check the starter relay terminal No.86 and the BCM connector IP29 terminal No.11 wiring harnesses.

- Check whether the BCM anti-theft is activated.

Step 22 Check the ignition switch power output.

Ignition Switch Harness Connector IP23



- Connect the ignition switch wiring harness connector IP23 terminal No.4 with a multimeter (Note: During this test, do not Disconnect the wiring harness connector IP23.).
- Turn the ignition switch to the "ST" position.
- Measure voltage between IP23 terminal No.4 and a reliable ground.

Standard Voltage: 11-14 V

Is the voltage specified value?

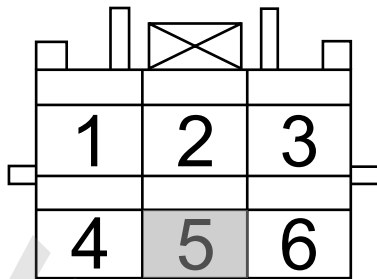
Yes

The circuit between ignition switch IP23 terminal No.4 and the starter relay terminal No.85.

No

Step 23 Check the ignition switch power input.

Ignition Switch Harness Connector IP23



FE02-9408b

- Turn the ignition switch to "OFF" position.
- Disconnect the ignition switch wiring harness connector IP23.
- Measure voltage between IP23 terminal No.5 and a reliable ground.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Replace the ignition switch.

No

Step 24 The circuit between ignition switch wiring harness connector IP23 terminal No.5 and power supply is open.

Next

Step 25 Diagnostic completed.

### 2.11.7.5 Start Motor Noise Diagnostic

Before the diagnostic, please refer to the [2.11.2.1 Battery Description and Operation](#), [2.11.2.2 Starting System Description and Operation](#) and [2.11.2.3 Charging System Description and Operation](#) and perform the necessary checks.

Step 1 Start the engine, while monitoring whether the generator motor starts turning.

When the engine started and the starter remained at the bonding position, whether there is loud "breathing" (If the starter remains in bonding position and further increase the engine speed, the sound may sound as an alarm)?

Yes

Check the flywheel ring gear for existence of the following: tooth cracking, tooth loss, tooth wear, flywheel bent or the tooth damage, if necessary, replace the flywheel.

No

Step 2 When the engine started, and the starter gradually stops, is there any "rumble", "roar" or in some cases "percussion sound"?

Yes

Go to step 4

No

Step 3 The engine crankshaft rotates and the starts as per normal, is there any high-frequency hum sound?

Yes

Replace the starter motor. Refer to [2.11.8.4 Starter Replacement](#)

No

Step 4 Remove the starter motor.

Check starter motor sleeve and clutch gear for clutch gear cracks, worn or sleeve worn?

Yes

Replace the starter motor. Refer to [2.11.8.4 Starter Replacement](#)

No

Step 5 Replace the flywheel.

Next

Step 6 Diagnostic completed.

### 2.11.7.6 Charging Indicator Always On

Step 1 Start the engine, is the battery charging indicator still on?

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 2 Measure the battery terminal voltage with a multimeter, is it between 11 V and 14.9 V?

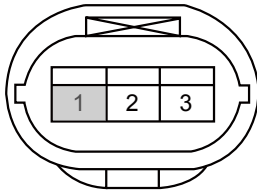
No

Go to step 5

Yes

Step 3 Check the charging indicator control circuit.

Generator Harness Connector EN07



Instrument Cluster Harness Connector IP03

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE02-9409b

- Turn the ignition switch to "OFF" position.
- Disconnect generator harness connector EN07.
- Remove the instrument cluster, Disconnect the instrument cluster wiring harness connector IP03.
- Check the continuity between instrument cluster wiring harness connector IP03 and generator harness connector EN07 terminal No.1.
- Measure resistance between generator harness connector EN07 terminal No.1 and a reliable ground.

Standard Resistance Value:

Test Items	Standard Value Value
Continuity Between IP03 (13) and EN07 (1)	<1 Ω
Resistance Between EN07 (1) and A Reliable Ground	<1 Ω

- Connect generator harness connector EN07.
- Connect instrument cluster harness connector IP03, and install the instrument cluster.

Is the resistance specified value?

No

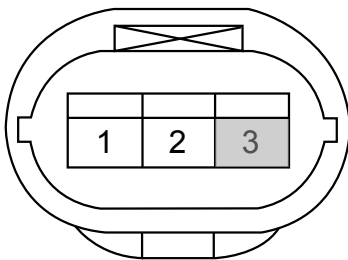
Repair the faulty part. Confirm the fault has been fixed.

Yes

Step 4 Replace the instrument cluster. Confirm the fault has been fixed.

Step 5 Check the generator regulator power supply circuit.

Generator Harness Connector EN07



FE02-9410b

- Turn the ignition switch to "OFF" position.
- Disconnect generator harness connector EN07.
- Measure voltage between generator harness connector EN07 terminal No.3 and a reliable ground.

Standard Voltage: 11-14 V

- Connect generator harness connector EN07.

Is the voltage specified value?

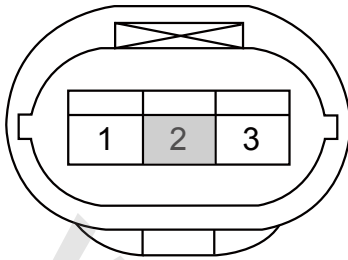
No

Generator regulator power circuit is open. Repair the faulty part. Confirm the fault has been fixed.

Yes

Step 6 Check the generator regulator excitation power supply.

Generator Harness Connector EN07



FE02-9411b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect generator harness connector EN07.
- (c) Measure voltage between generator harness connector EN07 terminal No.2 and a reliable ground.  
Standard Voltage: 11-14 V
- (d) Connect generator harness connector EN07.

Is the voltage specified value?

No

Go to step 8

Yes

Step 7 Replace the generator. Refer to [2.11.8.3 Generator Replacement](#).

Step 8 Are Instrument cluster, electric windows, air-conditioning system working properly?

No

Relay IG1 does not provide IG1 power. Check the IG1 relay.

Yes

Step 9 The circuit between EN07 terminal No.2 and instrument cluster fuse IF25 is open. Check and repair the faulty part.

Next

Step 10 Diagnostic completed.

### 2.11.7.7 Charging Indicator Always Off

Step 1 Connect the ignition switch, and keep the engine off, is battery charging indicator on?

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 2 Disconnect generator harness connector EN07, is battery charging indicator on?

No

Go to step 6

Yes

Step 3 Check the generator regulator power supply circuit.

Refer to [2.11.7.6 Charging Indicator Always On](#) Step 4.

Is the voltage specified value?


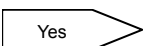
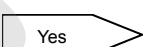

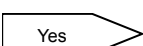


		No	The generator regulator power circuit is open. Repair the faulty part. Confirm the fault has been fixed.
		Yes	
Step 4	Check the generator regulator excitation power supply.		
Refer to <a href="#">2.11.7.6 Charging Indicator Always On</a> Step 5.			
Confirm the fault has been fixed.			
		No	Refer to <a href="#">2.11.7.6 Charging Indicator Always On</a> Step 6
		Yes	
Step 5	Replace the generator. Confirm the fault has been fixed.		
Step 6	Are other instrument lights and indicators working properly?		
		No	Go to step 8
		Yes	
Step 7	Replace the instrument cluster. Refer to <a href="#">12.8.3.1 Instrument Panel Replacement</a> .		
Step 8	Check the instrument power circuit and ground circuit. Refer to <a href="#">11.7.6.7 DTC U129C U129D</a> .		
		Next	
Step 9	Diagnostic completed.		

### 2.11.7.8 Generator Noise Diagnosis

Diagnostic Tips: Generator noise may be caused by electrical or mechanical noise. Electrical noise (electromagnetic hum sound) is usually added to the generator with the electrical load changes, which is the normal operating characteristics of all generators. During the service, pay attention to distinguish, otherwise it will cause unnecessary customer complaints. When diagnose the generator mechanical noise, firstly check whether there are loose generator components or interference. In some cases even if the sound in engine compartment is light, it can enter into the passenger compartment. If this is the case, replacing the generator does not solve the problem, which leads to misjudgments.

Step 1	Keep the generator not working, and confirm whether the noise disappears.
(a) Start the engine, verify that the noise can be heard. (b) Shut down the engine. (c) Disconnect the generator from the generator on the wiring harness connector EN07. (d) Start the engine. Confirm whether the noise disappears?	
Yes	
Go to step 6	

No	
Step 2	Check the generator shaft.
<p>(a) Shut down the engine.</p> <p>(b) Remove the drive belt.</p> <p>(c) Rotate the generator pulley by hand.</p> <p>Does the generator rotate smoothly without catching and grinding noise?</p>	
<p>Yes </p> <p>Go to step 6</p>	
No	
Step 3	Reinstall the generator.
<p>Remove and install the generator. Tighten the generator retaining bolts to the specified torque. Refer to <a href="#">2.11.8.3 Generator Replacement</a>. Start the engine, does the noise disappear?</p>	
<p>Yes </p> <p>System normal</p>	
No	
Step 4	Is the drive belt loose?
<p>Yes </p> <p>Go to step 7</p>	
No	
Step 5	Compare with a known good vehicle, is the noise the same?
<p>Yes </p> <p>System normal</p>	
No	
Step 6	Replace the generator.
<p><b>Important Note</b></p> <p>If a clear generator fault has not been found, make sure that all other possible noise sources have been excluded and then replace the generator.</p> <p>If the noise is part of the normal generator characteristics, after replacing generator the noise will not disappear.</p>	
<p>Yes </p> <p>Troubleshooting</p>	
Step 7	Replace the drive belt or the drive belt tensioner.
<p>Refer to <a href="#">2.6.8.3 Drive Belt Replacement</a> or <a href="#">2.6.8.4 Drive Belt Tensioner Replacement</a>.</p>	

Next

Step 8	Diagnostic completed.
--------	-----------------------

### 2.11.7.9 Battery Discharging Current Parasitic Load Test

If the battery continues to loss power, perform the following test to check whether there are parasitic battery current.

#### Note

Before carry out this procedure, please check whether there are installed after market equipments such as DVD, audio power amplifier, subwoofer speaker box back and other non-original accessories. If there are, please Disconnect these systems and then carry out this test procedure.

#### Warning!

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

Step 1	Disconnect the battery negative cable. Refer to <a href="#">2.11.8.1 Battery Disconnection</a> .
--------	--

Next

Step 2	With a digital multimeter, connect one end to the battery negative cable, the other to the negative battery post.
--------	---

Next

Step 3	Select digital multimeter's "current test" maximum range.
--------	---

Next

Step 4	Left open the front door to observe the meter display readings.
--------	---

#### Note

Do not carry out any other operations action at this time, otherwise it is likely to damage the multimeter.

Next

Step 5	If the multimeter has no display, check whether the meter is damaged. If there is displayed reading, close the left front door and press down the engine compartment button, press the remote control door lock button.
--------	---

Next

Step 6	Observe the body Anti-theft system lamp the indicating system is in alert mode.
--------	---

Next

Step 7	Wait for more than 10 min to observe the meter readings, (if the multimeter shows an abnormal reading, tune the multimeter to minimum range). The reading should be below 30 mA. If the reading is higher than 30 mA, there may be parasitic current.
--------	---

**Note**

When the system parasitic current can not be confirmed, compare the vehicle with a known good vehicle to helping with diagnostic.

**2.11.7.10 Jump Start Procedure****Warning!**

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

Step 1	Park the vehicle that will provide jump starting power properly to make sure the jumper cable can connect two vehicles batteries.
--------	---

Next

Step 2	Turn both vehicles' ignition switch to "OFF" position and turn off headlights and all the accessories power supplies.
--------	---

Next

Step 3	Press the hazard warning lamp switch, so that hazard warning lamps are on.
--------	--

Next

Step 4	Apply two vehicles parking brake.
--------	-----------------------------------

Next

Step 5	Make sure that the transmission gears are in neutral gear position.
--------	---

**Warning!**

The jumper cable must be intact without exposed wires, otherwise it will cause unnecessary personal injury or vehicle damage.

Next

Step 6	Connect one end of the red cable to the positive terminal of the battery with sufficient capacity providing the power, and confirm that there is no contact with other metal parts.
--------	---

Next

Step 7	Connect the other end of the red cable the positive terminal of the flat battery. Do not connect the red cable to the negative terminal of flat battery.
--------	--

**Warning!**

Do not connect the jumper cable directly to a flat battery negative terminal to prevent the spark and possible battery gas explosion.

Next

Step 8	Connect one end of the black cable to the negative terminal of the battery with sufficient capacity providing the power.
--------	--

Next

- |        |   |
|--------|---|
| Step 9 | Finally, connect the other end of the black cable to the flat battery engine ground, and at least 500mm away from the flat battery (19.7 in). |
|--------|---|

Next

- |         |  |
|---------|--|
| Step 10 | Start the vehicle, which has a battery with sufficient power, and run the engine speed at intermediate speed for more than 3min. |
|---------|--|

Next

- |         |  |
|---------|--|
| Step 11 | Start the vehicle with the flat battery. |
|---------|--|

Next

- |         |   |
|---------|---|
| Step 12 | Remove the by jumper cables in reverse order. |
|---------|---|

**Note**

During the removal procedure, if the other end of the cable has not been fully disconnected, avoid the cable clamp contact with any metal objects.

Next

- |         |                         |
|---------|-------------------------|
| Step 13 | Operation is completed. |
|---------|-------------------------|

## 2.11.8 Removal and Installation

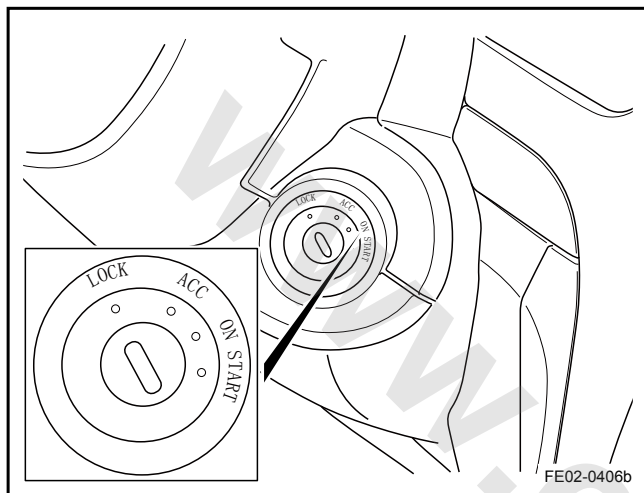
### 2.11.8.1 Battery Disconnection

Disconnecting Procedure:

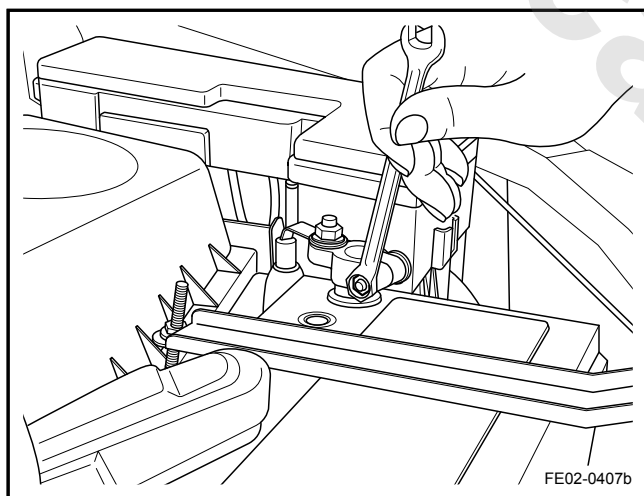
**Warning!**

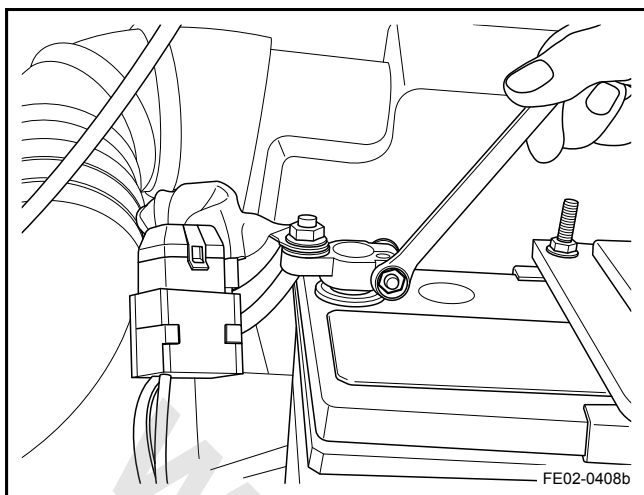
Refer to "Battery Disconnection Warning" in "Warnings and Notices".

1. Turn off all electrical equipments, and turn the ignition switch to "OFF" position.



2. Disconnect the battery negative cable.



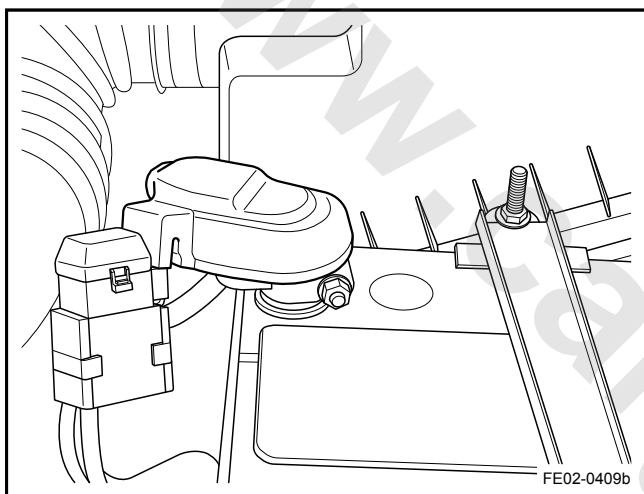


3. Disconnect battery positive cable.

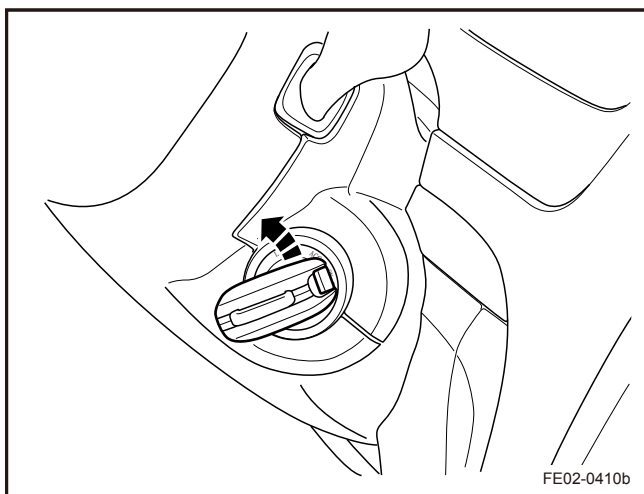
Connecting Procedure:

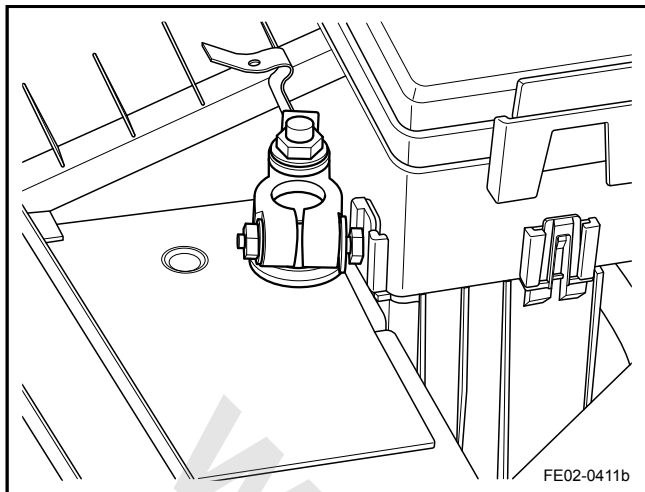
1. Connect battery positive cable, and tighten the retaining nut.

Torque: 10.3 Nm (Metric) 7.6 lb-ft (US English)



2. Make sure the ignition switch is turned to "OFF" position.





3. Connect the battery negative cable.

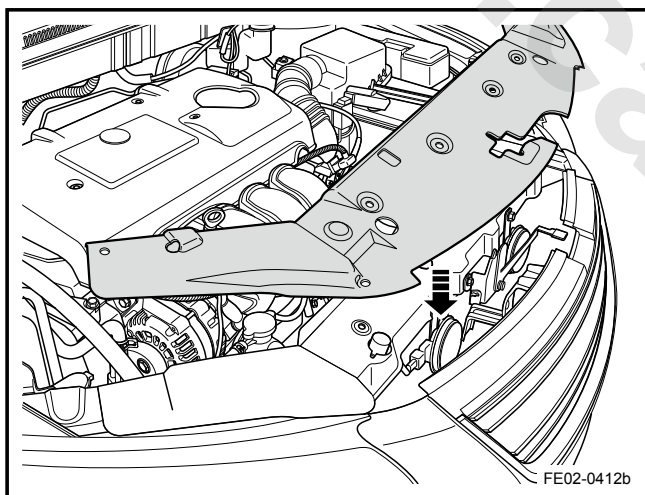
Torque: 10.3 Nm (Metric) 7.6 lb-ft (US English)

### 2.11.8.2 Battery Replacement

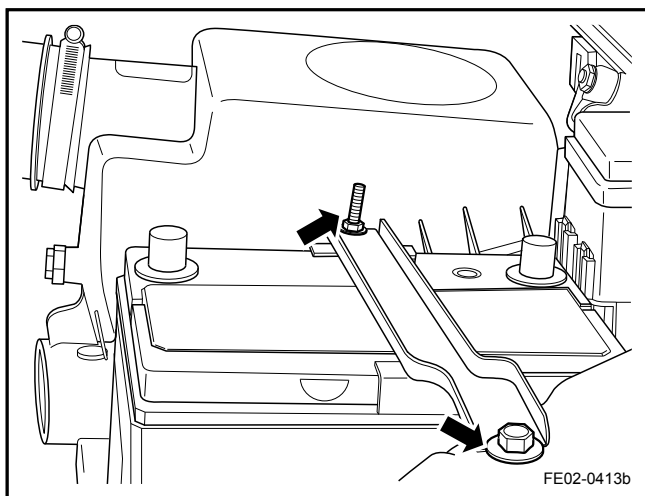
Removal Procedure:

**Warning!**

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

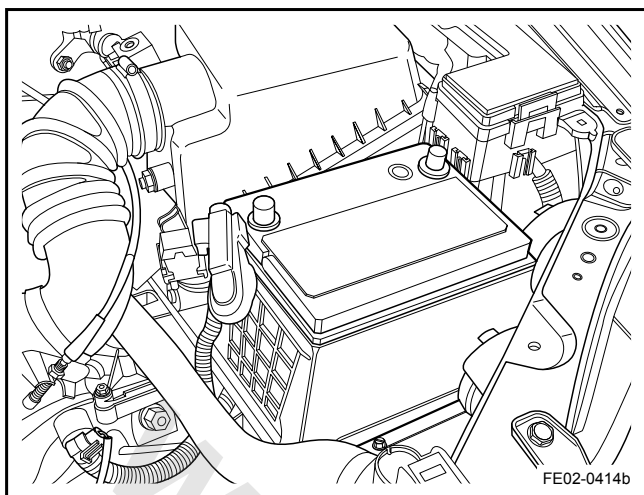


1. Disconnect battery positive and negative cables. Refer to [2.11.8.1 Battery Disconnection](#).
2. prior to Remove  
Remove the radiator upper grille retaining clips, and remove the radiator upper grille from the front bumper.

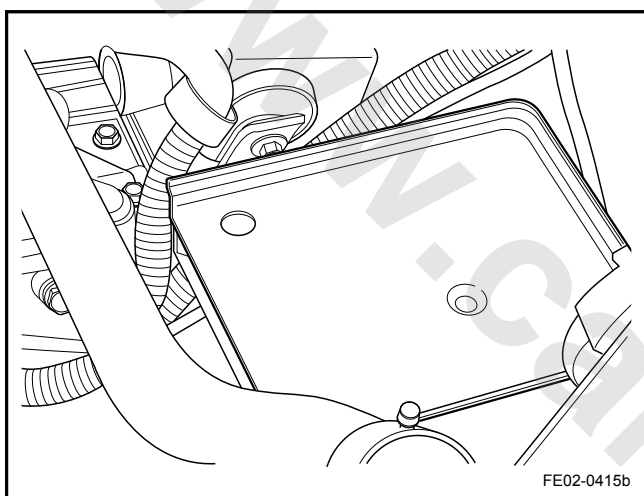


3. Remove the battery bracket retaining bolts and nuts.





4. Remove the battery.



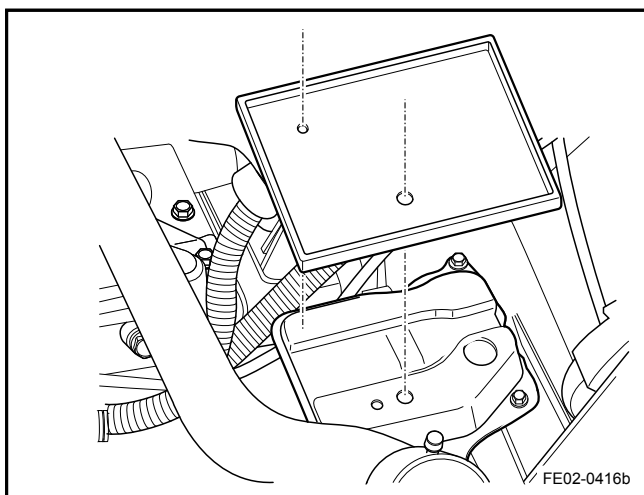
5. Remove the battery bracket.

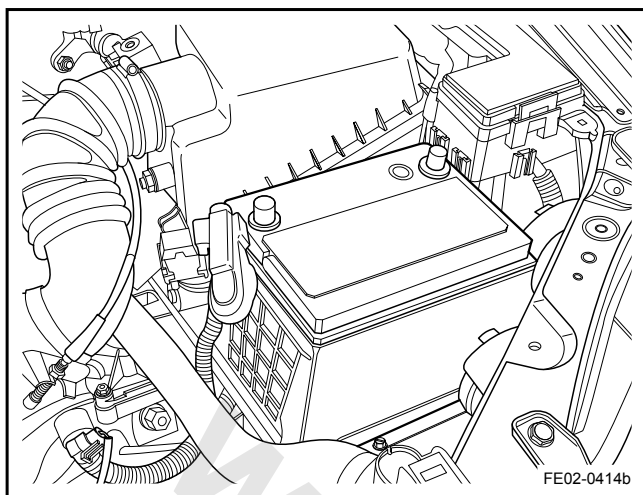
#### Installation Procedure:

1. Install the battery bracket.

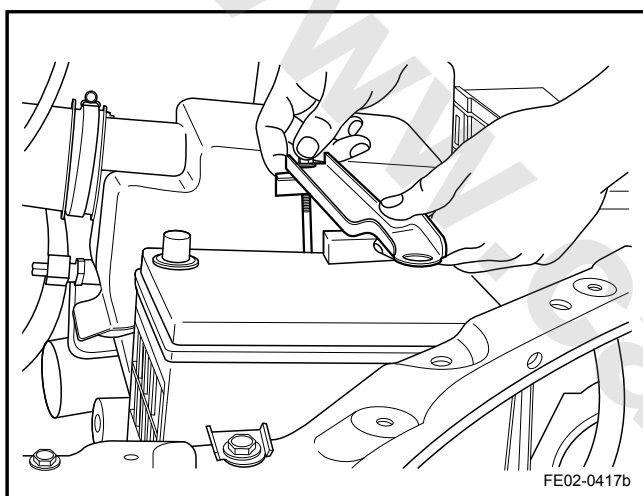
#### Note

The battery bracket is retained by two convex sets, pay attention during installation align the convex with the bracket holes.

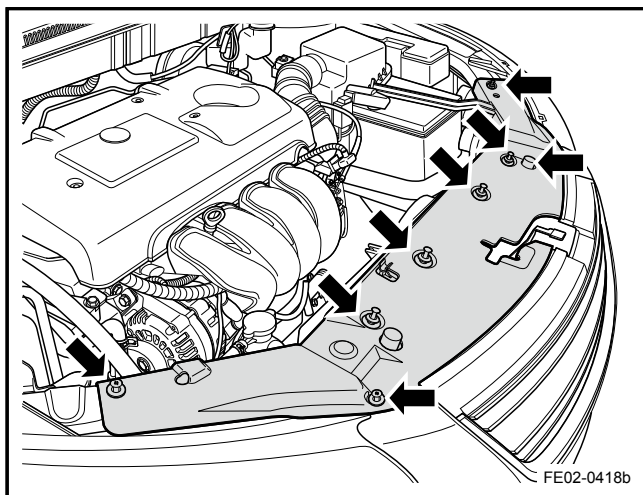




2. Install the battery.



3. Install the battery bracket and tighten the nuts and bolts.  
Torque: 13 Nm (Metric) 9.6 lb-ft (US English)



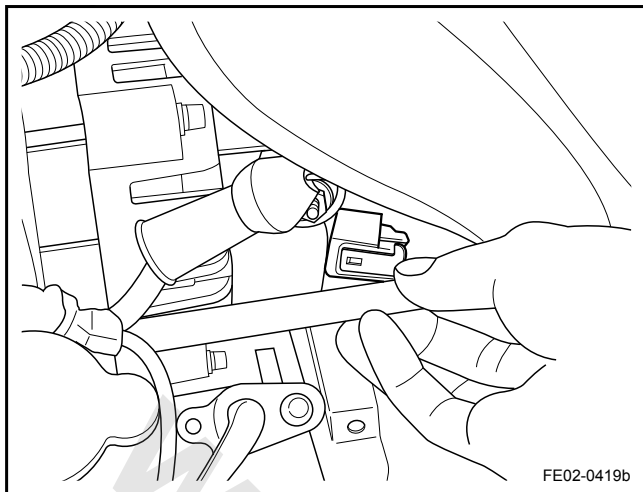
4. Install the radiator upper grille.
5. Connect the battery positive and negative cables.

### 2.11.8.3 Generator Replacement

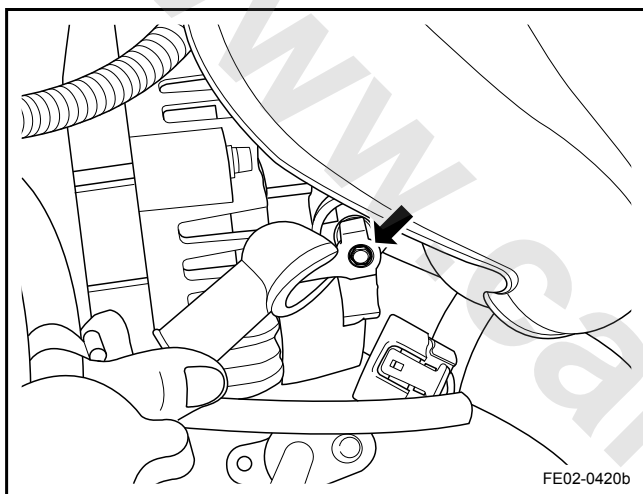
Removal Procedure:

**Warning!**

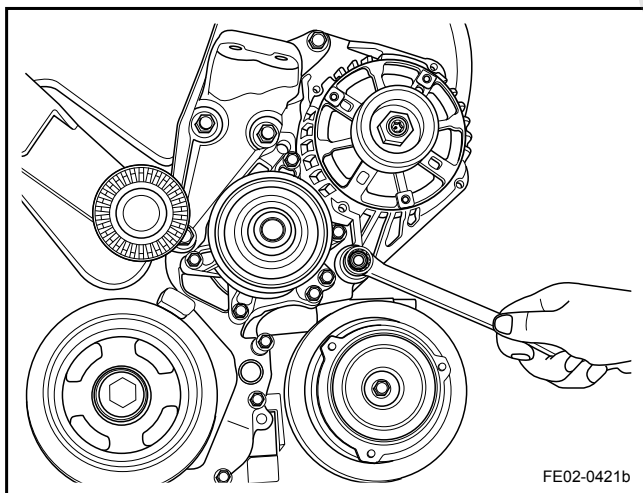
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



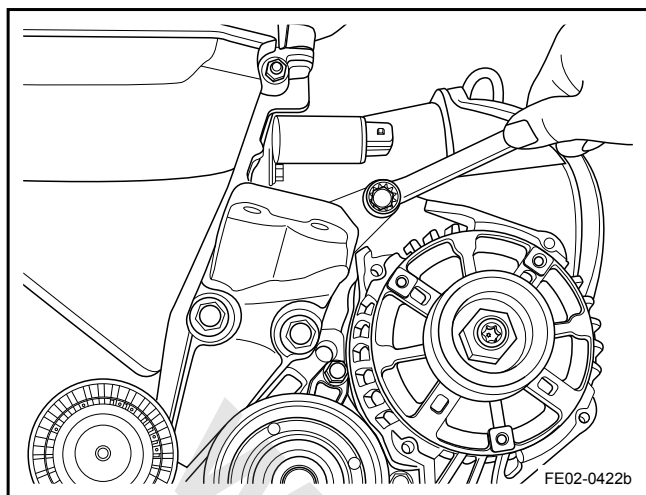
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect the generator harness connector.



3. Remove the generator charging wiring harness retaining nut.



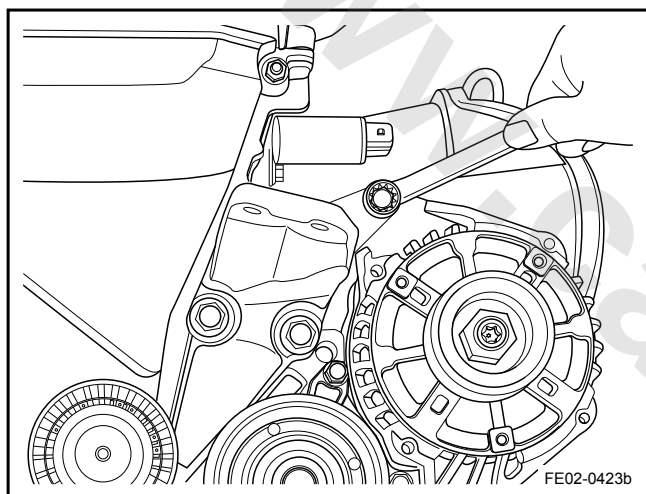
4. Remove the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#).
5. Remove the generator lower retaining bolt.



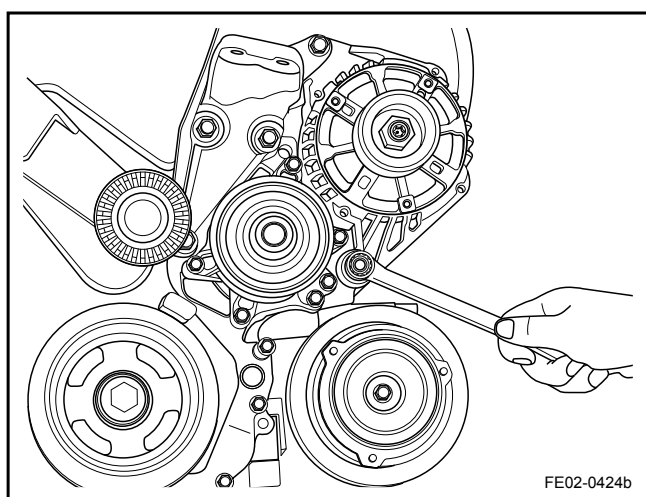
6. Remove the generator upper retaining bolt.
7. Remove the generator from the generator bracket.

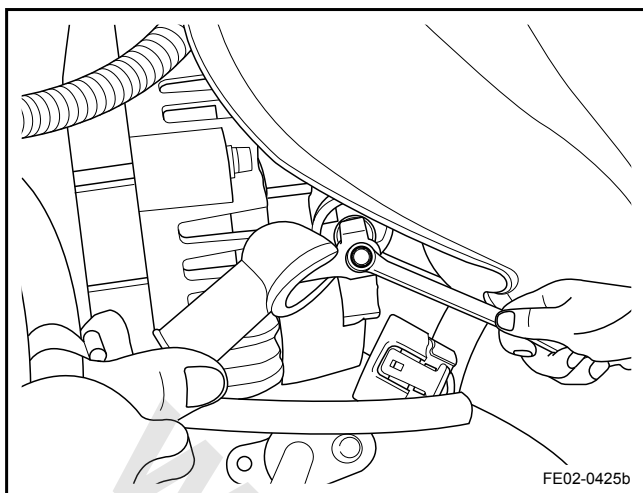
Installation Procedure:

1. Install and tighten the generator upper retaining bolt.  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)



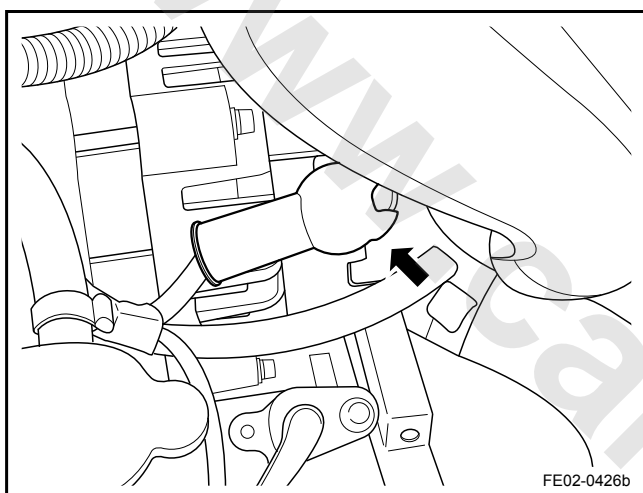
2. Install and tighten the generator lower retaining bolt.  
Torque: 54 Nm (Metric) 40 lb-ft (US English)





3. Install the drive belt.
4. Install the generator charging wiring harness and tighten the harness retaining nut.

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)



5. Connect the generator harness connector.
6. Connect the battery negative cable.

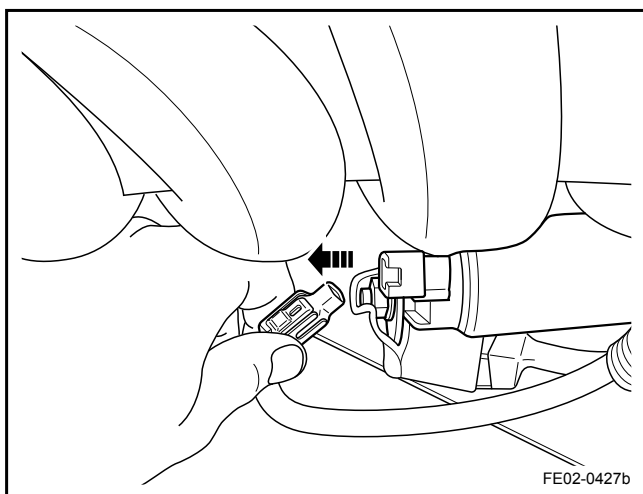
#### 2.11.8.4 Starter Replacement

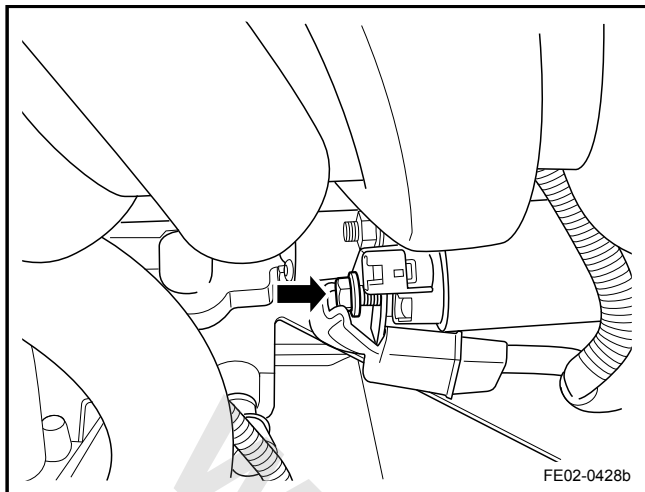
Removal Procedure:

**Warning!**

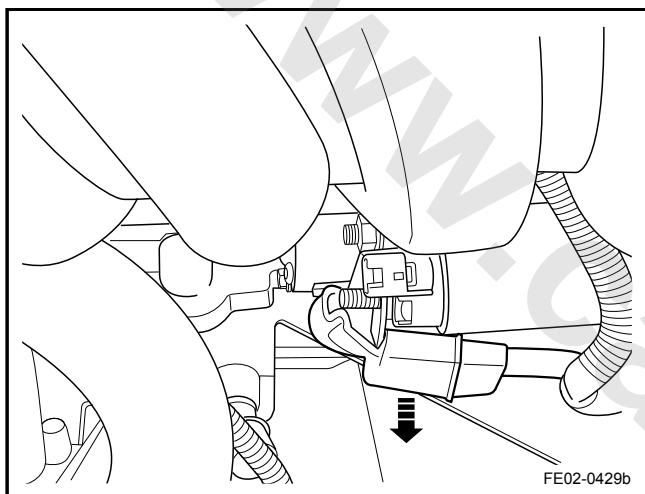
Refer to "Battery Disconnection Warning" in "Warnings and Notices"

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect starter control wiring harness connector.

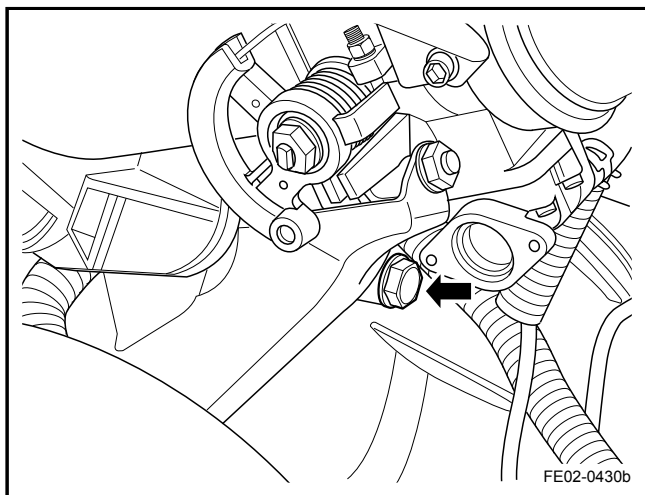




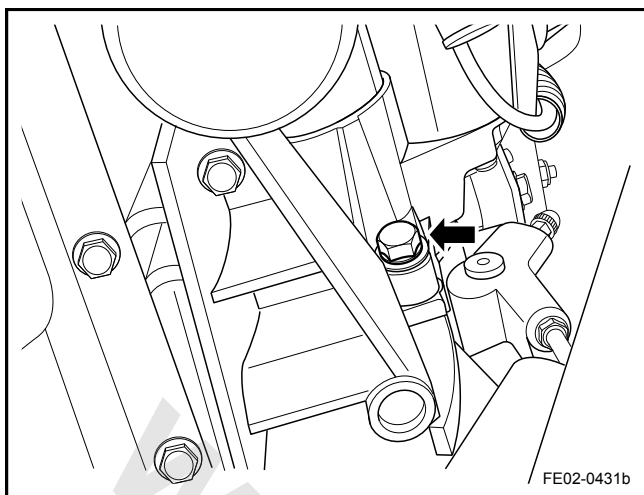
3. Remove the starter power supply wiring harness retaining nut.



4. Remove the starter power supply wiring harness.



5. Remove the starter upper retaining bolt.

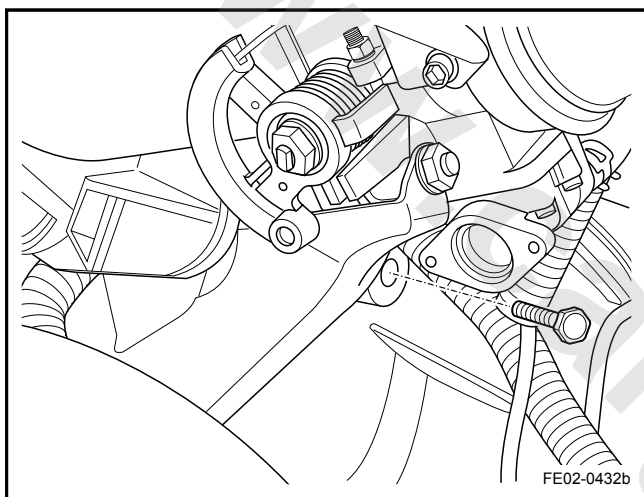


6. Remove the starter lower retaining bolt.

#### Installation Procedure:

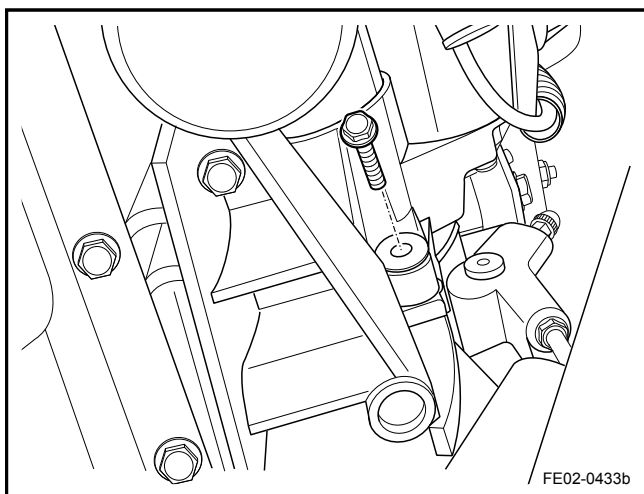
1. Install the starter upper retaining bolt.

Torque: 37 Nm (Metric) 27.4 lb-ft (US English)

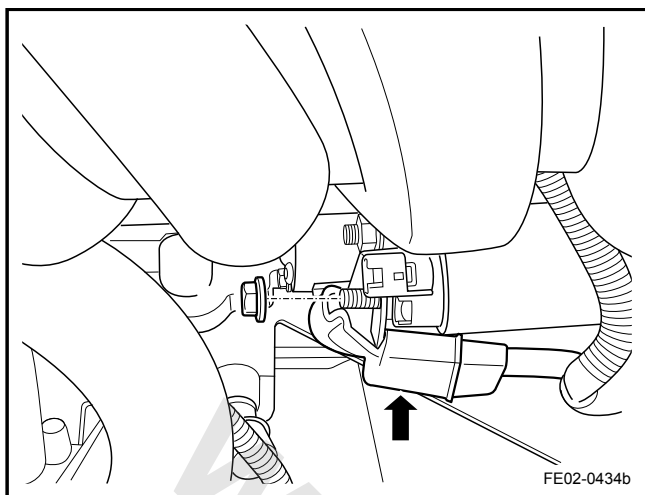


2. Install the starter lower retaining bolt.

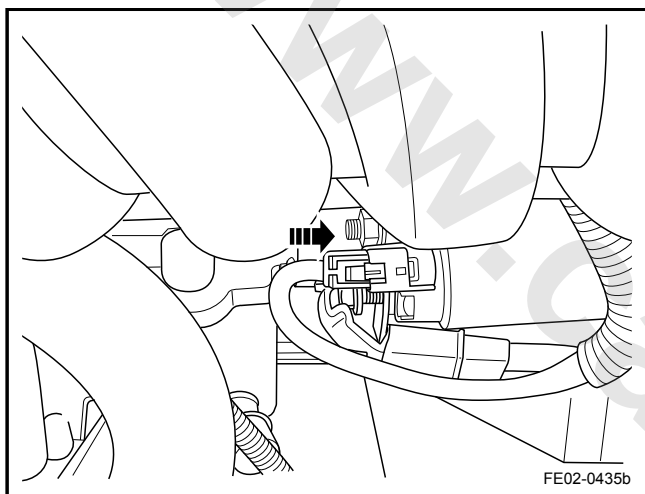
Torque: 37 Nm (Metric) 27.4 lb-ft (US English)







3. Install the starter power supply wiring harness and tighten the retaining nut.



4. Connect the starter motor control wiring harness connector.
5. Connect the battery negative cable.



## 2.12 Control System JL4G15-D

### 2.12.1 Specifications

#### 2.12.1.1 Fastener Tightening Specifications

Applications	Models	Specifications	
		Metric (Nm)	US English (lb-ft)
Camshaft Position Sensor Retaining Bolts	M6X14	8-10	6.0-7.4
Crankshaft Position Sensor Retaining Bolts	M6X12	8-10	6.0-7.4
Ignition Coil Retaining Bolts	M6X35	7-11	5.2-7.8
Engine Control Module Retaining Bolts	M6X16	8-10	6.0-7.4
Engine Coolant Temperature Sensor Retaining Bolts	M12 × 1.5 × 6	15	11
Evaporative Emission Canister	M6X20	7-9	5.2-6.7
Evaporative Emission Canister Solenoid Valve Bracket Bolts	M6X20	7-9	5.2-6.7
Fuel Filter Mounting Bracket Assembly Bolts	M6X16	8-10	6.0-7.4
Fuel Filter Mounting Bracket Bolts	M6X16	8-10	6.0-7.4
Fuel Rail Retaining Bolts	M6X20	10	7
Fuel Tank Retaining Bolts	M10X30	38-46	28.1-34.0
Idle Air Control Valve Retaining Bolts	M4X10	2-3	1.5-2.2
Knock Sensor Retaining Bolts	M8X30	15-22	10.7-16.0
Intake Manifold Absolute Pressure and Temperature Sensors Retaining Bolts	M6X12	8-10	6.0-7.4
Oxygen Sensor Bolts	M18X8	44	32.6
Air-Conditioning Compressor Mounting Bolts	M8X80	25	18.2
Spark Plug	M14 × 1.25 × 22	20-30	14.8-22.2
Throttle Body Retaining Nut	M8	20-25	14.8-18.5

#### 2.12.1.2 Intake Air Temperature Sensor Non-Load Resistance Temperature Characteristics Table

Temperatur (°C / °F)	Resistance (Ω)	Temperature (°C / °F)	Resistance (Ω)
-40/-40	100,865	60/140	671
-30/-22	52,594	70/158	470
-20/-4	28,582	80/176	334
-10/14	16,120	90/194	242

Temperatur (°C / °F)	Resistance (Ω)	Temperature (°C / °F)	Resistance (Ω)
0 / 32	9,399	100/212	178
10/50	5,658	110/230	133
20/68	3,511	120/248	101
30/86	2,240	130/266	76
40/104	1,465	140/284	60
50/122	980	150/302	48

### 2.12.1.3 Intake Air Pressure Sensor Output Voltage and Pressure Relationship

Pressure (kPa)	15	40	94	102
Output Voltage (V)	0.12-0.38	1.52-1.68	4.44-4.60	4.86-5.04

## 2.12.2 Description and Operation

### 2.12.2.1 Overview

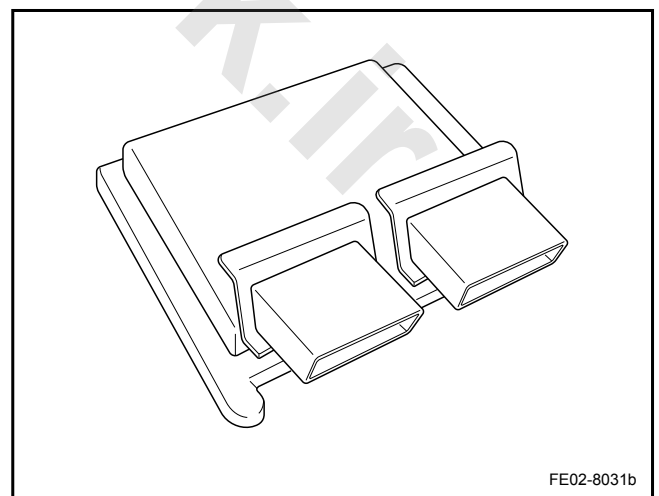
4G15D uses Delphi MT80 Engine Control System. Its main characteristic is that the engine control module (ECM) is the core system. The traditional mechanical throttle pedal and mechanical throttle body are replaced by more advanced electronic throttle acceleration pedal sensor assembly and the electronic throttle body assembly. Due to adopt this system, ECM control over the engine torque is more convenient. In addition, MT80 control system also incorporates multi-point sequential fuel injection, group direct ignition without electricity distributions, variable valve timing control and three-way catalytic converter processing, to meet the increasingly stringent emission regulations.

System main functions includes:

1. Engine torque output control mode: ECM calculated the gas flow through the intake air temperature sensor and intake manifold pressure sensor signals, so that the Air-Fuel ratio is closer to the current engine operating conditions demand.
2. Torque control mode: ECM calculates the output torque required and controls the engine output power, according to the acceleration pedal position sensor signal.
3. Main relay control.
4. Close-loop control multi-point sequential fuel injection: A close-loop fuel control can precisely control the engine Air-Fuel ratio, therefore efficiently controls emissions. Close-loop control can effectively eliminate the system and related mechanical components wear and tear due to manufacturing error and improves vehicle consistency.
5. Variable Valve Timing (VVT) control: Variable valve timing control system uses VVT actuator to change the intake camshaft and the crankshaft relative positions. Engine power management system calculates the best valve timing based on engine operating conditions, and controls VVT solenoid valve movement, allowing oil pressure, flow and direction to change, and ultimately promoting the camshaft movement to the desired position.
6. Fuel control without fuel return.
7. Fuel pump control.
8. ECM has built-in ignition drive module, without electricity distinction group direct ignition.
9. Knock Control: When the knock sensor detects a knock occurring, the system will calculate the ignition advance angle delay based on the current conditions, knock intensity and other necessary information, and defers the ignition advance angle, so as to avoid or reduce knock. Electronic Throttle Control: Since the system uses an electronic throttle idle speed control, highly precise idle control can be achieved. Such as the electrical load compensation, when there are electrical loads or the load is cut off, due to a sudden increase or decrease in engine load, resulting in engine speed fluctuation in a certain range, this increases the electrical load control adjustments. When the load increases or decreases, the air flow rate and (or) the ignition advance angle will be adjusted accordingly, so that the idle speed remains steady.
10. Canister solenoid valve control
11. Cooling fan relay control
12. System self-diagnostic function: After the system enters into working condition, ECM controls all system components working, and tests them in real time. Once the system or component malfunction occurs, the system will light up the engine malfunction lamp to remind the driver to repair or service the vehicle on time. In the mean time ECM will start fault protection mode.
13. System voltage over load protection: When the charging system malfunction causes the voltage too high, the system will enter protection mode to restrict the engine speed to prevent ECM damage.

### 2.12.2.2 Components Descriptions

#### 1. Engine Control Module (ECM)

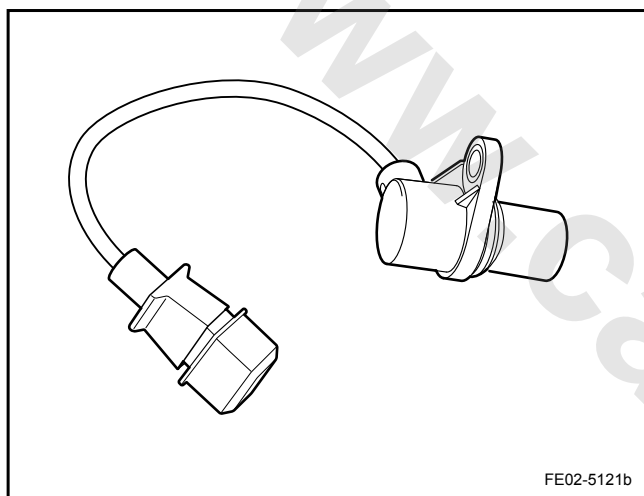


Engine control module is a core microprocessor with a micro chip controller. Its function is to process data from various vehicle sensors to determine the engine's working condition, and through the various actuators controls engine actuators. ECM normal working voltage is 9.0 V-16 V

#### Note

Although ECM has the voltage over load and reverse polarity voltage protection function, during the repair process it is prohibited to connect the battery positive and negative wrong or apply voltage higher than 15V. Otherwise, it will cause damage to ECM and other electrical equipments.

### 2. Crankshaft Position Sensor (CKP)

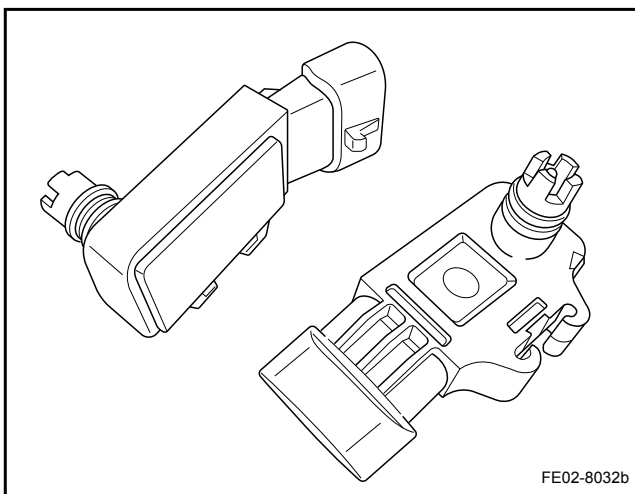


The crankshaft position sensor output can be used to determine crankshaft position and rotation speed. Crankshaft position sensor is a magnetic-electric sensor, which is installed in the front end of the transmission housing, and tightened with bolts, below the coolant temperature sensor. Flywheel signal plate and the crankshaft sensor is an integrated part. The sensor and the signal plate tooth gap in between 0.3 and 1.5 mm (0.01-0.06 in). The signal plate has 58 machined slots. When the crankshaft rotates, 58X tooth tip and the alveolar passes through the sensor from different distances. The sensor senses the reluctance change, the alternating reluctance generates an alternating output signal. The 58X gear plate gap position aligns with engine top dead center. When the cylinder No.1 reaches top dead center, The sensor aligns with the 20th tooth lower edge. ECM uses this signal to determine crankshaft position and rotation speed.

Sensor Resistance: 500  $\Omega$ -610  $\Omega$

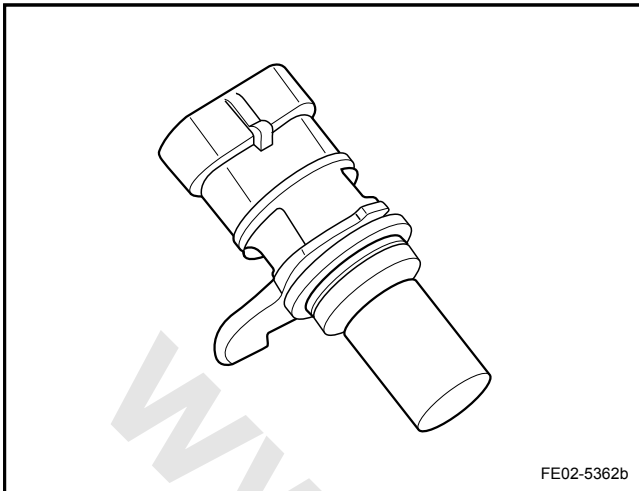
Output Voltage: 400 mV when 60 rpm. The voltage increases as the speed increases.

### 3. Intake Manifold Pressure / Temperature Sensor (MAP / IAT)



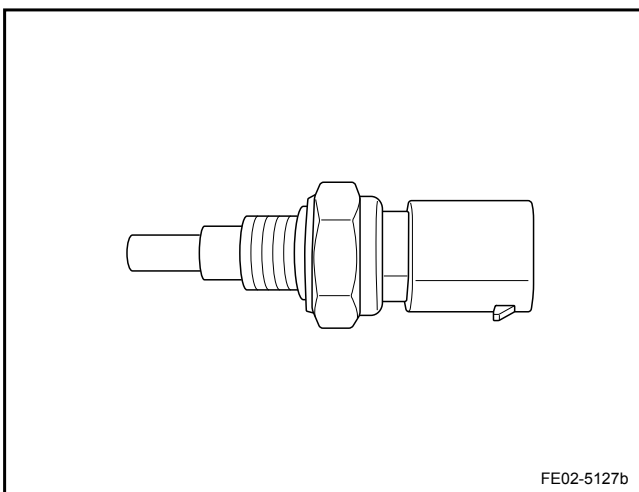
This sensor detects intake manifold pressure change caused by engine load and speed changes. These changes will be converted to the voltage output. When the engine decelerates, the throttle body closes resulting in a relatively low intake manifold absolute pressure output. Intake manifold absolute pressure and vacuum degree is opposite. When the manifold pressure is high, the vacuum is low. MAP sensor is also used to measure atmospheric pressure. This measurement is calculated as part of the MAP calculation. When the ignition switch is turned on and the engine is not running, the engine control module reads atmospheric pressure as the intake manifold pressure, and adjusts the Air-Fuel ratio accordingly. With this kind of altitude compensation, the system can maintain a low emissions while maintaining maneuverability. Sensor signal passes through ECM harness connector EN01 terminal No.19 to ECM. When MAP sensor and its circuit malfunction occurs, DTC P0105, P0106, P0107, P0108 will be recorded.

#### 4. Camshaft Position Sensor (CMP)



Camshaft position sensor is a Hall-effect sensor, which is installed in the vicinity of the intake camshaft, and works together with camshaft signal wheel. The signal wheel is corresponding to the specific engine location. ECM measures digital voltage signal through the sensor, therefore determining the working cylinder and to implement one to one control. Engine control module then calculates the actual sequence of fuel injection. If the engine is running when the camshaft position sensor signal is lost, the fuel injection system will be converted to fuel injection order based on the final fuel injection pulse, while the engine continues to run. If the engine starts after being shut down, the fuel injection will be converted from sequential injection to group injection. Even if the fault exists, the engine can be restarted.

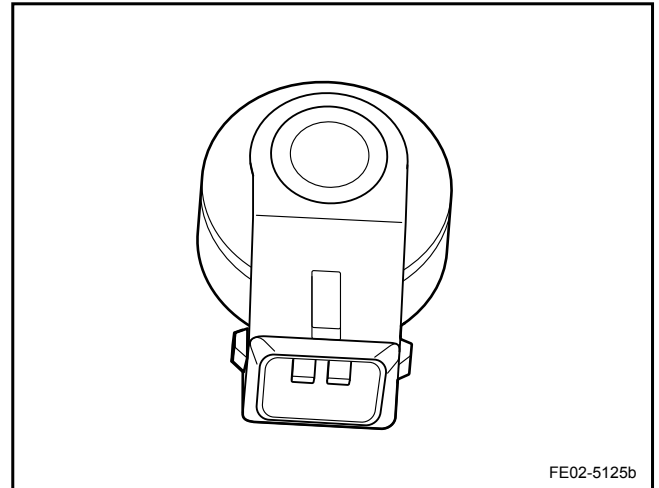
#### 5. Engine Coolant Temperature Sensor (ECT)



Engine coolant temperature (ECT) sensor is used to detect the engine operating temperature. ECM provides the best control scheme depending on the temperature. The sensor uses a

negative temperature coefficient thermistor as the sensing element, when the coolant temperature rises, the resistance decreases. At  $-30^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$ ) the resistance is  $26000\ \Omega$ ; at  $130^{\circ}\text{C}$  ( $266^{\circ}\text{F}$ ), the resistance is  $90\ \Omega$ . The sensors is installed in the main coolant path. The coolant temperature signal is important to the ignition timing and fuel injection adjustment, while the signal is also transmitted to the instrument panel (IP) through the CAN network, used to display the current engine working temperature.

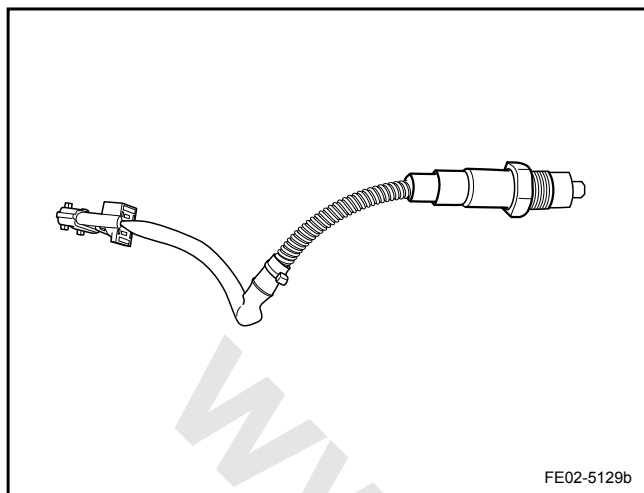
#### 6. Knock Sensor (KS)



Knock sensor is a frequency response sensor, installed in the engine block the most sensitive to knocking part, the lower intake manifold. ECM uses knock sensor to detect knock intensity, and then to adjust the ignition advance angle, to effectively control knocking and optimize the engine power, fuel economy and emission levels. If the engine knocking occurs, ECM will receive the signal, filter out the non-knock signals and determine engine cycle calculated by camshaft and crankshaft position sensor signals. ECM determines the cylinder in which the knock occurs and will delay the ignition advance angle for this cylinder until the knock disappears. Then ECM advances the ignition advance angle until the ignition angle is best suited for the operating conditions at that time.

Due to weak sensor signals, the sensor wire has a shielded cable. Its resistance is  $1\text{M}\ \Omega$ , in any case the output signal is greater than  $17\text{mV} / \text{g}$

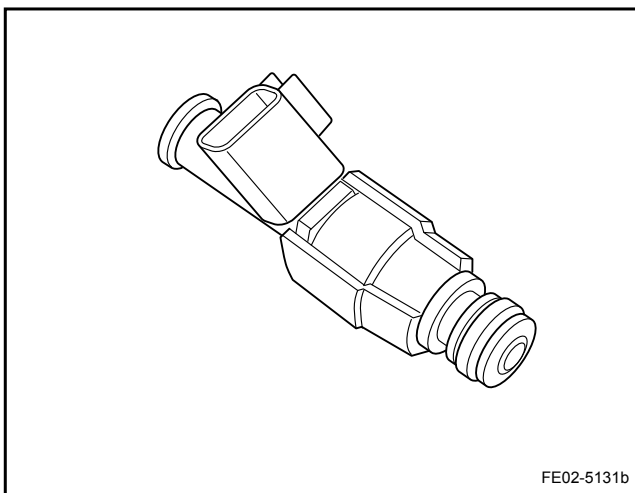
## 7. Oxygen Sensor (HO2S)



Oxygen sensor is an important sensor in a close-loop fuel control system, which adjusts and maintains the ideal Air-Fuel ratio, so that three-way catalytic converter achieves the best conversion efficiency. When the mixture Air-Fuel ratio becomes lean, the oxygen content in the exhaust increases, and oxygen sensor output voltage is reduced. On the contrary, the output voltage increase feedback to ECM indicates the air-fuel ratio.

Oxygen sensor sensing material is zirconia, hollow with an external sensing part. When Zirconia components are heated, they are activated, reference air enters the hollow parts of zirconium oxide from the wire. Exhaust passes through the outer electrode, oxygen ions move from the center of zirconia to the outer electrode, thus consisting a simple atomic battery with a voltage between two electrodes. According to the oxygen concentration in the exhaust, Zirconium oxide changes the output voltage, and thus determining the oxygen content in the exhaust. Usually the exhaust oxygen sensor design generates a voltage amplitude jump in the vicinity of the Air-Fuel ratio (14.6:1) to help ECM to determine the exact Air-Fuel ratio. Pre-Catalytic oxygen sensor is installed in the exhaust manifold, the three-way catalytic converter front end. Post-Catalytic oxygen sensor is installed in the three-way catalytic converter rear end. When the mixture is rich, the output voltage is 750 mV. When the mixture is lean, the output voltage is less than 200 mV. When the mixture becomes rich from lean, the responding time is less than 75 ms. When the mixture becomes lean from rich, the responding time is less than 150 ms.

## 8. Fuel Injectors



The injector structure is an electromagnetic switch valve device. The coil form poles leads to the engine wiring harness and ECM and is connected to power supply. When the coil is controlled by ECM to connect to the system ground, the resulting magnetic force overcomes the spring force, fuel pressure and manifold vacuum suction, and draws the valve core. The fuel sprays through the valve seat hole to the guide hole as a mist type spraying into the intake valve. When the power supply is cut off, the magnetic force disappears, with the spring force and fuel pressure, the injector closes.

The top of the fuel injector rubber seal and the fuel rail form a reliable fuel pressure seal; the lower part of the same rubber seal and the engine air intake manifold form an air seal. Fuel injector resistance is 11.6-12.4  $\Omega$ .

**Note**

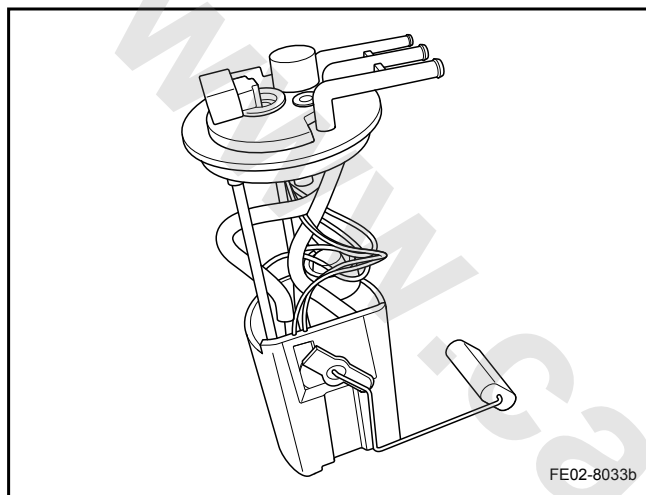
When the fuel injector is blocked or not closed tight, the engine malfunction lamp may be lit, but the detection of DTC code is: oxygen sensor distortion, erratic signal, such as Air-Fuel ratio is not normal fault. At this time component malfunction should be carefully judged. Because when the fuel injector is blocked or leaking, the amount of fuel injected is not controlled by the ECM pulse width control. The oxygen sensor feedback to ECM will be very different from the ECM control target. When ECM detects this signal, it will determine the oxygen sensor is not working properly. But the system can not determine whether the fault is the oxygen sensor itself or other associated parts. Therefore when diagnose such a malfunction, the malfunction component must be carefully identified.



### 9. Oil Pressure Regulator

With a non fuel return system, fuel pressure regulator is installed in the fuel pump assembly. Hydraulic regulator function is to regulate the fuel pressure in the fuel rail to eliminate the fuel supply rate change, fuel pump supply change and engine vacuum changes interfering the fuel injection. Using the internal springs, the fuel supply system pressure will be constant at 350 kPa. After regulation, the excessive fuel returns back to the fuel tank through the return pipe.

### 10. Fuel Pump Assembly

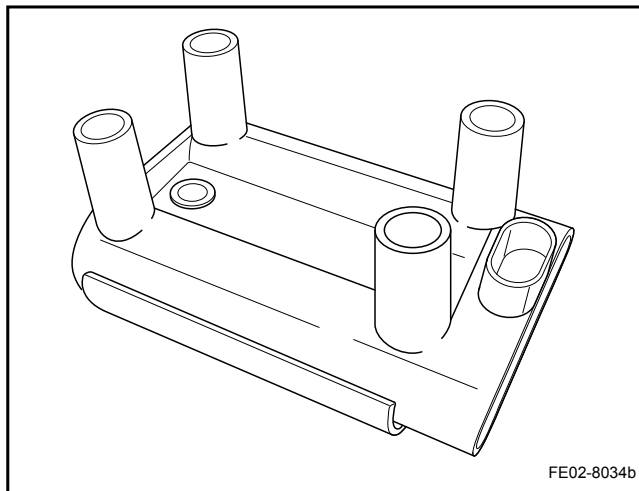


Fuel pump assembly consists of the fuel pump, brackets, fuel level sensor, fuel pressure regulator (non return-style design). Its function is to provide adequate fuel pressure at the same time to provide the driver fuel amount information on instrument panel. The fuel pump assembly is installed inside the fuel tank. The fuel pump is a turbine-type single-stage electric fuel pump, controlled by ECM through the fuel pump relay. It is different from the joint electronic control system. This control system controls fuel pump relay power supply. The fuel pump outlet has a one-way valve. When the engine is not running, the fuel inside the pipeline will not quickly return to the fuel tank to ensure the re-starting performance. Fuel level sensor is a variable resistance type. Fuel pump output fuel pressure is greater than 350 kPa.

#### Note

If the fuel pump outlet check valve leaks, the vehicle will be difficult to start in a short period of time. Because there is no fuel inside the pipe. It takes some time to establish a certain degree of fuel pressure. In summer heat, if the check valve leaks, fuel supply system does not have residual pressure. It will produce air resistance, resulting in difficulty in starting, or can not start.

### 11. Ignition Coil

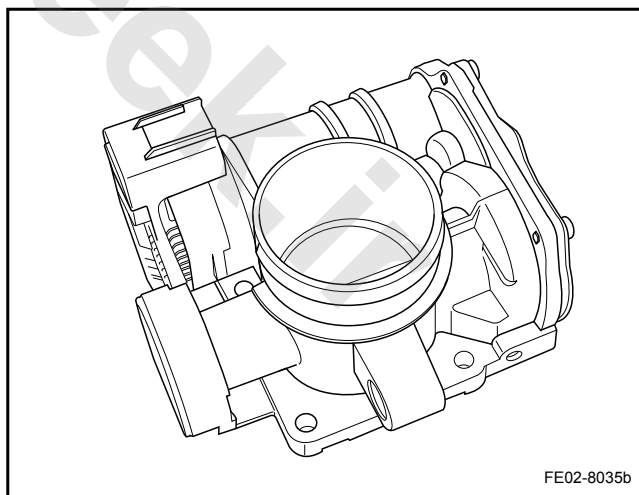


Ignition coil assembly includes two sets of coils. The coils provide ignition spark to two cylinders with 360-degree crankshaft angle difference. Ignition occurs when one piston is at compression TDC, the other is at exhaust TDC. The cylinder at exhaust TDC internal air pressure is low, and the temperature is high. Less energy will enable the ignition, known as redundant ignition. The cylinder at compression TDC mixture density and pressure is high, so more ignition energy is required for spark plug ignition. The mixture is quickly ignited for power, this is called an effective ignition.

Ignition Coil Primary Resistance: 0.45-0.55  $\Omega$

Ignition Coil Primary Resistance: 0.45-0.55  $\Omega$

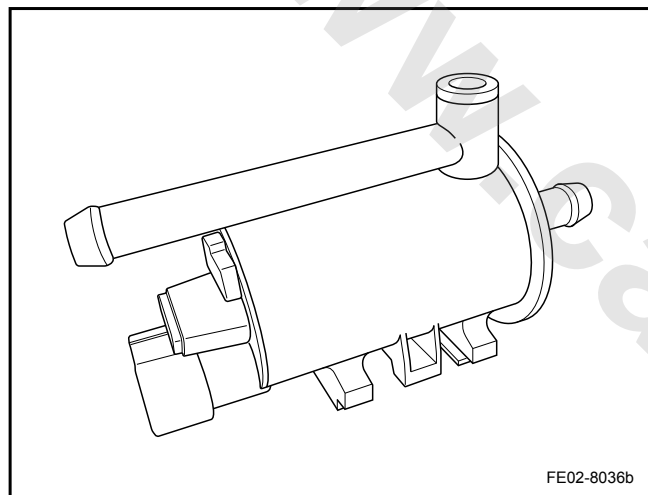
### 12. Electronic Throttle Body (ETC)



The throttle valve assembly opening is determined by ECM according to the driver-controlled throttle pedal control input signals, and other input signals. ECM calculates the vehicle currently needed power to control the fuel supply (spray) amount, and adjusts based on feedback signals to make sure that the engine works in the best controlled status. Electronic throttle body valve adds the drive motor, gear drive mechanism and other components, as well as a function and reliability enhanced throttle position sensor.

Without power supply, throttle body initial angle is 14.5 degrees. When the ignition switch is turned on, it has a 13 degree angle. At this point, the data stream readings of the throttle body opening is 6.62 %. (Note: the former represents percentage of opening, the latter perspective of value.)

### 13. Canister Solenoid Valve (EVAP)

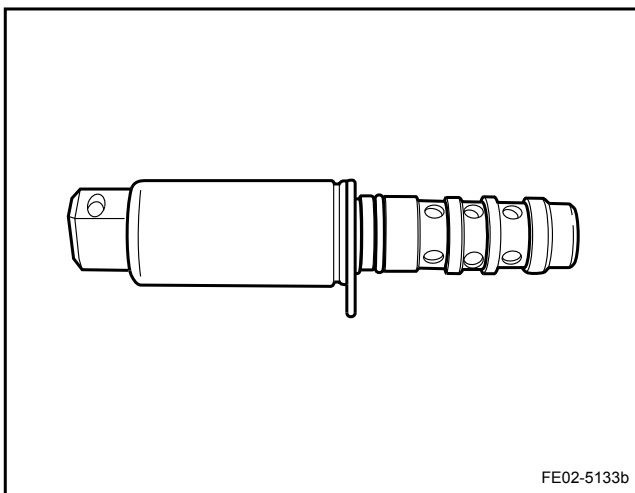


The Canister control valve is located at the engine cylinder head side (transmission side) and is used to control the Canister clean air flow. ECM controls intake manifold gasoline vapor volume through Canister solenoid valve. ECM sends square pulse wave. Air flow volume and control square wave pulse relationship is linear.

ECM changes canister working time and rate according to engine speed and load conditions.

Solenoid valve coil resistance: 19-22  $\Omega$ .

### 14. Variable Valve Timing Solenoid Valve (VVT)



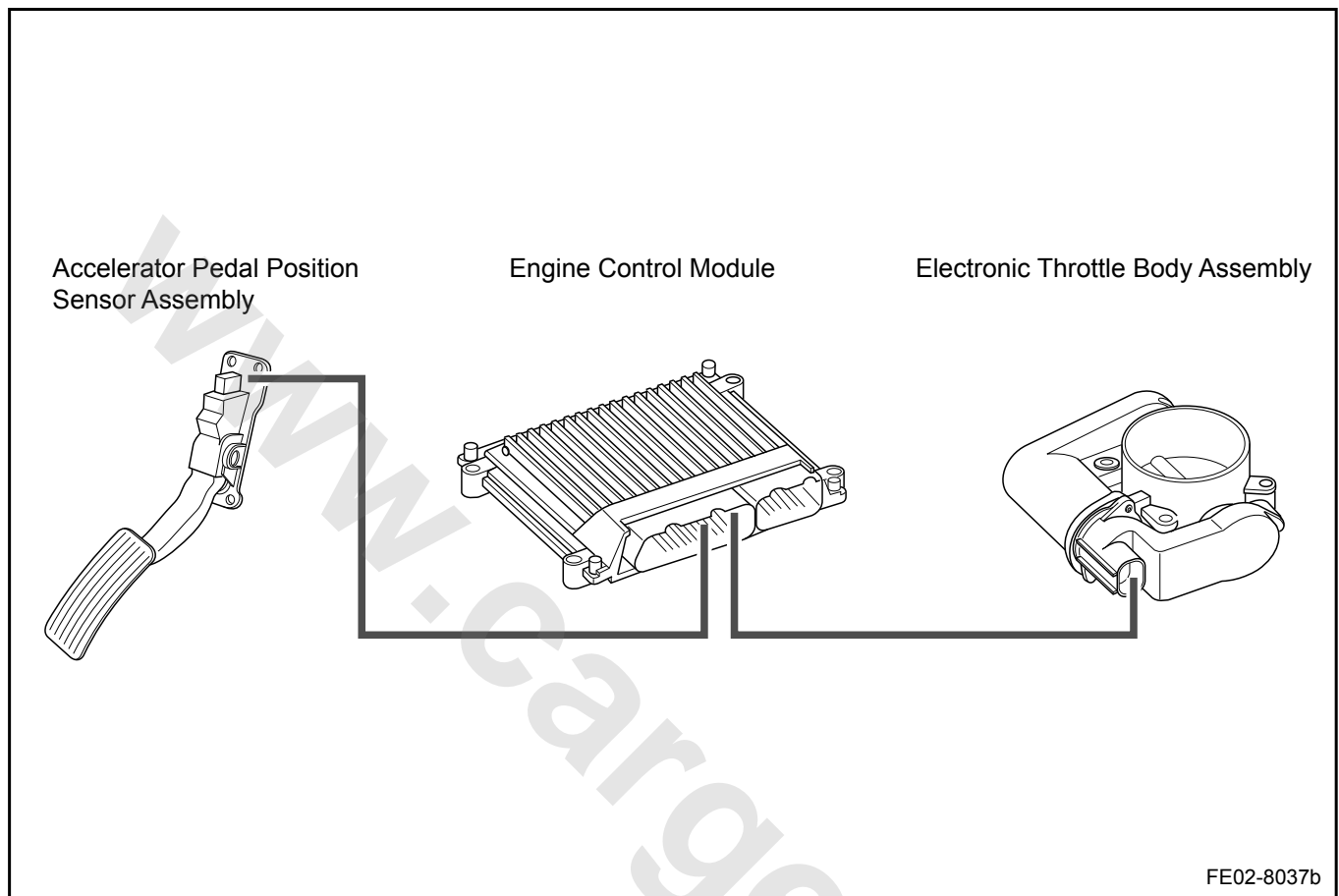
VVT solenoid valve is located at the engine intake manifold side near the front. VVT magnetic valve is a 4-bit 4-pass solenoid valve, the working power supplied from main relay controlled by ECM. ECM controls VVT solenoid valve ground with a pulse width modulation signal. The crankshaft to the camshaft timing relations can be continuously changed. The best valve timing control can be achieved at different engine running conditions. This will help to increase engine efficiency, improve idle stability, and provide more torque and power, while helping to improve fuel economy and lower emissions of hydrocarbons and nitrogen oxides.

Solenoid valve resistance: 7.2  $\Omega$ /20°C (68 °F)



### 2.12.3 System Working Principle

#### 2.12.3.1 Electronic Throttle Body (ETC) Working Principle



Electronically controlled throttle body assembly must be use dedicated engine electronic control module (ECM) with ETC system-driven feature hardware as the core control element. System control software usually uses the engine torque output control mode as computer algorithms. At the same time, due to the cancellation of the traditional mechanical throttle valve control of mechanical pull cables, ETC is equipped with a pedal position sensor (APP) with a resistive potentiometer device, in order to provide vehicle handling demand information and other information for the driver to control the vehicle to the engine electronic control module (ECM).

Electronic throttle body opening is determined by ECM according to the acceleration pedal control input signals. With other engines and vehicles sensor input signals, ECM analyzes the driver's intention and calculates the needed engine output power and accordingly adjusts the engine throttle opening and fuel supply (injection) amount. At the same time, the electronically controlled throttle position sensor can detect the actual throttle opening and send the feedback to ECM. ECM

then based on this feedback signal adjusts the vehicle control parameters. This control process ensures that the engine and vehicle work in the ideally controlled conditions.

Due to the rapid development of modern science and technology, High-Speed ECM can quickly analyze the driver's intention and calculate the basic throttle opening parameter values, based on the throttle pedal signal, the signal variation and signal change rate. At the same time, ECM adjusts and optimizes the throttle opening parameter, based on various sensors input signal status, so that the system further calculates the optimum throttle opening control parameters and implements the actual throttle control. ECM sends the output control signal to the ETC motor drive circuit to open the throttle according to the calculated opening parameter, based on the revised throttle opening and pre-determined control strategy. Because of the high speed calculation, the system enables the engine speed changes are smooth under transition engine operating conditions. The whole control process only requires a few milliseconds, achieving excellent vehicle performance.

The application of automotive electronic technology makes the electronic drive control valve assembly diagnosis difficult to use conventional visual inspection method. In the event of electronic controlled throttle body malfunction, the system needs to provide a "Jolt-limited" function to allows the driver to drive the vehicle to a repair station for repair.

"Jolt-limited" control has the following two kinds of control modes

#### 1. System is unable to control the engine power

ECM will limit the engine power output, and the system can not control the throttle opening and closing. The throttle opens to the system pre-determined position.

ECM will shut down the engine ignition output. At this time ECM internal fault occurs, the system can not control the engine torque output. The throttle body adjust the opening to (zero bit) off status. The system will be fully turn off the ignition control functions.

#### 2. System can not monitor the driver's intention

ECM will limit the engine power output. At this point, the system loses the ability to determine and monitor the driver's intention. In order to prevent damage to the engine, ECM will limit the engine power output and lower engine power increment and velocity increment. When braking, ECM will adjust the engine speed to idle speed and adjust the throttle opening to the system pre-determined position. ECM will force the engine working at idle running status. When the system loses the ability to determine and monitor the driver's intention, ECM will force the engine working at idle running status, and the idle speed will be the default speed.

### 2.12.3.2 ECM Controlled Fuel Supply System

#### 1. Fuel Pump Control

When the ignition switch is turned on, the fuel pump will run for 2 s. At this moment, if ECM does not detect the engine speed signal, fuel pump stops running. Once the engine rotates, ECM detects the engine speed signal and then controls the fuel pump running.

0.6 s after the engine speed signal is lost, or the anti-theft device requests to shut down the fuel pump, the fuel pump stops running.

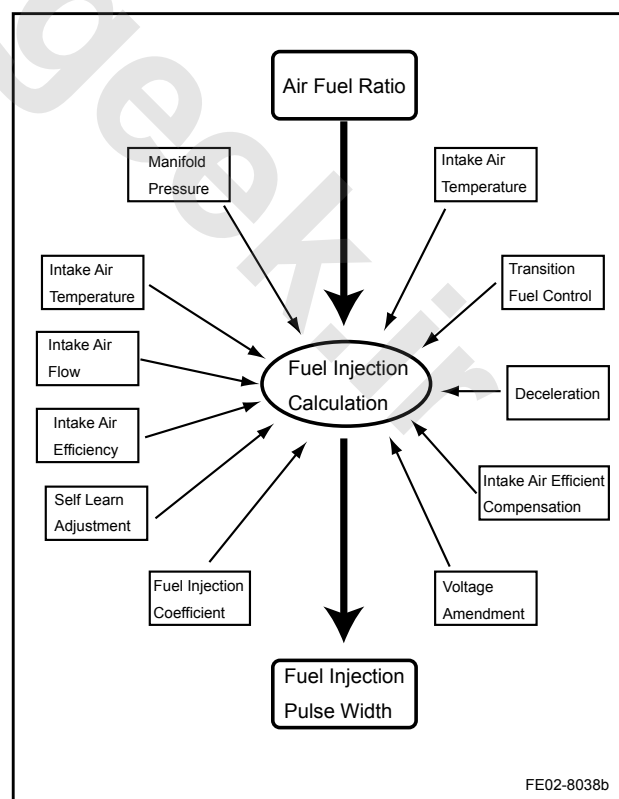
#### 2. Start-up Fuel Injection Control

The pre-injection only occurs once during a normal start-up process, and the following conditions have to be met:

- Engine starts to running (ECM detects a valid engine speed signal).
- Fuel pump relay pull-in
- Fuel pump running longer than the accumulator delay time
- The pre-injection has not yet happened

Once all the above conditions are met, the pre-injection will happen in all cylinders at the same time.

#### 3. Fuel Injection Pulse Width Control



## A. Air-Fuel Ratio

Start Air-Fuel ratio, normal start Air-Fuel ratio, clear the flooded cylinder Air-Fuel ratio, engine running Air-Fuel ratio, cooling state Air-Fuel ratio, warm-up state Air-Fuel ratio, theoretical Air-Fuel ratio, power-enriched Air-Fuel ratio, catalytic overheating protection Air-Fuel ratio, engine overheating protection Air-Fuel ratio.

## B. Intake Manifold Absolute Pressure

Intake manifold absolute pressure is detected by the MAP sensor installed on the intake manifold.

## C. Volumetric Efficiency

Volumetric efficiency is the actual air flow into the cylinder to the ideal air flow ratio.

## D. Phase Volumetric Efficiency

The valve timing changes affect the engine's volumetric efficiency. The basic efficiency table is set when the valve timing control system has not started to work, the camshaft and the crankshaft are at initial positions. When the valve timing control system starts to work, the system will compensate the volumetric efficiency to ensure an accurate calculation of air flow.

## E. Self Learn

self learn does not amend the changes as the engine running time increases, or the engine and vehicle manufacturing errors.

## F. Close-loop Feedback Correction

Close-loop feedback correction controls the actual Air-Fuel ratio close to the theoretical Air-Fuel ratio through the oxygen sensor feedback signals.

## G. Transition Condition Fuel Control

System uses more complex algorithms to establish the fuel evaporation model to calculate Air-Fuel mixing conditions, taking into account the engine coolant temperature, intake air temperature and engine working condition and the best fuel injection amount. It greatly improves fuel control under various transitional working conditions, including sudden acceleration/ deceleration and other working conditions.

## H. Protective Fuel Supply Control

When any one of the following conditions is met, the system will stop fuel injection:

- When the engine speed is higher than 6,400 rpm, resume fuel supply when the engine speed drops below 6,000 rpm.

- When the system detects a ignition system malfunction, it stops the fuel supply.
- When the system voltage is greater than 18 V, it will enter the electronic throttle body function restriction mode (forced idle mode).

## I. Basic Fuel Injection Constant

The basic fuel injection constant provides engine displacement and the fuel injector fuel flow rate relationship.

## J. Battery Voltage Amendment

When the battery voltage changes, voltage is amended to ensure the correct amount of fuel injection.

## 2.12.3.3 ECM Controlled Ignition System

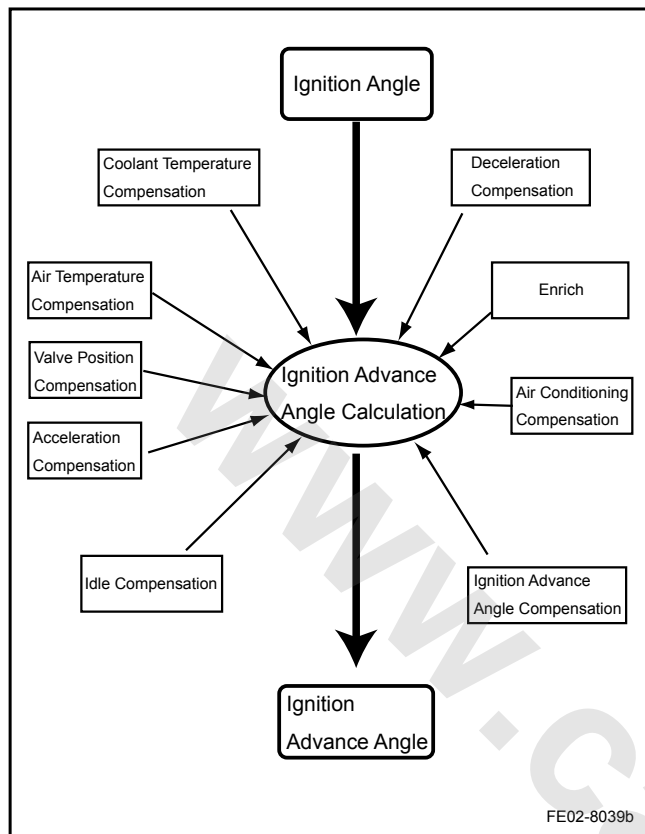
## 1. Closed Ignition Angle Control

The length the ignition angle closes determines the spark plug ignition energy. Ignition coil magnetizing too long will damage the coil or ECM internal ignition coil driver circuit, while too short will cause ignition failure (misfire).

## 2. Starting Mode

In the starting mode, the system uses a fixed ignition angle in order to ensure cylinder mixture is ignited, and provide positive torque. When the engine starts to run, the engine speed increases. The ignition angle will no longer be in starting mode.

## 3. Ignition Advance Angle Calculation and Control



## A. Main Ignition Advance Angle

When the engine temperature is normal, with the throttle opening, the main ignition angle is the minimum ignition angle with the optimal torque or the threshold of detonation. When the throttle is closed, the ignition angle should be less than optimal torque point for idle stability.

Without affecting driving with a cold engine, in order to reach the normal operating temperature as quickly as possible, in the catalytic converter heating process, the basic ignition angle can be angle other than the minimum ignition angle with the optimal torque or the threshold of detonation. This angle should also be delayed as much as possible without affecting the driving ability.

## B. Ignition Advance Angle Adjustment

temperature adjustment, intake air temperature adjustment, altitude compensation adjustment, idle speed adjustment, power-enriched adjustment, deceleration fuel supply adjustment, Air-Conditioning control adjustment, exhaust gas recirculation adjustment.

## C. Acceleration Adjustment

Ignition advance angle acceleration adjustment is used to mitigate the drive system torque shock caused by engine speed fluctuations, and also to eliminate possible detonation during acceleration, so that the acceleration is smooth.

## D. Valve Timing-controlled Ignition Angle Compensation

In order to obtain a better power and torque, system will enrich the Air-Fuel ratio to achieve the optimal torque and adjusts the ignition advance to achieve the optimal torque output.

## E. Valve Timing-controlled Ignition Angle Compensation

When the valve timing control system works, the engine's intake and exhaust overlap angle change will affect the internal exhaust gas recirculation rate and the cylinder temperature. According to different valve timing, system needs to adjust ignition advance angle to ensure that under current valve timing, the actual ignition advance angle is the best.

## F. Deceleration Fuel Supply Adjustment

When the system exits the deceleration fuel supply control mode, the ignition angle will be adjusted to make the throttle closing transition smooth.

## G. Air-Conditioning Control Adjustment

When the engine is idling, the Air-Conditioning is turned off. The ignition angle will be adjusted to make the engine run smoothly.

## 2.12.3.4 Electronic Throttle Body Function Restrictions

## 1. Forced Shut Down

When ECM reports a malfunction, intake or throttle air flow control has a malfunction. The control strategy is to stop the fuel supply, stop the ignition and close the throttle and shut down the engine.

## 2. Forced Idle Power Management Mode

When the engine is idling, ETC system can not reliably use the throttle to control engine power. At this point ETC cancels the throttle control. The throttle opening is at the default position. The engine power control is achieved by stopping one cylinder fuel injection and delaying the ignition angle.

### 3. Forced Idle Mode

When the driver's intention can not be reliably detected, such as when the pedal signal is lost. The vehicle only maintains cooling, heating, electricity supply and lighting functions with engine idling. When pressing the acceleration pedal there is no engine response, so in this mode the vehicle can not be driven.

### 4. Restricted Power Management Mode

ETC system can not use the throttle to control engine power. In this mode, the system determines whether the engine is at idle speed or is accelerating based on the acceleration pedal signal. The system controls engine power output by shutting down the engine, or by stopping a cylinder fuel injection, or by delaying the ignition. The engine output fluctuation is obvious. Working a long time in this mode would be harmful to the engine emission system. The model ensures that the vehicle can be driven, but difficult to control in normal driving or in traffic or on a steep slope.

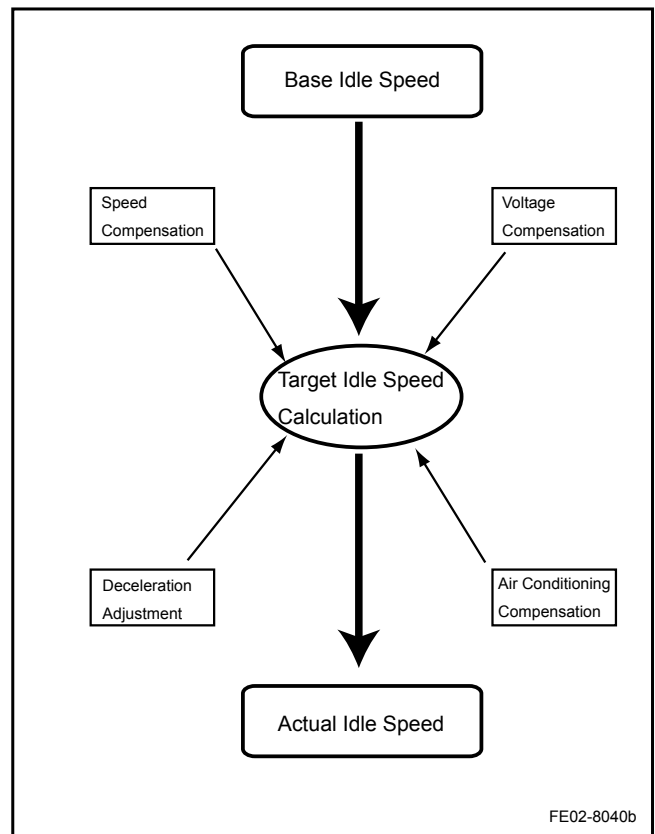
### 5. When the reliability of determining the drive intention is decreased or when the system can not achieve high power output

When the two acceleration pedal position sensors input signals difference is too great, the engine's output torque is limited. The engine's response to with the pedal position change is much slower. The driver may feel that the engine power output will be significantly weakened , but the vehicle will still be able to drive in normal traffic.

#### 2.12.3.5 Idle Speed Control

idle air flow control is that the engine control system maintains the throttle body fully closed at target idle speed. The system maintains a smooth transition with the throttle body fully closed to prevent the stall. When the engine load changes at idle speed, system maintains a steady engine speed.

### 1. Target Idle Speed Calculating



### 2. The Basic Target Idle Speed

At different coolant temperatures, the basic target idle settings are as following:

Coolant Temperature (°C/ °F)	Target Idle Speed (rpm)
< 20/-4	1,175
-10/14	1,200
0/32	1,200
10/50	1,150
20/68	1,150
30/86	1,150
40/104	1,000
50/122	900
60/140	850
70/158	800
80/176	750
90/194	750

Coolant Temperature (°C/ °F)	Target Idle Speed (rpm)
100/212	750
110/230	750
>?20/248	800

### 3. Vehicle Speed Compensation and Deceleration Speed Adjustment

To improve the deceleration and stop driving performance, when the vehicle is driving, the target idle speed increases by 100 rpm higher than stopping idle speed. During the deceleration and stopping, the speed gradually decreases to the parking target idle speed.

### 4. Air-Conditioning Compensation

When the air-conditioning is turned on with the vehicle parking, in order to compensate for the compressor power consumption, when the coolant temperature is below 0°C / 32F, the target idle speed increases by 50 rpm; when the coolant temperature is above 0°C / 32F, the target idle speed increases by 200 rpm.

### 5. Voltage Compensation

When the system voltage is lower than 11.5 V, and not restored in 10 s, the system will increase the target idle speed by 250 rpm, in order to increase the amount of electricity generated.

When the external power load impacts the system, the transient voltage will fluctuate. The system will automatically compensate for the air flow rate in order to curb the engine speed fluctuations.

## 2.12.3.6 Knock Control

Knock control is used to eliminate engine detonations that may occur during the combustion to optimize engine power and fuel economy. System can control different cylinder knocking independently.

#### 1. Knock Control Enable Conditions

- The engine running time is longer than 2 s.
- The engine coolant temperature is higher than 70°C / 158 °F
- The engine speed is greater than 800 rpm .

#### 2. Knock Control Mode

When a knocking occurs or is likely to occur, the system will quickly delay the ignition advance angle. System-based spark

advance angle is either normal ignition advance angle or safety ignition advance angle. Knock controlled speed is between thees two.

#### — Steady-State Control

When the engine is running as per normal, ECM collects and analyzes engine combustion signals filters knocking signal through the knock sensor. Once the knock intensity is higher than the acceptable limit, the system will rapidly delay the ignition advance angle cylinder in which the detonation happened, to eliminate detonation in the following combustion. The ignition advance angle will be back to normal angle gradually.

#### — Transient Control

During a sudden acceleration or a engine sudden speed change, detonation is likely to happen. The system predicts the likelihood of detonation, and automatically delays the ignition advance angle in order to avoid a strong detonation.

#### — Rapidly Delayed Ignition Advance Angle

Once the system detects a detonation, according to different engine speeds, the system rapid delays ignition advance angle 3-5 degrees, and resumes to normal controls in 2-3 s afterward.

#### — Adaptive Ignition Advance Angle

Due to wear and tear after long-term use, there are differences between the engines. When the system and the engine are in initial use or ECM is supplied with power, the engine detonation may occur. The system will record the detonation, after a period of running, the system will automatically generate an adaptive adjustment value of the ignition (self learn value). When the engine is running in the same conditions, the system will automatically advance the ignition angle, to the detonation occurring.

System adaptive learn process is constantly updated with the engine running.

## 2.12.3.7 Air-Conditioning Switch Off Control

In some cases, in order to ensure the engine power or protect the engine or protect the Air-Conditioning system, ECM must stop the Air-Conditioning compressor working or prohibit the Air-Conditioning system to start. At the same time to prevent the compressor clutch and frequently on-off, once the system enters into the Air-Conditioning switch off mode, ECM delays for a specified period of time to control Air-Conditioning clutch pull-in.



- Full-throttle Air-Conditioning Off Mode: Ensure the vehicle dynamic.  
Engine speed is less than 3,600 rpm  
No TPS fault  
TPS is greater than 105%, and since the last time full-throttle air-condition-off the TPS is less than this value
- Engine Speed Too High Air-Conditioning Off Mode: Protect the Air-Conditioning system.  
A/C off, the engine speed is less than 4,900 rpm, the compressor is allowed to start.  
A/C on, the engine speed is greater than 5,100 rpm, the compressor is off.
- Engine Coolant Temperature Too High Air-Conditioning Off Mode: Protect the engine.  
A/C off, when the coolant temperature is less than 106°C (223°F), the compressor is allowed to start.  
A/C on, when the coolant temperature is higher than 108°C (226°F), the compressor is off.
- Air-Conditioning Evaporator Temperature Too Low Air-Conditioning Off Mode: Protect the Air-Conditioning system.  
Air-Conditioning evaporator temperature sensor malfunction  
Air-Conditioning evaporator temperature is less than 3°C (37°F)

### 2.12.3.8 Canister Solenoid Valve Control

Canister solenoid valve controls the amount and time the fuel vapor enters in cylinders by controlling the passage between the Canister and intake manifold opening and closing timing, therefore maximizing the vehicle emissions, while minimizing the impact on engine performance.

#### 1. Canister solenoid valve working conditions

In order to reduce the amount of fuel vapor entering into the cylinder affecting the combustion, following conditions must be met before the Canister solenoid valve is open:

- System voltage is less than 18 V and more than 8 V
- Engine coolant temperature is higher than 0°C (32 °F)
- Engine intake air temperature is higher than 0°C (32 °F)
- No Related System Malfunctions
  - Fuel System Malfunction
  - Fuel Pump Malfunction

- Idle Speed Too High / Too Low
- Intake Air Pressure Sensor Malfunction
- Engine Misfire
- Pre-Catalytic Oxygen Sensor Heating Malfunction
- Pre-Catalytic Oxygen Sensor Signal Malfunction
- System Voltage Too Low / Too High
- Crankshaft Position Sensor Malfunction
- Ignition Coil Malfunction
- Fuel Injector Malfunction
- Canister Solenoid Valve Output Malfunction

#### 2. Operating Mode

Canister solenoid valve opening is determined by ECM according to the duty cycle (PWM) signal. In the non-idling state, the maximum Canister solenoid valve opening is determined by the close-loop air flow with a maximum 100%.

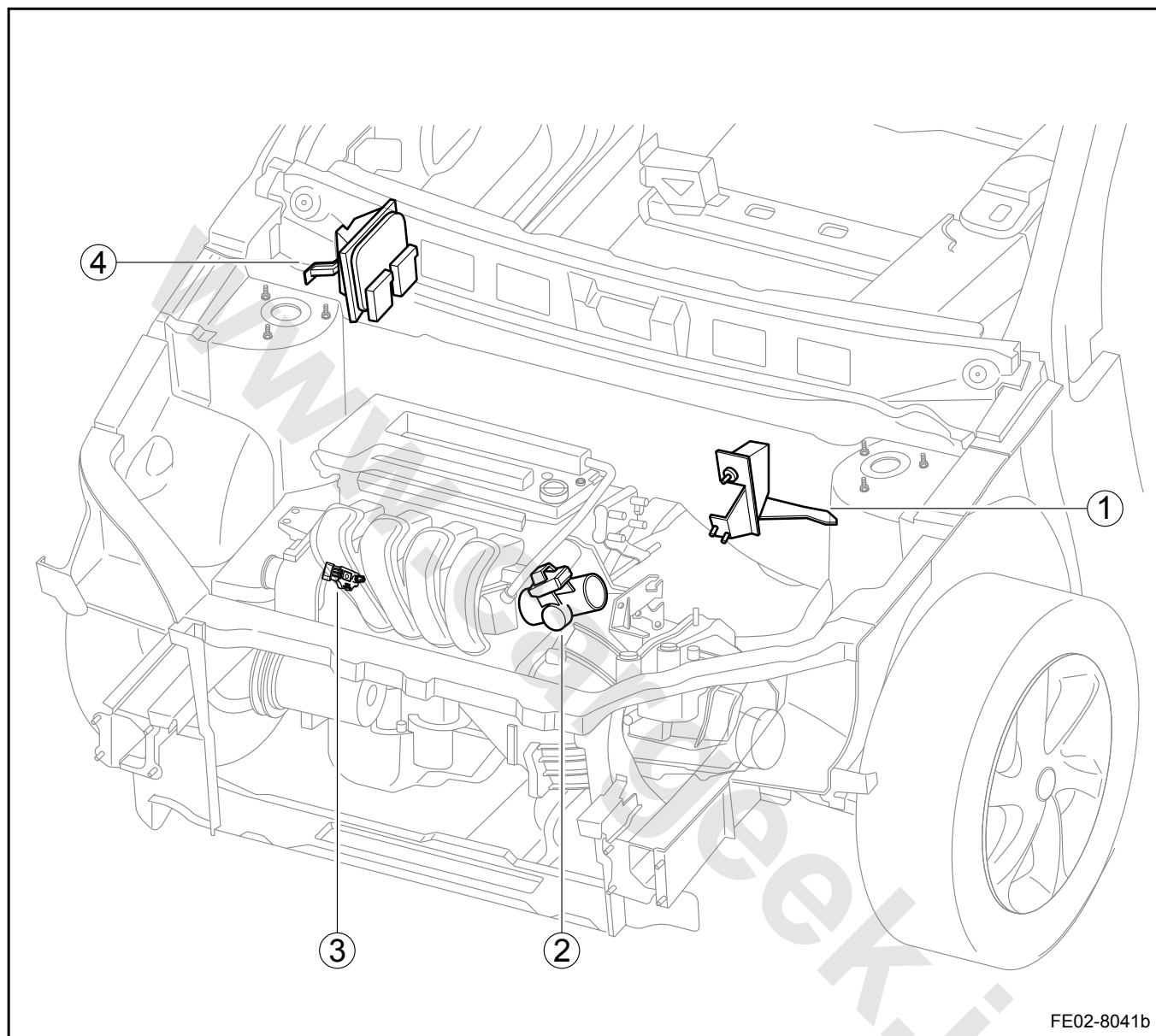
### 2.12.3.9 Fault Self-diagnosis and Protection Function

When the system is working and the engine is running, ECM controls all system components working, and monitors components directly connected to it. When one or more components are in abnormal working conditions, the system will automatically set an alarm. Each fault condition has a corresponding unique DTC code and once the fault occurs, the system will send output signal corresponding to this code through the datalink connector. The engine malfunction indicator lamp will be lit to alert the driver to repair. DTC code indicates a possible malfunction component.

When a malfunction occurs, the system controls the engine using temporary emergency program to ensure that the vehicle can be driven to a repair station for repair.

## 2.12.4 Component Locator

### 2.12.4.1 Component Locator



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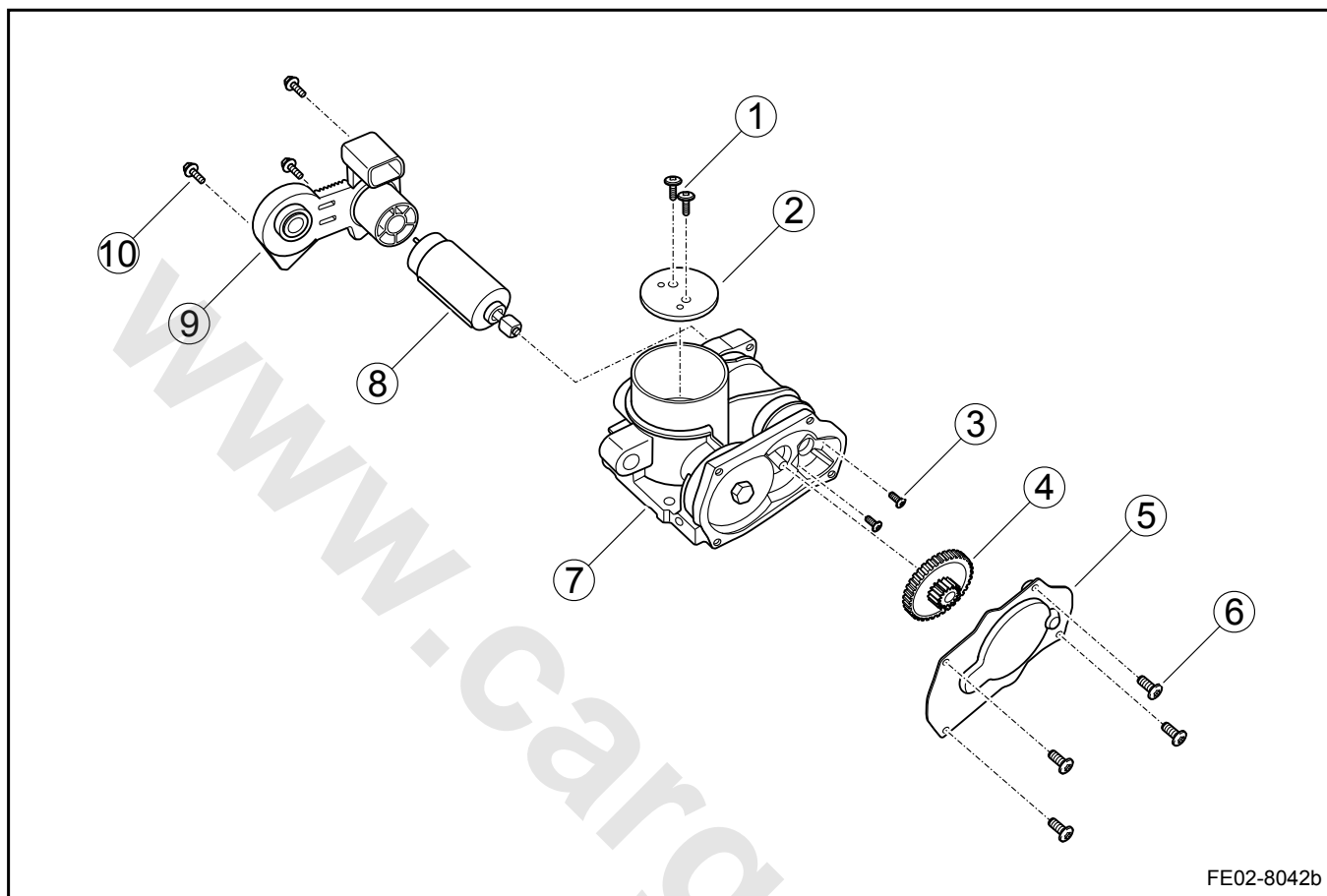
#### Legend

- |   |                                    |
|---|------------------------------------|
| 1. Acceleration Pedal Position Sensor       | 4. Electronic Control Module (ECM) |
| 2. Electronic Throttle Body (ETC) Assembly  |                                    |
| 3. Intake Air Pressure / Temperature Sensor |                                    |



## 2.12.5 Disassemble View

## 2.12.5.1 Disassemble View



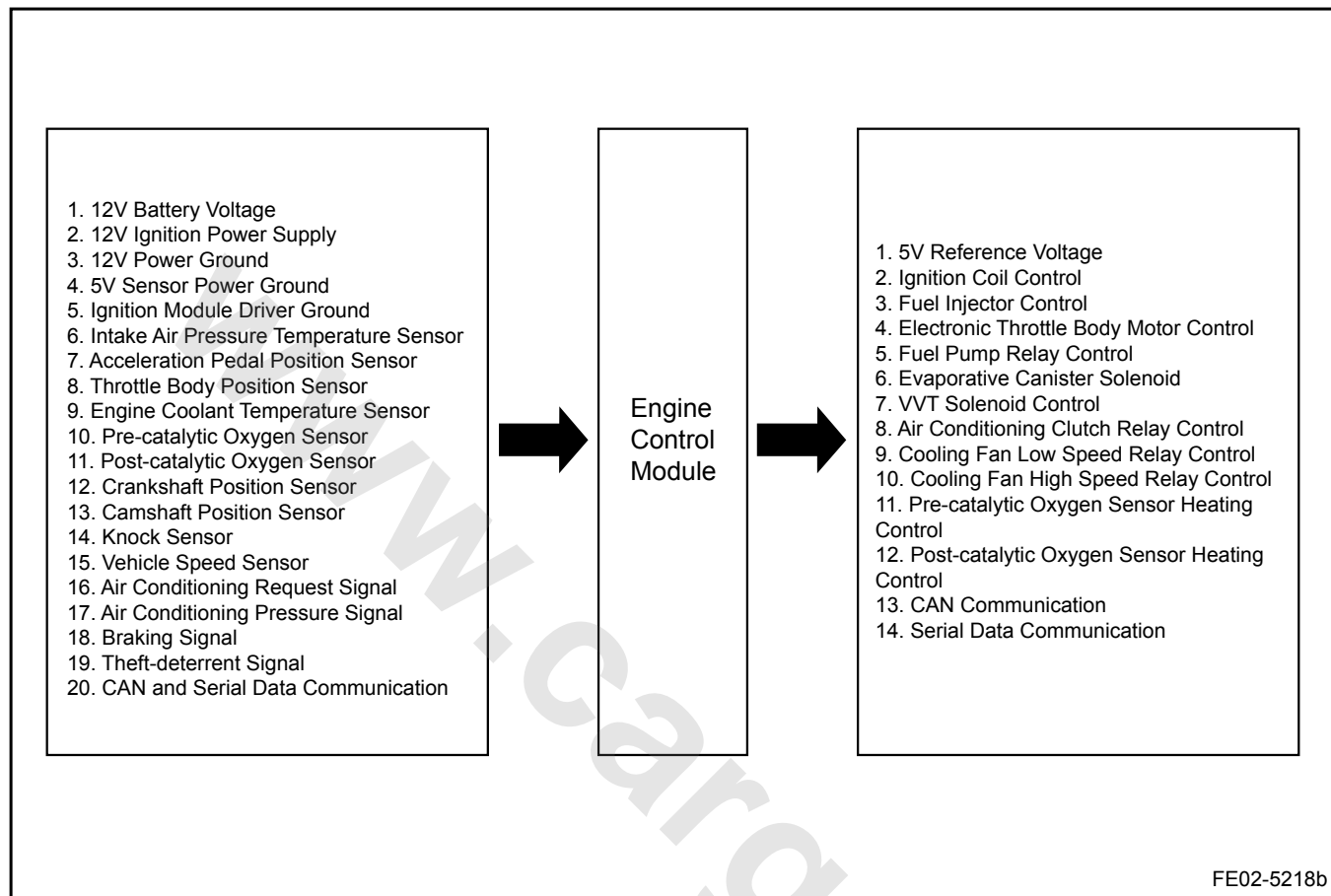
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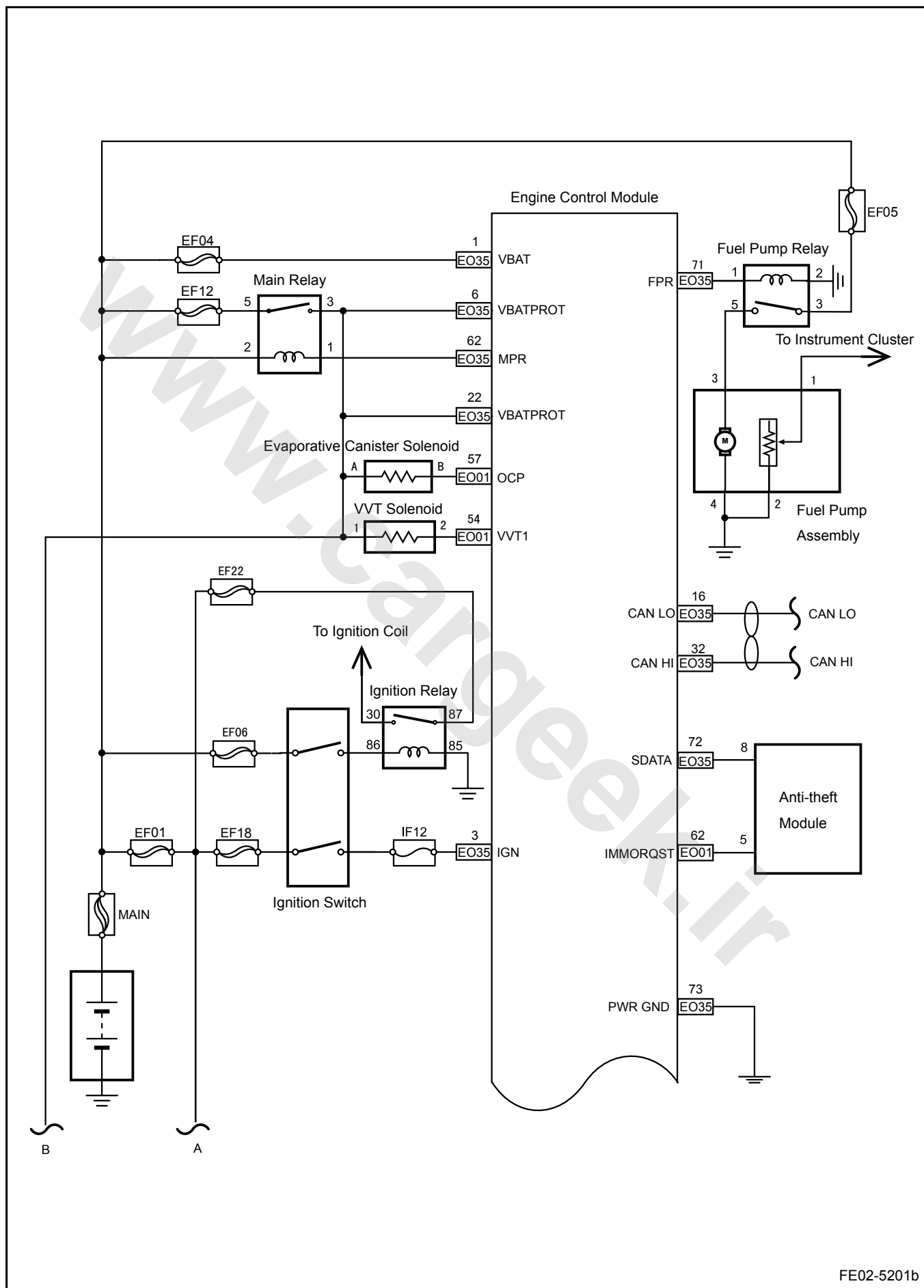
## Legend

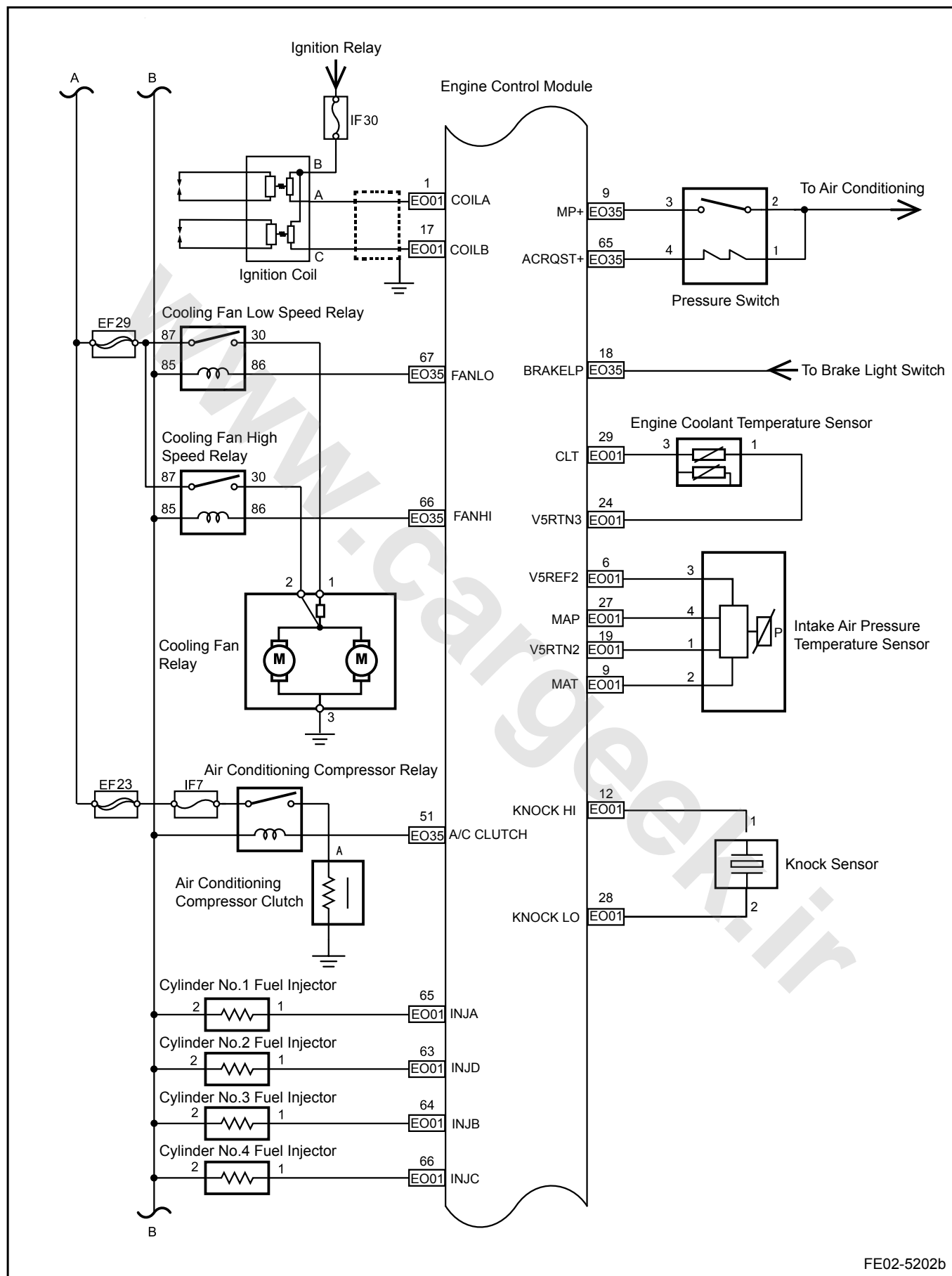
- |   |  |
|---|--|
| 1. Throttle Valve Retaining Bolts       | 7. Throttle Body                             |
| 2. Throttle Valve                       | 8. Throttle Drive Motor                      |
| 3. Throttle Drive Motor Retaining Bolts | 9. Throttle Position Sensor                  |
| 4. Throttle Drive Gear                  | 10. Throttle Position Sensor Retaining Bolts |
| 5. Seal Plate                           |  |
| 6. Seal Plate Retaining Bolts           |  |

## 2.12.6 Schematic

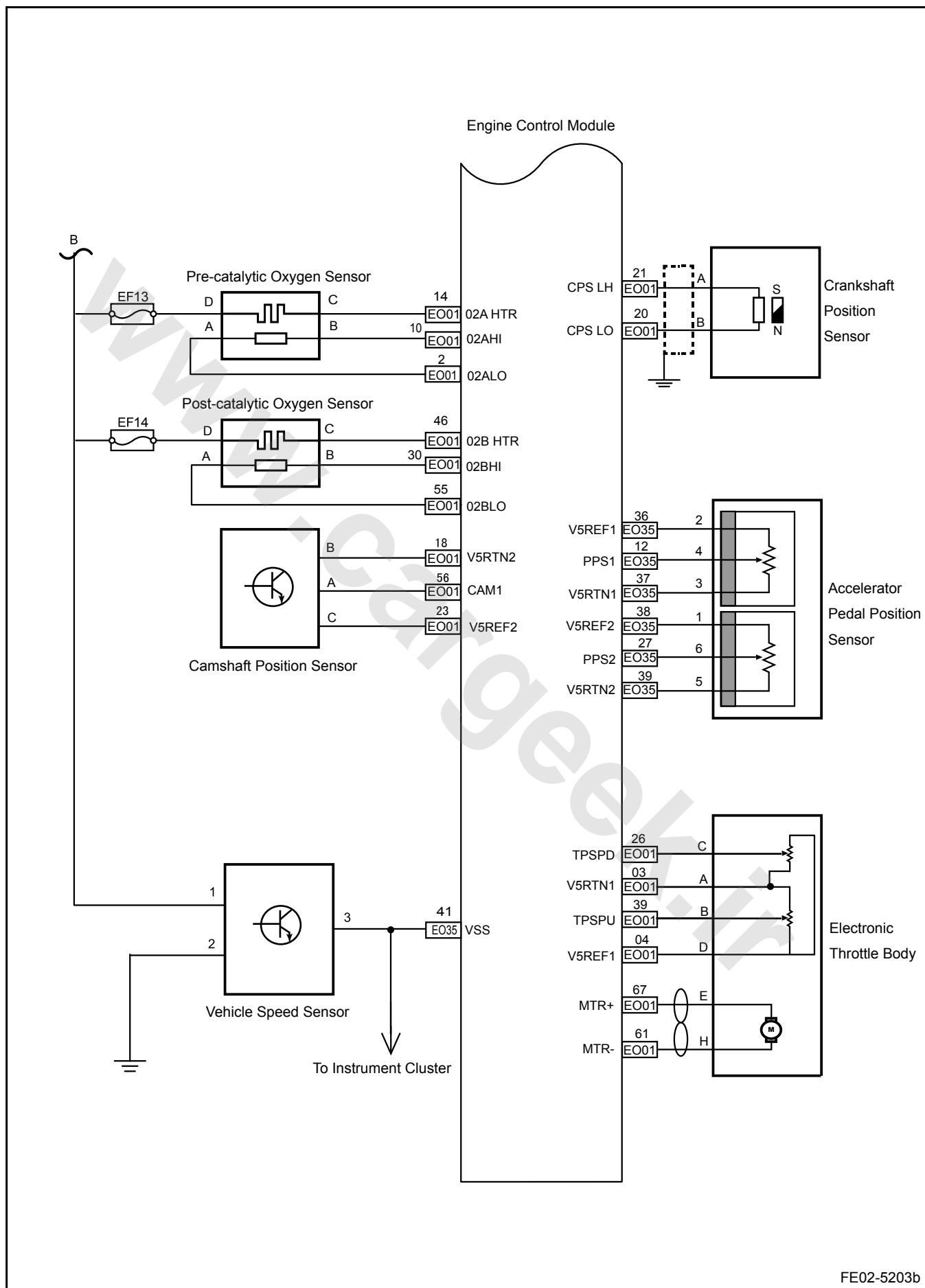
## 2.12.6.1 Schematic







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## 2.12.7 Diagnostic Information and Procedures

### 2.12.7.1 Diagnosis Description

Before carry out the control system diagnostic. Refer to [2.12.2 Description and Operation](#) and [2.12.3 System Working Principle](#). Understand and get familiar with control system working principle, and then start systematic diagnostic, so that it will help to determine the correct diagnostic steps, more importantly, it also help to determine whether the customer described situation is normal.

Before any control system fault diagnostic, using the [2.2.7.2 Control System Check](#) as a starting point to guide the service personnel to take the next logical step for fault diagnosis. Understand and correctly use the diagnostic flow chart can reduce the diagnostic time and avoid misjudge on components.

### 2.12.7.2 Control System Check

For 4G15-D engine control system check. Refer to the 4G18-D engine [2.2.7.2 Control System Check](#).

### 2.12.7.3 Intermittent Fault Check

For 4G15-D engine intermittent fault check, please refer to the 4G18-D engine [2.2.7.3 Intermittent Fault Check](#).

### 2.12.7.4 Symptoms Table

If a malfunction occurs, but it has been not stored in ECM DTC code (DTC), and its faulty reason can not be identified in the basic diagnostic, carry out the diagnostic based on the following table listed order.

Symptoms	Suspected Faulty Items	Relevant Sections
Retardation, Engine Speed Decreases, Speed Instability Fault Definition: When pressing the acceleration pedal, there is no response. At any speed, this malfunction may occur. Start the vehicle for the first time (for example, start after parking), this malfunction is usually more obvious. In severe cases, this malfunction may lead to engine stalling.	1. ECM Power Supply Circuit	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
	2. Intake Manifold Absolute Pressure (MAP) Sensor	Refer to <a href="#">2.12.7.18 DTC P0107 P0108</a>
	3. Fuel Pressure Abnormal	Refer to <a href="#">2.13 Fuel System JL4G15-Din2.13.1 Diagnostic Information and Procedures</a>
	4. Injector Working Abnormal	
	5. Mixture Too Rich	Refer to <a href="#">2.12.7.26 DTC P0171 P0172 P1167 P1171 P2187 P2188</a>
	6. Mixture Too Lean	
	7. Ignition system: spark plug abnormal, ignition wires abnormal.	Refer to <a href="#">2.20 Ignition System JL4G15-Din2.20.4 Diagnostic Information and Procedures</a>
	8. Knock Sensor (KS) system, the ignition delay is too great.	
	9. Crankshaft Position Sensor	Refer to <a href="#">2.12.7.35 DTC P0335 P0336</a>
	10. Thermostat Abnormal	<a href="#">2.18 Engine Cooling System JL4G15-Din2.18.3 Diagnostic Information and Procedures</a>
	11. Generators Working Abnormal	Refer to <a href="#">2.11 Starting / Charging System JL4G18-Din2.11.7 Diagnostic Information and Procedures</a>
Only when Air-Conditioning is working, the engine stalls.	1. Air-Conditioning Signal Circuit	Refer to <a href="#">8.2 Automatic Air-conditioning</a> in <a href="#">8.2.7 Diagnostic Information and Procedures</a>

Symptoms	Suspected Faulty Items	Relevant Sections
Fault Definition: When Air-Conditioning is working, the engine speed is instable or engine stalls.	2. Electronic Throttle Body	Refer to <a href="#">2.12.7.54 DTC P2135</a>
	3. ECM	Refer to <a href="#">2.2.8.8 Engine Control Module Replacement</a>
<p>High Fuel Consumption, Poor Fuel Economy</p> <p>Fault Definition: During the actual road test, fuel consumption is significantly higher than expected. In addition, the fuel consumption is also significantly higher than the actual road test the same vehicle had.</p>	1. ECM Power Supply Circuit	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
	2. Mixture Too Rich	Refer to <a href="#">2.12.7.26 DTC P0171 P0172 P1167 P1171 P2187 P2188</a>
	3. Air filter Blocked	-
	4. Poor Fuel Quality, Fuel Contamination	Refer to <a href="#">2.13 Fuel System JL4G15-Din2.13.1 Diagnostic Information and Procedures</a>
	5. Fuel Pressure Abnormal	
	6. Injector Working Abnormal	
	7. Electronic Throttle Body	Refer to <a href="#">2.12.7.54 DTC P2135</a>
	8. The driver has the following driving habits: <ul style="list-style-type: none"> <li>• Air-Conditioning or Defroster Always On</li> <li>• Tire pressure is incorrect</li> <li>• Vehicle Overload</li> <li>• Accelerate Too Fast, Too Frequent</li> </ul>	-
	9. Air Leakage In Intake System and Crankcase System	Refer to <a href="#">2.14 Auxiliary Emission Control JL4G15-Din2.14.2 Diagnostic Information and Procedures</a>
	10. Crankcase Ventilation Valve Catching	
	11. Knock Sensor (KS) System Ignition Delay Too Great	Refer to <a href="#">2.20 Ignition System JL4G15-Din2.20.4 Diagnostic Information and Procedures</a>
	12. Spark Plug: Thermal value is incorrect, damp, crack, gap incorrect, excessive erosion, excessive carbon residue, contaminated by fuel	
	13. Spark Plug Wire Damage	
	14. Ignition Coil Damage	
	15. Coolant Level Too Low, Thermostat Malfunction	Refer to <a href="#">2.18 Engine Cooling System JL4G15-Din2.18.3 Diagnostic Information and Procedures</a>
	16. Too Much Oil In Combustion Chamber or Valve Seals Leakage	Refer to <a href="#">2.6 Engine Mechanical System JL4G18-Din2.6.7 Diagnostic Information and Procedures</a>
	17. Cylinder Compression Pressure Incorrect	
	18. Valve Stagnant or Leaking, Broken Valve Spring, Valve Timing Incorrect	
	19. Too Much Carbon Residue In Combustion Chamber	

Symptoms	Suspected Faulty Items	Relevant Sections
	20. Vacuum Hose Cracking or Kink, The Connection Is Unreliable	
	21. Exhaust Blocked: Three-Way Catalytic Converter Blocked, Muffler Internal Damage	Refer to <a href="#">2.7 Exhaust System JL4G18-Din2.7.5 Diagnostic Information and Procedures</a>
	22. Braking System Dragging or Operation Abnormal	Refer to <a href="#">6 Brake System in 6.2.4 Diagnostic Information and Procedures</a>
	23. Electromagnetic interference (EMI) on voltage circuit may lead to misfire. Use a scan tool to monitor the engine speed to detect electromagnetic interference. Engine speed parameter suddenly increase while the actual engine speed is almost not changed, then there is electromagnetic interference. If there is a malfunction, check whether there is a high voltage component in the vicinity of the ignition control circuit.	-
Fuel Supply Stopped, Misfire Fault Definition: Continuous pulsation or jitter as the engine speed increases, usually with the engine load increases it is even more noticeable. When the engine speed is above 1500 rpm, the malfunction does not occur.	1. ECM Power Supply Circuit	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
	2. Air Filter Blocked	-
	3. Fuel Pressure Abnormal	Refer to <a href="#">2.13 Fuel System JL4G15-Din2.13.1 Diagnostic Information and Procedures</a>
	4. Injector Working Abnormal	
	5. Mixture Too Rich	Refer to <a href="#">2.12.7.26 DTC P0171 P0172 P1167 P1171 P2187 P2188</a>
	6. Mixture Too Lean	
	7. Electronic Throttle Body	Refer to <a href="#">2.12.7.54 DTC P2135</a>
	8. Knock Sensor (KS) system ignition delay is too great	
	9. Spark Plug: Thermal value is incorrect, damp, crack, gap incorrect, excessive erosion, excessive carbon residue, contaminated by fuel	Refer to <a href="#">2.20 Ignition System JL4G15-Din2.20.4 Diagnostic Information and Procedures</a>
	10. Spark Plug Wire Damage	
	11. Ignition Coil Damage	
	12. Crankshaft Position Sensor	Refer to <a href="#">2.12.7.35 DTC P0335 P0336</a>
	13. Too Much Oil In Combustion Chamber or Valve Oil Seals Leakage	Refer to <a href="#">2.6 Engine Mechanical System JL4G18-Din2.6.7 Diagnostic Information and Procedures</a>
	14. Cylinder compression pressure is incorrect	
	15. Valve Stagnant or Leakage	



Symptoms	Suspected Faulty Items	Relevant Sections
	16. Camshaft Convex Corner Wear	
	17. Valve Timing Incorrect	
	18. Valve Spring Broken	
	19. Too Much Carbon Residue In Combustion Chamber	
	20. Camshaft, Cylinder Head, Piston, Connecting Rod and Bearing Abnormal	
	21. Exhaust Blocked: Three-Way Catalytic Converter Blocked, Muffler Internal Damage	Refer to <a href="#">2.7 Exhaust System JL4G18-Din2.7.5 Diagnostic Information and Procedures</a>
<p>Poor idle, Idle Speed Unstable, Inaccurate or Engine Stall</p> <p>Fault Definition: When idling, the engine running is not smooth. In extreme cases, the engine or the vehicle will tremble. With a certain throttle opening, the engine idle speed may fluctuate. Any of these circumstances is likely to be serious enough to make the engine stall.</p>	1. ECM Power Supply Circuit	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
	2. Air Cleaner Filter Blocked	-
	3. Fuel Pressure Abnormal	Refer to <a href="#">2.13 Fuel System JL4G15-Din2.13.1 Diagnostic Information and Procedures</a>
	4. Fuel Contamination	
	5. Injector Working Abnormal	
	6. Electronic Throttle Body	Refer to <a href="#">2.12.7.54 DTC P2135</a>
	7. Acceleration Pedal Position Sensor	Refer to <a href="#">2.12.7.55 DTC P2138</a>
	8. Crankcase Ventilation Valve	Refer to <a href="#">2.14 Auxiliary Emission Control JL4G15-Din2.14.2 Diagnostic Information and Procedures</a>
	9. Evaporative emission (EVAP) Canister Solenoid Valve	
<p>Poor Idle, Idle Speed Unstable, Inaccurate or Stall</p> <p>Fault Definition: When idling, the engine running is not smooth. In extreme cases, the engine or the vehicle will tremble. With a certain throttle opening, the engine idle speed may fluctuate. Any of these circumstances is likely to be serious enough to make the engine stall.</p>	10. Knock Sensor (KS) system ignition delay is too great	
	11. Spark Plug: Thermal value is incorrect, damp, crack, gap incorrect, excessive erosion, excessive carbon residue, contaminated by fuel.	Refer to <a href="#">2.20 Ignition System JL4G15-Din2.20.4 Diagnostic Information and Procedures</a>
	12. Spark Plug Wire Damage	
	13. Ignition Coil Damage	
	14. Crankshaft Position Sensor	Refer to <a href="#">2.12.7.35 DTC P0335 P0336</a>
	15. Too Much Oil In Combustion Chamber or Valve Seals Leakage	Refer to <a href="#">2.6 Engine Mechanical System JL4G18-Din2.6.7 Diagnostic Information and Procedures</a>
	16. Cylinder Compression Pressure Incorrect	
	17. Valve Catching or Leak, Broken Valve Spring, Valve Timing Incorrect	
	18. Too Much Carbon Residue In Combustion Chamber	
	19. Check Engine Bearings	

Symptoms	Suspected Faulty Items	Relevant Sections
	20. Electromagnetic interference (EMI) on voltage circuit may lead to misfire. Use a scan tool to monitor the engine speed to detect electromagnetic interference. Engine speed parameter suddenly increase while the actual engine speed is almost not changed, then there is electromagnetic interference. If there is a malfunction, check whether there is a high voltage component in the vicinity of the ignition control circuit.	-
<b>Detonation, Ignition Knock</b> Fault Definition: Knocking sound is worsen during accelerating. With the throttle opening changes, the engine will generate a sharp metal knocking sound.	1. ECM Power Supply Circuit	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
	2. Incorrect Fuel	Refer to <a href="#">2.13 Fuel System JL4G15-Din2.13.1 Diagnostic Information and Procedures</a>
	3. Fuel Pressure Abnormal	
	4. Injector Working Abnormal	
	5. Mixture Too Lean	Refer to <a href="#">2.12.7.26 DTC P0171 P0172 P1167 P1171 P2187 P2188</a>
	6. Knock Sensor (KS) System Ignition Delay Too Great	Refer to <a href="#">2.20 Ignition System JL4G15-Din2.20.4 Diagnostic Information and Procedures</a>
	7. Spark Plug Heat Value Incorrect	
	8. Cooling system: Coolant level is too low, coolant is incorrect, coolant leaks, cooling fan is not running	Refer to <a href="#">2.18 Engine Cooling System JL4G15-Din2.18.3 Diagnostic Information and Procedures</a>
	9. Too Much Oil In Combustion Chamber and The Valve Seal Leaking	Refer to <a href="#">2.6 Engine Mechanical System JL4G18-Din2.6.7 Diagnostic Information and Procedures</a>
	10. Cylinder Compression Pressure Too High	
	11. Too Much Carbon Residue In Combustion Chamber	
	12. Camshaft, Cylinder Head, Piston, Connecting Rod and Bearing Abnormal	
<b>Difficulty In Starting The Engine</b> Fault Definition: The engine crankshaft rotation is normal, but the vehicle can not start for a long time. Eventually the vehicle will be able to start, but it the engine may shut down immediately.	1. Too Much Oil In Combustion Chamber and The Valve Seal Leaking	Refer to <a href="#">2.6 Engine Mechanical System JL4G18-Din2.6.7 Diagnostic Information and Procedures</a>
	2. Too Carbon Residue In Combustion Chamber	
	3. Timing Chain Installation Incorrect	
	4. Cylinder Compression Pressure Incorrect	
	5. Fuel Pump Relay, Fuel Pump, Fuel Injector, Fuel Contamination	Refer to <a href="#">2.13 Fuel System JL4G15-Din2.13.1 Diagnostic Information and Procedures</a>

Symptoms	Suspected Faulty Items	Relevant Sections
	6. Ignition System: Ignition Wires, Spark Plug, Ignition Coil	Refer to <a href="#">2.20 Ignition System JL4G15-Din2.20.4 Diagnostic Information and Procedures</a>
	7. ECM Power Supply Circuit	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
	8. Engine Coolant Temperature Sensor	Refer to <a href="#">2.12.7.20 DTC P0117 P0118</a>
	9. Electronic Throttle Body	Refer to <a href="#">2.12.7.54 DTC P2135</a>
	10. Acceleration Pedal Position Sensor	Refer to <a href="#">2.12.7.55 DTC P2138</a>
<b>Backfire, Pinging</b> Fault Definition: Unburned gases enter the intake manifold or the exhaust system, ignited, producing a very loud cracking sound.	1. ECM Power Supply Circuit	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
	2. Fuel Pressure Abnormal	Refer to <a href="#">2.13 Fuel System JL4G15-Din2.13.1 Diagnostic Information and Procedures</a>
	3. Fuel Contamination	
	4. Injector Working Abnormal	
	5. Air Leakage In Intake System and Crankcase	Refer to <a href="#">2.14 Auxiliary Emission Control JL4G15-Din2.14.2 Diagnostic Information and Procedures</a>
	6. Crankcase Ventilation Valve	
	7. Knock Sensor (KS) System Ignition Delay Too Great	Refer to <a href="#">2.12.7.34 DTC P0324 P0325</a>
	8. Spark Plug: Thermal value is incorrect, damp, crack, gap is incorrect, excessive erosion, excessive carbon residue, contaminated by fuel	Refer to <a href="#">2.20 Ignition System JL4G15-Din2.20.4 Diagnostic Information and Procedures</a>
	9. Spark Plug Wire Damage	
	10. Ignition Coil Damage	
	11. Coolant Level Too Low, Thermostat Malfunction	<a href="#">2.18 Engine Cooling System JL4G15-Din2.18.3 Diagnostic Information and Procedures</a>
<b>Surge</b> Fault Definition: When the throttle opening is stable, the engine power changes. The vehicle speed changes while the acceleration pedal position does not change.	1. ECM Power Supply Circuit	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
	2. Air-Conditioning Compressor	Refer to <a href="#">8.2 Automatic Air-conditioning in 8.2.7 Diagnostic Information and Procedures</a>
	3. Heated Oxygen Sensor Abnormal	Refer to <a href="#">2.12.7.22 DTC P0131 P0132 P0133 P0134</a>
	4. Poor Fuel Quality, Fuel Contamination	Refer to <a href="#">2.13 Fuel System JL4G15-Din2.13.1 Diagnostic Information and Procedures</a>
	5. Fuel Pressure Abnormal	
	6. Injector Working Abnormal	
	7. Mixture Too Rich	Refer to <a href="#">2.12.7.26 DTC P0171 P0172 P1167 P1171 P2187 P2188</a>
	8. Mixture Too Lean	

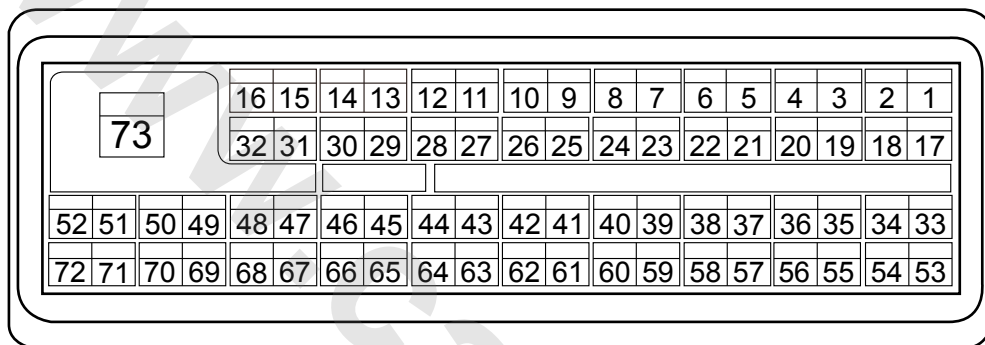
Symptoms	Suspected Faulty Items	Relevant Sections
	9. Intelligent Variable Valve Timing System	Refer to <a href="#">2.6 Engine Mechanical System JL4G18-Din2.6.7 Diagnostic Information and Procedures</a>
	10. Vacuum Hose Cracking or Kink, The Connection Unreliable	
	11. Spark Plug: Thermal value is incorrect, damp, crack, gap is incorrect, excessive erosion, excessive carbon residue, contaminated by fuel	Refer to <a href="#">2.20 Ignition System JL4G15-Din2.20.4 Diagnostic Information and Procedures</a>
	12. Spark Plug Wire Damage	
	13. Ignition Coil Damage	
<b>Power Shortage</b> <b>Fault Definition:</b> The engine power output is lower than expected. Half-press the acceleration pedal, almost no acceleration or no acceleration at all.	1. ECM Power Supply Circuit	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
	2. Air Filter Blocked	-
	3. Poor Fuel Quality, Fuel Contamination	Refer to <a href="#">2.13 Fuel System JL4G15-Din2.13.1 Diagnostic Information and Procedures</a>
	4. Fuel Pressure Abnormal	
	5. Injector Working Abnormal	
	6. Mixture Too Rich	Refer to <a href="#">2.12.7.26 DTC P0171 P0172 P1167 P1171 P2187 P2188</a>
	7. Mixture Too Lean	
	8. Knock Sensor (KS) system ignition delay is too large	Refer to <a href="#">2.20 Ignition System JL4G15-Din2.20.4 Diagnostic Information and Procedures</a>
	9. Spark Plug: Thermal value is incorrect, damp, crack, gap is incorrect, excessive erosion, excessive carbon residue, contaminated by fuel	
	10. Spark Plug Wire Damage	
	11. Ignition Coil Damage	
	12. Crankshaft Position Sensor	Refer to <a href="#">2.12.7.35 DTC P0335 P0336</a>
	13. Too Much Oil In Combustion Chamber or Valve Seals Leakage	Refer to <a href="#">2.6 Engine Mechanical System JL4G18-Din2.6.7 Diagnostic Information and Procedures</a>
	14. Cylinder compression pressure is incorrect	
	15. Valve Catching or Leak, Broken Valve Spring, Valve Timing Is Incorrect	
	16. Too Much Carbon Residue In Combustion Chamber	
	17. Intelligent Variable Valve Timing System	
	18. Exhaust Blocked: Three-Way Catalytic Converter Blocked, Muffler Internal Damage	Refer to <a href="#">2.7 Exhaust System JL4G18-Din2.7.5 Diagnostic Information and Procedures</a>
Engine Does Not Turn	1. Battery	Refer to <a href="#">2.11 Starting / Charging System JL4G18-Din2.11.7.4 Engine</a>

Symptoms	Suspected Faulty Items	Relevant Sections
Fault Definition: When the ignition switch is at "ST" position, the engine crankshaft does not rotate.	2. Starter	<a href="#">Can Not Start.</a>
	3. Start Relay	
	4. Ignition Switch	
	5. BCM	
	6. Engine Anti-theft Locking System	Refer to <a href="#">2.5 Engine Anti-theft System JL4G18-Din2.5.7 Diagnostic Information and Procedures.</a>
Engine Does Not Start Fault Definition: When the ignition switch is at "ST" position, the engine crankshaft rotates, but the vehicle does not start.	1. ECM Power Supply Circuit	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
	2. Crankshaft Position Sensor	Refer to <a href="#">2.12.7.35 DTC P0335 P0336</a>
	3. Camshaft Position Sensor	Refer to <a href="#">2.12.7.36 DTC P0340 P0341</a>
	4. Ignition System	<a href="#">2.20 Ignition System JL4G15-Din2.20.4 Diagnostic Information and Procedures</a>
	5. Fuel Pump Control Circuit	Refer to <a href="#">2.13 Fuel System JL4G15-Din2.13.1 Diagnostic Information and Procedures</a>
	6. Fuel Injectors Working Circuit	
	7. ECM	Refer to <a href="#">2.2.8.8 Engine Control Module Replacement</a>

## 2.12.7.5 ECM Terminal List

EO01

ECM Harness Connector EO01



FE02-5217b

Note:

1. UB is the battery voltage.
2. If there is no instruction, GND is 0 V or close to 0 V.

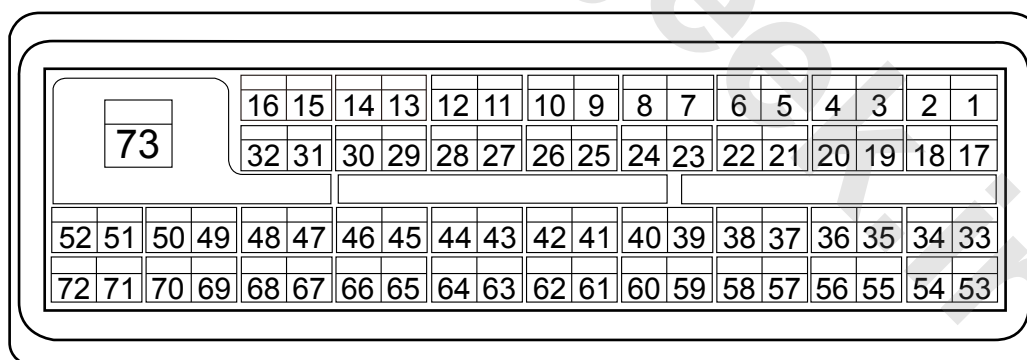
Terminal ID	Name	Wiring	Terminal Instructions	Status	Specified Conditions
1	COILA	0.85 W	Ignition Coil A	Engine Running	GND-UB PWM Wave
2	O2ALO	0.5 L/R	Pre-Catalytic Oxygen Sensor A-Side	Ignition Switch "ON"	0-5 V
3	V5RTN1	0.5 G/W	5V Power Supply Ground	-	GND
4	V5REF1	0.5 G	5V Power Supply	Ignition Switch "ON"	5 V
5	-	-	-	-	-
6	V5REF2	0.5 L/B	5V Power Supply	Ignition Switch "ON"	5 V
7-8	--	--	--	--	--
9	MAT	0.5 G/Y	Intake Air Temperature	Ignition Switch "ON"	0-5 V

Terminal ID	Name	Wiring	Terminal Instructions	Status	Specified Conditions
10	O2AHi	0.5 P	Pre-Catalytic Oxygen Sensor B-Side	Ignition Switch "ON"	0-5 V
11	--	--	--	--	--
12	KNOCK_Hi	0.5 L	Knock Sensor A-Side	Engine Running	PWM Wave
13	--	--	--	--	--
14	O2A_HTR	0.75 B/G	Heated Pre-Catalytic Oxygen Sensor	Heating	PWM Wave
15-16	-	-	-	-	-
17	COILB	0.85 O	Ignition Coil B	Engine Running	GND-UB PWM Wave
18	V5RTN2	0.5 W/R	5V Voltage Ground	-	GND
19	V5RTN2	0.5 Gr	5V Voltage Ground	-	GND
20	CPS_Lo	0.5 L	58-Tooth B-Side	Engine Running	Sin / Cos Wave, AB Conjugate Signal
21	CPS_Hi	0.5 Gr	58-Tooth A-Side	Engine Running	-
22	-	-	-	-	-
23	V5REF2	0.5 B/R	5V Voltage	Ignition Switch "ON"	5 V
24	V5REF3	0.5 Y/L	5V Voltage	Ignition Switch "ON"	5 V
25	--	--	--	--	--
26	TPSPD	0.5 W / P	Electronically Controlled Throttle Body C-Side	Ignition Switch "ON"	0-5 V
27	MAP	0.5 Br/Y	Intake Air Pressure Sensor	Ignition Switch "ON"	0-5 V
28	KNOCK_Lo	0.5 L/W	Knock Sensor B-Side	Engine Running	PWM Wave
29	CLT	0.5 O/G	Coolant Temperature Sensor	Ignition Switch "ON"	0-5 V
30-38	--	--	--	--	--
39	TPSPU	0.5 Gr/W	Electronically Controlled Throttle Body B-Side	Ignition Switch "ON"	0-5 V
40-53	-	-	-	-	-
54	VVT1 (PWM)	0.75 W/L	Intake VVT Valve	Engine Running	0-5 V
55	-	-	-	-	-
56	Camshaft1	0.5 R	Camshaft Position Sensor	Engine Running	GND-UB PWM Wave
57	CCP (PWM)	0.5 B/Y	Canister Solenoid Valve	Engine Running	PWM Wave
58-60	-	-	-	-	-

Terminal ID	Name	Wiring	Terminal Instructions	Status	Specified Conditions
61	MTR-	0.75 O	Electronically Controlled Throttle Body H-Side	Ignition Switch "ON"	GND
62	IMMORQST	0.5 Gr/W	Immobilisier A-Side	Ignition Switch "ON"	-
63	INJD	0.5 Y/B	Cylinder No.2 Injector	Engine Running	GND-UB PWM Wave
64	INJB	0.5 Y/V	Cylinder No.3 Injector	Engine Running	GND-UB PWM Wave
65	INJA	0.5 G/L	Cylinder No.1 Injector	Engine Running	GND-UB PWM Wave
66	INJC	0.5 B/L	Cylinder No.4 Injector	Engine Running	GND-UB PWM Wave
67	MTR +	0.7 V/O	Electronically Controlled Throttle Body E-Side	Ignition Switch "ON"	UB
68-73	--	--	--	--	--

EO35

## ECM Harness Connector EO35



FE02-5216b

Note:

1. UB is the battery voltage.
2. If no instructions, GND is 0 V or close to 0 V.



Terminal ID	Name	Wiring	Terminal Instructions	Status	Specified Conditions
1	VBATT	0.75 R	Battery Voltage	All	UB
2	--	--	--	--	--
3	IGN	0.5 W/Y	Ignition Switch	Ignition Switch "ON"	UB
4-5	--	--	--	--	--
6	VBATPROT	0.5 G / Y	Main Relay Controlled Power Supply	Ignition Switch "ON"	UB
7-8	--	--	--	--	--
9	MP+	0.5 B/O	Air-Conditioning Medium Voltage Switch	On or Off	UB or GND
10-11	--	--	--	--	--
12	PPS1	0.5 G/B	Accelerator Acceleration Pedal Sensor 1	Ignition Switch "ON"	0-5 V
13-15	--	--	--	--	--
16	CANLO	0.5 Y/R	CAN Communication	Ignition Switch "ON"	PWM Wave
17	--	--	--	--	--
18	BRKLP	0.5 Gr	Brake Signal	Braking	UB or GND
19-21	--	--	--	--	--
22	VBATPROT	0.5 G/Y	Main Relay Controlled Power Supply	Ignition Switch "ON"	UB
23-26	--	--	--	--	--
27	PPS2	0.5 R/B	Acceleration Pedal Sensor 2	Ignition Switch "ON"	0-5 V
28-29	--	--	--	--	--
30	O2BHI	0.5 V	Post-Catalytic Oxygen Sensor B-Side	Ignition Switch "ON"	UB
31	--	--	--	--	--
32	CANHI	0.5 L/R	CAN Communication	Ignition Switch "ON"	PWM Wave
33-35	--	--	--	--	--
36	V5REF1	0.5 W/B	5V Voltage	Ignition Switch "ON"	5 V
37	V5RTN1	0.5 R	5V Voltage Ground	-	GND
38	V5REF2	0.5 G	5V Voltage	Ignition Switch "ON"	5 V
39	V5RTN2	0.5 W	5V Voltage Ground	--	GND
40	--	--	--	--	--
41	VSS	0.5 Y	Vehicle Speed Sensor	Moving	PWM Wave

Terminal ID	Name	Wiring	Terminal Instructions	Status	Specified Conditions
42-45	--	--	--	--	--
46	O2B_HTR	0.75 B/O	Post-Catalytic Oxygen Sensor Heating	Heating	PWM Wave
47-50	--	--	--	--	--
51	A/C Relay	0.5 B/Y	Air-Conditioning Compressor Relay	Air-Conditioning Switch	UB or GND
52-54	--	--	--	--	--
55	O2BLO	0.5 L/R	Post-Catalytic Oxygen Sensor A-Side	Ignition Switch "ON"	0-5 V
56-61	--	--	--	--	--
62	MPR	0.5 B/L	Main Relay	All	UB
63-64	--	--	--	--	--
65	ACRQST+	0.5 P	Air-Conditioning Request	Ignition Switch "ON"	UB or GND
66	FANHI	0.5 B/O	High-Speed Fan Relay	Coolant Temperature That Activates High-Speed Fan	UB or GND
67	FANLO	0.5 L	Low-Speed Fan Relay	Coolant Temperature That Activates Low-Speed Fan	UB or GND
68-70	--	--	--	--	--
71	FPR(HSD)	0.5 G	Oil Pump Relay	Ignition Switch "ON"	UB or GND
72	SDATA	0.5 Gr/P	Data Link Connector	Using	PWM Wave
73	PWRGND	4 B	Power Ground	All	GND

### 2.12.7.6 DTC Code Type Definition

In the diagnosis calibration settings, different fault type settings have different fault lamps light timing and methods. Fault type is divided into A, B, C, E, Z, their definitions and fault lamps light principles are as following :

Fault Type	Emission-Related	Definition
A-type	Yes	Occurring once MIL lamp will be lit and a DTC code will be recorded
B-type	Yes	Occurring once in each two consecutive trips, MIL lamp will be lit and a DTC code will be recorded.
E-type	Yes	Occurring once in each three consecutive trips, MIL lamp will be lit and a DTC code will be recorded.
C-type	No	Record the DTC code when the fault occurs, but the MIL lamp will not be lit, SVS lamps may be lit.

Z-type	-	Record the DTC code when the fault occurs, but does not light any lamp
--------	---	--

In three consecutive trips, if the system does not detect any faults, and no other faults are detected, the MIL lamp will be off.

If a fault no longer occurs in more than 40 warm-up cycles, vehicle diagnostic system will request to clear the DTC code and the driving distance and the fixed grid data associated with the fault.

### 2.12.7.7 DTC Code (DTC) List

DTC Code	Description	Fault Type
P0011	Intake VCP Valve Timing Response Lag	B
P0012	Intake VCP Camshaft Valve Timing Error	A
P0016	Intake Camshaft Gear VCP Learning Bias Out Of Range	B
P0026	Intake VCP Hydraulic Control Valve	A
P0068	Electronic Throttle Air Flow Error	A
P0076	Intake VCP Hydraulic Control Valve Coil Low Voltage or Open Circuit	A
P0077	Intake VCP Hydraulic Control Valve Coil High Voltage	A
P0106	Intake Pressure / Throttle Position Fault	E
P0107	Intake Air Pressure Sensor Circuit Low Voltage or Open	A
P0108	Intake Air Pressure Sensor Circuit High Voltage	A
P0112	Intake Air Temperature Sensor Circuit Low Voltage	E
P0113	Intake Air Temperature Sensor Circuit High Voltage or Open	E
P0117	Coolant Temperature Sensor Circuit Low Voltage	A
P0118	Coolant Temperature Sensor Circuit High Voltage or Open	A
P0122	Electronic Throttle Position Sensor 1 Circuit Low Voltage	A
P0123	Electronic Throttle Position Sensor 1 Circuit High Voltage	A
P0131	Pre-Catalytic Oxygen Sensor Circuit Short To Low Voltage	E
P0132	Pre-Catalytic Oxygen Sensor Circuit Short To High Voltage	E
P0133	Pre-Catalytic Oxygen Sensor Response Too Slow	E
P0134	Pre-Catalytic Oxygen Sensor Circuit Open	A
P0135	Pre-Catalytic Oxygen Sensor Heater Malfunction	A
P0137	Post-Catalytic Oxygen Sensor Circuit Short To Low Voltage	E
P0138	Post-Catalytic Oxygen Sensor Circuit Short To High Voltage	E
P0140	Post-Catalytic Oxygen Sensor Circuit Open	E
P0141	Post-Catalytic Oxygen Sensor Heater Malfunction	A
P0171	Fuel System Too Lean	E
P0172	Fuel System Too Rich	E

DTC Code	Description	Fault Type
P0222	Electronic Throttle Position Sensor 2 Circuit Low Voltage	A
P0223	Electronic Throttle Position Sensor 2 Circuit High Voltage	A
P0230	Oil Pump Relay Malfunction	A
P0261	Nozzle 1 Circuit Low Voltage Fault	A
P0262	Nozzle 1 Circuit High Voltage Fault	A
P0264	Nozzle 2 Circuit Low Voltage Fault	A
P0265	Nozzle 2 Circuit High Voltage Fault	A
P0267	Nozzle 3 Circuit Low Voltage Fault	A
P0268	Nozzle 3 Circuit High Voltage Fault	A
P0270	Nozzle 4 Circuit Low Voltage Fault	A
P0271	Nozzle 4 Circuit High Voltage Fault	A / B
P0300	One or More Cylinder Misfire	C
P0324	Knock Control System Malfunction	C
P0325	Knock Sensor Malfunction	A
P0335	Crankshaft Position Sensor Circuit No Signal	E
P0336	Crankshaft Position Sensor Circuit Signal Interference	A
P0340	Intake VCP Camshaft Position Sensor Status Diagnostic	A
P0341	Intake VCP Target Diagnostic	A
P0351	Ignition Coil 1 Malfunction	A
P0352	Ignition Coil 2 Malfunction	A
P0420	Catalytic Converter Low Conversion Efficiency	A
P0458	Canister Solenoid Valve Short To Low Voltage or Open Circuit	E
P0459	Canister Solenoid Valve Short To High Voltage	E
P0480	Low-Speed Fan Malfunction	C
P0481	High-Speed Fan Malfunction	C
P0502	Vehicle Speed Sensor No Signal	E
P0506	Idle Speed Too Low	E
P0507	Idle Speed Too High	E
P0562	System Voltage Low	C
P0563	System Voltage High	C
P0571	Brake Lamp Switch Status No Change When Braking	C
P0601	ROM Error	A

DTC Code	Description	Fault Type
P0602	ECM Processor Malfunction	A
P0604	RAM Error	A
P0606	ECM Processor Malfunction	A
P060A	ECM Programming Error	A
P0641	ETC Reference Voltage A Amplitude Malfunction	A
P0646	Air-Conditioning Clutch Relay Short To Low Voltage or Open Circuit	C
P0647	Air-Conditioning Clutch Relay Short To High Voltage	C
P0650	Fault Indicator Malfunction	C
P0651	ETC Reference Voltage B Amplitude Malfunction	A
P0685	Main Relay Fault Malfunction	A
P1167	Post-Catalytic Sensor Indicating Fuel Too Rich During Deceleration	E
P1171	Pre-Catalytic Sensor Indicating Fuel Too Lean During Acceleration	E
P1336	58-Tooth Gear Error Not Learn	A
P1516	ETC-Driver Second-Order Diagnostic Error	A
P2101	ETC-Driver Steady-State Diagnostic Error	A
P2104	Controlled idle	A
P2105	Engine Forced Shutdown	A
P2106	Restrictions on Engine Performance	A
P2110	Engine Power Management	A
P2119	Electronic Throttle Return Malfunction	A
P2122	Electronic Throttle Pedal Position Sensor 1 Circuit Low Voltage	A
P2123	Electronic Throttle Pedal Position Sensor 1 Circuit High Voltage	A
P2127	Electronic Throttle Pedal Position Sensor 2 Circuit Low Voltage	A
P2128	Electronic Throttle Pedal Position Sensor 2 Circuit High Voltage	A
P2135	Electronic Throttle Position Sensor 1 and 2 Circuits Malfunction	A
P2138	Electronic Throttle Pedal Position Sensor 1 and 2 Circuits Malfunction	A
P2187	Mixture Too Lean During idle	E
P2188	Mixture Too Rich During idle	E
P2610	LPC Malfunction	E
P0633	Alarm Does Not Learn Malfunctions	C
U0167	Anti-theft Device No Response	C

DTC Code	Description	Fault Type
U0426	Anti-theft Device Authentication Failure	C

## 2.12.7.8 DTC Fail-Safe List

DTC Code	DTC Code Diagnostic Information	Fail-Safe Mode	Restore Conditions
P0068	Electronic Throttle Air Flow Error	Electronic Throttle Position Sensor 1 Circuit Low Voltage	Electronic Throttle Position Sensor 1 Circuit Low Voltage
P0122	Electronic Throttle Position Sensor 1 Circuit Low Voltage	Use TPS signal value that is not expired. If the both TPS1 and TPS2 fail, the system will enter into the "Engine Power Management" mode, while reporting P2106, P2110 fault; VCP inoperative	No malfunction condition detected.
P0123	Electronic Throttle Position Sensor 1 Circuit Low Voltage		
P0222	Electronic Throttle Position Sensor 1 Circuit Low Voltage		
P0223	Electronic Throttle Position Sensor 1 Circuit Low Voltage		
P0571	Brake Lamp Switch Status No Change During Braking	At this time if the system enters "Restrictions on Engine Performance" mode, the system enters the "engine controlled idle" mode.	No malfunction condition detected.
P0606	ECM Processor Malfunction	System enters into "engine forced shutdown" mode, the engine can not start and the system will report P2105 fault.	Next key cycle, no malfunction condition detected.
P060A	ECM Programming Malfunction	Engine can not start.	Next key cycle, no malfunction condition detected.
P0641	ETC Reference Voltage A # Amplitude Fault	System enters "Engine Power Management" mode, while reporting P0122, P0223, P2106, P2110 fault; VCP inoperative	Next key cycle, no malfunction condition detected.
P0651	ETC Reference Voltage B # Amplitude Fault	System enters "restrictions on engine performance" model, while reported P2106 fault; VCP inoperative	No malfunction condition detected.
P1516	ETC-Driver Steady-State Diagnostic Error	System enters "Engine Power Management" mode, while reporting P2106, P2110 fault; VCP inoperative	Next key cycle, no malfunction condition detected.

DTC Code	DTC Code Diagnostic Information	Fail-Safe Mode	Restore Conditions
P2101	ETC-Driver Second-Order Diagnostic Error	System enters "Engine Power Management" mode, while reporting P2106, P2110 fault; VCP inoperative	Next key cycle, no malfunction condition detected.
P2104	Engine Controlled idle	Refer to ETC TPS and APS diagnostics.	Refer to ETC TPS and APS diagnostics.
P2105	Engine Forced Shutdown		
P2106	Restrictions on engine performance.		
P2110	Engine Power Management		
P2119	Electronic Throttle Return Malfunction	No	No malfunction condition detected.
P2122	Electronic Throttle Pedal Position Sensor 1 Circuit Low Voltage	(1) Single APS malfunction, the system enters "Restrictions on engine performance" mode, while reporting P2106 fault  (2) If both APS1 and APS2 fail, the system enters "engine forced idle" mode, while reporting P2104 fault  (3) VCP Inoperative	Next key cycle, no malfunction detected.
P2123	Electronic Throttle Pedal Position Sensor 1 Circuit High Voltage		
P2127	Electronic Throttle Pedal Position Sensor Circuit 2 Low Voltage		
P2128	Electronic Throttle Pedal Position Sensor 2 Circuit High Voltage		
P2135	Electronic Throttle Position Sensors 1 and 2 Related Malfunctions	System enters "restrictions on engine performance" model, while reporting P2106 fault; VCP inoperative	No malfunction condition detected.
P2138	Electronic Throttle Pedal Position Sensors 1 and 2 Related Malfunctions	System enters "restrictions on engine performance" model, while reporting P2106 fault; VCP inoperative	No malfunction condition detected.
P0011	Intake VCP Valve Timing Response Lag	No	No malfunction condition detected.
P0012	Intake VCP Camshaft Valve Timing Error	VCP Inoperative	No malfunction condition detected.
P0016	Intake VCP Camshaft Gear Learning Bias Out Of Range	OCV cleaning function turned on; VCP inoperative	No malfunction condition detected.
P0026	Intake VCP Hydraulic Control Valve	OCV cleaning function turned on, if the cleaning is unsuccessful, VCP inoperative	No malfunction condition detected.
P0076	Intake VCP Hydraulic Control Valve Coil Low Voltage or Open Circuit	VCP Inoperative	No malfunction condition detected.

DTC Code	DTC Code Diagnostic Information	Fail-Safe Mode	Restore Conditions
P0077	Intake VCP Hydraulic Control Valve Coil High Voltage	VCP Inoperative	Next key cycle, no malfunction condition detected.
P0340	Intake VCP Camshaft Position Sensor Status Diagnostic	VCP Inoperative, Ignition Angle	No malfunction condition detected.
P0341	Intake VCP Target Diagnostic	VCP Inoperative, Ignition Angle	No malfunction condition detected.
P0106	Intake Pressure / Throttle Position Fault	(1) Key On, the system uses the default intake manifold pressure 100 kPa (2) Engine running, the system uses the estimated intake manifold pressure value	No malfunction condition detected.
P0107	Intake Air Pressure Sensor Circuit Low Voltage or Open Circuit	(1) Key On, the system uses the default intake manifold pressure 100 kPa (2) Engine running, the system uses the estimated intake manifold pressure value	No malfunction condition detected.
P0108	Intake Air Pressure Sensor Circuit High Voltage		
P0112	Intake Air Temperature Sensor Circuit Low Voltage	System uses the default intake air temperature 20°C	No malfunction condition detected.
P0113	Intake Air Temperature Sensor Circuit High Voltage or Open Circuit		
P0117	Coolant Temperature Sensor Circuit Low Voltage	(1) System calculates the engine coolant temperature, up to 98°C, based on intake air temperature and when Key On and the engine running time (2) There is a malfunction present, high or Low-Speed fan turned on.	No malfunction condition detected.
P0118	Coolant Temperature Sensor Circuit High Voltage or Open Circuit		
P0131	Pre-Catalytic Oxygen Sensor Short To Low Voltage	Open Loop Control	No malfunction condition detected.
P0132	Pre-Catalytic Oxygen Sensor Short To High Voltage	Open Loop Control	No malfunction condition detected.
P0133	Pre-Catalytic Oxygen Sensor Response Too Slow	No	No malfunction condition detected.
P0134	Pre-Catalytic Oxygen Sensor Open Circuit	Open Loop Control	No malfunction condition detected.



DTC Code	DTC Code Diagnostic Information	Fail-Safe Mode	Restore Conditions
P0135	Pre-Catalytic Oxygen Sensor Heater Malfunction	Open Loop Control; Pre-Catalytic Oxygen Sensor Heater Inoperative	Next key cycle, no malfunction condition detected.
P1167	Pre-Catalytic Oxygen Sensor Indicating Mixture Too Rich During Deceleration	No	No malfunction condition detected.
P1171	Pre-Catalytic Oxygen Sensor Indicating Mixture Too Lean During Acceleration	No	No malfunction condition detected.
P0137	Post-Catalytic Oxygen Sensor Short To Low Voltage	No	No malfunction condition detected.
P0138	Post-Catalytic Oxygen Sensor Short To High Voltage	No	No malfunction condition detected.
P0140	Post-Catalytic Oxygen Sensor Circuit Open	No	No malfunction condition detected.
P0141	Post-Catalytic Oxygen Sensor Heater Malfunction	Post-Catalytic Oxygen Sensor Heater Inoperative	Next key cycle, no malfunction condition detected.
P0171	Mixture Too Lean When Non-idling	No	No malfunction condition detected.
P0172	Mixture Too Rich When Non-idling	No	No malfunction condition detected.
P2187	Mixture Too Lean When idling	No	No malfunction condition detected.
P2188	Mixture Too Rich When idling	No	No malfunction condition detected.
P0230	Fuel Pump Relay Malfunction	Vehicle can not start.	(1) Open circuit or short to ground, no malfunction condition detected. (2) Short to power supply. Next key cycle, no malfunction condition detected.
P0261	Fuel Injector 1 Circuit Low Voltage	Prolonged malfunction, reporting misfire (P0300); system enters open loop fuel control.	No malfunction condition detected.
P0264	Fuel Injector 2 Circuit Low Voltage		
P0267	Fuel Injector 3 Circuit Low Voltage		
P0270	Fuel Injector 4 Circuit Low Voltage		
P0262	Fuel Injector 1 Circuit High Voltage		Next key cycle, no malfunction condition detected.
P0265	Fuel Injector 2 Circuit High Voltage		
P0268	Fuel Injector 3 Circuit High Voltage		
P0271	Fuel Injector 4 Circuit High Voltage		

DTC Code	DTC Code Diagnostic Information	Fail-Safe Mode	Restore Conditions
P0300	One or More Cylinder Misfire	Catalytic converter damaged, the system enters open loop control. in certain operating conditions, fault lamp flashes.	No malfunction condition detected.
P0324	Knock Control System Malfunction	Ignition Back Angle	Next key cycle, no malfunction condition detected.
P0325	Knock Sensor No Signal	Ignition Back Angle	Next key cycle, no malfunction condition detected.
P0335	Crankshaft Position Sensor Circuit No Signal	Vehicle can not start.	No malfunction condition detected.
P0336	Crankshaft Position Sensor Circuit Signal Interference	Ignition Back Angle; VCP Inoperative	No malfunction condition detected.
P1336	58-Tooth Gear Error Not Learned	No misfire diagnostic	New tooth learn successful
P0351	Ignition Coil 1 Malfunction (Cylinder No.2 and 3)	Prolonged Malfunction, Reporting Misfire (P0300)	(1) Open Circuit or Short To Ground, No Malfunction Condition Detected.
P0352	Ignition Coil 2 Malfunction (Cylinder No.1 and 4)		(2) Short to power supply. Next key cycle, no malfunction condition detected.
P0420	Catalytic Converter Low Conversion Efficiency	No	No malfunction condition detected.
P0458	Canister Solenoid Valve Short Circuit To Low Voltage or Open Circuit	No	No malfunction condition detected.
P0459	Canister solenoid valve circuit short to high voltage	No	Next key cycle, no malfunction condition detected.
P0480	Low-Speed Fan Malfunction	No	No malfunction condition detected.
P0481	High-Speed Fan Malfunction	No	Next key cycle, no malfunction condition detected.
P0502	Vehicle Speed Sensor No Signal	Malfunctions Reported, Engine idle	No malfunction condition detected.
P0506	Idle Speed Low	No	No malfunction condition detected.
P0507	Idle Speed High	No	No malfunction condition detected.
P0562	System Voltage Low	Other Diagnostics Shielded; Idle Speed Increased; VCP Inoperative	No malfunction condition detected.
P0563	System Voltage High	Other Diagnostics Shielded; VCP Inoperative	No malfunction condition detected.

DTC Code	DTC Code Diagnostic Information	Fail-Safe Mode	Restore Conditions
P0601	ROM Error	Vehicle can not start.	Next key cycle, no malfunction condition detected.
P0602	ECM Processor Malfunction	Vehicle can not start.	Next key cycle, no malfunction condition detected.
P0604	RAM error	Vehicle can not start.	Next key cycle, no malfunction condition detected.
P0646	Air-Conditioning Clutch Relay Short To Low Voltage or Open Circuit	No	No malfunction condition detected.
P0647	Air-Conditioning Clutch Relay Short To High Voltage	No	Next key cycle, no malfunction condition detected.
P0650	Fault Indicator Malfunction	No	No malfunction condition detected.
P0685	Main Relay Malfunction	Vehicle may not start.	(1) Open circuit, no malfunction condition detected. (2) Short to power supply. Next key cycle, no malfunction condition detected.
P2610	LPC Malfunction	No	No malfunction condition detected.
P0633	Alarm does not learn from malfunction.	SVS lamp flashing; vehicle can not start.	Next key cycle, IMMO learn successful, or No malfunction condition detected.
U0167	Anti-theft Device No Response		
U0426	Anti-theft Device Authentication Failure		

### 2.12.7.9 Data Stream List

By reading the "Data Stream List" on the scan tool, you can check switches, sensors, actuators working state without removing any parts. Before the control system diagnosis, observing and analyzing data is the first step, so that the diagnose time could be shortened.

#### Note

Data under normal conditions is listed in the following table for reference only. Do not determine whether a part is faulty solely based on these reference values. Under normal circumstances you can compare the vehicle that needs to be repaired with a normal working vehicle in the same state to determine the current vehicle diagnostic data is normal or not.

1. Run the engine to reach normal working temperature.
2. Turn the ignition switch to "OFF" position.
3. Connect the scan tool.
4. Turn the ignition switch to "ON" position.
5. Select "Engine"/"Read data stream."

6. Refer to the table and check all the data.

Data Stream Name	Ignition Switch "ON"	Idle Speed	2,500 rpm When
Engine Speed	0 rpm	795 rpm	2,500 rpm
Vehicle Speed	0	0	0
Current Computing Load	0.0%	100%	100%
Coolant Temperature	93°C (199 °F)	93°C (199 °F)	93°C (199 °F)
Current Short-Term Fuel Adjustment (Bank1)	100%	90.62%	93.75%
Current Long-Term Fuel Adjustment (Bank1)	92.97%	92.97%	99.22%
Absolute Boost Pressure	100 kPa	47 kPa	27 kPa
Intake Air Temperature	54°C (129 °F)	47°C (117 °F)	52°C (126 °F)
Absolute Throttle Position A	80.78%	85.10%	82.75%
Ignition Voltage	12.3 V	13.3 V	13.7 V
Oxygen Sensor 1 Installation Location	Yes	Yes	Yes
Oxygen Sensor 2 Installation Location	Yes	Yes	Yes
Pre-Catalytic Oxygen Sensor Voltage	0.08 V	0.07-0.81 V	0.067-0.81 V
Pre-Catalytic Oxygen Sensor Short-Term Fuel Adjustment	100%	92.19%	94.53%
Post-Catalytic Oxygen Sensor Voltage	0.71 V	1.28 V	0.68 V
Post-Catalytic Oxygen Sensor Short-Term Fuel Adjustment	99.22%	99.22%	99.22%
Current Instruction to Cylinder No.1 Ignition Advance Angle	4 °	2 °	33 °
Vehicle Driving Distance When MIL Lamp Light	0 km	0 km	0 km
Relative Throttle Position	6.27%	1.57%	3.92%
Absolute Throttle Position B	18.82%	14.12%	16.86%
Acceleration Pedal Position D	14.51%	14.51%	18.43%
Acceleration Pedal Position E	7.06%	7.06%	9.02%
Throttle Position	8.63%	1.96%	5.49%
Vehicle Driving Time When MIL Lamp Light	0 min	0 min	0 min
Air-Conditioning Pressure Switch Voltage	0 V	0 V	0 V
Pre-Catalytic Oxygen Sensor Heating	78 mV	143-706 mV	14 mV
Post-Catalytic Oxygen Sensor Heating	703 mV	755 mV	660 mV
Fuel Sensor Voltage	5 V	5 V	5 V
Coolant Temperature (Start)	87°C (189 °F)	87°C (189 °F)	87°C (189 °F)

Data Stream Name	Ignition Switch "ON"	Idle Speed	2,500 rpm When
EVAP Valve Duty Cycle	0%	6.25%	0%
Fuel Adjustment Cell	19 cell	18 cell	2 cell
Target Idle Speed	935 rpm	737 rpm	887 rpm
Injection	8.67 ms	2.56 ms	1.82 ms
Atmospheric Pressure	100.37 kPa	100.37 kPa	100.37 kPa
Air-Fuel Ratio	11.5	14.5	14.5
Engine Running Time	0 s	0 s	0 s
Calculated Catalyst Temperature	600°C (1112 °F)	498°C (928 °F)	591°C (1096 °F)
Detonation Delay	0 °	0 °	0 °
Cylinder No.2 Currently Misfire	0 count	0 count	0 count
Cylinder No.1 Currently Misfire	0 count	0 count	0 count
Cylinder No.3 Currently Misfire	0 count	0 count	0 count
Cylinder No.4 Currently Misfire	0 count	0 count	0 count
Engine Odometer	0 km	0 km	0 km
ETC Acceleration Pedal Position	0%	0%	2.22%
Intake Valve Opening (As Opposed To LWOT)	8.66%	2.02%	5.55%
ETC Pedal Position Sensor 1	0%	0%	4.16%
ETC Pedal Position Sensor 2	0%	0%	4.09%
ETC Throttle Position Sensor 1	6.62%	1.54%	4.21%
ETC Throttle Position Sensor 2	6.55%	1.54%	4.21%
Fuel Level Output	4.71%	4.71%	4.71%
Pre-Catalytic Oxygen Sensor - Rich To Lean Average Time	0.0 ms	0.0 ms	0.0 ms
Intake Air Temperature At Startup	55°C (131 °F)	49°C (120 °F)	49°C (120 °F)
Intake Air Pressure	0.0 kPa	0.0 kPa	0.0 kPa
TEC Attempt To Convert To Lean	0 count	0 count	0 count
TEC ideal Throttle Position	8.82%	2.15%	5.76%
VVT Target Location	0 °	0 °	0 °
ETC Unpowered Throttle Position	8.40%	8.44%	8.44%
Pre-Catalytic Oxygen Sensor Heating	0.70 E	0.80 E	0.50 E
Post-Catalytic Oxygen Sensor Heating	0.42 E	0.44 E	0.34 E

### 2.12.7.10 Action Test Table

By reading the "Action Test Table" on the scan tool, you can check switches, sensors, actuators working state without removing any parts. Before the control system diagnosis, carrying out action test is a prerequisite, so that the diagnose time could be shortened.

#### Note

Data under normal conditions is listed in the following table for reference only. Do not determine whether a part is faulty solely based on these reference values. Under normal circumstances you can compare the vehicle that needs to be repaired with a normal working vehicle in the same state to determine the current vehicle diagnostic data is normal or not.

1. Run the engine to reach normal working temperature.
2. Turn the ignition switch to "OFF" position.
3. Connect scan tool.
4. Turn the ignition switch to "ON" position.
5. Select "engine" / "Action Test".
6. Refer to the following table to test.

Scan Tool Display Item	Test Component	Control Range	Diagnosis Description
Fault Indicator	Enable the engine fault indicator.	ON/OFF	When the engine is running (or) the ignition switch is turned on, with the signal accepted, the engine control module will request the fault indicator to light through the CAN bus. The fault indicator will be on or off in 3-5s.
Canister Control Valve	Enable the canister solenoid valve	0%, 50%, 100%	When the command is "ON" the solenoid valve will be on or off within 3-5s.
Fuel Pump	Enable the Fuel Pump	ON/OFF	<p><b>Note</b></p> <p>Carry out this test only when the vehicle speed is equal to zero and the vehicle speed sensor has no fault.</p> <p>This function controls the fuel pump relay. Fuel pump relay will be ON/OFF within 3-5s.</p>
Low-Speed Fan	Enable the Low-Speed cooling fan.	ON/OFF	<p><b>Note</b></p> <p>Carry out this test only when the engine coolant temperature is below 100°C (212 °F) and Air-Conditioning is not switched on.</p> <p>This function controls the Low-Speed cooling fan relay. When the instruction is received, the cooling fan will be on at high speed for 5 s.</p>

Scan Tool Display Item	Test Component	Control Range	Diagnosis Description
High-Speed Fan	Enable the High-Speed cooling fan	ON/OFF	<p><b>Note</b></p> <p>Carry out this test only when the engine coolant temperature is below 100°C (212 °F) and Air-Conditioning is not switched on.</p> <p>This function controls the High-Speed cooling fan relay. When the instruction is received, the cooling fan will be on at high speed for 5 s.</p>
Air-Conditioning Clutch	Enable the Air-Conditioning compressor clutch.	ON/OFF	<p><b>Note</b></p> <p>Carry out this test only when the ignition switch is at "ON" position and the engine is not running.</p> <p>This function controls Air-Conditioning compressor relay. When the instruction is "ON", the Air-Conditioning compressor relay will be on or off in 3-5 s.</p>
Ignition Advance Angle	Control the ignition advance angle	0, 45, 246, 255	-
Fuel Injector	Disable the fuel injection (Cylinder No.1, Cylinder No.2, Cylinder No.3, Cylinder No.4).	ON/OFF	-
BLM Learn	Fuel closed-loop learn	-	<p>Fuel closed-loop learn not allowed when the ignition switch is ON.</p> <p>Based on the software logic, decide whether to conduct relevant learn when the ignition switch is OFF.</p>
Fuel Open-Loop Control	ECM Open-Loop Control	ON/OFF	-
BLM Reset	Fuel Closed-Loop Learn	ON/OFF	All fuel closed-loop learn values reset to 1
Idle Catalyst Monitor	Enable catalyst monitor diagnostics	ON/OFF	-
ETC Motor	Electronic throttle body movements	0, 50%, 100%	-
Reset TPS Learn Value	Clear throttle position sensor learn value	-	-
Intake Camshaft Phasing Device	Used to control the VVT's current valve timing, the control parameter is not a percentage, but the target valve timing.	0, 30%, 60%	-
Intake Camshaft Valve Timing Control Device	VVT Control Valve Control Signal Duty Cycle Test	0, 50%, 100%	-

Scan Tool Display Item	Test Component	Control Range	Diagnosis Description
Expected idle	Control the idle speed	0,700 rpm, 800 rpm, 900 rpm, 1,000 rpm	-

### 2.12.7.11 Crankshaft Position Sensor (CKP) Learn

#### Note

After crankshaft position sensor replacement, ECM replacement or engine replacement, the crankshaft position sensor adaptive learn must be carried out. Otherwise the fault warning lamp will be always on, while ECM will record "P1336 58-tooth gear tolerance does not learn" DTC code.

Before the gear learn, the following conditions must be met:

1. Make sure the engine coolant temperature is above 60°C (140 °F)
2. Air-Conditioning switch is not turned on.
3. 10 s after start the engine.

Carry out the following steps when the above conditions are met:

Step 1	Connect scan tool.
--------	--------------------

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (d) Select the "engine" / gear to learn.

Next

Step 2	Carefully read the instructions attached to scan tool and press confirm key.
--------	--

Next

Step 3	Enter the learning interface, press start button.
--------	---

Next

Step 4	Press the acceleration pedal to 80% of the full travel and keep the pedal position.
--------	---

Next

Step 5	Make the engine speed jumping back and forth between 1,300 rpm and 4,500 rpm 3-5 cycles, maintain the engine speed at above 4,000 rpm.
--------	--

Next

Step 6	Release the acceleration pedal, Turn the ignition switch to "OFF" position.
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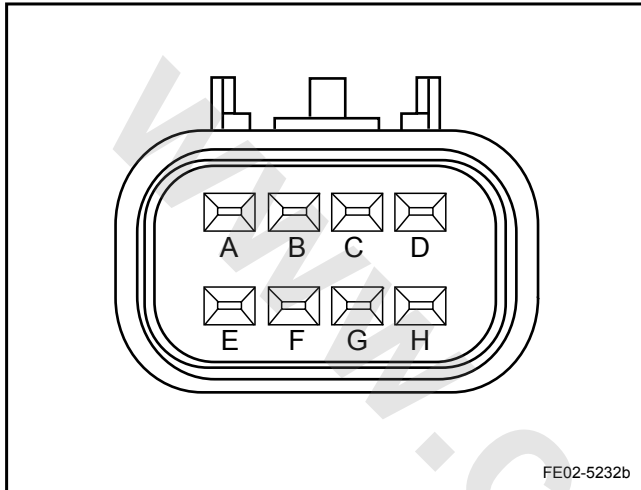
Next

Step 7 Complete the learn, clear the DTC code.

### 2.12.7.12 Electronic Throttle Body (ETC) Check

Electronic throttle body consists of two throttle position sensors and a throttle body drive motor.

#### 1. Electronic Throttle Body Connector View and Functions:



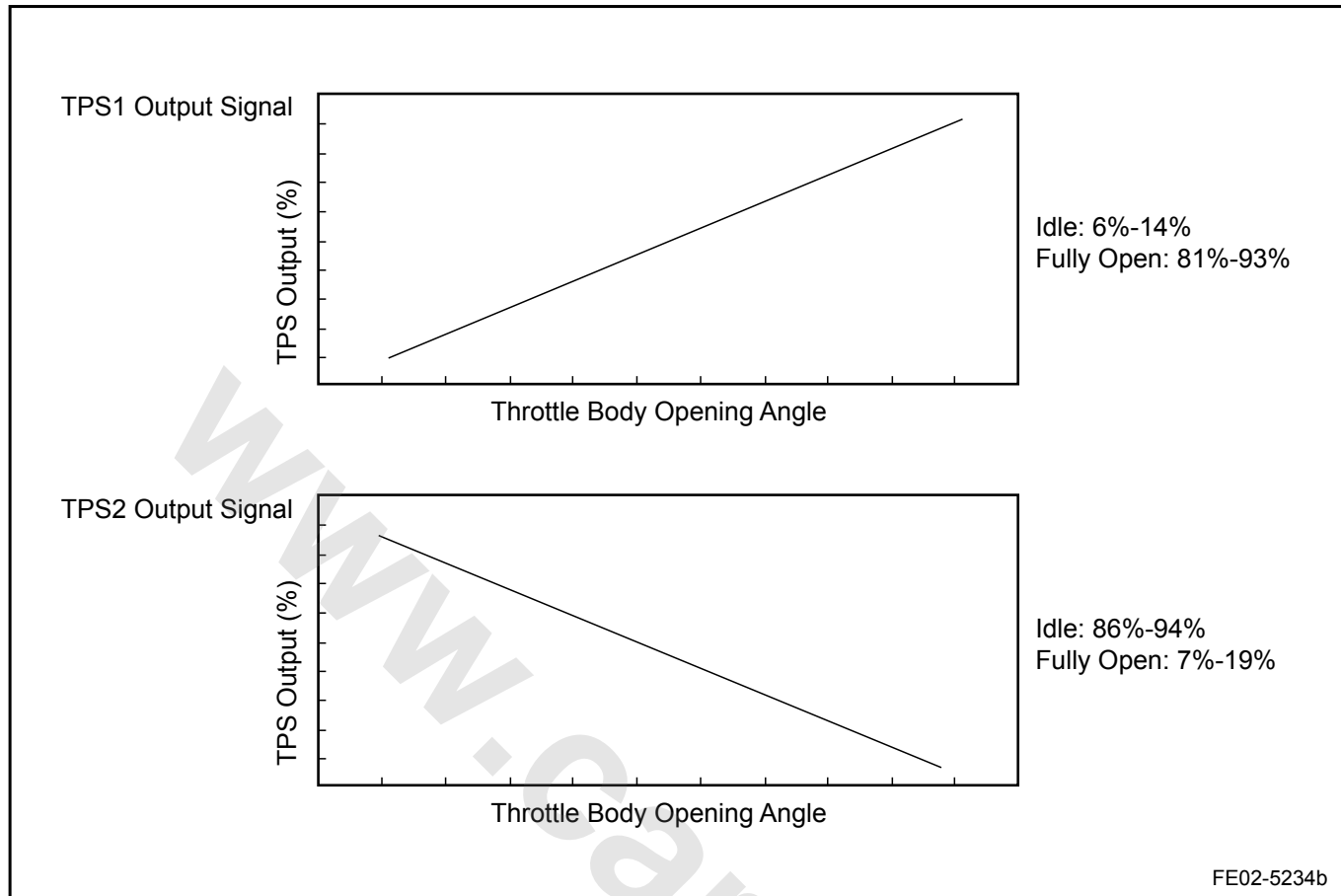
Terminal ID	ECM Related Terminal No.	Function
A	EO01 (3)	Low Reference Voltage
B	EO01 (39)	TPS1 Signal
C	EO01 (26)	TPS1 Signal
D	EO01 (4)	5V Reference Voltage
E	EO01 (67)	Throttle Body Motor Control (Plus)
F	-	Empty
G	-	Empty
H	EO01 (61)	Throttle Body Motor Control (Minus)

#### 2. Throttle Position Sensor Technical Specifications

As one of the system security measures, the system consists of dual output throttle position sensors. One throttle position sensor output voltage signal increases as the throttle body opening increases, while the other throttle position sensor output voltage signal decreases as the throttle body opening increases.

Resistance Between Terminals A and D:  $1.9 \pm 0.9 \text{ k}\Omega$

TPS Sensor Output Signal Diagram:



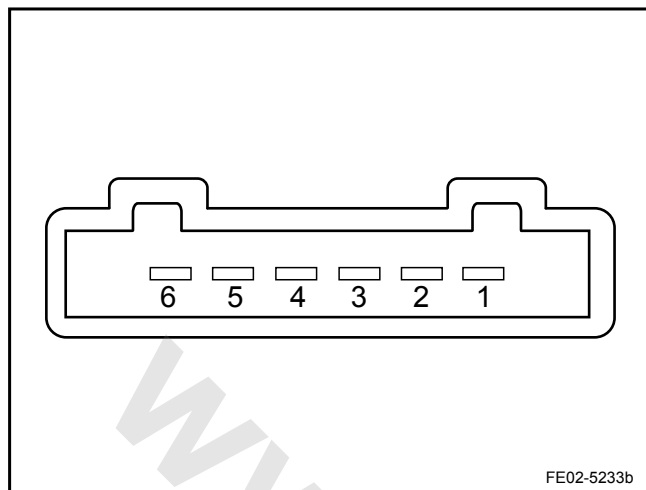
#### Note

When test the above TPS sensor output signals, use an oscilloscope. the output waveform of the circuit should be smooth and without other waveforms. If the throttle body rotates to an angle and the output signal drops to zero or drops rapidly, replace the ETC. ETC is an assembly. Do not disassemble it to repair.

#### 2.12.7.13 Acceleration Pedal Position Sensor (APP) Check

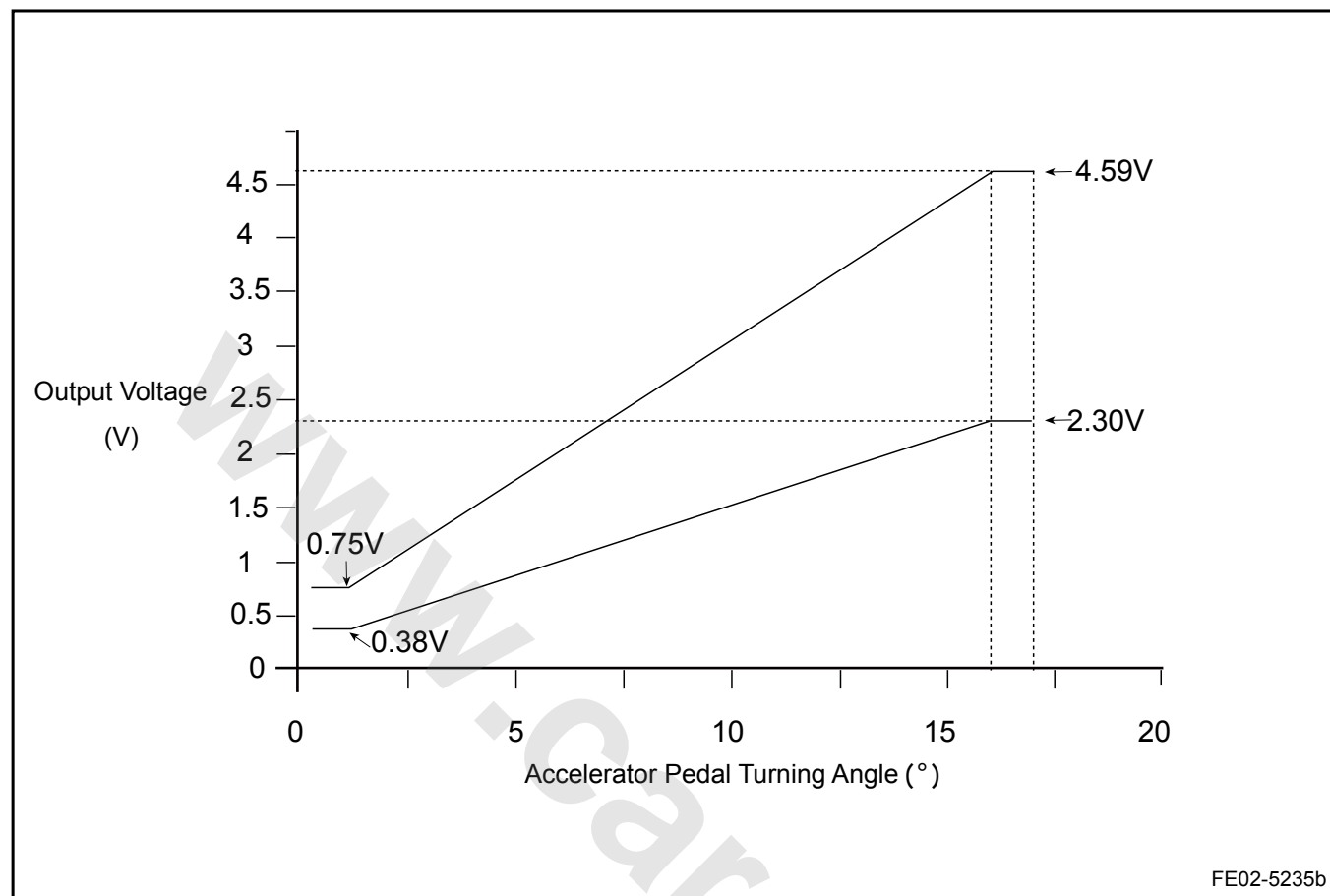
As one of the system security measures, acceleration pedal position sensor is designed to have dual outputs. Two sensors output voltage signals increase as the acceleration pedal position increases.

## 1. Acceleration Pedal Position Sensor Connector End View and Function



Terminal ID	ECM Related Terminal No.	Function
1	EO36 (38)	Sensor No.2 Reference Voltage
2	EO36 (36)	Sensor No.1 Reference Voltage
3	EO36 (37)	Sensor No.1 Low Reference Voltage
4	EO36 (12)	Sensor No.1 Output Signal
5	EO36 (39)	Sensor No.2 Low Reference Voltage
6	EO36 (27)	Sensor No.2 Output Signal

## 2. Acceleration Pedal Position Sensor Technical Specifications



## Note

When test the above APP sensor output signals, use an oscilloscope. the output waveform of the circuit should be smooth and without other waveforms. If the acceleration pedal rotates to an angle and the output signal drops to zero or drops rapidly, replace the APP. APP is an assembly. Do not disassemble it to repair.

## 2.12.7.14 DTC Code Index

DTC code	Description	Diagnostic Procedures
P0011	Intake VCP Valve Timing Response Lag	Refer to <a href="#">2.12.7.15 DTC P0011 P0012 P0016 P0026</a>
P0012	Intake VCP Camshaft Valve Timing Error	
P0016	Intake VCP Camshaft Gear Learn Bias Out Of Range	
P0026	Intake VCP Hydraulic Control Valve	
P0068	Electronic Throttle Air Flow Error	Refer to <a href="#">2.12.7.16 DTC P0068 P0106</a>
P0076	Intake VCP Hydraulic Control Valve Coil Low Voltage or Open Circuit	Refer to <a href="#">2.12.7.17 DTC P0076 P0077</a>
P0077	Intake VCP Hydraulic Control Valve Coil High Voltage	
P0106	Intake Pressure / Throttle Position Fault	Refer to <a href="#">"2.12.7.16 DTC P0068 P0106"</a>

DTC code	Description	Diagnostic Procedures
P0107	Intake Air Pressure Sensor Circuit Low Voltage or Open Circuit	Refer to <a href="#">2.12.7.18 DTC P0107 P0108</a>
P0108	Intake Air Temperature Sensor Circuit High Voltage	Refer to <a href="#">2.12.7.18 DTC P0107 P0108</a>
P0112	Intake Air Temperature Sensor Circuit Low Voltage	Refer to <a href="#">2.12.7.19 DTC P0112 P0113</a>
P0113	Intake Air Temperature Sensor Circuit High Voltage or Open Circuit	
P0117	Coolant Temperature Sensor Circuit Low Voltage	Refer to <a href="#">2.12.7.20 DTC P0117 P0118</a>
P0118	Coolant Temperature Sensor Circuit High Voltage or Open Circuit A	
P0122	Electronic Throttle Position Sensor 1 Circuit Low Voltage	Refer to <a href="#">2.12.7.21 DTC P0122 P0123</a>
P0123	Electronic Throttle Position Sensor Circuit 1 High Voltage	
P0131	Pre-Catalytic Oxygen Sensor Circuit Short To Low Voltage	Refer to <a href="#">2.12.7.22 DTC P0131 P0132 P0133 P0134</a> "
P0132	Pre-Catalytic Oxygen Sensor Circuit Short To High Voltage	
P0133	Pre-Catalytic Oxygen Sensor Response Too Slow	
P0134	Pre-Catalytic Oxygen Sensor Circuit Open	
P0135	Pre-Catalytic Oxygen Sensor Heater Malfunction	Refer to <a href="#">2.12.7.23 DTC P0135</a>
P0137	Post-Catalytic Oxygen Sensor Circuit Short To Low Voltage	Refer to <a href="#">2.12.7.24 DTC P0137 P0138 P0140</a> "
P0138	Post-Catalytic Oxygen Sensor The Short-Circuit To High Voltage	
P0140	Post-Catalytic Oxygen Sensor Circuit Open	
P0141	Post-Catalytic Oxygen Sensor Heater Malfunction	Refer to <a href="#">2.12.7.25 DTC P0141</a>
P0171	Mixture Too Lean	Refer to <a href="#">2.12.7.26 DTC P0171 P0172 P1167 P1171 P2187 P2188</a>
P0172	Mixture Too Rich	
P0222	Electronic Throttle Position Sensor 2 Circuit Low Voltage	Refer to <a href="#">2.12.7.27 DTC P0222 P0223</a>
P0223	Electronic Throttle Position Sensor 2 Circuit High Voltage	
P0230	Fuel Pump Relay Malfunction	Refer to <a href="#">2.12.7.28 DTC P0230</a>
P0261	Fuel Injector 1 Low Voltage Fault	Refer to <a href="#">2.12.7.29 DTC P0261 P0262</a>
P0262	Fuel Injector 1 High Voltage Fault	
P0264	Fuel Injector 2 Low Voltage Fault	Refer to <a href="#">2.12.7.30 DTC P0264 P0265</a>
P0265	Fuel Injector 2 High Voltage Fault	
P0267	Fuel Injector 3 Low Voltage Fault	Refer to <a href="#">2.12.7.31 DTC P0267 P0268</a>

DTC code	Description	Diagnostic Procedures
P0268	Fuel Injector 3 High Voltage Fault	
P0270	Fuel Injector 4 Low Voltage Fault	Refer to <a href="#">2.12.7.32 DTC P0270 P0271</a>
P0271	Fuel Injector 4 High Voltage Fault	
P0300	One or More Cylinder Misfire	Refer to <a href="#">2.12.7.33 DTC P0300</a>
P0324	Knock Control System Malfunction	Refer to <a href="#">2.12.7.34 DTC P0324 P0325</a>
P0325	Knock Sensor Malfunction	
P0335	Crankshaft Position Sensor Circuit No Signal	Refer to <a href="#">2.12.7.35 DTC P0335 P0336</a>
P0336	Crankshaft Position Sensor Circuit Signal Interference	
P0340	Intake VCP Camshaft Position Sensor Status Diagnostic	Refer to <a href="#">2.12.7.36 DTC P0340 P0341</a>
P0341	Intake VCP Target Diagnostic	
P0351	Ignition Coil 1 Malfunction	Refer to <a href="#">2.12.7.37 DTC P0351 P0352</a>
P0352	Ignition Coil 1 Malfunction	
P0420	Catalytic Converter Low Conversion Efficiency	Refer to <a href="#">2.12.7.38 DTC P0420</a>
P0458	Canister Solenoid Valve Circuit Short To Low Voltage or Open	Refer to <a href="#">2.12.7.39 DTC P0458 P0459</a>
P0459	Canister Solenoid Valve Circuit Short To High Voltage	
P0480	Low-Speed Fan Malfunction	Refer to <a href="#">2.12.7.40 DTC P0480 P0481</a>
P0481	High-Speed Fan Malfunction	
P0502	Vehicle Speed Sensor No Signal	Refer to <a href="#">2.12.7.41 DTC P0502</a>
P0506	Idle Speed Too Low	Refer to <a href="#">2.12.7.42 DTC P0506 P0507</a>
P0507	Idle Speed Too High	
P0562	System Voltage Low	Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>
P0563	System Voltage High	
P0571	Brake Lamp Switch Status No Change During Braking	Refer to <a href="#">2.12.7.44 DTC P0571</a>
P0601	ROM error	Refer to <a href="#">2.12.7.45 DTC P0601 P0602 P0604 P0606 P060A P1516 P2101</a>
P0602	ECM Processor Malfunction	
P0604	RAM Error	
P0606	ECM Processor Malfunction	
P060A	ECM Programming Errors	
P0641	ETC Reference Voltage A Amplitude Fault	Refer to <a href="#">2.12.7.46 DTC P0641 P0651</a>
P0646	Air-Conditioning Clutch Relay Circuit Short To Low Voltage or Open	Refer to <a href="#">2.12.7.47 DTC P0646 P0647</a>

DTC code	Description	Diagnostic Procedures
P0647	Air-Conditioning Clutch Relay Circuit Short To High Voltage	
P0650	Fault Indicator Malfunction	Refer to <a href="#">2.12.7.48 DTC P0650</a>
P0651	ETC Reference Voltage B Amplitude Fault	Refer to <a href="#">2.12.7.46 DTC P0641 P0651</a>
P0685	Main Relay Malfunction	Refer to <a href="#">2.12.7.49 DTC P0685</a>
P1167	Pre-Catalytic Oxygen Sensor Indicating Mixture Too Rich During Deceleration	Refer to <a href="#">2.12.7.26 DTC P0171 P0172 P1167 P1171 P2187 P2188</a>
P1171	Post-Catalytic Oxygen Sensor Indicating Mixture Too Lean During Acceleration	
P1336	58-Tooth Gear Error Not Learn	Refer to <a href="#">"2.12.7.11 Crankshaft Position Sensor (CKP) Learn"</a>
P1516	ETC-Driver Second-Order Diagnostic Error	Refer to <a href="#">2.12.7.45 DTC P0601 P0602 P0604 P0606 P060A P1516 P2101</a>
P2101	ETC-Driver Steady-Status Diagnostic Error	
P2104	Engine Controlled idle	Refer to <a href="#">2.12.7.50 DTC P2104 P2105 P2106 P2110</a>
P2105	Engine Shutdown	
P2106	Restrictions On Engine Performance	
P2110	Engine Power Management	
P2119	Electronic Throttle Return Malfunction	Refer to <a href="#">2.12.7.51 DTC P2119</a>
P2122	Electronic Throttle Pedal Position Sensor 1 Circuit Low Voltage	Refer to <a href="#">2.12.7.52 DTC P2122 P2123</a>
P2123	Electronic Throttle Pedal Position Sensor 1 Circuit High Voltage	
P2127	Electronic Throttle Pedal Position Sensor 2 Circuit Low Voltage	Refer to <a href="#">2.12.7.53 DTC P2127 P2128</a>
P2128	Electronic Throttle Pedal Position Sensor 2 Circuit High Voltage	
P2135	Electronic Throttle Position Sensors 1 and 2 Circuits Related Malfunctions	Refer to <a href="#">2.12.7.54 DTC P2135</a>
P2138	Electronic Acceleration Pedal Position Sensors 1 and 2 Circuits Related Malfunctions	Refer to <a href="#">2.12.7.55 DTC P2138</a>
P2187	Mixture Too Lean At idle	Refer to <a href="#">2.12.7.26 DTC P0171 P0172 P1167 P1171 P2187 P2188</a>
P2188	Mixture Too Rich At idle	
P2610	LPC Malfunction	Refer to <a href="#">2.12.7.56 DTC P2610</a>
P0633	Anti-theft Device Not Learn From Malfunctions	Refer to <a href="#">2.12.7.57 DTC P0633 U0167 U0426</a>
U0167	Anti-theft Device No Response	

DTC code	Description	Diagnostic Procedures
U0426	Anti-theft Device Authentication Failure	

### 2.12.7.15 DTC P0011 P0012 P0016 P0026

#### 1. DTC Descriptor:

DTC	P0011	Intake VCP Valve Timing Response Lag
DTC	P0012	Intake VCP Camshaft Valve Timing Error
DTC	P0016	Intake VCP Camshaft Gear Learn Bias Out Of Range
DTC	P0026	Intake VCP Hydraulic Control Valve

Intake camshaft position (CMP) actuator is connected to the intake camshaft and operated by the hydraulic pressure, which is provided by the oil pump in order to change the intake camshaft to the CKP (CKP) relative angle. Intake VVT solenoid valve power is provided from the main relay. ECM controls ground with a pulse-width modulation signal to control the engine oil flow to the camshaft position actuator. Oil pressure moves a security slide valve within the camshaft position actuator body at the front of the camshaft. When the safety slide valve moves, the oil is imported to the camshaft position actuator to rotate the camshaft. The intake camshaft camshaft actuator change the camshaft working angle up to 50 degrees.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0011	VVT Actual Angle and Target Angle Difference Too Great	<ol style="list-style-type: none"> <li>VVT Actual Angle and Target Angle Difference Too Great</li> <li>Camshaft completed self learn.</li> <li>Oil Temperature Between -40°C (-40 °F) and 120°C (248 °F).</li> <li>Coolant Temperature Between 0°C (32 °F) and 105°C (221 °F) .</li> <li>Engine Speed Between 600 rpm and 6,000 rpm.</li> <li>No VVT Circuit Fault Set.</li> </ol>	<ol style="list-style-type: none"> <li>Valve Timing</li> <li>VVT Solenoid Valve</li> <li>Solenoid Valve Filter</li> <li>VVT Actuator</li> <li>ECM</li> </ol>



DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0012 P0016 P0026	VVT is not at the default position	1. VVT actual angle and default angle difference greater than or equal to 20 degrees. 2. Camshaft completed self learn. 3. The engine running time is less than or equal to 1.5 s. 4. Oil Temperature Between -40°C (-40 °F) and 120°C (248 °F) . 5. Coolant Temperature Between 0°C (32 °F) and 105°C (221 °F) . 6. Engine Speed Between 600 rpm and 6,000 rpm. 7. No VVT circuit fault set.	1. Valve Timing 2. VVT Solenoid Valve 3. Solenoid Valve Filter 4. VVT Actuator 5. ECM

## 3. Schematic:

Refer to [2.12.7.17 DTC P0076 P0077](#).

## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Check whether there are control system DTC codes other than DTC P0011, P0012, P0016 and P0026.
--------	--

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Press the scan tool power button.
- Select the following menu items: Engine/Read DTC codes.
- Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC P0011, P0012, P0016, P0026	Yes
DTC codes other than DTC P0011, P0012, P0016 and P0026	No

No

Refer to [2.12.7.14 DTC Code Index](#)

Yes

Step 2	Check the following items.
--------	----------------------------

- Check whether the oil viscosity is normal and whether the oil is clean.
- Observe the Engine oil level. Engine oil level should be within the work range.

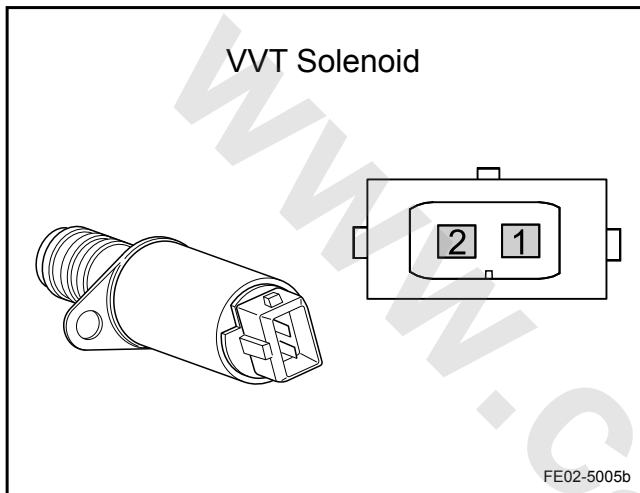
- (c) Check whether the oil is changed in a timely manner and whether the engine oil contains additives or viscosity is incorrect.

No

Replace engine oil and oil filter. When necessary, clean the engine lubrication system.

Yes

Step 3 Check VVT solenoid valve resistance.



- (a) Disconnect VVT solenoid valve wiring harness connector EN10.  
(b) Measure resistance between the two VVT solenoid valve terminals.

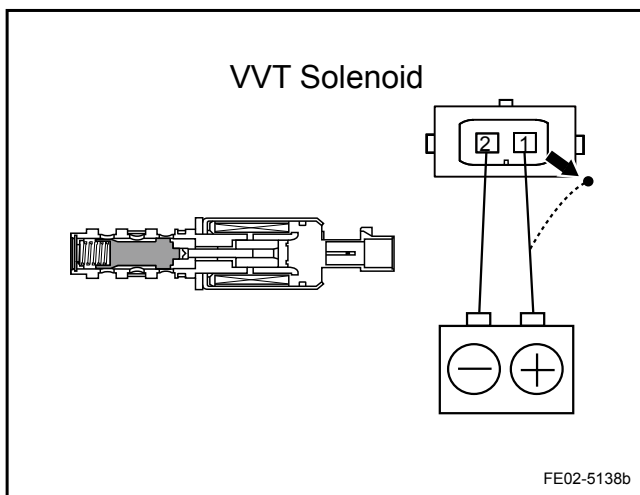
Standard Resistance: 10.5  $\Omega$  (68 °F) at 20°C

No

Replace the VVT solenoid valve. Refer to [2.2.8.4 VVT Solenoid Valve Replacement and Filter Cleaning](#).

Yes

Step 4 Check the VVT solenoid valve actuator.



Note: In the testing process, it is strictly prohibited Connect two wires directly together, otherwise it might cause an explosion, fire or other dangers.

- (a) Connect the battery positive terminal to VVT solenoid valve terminal No.1 and the negative terminal to the VVT solenoid valve terminal No.2.

- (b) Check the filter movement.

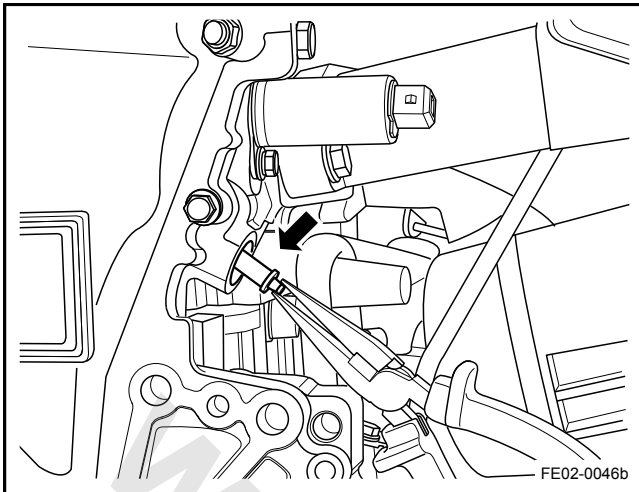
Does the filter move?

No

Replace the VVT solenoid valve. Refer to [2.2.8.4 VVT Solenoid Valve Replacement and Filter Cleaning](#).

Yes

Step 5 Check VVT solenoid valve filter.



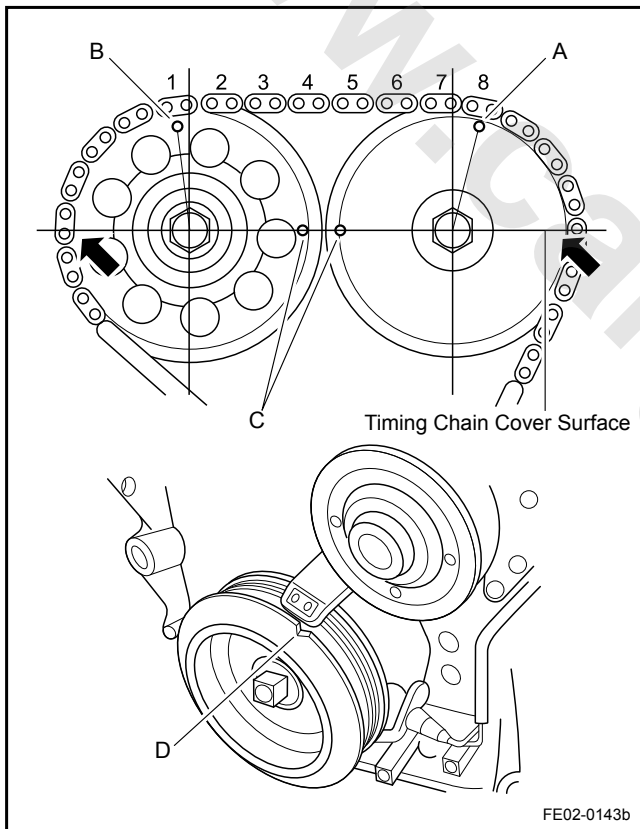
- Remove the VVT solenoid valve filter.
- Check whether the filter is blocked.
- Check whether the filter is damaged.
- Reinstall the VVT solenoid valve filter.

No

Clean VVT solenoid valve filter. If necessary, replace it.

Yes

Step 6 Check whether the timing system is normal.



- Remove the cylinder head cover.
  - Align point D shown in the graphic. Rotate the crankshaft pulley, so that the timing mark on the pulley groove aligns with "0" marked on the timing chain cover.
  - Check points C alignment shown in the graphic. The camshaft timing gear timing marks should be at horizontal positions as shown in the graphic.
  - Check points A,B alignment shown in the graphic. Make sure intake, exhaust camshaft gear timing marks distance between A and B is 8 timing chain sections.
  - Reinstall the cylinder head cover.
- Are timing marks shown as in the graphic?

No

Adjust the valve timing

Yes

Step 7 Replace the VVT actuator.

Next

Step 8 Check control system DTC codes.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.

- (c) Press the scan tool power button.
  - (d) Select the following menu items: Engine/Read DTC codes.
  - (e) Read DTC codes.
- Any DTC code?

No

Intermittent Fault. Refer to  
[2.12.7.4 Symptoms Table](#)

Yes

Step 9 System normal, diagnostic completed.

### 5. Repair Instructions:

Intake VVT Actuator can only be replaced as an assembly. Do not disassemble it and repair. VVT actuator replacement [2.6.8.12 Camshaft Replacement](#).

### 2.12.7.16 DTC P0068 P0106

#### 1. DTC Descriptor:

DTC	P0068	Electronic Throttle Air Flow Error
DTC	P0106	Intake Pressure / Throttle Position Fault

Intake Manifold Absolute Pressure (MAP) Sensor measures intake manifold pressure changes caused by the engine load, intake manifold vacuum and engine speed changes, and convert these changes into voltage output and send to the engine Control Module (ECM). At the same time the engine control module (ECM) compares the actual and expected intake manifold absolute pressure changes based on the throttle position opening change, to determine whether the intake manifold absolute pressure sensor responds to throttle position opening change and whether or not set DTC P0106.

Engine Control Module (ECM) detects air flow based on the intake manifold pressure sensor and intake air temperature sensors measured data and compare the air flow with expected air flow based on throttle position sensor. If the engine control module (ECM) detects that the intake manifold absolute pressure / temperature sensor detected actual air flow and expected air flow based on throttle position sensor is inconsistent, it will set DTC P0068.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0068	Difference between intake manifold absolute pressure / temperature sensor detected air flow and the expected air flow based on throttle position is 9g/s.	<ol style="list-style-type: none"> <li>1. Engine Running</li> <li>2. No Intake Air Pressure / Temperature Sensor Fault</li> <li>3. Duration Longer Than 4 s</li> </ol>	<ol style="list-style-type: none"> <li>1. Intake Manifold Pressure / Temperature Sensor</li> <li>2. Intake Manifold and Vacuum Tube</li> <li>3. Throttle</li> <li>4. ECM</li> </ol>

P0106	Atmospheric Pressure Greater Than The Maximum or Less Than The Minimum	<ol style="list-style-type: none"> <li>1. Engine Running</li> <li>2. No intake air pressure sensor, coolant temperature sensor, ETC throttle position sensor, fuel injector, ignition coil and misfire fault, etc.</li> <li>3. Coolant temperature is higher than 60°C (140 °F).</li> <li>4. Duration Longer Than 15 s</li> </ol>	
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## 3. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

Check the existence of the following conditions:

- (a) Damaged Intake Manifold Pressure / Temperature Sensor Housing Is, Broken Vacuum Tubes
- (b) Damaged Intake Manifold Pressure / Temperature Sensor Seals
- (c) Intake Manifold Pressure / Temperature Sensor Loose or Improperly Installed
- (d) Throttle seals is damaged, causing air leaks.

Next

Step 2	Check whether there is control system DTC code other than DTC P0068 P0106.
--------	--

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC P0068 P0106	No
DTC Code Other Than DTC P0068 P0106	Yes

Yes

[2.12.7.14 DTC Code Index](#)

No

Step 3	Check scan tool atmospheric pressure data.
--------	--

- (a) Compare the actual atmospheric pressure with atmospheric pressure parameter. Refer to "4G18-D Engine Control

System 2.2.1.3 Altitude and Atmospheric Pressure Correlation".

Similar?

No

Replace the intake manifold pressure / temperature sensor.

Yes

Step 4 Check the intake manifold pressure (MAP) sensor value with the engine running.

- (a) Start the engine.
- (b) When idling, observe the intake manifold pressure (MAP) sensor values.
- (c) During acceleration, observe the intake manifold pressure (MAP) sensor values.
- (d) Compare the above intake manifold pressure (MAP) sensor values.

Are above intake manifold pressure (MAP) sensor values changed?

Yes

Go to step 7

No

Step 5 Check the intake manifold pressure sensor.

- (a) Shut down the engine.
- (b) Turn the ignition switch to "ON".
- (c) Without disconnecting the intake manifold pressure sensor wiring harness connector, pull out the intake manifold pressure sensor from the intake manifold and use the vacuum pump. install the vacuum pump tube to the intake manifold pressure sensor.
- (d) Apply 50 kPa pressure on the intake manifold pressure sensor.

Observe whether the intake manifold pressure (MAP) sensor value changes?

No

Replace the intake manifold pressure / temperature sensor.

Yes

Step 6 Check the intake manifold pressure sensor installation port and vacuum tubes.

- (a) Check the intake manifold pressure sensor installation port and vacuum tubes.

Are the installation port and vacuum tubes blocked?

Yes

Clean and service the intake manifold and vacuum tubes.

No

Go to step 9

Step 7	Check whether the intake manifold pressure sensor parameter respond to changes.
--------	---

(a) Engine Running

(b) Change the throttle position, hold the throttle position, observe intake manifold pressure sensor parameter value. Whether the value rapidly changes with the throttle position changes.

Does intake manifold pressure (MAP) sensor value rapidly change with the throttle position changes?

Yes

Go to step 9

No

Step 8	Check the intake manifold pressure sensor installation port and vacuum tubes.
--------	---

(a) Check the intake manifold pressure sensor installation port and vacuum tubes.

Are the installation port and vacuum tubes blocked?

Yes

Clean and service the intake manifold and vacuum tubes.

No

Replace the intake manifold pressure sensor.

Step 9	Use scan tool to confirm whether the DTC code is stored again.
--------	--

(a) Connect scan tool to the datalink connector.

(b) Turn the ignition switch to "ON" position.

(c) Clear DTC code.

(d) Start and run the engine at idle speed to warm up the engine for at least 5 min.

(e) Read control system DTC code again to confirm that the system has no DTC code.

Yes

Diagnostic

No

Step 10	Check ECM power supply circuit.
---------	---------------------------------

(a) Check whether ECM power supply circuit is normal.

(b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 11	Replace ECM.
---------	--------------

(a) Replace ECM.

(b) Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 12 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 13 Diagnostic completed.

#### 5. Repair Instructions:

Replace intake pressure / temperature sensor. Refer to [2.2.8.7 Intake Air Pressure and Temperature Sensor Replacement](#).

Refer to [2.2.8.8 Engine Control Module Replacement](#) Replace ECM.

### 2.12.7.17 DTC P0076 P0077

#### 1. DTC Descriptor:

DTC	P0076	Intake VCP Hydraulic Control Valve Coil Low Voltage or Open Circuit
DTC	P0077	Intake VCP Hydraulic Control Valve Coil High Voltage

Intake camshaft position (CMP) actuator is connected to the intake camshaft and operated by the hydraulic pressure, which is provided by the oil pump in order to change the intake camshaft to the CKP (CKP) relative angle. Intake VVT solenoid valve power is provided from the main relay. ECM controls ground with a pulse-width modulation signal to control the engine oil flow to the camshaft position actuator. Oil pressure moves a security slide valve within the camshaft position actuator body at the front of the camshaft. When the safety slide valve moves, the oil is imported to the camshaft position actuator to rotate the camshaft. The intake camshaft camshaft actuator change the camshaft working angle up to 50 degrees.

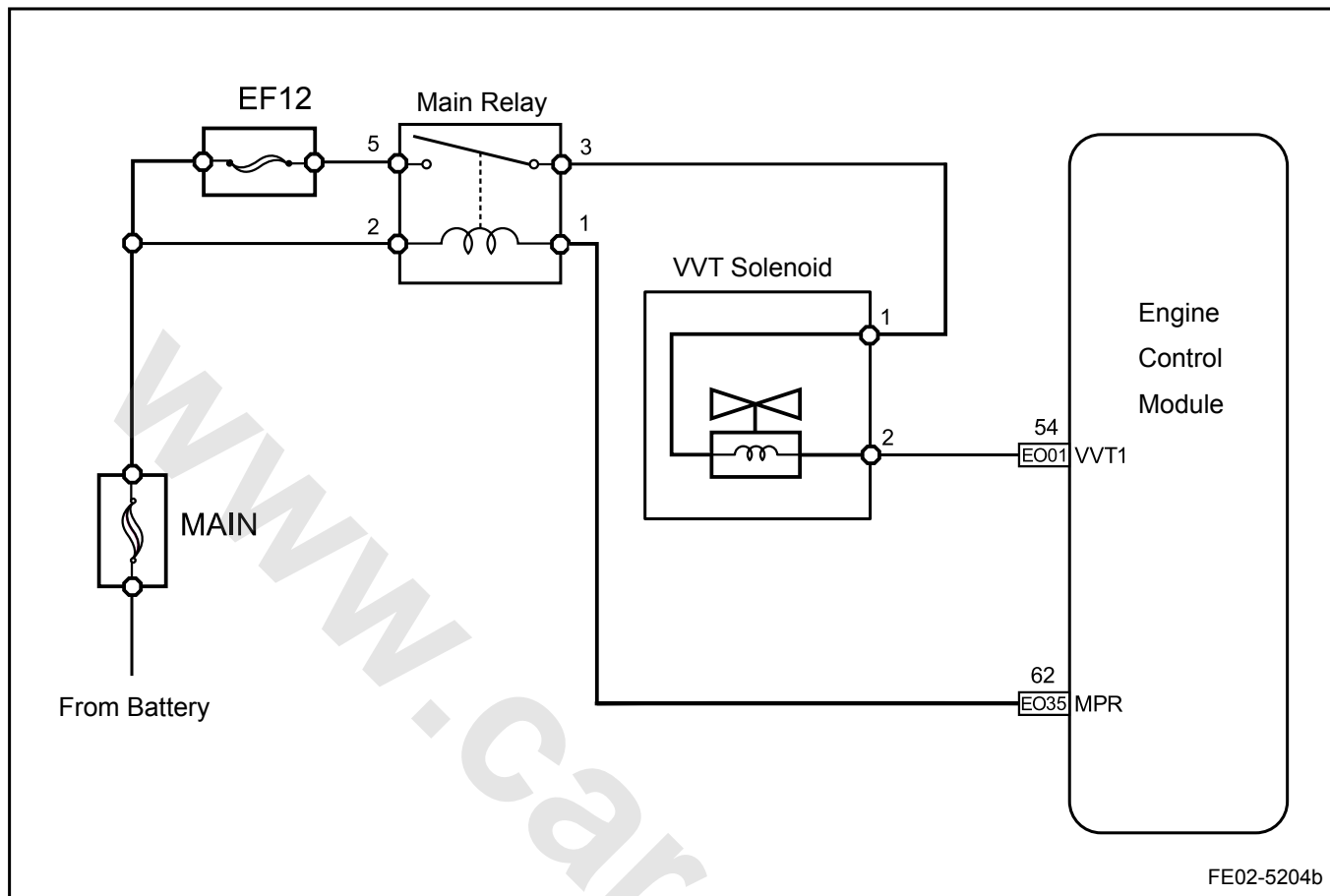
ECM controls the solenoid valve internal ground through ECM harness connector EN01 terminal No.2. There is a feedback circuit within ECM. Engine ECM monitors feedback signals to determine whether the control circuit is open, short to ground or short to voltage. If ECM detects the control circuit voltage is within the specified range when the control circuit is instructed to disconnect, it will set this DTC code.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0076 P0077	Hardware Circuit Checks	<ol style="list-style-type: none"> <li>1. Circuit Open</li> <li>2. Circuit Short To Power Supply</li> <li>3. Circuit Short To Ground</li> </ol>	<ol style="list-style-type: none"> <li>1. Solenoid Valve Circuit</li> <li>2. Solenoid Valve</li> <li>3. ECM</li> </ol>



## 3. Schematic:

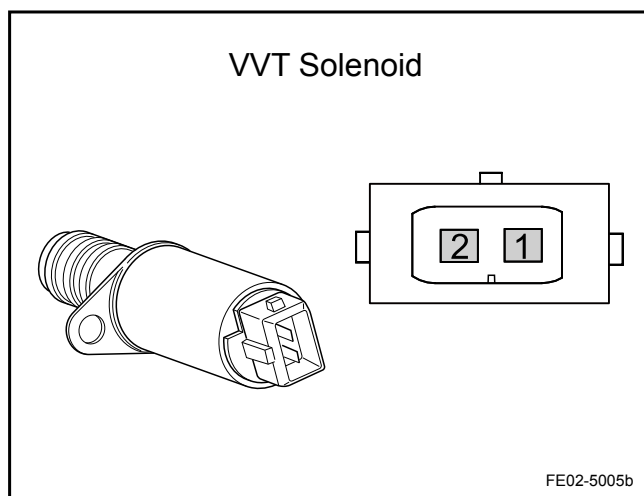


## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Measure VVT solenoid valve resistance.
--------	--



- Disconnect VVT solenoid valve wiring harness connector EN10.
- Measure resistance between the two VVT solenoid valve terminals.  
Standard Resistance: 9.4-10.6  $\Omega$  at 20°C(68 °F)
- Connect VVT solenoid valve wiring harness connector.

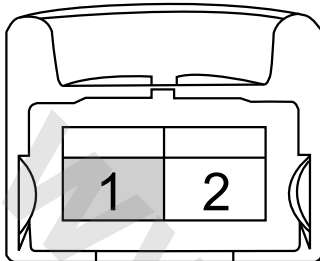
No

Replace VVT solenoid valve. Go to step 7

Yes

Step 2 Measure VVT solenoid valve working power supply.

VVT Solenoid Harness Connector EO10



FE02-5230b

- (a) Turn the ignition switch to "OFF" position.
  - (b) Disconnect VVT solenoid valve wiring harness connector EO10.
  - (c) Turn the ignition switch to "ON" position.
  - (d) Test EO10 connector terminal No.1 with a multimeter.  
Standard Voltage: 11-14 V
  - (e) Connect VVT solenoid valve wiring harness connector EO10.
- Results:

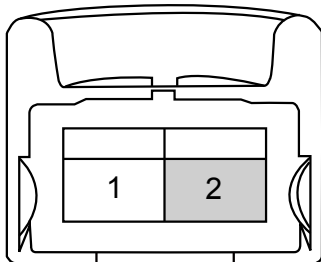
No

Check whether circuit between EN10 solenoid valve wiring harness connector terminal No.1 and main relay terminal No.3 is open or short to ground.

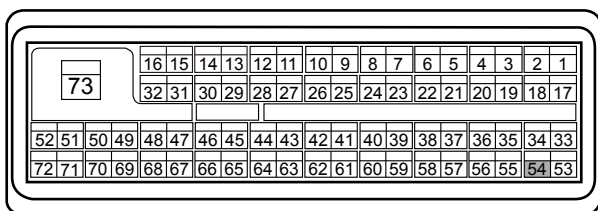
Yes

Step 3 Check VVT solenoid valve control circuit.

VVT Solenoid Harness Connector EO10



ECM Harness Connector EO01



FE02-5231b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect VVT solenoid valve wiring harness connector EO10.
- (c) Disconnect ECM harness connector EO01.
- (d) Measure resistance between VVT solenoid valve wiring harness connector EO10 terminal No.2 and ECM harness connector EO01 terminal No.2 with a multimeter. the Standard Value is in the table below.
- (e) Measure resistance between VVT solenoid valve wiring harness connector EO10 terminal No.2 and a reliable ground with a multimeter. the Standard Value is in the table below.
- (f) Turn the ignition switch to "ON" position, (Note: At this point EO01, EO10 connectors must be disconnected) Measure voltage between VVT solenoid valve wiring harness connector EO10 terminal No.2 and a reliable ground with a multimeter. the Standard Value is in the table below.

Test Connection	Standard Value
Resistance Between EO10 (2) and EO01 (2)	Less than 1 $\Omega$
Resistance Between EO10 (2) and Ground	10 k $\Omega$ or higher
Voltage Between EO10 (2) and Ground	Less than 0 V

No

Repair or replace wiring harness connectors.

Yes

Step 4 Check ECM power supply circuit.

- (a) Check whether ECM power supply circuit is normal.  
 (b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 5 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Next

Step 6 Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 7 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Road test the vehicle for at least 10 min.  
 (f) Read control system DTC code.  
 Verify that the system has no DTC code.

No

Intermittent Fault. Refer to [2.12.7.3 Intermittent Fault Check](#)

Yes

Step 8 Diagnostic completed.

## 5. Repair Instructions:

VVT solenoid valve replacement, refer to [2.2.8.4 VVT Solenoid Valve Replacement and Filter Cleaning](#).

## 2.12.7.18 DTC P0107 P0108

### 1. DTC Descriptor:

DTC	P0107	Intake Air Pressure Sensor Circuit Low Voltage or Open
DTC	P0108	Intake Air Pressure Sensor Circuit High Voltage

Intake Manifold Absolute Pressure (MAP) Sensor responds to the intake manifold pressure changes. Pressure varies as engine load changes. MAP sensor circuit consists of the following:

- 5 V Reference Voltage Circuit

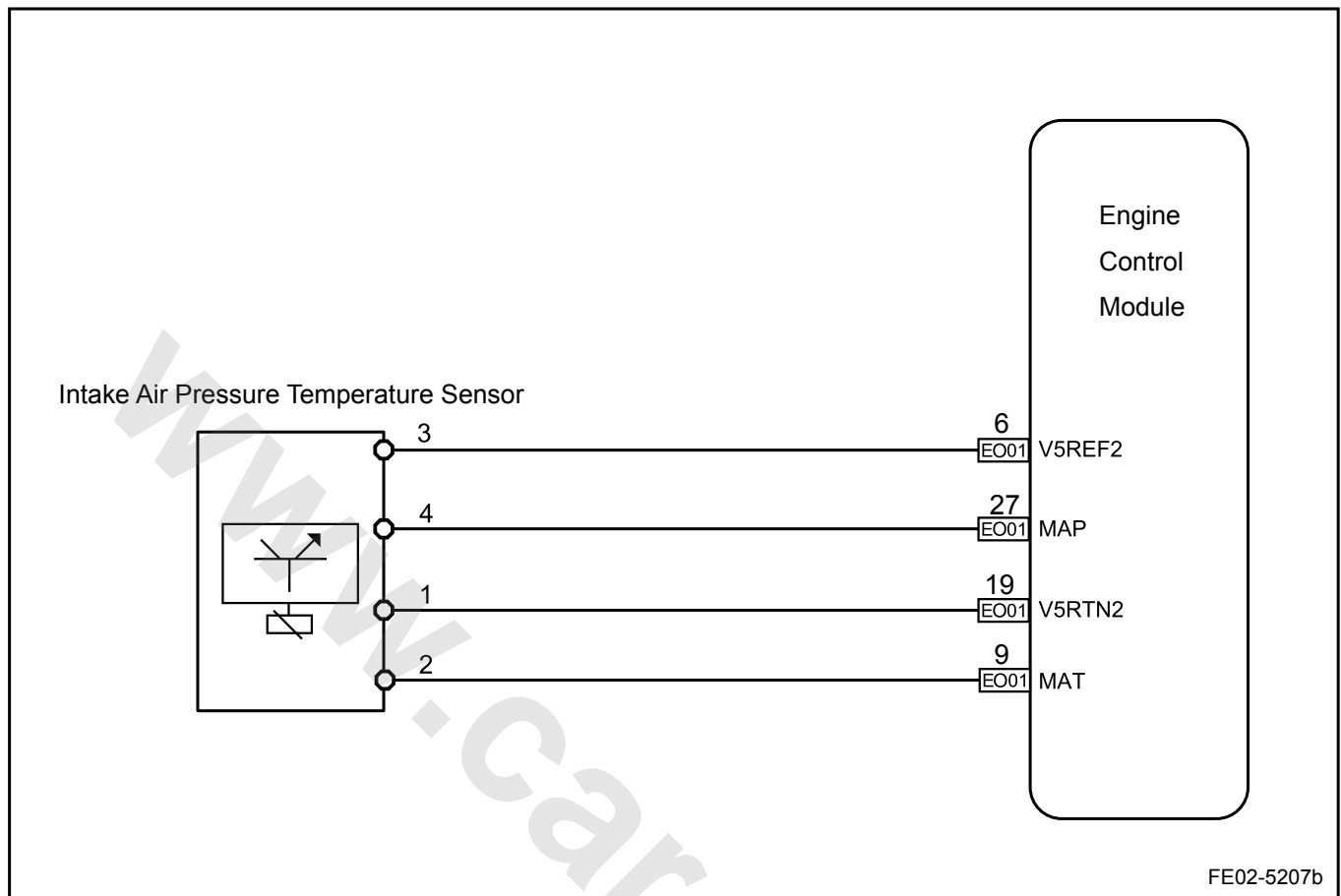
- Low Reference Voltage Circuit
- Sensor Signal Circuit

ECM provides 5 V reference voltage through ECM harness connector EO01 terminal No.6 to the sensor harness connector EO16 terminal No.3 and a low reference voltage through EO01 terminal No.19 to EO16 terminal No.1. The sensor provides a signal through EO16 terminal No.4 to ECM harness connector EO01 terminal No.27. This signal is related to the intake manifold pressure change. When the intake manifold absolute pressure is low, such as at idle or during deceleration, ECM detected signal voltage is low. When the intake manifold absolute pressure is high, such as the ignition switch turned on with the engine is turned off, or when the throttle is fully open, ECM detected signal voltage is high. Sensors are also used to determine the atmospheric pressure. Running the engine with the throttle fully open, atmospheric pressure readings will also be updated. ECM monitors sensor signals in order to determine whether the voltage is beyond the normal range.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0107	Circuit Inspection, Lower Than The Minimum	<ol style="list-style-type: none"> <li>1. Idle</li> <li>2. When the sensor circuit short or ground, the sensor signal voltage is 0</li> </ol>	<ol style="list-style-type: none"> <li>1. Sensor Circuit</li> <li>2. Sensor</li> <li>3. ECM</li> </ol>
P0108	Circuit Inspections, Exceeding The Maximum	<ol style="list-style-type: none"> <li>1. Idle</li> <li>2. When the sensor circuit short to power supply or a 5 V reference voltage</li> <li>3. Sensor A / D initial signal is 99.6%</li> </ol>	

## 3. Schematic:



## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

Check the existence of the following conditions:

- (a) Sensor housing damage, vacuum tubes broken.
- (b) Sensor seal damage.
- (c) Sensor loose or improperly installed.
- (d) Sensor tube blockage.

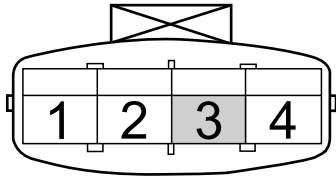
Next

## Note

It is prohibited Connect intake manifold absolute pressure sensor 5 V reference voltage circuit to other components, otherwise it will damage the sensor and ECM.

Step 2	Measure intake manifold absolute pressure sensor 5 V reference voltage.
--------	---

## Intake Air Temperature/Pressure Sensor Harness Connector EO16



FE02-5335b

- Turn the ignition switch to "OFF" position.
- Disconnect intake manifold absolute pressure sensor wiring harness connector EO16.
- Turn the ignition switch to "ON" position.
- Measure voltage between intake manifold absolute pressure sensor wiring harness connector EO16 terminal No.3 and a reliable ground.

Standard voltage: 4.5V-5.5V

- Connect intake manifold absolute pressure sensor wiring harness connector EO16.

Is the voltage specified value?

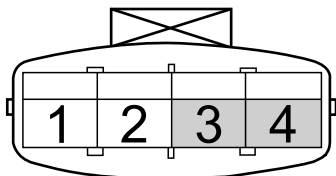
No

Go to step 6

Yes

## Step 3 Measure sensor signal circuit.

## Intake Air Temperature/Pressure Sensor Harness Connector EO16



FE02-5336b

- Turn the ignition switch to "OFF" position.
- Disconnect intake manifold absolute pressure sensor wiring harness connector EO16.
- Turn the ignition switch to "ON" position.
- Connect a 5A fuse cross-wiring between EO16 terminals No. 3 and No.4. With a scan tool, observe "Actual Intake Manifold Absolute Pressure Sensor Voltage" parameter.

standard value: 4.5V-5.5V

- Connect intake manifold absolute pressure sensor wiring harness connector EO16.

Data normal?

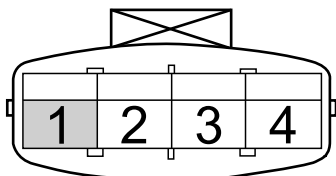
No

Go to step 7

Yes

## Step 4 Measure intake manifold absolute pressure sensor ground circuit.

## Intake Air Temperature/Pressure Sensor Harness Connector EO16



FE02-5337b

- Turn the ignition switch to "OFF" position.
- Disconnect intake manifold absolute pressure sensor wiring harness connector EO16.
- Turn the ignition switch to "ON" position.
- Measure resistance between intake manifold absolute pressure sensor wiring harness connector EO16 terminal No. 1 and a reliable ground.

Standard Value: Less than 3 Ω

- Connect intake manifold absolute pressure sensor wiring harness connector EO16.

Resistance normal?

No

Go to step 8

Yes

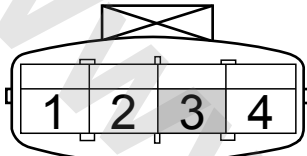
Step 5 Replace intake manifold absolute pressure sensor.

Next

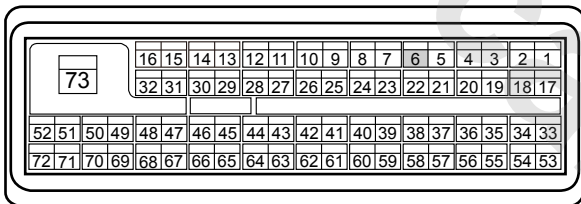
Go to step 10

Step 6 Check sensor 5 V reference voltage circuit.

Intake Air Temperature/Pressure Sensor Harness Connector EO16



ECM Harness Connector EO01



FE02-5338b

- Turn the ignition switch to "OFF" position.
- Disconnect intake manifold absolute pressure sensor wiring harness connector EO16.
- Disconnect ECM harness connector EO01.
- Measure resistance between intake manifold absolute pressure sensor wiring harness connector EO16 terminal No. 3 and ECM harness connector terminal No.6. Check whether the circuit is open. Otherwise, repair the fault part.
- Measure resistance between intake manifold absolute pressure sensor wiring harness connector EO16 terminal No. 3 and a reliable ground. check whether the circuit is short to ground. Otherwise, repair the fault part.
- Measure resistance between intake manifold absolute pressure sensor wiring harness connector EO16 terminal No. 3 and power supply. check whether the circuit is short to power supply. Otherwise, repair the fault part.

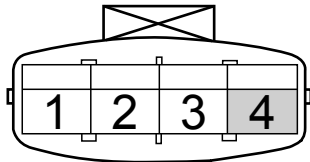
Test Items	Standard Value
Resistance Between EO16 (3) and EO01 (6)	Less than 1 $\Omega$
Resistance Between EO16 (3) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EO16 (3) and A Reliable Ground	0 V

Next

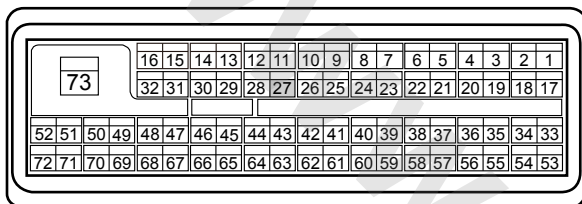
Go to step 9

Step 7 Check sensor signal circuit.

Intake Air Temperature/Pressure Sensor Harness Connector EO16



ECM Harness Connector EO01



FE02-5339b

- Turn the ignition switch to "OFF" position.
- Disconnect intake manifold absolute pressure sensor wiring harness connector EO16.
- Disconnect ECM harness connector EO01.
- Measure resistance between intake manifold absolute pressure sensor harness connector EO16 terminal No.4 and ECM harness connector terminal No.27. Check whether the circuit is open. Otherwise, repair the faulty part.
- Measure resistance between intake manifold absolute pressure sensor harness connector EO16 terminal No.4 and a reliable ground. Check whether the circuit is short to ground. Otherwise, repair the faulty part.
- Measure voltage between intake manifold absolute pressure sensor harness connector EO16 terminal No.4 and power supply. Check whether the circuit is short to power supply. Otherwise, repair the faulty part.

Test Items	Standard Value
Resistance Between EO16 (4) and EO01 (27)	Less than 1 $\Omega$
Resistance Between EO16 (4) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EO16 (4) and A Reliable Ground	0 V

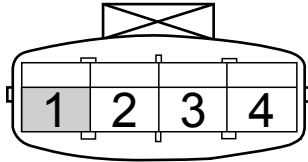
Normal

Go to step 9

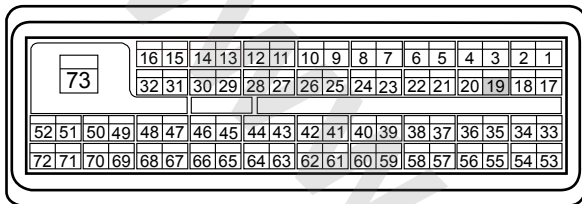
Step 8 Check sensor ground circuit.



Intake Air Temperature/Pressure Sensor Harness Connector EO16



ECM Harness Connector EO01



FE02-5340b

Next

Step 9 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 10 Replace ECM.

- Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).
- Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 11 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 12 Diagnostic completed.

## 5. Repair Instructions:

Replace MAP sensor. Refer to [2.2.8.7 Intake Air Pressure and Temperature Sensor Replacement](#).Refer to [2.2.8.8 Engine Control Module Replacement](#) Replace ECM.

## 2.12.7.19 DTC P0112 P0113

## 1. DTC Descriptor:

DTC	P0112	Intake Air Temperature Pressure Sensor Circuit Low Voltage
DTC	P0113	Intake Air Temperature Pressure Sensor Circuit High Voltage or Open

Intake air temperature pressure sensor has a signal circuit and an ECM internal ground circuit. Intake air temperature pressure sensor is used to measure the air temperature entering the engine. ECM provides 5 V reference voltage through ECM harness connector EO01 terminal No.9 to the intake air temperature pressure sensor harness connector EO16 terminal No.2 and an internal low reference voltage through EO01 terminal No.19 to the intake air temperature pressure sensor EO16 terminal No.1. When the intake air temperature pressure sensor in cold, the sensor resistance is relatively high. When the air temperature rises, the sensor resistance decreases. When the sensor resistance is high, ECM detected intake air temperature pressure sensor signal circuit voltage is high. With the decrease of sensor resistance, ECM detected intake air temperature pressure sensor signal circuit voltage also decreases.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0112 P0113	1. More Than the Upper Limit	1. Vehicle speed is greater than 50 km/h. 2. MAT circuit is short to ground. 3. MAT signal voltage becomes 0 immediately.	1. Sensor Circuit 2. Sensor 3. ECM
	2. Lower Than the Lower Limit	1. Vehicle speed is less than 25 km/h. 2. MAT circuit is open or short to 5 V reference voltage.	

## 3. Schematic:

schematic Refer to [2.12.7.18 DTC P0107 P0108](#) in Schematic.

## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1 Initial Inspection

Check the existence of the following conditions:

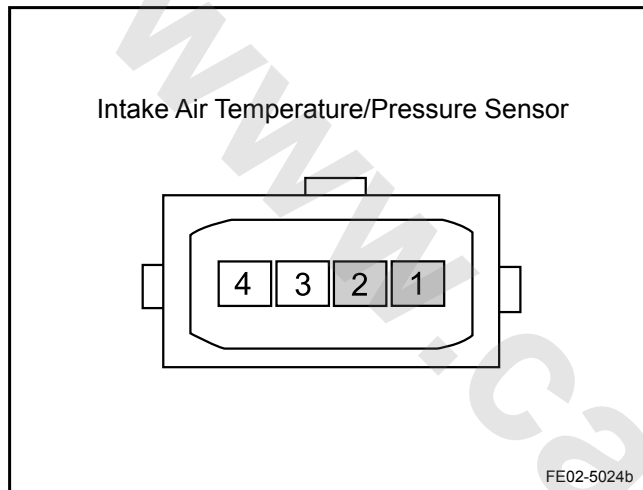
- (a) Sensor housing is damaged.
- (b) Sensor loose or improperly installed.
- (c) Sensor wiring harness connector loose.

Next

### Note

It is prohibited Connect intake manifold absolute pressure sensor 5 V reference voltage circuit and other components, otherwise it will damage the sensor and ECM.

Step 2	Measure intake air pressure and temperature sensor resistance.
--------	--



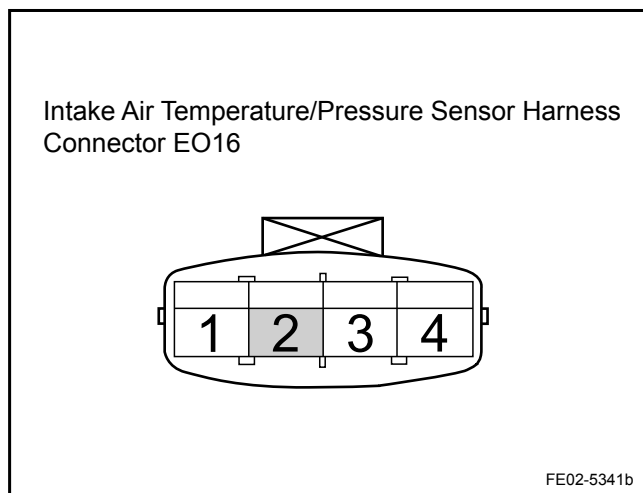
- (a) Turn the ignition switch to "OFF" position.
  - (b) Disconnect intake air pressure and temperature sensor wiring harness connector EN16.
  - (c) Measure intake air temperature sensor resistance.  
Standard Resistance: (Refer to the specific parameters [2.2.1.2 Temperature Sensor Temperature and Resistance Correlation](#)):  $2,400 \Omega/20^{\circ}\text{C}(68^{\circ}\text{F})$
  - (d) Connect intake air pressure and temperature sensor wiring harness connector EO16.
- Is the resistance specified value?

No

Replace the intake air pressure and temperature sensor. Go to step 9

Yes

Step 3	Measure intake air temperature pressure sensor signal circuit.
--------	--



- (a) Turn the ignition switch to "OFF" position.
  - (b) Disconnect intake air pressure and temperature sensor wiring harness connector EO16.
  - (c) Turn the ignition switch to "ON" position.
  - (d) Measure voltage between intake air pressure and temperature sensor wiring harness connector EO16 terminal No.2 and a reliable ground.  
Standard Voltage: 4.7-5.5 V
  - (e) Connect intake air pressure and temperature sensors connector EO16.
- Voltage normal?

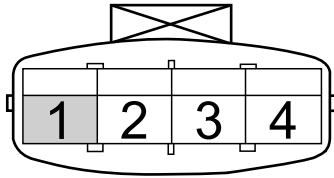
No

Go to step 5

Yes

Step 4	Measure intake air temperature pressure sensor ground circuit.
--------	--

### Intake Air Temperature/Pressure Sensor Harness Connector EO16



FE02-5342b

- Turn the ignition switch to "OFF" position.
- Disconnect intake air pressure and temperature sensor wiring harness connector EO16.
- Turn the ignition switch to "ON" position.
- Measure resistance between intake air pressure and temperature sensor wiring harness connector EO16 terminal No.1 and a reliable ground.

Standard Resistance Value: Less than 3  $\Omega$ 

- Connect intake air pressure and temperature sensors wiring harness connector EO16.

Resistance normal?

No

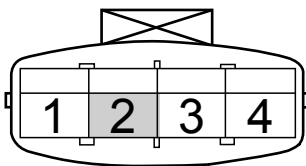
Go to step 6

Yes

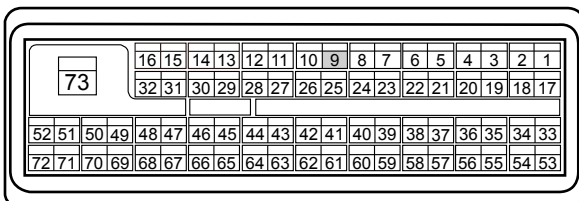
Go to step 7

Step 5 Check intake air temperature pressure sensor signal circuit.

### Intake Air Temperature/Pressure Sensor Harness Connector EO16



### ECM Harness Connector EO01



FE02-5343b

- Turn the ignition switch to "OFF" position.
- Disconnect intake air pressure and temperature sensor wiring harness connector EO16.
- Disconnect ECM harness connector EO01.
- Measure resistance between intake air pressure and temperature sensor wiring harness connector EO16 terminal No.2 and ECM harness connector terminal No.9. Check whether the circuit is open.
- Measure resistance between intake air pressure and temperature sensor wiring harness connector EO16 terminal No.2 and a reliable ground. check whether the circuit is short to ground.
- Measure voltage between intake air pressure and temperature sensor wiring harness connector EO16 terminal No.2 and power supply. check whether the circuit is short to power supply.

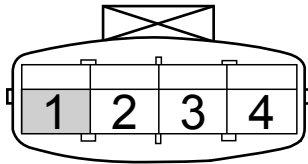
Test Items	Standard Value
Resistance Between EO16 (2) and EO01 (9)	Less than 1 $\Omega$
Resistance Between EO16 (2) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EO16 (2) and A Reliable Ground	0 V

Next

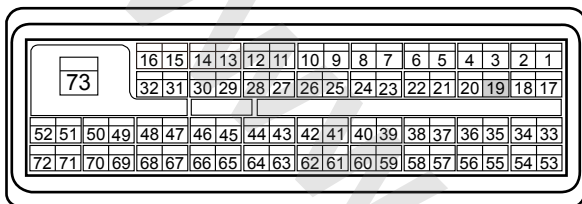
Go to step 7

Step 6 Check intake air temperature pressure sensor ground circuit.

Intake Air Temperature/Pressure Sensor Harness Connector EO16



ECM Harness Connector EO01



FE02-5340b

Next

Step 7 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

- Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).
- Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 10 Diagnostic completed.

## 5. Repair Instructions:

Replace intake air pressure and temperature sensors. Refer to [2.2.8.7 Intake Air Pressure and Temperature Sensor Replacement](#).

## 2.12.7.20 DTC P0117 P0118

## 1. DTC Descriptor:

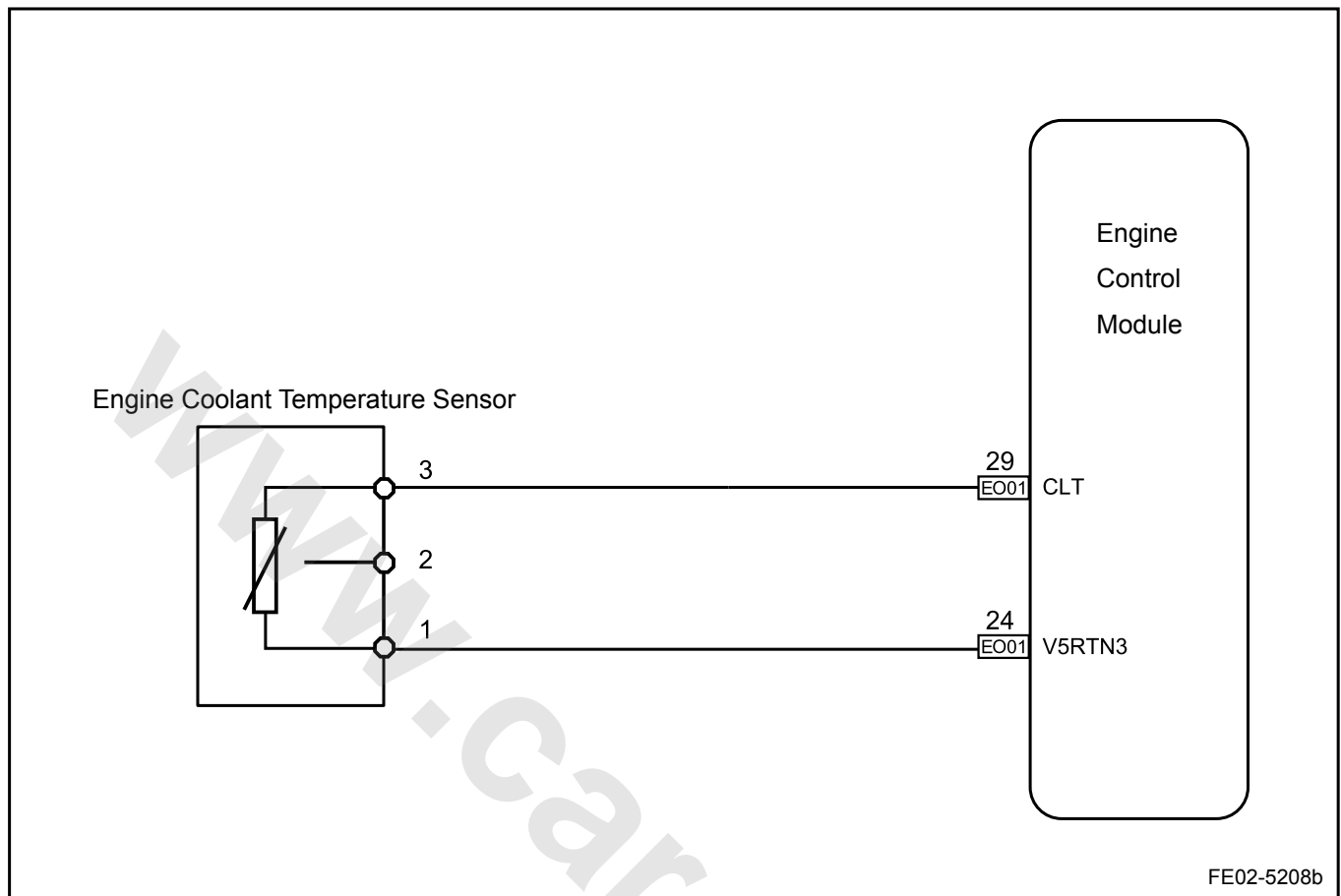
DTC	P0117	Engine Coolant Temperature Sensor Circuit Voltage Too Low
DTC	P0118	Engine Coolant Temperature Sensor Circuit Voltage Too High

ECT sensor is a variable resistor with a negative temperature coefficient and used to measure the temperature of engine coolant. ECM provides a 5V voltage through ECM harness connector EO01 terminal No.24 to ECT sensor harness connector EO23 terminal No.1 and a low internal reference voltage through EO01 terminal No.29 to ECT sensor connector EO23 terminal No.3. ECM will always record the length of time the ignition switched off. When starting, if the ignition switched off time reaches the preset time, the engine control module will compare the engine coolant temperature and intake air temperature in order to determine whether the difference between the two is in normal working range.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0117	1. More Than the Upper Limit	1. Idle 2. Coolant temperature sensor circuit is short to ground. 3. Coolant temperature by default changes as the running time changes.	1. Sensor Circuit
P0118	2. Lower Than the Lower Limit	1. Idle. 2. Coolant temperature sensor signal circuit is open or short to 5V voltage. 3. Coolant temperature by default changes as the running time changes.	2. Sensor 3. ECM

## 3. Schematic:



## 4. Diagnostic Steps:

## Warning!

Refer to "Cooling System Service Warning" in "Warnings and Notices".

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

## Note

At any time do not use flammable antifreeze, such as alcohol. Combustible antifreeze can cause serious fires.

Step 1	Initial Inspection
--------	--------------------

- (a) Check the engine coolant temperature sensor whether there is evidence of corrosion, as well as the engine coolant is leaking through the sensor.
- (b) Check whether the engine coolant level is correct.

Next

Step 2	Measure engine coolant temperature sensor resistance.
--------	---

- (a) Turn the ignition switch to "OFF" position.

- (b) Disconnect the engine coolant temperature sensor wiring harness connector EO23.
- (c) Measure engine coolant temperature sensor resistance. Standard Resistance: (Refer to the specific parameters [2.2.1.2 Temperature Sensor Temperature and Resistance Correlation](#)): 2,400  $\Omega$ /20°C (68 °F)
- (d) Connect the engine coolant temperature sensor wiring harness connector EO23.

Is the resistance specified value?

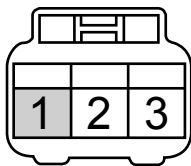
No

Replace the engine coolant temperature sensor. Go to step 9

Yes

Step 3 Measure engine coolant temperature sensor signal circuit.

Engine Coolant Temperature Sensor Harness Connector EO23



FE02-5344b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the engine coolant temperature sensor wiring harness connector EO23.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between engine coolant temperature sensor EO23 terminal No.1 and a reliable ground.

Standard Voltage: 4.7-5.5 V

- (e) Connect the engine coolant temperature sensor wiring harness connector EO23.

Voltage normal?

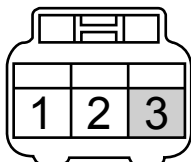
No

Go to step 5

Yes

Step 4 Measure engine coolant temperature sensor ground circuit.

Engine Coolant Temperature Sensor Harness Connector EO23



FE02-5345b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the engine coolant temperature sensor wiring harness connector EO23.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure resistance between engine coolant temperature sensor wiring harness connector EO23 terminal No.3 and A reliable ground.

Standard Resistance: Less than 3  $\Omega$

- (e) Connect the engine coolant temperature sensor wiring harness connector EO23.

Resistance normal?

No

Go to step 6

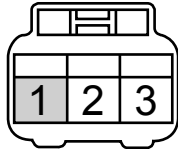
Yes

Go to step 7

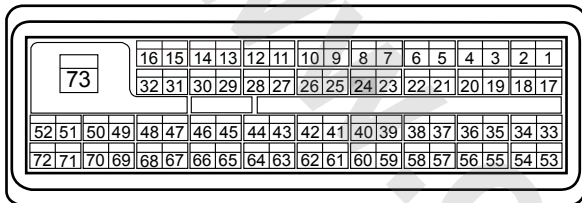


Step 5 check the engine coolant temperature sensor signal circuit.

Engine Coolant Temperature Sensor Harness Connector EO23



ECM Harness Connector EO01



FE02-5346b

- Turn the ignition switch to "OFF" position.
- Disconnect the engine coolant temperature sensor wiring harness connector EO23.
- Disconnect ECM harness connector EO01.
- Measure resistance between engine coolant temperature sensor wiring harness connector EO23 terminal No.1 and ECM harness connector terminal No.24. Check whether the circuit is open.
- Measure resistance between engine coolant temperature sensor wiring harness connector EO23 terminal No.1 and a reliable ground. Check whether the circuit is short to ground.
- Measure voltage between engine coolant temperature sensor wiring harness connector EO23 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply.

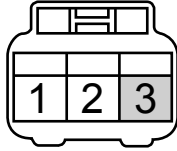
Test Items	Standard Value
Resistance Between EO23 (1) and EO01 (24)	Less than 1 $\Omega$
Resistance Between EO23 (1) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EO23 (1) and A Reliable Ground	0 V

Next

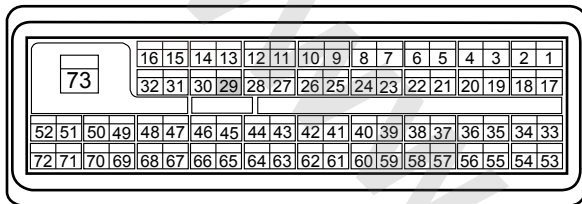
Go to step 7

Step 6 Check the engine coolant temperature sensor ground circuit.

Engine Coolant Temperature Sensor Harness Connector EO23



ECM Harness Connector EO01



FE02-5347b

Next

- Turn the ignition switch to "OFF" position.
- Disconnect the engine coolant temperature sensor wiring harness connector EO23.
- Disconnect ECM harness connector EO01.
- Measure resistance between engine coolant temperature sensor wiring harness connector EO23 terminal No.3 and ECM harness connector terminal No.29. Check whether the circuit is open. Otherwise, repair the faulty part.
- Measure voltage between engine coolant temperature sensor wiring harness connector EO23 terminal No.3 and a reliable ground. Check whether the circuit is short to power supply. Otherwise, repair the faulty part.

Test Items	Standard Value
Resistance Between EO23 (3) and EO01 (29)	Less than 1 $\Omega$
Voltage Between EO23 (3) and A Reliable Ground	0 V

Execute next step as per normal.

Step 7 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

- Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).
- Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 10 Diagnostic completed.

## 5. Repair Instructions:

Replace the engine coolant temperature sensor. Refer to [2.2.8.6 Engine Coolant Temperature Sensor Replacement](#).

## 2.12.7.21 DTC P0122 P0123

## 1. DTC Descriptor:

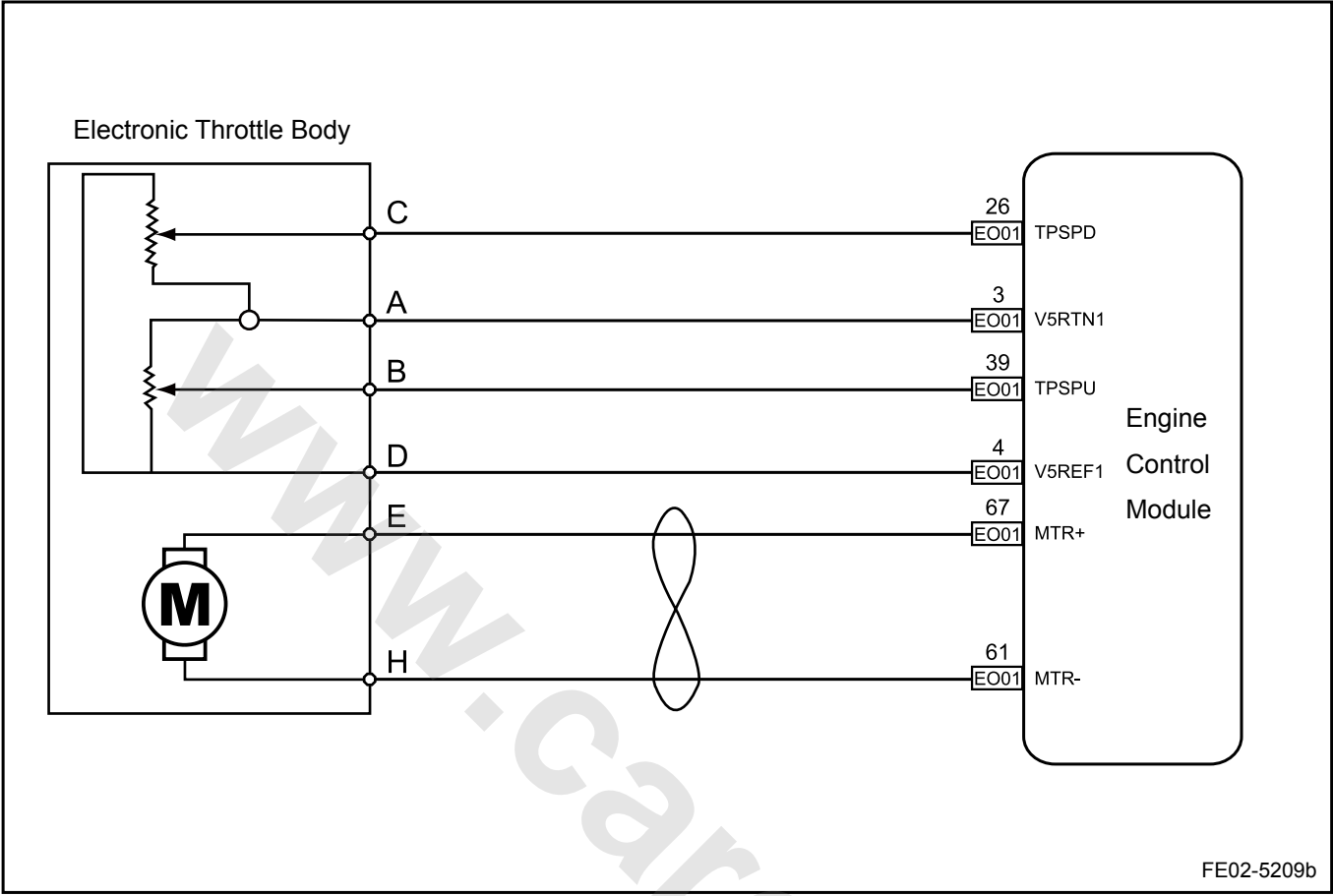
DTC	P0122	Electronic Throttle Position Sensor 1 Circuit Low Voltage
DTC	P0123	Electronic Throttle Position Sensor 1 Circuit High Voltage

TPS1 sensor sends signal through ECT harness connector EO27 terminal B to ECM through ECM harness connector EO01 terminal No.39. If the TPS1 sensor signal is lost, but ECM is able to receive the normal TPS2 sensor signal, then ECM controls the engine enter "reliability of determining the driver's intention decline or no high power output mode". Engine responds to the pedal changes slow and engine power output will be significantly weaker, although the vehicle can still be able to driving in normal traffic.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0122	Hardware Circuit Malfunction	TPS signal is short to ground or open, the input signal is less than 8%, DTC code set.	1. Electronic Throttle Body
P0123	Hardware Circuit Malfunction	TPS signal is short to power supply, input signal is greater than 92.7%, DTC code set.	2. Electronic Throttle Circuit 3. ECM

3. Schematic:



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	check for DTC code P0641, P0651, P0222, P0223.
--------	--

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
P0122, P0123	Yes
P0222, P0223, P0641, P0651	No

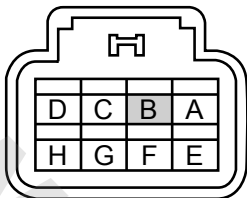
No

Refer to [2.12.7.46 DTC P0641 P0651](#)

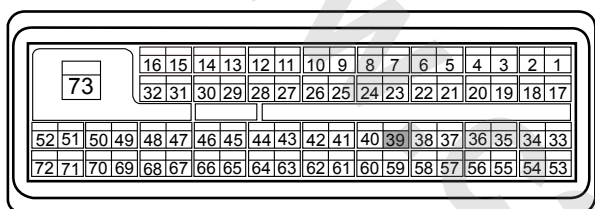
Yes

Step 2 Check EO27 terminal B.

Electronic Throttle Body Harness Connector EO27



ECM Harness Connector EO01



FE02-5236b

- Turn the ignition switch to "OFF" position.
- Disconnect ETC harness connector EO27.
- Disconnect ECM harness connector EO01.
- Measure resistance between EO27 terminal B and a reliable ground.
- Measure voltage between EO27 terminal B and a reliable ground.
- Test continuity between EO27 terminal B and EO01 terminal No.39.

Results:

Test Items	Standard Value
Resistance Between EO27 (B) and A Reliable Ground	10 kΩ or higher
Voltage Between EO27 (B) and A Reliable Ground	0 V
EO27 (B) and EO01 (39) Continuity	Less than 1 Ω

Is the value specified value?

No

Circuit malfunction, repair the circuit.

Yes

Step 3 Check terminal B voltage output signal.

- Connect ETC harness connector EO27.
- Connect ECM harness connector EO01.
- Measure ETC harness connector EO27 terminal B output voltage.

Standard Value: Refer to [2.12.7.12 Electronic Throttle Body \(ETC\) Check](#).

Is the output voltage value specified value?

No

Replace the electronic throttle body (ETC).  
Refer to [2.16.3.2 Electronic Throttle Body Replacement](#).

Yes

Step 4 Check ECM power supply circuit and ground circuit.

- Check ECM Power Supply Circuit and ground circuit. Refer to [2.12.7.43 DTC P0562 P0563](#).

ECM power and ground circuits normal?

No

Repair power and ground fault circuits.

Yes

Step 5	Replace ECM.
--------	--------------

- (a) Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).
- (b) Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 6	Use scan tool to confirm whether the DTC code is stored again.
--------	--

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to <a href="#">2.2.7.3 Intermittent Fault Check</a>
---

Yes

Step 7	Diagnostic completed.
--------	-----------------------

#### 5. Repair Instructions:

Electronic throttle body (ETC) can only be replaced as an assembly. Do not disassemble it and repair. Refer to [2.16.3.2 Electronic Throttle Body Replacement](#) replacement.

### 2.12.7.22 DTC P0131 P0132 P0133 P0134

#### 1. DTC Descriptor:

DTC	P0131	Pre-Catalytic Oxygen Sensor Circuit Short To Low Voltage
DTC	P0132	Pre-Catalytic Oxygen Sensor Circuit Short To High Voltage
DTC	P0133	Pre-Catalytic Oxygen Sensor Slow Response
DTC	P0134	Pre-Catalytic Oxygen Sensor Circuit Open

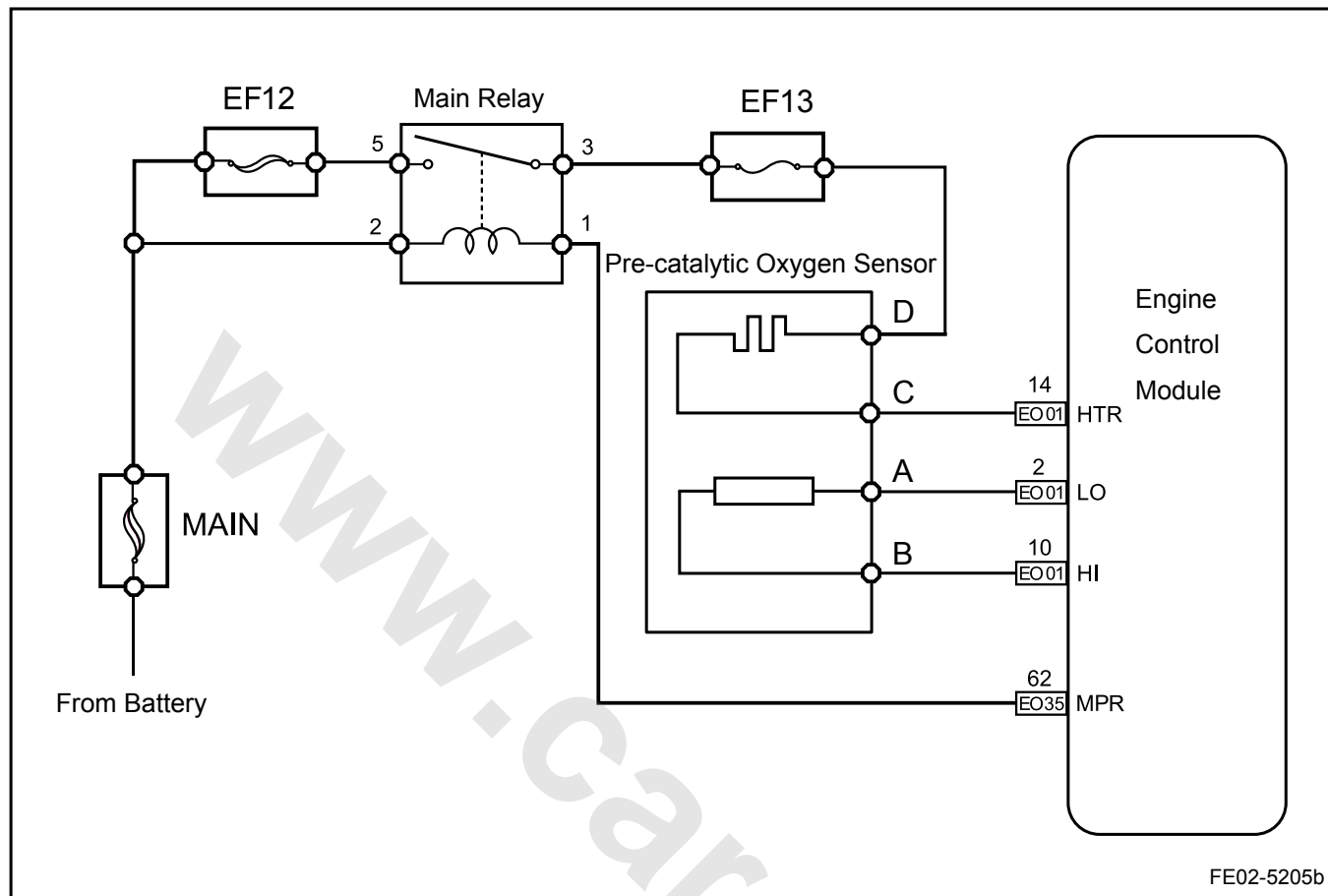
After the vehicle started, ECM works in open-loop mode, in which ECM ignores the Pre-Catalytic oxygen sensor signal voltage when calculating the Air-Fuel ratio. ECM provides an approximate 450mV reference voltage to the Pre-Catalytic oxygen sensor. When the engine is running, Pre-Catalytic oxygen sensors start heating and begin to generate a 0-0.1 V voltage, which fluctuates. Once ECM detects that the Pre-Catalytic oxygen sensor voltage exceeds a preset threshold voltage, ECM immediately enters into the closed-loop mode. ECM uses Pre-Catalytic oxygen sensor signal voltage to determine the Air-Fuel ratio. If the Pre-Catalytic oxygen sensor voltage is increased to above the reference voltage (tend to 1 V), the mixture is too rich. If the Pre-Catalytic oxygen sensor the voltage decreased to below the reference voltage (tend to 0 mV), the mixture is too lean.

ECM provides a signal through ECM harness connector EO01 terminal No.10 to Pre-Catalytic oxygen sensor wiring harness connector EO02 terminal B and an internal low reference voltage through ECM harness connector EO01 terminal No.2 to Pre-Catalytic oxygen sensor wiring harness connector EO02 terminal No. A.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0131	1. Pre-Catalytic Oxygen Sensor Voltage Too High	1. Engine Running Longer Than 60 s. 2. Coolant Temperature Less Than 70°C (158 °F). 3. Oxygen sensor signal is 0. 4. Duration Longer Than 25 s.	1. Sensor Circuit
P0132	2. Pre-Catalytic Oxygen Sensor Voltage Too Low	1. Engine Running Longer Than 60 s. 2. Coolant temperature is less than 70°C (158 °F). 3. Pre-Catalytic oxygen sensor signal is short to power supply, oxygen sensor signal is around 3,200 mV. 4. Duration Longer Than 25 s.	2. Sensor 3. ECM
P0133	1. Post-Catalytic oxygen sensor control integral value is over than upper limit. 2. Post-Catalytic oxygen sensor control integral value is lower than lower limit. 3. Filtered Pre-Catalytic oxygen sensor signal period is greater than the specified value.	1. Engine Running Longer Than 60 s. 2. Coolant temperature is greater than 70°C (158 °F). 3. Engine speed range is 1,700-2,350 rpm. 4. Oxygen sensors to the exhaust oxygen concentration changes responding time longer than the system preset threshold.	1. Sensor Circuit 2. Sensor 3. ECM 4. Mixture Too Rich 5. Mixture Too Lean
P0134	1. Signal Circuit Open. 2. Oxygen Sensors High-Temperature and High Resistance.	1. Engine Running Longer Than 60 s. 2. Coolant Temperature Less Than 70°C (158 °F). 3. Duration Longer Than 25 s.	1. Sensor Circuit 2. Sensor 3. ECM

## 3. Schematic:



## 4. Diagnostic Steps:

Step 1	Connect scan tool.
Next	
Step 2	Start engine and turn on the scan tool.
Next	
Step 3	Maintain the engine speed at 2,500 rpm for more than 2 min to warm up the engine, until the engine coolant temperature reaches 0°C (176 °F).
Next	
Step 4	Select on the scan tool: Engine / read data stream / group 1 oxygen sensor voltage 1 (Pre-Catalytic oxygen sensors).
Next	
Step 5	Observe oxygen sensor output voltage, which should fluctuate within 0.1-0.8 V.



Yes

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

No

Step 6 Carry out the oxygen sensor signal test.

- (a) If the voltage is consistently below 0.45 V (mixture too lean), carry out the following steps:
- Spray proper amount propane gas into intake.
  - Observe whether the Pre-Catalytic oxygen sensor voltage has a significant change, so the voltage will rise rapidly.
- (b) If the voltage is always higher than 0.45 V (the mixture too rich), carry out the following steps:
- Put the gear into neutral.
  - Apply hand brake.
  - Press the acceleration pedal so the engine speed suddenly increased to 4,000 rpm and then quickly release the acceleration pedal.
  - Repeat the previous step more than 3 times.
  - Check whether the Pre-Catalytic oxygen sensor voltage has a significant change, so the voltage will rise rapidly.

During the above test, the oxygen sensor signal voltage should have a significant change.

Does the voltage have a significant change?

Yes

Check the cause for engine Air-Fuel ratio too thin / too rich. Refer to [2.12.7.4 Symptoms Table](#).

No

Step 7 Check and confirm there is no other control system DTC code.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC other than P0131, P0133, P0134	No
P0131, P0133, P0134	Yes

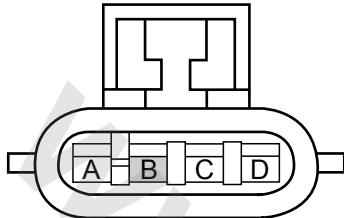
No

Refer to [2.12.7.14 DTC Code Index](#)

Yes

**Step 8** Measure pre-catalytic oxygen sensor signal circuit.

Pre-catalytic Oxygen Sensor Harness Connector EO02



FE02-5348b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect oxygen sensor wiring harness connector EO02.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure pre-catalytic oxygen sensor wiring harness connector terminal No. EO02 B, the voltage between ground and reliable value.

Standard Voltage Value: 0.35-0.5 V

- (e) Connect pre-catalytic oxygen sensor wiring harness connector EO02.

Is the voltage specified value?

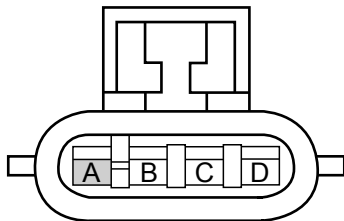
No

Go to step 11

Yes

**Step 9** Measure pre-catalytic oxygen sensor ground circuit.

Pre-catalytic Oxygen Sensor Harness Connector EO02



FE02-5349b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect oxygen sensor wiring harness connector EN02.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure resistance between Pre-Catalytic oxygen sensor EO02 terminal A and a reliable ground.

Standard Resistance: Less than 1  $\Omega$ 

- (e) Connect pre-catalytic oxygen sensor wiring harness connector EO02.

Is the resistance specified value?

No

Go to step 12

Yes

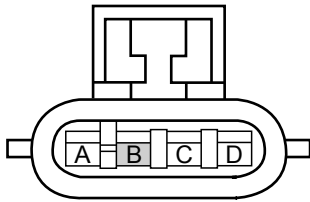
**Step 10** Replace the pre-catalytic oxygen sensor. Refer to [2.4.7.2Pre-Catalytic Oxygen Sensor Replacement](#).

Next

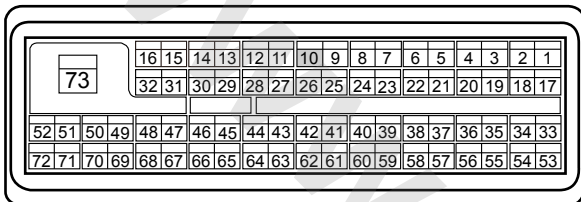
Go to step 15

**Step 11** Check pre-catalytic oxygen sensor signal circuit.

Pre-catalytic Oxygen Sensor Harness Connector EO02



ECM Harness Connector EO01



FE02-5350b

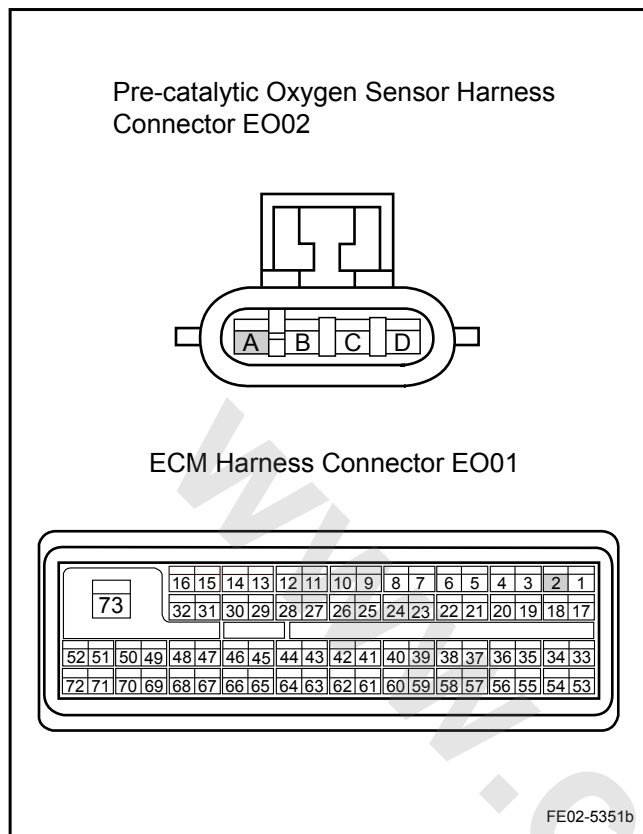
- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect oxygen sensor wiring harness connector EO02.
- (c) Disconnect ECM harness connector EO01.
- (d) Measure resistance between pre-catalytic oxygen sensor wiring harness connector EO02 terminal B and ECM harness connector terminal No.10. Check whether the circuit is open. otherwise, repair the faulty part.
- (e) Measure resistance between pre-catalytic oxygen sensor wiring harness connector EO02 terminal B and a reliable ground. Check whether the circuit is short to ground. otherwise, repair the faulty part.
- (f) Measure voltage between pre-catalytic oxygen sensor wiring harness connector EO02 terminal B and a reliable ground. Check whether the circuit is short to power supply. Otherwise, repair the faulty part.

Test Items	Standard Value
Resistance Between EO02 (B) and EO01 (10)	Less than 1 $\Omega$
Resistance Between EO02 (B) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EO02 (B) and A Reliable Ground	0 V

Normal

Go to step 15

Step 12	Check pre-catalytic oxygen sensor ground circuit..
---------	--



- Turn the ignition switch to "OFF" position.
- Disconnect oxygen sensor wiring harness connector EO02.
- Disconnect ECM harness connector EO01.
- Measure resistance between pre-catalytic oxygen sensor wiring harness connector EO02 terminal A and ECM harness connector terminal No.2. Check whether the circuit is open. otherwise, repair the faulty part.
- Measure resistance between pre-catalytic oxygen sensor wiring harness connector EO02 terminal A and a reliable ground. Check whether the circuit is short to ground. otherwise, repair the faulty part.
- Measure voltage between pre-catalytic oxygen sensor wiring harness connector EO02 terminal A and a reliable ground. Check whether the circuit is short to power supply. otherwise, repair the faulty part.

Test Items	Standard Value
Resistance Between EO02 (A) and EO01 (2)	Less than 1 $\Omega$
Resistance Between EO02 (A) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EO02 (A) and A Reliable Ground	0 V

Execute next step as per normal.

Next

Step 13 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 14 Replace ECM.

- Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).
- Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 15 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.

- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 16	Diagnostic completed.
---------	-----------------------

#### 5. Repair Instructions:

Replace the pre-catalytic oxygen sensor. Refer to [2.4.7.2 Pre-Catalytic Oxygen Sensor Replacement](#).

### 2.12.7.23 DTC P0135

#### 1. DTC Descriptor:

DTC	P0135	Pre-Catalytic Oxygen Sensor Heater Malfunction
-----	-------	--

Upstream Heated Oxygen Sensor (HO<sub>2</sub>S) is used for fuel control. The sensor compares the oxygen content in ambient air and oxygen content in the exhaust flow. Each heated oxygen sensor has an internal heating element. ECM controls the heated oxygen sensor heating control circuit. This makes the system enter the closed-loop system earlier, so that ECM will calculate Air-Fuel ratio earlier. ECM controls the heating control circuit switched on or off, so that heated oxygen sensor working temperature maintains in the specified range. ECM measures the heater current to determine the temperature.

Pre-Catalytic oxygen sensor heating coil voltage is provided by The Main Relay controlled by ECM, when the ignition switch is turned to "ON", EO02 sensor harness connector terminal D will have battery voltage. ECM controls heater working hours through ECM harness connector EO01 terminal No.14.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0135	Hardware Circuit Checks	<ol style="list-style-type: none"> <li>1. Engine Running Longer Than 60 s.</li> <li>2. At idle Running Condition.</li> <li>3. Pre-Catalytic Oxygen Sensor Heating</li> <li>4. Pre-Catalytic Oxygen Sensor Heating Control Terminal Disconnected.</li> <li>5. Duration Less Than 20 s.</li> </ol>	<ol style="list-style-type: none"> <li>1. Sensor Circuit</li> <li>2. Sensor</li> <li>3. ECM</li> </ol>

#### 3. Schematic:

Refer to [2.12.7.22 DTC P0131 P0132 P0133 P0134](#).

#### 4. Diagnostic Steps:

##### Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

Check the existence of following factors that will affect the oxygen sensor working status:

- (a) Exhaust system leakage or blockage.
- (b) Water entering the heated oxygen sensor connector.
- (c) Engine working at high temperatures, exhaust pipes too hot.

Next

Step 2 Check pre-catalytic oxygen sensor heater resistance.

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect oxygen sensor wiring harness connector.
- (c) Measure heater resistance between pre-catalytic oxygen sensor terminals C and D.

Standard Resistance:  $9 \Omega/20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ )

- (d) Connect pre-catalytic oxygen sensor wiring harness connector.

Is the resistance specified value?

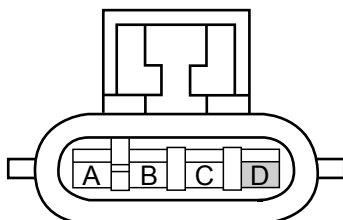
No

Replace the pre-catalytic oxygen sensor.  
Refer to [2.4.7.2 Pre-Catalytic Oxygen Sensor Replacement](#)

Yes

Step 3 Check terminal D to ground voltage.

Pre-catalytic Oxygen Sensor Harness Connector EO02



FE02-5352b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect oxygen sensor wiring harness connector.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between Pre-Catalytic oxygen sensor wiring harness connector EO02 terminal D and a reliable ground.

Standard Voltage Value: 11-14 V

- (e) Connect the pre-catalytic oxygen sensor wiring harness connector EO02.

Is the voltage specified value?

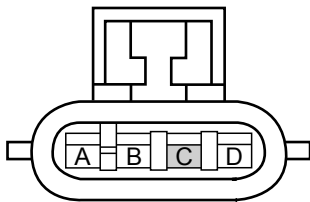
No

Pre-Catalytic oxygen sensor heater power supply circuit fault

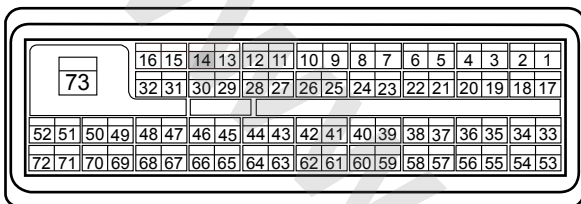
Yes

Step 4 Check pre-catalytic oxygen sensor heater control terminal continuity.

Pre-catalytic Oxygen Sensor Harness Connector EO02



ECM Harness Connector EO01



FE02-5353b

- Turn the ignition switch to "OFF" position.
- Disconnect oxygen sensor wiring harness connector EO02.
- Disconnect ECM harness connector EO01.
- Test Continuity between pre-catalytic oxygen sensor wiring harness connector EO02 terminal C and ECM harness connector EO01 terminal No.14.

Standard Resistance: Less than 1  $\Omega$ 

- Connect ECM harness connector EO01.
- Connect pre-catalytic oxygen sensor wiring harness connector EO02.

Is the resistance specified value?

No

ECM control circuit malfunction

Yes

Step 5 Check ECM working circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 6 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

- Replace ECM.
- Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 7 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 8 Diagnostic completed.

## 5. Repair Instructions:

Replace the pre-catalytic oxygen sensor. Refer to [2.4.7.2 Pre-Catalytic Oxygen Sensor Replacement](#).

## 2.12.7.24 DTC P0137 P0138 P0140

## 1. DTC Descriptor:

DTC	P0137	Post-Catalytic Oxygen Sensor Circuit Short To Low Voltage
DTC	P0138	Post-Catalytic Oxygen Sensor Circuit Short To High Voltage
DTC	P0140	Post-Catalytic Oxygen Sensor Circuit Open

After the vehicle started, ECM works in open-loop mode, in which ECM ignores the Pre-Catalytic oxygen sensor signal voltage when calculating the Air-Fuel ratio. ECM provides an approximate 450 mV reference voltage to the Pre-Catalytic oxygen sensor. When the engine is running, Pre-Catalytic oxygen sensors start heating and begin to generate a 0-0.1 V voltage, which fluctuates. Once ECM detects that the Pre-Catalytic oxygen sensor voltage exceeds a preset threshold voltage, ECM immediately enters into the closed-loop mode. ECM uses Pre-Catalytic oxygen sensor signal voltage to determine the Air-Fuel ratio. If the Pre-Catalytic oxygen sensor voltage is increased to above the reference voltage (tend to 1 V), the mixture is too rich. If the Pre-Catalytic oxygen sensor the voltage decreased to below the reference voltage (tend to 0 mV), the mixture is too lean.

- ECM provides a signal through ECM harness connector EO01 terminal No.30 to Post-Catalytic oxygen sensor wiring harness connector EO03 terminal B.
- ECM provides an internal low reference voltage through ECM harness connector EO01 terminal No.55 to Pre-Catalytic oxygen sensor wiring harness connector EO03 terminal No.A.

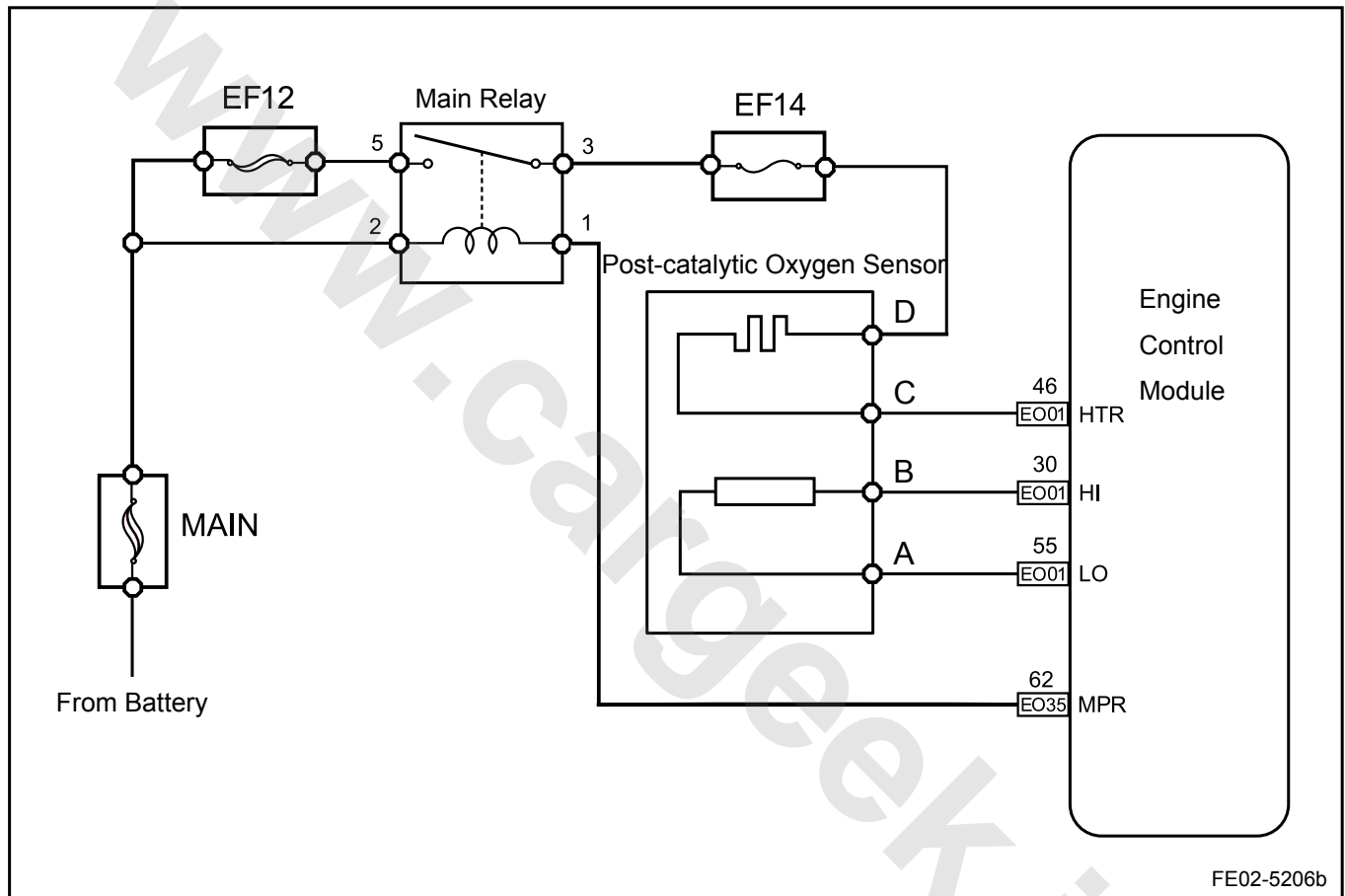
## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0137	Short to Ground When Cold	<ol style="list-style-type: none"> <li>Engine running longer than 60 s.</li> <li>Coolant temperature is less than 70 °C (158 °F).</li> <li>Post-Catalytic oxygen sensor signal 0.</li> <li>Duration longer than 25 s.</li> </ol>	1. Sensor circuit
P0138	Post-Catalytic oxygen sensor voltage signal too high	<ol style="list-style-type: none"> <li>Engine running longer than 60 s.</li> <li>Coolant temperature is less than 70 °C (158 °F).</li> <li>Post-Catalytic oxygen sensor signal around 3,200 mV.</li> <li>Duration longer than 25 s.</li> </ol>	<ol style="list-style-type: none"> <li>Sensor</li> <li>ECM</li> </ol>



DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0140	<ol style="list-style-type: none"> <li>Oxygen sensor signal circuit open</li> <li>Oxygen sensor high-temperature and high resistance</li> </ol>	<ol style="list-style-type: none"> <li>Engine running longer than 60 s.</li> <li>Coolant temperature is less than 70 °C (158 °F).</li> <li>Post-Catalytic oxygen sensor signal exceeds a reasonable range.</li> <li>Duration longer than 25 s.</li> </ol>	

## 3. Schematic



## 4. Diagnostic Steps:

Step 1	Connect scan tool.
Next	
Step 2	Start engine and turn on the scan tool.
Next	
Step 3	Select on the scan tool: Engine / read data flow / group 1 oxygen sensor voltage 2(Post-Catalytic oxygen sensors).

Next

Step 4 Observe oxygen sensor output voltage, which should be within 0.6-0.7 V.

Yes

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

No

Step 5 Carry out the oxygen sensor signal test.

- (a) If the data is consistently below 0.45 V (mixture too lean), carry out the following steps:
- Spray proper amount propane gas into intake.
  - Observe whether the Post-Catalytic oxygen sensor voltage has a significant change, as the signal voltage will increase rapidly.
- (b) If the data is consistently higher than 0.45 V (mixture too rich), carry out the following steps:
- Put the gear into neutral.
  - Apply hand brake.
  - Press the acceleration pedal so the engine speed suddenly increases to 4,000 rpm and then quickly release the acceleration pedal.
  - Repeat the previous step more than 3 times.
  - Observe whether the Post-Catalytic oxygen sensor voltage has a significant change, as the signal voltage will decrease rapidly.

During the above test, the oxygen sensor signal voltage should have a significant change.

Does the voltage have a significant change?

Yes

Check the cause for Air-Fuel ratio too thin / too rich. Refer to [2.12.7.4 Symptoms Table](#).

No

Step 6 Confirm no other control system DTC code.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC codes other than P0137, P0138, P0140	No
P0137, P0138, P0140	Yes

No

Refer to [2.12.7.14 DTC Code Index](#)

Yes

Step 7 Inspect the exhaust system seal.

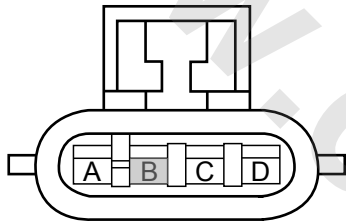
- (a) Check whether the three-way catalytic converter looks good (signs of excessive heat and gasket missing, etc.).
- (b) Check whether the exhaust pipe is intact, whether the gasket is intact.

No

replace the damaged parts. Go to step 15

Step 8 measure oxygen sensor signal circuit.

Post-catalytic Oxygen Sensor Harness Connector EO03



FE02-5354b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the oxygen sensor wiring harness connector EO03.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between oxygen sensor wiring harness connector EO03 terminal B and a reliable ground.

Standard Voltage Value: 0.35-0.5 V

- (e) Connect the oxygen sensor wiring harness connector EO03. Is the voltage specified value?

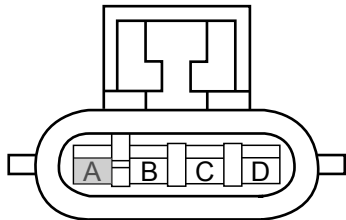
No

Go to step 11

Yes

Step 9 Measure Post-Catalytic oxygen sensor ground circuit.

Post-catalytic Oxygen Sensor Harness Connector EO03



FE02-5355b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the oxygen sensor wiring harness connector EO03.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure resistance between oxygen sensor EO03 terminal A and a reliable ground.

Standard Resistance: Less than 1 Ω

- (e) Connect the oxygen sensor wiring harness connector EO03. Is the resistance specified value?

No

Go to step 12

Yes

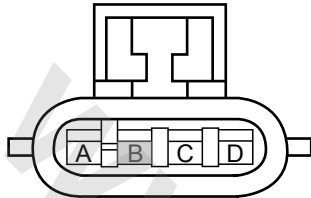
Step 10 replace the oxygen sensor.

Next

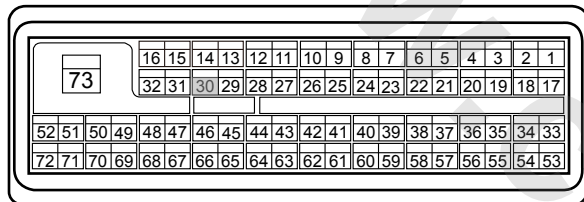
Go to step 15

Step 11 check Post-Catalytic oxygen sensor signal circuit.

Post-catalytic Oxygen Sensor Harness Connector EO03



ECM Harness Connector EO01



FE02-5356b

- Turn the ignition switch to "OFF" position.
- Disconnect the oxygen sensor wiring harness connector EO03.
- Disconnect ECM harness connector EO01.
- Measure resistance between oxygen sensor wiring harness connector EO03 terminal B and ECM harness connector terminal No.30. Check whether the circuit is open. otherwise, repair the faulty part.
- Measure resistance between oxygen sensor wiring harness connector EO03 terminal B and a reliable ground. Check whether the circuit is short to ground. otherwise, repair the faulty part.
- Measure voltage between oxygen sensor wiring harness connector EO03 terminal B and a reliable ground. Check whether the circuit is short to power supply. otherwise, repair the faulty part.

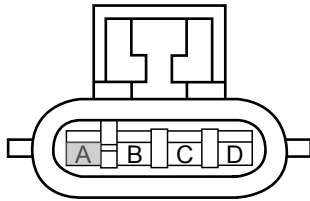
Test Items	Standard Value
Resistance between EO03 (B) and EO01 (30)	Less than 1 $\Omega$
Resistance between EO03 (B) and a reliable ground	10 k $\Omega$ or higher
Voltage between EO03 (B) and a reliable ground	0 V

normal

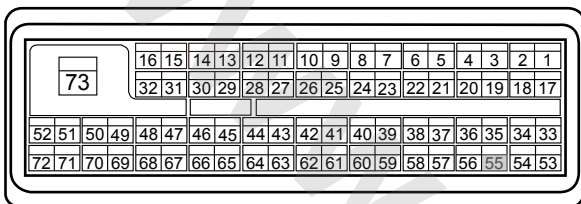
Go to step 13

Step 12 Check Post-Catalytic oxygen sensor ground circuit.

Post-catalytic Oxygen Sensor Harness Connector EO03



ECM Harness Connector EO01



FE02-5357b

- Turn the ignition switch to "OFF" position.
- Disconnect the oxygen sensor wiring harness connector EO03.
- Disconnect ECM harness connector EO01.
- Measure resistance between oxygen sensor wiring harness connector EO03 terminal A and ECM harness connector terminal No.55. Check whether the circuit is open. otherwise, repair the faulty part.
- Measure resistance between oxygen sensor wiring harness connector EO03 terminal A and a reliable ground. Check whether the circuit is short to ground. otherwise, repair the faulty part.
- Measure voltage between oxygen sensor wiring harness connector EO03 terminal A and a reliable ground. Check whether the circuit is short to power supply. otherwise, repair the faulty part.

Test Items	Standard Value
Resistance between EO03 (A) and EO01 (55)	Less than 1 $\Omega$
Resistance between EO03 (A) and a reliable ground	10 k $\Omega$ or higher
Voltage between EO03 (A) and a reliable ground	0 V

Execute next step as per normal.

Next

Step 13 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 14 Replace ECM.

- Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).
- Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 15 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.

- (e) Road test the vehicle for at least 10 min.  
 (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 16 Diagnostic completed.

### 5. Repair Instructions:

Replace the Post-Catalytic oxygen sensor. Refer to [2.4.7.1 Post-Catalytic Oxygen Sensor Replacement](#).

## 2.12.7.25 DTC P0141

### 1. DTC Descriptor:

DTC	P0141	Post-Catalytic oxygen sensor heater malfunction
-----	-------	---

Heated Post-Catalytic Oxygen Sensor (HO<sub>2</sub>S) is used to monitor the three-way catalytic converter working status. The sensor compares the oxygen content in ambient air and oxygen content in the exhaust flow. Each heated oxygen sensor has an internal heating element. ECM controls the heated oxygen sensor heating control circuit. This makes the system enter the closed-loop system earlier, so that ECM will calculate Air-Fuel ratio earlier. ECM controls the heating control circuit switched on or off, so that heated oxygen sensor working temperature maintains in the specified range. ECM measures the heater current to determine the temperature.

The Post-Catalytic oxygen sensor heating coil voltage is provided by The Main Relay controlled by ECM. When the ignition switch is turned to "ON", Post-Catalytic oxygen sensor connector EO03 terminal D will have battery voltage. ECM controls the heater working hours by ECM harness connector EO01 terminal No.46.

### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0141	Hardware Circuit Checks	1. Engine Running Longer Than 60 s. 2. Idle Running Condition. 3. Post-Catalytic Oxygen Sensor Heating. 4. Post-Catalytic Oxygen Sensor Heating Control Terminal Circuit Open. 5. Duration Less Than 20 s.	1. Sensor Circuit 2. Sensor 3. ECM

### 3. Schematic:

Refer to [2.12.7.24 DTC P0137 P0138 P0140](#).

### 4. Diagnostic Steps:

#### Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

Check the existence of following factors that will affect the oxygen sensor working status:

- (a) Exhaust system leakage or blockage.
- (b) Water entering the oxygen sensor connector.
- (c) Engine working at high temperatures, exhaust pipes too hot.

Next

Step 2	check oxygen sensor heater resistance.
--------	--

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the oxygen sensor wiring harness connector.
- (c) Measure the oxygen sensor heater resistance.

Standard Resistance: Connectors C and D,  $9\ \Omega/20^{\circ}\text{C}(68\ ^{\circ}\text{F})$

- (d) Connect the oxygen sensor wiring harness connector.

Is the resistance specified value?

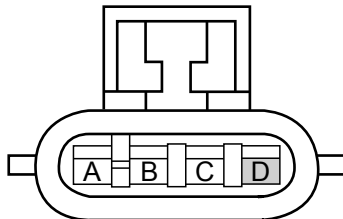
No

Replace oxygen sensor. Refer to [2.4.7.1 Post-Catalytic Oxygen Sensor Replacement](#)

Yes

Step 3	Measure voltage between terminal D and ground.
--------	--

Post-catalytic Oxygen Sensor Harness Connector EO03



FE02-5358b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the oxygen sensor wiring harness connector.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between oxygen sensor harness connector EO03 terminal D and ground.

Standard Voltage: 11-14 V

- (e) Connect the oxygen sensor wiring harness connector EO03.

Is the voltage specified value?

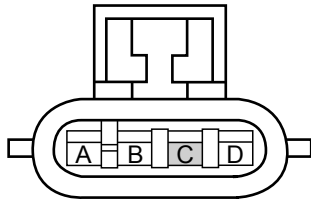
No

Post-Catalytic oxygen sensor heater power supply circuit fault.

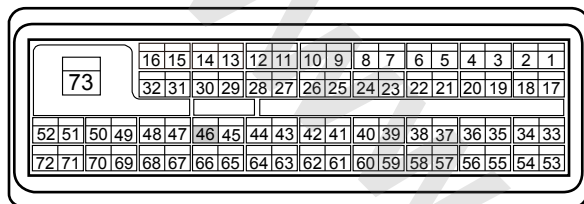
Yes

Step 4	Check oxygen sensor heater control terminal Continuity.
--------	---

Post-catalytic Oxygen Sensor Harness Connector EO03



ECM Harness Connector EO01



FE02-5359b

- Turn the ignition switch to "OFF" position.
- Disconnect the oxygen sensor wiring harness connector EO03.
- Disconnect ECM harness connector EO01.
- Test Continuity between oxygen sensor wiring harness connector EO03 terminal C and ECM harness connector EO01 terminal No.46.

Standard Resistance: Less than 1  $\Omega$

- Connect ECM harness connector EO01.
  - Connect the oxygen sensor wiring harness connector EO03.
- Is the resistance specified value?

No

ECM control circuit malfunction.

Yes

Step 5 Check ECM working circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 6 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

- Replace ECM.
- Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 7 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.



No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 8 Diagnostic completed.

## 5. Repair Instructions:

Replace post-catalytic oxygen sensor. Refer to [2.4.7.1 Post-Catalytic Oxygen Sensor Replacement](#).

## 2.12.7.26 DTC P0171 P0172 P1167 P1171 P2187 P2188

## 1. DTC Descriptor:

DTC	P0171	Mixture Too Lean
DTC	P0172	Mixture Too Rich
DTC	P1167	Pre-Catalytic Oxygen Indicating Mixture Too Rich During Deceleration
DTC	P1171	Pre-Catalytic Oxygen Indicating Mixture Too Lean During Acceleration
DTC	P2187	Mixture Too Lean When idling
DTC	P2188	Mixture Too Rich When idling

Engine Control Module (ECM) controls the close-loop Air-Fuel ratio Measure system that achieves optimal combination of performance, fuel economy and emissions control. In the close-loop mode, the engine control module monitors heated oxygen sensor (HO<sub>2</sub>S) signal voltage and adjusts fuel supply according to the signal. Changes in fuel supply will change the value of long-term and short-term fuel supply adjustment. Short-term fuel supply adjustment will respond to heated oxygen sensor signal voltage and rapidly change. These changes will fine tune the fuel supply. Long-term fuel supply adjustment will respond to the trend in short-term fuel supply adjustment. Long-term fuel adjustment adjusts the fuel supply in order to return to the center of the short-term fuel adjustment value and controls the short-term fuel adjustment. The ideal fuel adjustment value is around 0%. A positive value indicates that engine control module is increasing fuel supply to compensate the lean Air-Fuel mixture. A negative value indicates that engine control module is decreasing fuel supply to compensate the rich Air-Fuel mixture.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0170 P0171 P0172 P2177 P2178 P2187 P2188	1. Fuel Adjustment Value Higher Than Maximum Limit 2. Fuel Adjustment Value Lower Than Minimum Limit 3. Fuel Adjustment Value Higher Than Maximum Limit (Low-Load Zone) 4. Fuel Adjustment Value Lower Than Minimum Limit (Low-Load Zone)	1. Engine slows down and enters (DFCO) working condition. 2. ECM detected oxygen sensor signal voltage is higher than 0.55 V. 3. Engine enters power-enriched (PE) working condition. 4. ECM detected oxygen sensor signal voltage is lower than 0.35 V. 5. Duration is longer than 12 s.	1. Fuel Injectors 2. Canister 3. MAP 4. TPS 5. HO <sub>2</sub> S (Pre-Catalytic)

## 3. Schematic:

Refer to [2.12.6.1 Schematic](#).

## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Check there are no other control system DTC codes.
--------	--

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Press the scan tool power button.
- Select the following menu items: Engine/Read DTC codes.
- Read DTC codes.

Are there DTC codes other than P0170, P0171, P0172, P2177, P2178, P2187, P2188?

Yes

Refer to [2.12.7.14 DTC Code Index](#)

No

Step 2	Read the intake manifold absolute pressure sensor data.
--------	---

- Turn ignition switch to "OFF" position, connect scan tool.
- Start the vehicle.
- Read the intake manifold absolute pressure sensor data.
- Read the scan tool for atmospheric pressure value, and compare it with table [2.2.1.3 Altitude and Atmospheric Pressure Correlation](#).

Is scan tool atmospheric pressure reading normal?

No

Refer to [2.12.7.18 DTC P0107 P0108](#)

Yes

Step 3 Read the throttle position sensor data.

- (a) Start the vehicle.
  - (b) Warm up the engine with normal idle speed and throttle opening is less than 10%.
  - (c) Use scan tool to read throttle position sensor data.
- Is throttle position sensor data normal?

No

Refer to [2.12.7.27 DTC P0222 P0223](#)

Yes

Step 4 Read the Pre-Catalytic oxygen sensor data.

- (a) Start the vehicle.
  - (b) Warm up the engine with normal idle speed.
  - (c) Read the Pre-Catalytic oxygen sensor data.
- Pre-Catalytic oxygen sensor standard value: 0.2-0.8 V

Is Pre-Catalytic oxygen sensor data is normal?

No

Refer to [2.12.7.22 DTC P0131 P0132 P0133 P0134](#)

Yes

Step 5 Observe the long-term fuel adjustment parameter.

- (a) Start the vehicle.
  - (b) Warm up the engine.
  - (c) Observe the long-term fuel adjustment parameter.
- Is the long-term fuel adjustment parameter normal?

Yes

System normal

No

Step 6 Check engine and its components.

- (a) Turn the ignition switch to "OFF" position.
- (b) Check the vacuum hose crack, kink or connections.
- (c) Check the intake manifold, throttle body and fuel injector vacuum leakage.
- (d) Check the crankshaft ventilation system leakage.
- (e) Check Fuel Contamination.
- (f) Check the fuel system working at Air-Fuel ratio too lean.
- (g) Check injector nozzle spray fuel too lean.
- (h) Check the fuel system working at Air-Fuel ratio too rich.
- (i) Check injector spray fuel too rich.
- (j) Check intake manifold collapse or obstruction.
- (k) Check whether there is excessive fuel in the crankcase.
- (l) Check evaporative emission control systems working condition.

- (m) Check other fault lights in I/P working condition.  
Is engine System normal?

Yes

System normal

No

Step 7 Repair engine and its components.

Next

Step 8 System normal.

### 5. Repair Instructions:

Replace fuel injectors. Refer to [2.2.8.2 Fuel Injector Replacement](#).

Replace Canister solenoid valve. Refer to [2.4.7.3 Canister Solenoid Valve Replacement](#).

### 2.12.7.27 DTC P0222 P0223

#### 1. DTC Descriptor:

DTC	P0222	Electronic Throttle Position Sensor 2 Circuit Low Voltage
DTC	P0223	Electronic Throttle Position Sensor 2 Circuit High-Voltage

TPS2 sensor sends signal through ECT harness connector EO27 terminal C to ECM through ECM harness connector EO01 terminal No.26. If the TPS2 sensor signal is lost, ECM is still able to receive the normal TPS1 sensor signal, then ECM controls the engine enter "reliability of determining the driver's intention decline or no high power output mode". Engine responds to the pedal changes slow and engine power output will be significantly weaker, although the vehicle can still be able to driving in normal traffic.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0122	Hardware Circuit Malfunction	TPS signal end short to ground or open, the input signal is less than 8%, DTC code set.	1. Electronic Throttle Body
P0123	Hardware Circuit Malfunction	TPS signal end short to power supply, input signal is greater than 92.7%, DTC code set.	2. Electronic Throttle Circuit 3. ECM

#### 3. Schematic:

Refer to [2.12.7.21 DTC P0122 P0123](#).

#### 4. Diagnostic Steps:

Step 1	Check for DTC codes P0641, P0651, P0222, P0223.
--------	---

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Press the scan tool power button.
- Select the following menu items: Engine/Read DTC codes.

(e) Read DTC codes.

Results:

DTC Codes Shown	To Step
only P0222, P0223	Yes
P0122, P0123, P0641, P0651	No

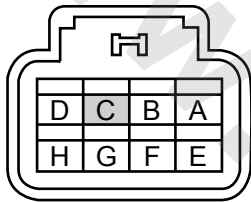
No

Refer to [2.12.7.46 DTC P0641 P0651](#)

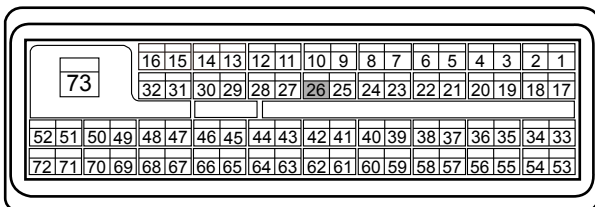
Yes

Step 2 Check EO27 terminal C.

Electronic Throttle Body Harness Connector EO27



ECM Harness Connector EO01



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- Turn the ignition switch to "OFF" position.
- Disconnect ETC harness connector EO27.
- Disconnect ECM harness connector EO01.
- Measure resistance between EO27 terminal C and a reliable ground.
- Measure voltage between EO27 terminal C and a reliable ground.
- Test continuity between EO27 terminal C and EO01 terminal No.26.

Results:

Test Items	Standard Value
Resistance Between EO27 (C) and A Reliable Ground	10 kΩ or higher
Voltage Between EO27 (C) and A Reliable Ground	0 V
EO27 (C) and EO01 (26) Continuity	Less than 1 Ω

Is the value specified value?

No

Circuit malfunction, repair the circuit.

Yes

Step 3 Check terminal C voltage output signal.

- Connect ETC harness connector EO27.
- Connect ECM harness connector EO01.
- Measure ETC harness connector EO27 terminal C output voltage.

Standard Value: Refer to [2.12.7.12 Electronic Throttle Body \(ETC\) Check](#).

Is the output voltage value specified value?

No

Replace the electronic throttle body (ETC).  
Refer to the throttle replacement.

Yes

Step 4 Check ECM power supply circuit and ground circuit.

- (a) Check ECM Power Supply Circuit and ground circuit. Refer to [2.12.7.43 DTC P0562 P0563](#).

ECM power and ground circuits normal?

No

Repair power and ground fault circuits.

Yes

Step 5 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Next

Step 6 Carry out crankshaft position sensor self learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 7 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Road test the vehicle for at least 10 min.  
 (f) Read control system DTC code.  
 Verify the system output is DTC free.

No

Intermittent Fault. Refer to [2.12.7.3 Intermittent Fault Check](#)

Yes

Step 8 Diagnostic completed.

### 5. Repair Instructions:

Electronic throttle body (ETC) can only be replaced as an assembly. Do not disassemble it and repair. Refer to "Electronic Throttle Body Replacement".

## 2.12.7.28 DTC P0230

### 1. DTC Descriptor:

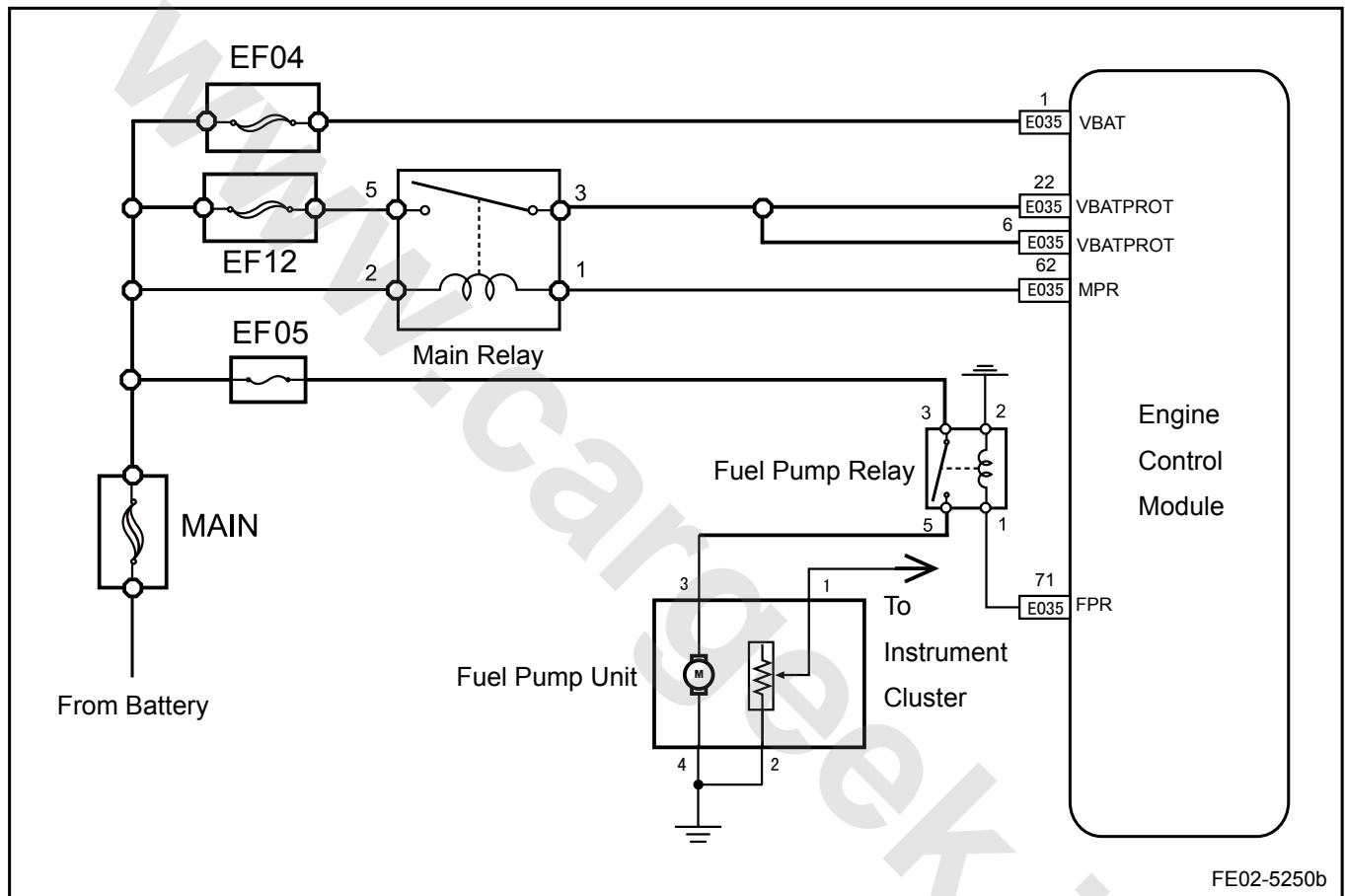
DTC	P0230	Fuel Pump Relay Malfunction
-----	-------	-----------------------------

The power pump relay coil working voltage is provided by ECM. ECM provides power through ECM harness connector EO35 terminal No.71 to pump relay terminal No.1. The fuel pump is grounded through the terminal No.2, pump relay pull-in. ECM has an internal detection circuit. By monitoring the feedback voltage ECM determines whether the control circuit is open, short to ground or short to voltage.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0230	Hardware Circuit Checks	The ignition switch is turned on, turning on time longer than the system preset threshold. the fuel pump relay voltage is too high or too low.	1. Relay Circuit 2. Relay 3. ECM

## 3. Schematic



## 4. Diagnostic Steps:

For fuel pump relay diagnostic. Refer to [2.13.1.1 Fuel Pump Inoperative](#).

## 2.12.7.29 DTC P0261 P0262

## 1. DTC Descriptor:

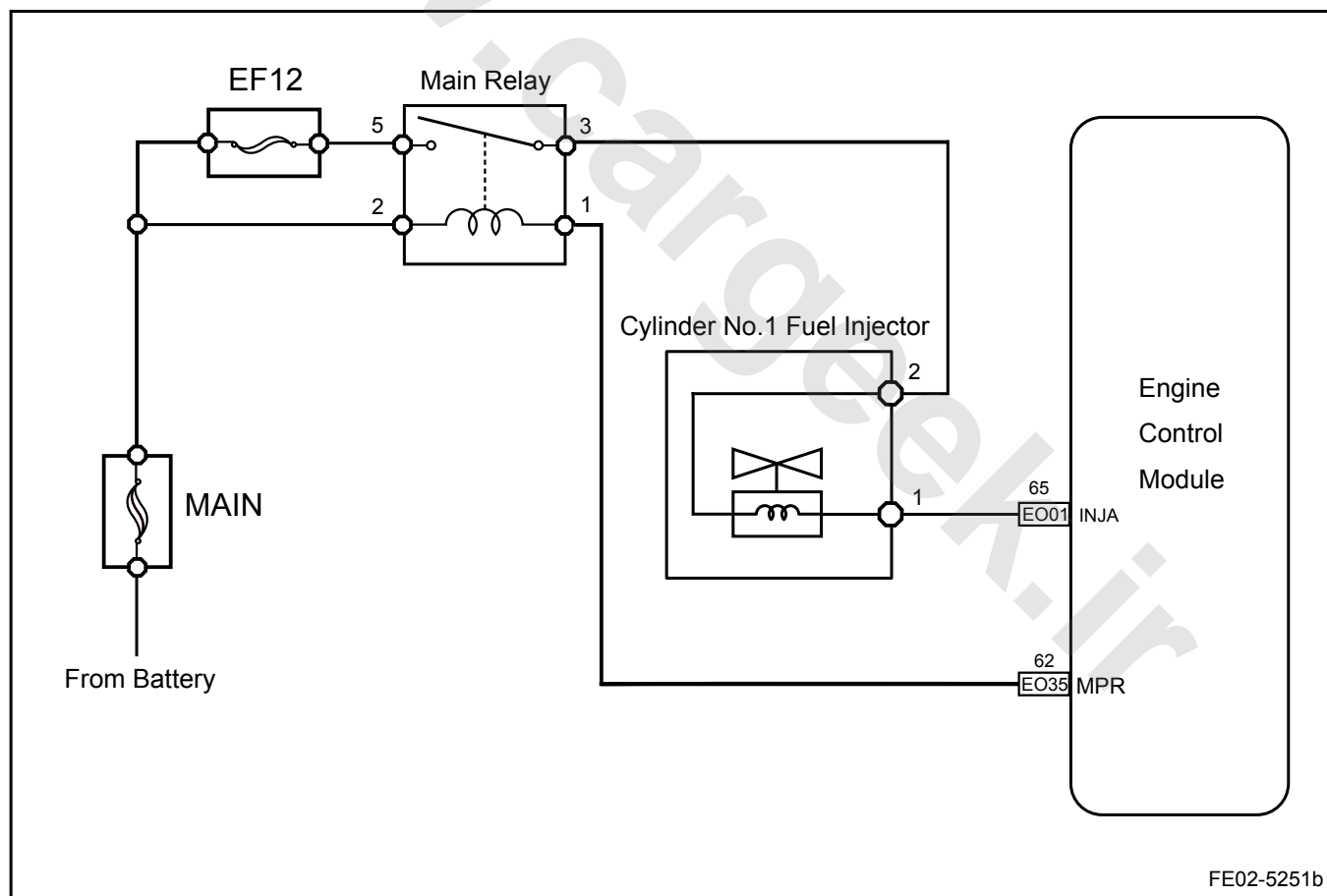
DTC	P0261	Cylinder No.1 Fuel Injector Circuit Low Voltage Fault
DTC	P0262	Cylinder No.1 Fuel Injector Circuit High Voltage Fault

Fuel injectors operating voltage is provided by The Main Relay controlled by ECM. battery voltage passes through the main relay terminal No.3 to all fuel injector wiring harness connectors terminal No.1. ECM controls Cylinder No.1 fuel injector internal ground circuit through ECM harness connector EO01 terminal No.65. ECM monitors all fuel injector driver circuits status, if ECM detects driving circuit status corresponding voltage is incorrect, ECM will set a fuel injector control circuit fault DTC code.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0261	Hardware Circuit Checks	Injector Signal Circuit Open or Short To Ground	1. Sensor Circuit 2. Sensor 3. ECM
P0262	Hardware Circuit Checks	Injector Signal Circuit Short To Power Supply	1. Sensor Circuit 2. Sensor 3. ECM

## 3. Schematic:





## 4. Diagnostic Steps:

## Note

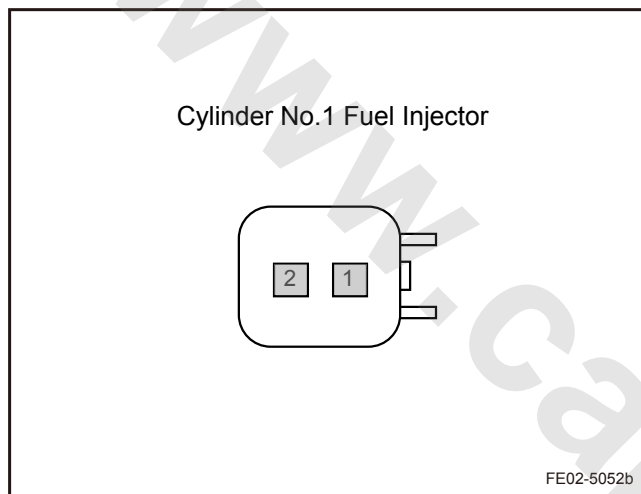
Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

- (a) Check for fuel injector wiring harness connector damage, poor connection, aging and signs of loosening.

Next

Step 2	Measure the fuel injector resistance.
--------	---------------------------------------



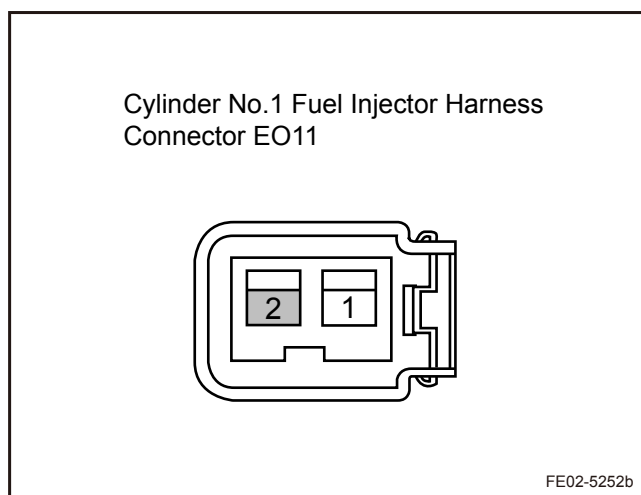
- (a) Disconnect the fuel injector wiring harness connector EO11.  
 (b) Measure resistance between the two fuel injector terminals.  
 Standard Resistance: 11.6-12.4  $\Omega$  at 20°C(68 °F)  
 (c) Connect the fuel injector wiring harness connector EO11.

No

Replace fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).

Yes

Step 3	Measure fuel injector working power supply.
--------	---



- (a) Turn the ignition switch to "OFF" position.  
 (b) Disconnect cylinder No.1 fuel injector wiring harness connector EO11.  
 (c) Turn the ignition switch to "ON" position.  
 (d) Measure voltage between cylinder No.1 fuel injector wiring harness connector EO11 terminal No.2 and a reliable ground.  
 Standard Voltage: 11-14 V  
 (e) Connect cylinder No.1 fuel injector wiring harness connector EO11.

Voltage normal?

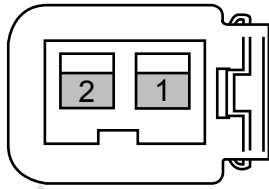
No

Go to step 5

Yes

Step 4	Check the fuel injector control circuit.
--------	--

Cylinder No.1 Fuel Injector Harness Connector EO11



FE02-5253b

- Turn the ignition switch to "OFF" position.
- Disconnect cylinder No.1 fuel injector wiring harness connector EO11.
- Connect a light-emitting diodes test lamp to the fuel injector wiring harness connector EO11 terminal No.1 and 2.
- Start the engine.
- Observe whether test lamp is flashing.

Is the test lamp flashing?

No

Go to step 6

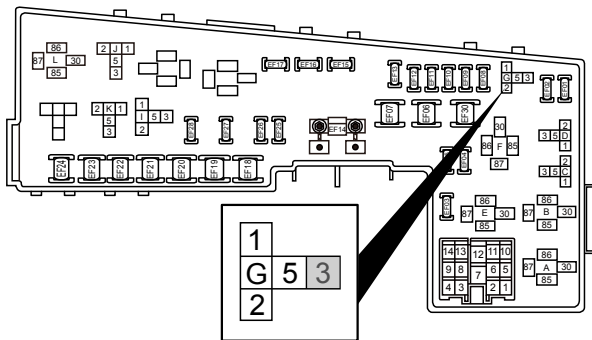
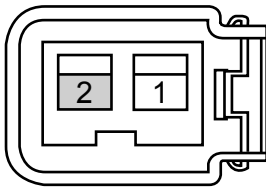
Yes

Go to step 7

## Step 5

Check and repair cylinder No.1 fuel injector power circuit.

Cylinder No.1 Fuel Injector Harness Connector EO11



FE02-5254b

- Turn the ignition switch to "OFF" position.
- Disconnect the fuel injector wiring harness connector EO11.
- Remove the engine main relay.
- Measure resistance between cylinder No.1 fuel injector wiring harness connector EO11 terminal No.2 and engine main relay terminal No.3.
- Measure resistance between cylinder No.1 fuel injector wiring harness connector EO11 terminal No.2 and a reliable ground.

Test Items	Standard Value
Resistance Between EO11 (2) and Main Relay Terminal No.3	Less than 1 $\Omega$
Resistance Between EO11 (2) and a reliable ground	10 k $\Omega$ or higher

- Install the engine main relay.
- Connect cylinder No.1 fuel injector wiring harness connector EO11.

Exclude fuel injector power circuit malfunction.

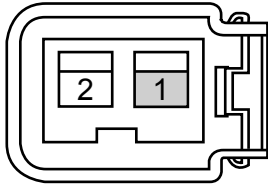
Next

Go to step 9

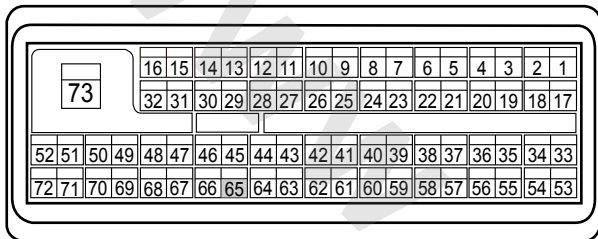
## Step 6

Check cylinder No.1 fuel injector control circuit.

Cylinder No.1 Fuel Injector Harness Connector EO11



ECM Harness Connector EO01



FE02-5255b

- Turn the ignition switch to "OFF" position.
- Disconnect cylinder No.1 fuel injector wiring harness connector EO11.
- Disconnect ECM harness connector EO01.
- Measure resistance between cylinder No.1 fuel injector wiring harness connector EO11 terminal No.1 and ECM harness connector terminal No.65. Check whether the circuit is open. Otherwise, repair the faulty part.
- Measure resistance between cylinder No.1 fuel injector wiring harness connector EO11 terminal No.1 and a reliable ground. Check whether the circuit is short to ground. Otherwise, repair the faulty part.
- Measure voltage between cylinder No.1 fuel injector wiring harness connector EO11 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. Otherwise, repair the faulty part.

Test Items	Standard Value
Resistance Between EO11 (1) and EO01 (65)	Less than 1 $\Omega$
Resistance Between EO11 (1) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EO11 (1) and A Reliable Ground	0 V

Execute next step as per normal.

Next

Step 7 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

- Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.

- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 10 Diagnostic completed.

### 2.12.7.30 DTC P0264 P0265

#### 1. DTC Descriptor:

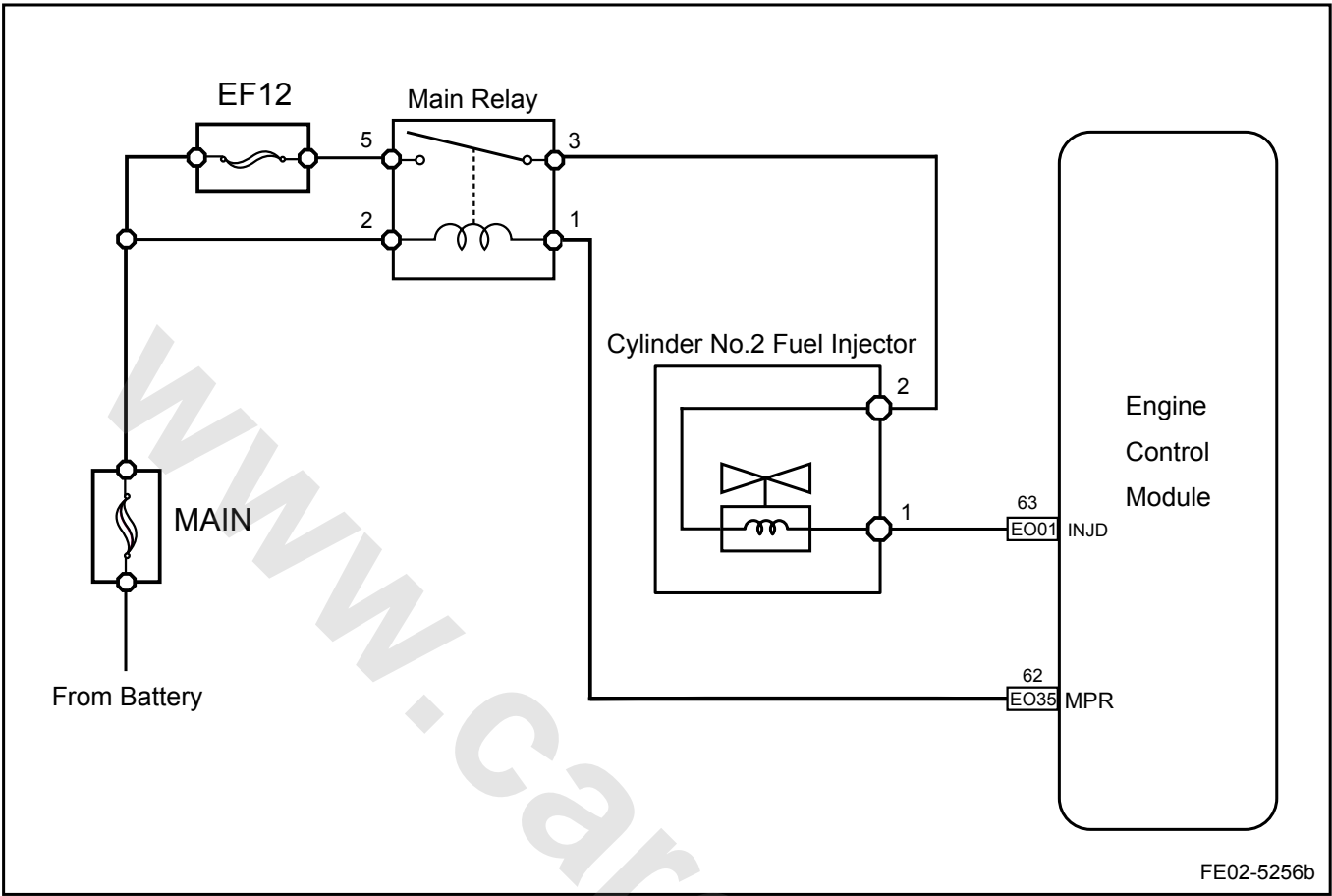
DTC	P0264	Cylinder No.2 Fuel Injector Circuit Low Voltage Fault
DTC	P0265	Cylinder No.2 Fuel Injector Circuit High Voltage Fault

Fuel injectors operating voltage is provided by The Main Relay controlled by ECM. battery voltage passes through the main relay terminal No.3 to all fuel injector wiring harness connectors terminal No.1. ECM controls Cylinder No.2 fuel injector internal ground circuit through ECM harness connector EO01 terminal No.63. ECM monitors all fuel injector driver circuits status, if ECM detects driving circuit status corresponding voltage is incorrect, ECM will set a fuel injector control circuit fault DTC code.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0264	Hardware Circuit Checks	Injector Signal Circuit Open or Short To Ground	1. Sensor Circuit 2. Sensor 3. ECM
P0265	Hardware Circuit Checks	Injector Signal Circuit Short To Power Supply	1. Sensor Circuit 2. Sensor 3. ECM

3. Schematic:



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

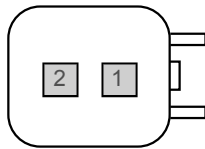
Step 1	Initial Inspection
--------	--------------------

- (a) Check for fuel injector wiring harness connector damage, poor connection, aging and signs of loosening.

Next

Step 2	Measure the fuel injector resistance.
--------	---------------------------------------

Cylinder No.2 Fuel Injector



FE02-5058b

- (a) Disconnect the fuel injector wiring harness connector EO12.
- (b) Measure resistance between the two fuel injector terminals.  
Standard Resistance: 11.6-12.4  $\Omega$  at 20°C(68 °F)
- (c) Connect the fuel injector wiring harness connector EO12.

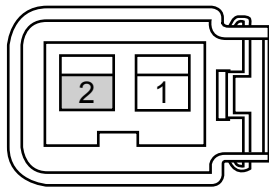
No

Replace fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).

Yes

Step 3 Measure fuel injector working power supply.

Cylinder No.2 Fuel Injector Harness Connector EO12



FE02-5257b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect cylinder No.2 fuel injector wiring harness connector EO12.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between cylinder No.2 fuel injector wiring harness connector EO12 terminal No.2 and a reliable ground.  
Standard Voltage: 11-14 V
- (e) Connect cylinder No.2 fuel injector wiring harness connector EO12.

Voltage normal?

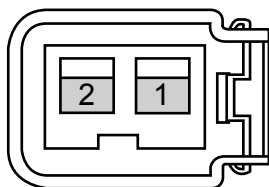
No

Go to step 5

Yes

Step 4 Check the fuel injector control circuit.

Cylinder No.2 Fuel Injector Harness Connector EO12



FE02-5258b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect cylinder No.2 fuel injector wiring harness connector EO12.
- (c) Connect a light-emitting diodes test lamp to the fuel injector wiring harness connector EO12 terminal No.1 and 2.
- (d) Start the engine.
- (e) Observe whether test lamp is flashing.

Is the test lamp flashing?

No

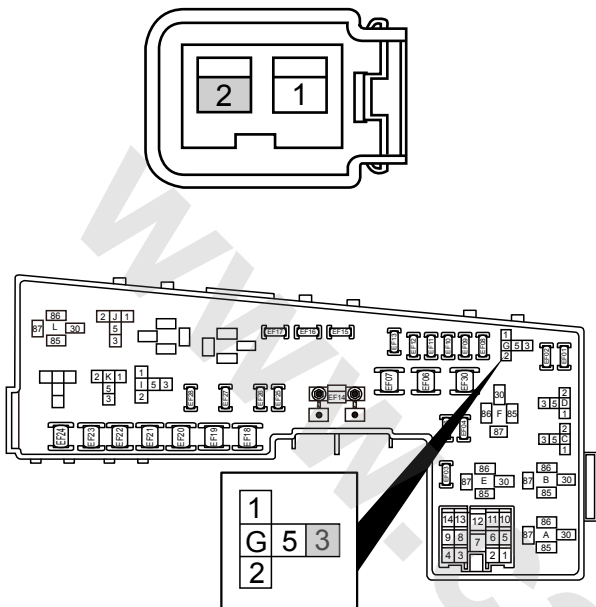
Go to step 6

Yes

Go to step 7

Step 5 Check and repair cylinder No.2 fuel injector power circuit.

Cylinder No.2 Fuel Injector Harness Connector EO12



FE02-5259b

- Turn the ignition switch to "OFF" position.
- Disconnect the fuel injector wiring harness connector EO12.
- Remove the engine main relay.
- Measure resistance between cylinder No.1 fuel injector wiring harness connector EO12 terminal No.2 and engine main relay terminal No.3.
- Measure resistance between cylinder No.1 fuel injector wiring harness connector EO12 terminal No.2 and a reliable ground.

Test Items	Standard Value
Resistance Between EO12 (2) and Main Relay Terminal No.3	Less than 1 $\Omega$
Resistance Between EO12 (2) and A Reliable Ground	10 k $\Omega$ or higher

- Install the engine main relay.
- Connect cylinder No.2 fuel injector wiring harness connector EO12.

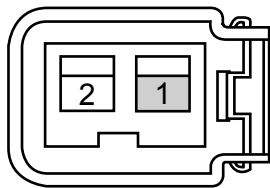
Exclude fuel injector power circuit malfunction.

Next

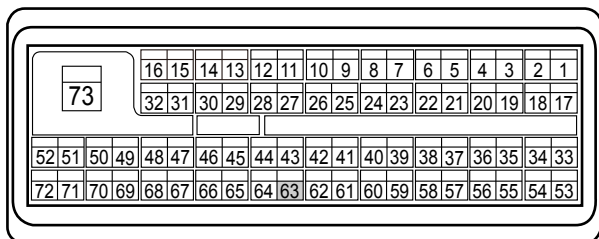
Go to step 9

Step 6 Check cylinder No.2 fuel injector control circuit.

Cylinder No.2 Fuel Injector Harness Connector EO12



ECM Harness Connector EO01



FE02-5260b

- Turn the ignition switch to "OFF" position.
- Disconnect cylinder No.2 fuel injector wiring harness connector EO12.
- Disconnect ECM harness connector EO01.
- Measure resistance between cylinder No.2 fuel injector wiring harness connector EO12 terminal No.1 and ECM harness connector terminal No.63. Check whether the circuit is open. Otherwise, repair the faulty part.
- Measure resistance between cylinder No.2 fuel injector wiring harness connector EO12 terminal No.1 and a reliable ground. Check whether the circuit is short to ground. Otherwise, repair the faulty part.
- Measure voltage between cylinder No.2 fuel injector wiring harness connector EO12 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. Otherwise, repair the faulty part.

Test Items	Standard Value
Resistance Between EO12 (1) and EO01 (63)	Less than 1 $\Omega$

Resistance Between EO12 (1) and A Reliable Ground	10 kΩ or higher
Voltage Between EO12 (1) and A Reliable Ground	0 V

Execute next step as per normal.

Next

Step 7 Check ECM power supply circuit.

- (a) Check whether ECM power supply circuit is normal.
- (b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

- (a) Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Road test the vehicle for at least 10 min.
- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 10 Diagnostic completed.

#### 5. Repair Instructions:

Replace the fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).

### 2.12.7.31 DTC P0267 P0268

#### 1. DTC Descriptor:

DTC	P0267	Cylinder No.3 Fuel Injector Circuit Low Voltage Fault
DTC	P0268	Cylinder No.3 Fuel Injector Circuit High Voltage Fault

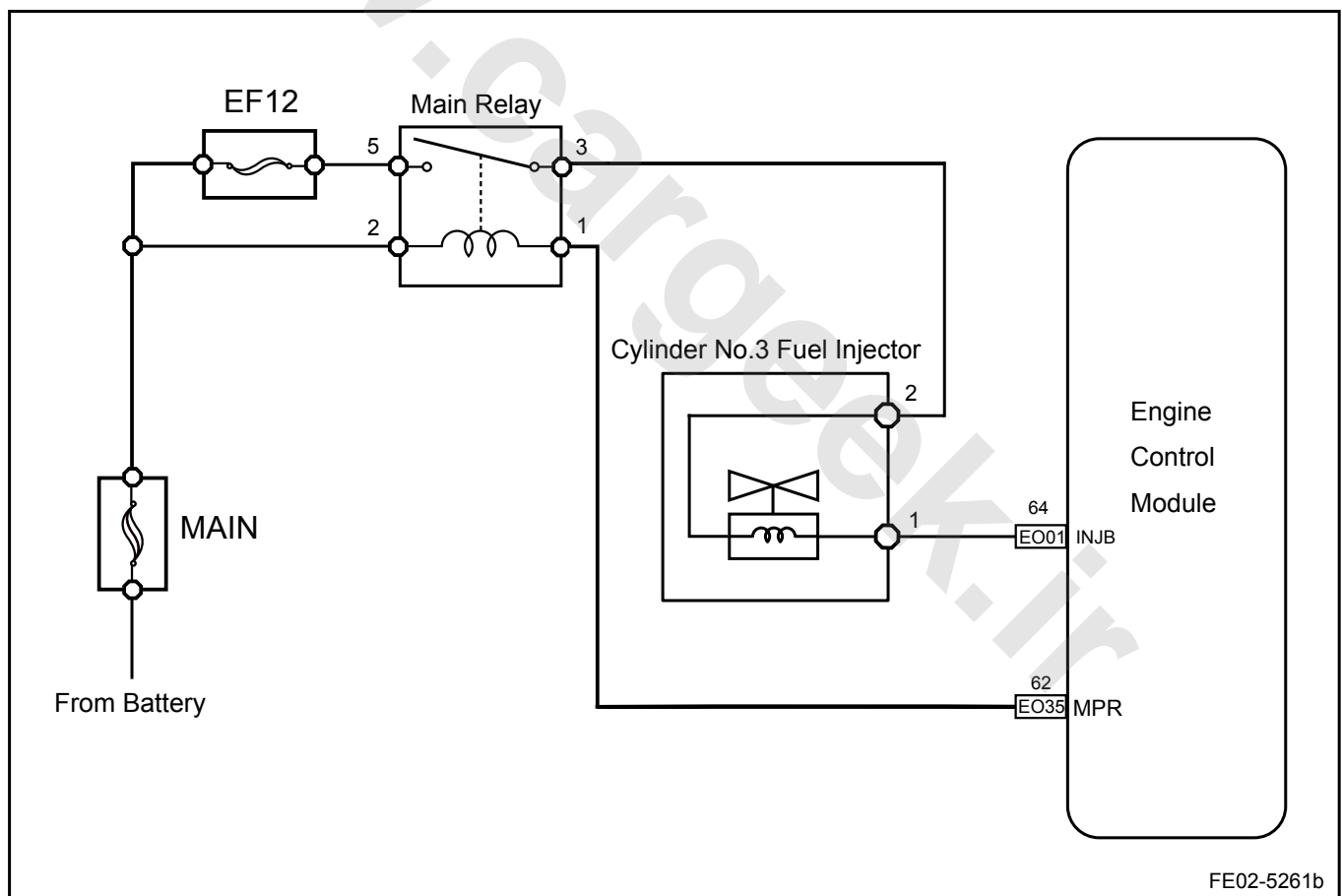


Fuel injectors operating voltage is provided by The Main Relay controlled by ECM. battery voltage passes through the main relay terminal No.3 to all fuel injector wiring harness connectors terminal No.1. ECM controls Cylinder No.3 fuel injector internal ground circuit through ECM harness connector EO01 terminal No.64. ECM monitors all fuel injector driver circuits status, if ECM detects driving circuit status corresponding voltage is incorrect, ECM will set a fuel injector control circuit fault DTC code.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0267	Hardware Circuit Checks	Injector Signal Circuit Open or Short To Ground	1. Sensor Circuit 2. Sensor 3. ECM
P0268	Hardware Circuit Checks	Injector Signal Circuit Short To Power Supply	1. Sensor Circuit 2. Sensor 3. ECM

## 3. Schematic



## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

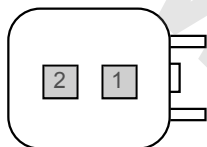
Step 1	Initial Inspection
--------	--------------------

- (a) Check for fuel injector wiring harness connector damage, poor connection, aging and signs of loosening.

Next

Step 2	Measure the fuel injector resistance.
--------	---------------------------------------

Cylinder No.3 Fuel Injector



FE02-5064b

- (a) Disconnect the fuel injector wiring harness connector EO13.  
(b) Measure resistance between the two fuel injector terminals.  
Standard Resistance: 11.6-12.4  $\Omega$  at 20°C(68 °F)  
(c) Connect the fuel injector wiring harness connector EO13.

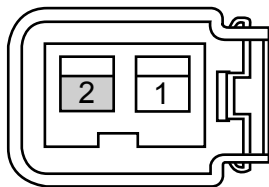
No

Replace fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).

Yes

Step 3	Measure fuel injector working power supply.
--------	---

Cylinder No.3 Fuel Injector Harness Connector EO13



FE02-5262b

- (a) Turn the ignition switch to "OFF" position.  
(b) Disconnect cylinder No.3 fuel injector wiring harness connector EO13.  
(c) Turn the ignition switch to "ON" position.  
(d) Measure voltage between cylinder No.3 fuel injector wiring harness connector EO13 terminal No.2 and a reliable ground.  
Standard Voltage: 11-14 V  
(e) Connect cylinder No.3 fuel injector wiring harness connector EO13.

Voltage normal?

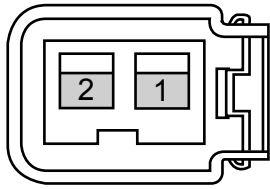
No

Go to step 5

Yes

Step 4	Check the fuel injector control circuit.
--------	--

Cylinder No.3 Fuel Injector Harness Connector EO13



FE02-5263b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect cylinder No.3 fuel injector wiring harness connector EO13.
- (c) Connect a light-emitting diodes test lamp to the fuel injector wiring harness connector EO13 terminal No.1 and 2.
- (d) Start the engine.
- (e) Observe whether test lamp is flashing.

Is the test lamp flashing?

No

Go to step 6

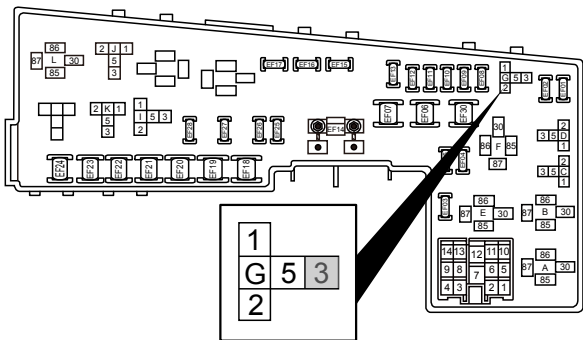
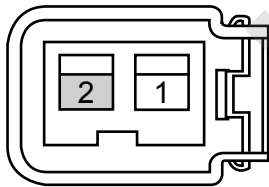
Yes

Go to step 7

## Step 5

Check and repair cylinder No.3 fuel injector power circuit.

Cylinder No.3 Fuel Injector Harness Connector EO13



FE02-5264b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the fuel injector wiring harness connector EO13.
- (c) Remove the engine main relay.
- (d) Measure resistance between cylinder No.3 fuel injector wiring harness connector EO13 terminal No.2 and engine main relay terminal No.3.
- (e) Measure resistance between cylinder No.3 fuel injector wiring harness connector EO13 terminal No.2 and a reliable ground.

Test Items	Standard Value
Resistance Between EO13 (2) and Main Relay Terminal No.3	Less than 1 $\Omega$
Resistance Between EO13 (2) and A Reliable Ground	10 k $\Omega$ or higher

- (f) Install the engine main relay.
- (g) Connect cylinder No.3 fuel injector wiring harness connector EO13.

Exclude fuel injector power circuit malfunction.

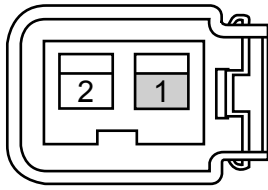
Next

Go to step 9

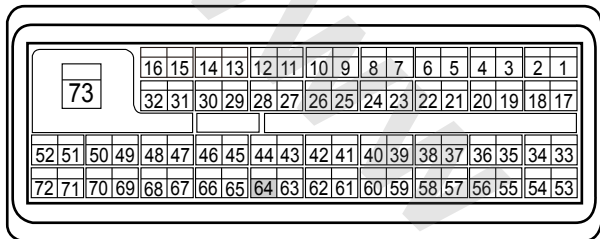
## Step 6

Check cylinder No.3 fuel injector control circuit.

Cylinder No.3 Fuel Injector Harness Connector EO13



ECM Harness Connector EO01



FE02-5265b

- Turn the ignition switch to "OFF" position.
- Disconnect cylinder No.3 fuel injector wiring harness connector EO13.
- Disconnect ECM harness connector EO01.
- Measure resistance between cylinder No.3 fuel injector wiring harness connector EO13 terminal No.1 and ECM harness connector terminal No.64. Check whether the circuit is open. Otherwise, repair the faulty part.
- Measure resistance between cylinder No.3 fuel injector wiring harness connector EO13 terminal No.1 and a reliable ground. Check whether the circuit is short to ground. Otherwise, repair the faulty part.
- Measure voltage between cylinder No.3 fuel injector wiring harness connector EO13 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. Otherwise, repair the faulty part.

Test Items	Standard Value
Resistance Between EO13 (1) and EO01 (64)	Less than 1 $\Omega$
Resistance Between EO13 (1) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EO13 (1) and A Reliable Ground	0 V

Execute next step as per normal.

Next

Step 7 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

- Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.

- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 10 Diagnostic completed.

#### 5. Repair Instructions:

Replace the fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).

### 2.12.7.32 DTC P0270 P0271

#### 1. DTC Descriptor:

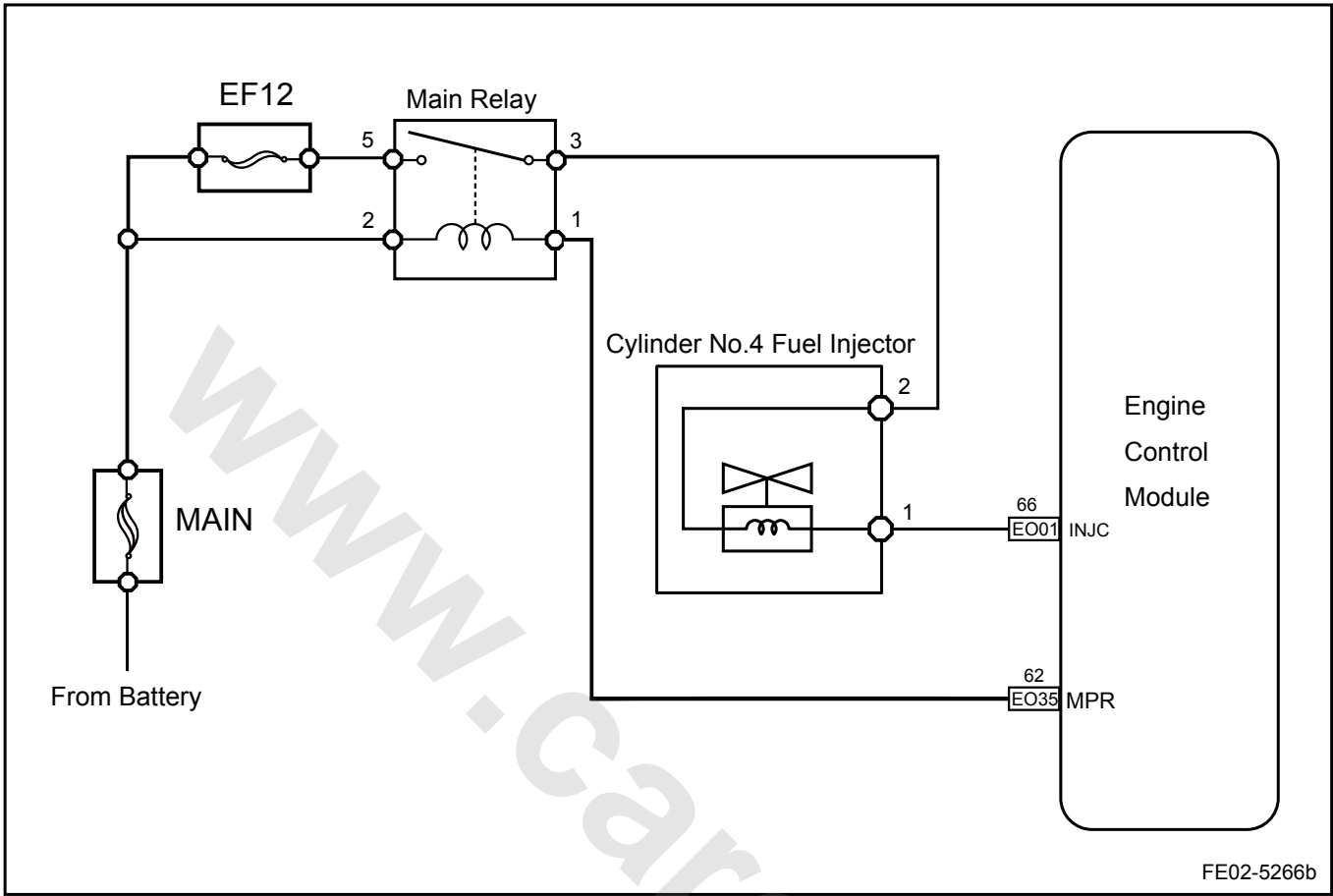
DTC	P0270	Cylinder No.4 Fuel Injector Circuit Low Voltage Fault
DTC	P0271	Cylinder No.4 Fuel Injector Circuit High Voltage Fault

Fuel injectors operating voltage is provided by The Main Relay controlled by ECM. battery voltage passes through the main relay terminal No.3 to all fuel injector wiring harness connectors terminal No.1. ECM controls Cylinder No.4 fuel injector internal ground circuit through ECM harness connector EO01 terminal No.66. ECM monitors all fuel injector driver circuits status, if ECM detects driving circuit status corresponding voltage is incorrect, ECM will set a fuel injector control circuit fault DTC code.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0270	Hardware Circuit Checks	Injector Signal Circuit Open or Short To Ground	1. Sensor Circuit 2. Sensor 3. ECM
P0271	Hardware Circuit Checks	Injector Signal Circuit Short To Power Supply	1. Sensor Circuit 2. Sensor 3. ECM

3. Schematic:



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

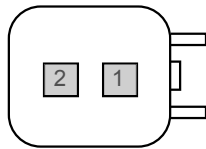
Step 1	Initial Inspection
--------	--------------------

- (a) Check for fuel injector wiring harness connector damage, poor connection, aging and signs of loosening.

Next

Step 2	Measure the fuel injector resistance.
--------	---------------------------------------

Cylinder No.4 Fuel Injector



FE02-5070b

- (a) Disconnect the fuel injector wiring harness connector EO14.
- (b) Measure resistance between the two fuel injector terminals.  
Standard Resistance: 11.6-12.4  $\Omega$  at 20°C(68 °F)
- (c) Connect the fuel injector wiring harness connector EO14.

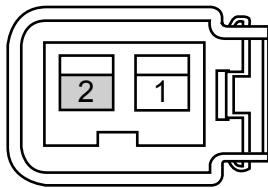
No

replace fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).

Yes

Step 3 Measure fuel injector working power supply.

Cylinder No.4 Fuel Injector Harness Connector EO14



FE02-5267b

- (a) Turn the ignition switch to "OFF" position.
  - (b) Disconnect cylinder No.4 fuel injector wiring harness connector EO14.
  - (c) Turn the ignition switch to "ON" position.
  - (d) Measure voltage between cylinder No.4 fuel injector wiring harness connector EO14 terminal No.2 and a reliable ground.  
Standard Voltage: 11-14 V
  - (e) Connect cylinder No.4 fuel injector wiring harness connector EO14.
- Voltage normal?

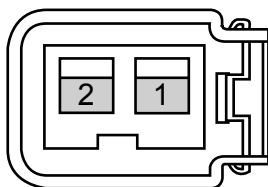
No

Go to step 5

Yes

Step 4 Check the fuel injector control circuit.

Cylinder No.4 Fuel Injector Harness Connector EO14



FE02-5268b

- (a) Turn the ignition switch to "OFF" position.
  - (b) Disconnect cylinder No.4 fuel injector wiring harness connector EO14.
  - (c) Connect a light-emitting diodes test lamp to the fuel injector wiring harness connector EO14 terminal No.1 and 2.
  - (d) Start the engine.
  - (e) Observe whether test lamp is flashing.
- Is the test lamp flashing?

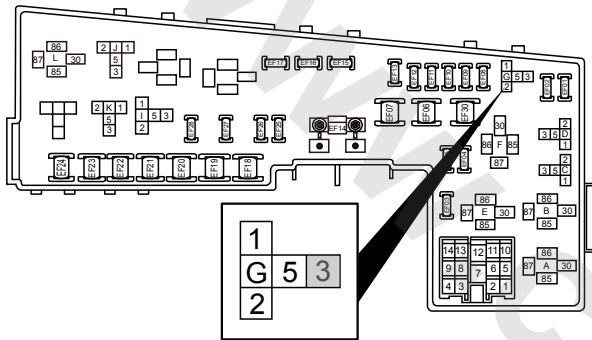
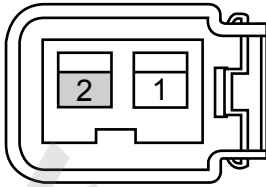
No

Go to step 6

Yes

Go to step 7

**Step 5** Check and repair cylinder No.4 fuel injector power circuit.

**Cylinder No.4 Fuel Injector Harness Connector EO14**


FE02-5269b

- Turn the ignition switch to "OFF" position.
- Disconnect the fuel injector wiring harness connector EO14.
- Remove the engine main relay.
- Measure resistance between cylinder No.4 fuel injector wiring harness connector EO14 terminal No.2 and engine main relay terminal No.3.
- Measure resistance between cylinder No.4 fuel injector wiring harness connector EO14 terminal No.2 and a reliable ground.

Test Items	Standard Value
Resistance Between EO14 (2) and Main Relay Terminal No.3	Less than 1 $\Omega$
Resistance Between EO14 (2) and A Reliable Ground	10 k $\Omega$ or higher

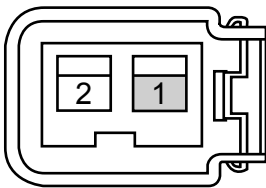
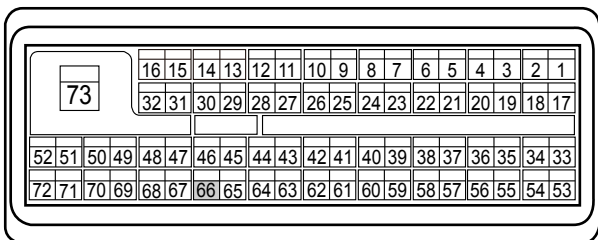
- Install the engine main relay.
- Connect cylinder No.4 fuel injector wiring harness connector EO14.

Exclude fuel injector power circuit malfunction.

Next

Go to step 9

**Step 6** Check cylinder No.4 fuel injector control circuit.

**Cylinder No.4 Fuel Injector Harness Connector EO14**

**ECM Harness Connector EO01**


FE02-5270b

- Turn the ignition switch to "OFF" position.
- Disconnect cylinder No.4 fuel injector wiring harness connector EO14.
- Disconnect ECM harness connector EO01.
- Measure resistance between cylinder No.4 fuel injector wiring harness connector EO14 terminal No.1 and ECM harness connector terminal No.66. Check whether the circuit is open. Otherwise, repair the faulty part.
- Measure resistance between cylinder No.4 fuel injector wiring harness connector EO14 terminal No.1 and a reliable ground. Check whether the circuit is short to ground. Otherwise, repair the faulty part.
- Measure voltage between cylinder No.4 fuel injector wiring harness connector EO14 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply. Otherwise, repair the faulty part.

Test Items	Standard Value
Resistance Between EO14 (1) and EO01 (66)	Less than 1 $\Omega$



Resistance Between EO14 (1) and a reliable ground	10 kΩ or higher
voltage between EO14 (1) and A Reliable Ground	0 V

Execute next step as per normal.

Next

Step 7	Check ECM power supply circuit.
--------	---------------------------------

- (a) Check whether ECM power supply circuit is normal.
- (b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8	Replace ECM.
--------	--------------

- (a) Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9	Use scan tool to confirm whether the DTC code is stored again.
--------	--

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Road test the vehicle for at least 10 min.
- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 10	Diagnostic completed.
---------	-----------------------

#### 5. Repair Instructions:

Replace the fuel injector. Refer to [2.2.8.2 Fuel Injector Replacement](#).

### 2.12.7.33 DTC P0300

#### 1. DTC Descriptor:

DTC	P0300	One or More Cylinder Misfire
-----	-------	------------------------------

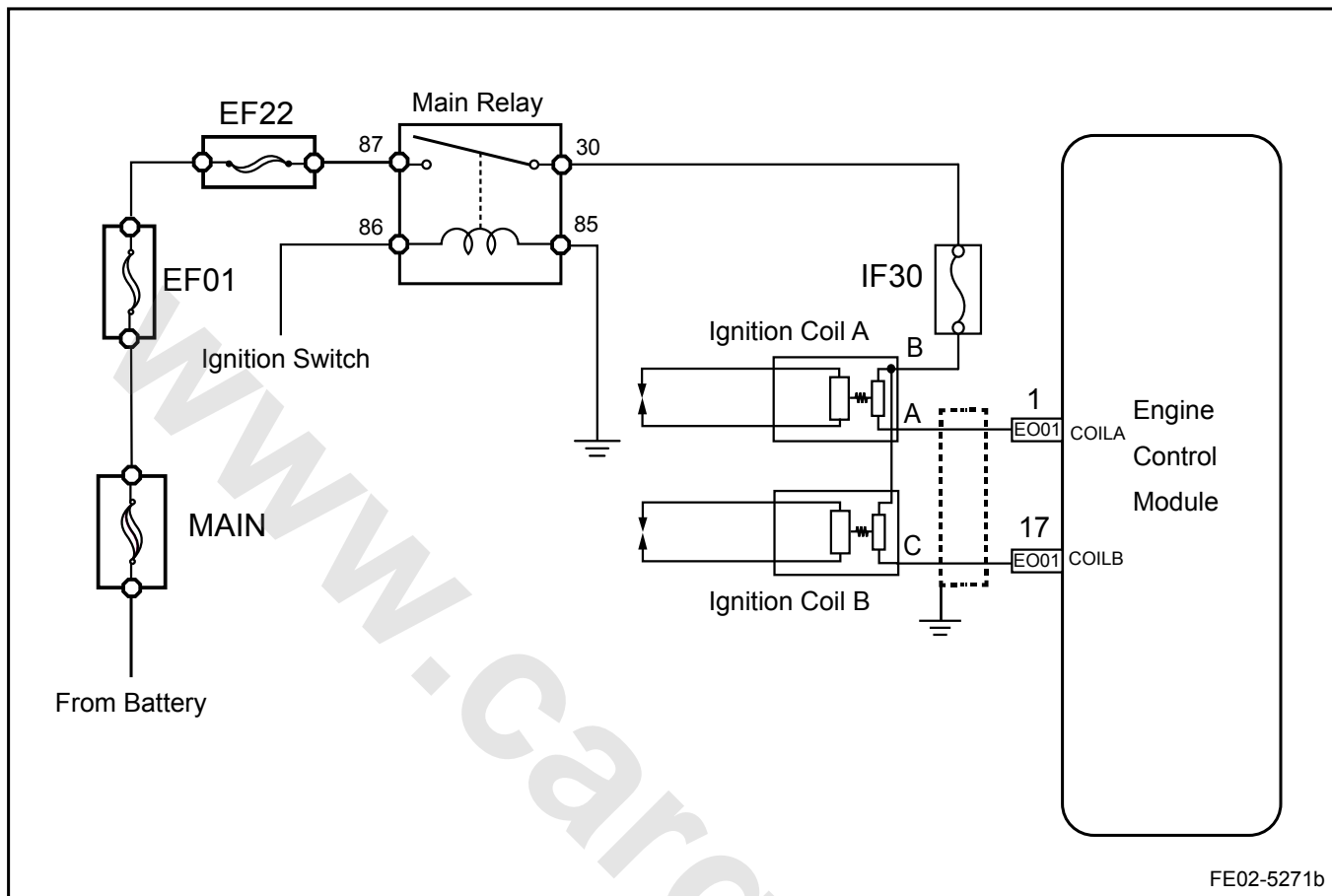
The engine control module (ECM) uses information from the crankshaft position (CKP) sensor and the camshaft position (CMP) sensors to determine when an engine misfire is occurring. By monitoring variations in the crankshaft rotation speed for each cylinder ECM is able to detect individual misfire events. When a misfire happens, unburnt mixture will be discharged into the exhaust system and burnt in the exhaust system. A misfire rate that is high enough can cause 3-way catalytic converter damage. The malfunction indicator lamp (MIL) will flash ON and OFF when the conditions for catalytic converter damage are present. A DTC will be set.

## 2. DTC Code Set Up and Removal Conditions:

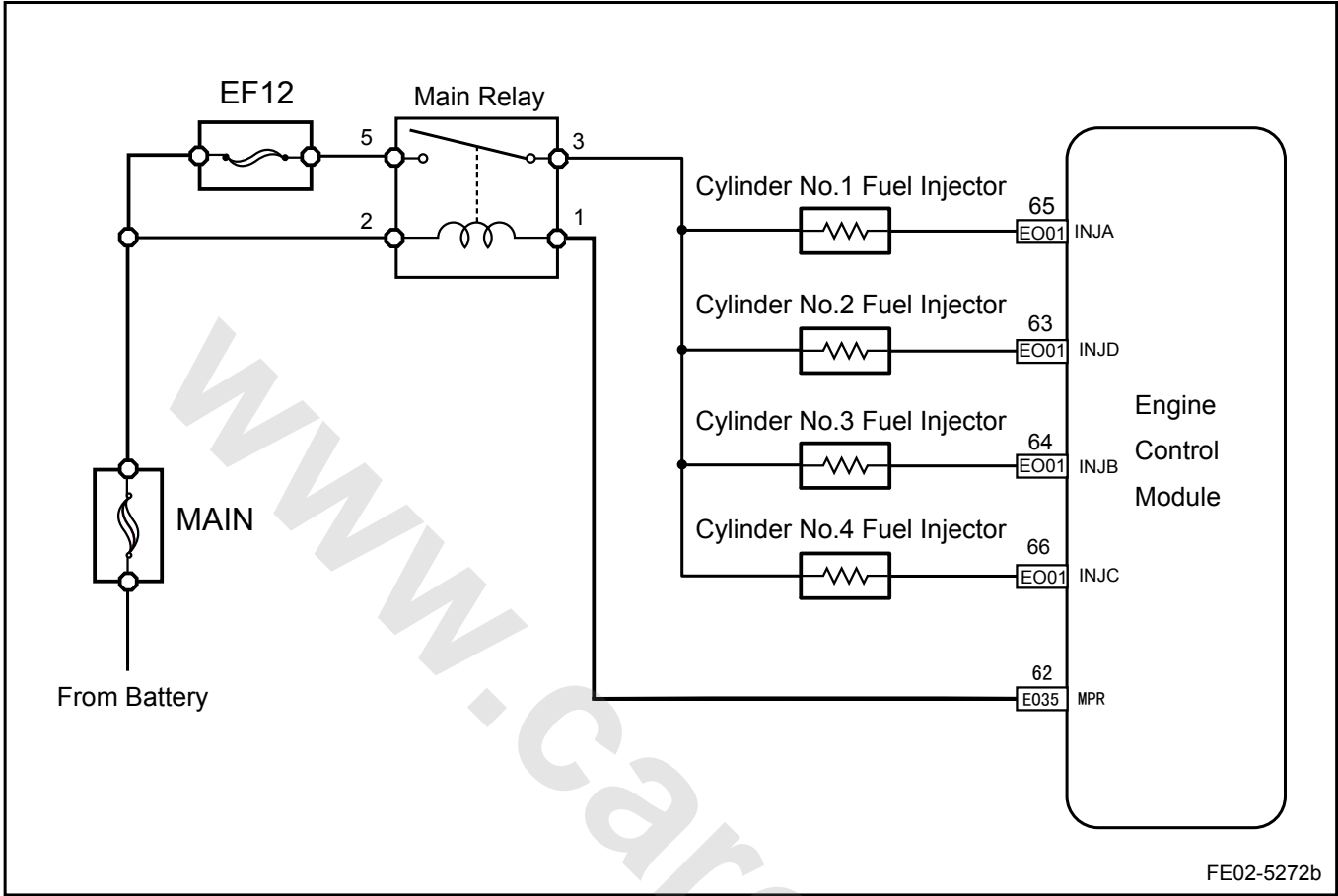
DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0300	Under stable operating conditions, ECM detects the crankshaft rotation speed fluctuations.	Under stable operating conditions, when ECM detect fluctuations in the crankshaft rotation speed exceeds the preset threshold value and when a mild misfire occurs, there is no emergency control programs. System only records the DTC code and data flow, and malfunction lamp light. When there a serious misfire, the system will be forced into the open-loop control mode, and the oxygen sensor learn is not allowed. The malfunction lamp will flash at 1 Hz frequency.	<ol style="list-style-type: none"> <li>1. Connector Loose or Poor Connection</li> <li>2. Vacuum Tube Hose Broken or Loose</li> <li>3. Ignition System</li> <li>4. Fuel Injectors</li> <li>5. Fuel Pressure</li> <li>6. Intake Air Pressure Sensor</li> <li>7. Engine Coolant Temperature Sensor</li> <li>8. Cylinder Compression Pressure</li> <li>9. Valve Clearance and Timing</li> <li>10. Evaporative Emission Control System</li> <li>11. Purged Crankcase Ventilation System</li> <li>12. Intake System</li> <li>13. Poor Exhaust System Ventilation</li> <li>14. ECM</li> </ol>

## 3. Schematic:

Ignition System



Fuel Injector



4. Diagnostic Steps:

Note

- If the control system stores DTC other than misfire, diagnose these DTC first and eliminate the faults.
- If the vehicle does not have a misfire when sent to a service station, road test the vehicle, so that the misfire will occur again. Use scan tool to record ECM data when misfire is occurring, in order to facilitate analyzing the cause of the fault.
- If after a long period road test, ECM does not store any misfire associated DTC codes, then the fault may be due to the following reasons:
  - Overfill fuel tank and fuel enters into the evaporative emission control system, so that the mixture is too rich and causes misfire.
  - Use improper fuel caused poor combustion and misfire.
  - Contaminated spark plug causes the ignition failure and misfire.
  - Carry out basic checks at fault locations identified by DTC codes.
- Road test the vehicle after repair to confirm no DTC is stored.

Step 1	Initial Inspection
--------	--------------------

- (a) Check the wiring harness connector for damage, poor connection, aging or signs of loosening.

- (b) Check the vacuum tube for damaged, loose, leakage and so on.

Next

Step 2 Check for other DTC codes.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Press the scan tool power button.  
 (d) Select the following menu items: Engine/Read DTC codes.  
 (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC Codes Other Than DTC P0300-P0304	No
DTC P0300	Yes

No

Refer to [2.12.7.14 DTC Code Index](#).

Yes

Step 3 Check valves and air intake system.

- (a) Check vacuum solenoid valve Canister connection is correct or not and leakage.  
 (b) Check the vacuum brake booster vacuum tube connection is correct or not and leakage.  
 (c) Check the intake tube pressure sensor connection is correct or not and leakage.  
 (d) Check purged crankcase ventilation valve, ventilation pipe connection is correct or not and leakage.  
 (e) Check whether there is intake leakage.

Is there above mentioned fault?

Yes

Repair the faulty part. Go to step 17

No

Step 4 Check the spark plug.

- (a) Remove the spark plug from the misfire cylinder.  
 (b) Check whether the spark plug gap is too large or too small.  
 Standard Gap: 0.8-1.0 mm (0.031-0.039 in)  
 (c) Check the existence of spark plug electrode erosion, damage.  
 (d) Check whether the spark plug and the electrode part skirt is wet or not and check the existence of a serious gasoline leakage.  
 (e) Reinstall the spark plug.

Is there above mentioned fault?

Yes

Replace the spark plug. Refer to [2.10.8.4 Spark Plug Replacement](#). Go to step 8

No

**Note**

Prior to the implementation of this program, the following conditions must be met:

1. Disconnect all fuel injector connectors.
2. Engine running time must not be longer than 5 s.

Step 5 Check whether the spark plug arcing is normal.

- (a) Test the spark.
  - (b) Remove misfire cylinder ignition wires.
  - (c) Disconnect all fuel injector cylinder connectors.
  - (d) Install the ignition wires to the spark plug.
  - (e) Run the engine (the engine running time no longer than 5s) and check the arcing.
  - (f) Reconnect all cylinder fuel injector connectors.
  - (g) Install the ignition wires.
- Is spark plug arcing normal?

No

Go to step 9

Yes

Step 6 Check the misfire cylinder compression pressure.

- (a) For detailed steps. Refer to .
- Is cylinder compression pressure normal?

Yes

Go to step 10

No

Step 7 Check the cause of cylinder compression pressure too low. Refer to the "Engine Mechanical System" in the [2.6.7 Diagnostic Information and Procedures](#).

Step 8 Check fuel and misfire cylinder fuel injectors.

- (a) Check whether there is fuel injectors leakage and stagnate.
  - (b) Check fuel quality.
- Is there above mentioned fault?

Yes

Repair the faulty part. Go to step 17

No

**Note**

Prior to the implementation of this test, the following conditions must be met:

1. Disconnect all fuel injector connectors.

## 2. Run the engine for no longer than 5 s.

Step 9	Use a properly working spark plug and check whether there is misfire cylinder arcing.
--------	---

(a) Replace the installed spark plug with a spark plug that works properly.

(b) Test spark plug.

(c) Remove misfire cylinder ignition wires.

(d) Disconnect all fuel injector cylinder connectors.

(e) Install the ignition wires to the spark plug.

(f) Run the engine (the engine running time no longer than 5 s) and check the arcing.

(g) Reconnect all cylinder fuel injector connectors.

(h) Install the ignition wires.

Is spark plug arcing normal?

No → Check the ignition coil and ignition wire. Go to step 17

Yes → Replace the spark plug. Refer to [2.10.8.4 Spark Plug Replacement](#). Go to step 17

Step 10	Check ECM control connector terminal voltage of the misfire cylinder fuel injector.
---------	---

ECM Harness Connector EO01

FE02-5273b

(a) Turn the ignition switch to the "ON" position.

(b) Remove ECM harness connector EO01.

(c) Measure ECM harness connector EN01 terminal voltage according to the following table.

Connector Terminal	Standard Value
EO01 (65)	9-14 V
EO01 (63)	
EO01 (64)	
EO01 (66)	

Is voltage the specified value?

No → Check the fuel injector circuit. Refer to [2.12.7.29 DTC P0261 P0262](#).

Yes →

Step 11	Check the misfire cylinder valve gap.
---------	---------------------------------------

(a) Refer to the "Engine Mechanical System" in the [2.6.8.20 Valve Clearance Adjustments](#), Is valve clearance normal?

No → Adjust the valve clearance. Go to step 17

Yes

Step 12 Check valve timing system.

- (a) Refer to the "Engine Mechanical System" in the [2.6.8.9 Timing Chain Cover Replacement](#), Is valve timing normal?

No

Adjust the valve timing. Go to step 17

Yes

Step 13 Check the fuel pressure.

- (a) Refer to "Fuel System" in the [2.3.7.7 Fuel Pressure Testing Procedure](#), Is fuel pressure normal?

No

Check fuel system: fuel pump, fuel filter, fuel pipe circuit and fuel pressure regulator.

Yes

Step 14 Check whether the data in the data stream table is normal.

- (a) Check intake air pressure sensor data.  
 (b) Check engine coolant temperature sensor data.  
 (c) Check throttle position sensor.

Are these components normal?

No

Replace the damaged components. Go to step 17

Yes

Step 15 Check ECM power supply circuit.

- (a) Check whether ECM power supply circuit is normal.  
 (b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 16 Replace ECM.

- (a) Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 17 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Road test the vehicle for at least 10 min.



- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 18	Diagnostic completed.
---------	-----------------------

#### 5. Repair Instructions:

Replace the spark plug. Refer to [2.10.8.4 Spark Plug Replacement](#).

### 2.12.7.34 DTC P0324 P0325

#### 1. DTC Descriptor:

DTC	P0324	Knock Control System Malfunction
DTC	P0325	Knock Sensor Malfunction

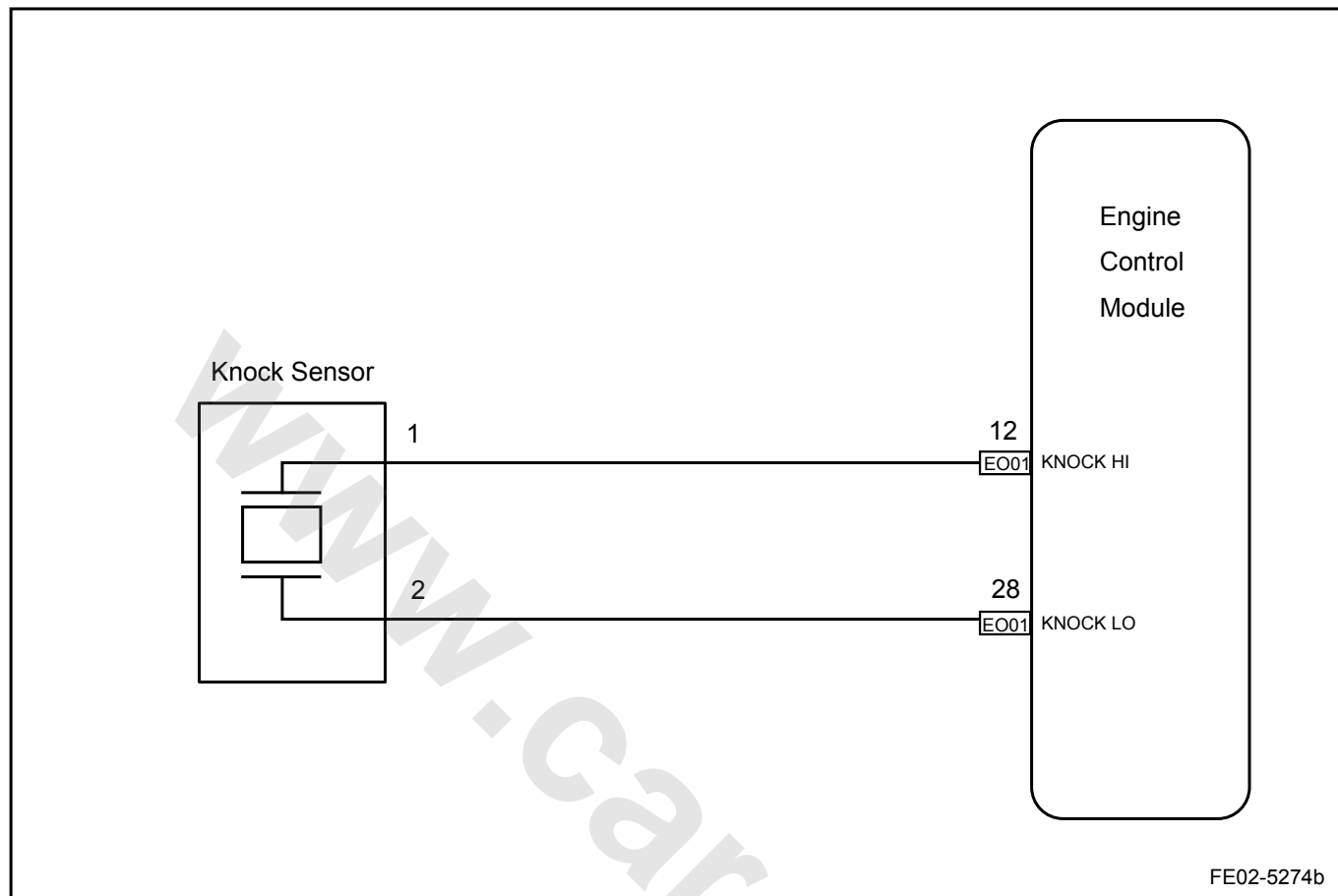
KS sensor to ECM feedback signal helps ECM control the ignition timing to achieve the optimal operation and the ignition system to achieve the best performance, as well as to prevent damage to the engine by a potential knock. KS sensor is located below the intake manifold on the cylinder. KS sensor voltage changes with the AC signal generated by the vibration with running engine. Engine control module adjusts spark timing according to KS sensor signal amplitude and frequency.

ECM receives signals from KS sensor harness connector EN08 terminal No.1 and 2 through ECM harness connector EN01 terminal No.12 and 28.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0324	Shock Control System Malfunction	1. Engine speed is higher than 1,600 rpm. 2. Certain Load Conditions. 3. Sensor signal circuit is short to ground.	1. Sensor Circuit 2. Sensor 3. ECM
P0325	Knock Sensor Malfunction	1. Engine speed is higher than 1,600 rpm. 2. Certain Load Conditions. 3. Sensor Signal Circuit Open.	

## 3. Schematic:



## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

- (a) Check whether there is KS sensor physical damage.
- (b) Check whether KS sensor is installed correctly. Torque is set too tight or too loose will trigger DTC codes.
- (c) Check KS sensor installation surface whether there are glitches, casting flash and foreign matter.
- (d) Knock sensor must be kept away from hoses, brackets and engine wires.

Are above mentioned parts normal?

No

Repair the faulty part. Go to step 9

Yes

Step 2	Read the engine data (engine speed) on the scan tool.
--------	---

- (a) Connect scan tool to datalink connector.

- (b) Turn the ignition switch to "ON" position.
- (c) Select "Engine"/"Read Data"/"Knock Sensor Signal 1".
- (d) Start and run the engine at normal working temperature.
- (e) Road test the vehicle and read the engine speed data on the scan tool.

Is data normal?

Standard Value: Normal data. Refer to [2.12.7.9 Data Stream List](#).

No

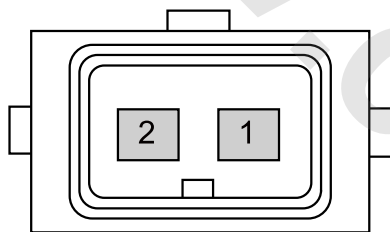
Go to step 4

Yes

Step 3 Intermittent Fault. Refer to [2.12.7.4 Symptoms Table](#).

Step 4 Check the knock sensor.

Knock Sensor



FE02-5083b

- (a) Turn the ignition switch to "OFF" position.
  - (b) Disconnect Knock Sensor harness connector EN08.
  - (c) Measure knock sensor resistance.
- Standard Resistance:  $>1\text{M } \Omega$  at  $25^{\circ}\text{C}(77^{\circ}\text{F})$

- (d) Connect Knock Sensor harness connector EN08.

Is resistance normal?

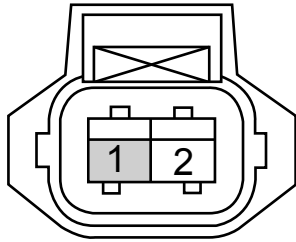
No

Replace the knock sensor. Refer to [2.10.8.5 Knock Sensor Replacement](#).

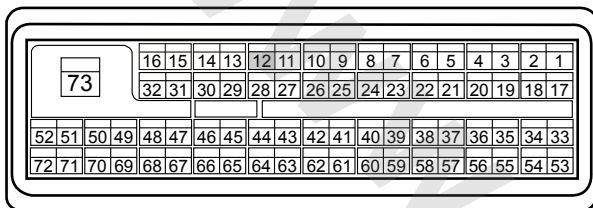
Yes

Step 5 Check sensor terminal No.1 line.

Knock Sensor Harness Connector EO08



ECM Harness Connector EO01



FE02-5275b

- Turn the ignition switch to "OFF" position.
- Disconnect Knock Sensor harness connector EN08.
- Disconnect ECM harness connector EO01.
- Measure resistance between knock sensor harness connector EN08 terminal No.1 and ECM harness connector EN01 terminal No.12. Check whether the circuit is open.
- Measure resistance between knock sensor harness connector EN08 terminal No.1 and a reliable ground. Check whether the circuit is short to ground.
- Measure voltage between knock sensor harness connector EN08 terminal No.1 and a reliable ground. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN08 (1) and EN01 (12)	Less than 1 $\Omega$
Resistance Between EN08 (1) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN08 (1) and A Reliable Ground	0 V

Are the values specified values?

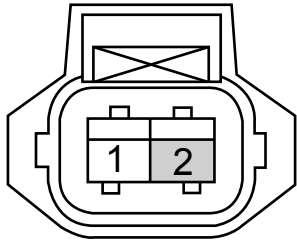
No

Repair the faulty part. Go to step 9

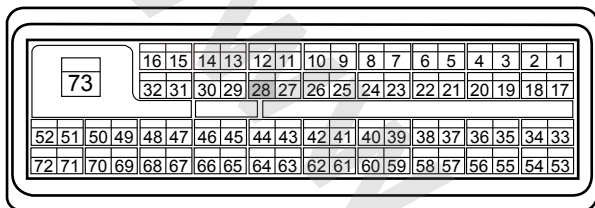
Yes

Step 6	Check sensor terminal No.2 circuit.
--------	-------------------------------------

Knock Sensor Harness Connector EO08



ECM Harness Connector EO01



FE02-5276b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect Knock Sensor harness connector EO08.
- (c) Disconnect ECM harness connector EO01.
- (d) Measure resistance between knock sensor harness connector EN08 terminal No.2 and ECM harness connector EN01 terminal No.28. Check whether the circuit is open.
- (e) Measure resistance between knock sensor harness connector EN08 terminal No.2 and a reliable ground. Check whether the circuit is short to ground.
- (f) Measure voltage between knock sensor harness connector EN08 terminal No.2 and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN08 (2) and EN01 (28)	Less than 1 $\Omega$
Resistance Between EN08 (2) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN08 (2) and A Reliable Ground	0 V

Are the values specified values?

No

Repair the faulty part. Go to step 9

Yes

Step 7 Check ECM power supply circuit.

- (a) Check whether ECM power supply circuit is normal.
- (b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

- (a) Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Road test the vehicle for at least 10 min.
- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 10 Diagnostic completed.

## 5. Repair Instructions:

Replace the knock sensor. Refer to [2.10.8.5 Knock Sensor Replacement](#).

## 2.12.7.35 DTC P0335 P0336

## 1. DTC Descriptor:

DTC	P0335	Crankshaft Position Sensor Circuit No Signal
DTC	P0336	Crankshaft Position Sensor Circuit Signal Interference

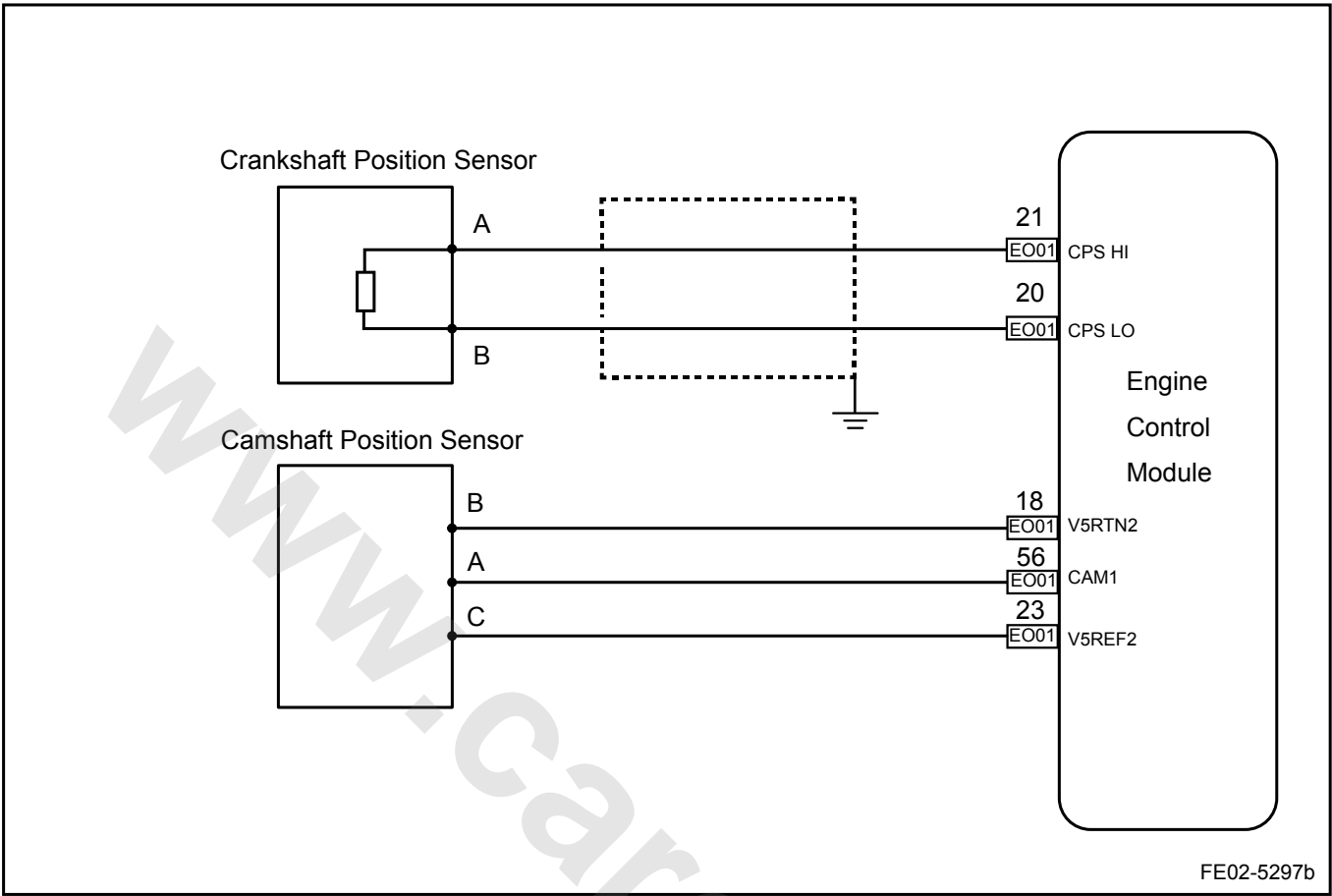
CKP sensor signals ECM current crankshaft speed and position. CKP sensor produces an alternating voltage with different amplitude and frequency. Frequency depends on the crankshaft speed, the output AC voltage depends on the CKP. The CKP sensor works in conjunction with a 58X reluctor wheel that is attached to the crankshaft. ECM calculates the ignition timing, injection timing, and knock ignition timing based on CKP sensor and camshaft position sensor input signals. CKP sensor is also used to detect misfire and tachometer display. ECM uses CAN network to send the engine speed signal to the instrument cluster.

CKP sensor signal is sent through CKP sensor harness connector EO26 terminals A, B to ECM harness connector No.EO01 terminals No.21 and 20.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0335	Hardware Circuit Checks	<ol style="list-style-type: none"> <li>During startup, the crankshaft position sensor is disconnected, short to Ground and short to power supply.</li> <li>Fault timer accumulated time is longer than 2 s.</li> </ol>	<ol style="list-style-type: none"> <li>Sensor Circuit</li> <li>Sensor</li> <li>ECM</li> <li>Sensor Signal Plate</li> </ol>
P0336	Hardware Circuit Checks	<ol style="list-style-type: none"> <li>Crankshaft position sensor and the signal tooth gap is too large.</li> <li>The difference between actual identified number of teeth and 58 teeth is bigger than a specified value.</li> </ol>	<ol style="list-style-type: none"> <li>Sensor Circuit</li> <li>Sensor</li> <li>ECM</li> <li>Sensor Signal Plate</li> </ol>

3. Schematic:



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

- (a) Check the sensor wiring harness connector EN26 whether there is loose or poor connection and so on.
- (b) Check whether the sensor is installed correctly.
- (c) Check whether the sensor gap is normal.

No → Repair the faulty part. Go to step 10

Yes

Step 2	Read the engine data (engine speed) on the scan tool.
--------	---

- (a) Connect scan tool to datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Select "Engine"/"Reading Data"/"Engine Speed."
- (d) Start the engine.
- (e) With the engine running, read the engine data on the scan tool

Standard Value: Normal data. Refer to [2.12.7.9 Data Stream List](#).

- (f) If the engine does not start, check the data with the engine running.
- (g) If the engine speed is shown as "0", it indicates the circuit between the crankshaft position sensor and ECM wiring harness open or short.

Yes

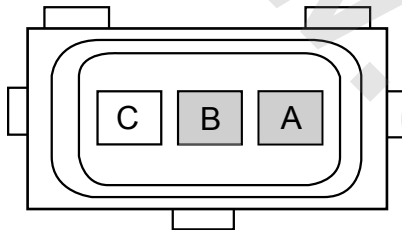
Go to step 4

No

Step 3 Intermittent Fault. Refer to [2.12.7.4 Symptoms Table](#).

Step 4 Check the crankshaft position sensor.

Crankshaft Position Sensor



FE02-5278b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the crankshaft position sensor wiring harness connector EO26.
- (c) Measure crankshaft position sensor resistance.  
Standard Resistance: 504-616  $\Omega$  at 25°C(77 °F)
- (d) Connect the crankshaft position sensor wiring harness connector EN26.

Is resistance normal?

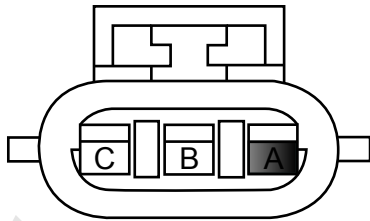
No

Replace the crankshaft position sensor. Refer to [2.10.8.2 Crankshaft Position Sensor Replacement](#).

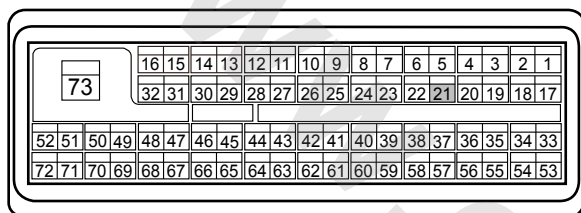
Yes

Step 5 Check sensor terminal No.A circuit.



Crankshaft Position Sensor Harness  
Connector EO26

ECM Harness Connector EO01



FE02-5279b

- Turn the ignition switch to "OFF" position.
- Disconnect the crankshaft position sensor wiring harness connector EO26.
- Disconnect ECM harness connector EO01.
- Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal A and ECM harness connector EN01 terminal No.21. Check whether the circuit is open.
- Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal A and a reliable ground. Check whether the circuit is short to ground.
- Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal A and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN26 (A) and EN01 (21)	Less than 1 $\Omega$
Resistance Between EN26 (A) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN26 (A) and A Reliable Ground	0 V

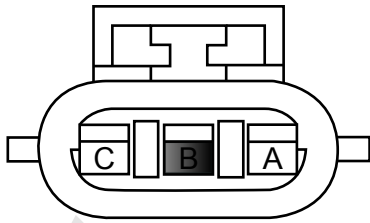
Are the values specified values?

No

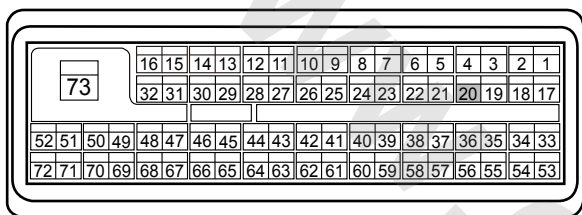
Repair the faulty part. Go to step 10

Yes

Step 6 Check sensor terminal B circuit.

Crankshaft Position Sensor Harness  
Connector EO26

ECM Harness Connector EO01



FE02-5280b

- Turn the ignition switch to "OFF" position.
- Disconnect the crankshaft position sensor wiring harness connector EO26.
- Disconnect ECM harness connector EO01.
- Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal B and ECM harness connector EN01 terminal No.20. Check whether the circuit is open.
- Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal B and a reliable ground. Check whether the circuit is short to ground.
- Measure resistance between crankshaft position sensor wiring harness connector EN26 terminal B and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN26 (B) and EN01 (20)	Less than 1 $\Omega$
Resistance Between EN26 (B) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN26 (B) and A Reliable Ground	0 V

Are the values the specified values?

No

Repair the faulty part. Go to step 10

Yes

Step 7 Check sensor signal plate.

- Check whether the sensor signal plate is damaged, missing and so on.
- Check whether the sensor signal plate is installed correctly.

No

Repair the faulty part. Go to step 10

Yes

Step 8 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 9 Replace ECM.

- Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 10	Use scan tool to confirm whether the DTC code is stored again.
---------	--

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Road test the vehicle for at least 10 min.
- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 11	Diagnostic completed.
---------	-----------------------

### 5. Repair Instructions:

Replace crankshaft position sensor. Refer to [2.10.8.2 Crankshaft Position Sensor Replacement](#).

### 2.12.7.36 DTC P0340 P0341

#### 1. DTC Descriptor:

DTC	P0340	Intake VCP Camshaft Position Sensor Status Diagnosis
DTC	P0341	Intake VCP Target Wheel Diagnosis

Camshaft position (CMP) sensor is used to detect camshaft position, and is associated with the crankshaft position. It sends signals to the engine control module (ECM) to determine the upcoming fuel injection.

Engine Control Module (ECM) also uses the camshaft position sensor output to determine the camshaft to the crankshaft relative position to control the valve timing of camshaft adjustment and conduct emergency operations.

Camshaft position sensor circuit includes the following:

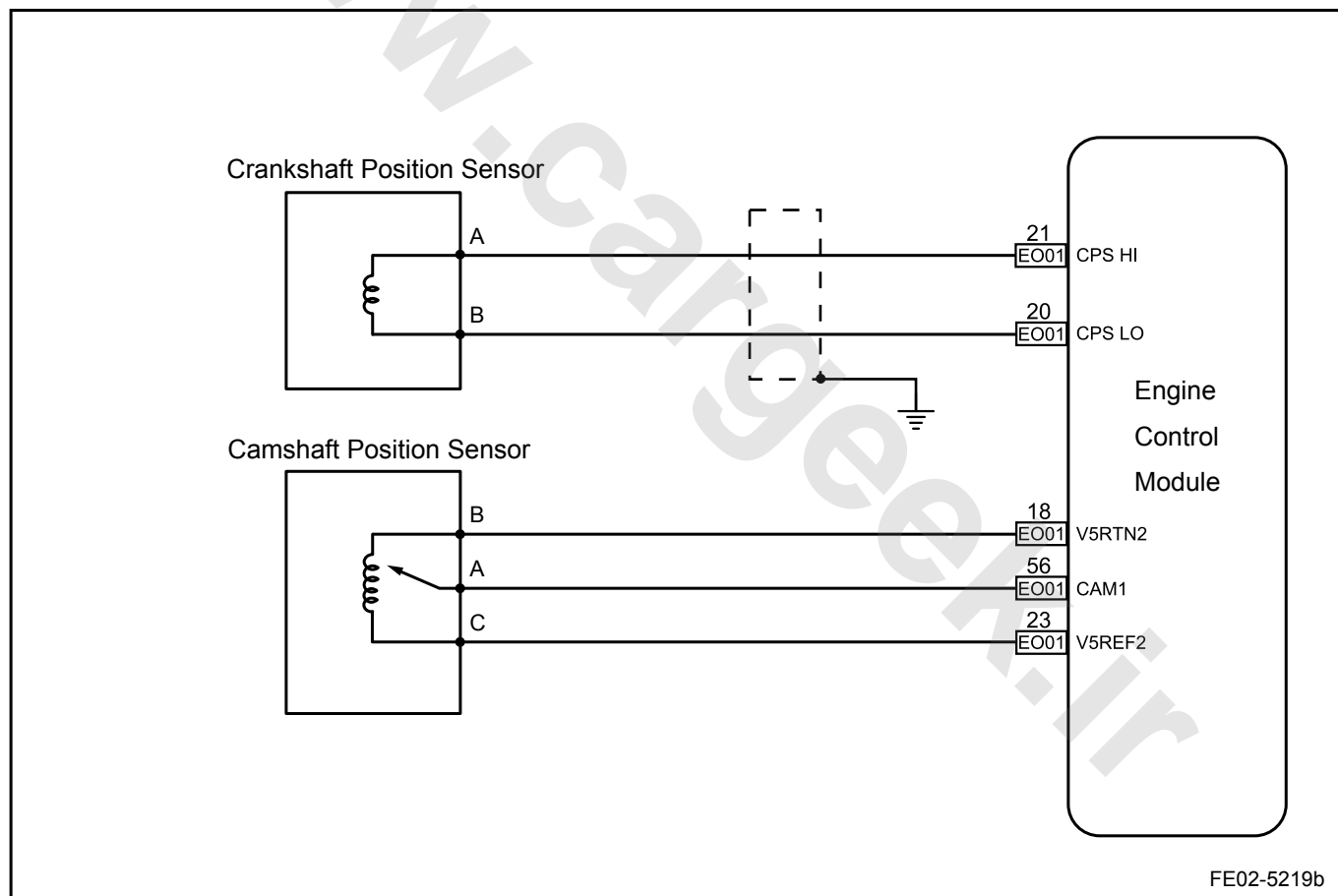
- Reference Voltage: ECM provides a reference voltage to CMP sensor harness connector EN15 terminal C via ECM harness connector EN01 terminal No.23.
- Signal Circuit: ECM receives signal voltage from CMP sensor harness connector EN15 terminal A via ECM harness connector EN01 terminal No.56.
- ECM Low Reference Voltage Circuit: ECM provides a low reference voltage to CMP sensor harness connector EN15 terminal B via ECM harness connector EN01 terminal No.18.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
----------	------------------------	--	-----------------

P0340	ECM detects the engine running but does not receive the camshaft position sensor signal	<ol style="list-style-type: none"> <li>1. ECM detects the engine running.</li> <li>2. ECM detects the crankshaft position sensor signal.</li> <li>3. Camshaft position sensor signal is lost.</li> </ol>	<ol style="list-style-type: none"> <li>1. Sensor Circuit</li> <li>2. Sensor</li> <li>3. Camshaft Signal Wheel</li> <li>4. ECM</li> </ol>
P0341	ECM detects the engine running, but receives a camshaft position sensor signal and that does not match calibration.	<ol style="list-style-type: none"> <li>1. ECM detects the engine running.</li> <li>2. ECM detects the crankshaft position sensor signal.</li> <li>3. ECM detected camshaft position sensor signal does not match the reference crankshaft position sensor signal.</li> </ol>	

## 3. Schematic:



## 4. Diagnostic Steps:

**Note**

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Initial Inspection
--------	--------------------

(a) Check the sensor wiring harness connector EN15 whether there is loose or poor connection and so on.

(b) Check whether the sensor is installed correctly.

(c) Check whether the sensor gap is normal.

Are above mentioned parts normal?

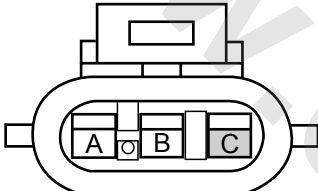
Yes

No

Repair the faulty part. Go to step 9

Step 2	Measure sensor 5 V reference voltage.
--------	---------------------------------------

Camshaft Position Sensor Harness Connector EO15



FE02-5311b

(a) Turn the ignition switch to "OFF" position.

(b) Disconnect camshaft position sensor wiring harness connector EN15.

(c) Turn the ignition switch to "ON" position.

(d) Measure voltage between camshaft position sensor wiring harness connector EN15 terminal No.3 and a reliable ground.

Standard Voltage: 4.5-5 .5 V

(e) Connect camshaft position sensor wiring harness connector EN15.

Is the value specified value?

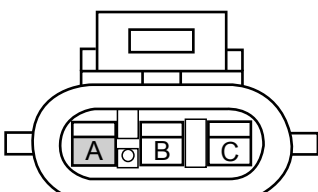
No

Go to step 6

Yes

Step 3	Measure sensor signal circuit.
--------	--------------------------------

Camshaft Position Sensor Harness Connector EO15



FE02-5312b

(a) Turn the ignition switch to "OFF" position.

(b) Disconnect camshaft position sensor wiring harness connector EO15.

(c) Turn the ignition switch to "ON" position.

(d) Measure voltage between camshaft position sensor wiring harness connector EN15 terminal A and a reliable ground.

Standard Voltage: 4.5-5 .5 V

(e) Connect camshaft position sensor wiring harness connector EN15.

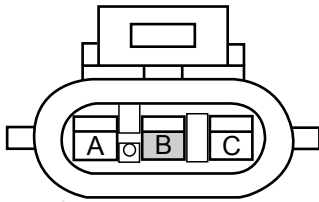
Is the value specified value?

No

Go to step 7

Yes

Step 4	Test ECM internal low reference circuit.
--------	--

Camshaft Position Sensor Harness  
Connector EO15

FE02-5313b

- Turn the ignition switch to "OFF" position.
  - Disconnect camshaft position sensor wiring harness connector EO15.
  - Turn the ignition switch to "ON" position.
  - Measure voltage between camshaft position sensor wiring harness connector EN15 terminal B and a reliable ground.
- Standard Resistance: Less than 3  $\Omega$
- Connect camshaft position sensor wiring harness connector EN15.

Is the value specified value?

No

Go to step 8

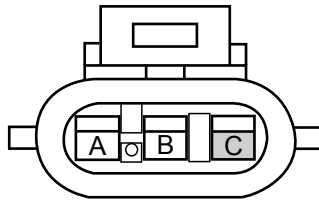
Yes

Step 5 Replace the camshaft position sensor. Refer to [2.10.8.1 Camshaft Position Sensor Replacement](#).

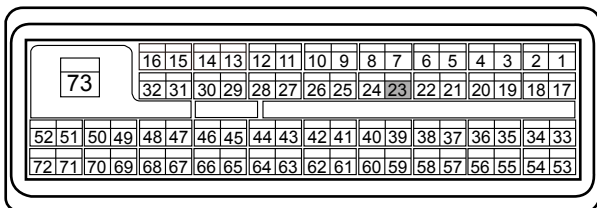
Next

Go to step 12

Step 6 Check the sensor 5 V reference voltage circuit.

Camshaft Position Sensor Harness  
Connector EO15

ECM Harness Connector EO01



FE02-5314b

- Turn the ignition switch to "OFF" position.
- Disconnect camshaft position sensor wiring harness connector EO15.
- Disconnect ECM harness connector EO01.
- Measure resistance between camshaft position sensor harness connector EN015 terminal C and ECM harness connector EN01 terminal No.23. Check whether the circuit is open.
- Measure resistance between camshaft position sensor harness connector EN015 terminal C and a reliable ground. Check whether there is short to ground circuit.
- Measure voltage between camshaft position sensor harness connector EN015 terminal C and power supply. Check whether there is short to power supply circuit.

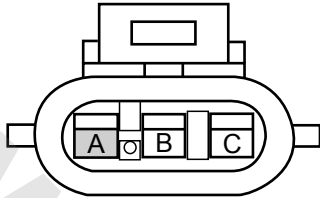
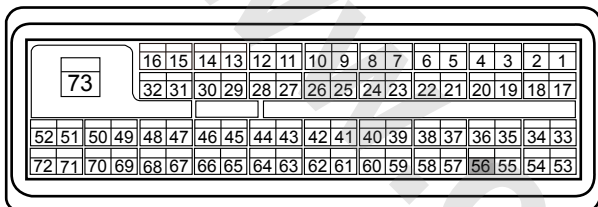
Test Items	Standard Value
Resistance Between EN15 (C) and EN01 (23)	Less than 1 $\Omega$
Resistance Between EN15 (C) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN15 (C) and A Reliable Ground	0 V

Execute next step as per normal.

Next

Repair the faulty part. Go to step 12

**Step 7** Check sensor signal circuit.

**Camshaft Position Sensor Harness Connector EO15**

**ECM Harness Connector EO01**


FE02-5315b

- Turn the ignition switch to "OFF" position.
- Disconnect camshaft position sensor wiring harness connector EO15.
- Disconnect ECM harness connector EO01.
- Measure resistance between camshaft position sensor harness connector EN015 terminal A and ECM harness connector EN01 terminal No.56. Check whether the circuit is open.
- Measure resistance between camshaft position sensor harness connector EN015 terminal A and a reliable ground. Check whether the circuit is short to ground.
- Measure resistance between camshaft position sensor harness connector EN015 terminal A and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN15 (A) and EN01 (56)	Less than 1 $\Omega$
Resistance Between EN15 (A) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN15 (A) and A Reliable Ground	0 V

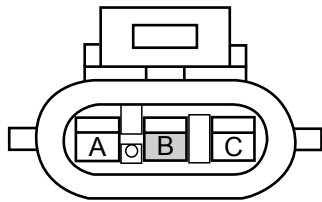
Are the values specified values?

No

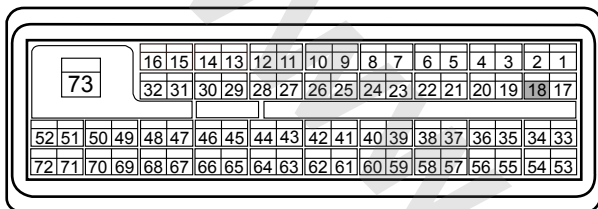
Repair the faulty part. Go to step 12

Yes

**Step 8** Check ECM internal low reference circuit.

Camshaft Position Sensor Harness  
Connector EO15

ECM Harness Connector EO01



FE02-5316b

- Turn the ignition switch to "OFF" position.
- Disconnect camshaft position sensor wiring harness connector EO15.
- Disconnect ECM harness connector EO01.
- Measure resistance between camshaft position sensor wiring harness connector EN15 terminal B and ECM harness connector EN01 terminal No.18. Check whether the circuit is open.
- Measure voltage between camshaft position sensor wiring harness connector EN15 terminal B and a reliable ground. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN15 (B) and EN01 (18)	Less than 1 $\Omega$
Voltage Between EN15 (B) and A Reliable Ground	0 V

Execute next step as per normal.

Next

Step 9 Check whether camshaft signal plate is normal.

No

Repair the faulty part. Go to step 12

Yes

Step 10 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 11 Replace ECM.

Next

Step 12 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Read control system DTC code again to confirm that the system has no DTC code.



No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 13 Diagnostic completed.

## 5. Repair Instructions:

Replace CMP sensor. Refer to [2.10.8.1 Camshaft Position Sensor Replacement](#).

## 2.12.7.37 DTC P0351 P0352

## 1. DTC Descriptor:

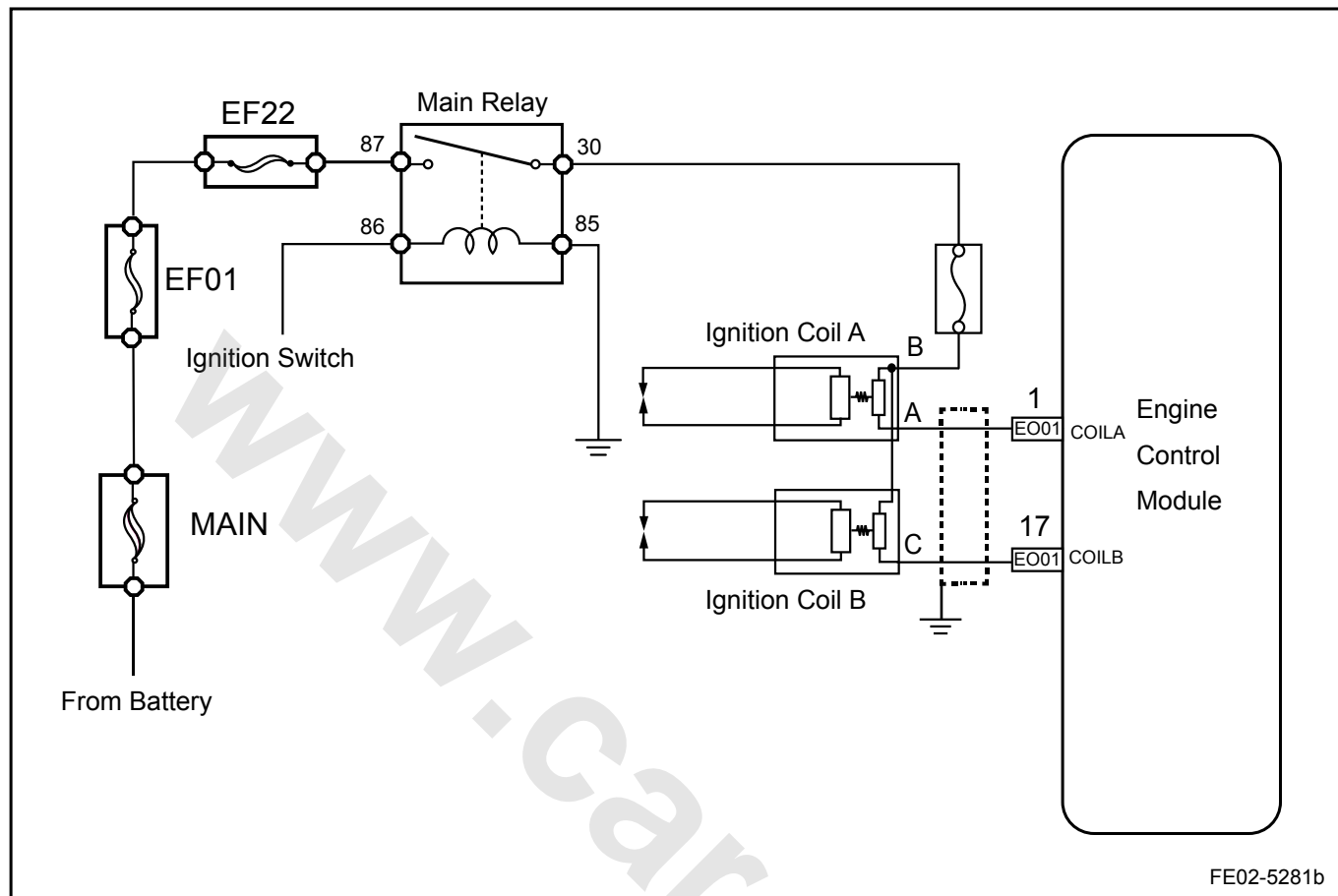
DTC	P0351	Ignition Coil 1 Malfunction
DTC	P0352	Ignition Coil 2 Malfunction

Ignition coil 1 provides ignition for cylinders No.1 and 4. Ignition coil 2 provides ignition for cylinders No.2 and 3. Ignition relay provides power time to the two ignition coils at the same time. ECM controls cylinders No.1 and 4 primary ground circuit through ECM harness connector EO01 terminal No.1. ECM controls cylinders No.2 and 3 primary ground circuit through ECM harness connector EO01 terminal No.17.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0351	Hardware Circuit Checks	Operating at idle, with the ignition coil control end disconnected, short to ground and short to power supply, this DTC code will be set. The fuel injection to the cylinder with this DTC code stops. Engine speed fluctuates.	1. Ignition Coil Circuit 2. Ignition Coil 3. ECM
P0352			

## 3. Schematic:



## 4. Diagnostic Steps:

Check ignition coil. Refer to [2.20 Ignition System JL4G15-D](#) in [2.20.4 Diagnostic Information and Procedures](#).

## 5. Repair Instructions:

Replace the ignition coil. Refer to [2.10.8.3 Ignition Coil Replacement](#).

## 2.12.7.38 DTC P0420

## 1. DTC Descriptor:

DTC	P0420	Three-Way Catalytic Converter Conversion Efficiency Low
-----	-------	---

ECM uses two oxygen sensors (Pre-Catalytic oxygen sensor and Post-Catalytic oxygen sensor) installed before and after the three-way catalytic converters to monitor the conversion efficiency of the three-way catalytic converter (TWC). ECM uses Pre-Catalytic oxygen sensor for Air-Fuel ratio close-loop control and monitors oxygen content in the exhaust gas not purified by TWC. The Post-Catalytic oxygen sensor sends voltage signal to ECM indicating the oxygen content in the exhaust gas purified by the TWC. ECM compares signals from the two sensors to determine whether the TWC is currently under normal working condition. If the calculated TWC conversion efficiency is too low, the fault lamp will be lit and the DTC code will be set.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0420	Hardware Circuit Checks	Coolant temperature is higher than 70°C (158 °F), and the fuel system is in close-loop mode. After driving some distance and stop the vehicle, run the engine at idle, the system compares the Pre-Catalytic and Post-Catalytic oxygen sensor signals to calculate three-way catalyst converter oxygen storing time. When the oxygen storing time is less than the threshold, the system reports a fault.	<ol style="list-style-type: none"> <li>1. Pre-Catalytic Oxygen Sensor</li> <li>2. Post-Catalytic Oxygen Sensor</li> <li>3. Three-Way Catalytic Converter</li> <li>4. Exhaust Leak</li> </ol>

## 3. Schematic:

Refer to [2.2.6.1 Schematic](#)

## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Check whether there are control system DTC codes other than DTC P0420.
--------	--

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Press the scan tool power button.
- Select the following menu items: Engine/Read DTC codes.
- Read DTC code

DTC Codes Shown	To Step
DTC P0420	Yes
DTC Code Other Than DTC P0420	No

No

Refer to [2.12.7.14 DTC Code Index](#).

Yes

Step 2	Start engine and turn on the scan tool.
--------	---

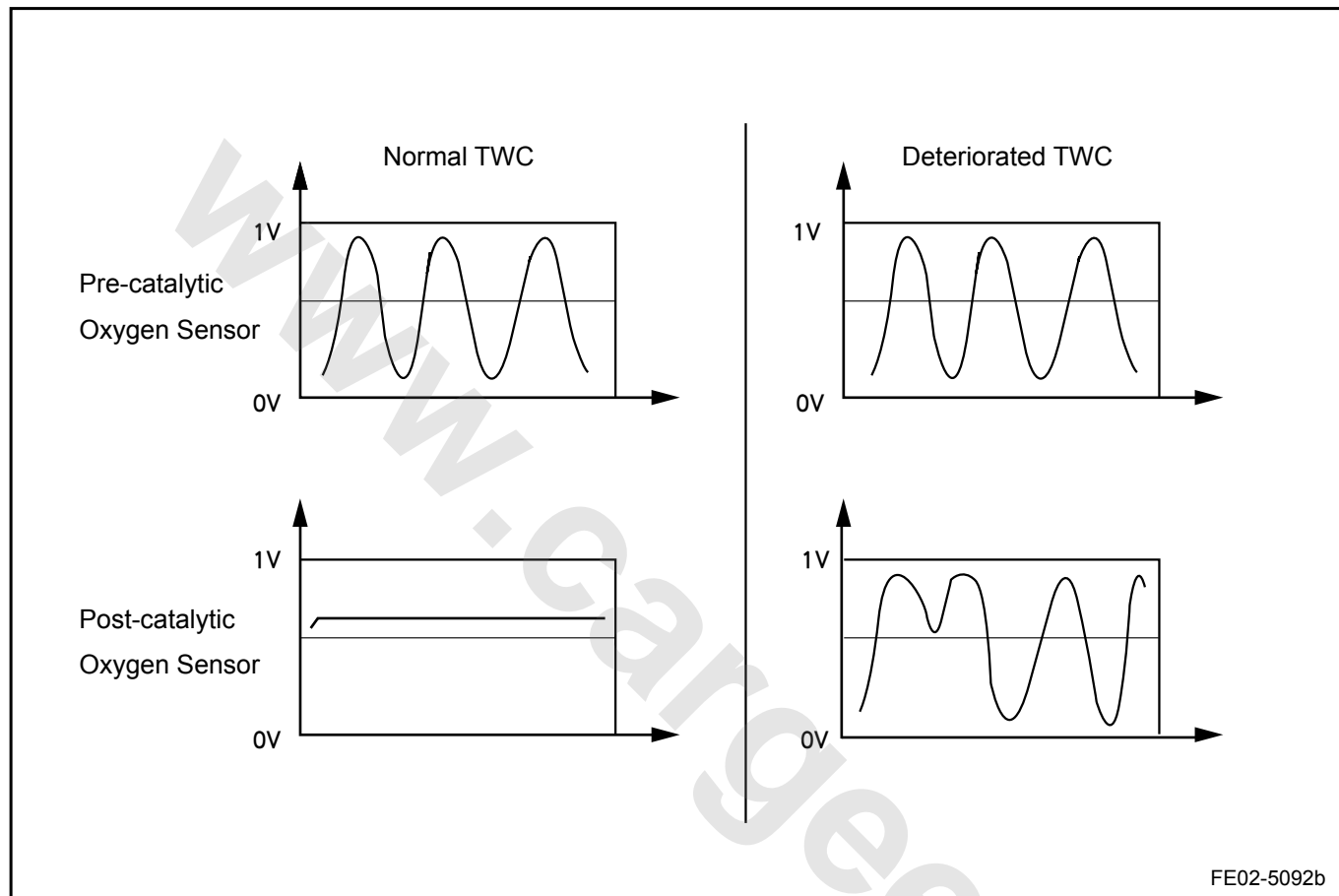
Next

Step 3	Keep the engine speed at 2,500 rpm for more than 2 min to warm up the engine, until the engine coolant temperature reaches 80°C (176 °F).
--------	---

Next

Step 4 Select on the scan tool: Engine/Read data/Group 1 oxygen sensor voltage 1 (Pre-Catalytic oxygen sensor), Group 1 oxygen sensor voltage 2 (Post-Catalytic oxygen sensor)

Next



Step 5 Observe Pre-Catalytic oxygen sensor and Post-Catalytic oxygen sensor output voltages.

Whether Pre-Catalytic oxygen sensor and Post-Catalytic oxygen sensor signal voltage is matching "Normal TWC" in the graphic?

Yes

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

No

### Warning!

Propane gas as is a flammable gas. It is strictly prohibited to operate propane gas near a fire, otherwise it will cause a fire.

Step 6 Test the oxygen sensor signal.

- (a) If the voltage data is consistently below 0.45 V (mixture too lean), carry out the steps as following:
- Spray proper amount of propane gas into the intake.

- Inspect whether the sensor voltage data is changed significantly, as the signal voltage will increase rapidly.

Pre-Catalytic Oxygen Sensor Signal Voltage	Post-Catalytic Oxygen Sensor Signal Voltage	To Step
Obvious Change	No Change	A
No Change	Obvious Change	B
Obvious Change	No Change	C
No Change	No Change	D

B

Replace the pre-catalytic oxygen sensor. Refer to [2.4.7.2 Pre-Catalytic Oxygen Sensor Replacement](#).

C

Go to step 9

D

Check the cause for engine air-fuel ratio too lean/too rich. Refer to [2.12.7.4 Symptoms Table](#)

A

Step 7 Check whether there is exhaust leakage.

Yes

Repair the faulty part. Go to step 11

No

Step 8 Replace the three-way catalytic converter. Refer to [2.7.6.2 Three-way Catalytic Converter Replacement](#).

Next

Go to step 11

Step 9 Check whether there is exhaust leakage.

Yes

Repair the faulty part. Go to step 11

No

Step 10 Replace the post-catalytic oxygen sensor. Refer to [2.4.7.1 Post-Catalytic Oxygen Sensor Replacement](#).

Next

Step 11 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.

- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 12 Diagnostic completed.

### 2.12.7.39 DTC P0458 P0459

#### 1. DTC Descriptor:

DTC	P0458	Canister Control Valve Control Circuit Short To Ground or Open
DTC	P0459	Canister Control Valve Control Circuit Short To Power Supply

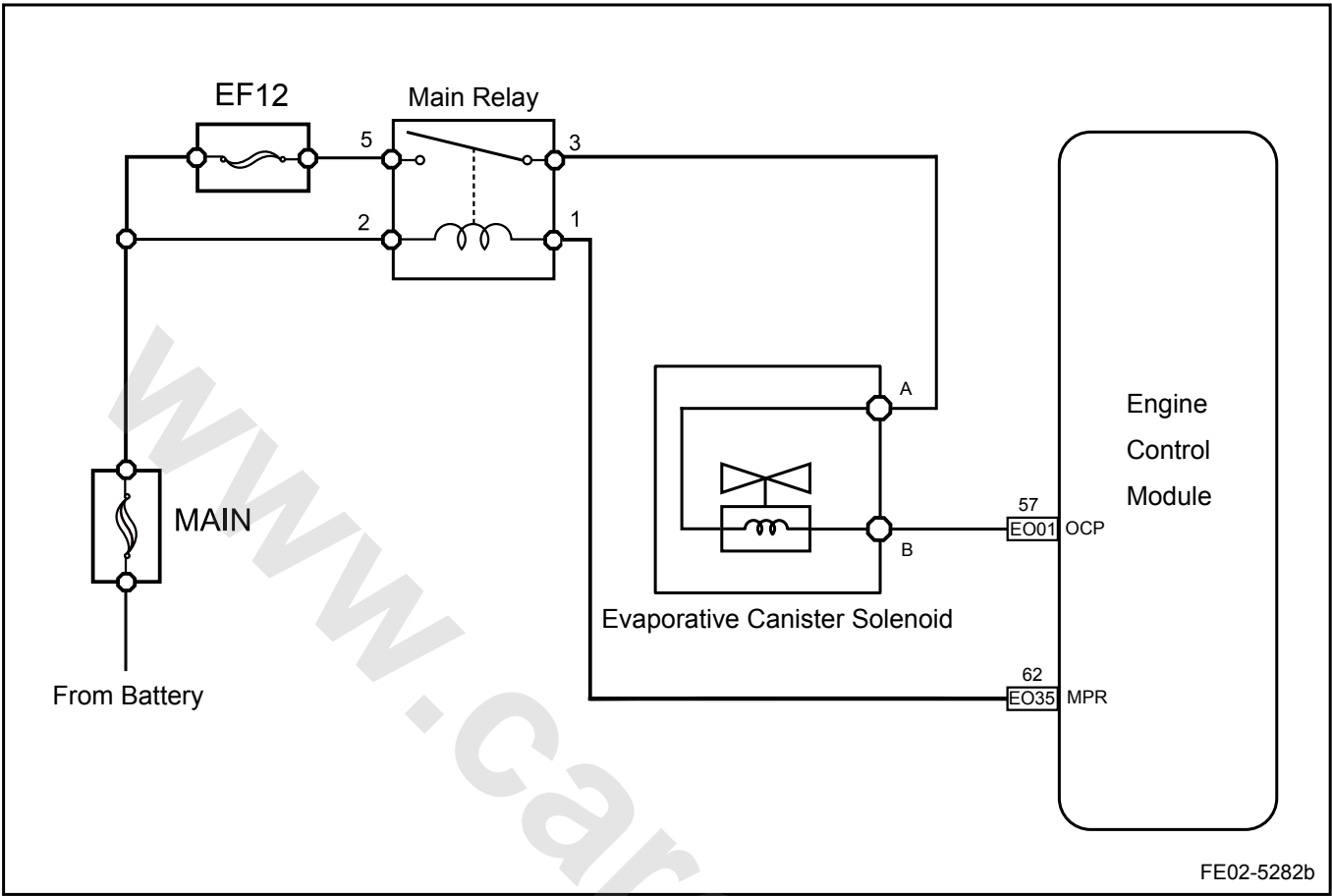
EVAP solenoid valve absorbs fuel vapor from the evaporative emission Canister to the intake manifold. EVAP solenoid valve is controlled by the pulse width modulation (PWM). The circuit consists of:

- Operating Voltage: Battery voltage passes through ECM controlled main relay terminal No.87 to reach EVAP solenoid harness connector EN24 terminal A.
- ECM control circuit: EVAP solenoid valve wiring harness connector EN24 terminal B is connected to ECM harness connector EN01 terminal No.57. ECM has an internal driver circuit to control the solenoid valve ground. Driver circuit is equipped with a ECM feedback circuit. ECM monitors the feedback voltage to determine whether the control circuit is open, short to ground or short to power supply.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0458	Hardware Circuit Checks	At idle conditions, canister solenoid valve inoperative, canister solenoid valve circuit short to ground or open, DTC code set.	1. Canister Solenoid Valve Circuit 2. Solenoid Valve 3. ECM
P0459	Hardware Circuit Checks	At idle conditions, canister solenoid valve inoperative, canister solenoid valve circuit short to power supply, DTC code set.	1. Canister Solenoid Valve Circuit 2. Solenoid Valve 3. ECM

3. Schematic:



4. Diagnostic Steps:

Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Use scan tool for canister solenoid valve active testing.
--------	---

(a) Connect scan tool to the "Data Link Connector".

(b) Disconnect the Canister solenoid valve to the Canister vacuum tubes.

(c) Start engine and turn on the scan tool.

(d) Select the following menu: "Engine"/"Action Test"/"Canister Solenoid Valve"

(e) Use scan tool to enable the use of "Canister Control Valve". Place a finger over the vacuum port solenoid valve and check whether there is suction.

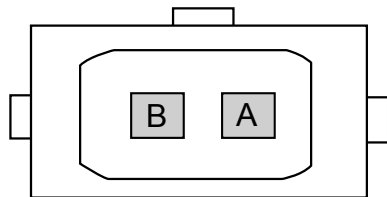
No

Yes

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Step 2	Measure canister solenoid valve resistance.
--------	---

## Evaporative Canister Solenoid



FE02-5283b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect Canister solenoid valve harness connector EO24.
- (c) Measure resistance between the Canister solenoid valve two terminals.

Standard Resistance: 19-22  $\Omega$  at 20°C(68 °F)

- (d) Connect canister solenoid valve harness connector EN24.
- Is the value specified value?

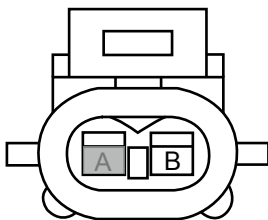
No

Replace the canister solenoid valve. Refer to [2.4.7.3 Canister Solenoid Valve Replacement](#).

Yes

Step 3 Measure canister solenoid valve working power supply.

## Evaporative Canister Solenoid Harness Connector EO24



FE02-5284b

- (a) Turn the ignition switch to "OFF" position.
  - (b) Disconnect Canister solenoid valve harness connector EN24.
  - (c) Turn the ignition switch to "ON" position.
  - (d) Measure voltage between Canister solenoid valve wiring harness connector EN24 terminal A and a reliable ground.
- Standard Voltage: 11-14 V

- (e) Connect canister solenoid valve harness connector EN24.
- Is the value specified value?

No

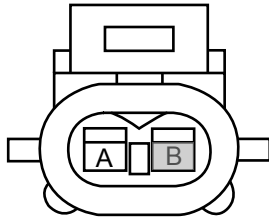
Check whether there is an open circuit or a circuit short to ground between solenoid valve wiring harness connector EN24 terminal A and main relay terminal No.3. Repair the faulty part. Go to step 7

Yes

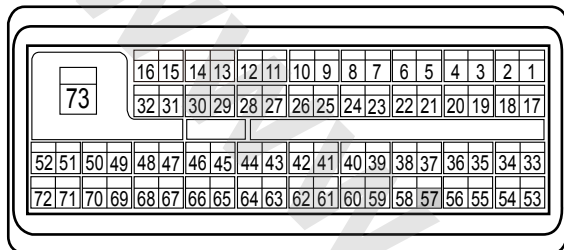
Step 4 Check canister solenoid valve control circuit.



Evaporative Canister Solenoid Harness Connector EO24



ECM Harness Connector EO01



FE02-5285b

- Turn the ignition switch to "OFF" position.
- Disconnect Canister solenoid valve harness connector EO24.
- Disconnect ECM harness connector EO01.
- Measure resistance between Canister solenoid valve wiring harness connector EN24 terminal B and ECM harness connector EN01 terminal No.57. Check whether the circuit is open.
- Measure resistance between Canister solenoid valve wiring harness connector EN24 terminal B and a reliable ground. Check whether the circuit is short to ground.
- Measure voltage between Canister solenoid valve wiring harness connector EN24 terminal B and a reliable ground. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EN24 (B) and EN01 (57)	Less than 1 $\Omega$
Resistance Between EN24 (B) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EN24 (B) and A Reliable Ground	0 V

Are the values specified values?

No

Repair or replace the wiring harness connectors. Go to step 7

Yes

Step 5 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 6 Replace ECM.

- Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 7 Use scan tool to confirm whether the DTC code is stored again.

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.

- (e) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 8 Diagnostic completed.

#### 5. Repair Instructions:

Replace EVAP solenoid valve. Refer to [2.4.7.3 Canister Solenoid Valve Replacement](#).

### 2.12.7.40 DTC P0480 P0481

#### 1. DTC Descriptor:

DTC	P0480	Low-Speed Fan Malfunction
DTC	P0481	High-Speed Fan Malfunction

High or low speed cooling fan relay coil power is provided by ECM controlled main relay. ECM controls the relay via ECM harness connector EO36 terminal No.66 and 67. ECM has an internal driver circuit that controls the relay coil ground. Drive circuit is equipped with a feedback circuit to ECM. ECM monitors the feedback voltage control circuit to determine whether the control circuit is open, short to ground or short to ground.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0480	Hardware Circuit Checks	Under idle operating condition, when the fan is working. The fan control is short to power supply, DTC code set.	1. Relay Circuit 2. Relay
P0481	Hardware Circuit Checks	Under idle operating condition, when the fan is working. The fan control is short to power supply, DTC code set.	3. ECM 4. Cooling Fan

#### 3. Schematic:

Refer to [2.12.6.1 Schematic](#).

#### 4. Diagnostic Steps:

Refer to [2.18.3.1 Cooling Fan Circuit Diagnosis](#)

#### 5. Repair Instructions:

Replace the cooling fan. Refer to [2.8.8.3 Cooling Fan Replacement](#).

### 2.12.7.41 DTC P0502

#### 1. DTC Descriptor:

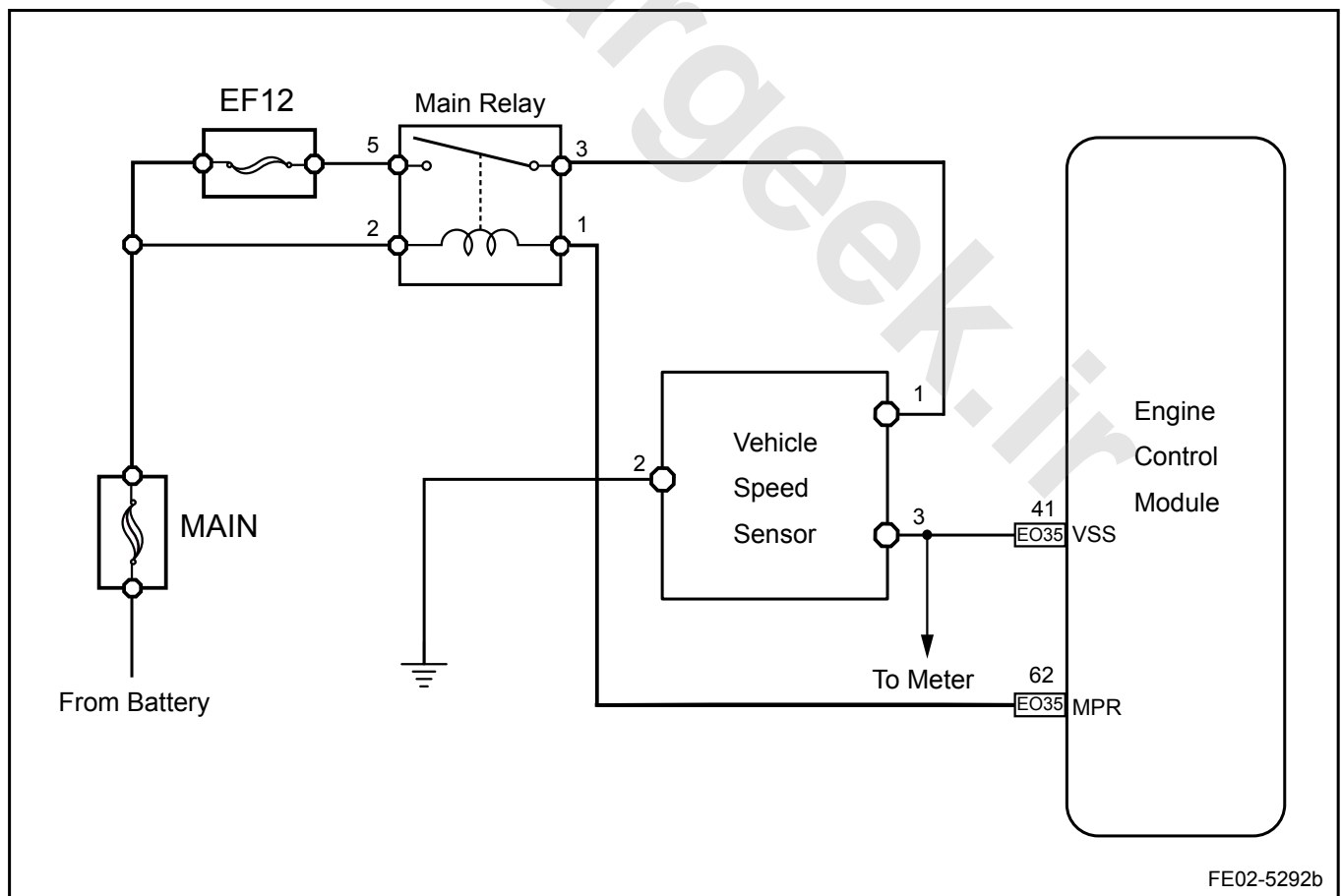
DTC	P0502	Vehicle Speed Sensor No Signal
-----	-------	--------------------------------

The vehicle speed signal is used to monitor the vehicle speed. The vehicle speed signal is one of the fuel control reference signals during an urgent deceleration. The vehicle speed sensor working voltage is provided by The Main Relay which is controlled by ECM via ECM harness connector EN01 terminal No.57. The vehicle speed sensor signal is sent to the instrument panel used for the vehicle speed display.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0502	Vehicle Speed Sensor No Signal	<ol style="list-style-type: none"> <li>Under hot operating conditions, driving the vehicle at Low-Speed at 3rd gear, Disconnect the vehicle speed sensor. and then press the acceleration pedal hard to accelerate to higher than 4,000 and immediately release the pedal. Engine speed, vehicle speed and MAP values begin to decline. When entering the fault setting window, DTC code will be set.</li> <li>Under hot operating conditions, driving the vehicle at medium speed at 4th gear, Disconnect the vehicle speed sensor. and then press the acceleration pedal to accelerate the vehicle. Engine speed, vehicle speed and MAP values entering the fault setting window, DTC code will be set.</li> </ol>	<ol style="list-style-type: none"> <li>Vehicle Speed Sensor Circuit</li> <li>Vehicle Speed Sensor</li> <li>ECM</li> </ol>

## 3. Schematic:



## 4. Diagnostic Steps:

Step 1	Road test the vehicle. Is the vehicle speed meter display working properly?
--------	---

- (a) If the instrument panel displays the vehicle speed as per normal, the vehicle speed sensor is working correctly.
- (b) If the instrument panel displays the vehicle speed abnormally, the vehicle speed sensor or the circuit may be faulty.

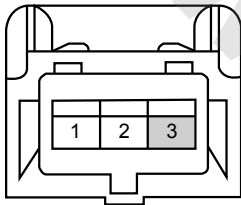
No

Go to step 3

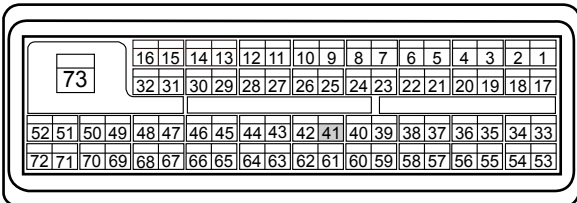
Yes

Step 2	Check the vehicle speed signal circuit.
--------	---

Vehicle Speed Sensor Harness Connector EO21



ECM Harness Connector EO35



FE02-5293b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect vehicle speed sensor wiring harness connector EO21.
- (c) Disconnect ECM harness connector EO35.
- (d) Measure resistance between the vehicle speed sensor harness connector EO21 terminal No.3 and ECM harness connector EO35 terminal No.41. Check whether the circuit is open.
- (e) Measure resistance between the vehicle speed sensor harness connector EO21 terminal No.3 and a reliable ground. Check whether the circuit is short to ground.
- (f) Measure voltage between the vehicle speed sensor harness connector EO21 terminal No.3 and power supply. Check whether the circuit is short to power supply.

Test Items	Standard Value
Resistance Between EO21 (3) and EO35 (41)	Less than 1 $\Omega$
Resistance Between EO21 (3) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between EO21 (2) and A Reliable Ground	0 V

Are the values specified values?

No

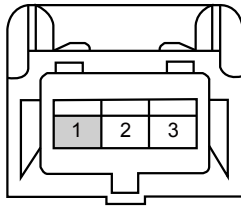
Repair or replace wiring harness connectors.  
Go to step 8

Yes

Go to step 6

Step 3	Check the vehicle speed sensor power supply circuit.
--------	--

## Vehicle Speed Sensor Harness Connector EO21



FE02-5294b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect vehicle speed sensor wiring harness connector EO21.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between vehicle speed sensor harness connector EO21 terminal No.1 and a reliable ground.

Standard Voltage: 11-14 V

- (e) Connect vehicle speed sensor harness connector EO21.

Is the value specified value?

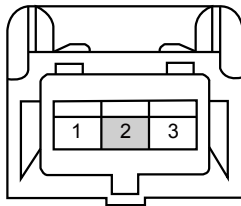
No

Check whether there is a short circuit between the vehicle speed sensor terminal No.1 and the main relay terminal No.87. Repair the faulty part.

Yes

Step 4 Check the vehicle speed sensor ground circuit.

## Vehicle Speed Sensor Harness Connector EO21



FE02-5295b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect vehicle speed sensor wiring harness connector EO21.
- (c) Measure resistance between vehicle speed sensor harness connector EO21 terminal No.2 and a reliable ground. Check whether the circuit is short to ground.

Standard Resistance: Less than 1  $\Omega$ 

Is the value specified value

No

Check whether there is an open circuit between the vehicle speed sensor terminal No.2 and a reliable ground. Repair the faulty part.

Yes

Step 5 Replace the vehicle speed sensor.

Next

Go to step 8

Step 6 Check ECM power supply circuit.

- (a) Check whether ECM power supply circuit is normal.
- (b) Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 7 Replace ECM.

- (a) Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 8 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 9 Diagnostic completed.

### 2.12.7.42 DTC P0506 P0507

#### 1. DTC Descriptor:

DTC	P0506	Idle Speed Too Low
-----	-------	--------------------

DTC	P0507	Idle Speed Too High
-----	-------	---------------------

Throttle actuator control motor is controlled by the engine control module (ECM). Internal DC motor drives throttle body. In order to reduce idle speed and adjust the spark and fuel supply, engine control module commands the throttle to close. By reducing the air flow into the engine, idle speed is lowered. In order to improve idle, the engine control module commands the throttle to open, so that more air flows through the throttle.

Engine Control Module (ECM) calculates and controls engine idle speed based on coolant temperature, speed compensation, reducing speed, Air-Conditioning compensation and voltage compensation.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0506	Idle speed is lower than the target speed by 100 rpm	<ol style="list-style-type: none"> <li>1. Engine is at idle.</li> <li>2. Vehicle speed is equal to 0.</li> <li>3. Engine coolant temperature is higher than 60°C (140 °F) .</li> <li>4. Duration Longer Than 10 s.</li> </ol>	<ol style="list-style-type: none"> <li>1. ETC throttle body assembly</li> <li>2. Intake System</li> <li>3. Exhaust System</li> <li>4. ECM</li> </ol>

P0507	Idle speed is higher than the target speed by 200 rpm	<ol style="list-style-type: none"> <li>1. Engine is at idle.</li> <li>2. Vehicle speed is equal to 0.</li> <li>3. Engine coolant temperature is higher than 60°C (140 °F) .</li> <li>4. Duration Longer Than 10 s.</li> </ol>	
-------	---	---	--

## 3. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Check whether there are control system DTC codes other than DTC P0506 P0507.
--------	--

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC P0506 P0507	No
DTC code other than P0506 P0507	Yes

Yes

[2.2.7.11 DTC Code Index](#)

No

Step 2	Check whether generator is working properly.
--------	--

- (a) Use scan tool to observe whether the system voltage parameters are normal.

Generator generating capacity normal?

No

Repair generator fault.

Yes

Step 3	Check intake air pressure sensor parameters.
--------	--

- (a) Use scan tool to observe whether system intake pressure transducer parameters are correct. Refer to "Data Stream List".

Are intake air pressure sensor parameters normal?

No

Go to step 5

Yes

Step 4 Check air-conditioning working condition.

- (a) Use scan tool to observe whether the Air-Conditioning working status is consistent with the actual Air-Conditioning working condition. Refer to the "Data Stream List".
- When the air-conditioning is switched on and the pressure switch voltage is greater than 0 V, does the idle speed increase by about 150 rpm?

Yes

Go to step 7

No

Step 5 Check air intake system, exhaust system.

- (a) Check exhaust system for the existence of congestion, air leakage.
- (b) Too much carbon residue in throttle.
- Any of these malfunctions?

Yes

Repair the faulty parts.

No

Step 6 Check engine mechanical parts and accessory drive.

- (a) Shut down the engine and turn the ignition switch to "OFF".
- (b) Check whether engine accessory drive belt is slack.
- (c) Remove engine accessory belt, neutral gear. Rotate the engine crankshaft check whether mechanical moving parts catching.
- (d) Rotate engine accessory pulley and air-conditioning pump. Check whether engine and other components catching.
- Any of these malfunctions?

Yes

Repair the faulty parts.

No

Step 7 Check ECM power supply circuit.

- (a) Check whether ECM power supply circuit is normal.
- (b) Check whether ECM ground circuit is normal.

No

Repair the faulty parts.

Yes

Step 8 Replace ECM.

- (a) Replace ECM.



- (b) Carry out crankshaft position sensor self learn. Refer to the "crankshaft position sensor to learn."

Next

Step 9	Use scan tool to confirm whether the DTC code is stored again.
--------	--

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 10	Diagnostic completed.
---------	-----------------------

#### 5. Repair Instructions:

Replace throttle valve. Refer to "Throttle Replacement".

Refer to [2.2.8.8 Engine Control Module Replacement](#) Replace ECM.

### 2.12.7.43 DTC P0562 P0563

#### 1. DTC Descriptor:

DTC	P0562	System Voltage Too Low
DTC	P0563	System Voltage Too High

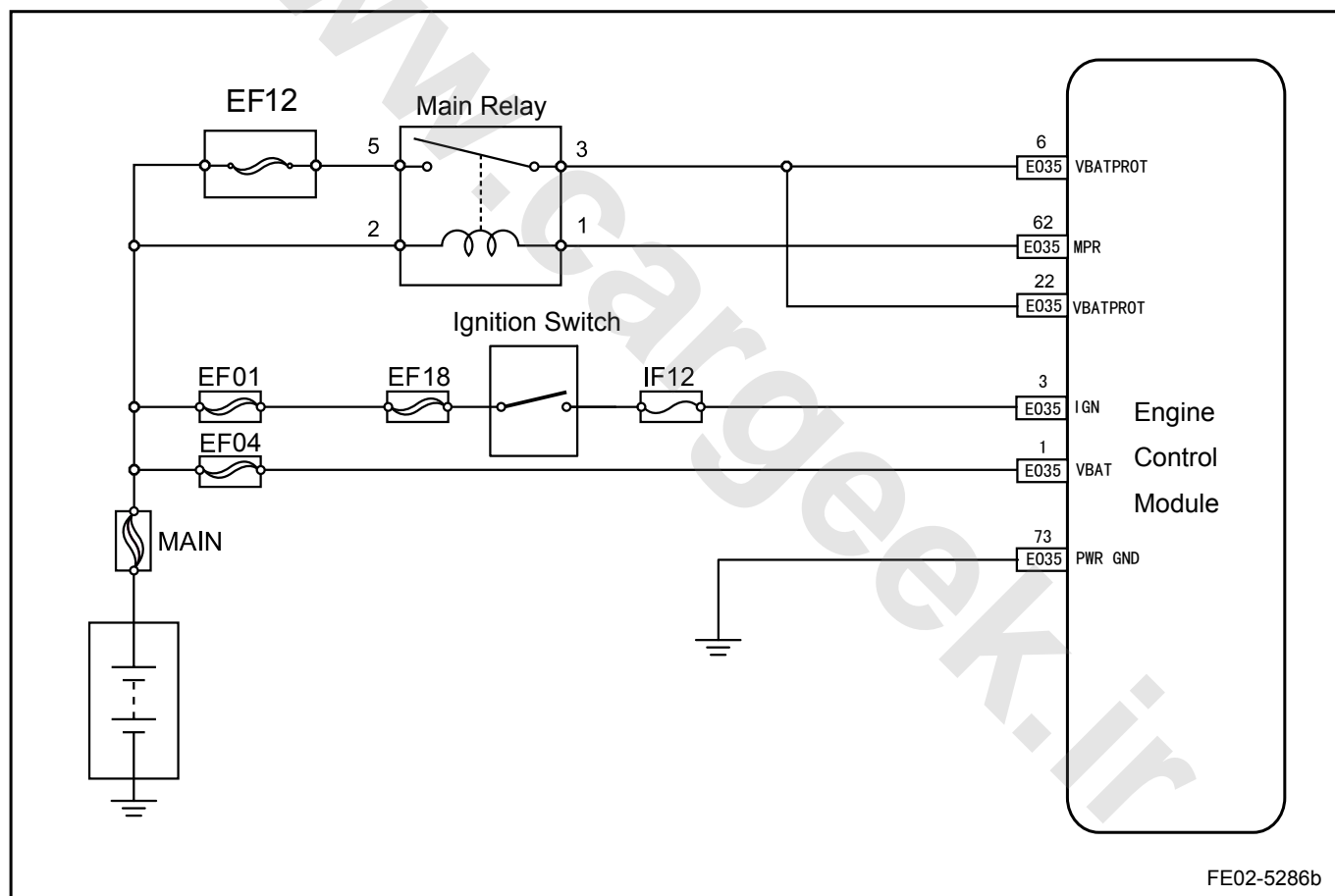
ECM Power Supply Circuit consists of the following circuits:

- Battery power passes through main fuse and EF04 to ECM harness connector EO35 terminal No.1.
- When the ignition switch turned to "ON" position, battery power passes through the ignition switch wiring harness connector IP23 terminal No.6 to the ECU fuse 10, and finally to ECM harness connector EO35 terminal No. 3.
- When ECM detects both ECM harness connector EO35 terminal No.3 and ECM connector EO35 terminal No.62 have battery voltage, ECM grounds EO35 terminal No.62 through an internal circuit. Because EO35 terminal No.62 and main fuse terminal No.1 are connected, the main relay pulls in.
- When main relay pulls in, the battery power passes through main relay terminal No.3 to ECM harness connector EO35 terminals No.6 and 22.

## 2. Conditions For Setting DTC and The Fault Location:

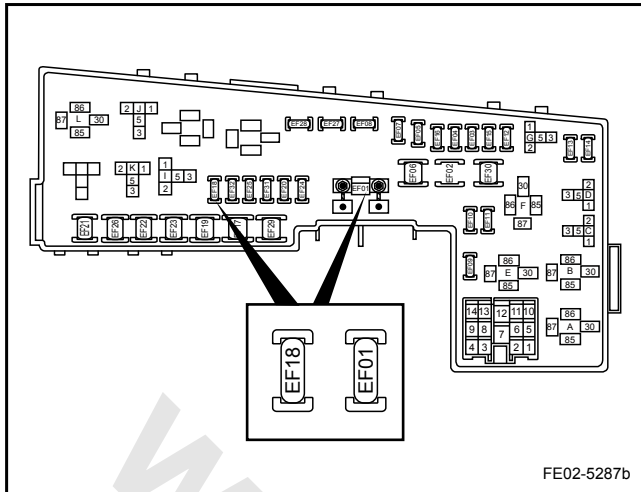
DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0562	Lower Than the Lower Limit	<ol style="list-style-type: none"> <li>1. Ignition switch is at "ON".</li> <li>2. Battery voltage is less than 11 V.</li> <li>3. Duration is longer than 40 s.</li> </ol>	1. ECM Power Supply Circuit
P0563	More Than the Upper Limit	<ol style="list-style-type: none"> <li>1. Ignition switch is at "ON".</li> <li>2. Battery voltage is greater than 16 V.</li> <li>3. Duration is longer than 40 s.</li> </ol>	<ol style="list-style-type: none"> <li>2. Generator</li> <li>3. ECM</li> </ol>

## 3. Schematic:



## 4. Diagnostic Steps:

Step 1	Check ECM fuses EF01 and EF18.
--------	--------------------------------



- Turn the ignition switch to "OFF" position.
- Remove fuses EF01 and EF18.
- Test continuity between the two fuses with a multimeter.

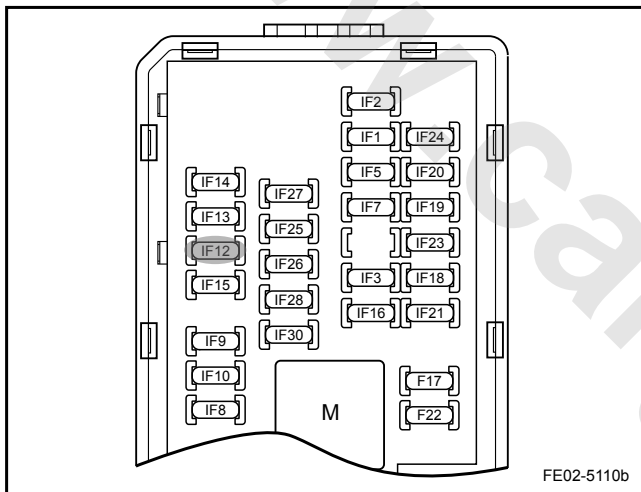
Conducted?

No

Check whether there is a short circuit.  
Replace the fuse.

Yes

Step 2 Check ECM fuse IF12 in I/P fuse block.



- Turn the ignition switch to "OFF" position.
- Remove IF12 from I/P fuse block.
- Test continuity between the two fuses with a multimeter.

Conducted?

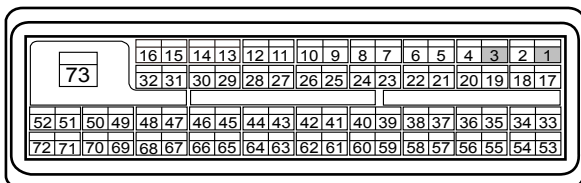
No

Check whether there is a short circuit.  
Replace the fuse.

Yes

Step 3 Check ECM power supply voltage.

### ECM Harness Connector EO35



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Turn the ignition switch to "ON" position.
- Measure voltage between ECM harness connector EO35 terminal No.1 and a reliable ground.
- Measure voltage between ECM harness connector EO35 terminal No.3 and a reliable ground.

Standard Voltage: 11-14 V

Voltage normal?

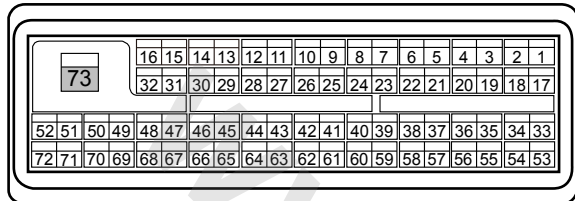
No

Go to step 5

Yes

Step 4 Check ECM grounding the circuit.

ECM Harness Connector EO35



FE02-5289b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect ECM harness connector EO35.
- (c) Measure resistance between ECM harness connector EO35 terminal No.73 of and a reliable ground.

Standard Resistance: Less than 1  $\Omega$ 

Resistance normal?

No

ECM ground circuit malfunction. Repair the faulty part.

Yes

Step 5 Check charging system.

- (a) Check the battery voltage.

Standard voltage: 11-14 V

- (b) Check voltage generator charging voltage.

Standard voltage: 11.5-14.5V

All normal?

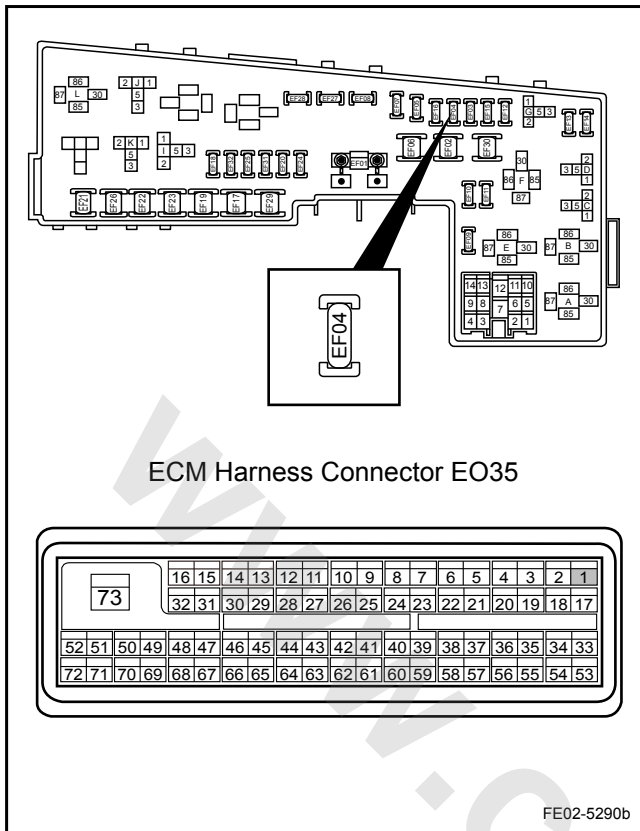
No

Repair the faulty part.

Yes

Go to step 9

Step 6 Check fuse EF04 to ECM circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EO35.
- Test continuity between ECM harness connector EO35 terminal No.1 and fuse EF04.
- Measure resistance between ECM harness connector EO35 terminal No.1 and a reliable ground.

Standard Value:

Test Items	Specified Value
Continuity Between EO35 (1) and EF04	Turn
Resistance Between EO35 (1) and A reliable ground	10 kΩ or higher

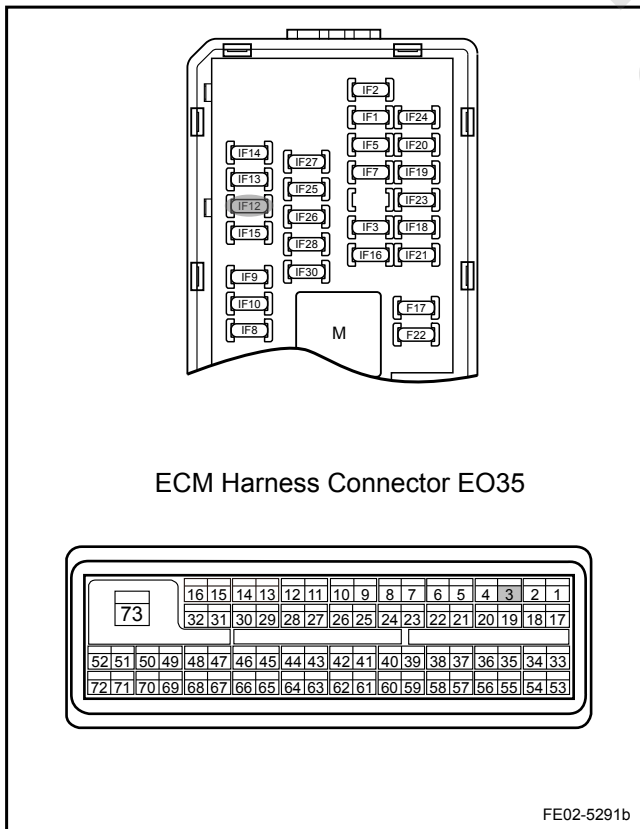
Normal?

No

Circuit malfunction. repair or replace the wiring harness.

Yes

Step 7 Check fuse IF12 to ECM circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EO35.
- Test Continuity between ECM harness connector EO35 No. 3 terminal and fuse IF12.
- Measure resistance between ECM harness connector EO35 terminal No.3 and a reliable ground.

Standard Value:

Test Items	Specified Value
Continuity Between EO35 (3) and IF12	Turn
Resistance Between EO35 (3) and A reliable ground	10 kΩ or higher

All normal?

No

Circuit malfunction, repair or replace the wiring harness.

Yes

Step 8 Replace ECM.

- (a) Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Road test the vehicle for at least 10 min.  
 (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 10 Diagnostic completed.

#### 2.12.7.44 DTC P0571

##### 1. DTC Descriptor:

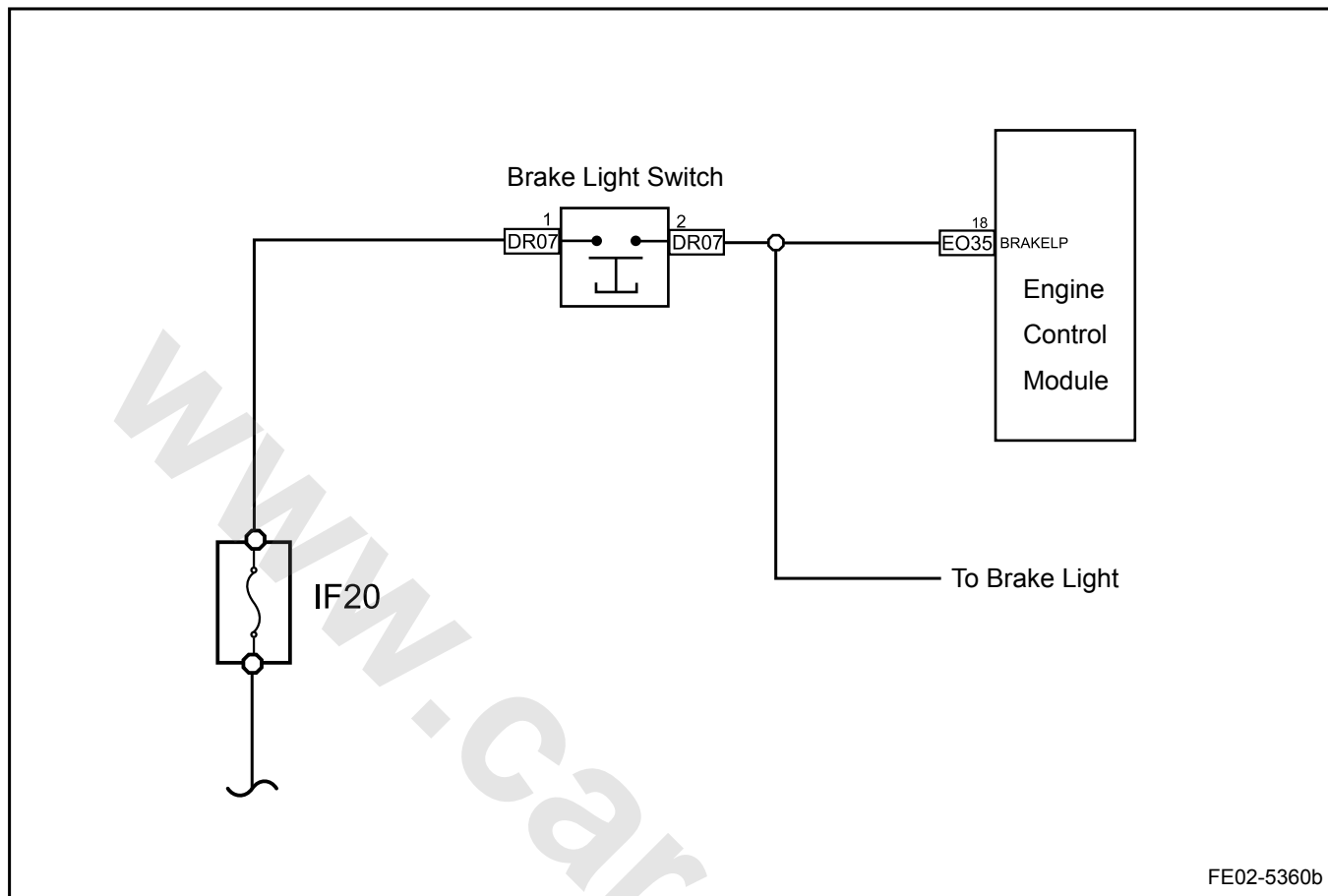
DTC	P0571	Brake Lamp Switch Status No Change During Braking
-----	-------	---

Disconnect the brake light switch signal. the vehicle braking, system enters the diagnostic window. After multiple braking, DTC code appears. Engine running smooth, the vehicle can be driven.

##### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0571	ECM receives the brake light switch signal.	1. Brake Light Switch Signal Disconnected. 2. Vehicle braking, system enters the diagnostic window. 3. DTC codes appear after repeatedly braking.	1. Brake Light Switch Circuit 2. Brake Lights Switch 3. ECM

## 3. Schematic:



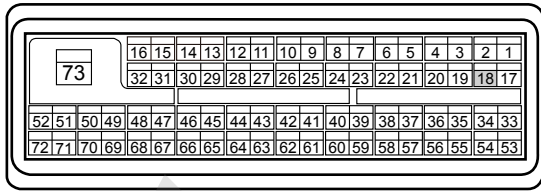
## 4. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Check whether brake lights are working properly.
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">Yes</div> <div style="border: 1px solid black; padding: 2px 5px;">No</div> <div style="border: 1px solid black; padding: 2px 5px;">Refer to <a href="#">11.4.7.8 Brake Lamp Inoperative.</a></div> </div>	
Step 2	Test continuity between brake light switch wiring harness connector R07 and ECM harness connector EO35.

## ECM Harness Connector EO35



FE02-5361b

- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EO35.
- Press the brake pedal.
- Measure ECM harness connector EO35 terminal No.18 voltage.

Standard Voltage: 11-14 V

Is voltage normal.

Yes

Replace ECM. Refer to [2.2.8 Engine Control Module Replacement](#)

No

**Step 3** Repair circuit between brake light switch wiring harness connector DR07 and ECM harness connector EO35.

- Repair circuit between brake light switch wiring harness connector DR07 and ECM harness connector EO35.
- Confirm repair completed.

Next

**Step 4** Diagnostic completed.

## 2.12.7.45 DTC P0601 P0602 P0604 P0606 P060A P1516 P2101

## 1. DTC Descriptor:

DTC	P0601	ROM Error
DTC	P0602	ECM Processor Malfunction
DTC	P0604	RAM Error
DTC	P0606	ECM Processor Malfunction
DTC	P060A	ECM Programming Errors
DTC	P1516	ETC-Driver Second-Order Diagnostic Error
DTC	P2101	ETC-Driver Steady-State Diagnostic Error

ECM Internal Program Errors.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0601	ECM Internal Monitoring	---	ECM



DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0602	ECM Internal Monitoring	---	ECM
P0604	ECM Internal Monitoring	---	ECM
P0606	ECM Internal Monitoring	---	ECM
P060A	ECM Internal Monitoring	---	ECM
P1516	ECM Internal Monitoring	---	ECM
P2101	ECM Internal Monitoring	---	ECM

## 4. Diagnostic Steps:

Step 1	Check whether there is control system DTC code other than P0601, P0602, P0604, P0606, P060A, P1516, P2101.
--------	--

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Press the scan tool power button.
- Select the following menu items: Engine/Read DTC codes.
- Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC P0601, P0602, P0604, P0606, P060A, P1516, P2101	Yes
DTC code other than DTC P0601, P0602, P0604, P0606, P060A, P1516, P2101	No

No

Refer to [2.12.7.14 DTC Code Index](#).

Yes

Step 2	Replace ECM.
--------	--------------

- Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

## 2.12.7.46 DTC P0641 P0651

## 1. DTC Descriptor:

DTC	P0641	ETC Reference Voltage A # Amplitude Fault
DTC	P0651	ETC Reference Voltage B # Amplitude Fault

As ETC uses two throttle position sensors, its normal working required 5 V reference voltage and low reference voltage is shared with ETC harness connector terminals A and D. Where A and EO01 terminal No.3 is connected, sharing the low reference voltage. D terminal and EO01 terminal No.4 is connected, sharing 5 V reference voltage. Malfunction in any circuit will report DTC code P0641 or P0651.

## 2. Conditions For Setting DTC and The Fault Location:

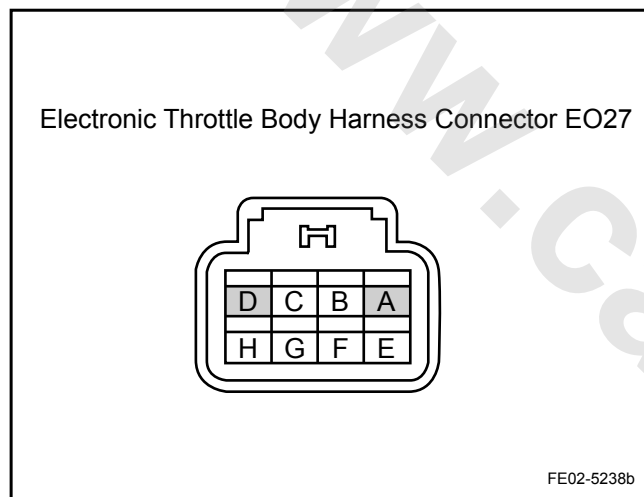
DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0641	Hardware Circuit Malfunction	-	1. Electronic Throttle Body
P0651	Hardware Circuit Malfunction	-	2. Electronic Throttle Circuit 3. ECM

## 3. Schematic:

Refer to [2.12.7.21 DTC P0122 P0123](#).

## 4. Diagnostic Steps:

Step 1	Check ETC harness connector EO27 terminals A and D.
--------	---



- Turn the ignition switch to "OFF" position.
- Disconnect ETC harness connector EO27.
- Turn the ignition switch to "ON" position.
- Measure resistance between EO27 terminal A and a reliable ground.
- Measure voltage between EO27 terminal D and a reliable ground.

Results:

Test Items	Standard Value
Resistance Between EO27 (A) and A Reliable Ground	Less than 3 $\Omega$
Voltage Between EO27 (D) and A Reliable Ground	4.8-5.2 V

Standard values?

No

Circuit malfunction, repair circuit.

Yes

Step 2	Replace the electronic throttle body.
--------	---------------------------------------

- Refer to "Electronic Throttle Body Replacement".

Next

Step 3	Use scan tool to confirm whether the DTC code is stored again.
--------	--

- Connect scan tool to the datalink connector.
- Turn the ignition switch to "ON" position.
- Clear DTC code.
- Start and run the engine at idle speed to warm up the engine for at least 5 min.
- Road test the vehicle for at least 10 min.

- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.12.7.3 Intermittent Fault Check](#)

Yes

Step 4 Check ECM power supply circuit and ground circuit.

- (a) Check ECM power supply circuit and ground circuit. Refer to "[2.12.7.43 DTC P0562 P0563](#)".

ECM power and ground circuits normal?

No

Power and ground circuits fault.

Yes

Step 5 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Next

Step 6 Carry out crankshaft position sensor learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 7 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Road test the vehicle for at least 10 min.  
 (f) Read control system DTC code.

Verify that the system has no DTC code output.

No

Intermittent Fault. Refer to [2.12.7.3 Intermittent Fault Check](#)

Yes

Step 8 Diagnostic completed.

### 2.12.7.47 DTC P0646 P0647

#### 1. DTC Descriptor:

DTC	P0646	Air-Conditioning Clutch Relay Circuit Short To Low Voltage or Open
DTC	P0647	Air-Conditioning Clutch Relay Circuit Short To High Voltage

Air-Conditioning compressor working voltage is provide by main relay which is controlled by ECM. ECM controls Air-Conditioning compressor relay internal ground through ECM harness connector EO35 terminal No.51 of, relay pull-in. ECM has a drive circuit which controls relay coil ground, and drive circuit is equipped with a feedback circuit to ECM. By monitoring the feedback voltage, ECM determines whether the control circuit is open, short to ground or short to power supply.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0646	Hardware Circuit Checks	When air-conditioning is not working, with air-conditioning relay control circuit open or short to ground, the DTC code will be set.	1. Air-Conditioning Relay 2. ECM 3. Air-Conditioning Relay Circuit
P0647	Hardware Circuit Checks	When air-conditioning is not working, with air-conditioning relay control circuit open or short to ground, the DTC code will be set.	1. Air-Conditioning Relay 2. ECM 3. Air-Conditioning Relay Circuit

## 3. Schematic:

Refer to [8.2.6.2 Air-conditioning System Circuit Schematic](#).

## 4. Diagnostic Steps:

Refer to [8.2.7.6 Air-conditioning Clutch Inoperative](#).

### 2.12.7.48 DTC P0650

#### 1. DTC Descriptor:

DTC	P0650	Fault Indicator (MIL) Malfunction
-----	-------	-----------------------------------

CAN network is used in vehicles. Fault lamps are controlled via the instrument panel circuit. When ECM DTC code is set to light fault lamps, ECM sends a "Light the fault lamp" signal through the CAN network the instrument panel. The instrument panel internal circuit light the fault lamp indicating engine fault after receiving the instruction from ECM.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0650	Hardware Circuit Checks	Fault indicator output state and ECM expected status does not match.	1. Instrument Cluster 2. CAN-Bus

## Diagnostic Steps:

Step 1	Check other fault lights working.
--------	-----------------------------------

(a) Turn the ignition switch to "ON" position.  
Other fault lights normal?

Yes

Go to step 3

No

Step 2	Repair instrument cluster circuit.
--------	------------------------------------

Instrument Repair

- (a) Repair instrument cluster power supply circuit. Refer to [11.7.6.7 DTC U129C U129D](#).
- (b) Repair instrument cluster ground circuit. Refer to [11.7.6.7 DTC U129C U129D](#).

Is fault resolved?

Yes

System normal.

No

Step 3	Check instrument DTC.
--------	-----------------------

- (a) Connect scan tool.
- (b) Turn the ignition switch to "ON" position.
- (c) Scan instrument DTC.

Is there DTC code?

Yes

Go to step 5

No

Step 4	Test fault indicator.
--------	-----------------------

- (a) Connect scan tool.
- (b) Turn the ignition switch to "ON" position.
- (c) Choose scan tool "Function Test" menu and then "Fault Light Test".

Is fault indicator lit?

Yes

Go to step 6

No

Step 5	Replace instrument cluster.
--------	-----------------------------

- (a) Turn off the ignition switch and remove the ignition key.
- (b) Disconnect the battery negative cable.
- (c) Replace instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#).

Is fault solved?

Yes

System normal.

No

Step 6	Check instrumentation and ECM network communication.
--------	--

- (a) Repair instrumentation and ECM network communication malfunction. Refer to [11.17.7.4 CAN Bus Integrity Diagnosis](#).

Is fault solved?

Yes

System normal

No

Step 7	Repair ECM power supply circuits.
--------	-----------------------------------

(a) Repair ECM power supply circuit. Refer to [2.12.7.43 DTC P0562 P0563](#).

Is fault solved?

Yes

System normal.

No

Step 8	Replace ECM.
--------	--------------

- (a) Connect scan tool.
- (b) Turn the ignition switch to "ON" position.
- (c) Scan ECM DTC codes, repair ECM. Repair the faulty part. if necessary, replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).
- (d) Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).
- (e) Clear malfunction code.

Next

Step 9	System normal.
--------	----------------

### 2.12.7.49 DTC P0685

#### 1. DTC Descriptor:

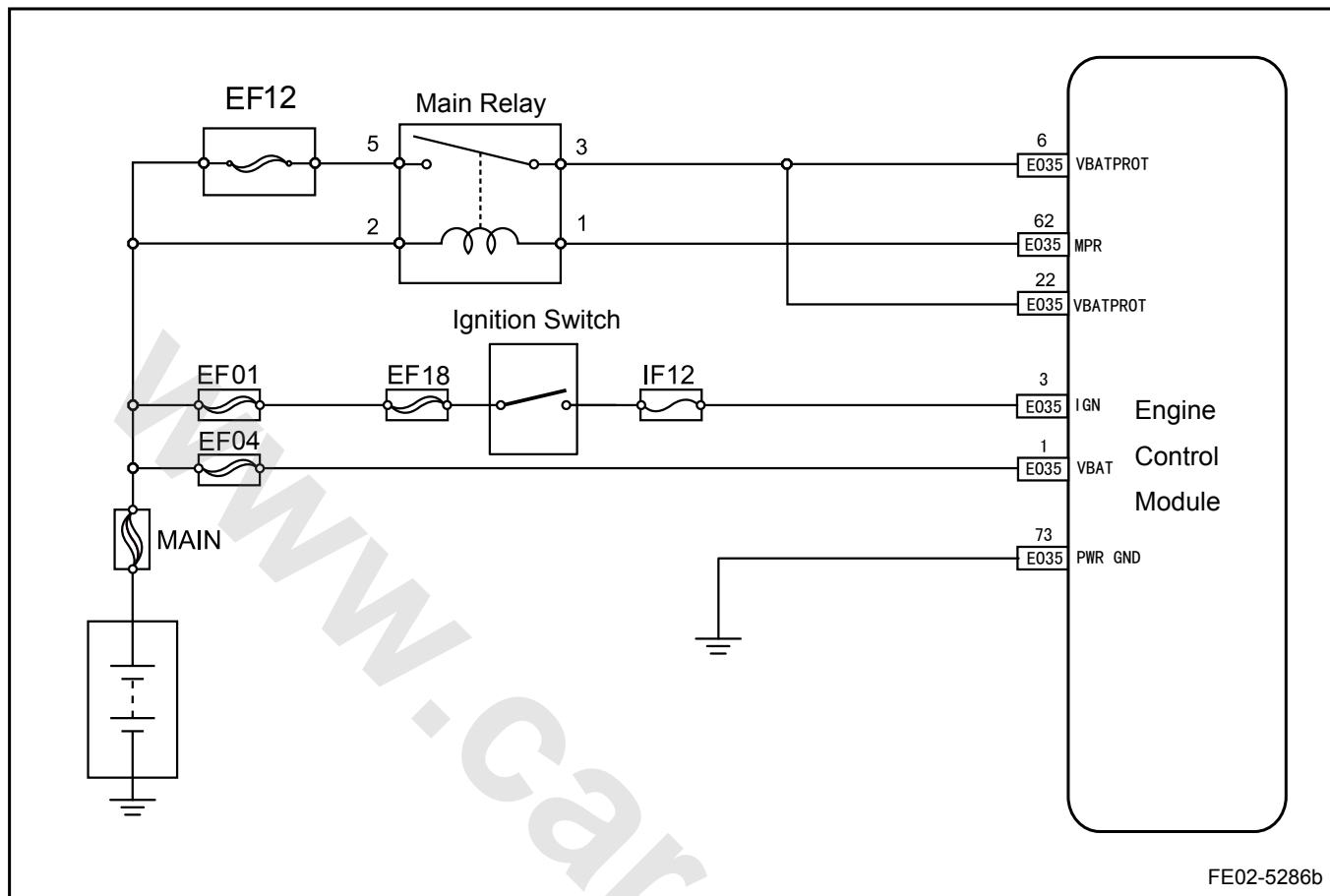
DTC	P0685	Main Relay Malfunction
-----	-------	------------------------

Main relay is used to provide power to fuel injectors and oxygen sensors and other components. Battery provides power to main relay terminal No.2. ECM controls main relay ground through ECM harness connector EO35 terminal No.62. ECM has a detection circuit. By monitoring the feedback voltage, ECM determines whether the control circuit is open, short to ground or short to power supply.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0685	Main Relay Malfunction	The main relay circuit control state does not match ECM expected status.	1. Main Relay Circuit 2. Main Relay 3. ECM

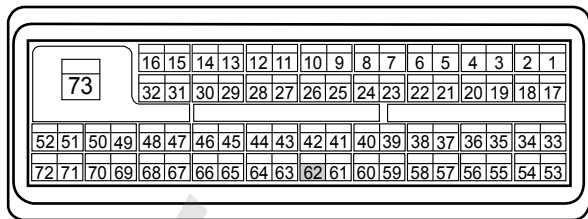
## 3. Schematic:



## 4. Diagnostic Steps:

Step 1	Visual Inspection.
(a) Check main relay for signs of damage.	
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">No</div> <div style="border: 1px solid black; padding: 2px;">Yes</div> <div style="border: 1px solid black; padding: 2px;">Replace the main relay. Go to step 10.</div> </div>	
Step 2	Check ECM harness connector E035 terminal No.62.

## ECM Harness Connector EO35



FE02-5298b

- (a) Turn the ignition switch to "OFF" position.
- (b) Remove of ECM harness connector EO35.
- (c) Measure voltage between ECM harness connector EO35 terminal No.62 and a reliable ground.
- (d) Measure resistance between ECM harness connector EO35 terminal No.62 and a reliable ground.

Standard Value:

Test Items	Specified Value
Voltage Between EO35 (62) and A Reliable Ground	11-14 V
Resistance Between EO35 (62) and A Reliable Ground	10 kΩ or higher

All normal?

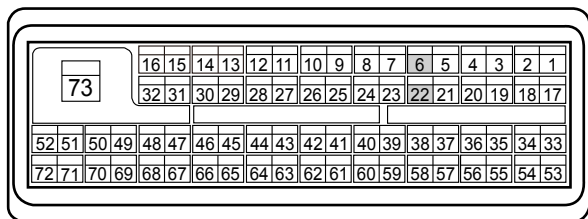
No

Repair circuit between the battery and EO35 terminal No.62. Go to step 10.

Yes

Step 3 Check ECM harness connector EO35 terminals No.6 and 22.

## ECM Harness Connector EO35



FE02-5299b

- (a) Turn the ignition switch to "OFF" position.
- (b) Measure resistance between ECM harness connector EO35 terminals No.6, 22 and a reliable ground.
- (c) Connect EO35 terminal NO.62 to ground.
- (d) Measure voltage between ECM harness connector EO35 terminals No.6, 22 and a reliable ground.

Standard Value:

Test Items	Specified Value
Resistance Between EO35 (6,22) and A Reliable Ground	10 kΩ or higher
Voltage Between EO35 (6,22) and A Reliable Ground	11-14 V

All normal?

No

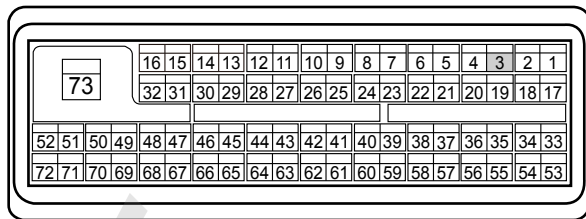
Go to step 5

Yes

Step 4 Check the ignition switch input signal.



ECM Harness Connector EO35



FE02-5300b

- (a) Turn the ignition switch to "ON" position.
- (b) Measure voltage between ECM harness connector EO35 terminal No.3 and a reliable ground.

Standard Value:

Test Items	Specified Value
Voltage Between EO35 (3) and A Reliable Ground	11-14 V

- (c) Turn the ignition switch to "OFF" position.

Voltage normal?

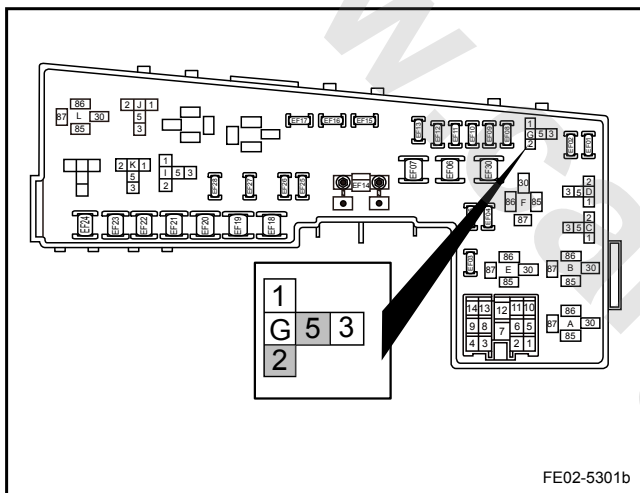
No

Repair circuit between the battery and EO35 terminal No.3.

Yes

Go to step 8

Step 5 Check main relay terminals No.2 and 5 voltage.



FE02-5301b

- (a) Remove the main relay.
- (b) Measure voltage between the main relay terminal No.2,5 and a reliable ground.
- (c) Measure resistance between the main relay terminal No.2,5 and a reliable ground.

Standard Value:

Test Items	Standard Value
Voltage Between The Main Relay Terminal No.2,5 and A Reliable Ground	11-14 V
Resistance Between The Main Relay Terminal No.2,5 and A Reliable Ground	10 kΩ or higher

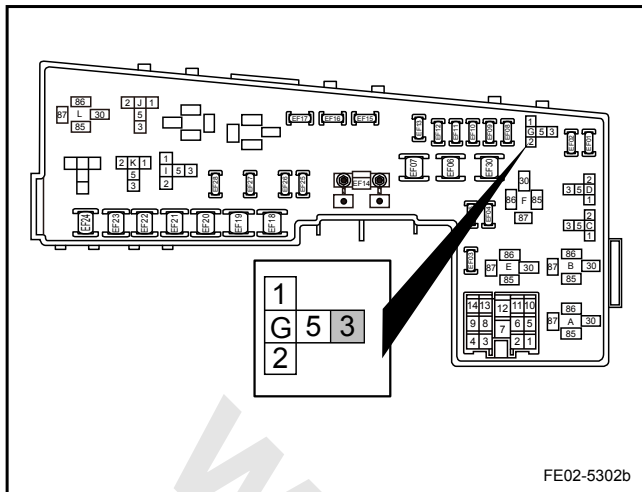
All normal?

No

Repair battery to the main relay terminal No. 2,5 circuit.

Yes

Step 6 Check main relay terminal No.3.



- Install the main relay.
- Connect ECM harness connector EO35 terminal No.62 to ground.
- Measure voltage between main relay terminal No.3 and a reliable ground.

Standard voltage: 11-14 V

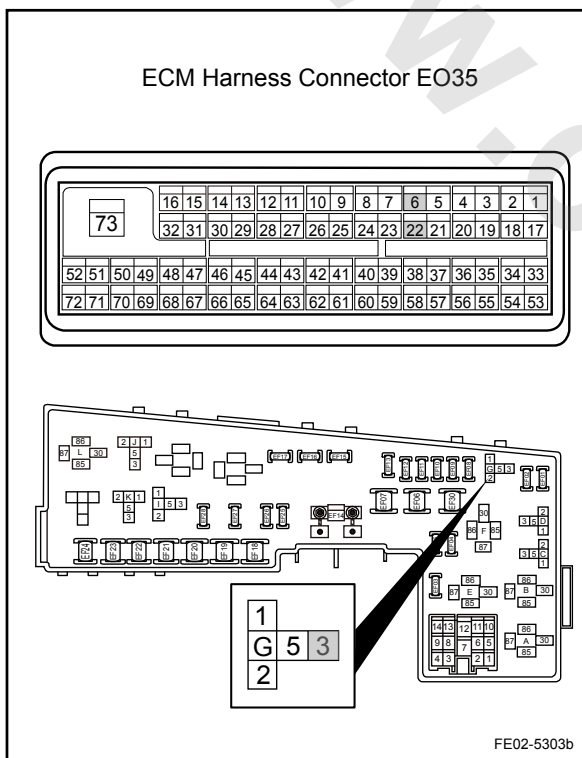
Voltage normal?

No

Replace the main relay. Go to step 10

Yes

Step 7 Test continuity between main relay and ECM harness connector.



- Remove the main relay.
- Measure resistance between main relay terminal No.3 and ECM harness connector EO35 terminals No. 6,22.

Standard Resistance: Less than 1 Ω

Resistance normal?

No

Repair the circuit between main relay terminal No.3 and ECM harness connector EO35 terminals No. 6,22.

Step 8 Check ECM power supply circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair ECM Power Supply Circuits.

Yes

Step 9 Replace ECM.

- (a) Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 10 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Road test the vehicle for at least 10 min.  
 (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

Yes

Step 11 Diagnostic completed.

### 2.12.7.50 DTC P2104 P2105 P2106 P2110

#### 1. DTC Descriptor:

DTC	P2104	Mandatory Engine idling
DTC	P2105	Mandatory Engine Shutdown
DTC	P2106	Restrictions On Engine Performance
DTC	P2110	Engine Power Management

When the intake system or throttle body valve air flow control have faults, ETC system can not reliably use the throttle to control engine power. ECM will report the relevant DTC code, while the engine works in the protected mode.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P2104	Protected mandatory idle	1. Engine At idle. 2. Acceleration pedal position sensor signal 1 and signal 2 circuits all open, or short to GND and short to 5 V.	---
P2105	Fault Protection Mandatory Shutdown	1. Engine At idle. 2. Use scan tool to modify engine running state, shut down the engine.	---

P2106	Fault Protection Limits	<ol style="list-style-type: none"> <li>1. Engine At idle.</li> <li>2. Acceleration pedal position sensor signal 1 and signal 2 circuits all open, there is a sensor related fault.</li> <li>3. Sensor DTC codes appears, engine enters into the limited implementation state.</li> </ol>	
P2110	Failsafe Power Limit	<ol style="list-style-type: none"> <li>1. Engine At idle.</li> <li>2. throttle position sensor signal 1 and signal 2 circuits all open, there is a sensor related fault.</li> <li>3. Sensor DTC codes appears, default throttle opening.</li> </ol>	

## 3. Diagnostic Steps:

## Note

Before carrying out this diagnosis step, observe the data list on scan tool and analyze the accuracy of the data, as these will help with quick diagnosis.

Step 1	Check whether there is control system DTC code other than DTC P2104 P2105 P2106 P2110.
--------	--

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
DTC P2104 P2105 P2106 P2110	No
DTC code other than DTC P2104 P2105 P2106 P2110	Yes

Yes

[2.2.7.11 DTC Code Index](#)

No

Step 2	Use scan tool to confirm whether the DTC code is stored again.
--------	--

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Read control system DTC code again to confirm that the system has no DTC code.

Yes

Diagnostic

No

Step 3 Check ECM power supply circuit.

(a) Check whether ECM power supply circuit is normal.  
(b) Check whether ECM ground circuit is normal.

No

Repair the faulty parts. Go to step 5

Yes

Step 4 Replace ECM.

(a) Replace ECM.  
(b) Carry out crankshaft position sensor self learn. Refer to the "Crankshaft Position Sensor Learn".

Next

Step 5 Use scan tool to confirm whether the DTC code is stored again.

(a) Connect scan tool to the datalink connector.  
(b) Turn the ignition switch to "ON" position.  
(c) Clear DTC code.  
(d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
(e) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

Yes

Step 6 Diagnostic completed.

### 5. Repair Instructions:

Refer to [2.2.8.8 Engine Control Module Replacement](#) Replace ECM.

### 2.12.7.51 DTC P2119

1. DTC Descriptor:

DTC	P2119	Electronic Throttle Return Malfunction
-----	-------	--

After the ignition switch is switched off, electronic throttle stays at the initial angle of 14.5 degrees. If the ignition switch is off, the throttle is always off, the DTC code may be recorded, and it may be accompanied by the engine difficult to start and so on.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P2119	Electronic Throttle Return Malfunction	<ol style="list-style-type: none"> <li>1. Ignition Switch "OFF".</li> <li>2. Throttle is always off, so throttle fails to reach proper opening for return test.</li> </ol>	<ol style="list-style-type: none"> <li>1. Electronic Throttle Body Dirty</li> <li>2. Electronic Throttle Body Mechanical Malfunction</li> </ol>

## 3. Diagnostic Steps:

Step 1	Check whether there is other ETC system related DTC code?
--------	---

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
Only P2119	Yes
DTC Code Other Than P2119	No

No

Refer to [2.12.7.14 DTC Code Index](#)

Yes

Step 2	Cleaning electronic throttle body.
--------	------------------------------------

- (a) Remove electronic throttle body. Refer to the "Electronic Throttle Body Replacement".
- (b) Clean electronic throttle body.

Next

Step 3	Use scan tool to confirm whether the DTC code is stored again.
--------	--

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Read control system DTC code again to confirm that the system has no DTC code.

No

Diagnostic

Yes

Step 4 Replace electronic throttle body.

- (a) Replace electronic throttle body. Refer to the "Electronic Throttle Body Replacement".

Next

Step 5 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) start the engine and idle speed warm-up run for at least 5 min.  
 (e) Read control system DTC code again to confirm that the system has no DTC code.

No

diagnostic

Yes

Step 6 Check ECM power supply circuit and ground circuit.

- (a) Check ECM power supply circuit and ground circuit. Refer to [2.12.7.43 DTC P0562 P0563](#).

ECM power and ground circuits normal?

No

Repair power and ground circuit faults

Yes

Step 7 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Next

Step 8 Carry out crankshaft position sensor learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Road test the vehicle for at least 10 min.  
 (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.12.7.3 Intermittent Fault Check](#)

Yes

Step 10 Diagnostic completed.

## 2.12.7.52 DTC P2122 P2123

## 1. DTC Descriptor:

DTC	P2122	Electronic Throttle Pedal Position Sensor 1 Circuit Low Voltage
DTC	P2123	Electronic Throttle Pedal Position Sensor 1 Circuit High Voltage

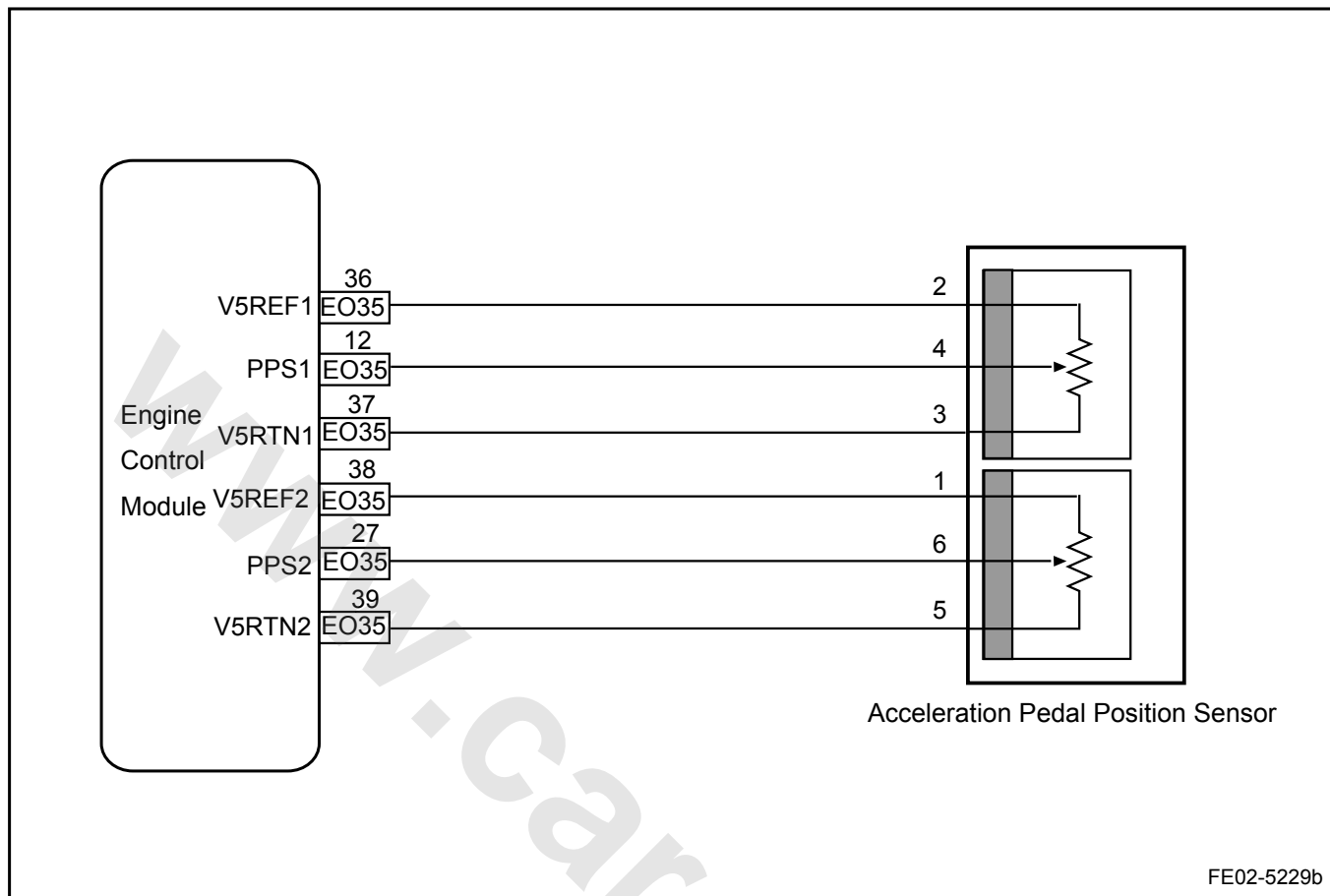
In order to protect the security of the system, acceleration pedal position sensor (APP) uses a dual-sensor setting, sliding resistive. APP sensor 1 output is IP50 terminal No.4, through ECM wiring harness Connect EO35 terminal No.12 to ECM.

## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P2122	Hardware Circuit Malfunction	Voltage is below the minimum limit, or short to ground	1. Acceleration Pedal Position Sensor
P2123	Hardware Circuit Malfunction	Voltage is higher than the maximum limit, or short to power supply	2. Acceleration Pedal Position Sensor Circuit 3. ECM

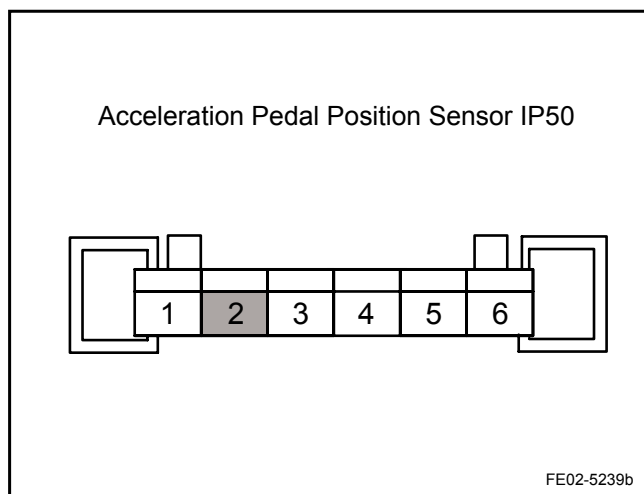


## 3. Schematic:



## 4. Diagnostic Steps:

Step 1	Check APP sensor harness connector IP50 terminal No.2 voltage.
--------	--



- Turn the ignition switch to "OFF" position.
- Disconnect APP sensor harness connector IP50.
- Turn the ignition switch to "ON" position.
- Measure voltage between IP50 terminal No.2 and a reliable ground.

Standard Voltage: 4.8-5.2 V

Standard values?

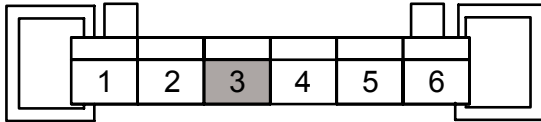
No

If the voltage is higher than the standard value, the circuit is short to power supply, if the voltage is lower than the standard value.

Yes

Step 2	Check resistance between APP sensor harness connector IP50 terminal No.3 and a reliable ground.
--------	---

## Acceleration Pedal Position Sensor IP50



FE02-5240b

- Turn the ignition switch to "OFF" position.
- Disconnect APP sensor harness connector IP50.
- Turn the ignition switch to "ON" position.
- Measure resistance between IP50 terminal No.3 and a reliable ground.

Standard Resistance: Less than 3  $\Omega$ 

Is the resistance standard value?

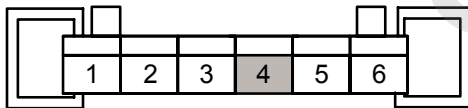
No

Go to step 5

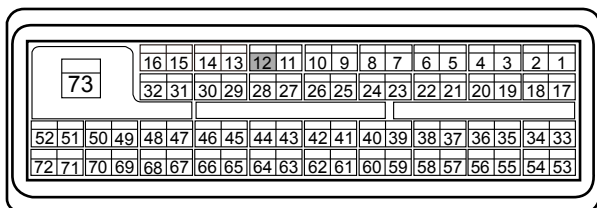
Yes

Step 3 Check APP sensor harness connector IP50 terminal No.4.

## Acceleration Pedal Position Sensor IP50



## ECM Harness Connector EO35



FE02-5241b

- Turn the ignition switch to "OFF" position.
- Disconnect APP sensor harness connector IP50.
- Disconnect ECM harness connector EO35.
- Measure resistance between IP50 terminal No.4 and a reliable ground.
- Measure voltage between IP50 terminal No.4 and a reliable ground.
- Test continuity between IP50 terminal No.4 and EO35 terminal No.12.

Results:

Test Items	Standard Value
Resistance Between IP50 (4) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between IP50 (4) and A Reliable Ground	0 V
Continuity Between IP50 (4) and EO35 (12)	Less than 1 $\Omega$

Standard values?

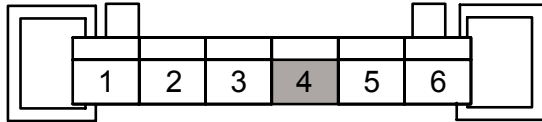
No

Circuit fault. Repair the faulty part.

Yes

Step 4 Check APP sensor harness connector IP50 terminal No.4 output voltage.

Acceleration Pedal Position Sensor IP50

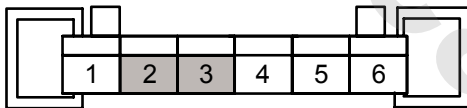


FE02-5242b

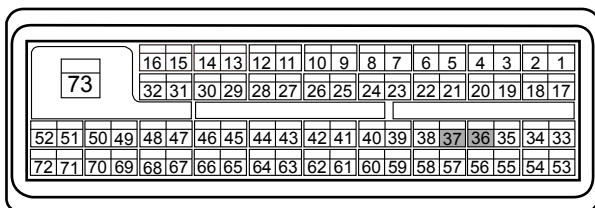
Yes

Step 5 Check APP sensor harness connector IP50 terminals No.2 and 3.

Acceleration Pedal Position Sensor IP50



ECM Harness Connector EO35



FE02-5243b

- (a) Check APP sensor harness connector IP50 terminal No.4 output voltage. For the Standard Value. Refer to [2.12.7.13 Acceleration Pedal Position Sensor \(APP\) Check](#).

Is the output voltage Standard Value?

No

Replace the APP sensor. Refer to the "APP sensor better."

Yes

Go to step 7

- (a) Turn the ignition switch to "OFF" position.  
 (b) Disconnect APP sensor harness connector IP50.  
 (c) Disconnect ECM harness connector EO35.  
 (d) Turn the ignition switch to "ON" position.  
 (e) Measure resistance between IP50 terminal No.2 and a reliable ground.  
 (f) Test continuity between IP50 terminal No.2 and EO35 terminal No.36.  
 (g) Measure voltage between IP50 terminal No.2 and a reliable ground.  
 (h) Test continuity between IP50 terminal No.3 and EO35 terminal No.37.

Results:

Test Items	Standard Value
Resistance Between IP50 (2) and A Reliable Ground	10 kΩ or higher
Continuity Between IP50 (2) and EO35 (36)	Less than 1 Ω
Voltage Between IP50 (3) and A Reliable Ground	0 V
Continuity Between IP50 (3) and EO35 (37)	Less than 1 Ω

Standard values?

No

Circuit fault, Repair the faulty part.

Yes

Step 6 Check ECM power supply circuit and ground circuit.

- (a) Check ECM power supply circuit and ground circuit. Refer to [2.12.7.43 DTC P0562 P0563](#).

ECM power and ground circuits normal?

No

Power and ground circuit fault.

Yes

Step 7 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Next

Step 8 Carry out crankshaft position sensor learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Road test the vehicle for at least 10 min.
- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.12.7.3 Intermittent Fault Check](#)

Yes

Step 10 Diagnostic completed.

#### 5. Repair Instructions:

Acceleration pedal position sensor (APP) can only be replaced as an assembly. Do not disassemble. APP replacement Refer to "Acceleration Pedal Position Sensor Replacement".

### 2.12.7.53 DTC P2127 P2128

#### 1. DTC Descriptor:

DTC	P2127	Electronic Throttle Pedal Position Sensor 2 Circuit Low Voltage
DTC	P2128	Electronic Throttle Pedal Position Sensor 2 Circuit High Voltage

In order to protect the security of the system, acceleration pedal position sensor (APP) uses a dual-sensor setting, sliding resistive. APP sensor 2 output is IP50 terminal No.6, through ECM wiring harness Connect EO35 terminal No.27 to ECM.

## 2. Conditions For Setting DTC and The Fault Location:

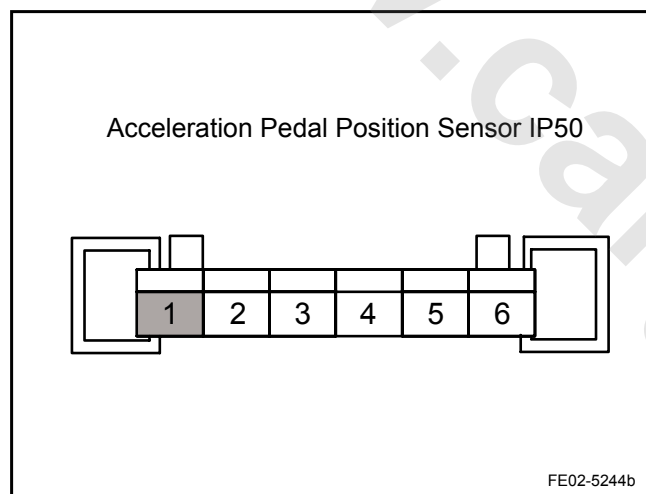
DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P2127	Hardware Circuit Malfunction	Voltage is below the minimum limit, or short to ground	1. Acceleration Pedal Position Sensor
P2128	Hardware Circuit Malfunction	Voltage is higher than the maximum limit, or short to power supply	2. Acceleration Pedal Position Sensor Circuit 3. ECM

## 3. Schematic:

Refer to [2.12.7.52 DTC P2122 P2123](#).

## 4. Diagnostic Steps:

Step 1	Check APP sensor harness connector IP50 terminal voltage of the No.1.
--------	---



- Turn the ignition switch to "OFF" position.
- Disconnect APP sensor harness connector IP50.
- Turn the ignition switch to "ON" position.
- Measure voltage between IP50 terminal No.1 and a reliable ground.

Standard Voltage: 4.8-5.2 V

Standard values?

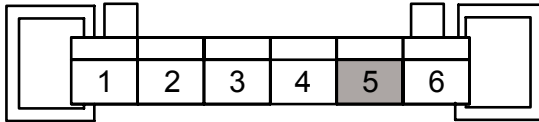
No

If the voltage is higher than the Standard Value, the circuit is short to power supply, if the voltage is lower than the standard value.

Yes

Step 2	Check resistance between APP sensor harness connector IP50 terminal No.5 and a reliable ground.
--------	---

## Acceleration Pedal Position Sensor IP50



FE02-5245b

- Turn the ignition switch to "OFF" position.
- Disconnect APP sensor harness connector IP50.
- Turn the ignition switch to "ON" position.
- Measure resistance between IP50 terminal No.5 and a reliable ground.

Standard Resistance: Less than 3  $\Omega$ 

Standard resistance?

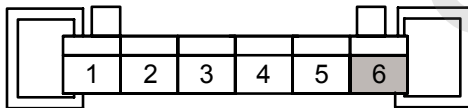
No

Go to step 5

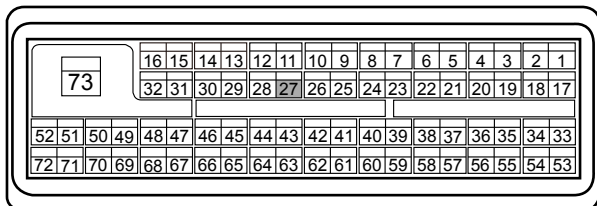
Yes

Step 3 Check APP sensor harness connector IP50 terminal No.6.

## Acceleration Pedal Position Sensor IP50



## ECM Harness Connector EO35



FE02-5246b

- Turn the ignition switch to "OFF" position.
- Disconnect APP sensor harness connector IP50.
- Disconnect ECM harness connector EO35.
- Measure resistance between IP50 terminal No.6 and a reliable ground.
- Measure voltage between IP50 terminal No.6 and a reliable ground.
- Test continuity between IP50 terminal No.6 and EO35 terminal No.27.

Results:

Test Items	Standard Value
Resistance Between IP50 (6) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between IP50 (6) and A Reliable Ground	0 V
Continuity Between IP50 (6) and EO35 (27)	Less than 1 $\Omega$

Standard values?

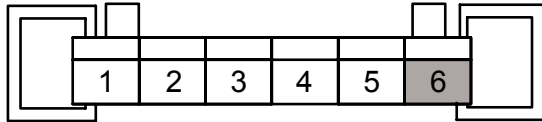
No

Circuit fault. Repair the faulty part.

Yes

Step 4 Check APP sensor harness connector IP50 terminal No.6 output voltage.

Acceleration Pedal Position Sensor IP50

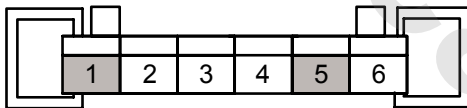


FE02-5247b

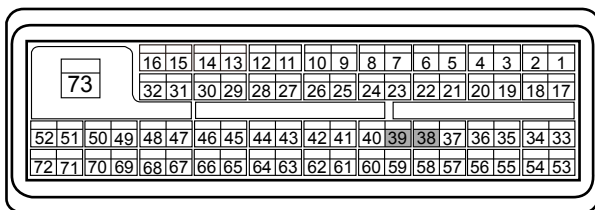
Yes

Step 5 Check APP sensor harness connector IP50 terminals No.1 and 5.

Acceleration Pedal Position Sensor IP50



ECM Harness Connector EO35



FE02-5248b

- (a) Check APP sensor harness connector IP50 terminal No.6 output voltage. For the Standard Value. Refer to [2.12.7.13 Acceleration Pedal Position Sensor \(APP\) Check](#).

Is the output voltage Standard Value?

No

Replace the APP sensor. Refer to the "APP sensor replacement."

Yes

Go to step 7

- (a) Turn the ignition switch to "OFF" position.  
 (b) Disconnect APP sensor harness connector IP50.  
 (c) Disconnect ECM harness connector EO35.  
 (d) Turn the ignition switch to "ON" position.  
 (e) Measure resistance between IP50 terminal No.1 and a reliable ground.  
 (f) Test continuity between IP50 terminal No.1 and EO35 terminal No.38.  
 (g) Measure voltage between IP50 terminal No.5 and a reliable ground.  
 (h) Test continuity between IP50 terminal No.5 and EO35 terminal No.39.

Results:

Test Items	Standard Value
Resistance Between IP50 (1) and A Reliable Ground	10 kΩ or higher
Continuity Between IP50 (1) and EO35 (38)	Less than 1 Ω
Voltage Between IP50 (5) and A Reliable Ground	0 V
Continuity Between IP50 (5) and EO35 (39)	Less than 1 Ω

Standard values?

No

Circuit fault, repair the faulty part.

Yes

Step 6 Check ECM power supply circuit and ground circuit.

- (a) Check ECM Power Supply Circuit and ground circuit. Refer to [2.12.7.43 DTC P0562 P0563](#).

ECM power and ground circuits normal?

No

Power and ground circuits fault.

Yes

Step 7 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Next

Step 8 Carry out crankshaft position sensor learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Clear DTC code.  
 (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.  
 (e) Road test the vehicle for at least 10 min.  
 (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.12.7.3 Intermittent Fault Check](#)

Yes

Step 10 Diagnostic completed.

#### 5. Repair Instructions:

Acceleration pedal position sensor (APP) can only be replaced as an assembly. Do not disassemble. APP replacement Refer to "Acceleration Pedal Position Sensor Replacement".

### 2.12.7.54 DTC P2135

#### 1. DTC Descriptor:

DTC	P2135	Electronic Throttle Position Sensor 1 and 2 Circuits Relations Malfunctions
-----	-------	---

ECM compares TPS1 and TPS2 input signals. Two input signals' sum at any time should be close to 5V. If ECM detects difference between the sum of TPS1 and TPS2 signals and the theoretical value is big, ECM will report the DTCs code.



## 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P2135	Hardware Circuit Malfunction	Voltage is lower than the minimum limit, or circuit short to ground.	1. ETC 2. TPS Sensor Circuit 3. ECM

## 3. Schematic

Refer to [2.12.7.21 DTC P0122 P0123](#).

## 4. Diagnostic Steps:

Step 1	Check whether there is other TPS system related DTC code?
--------	---

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Press the scan tool power button.
- (d) Select the following menu items: Engine/Read DTC codes.
- (e) Read DTC codes.

Results:

DTC Codes Shown	To Step
Only P2135	Yes
P0122, P0123, P0222, P0223	No

No

Refer to [2.12.7.14 DTC Code Index](#)

Yes

Step 2	Check TPS1 and TPS2 output voltage signals.
--------	---

- (a) For technical specifications. Refer to [2.12.7.12 Electronic Throttle Body \(ETC\) Check](#).

Specified values?

No

Replace electronic throttle body. Refer to "Electronic Throttle Body Assembly Replacement".

Yes

Step 3	Check ECM power supply circuit and ground circuit.
--------	--

- (a) Check ECM power supply circuit and ground circuit. Refer to [2.12.7.43 DTC P0562 P0563](#).

ECM power and ground circuits normal?

No

Power and ground circuits fault.

Yes

Step 4 Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Next

Step 5 Carry out crankshaft position sensor learn. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 6 Use scan tool to confirm whether the DTC code is stored again.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear DTC code.
- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Road test the vehicle for at least 10 min.
- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to [2.12.7.3 Intermittent Fault Check](#)

Yes

Step 7 Diagnostic completed.

### 2.12.7.55 DTC P2138

#### 1. DTC Descriptor:

DTC	P2138	Electronic Acceleration Pedal Position Sensor 1 and 2 Circuits Relations Malfunctions
-----	-------	---

ECM compares APP1 and APP2 signals. APP2 input signal at any given time should be close to twice the APP1 signal. If ECM detects the APP1 and APP2 signals do not satisfy this condition, ECM will report the DTC code.

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P2138	Hardware Circuit Malfunction	Voltage is below the minimum limit, or circuit short to ground	1. APP 2. APP Sensor Circuit 3. ECM

#### 3. Schematic

Refer to [2.12.7.52 DTC P2122 P2123](#).

## 4. Diagnostic Steps:

Step 1	Check whether there is other APP sensor related DTC code?							
	<p>(a) Connect scan tool to the datalink connector.</p> <p>(b) Turn the ignition switch to "ON" position.</p> <p>(c) Press the scan tool power button.</p> <p>(d) Select the following menu items: Engine/Read DTC codes.</p> <p>(e) Read DTC codes.</p> <p>Results:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">DTC Codes Shown</th> <th style="width: 30%;">To Step</th> </tr> </thead> <tbody> <tr> <td>Only P2138</td> <td>Yes</td> </tr> <tr> <td>P2122, P2123, P2127, P2128</td> <td>No</td> </tr> </tbody> </table>	DTC Codes Shown	To Step	Only P2138	Yes	P2122, P2123, P2127, P2128	No	
DTC Codes Shown	To Step							
Only P2138	Yes							
P2122, P2123, P2127, P2128	No							
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 2px 10px;">Refer to <a href="#">2.12.7.14 DTC Code Index</a></div> </div>							
	<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">Yes</div>							
Step 2	Check TPS1 and TPS2 output voltage signals.							
	<p>(a) For technical specifications. Refer to <a href="#">2.12.7.13 Acceleration Pedal Position Sensor (APP) Check</a>.</p> <p>Specified values?</p>							
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 2px 10px;">Replace the acceleration pedal. Refer to the "acceleration pedal assembly replacement."</div> </div>							
	<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">Yes</div>							
Step 3	Check ECM Power Supply Circuit and ground circuit.							
	<p>(a) Check ECM Power Supply Circuit and ground circuit. Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a>.</p> <p>ECM power and ground circuits normal?</p>							
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 2px 10px;">Power and ground circuits fault.</div> </div>							
	<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">Yes</div>							
Step 4	Replace ECM. Refer to <a href="#">2.2.8.8 Engine Control Module Replacement</a> .							
	<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">Next</div>							
Step 5	Carry out crankshaft position sensor learn. Refer to <a href="#">2.12.7.11 Crankshaft Position Sensor (CKP) Learn</a> .							
	<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">Next</div>							
Step 6	Use scan tool to confirm whether the DTC code is stored again.							
	<p>(a) Connect scan tool to the datalink connector.</p> <p>(b) Turn the ignition switch to "ON" position.</p> <p>(c) Clear DTC code.</p>							

- (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
- (e) Road test the vehicle for at least 10 min.
- (f) Read control system DTC code again to confirm that the system has no DTC code.

No

Intermittent Fault. Refer to  
[2.12.7.3 Intermittent Fault Check](#)

Yes

Step 7 Diagnostic completed.

### 2.12.7.56 DTC P2610

Lack of information, to provide in the future.

### 2.12.7.57 DTC P0633 U0167 U0426

#### 1. DTC Descriptor:

DTC	P0633	Alarm Does Not Learn Malfunction
DTC	U0167	Anti-theft Device No Response
DTC	U0426	Anti-theft Device Authentication Failure

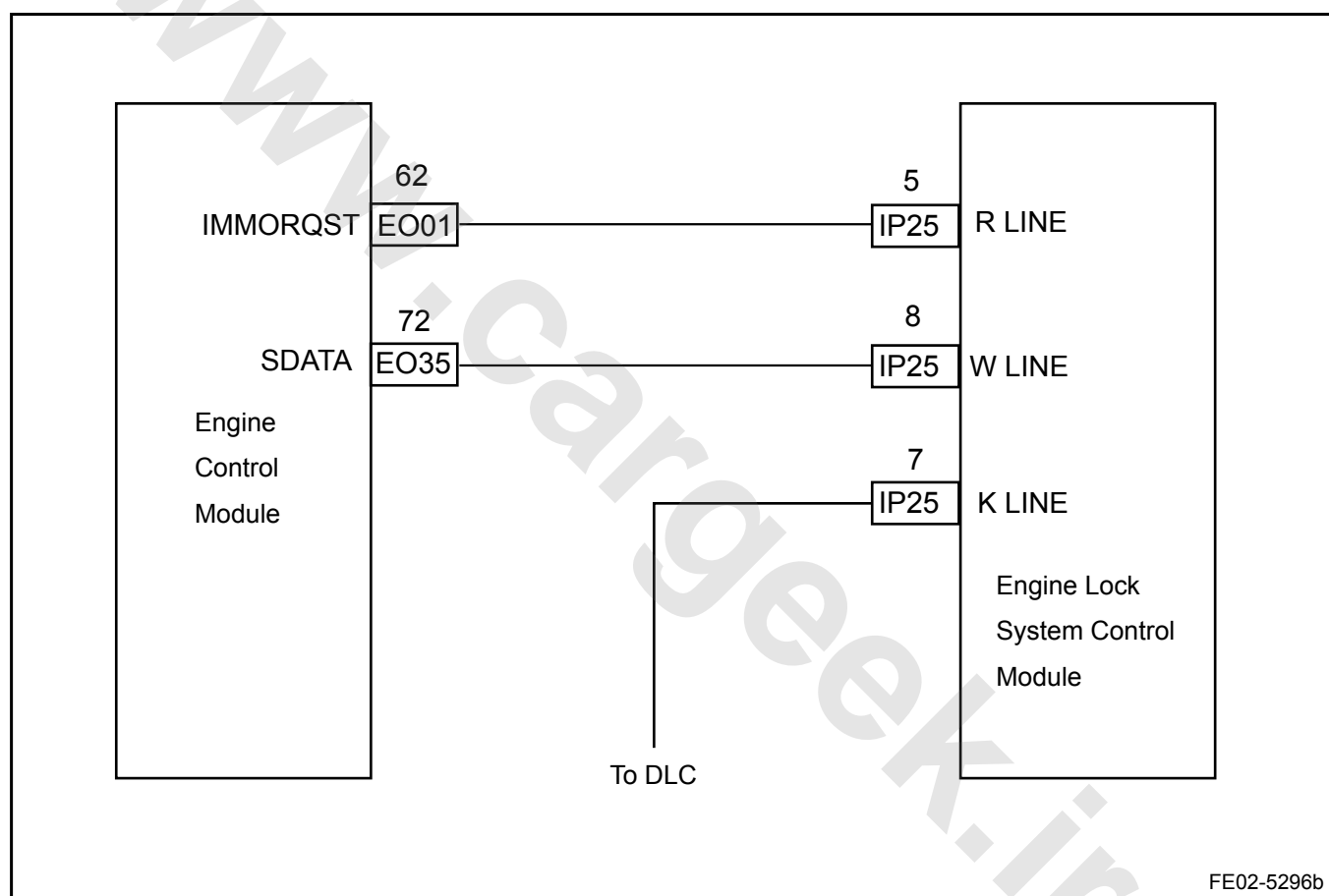
ECM communicates with Anti-theft control module through ECM harness connector EO01 terminal No.62 R-LIN circuit and wiring harness connector EO35 terminal No.72 R-LIN circuit. For details, Refer to [11.17 Data Communication System](#).

#### 2. Conditions For Setting DTC and The Fault Location:

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
P0633	Alarm Does Not Learn Malfunction	Ignition Switch "ON".	1. Ignition Key 2. Ignition Key Incentive Coil 3. ECM 4. Chip Security Module 5. Data Circuit (W-LIN Circuit, R-LIN Circuit)
U0167	Anti-theft Device No Response	Ignition Switch "ON".	1. Ignition Key 2. Ignition Key Incentive Coil 3. ECM 4. Chip Security Module 5. Data Circuit (W-LIN Circuit, R-LIN Circuit)

DTC Code	DTC Detection Strategy	Conditions For Setting The DTC (Control Strategy)	Fault Locations
U0426	Anti-theft Device Authentication Malfunction	Ignition Switch "ON".	<ol style="list-style-type: none"> <li>1. Ignition key</li> <li>2. Ignition Key Incentive Coil</li> <li>3. ECM</li> <li>4. Chip Security Module</li> <li>5. Data Circuit (W-LIN Circuit, R-LIN Circuit)</li> </ol>

## 3. Schematic:



## 4. Diagnostic Steps:

Refer to [2.15.1.1 Engine Anti-theft System Warning Lamp Flashing, The Vehicle Can Not Be Started.](#)

## 5. Repair Instructions:

Anti-theft system repair. Refer to anti-theft system, [2.15.1 Diagnostic Information and Procedures.](#)

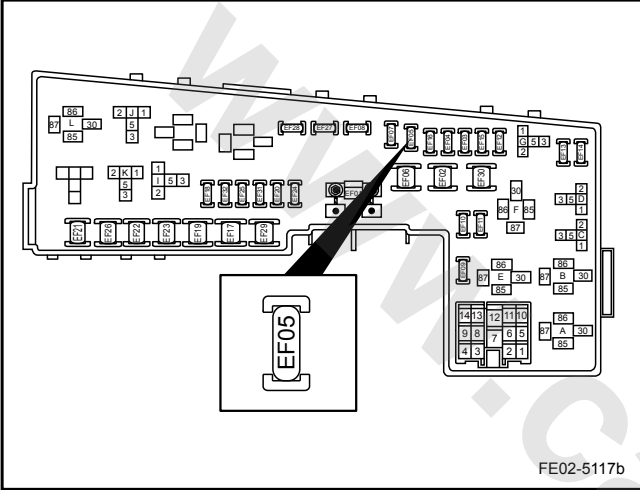
## 2.12.7.58 Crankshaft Rotation Normal, But The Engine Can Not Start

## Note

Before carry out this diagnostic step, make sure the engine oil meets manufacturers requirements and make sure the fuel tank has sufficient fuel, battery capacity meets the requirements for engine starting. Observe the scan tool data list, analyze the accuracy of the data, as it will help with quick Diagnostic.

## Diagnostic Steps:

Step 1	Check fuel pump fuse.
--------	-----------------------



FE02-5117b

(a) Check whether the fuel pump fuse is faulty.  
 (b) Repair pump fuse power circuit.  
 (c) When necessary, replace the faulty fuel pump fuse.

Is fault solved?

Yes

System normal.

No

Step 2	Scan ECM DTC codes.
--------	---------------------

(a) Connect scan tool.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Scan ECM DTC codes.  
 (d) Repair any fuel system related DTC code and Repair the faulty part. Refer to [2.2.7.11 DTC Code Index](#).  
 (e) Clear ECM DTC code.

Start the engine, fault solved?

Yes

System normal.

No

Step 3	Check fuel pump relay.
--------	------------------------

(a) Connect scan tool.  
 (b) Turn the ignition switch to "ON" position.  
 (c) Choose scan tool "Action Test" then "fuel pump relay" to drive the fuel pump relay.

Is pump relay working properly?

Yes

Go to step 6

No

Step 4 Repair fuel pump relay.

(a) Refer to "Fuel System" in the [2.3.7.3 Fuel Pump Inoperative](#).

(b) Replace the pump relay.

(c) Repair pump relay circuit. Repair circuit faults.

Start the engine, fault solved?

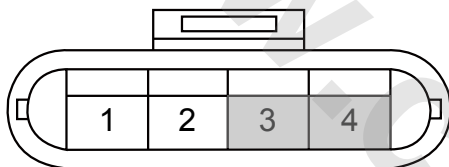
Yes

System normal.

No

Step 5 Check the fuel pump circuit.

Fuel Pump Harness Connector SO29



FE02-5119b

(a) Turn the ignition switch to "OFF" position.

(b) Disconnect fuel pump harness connector SO29.

(c) Connect scan tool.

(d) Turn the ignition switch to "ON" position.

(e) Choose scan tool "Function Test" then "fuel pump relay" to drive the fuel pump relay.

(f) Use a test lamp to connect SO29 terminals No. 3 and 4.

Is test lamp lit properly?

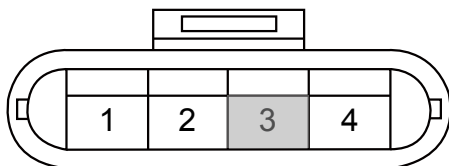
Yes

Go to step 8

No

Step 6 Repair fuel pump circuit.

Fuel Pump Harness Connector SO29



FE02-5120b

(a) Turn the ignition switch to "ON" position.

(b) Check fuel pump working circuit, repair the pump SO29 terminals No.3 and fuel pump relay terminal No.5 open circuit fault.

Start the engine, fault solved?

Yes

System normal.

No

Step 7 Check fuel pressure.

(a) Turn the ignition switch to "OFF" position.

(b) Install fuel pressure gage, connect scan tool.

- (c) Turn the ignition switch to "ON" position.
- (d) Connect scan tool, select the "Function Test" then "fuel pump relay" to drive the fuel pump relay.

Standard fuel pressure: 400 kPa

Is fuel pressure normal?

Yes

Go to step 9

No

Step 8 Replace the fuel pump.

- (a) Turn off the ignition switch and remove the ignition key.
- (b) Replace the fuel pump. Refer to [2.3.8.3 Fuel Pump Assembly Replacement](#).

Start the engine, fault solved?

Yes

System normal

No

Step 9 Inspect (repair) fuel injectors.

- (a) Inspect (repair) fuel injectors. Refer to the DTC code [2.12.7.32 DTC P0270 P0271](#) repair procedures. If necessary, replace the faulty fuel injectors.

Start the engine, fault solved?

Yes

System normal.

No

Step 10 Check ignition coils.

- (a) Turn the ignition switch to "OFF" position.
- (b) Remove cylinder No.1 ignition wire, connected the spark plug wire to the ignition wire, so that spark plug connects to a reliable ground.
- (c) Remove fuel pump fuse.
- (d) Start the engine.

Is spark plug ignition normal?

Yes

Go to step 13

No

Step 11 Replace the ignition coil.

- (a) Turn off the ignition switch and remove the ignition key.
- (b) Replace the ignition coil. Refer to [2.10.8.3 Ignition Coil Replacement](#).

Start the engine, fault solved?



Yes

System normal.

No

Step 12 Check crankshaft position sensor and circuit.

(a) Check crankshaft position sensor. Refer to [2.12.7.35 DTC P0335 P0336](#).

(b) Measure crankshaft position sensor resistance with a multimeter.

Standard Resistance: 504-616  $\Omega$

(c) Inspect sensor circuit, repair the faulty part. If necessary, replace the crankshaft position sensor. Refer to [2.10.8.2 Crankshaft Position Sensor Replacement](#).

Start the engine, fault solved?

Yes

System normal.

No

Step 13 Test cylinder pressure.

(a) Test cylinder compression pressure. Refer to the "Engine Mechanical System" in the.

Standard Cylinder Pressure: 800 kPa

is cylinders compression pressure the specified value?

Yes

Go to step 16

No

Step 14 Inspect Timing Chain positioning.

(a) Turn off the ignition switch and remove the ignition key.

(b) Inspect Timing Chain positioning. Refer to "Engine Mechanical System" in the [2.6.8.11 Timing Chain Inspection](#).

Is the chain positioned properly?

Yes

Go to step 16

No

Step 15 Install timing chain.

(a) Turn off the ignition switch and remove the ignition key.

(b) Install timing chain. Refer to "Engine Mechanical System" in the [2.6.8.10 Timing Chain Replacement](#).

Start the engine, fault solved?

Yes

System normal.

No

Step 16	Check engine mechanical parts.
---------	--------------------------------

- (a) Remove the engine.
- (b) Check engine mechanical parts. If necessary, repair the damaged engine parts.
- (c) identify the engine damaged parts repair has been completed.

Next

Step 17	Diagnostic completed.
---------	-----------------------

### 2.12.7.59 Electronic Throttle Body (ETC) Adaptive Learn Program

#### Note

After the throttle body for cleaning and serving, carry out ETC self-adaptive learn. Otherwise there will be idle instable, jitter and so on.

Step 1	Use scan tool "Action Test" function, clear the TPS learn value.
--------	--

Next

Step 2	Turn the ignition switch to "ON" position, after 3 s to "OFF" position.
--------	---

Next

Step 3	In 1s turn the ignition switch to "ON" position, after 3 s to "OFF" position.
--------	---

Next

Step 4	Repeat the above steps 5 times.
--------	---------------------------------

Next

Step 5	Initialization completed.
--------	---------------------------

## 2.12.8 Removal and Installation

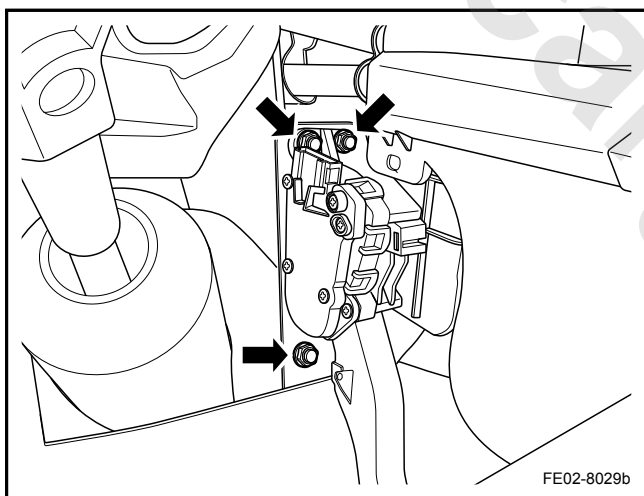
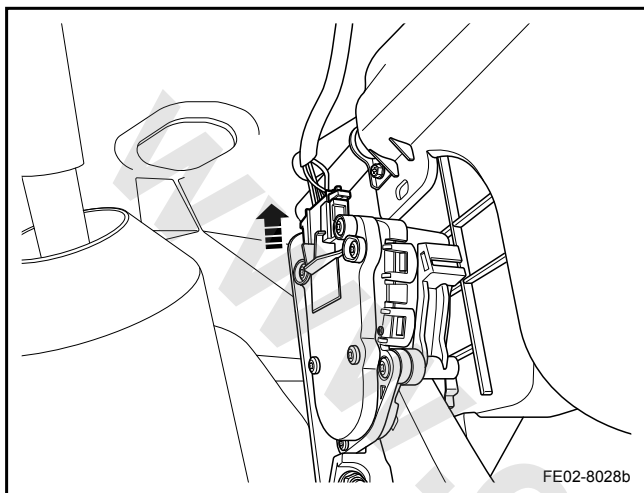
### 2.12.8.1 Acceleration Pedal Replacement

Removal Procedure:

**Warning!**

**Warning:** Refer to "Battery Disconnection Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect the acceleration pedal harness connector.

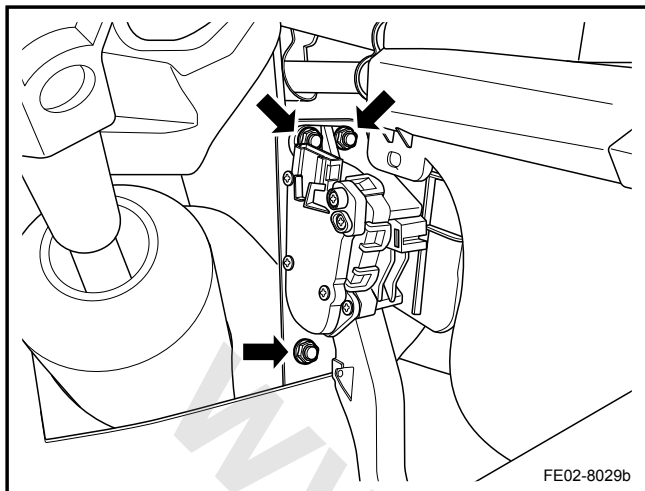


3. Remove the acceleration pedal bolts and remove the acceleration pedal.

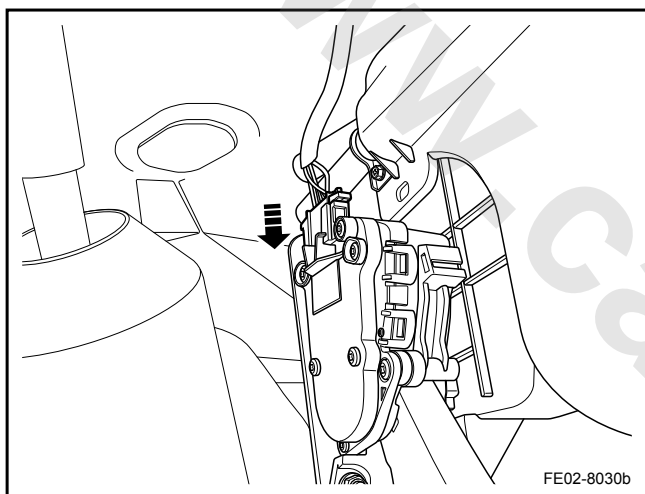
Installation Procedure:

1. Install the acceleration pedal and tighten the retaining nuts.

Torque: 15 Nm (Metric) 11 lb-ft (US English)



2. Connect the acceleration pedal harness connector.
3. Connect the battery negative cable.



## 2.13 Fuel System JL4G15-D

### 2.13.1 4G15-D Fuel System Overview

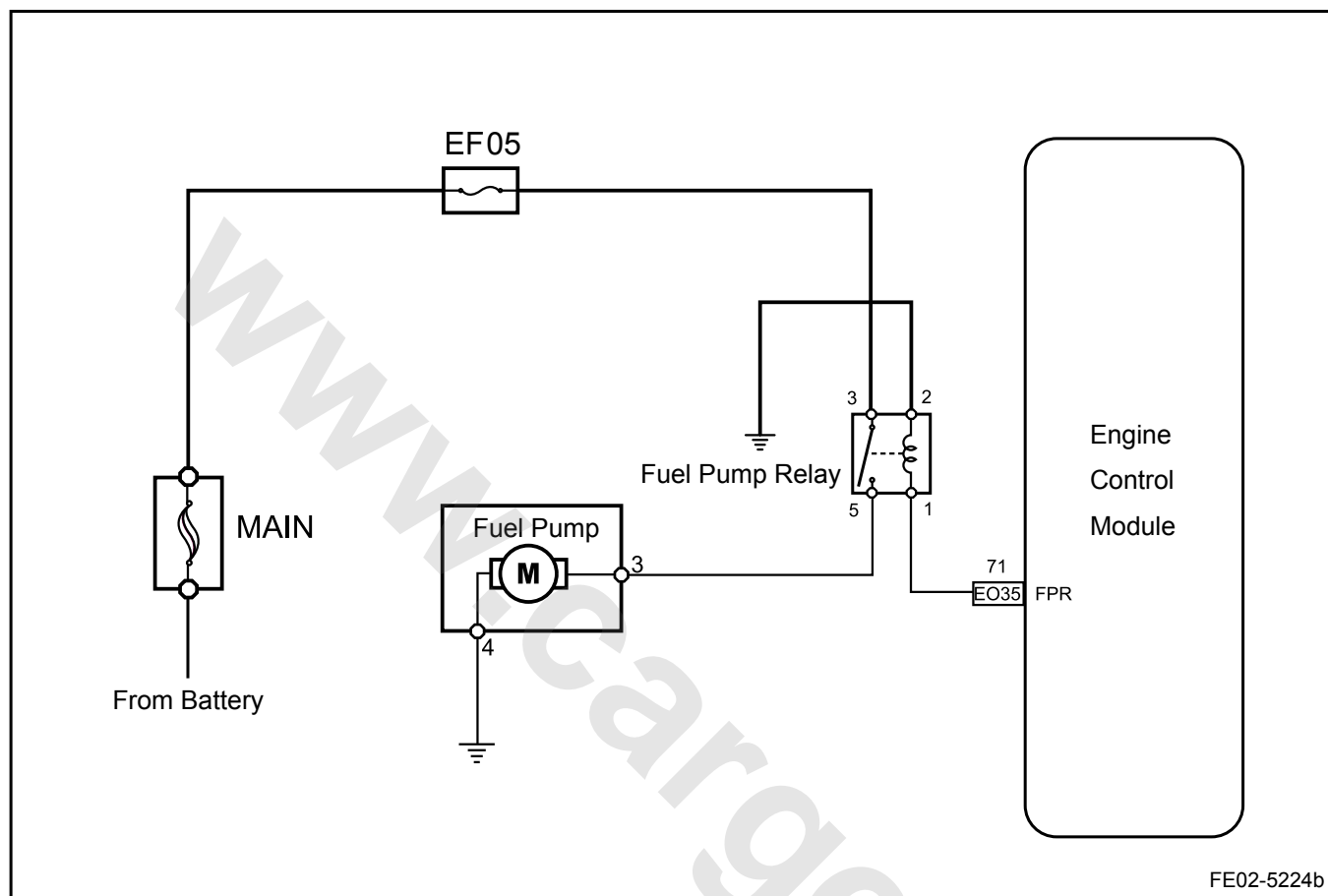
Compared with 4G18-D, 4G15-D engine fuel system has the same content in Specification, Description and Operation, the System Working Principle, Component Locator, Schematic, Removal and Installation. For specific information, please refer to [2.3 Fuel System JL4G18-D](#). This chapter described contents are different from 4G18-D. For relevant information. Refer to the following content.

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## 2.13.1 Diagnostic Information and Procedures

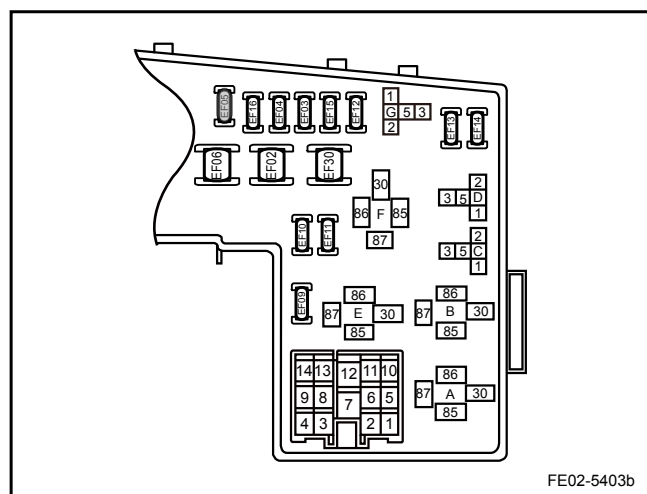
## 2.13.1.1 Fuel Pump Inoperative

Schematic



Diagnostic Steps:

Step 1	Check fuel pump fuse EF05.
--------	----------------------------



Is the fuel pump fuse EF05 blown?

No

Go to step 3

Yes

Step 2 Repair fuel pump fuse EF05 circuit.

- (a) Check fuel pump fuse EF05 circuit.
- (b) Repair fuel pump power circuit short to ground.
- (c) Replace the fuse EF05.

Fuse Rating: 15 A

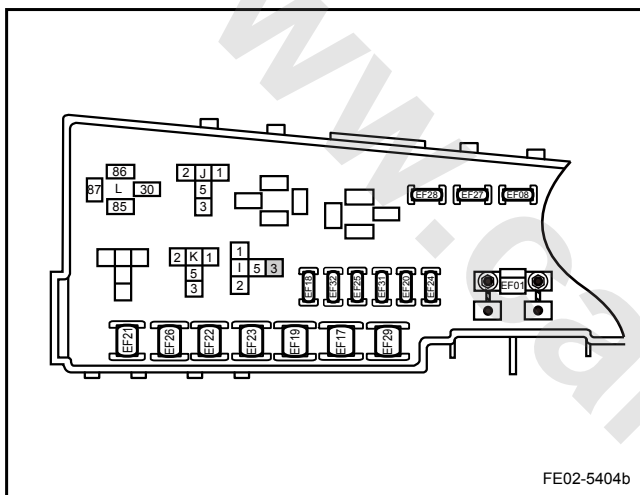
Is fuel pump working properly?

Yes

System normal

No

Step 3 Check fuel pump relay terminal No.3 voltage.



- (a) Turn the ignition switch.
- (b) At the same time, check the fuel pump relay terminal No.3 voltage with a multimeter.

#### Note

Pump relay will only work for a short period. use scan tool drive fuel pump relay work to facilitate inspection.

Standard Voltage: 11-14 V

Is the voltage Standard Value?

Yes

Go to step 5

No

Step 4 Repair fuel pump relay terminal No.3 and fuel pump fuse EF05 circuit open fault.

- (a) Repair fuel pump relay terminal No.3 and fuel pump fuse EF05 circuit open fault.

Is fuel pump working properly?

Yes

System normal

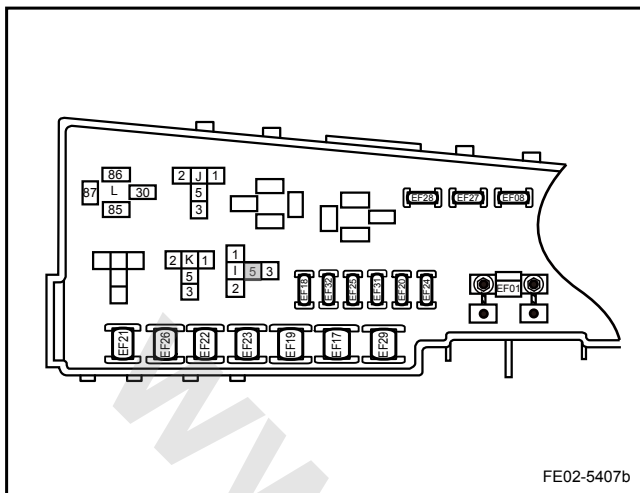
No

Step 5 Check fuel pump relay terminal No.1 voltage.





Step 10 Check pump relay terminal No.5 voltage.



(a) Turn on the ignition switch.

Standard Voltage: 11-14 V

Confirm whether the voltage is standard value.

Yes

Go to step 12

No

Step 11 Replace the fuel pump relay.

(a) Replace the fuel pump relay.

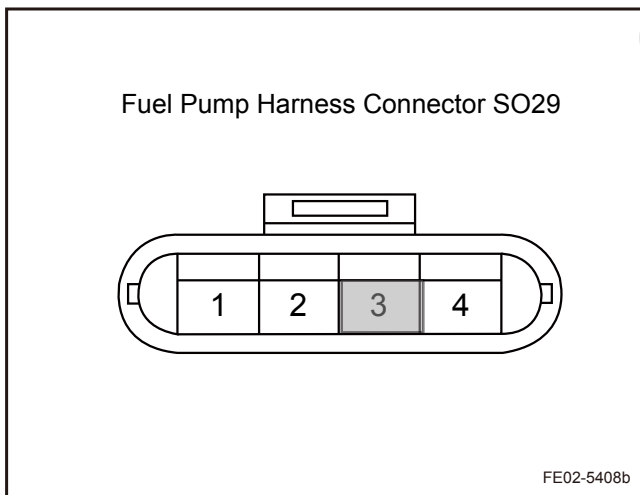
Make sure fuel pump is working properly.

Yes

System normal

No

Step 12 Check the fuel pump wiring harness connector SO29 terminal No.3 voltage.



(a) Check fuel pump wiring harness connector SO29 terminal No.3 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage standard value?

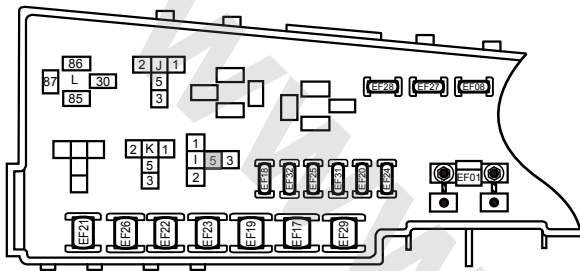
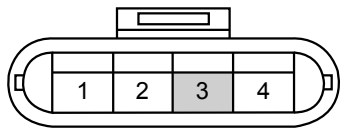
Yes

Go to step 14

No

Step 13 Repair the circuit between fuel pump wiring harness connector SO29 terminal No.3 and the fuel pump relay terminals No.5.

Fuel Pump Harness Connector SO29



FE02-5409b

- (a) Check the circuit between fuel pump wiring harness connector SO29 terminal No.3 and the fuel pump relay terminals No.5.
- (b) Repair the circuit between fuel pump wiring harness connector SO29 terminal No.3 and the fuel pump relay terminals No.5 open fault.

Is fuel pump working properly?

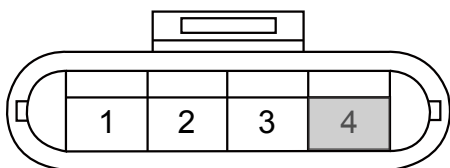
Yes

System normal

No

Step 14 Check fuel pump wiring harness connector SO29 terminal No.4 and body ground circuit.

Fuel Pump Harness Connector SO29



FE02-5410b

- (a) Check resistance between fuel pump wiring harness connector SO29 terminal No.4 and body ground circuit with a multimeter.

Standard Resistance Value: Less than 1  $\Omega$ 

Is fuel pump ground circuit normal?

Yes

Go to step 16

No

Step 15 Repair fuel pump wiring harness connector SO29 terminal No.4 and body ground circuit.

- (a) Repair fuel pump wiring harness connector SO29 terminal No.4 and body ground circuit open fault.

Is fuel pump working properly?

Yes

System normal

No

Step 16	Replace the fuel pump.
---------	------------------------

(a) Replace the fuel pump. Refer to [2.3.8.3 Fuel Pump Assembly Replacement](#).

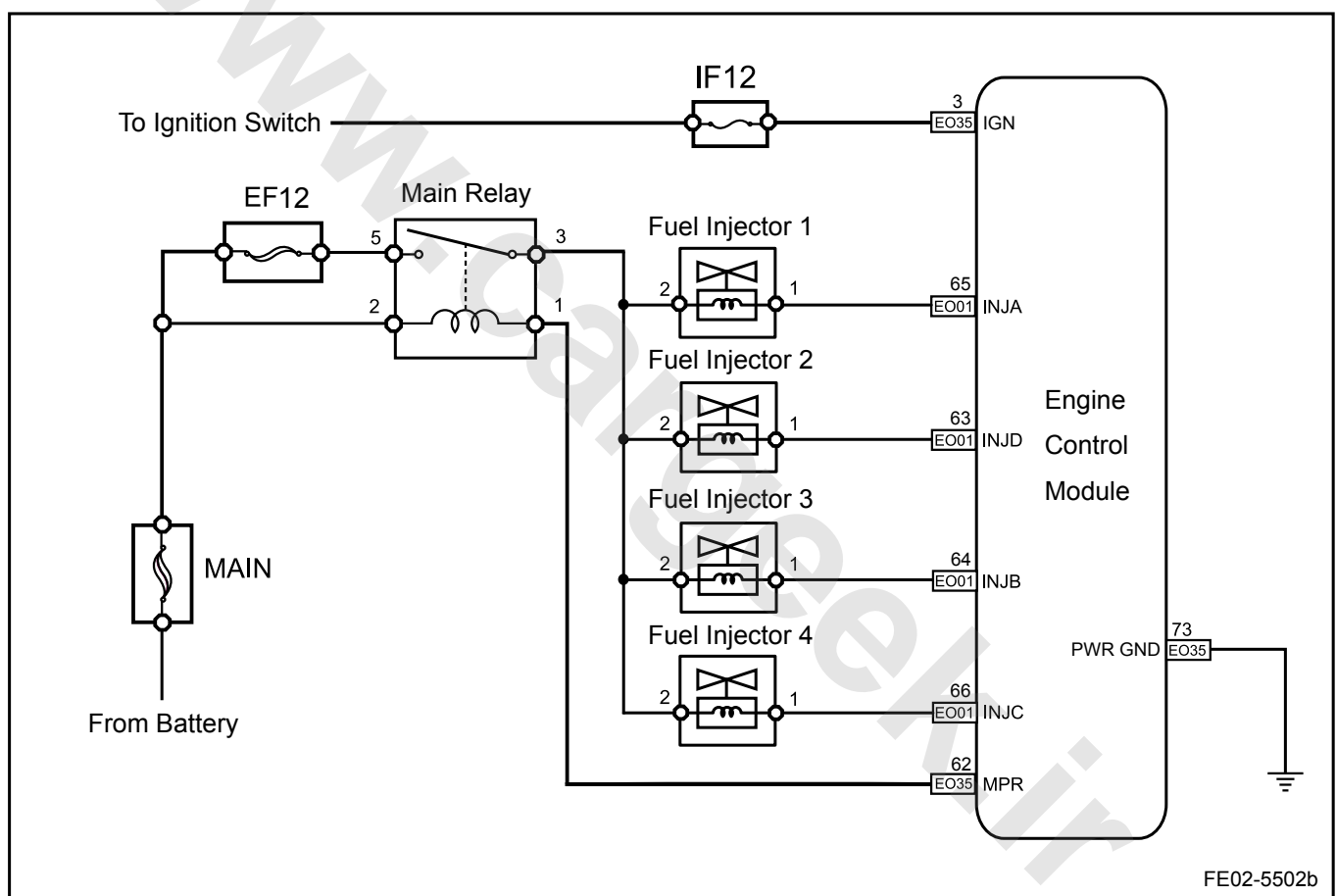
Confirm repair completed.

Next

Step 17	System normal.
---------	----------------

### 2.13.1.2 All Fuel Injectors Inoperative

Schematic:



Diagnostic Steps:

Step 1	Check whether the engine anti-theft system is activated.
--------	--

Does engine trouble indicator light flashes?

No

Go to step 3
--------------

Yes

Step 2 Repair the engine anti-theft system malfunction.

- (a) Repair the engine anti-theft system malfunction. Refer to [2.5.7.12 Engine Anti-theft Warning Lamp Flashing, Vehicle Can Not Start](#).

Is fuel injector working properly?

Yes

System normal

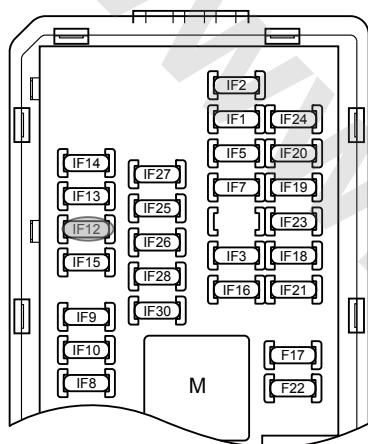
No

Step 3 Check ECM fuse.

Check whether ECM fuse IF12 is blown?

No

Go to step 6



FE02-5412b

Yes

Step 4 Check ECM power supply circuit.

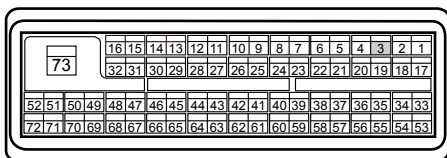
- (a) Repair ECM power supply short to body ground fault.  
(b) Replace the fuse IF12.

Is fuel injector working properly?

Yes

System normal

ECM Harness Connector EO35

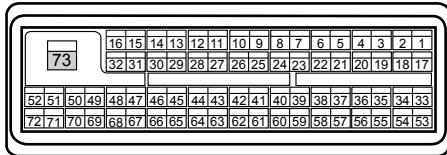


FE02-5503b

No

Step 5 Inspect and repair ECM ground circuit.

## ECM Harness Connector EO35



FE02-5504b

- (a) Check ECM ground circuit.  
 (b) Repair open circuit ECM connector EO35 terminal No.73 and the body.

Is fuel injector working properly?

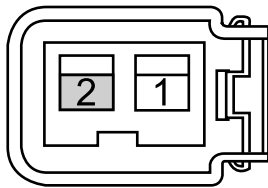
Yes

System normal

No

Step 6 Check fuel injector wiring harness connector terminal No.2 voltage.

## Fuel Injector 1 Harness Connector EO11



FE02-5505b

- (a) Turn on the switch.  
 (b) Measure fuel injector wiring harness connector terminal No. 3 voltage with a multimeter.

Standard voltage:11-14 V

Is the voltage Standard Value?

Yes

Go to step 8

No

Step 7 Repair main relay circuit malfunction.

- (a) Repair main relay circuit malfunction. Refer to [2.12.7.49DTC P0685](#).

Is fuel injector working properly?

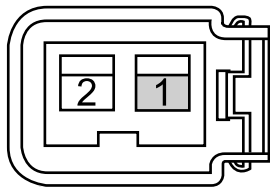
Yes

System normal

No

Step 8 Check the fuel injector wiring harness connector terminal No.1 periodical low voltage waveform.

Fuel Injector 1 Harness Connector EO11



FE02-5506b

- (a) Turn on the ignition switch and try to Start the engine.  
(b) At the same time, check the fuel injector wiring harness connector terminal No.1 periodical low voltage waveform.  
Is there a periodical low voltage waveform?

Yes

Go to step 10

No

**Step 9** Replace ECM.

- (a) Replace ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Is fuel injector working properly?

Yes

System normal

No

**Step 10** Replace fuel injectors.

- (a) Replace fuel injectors. Refer to [2.2.8.2 Fuel Injector Replacement](#).

Confirm repair completed.

Next

**Step 11** System normal.

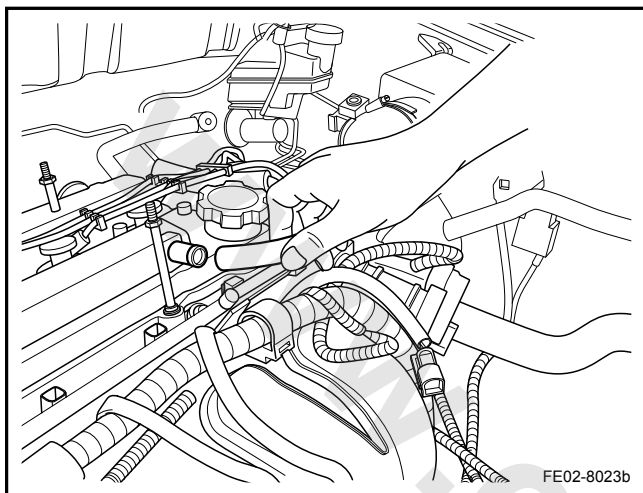
## 2.13.2 Removal and Installation

### 2.13.2.1 Fuel Injector Replacement

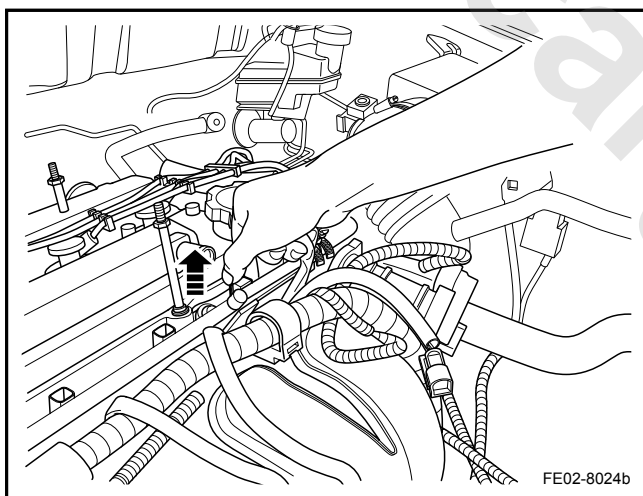
Removal Procedure:

**Warning!**

**Warning:** Refer to "Battery Disconnection Warning" in "Warnings and Notices"



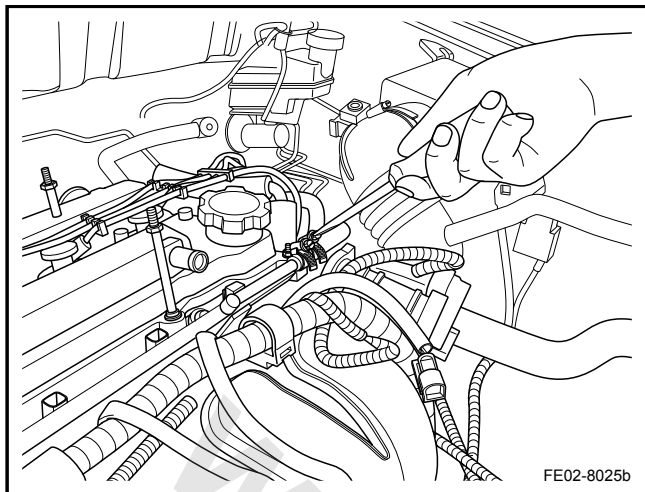
1. Release fuel system pressure. Refer to [2.3.8.1 Fuel Pressure Release Procedure](#).
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Remove the hood. Refer to [2.6.8.1 Plastic Engine Shield Replacement](#).
4. Disconnect the crankcase ventilation tube from the cylinder head cover.



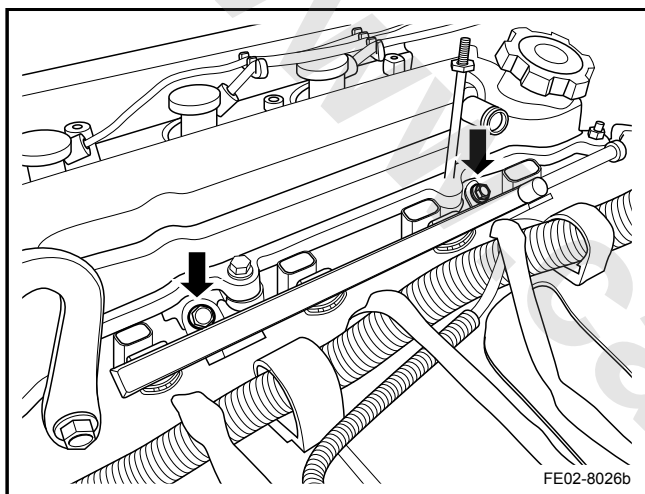
5. Disconnect the engine fuel injector harness connector.

**Note**

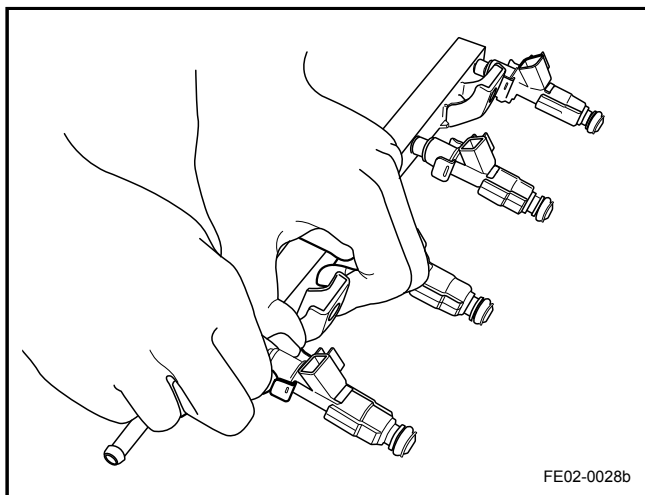
Pull up the gray self-locking device, and then press to Disconnect the connector.



6. Remove the fuel pipe from fuel rail.



7. Remove the fuel rail retaining bolts and remove the fuel rail.



8. Remove fuel injectors spring and unplug the fuel injectors.

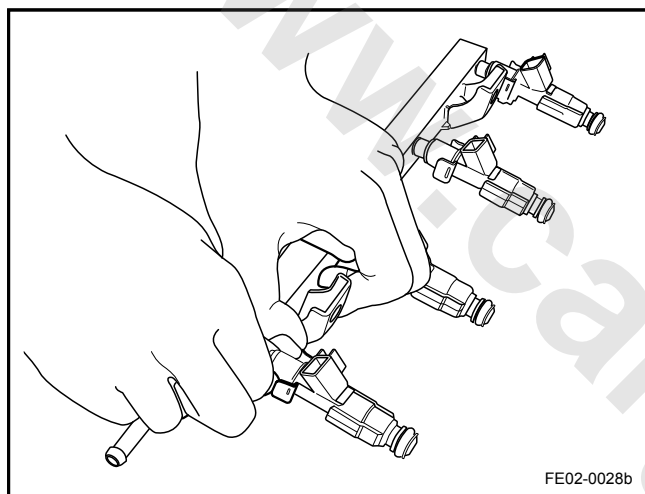
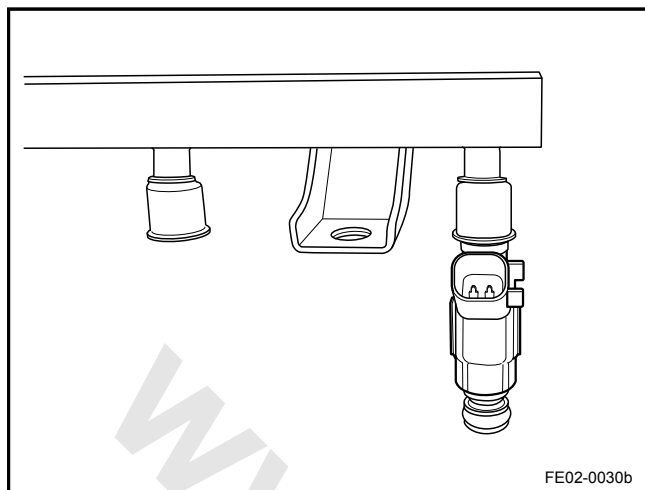


## Installation Procedure:

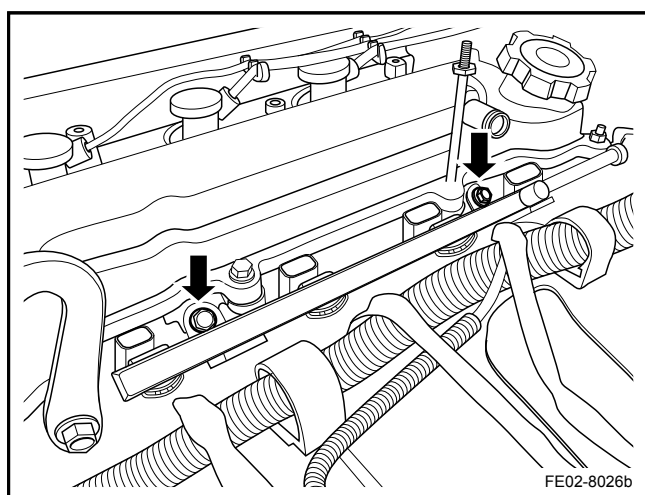
1. Apply a small amount of engine oil to lubricate the fuel injector O-ring.
2. Install the fuel injectors to the fuel rail.

**Note**

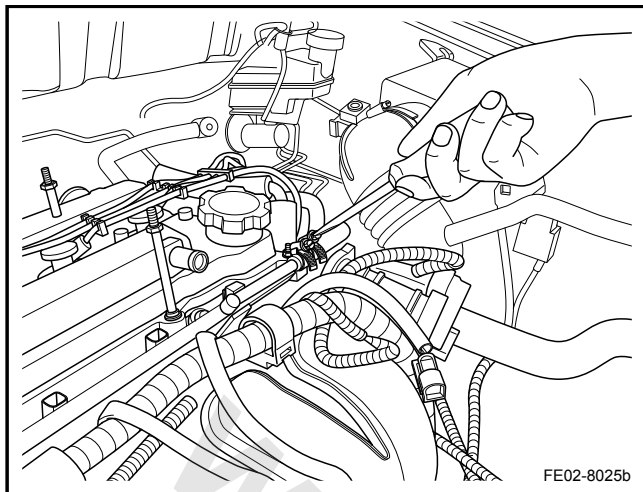
Fuel injectors terminal should face outward.



3. Install fuel injectors springs, make sure that the fuel injector wiring harness connector port and the fuel rail mounting hole are in the same direction.



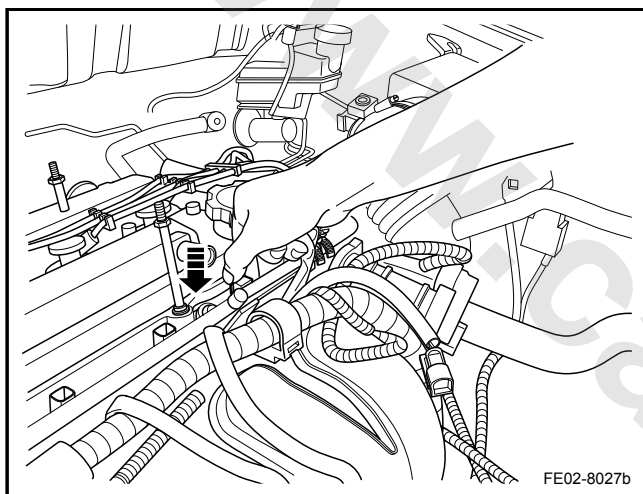
4. Install the fuel rail and tighten the retaining bolts.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)



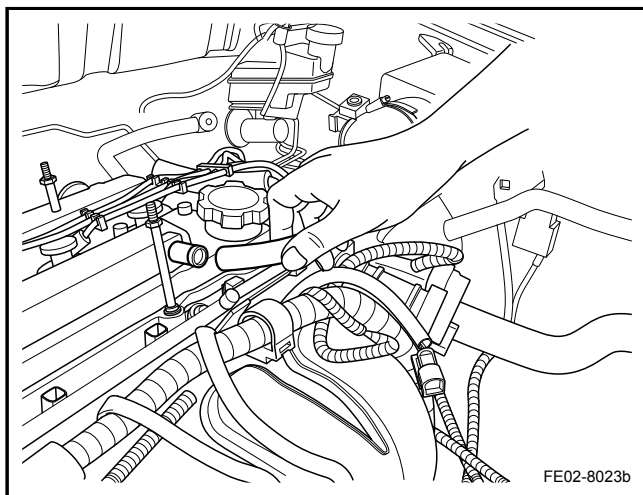
5. Connect the fuel pipe into fuel rail.

**Note**

Fuel pipe must be inserted into the fuel rail after the second boss and then tighten.



6. Connect engine fuel injector wiring harness connector.



7. Connect crankcase ventilation tube.  
8. Connect the battery negative cable.

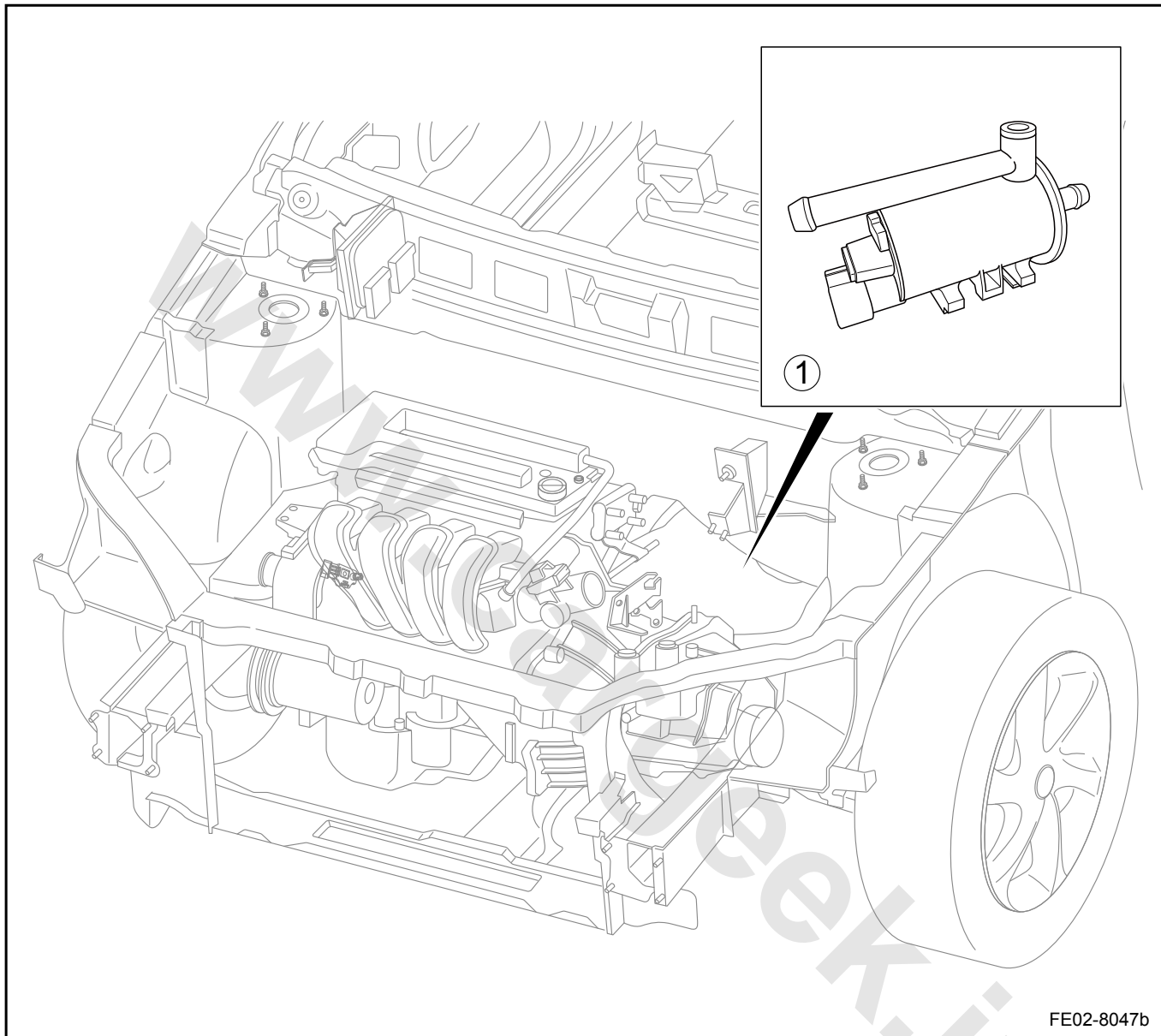
## 2.14 Auxiliary Emission Control JL4G15-D

### 2.14.1 4G15-D auxiliary emission control devices, an overview

Compared with 4G18-D, 4G15-D engine auxiliary emission control devices has the same content in Specification, Description and Operation, the System Working Principle, Component Locator, Schematic, Removal and Installation. For specific information, please refer to [2.3 Fuel System JL4G18-D](#). This chapter described contents are different from 4G18-D. For relevant information. Refer to the following content.

## 2.14.1 Component Locator

### 2.14.1.1 Component Locator



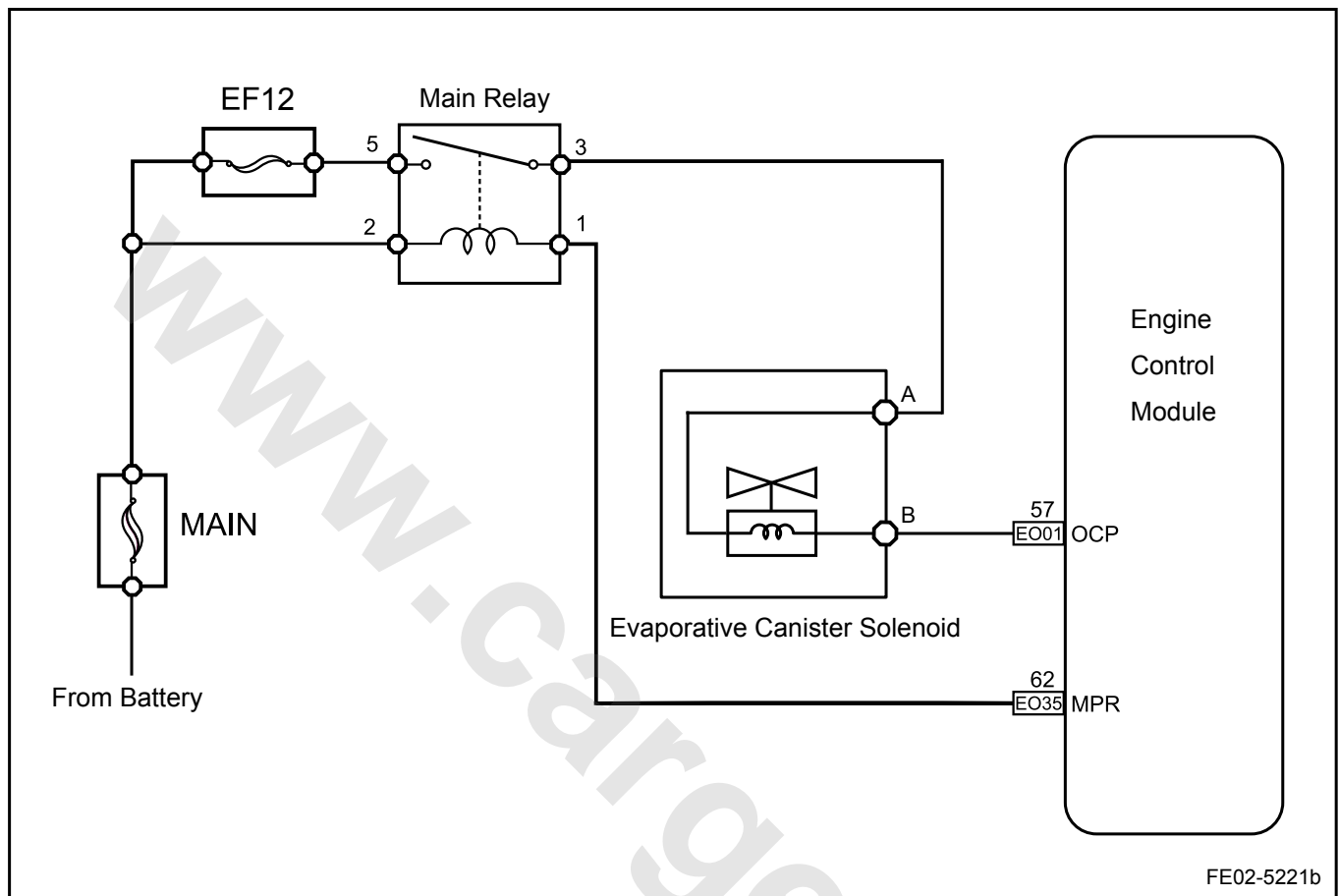
#### Legend

1. Canister Solenoid Valve

## 2.14.2 Diagnostic Information and Procedures

## 2.14.2.1 Canister Solenoid Valve Inoperative

Schematic:



## Diagnostic Steps:

Step 1	Check engine emission warning lamp malfunction.
--------	---

(a) Start the engine.

Check whether engine emissions malfunction warning lamp is lit?

No

Go to step 3

Yes

Step 2	Repair engine control system malfunction.
--------	---

(a) Repair engine emissions malfunction warning lamp malfunction. Refer to [2.12.7.14 DTC Code Index](#)

Is Canister solenoid valve working properly?

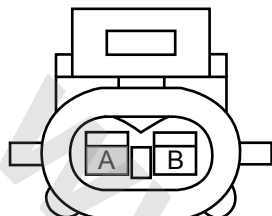
Yes

System normal

No

**Step 3** Check Canister solenoid valve power supply circuit.

Evaporative Canister Solenoid Harness Connector EO24



FE02-5227b

- (a) Turn on the ignition switch.
- (b) Measure Canister solenoid valve EO24 terminal A voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage Standard Value?

Yes

Go to step 5

No

**Step 4** Repair the main relay.

- (a) Turn off the ignition switch.
- (b) Repair the main relay circuit. Refer to [2.12.7.49 DTC P0685](#)

Is Canister solenoid valve working properly?

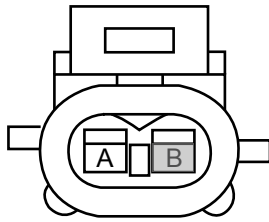
Yes

System normal

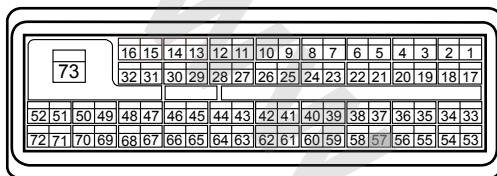
No

**Step 5** Check Canister solenoid valve wiring harness connector and ECM harness connector circuit.

### Evaporative Canister Solenoid Harness Connector EO24



### ECM Harness Connector EO01



FE02-5228b

- Turn off the ignition switch.
- With a multimeter, check resistance between Canister solenoid valve wiring harness connector EO24 terminal B and ECM harness connector EO01 terminals No.57 to determine the continuity.

Standard Resistance: Less than 1  $\Omega$ 

Is resistance the specified value?

Yes

Go to step 7

No

Step 6

Repair Canister solenoid valve wiring harness connector and ECM harness connector.

- Turn off the ignition switch.
- Repair Canister solenoid valve wiring harness connector EO24 terminal B and ECM harness connector EO01 terminal No.57 circuit open fault.

Is Canister solenoid valve working properly?

Yes

System normal

No

Step 7

Check Canister solenoid valve.

- Turn off the ignition switch.
  - Check canister solenoid valve resistance.
- Standard Resistance Value: 26  $\Omega$  / 20°C (68 °F)

Is Canister solenoid valve resistance the specified value?

Yes

System normal

No

Step 8

Replace Canister solenoid valve.

- Turn off the ignition switch.
- Replace Canister solenoid valve. Refer to [2.4.7.3 Canister Solenoid Valve Replacement](#).

Confirm the repair has been completed.

Next

Step 9


System normal.



## 2.15 Engine Anti-theft System JL4G15-D

### 2.15.1 4G15-D Engine Anti-theft System Overview

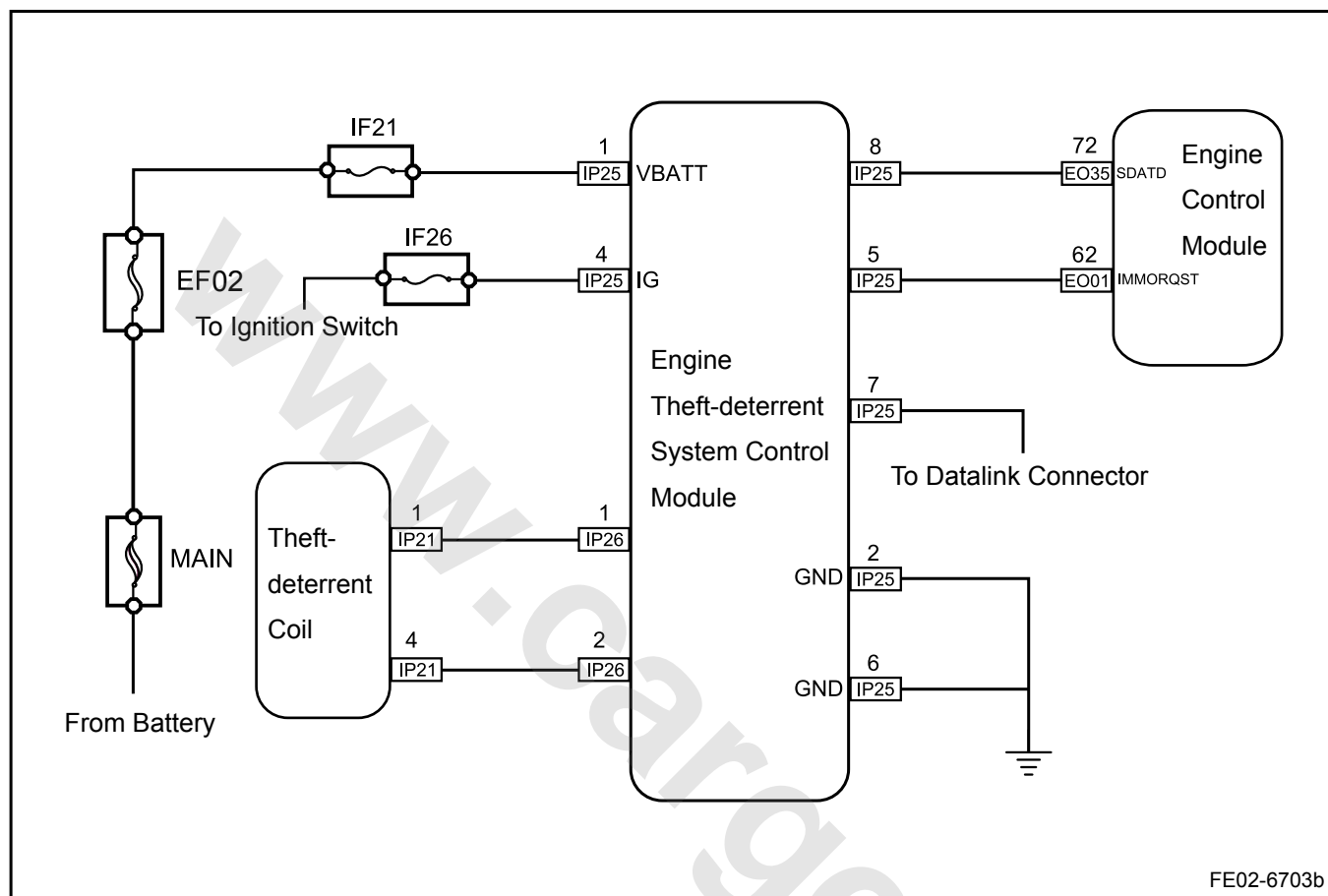
Compared with 4G18-D, 4G15-D engine anti-theft system has the same content in Specification, Description and Operation, the System Working Principle, Component Locator, Schematic, Removal and Installation. For specific information, please refer to [2.3 Fuel System JL4G18-D](#). This chapter described contents are different from 4G18-D. For relevant information. Refer to the following content.



## 2.15.1 Diagnostic Information and Procedures

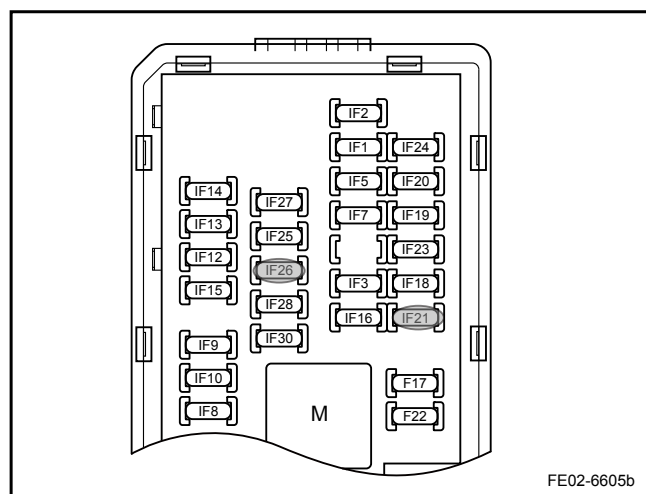
## 2.15.1.1 Engine Anti-theft System Warning Lamp Flashing, The Vehicle Can Not Be Started

Schematic:

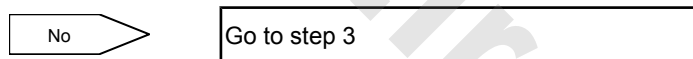


## Diagnostic Steps:

Step 1	Check the fuses IF26 and IF21.
--------	--------------------------------



- (a) Check whether the fuses IF26 and IF21 are broken.  
Fuse Rating: IF26 rating is 10 A, IF21 rating is 10 A



Yes

Step 2 Repair fuse IF26 and IF21 circuits.

- (a) Check the fuse IF26 circuit, repair short-circuit fault.
- (b) Check the fuse IF21 circuit, repair short-circuit fault.
- (c) Replace the fuses.

Can vehicles normally start?

Yes

System normal

No

Step 3 Check engine anti-theft system control module ground.

Engine Anti-theft Control Unit 1 Harness  
Connector IP25



FE02-6606b

- (a) With a multimeter, measure resistance between continuity between engine anti-theft system control module terminal IP25 or IP25 and 6 and body ground to determine the continuity.

Standard Resistance: Less than 1  $\Omega$ .

Is the resistance specified value?

Yes

Go to step 5

No

Step 4 Repair the engine anti-theft system control module ground circuit.

- (a) Repair circuit between the engine anti-theft system control module connector IP25 terminal No.2 or 6 and body ground open fault.

Can the vehicle start?

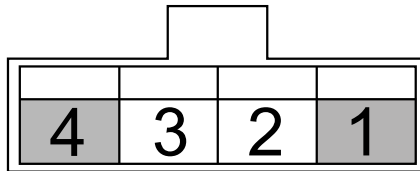
Yes

System normal

No

Step 5 Check EAS coil.

## Engine Anti-Theft Coil



FE02-6609b

- (a) Disconnect electronic Anti-theft coil harness connector.  
 (b) Measure coil resistance with a multimeter.  
 Standard Resistance: resistance 5  $\Omega$  (68 °F) at room temperature 20°C

Is EAS coil resistance specified value?

Yes

Go to step 7

No

Step 6 Replace electronic Anti-theft coil.

- (a) Replace electronic Anti-theft coil. Refer to "[2.5.8.1 EAS Coil Replacement](#)."

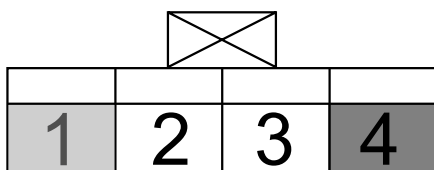
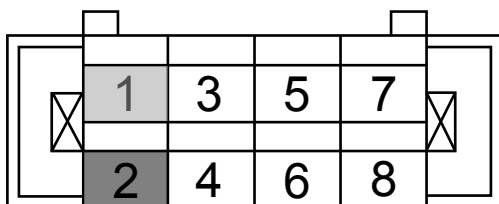
Can the vehicle start?

Yes

System normal

No

Step 7 Check circuit between EAS coil harness connector and engine anti-theft system control module harness connector.

Engine Anti-Theft Coil Harness  
Connector IP21Engine Anti-Theft Control Unit 1 Harness  
Connector IP25

FE02-6607b

- (a) With a multimeter, measure resistance between EAS coil harness connector IP21 terminal No.1 and engine anti-theft system control module wiring harness connector IP25 terminal No.1 to determine circuit continuity.

Standard Resistance: Less than 1  $\Omega$ 

- (b) With a multimeter, measure resistance between EAS coil harness connector IP21 terminal No.4 and engine anti-theft system control module wiring harness connector IP25 terminal No.2 to determine circuit continuity.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 9

No

Step 8

Repair circuit between EAS coil harness connector and engine anti-theft system control module harness connector.

- (a) Check serial communication circuit resistance between engine anti-theft system control module wiring harness connector IP25 terminals No.5 and engine control module wiring harness connector EO01 terminal No.62 to determine circuit continuity.
- (b) Check serial communication circuit resistance between engine anti-theft system control module wiring harness connector IP25 terminals No.8 and engine control module wiring harness connector EO35 terminal No.72 to determine circuit continuity.

Can the vehicle start?

Yes

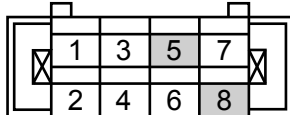
System normal

No

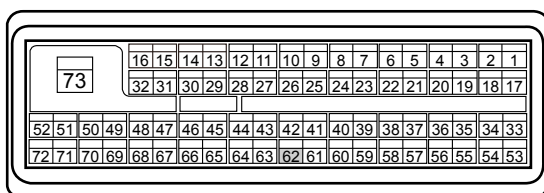
Step 9

Repair serial communication circuit between engine anti-theft system control module and engine control module.

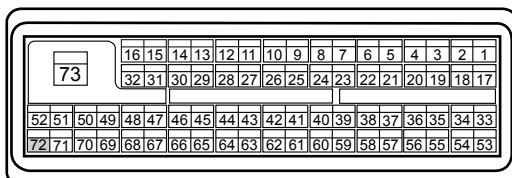
Engine Anti-Theft Unit 1 Harness Connector IP25



ECM Harness Connector EO01



ECM Harness Connector EO35



FE02-6701b

- (a) Repair serial communication circuit open between engine anti-theft system control module wiring harness connector IP25 terminals No.5 and engine control module wiring harness connector EO01 terminal No.62.  
Standard Resistance: Less than 1  $\Omega$
- (b) Repair serial communication circuit open resistance between engine anti-theft system control module wiring harness connector IP25 terminals No.8 and engine control module wiring harness connector EO35 terminal No.72.  
Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#)

No

Step 10	Repair serial communication circuit between engine anti-theft system control module and engine control module.
---------	--

- (a) Repair serial communication circuit open between engine anti-theft system control module wiring harness connector IP25 terminals No.5 and engine control module wiring harness connector EO01 terminal No.62.
- (b) Repair serial communication circuit open resistance between engine anti-theft system control module wiring harness connector IP25 terminals No.8 and engine control module wiring harness connector EO35 terminal No.72.

Can the vehicle start?

Yes

System normal

No

Step 11	Replace Anti-theft system control module.
---------	---

- (a) Replace Anti-theft system control module. Refer to [2.5.8.2 Anti-theft System Control Module Replacement](#).
- (b) Carry out engine anti-theft system programming procedures. Refer to [2.5.7.9 Replaced Security Module Programming](#).

Yes

System normal

No

Step 12	Replace engine control module.
---------	--------------------------------

- (a) Replace engine control module. Refer to [2.2.8.8 Engine Control Module Replacement](#).
- (b) Carry out engine anti-theft system programming procedures. Refer to [2.5.7.10 Replaced ECM Programming](#).

Confirm the repair has been completed.

Next

Step 13	System normal.
---------	----------------

## 2.16 Engine Mechanical Systems JL4G15-D

### 2.16.1 4G15-D Engine Mechanical System Overview

Compared with 4G18-D, 4G15-D engine mechanical system has the same content in Specification, Description and Operation, the System Working Principle, Component Locator, Schematic, Removal and Installation. For specific information, please refer to [2.3 Fuel System JL4G18-D](#). This chapter described contents are different from 4G18-D. For relevant information. Refer to the following content.

## 2.16.1 Specifications

## 2.16.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Spark Plug Bolts	M14 × 1.25	20-30	14.8-22.2
Cylinder Head Cover (Short Bolts)	M6	7-11	5.2-8.2
Cylinder Head Cover (Long Bolts, Nuts, Special Bolts)	M6	9-13	6.7-9.6
Knock Sensor Bolt	M8 × 30	14.4-21.6	10.7-16
Cylinder Head Bolts	M10 × 1.25	First Pass 46-52	First Pass 34-38.5
		Second Pass 76-84	Second Pass 56-62.2
VVT Actuator Mounting Bolt	M12 × 1.25	59-81	43.7-60
Intake Manifold Mounting Bolt	M8	24-36	17.8-26.7
Crankcase Mounting Bolt	M8	14.4-21.6	10.7-16
Exhaust Pipe Mounting Bolt	M8	20-30	14.8-22.2
Main Bearing Cap Retaining Bolt	M10 × 1.25	First Pass 42-46	First Pass 31-34
		Second Pass 54-66	Second Pass 40-48.9
Flywheel Mounting Bolt	M10 × 1.25	83-93	61.4-68.8
Water Pump Short Mounting Bolt	M6 × 25	8-10	6-7.4
Water Pump Long Mounting Bolt	M6 × 35	9-13	6.7-9.6
Fuel Rail Retaining Bolts	M6 × 20	7.2-10.8	5.3-8
Connecting Rod Cap Retaining Bolt	M8 × 1	First Pass 19-21	First Pass 14-15.5
		Second Pass 50-52	Second Pass 37-38.5
Camshaft Bearing Cap Retaining Bolts	M8 M6	21.6-24.5	16-18.2
		12.2-13.8	9-10.2
Oil Pan Retaining Bolts	M6	7.2-10.8	5.3-8
Oil Filter Mounting Bolt	M6	7.2-10.8	5.3-8
Engine Oil Pressure Alarm Bolts	R1 / 8	10.5-19.5	7.8-14.4
Oil Filter Pipe Joints Bolts	M28 × 1.5	16-24	11.8-17.8
Oil Filter Pipe Fittings Bolts	UNF3 / 4 "-16	33-37	24.4-27.4
Crankshaft Pulley Mounting Bolt	M12 × 1.25	129.7-146.3	96-108.3
Generator Through Screw	M10 × 1.25 × 72	43.2-64.8	32-48
Generator Retaining Bolt	M8 × 30	20-30	14.8-22.2
Clutch Assembly Mounting Bolt	M8	21.6-32.4	16-24



Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Water Pump Outlet Components Bolt	M10	25 and Above	18.5 and Above
Oil Pump Mounting Bolt	M6	7.2-10.8	5.3-8
Timing Chain Cover Bolt	M8	14.4-21.6	10.7-16
Timing Chain Cover Bolt	M6	8.8-13.2	6.5-9.8
Engine Right Mounting Bolts	M10 × 55	37.6-56.4	27.8-41.7
Drive Belt Tensioner Bolt	M12	55.2-82.8	40.8-61.3
Drive Belt Tensioner Nut	M8	23.2-34.8	17.2-25.8
Exhaust Camshaft Timing Sprocket Mounting Bolt	M10	43.2-64.8	32-48
Oil Pan Oil Discharge Bolt	M12	25-35	18.5-25.9
Manufacturing Hole Plug	M20	39-49	28.8-36.1
Cylinder Head Oil Drain Plug	M14 × 1.25	24-36	17.7-26.6
Engine Hook Bolt	M10 × 1.25	27-49	19.9-36.1
Heater Outlet Pipe Components Bolt	M6	7-11	5.2-8.1
Timing Chain Rail Mounting Bolt	M6	7-11	5.2-8.1
Timing Chain Tensioner Rail Mount Bolt	M8	15-21	11.1-15.5
Timing Chain Tensioner Mounting Bolt	M6	7-11	5.2-8.1
PCV Valve	NPT 3 / 8	20-30	14.8-22.1
Engine Coolant Inlet Connector Components Retaining Bolt	M6	9-13	6.6-9.6
Oil Stick Tube Assembly Mounting Bolt	M6	9-13	6.6-9.6
Ignition Coil Components	M6	7-11	5.2-8.1
Throttle Body Components Retaining Bolt	M6	15-25	11.1-18.4
Stiffener To Install Intake Manifold Retaining Bolt	M8	24-36	17.7-26.6
Upper (Lower) Heat Shield Components Retaining Bolt	M8	14-22	10.3-16.2
Exhaust Manifold Bracket Retaining Bolts	M10 × 1.25	28-42	20.7-31.0

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Power Steering Pump Mounting Bolt	M10	36-54	26.6-39.8
Compressor Retaining Bolt	M8	20-30	14.8-22.1
VVT Solenoid Valve Components Retaining Bolt	M6	7-11	5.2-8.1

### 2.16.1.2 Mechanical System Specifications

Items	Specifications
Bore (mm/in)	77.8/3.07
Stroke (mm/in)	78.8/3.10
Displacement (L)	1.498
Compression Ratio	10.3:1
Power (km/rpm)	78/6,000
Torque (Nm/rpm)	135/4,800
Idle Speed (rpm)	750 ± 50 (Air-Conditioning A/C ON, 1,000 ± 50)
Ignition Sequence	1-3-4-2 (Cylinder No.1,4 and Cylinder No.2,3 group ignition)
Fuel	Octane Number 93 and Above Unleaded Motor Gasoline
Engine Coolant Capacity (L/pt)	6.0/10.56
Engine Oil Capacity (L/pt)	4.0/7.04
Engine Coolant Specifications / Grades	Comply With SH0521 (Freezing Point ≤-40°C (-40 °F))
Lubricant Specification / Grades	SAE10W-30 or 15W-40, API quality grade SJ and above, (winter cold regions use SAE5W-30)
Spark Plug Type	K6RTC
Spark Plug Gap (mm/in)	0.9 ± 0.1/0.04 ± 0.003
Dry Mass (kg/lb)	Without Starter, With Oil, Coolant, Wiring Harness, and Clutch 110 ± 2/242.51 ± 4.41
Overall Size (LxWxH) mm/in	631 × 600 × 620/24.84 × 23.62 × 24.41
Camshaft	
Journal Diameter (mm/in)	23/0.91
Camshaft Axial Clearance (mm/in)	0.05-0.12/0.0020- (-0.0047)
Intake Valve Clearance (mm/in)	0.23 ± 0.03/0.0091 ± 0.0011
Exhaust Valve Clearance (mm/in)	0.32 ± 0.03/0.0126 ± 0.0011
Intake VVT Adjustment Range	± 25 °

Items	Specifications
Valve Timing	
Intake Valve Opening	16 ° Before TDC
Intake Valve Closing	70.5 ° After BDC
Exhaust Valve Opening	55.5 ° Before TDC
Exhaust Valve Closing	17 ° After BDC
Crank Pin	
Connecting Rod Bearing Clearance (mm/in)	0.020-0.044/0.0007-0.0017
Connecting Rod Bearing Axial Clearance (mm/in)	0.16-0.342/0.006-0.0135
Crankshaft	
Axial Clearance (mm/in)	0.04-0.24/0.0015-0.0094
Main Bearing Clearance - All (mm/in)	0.015-0.033/0.0006-0.0013
Spindle Collar Diameter - All (mm/in)	47.982-48/1.8891-1.8898
Top Surface Flatness (mm/in)	0.05/0.0019
Crankshaft Main Journals Roundness (mm/in)	0.003/0.0001
Crankshaft Main Journals Run Out (mm/in)	0.004/0.0002
Cylinder Head	
Machined Minimal Total Height (mm/in)	115-0.05/4.53-0.0019
Overall Height (mm/in)	115 +0.05 / 4.53 +0.0019
Valve Guide Height (mm/in)	34.5/1.36
Pistons	
Gap Between Piston and Cylinder (mm/in)	0.070-0.090/0.0028-0.0035
Diameter (mm/in)	78.9/3.11
Piston Pin	
Gap Between Piston Pin and Piston (mm/in)	0.005-(-0.001) / 0.0002-(-0.00003)
Gap Between Piston Pin and Rod (mm/in)	0.005-0.011/0.0002-0.0004
Diameter (mm/in)	20/0.787
Length (mm/in)	50-0.2/1.969-0.0079
Piston Pin Offset - Thrust Side (mm/in)	0.6 ± 0.1/0.0236 ± 0.0039
Oil Pump	
Safety Valve Opening Pressure (kPa/psi)	500/72.52
Piston Ring	
Oil Ring End Gap (mm/in)	0.20-0.70/0.0079-0.0276

Items	Specifications
Second Compression Ring End Gap (mm/in)	0.20-0.40/0.0079-0.0157
First Compression Ring End Gap (mm/in)	0.25-0.35/0.0098-0.0138
Sealants and Adhesives	
Cylinder Head Cover Mat Sealant	Kesaixin 1596 Flat Silicone Rubber Sealants
Engine Oily Road Conce	Kesaixin 1243-Type Anaerobic Thread Locking Sealant
Oil Pan and Crankcase Mating Surface	Kesaixin 1596 Flat Silicone Rubber Sealants
Crankcase and Cylinder Block Mating Surface	Kesaixin 1596 Flat Silicone Rubber Sealants
Flywheel Bolt	Letai 204 Anaerobic Sealant
Valve System	
Intake Valve Diameter (mm/in)	31/1.2
Exhaust Valve Diameter (mm/in)	26 / 1
Valve Tube Diameter (mm/in)	5.5/0.22
Valve Stem Diameter - Intake Valve (mm/in)	5.5/0.22
Valve Rod Diameter - Exhaust Valve (mm/in)	5.5/0.22

### 2.16.1.3 Intake and Exhaust Valves Lifter Specifications Table

Packet No.	Thickness (mm/in)	Packet No.	Thickness (mm/in)
06	5.06(0.1992)	42	5.42(0.2134)
08	5.08(0.2000)	44	5.44(0.2142)
10	5.10(0.2008)	46	5.46(0.2150)
12	5.12(0.2016)	48	5.48(0.2157)
14	5.14(0.2024)	50	5.50(0.2165)
16	5.16(0.2031)	52	5.52(0.2173)
18	5.18(0.2039)	54	5.54(0.2181)
20	5.20(0.2047)	56	5.56(0.2189)
22	5.22(0.2055)	58	5.58(0.2197)
24	5.24(0.2063)	60	5.60(0.2205)
26	5.26(0.2071)	62	5.62(0.2213)
28	5.28(0.2079)	64	5.64(0.2220)
30	5.30(0.2087)	66	5.66(0.2236)
32	5.32(0.2094)	68	5.68(0.2236)
34	5.34(0.2102)	70	5.70(0.2252)

Packet No.	Thickness (mm/in)	Packet No.	Thickness (mm/in)
36	5.36(0.2110)	72	5.72(0.2260)
38	5.38(0.2118)	74	5.74(0.2260)
40	5.40(0.2126)		

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### 2.16.1.4 Intake and Exhaust Valves Lifter Selection Table

Intake Valve Selection Table

		5.74(0.2260) 5.72(0.2260) 5.70(0.2252) 5.68(0.2236) 5.66(0.2236) 5.64(0.2220) 5.62(0.2213) 5.60(0.2205) 5.58(0.2197) 5.56(0.2189) 5.54(0.2181) 5.52(0.2173) 5.50(0.2165) 5.48(0.2157) 5.46(0.2150) 5.44(0.2142) 5.42(0.2134) 5.40(0.2126) 5.38(0.2118) 5.36(0.2110) 5.34(0.2102) 5.32(0.2094) 5.30(0.2087) 5.28(0.2079) 5.26(0.2071) 5.24(0.2063) 5.22(0.2055) 5.20(0.2047) 5.18(0.2039) 5.16(0.2031) 5.14(0.2024) 5.12(0.2016) 5.10(0.2008) 5.08(0.2000) 5.06(0.1992)																																Lifter No. and Thickness (mm/in) Gap (mm/in)	
54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06											0.000-0.030(0.0000-0.0012)
58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06									0.031-0.050(0.0012-0.0020)
60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06								0.051-0.070(0.0020-0.0028)
62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.071-0.090(0.0028-0.0035)
64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06						0.091-0.110(0.0036-0.0043)
66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06					0.111-0.130(0.0044-0.0051)
68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06			0.131-0.150(0.0052-0.0059)	
70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06		0.151-0.170(0.0059-0.0067)	
72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06		0.171-0.189(0.0067-0.0074)
	74	74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	0.291-0.310(0.0115-0.0122)
		74	74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	0.311-0.330(0.0122-0.0130)
			74	74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	0.331-0.350(0.0130-0.0138)
				74	74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	0.351-0.370(0.0138-0.0146)
					74	74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	0.371-0.390(0.0146-0.0154)
						74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	0.391-0.410(0.0154-0.0161)	
							74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	0.411-0.430(0.0162-0.0169)	
								74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	0.431-0.450(0.0170-0.0177)	
									74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	0.451-0.470(0.0178-0.0185)	
										74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	0.471-0.490(0.0185-0.0193)	
											74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	0.491-0.510(0.0193-0.0201)	
												74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	0.511-0.530(0.0201-0.0209)	
													74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	0.531-0.550(0.0209-0.0217)	
														74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	0.551-0.570(0.0217-0.0224)	
															74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	0.571-0.590(0.0225-0.0232)	
																74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	0.591-0.610(0.0233-0.0240)	
																	74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	0.611-0.630(0.0241-0.0248)	
																		74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	0.631-0.650(0.0248-0.0256)	
																			74	74	72	70	68	66	64	62	60	58	56	54	52	50	48	0.651-0.670(0.0256-0.0264)	
																				74	74	72	70	68	66	64	62	60	58	56	54	52	50	0.671-0.690(0.0264-0.0272)	
																					74	74	72	70	68	66	64	62	60	58	56	54	52	0.691-0.710(0.0272-0.0280)	
																						74	74	72	70	68	66	64	62	60	58	56	54	0.711-0.730(0.0280-0.0287)	
																							74	74	72	70	68	66	64	62	60	58	56	0.731-0.750(0.0288-0.0295)	
																								74	74	72	70	68	66	64	62	60	58	0.751-0.770(0.0296-0.0303)	
																									74	74	72	70	68	66	64	62	60	0.771-0.790(0.0304-0.0311)	
																										74	72	70	68	66	64	62	0.791-0.810(0.0311-0.0319)		
																											74	72	70	68	66	64	0.811-0.830(0.0319-0.0327)		
																												74	72	70	68	66	0.831-0.850(0.0327-0.0335)		
																													74	72	70	68	0.851-0.870(0.0335-0.0343)		
																														74	72	70	0.871-0.890(0.0343-0.0350)		
																															74	72	0.891-0.910(0.0351-0.0358)		
																																74	0.891-0.910(0.0351-0.0358)		

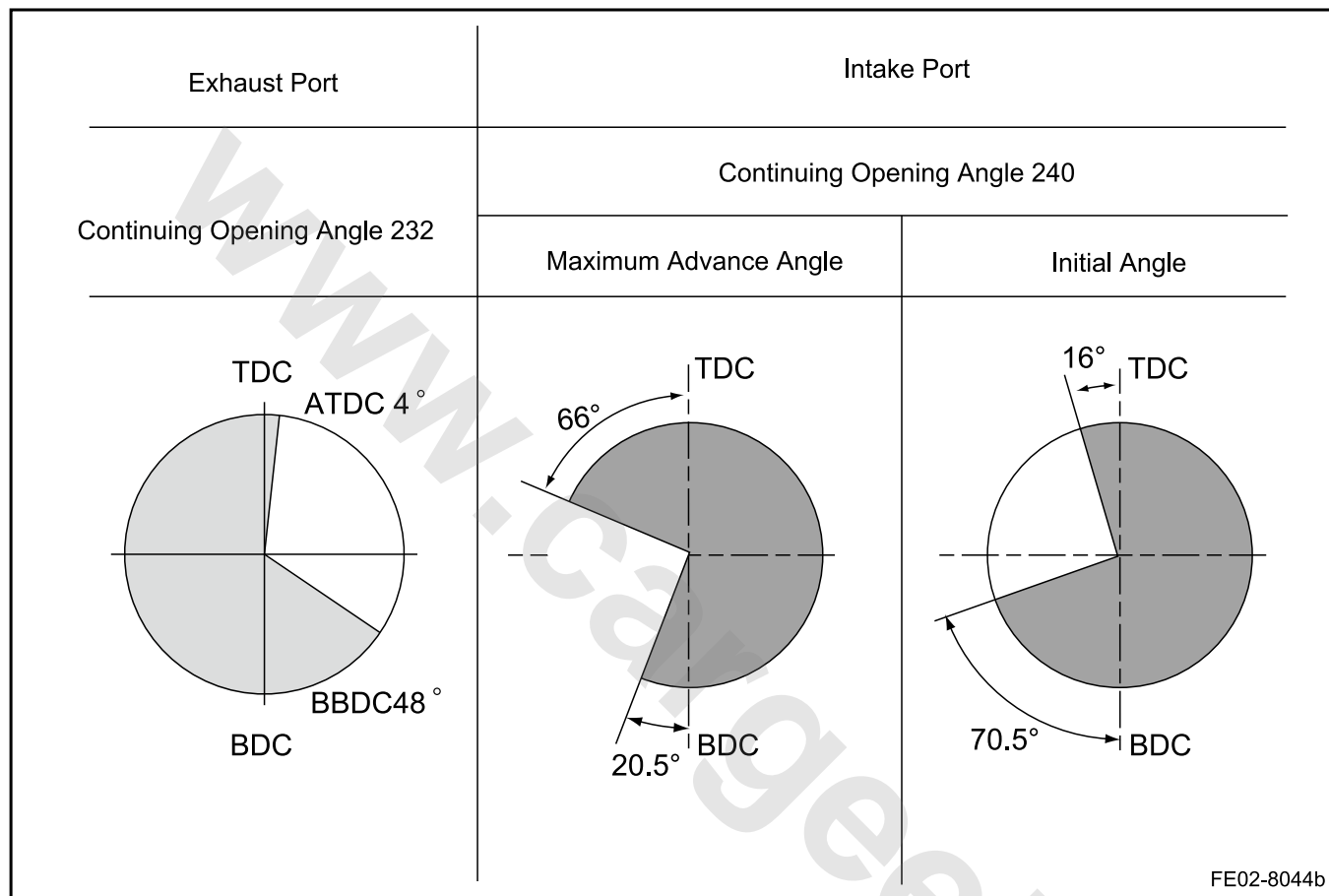
Exhaust Valve Selection Table

5.74(0.2260) 5.72(0.2260) 5.70(0.2252) 5.68(0.2236) 5.66(0.2236) 5.64(0.2220) 5.62(0.2213) 5.60(0.2205) 5.58(0.2197) 5.56(0.2189) 5.54(0.2181) 5.52(0.2173) 5.50(0.2165) 5.48(0.2157) 5.46(0.2150) 5.44(0.2142) 5.42(0.2134) 5.40(0.2126) 5.38(0.2118) 5.36(0.2110) 5.34(0.2102) 5.32(0.2094) 5.30(0.2087) 5.28(0.2079) 5.26(0.2071) 5.24(0.2063) 5.22(0.2055) 5.20(0.2047) 5.18(0.2039) 5.16(0.2031) 5.14(0.2024) 5.12(0.2016) 5.10(0.2008) 5.08(0.2000) 5.06(0.1992)																												Lifter No. and Thickness (mm/in)		Gap (mm/in)					
54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06									0.000-0.030(0.0000-0.0012)		
56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06								0.031-0.050(0.0012-0.0020)		
58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06								0.051-0.070(0.0020-0.0028)	
60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.071-0.090(0.0028-0.0035)	
62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06							0.091-0.110(0.0036-0.0043)
64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06						0.111-0.130(0.0044-0.0051)
66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06					0.131-0.150(0.0052-0.0059)
68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06				0.151-0.170(0.0059-0.0067)
70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	06			0.171-0.190(0.0067-0.0075)
70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	08	08	06		0.191-0.199(0.0075-0.0078)
		74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	0.261-0.280(0.0103-0.0110)
			74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	0.281-0.300(0.0111-0.0118)
				74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	0.301-0.320(0.0119-0.0125)
					74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	0.321-0.340(0.0126-0.0134)
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							74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	0.361-0.380(0.0142-0.0150)
								74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	0.381-0.400(0.0150-0.0157)
									74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	0.401-0.420(0.0158-0.0165)
										74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	0.421-0.440(0.0166-0.0173)
											74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	0.441-0.460(0.0174-0.0181)
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													74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	0.481-0.500(0.0189-0.0197)
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																			74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	0.601-0.620(0.0237-0.0244)
																				74	72	70	68	66	64	62	60	58	56	54	52	50	48	46	0.621-0.640(0.0244-0.0252)
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																						74	72	70	68	66	64	62	60	58	56	54	52	50	0.661-0.680(0.0260-0.0268)
																							74	72	70	68	66	64	62	60	58	56	54	52	0.681-0.700(0.0268-0.0276)
																								74	72	70	68	66	64	62	60	58	56	54	0.701-0.720(0.0276-0.0283)
																									74	72	70	68	66	64	62	60	58	56	0.721-0.740(0.0284-0.0291)
																										74	72	70	68	66	64	62	60	58	0.741-0.760(0.0292-0.0299)
																											74	72	70	68	66	64	62	60	0.761-0.780(0.0300-0.0307)
																												74	72	70	68	66	64	62	0.781-0.800(0.0307-0.0315)
																													74	72	70	68	66	64	0.801-0.820(0.0315-0.0323)
																														74	72	70	68	66	0.821-0.840(0.0323-0.0331)
																															74	72	70	68	0.841-0.860(0.0331-0.0339)
																																74	72	70	0.861-0.880(0.0339-0.0346)
																																	74	72	0.881-0.900(0.0347-0.0350

## 2.16.2 System Working Principle

## 2.16.2.1 System Working Principle

For specific working descriptions, Refer to [2.6 Engine Mechanical System JL4G18-Din2.6.3.1 System Working Principle](#).



## Legend

- |                                 |                                    |
|---------------------------------|------------------------------------|
| 1. TDC: Top Dead Center         | 5. ABDC: After Bottom Dead Center  |
| 2. BDC: Bottom Dead Center      | 6. BBDC: Before Bottom Dead Center |
| 3. ATDC: After Top Dead Center  |                                    |
| 4. BTDC: Before Top Dead Center |                                    |



## 2.16.3 Removal and Installation

### 2.16.3.1 4G15-D Mechanical Parts Disassemble Instructions

Other than using an electronic throttle body instead of the mechanical throttle body, there is no difference between this engine mechanical parts 4G15-D engine. Therefore this section only lists electronic throttle body replacement. For other parts replacement, Refer to [2.6.8 Removal and Installation](#) in the "Engine Mechanical System 4G18-D".

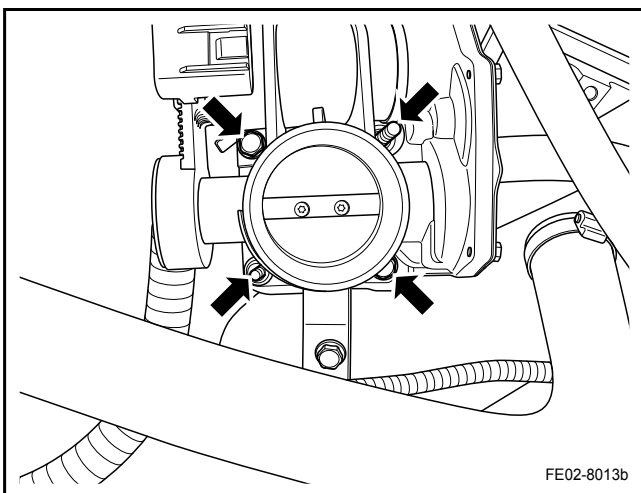
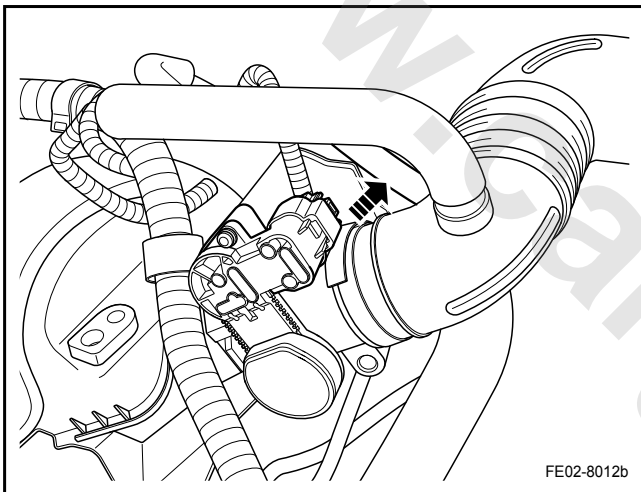
### 2.16.3.2 Electronic Throttle Body Replacement

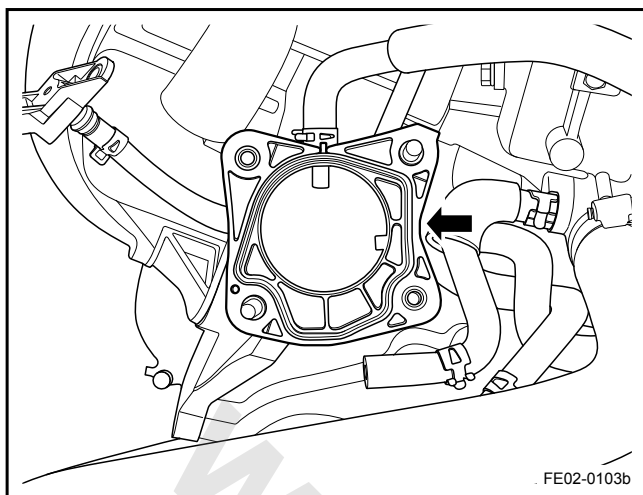
Removal Procedure:

#### Warning!

Warning: Refer to "Battery Disconnection Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove intake manifold from the throttle body.
3. Disconnect throttle control valve wiring harness connector.
4. Remove throttle body retaining bolts and nuts, and two retaining nuts from the throttle body bracket.

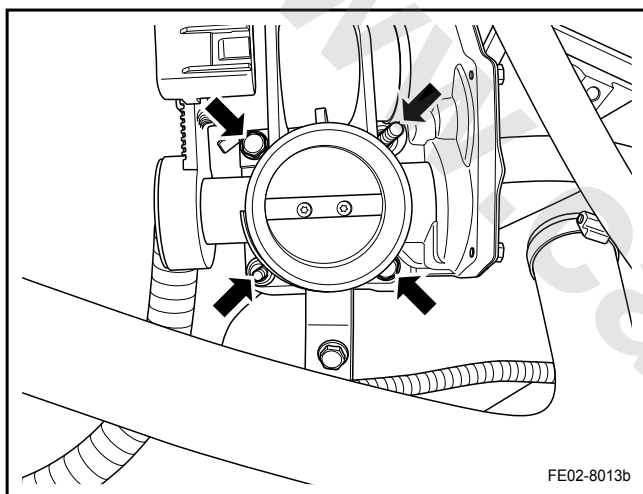




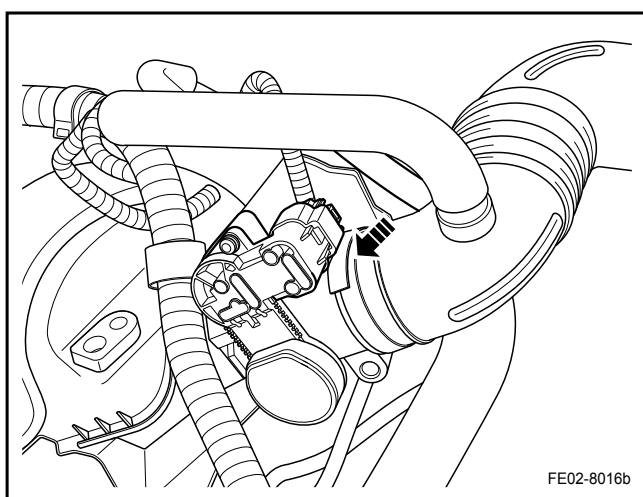
5. Remove throttle body from the intake manifold.
6. Clean the engine throttle body and intake manifold mating surface and replace with a new gasket.

#### Installation Procedure:

1. Install and tighten throttle body retaining bolts and nuts.  
Torque: 15 Nm (Metric) 11 lbf-ft (US English)



2. Connect throttle control valve wiring harness connector.
3. Install intake manifold.
4. Connect the battery negative cable.



## 2.17 Exhaust System JL4G15-D

### 2.17.1 4G15-D Engine Exhaust System Overview

Compared with 4G18-D, 4G15-D engine exhaust system has the same content in Specification, Description and Operation, the System Working Principle, Component Locator, Schematic, Removal and Installation. For specific information, please refer to [2.3 Fuel System JL4G18-D](#). This chapter described contents are different from 4G18-D. For relevant information. Refer to the following content.

## 2.17.1 Specifications


## 2.17.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Exhaust Manifold Retaining Nut	M8	20-30	14.8-22.2
Exhaust Manifold Bracket Retaining Bolts	M12 × 1.25 × 28	28-42	20.7-31.1
Heat Shield Retaining Bolts	M8 × 25	14-22	10.4-16.3
Three-Way Catalytic Converter To Front Muffler Retaining Nuts	M12 × 1.25 × 45	47-57	34.8-42.2
Three-Way Catalytic Converter To Front Muffler Retaining Bolts	M12	47-57	34.8-42.2
Front and Rear Muffler Connecting Bolts	M12 × 1.25 × 45	47-57	34.8-42.2
Front and Rear Muffler Connecting Nuts	M12	47-57	34.8-42.2

## 2.18 Engine Cooling System JL4G15-D

### 2.18.1 4G15-D Engine Cooling System Overview

Compared with 4G18-D, 4G15-D engine cooling system has the same content in Specification, Description and Operation, the System Working Principle, Component Locator, Schematic, Removal and Installation. For specific information, please refer to [2.3 Fuel System JL4G18-D](#). This chapter described contents are different from 4G18-D. For relevant information. Refer to the following content.



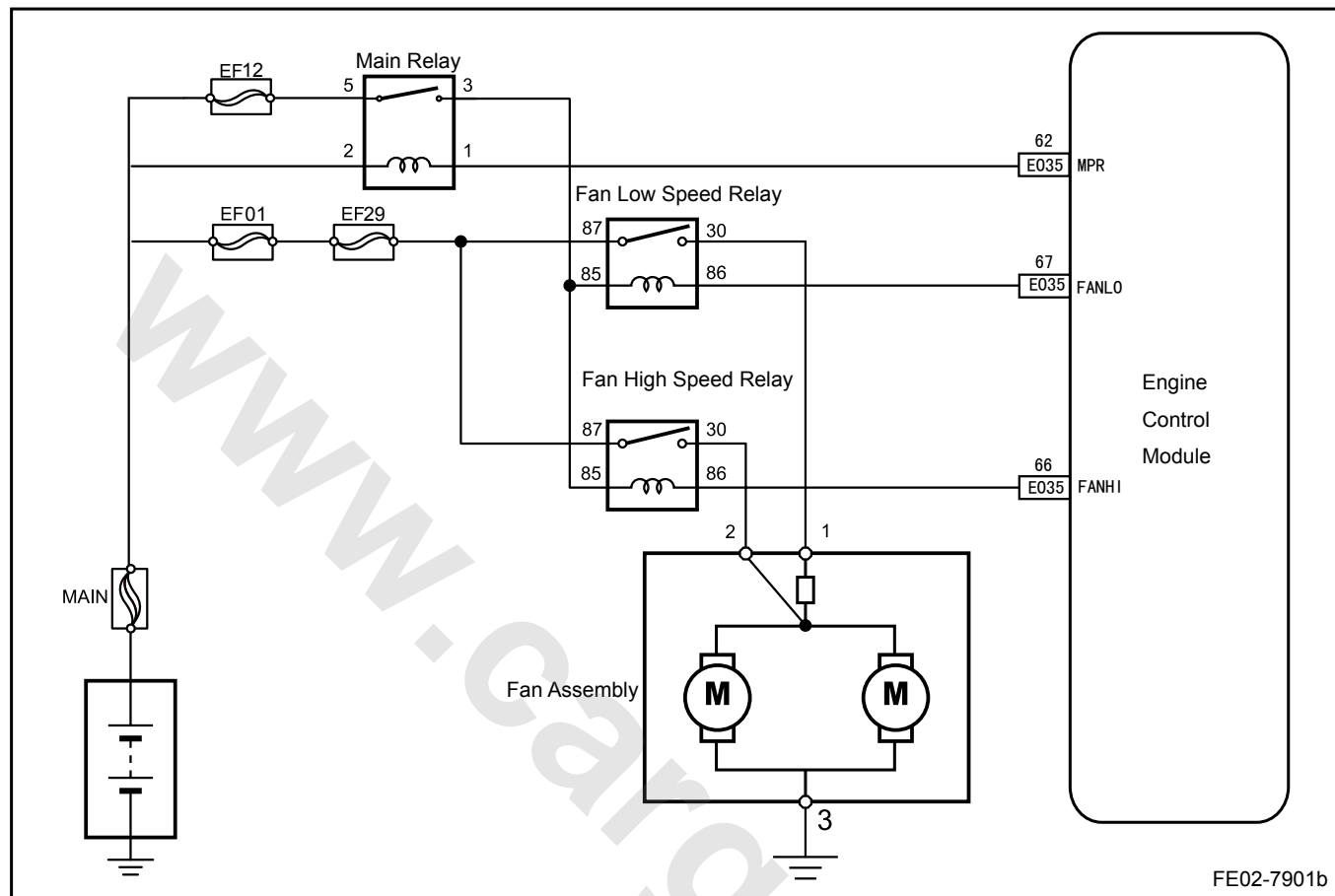
## 2.18.1 Specifications

## 2.18.1.1 Cooling System Specifications

Applications	Specifications
Cooling Type	Coolant
Engine Coolant Specifications / Grades	Comply With SH0521 (Freezing Point $\leq -40^{\circ}\text{C}$ / $-40^{\circ}\text{F}$ )
Engine Coolant Capacity (Coolant Recovery Reservoir)	6.0 L (10.6 pt)
Thermostat Type	Wax-Type Thermostat
Pump Type	Impeller
Blade Diameter	60 mm (2.36 in)
Blades	6
Thermostat Opening Temperature	$82^{\circ}\text{C}$ ( $179.6^{\circ}\text{F}$ )
Thermostat Fully Open Temperature	$95^{\circ}\text{C}$ ( $203^{\circ}\text{F}$ )
Low Speed Cooling Fan On Temperature	$95^{\circ}\text{C}$ ( $203^{\circ}\text{F}$ )
Low Speed Cooling Fan Off Temperature	$90^{\circ}\text{C}$ ( $194^{\circ}\text{F}$ )
High Speed Cooling Fan On Temperature	$99^{\circ}\text{C}$ ( $210.2^{\circ}\text{F}$ )
High Speed Cooling Fan Off Temperature	$95^{\circ}\text{C}$ ( $203.0^{\circ}\text{F}$ )
Low-Speed Fan Resistor	0.35 $\Omega$

## 2.18.2 Schematic

## 2.18.2.1 Schematic



## 2.18.3 Diagnostic Information and Procedures

### 2.18.3.1 Cooling Fan Circuit Diagnosis

#### Diagnostic Tips:

- If there is an overheating complaint, verify whether it is because the engine coolant boiling or the engine coolant temperature gage indicates the coolant overheating. If the engine is overheating, but the cooling fan is still running, check the engine cooling system.
- If the fuse EF29 in underhood fuse block fuses immediately after installation, check whether the circuit between the cooling fan high or Low-Speed relay and cooling fan motor is short to ground. If the engine control module has just controlled relay pull-in, EF29 fuses, then the cooling fan motor may be faulty.
- When the Air-Conditioning system is switched on, the engine control module controls the cooling fan run at low speed. When the Air-Conditioning high pressure is 1,520 Pa (220.5 psi), the engine control module will switch cooling fan from low speed to high speed. When the Air-Conditioning high pressure drops back to 1,450 kPa (210.3 psi), the cooling fan will return to low speed.
- Use scan tool "Function Test" to drive high or low speed cooling fan relay pull-in to confirm whether the fan works properly to quickly determine the fault.

#### Note

Before carry out this diagnostic procedure, make sure check whether fuse EF29 works properly, whether main relay works properly. When using scan tool "action test", make sure the scan tool communicates with ECM properly.

Step 1	Verify the fault.
--------	-------------------

Next

Step 2	Confirm whether the low speed cooling fan is running.
--------	---

- (a) Turn the ignition switch to "OFF" position.
- (b) Connect scan tool to the datalink connector.
- (c) Start the engine to normal working temperature.
- (d) Turn off A/C switch.
- (e) Select in sequence: Engine / Data List / Engine Coolant Temperature.
- (f) When the engine coolant temperature gage displays 95°C (203 °F) Cooling fan should be running at low speed.

Is cooling fan running at Low speed?

No

Refer to [2.18.3.3 Low Speed Cooling Fan Inoperative](#)

Yes

Step 3	Confirm whether the high speed cooling fan is running.
--------	--

- (a) Turn off A/C switch.
- (b) When the engine coolant temperature gage displays 99°C (210.2 °F) When the cooling fan should be running at high speed.

Is the cooling fan running at high speed?



No

Refer to [2.18.3.2 High Speed Cooling Fan Inoperative](#)

Yes

Step 4 Turn on the A/C switch and confirm whether the low speed cooling fan is running.

- (a) Turn the ignition switch to "OFF" position.
- (b) Connect scan tool to datalink connector.
- (c) Select in sequence: Engine / Data List / Engine Coolant Temperature.
- (d) When the engine coolant temperature is below 90°C (194 °F), Start the engine, turn on the A/C switch, cooling fan should be running low speed.

Is cooling fan running at Low speed?

No

A/C system malfunction, Refer to [8.2.7 Diagnostic Information and Procedures](#)

Yes

Step 5 Intermittent Fault. Refer to [2.2.7.3 Intermittent Fault Check](#).

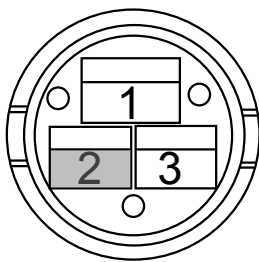
### 2.18.3.2 High Speed Cooling Fan Inoperative

#### Note

Before carry out this diagnostic procedure, please Refer to the [2.18.3.1 Cooling Fan Circuit Diagnosis](#) program, which will help with quick diagnostic.

Step 1 Check high speed cooling fan power supply.

Cooling Fan Harness Connector CA16



FE02-7801b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect cooling fan wiring harness connector CA16.
- (c) Turn the ignition switch to "ON" position.
- (d) Connect scan tool to the datalink connector.
- (e) Select in sequence: Engine / Action Test / Fan 2.
- (f) Make High-Speed relay work.
- (g) Measure voltage between cooling fan wiring harness connector CA16 terminal No.2 and a reliable ground.

Standard Voltage: 11-14 V

Is the voltage specified Value?

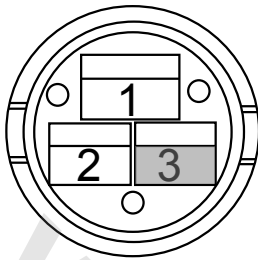
No

Go to step 4

Yes

Step 2 Check the cooling fan ground circuit.

## Cooling Fan Harness Connector CA16



FE02-7802b

- Turn the ignition switch to "OFF" position.
- Disconnect cooling fan wiring harness connector CA16.
- Measure resistance between cooling fan wiring harness connector CA16 terminal No.3 and a reliable ground.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified Value?

No

CA16 terminal No.3 has poor connection to ground. inspect and repair faulty part.

Yes

Step 3 Replace cooling fan.

Step 4 Use scan tool "Action Test" to drive the fan 2. Does high speed relay work?

No

Go to step 8

Yes

Step 5 Check high speed relay A terminal No.87 power supply.

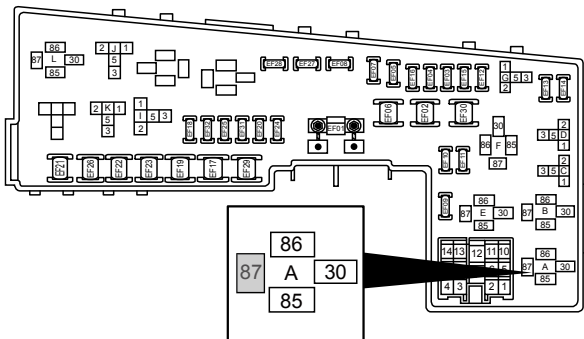
- Turn the ignition switch to "OFF" position.
- Remove the High-Speed cooling fan relay A.
- Measure voltage between high speed cooling fan relay A terminal No.87 and a reliable ground.

Standard Voltage: 11-14 V

Is the voltage specified Value?

No

Relay A terminal No.87 power supply circuit malfunction. inspect and repair faulty parts.

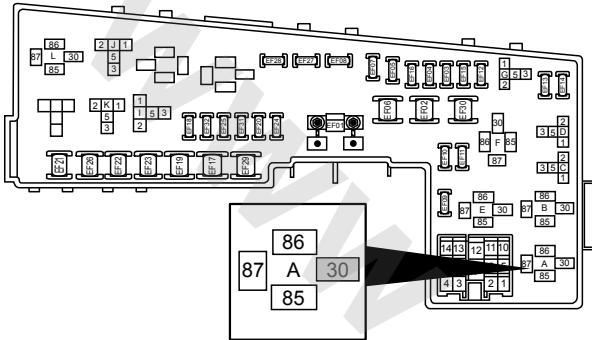
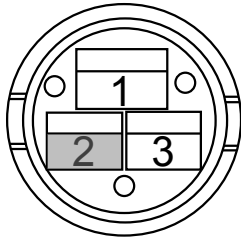


FE02-7803b

Yes

Step 6 Check high speed cooling fan relay A and cooling fan harness connector CA16 wiring harnesses.

Cooling Fan Harness Connector CA16



FE02-7804b

- Turn the ignition switch to "OFF" position.
- Remove the High-Speed cooling fan relay.
- Disconnect cooling fan wiring harness connector CA16.
- Test continuity between high speed cooling fan relay A terminal No.30 and cooling fan wiring harness connector CA16 terminal No.2.
- Measure resistance between high speed cooling fan relay A terminal No.30 and a reliable ground. check whether the circuit is short to ground.

Standard Value:

Test Items	Specified Value
Resistance Between Relay A (30) and CA16 (2)	Less than 1 $\Omega$
Resistance Between Relay A (30) and A Reliable Ground	10 k $\Omega$ or higher

Are measured values specified values?

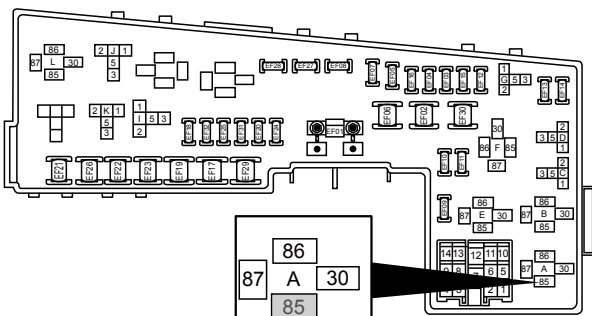
No

Circuit between cooling fan relay terminal No. 30 and wiring harness connector CA16 terminal No.2 is faulty. check and Repair the faulty part.

Yes

**Step 7** Replace high speed cooling fan relay A. Confirm whether the fault has been fixed.

**Step 8** Check high speed relay A coil power supply.



FE02-7805b

- Turn the ignition switch to "OFF" position.
- Remove the High-Speed cooling fan relay A.
- Turn the ignition switch to "ON" position.
- Measure voltage between high speed cooling fan relay A terminal No.85 and a reliable ground.

Standard Voltage: 11-14 V

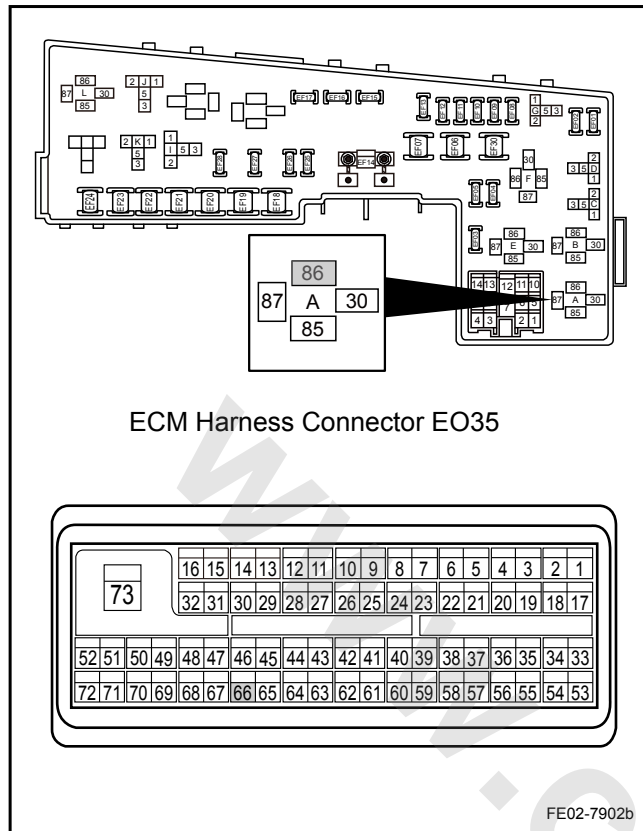
Is the voltage specified value?

No

Circuit between relay terminal No.85 and main relay terminal No.3 is open.

Yes

**Step 9** Check high speed relay A control circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EO35.
- Remove the High-Speed cooling fan relay A.
- Test continuity between high speed cooling fan relay A terminal No.86 and EO35 terminal No.66.
- Measure voltage between high speed cooling fan relay A terminal No.86 and a reliable ground.

Standard Value:

Test Items	Specified Value
Resistance Between Relay A (86) and EO35 (66)	Less than 1 $\Omega$
Resistance Between Relay A (86) and A Reliable Ground	0 V

Are measured values specified values?

No

Circuit between Relay A terminal No.86 and EO35 terminal No.66 is open. inspect and repair the relevant parts.

Yes

Step 10 Check ECM working circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 11 Replace ECM.

- Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 12 Diagnostic completed.

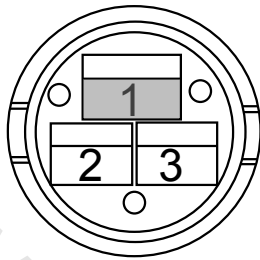
### 2.18.3.3 Low Speed Cooling Fan Inoperative

#### Note

Before carry out this diagnostic procedure, please Refer to the [2.18.3.1 Cooling Fan Circuit Diagnosis](#) program, which will help with quick diagnostic.

Step 1 check low speed cooling fan power supply.

Cooling Fan Harness Connector CA16



FE02-7807b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect cooling fan wiring harness connector CA16.
- (c) Turn the ignition switch to "ON" position.
- (d) Connect scan tool to the datalink connector.
- (e) Select in sequence: Engine / Action Test / fan 1.
- (f) Make low-speed relay work.
- (g) Measure voltage between cooling fan wiring harness connector CA16 terminal No.1 and a reliable ground.

Standard Voltage: 11-14 V

Is the voltage specified Value?

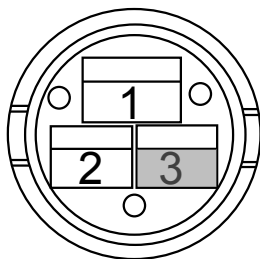
No

Go to step 4

Yes

Step 2 Check the cooling fan ground circuit.

Cooling Fan Harness Connector CA16



FE02-7802b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect cooling fan wiring harness connector CA16.
- (c) Measure resistance between cooling fan wiring harness connector CA16 terminal No.3 and a reliable ground.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified Value?

No

CA16 terminal No.3 has poor connection to ground. Inspect and repair faulty part.

Yes

Step 3 Replace cooling fan assembly.

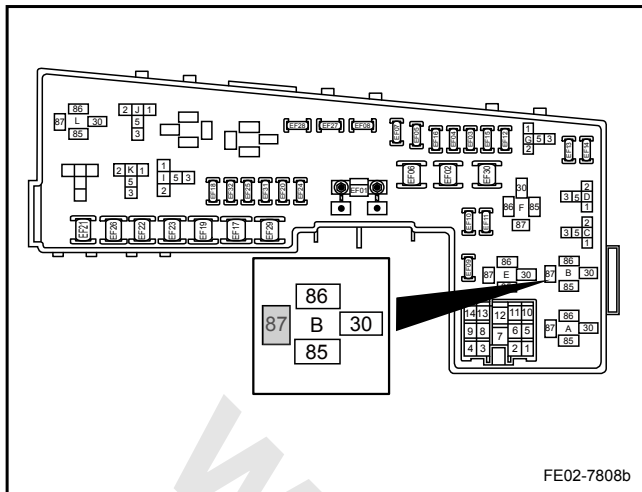
Step 4 Use scan tool "Action Test" to drive the fan 1. Does low speed relay work?

No

Go to step 8

Yes

Step 5 Check low speed relay B terminal No.87 power supply.



- Turn the ignition switch to "OFF" position.
- Remove the low-speed cooling fan relay B.
- Measure voltage between low speed cooling fan relay B terminal No.87 and a reliable ground.

Standard Voltage: 11-14 V

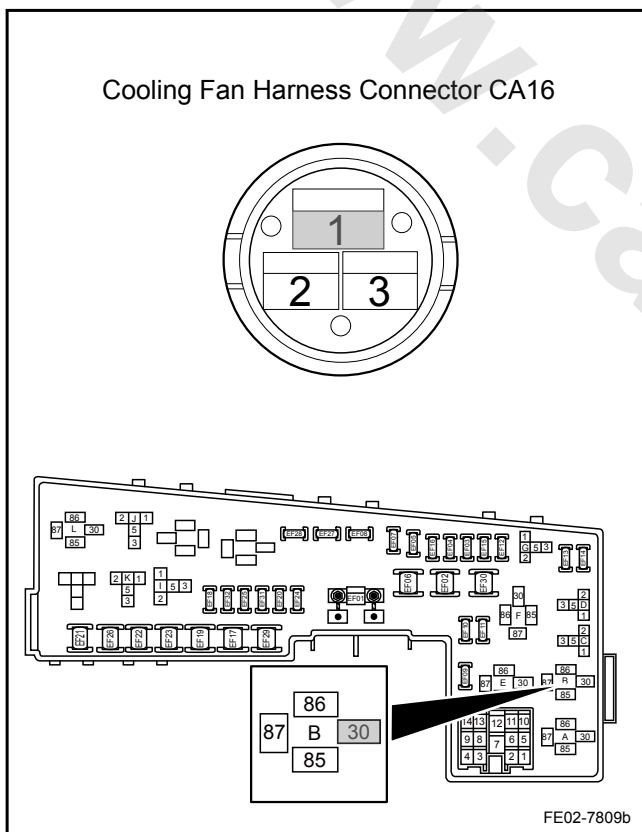
Is the voltage specified Value?

No

Relay B terminal No.87 power supply circuit malfunction. Inspect and repair faulty parts.

Yes

Step 6 Check low speed cooling fan relay and cooling fan harness connector CA16 wiring harnesses.



- Turn the ignition switch to "OFF" position.
- Remove the low-speed cooling fan relay.
- Disconnect cooling fan wiring harness connector CA16.
- Test continuity between low speed cooling fan relay B terminal No.30 and cooling fan wiring harness connector CA16 terminal No.1.
- Measure resistance between low speed cooling fan relay B terminal No.30 and a reliable ground. check whether the circuit is short to ground.

Standard Value:

Test Items	Specified Value
Resistance Between Relay B (30) and CA16 (1)	Less than 1 $\Omega$
Resistance Between Relay B (30) and A Reliable Ground	10 k $\Omega$ or higher

Are measured values specified values?

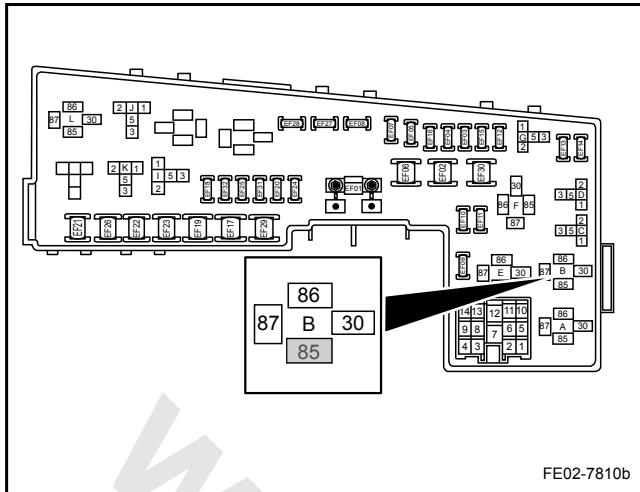
No

Circuit between cooling fan relay terminal No. 30 and wiring harness connector CA16 terminal No.1 is faulty. Check and repair the faulty part.

Yes

Step 7 Replace cooling fan Low speed relay B. Confirm whether the fault has been fixed.

Step 8 Check low speed relay B coil power supply.



- Turn the ignition switch to "OFF" position.
- Remove the low speed cooling fan relay B.
- Turn the ignition switch to "ON" position.
- Measure voltage between low speed cooling fan relay B terminal No.85 and a reliable ground.

Standard Voltage: 11-14 V

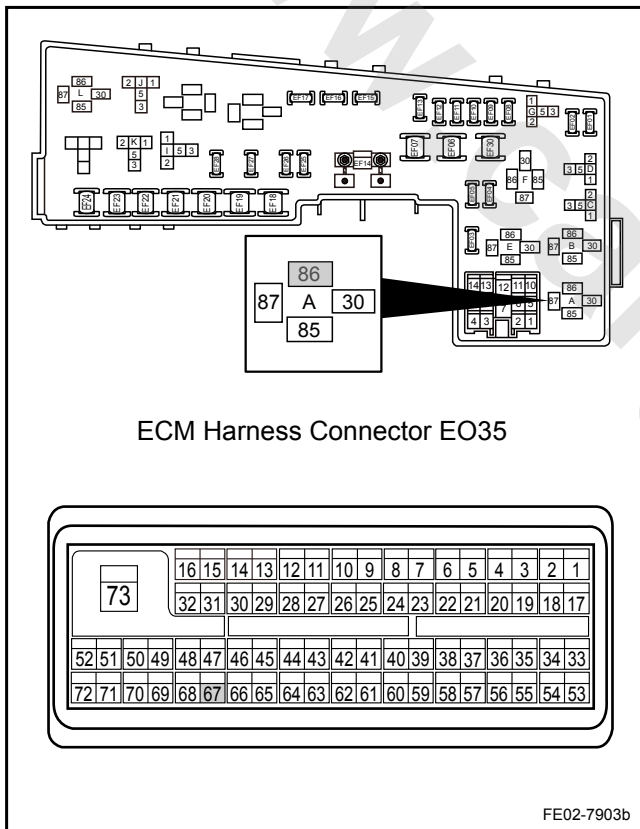
Is the voltage specified value?

No

Circuit between relay terminal No.85 and main relay terminal No.3 is open.

Yes

Step 9 Check low-speed relay B control circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Remove the low-speed cooling fan relay B.
- Test continuity between low speed cooling fan relay B terminal No.86 and EO35 terminal No.67.
- Measure voltage between low speed cooling fan relay B terminal No.86 and a reliable ground.

Standard Value:

Test Items	Specified Value
Resistance Between Relay B (86) and EO35 (67)	Less than 1 $\Omega$
Resistance Between Relay B (86) and A Reliable Ground	0 V

Are measured values specified values?

No

Circuit between relay A terminal No.86 and EO35 terminal No.66 is open.

Yes

Step 10 Check ECM working circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 11 Replace ECM.

- (a) Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 12 Diagnostic completed.

### 2.18.3.4 Cooling Fan Always Runs At Low-Speed

#### Note

When this fault is present, it is recommended to carry out diagnostic when engine is completely cooled down.

Step 1 Verify the fault.

Next

Step 2 Check the engine coolant temperature sensor signal.

- (a) Turn the ignition switch to "OFF" position.  
 (b) Connect scan tool to the datalink connector.  
 (c) Turn off A/C switch.  
 (d) Turn the ignition switch to "ON" position.  
 (e) Select in sequence: Engine / Data List / Engine Coolant Temperature.  
 (f) Observe the engine coolant temperature sensor displayed temperature, when the engine is completely cooled down, the displayed temperature should be slightly higher than the ambient temperature.

Is displayed temperature normal.

No

Coolant temperature sensor or circuit malfunction. Refer to the [2.12.7.20 DTC P0117 P0118](#)

Yes

Step 3 Remove and check the cooling fan low-speed relay, cooling fan still running?

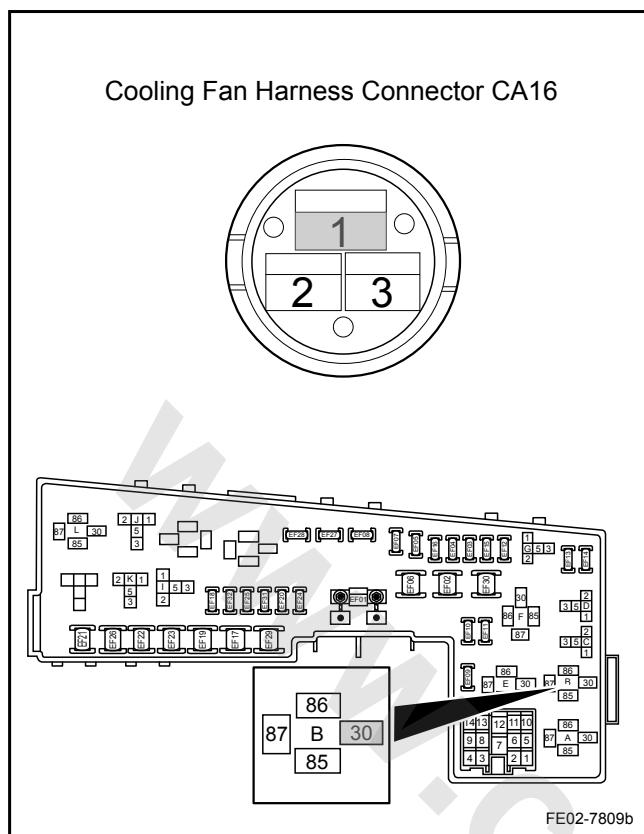
No

Go to step 5

Yes

Step 4 Check and repair circuit between low speed cooling fan relay and cooling fan wiring harness connector CA16.





- (a) Turn the ignition switch to "OFF" position.
- (b) Remove the low-speed cooling fan relay.
- (c) Disconnect cooling fan wiring harness connector CA16.
- (d) Check and repair circuit between relay and connector short to power supply fault.

Step 5 Check cooling fan low speed relay.

- (a) Measure resistance between relay terminals No.87 and No. 30.

Standard Resistance: 10 kΩ or higher

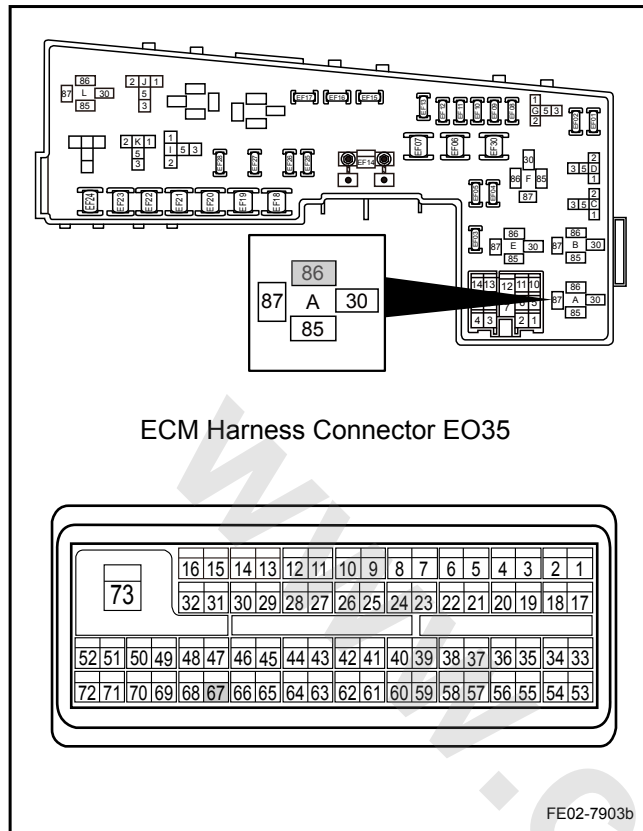
Is the resistance specified value?

No

Replace relay.

Yes

Step 6 Check low-speed relay B control circuit.



ECM Harness Connector EO35

- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Remove the low-speed cooling fan relay B.
- Test continuity between cooling fan low speed relay B terminal No.86 and ECM harness connector EO35 terminal No.67.
- Measure resistance between cooling fan low-speed relay B terminal No.86 and a reliable ground. Check whether the circuit is short to ground.

Standard Value:

Test Items	Specified Value
Resistance Between Relay B (86) and EO35 (67)	Less than 1 $\Omega$
Resistance Between Relay B (86) and A Reliable Ground	10 k $\Omega$ or higher

Are measured values specified values?

No

Relay B terminal No.86 and EO35 terminal No.67 wiring harnesses are faulty.

Yes

Step 7 Check ECM working circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

- Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Diagnostic completed.

### 2.18.3.5 Cooling Fan Always Runs At High Speed

#### Note

When this fault is present, it is recommended to carry out diagnostic when engine is completely cooled down.

Step 1 Verify the fault.

Next

Step 2 Check the engine coolant temperature sensor signal.

- (a) Turn the ignition switch to "OFF" position.
- (b) Connect scan tool to the datalink connector.
- (c) Turn off A/C switch.
- (d) Turn the ignition switch to "ON" position.
- (e) Select in sequence: Engine / Data List / Engine Coolant Temperature.
- (f) Observe the engine coolant temperature sensor displayed temperature, when the engine is completely cooled down, the displayed temperature should be slightly higher than the ambient temperature.

Is displayed temperature normal?

No

Coolant temperature sensor or circuit malfunction. Refer to the [2.12.7.20 DTC P0117 P0118](#)

Yes

Step 3 Remove and check the cooling fan low-speed relay, cooling fan still running?

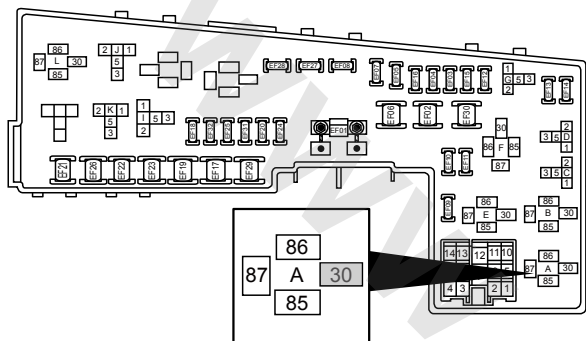
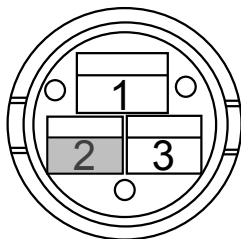
No

Go to step 5

Yes

Step 4 Check and repair circuit between high speed cooling fan relay and cooling fan wiring harness connector CA16.

Cooling Fan Harness Connector CA16



FE02-7804b

- (a) Turn the ignition switch to "OFF" position.
- (b) Remove the high-speed cooling fan relay.
- (c) Disconnect cooling fan wiring harness connector CA16.
- (d) Check and repair circuit between relay and connector short to power supply fault.

Step 5 Check cooling fan high-speed relay.

- (a) Measure resistance between relay terminals No.87 and No. 30.

Standard Resistance: 10 kΩ or higher

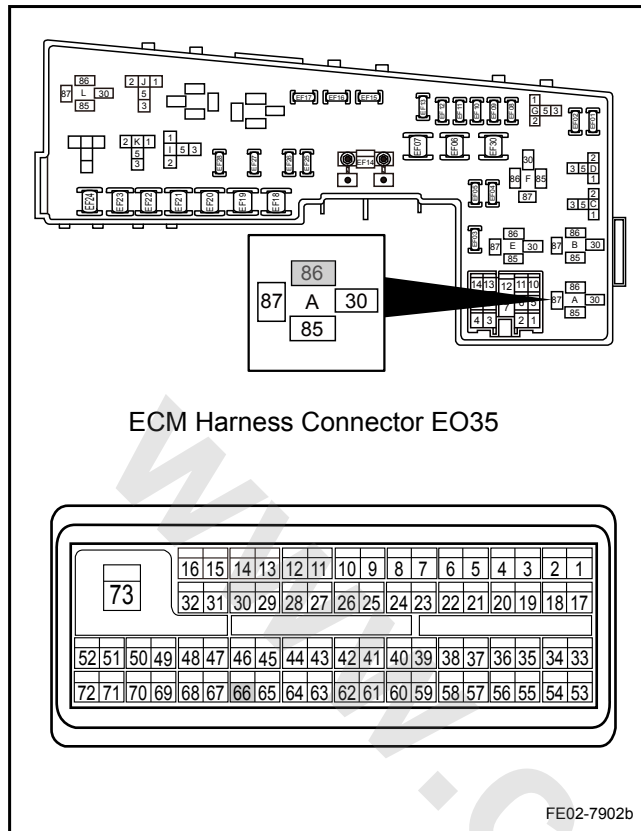
Is the resistance specified value?

No

Replace relay.

Yes

Step 6 Check high-speed relay a control circuit.



- Turn the ignition switch to "OFF" position.
- Disconnect ECM harness connector EN01.
- Remove the high-speed cooling fan relay A.
- Test continuity between cooling fan high speed relay A terminal No.86 and ECM harness connector EO35 terminal No.66.
- Measure resistance between cooling fan high speed relay A terminal No.86 and a reliable ground. Check whether the circuit is short to ground.

Standard Value:

Test Items	Specified Value
Resistance Between Relay A (86) and EO35 (66)	Less than 1 $\Omega$
Resistance Between Relay A (86) and A Reliable Ground	10 k $\Omega$ or higher

Are measured values specified values?

No

Relay A terminal No.86 and EO35 terminal No.66 wiring harnesses are faulty.

Yes

Step 7 Check ECM working circuit.

- Check whether ECM power supply circuit is normal.
- Check whether ECM ground circuit is normal.

No

Repair the faulty part.

Yes

Step 8 Replace ECM.

- Carry out crankshaft self learn after ECM replacement. Refer to [2.12.7.11 Crankshaft Position Sensor \(CKP\) Learn](#).

Next

Step 9 Diagnostic completed.

## 2.19 Lubrication System JL4G15-D

### 2.19.1 4G15-D Engine Lubrication System Overview

Compared with 4G18-D, 4G15-D engine lubrication system has the same content in Specification, Description and Operation, the System Working Principle, Component Locator, Schematic, Removal and Installation. For specific information, please refer to [2.3 Fuel System JL4G18-D](#). This chapter described contents are different from 4G18-D. For relevant information. Refer to the following content.

## 2.19.1 Specifications

### 2.19.1.1 Oil Pump Specifications

Applications	Specifications
Side Clearance	0.025-0.062 mm (0.0010-0.0024 in)
Tooth Gap	0.030-0.099 mm (0.0012-0.0039 in)
Engine Oil Pressure Sensor Plug Pressure	≤40 kPa (≤6 psi)
Oil Pump Output Pressure	0.6 MPa (87 psi)
Oil Pump Relief Valve Opening Pressure	0.42-0.58 MPa (61-85 psi)

## 2.20 Ignition System JL4G15-D

### 2.20.1 4G15-D Engine Ignition System Overview

Compared with 4G18-D, 4G15-D engine ignition system has the same content in Specification, Description and Operation, the System Working Principle, Component Locator, Schematic, Removal and Installation. For specific information, please refer to [2.3 Fuel System JL4G18-D](#). This chapter described contents are different from 4G18-D. For relevant information. Refer to the following content.



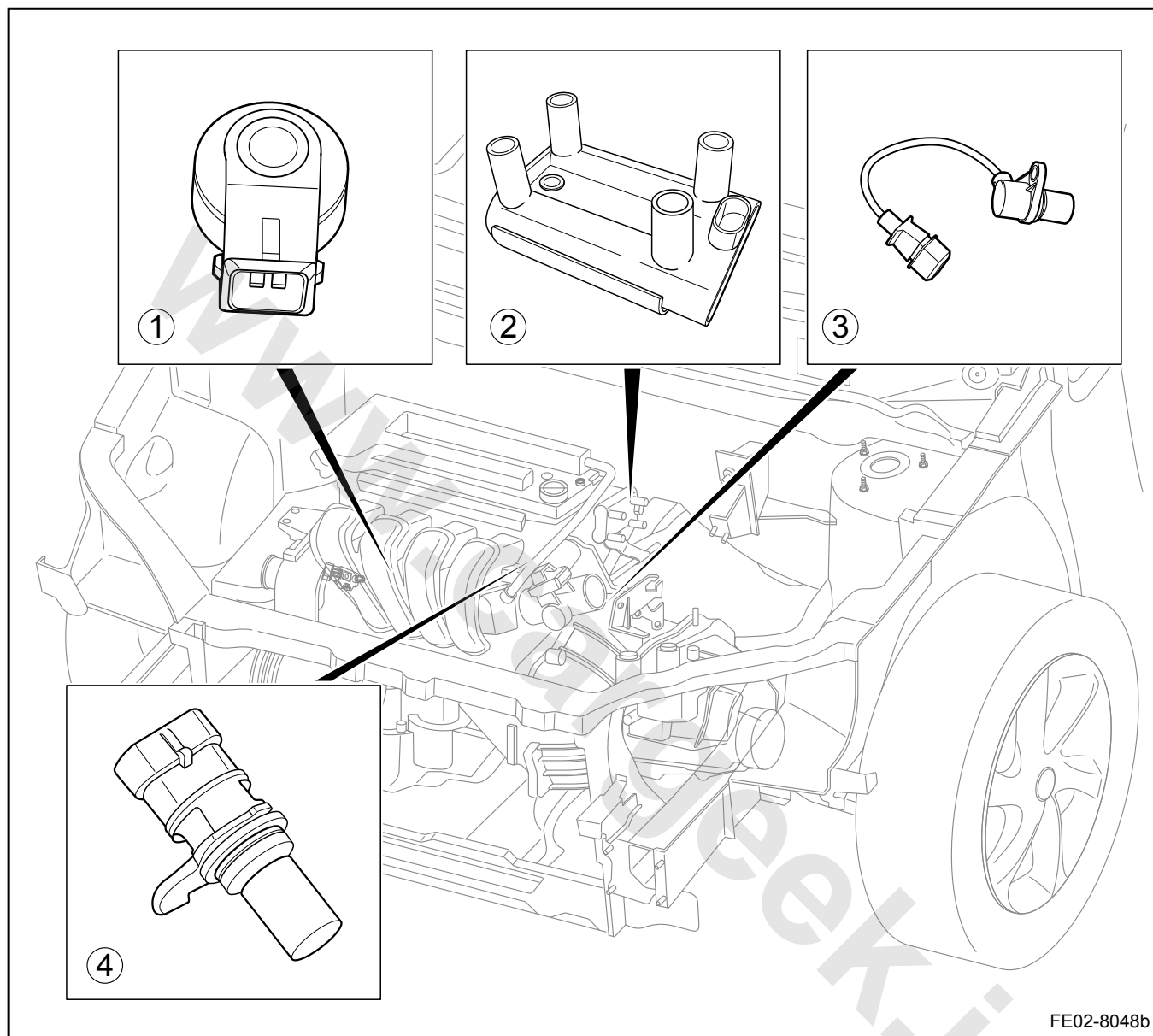
## 2.20.1 Specifications

### 2.20.1.1 Ignition System Specification

Applications	Specifications
Ignition Sequence	1-3-4-2
Ignition Timing	8 °-14 °before TDC
Ignition Type	Spark Discharge
Spark Plug Gap	0.8-1.0 mm (0.03-0.04 in)
Spark Plug Manufacturer	Zhuzhou Torch Spark Plug Co., Ltd.
Spark Plug Model	K6RTC

## 2.20.2 Component Locator

### 2.20.2.1 Component Locator

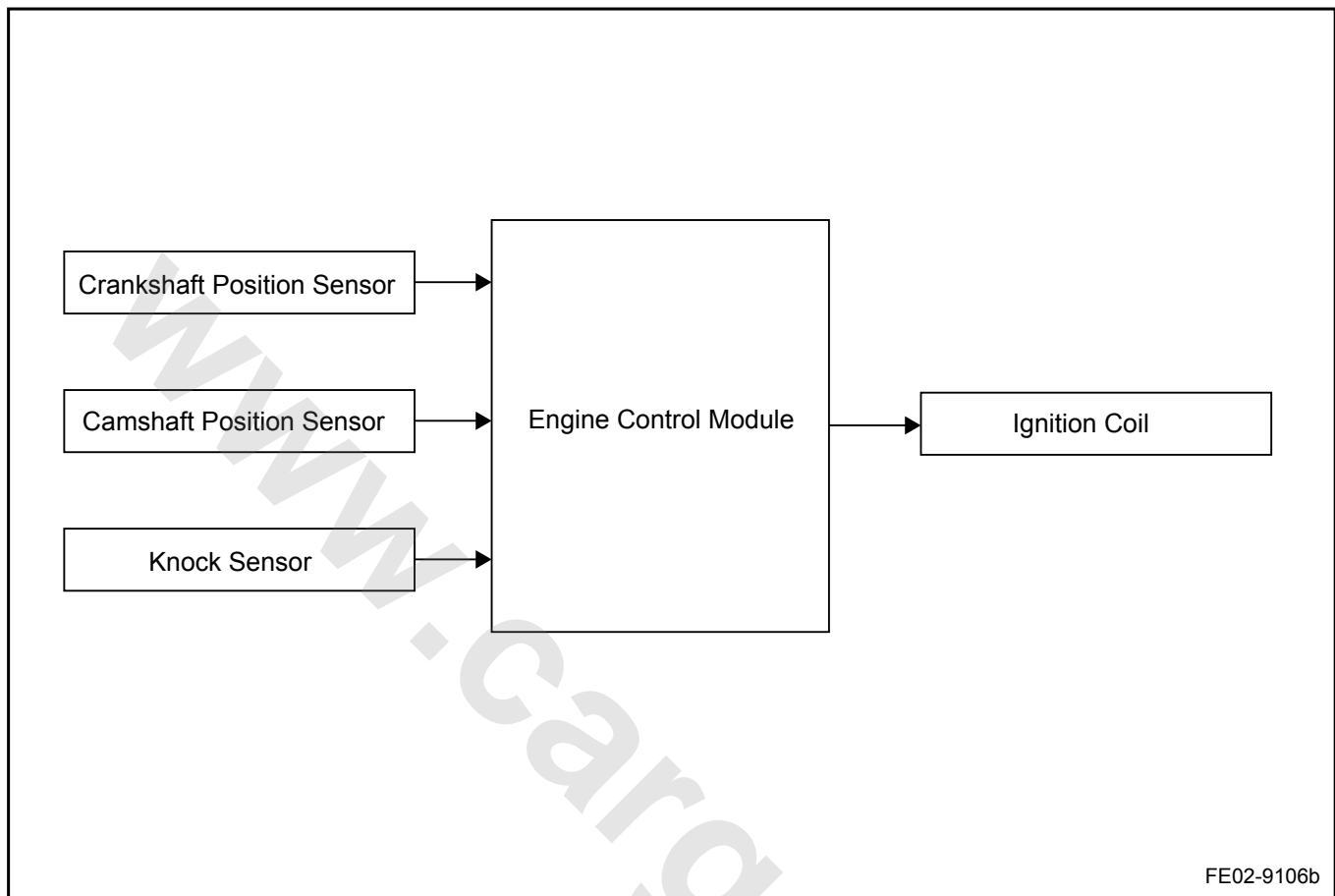


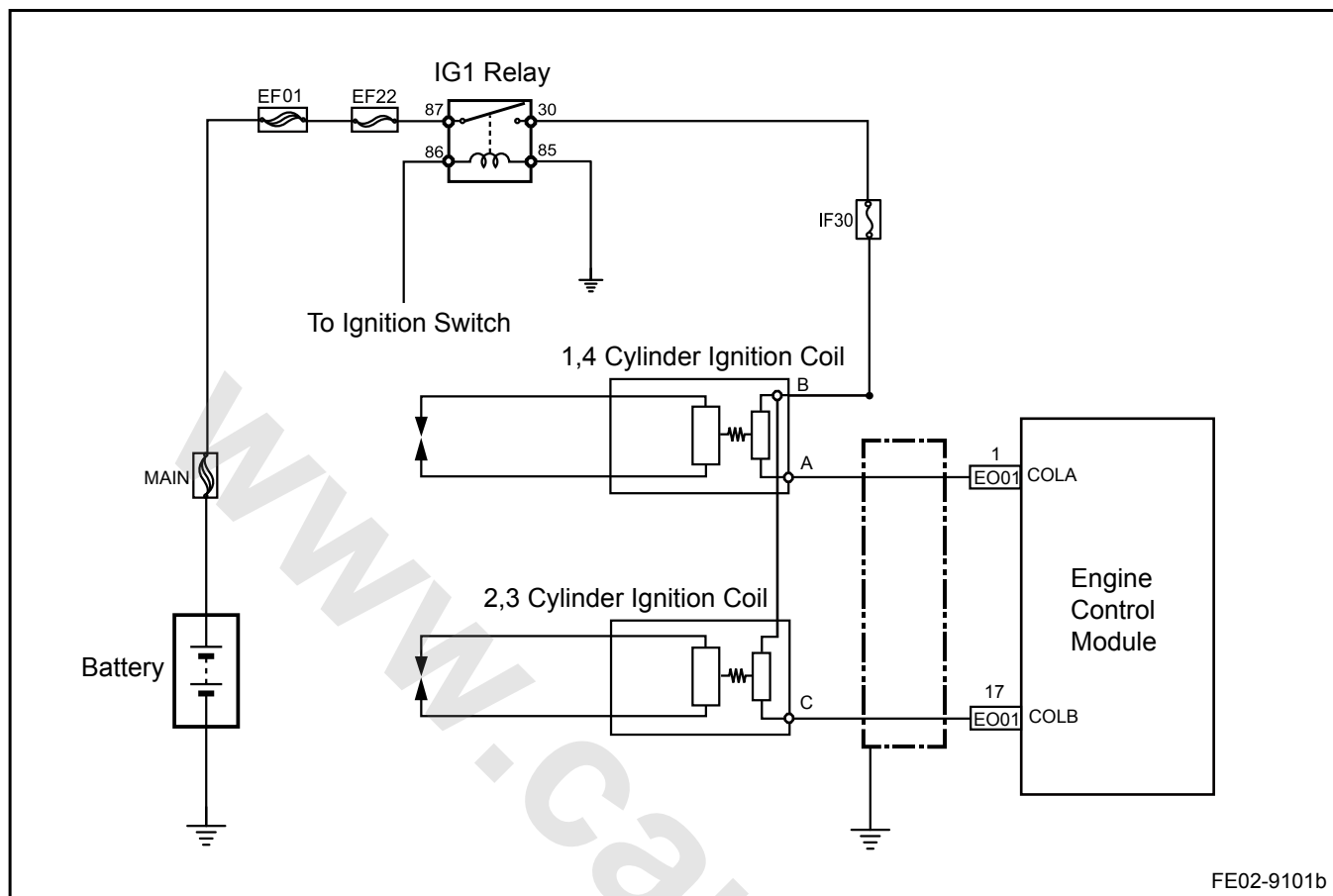
#### Legend

- |                               |                             |
|-------------------------------|-----------------------------|
| 1. Knock Sensor               | 4. Camshaft Position Sensor |
| 2. Ignition Coil              |                             |
| 3. Crankshaft Position Sensor |                             |

## 2.20.3 Schematic

## 2.20.3.1 Schematic





## 2.20.4 Diagnostic Information and Procedures

### 2.20.4.1 Spark Plug No Arcing

#### Note

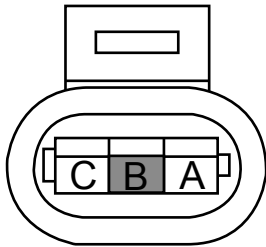
Before carry out this diagnostic procedure, make sure that the engine Anti-theft locking system is not activated and working properly.

#### Note

During this test, it is prohibited to connect the high-voltage damping line to ground, as this may damage the ignition coil or the engine control module. The correct approach is to connect spark plug one end to a known good high-voltage damping line, the other end to a reliable ground.

Step 1	Instruments, wiper and other electrical accessories work properly?
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">             Ignition relay IG1 is not working properly.              Refer to <a href="#">2.10.7.4 Ignition Relay IG1 No Power Output</a> </div> </div>	

Yes	
Step 2	Check the ignition coil working power supply.

<p>Ignition Coil Harness Connector EO19</p>  <p style="text-align: right; font-size: small;">FE02-9102b</p>	<p>(a) Turn the ignition switch to "OFF" position.</p> <p>(b) Disconnect the ignition coil harness connector EO19.</p> <p>(c) Turn the ignition switch to "ON" position.</p> <p>(d) Measure voltage between ignition coil harness connector EO19 terminal B and a reliable ground.</p> <p>Standard Voltage: 11-14 V</p> <p>Voltage normal?</p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">             Ignition relay IG1 terminal No.30 circuit is open.           </div> </div>
--	--

Yes	
Step 3	Measure the ignition coil primary resistance.

(a) Turn the ignition switch to "OFF" position.

(b) Disconnect the ignition coil harness connector EO19.

(c) Measure resistance between ignition coil terminal B and A or between terminal B and C.

Standard Resistance Value: 0.45-0.55 Ω

Is resistance normal?

No

Replace the ignition coil.

Yes

Step 4 Measure the ignition coil secondary resistance.

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the ignition coil harness connector EO19.
- (c) Measure resistance between ignition coil secondary terminals.

Standard Resistance Value: 8.86-10.82 kΩ

Is resistance normal?

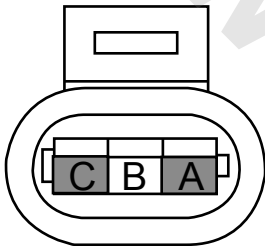
No

Replace the ignition coil.

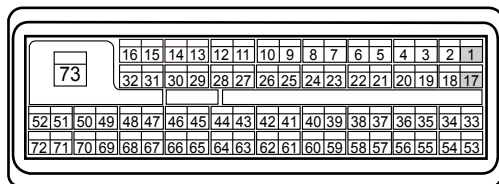
Yes

Step 5 Check the ignition coil control circuit.

Ignition Coil Harness Connector EO19



ECM Harness Connector EO01



FE02-9105b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect ECM harness connector EO01.
- (c) Disconnect the ignition coil harness connector EO19.
- (d) With a multimeter, measure resistance between ECM harness connector EO01 terminal No.1 and ignition coil harness connector EO19 terminal A, and resistance between EO01 terminal No.17 and EO19 terminal C.
- (e) With a multimeter, measure resistance between ignition coil harness connector EO19 terminal A, C and a reliable ground. Check whether the circuit is short to ground.
- (f) With a multimeter, measure voltage between ignition coil harness connector EO19 terminal A, C and a reliable ground. Check whether the circuit is short to power supply.

Test Items	Standard Value
EO01 (1)-EO19 (A) / EO01 (17)-EO19 (C) Resistance	0 Ω
Resistance Between EO19 (A, C) and A Reliable Ground	10 kΩ or higher
Voltage Between EO19 (A, C) and A Reliable Ground	0 V

All normal?

No

Repair the circuit fault.

Yes

### Note

Each time the ignition switch can not stay at the "ST" position longer than 5 s, otherwise it will damage the starter motor.

## Note

Connect scan tool, when the ignition switch is turned to "ST" position, observe the scan tool data: Engine / data list / "engine speed."

Step 6	Turn the ignition switch to the "ST" position, is engine speed showing?
Showing speed?	
<div> <div>No</div> <div>Go to step 10</div> </div>	
<div>Yes</div>	
Step 7	Check the crankshaft position sensor.
(a) For inspection steps. Refer to <a href="#">2.12.7.35 DTC P0335 P0336</a> . Is resistance normal?	
<div> <div>No</div> <div>Replace the crankshaft position sensor.</div> </div>	
<div>Yes</div>	
Step 8	Check the crankshaft position sensor signal circuit.
(a) For inspection steps. Refer to <a href="#">2.12.7.35 DTC P0335 P0336</a> . All normal?	
<div> <div>No</div> <div>Repair the circuit fault.</div> </div>	
<div>Yes</div>	
Step 9	Check ECM power supply circuit.
(a) For inspection steps. Refer to <a href="#">2.12.7.43 DTC P0562 P0563</a> . Is ECM power supply circuit normal?	
<div> <div>No</div> <div>Repair the circuit fault.</div> </div>	
<div>Yes</div>	
Step 10	Replace ECM.
(a) Carry out crankshaft self learn after ECM replacement. Refer to <a href="#">2.12.7.11 Crankshaft Position Sensor (CKP) Learn</a> .	
<div>Next</div>	
Step 11	Diagnostic completed.

## 2.20.5 Removal and Installation

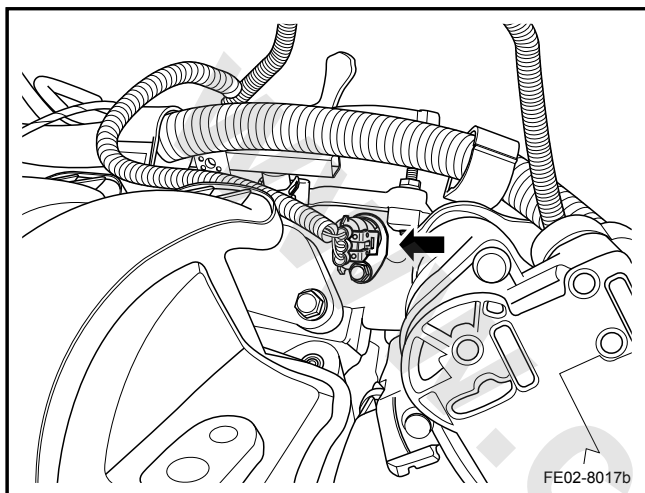
### 2.20.5.1 Camshaft Position Sensor Replacement

Removal Procedure:

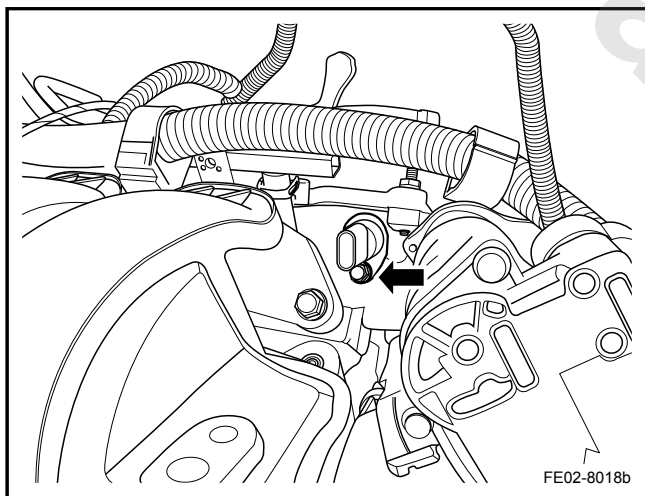
Warning!

Warning: Refer to "Battery Disconnection Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect camshaft position sensor wiring harness connector.



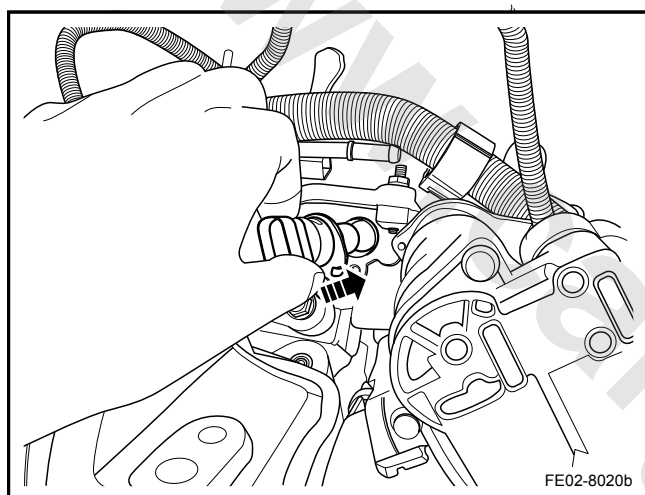
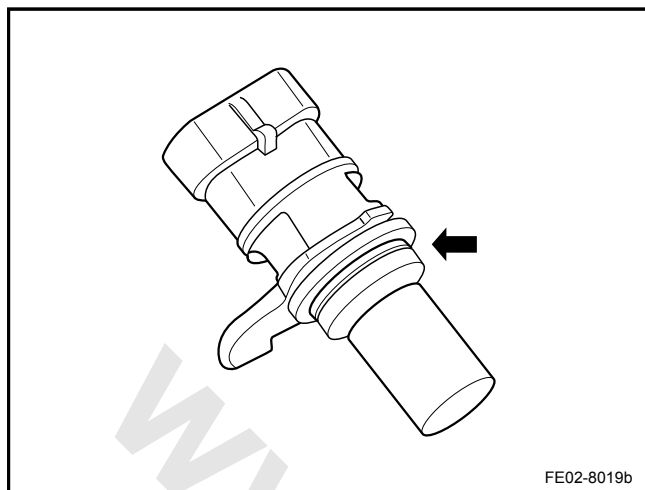
3. Remove camshaft position sensor retaining bolts and remove the sensor.



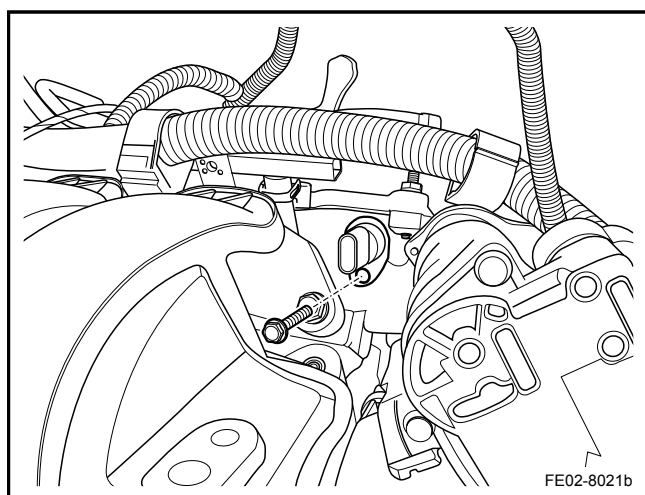


## Installation Procedure:

1. Check whether the camshaft position sensor seal is intact.

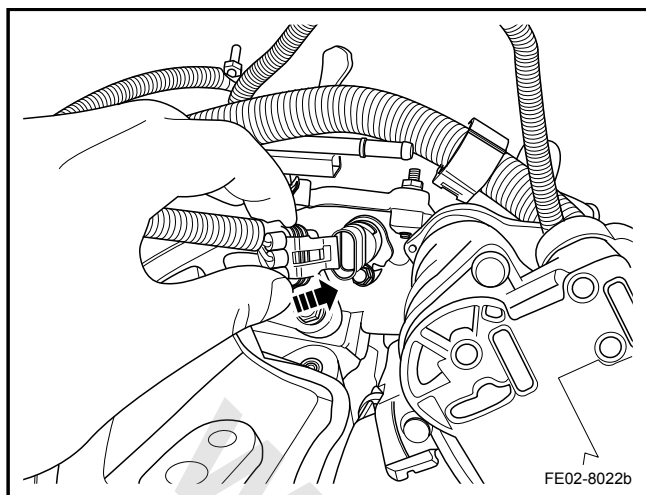


2. Install camshaft position sensor.



3. Install and tighten camshaft position sensor retaining bolts.

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

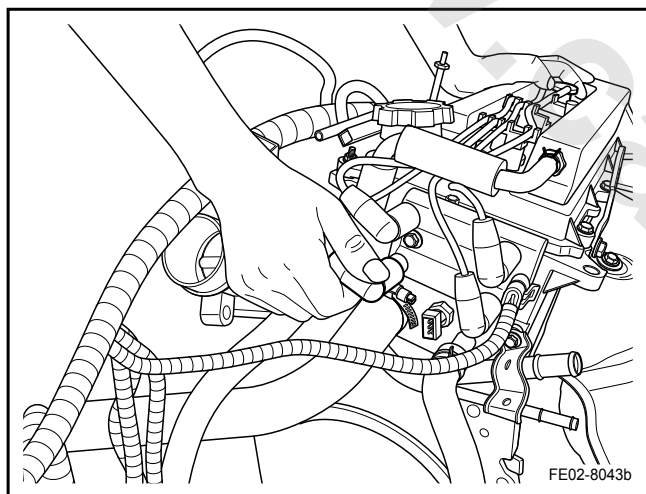


4. Connect camshaft position sensor wiring harness connector.
5. Connect the battery negative cable.

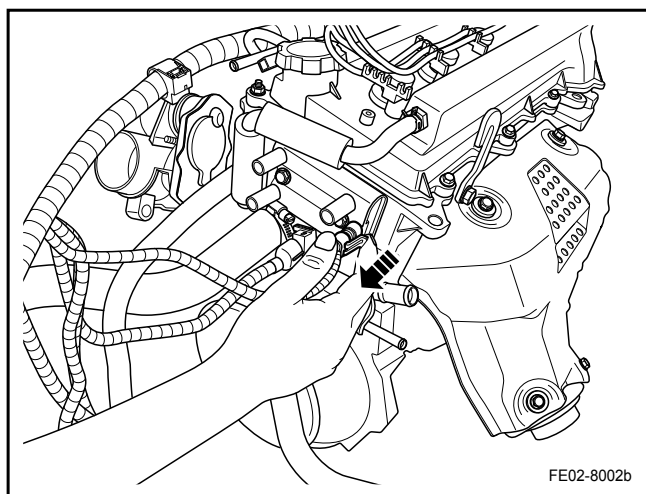
### 2.20.5.2 Ignition Coil Replacement

#### Warning!

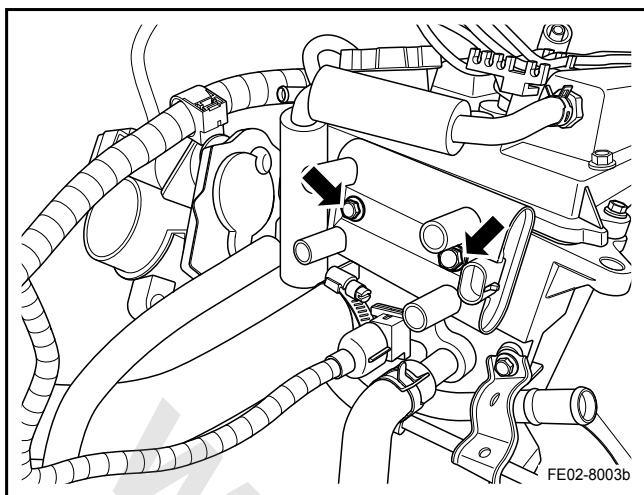
Warning: Refer to "Battery Disconnection Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect high-voltage damping line from the ignition coil.



3. Disconnect ignition coil harness connector.

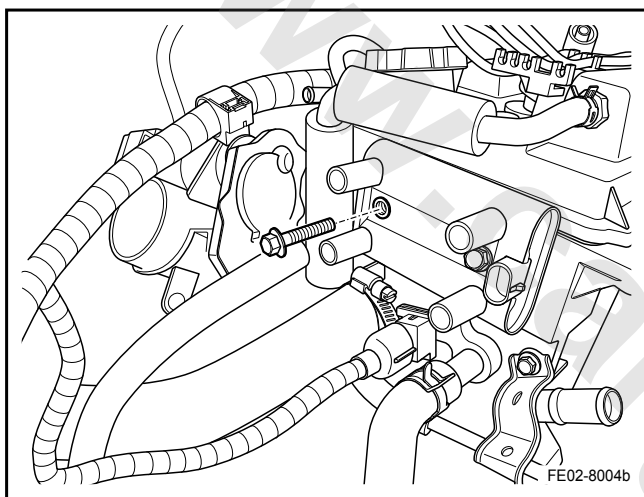


4. Remove the ignition coil bolts and remove the ignition coil.

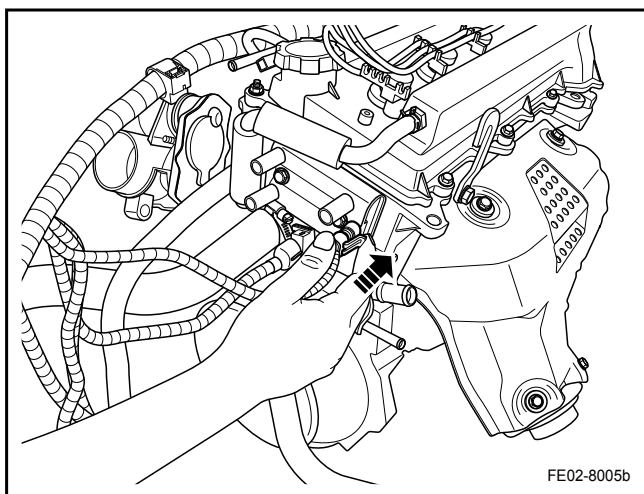
#### Installation Procedure:

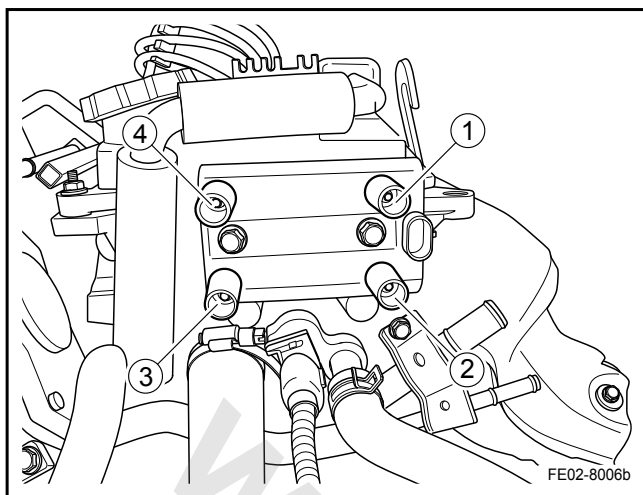
1. Install the ignition coil and tighten retaining bolts.

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

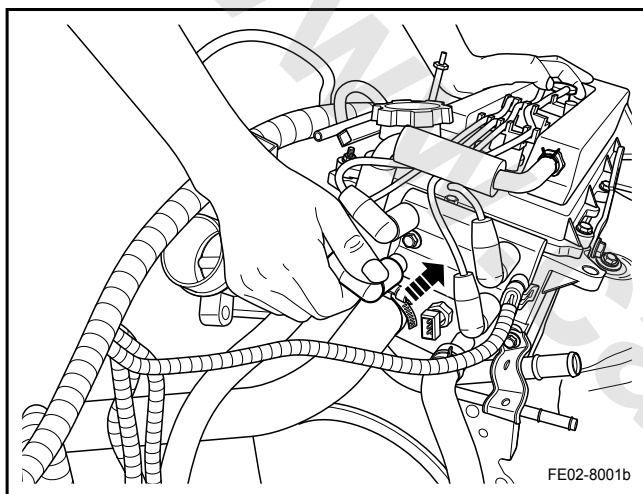


2. Connect the ignition coil harness connector.





3. Connect high-voltage damping line according to the number of labels on the ignition coil.



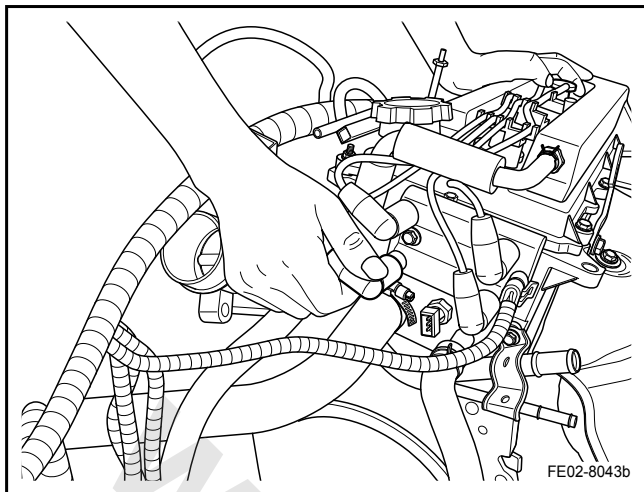
4. Connect high-voltage damping line.
5. Connect the battery negative cable.

### 2.20.5.3 High-voltage Damping Line Replacement

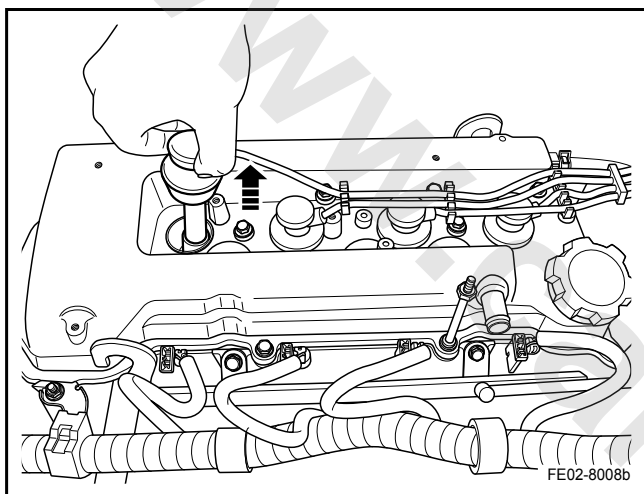
Removal Procedure:

Warning!

Warning: Refer to "Battery Disconnection Warning" in "Warnings and Notices".



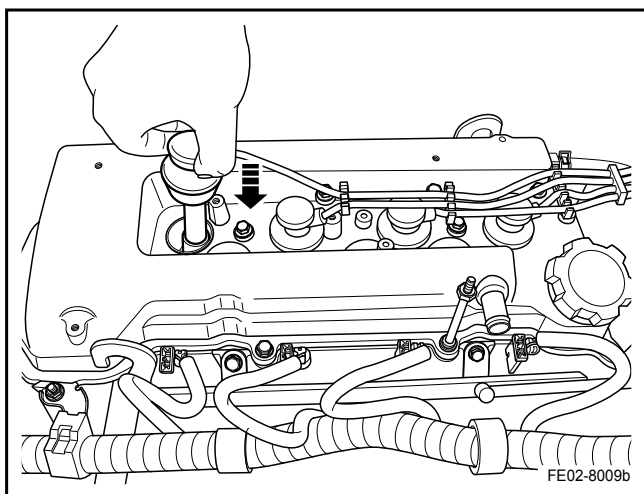
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect high-voltage damping line from the ignition coil.

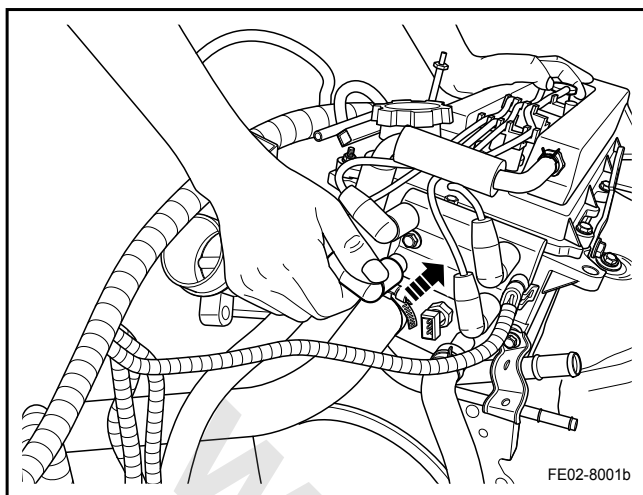


3. Unplug the high-voltage damping line and remove from the high-voltage wire mount.

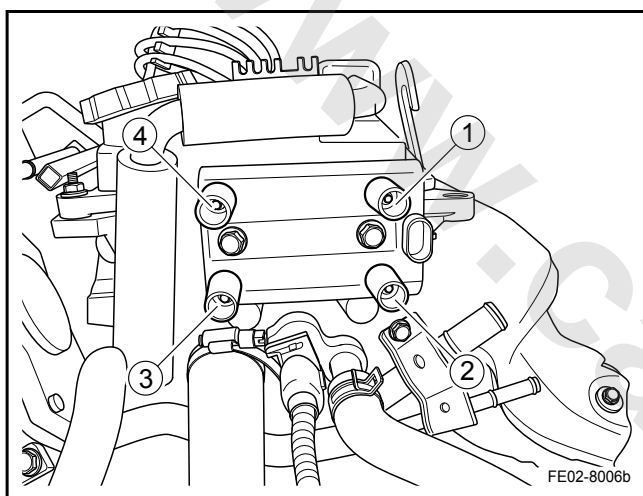
#### Installation Procedure:

1. Install the high-voltage damping line to the engine.

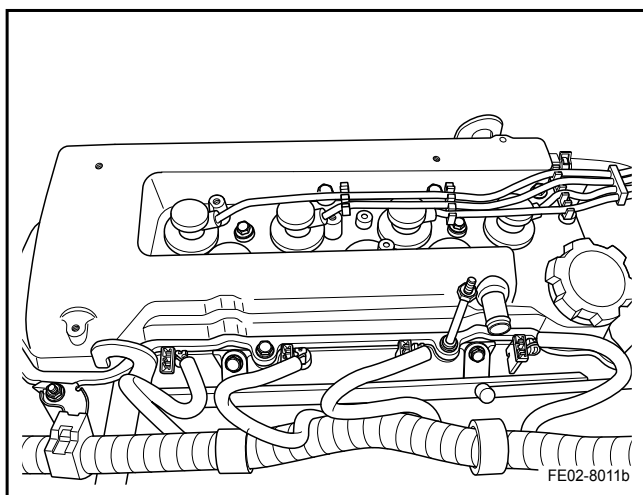




2. Connect the high-voltage damping line to the ignition coil.



3. Connect high-voltage damping line according to the number of labels on the ignition coil.



4. As shown in graphic, fix the high-voltage damping line on the mount in order to avoid high-voltage damping line interference with each other.
5. Connect the battery negative cable.

## 2.21 Starting / Charging System JL4G15-D

### 2.21.1 4G15-D Engine Starting / Charging System Overview

Compared with 4G18-D, 4G15-D engine starting / charging system has the same content in Specification, Description and Operation, the System Working Principle, Component Locator, Schematic, Removal and Installation. For specific information, please refer to [2.3 Fuel System JL4G18-D](#). This chapter described contents are different from 4G18-D. For relevant information. Refer to the following content.

## 2.21.1 Specifications

### 2.21.1.1 Starter Motor Specifications

#### Starter Motor Specifications

Applications	Specifications
Starter	
Rated Output	12 V, 1.2 kW
Non-Load Performance	Voltage 11.0 V, Current 90 A, Speed 2,800 r/min
Load Performance	Voltage 7.7 V, Current 300 A, Torque 8 Nm, Speed 890 r /min
Solenoid	
Coil Working	Voltage 12.2 V, Current 30 A
Suction Coil Working	Voltage 12.2 V, Current 5 A

### 2.21.1.2 Generator Specifications

Applications	Specifications
Rated Output	14 V, 90 A
Zero Current Speed	Less than 1,200 r/min
Rated Speed	6,000 r/min
Model	JFZ1906



## 3 Transmission / Drive Axle

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## 3.1 Warnings and Notices

### 3.1.1 Warnings and Notices

#### Battery Disconnect Warning

##### Warning!

Warning: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

#### Clutch Dust Warning

##### Warning!

Warning: When servicing clutch parts, do not create dust by grinding or sanding the clutch disc or by cleaning parts with a dry brush or with compressed air. A water-dampened cloth--NOT SOAKED--should be used. The clutch disc may contain fibers which can become airborne if dust is created during servicing. Breathing dust with fibers may cause serious bodily harm.

#### Moving Parts and Hot Surfaces Warning

##### Warning!

Warning: Avoid contact with moving parts and hot surfaces while working around a running engine in order to prevent physical injury.

#### Protective Goggles and Glove Warning

##### Warning!

Warning: Approved safety glasses and gloves should be worn when performing this procedure to reduce the chance of personal injury.

#### Road Test Warning

##### Warning!

Warning: Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

#### Engine Lifting Notice

##### Note

Notice: When raising or supporting the engine for any reason, do not use a jack under the oil pan, any sheet metal, or the crankshaft pulley. Lifting the engine in an unapproved manner may cause component damage.

#### Fastener Notice

##### Note

Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

#### Sealant Notice

##### Note

Notice: Do not allow the RTV sealant to enter any blind threaded hole. RTV sealant that is allowed to enter a blind threaded hole can cause hydraulic lock of the fastener when the fastener is tightened. Hydraulic lock of a fastener can lead to damage to the fastener and/or the components. Hydraulic lock of a fastener can also prevent the proper clamping loads to be obtained when the fastener is tightened. Improper clamping loads can prevent proper sealing of the components allowing leakage to occur. Preventing proper fastener tightening can allow the components to loosen or separate leading to extensive engine damage.

## 3.2 Clutch System

### 3.2.1 Specifications

#### 3.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Clutch Cylinder Bolts	M8 × 1.25 × 25	18-22	13.3-16.2
Clutch Master Cylinder Assembly Retaining Nut	M8	16-26	11.8-19.2
Clutch Cylinder Oil Pipe Bracket Bolts	M8 × 1.25 × 16	18-22	13.3-16.2
Clutch / Brake Pedal Assembly Retaining Nut	M8	16-26	11.8-19.2
Clutch Pressure Plate and Driven Plate Bolts	M8 × 1.25 × 14	22-33	16.2-24.3

#### 3.2.1.2 General Specifications

Applications	Specifications	
	Metric (mm)	Inch (in)
Oil (Hydraulic Clutch)	DOT4	
Clutch Pedal Working Travel	128	5.0
Clutch Pedal Free Travel	6-12	0.2-0.5
Clutch Pressure Plate Outer Diameter	256	10.1
Clutch Driven Plate Outer Diameter	212	8.3
Clutch Disc Wear Limit (Rivet Head Depth)	0.5	0.02
Flywheel Plane Run Out (Clutch Driven Plate Mating Surface)	0.06	0.0024

### 3.2.2 Description and Operation

#### 3.2.2.1 Description and Operation

The clutch is located between the engine and the transmission. The clutch is retained to the flywheel rear surface by retaining bolts. The clutch spline hub and transmission input shaft form rigid connections. During driving, the driver can press or release the clutch pedal, to temporarily separate the engine and the transmission and or connect the engine and the transmission gradually, to cut off or pass the engine to the transmission input power. Clutch system mainly includes the following components:

- Drive parts: Clutch pressure plate. Clutch pressure plate is fixed to the flywheel by retaining bolts.
- Driven parts: Clutch driven plate with a splined hub. Spline hub slides along the input shaft. Drive parts and driven parts maintain contact through spring pressure. The pressure is applied by the diaphragm spring in the pressure plate assembly.
- Working parts: Clutch separation system consists of the clutch pedal, split shaft, fork and split bearings. When the clutch pedal is pressed, the isolation bearings are pushed. Bearings then pushes the separation rod within the pressure plate and then the clutch is separated.

### 3.2.3 System Working Principle

#### 3.2.3.1 System Working Principle

##### 1. Make Sure Vehicle Smooth Start:

Before start, the vehicle is stationary. If the engine and transmission has a rigid connection, and once a gear is engaged, vehicle will suddenly move forward because of the suddenly transmitted power. It not only will cause mechanical parts damage, but also the driving force is not enough to overcome the enormous inertia caused by the forward force, so that the rapidly decrease in engine speed will shut down the engine. If a clutch is used when starting, the engine and transmission will be temporarily separated, and then the clutch will gradually engage. Due to the sliding between the clutch driving parts and the driven part, the torque transmitted from the clutch gradually increases from zero, while the vehicle driving force gradually increases, so that the vehicle starts smoothly.

##### 2. Easy to Shift:

During driving, there is a need to frequently switch to different gears in order to adapt to changing driving conditions. If there is no clutch to temporarily separate the engine and transmission, then the transmission meshing gears will be hard to separate due to the unreleased load. In addition, gears with different speeds are difficult to mesh. Even if forced into the mesh, there will be a huge impact on tooth side and cause damage to parts. The use of the clutch to temporarily separate the engine and transmission, then the original pair of meshing gears surfaces pressure will be greatly reduced due to load released, and are easy to separate. For the other pairs of meshing gears, because the gear is separated from the engine, the inertia is small. Use appropriate shifting action to make the gears meshing circumferential speed to be equal to or close to equal, so as to avoid or mitigate the impact between gears.

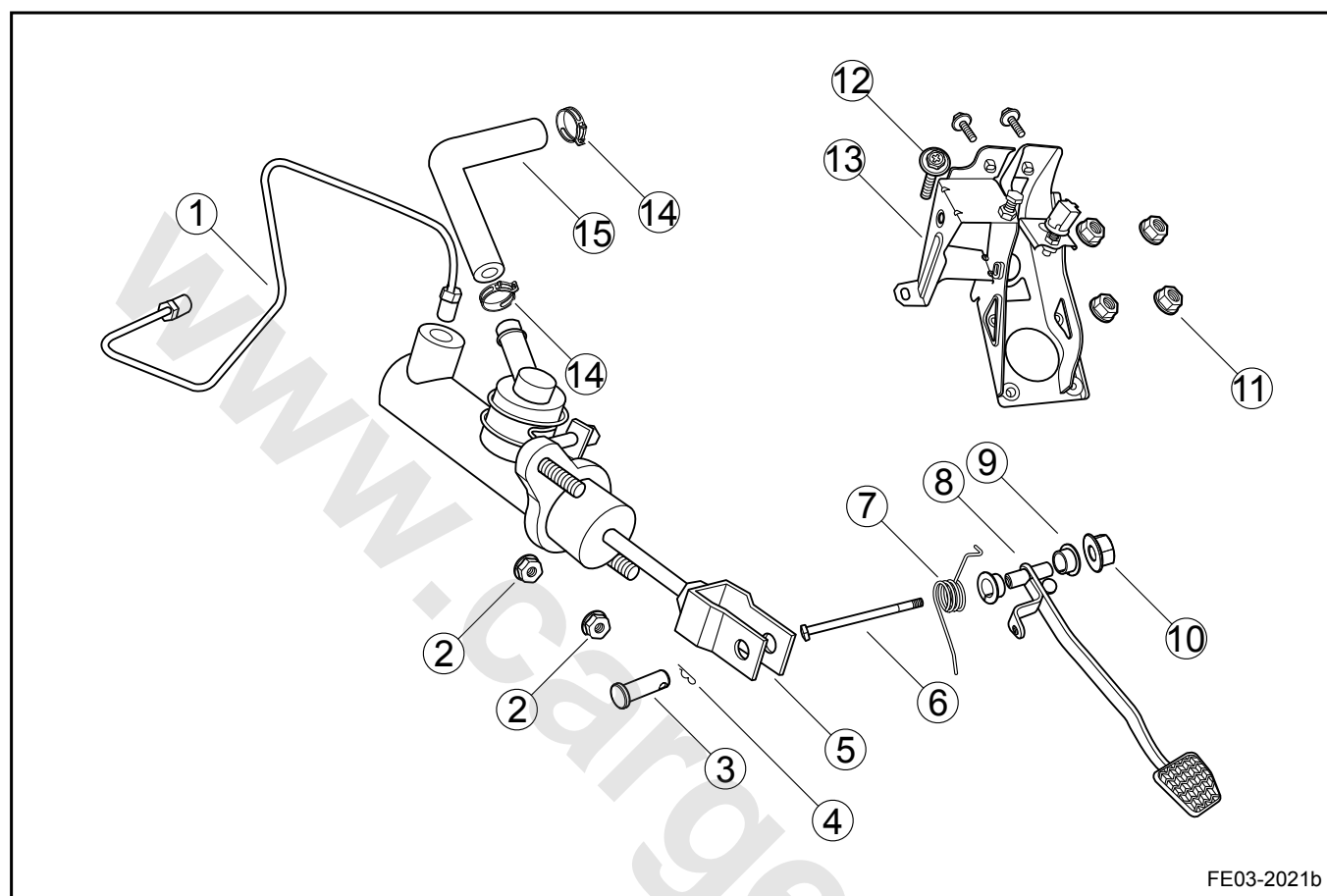
##### 3. Prevent the Transmission System Overload:

During emergency braking, the wheel speed suddenly decreases. Transmission system is connected to the engine and has the rotation inertia, so it remains the original speed, which generates a far greater inertia torque than the engine, causing damage to the powertrain parts. As the clutch relies on friction to transmit torque, so when the transmission system load exceeds the friction torque, the clutch drive parts and driven parts will skid, thus to prevent the overload .

## 3.2.4 Disassemble View

## 3.2.4.1 Disassemble View

Clutch

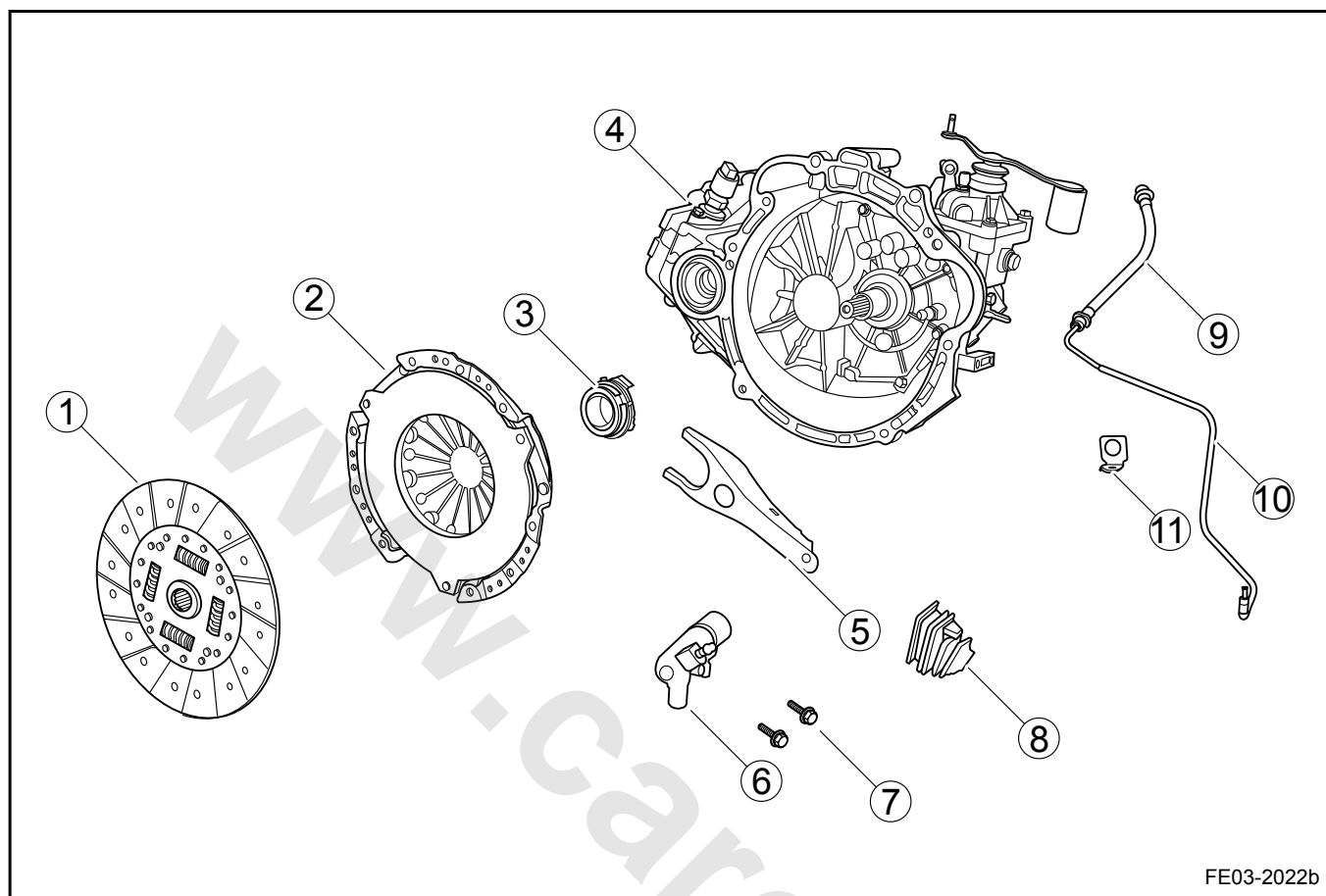


FE03-2021b

## Legend

- |  |  |
|--|--|
| 1. Master Cylinder Oil Outlet Components | 10. Pedal Retaining Nut                                |
| 2. Clutch Master Cylinder Retaining Nuts | 11. Clutch Pedal and Brake Pedal Bracket Mounting Nut  |
| 3. Pin $\phi 8 \times 24$                | 12. Clutch Pedal and Brake Pedal Bracket Mounting Bolt |
| 4. Lock Pin                              | 13. Clutch Pedal Bracket                               |
| 5. Clutch Master Cylinder Assembly       | 14. Screw Driving Double Steel Wire Hoop               |
| 6. Clutch Pedal and Brake Pedal Bolts    | 15. Master Cylinder Oil Inlet Hose                     |
| 7. Clutch Pedal Return Spring            |  |
| 8. Clutch Pedal                          |  |
| 9. Lubrication Sleeve                    |  |

## Clutch Body



FE03-2022b

## Legend

- |                          |   |
|--------------------------|---|
| 1. Clutch Driven Plate   | 8. Separation Fork Jacket                   |
| 2. Clutch Pressure Plate | 9. Clutch Hydraulic Hose                    |
| 3. Release Bearings      | 10. Clutch Cylinder Oil Inlet Pipe          |
| 4. Transmission Assembly | 11. Clutch Hydraulic Hose Retaining Bracket |
| 5. Separation Fork       |   |
| 6. Clutch Cylinder       |   |
| 7. Clutch Cylinder Bolts |   |



### 3.2.5 Diagnostic Information and Procedures

#### 3.2.5.1 Diagnosis Description

Refer to "Description and Operation" and start system diagnostics. When a malfunction occurs. Refer to "Description and Operation" as it will help determine the correct symptom diagnostic procedures, so that it will also help to determine whether the customer described condition is normal. Refer to [3.2.2 Description and Operation](#) to confirm the correct procedures for system diagnostics.

#### 3.2.5.2 Clutch Inseparable Malfunction (Gearshift Lever Can Not Select Gear)

**Fault Definition:** In the normal engine running condition, press the clutch pedal to the full travel, the gearshift lever can not engage to or disengage from a gear.

Step 1	check whether there are obstacles under the clutch pedal?
	(a) Check whether the floor blocks the clutch pedal travel. (b) Check whether installed after market equipment, such as rubber flooring, etc. affecting the clutch pedal travel.
	<div style="display: flex; justify-content: space-between;"> <div>Yes</div> <div>Repair the faulty part.</div> </div>
	No
Step 2	Press the clutch pedal, check whether the clutch release fork moves?
	<div style="display: flex; justify-content: space-between;"> <div>Yes</div> <div>Go to step 8</div> </div>
	No
Step 3	Check whether the travel between the clutch pedal and clutch master cylinder is too great?
	(a) Check the pedal bushing for wear and tear.
	<div style="display: flex; justify-content: space-between;"> <div>Yes</div> <div>Replace pedal bush.</div> </div>
	No
Step 4	Check whether the clutch master cylinder is seized or binding?
	<div style="display: flex; justify-content: space-between;"> <div>Yes</div> <div>Replace the clutch master cylinder. Refer to <a href="#">3.2.6.2 Clutch Master Cylinder Replacement</a></div> </div>
	No
Step 5	Bleed the clutch hydraulic system. Refer to <a href="#">3.2.6.3 Hydraulic Clutch Bleeding</a> , Does clutch fork resume normal actions?
	<div style="display: flex; justify-content: space-between;"> <div>Yes</div> <div>System normal</div> </div>
	No
Step 6	Check whether the clutch slave cylinder is seized or binding? (Under normal circumstances, cylinder should be able to move freely.)

Yes

Replace the clutch slave cylinder. Refer to [3.2.6.7 Clutch Slave Cylinder Replacement](#)

No

Step 7 Clutch master cylinder leaking internally?

Inspect for correct clutch pedal reserve.

- (a) Release the clutch pedal to the halfway position.
  - (b) Apply the clutch pedal several times.
  - (c) Inspect to ensure the clutch pedal reserve is correct.
- Clutch pedal reserve?

Yes

Replace the clutch slave cylinder. Refer to [3.2.6.7 Clutch Slave Cylinder Replacement](#)

No

Step 8 Remove the transmission assembly. Check whether the clutch driven plate is damaged? (Whether warp or bend)

Yes

Replace the clutch driven plate. Refer to [3.2.6.5 Clutch Assembly Replacement](#)

No

Step 9 Remove the transmission assembly. Check whether the clutch pressure plate is damaged? (Whether warp or bend)

Yes

Replace the clutch pressure plate. Refer to [3.2.6.5 Clutch Assembly Replacement](#)

No

Step 10 Remove the transmission assembly, check whether the clutch driven plate is bidding on the transmission input shaft axle?

Yes

Replace the clutch driven plate. Refer to [3.2.6.5 Clutch Assembly Replacement](#)

No

Step 11 System normal.

### 3.2.5.3 Clutch Slipping

Fault Definition: When the first gear is selected and the clutch is fully engaged, the vehicle is difficult to start or can not start.

Step 1 Check whether the clutch pedal height is correct, otherwise the clutch master cylinder can not be completely reset. Measure the clutch pedal free travel. Refer to [3.2.6.4 Clutch Pedal Free Travel Adjustment](#).

Next

Step 2 Check whether the pipes are broken or damaged, causing the clutch slave cylinder oil pressure can not be released in time.

Yes

Replace the damaged pipe.

No

Step 3 Check whether the clutch slave cylinder is binding?

Yes

Replace the clutch slave cylinder. Refer to [3.2.6.7 Clutch Slave Cylinder Replacement](#)

No

Step 4 Check whether the clutch master cylinder is binding?

Yes

Replace the clutch master cylinder. Refer to [3.2.6.2 Clutch Master Cylinder Replacement](#)

No

Step 5 Check whether the Clutch Driven plate is overheating?

Yes

Cool the clutch driven plate.

No

Step 6 Remove the transmission. Check whether the clutch disc is contaminated by oil.

Next

Step 7 Remove the transmission. Check whether the clutch driven plate is excessively worn and torn, or broken?

Yes

Replace the clutch driven plate. Refer to [3.2.6.5 Clutch Assembly Replacement](#)

No

Step 8 Check whether the clutch pressure plate or flywheel is warped?

Yes

Replace the clutch pressure plate or flywheel. Refer to [3.2.6.5 Clutch Assembly Replacement](#) and [2.6.8.17 Flywheel Replacement](#)

No

Step 9 Check whether the clutch pressure plate diaphragm spring is too soft. Replace the clutch assembly.

Next

Step 10	Diagnostic completed.
---------	-----------------------

### 3.2.5.4 Clutch Pedal Hard to Push

#### Note

If the clutch oil is not correct, replace the clutch master cylinder, clutch working cylinder, bleed the system and fill the correct oil.

Step 1	Check whether clutch hydraulic oil is correct? (Check whether the brake system is working properly)
--------	---

Next

Step 2	Check whether the clutch oil is contaminated.
--------	---

- (a) Check whether there is water in clutch oil.
- (b) Check whether there is dust or debris in the clutch oil.
- (c) Check whether the clutch oil is subject to the incorrect oil contamination. If the oil is contaminated, replace clutch master cylinder and clutch slave cylinder.
- (d) Flush hydraulic system and fill the correct oil.

Next

Step 3	Check whether the clutch hydraulic hose is twisted or damaged.
--------	--

Next

Step 4	Check the clutch pressure plate, clutch driven plate.
--------	---

Next

Step 5	Diagnostic completed.
--------	-----------------------

### 3.2.5.5 Clutch Pedal Does Not Return

Step 1	Check whether the clutch slave cylinder is binding?
--------	---

Yes

Replace the clutch slave cylinder. Refer to <a href="#">3.2.6.7 Clutch Slave Cylinder Replacement</a>
---

No

Step 2	Check whether the clutch master cylinder is binding?
--------	--

Yes

Replace the clutch master cylinder. Refer to <a href="#">3.2.6.2 Clutch Master Cylinder Replacement</a>
---

No

Step 3 Check whether the clutch pedal height is correct, otherwise the clutch master cylinder can not be completely reset. Measure the clutch pedal free travel. Refer to [3.2.6.4 Clutch Pedal Free Travel Adjustment](#).

Next

Step 4 Check whether the pipes are broken or damaged, causing the clutch slave cylinder oil pressure can not be released in time.

Yes

Replace the damaged pipe.

No

Step 5 Check whether clutch fork or split is binding?

Yes

Separate bearings separate Fork. Refer to [3.2.6.6 Clutch Pilot Bearing Replacement](#)

No

Step 6 Check whether the pressure plate spring is too soft. Replace the clutch pressure plate.

Next

Step 7 Diagnostic completed.

### 3.2.5.6 Clutch Bearings Noisy When Release

Step 1 Check whether the bearing is binding?

Yes

Clean and re-lubricate bearings. Check whether the bearing is damaged.

No

Step 2 Check whether the fork is installed incorrectly. Remove and re-install the correct fork.

Next

Step 3 Diagnostic completed.

### Clutch Rattle

Step 1 Check whether the pressure plate diaphragm spring is too soft?

Yes

Replace the clutch pressure plate

No

Step 2 Check whether the fork is not installed correctly, remove and re-install the correct fork.

[Next](#)

Step 3	Check whether there is engine oil in Clutch Driven plate block?
--------	---

[Yes](#)

Rule out engine oil leakage and replace the clutch driven plate.
--

[No](#)

Step 4	Check whether the Clutch Driven plate damping spring is damaged. Replace the clutch driven plate.
--------	---

[Next](#)

Step 5	Diagnostic completed.
--------	-----------------------

### 3.2.6 Removal and Installation

#### 3.2.6.1 Clutch Pedal Replacement

Removal Procedure:

##### Warning!

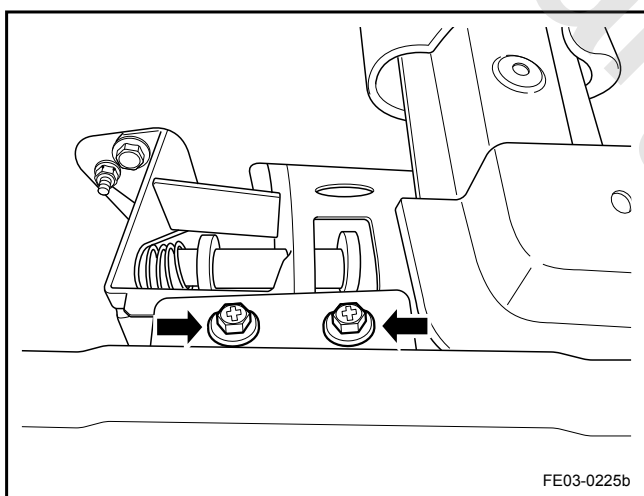
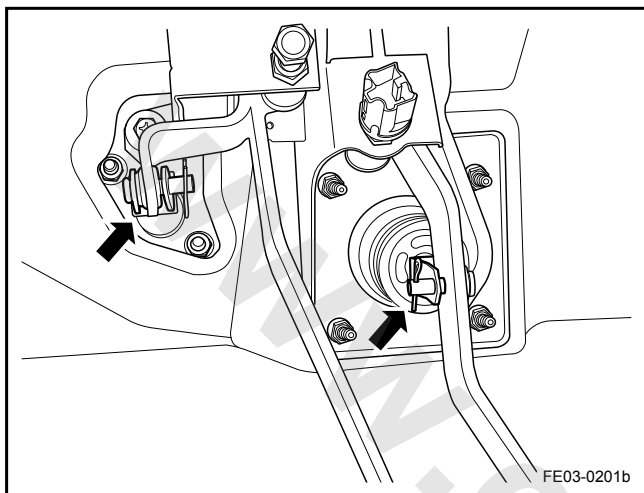
Refer to "Battery Disconnection Warning" in "Warnings and Notices".

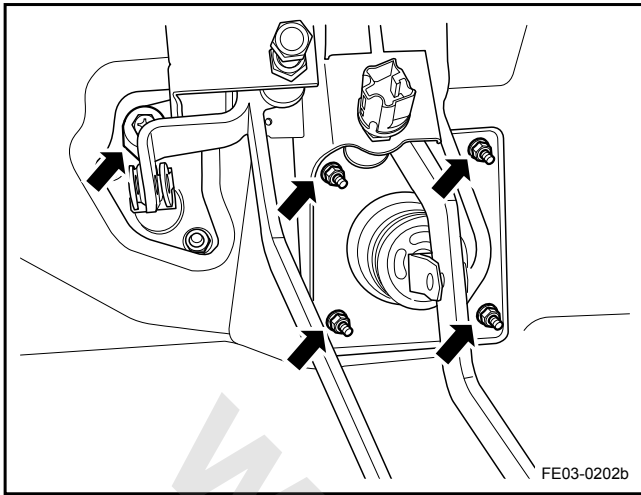
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the instrument panel. Refer to [12.8.3.1 Instrument Panel Replacement](#).

##### Note

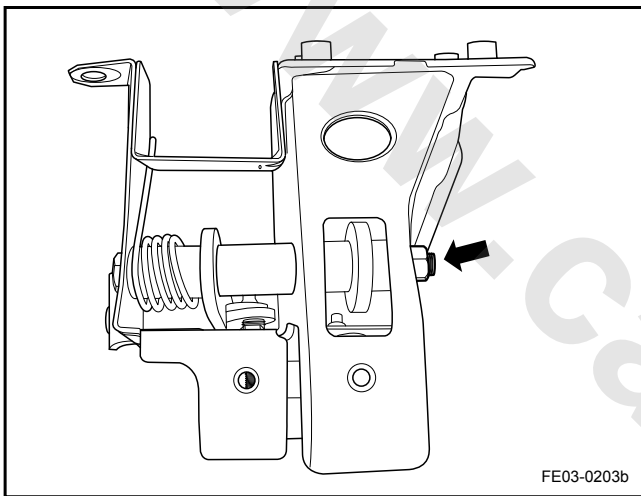
Please use trim repair tools, otherwise interior trims will easily be scratched.

3. Disconnect brake switch wiring harness connector.
4. Separate the clutch master cylinder piston rod U-shaped clip and the clutch pedal.
5. Separate the vacuum brake booster rod U-shaped clip and brake pedal.
6. Remove the clutch pedal assembly upper retaining bolts.

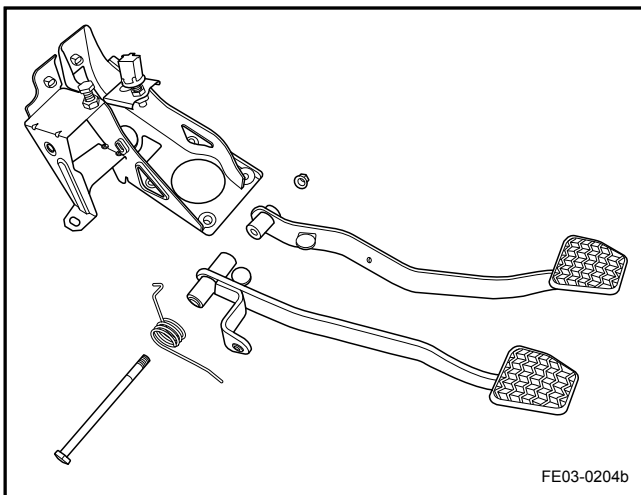




7. Remove clutch / brake pedal assembly bolt and nuts.



8. Remove the clutch / brake pedal assembly, remove screws and pull retaining nuts out of the pedal.
9. Remove the return spring and clutch pedal.



#### Installation Procedure:

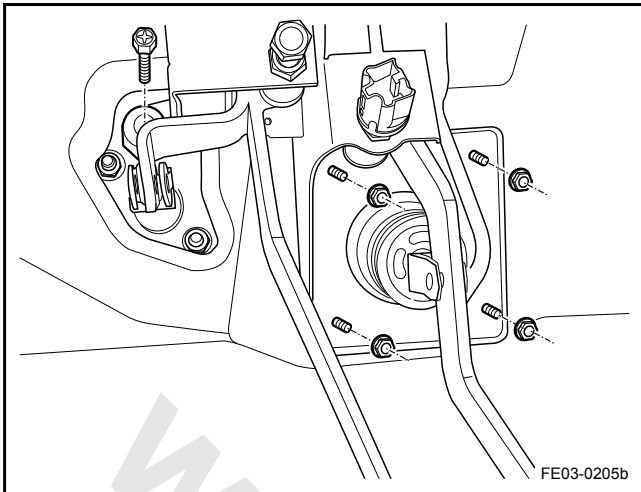
1. Install the return spring and clutch pedal.
2. Install the pedal screws and nuts.

Torque: 35 Nm (Metric) 25.9 lb-ft (US English)

#### Note

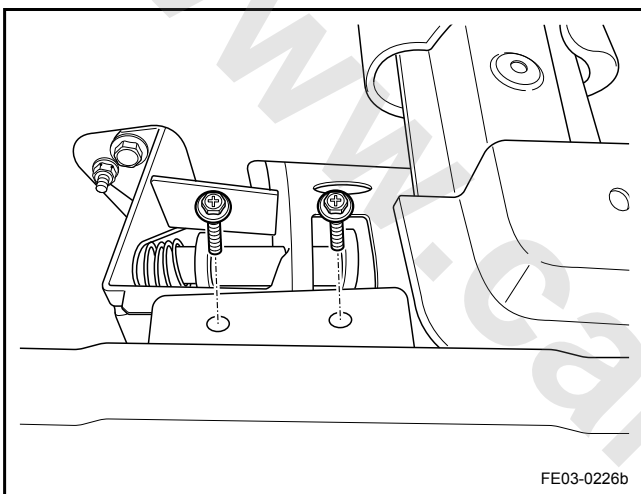
Apply grease on the pedal axle and the return spring.





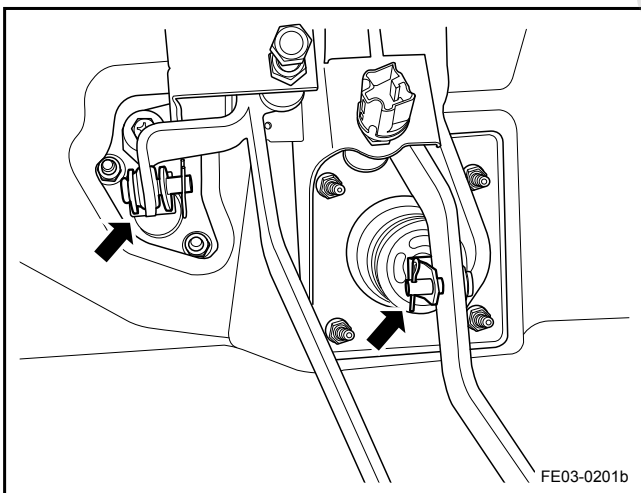
3. Install clutch / brake pedal assembly bolt and nuts.

Torque: 23 Nm (Metric) 17.0 lb-ft (US English)



4. Install clutch pedal assembly upper retaining bolts.

Torque: 23 Nm (Metric) 17.0 lb-ft (US English)



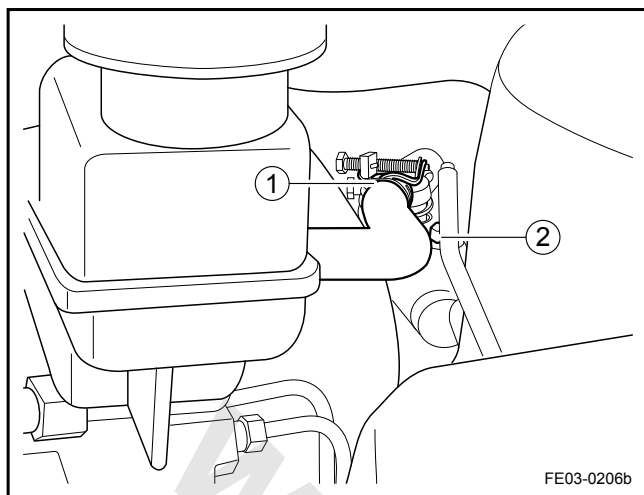
5. Install the vacuum brake booster rod U-shaped clip and the brake pedal connecting pin.
6. Install the clutch master cylinder piston rod U-shaped clip and the clutch pedal connecting pin.
7. Connect brake switch harness connector.
8. If necessary, adjust the clutch pedal free travel.
9. Install the instrument panel.
10. Connect the battery negative cable.

### 3.2.6.2 Clutch Master Cylinder Replacement

Removal Procedure:

**Warning!**

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

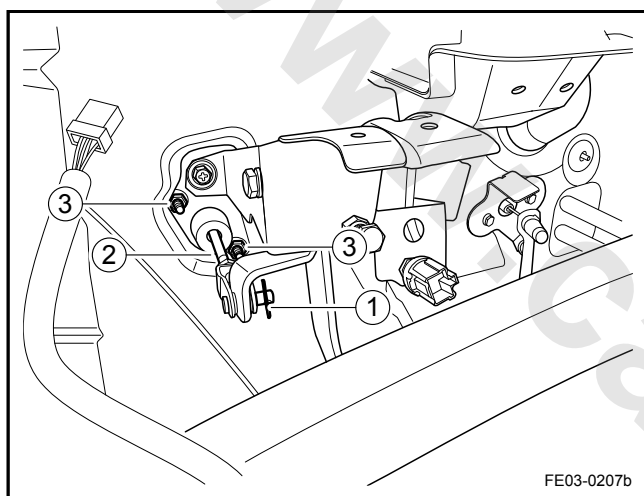


1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove Instrument panel lower left panel. Refer to [12.8.3.1 Instrument Panel Replacement](#).

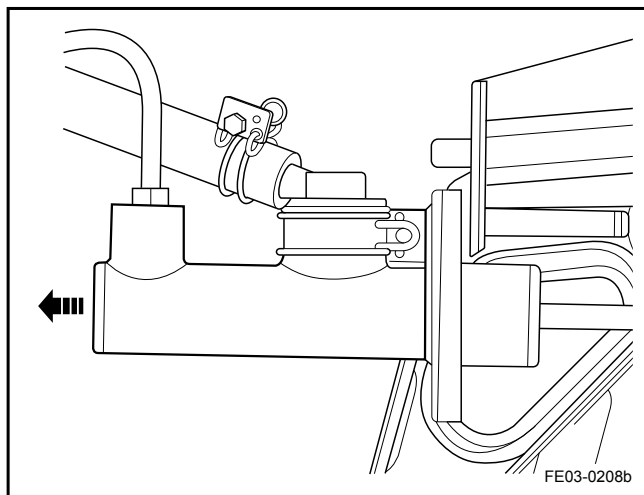
#### Note

Before disconnecting the cylinder, release the clutch / brake fluid.

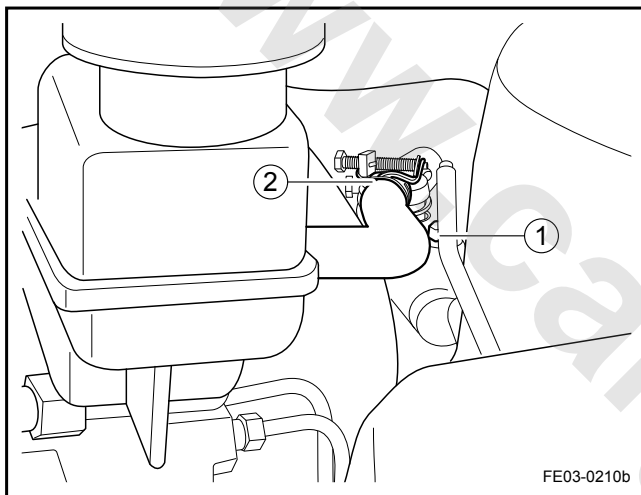
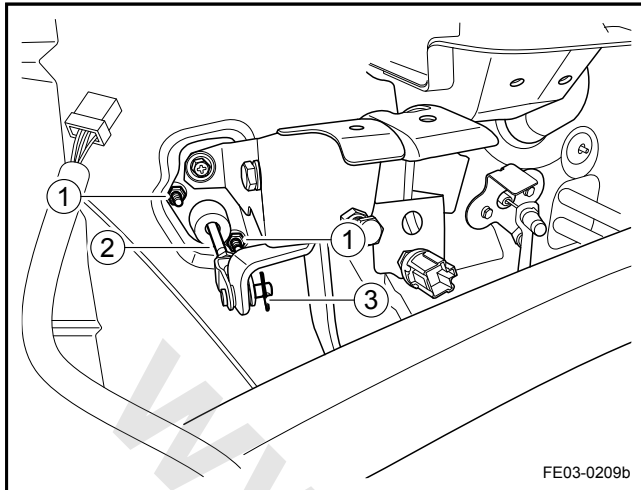
3. Loosen thread on the master cylinder drive dual wire hoop, Remove tank to the master cylinder oil inlet hose (1).
4. Disconnect clutch master cylinder metal connector (2).



5. Remove pin (1) from the clutch pedal and the piston rod U-shaped clip, and pull out connecting pin (1).
6. Release the clutch master cylinder piston rod and the piston rod between the U-shaped clip locking nut, piston rod U-shaped clip from the clutch master cylinder piston rod on the screw of 2.
7. Remove the clutch master cylinder retaining nuts (3).



8. Pull out of master cylinder along the direction of the engine compartment.



#### Installation Procedure:

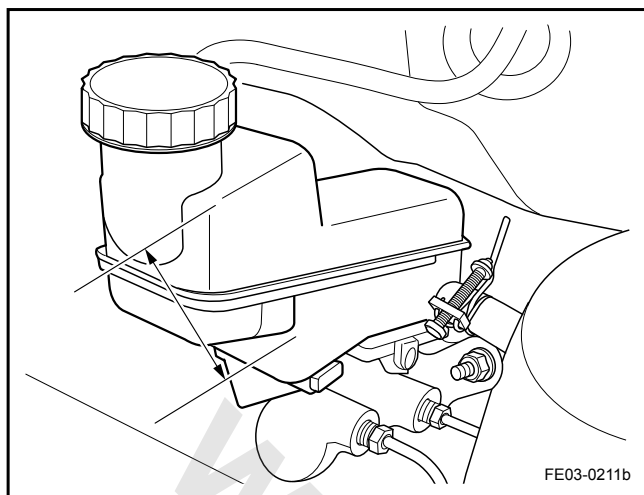
1. Install clutch master cylinder and tighten clutch master cylinder retaining nuts (1).  
Torque: 23 Nm (Metric) 17.0 lb-ft (US English)
2. Install piston rod U-shaped clip to the clutch master cylinder piston rod, and tighten the clutch master cylinder piston rod and the piston rod U-shaped locking nut (20).  
Torque: 11 Nm (Metric) 8.1 lb-ft (US English)
3. Install connecting pin (3) between the clutch pedal and the piston rod U-shaped clip, lock the pin (3).
4. Connect the clutch master cylinder metal connector 1.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
5. Install the master cylinder oil inlet hoses, tighten the steel clamp (2).  
Torque: 14 Nm (Metric) 10.3 lb-ft (US English)
6. Bleed air.
7. Adjust the clutch pedal.
8. Install Instrument panel lower left shield panel.
9. Fill the clutch / brake fluid to the MAX (maximum) mark.
10. Connect the battery negative cable.

### 3.2.6.3 Hydraulic Clutch Bleeding

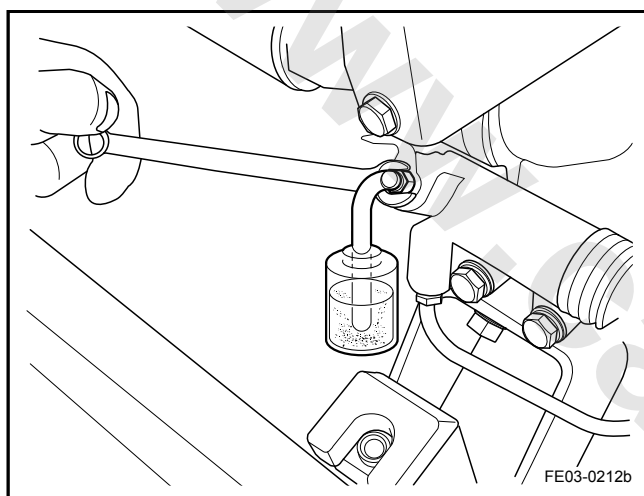
#### Note

Brake fluid is corrosive and it will damage electrical connectors and paint. Use a suitable container and fender cover to prevent exposure to brake fluid. Use cotton cloth to wipe spilled fluid.

It is prohibited to refill brake fluid to the clutch master cylinder brake fluid reservoir, because the used brake fluid may be mixed with the air, impurities and moisture.

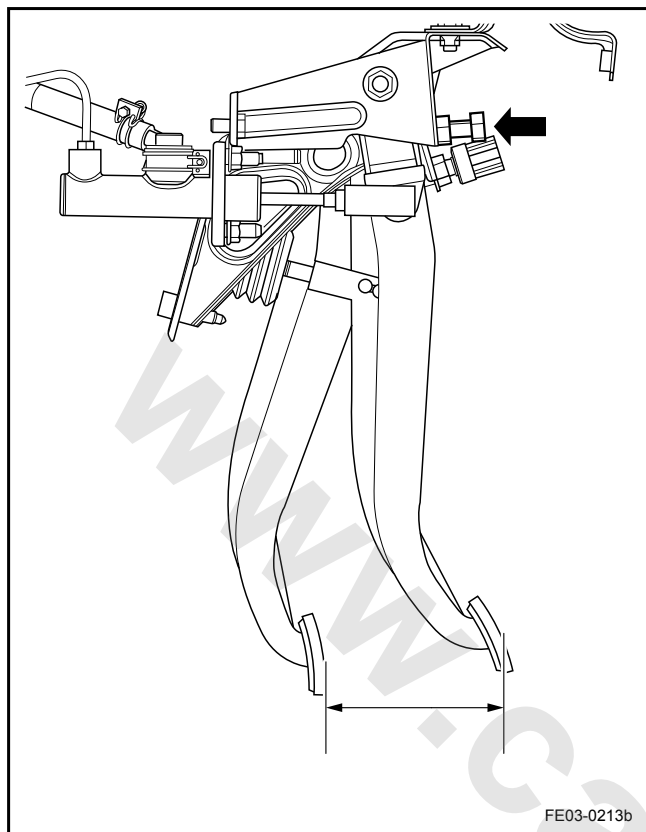


1. During the hydraulic system bleeding, make sure the clutch / brake fluid level is between reservoir minimum (MIN) and maximum (MAX) marker.

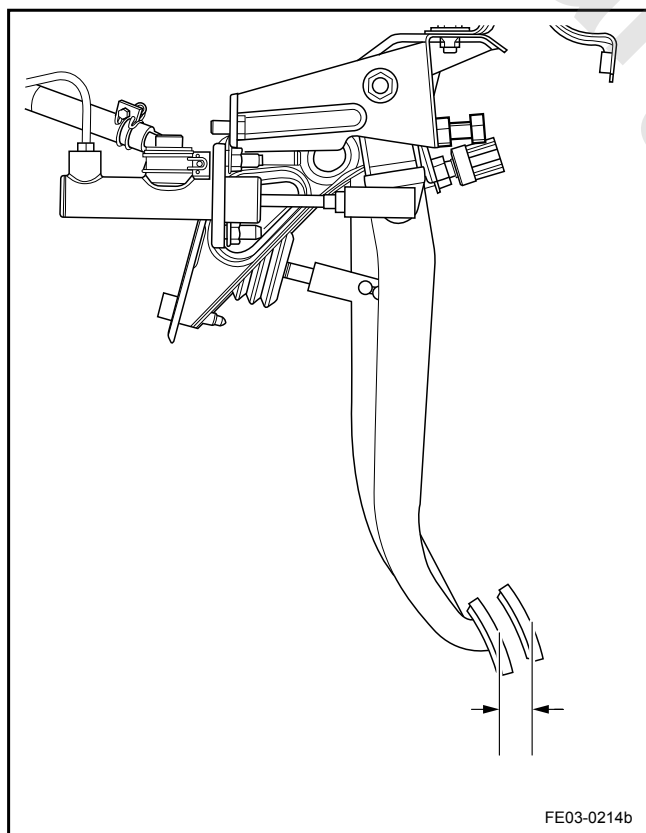


2. Connect one end of the vinyl plastic hose to the bleeder nipple, the other end to a half full brake fluid container.
3. Slowly press the clutch pedal several times.
4. Release the bleeder nipple screws, until the fluid begins to flow, and then tighten the bleeder nipple screws.
5. Repeat step 3 until bubbles no longer appear in brake fluid.
6. Fill brake fluid to the maximum (MAX) marker level.

### 3.2.6.4 Clutch Pedal Free Travel Adjustment



1. Measure clutch pedal travel. Press the clutch pedal to the end. Measure the distance between the start position and the end position.
2. Adjust the clutch pedal travel. Release the locking nut and rotate the bolt. Clutch pedal travel should be more than 128 mm (5.0 in). Tighten the lock nut after adjustment.



3. Determine the clutch pedal free travel, with a hand gently press the clutch pedal and determine the distance while there is a resistance feel.
4. Adjust the clutch pedal free travel. Release the lock nut and turn. Clutch pedal free travel should be between 6 and 12 mm (0.2-0.5 in). Tighten the lock nut after adjustment.

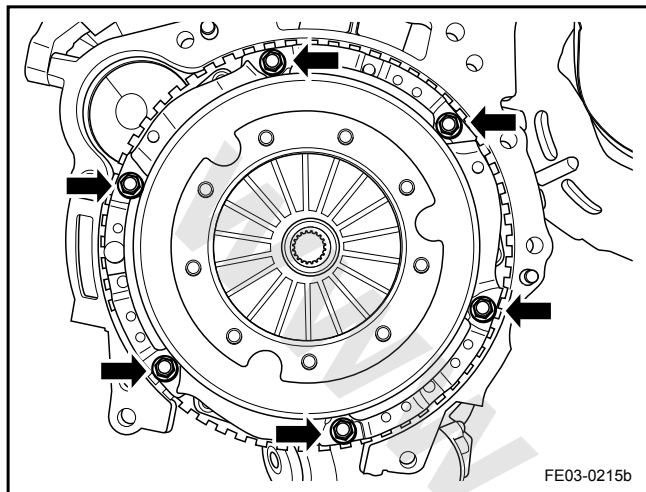
### 3.2.6.5 Clutch Assembly Replacement

Removal Procedure:

**Warning!**

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Lift the vehicle.
3. Remove the engine bottom shield. Refer to [12.10.1.7 Left and Right Engine Bottom Shield Replacement](#).
4. Remove the transmission assembly. Refer to [3.3.8.3 Transmission Assembly Replacement](#).
5. Remove clutch bolts, the clutch pressure plate and clutch driven plate.



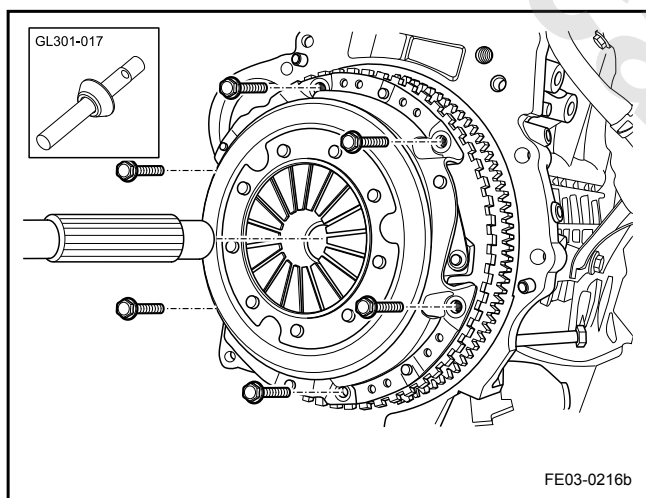
Installation Procedure:

1. Apply grease on the clutch plate spline.
2. With a special tool GL301-017, align the clutch pressure plate and drive plate with the flywheel.
3. Install pressure plate bolts and tighten.  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)

**Note**

Install bolts in diagonal order.

4. Remove the special tool GL301-017.
5. Install the transmission assembly.
6. Install the engine bottom shield.
7. Lower the vehicle.
8. Connect the battery negative cable.

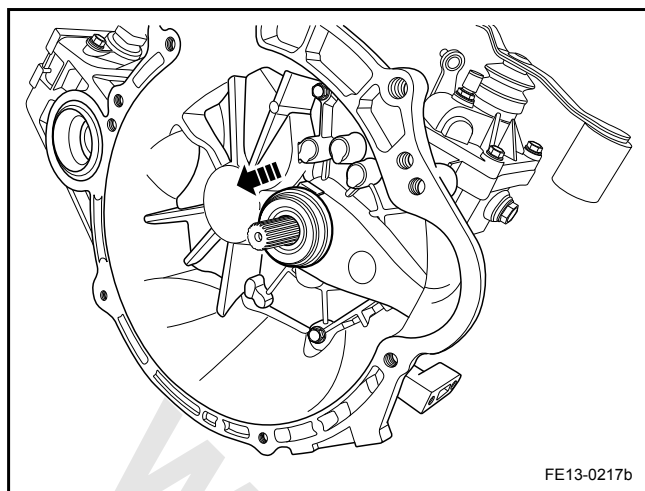


### 3.2.6.6 Clutch Pilot Bearing Replacement

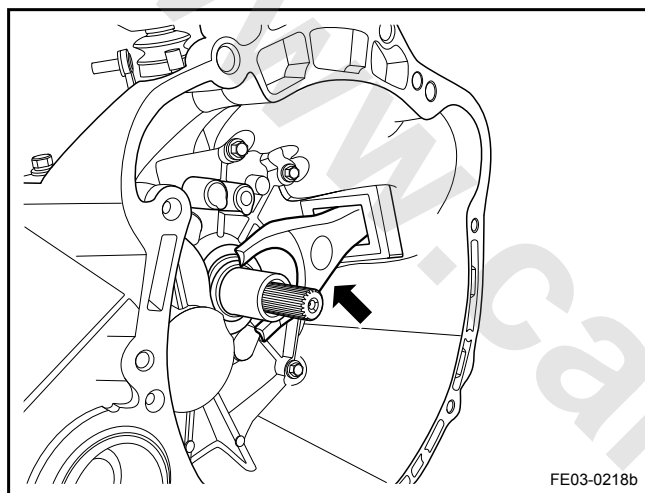
Removal Procedure:

**Warning!**

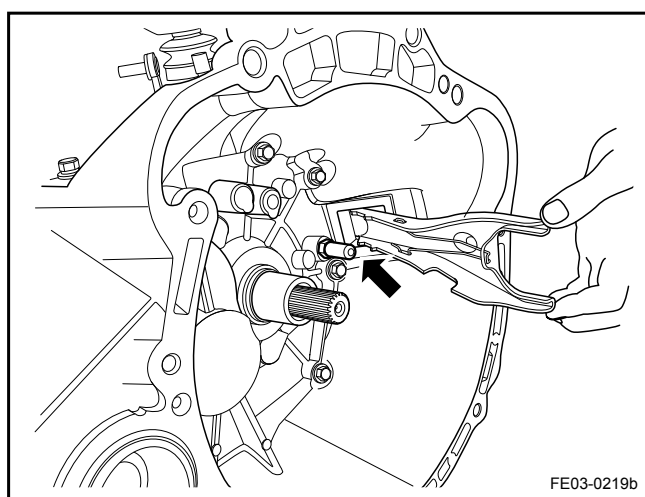
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#)
2. Lift the vehicle.
3. Remove the engine bottom shield. Refer to [12.10.1.7 Left and Right Engine Bottom Shield Replacement](#).
4. Remove the transmission assembly. Refer to [3.3.8.3 Transmission Assembly Replacement](#).
5. Remove the pilot bearing from the transmission input shaft.

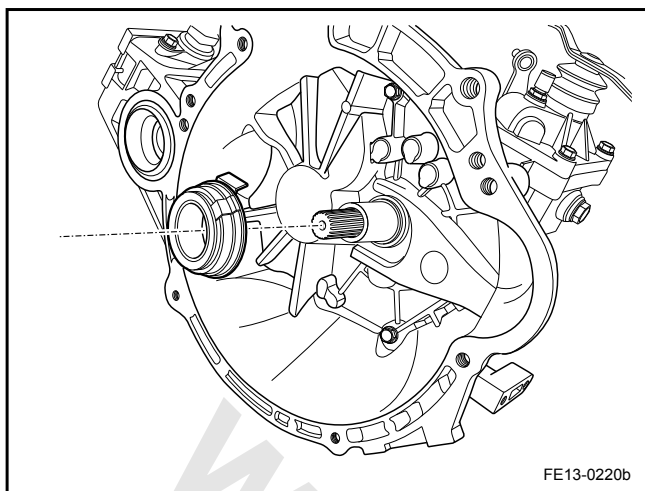


6. Separate and remove the fork.



#### Installation Procedure:

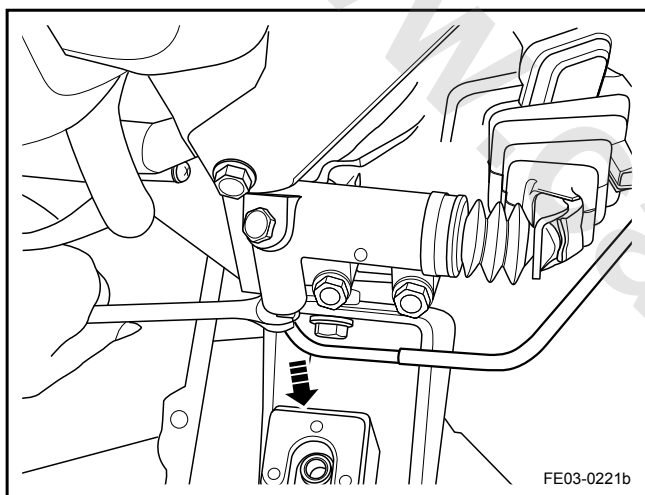
1. Install the fork to the dust cover.



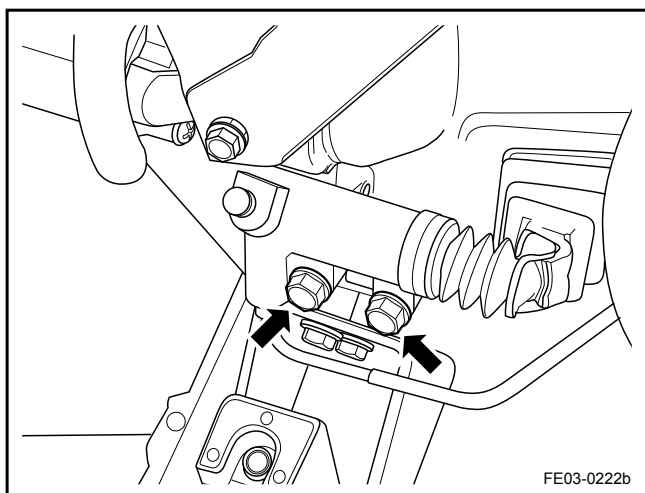
2. Install the pilot bearing to the transmission input shaft.
3. Install the transmission assembly.
4. Install the engine bottom shield.
5. Lower the vehicle.
6. Connect the battery negative cable.

### 3.2.6.7 Clutch Slave Cylinder Replacement

#### Removal Procedure:



1. Remove the bolts and Disconnect the tube from the clutch slave cylinder.



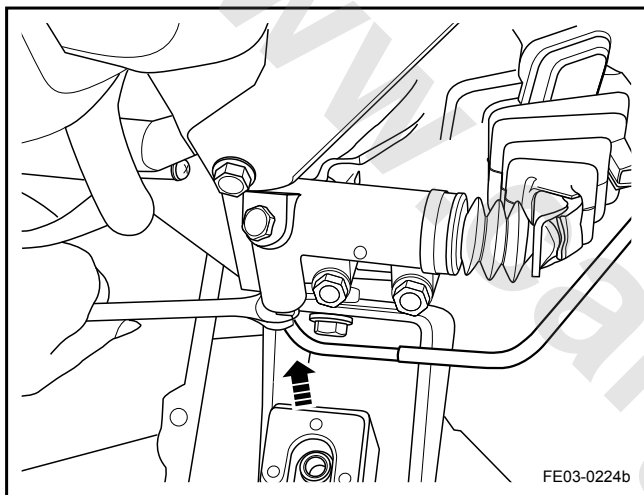
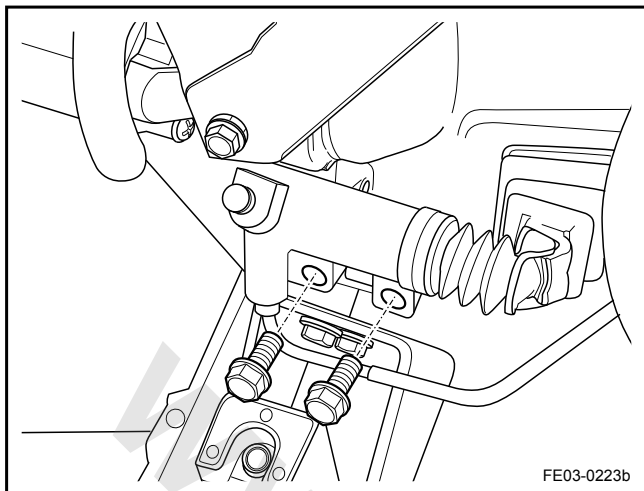
2. Remove clutch slave cylinder bolts and the clutch slave cylinder.



## Installation Procedure:

1. Connect the clutch slave cylinder to the transmission housing and tighten the bolts.

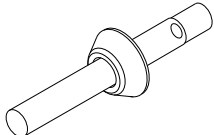
Torque: 20 Nm (Metric) 14.8 lb-ft (US English)



2. Connect the clutch fluid tube to the clutch slave cylinder and tighten the bolts.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
3. Apply grease to the rod joints and be careful not to make the dust cover dirty.
4. Hydraulic clutch bleeding. Refer to [3.2.6.3 Hydraulic Clutch Bleeding](#).
5. Adjust the clutch pedal. Refer to [3.2.6.4 Clutch Pedal Free Travel Adjustment](#).
6. Fill brake fluid to the fluid reservoir Maximum mark.

## 3.2.7 Special Tools and Equipment

## 3.2.7.1 Special Tools List

Serial Number	Illustration	Tool Number	Description
1	 FE01-2021b	GT301-017	Clutch Installation Tool

### 3.3 Manual Transmission

#### 3.3.1 Specifications

##### 3.3.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Manual-Shift Assembly Retaining Bolts	M8 × 40	20-26	15-19
Engine and Transmission Connecting Bolts (Upper)	M12 × 50	96-110	71-81
Engine and Transmission Connecting Bolt (Middle)	M10 × 45	53-65	39-48
Engine and Transmission Connecting Bolt (Lower)	M10 × 40	53-65	39-48
Transmission Left Bracket Bolts	M10 × 22	47-57	35-42
Transmission Left Bracket Screw and Nut	M10 × 100	47-57	35-42
Transmission Front Bracket Bolts	M10 × 22	47-57	35-42
Transmission Front Bracket Screw and Nut	M10 × 90	47-57	35-42
Vehicle Speed Sensor Driven Gear Locking Bolt	M8 × 15	20-26	15-19
Transmission Front Bracket Bolts	M10	47-57	35-42
Transmission Front Bracket Screw and Nut	M12 × 100	70-90	52-67
Transmission Casing Retaining Bolt	M8 × 35	20-26	15-19
Shift Control Mechanism Retaining Bolt	M8 × 35	20-26	15-19
Cover Connecting Bolts	M6 × 15	7-11	5-8
Gear Shaft Self-Locking Bolt	M18 × 25	37-40	27-30
Reverse idler Locking Bolts	M8 × 35	20-26	5-19
Fork Bolts	M8 × 15	20-26	5-19
Fluid Level Inspection Hole Bolt	M18 × 10	28-30	21-22
Fluid Drain Plug Bolt	M18 × 10	28-30	21-22

##### 3.3.1.2 Manual Transmission Specifications

###### Manual Transmission Specifications

Applications	Specifications
Gear Ratio	
1st Gear	3.182
2nd Gear	1.895

Applications	Specifications
3rd Gear	1.25
4th Gear	0.909
5th Gear	0.78
Reverse	3.083
Main Reduction Ratio	4.308
Maximum Speed	≥185 km/h (115 mph)
0-100 km/h Acceleration Time	≤12 s
Max.Grade Ability	≤40%
Gear Oil Capacity	2.2 L
Lubricant	Comply with GB13895, API quality grade GL-4, Viscosity: SAE 75W-90, 80W-90, 85W-90
Type or Model	JL-S170B

## Dimensions

Size Parameters	Specifications	
	Metric (mm)	US English (in × 10 <sup>-3</sup> )
Input Shaft Third Gear Axial Clearance	0.1-0.35	3.937 -13.780
Input Shaft Fifth Gear Axial Clearance	0.1-0.50	3.937-19.685
Input Shaft Fourth Gear, Fifth Gear Gear Radial Clearance	≥0.058	≥3.346
Input Shaft Fourth Gear Axial Clearance	0.1-0.55	3.937-21.654
Input Shaft Axial Runout	≥0.03	≥1.181
Synchronizer Back End and The Gear Ring Surface Distance	≤0.8	≤31.496
Gear Shift and Fork Sleeve Distance	≥0.35	≥13.780
Input Shaft Wear and Tear: Minimum Diameter	33.985 and 30.985	1,337.989 and 1,219.879
Main Shaft 1st Gear and 2nd Gear Axial Clearance	0.1-0.35	3.937-13.780
Main Shaft 1st Gear and 2nd Gear Runout	≥0.056	≥2.205
Main Shaft Runout	≥0.03	≥1.181
Spindle Wear and Tear: Minimum Diameter	33.985	1,337.989
Gear Cover Oil Seal (Side) Surface To The Seal Hole Surface	2.0-2.5	78.740-98.425

Size Parameters	Specifications	
	Metric (mm)	US English (in × 10 <sup>-3</sup> )
Gear Cover Oil Seal (Upper) Surface To The Seal Hole Surface	0-0.5	0-19.685

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### 3.3.2 Description and Operation

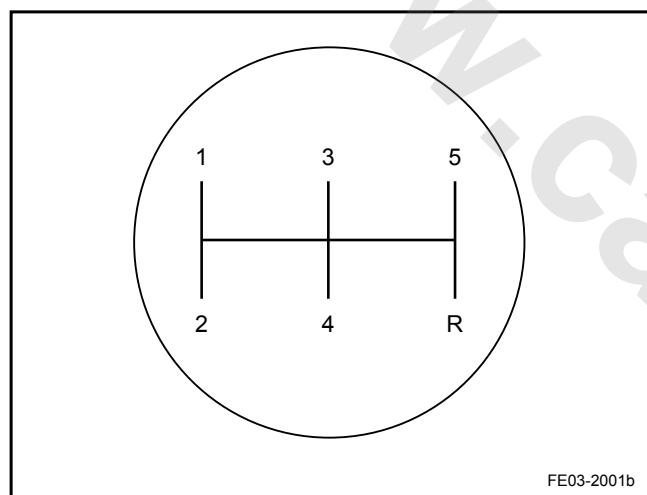
#### 3.3.2.1 Transmission System Operation

##### Warning!

During the diagnostic and repair process, we must strictly follow the safety operating standards, in order to prevent personnel injury and damage to the vehicle. Refer to "Vehicle lifting Warning" and " Road Test Warning" in "Warnings and Notices".

During the transmission service, it is necessary to prevent dust entering the system. we must use the transmission service special tools, not only we can improve the service efficiency and quality, but also prevent unnecessary vehicle damage. The manual transmission is a regular full-mesh five-speed transmission synchronizer.

Shift control is shown as in the graphic:



gear fork, and between the 5th/reverse gear fork and the 3rd/4th gear fork, there are interlock pin to prevent engaging two gears at the same time, so as to ensure transmission work properly.

##### Gear

##### Forward Gear

Forward gear disengaged by a group of shift fork to control the sliding lock ring synchronizer.

##### Reverse Gear

Reverse gear is not synchronized, using a sliding idler wheel. When the reverse gear is engaged, sliding idler pulley will be meshing with the input shaft and main shaft reverse gear reverse output gear at the same time, to transmit the input torque to the main shaft output, and so that the main shaft rotation is opposite to that when the forward gears are engaged, thus reversing the vehicle.

#### Basic components includes

- Transmission Case
- Ring Gear and Differential Assembly
- Shift Control Assembly
- Input Shaft
- Input Shaft Gear
- Main Shaft
- Main Shaft Gear

#### Shift Control Assembly

Shift control assembly is to select the gear through the fork movement. Self-locking bolt is used to prevent the gear jumping out. Between the 5th/reverse gear fork and the 1st/2nd

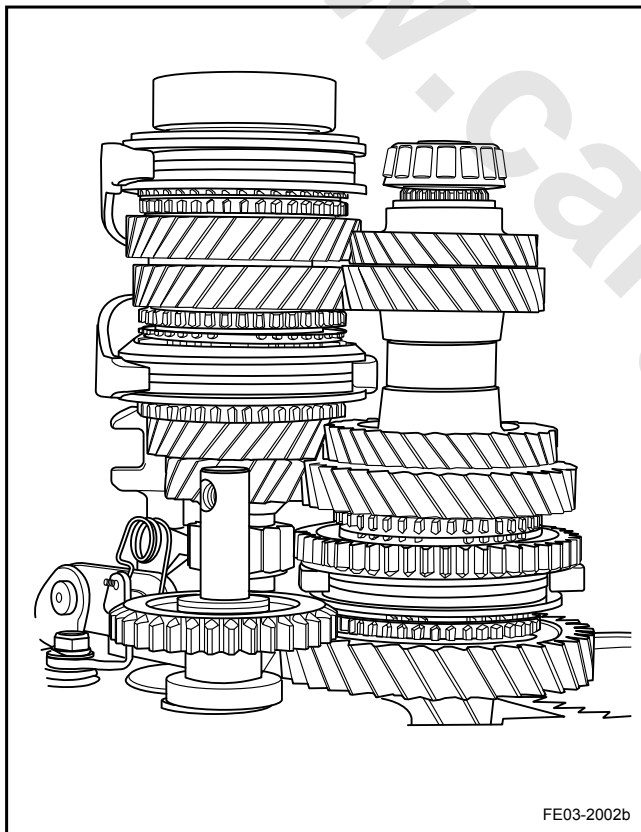
### 3.3.3 System Working Principle

#### 3.3.3.1 Shifting Working Principle

Because the engine output torque and speed range is relatively narrow, unable to meet the complex requirements of the vehicle under the conditions of a big range of traction and speed changes, the role of transmission is to expand the driving wheel torque and speed range by changing the transmission ratio, therefore to adapt to constantly changing conditions.

This vehicle's transmission is a five-speed manual transmission with two axles. There are five forward gears, a reverse gear, and a neutral gear. Gear shift control is achieved by controlling the shift shaft. The shift shaft and the shift fork make the selected synchronizer and gear mesh. The input shaft torque and speed is delivered to the main shaft, to the differential, and to the drive axle and wheels.

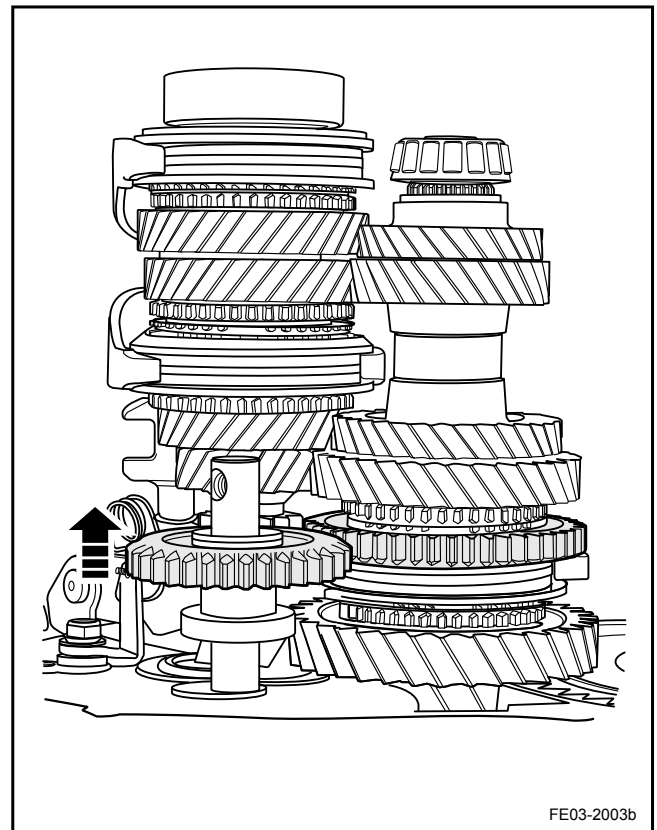
#### Neutral Gear Working Status:



The shift control does shift the shift shaft and the shift fork. Synchronizer and the neutral gear are not meshing. Reverse idler wheel and the input shaft reverse gear and main shaft output gear are not mesh, No main shaft torque and speed output.

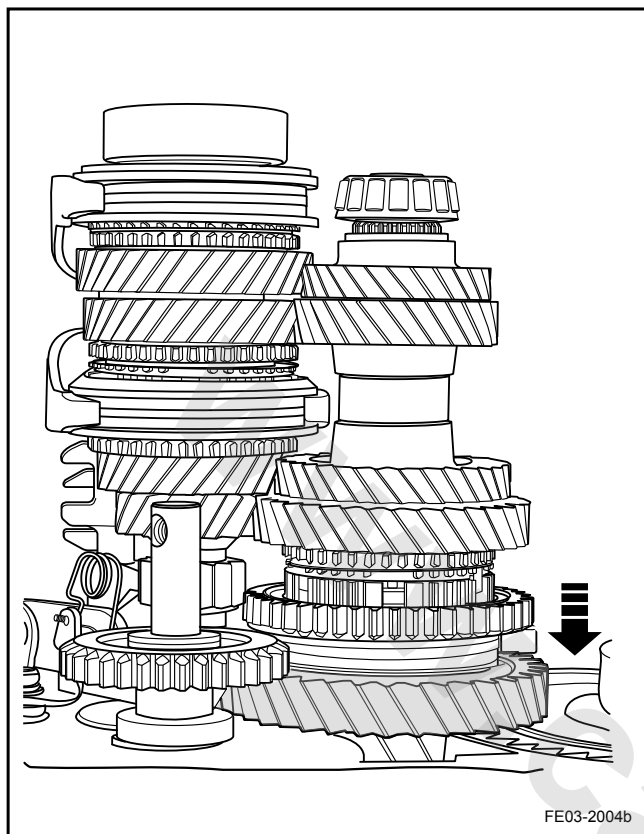
Reverse

#### Reverse Gear Working Status:



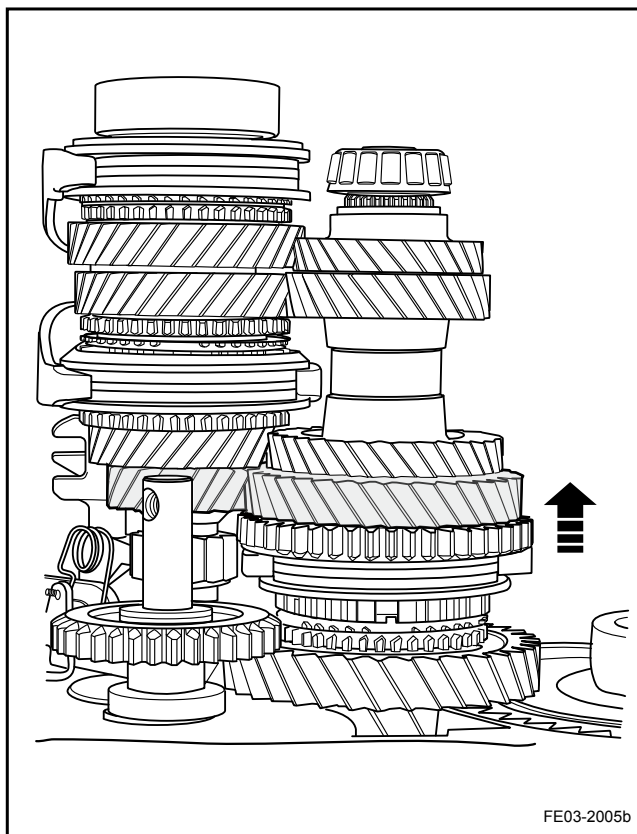
The shift control makes the 5th/Reverse shift shaft and fork move to rear end of the transmission. Reverse idler wheel and the input shaft reverse gear and main shaft output gear are meshing. Main shaft input and output torque and speed is the same direction.

## 1st Gear Working Status:



The shift control makes the 1st/2nd shift shaft and fork move to the front end of the transmission. The 1st/2nd gear synchronizer and 1st gear are meshing. Main shaft receives the input torque from the 1st gear and outputs torque and speed opposite to the input shaft.

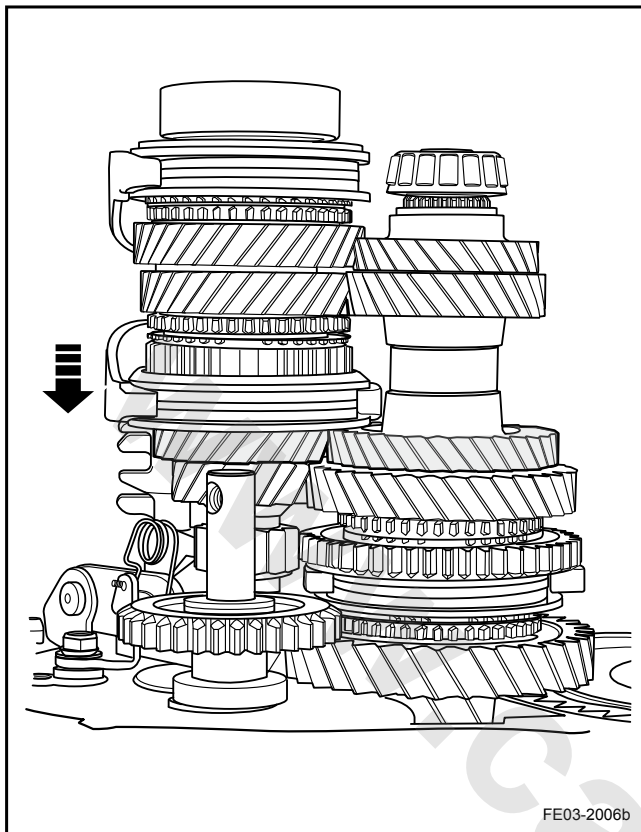
## 2nd Gear Working Status:



The shift control makes the 1st/2nd shift shaft and fork move to the rear end of the transmission. The 1st/2nd gear synchronizer and 2nd gear are meshing. Main shaft receives the input torque from the 2nd gear and outputs torque and speed opposite to the input shaft.

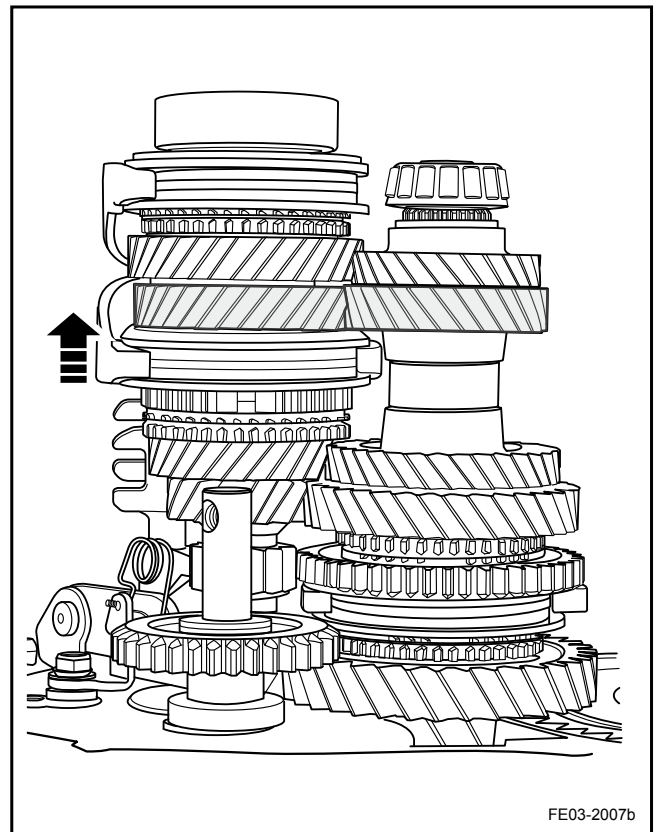


## 3rd Gear Working Status:



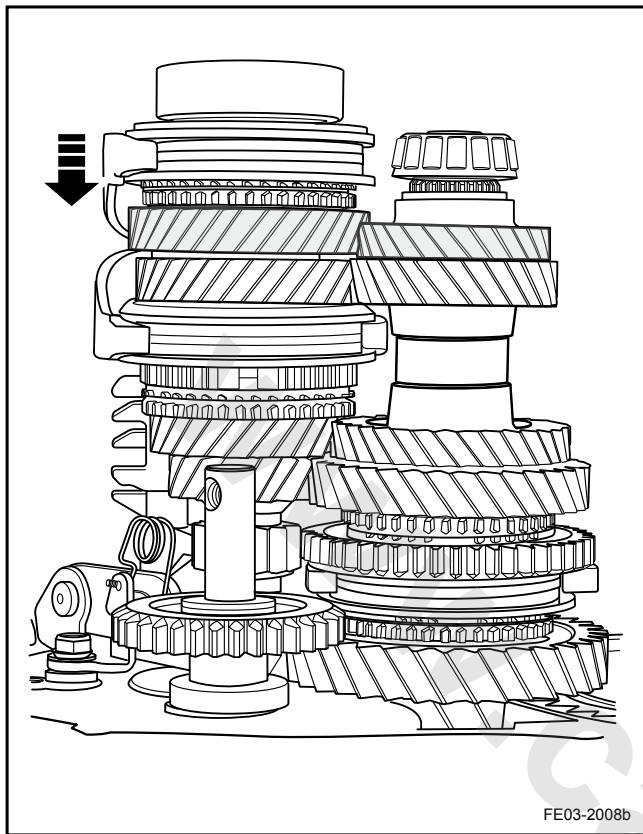
The shift control makes the 3rd/4th shift shaft and fork move to the left side (front end) of the transmission. The 3rd/4th gear synchronizer and 3rd gear are meshing. Main shaft receives the input torque from the 3rd gear and outputs torque and speed opposite to the input shaft.

## 4th Gear Working Status:



The shift control makes the 5th/Reverse shift shaft and fork move to the left side (rear end) of the transmission. The 3rd/4th gear synchronizer and 4th gear are meshing. Main shaft receives the input torque from the 4th gear and outputs torque and speed opposite to the input shaft.

### 5th Gear Working Status:



The shift control makes the 5th/Reverse shift shaft and fork move to the left side (front end) of the transmission. The 5th/Reverse gear synchronizer and 5th gear are meshing. Main shaft receives the input torque from the 5th gear and outputs torque and speed opposite to the input shaft.

#### 3.3.3.2 Vehicle Speed Sensor Working Principle

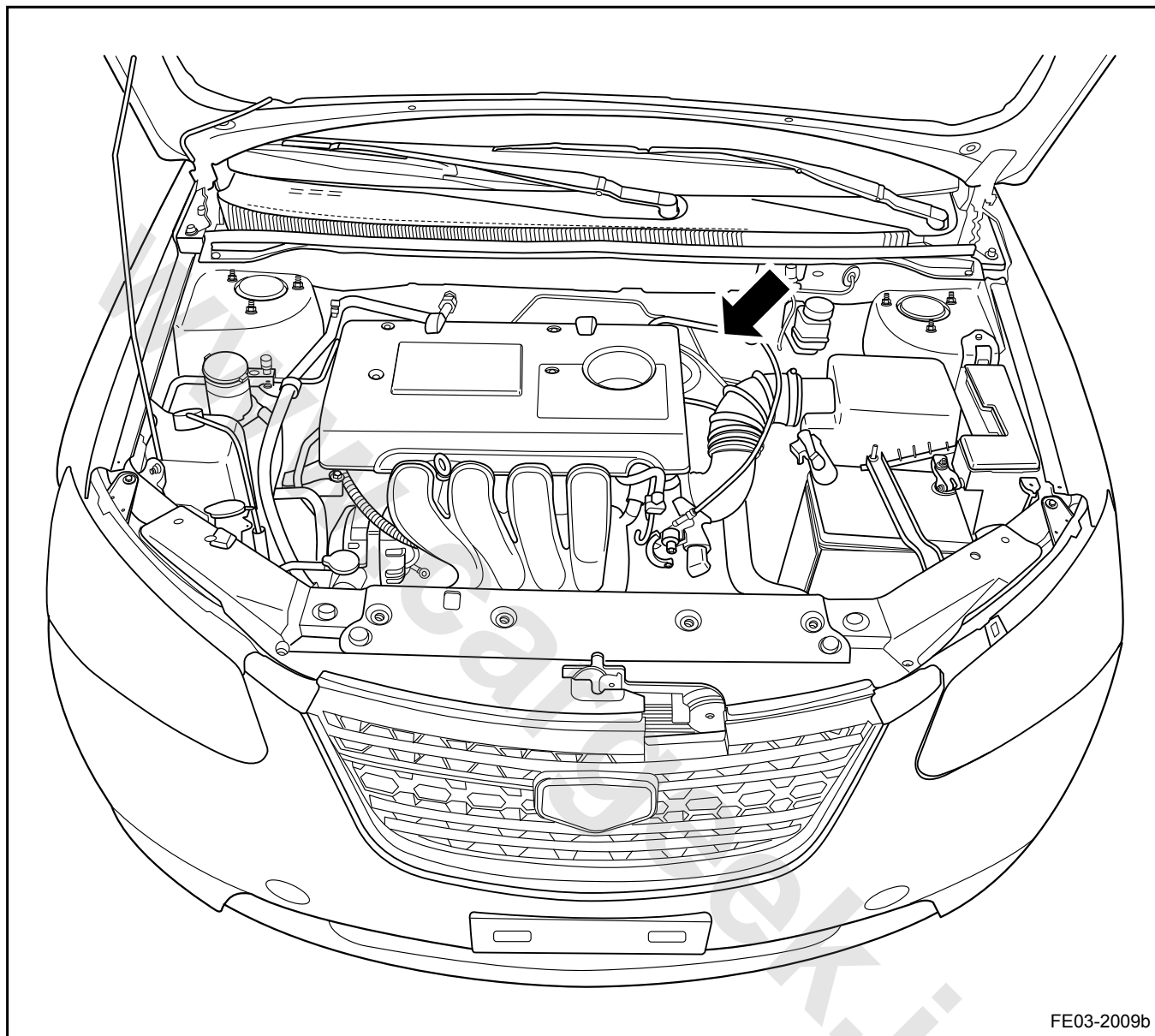
Vehicle speed sensor is a Hall sensor, installed on the drive gear shaft. When the transmission main shaft rotates, the vehicle speed sensor operates, so that the vehicle speed sensor generates signals and sends the signal to the instrument panel.

#### 3.3.3.3 Reverse Switch Working Principle

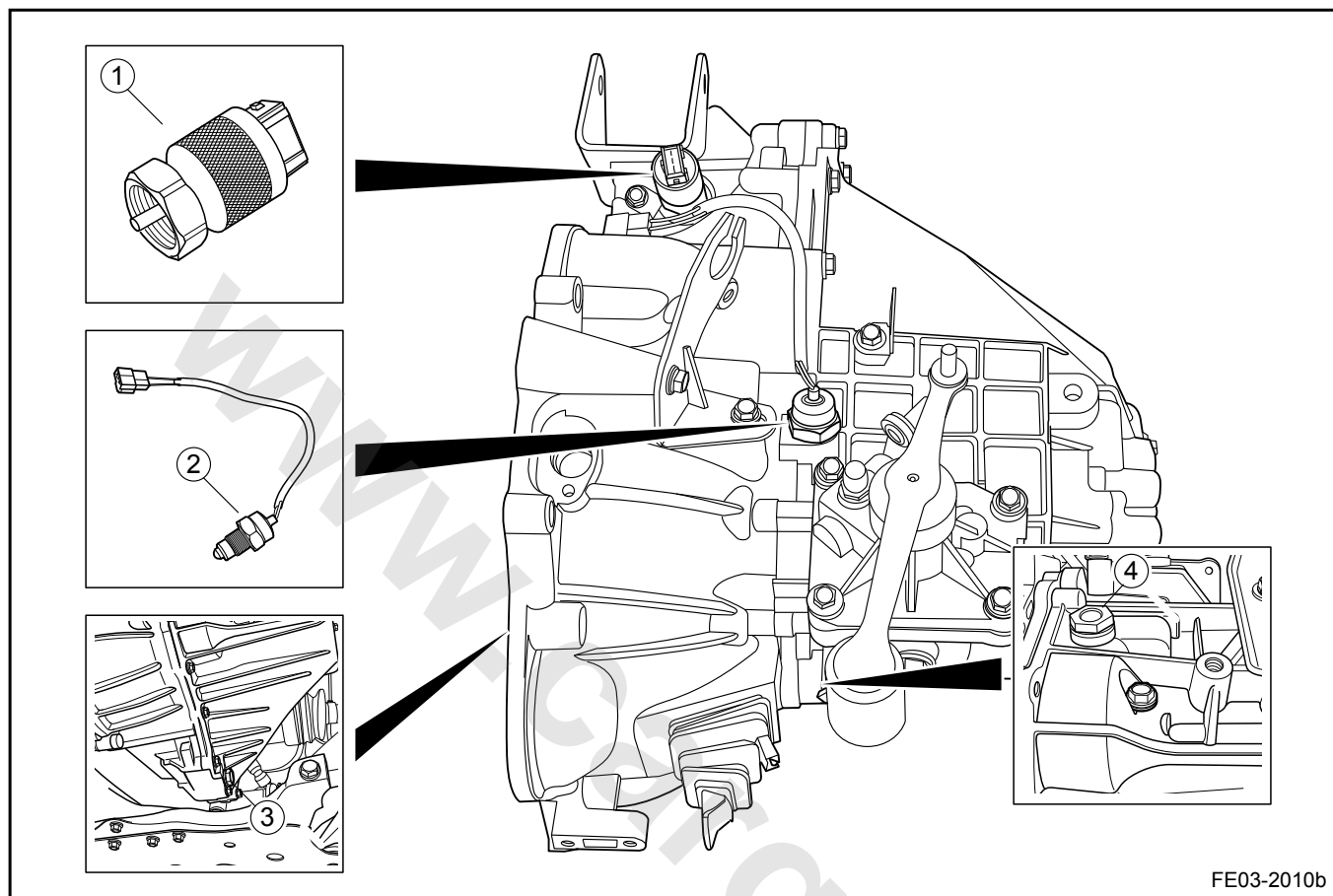
Reverse switch is a normally open switch. When the reverse gear is engaged, the reverse fork will squeeze reverse switch contact, making reverse switch closed, then the reversing light circuit is completed and reversing light is lit.

### 3.3.4 Component Locator

#### 3.3.4.1 Transmission Assembly Location



### 3.3.4.2 Vehicle Speed Sensor, Reverse Switch Location

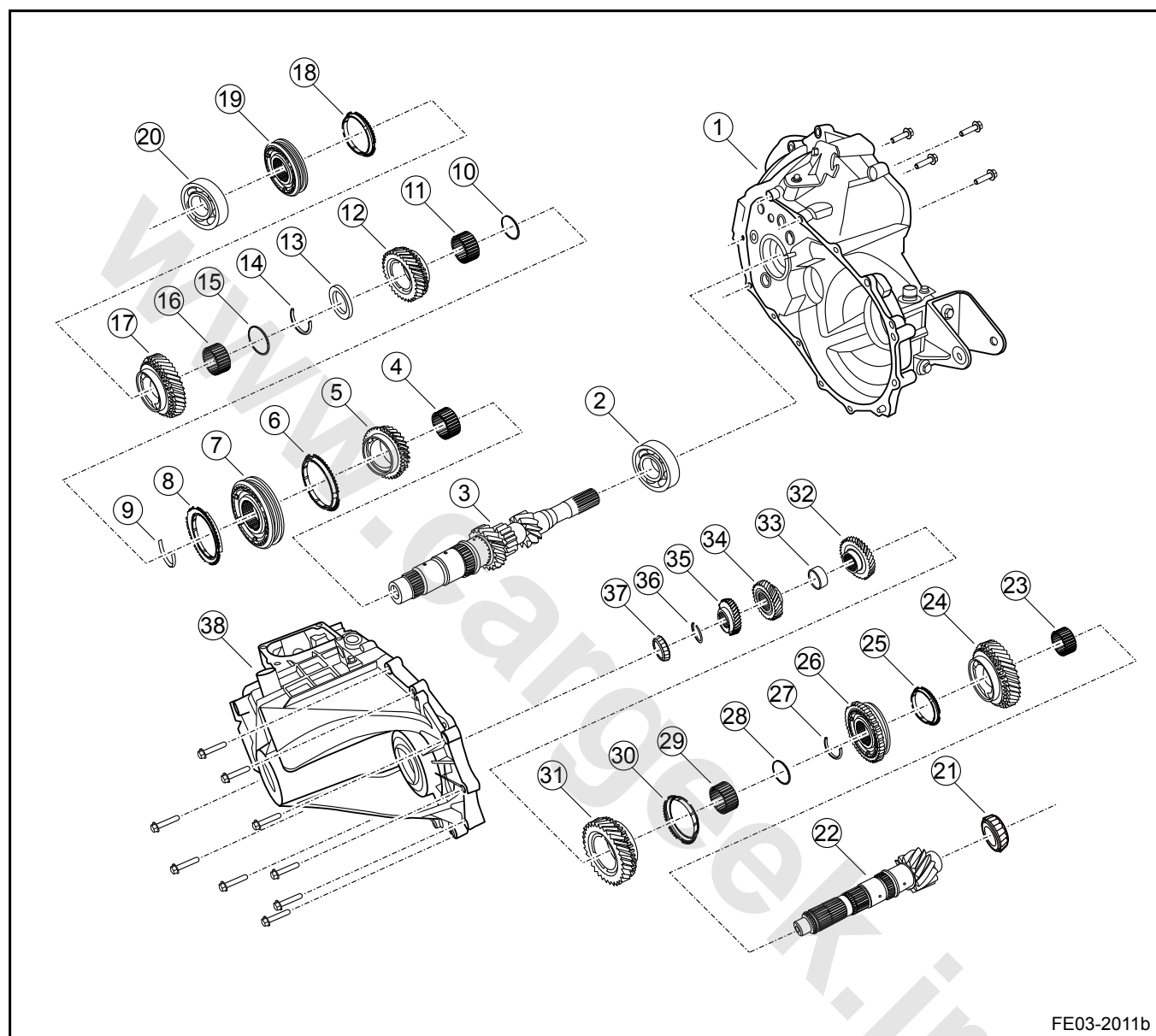


#### Legend

- |                         |                                    |
|-------------------------|------------------------------------|
| 1. Vehicle Speed Sensor | 4. Transmission Fluid Filling Hole |
| 2. Reversing Switch     |                                    |
| 3. Fluid Drain Hole     |                                    |

### 3.3.5 Disassemble View

#### 3.3.5.1 Gear Components and Gear Box Disassemble View



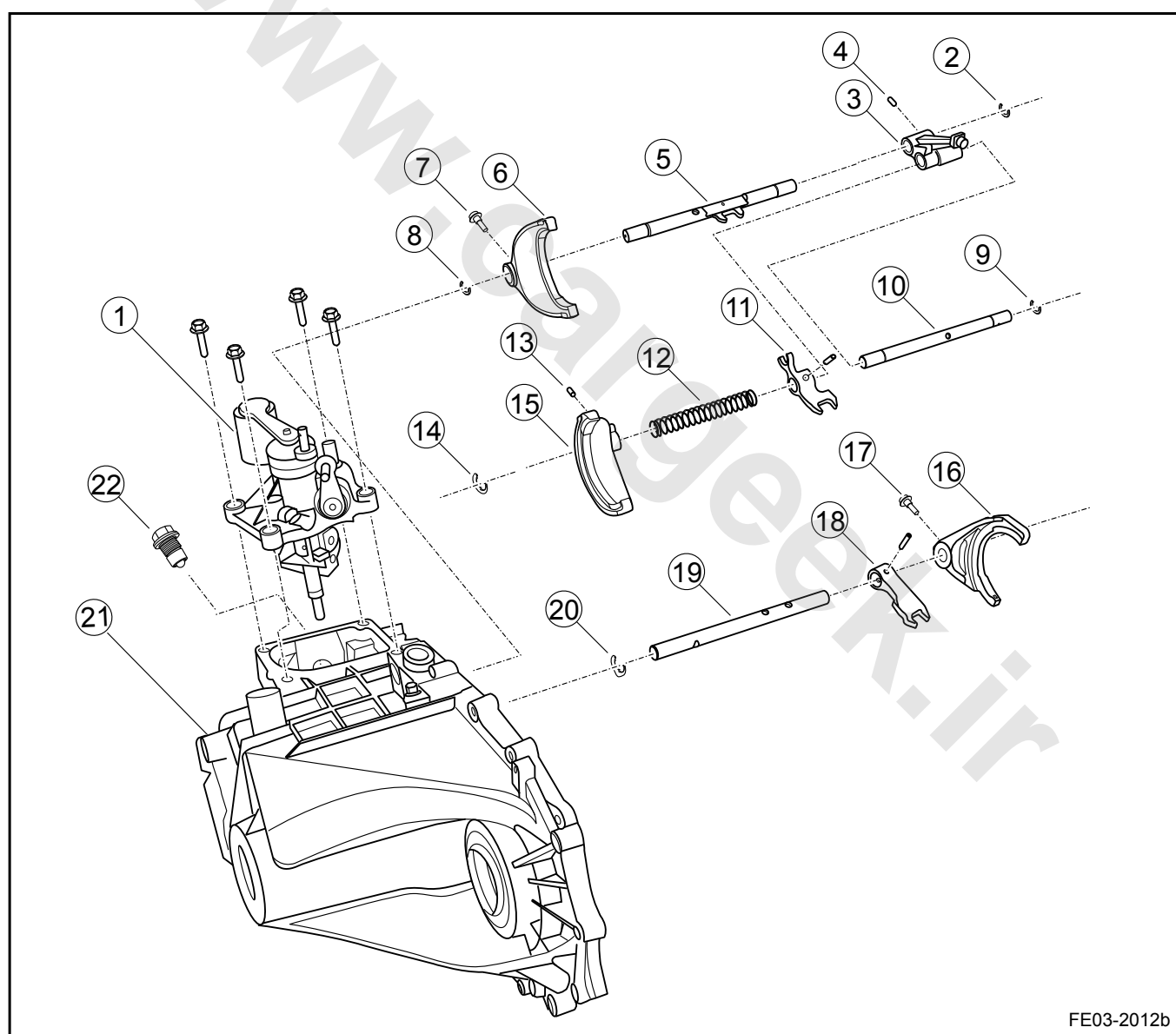
FE03-2011b

#### Legend

- |  |                                |
|--|--------------------------------|
| 1. Transmission Front End Case         | 11. 4th Gear Bearing           |
| 2. Input Shaft Front Bearing           | 12. 4th Gear                   |
| 3. Input Shaft                         | 13. 4th Gear Locking Ring      |
| 4. 3rd Gear Bearing                    | 14. 4th Gear Snap Ring         |
| 5. 3rd Gear                            | 15. 5th Gear Bearing Washer    |
| 6. 3rd Gear Synchronizer Ring          | 16. 5th Gear Bearing           |
| 7. 3rd/4th Gear Synchronizer           | 17. 5th Gear                   |
| 8. 4th Gear Synchronizer Ring          | 18. 5th Gear Synchronizer Ring |
| 9. 3rd/4th Gear Synchronizer Snap Ring | 19. 5th Gear Synchronizer      |
| 10. 4th Gear Bearing Washer            | 20. Input Shaft Rear Bearing   |

- |   |                               |
|---|-------------------------------|
| 21. Main Shaft Front Bearing            | 31. 2nd Gear                  |
| 22. Main Shaft                          | 32. 3rd Gear Output Gear      |
| 23. 1st Gear Bearing                    | 33. 3rd/4th Output Gear Bush  |
| 24. 1st Gear                            | 34. 4th Gear Output Gear      |
| 25. 1st Gear Synchronizer Ring          | 35. 5th Output Gear           |
| 26. 1st/2nd Gear Synchronizer           | 36. 5th Output Gear Snap Ring |
| 27. 1st/2nd Gear Synchronizer Snap Ring | 37. Main Shaft Rear Bearings  |
| 28. 2nd Gear Bearing Washer             | 38. Transmission Rear Case    |
| 29. 2nd Gear Bearing                    |                               |
| 30. 2nd Gear Synchronizer Ring          |                               |

### 3.3.5.2 Control Mechanism, Fork Component Disassemble View



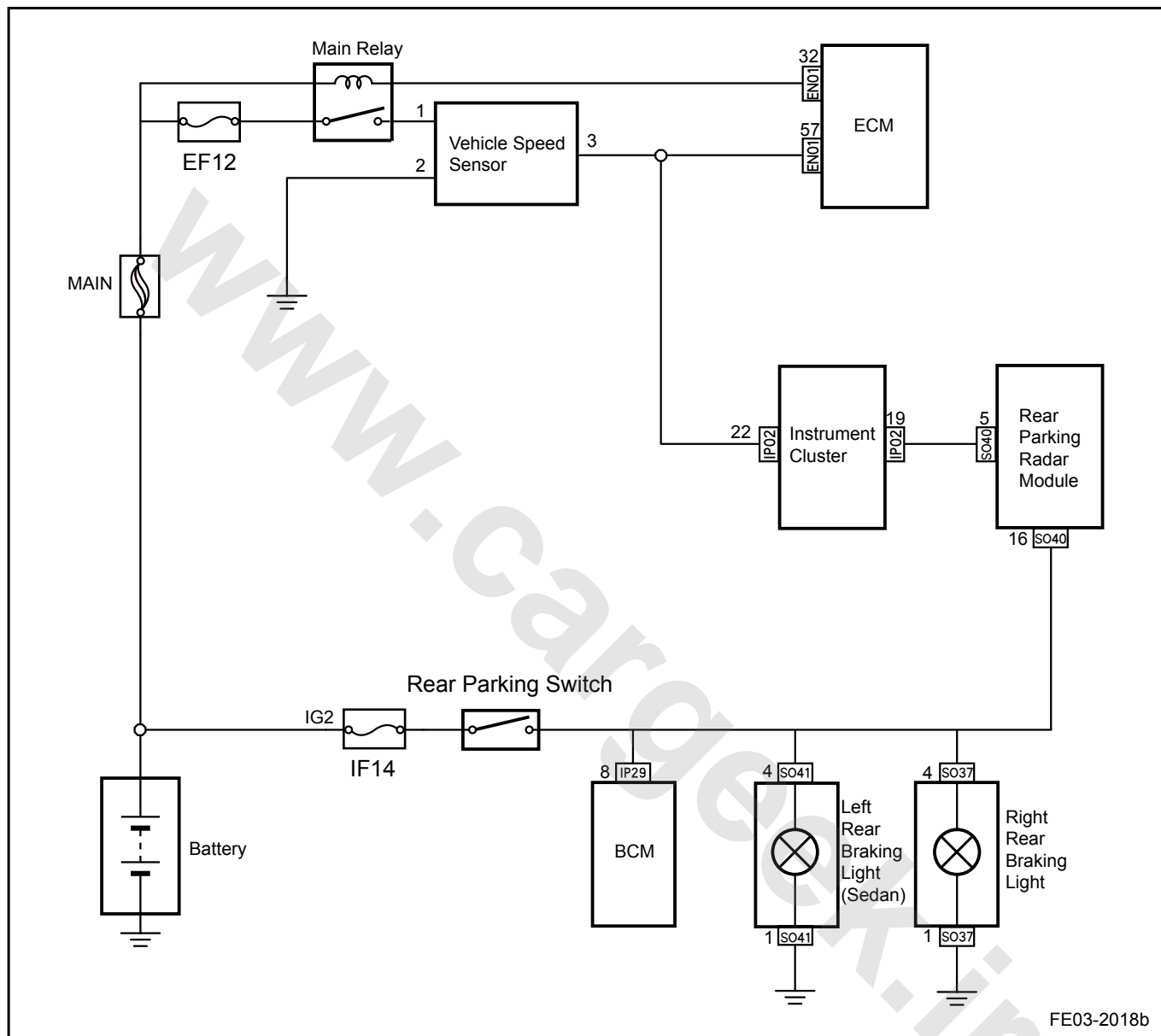
FE03-2012b

#### Legend

- |              |  |
|--------------|--|
| 1. Gearshift | 2. 3rd/4th Gear Fork Shaft Front Snap Ring |
|--------------|--|

- 
- |   |   |
|---|---|
| 3. 3rd/4th Gear and 5th/Reverse Installation Sleeve | 14. 5th/Reverse Gear Shaft Rear Snap Ring |
| 4. Interlocking Pin                                 | 15. 5th Fork                              |
| 5. 3rd/4th Gear Fork Shaft                          | 16. 1st/2nd Gear Fork                     |
| 6. 3rd/4th Gear Fork                                | 17. 1st/2nd Gear Fork Retaining Screw     |
| 7. 3rd/4th Gear Fork Retaining Screw                | 18. 1st/2nd Gear Installation Sleeve      |
| 8. 3rd/4th Gear Shaft Rear Snap Ring                | 19. 1st/2nd Gear Fork Shaft               |
| 9. 5th/Reverse Gear Shaft Front Snap Ring           | 20. 1st/2nd Gear Fork Shaft Snap Ring     |
| 10. 5th/Reverse Gear Shift Fork                     | 21. Transmission Rear Case                |
| 11. 5th/Reverse Gear Installation Sleeve            | 22. Gear Shaft Self-Locking Bolt          |
| 12. 5th Fork Springs                                |   |
| 13. Interlocking Pin                                |   |
-

## 3.3.6 Schematic

3.3.6.1 Reverse Switch, Vehicle Speed Sensor  
Circuit Schematic



### 3.3.7 Diagnostic Information and Procedures

#### 3.3.7.1 Diagnosis Description

Refer to [3.3.2 Description and Operation](#) get familiar with the contents of system functions and operation before start system diagnostic, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described the situation is normal.

#### 3.3.7.2 Visual Inspection

Transmission common malfunctions are: hard to shift, gear stuck, gear collision and grinding noise other abnormal sound. The clutch, drive system malfunction can also cause the above symptoms. During the service, we need carefully analyze and distinguish.

1. Prior to transmission repair, carry out the clutch general inspection:

- A. Check transmission, clutch pipe for fluid leaking.
- B. Check the transmission fluid level, transmission fluid viscosity and color, check for dirt and metal debris. Determine whether there have been internal components stuck, burning or broken.
- C. Check transmission and the surrounding components. Check for bolts and nuts loose or falling off.
- D. Road test and engage gears to confirm the vehicle conditions for further diagnostic.

2. Before repair the transmission abnormal sound, distinguish the clutch, drive shaft, and the engine abnormal sound, and exclude the external factors that may generate abnormal sound and noise.

3. Before repair the transmission abnormal sound, identify the following items:

A. Road Noise

Such as tires, road, wheel bearings, engine and exhaust system generated noise. The noise varies due to vehicle size, type and body insulation materials, etc..

B. Drive Shaft System Noise

Drive shaft system as a mechanical device, can not be without sound during the operation. There will be some sound during the operation. Confirm the abnormal noise:

- a. Choose a good road surface in order to reduce tires friction and body vibration generated noise.
- b. Drive a distance long enough to completely warm up the lubricant.
- c. Record speed and transmission gear when the noise occurs.
- d. Stop vehicle and shut down the engine, whether there is abnormal sound.
- e. Determine whether there is noise when driving the vehicle in the following conditions:
  - I. Slow acceleration or sudden acceleration.
  - II. On a even road, keep the throttle slightly open and maintain constant speed when driving.
  - III. Transmission is put in gear and the throttle closed when cruising.

C. Bearing Noise

a. Differential Gear or Bearing Noise

Differential bearings noise and the wheel bearing noise is likely to be mixed up. As the differential bearings have a pre-load force, even if the wheels leave the road, as long as the differential and drive shaft are in operation, the differential bearings noise will not be significantly reduced.

## b. Wheel Bearing Noise

When the transmission is in neutral gear and the vehicle is sliding, the wheel bearing issue a continuous roar or friction sound. Since there is no wheel bearing pre-load force, when the wheels leave the ground the wheel bearing noise will be significantly reduced.

- D. Bearing internal wear, deformation, indentation in bearing ring, micro-abrasive entering into the bearing and its seat ring, foreign matter entering into the bearing and the seat ring is locked, bearing and its seat ring due to wear and tear become loose, these will have the noise and thus make the system not work properly.

## 3.3.7.3 Hard to Shift

The following table shows the location the fault may occur, check each component, if necessary, replace these them.

Symptoms	Suspected Parts	Refer to
Hard to shift	1. Clutch	Clutch system <a href="#">3.2.5 Diagnostic Information and Procedures.</a>
	2. Transmission Gearshift Lever	<a href="#">3.3.8.9 Shift Lever Replacement.</a>
	3. Transmission Shift Control Cable	<a href="#">3.3.8.9 Shift Lever Replacement.</a>
	4. Transmission Shift Control Assembly	<a href="#">3.3.8.4 Shift Control Assembly Replacement,</a> <a href="#">3.3.8.5 Shift Control Assembly Disassemble and Assemble.</a>
	5. Faulty Gear or Synchronizer	<a href="#">3.3.8.3 Transmission Assembly Replacement,</a> <a href="#">3.3.8.6 Shift Shaft Replacement,</a> <a href="#">3.3.8.7 Input Shaft Disassemble and Assemble,</a> <a href="#">3.3.8.8 Main shaft Disassemble and Assemble.</a>

## Diagnostic Steps:

Step 1	Check the shift lever operation.
--------	----------------------------------

(a) Shut down the engine.

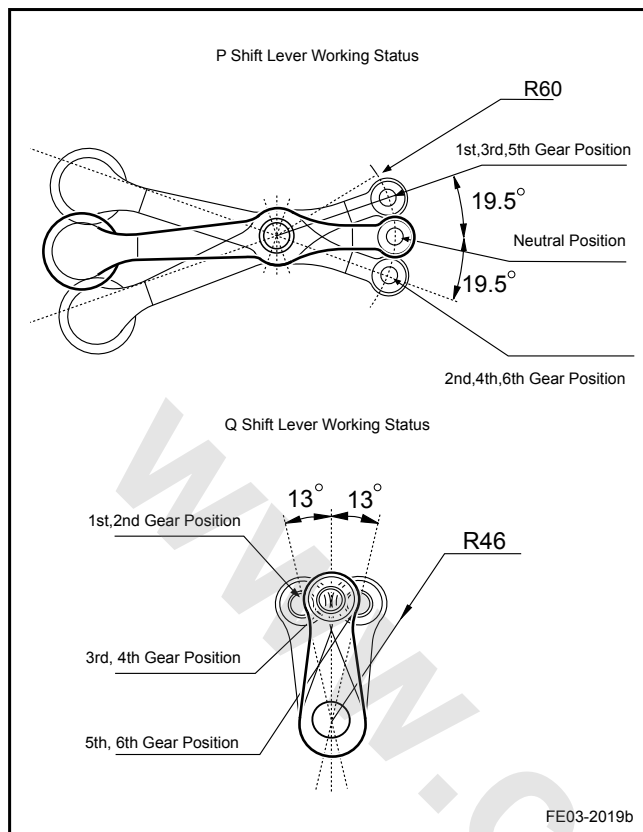
(b) Shift rod hard to engage or disengage gears.

No

Go to step 6

Yes

Step 2	Check shifting force and shift control travel.
--------	--



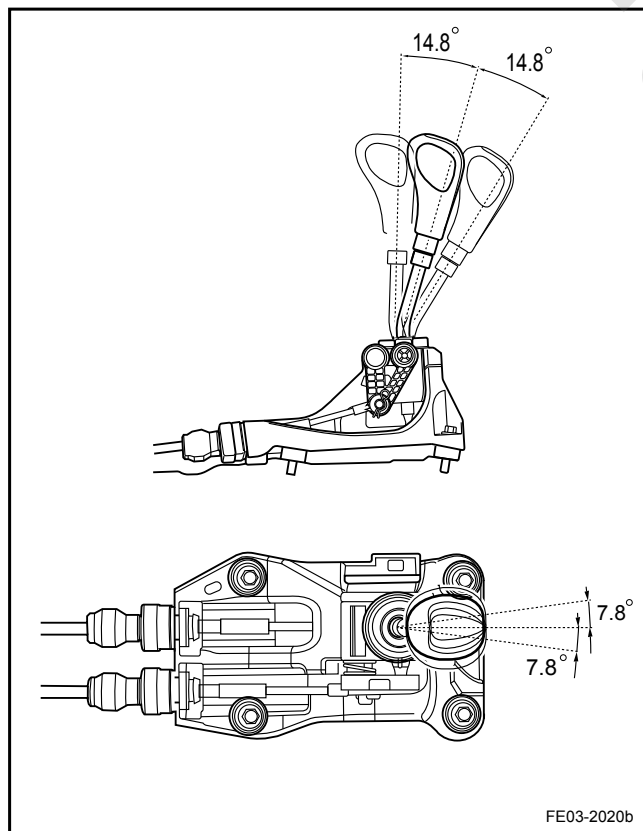
- (a) Operate the shift lever. Shifting force is 20-30 N (4.5-6.7 LB). Transmission shift control travel should meet the range shown in the graphic.

Yes

Repair or replace worn transmission shift control assembly or the fork.

No

Step 3 Check shifting force and shift control travel.



- (a) Disconnect manual shift control cable and transmission control assembly connections.
- (b) Operate the shift lever. Check whether the shift control cable can stretch freely and easily.
- (c) Transmission shift lever selectional force is  $< 8$  N (1.8 LB), shifting force is  $< 4$  N (0.9 LB). Transmission shift control travel should meet the range shown in the graphic.

Yes

Adjust or replace the gear control cable. Repair or replace the transmission shift control assembly or fork.

No

Step 4

Check transmission shift control cable movement.

(a) Disconnect cable between the shift lever and the transmission control cable connection.

(b) Check whether the transmission control cable is difficult to stretch or broken.

Yes

Replace the transmission shift control cable.

No

Step 5

Replace the shift lever.

(a) Is shifting problem resolved?

Yes

System normal

No

Step 6

Check the clutch.

(a) With the engine running, transmission is placed in neutral gear.

(b) Press the clutch pedal to the end, check whether the lever can easily engage or disengage the reverse gear.

No

Repair the clutch. Repair or replace the reverse gear.

Yes

Step 7

Check the faulty gear.

(a) Press the clutch pedal to the end. Try each forward gear to identify the faulty gear.

(b) Disassemble the transmission. Check whether the faulty gear synchronizer or gear are damaged.

(c) Replace the synchronizer or the gear.

(d) Confirm repair completed.

Next

Step 8

System normal.

### 3.3.7.4 Jumping Out Of Gear

The following table shows the location of fault may occur, check each component, if necessary, replace these parts.

Symptoms	Suspected Parts	Refer to
Off Gear	1. Engine Mount	<a href="#">2.6.8.7 Engine Mount Replacement.</a>
	2. Shift Lever	<a href="#">3.3.8.9 Shift Lever Replacement.</a>
	3. Shift Control Cable	<a href="#">3.3.8.9 Shift Lever Replacement.</a>

Symptoms	Suspected Parts	Refer to
	4. Shift Control Assembly	<a href="#">3.3.8.4 Shift Control Assembly Replacement</a> , <a href="#">3.3.8.5 Shift Control Assembly Disassemble and Assemble</a> .
	5. Shift Fork and Locking Mechanism	<a href="#">3.3.8.6 Shift Shaft Replacement</a> .

## Diagnostic Steps:

Step 1	Check the transmission and the engine mount.
--------	--

(a) When engine is running, is it jittering.

(b) Serious jitter will cause the engine stall.

Yes

Tighten or replace the transmission and engine mount.

No

Step 2	Check shift control assembly.
--------	-------------------------------

(a) Whether the connection between transmission shift control cable and the transmission shift control assembly is firm.

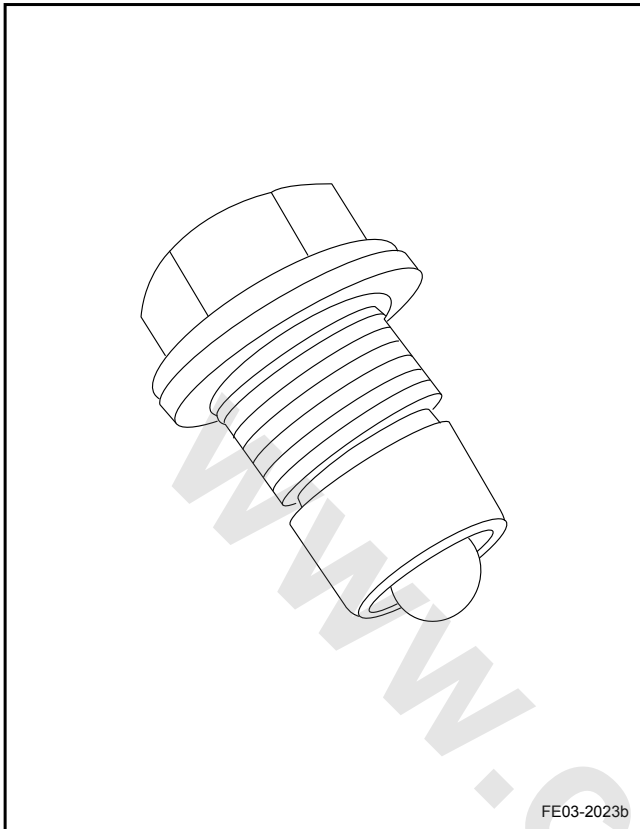
(b) Whether the connection between the shift lever and the transmission control cable is firm.

No

Tighten or replace the transmission gear or shift lever.

Yes

Step 3	Check transmission gear self-locking nut.
--------	---



(a) Is the gear self-locking nut installed correctly?

No

Tighten or replace the gear self-locking nut.

Yes

Step 4 Check the shift control assembly.

(a) Remove the shift control assembly to check for wear and tear or deformation.

Yes

Replace the shift control assembly.

No

Step 5 Inspect the faulty gear fork locking pin.

- (a) Remove the transmission.
- (b) Disassemble the transmission. Check the shift fork for deformation.
- (c) Replace the damaged shift fork.
- (d) Confirm repair completed.

Next

Step 6 System normal.

### 3.3.7.5 Hard to Disengage

The following table shows the location the fault may occur, check each component, if necessary, replace these components.

Symptoms	Suspected Parts	Refer to
Hard to Disengage	1. Shift Lever	<a href="#">3.3.8.9 Shift Lever Replacement.</a>

	2. Transmission Shift Control Cable	<a href="#">3.3.8.9 Shift Lever Replacement.</a>
	3. Shift Control Assembly	<a href="#">3.3.8.4 Shift Control Assembly Replacement, 3.3.8.5 Shift Control Assembly Disassemble and Assemble.</a>
	4. Shift Fork and The Lock Mechanism	<a href="#">3.3.8.3 Transmission Assembly Replacement, 3.3.8.6 Shift Shaft Replacement, 3.3.8.7 Input Shaft Disassemble and Assemble, 3.3.8.8 Main shaft Disassemble and Assemble.</a>
	5. Synchronizer	<a href="#">3.3.8.3 Transmission Assembly Replacement, 3.3.8.6 Shift Shaft Replacement, 3.3.8.7 Input Shaft Disassemble and Assemble, 3.3.8.8 Main shaft Disassemble and Assemble.</a>

## Diagnostic Steps:

Step 1	Check transmission shift control system.
--------	--

- (a) Disconnect transmission shift control cable and transmission control connections.
- (b) Check the shift lever for catching. The normal gear selection force is <8N (1.8LB), engaging a gear force is <4N (0.9LB).
- (c) Check the transmission shift control for damaged cables and catching.

Yes

Repair or replace the shift lever or shift control cable.

No

Step 2	Check the shift control assembly.
--------	-----------------------------------

- (a) Engage and disengage gears.
- (b) Check the shift control assembly for catching.
- (c) Repair or replace damaged shift fork, or synchronizer.
- (d) Confirm repair completed.

Next

Step 3	System normal.
--------	----------------

## 3.3.7.6 Abnormal Sound When Running

## Diagnostic Steps:

Step 1	Check abnormal sound.
--------	-----------------------

- (a) Stop the vehicle, shut down the engine, place transmission in neutral gear.
- (b) Check whether the abnormal sound stops.

Yes

Go to step 4

No

Step 2 Check the clutch abnormal sound.

- (a) Press the clutch to the end.
- (b) Check whether the abnormal sound stops.

No

clutch system abnormal sound diagnostic,  
engine abnormal sound diagnostic

Yes

Step 3 Check the transmission internal components.

- (a) Remove and disassemble the transmission.
- (b) Check for gear group bearing, input shaft gears, each gears / bearings, main shaft bearings damage.
- (c) Replace the faulty transmission components.
- (d) Confirm whether the system is normal.

Yes

System normal

No

Step 4 Check drive shaft system and front suspension.

- (a) Place transmission in neutral gear and release the hand brake.
- (b) Lift the vehicle.
- (c) Rotate the wheels. Check the drive axle, drive axle bearings whether there is abnormal sound.

**Note**

The vehicle is lifted at this time. The noise may disappear because the front suspension, drive axle and its bearings load decrease. Check whether the abnormal sound appears only when the axle and the front suspension are under load.

- (d) Replace the damaged drive axle or drive axle bearings.
- (e) Confirm repair completed.

Next

Step 5 System normal.

- Engage in reverse when driving, there is gear collision or grinding sound.

Remove the transmission. Inspect and replace the faulty gear, synchronizer or the bearing.

- Engage in reverse when driving, there is a dull metal sound.

Check the clutch and confirm there is no fault. Refer to "Clutch System" [3.2.5 Diagnostic Information and Procedures](#). Remove the transmission. Inspect and replace the faulty synchronizer.



### 3.3.8 Removal and Installation

#### 3.3.8.1 Transmission Fluid Level Inspection

##### Inspection Procedure:

##### Note

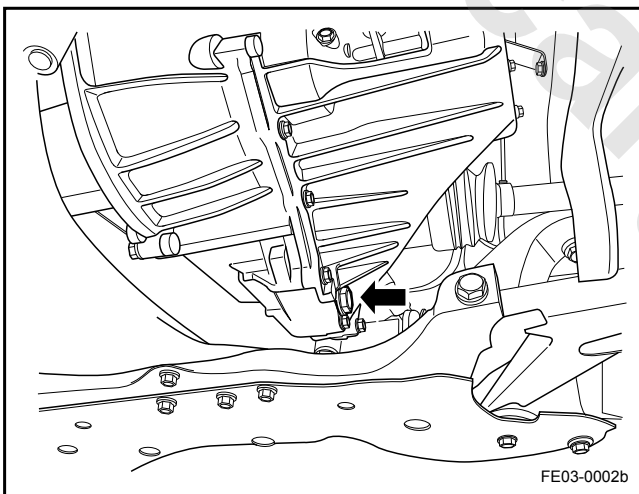
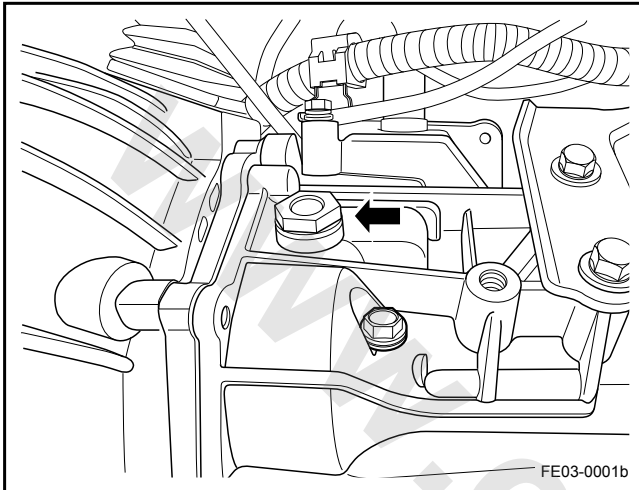
If inspect the transmission fluid when the transmission fluid temperature is too high, it may cause burns.

1. Park the vehicle on a level ground, wait for the transmission fluid cooling down, remove the transmission fill plug and check the transmission fluid level (Arrow shown in the graphic).

Transmission fluid level should be even with the lower edge of plug.

2. If the transmission fluid level is too low, add the dedicated manual transmission fluid through the plug to until the fluid begins to flow out.
3. Reinstall and tighten transmission fluid plug.

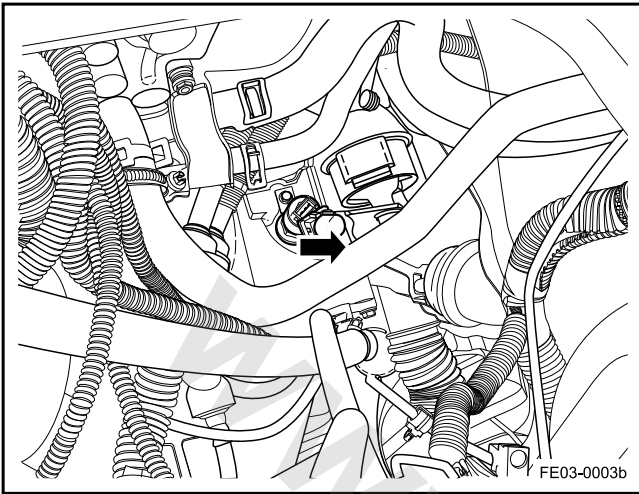
4. If needed, replace the transmission fluid. Remove the transmission fluid plug, drain the transmission fluid (Arrow shown in the graphic).



### 3.3.8.2 Vehicle Speed Sensor Replacement

#### Removal Procedure:

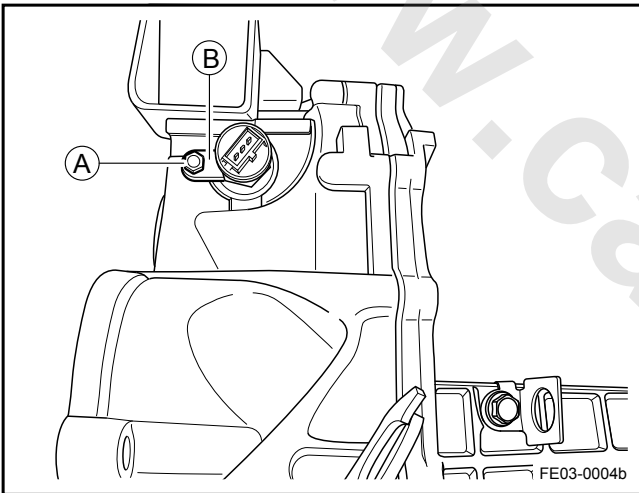
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect the vehicle speed sensor wiring harness connector.



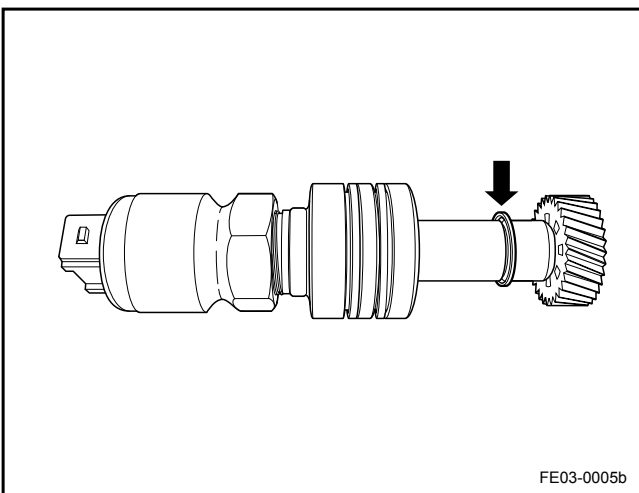
3. Remove the vehicle speed sensor retaining bolt A.

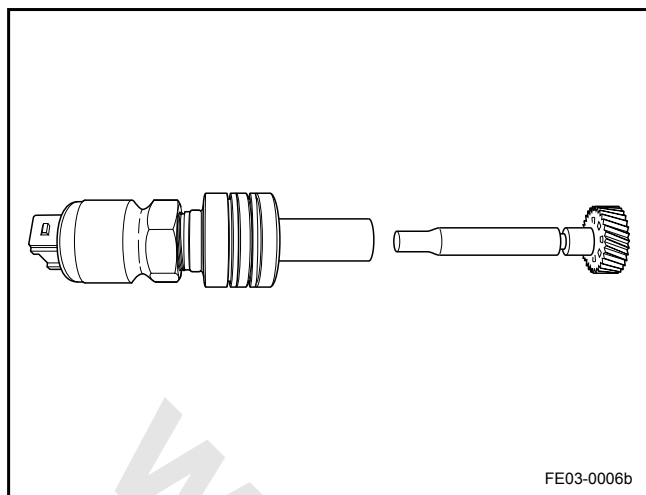
#### Note

The washer B shown in the graphic is movable.



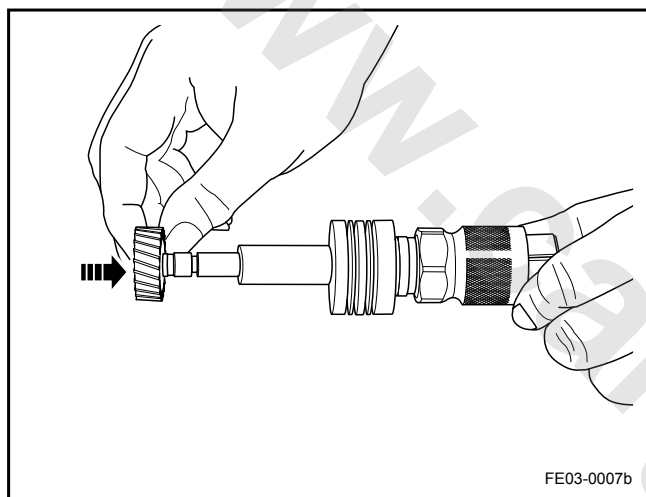
4. As shown in Figure Remove the retaining ring as shown in the graphic, disassemble the vehicle speed sensor driven gear.



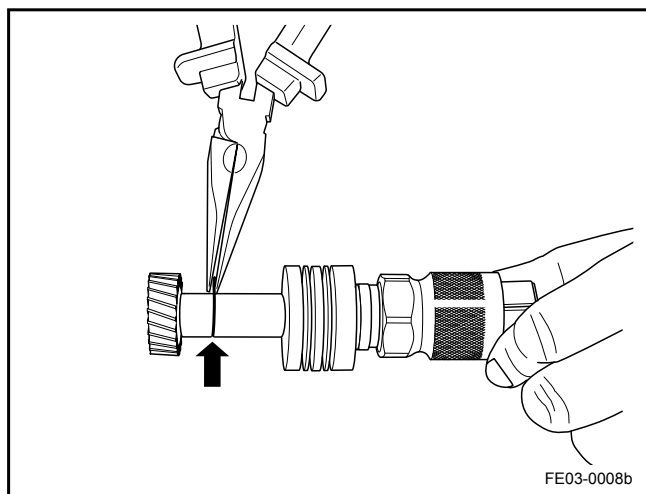


5. Disassemble vehicle speed sensor.

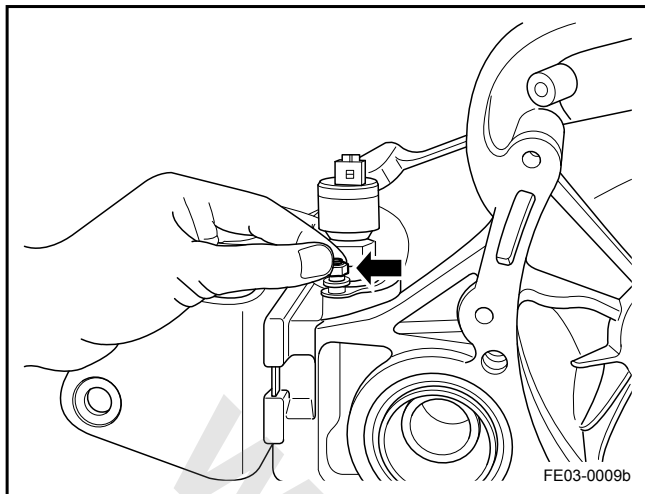
Installation Procedure:



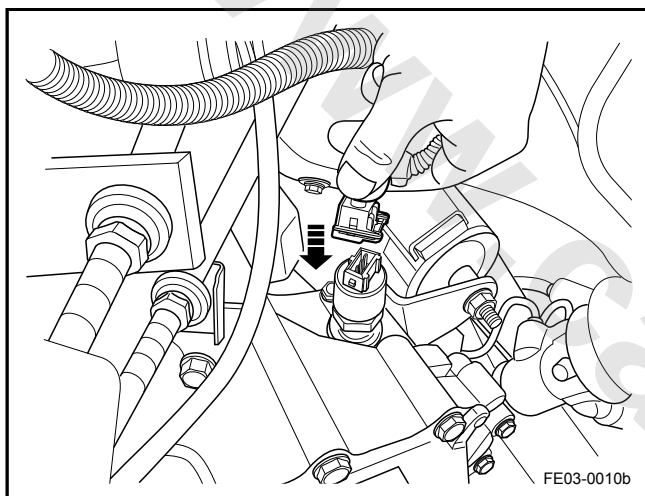
1. Install the vehicle speed sensor driven gear.



2. Install the driven gear retaining ring.



3. Install the vehicle speed sensor and tighten the bolt, note the location of the washer.



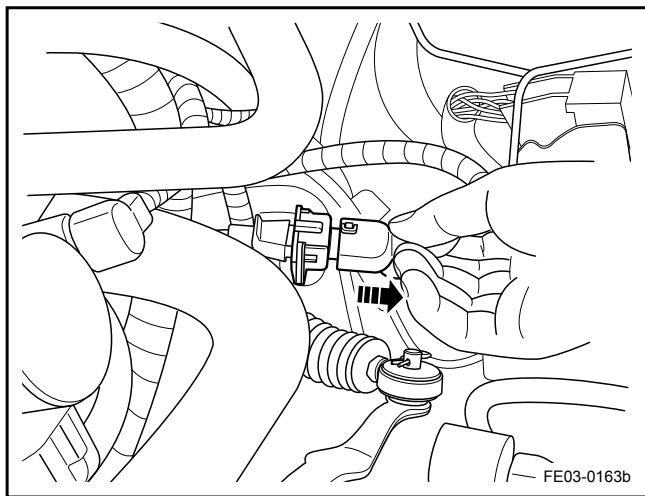
4. Connect the vehicle speed sensor harness connector, as shown in the graphic.
5. Connect the battery negative cable.

### 3.3.8.3 Transmission Assembly Replacement

Removal Procedure:

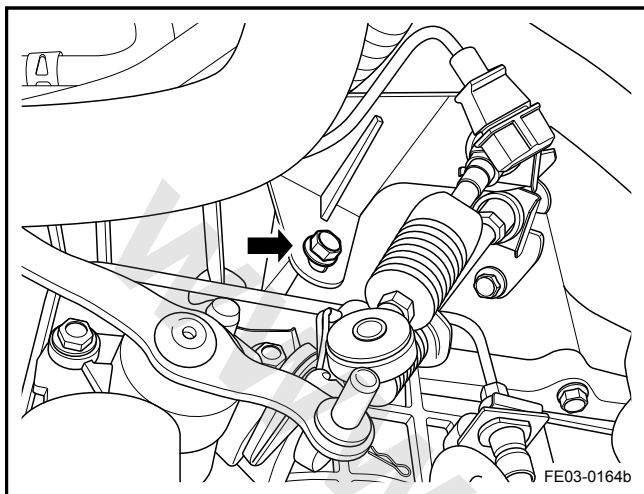
**Warning!**

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

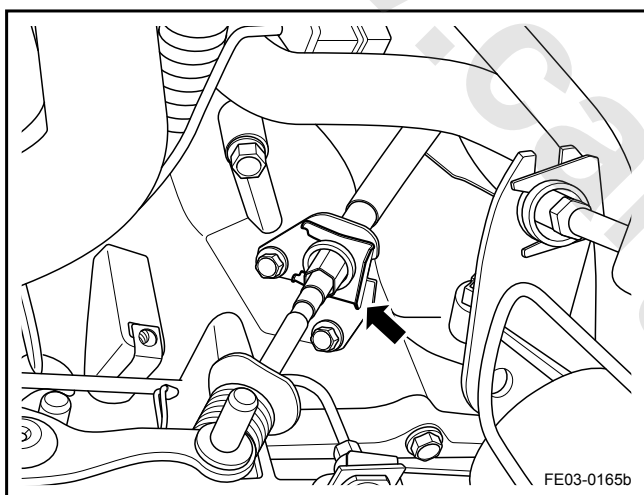


1. Remove the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the battery. Refer to [2.11.8.2 Battery Replacement](#).
3. Remove the air filter bracket.
4. Disconnect  
Disconnect the reverse lamp switch wiring harness connector.
5. Disconnect the vehicle speed sensor wiring harness connector.

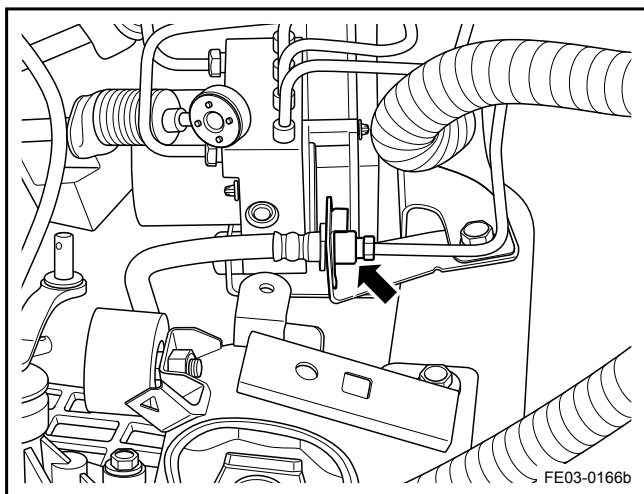
6. Disconnect the crankshaft position sensor wiring harness connector.
7. Remove the gearshift lever pull bolt. Refer to [3.3.8.4 Shift Control Assembly Replacement](#).
8. Remove the selector shaft bracket.

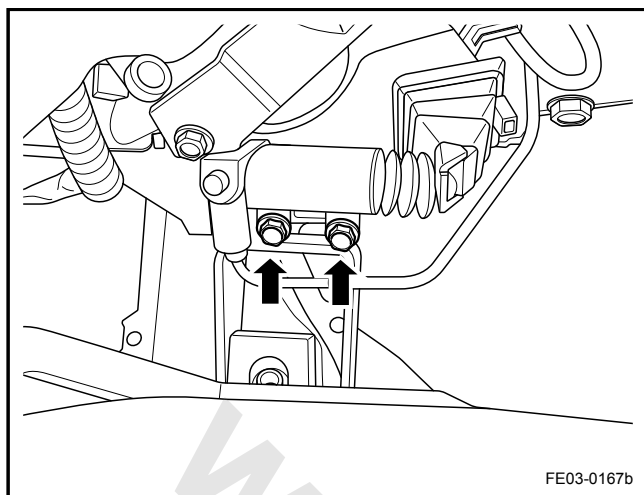


9. Remove the selector shaft retaining pin.

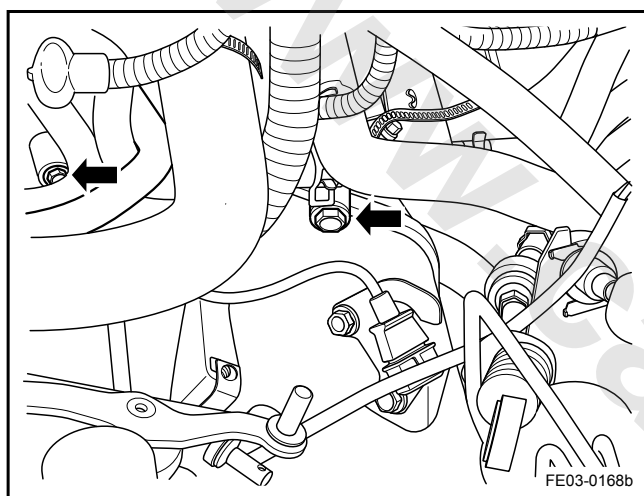


10. Remove the clutch slave cylinder tube.

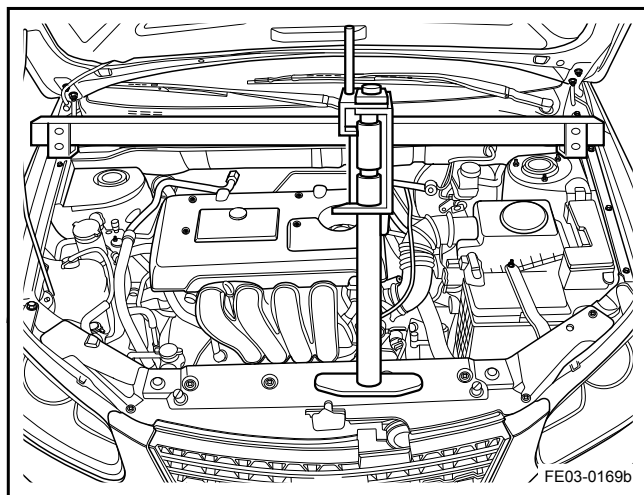




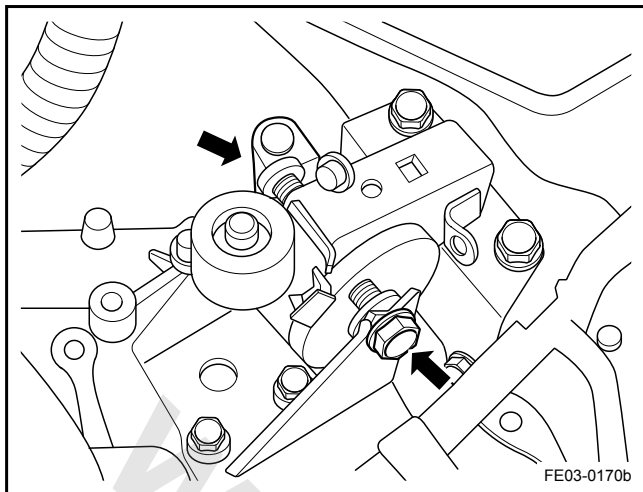
11. Remove the clutch slave cylinder retaining bolts.
12. Remove the starter cable and the retaining bolts. Refer to [2.11.8.4 Starter Replacement](#).



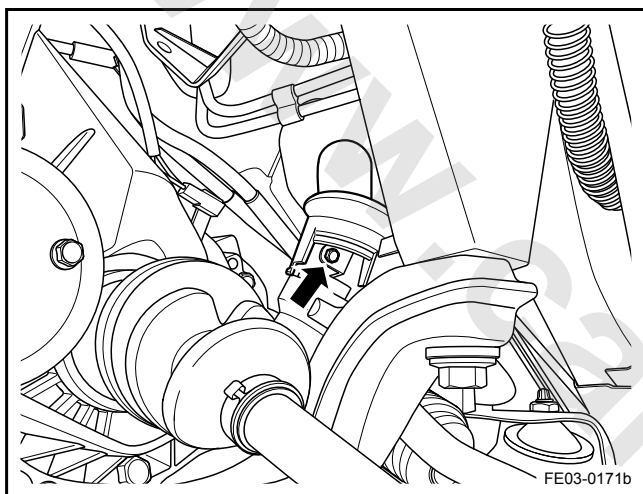
13. Remove the transmission upper connecting bolts.



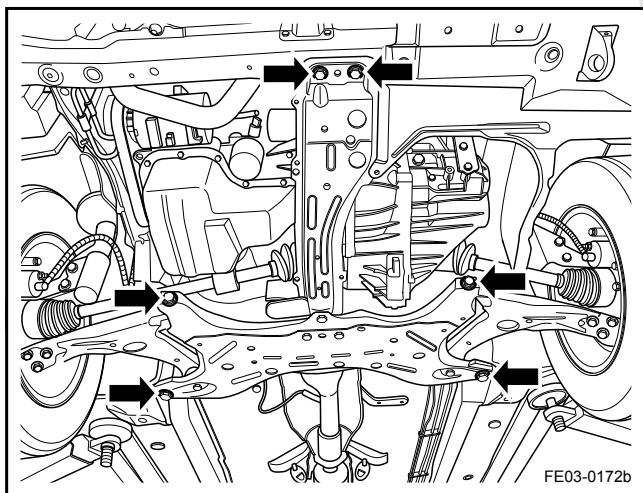
14. With an engine hoisting tool, fix the engine.



15. Remove transmission left bracket assembly.
16. Remove the front wheels.
17. Lift the vehicle.
18. Remove the transmission fluid plug, after draining the transmission fluid, clean and install the transmission plug. Refer to [3.3.8.1 Transmission Fluid Level Inspection](#).

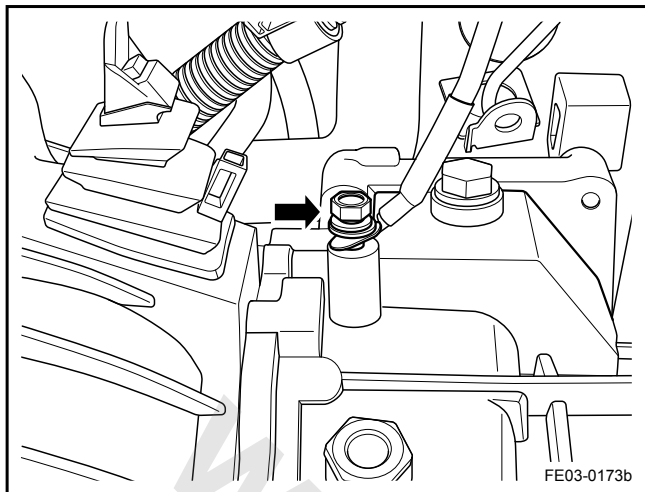


19. Remove the steering horizontal bolts.

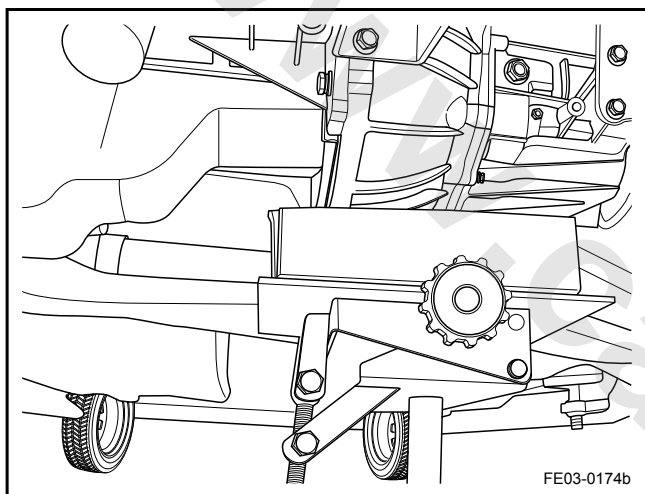


20. Remove the front sub frame and related components. Refer to [12.6.4.3 Cross Member Replacement](#) and [12.6.4.2 Subframe Replacement](#).
21. Remove the left and right side drive shafts. Refer to [5.3.4.1 Drive Shaft Replacement](#).

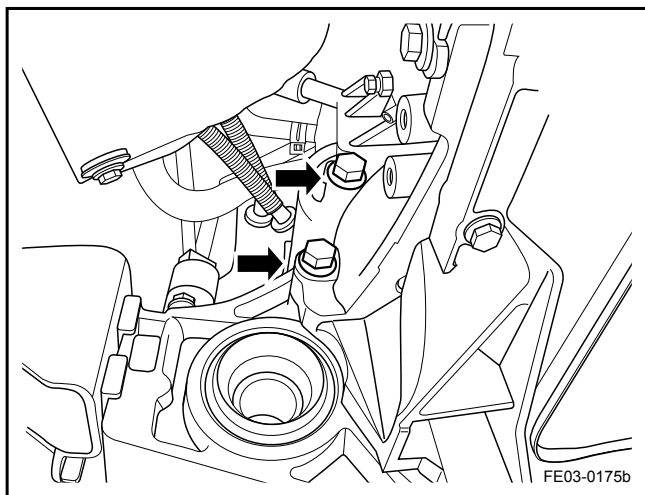




22. Remove the transmission case ground cable.

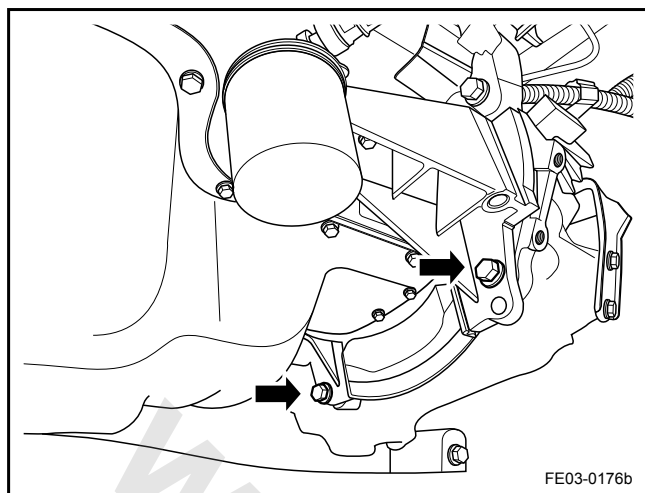


23. Use a jack to support the transmission.

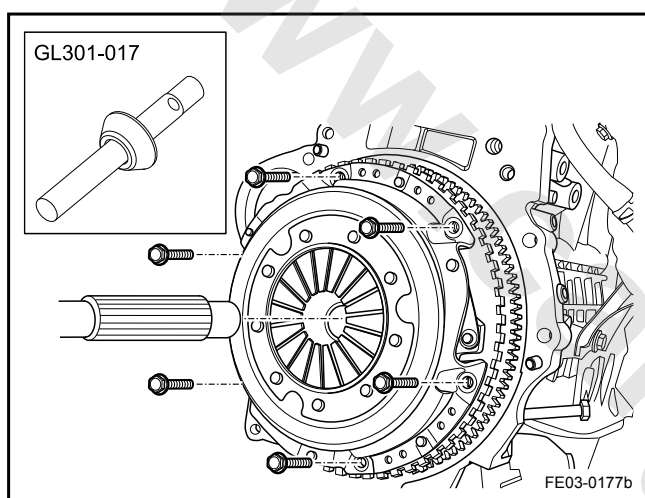


24. Remove the transmission rear connecting bolts.



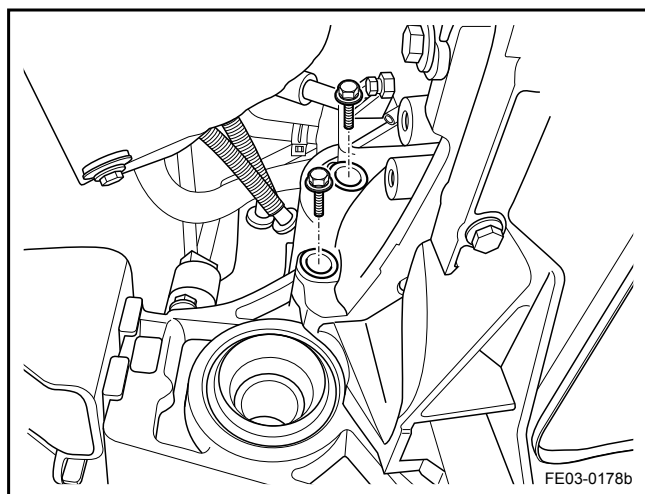


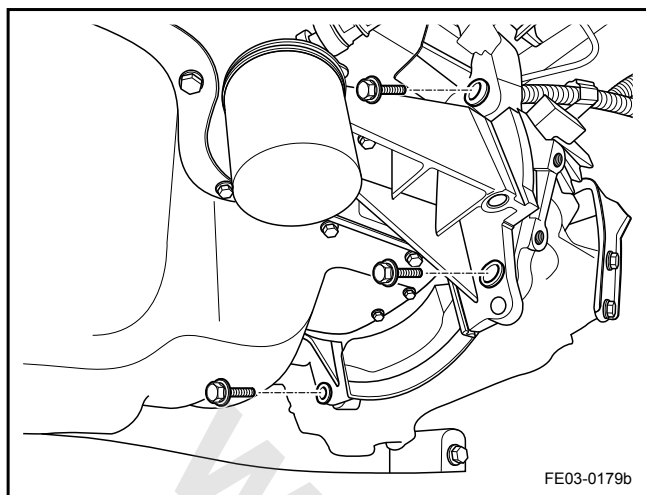
25. Remove the transmission bottom connecting bolts.
26. Remove the transmission assembly.



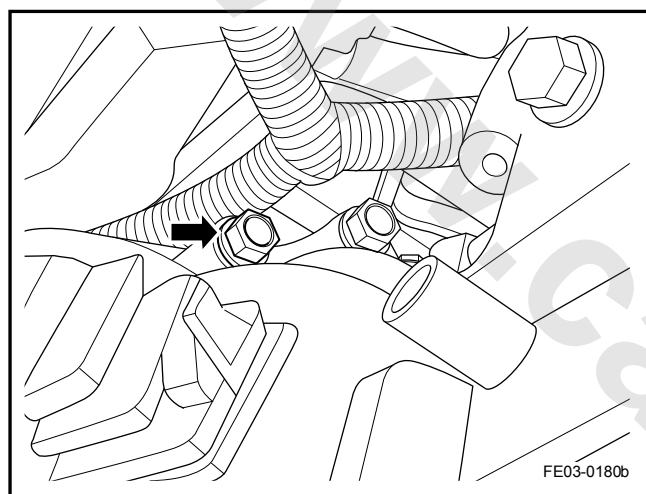
#### Installation Procedure:

1. Use a flat-panel jack to support the transmission assembly.
2. Insert the transmission input shaft into the clutch plates. Push the transmission to the engine side, pay attention to locating pin position.
3. Install the transmission rear connecting bolts.

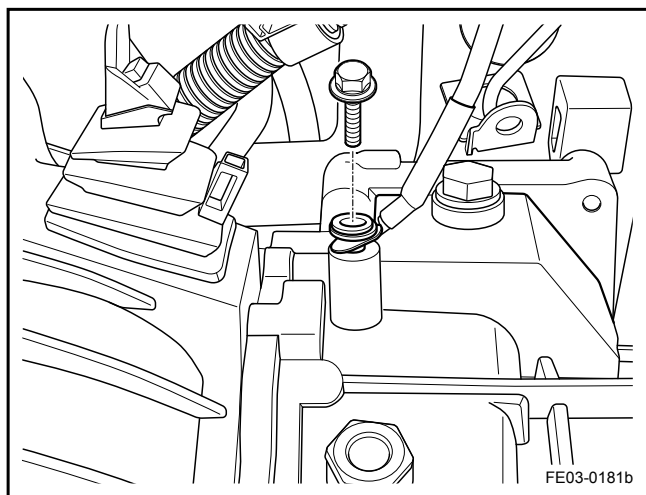




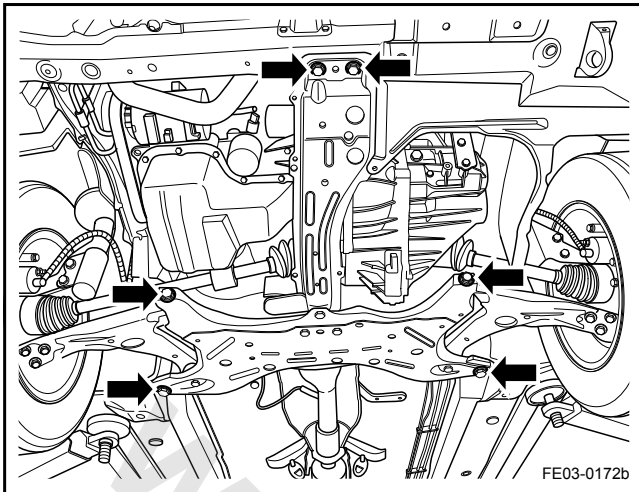
4. Install the transmission rear connecting bolts and the starter motor bottom retaining bolts.



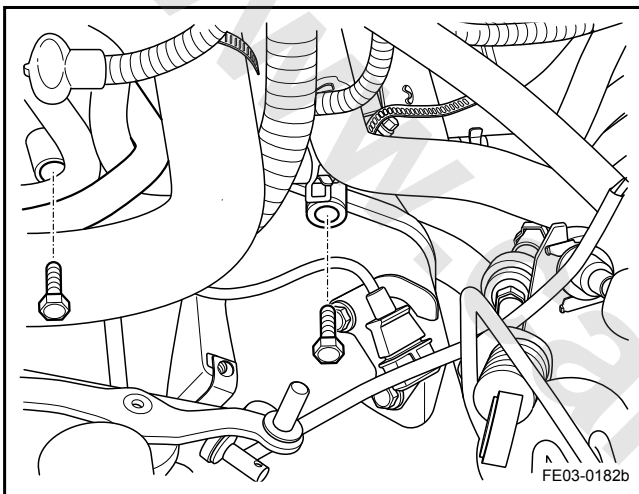
5. Install the starter motor upper retaining bolts and cables.
6. Remove the flat-panel jack.



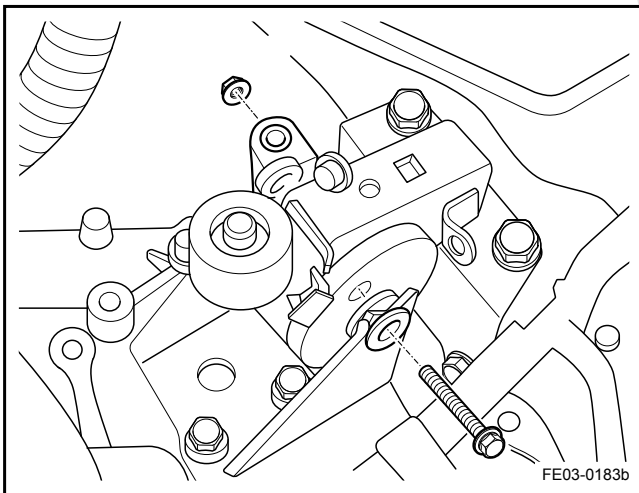
7. Install the transmission case ground cable.
8. Install the left and right drive shafts.



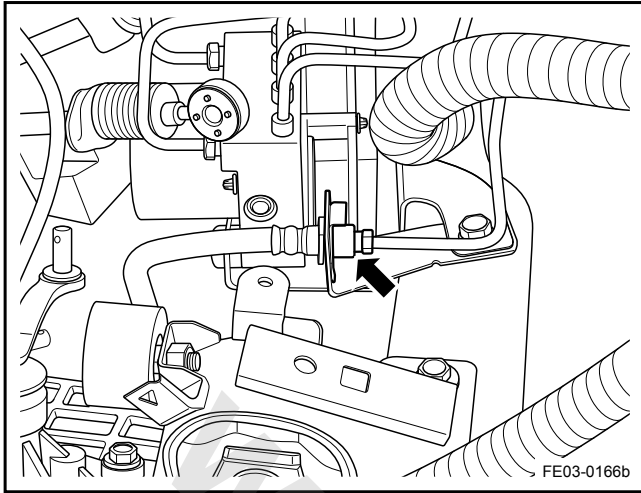
9. Install the front sub frame and related components.
10. Install the front wheels.
11. Remove the engine hoisting tool.



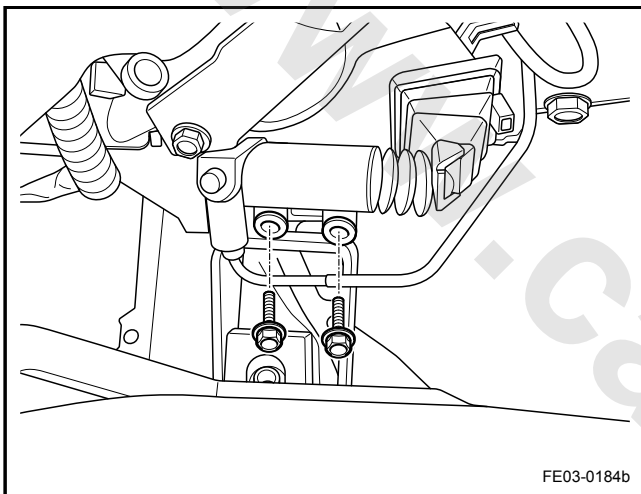
12. Install the transmission upper retaining bolts.



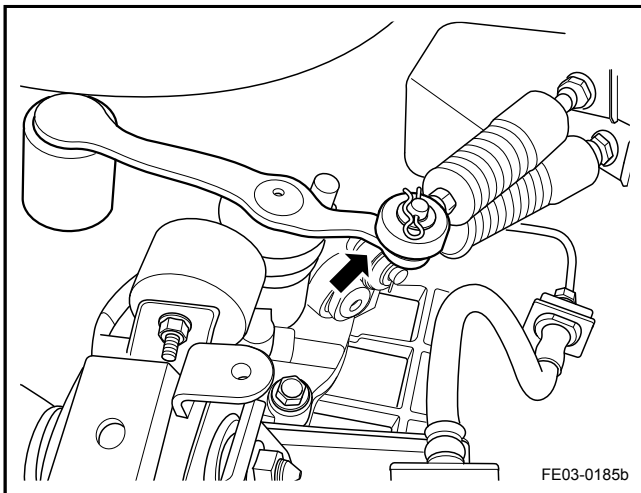
13. Install the transmission left bracket assembly.



14. Install the clutch slave cylinder tube.



15. Install the clutch slave cylinder and bleed the air.



16. Install the gearshift control mechanism.

17. Connect the crankshaft position sensor wiring harness connector.

18. Connect the vehicle speed sensor wiring harness connector.

19. Connect the reverse lamp switch harness connector.

20. Install the battery bracket.

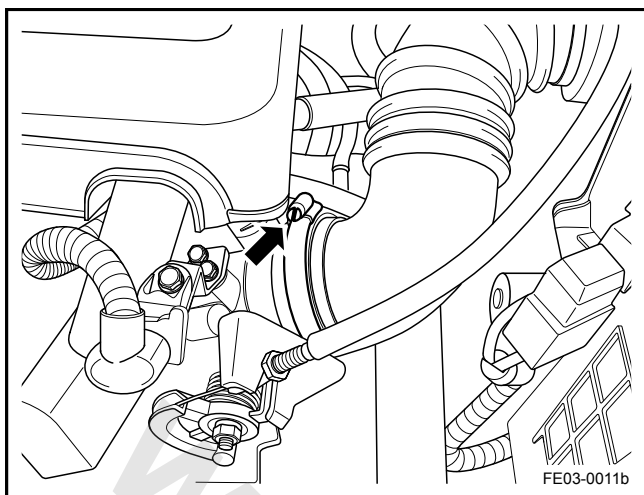
21. Connect the battery negative cable.

### 3.3.8.4 Shift Control Assembly Replacement

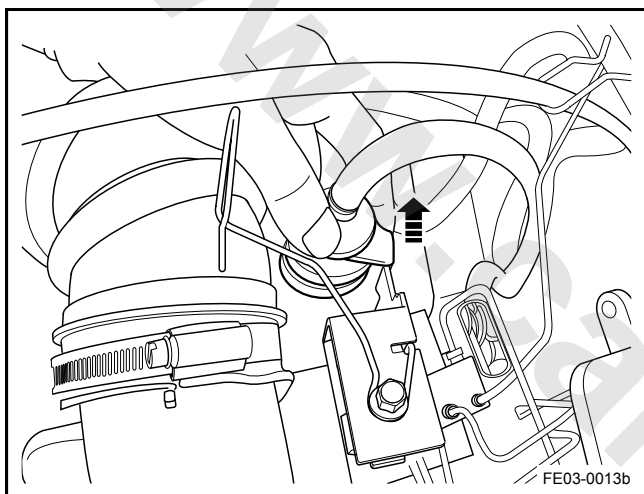
Removal Procedure:

**Warning!**

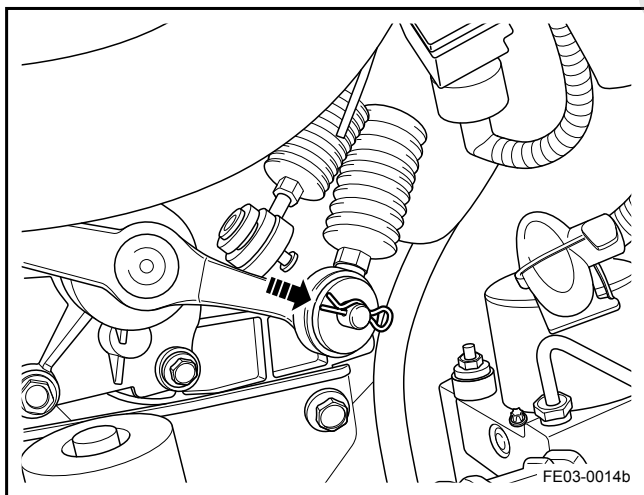
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



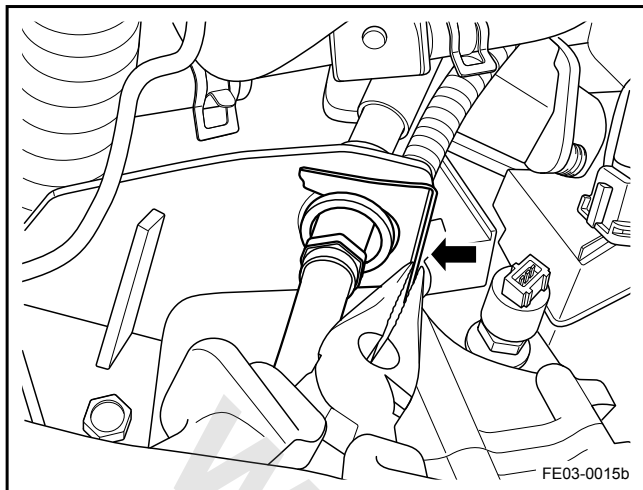
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the intake pipe clamp.



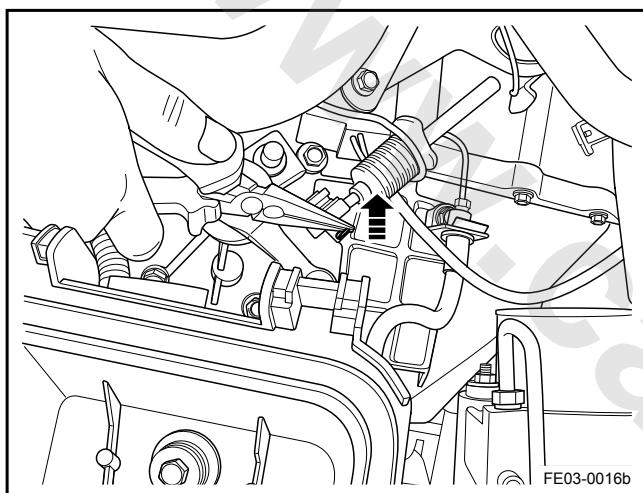
3. Remove the Canister solenoid valve components from the Canister solenoid valve bracket.



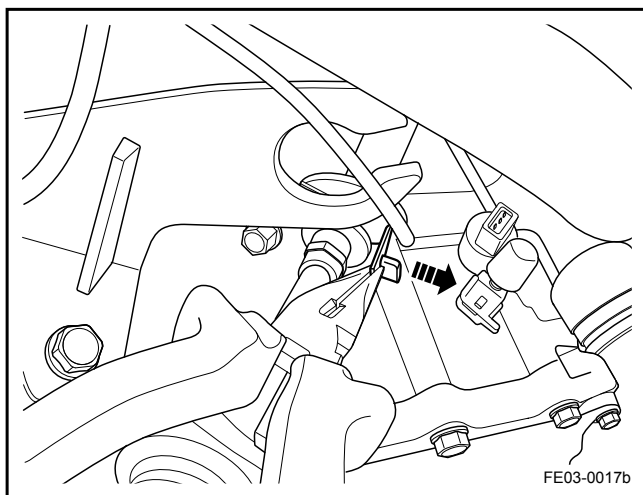
4. Remove the selector shaft rod retaining pin.



5. Remove the selector shaft locating pin and the selector shaft rod.

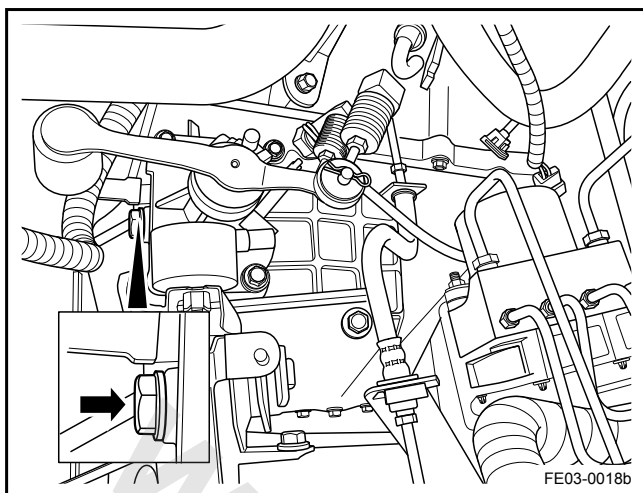


6. Remove the selector shaft rod bolt.

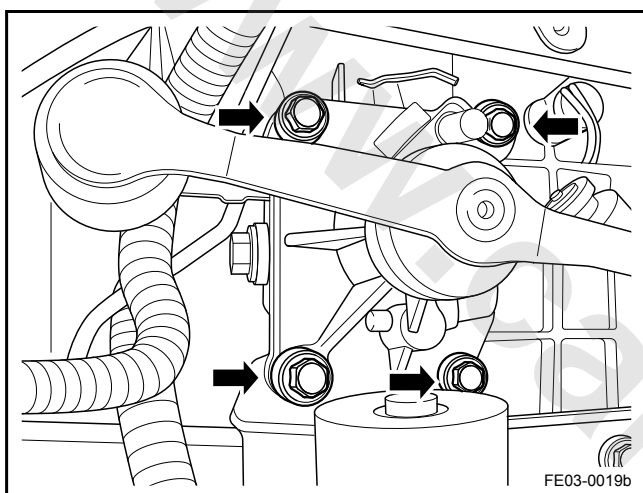


7. Remove the selector shaft locating pin and the selector shaft rod.

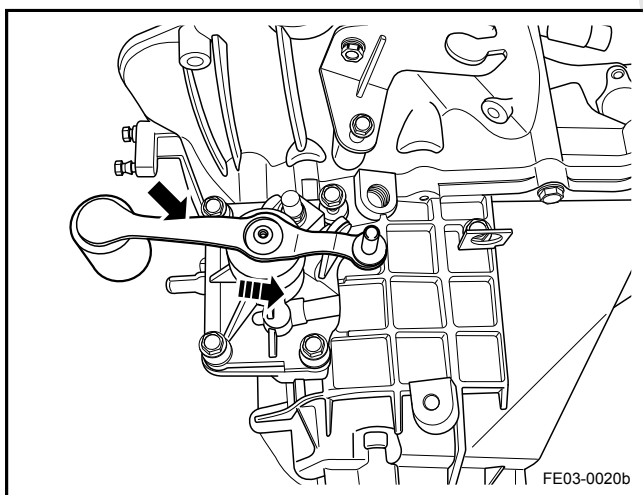




8. Remove the selector shaft self-locking bolt.



9. Remove the four bolts as shown in the graphic.



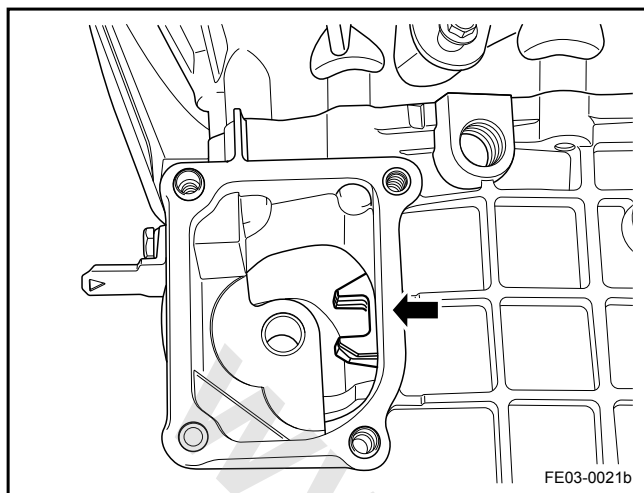
10. Remove the shift control assembly.

#### Note

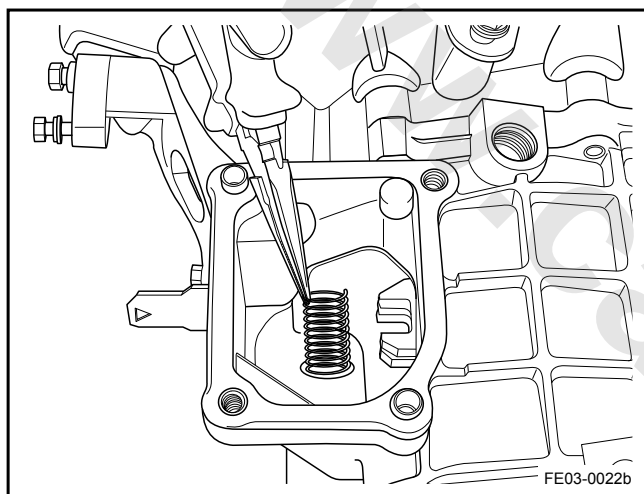
The gear must be at neutral position as shown in the graphic, otherwise the shift control assembly is unable to remove. During the removal, make sure the return spring within the transmission is in a free state, otherwise it may fall into the transmission case.

## Installation Procedure:

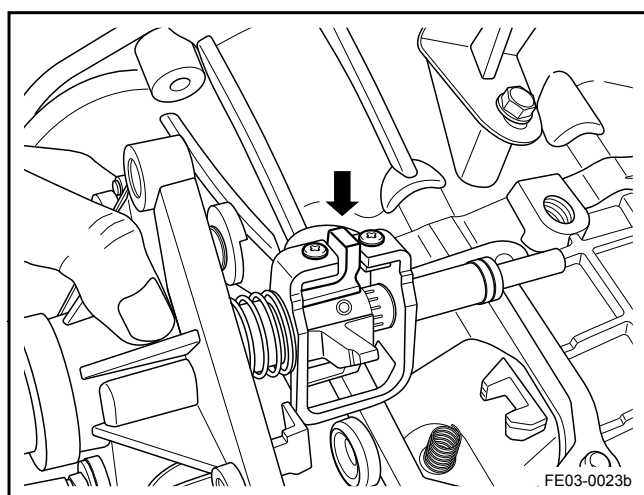
1. Confirm the gear is at neutral position as shown in the graphic.



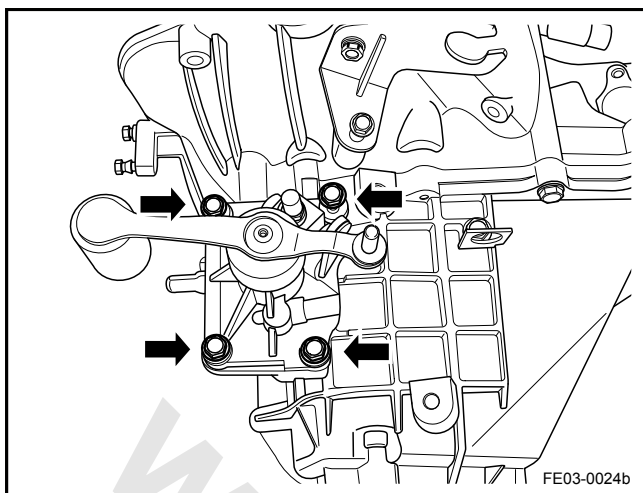
2. Install the return spring to the fixed hole and confirm it is installed into place.



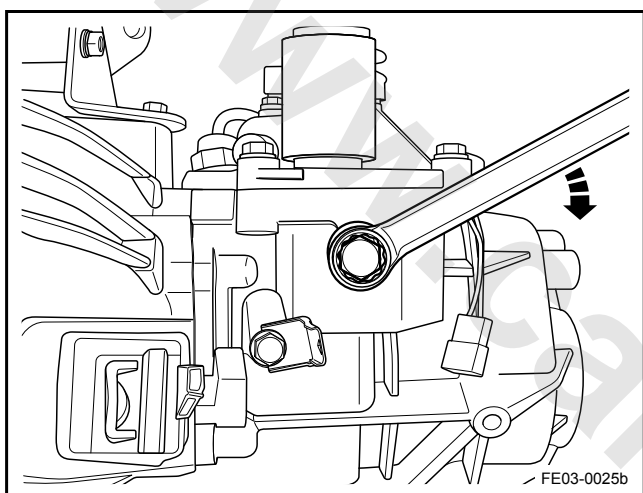
3. Before installation, confirm the shift control assembly and the control slider are at the same level.



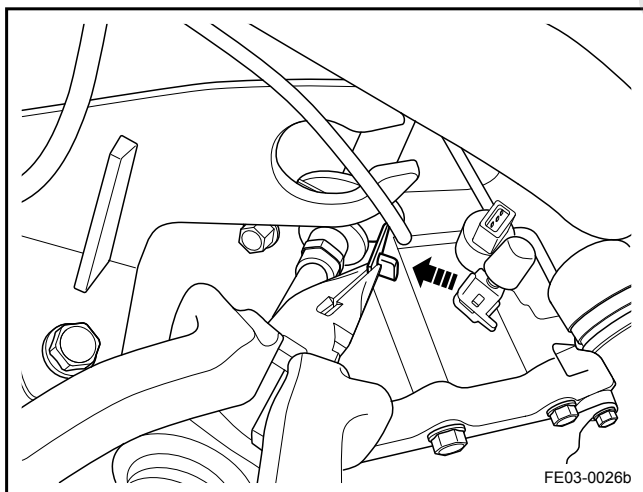




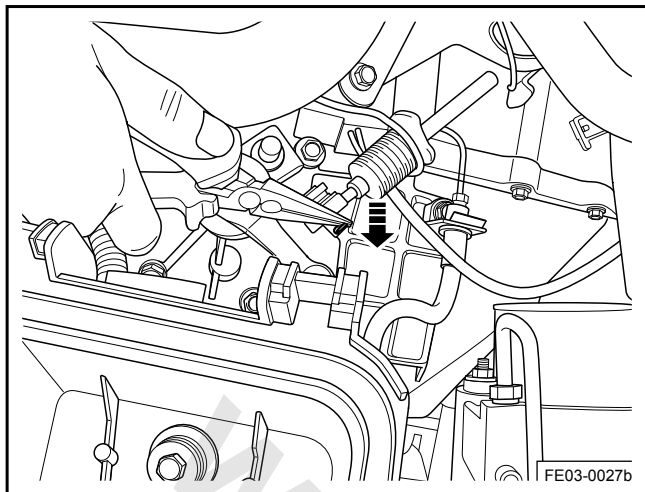
4. Before installation, apply sealant evenly on the mating surface. Install the shift control assembly and tighten the four retaining bolts.



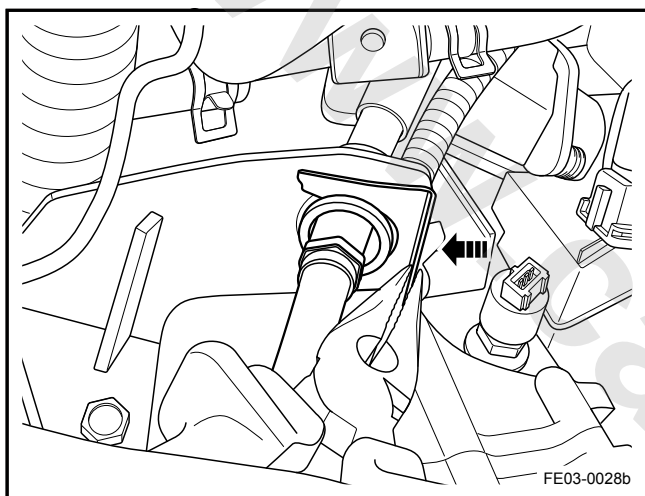
5. Install and tighten the selector shaft self-locking bolt.



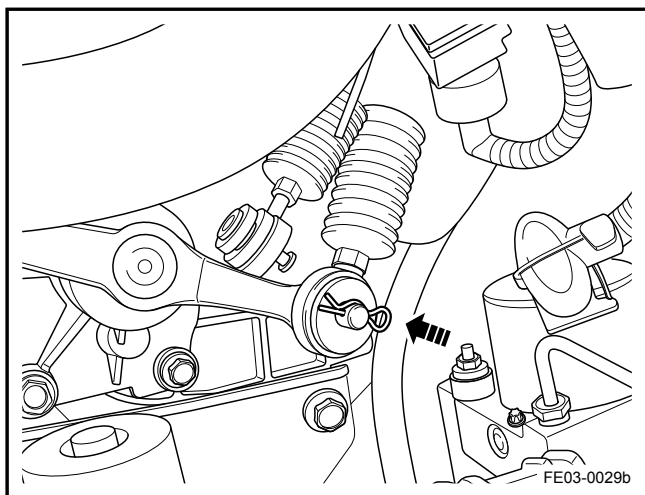
6. Install the selector shaft rod locating pin.



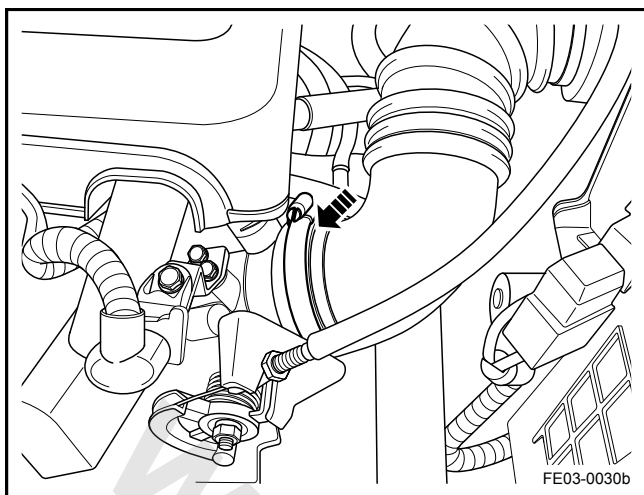
7. Install the selector shaft rod retaining pin.



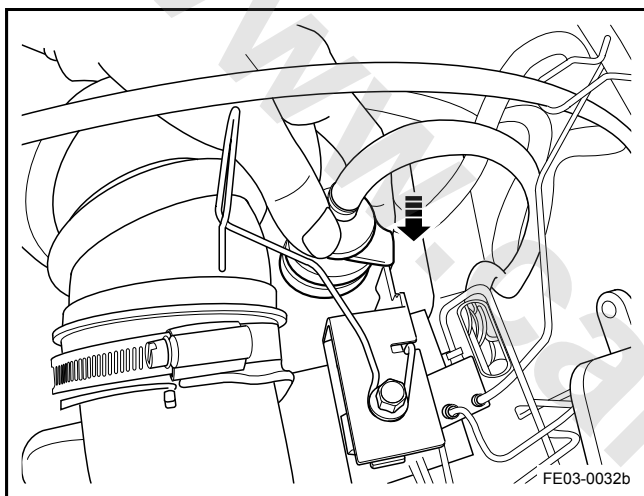
8. Install the selector shaft rod locating pin.



9. Install the selector shaft rod retaining pin.



10. Install the air intake duct and tighten the clamp.



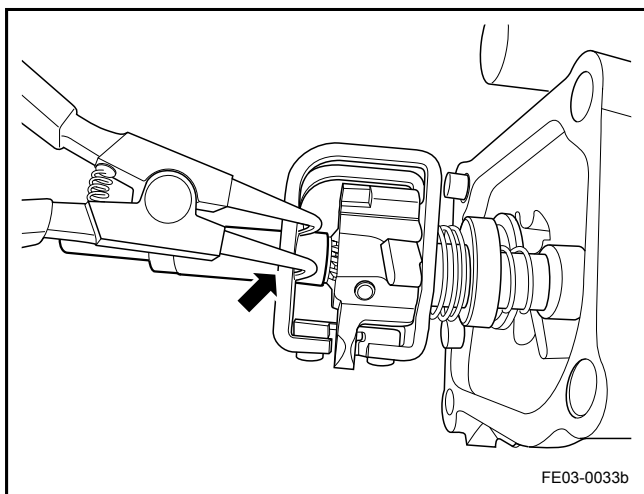
11. Install the Canister solenoid valve bracket.
12. Connect the battery negative cable.

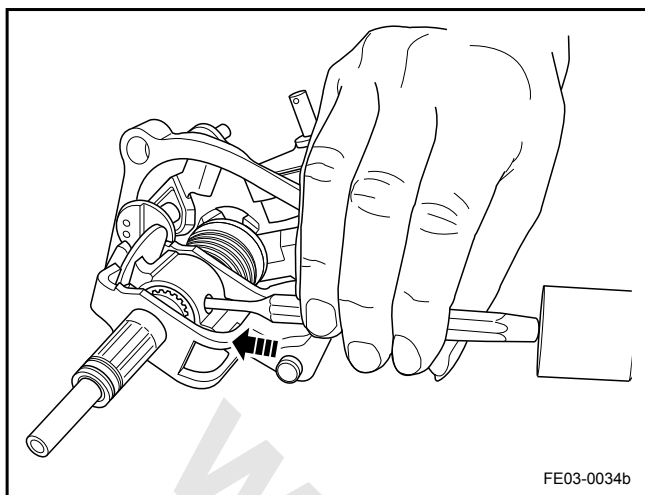
### 3.3.8.5 Shift Control Assembly Disassemble and Assemble

Disassemble Procedure:

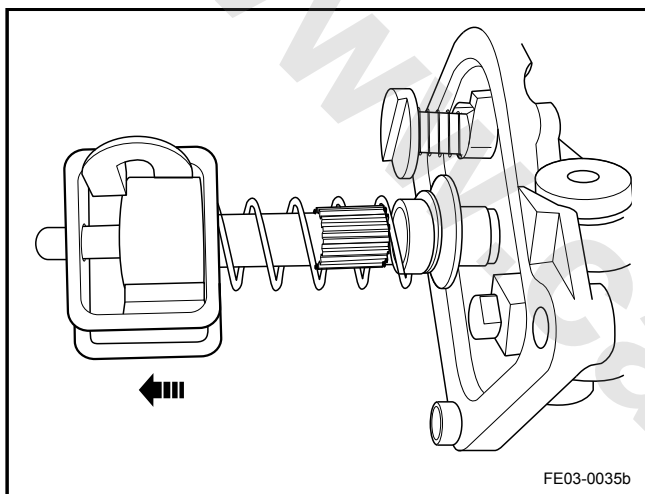
#### Warning!

1. Remove the shift control assembly. Refer to [3.3.8.4 Shift Control Assembly Replacement](#).
2. With a plier, remove the shift control outer retaining ring.

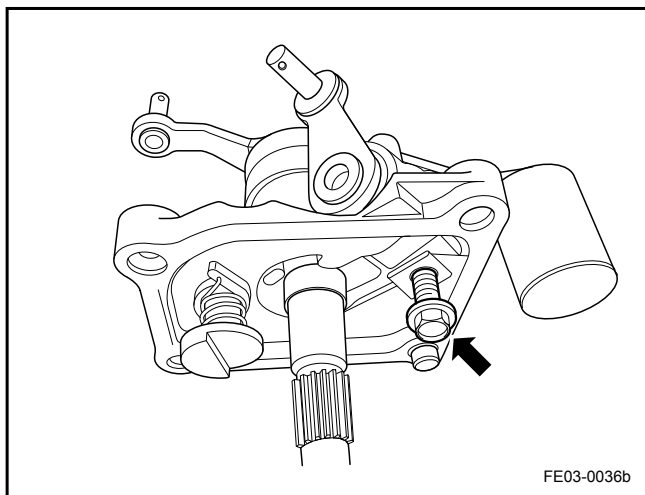




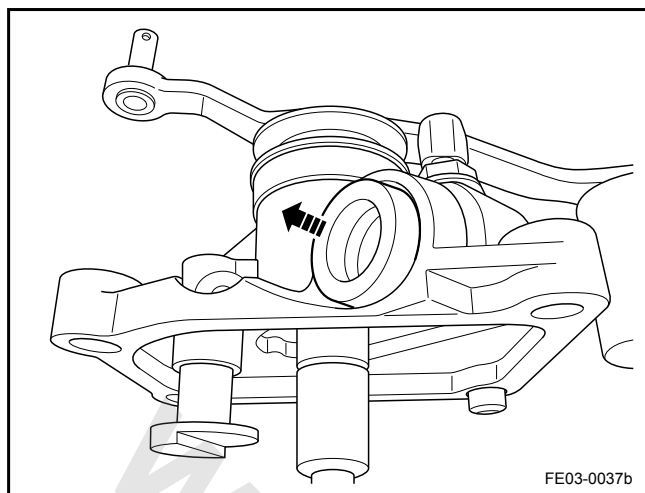
3. Remove the shift control locking pin.



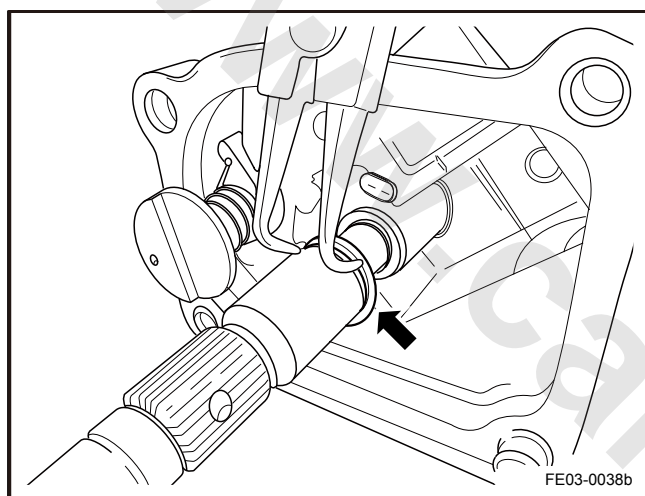
4. Remove the selector shaft sleeve.



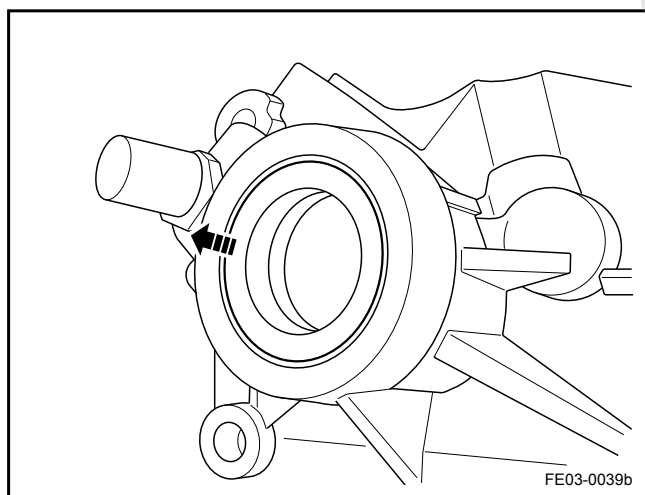
5. Remove the selector shaft retaining bolts.



6. Remove the selector shaft oil seal as shown in the graphic.



7. With a plier, remove the shift control inner retaining ring.



8. Remove the selector shaft oil seal to complete the shift control assembly disassemble.

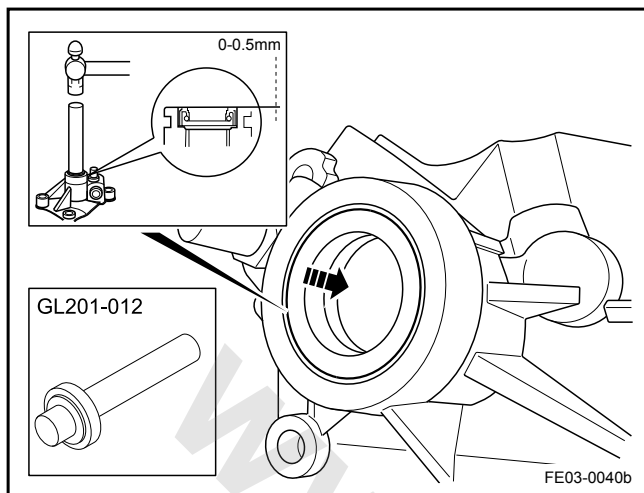
## Assemble Procedure:

1. With a special tool GL201-012, install the selector shaft oil seal.

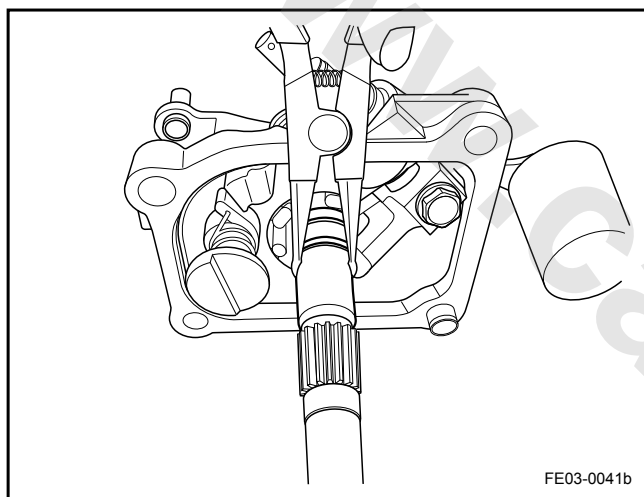
Seal Face To Face Seal Hole Distance:

0-0.5 mm ( $0-19.685 \times 10^{-3}$  in)

2. Install the selector shaft.



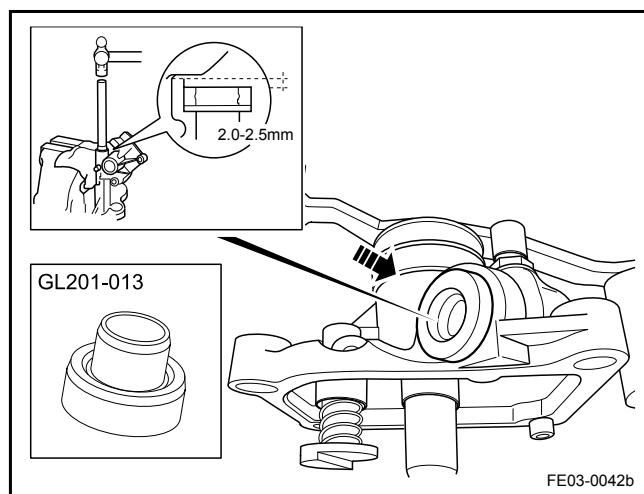
3. Install the selector shaft inner retaining ring.

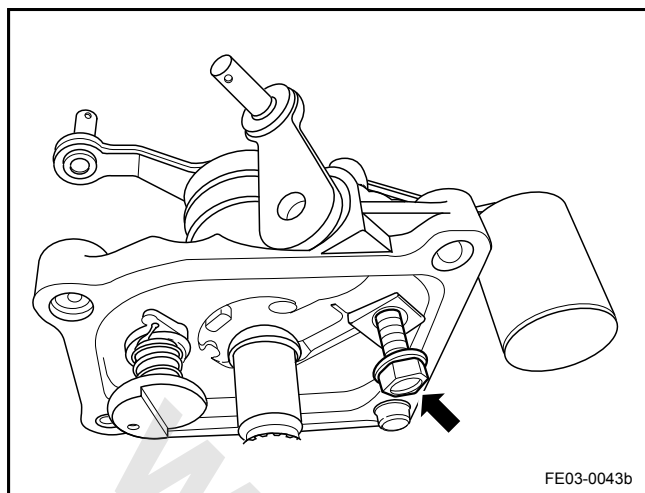


4. With a special tool GL201-013, install the selector shaft oil seal.

Seal Surface To Seal Hole Surface Distance:

2.0-2.5 mm ( $78.740-98.425 \times 10^{-3}$  in)

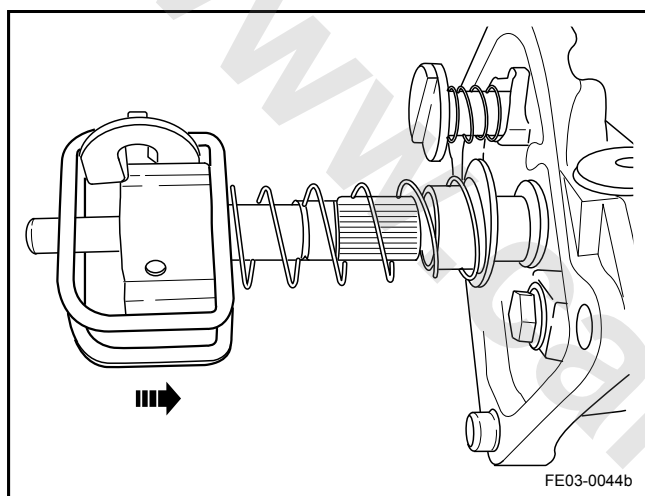




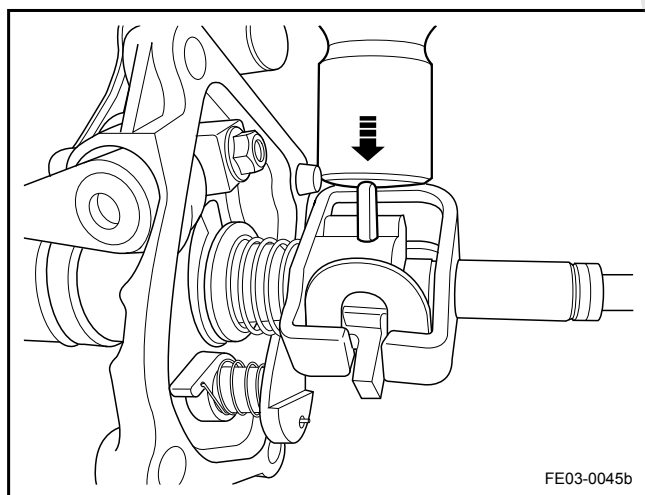
5. Install the selector shaft and tighten the bolts.

**Note**

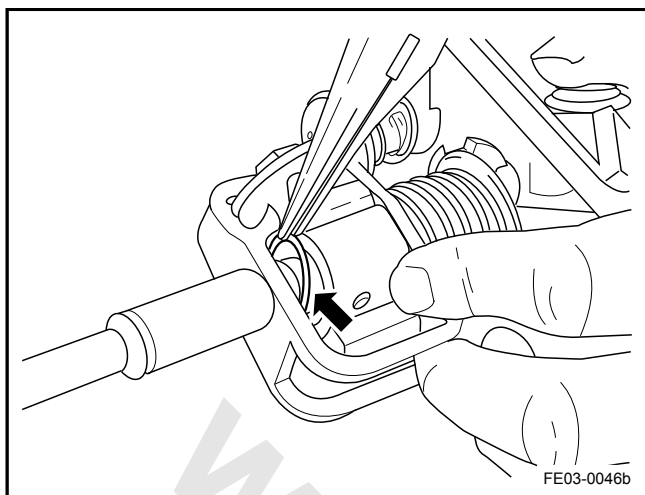
Do not damage the oil seal.



6. Install the selector shaft sleeve.



7. Install the selector shaft sleeve locking pin.

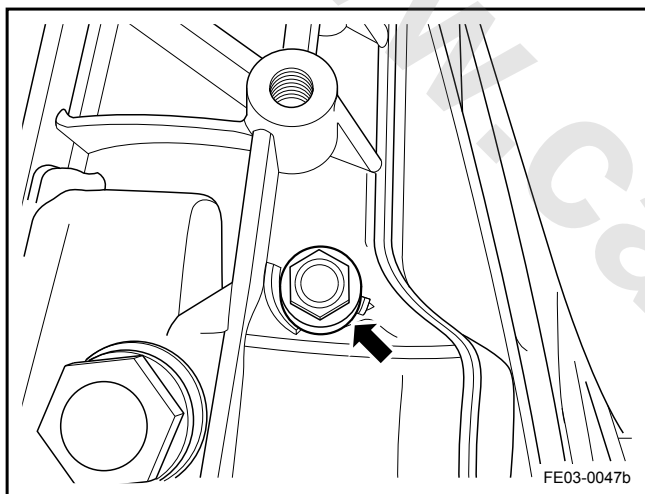


8. Install the selector shaft outer retaining ring.
9. Complete the shift control assembly assembly.

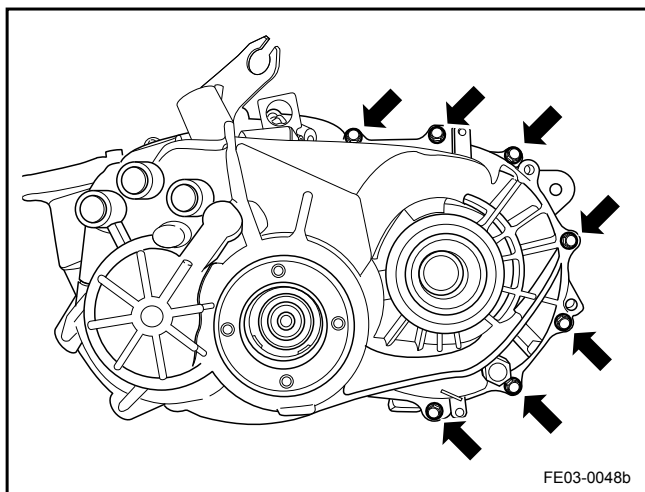
### 3.3.8.6 Shift Shaft Replacement

Removal Procedure:

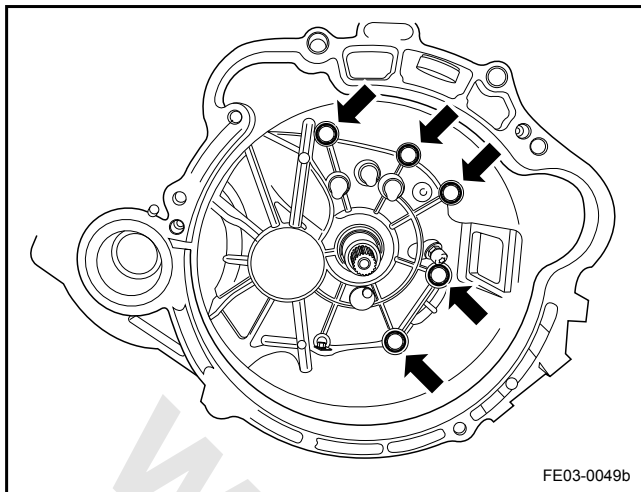
1. Remove the transmission assembly. Refer to [3.3.8.3 Transmission Assembly Replacement](#).
2. Remove the shift control assembly. Refer to [3.3.8.4 Shift Control Assembly Replacement](#).
3. Remove the reverse gear locating bolt.



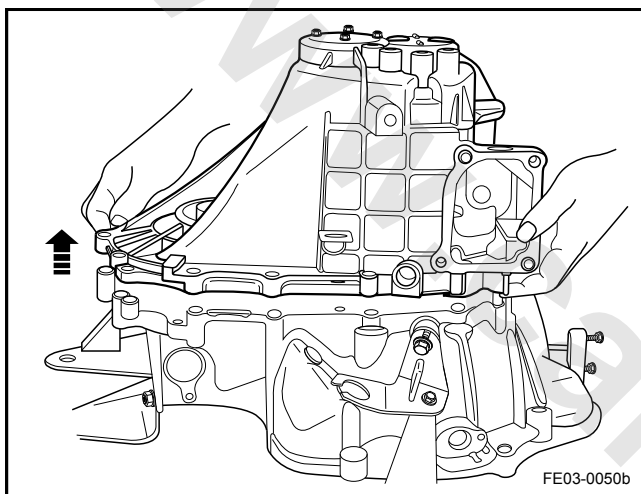
4. Remove the transmission case external connecting bolts.



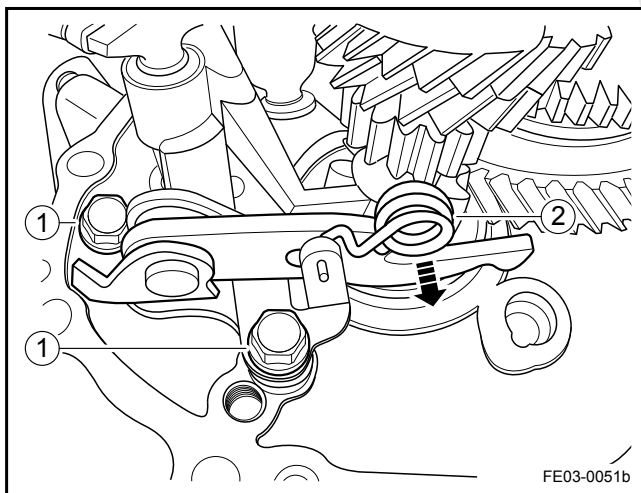




5. Remove the transmission case internal connecting bolts.



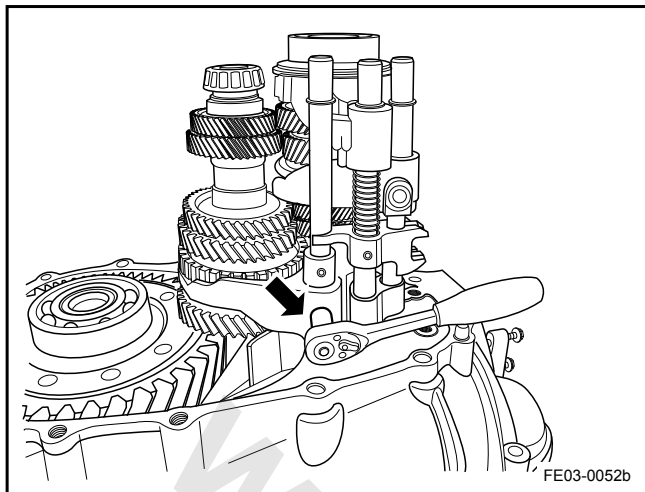
6. Remove the transmission rear case.



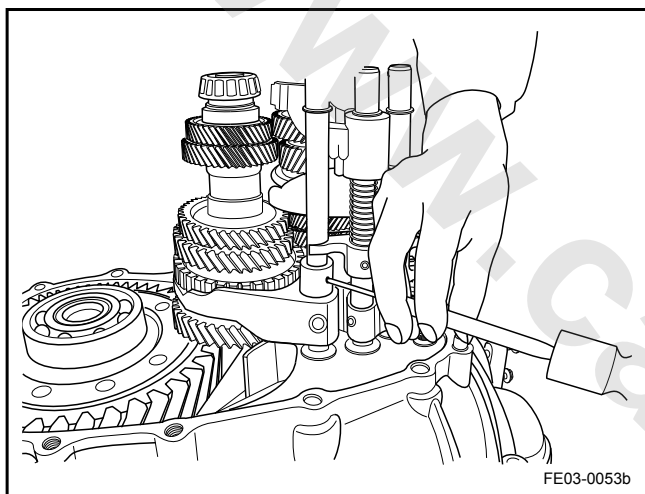
7. Remove the reverse shift rod.

**Note**

Before remove the retaining bolt (1), remove the return spring end (2).



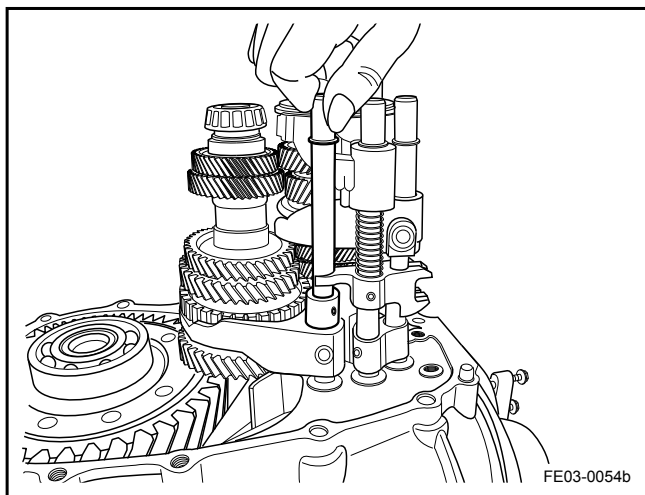
8. Remove the 1st/2nd shift shaft retaining bolts.



9. Remove the 1st/2nd shift shaft locking pin.

**Note**

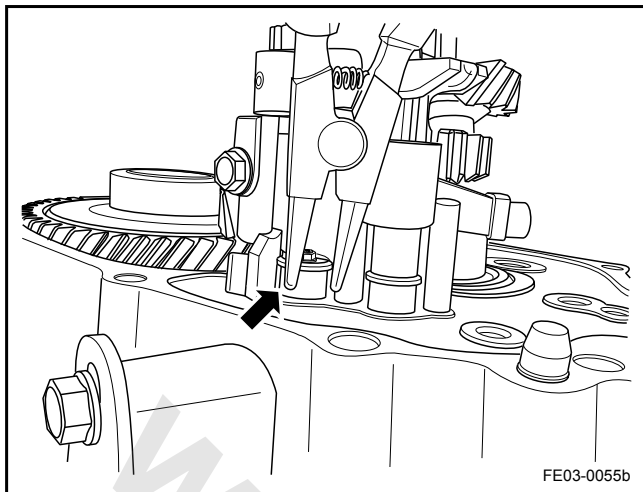
Use a specified tool, otherwise the locking pin may lock and can not be removed.



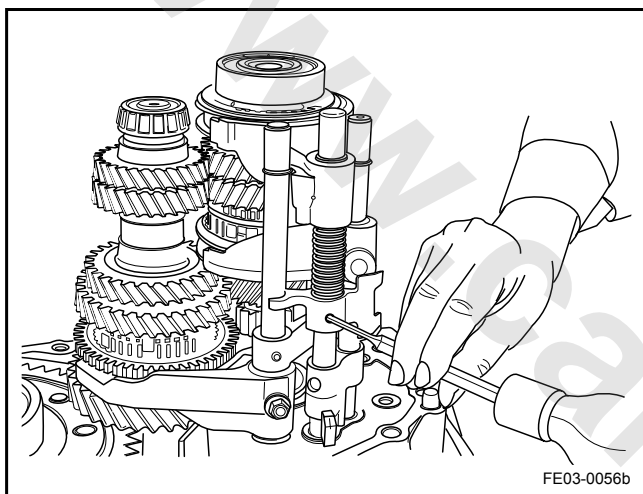
10. Rotate the 1st/2nd shift shaft 180° and pull upward to remove it. Pay attention to 5th and reverse shift shaft locking pin.

**Note**

The shift shaft and fork fitting is highly precise. During the removal, it is prohibited to force the shift shaft, as this will cause the shift shaft bending and can not be used.



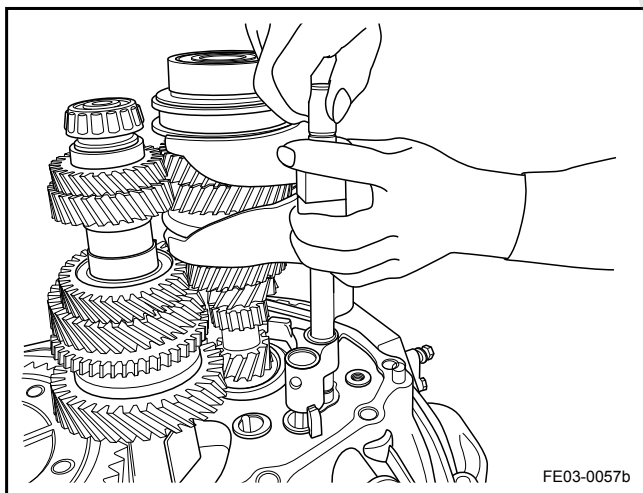
11. With a plier, remove the 5th and reverse shift shaft bottom retaining ring.



12. Remove the 5th and reverse shift shaft locking pin.

**Note**

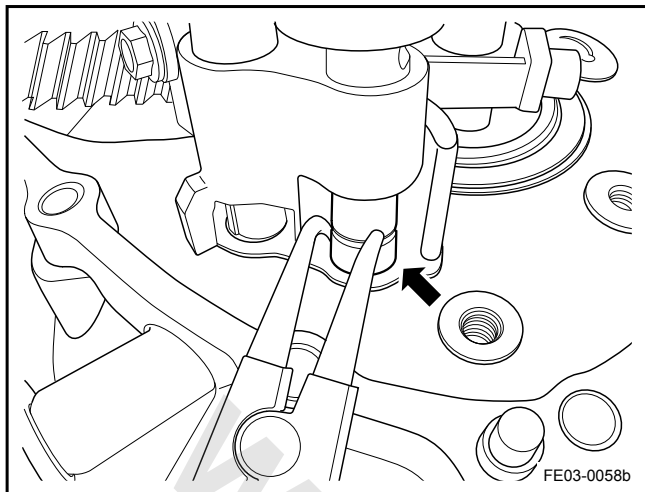
Use a specified tool, otherwise the locking pin may lock and can not be removed.



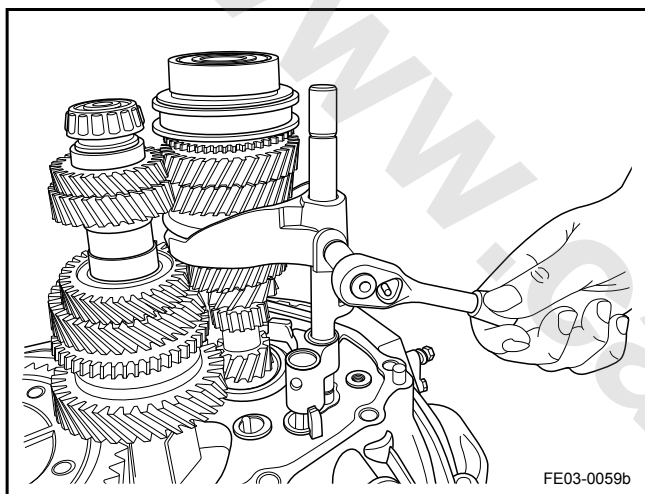
13. Rotate the 5th and reverse shift shaft 180° and pull upward to remove it. Prevent dropping the locking pin.

**Note**

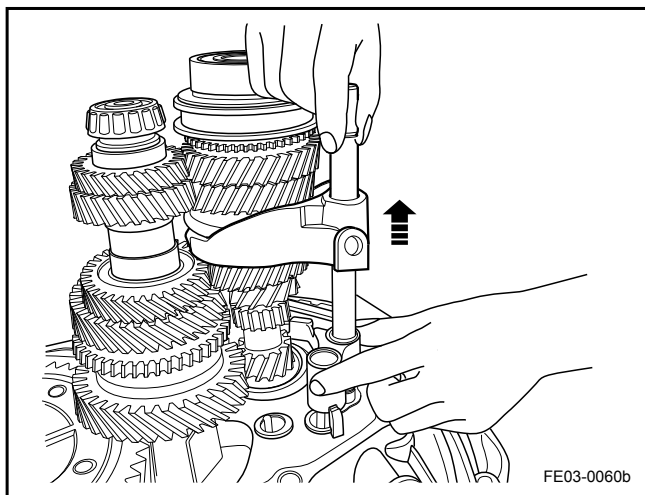
The shift shaft and fork fitting is highly precise. During the removal, it is prohibited to force the shift shaft, as this will cause the shift shaft bending and can not be used. During the removal, hold the middle spring by hand to prevent the fork spring pop-up.



14. With a plier, remove the 3rd/4th shift shaft bottom retaining ring.



15. Remove the 3rd/4th shift shaft retaining bolts.



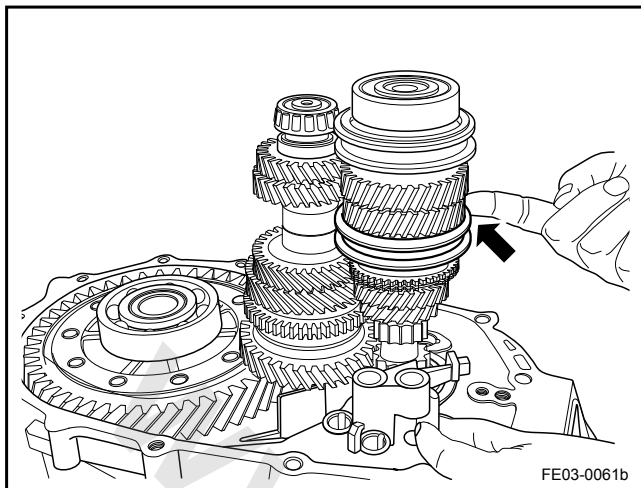
16. Engage the 3rd/4th gear synchronizer to the 4th gear. Remove the 3rd/4th shift shaft and other components.

#### Note

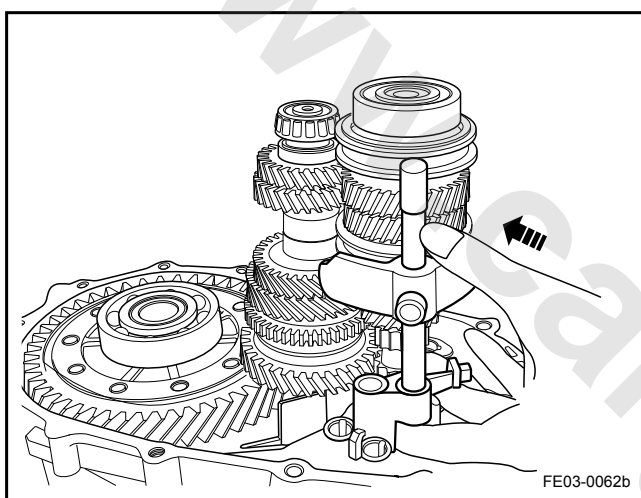
The shift shaft and fork fitting is highly precise. During the removal, it is prohibited to force the shift shaft, as this will cause the shift shaft bending and can not be used. During the removal, hold the middle spring by hand to prevent the fork spring pop-up.

## Installation Procedure:

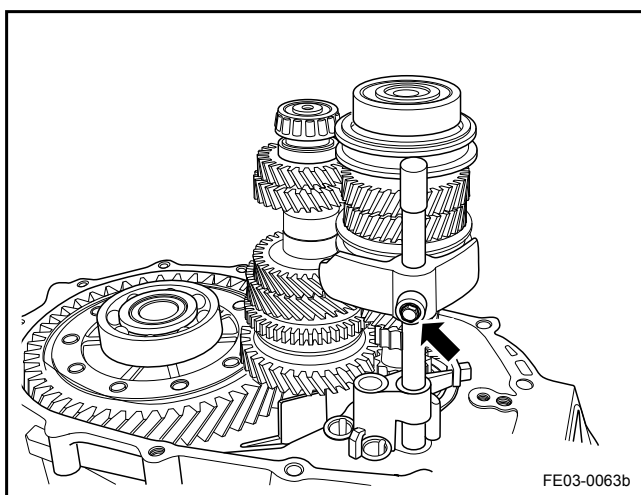
1. Engage the 3rd/4th gear synchronizer to the 4th gear.

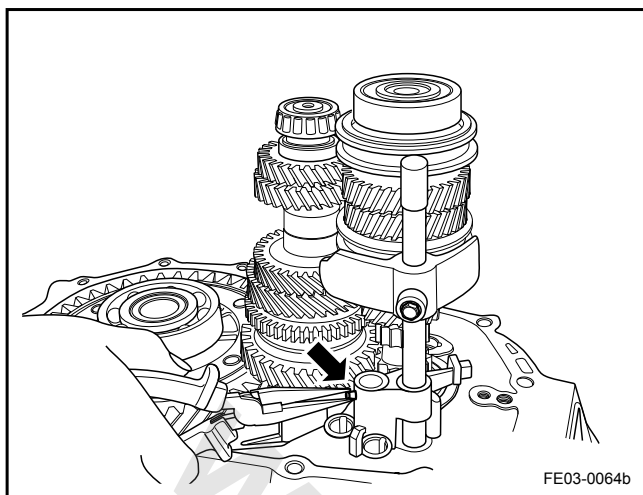


2. Install the 3rd/4th shift shaft and other components.



3. Install the 3rd/4th shift shaft retaining bolts.

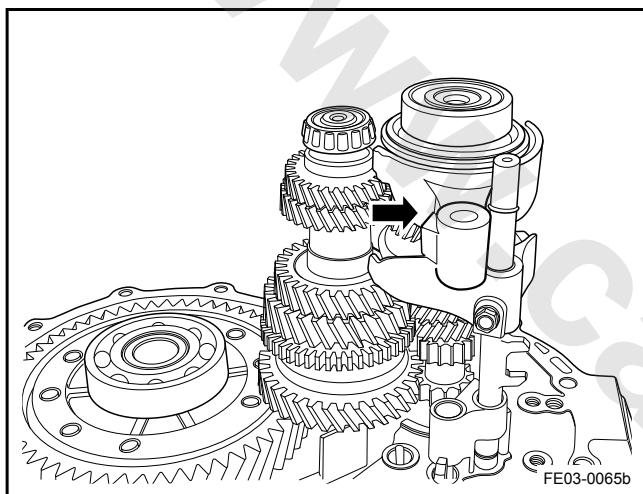




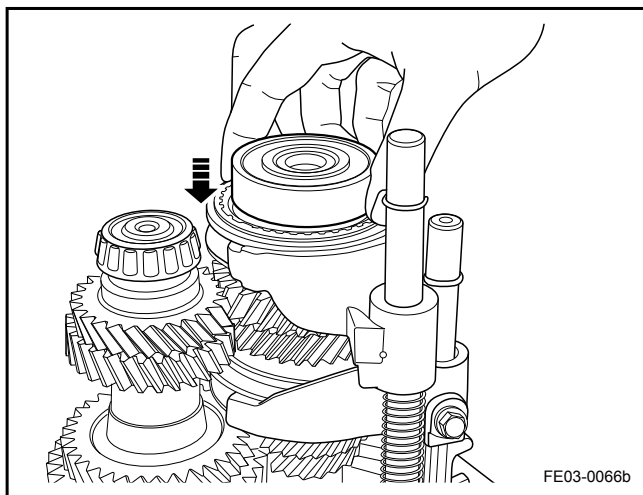
4. Install the 3rd/4th shift shaft and 5th shift shaft interlocking pin.

**Note**

The 3rd/4th shift shaft groove is aligned with the pin hole.



5. Install the 5th gear synchronizer.

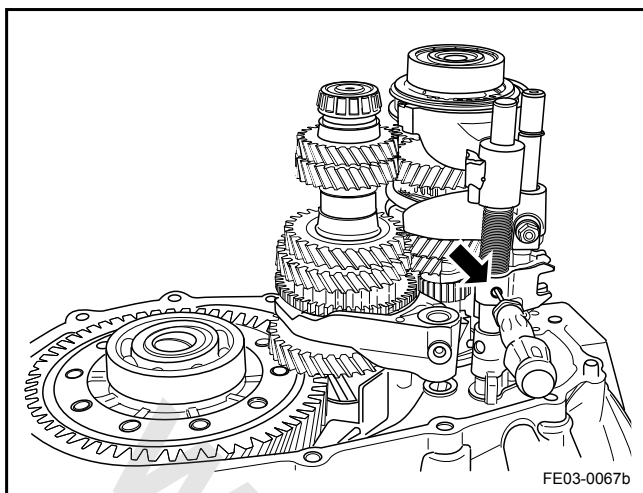


6. Install the 5th shift shaft.

**Note**

Hold the 5th gear synchronizer to prevent the synchronizer pop-up.

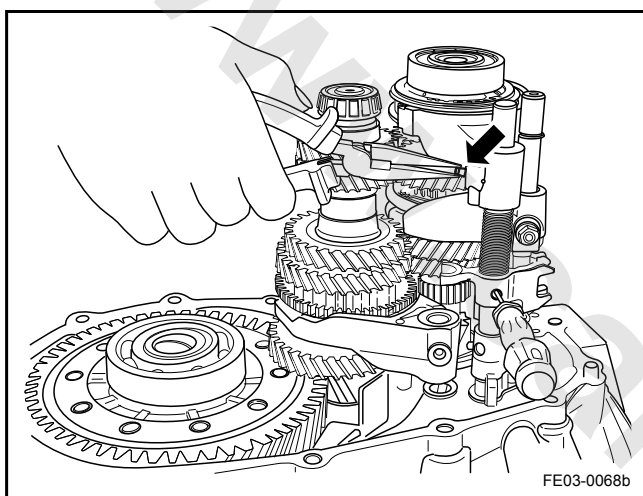




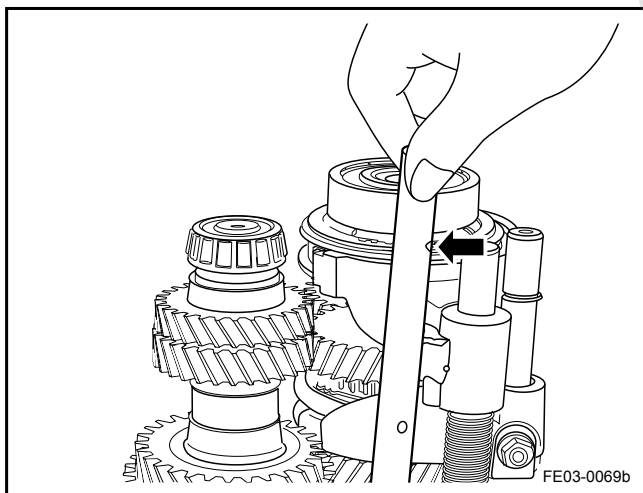
7. Insert a screwdriver into the locking pin hole, temporarily fix the 5th shift shaft.

**Note**

The shift shaft groove is aligned with the pin hole.



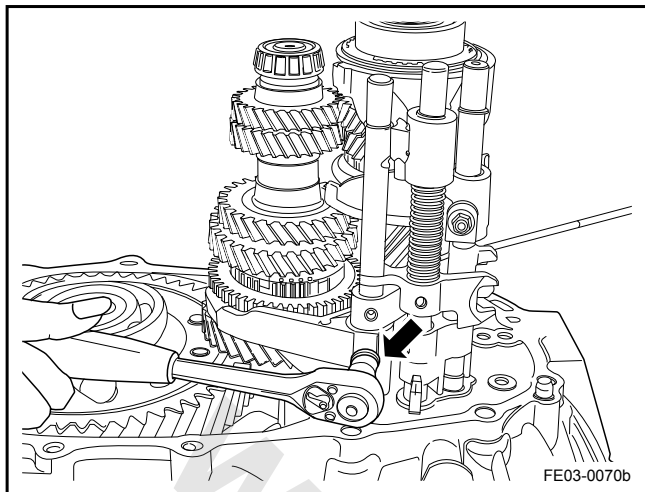
8. Install the 1st/2nd and 5th/reverse shift shaft interlocking pins.



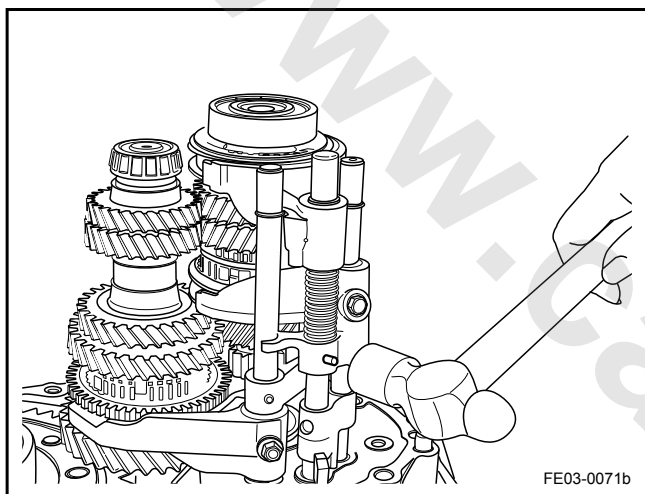
9. Install the 1st/2nd shift shaft.

**Note**

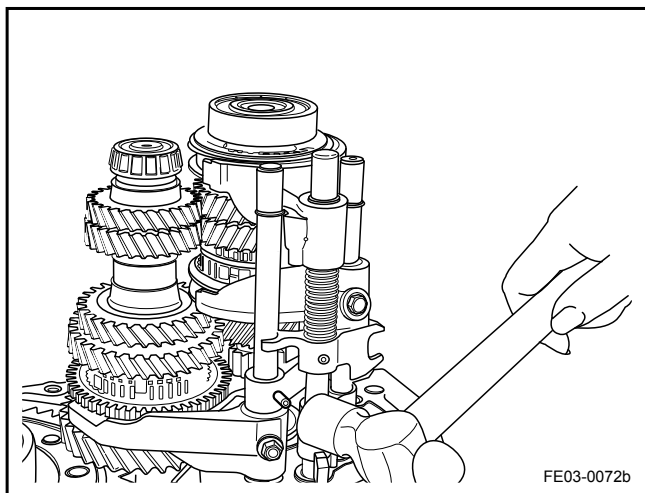
The shift shaft groove is aligned with the pin hole.



10. Install the 1st/2nd shift shaft retaining bolts.

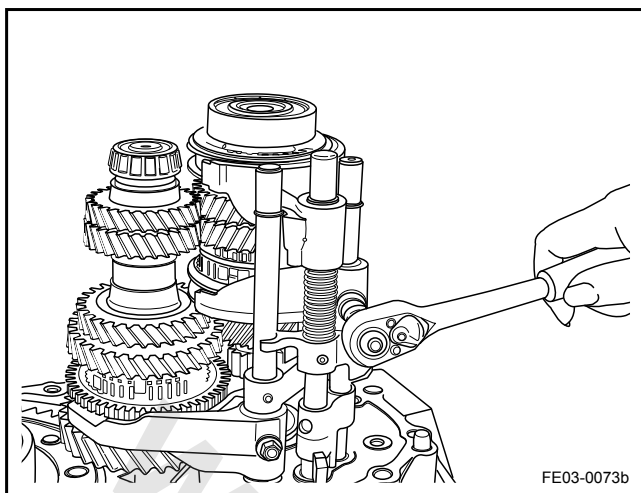


11. Install the 5th/reverse shift shaft locking pin.

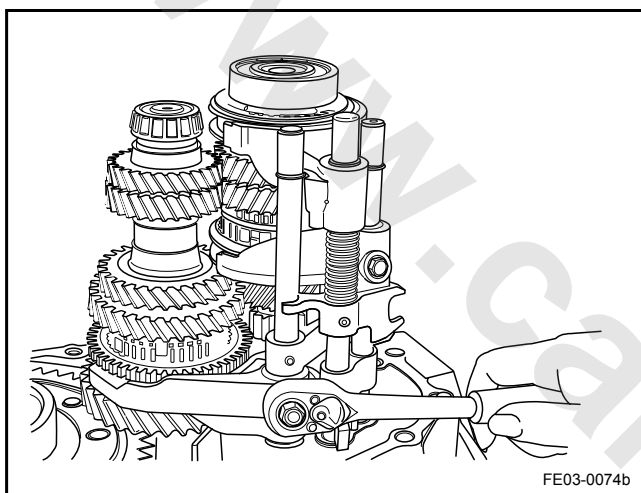


12. Install the 1st/2nd shift shaft locking pin.

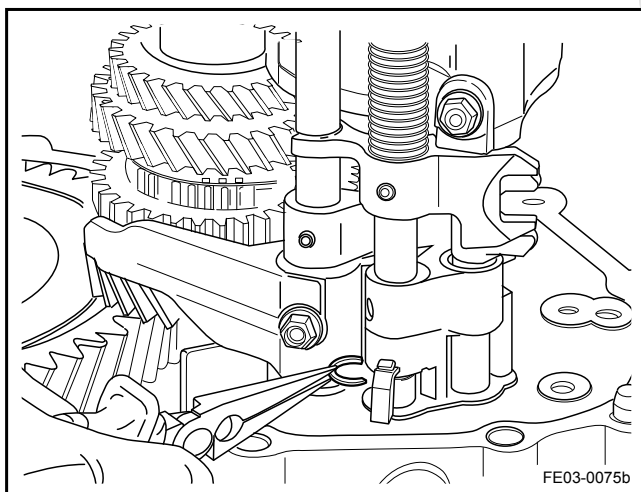




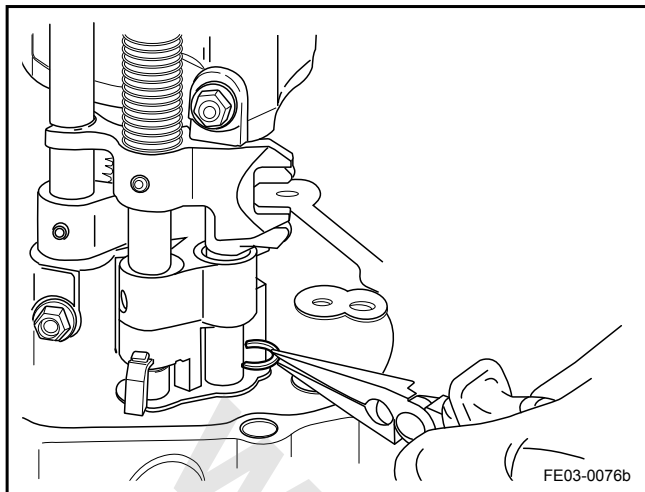
13. Tighten the 3rd/4th shift shaft retaining bolts.



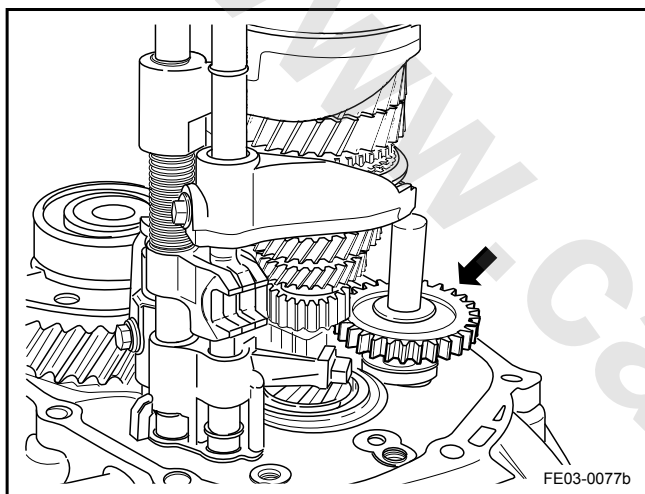
14. Tighten the 1st/2nd shift shaft retaining bolts.



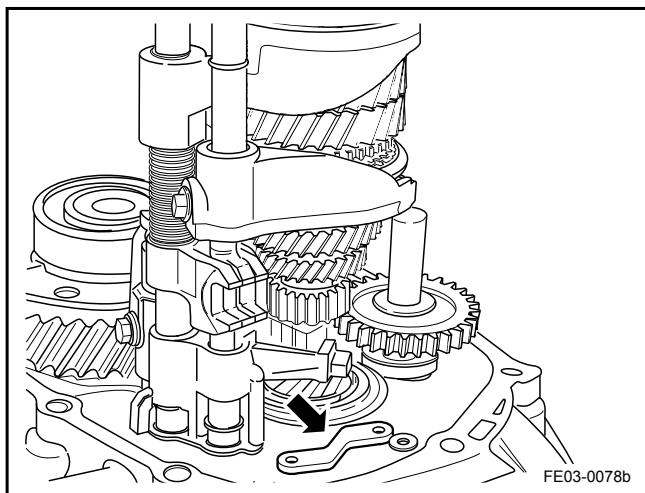
15. Install the 5th/reverse lower limit ring.



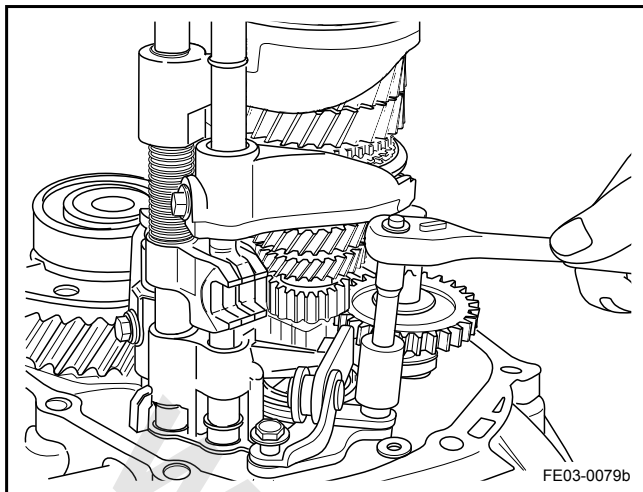
16. Install the 3rd/4th lower limit ring.



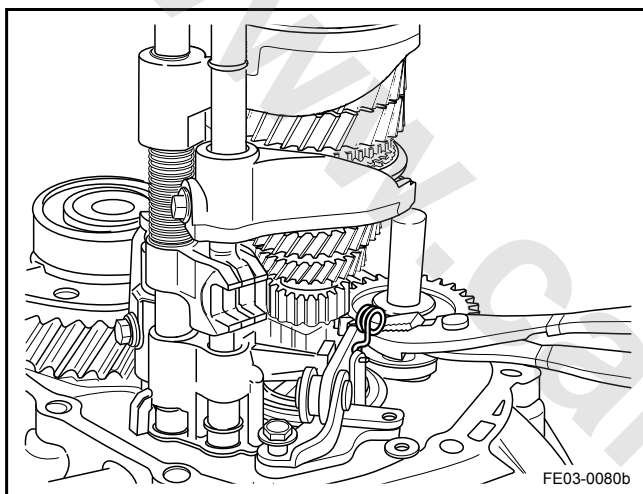
17. Install the reverse gear and shaft.



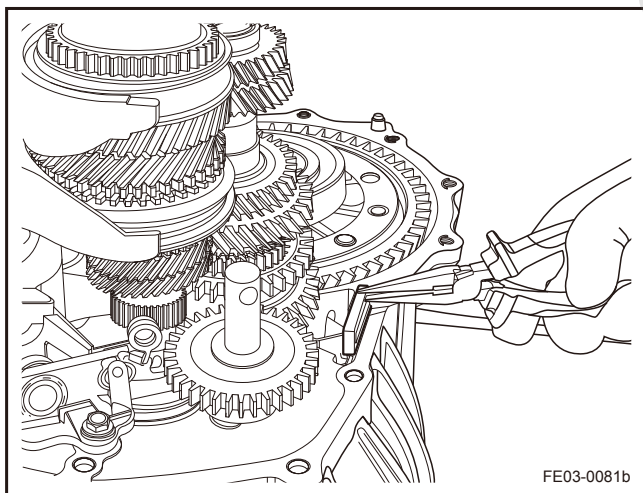
18. Install the reverse shift shaft and the washer.



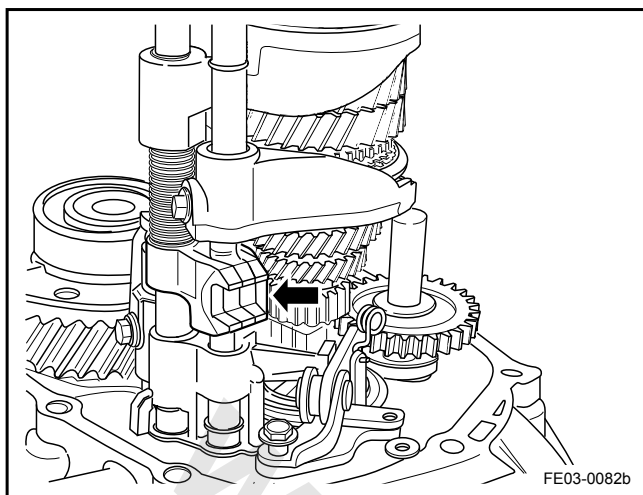
19. Install and tighten the reverse shift shaft retaining bolts.



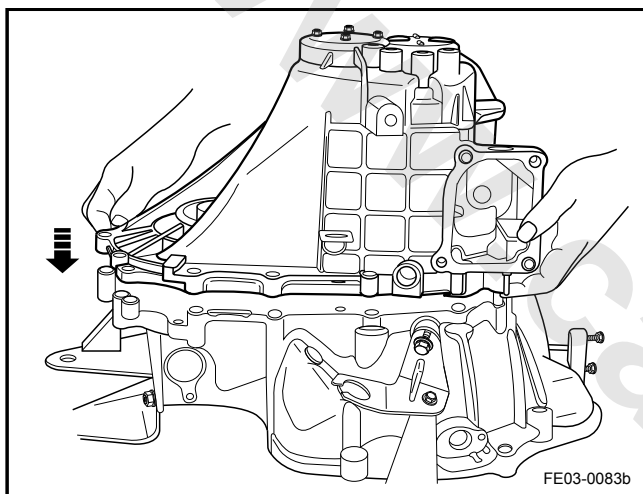
20. Install the reverse shift shaft return spring.



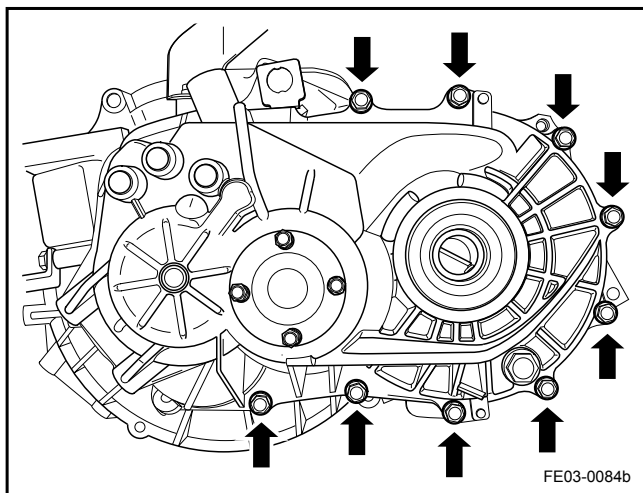
21. Install the transmission case inner magnet.



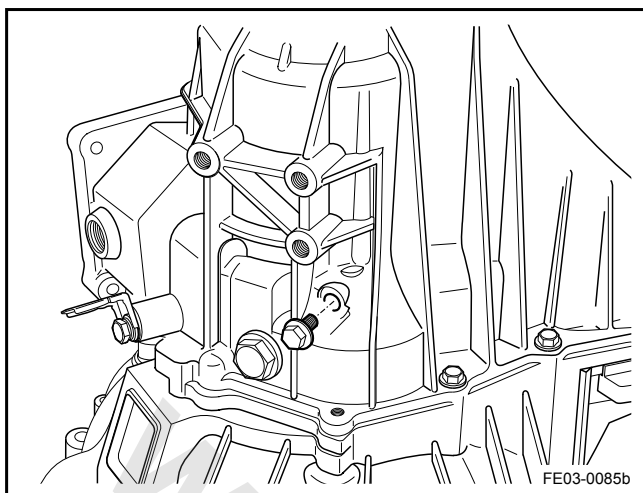
22. As shown in the graphic, confirm that all shift shafts are in neutral (all forks are at the same level).



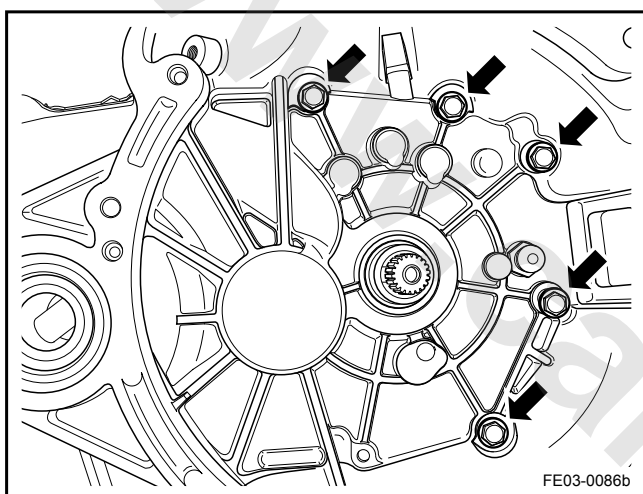
23. Install the transmission rear case.



24. Install and tighten the transmission case external retaining bolts.



25. Install and tighten reverse gear shaft retaining bolt.



26. Install and tighten the transmission case internal retaining bolts.

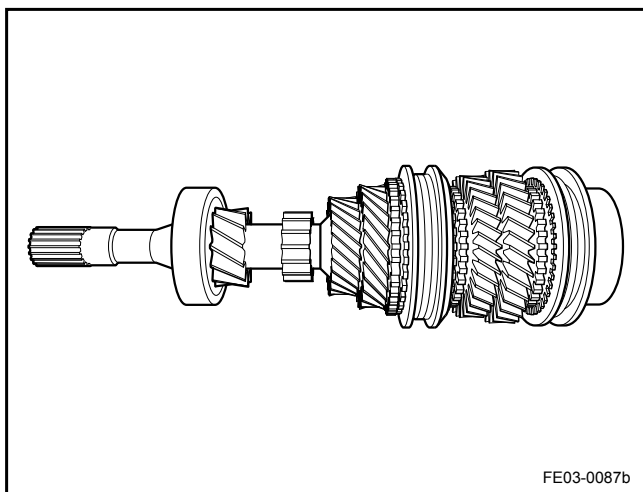
27. Install the shift control assembly.

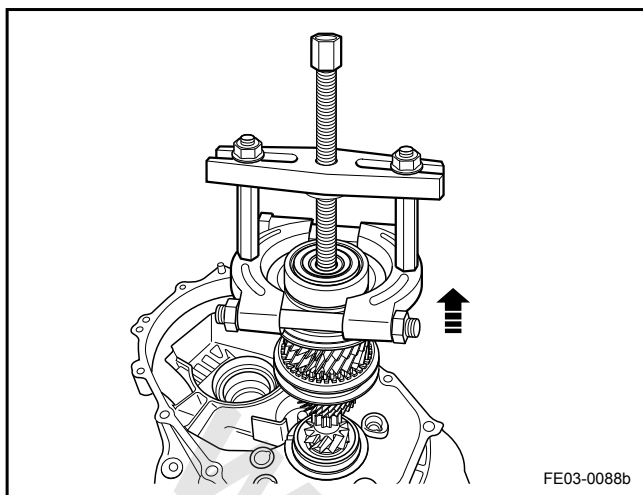
28. Install the transmission.

### 3.3.8.7 Input Shaft Disassemble and Assemble

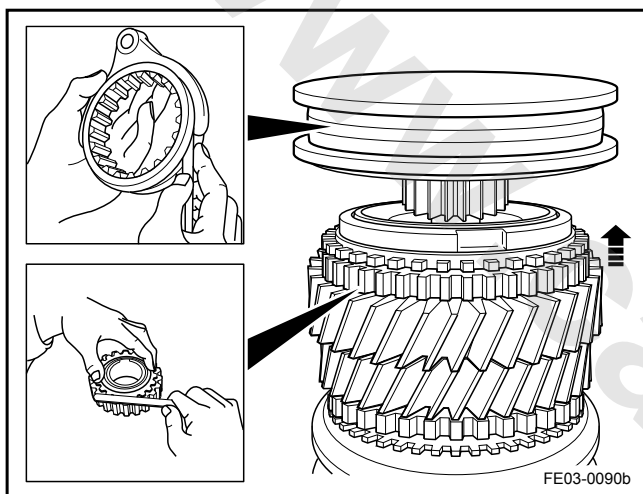
Removal Procedure:

1. Remove the transmission. Refer to [3.3.8.3 Transmission Assembly Replacement](#).
2. Remove shift control assembly. Refer to [3.3.8.4 Shift Control Assembly Replacement](#).
3. Remove the shift shaft. Refer to [3.3.8.6 Shift Shaft Replacement](#).
4. Remove the input shaft assembly from the transmission.





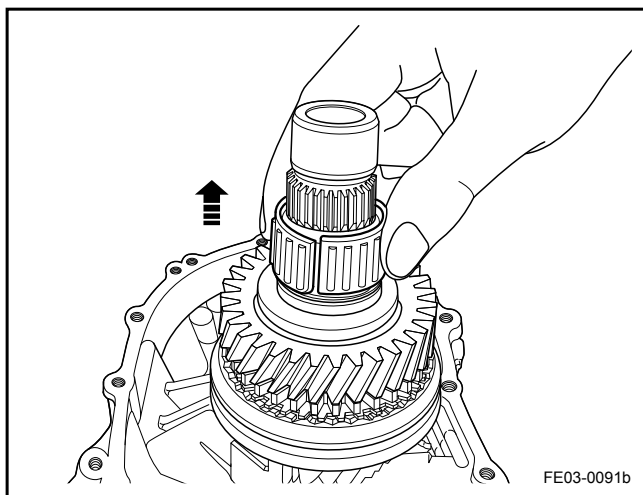
5. Pull out the input shaft rear bearing with a bearing puller.



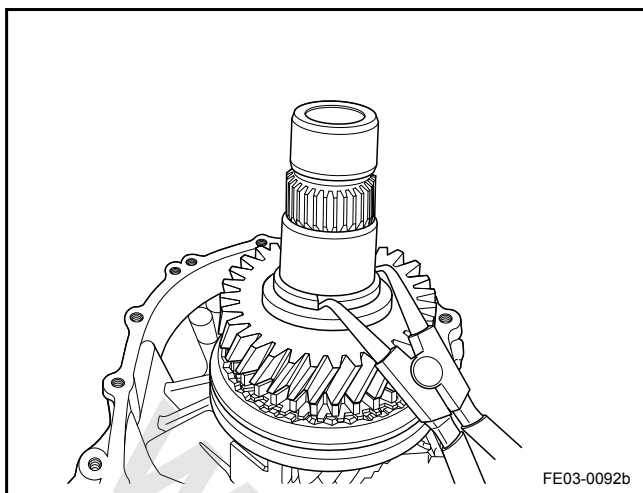
6. Remove the 5th gear synchronizer assembly.

Gear Synchronizer Sleeve and The Shift Fork Distance:  
 $\leq 0.35 \text{ mm } (13.780 \times 10^{-3} \text{ in})$

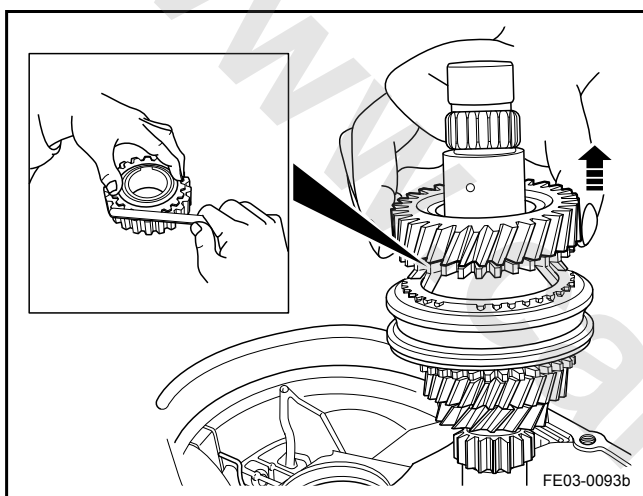
Synchronizer Back and the Gear Surface Distance:  
 $\geq 0.8 \text{ mm } (31.496 \times 10^{-3} \text{ in})$



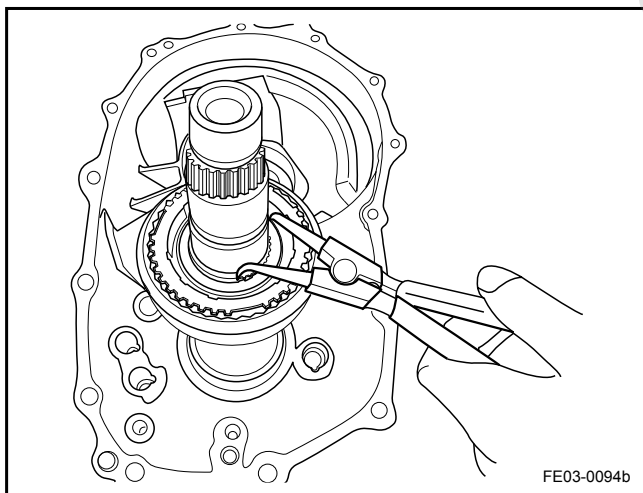
7. Remove the 5th gear, needle roller bearing and needle roller bearing washer.



8. Remove the 4th gear fourth retaining ring and washer with a plier.



9. Remove the 4th gear, needle bearing and needle bearing washer.

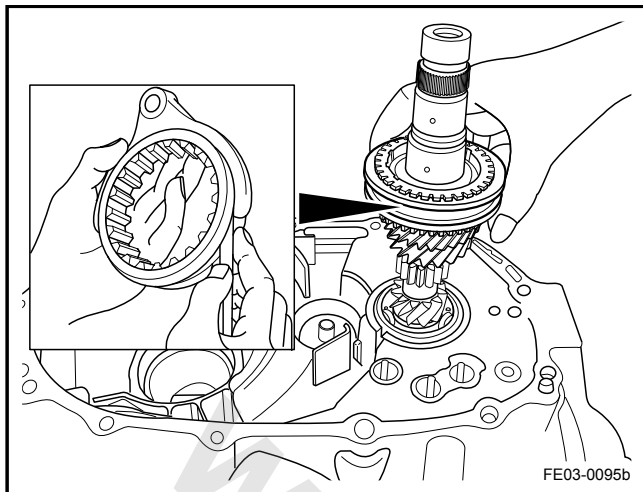


10. Remove the 3rd/4th gear synchronizer snap ring with a plier.

**Note**

Remove the synchronizer first if the snap ring is hard to remove.

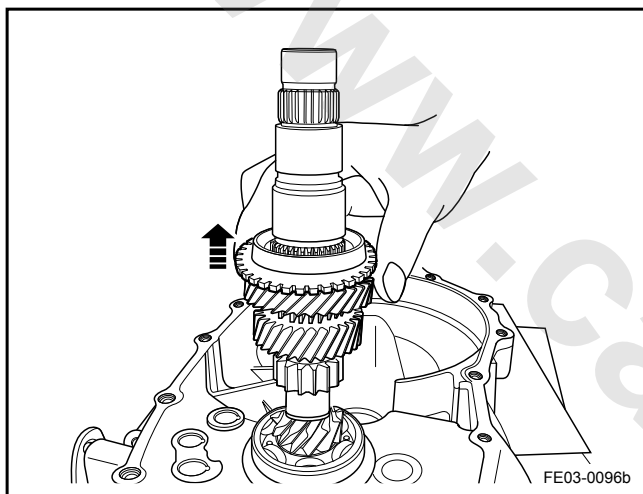




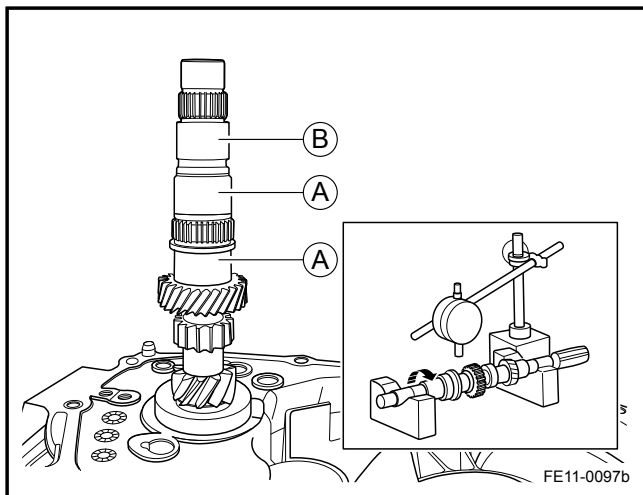
11. Remove the 3rd/4th gear synchronizer.

Synchronizer Sleeve and Shift Fork Distance:

$\leq 0.35 \text{ mm } (13.780 \times 10^{-3} \text{ in})$



12. Remove the 3rd gear, needle bearing and needle bearing washer.



13. After the removal, the input shaft final state is:

Input Shaft Runout:

$\leq 0.03 \text{ mm } (1.181 \times 10^{-3} \text{ in})$

Input Shaft Wear Surface A Minimum Diameter:

$33.985 \text{ mm } (1,337.989 \times 10^{-3} \text{ in})$

Surface B Minimum Diameter:

$30.985 \text{ mm } (1,219.879 \times 10^{-3} \text{ in})$

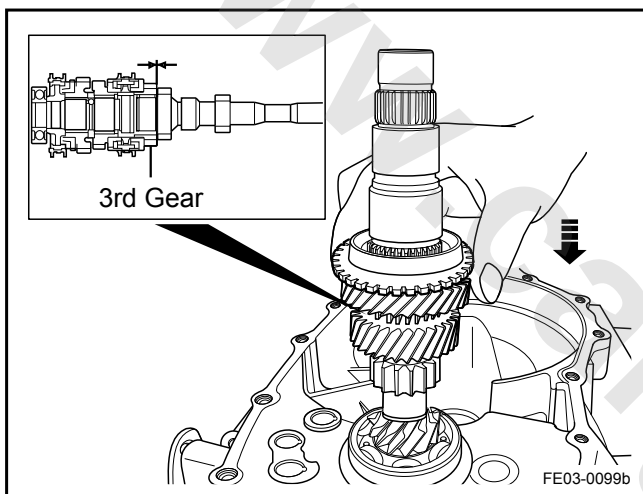
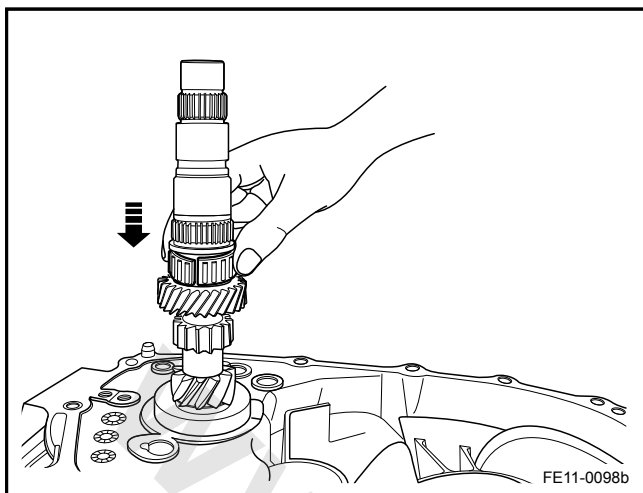


## Installation Procedure:

1. Install the 3rd gear, needle bearing and needle bearing washer.

**Note**

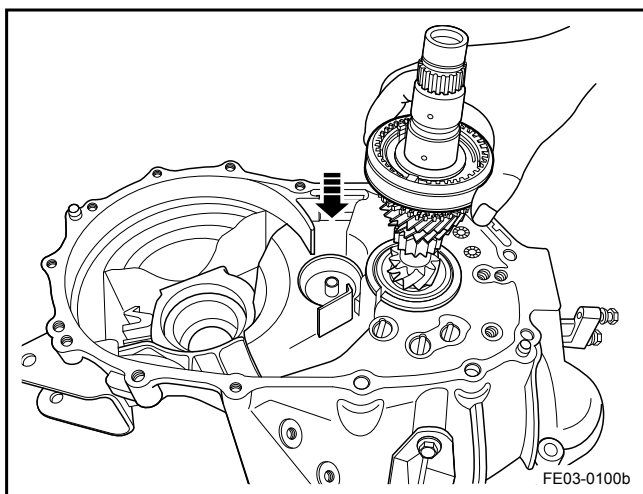
Apply a small amount of transmission fluid to bearing journal before installation.



2. Install the 3rd gear.

Input Shaft 3rd Gear Axial Clearance:

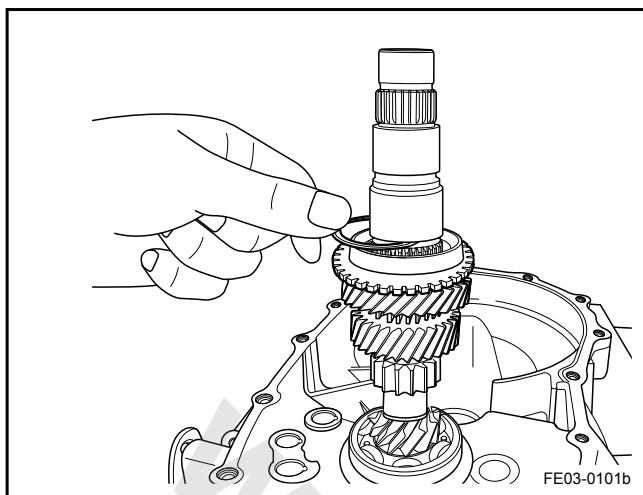
0.1-0.35 mm ( $3.937-13.780 \times 10^{-3}$  in)



3. Install the 3rd/4th gear synchronizer.

**Note**

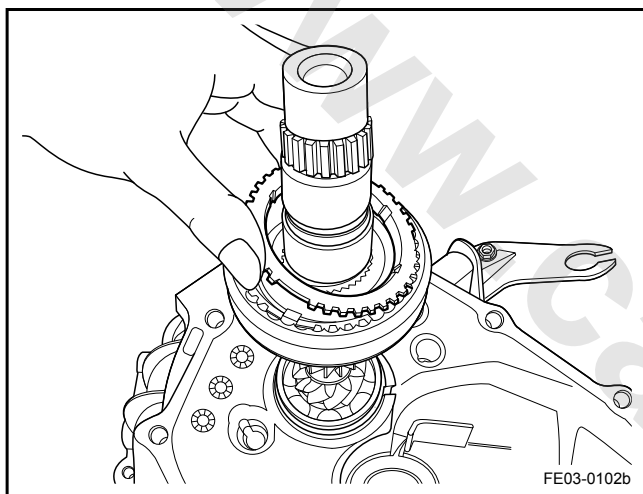
Do not install the 4th gear synchronizer together, otherwise, it is difficult to install the 3rd/4th synchronizer snap ring. Chamfered side of the synchronizer should face the rear of the transmission.



4. Install the 3rd/4th gear synchronizer snap ring.

**Note**

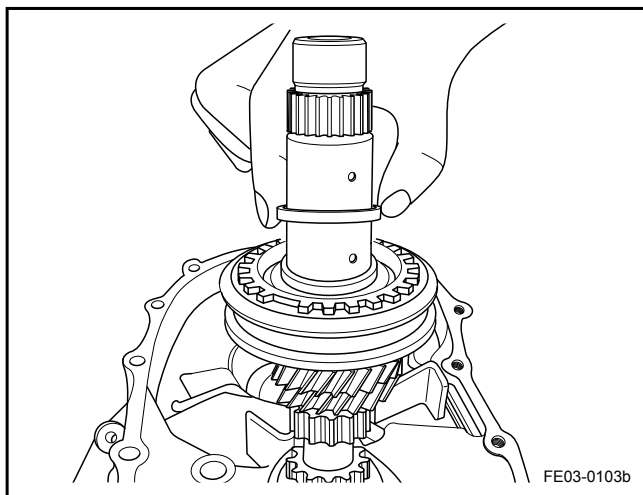
If it is difficult to install the snap ring, install the snap ring before installing the synchronizer.



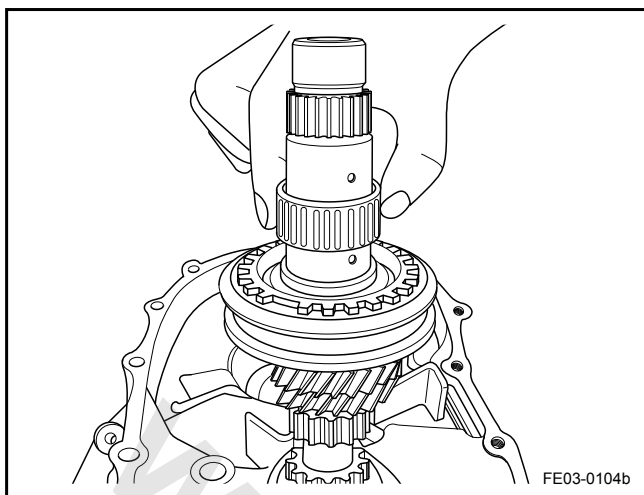
5. Install the 4th gear synchronizer

**Note**

Synchronizer groove should fit in the synchronizer ring.



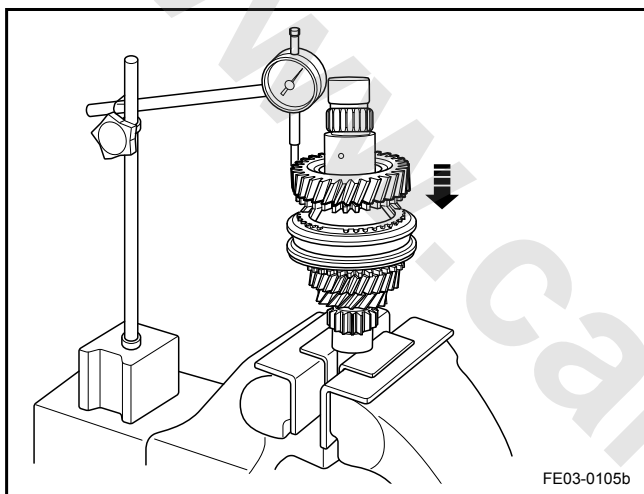
6. Install the 4th gear needle bearing washer.



7. Install the 4th gear needle bearing.

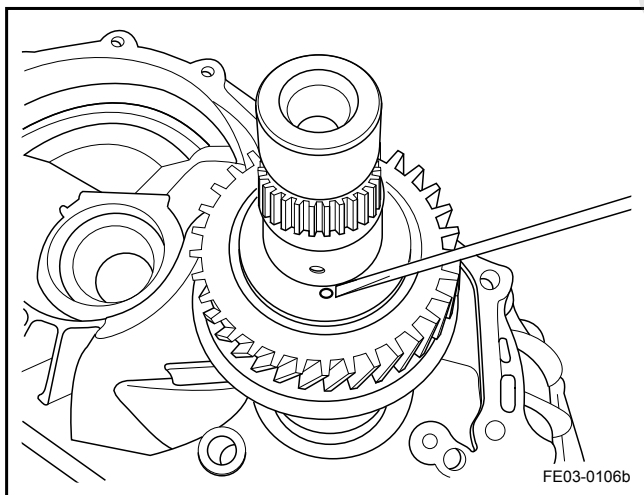
**Note**

Apply a small amount of transmission fluid to the bearing journal before installation.



8. Install the 4th gear.

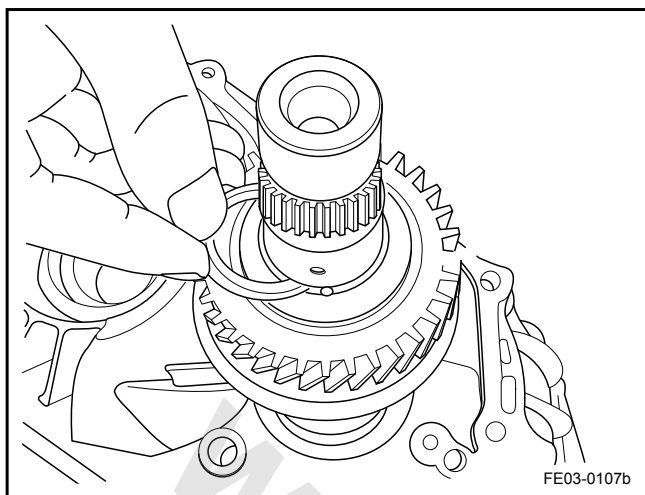
Input Shaft 4th Gear Axial Clearance:  
0.1-0.55 mm ( $3.937-21.654 \times 10^{-3}$  in)



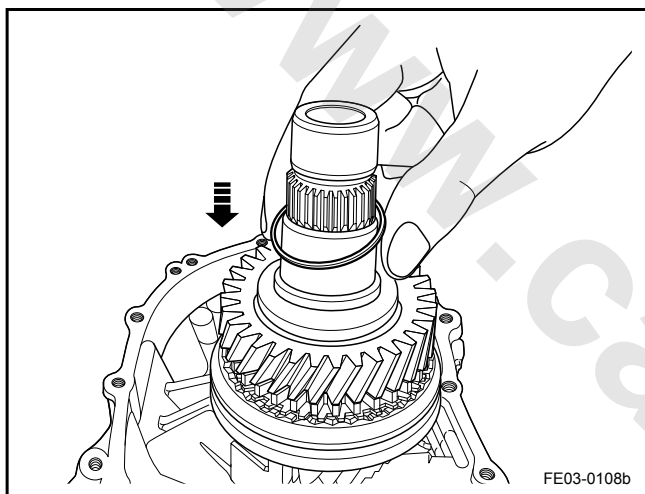
9. Install the 4th gear synchronizer hub.

**Note**

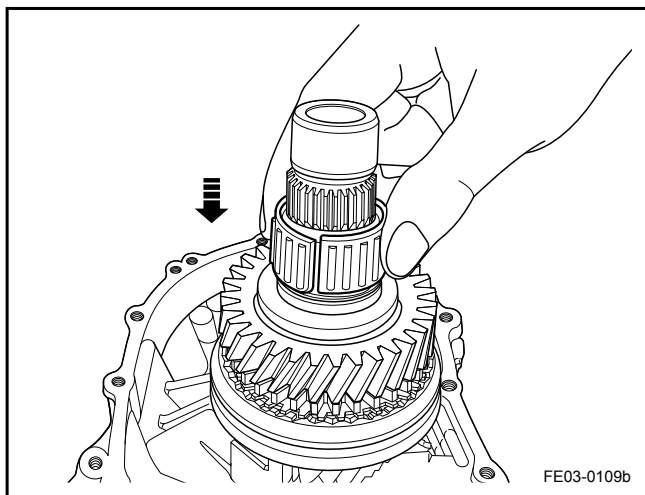
The dent ball should be aligned with the hole.



10. Install the 4th gear snap ring.



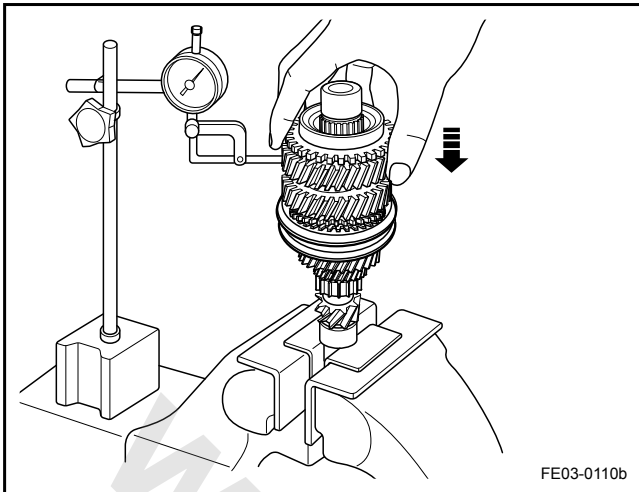
11. Install the 5th gear needle bearing washer.



12. Install the 5th gear needle bearing.

**Note**

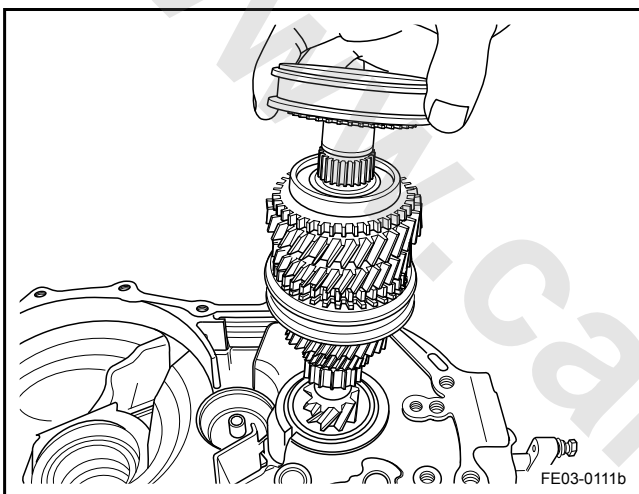
Apply a small amount of transmission fluid to the bearing journal before installation.



13. Install the 5th gear.

Input Shaft 5th Gear Axial Clearance:

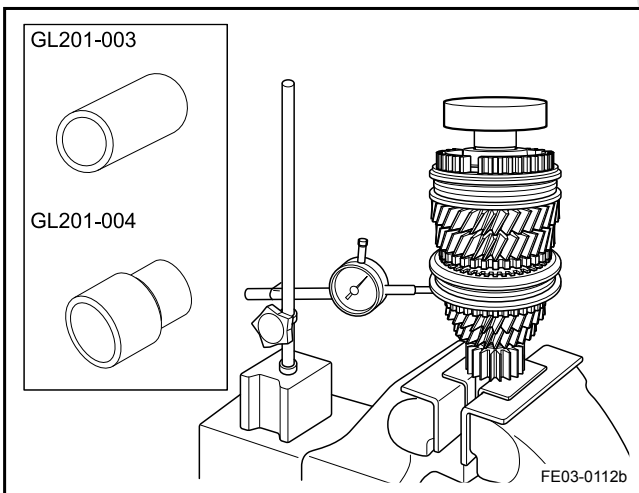
0.1-0.50 mm ( $3.937-19.685 \times 10^{-3}$  in)



14. Install the 5th gear synchronizer.

**Note**

The synchronizer is directional, the convex side should face the rear of the transmission.



15. Install the input shaft rear bearing with special tools GL201-003 and GL201-004.

Input Shaft 4th Gear and 5th Gear Radial Clearance:

$\leq 0.058$  mm ( $3.346 \times 10^{-3}$  in)

**Note**

The bearing is directional, the transmission fluid seal side should face the rear of the transmission.

16. Install the input shaft assembly.
17. Install the shift shaft.
18. Install the shift control assembly.
19. Install the transmission.

## 3.3.8.8 Main shaft Disassemble and Assemble

## Removal Procedure:

1. Remove the transmission. Refer to [3.3.8.3 Transmission Assembly Replacement](#).
2. Remove the shift control assembly. Refer to [3.3.8.4 Shift Control Assembly Replacement](#).
3. Remove the shift shaft. Refer to [3.3.8.6 Shift Shaft Replacement](#).

4. Remove the main shaft from inside the transmission.

Main shaft 1st Gear and 2nd Gear Axial Clearance:

1st Gear: 0.1-0.35 mm ( $3.937-13.780 \times 10^{-3}$  in)

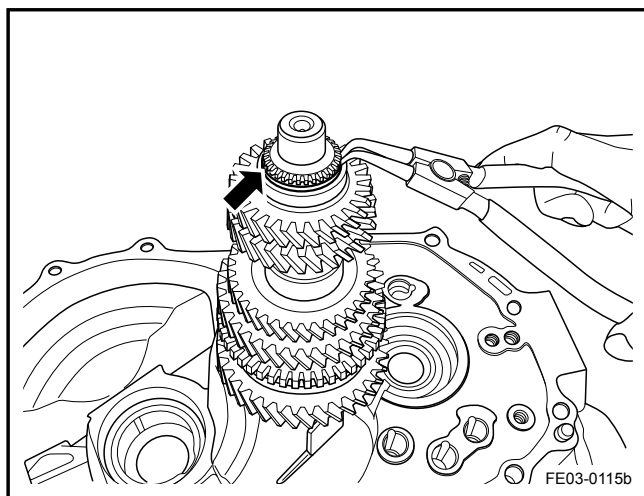
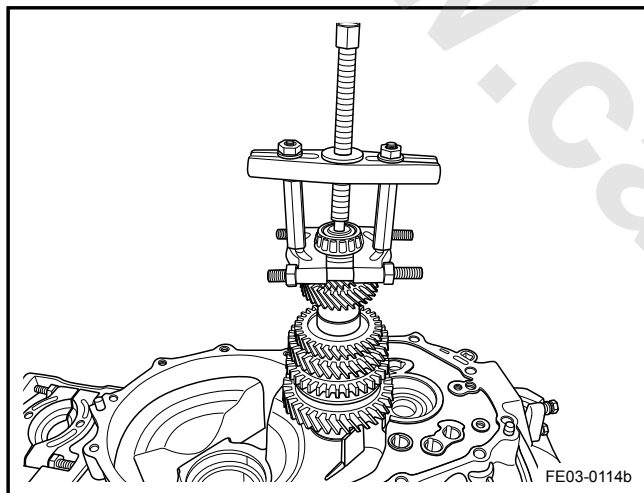
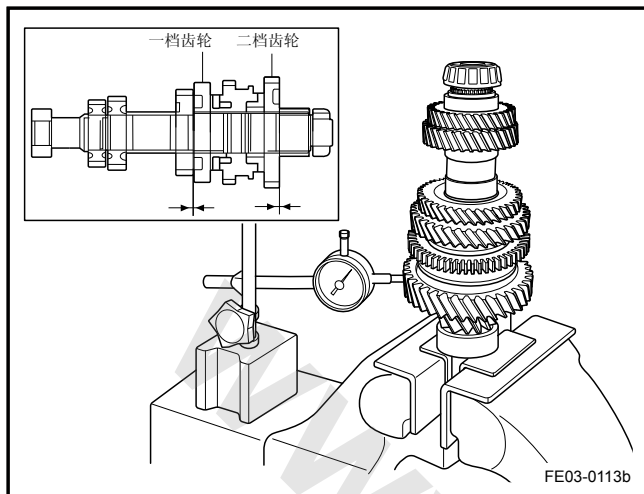
2nd Gear: 0.1-0.35 mm ( $3.937-13.780 \times 10^{-3}$  in)

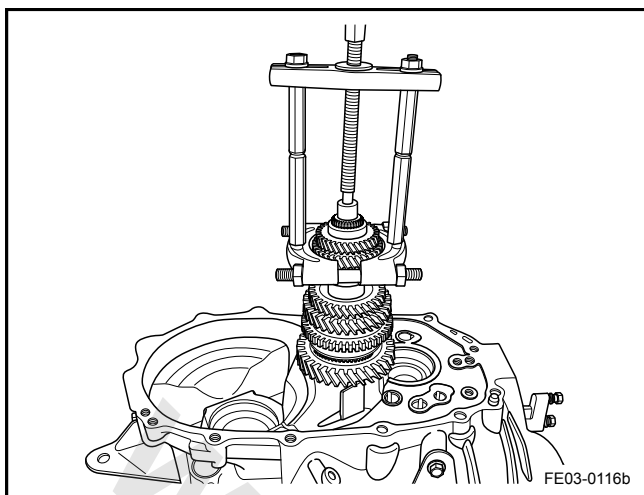
Main shaft 1st Gear and 2nd Gear Runout:

$\leq 0.056$  mm ( $2.205 \times 10^{-3}$  in)

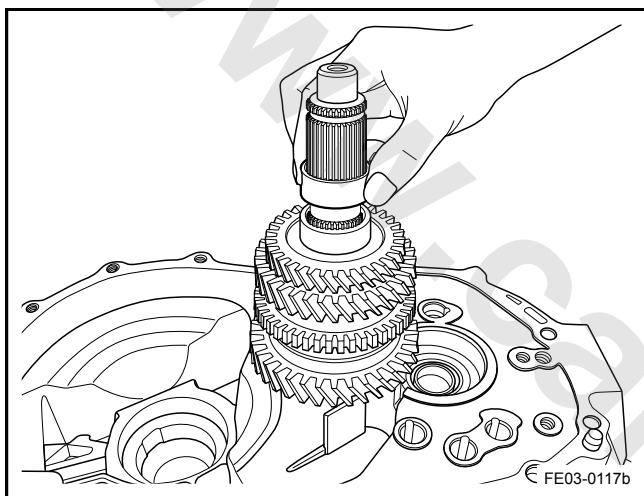
5. Pull out the main shaft rear bearing with a universal bearing puller.

6. Remove the 5th gear snap ring with a plier.

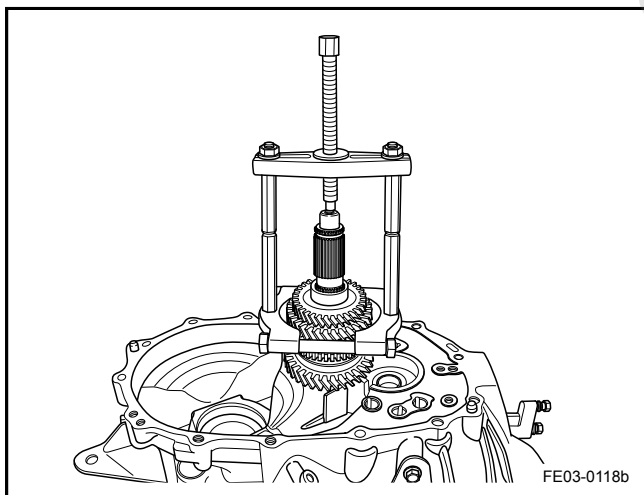




7. Pull out the 4th gear and the 5th gear with a universal bearing puller.



8. Remove the 3rd gear and the 4th gear sleeve.

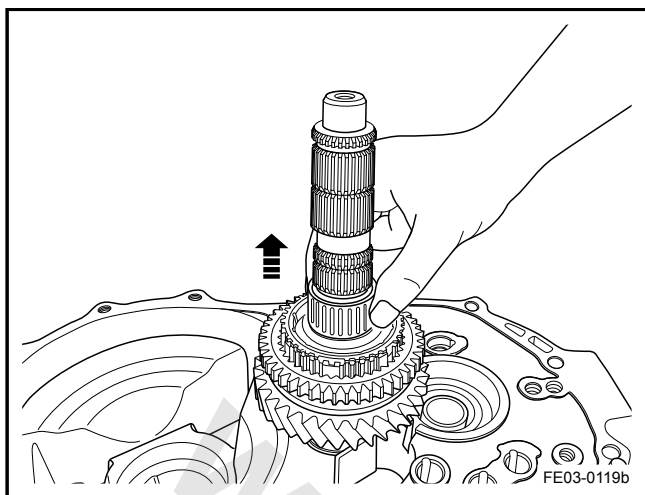


9. Pull out the 3rd gear with a universal bearing puller.

**Note**

The gap between the 2nd gear and the 3rd gear is very small. Pulling out after a certain distance, then pull the 3rd gear separately.

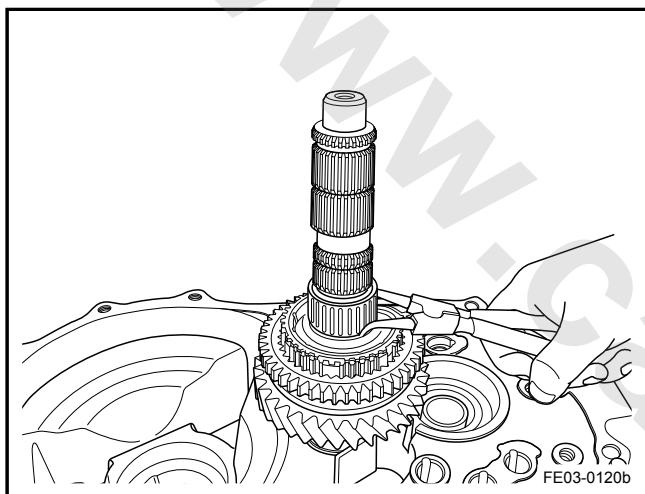




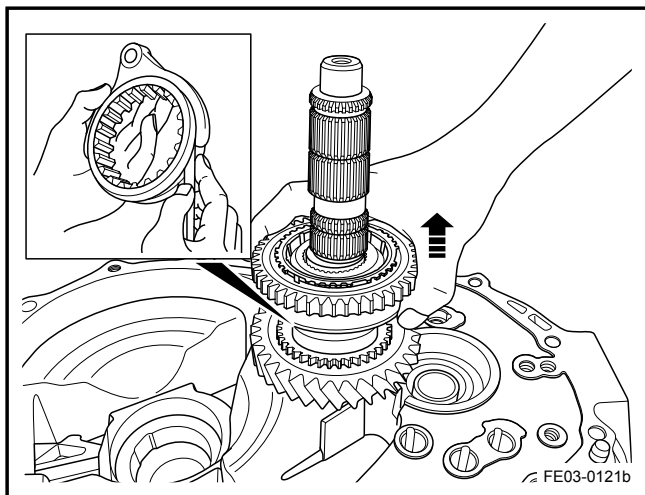
10. Remove the 2nd gear bearing.

**Note**

This needle bearing has no opening and can be directly removed.



11. Remove the 1st and 2nd gear synchronizer snap ring with a plier.

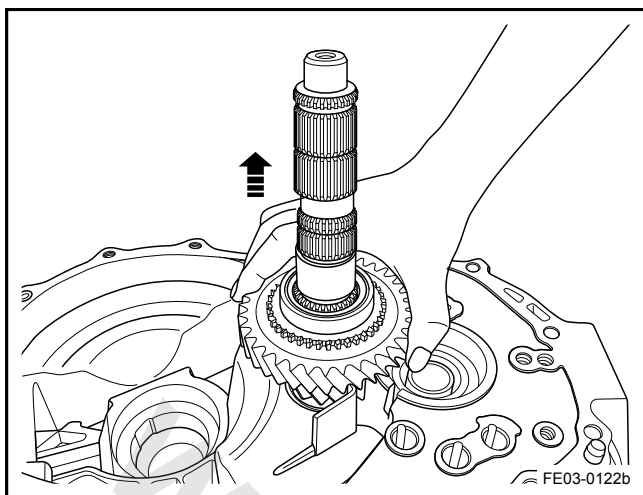


12. Remove the 1st and 2nd gear synchronizer.

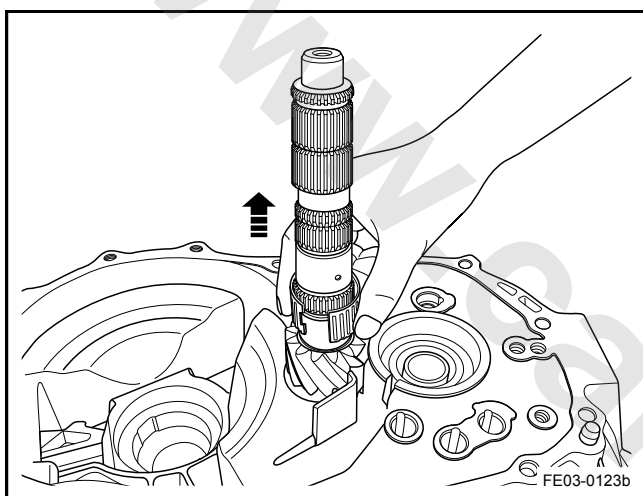
Gear Synchronizer Sleeve and Shift Fork Distance:

$\leq 0.35 \text{ mm } (13.780 \times 10^{-3} \text{ in})$





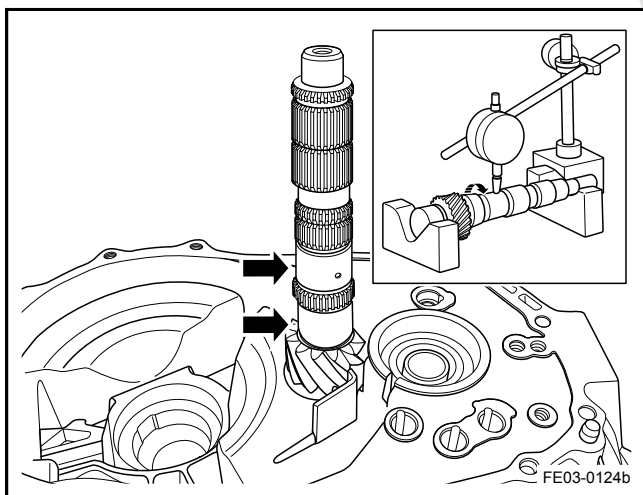
13. Remove the 1st gear.



14. Remove the 1st gear needle bearing.

**Note**

The bearing has only one opening. Do not force to remove, as it may damage the bearing.



15. After disassemble, the main shaft final state is:

Main shaft Wear:

Minimum Diameter 33.985 mm ( $1,337.989 \times 10^{-3}$  in)

Main shaft Runout:

$\leq 0.03$  mm ( $1.181 \times 10^{-3}$  in)

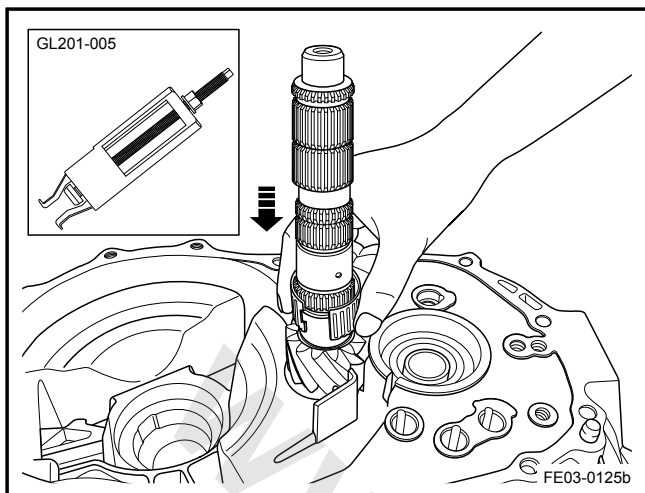
## Installation Procedure:

1. Install the 1st gear needle bearing.

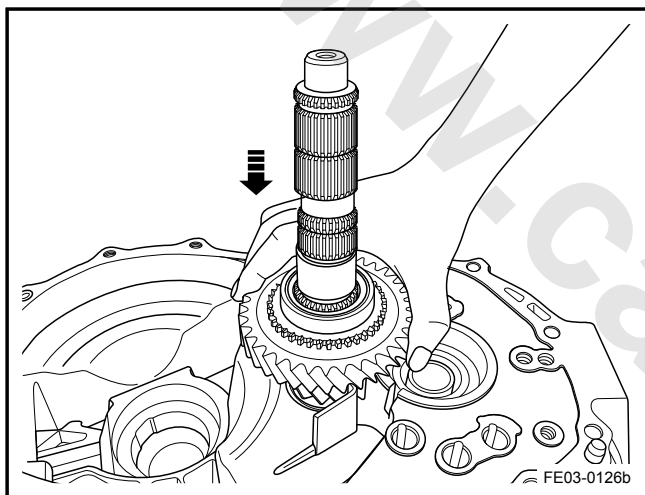
**Note**

Apply a small amount of transmission fluid to the bearing journal before installation.

If the bearings need to be replaced, the bearing outer ring also need to be replaced. During the removal, please use a special tool GL201-005.



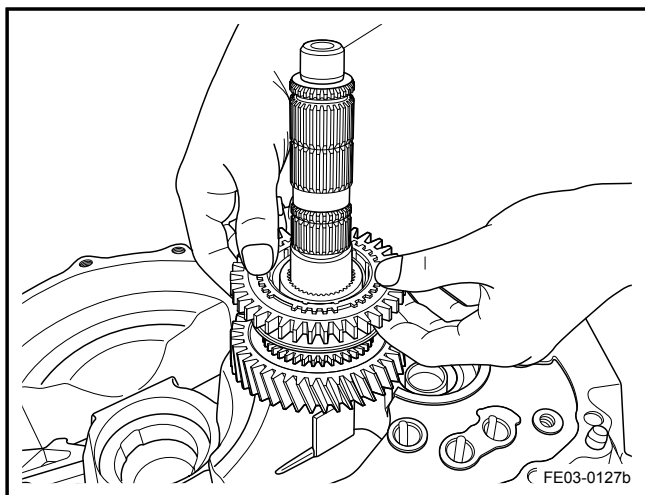
2. Install the 1st gear.

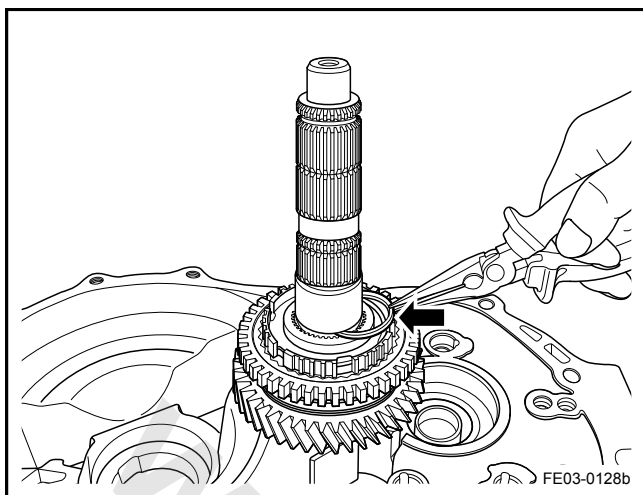


3. Install the 1st and 2nd gear synchronizer.

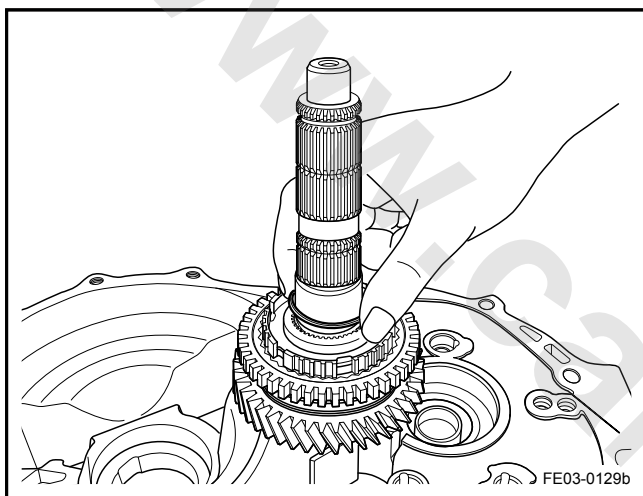
**Note**

Gear side should face the rear of the transmission.

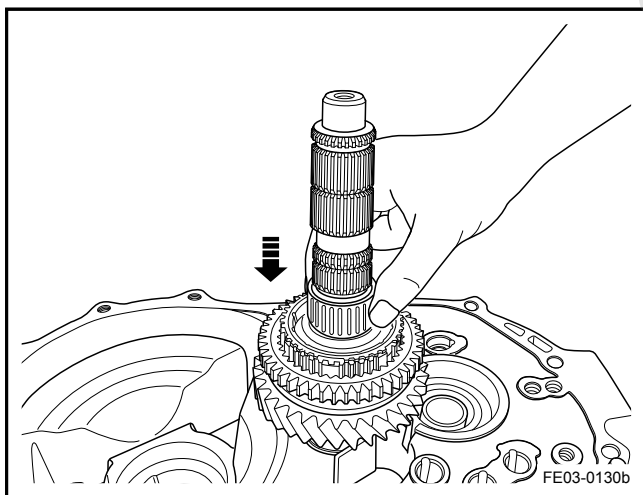




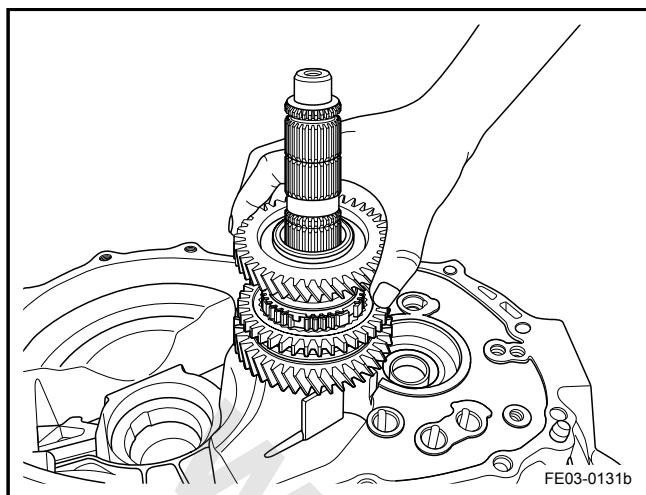
4. Install the 1st and 2nd gear synchronizer snap ring.



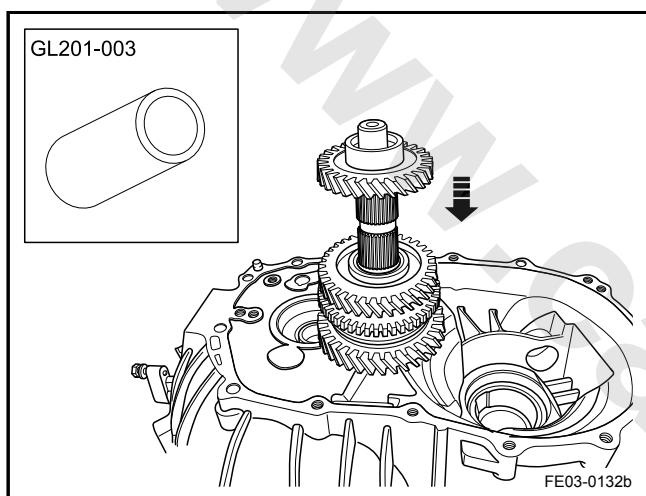
5. Install the 2nd gear needle bearing snap ring.



6. Install the 2nd gear needle bearing.



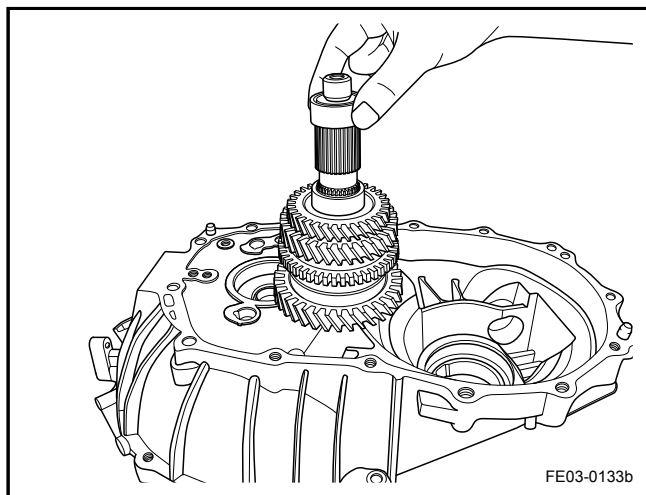
7. Install the 2nd gear.



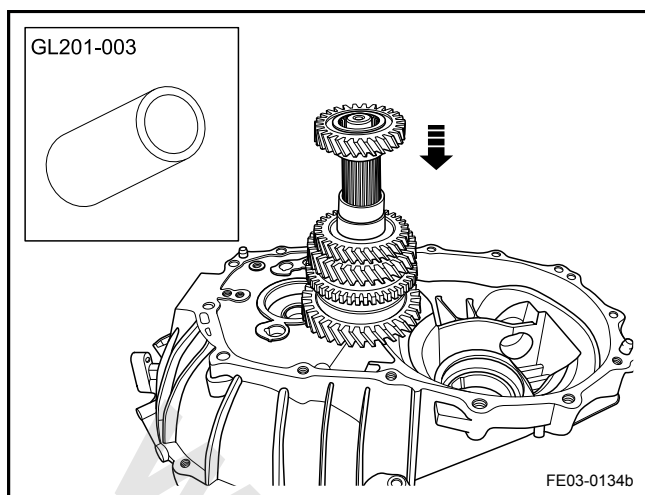
8. Install the 3rd gear with a special tool GL201-003.

**Note**

The 3rd gear need to be pressed into the position, with the convex side up.



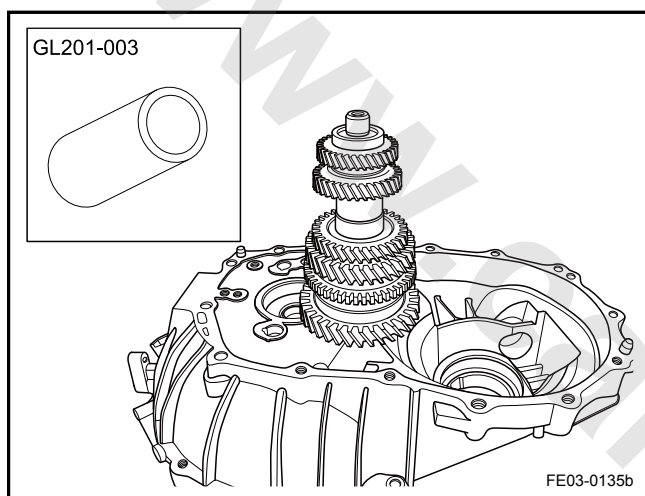
9. Install the sleeve between the 3rd gear and the 4th gear.



10. Install the 4th gear with a special tool GL201-003.

**Note**

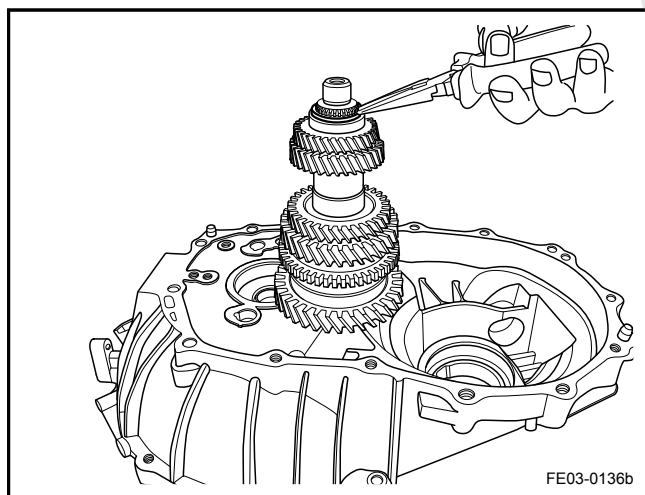
The 4th gear need to be pressed into the position, with the convex side up.



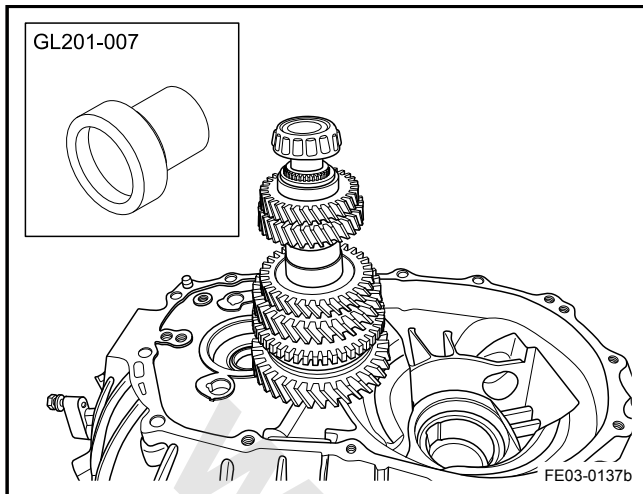
11. Install the 5th gear with a special tool GL201-003.

**Note**

The 5th gear need to be pressed into the position, with the convex side up.



12. Install the 5th gear snap ring.



13. Install the main shaft rear bearing with a special tool GL201-007.

#### Note

If the bearings need to be replaced, the bearing outer ring also need to be replaced. During the removal, please use a special tool GL201-006. After the installation of the transmission rear case, please use a special tool GL201 - 008 to adjust the bearing pre-load.

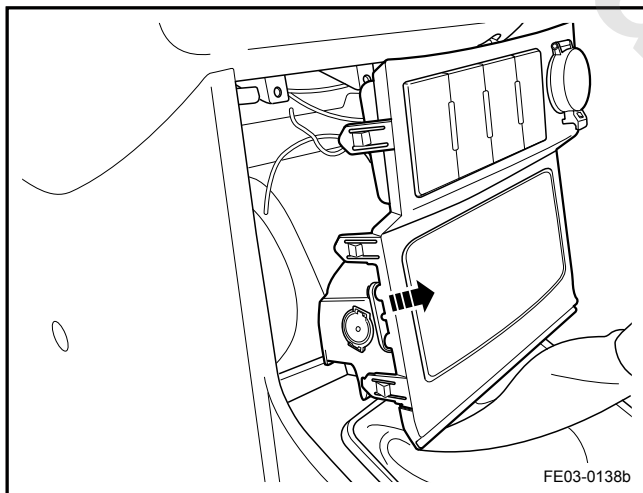
14. Install the main shaft assembly.
15. Install the shift shaft.
16. Install the shift control assembly.
17. Install the transmission.

### 3.3.8.9 Shift Lever Replacement

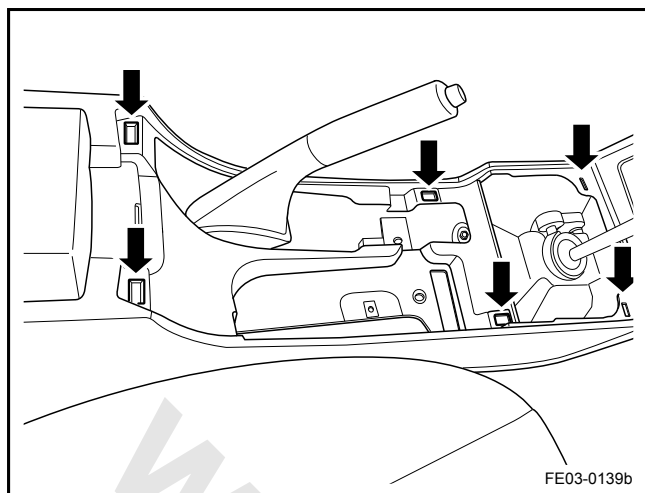
Removal Procedure:

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



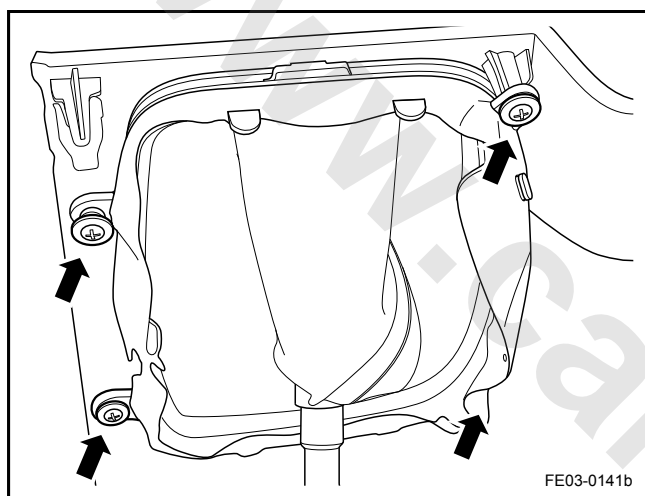
1. Disconnect the battery negative cable. [2.11.8.1 Battery Disconnection](#).
2. Remove the center console upper panel and Disconnect the harness connector.



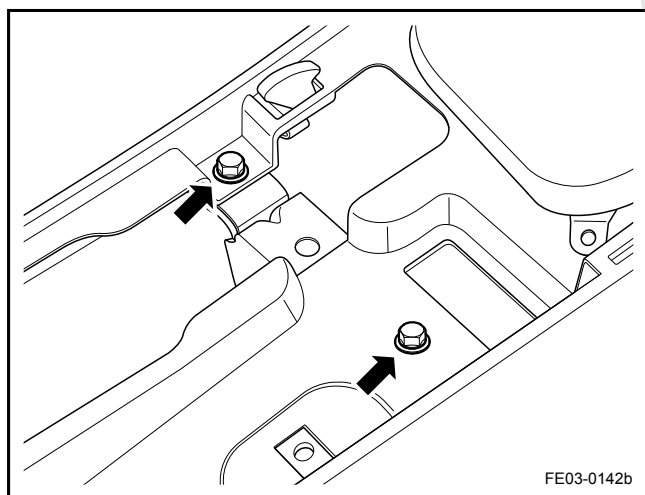
3. Remove the center console cup holder. There are six clips, as shown in the graphic.

**Note**

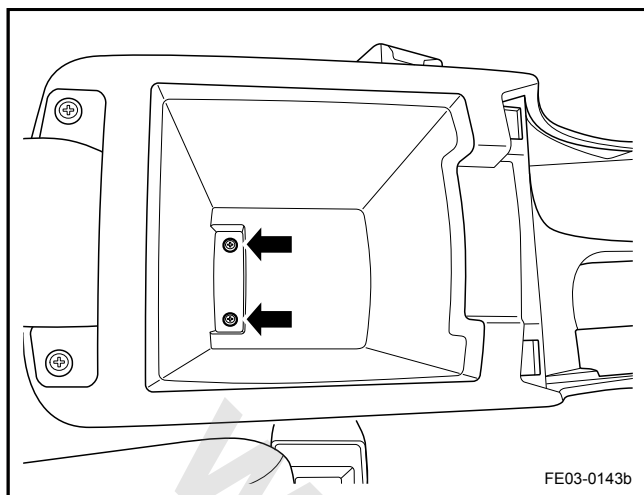
Disconnect the heated seat switch harness connector first with high-spec vehicles.



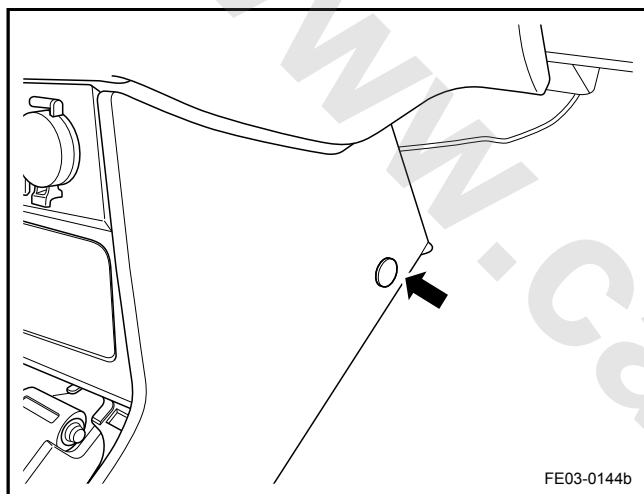
4. Remove the leather gearshift lever mounting screws, separate the lever holster from the center console cup holder .



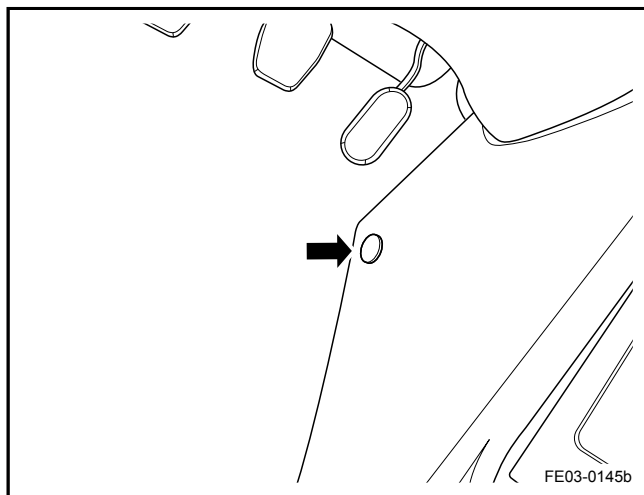
5. Remove the center console central retaining bolts.



6. Remove the center console storage box retaining bolts.

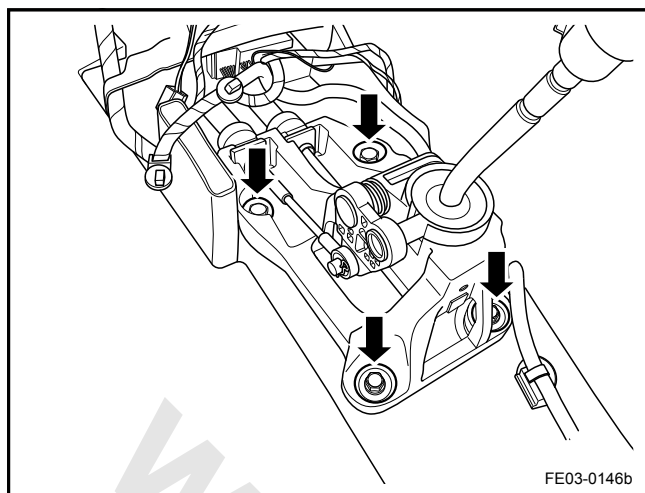


7. Remove the center console passenger side retaining clip.

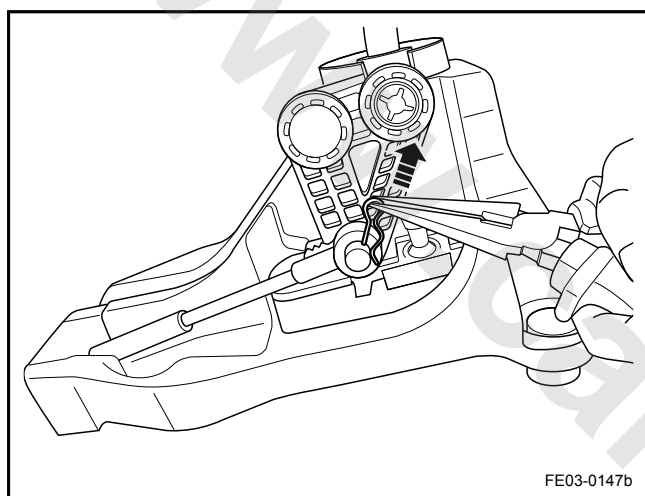


8. Remove the center console driver side retaining clip.

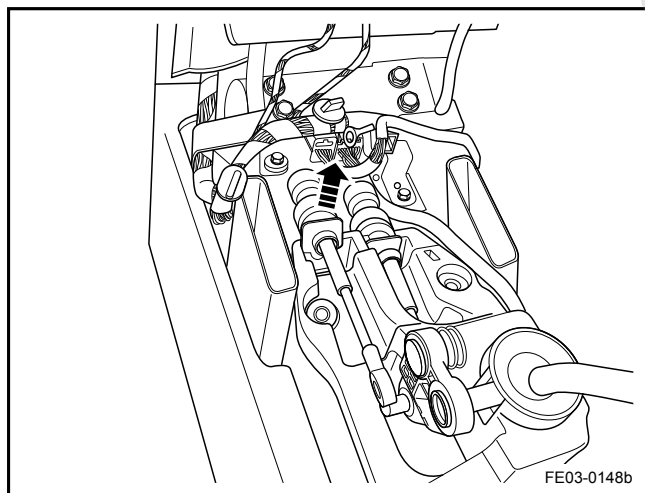




9. After the center console removal, remove the retaining bolts as shown in the graphic.



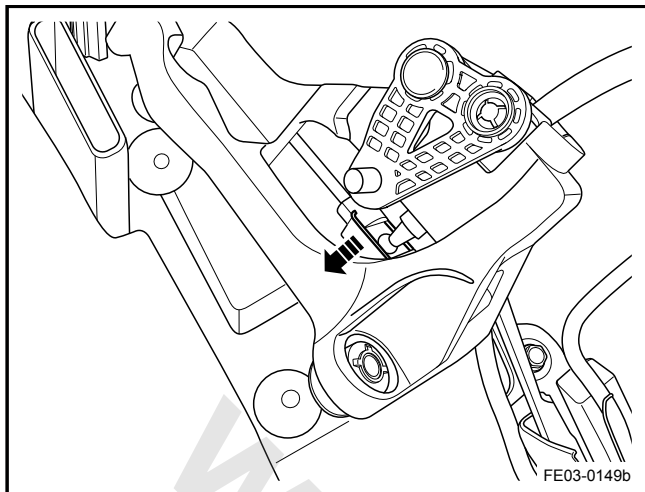
10. Remove the shift lever locking pin with a plier.



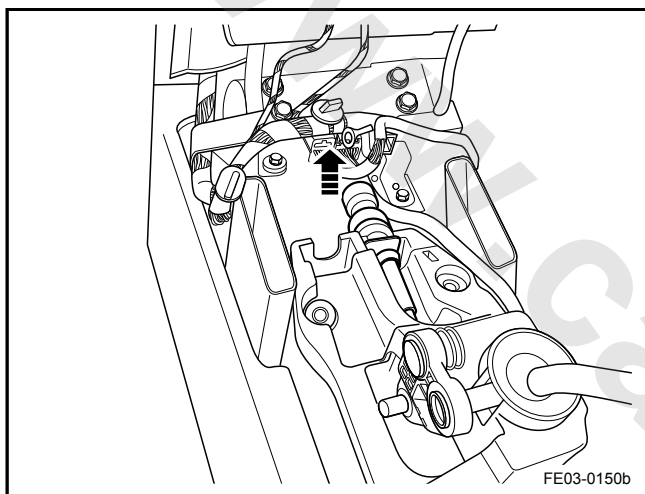
11. Remove the shift lever rod sleeve.

**Note**

Pull the shift lever rod upward to remove it as an assembly. The black sleeve is part of the assembly.



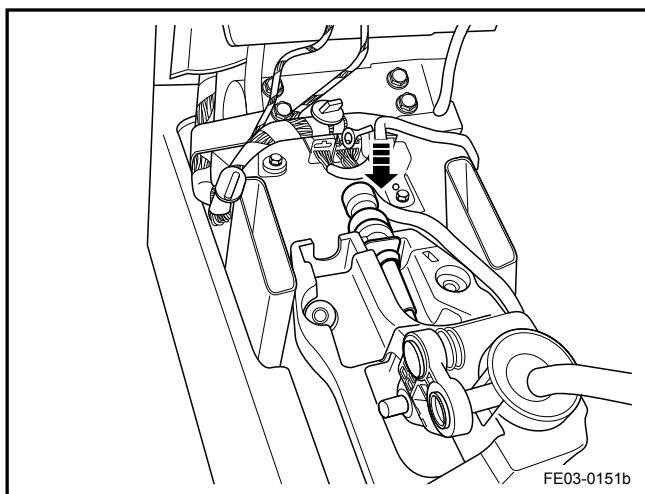
12. Move the black springs on both sides with a flat blade screwdriver. Remove the shift lever.



13. Remove the shift lever rod sleeve.

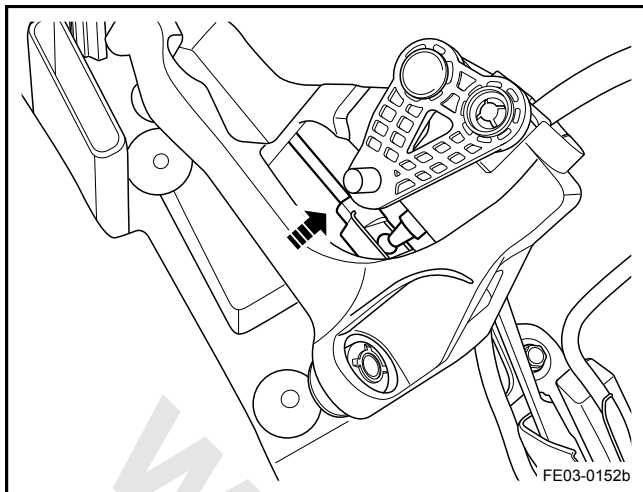
#### Note

Pull the shift lever rod upward to remove it as an assembly. The black sleeve is part of the assembly.

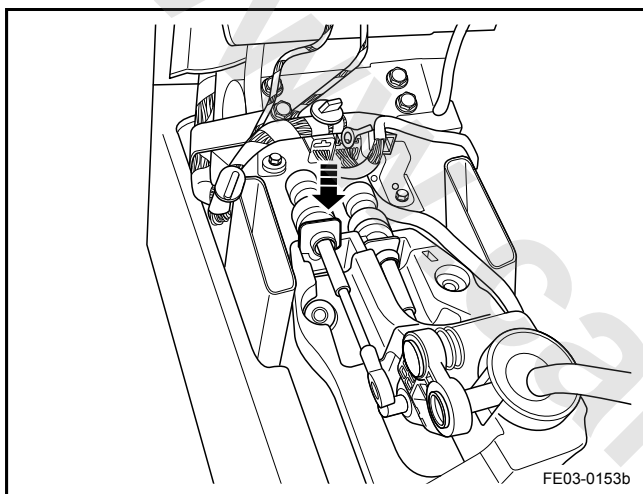


#### Installation Procedure:

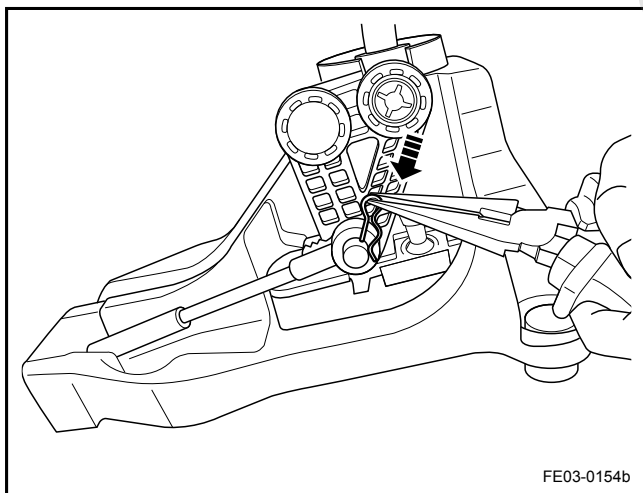
1. Press the shift lever rod into the sleeve.



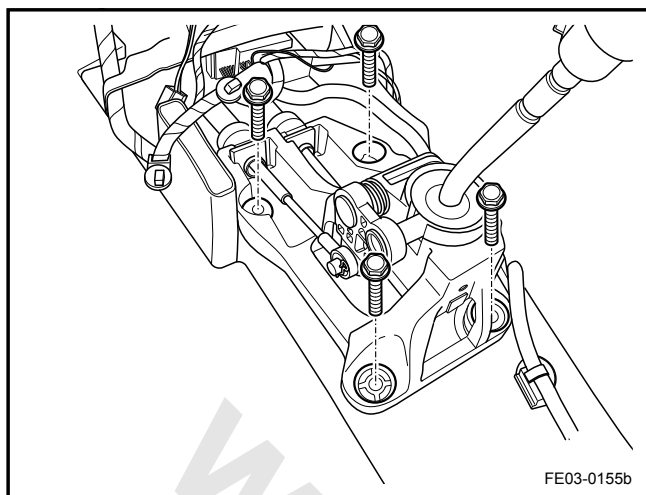
2. Press the shift lever rod to the end of the shift lever and confirm the installation.



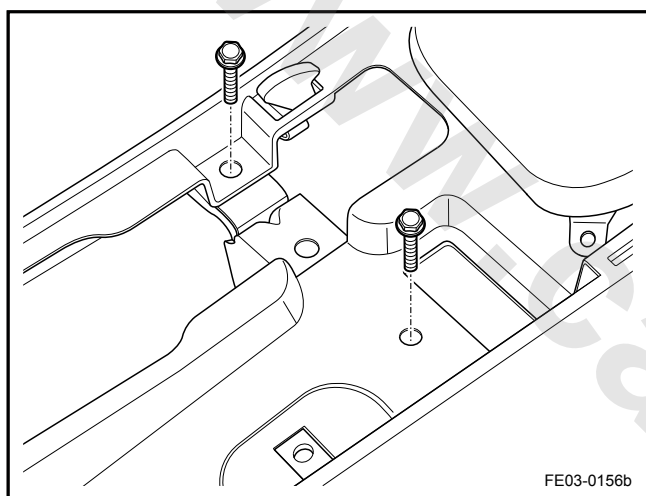
3. Install the shift lever sleeve, press the sleeve.



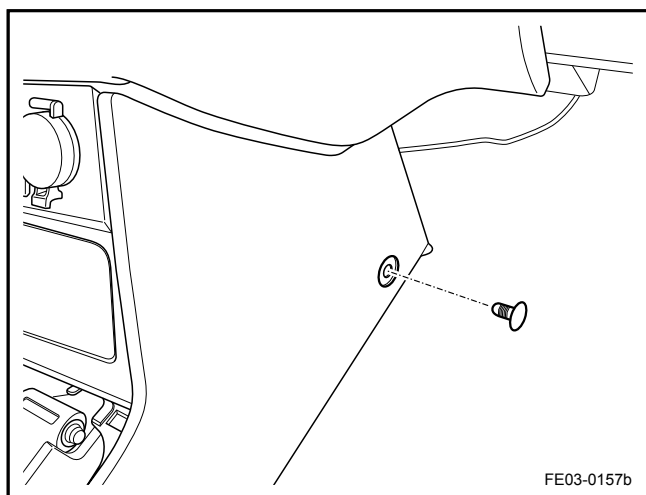
4. Press the shift lever rod locking pin.



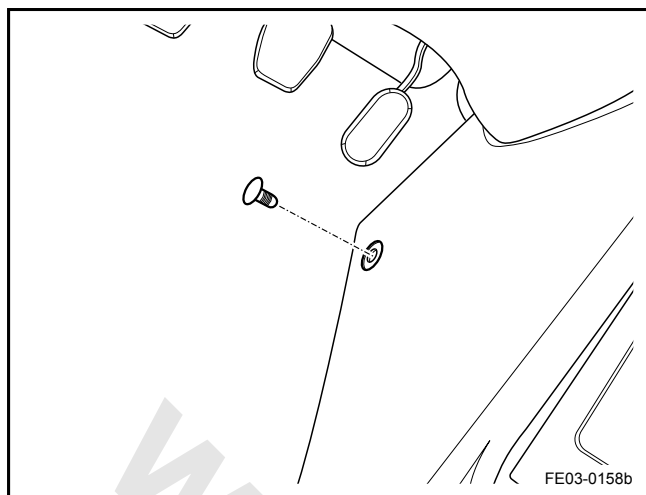
5. Install and tighten the shift lever retaining bolts. Confirm the shift operations are normal.



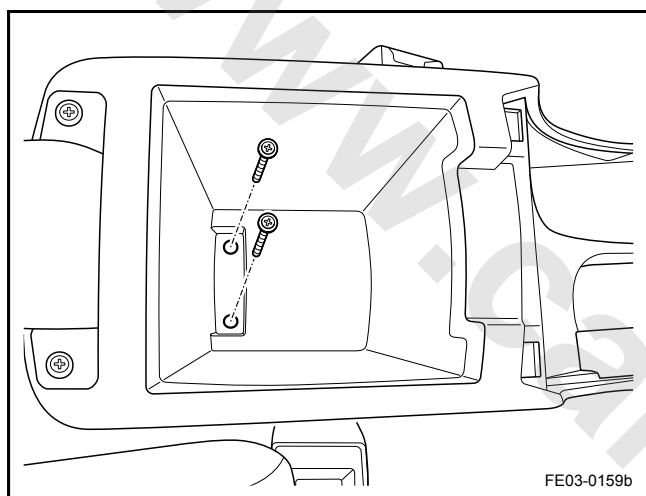
6. Install the center console and tighten retaining bolt.



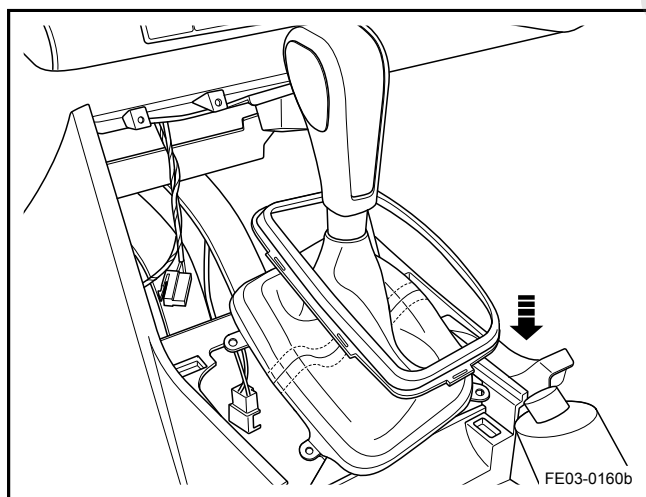
7. Install the center console passenger side retaining clip.



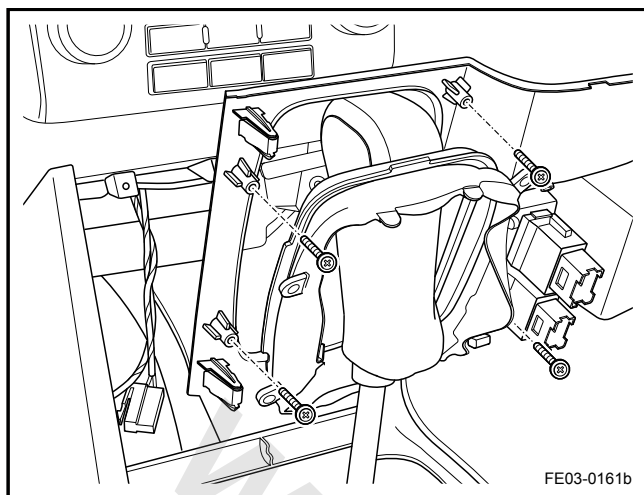
8. Install the center console driver side retaining clip.



9. Install the central console storage box retaining bolts.



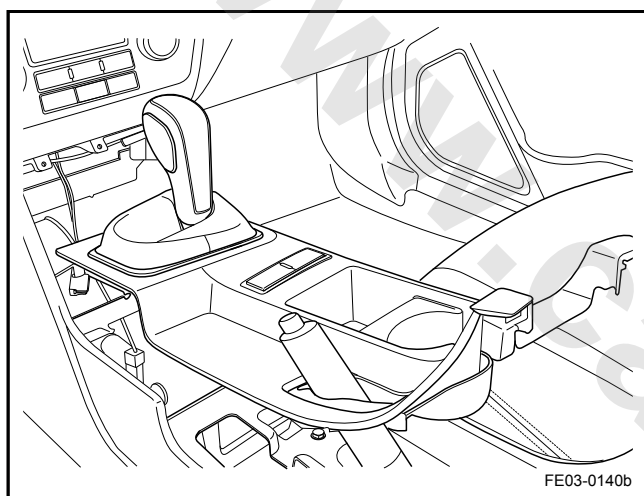
10. Install the shift lever leather holster.



11. Install the lever holster with the central console cup holder and tighten screws.

**Note**

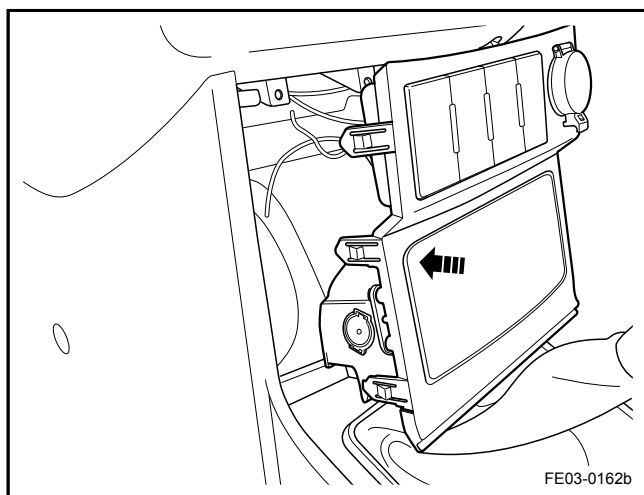
Connect the heated seat switch wiring harness connector in high-spec vehicles.



12. Press the center console cup holder and confirm that six clips are in place.

**Note**

Disconnect the heated seat switch wiring harness connector first in high-spec vehicles.



13. Install the center console upper panel and connect the wiring harness connector.
14. Connect the battery negative cable.

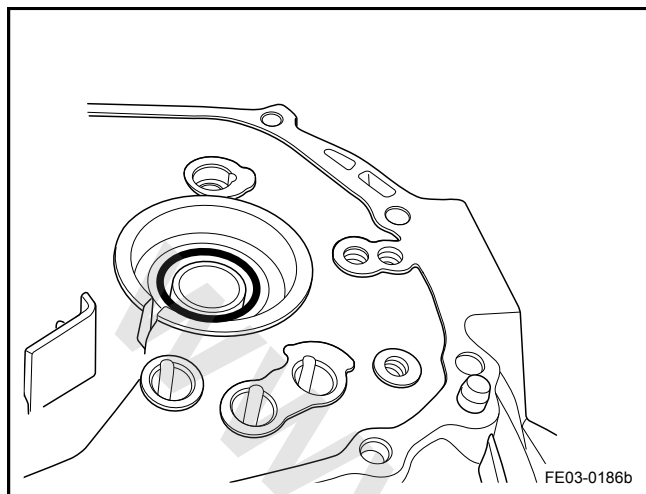
### 3.3.8.10 Transmission Input Shaft Oil Seal Replacement

#### Removal Procedure:

1. Remove the transmission. Refer to [3.3.8.3 Transmission Assembly Replacement](#).
2. Remove the input shaft. Refer to [3.3.8.7 Input Shaft Disassemble and Assemble](#).
3. Remove the input shaft oil seal.

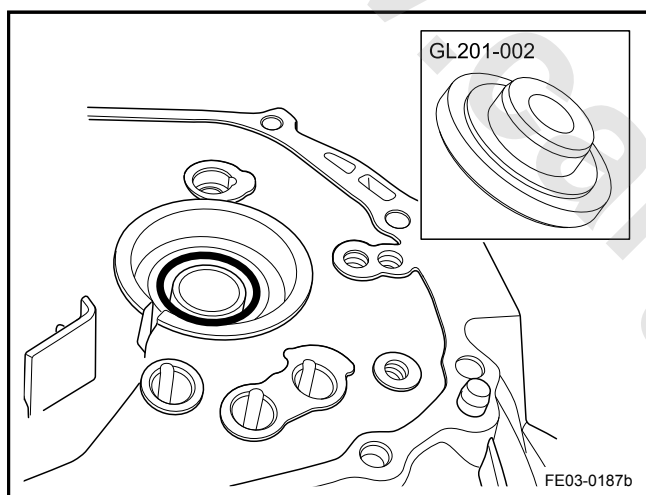
#### Note

Do not damage transmission fluid seal mounting surface.



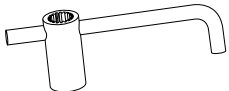
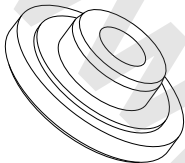
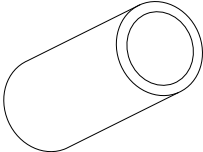
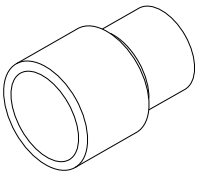
#### Installation Procedure:

1. Install the transmission input shaft oil seal with a special tool GL201-002.
2. Install the transmission input shaft.
3. Install the transmission.

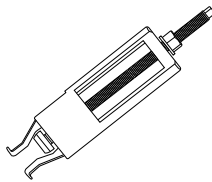
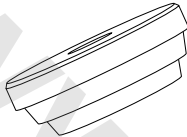
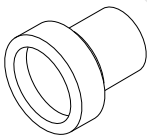
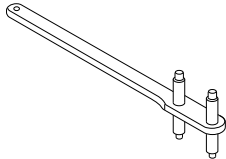
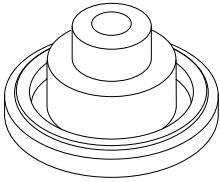


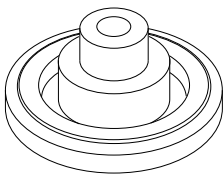
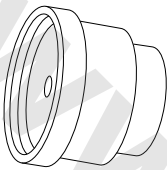
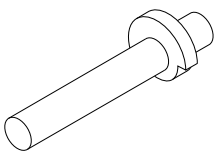
## 3.3.9 Special Tools and Equipment

## 3.3.9.1 Special Tools List

Serial Number	Illustration	Tool Number	Description
1	 <p>FE01-2001b</p>	GL201-001	Input Shaft Locking Tool
2	 <p>FE01-2002b</p>	GL201-002	Input Shaft Oil Seal Installation Tool
3	 <p>FE01-2003b</p>	GL201-003	Input and Output Shaft Parts Installation Tool
4	 <p>FE01-2004b</p>	GL201-004	Input Shaft Bearing Removal Tool



Serial Number	Illustration	Tool Number	Description
5	 <p>FE01-2005b</p>	GL201-005	Output Shaft Clutch Bearing Outer Ring Removal Tool
6	 <p>FE01-2006b</p>	GL201-006	Output Shaft Bearing Outer Ring Installation Tool
7	 <p>FE01-2007b</p>	GL201-007	Output Shaft Bearing Removal Tool
8	 <p>FE01-2008b</p>	GL201-008	Output Shaft Adjustment Tool
9	 <p>FE01-2009b</p>	GL201-009	Differential Clutch Housing Oil Seal Removal Tool

Serial Number	Illustration	Tool Number	Description
10	 <p>FE01-2010b</p>	GL201-010	Differential Transmission Housing Oil Seal Removal Tool
11	 <p>FE01-2011b</p>	GL201-011	Differential Bearing Removal Tool
12	 <p>FE01-2028b</p>	GL201-014	Shift Lever and Gear Selector Oil Seal Installation Tool

## 4 Suspension System

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## 4.1 Warnings and Notices

### 4.1.1 Warnings and Notices

#### Assistant Driving Warning

##### Warning!

Warning: An assistant should drive the vehicle while the technician checks for the location of the reported condition. Otherwise, personal injury could result.

#### Battery Disconnect Warning

##### Warning!

Warning: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

#### Road Test Warning

##### Warning!

Warning: Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

#### Engine Lifting Notice

##### Note

Notice: When raising or supporting the engine for any reason, do not use a jack under the oil pan, any sheet metal, or the crankshaft pulley. Lifting the engine in an unapproved manner may cause component damage.

#### Excessive Adhesive on Flywheel Bolts Notice

##### Note

Notice: Apply the proper amount of the sealant to the fastener when assembling this component. Excessive use of the sealant can prohibit the component from being assembled properly or allow the fastener to loosen. A component or fastener that is not assembled properly can loosen or fall off leading to extensive engine damage.

## 4.2 Front Suspension

### 4.2.1 Specifications

#### 4.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications		Notes
		Metric (Nm)	US English (lb-ft)	
Front Subframe Bolts	M14 × 1.5 × 95	160-200	118.0-147.5	
Rear Subframe Bolts	M14 × 1.5 × 55	160-200	118.0-147.5	
Cross Member Front Bolts	M10 × 1.25 × 18	65-85	47.9-62.7	
Steering Rod Ball Pin Groove Nut	M10 × 1.25	44-54	32.5-39.8	Turn the nut 60 ° if the pin can not be installed.
Front Shock Absorber Upper Nuts	M8 × 1.25	36-42	26.6-31	
Lower Control Arm Ball Joint Connecting Bolts	M10 × 1.25 × 16	131-159	96.6-117.3	
Lower Control Arm Ball Joint Connecting Nuts	M12 × 1.25	131-159	96.6-117.3	
Lower Control Arm Front Bolts	M14 × 1.5 × 95	160-200	118.0-147.5	Drop the wheels and then tighten to the specified torque
Lower Control Arm Rear Bolts	M14 × 1.5 × 95	160-200	118.0-147.5	Drop the wheels and then tighten to the specified torque
Front Stabilizer Bar Connecting Nuts	M12 × 1.25	69-79	50.9-58.3	
Ball Groove Nut	M14 × 1.5	131-158	96.6-116.5	Turn the nut 60 ° if the pin can not be installed.
Shock Absorber Upper Bracket and Piston Rod Nut	M14 × 1.5	60-80	44.3-59.0	
Stabilizer Bar Bracket and Front Subframe Connecting Nut	M10	45-55	33.2-40.6	
Front Axle Wheel Hub Nut (drive shaft)	M22 × 1.5	201-231	148.2-170.4	Fixed Locking Nut

#### 4.2.1.2 General Specifications

Applications	Specifications
--------------	----------------


	Metric (mm)	US English (in)
Front Wheel Upper Run Out	80	3.1
Front Wheel Lower Run Out	80	3.1

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## 4.2.2 Description and Operation

### 4.2.2.1 Description and Operation

The function of the front suspension system is to maximize the friction between tires and road surface, provide good steering control and stability, ensure passenger comfort. It is able to absorb the energy of the wheel vertical acceleration, so when the wheels move up and down along the bumpy road the frame and body will not be interfered. This vehicle uses independent strut front suspension, which includes the following components: springs, shock absorbers and the stabilizer bar.





### 4.2.3 System Working Principle

#### 4.2.3.1 Suspension System Terms

##### 1. Sprung Load:

- Sprung load refers to the weight supported by the spring.
- Sprung load should be larger than the non-Sprung Load to get the normal handling performance.

Sprung Load Examples:

- a. Body and Frame
- b. Load or Cargo
- c. Fuel Tank

Spring Components:

- a. Frame (Including the subframe)
- b. Body (Including the whole body)
- c. Power System (Engine, Transmission, Differential, Drive Axle)
- d. Steering

##### 2. Non-Sprung Load:

- Non-Sprung load refers to the weight not supported by the spring
- The less the non-Sprung Load the better, in order to ensure the normal handling and ride comfort.

Non-Sprung Load Examples:

- a. Wheels and Tires
- b. Wheel Bearings and Hub
- c. Axle and Steering Knuckle
- d. brake parts (mounted on wheels)

Non-Sprung Load Components:

- a. Wheels / Tires, Ball Joint, Bearings, Control Arm, Beam, Cross Members, Overall Drive Axle
- b. Stabilizer Bar, Control Rod, etc.
- c. Shaft, Steering Knuckle, Brake, etc.
- d. Non-Sprung load is small then the suspension response is good.

### 3. Components Between Sprung Load and Non-Sprung Load:

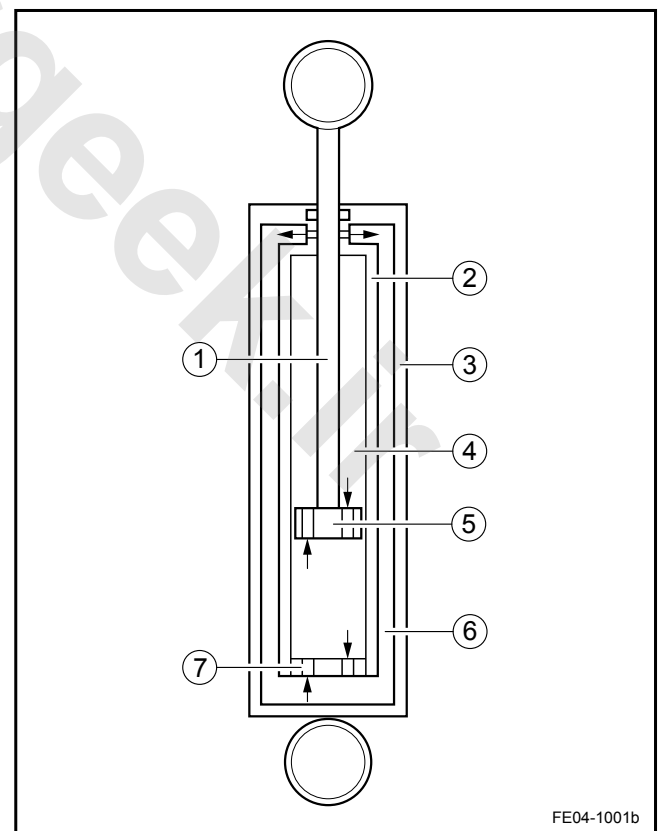
Steering rod, drive axle, stabilizer bar and other components installed between the sprung load and the non-sprung load.

### 4.2.3.2 Suspension System Component Working Principle

#### 1. Spring:

Spring stiffness will affect the Sprung Load response quality during driving. If the spring is soft, it can eliminate bumps and provide a very smooth driving feel, but in the process of braking and acceleration, it feels crawling and crouching. In the corner, it intends to roll and tumble. If the spring is firm, it feels less smooth on bumpy roads, but the body movement is very small, which means that even in the corner, you can also drive the vehicle fast. The spring itself is simple. Designing, implementing these devices and finding balance between the passenger comfort and vehicle handling performance is not easy. Smooth driving feel can not be achieved alone by the spring. The spring absorbing energy ability is excellent, but the dissipation ability is less impressive. Therefore, the suspension system uses a device called on shock absorber. If the damping structure is not used, spring will bounce at an uncontrolled rate and release the energy it absorbed through bumping and continue to bounce at its own frequency until it runs out all the energy. Built on the spring, the suspension allows the vehicle to drive on bumpy roads without losing control.

#### 2. Shock Absorber:



1. Piston Rod
2. Inner Cylinder

3. Outer Tube
4. Hydraulic Chamber
5. Piston and Valve
6. Liquid Storage Space
7. Inner Cylinder Bottom Valve

It controls the unwanted spring movement through a process known as damping. Shock absorber converts the suspension kinetic energy to heat dissipated by the hydraulic fluid to slow and weaken the vibration movement. Shock absorber upper bearing is connected to the frame (ie. Sprung Load), lower bearing is connected to the axle (ie. non-Sprung Load). In the double-cylinder design, one of the most common types of shock absorber is that the upper bearing is connected to the piston rod, piston rod is connected to the piston and piston is in the cylinder filled with hydraulic fluid. Inner cylinder is known as the pressure cylinder, outer cylinder is known as the reservoir cylinder. Reservoir cylinder stores the extra hydraulic fluid. When the wheels encounter bumps along the road and the spring is compressed or stretched, the spring energy passes through the bearing to the shock absorber, and passes down through the piston rod to the piston. There are holes on the piston. When the piston moves up and down in the pressure cylinder, hydraulic fluid may leak through these holes. Because these holes are very small, so even under a lot of pressure only a small amount hydraulic fluid can leak through. This slows down the velocity of the piston, so it slows down the spring movement. Shock Absorber's work consists of two cycles - compression cycle and extension cycle. Compression cycle is when the piston moves downward to compress the hydraulic fluid beneath it; extension cycle is when the piston moves upward to compress the hydraulic fluid on the top. For a typical vehicle, the extension cycle resistance is greater than its compression cycle. Moreover, please note that compression cycle control is related to the non-sprung load movement, while the extension cycle control is related to heavier Sprung Load movement. All modern shock absorbers come with speed-sensing capabilities - the faster the suspension speed, the greater the resistance shock absorber provides. This makes the shock absorber can be adjusted according to road conditions and controls the vehicle to eliminate unwanted movements, including bounce, roll, brake dive and acceleration squat and so on.

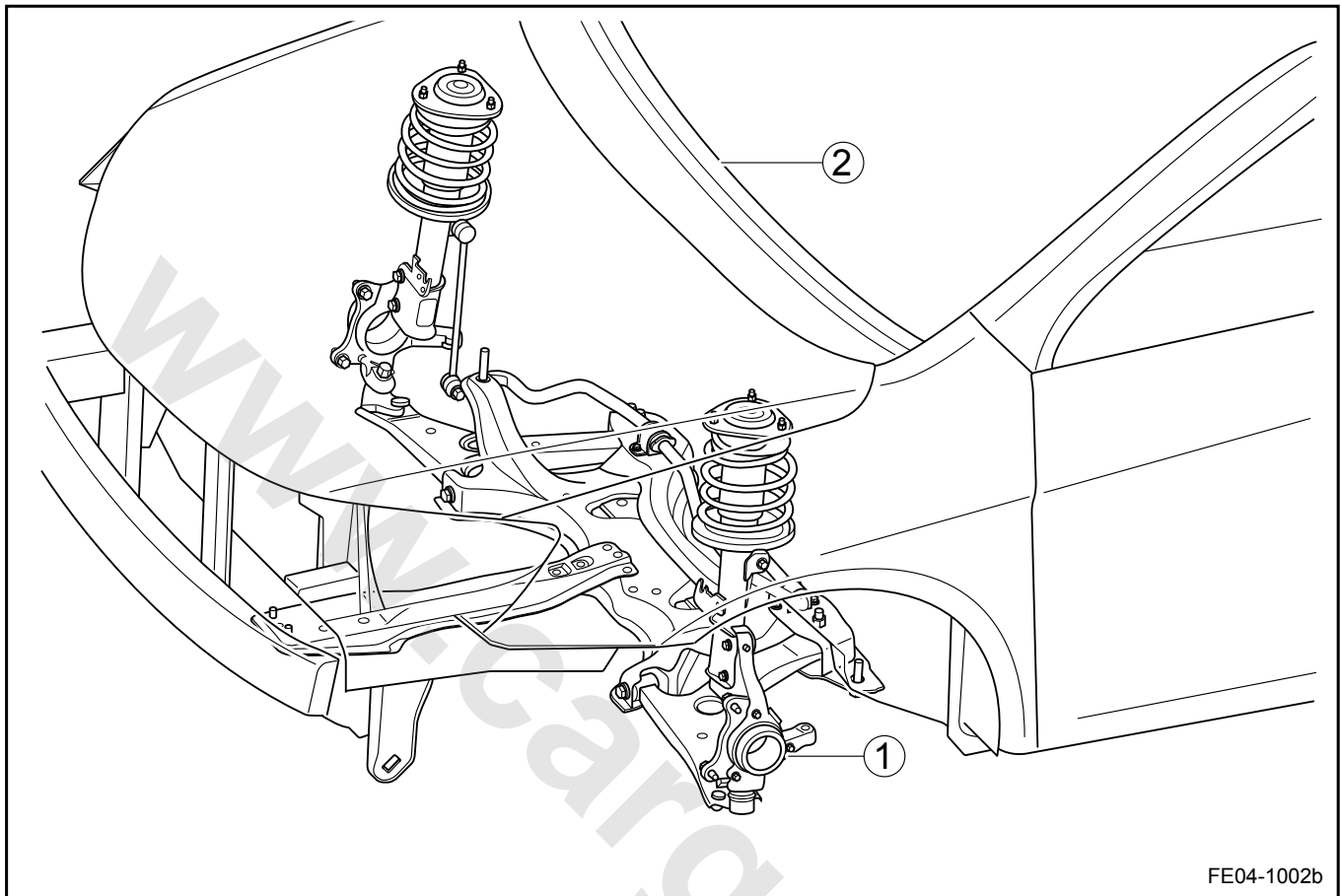
### 3. Stabilizer Bar:

It is used in conjunction with the shock absorber to provide additional stability for the driving vehicle. Stabilizer is a metal bar across the axle, effectively connecting the suspension on both sides together. When a wheel moves up and down on the

suspension, stabilizer bar will pass the movement to the other wheel. This can make driving more stable and reduce the vehicle inclination. In particular, it is capable to compensate the vehicle rollover tendency when the vehicle is turning.

#### 4.2.4 Component Locator

##### 4.2.4.1 Component Locator



#### Legend

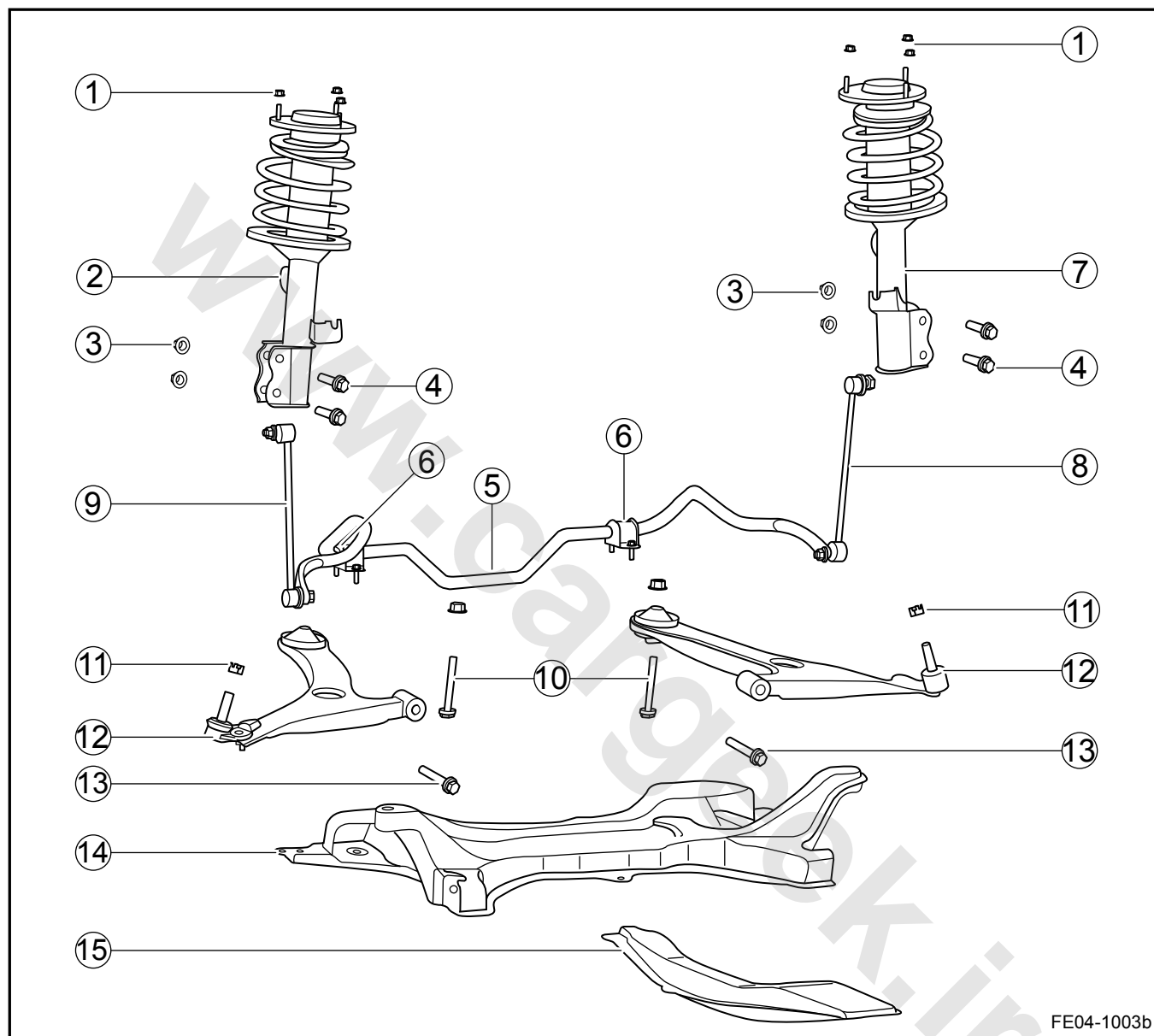
1. Front Suspension

2. Body

## 4.2.5 Disassemble View

## 4.2.5.1 Disassemble View

Front Suspension

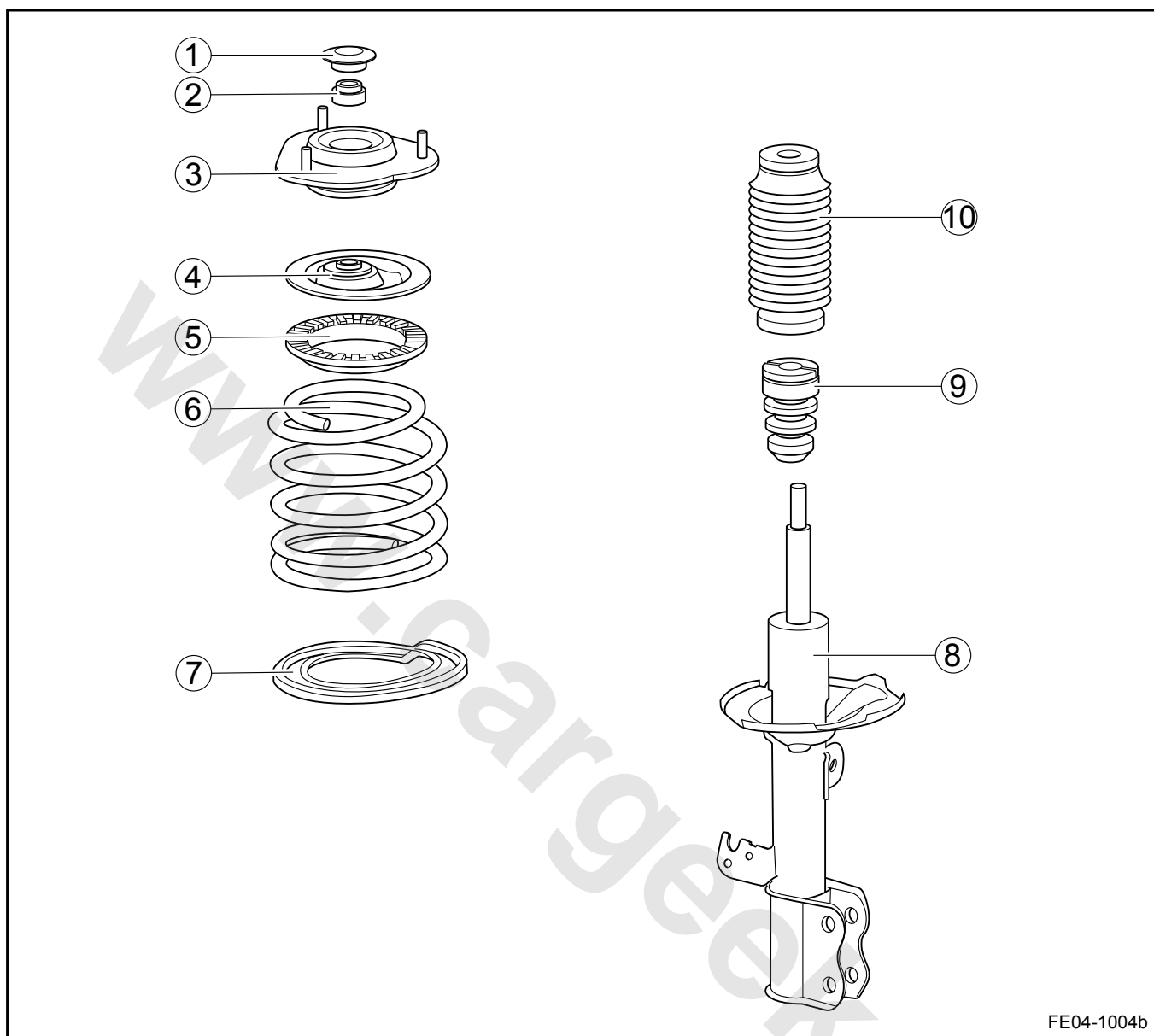


FE04-1003b

## Legend

- |   |  |
|---|--|
| 1. Front Strut Assembly Upper Nuts                            | 9. Right Front Stabilizer Bar Link Assembly  |
| 2. Right Front Strut Assembly                                 | 10. Lower Control Arm Rear Connecting Bolts  |
| 3. Front Shock Absorber and Steering Knuckle Connecting Nuts  | 11. Ball Groove Nuts                         |
| 4. Front Shock Absorber and Steering Knuckle Connecting Bolts | 12. Lower Control Arm Ball Joint             |
| 5. Front Stabilizer Bar                                       | 13. Lower Control Arm Front Connecting Bolts |
| 6. Front Stabilizer Bracket, Bushings and Bolts               | 14. Subframe                                 |
| 7. Left Front Strut Assembly                                  | 15. Crossmember                              |
| 8. Left Front Stabilizer Bar Link Assembly                    |  |

## Front Strut Assembly



FE04-1004b

## Legend

- |  |  |
|--|--|
| 1. Front Strut Upper Mount Dust Cover              | 7. Front Coil Spring Lower Vibration Isolation Pad |
| 2. Locking Nut                                     | 8. Front Shock Absorber Assembly                   |
| 3. Front Strut Upper Mount                         | 9. Front Shock Absorber                            |
| 4. Front Coil Spring Upper Mount                   | 10. Front Shock Absorber Dust Cover                |
| 5. Front Coil Spring Upper Vibration Isolation Pad |  |
| 6. Front Suspension Coil Spring                    |  |

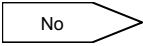
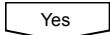
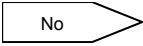
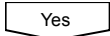
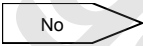
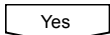
## 4.2.6 Diagnostic Information and Procedures

### 4.2.6.1 Diagnosis Description

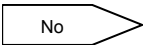
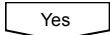
Refer to "Description and Operation" and start system diagnostics. When a malfunction occurs. Refer to "Description and Operation", as it will help determine the correct symptoms diagnostic procedures, it will also help to determine whether the customer described condition in normal. Refer to [4.2.2 Description and Operation](#) to confirm the correct procedures for system diagnostics.

### 4.2.6.2 Shock Absorber Inspection

#### 1. Shock absorber is too soft

Step 1	Check whether the tire pressure is normal?
	<div style="text-align: right;">No </div> <div>Adjust tire pressure to the standard value according to the tire label.</div>
	Yes 
Step 2	Check whether the vehicle is overloaded?
	<div style="text-align: right;">No </div> <div>Consult with the user. Explain to the user what is the vehicle normal load.</div>
	Yes 
Step 3	Check whether the shock absorber compression rebound effect is normal?
	<p>Quickly press and release the bumper corner closest to the shock absorber being tested. Compare the compression and rebound with a similar vehicle.</p> <div style="text-align: right;">No </div> <div>Replace the shock absorber. Refer to <a href="#">4.2.7.3 Front Strut Assembly Replacement</a>, <a href="#">4.3.7.1 Rear Strut Assembly Replacement</a></div>
	Yes 
Step 4	System normal.

#### 2. Shock Absorber Noise

Step 1	Check whether the shock absorber is installed correctly. check whether all shock absorber components are working correctly (Make sure there is no loose or other abnormal situation).
	<div style="text-align: right;">No </div> <div>If necessary, replace the shock absorber.</div>
	Yes 
Step 2	Check whether the shock absorber compression and rebound effect is normal?

Quickly press and release the bumper corner closest to the shock absorber being tested. Compare the compression and rebound with a similar vehicle.

No

Replace the shock absorber. Refer to  
[4.2.7.3 Front Strut Assembly Replacement](#),  
[4.3.7.1 Rear Strut Assembly Replacement](#)

Yes

Step 3 System normal.

### 3. Shock Absorber Oil Leaks

Step 1 Check whether there is slight oil leakage. If the leaking is very slight, it is normal.

Next

Step 2 Check the shock absorber seals when fully extended. Check whether the dust cover is damaged and so on.

Yes

Replace the shock absorber. Refer to  
[4.2.7.3 Front Strut Assembly Replacement](#),  
[4.3.7.1 Rear Strut Assembly Replacement](#)

No

Step 3 Check whether there is excessive oil on the shock absorber?

Yes

Replace the shock absorber. Refer to  
[4.2.7.3 Front Strut Assembly Replacement](#),  
[4.3.7.1 Rear Strut Assembly Replacement](#)

No

Step 4 System normal.

### 4.2.6.3 Ball Pin and Steering Knuckle Inspection

#### Warning!

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

Step 1 Raise the vehicle front end, so that the front suspensions are in a free hanging state.

Next

Step 2 Hold the top and bottom of the tire.

Next

Step 3 Turn the tire inward and outward at the top

Next

Step 4 Check whether there is gap, whether the steering knuckle moves horizontally in relation to the control arm?

Next

Step 5	If there are following conditions, replace the ball joint.
--------	--

- (a) Ball joint loose.
- (b) Ball joint seal broken.
- (c) Ball stud and steering knuckle disconnected.
- (d) Ball stud loose in the steering knuckle.
- (e) Press the ball stud, it twists.

Next

Step 6	Components normal.
--------	--------------------

#### 4.2.6.4 Ball Stud Inspection

During each inspection, check whether the ball stud is tightly installed in the steering knuckle.

Check whether the ball stud is worn:

- A. Shake the wheel and the ball stud or nut movement in the steering knuckle.
- B. Check slotted nut fastening torque. Nut loose indicates that ball joint withstands stress or there is a hole in the steering knuckle.

Replace the worn or damaged ball joint or steering knuckle. Refer to [4.2.7.7 Lower Control Arm Ball Joint Replacement](#), [4.2.7.8 Steering Knuckle Replacement](#).

#### 4.2.6.5 Friction Too Great Inspection

Follow the procedures to check whether the front suspension friction is too great:

Step 1	Raise the front bumper and lift the vehicle as high as possible.
--------	--

Next

Step 2	Slowly lower down the bumper for the vehicle front end to resume its height.
--------	--

Next

Step 3	Measure the distance between the ground and the bumper center.
--------	--

Next

Step 4	Push the bumper and then slowly release to allow the vehicle to resume its height.
--------	--

Next

Step 5	Measure the distance between the ground and the bumper center.
--------	--

Next

Step 6	The two measured values difference should be less than 12.7 mm (0.5 in). If the distance exceeds this limit, check the control arm, shock absorber and ball joint for damage or wear and tear.
--------	--



#### 4.2.6.6 Ride Diagnostic (Too Soft or Hard)

##### 1. Too Soft

Step 1	Check whether the shock absorber is worn. If necessary, replace the shock absorber.
--------	---

Next

Step 2	Check whether the coil spring is broken or loose. If necessary, replace the spring.
--------	---

##### 2. Too Hard

Step 1	Check whether the shock absorber is installed correctly, whether the shock absorber suits the vehicle. If necessary, replace the shock absorber.
--------	--

Next

Step 2	Check whether the coil spring is the correct type. If necessary, replace the coil spring.
--------	---

#### 4.2.6.7 Body Tilt or Sway When Cornering

Step 1	Check whether the stabilizer bar link is loose. Tighten the stabilizer bar link to the strut assembly connecting nuts to the specified torque.
--------	--

Next

Step 2	Check whether the shock absorber and the coil spring are wear and tear. If necessary, replace the shock absorber and tighten the shock absorber retaining nuts.
--------	---

Next

Step 3	Check whether the vehicle is overload. Provide the user a reasonable explanation.
--------	---

Next

Step 4	Check whether the coil spring is broken or loose. If necessary, replace them.
--------	---

#### 4.2.6.8 Noise Diagnostics

Step 1	Check whether the ball joint and the steering rod lubrication is inadequate?
--------	--

Yes

Replace the ball joint or the steering rod.  
Refer to [4.2.7 Stabilizer Bar Link Replacement](#)

No

Step 2	Check whether the suspension components are damaged?
--------	--

Yes

Replace the damaged suspension components.

No	
Step 3	Check whether there is lower control arm wear and tear?
Yes	
Replace the lower control arm bush. Refer to <a href="#">4.2.7.2 Lower Control Arm Bushing Replacement</a>	
No	
Step 4	Check whether the Stabilizer Bar link is loose?
Yes	
Tighten the stabilizer bar link bolts.	
No	
Step 5	Check whether the shock absorber or coil spring vibration isolation pad are intact. Check whether the installation is correct. Check the existence of damage and so on?
Yes	
Replace the faulty components.	
No	
Step 6	Check whether the coil spring installation is incorrect?
Yes	
Install the coil spring.	
No	
Step 7	Check whether the stabilizer bar bushing is wear and tear?
Yes	
Replace the stabilizer bar bushing. Refer to <a href="#">4.2.7.5 Stabilizer Bar Replacement</a>	
No	
Step 8	Find a same model vehicle. Assess whether the noise is the normal operating noise.
Yes	
Step 9	System normal.

#### 4.2.6.9 Vehicle Front End Height Abnormal

Step 1	Check whether the coil spring is broken or loose. If necessary, replace it.
Next	
Step 2	Check whether the vehicle is overloaded. If necessary, explain to the user the overload damage.

[Next](#)

Step 3	Check whether the coil spring is not correct or too soft. Replace with Geely genuine coil spring.
--------	---

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## 4.2.7 Removal and Installation

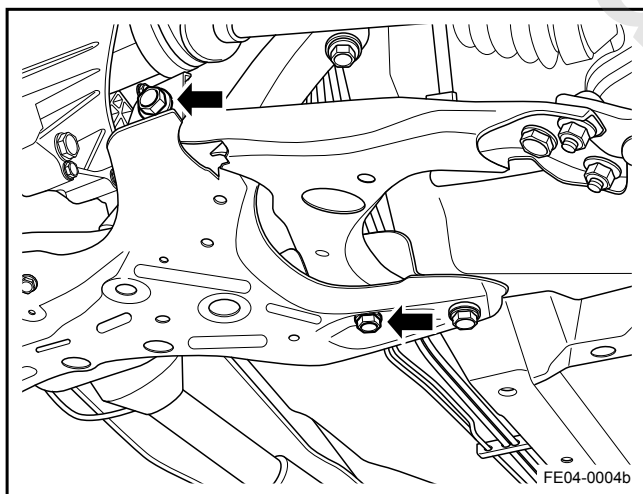
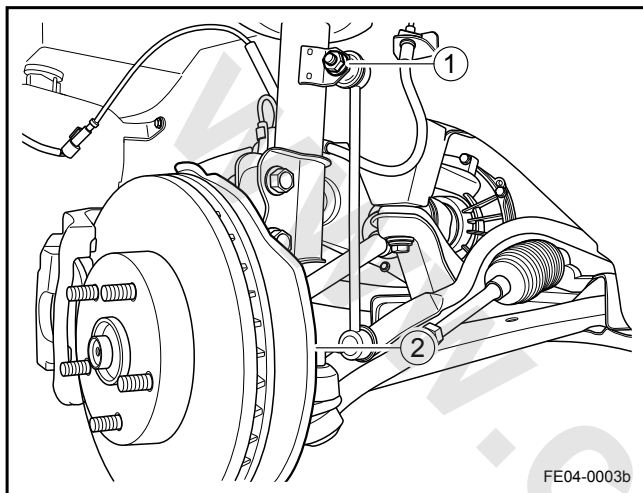
### 4.2.7.1 Lower Control Arm Replacement

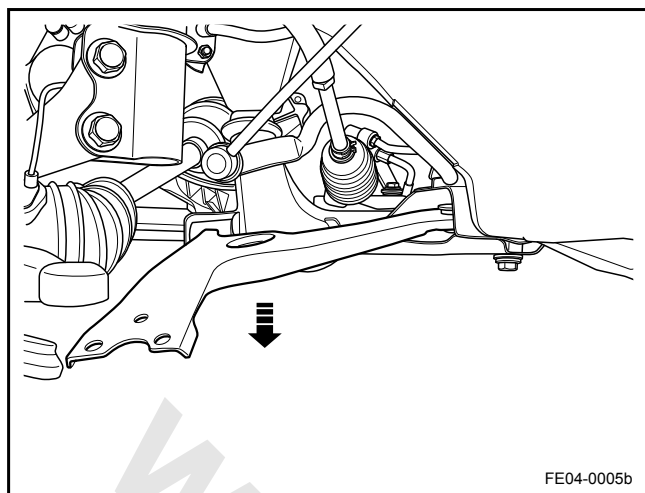
Removal Procedure:

#### Note

Before the following removal procedure, remove the ignition key from the ignition switch first and turn to lock the steering wheel.

1. Lift and support the vehicle.
2. Remove the front wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove the lower control arm ball joint. Refer to [4.2.7.7 Lower Control Arm Ball Joint Replacement](#).
4. Remove the left and right stabilizer link to the shock absorber connecting nut (1).
5. Remove the steering tie rod ball nut and remove the steering tie rod from the steering knuckle (2).
6. Rotate the stabilizer bars and the steering gear to make room for the lower control arm removal.
7. Remove lower control arm to the subframe retaining bolts.





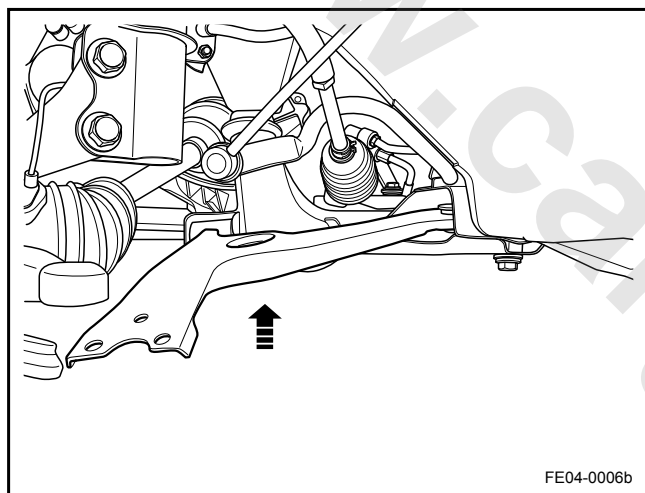
8. Remove the lower control arm.

Installation Procedure:

**Note**

Refer to "Fastener Notice" in "Warnings and Notices".

1. Install the lower control arm to the subframe.

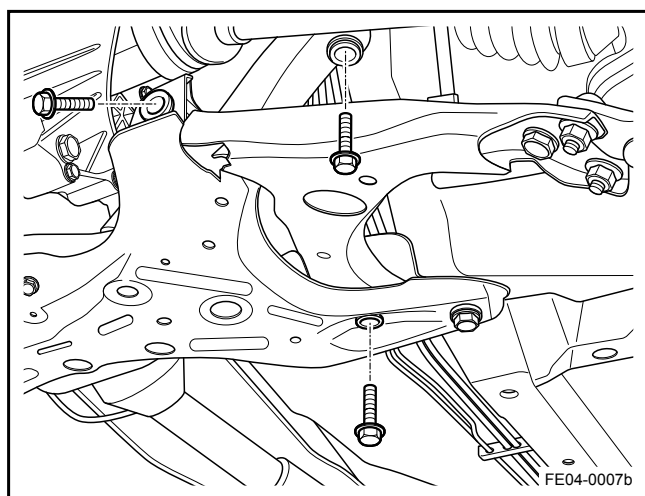


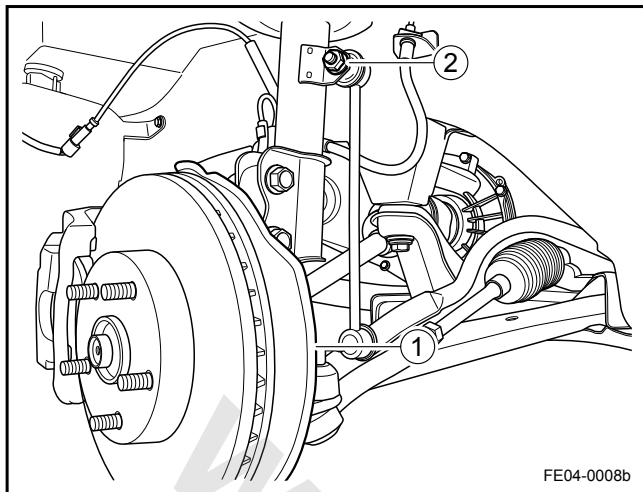
2. Tighten the lower control arm to the subframe retaining bolts.

**Note**

Lower down the wheel and then tighten the bolts to the required torque.

Torque: 180 Nm (Metric) 133 lb-ft (US English)





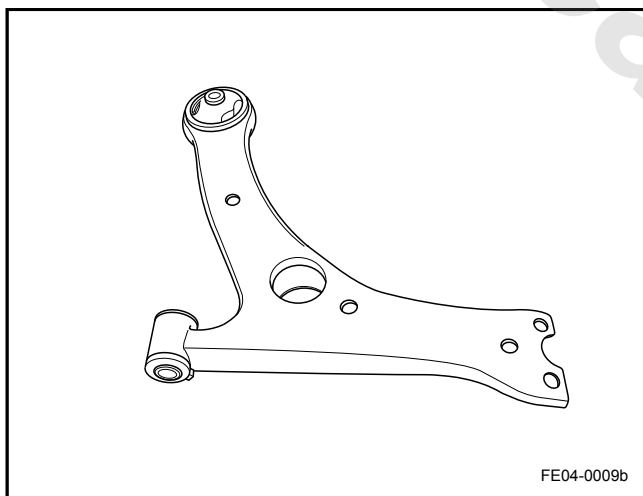
3. Install the lower control arm ball joint.
4. Install the steering tie rod ball nut (1).
5. Rotate the Stabilizer bars to the correct position and tighten the left and right Stabilizer bar link connection nuts (2).  
Torque: 75 Nm (Metric) 55 lb-ft (US English)
6. Install the front wheels.
7. Lower the vehicle.

#### 4.2.7.2 Lower Control Arm Bushing Replacement

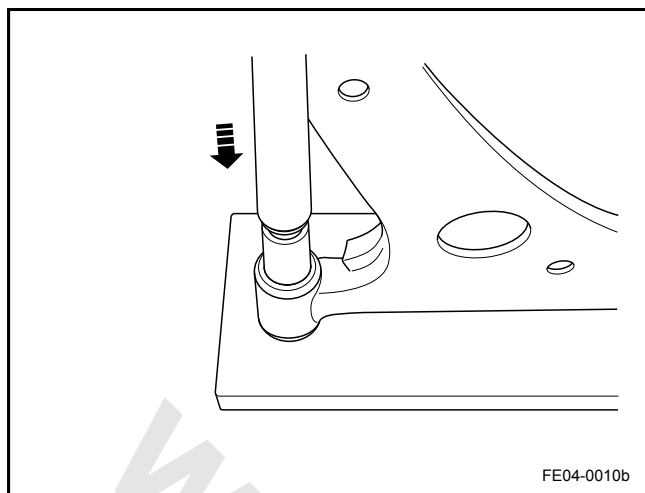
Removal Procedure:

##### Note

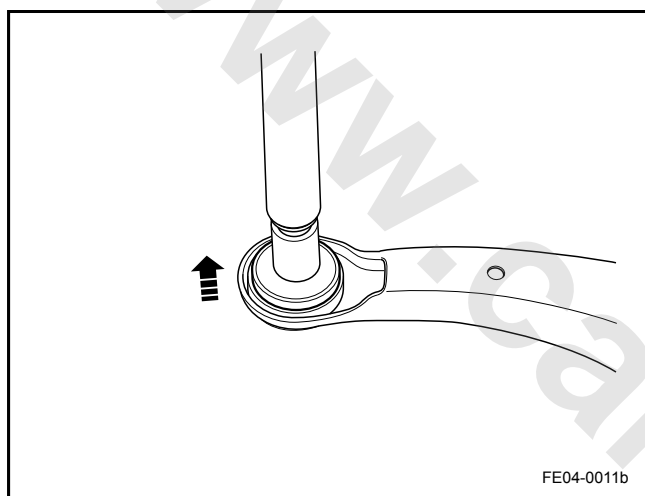
Bushings are only allowed to replace once. If the bushing is faulty a second time, replace the lower control arm assembly.



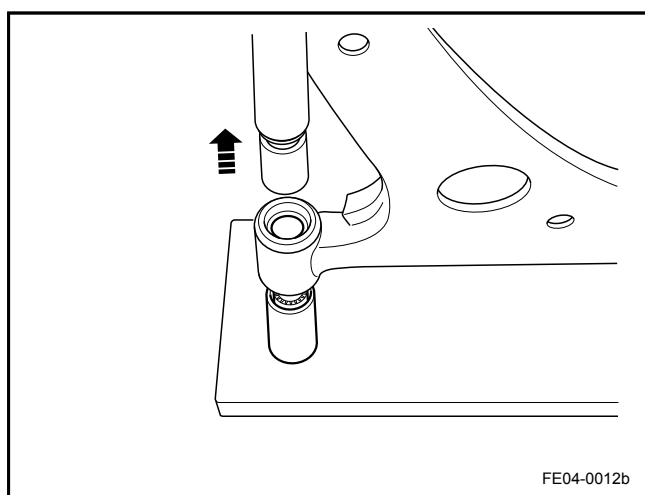
1. Remove the lower control arm ball joint. Refer to [4.2.7.7 Lower Control Arm Ball Joint Replacement](#).
2. Remove the lower control arm assembly. Refer to [4.2.7.1 Lower Control Arm Replacement](#).



3. Use the bushing removal tool to remove the lower control arm front bush.

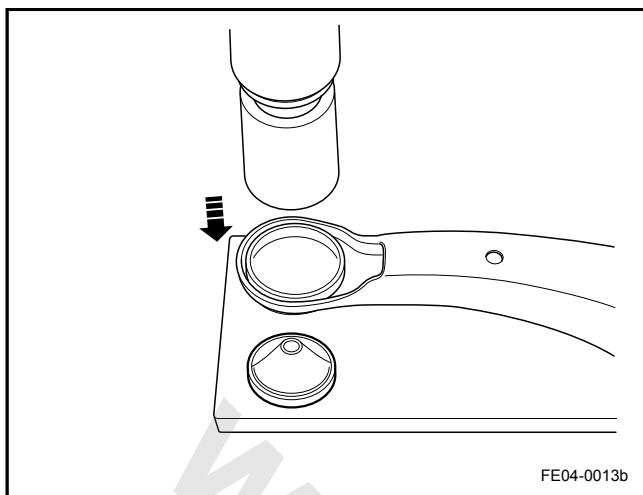


4. Use the bushing removal tool to remove the lower control arm rear bush.



#### Installation Procedure:

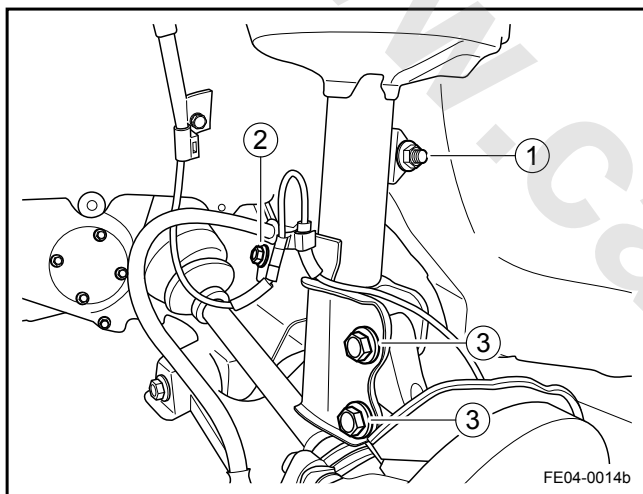
1. Apply the multi-use grease on the lower control arm rear axle, press the bushing into the lower control arm rear axle.



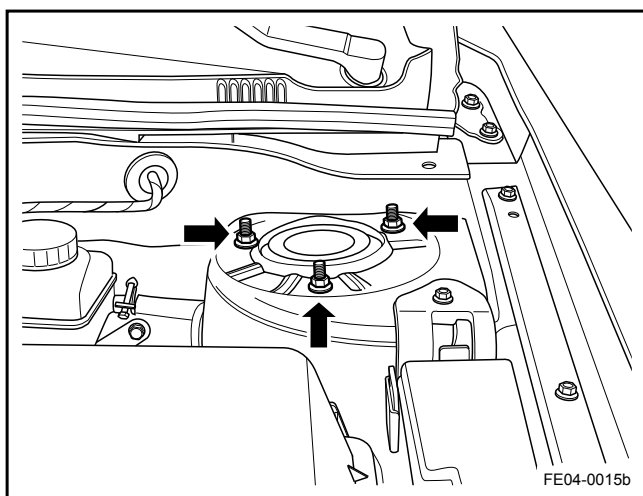
2. Apply the multi-use grease on the lower control arm front axle, press the bushing into the lower control arm front axle.
3. Install the lower control arm assembly.
4. Install the lower control arm ball joint.

#### 4.2.7.3 Front Strut Assembly Replacement

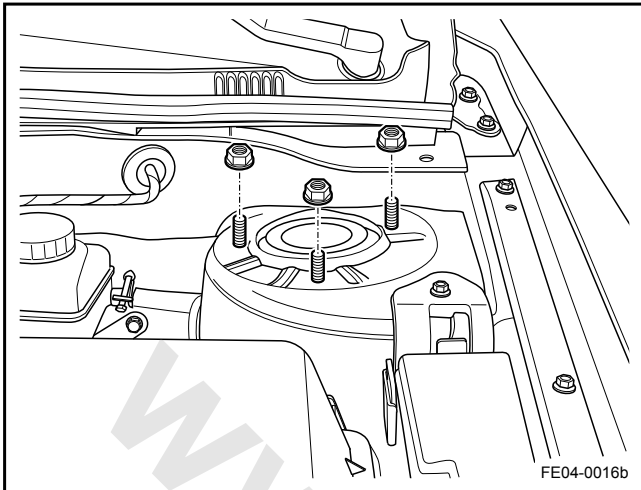
##### Removal Procedure:



1. Lift and support the vehicle.
2. Remove the wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove the front stabilizer bar link with a connection to the shock absorber connecting nut (1), loose the front stabilizer bar link from the shock absorber.
4. Remove the front wheel speed sensor to the front brake pipe bracket bolt (2).
5. Loosen the front brake pipe and the wheel speed sensor from the shock absorber.
6. Remove the steering knuckle to the front shock absorber connection bolts (3).
7. Remove the front shock absorber upper retaining nuts.
8. Remove the front strut assembly from the front wheelhouse.







## Installation Procedure:

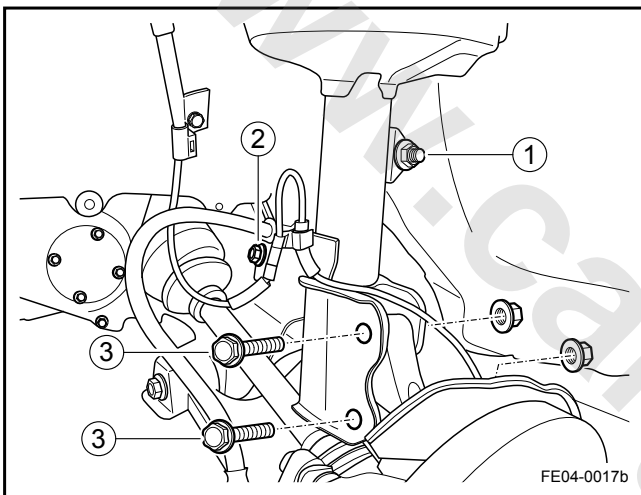
1. Install the front shock absorber assembly and tighten the upper retaining nuts.

**Note**

Operate carefully to avoid damage or scratch to the paint while moving coil spring. Damaged paint will cause premature malfunction.

Refer to "Fastener Notice" in "Warnings and Notices".

Torque: 40 Nm (Metric) 29.6 lb-ft (US English)



2. Install the front shock absorber to the steering knuckle and tighten the bolts (3).

Torque: 135 Nm (Metric) 100 lb-ft (US English)

3. Fix the front brake hoses and the wheel speed sensor wiring harness to the front shock absorber and tighten bolts (2).

4. Install the stabilizer bar link to the shock absorber and tighten the nut (1).

Torque: 75 Nm (Metric) 55 lb-ft (US English)

5. Install the front wheels.

6. Lower the vehicle.

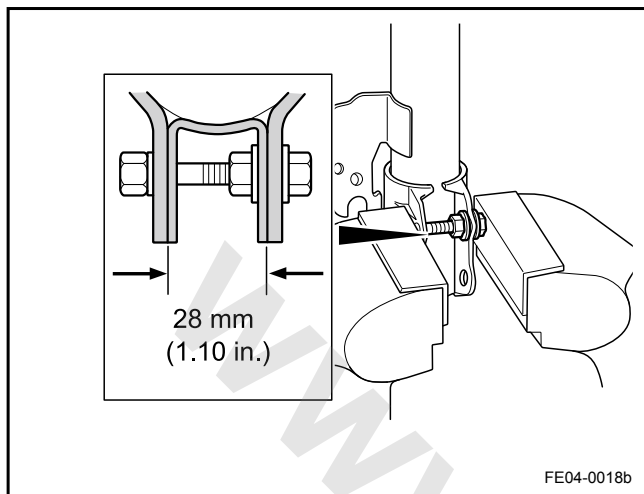
**Note**

The left front and right front shock absorber replacement is similar.

#### 4.2.7.4 Front Shock Absorber Components and Spring Replacement

##### Removal Procedure:

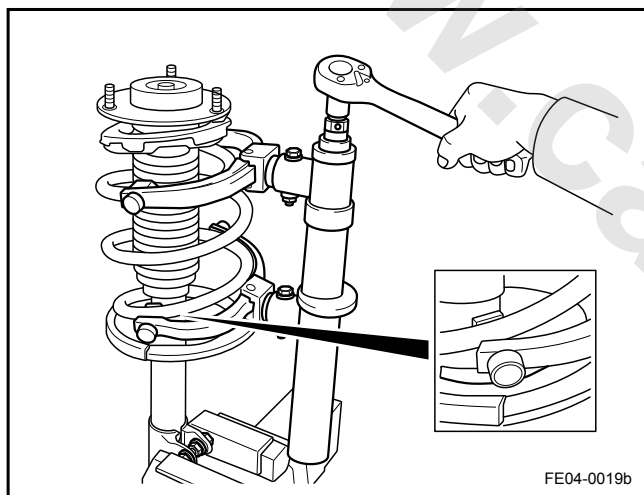
1. Install two nuts and one bolt to the shock absorber bracket, and then fix the front shock absorber assembly on a table vice.



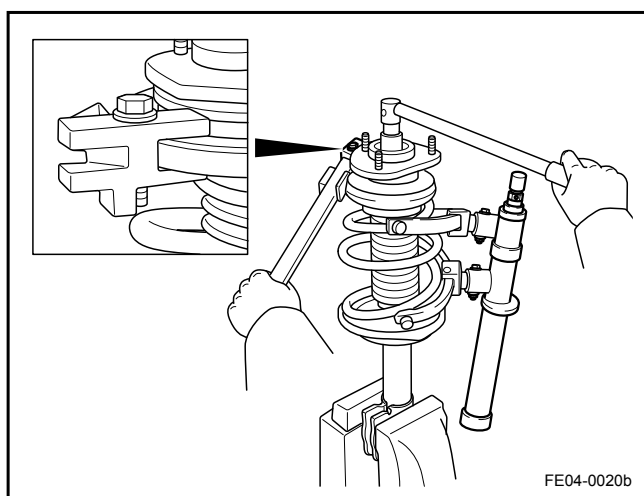
2. Use the spring compression tool to compress the coil spring.

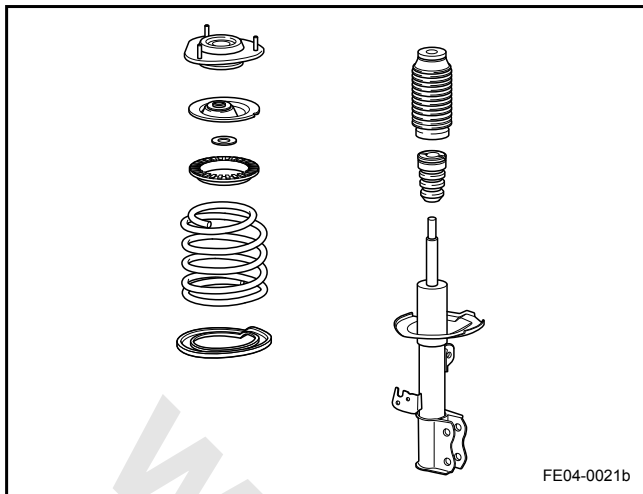
##### Note

Do not use pneumatic wrenches, otherwise it will damage the compression tool.



3. Remove the front shock absorber dust cover. Use a suitable tool to fix the spring mount and remove the locking nut.

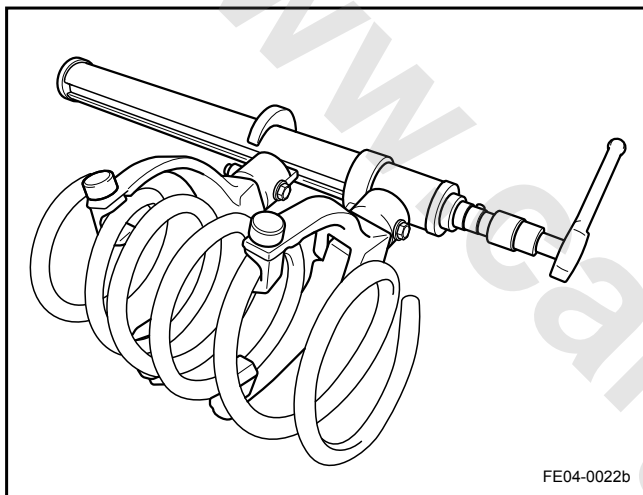




4. Remove the front shock absorber upper mount, front coil spring upper mount, the front coil spring upper vibration insulator pad, the front suspension coil spring, the front shock absorber dust cover, the front shock absorber buffer block and the front coil spring lower vibration insulator pad.

#### Installation Procedure:

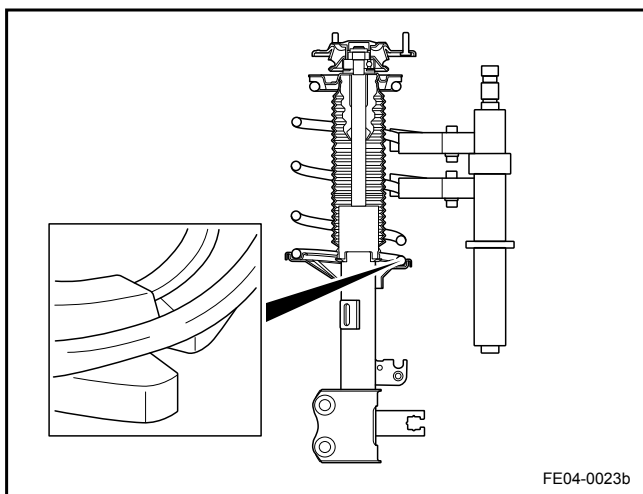
1. Use the spring compression tool to compress the coil spring.

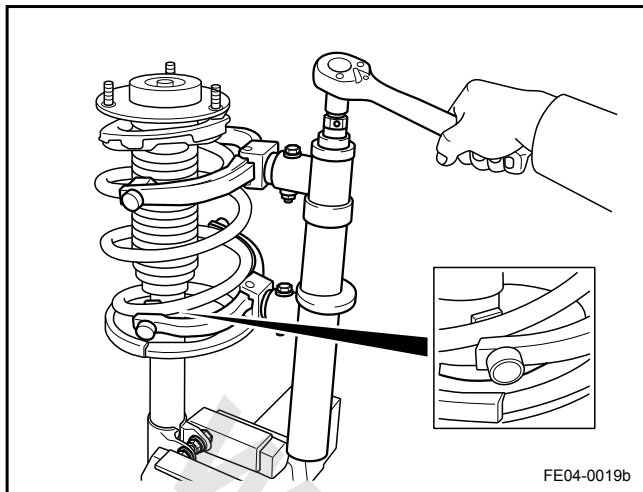


2. On the front shock absorber bracket, install the front coil spring lower vibration insulation pad, front shock absorber buffer block, the front shock absorber dust cover, the front suspension coil spring, the front coil spring upper vibration insulation pad, the front coil spring upper mount and the front shock absorber assembly.

#### Note

Install the coil spring bottom to the shock absorber spring mount notch.





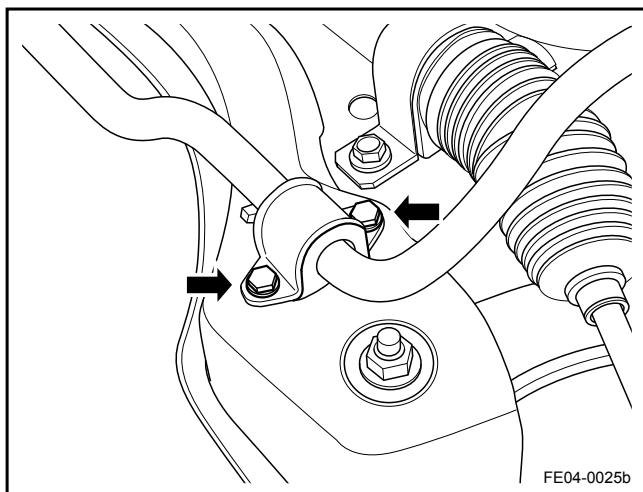
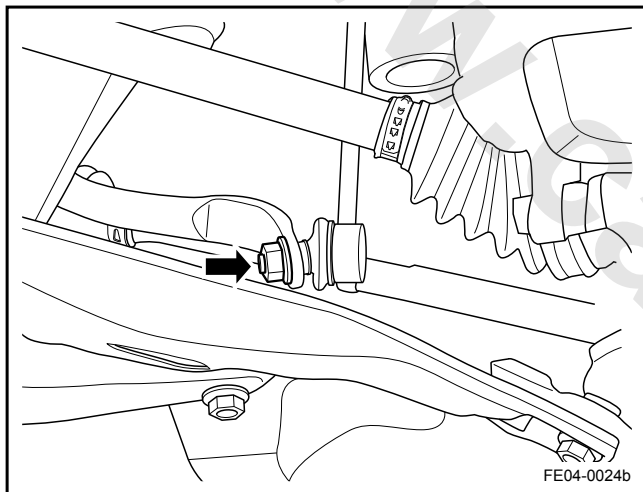
3. Install the locking nut and install the front shock absorber dust cover.

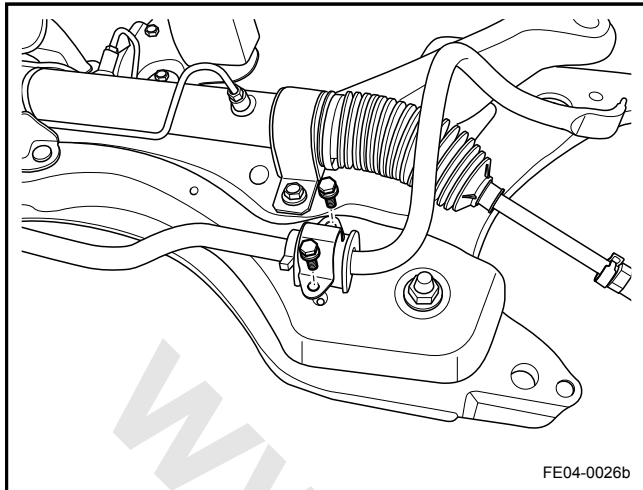
Torque: 70 Nm (Metric) 51.8 lb-ft (US English)

#### 4.2.7.5 Stabilizer Bar Replacement

Removal Procedure:

1. Lift and support the vehicle.
2. Remove the wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove the stabilizer bar to the stabilizer bar left and right link nut.
4. Remove the subframe. Refer to [12.6.4.2 Subframe Replacement](#).
5. Remove the Stabilizer Bar U-shape bracket and bushing.
6. Remove the Stabilizer Bar.



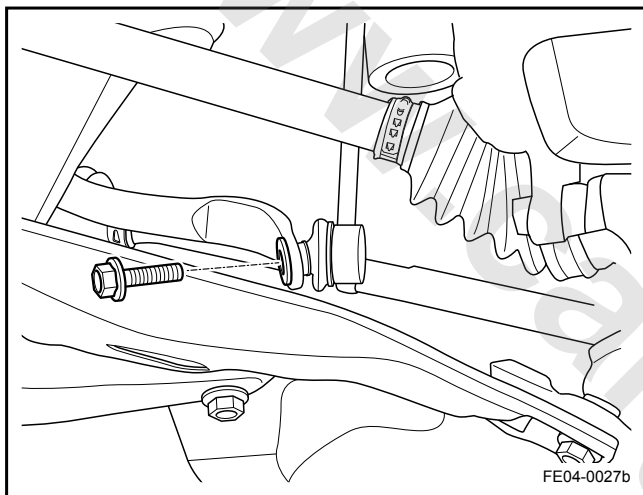


## Installation Procedure:

1. Install the bushing to the stabilizer bar, and then install the U-shape bracket and tighten the bolts.

Torque: 50 Nm (Metric) 37 lb-ft (US English)

2. Install the subframe.



3. Install the Stabilizer Bar to the Stabilizer Bar left and right link nut.

Torque: 75 Nm (Metric) 55 lb-ft (US English)

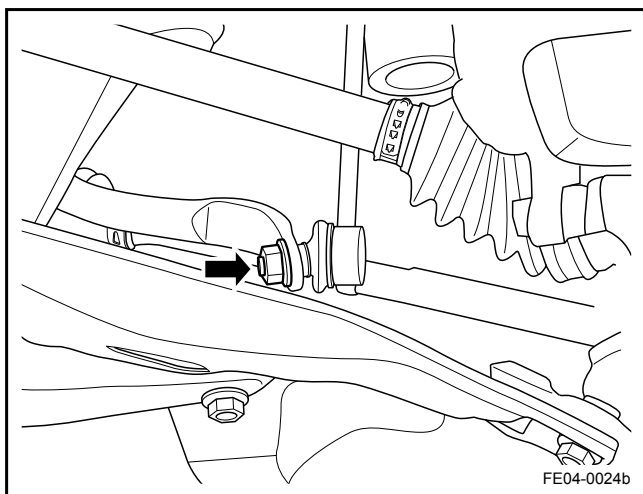
4. Install the wheels.

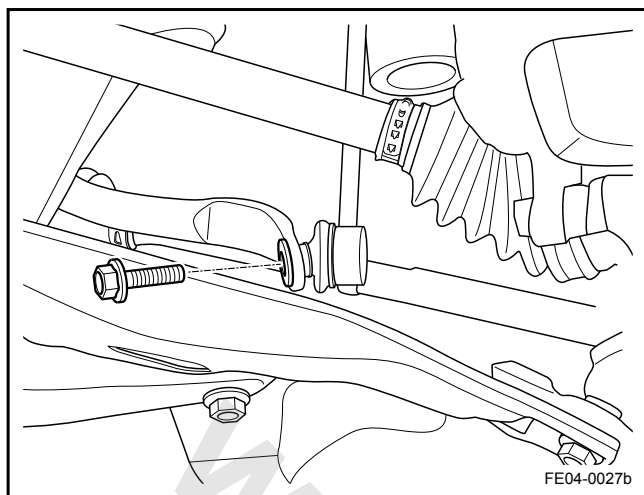
5. Lower the vehicle.

#### 4.2.7.6 Stabilizer Bar Link Replacement

## Removal Procedure:

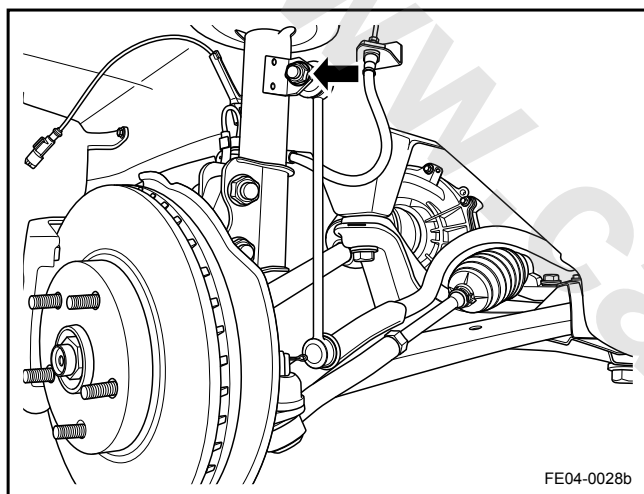
1. Lift and support the vehicle.
2. Remove the wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove the Stabilizer Bar Link to the shock absorber connecting nut. Loosen the Stabilizer Bar Link from the front shock absorber.





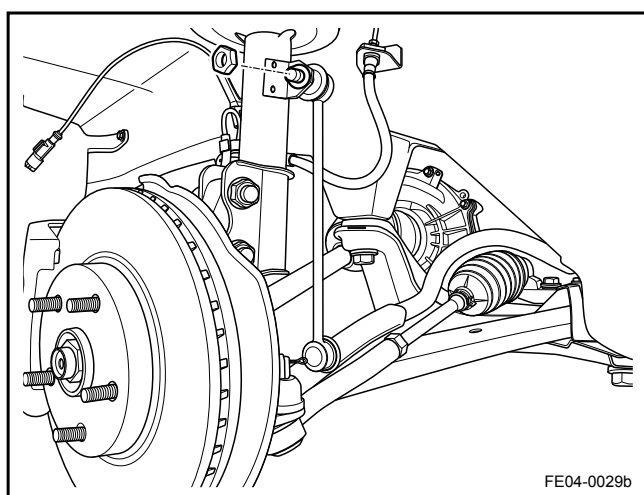
4. Remove the Stabilizer Bar Link to the stabilizer bar connecting nut.
5. Remove the Stabilizer Bar Link.

#### Installation Procedure:



1. Install the Stabilizer Bar Link to the stabilizer bar and tighten the nut.

Torque: 74 Nm (Metric) 54 lb-ft (US English)



2. Install the Stabilizer Bar Link to the shock absorber and the tighten the connecting nut.

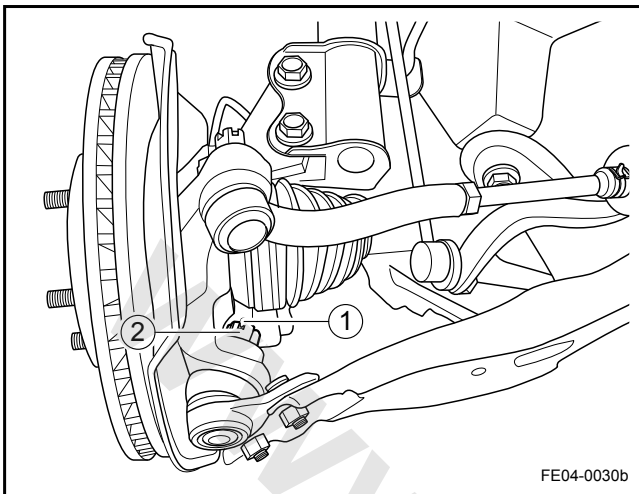
Torque: 75 Nm (Metric) 55 lb-ft (US English)

3. Install the wheels.
4. Lower the vehicle.

#### 4.2.7.7 Lower Control Arm Ball Joint Replacement

##### Removal Procedure:

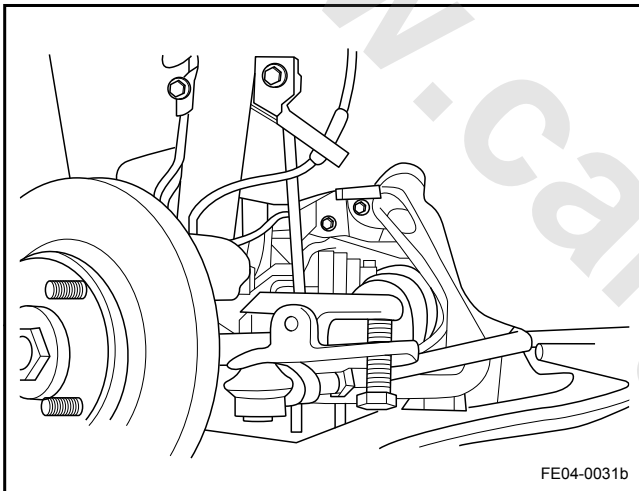
1. Lift and support the vehicle.
2. Remove the front wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove the the ball joint opening pin (1) and the nut (2).



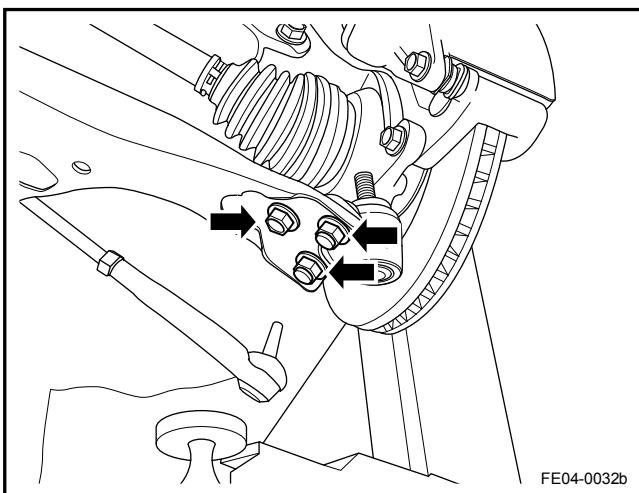
4. Use a universal tool to separate the ball joint and the steering knuckle.

##### Note

Only use a universal tool to separate the ball joint and the steering knuckle. Do not use a hand hammer or pry bar to remove the ball joint. If the recommended tool is not used, it will lead to the ball joint and seal damage.



5. Remove the ball of retaining nuts and bolts.
6. Remove the ball joint.





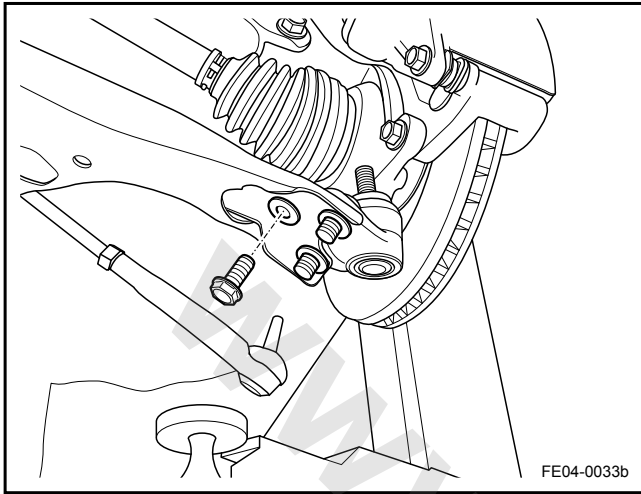
## Installation Procedure:

## Note

Refer to "Fastener Notice" in "Warnings and Notices".

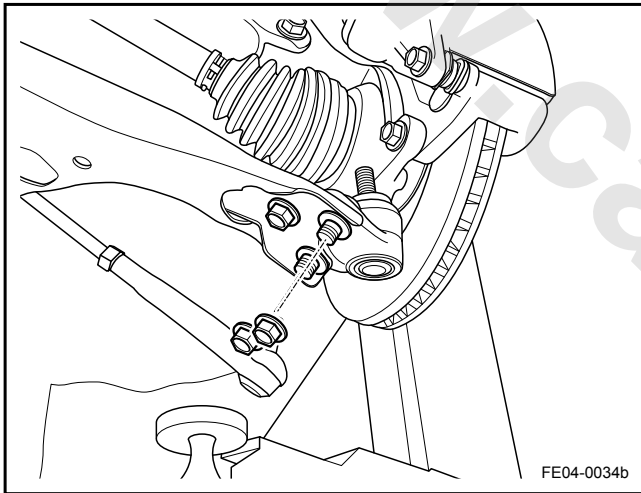
1. Install the ball joint to the lower control arm and tighten the bolts.

Torque: 145 Nm (Metric) 107.3 lb-ft (US English)



2. Tighten the ball joint nuts.

Torque: 145 Nm (Metric) 107.3 lb-ft (US English)



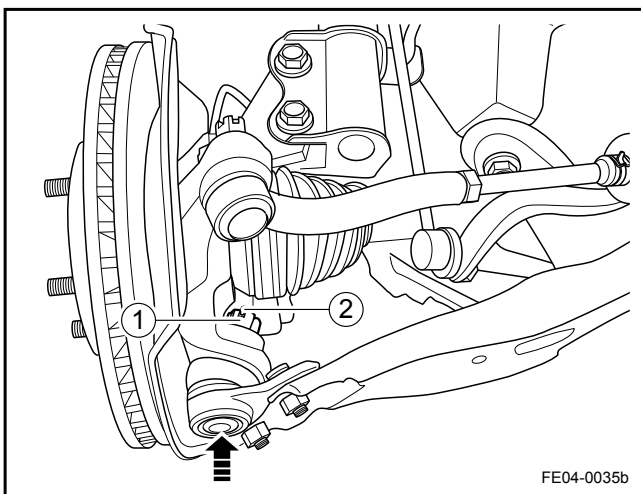
3. Install the ball inside to the steering knuckle and tighten the slotted hex nut (1) and the opening pin (2).

Torque: 145 Nm (Metric) 107.3 lb-ft (US English)

4. Install the front wheels.
5. Lower the vehicle.

## Note

Left and right front ball joint replacement is similar.

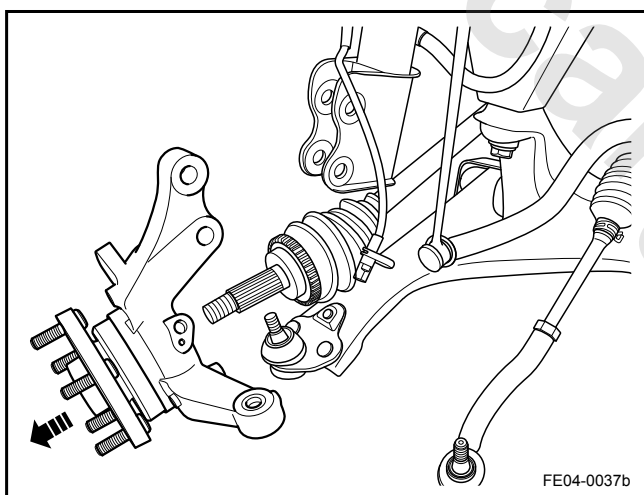
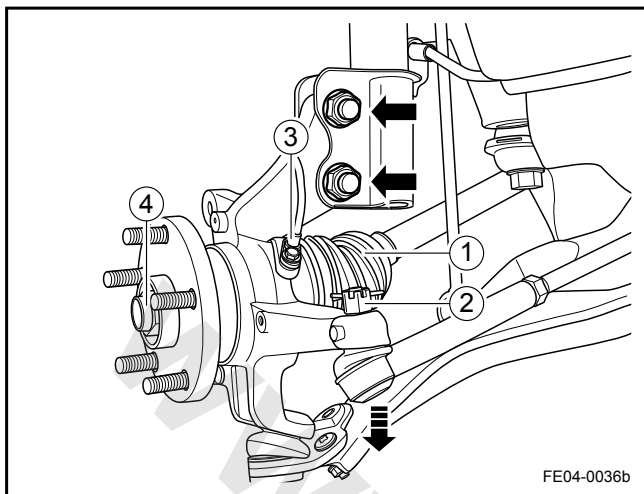


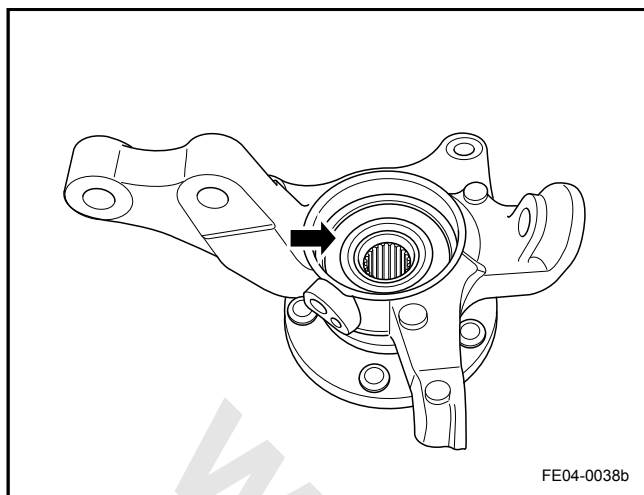


#### 4.2.7.8 Steering Knuckle Replacement

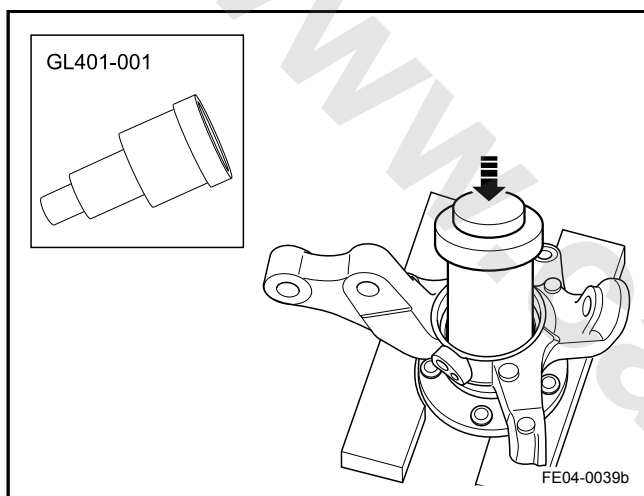
##### Removal Procedure:

1. Lift and support the vehicle.
2. Remove the front wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove the ball joint. Refer to [4.2.7.7 Lower Control Arm Ball Joint Replacement](#).
4. Remove the steering tie rod to the steering knuckle opening pin (1) and slotted hex nut (2). Separate the steering tie rod.
5. Remove the wheel speed sensor retaining bolt (3). Remove the wheel speed sensor from the steering knuckle.
6. Remove the front wheel hub nut (4).
7. Remove the steering knuckle to the shock absorber bolts. Remove the steering knuckle from the shock absorber.
8. Remove the steering knuckle with the front wheel hub.

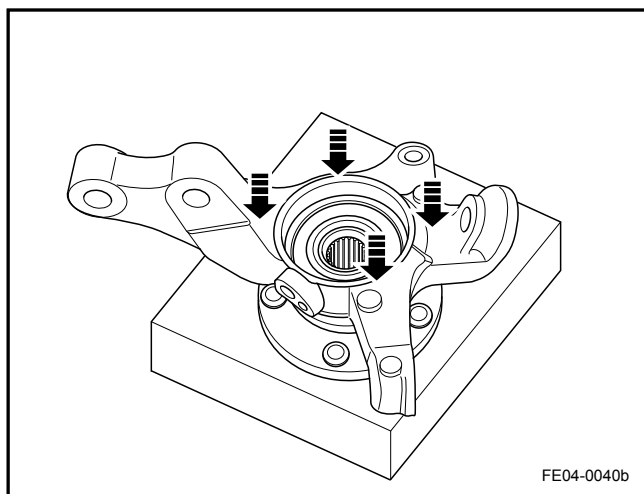




9. Remove the front wheel hub retaining ring.



10. Use the special tool GL401-001 to remove the front wheel hub from the steering knuckle.

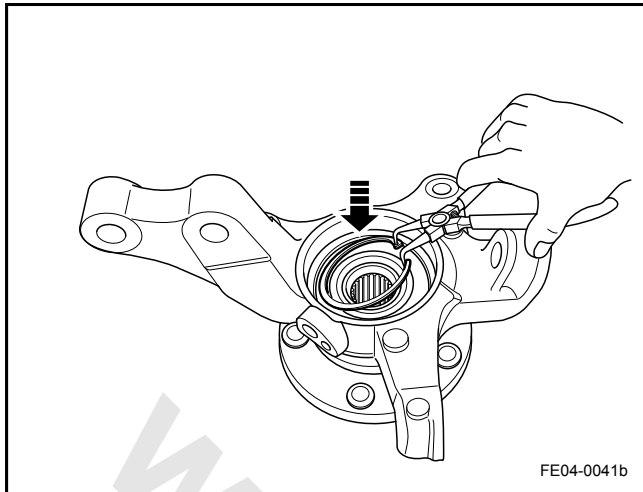


#### Installation Procedure:

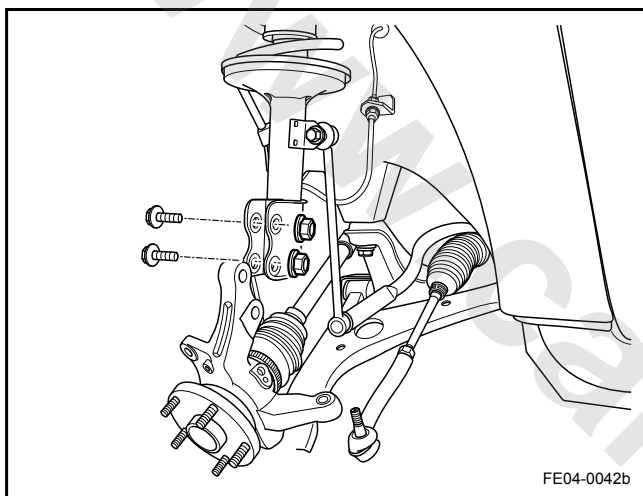
1. Place a piece of wood under the front wheel hub and install the front wheel hub to the steering knuckle.

#### Note

Refer to "Fastener Notice" in "Warnings and Notices".



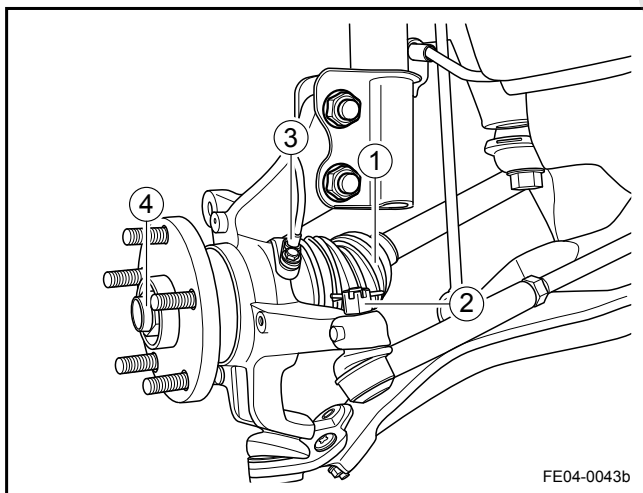
2. Install the front wheel hub retaining ring.



3. Install the steering knuckle with the front wheel hub. Tighten the steering knuckle to the shock absorber connecting bolts.

Torque: 135 Nm (Metric) 99 lb-ft (US English)

4. Install the ball joint.



5. Tighten the nut (4).  
Torque: 216 Nm (Metric) 160 lb-ft (US English)
6. Connect the wheel sensor harness connector and the tighten the bolt (3).  
Torque: 20 Nm (Metric) 14.8 lb-ft (US English)
7. Tighten the steering tie rod hexagonal opening nut (2) and insert the pin (1).  
Torque: 50 Nm (Metric) 37 lb-ft (US English)
8. Install the front wheels.
9. Lower the vehicle.

#### Note

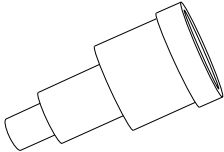
Left and right steering knuckle replacement is similar.

#### 4.2.7.9 Front Wheel Hub Replacement

Refer to [4.2.7.8 Steering Knuckle Replacement](#).

## 4.2.8 Special Tools and Equipment

## 4.2.8.1 Special Tool List

Serial Number	Illustration	Tool Number	Tool Name
1	 FE01-2025b	GL401-001	Front Wheel Hub Bearings Removal Tool

## 4.3 Rear Suspension

### 4.3.1 Specifications


#### 4.3.1.1 Fastener Tightening Specifications

Applications	Model	Specifications		Notes
		Metric (Nm)	US English (lb-ft)	
Rear Shock Absorber Upper Mount Bolts	M10 × 1.25 × 25	75-85	55.3-62.7	
Rear Shock Absorber Upper Mount Nuts	M10 × 1.25	75-85	55.3-62.7	
Rear Shock Absorber Lower Sleeve Retaining Nuts	M14 × 1.5	135-165	99.6-121.7	Tighten after drop the wheels
Rear Stabilizer Bar Bolt	M12 × 55	135-165	99.6-121.7	
Rear Stabilizer Nut	M12	135-165	99.6-121.7	
Rear Control Arm Bolts	M12 × 1.25 × 135	130-160	95.9-118.0	Tighten after dropping the wheels

## 4.3.2 Description and Operation

### 4.3.2.1 Description and Operation

The rear suspension adopts the vertical swing arm and torsion beam structure. It includes: the axle with a torsion beam and a vertical arm, two strut assemblies (including the shock absorber and coil spring). The axle support assembly is connected to the underbody through the control arm rubber bushings. The insulating frame and the underbody crossmember form an integrated part. The wheel axle and body structure maintain the connection. Stabilizer bar is connected to each control arm and forms an integrated part with the axle.



### 4.3.3 System Working Principle

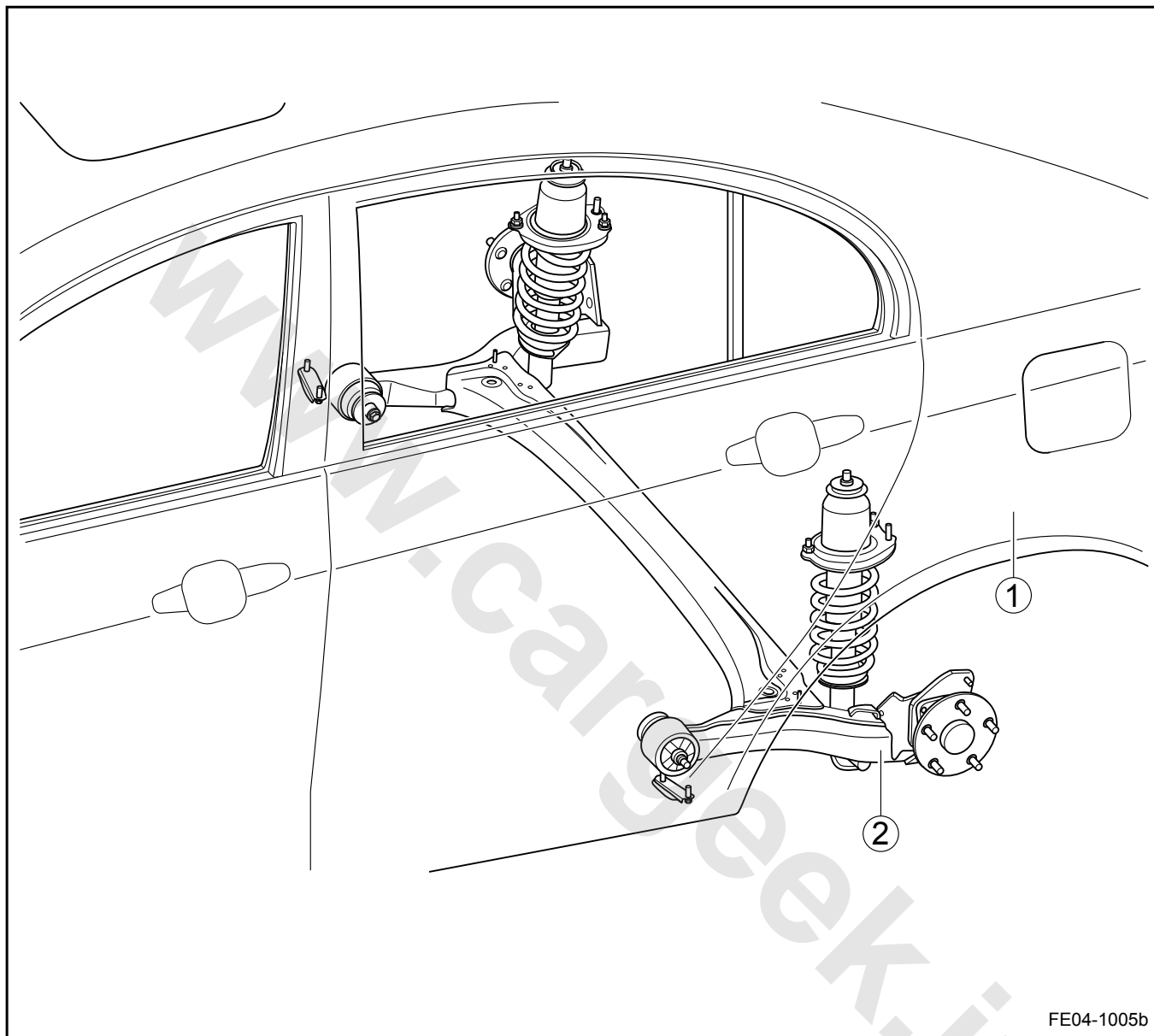
#### 4.3.3.1 System Working Principle

Refer to [4.2.3 System Working Principle](#).

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## 4.3.4 Component Locator

## 4.3.4.1 Component Locator



## Legend

1. Body

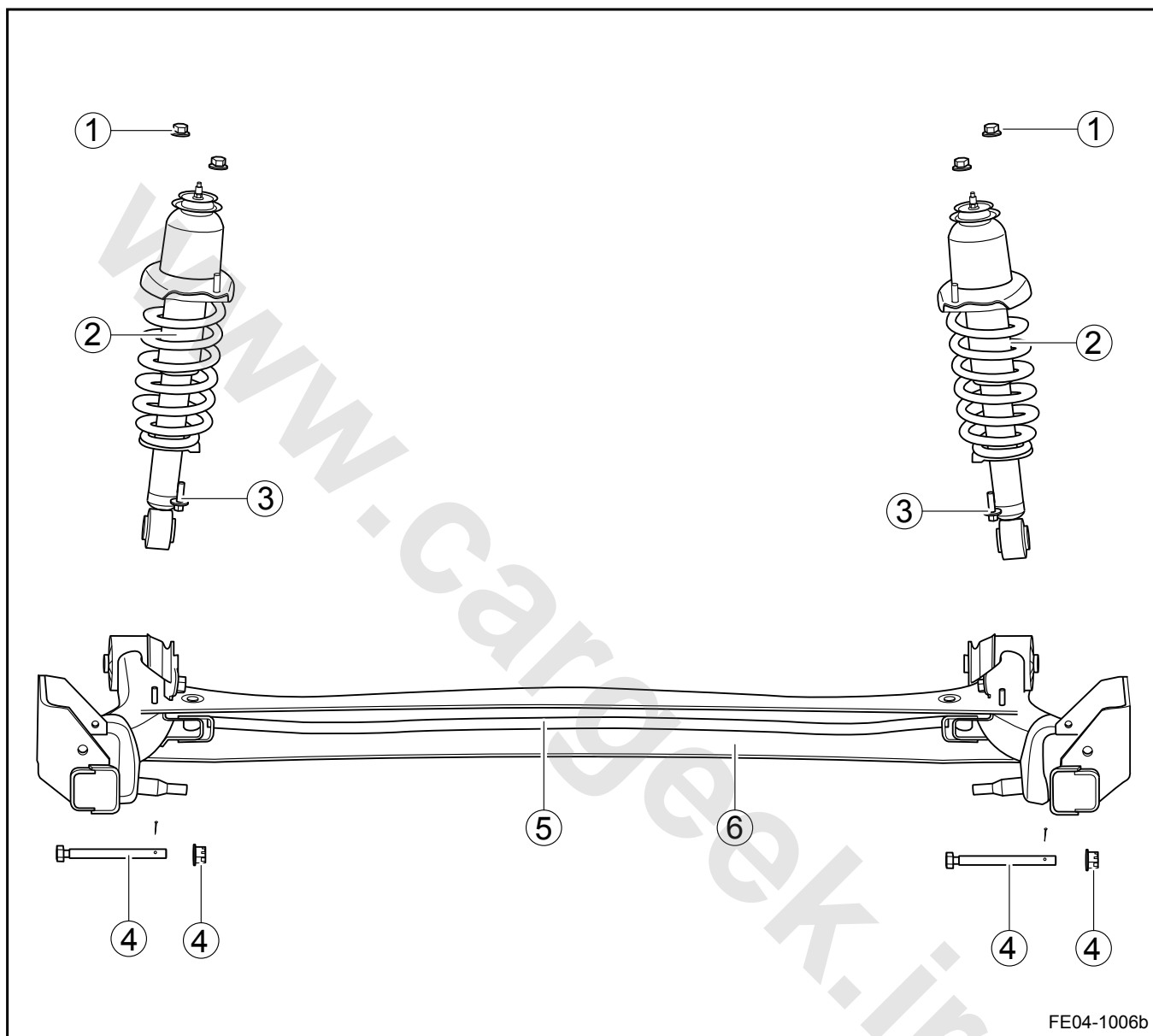
2. Rear Suspension



## 4.3.5 Disassemble View

## 4.3.5.1 Disassemble View

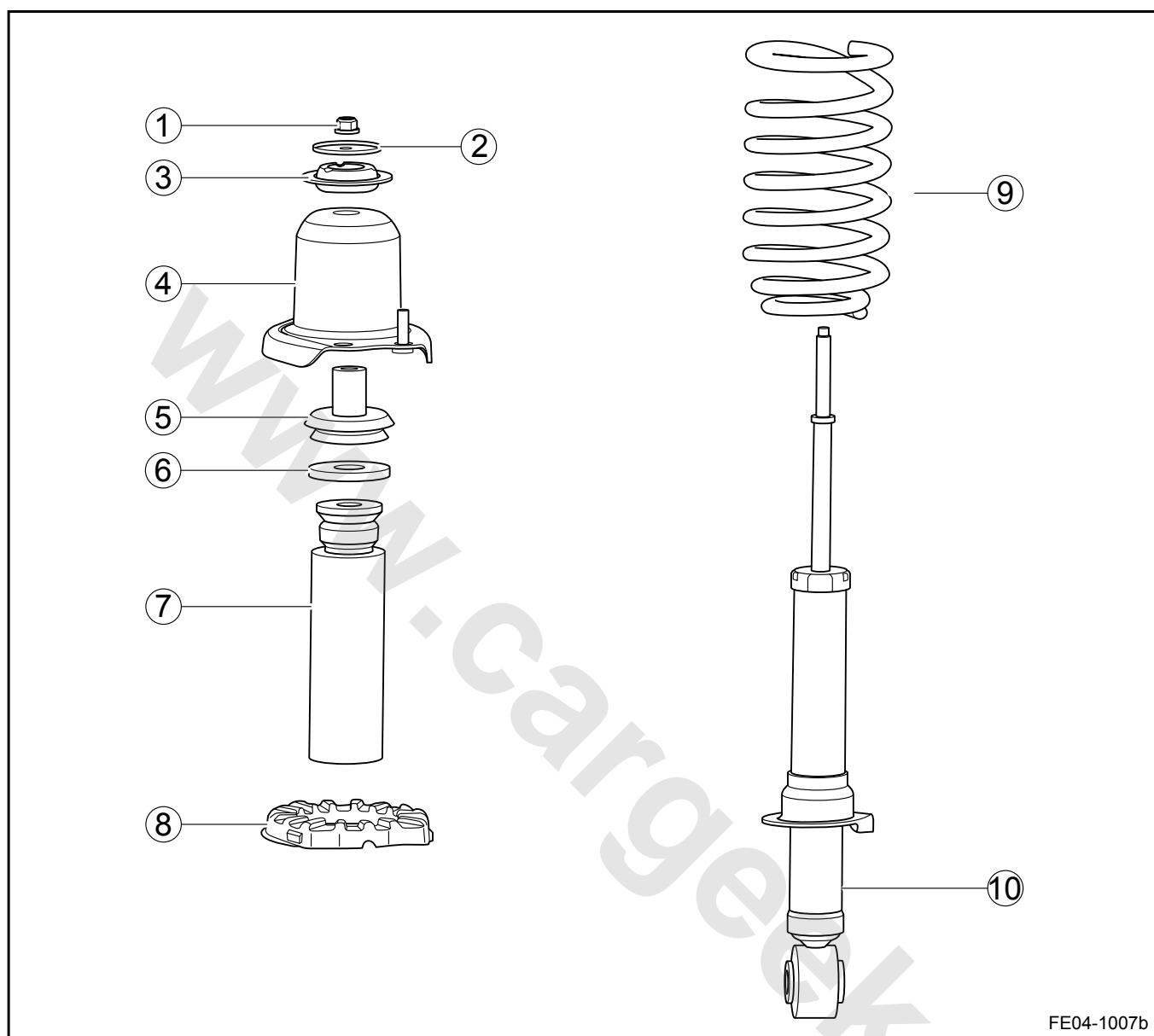
## Rear Suspension



## Legend

- |   |                                 |
|---|---------------------------------|
| 1. Rear Strut Assembly Upper Retaining Nuts   | 5. Rear Stabilizer Bar Assembly |
| 2. Rear Strut Assembly                        | 6. Rear Axle Assembly           |
| 3. Rear Strut Assembly Upper Locking Bolts    |                                 |
| 4. Rear Axle to Body Retaining Bolts and Nuts |                                 |

## Rear Strut Assembly



FE04-1007b

## Legend

- |   |                                  |
|---|----------------------------------|
| 1. Hex Flange Locking Nuts                          | 7. Rear Shock Absorber           |
| 2. Upper Mount Plate                                | 8. Rear Coil Spring Upper Mat    |
| 3. Rear Shocker Absorber Upper Mount                | 9. Rear Coil Spring              |
| 4. Rear Shocker Absorber Bracket Assembly           | 10. Rear Shock Absorber Assembly |
| 5. bearing components under the post-shock absorber |                                  |
| 6. Lower Mount Plate                                |                                  |

### 4.3.6 Diagnostic Information and Procedures

#### 4.3.6.1 Diagnostic Information and Procedures

Refer to [4.2.6 Diagnostic Information and Procedures](#).

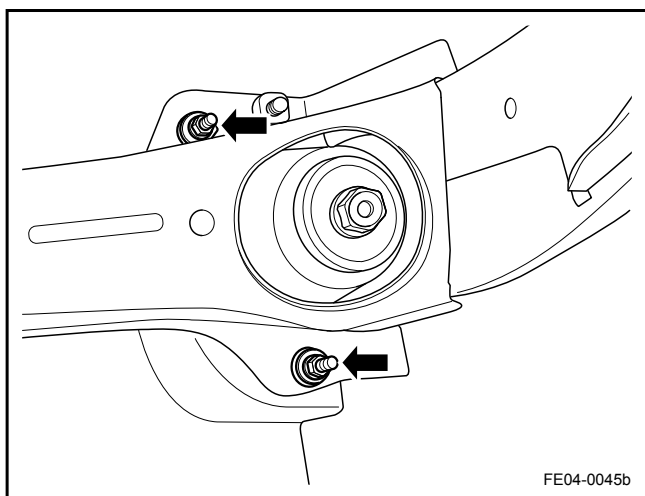
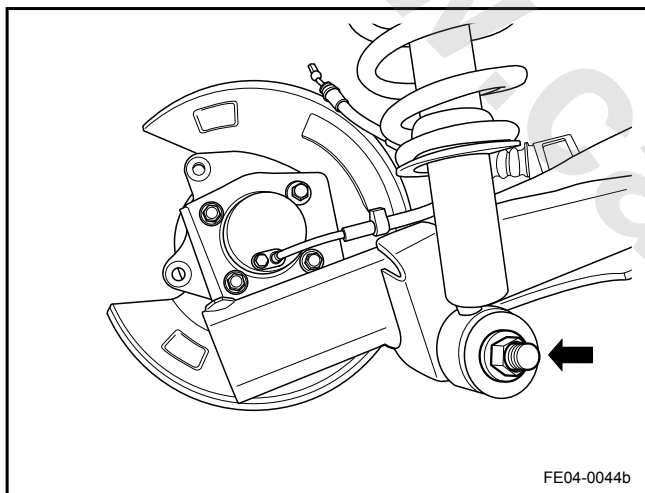
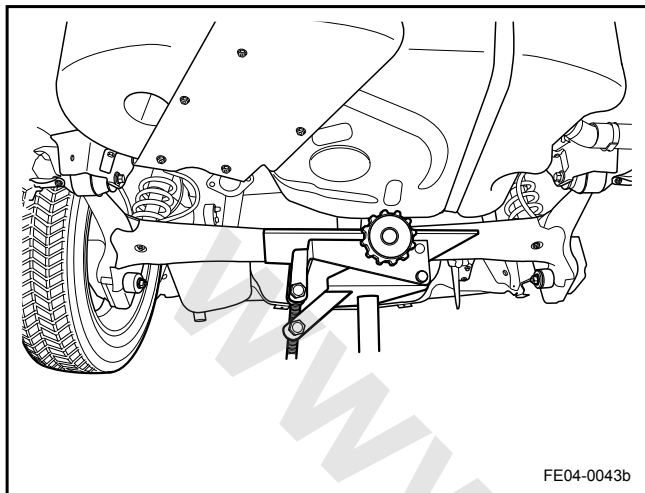
www.cargeek.ir

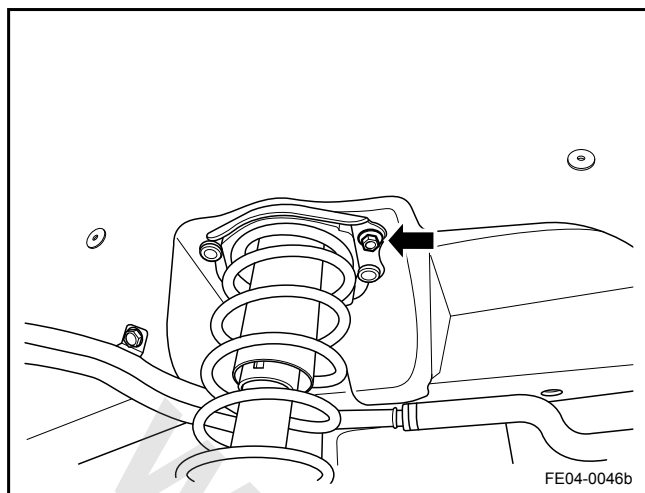
### 4.3.7 Removal and Installation

#### 4.3.7.1 Rear Strut Assembly Replacement

Removal Procedure:

1. Remove the rear wheels. Refer to [4.4.5.1 Wheel Replacement](#).
2. Lift and support the vehicle.
3. Use a jack to support the live rear axle.
4. Remove the rear shock absorber to the rear axle nut.
5. Remove the rear compartment trim panel or hatchback trim panel. Refer to [12.9.1.9 Rear Compartment Trim Panel Replacement](#).
6. From the rear compartment, remove the rear shock absorber upper nuts.



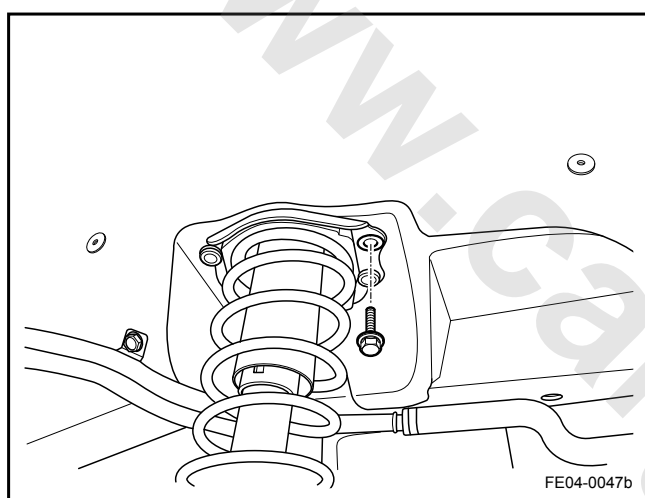


7. Remove the rear shock absorber upper bolts and remove the rear shock absorber.

Installation Procedure:

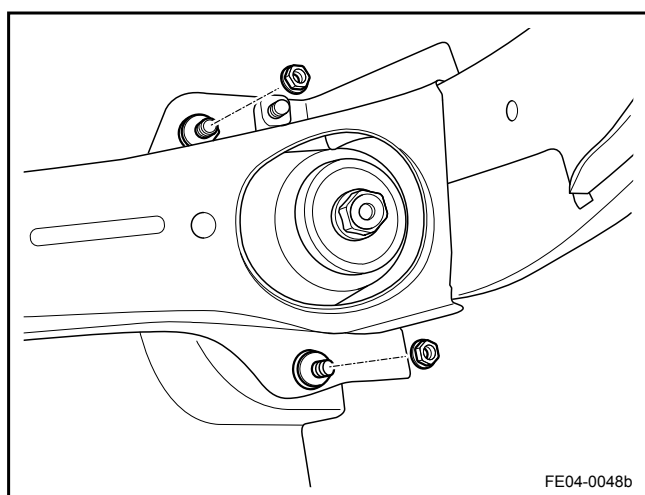
1. Install the rear shock absorber and tighten the rear shock absorber upper bolts.

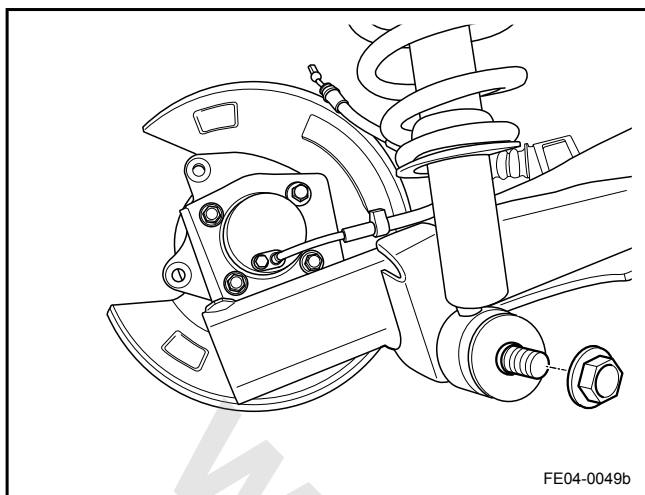
Torque: 80 Nm (Metric) 59.2 lb-ft (US English)



2. From the rear compartment, install the rear shock absorber upper nuts.

Torque: 80 Nm (Metric) 59.2 lb-ft (US English)





3. Install the rear compartment trim panel or hatchback trim panel.
4. Install the rear shock absorber to the rear axle nut.  
Torque: 150 Nm (Metric) 110.1 lb-ft (US English)
5. Remove the jack.
6. Install the rear wheels.
7. Lower the vehicle.

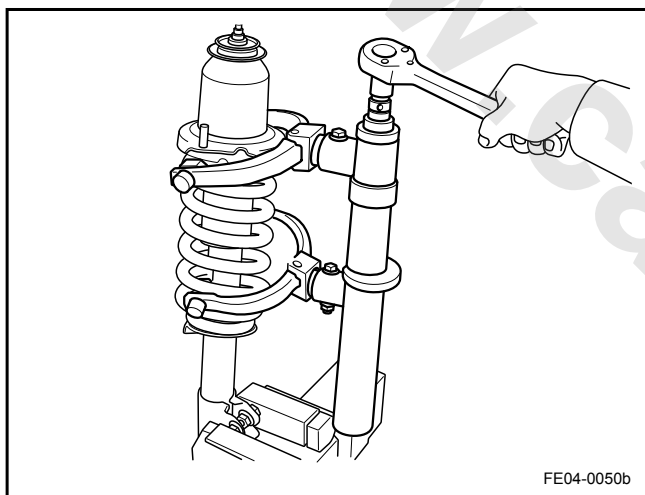
#### 4.3.7.2 Rear Shock Absorber Component and Spring Replacement

##### Removal Procedure:

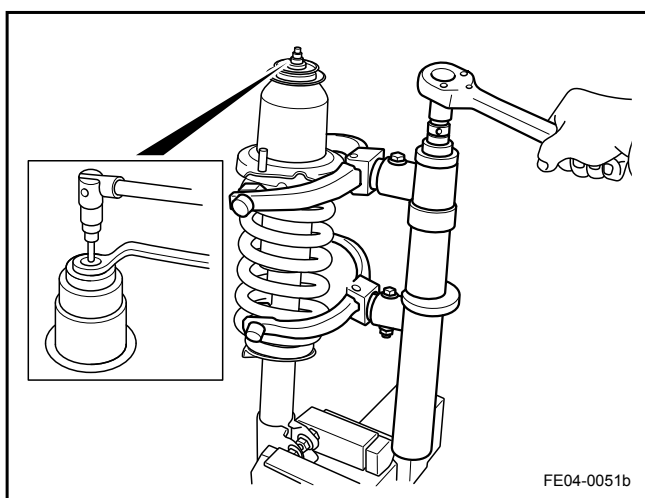
1. Use the spring compression tool to compress the coil spring.

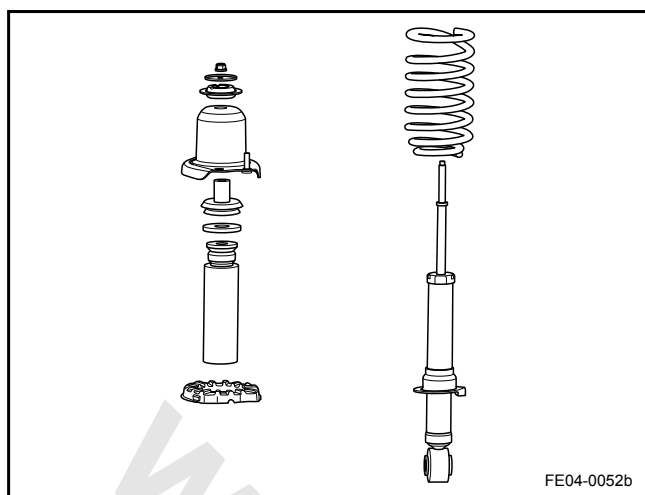
##### Note

Do not use pneumatic wrenches, otherwise it will damage the spring compression tool.



2. Use a Hexagon wrench to fix the piston rod and remove the lock nut.

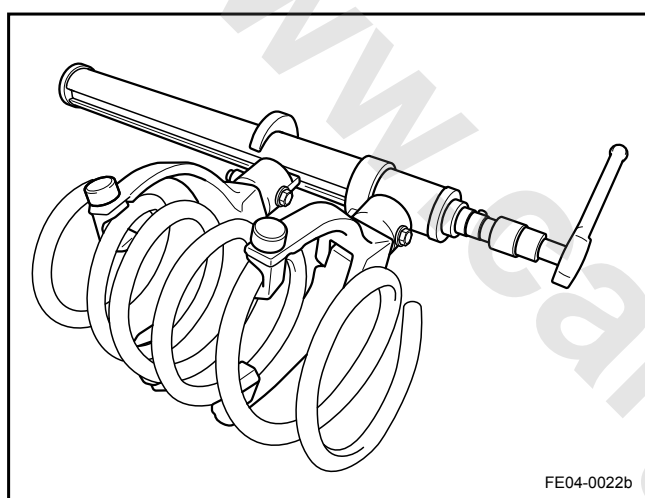




3. Remove the upper mount upper plate, the rear shock absorber upper mount, the rear shock absorber mounting bracket assembly, the upper coil spring pad, the rear shock absorber dust cover and the rear coil spring.

#### Installation Procedure:

1. Use the spring compression tool to compress the coil spring.

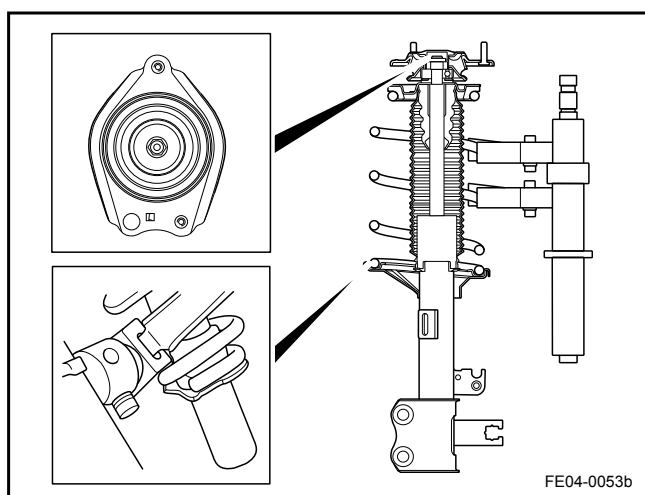


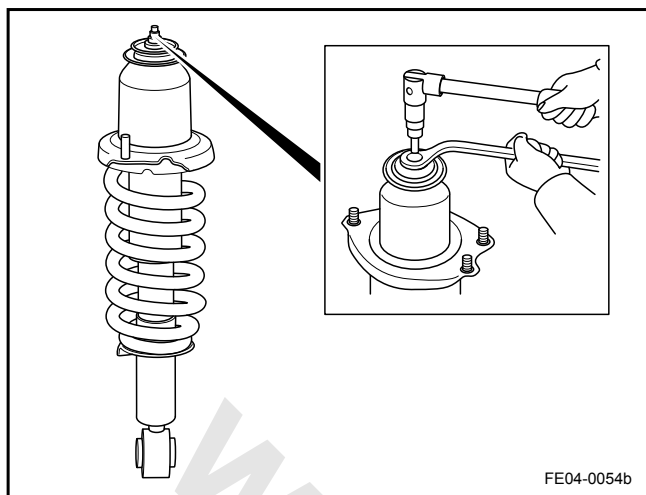
2. Install the rear shock absorber coil spring, the rear shock absorber dust cover, the upper coil spring pad, the shock absorber mounting bracket assembly, the rear shock absorber upper mount and the upper mount upper plate.

#### Note

Install the shock absorber mounting bracket assembly as shown.

Install the coil spring bottom into the notch.





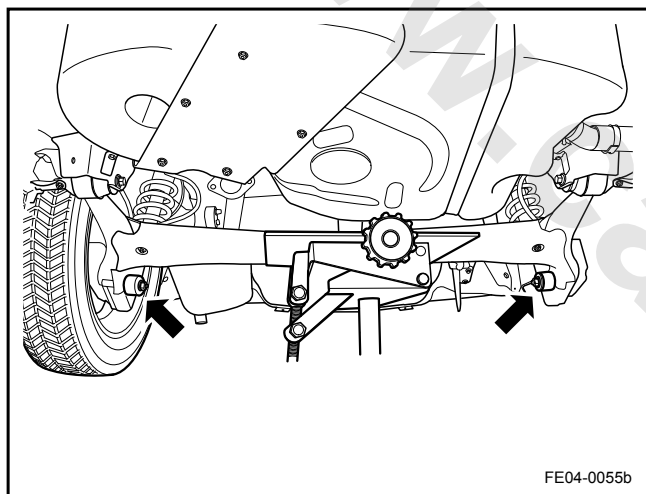
3. Install the locking nut, do not tighten at this stage.
4. Remove the spring compression tool and examine the spring frame direction.
5. Use a Hexagon wrench to tighten the piston rod and locking nut.

Torque: 45 Nm (Metric) 33.3 lb-ft (US English)

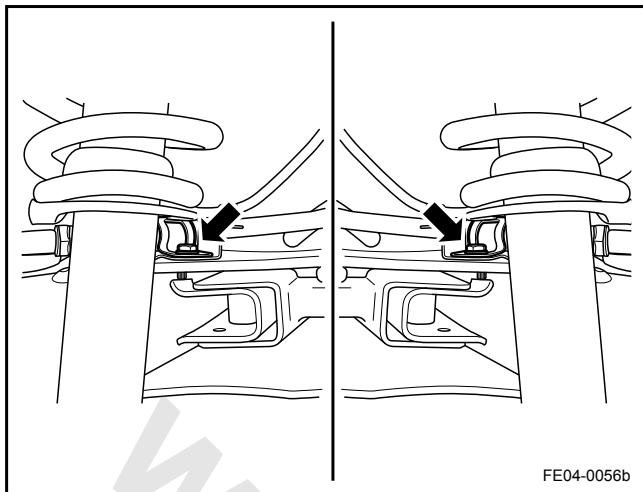
#### 4.3.7.3 Rear Axle Assembly Replacement

Removal Procedure:

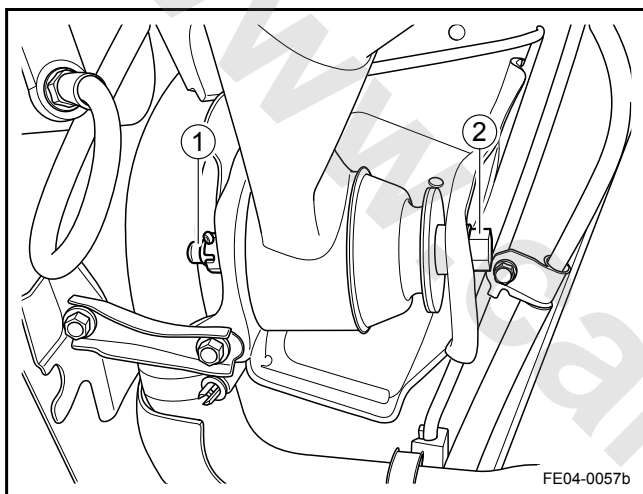
1. Remove the left and right rear wheels. Refer to [4.4.5.1 Wheel Replacement](#).
2. Lift and support the vehicle.
3. Use a jack to support the rear axle.
4. Remove the left and right rear shock absorber to the rear axle retaining nuts.
5. Remove the left and right rear brake pads. Refer to [6.3.5.1 Brake Pad Replacement - Rear](#).
6. Remove the left and right rear brake caliper. Refer to [6.3.5.2 Brake Caliper Replacement - Rear](#).
7. Remove the left and right rear brake disc. Refer to [6.3.5.3 Brake Disc Replacement - Rear](#).
8. Remove the left and right rear wheel hub. Refer to [4.3.7.5 Rear Wheel Hub Replacement](#).



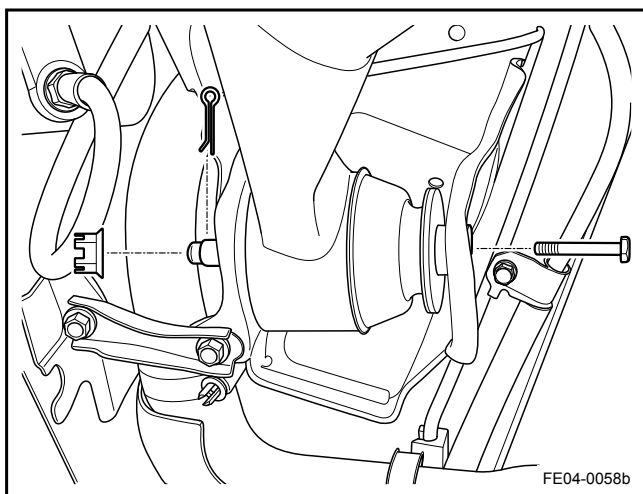




9. Remove the left and right side park brake cable bracket.

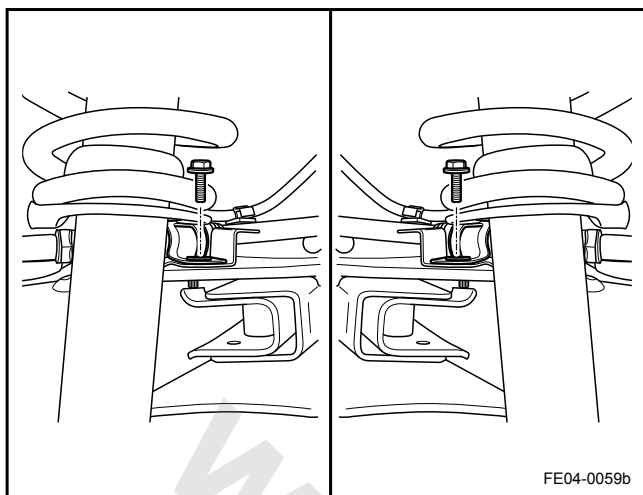


10. Remove the left rear axle assembly to the body connecting bolt pin (1).
11. Remove the left rear axle assembly to the body connecting bolts (2).
12. Remove the right rear axle assembly to the body connecting pins and bolts, the same way as the left side.
13. Remove the rear axle assembly.



#### Installation Procedure:

1. Lift the rear axle assembly and install the rear axle assembly.
2. Install the left rear axle assembly to the body connecting bolts  
Torque: 145 Nm (Metric) 107.3 lb-ft (US English)
3. Install the left rear axle assembly to the body connecting bolts and pin.
4. Install the right side of the rear axle assembly to the body connecting bolts and pin, the same way as the left side.

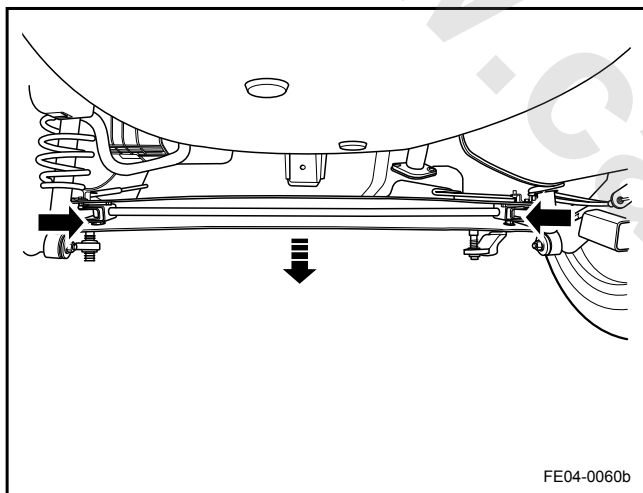


5. Install the left and right side park brake cable bracket.
6. Install the left and right rear wheel hub.
7. Install the left and right rear brake disc.
8. Install the left and right rear brake caliper.
9. Install the left and right rear brake pads.
10. Install the left and right rear shock absorber to the rear axle retaining nut.
11. Remove the jack.
12. Install the left and right rear wheel.
13. Lower the vehicle.

#### 4.3.7.4 Rear Stabilizer Bar Replacement

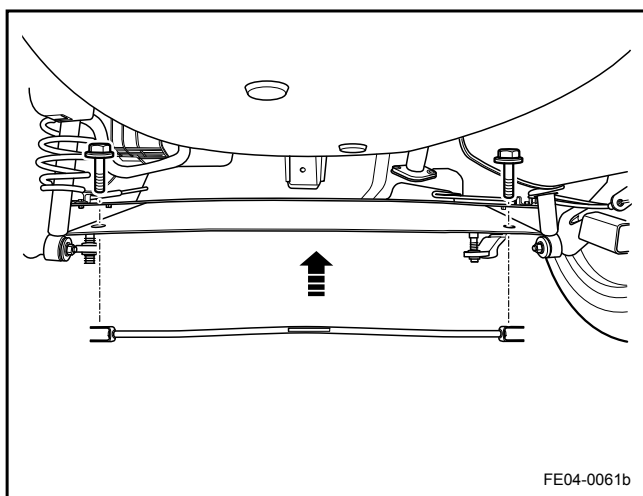
##### Removal Procedure:

1. Lift and support the vehicle.
2. Remove the left and right rear stabilizer bar installation bolts.
3. Remove the stabilizer bar.



##### Installation Procedure:

1. Install the stabilizer bar.
2. Tighten the left and right rear stabilizer bar installation bolts.  
Torque: 150 Nm (Metric) 110.1 lb-ft (US English)
3. Lower the vehicle.

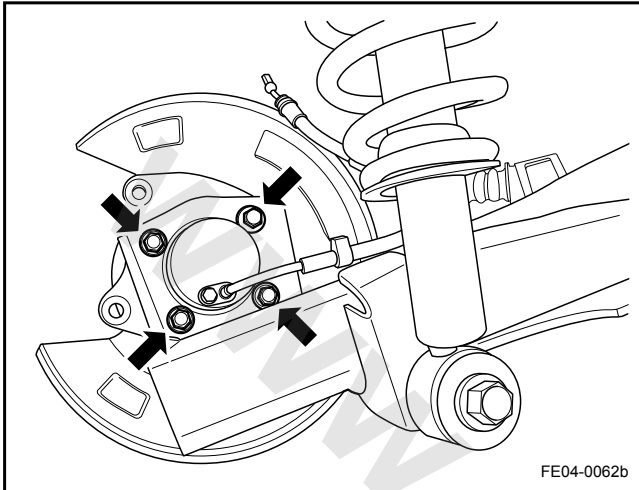


#### 4.3.7.5 Rear Wheel Hub Replacement

Removal Procedure:

**Warning!**

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".



1. Lift and support the vehicle.
2. Remove the rear wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove the park brake cable from the rear calipers. Refer to [6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement](#).
4. Remove the brake pads. Refer to [6.3.5.1 Brake Pad Replacement - Rear](#).

**Note**

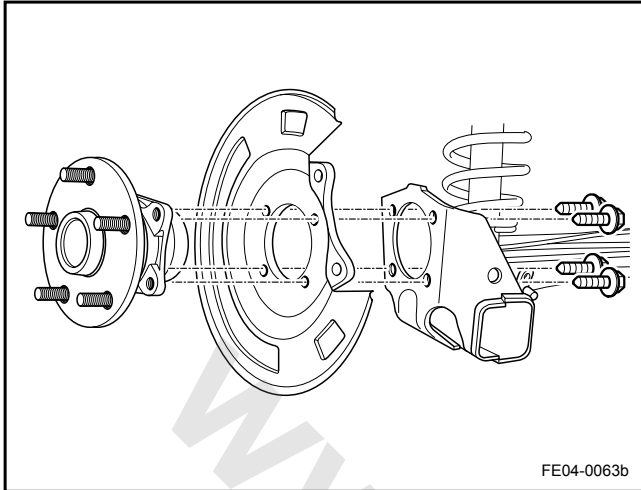
Refer to "Brake Caliper Notice" in "Warnings and Notices".

5. Remove the brake caliper. Refer to [6.3.5.2 Brake Caliper Replacement - Rear](#).

**Note**

Remove the brake caliper without having to remove the brake hose. Use a wire to hang the brake caliper in order to avoid damage to the brake hose.

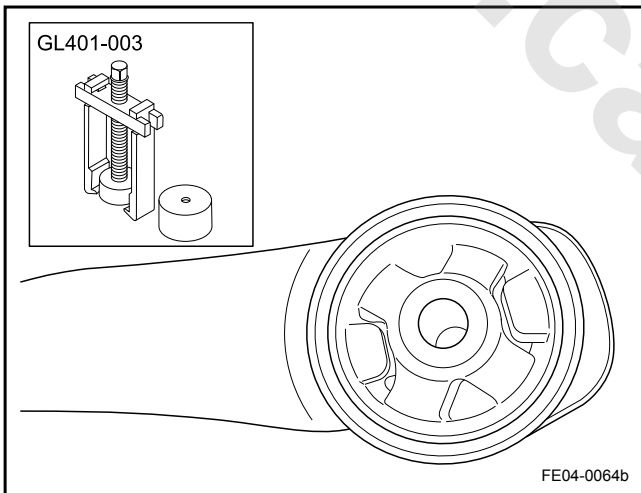
6. Remove the brake disc. Refer to [6.3.5.3 Brake Disc Replacement - Rear](#).
7. Remove the rear wheel speed sensor. Refer to [6.6.7.3 Wheel Speed Sensor Replacement \(Rear\)](#).
8. Remove the rear wheel hub retaining bolts.
9. Remove the rear wheel hub and the dust cover.

**Installation Procedure:**

1. Install the rear wheel hub and the dust cover.
2. Tighten the rear wheel hub retaining bolts.  
Torque: 80 Nm (Metric) 59.2 lb-ft (US English)
3. Install the rear wheel speed sensor.
4. Install the brake disc.
5. Install the brake caliper.
6. Install the brake pad.
7. Install the park brake cable.
8. Install the rear wheel.
9. Lower the vehicle.

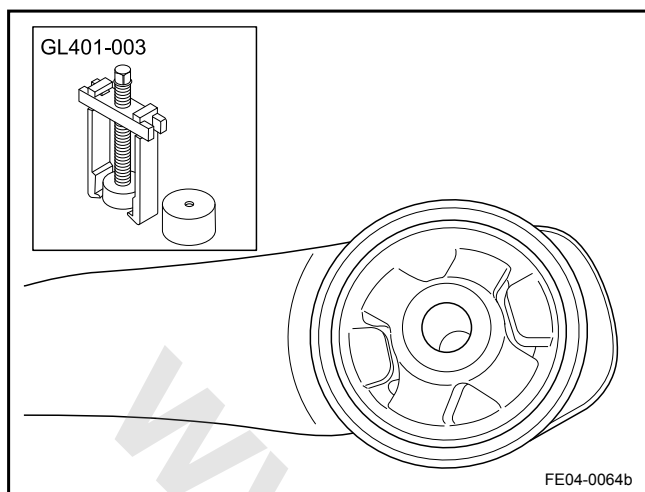
**4.3.7.6 Rear Axle Sleeve Replacement****Removal Procedure:**

1. Remove the rear axle assembly. Refer to [4.3.7.3 Rear Axle Assembly Replacement](#).
2. Use a special tool GL401-003 to remove the rear axle sleeve.



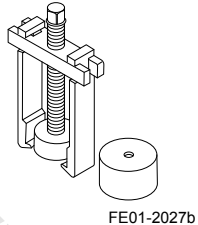
Installation Procedure:

1. Use a special tool GL401-003 to install the rear axle sleeve.
2. Install the rear axle assembly.



### 4.3.8 Special Tools and Equipment

#### 4.3.8.1 Special Tool List

Serial Number	Illustration	Tool Number	Tool Name
1	 FE01-2027b	GL401-003	Rear Axle Sleeve Removal Tool

## 4.4 Wheels and Tires

### 4.4.1 Specifications

#### 4.4.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Wheel Nut	M12	100-120	74-89

#### 4.4.1.2 Tire Specifications

Specifications	205/65R15-94H 215/55R16-93V
Cold Pressure (Front / Rear)	210/200 kPa (Metric) 30/29 psi (US English)
Rim	15 × 6.5 J, 16 × 7 J

Tire Pressure Conversion Table					
kPa	psi	kPa	psi	kPa	psi
140	20	185	27	235	34
145	21	190	28	240	35
155	22	200	29	250	36
160	23	205	30	275	40
165	24	215	31	310	45
170	25	220	32	345	50
180	26	230	33	380	55

#### 4.4.1.3 Front Suspension Positioning Specifications

##### Note

The following parameters refer to the whole vehicle technical parameters.

Maximum Front Corner	Left Internal / External	40 ± 2° / 33.8 ± 2°
	Right Internal / External	40 ± 2° / 33.8 ± 2°
Camber		0° ± 45'
Kingpin Inclination		12°7' ± 45'
Caster		2°33' ± 45'
Front Wheel Toe		0° ± 13'

Front Tread	1,502 ± 10 mm / 59 ± 0.39 in
-------------	------------------------------

#### 4.4.1.4 Rear Suspension Positioning Specifications

##### Note

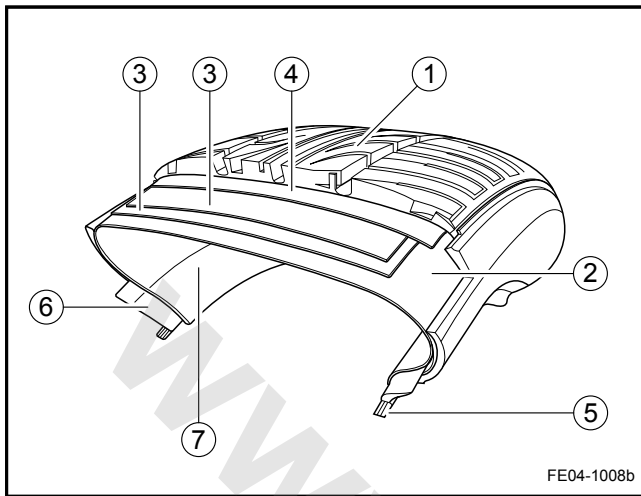
The following parameters refer to the whole vehicle technical parameters.

Rear Wheel Toe	4' ± 30 '
Rear Camber	- 44 ' ± 30'
Rear Tread	1,492 mm / 58.7 in (Hatchback)
	1,483 mm / 58.4 in (Sedan)
Wheelbase	2,620 mm / 103 in



## 4.4.2 Description and Operation

### 4.4.2.1 Tire Structure



#### 1. Tread

The tread is the tire and road surface contacting part. Through the friction it enables the vehicle driving, braking and performances. It should have good wear resistance, puncture resistance, impact resistance and heat dissipation properties.

#### 2. Carcass

The main part that supports the load. It should have good impact resistance and good resistance to flex.

#### 3. Belt

The steel cord between the tread and the carcass that protects matrix, it prevents the tread deformation, maintains the contact with the ground, improves wear resistance and driving stability.

#### 4. Cap Ply

A special ply on top of the belt, it prevents the belt from moving, prevents the belt detached at high speeds and maintains the tire size at high speeds.

#### 5. Bead

Hanging plastic wire winding according to a certain shape (square or hexagonal shape), it fixes the tire on the rim.

#### 6. Triangle Strips

The filling material on the steel cord, it prevents the bead spread and slows down the impact on the bead and prevents the air entering into the molding.

#### 7. Inner Liner

Component that maintains the air tightness in a tubeless tire, made from special rubber, equivalent to the role of tube.

## 4.4.2.2 Tire Sidewall Mark Meaning and the Pressure Instructions

### Tire Sidewall Mark Meaning

Example: 205/60R15 91V

205 - Nominal Cross-section Width (Unit: mm)

60 - Flat Rate (High Aspect Ratio :%)

R - Radial Structure

15 - Nominal Rim Diameter (Unit: in)

91 - Load Index

V - Speed (240 km/h)

Common Speed Rating Table:

Speed Rating	Maximum Speed (km/h)
S	180
T	190
H	210
V	240
W	270
Y	300
ZR	240 or higher

### Tire Pressure Instructions

Tire pressure has a decisive influence on the tire wear, fuel consumption, fault and damage. For safety, driver must maintain standard tire pressure and regularly check the tire pressure.

- The tire load capacity is corresponding to the tire inflation pressure, which must be adjusted to a reasonable value based on the vehicle load conditions. Climate and seasonal changes should not be a reason for the tire pressure adjustment.
- During the initial use, a new tire outer sizes will change due to the heated generated by flex, making tire pressure reduced. After driving 24 hours or 2,000-3,000 km, check and adjust the tire pressure.
- Long time high-speed driving will increase tire pressure by 10% -15%.

#### 1. Insufficient Tire Pressure

Insufficient tire pressure will accelerate tire sidewall deformation, increase heat, dramatically reduce tire life, and cause the following issues as well as security risks:

- a. Excessive shoulder wear
- b. Increased possibility of tire protrusion.
- c. Reduce the adhesion between the various components leading to de-lamination.
- d. Tire sidewall damage.
- e. Tire run out too great, resulting in bead rim between abnormal friction between the rim and the tire and rim damage.
- f. Increased rolling resistance and fuel consumption.

#### 2. Excessive Tire Pressure

Excessive tire pressure will reduce the tire tread and ground contacting area, increase tire stiffness, decrease the buffer, and cause the following issues as well as security risks:

- a. Tire central tread excessive wear.
- b. Increased possibility of tire rupture and puncture under external shocks.
- c. Reduced maneuverability due to reduced ground contacting area, prone to tail-flick, slide.
- d. Reduced ride comfort.

- e. Reduced smoothness. Long-term driving under excessive tire pressure will damage the vehicle chassis.

#### 3. Uneven Tire Pressure On the Same Suspension:

- a. Uneven braking force.
- b. Steering deviation.
- c. Reduced maneuverability.
- d. Deviation when accelerating.
- e. Deviation when driving.

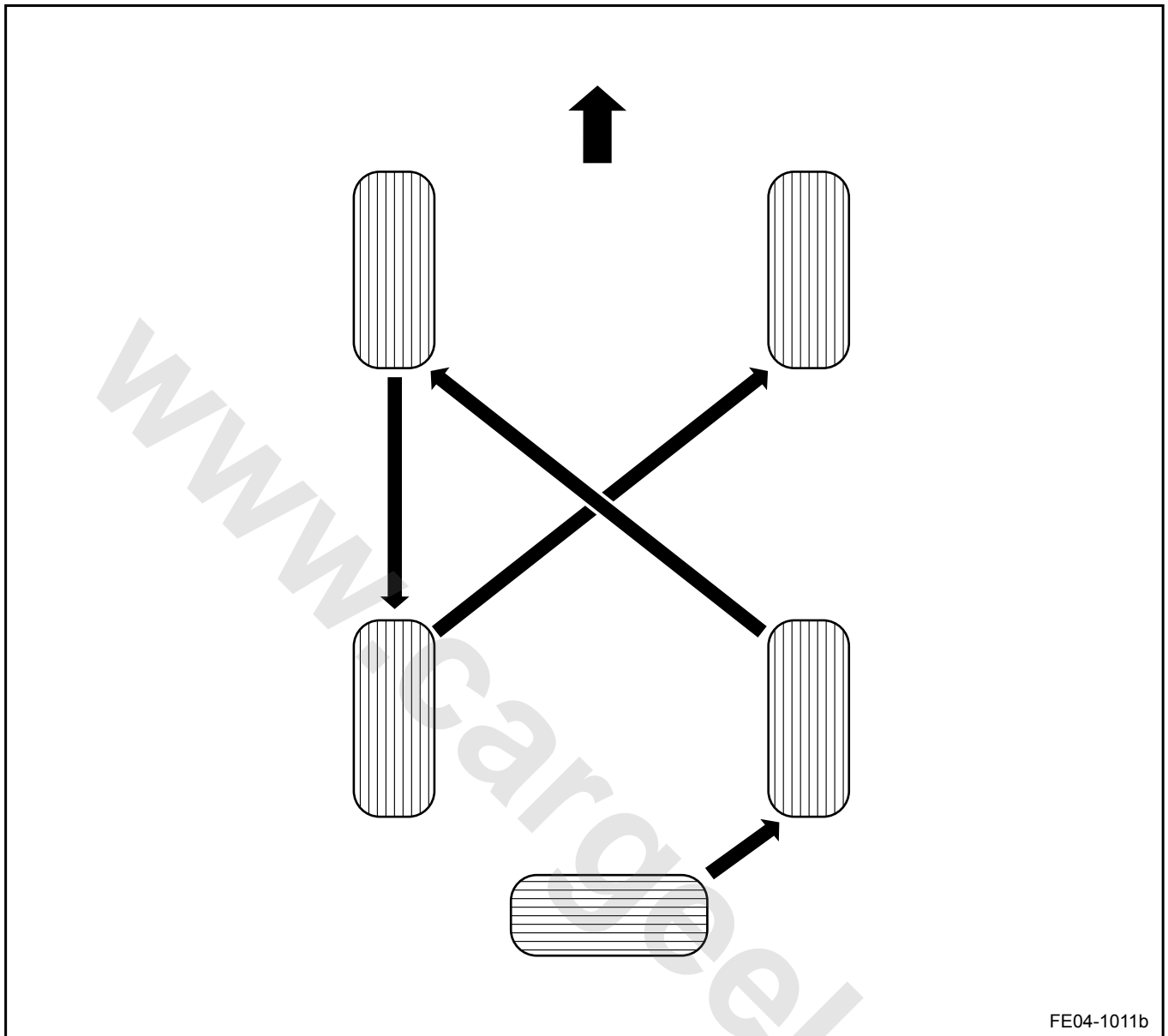
#### 4.4.2.3 Tire Transposition

Front and rear tires wear will be different due to different load. In order to avoid the single direction tires wear and tear, regular tire transposition will make tires wear even, extending tire life. It is recommended that rotate tires every 5,000-8,000 km. The main purposes of tire transposition are:

- A. Ensure even tire wear, fatigue, stability and fuel economy.
- B. Check tire conditions during tire transposition, regularly check for damage to prevent accidents.

#### Tire Transposition Method as Shown:

Transposition with A Spare Tire



Parallel transposition, Diagonal transportation refer to [1.4.2.5 Tire Rotation Description](#) Transposition Method.

### 4.4.3 System Working Principle

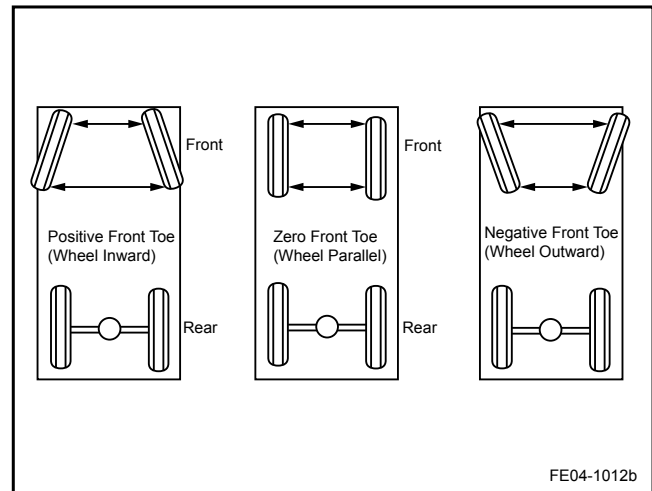
#### 4.4.3.1 Wheel Alignment

Driver turning the steering wheel turn the vehicle to the desired direction. However, if driving on the straight road, driver must adjust the steering wheel from time to time in order to maintain the vehicle straight-line driving, or turning at a corner, driver makes a lot of effort, the driver will be under physical and mental stress. To address this problem and to prevent premature tire wear, according to certain requirements, wheels are installed on a vehicle body (or chassis) at a certain angle. These angles are called as "Wheel Alignment". It is a comprehensive term referring to the front and rear axles, wheels, steering components and suspension components relative angles.

Correct wheel alignment makes the steering easy. On the straight road, the driver only needs minor adjust to the steering wheel to keep the vehicle move straight ahead, and only a little effort to turn the vehicle. In other words, if various angles constitutes the "wheel alignment" are adjusted correctly, the turning will be easy. But even if one of them is adjusted improperly, it may have the following problems: steering problems; poor steering stability; poor steering wheel return; reduced tires life.

Vehicle positioning angles include: front toe, camber, caster, kingpin inclination angle, steering angle, tolerance angle, forward angle, grinding tire radius. These angles and size depend on the vehicles suspension systems, drive system (Front-engine front-wheel drive or front-engine rear-wheel drive, two-wheel drive or four-wheel drive), and the steering system (manual or power steering shift). Adjusting these elements will optimize the driving performance and steering stability and prolong the service life of components. Maintenance is usually recommended only for front toe adjustment.

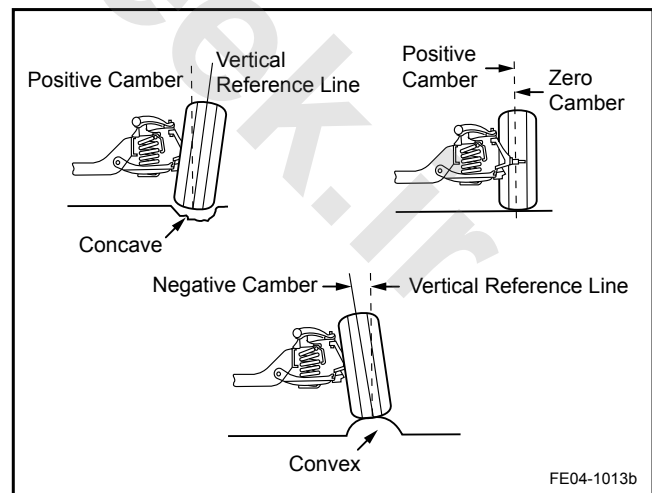
#### 1. Front Toe



Front toe is used to measure wheel rotation, or deviation from the vehicle centerline. Another way to understand the front toe is that two front wheels distance relative to the same vehicle rear wheels distance. If all the wheels are completely parallel, then these two measurements should be equal and the front toe should be zero. If the front wheels tilt inward, the front toe is positive. When the front wheels tilt outward, the front toe is negative. Positive and the negative front toes are usually referred to as the front wheel toe-in and front wheel toe-out.

Front toe function is to compensate for tire drag due to camber and road surface resistance caused the inward or outward rolling trend to keep the vehicle straight ahead.

#### 2. Camber



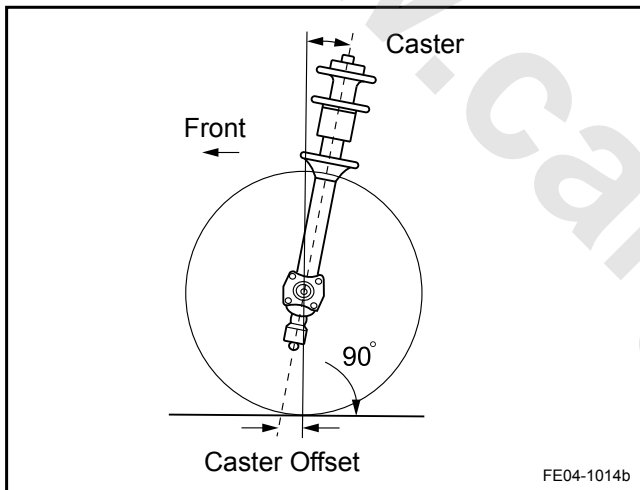
Camber is the vertical reference line of tires relative angle, when a wheel is tilted outward at the top, the camber is positive. When a wheel is tilted inward at the top, the camber is negative. Camber settings can affect the vehicle direction control and tire wear.

A variety of suspension and steering devices are designed to keep the wheels perpendicular to the ground and move along the straight road to minimize the tire tread wear and deliver the traction, when starting the vehicle.

Improper camber settings will cause excessive tire wear or uneven wear. Excessive positive camber will cause the outer tire tread wear, when the load is higher at the outer tread side, it will cause such uneven wear.

Excessive negative camber will cause the inner tire tread wear, when the load is higher at the inner tread side, it will cause uneven wear.

### 3. Caster



Caster is the kingpin axis forward or backward tilt angle. Caster is observed from the side when measure the angle between the steering axis and the vertical line.

Backward tilt from the vertical line, is called as positive caster. Forward tilt is called the negative caster. The steering axis center line intersects with the ground, tire contacts the road surface at a central point. The distance between these two points is called the caster. Caster can provide straight road driving stability: if the vehicle has a positive caster, when turning, the left journal will have a tendency to move downward. (This is due to the journal rotation along the tilted axis.). However, because the journal is fixed to the wheel assembly, besides the ground prevents it from moving down, the journal will not actually move down, the left steering knuckle will be forced to move up and down. This allows the body to rise

slightly. After turning, the steering wheel is release, the raised body weight will force the steering knuckle move down, and make the journal back to the original straight ahead position.

## 4.4.4 Diagnostic Information and Procedures

### 4.4.4.1 Diagnosis Description

Refer to [4.4.2 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

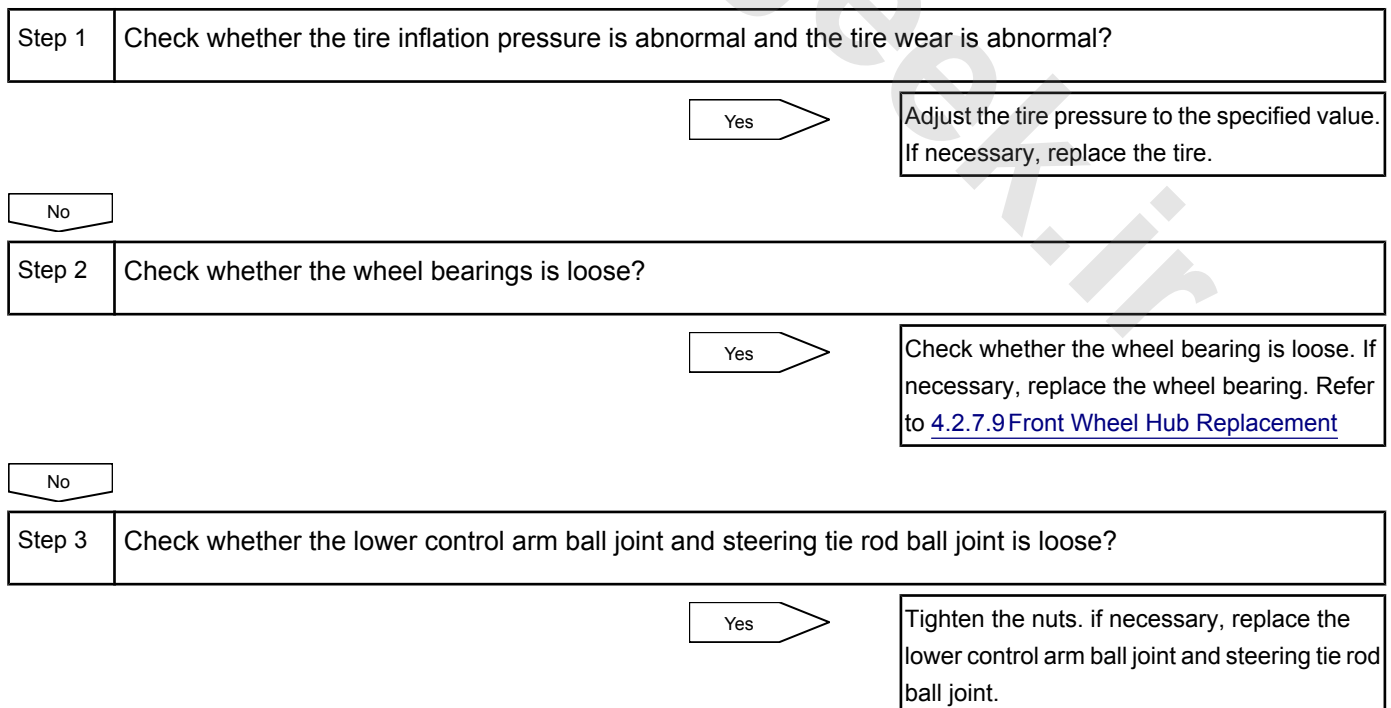
### 4.4.4.2 Visual Inspection

1. Check installed after market equipment that may affect the wheels and tires.
2. Check the easy to access system components to identify whether there is a damage or a potential malfunction.
3. Check the existence of the following conditions:
  - A. Obvious tire and wheel run out.
  - B. Apparent drive axle bounce.
  - C. Incorrect tire pressure.
  - D. Incorrect vehicle front end height.
  - E. Wheel bent or damage.
  - F. Debris on the tires or wheels.
  - G. Abnormal or excessive tire wear.
  - H. Tire defects include tire deformation caused by collision, tread separation or muster - slight tire sidewalls indentation is normal and does not affect the driving ability.

### 4.4.4.3 Initial Inspection Before Tire Positioning

#### Note

Before the tire positioning, carry out the following inspection steps, otherwise, it may lead to incorrect positioning and other fault.



No	
Step 4	Check whether the wheel and tire run out is abnormal?
Yes	
Measure and correct the tire run out.	
No	
Step 5	Check whether the vehicle front end height is abnormal?
Yes	
Adjust the vehicle front end height.	
No	
Step 6	Check whether the strut assembly is installed correctly?
Yes	
Replace the strut assembly. Refer to <a href="#">4.2.7.3 Front Strut Assembly Replacement</a>	
No	
Step 7	Check whether the lower control arm is loose?
Yes	
Tighten the lower control arm connecting bolts. If necessary, replace the lower control arm bushing. Refer to <a href="#">4.2.7.2 Lower Control Arm Bushing Replacement</a>	
No	
Step 8	Check whether the vehicle Curb Weight is normal, whether it is overloading?
Yes	
Restore the the vehicle factory Curb Weight.	
No	
Step 9	Carry out four tires positioning.

#### 4.4.4.4 Wheel Bearing Diagnostic

##### Warning!

Please road test the vehicle safely and comply with all traffic laws and regulations. Do not try operation that might jeopardize the vehicle control. A breach to the safety precautions can result in serious personal injury and damage to the vehicle.

Step 1	Road test the vehicle to verify the fault.
--------	--

Tip: When the sealed wheel bearing is damaged, foreign matter will enter the bearing and damage the bearing. When the bearing rotates under external stress, it will send out hum noise similar to the aircraft taking off. The noise only occurs when vehicle is driving. The noise is stable. The noise increases as the the vehicle speed increases.

Next

**Warning!**

To avoid the vehicle damage, serious personal injury or even death, using a jack to support the vehicle when remove the major components from the vehicle.

Step 2	Confirm whether the noise is from the wheel bearings. If it can not be determined during the road test, lift and support the vehicle.
--------	---

Next

Step 3	Check whether wheels are bent?
--------	--------------------------------

Yes

Replace the wheels. Refer to [4.4.5.1 Wheel Replacement](#)

No

Step 4	Check whether the wheels are in imbalance?
--------	--

Yes

Carry out the wheel balancing.

No

**Warning!**

When rotating the wheel with hand, hold the tire with. If the location is not correct, it is likely to cause bodily injury.

**Note**

The front wheel bearing is pressed into the steering knuckle. The rear wheel bearing is inside brake drums and wheel bearing assembly. If the inside seat ring and the rear wheel bearing are separated, it will lead to the noise.

Step 5	Rotate the tire and wheel assembly, listen to the wheel bearings noise.
--------	---

Yes

Replace the wheel bearings. Refer to [4.2.7.9 Front Wheel Hub Replacement](#)

No

Step 6	Shake the wheel with hands, check whether the wheel bearing is loose?
--------	---

Yes

Replace the wheel bearings. Refer to [4.2.7.9 Front Wheel Hub Replacement](#)

No

Step 7	Compare with a the same model normal vehicle to confirm whether the noise is a normal operating noise.
--------	--



#### 4.4.4.5 Wheel Vibration Diagnostic

##### 1. Tire Dynamic Balancing

The tire balancing is the most easy to check procedure. If vibrations occurs at high vehicle speed, conduct dynamic balance first. Firstly, carry out the double-sided dynamic balancing under the vehicle to correct tire and wheel assembly imbalance. Correct the brake disc or wheel covers imbalance on vehicle. If the balance does not eliminate the high speed vibration, or if the vibration occurs at the low speed, the vibration is likely caused by run out.

##### 2. Run Out

Tires, wheels or the connection between the wheels and the vehicle may lead to run out. In order to inspect the possibility of run out the wheel produced. Refer to the following wheels run out diagnostic procedure.

##### Warning!

Please road test the vehicle safely and comply with all traffic laws and regulations. Do not try operation that might jeopardize the vehicle control. A breach to the safety precautions can result in serious personal injury and damage to the vehicle.

Step 1	Road test the vehicle to verify the fault. Whether the customer described vibration is a fault?
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div>Yes</div> <div>No</div> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">             Replace the front wheel bearings. Refer to <a href="#">4.2.7.9 Front Wheel Hub Replacement</a> </div>
Step 2	Determine the speed when the vibration occurs. Is vibration occurring at 65 km/h or above?
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div>Yes</div> <div>No</div> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">             Go to step 5           </div>
Step 3	Carry out the off-vehicle tire dynamic balance. Road test the vehicle to confirm the existence of the fault?
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div>Yes</div> <div>No</div> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">             The fault has been fixed.           </div>
Step 4	Carry out final on-vehicle balance. road test the vehicle to confirm the existence of fault?
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div>Yes</div> <div>No</div> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">             The fault has been fixed.           </div>
Step 5	Check the wheels free face and radial run out (Standard Value: 1.0 mm / 0.0394 in). Is the value specified value?
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div>Yes</div> <div>No</div> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">             Go to step 8           </div>
Step 6	Check whether there is an imbalance in transmission?

Thoroughly examine the drive axle and the constant-velocity joints.

No

Replace the faulty components.

Yes

Step 7      Check the wheel flange run out(Standard Value: 0.26 mm /0.0102 in). Is the value specified value?

No

Replace wheel hub assembly. Refer to [4.2.7.9 Front Wheel Hub Replacement](#)

Yes

Step 8      Remove the wheel assembly. Remove the tires. measure the wheel run out (Standard Value: 0.8 mm / 0.03 in), Is the value specified value?

No

Replace the wheels. Refer to [4.4.5.1 Wheel Replacement](#)

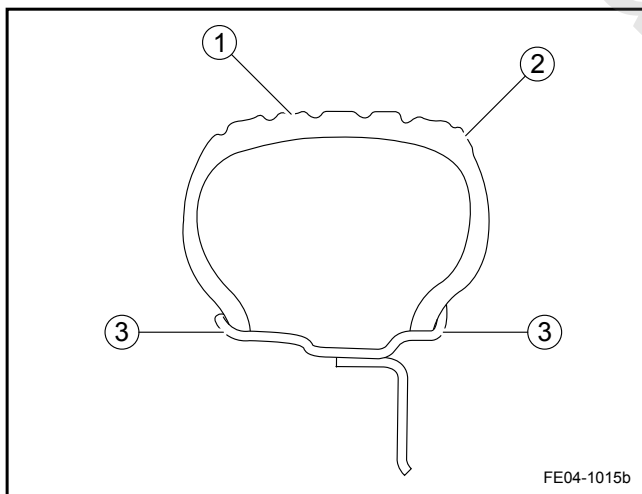
Yes

Step 9      Replace the tires.

Next

Step 10      Confirm whether the fault has been excluded.

#### 4.4.4.6 Wheels Run Out Inspection



Measure the wheel run out with a dial indicator on-vehicle or off-vehicle. Make sure the installation surface is correct. Measurements can be carried out with or without tires installed. Measure radial and face run out inside and outside the wheel rim. install a dial gage on the wheel and tire assembly, slowly turn wheels a circle and record the dial indicator readings. if the measured value exceeds the following specifications, and the wheel balance can not eliminate the vibration, then replace the wheel.

##### Steel Wheels

Radial Run Out: 0.8 mm (0.03 in)

Face Run Out: 1 mm (0.04 in)

**Aluminum Wheels**

Radial Run Out: 0.8 mm (0.03 in)

Face Run Out: 0.8 mm (0.03 in)

**Steel and Aluminum Wheels**

Free Radial Run Out: 1.5 mm (0.06 in)

**4.4.4.7 Tire Abnormal Wear Diagnostic**

There are many reasons for abnormal and premature tire wear, including the inflation pressure is incorrect, no regular tire rotation, bad driving habits or the wheel alignment is incorrect. If the tire wear and there is a need to re-adjust the wheel position, as long as within the specifications, make sure to adjust the toe as close to zero as possible.

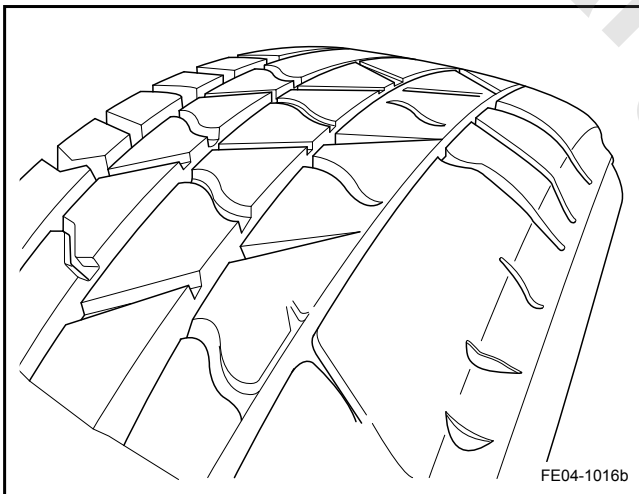
If there are following conditions, rotate tires:

- A. Front tire wear is different from the rear tire.
- B. Left front and right front tire wear is different.
- C. Left rear and right rear tire wear is different.

If there are following conditions, check the wheel alignment:

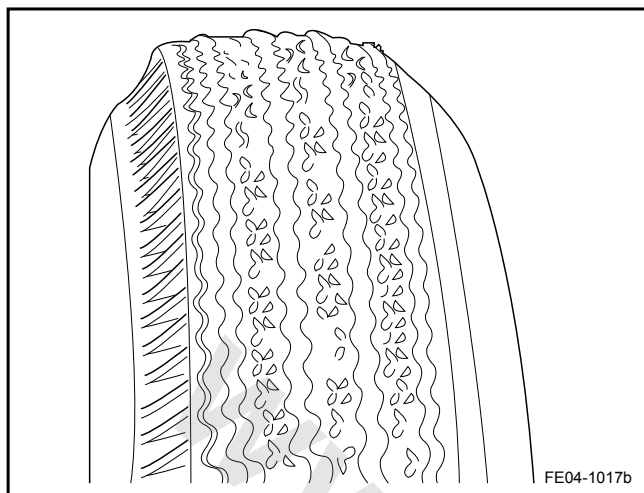
- A. Left front and right front tire wear is different.
- B. Any front tire uneven tread wear.
- C. Front tire tread has feather scratches.

Several typical tire wear situations are shown as following:

**1. Eccentric Worn****Reasons:**

- A. Axles, bearings and other rotating parts malfunction.
- B. Braking system.
- C. Emergency start, emergency braking.
- D. Uneven wheel weight center.
- E. Tire and wheel rim sizes do not match.

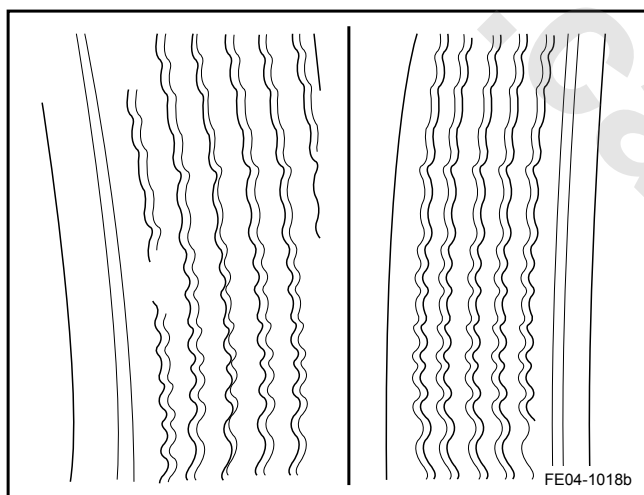
## 2. Sidewall Feather Worn Pattern



Reasons:

A. Toe value is incorrect.

## 3. Abnormal Wear and Tear:

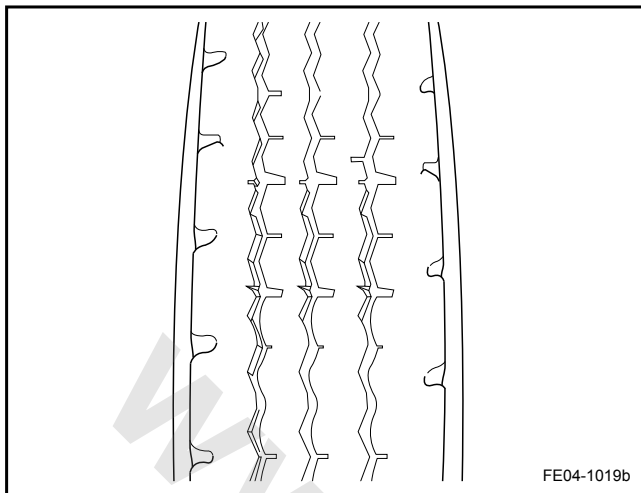


Reasons:

A. Camber is incorrect.

B. Toe value is incorrect.

## 4. Abnormal Wear and Tear:



Reasons:

- A. Dynamic balance is incorrect.
- B. Four wheel position is incorrect.

## 4.4.4.8 Excessive Tire Wear Diagnostic

Step 1	Check whether the wheel positioning is normal?	
	No	Adjust the wheel positioning.
	Yes	
Step 2	Access to the vehicle maintenance records, should tire rotation be carried out? Have tires been rotated as specified?	
	No	Rotate tires. Refer to the <a href="#">4.4.2.3 Tire Transposition</a>
	Yes	
Step 3	Check whether the tire balance is normal, tire pressure is normal?	
	No	Adjust the tire pressure to the standard value. Carry out the tire balancing.
	Yes	
Step 4	No overload situation.	
	No	Explain to the user the importance of maintaining a reasonable load.
	Yes	
Step 5	Check whether the coil spring is working properly?	

No

Replace the coil spring. Refer to [4.2.7.4 Front Shock Absorber Components and Spring Replacement](#)

Yes

Step 6 Check whether the strut assembly is working properly?

No

Replace the faulty component.

Yes

Step 7 Check whether the lower control arm is working properly? (wear, loosen, etc.)

No

Replace the lower control arm. Refer to [4.2.7.1 Lower Control Arm Replacement](#)

Yes

Step 8 Check whether the wheel bearing is working properly? (wear, loose, etc.)

No

Replace the wheel bearing. Refer to [4.2.7.9 Front Wheel Hub Replacement](#)

Yes

Step 9 Check whether the lower control arm ball joint and the steering tie rod ball joint are working properly? (Wear, Loose, etc.)

No

Tighten the nuts. If necessary, replace the the lower control arm ball joint and the steering tie rod ball joint.

Yes

Step 10 Check whether the wheel run out is normal? Refer to [4.4.4.6 Wheels Run Out Inspection](#).

No

Reassemble the tires. If necessary, replace the tires or wheels.

Yes

Step 11 Confirm that failure has been ruled out.

#### 4.4.4.9 Vehicle Waddle Diagnostic

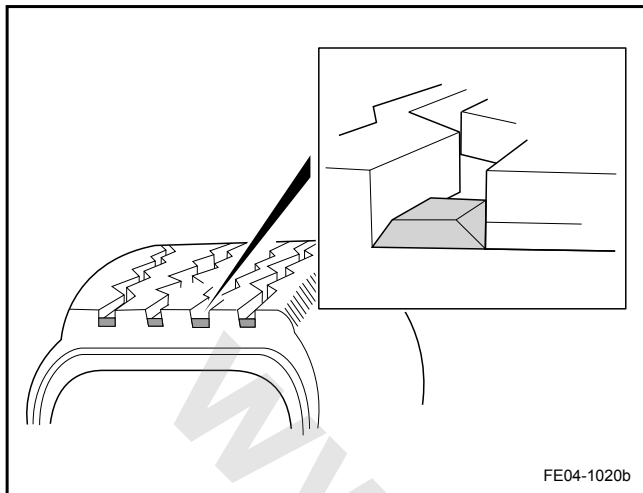
Step 1 Check whether the tire balance is normal, tire pressure is normal?

No

Adjust the tire pressure to the standard value, carry out the tire balancing.

Yes	
Step 2	Check whether the wheel positioning is normal?
No	
Readjust the wheel positioning.	
Yes	
Step 3	Check whether the tire wear is normal?
No	
Replace the tire. Note: After replace the tires, immediately carry out the wheel positioning.	
Yes	
Step 4	Check whether the wheel run out is normal?
No	
Measure the wheel flange run outs. If necessary, replace the wheel hub.	
Yes	
Step 5	Check whether the steering tie rod ball joint is working properly? (wear, loose, etc.)
No	
Tighten the nuts. If necessary, replace the steering tie rod ball joint.	
Yes	
Step 6	Check whether the lower control arm ball joint is working properly? (wear, loose, etc.)
No	
Tighten the nuts. If necessary, replace the lower control arm ball joint. Refer to <a href="#">4.2.7.7 Lower Control Arm Ball Joint Replacement</a>	
Yes	
Step 7	Check whether the wheel run out is too great?
No	
Measure the wheel run out, re-assemble the wheels and tires. If necessary, replace the damaged parts.	
Yes	
Step 8	Confirm that the fault has been fixed.

#### 4.4.4.10 Tire Wear Indicator



Original tires have embedded tread wear indicator, which indicates when the tires need to be replaced. When the tire tread becomes shallow, these marks appear as bands. When three out of six indicators appear, it is recommended to replace the tire.

#### 4.4.4.11 Radial Tire Deviation Correction

##### 1. Fault Definitions:

When the vehicle is driving a straight line at a certain speed, without external force on the steering wheel, the vehicle deviates from the original direction to the left or the right direction.

##### 2. Vehicle Deviation Benchmark :

- A. When the vehicle is driving a straight line at a certain speed, it is necessary to impose force on the steering wheel to prevent its clockwise or counterclockwise rotation.
- B. When the vehicle is driving a straight line at a certain speed, release the steering wheel, the vehicle deviates to the left or the right direction (usually travel 100 m (3,940 in) from the original travel direction 1 m (39.4 in) or above).

##### Note

Before correct the deviation, check the following basic items

- A. Check whether the front and rear brakes are dragging.
- B. Check on the same suspension, whether the tire wear difference is too great.
- C. Check on the same suspension, whether the tire pressure difference is too great.

If there is any abnormal item, please adjust to the normal state before road testing the vehicle. Confirm whether the fault has been excluded.

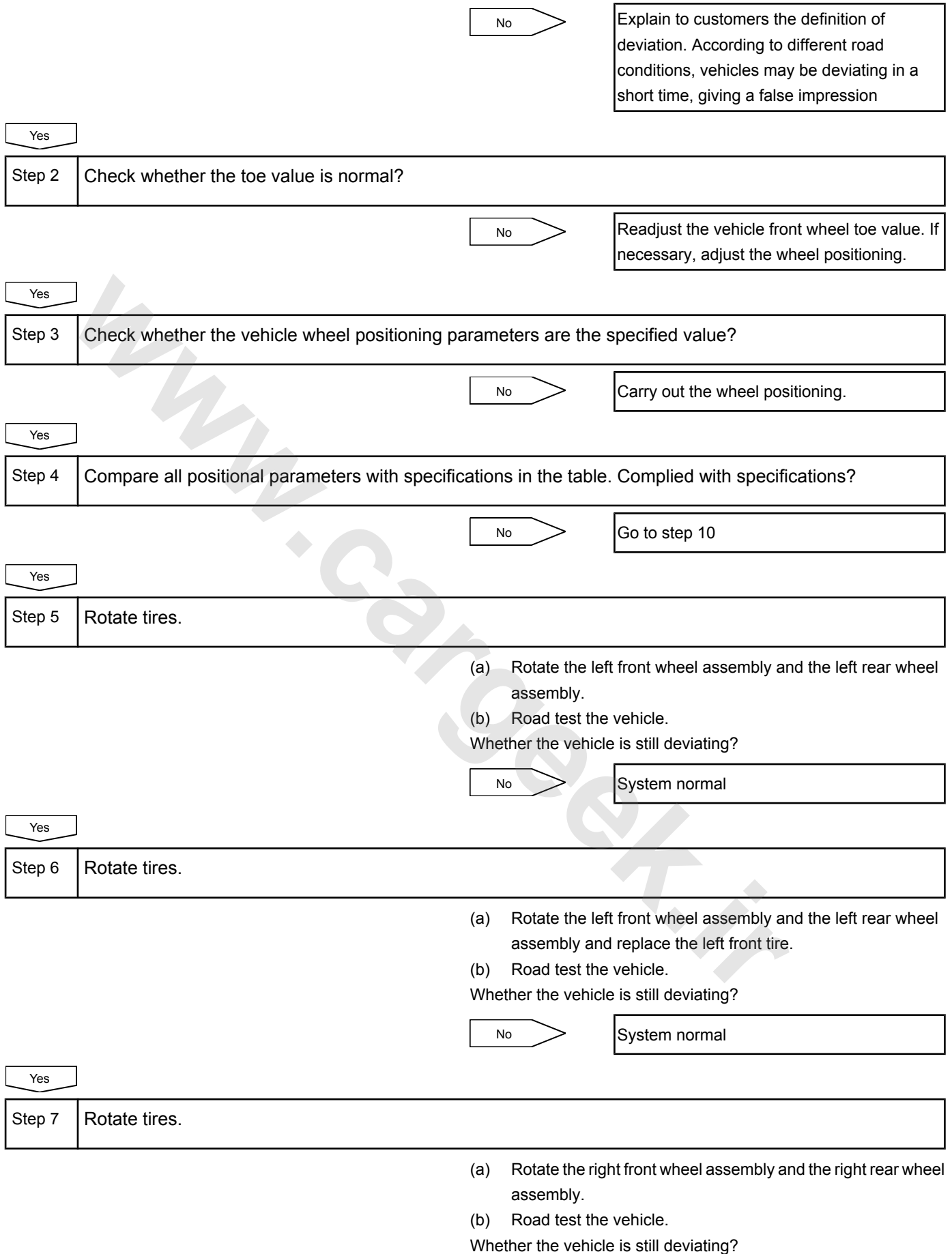
##### 3. Correction Procedure:

##### Warning!

Please road test the vehicle safely and comply with all traffic laws and regulations. Do not try operation that might jeopardize the vehicle control. A breach to the safety precautions can result in serious personal injury and damage to the vehicle.

Step 1	Road test the vehicle to determine whether the vehicle is deviating?
--------	--





No

System normal

Yes

Step 8    Rotate tires.

(a)    Rotate the right front wheel assembly and the right rear wheel assembly and replace the right front tire.

(b)    Road test the vehicle.

Whether the vehicle is still deviating?

No

System normal

Yes

Step 9    Return to the diagnosis starting point.

Step 10    Check the axle, suspension system components, for existence of bending damage?

No

Go to step 1

Yes

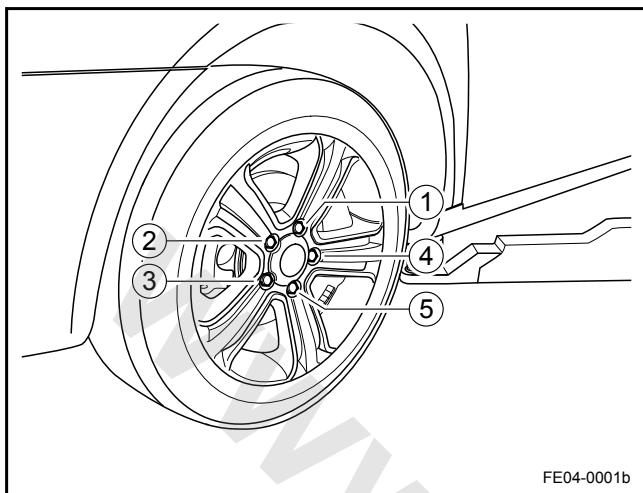
Step 11    Adjust the axle. If necessary, replace the damaged parts to confirm The fault has been fixed..

#### 4.4.5 Removal and Installation

##### 4.4.5.1 Wheel Replacement

Removal Procedure:

1. Loosen wheel nut.
2. Lift and support the vehicle.
3. Remove the wheel nut.
4. Remove the wheel.



Installation Procedure:

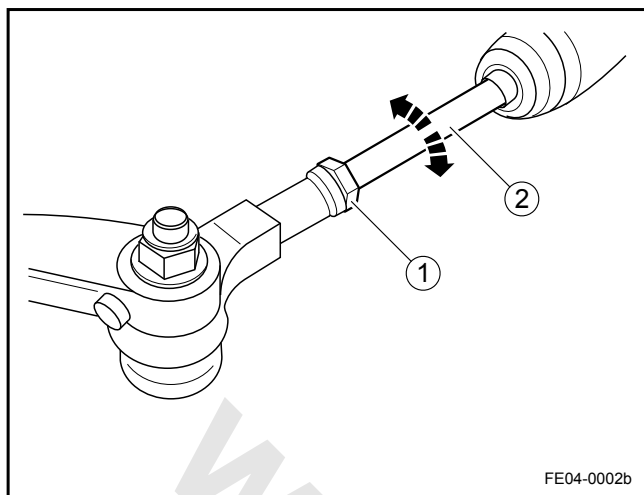
1. Install the wheel.
2. Install the wheel nuts according to the sequence 1-5-2-4-3 as shown in the graphic, slightly tighten the nuts.
3. Lower the vehicle.
4. Tighten the wheel nuts according to the sequence 1-5-2-4-3 as shown in the graphic.

Torque: 110 Nm (Metric) 81.4 lb-ft (US English)

##### 4.4.5.2 Front Toe Adjustment

###### Note

Make sure that the vehicle is parked on a even ground.  
Make sure that the front wheels are in the straight position.



1. Check both ends of toe settings.  
Equipment: Wheel Positioning System
2. Lift and support the vehicle.
3. Release rod retaining nuts at both ends.
4. Clockwise or counter-clockwise rotate the same amount at both ends to adjust the front toe setting (2).
5. Tighten the rod retaining nuts at both ends.

---

## 5 Transmission / Axle

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## 5.1 Warnings and Notices

### 5.1.1 Warnings and Notices

#### Assistant Driving Warning

##### Warning!

Warning: An assistant should drive the vehicle while the technician checks for the location of the reported condition. Otherwise, personal injury could result.

#### Battery Disconnect Warning

##### Warning!

Warning: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

#### Road Test Warning

##### Warning!

Warning: Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

#### Engine Lifting Notice

##### Note

Notice: When raising or supporting the engine for any reason, do not use a jack under the oil pan, any sheet metal, or the crankshaft pulley. Lifting the engine in an unapproved manner may cause component damage.

## 5.2 Differential

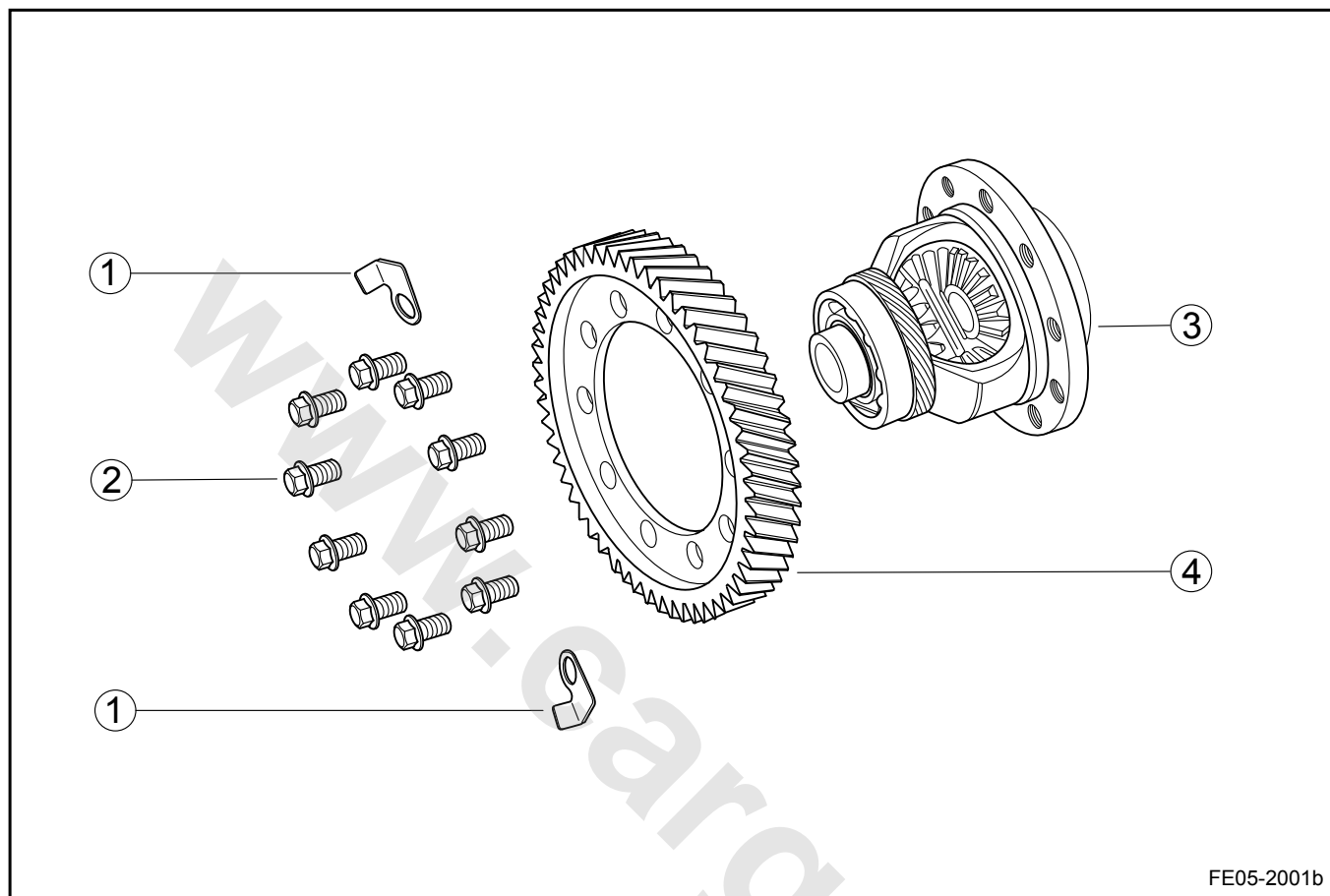
### 5.2.1 Specifications

#### 5.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Main Reducer Driven Gear Retaining Bolts	M10 × 20	47-57	35-42

## 5.2.2 Disassemble View

## 5.2.2.1 Disassemble View



## Legend

- 1. Planetary Axle Locking Piece
- 2. Driven Gear and Planet Carrier Retaining Bolts
- 3. Planet Carrier

- 4. Driven Gear



### 5.2.3 Diagnostic Information and Procedures

#### 5.2.3.1 Fault Symptom Table

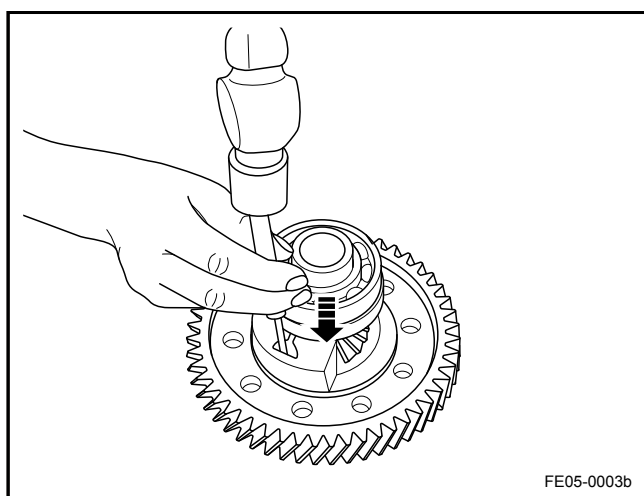
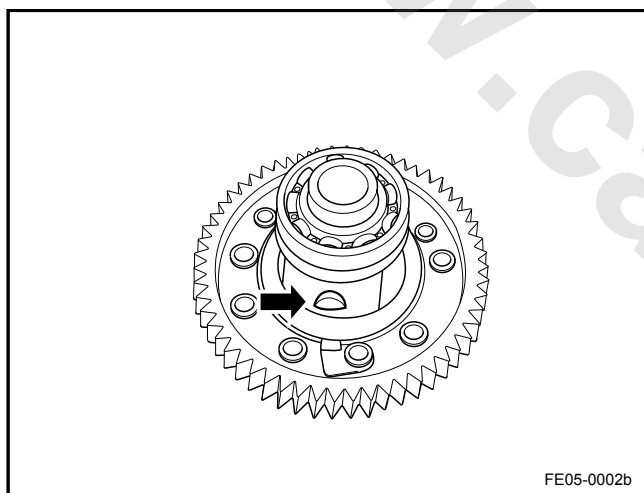
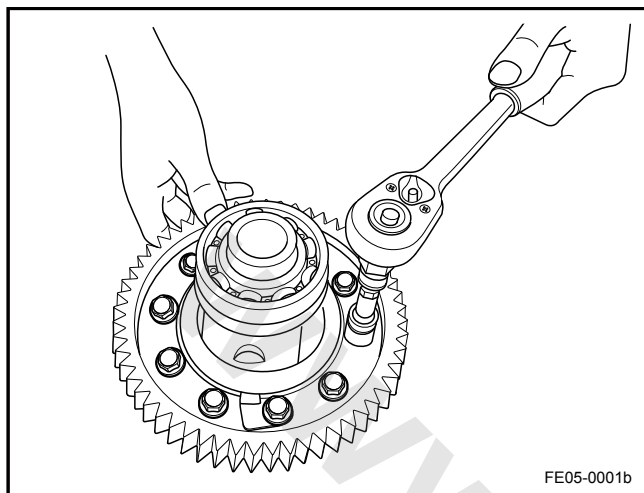
Symptoms	Suspected Parts	Refer to
Abnormal Sound	Planet Carrier, Planetary Axle	<a href="#">3.3.7.6 Abnormal Sound When Running</a> and <a href="#">5.2.4.1 Differential Disassemble and Assemble</a>

## 5.2.4 Removal and Installation

### 5.2.4.1 Differential Disassemble and Assemble

#### Removal Procedure:

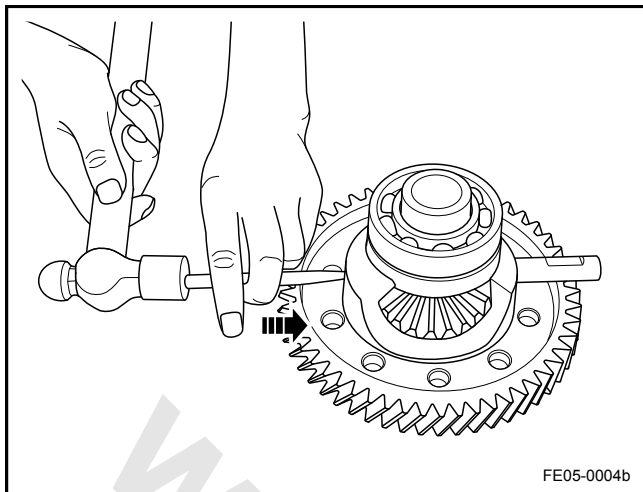
1. Remove the gearbox assembly. Refer to [3.3.8.3 Transmission Assembly Replacement](#).
2. Remove the shift control mechanism assembly. Refer to [3.3.8.4 Shift Control Assembly Replacement](#).
3. Remove the fork shaft. Refer to [3.3.8.6 Shift Shaft Replacement](#).
4. Remove differential assembly from the gearbox.
5. Remove the main reducer driven gear retaining bolts, a total of 10.
6. Find the location of the planet wheel locking pin.



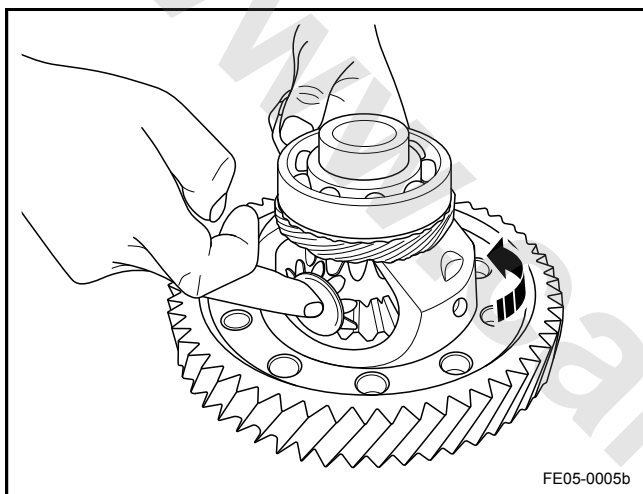
7. Use a universal tool to remove the planetary axle locking pin.

#### Note

There is a locking ball on the other side locking pin. Prevent the ball falling during the removal.



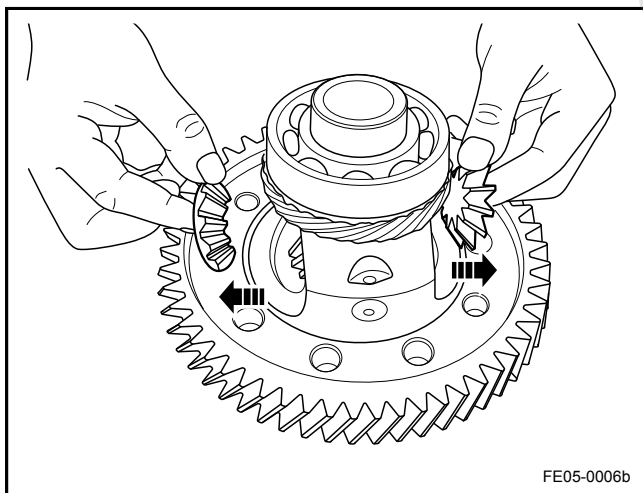
8. Remove the planetary axle.



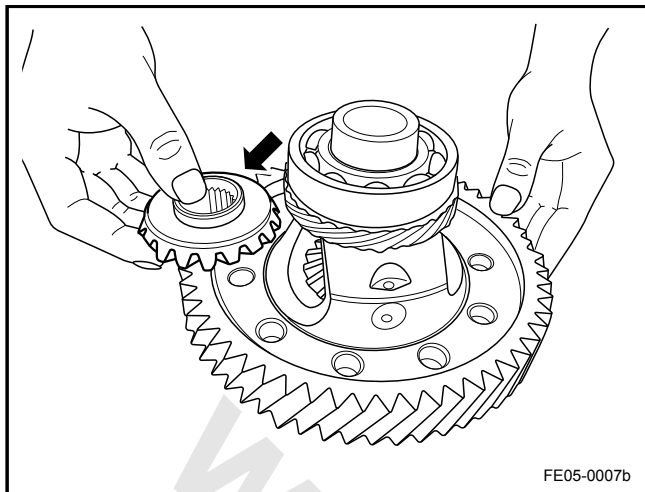
9. Rotate the planetary gear.

**Note**

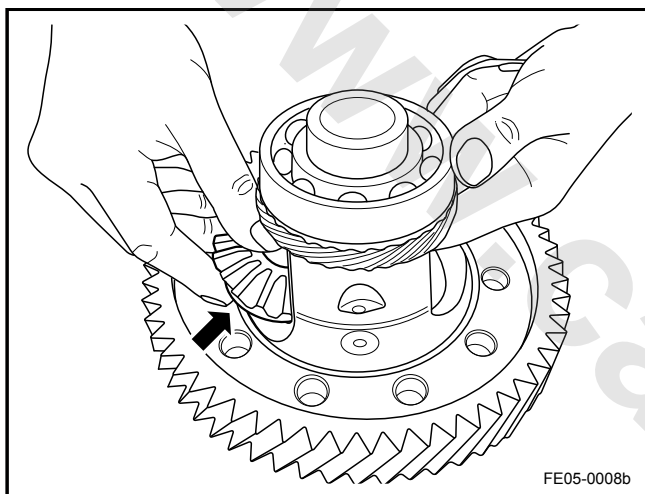
Rotate the planetary gear 90 °, as shown.



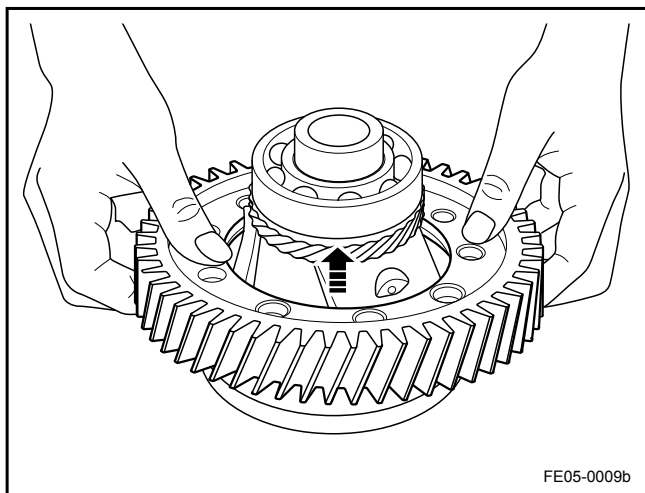
10. Remove the planetary gear.



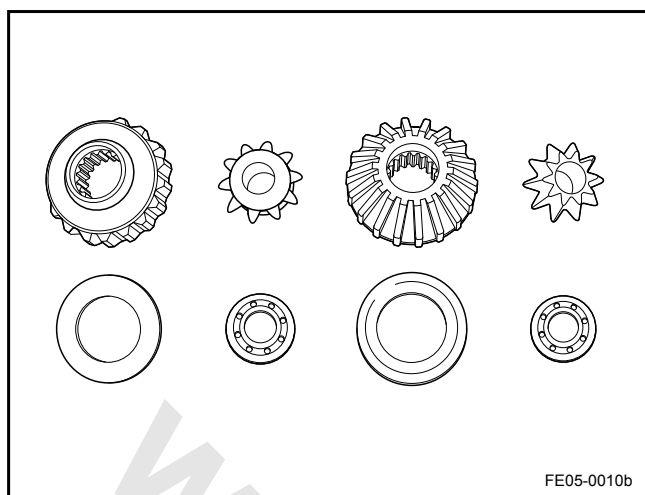
11. Remove the right output pinion.



12. Remove the left output pinion.



13. Remove the primary reducer driven gear.



14. Removed planetary gear and output gear.

#### Note

If it needs to adjust the planetary gear and output gear meshing gap, adjust the thickness of the pads.

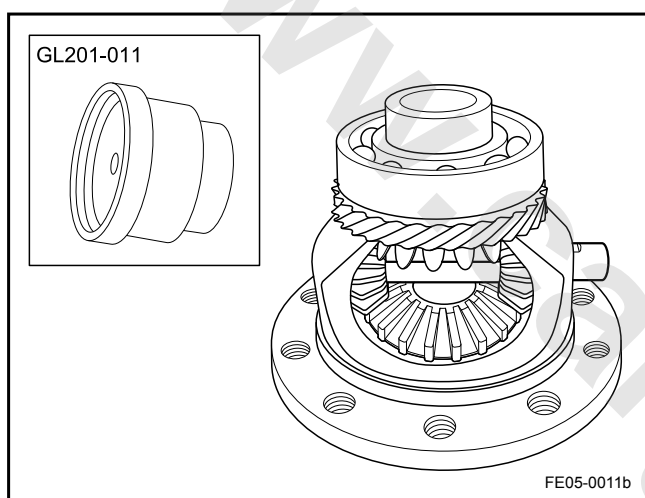
#### Installation Procedure:

1. Install the planetary gear.

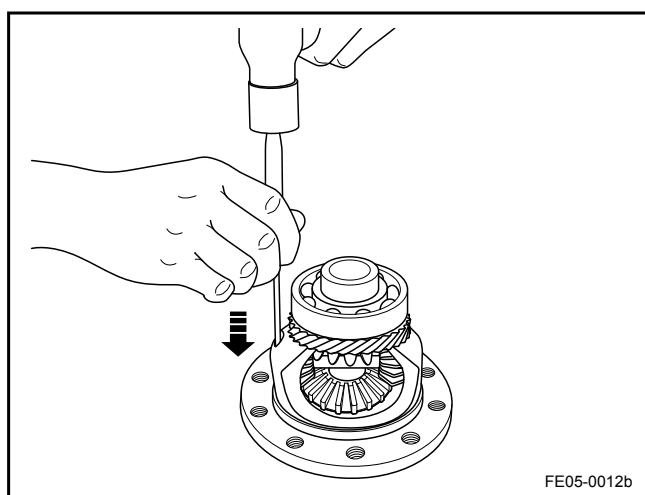
#### Note

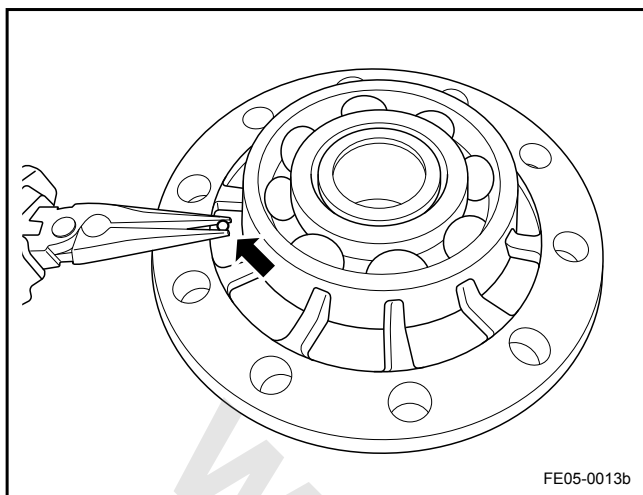
During the installation process, please note that the planetary gear and the output gear gasket status. If it needs to replace the differential bearings, please use the special tool GL201-011 to install the bearing.

2. Install the planetary axle.

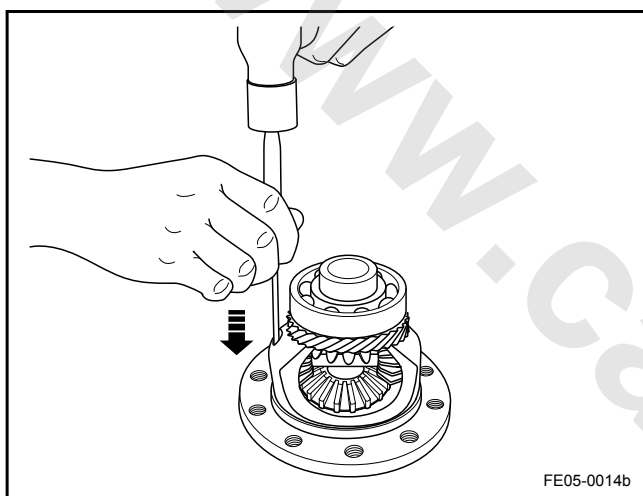


3. Install the planetary axle locking pin.

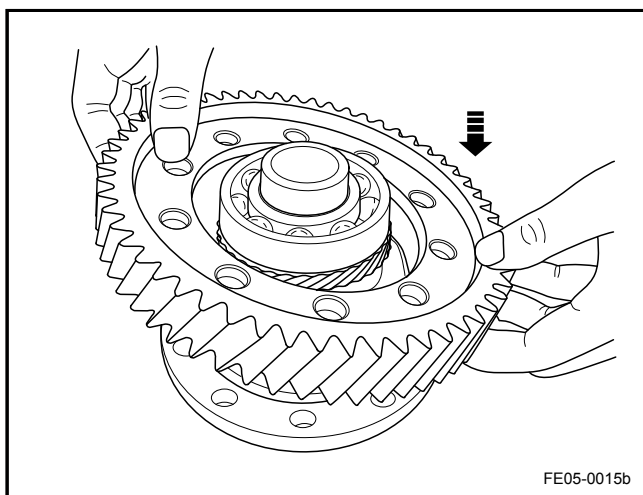




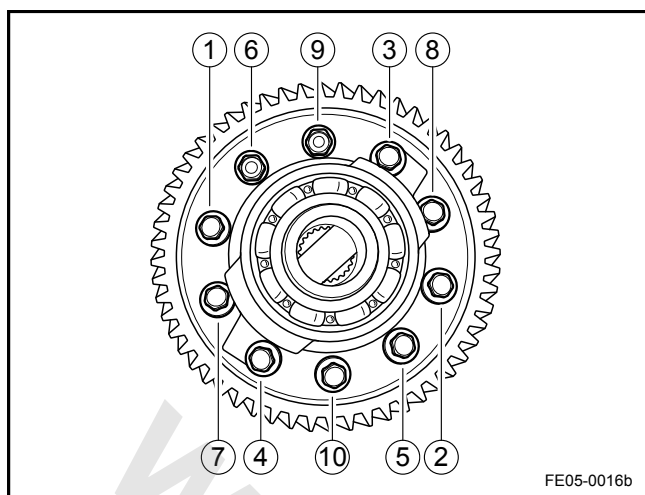
4. Install the planetary axle locking pin ball.



5. Lock the locking pins (both sides).



6. Install the primary reducer driven gear.



7. Tighten the primary reducer driven gear retaining bolts.

#### Note

During the installation process, do not forget the planetary locking pieces on both sides, according to the sequence as shown in the graphic.

8. Install the differential assembly.
9. Install the fork shaft.
10. Install the gearbox assembly.
11. Install the shift control assembly.

## 5.3 Drive Shaft System

### 5.3.1 Specifications

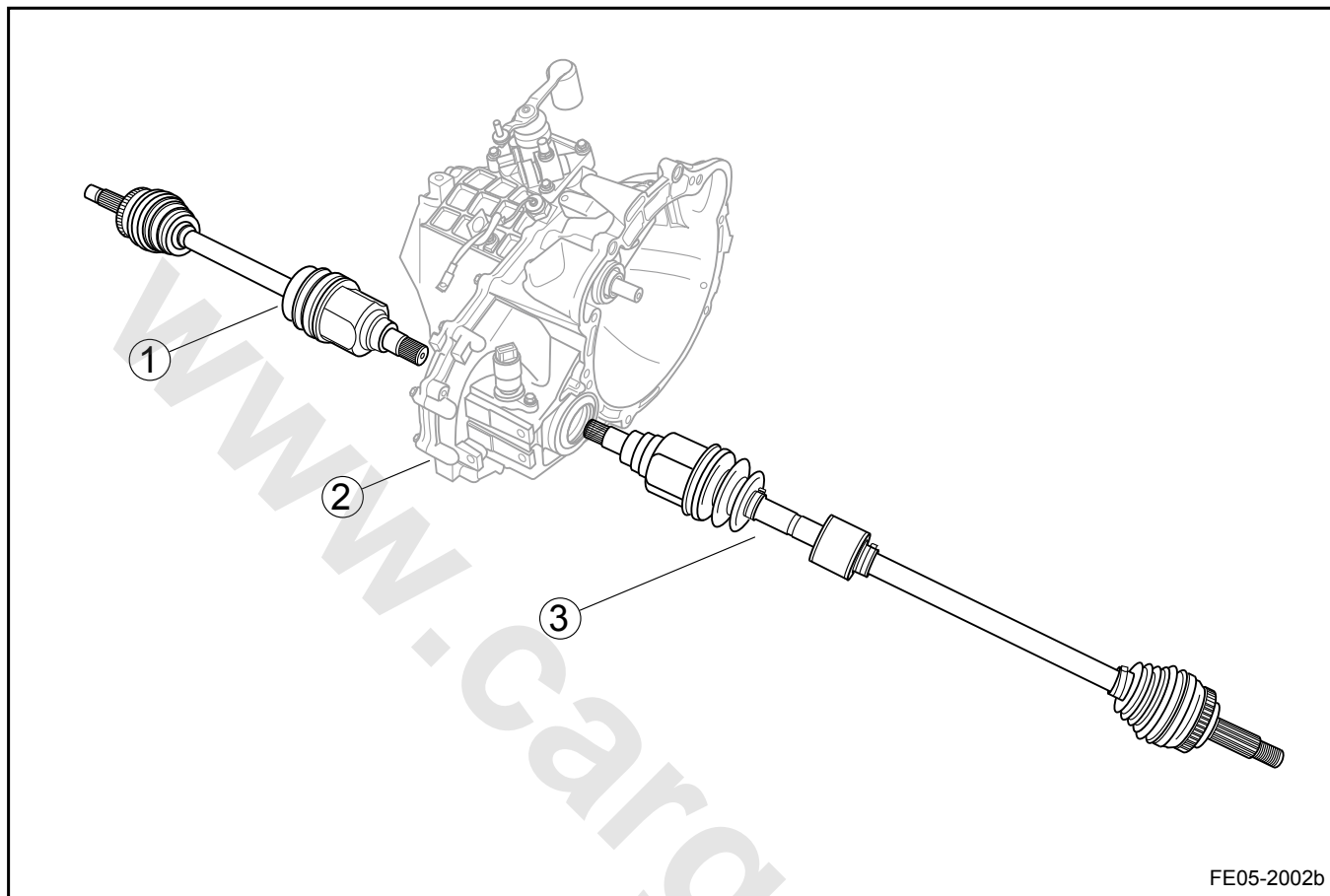
#### 5.3.1.1 Fastener Tightening Specifications

Applications	Model	Specifications		Notes
		Metric (Nm)	US English (lb-ft)	
Drive Shaft Outer Locking Nut	M22 × 1.5	210-230	154.9-170.0	
Lower Control Arm Ball Joint Connecting Bolts	M10 × 1.25 × 16	131-159	96.6-117.3	
Lower Control Arm Ball Joint Connecting Nuts	M12 × 1.25	131-159	96.6-117.3	
Steering Rod Ball Pin Groove Nut	M12 × 1.25	44-54	32.5-39.8	When the pin can not be installed , turn the nut 60 °



### 5.3.2 Disassemble View

#### 5.3.2.1 Disassemble View



#### Legend

- 1. Left Drive Shaft
- 2. Transmission

- 3. Right Drive Shaft

### 5.3.3 Diagnostic Information and Procedures

#### 5.3.3.1 Fault Symptom Table

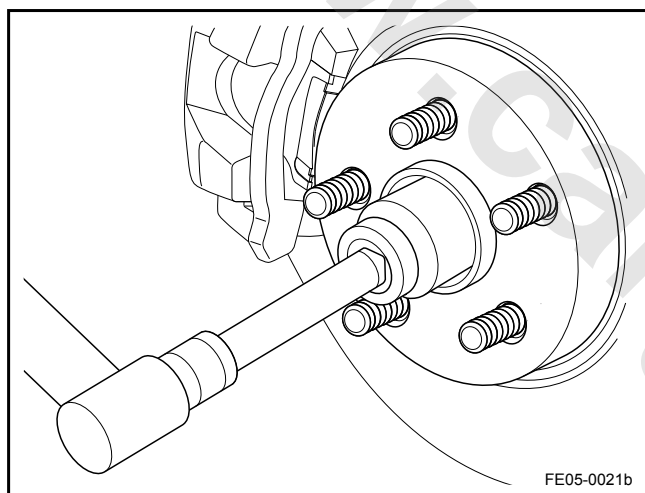
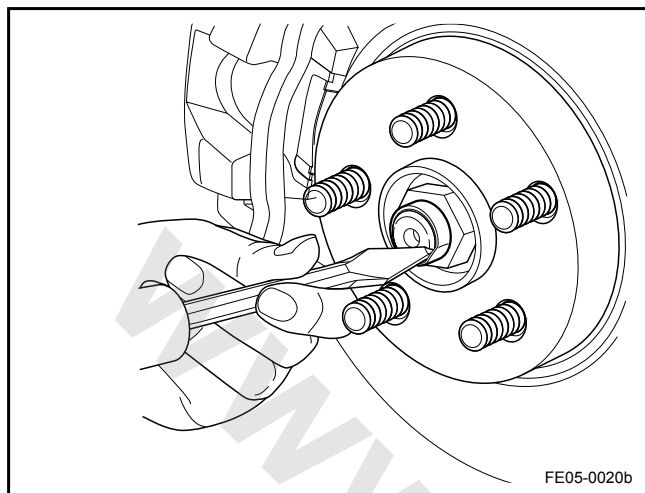
Symptoms	Suspected Parts	Refer to
Noise (Front Drive Shaft)	Inside or Outside Ball Joint (Worn)	<a href="#">3.3.7.6 Abnormal Sound When Running</a> and <a href="#">5.3.4.1 Drive Shaft Replacement</a>

### 5.3.4 Removal and Installation

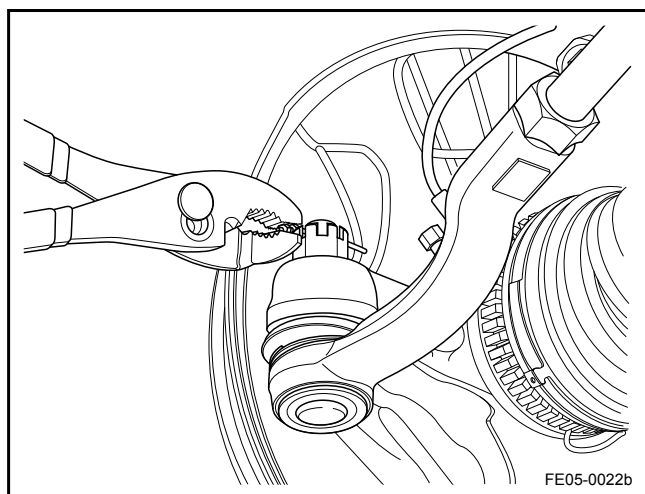
#### 5.3.4.1 Drive Shaft Replacement

Removal Procedure:

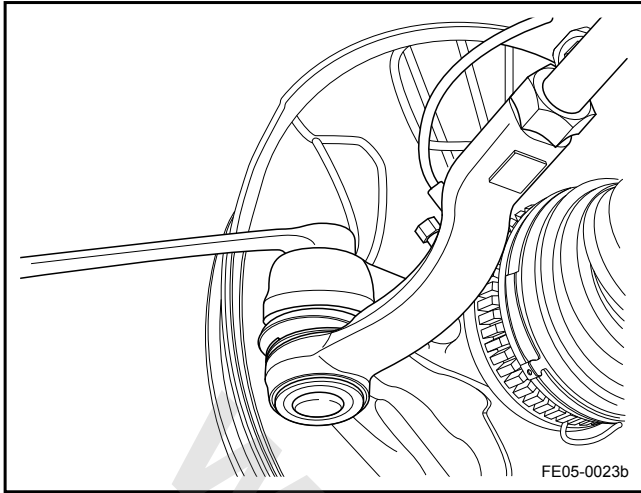
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the tires. Refer to [4.4.5.1 Wheel Replacement](#).
3. Release the drive shaft outside locking nut self-locking device.



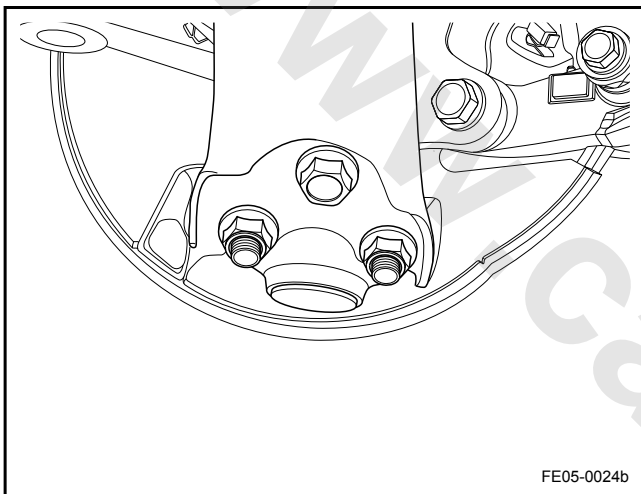
4. Remove the drive shaft outside locking nut.



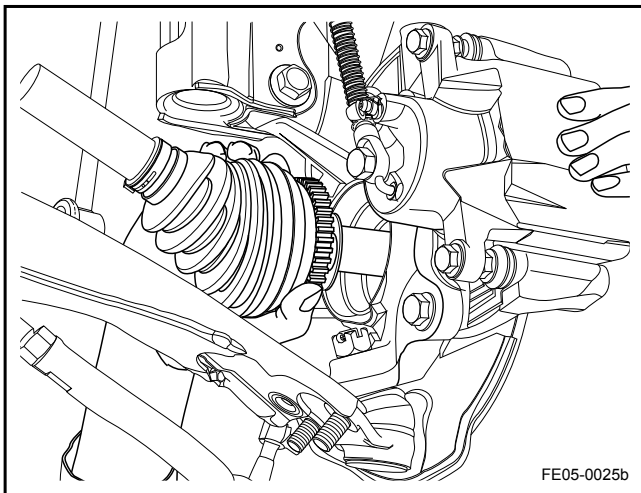
5. Remove the steering rod ball joint locking pin.



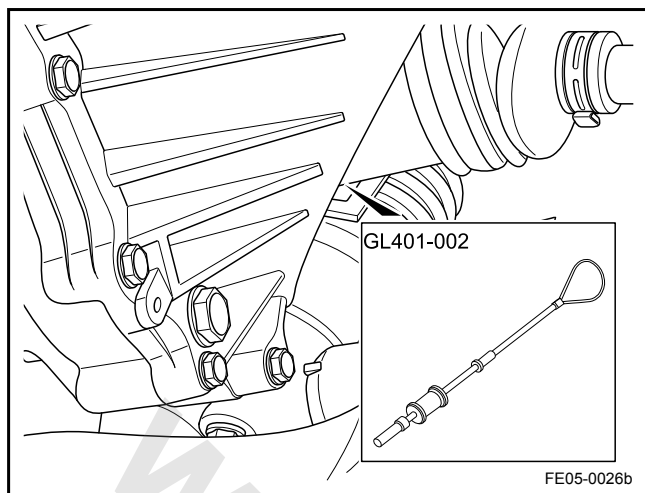
6. Remove the Steering tie rod nut.



7. Remove the lower control arm ball joint retaining bolts and nuts.



8. Remove the drive shaft outer side.



9. Use special tool GL401-002 to remove the drive shaft.

#### Note

During the removal process, do not force the remove a part to prevent damage to the gearbox housing.

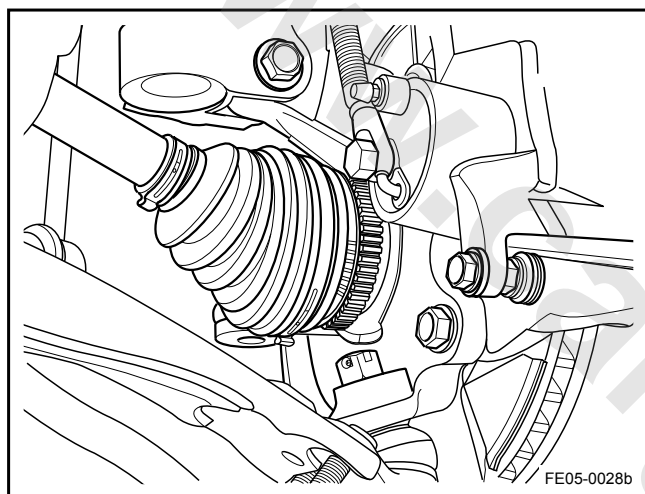
#### Installation Procedure:

1. Install the drive shaft inner side.

#### Note

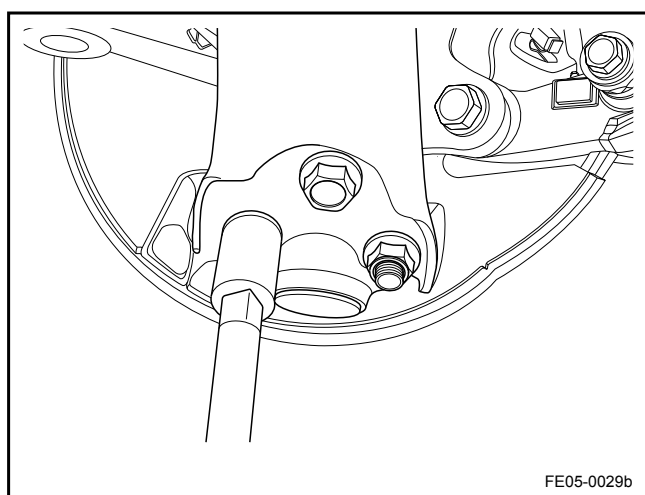
During the installation process, push the drive shaft to confirm the drive shaft is installed in place.

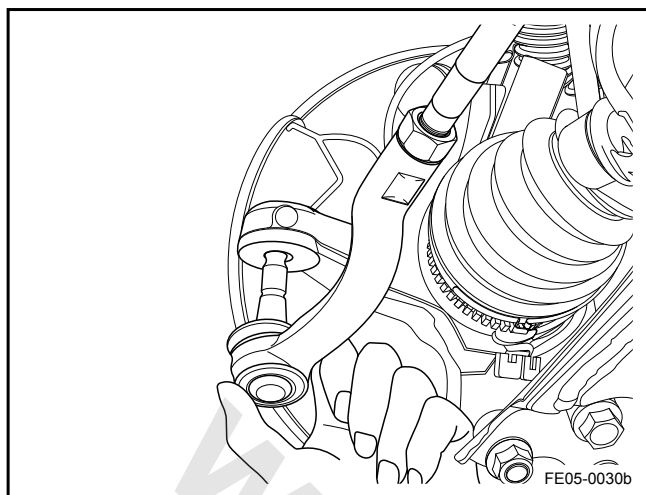
2. Install the drive shaft outer side.



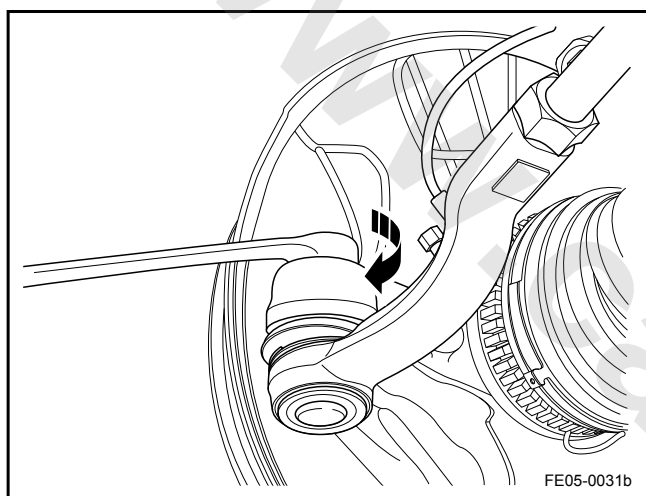
3. Install and tighten the lower control arm ball joint retaining bolts and nuts.

Torque: 145 Nm (Metric) 106.9 lb-ft (US English)

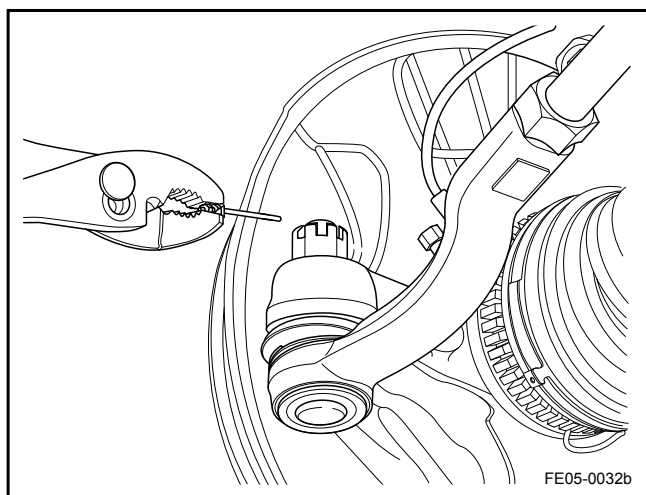




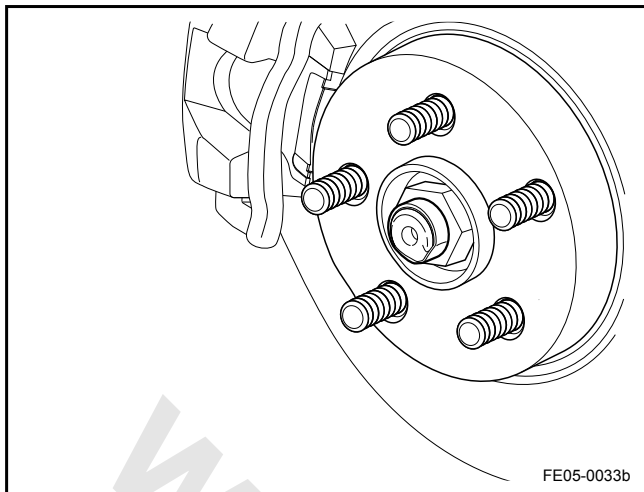
4. Install the steering rod ball joint.



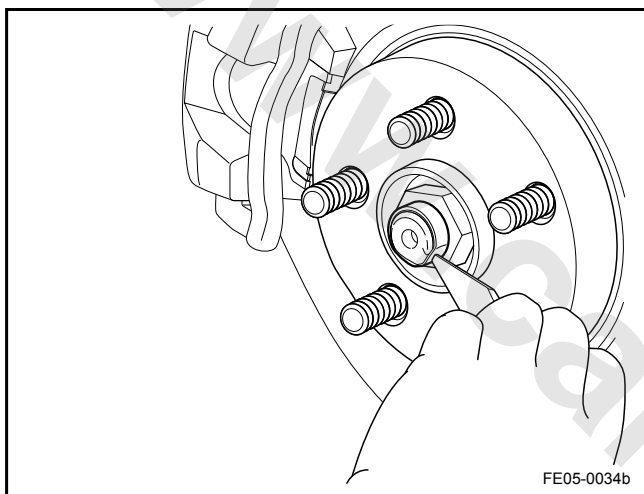
5. Install and tighten the steering tie rod ball joint nut.  
Torque: 49 Nm (Metric) 36.1 lb-ft (US English)



6. Install the steering rod ball joint nut locking pin.



7. Install and tighten the drive shaft outside locking nuts.  
Torque: 215 Nm (Metric) 158.6 lb-ft (US English)



8. Lock the drive shaft outside locking nut self-locking device.
9. Install the tires.
10. Tighten the tire bolts.
11. Connect the battery negative cable.

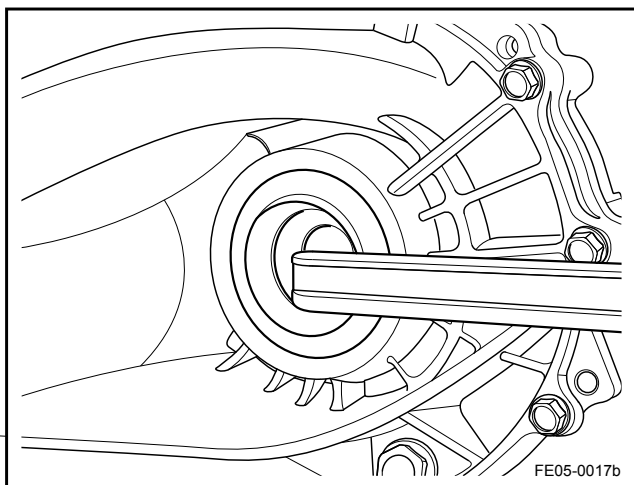
#### 5.3.4.2 Drive Shaft Oil Seal Replacement

##### Removal Procedure:

1. Remove the drive shaft from the gearbox. Refer to [5.3.4.1 Drive Shaft Replacement](#).
2. Lever with pry bar outside the lip seals, Remove drive axle seal.

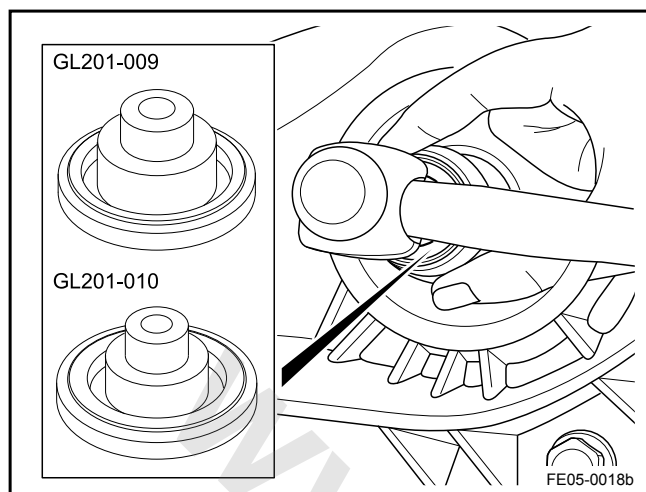
##### Note

When pry the seal, be careful not to damage the gearbox housing and seals.



## Installation Procedure:

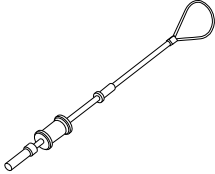
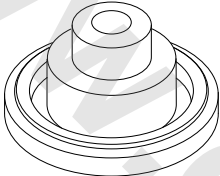
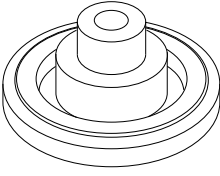
1. Using special tools GL201-009, GL201-010 to install the drive shaft seal components.
2. Apply gearbox oil to the drive shaft oil seal component lip.
3. Install the drive shaft.





## 5.3.5 Special Tools and Equipment

## 5.3.5.1 Special Tool List

Serial Number	Illustration	Tool Number	Tool Name
1	 <p>FE01-2026b</p>	GL401-002	Drive Shaft Inner Cage Removal Device
2	 <p>FE01-2009b</p>	GL201-009	Differential Clutch Housing Oil Seal Removal Tool
3	 <p>FE01-2010b</p>	GL201-010	Differential Gearbox Housing Oil Seal Removal Tool

[www.cargeek.ir](http://www.cargeek.ir)

## 6 Brake System

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## 6.1 Warnings and Notices

### 6.1.1 Warnings and Notices

#### ABS Component Handling Warning

##### Warning!

Warning: Certain components in the Anti-lock Brake System (ABS) are not intended to be serviced individually. Attempting to remove or disconnect certain system components may result in personal injury and/or improper system operation. Only those components with approved removal and installation procedures should be serviced.

#### Brake Dust Warning

##### Warning!

Warning: Avoid taking the following actions when you service wheel brake parts:

- Do not grind brake linings.
- Do not sand brake linings.
- Do not clean wheel brake parts with a dry brush or with compressed air.

##### Warning!

Warning: Some models or aftermarket brake parts may contain fibers which can become airborne in dust. Breathing dust with fibers may cause serious bodily harm. Use a water-dampened cloth in order to remove any dust on brake parts. Equipment is available commercially in order to perform this washing function. These wet methods prevent fibers from becoming airborne.

#### Brake Fluid Warning

##### Warning!

Warning: Do not use fluid from an open container that may be contaminated with water. Incorrect or contaminated fluid could result in system failure, loss of vehicle control and personal injury.

#### Brake Fluid Irritant Warning

##### Warning!

Warning: Brake fluid may be irritating to the skin or eyes. In case of contact, take the following actions:

- Eye contact--rinse eyes thoroughly with water.
- Skin contact--wash skin with soap and water.

#### Brake Pipe Replacement Warning

##### Warning!

Warning: Carefully route and retain replacement brake pipes. Always use the correct fasteners and in the original location for replacement brake pipes. Failure to properly route and retain brake pipes may cause damage to the brake pipes and brake system resulting in personal injury.

#### Adding Fluid to the Brake System Notice

##### Note

Notice: When adding fluid to the brake master cylinder reservoir, use DOT-4 brake fluid from a clean, sealed brake fluid container. The use of any type of fluid other than the recommended type of brake fluid may cause contamination which could result in damage to the internal rubber seals and/or rubber linings of hydraulic brake system components.

#### Brake Caliper Notice

##### Note

Notice: Support the caliper with a piece of wire to prevent damage to the brake line.

## 6.2 Front Brake

### 6.2.1 Specifications

#### 6.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Brake Hose Bolts	M10 × 15	11-20	8.1-14.8
Brake Caliper Bolts	M8 × 22	25-35	18.5-25.9
Brake Caliper Bracket Bolts	M10 × 23	100-110	74.0-81.4

#### 6.2.1.2 Front Disc Brake Parts Specifications

Applications	Specifications	
	Metric (mm)	US English (in)
Scrapped Front Brake Disc Thickness	24.0	0.980
Front Brake Disc Acceptable Face Run Out	0.05	0.002
Front Brake Disc Thickness - New	26.0	1.020
Front Brake Pads Standard Thickness	11.0	0.433
Front Brake Pads Minimum Thickness	2.0	0.078

## 6.2.2 Description and Operation

### 6.2.2.1 Description and Operation

Front Disc Brake System Components:

Front disc brake system consists of the following components:

**Brake Pad:** Apply the force from the hydraulic brake caliper mechanical output on the brake disc friction surface.

**Brake Pad Guide:** Installed between the the disc brake pad and the brake pad mounting bracket to keep the brake pad moving smooth and to eliminate the noise.

**Brake Disk:** The disc brake pad and the brake disc surface friction mechanical output slows down the tires and wheels assembly rotation speed, enables the vehicle's braking.

**Brake Caliper:** Receive the hydraulic pressure from the brake master cylinder, converts the hydraulic pressure to mechanical output force acting on the brake pads; When the master cylinder returns its position, the brake caliper piston returns to its position.

**Brake Caliper and Brake Pad Mounting Bracket:** It is used to fix the disc brake pad and brake caliper in place to maintain the correct correlation with the hydraulic brake caliper. When the mechanical output is applied on the brake pad, it makes the brake pad slide.

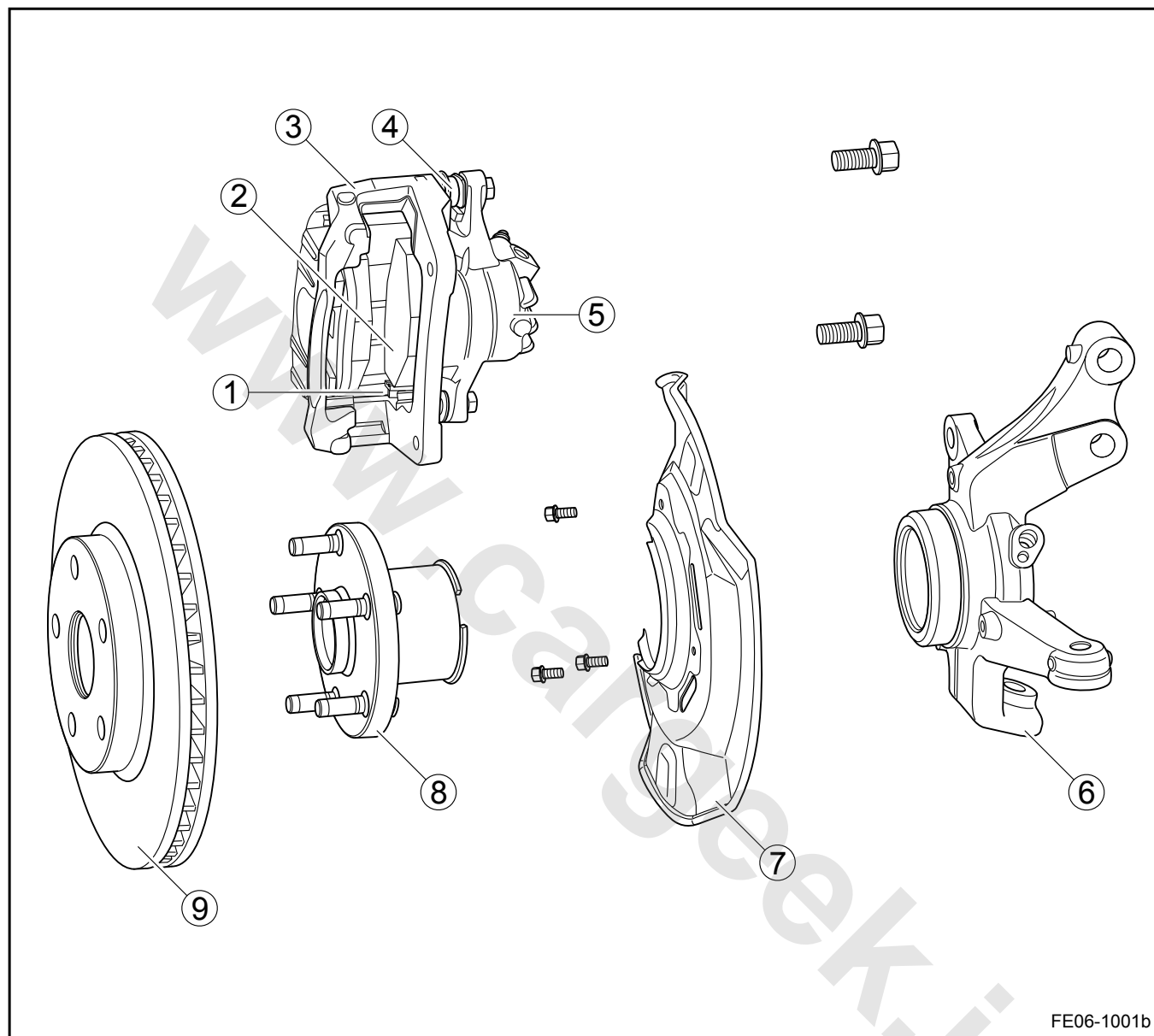
**Brake Caliper Floating Pin:** It is used to install the hydraulic brake caliper, fix the brake caliper in place to maintain the correct correlation with the with the brake caliper bracket. When the mechanical output is applied on the brake caliper, it makes the the brake caliper slide in relation to the brake pad.

Front Disc Brake System Operation:

The mechanical output from the hydraulic brake caliper piston is applied on the brake pad. When the piston pushes the inside brake pad from outside, at the same time, the brake caliper pulls the outer brake pads inward, so that the output power is evenly distributed. The brake pad applies the output force to the brake disc friction surface on both sides, thus slowing down the tire and wheel assembly speed. Whether the brake lining guide and the floating brake caliper pin are working properly is very important to evenly distribute the braking force.

## 6.2.3 Disassemble View

## 6.2.3.1 Disassemble View



FE06-1001b

## Legend

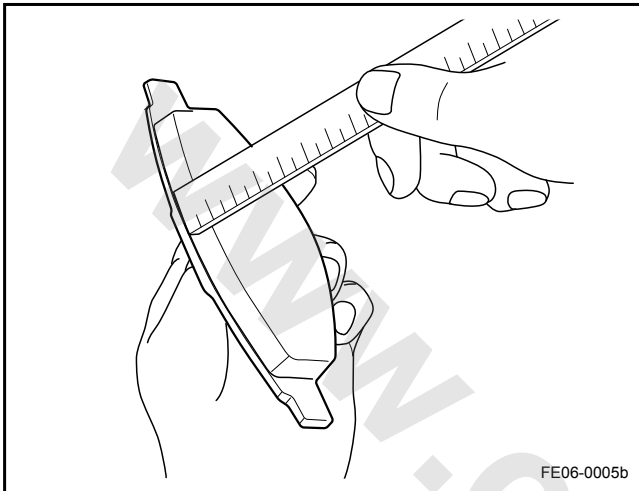
- |                                   |                          |
|-----------------------------------|--------------------------|
| 1. Brake Pad Guide                | 7. Disc Brake Dust Cover |
| 2. Brake Pad                      | 8. Wheel Hub Assembly    |
| 3. Brake Caliper Mounting Bracket | 9. Brake Disc            |
| 4. Floating Pin Seal              |                          |
| 5. Brake Caliper                  |                          |
| 6. Steering Knuckle               |                          |



## 6.2.4 Diagnostic Information and Procedures

### 6.2.4.1 Brake Pad Inspection

1. Regularly check the brake pad, measure the brake pad according to the graphic shown below. If the measurement is not within the specification, replace the brake pad.
2. If the brake pad needs to be replaced, replace the disc brake pads on the same axle at the same time.
3. Check whether the disc brake pad friction surface is cracked, broken or damaged.



### 6.2.4.2 Brake Caliper Inspection

1. Check whether the brake caliper housing is cracking, severely worn or damaged. If the above conditions exist, replace the brake caliper.
2. Check whether the brake caliper piston dust cover seal is cracked, broken, punctured, aging, and improperly installed in the brake caliper body. If there is any of the above conditions, replace the brake caliper.
3. Check whether there is brake fluid leak on the brake caliper piston dust cover seal surrounding and the disc brake pad. If there is brake fluid leaking sign, replace the brake caliper.
4. Check whether the brake caliper piston enters into the caliper cylinder smoothly and completely. The movement should be smooth. If the brake caliper piston is stuck or hard to reach the cylinder bottom, replace the brake caliper.

### 6.2.4.3 Brake Guide Inspection

- Check the brake guide for the existence of deficiencies, severe corrosion, installing convex tongue bent.
- If any of the above is found, replace the disc brake guide. Make sure that the brake pad slide smoothly on the disc brake pad guide without blocking.

### 6.2.4.4 Floating Brake Caliper Pin Inspection

Check the brake caliper pin floating whether the following conditions exist:

- Catching
- Stuck
- Jacket Cracking or Broken
- Jacket Missing

If any of the above is found, replace the brake caliper and the dust cover seal.

#### 6.2.4.5 Brake Disc Surface and Worn Inspection

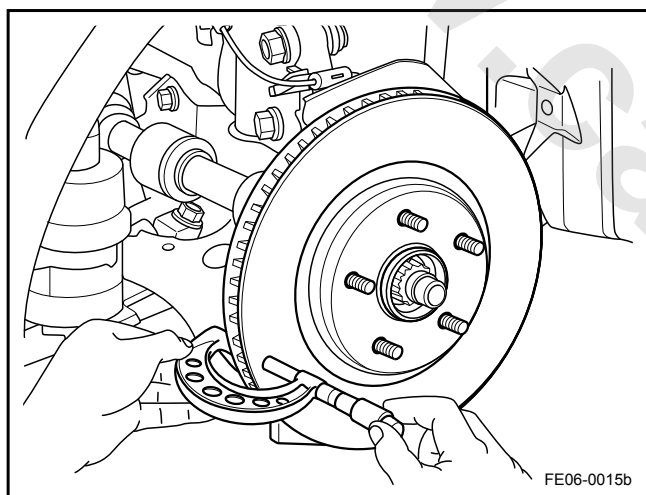
1. Clean the brake disc brake friction surface with industrial alcohol or a permitted equivalent detergent.
2. Check the brake disc friction surface for the following conditions:
  - Severe corrosion and / or pitting
  - Minor Surface Rust
  - Cracking and / or Sunburn
  - Serious Color Changing (Blue)
  - Deep scratches on the brake disc friction surface

If one or more of the above exists, then the brake disc needs to be repaired or replaced.

#### Note

After the brake disk surface repair or replacement, the brake pad needs to be replaced.

#### 6.2.4.6 Brake Disc Thickness Measurement



1. Clean the brake disc brake friction surface with industrial alcohol or similar cleaning agent .
2. With a micrometer to measure and record evenly distributed 4 or more points minimum thickness along the circumference of the brake disc. Make sure that only measure the brake pad lining contacting area. For each measurement, the micrometer and the brake disc outer edge distance must be equal.
3. If the brake disc thickness exceeds the specifications, replace the brake disc.

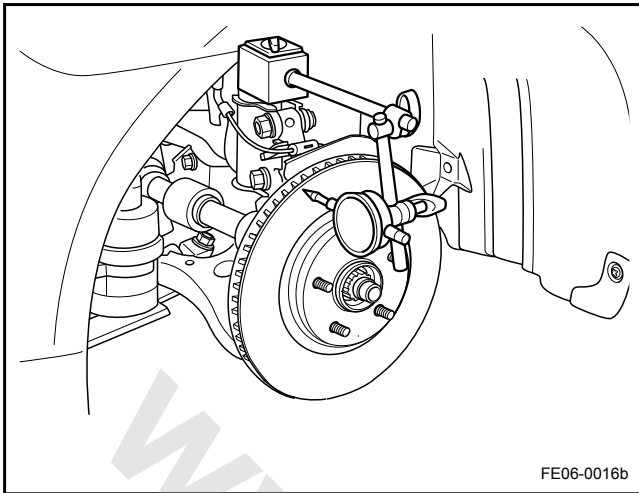
#### Note

After the brake disk repair or replacement, the brake pad should be replaced.

#### 6.2.4.7 Brake Disc Assembly Rear Face Run Out Measurement

#### Note

When removing the brake disc from the wheel hub / axle flange, remove the rust or dirt from the wheel hub / axle flange and the brake disc mating surface, otherwise, it could lead to brake disc assembly rear face excessive run out, lead to the brake pulsation.



1. Remove the brake disc from the vehicle. Refer to [6.2.5.3 Brake Disc Replacement](#) and / or [6.3.5.3 Brake Disc Replacement - Rear](#).
2. Clean the brake disc friction surface with industrial alcohol or similar cleaning agent .
3. Install the brake disc to the wheel brake disc / axle flange.
4. Manually install the nuts and tighten the nuts with a wrench.
5. Install the dial indicator base to the steering knuckle and place the dial indicator measuring head, so that it contacts with the brake disc friction surface and is at 90 °, and is from the brake disc outer edge about 13 mm (Metric) 0.5 in (US English)
6. Rotate the brake disc, until the dial indicator reading reaches the minimum, and then dial the indicator to zero.
7. Rotate the brake disc, until the dial indicator reading reaches the maximum.
8. Mark and record the face run out.
9. After install the brake disc assembly, compare the face run out with the specifications.  
Standard Value: 0.05 mm (Metric) 0.002 in (US English)
10. If the brake disc assembly rear face run out exceeds the specifications after installation, check the bearing axial clearance and the wheel axle run out. If the bearing axial clearance and the wheel axle run out is normal, and brake disc thickness is within the prescribed limits, adjust the brake disc surface in order to ensure proper flatness.

## 6.2.5 Removal and Installation

### 6.2.5.1 Brake Pad Replacement - Front

Removal Procedure:

Warning!

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

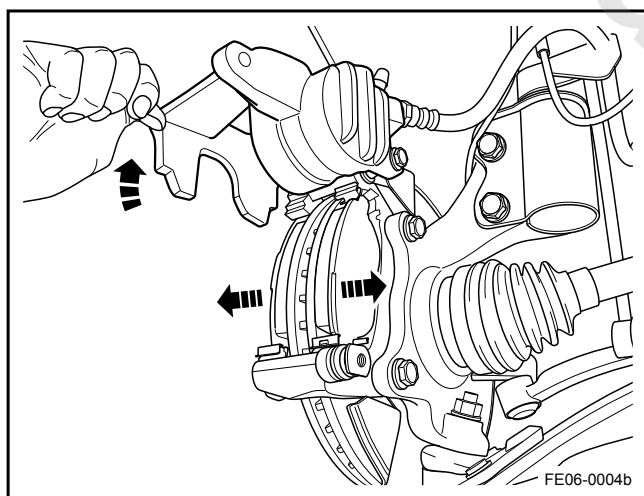
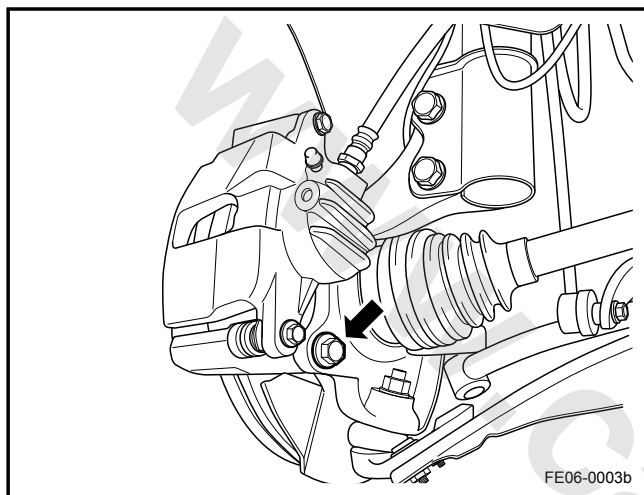
Refer to "Brake Dust Warning" in "Warnings and Notices".

1. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).

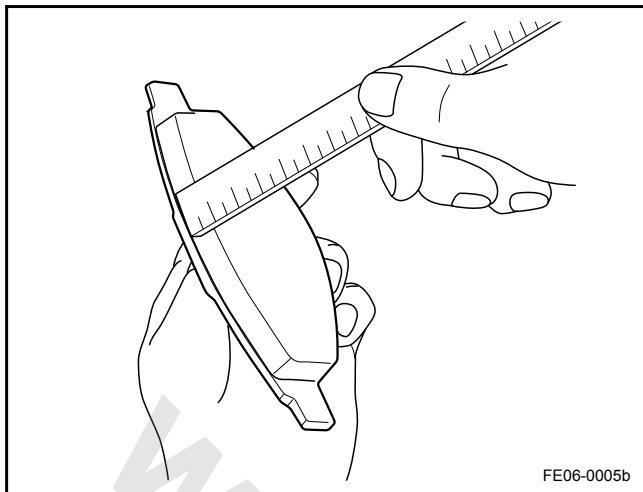
#### Note

In order to maintain wheel balance, before the tire removal, mark the tire relative to the wheel position.

2. Remove the front wheel. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove brake caliper lower assembly bolts.



4. Flip the caliper upward.
5. Remove the brake pad.



6. Check the brake pad.

Standard Thickness: 11.0 mm (0.433 in)

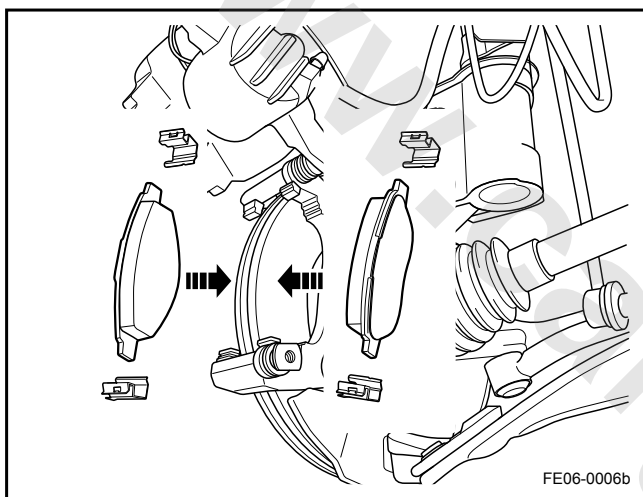
Minimum Thickness: 2.0 mm (0.078 in)

#### Note

If the brake pad lining thickness is less than the minimum value, replace the front brake pad.

#### Installation Procedure:

1. Check the brake pad lining thickness.
2. Install the brake pad into the caliper.



3. When necessary, use a dedicated tool to push the piston inside.

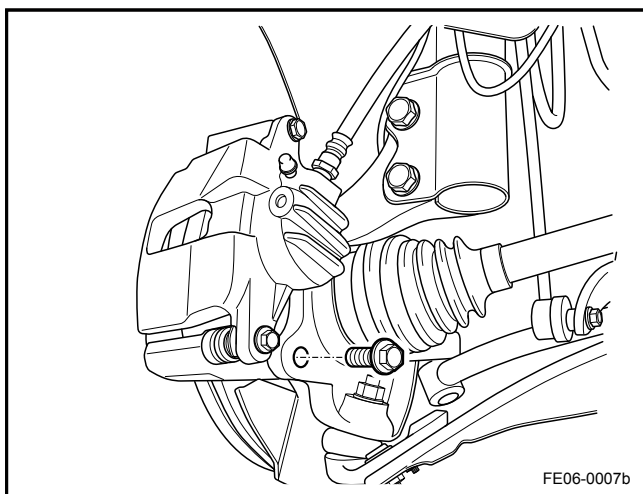
#### Note

Carefully drop down the brake caliper assembly and install the lower assembly bolts, do not damage the piston dust seals.

4. Install the bolt assembly the bolt assembly to the bottom of the drop-down brake caliper and .  
Torque: 30 Nm (Metric) 22.2 lb-ft (US English)
5. Align the marks made when removing the wheels and install the front wheels.
6. Lower the vehicle.

#### Note

The left and right front brake pad replacement is similar.



### 6.2.5.2 Brake Caliper Replacement - Front

Removal Procedure:

**Warning!**

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".

1. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).

**Note**

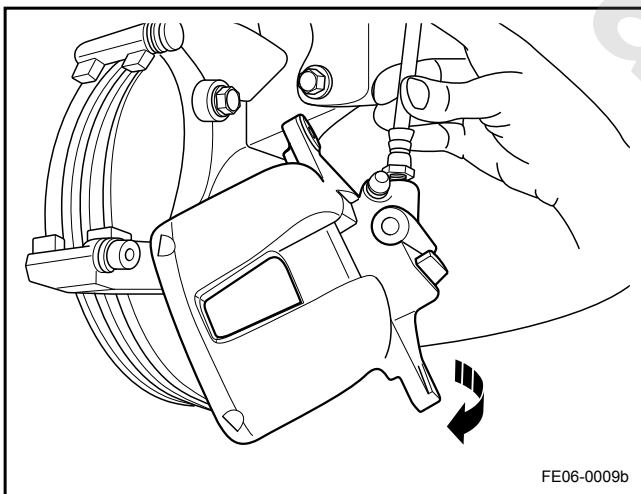
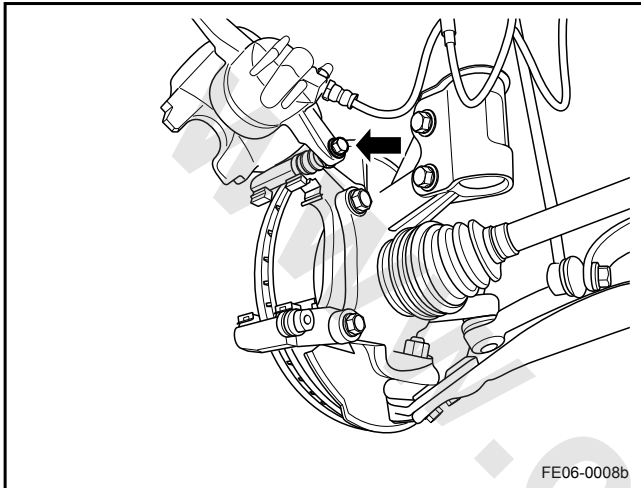
In order to maintain wheel balance, before the tire removal, mark the tire relative to the wheel position.

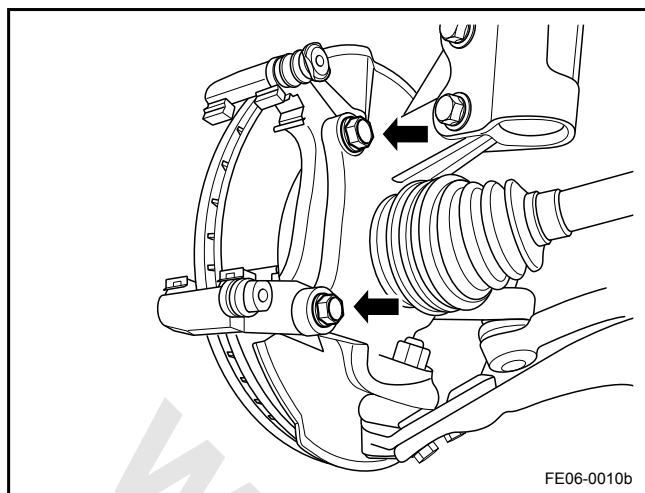
2. Remove the front wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove the brake pad. Refer to [6.2.5.1 Brake Pad Replacement - Front](#).
4. Remove the brake caliper upper assembly bolts and remove the brake caliper.

5. Remove the brake caliper brake hose inlet retaining bolts, remove the brake caliper. Plug the brake caliper inlet brake hose to prevent the brake fluid loss or contamination.

**Note**

Rotate to remove the brake caliper, separate the brake hose import bolt from brake caliper inlet to prevent damage to the brake hose.



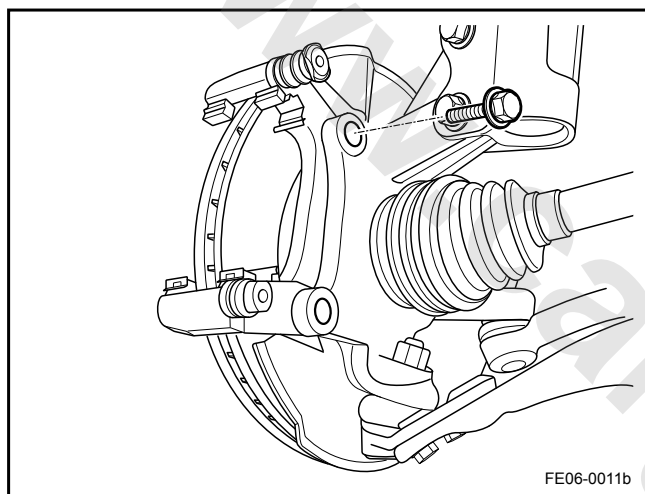


6. Remove the brake caliper bracket bolts and remove the brake caliper bracket.

#### Installation Procedure:

1. Install the brake caliper bracket.

Torque: 105 Nm (Metric) 77.7 lb-ft (US English)

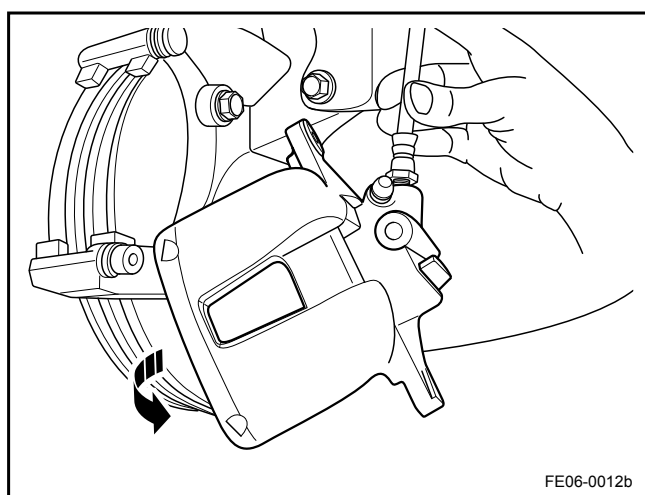


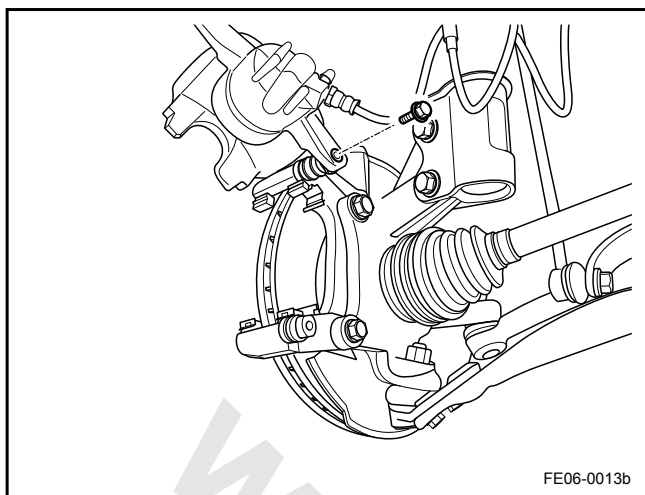
2. Install the brake caliper brake hose inlet bolts.

#### Note

Rotate to install the brake caliper, install the bolt into the brake caliper inlet to prevent damage to the brake hose.

Torque: 16 Nm (Metric) 11.8 lb-ft (US English)





3. Install the brake caliper and tighten the brake caliper upper assembly bolts.  
Torque: 30 Nm (Metric) 22.2 lb-ft (US English)
4. Install the brake pad.
5. Install the front wheels.
6. Lower the vehicle.
7. Add clean brake fluid to the master cylinder to the required level.
8. Bleed air in the brake system. Refer to [6.4.5.5 Hydraulic Brake System Exhaust Procedure](#).

#### Note

Left and right front brake caliper replacement is similar.

### 6.2.5.3 Brake Disc Replacement

Removal Procedure:

#### Warning!

Refer to "Vehicle Lifting Notice" in "Warnings and Notices".

1. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).

#### Note

In order to maintain wheel balance, before the tire removal, mark the tire relative to the wheel position.

2. Remove the front wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove the brake pad. Refer to [6.2.5.1 Brake Pad Replacement - Front](#).
4. Remove the brake caliper. Refer to [6.2.5.2 Brake Caliper Replacement - Front](#).

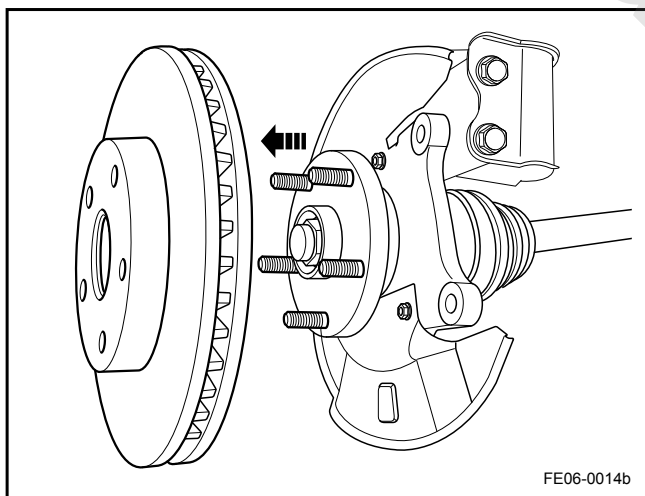
#### Note

Remove the brake caliper without having to remove the brake hose. Using a wire to hang the brake caliper in order to avoid damage to the brake hose.

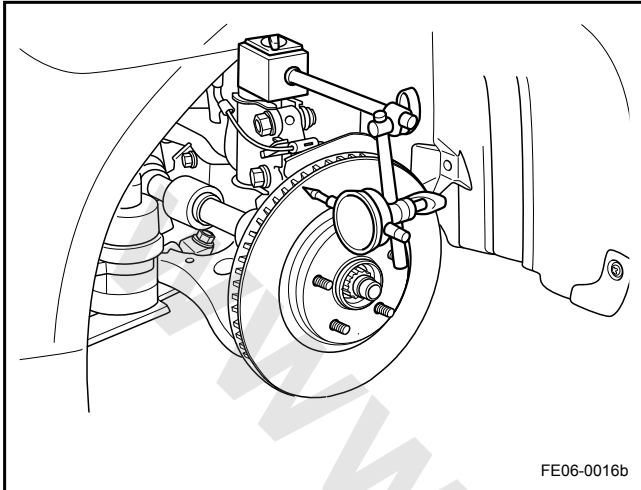
5. Remove the brake disc.

#### Note

Mark the location on the brake disc and the wheel axle.







6. Check the front brake disc thickness if the thickness is less than minimum, then replace the front brake disc.

Standard Thickness: 26.0 mm (1.02 in)

Minimum Thickness: 24.0 mm (0.98 in)

7. Check the brake disc run out.
  - a. Install the front brake disc.
  - b. Use special tools and wheel nut to tighten the brake disc.
 

Torque: 110 Nm (Metric) 81.4 lb-ft (US English)
  - c. Install a dial indicator on the shock absorber, away from the wheel axle and the speed sensor.

Using the dial indicator to measure the brake disc run out on the brake disc 13 mm (0.53 in) from the outer edge.

Largest brake disc run out: 0.05 mm (0.0020 in)

#### Note

##### If the brake disc

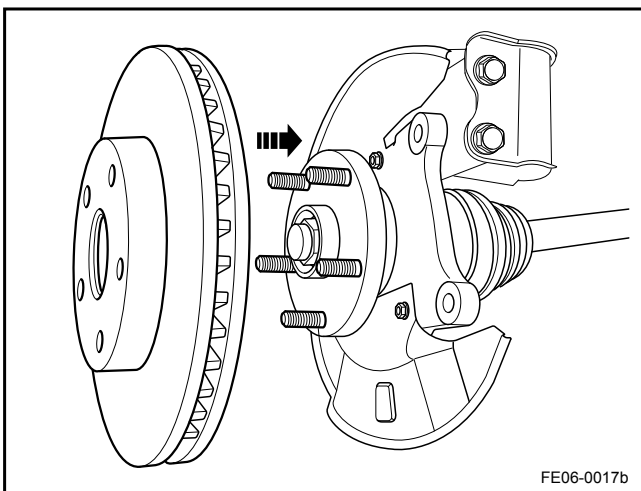
If the run out is more than maximum, firstly change the brake disc and axle installation location so that the brake disc run out is the smallest. if after changing the installation location, the brake disc run out is still bigger than the maximum value, check up the wheel axle bearing gap. if the bearing clearance and wheel axle hub run out is normal, or the brake disc thickness is within the specified limits, grind the brake disc. if the brake disc thickness is less than the minimum, replace the brake disc.

#### Installation Procedure:

1. Align the brake disc and the wheel axle mark, install the brake disc.
2. Install the brake caliper.
3. Install the brake pad.
4. Install the front wheels.
5. Lower the vehicle.

#### Note

The left and right front brake disc replacement is similar.



### 6.2.5.4 Disc Brake Dust Cover Replacement

Removal Procedure:

Warning!

Refer to "Vehicle Lifting Notice" in "Warnings and Notices".

1. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).

Note

In order to maintain wheel balance, before the tire removal, mark the tire relative to the wheel position.

2. Remove the front wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Remove the brake pad. Refer to [6.2.5.1 Brake Pad Replacement - Front](#).

Note

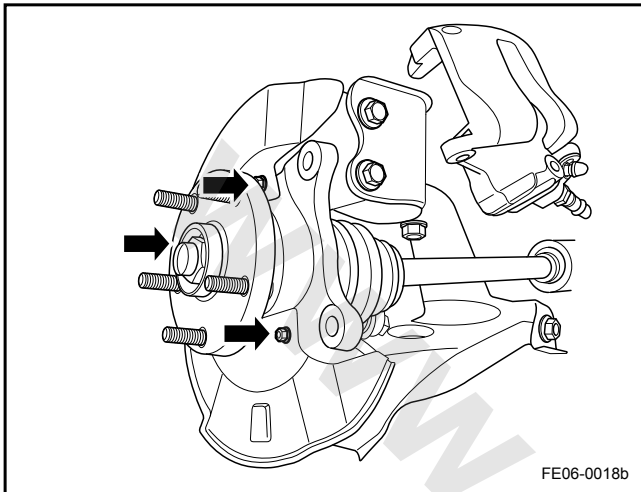
Refer to "Brake Caliper Notice" in "Warnings and Notices".

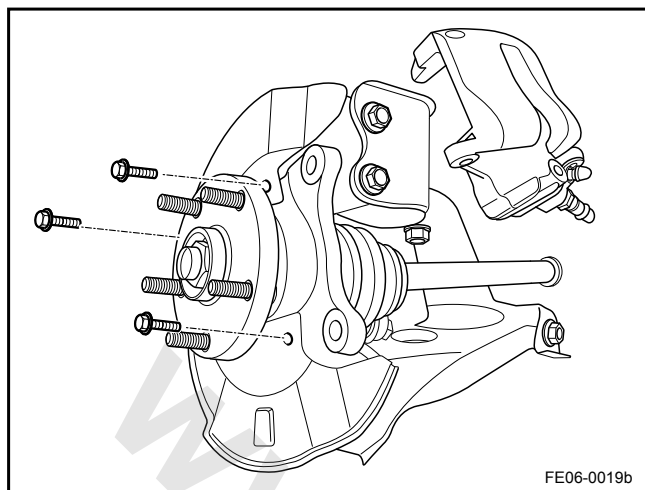
4. Remove the brake caliper. Refer to [6.2.5.2 Brake Caliper Replacement - Front](#).

Note

Remove the brake caliper without having to remove the brake hose. Using a wire to support the brake caliper to avoid damage to the brake hose.

5. Remove the brake disc. Refer to [6.2.5.3 Brake Disc Replacement](#).
6. Remove the disc brake dust cover retaining bolts and remove the disc brake dust cover.



**Installation Procedure:**

1. Install the disc brake dust cover, tighten the retaining bolts.

Torque: 14 Nm (Metric) 10.4 lb-ft (US English)

2. Install the brake disc.
3. Install the brake caliper.
4. Install the brake pad.
5. Install the front wheels.
6. Lower the vehicle.

**Note**

The left and right front disc brake dust cover replacement is similar.

## 6.3 Rear Brake

### 6.3.1 Specifications

#### 6.3.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Brake Hose Bolt	M10 × 15	11-20	8.1-14.8
Brake Caliper Bolts	M8 × 22	25-35	18.5-25.9
Brake Caliper Bracket Bolts	M10 × 23	100-110	74.0-81.4

#### 6.3.1.2 Rear Disc Brake Parts Specifications

Applications	Specifications	
	Metric (mm)	US English (in)
Scrapped Rear Brake Disc Thickness	8.5	0.334
Rear Brake Disc Acceptable Run Out	0.05	0.002
Rear Brake Disc Thickness - New	10	0.390
Rear Brake Pad Standard Thickness	11.0	0.433
Rear Brake Pad Minimum Thickness	2.0	0.078

## 6.3.2 Description and Operation

### 6.3.2.1 Description and Operation

Rear disc brake system components:

Rear disc brake system consists of the following components:

**Brake Pad:** Apply the mechanical output force from the hydraulic brake caliper on the brake disc friction surface.

**Brake Pad Guide:** Installed between the brake pad and brake pad mounting bracket to ensure the brake pads move smoothly and eliminate noise.

**Brake Disk:** Use the disc brake pad mechanical output force on the brake disc surface to slow down the tires and wheels rotation speed, achieve the vehicle braking.

**Brake Caliper:** Receive the braking fluid pressure from the brake master cylinder, converts the fluid pressure to the mechanical output force applying to the brake pad. When the master cylinder returns, enables the brake piston return.

**Brake Caliper to Brake Pad Bracket:** Used to fix the disc brake pad to the brake caliper and maintain the correct brake pad to brake caliper correlation. When the mechanical output force is applied to the brake pad, it makes the brake pad slide.

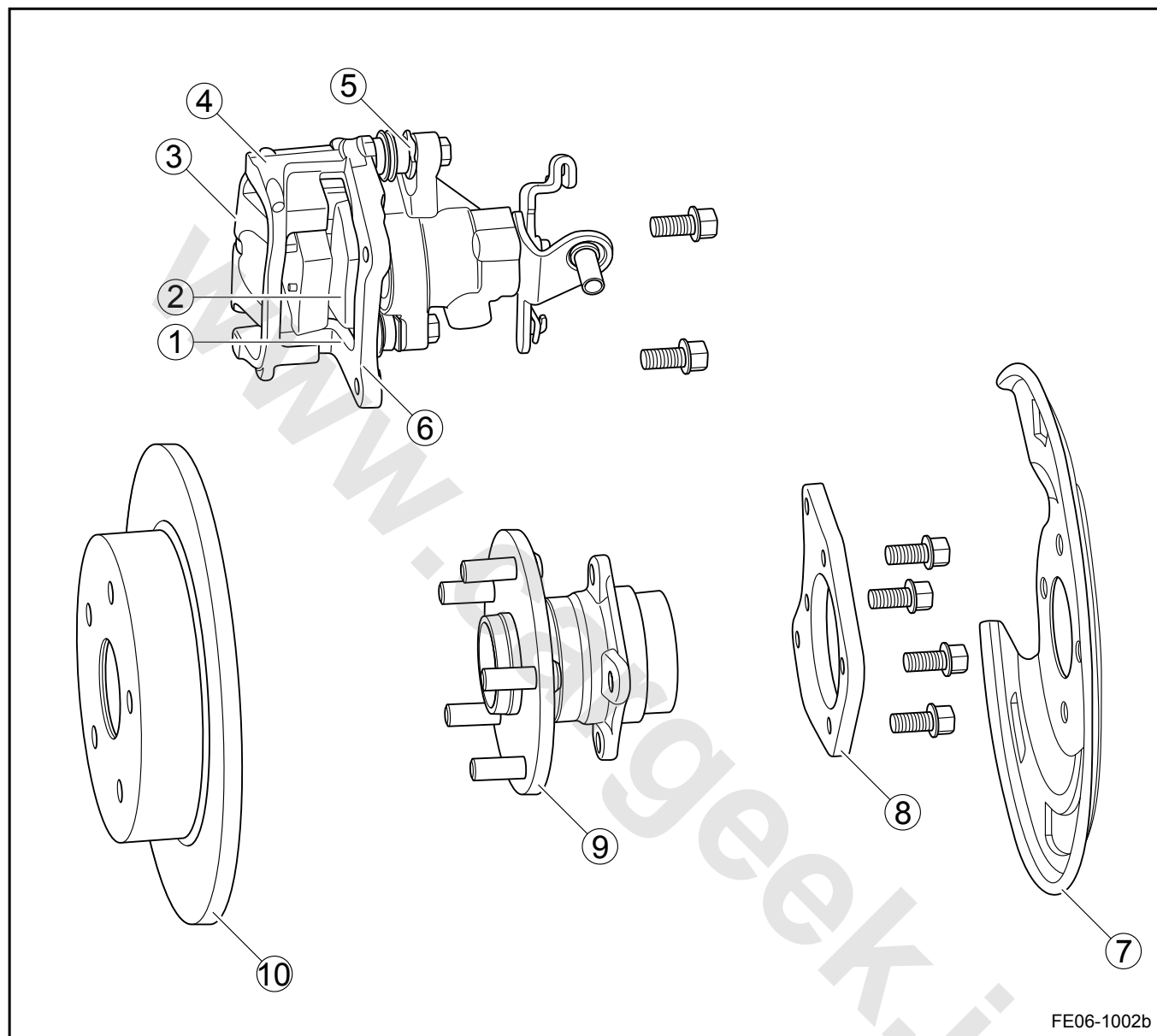
**Floating Disc Brake Caliper Pin:** Used to install the hydraulic brake caliper, and fix the caliper with the brake caliper bracket in place to maintain the with the correct location. When the mechanical output force is applied, it makes the brake caliper slide in relation to the brake pad.

Rear disc brake system operation:

Mechanical output force from the hydraulic brake caliper piston is applied on the brake pads. When the piston pushes the brake pad inward, the brake caliper pulls the outer brake pad inward at the same time. The output is evenly distributed. The brake pad applied the output force to the brake disc friction surface on both sides of the, and thus slows down the tire and wheel assembly speed. Whether the brake pad and the brake caliper are working properly is very important to the braking force distribution.

## 6.3.3 Disassemble View

## 6.3.3.1 Disassemble View



## Legend

- |                                   |                          |
|-----------------------------------|--------------------------|
| 1. Brake Pad Guide                | 7. Disc Brake Dust Cover |
| 2. Brake Pad                      | 8. Flange                |
| 3. Brake Caliper                  | 9. Wheel Assembly        |
| 4. Brake Caliper Mounting Bracket | 10. Brake Disc           |
| 5. Floating Pin Dust Cover        |                          |
| 6. Brake Caliper Mounting Bracket |                          |

### 6.3.4 Diagnostic Information and Procedures

#### 6.3.4.1 Diagnostic Information and Procedures

For rear brake Diagnostic Information and Procedures, please refer to [6.2.4 Diagnostic Information and Procedures](#).

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### 6.3.5 Removal and Installation

#### 6.3.5.1 Brake Pad Replacement - Rear

Removal Procedure:

Warning!

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

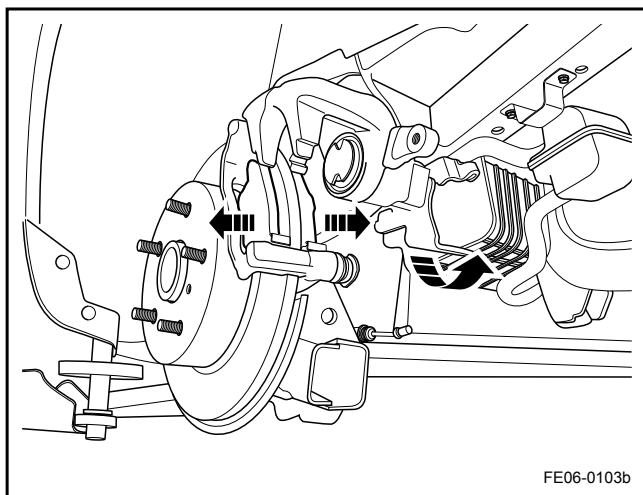
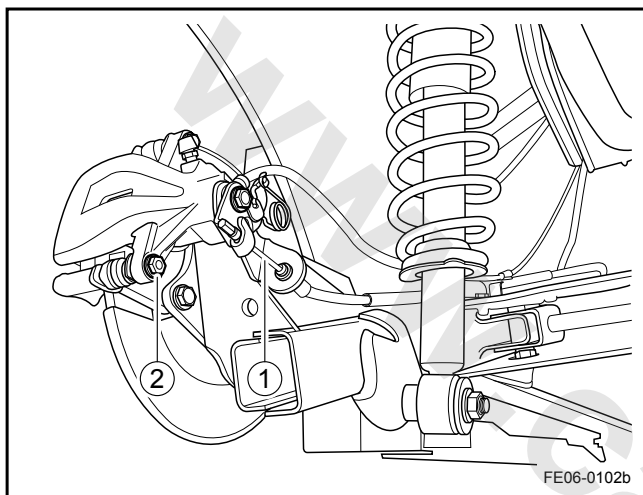
Refer to "Brake Dust Warning" in "Warnings and Notices".

1. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).

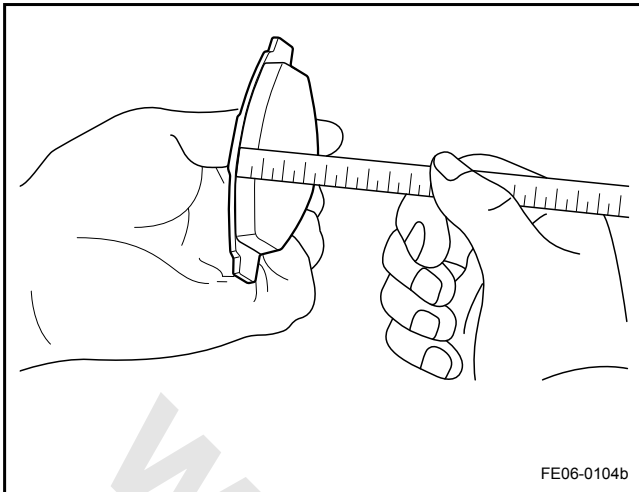
Note

In order to maintain wheel balance, before the tire removal, mark the wheel to the wheel relative position.

2. Remove the rear wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Disconnect the park brake from the rear caliper. Refer to [6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement](#).
4. Remove the rear brake caliper lower assembly bolts (2).
5. Flip the brake caliper upward.
6. Remove the rear brake pad.







7. Check the brake pad thickness.

Standard Thickness: 11.0 mm (0.433 in)

Minimum Thickness: 2.0 mm (0.078 in)

If the rear brake pad lining thickness is less than minimum, replace the rear brake pad.

#### Note

After replacing with new brake lining block, check the rear brake disc wear.

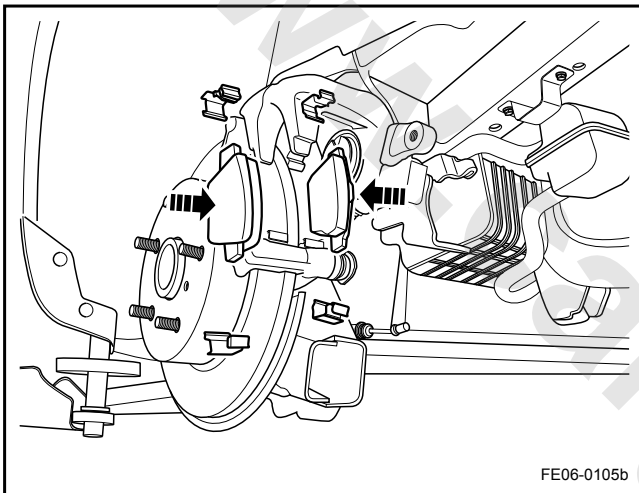
#### Installation Procedure:

1. Check the rear brake pad lining thickness.

#### Note

Brake caliper piston gap should face the level direction.

2. Install the brake pad into the caliper.



3. Where necessary, use a suitable tool to push the piston.

#### Note

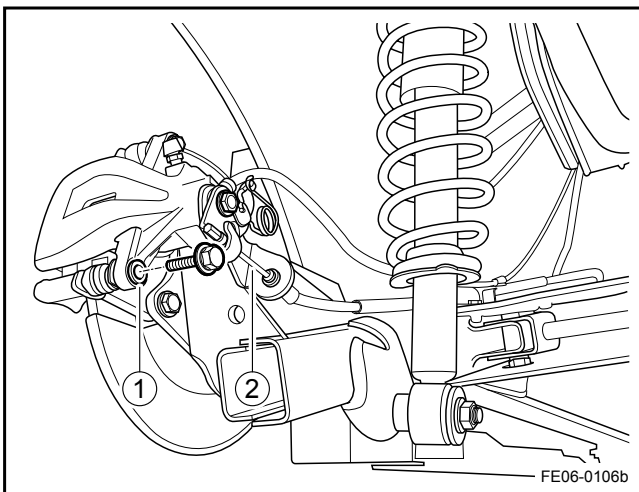
Carefully pull down the brake caliper assembly and install the bolts, do not to damage the piston dust seals.

4. Pull down the brake caliper and install the assembly bolt (1).

Torque: 30 Nm (Metric) 22.2 lb-ft (US English)

#### Note

Refer to "Fastener Notice" in "Warnings and Notices".



5. Install the park brake cable (2).
6. Align the marks made during the wheel removal, install the rear wheels.

7. Lower the vehicle.

#### Note

Left and right rear brake pad replacement is similar.

### 6.3.5.2 Brake Caliper Replacement - Rear

#### Removal Procedure:

#### Warning!

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".

1. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).

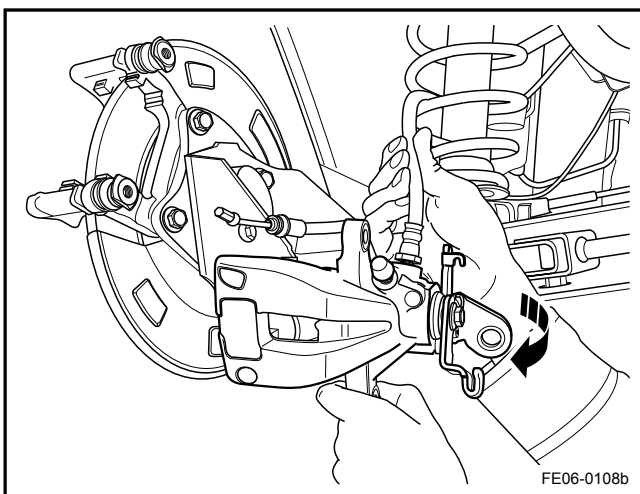
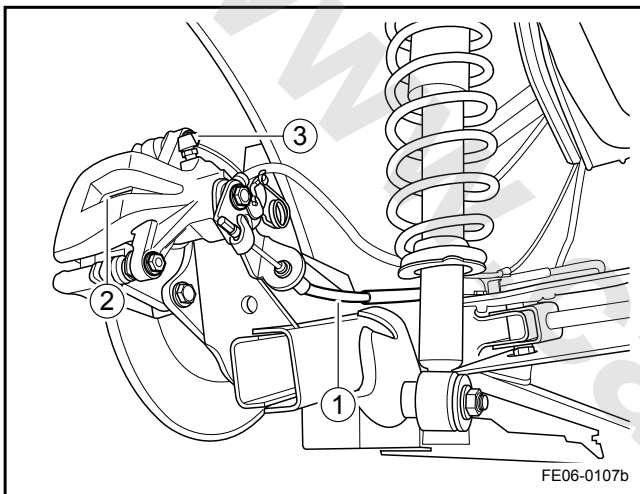
#### Note

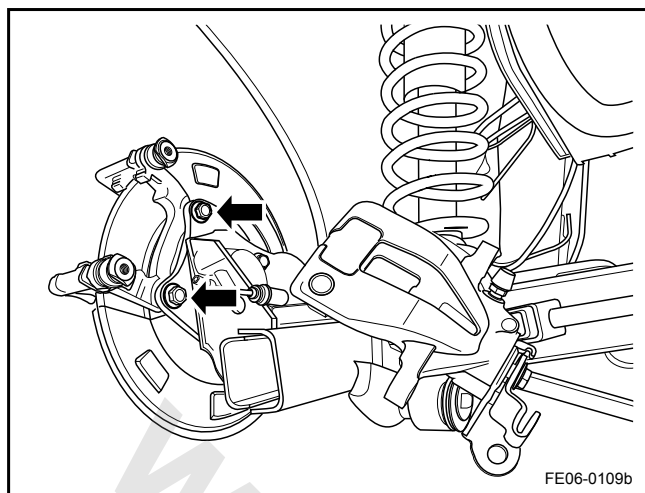
In order to maintain wheel balance, before the tire removal, mark the wheel to the wheel relative position.

2. Remove the rear wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Disconnect the park brake cable from the rear calipers. Refer to [6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement](#).
4. Remove the brake pad (2). Refer to [6.3.5.1 Brake Pad Replacement - Rear](#).
5. Remove the brake caliper upper assembly bolts, remove the brake caliper (3).
6. Remove the brake hose inlet retaining bolts, remove the brake caliper. Plug the brake caliper inlet and the brake hose, to prevent the brake fluid loss or contamination.

#### Note

Rotate to remove the brake caliper, separate the brake hose inlet bolt from the brake caliper fluid inlet to prevent damage to the brake hose.





7. Remove the brake caliper bracket.

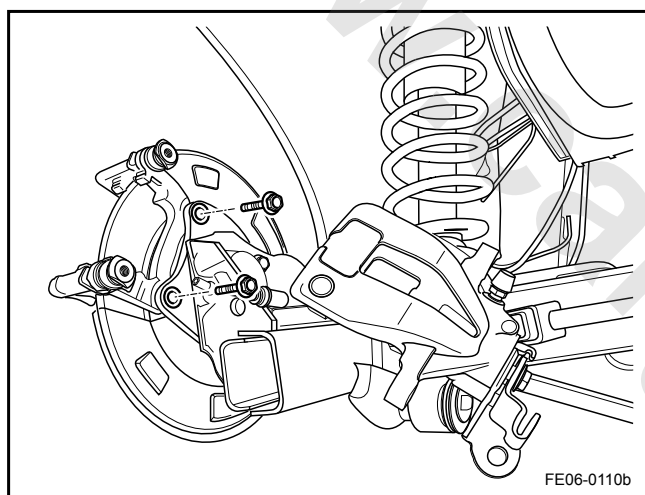
Installation Procedure:

**Warning!**

Refer to "Fastener Notice" in "Warnings and Notices".

1. Install the brake caliper bracket.

Torque: 105 Nm (Metric) 77.7 lb-ft (US English)

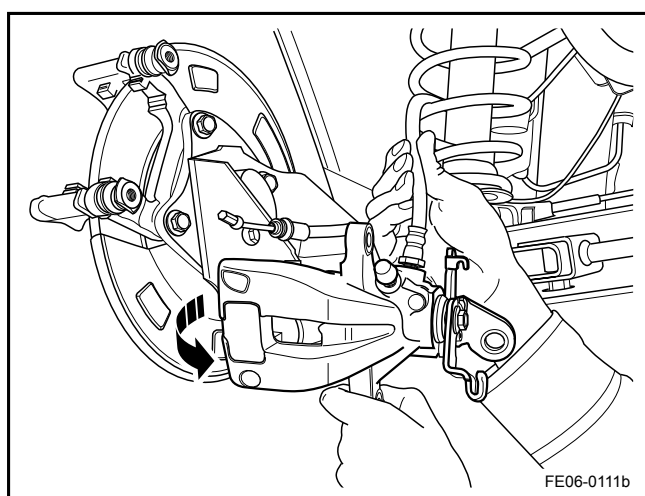


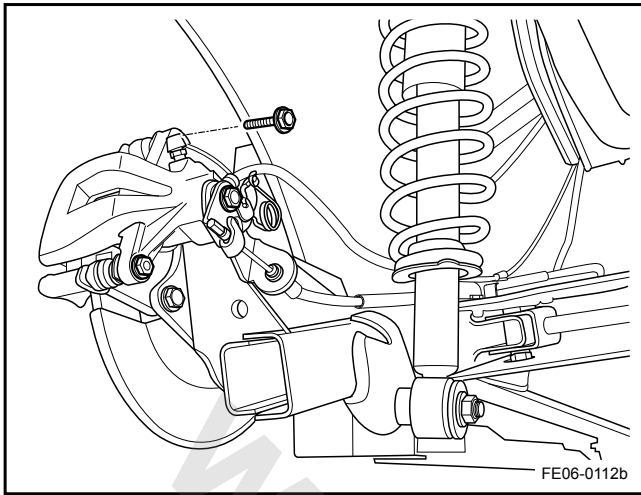
2. Install the brake caliper brake hose inlet bolt.

Torque: 16 Nm (Metric) 11.8 lb-ft (US English)

**Note**

Rotate to install the brake caliper, install the brake hose inlet bolt to the brake caliper inlet to prevent damage to the brake hose.





3. Install the brake caliper and tighten the brake caliper upper assembly bolts.  
Torque: 30 Nm (Metric) 22.2 lb-ft (US English)
4. Install the brake pad.
5. Install the park brake cable.
6. Install the rear wheels.
7. Lower the vehicle.
8. Add clean brake fluid to the master cylinder tank to the correct level.
9. Bleed air in the brake system. Refer to [6.4.5.5 Hydraulic Brake System Exhaust Procedure](#).

#### Note

Left and right rear brake caliper replacement is similar.

### 6.3.5.3 Brake Disc Replacement - Rear

Removal Procedure:

#### Warning!

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

1. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).

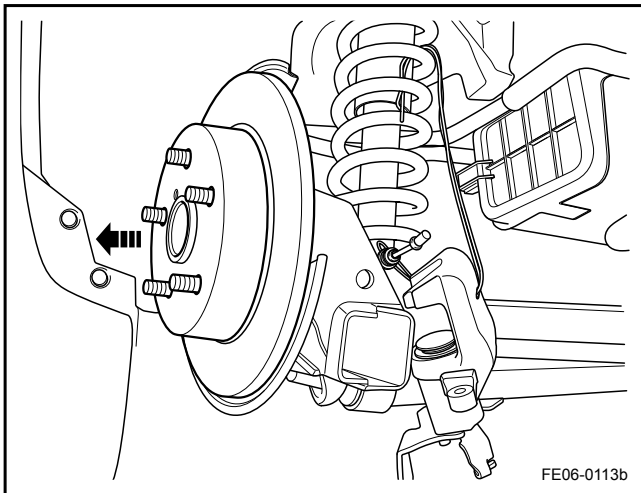
#### Note

In order to maintain wheel balance, before the tire removal, mark the wheel to the wheel relative position.

2. Remove the rear wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Disconnect the park brake cable from the rear calipers. Refer to [6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement](#).
4. Remove the brake pad. Refer to [6.3.5.1 Brake Pad Replacement - Rear](#).

#### Note

Refer to "Brake Caliper Notice" in "Warnings and Notices".



5. Remove the brake caliper. Refer to [6.3.5.2 Brake Caliper Replacement - Rear](#).

**Note**

Remove the brake caliper without having to remove the brake hose. Use a wire to support the brake caliper to avoid damage to the brake hose.

6. Remove the brake disc.

**Note**

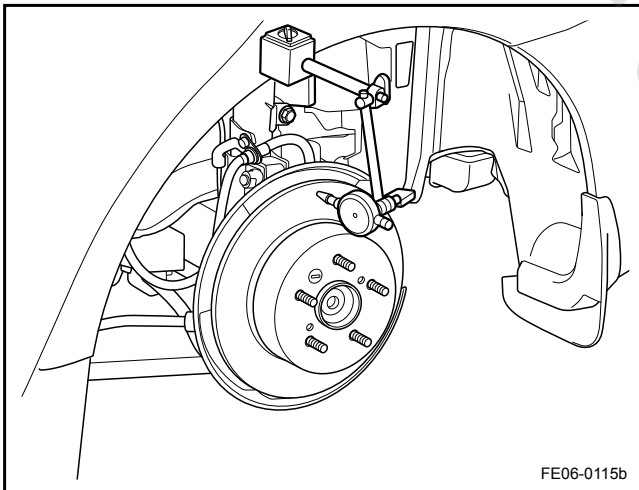
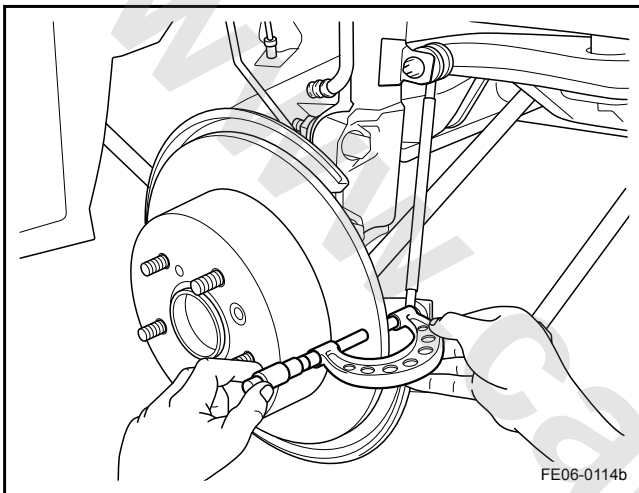
Mark on the brake disc and wheel axle.

7. Check the brake disc thickness.

Standard Thickness: 10.0 mm (0.390 in)

Minimum Thickness: 8.5 mm (0.334 in)

If the brake disc thickness is less than minimum, replace the rear brake disc.



8. Check the brake disc run out.

- Install the brake disc.

- Use a special tools and wheel nut to tighten the brake disc.

Torque: 110 Nm (Metric) 81.4 lb-ft (US English)

- Use the dial indicator to measure the brake disc run out on the brake disc 10 mm (0.39 in) from the outer edge.

The largest brake disc run out: 0.05 mm (0.002 in)

#### Note

##### If the brake disc

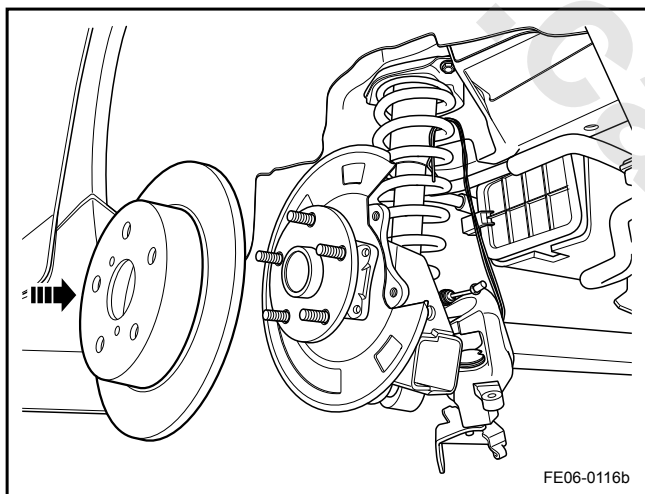
If the run out is more than maximum, firstly change the brake disc and axle installation location so that the brake disc run out is the smallest. If after changing the installation location, the brake disc run out is still bigger than the maximum value, check up the wheel axle bearing gap. If the bearing clearance and wheel axle hub run out is normal, or the brake disc thickness is within the specified limits, grind the brake disc. If the brake disc thickness is less than the minimum, replace the brake disc.

#### Installation Procedure:

1. Align the brake disc and wheel axle with the mark, install the brake disc.
2. Install the brake caliper.
3. Install the brake pad.
4. Install the park brake cable.
5. Install the rear wheels.
6. Lower the vehicle.

#### Note

Left and right rear brake disc replacement is similar.



## 6.4 Hydraulic Brake

### 6.4.1 Specifications

#### 6.4.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Brake Master Cylinder Retaining Nut	M8	20-30	14.8-22.2
Brake Master Cylinder Tube Connecting Nut	M10	11-21	8.1-15.5
Brake Hose Connecting Nut	M10	11-21	8.1-15.5
Vacuum Booster U-shape Clip Locking Nut	M10	15-25	11.1-18.5
Vacuum Booster Retaining Nut	M8	20-25	14.8-18.5
Clutch / Brake Pedal Assembly Lower Retaining Bolt	M8 × 16	20-25	14.8-18.5
Clutch / Brake Pedal Assembly Upper Retaining Bolt	M8 × 15	20-25	14.8-18.5
Clutch / Brake Pedal Assembly Retaining Nut	M8	16-26	11.8-19.2
Pedal Installation Screw	M10 × 130	30-40	22.2-29.6
Pedal Installation Nut	M10	30-40	22.2-29.6

## 6.4.2 Description and Operation

### 6.4.2.1 Description and Operation

Hydraulic braking system includes the following components:

**Brake Pedal:** Receives, amplifies and transmits braking system input from the driver.

**Brake Pedal Putter:** Transmits amplified brake pedal input force into the vacuum booster.

**Vacuum Booster:** Braking system input force is amplified through the brake pedal and passed to the vacuum booster, boosted by the vacuum brake booster and then transmitted to the master cylinder. Vacuum booster boosts the braking force by vacuum to help reduce the driver braking effort.

**Vacuum Hose:** Used for transmission of the vacuum booster required vacuum source.

**Brake Master Cylinder Tank:** Filled with the hydraulic brake fluid used by the system.

**Brake Master Cylinder:** Converts the mechanical input to hydraulic output pressure. Hydraulic pressure from the master cylinder output assigned to the two hydraulic fluid channels, providing braking fluid pressure to diagonal wheels.

**Hard brake pipe and brake hose:** Pass brake fluid flow to hydraulic brake system components.

**Brake Wheel Cylinder:** Converts the hydraulic input pressure to mechanical output force.

#### System Operation

The mechanical force from the brake pedal is converted to fluid pressure by the master cylinder, through the hydraulic electronic control unit (ie HECU) , and through the brake pipes and hoses transferred to the braking cylinder. Brake Cylinder then converts the hydraulic pressure to the mechanical force. So the brake pad presses the brake disc to achieve the vehicle braking.

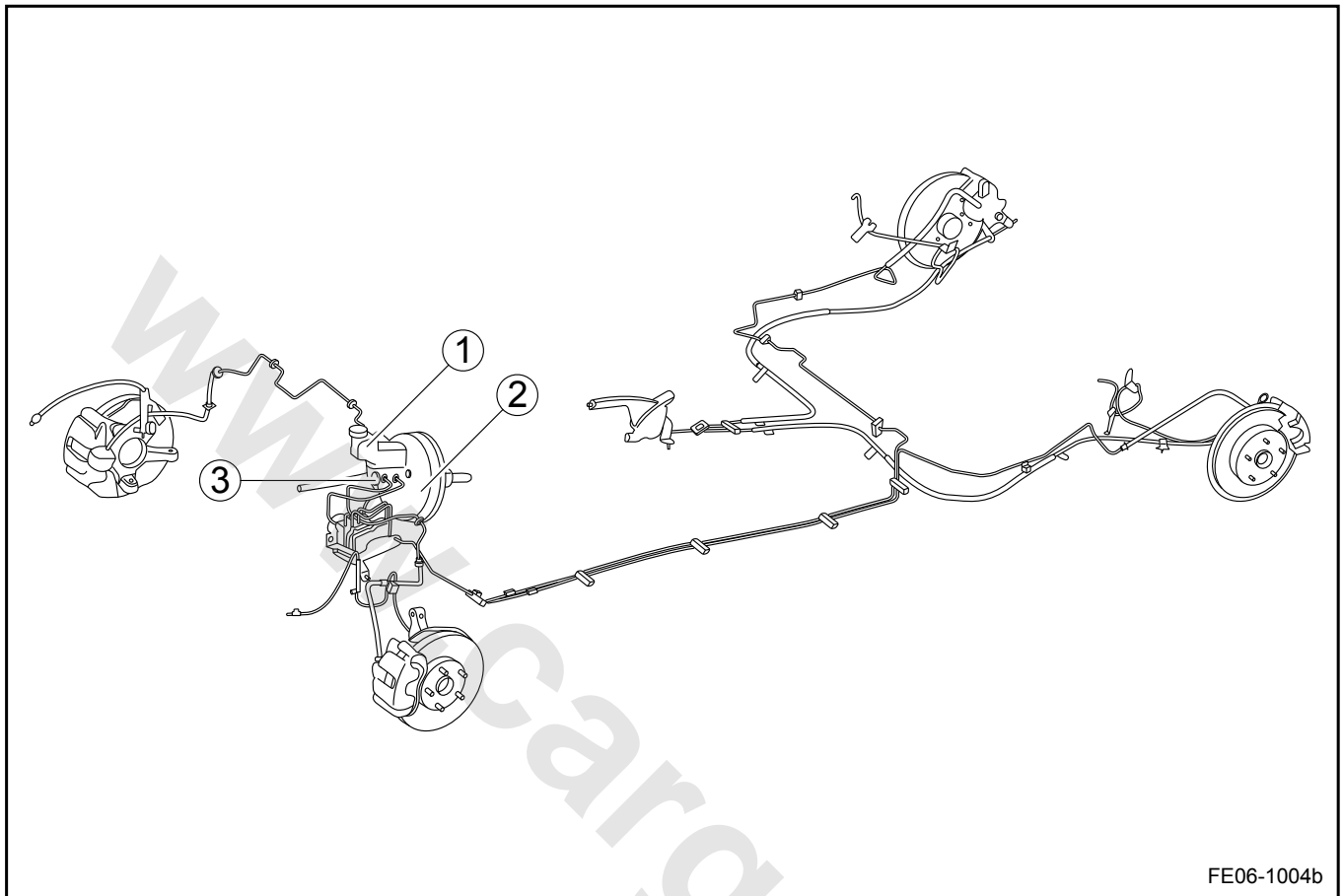
#### Brake Fluid Level Low Warning Lamp

Instrument cluster detects the low brake fluid level (signal circuit low voltage), and lights up the brake fluid level low warning lamp.



### 6.4.3 Component Locator

#### 6.4.3.1 Component Locator



#### Legend

- |                               |                          |
|-------------------------------|--------------------------|
| 1. Brake Master Cylinder Tank | 3. Brake Master Cylinder |
| 2. Vacuum Booster             |                          |

## 6.4.4 Diagnostic Information and Procedures

### 6.4.4.1 Diagnostic Notes

1. Be careful when replacing various components, it may affect the brake system performance and lead to driving danger. Use Geely genuine parts.
2. When servicing the brake system, keeping venues and parts clean is very important.
3. If brake fluid leakage is found, must disassemble components. If any unusual circumstance is found, replace with new components.
4. When removing brake components, wrap brake pipe joints to prevent dust, dirt and other impurities entering into the pipe.
5. When removing or installing brake pipes, do not damage or deform the brake pipes.
6. When installing brake pipes or brake hose, make sure do not distort or bend.
7. Brake hose must be away from the shock absorber oil, grease and so on.
8. After installing brake hardware, the pipes and brake hoses should not interfere with other components.
9. Do not let brake fluid adhere to the surface of the body such as painting. If the brake fluid leaks to the paint surface, promptly remove it.

### 6.4.4.2 Fault Symptom Table

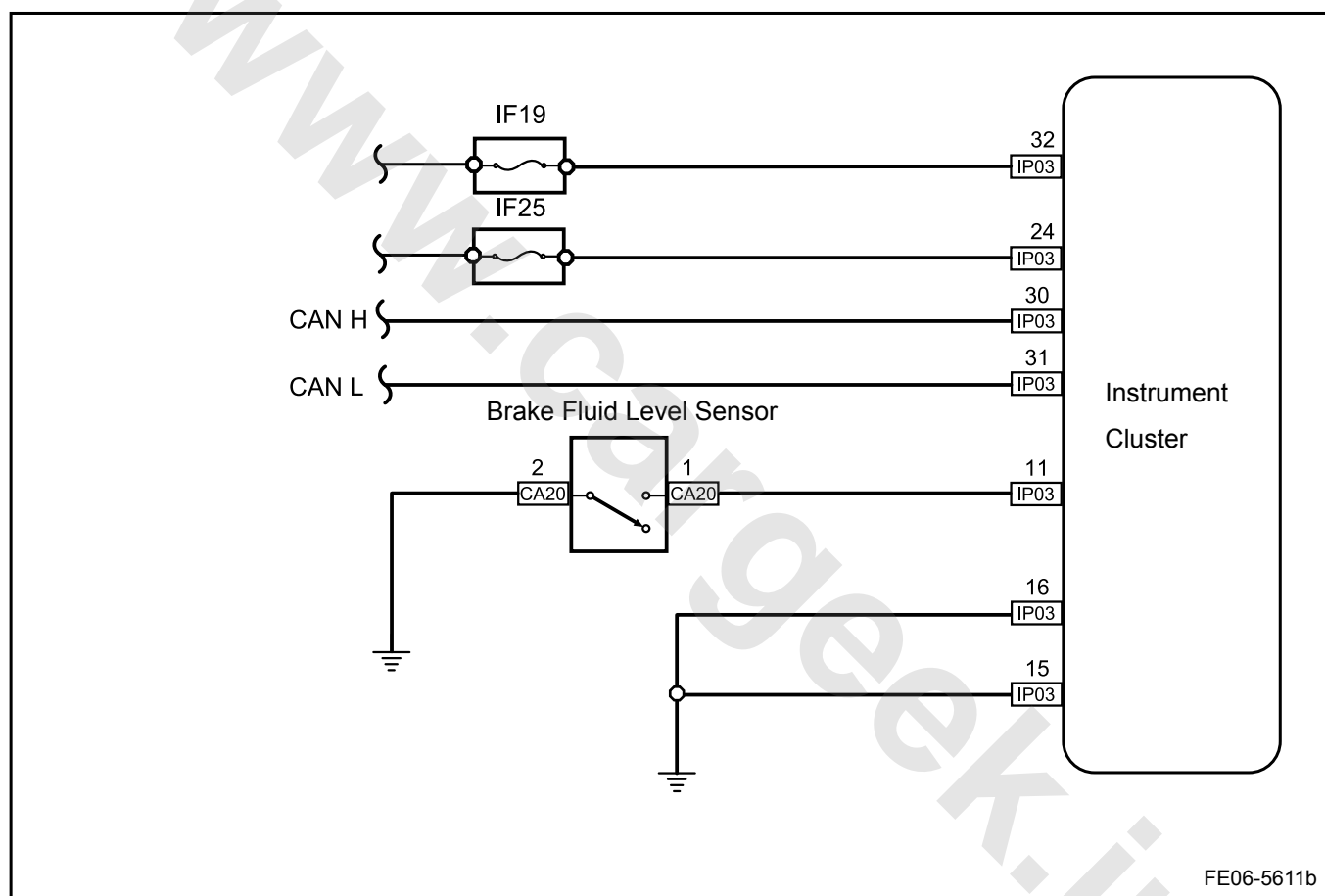
Symptoms	Suspected Parts	Measures / Refer to
Brake Warning Lamp Always On	1. Brake Surface	Refer to <a href="#">6.4.4.3 Brake Warning Lamp Always On</a>
	2. Brake Fluid Level Sensor	Refer to <a href="#">6.4.4.3 Brake Warning Lamp Always On</a>
	3. Brake Fluid Level Sensor Wiring Harness	Refer to <a href="#">6.4.4.3 Brake Warning Lamp Always On</a>
Brake System Noise	1. Brake Pads (Broken, Twisted, Dirty, Smooth)	Refer to the front and rear brake Diagnostic Information and Procedures in the <a href="#">6.2.4.1 Brake Pad Inspection</a>
	2. Brake caliper bracket bolts (Loose)	Check the brake caliper bracket bolts
	3. Brake caliper bolts (Loose)	Check the brake caliper bolts
	4. Brake disc (Front)	Refer to <a href="#">6.2.4.5 Brake Disc Surface and Worn Inspection</a>
	5. Brake Disc Guide (Loose)	Refer to the front and rear brake Diagnostic Information and Procedures in the <a href="#">6.2.4.3 Brake Guide Inspection</a>
	6. Brake Caliper Floating Pin (Worn)	Refer to the front and rear brake Diagnostic Information and Procedures in the <a href="#">6.2.4.4 Floating Brake Caliper Pin Inspection</a>
Brake Deviation	1. Piston (Fixed, and Block)	Refer to the front and rear brake Diagnostic Information and Procedures in the <a href="#">6.2.4.2 Brake Caliper Inspection</a>

Symptoms	Suspected Parts	Measures / Refer to
	2. Brake Disc	Refer to the front and rear brake Diagnostic Information and Procedures in the <a href="#">6.2.4.5 Brake Disc Surface and Worn Inspection</a>
	3. Brake Pad (Rupture, Distort or Grease)	Refer to the front and rear brake Diagnostic Information and Procedures in the <a href="#">6.2.4.1 Brake Pad Inspection</a>
	4 Brake Pipe, Hose (Distortion, Deformation)	Check the brake pipe, hose
Brake Pedal Too Hard	1. Hydraulic brake booster system (Vacuum Leaks, Ineffective)	Check the hydraulic vacuum booster
	2. Brake pipe, Hose (Distortion, Deformation)	Check the brake pipe, hose.
brake and brake pedal too soft	1. Brake System Brake Fluid Leak	Check for brake fluid leak.
Brake and Brake Pedal Too Soft	2. Air in the brake system	Refer to Removal and Installation <a href="#">6.4.5.5 Hydraulic Brake System Exhaust Procedure</a>
	3. Brake Disc	Refer to the front and rear brake Diagnostic Information and Procedures in the <a href="#">6.2.4.5 Brake Disc Surface and Worn Inspection</a>
	4. brake pads (broken, twisted, excessive wear or oil stains)	Refer to the front and rear brake Diagnostic Information and Procedures in the <a href="#">6.2.4.1 Brake Pad Inspection</a>
	5 Brake Master Cylinder (Internal Leakage)	Check the brake master cylinder.
Braking Lag	1. Brake Pedal Free Travel Too Short	Refer to Removal and installation <a href="#">6.4.5.8 Brake Pedal Replacement</a>
	2. Brake Rod Travel (Can not adjust)	Refer to the Parking System Removal and Installation <a href="#">6.5.5.4 Park Brake Control Mechanism Adjustment</a>
	3. Front Park Brake Cable (Stuck)	Refer to <a href="#">6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement</a>
	4. Left and Right Park Brake Cable (Stuck)	Refer to <a href="#">6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement</a>
	5. Brake Lining Block (Catching)	Refer to the front and rear brake Diagnostic Information and Procedures in the <a href="#">6.2.4.1 Brake Pad Inspection</a>

Symptoms	Suspected Parts	Measures / Refer to
	6. Piston (Fixed, Catching)	Refer to the front and rear brake Diagnostic Information and Procedures in the <a href="#">6.2.4.2 Brake Caliper Inspection</a>
	7. Vacuum Booster Catching	Check the vacuum booster.
	8. Brake Master Cylinder (Malfunction)	Check the brake master cylinder.

#### 6.4.4.3 Brake Warning Lamp Always On

Schematic:



Diagnostic Steps:

Step 1	Check the brake fluid surface.
<div style="text-align: right;">(a) Check whether the brake fluid surface is normal.</div> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 2px 10px;">Fill the brake fluid to the MAX</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">Yes</div>	
Step 2	Check the wiring harness (instrument cluster - power, ground).

## Instrument Cluster Harness Connector IP03

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE09-5105b

- Turn the ignition switch to OFF.
- Disconnect the battery negative cable.
- Disconnect the instrument cluster connector IP03.
- Connect the battery negative cable.
- Turn the ignition switch to ON (IG).
- Measure voltage between connector IP03 terminals No. 24,32 and the body ground with a multimeter.  
Standard Voltage: 11-14 V
- Turn the ignition switch to OFF.
- Measure voltage between connector IP03 terminals No. 15,16 and the body ground with a multimeter.  
Standard Resistance: Less than 1  $\Omega$

Is the voltage specified value?

No

Check the fuses, repair or replace the wiring harness.

Yes

Step 3 Check the brake fluid level sensor.

- Disconnect the brake fluid level sensor wiring harness connector.
- Measure resistance between the brake fluid level sensor two terminals with a multimeter.  
Standard Resistance: 10 k $\Omega$  or higher

Is the resistance specified value?

No

Replace the brake fluid liquid level sensor.  
Refer to [6.4.5.7 Brake Fluid Level Sensor Replacement](#)

Yes

Step 4 Check the brake fluid level sensor wiring harness.

## Instrument Cluster Harness Connector IP03

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE06-5609b

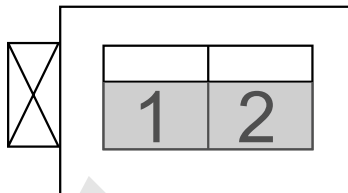
- Disconnect the instrument cluster harness connector IP03.
- Measure resistance between IP03 terminal No.11 and CA20 terminal No.1 with a multimeter.
- Measure resistance between CA20 terminal No.2 and the body ground with a multimeter.  
Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

No

Repair or replace the wiring harness.

Brake Fluid Level Sensor Harness Connector CA20



FE06-5608b

Yes

Step 5	Replace the instrument cluster.
--------	---------------------------------

- (a) Replace the instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#).
- (b) Confirm the repair is completed.

Next

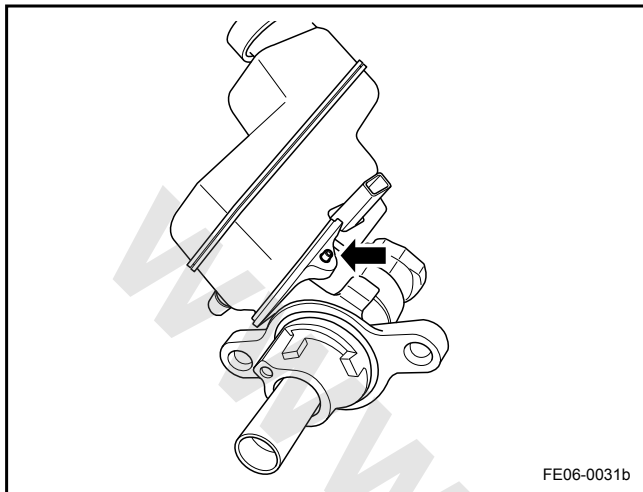
Step 6	System normal.
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### 6.4.5 Removal and Installation

#### 6.4.5.1 Brake Master Cylinder Tank Replacement

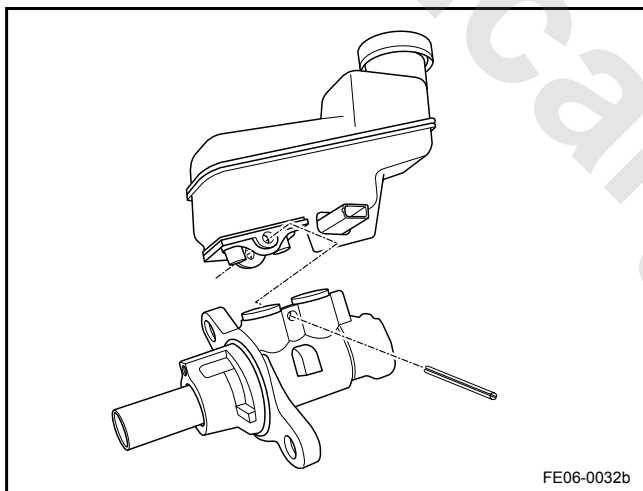
Removal Procedure:

1. Remove the brake master cylinder. Refer to [6.4.5.2 Brake Master Cylinder Replacement](#).
2. Remove the brake master cylinder and the tank connecting pin. From the brake master cylinder tank remove and replace the seals.



Installation Procedure:

1. Apply clean brake fluid to lubricate tank seals.
2. Install the lubricated seal into the brake master cylinder.
3. Install the tank to the brake master cylinder and install the connecting pin.
4. Install the brake master cylinder with the tank.

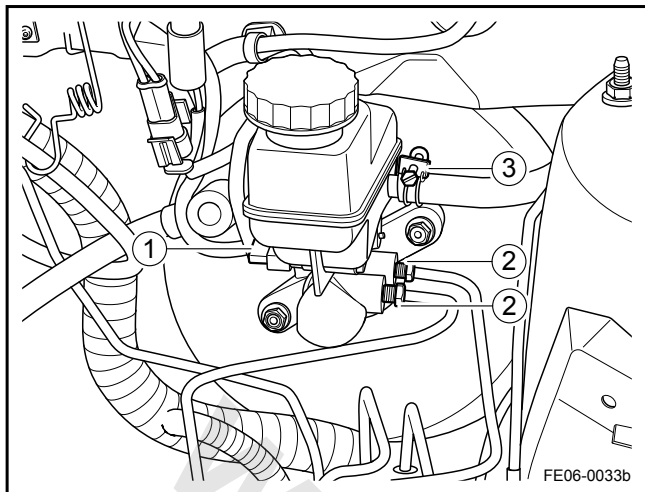


#### 6.4.5.2 Brake Master Cylinder Replacement

Removal Procedure:

**Warning!**

Refer to 'Battery Disconnect Warning' in "Warnings and Notices".



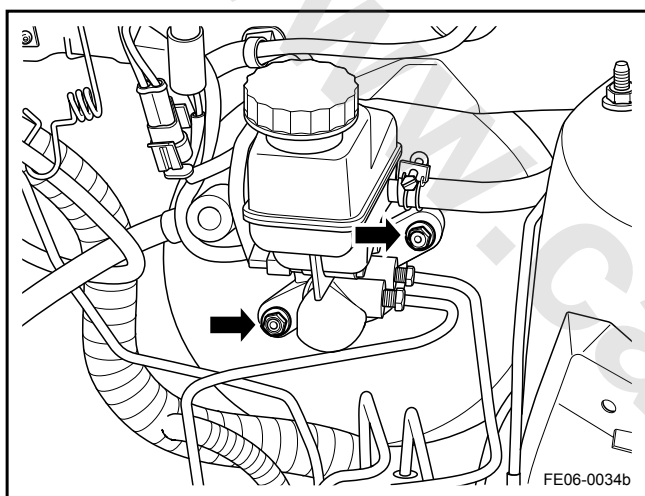
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).

2. Drain the brake fluid.

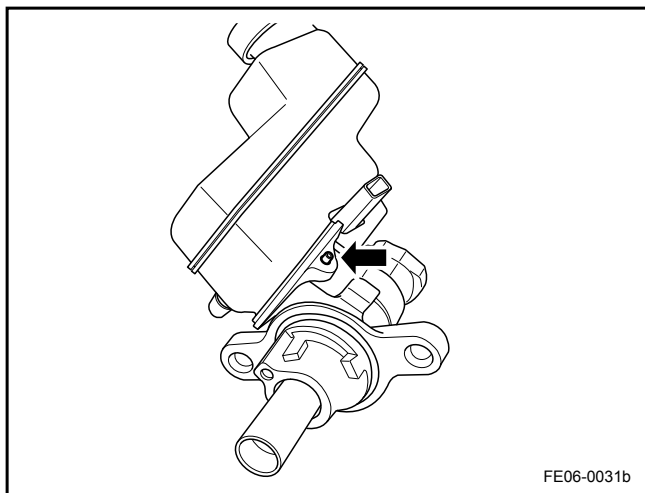
#### Note

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".

3. Disconnect the brake fluid level sensor wiring harness connector (1), and remove the brake pipe connector nut (2).
4. Loosen clutch master cylinder to the tank hose clip (3), and pull the hose from the tank.



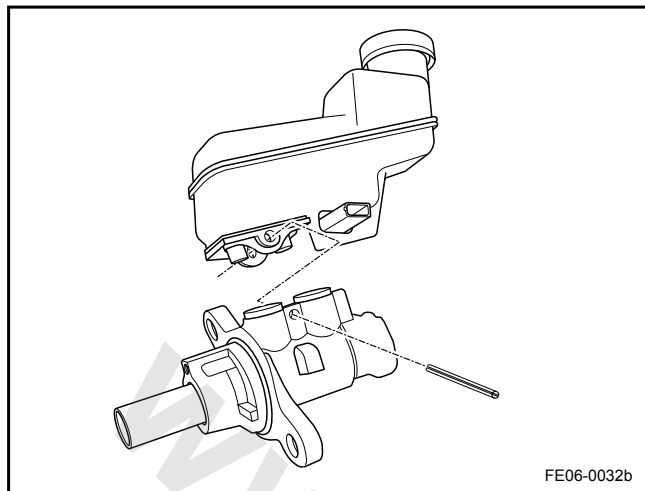
5. Plug the brake pipe openings to prevent brake fluid loss and contamination.
6. Remove the brake master cylinder retaining nuts.
7. Remove the brake master cylinder with the tank, place the brake master cylinder on a clean table.



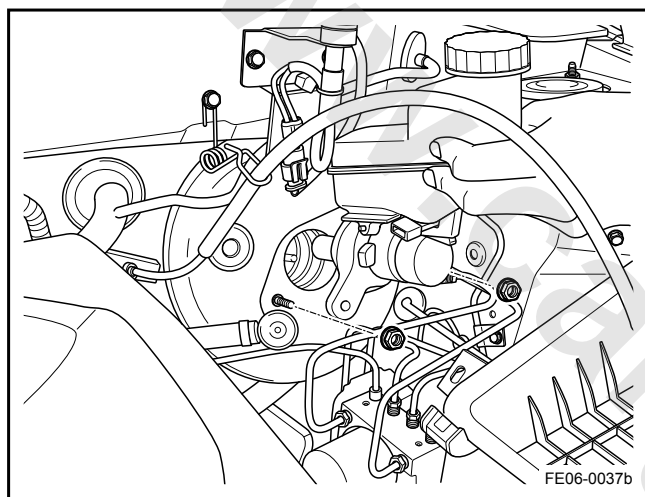
8. Remove the tank and the brake master cylinder connection pin, separate the tank and the brake master cylinder.
9. Remove the brake master cylinder.



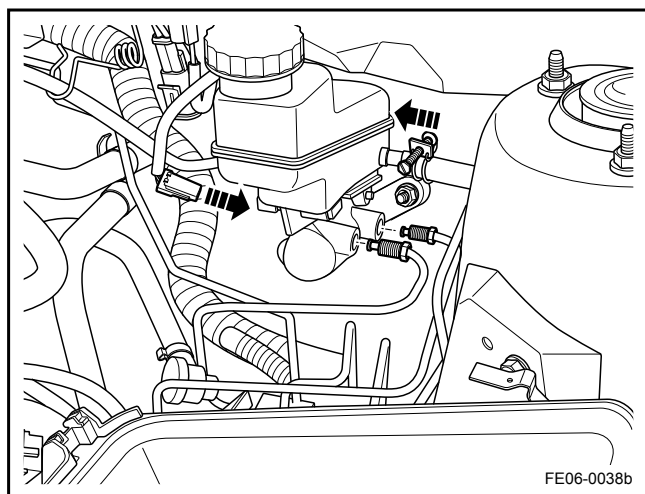
## Installation Procedure:



1. Install the brake master cylinder to the tank connecting pin.



2. Install the brake master cylinder with the tank into the vacuum booster.
3. Tighten the brake master cylinder retaining nuts.  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)



4. Connect the brake fluid level sensor harness connector, fix with the clutch master cylinder hose to the tank, tighten the brake pipe connecting nut.  
Torque: 16 Nm (Metric) 11.9 lb-ft (US English)

5. Add brake fluid.

**Note**

Refer to "Adding Fluid to the Brake System Notice" in "Warnings and Notices".

6. Bleed air in the brake system. Refer to [6.4.5.5 Hydraulic Brake System Exhaust Procedure](#).
7. Bleed air in the clutch system. Refer to [3.2.6.3 Hydraulic Clutch Bleeding](#).
8. Check for leaks.
9. Re-examine the brake fluid.

10. Connect the battery negative cable.

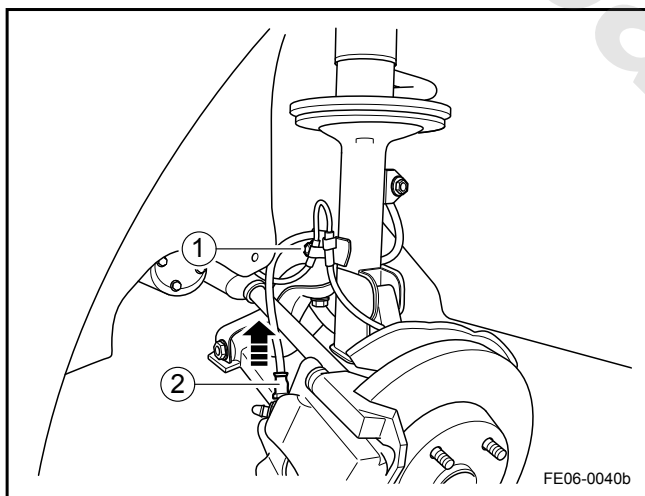
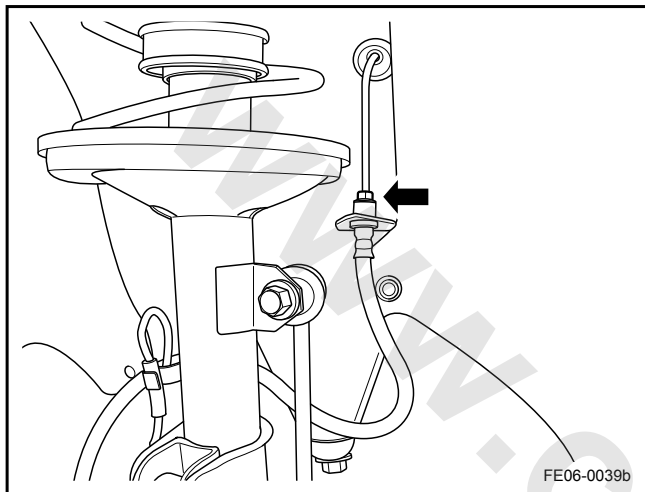
### 6.4.5.3 Brake Hose Replacement (Front)

Removal Procedure:

#### Note

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".

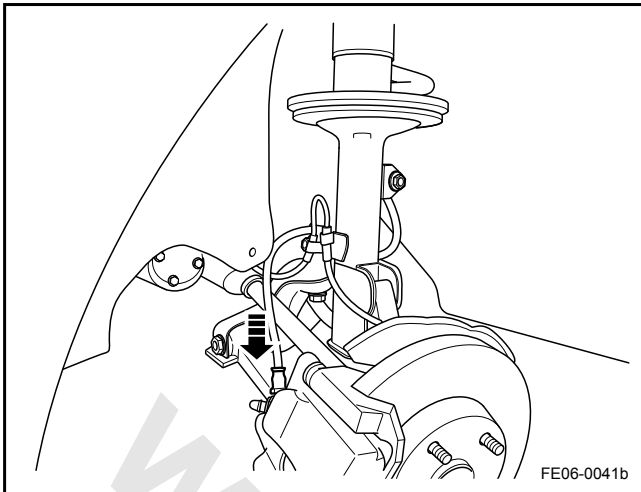
1. Drain the brake fluid.
2. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).
3. Remove the front wheels. Refer to [4.4.5.1 Wheel Replacement](#).
4. Remove the brake hose and brake pipe connecting bolts, pull out the spring, and remove the brake hose from the bracket.
5. Remove the brake hose bolts (1), disconnect the brake hose from the shock absorber, remove the brake hose to the brake cylinder connecting bolt (2).
6. Remove the front brake hose.



Installation Procedure:

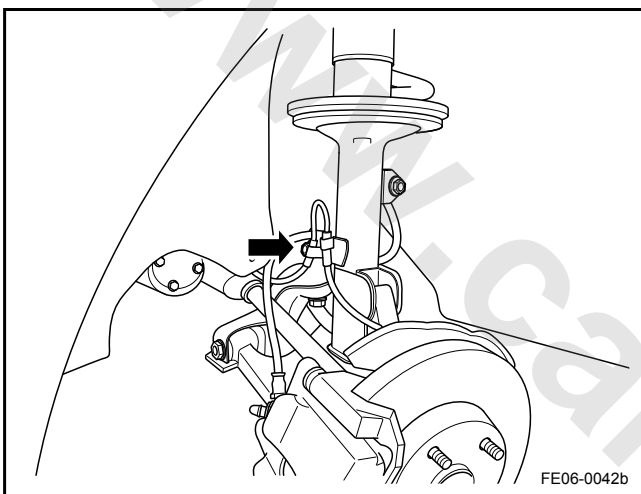
#### Warning!

Refer to "Brake Pipe Replacement Warning" in "Warnings and Notices".

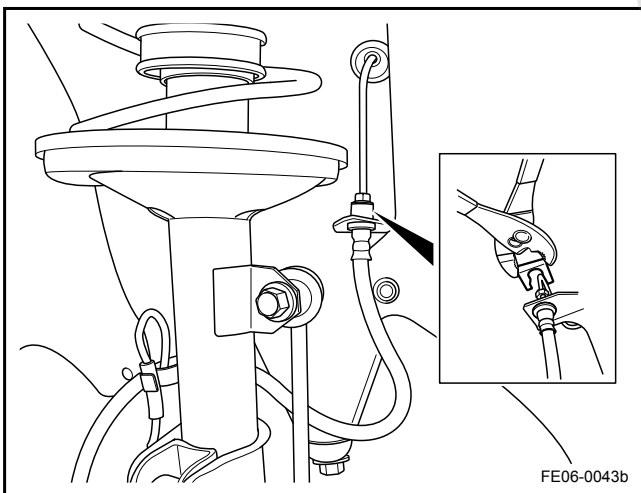


1. Install the brake hose to the brake cylinder and tighten the bolts.

Torque: 16 Nm (Metric) 11.9 lb-ft (US English)



2. Fix the brake hose.



3. Connect the brake hose and the brake pipe and tighten the bolt, install the spring.

Torque: 16 Nm (Metric) 11.9 lb-ft (US English)

4. Install the wheels.

#### Note

Refer to "Adding Fluid to the Brake System Notice" in "Warnings and Notices".

5. Fill the brake fluid.

6. Check fluid leak.

#### Note

Front left and right brake hose replacement is similar.

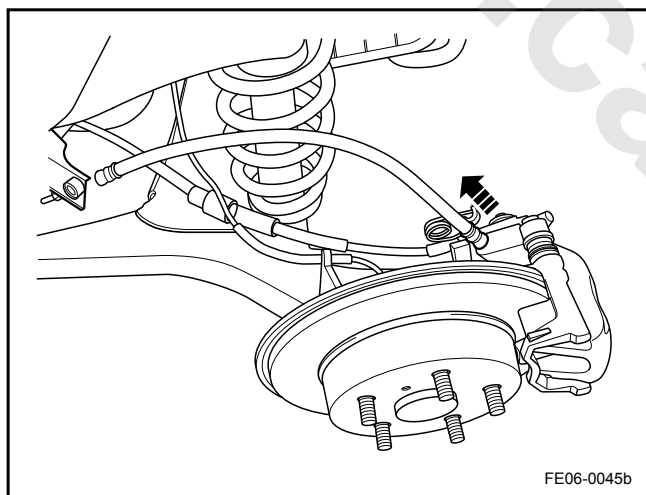
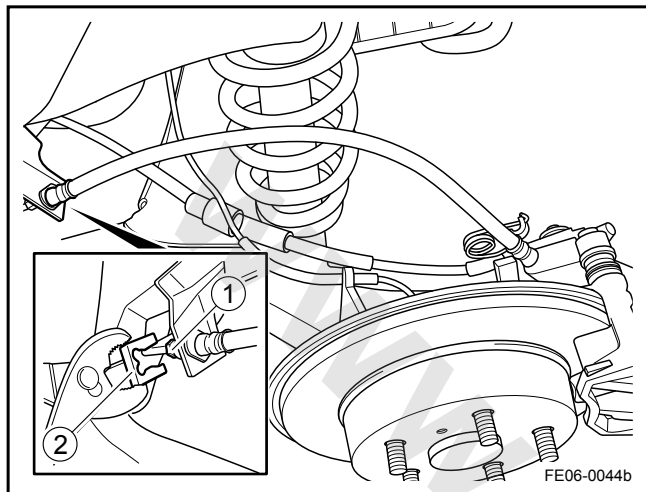
### 6.4.5.4 Brake Hose Replacement (Rear)

Removal Procedure:

Note

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice in ""Warnings and Notices".

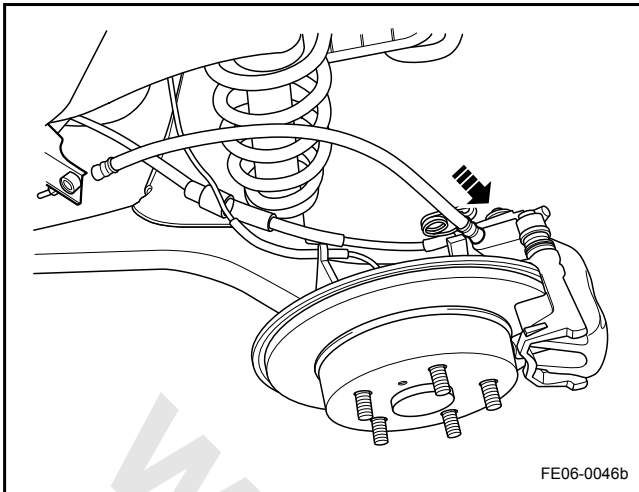
1. Drain the brake fluid.
2. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).
3. Remove the rear wheels, taking into account [4.4.5.1 Wheel Replacement](#).
4. Remove the bolts, separate the brake pipe and brake hose (1).
5. Pull out the spring, pull out brake hose (2) from the bracket.
6. Remove the bolts, disconnect the the brake hose from the rear brake slave cylinder.
7. Remove the rear brake hose.



Installation Procedure:

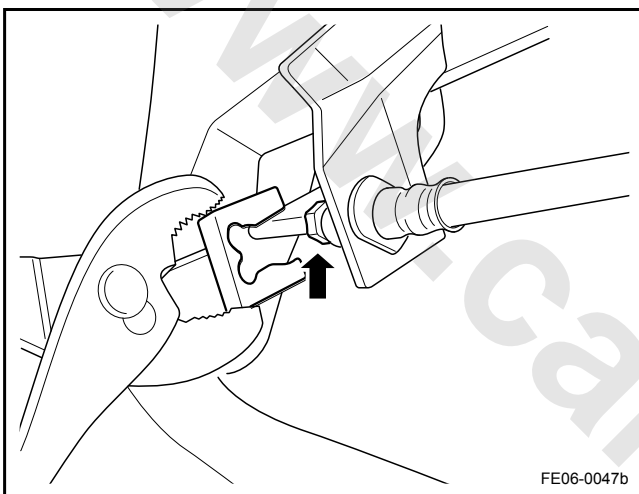
Warning!

Refer to "Brake Pipe Replacement Warning" in "Warnings and Notices".



1. Install the brake hose to the rear brake cylinder and tighten the bolts.

Torque: 16 Nm (Metric) 11.9 lb-ft (US English)



2. Connect the brake hoses and the brake pipe and tighten the bolts, install the spring.
3. Install the wheels.

#### Note

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".

4. Fill the brake fluid.
5. Check brake fluid leak.

#### Note

Rear brake left and right brake hose replacement is similar.

### 6.4.5.5 Hydraulic Brake System Exhaust Procedure

#### Note

Refer to "Adding Fluid to the Brake System Notice" in "Warnings and Notices".

#### Note

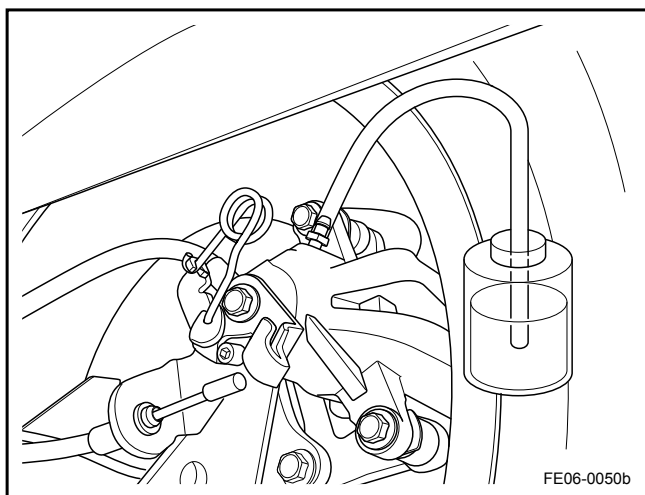
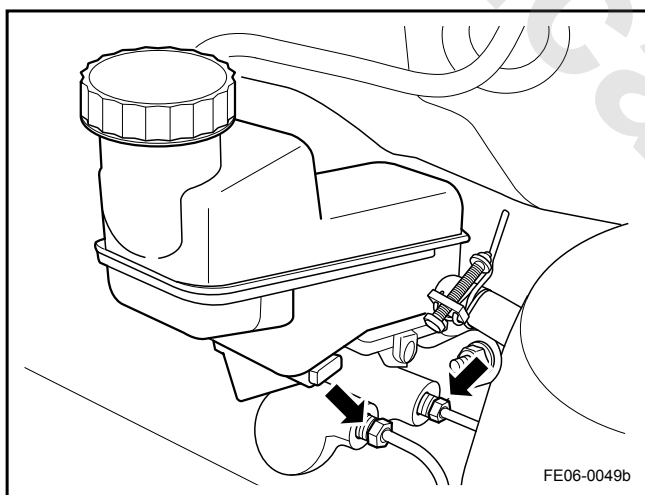
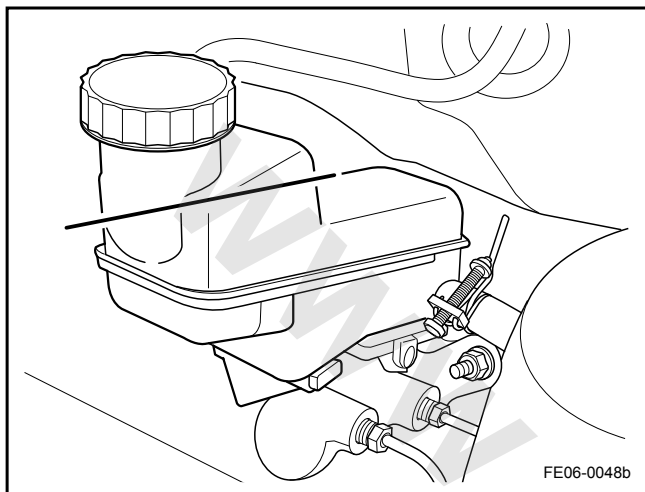
Air can not be discharged in hydraulic brake regulator manually. If the air enters the ABS hydraulic brake regulator or the installed ABS hydraulic brake adjuster is not fully filled with fluid, using a scan tool to exhaust brake system air. The factory ABS hydraulic brake adjuster is fully filled with fluid, and air is exhausted. In the normal service regulator procedure, the air will not enter the ABS hydraulic brake regulator, in this case, carry out the manual exhaust program.

**Note**

If it is not suspected that air enters the master cylinder, start from step 5. Otherwise, start from step 2.

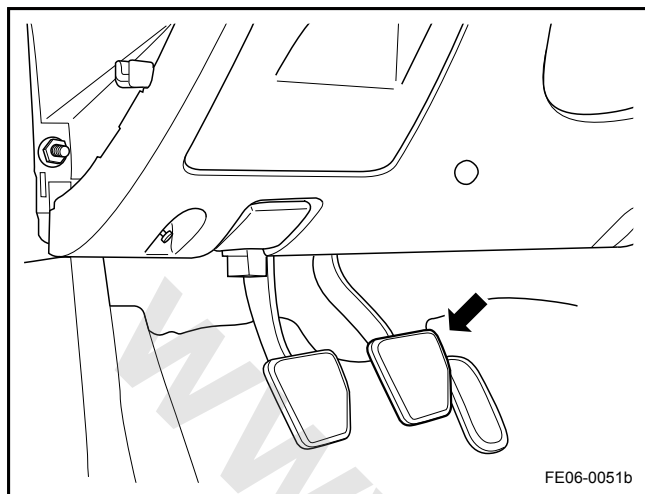
**Note**

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".

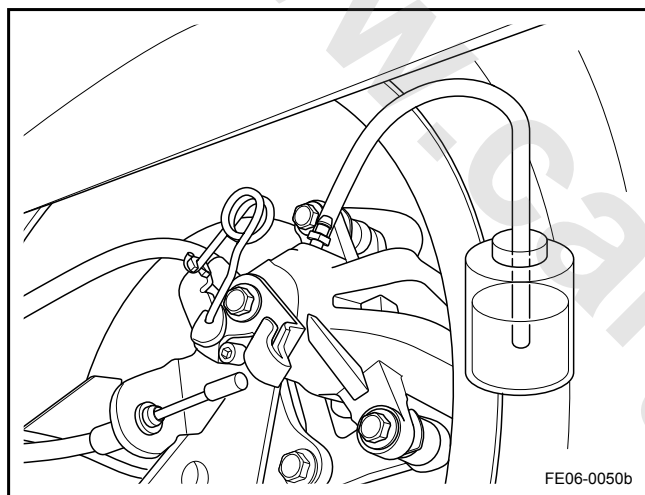


1. Shut down the engine, press the brake pedal several times until the completely eliminate the booster pressure.
2. Fill the brake fluid to the master cylinder tank. in the exhaust operations, leave the master cylinder tank fluid level at least more than half.
3. Slowly press the brake pedal to the end, and hold the position.
4. Loosen one brake master cylinder pipe, tighten the connection when the brake fluid flows out.  
Torque: 16 Nm (Metric) 11.9 lb-ft (US English)
5. Loosen the other brake master cylinder pipe, tighten the connection when the brake fluid flows out.  
Torque: 16 Nm (Metric) 11.9 lb-ft (US English)
6. Repeat steps 2 to step 5 three to four times.
7. Remove the air discharge screw dust cover, connect a transparent tube to the right rear brake caliper air discharge screw. The tube is immersed in a transparent

container with brake fluid inside. Discharge the right rear brake caliper air according to the following steps.



8. Slowly press the brake pedal, do not press the brake pedal abruptly.



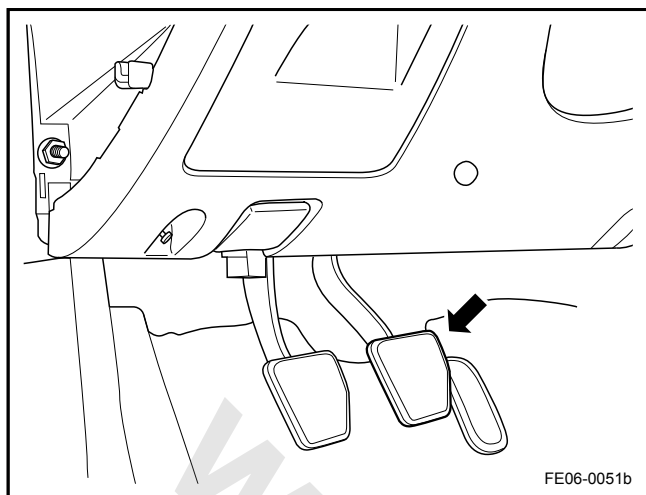
9. Press the brake pedal, at the same time, loosen the air discharge screw, exhaust the air in the brake caliper.
10. When bubbles emerge in the brake fluid container, slightly tighten the air discharge screw.
11. Slowly release the brake pedal.
12. Wait for 20 s, repeat steps 6-9 until all the air is discharged.
13. Loosen the air discharge screw, if the bubble no longer appears in the container, this indicates that the air has been fully discharged.

#### Note

In the exhaust process, leave the master cylinder tank fluid level at least more than half.

14. Tighten the air discharge screw.

Torque: 6.5 Nm (Metric) 4.8 lb-ft (US English)



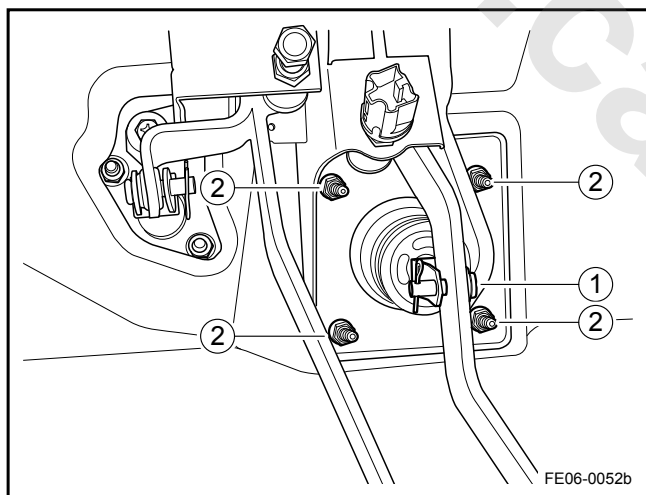
15. Discharge air in sequence of the left front, left rear and right front brake caliper. Follow the steps 5-12.
16. After discharging all the brake caliper air, check whether the brake pedal is soft and whether the pedal has no resistance at all. repeat the entire discharge process, until the pedal is normal.

#### 6.4.5.6 Vacuum Booster Replacement

Removal Procedure:

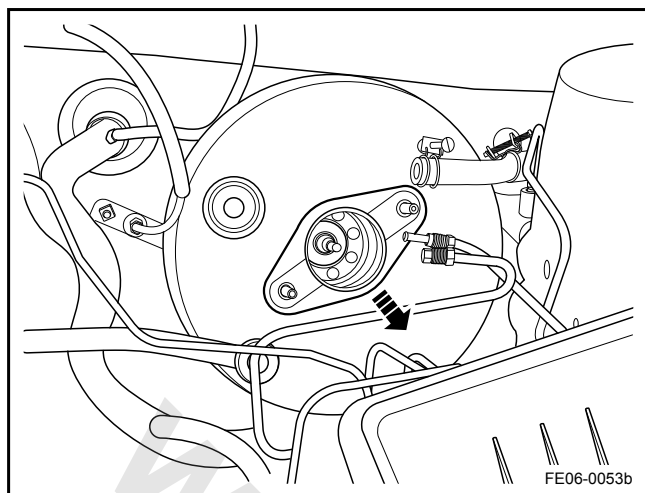
**Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

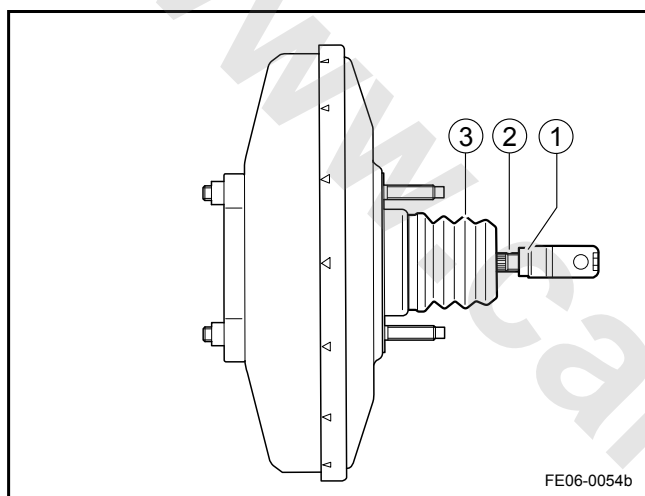


1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the brake fluid tank and the brake master cylinder assembly. Refer to [6.4.5.2 Brake Master Cylinder Replacement](#).
3. Remove the vacuum hose.
4. Remove the Instrument panel lower left panel. Refer to [12.8.3.1 Instrument Panel Replacement](#).
5. Separate the vacuum booster rod U-shape clip and the brake pedal.
6. Remove the clutch / brake pedal assembly retaining nuts (2).





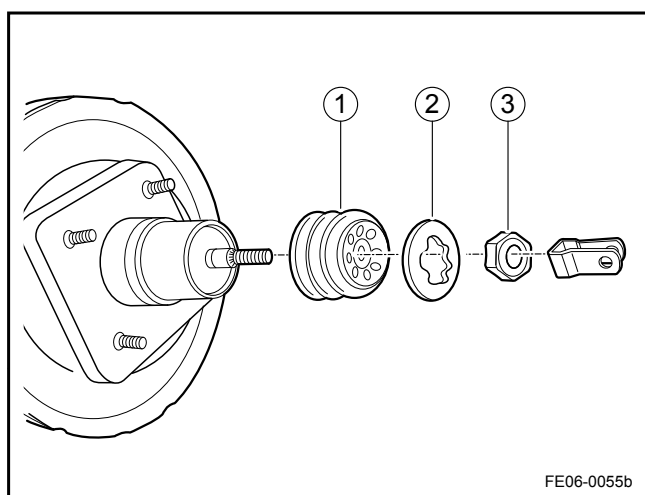
7. Remove the vacuum booster.



8. Release the connecting rod U-shape clip locking nut, remove the U-shape clip and the locking nut (1).
9. Remove the spring clip (2).
10. Remove the rubber sleeve and gasket (3).

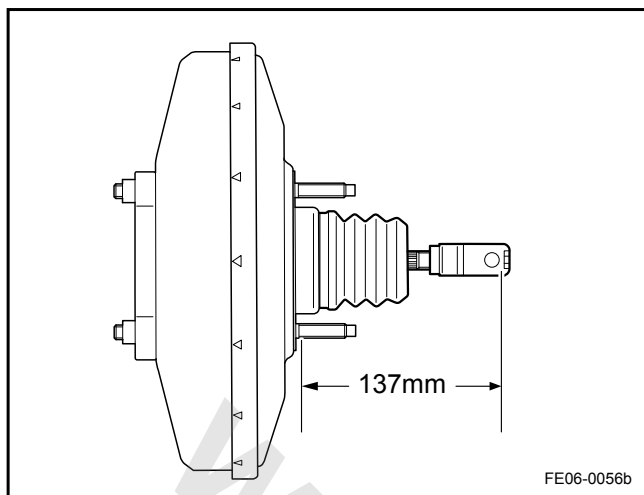
#### Note

If the rubber sleeve is damaged or aging, replace it and the gasket.



#### Installation Procedure:

1. Install a new gasket, install the rubber sleeve to the booster rod.
2. Install the spring clip (2).
3. Install the U-shape clip and the U-shape rod locking nut, and tighten the nut 3.

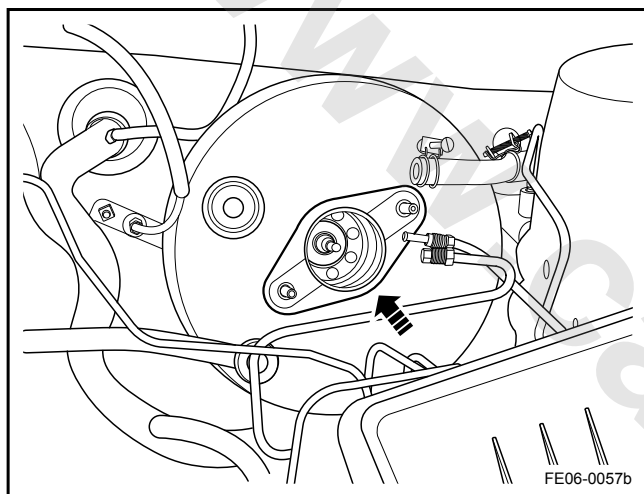


4. Adjust the U-shape rod clip travel.

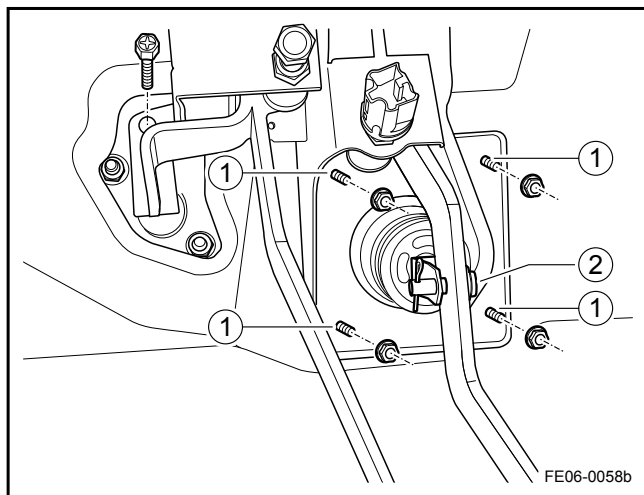
U-shape rod clip and the booster rear end distance: 137 mm (5.39 in).

5. Tighten the U-shape clip lock nut.

Torque: 20 Nm (Metric) 14.8 lb-ft (US English)



6. Install the vacuum booster.



7. Tighten the clutch / brake pedal assembly retaining nuts (1).

Torque: 23 Nm (Metric) 17.0 lb-ft (US English)

8. Connect the vacuum booster U-shape rod clip and the brake pedal (2).

9. Install the Instrument panel lower left panel.

10. Install the vacuum hose.

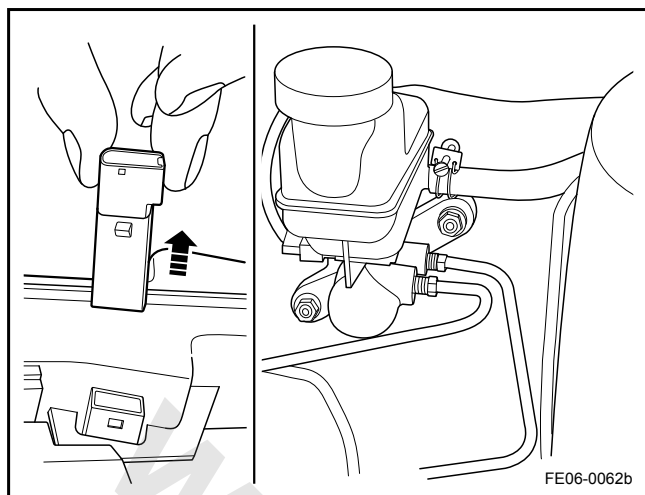
11. Install the brake fluid tank and the brake master cylinder assembly.

#### 6.4.5.7 Brake Fluid Level Sensor Replacement

Removal Procedure:

**Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



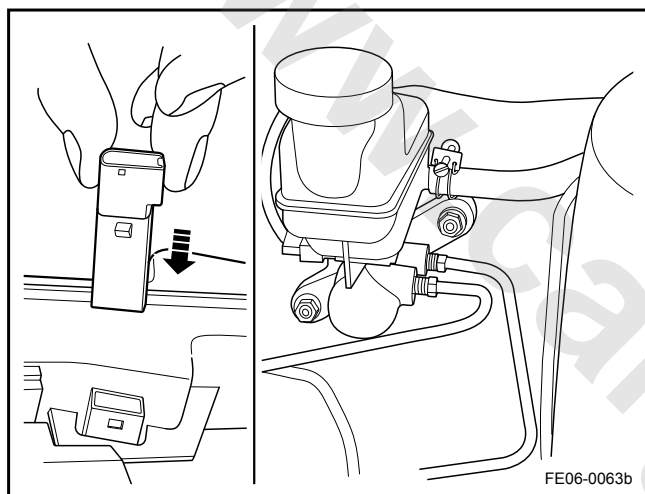
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect the brake fluid level sensor wiring harness connector.
3. Remove the brake fluid level sensor from the brake fluid tank bottom.

**Note**

No need to discharge brake fluid.

**Installation Procedure:**

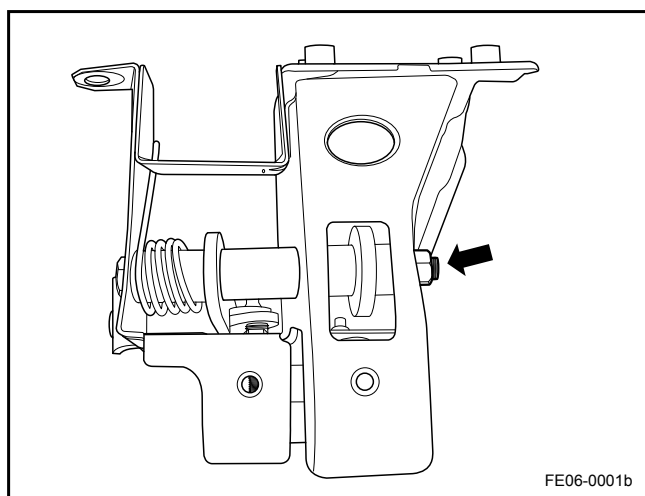
1. Install the brake fluid level sensor to the tank.
2. Connect the brake fluid level sensor wiring harness connector.
3. Connect the battery negative cable.

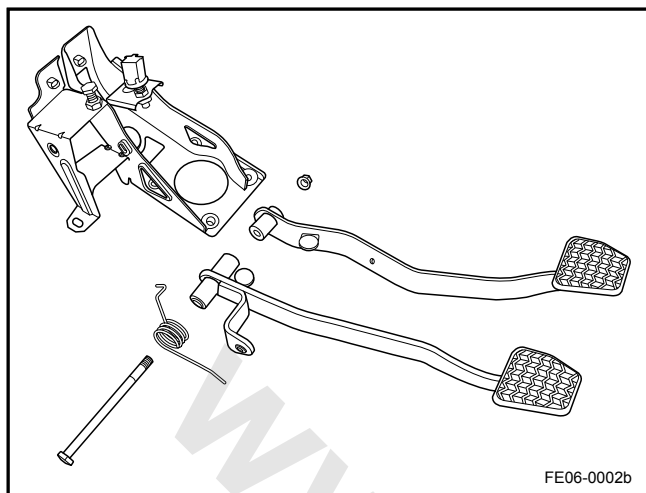


### 6.4.5.8 Brake Pedal Replacement

**Removal Procedure:**

1. Remove the clutch / brake pedal assembly. Refer to [3.2.6.1 Clutch Pedal Replacement](#).
2. Remove the clutch / brake pedal assembly, remove the nut and remove the pedal installation bolt.
3. Remove the brake pedal.



**Installation Procedure:**

1. Install the brake pedal and clutch pedal.

2. Install the pedal bolt and nut.

Torque: 23 Nm (Metric) 17.0 lb-ft (US English)

**Note**

Apply grease to the pedal axle and the return spring.

3. Install the clutch / brake pedal assembly.

## 6.5 Parking System

### 6.5.1 Specifications


#### 6.5.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Park Brake Control Mechanism Switch Assembly Retaining Screw	ST4.2 × 15	4.5	3.3
Park Brake Control Mechanism Assembly Rod Assembly To Body Retaining Bolt	M8 × 25	16-26	13.3-16.2
Park Brake Cable Retaining Bolts	M6 × 14	6-12	4.4-8.9

## 6.5.2 Description and Operation

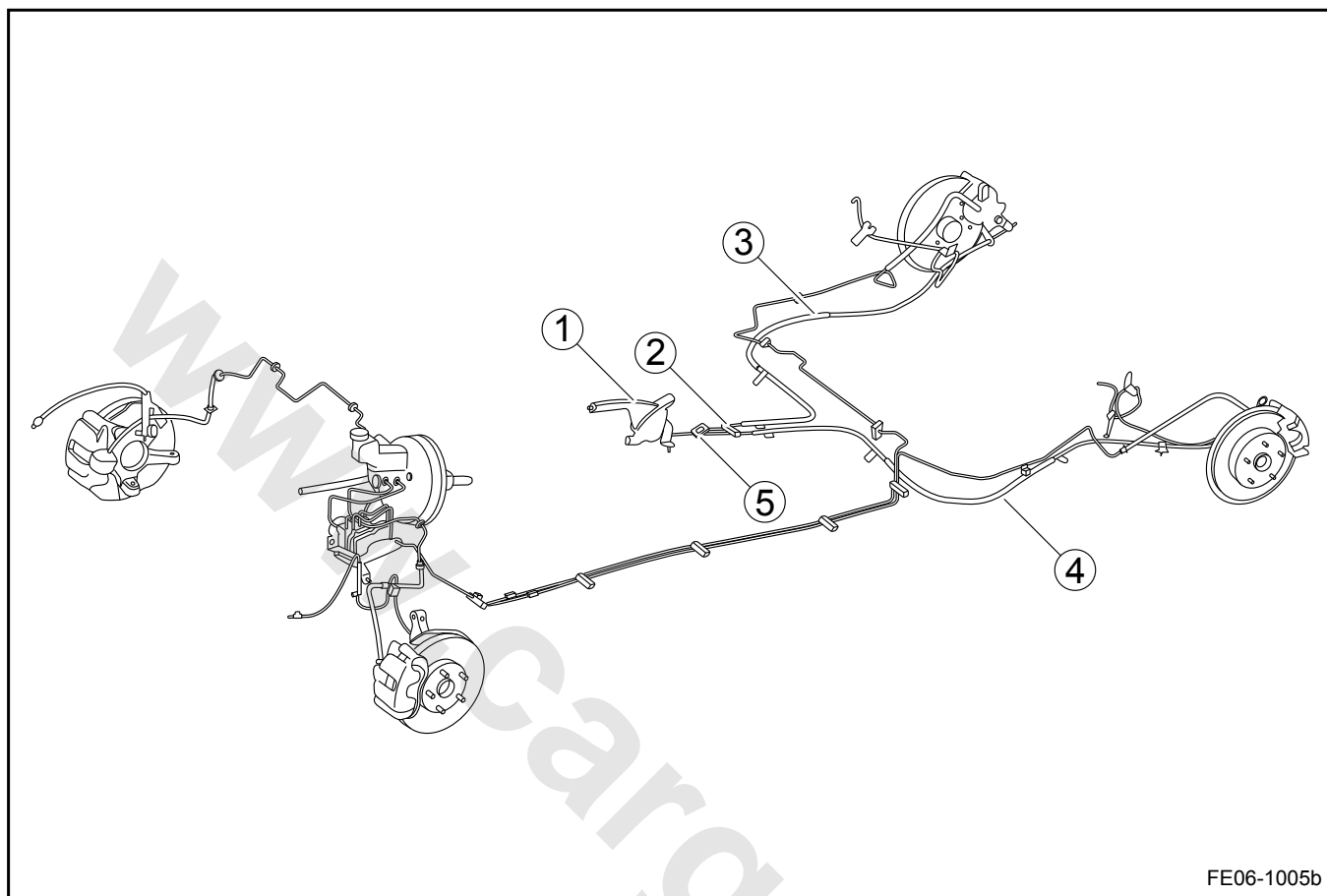
### 6.5.2.1 Description and Operation

Park brake system is a mechanical system that operates the rear disc brake caliper rod through the park brake cable. Pull the cable to activate the system. The park brake pull handle controls rear disc brake caliper piston work through the cable. When the park brake is applied and the ignition switch is turned on, the park brake indicator light in the instrument cluster will be turned on. Pull up the park brake handle and press the button on the handle to drop down the handle and release the park brake. The park brake indicator light in the instrument cluster will be turned off.



### 6.5.3 Component Locator

#### 6.5.3.1 Component Locator



#### Legend

- |  |                        |
|--|------------------------|
| 1. Park Brake Control Mechanism Assembly             | 5. Pull Cable Adjuster |
| 2. Park Brake Front Cable                            |                        |
| 3. Right Rear Park Brake Cable With Bracket Assembly |                        |
| 4. Left Rear Park Brake Cable With Bracket Assembly  |                        |

## 6.5.4 Diagnostic Information and Procedures

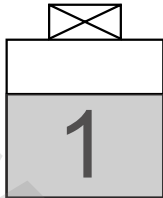
## 6.5.4.1 Fault Symptom Table

Symptoms	Suspected Parts	Measures / Refer to
Park Brake Dragging	1. Park Brake Handle Travel Too Small	Refer to <a href="#">6.5.5.4 Park Brake Control Mechanism Adjustment</a>
	2. Park Brake Front Cable (Stuck)	Refer to <a href="#">6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement</a>
	3. Left and Right Park Brake Cable (Stuck)	Refer to <a href="#">6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement</a>
	4. Rear Disc Brake Pads (Broken or Distorted)	Refer to the rear brake system <a href="#">6.2.4.1 Brake Pad Inspection</a>
	5. Rear Disc Brake Caliper Failure (Can not return)	Refer to the rear brake system <a href="#">6.2.5.2 Brake Caliper Replacement - Front</a>
Park Brake Failure	1. Park Brake Handle Travel Too Great	Refer to <a href="#">6.5.5.4 Park Brake Control Mechanism Adjustment</a>
	2. Park Brake Front Cable (Stuck, Broken)	Refer to <a href="#">6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement</a>
	3. Left and Right Park Brake Cable (Stuck, Broken)	Refer to <a href="#">6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement</a>
	4. Rear Disc Brake Pads (Wear and tear to the limit)	Refer to the rear brake system <a href="#">6.2.4.1 Brake Pad Inspection</a>
	5. Rear Disc Brake Caliper Failure	Refer to the rear brake system <a href="#">6.2.4.2 Brake Caliper Inspection</a>





## Park Brake Switch Harness Connector SO13



FE06-5502b

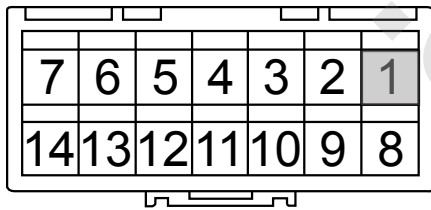
- Disconnect the harness connectors IP49 and SO01 connection.
- Measure resistance between SO01 terminal No.1 and SO13 terminal No.1 with a multimeter.  
Standard Resistance: Less than 1  $\Omega$
- Measure resistance between SO01 terminal No.1 and the body ground with a multimeter.  
Standard Resistance: 10 k $\Omega$  or higher

Is the resistance specified value?

No

Repair or replace the wiring harness

## To Instrument Cluster Harness Connector SO01



FE06-5503b

Yes

**Step 3** Check the wiring harness between the IP03-IP49.

## Instrument Cluster Harness Connector IP03

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE06-5504b

- Disconnect the instrument cluster harness connector IP03.
- Measure resistance between the IP03 terminal 10 and IP49 terminal 1 with a multimeter.  
Standard Resistance: Less than 1  $\Omega$
- Measure resistance between the IP03 terminal 10 and the body ground with a multimeter.  
Standard Resistance: 10 k $\Omega$  or higher

Is the resistance specified value?

No

Repair or replace the wiring harness



Yes

FF09-5105b

- No

Check the fuses, repair or replace the wiring harness

Yes

- Replace the instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#).
- Confirm that the repair is completed.

Next

Step 6	System normal.
--------	----------------

## 6.5.5 Removal and Installation

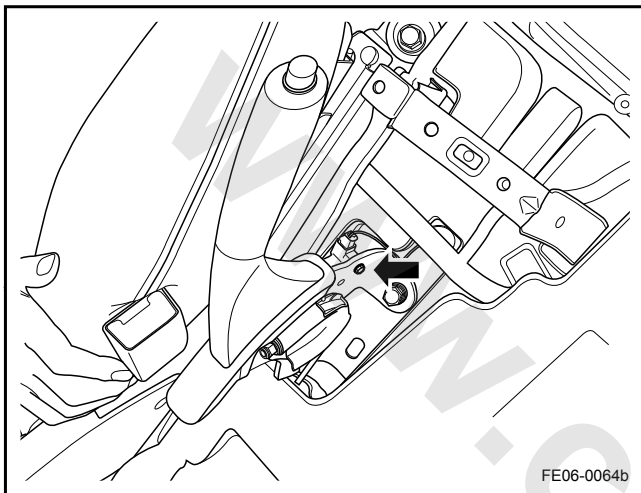
### 6.5.5.1 Park Brake Control Mechanism Switch Replacement

Removal Procedure:

**Warning!**

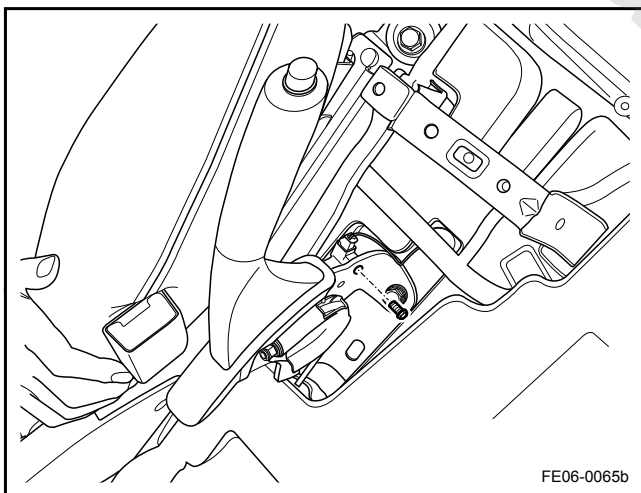
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the negative battery cable and wait for the 90s and above. Refer to [2.11.8.1 Battery Disconnection](#).
2. Release the park brake control mechanism assembly.
3. Remove the center console. Refer to [3.3.8.9 Shift Lever Replacement](#).
4. Disconnect the park brake control mechanism switch wiring harness connector.
5. Remove the park brake control mechanism switch retaining bolts.



Installation Procedure:

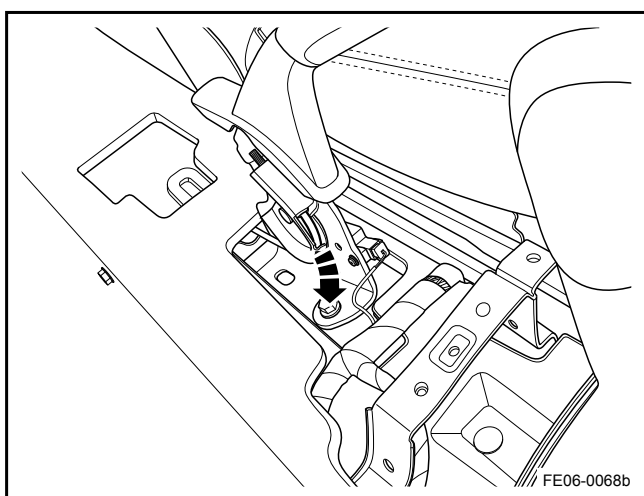
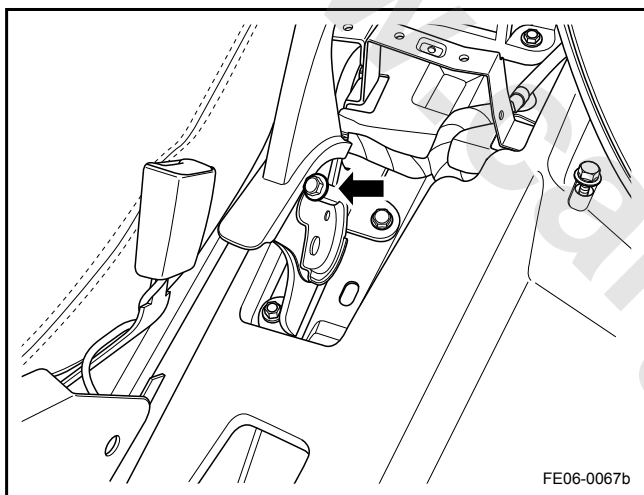
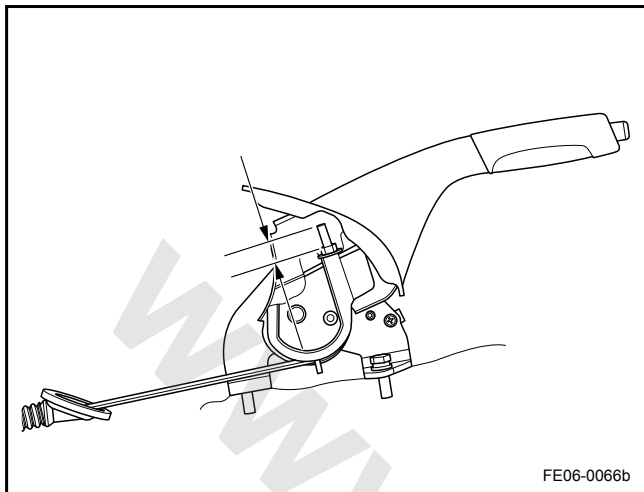
1. Install the park brake control mechanism switch retaining bolts.  
Torque: 21 Nm (Metric) 15.5 lb-ft (US English)
2. Connect the park brake control mechanism switch wiring harness connector.
3. Install the center console.
4. Apply the park brake control mechanism.
5. Connect the battery negative cable.

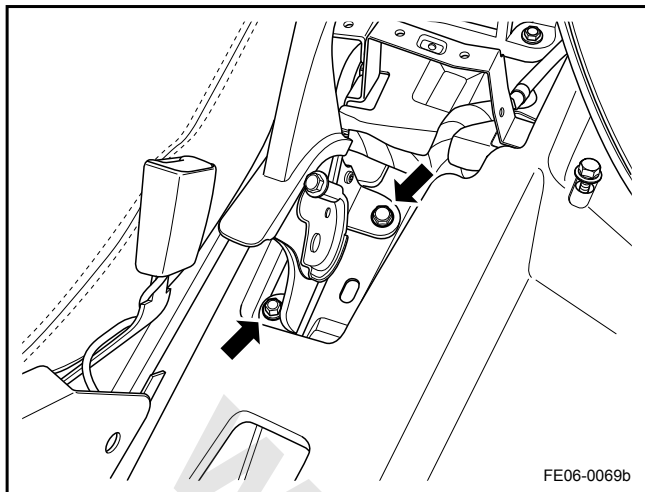


### 6.5.5.2 Park Brake Control Mechanism Assembly Replacement

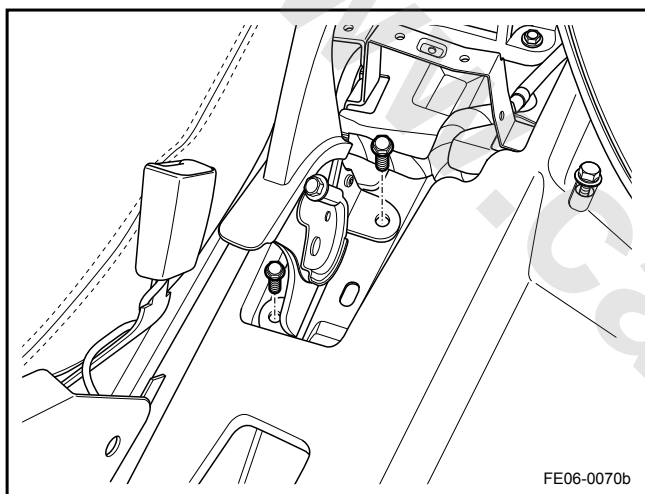
#### Removal Procedure:

1. Release the park brake control mechanism assembly.
2. Remove the center console. Refer to [3.3.8.9 Shift Lever Replacement](#).
3. Disconnect the park brake control mechanism switch wiring harness connector.
4. Measure the thread length between to the handle top to the hexagonal nut and record it.
5. Remove the park brake control mechanism assembly cable adjuster nut and gasket.
6. Open the park brake control mechanism assembly park brake handle installation pad and pull out of the park brake cable.





7. Remove the park brake control mechanism assembly handle assembly to the body bottom retaining bolts.
8. Remove the park brake control mechanism assembly handle assembly.



#### Installation Procedure:

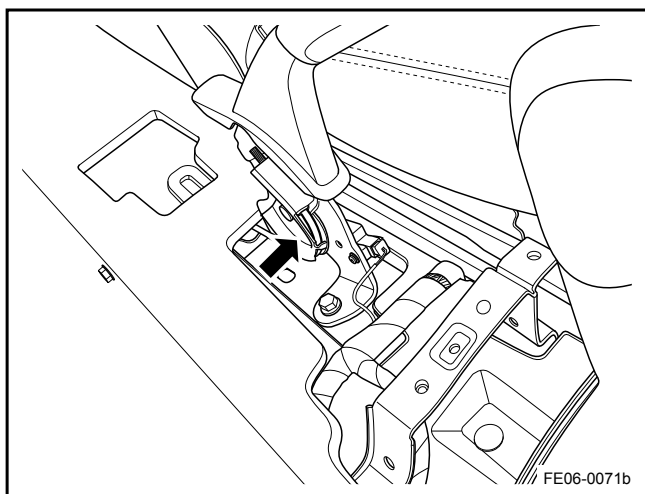
1. Install the park brake control mechanism assembly handle assembly.

#### Note

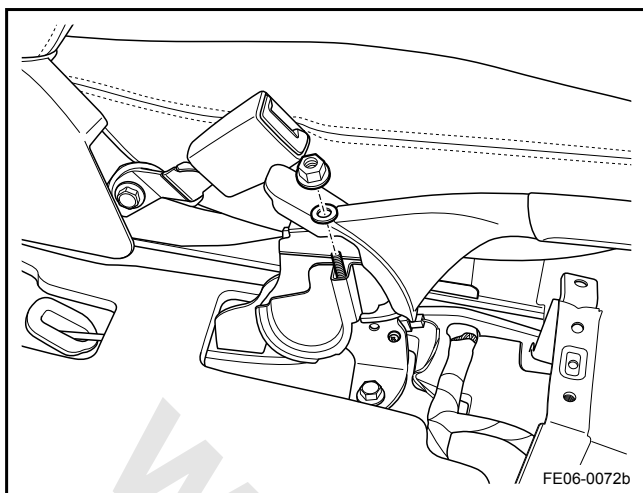
Refer to "Fastener Notice" in "Warnings and Notices".

2. Install the park brake control mechanism assembly handle assembly to the body bottom retaining bolts.

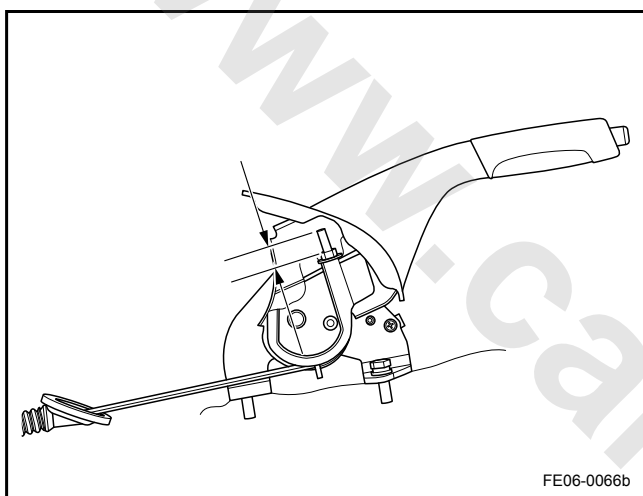
Torque: 21 Nm (Metric) 15.5 lb-ft (US English)



3. Install the park brake control mechanism assembly park brake handle installation pad and install the park brake handle assembly.



4. Install park brake control mechanism assembly cable adjuster nut and gasket.



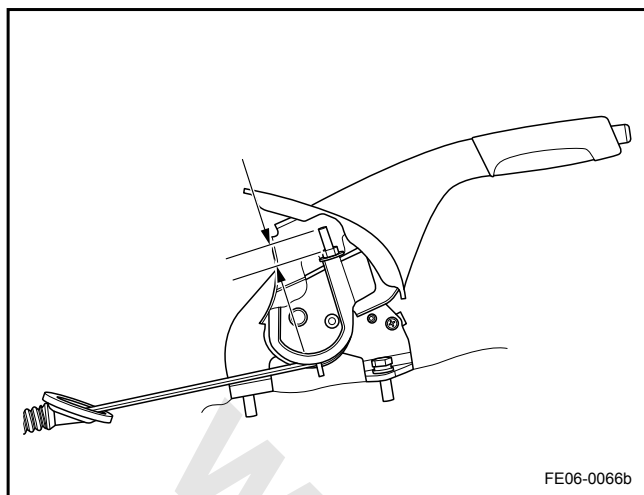
5. Adjust the thread length between the handle top to the hexagonal nut according to the record, adjust the brake control mechanism assembly cable.
6. Apply the park brake control mechanism.
7. If necessary, adjust the park brake control mechanism assembly.
8. Install the center console.

### 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement

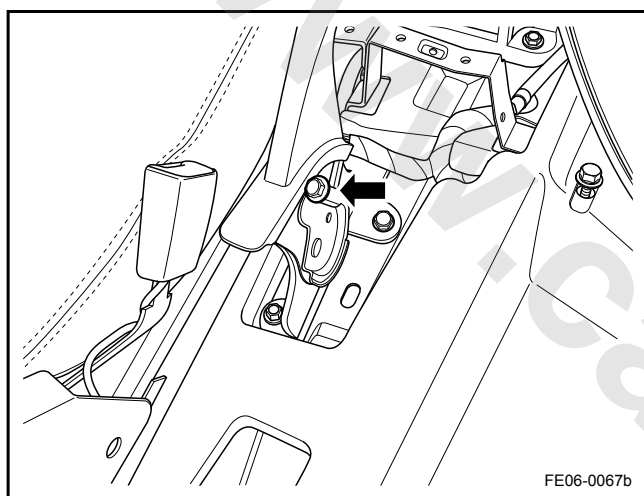
Removal Procedure:

**Warning!**

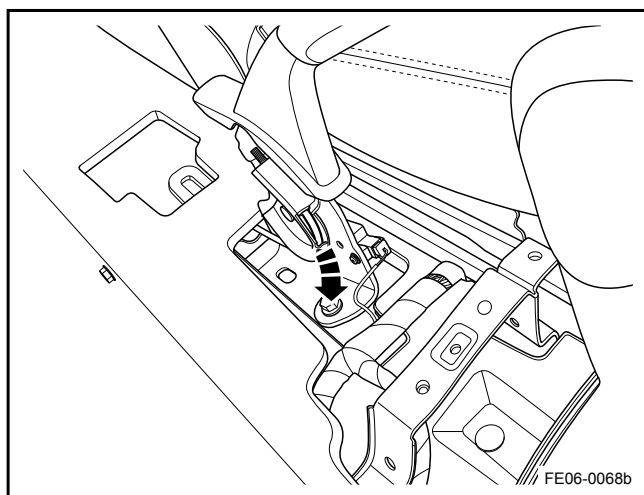
Refer to "Vehicle Lifting Warning" in "Warnings and Notices".



1. Release the park brake control mechanism.
2. Remove the center console. Refer to [3.3.8.9 Shift Lever Replacement](#).
3. Disconnect the park brake control mechanism switch wiring harness connector.
4. Measure the thread length between the handle top to the hexagonal nut and record it.

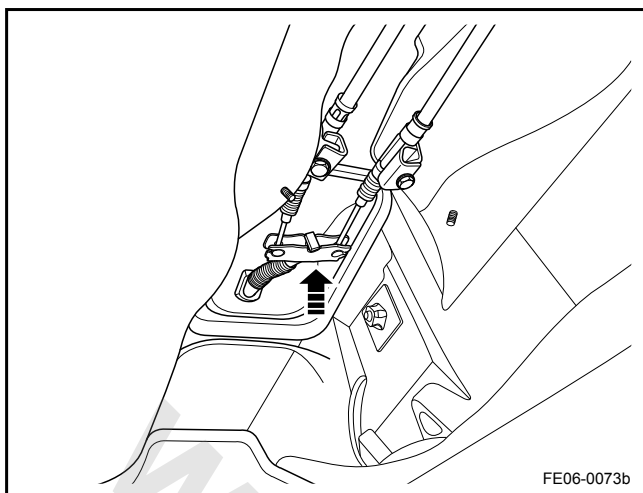


5. Remove the park brake cable adjustment nut and gasket.

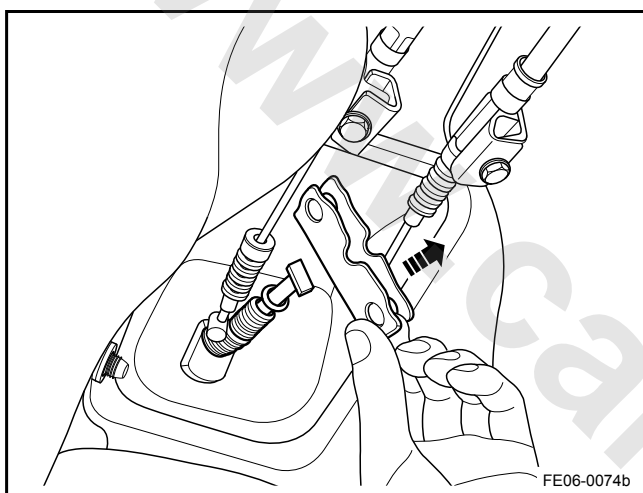


6. Open the park brake control mechanism assembly park brake cable installation piece, pull out of the park brake cable.

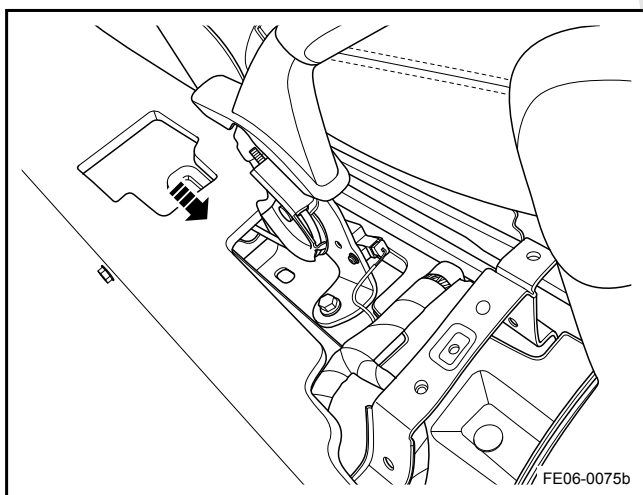




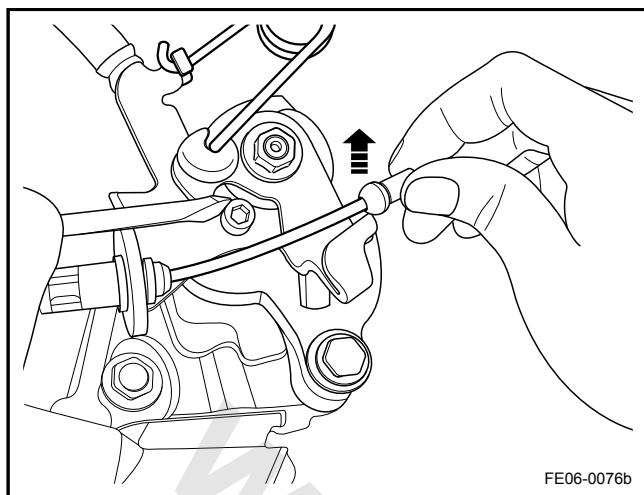
7. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).
8. Remove the front muffler and the heat shield. Refer to [2.7.6.3 Front Muffler Replacement](#).
9. Disconnect the left and right rear park brake cable from the adjuster.



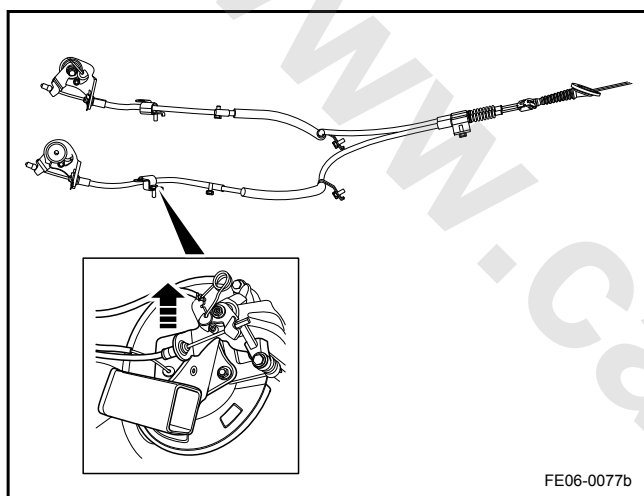
10. Rotate the cable adjuster, remove the park brake cable adjuster from the front of the park brake.



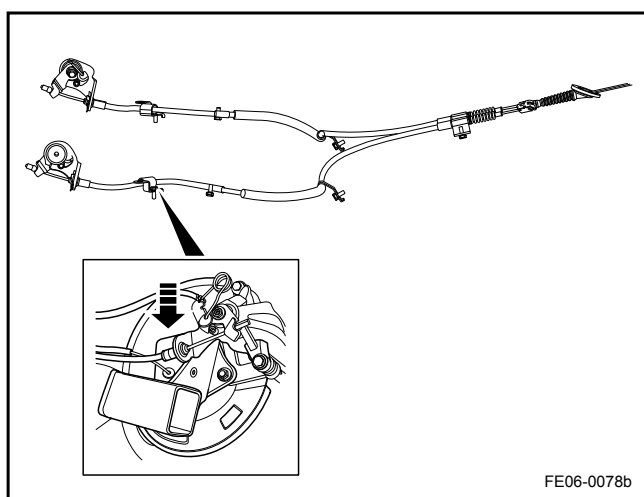
11. Lower the vehicle and remove the park brake cable from inside the vehicle.



12. Lift and support the vehicle.
13. Disconnect the left and right rear park brake cable from the rear calipers.



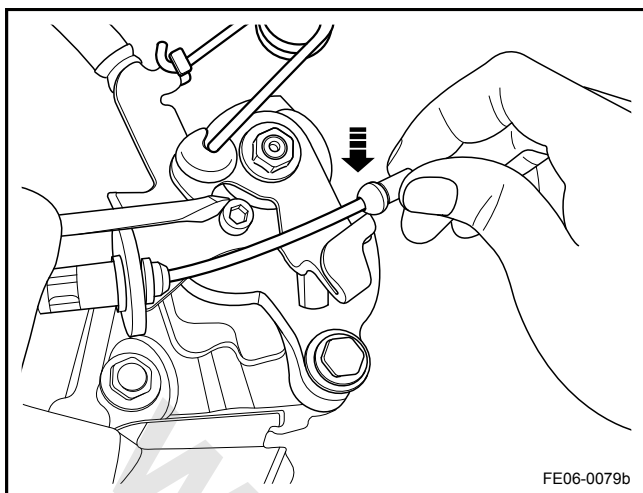
14. Remove the left and right rear brake cable retaining bolts and springs.
15. Remove the left and right rear park brake cable.



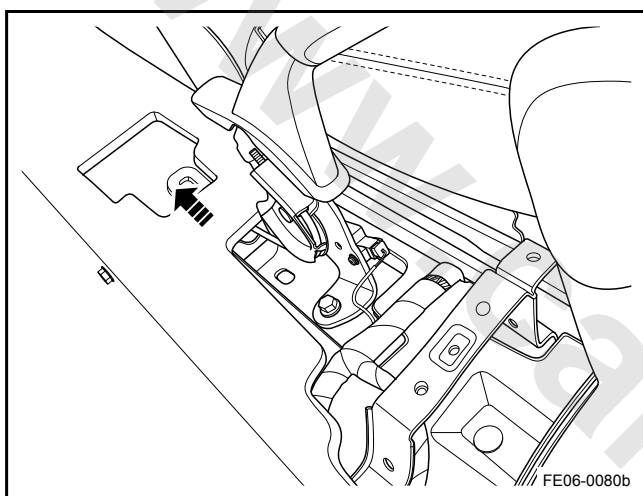
#### Installation Procedure:

1. Install the left and right rear park brake cable.
2. Install the left and right rear brake cable retaining bolts and springs.

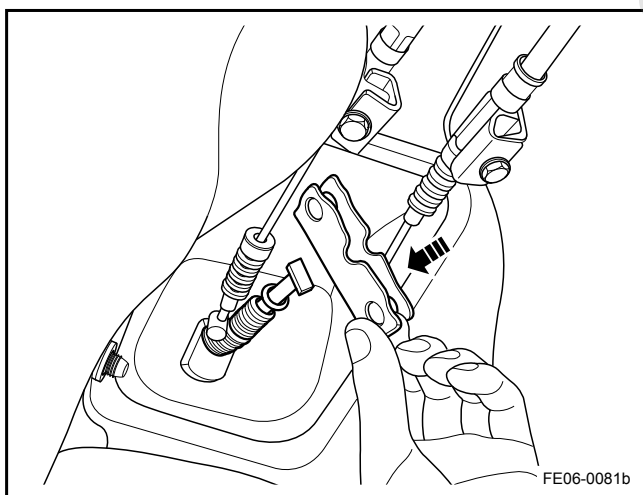
Torque: 9 Nm (Metric) 6.6 lb-ft (US English)



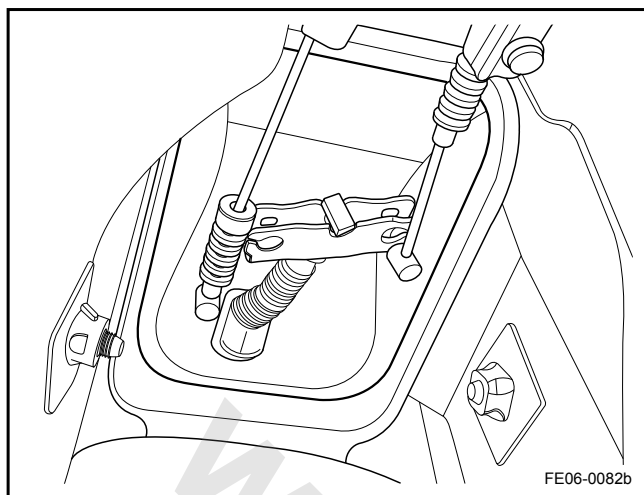
3. Install the left and right rear park brake cables to the rear brake calipers.



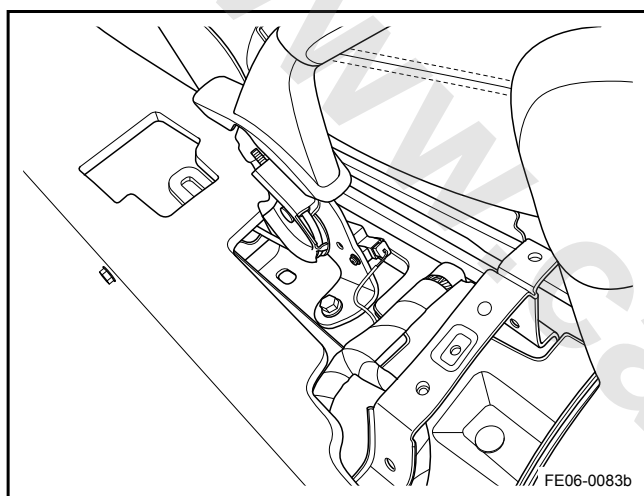
4. Lower the vehicle.
5. Install the front park brake cable to the vehicle from the vehicle bottom and install the dust cover.



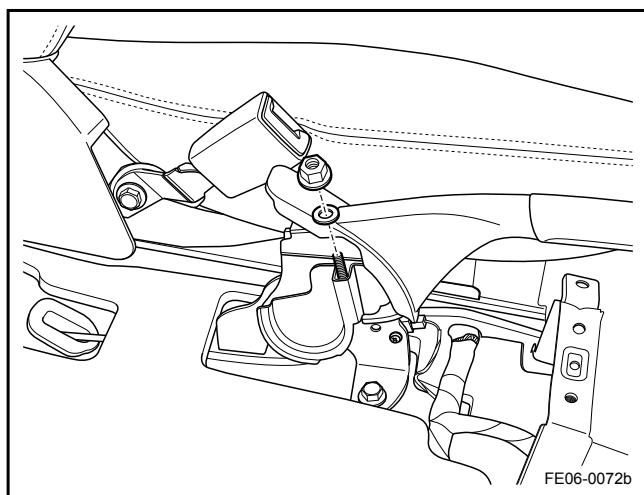
6. Lift and support the vehicle.
7. Install the park brake cable adjuster to the front park brake cable.



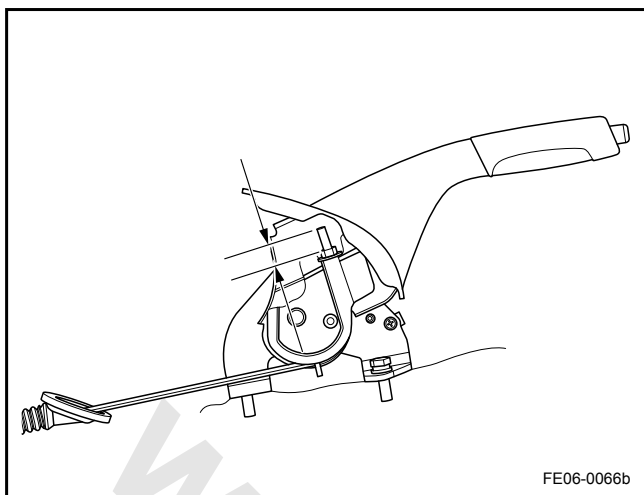
8. Install the left and right rear park brake cable to the cable adjuster.
9. Install the front muffler and the heat shield.
10. Lower the vehicle.



11. Install the park brake control mechanism cable assembly and press the installation piece to install the park brake cable assembly.



12. Install the park brake cable control mechanism adjust nut and washer.



13. Adjust the thread length between the handle top to the hexagonal nut according to the record, adjust the park brake cable assembly.
14. If necessary, adjust the brake control mechanism assembly. Refer to [6.5.5.4 Park Brake Control Mechanism Adjustment](#).
15. Apply the park brake control mechanism.
16. Install the center console.

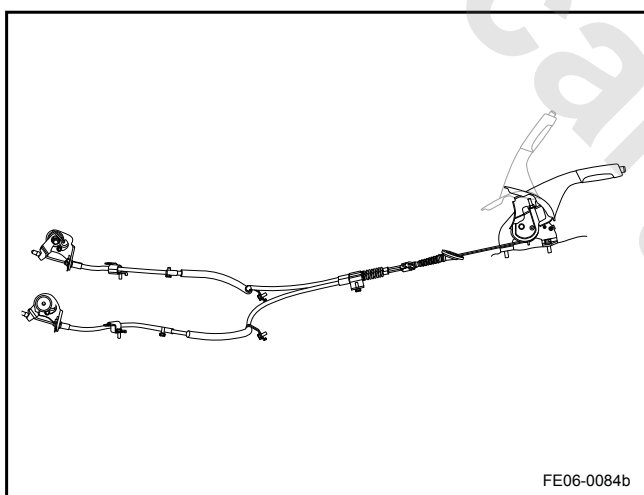
#### 6.5.5.4 Park Brake Control Mechanism Adjustment

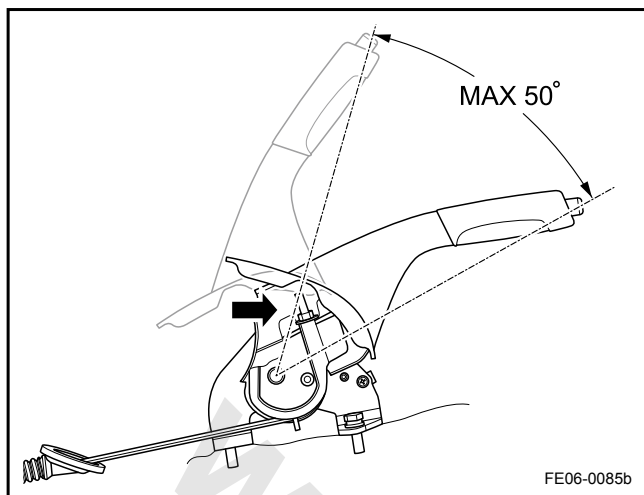
Adjustment Procedure:

##### Warning!

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

1. Release the park brake assembly control mechanism.
2. Lift the vehicle. [1.3 Lifting and Jacking the Vehicle](#).
3. Check whether the park brake mechanism cable assembly is able to move freely.





4. Lower the vehicle.
5. Remove the center console cup holder. Refer to [3.3.8.9 Shift Lever Replacement](#).
6. Apply the park brake, remove the center console cup holder, lay down the park brakes, exposing the brake cable adjuster nut.
7. Slightly lift the vehicle, so that the wheels are free to rotate.
8. Tighten the park brake cable adjuster nut assembly, until the wheels are hard to rotate.
9. Loosen the nut until the rear wheels can just rotate freely.
10. Lower the vehicle.
11. Apply the park brake, install the center console cup holder.

## 6.6 ABS / TCS / EBD / ESP

### 6.6.1 Specifications

#### 6.6.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Wheel Speed Sensor Harness Connector Bolts	M6 × 18	19-22	14-16.3
ABS Bracket Strengthening Plate Assembly Nut	M8	23-30	17-22.2

#### 6.6.1.2 Wheel Speed Sensor Technical Specifications

Wheel Speed Sensor	Description
Sensor Type	Hall-type Speed Sensor
Voltage	4.5-20 V
Signal Current	Low: $7 \pm 20\%$ mA, High: $14 \pm 20\%$ mA
Gap Between The Signal Plate and The Sensor	Front Axle 1.56 mm (0.06 in) Rear Axle 0.738 mm (0.03 in)

## 6.6.2 Description and Operation

### 6.6.2.1 Description and Operation

This vehicle is equipped with anti-lock braking system (ABS) and electronic brake-force distribution (EBD) system. In addition to in the original brake system, the following components are added:

Hydraulic Electronic Control Unit (HECU):

#### Note

Between hydraulic electronic control unit installation bolts and bracket, there are rubber anti-vibration pads, which are used to avoid the hydraulic electronic control unit being affected by the vehicle vibration. The hydraulic electronic control unit can not be disassembled, and must be replaced as an assembly.

The hydraulic electronic control unit (HECU) controls system function and detect faults. When the ignition switch is turned on and there are no anti-lock braking system DTC codes, the system provides power to the relay, so the battery positive voltage is provided to the solenoid valve and pump. Hydraulic electronic control unit (HECU) continuously tests the wheels status to control wheel slip rate within a certain range so as to maintain the vehicle stability. Hydraulic control piping uses diagonal configuration, so that from the brake master cylinder one channel fluid flows along the left front to right rear wheel, the other flows from the right front to the left rear wheel. Two channels are isolated, so that when one brake channel fails or leaks, the other will make sure the continuous braking ability. Hydraulic electronic control unit (HECU) includes the following main components:

- ABS control module
- ABS Pump and Relay
- Inlet Valve, each valve controls one wheel
- Outlet Valve, each valve controls one wheel
- Electromagnetic Coil Relay

#### Wheel Speed Sensor:

Wheel speed sensor is a Hall-type speed sensor. With the wheels rotating, ABS control module uses the wheel speed signal to calculate the wheel speed. Wheel speed sensor can be individually replaced, but the signal plate (Gear) is fitted on the axle and must be replaced together with the axle.

#### Brake Lamp Switch:

Press the brake pedal, the brake lamps are lit, while signals are sent to the ABS brake control module.

#### ABS Warning Lamp:

Located on the instrument cluster, light to notify the driver the ABS failure when the following events occurs:

- ABS control module detects the ABS system malfunction, the instrument cluster receives a request for lighting the ABS warning lamp through the CAN bus from the ABS control module.
- Instrument cluster carry out self-test in the beginning of each ignition cycle, the indicator light about 3s.
- Instrument cluster detects the communication to the ABS control module is lost.

#### EBD Warning Lamp:

Located on the instrument cluster, light to notify the driver EBD failure. When the ABS Warning Lamp is lit, but EBD warning lamp is not lit, the system will still have EBD function. When the ABS Warning Lamp and EBD warning lamp are all lit, ABS and EBD function all fail.

#### Self-diagnostic Test:

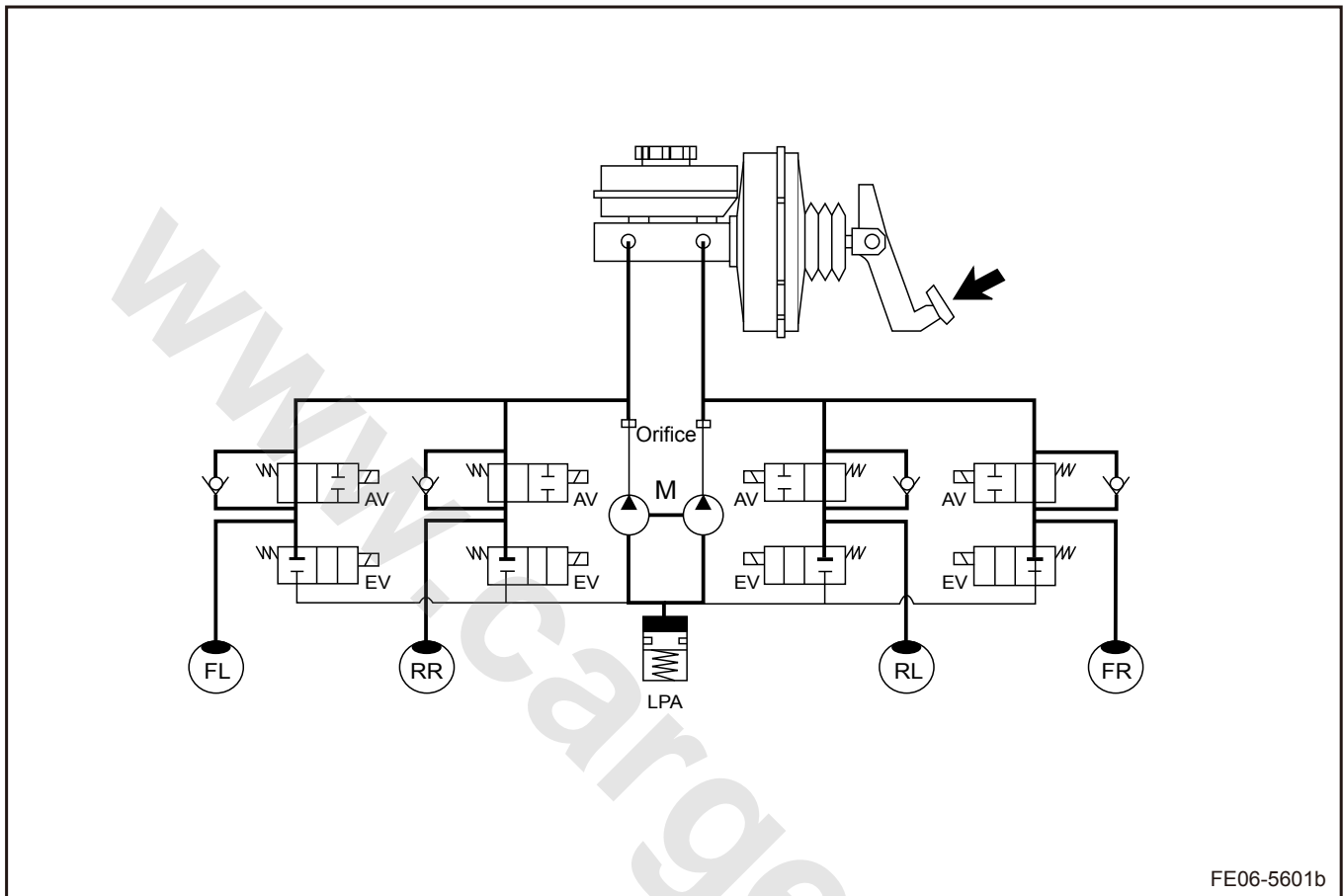
ABS control module performs a self-diagnostic test each time the ignition switch is turned to on. As long as the ABS is provided power and in a working status, it monitors the performance. Once a fault is detected, it will trigger an alarm until the fault disappears. ABS error code will be stored in memory until being manually erased.



### 6.6.3 System Working Principle

#### 6.6.3.1 System Working Principle

Anti-lock Braking System (ABS) Hydraulic Piping Diagram



FE06-5601b

#### Legend

- |                                 |                         |
|---------------------------------|-------------------------|
| 1. AV-Inlet Solenoid Valve      | 6. RR-Right Rear Wheel  |
| 2. EV-Outlet Solenoid Valve     | 7. RL-Left Rear Wheel   |
| 3. LPA-Low Pressure Accumulator | 8. FR-Right Front Wheel |
| 4. M-Motor                      |                         |
| 5. FL-Left Front Wheel          |                         |

### Anti-lock Braking System (ABS)

In the anti-lock braking period, anti-lock braking system controls each wheel braking fluid pressure to prevent wheel slip. Each wheel is equipped with a separate and specific hydraulic fluid line solenoid valve. Anti-lock braking system can reduce, maintain or increase brake fluid pressure to each wheel. However, the anti-lock braking system can not make the pressure exceed the pressure provided by the brake master cylinder. During the anti-lock braking, a series of rapid pulse can be felt on the brake pedal. When the ABS control module

detects the speed sensor input and tries to prevent wheel slip, each solenoid valve position rapidly changes. ABS pump starts working, resulting pulse. Pedal pulse only appears during the anti-lock braking, and disappears during the normal braking or parking. For vehicles equipped with anti-lock braking system, apply normal force on the brake pedal can stop the vehicle. Anti-lock braking system can effectively shorten the braking distance and maintain the vehicle stability. During the anti-lock braking, brake system pressure is adjusted in three stages.

### Pressure Maintaining

When the wheel spins, ABS control module closes the inlet valve and keeps the valve closed and isolated from the system. It maintains the braking fluid pressure without increasing or decreasing.

### Pressure Decrease

When the wheel spins, ABS control module reduces the pressure to individual wheels during deceleration. The inlet valve is closed, while the outlet valve is open. The excess fluid is stored in the accumulator until the ABS pump returns the fluid to the master cylinder.

### Pressure Increase

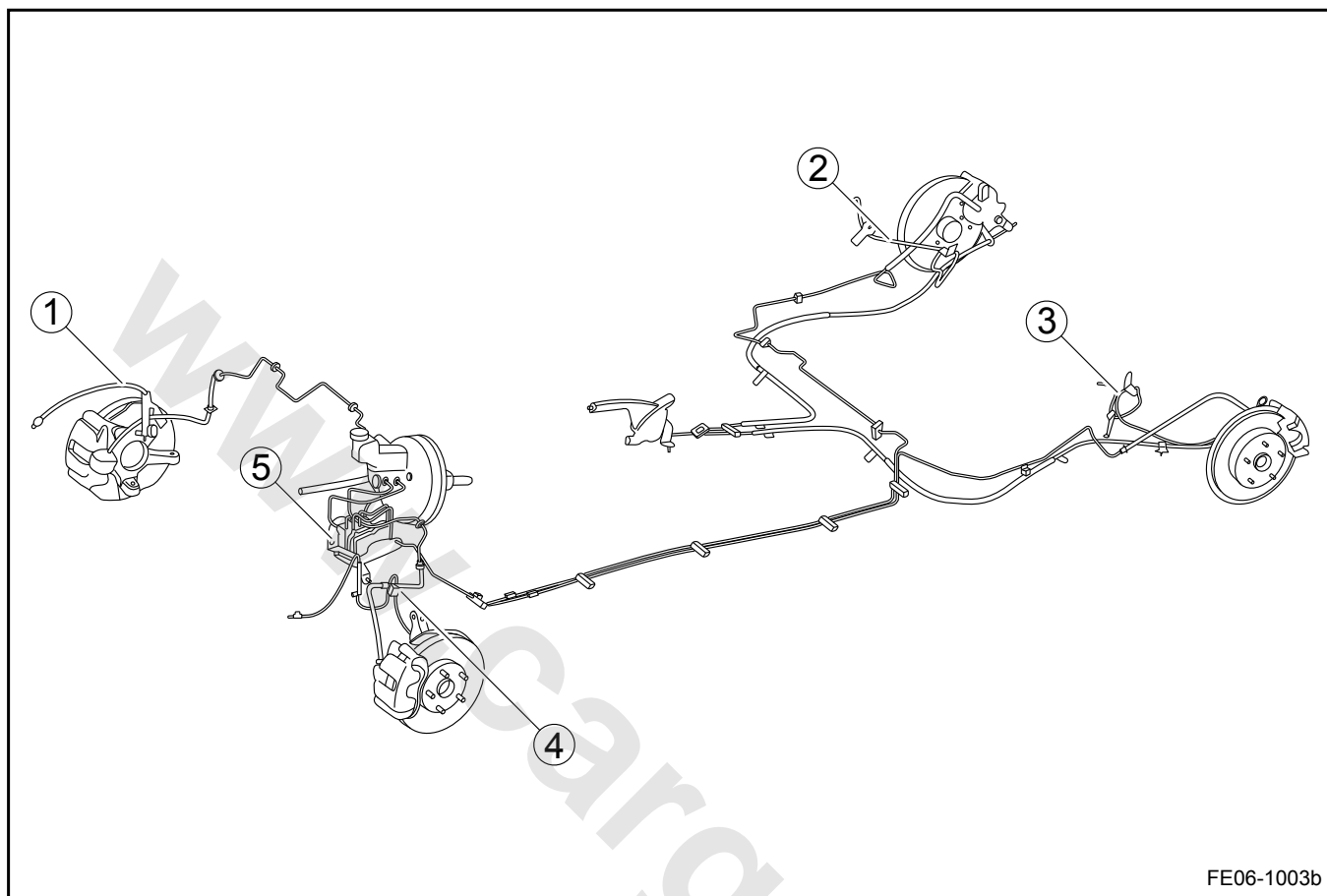
When the wheel does not spin, ABS control module gradually increases the braking pressure to each wheel to reduce wheel speed. The inlet valve is open, while the outlet valve is closed. The increased pressure is provided by the brake master cylinder.

## Electronic Brake Force Distribution (EBD)

Each wheel attached ground conditions may be different, then the ground friction coefficient will be different. During braking, the vehicle gravity center will change, so the vehicle is prone to skid when braking, tilt and roll and so forth. EBD's function is to calculate four tires friction difference as a result of different adhesion coefficients at the braking moment, then adjust the hydraulic unit electromagnetic valve. The valve adjusts as the preset program to match the system power to the friction (adhesion), ensure vehicle braking smooth and safety. Under the emergency braking situation, before the ABS action EBD has balanced each wheel grip, to prevent tail-flick and the lateral movement. EBD is actually an additional ABS function. Based on road and load changes, it automatically adjusts the braking force distribution, improves and the ABS efficiency.

## 6.6.4 Component Locator

## 6.6.4.1 Component Locator

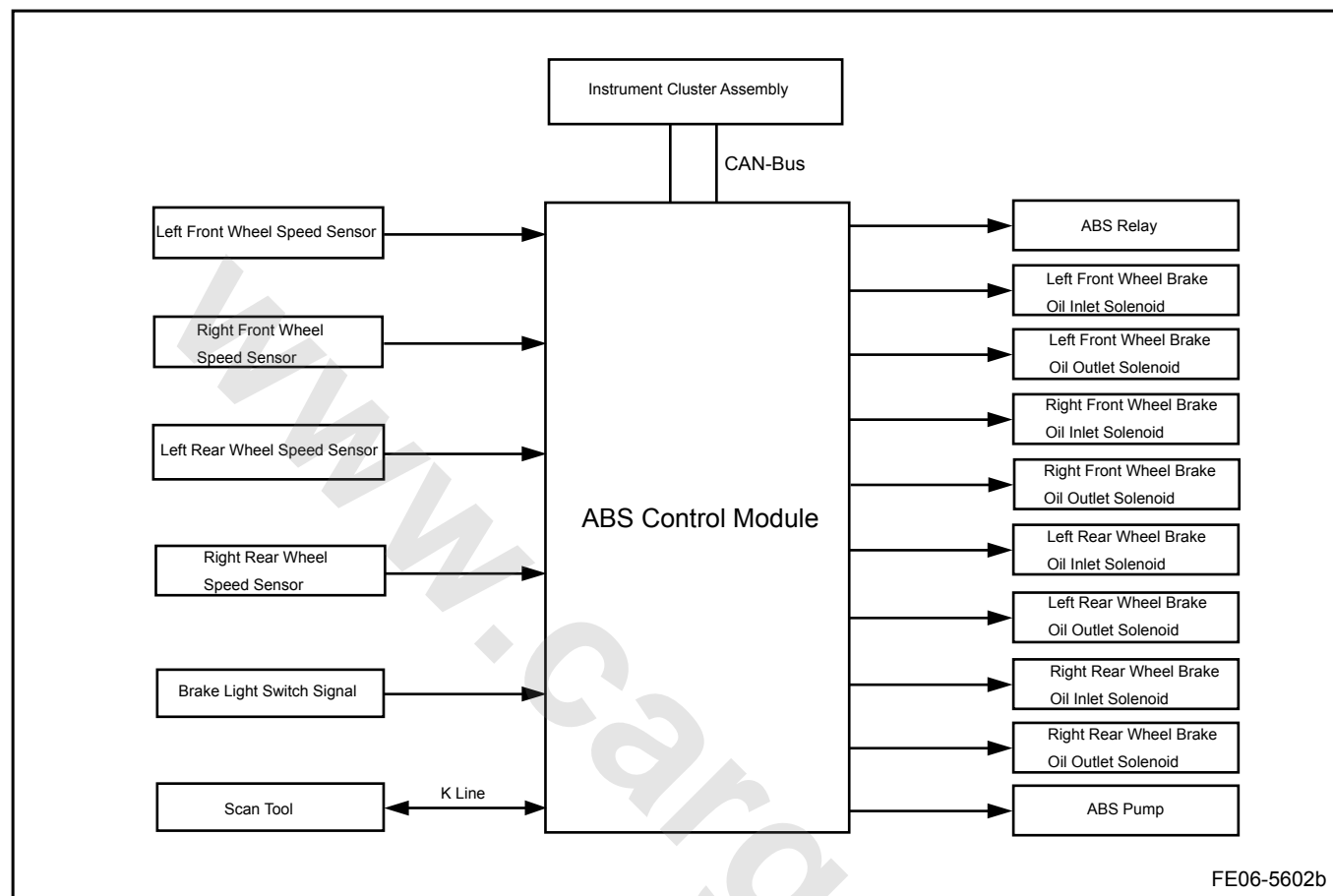


## Legend

- 1. Right Front Wheel Speed Sensor
- 2. Right Rear Wheel Speed Sensor
- 3. Left Rear Wheel Speed Sensor
- 4. Left Front wheel Speed Sensor
- 5. Hydraulic Electronic Control Unit (HECU)

## 6.6.5 Schematic

## 6.6.5.1 Schematic



## 6.6.6 Diagnostic Information and Procedures

### 6.6.6.1 Diagnosis Description

Read DTC codes through the vehicle data-link connector (DLC data-link connector). Use ABS control module data table, through reading scan tool displayed data, to read the switches and sensors function without removing any component. Reading the data is the first diagnostic step and is also one of the ways to reduce diagnostic time.

### 6.6.6.2 Visual Inspection

#### — Confirm Fault Symptom

In the diagnostic process, the most difficult situation is that no symptoms appear. In this case, you must thoroughly analyze the described malfunction. and then simulate the malfunction occurring conditions and circumstances. Even for a very experienced technician, if carry out the diagnostic without verify the malfunctions first, it is possible to ignore a number of important things, and make wrong judgment. This will cause the diagnostic can not continue.

- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- Connectors connection and vibration should be thoroughly examined. If possible, for vibrations caused malfunction, it is recommended to use the vibration method.
  1. With a finger, gently shake the sensor that may be faulty and check for malfunction.
  2. Gently shake the sensor in the vertical and horizontal directions.
  3. Gently shake the sensor wiring harness in the vertical and horizontal directions.

### 6.6.6.3 DTC Code (DTC) List

DTC code	Description
C1101	ECU Power Supply Voltage: High Voltage
C1102	ECU Power Supply Voltage: Low Voltage
C1200	Wheel Speed Sensor, Left Front: Open / Short
C1201	Wheel Speed Sensor, Left Front: Scope, Performance, Intermittent Fault
C1202	Wheel Speed Sensor, Left Front: Invalid / No Signal
C1203	Wheel Speed Sensor, Right Front: Open / Short
C1204	Wheel Speed Sensor, Right Front: Scope, Performance, Intermittent Fault
C1205	Wheel Speed Sensor, Right Front: Invalid / No Signal
C1206	Wheel Speed Sensor, Left Rear: Open / Short
C1207	Wheel Speed Sensor, Left Rear: Scope, Performance, Intermittent Fault
C1208	Wheel Speed Sensor, Left Rear: Invalid / No Signal
C1209	Wheel Speed Sensor, Right Rear: Open / Short
C1210	Wheel Speed Sensor, Right Rear: Scope, Performance, Intermittent Fault
C1211	Wheel Speed Sensor, Right Rear: Invalid / No Signal
C1213	Wheel Speed Sensor Frequency Error (General wheel speed sensor fault, slip or tooth error)
C1604	ECU Hardware Malfunction

DTC code	Description
C1605	CAN Hardware Malfunction
C1616	CAN Bus Malfunction
C2112	Valve Relay Malfunction
C2308	Valve Malfunction, Left Front Inlet Valve
C2312	Valve Malfunction, Left Front Outlet Valve
C2316	Valve Malfunction, Right Front Inlet Valve
C2320	Valve Malfunction, Right Front Outlet Valve
C2324	Valve Malfunction, Left Rear Inlet Valve
C2328	Valve Malfunction, Left Rear Outlet Valve
C2332	Valve Malfunction, Right Rear Inlet Valve
C2336	Valve Malfunction, Right Rear Outlet Valve
C2402	Return Pump Malfunction (Electrical and Electronic Malfunction)

#### 6.6.6.4 Scan Tool and The Vehicle Can Not Communicate

Connect scan tool to the data-link connector (DLC data-link connector), turn the ignition switch to ON, operate the scan tool, if the display shows the communication error message, then the vehicle or the scan tool has a malfunction.

- If the scan tool connected with another vehicle shows normal, then check the original vehicle DLC.
- If the scan tool is still unable to establish communication, then the problem may be in the scan tool, for the specific circumstances. Refer to [11.17 Data Communication System](#).

#### 6.6.6.5 Fault Symptom Table

If the scan tool shows the normal codes, but the fault still exists, check the circuit whether there are various fault symptoms according to sequence in the following table, and then refer to the appropriate maintenance program to fix the fault.

Symptoms	Suspected Parts	Repair Program
ABS Inoperative	1. Check DTC, confirm that there is no historical and current DTC code.	Use scan tool to access the module
	2. IG2 Power Supply Circuit (ABS module wiring harness connector CA13 terminal 32)	Refer to <a href="#">6.6.6.8 ABS Warning Lamp Always On</a> check the ABS control module in the wiring harness connector inspection (CA13 terminal 32 voltage)
	3. Front Speed Sensor Circuit	Refer to <a href="#">6.6.6.11 Wheel Speed Sensor Fault Diagnosis</a>
	4. Rear Speed Sensor Circuit	Refer to <a href="#">6.6.6.11 Wheel Speed Sensor Fault Diagnosis</a>

Symptoms	Suspected Parts	Repair Program
	5. Use scan tool active test function to check the hydraulic electronic control unit. If it is abnormal, check whether there is leakage in hydraulic pipes.	Refer to <a href="#">6.6.6.6 Active Test and Data Flow</a>
	6. If the suspect parts are confirmed as normal, but the symptoms still occur, replace the hydraulic electronic control unit.	Refer to <a href="#">6.6.7.1 Hydraulic Electronic Control Unit Replacement</a>
ABS Can Not Run Effectively	1. Check DTC, confirm that there is no historical and current fault code.	Use scan tool to access the module
	2. Front Speed Sensor Circuit	Refer to <a href="#">6.6.6.11 Wheel Speed Sensor Fault Diagnosis</a>
ABS Can Not Run Effectively	3. Rear Speed Sensor Circuit	Refer to <a href="#">6.6.6.11 Wheel Speed Sensor Fault Diagnosis</a>
ABS Can Not Run Effectively	4. Brake Lamp Switch Circuit	1. Confirm the brake lamps are working properly, otherwise refer to <a href="#">11.4.7.8 Brake Lamp Inoperative</a> 2. Press the brake pedal. ABS module wiring harness connector CA13 terminal 30 voltage is the power supply voltage .
	5. Use scan tool active test function to test the hydraulic electronic control unit. If it is abnormal, check whether there is leakage in hydraulic pipes.	Refer to <a href="#">6.6.6.6 Active Test and Data Flow</a>
	6. If the suspected parts circuit are confirmed as normal, but the symptoms still occur, replace the hydraulic electronic control unit.	Refer to <a href="#">6.6.7.1 Hydraulic Electronic Control Unit Replacement</a>
ABS Warning Lamp Fault (Always On)	1. Instrument Cluster	Refer to <a href="#">6.6.6.8 ABS Warning Lamp Always On</a>
	2. Hydraulic Electronic Control Unit	Refer to <a href="#">6.6.6.8 ABS Warning Lamp Always On</a>
ABS Warning Lamp Fault (Always Off)	Instrument Cluster	Refer to <a href="#">6.6.6.9 ABS Warning Lamp Always Off</a>
Brake Warning Lamp Fault (Always On)	Brake Warning Lamp Circuit	Refer to <a href="#">6.4.4.3 Brake Warning Lamp Always On</a>

### 6.6.6.6 Active Test and Data Flow

#### Active Test

##### Suggestions:

Use scan tool active test function without removing any component to run relays, actuators and other components. Carry out the active test first can reduce the diagnostic time.

Data table can be displayed during active test.

1. Connect scan tool to the vehicle.
2. Turn the ignition switch to ON (IG).
3. Carry out the active test according to the display.

Display	Test Parts	Control	Test Notes
ABS Warning Lamp	ABS Warning Lamp lit or not (ON / OFF)	Warning lamp on and off (ON / OFF)	Observe the instrument cluster
Pump Motor	Pump motor action or no action	Pump motor action or no action	No motor working sound
Left Front Inlet Valve	ABS solenoid work or not work	Electromagnetic coil working or not working	Electromagnetic coil working sound can be heard
Right Front Inlet Valve	ABS solenoid working or not working	Electromagnetic coil working or not working	Electromagnetic coil working sound can be heard
Left Rear Inlet Valve	ABS solenoid working or not working	Electromagnetic coil working or not working	Electromagnetic coil working sound can be heard
Right Rear Inlet Valve	ABS solenoid working or not working	Electromagnetic coil working or not working	Electromagnetic coil working sound can be heard
Left Front Outlet Valve	ABS solenoid working or not working	Electromagnetic coil working or not working	Electromagnetic coil working sound can be heard
Left Rear Outlet Valve	ABS solenoid working or not working	Electromagnetic coil working or not working	Electromagnetic coil working sound can be heard
Right Front Outlet Valve	ABS solenoid working or not working	Electromagnetic coil working or not working	Electromagnetic coil working sound can be heard
Right Rear Outlet Valve	ABS solenoid working or not working	Electromagnetic coil working or not working	Electromagnetic coil working sound can be heard

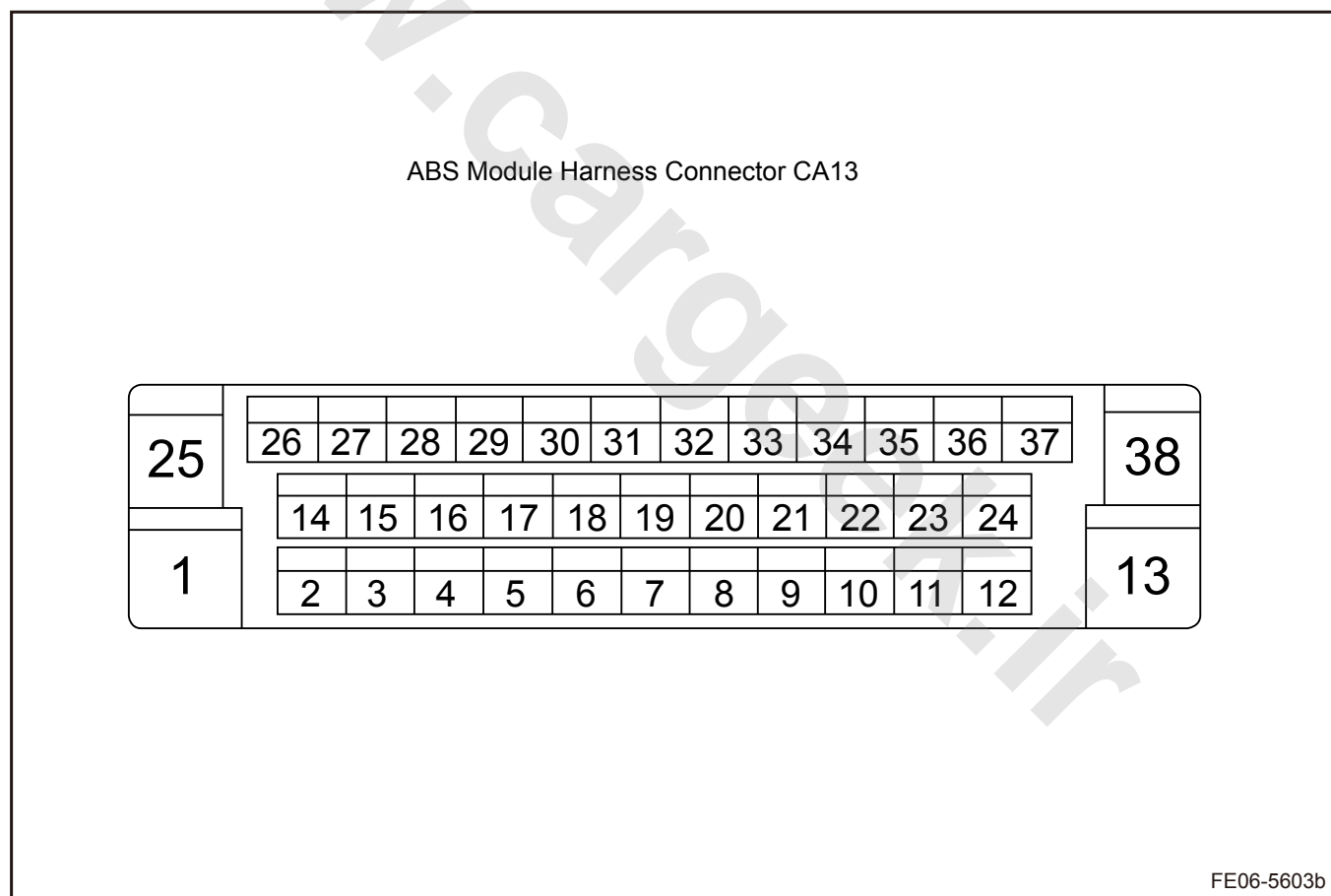
#### Data Flow

Name	Status
Left Front Wheel Speed	1 km/h
Right Front Wheel Speed	1 km/h
Left Rear Wheel Speed	1 km/h
Right Rear Wheel Speed	1 km/h
Vehicle Speed	1 km/h
Left Front Inlet Solenoid Valve	Termination



Name	Status
Left Front Outlet Solenoid Valve	Termination
Right Front Inlet Solenoid Valve	Termination
Right Front Outlet Solenoid Valve	Termination
Left Rear Inlet Solenoid Valve	Termination
Left Rear Outlet Solenoid Valve	Termination
Right Rear Inlet Solenoid Valve	Termination
Right Rear Outlet Solenoid Valve	Termination
ABS pump Status	OFF
BCS Status (Brake Light Status)	OFF
Battery Voltage	12.08 V

#### 6.6.6.7 ABS Control Module Terminal List



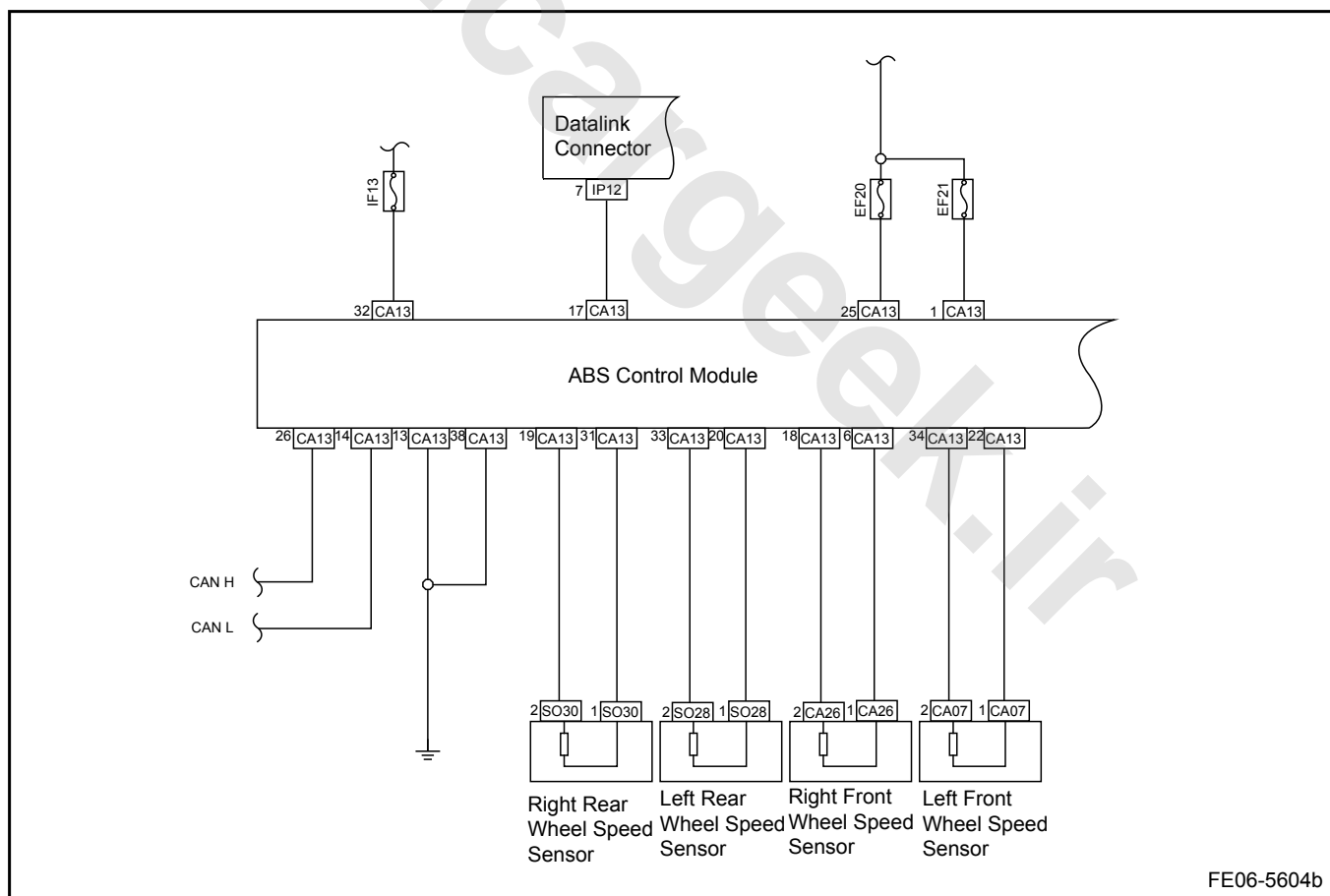
Terminal ID	Name	Wiring	Terminal Descriptions	Status	Specified Conditions
1	ALT	4.0 R	Power Supply		
2	Empty	Empty	Empty		

Terminal ID	Name	Wiring	Terminal Descriptions	Status	Specified Conditions
3	Empty	Empty	Empty		
4	ABS Lamp	0.5 Gr	Empty	ABS Output Signal	Active
5	Empty	Empty	Empty		
6	WSFR	0.5 Y/R	Right Front Wheel Speed Sensor		
7	Empty	Empty	Empty		
8	Empty	Empty	Empty		
9	Empty	Empty	Empty		
10	Empty	Empty	Empty		
11	Empty	Empty	Empty		
12	Empty	Empty	Empty		
13	GND	4.0 B	Ground		
14	CAN_L	0.5 Gr	CAN Low	Suspended	
15	Empty	Empty	Empty		
16	EBD Lamp	Empty	ABS Warning Lamp	ABS Output Signal	Active
17	Diagnostic	0.5 Gr/P	K-line	Data Link Connector	
18	WPFR	0.5 W/R	Right Front Wheel Speed Sensor		
19	WPRR	0.5 W/G	Right Rear Wheel Speed Sensor		
20	WSRL	0.5 Y/L	Left Rear Wheel Speed Sensor		
21	Empty	Empty	Empty		
22	WSFL	0.5 Y	Left Front Wheel Speed Sensor		
23	Empty	Empty	Empty		
24	Empty	Empty	Empty		
25	ALT	2.5 R/L	Power Supply		
26	CAN_H	0.5 L/W	CAN High	Suspended	
27	Empty	Empty	Empty		
28	Empty	Empty	Empty		
29	Empty	Empty	Empty		
30	+ BRAKE LIGHT SW	0.5 Gr	Brake Switch	Input ABS	

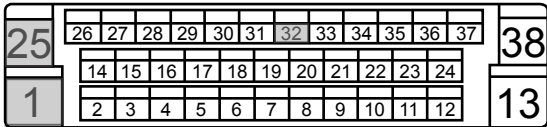
Terminal ID	Name	Wiring	Terminal Descriptions	Status	Specified Conditions
31	WSRR	0.5 Y/G	Right Rear Wheel Speed Sensor		
32	IG2	0.85 G/Y	ON Power Supply		
33	WPRL	0.5 W/L	Left Rear Wheel Speed Sensor		
34	WPFL	0.5 W	Left Front Wheel Speed Sensor		
35	Empty	Empty	Empty		
36	Empty	Empty	Empty		
37	Empty	Empty	Empty		
38	GND	2.5 B	Empty		

#### 6.6.6.8 ABS Warning Lamp Always On

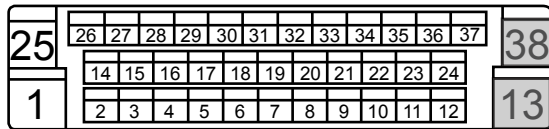
Schematic:



## Diagnostic Steps:

Step 1	Use scan tool to access ABS control module.
(a) Check the DTC.	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">Yes</div> <div style="border: 1px solid black; padding: 5px;">Repair according to the DTC.</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: 100px; margin: 0 auto;">No</div>	
Step 2	Check the battery.
(a) Measure battery voltage with a multimeter. Standard Voltage Value: 11-14 V	
Is the voltage specified value?	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Charge the battery, or check the charging system.</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: 100px; margin: 0 auto;">Yes</div>	
Step 3	Check the ABS control module harness connector.
(a) Check whether the wiring harness connector is connected correctly.	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Properly connect the harness connectors.</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: 100px; margin: 0 auto;">Yes</div>	
Step 4	Check the ABS control module harness connector (terminal voltage).
<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <p style="text-align: center;">ABS Control Module Harness Connector</p>  <p style="text-align: right; font-size: small;">FE06-5605b</p> </div> <div style="width: 55%;"> <p>(a) Turn off the ignition switch.</p> <p>(b) Disconnect the control module harness connector.</p> <p>(c) Turn on the ignition switch.</p> <p>(d) Measure voltage between the CA13 terminals 1,25,32 and the body ground with a multimeter. Standard Voltage Value: 11-14 V</p> <p>Is the voltage specified value?</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Check the fuses, repair or replace the wiring harness</div> </div> </div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: 100px; margin: 0 auto;">Yes</div>	
Step 5	Check the ABS control module harness connector (ground terminal Continuity).

## ABS Control Module Harness Connector CA13



FE06-5606b

- (a) Measure resistance between the connector CA13 terminals 13.38 and the body ground with a multimeter.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

No

Repair or Replace the wiring harness or the connectors.

Yes

Step 6 Replace the hydraulic electronic control unit assembly.

- (a) Replace the hydraulic electronic control unit. Refer to [6.6.7.1 Hydraulic Electronic Control Unit Replacement](#).
- (b) Connect the battery positive cable.
- (c) Turn on the ignition switch to confirm whether the ABS Warning Lamp is lit.

Yes

System normal

No

Step 7 Check the instrument cluster.

- (a) Connect scan tool.
- (b) In the functional test, select "Active test."
- Active Test: ABS

Display	Test Parts
ABS Warning Lamp	ABS Warning Lamp Lit or Not Lit (ON / OFF)

- (c) Check whether the ABS Warning Lamp is working properly.

Yes

System normal

No

Step 8 Replace the instrument cluster control unit.

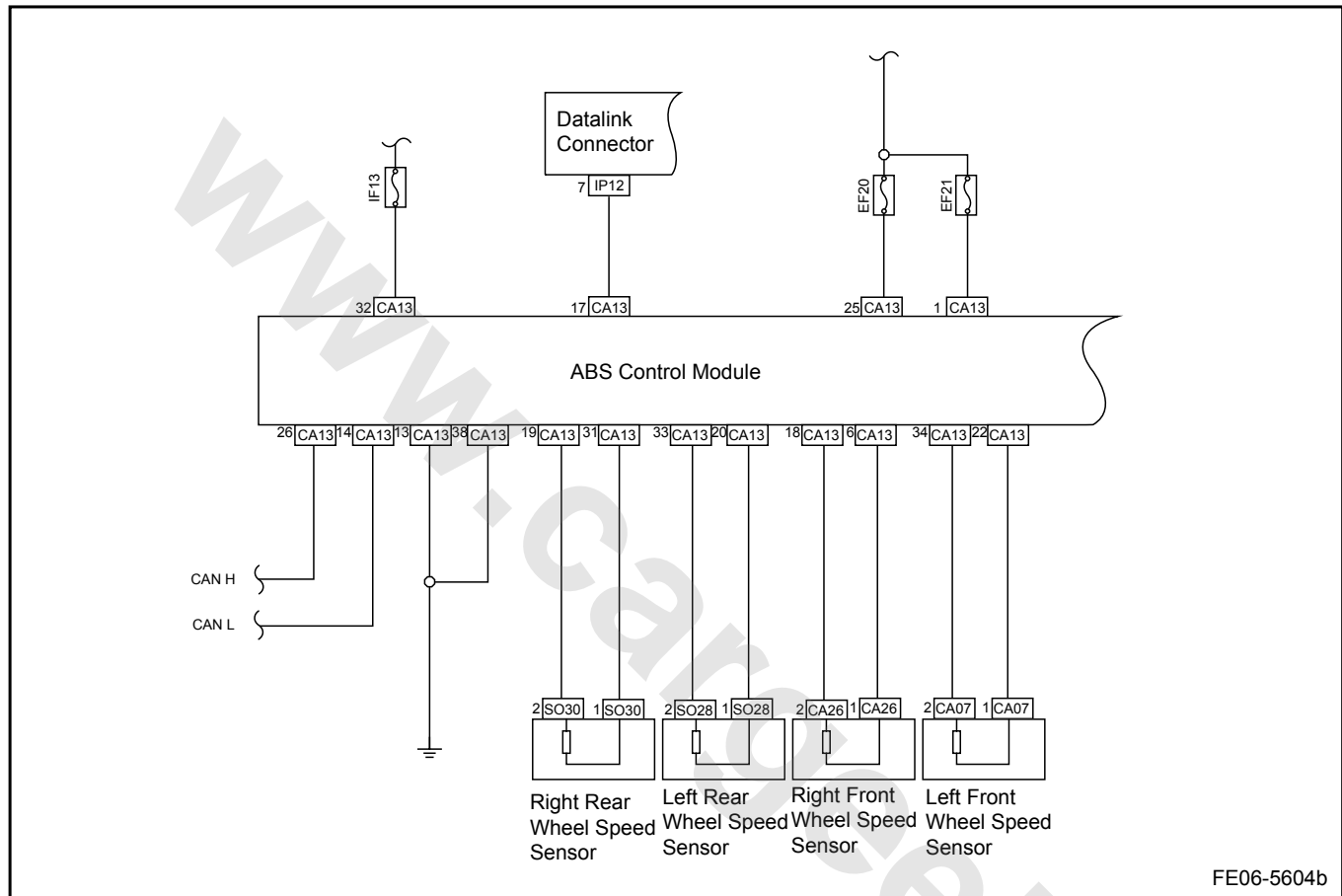
- (a) Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
- (b) Replace the instrument cluster control unit. Refer to [11.7.7.1 Instrument Cluster Replacement](#).
- (c) Confirm that the repair is completed.

Next

Step 9      System normal.

## 6.6.6.9 ABS Warning Lamp Always Off

Schematic:



Diagnostic Steps:

Step 1      Check the battery.

- (a) Measure the battery voltage.  
Standard Voltage Value: 11-14 V  
Is the voltage specified value?

No

Check and replace the battery or the charging system.

yes

Step 2      Check the instrument cluster connector.

- (a) Turn the ignition switch to OFF.  
(b) Disconnect the negative battery cable.  
(c) Check whether the connectors are properly connected to the instrument cluster.

No

Properly connect the connector.

Yes

Step 3 Check the wiring harness (instrument cluster - power, ground).

Instrument Cluster Harness Connector IP03

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE09-5105b

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the battery negative cable.
- (c) Disconnect the instrument cluster harness connector IP03.
- (d) Connect the battery negative cable.
- (e) Turn the ignition switch to ON (IG).
- (f) Measure voltage between the connector IP03 terminals 24,32 and the body ground respectively with a multimeter.  
Standard Voltage Value: 11-14 V
- (g) Turn the ignition switch to OFF.
- (h) Measure resistance between the connector IP03 terminals 15,16 and the body ground respectively with a multimeter.  
Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

No

Check the fuses, repair or replace the wiring harness.

Yes

Step 4 Check the instrument cluster.

- (a) Connect scan tool, turn the ignition switch to ON (IG).
- (b) In the functional test, select "Active test."  
Active Test: ABS Warning Lamp

Display	Test Parts
ABS Warning Lamp	ABS Warning Lamp lit or not lit (ON / OFF)

- (c) Check whether the ABS Warning Lamp is working properly.

Yes

System normal

No

Step 5 Replace the instrument cluster.

- (a) Replace instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#).
- (b) Check whether the ABS Warning Lamp is working properly.

Yes

System normal

No

Step 6 Replace the hydraulic electronic control unit.

- (a) Replace the ABS control module. Refer to [6.6.7.1 Hydraulic Electronic Control Unit Replacement](#).
- (b) Check whether the ABS Warning Lamp is working properly.

(c) Confirm that the repair is completed.

Next

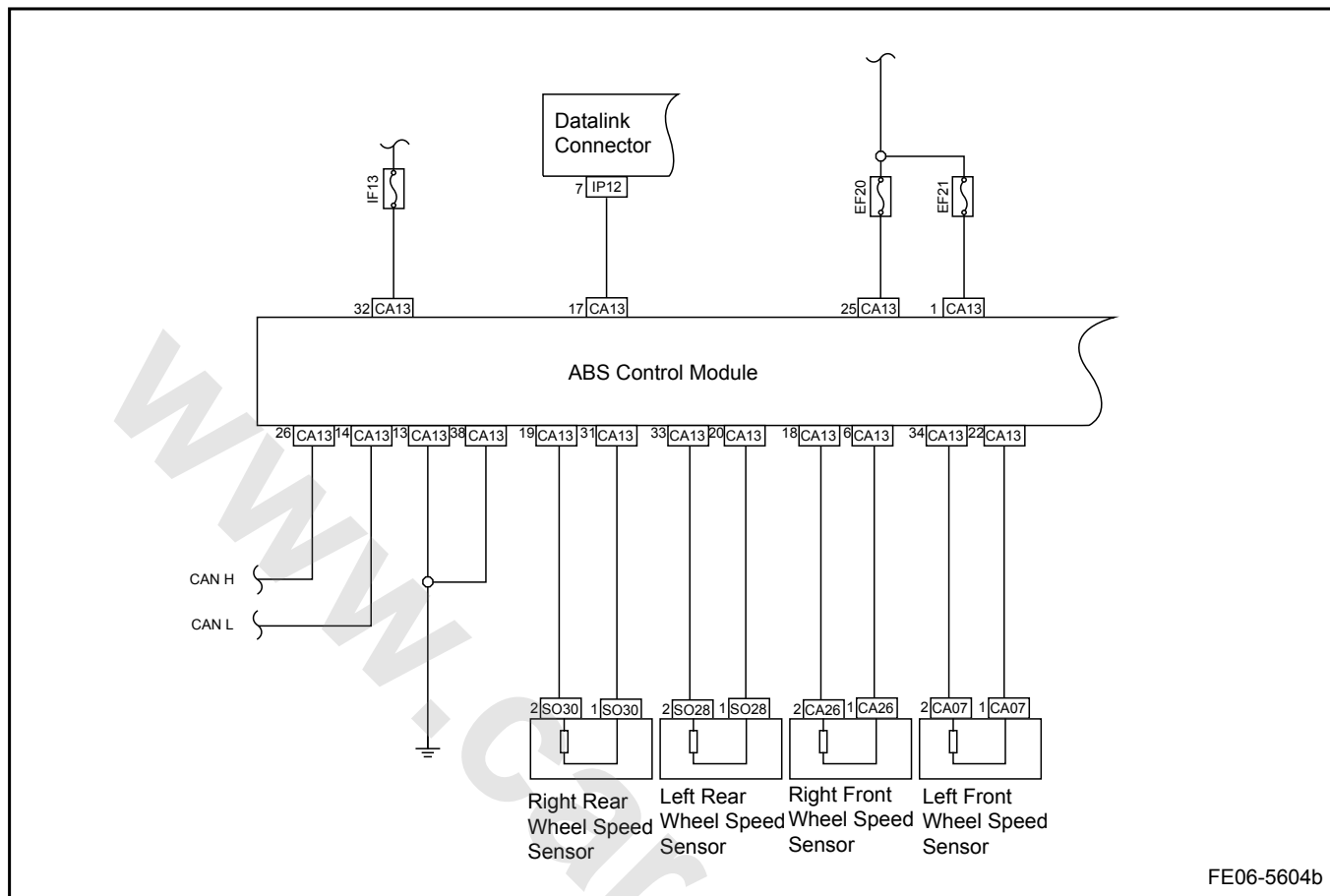
Step 7	System normal.
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#### 6.6.6.10 Power Failure and Hydraulic Electronic Control Unit Assembly Internal Fault Diagnosis

DTC code	Description
C1101	ECU Power Supply Voltage: High Voltage
C1102	ECU Power Supply Voltage: Low Voltage
C2112	Valve Relay Fault
C2308	Valve Malfunction, Left Front Inlet Valve
C2312	Valve Malfunction, Left Front Outlet Valve
C2316	Valve Malfunction, Right Front Inlet Valve
C2320	Valve Malfunction, Right Front Outlet Valve
C2324	Valve Malfunction, Left Rear Inlet Valve
C2328	Valve Malfunction, Left Rear Outlet Valve
C2332	Valve Malfunction, Right Backward Valve
C2336	Valve Malfunction, Right Rear Inlet Valve
C2402	Return Pump Malfunction (Electrical and Electronic Failure)



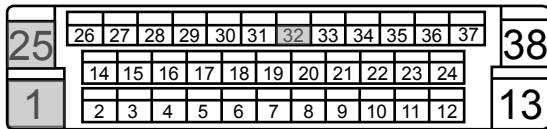
Schematic:



Diagnostic Steps:

Step 1	Check the battery.
	<p>(a) Measure the battery voltage. Standard Voltage Value: 11-14 V Is the voltage specified value?</p> <p>No → Check and replace the battery or the charging system.</p> <p>Yes →</p>
Step 2	Check the ABS control module harness connector.
	<p>(a) Check whether the wiring harness connector is connected correctly.</p> <p>No → Properly connect harness connectors.</p> <p>Yes →</p>
Step 3	Check the ABS control module harness connector (terminal voltage).

## ABS Control Module Harness Connector



FE06-5605b

- Turn off the ignition switch.
- Disconnect the control module harness connector.
- Turn on the ignition switch.
- Measure voltage between the harness connector CA13 terminals 1, 25, 32 and the body ground with a multimeter.  
Standard Voltage Value: 11-14 V

Is the voltage specified value?

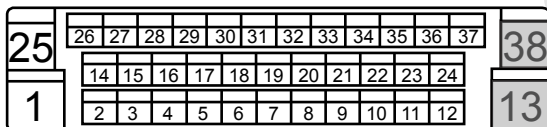
No

Check the fuses, repair or replace the wiring harness

Yes

Step 4 Check the ABS control module harness connector (ground terminal continuity).

## ABS Control Module Harness Connector CA13



FE06-5606b

- Measure resistance between the harness connector CA13 terminals 13, 38 and the body ground with a multimeter.  
Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

No

Repair or Replace the wiring harness or the connector.

Yes

Step 5 Replace the hydraulic electronic control unit

- Replace the ABS control module assembly. Refer to [6.6.7.1 Hydraulic Electronic Control Unit Replacement](#).
- Connect the battery negative cable.
- Turn the ignition switch, to confirm whether the ABS Warning Lamp lit out.
- Confirm that the repair is completed.

Next

Step 6 System normal.

## 6.6.6.11 Wheel Speed Sensor Fault Diagnosis

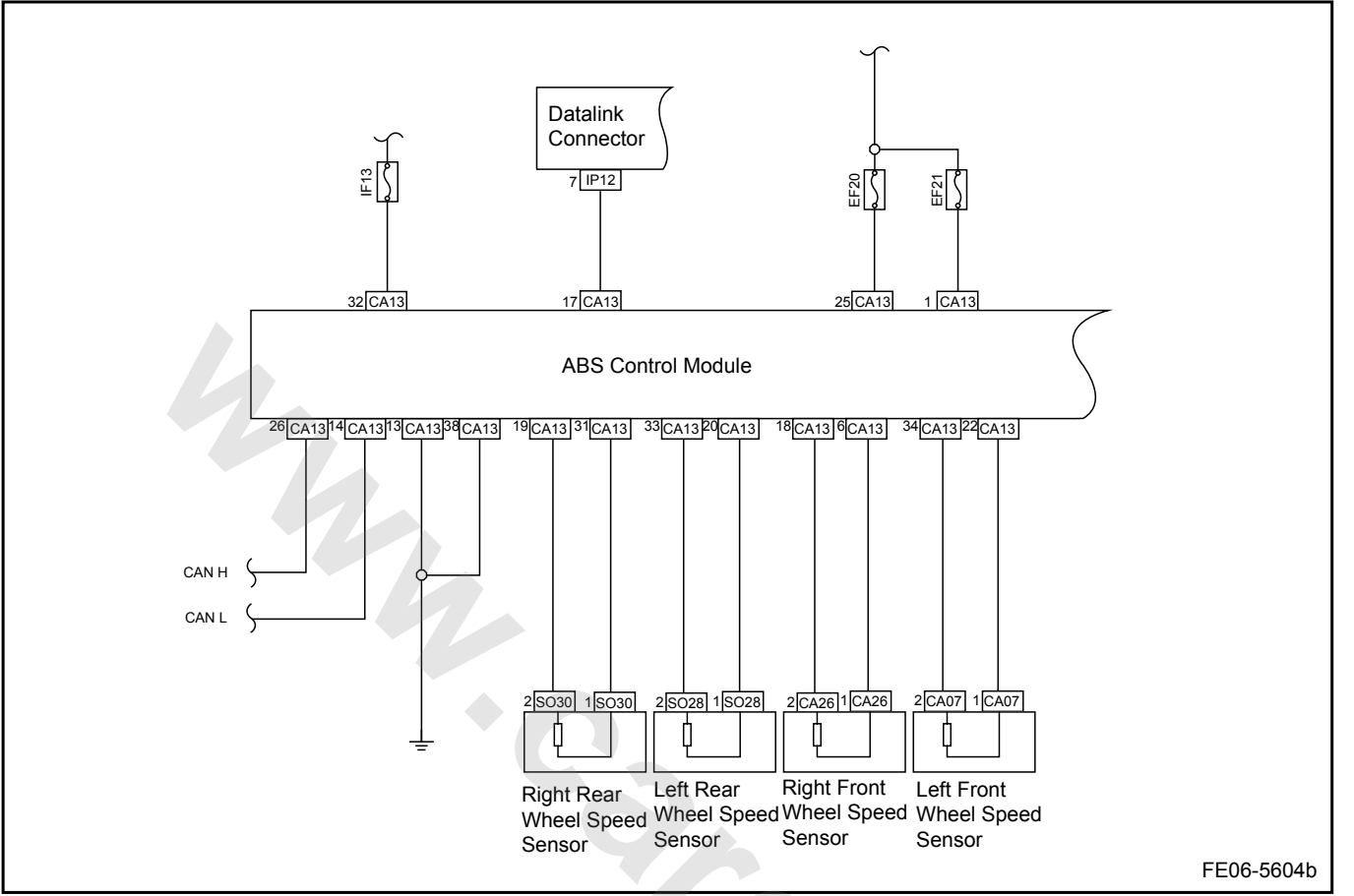
DTC code	Description
C1200	Wheel Speed Sensor, Left Front: Open / Short

DTC code	Description
C1201	Wheel Speed Sensor, left Front: Scope, Performance, Intermittent Fault
C1202	Wheel Speed Sensor, Left Front: Invalid / No Signal
C1203	Wheel Speed Sensor, Right Front: Open / Short
C1204	Wheel Speed Sensor, Right Front: Scope, Performance, Intermittent Fault
C1205	Wheel Speed Sensor, Right Front: Invalid / No Signal
C1206	Wheel Speed Sensor, Left Rear: Open / Short
C1207	Wheel Speed Sensor, Left Rear: Scope, Performance, Intermittent Fault
C1208	Wheel Speed Sensor, Left Rear: Invalid / No Signal
C1209	Wheel Speed Sensor, Right Rear: Open / Short
C1210	Wheel Speed Sensor, Right Rear: Scope, Performance, Intermittent Fault
C1211	Wheel Speed Sensor, Right Rear: Invalid / No Signal
C1213	Wheel Speed Sensor Frequency Error (general wheel speed sensor fault, slip or tooth error)

**Note**

This manual is only for the left front wheel speed sensor fault diagnosis, other sensor diagnostic methods are similar. Please refer to the "left Front wheel Speed Sensor Fault Diagnosis."

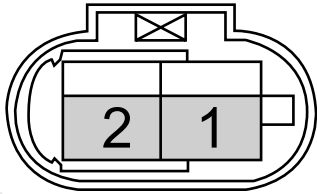
Schematic:



Diagnostic Steps:

Step 1	Check the left front wheel speed sensor harness connector.
(a) Check whether the left front wheel speed sensor wiring harness connector is connected correctly.	
<div>No</div> <div>Properly connect harness connectors.</div>	
<div>Yes</div>	
Step 2	Check the left front wheel speed sensor installation.
(a) Check whether the left front wheel speed sensor is installed correctly.	
Tightening Torque: 19 Nm (Metric) 14 lb-ft (US English)	
<div>No</div> <div>Correctly install the left front wheel speed sensor.</div>	
<div>Yes</div>	
Step 3	Check the left front wheel speed sensor.

Left Front Wheel Speed Sensor Harness Connector CA07



FE06-5610b

- With a multimeter measure the left front wheel speed sensor according to the table below.
- Confirm the voltage and current is complied with the standard value.

**Note**

Turn the wheel with hand when measuring.

**Warning!**

Do not place finger into a rotating wheel, otherwise, it may result in personal injury.

Wheel Speed Sensor	Description
Sensor Type	Hall Type Speed Sensor
Signal Current	Low: $7 \pm 20\%$ mA, High: $14 \pm 20\%$ mA
Gap Between The Sensor and The Signal Plate	Front Axle 1.56 mm (0.061 in); Rear Axle 0.738 mm (0.029 in)

Yes

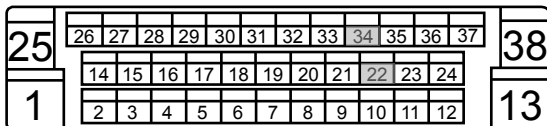
Go to step 5

No

Step 4

Check the left front wheel speed sensor and ABS control module wiring harness.

ABS/ESP Harness Connector CA13



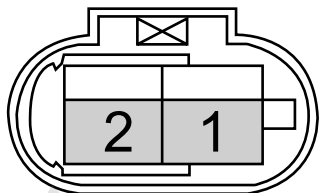
FE06-5607b

- Disconnect the left front wheel speed sensor harness connector.
  - Disconnect the ABS control module harness connector.
  - Measure resistance between the connector CA13 terminal 34 and CA07 terminal 2 with a multimeter.
  - Measure resistance between the connector CA13 terminal 22 and CA07 terminal 1 with a multimeter.  
Standard Resistance: Less than  $1 \Omega$
  - Measure resistance between the connector CA13 terminals 34, 22 and the body ground.  
Standard Resistance:  $10 \text{ k}\Omega$  or higher
- Is the resistance specified value?

No

Repair or Replace the wiring harness

Left Front Wheel Speed Sensor Harness  
Connector CA07



FE06-5610b

Yes

Step 5 Check the left front wheel speed sensor.

- (a) Confirm that there is no short circuit between the sensor terminals with a multimeter.
- (b) Resistance between the sensor two terminals and the body ground are infinity.

Is the resistance specified value?

No

Replace the left front wheel speed sensor

Yes

Step 6 Check the left front wheel speed sensor probe.

- (a) Remove the left front wheel speed sensor. Refer to [6.6.7.2 Wheel Speed Sensor Replacement \(Front\)](#).
- (b) Check whether the sensor probe is scratched or contaminated by foreign matter and dirt.

Yes

Clean or replace the sensor.

No

Step 7 Check the left front wheel speed sensor ring gear.

- (a) Check whether the left front wheel speed sensor ring gear is deformed, or whether there are teeth missing.

Yes

Replace the left front wheel speed sensor ring gear

No

Step 8 Replace the hydraulic electronic control unit.

- (a) Replace the hydraulic electronic control unit. Refer to [6.6.7.1 Hydraulic Electronic Control Unit Replacement](#)
- (b) Confirm that the repair is completed.

[Next](#)

Step 9	System normal.
--------	----------------

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## 6.6.7 Removal and Installation

### 6.6.7.1 Hydraulic Electronic Control Unit Replacement

Removal Procedure:

**Warning!**

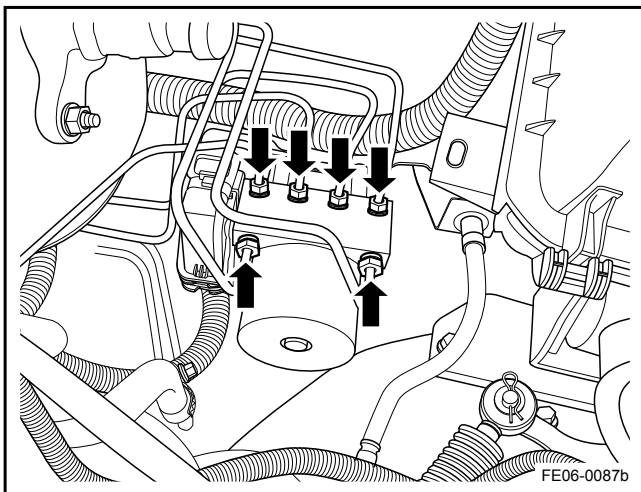
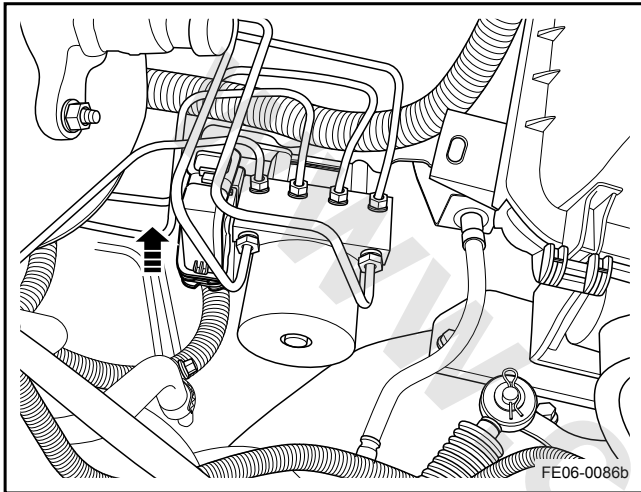
Refer to "Battery Disconnect Warning" in "Warnings and Notices" .

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the air filter and air filter to the throttle pipe.
3. Press plug, pull the zipper upward, disconnect the brake regulator wiring harness connector.
4. Drain the brake fluid.
5. Use a cloth to cover the wiring harness connector sockets and plugs to avoid contact with brake fluid.

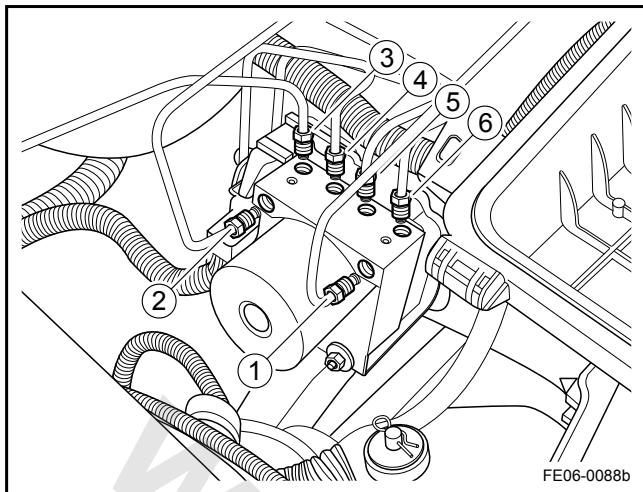
**Note**

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".

6. Remove brake fluid pipe connecting nuts from the brake adjuster, and immediately wipe the brake fluid overflow.



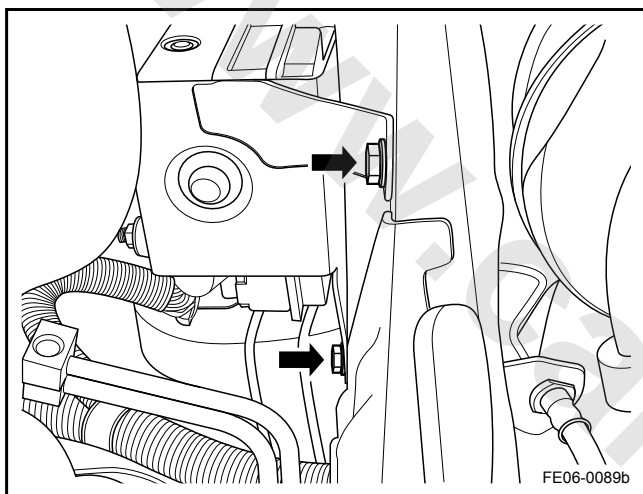




7. Use tags or make marks to identify the locations for re-connection.

Tip:

1. To the No. 1 Brake Master Cylinder
2. To the No. 2 Brake Master Cylinder
3. To the Right Front Brake Cylinder
4. To the Left Rear Brake Cylinder
5. To the Right Rear Brake Cylinder
6. To the Left Front Brake Cylinder

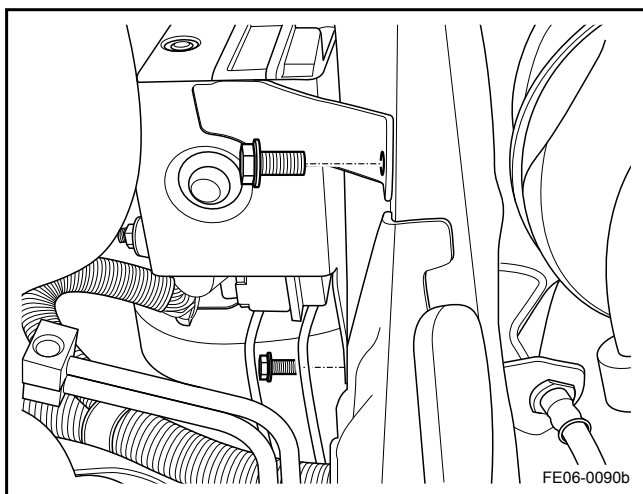


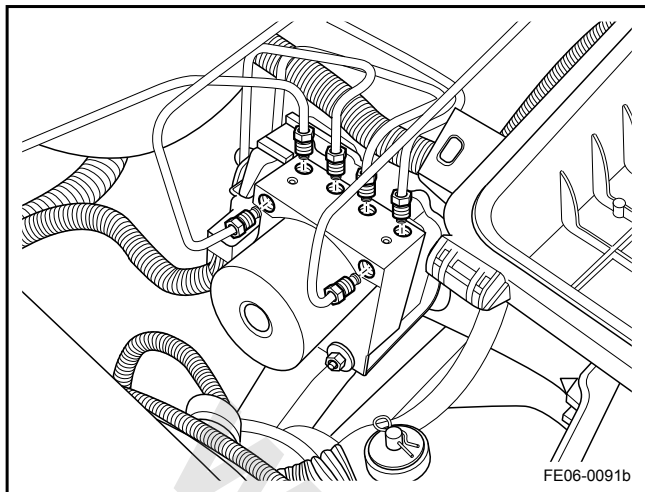
8. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).
9. Remove the engine bottom shield. Refer to [12.10.1.7 Left and Right Engine Bottom Shield Replacement](#).
10. Remove the brake adjuster bracket retaining bolts.
11. Remove the hydraulic electronic control unit.

#### Installation Procedure:

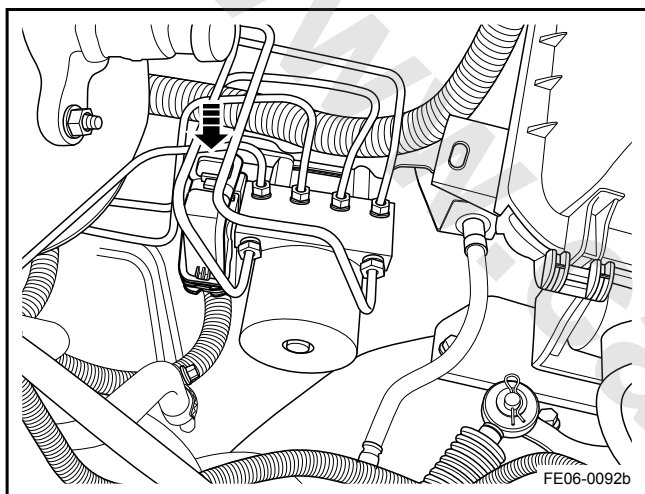
1. Install the hydraulic electronic control unit and tighten the bolts.

Torque: 25 Nm (Metric) 18.5 lb-ft (US English)





2. Install the brake hard pipe joints, and tighten the nuts.  
Torque: 16 Nm (Metric) 11.9 lb-ft (US English)



3. Push down the lock, connect the hydraulic electronic control unit wiring harness connector.

4. Fill the brake fluid.

**Note**

Refer to "Adding Fluid to the Brake System Notice" in "Warnings and Notices".

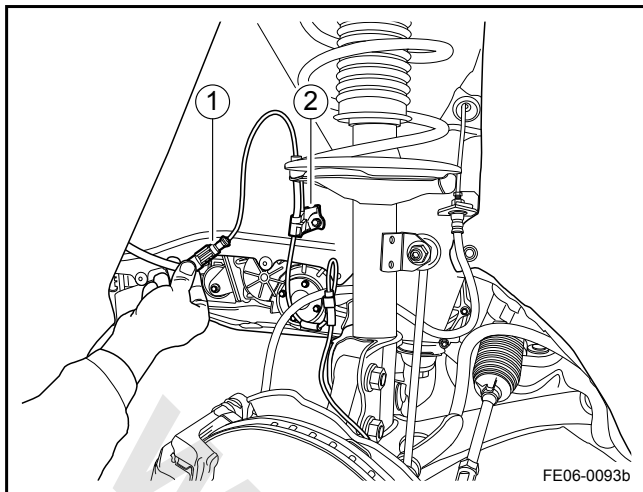
5. Discharge air from the hydraulic brake system.
6. Check whether the brake system is leaking.
7. Install the engine bottom shield.
8. Connect the battery negative cable.

### 6.6.7.2 Wheel Speed Sensor Replacement (Front)

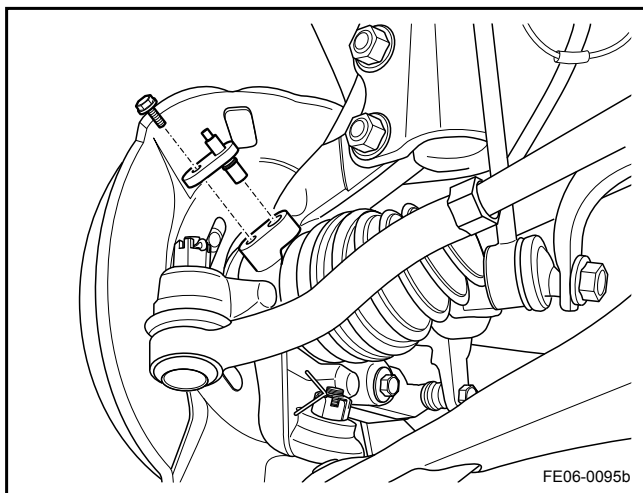
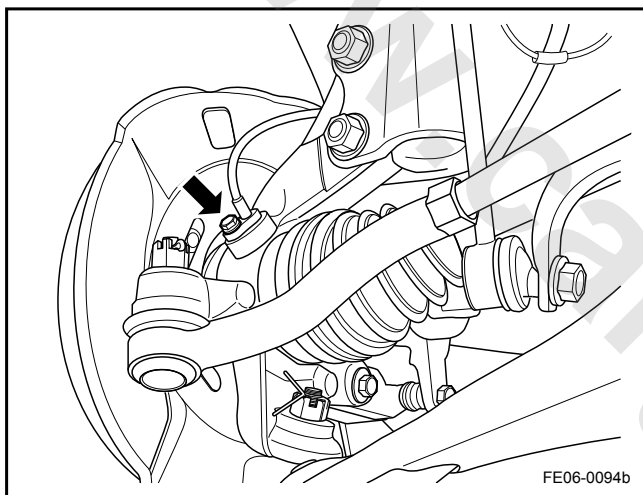
Removal Procedure:

**Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices" .

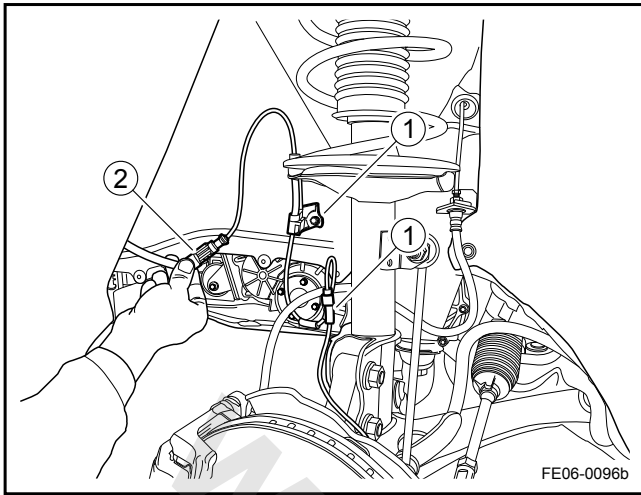


1. Remove the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).
3. Remove the front wheels. Refer to [4.4.5.1 Wheel Replacement](#).
4. Disconnect the front wheel speed sensor wiring harness from the shock absorber.
5. Remove the front fender liner. Refer to [12.10.1.8 Front Wheelhouse Liner Replacement](#).
6. Disconnect the front wheel speed sensor harness connector (1) from the back of the front fender liner. Remove the sensor wiring harness bolt (2).
7. Remove the front wheel speed sensor retaining bolt.
8. Remove the front wheel speed sensor.



#### Installation Procedure:

1. Install the front wheel speed sensor and using the bolt with a flat washer to tighten.  
Torque: 19 Nm (Metric) 14 lb-ft (US English)



2. Fix the front wheel speed sensor wiring harness (1).
3. Connect the front wheel speed sensor harness connector (2).
4. Install the front fender liner.
5. Lower the vehicle.
6. Connect the battery negative cable.
7. Install the front wheels.

#### Note

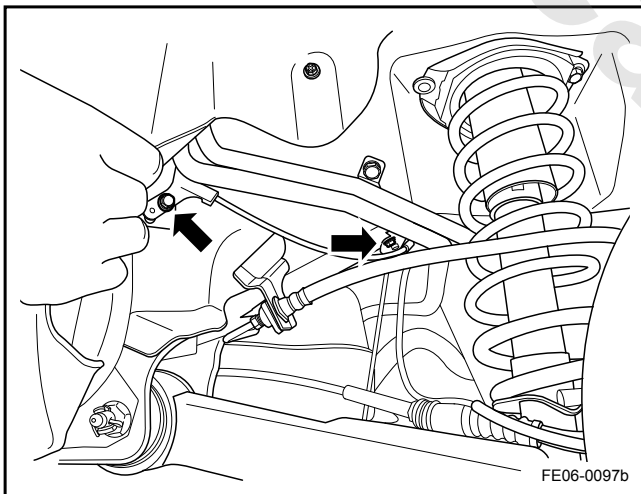
Left front and right front wheel speed sensor replacement is similar.

### 6.6.7.3 Wheel Speed Sensor Replacement (Rear)

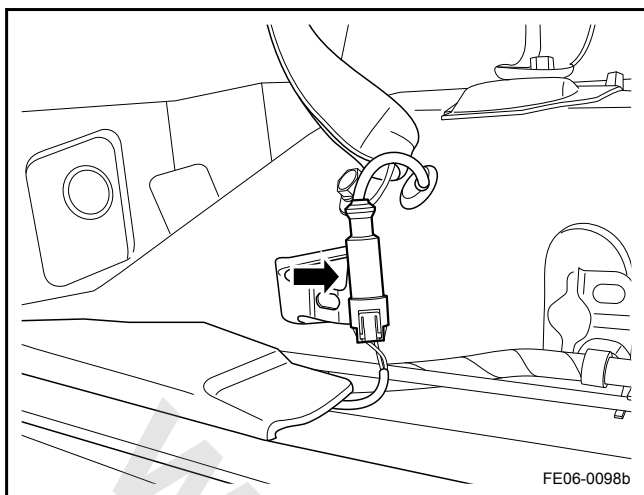
Removal Procedure:

#### Warning!

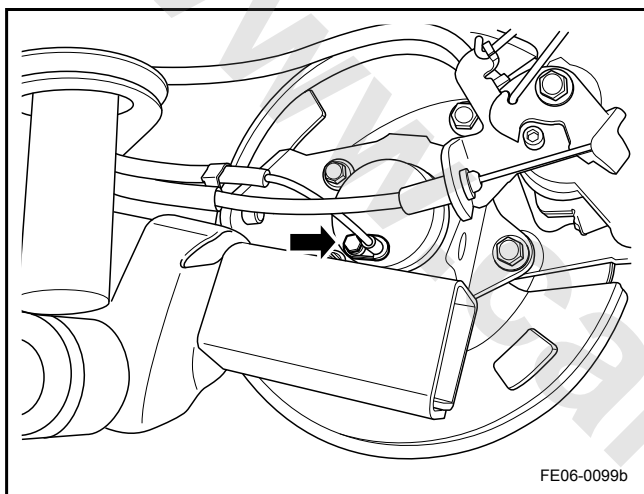
Refer to "Battery Disconnect Warning" in "Warnings and Notices" .



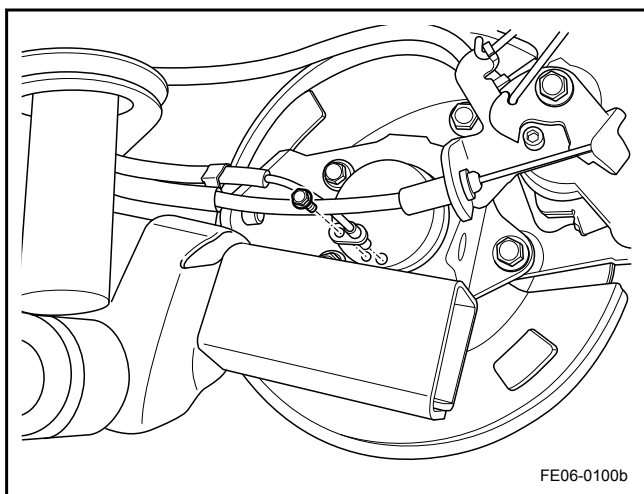
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).
3. Remove the rear wheels. Refer to [4.4.5.1 Wheel Replacement](#).
4. Disconnect the rear wheel speed sensor wiring harness from the rear suspension.
5. Remove the rear wheel speed sensor wiring harness to rear axle retaining bolts.
6. Remove the rear seat back. Refer to [12.7.3.6 Rear Seat Armrest Assembly Replacement](#).



7. Disconnect the rear wheel speed sensor wiring harness connector.



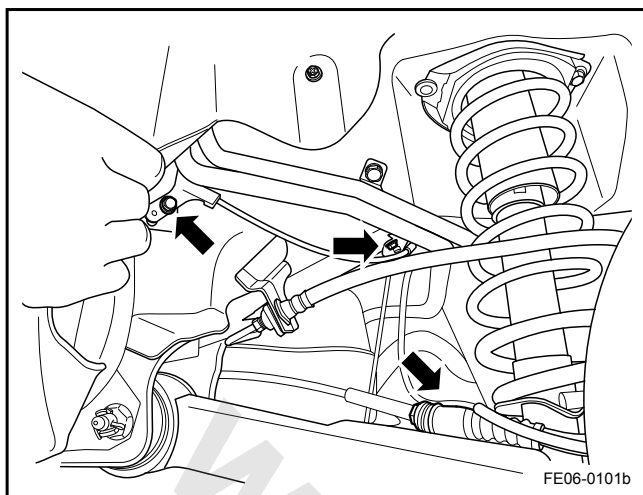
8. Remove the rear wheel speed sensor retaining bolts.
9. Remove the rear wheel speed sensor.



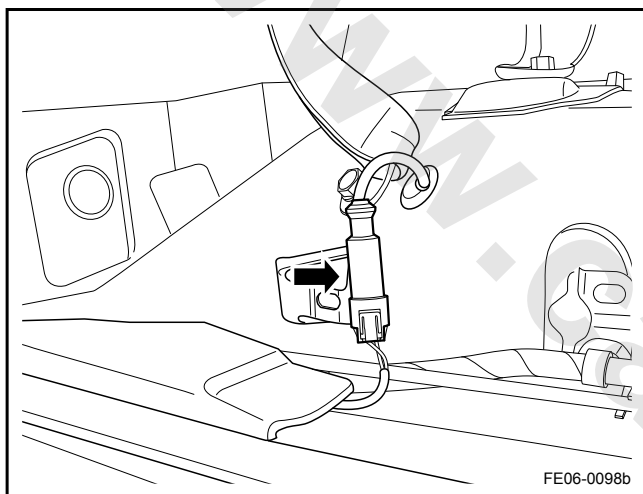
#### Installation Procedure:

1. Install the rear wheel speed sensor and use the bolt with a flat washer to tighten.

Torque: 19 Nm (Metric) 14 lb-ft (US English)



2. Connect the rear wheel speed sensor wiring harness.



3. Run through the rear wheel speed sensor wiring harness from the passenger compartment and connect the wiring harness connector.
4. Install the rear seat back.
5. Connect the battery negative cable.
6. Install the rear wheels.

#### Note

Left and right rear wheel speed sensor replacement is similar.

## 6.7 TPMS

### 6.7.1 Specifications

#### 6.7.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
TPMS Module Bolts	M6 × 14	8-10	6.0-7.4

#### 6.7.1.2 Sensor Specifications

Applications	Specifications
Weight	36-38 g
Shell Material	PBT +30% GF
Material	Polybutadiene
Put the valve rod into the mold for a second injection, final assembly dimensions	Length: 72.2-73.2 mm (2.85-2.88 in) Width: 36.3-37.3 mm (1.43-1.47 in) Height: 24.8-25.8 mm (0.98-1.02 in)
Valve Material	Electric Aluminum
Installation Location	Inside tires, on the valve lip
Valve Nut Torque	8-10 Nm (6-7.4 lb-ft)
Working Voltage	Long-life (normal working life 5 years) 3 V battery



## 6.7.2 Description and Operation

### 6.7.2.1 Tire Pressure Monitoring System Overview

In the current auto industry there are two kinds of tire pressure monitoring system (TPMS): Direct and indirect. Direct TPMS can detect the real pressure of automobile tires. Indirect TPMS tires by checking out some of the technical parameters to infer tire pressure. Direct TPMS tire pressure and temperature can be accurately detected. TPMS is aimed at alerting the driver when one or more tire pressure is below the warning pressure level. Direct TPMS is divided into two types: high-end system and low-end system. Low-end system will alert the driver when the tire pressure is below the warning level, while the high-end systems can not only alert the driver but also show which tire tire pressure is not normal. This vehicle TPMS is a low-end direct TPMS system provided by Lier Company.

### 6.7.2.2 The Composition Of Tire Pressure Monitoring System

TPMS system is composed of the following components

- TPMS Control Unit
- TPMS Sensors (one for each wheel) (does not include spare tire)
- TPMS tire pressure management system and the TREAD tire pressure warning indicator lights

### TPMS Control Unit

#### Note

Tire Pressure Monitoring System receiver can provide excellent installation flexibility to meet a broader range of installation requirements. This flexibility of installation can be achieved by the metal bracket connected to the shell. Bracket connection with the shell allows the bracket to pass through the shell side and to be locked without the use of additional fixtures.

When the vehicle ignition circuit is connected, TPMS control unit micro-control unit and the RF receiver circuit are activated. The control unit continuously monitors the TPMS sensors wireless signals. TPMS receiver unit can store TPMS sensor id code (identification code, differentiate each sensor). When the TPMS receiver unit receives a signal, it will check whether the received information contained id code is consistent with the stored id code. If they match, TPMS receiver unit will input the information to the TPMS alarm algorithm. This algorithm will evaluate each tire pressure and temperature changes over

time, and make a decision on the potential danger caused by tire deflation, remind the driver through the tire pressure (TREAD) warning lamp. In addition to handling the TPMS sensors signals, TPMS control unit can also conduct its own self-test on its circuit and working status. If a fault is detected, TPMS control unit will continue to light the TPMS malfunction warning lamp, to remind the driver.

### TPMS Sensor

Each tire is equipped with a TPMS sensor, through the valve installed on the wheel rim. TPMS sensor is a battery powered component, regularly measures the tire pressure, temperature and acceleration information. Pressure, temperature and acceleration information will be converted by the TPMS sensor unit micro-control unit into a digital form. Acceleration information is used to determine whether the vehicle is stationary or moving. TPMS sensor is equipped with radio-frequency transmitting circuit for periodically sending information to the TPMS control unit.

### Tire Pressure Management System Indicator (TPMS) and Tire Pressure Warning Lamp (TREAD)

TPMS control unit can provide two consecutive current drive capability of 200 mA, respectively, to drive two warning lamps. When the tire pressure drops below a warning level pressure, TPMS receiver will continuously light the TREAD warning lamp to remind the driver. Throughout the course of the ignition cycle, TREAD alarm indicator status will be maintained. When the TPMS is faulty, TPMS receiver unit will continuously light the Tire Pressure Management System (TPMS) warning lamp. TPMS receiver unit has a self-diagnostic function, its features include: warning lamp diagnostic tests, EEPROM data accuracy check, vehicle power supply voltage measurement, warning lamp circuit failure, TPMS sensors low voltage status monitoring, TPMS sensor fault condition monitoring, TPMS sensor learn mode, the installation of not monitored tire.

When the tire low voltage alarm and system failures arise at the same time, the tire low voltage alarm has a higher priority.



### 6.7.3 System Working Principle

#### 6.7.3.1 System Working Principle

##### TPMS Function Description

##### 1. Reset

During the initial power-up or the voltage is below the reset threshold, TPMS control unit will be in a non-operational services status, in reset status. Once the voltage reaches an acceptable value, TPMS control unit will be released from the reset status, the module will enter the normal status.

##### 2. Initialization Mode (System Self-test)

When the ignition is turned to ON, the initialization starts. The system will initialize I / O ports, registers, internal variables, data storage address.

##### 3. Start Mode

In the start mode, TPMS supports systems running:

##### a. Receive WE Sensors RF Data Frame

TPMS control unit continuously receives and deals with TPMS sensors RF data frame.

##### b. Verify Sensor Received WE Frame Data

Upon receiving a radio frequency emitted by the WE sensor data frame, TPMS control unit will firstly verify the legitimacy of the message received. Sensor information will be sent through an early warning algorithms for processing.

##### c. Process Each Received Valid TPMS Sensor Message

Once a low tire pressure is detected, tire pressure warning lamp will be lit (TREAD).

##### d. Continuously Monitors The K-Bus Request

TPMS control unit must be activated prior to use of the K-bus.

##### e. Vehicle Moving (Wheel Speed Sensor)

Monitor whether there is a tire without speed sensor or the spare tire is used on the vehicle.

##### 4. Diagnostic Mode

When connecting scan tool to communicate through the K-bus, TPMS control unit enters into the diagnostic mode.

##### 5. Sleep Mode

When the system enters into sleep mode, it will enter a low power consumption mode. When entering sleep mode, it does not receive and process sensor information, or the

diagnosis command, until the ignition is detected turned on, the system exits sleep mode.

##### — Wake-up Condition

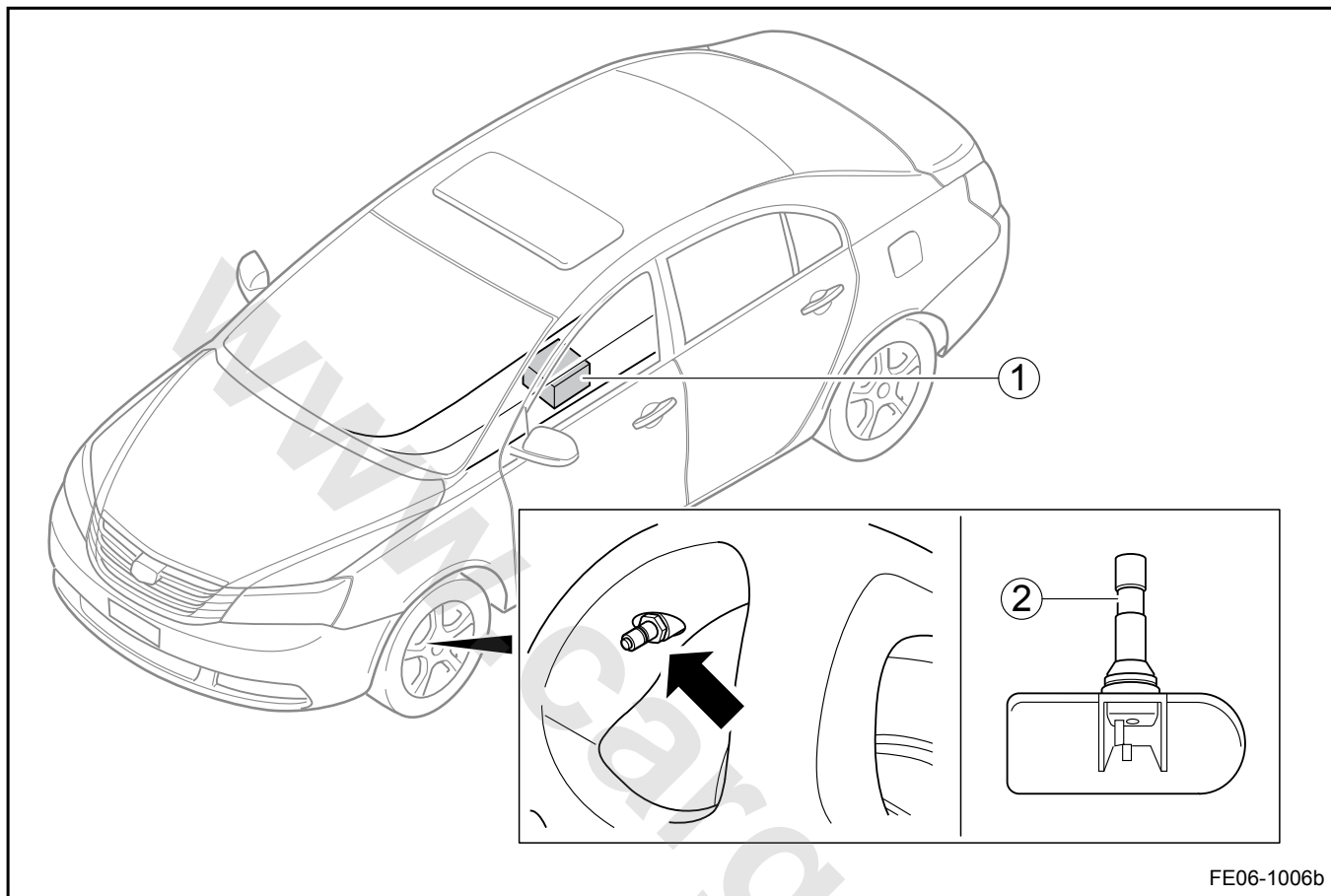
When the ignition input signal changes from the ignition off (OFF) to ignition on (ON), the TPMS control unit exits sleep mode.

##### — Sleep Condition

When the TPMS control unit detects that the ignition input information is off (OFF) and no pending received RF information, TPMS control unit will enter into sleep mode.

## 6.7.4 Component Locator

## 6.7.4.1 Component Locator



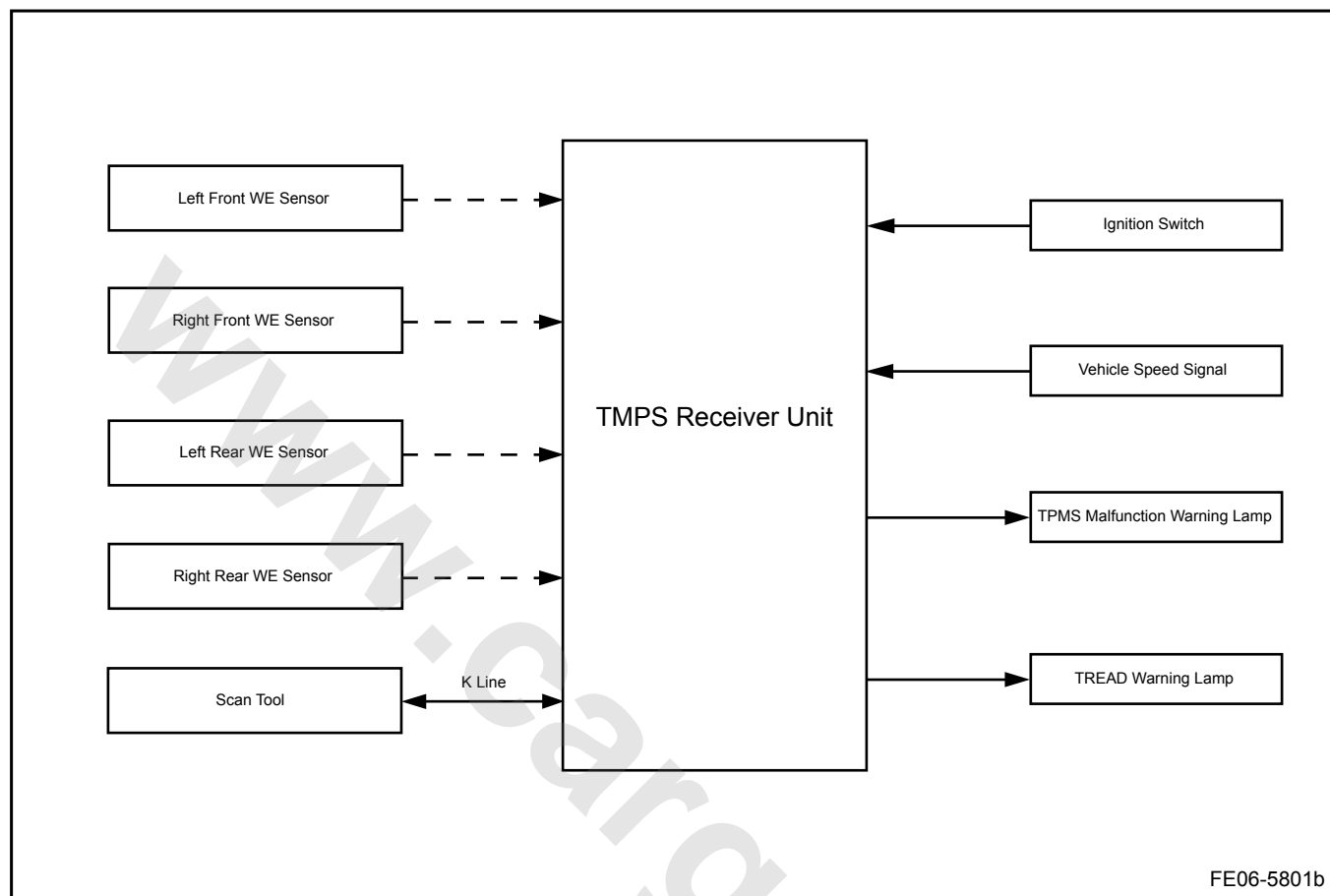
## Legend

1. TPMS Control Module

2. TPMS Sensor

## 6.7.5 Schematic

## 6.7.5.1 Schematic



## 6.7.6 Diagnostic Information and Procedures

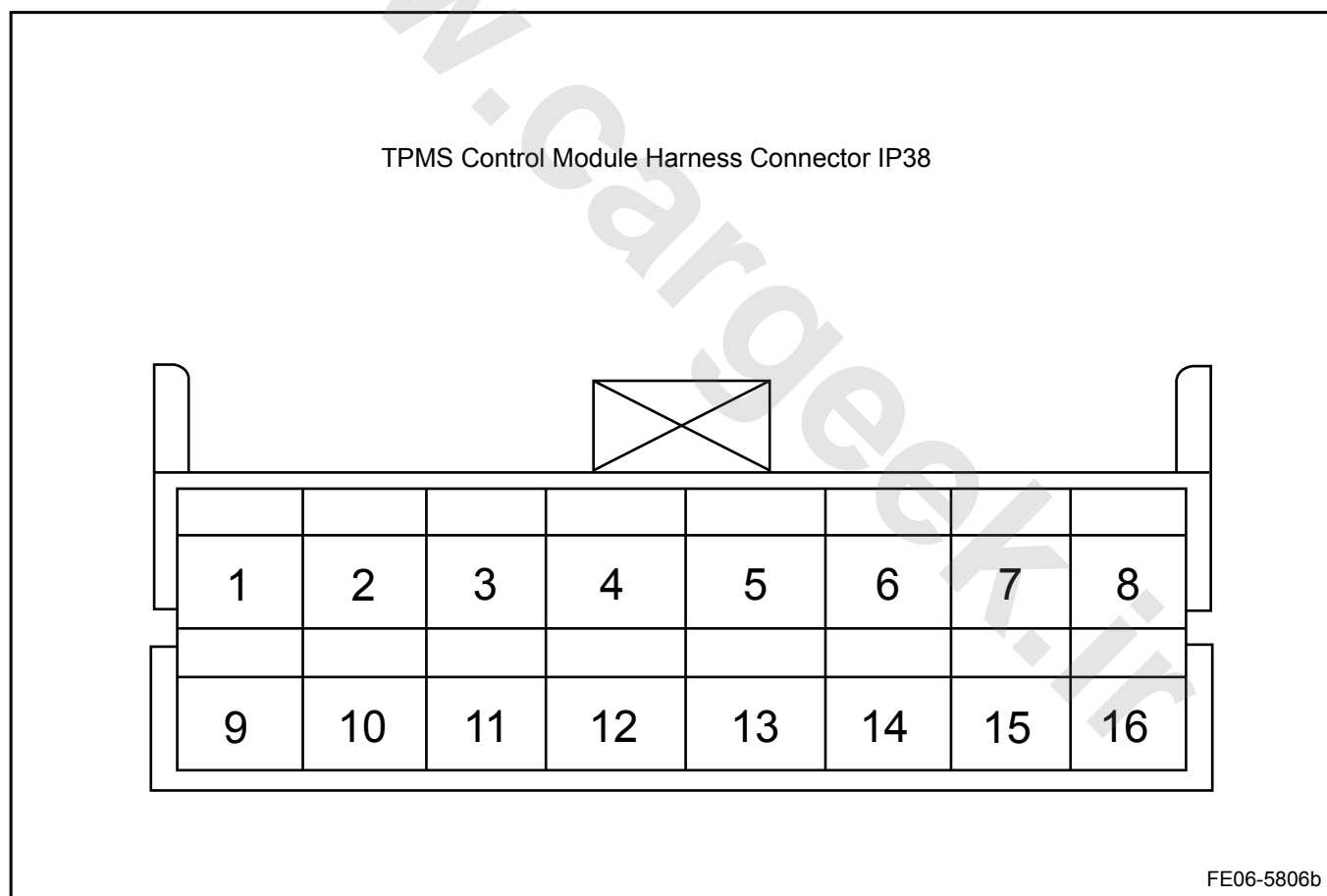
### 6.7.6.1 Sensor Learn

Scan tool sends the learn commands with sensor serial numbers to command the sensor into the learn process through the K-line. When the sensor is triggered, TPMS control unit can receive a corresponding sensor id. Trigger Tool needs to manually trigger the TPMS sensors to send id. Learn id number is related to the sensor serial number. Learned sensor must be associated with a sensor number.

In this system, each sensor corresponding tire fixed location is shown in the following order:

Sensor #	Wheel Sensor Position
Sensor 1	Left Front
Sensor 2	Right Front
Sensor 3	Left Rear
Sensor 4	Right Rear

### 6.7.6.2 TPMS Control Module Terminal List



Pin	Function	I / O	Maximum Current	Logic		Description
				On	Off	
01	--	--	--	--	--	--

Pin	Function	I / O	Maximum Current	Logic		Description
				On	Off	
02	--	--	--	--	--	--
03	--	--	--	--	--	--
04	--	--	--	--	--	--
05	K-line	IN/OUT	--	L	H	K_BUS
06	--	--	--	--	--	--
07	Ignition	IN	12 mA	H	L	-
08	Power Supply	POWER	200 mA	--	--	--
09	--	--	--	--	--	--
10	--	--	--	--	--	--
11	--	--	--	--	--	--
12	--	--	--	--	--	--
13	TPMS Warning Lamp	OUT	200 mA	H	L	TPMS Receiver Unit Drive
14	TREAD Warning Lamp	OUT	200 mA	L	H	TREAD Receiver Unit Drive
15	Speed Information	IN	1 mA	L	H	-
16	Ground	POWER	2 A	--	--	--

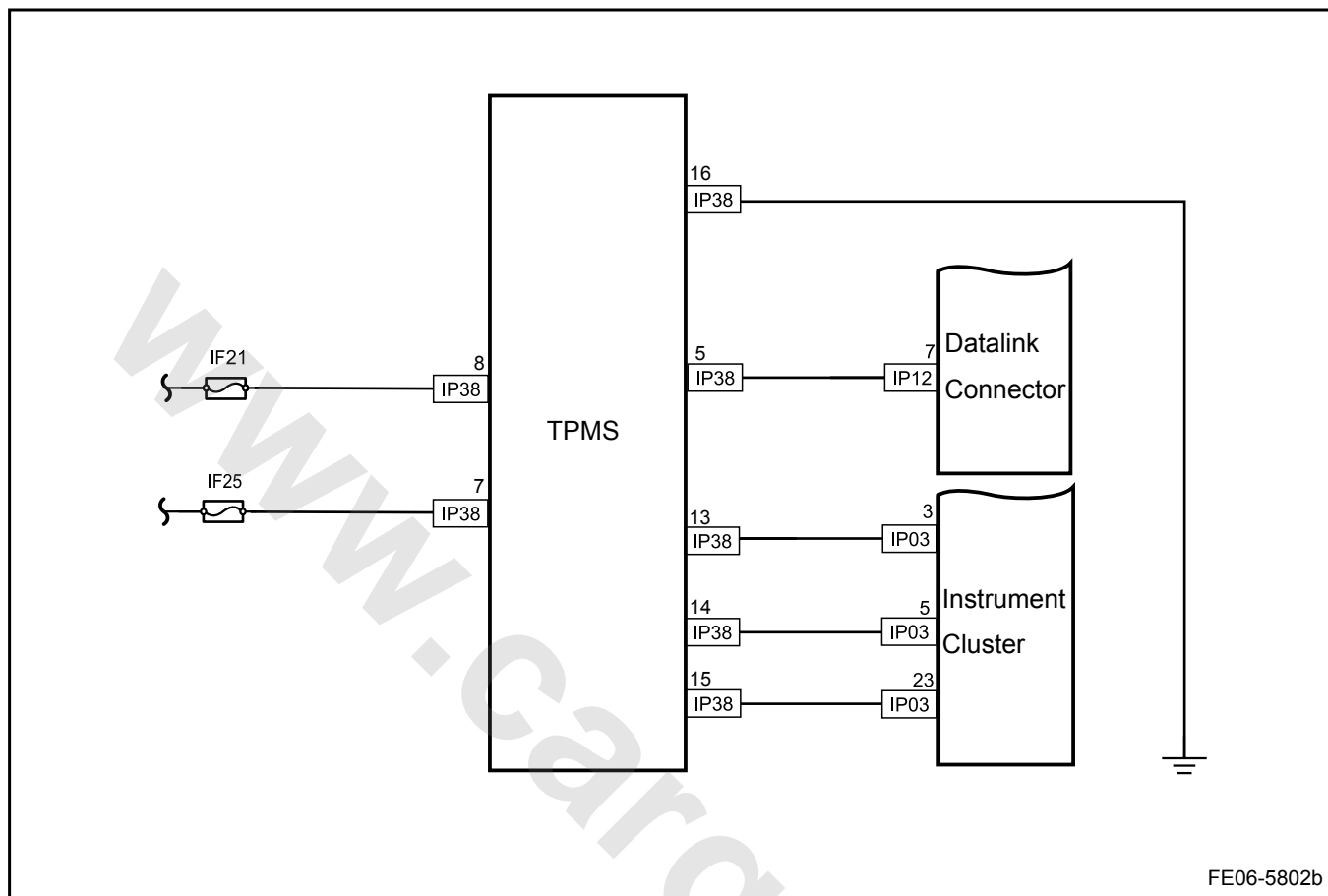
### 6.7.6.3 DTC Code (DTC) List

DTC Code	DTC Code Descriptions
C1121	Left Front Wheel Sensor Battery Voltage Low
C1122	Right Front Wheel Sensor Battery Voltage Low
C1123	Left Rear Wheel Sensor Battery Voltage Low
C1124	Right Rear Wheel Sensor Battery Voltage Low
C1312	Left Front Wheel Sensor Is Not Emitting
C1313	Right Front Wheel Sensor Is Not Emitting
C1314	Left Rear Wheel Sensor Is Not Emitting
C1315	Right Rear Wheel Sensor Is Not Emitting
C1316	Spare Wheel Sensor Is Not Emitting
C1322	Left Front Wheel Sensor Too Hot and Off
C1323	Right Front Wheel Sensor Too Hot and Off

DTC Code	DTC Code Descriptions
C1324	Left Rear Wheel Sensor Too Hot and Off
C1325	Right Rear Wheel Sensor Too Hot and Off
C1332	Left Front Wheel Sensor Malfunction
C1333	Right Front Wheel Sensor Malfunction
C1334	Left Rear Wheel Sensor Malfunction
C1335	Right Rear Wheel Sensor Malfunction
C1126	Battery Voltage Low
C1127	Battery Voltage High
C1660	No Actuation
C1668	Watchdog Reset
C2510	Tire Pressure Warning Lamp (TREAD)
C2511	Tire Pressure Management System Indicator (TPMS) Circuit Malfunction
C1661	EEPROM Checksum Error
C1301	Not Monitored Tire Installed
C1212	Speed Sensor Malfunction

## 6.7.6.4 Tire Pressure Monitoring System (TPMS) Indicator Always On

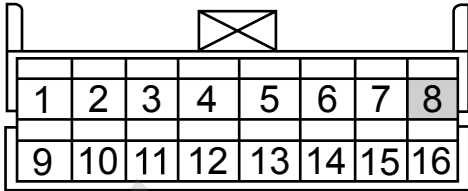
Schematic:



Diagnostic Steps:

Step 1	1. Use scan tool to access the TPMS control.
	(a) Check the DTC. Yes → Repair according to the DTC. No →
Step 2	Check the battery voltage.
	(a) Measure the battery voltage with a multimeter. Standard Voltage: 12-14 V Is the voltage specified value? No → Check and replace the battery or the charging system. Yes →
Step 3	Check TPMS control unit power supply.

TPMS Control Module Harness Connector IP38



FE06-5803b

- Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
- Disconnect TPMS control unit harness connector.
- Connect the battery negative cable.
- Measure voltage between TPMS control unit harness connector IP38 terminal 8 and the body ground with a multimeter.

Standard Voltage: 12-14 V

Is the voltage specified value?

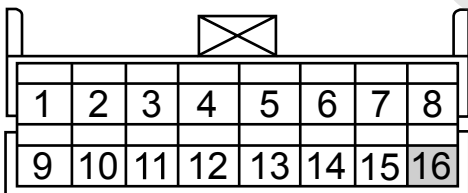
No

Check the fuses, repair or replace the wiring harness.

Yes

Step 4 Check TPMS control unit ground.

TPMS Control Module Harness Connector IP38



FE06-5804b

- Measure resistance between IP38 terminal 16 and the body ground with a multimeter.

Standard Resistance: Less than 1 Ω

Is the resistance specified value?

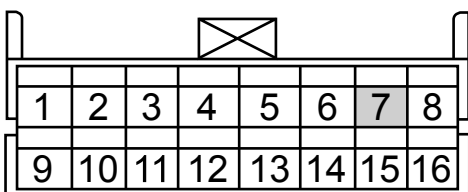
No

Repair or Replace the wiring harness.

Yes

Step 5 Check TPMS control unit ignition switch signal.

TPMS Control Module Harness Connector IP38



FE06-5805b

- Turn the ignition switch to the ON position.
- Measure voltage between connector IP38 terminal 7 and the body ground with a multimeter.

Standard Voltage: 12-14 V

Is the voltage specified value?

Note: The circuit does not provide TPMS receiver unit working current, it is only used as a logic level input.

No

Check the fuses, repair or replace the wiring harness.



Yes

Step 6 Replace the TPMS control unit.

- (a) Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
- (b) Replace the TPMS control unit. Refer to [6.7.7.1 TPMS Control Unit Replacement](#).
- (c) Confirm that the repair is completed.

Next

Step 7 System normal.

### 6.7.7 Removal and Installation

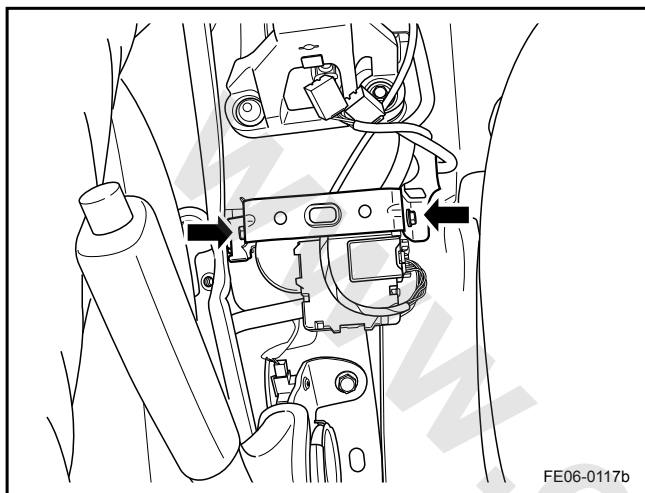
#### 6.7.7.1 TPMS Control Unit Replacement

Removal Procedure:

**Warning!**

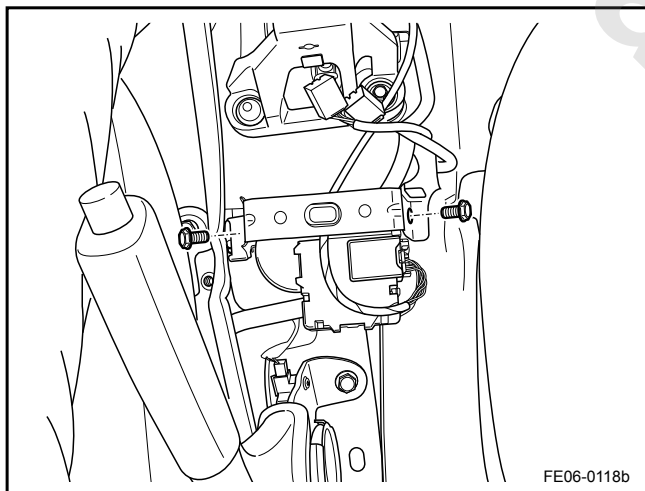
Refer to "Battery Disconnect Warning" in "Warnings and Notices" .

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the center console. Refer to [3.3.8.9 Shift Lever Replacement](#).
3. Disconnect TPMS control unit wiring harness connector.
4. Remove the TPMS control unit retaining bolts.



Installation Procedure:

1. Install the TPMS control unit retaining bolts.  
Torque: 9 Nm (Metric) 6.7 lb-ft (US English)
2. Connect TPMS control unit wiring harness connector.
3. Install the center console.
4. Connect the battery negative cable.

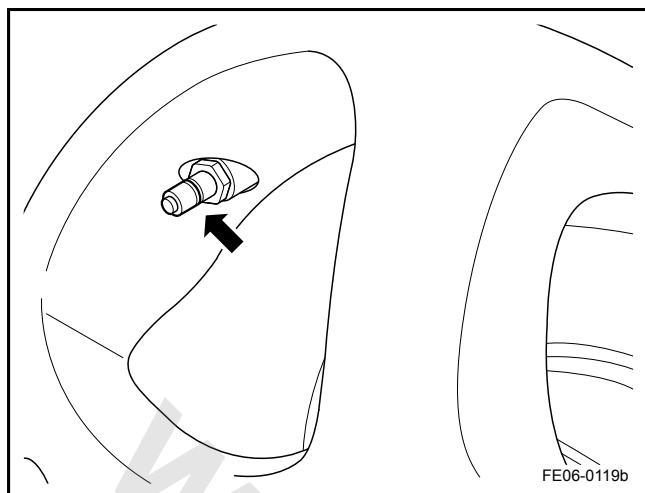


#### 6.7.7.2 TPMS Sensor Replacement

Removal Procedure:

**Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices" .



1. Remove the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Lift and support the vehicle. Refer to [1.3 Lifting and Jacking the Vehicle](#).
3. Remove the wheels. Refer to [4.4.5.1 Wheel Replacement](#).
4. Remove the tires.
5. Remove the TPMS sensor.

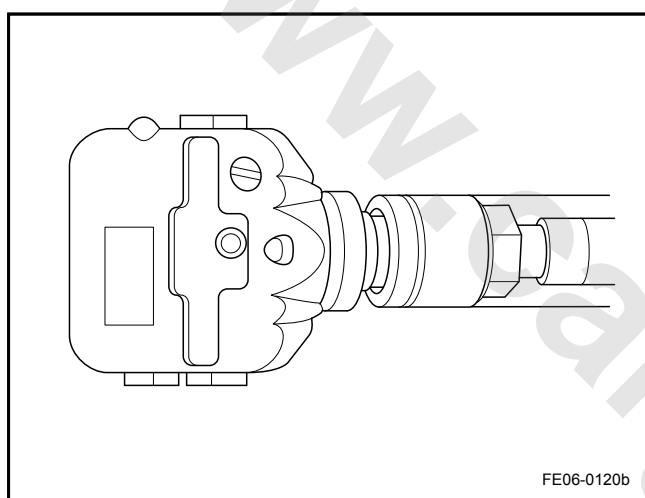
#### Installation Procedure:

1. Install the TPMS sensor.

#### Note

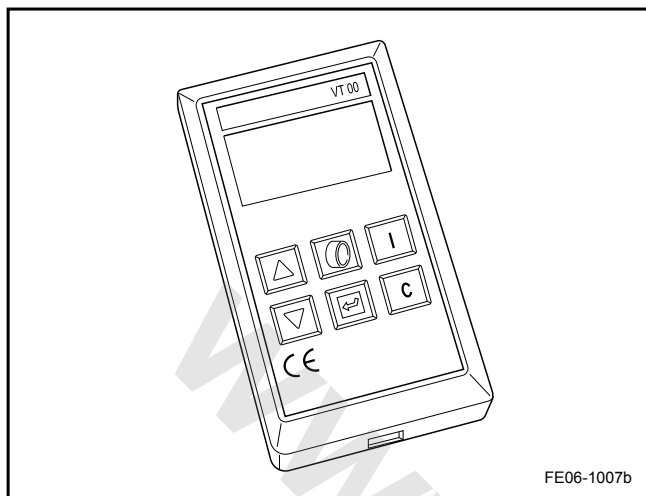
Make sure that the sealing rubber and steel ring sensor are installed properly to ensure tires sealing.

2. Install the tires.
3. Carry out tires balancing detection and correction.
4. Install the wheels.
5. Lower the vehicle.
6. Connect the battery negative cable.



## 6.7.8 Special Tools and Equipment

### 6.7.8.1 Trigger Tool



## 7 Steering System

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## 7.1 Warnings and Notices

### 7.1.1 Warnings and Notices

#### Anti-Corrosion Materials

##### Warning!

Notice: If the power steering system has been serviced, an accurate fluid level reading cannot be obtained unless air is bled from the steering system. The air in the fluid may cause pump cavitation noise and may cause pump damage over a period of time.

#### Power Steering Hose Disconnected

##### Warning!

Notice: Do not start the vehicle with any power steering gear inlet or outlet hoses disconnected. When disconnected, plug or cap all openings of components. Failure to do so could result in contamination or loss of power steering fluid and damage to the system.

#### Steering Wheel in the Full Turn Position

##### Warning!

Notice: Do not hold the steering wheel in the full turn position longer than 5 s, as damage to the steering pump may result.

#### Using Proper Power Steering Fluid

##### Warning!

Notice: When adding fluid or making a complete fluid change, always use DEXRON<sup>®</sup>. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

## 7.2 Hydraulic Power Steering System

### 7.2.1 Specifications

#### 7.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Intermediate Shaft Assembly Bolt	M8 × 30	25-28	18.5-20.7
Power Steering Assembly Tie Rod Right Assembly Bolt	M12 × 58	53-63	39.2-46.6
Power Steering Assembly Tie Rod Left Assembly Bolt	M12 × 33	53-58	39.2-43.0
Steering Tie Rod End Lock Nut	M12	69-79	50.9-58.3
Steering Tie Rod Ball Joint Locking Nut	M12	33-43	24.4-31.9
Power Steering Outlet Pipe to Subframe and Crossmember Retaining Bolts	M6 × 14	10-12	7.4-8.9
Power Steering Pipe to Crossmember Retaining Bolts	M6 × 30	10-12	7.4-8.9
Power Steering High Pressure Pipe to Power Steering Pump Retaining Bolts	M6 × 20	10-12	7.4-8.9
Power Steering Assembly Bolts	M10 × 122	50-55	37.0-40.7
Power Steering Pump Assembly Nuts	M10	50-55	37.0-40.7
Inlet Pipe Connecting Nut (to Power Steering Pump Assembly)	M16	38-44	28.1-32.6
Inlet Pipe Connecting Nut (to Steering)	M16	41-49	30.2-36.1
Outlet Pipe Connecting Nut (to Steering)	M17	41-49	30.2-36.1
Power Steering Pump Assembly Pulley Assembly Retaining Nut	M12	72-92	53.1-67.7

#### 7.2.1.2 General Specifications

Applications	Specifications	
	Metric	US English
System Pressure Difference (Straight Direction)	490 kPa or less	71 psi or less
Idle System Pressure (Full Turn Position)	Greater Than or Equal To 8,000 kPa	Greater Than or Equal To 928 psi
Approximate Fluid Capacity (Entire Power Steering System)	0.9 L	4.58 pt

Applications	Type	Specifications
Fluid	Power Steering Fluid	DEXRON III



## 7.2.2 Description and Operation

### 7.2.2.1 Description and Operation

#### Warning!

Refer to "Steering Wheel in the Full Turn Position Notice" in "Warnings and Notices".

#### Warning!

Before disconnecting the mechanical steering column assembly with the power steering gear, the wheels should be kept in the straight front positions and the mechanical steering column assembly must be in the LOCK (lock) position.

After disconnecting the above components, do not move front tires and wheels, otherwise it will cause some parts are not positioned correctly during the installation process and lead to mechanical steering column airbag assembly spiral off center position, and damage the airbag spiral coil.

### Power Steering Pump Assembly Instructions

Power steering pump assembly provides hydraulic pressure for the whole steering system, and it is a vane-type pump.

Power steering pump assembly consists the following components:

- Pump Housing
- Impeller Pump Rotor
- Pump Impeller Blades
- Impeller Pump Front Side Panel
- Impeller Shaft
- Impeller Shaft Bearings
- Fluid Pressure Switch Assembly
- Flow Control Valve Assembly
- Fluid Pipe
- Fluid Seals and O-ring

Following components are installed in the pump housing side hole :

- Fluid Pipe
- Fluid Pressure Switch Assembly
- Flow Control Valve Assembly

Flow control valve assembly consists of the following components:

- Filling Joints
- Flow Control Valve
- Flow Control Valve Compression Spring

Flow control valve hole and the outlet connector is an integrated part. Flow control valve's primary role is to prevent high steering pump pressure.

### Power Steering Gear Assembly Instructions

Power steering gear assembly uses the rack and pinion hydraulic power steering.

When turning the steering wheel, steering wheel movement is passed to the steering control valve shaft, steering control valve axle pinion and rack mesh, so the rack moves left and right.

Power steering gear assembly has a steering control valve. Steering control valve assembly introduces high pressure fluid from the power steering pump to both sides of the rack piston to move the rack piston. Integral power cylinder piston and rack connection can convert rack piston hydraulic pressure to linear force and move the rack. linear force is transmitted to the inner and outer steering tie rod, and then passed to the steering knuckle, which turns the wheel.

If the auxiliary hydraulic fails, manually control steering will require much greater effort.

### Power Steering Fluid Description

#### Warning!

After adding or completely replace the power steering fluid, make sure use the correct power steering fluid. using the incorrect power steering fluid will cause damage to hoses and seals, and oil leaks. Refer to this chapter for recommended power steering fluid.

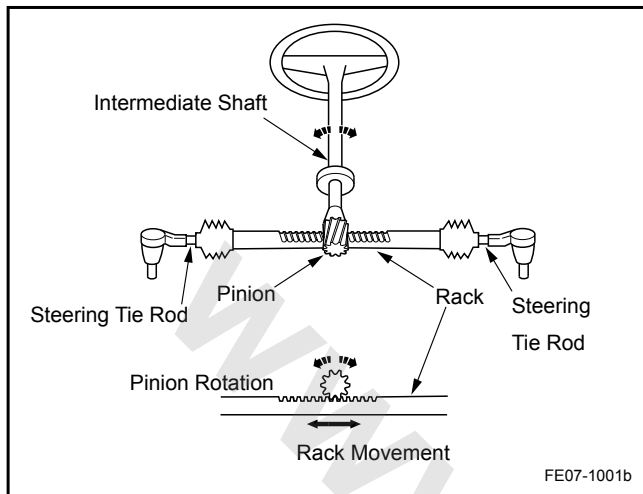
Power steering fluid reservoir and pipe assembly is made from plastic, and the fluid level within the reservoir can be seen from outside. There are fluid level mark on the fluid reservoir side. The marks are used to indicate the power steering fluid level.

Make sure use proper power steering fluid. Refer to .

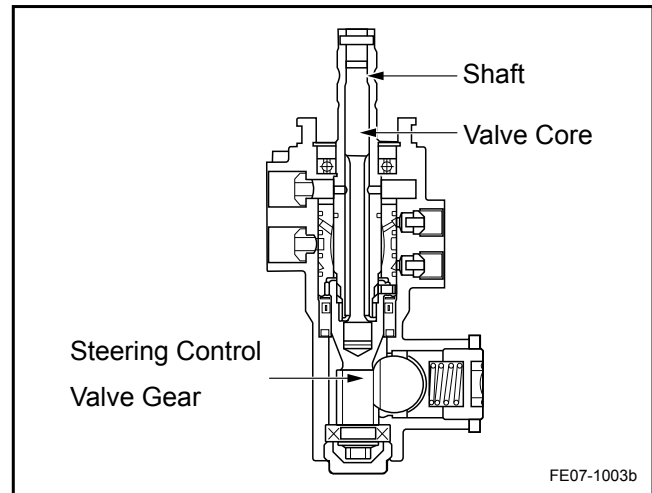
- After preheating the power steering fluid, its temperature is about 75 °C -80 °C (167-176 °F). Power steering fluid level should be between "HOT-MAX" and "HOT-MIN".
- After cooling the power steering fluid, its temperature is about 20 °C -25 °C (68-77 °F). Power steering fluid level should be between "COLD-MAX" and "COLD-MIN".

### 7.2.3 System Working Principle

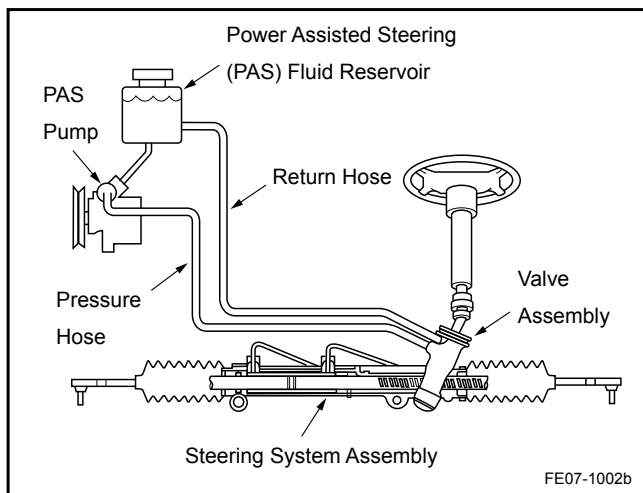
#### 7.2.3.1 Hydraulic Power Rack and Pinion Steering Working Principle



When there is no hydraulic pressure assistance, the steering working principle is as shown in the graphic. The torque applied on the steering wheel, passes through the intermediate shaft to the steering drive gear (steering control valve gear), because the drive gear tooth (steering control valve gear tooth) and the rack teeth are in meshing state, it will convert the torque to rack linear force, move the rack. Linear force passes through the inner and outer steering tie rod, to the steering knuckle, which steers the wheel.



When the steering wheel is not turned, the steering control valve is in the middle position, fluid the master cylinder flows through the steering control valve inlet into the valve cavity. As the steering control valve is in the middle position, so that power cylinder two chamber are connected. The fluid flows from the steering control valve outlet to to the fluid reservoir, so the hydraulic power does not work.

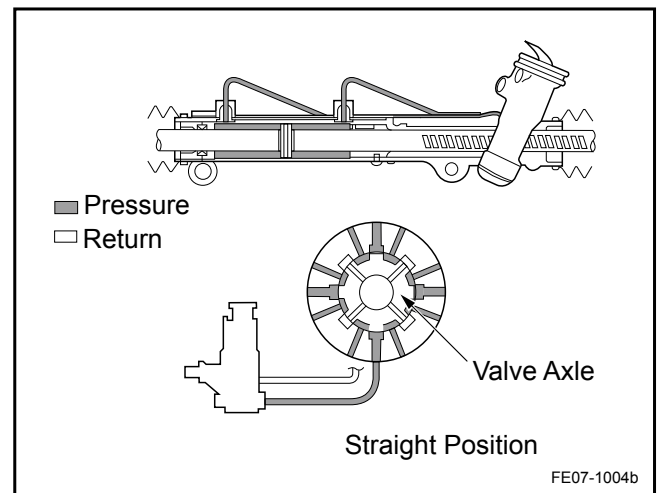


Rack and pinion with hydraulic pressure assistance steering system is as shown in the graphic. The mechanical rack and pinion steering, steering cylinder and steering control valve are designed to be integrated to form the integral power steering system. Power cylinder piston and the rack is made as a whole, the power cylinder is divided into about two chambers.

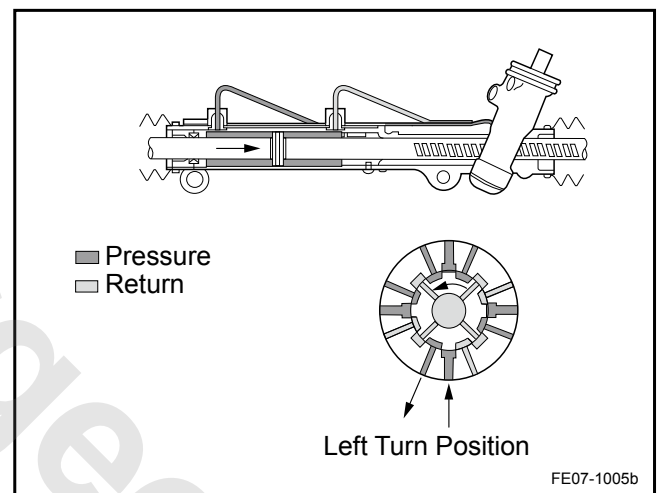
When turning the steering wheel, the steering shaft, together with the steering control valve spool rotation, as transmitted by the steering knuckle arm of the road turning resistance, power cylinder piston and the rack can not be a temporary movement, it turned to control valve and steering gear before they can rotate with the shaft. In this way, transmitted by the steering shaft torque steering control valve gear steering control valve can only produce a little to reverse the deformation of the torsion bar, so that, together with the steering shaft steering control valve control valve spool to shift gears produce a relatively small rotation, thereby steering control valve to the side of power cylinder high-pressure chamber into the oil chamber into the other side of the back cavity has become the low-pressure oil chamber. The role of the high-powered hydraulic cylinder piston force to help force the steering gear steering control valve to the side of the mobile rack, and steering control valve and steering gear shaft itself began to rotate in the same direction. Continue as long as the steering wheel rotation, the torsional deformation of torsion bar has been unchanged, the role of steering control valve is also the same help. Once the steering wheel to stop turning, power cylinder side of the cavity of the high hydraulic forces temporarily continue to exist, led to a shift control valve gear continues to rotate, so that reduces the deformation of torsion bars, until the torsion bar to return to its natural state. Steering control valve back to the middle position, left and right power cylinder interlinked, so that hydraulic power does not work. At this point, steering wheel that is docked in a position without moving, then the wheels to maintain a certain corner. If rotating steering wheel, hydraulic power also play a role.

Power cylinder piston suffered a hydraulic pressure into linear force to help the rack and move around, through the steering horizontal rod to promote the steering knuckle and the wheels turning.

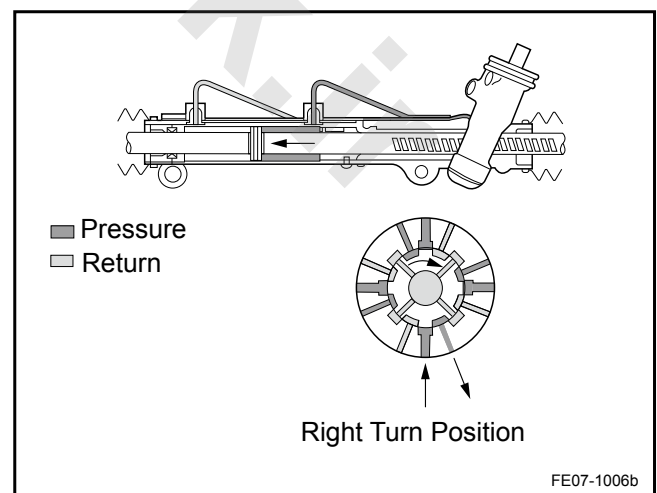
### Control Valve In the Middle



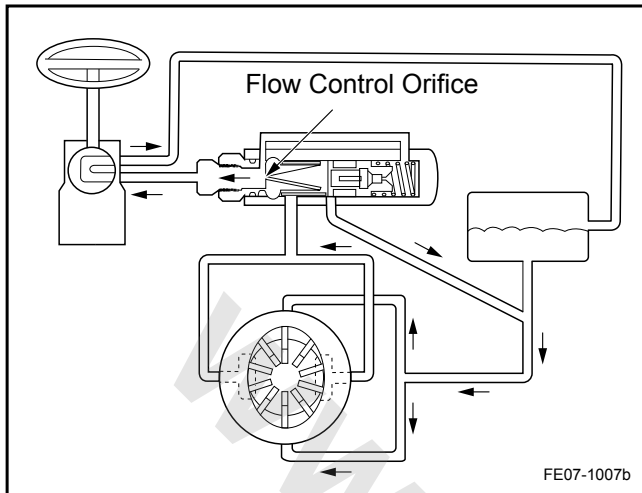
### Control Valve Turning Left



### Control Valve Turning Right



### 7.2.3.2 Power Steering Pump Assembly Working Principle

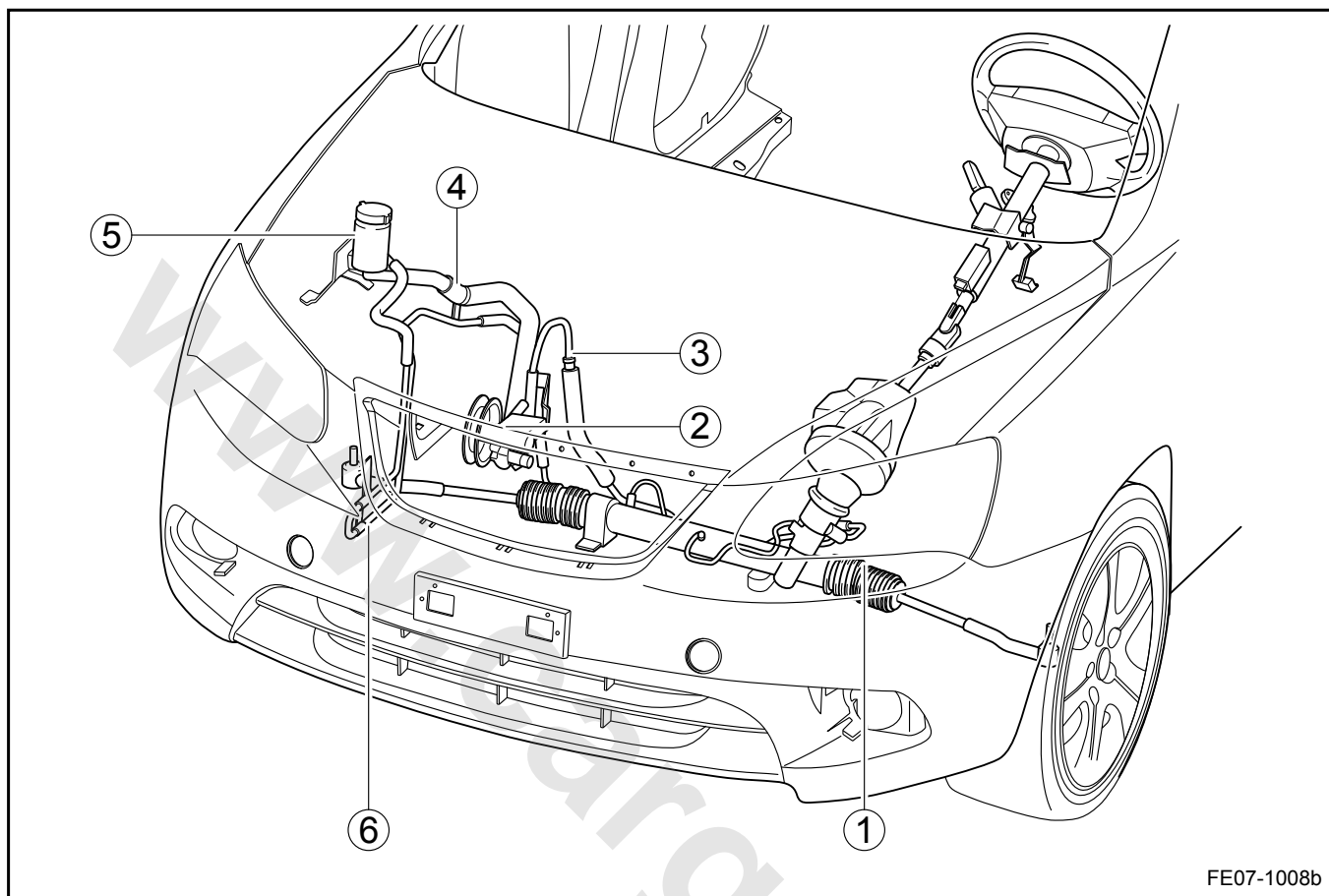


Power steering pump is a blade power steering pump and its working principle is as shown in the graphic. The engine rotating torque is delivered through the drive belt to the power steering pump belt drive assembly and rotates the power steering pump assembly drive shaft and the rotor. Blades installed on the rotor are thrown out due to the centrifugal force, rotate close to the pump ring (rear pump housing) wall, draw the steering fluid from the fluid reservoir to the pump chamber, and press the fluid through the flow control valve to the steering gear, provide power steering hydraulic assistance.

Flow control valve regulates the steering gear fluid flow based on the system fluid pressure. adjust the system fluid pressure. Prevent the system hydraulic pressure being too high.

## 7.2.4 Component Locator

### 7.2.4.1 Component Locator

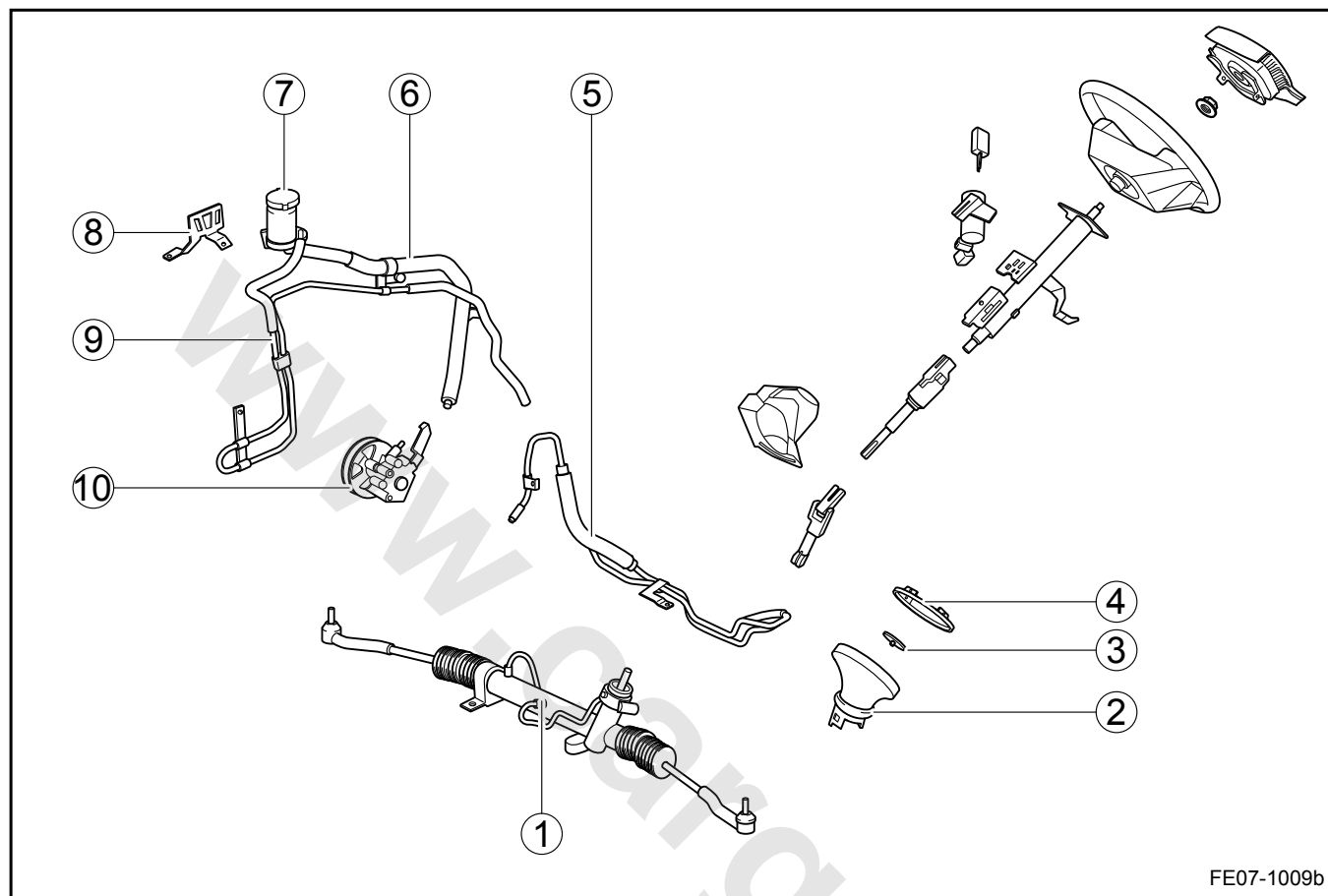


#### Legend

- |   |   |
|---|---|
| 1. Power Steering Gear and Rack Assembly  | 5. Power Steering Pipe with Fluid Reservoir Assembly                            |
| 2. Power Steering Pump Assembly   | 6. Power Steering Inlet/Outlet Pipe/Hose Assembly (to Steering Gear, Reservoir) |
| 3. Power Steering Inlet/Outlet Pipe/Hose Assembly (to Steering Gear, Power Steering Pump) |   |
| 4. Power Steering Inlet/Outlet Pipe/Hose Assembly (to Power Steering Pump, Reservoir)     |   |

## 7.2.5 Disassemble View

## 7.2.5.1 Disassemble View

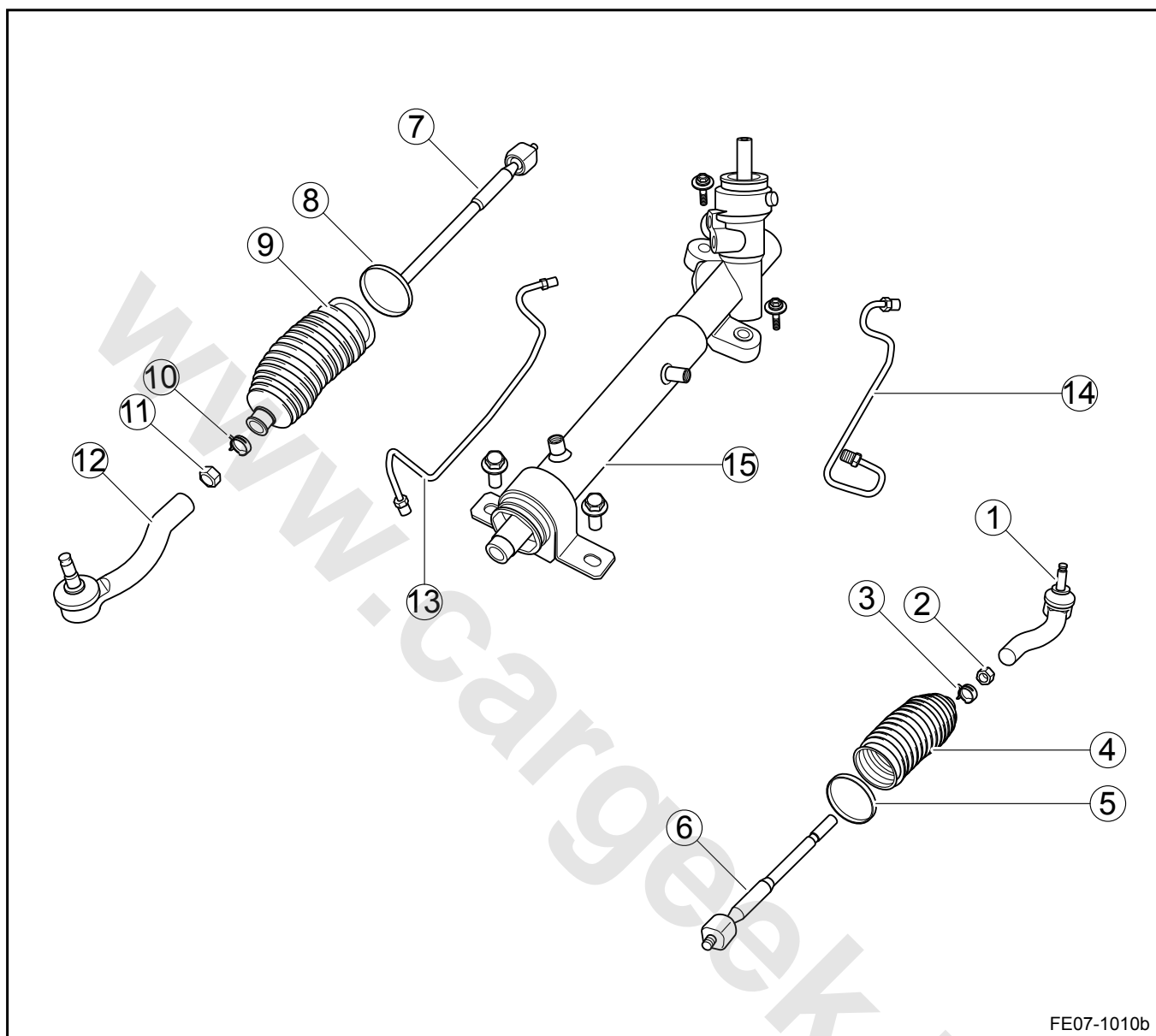


FE07-1009b

## Legend

- |  |   |
|--|---|
| 1. Power Steering Gear and Rack Assembly                   | 7. Power Steering Pipe with Fluid Reservoir Assembly        |
| 2. Steering Dust Cover                                     | 8. Fluid Reservoir Bracket                                  |
| 3. Washer  | 9. Power Steering Inlet/Outlet Pipe Assembly (Fluid Outlet) |
| 4. Steering Dust Cover Liner                               | 10. Power Steering Pump Assembly                            |
| 5. Power Steering Inlet/Outlet Pipe Assembly               |   |
| 6. Power Steering Inlet/Outlet Pipe Assembly (Fluid Inlet) |   |

## 7.2.5.2 Steering Disassemble View

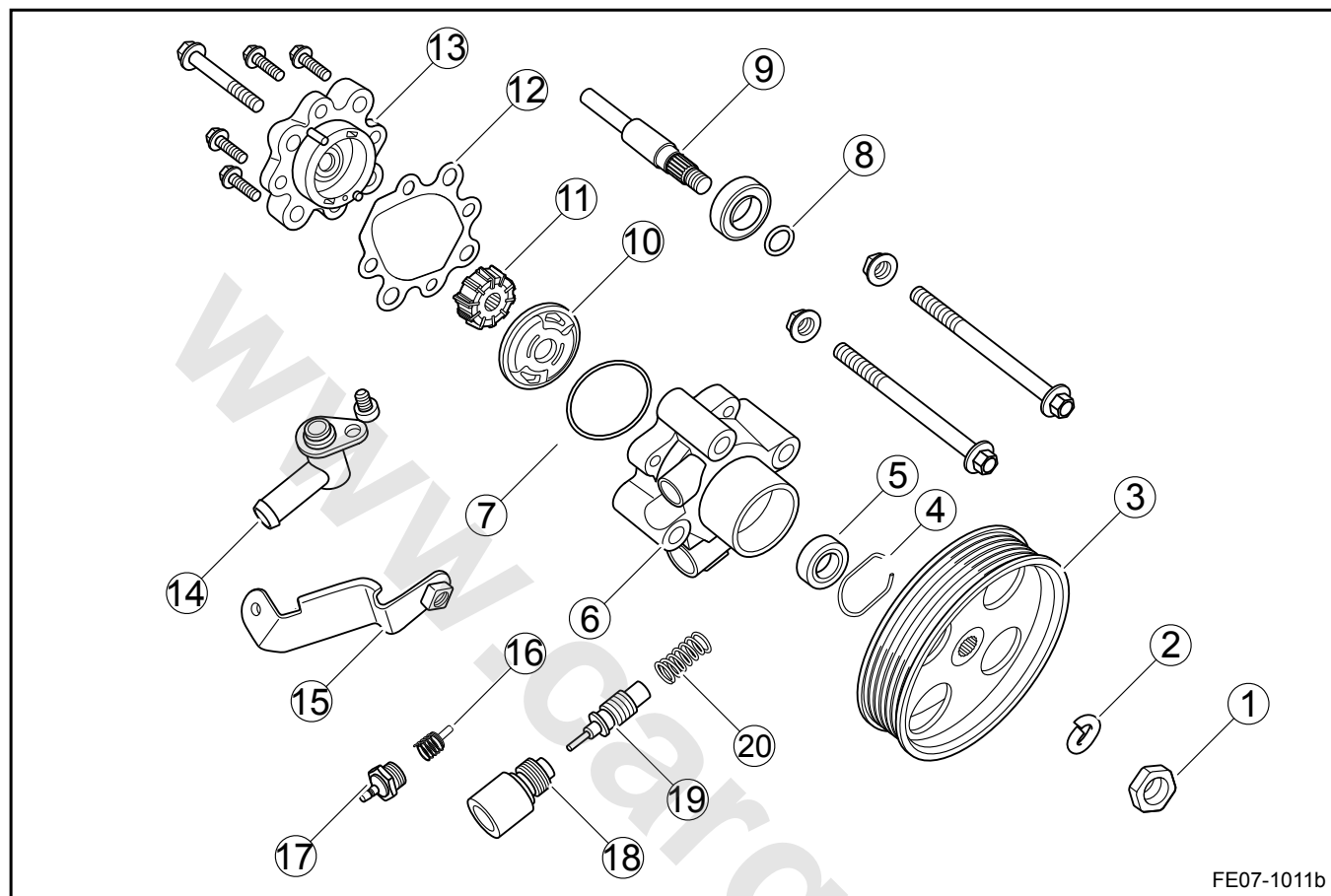


FE07-1010b

## Legend

- |                           |                            |
|---------------------------|----------------------------|
| 1. Left Tie Rod Assembly  | 10. Lateral Hoop           |
| 2. Locking Nut            | 11. Locking Nut            |
| 3. Lateral Hoop           | 12. Right Tie Rod Assembly |
| 4. Left Protective Cover  | 13. Right Turn Pipe        |
| 5. Inside Hoop            | 14. Left Turn Pipe         |
| 6. Left Intermediate Bar  | 15. Steering Case          |
| 7. Right Intermediate Bar |                            |
| 8. Inside Hoop            |                            |
| 9. Right Protective Cover |                            |

### 7.2.5.3 Power Steering Pump Assembly Disassemble View



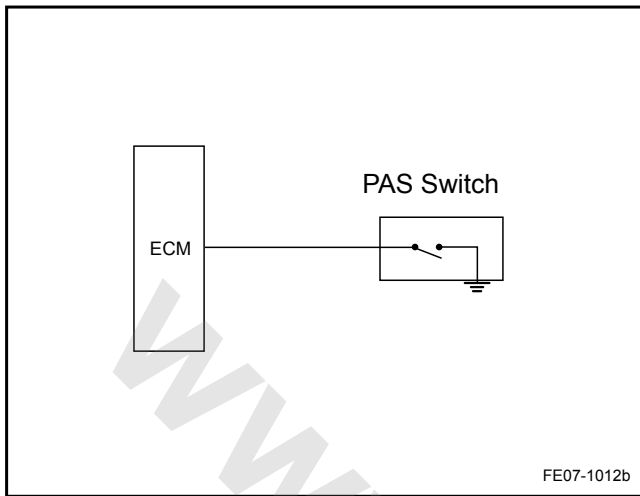
#### Legend

- |                                    |   |
|------------------------------------|---|
| 1. Pulley Locking Nut              | 12. Gasket  |
| 2. Washer                          | 13. Impeller Pump Rear Shell                      |
| 3. Pulley                          | 14. Fluid Pipe                                    |
| 4. Bearing Clamp                   | 15. Bracket                                       |
| 5. Oil Seal                        | 16. Hydraulic Switch Valve and Compression Spring |
| 6. Pump Front Shell                | 17. Fluid Pressure Switch Connector               |
| 7. Large O-ring                    | 18. Fluid Outlet Joint                            |
| 8. Small O-ring                    | 19. Flow Control Valve                            |
| 9. Impeller Shaft with Bearings    | 20. Flow Control Valve Compression Spring         |
| 10. Impeller Pump Front Side Panel |   |
| 11. Impeller Pump Rotor and Vane   |   |



## 7.2.6 Schematic

### 7.2.6.1 Schematic



## 7.2.7 Diagnostic Information and Procedures

### 7.2.7.1 Diagnosis Description

Refer to [7.2.2.1 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 7.2.7.2 Visual Inspection

Prior to maintenance, confirm the fault, carry out road test. Consider and visual inspect the following systems:

- Tire and Wheel
  - a. Check whether the tire pressure is appropriate, whether the wear is even.
  - b. Whether the tires lose roundness.
  - c. Whether the tires are unbalanced.
  - d. Whether the wheel bearings loose or noisy.
- Suspension System
  - a. Front suspension, rear suspension, whether the connecting rod is loose or damaged.
- Steering System
  - a. Whether the mechanical steering column and steering gear assembly connection is loose or worn.
  - b. Whether the power steering pump assembly, steering gear and the pipe are leaking.
  - c. Whether the power steering fluid surface is correct. Refer to [7.2.8.2 Power Steering Fluid Level Inspection](#).

### 7.2.7.3 Fault Symptom Table

During diagnostic process. Refer to the following table. It can help to determine the cause and location of faults. Numbers are in descending order to indicate the possible causes of faults, check each component. If necessary, repair or Replace these components.

Symptoms	Suspected Parts	Measures / Refer to
Steering Effort Hard	1. Tires (Tire pressure inadequate or tread damage)	Add air or replace the tires. Refer to <a href="#">4.4 Wheels and Tires</a> .
	2. Power Steering Fluid Level (Low)	Add steering fluid. Refer to <a href="#">7.2.8.2 Power Steering Fluid Level Inspection</a> .
	3. Drive Belt (Loose)	Adjust or Replace the drive belt. Refer to <a href="#">7.2.8.1 Drive Belt Inspection</a> .
	4. Front Wheel Positioning (Incorrect)	Adjust the front wheel positioning. Refer to <a href="#">4.4.3.1 Wheel Alignment</a> .
	5. Power Steering Tie Rod Ball Joint (wear)	Replace the Power Steering Tie Rod Ball Joint. Refer to <a href="#">7.2.8.11 Steering Bar and Ball Joint Replacement</a> .
	6. Lower Control Arm Ball Joint (Wear)	Replace the lower control arm Ball joint. Refer to <a href="#">4.2.7.7 Lower Control Arm Ball Joint Replacement</a> .
	7. Front Shock Absorber Upper Bearing Assembly (Wear)	Replace the Front shock absorber Upper bearing assembly. Refer to <a href="#">4.2.7.4 Front Shock Absorber Components and Spring Replacement</a> .

Symptoms	Suspected Parts	Measures / Refer to
	8. Steering Column Intermediate Shaft (Catching)	Repair or Replace the steering column. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	9. Upper and Lower Intermediate Shaft Assembly Joints (Wear, Rusty)	Lubricate or replace the mechanical steering column intermediate shaft assembly. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	10. Power Steering Pump Assembly (Internal Pressure Relief or Blockage, Pump Blade Damage)	Replace the power steering pump assembly. Refer to <a href="#">7.2.8.10 Power Steering Pump Assembly Replacement</a> .
	11. Power Steering Gear (Internal pressure relief, control valves or rack catching or damaged)	Replace the power steering gear. Refer to <a href="#">7.2.8.13 Power Steering Gear Assembly Replacement</a> .
Poor Steering Wheel Return	1. Tires (Insufficient Pressure)	Add air or Replace the tires. Refer to <a href="#">4.4 Wheels and Tires</a> .
	2. Front Wheel Positioning (Incorrect)	Adjust the front wheel positioning. Refer to <a href="#">4.4.3.1 Wheel Alignment</a> .
	3. Lower Control Arm Ball Joint (Catching)	Repair or replace the lower control arm ball joint. Refer to <a href="#">4.2.7.7 Lower Control Arm Ball Joint Replacement</a> .
	4. Upper and Lower Intermediate Shaft Assembly Joints (Rusty, Catching)	Lubricate or replace the upper and lower intermediate shaft assembly. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	5. Steering Column Axle (Catching)	Lubricate or replace the steering column. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	6. Power Steering (Control valves viscous or a rack bearing pre-load is too high, catching)	Clean or repair the steering hydraulic system. Replace the power steering gear. Refer to <a href="#">7.2.8.13 Power Steering Gear Assembly Replacement</a> .
	7. Front Shock Absorber Upper Bearing Assembly (Wear)	Replace the front shock absorber upper bearing assembly. Refer to <a href="#">4.2.7.4 Front Shock Absorber Components and Spring Replacement</a> .
Steering system travel is too great.	1. Steering Rack (Loose)	Tighten or replace the steering rack. Refer to <a href="#">7.2.8.11 Steering Bar and Ball Joint Replacement</a> .
	2. Lower control arm ball joint (Wear or Loose)	Replace the lower control arm ball joint. Refer to <a href="#">4.2.7.7 Lower Control Arm Ball Joint Replacement</a> .
	3. Front wheel bearing (Wear and Tear, or Loose)	Replace the front wheel bearings. Refer to <a href="#">4.2.7.9 Front Wheel Hub Replacement</a> .
	4. Power Steering Steering Tie Rod Assembly (Retaining Bolts Loose)	Tighten bolts. Refer to <a href="#">7.2.8.13 Power Steering Gear Assembly Replacement</a> .

Symptoms	Suspected Parts	Measures / Refer to
Noise	1. Power Steering Fluid Level (Low)	Add steering fluid. Refer to <a href="#">7.2.8.2 Power Steering Fluid Level Inspection</a> .
	2. Steering Column (Axle, Bearings Loose)	Repair or replace the steering column. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	3. Intermediate Shaft Upper and Lower Universal Joints (Loose)	Tighten or replace the upper and lower intermediate shaft assembly. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	4. Power Steering Steering Tie Rod Assembly (Retaining Bolts Loose)	Tighten nuts. Refer to <a href="#">7.2.8.13 Power Steering Gear Assembly Replacement</a> .
	5. Steering Rack (Loose)	Tighten nuts or replace the tie rod. Refer to <a href="#">7.2.8.11 Steering Bar and Ball Joint Replacement</a> .
	6. Power Steering Gear (Rack Bearing Pre-load Too Loose)	Repair or replace the power steering gear. Refer to <a href="#">7.2.8.13 Power Steering Gear Assembly Replacement</a> .
	7. Power Steering Pump Assembly (Flow Control Valve or Pump Blade Damage)	Replace the power steering pump assembly. Refer to <a href="#">7.2.8.10 Power Steering Pump Assembly Replacement</a> .
Steering wheel retuning force is too great or steering wheel too loose	1. Power Steering System (Loose)	Bleed air in the steering system. Refer to <a href="#">7.2.8.7 Power Steering System Bleeding</a> .
	2. Upper and lower intermediate steering shaft assembly and power steering gear assembly connection (loose)	Tighten nuts. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	3. Tie Rod (Loose)	Tighten or replace the steering tie rod ball joint. Refer to <a href="#">7.2.8.11 Steering Bar and Ball Joint Replacement</a> .
	4. Front Wheel Bearing (Worn)	Replace the front wheel bearing. Refer to <a href="#">4.2.7.9 Front Wheel Hub Replacement</a> .
	5. Power Steering Gear (Internal Loose)	Repair or Replace the power steering gear assembly. Refer to <a href="#">7.2.8.13 Power Steering Gear Assembly Replacement</a> .
Steering Instability	1. Front Wheel Alignment (Incorrect)	Adjust the front wheel alignment. Refer to <a href="#">4.4.5.2 Front Toe Adjustment</a> .
	2. Front Suspension (Location Inaccurate)	Adjust the front suspension components fasteners. Refer to <a href="#">4.2 Front Suspension</a> .
	3. Tires and Wheels (Imbalance)	Tire balancing or Replace the tires, wheel rim. Refer to <a href="#">4.4 Wheels and Tires</a> .
	4. Front wheel bearing (Worn, Loose)	Replace the front wheel bearing. Refer to <a href="#">4.2.7.9 Front Wheel Hub Replacement</a> .

Symptoms	Suspected Parts	Measures / Refer to
	5. Coil spring (Broken / or Weak)	Replace the coil spring. Refer to <a href="#">4.2.7.4 Front Shock Absorber Components and Spring Replacement</a> .
	6. Front Strut (Loose or Damaged)	Tighten or replace the front strut. Refer to <a href="#">4.2.7.3 Front Strut Assembly Replacement</a> .
	7. Brake System (Loose or Not Working Properly)	Check the brake system. Refer to <a href="#">6 Brake System</a> .
	8. Rear Suspension (Positioning Inaccurate or Loose)	Adjust rear suspension components fasteners. Refer to <a href="#">4.3 Rear Suspension</a> .
Steering Unstable When Braking	1. Front Suspension (Strut Inclination Incorrect)	Check and adjust the front suspension position. Refer to <a href="#">4.2 Front Suspension</a> .
	2. Lower Control Arm (Loose)	Tighten or replace the lower control arm bushing. Refer to <a href="#">4.2.7.2 Lower Control Arm Bushing Replacement</a> .
	3. Brake Disc (Deformation)	Replace the brake disc's. Refer to <a href="#">6.2.5.3 Brake Disc Replacement</a> .
	4. Coil Spring (Broken / or Weak)	Replace the coil spring. Refer to <a href="#">4.2.7.4 Front Shock Absorber Components and Spring Replacement</a> .
	5. Front or Rear Wheel Bearings (Worn, Loose)	Replace the front or rear wheel bearing. Refer to <a href="#">4.2.7.9 Front Wheel Hub Replacement</a> , <a href="#">4.3.7.5 Rear Wheel Hub Replacement</a> .
	6. Brake System (Braking force is uneven or incorrect.)	Check the brake system. Refer to <a href="#">6 Brake System</a> .

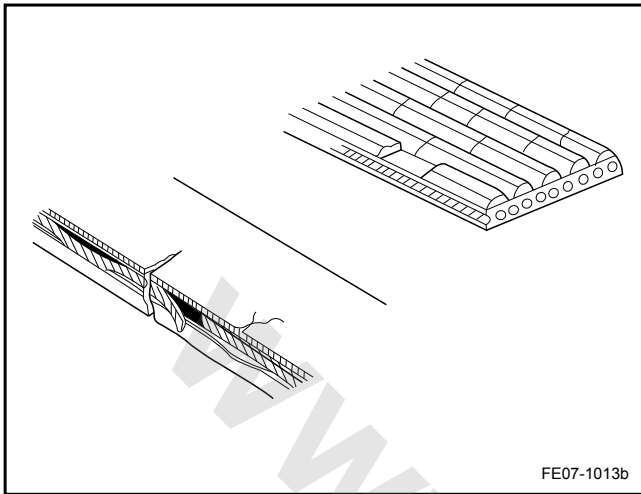
## 7.2.8 Removal and Installation

### 7.2.8.1 Drive Belt Inspection

1. Check whether the drive belt pre-load is normal. Refer to [2.6.7.9 Drive Belt Inspection](#).
2. Check whether there is excessive drive belt wear, cord broken and so on.
3. If the drive belt is found faulty, replace the drive belt.

#### Note

Slight crack on the drive belt rib side is acceptable. If the drive belt cracks from the rib or convex shoulder missing, it should be replaced.

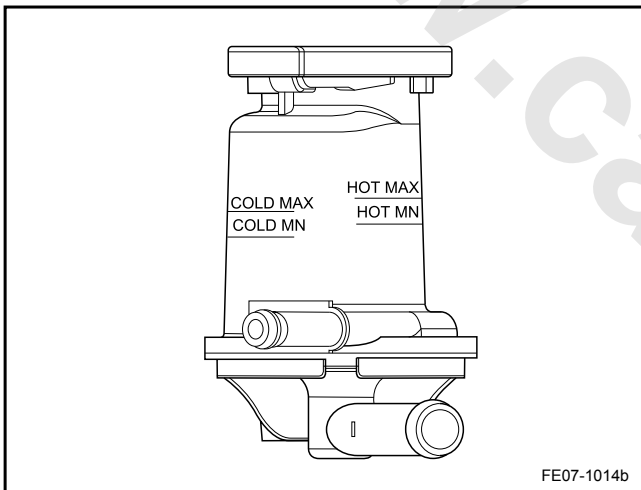


### 7.2.8.2 Power Steering Fluid Level Inspection

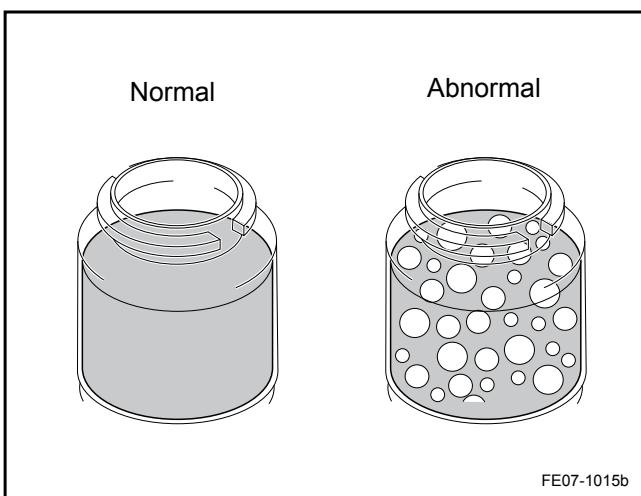
1. Park the vehicle on a level position.
2. Shut down the engine. check the fluid level. If necessary, add fluid to the reservoir. After preheating the fluid, its temperature is about 75-80°C (167-176 °F). Fluid level should be between "HOT MAX "and" HOT MIN ". After cooling the fluid, its temperature is about 20 °C -25 °C (68-77 °F). Fluid level should be between "COLD MAX " and "COLD MIN ".

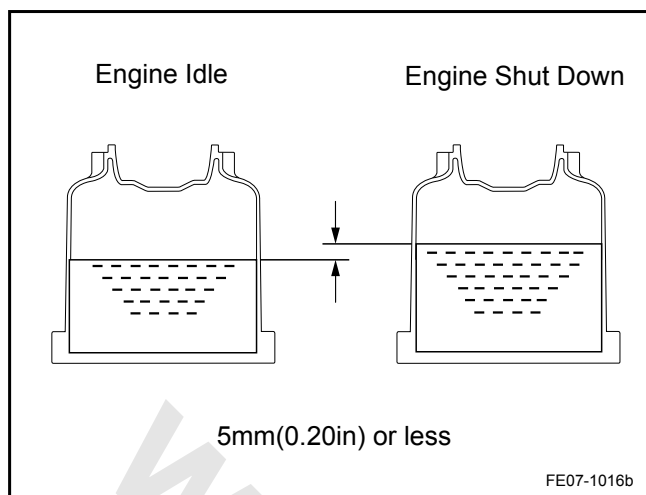
#### Note

Note: Please use correct fluid.



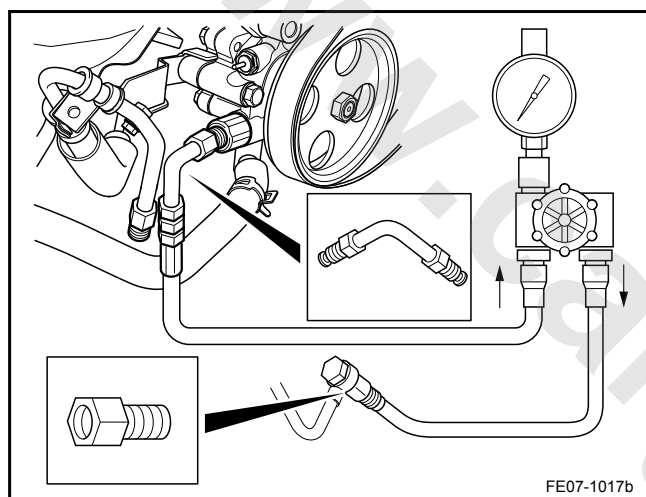
3. Preheat the power steering fluid, start the engine and let the engine run at idle.
4. Rotate the steering wheel from right to left and then rotate back and forth several times, so that the fluid temperature rise. Preheat fluid temperature to: 75-80 °C (167-176 °F).
5. Check whether there is foam or emulsion, if so, it is necessary to bleed the power steering system. Refer to [7.2.8.7 Power Steering System Bleeding](#).





6. With the engine idling, check the fluid level.
7. Stop the engine.
8. Wait for a few minutes, re-check the fluid level.  
maximum fluid level rising height: 5 mm (0.20 in)
9. If problems are detected, bleed the power steering system. Refer to [7.2.8.7 Power Steering System Bleeding](#).
10. Re-check the fluid level height.

### 7.2.8.3 Steering Fluid Pressure Inspection



1. Disconnect the power steering pump assembly outlet pipe. Refer to [7.2.8.6 Power Steering Outlet Pipe Replacement](#).
2. Install the hydraulic pressure detection tool as shown in the graphic.

#### Note

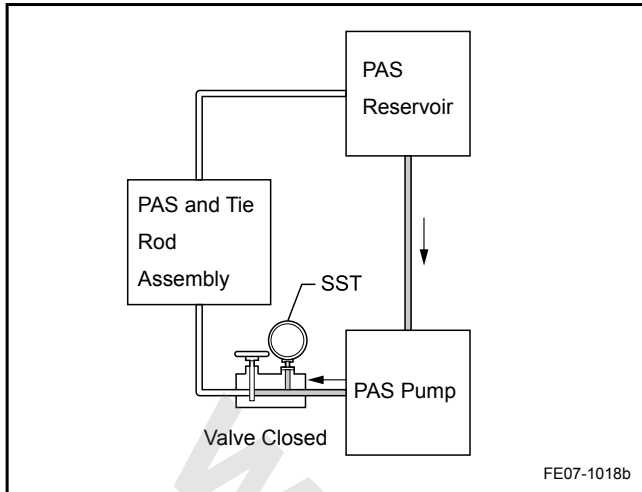
At the beginning of the inspection, the tool valve should be at open position.

3. Bleed the power steering system. Refer to [7.2.8.7 Power Steering System Bleeding](#).
4. Preheat the power steering fluid, start the engine and let the engine run at idle.
5. Rotate the steering wheel from right to left and then rotate back and forth several times, so that the fluid temperature rise.

Preheat the fluid temperature to: 75-80 °C (167-176 °F)

#### Note

Refer to "Steering Wheel in the Full Turn Position Notice" in "Warnings and Notices".



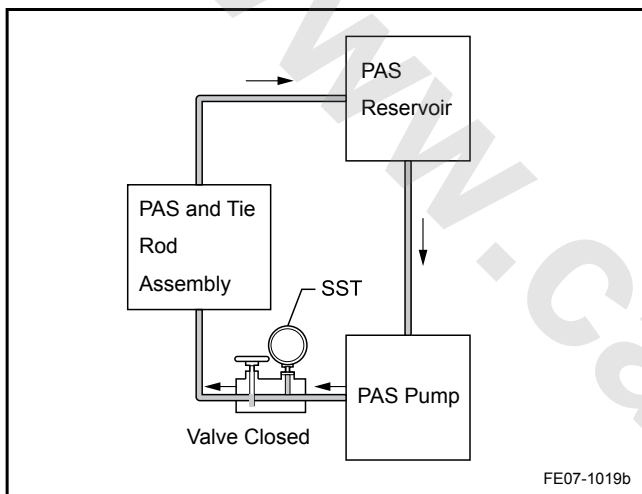
- Keep the engine at idle, close the tool valves, observe the pressure gage readings and take notes.

Minimum hydraulic: 6,400 kPa (928 psi)

If the fluid pressure is too low, then the power steering pump assembly is damaged, it needs to be Replaced. Refer to [7.2.8.10 Power Steering Pump Assembly Replacement](#).

#### Warning!

Special tool valves closing time can not exceed 5s, otherwise the fluid temperature becomes too high causing damage to the power steering pump assembly.



- Keep the engine at idle, open the valve.
- Maintain the engine speed between 1,000 rpm and 3,000 rpm, measure the fluid pressure.

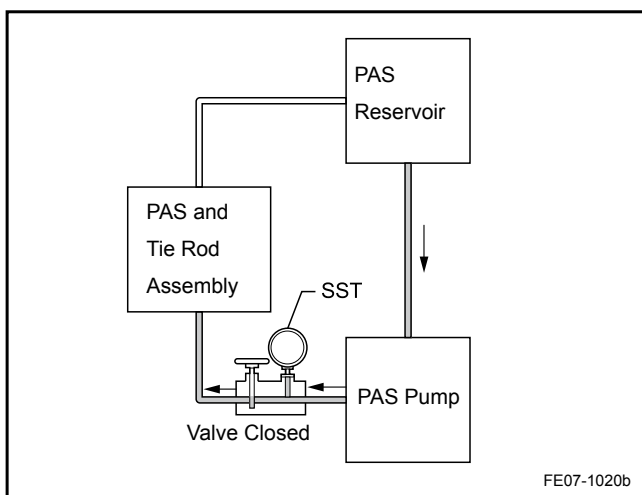
Hydraulic pressure difference: 490 kPa (71 psi) or less

#### Note

**Do not turn the steering wheel.**

If the fluid pressure difference is too great, the power steering pump flow control valve assembly is damaged and it needs repair or to be replaced. Refer to [7.2.8.10 Power Steering Pump Assembly Replacement](#).

If there is blockage or leakage in the power steering system, clean the fluid pipes and the relevant parts.



- Keep the engine at idle, fully open the valve, turn the steering wheel to the left or right to the end, measure fluid pressure.

Minimum hydraulic: 6,400 kPa (928 psi)

If the oil pressure is too low, then the power steering leaks or is damaged, replace the damaged power steering pump assembly. Refer to [7.2.8.10 Power Steering Pump Assembly Replacement](#).

If the power steering system hydraulic pipes leak, repair or replace the relevant hydraulic piping components. Refer to [7.2.8.6 Power Steering Outlet Pipe Replacement](#).

#### Note

Keep the steering wheel at fully turned position no more than 5s, otherwise it may damage the steering pump.

- Remove the test tool.

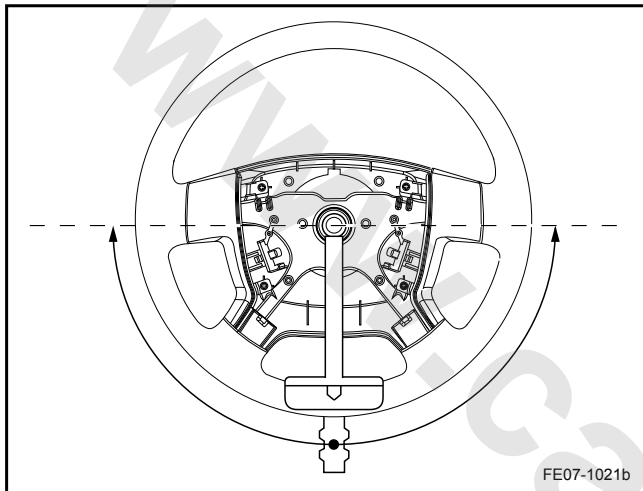


11. Connect the power steering pump outlet pipe. Refer to [7.2.8.6 Power Steering Outlet Pipe Replacement](#).
12. Bleed the power steering system air. Refer to [7.2.8.7 Power Steering System Bleeding](#).

#### 7.2.8.4 Power Steering Effort Check

##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices" .



1. Park the vehicle on a even surface and straighten the front wheels.
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).

##### Note

Disconnect the battery cable and wait for at least 60s, prevent airbag and seat belt pre-tensioner being activated.

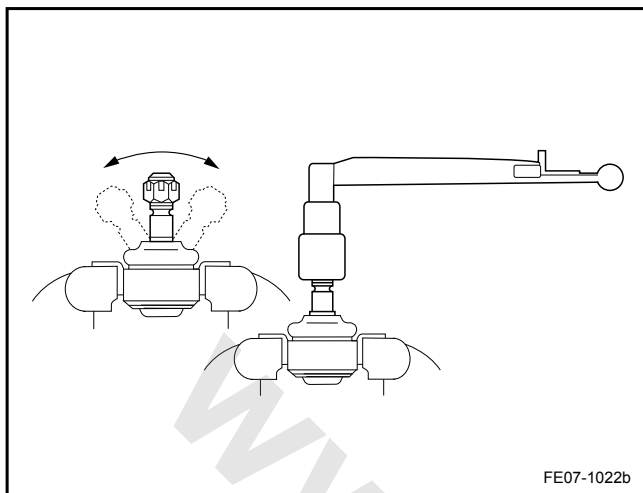
3. Remove the driver front airbag. Refer to [9.2.7.2 Driver Front Airbag Replacement](#).
4. Connect the battery negative cable.
5. Use a torque wrench to check whether the steering wheel nut fastening torque is correct.
6. Start the engine and let the engine run at idle.
7. Use a torque wrench to turn the steering wheel left and right 90 degrees, check the left and right rotation torque.  
Steering torque (reference): 5.5 Nm (Metric) 4.1 lb-ft (US English)

##### Note

Before the test, consider the tire type, tire pressure and the contacting surface.

8. Disconnect the battery negative cable.
9. Re-examine the steering wheel nut torque.  
Torque: 45 Nm (Metric) 33.3 lb-ft (US English)
10. Install the driver front airbag.
11. Connect the battery negative cable.

### 7.2.8.5 Steering Tie Rod Ball Joint Inspection



1. Remove the horizontal steering bar. Refer to [7.2.8.11 Steering Bar and Ball Joint Replacement](#).
2. Firmly clamp the tie rod ball joint between the calipers.
3. Install the bolt on the ball joint nut.
4. Shake the ball joint bolt back and forth more than five times.
5. Using a torque wrench, continuously rotate the nut at 2-4 rpm / s speed, and then read the fifth lap torque.

Rotation torque: 1.5-3.0 Nm (Metric) 1.1-2.2 lb-ft (US English)

If the rotation torque is not in the specified range, replace the steering horizontal bar assembly.

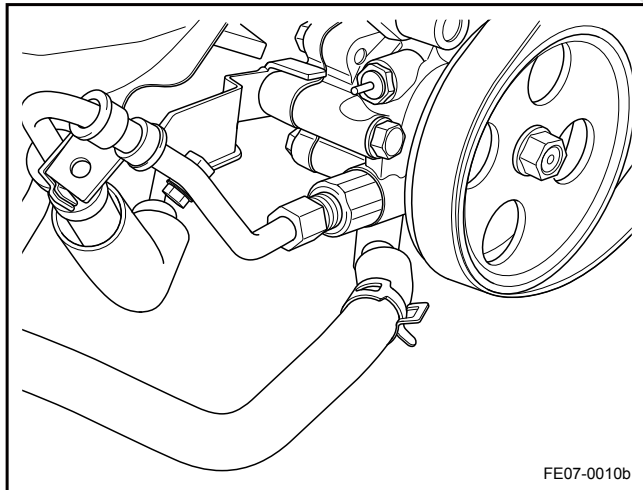
#### Note

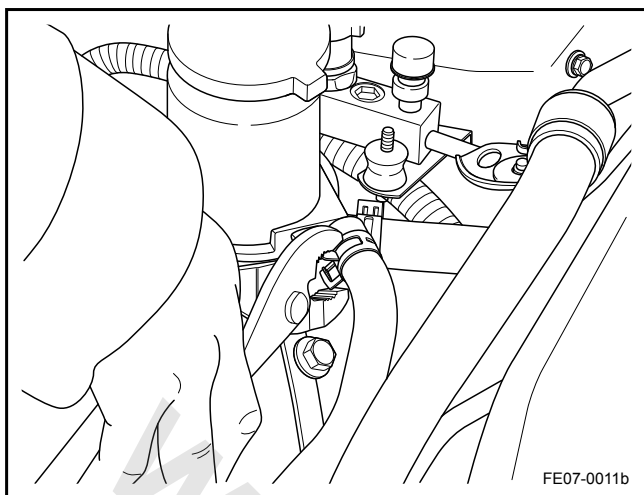
The left and right steering tie rod ball check is the same.

### 7.2.8.6 Power Steering Outlet Pipe Replacement

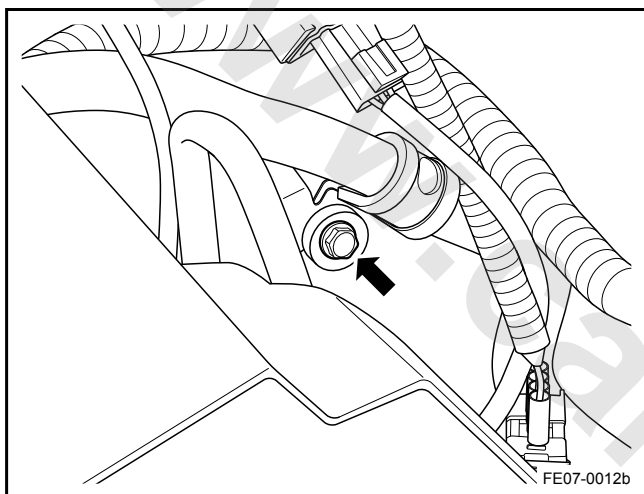
#### Removal Procedure:

1. Drain the power steering fluid from the power steering assembly.
2. Disconnect the power steering pump hose and high pressure fluid pipe connection.

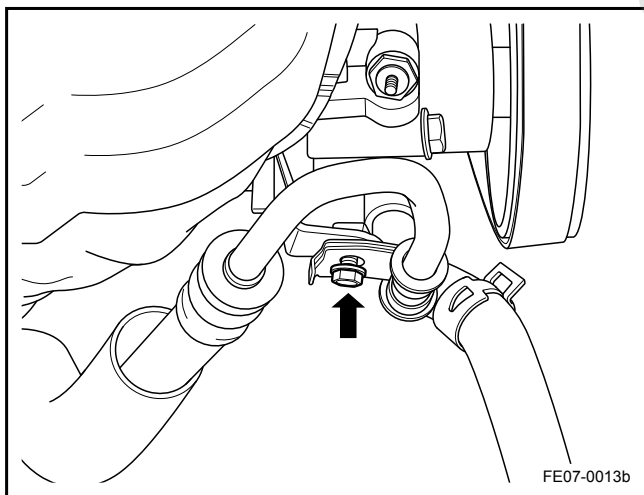




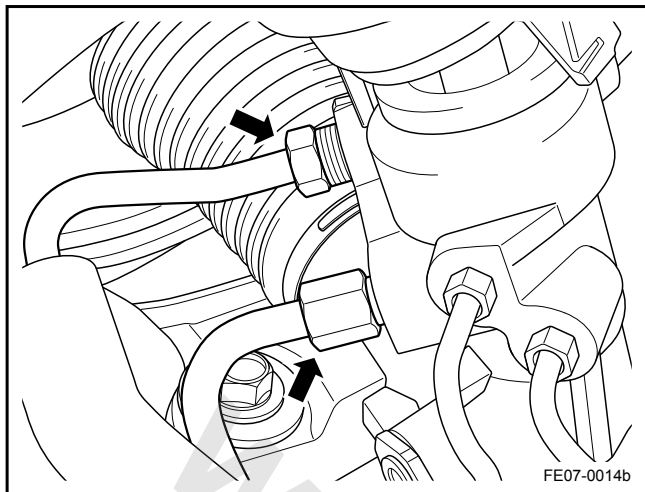
3. Disconnect the power steering outlet pipe from the fluid reservoir.



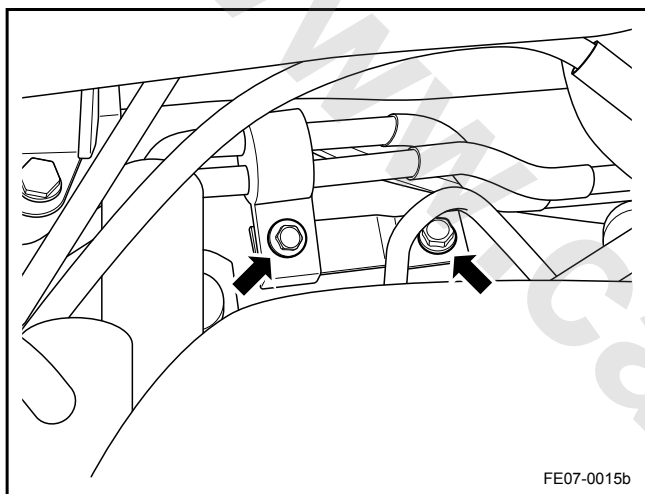
4. Remove the steering system pipe bracket bolt from the subframe.



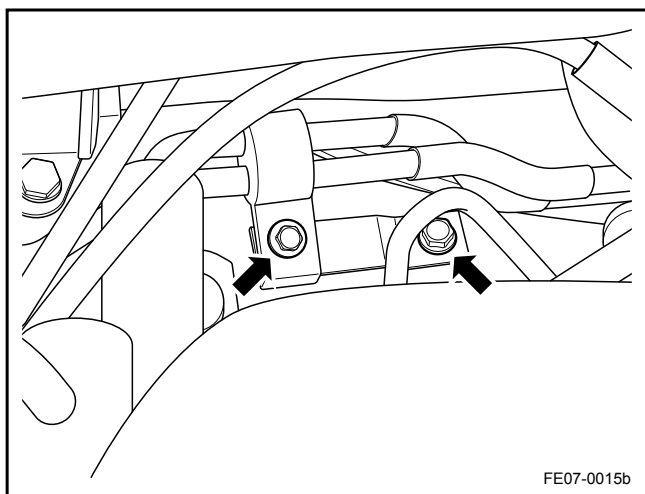
5. Remove the power steering inlet/outlet pipe bracket bolts from the power steering pump assembly.



6. Lift and support the vehicle. Refer to [1.3.1.1 Lifting and Jacking the Vehicle](#).
7. Disconnect the high pressure fluid pipe and the return pipe from the power steering gear assembly horizontal bar.

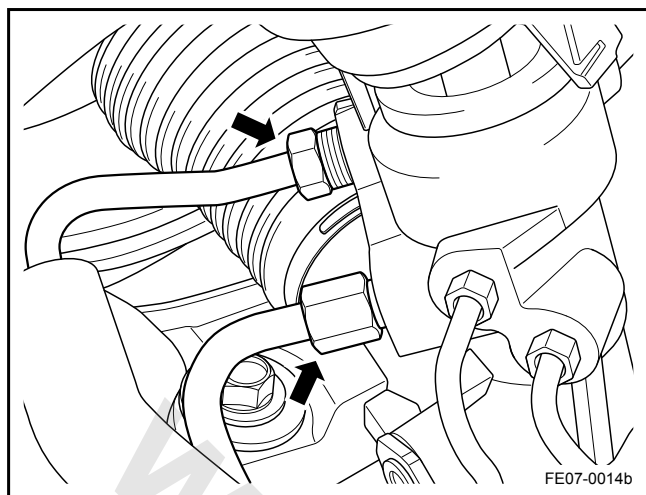


8. Remove the pipe bracket bolt from the subframe.
9. Remove the return pipe and the high pressure pipe from the vehicle.



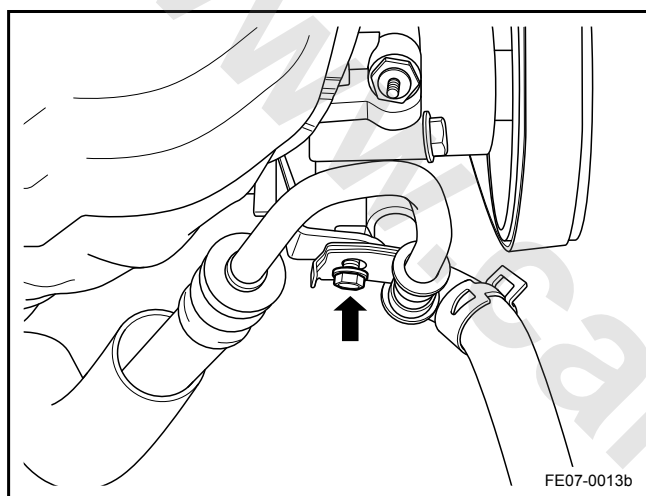
#### Installation Procedure:

1. Connect the high pressure pipe from the power steering pump assembly to the power steering gear.
2. Connect the return pipe from the fluid reservoir to the power steering gear.
3. Lift and support the vehicle.
4. Install the fluid pipe to the subframe and tighten the bolts.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)



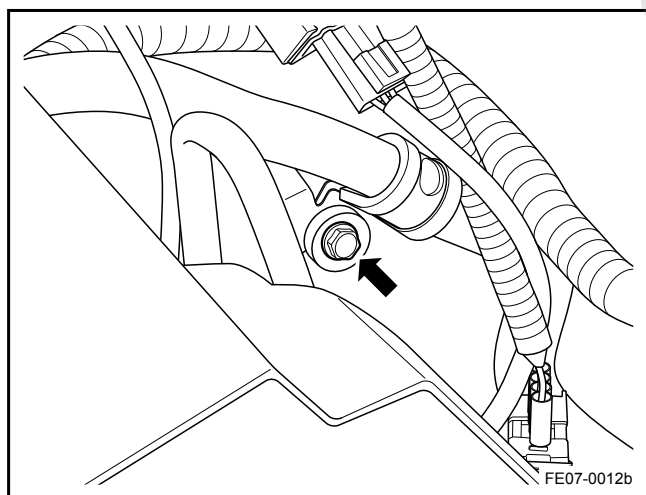
5. Connect the high pressure pipe and the return pipe to the power steering gear and tighten.

Torque: 28 Nm (Metric) 20.7 lb-ft (US English)



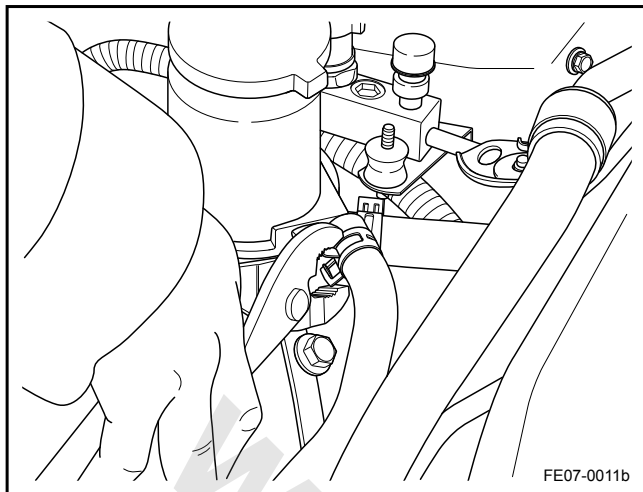
6. Install the high pressure pipe bracket bolts to the power steering pump assembly.

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

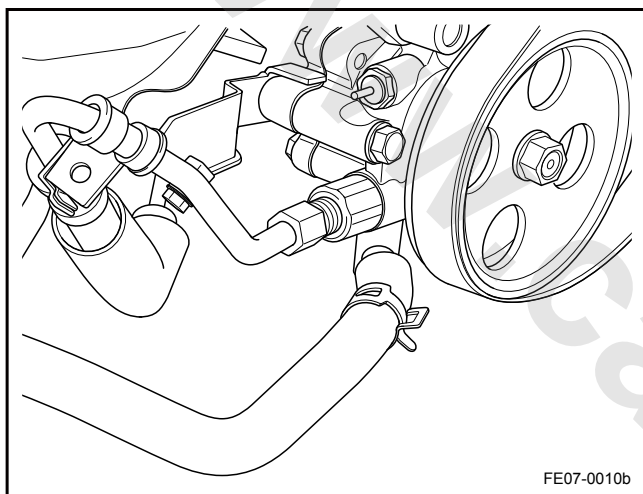


7. Install the steering system pipe bracket to the right side crossmember and tighten.

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)



8. Connect the steering system pipe to the fluid reservoir.



9. Connect the fluid supply hose and high pressure pipe to the power steering pump assembly.  
Torque: 30 Nm (Metric) 22.2 lb-ft (US English)
10. Fill the power steering fluid to the power steering fluid reservoir.
11. Check the existence for pipe leakage. if there is leakage, repeat the above steps to re-install the pipe, and bleed air in the pipes.

#### 7.2.8.7 Power Steering System Bleeding

1. Shut down the engine. Turn the steering wheel from one locking position to the other, repeat several times.
2. Start the engine, let the engine run at idle, check the power steering fluid level. If necessary, add fluid, so that the fluid level is remained above "MIN".
3. Turn the steering wheel back and forth, but do not fully turn the steering wheel, bleed the system. To maintain the fluid level above "MIN", bleed the system to obtain the proper power steering performance.
4. Return the steering wheel to the straight position, let the engine continue to run at idle for 2-3 min.
5. Road test the vehicle, confirm whether the power steering is functioning correctly and whether there is abnormal sound.

6. According to steps 1 and 2, re-check the power steering fluid level to ensure that when the system reaches the normal operating temperature and stabilize, the fluid level reaches "MAX". if necessary, add proper amount of fluid.

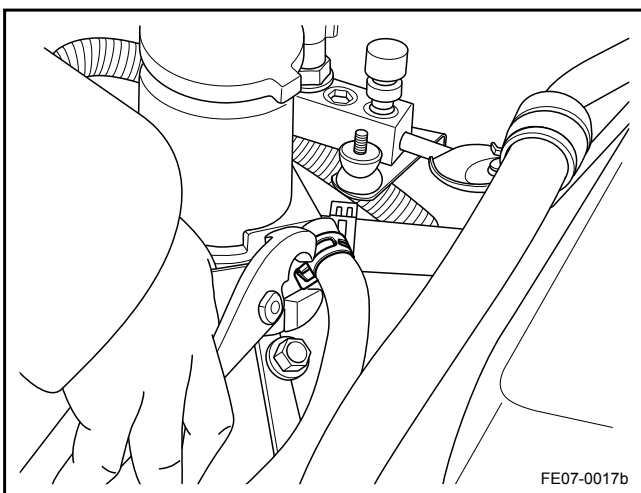
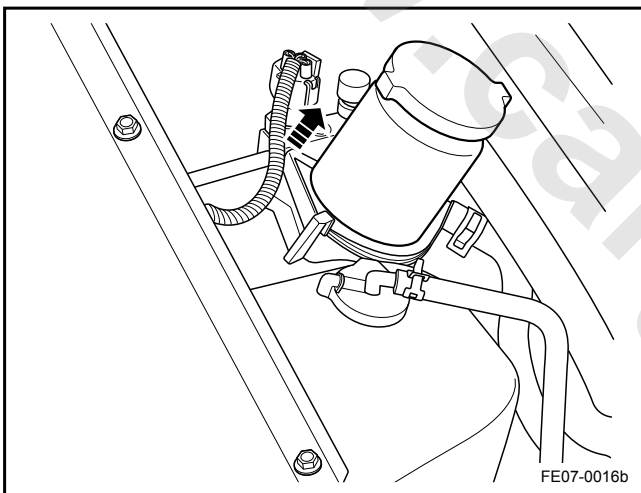
#### 7.2.8.8 Check Power Steering Fluid

- Power steering fluid level is indicated through the scale on the transparent power steering reservoir.
- If the steering fluid reaches normal working temperature, the fluid level should be between the MAX (maximum) and MIN (minimum). if necessary, add steering fluid.
- If the steering fluid temperature is low, the fluid level should be at the MIN (minimum) mark. If necessary, add steering fluid.

#### 7.2.8.9 Power Steering Pipe Assembly with Fluid Reservoir Replacement

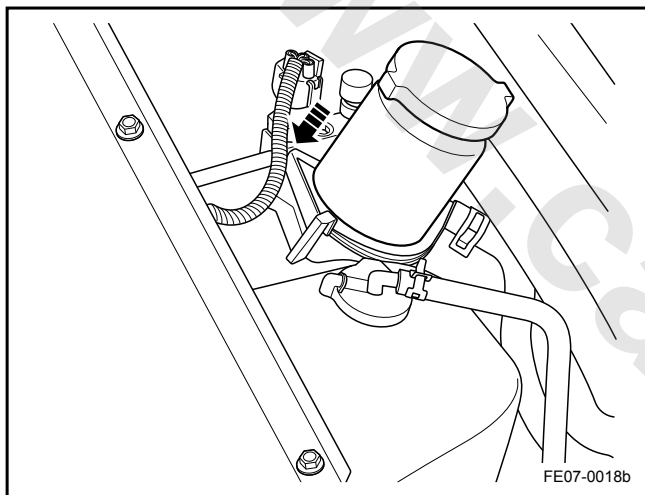
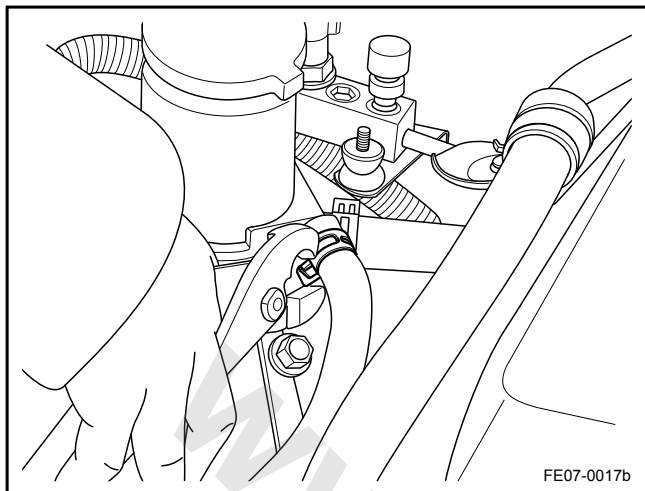
Removal Procedure:

1. Drain the power steering fluid from the power steering fluid reservoir.
2. Remove the fluid reservoir from the power steering fluid reservoir bracket, remove the power steering pipe assembly.
3. Release the power steering hose clamp and remove the hoses.



## Installation Procedure:

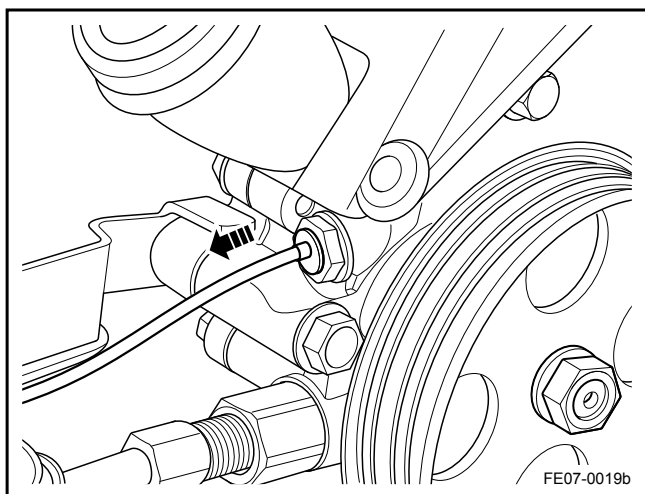
1. Install the power steering hose to the fluid reservoir and tighten the clamps.
2. Install the fluid reservoir to the fluid reservoir bracket.
3. Add power steering fluid to the fluid reservoir.
4. Check the power steering system pipes for leakage. If there is leakage, repeat the above steps until there is no leakage.
5. Bleed the power steering system.



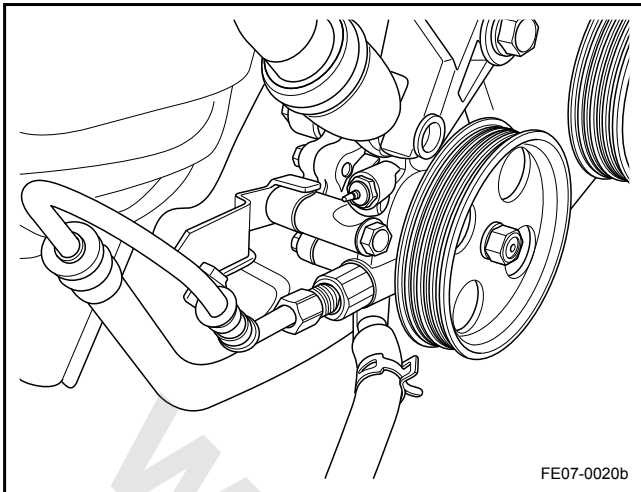
### 7.2.8.10 Power Steering Pump Assembly Replacement

## Removal Procedure:

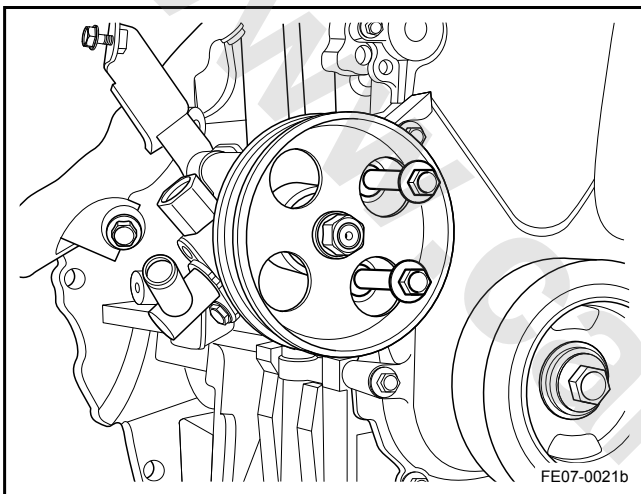
1. Remove the engine drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#).
2. Recycle the power steering fluid with a suitable recycling container.
3. Disconnect the power steering pump pressure switch wiring harness connector.



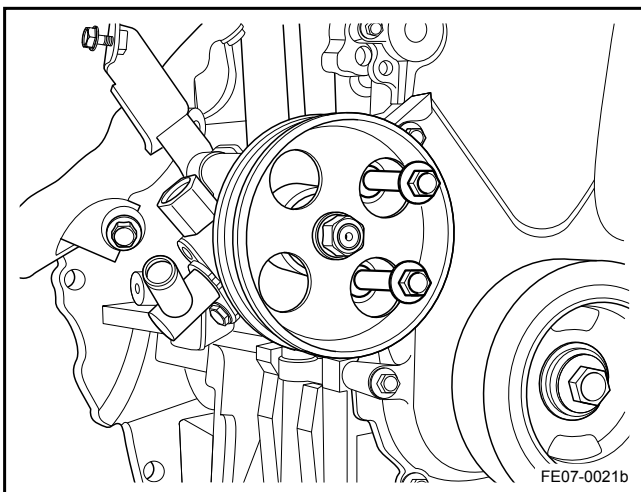




4. Disconnect the high pressure pipe and fluid supply hose from the power steering pump assembly.

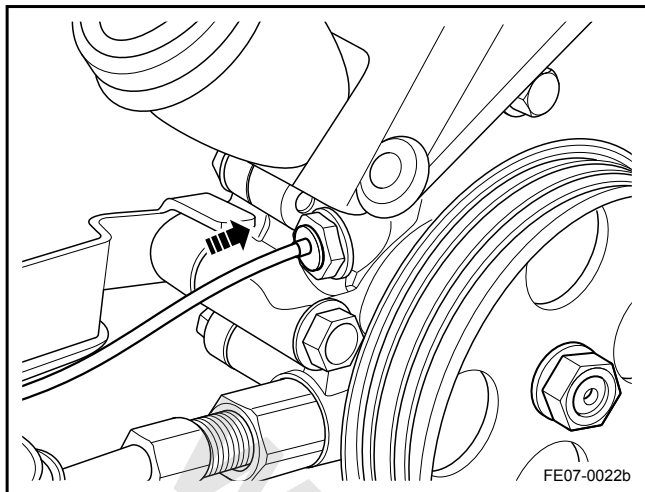


5. Remove the power steering pipe retaining bolts.
6. Remove the power steering pump assembly retaining bolts, and remove the power steering pump assembly.

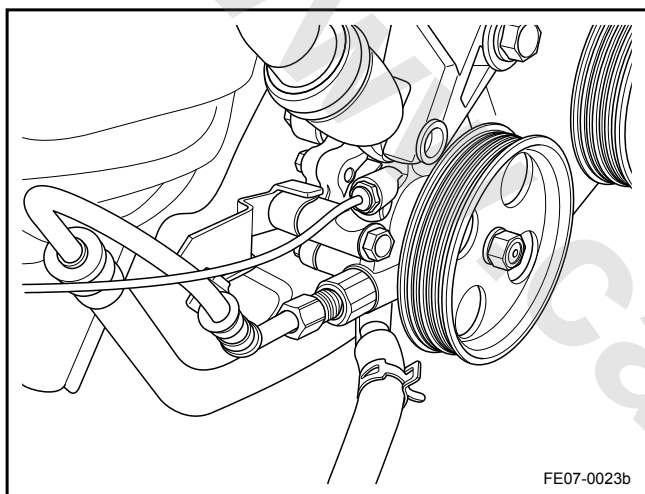


#### Installation Procedure:

1. Install the power steering pump assembly to the vehicle and tighten the retaining bolts.  
Torque: 50 Nm (Metric) 37 lb-ft (US English)
2. Install the power steering pipe retaining bolts.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)



3. Connect the power steering pump pressure switch wiring harness connector.

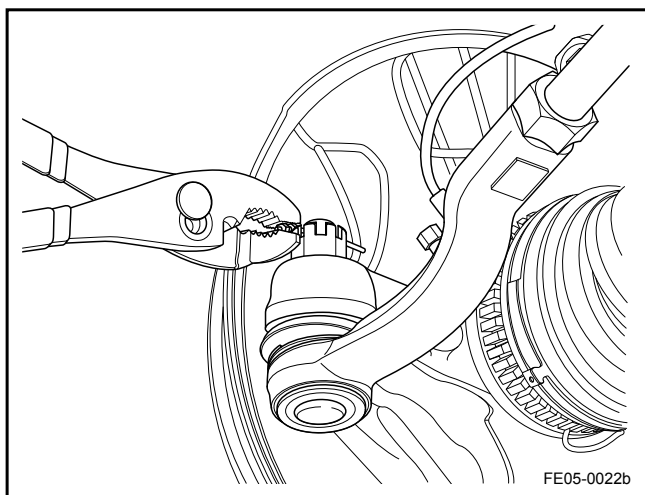


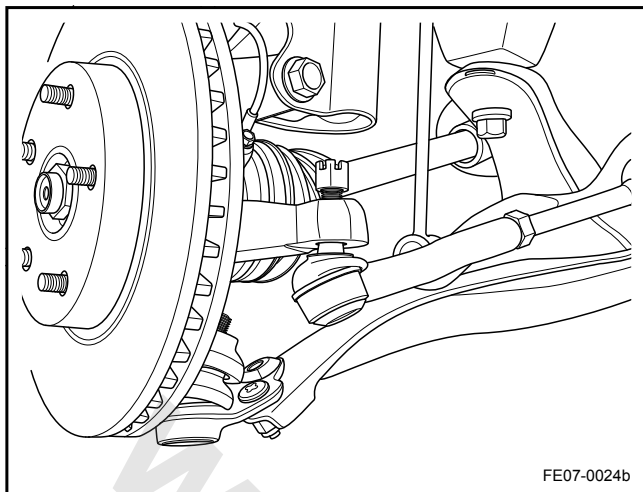
4. Connect power steering oil pump hose assembly.
5. Connect the power steering pump assembly high pressure pipe and tighten.  
Torque: 30 Nm (Metric) 22.2 lb-ft (US English)
6. Install the engine drive belt.
7. Fill the power steering fluid.
8. Bleed the power steering system. Refer to [7.2.8.7 Power Steering System Bleeding](#).

### 7.2.8.11 Steering Bar and Ball Joint Replacement

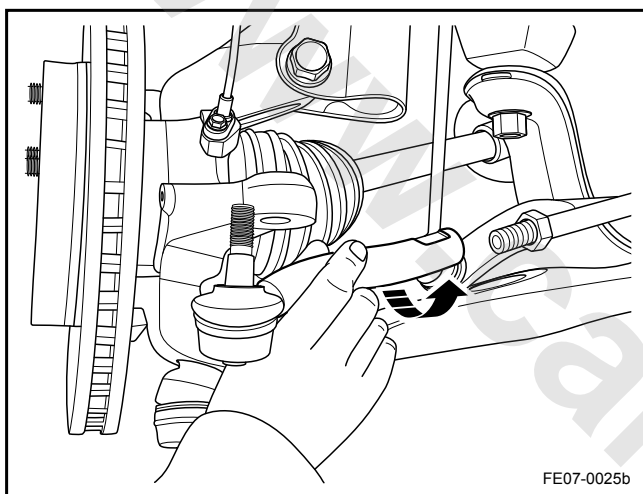
#### Removal Procedure:

1. Remove the tires. Refer to [4.4.5.1 Wheel Replacement](#).
2. Remove the steering tie rod ball nut locking pin.

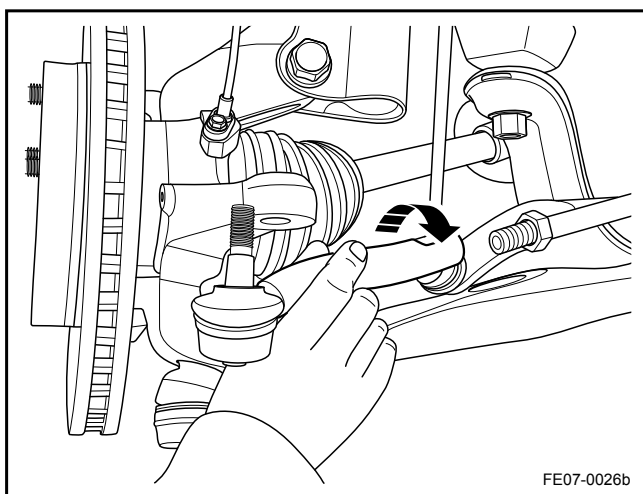




3. Mark the thread location on the inner steering horizontal rod to facilitate the nut installation and adjustment.
4. Remove the tie rod and the ball joint retaining nut and separate the tie rod and the ball joint from the steering knuckle.

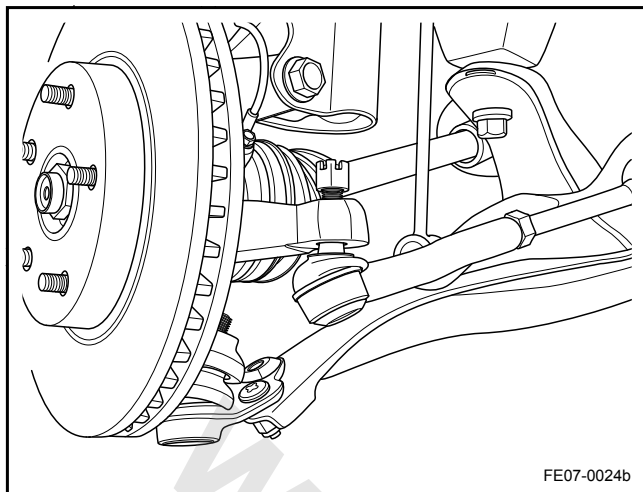


5. Loosen the steering tie rod adjustment nut and unscrew the steering tie rod and ball joint.



#### Installation Procedure:

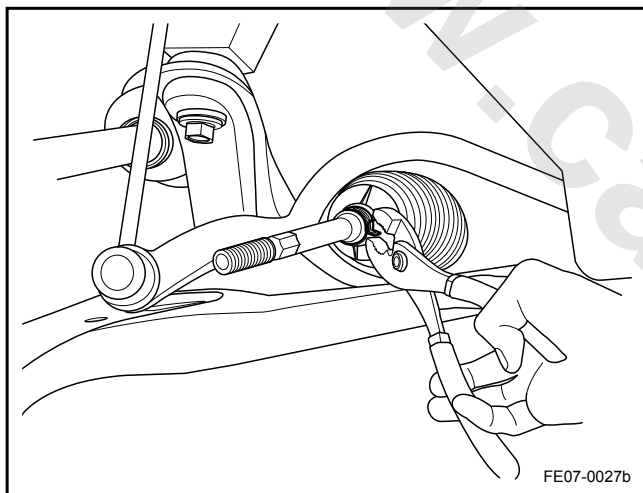
1. Align the adjustment nut with the mark on the steering tie rod.
2. Install the tie rod and the ball joint to the inner steering horizontal bar.



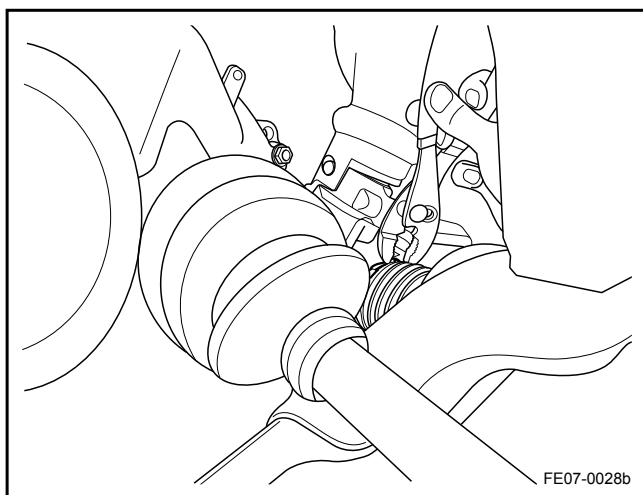
3. Install the tie rod and the ball joint to the steering knuckle.
4. Install the tie rod and the slotted hex nut and tighten.  
Torque: 33 Nm (Metric) 24.3 lb-ft (US English)
5. Install the tie rod ball nut locking pin.
6. Install the tires.
7. Carry out the front toe adjustment. Refer to [4.4.5.2 Front Toe Adjustment](#).
8. Tighten the steering bar and the ball joint adjust nut.  
Torque: 78 Nm (Metric) 57.5 lb-ft (US English)

### 7.2.8.12 Power Steering Dust Cover Replacement

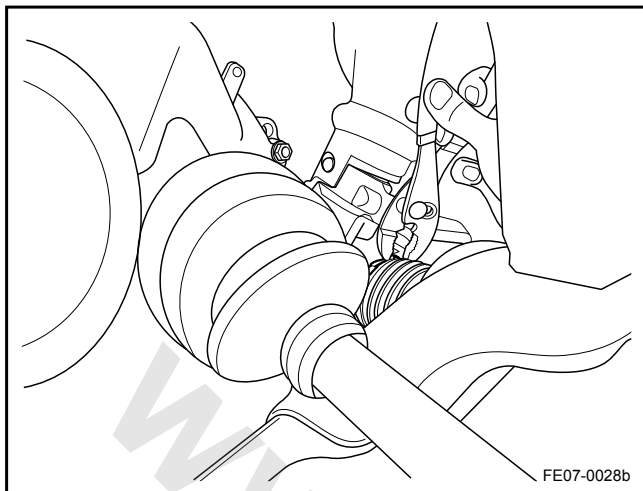
#### Removal Procedure:



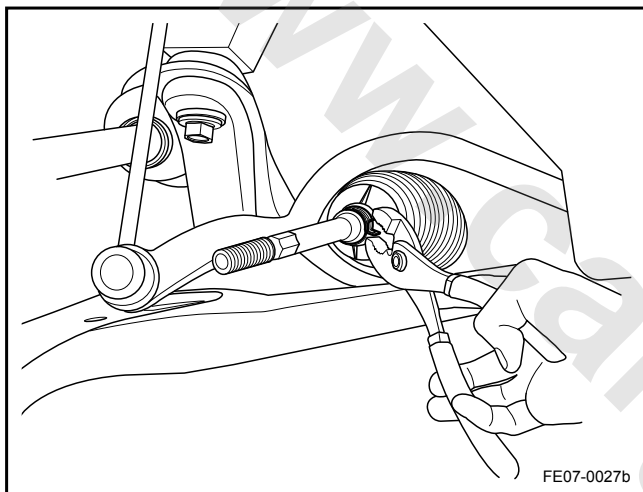
1. Remove the wheels. Refer to [4.4.5.1 Wheel Replacement](#).
2. Remove the power steering steering tie rod and the ball joint. Refer to [7.2.8.11 Steering Bar and Ball Joint Replacement](#).
3. Remove the tie rod adjustment nut.
4. Remove the Power Steering dust cover external retaining clamp.



5. Remove the power steering dust cover internal retaining clamp.
6. Remove the power steering dust cover.

**Installation Procedure:**

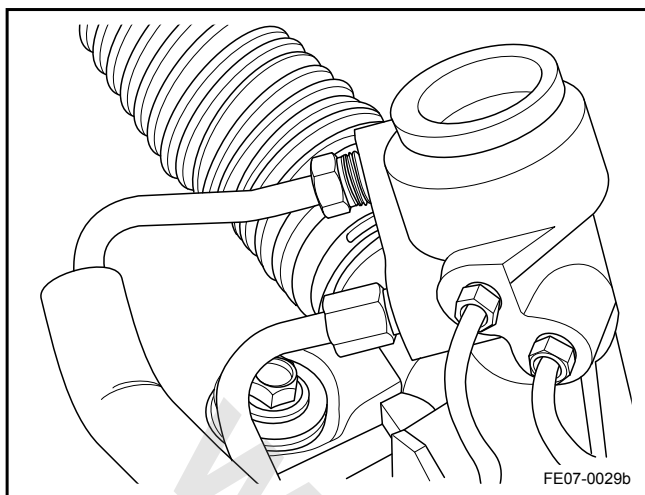
1. Install the power steering dust cover.
2. Install the power steering dust cover internal retaining clamp.
3. Install the power steering dust cover external retaining clamp.
4. Install the tie rod adjustment nut.
5. Install the the power steering steering tie rod and the ball joint.
6. Install the wheels.
7. Carry out the front toe adjustment. Refer to [4.4.5.2 Front Toe Adjustment](#).

**7.2.8.13 Power Steering Gear Assembly Replacement****Removal Procedure:****Note**

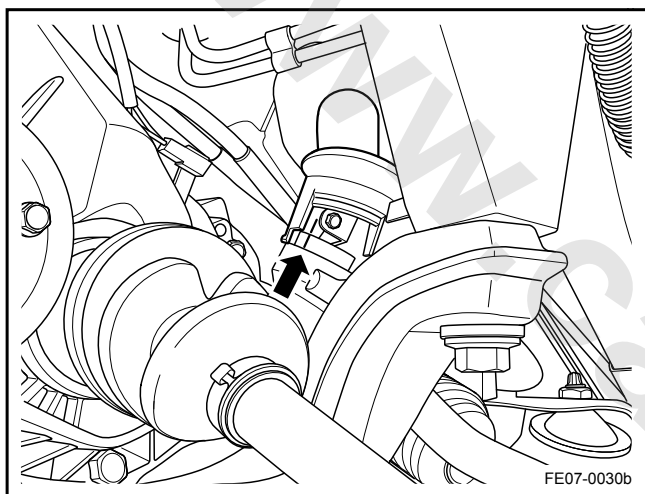
Before the removal, turn off the ignition switch.

**Warning!**

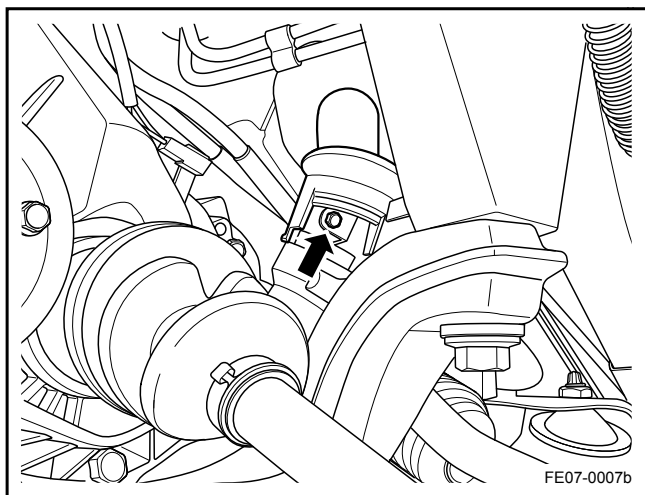
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



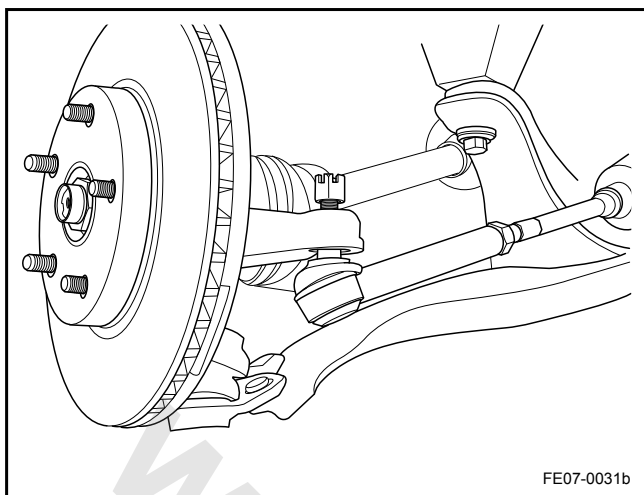
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Lift and support the vehicle. Refer to [1.3.1.1 Lifting and Jacking the Vehicle](#).
3. Remove the wheels. Refer to [4.4.5.1 Wheel Replacement](#).
4. Place a recycling container under the steering system to recycle the power steering fluid.
5. Disconnect the power steering fluid inlet and outlet pipes and return pipe from the power steering gear assembly.



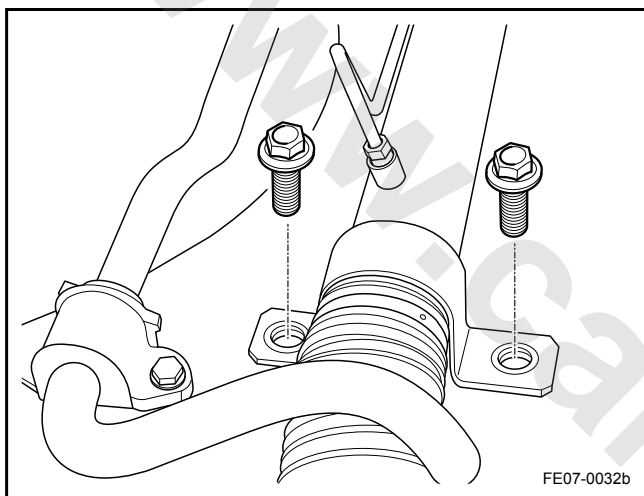
6. Turn the steering wheel to align the steering column with the short axle shell mark.



7. Remove the steering column assembly universal joint bolt.

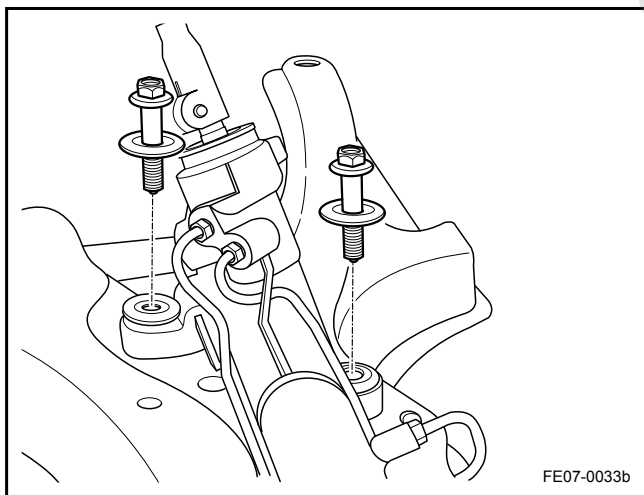


8. Remove the tie rod and the ball joint retaining nut.



9. Remove the subframe assembly. Refer to [12.6.4.2 Subframe Replacement](#).

10. Remove the power steering gear retaining bolts.



11. Remove the power steering gear to the subframe retaining bolts.

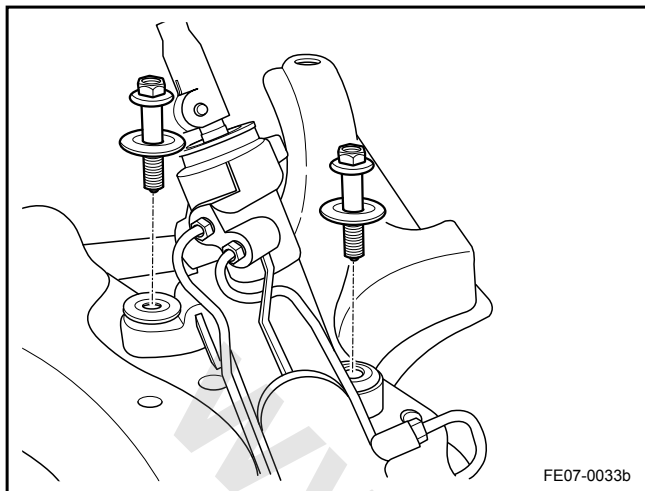
12. Remove the power steering gear assembly from the subframe.



## Installation Procedure:

1. Install the power steering gear assembly to the subframe.
2. Install the power steering gear to the subframe retaining bolts and tighten.

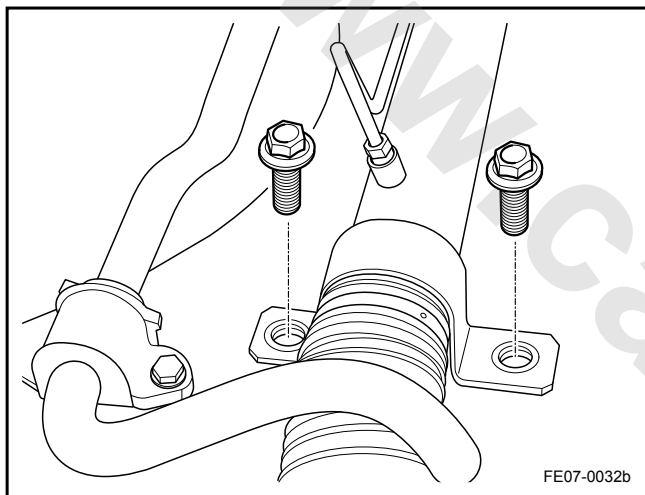
Torque: 58 Nm (Metric) 42.8 lb-ft (US English)



3. Tighten the power steering gear bracket and subframe retaining bolts.

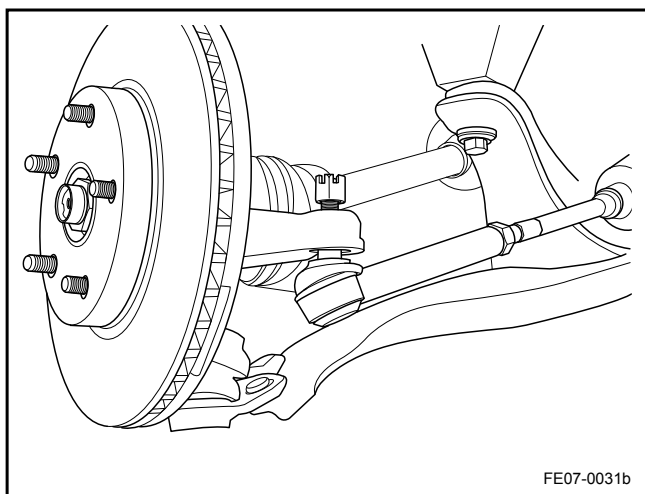
Torque: 58 Nm (Metric) 42.8 lb-ft (US English)

4. Install the subframe.

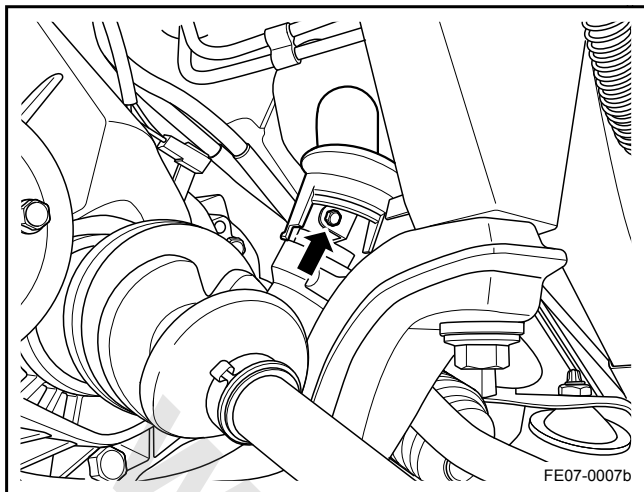


5. Install the power steering tie rod and the ball joint to the steering knuckle and tighten the retaining nuts.

Torque: 33 Nm (Metric) 24.3 lb-ft (US English)

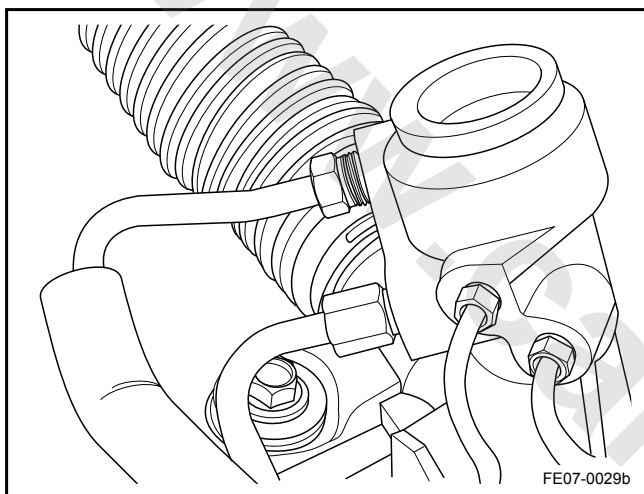






6. Install the steering column universal joints, and tighten the bolts.

Torque: 25 Nm (Metric) 18.4 lb-ft (US English)



7. Connect the power steering gear inlet/outlet pipes and the return pipe.

Torque: 28 Nm (Metric) 20.7 lb-ft (US English)

8. Install the wheels.
9. Lower the vehicle.
10. Re-fill the power steering fluid and check whether the system leaks. if there is leakage, repeat the above steps until the pipes are normal.
11. Carry out the power steering system bleeding procedure. Refer to [7.2.8.7 Power Steering System Bleeding](#).
12. Connect the battery negative cable.

## 7.3 Steering Wheel and Steering Column

### 7.3.1 Specifications

#### 7.3.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Steering Wheel Retaining Nut	M12	41-49	30.3-36.3
Steering Wheel Retaining Nut	ST4.8 × 13	2-4	1.5-3.0
Steering Column Universal Joint Bolts	M8	22-25	16.3-18.5
Steering Column Upper Retaining Bolt	M8 × 30	22-25	16.3-18.5
Steering Column Lower Retaining Bolt	M8 × 55	25-28	18.5-20.7

### 7.3.2 Description and Operation

#### 7.3.2.1 Description and Operation

##### Warning!

Refer to "SIR Warning" in "Warnings and Notices".

##### Note

Refer to "Steering Wheel in the Full Turn Position Notice" in "Warnings and Notices".

##### Note

Disconnect the mechanical steering column assembly, the upper intermediate shaft assembly, the lower intermediate shaft assembly. The wheels should be kept in the straight front direction, the mechanical steering column assembly must be in the LOCK (locked) position. After disconnecting the above components, do not move the front tires and wheels, otherwise it will cause some parts incorrect installation location, and lead to mechanical steering column assembly airbag spiral off the center, resulting in airbag spiral coil damage.

##### Note

Steering column can not only change the vehicle direction, but also provide protection. To ensure the steering column energy absorption, make sure use the provided screws, bolts and nuts and tighten to the required torque.

In the event of front end collision energy absorbing column will crumple, reducing the chance of injury to the driver.

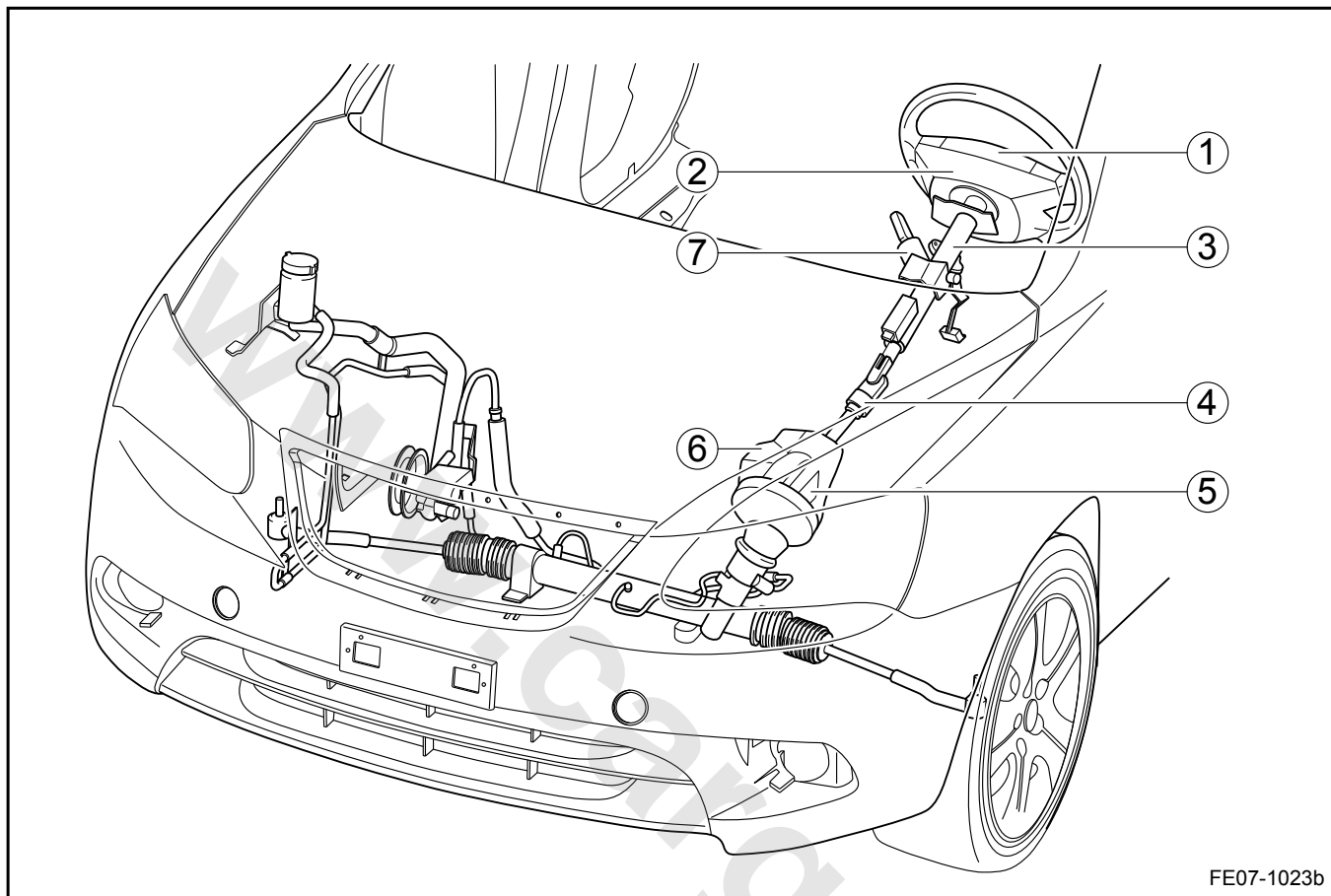
Ignition switch includes a steering wheel lock, installed in the mechanical steering column assembly. It is able to lock the steering wheel to prevent theft. When the ignition key is removed from the ignition switch, turn the steering wheel left and right, the pin inside the ignition switch pops up to lock the steering wheel. Release the locking handle, the steering wheel can tilt up and down. Therefore, the driver can adjust the steering wheel to a comfortable position. When driver leaves the vehicle, if the key is still inside the ignition switch, the reminder device inside the ignition key will beep to remind the driver. Refer to the [11.10 Remote Anti-theft System](#).

##### Note

When reassemble, apply a thin layer of lithium-based grease at all friction points. In this way, mechanical steering column assembly can removed and assembled easily.

### 7.3.3 Component Locator

#### 7.3.3.1 Component Locator

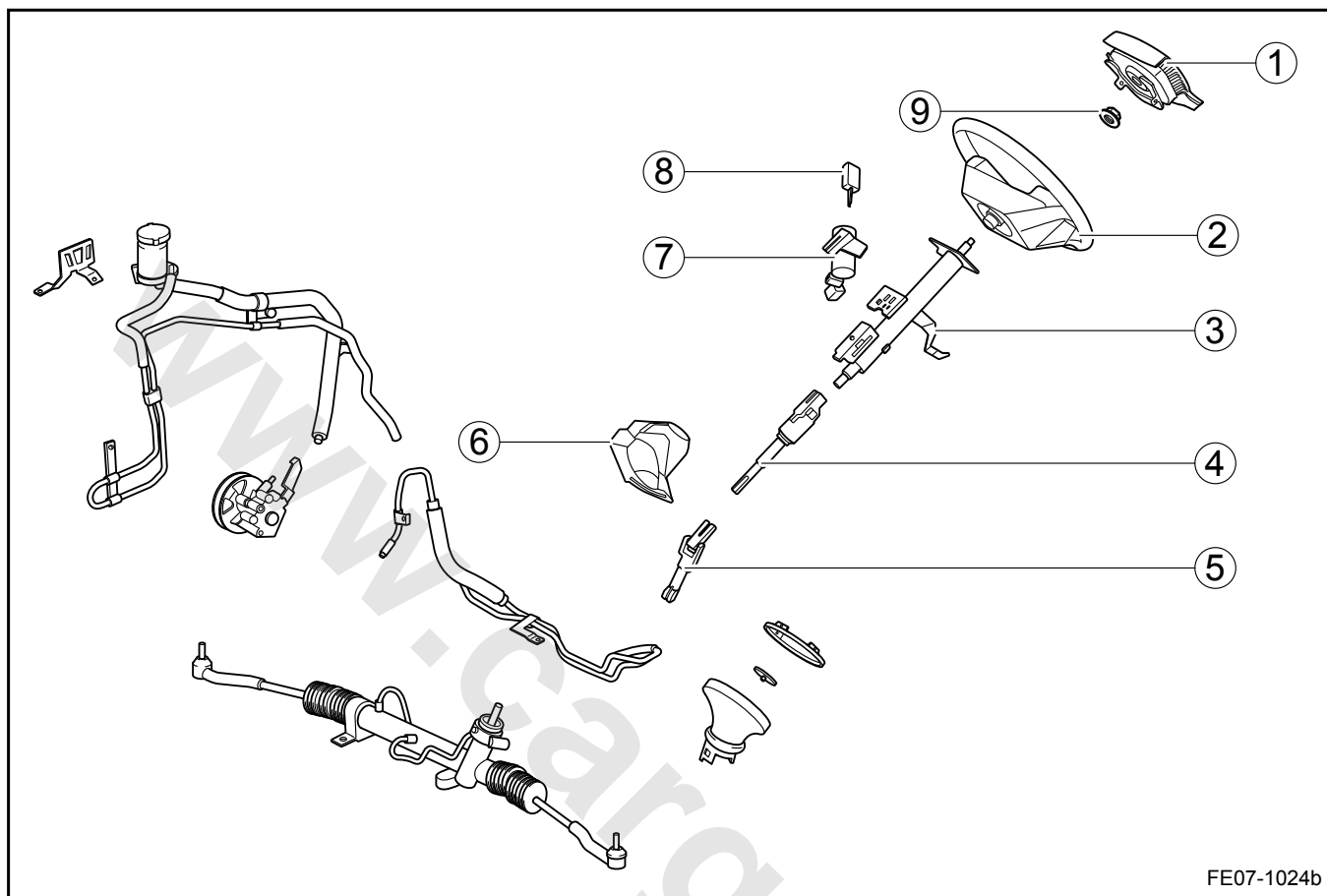


#### Legend

- |  |                                   |
|--|-----------------------------------|
| 1. Driver Front Airbag                 | 6. Steering Column Silencer Cover |
| 2. Steering Wheel                      | 7. Ignition Switch                |
| 3. Mechanical Steering Column Assembly |                                   |
| 4. Upper Intermediate Shaft Assembly   |                                   |
| 5. Lower Intermediate Shaft Assembly   |                                   |

## 7.3.4 Disassemble View

## 7.3.4.1 Disassemble View



FE07-1024b

## Legend

- |  |                                 |
|--|---------------------------------|
| 1. Driver Front Airbag                 | 7. Ignition Switch              |
| 2. Steering Wheel                      | 8. Ignition Switch Key          |
| 3. Mechanical Steering Column Assembly | 9. Steering Wheel Retaining Nut |
| 4. Upper Intermediate Shaft Assembly   |                                 |
| 5. Lower Intermediate Shaft Assembly   |                                 |
| 6. Steering Column Silencer Cover      |                                 |

## 7.3.5 Diagnostic Information and Procedures

### 7.3.5.1 Diagnosis Description

Refer to [7.3.2 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 7.3.5.2 Visual Inspection

Before diagnostic, verify the fault. Check whether tire pressure is normal, whether there are obvious signs of mechanical or electrical damage, whether the mechanical steering column shaft assembly connecting bolt is loose, whether the mechanical steering column assembly mounting bracket retaining bolt is loose.

### 7.3.5.3 Fault Symptom Table

During the diagnostic. Refer to the following table. It can help to determine the cause and location of faults. Ascending order indicates the possible causes of failure. Check each component. If necessary, repair or replace these components.

Symptoms	Suspected Parts	Measures / Refer to
Steering Wheel Loose	1. Steering wheel retaining nut (Loose / Damaged)	Tighten or replace the nut. Refer to <a href="#">7.3.6.3 Steering Wheel Replacement</a> .
	2. Mechanical steering column assembly connecting bolt (Loose / Damaged)	Tighten or replace bolt. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	3. Upper and lower intermediate shaft universal joints (Worn)	Replace the upper and lower intermediate shaft assembly. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	4. Steering wheel spline sleeve (Worn)	Replace the steering wheel. Refer to <a href="#">7.3.6.3 Steering Wheel Replacement</a> .
	5. Steering column spline shaft (Worn)	Replace the steering column. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	6. Upper and lower intermediate shaft spline sleeve / shaft (wear)	Replace the upper and lower intermediate shaft. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	7. Power steering gear assembly	Repair or replace the power steering gear assembly. Refer to <a href="#">7.2.8.13 Power Steering Gear Assembly Replacement</a> .
Mechanical Steering Column Assembly Loose	1. Mechanical steering column mounting bolt (Loose / Damaged)	Tighten or replace the bolt. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	2. Mechanical steering column assembly installation bearings (Damaged)	Replace the Instrument panel carrier. Refer to <a href="#">12.8.3.3 Instrument Panel Carrier Replacement</a> .
	3. Mechanical steering column assembly (Damaged)	Replace the mechanical steering column assembly. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .

Symptoms	Suspected Parts	Measures / Refer to
Steering Column Assembly Noise	1. Mechanical steering column assembly mounting bolt (Loose / Damaged)	Tighten or replace the bolt. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	2. Airbag clock spring (Loose / Damaged)	Install or replace the clock spring. Refer to <a href="#">9.2.7.3 Clock Spring Replacement</a> .
	3. Mechanical steering column assembly system connecting bolt (Loose / Damaged)	Tighten or replace the bolts. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	4. Mechanical steering column assembly shaft / bearing (Worn)	Replace the mechanical steering column assembly. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
Steering Column Assembly Noise	5. Upper and lower intermediate shaft universal joints (Lack of lubrication / Worn)	Apply grease or replace the upper and lower intermediate shaft. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
Adjustable Steering Column Tilt Function Abnormal	1. Steering column tilt locking block (Jam)	Clean impurities and rust, lubricate or replace the steering column locking block. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	2. Adjustable steering column tilt handle (Loose / Damaged)	Tighten the nuts or replace the handle. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	3. Steering column tilt spring (Weak / Damaged)	Install or replace the spring. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
	4. Mechanical steering column assembly tilt pivot (Rusty / Damaged)	Remove rust, lubricate or replace the mechanical steering column assembly. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
Mechanical Steering Column Assembly Hard to Lock / Unable to Lock	1. Ignition switch mounting bolt (Loose / Damaged)	Tighten or replace the installed bolt.
	2. Ignition switch lock (Stagnating / Damaged)	Remove rust, lubricate or replace the ignition switch.
	3. Ignition switch lock pin (Broken / Damaged)	Replace the ignition switch.
	4. Mechanical steering column assembly internal axle (Damaged)	Replace the mechanical steering column assembly. Refer to <a href="#">7.3.6.4 Mechanical Steering Column Assembly Replacement</a> .
Mechanical Steering Column Assembly Hard to Unlock / Unable to Unlock	1. Ignition switch lock (Stagnating / Damaged)	Remove rust, lubricate or replace the ignition switch.
	2. Ignition key (Worn / Damaged)	Replace the ignition switch.

### 7.3.6 Removal and Installation

#### 7.3.6.1 Steering Wheel Free Space Check

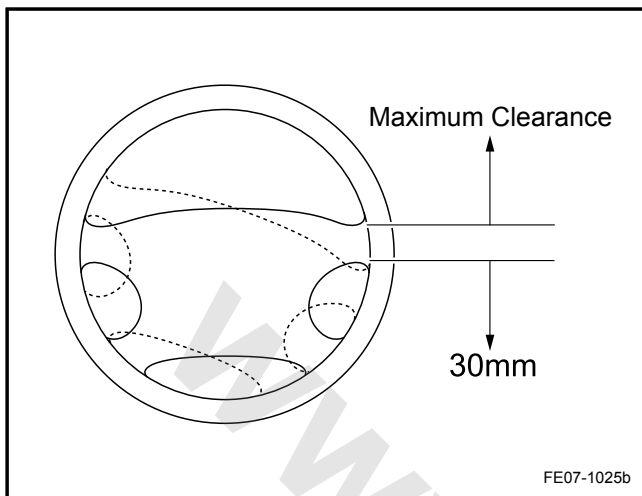
1. Park the vehicle, straighten the front wheels.

##### Note

This vehicle steering wheel free space can not be adjusted. When the upper and lower intermediate shaft universal joints are normal, replace the power steering gear assembly.

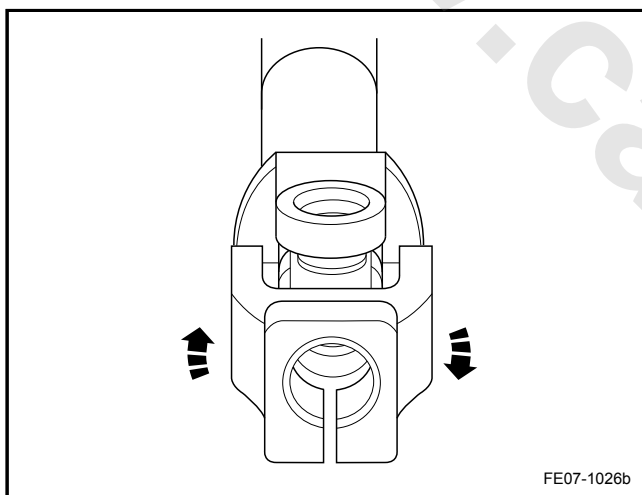
2. Turn the steering wheel while feel whether there is free space. If there is free space, replace the upper and lower intermediate shafts.

Maximum free-space: 30 mm (1.18 in)



#### 7.3.6.2 Upper and Lower Intermediate Shaft Universal Joints Inspection

1. Fix one end of the upper and lower intermediate shaft universal joints, rotate the other end clockwise and counterclockwise.
2. Check whether it feels any movement. If there is any movement, replace the upper and lower intermediate shafts.



#### 7.3.6.3 Steering Wheel Replacement

Removal Procedure:

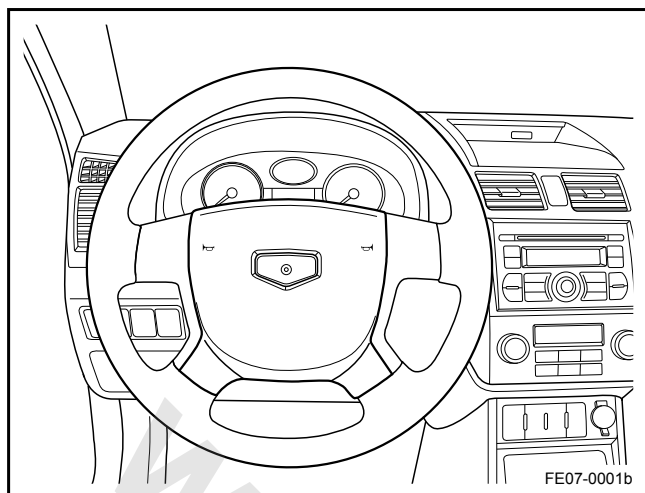
##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices" .

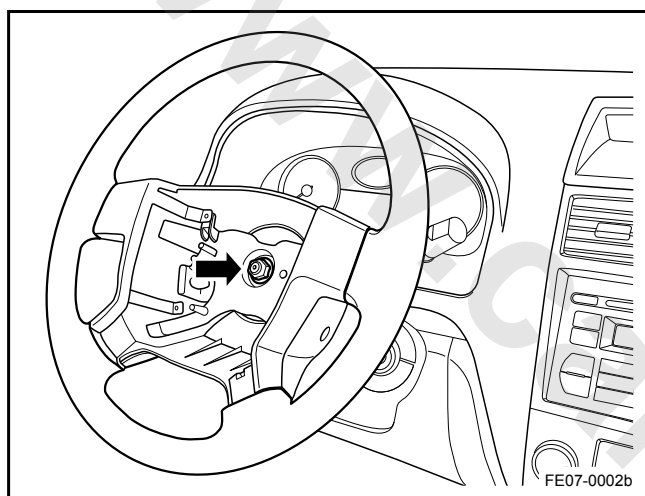
##### Note

Before operation, straighten the front wheels and lock the steering wheel.

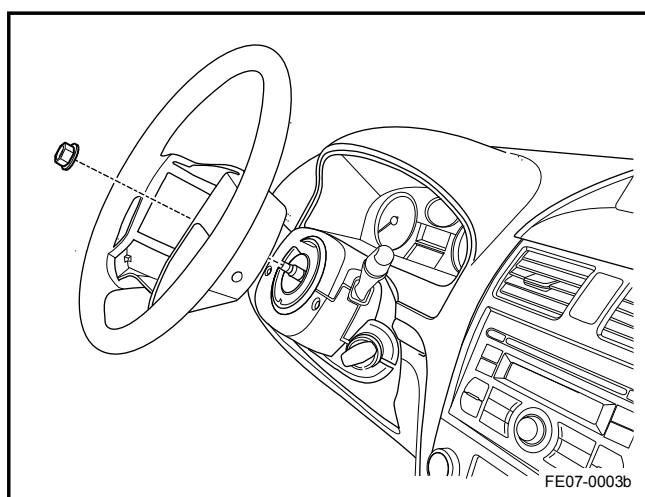




1. Remove the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the driver front airbag. Refer to [9.2.7.2 Driver Front Airbag Replacement](#).



3. Remove the steering wheel retaining nut.
4. Remove the steering wheel.



#### Installation Procedure:

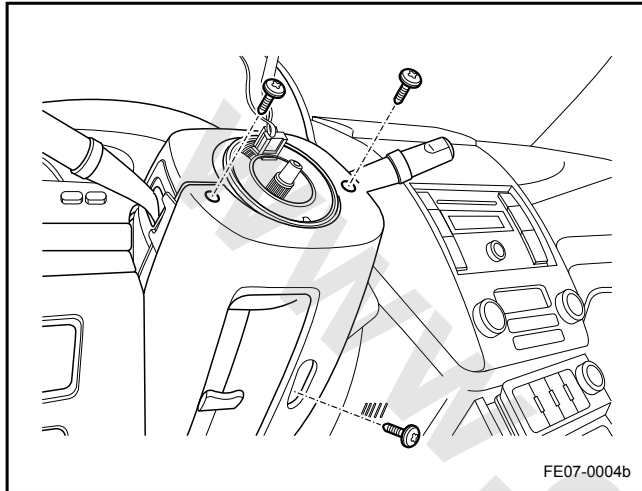
1. Straighten the front wheels, install the steering wheel.
2. Install the steering wheel retaining nut.  
Torque: 45 Nm (Metric) 33.3 lb-ft (US English)
3. Install the driver front airbag.

### 7.3.6.4 Mechanical Steering Column Assembly Replacement

Removal Procedure:

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices" .

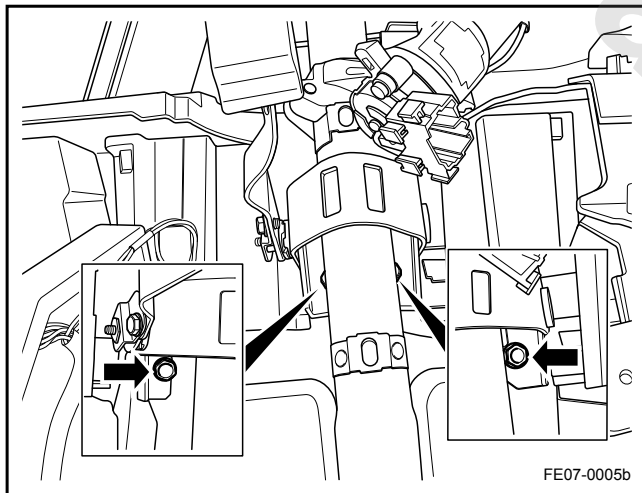


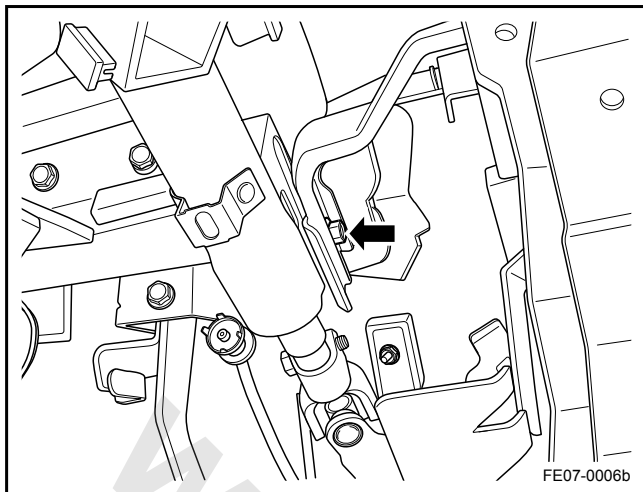
1. Turn the steering wheel, so that the front wheels are straight ahead.
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).

#### Note

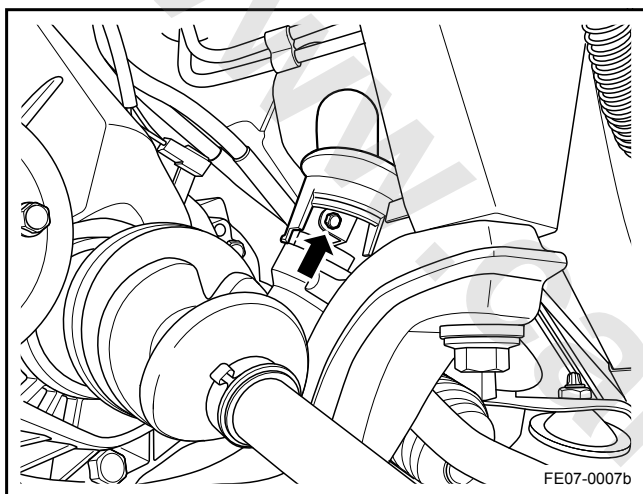
Disconnect the battery negative cable and wait at least 90s, prevent the airbag and seat belt pretensioner being activated.

3. Remove the steering wheel. Refer to [7.3.6.3 Steering Wheel Replacement](#).
4. Remove the mechanical steering column assembly upper and lower shield screws.
5. Remove the mechanical steering column assembly upper and lower shield panels.
6. Remove the clock spring.
7. Remove the headlamp switch. Refer to [11.4.8.1 Headlamp Switch Replacement](#).
8. Remove the wiper and washer switch. Refer to [11.6.8.8 Wiper and Washer Switch Replacement](#).
9. Remove the instrument panel side panel and lower panel. Refer to [12.8.3.1 Instrument Panel Replacement](#).
10. Remove the mechanical steering column assembly bracket retaining bolts.





11. Remove the mechanical steering column assembly bracket to carrier connecting bolt.
12. Remove the ignition switch cylinder.

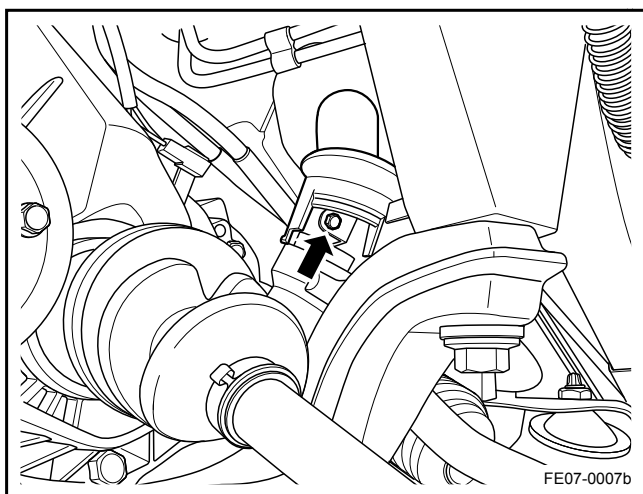


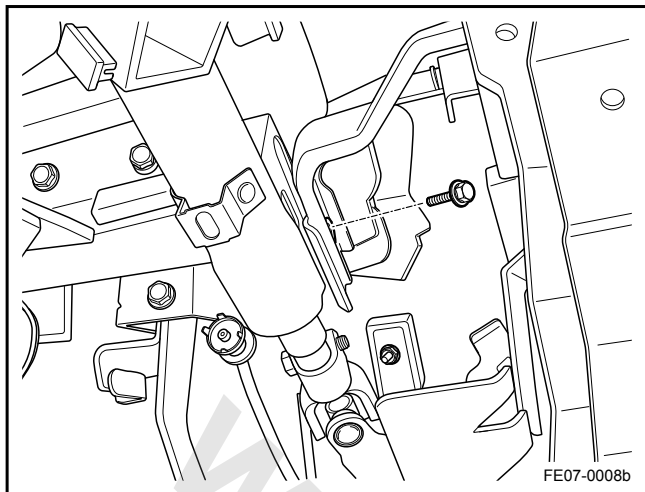
13. Remove the mechanical steering column assembly universal joint bolt, disconnect the upper and lower intermediate shafts from the power steering gear assembly input shaft.
14. Remove the mechanical steering column assembly with universal joint .

#### Installation Procedure:

1. Install the mechanical power steering column with the upper and lower steering intermediate shaft assembly to the power steering gear assembly input shaft and tighten the bolts.

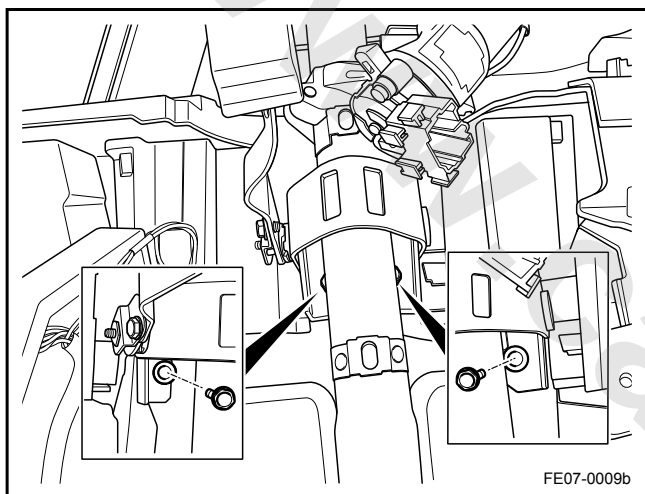
Torque: 28 Nm (Metric) 20.7 lb-ft (US English)





2. Install the mechanical steering column assembly bracket and carrier connecting bolts and tighten.

Torque: 25 Nm (Metric) 18.5 lb-ft (US English)



3. Install the mechanical steering column assembly bracket retaining bolts.

Torque: 25 Nm (Metric) 26 lb-ft (US English)

4. Install the ignition switch cylinder.
5. Install the side and the lower instrument panel shield panels.
6. Install the wiper and washer switch.
7. Install the headlamp switch.
8. Install the clock spring.
9. Install the mechanical steering column assembly upper and lower shield panels.
10. Install the steering wheel.
11. Connect the battery negative cable.
12. Check the airbag warning lamp.

## 8 Heating, Ventilation and A/C System

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## 8.1 Warnings and Notices

### 8.1.1 Warnings and Notices

#### Warning!

Carry out the refrigerant related work in a well-ventilated environment. Do not breathe refrigerant vapor. To avoid inhalation of air-conditioning refrigerant R-134a (PTFE oxide), and lubricant vapor or mist. Contact with them will stimulate the eyes, nose and throat. Operate in a well-ventilated area. When removing R-134a from the air-conditioning system, use certified maintenance equipment (R-134a recycling equipment) that meets the requirements. If the system accidentally discharges, before continuing to repair, the work area must be ventilated. Other relevant health and safety information can be obtained from refrigerant and lubricant manufacturers.

#### Warning!

Before servicing the electrical system, disconnect the battery negative cable. It is prohibited to carry out welding or steam cleaning operations near the vehicle with air-conditioning pipelines or parts installed.

#### Air-conditioning refrigerant Notice

##### Note

- Skin contact may cause frostbite.
- Must comply with the instructions provided by the manufacturer. During operation, wearing proper goggles and protective gloves.

To avoid following air-conditioning refrigerant operations

##### Note

- Do not store refrigerant under direct sunlight or near a heat source.
- During filling, do not place the refrigerant bottle upright, keep the valves facing down.
- Do not expose the refrigerant bottle to the frost or snow.
- Do not drop the refrigerant bottle.
- Do not in any case, directly discharge the refrigerant to the atmosphere.
- Do not mix refrigerants, such as R134a (PTFE ethane) and R12 (2 fluoro-2 chlorinated methane).

#### Frozen Oil Notice

##### Note

Must use compressor manufacturers recommended types and grades of lubricant. Do not mix different types and grades of lubricant, otherwise it will damage the compressor. Minimize lubricant contact with air, as it is highly absorbent.

##### Note

Do not use water, corrosive or flammable and explosive solvent to clean the air-conditioning system. It is recommended to use R-141b, heptane and other cleaning agents.

## 8.2 Automatic Air-conditioning

### 8.2.1 Specifications

#### 8.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Condenser Cylindrical Side Nut	M8	10-12	7.4-8.9
Air-conditioning Retaining Screw	ST6.3 × 19	5-7	3.7-5.2
Air-conditioning Retaining Nut	M6	5-7	3.7-5.2
Air-conditioning Retaining Bolts	M6 × 20	8-10	5.9-7.4
Air-conditioning Inlet Pipe Nut	M6	5-7	3.7-5.2
Compressor Retaining Bolts	M8 × 1.25 × 80	23-28	17.0-20.7
Compressor Suction Hose Retaining Bolts	M6 × 30	10-12	7.4-8.9
Compressor Discharge Hose Retaining Bolts	M6 × 30	10-12	7.4-8.9
High-pressure Pipe Fittings	M19	27-29	19.9-21.4
Low Pressure Pipe Fittings	M24	37-39	27.3-28.8
Air-conditioning High-pressure Pipe Bracket Bolts	M6 × 12	5-7	3.7-5.2
Air-conditioning Control Panel Retaining Bolts	M5 × 16	5-7	3.7-5.2
Suction Hose Bracket Bolts	M6	5-7	3.7-5.2
Condenser Upper Pipe	M6 × 25	9-11	6.7-8.1
Condenser Lower Pipe	M6 × 25	9-11	6.7-8.1
Expansion Valve Retaining Bolts	M8 × 20	16-20	11.8-14.8
Blower Speed Control Module Retaining Screws	ST4.8 × 16	2-4	1.5-3.0

#### 8.2.1.2 Cooling System Parameters

Applications		Parameters
Compressor	Displacement (ml/r)	167
	Model	CHD115
	Electromagnetic Clutch Power Consumption (W)	45
Blower	Maximum Air Volume (m <sup>3</sup> / h)	≥480
	Air Volume Control	7-speed Automatic



Applications		Parameters
	Electrical Power Consumption (W)	180
Condenser	Dimensions (mm)	16 × 445 × 694
	Heat Transfer (W)	≥11,000
Evaporator	Cooling Capacity (W)	≥5,000
	H-type Expansion Valve (Cold t)	1.5
System Cooling Capacity (W)		4,500

### 8.2.1.3 System Capacity

Applications	Specifications	
	Metric	US English
Refrigerant Lubricant (100 PG)		
Refrigerant Sudden Loss	40ml *	1.34 oz *
Compressor Replacement		
<b>Note</b> If lubricating oil released during the refrigerant recovery is not replaced, the compressor will be damaged.		
The vehicle compressor is pre-filled with 150 ml ** (5 oz **) refrigerant lubricant (100 PG).		
Condenser Replacement	40 ml **	1.34 oz **
Evaporator Replacement	60 ml **	2.0 oz **
Drier Core Replacement	20 ml #	0.67 oz #
Added 100 PG oil amount should be equal to the sum of the old drier core and the prescribed amount.		
Any Piping Component (Hose / Pipe or Pipe Assembly) Replacement	30 ml **	1.0 oz **
Entire System Refrigerant Lubricating Oil Capacity	150 ml	5.0 oz
R-134a		
Refrigerant Filling Amount	600 ± 10 g	1.37 ± 0.04 b
* It may lead to the refrigerant leakage but not refrigerant oil (100 PG) loss. A serious leakage, hose broken, collision or pressure relief valve open will lead to refrigerant sudden loss. When replacing components that lead to a large amount of refrigerant loss, add adequate amount of lubricating oil to the components. ** If the loss of refrigerant components lubricant (100 PG) exceeds the prescribed amount, add lubricating oil according to the loss amount.		



### 8.2.1.4 Indoor / Outdoor Temperature Sensor Resistance Properties

Temperature (°C / °F)	Lower Limit ( kΩ)	Nominal Value ( kΩ)	Upper Limit ( kΩ)
-20/-4	15.73	16.45	17.19
-15/5	12.27	12.77	13.30
-10/14	9.652	10.00	10.35
-5/23	7.626	7.886	8.151
0/32	6.019	6.270	6.520
5/41	4.833	5.024	5.215
10/50	3.908	4.050	4.192
15/59	3.170	3.285	3.399
20/68	2.600	2.680	2.760
25/77	2.134	2.200	2.266
30/86	1.762	1.816	1.870
35/95	1.441	1.507	1.576
40/104	1.198	1.258	1.319
45/113	1.001	1.056	1.110
50/122	0.840	0.890	0.937
55/131	0.708	0.751	0.797
60/140	0.601	0.643	0.680
65/149	0.511	0.546	0.582
70/158	0.437	0.468	0.501
75/167	0.375	0.402	0.432
80/176	0.323	0.348	0.375
85/185	0.279	0.300	0.326

## 8.2.2 Description and Operation

### 8.2.2.1 Description and Operation

#### 1. Overview

Automatic air-conditioning system is designed to provide a comfortable riding environment to passengers regardless of the external weather conditions. The system consists of the following main components:

- Cooling System
- Heating System
- Air Distribution System
- Mode / Temperature Control System

#### 2. Compressor

Air-conditioning compressor is driven by compressor clutch pulley, which is driven by the drive belt driven by the engine crankshaft. When the electromagnetic clutch coil is not powered, the compressor pulley is free to rotate and does not drive the compressor shaft. When the clutch coil is powered, the clutch piece and the hub are pushed to the pulley, magnetic clutch chip and pulley locks will be integrated to drive the compressor shaft. The compressor has a unique lubrication system. Crankcase suction fluid discharge through the mouth of the ramp plate spinning, this path allows the lubricating bearing swash plate. Rotation produce the oil separation effect. some oil removed from the crankcase mouth suction liquid discharge liquid separated flows back into the crankcase. Return oil lubricates compressor mechanical parts.

In the following circumstances, the compressor is turned off:

- The throttle body is fully open.
- Low idle
- Ambient Temperature Low
- Engine Coolant Temperature Too High
- Refrigerant pressure is higher than 3,140 kPa(455.4 psi) or less than 196 kPa (28.4 psi).

#### Note

Do not crash, drop or place the compressor upside down, if the compressor is impacted or placed upside down. Rotate the compressor clutch by hand 5-6 times to recirculate the engine oil in the cylinder. When engine oil is in the cylinder, the sudden rotation will cause valve damage and a negative impact on durability.

### 3. Condenser, Fluid Reservoir Drier

High temperature and high pressure refrigerant vapor flows out from the air-conditioning compressor into the condenser. The condenser is made from aluminum tubes and cooling fins that can rapidly transfer heat. Through heat transfer, cooling fins condenses the high temperature and high pressure refrigerant vapor into liquid with mild temperature and high pressure. The drier is located in the left side of the condenser, and welded with condenser into one part. Drier internal structure design ensures that the mild temperature and high pressure refrigerant air liquid mixture enter, while the mild temperature and high pressure liquid refrigerant flows out from the reservoir.

Dryer reservoir has the desiccant that absorbs cooling system water. The desiccant can not be reused. When leakage occurs due to the following reasons reservoir drier core can not repaired, but replace:

- Piercing
- Containment Damage
- Outside air entering into the system for a long time

### 4. Inside Temperature Sensor, Outside Temperature Sensor

The following sensors affect the inside air temperature automatic control:

- Inside Temperature Sensor
- Outside Temperature Sensor

These sensors are temperature sensitive thermal elements. the sensor resistance and temperature has corresponding inverse relationship. The resistance determines to the air-conditioning control module signal levels. Air-conditioning control module uses this information to instruct the following components.

- Inside and Outside Circulation Motor
- Warm and Cold Air Motor
- Blower Motor Control Module

Hose is used to connect the inside temperature sensor housing to the suction device. The air-conditioning outlet air flow form a small vacuum in the suction hose end. This vacuum has the following functions

- Let the air flow through the inside temperature sensor
- Improves the inside temperature sensor sensing accuracy

Outside temperature sensor is located in the vehicle front grille below the front bumper area. Air-conditioning control module uses this sensor to learn the surrounding air temperature information, and display the outside temperature in the instrument cluster.

## 5. Ambient and Sun Light Sensor

Ambient and sun light sensor is located in the instrument panel upper middle panel. ambient and sun light sensor is light energy sensor that measure sunlight generated heat, providing additional compensation parameters to air-conditioning control module. Air-conditioning control module in real time automatically adjusts the air-conditioning air volume and cold / hot air mixture ratio, according to light intensity, the vehicle status and the vehicle air-conditioning demand conditions, so that all occupants feel comfortable.

## 6. Inside Air-conditioning Assembly

Inside air-conditioning assembly is located in instrument panel, and consists the blower motor, blower motor control module, air-conditioning filter, heater core, evaporator, expansion valve, warm and cold air direction control motor and various air deflection damper, ventilation duct.

### A. Blower Motor

#### Note

**Do not place the blower motor on the blower motor fan wheel.**

Do not touch the fan wheel blades to prevent damage.

Blower consists of the following components:

- Permanent Magnet Motor
- Mouse-cage Fan

Blowers operate at different speeds depending on the changes in speed by the blower motor speed control device controlled by the blower motor control module. If the user selects the maximum air-conditioning mode, the vast majority of air into blower is from the passenger compartment (inside circulation).

Under most operating conditions, outside air entering the vehicle in the following ways:

- Blower motor draws outside air.
- Vehicle forward movement draws the outside air.

Blower motor blows air along the following lines:

- Through the evaporator core

- Through heater core
- Into the passenger compartment

### B. Heater Core

Heater core is the main heating system component. Heater Core is located inside the air-conditioning. Whenever the engine runs, the engine coolant from the engine is pumped into the heater core. Heater core will transfer the engine coolant heat to the air flowing through the heater core body. Heater core has specific inlet and outlet air pipes. To remove the heater core body, the heater core warm pipe must be completely discharged. For service, the heater core warm pipe must already be installed. Heater core is equipped with a temperature sensor. The sensor send the heater core surface temperature signal to the air-conditioning control module, providing more compensation parameters.

### C. Evaporator and Expansion Valve

Evaporator is located in the left hand side of the air-conditioning assembly. To remove and install the evaporator and expansion valve, the air-conditioning assembly must be removed first. When removing, the evaporator refrigerant piping must be completely discharged. When servicing, evaporator with separate refrigerant pipelines must already be installed. Expansion valve is connected to the evaporator, installed in one end of the evaporator, located in the evaporator inlet. Expansion valve one end is connected to the air-conditioning compressor inlet and outlet pipes, the other is connected to the evaporator inlet and outlet pipes. Within the pipeline, the high pressure refrigerant is regulated to low pressure refrigerant and flows to the evaporator.

Expansion valve changes the location according the air-conditioning lower pressure limit and the upper pressure limit.

Evaporator cools the air and removes the moisture from the air before the air enters into passenger compartment. Following procedures happen in the evaporator:

- Low-voltage low-temperature liquid / vapor refrigerant entering into the evaporator.
- Refrigerant flows through the evaporator.
- Refrigerant evaporation.
- Evaporated refrigerant absorbs heat from the air flowing through the evaporator.
- Low-pressure low temperature refrigerant enters into the evaporator, steam leaves the evaporator.

When the air heat passes the evaporator core, the air moisture will condense on the evaporator core external surface, forms water and flows out.

Evaporator is equipped with a temperature sensors to prevent it from freezing. The sensor measures the evaporator heat sink surface temperature. If the temperature is below 2°C (36 °F), the compressor clutch will not continue to work. If the temperature increases to 4°C (39 °F) or above, the compressor resume working. In the system equipped with automatic temperature control, the sensor signal will first be transferred to the air-conditioning module, and then transferred to the air pressure switch through dedicated circuit. If the air pressure meets the requirements, the corresponding air-conditioning signal will be sent to ECM. ECM controls the compressor clutch closing.

## 7. Refrigerant R-134a and Lubricant

Air-conditioning system refrigerant has the following roles

- Absorb heat
- Carry heat
- Release heat

This vehicle uses R-134a refrigerant, which is a non-toxic, flame retardant, transparent, colorless liquefied gas.

Before servicing the air-conditioning system. Refer to the refrigerant piping and fittings disposal and the chemical stability instructions

R-134a system uses special synthetic lubricant 100 PG refrigerant oil, which absorbs water. Refrigerant needs to be stored in airtight containers. R-134a air-conditioning systems can only use 100 PG synthetic refrigerant oil for internal circulation. Only apply fossil based 525 viscosity refrigerant oil to installation thread and O-ring. Using other lubricants will cause the compressor or components malfunction.

Follow the manual steps in the following repairs:

- Refrigerant recovery and recycling
- Adding oil
- Drain cooling system
- Refill cooling system

## 8. Air-conditioning High Pressure Pipe, Air-conditioning Low Pressure Pipe, Air-conditioning Pressure Switch

This vehicle uses high pressure pipe and low pressure pipe (air-conditioning hard pipes and / or hose) to form a closed system. Refrigerant and lubricating oil flow in this closed system, to complete the refrigerant cycle. Air-conditioning hard pipe consists of the aluminum pipe and the corresponding joints, air-conditioning hose consists rubber hose and the corresponding joints.

Air pressure switch is a three-state pressure switch, transmitting the air pressure signal.

Pressure Switch Values:

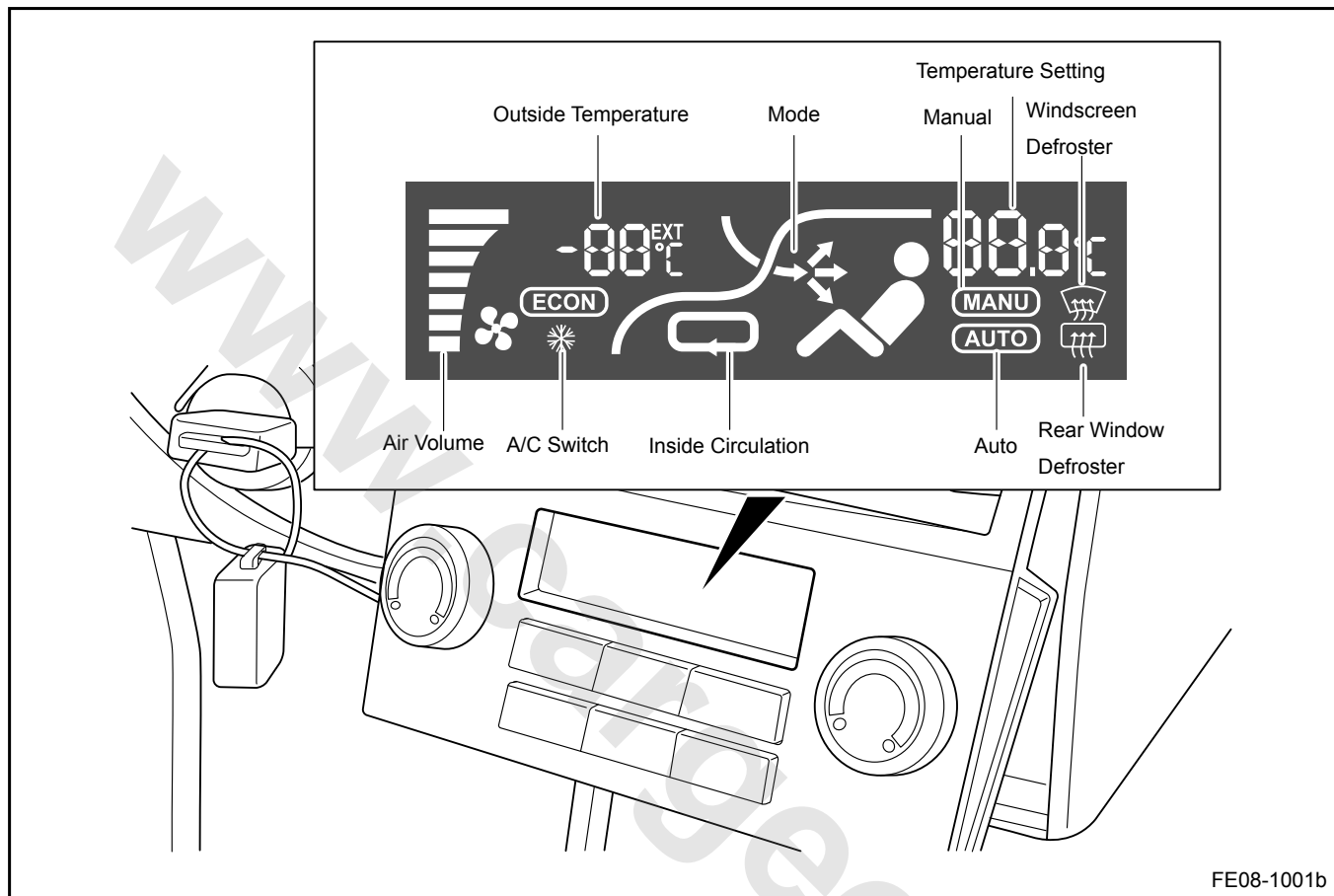
Name	Pressure Value		Signal Values
	Metric (MPa)	US English (psi)	
High Voltage Switch	2.51-3.14	364.0-455.3	OFF
Medium Voltage Switch	1.52	220.4	ON
Low Voltage Switch	0.196-0.201	28.4-29.1	OFF

## 8.2.3 System Working Principle

### 8.2.3.1 Air-conditioning Control Panel Features

#### Description

#### 1. Control Panel Icons



#### 2. Temperature Settings

Temperature setting knob is used to set the inside temperature. The temperature value is shown on the LCD as user information. The temperature is set within the range of 16-32°C (61-90 °F) the temperature regulation step is 0.5°C ( 33 °F). When the temperature is set below 16°C (61 °F) , LCD displays LO, When the temperature is set higher than the 32°C ( 90 °F) LCD displays HI.

Temperature setting will not change the air-conditioning system operating mode. In automatic mode, when access to LO / HI, the system will remain the largest amount of wind blowing. Measure the warm and cold conditioning motor Hi and Lo motor position angle and voltage as the following table:

Warm and Cold Conditioning Motor	Angle (°)	Voltage (V)

Low (Lo)	302.11	4.62
High (Hi)	84.70	1.07

#### 3. Air Volume Settings

Air volume control knob is used to manually set the fan speed. In automatic mode, blower speed will be automatically controlled by the system. Air volume control knob operation will make the system state change from automatic mode to manual mode. AUTO disappears, MANU displays. Air-conditioning system uses 4.4-13.1 V voltage linear regulator control the fan 1-7 speeds.

Air Volume	Fan Speed	Air Volume Ratio (%)	Blower Terminal Voltage (V)
0	0	0	0

Air Volume	Fan Speed	Air Volume Ratio (%)	Blower Terminal Voltage (V)
1	1	15	4.4
2	2	30	5.1
3	3	40	6.7
4	4	50	8.2
5	5	60	9.9
6	6	75	11.7
7	7	100	13.1

In manual mode, users can operate air volume control knob to set the right air volume, air volume change from 1 to 7 level. In automatic mode, blower speed is part of the automatic control logic. Blower speed is not limited to the level 7 in manual mode, but the LCD only displays 7. The bar in the display shows the nearest fan speed.

#### 4. Manual Adjustment / Automatic Adjustment of the Wind Patterns

Automatic air-conditioning controller provides two kinds of manual and automatic modes for users to choose out of wind. By adjusting the face / feet / windshield of the throttle to control the wind patterns. Blowing head and legs blown difference is that the temperature distribution of feet in order to provide a more warm air, and to provide more cool air head to ensure the driver is always in a comfortable driving environment. The temperature range of the distribution will be subject to the impact of vehicle space.

Automatic air-conditioning, heater and evaporator controller uses temperature sensors to determine the temperature of gas mixture.

In manual mode, users can choose 5 wind modes:

1. Blow Facial
2. Two-way (Blow surface and blow feet)
3. Blow Feet
4. Hybrid (Blow feet and defrost)
5. Defrost

LCD displays appropriate wind mode icons. When the air-conditioning system uses two DC motor control ventilation mode, the air-conditioning controller can affect the air flow

distribution. The wind pattern corresponding to the angle and voltage of the following table:

Manual Configuration	Throttle Angle (°)	Wind Motor Voltage (V)
Blow Facial	21.17	0.29
Two-way (Blow surface and blow feet)	112.94	1.57
Blow Feet	180.70	2.51
Hybrid (Blow feet and defrost)	286.58	3.98
Defrost	341.64	4.75

In automatic mode, the wind model is the automatic control logic, as part of the wind mode is automatically selected by the controller. When the wind mode button to operate the system from the automatic mode to manual mode. In order to achieve the degree of comfort, head to reach a certain temperature, foot temperature is higher than the head temperature 4-6°C (39-43 °F). Air-conditioning system may result in certain restrictions in certain special cases, the level of comfort not be achieved. Air-conditioning control module to choose a time closest to the pattern displayed in the LCD.

#### 5. Inside and Outside Circulation Control

User can select inside and outside circulation mode:

1. Outside circulation mode, the outside circulation throttle open, inside circulation throttle close.
2. Inside circulation mode, the inside circulation throttle open, outside circulation throttle close.

Inside and outside circulation control button is used for manual adjustment. In automatic mode, the throttle is controlled by the system automatically. When inside and outside circulation control button is operated, the system will enter the manual mode. According to inside temperature, automatic control logic automatically controls the throttle work. Users can switch modes between inside and outside circulations. when the inside circulation continues 20min, the system will automatically switch to the outside circulation 2min, and then back to inside circulation. Manually switch to the outside circulation, the system will not interfere with this operation.



In automatic mode, the throttle is controlled by the system automatically. When inside and outside circulation control button is operated, the system will enter the manual mode. Cooling effect at high temperature is poor, in principle, the system maintains the inside circulation, in order to replace the fresh air, ventilation will be carried out (keep 20min inside circulation, switch to outside circulation for 2min, and then back to inside circulation, manually switch to the outside circulation is an exception).

## 6. Defrosting Control

Defrost button is used to start the windscreen defrost function. At this point the fan speed is the maximum to exit the inside circulation (because the inside circulation may affect the defrost effect), and issued a request for compressor enabled.

### Defrost Status

At any working status (auto, manual, off), press the defrost button, the system enters into the defrost mode. After defrosting is finished, the system returns to the state before defrost. (automatic, manual, off).

In the defrost mode, the blower speed adjusts to the maximum, throttle position adjusts to blow the glass, the outlet temperature increased by a compensation constant. Compressor start, throttle opens as in outside circulation mode. In the defrost mode, pressing the button will adjust wind speed to increase or decrease accordingly. Keep defrosting working condition, the compressor continues to work to keep the wind blowing glass pattern.

Exit the defrost mode, the following parameters return to previous state:

1. Wind Speed
2. Wind Patterns

In the defrosting process, in addition to wind speed, temperature adjustment, and rear window defrost, operation of other buttons will cause the system to leave the defrost mode and back to the previous mode (except newly selected function). Exit defrosting, the system returns to the state before defrost. (automatic, manual, off).

### Rear Defrost Function

Rear defrost button is used for the rear window defrost. During the rear window defrosting, LCD displays the corresponding logos. Press the defrost button again to exit.

## 7. Automatic and Manual Working Status

System has automatic (AUTO), Manual (MANU) and stop (OFF) three states.

Manual mode, to achieve the following features:

- Manual speed adjustment
- Manual wind mode control
- Set the automatic temperature control according to the temperature

Automatic mode, to achieve the following features:

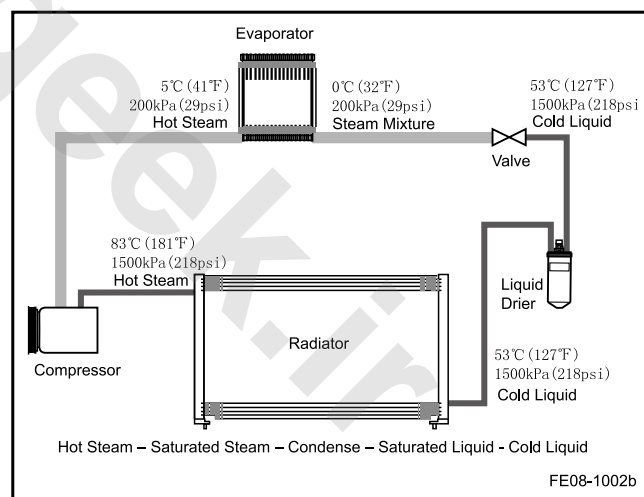
- Automatic speed adjustment
- Automatic wind control mode
- Automatic temperature control

### 8.2.3.2 Automatic Air-conditioning Working Principle

#### 1. System Diagnostics

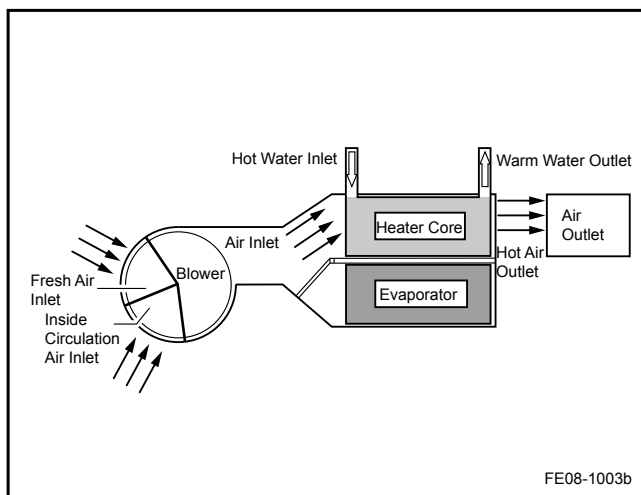
Through the Data Link Connector, air-conditioning control module can send the appropriate diagnostic information to the scan tool. Scan tool can read the air-conditioning control module manufacturers, and software version numbers.

#### 2. Cooling System Working Principle



Compressor is driven by the drive belt, which is driven by engine. extract compress gaseous refrigerant from the evaporator. Refrigerant temperature rises to 83-110°C (181-230 °F), the pressure reaches 1,470 kPa (213.2 psi). Heat is transferred to the condenser by high-pressure refrigerant, and then taken away by the condenser air. because of the heat dissipation, refrigerant is cooled. The temperature drops to 53-70°C (127-158 °F) under high pressure refrigerant fluid is sent to dryer storage. The reservoir fluid dryer is an intermediary, filters water mixed in the refrigerant. Dried refrigerant is transported to the expansion valve. Expansion valve decompresses the refrigerant, from the expansion valve the refrigerant mist pressure is 200 kPa (29 psi), the temperature drops to 0-2°C (32-36 °F). Refrigerant mist is heated in the evaporator and evaporates. Finally, the air blower blows air through the evaporator surface to each outlet. because inside the evaporator refrigerant evaporation absorbs heat, so the outlet air temperature is far below the environment temperature. After evaporation the low-pressure refrigerant to the air stream from the evaporator expansion valve box, at this time the refrigerant pressure is 200 kPa (29 psi), the temperature rises to 5-8°C (41-46 °F). The low-pressure refrigerant returns to the compressor through the air once again compressed, air-conditioning refrigeration agent completes a working cycle.

### 3. Heating System Working Principle

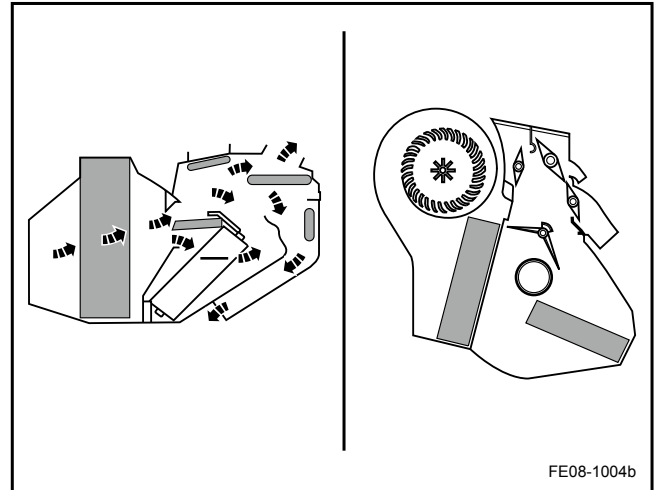


When the automatic air-conditioning system is in heating mode, the heating and cooling control motor will transfer the temperature control device to warm location, air entering the heater core has the following effect:

- Some air by-pass the heater core
- Heat Transfer

Any air that does not need to be heated will enter the passenger compartment, mixing with heated air to obtain the appropriate air temperature. Engine coolant state is a key factor to the heater system normal working.

### 4. Ventilation Control System Working Principle



A variety of locations in the ventilation control system, enables the model valve draw cold air, hot air and outside air through the air duct to the air-conditioning system. Air enters into the passenger compartment through the air duct.

In the "AUTO (Auto)" mode, the system will automatically select the appropriate mode. Press the "MODE (mode)" button to change the vehicle air supply mode. If the system currently displays an air supply mode, press the "MODE (mode)" button to select the next mode.

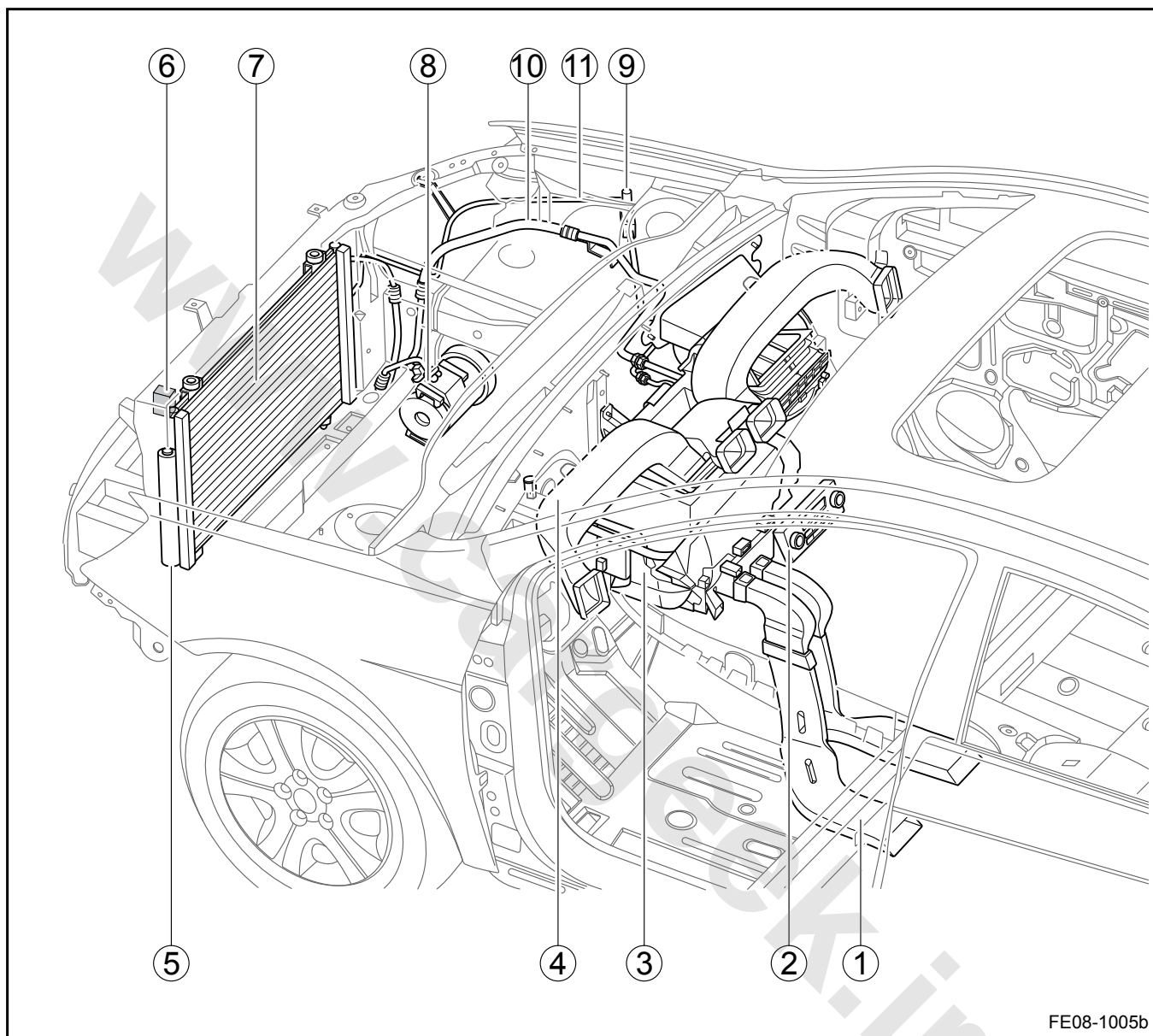
Air flow pattern changes according to the following:

- Face - through the instrument panel air duct
- Two way - through the instrument panel air duct, floor vent
- Feet - through the floor vent
- Mixing - through the floor vent, the Windshield vent
- Defrosting - Windshield vent



## 8.2.4 Component Locator

### 8.2.4.1 Air-conditioning System Component Component Locator

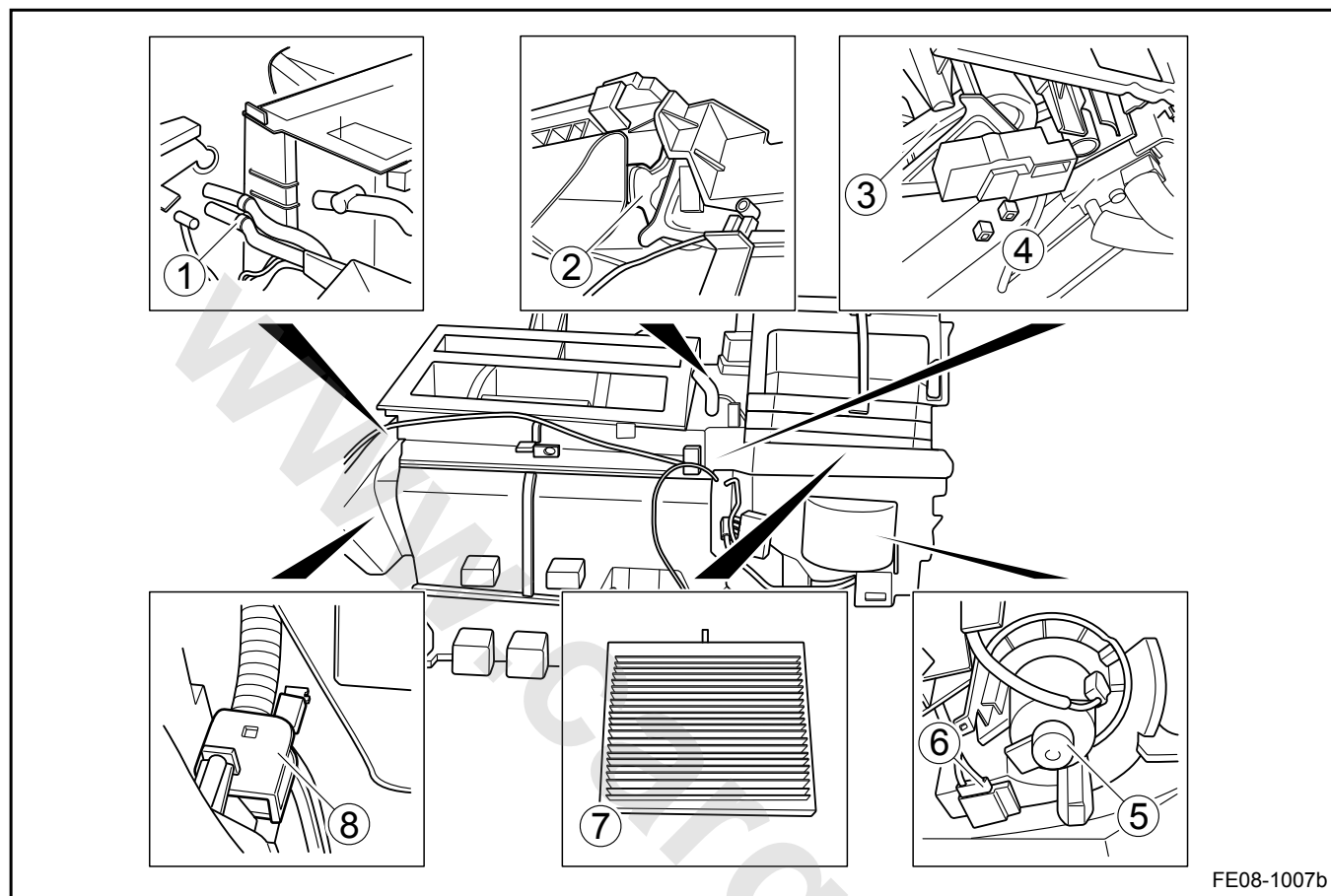


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#### Legend

- |  |   |
|--|---|
| 1. Floor Air Duct                          | 8. Compressor                           |
| 2. Air-conditioning Panel (Control Module) | 9. Pressure Switch                      |
| 3. Air-conditioning                        | 10. Air-conditioning Low Pressure Pipe  |
| 4. Instrument Panel Air Duct               | 11. Air-conditioning High Pressure Pipe |
| 5. Drier                                   |   |
| 6. Outside Temperature Sensor              |   |
| 7. Condenser                               |   |

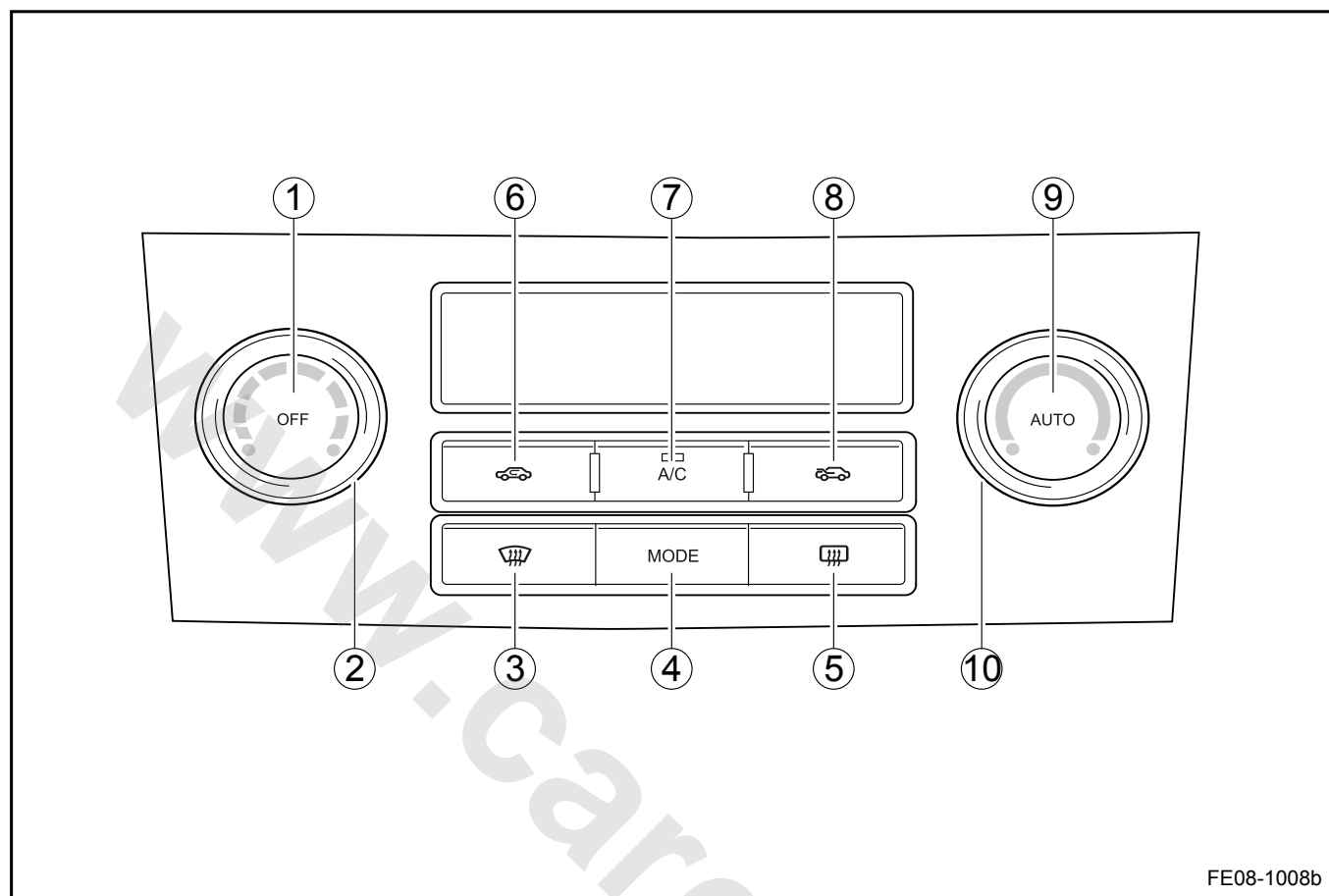
### 8.2.4.2 Air-conditioning Assembly Component Locator



#### Legend

- |   |                                  |
|---|----------------------------------|
| 1. Heater Core Inlet and Outlet Pipes           | 6. Blower Speed Adjusting Module |
| 2. Inside and Outside Circulation Control Motor | 7. Air-conditioning Filter       |
| 3. Cold and Warm Air Control Motor              | 8. Inside Temperature Sensor     |
| 4. Expansion Valve                              |                                  |
| 5. Blower                                       |                                  |

## 8.2.4.3 Air-conditioning Panel Diagram



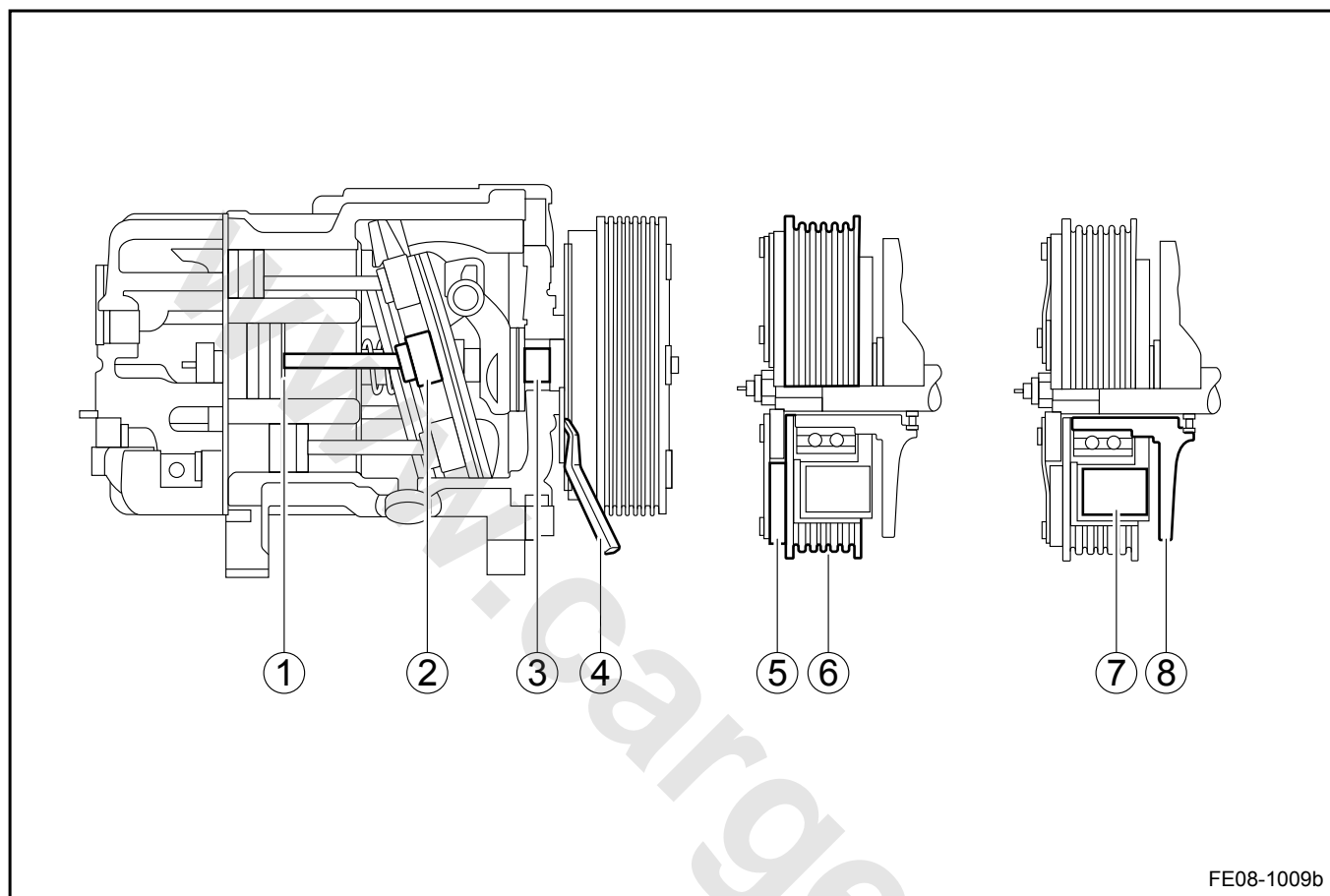
## Legend

- |                                 |                               |
|---------------------------------|-------------------------------|
| 1. OFF Button                   | 7. Compressor Button          |
| 2. Air Volume Control Knob      | 8. Outside Circulation Button |
| 3. Defrost Button               | 9. Auto Button                |
| 4. Mode Button                  | 10. Temperature Setting Knob  |
| 5. Rear Window Defroster Button |                               |
| 6. Inside Circulation Button    |                               |

## 8.2.5 Disassemble View

## 8.2.5.1 Disassemble View

Compressor

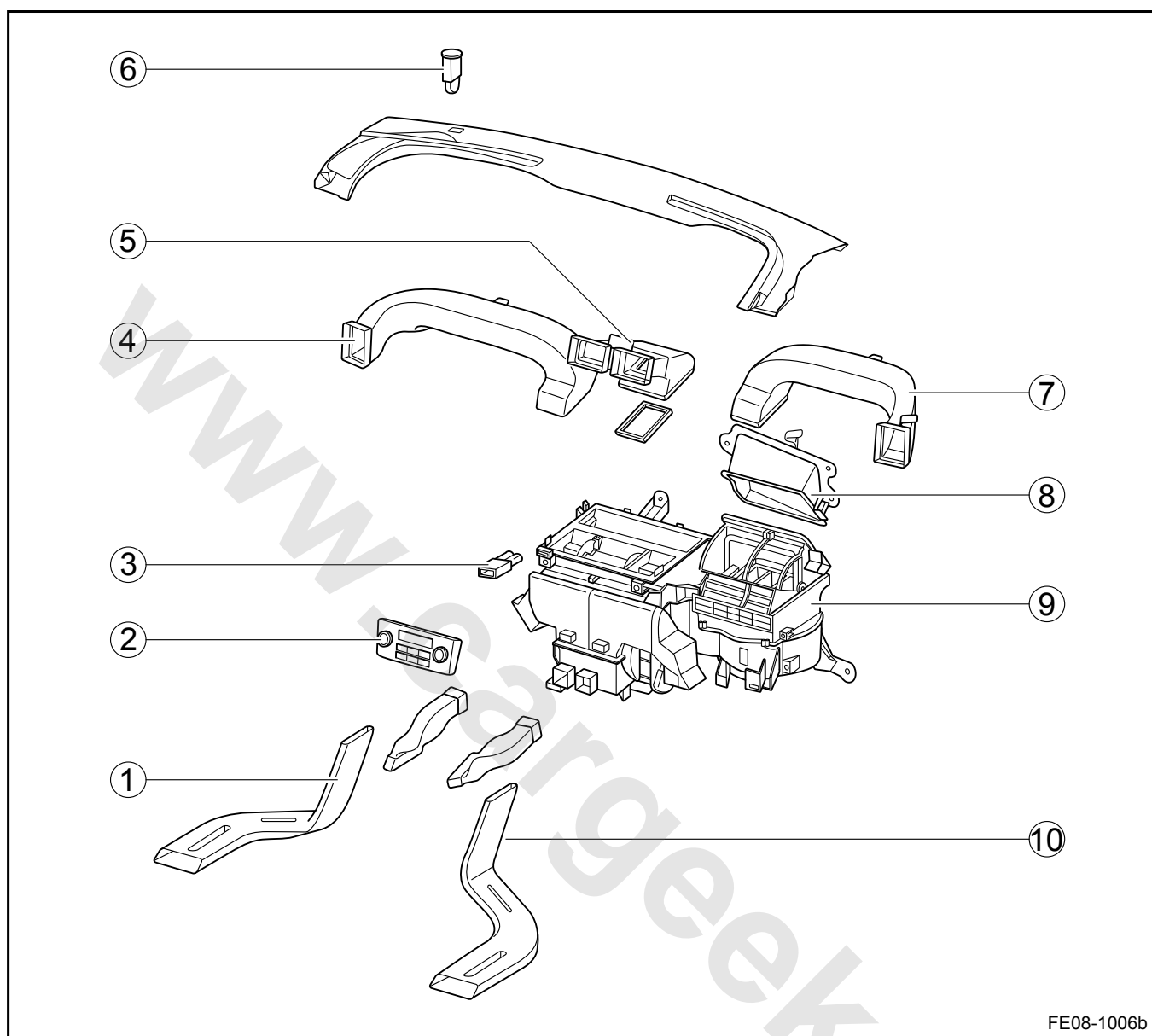


## Legend

- 1. Piston and Cylinder
- 2. Swash Plate
- 3. Compressor Shaft
- 4. Clutch Coil Plugs
- 5. Pallet

- 6. Pulley
- 7. Clutch Coil
- 8. Pressure Plate

Air-conditioning System Indoor Components Disassemble View



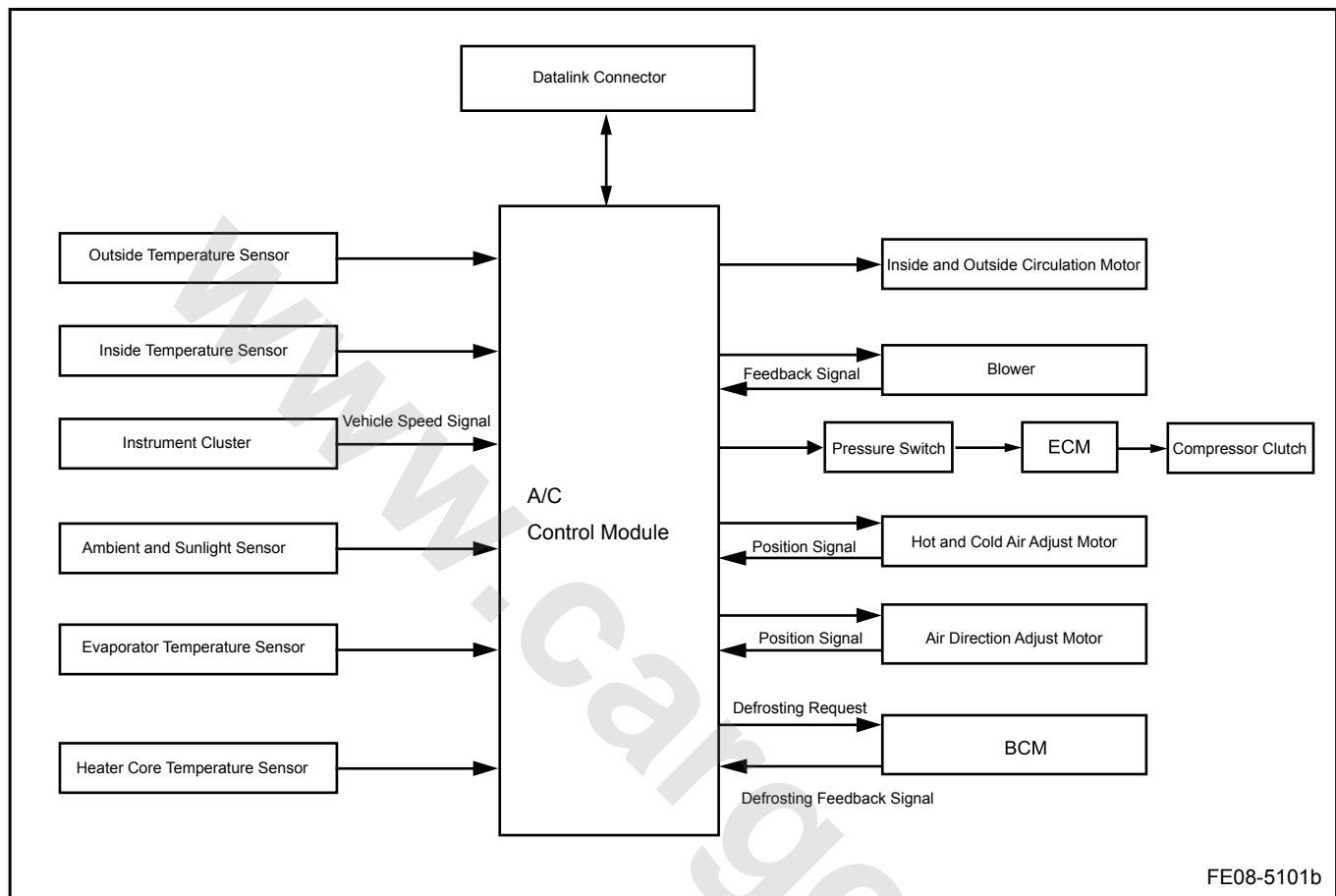
FE08-1006b

## Legend

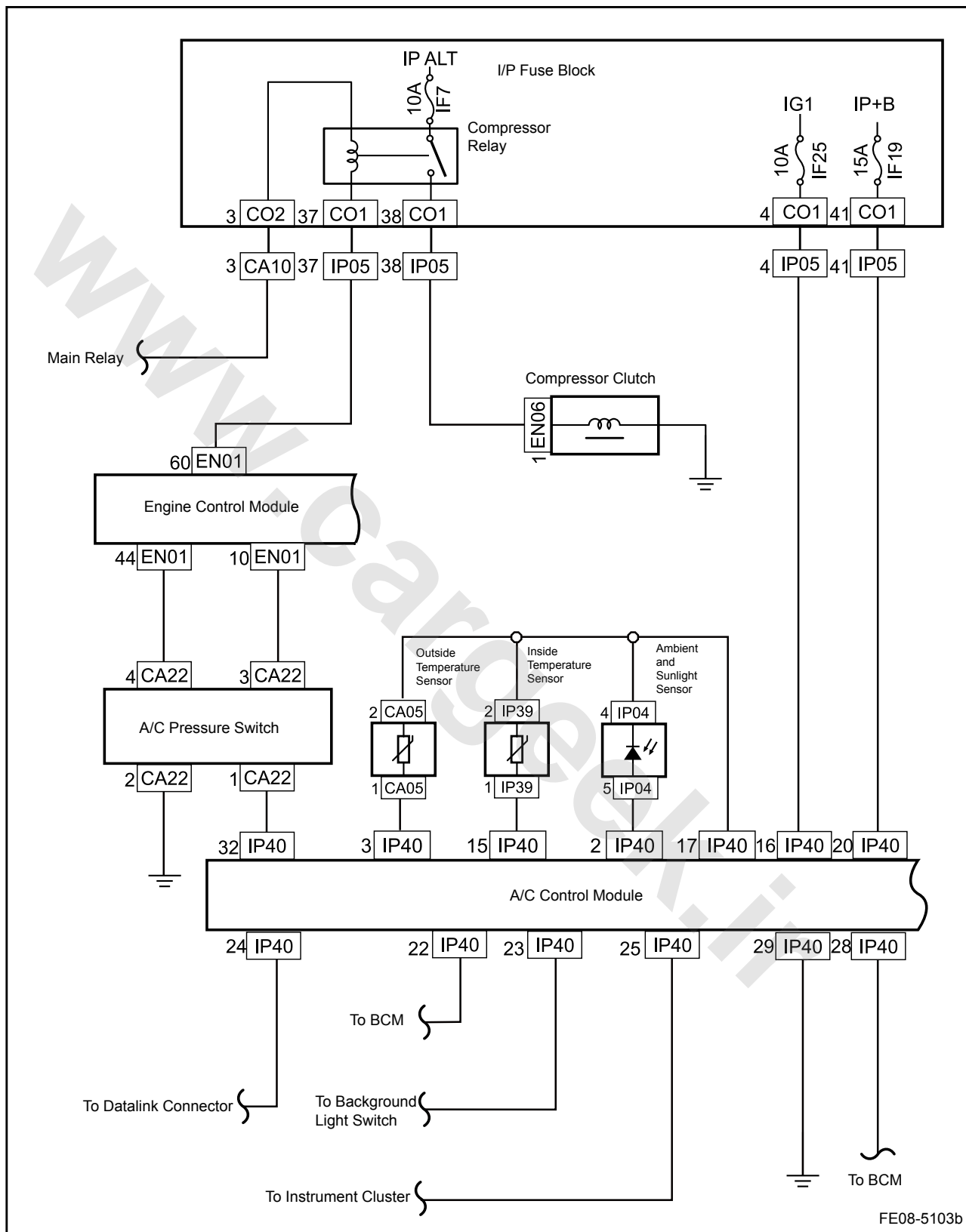
- |                                       |                                    |
|---------------------------------------|------------------------------------|
| 1. Left floor Air Duct                | 7. Instrument Panel Right Air Duct |
| 2. Air-conditioning Control Panel     | 8. Outside Circulation Inlet       |
| 3. Inside Temperature Sensor          | 9. Air-conditioning Assembly       |
| 4. Instrument Panel Left Air Duct     | 10. Right floor Air Duct           |
| 5. Instrument Panel Center Air Duct   |                                    |
| 6. Ambient Light and Sun Light Sensor |                                    |

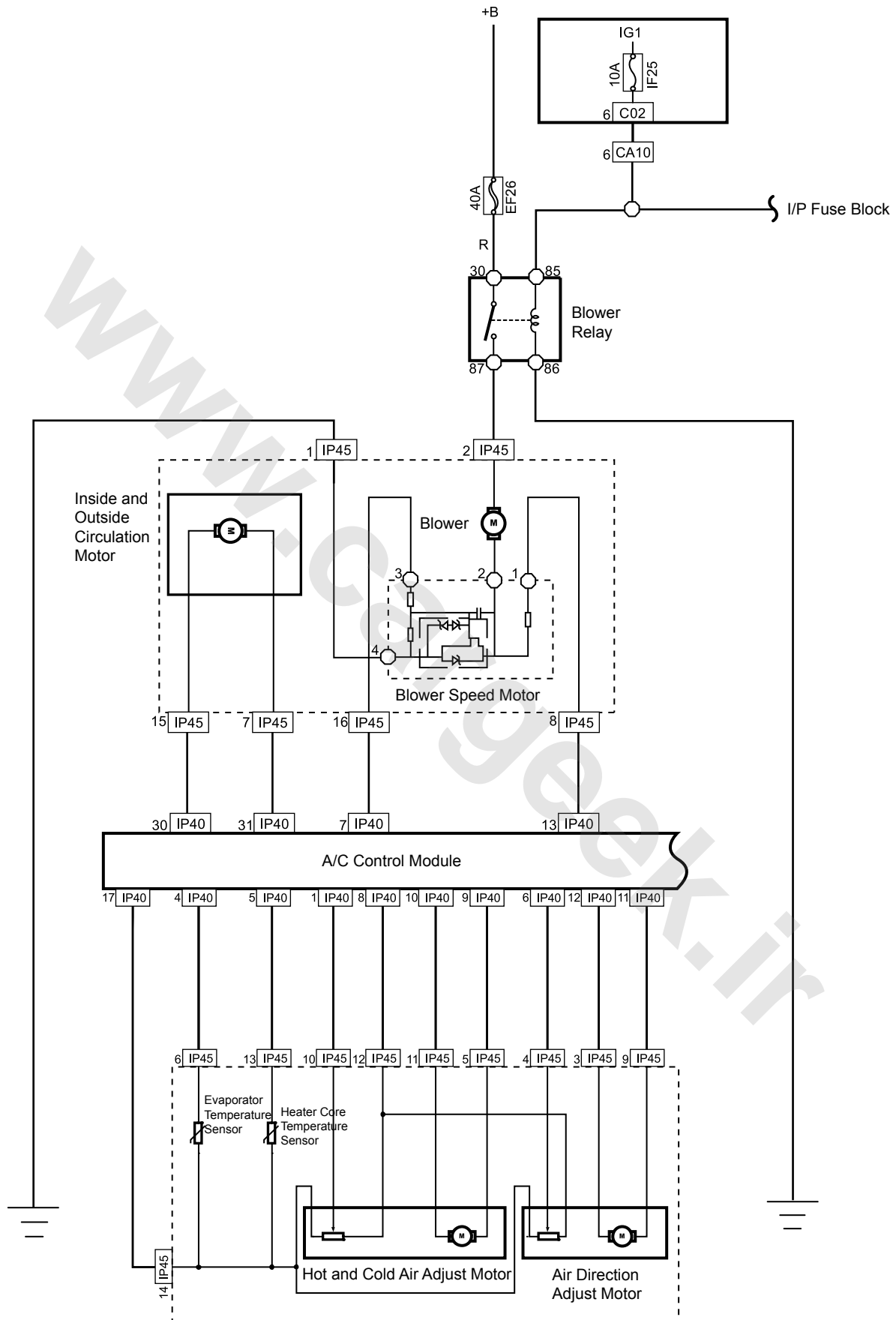
## 8.2.6 Schematic

## 8.2.6.1 Air-conditioning Control System Schematic



### 8.2.6.2 Air-conditioning System Circuit Schematic





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## 8.2.7 Diagnostic Information and Procedures

### 8.2.7.1 Diagnosis Description

Refer to [8.2.2 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct troubleshooting steps, more importantly, it would also help to determine whether the customer described the situation is normal.

### 8.2.7.2 Visual Inspection

- Check installed aftermarket equipments that may affect the air-conditioning system performance.
- Check easy to access air-conditioning system components and circuits, to identify whether there is significant damage or potential fault.
- Check easy to access air-conditioning system pipelines, to identify whether there is a leakage.

### 8.2.7.3 Air-conditioning Control Module Terminal List

# A/C Control Module Connector IP40

	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

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#### Comments

1. UB IS the battery voltage.
2. If there is no instruction, GND is 0 V or close to 0 V.

Terminal ID	Terminal Definition	Wire Color	Terminal Status	Specified Conditions (Voltage, Current, Waveform)
1	Warm and Cold Motor Feedback	0.3 G/Y	Input	GND-5V DC Signal

Terminal ID	Terminal Definition	Wire Color	Terminal Status	Specified Conditions (Voltage, Current, Waveform)
2	Sunshine Value	0.3 W/L	Input	GND-5V DC Signal
3	Outside Temperature	0.3 P/L	Input	GND-5V DC Signal
4	Evaporator Temperature	0.3 W/R	Input	GND-5V DC Signal
5	Heater Core Temperature	0.3 Y/L	Input	GND-5V DC Signal
6	Air Mode Motor Feedback	0.3 G/R	Input	GND-5V DC Signal
7	Blower Control	0.5 L/B	Output	GND-5V PWM Signal
8	5V Voltage	0.3 L/W	Output	5V DC Signal
9	Heating and Cooling Motor - Hot	0.5B / P	Output	GND or UB
10	Heating and Cooling Motor - Cold	0.5 B/G	Output	GND or UB
11	Mode Motor - Face Mode	0.5 B/W	Output	GND or UB
12	Mode Motor - Defrost	0.5 B/Y	Output	GND or UB
13	Blower Feedback	0.5 B/R	Input	GND-UB DC Signal
14	Spare 6	-	-	-
15	Inside Temperature	0.3 W/G	Input	GND-5V DC Signal
16	IG1	0.5 R/O	Power	UB
17	Ground	0.3 Br/G	-	GND
18	Spare 5	-	-	-
19	Spare 4	-	-	-
20	IP + B	0.85 R	Power	UB
21	Spare 3	-	-	-
22	Defrost Feedback	0.5 L	Input	GND or UB
23	Lighting Control	0.3 O/G	Input	GND-UB PWM Signal
24	Data Link Connector	0.5 Gr/P	Input / Output	K_BUS
25	Vehicle Speed Signal	0.3 G	Input	Frequency Signal
26	Spare 2	-	-	-
27	Spare 1	-	-	-
28	Defrost ON / OFF	0.3 L	Output	GND or UB
29	Ground	0.85 B	Power	GND
30	Inside Circulation	0.5 W/L	Output	GND or UB
31	Outside Circulation	0.5 Br/L	Output	GND or UB
32	Compressor ON / OFF	0.5 P/W	Output	GND or UB

## 8.2.7.4 Data Stream List

Serial Number	Name	Data Range
1	Inside Temperature Sensor	-40°C -80°C
2	Outside Temperature Sensor	-40°C -80°C
3	Evaporator Temperature Sensor	-40°C -80°C
4	Heater Temperature Sensor	-40°C -80°C
5	Ambient and Sun Light Sensor	0-1,250 W
6	Temperature Adjust Motor	0% -100%
7	Air Direction Adjust Motor	0% -100%
8	Inside and Outside Circulation Motor	Inside / Outside
9	Background Light Adjustment	PWM Signal, 0% -100%
10	Compressor Control	On / Off
11	Rear Defrosting Control	On / Off
12	Vehicle Speed Signal	0-255 km/h
13	Blower Voltage	0-16.5 V
14	Battery Voltage	0-18.5 V

## 8.2.7.5 DTC Code Table

Serial Number	Content	Possible Reasons
1	Inside temperature sensor circuit open or short to power supply or ground	1. Inside Temperature Sensor Malfunction 2. Harness Malfunction 3. Control Module Malfunction
2	Outside temperature sensor circuit open or short to power supply or ground	1. Outside Temperature Sensor Malfunction 2. Harness Malfunction 3. Engine Temperature Abnormal 4. Control Module Malfunction
3	Evaporator temperature sensor circuit open or short to power supply or ground	1. Evaporator Temperature Sensor Malfunction 2. Evaporator temperature sensor is not installed correctly 3. Harness Malfunction 4. Control Module Malfunction

Serial Number	Content	Possible Reasons
4	Heater temperature sensor circuit open or short to power supply or ground	<ol style="list-style-type: none"> <li>1. Heater Temperature Sensor Malfunction</li> <li>2. Heater temperature sensor is not installed correctly</li> <li>3. Harness Malfunction</li> <li>4. Control Module Malfunction</li> </ol>
5	Ambient and sun light sensor circuit open or short to power supply or ground	<ol style="list-style-type: none"> <li>1. Ambient and Sun Light Sensor Malfunction</li> <li>2. Harness Malfunction</li> <li>3. Control Module Malfunction</li> </ol>
6	Temperature control motor circuit open or short to power supply or ground	<ol style="list-style-type: none"> <li>1. Temperature Control Motor Malfunction</li> <li>2. Throttle Control System Malfunction</li> <li>3. Harness Malfunction</li> <li>4. Control Module Malfunction</li> </ol>
7	Mode motor circuit open or short to power supply or ground	<ol style="list-style-type: none"> <li>1. Mode Motor Malfunction</li> <li>2. Throttle Control System Malfunction</li> <li>3. Harness Malfunction</li> <li>4. Control Module Malfunction</li> </ol>
8	Inside and outside circulation motor locked or other obstruction	<ol style="list-style-type: none"> <li>1. Inside and Outside Circulation Motor Malfunction</li> <li>2. Inside and Outside Circulation Air Duct Malfunction</li> <li>3. Harness Malfunction</li> <li>4. Control Module Malfunction</li> </ol>
9	Blower circuit open or short to power supply or ground, or speed adjust module abnormal	<ol style="list-style-type: none"> <li>1. Blower Speed Control Module Malfunction</li> <li>2. Blower Malfunction</li> <li>3. Harness Malfunction</li> <li>4. Control Module Malfunction</li> </ol>
10	System voltage is too high or too low	<ol style="list-style-type: none"> <li>1. Generator Malfunction</li> <li>2. Control Module Malfunction</li> </ol>

#### 8.2.7.6 Air-conditioning Clutch Inoperative

Schematic:

Refer to [8.2.6.2 Air-conditioning System Circuit Schematic](#).

Diagnostic Steps:

Step 1	Check the air-conditioning system related DTC code.
--------	---

- (a) Connect scan tool, read air-conditioning system related to DTC codes.

(b) Repair the fault indicated by the DTC.

(c) Clear DTC.

Is air-conditioning clutch working properly?

Yes

System normal

No

Step 2 Repair according to the fault symptom table.

(a) Repair as the following fault symptom table.

Symptoms	Suspected Faulty Components	Repair Procedure
Engine Coolant Temperature Too Low	<ol style="list-style-type: none"> <li>ECT sensor malfunction.</li> <li>ECT sensor wiring harness malfunction.</li> <li>Engine cooling system work in the big loop.</li> <li>ECM malfunction.</li> </ol>	<ol style="list-style-type: none"> <li>Repair the ECT harness.</li> <li>Replace the ECT.</li> <li>Replace the thermostat.</li> <li>Repair the ECM, if necessary, replace it.</li> </ol>
Air Pressure Switch Signal Abnormal	<ol style="list-style-type: none"> <li>Pressure switch indicates the air pressure signal not comply with the Standard Value:.</li> <li>Pressure switch wiring harness malfunction.</li> <li>ECM malfunction.</li> </ol>	<ol style="list-style-type: none"> <li>Repair the pressure switch wiring harness.</li> <li>Repair the pressure switch.</li> <li>Repair the ECM, if necessary, replace it.</li> </ol>

Symptoms	Suspected Faulty Components	Repair Procedure
Outside Temperature Sensor Signal Abnormal	<ol style="list-style-type: none"> <li>1. Outside temperature sensor indicates that the temperature below 4°C.</li> <li>2. Outside temperature sensor wiring harness malfunction.</li> <li>3. Air-conditioning control module malfunction.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair the outside temperature sensor wiring harness.</li> <li>2. Repair the outside temperature sensor.</li> <li>3. Repair the air-conditioning control module, if necessary, replace it.</li> </ol>
Evaporator Temperature Sensor Signal Abnormal	<ol style="list-style-type: none"> <li>1. Evaporator temperature sensor indicates that the temperature is below 2°C (35.6 °F).</li> <li>2. Evaporator temperature sensor wiring harness malfunction.</li> <li>3. Air-conditioning control module malfunction.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the evaporator outside temperature sensor wiring harness.</li> <li>2. Replace the evaporator temperature sensor.</li> <li>3. Repair the air-conditioning control module, if necessary, replace it.</li> </ol>

Symptoms	Suspected Faulty Components	Repair Procedure
Refrigerant Pressures Abnormal	<ol style="list-style-type: none"> <li>1. Air-conditioning high pressure over 3.14 MPa (455.4 psi).</li> <li>2. Air-conditioning low pressure lower than 0.196 MPa (28.4 psi).</li> </ol>	<ol style="list-style-type: none"> <li>1. Discharge the excessive emission of refrigerant.</li> <li>2. Repair the vehicle cooling malfunction.</li> <li>3. Repair the engine malfunction.</li> <li>4. Repair the air-conditioning systems blockage.</li> <li>5. Repair the air-conditioning systems leakage.</li> </ol>

(b) Confirm the repair completed.

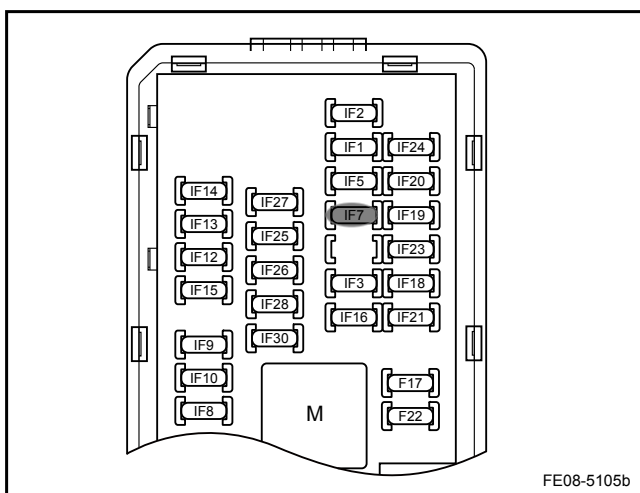
Is the air-conditioning clutch working properly?

Yes

System normal

No

Step 3 Check the compressor fuse.



(a) Check the compressor fuse IF7.

Fuse Rating: 10 A

Is the fuse blown?

No

Go to step 5

Yes

Step 4 Repair the compressor clutch power supply circuit.

- (a) Repair compressor clutch power supply circuit short to ground.

Is the air-conditioning clutch working properly?

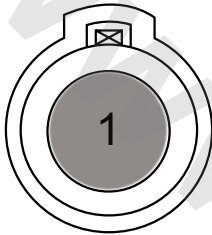
Yes

System normal

No

Step 5 Measure the compressor clutch power supply voltage.

Compressor Harness Connector EN06



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- (a) Start the engine, press the air-conditioning control switch (A / C switch), and measure the compressor clutch terminal EN06-1 voltage.

Standard Voltage: 11-14 V

Is the voltage specified value?

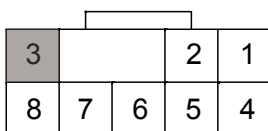
Yes

Replace the compressor clutch.

No

Step 6 Measure the I/P fuse block terminal C02-3 voltage.

I/P Fuse Block Harness Connector C02



FE08-5112b

- (a) Measure the I/P fuse block terminal C02-3 voltage.

Standard Voltage: 11-14 V

Is the voltage specified value?

No

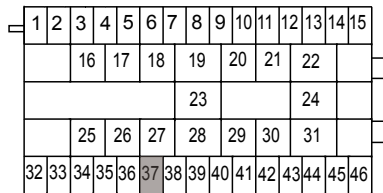
Repair the main relay circuit malfunction.  
Refer to [2.2.7.37 DTC P0560 P0562 P0563](#).

Yes

Step 7 Test the I/P fuse block terminal C01-37 working conditions.



## I/P Fuse Block Harness Connector C01

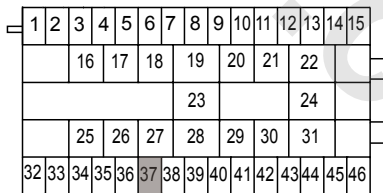


FE08-5111b

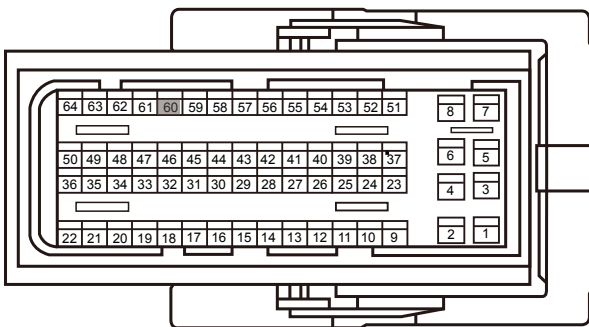
Yes

Step 8 Test the ECM terminal EN01-60 working status.

## I/P Fuse Block Harness Connector C01



## Engine Control Module Harness Connector EN01



FE08-5108b

Yes

Step 9 Check the ECM circuit.

- Start the engine.
- Connect one end of a test lamp to the battery negative terminal, the other to the I/P fuse block terminal C01-37.

Is the test lamp lit?

No

Replace the I/P fuse block.

- Start the engine.
- Connect one end of a test lamp to the battery negative terminal, the other to ECM connector EN01-60.

Is the test lamp lit?

No

Repair the open circuit between ECM terminal EN01-60 and the I/P fuse block terminal C01-37.

- Check the ECM power supply circuit and ground circuit.
- Confirm that ECM power supply circuit and ground circuit are normal.

Is the air-conditioning clutch working properly?

Yes

System normal

No

Step 10 Replace the ECM.

- (a) Replace the ECM. Refer to [2.2.8.8 Engine Control Module Replacement](#).

Is the air-conditioning clutch working properly?

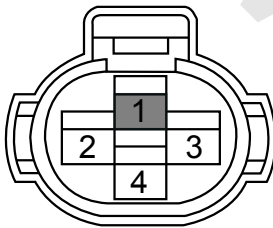
Yes

System normal

No

Step 11 Test the air pressure switch terminals CA22-1 working status.

A/C Pressure Switch Harness Connector CA22



FE08-5107b

- (a) Start the engine, press the air-conditioning control switch (A / C switch).

- (b) Connect one end of a test lamp to the battery positive terminal, the other to the air pressure switch terminal CA22-1.

Is the test lamp lit?

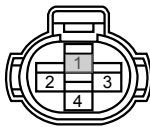
Yes

Replace the of air-conditioning pressure switch.

No

Step 12 Test the air-conditioning control module terminal IP40-32 working status.

A/C Pressure Switch Harness Connector CA22



A/C Control Module Harness Connector IP40

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE08-5109b

- (a) Start the engine, press the air-conditioning control switch (A / C switch).

- (b) Connect one end of a test lamp to the battery positive terminal, the other to the air control module terminal IP40-32.

Is the test lamp lit?

Yes

Repair the open circuit between air-conditioning control module terminal IP40-32 and air-conditioning Pressure Switch Terminal CA22-1.

No

Step 13 Check the air-conditioning control module circuit.

- (a) Check the air-conditioning control module power supply circuit and ground circuit.
- (b) Confirm that the air-conditioning control module power supply circuit and ground circuit are normal.

Is air-conditioning clutch working properly?

Yes

System normal

No

Step 14 Replace the air-conditioning control module.

- (a) Replace the air-conditioning control module. Refer to [8.2.8.1 Air-conditioning Control Panel Replacement](#).

Confirm the repair completed.

Next

Step 15 System normal.

### 8.2.7.7 Air-conditioning Blower Inoperative

Schematic:

Refer to [8.2.6.2 Air-conditioning System Circuit Schematic](#)

Diagnostic Steps:

Step 1 Check air-conditioning system failure codes DTC.

- (a) Connect scan tool, read air-conditioning system related to DTC codes.
- (b) Clear DTC.

Is blower working properly?

Yes

System normal

No

Step 2 Check blower relay L.

- (a) Repair according to the fault symptom table.

Symptoms	Suspected Faulty Components	Repair Procedure
Blower relay terminal No. 30 has no battery voltage	1. Fuse EF26 (40A) Blown 2. Harness Malfunction	1. Repair the harness. 2. Replace the fuse EF26.

Symptoms	Suspected Faulty Components	Repair Procedure
Blower relay terminal No.85 has no battery voltage	1. Fuse IF25 (10 A) Blown 2. Harness Malfunction	1. Repair the harness. 2. Replace the fuse IF25.
Blower assembly IP45-2 has no battery voltage	1. Blower Relay Malfunction 2. Harness Malfunction	1. Replace the blower relay. 2. Repair the harness.
Blower relay terminal No.86 poor connection to ground	1. Harness Malfunction 2. Ground G3 Malfunction	1. Repair the harness. 2. Repair ground G3 poor connection.
Blower relay terminal No. 86 and No. 85 between the resistance does not meet the standard	Blower relay Malfunction.	Replace the blower relay.

(b) Confirm the repair completed.

Is blower working properly

Yes	System normal
-----	---------------

No

Step 3	Check the air-conditioning control module terminal IP40-7 voltage.
--------	--

A/C Control Module Harness Connector IP40

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE08-5113b

- Start the engine.
- Adjust the air-conditioning air flow knob on the control panel.
- Measure air-conditioning control module terminal IP40-7 voltage with a multimeter.
- Each air flow speed voltage standard values are as shown.

Air Low	Blower	Blower Terminal Voltage
0	0	0
1	1	$4.4 \pm 0.3$
2	2	$5.1 \pm 0.3$
3	3	$6.7 \pm 0.3$
4	4	$8.2 \pm 0.3$

5	5	$9.9 \pm 0.3$
6	6	$11.7 \pm 0.3$
7	7	$13.1 \pm 0.3$

Are the voltages specified values?

Yes

System normal

No

Step 4 Check the air-conditioning control module circuit.

- (a) Check the air-conditioning control module power supply circuit and ground circuit.
- (b) Confirm that the air-conditioning control module power supply circuit and ground circuit are normal.

Is the blower working properly?

Yes

System normal

No

Step 5 Replace the air-conditioning control module.

- (a) Replace the air-conditioning control module. Refer to [8.2.8.1 Air-conditioning Control Panel Replacement](#).

Is the blower working properly?

Yes

System normal

No

Step 6 Measure the blower assembly plug terminal IP45-16 voltage.

A/C Actuator Harness Connector IP45

1	3	4	5		6	7	8	2
	9	10	11	12	13	14	15	16

A/C Control Module Harness Connector IP40

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE08-5110b

- (a) Start the engine.
- (b) Adjust the air-conditioning air flow knob on the control panel.
- (c) Measure the blower assembly plug terminal IP45-16 voltage with a multimeter.

Voltage Standard Value: 4.1-13.4 V

Is the terminal IP45-16 voltage specified value?

Yes

Repair the open circuit between air-conditioning control module terminal IP40-7 and the blower plug terminal IP45-16 assembly.

No

Step 7 Replace the blower speed control module.

- (a) Replace the blower speed control module. Refer to [8.2.8.8 Blower Speed Control Module Replacement](#).

Is the blower working properly?

Yes

System normal

No

Step 8 Repair the blower according to the fault symptom table.

- (a) Repair the blower according to the fault symptom table as following.

Symptoms	Suspected Malfunction Components	Repair Procedure
Blower catching	1. Blower fan blade has foreign matter. 2. Blower fan blade damaged. 3. Blower motor has foreign matter, catching.	1. Clean the blower fan blade foreign matter. 2. Clean the blower fan blade foreign matter. 3. Replace the blower motor assembly, including fan blade.
Blower motor inoperative	Blower motor damaged	Replace the blower motor assembly, including fan blade.

- (b) Make sure the blower is working correctly.  
Confirm the repair completed.

Next

Step 9 System normal.

## 8.2.7.8 Insufficient Cooling

Malfunction Symptom Table

Symptoms	Suspected Malfunction Components	Repair Procedure
Engine coolant temperature is too high	<ol style="list-style-type: none"> <li>1. Engine runs at idle for too long.</li> <li>2. Engine runs with heavy load for too long.</li> <li>3. Lack of engine coolant</li> <li>4. Engine coolant performance does not meet the requirements</li> <li>5. Thermostat Malfunction</li> <li>6. Engine Malfunction</li> <li>7. Cooling fan is running exception</li> <li>8. Cooling fan does not work properly</li> <li>9. Radiator Malfunction</li> <li>10. Cooling fan cover is damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduce the engine idle running time.</li> <li>2. Reduce the engine running time under heavy load.</li> <li>3. Inspect for engine coolant leakage, add the engine coolant to the standard amount.</li> <li>4. Replace the engine coolant with coolant comply with Geely requirements.</li> <li>5. Replace the thermostat.</li> <li>6. Inspect the engine cooling system.</li> <li>7. Inspect the engine working condition.</li> <li>8. Inspect the cooling fan motor and its circuit, if necessary, replace it.</li> <li>9. Clean the coolant reservoir.</li> <li>10. Inspect the coolant reservoir, if necessary, replace it.</li> <li>11. Inspect the cooling fan cover, if necessary, replace it.</li> </ol>
Condenser temperature is too high	<ol style="list-style-type: none"> <li>1. Poor condenser radiation</li> <li>2. The engine coolant temperature is too high.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean the condenser.</li> <li>2. Inspect the condenser, if necessary, replace it.</li> <li>3. Repair according to "the engine coolant temperature is too high," symptom in this table.</li> </ol>
Compressor Operation Abnormal	<ol style="list-style-type: none"> <li>1. Compressor belt slipping</li> <li>2. Compressor clutch slipping</li> <li>3. Compressor abnormal sound</li> <li>4. Frequent compressor start</li> <li>5. Compressor inoperative</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the compressor belt, if necessary, replace it.</li> <li>2. Inspect the compressor clutch, if necessary, replace it.</li> <li>3. Check refrigerant, lubricant quantity. Refer to "air-conditioning system pressure abnormal" symptom in this table.</li> <li>4. Inspect the compressor clutch circuit.</li> <li>5. Inspect the compressor, if necessary, replace it.</li> <li>6. Inspect the air-conditioning pressure switch, if necessary, replace it.</li> <li>7. Inspect the air-conditioning control module, if necessary, replace it.</li> <li>8. Inspect the engine control module, if necessary, replace it.</li> </ol>

Symptoms	Suspected Malfunction Components	Repair Procedure
Instrument Air Duct Air Flow Too Small	<ol style="list-style-type: none"> <li>Instrument air duct blocked</li> <li>Instrument air duct leakage</li> <li>Air direction control mechanism abnormal</li> <li>Air direction control motor abnormal</li> <li>Blower speed too low</li> <li>Blower Speed Control Module abnormal</li> <li>Air-conditioning pipes frozen</li> <li>Air-conditioning control module abnormal</li> </ol>	<ol style="list-style-type: none"> <li>Clean the instrument air duct, if necessary, replace it.</li> <li>Inspect the Instrument air duct, if necessary, replace it.</li> <li>Inspect the air direction control mechanism</li> <li>Inspect the air direction control motor.</li> <li>Inspect the circuits.</li> <li>Repair the blower motor, if necessary, replace it.</li> <li>Replace the blower speed control module.</li> <li>Replace the old refrigerant with the refrigerant comply with Geely standard.</li> <li>Replace the expansion valve.</li> <li>Inspect the air-conditioning control module circuits, if necessary, replace the module.</li> </ol>
Instrument air duct air temperature is too high	<ol style="list-style-type: none"> <li>Switched to the outside circulation</li> <li>The ambient temperature is too high</li> <li>Outside circulation valve catching or not closed</li> <li>Inside circulation motor malfunction</li> <li>Temperature control mechanism abnormal</li> <li>Temperature control motor abnormal</li> <li>Ambient and sun light temperature sensor abnormal</li> <li>Air-conditioning control module abnormal</li> </ol>	<ol style="list-style-type: none"> <li>Switch to the inside circulation.</li> <li>Move the vehicle to a cool place.</li> <li>Adjust the outside circulation valve, if necessary, replace it.</li> <li>Replace the inside and outside circulation regulation motor.</li> <li>Inspect the temperature control motor, if necessary, replace it.</li> <li>Inspect the ambient and sun light temperature sensor, if necessary, replace it.</li> <li>Inspect the air-conditioning control module circuits, if necessary, replace it.</li> </ol>
Air-conditioning high pressure too high, low pressure too high	<ol style="list-style-type: none"> <li>Air entering the cooling system</li> <li>Refrigerant overfill</li> <li>Refrigerant lubricant overfill</li> <li>Expansion valve opening too wide</li> </ol>	<ol style="list-style-type: none"> <li>Inspect the cooling system ducts airtight, re-fill refrigerant.</li> <li>Excessive discharge refrigerant.</li> <li>Excessive discharge refrigerant lubricant.</li> <li>Replace the expansion valve.</li> </ol>
Air-conditioning high pressure too high, low pressure too low	<ol style="list-style-type: none"> <li>High-pressure pipe before the expansion valve blocked</li> <li>Expansion valve blocked</li> <li>The expansion valve opening too small</li> </ol>	<ol style="list-style-type: none"> <li>Clean or replace the blocked high pressure pipes.</li> <li>Replace the expansion valve.</li> </ol>



Symptoms	Suspected Malfunction Components	Repair Procedure
Air-conditioning high pressure too low, low pressure too high	<ol style="list-style-type: none"> <li>1. Lack of compressor oil</li> <li>2. Compressor damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Add compressor refrigerant lubricant.</li> <li>2. Replace the compressor.</li> </ol>
Air-conditioning high pressure too low, low pressure too low	<ol style="list-style-type: none"> <li>1. Insufficient refrigerant</li> <li>2. Refrigerant Leakage</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill refrigerant according to Geely standard.</li> <li>2. Inspect the air-conditioning systems leakage, replace the leaking air-conditioning system components.</li> </ol>
Air-conditioning high pressure too low, low pressure close to vacuum	<ol style="list-style-type: none"> <li>1. Seriously expansion valve blockage</li> <li>2. Expansion valve blocked by ice</li> <li>3. Evaporator temperature sensor malfunction</li> <li>4. Low pressure pipe leakage</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the expansion valve.</li> <li>2. Extend the system vacuuming time, fill air-conditioning refrigerant according to Geely standard.</li> <li>3. Replace the reservoir dryer.</li> <li>4. Replace the evaporator temperature sensor.</li> <li>5. Clean or replace blocked low pressure pipes.</li> </ol>

### 8.2.7.9 Insufficient Heating

Fault Symptom Table

Symptoms	Suspected Malfunction Components	Repair Procedure
The engine coolant temperature does not reach 82°C (180 °F)	<ol style="list-style-type: none"> <li>1. Thermostat Malfunction</li> <li>2. The engine running time is not long enough.</li> <li>3. Air entering the cooling system</li> <li>4. Poor engine working conditions.</li> </ol>	<ol style="list-style-type: none"> <li>1. Extend the engine running time.</li> <li>2. Bleed the air in the cooling system.</li> <li>3. Replace the thermostat.</li> <li>4. Inspect the engine working conditions.</li> </ol>
Warm and Cold Air Leakage	<ol style="list-style-type: none"> <li>1. Throttle body heating and cooling mechanical malfunction</li> <li>2. Warm and cold air motor malfunction</li> <li>3. Air duct leakage</li> <li>4. Air-conditioning control module malfunction</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the throttle body heating and cooling mechanism.</li> <li>2. Replace the heating and cooling regulation motor.</li> <li>3. Replace the throttle body heating and cooling mechanism.</li> <li>4. Repair the leaking air duct.</li> <li>5. Replace the leaking air duct.</li> <li>6. Replace the air-conditioning control module.</li> </ol>

Inside and Outside Circulation Valve Leakage	<ol style="list-style-type: none"> <li>1. Switch to outside circulation.</li> <li>2. Outside circulation closing valve catching or not closed.</li> <li>3. Inside and outside circulation motor malfunction</li> <li>4. Air-conditioning control module malfunction</li> </ol>	<ol style="list-style-type: none"> <li>1. Switch to the inside circulation.</li> <li>2. Adjust the outside circulation mechanism.</li> <li>3. Replace the inside and outside circulation motor.</li> <li>4. Replace the inside and outside circulation mechanism.</li> <li>5. Replace the air-conditioning control module.</li> </ol>
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### 8.2.7.10 Air-conditioning Refrigerant Recovery and Filling

Air-conditioning (A/C) system, operating efficiency and service life depend on the the cooling system chemical stability. When the cooling system is contaminated by foreign matter (such as dust, air or moisture), the pollutants will change the refrigerant and compressor oil 100 PG stability. and, also affect the relationship between pressure and temperature, reduce work efficiency, and may lead to abnormal wear of internal components corrosion. Please ensure that the system chemical stability as following:

1. Before open joints, wipe the oil around the joints, reducing the possibility of oil entering into the system.
2. Disconnect the connector, immediately using a cap, plug, or tape to seal joints at both ends to prevent oil, foreign matter and moisture entering.
3. Keep all the tools clean, dry, including the manifold pressure gage components, and all replacement parts.
4. With clean, dry delivery devices and containers to add 100 PG refrigerant oil, ensure the refrigerant oil is not affected by moisture.
5. During operation, minimize the time the air-conditioning system exposed to air.
6. Empty and fill the air-conditioning system after exposing to air. All repairs must be dried and sealed before leaving the factory. Only open the sealed parts before the upcoming installation. All parts should be at room temperature to prevent moisture condensation in the air entering into the system, and re-seal all the parts as soon as possible.

Bleed air-conditioning system, add lubricant, emptying and filling process

#### Warning!

Refer to "Breathing R-134a Warning" in "Warnings and Notices". Other relevant health and safety information can be obtained from refrigerant and lubricant manufacturers.

#### Warning!

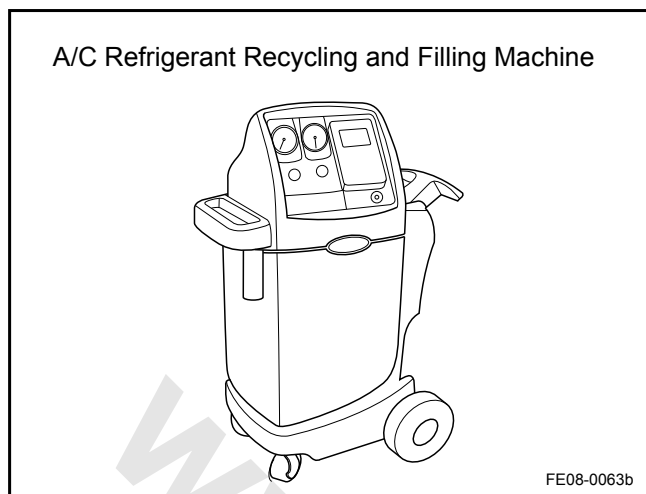
Refer to "Protective Goggles and Glove Warning" in "Warnings and Notices".

Filling air-conditioning systems, bleeding, emptying and re-filling process can be done within one connection. During the recovery and evacuation, refrigerant must be filtered in order to ensure the air-conditioning system refrigerant clean and dry.

1. Do not use R-12 filling machine for filling R-134a system. The two systems refrigerant and refrigerant oil are not compatible and must not mix, even a small amount is not allowed, mixed with residual refrigerant may damage the equipment.
2. Do not use different-diameter joints in order to ensure airtight within the system.

#### Filling Machine Installation and Maintenance

There are a lot filling machine types. All filling machines implement air-conditioning system bleeding, refrigerant recovery, system evacuation, adding refrigerant oil and cooling agent filling tasks. Refer to the filling machine manual, grasp the initial setup and maintenance procedures.



#### Control Panel Features

Filling machine operators can use control buttons and indicator light to control and monitor operations. Refer to filling machine manual, which should include the following:

1. Main Power Supply Switch: Control panel power supply.
2. Display: Programmed vacuum time and re-filling weight of the refrigerant. Refer to the manufacturer's instruction manual to understand the detailed programming information.
3. Low-pressure Side Manifold Pressure Gage: System low pressure.
4. High-pressure Side Manifold Pressure Gage: System high pressure.
5. Control Panel: It includes control of various operational functions of the control.
6. Low-pressure Side Valve: The valve is used to connect low-pressure side and air-conditioning systems filling machine.
7. Humidity Indicator: This indicator is indicative of refrigerant wet.
8. High-pressure Side Valve: The valve is used to connect high-pressure side and air-conditioning systems filling machine.

#### Refrigerant Recovery

##### Note

Only use machine specially designed for filling the refrigerant tank. Anti-overcharge filling machine body is designed for the use of such refrigerant tank and calibration. The refrigerant tank valve is manufactured specifically for the device.

1. Connect the high pressure side hose quick connector to the vehicle air-conditioning system.
2. Open the high pressure side connector valve.
3. Connect the low pressure side hose quick connector to the vehicle air-conditioning system.
4. Open the low pressure side connector valve.

##### Note

If the refrigerant runs out, immediately stop recovery operations, otherwise the air will be inhaled into the recovery tank.

5. Check the filling machine control panel high pressure and low pressure gage to ensure that air-conditioning systems are under pressure. If there is no pressure, then there is no recyclable refrigerant.
6. Open high pressure and low pressure valves.
7. Open the refrigerant air and liquid valve.

8. Empty refrigerant oil in the oil separator.
9. Close release valve.
10. Connect the filling machine to the appropriate power outlet.
11. Connect the main power switch.

**Note**

Do not mix the old refrigerant oil and the new refrigerant oil together. The old oil may have aluminum deposit or mixed with other foreign matter. Re-fill the air-conditioning system, make sure use the new refrigerant oil. Properly discard the used refrigerant oil.

**Note**

Part of the air-conditioning systems 100 PG lubricant may be recycled along with the refrigerant. Filling machine separates the lubricant and the refrigerant, it can determine the amount of recovered oil. When re-filling system, add the equivalent weight lubricant. Refer to the manufacturer's manual to learn more about filling machine.

12. Start the recycling process. Refer to the manufacturer's manual to learn more about filling machine.
13. Wait for 5 min, and then check the control panel low pressure gage. If the air-conditioning system maintains the vacuum, then the recovery is completed.

**Note**

If the control panel indicator light showing refrigerant can full in the recovery period, and the filling machine is turned off, then load an empty can, for the refrigerant storage. Do not use other types of refrigerant cans.

14. If the low pressure gage readings increase from zero, it indicates that system still has refrigerant. Recover the remaining refrigerant. Repeat this step until the system maintains a vacuum 2 min.

**Emptying**

Refrigerant tank filling machine must be equipped with sufficient amount of R-134a refrigerant for filling. Check refrigerant tank. If the cooling agent is less than 3.6 kg (8 lb), add new refrigerant to the refrigerant tank. Refer to filling machine instruction manual to find ways to add refrigerant.

1. Check whether high pressure and low pressure hoses are connected to the air-conditioning system, open the filling machine Control Panel high pressure and low pressure valves.
2. Open the refrigerant tank air and liquid valves.

**Note**

Refer to the manufacturer's instruction manual to learn more about filling machine. The system must first be emptied in order to re-fill new refrigerant or regenerated refrigerant.

3. Start the vacuum pump and start emptying process. In the recycling process, the non-condensed gas (mostly air) automatically discharges from the tank. You will hear the sound of pressure relief.

**Note**

Regularly change the vacuum pump oil. Refer to the manufacturer's instruction manual to learn more about filling machine.

4. Check whether the system leaks. Refer to the manufacturer's instruction manual to learn more about filling machine.

**Air-conditioning System Lubricant Filling**

Add lubrication oil, as the oil is discharged during the air-conditioning system recovery.

1. Use lubricant with a scale of bottled 100 PG exclusively for R-134a system.

2. Refer to the manufacturer's instruction manual to learn more about filling machine. add the appropriate amount 100 PG lubricant to the system.
3. When the fuel injection meet the requirement, close the valve.

#### Note

Remember to tighten the oil cap to prevent moisture or contaminants entering. This operation requires air-conditioning systems to have a certain degree of vacuum. Do not open filling valve when the air-conditioning system has a positive pressure, otherwise it will lead to oil flow back to the Oil Bottle. When filling or adding lubricant, the oil level can not be lower than the oil-absorbing tube, otherwise air will enter the air-conditioning system.

#### Filling

##### Note

Empty before filling the air-conditioning system.

1. Close the Control Panel low pressure valve.
2. Close the Control Panel high pressure valve.
3. Refer to the manufacturer's instruction manual to learn more about filling machine.
4. Fill the air-conditioning refrigerant with necessary amount to ensure that the correct units measurement (i.e. kilograms or pounds).
5. Start Filling.

#### Refrigerant filling successfully completed

1. Close filling machine control panel high pressure and low pressure valves. two valves should be closed.
2. Start the vehicle and turn on the air-conditioning system.
3. Keep the engine running, until the high pressure and low pressure gage pressure readings are stable.
4. Compare the reading with the system specifications.
5. Check the evaporator outlet temperature to ensure that air-conditioning system operating system specifications.
6. Keep the air-conditioning running.
7. Close high pressure quick connector valve.
8. Disconnect the high pressure hose from the vehicle.
9. On the control panel, open high pressure and low pressure valves. The system will quickly inhale refrigerant through the low pressure hose.
10. Disconnect the low pressure quick connector valves.
11. Disconnect the low pressure hose from the vehicle.

#### Refrigerant filling unsuccessful

Sometimes refrigerant entering the air-conditioning system does not meet the total filling volume. There are two reasons for this situation:

1. Filling machine pressure and the air-conditioning refrigerant pressure is similar. It will lead to filling too slowly. Refer to the manufacturer's instruction manual to learn more about filling machine.
2. There is not enough refrigerant in refrigerant tank for filling. In this regard, recover the refrigerant from the vehicle, and then empty the air-conditioning system, add refrigerant to refrigerant tank, then finally re-fill. Refer to the manufacturer's instruction manual to learn more about filling machine instructions.

## 8.2.8 Removal and Installation

### 8.2.8.1 Air-conditioning Control Panel Replacement

#### Removal Procedure

#### Warning!

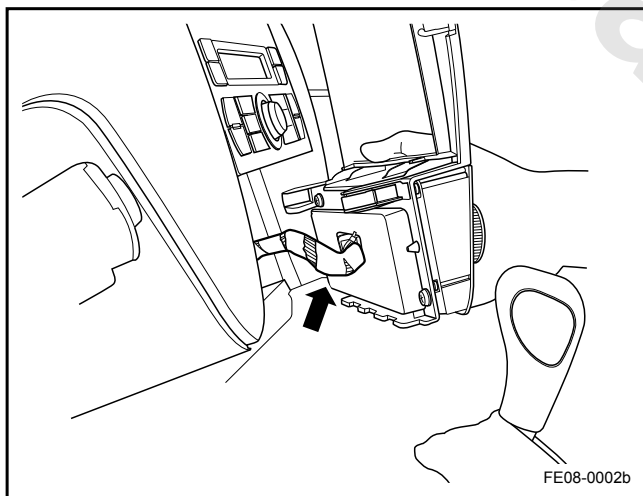
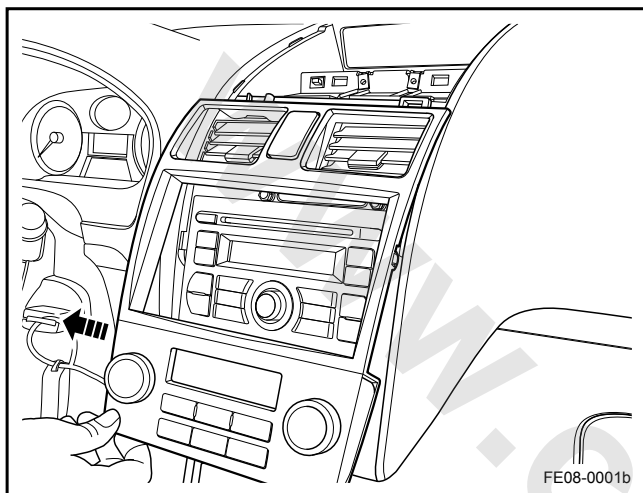
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

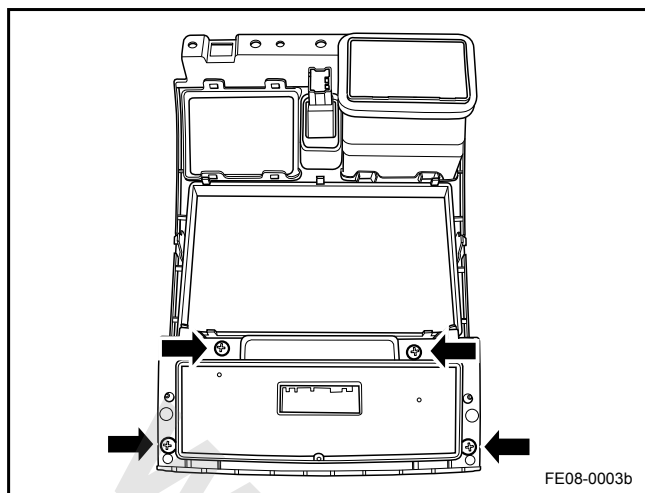
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).

#### Note

Please use special tools to remove interior panels, otherwise panels will be easily scratched.

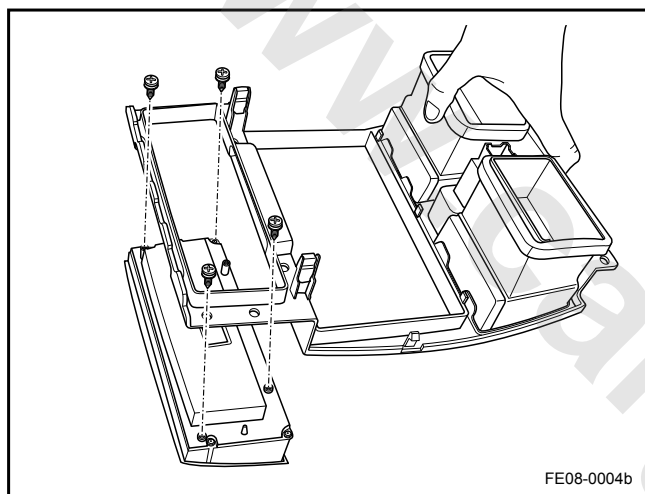
2. Remove the instrument cluster. Refer to [11.15.8.1 Instrument Cluster Replacement](#).
3. Remove the instrument cluster center air duct (the air-conditioning control module is retained on the center air duct panel). Refer to [8.2.8.11 Instrument Panel Air Duct Replacement](#).
4. Disconnect the air-conditioning control module harness connector from the back of the center air duct panel.



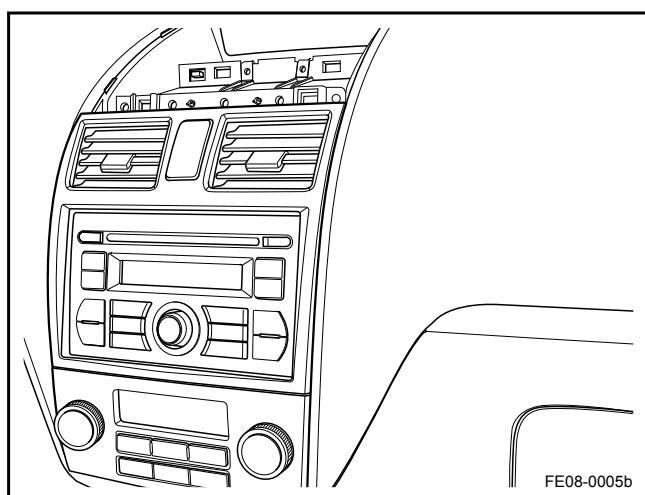


5. Remove the air-conditioning control module retaining screw from the center air duct panel and remove the air-conditioning control module.

#### Installation Procedure:



1. Install the air-conditioning control module and tighten the air-conditioning control module to the center air duct panel retaining screw.



2. Connect the air-conditioning control module harness connector on the back of the center air duct panel..
3. Install the center air duct panel.
4. Install the instrument cluster.



### 8.2.8.2 Air-conditioning Pipe Replacement

#### Cooling Pipe Replacement

##### Removal Procedure

##### Warning!

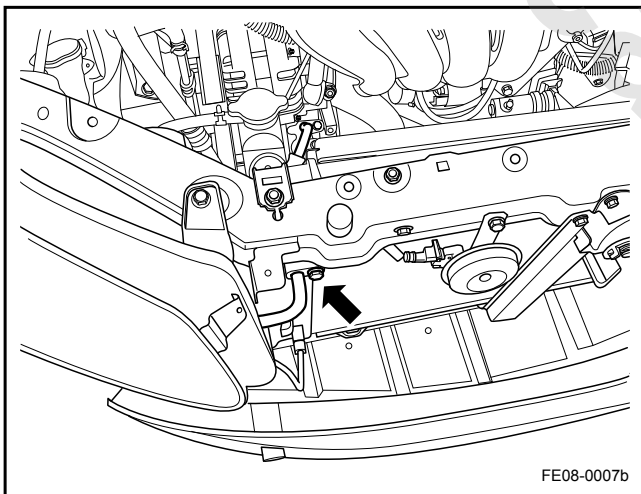
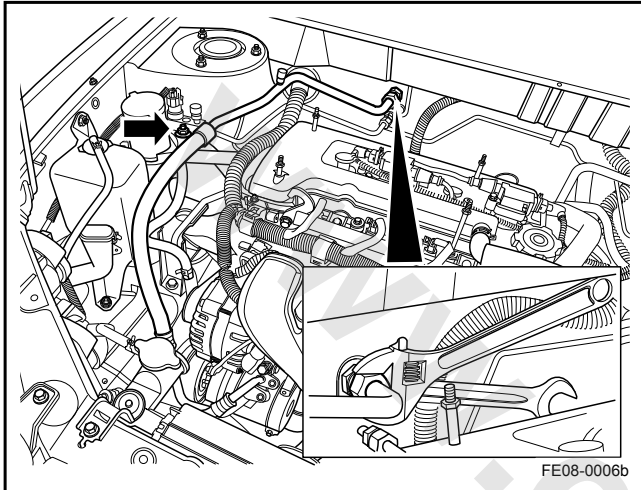
Refer to "Breathing R-134a Warning" in "Warnings and Notices".

1. Carry out the air-conditioning refrigerant recovery procedure. Refer to [8.2.7.10 Air-conditioning Refrigerant Recovery and Filling](#).
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Remove the evaporator to the air-conditioning compressor low pressure pipe.

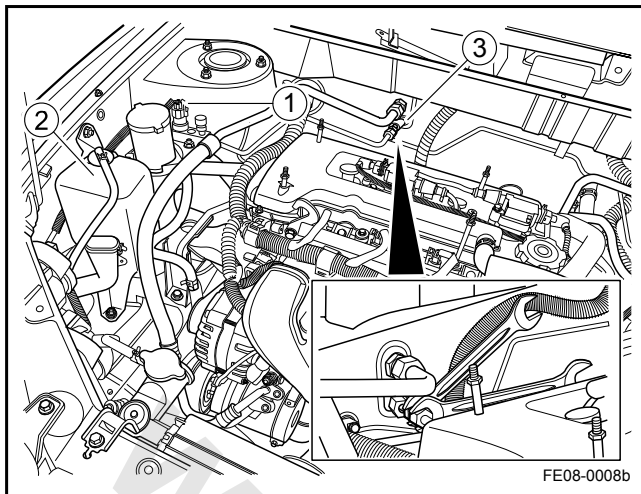
##### Note

To remove the evaporator, use two wrenches. One is to hold the evaporator side pipe to prevent damage to pipes.

4. Remove the front bumper. Refer to [12.4.3.1 Front Bumper Replacement](#).
5. Remove the air-conditioning compressor to the condenser high pressure pipe.





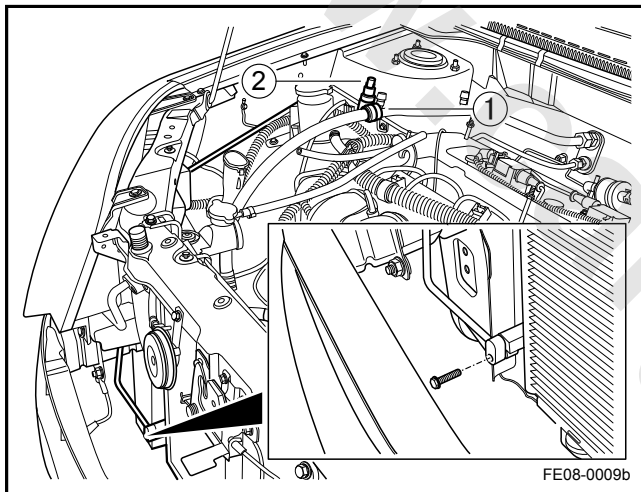


6. Disconnect the air-conditioning refrigerant pressure switch harness connector (1), remove the coolant reservoir (2), remove the evaporator to the air-conditioning compressor high pressure pipe and bracket (3).

#### Installation Procedure:

##### Note

During the installation, replace all the used O-rings.



1. Install evaporator to the air-conditioning compressor high pressure pipe and bracket (1), connect the air-conditioning refrigerant pressure switch harness connector (2), install the coolant reservoir.

Evaporator side high-pressure pipe fittings

Torque: 18 Nm (Metric) 13.3 lb-ft (US English)

Condenser side lower high pressure pipe fittings

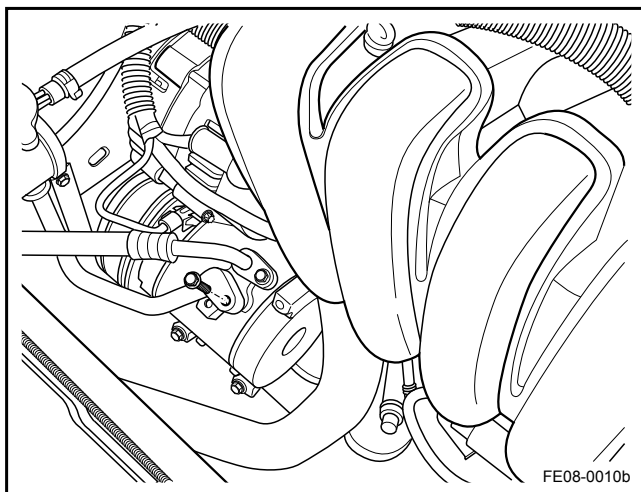
Torque: 9 Nm (Metric) 6.7 lb-ft (US English)

Air-conditioning high-pressure pipe bracket bolts

Torque: 6 Nm (Metric) 4.4 lb-ft (US English)

##### Note

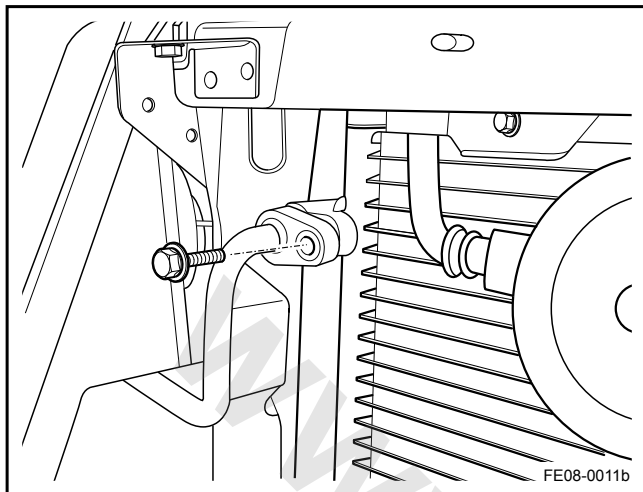
To install the air-conditioning pipes, firstly insert the pipes all the way and then tighten the retaining bolts or nuts, to prevent damage to O-rings and pipe joints.



2. Install the air-conditioning compressor to the condenser high pressure pipe.

Compressor side bolt

Torque: 11 Nm (Metric) 8.1 lb-ft (US English)



Condenser side bolt

Torque: 9 Nm (Metric) 6.7 lb-ft (US English)

3. Install the evaporator to the air-conditioning compressor low pressure pipe.

Compressor side bolt

Torque: 11 Nm (Metric) 8.1 lb-ft (US English)

Evaporator-side hard-pipe connection

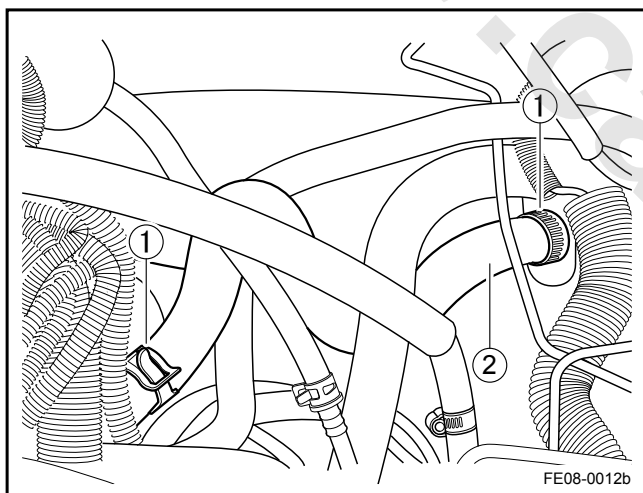
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)

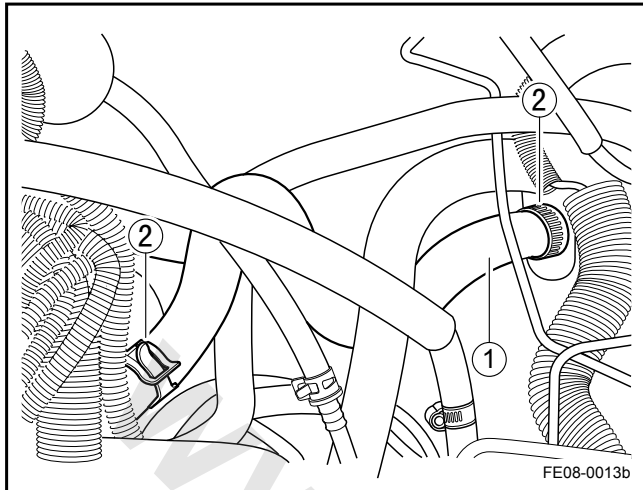
4. Carry out the air-conditioning refrigerant recovery procedure.
5. Install the front bumper.

### Warm Air Pipe Replacement

#### Removal Procedure

1. Discharge the engine coolant. Refer to [2.8.8.1 Engine Coolant Discharge and Filling](#).
2. Release the pipe retaining clamp (1) and remove the warm air pipe (2).





## Installation Procedure:

1. Install the warm air pipe (1) and tighten the retaining clamp (2).

**Note**

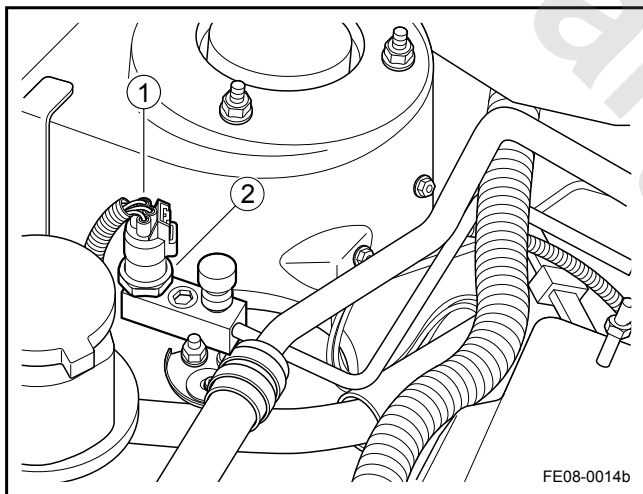
Inlet and outlet warm air pipe removal is similar.

### 8.2.8.3 Air-conditioning Pressure Switch Replacement

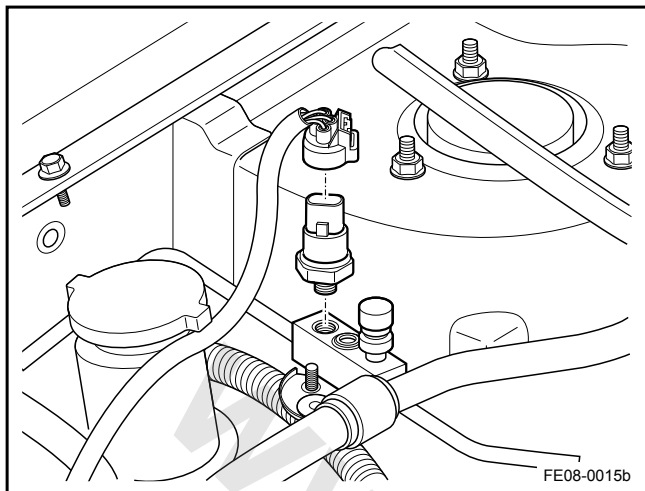
## Removal Procedure

**Warning!**

Refer to "Breathing R-134a Warning" in "Warnings and Notices".



1. Carry out the air-conditioning refrigerant recovery procedure. Refer to [8.2.7.10 Air-conditioning Refrigerant Recovery and Filling](#).
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Disconnect the air-conditioning refrigerant pressure switch harness connector (1) and remove the air-conditioning refrigerant pressure switch (2).



#### Installation Procedure:

1. Connect the air-conditioning refrigerant pressure switch (1) and connect the air-conditioning refrigerant pressure switch harness connector (2).

#### Note

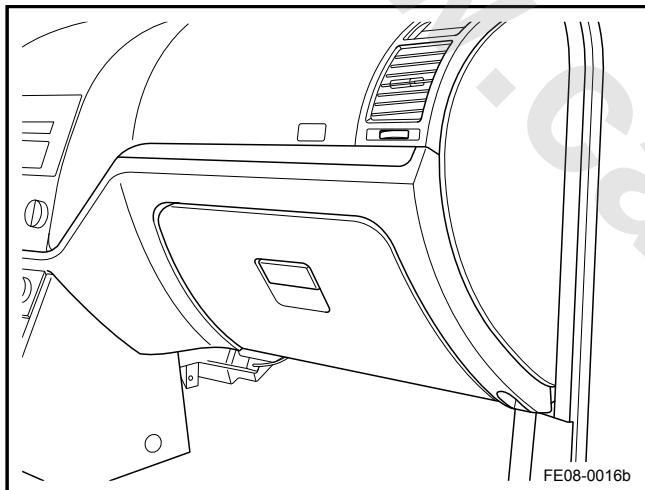
During installation, all the O-rings must be replaced.

2. Carry out air-conditioning refrigerant filling process.
3. Connect the battery negative cable.

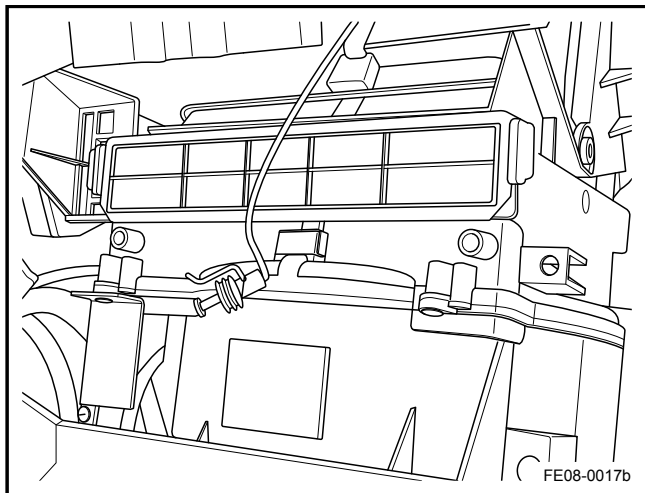
### 8.2.8.4 Air Filter Replacement

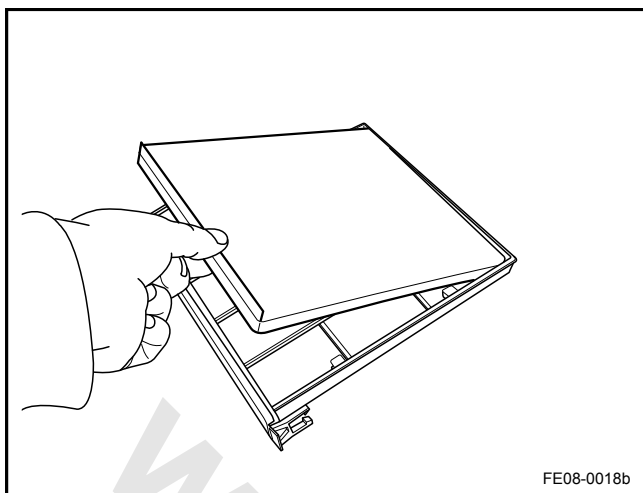
#### Removal Procedure

1. Remove the glove box. Refer to [12.8.3.2 Glove Box Replacement](#).

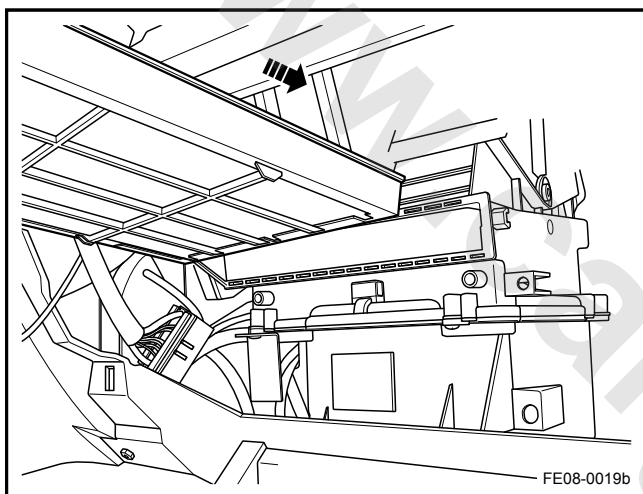


2. Pull out the air-conditioning filter housing.





3. Remove the air-conditioning filter.



#### Installation Procedure:

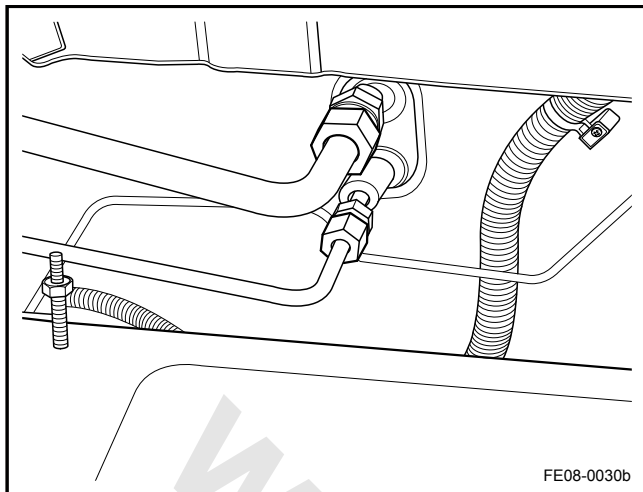
1. Install the air-conditioning filter.
2. Install the air-conditioning filter housing.
3. Install the glove box.

### 8.2.8.5 Air-conditioning Assembly Replacement

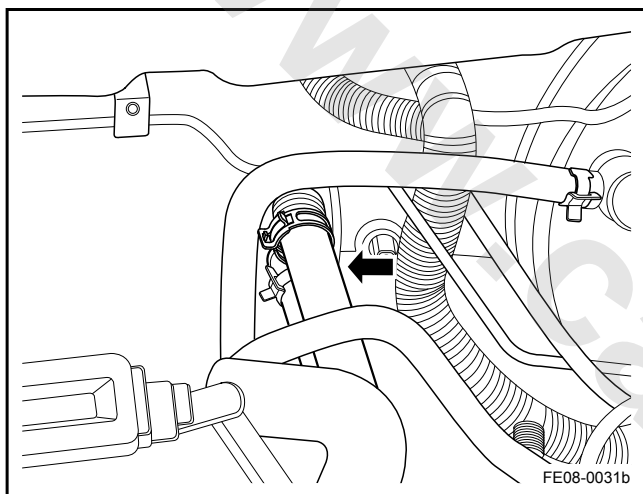
#### Removal Procedure

#### Warning!

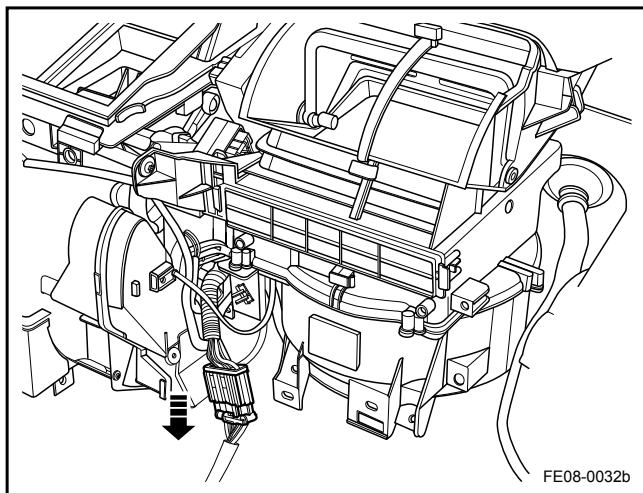
Refer to "Breathing R-134a Warning" in "Warnings and Notices".



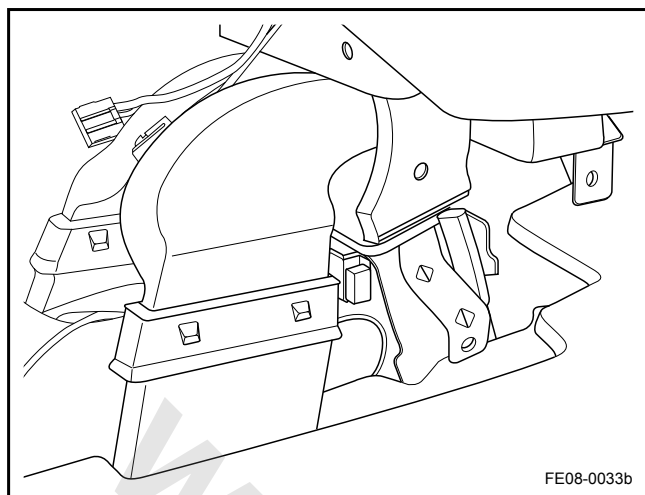
1. Carry out air-conditioning refrigerant recovery procedure. Refer to [8.2.7.10 Air-conditioning Refrigerant Recovery and Filling](#).
2. Discharge the engine coolant. Refer to [2.8.8.1 Engine Coolant Discharge and Filling](#).
3. Remove the evaporator side high and low pressure pipe connection nuts.



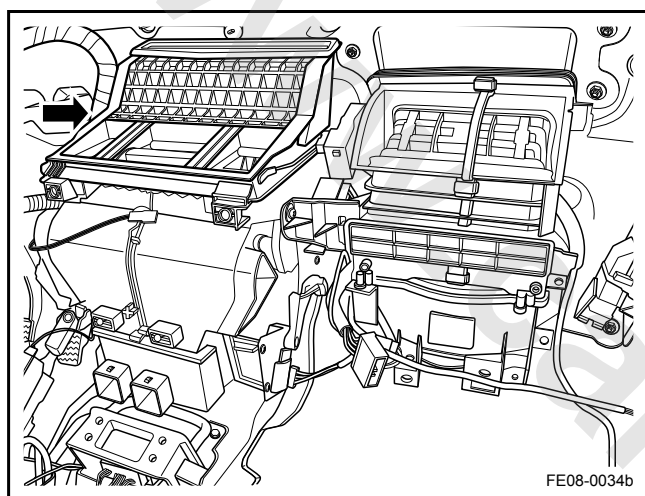
4. Remove the heater core side warm air inlet and outlet pipe clamps and remove the inlet and outlet pipes from the heater core.



5. Remove the instrument panel. Refer to [12.8.3.1 Instrument Panel Replacement](#).
6. Remove the instrument panel retainers. Refer to [12.8.3.3 Instrument Panel Carrier Replacement](#).
7. Disconnect the air-conditioning assembly harness connector.

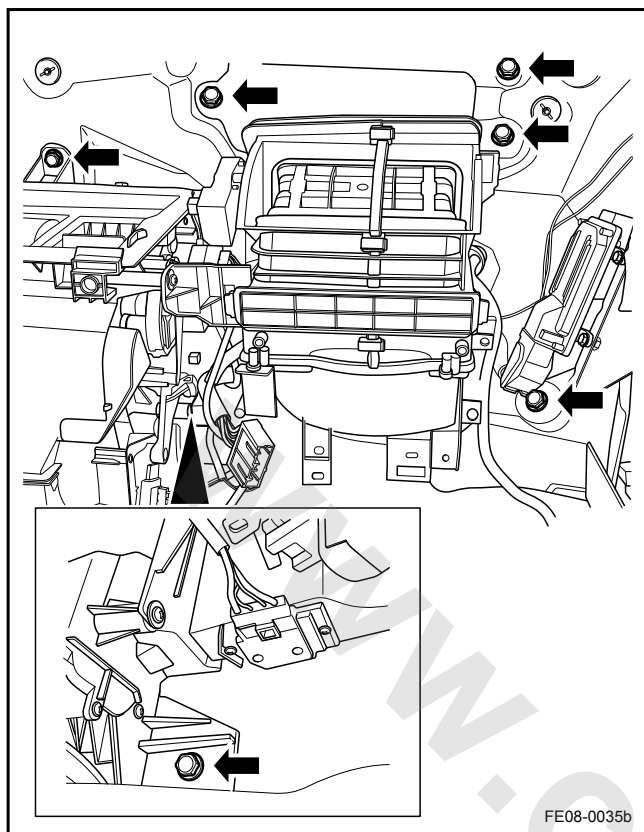


8. Remove the left and right lower air-conditioning ventilation pipes.

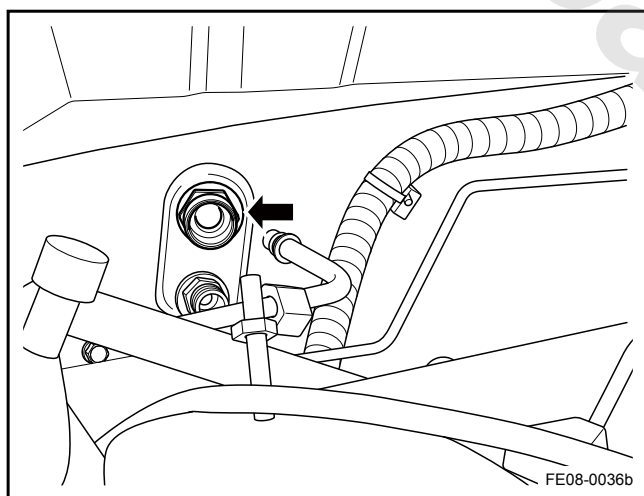


9. Remove the air-conditioning assembly upper air duct.





10. Remove the air-conditioning assembly retaining nuts.



11. Remove the air-conditioning evaporator side hard rubber sleeve.

12. Remove the air-conditioning assembly.



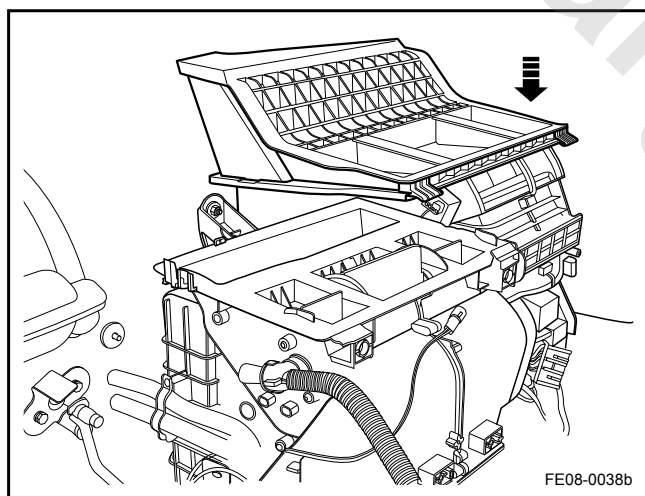
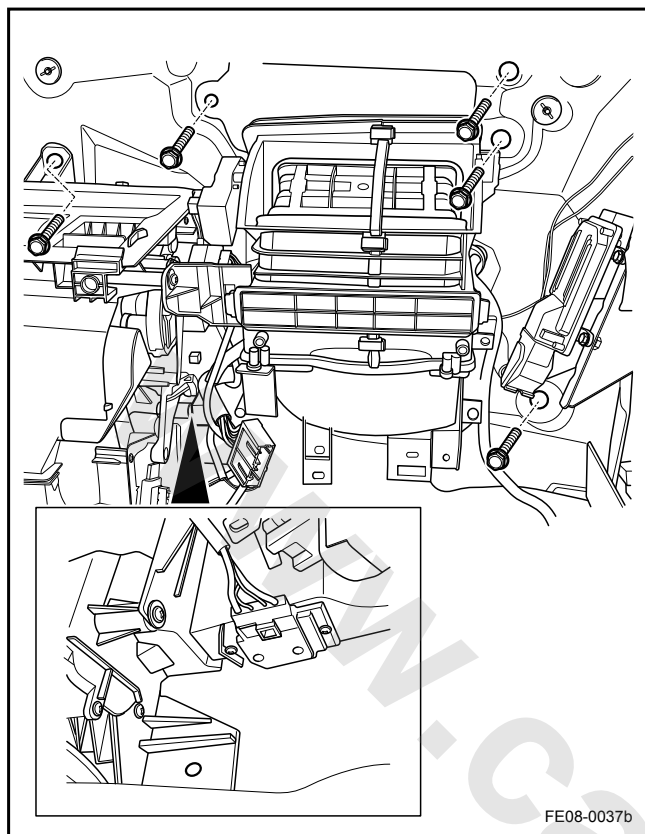
## Installation Procedure:

1. Install the air-conditioning assembly.
2. Install the air-conditioning assembly retaining nuts and bolts.

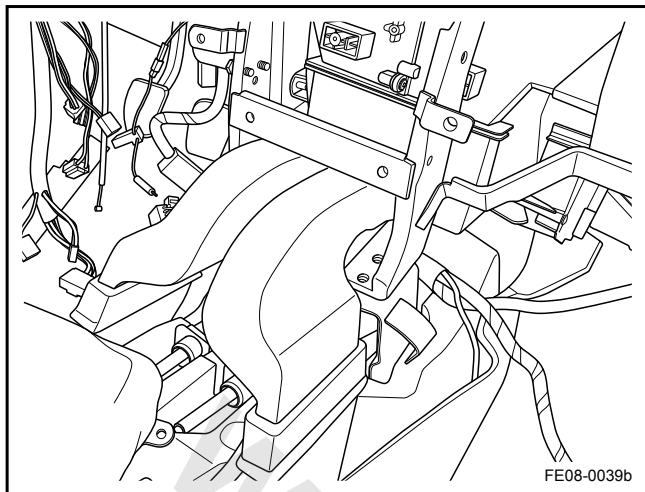
## Torque:

Nut 10 Nm (Metric) 7.4 lb-ft (US English)

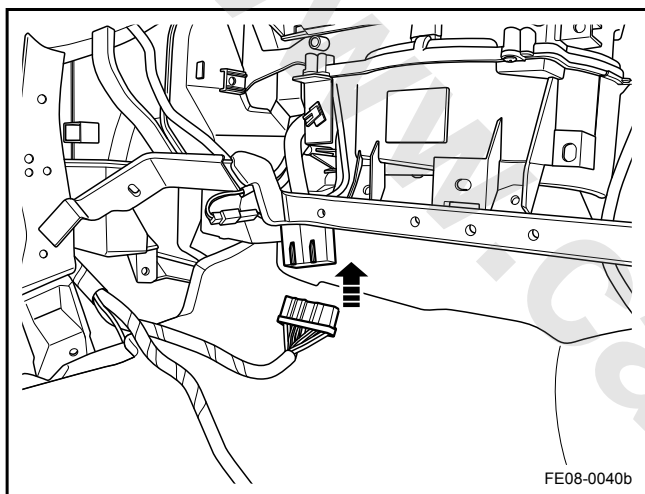
Bolt 6 Nm (Metric) 4.4 lb-ft (US English)



3. Install the air-conditioning evaporator side hard rubber sleeve.
4. Install the air-conditioning assembly upper air duct.



5. Install the left and right lower air-conditioning ventilation pipes.

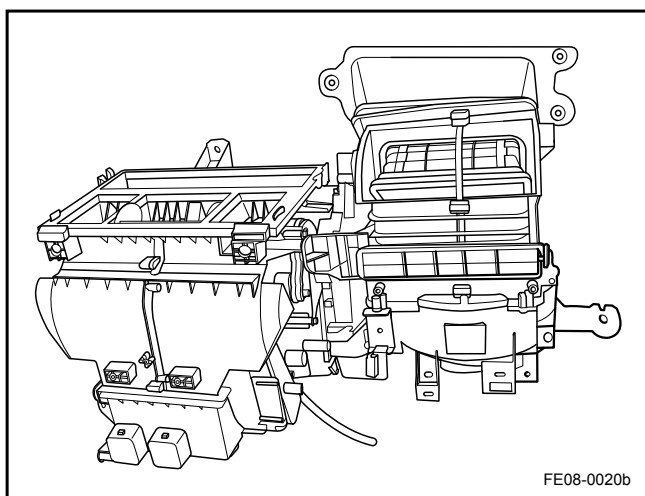


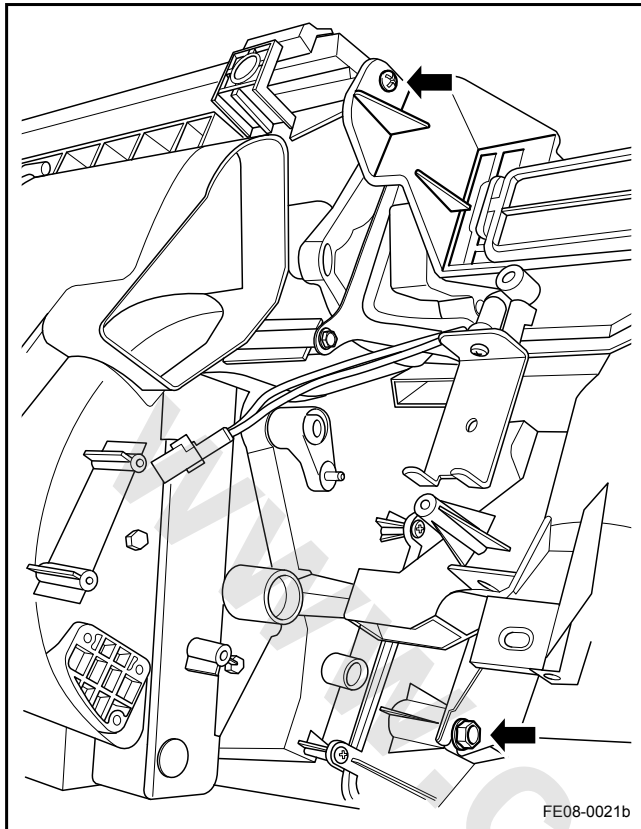
6. Connect the air-conditioning assembly harness connector.
7. Install the instrument panel retainers.
8. Install the instrument panel.
9. Install inlet/outlet warm air pipes, fastening the clamps.
10. Remove the heater core side warm air inlet and outlet pipes and clamps  
Torque: 8-10 Nm (Metric) 5.9-7.4 lb-ft (US English)
11. Fill the engine coolant.
12. Carry out the air-conditioning refrigerant filling process.

### 8.2.8.6 Expansion Valve Replacement

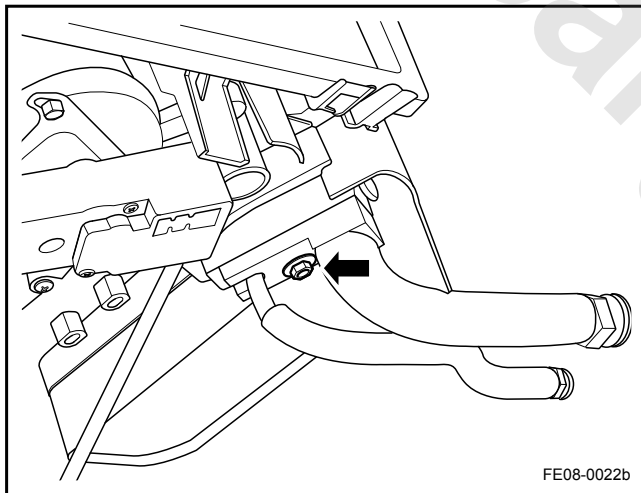
#### Removal Procedure

1. Remove the air-conditioning assembly. Refer to [8.2.8.5 Air-conditioning Assembly Replacement](#).

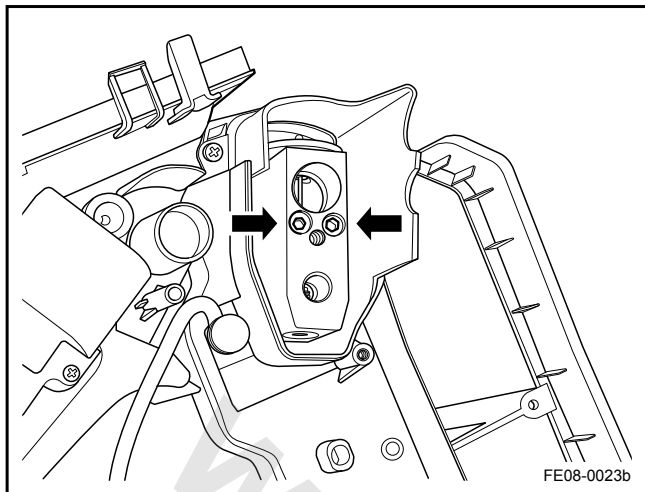




2. Separate the radiator and the blower.



3. Remove the evaporator upper air-conditioning short hard pipe.

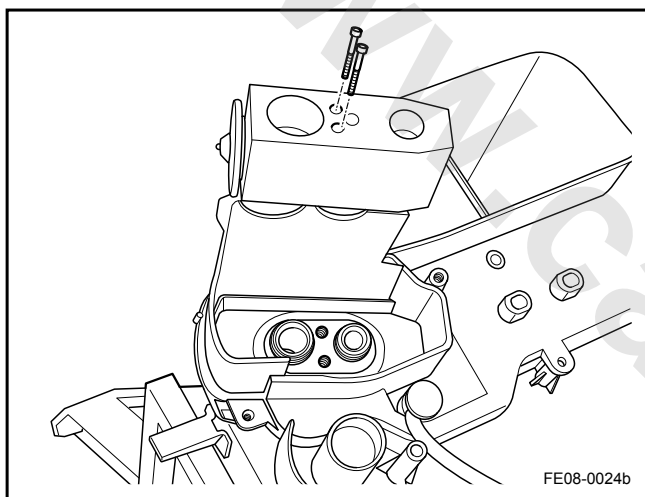


4. Remove the expansion valve retaining bolts and remove the expansion valve.

#### Installation Procedure:

1. Install the expansion valve and tighten the retaining bolts.

Torque: 18 Nm (Metric) 13.3 lb-ft (US English)



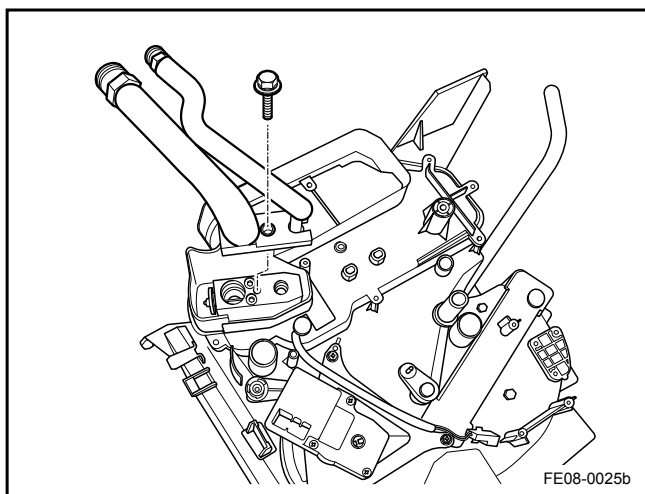
2. Install the evaporator upper air-conditioning short hard pipe.

Torque: 18 Nm (Metric) 13.3 lb-ft (US English)

3. Assemble the radiator and the blower assembly.
4. Install the air-conditioning assembly.

#### Note

During the installation, all the O-rings must be replaced.

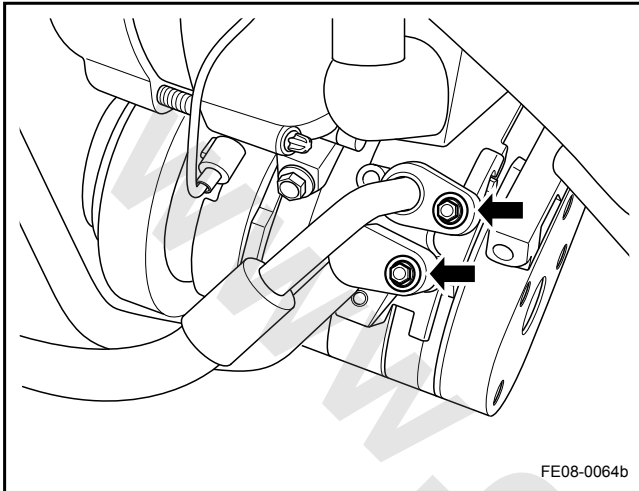


### 8.2.8.7 Air-conditioning Compressor Replacement

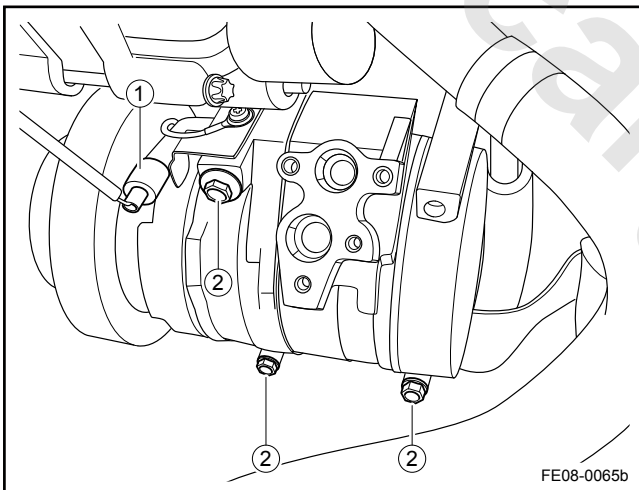
#### Removal Procedure

#### Warning!

Refer to "Breathing R-134a Warning" in "Warnings and Notices".



1. Carry out the air-conditioning refrigerant recovery procedure. Refer to [8.2.7.10 Air-conditioning Refrigerant Recovery and Filling](#).
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Remove the drive belt. Refer to [2.6.8.3 Drive Belt Replacement](#).
4. Disconnect the compressor to air-conditioning high and low pressure pipes.



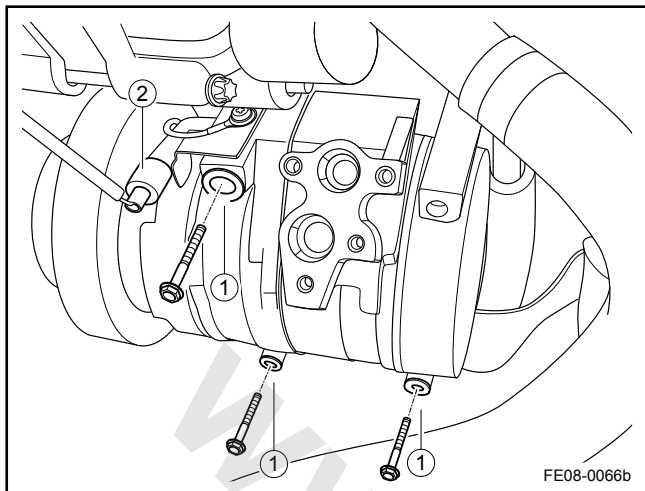
5. Disconnect the compressor harness connector (1).
6. Remove the compressor retaining screws and remove the compressor (2).

#### Note

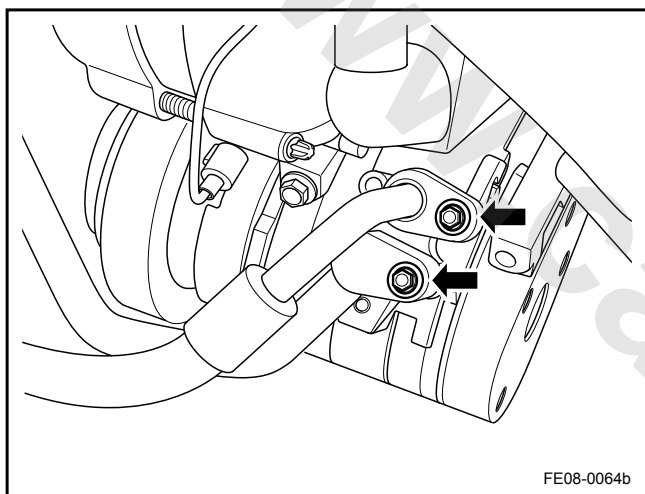
To prevent impurities and moisture in air condensed on the parts entering the system, seal all the parts as soon as possible.

## Installation Procedure:

1. Install and tighten the compressor retaining bolts (1).  
Torque: 28 Nm (Metric) 20.7 lb-ft (US English)
2. Connect the compressor harness connector (2).



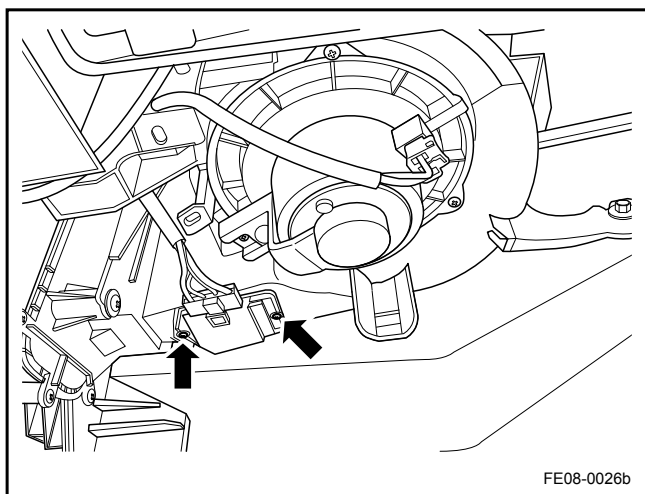
3. Install the compressor to air-conditioning high and low pressure pipes.  
Torque: 11 Nm (Metric) 8.1 lb-ft (US English)
4. Install the driver belt.
5. Connect the battery negative cable.
6. Carry out the air-conditioning refrigerant filling procedure.



### 8.2.8.8 Blower Speed Control Module Replacement

## Removal Procedure

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect blower speed control module harness connector.
3. Remove the blower speed control module retaining screws.

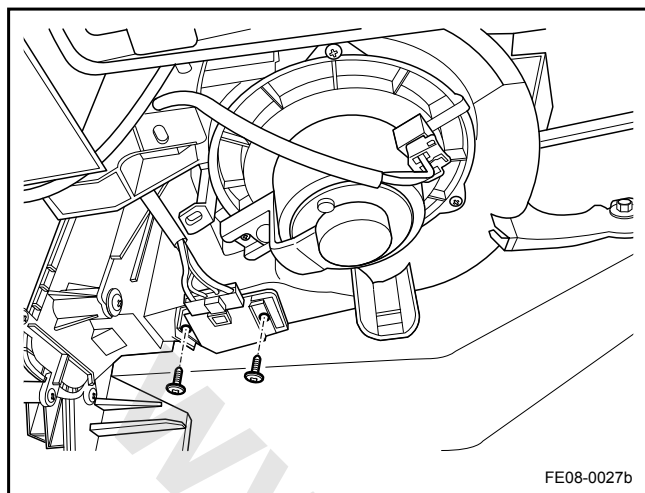


## Installation Procedure:

1. Install the blower speed control module and tighten the retaining screws.

Torque: 3 Nm (Metric) 2.2 lb-ft (US English)

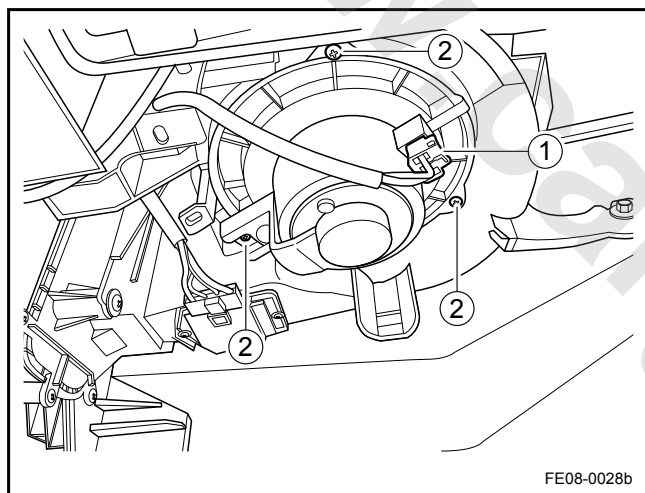
2. Connect the blower speed module harness connector.



## 8.2.8.9 Blower Motor Replacement

## Removal Procedure

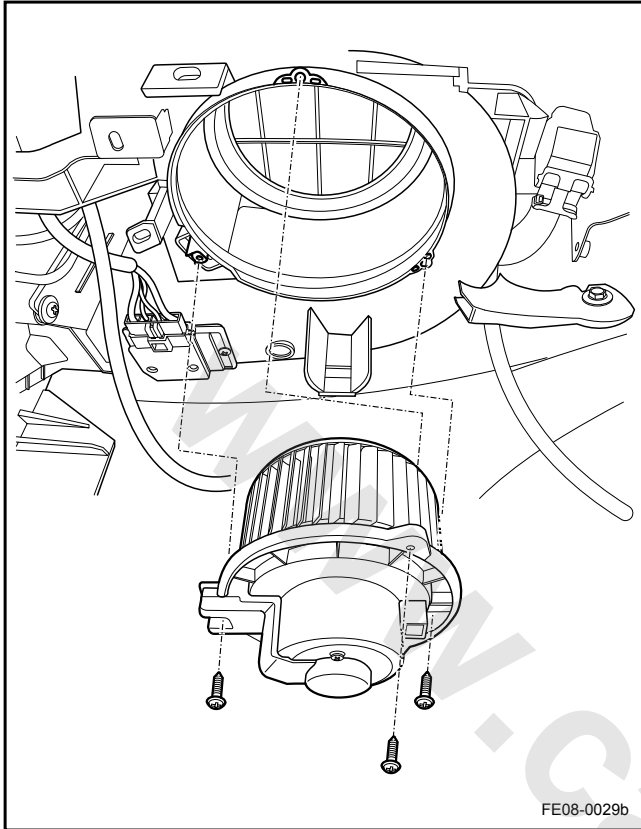
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#)
2. Disconnect the blower motor harness connector (1).
3. Remove the blower motor retaining screws (2) and remove the blower motor.





## Installation Procedure:

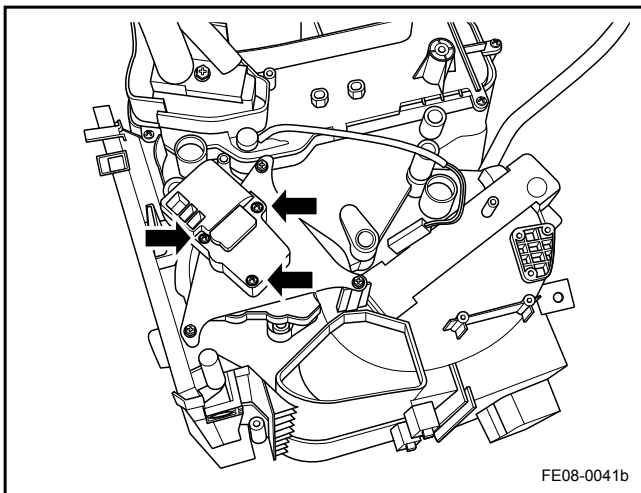
1. Install the blower motor and tighten the retaining screws.  
Torque: 3 Nm (Metric) 2.2 lb-ft (US English)
2. Connect the blower motor harness connector.



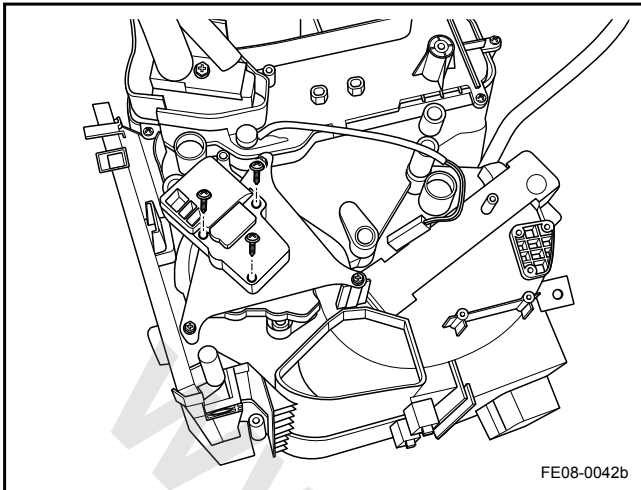
### 8.2.8.10 Warm and Cold Air Adjust Motor and Inside and Outside Circulation Motor Replacement

## Removal Procedure

1. Remove the air-conditioning assembly. Refer to [8.2.8.5 Air-conditioning Assembly Replacement](#).
2. Separate the radiator and the blower assembly.
3. Remove the warm air and cold air adjust motor retaining screws.





**Installation Procedure:**

1. Install the warm air and cold air adjust motor retaining screws  
Torque: 3 Nm (Metric) 2.2 lb-ft (US English)
2. Assemble the radiator and the blower assembly.
3. Install the air-conditioning assembly.

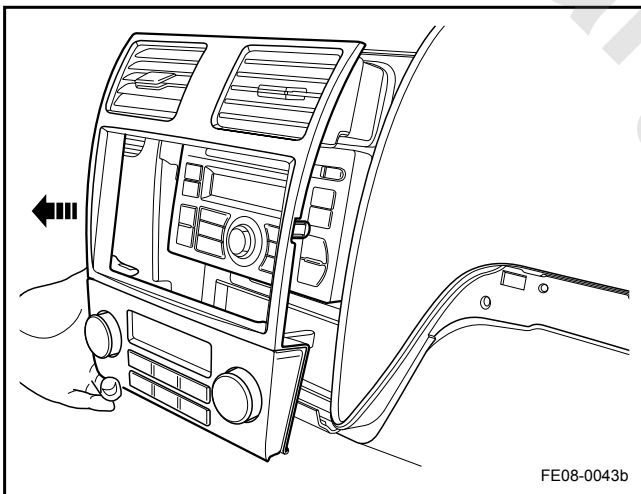
**Note**

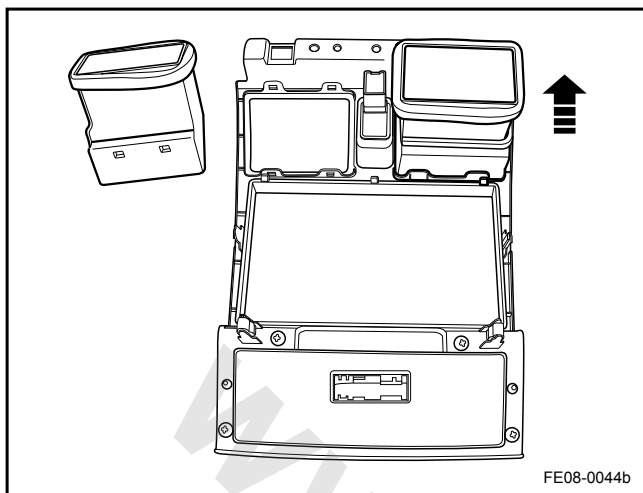
Inside and Outside Circulation Motor Replacement is the same as that of Warm and Cold Air Adjust Motor.

**8.2.8.11 Instrument Panel Air Duct Replacement****Center Air Duct Replacement****Removal Procedure****Note**

Please use special tools to remove interior panels, otherwise panels will be easily scratched.

1. Remove the instrument panel. Refer to [11.15.8.1 Instrument Cluster Replacement](#).
2. Remove the center air duct panel.
3. Remove the center air duct.





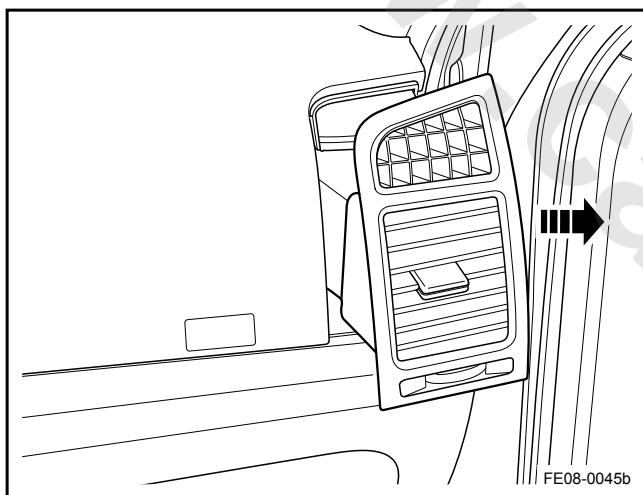
## Installation Procedure:

1. Install the center air duct.
2. Install the center air duct panel.
3. Install the instrument panel.

## Instrument Panel Side Air Duct Replacement

## Removal Procedure

1. Removal the instrument panel side panel.
2. Remove the air duct retaining screw.
3. Use a special tool to remove the side air duct.



## Installation Procedure:

1. Press the side air duct into place.

**Note**

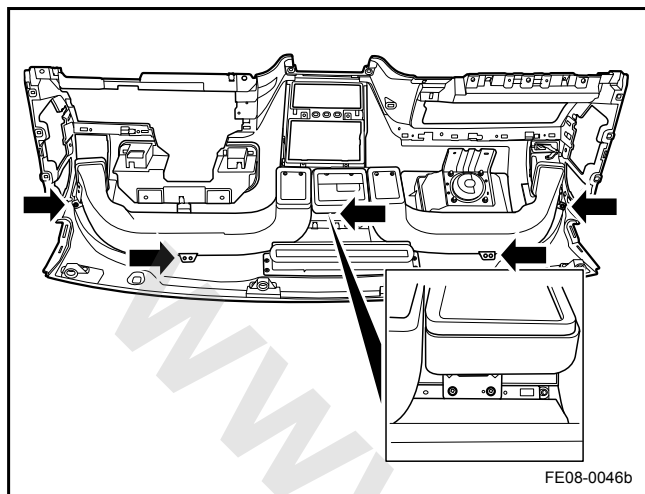
Both side air ducts replacement is the same.

2. Install the air duct retaining screw.
3. Install the instrument panel side panel.

### 8.2.8.12 Air-conditioning Ventilation Pipe Replacement

#### Removal Procedure

1. Remove the instrument panel. Refer to [12.8.3.1 Instrument Panel Replacement](#).
2. Remove the ventilation pipe retaining screws.



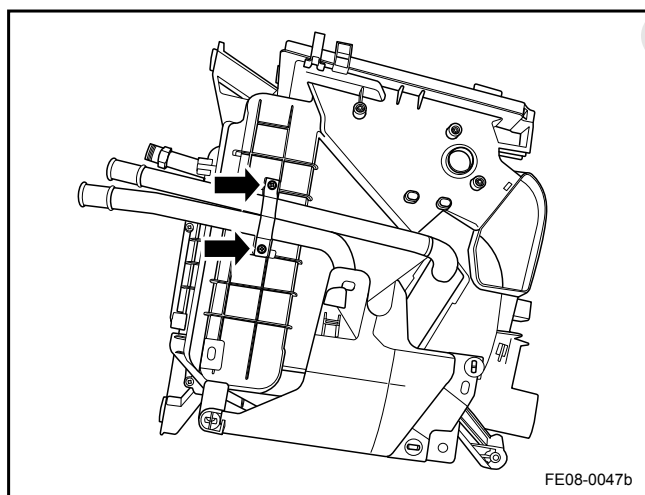
#### Installation Procedure:

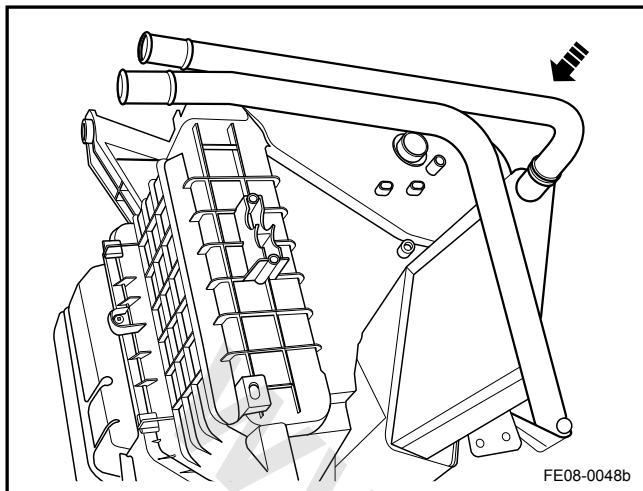
1. Install and tighten the ventilation pipe retaining screws.  
Torque: 6 Nm (Metric) 4.5 lb-ft (US English)
2. Install the instrument panel.

### 8.2.8.13 Heater Core Replacement

#### Removal Procedure

1. Remove the air-conditioning assembly. Refer to [8.2.8.5 Air-conditioning Assembly Replacement](#).
2. Remove the heater core body hard tube clamp.
3. Remove the heater core body.



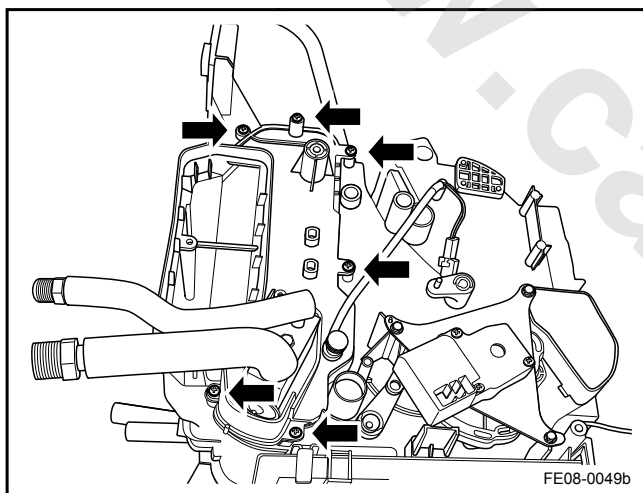


## Installation Procedure:

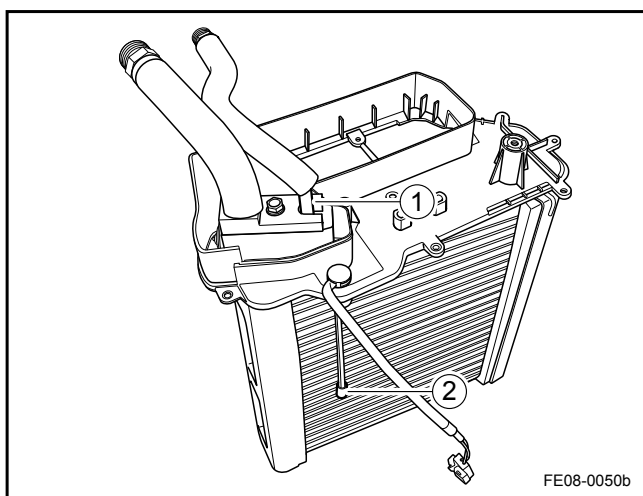
1. Insert the heater core body.
2. Install and tighten the heater core body hard tube clamp and tighten the retaining screw.  
Torque: 3 Nm (Metric) 2.2 lb-ft (US English)
3. Insert the air-conditioning assembly.

## 8.2.8.14 Evaporator Core Replacement

## Removal Procedure



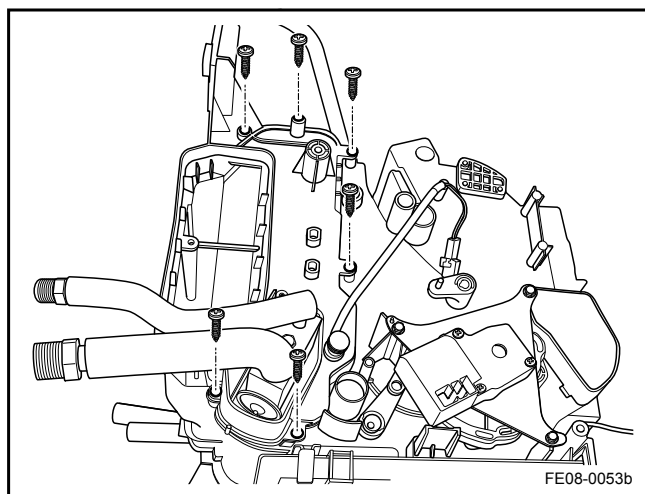
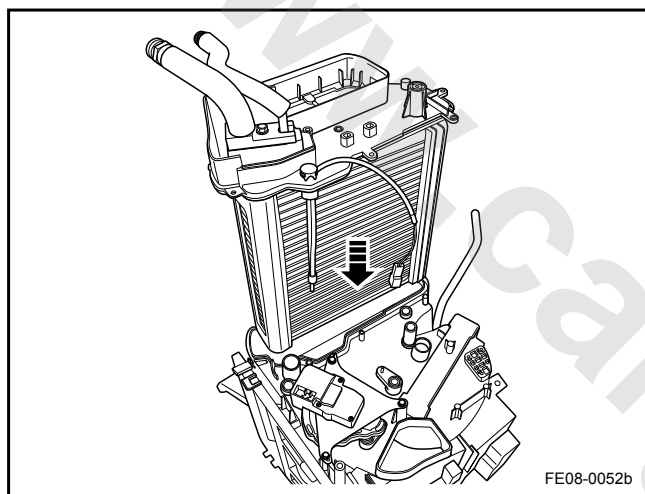
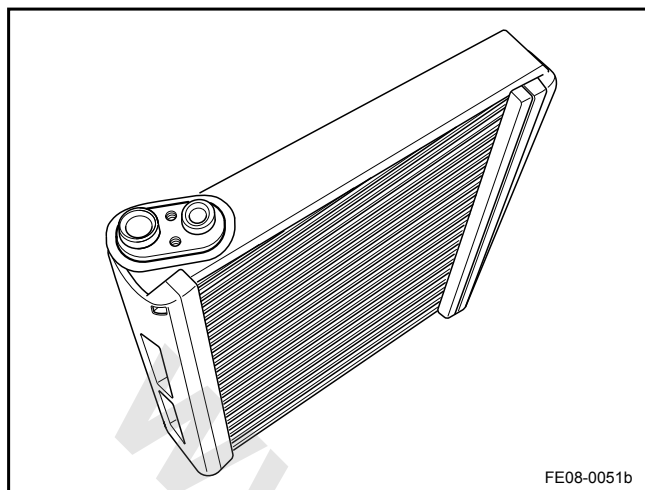
1. Remove the air-conditioning assembly. Refer to [8.2.8.5 Air-conditioning Assembly Replacement](#).
2. Separate the radiator and the blower assembly.
3. Remove the evaporator core body retaining screw.



4. Remove the evaporator core body.
5. Remove the expansion valve (1). Refer to [8.2.8.6 Expansion Valve Replacement](#).
6. Remove the evaporator temperature sensor (2). Refer to [8.2.8.19 Evaporator Temperature Sensor and Heat Core Temperature Sensor Replacement](#).

## Installation Procedure:

1. Install the evaporator temperature sensor.
2. Install the expansion valve.



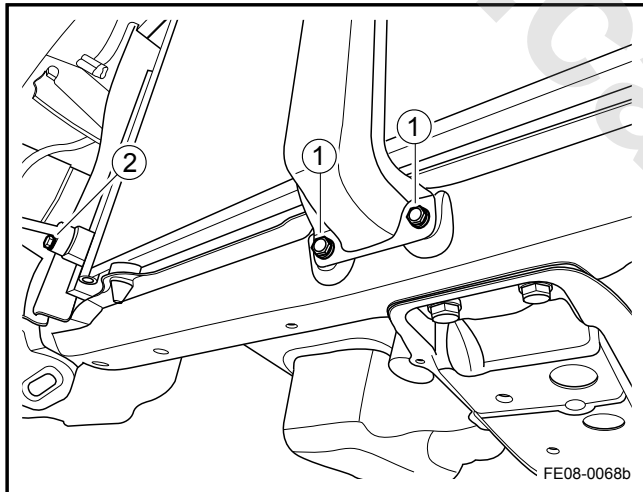
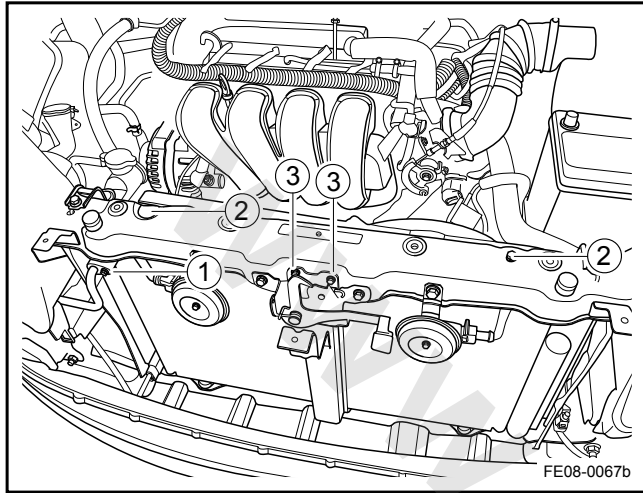
3. Insert the evaporator core body.
4. Install and tighten the evaporator core body retaining screw.  
Torque: 3 Nm (Metric) 2.2 lb-ft (US English)
5. Assemble the evaporator and the blower assembly.
6. Install the air-conditioning assembly.

### 8.2.8.15 Condenser Replacement

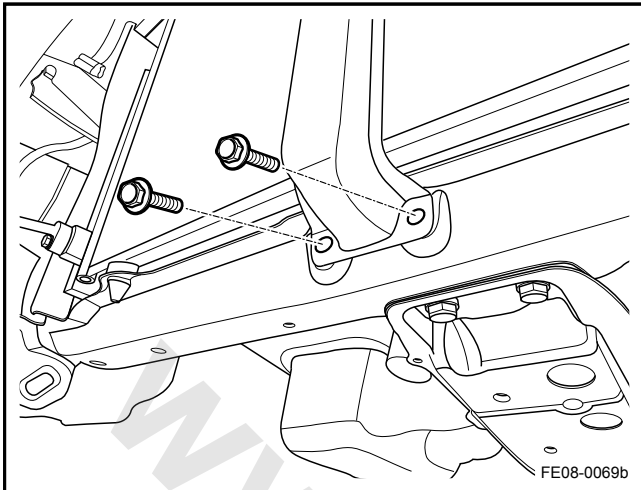
#### Removal Procedure

#### Warning!

Refer to "Breathing R-134a Warning" in "Warnings and Notices".



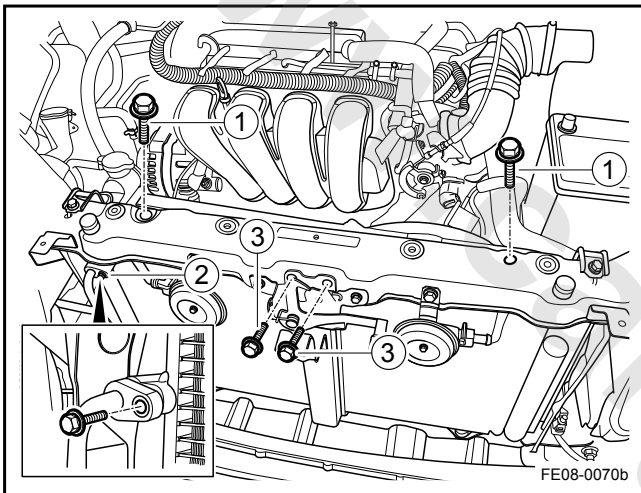
1. Carry out the air-conditioning refrigerant recovery procedure. Refer to [8.2.7.10 Air-conditioning Refrigerant Recovery and Filling](#).
2. Remove the radiator upper grille.
3. Remove the condenser upper air-conditioning hard pipe fittings (1).
4. Remove the condenser upper retaining bolts (2).
5. Remove the condenser front baffle upper retaining bolts (3).
6. Lift the vehicle. Refer to [1.3.1.1 Lifting and Jacking the Vehicle](#).
7. Remove the engine bottom shield. Refer to [12.10.1.7 Left and Right Engine Bottom Shield Replacement](#).
8. Remove the condenser front baffle lower retaining bolts and remove the baffle.
9. Remove the condenser lower air-conditioning hard pipe fittings (2).
10. Remove the condenser from the vehicle bottom.



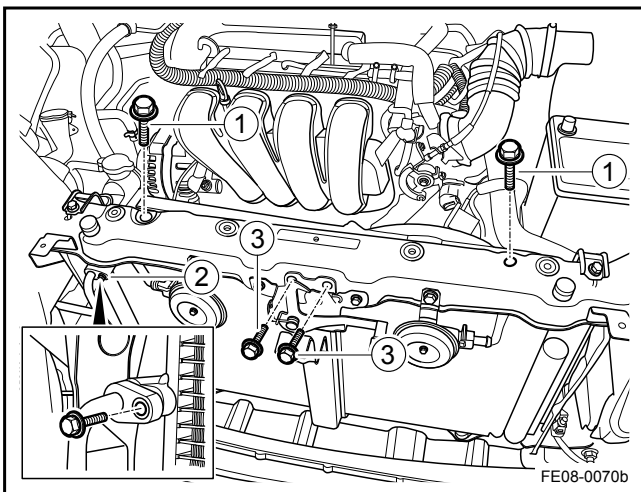
## Installation Procedure:

1. Install the condenser to the mount from the vehicle bottom.
2. Install the condenser front baffle and tighten the lower retaining bolts.

Torque: 10-12 Nm (Metric) 7.4-8.9 lb-ft (US English)



3. Lower the vehicle.
4. Install and tighten the condenser top retaining bolts (1).  
Torque: 11 Nm (Metric) 8.1 lb-ft (US English)
5. Install and tighten the condenser upper air-conditioning hard pipe fittings (2).  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
6. Install and tighten the condenser front baffle upper retaining bolts (3).  
Torque: 12 Nm (Metric) 8.9 lb-ft (US English)



7. Lift the vehicle, install and tighten the condenser lower air-conditioning hard pipe fittings (1).  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
8. Install and tighten the condenser front baffle lower retaining bolts (2).  
Torque: 12 Nm (Metric) 8.9 lb-ft (US English)
9. Install the engine bottom shield.
10. Lower the vehicle and install the radiator upper grille.
11. Carry out the air-conditioning refrigerant filling procedure.  
Refer to [8.2.7.10 Air-conditioning Refrigerant Recovery and Filling](#).



### 8.2.8.16 Ambient and Sun Light Sensor Replacement

Refer to [11.4.8.20 Ambient and Sun Light Sensor Replacement](#).

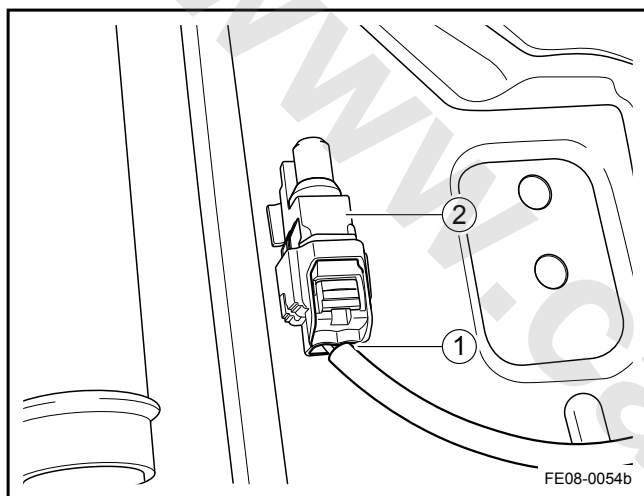
### 8.2.8.17 Outside Temperature Sensor Replacement

#### Removal Procedure

#### Warning!

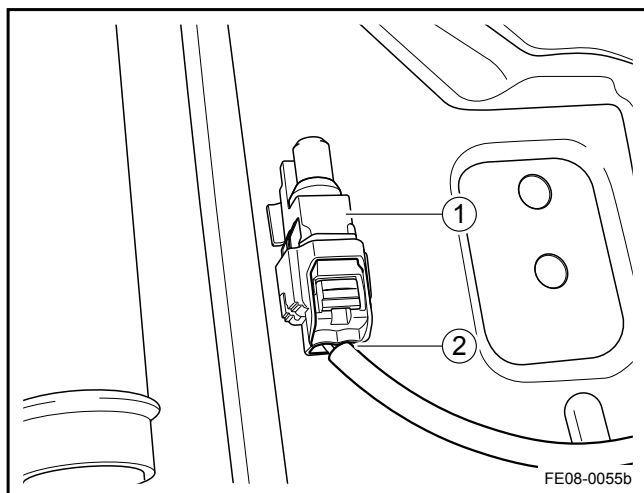
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the engine bottom shield. Refer to [12.10.1.7 Left and Right Engine Bottom Shield Replacement](#).
3. Disconnect the outside temperature sensor wiring harness connector (1).
4. Remove the outside temperature sensor (2).



#### Installation Procedure:

1. Install the outside temperature sensor (1).
2. Connect the outside temperature sensor wiring harness connector (2).
3. Install the engine bottom shield.
4. Connect the battery negative cable.





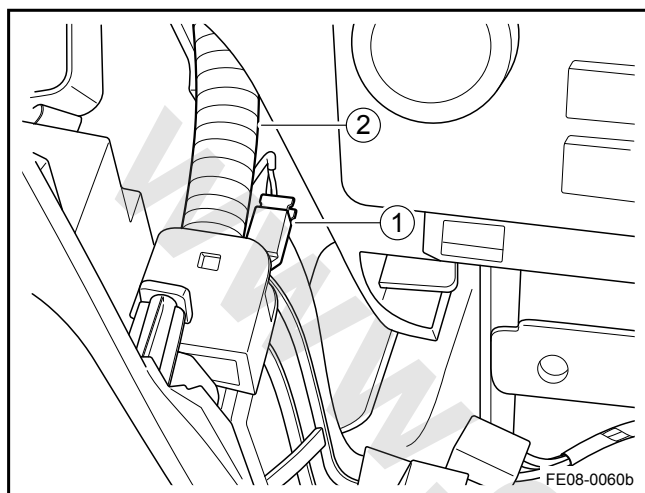
### 8.2.8.18 Inside Temperature Sensor Replacement

#### Removal Procedure

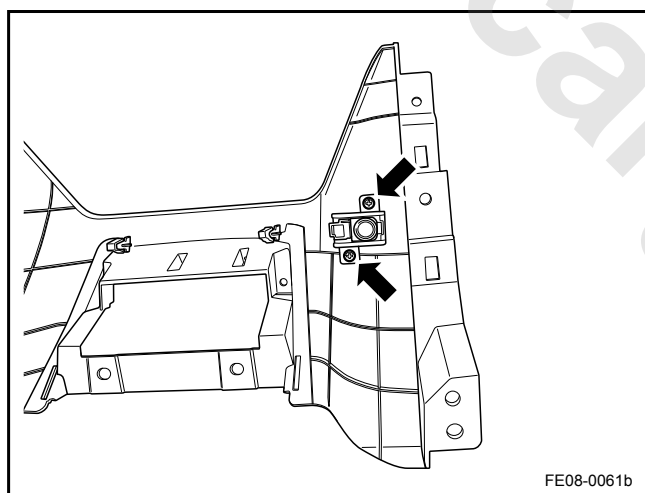
#### Warning!

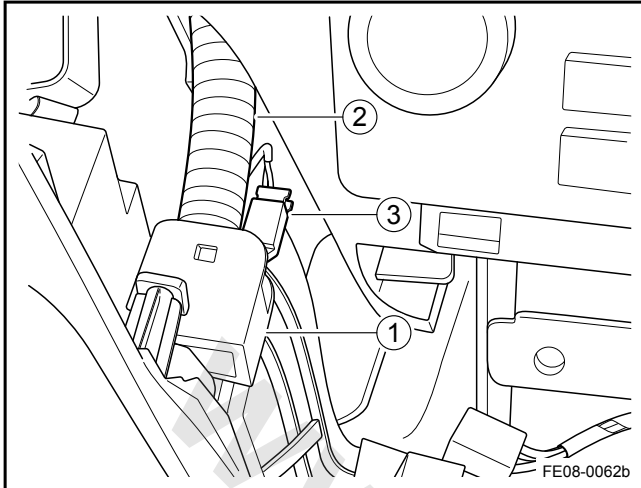
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the instrument panel lower right side panel. Refer to [12.8.3.1 Instrument Panel Replacement](#).
3. Disconnect the inside temperature sensor wiring harness connector (1).
4. Disconnect the air hose connection (2).



5. Remove the inside temperature sensor.





#### Installation Procedure:

1. Install the inside temperature sensor (1).
2. Connect the air hose connection (2).
3. Connect the inside temperature sensor wiring harness connector (3).
4. Install the instrument panel lower right side panel.
5. Connect the battery negative cable.

### 8.2.8.19 Evaporator Temperature Sensor and Heat Core Temperature Sensor Replacement

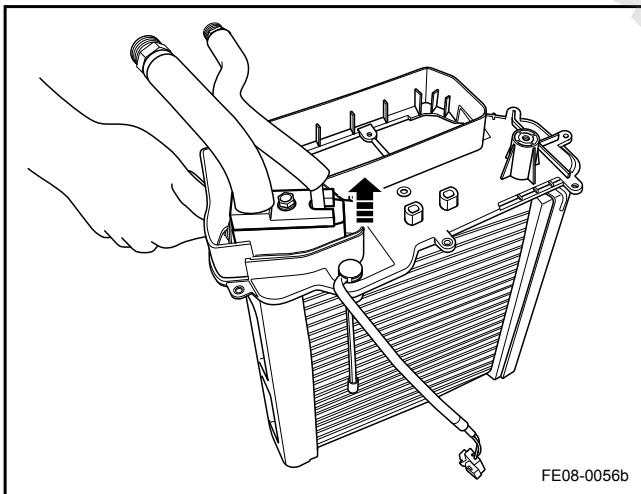
#### Evaporator Temperature Sensor Replacement

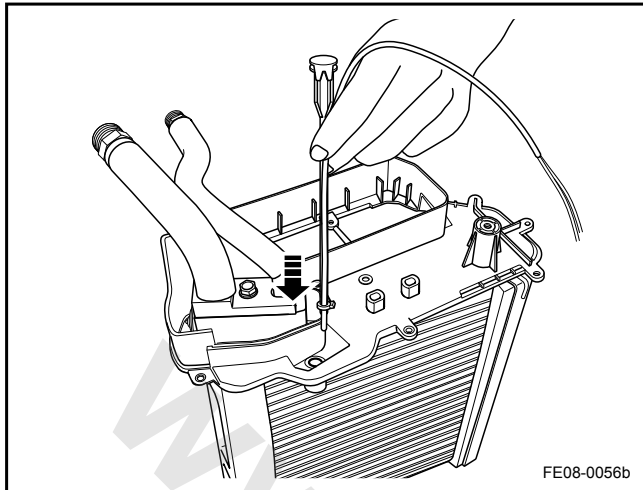
##### Removal Procedure

##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the air-conditioning assembly. Refer to [8.2.8.5 Air-conditioning Assembly Replacement](#).
3. Separate the radiator and the blower assembly.
4. Remove the evaporator core body. Refer to [8.2.8.14 Evaporator Core Replacement](#).
5. Remove the evaporator temperature sensor.

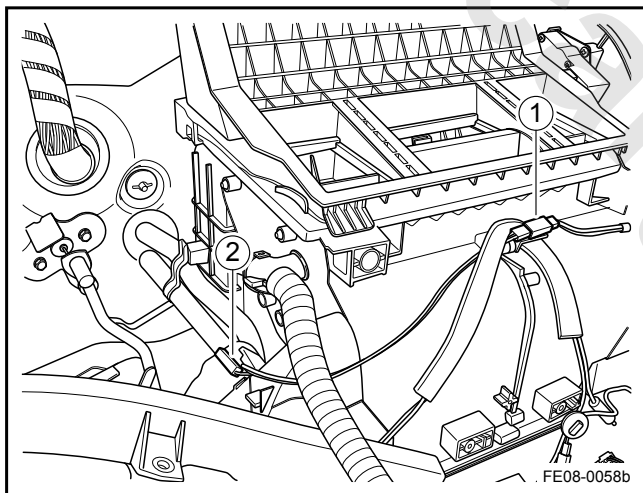


**Installation Procedure:**

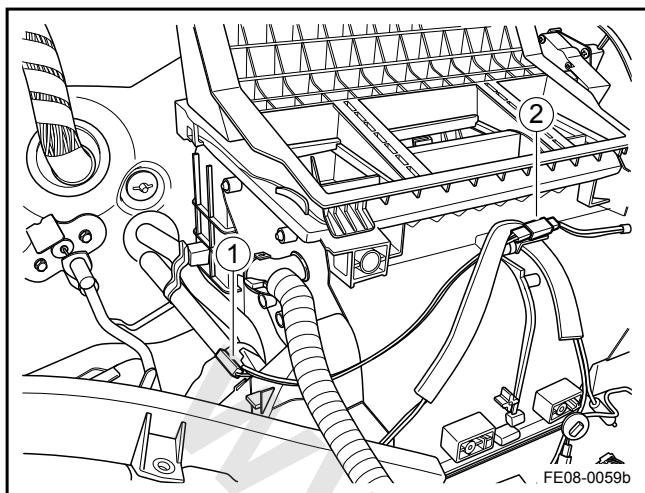
1. Insert and tighten the retaining evaporator temperature sensor.
2. Install the evaporator core body.
3. Assemble the evaporator and the blower assembly.
4. Install the air-conditioning assembly.
5. Connect the battery negative cable.

**Heat Core Temperature Sensor Replacement****Removal Procedure****Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the instrument panel. Refer to [12.8.3.1 Instrument Panel Replacement](#).
3. Disconnect the heat core temperature sensor wiring harness connector (1).
4. Push aside the plastic insulation, remove the heat core temperature sensor (2).

**Installation Procedure:**

1. Wrap the plastic insulation around the sensor probe and the heater core hard tube (1).
2. Connect the heater core temperature sensor wiring harness connector (2).
3. Install the instrument panel.
4. Connect the battery negative cable.

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## 9.1 Warnings and Notices

### 9.1.1 Warnings and Notices

#### Airbag System Warnings

##### Warning!

This vehicle is equipped with airbag system. Fail to follow the correct procedures will lead to the following conditions:

- Accidental airbag deployment
- Airbag inoperative when needed

##### Warning!

Strictly abide by the following criteria in order to avoid the above situation:

- Refer to the airbag system components view, determine whether you are repairing the airbag system components, surrounding components or the circuits.
- If you are servicing the airbag system components, surrounding components or the circuits, deactivate the airbag system. Refer to "Battery Disconnect Warning" in "Warnings and Notices".

#### SIR Deployed inflator Modules Are Hot Warning

##### Warning!

Warning: After deployment, the metal surfaces of the SIR component may be very hot. To help avoid a fire or personal injury:

- Allow sufficient time for cooling before touching any metal surface of the SIR component.
- Do not place the deployed SIR component near any flammable objects.

#### SIR inflator Module Coil Warning

##### Warning!

Warning: Improper routing of the wire harness assembly may damage the inflatable restraint steering wheel module coil. This may result in a malfunction of the coil, which may cause personal injury.

#### SIR inflator Module Disposal Warning

##### Warning!

Warning: In order to prevent accidental deployment and the risk of personal injury, do not dispose of an

undeployed inflator module as normal shop waste. Undeployed inflator modules contain substances that could cause severe illness or personal injury if their sealed containers are damaged during disposal. Use the following deployment procedures to safely dispose of an undeployed inflator module. Failure to observe the following disposal methods may be a violation of federal, state, or local laws

#### SIR Inflator Module Handling and Storage Warning

##### Warning!

Warning: When carrying an undeployed inflator module:

- Do not carry the inflator module by the wires or connector.
- Make sure the air bag opening points away from you and others.

##### Warning!

Warning: When storing an undeployed inflator module: make sure the airbag opening point away from the surface on which the inflator module rests. Do not point the the airbag opening to the ground. Do not place any items onto the airbag module. Provide free space for the airbag to expand in case of an accidental deployment.

Do not have the undeployed airbag module soaked in water or come into contact with other liquids.

Do not place the undeployed airbag module near the fire source or a high-temperature area. Prevent personal injury caused by accidental airbag deployment.

#### Airbag Collision Sensor Handling Warning

##### Warning!

Warning: Do not hit or shake airbag system collision sensors. Before supply power to the collision sensors, ensure the collision sensors firmly tightened. Failure to follow the correct procedures may cause airbag accidental deployment or inoperative, resulting in personal injury.

## 9.2 Airbag System

### 9.2.1 Specifications

#### 9.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Curtain Airbag Retaining Bolt	M6 × 16	7-10	5.2-7.4
Side Airbag Retaining Bolts	M6 × 16	4-4.5	3.0-3.2
Driver Front Airbag Bolts	M6 × 16	8.5-9.5	6.3-7.0
Passenger Front Airbag Bolts	M6 × 16	7-9	5.2-6.6
Side Collision Sensor Retaining Bolt	M6 × 20	7-9	5.2-6.6
Frontal Collision Sensor Bolts	M6 × 20	7-9	5.2-6.6
Airbag Electronic Control Unit Retaining Bolt	M6 × 20	7-9	5.2-6.6
Airbag Control Module Bracket Bolts	M6 × 20	7-9	5.2-6.6

## 9.2.2 Description and Operation

### 9.2.2.1 Description and Operation

#### Note

Airbag system is unable to replace the seat belt functions. If seat belts are not used, when the airbag is deployed, it may cause serious personal injury. Geely Automotive reminds you to wear and tighten your seat belts. Only when seat belts are tighten, during a collision system, airbag can provide supplementary protection for the occupants.

#### Airbag System Description

Airbag system consists of the following components:

- Airbag Warning Lamp
- Instrument Cluster
- Airbag Control Module Front Collision Sensor (Left / Right)
- Driver Side Collision Sensor
- Passenger Side Collision Sensor
- Passenger Recognition Sensor
- Driver Front Airbag
- Passenger Side Airbag
- Driver Seat Belt Pretensioner
- Passenger Seat Belt Pretensioner
- Driver Side Airbag
- Passenger Side Airbag
- Driver Curtain Airbag
- Passenger Curtain Airbag
- Inflator Module Coil
- Airbag System Wiring Harness
- Steering Wheel and Steering Column

Beside seat belts, airbag system provides additional protection to passengers and it is a passive safety system. Airbag system includes multiple inflatable protection module, distributed in different locations of vehicles, including steering wheel, instrument units, front seat back, the roof rails. In addition to inflatable protection module, the vehicle can be equipped with seat belt pretensioner. When a collision occurs, it will fasten seat belts, inflatable the module, at the same time increase the

distance between passenger and airbag. Each inflatable module has a detonating circuit, controlled by the airbag control module. When the airbag control module detects the collision impact is large enough, it deploys the airbag. Airbag control module continuously monitors the airbag system electrical components. When a circuit failure is detected, the airbag control module will set a DTC code and turn on airbag warning lamps to inform the driver. The steering column has adopted energy-absorbing design. In the event of frontal impact, it will contract, reducing the risk of driver injury.

Airbag control module receives the sensor signals to determine the severity of the collision. When the signal value is greater than the memory settings, airbag ignition control module commands to start the corresponding inflatable airbag system modules. When confronted with a large enough collision, front airbags and seat belt pretensioners will be activated; When confronted with a large enough side collision, side airbags, curtain airbags and seat belt pretensioners will be activated.

When airbag control module confirms the collision signal, it will send "collision unlock doors and stop fuel supply" signal to the bus within 20 ms, a total of 30 cycles (100 ms a cycle, a total of 3 s) . When BCM and EMS receive more than three consecutive signals, respectively, unlocking doors and stopping fuel supply will be implemented.



## 9.2.3 System Working Principle

### 9.2.3.1 System Working Principle

#### Airbag Warning Lamp

Airbag warning lamp is located inside the instrument cluster assembly, used to notify the driver airbag system failures and examine whether the airbag control module is communicating with the instrument panel. Turn the ignition key to "ON" position, the airbag control module carry out system self-test. If the system is normal, warning lamps flash 7 s and off. If a malfunction is detected, airbag control module will store a diagnostic trouble code (DTC), and then through the CAN-Bus serial data bus, instruct the instrument cluster to light the airbag warning lamp. After the vehicle starts, airbag control module will continue to test each loop. If there is a malfunction, airbag control module will communicate with the instrument cluster through the CAN-Bus serial data bus, the airbag warning lamp will be lit in 5 s. If there is a fault, airbag may fail to deploy, or deploy when the crash does not reach the set collision severity. If the airbag warning lamp is lit, please repair the vehicle at the authorized service station as soon as possible. Before the repair is completed, the airbag warning lamp will not be off.

#### Airbag Control Module

##### Note

Airbag control module has a back up power supply, which can deploy the airbag, even if the battery voltage is lost during a collision. Disconnect the battery negative cable for at least 90s to empty the stored power supply, before carry out the airbag system repair.

Airbag control module is a microprocessor, which is the airbag system control center. When a collision happens, the airbag control module will compare the signal from the sensor with the value stored in the memory. When the generated signal exceeds the stored value, the airbag control module will command (electric current signal) to deploy airbags. When the airbags are deployed, the airbag control module will record the status of airbag systems, and light the airbag indicator on the instrument cluster. After the vehicle starts, airbag control module will continue to monitor the airbag system electrical components and circuits. If an airbag control module malfunction is detected, it will store a diagnostic trouble code, and light the airbag warning lamp to inform the driver that a malfunction exists.

#### Front Collision Sensor (Left / Right)

Front collision sensors are used to enhance the airbag system performance. Front collision sensor is an acceleration sensor, which sends the acceleration signal to the airbag control module. Front collision sensor can help determine the severity of a frontal collision. Airbag control module uses the measured acceleration values to calculate and compare these calculated values with values stored in the memory. When the calculated value exceeds the value stored, the airbag control module will issue a positive ignition command (electric current signal) to activate the front airbag and seat belt pretensioner.

#### Driver Side Collision Sensor, Passenger Side Collision Sensor

Each side collision sensor includes a sensing device for monitoring vehicle acceleration to send vehicle lateral acceleration signal to the airbag control module. Side collision sensors can determine the severity of the side collision. Airbag control module uses the measured acceleration values to calculate and compare these calculated values with values stored in the memory. When the calculated value exceeds the value stored, the airbag control module will send a positive ignition command (electric current signal) to activate the curtain airbags, side airbags and seatbelt pretensioners.

#### Passenger Recognition Sensor

Passenger recognition sensor is located inside the passenger seat cushion assembly and used to sense whether the passenger seat is occupied by a passenger. It is a variable resistance-type pressure sensor and senses the pressure through the resistance changes. When the passenger seat is occupied by a passenger, the seat belt warning lamp will be lit to inform the driver to remind the passenger to fasten the seat belt.

#### Driver Front Airbag, Passenger Front Airbag

Driver front airbag, passenger front airbag module includes a shell, inflatable airbag, a detonating device and gas generating agent. When the front collision impact force is large enough, the airbag control module will command the front airbags to deploy. Electric current flows through the ignition and activates the gas generating agent to rapidly produce large amounts of gas. The gas inflates the airbag. The airbag, once filled with the gas, will deflate through holes in the airbag. Airbag control module harness connector (driver front airbag, passenger front airbag deployment circuits) has a short film. When the connector is disconnected, the airbag deployment short circuit will prevent the airbag accidental deployment during the repair.

## Driver Seat Belt Pretensioner, Passenger Seat Belt Pretensioner

Driver seat belt pretensioner, passenger seat belt pretensioner module includes a shell, a detonating device and gas generating agent. The ignition device is part of the seat belt pretensioner deployment circuit. When a vehicle front or side collision impact force is large enough, the airbag control module will command (electric current signal) the electric current flow through the ignition to detonate the gas generating agent and rapidly produce a large amount of gas. The reaction produced gas will make the seat belt pretensioner quickly tighten the seat belt. Airbag control module harness connector (airbag deployment circuit) has a short film. When the connector is disconnected, the airbag deployment short circuit will prevent the airbag accidental deployment during the repair.

## Driver Side Airbag, Passenger Side Airbag

Driver side airbag and passenger side side airbag are located in the driver seat back and passenger seat back respectively. Side airbag modules include airbags, detonating devices and gas generating agent. The detonating device is part of the airbag modules deployment circuit. When a side impact force is large enough, the side collision sensor will detect the collision and send a signal to the airbag control module. Airbag control module will compare the signal from the side collision sensor with the value in the memory. When the signal exceeds the stored value, the airbag control module commands the side airbag to deploy. When the passenger side collision happens, it requires the driver side airbag, driver curtain airbag are not deployed, while the passenger side airbag, passenger curtain airbag deploy. Airbag control module continuously monitors whether the airbag deployment circuit is faulty. In the event of a fault, it will light the airbag indicator. Airbag control module harness connector (airbag deployment circuit) has a short film. When the connector is disconnected, the airbag deployment short circuit will prevent the airbag accidental deployment during the repair.

## Driver Curtain Airbag, Passenger Curtain Airbag

Driver curtain airbag, passenger curtain airbag are located on the left and right roof rails, from the A-pillar extends to the C-pillar. Curtain airbag module includes airbags, a detonating device and gas generating agent. Detonating device is part of the curtain airbag deployment circuit. When a side impact force is large enough, side collision sensors will detect the collision and send a signal to the airbag control module. Airbag control module will compare the signal from the side collision sensor

with the value in the memory. When the signal exceeds the stored value, the airbag control module commands the curtain airbag to deploy. When the passenger side collision happens, it requires the driver side airbag, driver curtain airbag are not deployed, while the passenger side airbag, passenger curtain airbag deploy. Airbag control module continuously monitors whether the airbag deployment circuit is faulty. In the event of a fault, it will light the airbag indicator. Airbag control module harness connector (airbag deployment circuit) has a short film. When the connector is disconnected, the airbag deployment short circuit will prevent the airbag accidental deployment during the repair.

## Clock Spring

Airbag clock spring is located in the steering column below the steering wheel. When the steering wheel rotates, the clock spring maintains continuous electrical contact between the airbag deployment circuit and the driver front airbag. The steering wheel clock spring connector is equipped with a short film which can short the driver front airbag deployment circuit, in order to prevent the airbag accidental deployment during the repair.

## Airbag System Wiring Harness

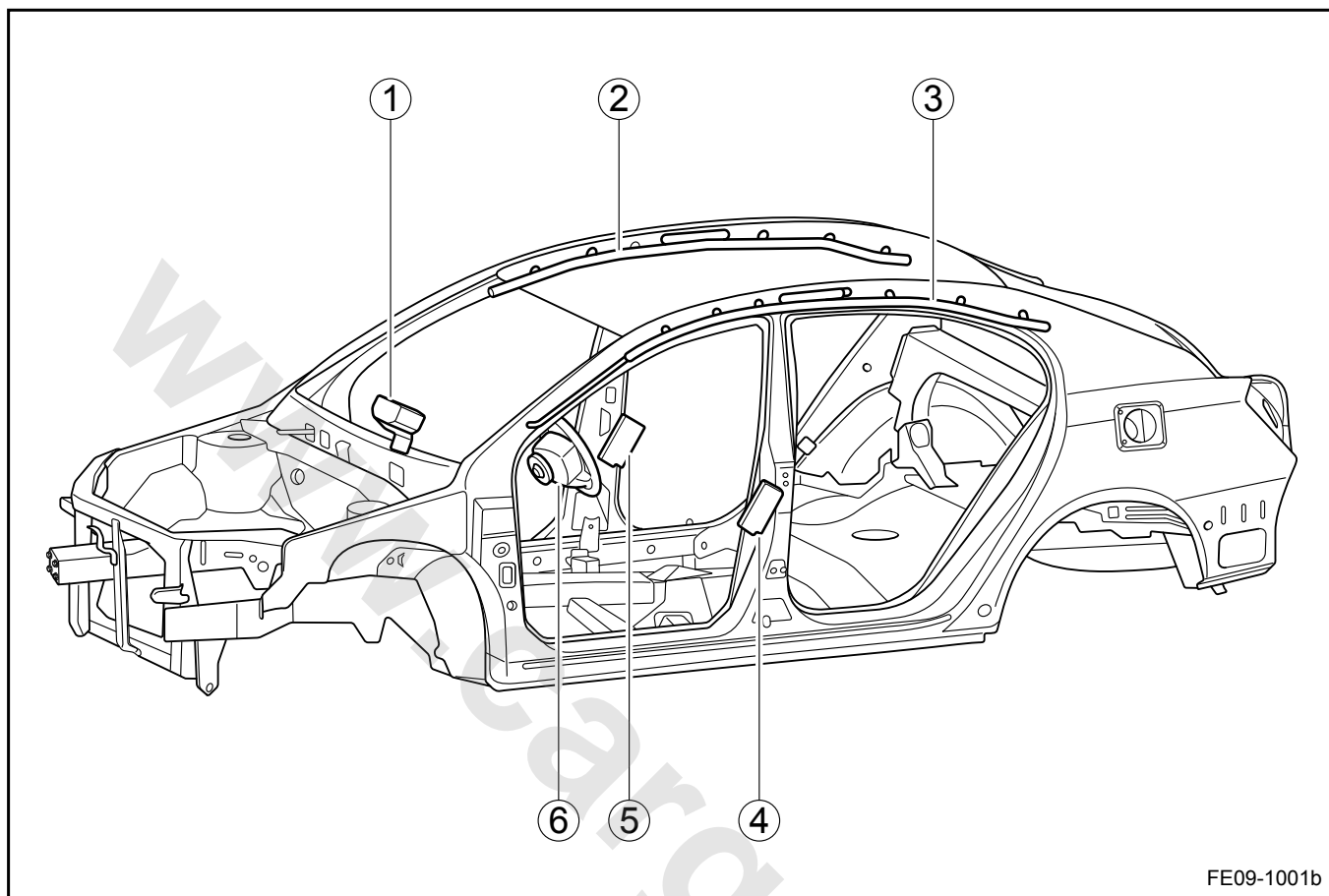
Airbag system connects sensors, the control unit, inflatable modules, airbag deployment circuits and CAN bus serial data circuits together through the waterproof harness. The airbag system deployment circuit connectors are yellow to facilitate identify them. For airbag system wiring harness repair, please refer to the appropriate testing and repair procedures in this manual.

## Steering Wheel and Steering Column

The steering wheel and steering column have adopted energy-absorbing designs to absorb energy when the driver and the steering wheel come into contact. When a vehicle front collision happens, the driver may be contacted directly with the steering wheel, or the impact will be loaded into the steering wheel and steering column. The steering column will shrink down to absorb some of the collision energy, thereby help to reduce the driver personal injury. After a collision, you must check the steering wheel and steering column damage.

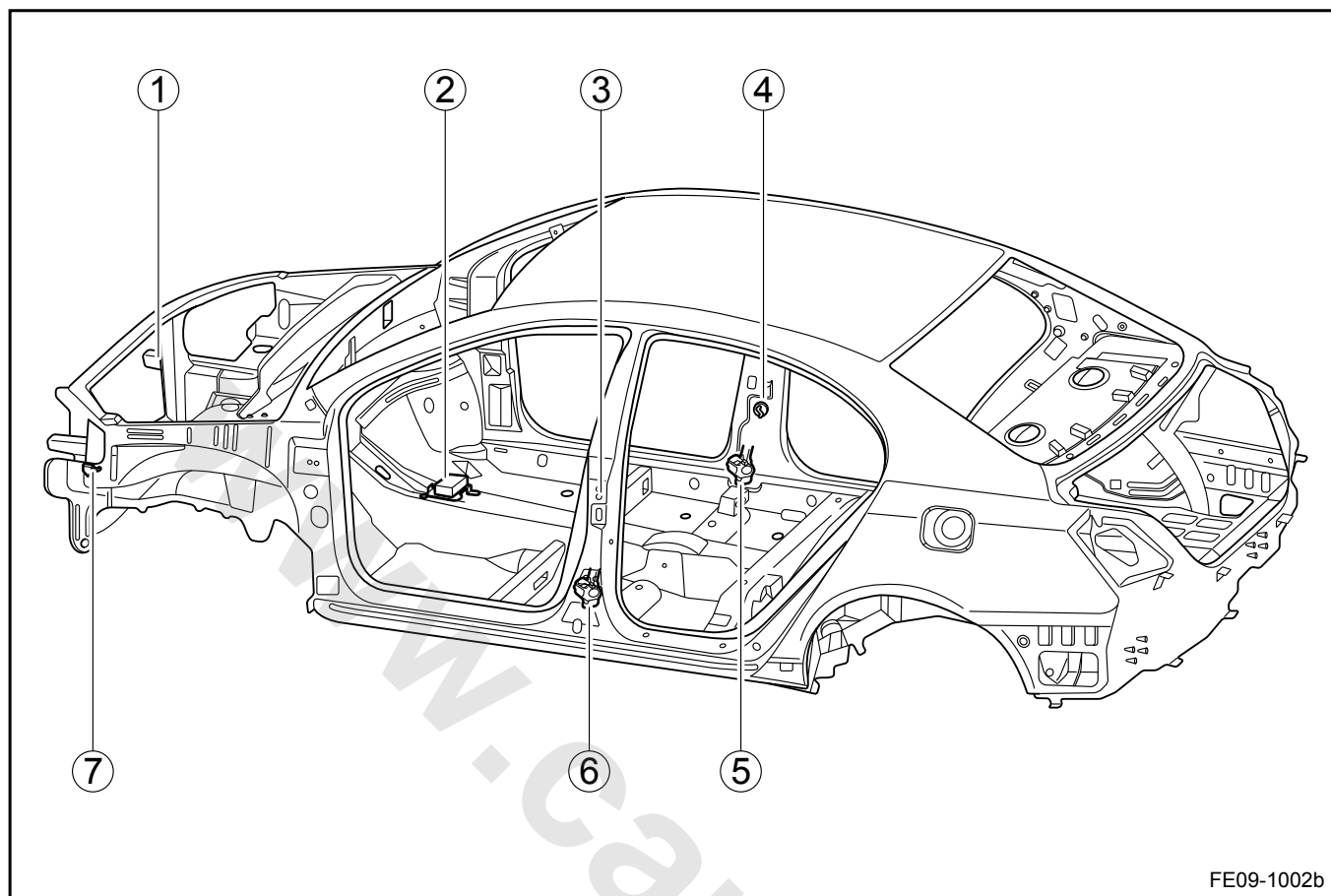
## 9.2.4 Component Locator

### 9.2.4.1 Component Locator



#### Legend

- |  |   |
|--|---|
| 1. Passenger Front Airbag                            | 5. Passenger Side Airbag (Located inside the seat back) |
| 2. Passenger Curtain Airbag                          | 6. Driver Side Airbag and Clock Spring                  |
| 3. Driver Curtain Airbag                             |   |
| 4. Driver Side Airbag (Located inside the seat back) |   |

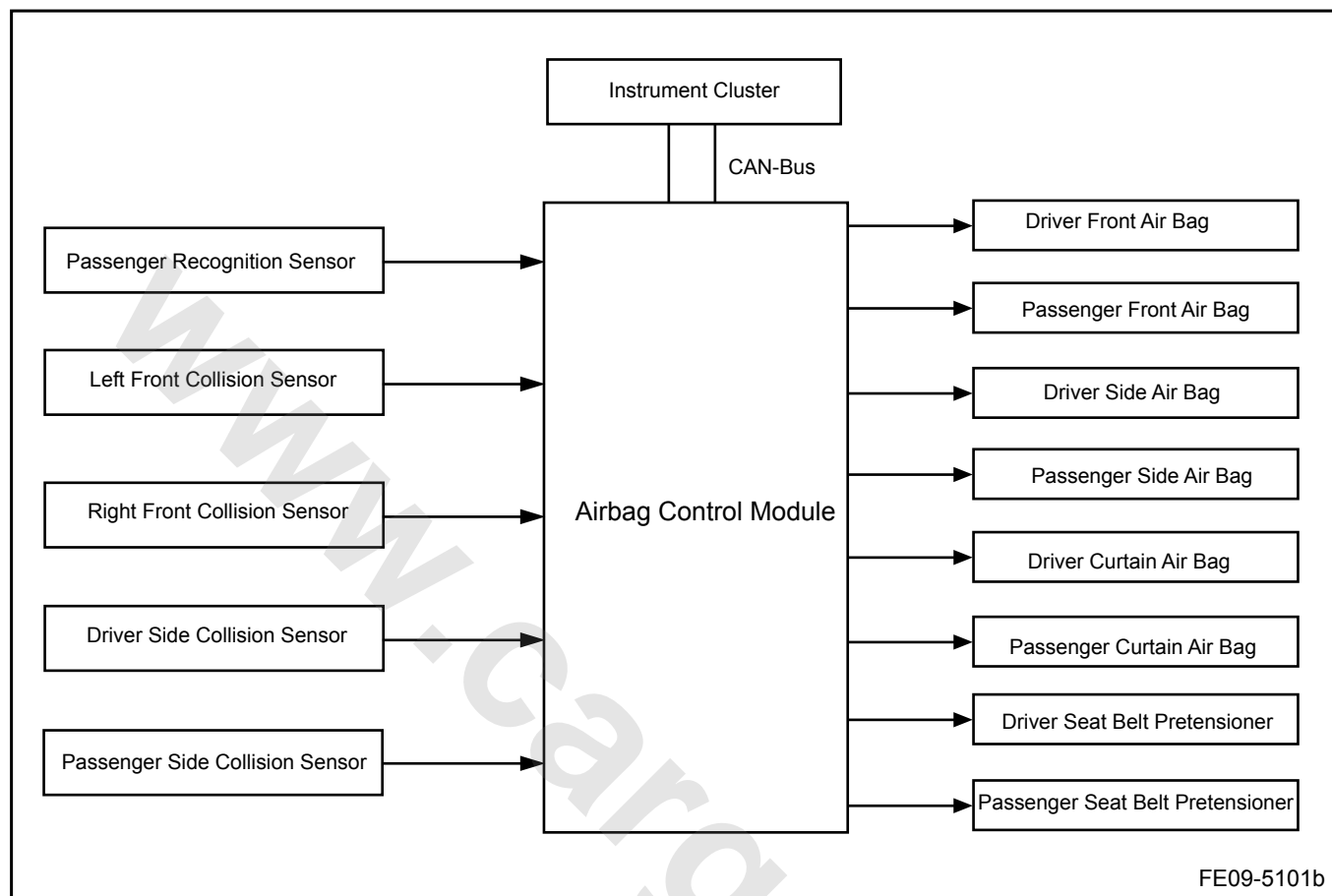


#### Legend

- |                                     |                                  |
|-------------------------------------|----------------------------------|
| 1. Front Collision Sensor (Right)   | 6. Driver Seat Belt Pretensioner |
| 2. Airbag Control Module            | 7. Front Collision Sensor (Left) |
| 3. Driver Side Collision Sensor     |                                  |
| 4. Passenger Side Collision Sensor  |                                  |
| 5. Passenger Seat Belt Pretensioner |                                  |

## 9.2.5 Schematic

### 9.2.5.1 Schematic



## 9.2.6 Diagnostic Information and Procedures

### 9.2.6.1 Visual Inspection

#### — Confirm Fault Symptoms

During diagnostic, the most difficult situation is that there is not any symptom. In this case, the technician must thoroughly analyze the described fault, and then simulate the conditions and the environment when the fault occurs. Even for a very experienced technician, if the fault system has not been confirmed before the diagnostic, it is likely to ignore a number of important things, and misjudge a fault, which will lead to diagnostic failure.

#### — Check the easy to access system components to identify whether there is a significant damage or potential failure.

#### — Connectors and vibration pivot joints should be thoroughly examined. If it is a vibration caused fault, it is recommended to use vibration method.

1. With a finger to gently shake the possible faulty part and inspect for malfunction.
2. Shake the connector vertically and horizontally gently.
3. Shake the wiring harness vertically and horizontally gently.

### 9.2.6.2 Fault Diagnostic Code (DTC) Table

#### Airbag Control Module Status

DTC Code	Description
B1021	Driver Front Airbag Circuit Short To GND
B1026	Passenger Front Airbag Circuit Short To GND
B1031	Driver Seat Belt Circuit Short To GND
B1036	Passenger Seat Belt Circuit Short To GND
B1041	Driver Side Airbag Circuit Short To GND
B1046	Passenger Side Airbag Circuit Short To GND
B1051	Driver Curtain Airbag Circuit Short To GND
B1056	Passenger Curtain Airbag Circuit Short To GND
B1022	Driver Front Airbag Circuit Short To + B
B1027	Passenger Front Airbag Circuit Short To + B
B1032	Driver Seat Belt Circuit Short To + B
B1037	Passenger Seat Belt Circuit Short To + B
B1042	Driver Side Airbag Circuit Short To + B
B1047	Passenger Side Airbag Circuit Short To + B
B1052	Driver Curtain Airbag Circuit Short To + B
B1057	Passenger Curtain Airbag Circuit Short To + B
B1023	Driver Front Airbag Low Resistance
B1028	Passenger Front Airbag Low Resistance
B1033	Driver Seat Belt Low Resistance

DTC Code	Description
B1038	Passenger Seat Belt Low Resistance
B1043	Driver Side Airbag Low Resistance
B1048	Passenger Side Airbag Low Resistance
B1053	Driver Curtain Airbag Low Resistance
B1058	Passenger Curtain Airbag Low Resistance
B1024	Driver Front Airbag High Resistance
B1029	Passenger Front Airbag High Resistance
B1034	Driver Seat Belt High Resistance
B1039	Passenger Seat Belt High Resistance
B1044	Driver Side Airbag High Resistance
B1049	Passenger Side Airbag High Resistance
B1054	Driver Curtain Airbag High Resistance
B1059	Passenger Curtain Airbag High Resistance
B1025	Driver Front Airbag Configuration Error
B102A	Passenger Front Airbag Configuration Error
B1035	Driver Seat Belt Configuration Error
B103Ax	Driver Side Airbag Configuration Error
B1045	Driver Side Airbag Configuration Error
B104A	Passenger Side Airbag Configuration Error
B1055	Driver Curtain Airbag Configuration Error
B105A	Passenger Curtain Airbag Configuration Error
B1071	Left Front Collision Sensor Voltage Error
B1076	Right Front Collision Sensor Voltage Error
B1081	Driver Side Collision Sensor Voltage Error
B1086	Passenger Side Collision Sensor Voltage Error
B1072	Left Front Collision Sensor Circuit Open
B1077	Right Front Collision Sensor Circuit Open
B1082	Driver Side Collision Sensor Circuit Open
B1087	Passenger Side Collision Sensor Circuit Open
B1074	Left Front Collision Sensor Configuration Error
B1079	Right Front Collision Sensor Configuration Error
B1084	Driver Side Collision Sensor Configuration Error



DTC Code	Description
B1089	Passenger Side Collision Sensor Configuration Error
B1074	Left Front Collision Sensor Sampling Error
B1079	Right Front Collision Sensor Sampling Error
B1084	Driver Side Collision Sensor Sampling Error
B1089	Passenger Side Collision Sensor Sampling Error
B1012	Battery Voltage Too High
B1011	Battery Voltage Too Low
B1075	Left Front Collision Sensor Saturation Error
B107A	Right Front Collision Sensor Saturation Error
B1085	Driver Side Collision Sensor Saturation Error
B108A	Passenger Side Collision Sensor Saturation Error
B1075	Left Front Collision Sensor Error
B107A	Right Front Collision Sensor Error
B1085	Driver Side Collision Sensor Error
B108A	Passenger Side Collision Sensor Error
B1073	Left Front Collision Sensor Communication Error
B1078	Right Front Collision Sensor Communication Error
B1083	Driver Side Collision Sensor Communication Error
B1088	Passenger Side Collision Sensor Communication Error
B1002	Driver Front Airbag Deployment
B1003	Passenger Front Airbag Deployment
B1006	Driver Side Airbag Deployment
B1007	Passenger Side Airbag Deployment
B1004	Driver Seat Belt Deployment
B1005	Passenger Seat Belt Deployment
B1008	Driver Curtain Airbag Deployment
B1009	Passenger Curtain Airbag Deployment
U1603	CAN Bus Interrupted
U1100	CAN ABS Data Lost
U1130	CAN EMS Data Lost



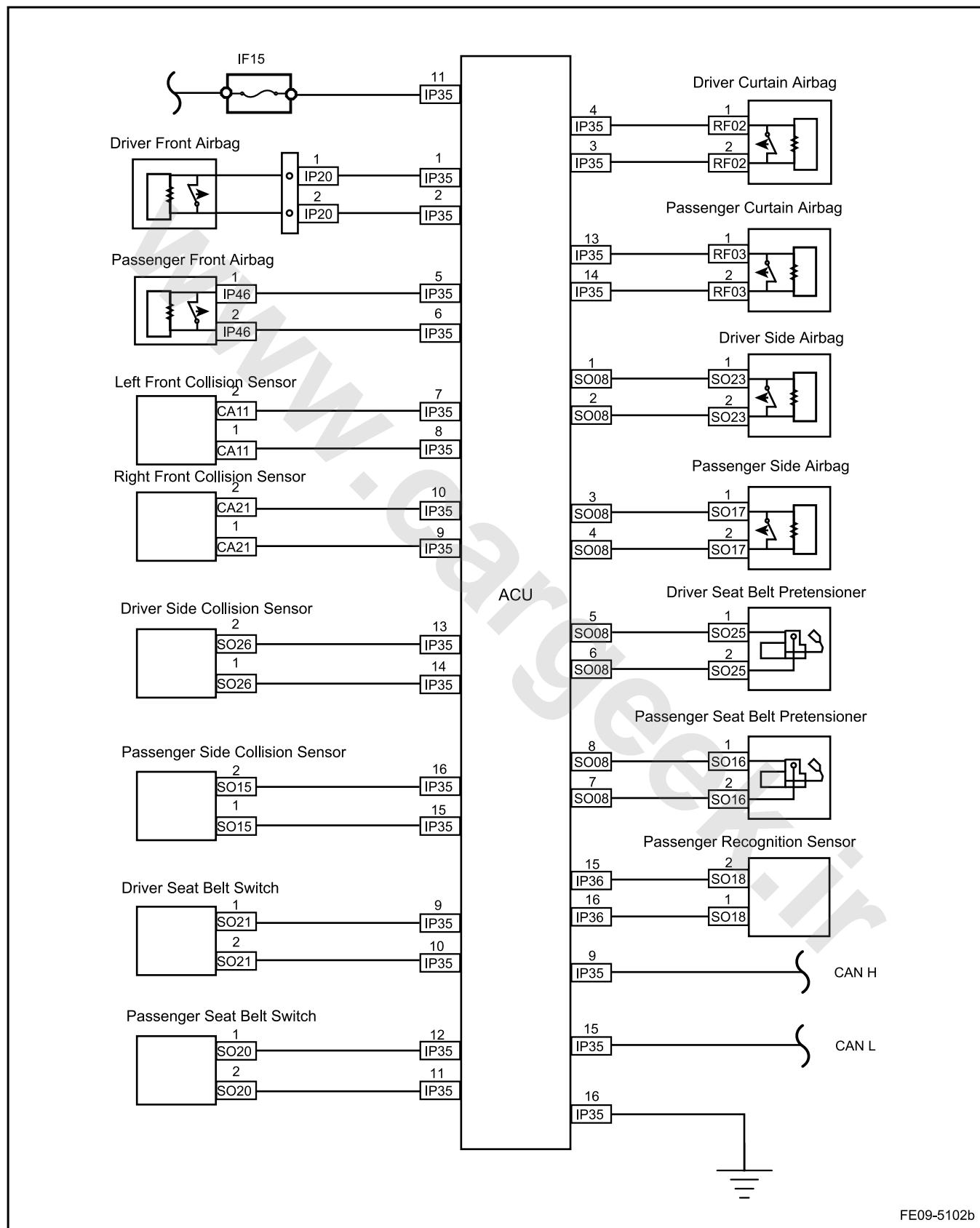
### 9.2.6.3 Scan tool and the vehicle can not communicate

Connect scan tool to the datalink connector (DLC Data Link Connector) and turn the ignition switch to "ON" position. Operate scan tool, if the display shows the communication error message, then the vehicle or the scan tool is faulty.

- If the scan tool can communicate with another vehicle, then check the DLC Data Link Connector. Refer to relevant content in [2.2.7.2 Control System Check](#).
- If the scan tool can not communicate with other vehicles, then the scan tool may be faulty. Please refer to the scan tool manual or consult the manufacturer.

## 9.2.6.4 Warning lamp Always On

Schematic:





Yes

Step 5 Check the wiring harness (instrument cluster power, ground).

Instrument Cluster Harness Connector IP03

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE09-5105b

- (a) Disconnect the battery negative cable and wait for at least 90s. Refer to [2.11.8.1 Battery Disconnection](#).
- (b) Disconnect the instrument cluster connector IP03.
- (c) Connect the battery negative cable and wait for at least 2s. Refer to [2.11.8.1 Battery Disconnection](#).
- (d) Turn the ignition switch to "ON" position.
- (e) Measure voltage between IP03 terminals No.24,32 and the body ground respectively with a multimeter.  
Standard Voltage: 11-14 V
- (f) Turn the ignition switch to "OFF" position.
- (g) Measure resistance between IP03 terminals No.15,16 and the body ground respectively with a multimeter.  
Standard Resistance: Less than 1  $\Omega$

Data Normal?

No

Repair or replace the wiring harness. Go to step 8

Yes

Step 6 Replace the instrument cluster.

- (a) Replace the instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#).
  - (b) Connect the battery negative cable and wait for at least 2s. Refer to [2.11.8.1 Battery Disconnection](#).
  - (c) Turn the ignition switch to "ON" position.
  - (d) Check the airbag warning lamp status.
- Is the airbag warning lamp still on after the ignition is off?

No

System normal

Yes

Step 7 Replace the airbag control module.

- (a) Replace the airbag control module. Refer to [9.2.7.1 Airbag Control Module Replacement](#).

Next

Step 8 Confirm the repair has been completed.

- (a) Turn the ignition switch to "ON" position and observe the warning lamp status to confirm the system is normal.
- (b) Use scan tool to check whether there is a historical fault and clear the historical DTC code.

### 9.2.6.5 SRS warning lamp always off

Schematic:

Refer to [9.2.6.4 Warning lamp Always On](#) in the schematic.

Diagnostic Steps:

Step 1	Check the battery.
--------	--------------------

(a) Measure the battery voltage.  
Standard Voltage: 11-14 V  
Is the voltage specified value?

No → Check and replace the battery or the charging system. Go to step 5

Yes →

Step 2	Check the instrument cluster connector.
--------	---

(a) Turn the ignition switch to "OFF" position.  
(b) Disconnect the battery negative cable and wait for at least 90s. Refer to [2.11.8.1 Battery Disconnection](#).  
Are the connectors properly connected to the instrument cluster?

No → Properly connect the connector. Go to step 5

Yes →

Step 3	Check the wiring harness (instrument cluster power and ground).
--------	---

Instrument Cluster Harness Connector IP03

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE09-5105b

(a) Turn the ignition switch to "OFF" position.  
(b) Disconnect the instrument cluster connector IP03.  
(c) Turn the ignition switch to "ON" position.  
(d) Measure voltage between connector IP03 terminals No. 24,32 and the body ground respectively with a multimeter.  
Standard Voltage: 11-14 V  
(e) Turn the ignition switch to "OFF" position.  
(f) Measure resistance between connector IP03 terminals No. 15,16 and the body ground respectively with a multimeter.  
Standard Resistance: Less than 1 Ω  
Are the voltage and resistance specified values?

No → Check the fuses, repair or replace the wiring harness. Go to step 5

Yes →

Step 4	Replace the instrument cluster.
--------	---------------------------------

(a) Replace the instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#).

Next

Step 5	Confirm the repair has been completed.
--------	--

- (a) Turn the ignition switch to "ON" position, observe the warning lamp status to confirm that the system is normal.
- (b) Use scan tool to check whether there is a historical failure and clear the historical DTC code.

### 9.2.6.6 Relevant DTC Code Diagnostic

#### Collision Sensor Malfunction

##### Note

This workshop manual only diagnoses the left front collision sensor, other sensors diagnostics are similar. Please refer to "Left Front Collision Sensor Diagnostic".

#### Left Front Collision Sensor

DTC Code	Description	Diagnostic
B1071	Left Front Collision Sensor Voltage Error	<ol style="list-style-type: none"> <li>1. Turn the ignition switch to OFF, disconnect the battery negative cable and wait for 90s and above, re-connect the battery negative cable.</li> <li>2. Check whether there is a fault. If the fault still exists, replace the sensor. Refer to <a href="#">9.2.7.6 Front Collision Sensor Replacement</a>.</li> </ol>
B1072	Left Front Collision Sensor Circuit Open	<ol style="list-style-type: none"> <li>1. Check whether the circuit between the airbag control module and the sensor wiring harness is open. Otherwise repair the fault part.</li> <li>2. Check whether the wiring harness connector is connected properly. Otherwise properly connect the harness connector.</li> </ol>
B1073	Left Front Collision Sensor Communication Error	Check whether the sensor signal pin and ground and the airbag control module definition pin is connected correctly. If the connection is not correct, replace the wiring harness.
B1074	Left Front Collision Sensor Configuration Error, Sampling Error	Replace the sensors. Refer to <a href="#">9.2.7.6 Front Collision Sensor Replacement</a> .
B1075	Left Front Collision Sensor Saturation Error, Left Front Collision Sensor Error	<ol style="list-style-type: none"> <li>1. Measure the ECU power supply voltage. If the voltage does not meet the requirements, check the charging system. Refer to <a href="#">2.11.7 Diagnostic Information and Procedures</a>.</li> <li>2. If the voltage is normal, replace the sensor. Refer to <a href="#">9.2.7.6 Front Collision Sensor Replacement</a>.</li> </ol>

Schematic:

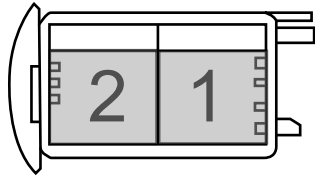
Refer to [9.2.6.4 Warning lamp Always On](#) in the schematic.

Diagnostic Steps:

Step 1	Check the wiring harness (airbag control module power supply, ground).
--------	--



Left Front Collision Sensor Harness  
Connector CA11



FE09-5110b

Yes

Step 4 Check the left front collision sensor wiring harness (if short circuit between lines).

- (a) Measure resistance between connector CA11 terminals No. 1 and 2 with a multimeter.

Standard Resistance: 10 kΩ or higher

Is the resistance specified value?

No

Replace the harness

Yes

Step 5 Check the left front collision sensor wiring harness (whether the circuit is short to ground).

- (a) Measure resistance between CA11 terminal No.1 and the vehicle body ground with a multimeter.

- (b) Measure resistance between CA11 terminal No.2 and the vehicle body ground with a multimeter.

Standard Resistance: 10 kΩ or higher

Is the resistance specified value?

No

Replace the harness

Yes

Step 6 Check the left front collision sensor wiring harness (short to power supply).

- (a) Connect the battery negative cable and wait for at least 2s.

- (b) Turn the ignition switch to "ON".

- (c) Measure voltage between CA11 terminals No.1 and 2 respectively and the body ground with a multimeter.

Standard Voltage: Less than 1 V

Is the voltage specified value?

No

Replace the harness



Yes

Step 7	Replace the left front collision sensor.
--------	--

(a) Disconnect the battery negative cable and wait for at least 90s. Refer to [2.11.8.1 Battery Disconnection](#).

(b) Replace the driver front collision sensor. Refer to [9.2.7.6 Front Collision Sensor Replacement](#).

Is the system working properly?

Yes

System normal

No

Step 8	Replace the airbag control module.
--------	------------------------------------

(a) Replace the airbag control module. Refer to [9.2.7.1 Airbag Control Module Replacement](#).

(b) Confirm the repair completed.

Next

Step 9	System normal.
--------	----------------

## Actuator Malfunction

### Note

The workshop manual only diagnoses the driver airbag and driver seat belt pretensioner, the rest actuators diagnostics are similar. Please refer to "Driver airbag and driver seat belt pretensioner Diagnostic".

### Driver Airbag Malfunction

DTC Code	Description
B1021	Driver Front Airbag Short To GND
B1022	Driver Front Airbag Short To + B
B1023	Driver Front Airbag Low Resistance
B1024	Driver Front Airbag High Resistance
B1025	Driver Front Airbag Configuration Error

Schematic:

Refer to [9.2.6.4 Warning lamp Always On](#) in the schematic.

Diagnostic Steps:

Step 1	Check the wiring harness (Airbag Control Module - power, ground).
--------	---



- (e) Measure resistance between airbag control module IP35 Terminal No.1 and 2 and the airbag wiring harness connector with a multimeter.  
Standard Resistance: Less than 1  $\Omega$
- (f) Measure resistance between airbag control module IP35 terminal No.1 and terminal No.2 with a multimeter.  
Standard Resistance: 10 k $\Omega$  or higher
- (g) Connect the battery negative cable and wait for at least 2s.
- (h) Turn the ignition switch to "ON".
- (i) Measure voltage between airbag control module IP35 terminal No.1,2 and the body ground with a multimeter.  
Standard Voltage: Less than 1 V

Are measured values specified values?

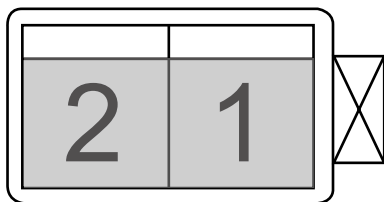
Yes

Go to step 6

No

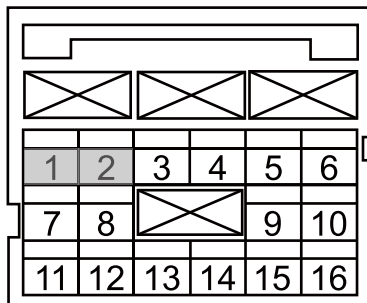
Step 4 Check the wiring harness between the clock spring and the airbag control module.

Clock Spring 2 Harness Connector IP20



FE09-5111b

Airbag Control Module 1 Harness Connector IP35



FE09-5112b

- (a) Disconnect the clock spring harness connector IP20.
- (b) Measure resistance between harness connector IP20 terminal No.1 and IP35 terminal No.2 with a multimeter. Measure resistance between harness connector IP20 terminal No.2 and IP35 terminal No.1 with a multimeter (Check for open circuit).  
Standard Resistance: Less than 1  $\Omega$
- (c) Measure resistance between harness connector IP20 terminal No.1 and No.2 with a multimeter (Check for short circuit).  
Standard Resistance: 10 k $\Omega$  or higher
- (d) Measure resistance between harness connector IP20 terminal No.1,2 and the body ground with a multimeter (Check for short to ground).  
Standard Resistance: 10 k $\Omega$  or higher
- (e) Connect the battery negative cable and wait for at least 2s. Refer to [2.11.8.1 Battery Disconnection](#).
- (f) Turn the ignition switch to "ON".
- (g) Measure voltage between harness connector IP20 terminal No.1,2 and the body ground with a multimeter (Check for short to power supply).  
Standard Voltage: Less than 1 V

Are measured values specified values?

No

Replace the IP20 wiring harness.

Yes

Step 5	Replace the clock spring.
--------	---------------------------

- (a) Replace the clock spring. Refer to [9.2.7.3 Clock Spring Replacement](#).
- (b) Connect various connectors.
- (c) Connect the battery negative cable and wait for at least 2s. Refer to [2.11.8.1 Battery Disconnection](#).
- (d) Turn the ignition switch to "ON".
- (e) Connect scan tool to clear stored DTC.
- (f) Read the DTC.

DTC exist?

No

System normal

Yes

Step 6	Replace driver front airbag.
--------	------------------------------

- (a) Connect the clock spring and airbag control unit harness connector.
- (b) Replace driver front airbag.
- (c) Connect the battery negative cable and wait for at least 2s.
- (d) Turn the ignition switch to "ON".
- (e) Connect scan tool to clear stored DTC.

DTC exist?

No

System normal

Yes

Step 7	Replace the airbag control module.
--------	------------------------------------

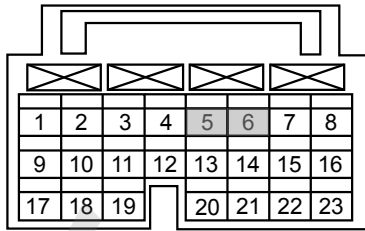
- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the battery negative cable and wait for at least 90s. Refer to [2.11.8.1 Battery Disconnection](#).
- (c) Replace the airbag control module. Refer to [9.2.7.1 Airbag Control Module Replacement](#).
- (d) Connect the battery negative cable and wait for at least 2s. Refer to [2.11.8.1 Battery Disconnection](#).
- (e) Turn the ignition switch to "ON".
- (f) Connect scan tool to clear the stored DTC.
- (g) Confirm the repair completed.

Next

Step 8	System normal.
--------	----------------

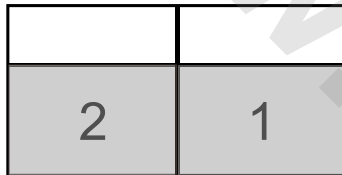


Airbag Control Module 2 Harness Connector SO08



FE09-5113b

Driver Seat Belt Pretensioner Harness Connector SO25



E09-5114b

- Disconnect the battery negative cable and wait for 90s and above. Refer to [2.11.8.1 Battery Disconnection](#).
- Disconnect the airbag control module harness connector SO08.

**Note**

Before measure, please remove the airbag control module harness connector SO08 terminal No.5,6 short films. Before installing the wiring harness connector, install the short films first.

- Disconnect the driver seat belt pretensioner wiring harness connector SO25.
- Measure resistance between connector SO08 terminals No. 5 and connector SO25 terminal No.1 with a multimeter. Measure resistance between connector SO08 terminals No. 6 and connector SO25 terminal No.2 with a multimeter (Check for open circuit).  
Standard Resistance: Less than 1  $\Omega$
- Measure resistance between connector SO08 terminal No.5 and terminal No.6 with a multimeter (Check for short circuit).  
Standard Resistance: 10 k $\Omega$  or higher
- Measure resistance between connector SO08 terminal No.5 and and the body with a multimeter. Measure resistance between connector SO08 terminal No.6 and and the body with a multimeter (Check for short to body ground).  
Standard Value: 10 k $\Omega$  or higher
- Connect the battery negative cable and wait for a moment.
- Turn the ignition switch to "ON".
- Measure voltage between connector SO08 terminal No.5 and and the body with a multimeter. Measure voltage between connector SO08 terminal No.6 and and the body with a multimeter (Check for short to power supply).  
Standard Voltage: Less than 1 V

Are measured values specified values?

No

Replace the harness

Yes

Step 4

Replace the driver seat belt retractor.

- Disconnect the battery negative cable and wait for at least 90s. Refer to [2.11.8.1 Battery Disconnection](#).
- Replace the driver seat belt retractor. Refer to [9.3.7.3 Front Seat Belt Retractor Replacement](#).
- Install short films and connect the wiring harness connector.
- Connect the battery negative cable and wait for at least 2s. Refer to [2.11.8.1 Battery Disconnection](#).
- Turn the ignition switch to "ON".
- Connect scan tool to clear stored DTC.
- Read the DTC,.

DTC exist?

No

System normal

Yes

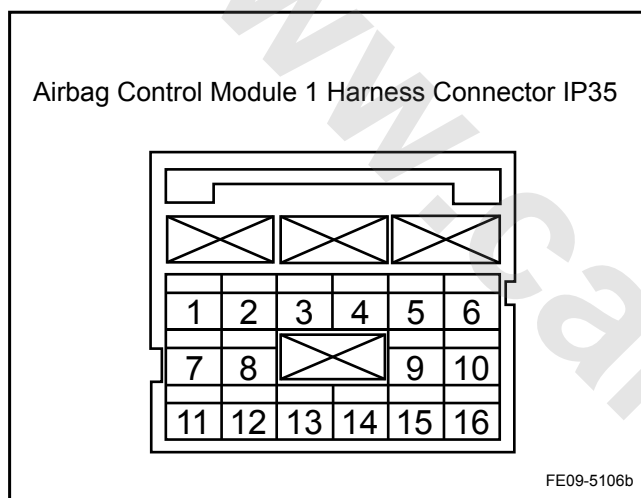
Step 5 Replace the airbag control module.

- (a) Replace the airbag control module. Refer to [9.2.7.1 Airbag Control Module Replacement](#).
- (b) Confirm the repair completed.

Next

Step 6 System normal.

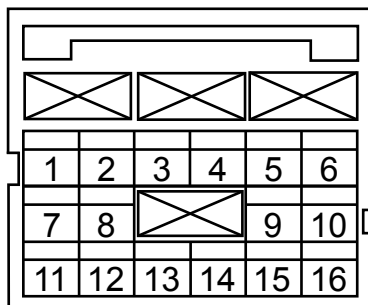
### 9.2.6.7 Airbag Control Module Terminal Table



Terminal ID	Name	Wiring	Terminal Descriptions	Status	Specified Conditions
1	Driver Front Airbag Positive	0.5 G/R	Loop Resistance 1.8-2.4 Ω	Normal	Working Voltage 12 V, Initiation Point Current 1.2 A, Duration 2 ms
2	Driver Front Airbag Negative	0.5 B/R			
3	Driver Curtain Airbag Negative	0.5 B/R	Loop Resistance 1.8-2.4 Ω	Normal	Working Voltage 12 V, Initiation Point Current 1.2 A, Duration 2 ms
4	Driver Curtain Airbag Positive	0.5 G/O			
5	Passenger Front Airbag Positive	0.5 G/W	Loop Resistance 1.8-2.4 Ω	Normal	Working Voltage 12 V, Initiation Point Current 1.2 A, Duration 2 ms
6	Passenger Airbag Negative	0.5 B/W			
7	--	--	--	--	--
8	--	--	--	--	--

Terminal ID	Name	Wiring	Terminal Descriptions	Status	Specified Conditions
9	CAN_H	0.5 L/B	Can Bus Communication High Voltage	Normal	Protocol KWP2000
10	--	--	--	--	--
11	IG2	0.5 G/O	Power Supply	Ignition Switch "ON"	Battery Voltage
12	--	--	--	--	--
13	Passenger Curtain Airbag Positive	0.5 G/L	Loop Resistance 1.8-2.4 $\Omega$	Normal	Working Voltage 12 V, Initiation Point Current 1.2 A, Duration 2 ms
14	Passenger Curtain Airbag Negative	0.5 B/L			
15	CAN_L	0.5 Gr/O	Can Bus Communication, Low Voltage	Normal	Protocol KWP2000
16	Ground	0.5 B	Body Ground	Always	Ground

Airbag Control Module 3 Harness Connector IP36

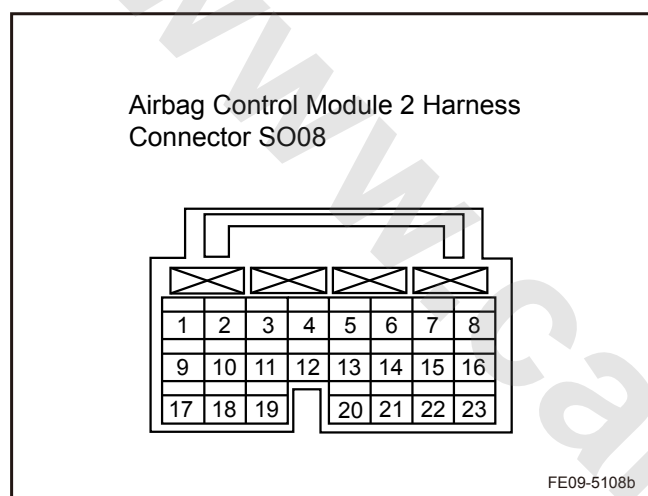


FE09-5107b

Terminal ID	Name	Wiring	Terminal Descriptions	Status	Specified Conditions
1	--	--	--	--	--
2	--	--	--	--	--
3	--	--	--	--	--
4	--	--	--	--	--
5	--	--	--	--	--
6	--	--	--	--	--



Terminal ID	Name	Wiring	Terminal Descriptions	Status	Specified Conditions
7	Left Front Collision Sensor Positive	0.5 W	Real-Time Continuous Transfer Acceleration Value	Normal	Working Voltage 5.5-6.5 V
8	Left Front Collision Sensor Negative	0.5 BR			
9	Right Front Collision Sensor Negative	0.5 BR/W	Real-Time Continuous Transfer Acceleration Value	Normal	Working Voltage 5.5-6.5 V
10	Right Front Collision Sensor Positive	0.5 W/V			



Terminal ID	Name	Wiring	Terminal Descriptions	Status	Specified Conditions
1	Driver Front Airbag Positive	0.5 G/B	Normal Loop Resistance 1.8-2.4 $\Omega$	Normal	Working Voltage 12 V, Initiation Point Current 1.2 A, Duration 2 ms
2	Driver Front Airbag Negative Side	0.5 B/G	Normal Loop Resistance 1.8-2.4 $\Omega$	Normal	Working Voltage 12 V, Initiation Point Current 1.2 A, Duration 2 ms
3	Passenger Front Airbag Negative	0.5 B/W	Normal Loop Resistance 1.8-2.4 $\Omega$	Normal	Working Voltage 12 V, Initiation Point Current 1.2 A, Duration 2 ms
4	Passenger Front Airbag Positive	0.5 G/W			
5	Driver Seat Belt Pretensioner Positive	0.5 G/L	Normal Loop Resistance 1.8-2.3 $\Omega$	Normal	Working Voltage 12 V, Initiation Point Current 1.2 A, Duration 2 ms
6	Driver Seat Belt Pretensioner Negative	0.5 B/L			

Terminal ID	Name	Wiring	Terminal Descriptions	Status	Specified Conditions
7	Passenger Seat Belt Pretensioner Negative	0.5 B/R	Normal Loop Resistance 1.8-2.3 $\Omega$	Normal	Working Voltage 12 V, Initiation Point Current 1.2 A, Duration 2 ms
8	Passenger Seat Belt Pretensioner Positive	0.5 G/O			
9	Driver Seat Belt Buckle Positive	0.5 W	Normally Closed	-	-
10	Driver Seat Belt Buckle Negative	0.5 G		-	-
11	Passenger Seat Belt Buckle Negative	0.5 G/R	Normally Closed	-	-
12	Passenger Seat Belt Buckle Positive	0.5 W/B		-	-
13	Driver Side Collision Sensor Positive	0.5 W	Real-Time Continuous Transfer Acceleration Value	Normal	Working Voltage 5.5-6.5 V
14	Driver Side Collision Sensor Negative	0.5 BR			
15	Passenger Side Collision Sensor Negative	0.5 BR/W	Real-Time Continuous Transfer Acceleration Value	Normal	Working Voltage 5.5-6.5 V
16	Passenger Side Collision Sensor Positive	0.5 W/V			
17	--	--	--	--	--
18	--	--	--	--	--
19	--	--	--	--	--
20	--	--	--	--	--
21	--	--	--	--	--
22	--	--	--	--	--
23	--	--	--	--	--

## 9.2.7 Removal and Installation

### 9.2.7.1 Airbag Control Module Replacement

#### Removal Procedure

#### Warning!

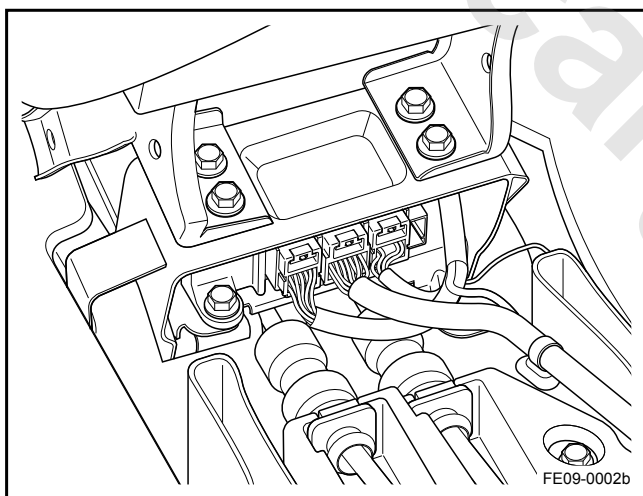
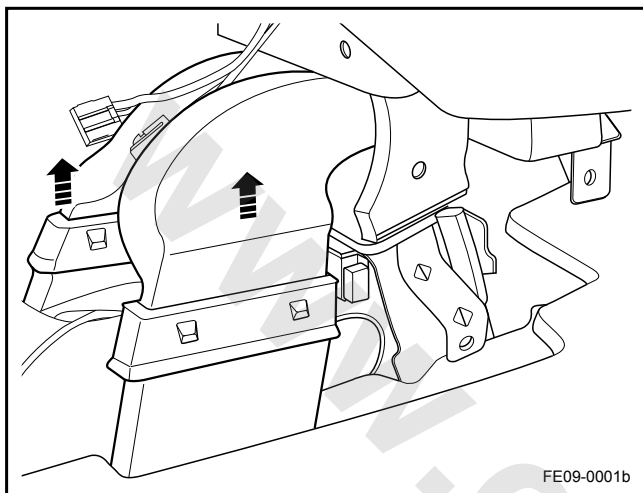
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).

#### Note

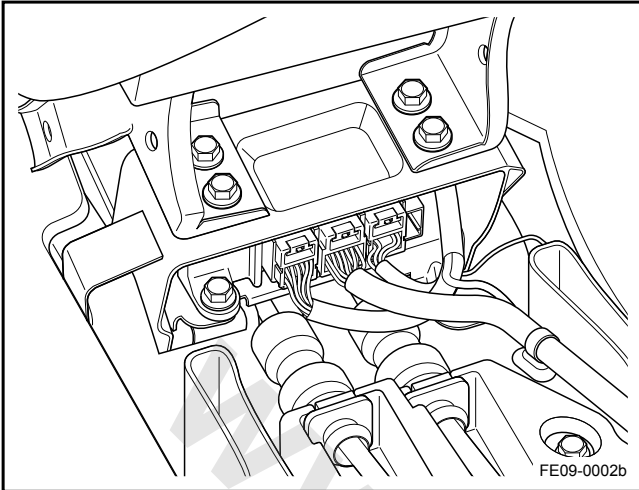
Start removal 90s after the battery negative is disconnected.

2. Remove the center console cup holder. Refer to [3.3.8.9 Shift Lever Replacement](#).
3. Remove the rear air duct.
4. Remove the airbag control module retaining bolts.
5. Disconnect the airbag control module wire harness connector and remove the airbag control module.

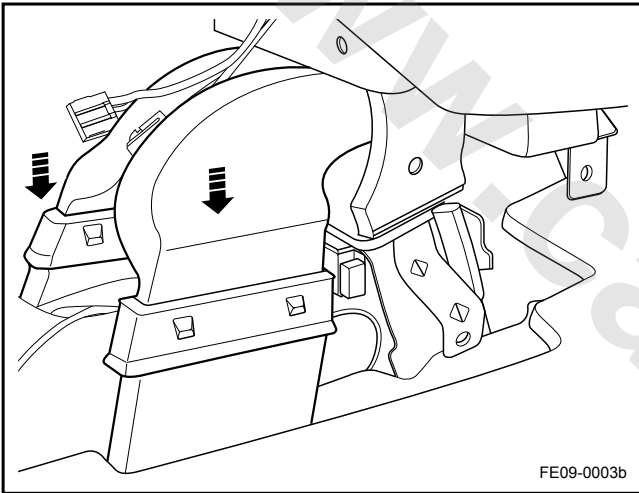


## Installation Procedure:

1. Install the airbag control module retaining bolts.  
Torque: 8 Nm (Metric) 5.9 lb-ft (US English)
2. Connect the airbag control module wiring harness connector.



3. Install the rear air duct.
4. Install the center console cup holder.
5. Connect the battery negative cable.

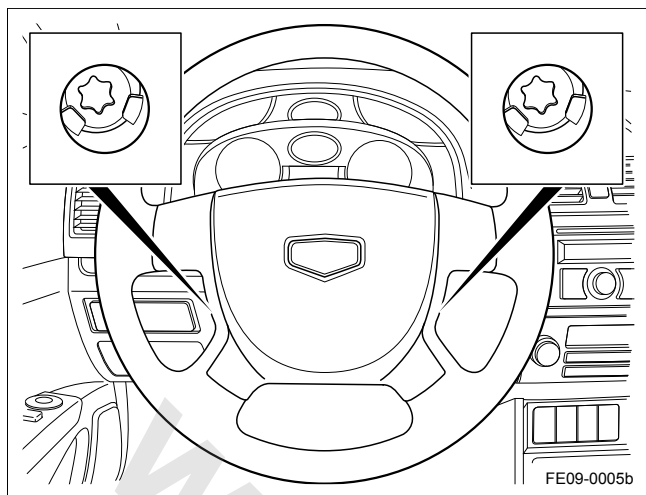


## 9.2.7.2 Driver Front Airbag Replacement

## Removal Procedure

## Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).

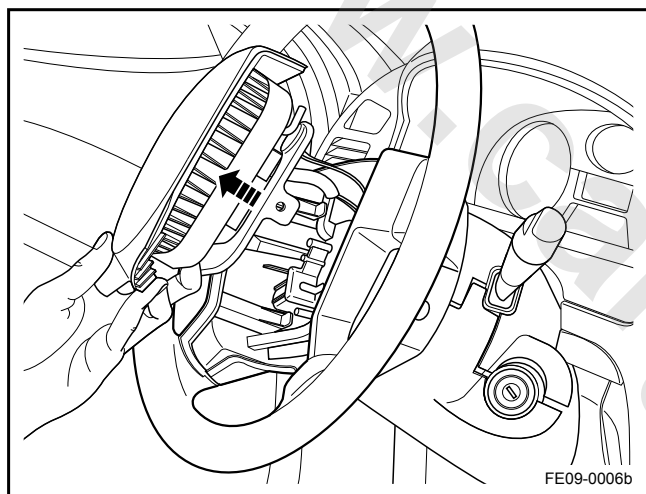
**Note**

Start removal 90s after the battery negative is disconnected.

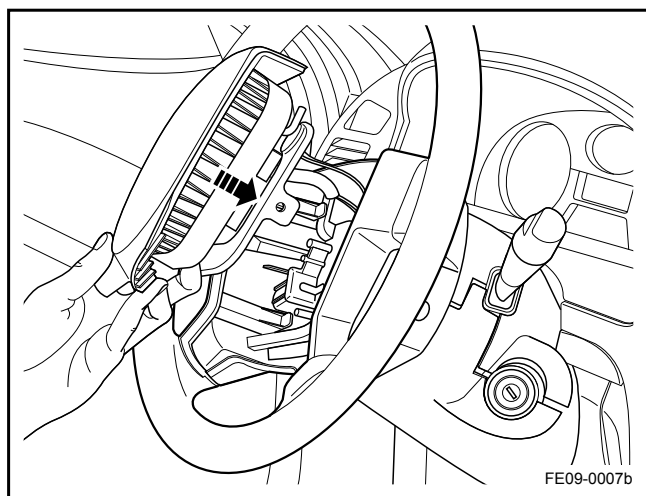
2. Remove the driver front airbag retaining screws on both sides.

**Warning!**

Refer to "Supplement Protection System Warning" in "Warnings and Notices".



3. Disconnect the clock spring and the driver front airbag wiring harness connector.
4. Disconnect the horn wiring harness connector and remove the driver front airbag.

**Installation Procedure:**

1. Connect the horn harness connector and the clock spring harness connector.
2. Tighten the driver front airbag retaining screws. Before tightening the retaining screws, preload the retaining screws first.  
Torque: 9 Nm (Metric) 6.6 lb-ft (US English)
3. Connect the battery negative cable.

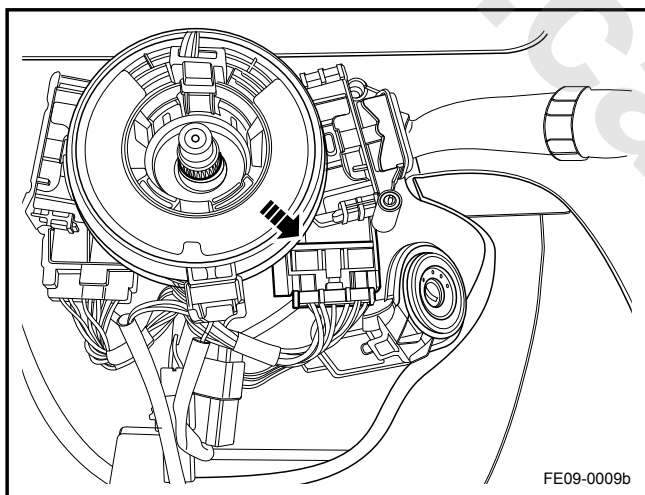
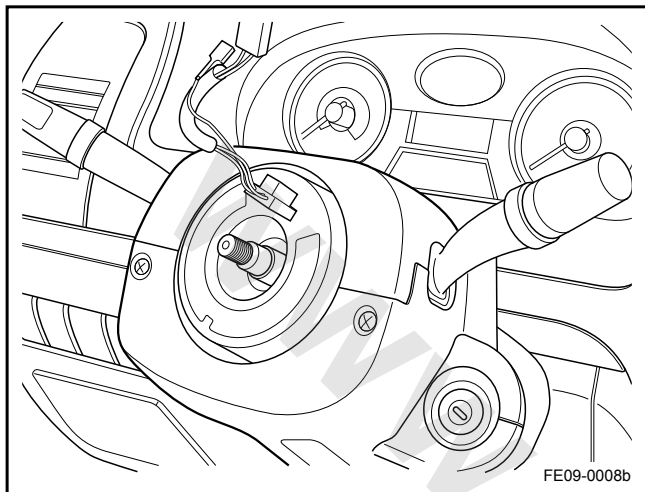
### 9.2.7.3 Clock Spring Replacement

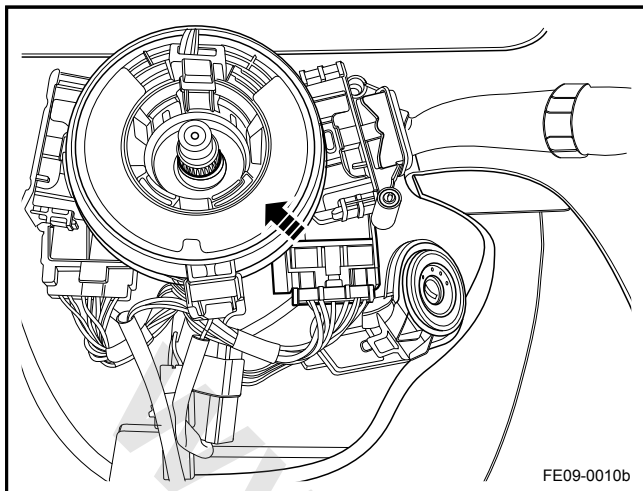
#### Removal Procedure

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable and wait for the 90s. Refer to [2.11.8.1 Battery Disconnection](#).
2. Adjust the steering wheel to a straight state and locked.
3. Remove the driver front airbag. Refer to [9.2.7.2 Driver Front Airbag Replacement](#).
4. Remove the steering wheel. Refer to [7.3.6.3 Steering Wheel Replacement](#).
5. Remove the steering column upper and lower shield panels. Refer to [11.4.8.1 Headlamp Switch Replacement](#).
6. Disconnect the clock spring harness connector and remove the clock spring.

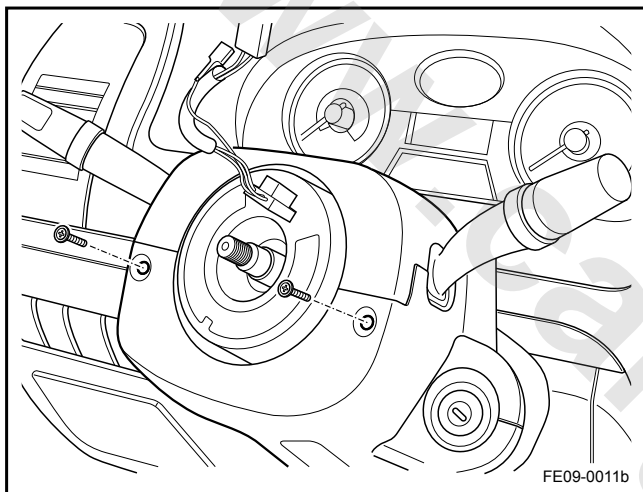


**Installation Procedure:**

1. Connect the clock spring harness connector and install the clock spring to the steering column.

**Note**

Do not unplug the clock spring locking pin.



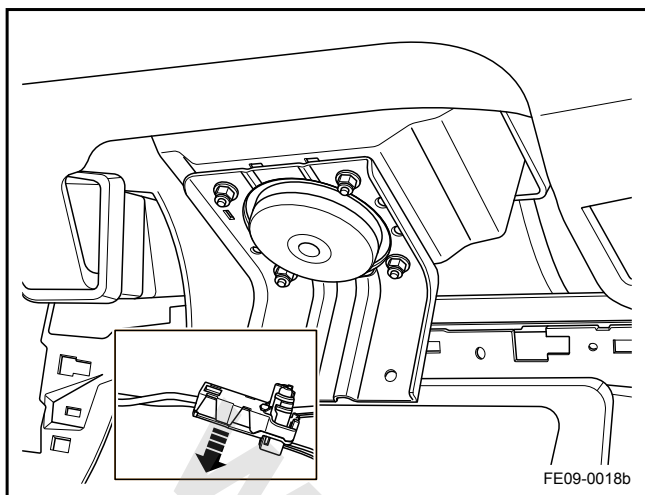
2. Install the steering column upper and lower shield panels.
3. Install the clock spring
4. Unplug the clock spring locking pin.
5. Install the steering wheel.
6. Install the driver front airbag.
7. Connect the battery negative cable.

**9.2.7.4 Passenger Front Airbag Replacement****Removal Procedure****Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

**Warning!**

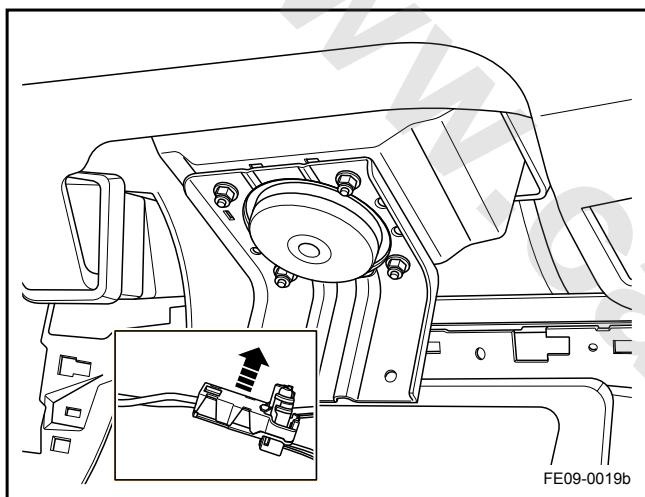
Refer to "Supplement Protection System Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the glove box. Refer to [12.8.3.2 Glove Box Replacement](#).
3. Remove the instrument panel. Refer to [12.8.3.1 Instrument Panel Replacement](#).
4. Disconnect passenger front airbag wiring harness connector.
5. Remove the passenger front airbag.

#### Installation Procedure:

1. Install the passenger front airbag.
2. Connect the passenger front airbag wiring harness connector.
3. Install the instrument panel.
4. Install the glove box.
5. Connect the battery negative cable.



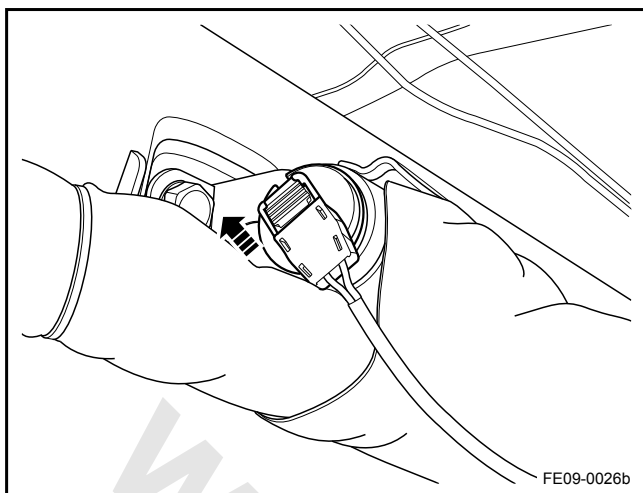
#### 9.2.7.5 Curtain Airbag Replacement (If equipped)

##### Removal Procedure

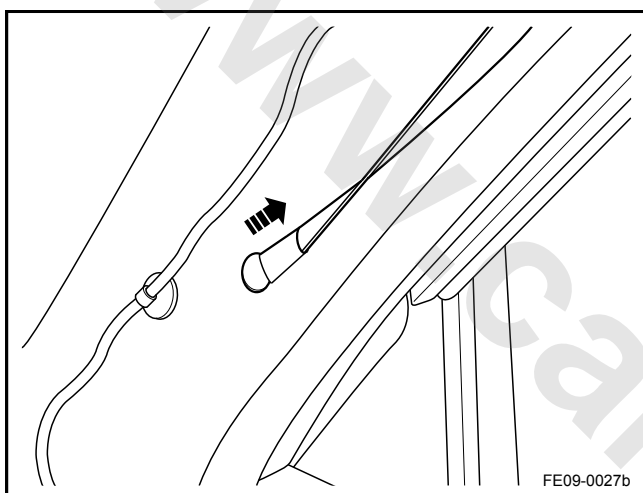
##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

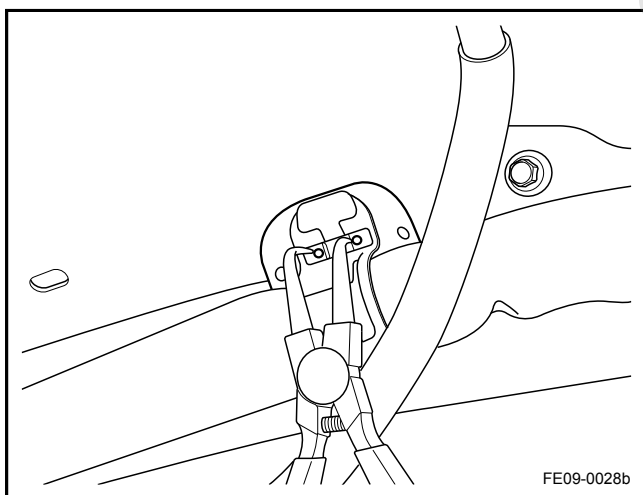




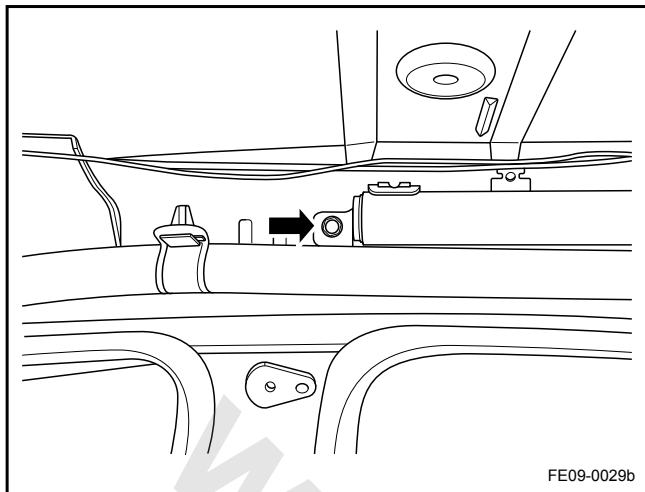
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the headliner. Refer to [12.9.1.1 Headliner Replacement](#).
3. Disconnect the curtain airbag harness connector.



4. Disconnect the curtain airbag front retaining cord.

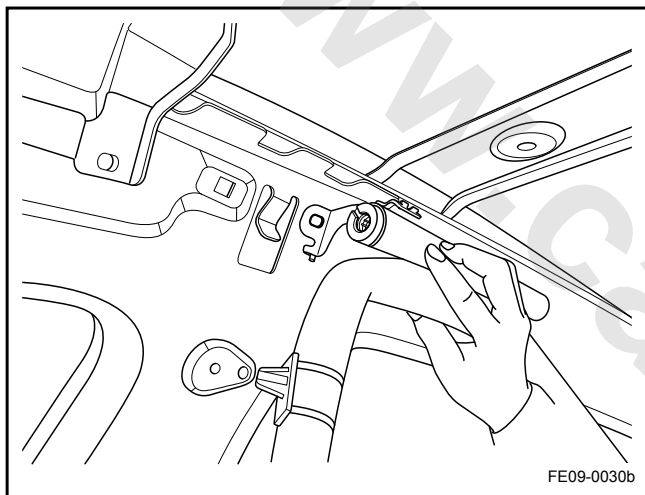


5. Remove the curtain airbag retaining clips with a plier.

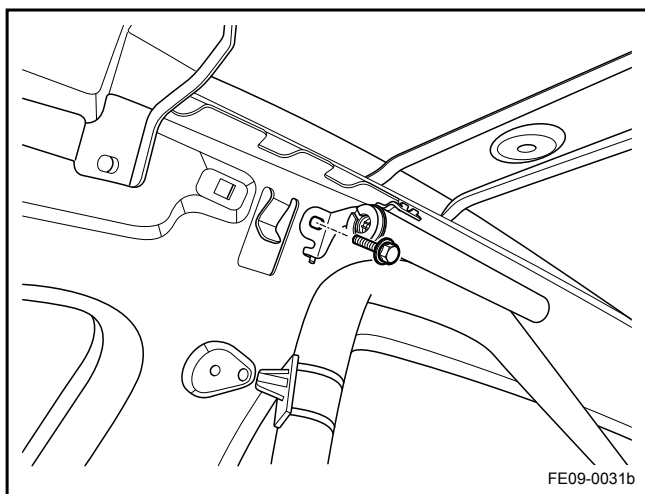


6. Remove the curtain airbag retaining retaining bolts and remove the curtain airbag.

#### Installation Procedure:

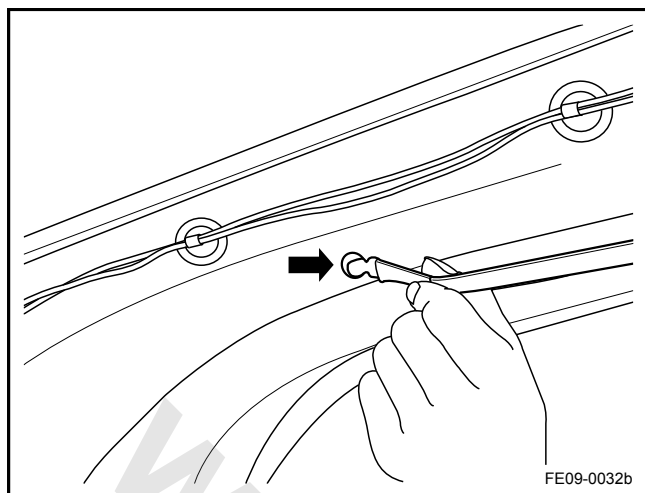


1. Install the curtain airbag.



2. Install and tighten the curtain airbag retaining bolts, preload the curtain airbag retaining nut first until the cord and retaining buckle installed, and then tighten the curtain airbag retaining bolts.

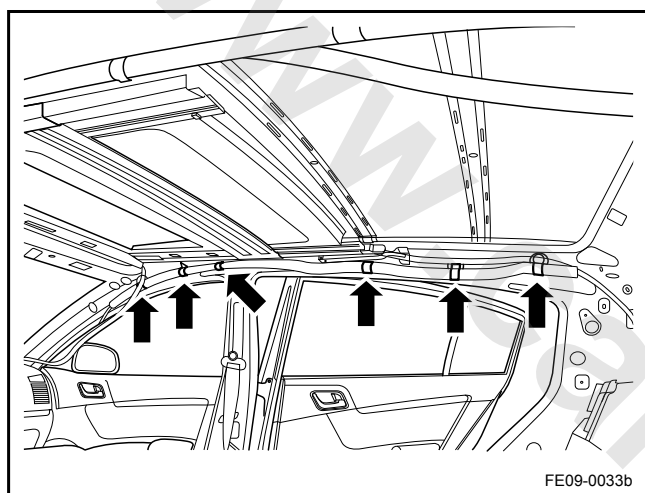
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)



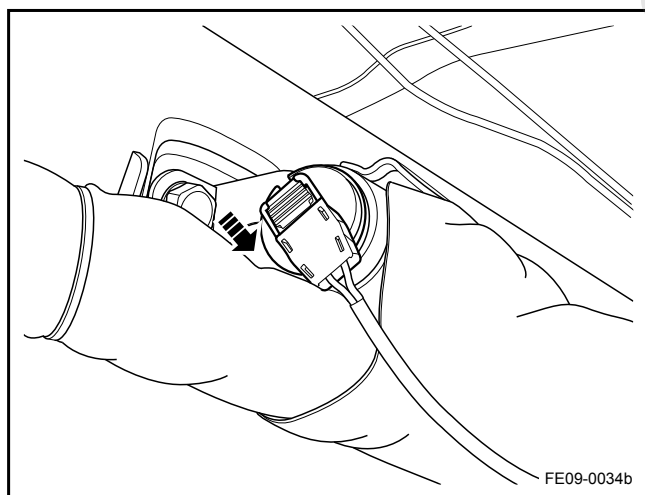
3. Fix the curtain airbag retaining Cord.

**Note**

Cord can not be distorted.



4. Install the curtain airbag retaining clips.



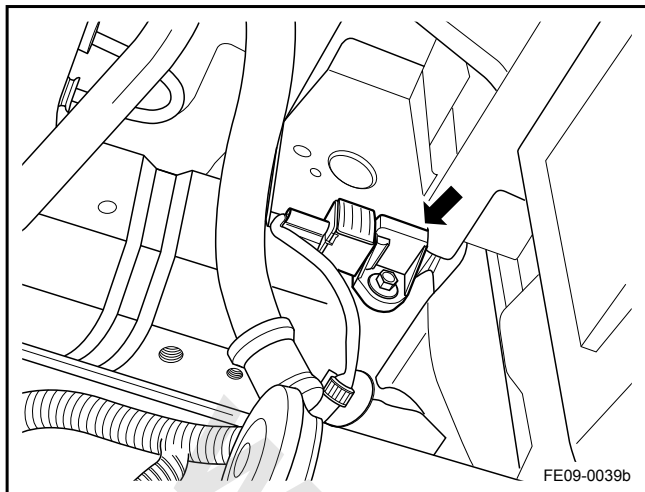
5. Connect the curtain airbag harness connector.
6. Install the headliner.
7. Connect the battery negative cable.

### 9.2.7.6 Front Collision Sensor Replacement

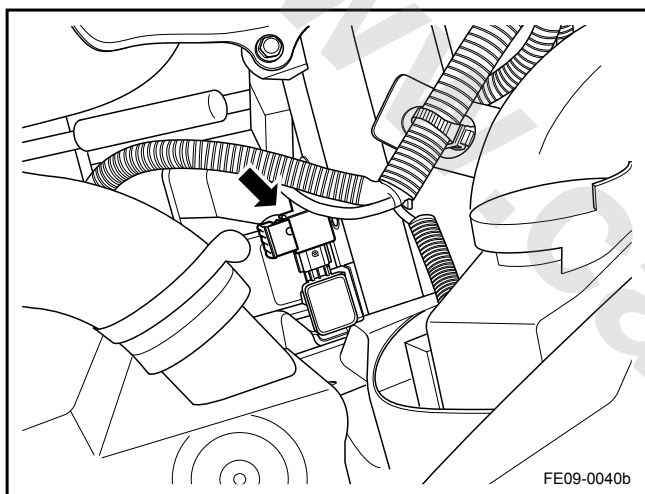
#### Removal Procedure

**Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable and wait for at least 90s. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the battery and the battery bracket. Refer to [2.11.8.2 Battery Replacement](#).
3. Disconnect the left front collision sensor wiring harness connector.
4. Remove left front collision sensor retaining bolts and remove the left front collision sensor.



#### Installation Procedure:

1. Install and tighten the left front collision sensor retaining sensors retaining bolts.  
Torque: 8 Nm (Metric) 5.9 lb-ft (US English)
2. Connect the left front collision sensor wiring harness connector.
3. Install the battery and the battery bracket.
4. Connect the battery negative cable.

#### Note

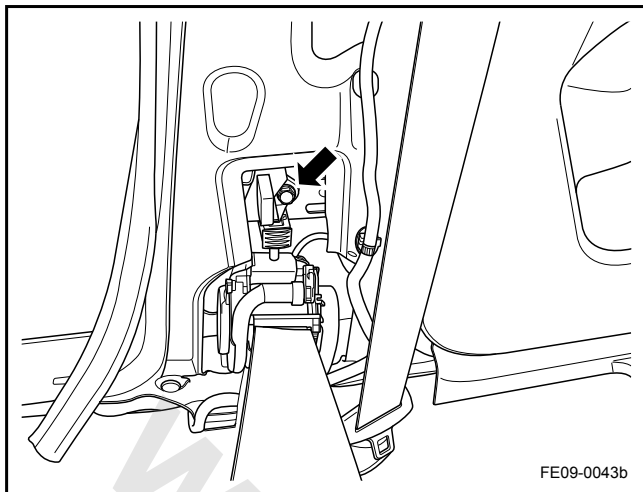
Right Front Collision Sensor Replacement is the same.

#### 9.2.7.7 Side Collision Sensor Replacement (If equipped)

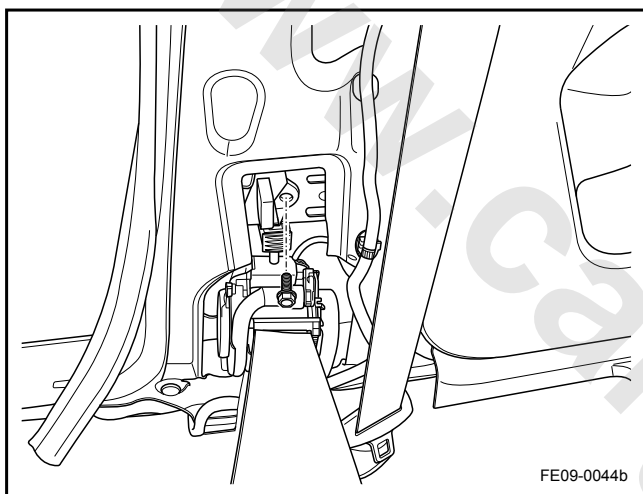
##### Removal Procedure

##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable and wait for 90s. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the center upper pillar trim panel. Refer to [12.9.1.4 Center Pillar Trim Panel Replacement](#).
3. Disconnect the side collision sensor harness connector.
4. Remove the side collision sensor retaining bolts and remove the sensor.



#### Installation Procedure:

1. Install the side collision sensor and tighten the retaining bolts.  
Torque: 8 Nm (Metric) 5.9 lb-ft (US English)
2. Connect the side collision sensor harness connector.
3. Install the center upper pillar trim panel.
4. Connect the battery negative cable.

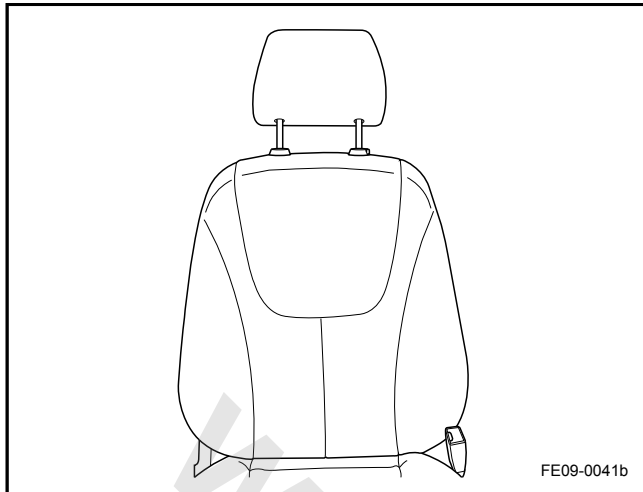
### 9.2.7.8 Passenger Recognition Sensor Replacement

Refer to [11.11.8.6 Electric Seat Cushion Replacement](#) removal procedure.

### 9.2.7.9 Side Airbag Replacement

#### Note

If the side airbag has been deployed, please replace the front seat back.



1. Refer to [11.11.8.4 Electric Seat Back Replacement](#) removal procedure.

## 9.3 Pretension Seat Belt System

### 9.3.1 Specifications

#### 9.3.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Front Left / Right Seat Belt Retractor Assembly	US English 7 / 16 × 25	40-50	29.5-36.9
Front Left / Right Seat Belt Buckle Retaining Bolts	US English 7 / 16 × 32	40-50	29.5-36.9
Front Left / Right Seat Belt Retaining Bolts	US English 7 / 16 × 35	40-50	29.5-36.9
Front Height Adjuster Retaining Bolts	M10 × 26	30-40	22.1-29.5
Rear Seat Left / Right Seat Belt Retractor Retaining Bolts	US English 7 / 16 × 25	40-50	29.5-36.9
Front Left / Right Seat Belt Guide Ring Retaining Bolt	US English 7 / 16 × 37	40-50	29.5-36.9
Rear Seat Left / Right Seat Belt Retaining Bolts	US English 7 / 16 × 35	40-50	29.5-36.9
Rear Middle Seat Belt Retaining Bolts	US English 7 / 16 × 25	40-50	29.5-36.9
Rear Seat Left / Right Seat Belt Buckle Retaining Bolts	US English 7 / 16 × 25	40-50	29.5-36.9
Rear Seat Belt Mounting Bracket Retaining Bolts	M10 × 25	30-40	22.1-29.5

### 9.3.2 Description and Operation

#### 9.3.2.1 Description and Operation

##### Seat Belt

Front seats and rear seats all have seat belts, which are the primary protection measure. In the following circumstances, the seat belts can be hold the passengers in seats, and reduce the impact force:

- Front Collision
- Rear Collision
- Side Collision
- Overturn Caused Collision

All vehicles are equipped with emergency locking retractor function. Seat belts have automatic locking feature. Locking feature is activated when the seat belt quickly pulled entirely from the retractor. Locking feature prevents seat belt pulled out by more than allowed retractor position. It is recommended to use self-locking function to retain the child seat. When completely roll back seat belt to the retractor, the feature is canceled. Canceling the locking feature, seat belts are unlocked. Canceling the locking feature, seat belts can be pulled from the retractor. The vehicle is also equipped with the airbag system. Refer to "Airbag System" in the [9.2.2.1 Description and Operation](#).

##### Seat Belt Warning Lamp

Driver seat belt and passenger seat belt warning lamps are located in instrument cluster and multi-instrument display to remind driver and passenger to tighten their seat belts.

##### Child Seat Protection System

###### Warning!

NEVER use a rear-facing child restraint in the front seat of this vehicle. If a forward-facing child restraint is suitable for your child, ALWAYS move the front passenger seat as far back as it will go and then install the child restraint. Be sure the child restraint position does not conflict with any additional requirements provided by the manufacturer. For more information. Refer to the vehicle owners manual and the instruction that came with the child restraint.

The child seat may only be used in a forward facing seating location. The child seat should be installed and secured according to the manufacturer's directions. If the child seat has

a top strap, the seat will need to be anchored. Passengers should not be allowed to sit at locations where the seat belts are being used to secure the child seat.



### 9.3.3 System Working Principle

#### 9.3.3.1 System Working Principle

##### Front Seat Belt System

Front seat belt system includes the driver and passenger seat belt pre-tensioner retractor, passenger recognition sensors, as well as two front seats safety switches.

Passenger recognition sensor is used to detect whether the passenger seat is occupied. If it is detected to be empty, the passenger seat belt warning lamp will go off. Two front seat belt switches are located in the seat locks for seat belt warning lamp and buzzer control.

##### 1. Driver Seat Belt Warning Lamp

When the ignition switch is at ON, if the driver seat belt is not tightened, airbag control module detects the driver seat belt status and send signals to the instrument cluster through the CAN bus. Instrument cluster driver seat belt warning lamp flashes and buzzer sounded 4 s to remind driver to wear seatbelt.

##### 2. Passenger Seat Belt Warning Lamp

When the ignition switch is at ON, the passenger recognition sensor detects whether the passenger seat is occupied and send signals to the airbag control module. Airbag control module tests seat belt status and send a signal to the instrument cluster, which sends a signal to request to light or turn off the passenger seat belt warning lamp.

##### Rear Seat Belt System

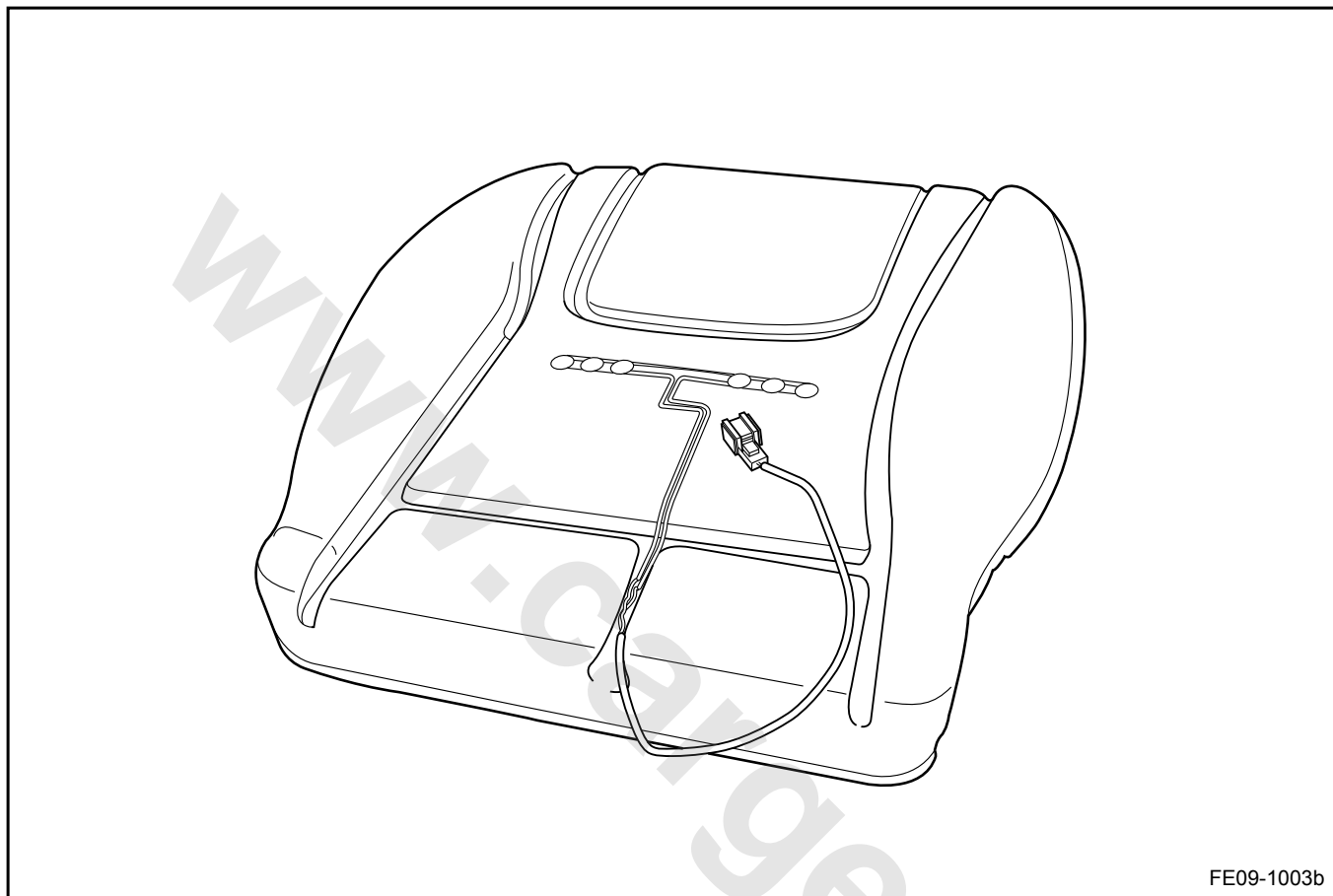
Rear seat belt system includes the following components:

- The center rear seat belt retractor is located under the rear shelf trim panel and is attached to the rear shelf body panel.
- The center rear seat belt buckle and the outer seat belt buckle are located in the center of the seat cushion and they are attached to the rear floor pan.

### 9.3.4 Component Locator

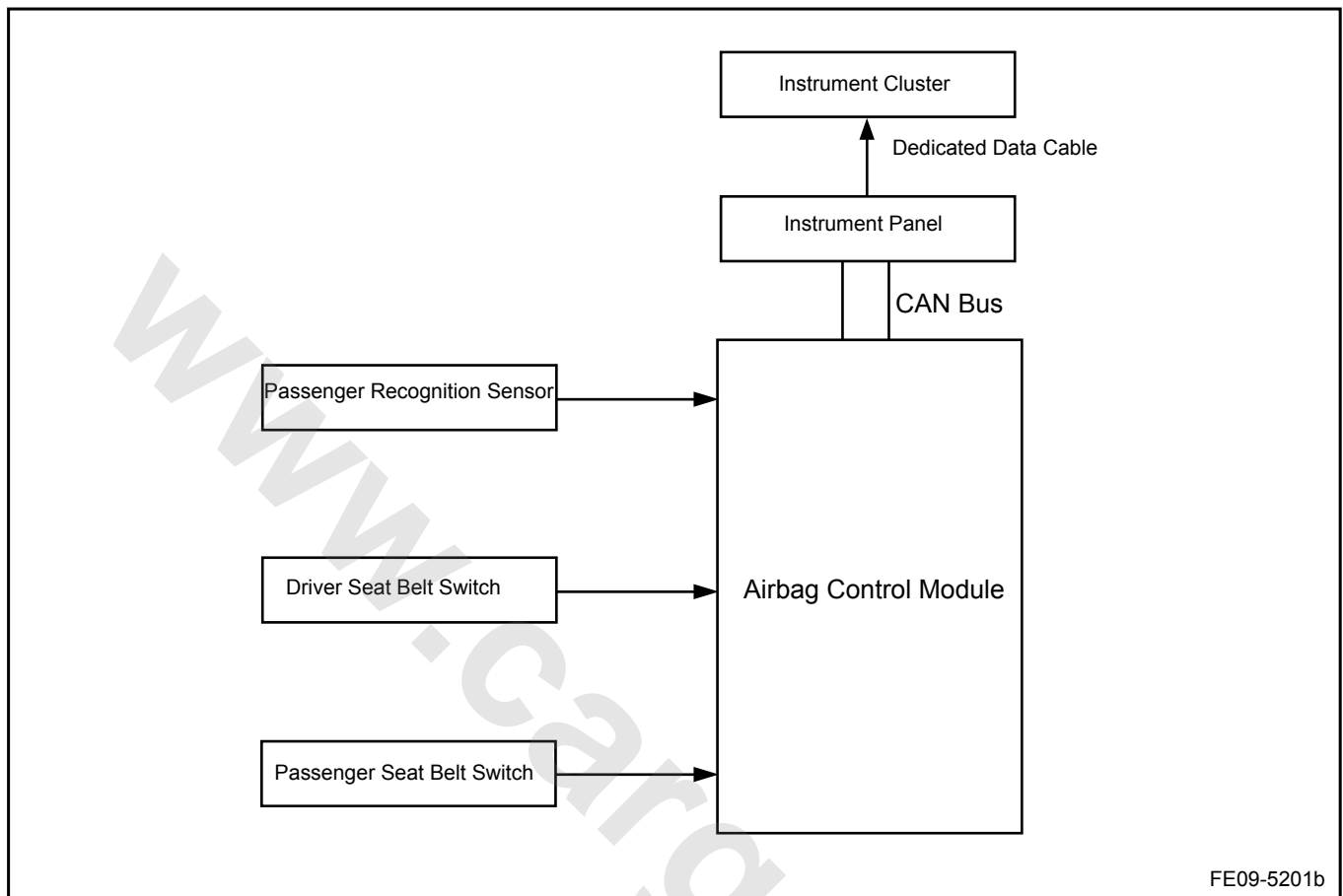
#### 9.3.4.1 Component Locator

Passenger Recognition Sensor



## 9.3.5 Schematic

## 9.3.5.1 Schematic



## 9.3.6 Diagnostic Information and Procedures

### 9.3.6.1 Visual Inspection

#### — Confirm Fault Symptom

In diagnostic, the most difficult situation is that there is no symptom. In this case, technician must thoroughly analyze the described fault, and then simulate the fault occurring conditions and environment. Even for a very experienced technician, if carry out diagnostics without verifying the fault, it is likely to ignore a number of important things, and even make misjudgments. This will result in the diagnostic can not be continued.

#### — Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.

#### — Connectors pivot and vibration support parts should be thoroughly examined. If possible, for vibration caused failure, it is recommended to use vibration method:

1. With a finger, gently shook the part that may be faulty and check for malfunction.
2. Gently shake the connector vertically and horizontally.
3. Gently shake the wiring harness vertically and horizontally.

#### — Vehicle Inspection

##### A. Check the driver seat belt warning lamp:

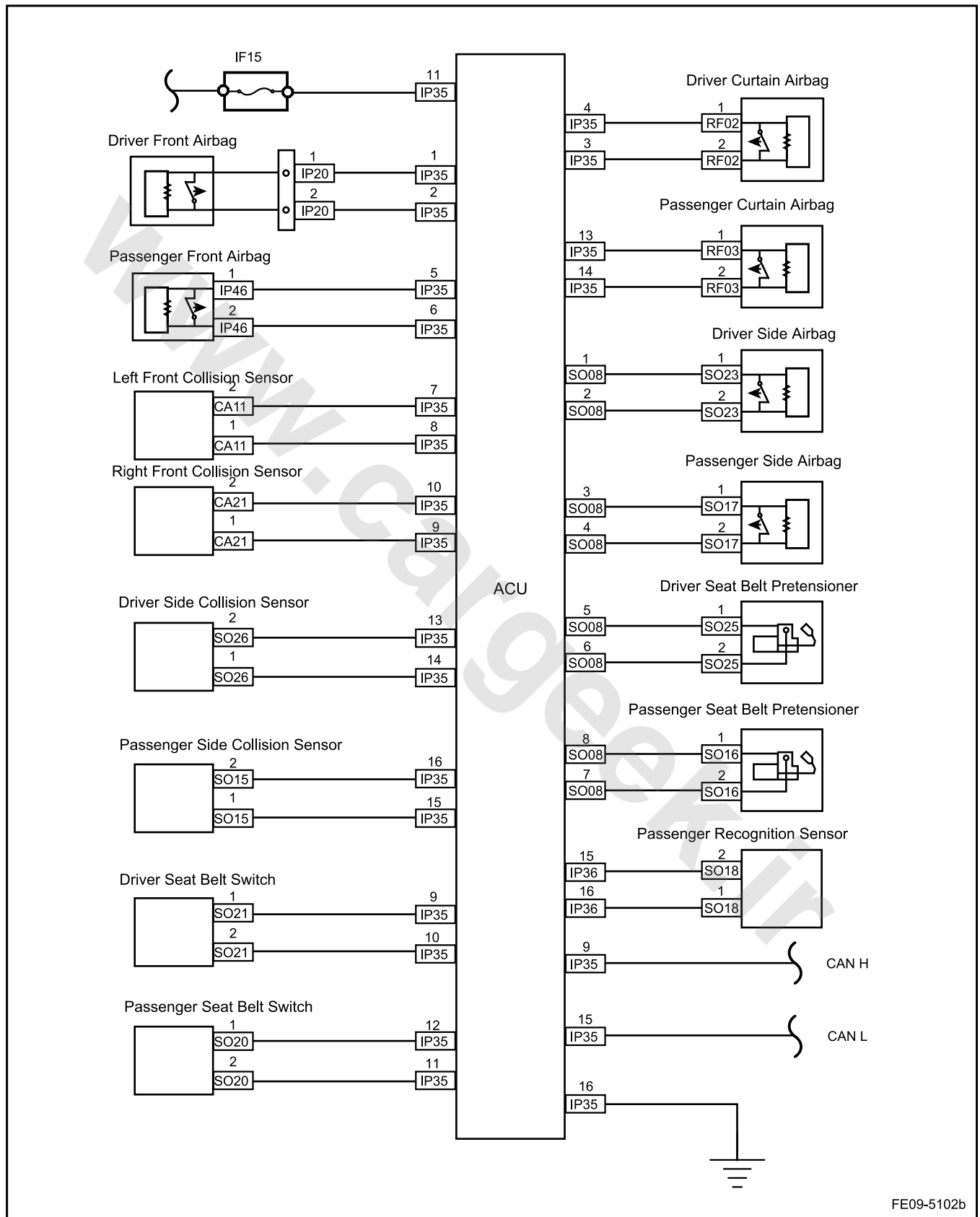
- a. Turn the ignition switch to "ON".
- b. When the driver seat belt is released, check whether the driver seat belt warning lamp is flashing.
- c. When the driver is seat belt fastened, check whether the driver seat belt warning lamp is off.

##### B. Check the passenger seat belt warning lamp:

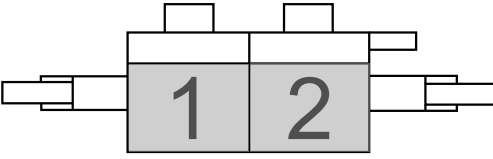
- a. Turn the ignition switch to "ON".
- b. When the passenger seat belt is released, check whether the passenger seat belt warning lamp is flashing.
- c. When the passenger is seat belt fastened, check whether the passenger seat belt warning lamp is off.

## 9.3.6.2 Driver Seat Belt Warning Lamp Inoperative

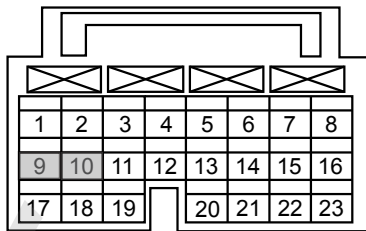
Schematic:



## Diagnostic Steps:

Step 1	Use scan tool to access airbag control module.
(a) Check for DTC.	
<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">Yes</div> <div style="border: 1px solid black; padding: 5px;">Repair according to the DTC.</div> </div>	
<div style="border: 1px solid black; padding: 2px 5px; width: 50px; float: left;">Yes</div>	
Step 2	Use scan tool to carry out active test.
(a) Use "active test" function to control the driver seat belt warning lamp, while observing whether the warning lamp status (ON / OFF) is changed.	
<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Replace the instrument cluster assembly</div> </div>	
<div style="border: 1px solid black; padding: 2px 5px; width: 50px; float: left;">Yes</div>	
Step 3	Check the driver seat belt lock assembly.
(a) Disconnect the driver seat belt lock connector SO21. (b) Test whether the driver seat belt switch status meets the following requirements with a multimeter. (c) Release the seat belt, measure resistance between terminal 1 and 2. Standard Resistance: Less than 1 $\Omega$ (d) Fasten the seat belt, measure resistance between terminal 1 and 2. Standard Resistance: 10 k $\Omega$ or higher Data normal?	
<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Replace the driver seat belt lock assembly</div> </div>	
<div style="border: 1px solid black; padding: 2px 5px; width: 50px; float: left;">Yes</div>	
Step 4	Check the wiring harness (driver seat belt lock to airbag control module).
<div style="border: 1px solid black; padding: 10px; margin-bottom: 10px;"> <p>Passenger Seat Belt Switch Harness Connector SO21</p>  <p style="text-align: right; font-size: small;">FE09-5202b</p> </div> <div>           (a) Disconnect the driver seat belt lock connector SO21 and the airbag control module connector SO08.            (b) Measure resistance between the connector SO21 terminal 2 and the connector SO08 terminal 10 with a multimeter.            (c) Measure resistance between the connector SO21 terminal 1 and the connector SO08 terminal 9 with a multimeter.                  Standard Resistance: Less than 1 <math>\Omega</math>            (d) Measure resistance between the connector SO21 terminal 2 and the body ground with a multimeter.                  Standard Resistance: 10 k<math>\Omega</math> or higher            Data normal?         </div>	
<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 10px;">No</div> <div style="border: 1px solid black; padding: 5px;">Repair or replace the wiring harness or connector.</div> </div>	

Airbag Control Module 2 Harness  
Connector SO08



FE09-5203b

Yes

Step 5 Replace the airbag control module.

- (a) Replace the airbag control module. Refer to [9.2.7.1 Airbag Control Module Replacement](#).
- (b) Confirm the repair completed.

Next

Step 6 System normal.

### 9.3.6.3 Front Passenger Seat Belt Warning Lamp Malfunction

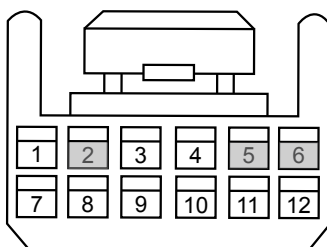
Schematic:

Refer to [9.3.6.2 Driver Seat Belt Warning Lamp Inoperative](#) in the circuit diagram.

Diagnostic Steps:

Step 1 Check the instrument cluster wiring harness.

Instrument Cluster Harness  
Connector IP01



FE09-5205b

- (a) Check the wiring harness connector IP01 to the instrument cluster harness and connectors.
- (b) With a multimeter, measure voltage according to the following table.

Instrument Cluster Terminal	Signal Name	Voltage	Current
2	Power Supply	12 V	1 A
5	Body Ground		1 A
6	Passenger Seat Belt	5 V	20 mA

Data normal?

No

Repair or replace the wiring harness or connector

Yes

Step 2 Check the instrument cluster.

(a) Adjust the clock display, and check whether it works properly.

No

Replace the instrument cluster.

Yes

Step 3 Check the passenger recognition sensor.

- (a) Disconnect the passenger recognition sensor connector SO18.
- (b) With a multimeter measure sensor resistance according to the following conditions.
- (c) Measure resistance value when the passenger seat is occupied with a multimeter.  
Standard Resistance: Less than 100  $\Omega$
- (d) Measure resistance value when the passenger seat is not occupied with a multimeter.  
Standard Resistance: 10 k $\Omega$  or higher

Data normal?

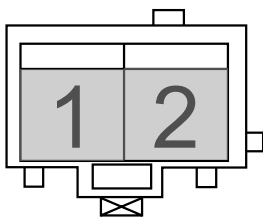
No

Replace the passenger recognition sensor

Yes

Step 4 Check the wiring harness (passenger recognition sensor to airbag control module).

Passenger Recognition Sensor SO18



FE09-5206b

- (a) Disconnect the airbag control module connector IP36.
- (b) Measure resistance between the connector SO18 terminal 2 and the connector IP36 terminal 15 with a multimeter.
- (c) Measure resistance between the connector SO18 terminal 1 and the connector IP36 terminal 16 with a multimeter.  
Standard Resistance: Less than 1  $\Omega$
- (d) Measure resistance between the connector SO18 terminals 1,2 and the body ground with a multimeter.  
Standard Value: 10 k $\Omega$  or higher

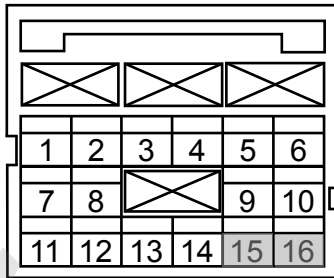
Data normal?

No

Repair or replace the wiring harness / connector



Airbag Control Module 3 Harness Connector IP36

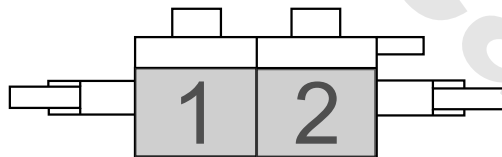


FE09-5207b

Yes

Step 5 Check the wiring harness (airbag control module - the passenger seat belt lock).

Passenger Seat Belt Buckle Harness Connector SO20



FE09-5208b

- (a) Disconnect the passenger Seat Belt Lock connector SO20 and the airbag control module connector SO08.
- (b) Measure resistance between the connector SO20 terminal 2 and connector SO08 terminal 11 with a multimeter.
- (c) Measure resistance between the connector SO20 terminal 1 and connector SO08 terminal 12 with a multimeter.

Standard Resistance: Less than 1  $\Omega$ 

- (d) Measure resistance between the connector SO20 terminals 1,2 and the body grounds with a multimeter.

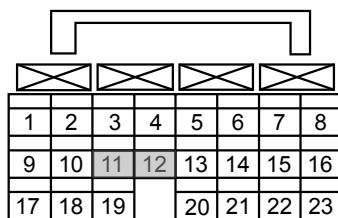
Standard Value: 10 k $\Omega$  or higher

Data normal?

No

Repair or replace the wiring harness or connector

Airbag Control Module 2 Harness Connector SO08



FE09-5209b

Yes

Step 6 Replace the passenger seat belt lock assembly.

- (a) Replace the passenger seat belt lock assembly. Refer to [9.3.7.1 Front Seat Belt Buckle replacement](#).

Is the passenger seat belt warning lamp normal?

Yes

System normal

No

Step 7 Replace the instrument cluster.

(a) Replace the instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#).

Is the passenger seat belt warning lamp normal?

Yes

System normal

No

Step 8 Replace the airbag control module.

(a) Replace the airbag control module. Refer to [9.2.7.1 Airbag Control Module Replacement](#).

(b) Confirm the repair completed.

Next

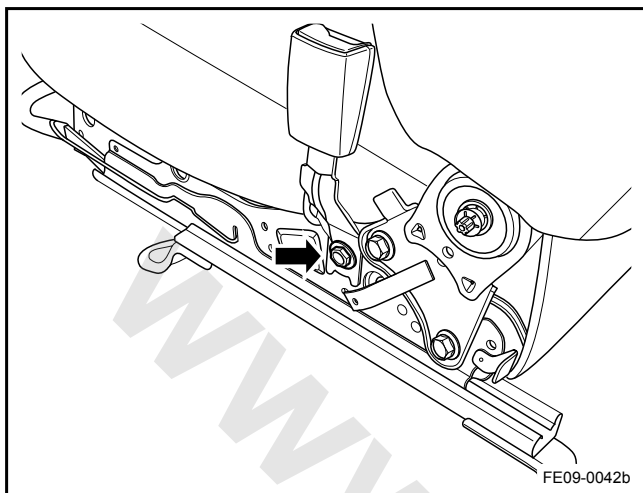
Step 9 System normal.

### 9.3.7 Removal and Installation

#### 9.3.7.1 Front Seat Belt Buckle replacement

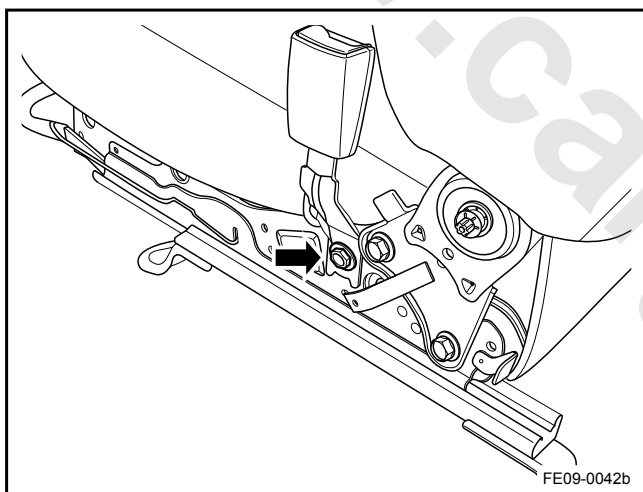
##### Removal Procedure

1. Remove the front seat. Refer to [11.11.8.1 Front Electric Seat Replacement](#).
2. Remove the front seat side trim. Refer to [11.11.8.2 Seat Side Trim Panel Replacement](#).
3. Remove the front seat belt buckle retaining bolts.



##### Installation Procedure:

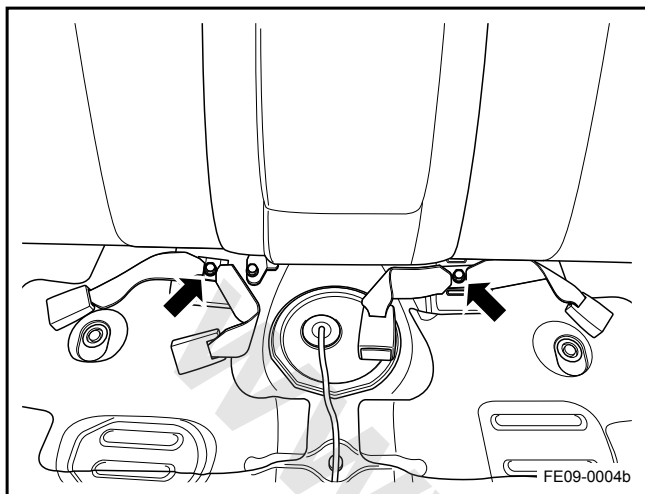
1. Install and tighten the front seat belt buckle retaining bolts.  
Torque: 45 Nm (Metric) 33 lb-ft (US English)
2. Install the front seat side trim.
3. Install the front seat.



### 9.3.7.2 Rear Seat Belt Buckle Replacement

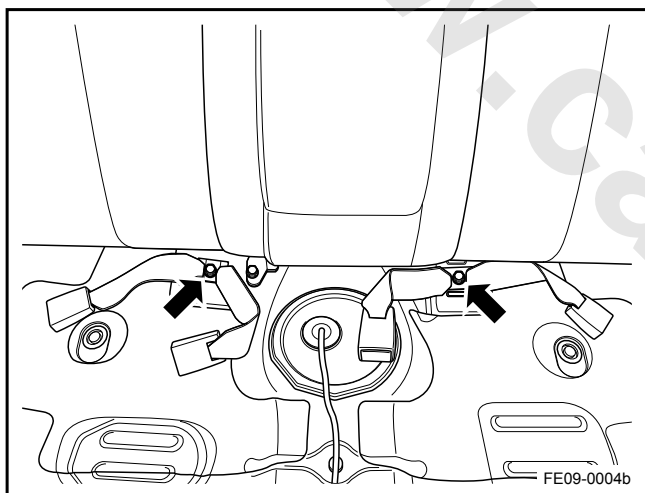
#### Removal Procedure

1. Remove the rear seat. Refer to [12.7.3.4 Rear Seat Cushion Replacement](#).
2. Remove the rear seat belt buckle retaining bolts.



#### Installation Procedure:

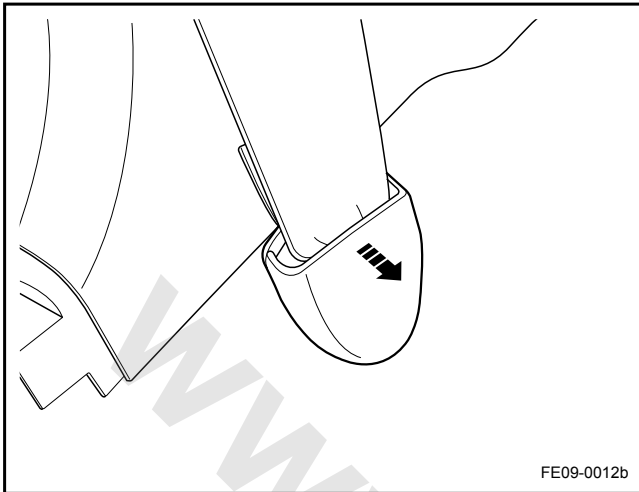
1. Install and tighten the rear seat belt buckle retaining bolts.  
Torque: 45 Nm (Metric) 33 lb-ft(US English)
2. Install the rear seat.



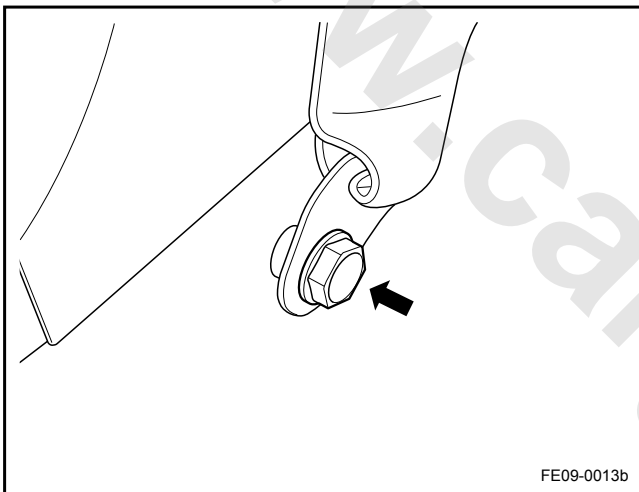
### 9.3.7.3 Front Seat Belt Retractor Replacement

#### Removal Procedure

1. Remove the front seat belt to the center pillar lower retaining bolt cover.

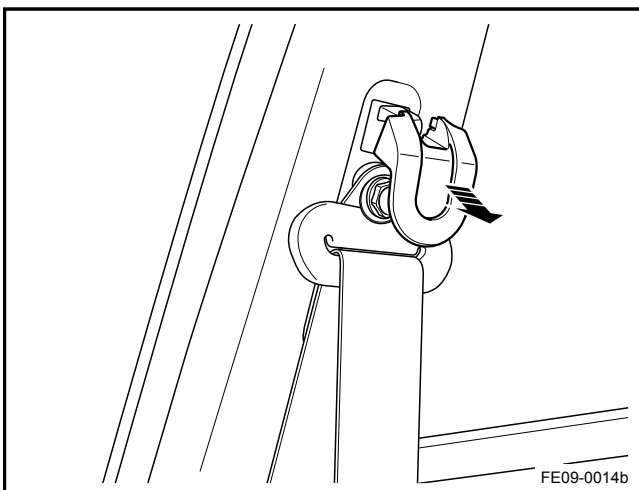


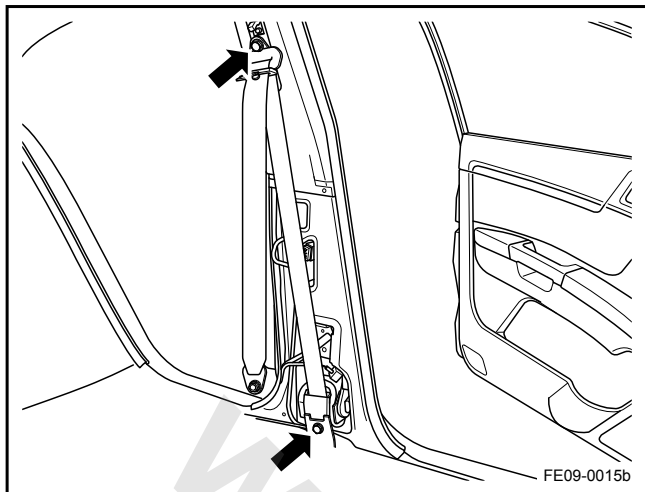
2. Remove the front seat belt to the center pillar lower retaining bolt.



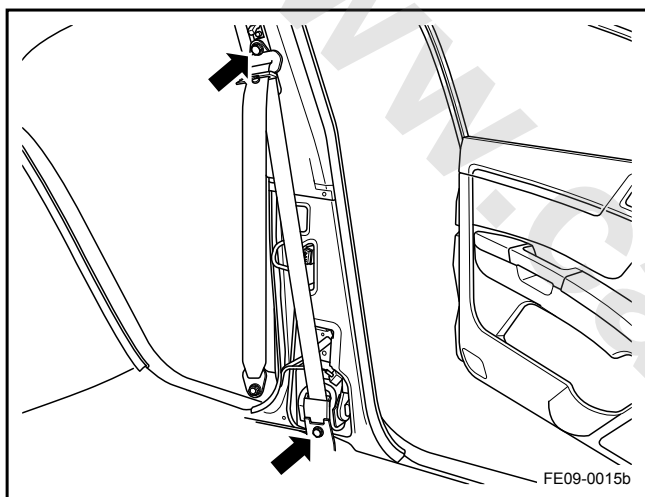
3. Remove the center pillar lower panel. Refer to [12.9.1.4 Center Pillar Trim Panel Replacement](#).

4. Remove the front seat belt to the center pillar upper retaining bolt cover.



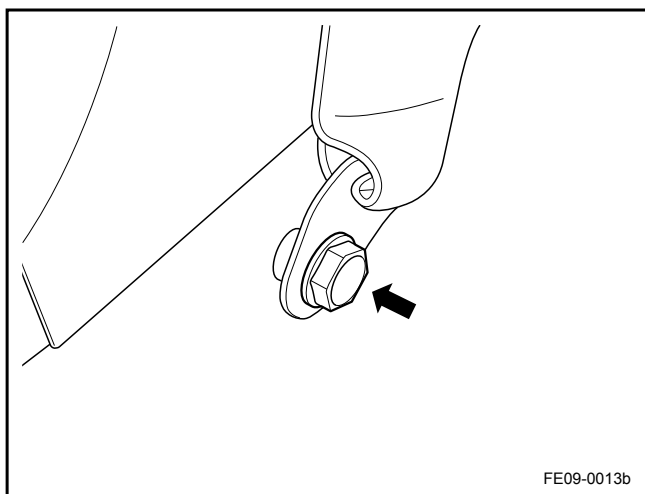


5. Remove the front seat belt to the center pillar upper retaining bolt.
6. Remove the front seat belt pretensioner retaining bolt.

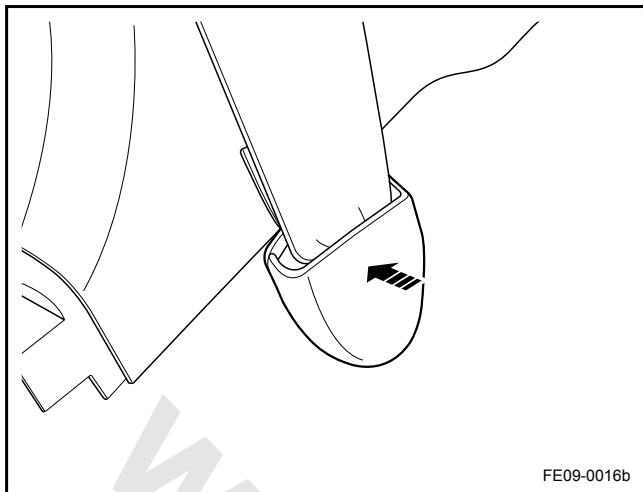


#### Installation Procedure:

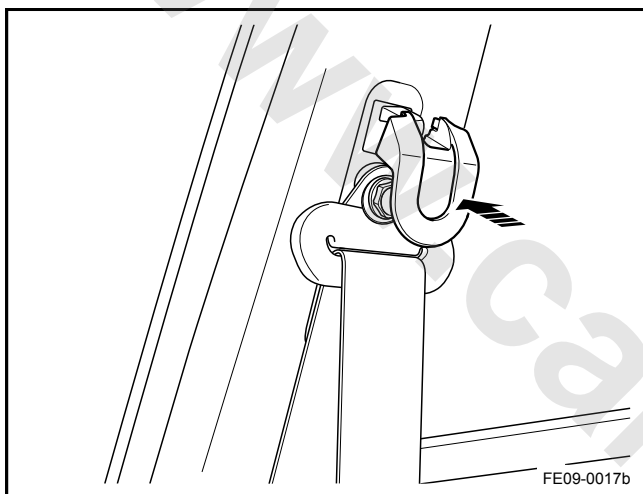
1. Install the front seat belt pretensioner and tighten the retaining bolt.  
Torque: 45 Nm (Metric) 33 lb-ft (US English)
2. Install the front seat belt to the center pillar upper retaining bolt.  
Torque: 45 Nm (Metric) 33 lb-ft (US English)



3. Install the center pillar lower panel.
4. Install the front seat belt to the center pillar lower retaining bolt.  
Torque: 45 Nm (Metric) 33 lb-ft (US English)



5. Install the front seat belt to the center pillar lower retaining bolt cover.

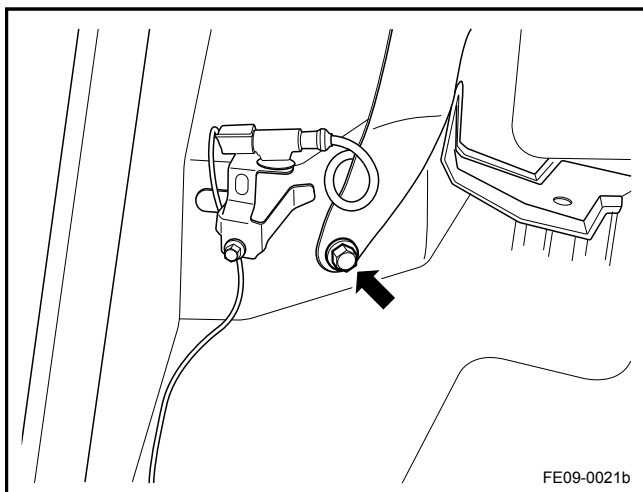


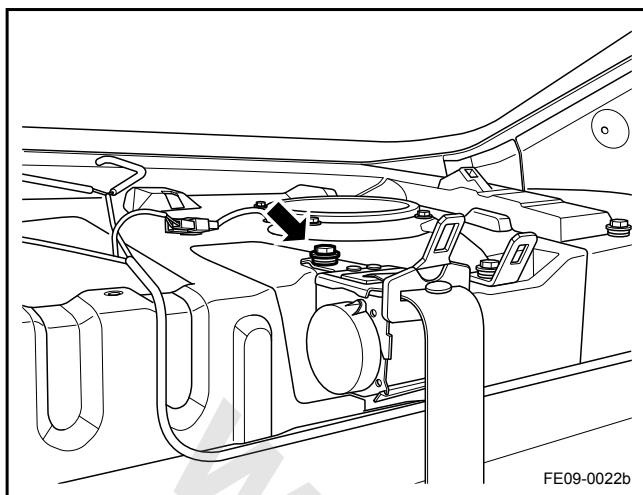
6. Install the front seat belt to the center pillar upper retaining bolt cover.

#### 9.3.7.4 Rear Seat Belt Retractor Replacement

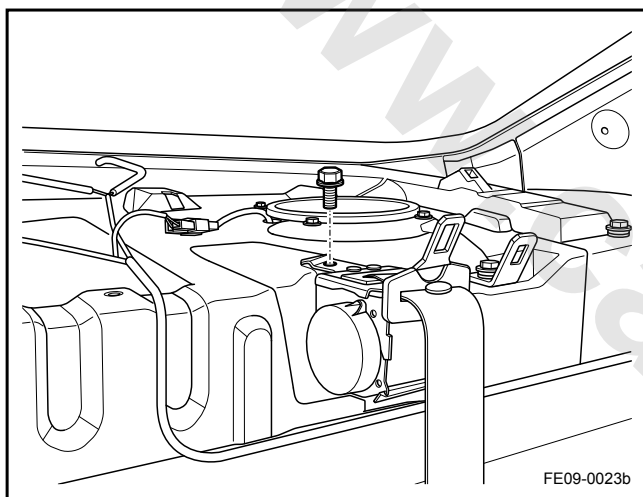
##### Removal Procedure

1. Remove the rear seat cushion. Refer to [12.7.3.4 Rear Seat Cushion Replacement](#).
2. Remove the rear right side armrest. Refer to [12.7.3.6 Rear Seat Armrest Assembly Replacement](#).
3. Remove the rear parcel shelf. Refer to [12.9.1.7 Rear Parcel Shelf Replacement \(Sedan\)](#).
4. Remove rear seat belt bolt lower panel retaining bolt.





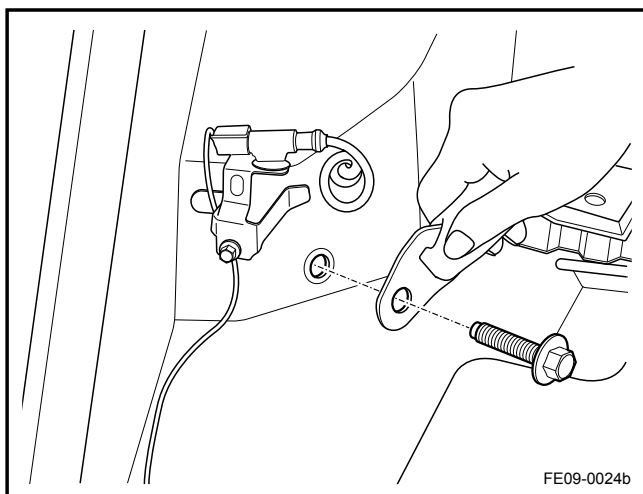
5. Fold down the rear seat back.
6. Remove the rear seat belt retractor retaining bolts.



#### Installation Procedure:

1. Install and tighten the rear seat belt retractor retaining bolts.

Torque: 45 Nm (Metric) 33 lb-ft (US English)



2. Install the rear parcel shelf.
3. Install and tighten the rear seat lower panel retaining bolts.  
Torque: 45 Nm (Metric) 33 lb-ft (US English)
4. Lift the rear seat back.
5. Install the right rear seat back.
6. Install the rear seat.

#### Note

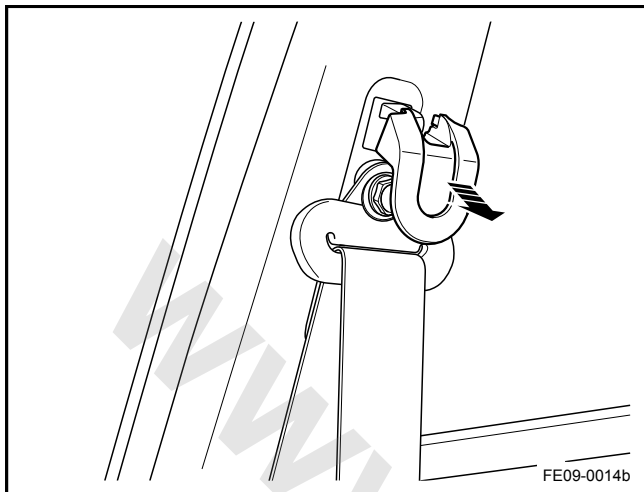
To replace the rear middle seat belt and the rear left seat belt. Refer to the above procedure.



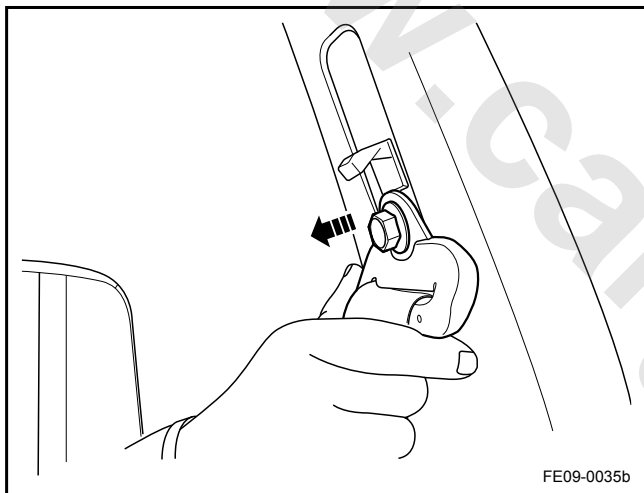
### 9.3.7.5 Front Seat Belt Height Adjuster Replacement

#### Removal Procedure

1. Remove the center pillar seat belt retaining panel retaining bolt cover.

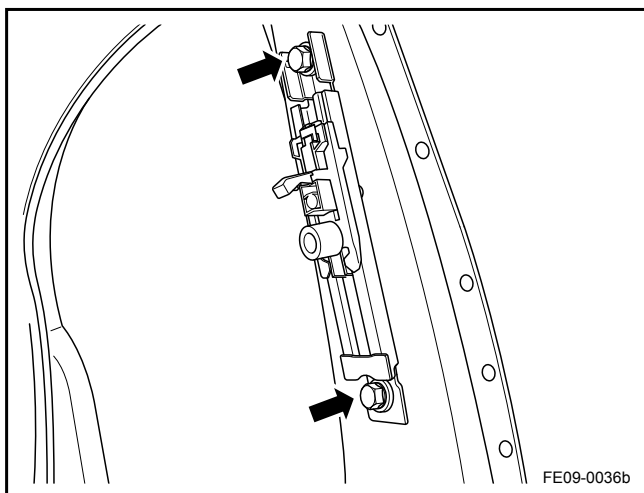


2. Remove the center pillar seat belt retaining panel retaining bolt.



3. Remove the center pillar upper and lower panel. Refer to [12.9.1.4 Center Pillar Trim Panel Replacement](#).

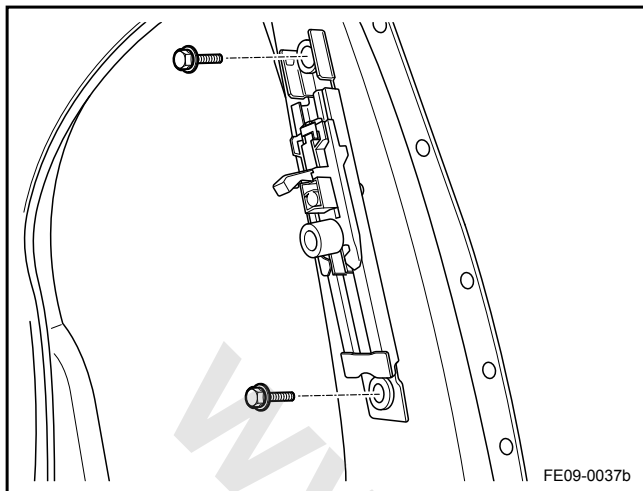
4. Remove the front seat belt height adjuster retaining bolt, and remove the height adjuster.



Installation Procedure:

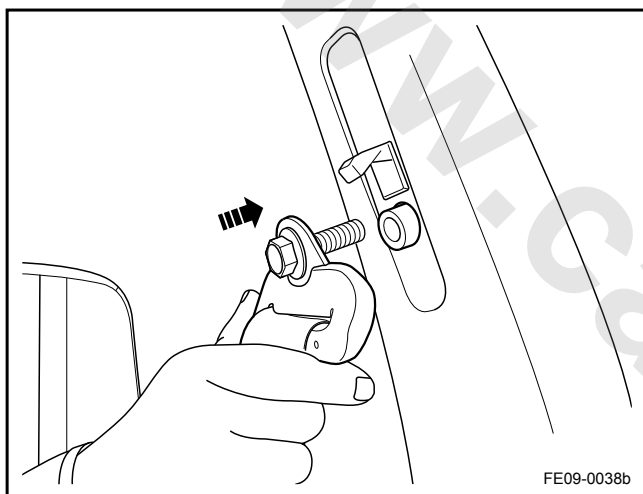
1. Install the front seat belt height adjuster, and tighten the retaining bolt.

Torque: 35 Nm (Metric) 25.8 lb-ft (US English)

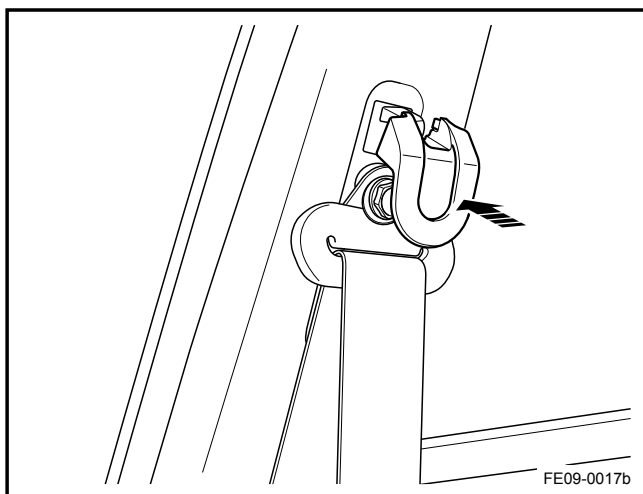


2. Install the center pillar upper and lower panel.
3. Install the center pillar seat belt retaining panel retaining bolt.

Torque: 45 Nm (Metric) 33 lb-ft (US English)



4. Install the center pillar seat belt retaining panel retaining bolt cover.



## 10 Vehicle Control System

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## 10.1 Warnings and Notices

### 10.1.1 Warnings and Notices

#### Battery Disconnect Warning

##### Warning!

Warning: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

#### Road Test Warning

##### Warning!

Warning: Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

#### Express Window Down Warning

##### Warning!

Warning: Disconnect the power window switch when working inside the driver door. When operated, the Express Up/Down Feature allows the door window to move very quickly, without stopping, which could cause personal injury.

#### Ignition OFF When Disconnecting Battery Notice

##### Note

Notice: Always turn the ignition OFF when connecting or disconnecting battery cables, battery chargers, or jumper cables. Failing to do so may damage the powertrain Control Module (PCM) or other electronic components.

#### Power-train Control Module and Electrostatic Discharge Notice

##### Note

Notice: Do not touch the connector pins or soldered components on the circuit board in order to prevent possible electrostatic discharge (ESD) damage to the PCM.

## 10.2 Computer / Integrated Systems

### 10.2.1 Specifications

#### 10.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Body Control Module (BCM) Retaining Bolt	M8 × 16	8-11	6-8

## 10.2.2 Description and Operation

### 10.2.2.1 Description and Operation

#### Overview

In order to reduce the vehicle faulty rate and implement more effective and human friendly control, electrical accessories are controlled by a centralized control mode (BCM). BCM includes a radio receiver and transmitter, with a frequency of 433 MHz.

#### External Anti-theft Feature

When the ignition key is pulled out, close the doors, rear compartment lid (hatchback) and the engine hood. Use the remote control to lock doors (press the lock button once), turn signal lamps flash once. After 3 s the system enters anti-theft mode. If the doors, rear compartment lid (hatchback), the engine hood is not closed, when press the remote control lock button, the turn signal lamps will flash 3 times, the anti-theft horns will sound twice with a 2 s interval. The system will enter the anti-theft alarm mode after 10 s (alarm loop is as following: left, right turn signal flash, anti-theft alarm horns sound. After 30 s, the horns will stop working, the left and right turn signals will flash 300 s). If the lock button is pressed after 10 s, the system will not enter the anti-theft alarm mode, but it will still enter the anti-theft mode (if there are no other external trigger conditions, horns will not sound and turn signal lamps will not flash). In the alarm mode, if the remote control unlock button is pressed, it will stop the alarm loop and deactivate the anti-theft alarm mode. If the lock button is pressed, the system will resume its original mode. When pressing lock or unlock button, the motor will be provided with power for 200 ms.

In the anti-theft or alarm mode, BCM will disable the starter relay coil. At this point you can use the remote control or receive the release signal from the ECM through the CAN bus to deactivate the anti-theft or alarm mode (turning signal flash / horns sound). When the remote control has no power, insert the key into the ignition switch in the anti-theft mode, start the engine at the same time deactivate the anti-theft or alarm mode. After automatic re-lock, the system will re-enter the anti-theft mode.

In the anti-theft mode, pressing the remote control "lock" and "unlock" buttons at the same time for more than two 2 s, turn signal lamps will flash twice and the system will enter the silent mode. In the silent mode, the alarms do not sound. Pressing the remote control "lock" and "unlock" buttons at the same time for more than two 2 s, turn signal lamps will flash twice and the system will exit the silent mode. In the anti-theft mode, pressing the lock button twice in 500 ms, horns will sound three times,

turn signal lamps will flash three times to achieve locating the vehicle function (in the absence of dual lock).

#### Door lock Control Function

When the ignition key is not inserted, press the unlock button on the remote control, four doors will open, turn signal lamps will flash. Press the lock button on the remote control, four doors will lock, turn signal lamps will flash. Turn the key on the driver side door lock to unlock position, four door will open. Turn the key to lock position, four doors will lock. When the inside door unlock / lock switch is unlocked, four doors will open. When the inside switch is locked, four door will lock. Unlock the vehicle with the remote control, in 15 s, if none of the four doors, engine hood or the rear compartment lid (Hatchback) is opened, the doors will automatically re-lock. If the unlock button is pressed within 15 s, the system will time 15 s again.

When the ignition switch is at "ON" position and the vehicle speed is greater than 20 km/h, the four doors will automatically lock. If the speed exceeds 20 km/h again, auto-locking action will not be repeated. Only when the ignition switch is turned from "OFF" to the "ON" position, or any one door is opened and re-closed, the auto-lock will be activated again.

If the key is inserted in the ignition switch at the "OFF" position (ACC position is not detected), the door can not be locked (key reminder function); if the driver door is open, BCM will send warning signals to the instrument (periodically) through the CAN bus to remind the key is not pulled out. With doors locked, when the ignition key is pulled out, the four doors automatically unlock. With doors unlocked, when the ignition key is pulled out, the four doors locking device will not operate. Rear compartment lid can be open by the remote control or by the release switch (sedan); hatchback can be open by the remote control or by the release switch (hatchback). At vehicle speed up to 5 km/h, inside trunk open function will be disabled.

When the airbag deploy signals received from the CAN bus (3 or more collision signal are received), four doors will automatically open. But this feature may not apply due to low battery voltage or collision damage to the door lock motor harness power supply.

Deadlock Function (If equipped) can be achieved in two ways:

- Press the remote control "lock" button twice within 500ms.
- Insert the key into the door lock, turn the key from "unlock" to "lock" position twice within 3s.
- Turn signal lamps will flash once to confirm the above two ways.

## Comfortable Lighting Control

### 1. Courtesy Lights:

If the ignition key is pulled out less than 10 min, turn the light switch from OFF to ON position within 2 s (park lamp, headlamp, or auto-headlamp) and then turn it back to OFF position, the courtesy headlamp will be activated. At this time, the headlamps light up will be delayed by 30 s. When this function is activated, if a door is opened, the headlamps will light up for 180 s, which are any door (including the trunk) opening timing. After all doors closed, it will re-time 30 s.

### 2. Automatic Lighting Function:

When the ignition switch is at "ON" position, and the headlamp switch in at AUTO position, park lamp relay and the headlamp relay automatically connect or disconnect in accordance with the surrounding environment brightness. (Need signal input from ambient and sun light sensor)

### 3. Turn Signal and Hazard Lamps:

When the ignition switch is at "ON" position, turn on the left turn signal switch. The left turn signal lamp will flash at a frequency of about 85 times per minute. When the ignition switch is at "ON" position, turn on the right turn signal switch. The right turn signal lamp will flash at a frequency of about 85 times per minute. No matter what position the ignition switch is at, press the hazard lamp button and left and right turn signals will flash at the same time at a frequency of about 85 times per minute. Press the hazard lamp button again and the warning flashing will be disabled. In the turning status, if one of the turning lamps (21 W) is damaged, the other turn signal lamp will flash at about double the frequency.

### 4. Interior Lighting Control:

BCM controls the dome lamp fade in light in about 0.7 s and fade out light in about 1.7 s. When unlocking, the dome lamp will fade in light, if there is no door open action, the dome lamp will fade out after 15 s. When doors are locked (lock device operated), the dome lamp will fade out within 1.7 s. When all doors are closed and the ignition switch is switched off, dome lamp will fade out after 15 s; with all doors closed, if the ignition switch is switched on, dome lamp will fade out immediately.

Any door opens, dome lamp will fade in light and keep lit, until the door closes and it will fade out after 1.7 s, turned off because of energy saving feature (the ignition switch is at "OFF" position, the energy saving function will be activated after 20 min).

### 5. Emergency Brake Warning Lamp:

If the vehicle speed (BCM receives the signal through the CAN bus.) is rapidly decreased due to emergency braking, all the turn signal lamps will be activated and flashing; if the vehicle

speed stops rapid decreasing, hazard lamp flashing will be disabled.

### 6. Daytime Running Light (If equipped):

When the engine is running, the daytime running light should be automatically turned on. The daytime running light should be automatically turned off when the headlamps are turned on, but remain on when the headlamps flash briefly. (High beam lamps being turned on for less than 700 ms is regarded as intermittent flashing warning).

## Rear Wiper / Washer Control

Turn the rear wiper/washer switch to the continuous operation position, the rear wiper relay will be activated and the rear wiper will work continuously. Turn the rear wiper/washer switch to the intermittent operation position, the rear wiper relay will be activated for about 600 ms every 5 s, and the rear wiper will work in intermittent mode. If the washer switch is pressed, the rear wiper relay will be activated for about 4 s. If the switch is pressed and held, BCM will be informed that the switch has been pressed only once. If the reverse gear is selected and the wiper switch is placed at low speed position, the rear wiper relay will be activated by 10 s delay. The rear wipers wipe once every 10 s.

When the voltage signal is received from the CAN bus, if the battery voltage is greater than 10.7V, and the ignition switch is at "ON" position, the rear defroster and heated rear window start to work; when the detected voltage is less than 10.3 V, the rear defroster and heated mirrors do not work.

The rear defrost and rear window heating switch is a push button switch. When the switch is pressed, the rear defroster and the rear window heater will start working for about 12 min; If the switch is pressed again during the rear defroster and the rear window heater working period, they will stop working. Pressed again, the rear defroster and the rear window heater will work the remaining time of the first 12 min (cumulative run 12 min). There should be a time parameter (about 36 min) to reset the first timer. After 36 min, the pre-heating time will not be cumulated as the next working time. In the low voltage status, the rear defroster / heater do not work, but the previous timer (12 min) will not be interrupted and still cumulated for the next cycle.

Rear defroster / rear window heater working signal will be sent to ECM through CAN.

## Energy Saving Feature

In order to avoid the electric load (interior lighting, etc.) working a long time leads to the vehicle battery over-discharge after the engine is shut down, 2 min after the ignition switch is turned to "OFF" position, if there is no change in the ignition switch, door status or unlock command, BCM will cut off the interior lighting power supply. Open or close any door, energy saving feature will begin timing. If the above-mentioned status has not changed for 20 min, BCM will cut off the interior lighting power supply. If the above-mentioned status has changed within 20 min, BCM will re-start timing 20 min.

When BCM receives the unlock command, the energy saving feature will start timing. If there is no change in the above-mentioned status for 20 min, BCM will cut off the interior lighting power supply. If there is change in the above-mentioned status within 20 min, BCM will restart 20 min timing. When the ignition switch is at "ON" position, the energy saving feature will start timing. After 20 min, BCM will not cut off the interior lighting power supply. When the ignition switch is at "OFF" position, the energy saving feature will start timing. If there is no change in the above-mentioned status in 20 min, BCM will cut off the interior lighting power supply. If there is a change in the above-mentioned status in 20 min, BCM will restart 20 min timing.

## Emergency Braking Warning Flash

Trigger Conditions:

- A. The current vehicle speed is greater than or equal to 45 km/h (if less than 45 km/h, even if emergency braking is detected, it will not trigger).
- B. The brake pedal is currently pressed and held in position.
- C. Hazard alarm switch is not manually turned on.
- D. Emergency braking operation has been detected.
- E. Emergency deceleration value reaches the pre-set value.

Stop Conditions:

- A. Emergency brake alarm flash is triggered after running time no less than 1,000 ms (either manual or automatic switch off).
- B. Manually switch off the hazard flash switch.
- C. Brake pedal has been released.
- D. Vehicle start to accelerate again, that is during the 2,000 ms speed sampling time, the vehicle acceleration value is greater than or equal to the pre-set value.
- E. If triggered, the vehicle is in a stopped status, then it continues to run until the vehicle acceleration is detected, and acceleration value meets the pre-set value.

## Other Features

### 1. Seat Heating Controller Working Control

Voltage signal is received from CAN, when the battery voltage is greater than 10.7 V, and the ignition switch is at "ON" position, the seat heater relay can be activated and heated seats work properly. When the detected battery voltage is less than 10.3 V, the seat heaters are not allowed to work.

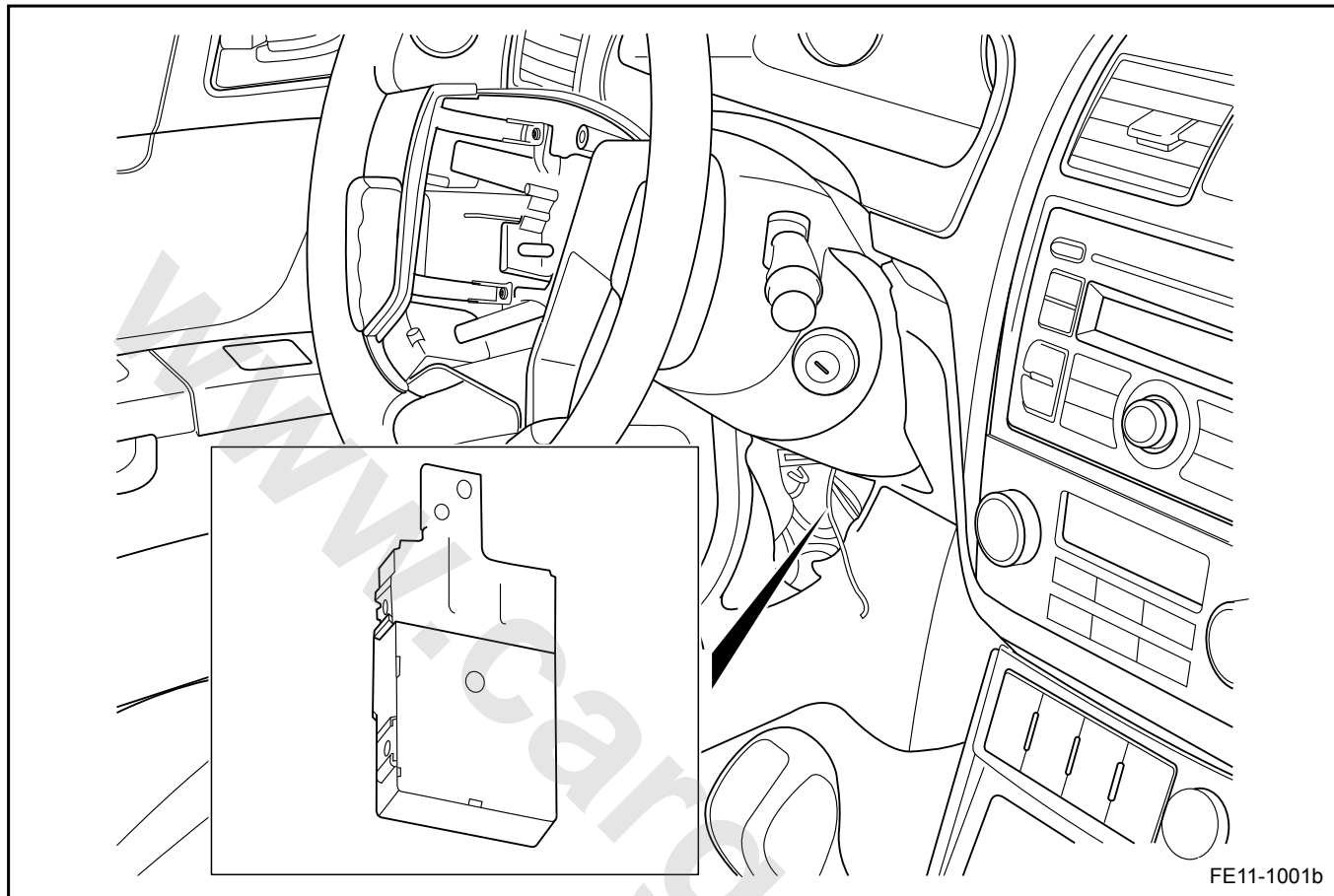
### 2. CAN bus communication capabilities

### 3. LIN bus communication capabilities



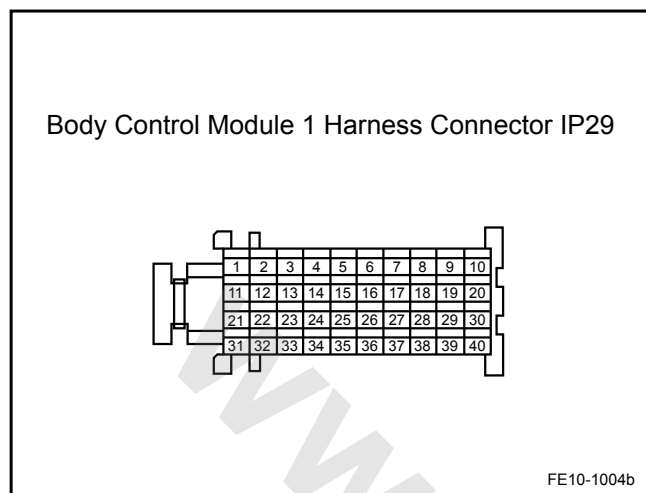
## 10.2.3 Component Locator

### 10.2.3.1 BCM Component Locator



## 10.2.4 Diagnostic Information and Procedures

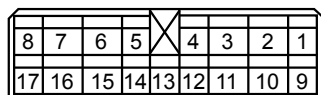
## 10.2.4.1 BCM Terminal List



Terminal	Wiring	Terminal Descriptions	Specified Conditions
1	-	Antenna	RF Input
2	0.5 B/W	Wiper Switch	High Voltage Input
3	0.5 B/W	Hood Contact Switch	Low Voltage Input
4	0.3 R	Ignition Key Insert Signal	Low Voltage Input
5	0.5 B/Y	Trunk Contact Switch	Low Voltage Input
6	0.3 Gr	Ambient and Sun Light Sensor Signal	Low Voltage Input
7	0.5 W/B	Front Wipers Low Speed	High Voltage Input
8	0.5 G/O	Reversing Signal	High Voltage Input
9	0.5 R/L	Right Turn Lamp Switch	Low Voltage Input
10	0.3 B/Y	Left Front Door Contact Switch	Low Voltage Input
11	0.5 Gr/B	Starter Relay Output Disable	Low Voltage Output, Maximum Current 500 mA
12	0.5 P/B	Seat Heater Output Enable	Low Voltage Output, Maximum Current 500 mA
13	0.3 B/L	Anti-theft Indicator Output	Low Voltage Output, Maximum Current 500 mA
14	0.3 Y/V	Rear Wipers Relay Driver	Low Voltage Output, Maximum Current 500 mA
15	--	--	--
16	0.5 B/W	Park Lamp Relay Output and Switch	High Voltage Output, Maximum Current 200 mA

Terminal	Wiring	Terminal Descriptions	Specified Conditions
17	0.5 B/G	Headlamp Relay Driver, and Switch	High Voltage Output, Maximum Current 200 mA
18	0.3 B/G	Right Rear Door Contact Switch	Low Voltage Input
19	0.3 B/R	Left Rear Door Contact Switch	Low Voltage Input
20	0.3 B/L	Central Lock Internal Lock Switch	Low Voltage Input
21	--	--	--
22	--	--	--
23	0.3 B/O	Central Lock Key Unlock Switch	Low Voltage Input
24	0.3 L	Rear Defroster Switch	Low Voltage Input
25	0.85 W/B	Rear Compartment Opening Switch	High Voltage Input
26	--	--	--
27	0.5 G/R	Left Turn Lamp Switch	Low Voltage Input
28	0.3 Gr	Warning Lamp Switch	Low Voltage Input
29	0.5 G	LIN-Bus	Square-Wave Signal
30	0.5 L/R	CAN Bus HIGH	Square-Wave Signal
31	0.5 G	Automatic Headlamp Switch	High Voltage Input
32	--	--	--
33	0.5 G/R	Ignition Switch	High Voltage Input
34	1.25 W/V	Rear Washer Switch	High Voltage Input
35	--	--	--
36	0.5 W/G	Rear Wipers Intermittent Switch	High Voltage Input
37	0.3 G/R	Central Lock Lock Switch	Low Voltage Input
38	--	--	--
39	0.3 B/L	Right Front Door Contact Switch	Low Voltage Input
40	0.5 Gr/R	CAN Bus LOW	Square-Wave Signal

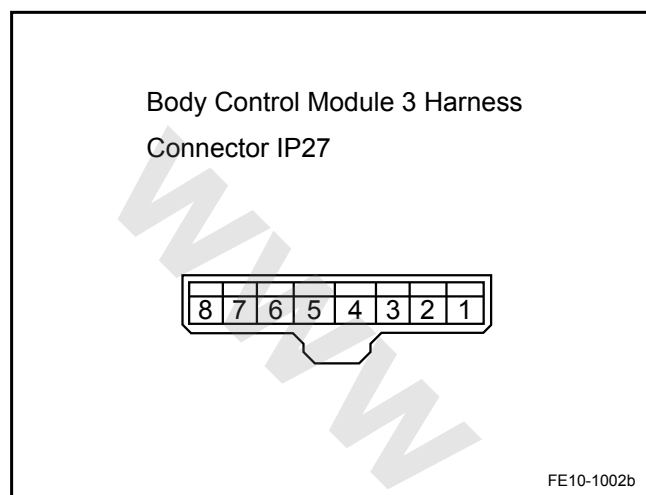
Body Control Module 2 Harness  
Connector IP28



FE10-1003b

Terminal	Wiring	Terminal Descriptions	Specified Conditions
1	0.5 B/W	Internal Dome Lamp Output	Low Voltage Output, Maximum Current 3 A
2	0.5 O	Daylight Lamp Relay Output	Low Voltage Output, Maximum Current 500 mA
3	-	-	-
4	0.5 G/B	Left Turn Lamp Signal Output	High Voltage Output, Maximum Current 4 A
5	0.5 B	Signal Ground	SGND, Maximum Current 10 A
6	0.85 R	Energy Saving Features	Power Supply, High Voltage, Maximum Current 10 A
7	--	--	--
8	0.85 W/B	Rear Compartment Open Output	High Voltage Output, Maximum Current 4 A
9	0.85 Y	Dual Lock Output	High Voltage Output, Maximum Current 10 A
10	0.85 L	Dual Lock Power Supply	Power Supply, High Voltage, Maximum Current 6 A
11	--	--	--
12	--	--	--
13	0.5 G/R	Right-Turn Lamp Signal Output	High Voltage Output, Maximum Current 4 A
14	0.5 W/B	Turning Lamp Signal Power Supply	Pvbat, High Voltage, Maximum Current 10 A
15	0.5 R/W	Energy Saving Features Output	High Voltage Output, Maximum Current 4 A

Terminal	Wiring	Terminal Descriptions	Specified Conditions
16	0.5 B	Power Supply Ground (Rear Door)	PGND, Low Voltage, Maximum Current 10 A
17	0.85 L	Rear Compartment Power Supply	Power Supply, High Voltage, Maximum Current 5 A



Terminal	Wiring	Terminal Descriptions	Specified Conditions
1	0.5 L/B	Alarm Speaker Power Supply	Power Supply, High Voltage, Maximum Current 12 A
2	0.5 P/B	Alarm Speaker Output	High Voltage Output, Maximum Current 12 A
3	2.0 L	Rear Defroster Control Output	High Voltage Output, Maximum Current 20 A
4	2.0 L	Rear Defroster Power Supply	High Voltage, Maximum Current 20 A
5	0.85 Y/B	Central Lock Lock Input	High Voltage Output, Maximum Current 16 A
6	0.85 W/B	Central Lock Unlock Output	High Voltage Output, Maximum Current 16 A
7	0.85 L	Central Lock Power Supply	Power Supply, High Voltage, Maximum Current 20 A
8	2.0 B	Power Supply Ground	Ground, High Voltage, Maximum Current 20 A

#### 10.2.4.2 Fault Diagnosis Code (DTC) List

##### 1. DTC Code Setting Method

C	Continuous Working	Regardless whether the system is working or not, BCM will be monitor whether the system condition is normal. If the system is faulty, BCM will record the related fault diagnosis code.
---	--------------------	---

O	On-Demand Self-Test	Only the system is working, BCM will monitor whether its status is normal. If the system is faulty, BCM will record the appropriate code for fault diagnosis. Check the module input state. When the input status is not correct set the DTC Code.
W	On-demand Wipers Test	Wiper Intermittent Wiper Relay will send an output signal at each wiper working cycle. If there is fault, it will be detected and recognized. In addition, it will detect the wiper input signal.

## 2. Code Table

Code	Description	Set Methods			Set Conditions
B1300	Center Door Lock Locking Switch Circuit Malfunction		O		Short To Ground
B1310	Center Door Lock Unlocking Switch Circuit Malfunction		O		Short To Ground
B1301	Internal Door Lock Locking Circuit Malfunction		O		Short To Ground
B1311	Internal Door Lock Unlocking Circuit Malfunction		O		Short To Ground
B1319	Driver Door Contact Circuit Malfunction		O		Short To Ground
B1327	Passenger Door Contact Circuit Malfunction		O		Short To Ground
B1335	Right Rear Door Contact Circuit Malfunction		O		Short To Ground
B1571	Left Rear Door Contact Circuit Malfunction		O		Short To Ground
B1551	Rear Compartment Lid Switch Contact Circuit Malfunction		O		Short To Ground
B1331	Rear Compartment Contact Circuit Malfunction		O		Short To Ground
B1519	Hood Contact Circuit Malfunction		O		Short To Ground
B1499	Left Turn Lamp Circuit Malfunction	C			Circuit Open or Short To The Battery
B1503	Right Turn Lamp Circuit Malfunction	C			Circuit Open or Short To The Battery
B1343	Rear Window Defrosting Circuit Malfunction		O		Short To Ground
B1875	Emergency Alarm Switch Circuit Malfunction		O		Short To Ground
B2281	Right Turn Switch Circuit Malfunction		O		Short To Ground
B2282	Left Turn Switch Circuit Malfunction		O		Short To Ground
B1695	Automatic Headlamp Circuit Malfunction		O		Short To K130 Circuit

Code	Description	Set Methods			Set Conditions
B2598	Headlamp Circuit and Headlamp External Relay Malfunction	C	O		Short To KI30 Circuit
B1697	Park Lamp Circuit and Park Lamp External Relay Malfunction	C	O		Short To KI30 Circuit
B1093	Key Insert Switch Circuit Malfunction		O		Short To Ground
B1612	Rear Wiper Continuous Wiping Circuit Malfunction		O	W	Short To KI30 Circuit
B1611	Rear Wiper Intermittent Wiping Circuit Malfunction		O	W	Circuit Open
B2114	Rear Washer Circuit Malfunction		O	W	Short To KI30 Circuit
B2116	Reverse Switch Circuit Malfunction		O	W	Short To KI30 Circuit
B1317	Battery Voltage Too High	C			
B1318	Battery Voltage Too Low	C			
B2477	Module Configuration Malfunction	C			
B2600	Ambient and Sun Light Sensor Too Dark		O		Sensor Darkness Beyond The Threshold
B2601	Ambient and Sun Light Sensor Too Bright		O		Sensor Brightness Beyond The Threshold
U2200	CAN With The ABS Communication Malfunction	C			No Communication With The ABS
U2210	CAN With The airbag control module Communication Malfunction	C			No Communication With The airbag control module
U2230	CAN With The EMS Communication Malfunction	C			No Communication With The EMS
U2260	Electrical Malfunction	C			BCM Unable To Send A LIN Frame
U2250	DDAPWL LIN Communication Response Malfunction	C			BCM does not receive response signals from DDAPWL module
U2253	PDAPWL LIN Communication Response Malfunction	C			BCM does not receive response signals from PDAPWL module
U2257	RRAPWL LIN Communication Response Malfunction	C			BCM does not receive response signals from RRAPWL module
U2255	RLAPWL LIN Communication Response Malfunction	C			BCM does not receive response signals from RLAPWL module
U2259	Sunroof LIN Communication Response Malfunction	C			BCM does not receive response signals from sunroof module
B1615	Front Wipers Low Speed Circuit Malfunction		O	W	Short To Ground

Code	Description	Set Methods			Set Conditions
U2600	BCM Bus Interrupted	C			BCM CAN Bus Malfunction

### 10.2.4.3 Data Stream Table

Name	Status
Hazard switch	Activated / Not Activated
Right Turn Switch	Activated / Not Activated
Left-Turn Switch	Activated / Not Activated
Left Front Turn Signal Driver Output Status	Off/On
Right Front Turn Signal Driver Output Status	Off/On
Headlamp Relay Driver Output Status	Off/On
Side Lamp Relay Output Status	Off/On
Daylight Lamp Relay Output Status	Off/On
Auto Headlamp Switch	Activated / Not Activated
Light Sensor Input Status	Activated / Not Activated
Driver Door Ajar	No / Yes
Passenger Door Ajar	No / Yes
Left Rear Door Ajar	No / Yes
Right Rear Door Ajar	No / Yes
Rear Compartment Lid / Rear Compartment Lid Ajar	No / Yes
Hood Ajar	No / Yes
Central Lock Ajar	Disabled / Not Disabled
Center Door Lock Switch and The Internal Central Locking Switch	Disabled / Not Disabled
Door Lock Switch	Disabled / Not Disabled
Battery Energy Saver Relay Control	Disconnect / Junction
Internal Lighting Relay	Disabled / Not Disabled
Rear Defroster Driver Output Status	Off/On
Rear Defroster Switch	Activated / Not Activated
Rear Wiper Relay Driver Output Status	Off/On
Reverse Switch	Off/On
Rear Washer Switch	Off/On
Rear Wiper Intermittent Switch	Off/On
Rear Wiper Switch	Off/On
Ignition Switch	Off/On



Name	Status
Rear Compartment Lid Release Input Switch	Off/On
Alarm Speaker Status	Off/On
Lock Relay	Off/On
Unlock Relay	Off/On
Dual Lock Relay	Off/On
Rear Compartment Lid Release Relay	Off/On
Power Windows Startup Relay Driver	Off/On
Anti-theft Indicator Light Relay Driver, Heated Seat Relay Startup Driver	Off/On
ECM Starter Lock Relay Driver	Off/On

#### 10.2.4.4 Configuration Information

Name	Status
Metal Key Dual Lock	Disable / Enable
Remote Control Key Insert Key Features	Disable / Enable
Ignition Switch Off Automatically Unlock	Disable / Enable
Two Consecutive Remote Key Locking Key Function Definitions	VS
Collision Auto Unlock	Disable / Enable
Automatic Re-Lock	Disable / Enable
Speed Automatic Lock	Disable / Enable
Left Hand Drive or Right Hand Drive Definition	Left / Right
Front Door Ajar Locking Leads To An Automatic Unlock Feature	Disable / Enable
Any Door Ajar Auto-Lock Function Disabled	Disable / Enable
All Doors Closed Auto-Lock Function Enabled	Disable / Enable
Rear doors closed, automatic dual-lock locking feature is available for vd1	VS
Rear Compartment Release Configuration	Low Voltage Trigger
Rear Compartment Locking Configuration	Release / Engage
Door Ajar Configuration	LOW
Dual Lock Configuration	Disable / Enable
Peripheral Anti-theft Feature	Disable / Enable
Automatic Alarm Function For Alarm System	Disable / Enable
Emergency alarm feature is enabled	Disable / Enable
Change Lane Turning Indicator Function	Disable / Enable
Rear Wiper Function	Disable / Enable

Name	Status
Reverse Automatic Wiper Function	Disable / Enable
Rear Wiper Two-Stage Wiping Function	Disable / Enable
Rear Washer Feature	Disable / Enable
Safe Return Signal Lamping Function	Disable / Enable
Locating Vehicle Function	Disable / Enable
Night Lighting Function	Disable / Enable
Daytime Running Light (BFC) Control	Disable / Enable
Automatic Headlamp	Disable / Enable
Side Lamps On Daytime Running Lights Off	Disable / Enable
Safe Return Home Lighting Function Timing Control	30 S
Emergency Brake Warning Lamp Function	Disable / Enable
Rear Window Heating	Disable / Enable
Rear Window Heating Conditions	VBat
Electric Window Control	Disable / Enable
Seat Heating Control	Disable / Enable
Rear Wiper Disable	Disable / Enable
Remote Window Control Feature	Disable / Enable
Third Key Rf Remote Control Button Function Definition	Trunk Release
RF Key Learn User Mode	Disable / Enable
Key Learn Audio Confirm	Disable / Enable
Key Learn Video Confirm	Disable / Enable
Remote Control Switch Mode Definition	Lock / Unlock
Mute Mode Switch	Disable / Enable
Door Open Triggered Courtesy Lamp On	Disable / Enable

#### 10.2.4.5 Alarm Triggered Event Log

##### Note

When diagnose the remote anti-theft alarm system fault, use this BCM alarm recording function to facilitate quick diagnostic.

##### 1. Most Recent Alarm Triggered Event Log

Hatchback / Rear Compartment Lid Ajar	Yes
Engine Hood Ajar	No
Right Rear Door Ajar	No

Left Rear Door Ajar	No
Passenger Door Ajar	No
Driver Door Ajar	No
Ignition Switch	No

## 2. Second Last Alarm Triggered Event Log

Hatchback / Rear Compartment Lid Ajar	Yes
Engine Hood Ajar	No
Right Rear Door Ajar	No
Left Rear Door Ajar	No
Passenger Door Ajar	No
Driver Door Ajar	No
Ignition Switch	No

## 3. Third Last Alarm Triggered Event Log

Hatchback / Rear Compartment Lid Ajar	Yes
Engine Hood Door Ajar	No
Right Rear Door Ajar	No
Left Rear Door Ajar	No
Passenger Door Ajar	No
Driver Door Ajar	No
Ignition Switch	No

## 4. Fourth Last Alarm Triggered Event Log

Hatchback / Rear Compartment Lid Ajar	Yes
Engine Hood Door Ajar	No
Right Rear Door Ajar	No
Left Rear Door Ajar	No
Passenger Door Ajar	No
Driver Door Ajar	No
Ignition Switch	No

### 10.2.4.6 LIN Bus Modules Running Status (Window Express Down Function)

#### 1. Read DDAPWL Status (Driver Side Window Regulator):

- A. On / Lowering Button Status
- B. Off / Raising Button Status

- C. Hall Sensor Status
  - D. Motor Relay Status
  - E. Hot / Overheating Protection Status
2. Reading PDAPWL Status (Passenger Window Regulator):
- A. On / Lowering Button Status
  - B. Off / Raising Button Status
  - C. Hall Sensor Status
  - D. Motor Relay Status
  - E. Hot / Overheating Protection Status
3. Reading RLAPWL Status (Left Rear Window Regulator):
- A. On / Lowering Button Status
  - B. Off / Raising Button Status
  - C. Hall Sensor Status
  - D. Motor Relay Status
  - E. Hot / Overheating Protection Status
4. Reading RRAPWL Status (Right Rear Window Regulator):
- A. On / Lowering Button Status
  - B. Off / Raising Button Status
  - C. Hall Sensor Status
  - D. Motor Relay Status
  - E. Hot / Overheating Protection Status

#### 10.2.4.7 BCM Active Test and Special Features

##### Active Test List

- 1. External Lamp Control Output
  - A. Turn on headlamps.
  - B. Turn off headlamps.
  - C. Turn on park lamps.
  - D. Turn off park lamps.
  - E. Turn on daylight lamps.
  - F. Turn off daylight lamps.
- 2. Rear Defroster Output Control
- 3. Rear Wiper Output Control (Hatchback)
- 4. Alarm Speaker Output Control
- 5. Light Sensor (Ambient and Sun Light Sensor) Darkness Test
- 6. Light Sensor (Ambient and Sun Light Sensor) Lightness Test

## BCM Special Setting Features

1. Rear Compartment Lid (Rear Compartment) Release Control
2. Lock / Unlock Dual Lock (All Doors)
3. Alarm System Enable / Disable
4. Anti-theft Indicator
5. Remote Keyless Initialization
6. Configure Daylight Lamps Feature

### 10.2.4.8 Self-Diagnostic Test List

#### 1. Visual Inspect Items

Visual testing program is defined as failure occurs, the fault can be very intuitive display.

Test Content	Test Results	DTC	Cause
21W Left Turn Lamp Circuit	Set to blink once per cycle.	B1499	Left turn lamp circuit is open or short to power supply.
5W Left Turn Lamp Circuit			
21W Right Turn Lamp Circuit		B1503	Right turn lamp circuit is open or short to power supply.
5W Right Turn Lamp Circuit			
Anti-theft LED Indicator	Alarm LED indicator blinks with 10 Hz frequency, until the end of the self-test.	-	-
Internal Lighting	Internal Lighting, Park Lamp, Headlamp On 1,000 ms	-	-
Park Lamp External Relay		B1697	Park lamp circuit and park lamp relay circuit is short to power supply.
Headlamp Relay	Internal Lighting, Park Lamp, Headlamp On 1,000 ms	B2598	Park lamp circuit and park lamp relay circuit is short to power supply.
Daylight Lamp External Relay	Enable and Disable Once, Frequency 1Hz	-	-
Rear Defrost Relay	Rear window heater is powered on once, and the heater indicator is lit once.	-	-
Alarm Horn	Alarm horn enable once, frequency 50 Hz	-	-

#### 2. Non-Visual Inspect Items

Test Content	Testing Requirements	DTC	Cause
Mechanical Key Central Lock Locking Control Circuit	<ol style="list-style-type: none"> <li>1. Door Unlocked</li> <li>2. Mechanical key is not inserted into driver door lock.</li> </ol>	B1300	Mechanical key central locking lock circuit is short to ground.

Test Content	Testing Requirements	DTC	Cause
Internal Central Locking Lock Circuit	3. Central Lock button is in the natural status.	B1301	Internal central locking lock circuit is short to ground.
Mechanical Key Central Locking Unlock Circuit		B1310	Mechanical key central locking unlock circuit is short to ground.
Internal Central Locking Unlock Control Circuit		B1311	Internal central locking unlock control circuit is short to ground.
Driver Door Contact Switch Circuit	1. All doors closed. 2. Engine hood closed. 3. Hatchback / rear compartment lid release button is in natural.	B1319	Driver door contact switch circuit is short to ground.
Passenger Door Contact Switch Circuit		B1327	Passenger door contact switch circuit is short to ground.
Right Rear Door Contact Switch Circuit		B1335	Right rear door contact switch circuit is short to ground.
Left Rear Door Contact Switch Circuit		B1571	Left rear door contact switch circuit is short to ground.
Hatchback / Rear Compartment Contact Switch Circuit	1. All doors closed. 2. Engine hood closed. 3. Hatchback / rear compartment lid release button is in natural.	B1331	Hatchback / rear compartment contact switch circuit is short to ground.
Hatchback / Rear Compartment Open Circuit		B1551	Hatchback / rear compartment open circuit is short to power supply.
Hood Contact Switch Circuit		B1519	Hood contact switch circuit is short to ground.
Left Turn Lamp Switch Circuit	1. Shift lever is in neutral. 2. Headlamp switch is at OFF position.	B2282	Left turn lamp switch circuit is short to ground.

Test Content	Testing Requirements	DTC	Cause
Right Turn Lamp Switch Circuit		B2281	Right turn signal lamp switch circuit is short to ground.
Automatic Headlamp Switch Circuit		B1695	Automatic headlamp switch circuit is short to power supply.
Headlamps Switch Circuit		B2598	Headlamp circuit and headlamp relay circuit are short to power supply.
Park Lamp Switch Circuit	1. Shift lever is in neutral. 2. Headlamp switch is at OFF position.	B1697	Park lamp circuit and park lamp relay circuit are short to power supply.
Key Insert Switch Circuit	1. Ignition key is not inserted. 2. Rear window defroster switch and emergency alarm push button are in natural.	B1093	Key insert switch circuit is short to ground.
Rear Window Defroster Switch Circuit		B1343	Rear window defroster switch circuit is short to ground.
Emergency Alarm Switch Circuit		B1875	Emergency alarm switch circuit is short to ground.

## 10.2.5 Removal and Installation

### 10.2.5.1 BCM replacement

Refer to [11.10.8.1 BCM Replacement](#).

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## 10.3 Programming and Set Up

### 10.3.1 Programming and Set Up

#### 1. Programming Note

Before control module programming, make sure the following conditions are met:

##### A. Vehicle System Voltage

- a. Charging system should have no trouble. In the control module programming, firstly rule out the charging system failure.
- b. Battery voltage should be greater than 12 V but less than 16 V. If the battery voltage is too low, before the control module programming the battery must be charged.
- c. Do not connect the vehicle battery charger to the battery. Incorrect or the battery charger or system voltage caused voltage fluctuations will lead to program failure or control module damage.
- d. Turn off or disable all electrical load, battery load, such as the following components:
  - Interior Lamps
  - Daylight Lamps (If equipped)
  - Heating, Ventilation and Air-Conditioning (HVAC) System
  - Engine Cooling Fans, Radio, etc.

B. Ignition switch must be placed in the correct location. In the programming process, do not change the ignition switch position, unless the diagnostic unit has instructions.

C. Make sure that all tools connections are solid, including the following components and circuits:

- a. Scan Tool
- b. Data Link Connector (DLC) Connections
- c. Power Supply Circuit

D. Do not disturb programming tool harness. Unexpected interruption of programming will lead to program failure or control module damage.

#### 2. Programming and Set Up After ECM Replacement

After ECM replacement, read the ECM security procedures. Refer to [2.5.7.10 Replaced ECM Programming](#).

#### 3. Programming and Setup After ABS Module Replacement

This device does not require programming or setup.

#### 4. Module Programming and Setup After TPMS Replacement

Replace the TPMS module, or TPMS sensor. TPMS module and sensors need to learn specific steps to refer to [6.7.6.1 Sensor Learn](#).

#### 5. Instrument Cluster Programming and Set Up After Replacement

This device does not require programming or setup.

#### 6. Programming and Set Up After BCM Replacement

After replacing BCM, the remote key must be reset, detailed steps are as follows:

Lift anti-theft case, open the driver door. Turn the key from OFF to ON 6 times in 10 s. the last stop is at the OFF position. At this time, the anti-theft indicator light enters the learn mode. Hold down any key on the remote control device. If the anti-theft light flashes once, it indicates a successful learn. Four keys can be learned in a row. 10 s after the completion of four keys, or after learning one key and the ignition is at "ON". End for each learn, the previous key id will be replaced.

#### 7. Anti-theft Control Module Programming and Setup After Replacement

After replacing engine anti-theft control module, read security program into the module. Refer to [2.5.7.11 Replaced Anti-theft Module and ECM Programming](#).

#### 8. Ignition Key Programming and Setup After Replacement

Engine anti-theft system can learn up to five keys. For detailed steps. Refer to [2.5.7.7 Replaced Key Programming](#)

#### 9. Remote Key Programming and Setup After Replacement

Refer to [10.3.1](#).

#### 10. Roof Module Motor Programming and Setup After Replacement

After replacing the roof motor module, initialize the sunroof module motor. For detailed steps. Refer to [11.8.7.3 Sunroof Initialization](#).

### 11. Reverse Radar Module Programming and Setup After Replacement

This device does not require programming or setup.

### 12. Airbag control module Module Programming and Setup After Replacement

This device does not require programming or setup.

### 13. Power Window Motor (Express Down Feature) Programming and Setup After Replacement

Window motor with express down feature must be initialized after replacement. For details, refer to [11.5.7.4 Glass Regulator Initialization \(If Window Express Down Feature Is Available\)](#).

## 11 Body Electric

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## 11.1 Warnings and Notices

### 11.1.1 Warnings and Notices

#### Vehicle Lifting Warning

##### Warning!

Warning: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

#### Battery Disconnect Warning

##### Warning!

Warning: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

#### Cracked Window Warning

##### Warning!

Warning: If a window is cracked but still intact, crisscross the window with masking tape in order to reduce the risk of damage or personal injury.

#### Express Window Down Warning

##### Warning!

Warning: Disconnect the power window switch when working inside the driver door. When operated, the Express Up/Down Feature allows the door window to move very quickly, without stopping, which could cause personal injury.

#### Halogen Bulb Warning

##### Warning!

Warning: Halogen bulbs contain gas under pressure. Handling a bulb improperly could cause it to shatter into flying glass fragments. To help avoid personal injury: Turn off the lamp switch and allow the bulb to cool before changing the bulb. Leave the lamp switch OFF until the bulb change is complete. Always wear eye protection

when changing a halogen bulb. Handle the bulb only by its base. Avoid touching the glass. Keep dirt and moisture off the bulb. Properly dispose of the used bulb. Keep halogen bulbs out of the reach of children.

## 11.2 Audio Entertainment System

### 11.2.1 Specifications

#### 11.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Radio Control Bolt	M6 × 20	8-11	6-8
Rear Speaker Self-Tapping Screws	ST4.8 × 9.5	3-4	2-3
Front Door Tweeters Self-Tapping Screws	ST4.2 × 9.5	3-4	2-3
Radio Antenna Bolts (Sedan)	M6 × 16	8-11	6-8

## 11.2.2 Description and Operation

### 11.2.2.1 Description and Operation

#### Audio System Settings

Whenever the sound system circuit and the battery is disconnected, the sound system all customers personalized settings will be initialized.

#### Roof Antenna

Hatchback roof antenna is located in the rear. antenna mast can be rotated (to facilitate washing and to avoid damage to the antenna), but can not be removed. Sedan antenna is located in the upper part of rear window defroster grille.

#### Front Speaker

All audio systems use six speakers: two front doors have front speakers and two tweeters. For sedan, the two rear speakers are installed on the rear parcel shelf. For hatchback, the rear speakers are installed in the C pillar trim panel.

#### CD maintenance

Carefully carry the CD-ROM. CD-ROM disc should be stored in boxes, and avoid sunlight, heat and dust. If the surface contamination, using a clean soft cloth soaked in neutral cleaning agent, wipe clean the disc.

### 11.2.3 System Working Principle

#### 11.2.3.1 System Working Principle

##### Radio:

Turn the radio control switch to "AM" and "FM", the antenna module receives the radio signal and transmits to the radio control through dedicated circuit. Radio control receives radio signals through the internal filter circuit, transfers out to the channel. Audio signal is amplified through the amplifier and eventually through the IP32 terminal output terminals 2-6,1-5,3-7,4-8 to each speaker.

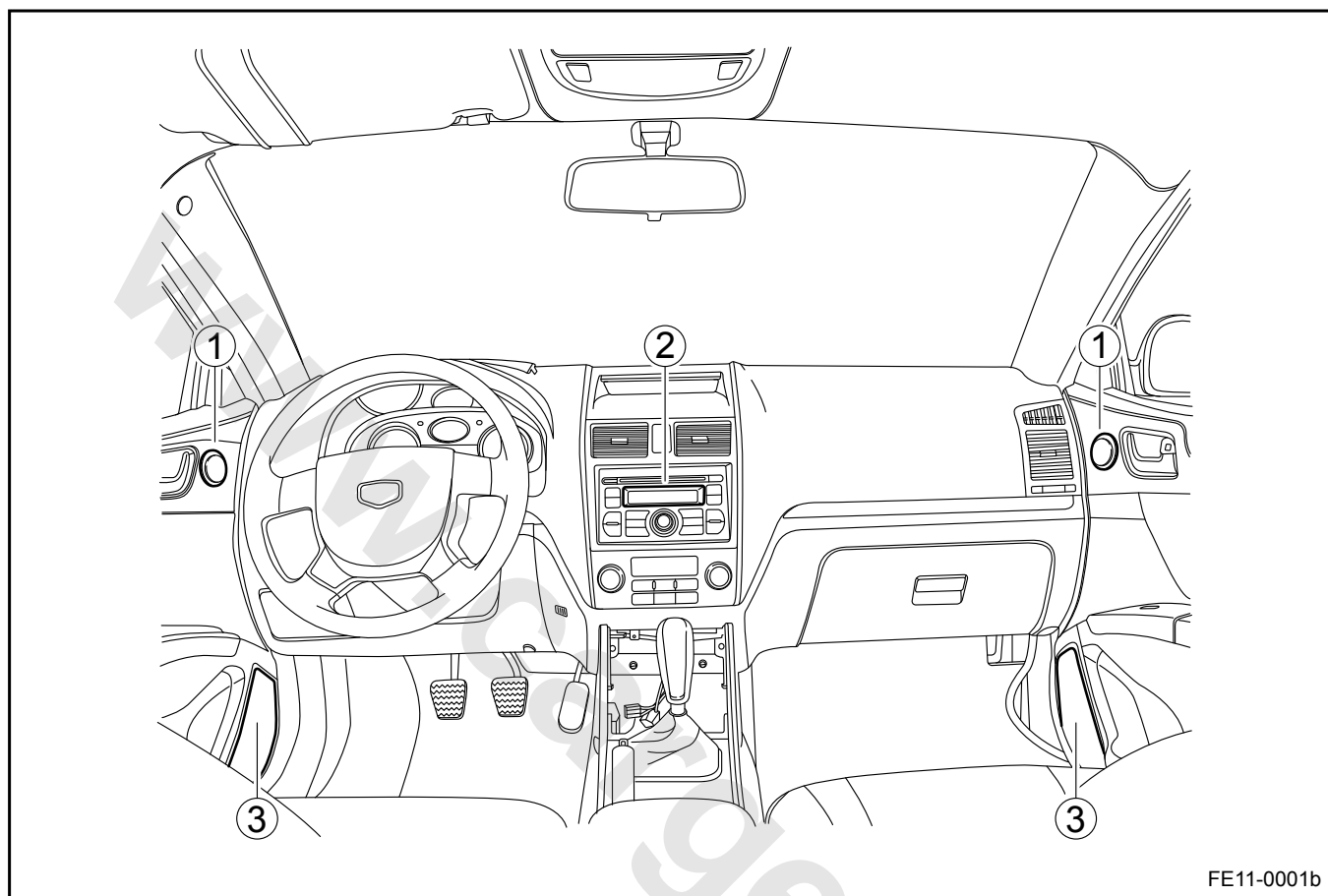
##### CD player:

Turn the radio control switch to CD mode, the radio control assembly controls the CD movement. CD system mainly consists of the laser and turntable system, servo system, signal processing system, information storage system and control system, etc.. CD player laser is a key component, which consists of semiconductor lasers, optical system and electrical detector component. It is a low-power laser diodes. Laser beam is sent through the optical lens system onto the LP information surface. The disc has a number of pits, when the beam hit the pit, because of the reflected light is weak, photoelectric detector picks up weak signals; when the beam hit the smooth aluminum surface, there will be a strong reflected light. The detector's high or low electrical pulse output signal corresponds to the presence or absence of the pits. Through the RF amplifier and the internal comparator, "1" and "0" serial digital signals are obtained, and added to the digital signal and processing circuit to carry out demodulation, frame sync detection, error correction. The processed data will be added to the digital-analog conversion (D / A) and converted into analog sound output to the amplifier. The amplified audio signals will be sent to each speaker through the radio control wiring harness connector IP32 terminals 2-6,1-5,3-7,4-8.

## 11.2.4 Component Locator

### 11.2.4.1 Component Locator

#### Radio Control and The Front Door Speakers

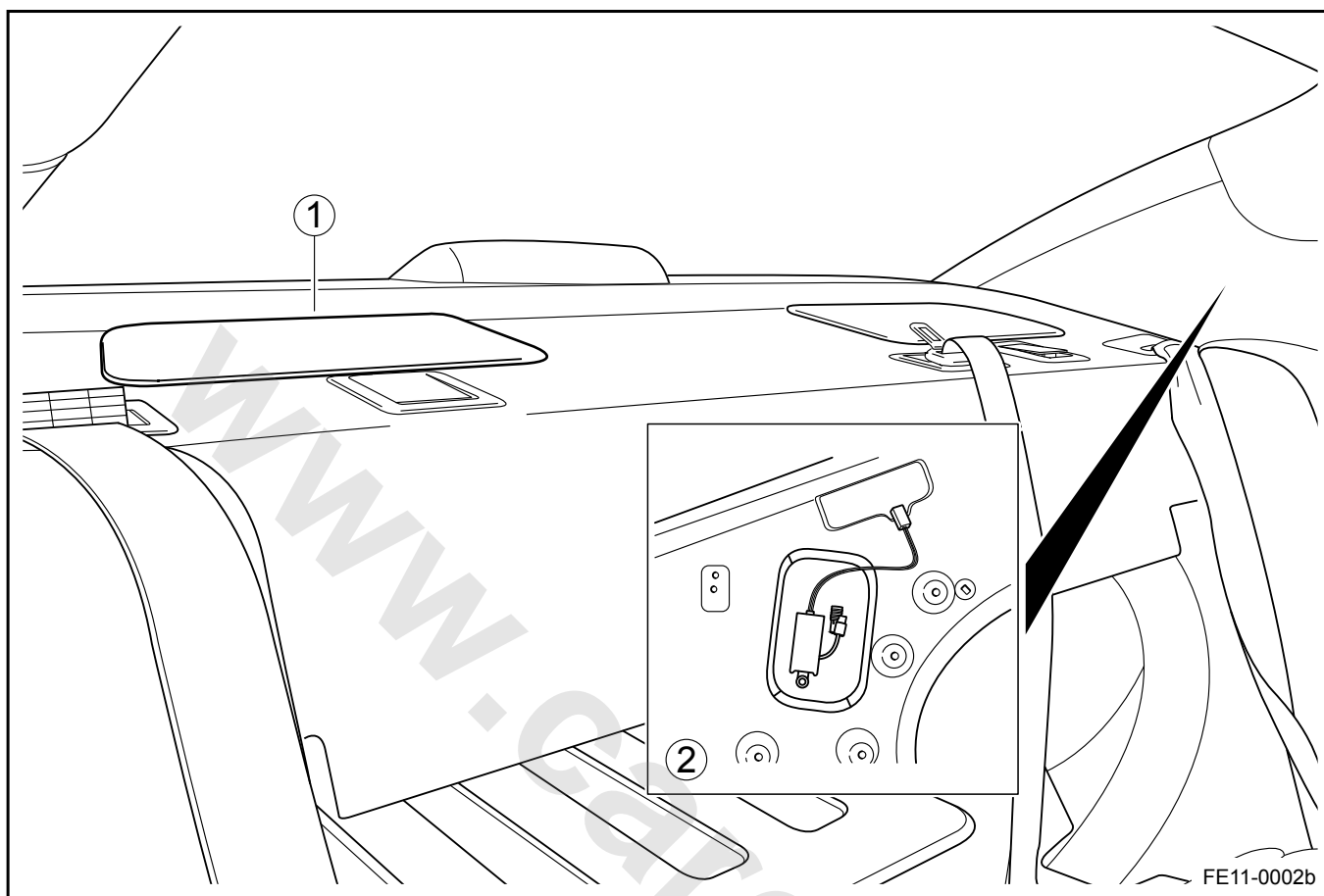


#### Legend

- 1. Front Door Tweeters
- 2. Radio Control

- 3. Front Door Speakers

Rear Speakers (Sedan)



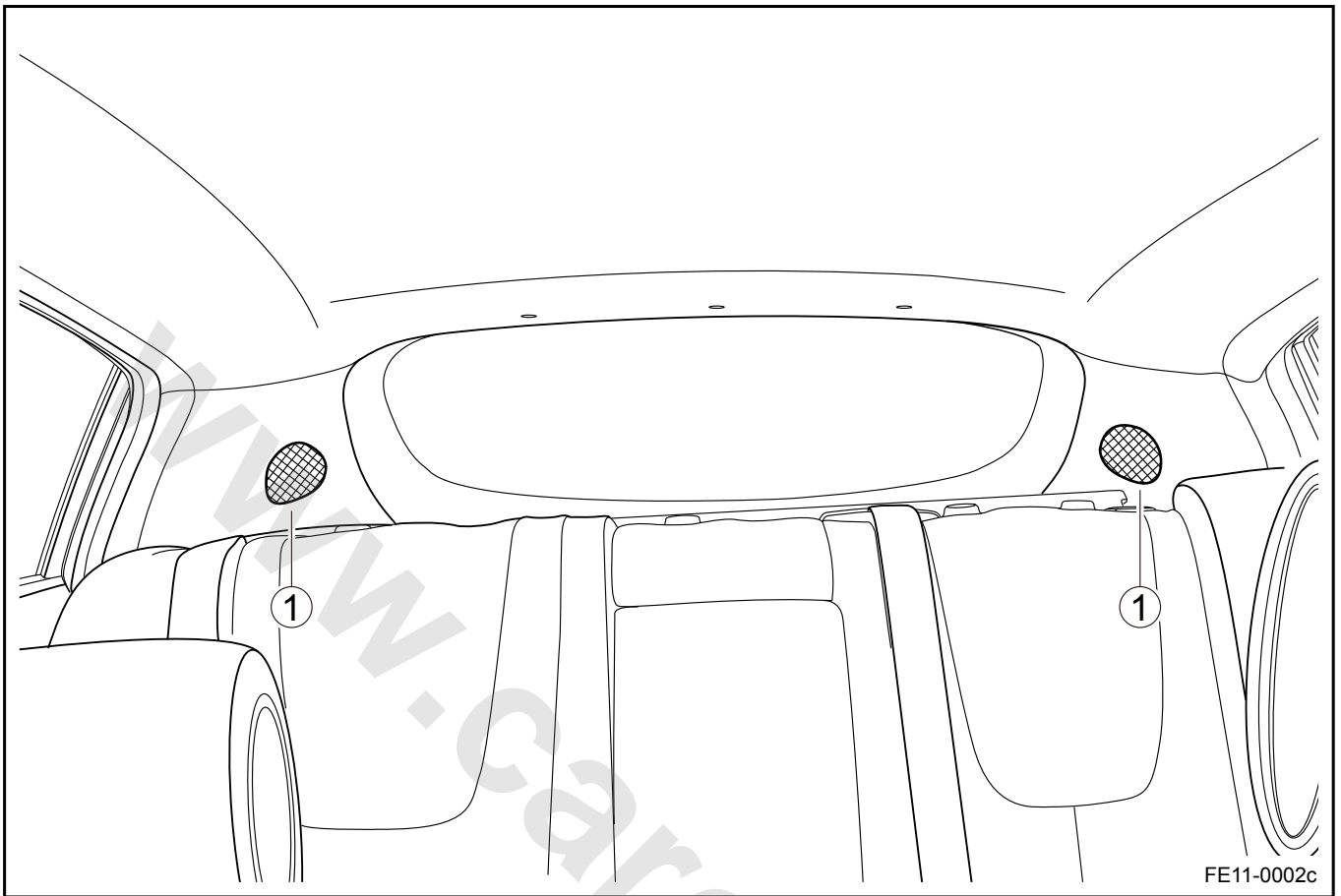
Legend

1. Rear Speaker

2. Radio Antenna Amplifier



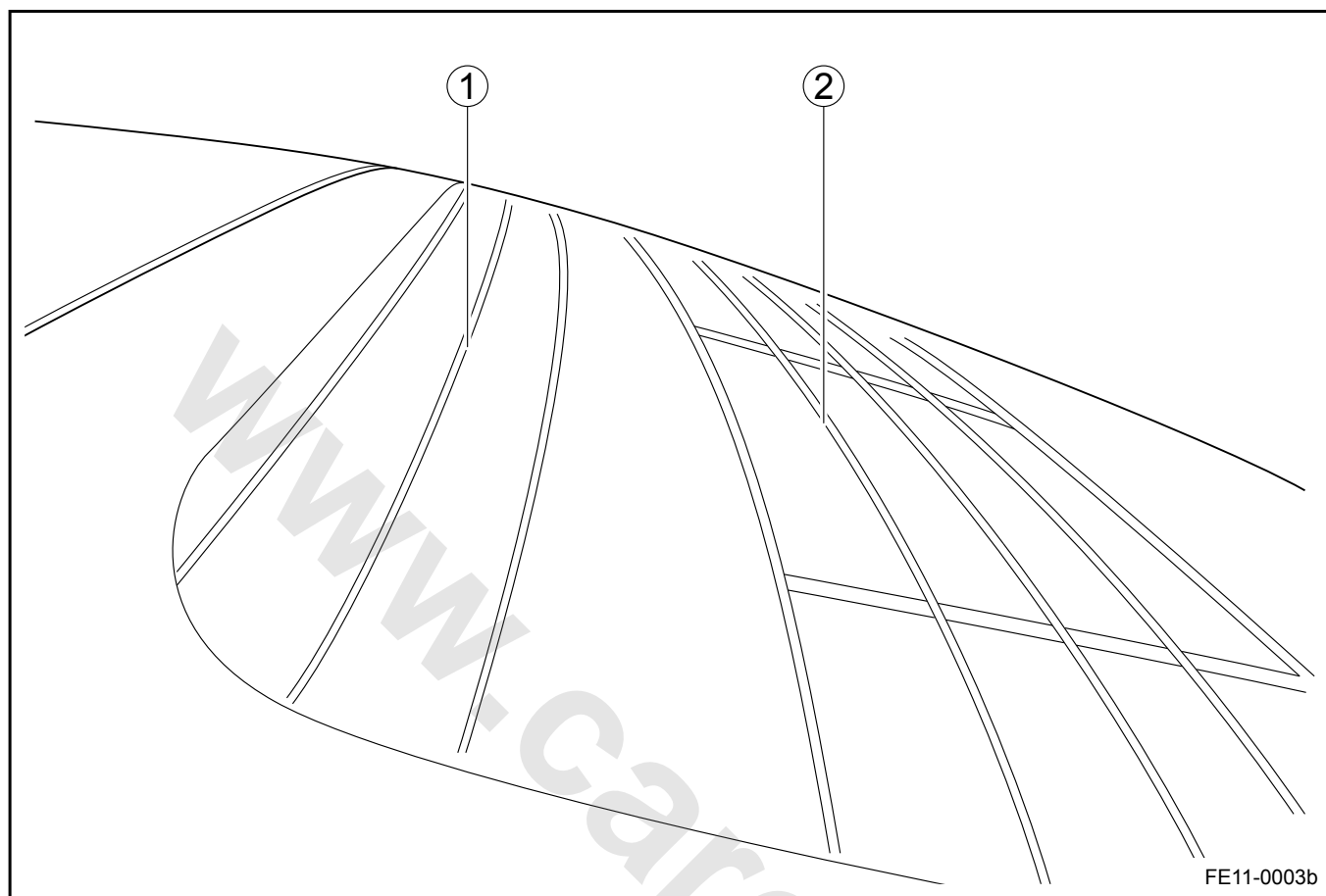
Rear Speakers (Hatchback)



Legend

1. Rear Speakers (Hatchback)

Radio Antenna (Sedan)

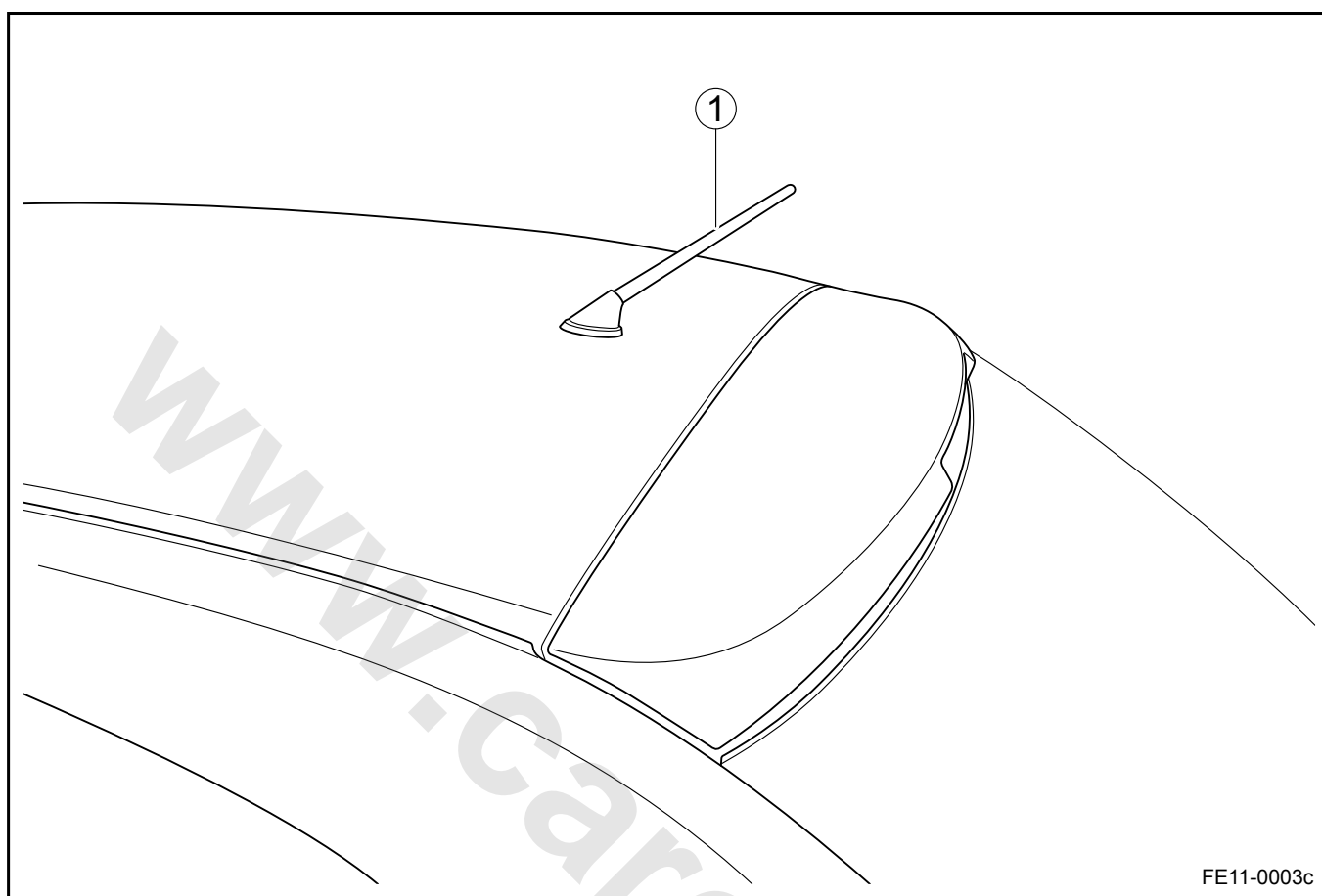


Legend

1. Radio Antenna Grid

2. Rear Window Defroster Grid

Radio Antenna (Hatchback)

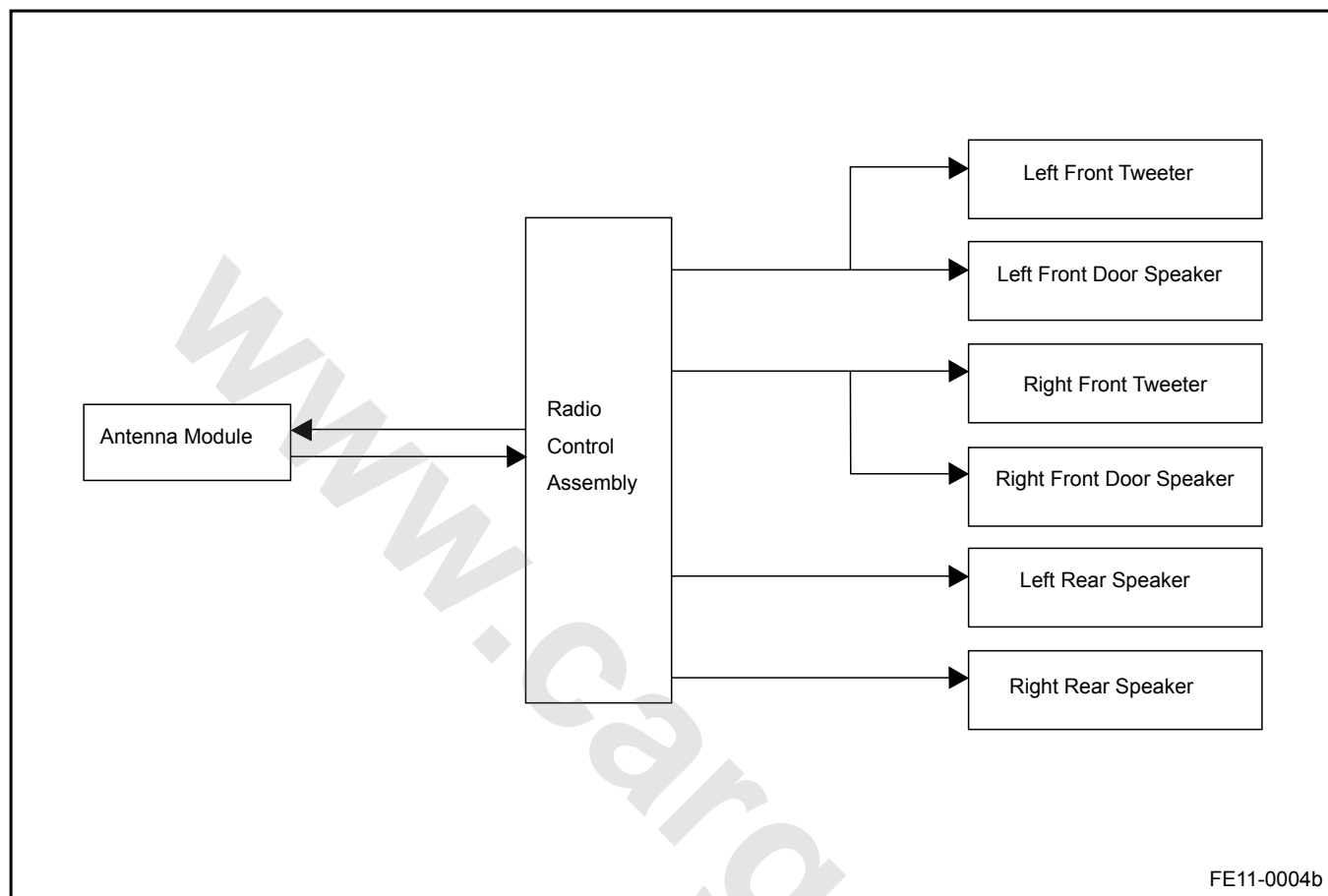


Legend

- 1. Radio Antenna

## 11.2.5 Schematic

## 11.2.5.1 Schematic



## 11.2.6 Diagnostic Information and Procedures

### 11.2.6.1 Diagnosis Description

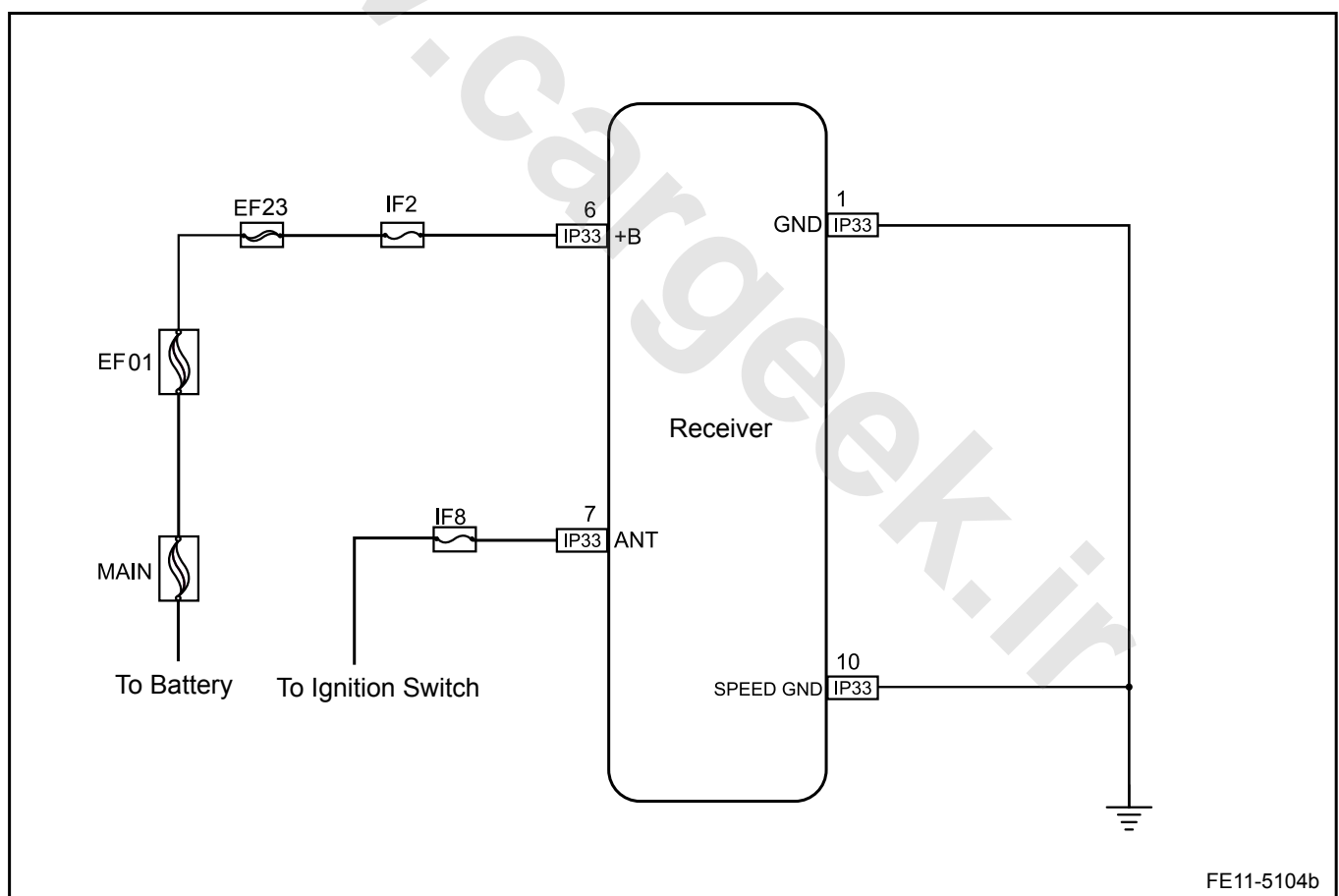
Refer to [11.2.2.1 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.2.6.2 Visual Inspection

- Check installed after market equipment that may affect the operation of the audio system.
- Check the easy to access system components to identify whether there is a significant damage or possible malfunction.
- In the event of all speakers inoperative, focus on circuits that are easy to short to ground, such as the rear compartment speaker wiring harness connector, as it will help with diagnostic.
- If a single speaker is inoperative, it may be the audio channel is shielded, causing a single channel inoperative. It is not a sound system malfunction. Refer to the sound system instructions in the owner handbook.

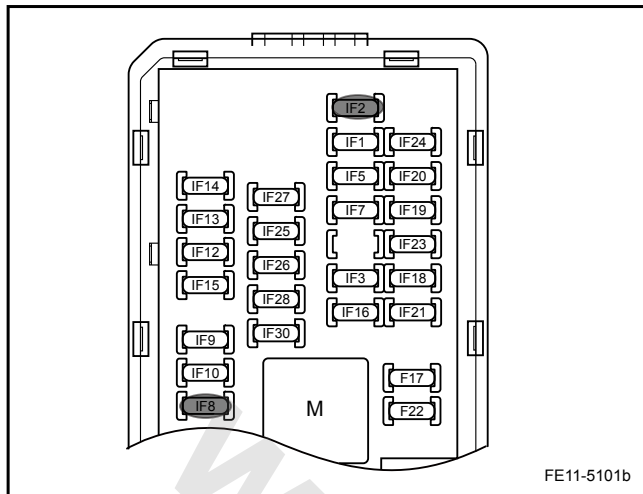
### 11.2.6.3 Radio Control Can Not Be Turned On

Schematic:



Diagnostic Steps:

Step 1	Check fuses, IF2 and IF8.
--------	---------------------------



(a) Are fuses IF2 and IF8 blown?

Fuse Rating: IF2 15A, and IF8 10 A respectively.

Confirm whether the fuses IF2 and IF8 are blown.

No

Go to step 3

Yes

Step 2 Check the fuses, IF2 and IF8 circuits.

(a) Check whether the fuses IF2 and IF8 circuits are short circuits.

(b) Repair the circuits. Confirm that there are no short circuits.

(c) Replace with fuses with rated current.

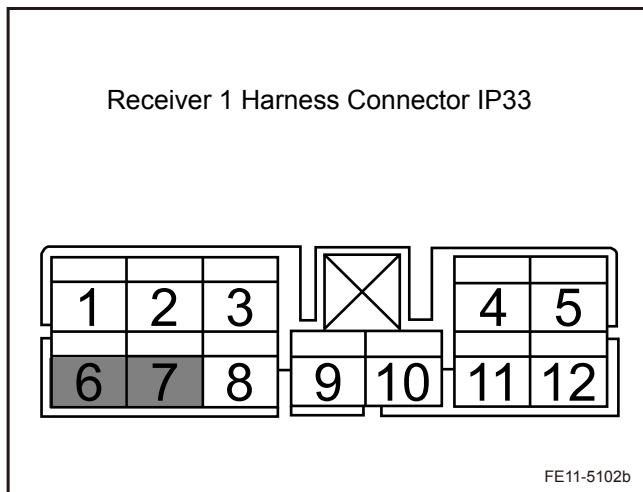
Confirm whether the radio is working correctly.

Yes

System normal

No

Step 3 Check the radio control power supply.



(a) Remove the radio control.

(b) Measure radio control harness connector IP33 terminals No. 6,7 voltage.

Standard Voltage

Test Terminal	Test Conditions	Standard Voltage
IP33 (6) and Body Ground	Always	11-14 V
IP33 (7) and Body Ground	Ignition Switch ACC	11-14 V

Confirm whether the power supply is normal.

Yes

Go to step 5

No

Step 4 Repair the open circuit between the radio control harness connector IP33 and fuse IF2.

(a) Confirm the open circuit between radio control wiring harness connector IP33 terminal No.6 and fuse IF2 repair is completed.

- (b) Confirm the open circuit between radio control wiring harness connector IP33 terminal No.7 and fuse IF8 repair is completed.

Confirm whether the radio control is working correctly.

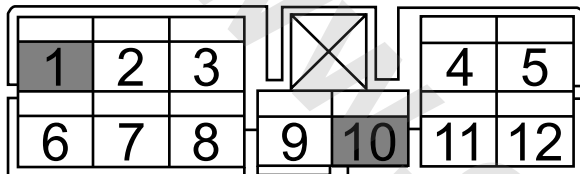
Yes

System normal

No

Step 5 Check the radio control ground.

Receiver 1 Harness Connector IP33



FE11-5103b

- (a) Measure resistance between radio control wiring harness connector IP33 terminals No.1,10 and the ground.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 7

No

Step 6 Repair the open circuit between radio control harness connector IP33 and the ground.

- (a) Confirm the open circuit between the radio control wiring harness connector IP33 terminals No.1,10 respectively and the body repair is completed.

Confirm whether the radio is working correctly.

Yes

System normal

No

Step 7 Replace the radio control.

- (a) Refer to [11.2.7.5 Radio Control Replacement](#).

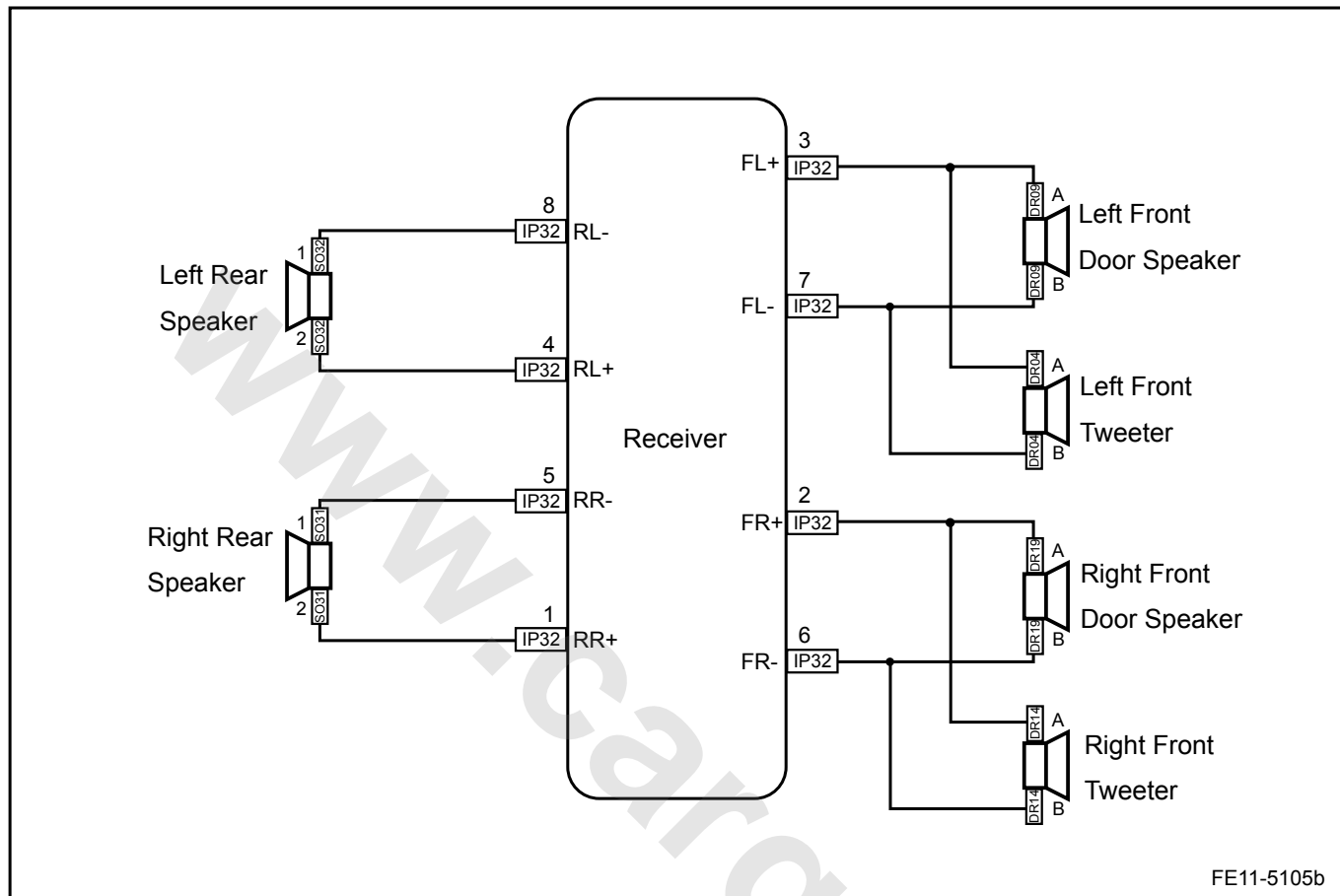
Confirm whether the radio is working correctly.

Next

Step 8 System normal.

## 11.2.6.4 Radio Control Can Be Turned On But The Speakers Are Inoperative

Schematic:

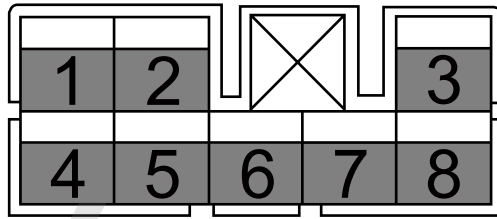


Diagnostic Steps:

Step 1	Turn on the radio control.
<p>(a) Operate the radio control master control panel, adjust the channel, so that front and rear and left and right channels are in the middle.</p> <p>Confirm whether all the speakers are inoperative.</p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 2px 10px;">Go to step 4</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">Yes</div>	
Step 2	Measure the resistance between radio control harness connector IP32 audio output and ground.



Receiver 2 Harness Connector IP32



FE11-5106b

- Remove the radio control.
- Disconnect the radio control harness connector IP32.
- Measure resistance between radio control wiring harness connector IP32 all audio output terminals and the ground with a multimeter.

Standard Resistance: 10 kΩ or higher

Is the resistance specified value?

Yes

Go to step 8

No

Step 3 Repair the short circuit between radio control harness connector IP32 all audio terminals and body ground.

- Confirm the short circuit between radio control harness connector IP32 all audio terminals and body ground repair is completed.

Confirm whether the radio is working correctly.

Yes

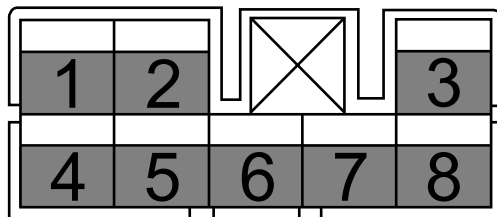
System normal

No

Go to step 8

Step 4 Check the inoperative speaker circuit.

Receiver 2 Harness Connector IP32



FE11-5106b

- Disconnect the radio control harness connector IP32.
- Measure the speaker resistance through the wiring harness connector IP32 with a multimeter.

Standard Resistance

Test Speakers	Test Terminal	Standard Resistance
Left Rear Speaker		3.5-4.5 Ω
Right Rear Speaker		3.5-4.5 Ω
Left Front Door Tweeter		3.5-4.5 Ω
Driver Door Speaker		3.5-4.5 Ω
Left Front Door Tweeter		3.5-4.5 Ω
Passenger Door Speaker		3.5-4.5 Ω

Confirm the resistances are normal.

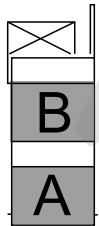
Yes

Go to step 7

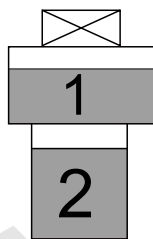
No

Step 5 Check for speaker open circuit.

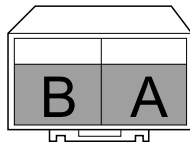
Front Door Speaker  
Harness Connector  
DR09/19



Rear Door Speaker  
Harness Connector  
SO32/31



Tweeter Harness  
Connector DR04/14



FE11-5107b

- (a) Disconnect radio control harness connector IP32.
- (b) Disconnect the inoperative speaker connector.
- (c) Listed in the following table, measure inoperative speaker connector terminal with a multimeter.

Location	Multimeter Connection	Specified Conditions
Left Rear Speaker		Less than 1 $\Omega$
Right Rear Speaker		Less than 1 $\Omega$
Left Front Door Tweeter	Door wiring harness connector DR04 terminals B, A and the instrument harness connector IP32 terminals No.7,3.	Less than 1 $\Omega$
Right Front Door Tweeter	Door wiring harness connector DR14 terminals B, A and the instrument harness connector IP32 terminals No.6,2.	Less than 1 $\Omega$
Driver Door Speaker	Door wiring harness connector DR09 terminals B, A and the instrument harness connector IP32 terminals No.7,3.	Less than 1 $\Omega$
Passenger Door Speaker	Floor wiring harness connector DR19 terminals B, A and the instrument harness connector IP32 terminals No.6,2.	Less than 1 $\Omega$

- (d) Confirm the open circuit repair is completed.  
Confirm the radio is working properly.

Yes

System normal

No

Step 6 Check the speaker.

- (a) Measure speaker terminals.  
Standard Resistance: 3.5-4.5  $\Omega$

Confirm whether the resistance are normal.

Yes

Go to step 8

No

Step 7

Replace the speaker.

Confirm speakers are working correctly.

Yes

System normal

No

Step 8

Replace the radio control.

(a) Refer to [11.2.7.5 Radio Control Replacement](#).

Confirm the repair completed.

Next

Step 9

System normal.

## 11.2.7 Removal and Installation

### 11.2.7.1 Front Door Speaker Replacement

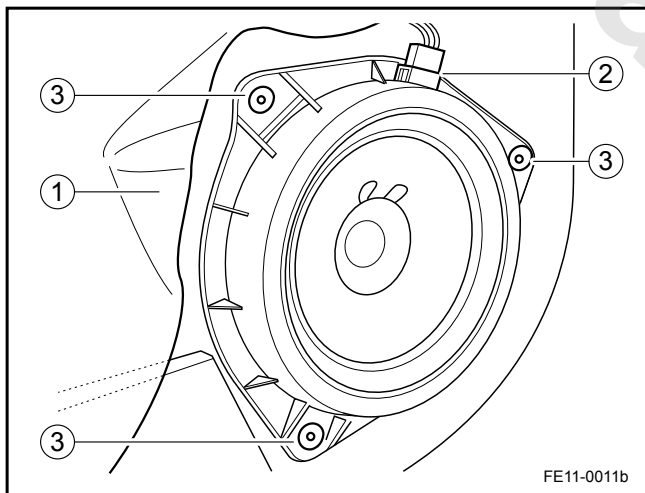
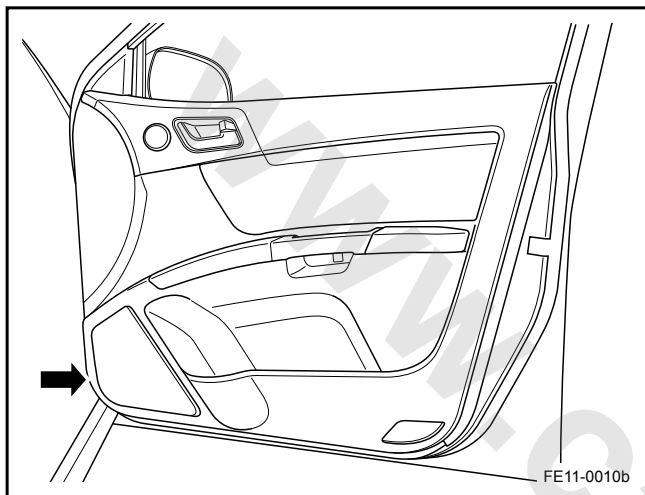
#### Woofer Replacement

##### Removal Procedure

##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

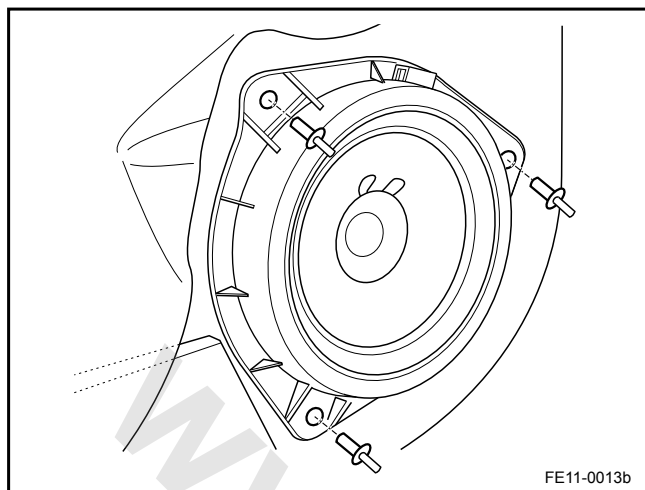
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the front door trim panel. Refer to [12.9.1.12 Front Side Door Trim Panel Replacement](#).



3. Peel the film (1).
4. Disconnect the speaker connector (2).
5. Remove the front door speaker retaining screws (3).

## Installation Procedure:

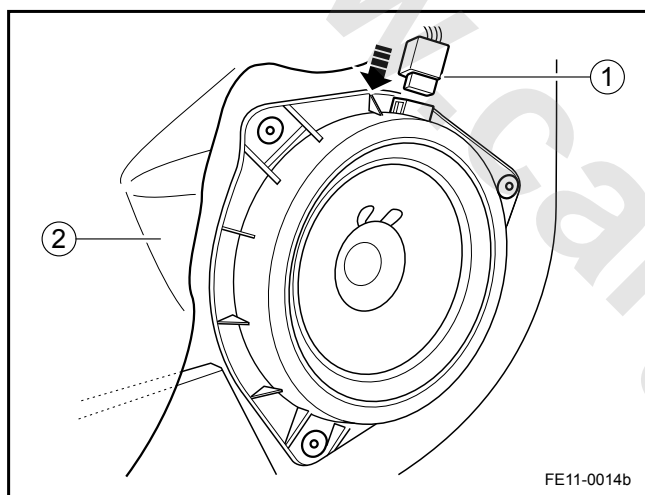
1. Install the speaker and tighten the retaining rivets.



## Note

Refer to "Fastener Notice" in "Warnings and Notices".

2. Connect the speaker harness connector (1).
3. Paste the film (2).
4. Install the front door trim.
5. Connect the battery negative cable.

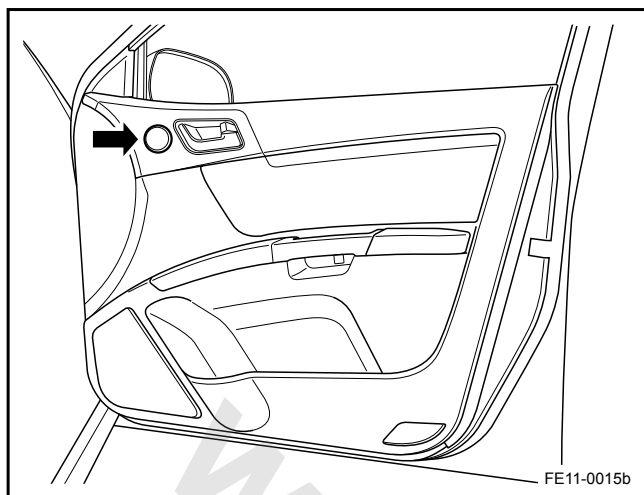


## Tweeter Replacement

## Removal Procedure

## Warning!

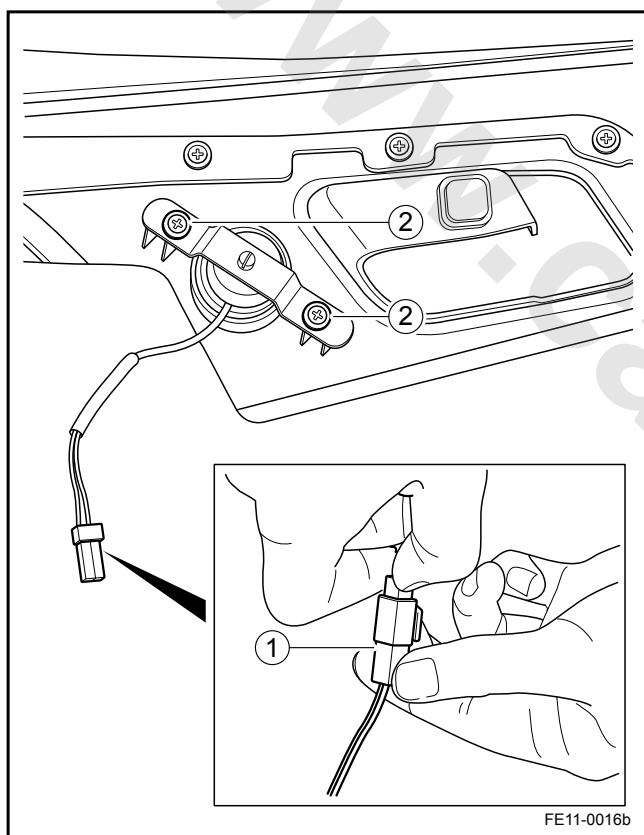
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the front door trim panels. Refer to [12.9.1.12 Front Side Door Trim Panel Replacement](#).

**Note**

The tweeters are symmetrically located on left and right doors.



3. Disconnect the tweeter wiring harness connector (1).
4. Remove the tweeter retaining screw (2).

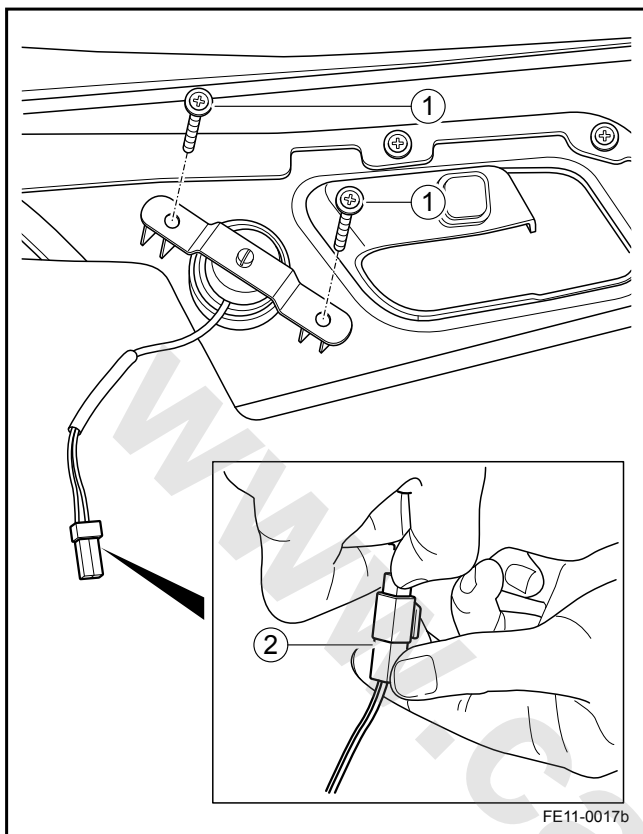
## Installation Procedure:

1. Install the tweeter retaining screw (1).  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)

**Note**

Refer to "Fastener Notice" in "Warnings and Notices".

2. Connect the tweeter harness connector (2).
3. Install the front door trim panel.
4. Connect the battery negative cable.



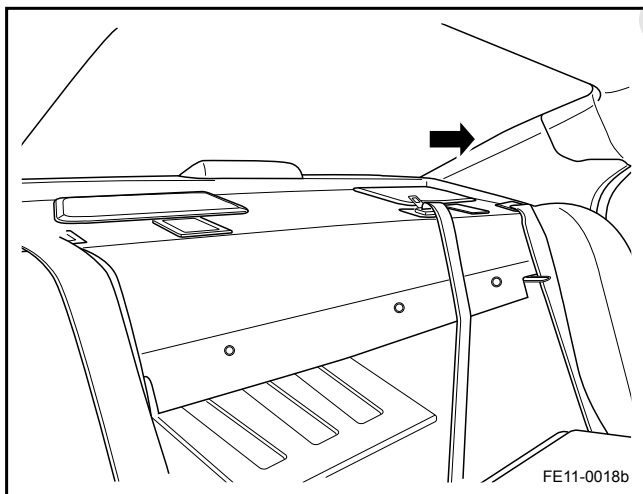
## 11.2.7.2 Radio Antenna Module Replacement

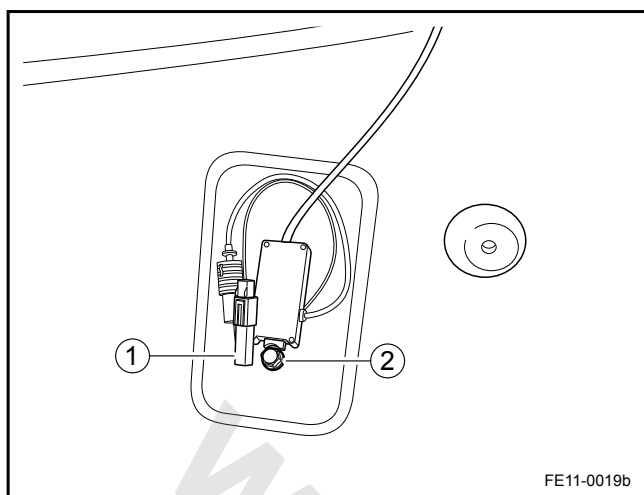
## Removal Procedure

1. Remove the left rear C pillar trim panel. Refer to [12.9.1.1 Headliner Replacement](#).

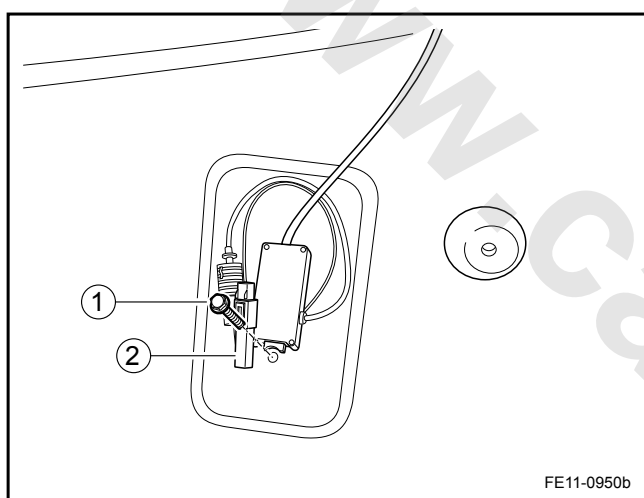
**Note**

To remove interior trim panels, please use the trim panel removal special tools, otherwise the trims are easily to be scratched.





2. Disconnect the antenna module harness connector (1).
3. Remove the antenna module retaining bolt (2).



#### Installation Procedure:

1. Install the antenna module retaining screw (1).
2. Connect the antenna module harness connectors (2).
3. Install the left rear C pillar trim panel.

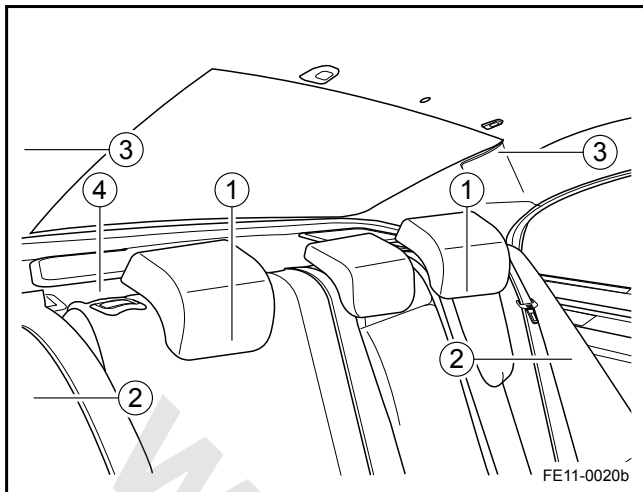
### 11.2.7.3 Rear Speaker Replacement

#### Removal Procedure

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



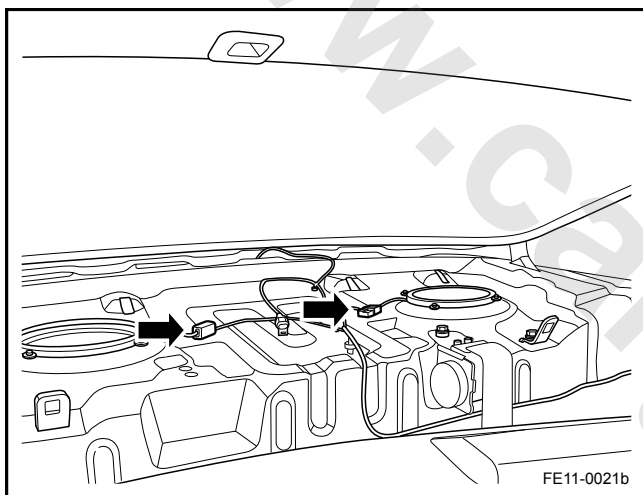


1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Fold down the rear seat back (1).
3. Remove the left and right rear seat back (2). Refer to [12.7.3.7 Rear Seat Back Replacement](#).
4. Remove the left rear and right rear C pillar trim panel (3). Refer to [12.9.1.1 Headliner Replacement](#).

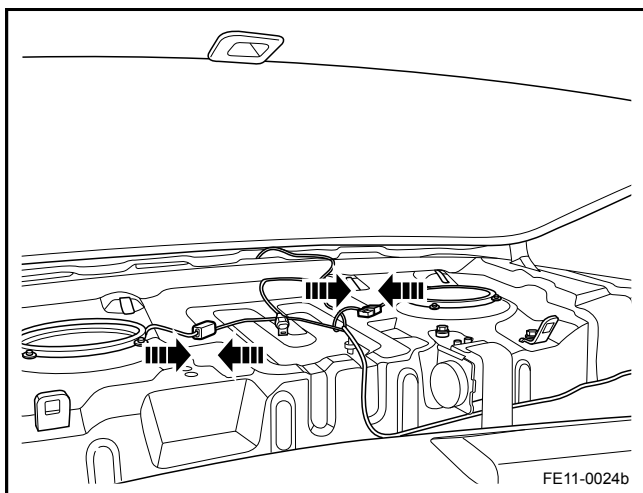
#### Note

To remove interior trim panels, please use the trim panel removal special tools, otherwise the trims are easily to be scratched.

5. Remove the rear parcel shelf (4). Refer to [12.9.1.7 Rear Parcel Shelf Replacement \(Sedan\)](#).
6. Disconnect the rear speaker wiring harness connector.



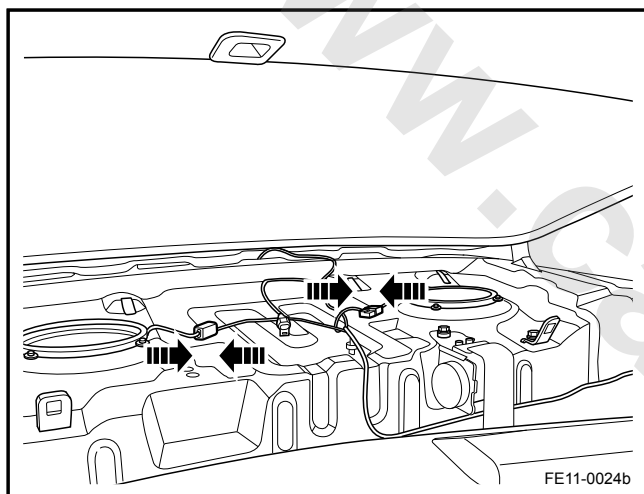
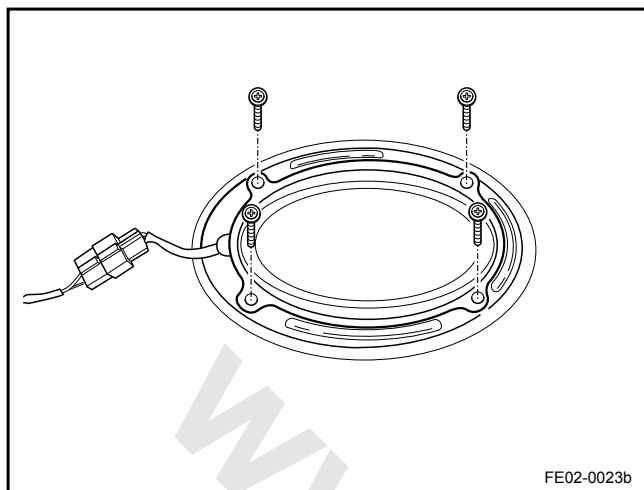
7. Remove the rear speaker retaining screw.



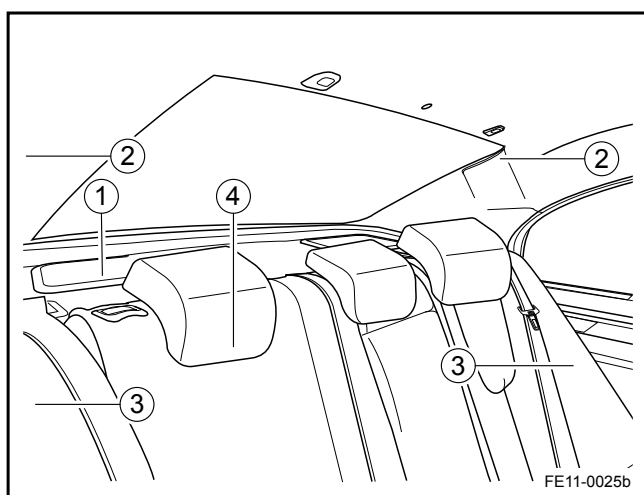
## Installation Procedure:

1. Install the rear speaker and the tighten the retaining screw.

Torque: 2 Nm (Metric) 1.5 lb-ft (US English)



2. Connect the rear speaker wiring harness connector.



3. Install the rear parcel shelf.
4. Install the left rear and right rear C pillar trim panels.
5. Install the left and right rear seat back.
6. Lift the rear passenger seat backrest.
7. Connect the battery negative cable.

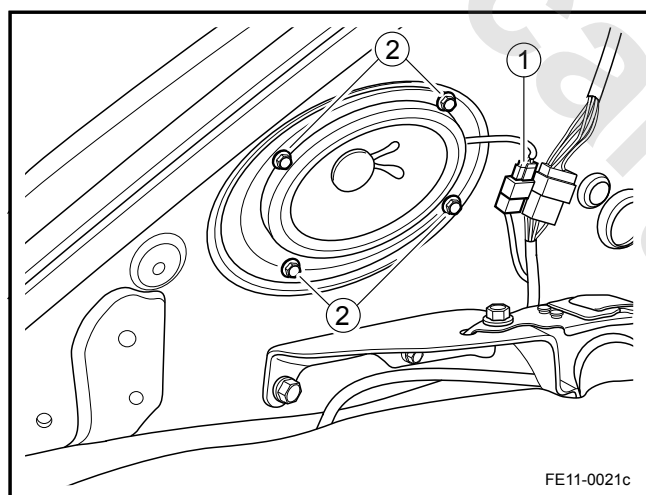
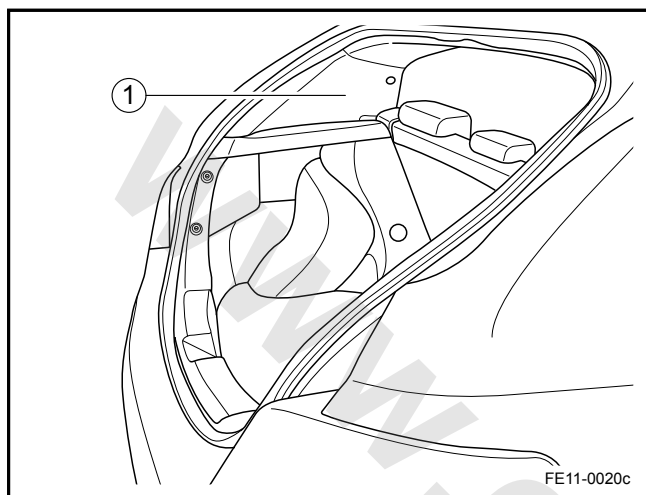
### 11.2.7.4 Rear Speaker Replacement (Hatchback)

#### Removal Procedure

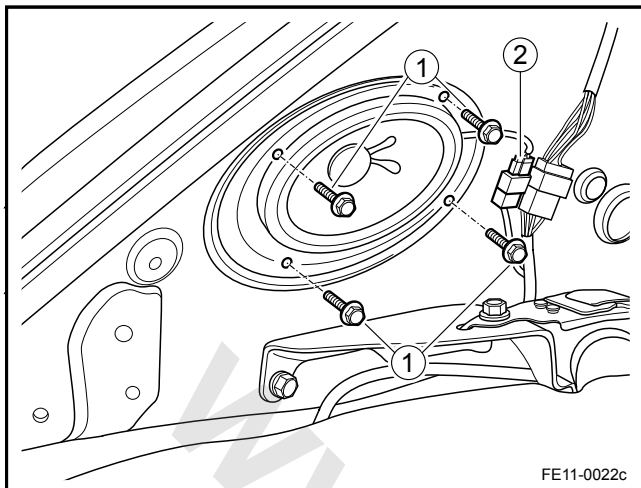
#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the hatchback left interior panel (1). Refer to [12.9.1.1 Headliner Replacement](#).



3. Disconnect the rear speaker wiring harness connector (1).
4. Remove the rear speaker retaining screw (2) and remove the rear speaker.

**Installation Procedure:**

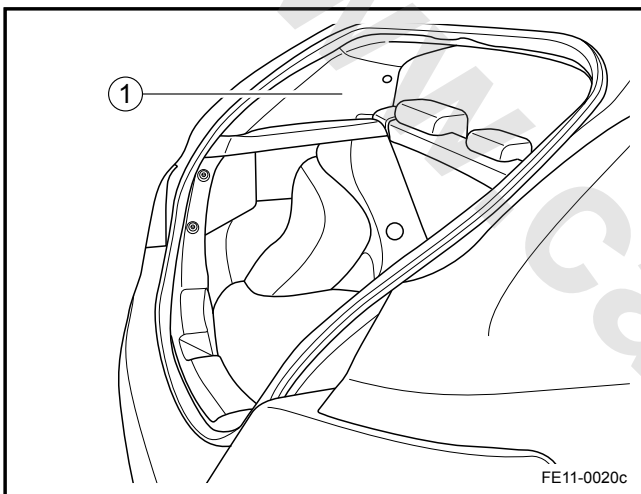
1. Install the rear speaker and tighten the retaining bolts.

Torque: 2 Nm (Metric) 1.5 lb-ft (US English)

**Note**

Refer to "Fastener Notice" in "Warnings and Notices".

2. Connect the rear speaker harness connector 2.

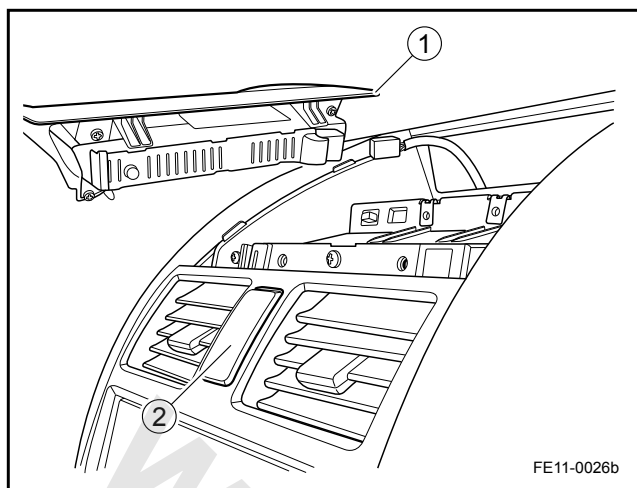


3. Install the hatchback left interior panel, the right interior panel is similar.

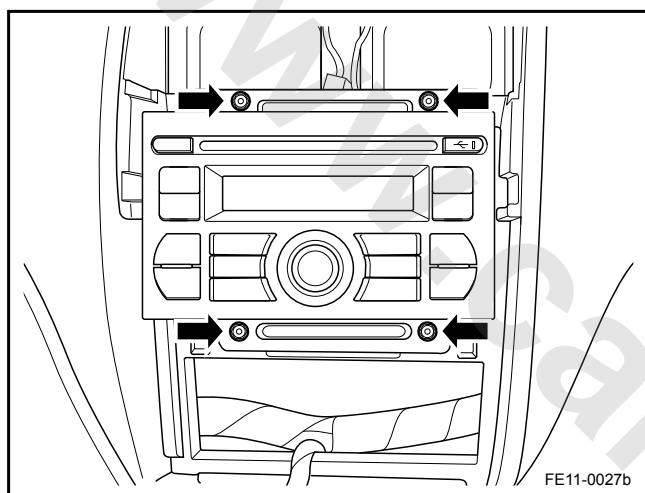
4. Connect the battery negative cable.

**11.2.7.5 Radio Control Replacement****Removal Procedure****Warning!**

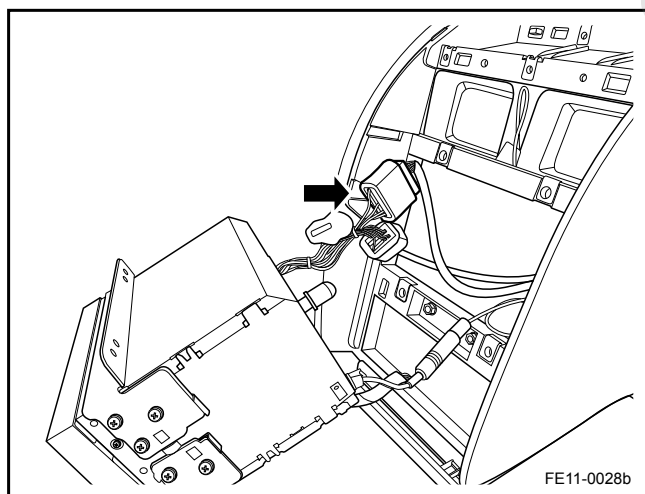
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the instrument cluster. Refer to [11.15.8.1 Instrument Cluster Replacement](#).
3. Remove the instrument panel center air duct panel (2). Refer to [8.2.8.11 Instrument Panel Air Duct Replacement](#).
4. Remove the air-conditioning panel. Refer to [8.2.8.1 Air-conditioning Control Panel Replacement](#).



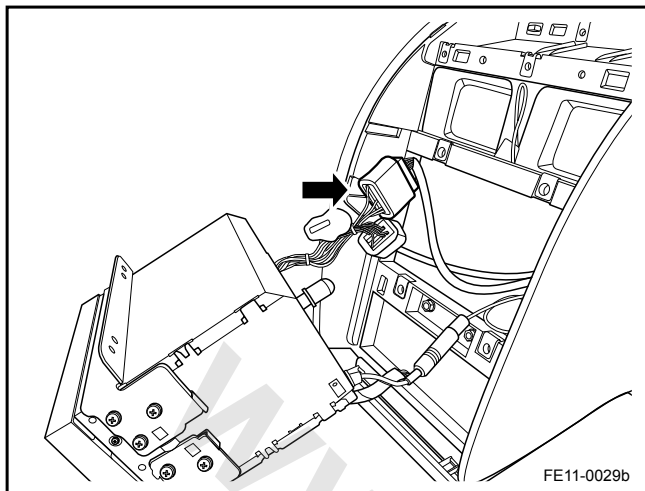
5. Remove the radio control retaining bolts.



6. Disconnect the radio control wiring harness connector.

## Installation Procedure:

1. Connect the radio control wiring harness connector.

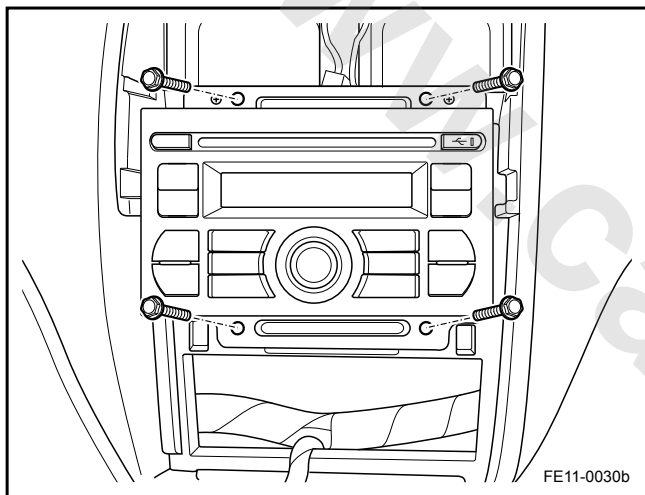


2. Install the radio control and tighten the retaining bolts.  
Torque: 9 Nm (Metric) 6.6 lb-ft (US English)

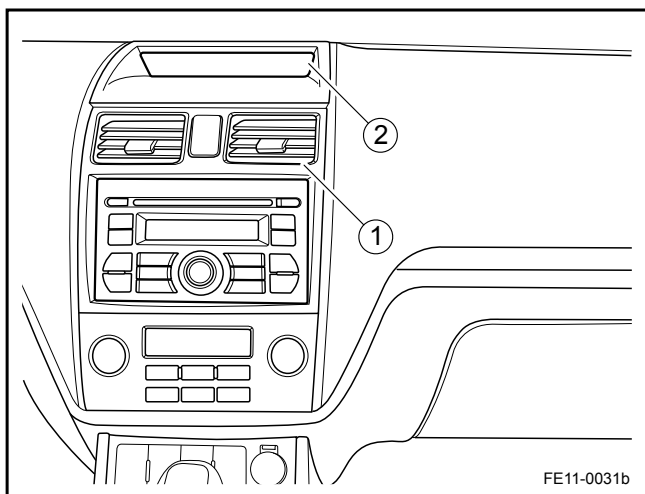
**Note**

Refer to "Fastener Notice" in "Warnings and Notices".

3. Install the air-conditioning control panel.



4. Install the Instrument panel center air duct panel.
5. Install the Instrument Cluster.
6. Connect the battery negative cable.



## 11.3 Navigation

### 11.3.1 Specifications

#### 11.3.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric(Nm)	US English(lb-ft)
Navigation Control Retaining Bolts	M6 × 20	8-11	6-8
GPS Antenna Self-Tapping Screws	ST4.2 × 16	3-4	2-3
Rear Speaker Self-Tapping Screws	ST4.8 × 9.5	3-4	2-3
Front Door Tweeters Self-Tapping Screws	ST4.2 × 9.5	3-4	2-3
Radio Antenna System Bolts (Sedan)	M6 × 16	8-11	6-8

## 11.3.2 Description and Operation

### 11.3.2.1 Overview

Vehicle navigation system consists of a GPS receiver, self-navigation device, speed sensors, gyro sensors, LCD monitor etc.. GPS is "Global Positioning System" acronym, the Global Positioning System, which is the U.S. research and development for military purposes. Its means using navigation satellites to measure time and distance, and form a global navigation system.

This vehicle navigation system uses current advanced design approach: navigation display screen, navigation ECU, radio, DVD are integrated in one. Map database uses SD card storage technology, previously using CD-ROM map to store database. Using SD cards as map data storage is faster than using CD-ROM. Without the CD-ROM player, its structure is simpler, so the failure chances are greatly reduced. When a new navigation map database needs to be updated, simply use the computer to update the SD card data. To update the traditional map data stored on CD-ROM, the only way is to replace the CD-ROM.

Vehicle navigation have the following main functions:

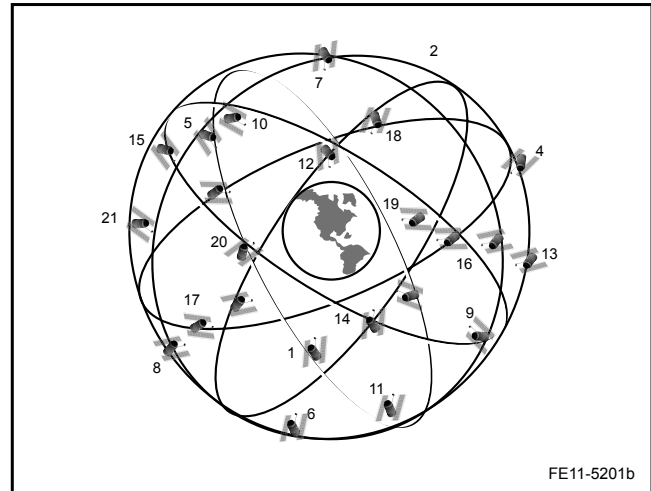
- Be able to retrieve the best route to the destination;
- With instantaneous re-search function;
- Provide an abundance set menu and records to facilitate the search;
- Provide real-time voice prompts at appropriate times;
- Function expansions.

### 11.3.2.2 GPS System Introduction

GPS consists of the space segment, ground control segment, the user device.

#### Space Segment:

It includes 21 satellites and three spare satellites, like a constellation, placed in the air 20,000 km away from the Earth. Evenly distributed in the orbit angle  $55^\circ$  in six orbital planes, different orbital planes form a  $60^\circ$  angle, four satellites are distributed on each orbit. The distribution structure ensures that at any location in the world, one can refer to at least four satellites.



#### Ground Control Segment:

For navigation and positioning, firstly the satellite location must be known. The satellite position is derived from calculations based on the satellite movement and its orbital parameters. Ground monitoring station continuously monitors each satellite for many years. According to the satellite observed parameters adjust the satellite orbit to amend the satellite positioning. When one satellite fails, a spare satellite can replace the failed satellite.

#### User Receiver System:

User receiver system includes a power supply, antenna, receiver, microprocessor, control display devices such as hardware and software, data processing software package and so on.

### 11.3.2.3 Function Expansion Introduction

#### 1. Radio Functions

Same as an ordinary radio, this system radio has radio receiving capabilities, and it can store 30 radio stations. When disconnecting the battery negative cable, the stored list of all the radio stations with all information will be cleared.

#### 2. CD/MP3 Functions

##### Note

If an already inserted disc does not pop up, inserting the second disc may damage the CD / DVD drive. Insert disc after the disc ejected from the CD/DVD drive.



This system supports regular music CD, MP3 CD. When the CD/MP3 is inserted, it will automatically start playing, the display shows CD/MP3 status, including "track number", "progress bar," and other information. (When you insert a MP3 disc, the machine will detect the MP3 disc, the screen will switch to the MP3 screen display. When playing MP3 disc, the track name and artist information will also be displayed on the screen).

### 3. SD Functions

#### Note

This system supports dedicated cards: If MP3/WMA format file is copied on the SD card with map files, the system does not recognize the corresponding audio files, only when the MP3/WMA format files are copied on other non-loaded SD card, the system will play the music.

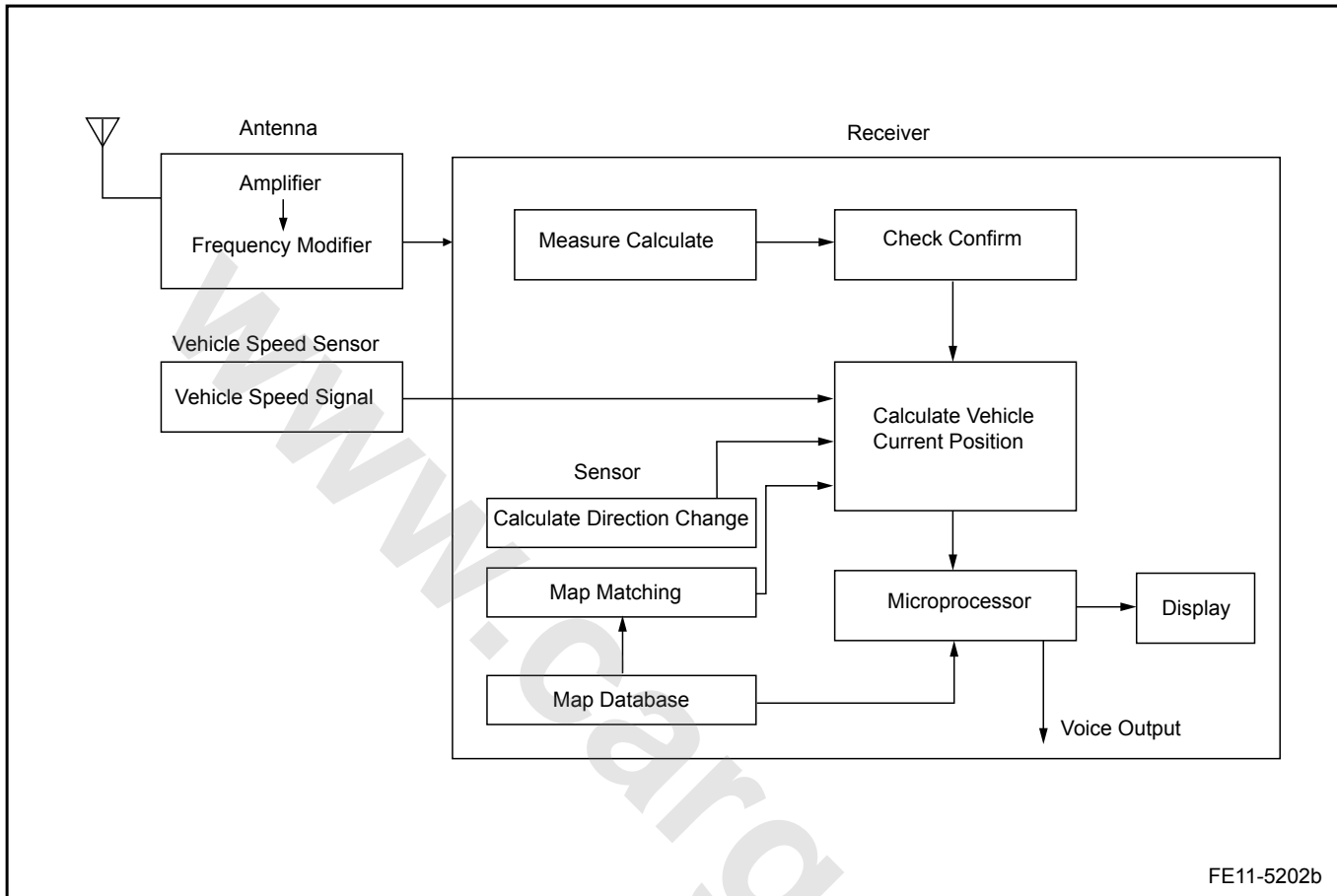
The system supports MP3/WMA format audio file playback. When a SD card with MP3/WMA files is inserted, press [SD] key, the system starts playing the audio files on the SD card, the display shows SD status, including "track name", "Artist Information", "progress bar", etc.

### 4. DVD Functions

When the DVD disc is inserted, the system will play DVD after reading the menu.

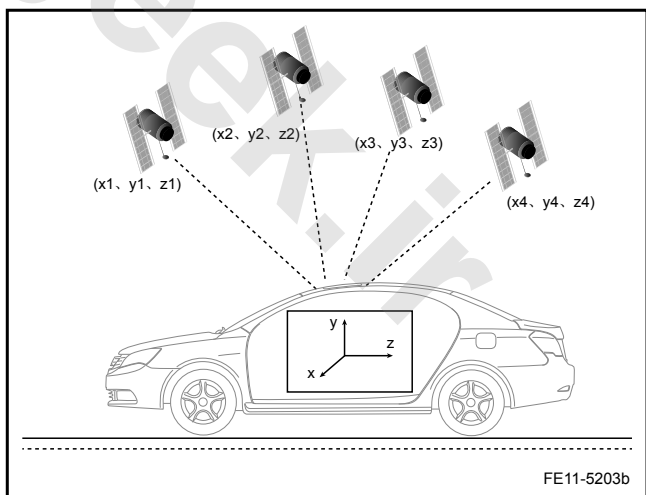
### 11.3.3 System Working Principle

#### 11.3.3.1 Navigation System Principle Diagram



#### 11.3.3.2 GPS System Positioning Principle

GPS system is used to determine the user's exact location on Earth. each satellite rotate around the Earth two laps every day, so at any location on Earth, four or more satellites signals can be received at the same time. the computer can calculate the user current location in Earth coordinates (longitude, latitude). After the receiver receives these signals, it calculates the current three-dimensional position, three-dimensional direction and velocity and time information. GPS receivers are usually used for pseudo-range measurements, carrier phase measurements, satellite radio interferometry, Doppler measurements and other measurements.

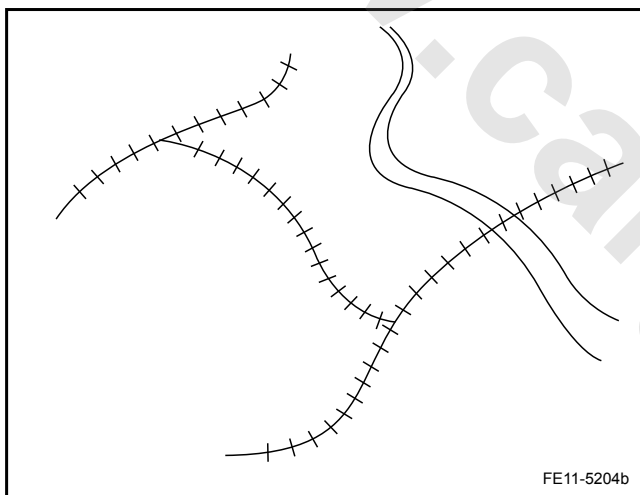


### 11.3.3.3 Self-Navigation

When the vehicle is traveling to an underground tunnel, between high-rise buildings, under highway bridges, it may not receive GPS satellite signals, the system can automatically enter the self-navigation mode. At this point the vehicle speed sensor detects the vehicle, the vehicle microprocessor calculates the distance. Gyro sensor directly detects the direction change and moving forward status. For example, when the vehicle is traveling in the ditch like Hill Road, round shape bridge, skidding on snow, all these curves cause positioning errors. Only the gyro sensor and microprocessor calculations can get the correct vehicle location. However, the positioning accuracy is far below the GPS positioning accuracy.

### 11.3.3.4 Map Matching Techniques

Microprocessor electronic map is identified by the node-based data.

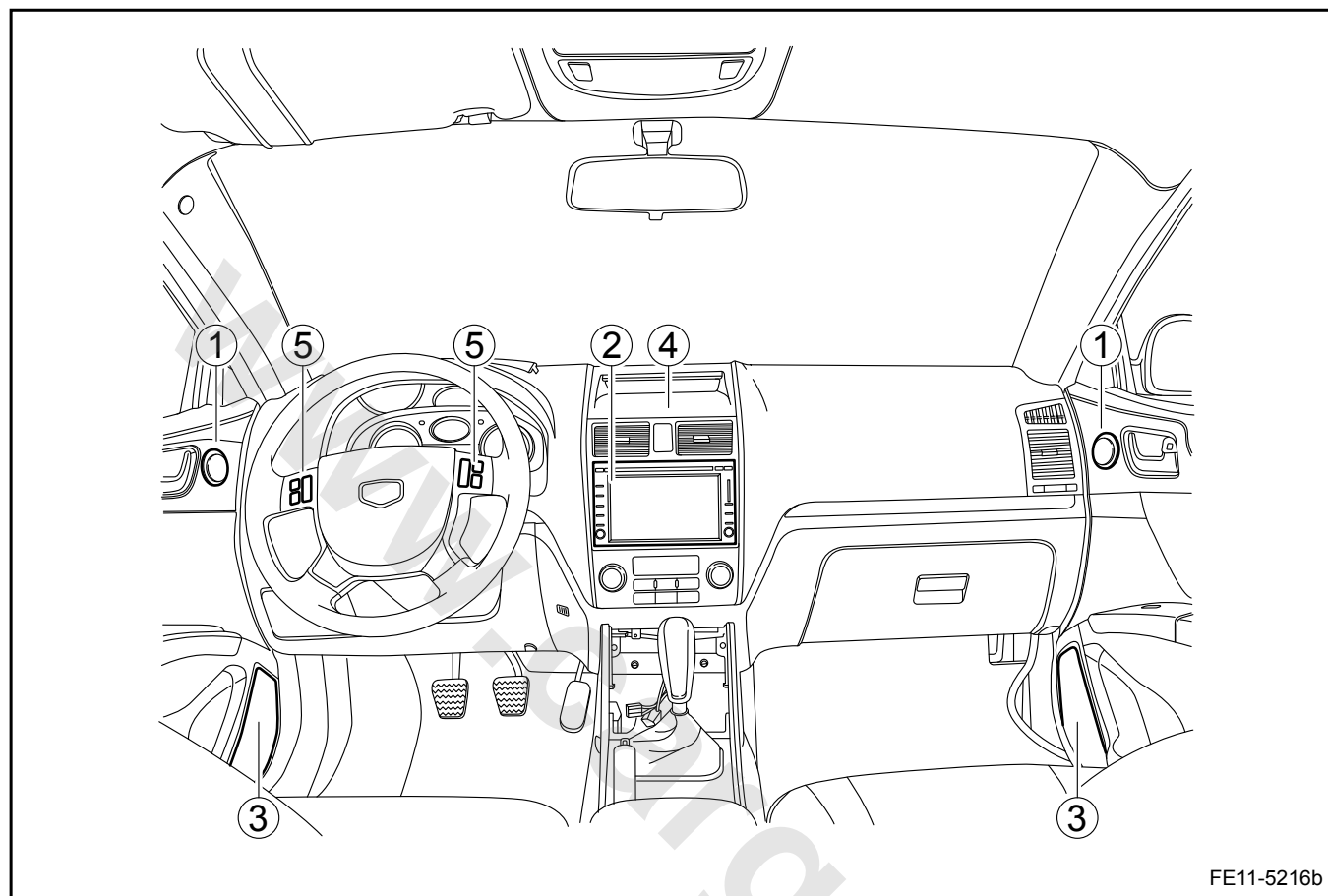


There are discrepancies between the GPS satellite navigation and self-navigation devices detected vehicle location and direction and the actual driving route. To correct these errors, the map-matching techniques are used. The microprocessor correct the errors electronic map errors and automatically adjust.

Map database stores roads, road maps and urban transport map. Before driving, input the city, streets, place names, etc. through the input interface. Through satellite signals systems, the processor determines the direction and the best route according to vehicle speed sensors, gyro sensors measured data. During driving, driver can observe the screen to get the current location. Display can also show the distance remaining to reach the destination. At the same time prompts the related information through audio voice output to the driver.

## 11.3.4 Component Locator

## 11.3.4.1 Component Locator

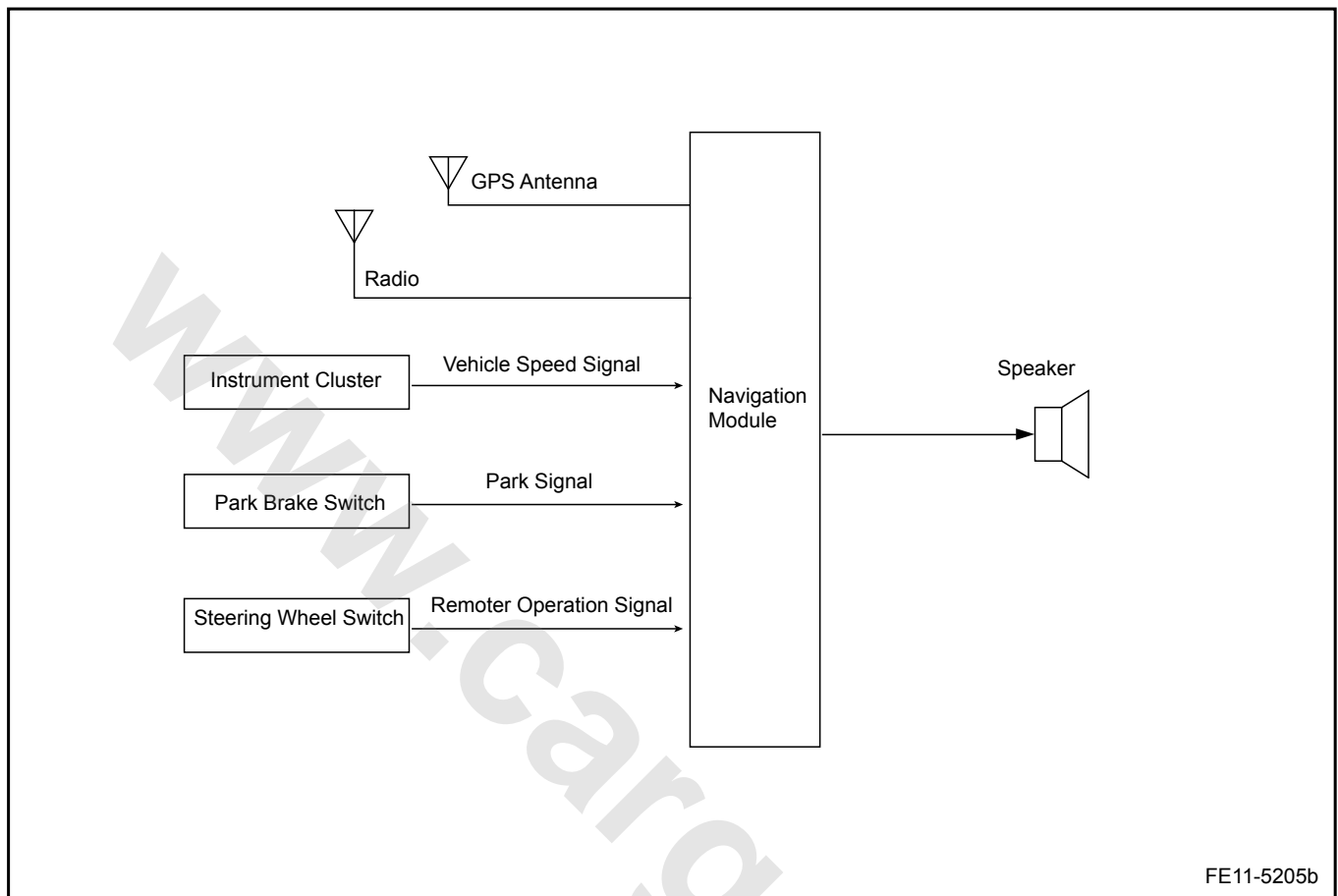


## Legend

- |                        |                          |
|------------------------|--------------------------|
| 1. Front Door Tweeters | 5. Steering Wheel Switch |
| 2. Navigation Unit     |                          |
| 3. Front Door Speakers |                          |
| 4. GPS Antenna         |                          |

## 11.3.5 Schematic

## 11.3.5.1 Schematic



## 11.3.6 Diagnostic Information and Procedures

### 11.3.6.1 Visual Inspection

- Check installed the after market equipment that may affect audio system operation.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- For all speakers inoperative malfunction, focus on easy to short to ground circuits, such as the rear compartment speaker wiring harness connector, as it will help with quick diagnostic.
- For one speaker inoperative malfunction, it may be because user accidentally shield one channel, making a single channel inoperative. this is not a sound system failure. Refer to the user manual for sound system instructions.
- For unable to enter the navigation interface malfunction, it may be because the SD card with map is not installed or the SD card is not a dedicated card. Check the SD card performance first, whether the internal data is normal.

### 11.3.6.2 System Diagnostics Description

1. When driving, driver can not watch DVD or operate the navigation system, to avoid distraction affecting driving safety.
2. This vehicle entertainment navigation system can play CD-DA, CD-ROM, CD-R, CD-RW, VCD, DVD-ROM, DVD Recordable disc.
3. The machine can only play the normal 12CM diameter disc. Do not use other disc, otherwise the disc may not eject or it cause no damage to the player.
4. Do not use any solvents, such as the commercially available cleaners, anti-static spray cleaning disc.
5. Keep the vehicle and the disk clean, avoid the dust adhering to the laser head, resulting in a reduced playing disc ability, and ultimately reduce the laser head life.
6. On the rough road, the sharp jolt could cause the sound jump.
7. The entertainment navigation system GPS positioning will be affected by the weather and the location (tower / tunnel / underpass / tree). Most GPS can not be used indoor and in the basement location. GPS the signal can not penetrate the high-rise buildings and metal-containing components of automotive insulation film or similar products.
8. Vehicle entertainment navigation system GPS positioning result is only for driver reference only. If abnormal, please drive according to the actual road conditions.
9. Vehicle entertainment navigation system navigation electronic map data only provides general access information. it can not provide high-precision positioning and the path planning. Voice prompts and the intersection information are based on the digital map database the best path calculation results, and are for reference purposes only, the driver must abide by the rules of the road.
10. Keep the volume at an appropriate level in order to be able to feel the situation of roads and vehicles to ensure road safety.
11. Avoid excessive moisture and dust. Do not let the navigation unit contact water, which will lead to electric shock, fire or other damage.
12. When the vehicle inside temperature is low, do not use entertainment navigation system immediately after turning on the heater. The entertainment navigation system disc or the player may be condensed with water. If there is condensation on the optical components, stop using the entertainment navigation system disc playback function for about 1h. The condensation will disappear naturally, and then it can be normally operated.
13. Very high or very low temperatures can interfere with normal function. If the engine is shut down, and the vehicle is parked under the direct sun or at a cold place under for too long, the vehicle inside may become very hot or very cold. In this environment entertainment navigation system may work properly. Once the temperature inside the vehicle is back to the normal range, the normal function can resume . If it does not, please contact the authorized service center for repair.

14. If the entertainment navigation system fails (power block-up, no picture, no voice) or any abnormal status (foreign matter inside the system, water entering the system, smoke, or smell), do not open the machine shell without permission. after removing the body, lubricate the rotating parts. The power supply should be immediately cut off and contact authorized service center for repair.

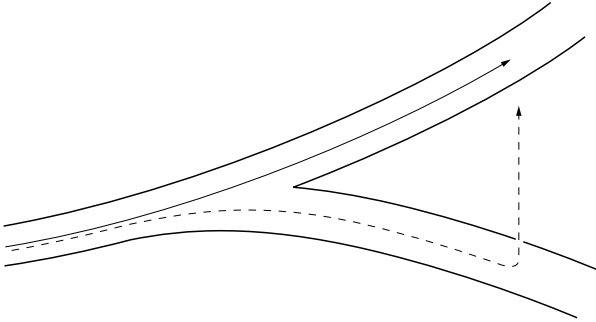
### 11.3.6.3 Navigation Notice

1. Because there are individual differences in each vehicle in the navigation system's initial use, it needs the calibration time for more accurate positioning of the vehicle. In driving, the system automatically and dynamically calibrate.
2. After shut down the engine for a long time, when restart the navigation system receiving GPS signals and re-positioning time will be longer. in general, the vehicle can be successfully positioned within 3min .
3. If the GPS signals are shielding such as: high-rise buildings on either side of the road, roadside trees, under overpasses, underground car parks, tunnels. at this time the GPS signals can not be received, and the positioning is also possibly biased.
4. It may sometimes not be able to identify the vehicles on the elevated road or on the ground. Over time, the vehicle will be re-positioned correctly.
5. To avoid excessive invalid voice order, at some turns there are no voice prompts: If there is no bifurcation of the turning point of intersection or the difference between the level of the road is too great.
6. If one was transferred to the road next to the other parallel road, then the voice will prompt"Turn at x to y" in order to help choose the right turn. Side roads will be counted as an intersection.
7. In the routes calculation, the address input, switching languages, day and night mode switching points of interest search, disc insert and eject operations require more system resources and need to wait for a period of time to complete. it is recommended that when doing these operations, do not turn the ignition or switch interface or plug SD card, otherwise it will affect the system stability. Under serious situation, system may restart.
8. To avoid navigation system not turned off and hot plug SD card, causing the SD card file system damage, lost, resulting in the normal navigation system can not read the map files for navigation, it is prohibit to hot plug the SD card.

### 11.3.6.4 Navigation Non-Fault Status, The Positioning Amendment

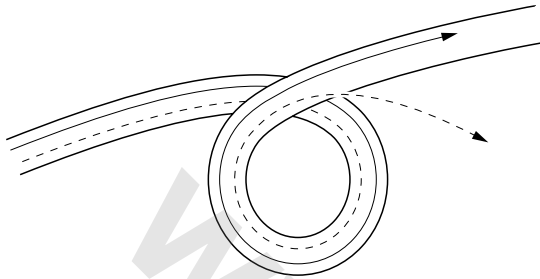
#### Note

The following list is not the navigation malfunction. If it occurs, after test the vehicle and verify the problem, explain to customers.

Step 1	Y-shaped Road
<p>Y-shape Divided Roads</p>  <p>FE11-5206b</p>	<p>On the Y-shaped road or similar roads, the sensor driving direction accumulated error may lead to the current location marker appears in the wrong path.</p> <div>Correction</div> <div>Continuously driving for some time, after divergent roads, the vehicle will be re-positioned correctly.</div>

## Step 2 Spiral-shaped Road

Spiral Road



FE11-5207b

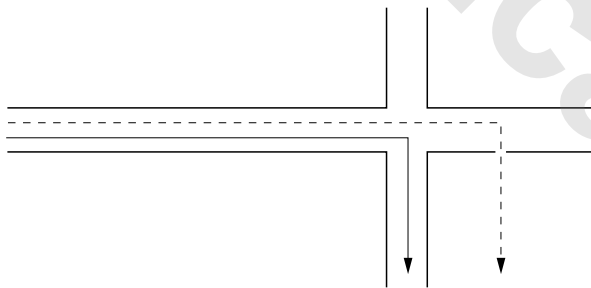
When traveling on a large, continuous spiral road (for example, ring overpasses, etc.), there will be turning point accumulated errors, the location marker may deviate from the current location.

Correction

Continuously driving for some time, after divergent roads, the vehicle will be re-positioned correctly.

## Step 3 Turning A Corner After The Straight Road

Straight Road



FE11-5208b

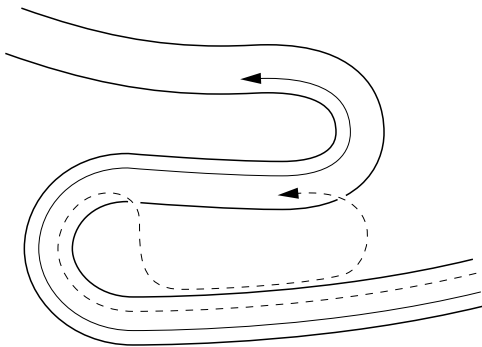
When traveling on a long, straight road, the map matching can not be effective enough to work and may thus accumulate error in distance. Therefore, when the vehicle turning a corner, the location marker may deviate from the current location.

Correction

Continuously driving for some time, after divergent roads, the vehicle will be re-positioned correctly. When turning, maintain a low constant speed to avoid such problems.

## Step 4 Zigzag Round-Trip Route

Zigzag Road



FE11-5209b

When traveling on a zig-zag road, at each turn the map may be matched to other nearby roads in the same direction, then the location marker may deviate from the current location.

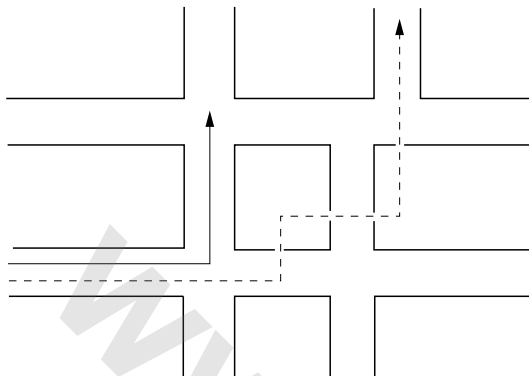
Correction

Continuously driving for some time, after divergent roads, the vehicle will be re-positioned correctly.



Step 5	Square-shaped Road
--------	--------------------

## Square Blocks



FE11-5210b

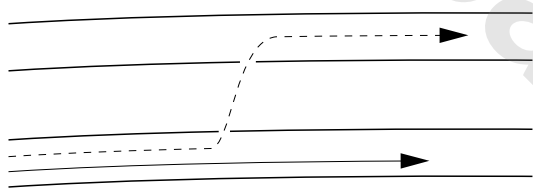
When traveling on a square-shaped road, there are many roads in the vicinity to the same direction, the map may be matched to other roads, then the location marker may deviate from the current location.

Correction

Continuously driving for some time, after divergent roads, the vehicle will be re-positioned correctly.

Step 6	Parallel Roads
--------	----------------

## Parallel Roads



FE11-5211b

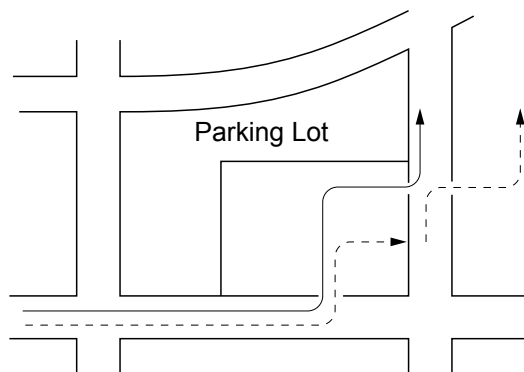
When the two roads are parallel (for example, there is a side road next to the highway.), map may be incorrectly matched to other roads, then the location marker may deviate from the current location.

Correction method

Continuously driving for some time, after divergent roads, the vehicle will be re-positioned correctly.

Step 7	In The Parking Lot
--------	--------------------

## Inside Parking Lot



FE11-5212b

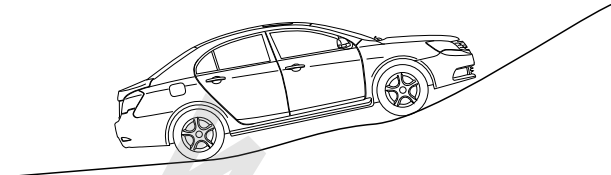
When the vehicle is in a parking lot or on an unnamed road, the current location marked as a nearby road. When the vehicle is back on the road, the location marker may deviate from the correct location.

Correction

Continuously driving for some time, after divergent roads, the vehicle will be re-positioned correctly.

## Step 8 Steep Hills, Slopes

Slope



FE11-5213b

When parking on slopes or on a steep hill, the turning point will have error and the location marker may deviate from the correct location.

Correction

Continuously driving for some time, after divergent roads, the vehicle will be re-positioned correctly.

## Step 9 Erratic Driving Route

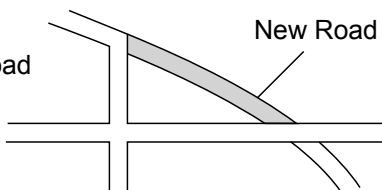
When the vehicle changes lane frequently, the location marker may deviate from the correct location.

Correction

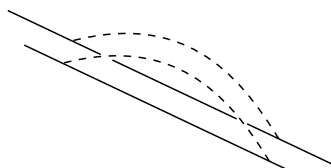
Continuously driving for some time, after divergent roads, the vehicle will be re-positioned correctly.

## Step 10 Map Data Related

Not Displayed Road



Different Road  
Pattern  
(Changed Due to  
Road Work)



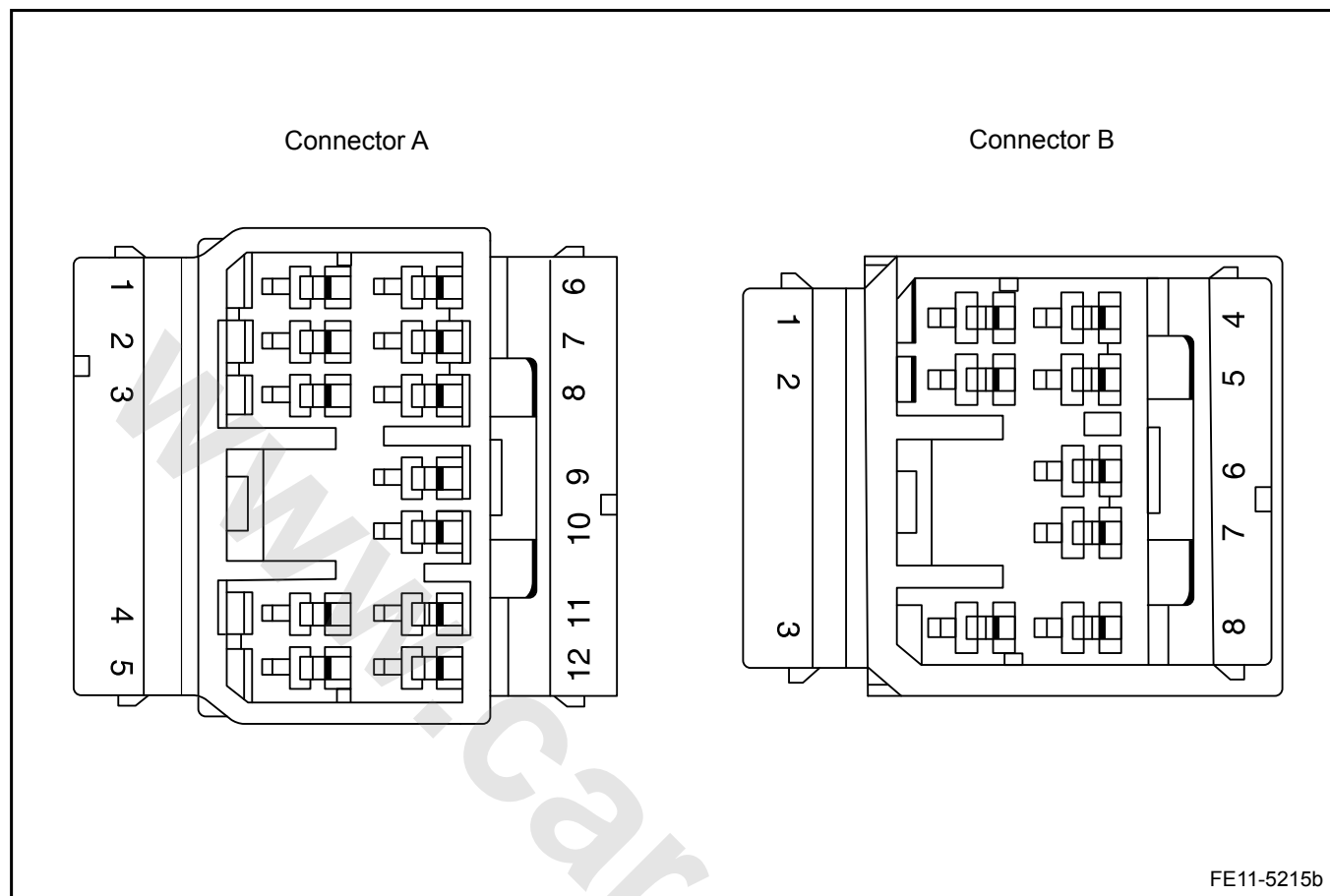
FE11-5214b

- (a) When traveling on a new road, or the the road that does not show on the screen, map matching can not be functioning properly, thus matching the other roads nearby, the marker point may be deviated from the correct location.
- (b) B. If the data stored in the road map is different from the actual road shape, normal map-matching does not work, thus matching other roads nearby, the location marker may be deviate from the correct location.

Correction

Continuously driving for some time, after divergent roads, the vehicle will be re-positioned correctly.

## 11.3.6.5 Navigation Host Terminal List



Connector A:

Terminal ID	Terminal Definition	Wire Color	Specified Conditions
1	Power Ground	0.85 B	Resistance between the terminal and the ground is Less than 1 $\Omega$ .
2	Steering Wheel Wire Signal	0.3 W	Volume Increase Button: 0.33 V Volume Decrease Button: 0.94 V Mute Button: 1.5 V Add: 1.98 V Minus: 2.5 V Mode Button: 3 V
3	--	--	--
4	--	--	--
5	Antenna Control	0.5 V	12 V Power Supply
6	Working Power Supply and Memory Power Supply	0.85 G/W	Battery Power Supply
7	Trigger Power Supply	0.5 R	Ignition Switch At ACC, Battery Power Supply
8	--	--	--

Terminal ID	Terminal Definition	Wire Color	Specified Conditions
9	Backlight Control Signals	0.3 O	Dimmer Output, PWM Power Supply
10	Speed Signal Ground	0.5 B	Parallel with speed signal circuit connected to the host, wiring harness should be as short as possible to reduce the wiring harness impedance.
11	Speed Signal	0.3 G	Vehicle Driving: Pulse
12	-	-	-

Connector B:

Terminal ID	Terminal Definition	Wire Color	Specified Conditions
1	Right Rear Speaker Positive	0.5 Gr/R	Sound System At Work: AC Voltage 10 mV ~ 12 V
2	Right Front Speaker Positive	0.5 W/B	Sound System At Work: AC Voltage 10 mV ~ 12 V
3	Left Front Speaker Positive	0.5 Br/W	Sound System At Work: AC Voltage 10 mV ~ 12 V
4	Left Rear Speaker Positive	0.5 G/B	Sound System At Work: AC Voltage 10 mV ~ 12 V
5	Right Rear Speaker Negative	0.5 Gr	Sound System At Work: AC Voltage 10 mV ~ 12 V
6	Right Front Speaker Negative	0.5 W	Sound System At Work: AC Voltage 10 mV ~ 12 V
7	Left Front Speaker Negative	0.5 Br	Sound System At Work: AC Voltage 10 mV ~ 12 V
8	Left Rear Speaker Negative	0.5 G	Sound System At Work: AC Voltage 10 mV ~ 12 V

### 11.3.6.6 Navigation Common Fault Symptom Table

Failure Symptoms	Reason	Approach
It can not successfully activate the map.	1. When activating, entered the wrong serial number for the navigation unit.	Update the navigation map data.
	2. CD-ROM map has more than two versions, CD-ROM with the wrong map, guide system activation maps generated version and the SD card map version is inconsistent, resulting in map version does not match, can not activate.	

	3. Continuous operation on multiple vehicles, the old U disk activation code is not deleted. directly downloaded the new activation code to the SD card, resulting in an error file name, resulting in maps can not be activated.	
Navigation is able to receive GPS signals, but the GPS does not synchronize with vehicle moving	There are other built-in gyroscope devices. GPS requires a certain driving distance for map data matching.	Driving a vehicle at 60 km/h or more for some time, and then test it.
It can not find the destination on the map.	1. The input address is not accurate.	Refer to the navigation manual, operate correctly.
	2. Input is the old name, the map has the old name, but the place has been renamed, or has changed address.	
	3. Map information related to national security is not shown on the map, such as embassies, water plants, and military units.	

### 11.3.6.7 Navigation Unit Can Not Be Turned On

For diagnostic steps. Refer to [11.2.6.3 Radio Control Can Not Be Turned On](#).

### 11.3.6.8 Navigation Host Can Boot But Can Not Enter The Navigation Interface

Step 1	Check the SD card.
--------	--------------------

(a) Check SD card is inserted correctly.

Yes  No  Re-install SD card

Yes

Step 2	Check whether the SD card is the dedicated navigation card.
--------	---

(a) Turn off the navigation.  
 (b) Remove the navigation SD card.  
 (c) With the PC, check the SD card whether there is any other data in addition to map data, .

SD card data normal?

Yes  No  Re-write SD card map data.

Yes

Step 3	Replace the SD card.
--------	----------------------

(a) Turn off the navigation. Navigation normal?  
 (b) Remove the SD card.  
 (c) Re-install the known good SD card.

Yes  System normal

No

Step 4	Check the navigation unit power supply circuit.
--------	---

- (a) For diagnostic steps. Refer to [11.2.6.3 Radio Control Can Not Be Turned On.](#)

Is power supply circuit normal?

No

Deal with the power circuit failure.

Yes

Step 5	Replace the navigation unit.
--------	------------------------------

- (a) Refer to [11.2.7.5 Radio Control Replacement.](#)

Next

Step 6	System normal.
--------	----------------

### 11.3.6.9 Navigation Interface Can Be Accessed, But The Navigation Satellite Signals Can Not Be Retrieved.

Fault Definition: at any location (including the open land), the vehicle GPS can not retrieve any satellite signals.

Step 1	Check whether the windshield is covered.
--------	--

Covered?

Yes

Clear the covering material.

No

Step 2	Check the GPS antenna connector.
--------	----------------------------------

- (a) Remove the navigation unit. Refer to [11.2.7.5 Radio Control Replacement.](#)

- (b) Check whether the GPS antenna connections are normal.

No

Reconnect the GPS antenna

Yes

Step 3	Replace the GPS antenna.
--------	--------------------------

- (a) Remove the GPS antenna. Refer to [11.3.7.1 GPS Antenna Replacement.](#)

System normal?

Yes

System normal

No

Step 4	Replace the navigation unit.
--------	------------------------------

- (a) Refer to [11.2.7.5 Radio Control Replacement.](#)

Next

Step 5	System normal.
--------	----------------

### 11.3.6.10 Navigation Unit Can Not Be Turned Off

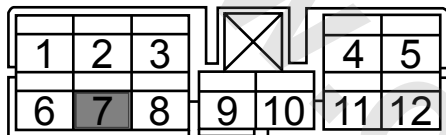
Schematic:

Refer to [11.2.6.3 Radio Control Can Not Be Turned On](#) schematic.

Diagnostic Steps:

Step 1	Check the navigation unit trigger working power supply.
--------	---

Navigation Module Harness Connector IP33



FE11-5221b

(a) Remove the navigation unit. Refer to [11.3.7.4 Navigation Unit Replacement](#).

(b) Turn the ignition switch to "OFF" position.

(c) Disconnect navigation unit harness connector IP33.

(d) Measure voltage between the navigation unit harness connector IP33 terminal No.7 and a reliable ground.

Standard Voltage: 0 V

Is the voltage Standard Value?

No

Navigation unit power circuit failure. Refer to the <a href="#">11.2.6.3 Radio Control Can Not Be Turned On</a> .
---

Yes

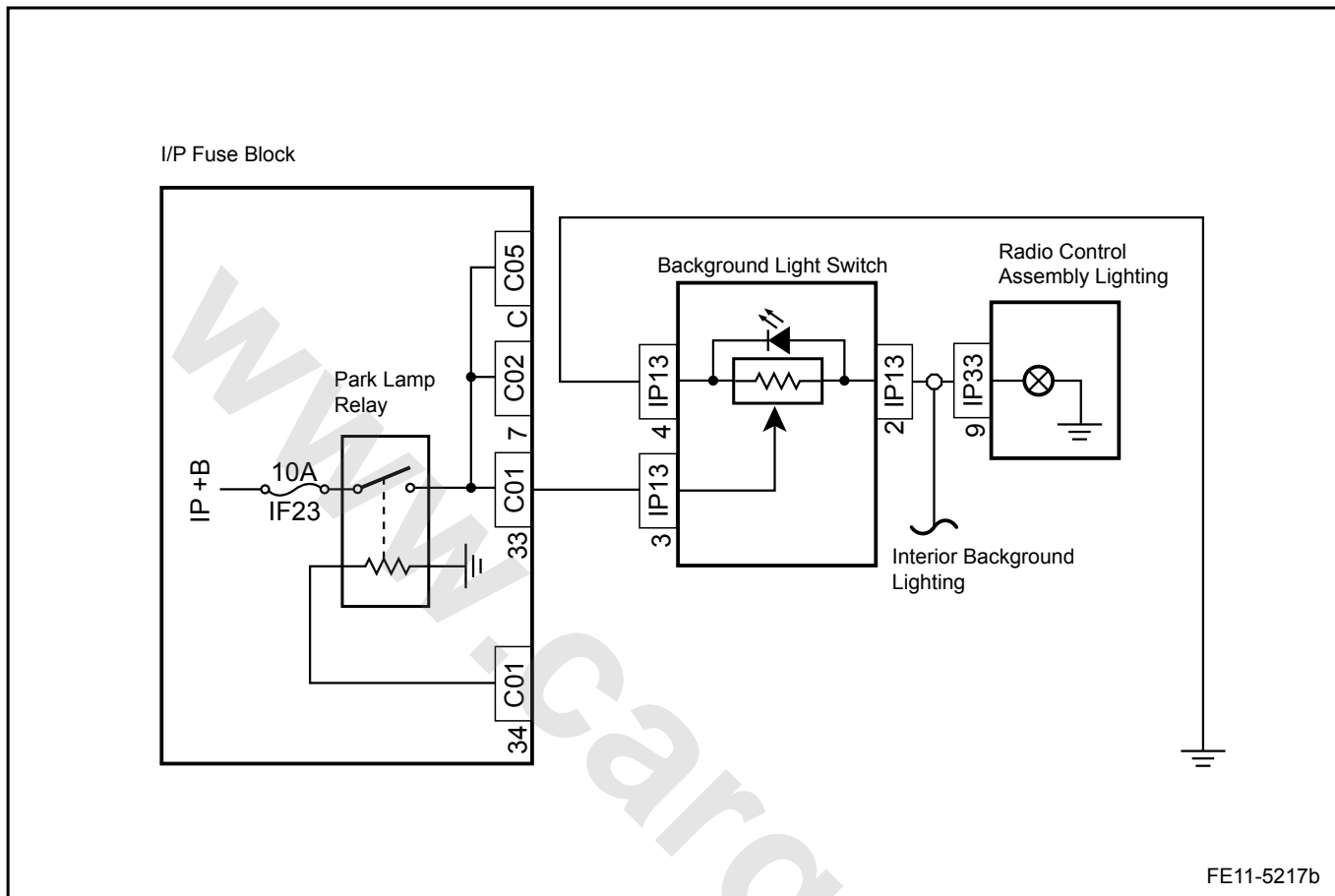
Step 2	Replace the navigation unit. Refer to <a href="#">11.3.7.4 Navigation Unit Replacement</a> .
--------	--

### 11.3.6.11 Navigation Normal Boot But The Speakers Inoperative

Refer to [11.2.6.4 Radio Control Can Be Turned On But The Speakers Are Inoperative](#).

## 11.3.6.12 Navigation Panel Background Light Is Not On When The Park Lamps Are On.

Schematic:



Diagnostic Steps:

## Note

Before this diagnostic procedures, verify the vehicle park lamps working status. if the park lamps are inoperative, please rule out the park lamp failures (Refer to [11.4.7.5 Park Lamp Inoperative](#)) before the implementation of this diagnostic procedures.

Step 1	Check the air-conditioning control panel, electric windows and the background light switch.
--------	---

Is the background light normal?

No

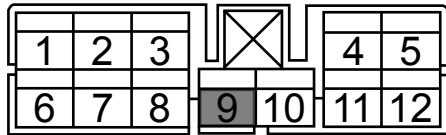
Go to step 4

Yes

Step 2	Check the navigation unit background light input voltage.
--------	---



Navigation Module Harness Connector IP33



FE11-5218b

- (a) Turn the ignition switch to "OFF" position.
  - (b) Remove the navigation unit. Refer to [11.3.7.4 Navigation Unit Replacement](#).
  - (c) Disconnect the navigation harness connector IP33.
  - (d) Turn the ignition switch to "ON" position.
  - (e) Turn on the park lamp.
  - (f) Adjust the background light adjustment switch to the brightest locations.
  - (g) Measure navigation unit harness connector IP33 terminal 9 voltage.  
Standard Voltage: 11-14 V
  - (h) Connect the navigation harness connector IP33.
- Is the voltage Standard Value:?

No

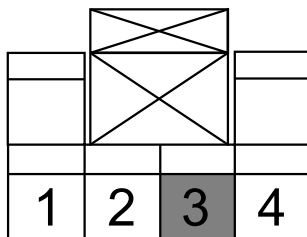
The circuit between the IP33 terminal No. 9 and the regulation background light switch IP13 No.2 terminal is open.

Yes

Step 3 Replace the navigation unit. Refer to [11.3.7.4 Navigation Unit Replacement](#).

Step 4 Check the background light adjustment switch voltage.

Background Light Switch Harness Connector IP13



FE11-5219b

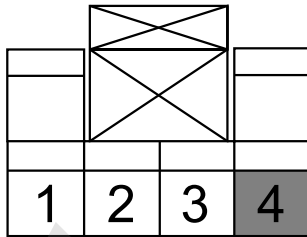
- (a) Turn the ignition switch to "OFF" position.
  - (b) Disconnect the background light adjustment switch wiring harness connector IP13.
  - (c) Turn the ignition switch to "ON" position.
  - (d) Turn on the park lamp.
  - (e) Measure the background light adjustment switch harness connector IP13 terminal 3 voltage.  
Standard Voltage: 11-14 V
  - (f) Connect the regulator switch harness connector IP13.
- Is the voltage Standard Value:?

No

The circuit between the IP33 terminal No.3 and the I/P fuse block terminal No.33 is open.

Yes

Step 5 Check regulator switch ground circuit resistance.

Background Light Switch Harness  
Connector IP13

FE11-5220b

- Turn the ignition switch to "OFF" position.
  - Disconnect the background light adjustment switch wiring harness connector IP13.
  - Measure the resistance between background light adjustment switch IP13 terminal No. 4 and a reliable ground.  
Standard Resistance: Less than 1  $\Omega$
  - Connect the regulator switch harness connector IP13.
- Is the resistance normal?

No

The circuit between the IP13 terminal No. 4 and a reliable ground is open.

Yes

- Step 6 Replace the background light adjustment switch. Refer to the [11.4.8.19 Instrument Background Light Adjustment Switch and Headlamp Height Adjustment Switch Replacement](#).

### 11.3.6.13 The Screen Is Not Dimmed When The Park Lamps Are On

Schematic:

Refer to [11.3.6.12 Navigation Panel Background Light Is Not On When The Park Lamps Are On](#) Schematic.

Diagnostic Steps:

- Step 1 Navigation panel switch background light normal?

No

Refer to [11.3.6.12 Navigation Panel Background Light Is Not On When The Park Lamps Are On](#) diagnostic step.

Yes

- Step 2 Check the navigation unit internal settings.

- Enter into the navigation interface display settings.
- Check the display settings whether the automatic mode is set to "on"

No

Set the display settings automatic mode to "on".

Yes

- Step 3 Check the navigation unit power circuit and ground circuit.

- Refer to [11.2.6.3 Radio Control Can Not Be Turned On](#).  
Power circuit and ground circuit normal?

No

After diagnostic, go to Step 1.

Yes

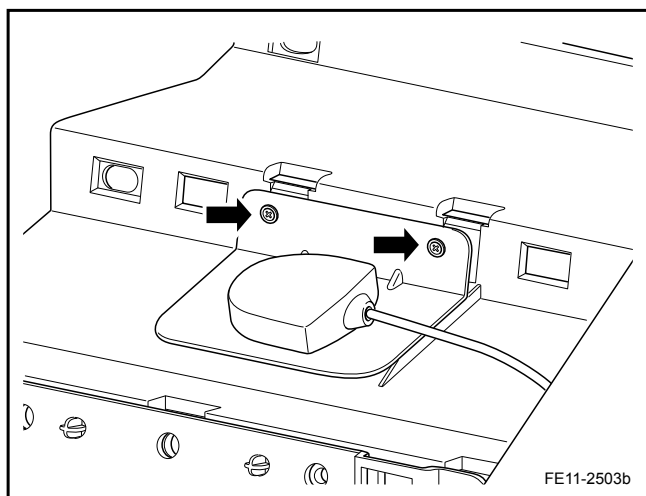
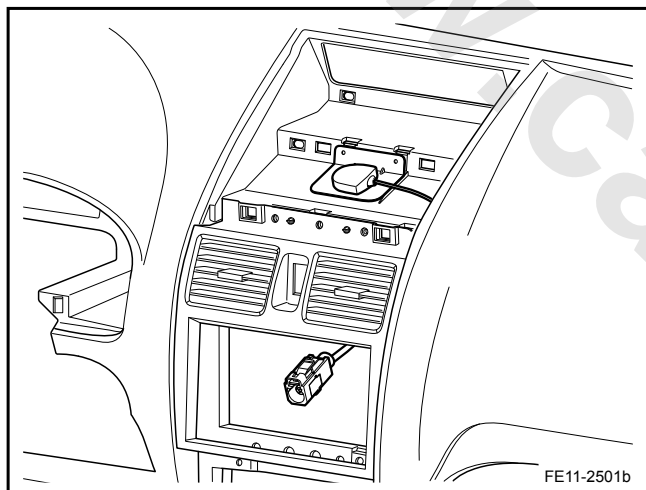
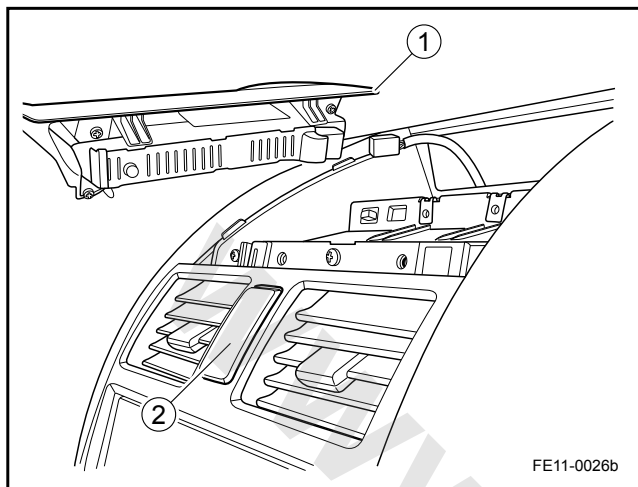
Step 4	Replace the navigation unit. Refer to <a href="#">11.3.7.4 Navigation Unit Replacement</a> .
--------	--

### 11.3.7 Removal and Installation

#### 11.3.7.1 GPS Antenna Replacement

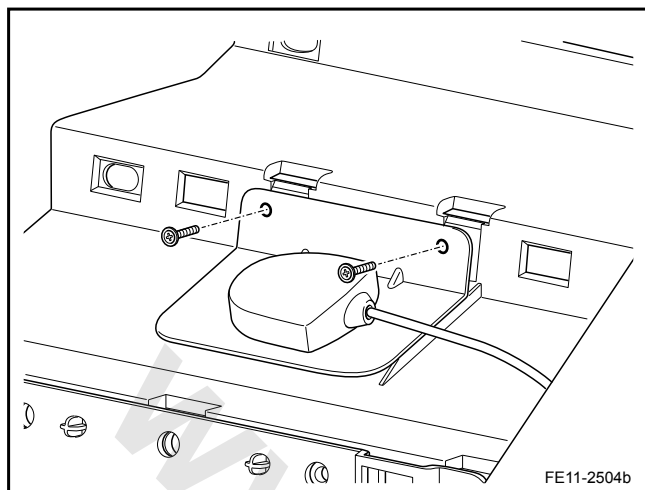
##### Removal Procedure

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the instrument cluster (1). Refer to [11.15.8.1 Instrument Cluster Replacement](#).
3. Remove the center air duct panel (2). Refer to [8.2.8.11 Instrument Panel Air Duct Replacement](#).
4. Remove the navigation unit. Refer to [11.2.7.5 Radio Control Replacement](#).
5. Disconnect the GPS antenna wiring harness connector.
6. Remove the GPS antenna screw.

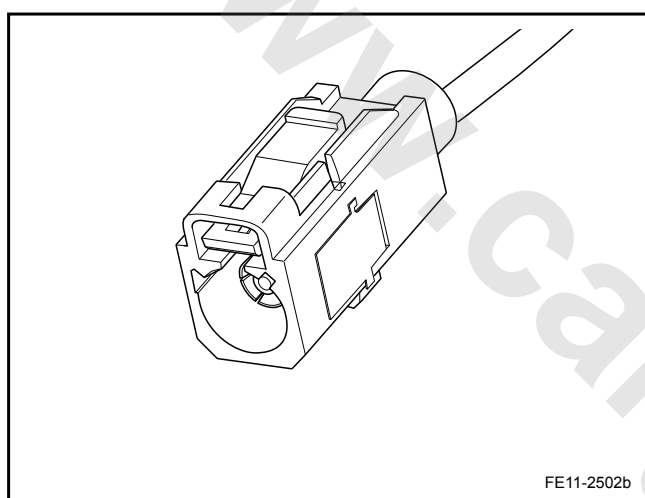


## Installation Procedure:

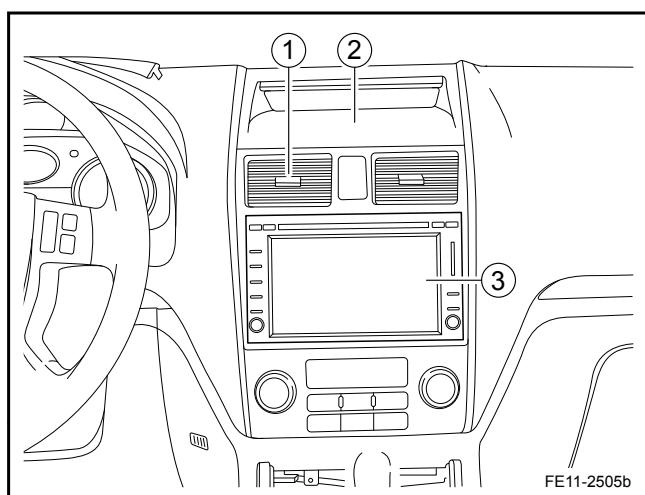
1. Install the GPS antenna screws.  
Torque: 3.5 Nm (Metric) 2.5 lb-ft (US English)



2. Connect the GPS antenna connector.



3. Install the navigation unit (3).
4. Install the center air duct panel (1).
5. Install the instrument cluster (2).
6. Connect the battery negative cable.



### 11.3.7.2 Speaker Replacement

Refer to [11.2.7.1 Front Door Speaker Replacement](#).

Refer to [11.2.7.3 Rear Speaker Replacement](#).

Refer to [11.2.7.4 Rear Speaker Replacement \(Hatchback\)](#).

### 11.3.7.3 Radio Antenna Module and Antenna Replacement

Refer to [11.2.7.2 Radio Antenna Module Replacement](#).

### 11.3.7.4 Navigation Unit Replacement

Refer to [11.2.7.5 Radio Control Replacement](#).

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## 11.4 Lighting System

### 11.4.1 Specifications

#### 11.4.1.1 Lamp Specifications (Sedan)

Component Name	Bulb Name	Bulb Type	Power
Headlamp Assembly	High Beam	H7	12 V 55 W
	Low Beam	H1	12 V 55 W
	Front Turn Lamp	PY21W	13.5 V 25 W
	Front Park Lamp	W5W	13.5 V 5 W
Tail Lamp Assembly	Brake Lamp	LED	-
	Rear Park Lamp	LED	-
	Rear Turn Lamp	PY21W	13.5 V 25 W
	Reverse Lamp	P21W	13.5 V 25 W
Front Fog Lamp Assembly	Front Fog Lamp	H3	12 V 55 W
	Daytime Running Lamp	P21W LL	13.5 V 25 W
Rear Fog Lamp Assembly	Rear Fog Lamp	P21W	13.5 V 25 W
High Mounted Brake Lamp Assembly	High Mounted Brake Lamp	LED	-
License Plate Lamp Assembly	License Plate Lamp	W5W	13.5 V 5 W
Dome Lamp Assembly	Left Reading Lamp	W5W	13.5 V 5 W
	Right Reading Lamp	W5W	13.5 V 5 W
Rear Dome Lamp Assembly	Left Reading Lamp	W5W	13.5 V 5 W
	Right Reading Lamp	W5W	13.5 V 5 W
	Door Lamp	C5W	13.5 V 5 W
Glove Box Lamp Assembly	Glove Box Lamp	C5W	13.5 V 5 W
Rear Compartment Lamp Assembly	Rear Compartment Lamp	W5W	13.5 V 5 W
Door Lamp Holder	Door Lamp	W3W	13.5 V 3 W

#### 11.4.1.2 Lamp Specifications (Hatchback)

Component Name	Bulb Name	Bulb Type	Power
Left / Right Headlamp Assembly	High Beam	H1	12 V 55 W
	Low Beam	H7	12 V 55 W
	Front Turn Lamp	PY21W	13.5 V 25 W
	Front Park Lamp	W5W	13.5 V 5 W
Left / Right Tail Lamp Assembly	Brake Lamp	W16W	13.5 V 16 W

Component Name	Bulb Name	Bulb Type	Power
Left / Right Tail Lamp Assembly	Rear Park Lamp	R5W	13.5 V 5 W
Left / Right Tail Lamp Assembly	Rear Turn Lamp	PY21W	13.5 V 25 W
	Rear Fog Lamp (Left)	PR21W	13.5 V 25 W
	Reverse Lamp (Right)	P21W	13.5 V 25 W
Front Fog Lamp Assembly	Front Fog Lamp	H11	12 V 55 W
High Mounted Brake Lamp Assembly	High Mounted Brake Lamp	W5W	13.5 V 5 W
License Plate Lamp Assembly	License Plate Lamp	W5W	13.5 V 5 W
Front Dome Lamp Assembly	Left Reading Lamp	W5W	13.5 V 5 W
	Right Reading Lamp	W5W	13.5 V 5 W
Front Dome Lamp With Sunroof Switch Assembly	Left Reading Lamp	W5W	13.5 V 5 W
	Right Reading Lamp	W5W	13.5 V 5 W
Rear Dome Lamp Assembly	Left Reading Lamp	W5W	13.5 V 5 W
	Right Reading Lamp	W5W	13.5 V 5 W
	Door Lamp	C5W	13.5 V 5 W
Glove Box Lamp Assembly	Glove Box Lamp	C5W	13.5 V 5 W
Rear Compartment Lamp Assembly	Rear Compartment Lamp	W5W	13.5 V 5 W
Door Lamp Holder	Door Lamp	W3W	13.5 V 3 W

#### 11.4.1.3 Fastener Tightening Specifications (Sedan)

Applications	Model	Specifications	
		Metric(Nm)	US English(lb-ft)
Left / Right Headlamp Assembly Bolts	M6 × 20	3-5	2-4
Left / Right Tail Lamp Assembly Retaining Nut	M5	3-5	2-4
Left / Right Front Fog Lamp Assembly Screws	M6 × 16	3-5	2-4
Left / Right Rear Fog Lamp Assembly Self-Tapping Screws	ST4.2 × 19	3-4	2-3
Dome Lamp Mounting Bracket Bolts	M6 × 16	4-5	3-4
Dome Lamp (With Sunroof Switch) Mounting Brackets Bolt	M6 × 16	4-5	3-4
Dome Lamp Assembly Screws	M5 × 8	3-5	2-4
Dome Lamp (With Sunroof Switch) Assembly Screws	M5 × 8	3-5	2-4
Rear Dome Lamp Assembly Screws	M5 × 12	3-5	2-4



Applications	Model	Specifications	
		Metric(Nm)	US English(lb-ft)
High Mounted Brake Lamp Assembly Self-Tapping Screws	ST4.2 × 13	3-4	2-3

#### 11.4.1.4 Fastener Tightening Specifications (Hatchback)

Applications	Model	Specifications	
		Metric(Nm)	US English(lb-ft)
Left / Right Headlamp Assembly Bolts	M6 × 20	3-5	2-4
Left / Right Tail Lamp Assembly Nut	M5	3-5	2-4
Front Fog Lamp Assembly Self-Tapping Screws	ST4.2 × 16	3-4	2-3
Dome Lamp Mounting Bracket Bolts	M6 × 16	4-5	3-4
Dome Lamp (With Sunroof Switch) Mounting Bracket Bolt	M6 × 16	4-5	3-4
Dome Lamp Assembly Screws	M5 × 8	4-5	3-4
Dome Lamp (With Sunroof Switch) Assembly Screws	M5 × 8	4-5	3-4
Rear Dome Lamp Assembly Screws	M5 × 12	4-5	3-4
High Mounted Brake Lamp Assembly Nut	M5	4-5	3-4
Left / Right Rear Retro-Reflector Assembly Screws	M5 × 6	4-5	3-4

## 11.4.2 Description and Operation

### 11.4.2.1 Exterior Lighting Description and Operation

#### Headlamp

When the headlamp is turned on, push the lever away from the driver, an audible click will be heard, the light changes from low beam to high beam. When the headlamp high beam is switched on, the indicator light on the instrument cluster assembly will be on. Pull the lever toward the driver, the headlamp changes from high beam to low beam. Continuously pull the lever to the driver direction, the headlamp changes from high beam to low beam again.

Headlamp must be light in order to achieve the correct road lighting. When installing a new headlamp assembly or maintenance, the headlamp light should be checked.

#### Headlamp Reminder Buzzer

When the headlamp switch is at the headlamp lamp turned on position or park lamp turned on position, and the ignition switch is not at "ON" position, "ACC (Accessories)" position or "START (to start )" position, the body control module monitors driver door status. If the left front door open, body control module will enable buzzer sound. If the headlamp is turned off, the body control module will not detect the headlamp switch, and buzzer will not sound.

#### Park Lamps and Turn Signals

Turn the headlamp switch to the first position, park lamps will be turned on. Turn the ignition switch to "OFF (off)" position to turn off park lamps. When the turn signals are enabled, the front and rear turn signal lamps and side turn signals flash, indicating vehicle turning. Turn signals only work when the ignition switch is turned on. Turn signals are controlled by the steering column left side light switch. Move the lever up or down (beyond the retaining-point) will turn on front, rear and side turn signals. After vehicle turning, return the lever to the horizontal position, steering signals will stop flashing.

Changing lane or turning at a small corner, the steering wheel angle may not be great enough to cancel turn signal, so the lever will stop and maintain at a position. When the lever is released, the lever will return to the horizontal position, turn signal will be canceled.

When the remote control anti-theft system is working, BCM controls the shift indicator light flashes indicating the remote anti-theft system working condition.

#### Fog Lamps

Front fog lamps switch is located on the left side of the steering column multi-function lever, while the rear fog lamp switch is located in the central dashboard, below the air-conditioning control panel. When the headlamp switch is turned on, rotate the multi-function lever front fog lamp switch to switch on the front fog lamps. Fog lamps will be lit. To use the rear fog lamps, turn on headlamps (or park lamps) first, with the front fog lamps turned on, press the rear fog lamps switch. The rear fog lamp indicator will be on, indicating the rear fog lamps are turned on. Press the switch again to turn off rear fog lamps. The indicator will be off. Headlamps (or park lamps) and rear fog lamps will also be off.

Fog lamp must be adjusted to achieve the correct lighting. After installing a new lamp or the front-end repair that may have affected the installation of front fog lamps, check the fog light.

#### Tail Lamp

Hatchback rear park lamps, brake lamps, rear fog lamps, turn signals and reverse lamps are an assembly. Sedan rear fog lamps are a separate assembly. When the headlamps or park lamps are turned on, rear park lamps will be turned on. When press the brakes, the rear park lamps will increase the brightness and will be used for brake lamps.

Sedan high mounted brake lamp is located in the rear window, the hatchback brake lamp is located at the top of the hatchback. Press the brake pedal, the high mounted brake lamp will be turned on.

#### Reverse Lamp

Sedan has two reverse lamps. Hatchback reverse lamp is located inside the right tail lamp. When the transmission is in reverse, the reverse lamps will be turned on. The reverse lamps are controlled by a reverse switch connected with the transmission.

#### License Plate Lamp

License plate lamp will be turned on when headlamps or park lamps are on. The license plate lamps are installed on top of the license plate.

#### Lamp Control Module

Automatic headlamp function will shut down headlamps, park lamps, tail lights, license plate lights and dashboard lights within a few seconds after the driver door is closed. If the headlamp switch is placed at the first or second position, and the key is pulled out, this feature will be enabled.

### 11.4.2.2 Interior Lighting Description and Operation

#### Door Controlled Lamp

Door controlled lamps are in the dome lamps. The switch is at the left. When the switch is pressed, the door opens, the door controlled lamps will be on. Close the door, the door controlled lamps will be off after a few seconds delay. When the switch is lifted, with the door open, the door controlled lamps will not be on. Reading lamps are at both sides of the dome lamp. The switch is located at the right side. Press the switch, both sides lamps will be on at the same time. Release the switch, both lamps will be off at the same time.

#### Rear Compartment Lamp

For sedan vehicles, the rear compartment lamp is located beneath the rear compartment lid. For hatchback vehicles, the rear compartment lamp is located on the left side of the wheel cover panel. As long as the rear compartment (hatchback) is open, the lamp will be on.

### 11.4.2.3 Comfortable Lighting Control

#### Following Lighting

If the headlamp switch is turned from "OFF" to "ON" (park lamp, headlamp or auto headlamp) and then to "OFF" again within 10 min the ignition key is pulled out, the following lighting function will be activated. The headlamps will be lit after 30 s delay. When the following lighting function is activated, if one door is opened="Headlamps will be lit after 180 s delay. The 180 s delay is the timing for any door (including rear compartment) opening. After all doors are closed, it will re-time 30 s.

#### Automatic Headlamp

When the ignition switch is at "ON", headlamp switch is at "AUTO", the park lamp relay and headlamp relay will automatically pull-in or disconnect (requires ambient and sun light sensor signal input) according to the surrounding environment brightness.

#### Lamp Detection

During turning, if one of the turn signal lamps is (21W) damaged, the other turn signal lamp will flash at about double normal frequency.

### Fade Lighting Features


- BCM controls dome lamp fade in light in about 0.7s, fade out in about 1.7s.
- When unlocking, the dome lamp will fade in light, if there is no door open action, 15 s after the dome lamp will fade out.
- When lock (locking device operated), the dome lamp will fade out in about 1.7s.
- With all doors closed and the ignition switch is turned off, dome lamp will fade out in 15 s; doors all shut, the ignition switch is open, dome lamp fade out immediately extinguished.
- With all doors closed and the ignition switch is turned on, dome lamp will immediately extinguish.
- Opening any door, dome lamp will fade in light and keep lit, until the door is closed then fade out in 1.7s, or turned off because of energy saving feature (with the ignition switch is at OFF, the energy saving feature will be activated in 20 min).

### Emergency Braking Warning Lamp

If the vehicle speed (BCM receives signal through CAN Bus) rapidly decreases due to emergency braking, all turn signal lamps will be activated and flashing; if the vehicle speed stops decrease, the alarm flash will be deactivated. (Speed decrease more than 0.55g is regarded as an emergency braking). This feature is enabled when all following conditions are met:

1. The current speed is greater than or equal to 45 km/h (if less than 45 km/h, even if an emergency brake is detected, HOD will not be triggered).
2. The brake pedal is pressed and held.
3. Hazard warning lamp (Hazard) have not been manually switched on by driver.
4. Emergency braking has been detected, namely: in 1,000ms sampling time, deceleration value is greater than or equal to the following pre-defined HOD activation deceleration threshold.
5. the pre-defined HOD activation deceleration threshold is stored in the EEPROM vehicle configuration part. It is the factory default value. If a user needs to change, it can be re-configured through scan tool commands.

When the following conditions are met, this feature will be deactivated:

1. After emergency braking warning lamp (HOD) is triggered, the running time is no less than 1,000 ms (either manually or automatically turn off).
  2. Driver manually switched off hazard warning lamp.
  3. Brake pedal has been released.
  4. The vehicle starts accelerating again, that is, in 2000ms speed sampling time, the vehicle acceleration value is greater than or equal to pre-defined stop HOD flashing acceleration threshold.
  5. The pre-defined stop HOD flashing acceleration threshold value is also stored in the EEPROM vehicle configuration part. It is selected as the factory default value. If a user needs to change, it can be re-configured through scan tool commands.
  6. If the HOD is triggered and the vehicle is stopped, the HOD continues to run until the vehicle acceleration is detected again, and the acceleration value satisfies the above conditions.
- 

### 11.4.3 System Working Principle

#### 11.4.3.1 System Working Principle

##### Headlamp Working Principle

When the headlamp switch is at "headlamp" position, the working voltage is provided by terminal 8 to pull-in headlamp relay and light up headlamps. Headlamp supply voltage is sent to the headlamp adjustment switch and the left and right headlamp adjustment motors. Moving up and down the switch can change the adjustment adjustment motor signal voltage, to achieve the headlamp height adjustment.

##### Note

Moving this button too frequently may cause motor inoperative or damage.

When BCM (the center controller) detects the headlamp switch terminal 12 voltage, it means the switch is at "AUTO" (automatic transmission), at this time BCM will monitor the ambient light sensors signal. If the ambient light is not strong, BCM sends power from IP29 terminal 31 to drive the headlamp relay, the headlamps will be automatically lit. When the ambient light is increased, BCM will cut off the power supply output, headlamps will be automatically off.

When the lighting switch is at high beam position, the working voltage is from the switch terminal 7 to drive high beam relay, at the same time the high beam power supply voltage is transmitted to the instrument panel to light high beam indicator.

##### Note

High beam relay working voltage is from the headlamp power supply circuit.

##### Park Lamp Working Principle

When the headlamp switch is at "headlamp" position, the working voltage is sent from terminal 14 to drive the park lamp relay and illuminate all park lamps, instrument lights, as well as left and right license plate lamps; at the same time this voltage is sent to the backlight adjustment switch, this switch can be used to adjust the backlight brightness.

##### Note

The BCM connector IP29 terminal 16 can also be used to drive park lamp relay, for example, when the vehicle is unlocked with the remote control, BCM light park lamps through this circuit.

##### Front Fog Lamp Working Principle

Front fog lamps relay coil drive power supply is from the park lamp power supply circuit. When the front fog lamp switch is turned on, the switch ground circuit will drive the front fog lamp relay. The working voltage through the relay will light front fog lamps. At the same time this voltage is sent to the instrument panel front fog lamp indicator.

##### Note

Note that front fog lamps working voltage will be sent to rear fog lamps at the same time.

##### Rear Fog Lamp Working Principle

When the rear fog lamp switch is turned on, the power supply from the front fog lamps will drive the rear fog lamps relay and light rear fog lamps, while the voltage is also sent to the instrument panel front fog lamp indicator.

##### Note

Note: The sedan has a separate rear fog lamp assembly; hatchback has only one rear fog lamp, located inside the left tail assembly.

##### Turn Signal Working Principle

The multi-function lever controls light switch terminals 1 and 3 ground circuits. This ground signal is sent to BCM. BCM lights the left and right turn signals through IP28 terminals No.4,13 respectively.

##### Note

When the hazard warning lamp button is pressed, BCM will send output voltage to these two circuits at the same time to light all turn signal lamps.

##### Brake Lamp Working Principle

The brake lamps are controlled by the brake lamp switch on the brake pedal. When the brake pedal is pressed. the working voltage is directly sent to the brake lamp bulb.

##### Note

Sedan high mounted brake lamp is located on the rear parcel shelf inside the rear window. Hatchback high mounted brake lamp is located at the top of the hatchback.

##### Reverse Lamp Working Principle

Reverse lamps are controlled by the reverse lamp switch. When the vehicle is at reversing, the working voltage is directly sent to the brake lamp bulb.

**Note**

Hatchback has only one reverse lamp, located inside the right tail lamp assembly.

**Courtesy Lamp and Rear Compartment (Hatchback) Lamp Working Principle**

Courtesy lamp and rear compartment lamp (Hatchback) power is from fuse IF19.

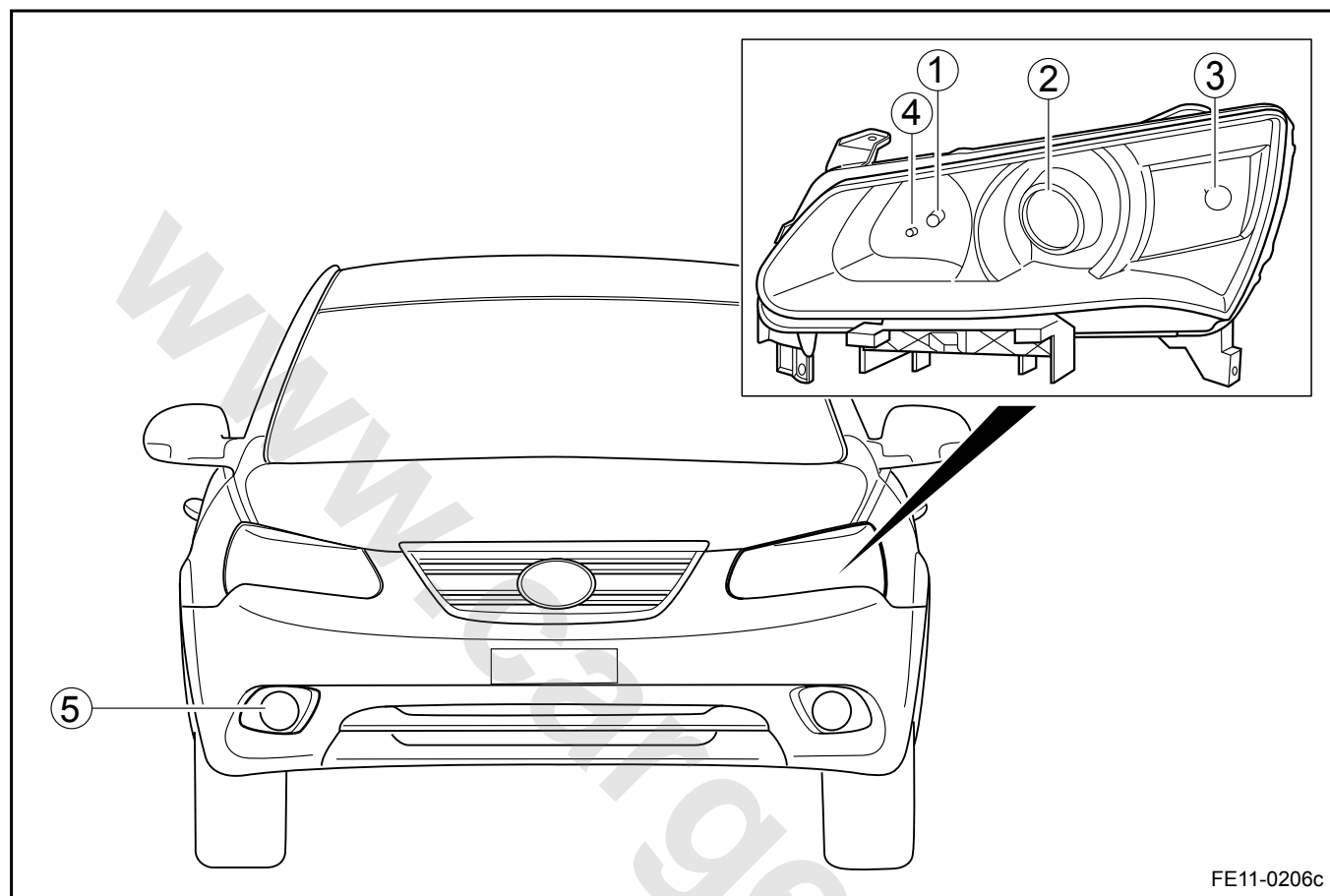
When the door is opened, the door lock will connect the door courtesy lamp circuit to ground so that the door courtesy lamp will be lit.

When the rear compartment (Hatchback) is opened, the rear compartment (Hatchback) lock connects the rear compartment lamp (Hatchback) ground circuit and light rear compartment lamp (Hatchback).

## 11.4.4 Component Locator

## 11.4.4.1 Component Locator

Body Front (Hatchback)



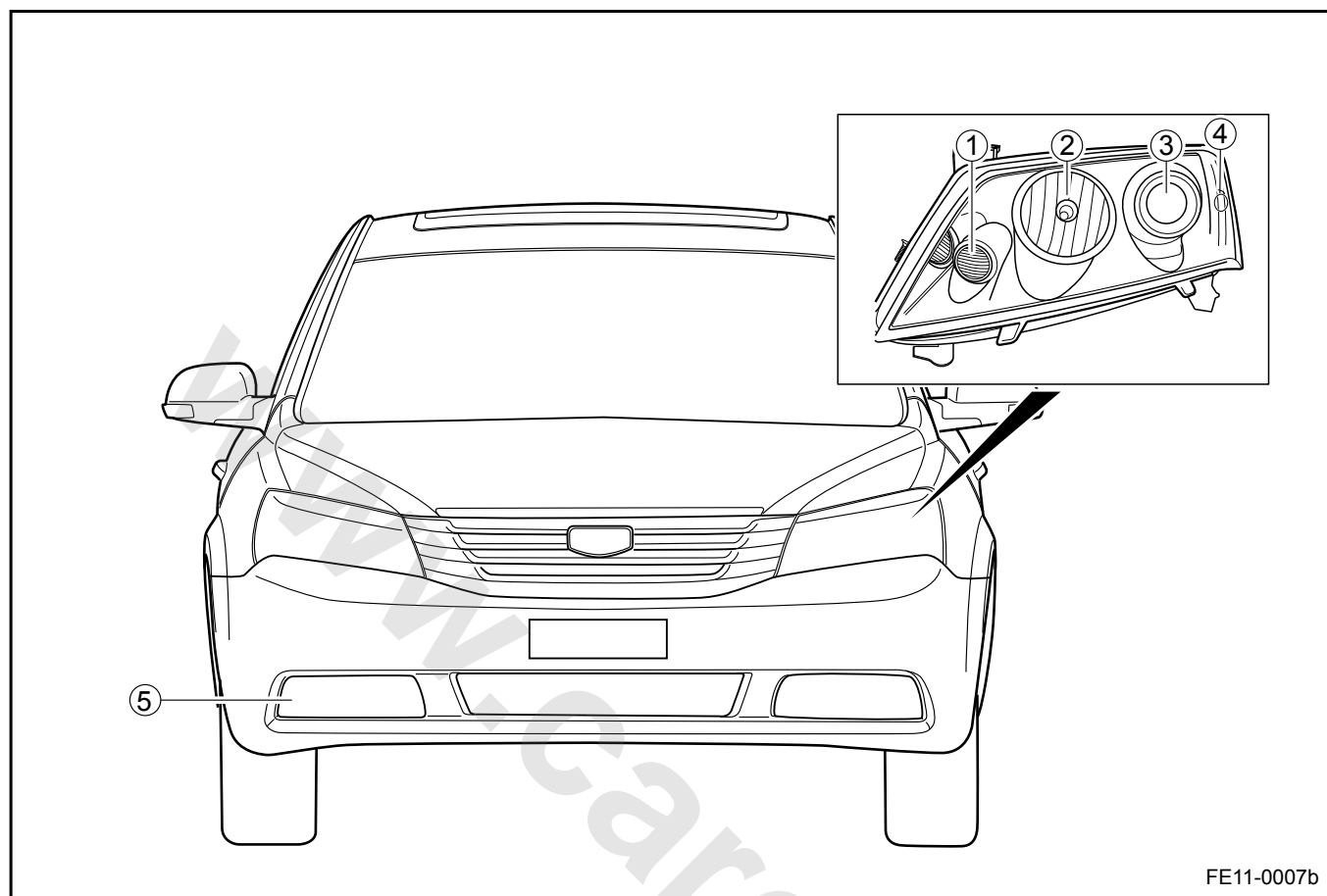
FE11-0206c

## Legend

- 1. High Beam
- 2. Low Beam
- 3. Turn Signal Lamp
- 4. Park Lamp

- 5. Front Fog Lamp

Body Front (Sedan)



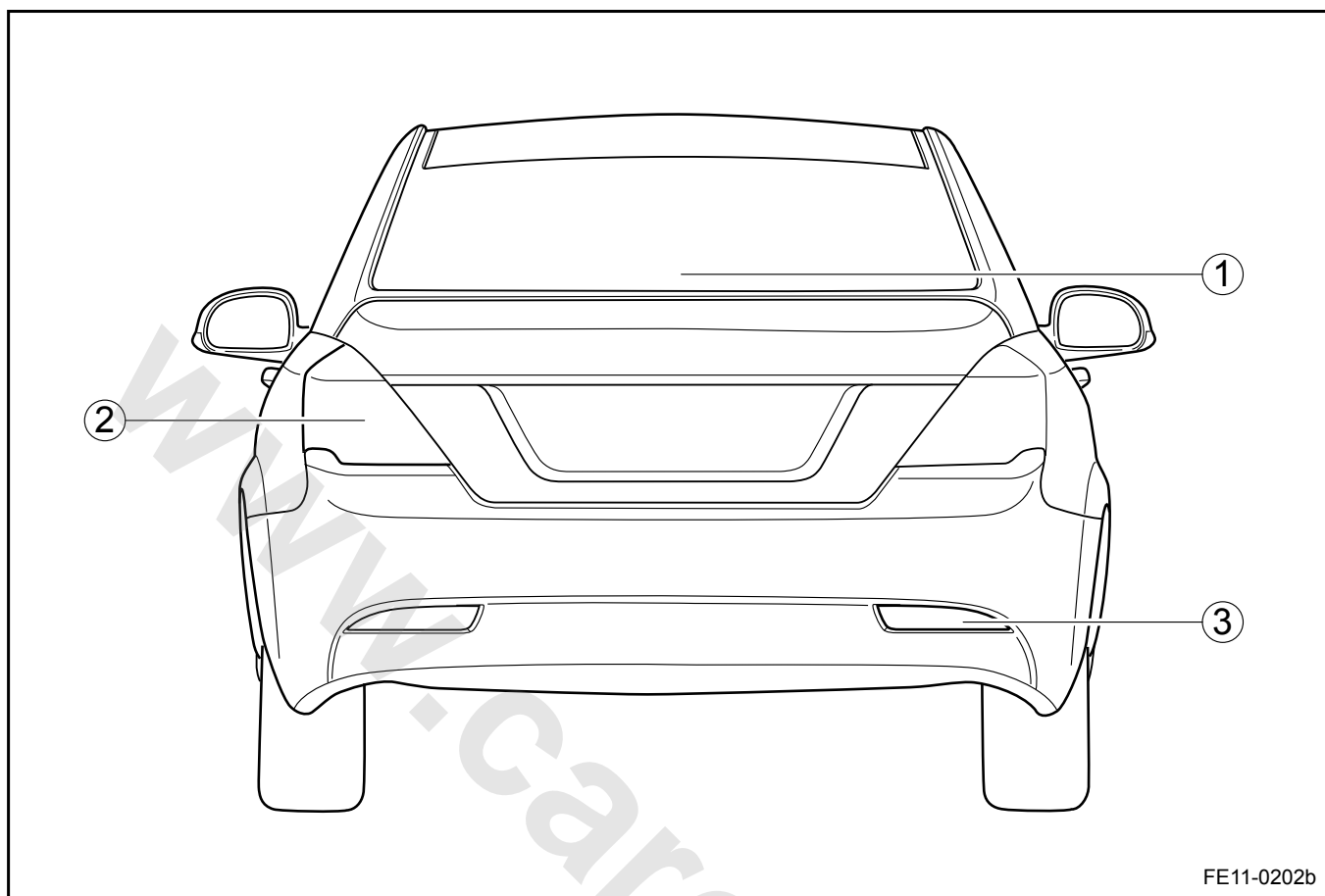
FE11-0007b

Legend

- 1. Park Lamp
- 2. High Beam
- 3. Low Beam
- 4. Turn Signal Lamp
- 5. Front Fog Lamp



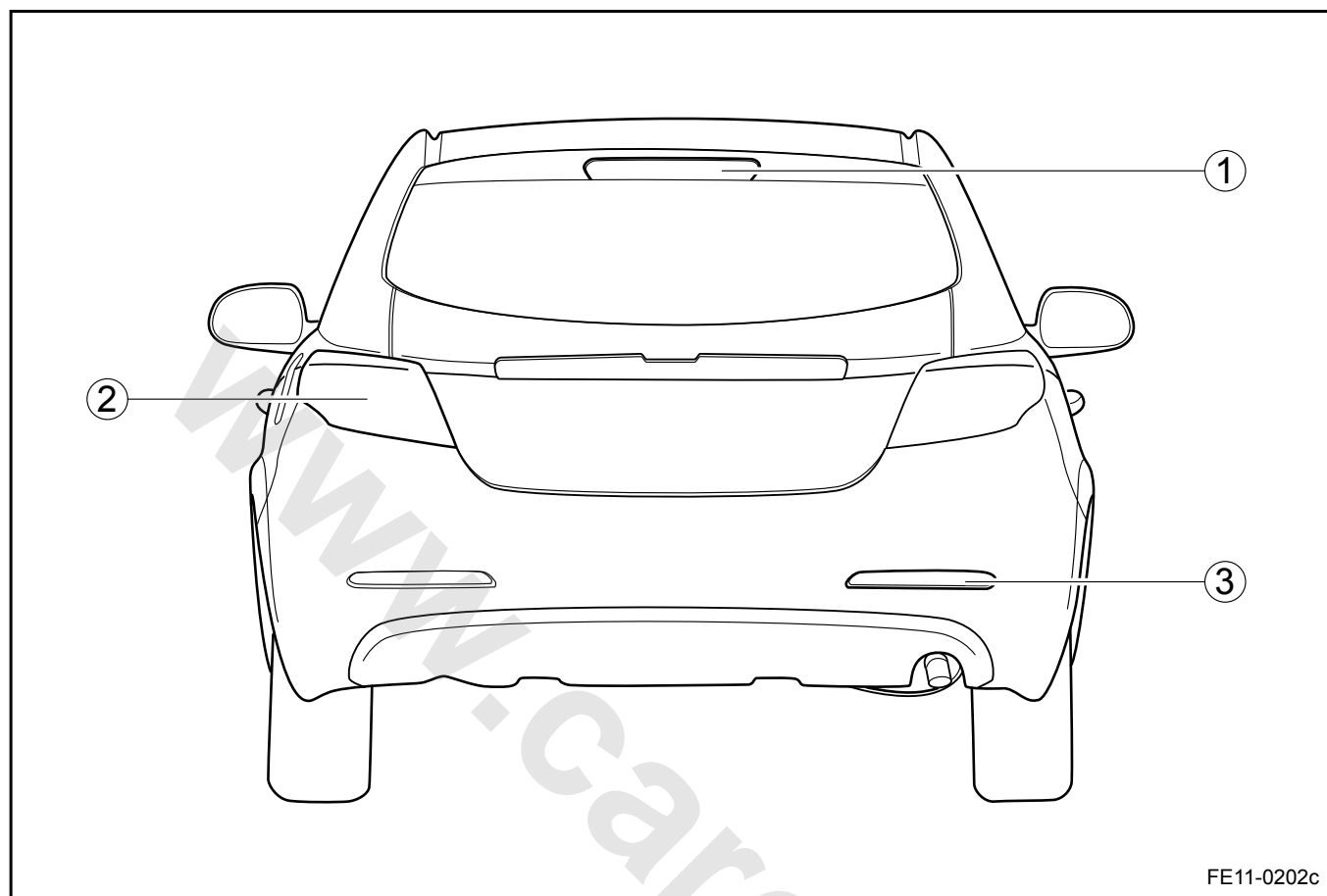
## Body Rear (Sedan)



## Legend

- |                            |  |
|----------------------------|--|
| 1. High Mounted Brake Lamp | 3. Rear Fog Lamp (Plus Rear-Retro-Reflector) |
| 2. Tail Lamp Assembly      |  |

Body Rear (Hatchback)

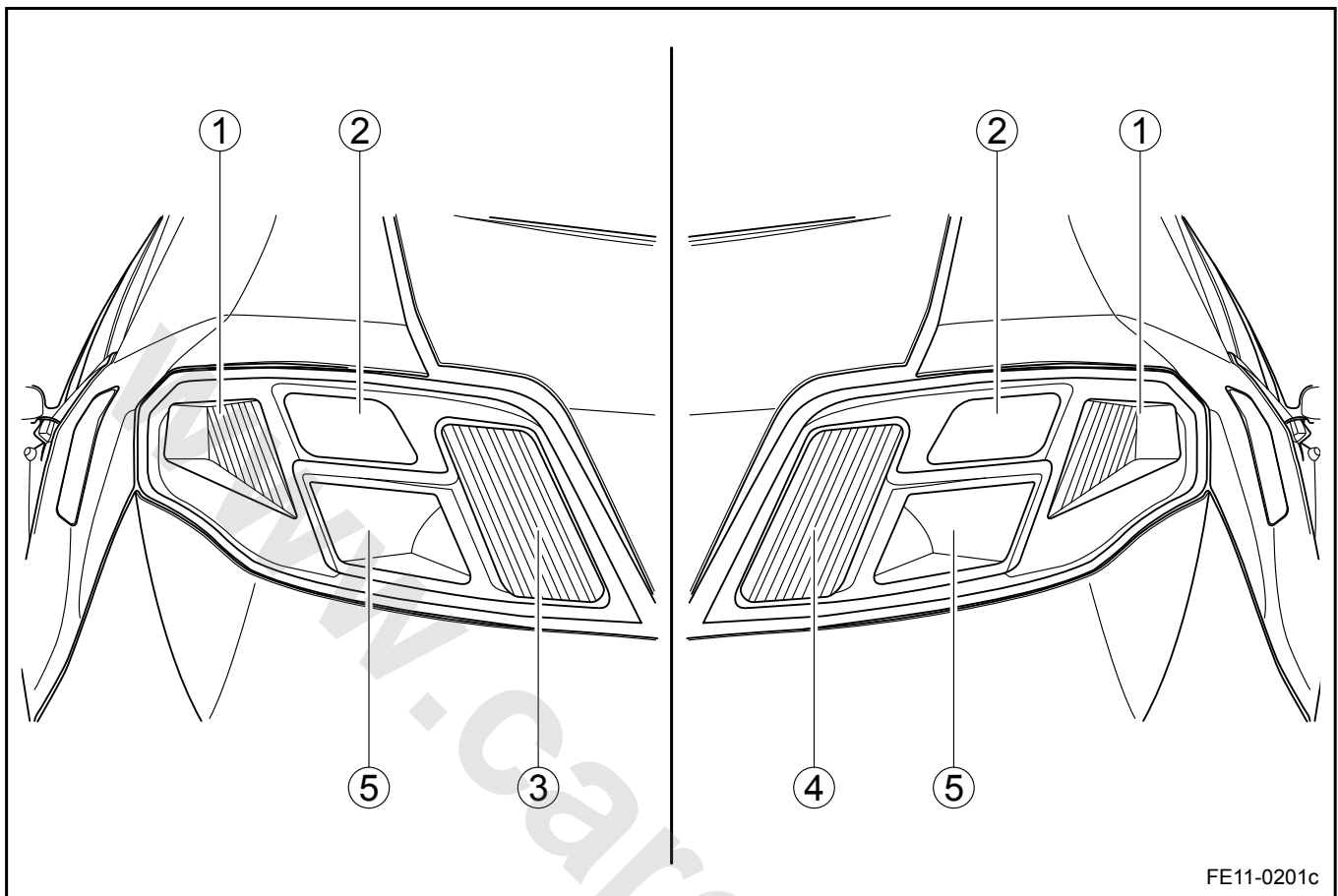


Legend

- 1. High Mounted Brake Lamp
- 2. Tail Lamp Assembly

- 3. Rear-Retro-Reflector

## Rear Lamp Assembly (Hatchback)

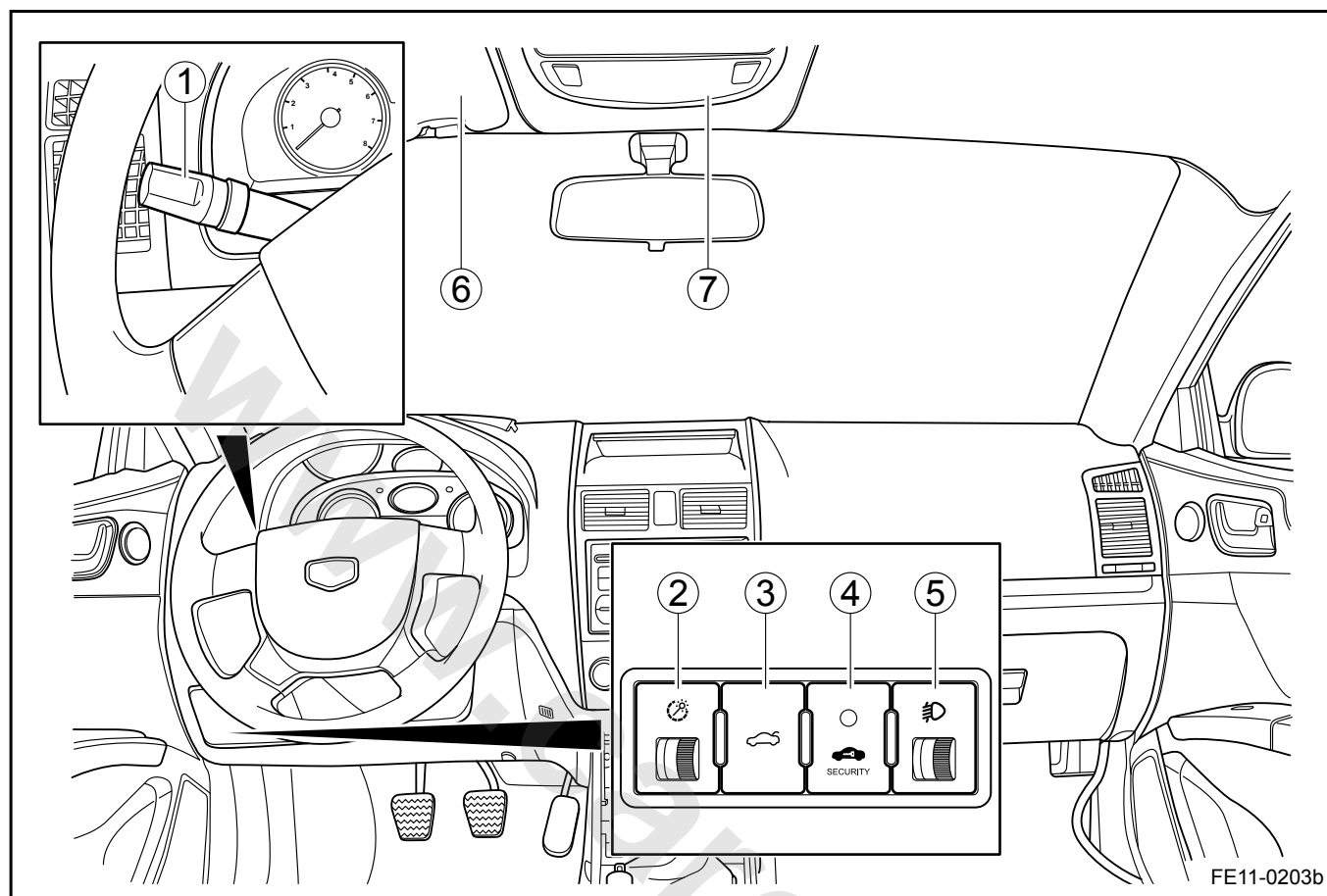


FE11-0201c

## Legend

- 1. Brake Lamp
- 2. Park Lamp
- 3. Rear Fog Lamp
- 4. Reverse Lamp
- 5. Turn Signal Lamp

## Interior Lamp and Switch



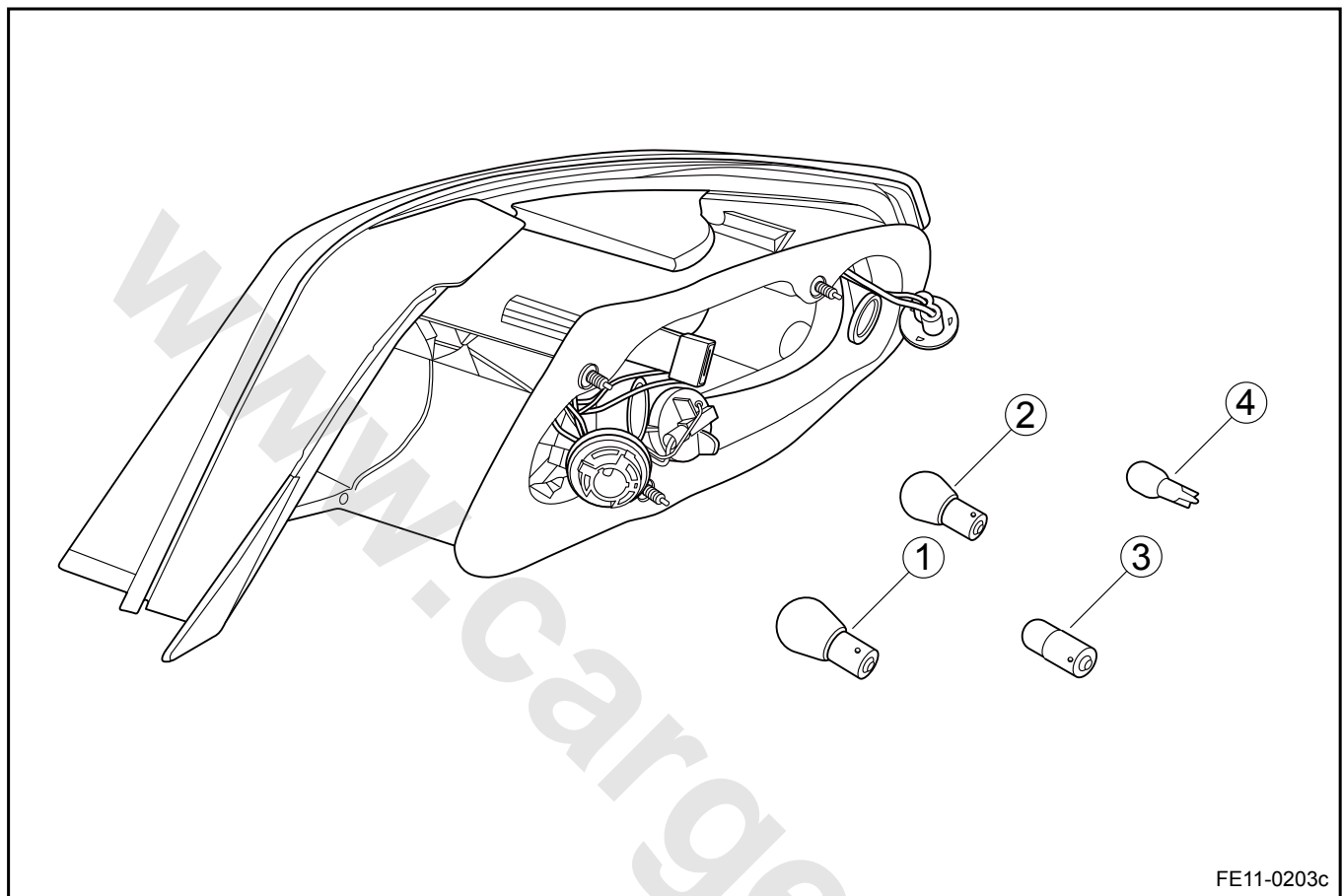
## Legend

- |  |                        |
|--|------------------------|
| 1. Multifunction Lever                           | 6. Visor / Mirror Lamp |
| 2. Background Light Brightness Adjustment Switch | 7. Reading Lamp        |
| 3. Rear Compartment Release Switch               |                        |
| 4. Anti-theft Indicator                          |                        |
| 5. Headlamp Height Adjustment Switch             |                        |

## 11.4.5 Disassemble View

## 11.4.5.1 Disassemble View

Left Tail Lamp Assembly (Hatchback)

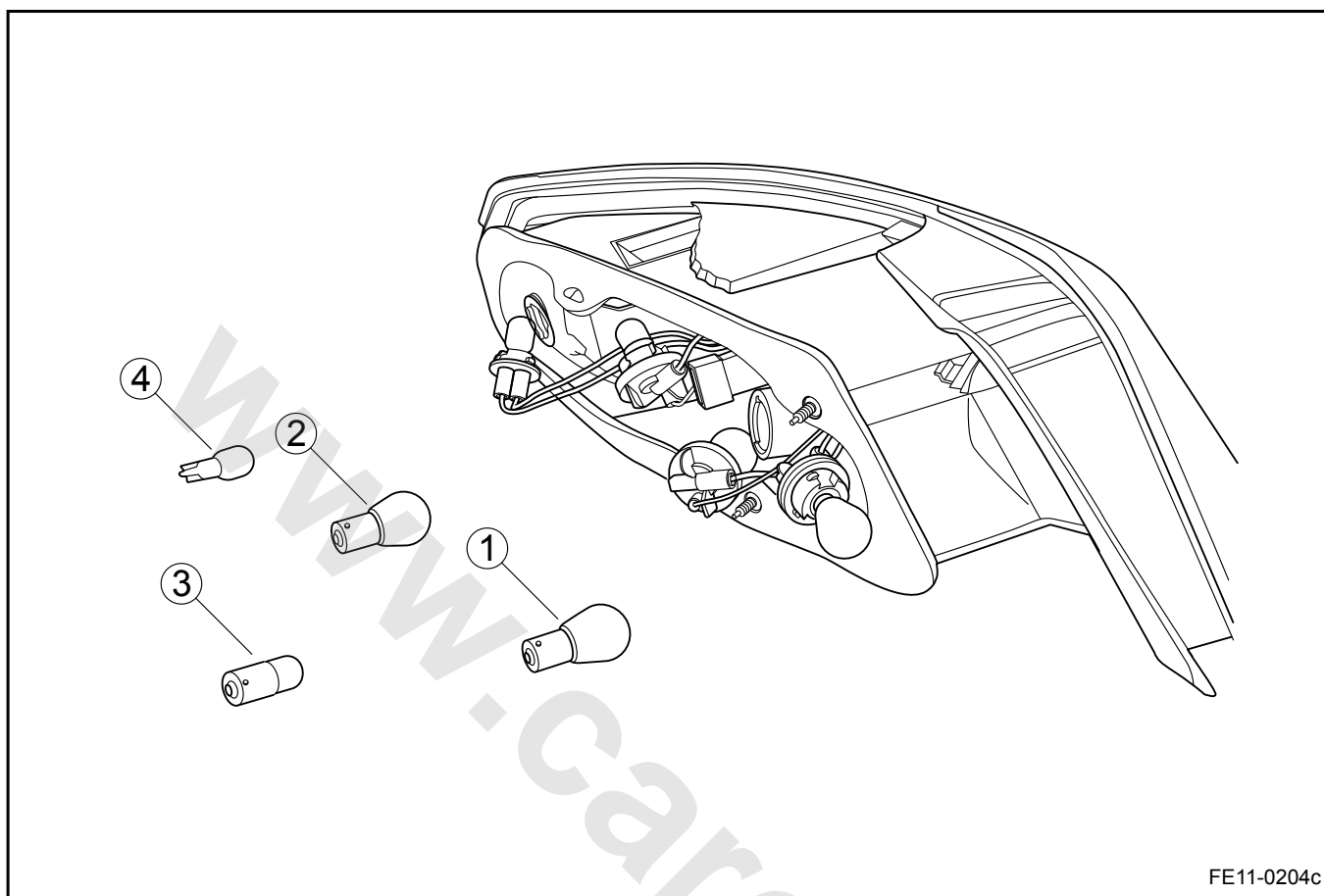


## Legend

- 1. Rear Fog Lamp Bulb
- 2. Turn Signal Lamp Bulb
- 3. Park Lamp Bulb

- 4. Brake Lamp Bulb

Right Tail Lamp Assembly (Hatchback)

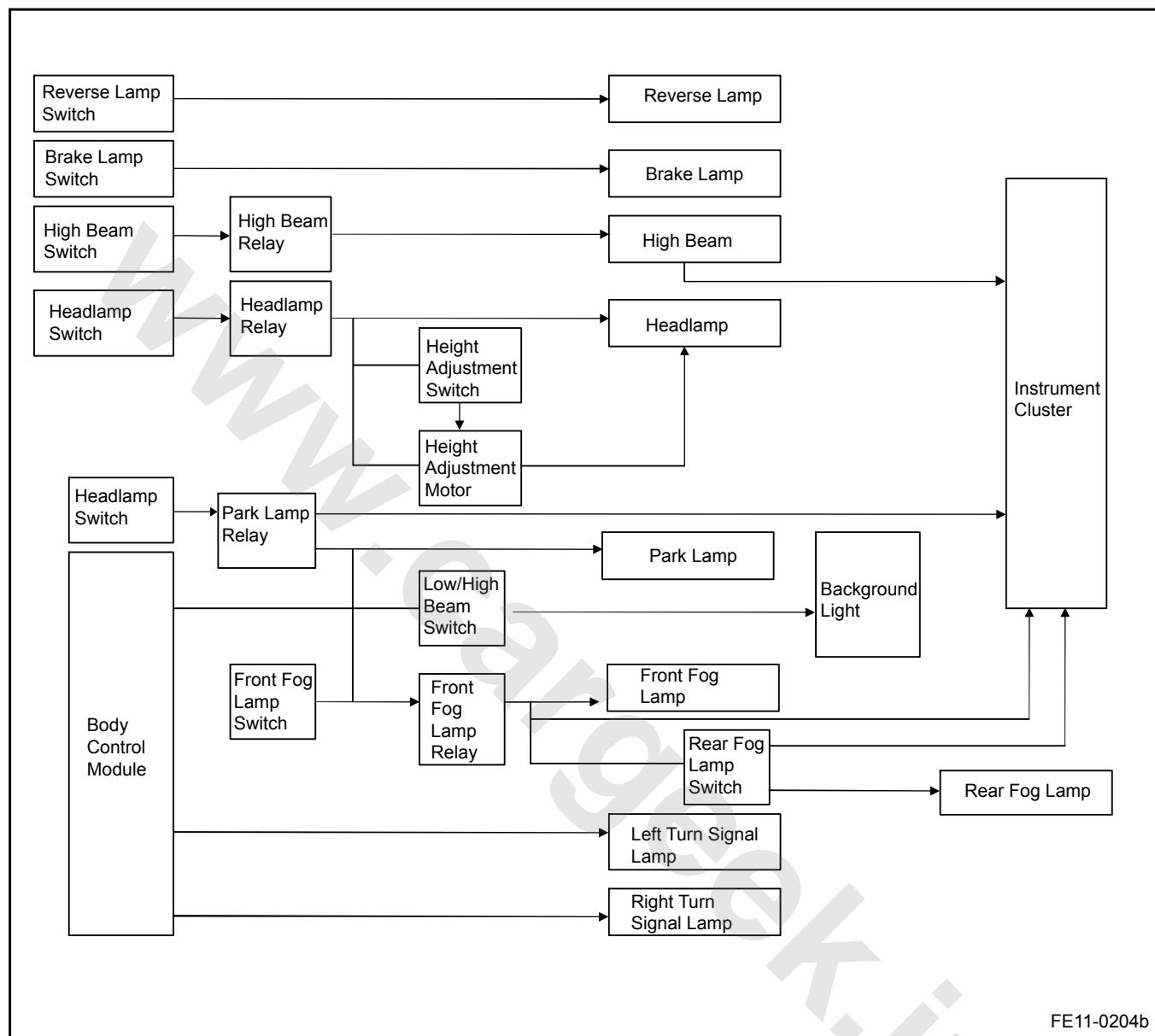


Legend

- |                          |                    |
|--------------------------|--------------------|
| 1. Reverse Lamp Bulb     | 4. Brake Lamp Bulb |
| 2. Turn Signal Lamp Bulb |                    |
| 3. Park Lamp Bulb        |                    |

## 11.4.6 Schematic

## 11.4.6.1 Schematic



## 11.4.7 Diagnostic Information and Procedures

### 11.4.7.1 Diagnosis Description

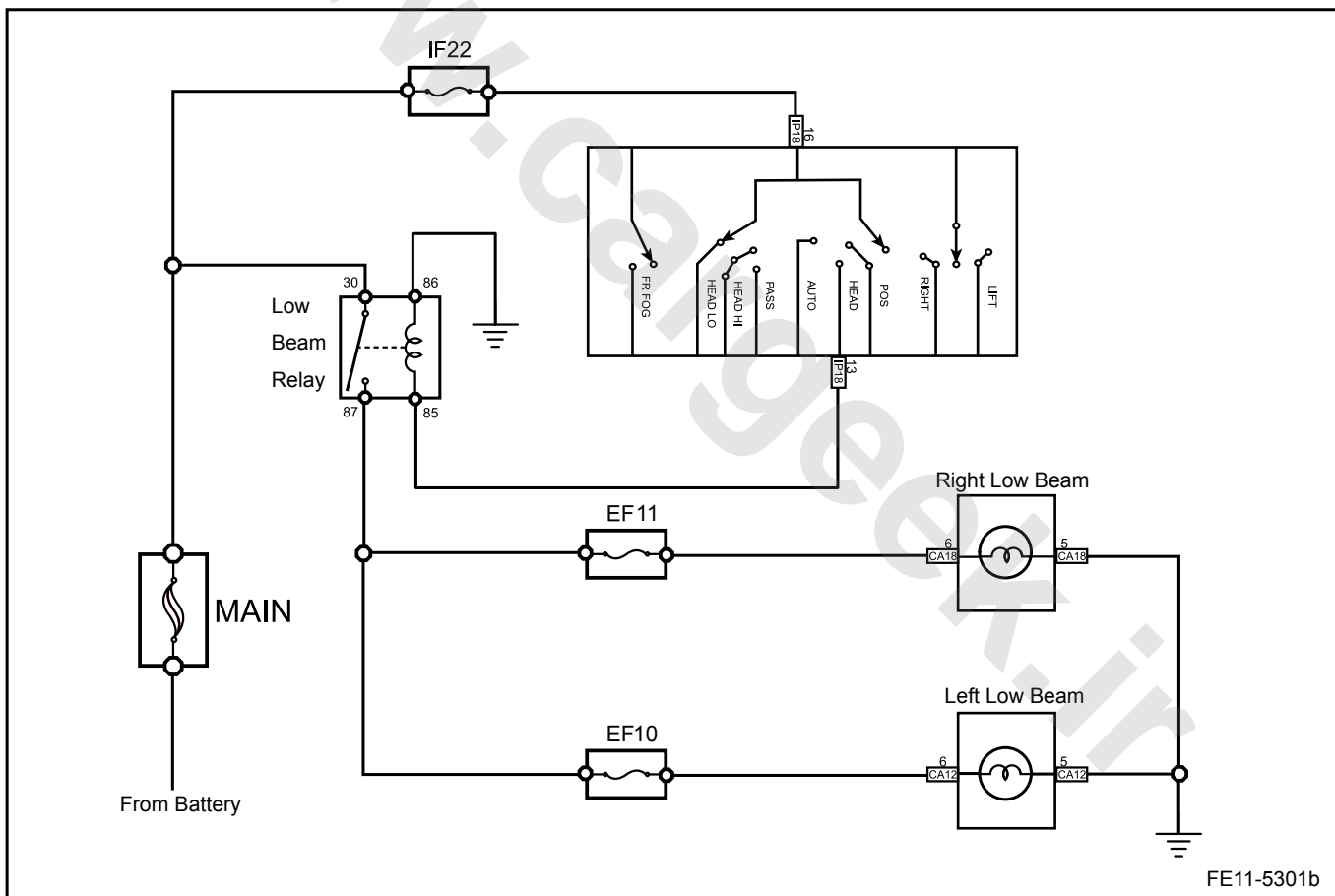
Refer to [11.4.2 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.4.7.2 Visual Inspection

- Check installed after market equipment that may affect windshield wiper/washer system operations.
- Check the easy to access system components to identify whether there is a significant damage or potential malfunction.
- If there is only one lamp inoperative, before replace the bulb, check and repair poor connections to power supply or ground or poor circuits.

### 11.4.7.3 Headlamp Inoperative

Schematic:



Diagnostic Steps:

Step 1	With a scan tool, carry out headlamp active to check the headlamp working status.
--------	---

- (a) Select as the following sequence: Body Control Module / active test / external lamp control output / light headlamps. Are headlamps lit?



Yes

Go to step 14

No

Step 2 Check the left front or right front headlamp bulb.

- (a) Remove the left front or right front headlamp bulb.  
Is the bulb filament blown?

No

Go to step 4

Yes

Step 3 Replace the faulty headlamp bulb.

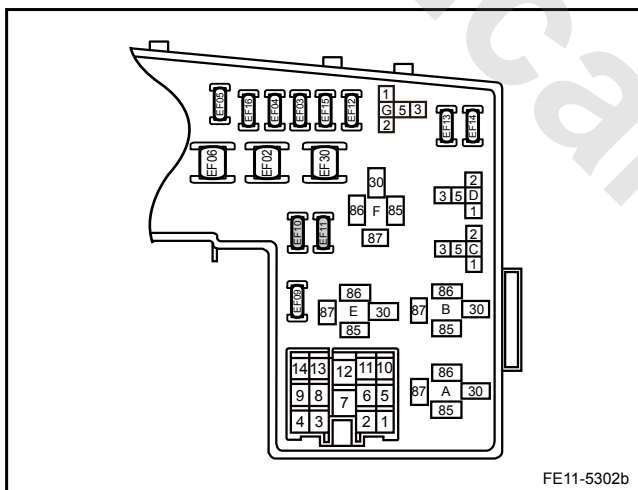
- (a) Replace the faulty headlamp bulb.  
Is the headlamp working properly?

Yes

System normal

No

Step 4 Check fuse EF10 or EF11.



- (a) Check whether the fuse EF10 or EF11 is blown.  
Fuse Rating: 10 A

No

Go to step 6

Yes

Step 5 Repair fuse EF10 or EF11 circuit.

- (a) Check for fuse EF10 or EF11 short circuit.  
(b) Repair the circuits. Confirm that there are no short circuits.  
(c) Replace with fuses with rated current.  
Confirm the headlamp is working correctly.

Yes

System normal

No

Step 6 Check fuse EF10 or EF11 voltage.

- (a) Turn on headlamps, measure fuse EF10 or EF11 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

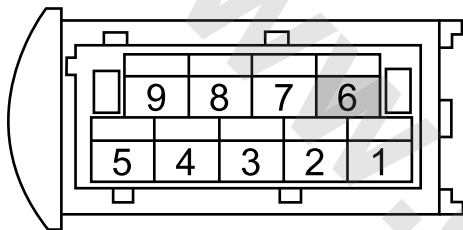
No

Go to step 10

Yes

Step 7 Check headlamp harness connector CA12/CA18 terminal terminal No.6 voltage.

Front Headlamp Harness Connector CA12/18



FE11-5303b

- (a) Turn on headlamps, measure wiring harness connector CA12/CA18 terminal No.6 voltage with a multimeter .

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 12

No

Step 8 Check circuit between headlamp fuse EF10/EF11 and the headlamp harness connector CA12/CA18 terminal No.6.

- (a) Measure resistance between headlamp fuse EF10/EF11 and headlamp harness connector CA12/CA18 terminal No.6 with a multimeter.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 10

No

Step 9 Repair open circuit between headlamp fuse EF10/EF11 and the headlamp harness connector CA12/CA18 terminal No.6.

- (a) Confirm open circuit between headlamp fuse EF10/EF11 and the headlamp harness connector CA12/CA18 terminal No.6 repair is completed.

Are headlamps working correctly?

Yes

System normal

No

Step 10 Replace the headlamp relay with the high beam relay.

- (a) Is the headlamp working properly after the relay replacement?

No

Go to step 12

Yes

Step 11 Install a new headlamp relay.

- (a) Return the headlamp relay to its original position and install a new high beam relay.

Is the headlamp working properly?

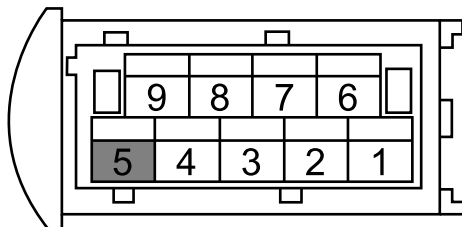
Yes

System normal

No

Step 12 Measure resistance between headlamp harness connector CA12/CA18 terminals No.5 and the body ground.

Front Headlamp Harness Connector CA12/18



FE11-5315b

- (a) Disconnect the headlamp wiring harness connector CA12/CA18.  
(b) Measure resistance between headlamp harness connector CA12/CA18 terminals No.5 and the body ground.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 14

No

Step 13 Repair the open circuit between headlamp harness connector CA12/CA18 and the body ground.

- (a) Confirm the open circuit between headlamp harness connector CA12/CA18 and the body ground repair is completed.

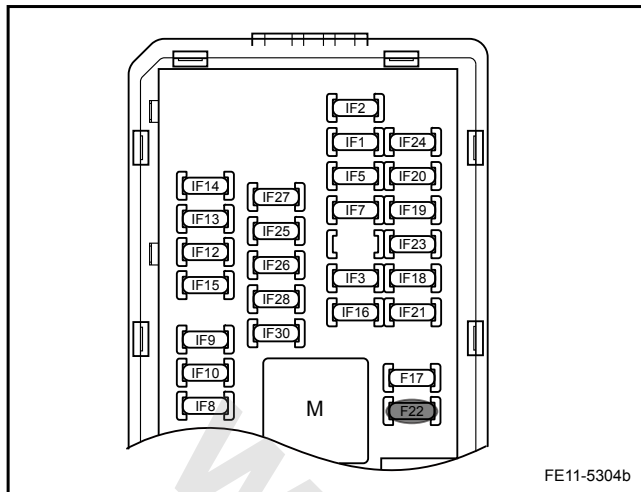
Is the headlamp working properly?

Yes

System normal

No

Step 14 Check the fuse IF22.



(a) Check the fuse IF22.

Fuse Rating: 10 A

Is the fuse IF22 blown?

No

Go to step 17

Yes

Step 15 Check fuse IF22 circuit.

(a) Check fuse IF22 for short circuit.

(b) Repair the circuits. Confirm that there are no short circuits.

(c) Replace with fuses with rated current.

Is the headlamp working properly?

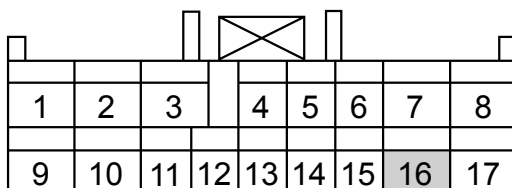
Yes

System normal

No

Step 16 Measure headlamp switch wiring harness connector IP18 terminal No.16 voltage.

Left Headlamp Harness Connector IP18



FE11-5308b

(a) Measure headlamp switch wiring harness connector IP18 terminal 16 voltage.

Standard Voltage: 11-14 V

Is the voltage normal?

Yes

Go to step 18

No

Step 17 Repair open circuit between fuse IF22 and headlamp switch wiring harness connector IP18 terminal No.16.

(a) Confirm open circuit between fuse IF22 and headlamp switch wiring harness connector IP18 terminal No.16 repair is completed.

Is the headlamp working properly?

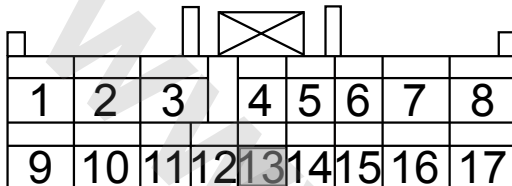
Yes

System normal

No

Step 18 Check headlamp switch wiring harness connector IP18 terminal No.13 voltage.

Left Headlamp Harness Connector IP18



FE11-5305b

- (a) Turn on headlamps, measure headlamp switch harness connector IP18 terminal No.13 voltage with a multimeter.  
Standard Voltage: 11-14 V  
Is the voltage specified value?

Yes

Go to step 20

No

Step 19 Replace the headlamp switch.

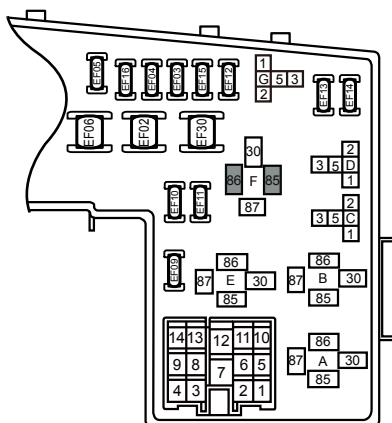
- (a) Refer to [11.4.8.1 Headlamp Switch Replacement](#).  
Are headlamps working properly?

Yes

System normal

No

Step 20 Check circuit between headlamp relay F terminal No.85 and headlamp switch connector IP18 terminal No. 13.



FE11-5306b

- (a) Confirm headlamp relay terminal No.86 ground is intact.  
(b) Check and repair headlamp relay terminal No.85 and the headlamp switch connector IP18 terminal No.13 circuit malfunction.

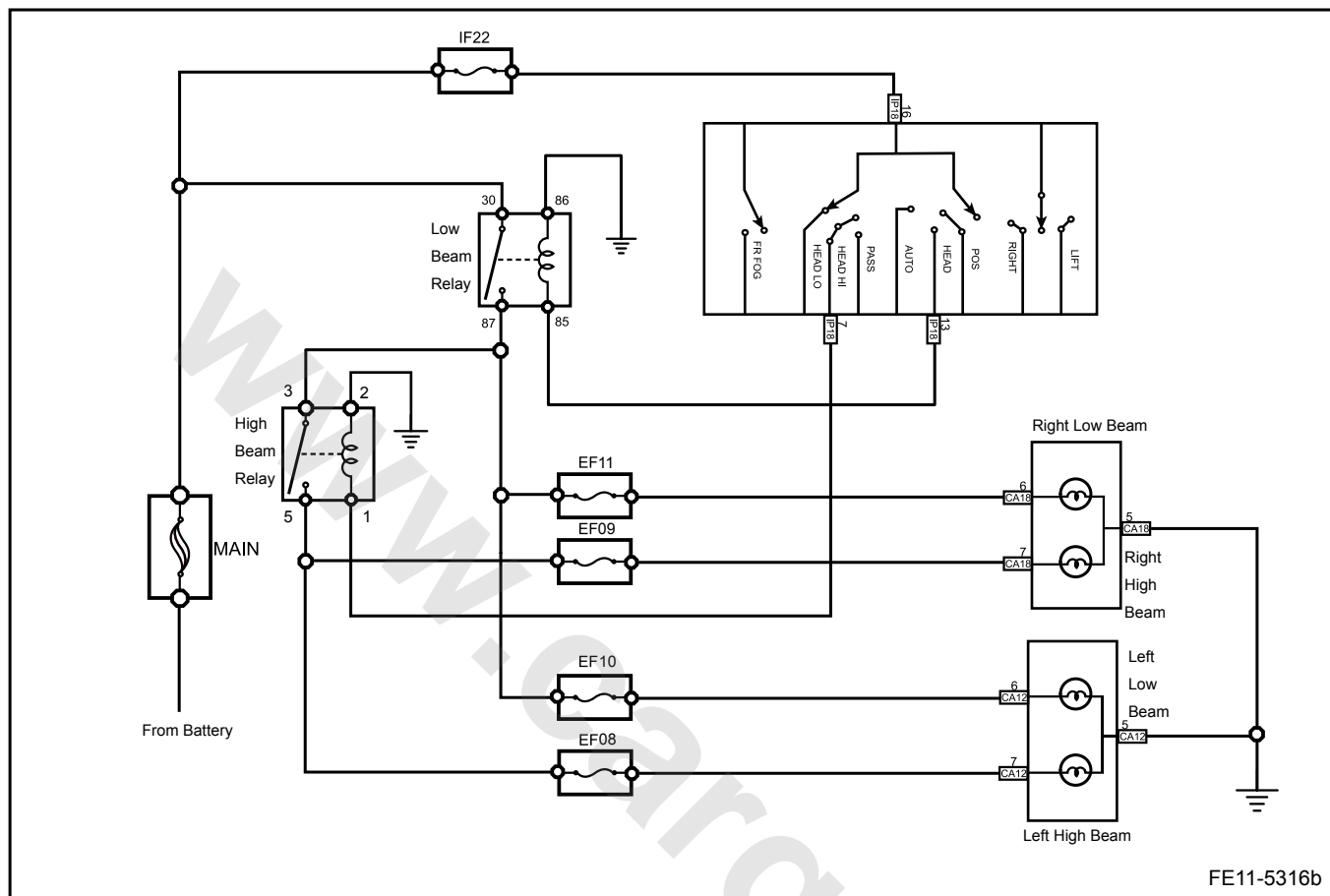
Confirm the repair completed.

Next

Step 21 System normal.

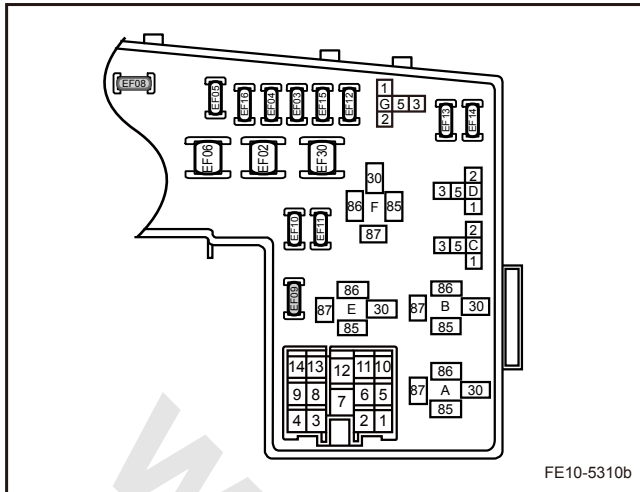
## 11.4.7.4 High Beam Inoperative

Schematic:



Diagnostic Steps:

Step 1	Check the left front or right front high beam bulb.
(a) Remove the left front or right front high beam bulb. Is the the bulb filament blown?	
<div>Yes</div> <div>No</div>	
Go to step 3	
Step 2	Replace the faulty bulb.
(a) Replace the faulty bulb. Are high beam lamps working properly?	
<div>Yes</div> <div>No</div>	
Step 3	Check fuses EF08 and EF09.



FE10-5310b

- (a) Check fuses EF08 or EF09.

Is the fuse blown?

Fuse Rating: 10 A

No

Go to step 5

Yes

Step 4 Check the fuses EF08 and EF09 circuits.

- (a) Check for the fuse EF10 or EF11 short circuit.  
 (b) Repair the circuits. Confirm that there are no short circuits.  
 (c) Replace with fuses with rated current.  
 Are high beam lamps working properly?

Yes

System normal

No

Step 5 Confirm headlamp harness connector CA12/CA18 terminal No.5 and body ground connection is intact.

- (a) Confirm headlamp harness connector CA12/CA18 terminal No.5 and body ground connection is intact. Refer to [11.4.7.3 Headlamp Inoperative](#).

Next

Step 6 Check the fuse EF08 or EF09 voltage.

- (a) Turn on high beams. measure the fuse EF08 or EF09 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

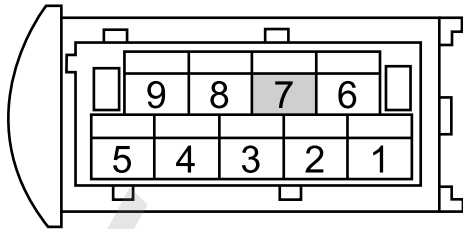
No

Go to step 8

Yes

Step 7 Repair the open circuit between headlamp fuse EF08 or EF09 and CA12/CA18 terminal No.7.

Headlamp Harness Connector CA12/18



FE11-5311b

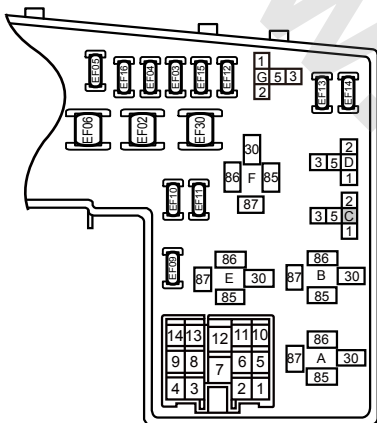
- (a) Confirm the open circuit between headlamp fuse EF08 or EF09 and CA12/CA18 terminal No.7 repair is completed.  
Is high beam working correctly?

Yes

System normal

No

Step 8 Replace the high beam relay C (M).



FE11-5312b

- (a) Replace the high beam relay.  
Is high beam working correctly?

Yes

System normal

No

Step 9 Measure the high beam relay C (M) terminal No.3 voltage.

- (a) Turn the headlamp switch to the high beam position.  
(b) Measure the high beam relay C (M) terminal No.3 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 11

No

Step 10 Check the circuit between the high beam relay C (M) terminal No.3 and the headlamp relay connector F terminal No.87.

- (a) Confirm headlamps are working properly.



- (b) Check and repair the circuit open between the high beam relay C (M) terminal No.3 and the headlamp relay connector F terminal No.87.

Confirm headlamps are working properly.

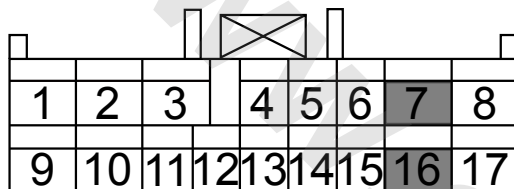
Yes

System normal

No

Step 11 Measure voltage between the headlamp switch wiring harness connector IP18 terminals No.7 and No.16.

Left Headlamp Switch Harness Connector IP18



FE11-5313b

- (a) Turn on high beam to determine the voltage between the headlamp switch wiring harness connector IP18 terminals No.7 and No.16.

Standard Voltage: 11-14 V

- (b) Is the voltage specified value?

No

Replace the headlamp switch. Refer to the [11.4.8.1 Headlamp Switch Replacement](#)

Yes

Step 12 Check headlamp switch wiring harness connector terminal No. 7 terminal IP18 and the high beam of the relay C (M) between terminal No. 1 line.

- (a) Check and repair circuit between the headlamp switch wiring harness connector IP18 terminal No.7 and the high beam relay C (M) terminal No.1.
- (b) Repair the high beam relay C (M) terminal No.2 ground circuit.

Confirm the high beam is working correctly.

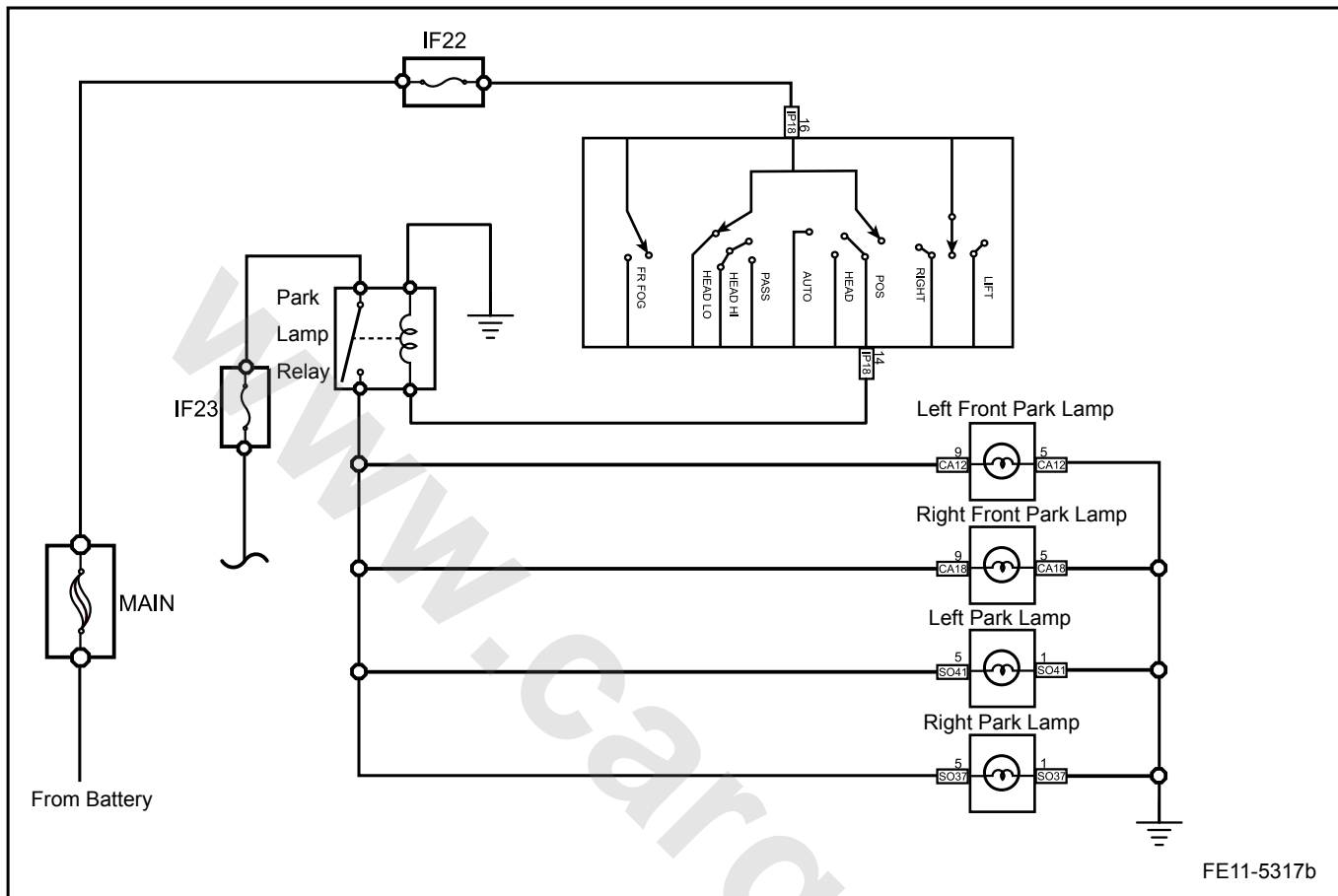
Confirm the repair completed.

Next

Step 13 System normal.

## 11.4.7.5 Park Lamp Inoperative

Schematic:



Diagnostic Steps:

Step 1	Use scan tool active test function to check the park lamp working status.
--------	---

- (a) Select as the following sequence: Body Control Module / active test / external lamp control output / light the park lamp.  
Is the park lamp (small lamp) lit?

Yes

Go to step 11

No

Step 2	Check the left front or right front park lamp bulb.
--------	---

- (a) Remove the left front or right front park lamp bulb.  
Is the the bulb filament blown?

No

Go to step 4

Yes

Step 3	Replace the faulty left front or right front park lamp bulb.
--------	--

- (a) Replace the faulty left front or right front park lamp bulb.

Confirm the park lamps are working properly.

Yes

System normal

No

Step 4 Check the fuse IF23.

(a) Check whether the fuse IF23 is blown.

Fuse Rating: 10 A

Is the fuse blown?

No

Go to step 6

Yes

Step 5 Check fuse IF23 circuit.

(a) Check the fuse IF23 circuit fault.

(b) Repair the circuit. Confirm that there are no short circuits.

(c) Replace with fuses with rated current.

Confirm the park lamp is working correctly.

Yes

System normal

No

Step 6 Check the left front park lamp harness connector CA12 terminal No.9 voltage.

(a) Turn on park lamps, measure the left front park lamp harness connector CA12 terminal No. 9 voltage.

Standard Voltage: 11-14 V

Is the voltage specified value?

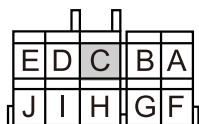
Yes

Go to step 8

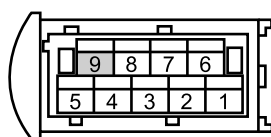
No

Step 7 Check continuity between S011 terminal C and the left front park lamp harness connector CA12 terminal No.9.

I/P Fuse Block Harness Connector S011



Left Headlamp Harness Connector CA12



FE11-5318b

(a) Check and repair the open circuit between S011 terminal C and the left front park lamp harness connector CA12 terminal No.9.

Confirm the park lamp is working correctly.

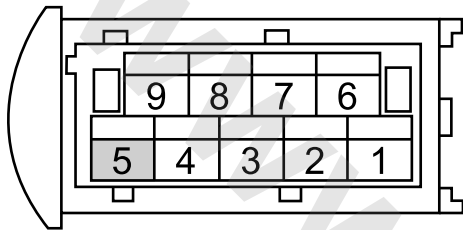
Yes

System normal

No

Step 8 Check continuity between the left front park lamp harness connector CA12 terminal No.5 and the body ground.

Left Headlamp Harness Connector CA12



FE11-5319b

- (a) Check and repair the open circuit between the left front park lamp harness connector CA12 terminal No.5 and the body ground.

Confirm the park lamp is working correctly.

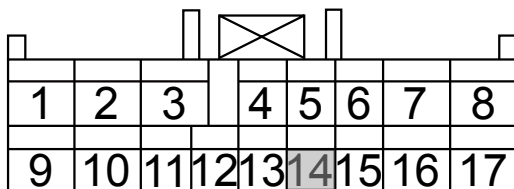
Yes

System normal

No

Step 9 Measure headlamp switch wiring harness connector IP18 terminal No.14 voltage.

Left Combination Switch Harness Connector IP18



FE11-5320b

- (a) Refer to [11.4.7.3 Headlamp Inoperative](#) diagnostic steps to confirm IP18 terminal No.16 voltage.  
 (b) Turn on park lamps, measure headlamp switch harness connector IP18 terminal No.14 voltage with a multimeter.  
 Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 11

No

Step 10 Replace the headlamp switch.

- (a) Refer to [11.4.8.1 Headlamp Switch Replacement](#).  
 Confirm the park lamps are working properly.

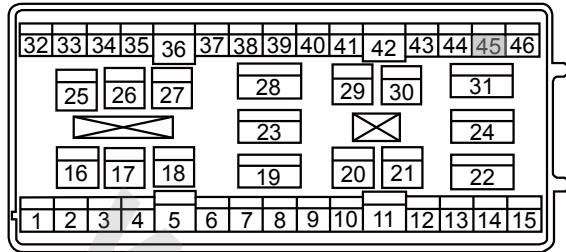
Yes

System normal

No

Step 11 Check I/P fuse block harness connector IP05 terminal No.45 voltage.

To I/P Fuse Block Harness Connector IP05



FE11-5321b

- (a) Remove the I/P fuse block and measure the wiring harness connector terminal No.45 voltage.

Standard Voltage: 11-14 V

Is the voltage normal?

Yes

Go to step 13

No

Step 12 Repair the open circuit between IP05 terminal No.45 and IP18 terminal No.14.

- (a) Confirm the open circuit between IP05 terminal No.45 and IP18 terminal No.14 repair is completed.

Confirm the park lamps are working properly.

Yes

Go to step 14

No

Step 13 Test continuity between I/P fuse block harness connector IP05 terminal No.46 and the body ground.

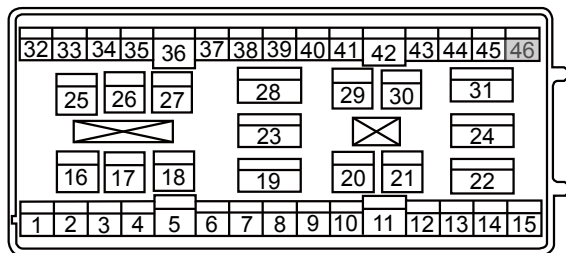
- (a) Check to confirm the continuity between I/P fuse block harness connector IP05 terminal No.46 and the body ground.

Confirm the park lamp is working correctly.

Yes

System normal

To I/P Fuse Block Harness Connector IP05



FE11-5322b

No

Step 14 Replace the I/P fuse block.

- (a) Replace the I/P fuse block.

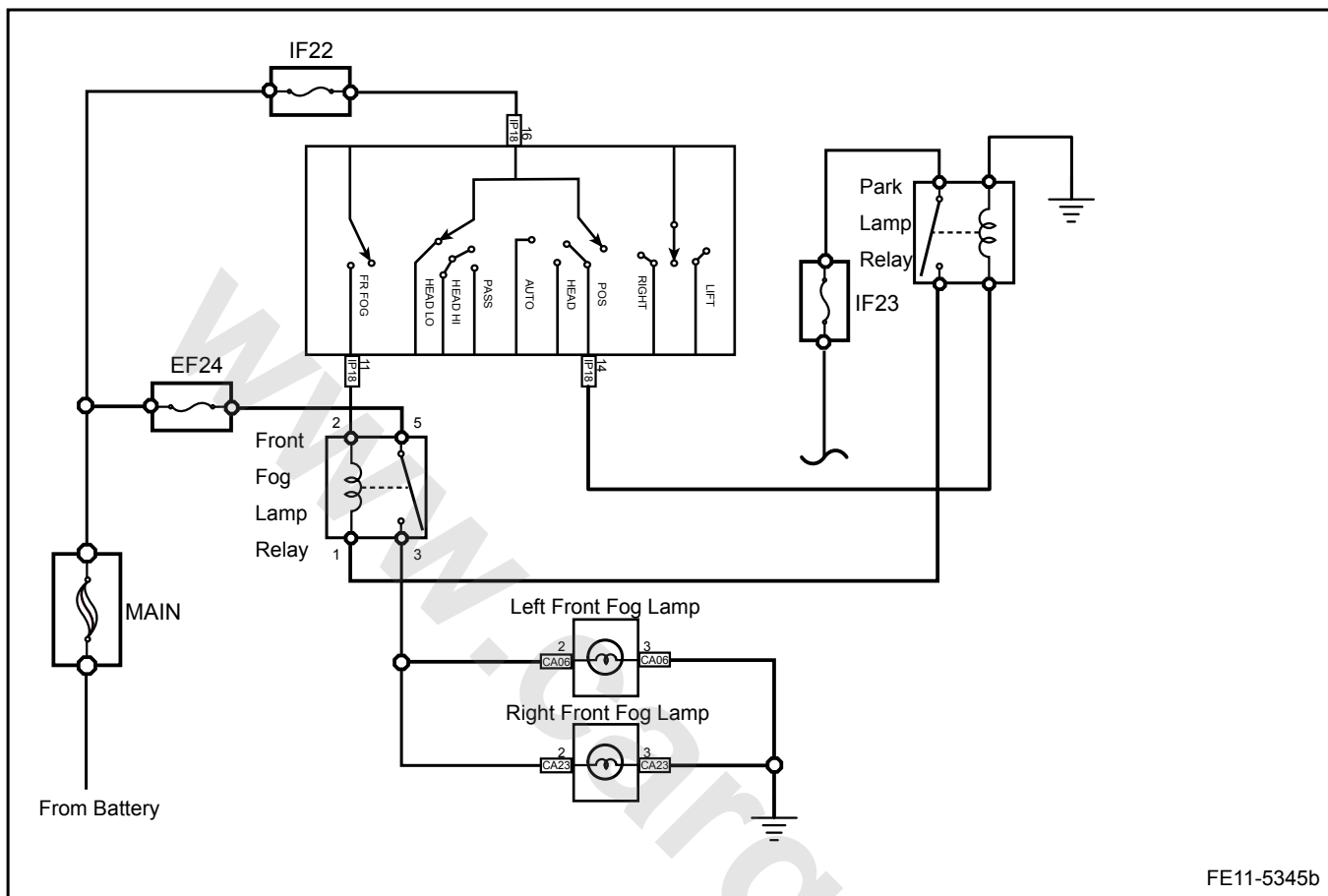
Confirm the repair completed.

Next

Step 15 System normal.

## 11.4.7.6 Front Fog Lamp Inoperative

Schematic:



Diagnostic Steps:

Step 1	Check the left front or right front fog lamp bulb.
(a) Remove the left front or right front fog lamp bulb. Is the the bulb filament blown?	
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 2px 10px;">Go to step 3</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">Yes</div>	
Step 2	Replace the faulty left front or right front fog lamps bulb.
(a) Replace the faulty left front or right front fog lamps bulb. Confirm front fog lamps are working properly.	
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">Yes</div> <div style="border: 1px solid black; padding: 2px 10px;">System normal</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">No</div>	
Step 3	Replace with a new front fog lamp relay.

(a) Replace with a new front fog lamp relay.

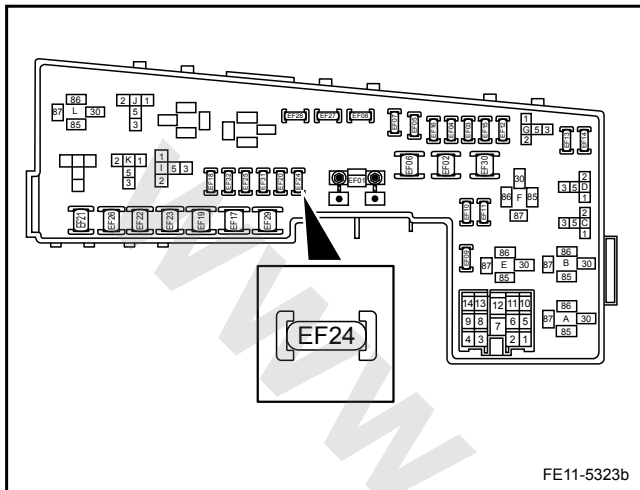
Confirm front fog lamps are working correctly.

Yes

System normal

No

Step 4 Check the front fog lamp fuse EF24.



(a) Check whether the fuse EF24 is blown.

Fuse Rating: 15 A

Is the fuse blown?

No

Go to step 6

Yes

Step 5 Check the fuse EF24 circuit.

(a) Check for the fuse EF24 short circuit.

(b) Repair the circuit. Confirm that there are no short circuits.

(c) Replace with a fuse with rated current.

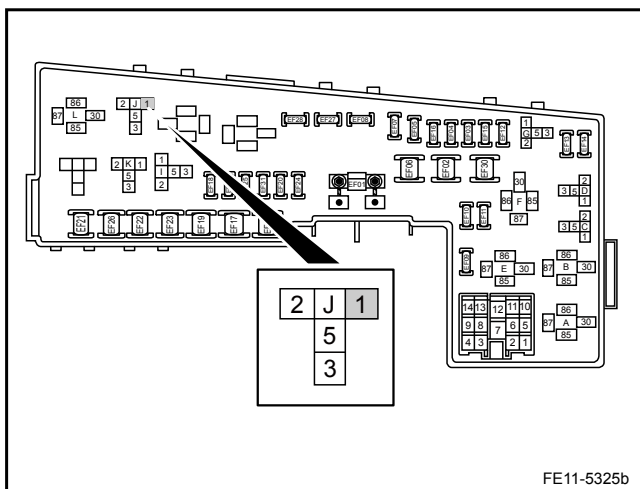
Is the headlamp working properly?

Yes

Working properly

No

Step 6 Measure the front fog lamps relay J (M) terminal No.1 voltage.



(a) Remove the fog lamp relay.

(b) Turn on park lamps and measure the front fog lamp relay terminal No.1 voltage.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 8

No

**Step 7** Repair the open circuit between the underhood fuse block wiring harness connector CA10 and I/P fuse block harness connector SO11.

- (a) Confirm the open circuit between the underhood fuse block wiring harness connector CA10 terminal No.7 and I/P fuse block harness connector SO11 terminal C repair is completed.

Confirm front fog lamps are working correctly.

Yes

System normal

No

**Step 8** Test continuity between the underhood fuse block J (M) terminal No.2 and headlamp switch wiring harness connector IP18 terminal No.11.

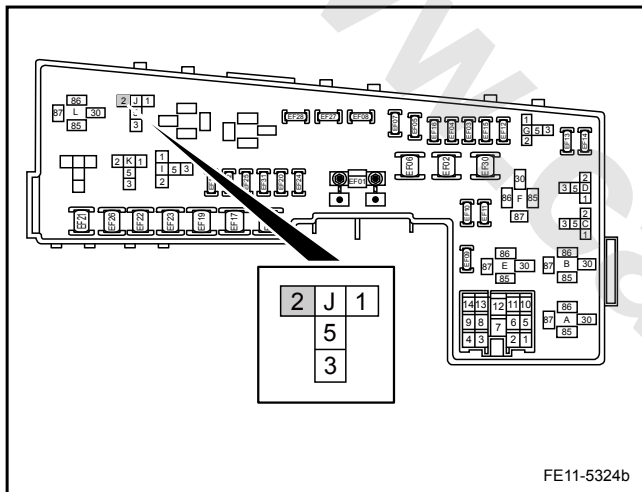
- (a) Remove the headlamp switch wiring harness connector IP18, and front fog lamp relay J (M). measure resistance between the underhood fuse block front fog lamp relay J (M) terminal No.2 and headlamp switch harness connector IP18 terminal No.11 with a multimeter .

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 10



No

**Step 9** Repair open circuit between the underhood fuse block front fog lamp relay J (M) terminal No.2 and headlamp switch wiring harness connector IP18 terminal No.11.

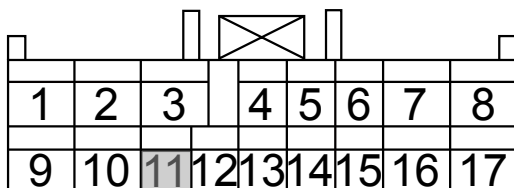
- (a) Confirm the open circuit between the underhood fuse block front fog lamp relay J (M) terminal No.2 and headlamp switch wiring harness connector IP18 terminal No.11 repair is completed.

Confirm front fog lamps are working properly.

Yes

System normal

Left Combination Switch Harness Connector IP18

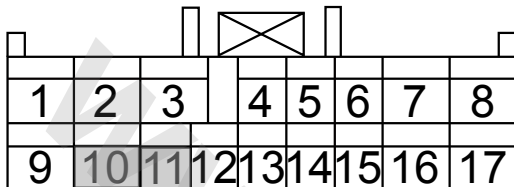




No

Step 10 Check the headlamp switch.

Left Combination Switch Harness Connector IP18



FE11-5327b

- (a) Disconnect the headlamp switch wiring harness connector IP18, turn on the front fog lamps switch. Test continuity between terminals No.10 and No.11 with a multimeter.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 12

No

Step 11 Replace the headlamp switch.

- (a) Replace the headlamp switch.

Confirm front fog lamps are working properly.

Yes

System normal

No

Step 12 Test continuity between the headlamp switch wiring harness connector IP18 terminal No.10 and the body ground.

- (a) Test continuity between the headlamp switch wiring harness connector IP18 terminal No.10 and the body ground.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 14

No

Step 13 Repair the open circuit between the headlamp switch wiring harness connector IP18 terminal terminal No. 10 and the body ground.

- (a) Confirm the open circuit between the headlamp switch wiring harness connector IP18 terminal terminal No.10 and the body ground repair is completed.

Confirm front fog lamps are working properly.

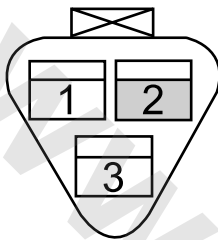
Yes

System normal

No

Step 14 Test continuity between the underhood fuse block relay J (M) terminal No.3 and front fog lamp wiring harness connector CA06/23 terminal No.2.

Left/Right Front Fog Lamp Harness Connector



FE11-5328b

- (a) Check and repair the open circuit between the underhood fuse block relay box J (M) Terminal No.3 and front fog lamp wiring harness connector CA06/23 terminal No.2.

Confirm front fog lamps are working properly.

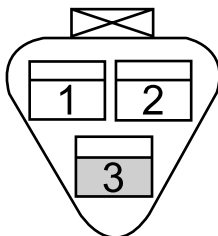
Yes

System normal

No

Step 15 Repair the open circuit between the front fog lamp wiring harness connector CA06/23 terminal No.3 and the body ground.

Left/Right Front Fog Lamp Harness Connector



FE11-5329b

- (a) Confirm the open circuit between the front fog lamp wiring harness connector CA06/23 terminal No.3 and the body ground repair is completed.

Confirm the repair completed.

Next

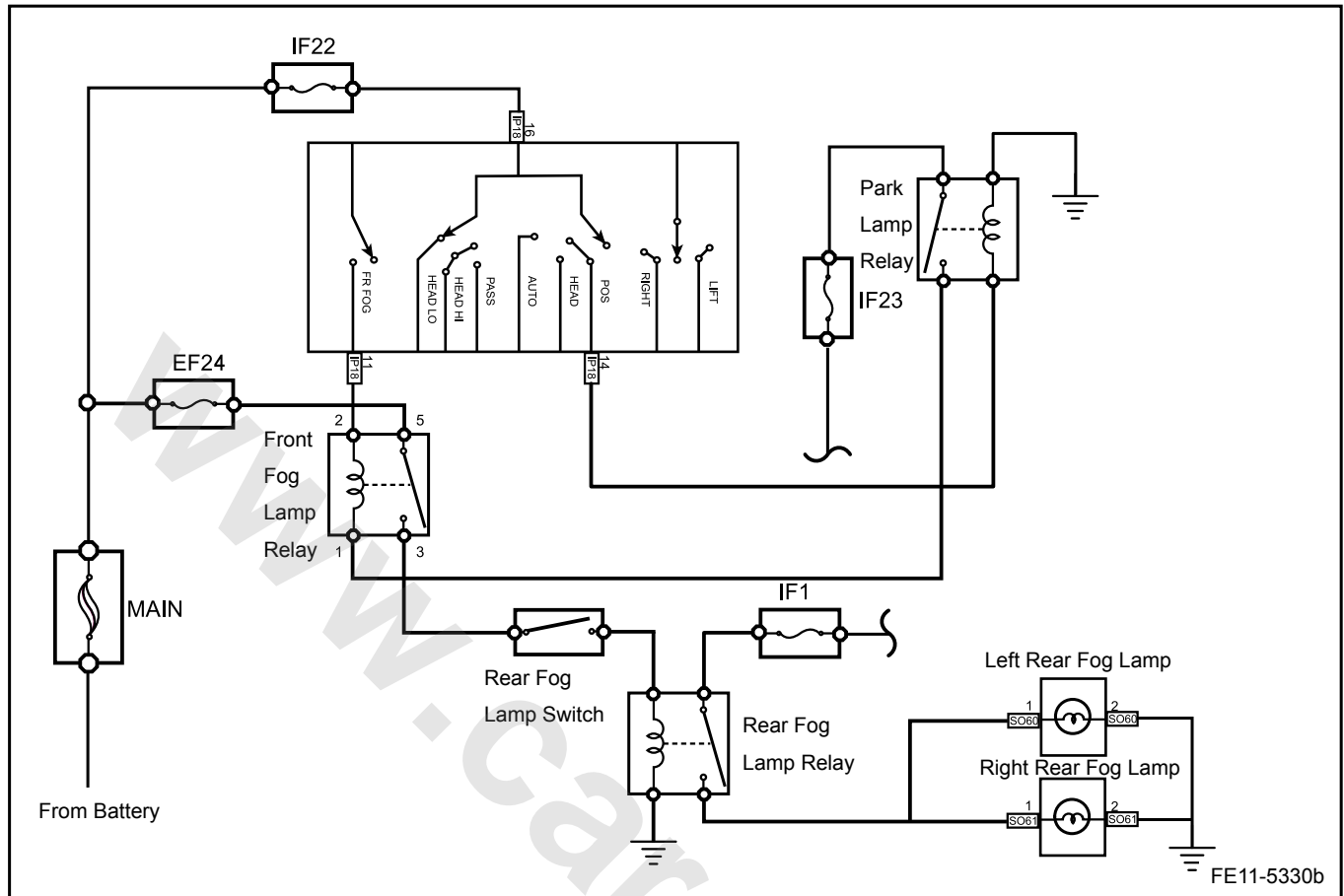
Step 16 System normal.

#### 11.4.7.7 Rear Fog Lamp Inoperative

##### Note

Sedan uses a separate rear fog lamp assembly. There is a bulb for either side of the rear fog lamps. Hatchback has only one rear fog lamp, located inside the left rear tail lamp assembly.

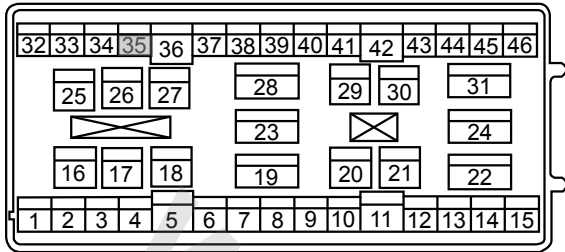
Schematic:



Diagnostic Steps:

Step 1	Check the rear fog lamp switch indicator.
<p>(a) Turn on fog lamps. Observe whether the rear fog lamp switch indicator is lit.</p> <p>Yes → Go to step 3</p> <p>No →</p>	
Step 2	Replace the fog lamp switch.
<p>(a) Replace the fog lamp switch. Refer to <a href="#">11.4.8.2 Fog Lamp Switch Replacement</a>.</p> <p>Confirm rear fog lamps are working properly.</p> <p>Yes → System normal</p> <p>No →</p>	
Step 3	Test continuity between I/P fuse block wiring harness connector IP05 terminal No.35 and the underhood fuse block relay J (M) terminal No.3 .

To I/P Fuse Block Harness Connector IP05



FE11-5331b

- (a) Test and repair continuity between I/P fuse block wiring harness connector IP05 terminal No.35 and the underhood fuse block relay J (M) terminal No.3.

Confirm rear fog lamps are working properly.

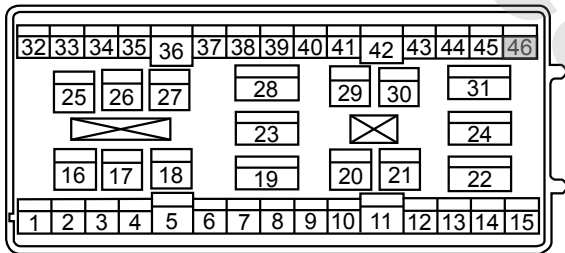
Yes

System normal

No

Step 4 Test and repair continuity between wiring harness connector IP05 terminal No.46 and the body ground.

To I/P Fuse Block Harness Connector IP05



FE11-5333b

- (a) Test and repair continuity between wiring harness connector IP05 terminal No.46 and the body ground.

Confirm rear fog lamps are working properly.

Yes

System normal

No

Step 5 Check the rear fog lamp bulb.

- (a) Remove the left rear or right rear fog lamp bulb.  
Is the the bulb filament blown?

No

Go to step 7

Yes

Step 6 Replace the rear fog lamp failure.

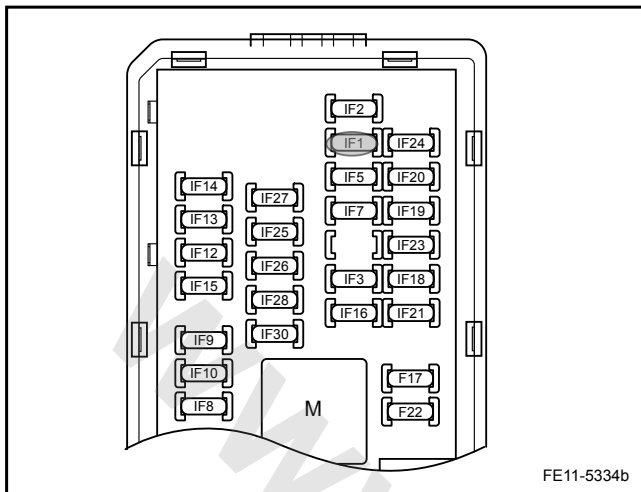
- (a) Replace the faulty rear fog lamp bulb.  
Confirm rear fog lamps are working properly.

Yes

System normal

No

Step 7 Check rear fog lamp fuse IF1.



(a) Check whether the rear fog lamp fuse IF1 is blown.

Fuse Rating: 10 A

Is the fuse blown?

No

Go to step 9

Yes

Step 8 Check the rear fog lamp fuse IF1 circuit.

(a) Check the fuse IF1 circuit.

(b) Repair the circuit. Confirm that there are no short circuits.

(c) Replace with the fuse with rated current.

Confirm rear fog lamps are working correctly.

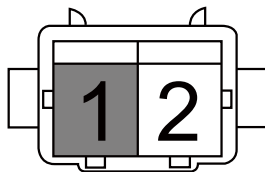
Yes

System normal

No

Step 9 Check SO60/61 terminal No.1 voltage.

Tail Lamp Harness Connector SO60/61



FE11-5335b

(a) Disconnect the rear fog lamp connector SO60/61.

(b) Turn on fog lamps and measure SO60/61 terminal No.1 voltage.

Standard Voltage: 11-14 V

Is the voltage specified value?

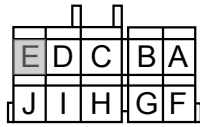
Yes

Go to step 11

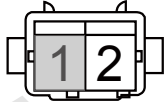
No

Step 10 Check the circuit between SO60/61 terminal No.1 and SO11 terminal E.

To I/P Fuse Block Harness Connector SO11



Tail Lamp Harness Connector SO60/61



FE11-5336b

- (a) Disconnect the I/P fuse block wiring harness connector SO60/SO61.
- (b) Check and repair the open circuit between SO60/61 terminal No.1 and SO11 terminal E.

Confirm rear fog lamps are working properly.

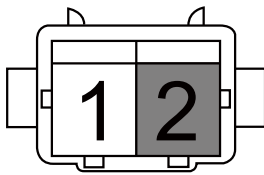
Yes

System normal

No

Step 11 Test continuity between SO60/61 terminal No.2 and the body ground .

Tail Lamp Harness Connector SO60/61



FE11-5337b

- (a) Check and repair the open circuit between SO60/61 Terminal No.2 and the body ground.

Confirm rear fog lamps are working properly.

Yes

System normal

No

Step 12 Replace the I/P fuse block.

- (a) Replace the I/P fuse block.
- Confirm the repair completed.

Next

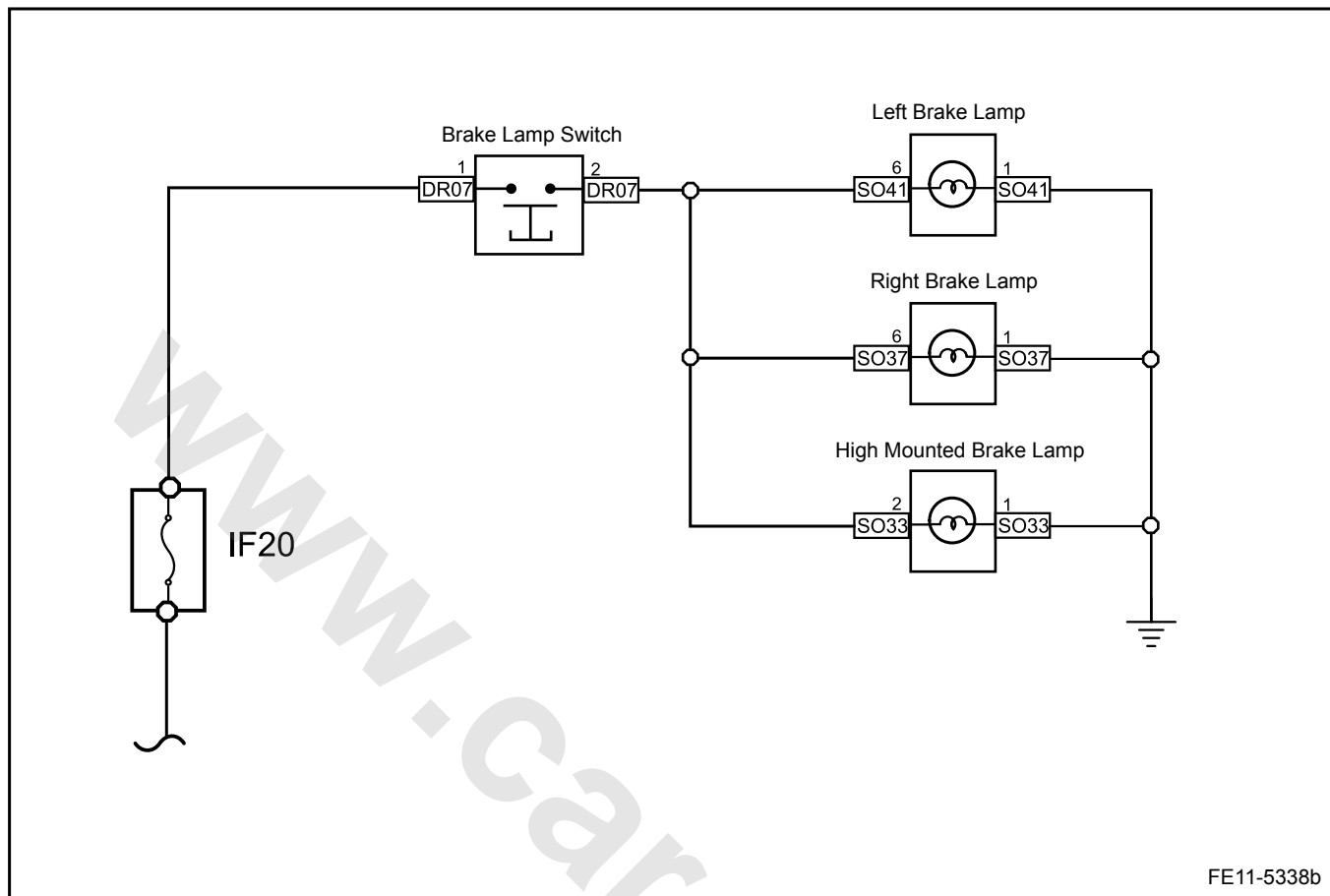
Step 13 System normal.

### 11.4.7.8 Brake Lamp Inoperative

#### Note

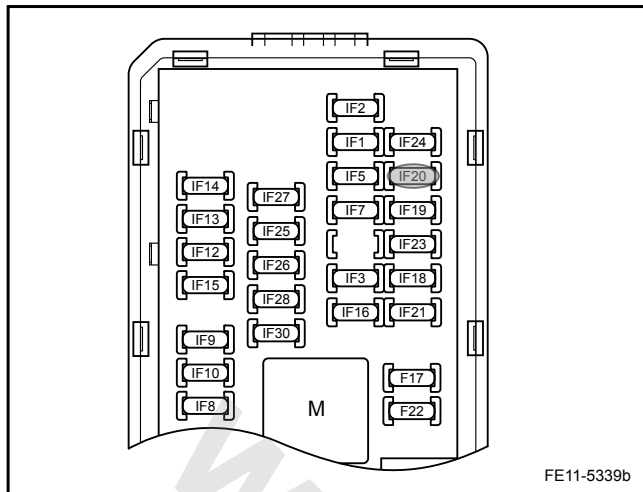
Sedan brake lamps and high mounted brake lamp have adopted light-emitting diodes. For hatchback , only high mounted brake lamp has light-emitting diodes

Schematic:



Diagnostic Steps:

Step 1	Check brake lamp bulb.
<p>(a) Remove the brake lamp bulb. Is the the bulb filament blown?</p> <p>Yes</p> <p>No</p> <p>Go to step 3</p>	
Step 2	Replace the brake lamp bulb.
<p>(a) Replace the faulty brake lamp bulb. Confirm brake lamps are working properly.</p> <p>Yes</p> <p>System normal</p> <p>No</p>	
Step 3	Check the fuse IF20.



(a) Check whether the fuse IF20 is blown.

Fuse Rating: 10 A

Is the fuse blown?

No

Go to step 5

Yes

Step 4 Check the fuse IF20 circuit.

- (a) Check the fuse IF20 circuit malfunction.  
 (b) Repair the circuits. Confirm that there are no short circuits.  
 (c) Replace with fuses with rated current.  
 Confirm brake lamps are working correctly.

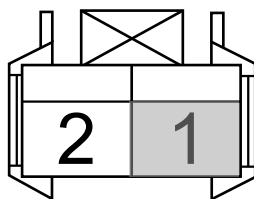
Yes

System normal

No

Step 5 Check the brake lamp switch wiring harness connector DR07 terminal No.1 voltage.

Brake Lamp Harness Connector DR07



FE11-5340b

(a) Measure brake lamp switch harness connector DR07 terminal No.1 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 7

No

Step 6 Repair the open circuit between the brake lamp switch wiring harness connector DR07 terminal No.1 and the fuse IF20.

- (a) Confirm the open circuit between the brake lamp switch wiring harness connector DR07 terminal No.1 and the fuse IF20 repair is completed.  
 Confirm brake lamps are working correctly.



Step 7	Check the brake switch.
--------	-------------------------

- (a) Disconnect the brake lamp switch wiring harness connector, press the brake pedal. Measure resistance between the brake switch connector terminals No.1 and No.2 with a multimeter.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

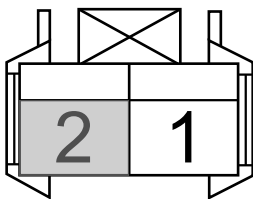
Step 8	Replace the brake lamp switch.
--------	--------------------------------

- (a) Replace the brake lamp switch. Refer to [11.4.8.17 Brake Lamp Switch Replacement](#).

Confirm brake lamps are working correctly.

Step 9	Test continuity between the brake lamp switch wiring harness connector DR07 and tail lamp harness connector SO41 (SO33).
--------	--

Brake Lamp Harness Connector DR07

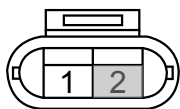


FE11-5341b

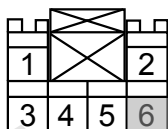
- (a) Confirm continuity between the brake lamp switch wiring harness connector DR07 terminal No.2 and tail lamp harness connector SO41/37 Terminal No.6 (SO33 terminal No.2).

Confirm brake lamps are work properly.

High Mounted Brake Lamp Harness  
Connector SO33



Tail Lamp Harness Connector SO41/SO37



FE11-5342b

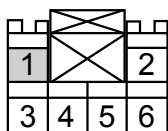
No

Step 10 Repair the open circuit between the tail lamp wiring harness connector SO41 (SO33) and the body ground.

High Mounted Brake Lamp Harness  
Connector SO33



Tail Lamp Harness Connector SO41/SO37



FE11-5343b

- (a) Confirm the open circuit between the tail lamp wiring harness connector SO41 (SO33) and the body ground repair is completed.

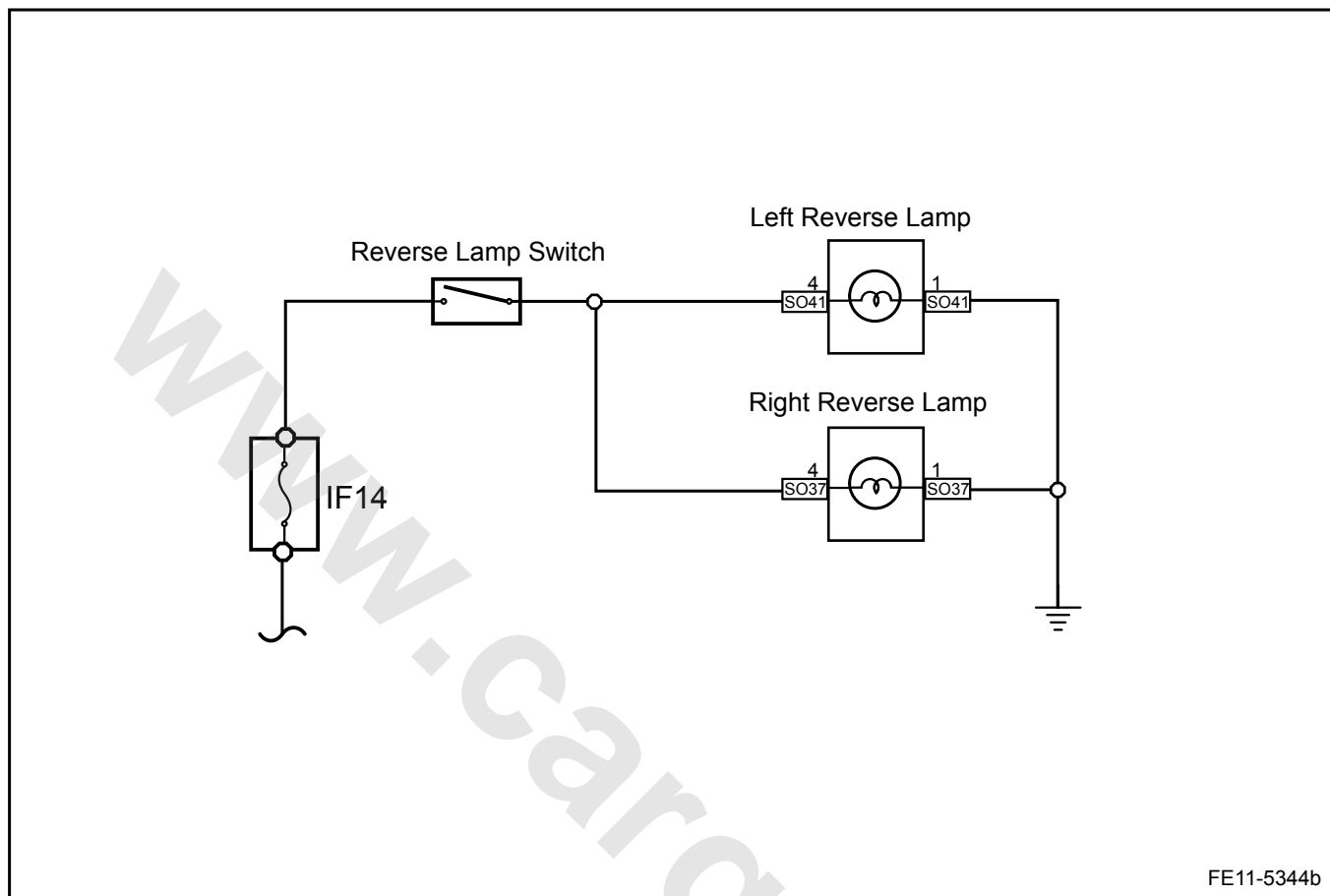
Confirm the repair completed.

Next

Step 11 System normal.

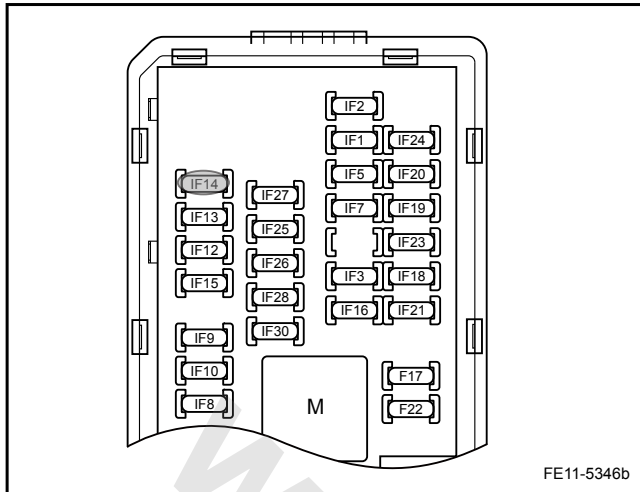
## 11.4.7.9 Reverse Lamp Inoperative

Schematic:



Diagnostic Steps:

Step 1	Check reverse lamp bulbs.
(a) Remove the brake lamp bulbs. Is the the bulb filament blown?	
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">No</div> <div style="border: 1px solid black; padding: 2px 10px;">Go to step 3</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">Yes</div>	
Step 2	Replace the reverse lamp bulbs.
(a) Replace the faulty reverse lamp bulb. Confirm brake lamps are working properly.	
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">Yes</div> <div style="border: 1px solid black; padding: 2px 10px;">System normal</div> </div>	
<div style="border: 1px solid black; padding: 2px 10px; width: fit-content;">No</div>	
Step 3	Check the fuse IF14 circuit.



(a) Check whether the fuse IF14 is blown.

Fuse Rating: 10 A

Is the fuse blown?

Yes

Go to step 5

No

Step 4 Repair the fuse IF14 circuit.

(a) Check the fuse IF14 short circuit.

(b) Repair the circuits. Confirm that there are no short circuits.

(c) Replace with fuses with rated current.

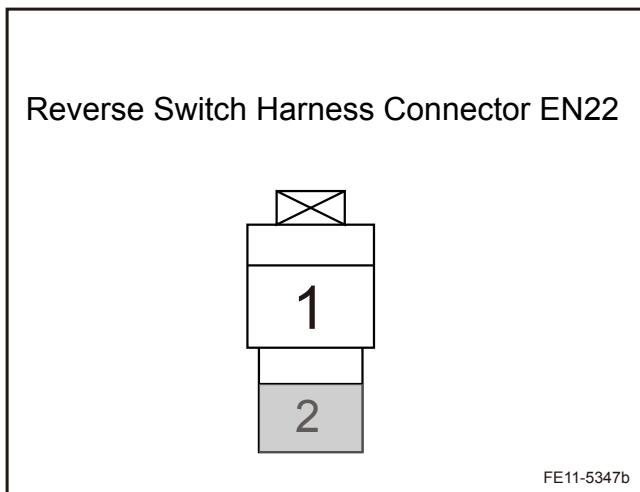
Confirm whether the reverse lamps are working properly.

Yes

System normal

No

Step 5 Measure the reverse lamp switch wiring harness connector EN22 terminal No.2 voltage.



(a) Measure the reverse lamp switch wiring harness connector EN22 terminal No.2 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 7

No

Step 6 Repair the open circuit between the reverse lamp switch wiring harness connector terminal and the fuse IF14.

(a) Confirm the open circuit between the reverse lamp switch wiring harness connector terminal and the fuse IF14 repair is completed.

Confirm whether the reverse lamps are working properly.

Yes

System normal

No

Step 7 Check the reverse lamp switch.

- (a) Turn the ignition switch. Do not start the engine. Engage reverse gear, disconnect the reverse switch wiring harness connector.
- (b) Measure resistance between the brake switch terminal No.1 and No.2 with a multimeter .
- Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 9

No

Step 8 Replace the reverse switch.

- (a) Replace the reverse switch. Refer to [11.4.8.16 Reverse Switch Replacement](#).

Confirm whether the reverse lamps are working properly.

Yes

System normal

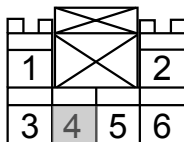
No

Step 9 Test continuity between the reverse lamp switch harness connector SO41/37 and reverse lamp switch harness connector EN22 terminal No.1.

Reverse Switch Harness Connector EN22



Tail Lamp Harness Connector SO37/SO41



FE11-5348b

- (a) Confirm continuity between the reverse lamp switch harness connector SO41/37 and reverse lamp switch harness connector EN22 terminal No.1.

Confirm whether the reverse lamps are working properly.

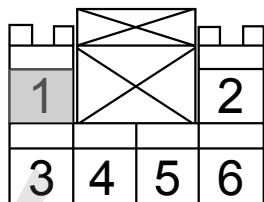
Yes

System normal

No

Step 10 Repair the open circuit between reverse lamp wiring harness connector SO41/37 terminal No.1 and the body ground.

Tail Lamp Harness Connector SO37/SO41



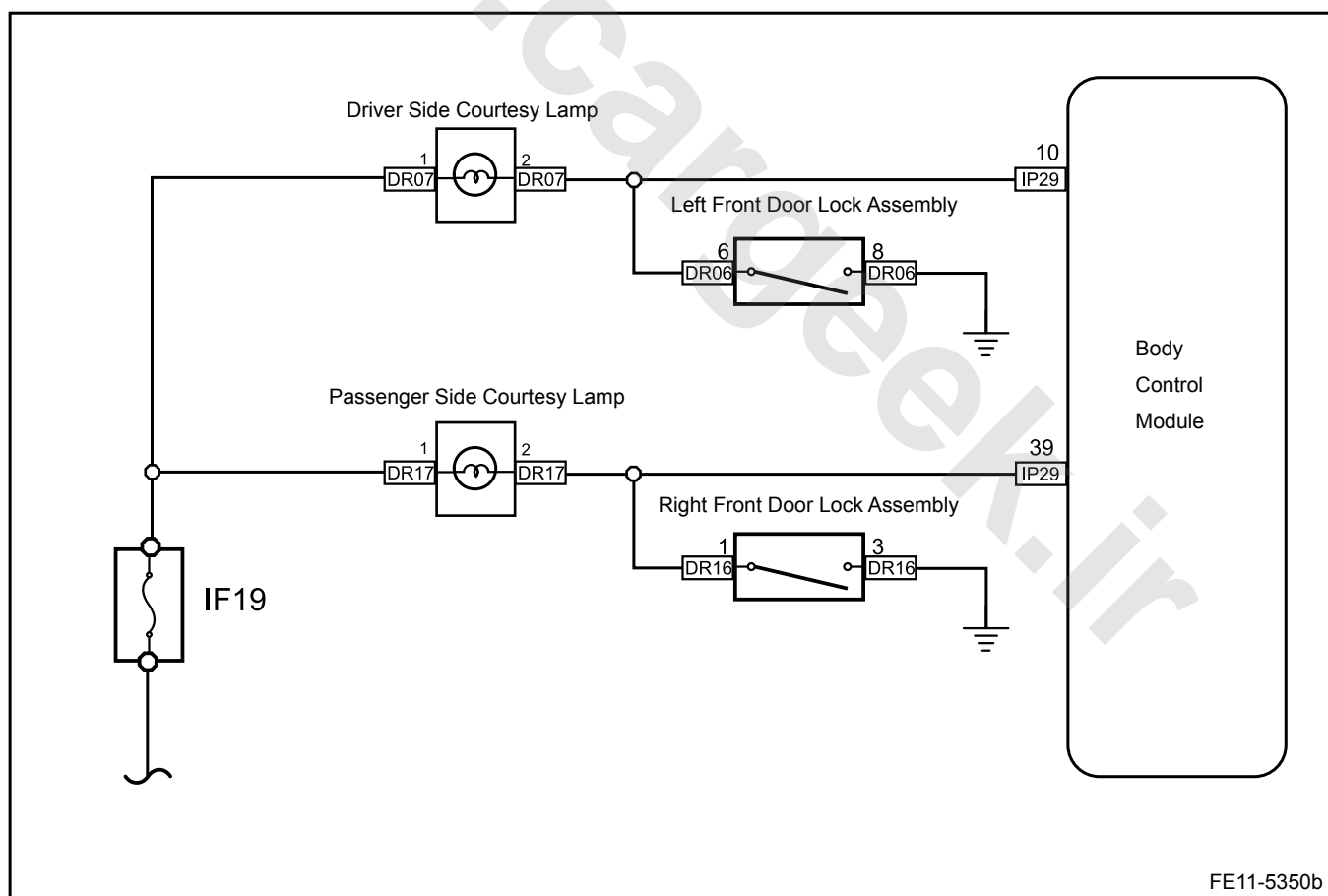
FE11-5349b

Next

Step 11 System normal.

## 11.4.7.10 Courtesy Lamp Inoperative

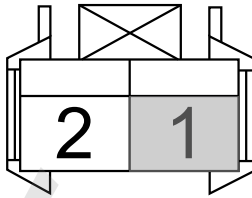
Schematic:



## Diagnostic Steps:

Step 1	Check the courtesy lamp bulb.
<p>(a) Remove the courtesy lamp bulb. Is the the bulb filament blown?</p> <p>Yes <input type="button" value="Yes"/> No <input type="button" value="No"/></p> <p>Go to step 3</p>	
Step 2	Replace the courtesy lamp bulb.
<p>(a) Replace the faulty courtesy lamp bulb. Confirm courtesy lamps are working properly.</p> <p>Yes <input type="button" value="Yes"/> No <input type="button" value="No"/></p> <p>System normal</p>	
Step 3	Check the fuse IF19 circuit.
<p>(a) Check whether the fuse IF19 is blown. Fuse Rating: 15 A Is the fuse IF19 blown?</p> <p>Yes <input type="button" value="Yes"/> No <input type="button" value="No"/></p> <p>Go to step 5</p>	
Step 4	Repair the fuse IF19 circuit.
<p>(a) Check for fuse IF19 short circuit. (b) Repair the circuits. Confirm that there are no short circuits. (c) Replace with fuses with rated current. Confirm courtesy lamps are working correctly.</p> <p>Yes <input type="button" value="Yes"/> No <input type="button" value="No"/></p> <p>System normal</p>	
Step 5	Measure courtesy lamp switch wiring harness connector DR07/DR17 terminal No.1 voltage.

Left/Right Courtesy Lamp Harness  
Connector DR07/DR17



FE11-5351b

- (a) Measure courtesy lamp switch wiring harness connector DR07/DR17 terminal No.1 voltage.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 7

No

Step 6 Repair the open circuit between courtesy lamp switch wiring harness connector DR07/17 terminal No.1 and fuse IF19.

- (a) Confirm the open circuit between courtesy lamp switch wiring harness connector DR07/17 terminal No.1 and fuse IF19 repair is completed.

Confirm courtesy lamps are working correctly.

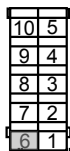
Yes

System normal

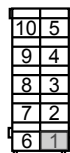
No

Step 7 Measure lock assembly harness connector DR06 terminal No.6 (DR16 terminal No.1) voltage.

Left Front Door Lock Harness  
Connector DR06



Right Front Door Lock Harness  
Connector DR16



FE11-5355b

- (a) Measure lock assembly harness connector DR06 terminal No.6 (DR16 terminal No.1) voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 9

No

Step 8 Test continuity between the door lock assembly harness connector DR06 terminal No.6 (DR16 terminal No.1) and door lock assembly harness connector DR07 terminal No.2 (DR17 terminal No.2).

- (a) Confirm continuity between the door lock assembly harness connector DR06 terminal No.6 (DR16 terminal No.1) and



door lock assembly harness connector DR07 terminal No.2  
(DR17 terminal No.2).

Confirm courtesy lamps are working correctly.

Yes

System normal

No

Step 9 Check the door lock assembly.

- (a) Remove the left / right door lock assembly harness connector. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#).
- (b) press the door lock switch, measure resistance between the door lock assembly DR06 terminal No.6 and No.8 (DR16 terminals No.1 and No.3).

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 11

No

Step 10 Replace the lock assembly.

- (a) Replace the lock assembly. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#).

Confirm courtesy lamps are working correctly.

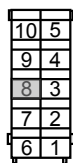
Yes

System normal

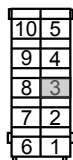
No

Step 11 Repair the open circuit between the door lock assembly harness connector DR06 terminal No.8 (DR16 terminal No.3) and the body ground.

Left Front Door Lock Harness  
Connector DR06



Right Front Door Lock Harness  
Connector DR16



FE11-5354b

- (a) Confirm the open circuit between the door lock assembly harness connector DR06 terminal No.8 (DR16 terminal No.3) and the body ground repair is completed.

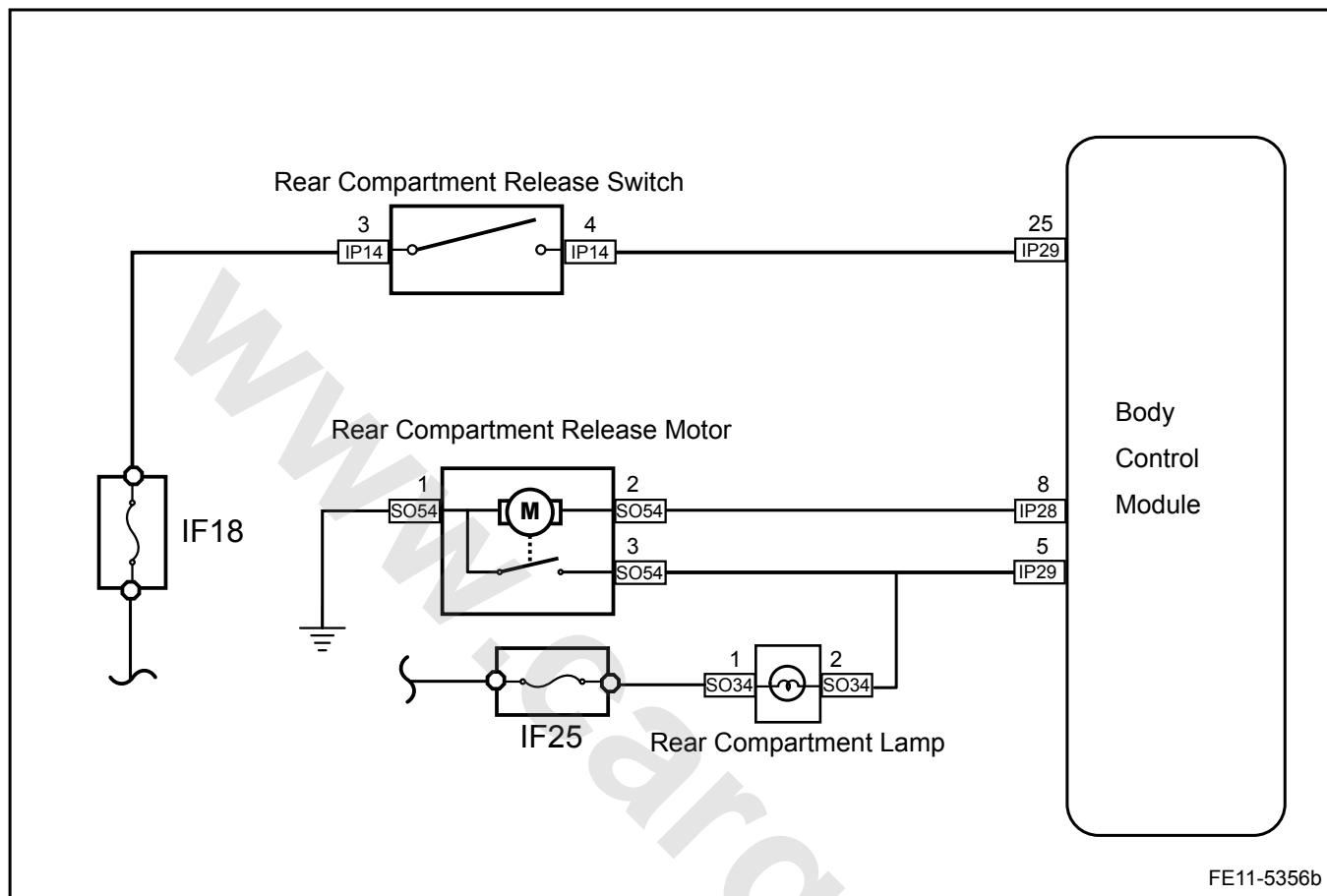
Confirm the repair completed.

Next

Step 12 System normal.

## 11.4.7.11 Rear Compartment Lamp Inoperative

Schematic:



Diagnostic Steps:

Step 1	Check whether the rear compartment lid opens.
--------	---

(a) Check whether the rear compartment lid opens.

No

Refer to [11.9.7.7 Rear Compartment Lid Can Not Be Opened \(Sedan\)](#).

Yes

Step 2	Check the rear compartment lamp bulb.
--------	---------------------------------------

(a) Remove the rear compartment lamp bulb.  
Is the the bulb filament blown?

No

Go to step 4

Yes

Step 3	Replace the rear compartment lamp bulb.
--------	---

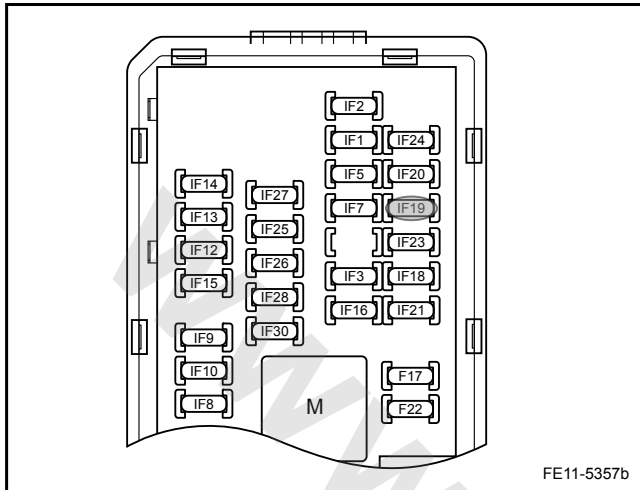
(a) Replace the faulty rear compartment lamp bulb.  
Confirm the rear compartment lamp is working properly.

Yes

System normal

No

Step 4 Check the fuse IF19 circuit.



(a) Check whether the fuse IF19 is blown.

Fuse Rating: 15A

Is the fuse blown?

No

Go to step 6

Yes

Step 5 Repair the fuse IF19 circuit.

- (a) Check the fuse IF19 for short circuit.  
 (b) Repair the circuits. Confirm that there are no short circuits.  
 (c) Replace with fuses with rated current.  
 Confirm the rear compartment lamp is working correctly.

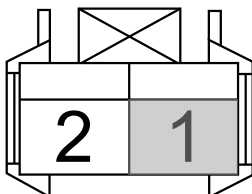
Yes

System normal

No

Step 6 Measure rear compartment light switch wiring harness connector SO34 terminal No.1 voltage.

Rear Compartment Lamp Harness  
Connector SO34



- (a) Measure the rear compartment lamp switch wiring harness connector SO34 terminal No.1 voltage.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 8

No

**Step 7** Repair the open circuit between the rear compartment light switch wiring harness connector SO34 terminal No.1 and fuse IF19.

- (a) Confirm the open circuit between the rear compartment light switch wiring harness connector SO34 terminal No.1 and fuse IF19 repair is completed.

Confirm the rear compartment lamp is working correctly.

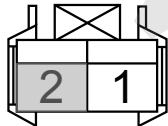
Yes

System normal

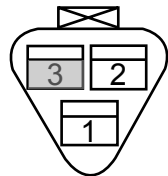
No

**Step 8** Test continuity between the rear compartment lamp switch wiring harness connector SO34 terminal No.2 and the rear compartment electrical wiring harness connector SO54 terminal No.3.

Rear Compartment Lamp Harness Connector SO34



Rear Compartment Lock Harness Connector SO54



FE11-5359b

- (a) Remove the rear compartment lamp switch wiring harness connector and the rear compartment electrical wiring harness connector.
- (b) Measure resistance between the rear compartment lamp switch wiring harness connector SO34 terminal No.2 and the rear compartment electrical wiring harness connector SO54 terminal No.3 with a multimeter.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 10

No

**Step 9** Repair the open circuit between the wiring harness connector SO34 and connector SO54.

- (a) Confirm the open circuit between the wiring harness connector SO34 terminal No.2 and connector SO54 terminal No.3 repair is completed.

Confirm the rear compartment lamp is working correctly.

Yes

System normal

No

**Step 10** Replace the rear compartment motor.

- (a) Replace the rear compartment motor. Refer to [11.9.8.4 Rear Compartment Lock Assembly Replacement \(Sedan\)](#), "

Confirm the repair completed.

Next

**Step 11** System normal.

## 11.4.8 Removal and Installation

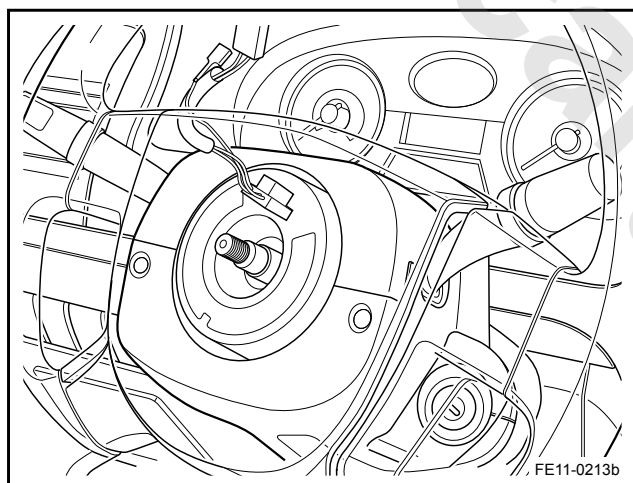
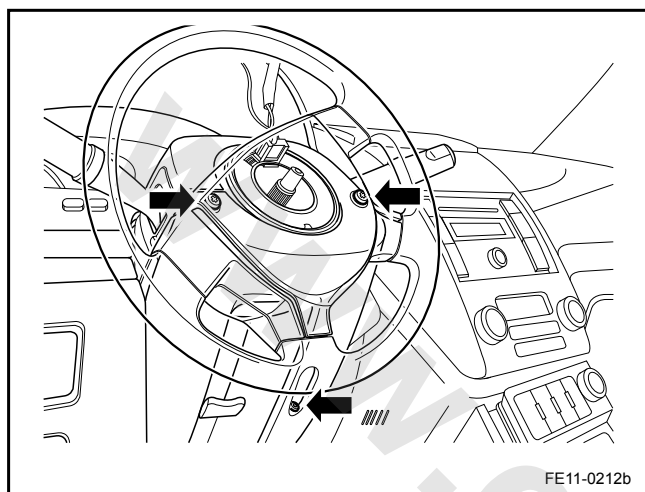
### 11.4.8.1 Headlamp Switch Replacement

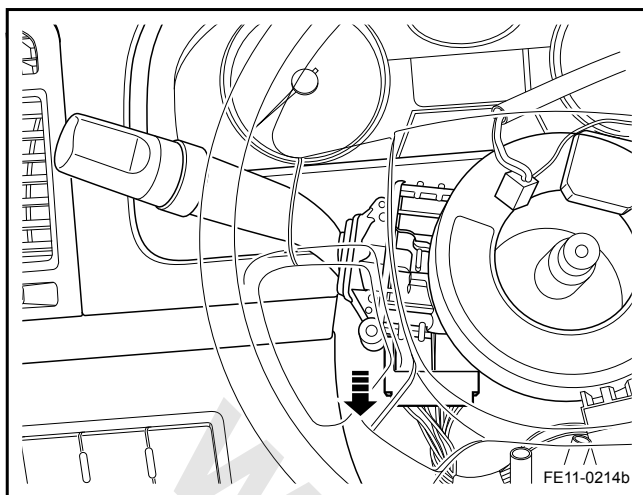
#### Removal Procedure

#### Warning!

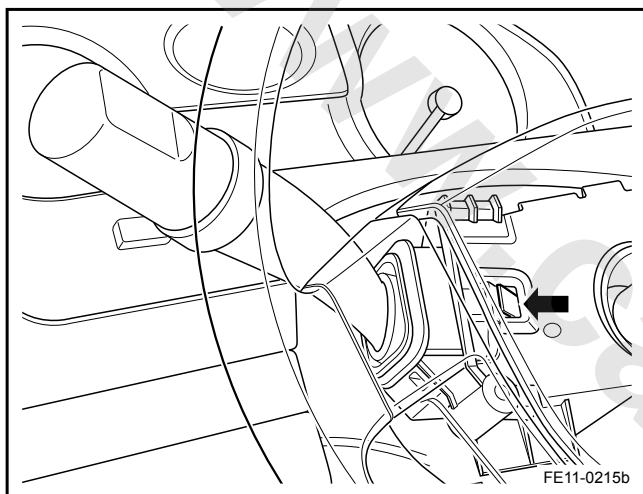
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Turn the steering wheel and remove the upper and lower steering column shield panel retaining screws.
3. Remove the upper and lower steering column shield panels.





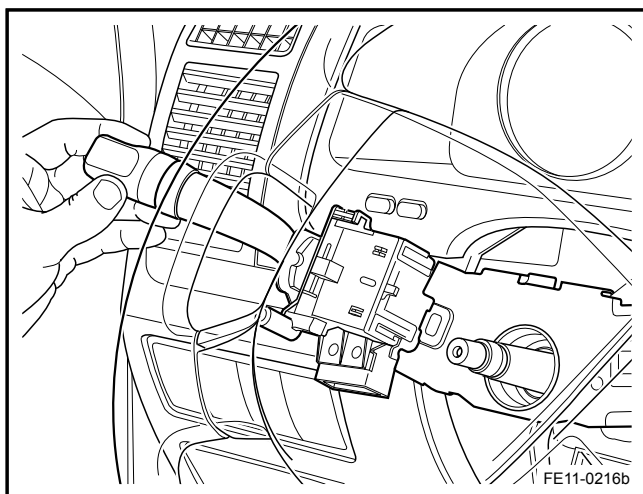
4. Disconnect the headlamp switch wiring harness connector.

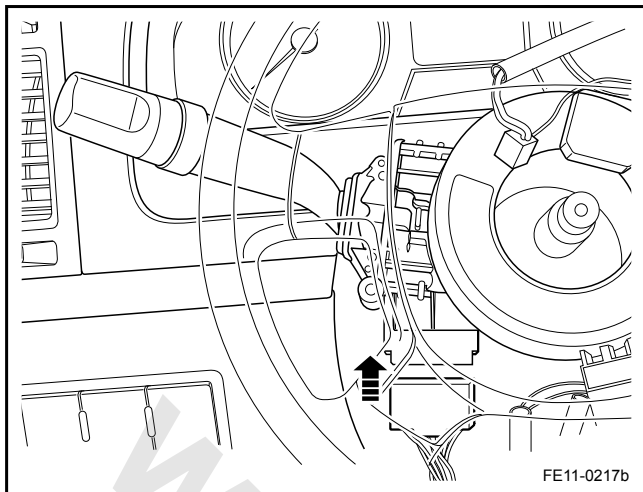


5. Press the switch outside tongue to remove the headlamp switch.

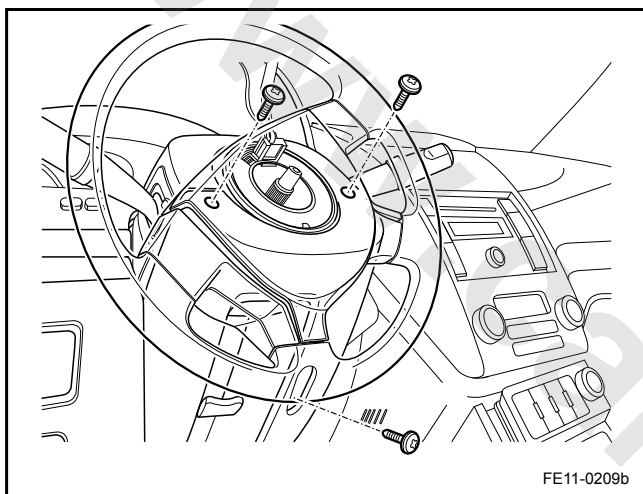
#### Installation Procedure:

1. Insert the headlamp switch into the switch seating.





2. Connect the headlamp switch wiring harness connector



3. Install and tighten the upper and lower steering column shield panel retaining screws.

#### Note

Refer to "Fastener Notice" in "Warnings and Notices".

Torque: 8.8 Nm (Metric) 6.5 lb-ft (US English)

4. Connect the battery negative cable.

### 11.4.8.2 Fog Lamp Switch Replacement

#### Removal Procedure

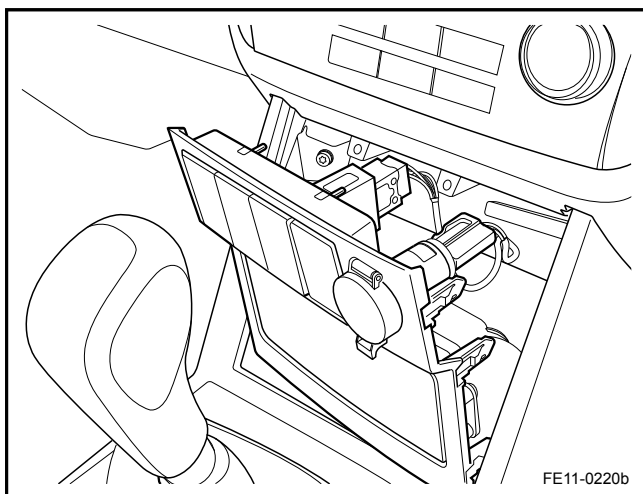
#### Warning!

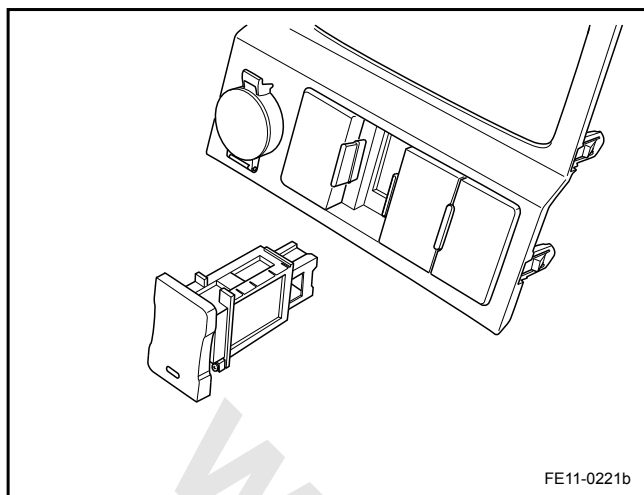
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. [2.11.8.1 Battery Disconnection](#).
2. Remove cigarette lighter panel. Refer to [11.16.6.1 Cigarette Lighter Replacement](#).
3. Disconnect the fog lamp, cigarette lighter and AUX wiring harness connectors.

#### Note

To remove interior panels, please use interior trim removal special tools, otherwise the interior trims will be easily scratched.

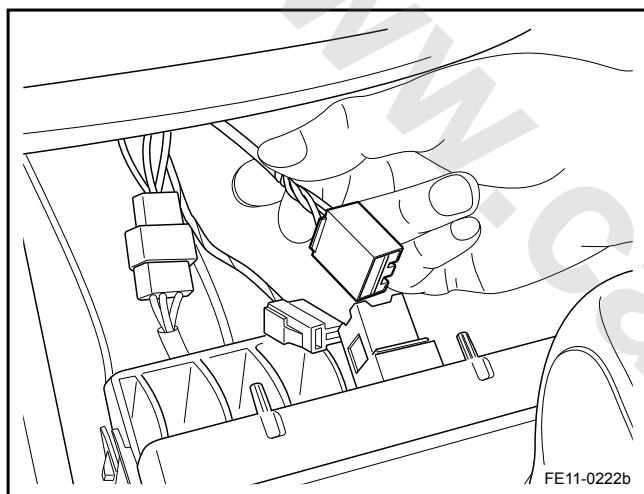




4. Remove the rear fog lamp switch from back of the cigarette lighter panel.

#### Installation Procedure:

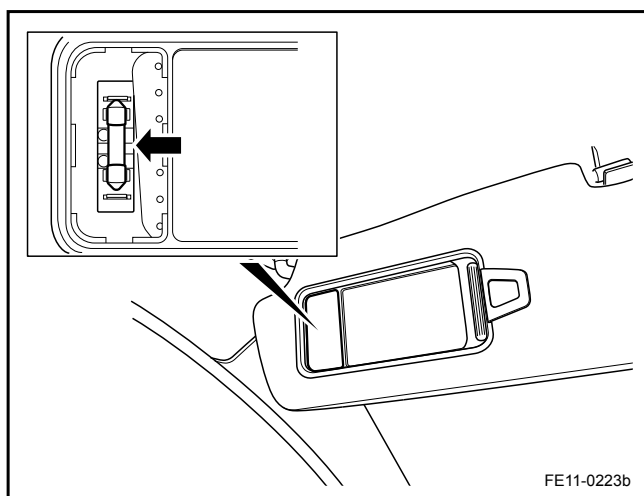
1. Install the rear fog lamp switch.
2. Connect the fog lamp, cigarette lighter and AUX wiring harness connectors.
3. Install the cigarette lighter panel.
4. Connect the battery negative cable.



#### 11.4.8.3 Vanity Mirror Lamp Replacement

##### Removal Procedure

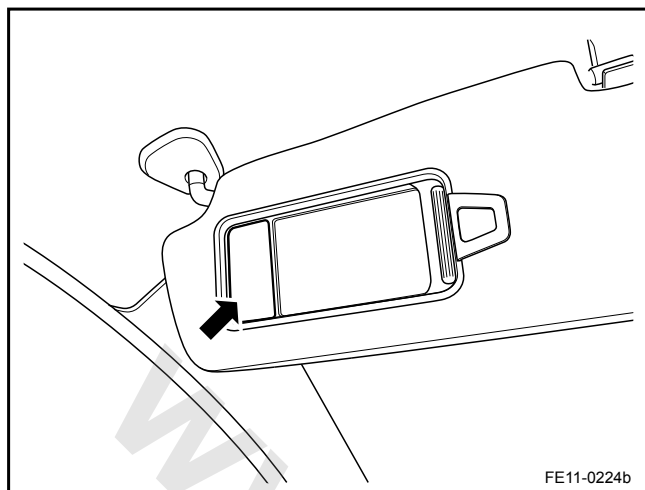
1. Remove the vanity mirror lamp cover.
2. Remove the vanity mirror lamp bulb.





## Installation Procedure:

1. Install the vanity mirror lamp bulb.
2. Press the vanity mirror lamp cover into place.



#### 11.4.8.4 Dome Lamp and Reading Lamp Replacement

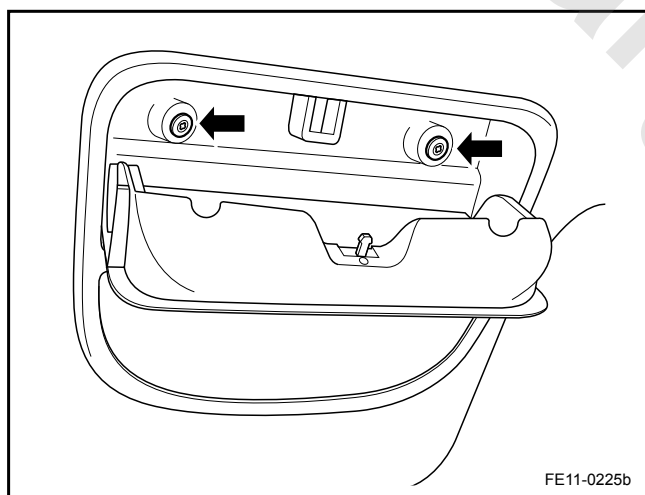
##### Front Dome Lamp Replacement

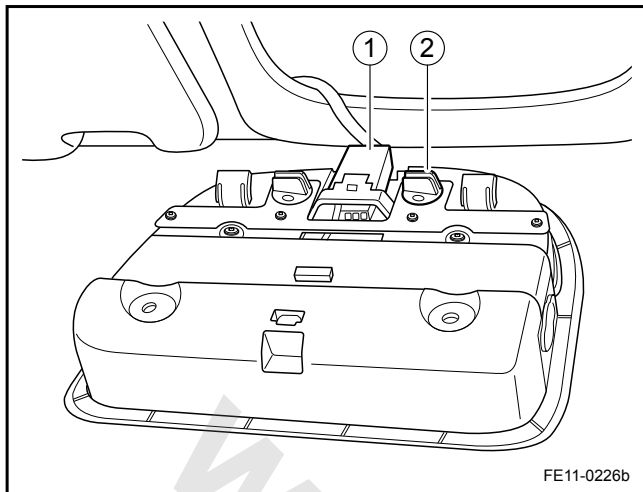
##### Removal Procedure

##### Warning!

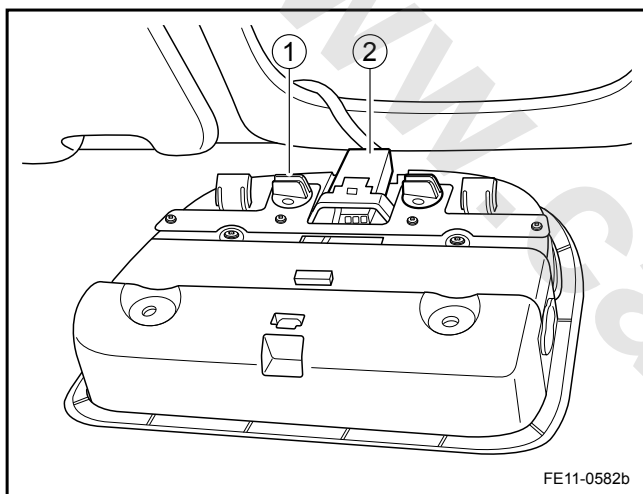
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Open the glasses case and remove the screw.



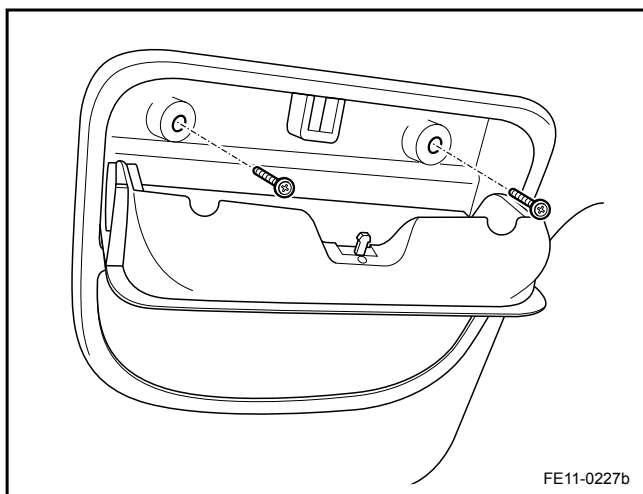


3. Remove the dome lamp, disconnect the wiring harness connector (1).
4. Remove the lamp bulb (2).



#### Installation Procedure:

1. Install the lamp bulb (1).
2. Connect the electrical wiring harness connector (2).



3. Install the dome lamp and tighten the retaining screws.

#### Note

"Fastener Notice" in "Warnings and Notices".

Torque: 3 Nm (Metric) 2.2 lb-ft (US English)

4. Connect the battery negative cable.

## Rear Dome Lamp and Reading Lamp Replacement

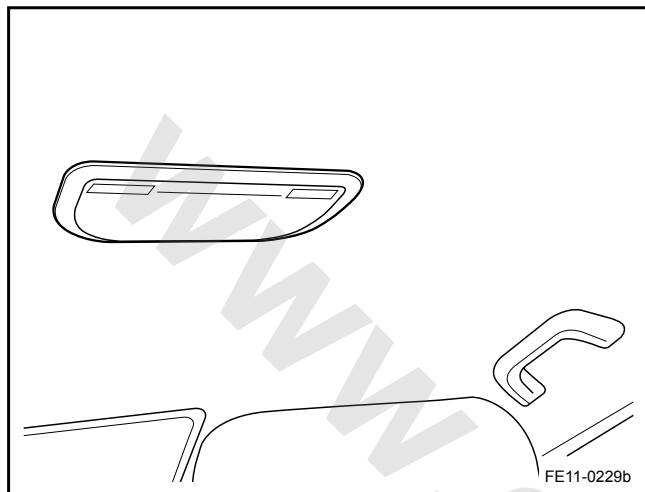
### Removal Procedure

#### Warning!

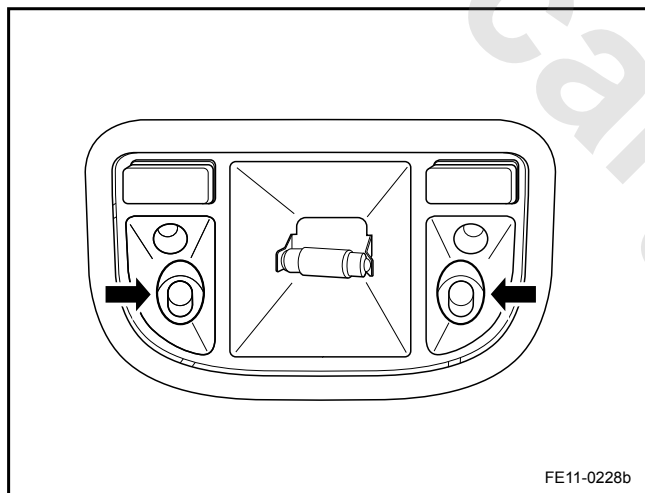
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).

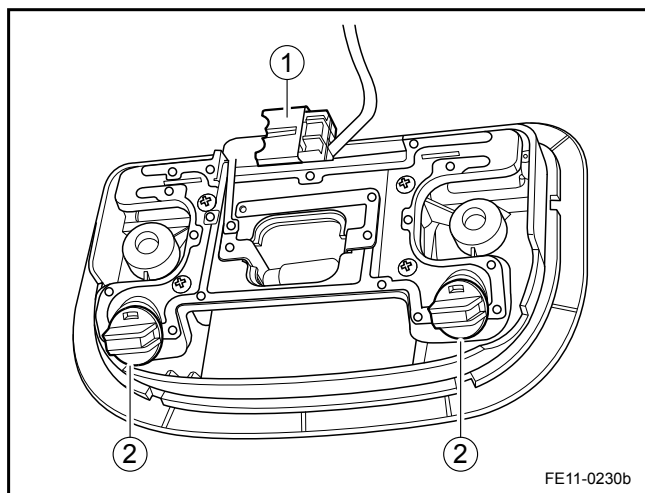
2. Insert a special tool to the dome lamp cover edge to remove the cover.



3. Remove the screws and the door controlled lamp cover.



4. Disconnect the rear dome lamp wiring harness connector (1).



5. Remove the lamp bulb (2).

#### Installation Procedure:

1. Install the lamp bulb (1).
2. Connect the electrical wiring harness connector (2).
3. Install the rear dome lamp.

#### Note

"Fastener Notice" in "Warnings and Notices".

Torque: 4 Nm (Metric) 3 lb-ft (US English)

4. Press the door controlled lamp cover into place.
5. Connect the battery negative cable.

### 11.4.8.5 Rear Compartment Lamp (Hatchback Lamp) Replacement

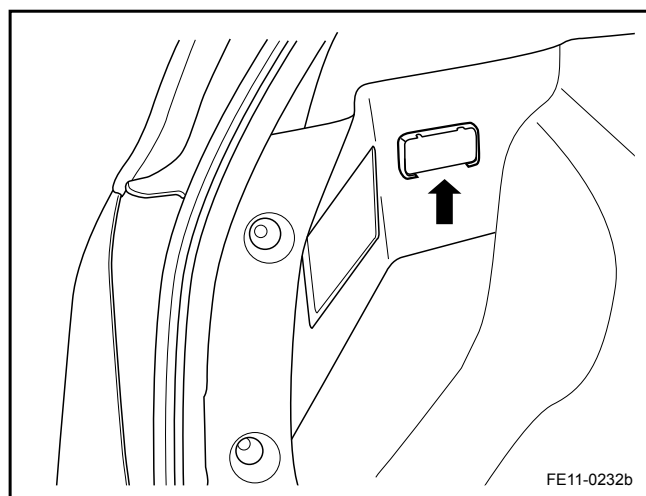
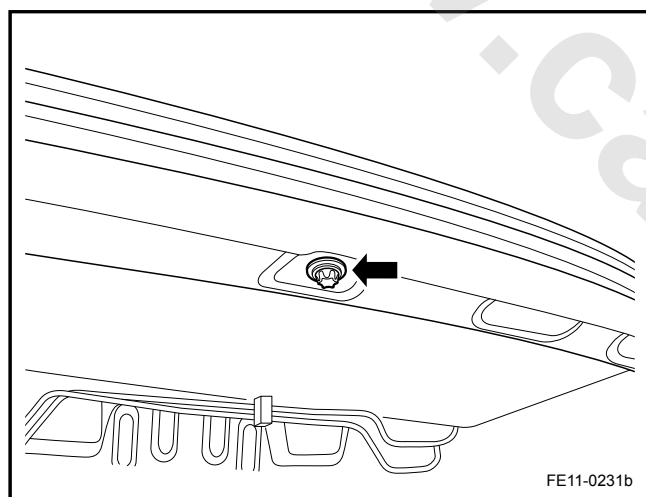
#### Removal Procedure

1. Remove the rear compartment lamp cover.

#### Note

Hatchback lamp cover for hatchback.

2. Remove the rear compartment lamp (Hatchback Lamp) bulb.



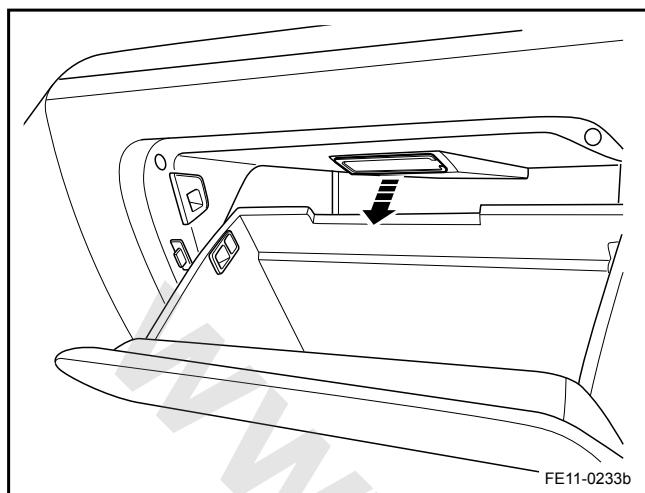
#### Installation Procedure:

1. Install the rear compartment lamp (Hatchback Lamp) bulb.
2. Install the rear compartment lamp cover (hatchback lamp cover).

### 11.4.8.6 Glove Box Lamp Replacement

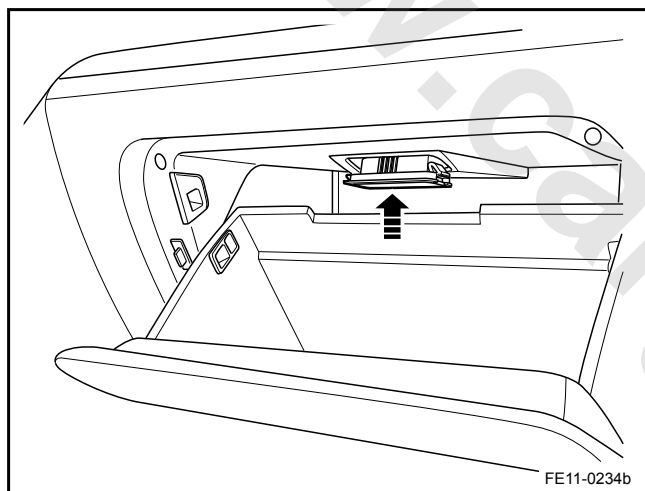
#### Removal Procedure

1. Remove the glove box lamp cover.
2. Disconnect the wiring harness connector.
3. Remove the glove box lamp bulb.



#### Installation Procedure:

1. Install the glove box lamp bulb.
2. Connect the wiring harness connector.
3. Press the glove box lamp cover into place.

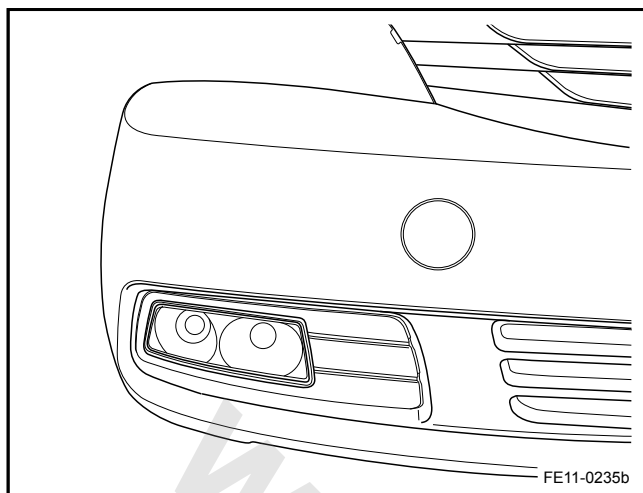


### 11.4.8.7 Front Fog Lamp Replacement

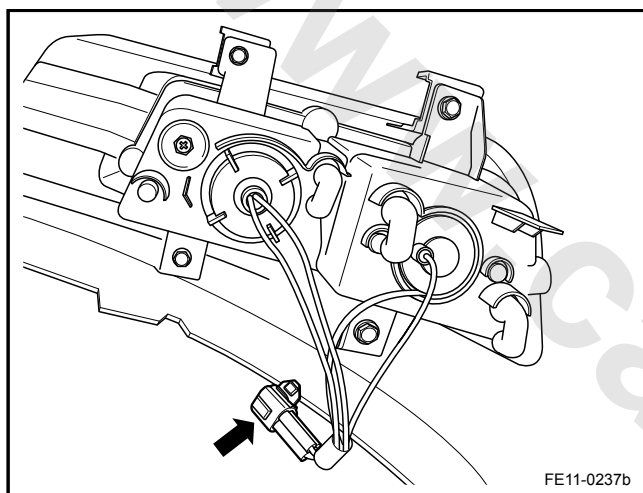
#### Removal Procedure

#### Warning!

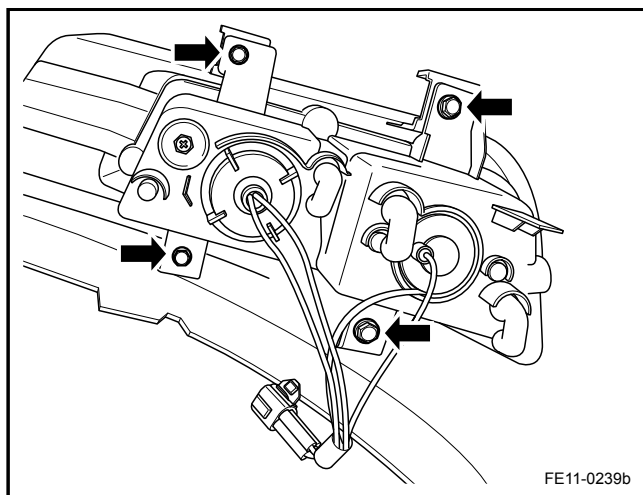
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



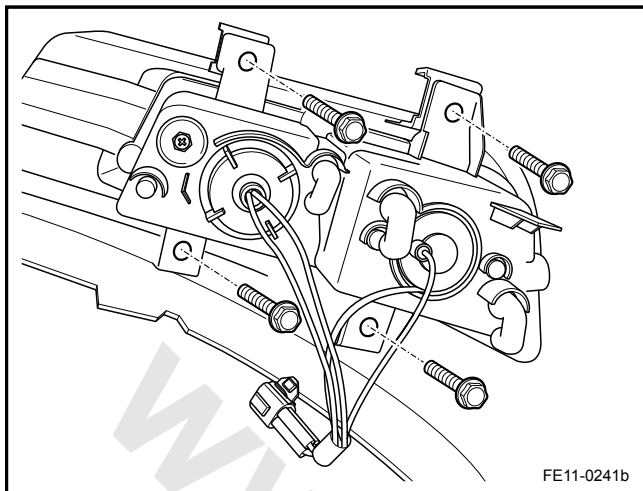
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the engine bottom shield. Refer to [12.10.1.7 Left and Right Engine Bottom Shield Replacement](#).



3. Disconnect the fog lamp assembly wiring harness connector.



4. Remove the fog lamp retaining bolts.
5. Remove the fog lamp assembly.
6. Loosen the fog lamp assembly screws and remove the bulb.



#### Installation Procedure:

1. Insert and tighten the new fog lamp bulb to the fog lamp assembly.

#### Note

Avoid touching the bulb or letting the bulb to come into contact with any moist. When the lamp is turned on, the grease or moisture on the bulb may cause the bulb explode. If the bulb contacts with grease or moisture, clean the bulb with alcohol or an appropriate cleaning agent and dry the bulb.

2. Tighten the fog lamp retaining bolts.  
Torque: 5.5 Nm (Metric) 4 lb-ft (US English)
3. Connect the fog lamp wiring harness connector.
4. Install the engine bottom shield.
5. Connect the battery negative cable.

#### Note

Hatchback front fog lamp replacement is the same as sedan.

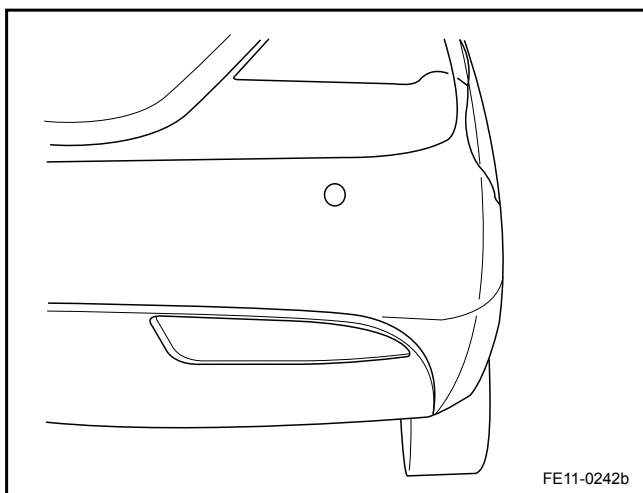
### 11.4.8.8 Rear Fog Lamp Replacement (Sedan)

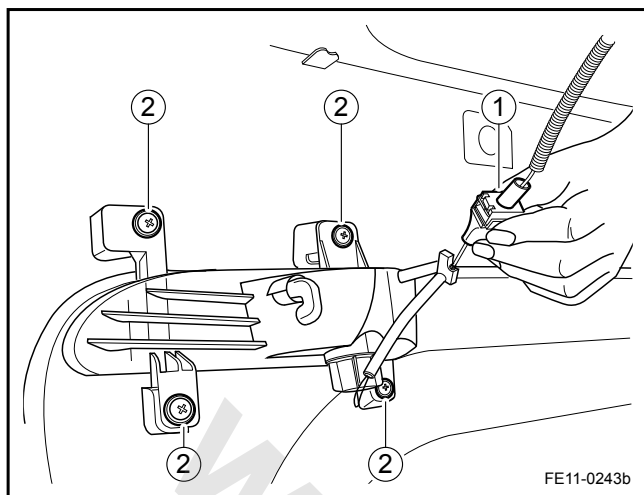
#### Removal Procedure

#### Warning!

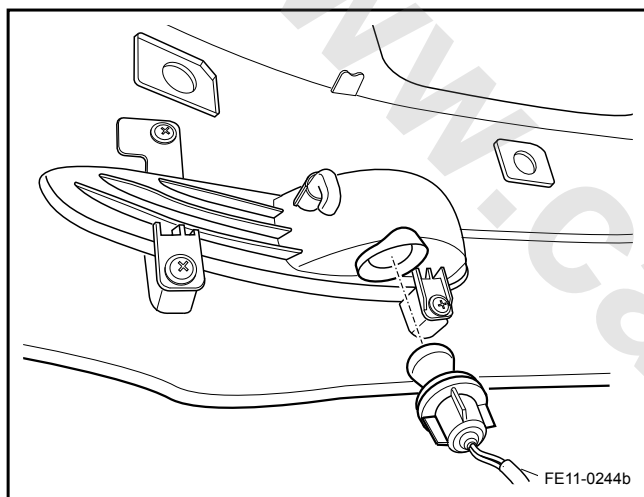
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the rear bumper. Refer to [12.4.3.3 Rear Bumper Replacement \(Sedan\)](#).





3. Disconnect the wiring harness connector (1).
4. Remove the rear fog lamp retaining bolts.
5. Remove the rear fog lamp bulb.

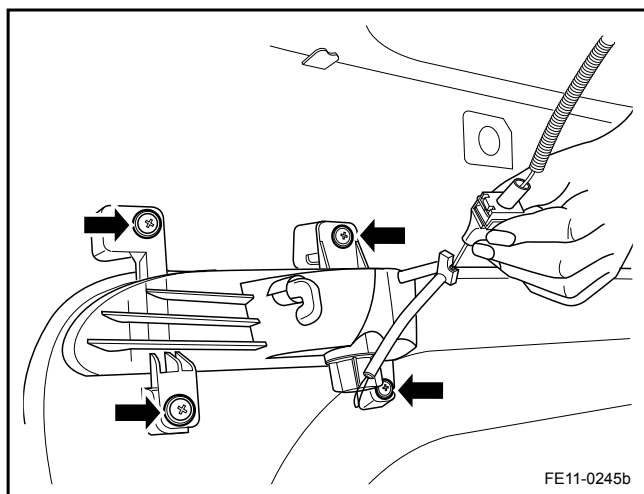


#### Installation Procedure:

1. Insert and tighten the fog lamp bulb to the rear fog lamp assembly.

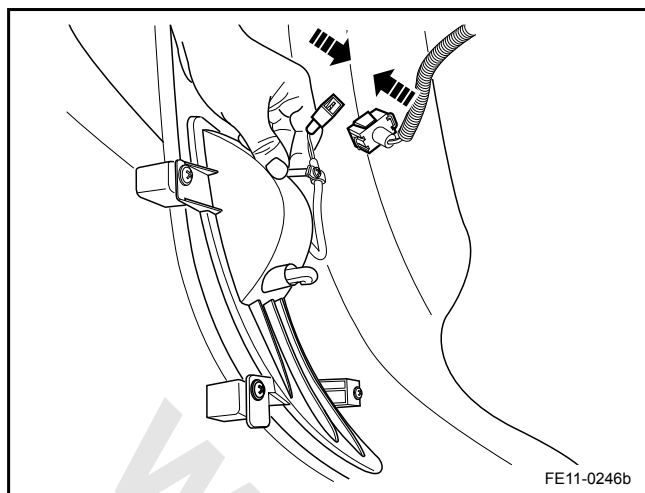
#### Note

Avoid touching the bulb or letting the bulb to come into contact with any moist. When the lamp is turned on, the grease or moisture on the bulb may cause the bulb explode. If the bulb contacts with grease or moisture, clean the bulb with alcohol or an appropriate cleaning agent and dry the bulb.



2. Install the rear fog lamp assembly.  
Torque: 5.5 Nm (Metric) 4 lb-ft (US English)





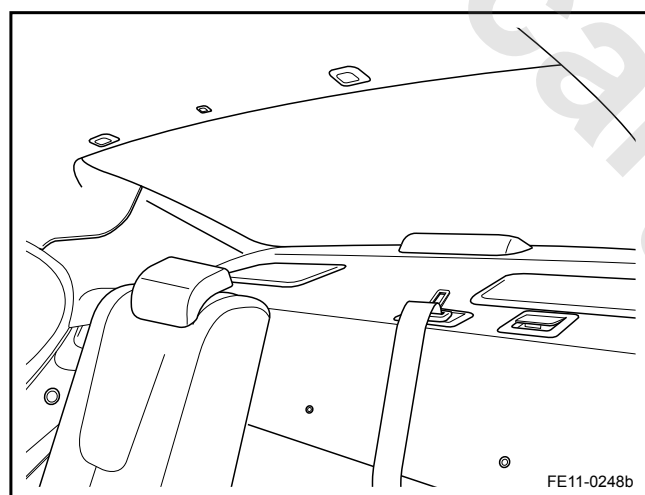
3. Connect the tail lamp assembly electrical wiring harness connector.
4. Install the rear bumper.
5. Connect the negative battery connector.

#### 11.4.8.9 High Mounted Brake Lamp Replacement (Sedan)

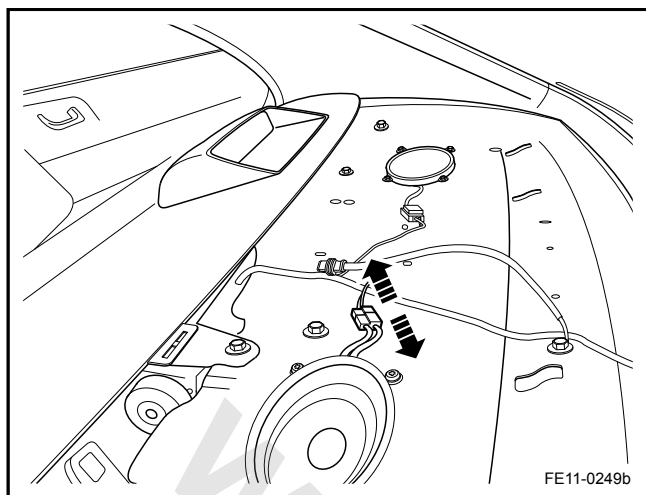
##### Removal Procedure

##### Warning!

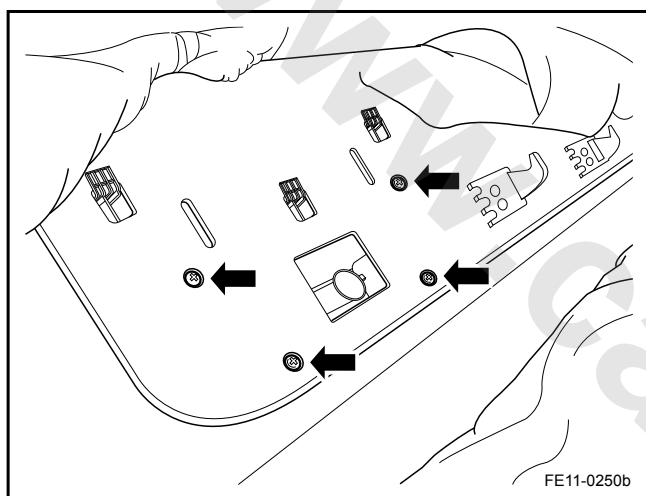
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



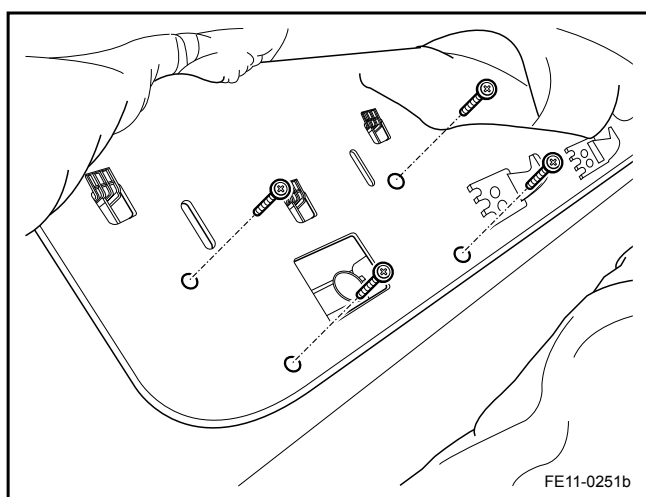
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the rear parcel shelf. Refer to [12.9.1.7 Rear Parcel Shelf Replacement \(Sedan\)](#).



3. Disconnect the high mounted brake lamp wiring harness connector.



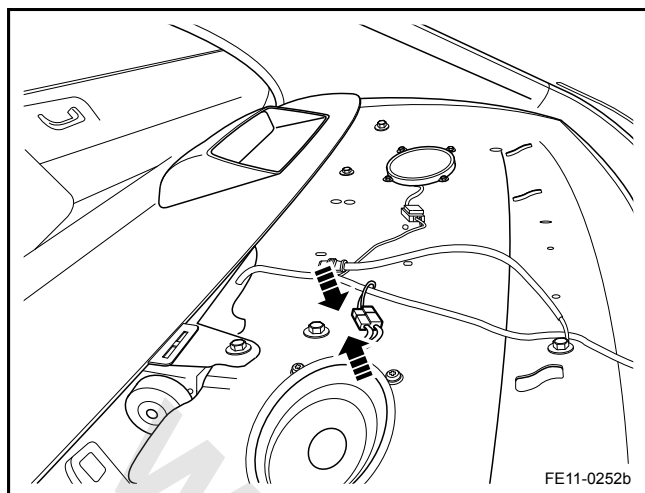
4. Remove the high mounted brake lamp retaining screws.
5. Remove the high mounted brake lamp.



#### Installation Procedure:

1. Install the high mounted brake lamp and tighten the retaining screws.

Torque: 3.5 Nm (Metric) 2.5 lb-ft (US English)



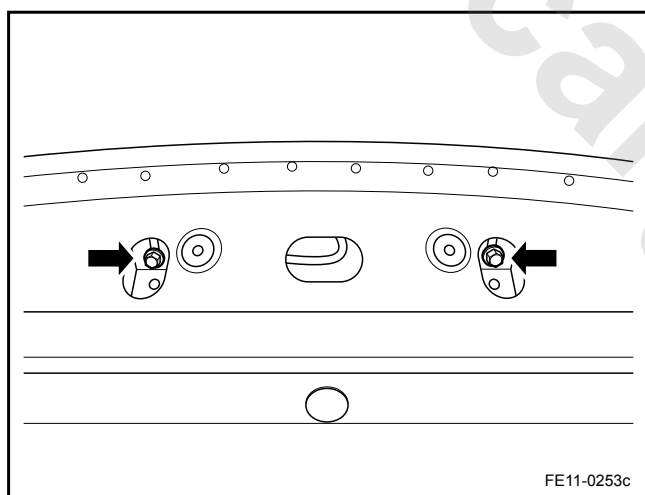
2. Connect the high mounted brake lamp wiring harness connector.
3. Install the rear parcel shelf.
4. Connect the battery negative cable.

#### 11.4.8.10 High Mounted Brake Lamp Replacement (Hatchback)

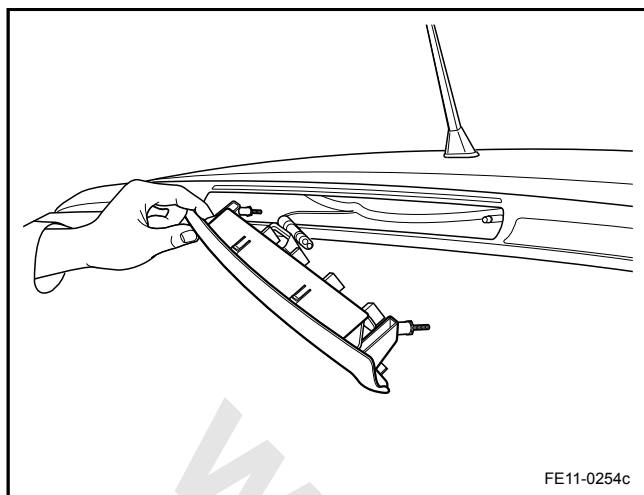
Removal Procedure:

**Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

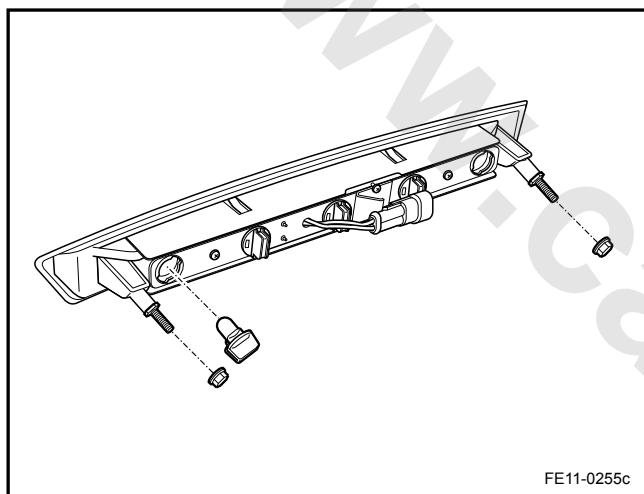


1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the hatchback trim panel. Refer to [12.9.1.15 Hatchback Inner Trim Panel Replacement \(Hatchback\)](#).
3. Remove the high mounted brake lamp retaining nut.

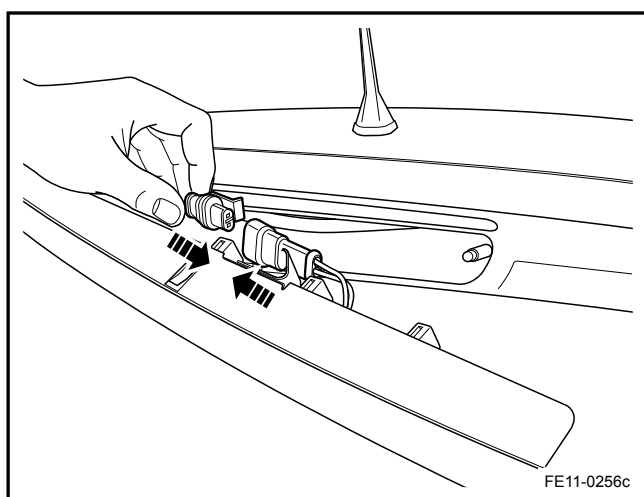


4. Remove the high mounted brake lamp.
5. Disconnect the high mounted brake lamp wiring harness connector and remove the wiper nozzle.
6. Remove the high mounted brake lamp.

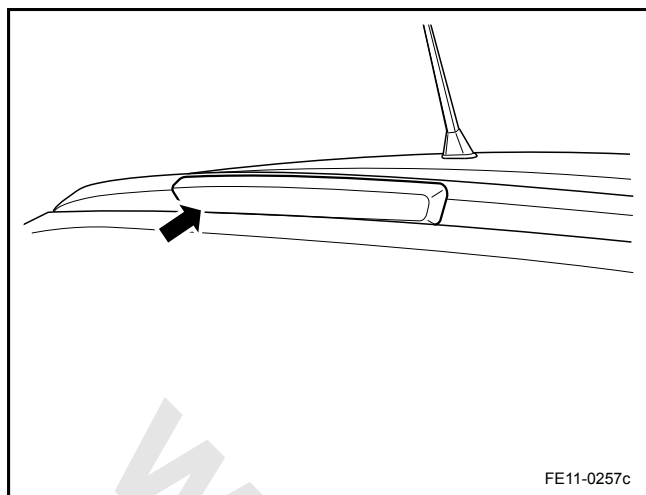
#### Installation Procedure:



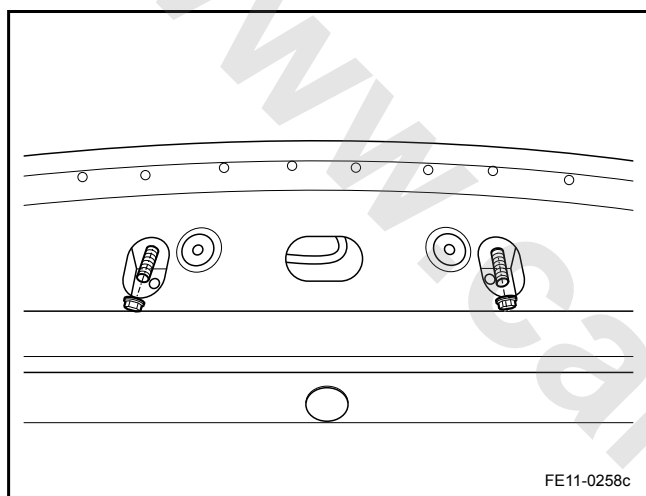
1. Clean the high mounted brake lamp and mounting holes and surroundings.



2. Install wiper nozzle into the high mounted brake lamp.
3. Connect the high mounted brake lamp wiring harness connector.



4. Install the high mounted brake lamp.



5. Tighten the high mounted brake lamp retaining nut.  
Torque: 3 Nm (Metric) 2.2 lb-ft (US English)
6. Install the hatchback trim panel.
7. Connect the battery negative cable.

#### 11.4.8.11 Headlamp Replacement

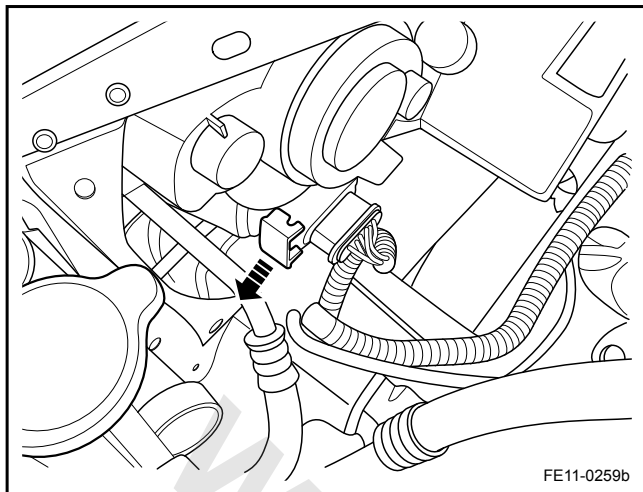
##### Removal Procedure

##### Note

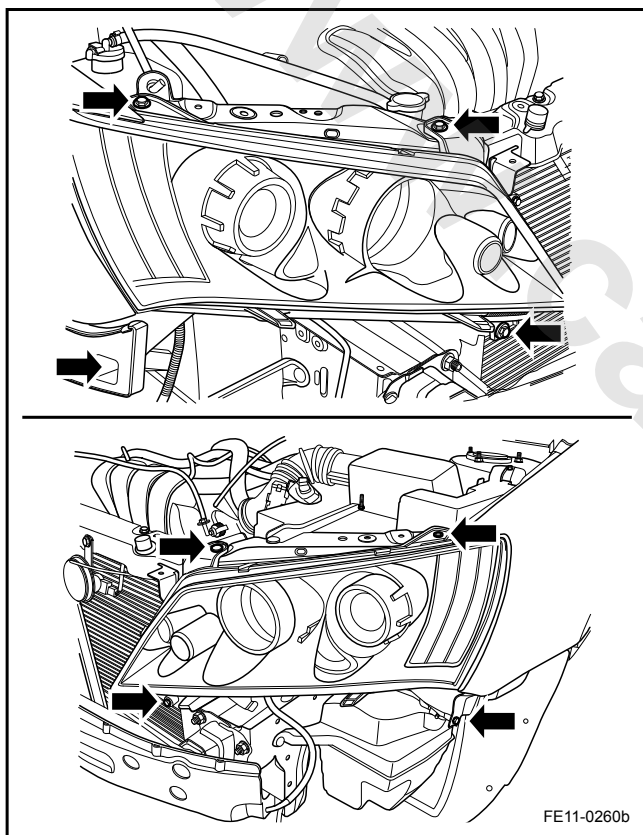
Headlamp height adjustment motor.

##### Warning!

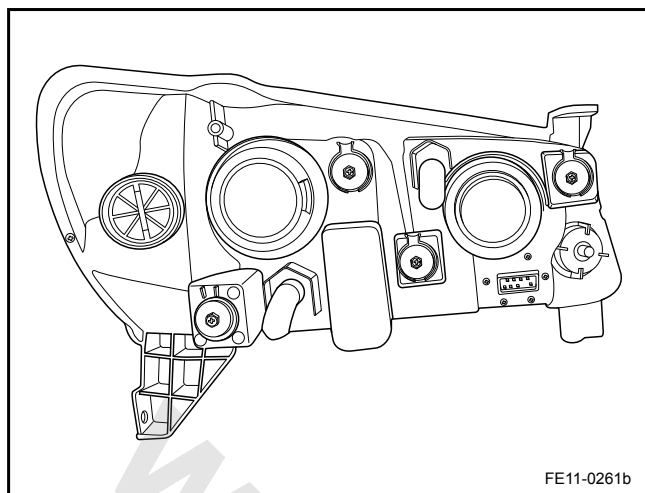
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the front bumper. Refer to [12.4.3.1 Front Bumper Replacement](#).
3. Disconnect the headlamp assembly harness connector.



4. Remove the bolts and the headlamp assembly.

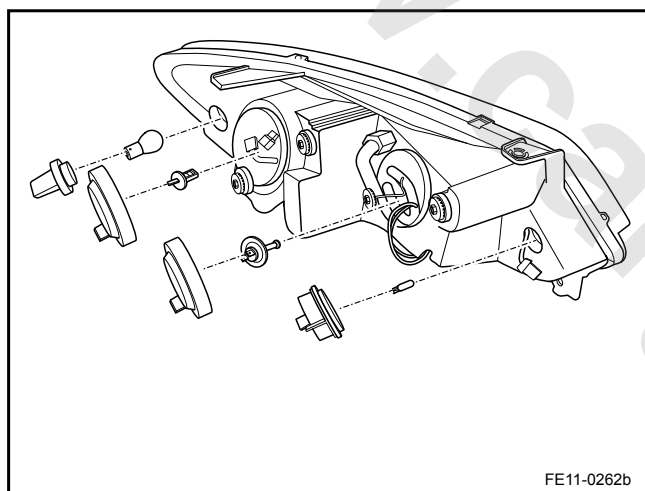


5. Remove the Headlamp bulb cover.
6. Disconnect the headlamp bulb connector.
7. Remove the Headlamp bulb.

#### Installation Procedure:

#### Warning!

Refer to "Halogen Bulb Warning" in "Warnings and Notices".

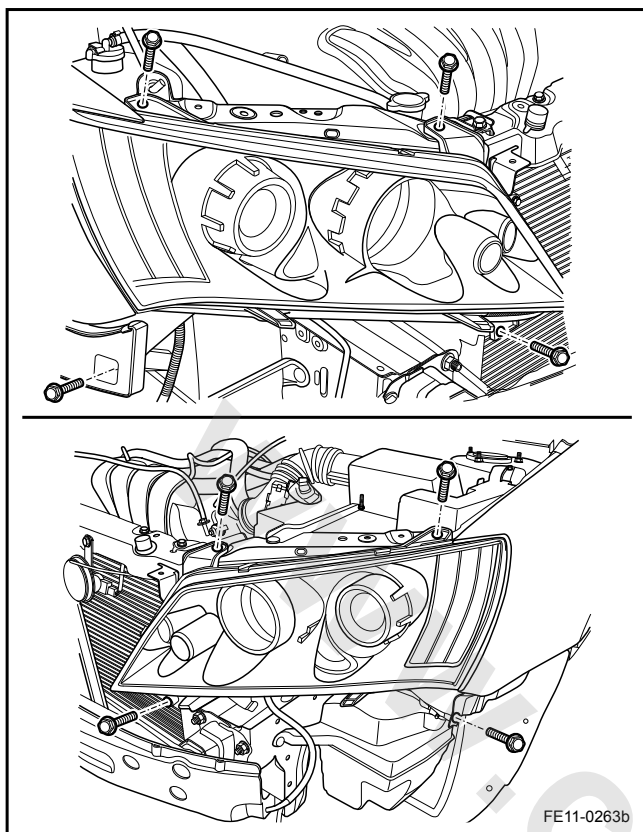


1. Install headlamp bulb.

#### Note

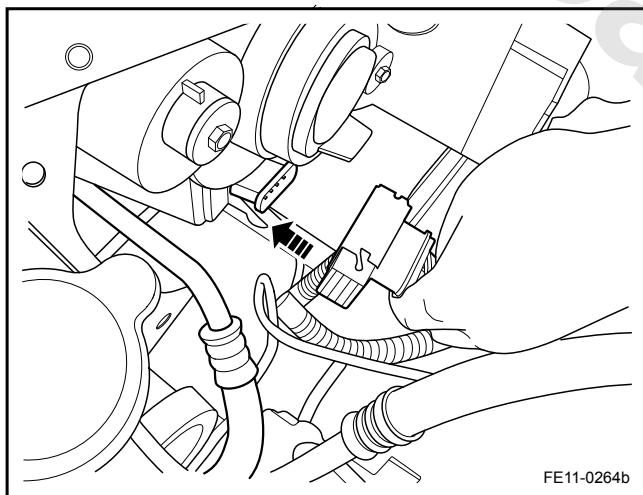
Avoid touching the bulb or letting the bulb to come into contact with any moist. When the lamp is turned on, the grease or moisture on the bulb may cause the bulb explode. If the bulb contacts with grease or moisture, clean the bulb with alcohol or an appropriate cleaning agent and dry the bulb.

2. Connect the Headlamp bulb connector.
3. Install the headlamp bulb cover.



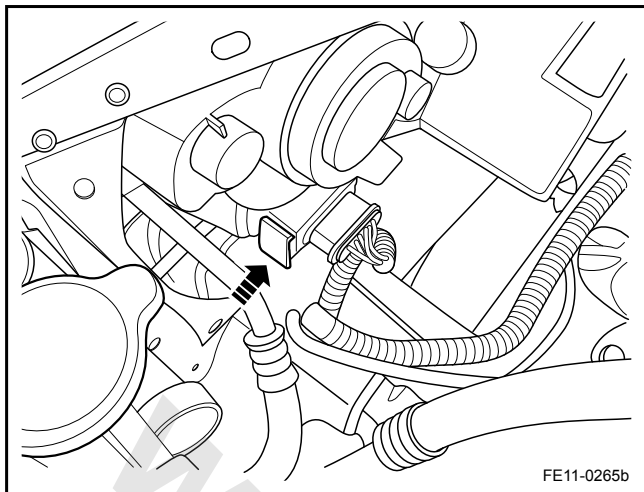
4. Install the headlamp and tighten the retaining bolts.

Torque: 8.8 Nm (Metric) 6.5 lb-ft (US English)



5. Connect the headlamp wiring harness connector.





6. Connect the connector.
7. Install the front bumper.
8. Connect the battery negative cable.

#### Note

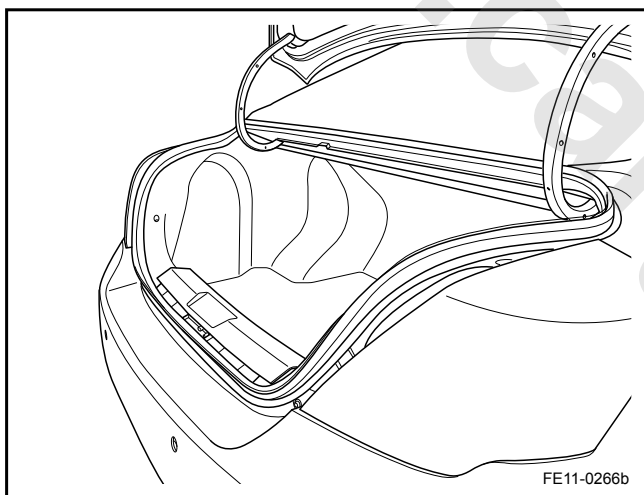
After installing the headlamp, adjust the light beam. The front park lamps, front turn signal lamps replacements are the same as the headlamp.

### 11.4.8.12 Tail Lamp Replacement (Sedan)

#### Removal Procedure

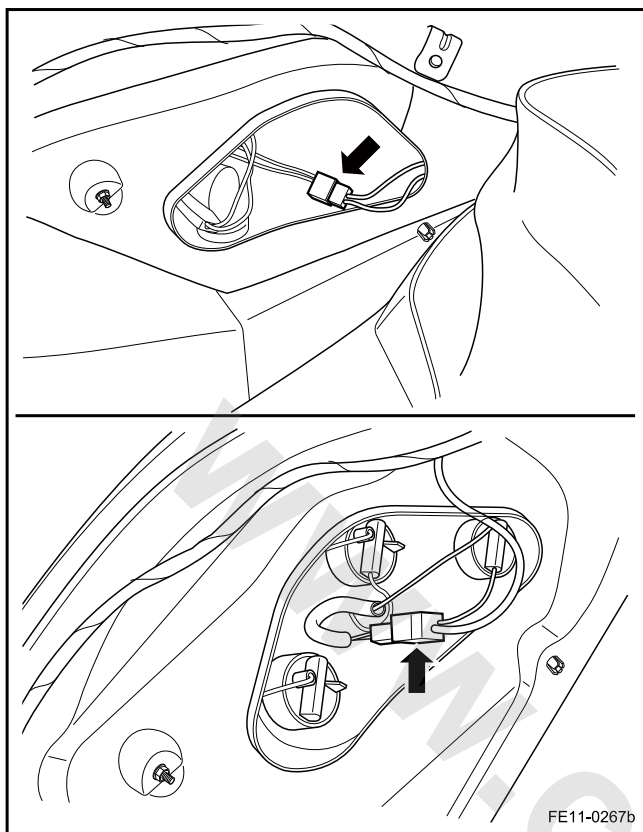
#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

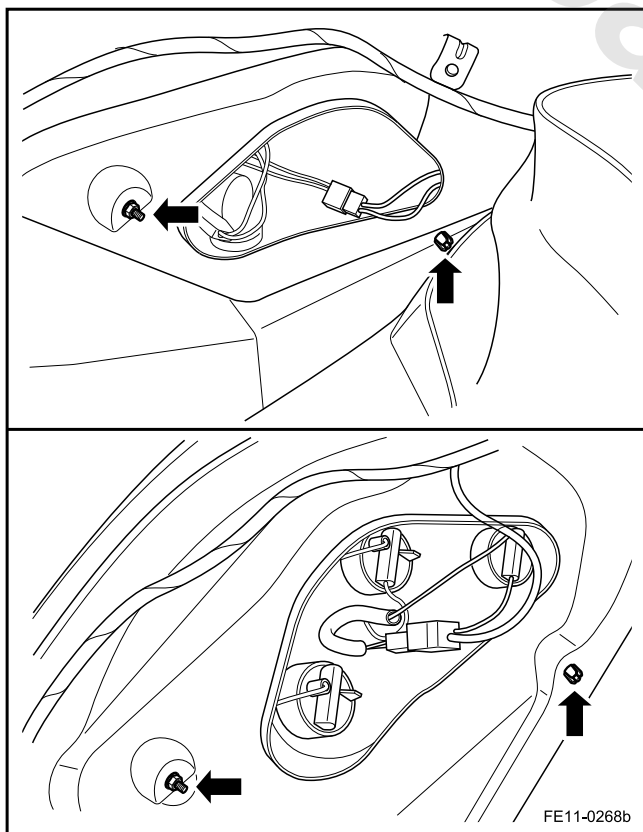


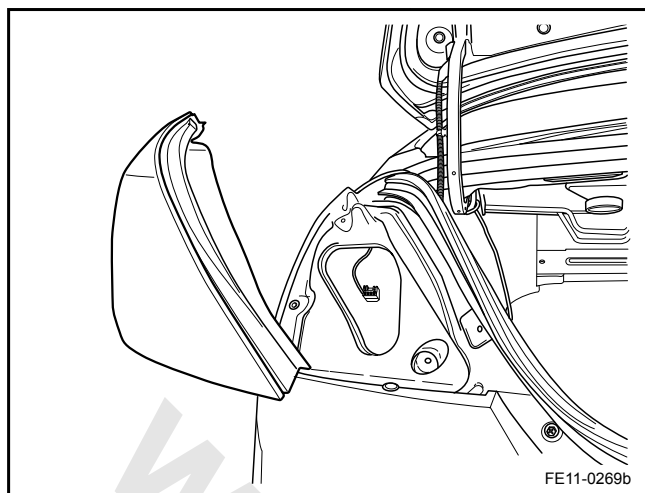
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the rear compartment side trim. Refer to [12.9.1.9 Rear Compartment Trim Panel Replacement](#).

3. Disconnect the tail lamp harness connector.

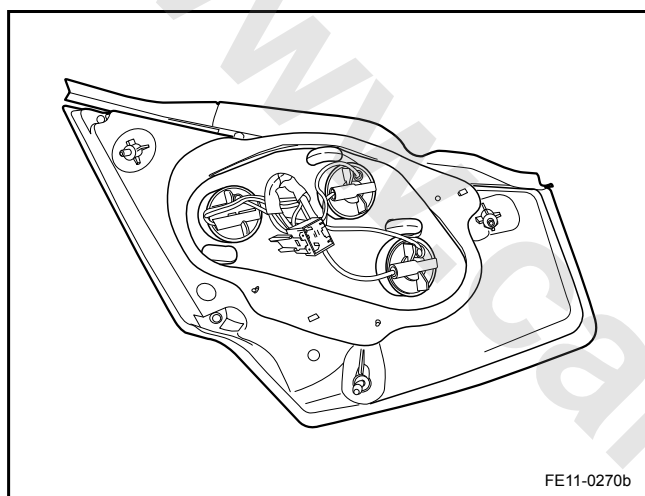


4. Remove the tail lamp retaining bolts.





5. Remove the tail lamp.

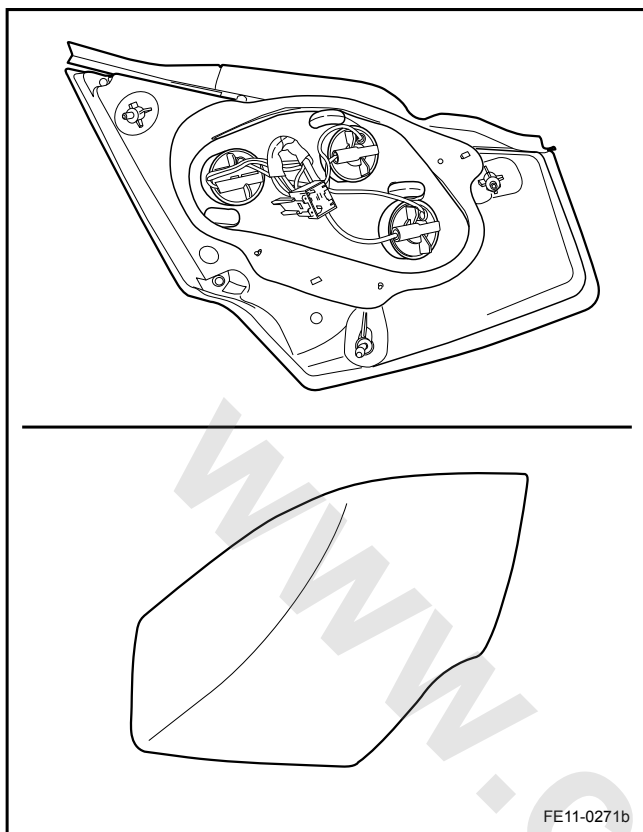


6. Remove the tail lamp cover and remove the tail lamp bulb.

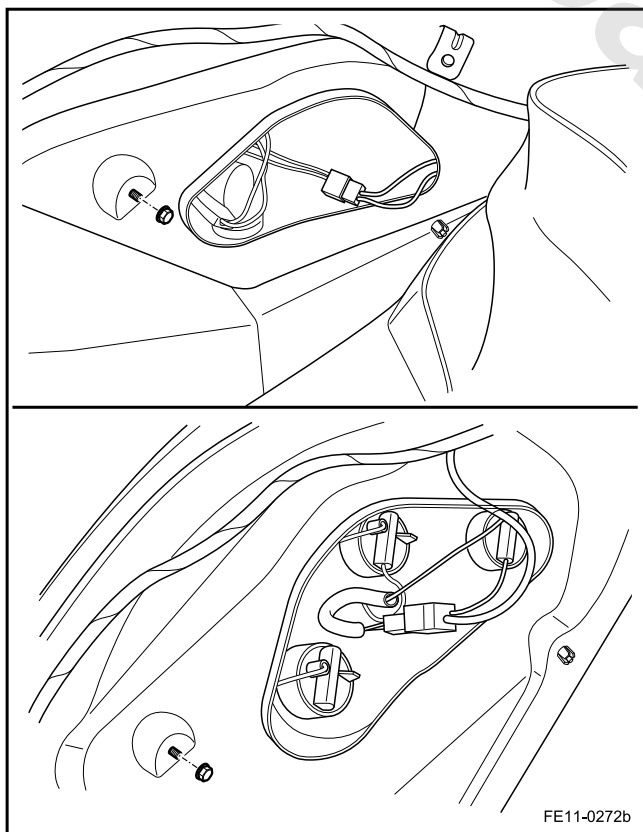
#### Installation Procedure:

##### Note

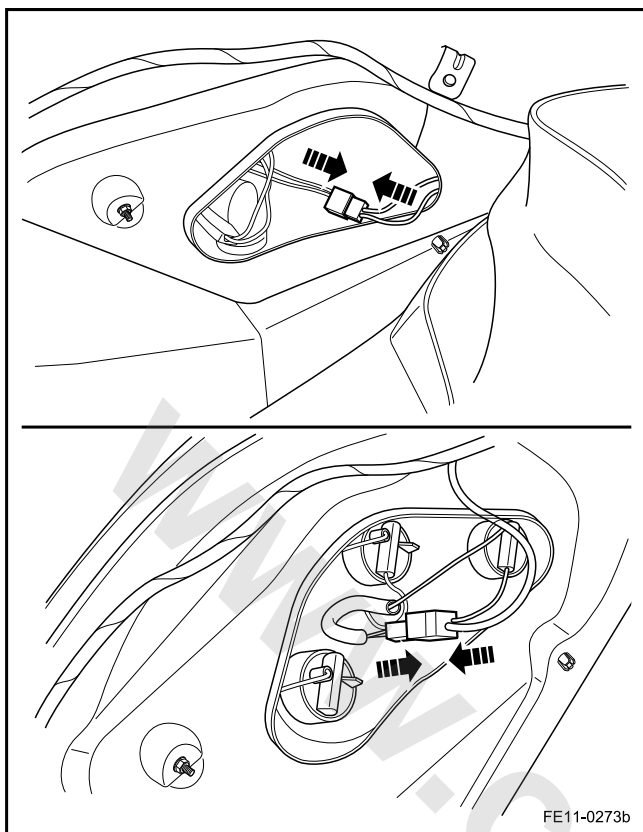
Avoid touching the bulb or letting the bulb to come into contact with any moist. When the lamp is turned on, the grease or moisture on the bulb may cause the bulb explode. If the bulb contacts with grease or moisture, clean the bulb with alcohol or an appropriate cleaning agent and dry the bulb.



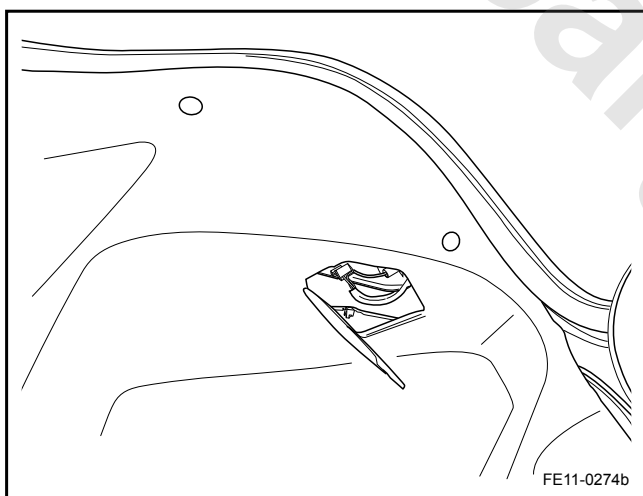
1. Install the tail lamp into the tail lamp assembly and install the tail lamp cover.



2. Install the tail lamp assembly.  
Torque: 3 Nm (Metric) 2.2 lb-ft (US English)



3. Connect the tail lamp wiring harness connector.
4. Install the rear compartment side trim panel.
5. Connect the battery negative cable.



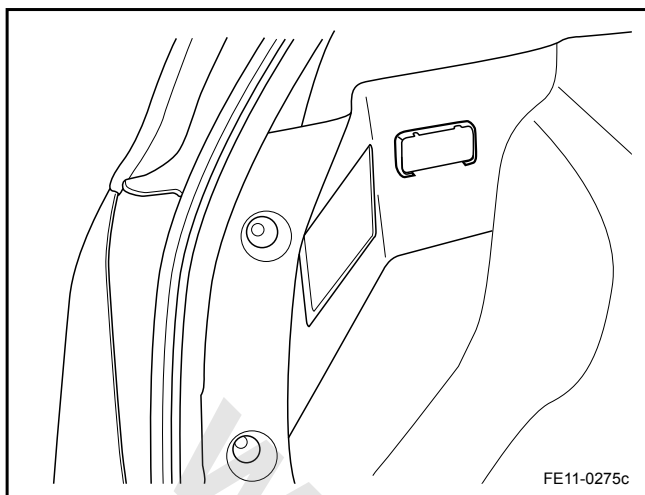
6. To replace the tail lamp bulb, open the tail lamp cover.

#### 11.4.8.13 Tail Lamp Replacement (Hatchback)

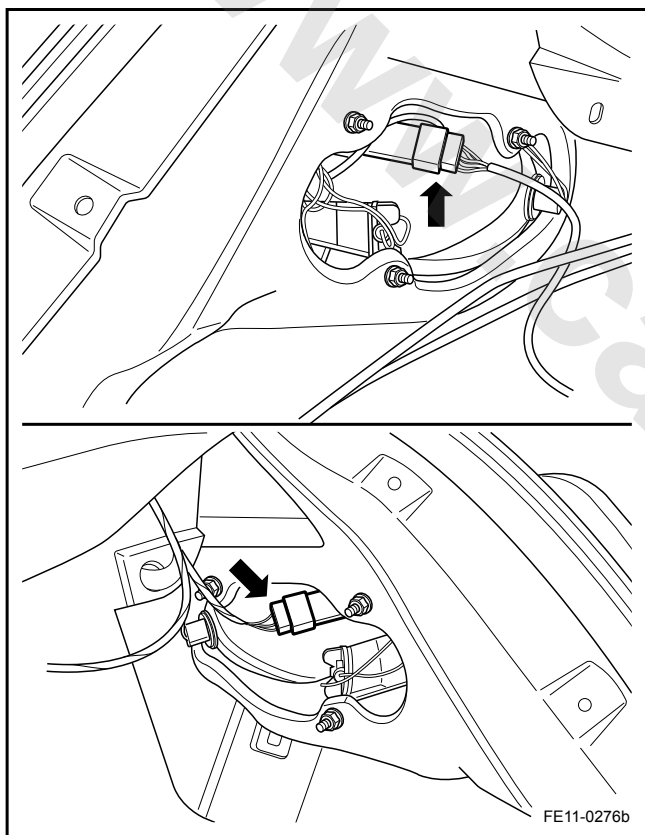
##### Removal Procedure

##### Warning!

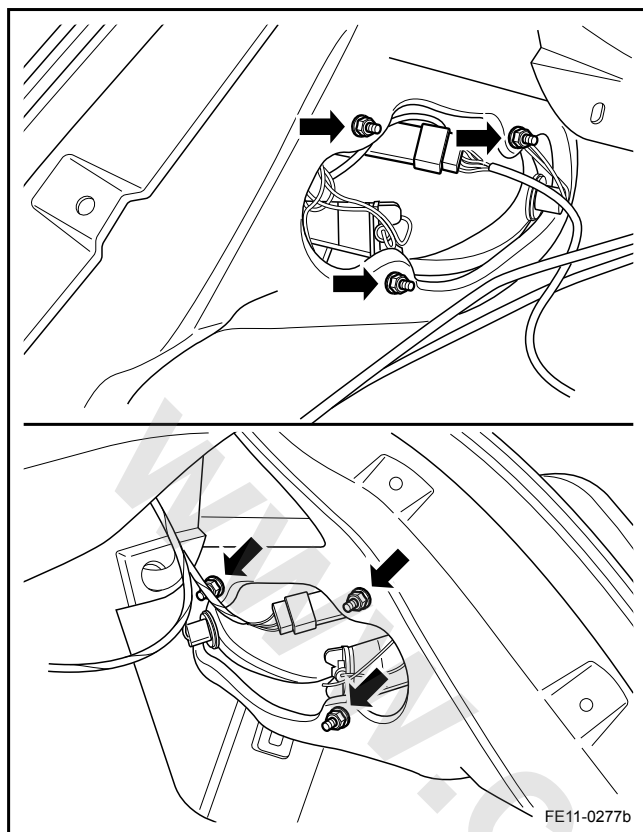
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



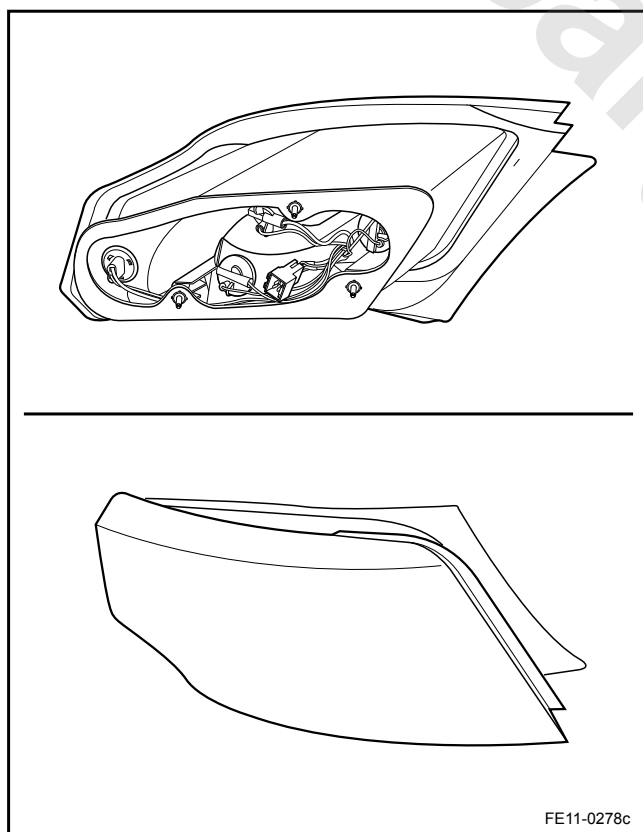
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the hatchback trim panel. Refer to [12.9.1.10 Rear Compartment Trim Panel Replacement \(Hatchback\)](#).



3. Disconnect the tail lamp harness connector.

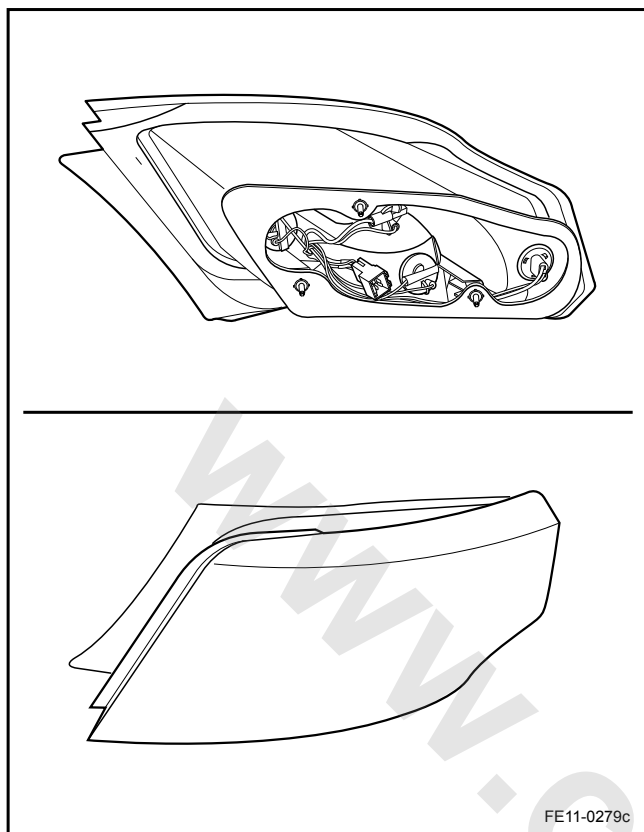


4. Remove the tail lamp retaining bolts and pull out the tail lamp.



5. Remove the left tail lamp and remove the bulbs.

6. Remove the left tail lamp and remove the bulbs.

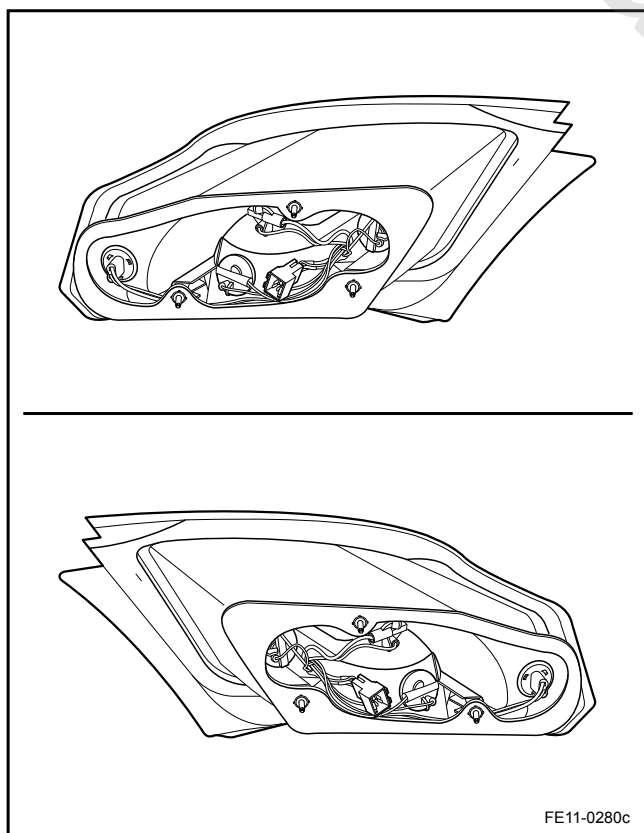


#### Installation Procedure:

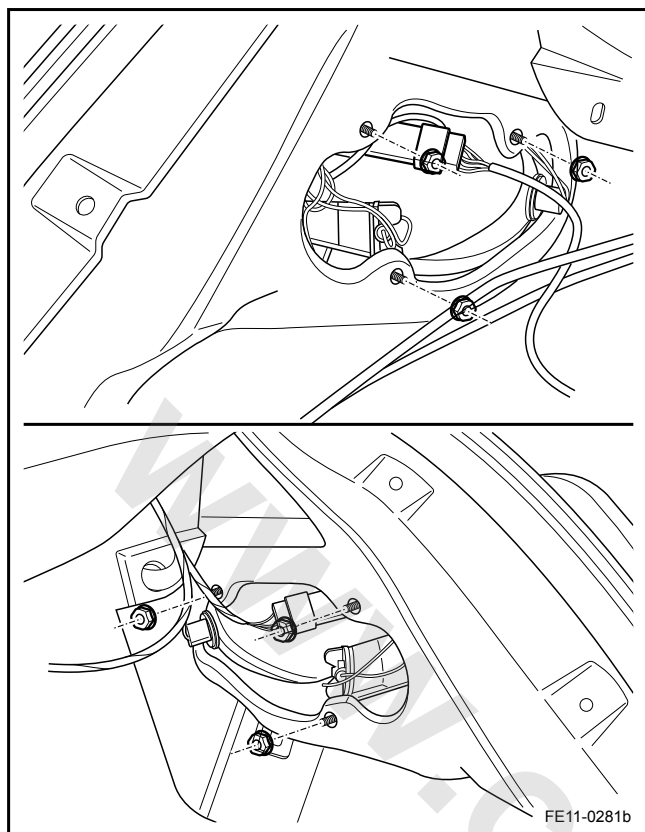
1. Insert the bulbs into the tail lamp assembly.

#### Note

Avoid touching the bulb or letting the bulb to come into contact with any moist. When the lamp is turned on, the grease or moisture on the bulb may cause the bulb explode. If the bulb contacts with grease or moisture, clean the bulb with alcohol or an appropriate cleaning agent and dry the bulb.

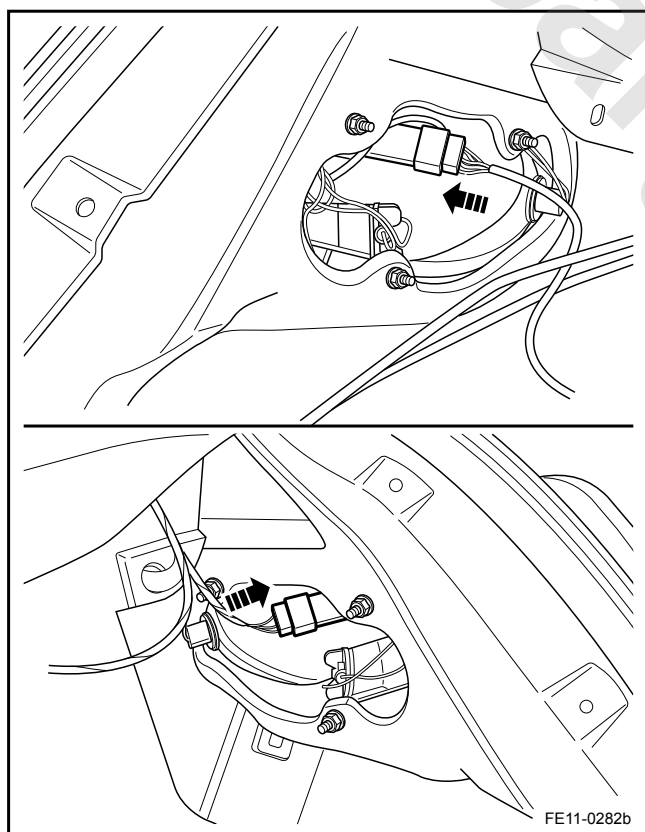




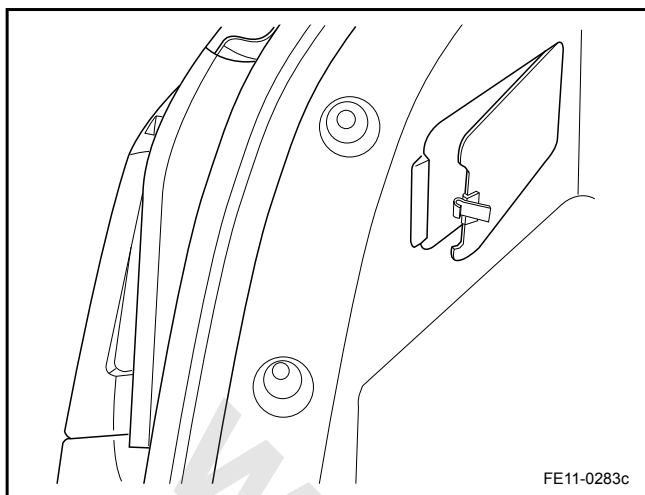


2. Install the tail lamp assembly.

Torque: 3 Nm (Metric) 2.2 lb-ft (US English)



3. Connect the tail lamp assembly wiring harness connector.
4. Install the hatchback trim panel.
5. Connect the battery negative cable.



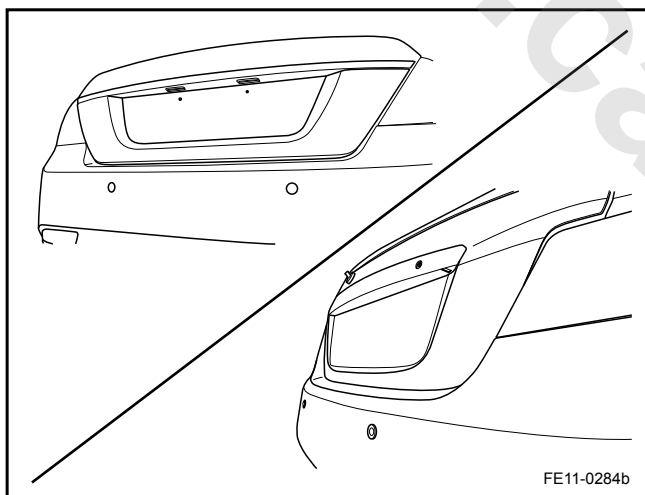
6. To replace the tail lamp bulb, open the tail lamp cover.

#### 11.4.8.14 License Plate Lamp Replacement

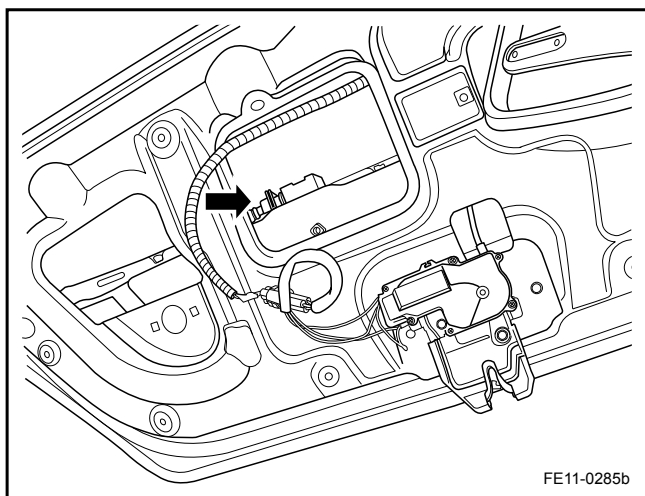
##### Removal Procedure

##### Warning!

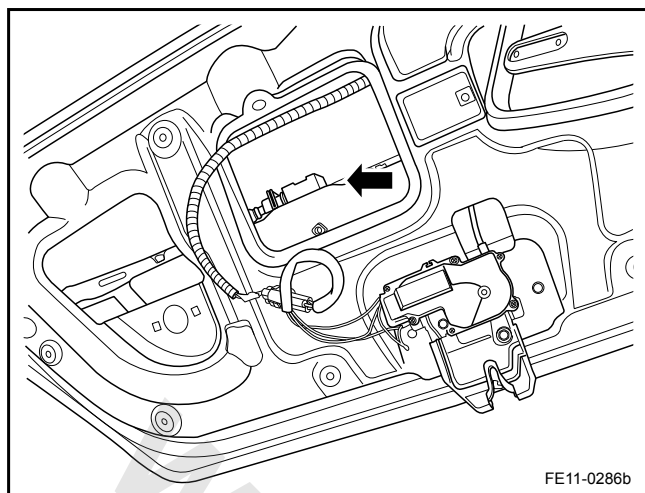
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the rear compartment lid trim panel. Refer to [12.9.1.14 Rear Compartment Lid Inner Trim Panel Replacement](#).



3. Disconnect the License Plate Lamp wiring harness to connect devices.
4. Remove the rear compartment lid applique. Refer to [12.10.1.4 Rear Compartment Lid Applique Replacement](#).



5. Hold down the license plate tongue and remove the license plate lamp.
6. Remove the license plate lamp bulb.

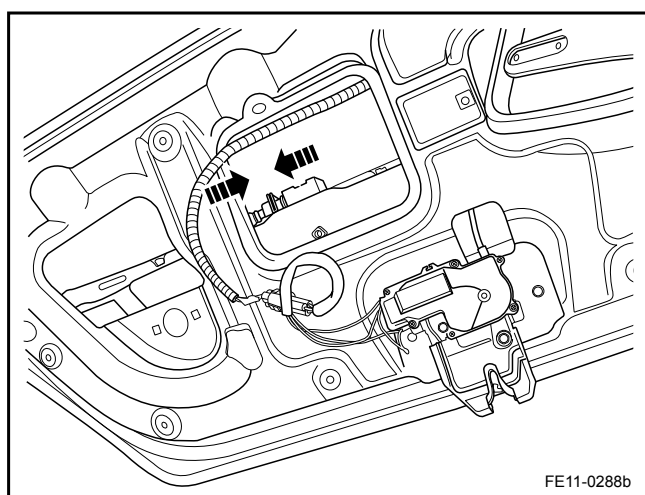
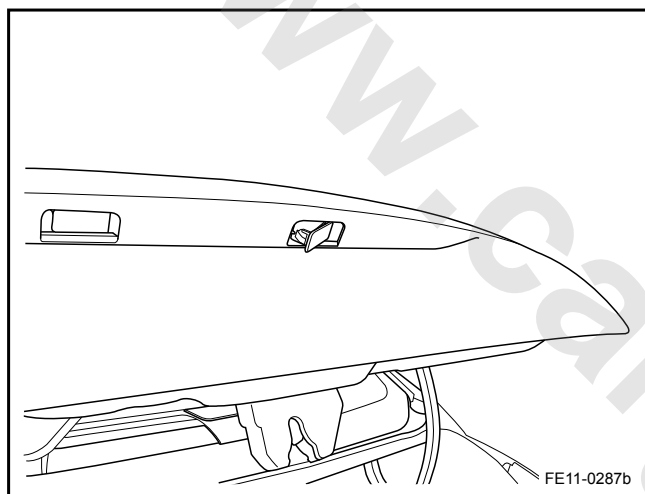
#### Installation Procedure:

1. Install the license plate lamp bulb.

#### Note

Avoid touching the bulb or letting the bulb to come into contact with any moist. When the lamp is turned on, the grease or moisture on the bulb may cause the bulb explode. If the bulb contacts with grease or moisture, clean the bulb with alcohol or an appropriate cleaning agent and dry the bulb.

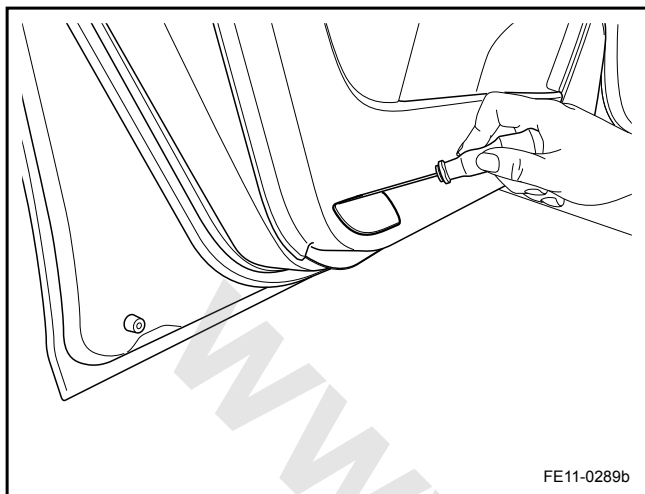
2. Press the license plate lamp into the mounting hole on the rear compartment lid.
3. Install the rear compartment lid applique.
4. Connect the license plate lamp harness connector.
5. Install the rear compartment lid trim panel.
6. Connect the battery negative cable.



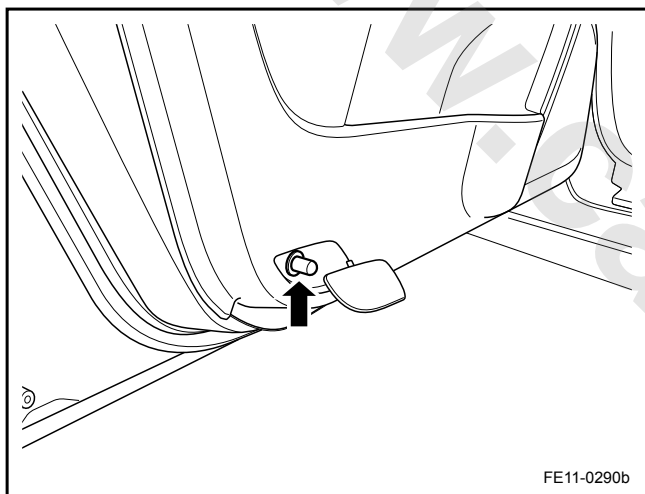
## 11.4.8.15 Door Lamp Replacement

## Removal Procedure

1. Remove the door lamp cover.



2. Remove the door lamp bulb.

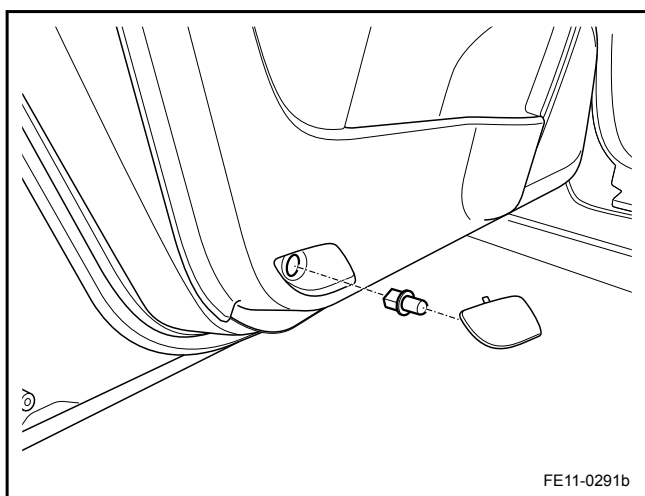


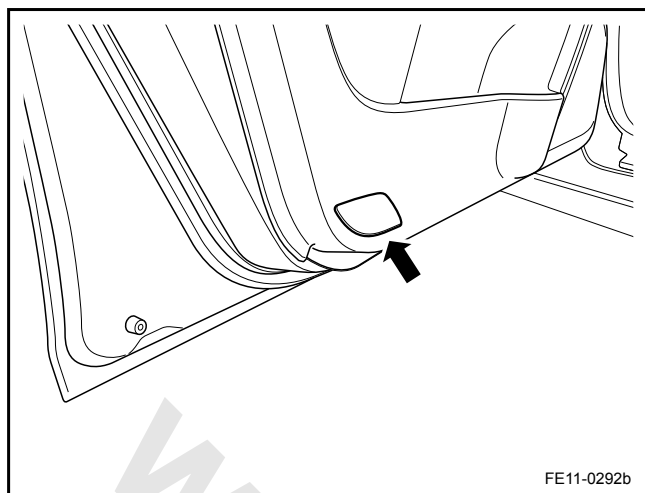
## Installation Procedure:

1. Install the door lamp bulb.

## Note

Avoid touching the bulb or letting the bulb to come into contact with any moist. When the lamp is turned on, the grease or moisture on the bulb may cause the bulb explode. If the bulb contacts with grease or moisture, clean the bulb with alcohol or an appropriate cleaning agent and dry the bulb.





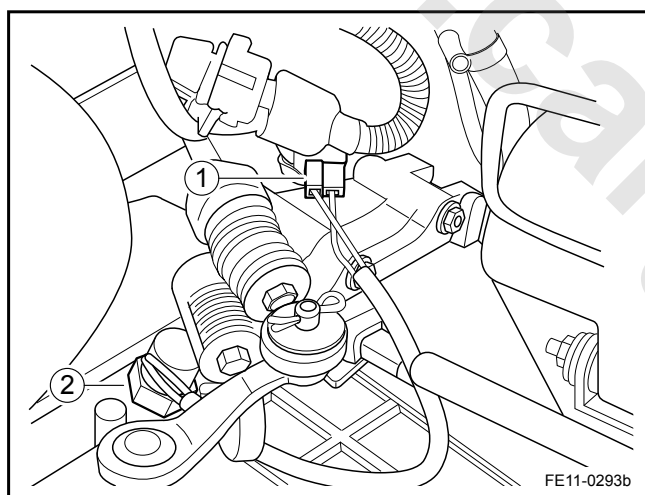
2. Install the door lamp cover.

#### 11.4.8.16 Reverse Switch Replacement

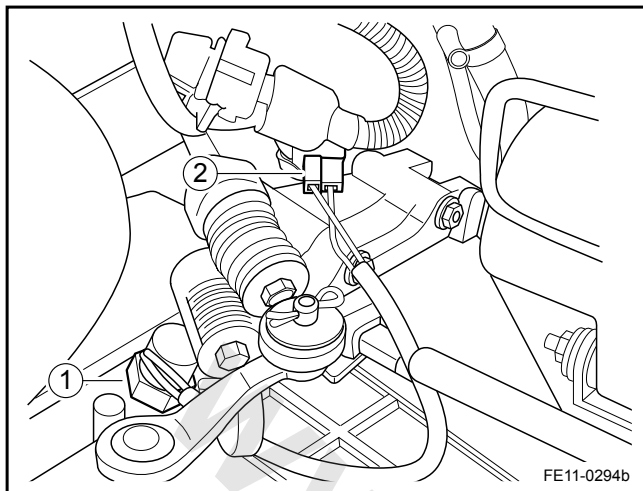
##### Removal Procedure

##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



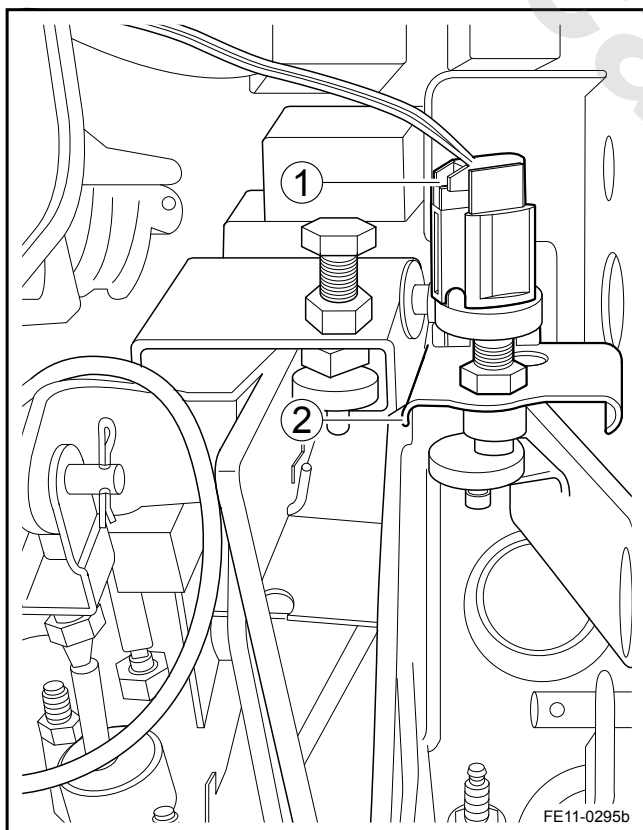
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect the reverse switch wiring harness connector (1).
3. Remove the reverse switch from the gearbox (2).

**Installation Procedure:**

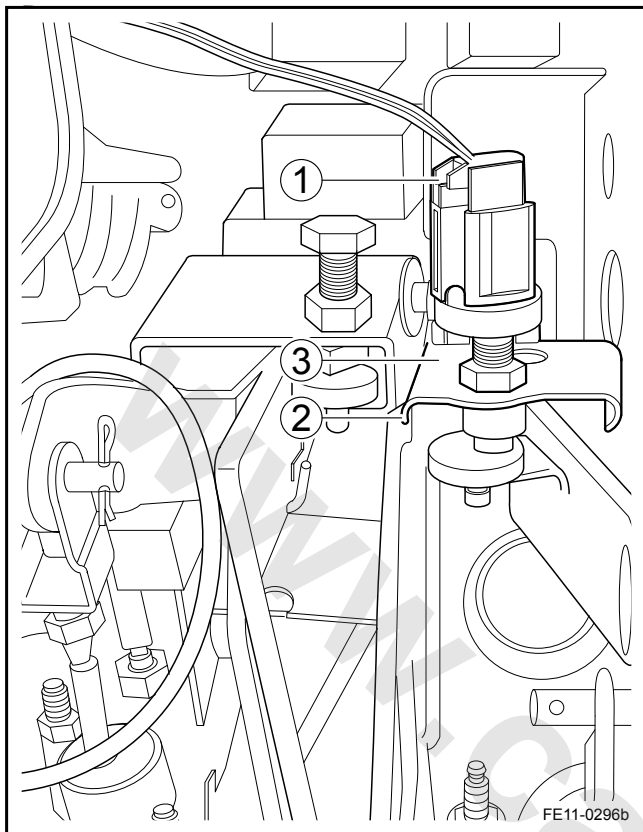
1. Install and tighten the reverse switch (1).  
Torque: 40 Nm (Metric) 30 lb-ft (US English)
2. Connect the reverse switch harness connector 2.
3. Connect the battery negative cable.

**11.4.8.17 Brake Lamp Switch Replacement****Removal Procedure****Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Disconnect the brake lamp switch wiring harness connector (1).
3. Release the locking nut, loose and remove the switch from the brake pedal bracket (2).



## Installation Procedure:

1. Rotate the brake lamp switch locking nut to the top position.
2. Press the brake pedal to the end.
3. Install the brake lamp switch into the mounting hole (2).

**Note**

Do not fully tighten the screw.

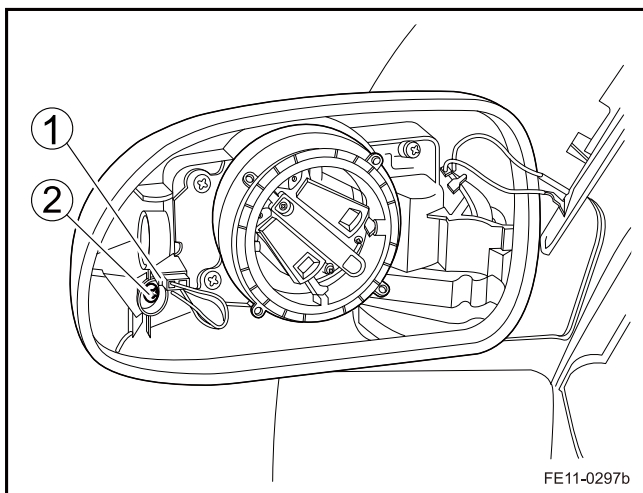
4. Slowly release the brake pedal until the brake lamp switch contacts fully pressed in because of brake pedal reaction.
5. Tighten the locking nut (3).  
Torque: 10 Nm (Metric) 7 lb-ft (US English)
6. Connect the brake lamp switch harness connector (1).
7. Connect the battery negative cable.

## 11.4.8.18 Turn Signal Lamp Replacement

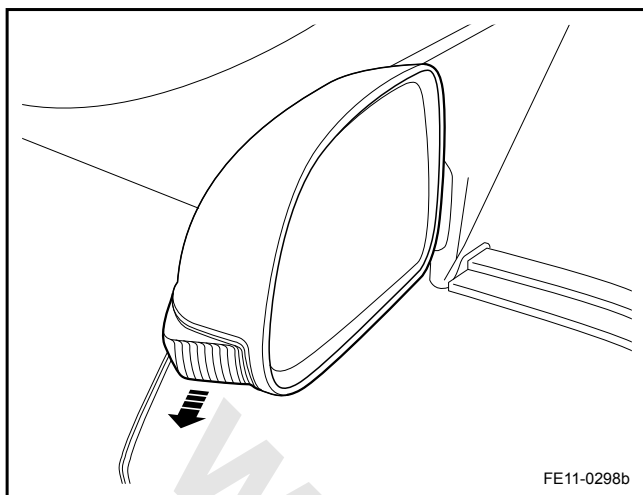
## Removal Procedure

**Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

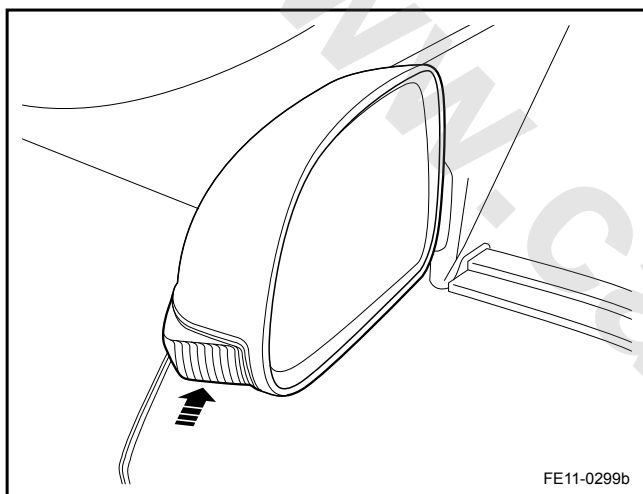


1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the outside rearview mirror glass. Refer to [11.5.8.1 Outside Rearview Mirror Replacement](#).
3. Disconnect the turn signal lamp wiring harness connector (1).
4. Remove the retaining screw (2).

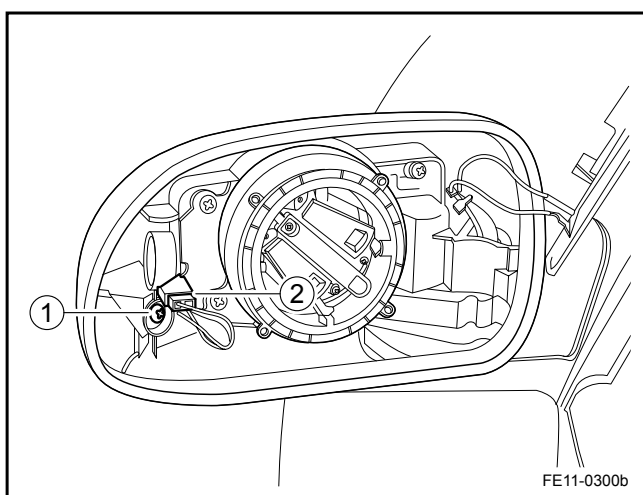


5. Remove the turn signal lamp.

#### Installation Procedure:



1. Install the turn signal lamp.



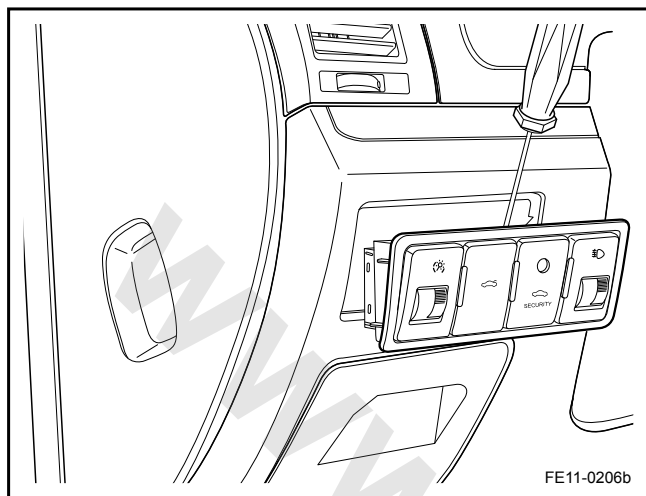
2. Install the turn signal lamp retaining screw (1).  
Torque: 1.5 Nm (Metric) 1.1 lb-ft (US English)
3. Connect the turn signal lamp wiring harness connector (2).
4. Install the outside rearview mirror glass.
5. Connect the battery negative cable.



#### 11.4.8.19 Instrument Background Light Adjustment Switch and Headlamp Height Adjustment Switch Replacement

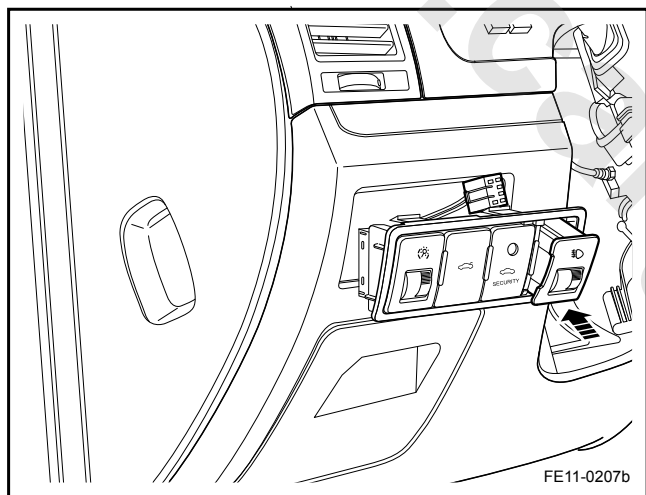
##### Removal Procedure

1. Remove the instrument background light switch.
2. Disconnect the dimmer switch wiring harness connector.
3. Remove the switch.



##### Installation Procedure:

1. Install the switch.
2. Connect the switch wiring harness connector.
3. Install the switch panel to the instrument panel.

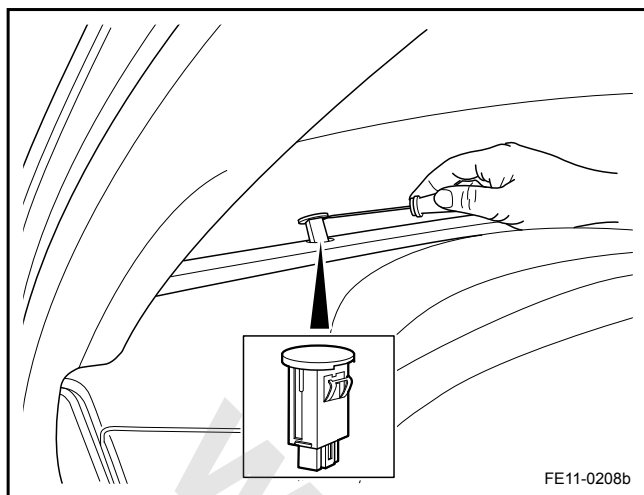


#### 11.4.8.20 Ambient and Sun Light Sensor Replacement

##### Removal Procedure

##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the ambient and sun light sensor from the instrument panel.
3. Disconnect the ambient and sun light sensor harness connector.

Installation Procedure:

1. Connect the ambient and sun light sensor harness connector.
2. Install the ambient and sun light sensor to the instrument panel.
3. Connect the battery negative cable.

## 11.5 Glasses / Windows / Mirrors

### 11.5.1 Specifications

#### 11.5.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Window Glass Regulator Assembly Nuts	M6	7-9	5-7
Window Glass Regulator Assembly Bolts	M6 × 10	7-9	5-7
Window Sealing Strip Self-Tapping Screws	4.2 × 9	3-4	2-3
Window Express Down Module Retaining Bolts	M6 × 16	7-9	5-7

## 11.5.2 Description and Operation

### 11.5.2.1 Description and Operation

#### Window Regulator Description and Operation

Anti-trap function has the following four kinds of operating modes: manual-up, manual-down, automatic-up, automatic-down. Window regulator without anti-trap function has two kinds of operating modes: manual-up, manual-down. Please review the configuration instructions before use and confirm whether the anti-trap function is available.

##### — Manual - Up

Gently pull the left front door window switch (pull up and the holding time is less than 500 ms), the left front window rises; the rest windows operation is the same.

##### — Manual - Down

Gently press the left front door window switch (press and the holding time is less than 500 ms), left front window goes down; the rest windows operation is the same.

##### — Automatic - Up

Completely pull the left front door window switch (pull up and the holding time is greater than 500 ms), left front window rises to the upper limit until the switch is pressed or pulled up again; the rest windows operation is the same.

##### — Automatic - Down

Completely press the left front door window switch (press and the holding time is greater than 500 ms), left front windows goes down to the lower limit until the switch is pressed or pulled up again; the rest windows operation is the same.

##### Note

During the window rising and doing down period, if the window switch is pulled or pressed and held for more than 500 ms, the window will change its moving direction; If pressing the left front door window switch no more than 500 ms, the window will stop moving.

##### — Delay Function

With the ignition switch is turned on, the window is allowed to move. After 90 s the ignition switch is turned off, the controller the power will be cut off to disable the operation of the window.

##### — Anti-Trap Function (If Equipped)

The window regulator control module is equipped with an integrated obstacle detection / anti-trap system.

The anti-trap system works in the window seal all exposed edges and 4-200 mm within the window seals. Window anti-trap function requirements: the window has been initialized in the automatic-up process, any obstacle within 4mm from the top should activate the anti-trap function and the window movement should be reversed.

##### Note

— If a certain window has not been initialized or has lost its initialization, there is no automatic-up function, at this time the anti-trap function will not be activated.

— The anti-trap function is only available during window automatic-up process.

The anti-trap system meets the 2000/4/EC specification. The anti-trap system window anti-trap force shall not exceed 100 N.

##### — Comfort Closing Function (If Equipped) (If Equipped With Anti-Trap Function)

Comfort closing is through a LIN communication to automatically close the window. Once the comfort closing instruction is received, all the windows will move upward, until the windows reach the trip destination (the windows fully closed position). The activation sequence and delay requirement is controlled by software. During comfort closing period, the signal from the window switch will be ignored, and the anti-trap function is active.

##### — Motor Protection (If Equipped With Anti-Trap Function)

If the motor runs continuously for longer than 20 s, the control module shuts down and loses initialization.

##### — Adaptive Learn (If Equipped With Anti-Trap Function)

The system has the ability to adapt to the vehicle characteristics and environmental conditions throughout the vehicle lifetime, such as seals wear.

— Overheating Protection (If Equipped With Anti-Trap Function)

Control module provides protection against overheating through a thermal protection algorithms and activates overheating protection during anti-trap period. The system will complete the window reverse movement, but will ignore any new window upward command until the motor is completely cooled down.

When the overheating protection is enabled, windows can still open, but the windows can not be closed.

When the overheating protection is enabled, the control module can not switch to the sleep mode, until the system exits the overheating protection, and the control module can move the window.

### Outside Rearview Mirror Description and Operation

Exterior rearview mirror is controlled by the driver door switch. Rearview mirror has 3 switches. The left and right selector switch selects the desired rearview mirror, the direction buttons are used to adjust the rearview mirror position.

Exterior rearview mirrors have heating elements inside. When the rear window demister switch is pressed, the exterior mirror heating element will also be working. For defrost function operation. Refer to the "Rear Window Defrost" and [11.12.2 Description and Operation](#).

### 11.5.3 System Working Principle

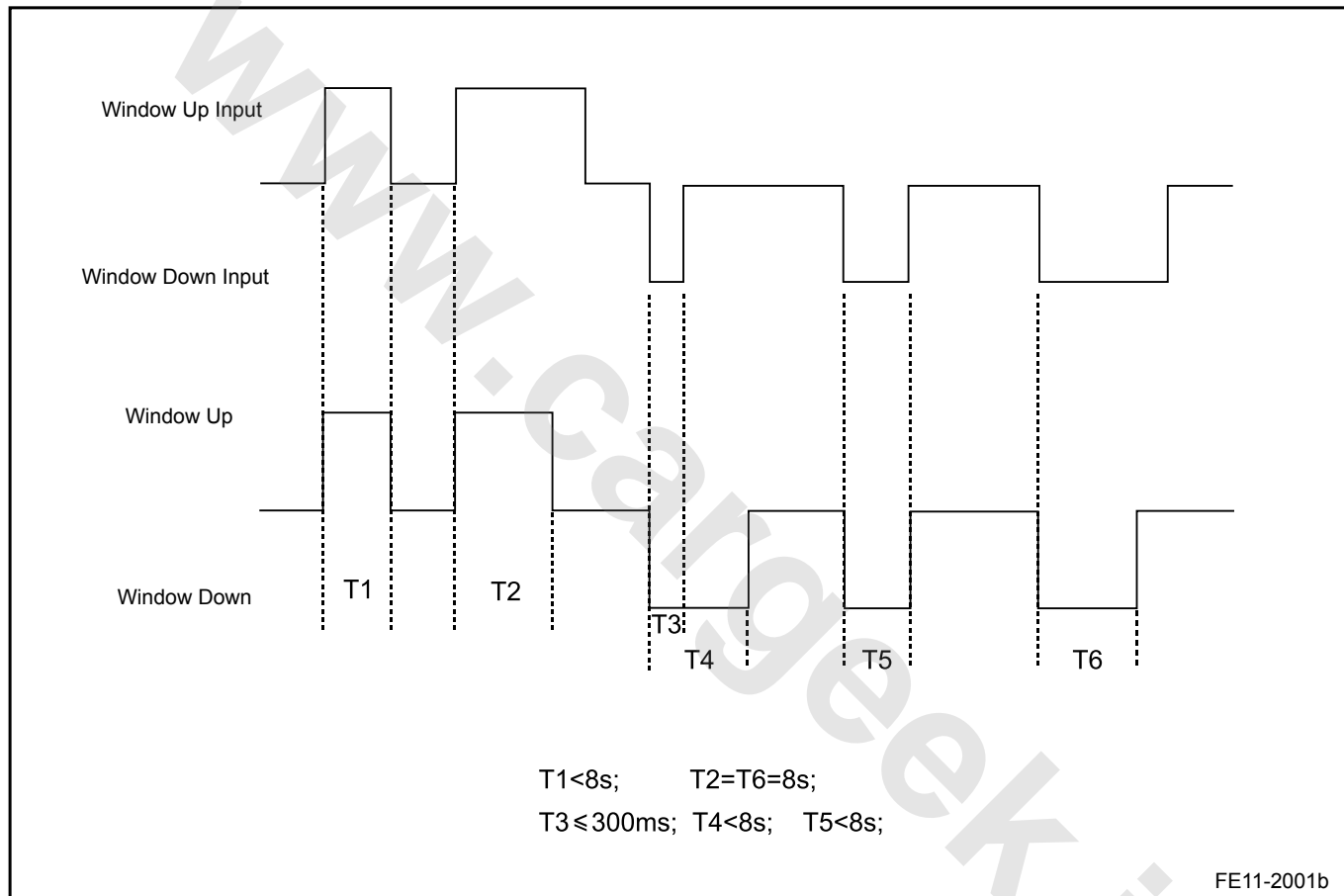
#### 11.5.3.1 Power Management

- Window regulator control module has a power supply (15 A).
- The left front door window regulator and the left rear door window share a power supply (30 A).
- The right front door window regulator and the right rear door window share a power supply (30 A).

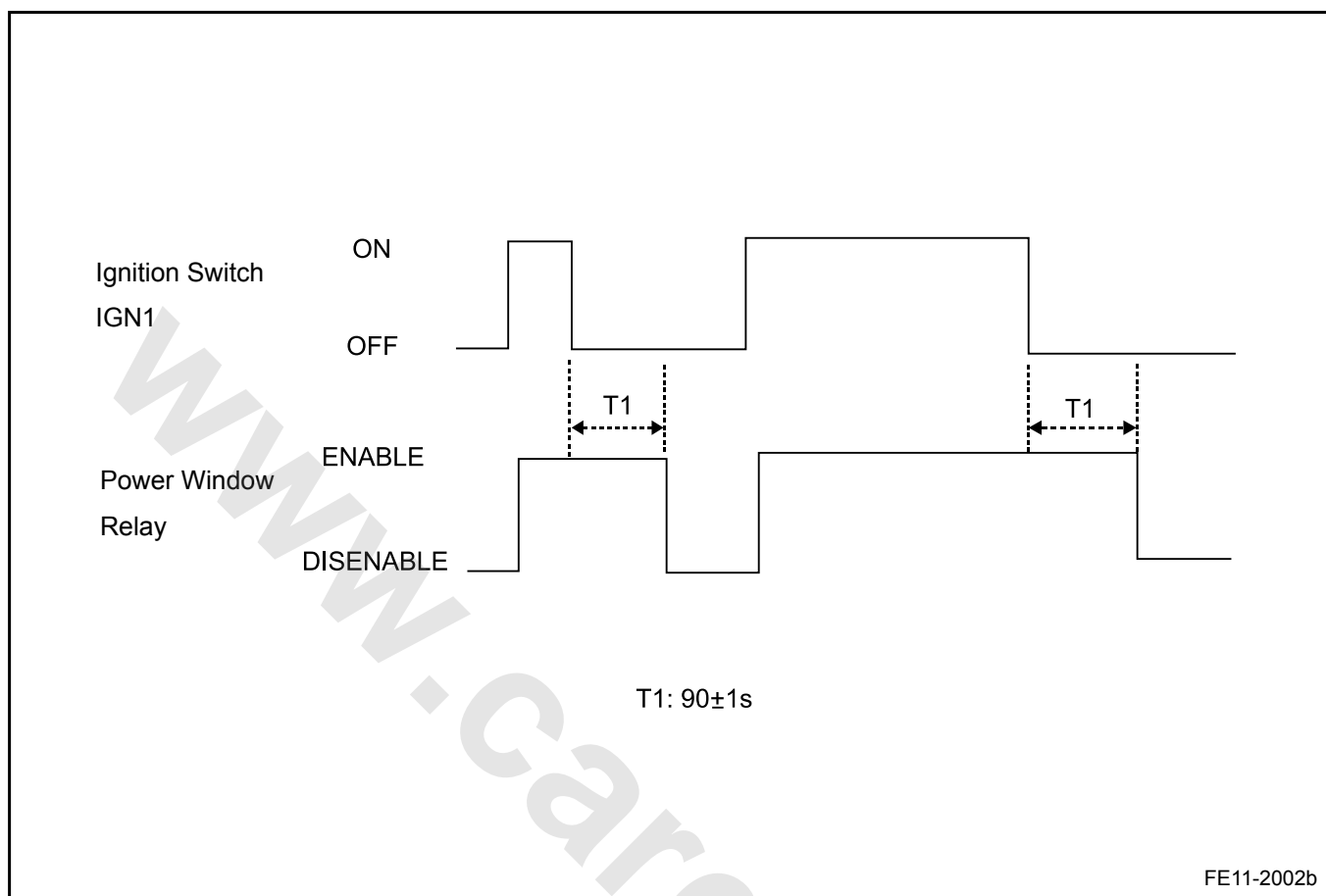
#### Note

Four window regulator switches low current controls high current, and have current protection function; four window regulator motors all have continuous output 8 s protection function.

#### 11.5.3.2 Functional Timing Diagram



### 11.5.3.3 Power Window Relay Time Control



### 11.5.3.4 Mode

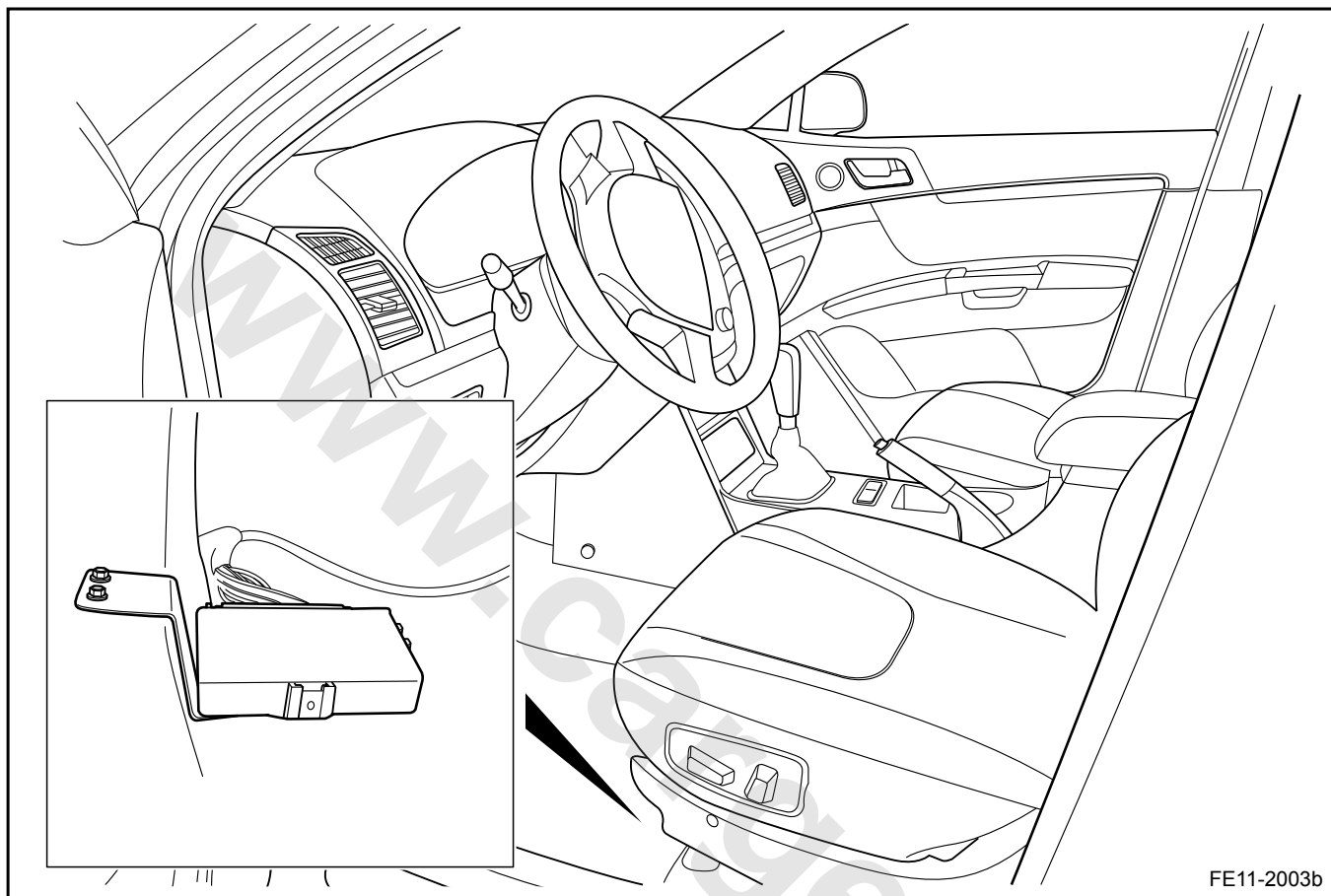
- Working Mode: All functions are available, normal operating current is obtained from the power supply + B.
- Sleep Mode: The supply current is reduced sleep mode current. The following two ways activate the system sleep mode.
  - LIN Master Node Sleep Mode Request
  - LIN Signal Interruption

If LIN signal is received from LIN master again, the system will exit sleep mode.

## 11.5.4 Component Locator

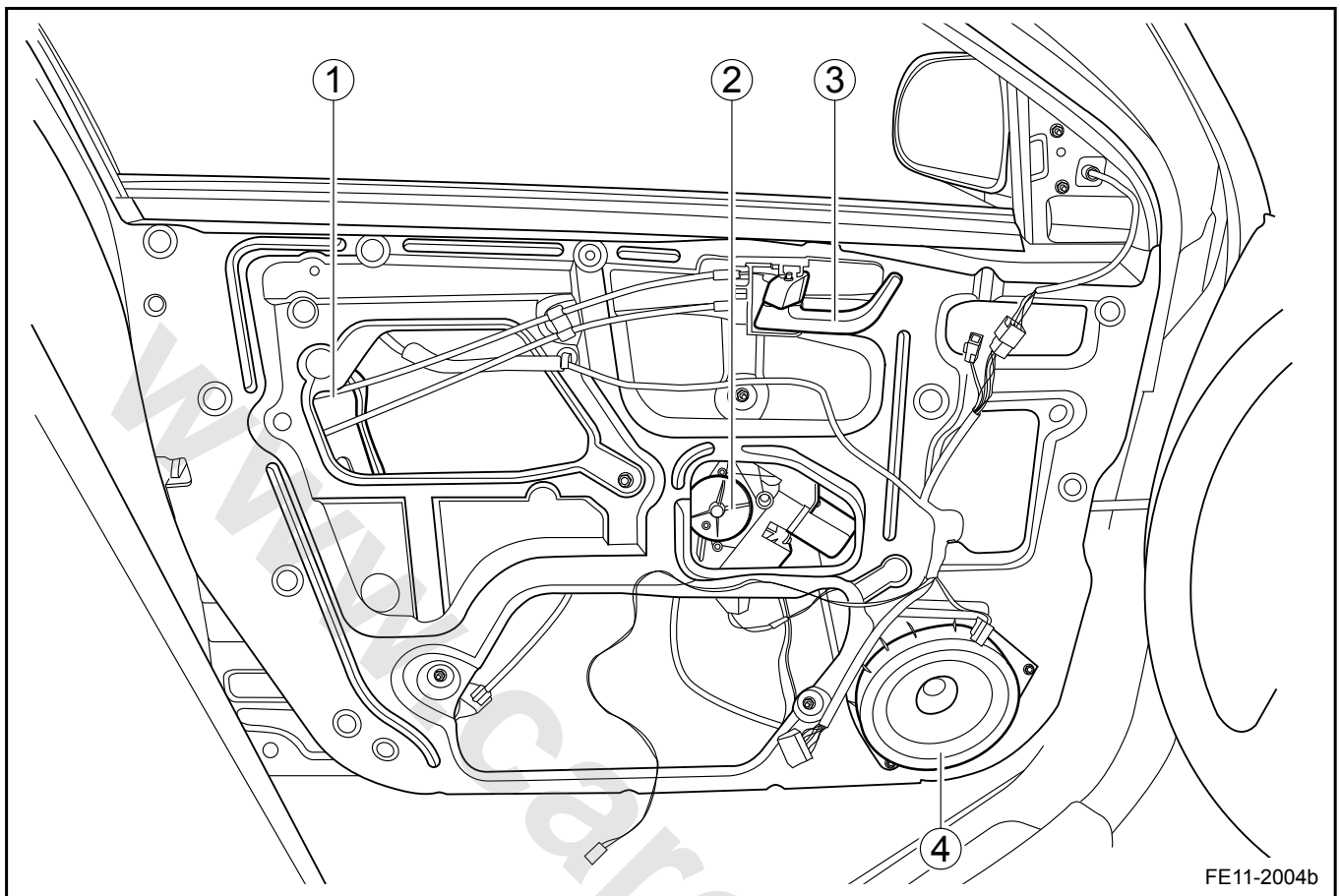
### 11.5.4.1 Component Locator

#### Electric Window Control Module (Without Express Down Function)





## Glass Regulator, Mirror

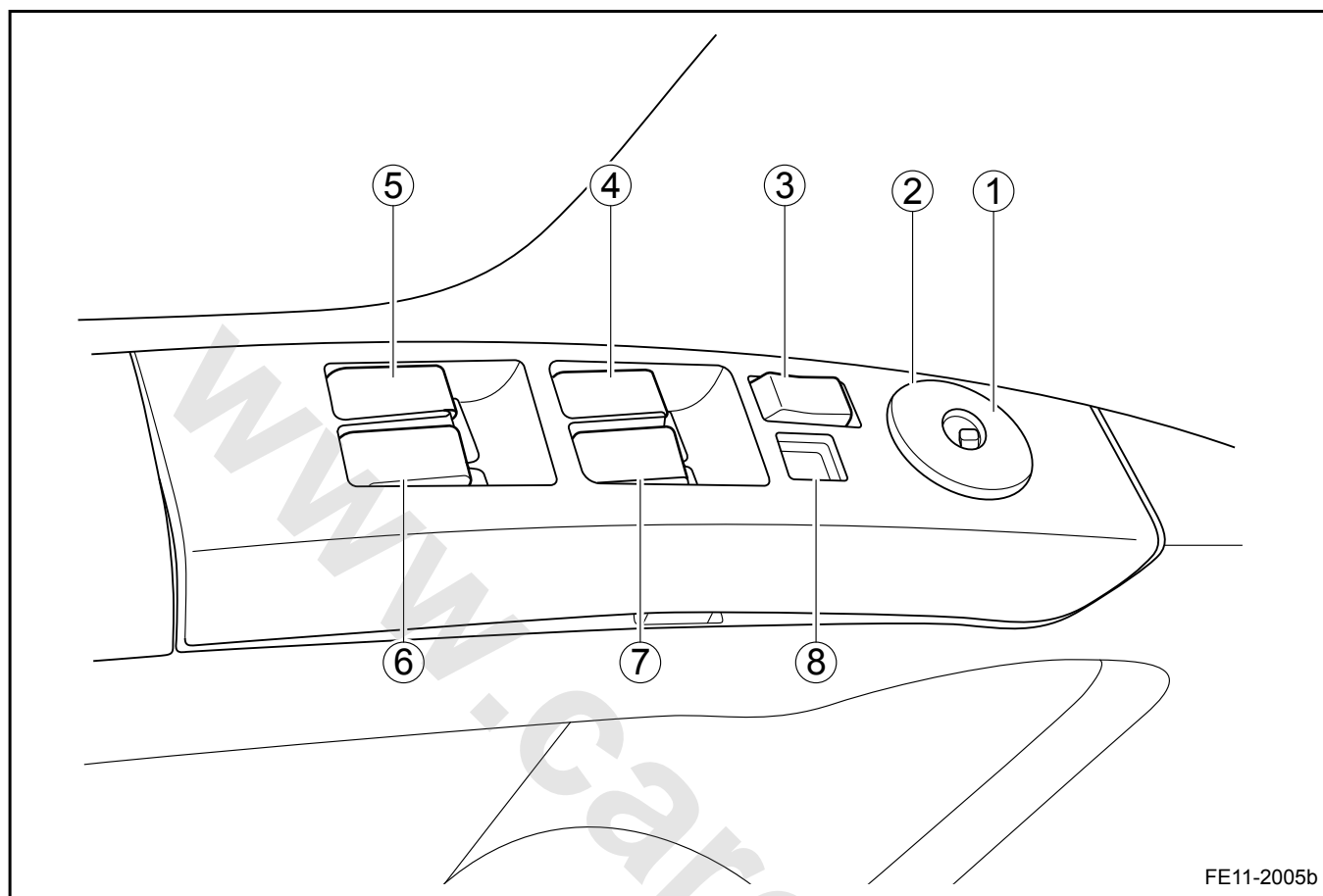


## Legend

- 1. Door Motor
- 2. Glass Motor
- 3. Inside Door Handle

- 4. Front Door Speaker

## Left Front Door Combination Switch



FE11-2005b

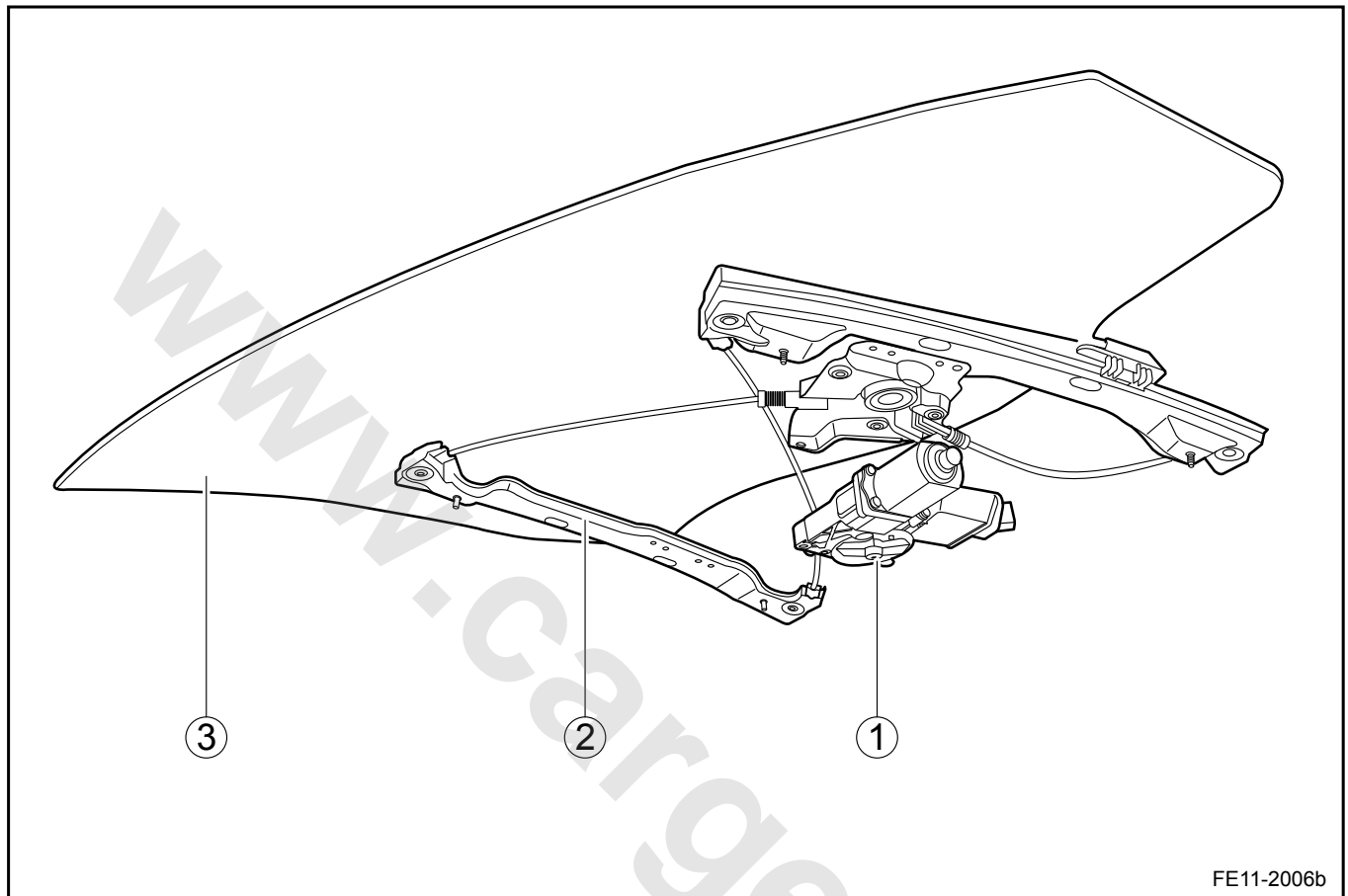
## Legend

- |   |                              |
|---|------------------------------|
| 1. Left/Right Outside Rearview Mirror Select Button | 6. Right Front Window Switch |
| 2. Left/Right Outside Rearview Mirror Adjust Button | 7. Right Rear Window Switch  |
| 3. Central Locking Button                           | 8. Window Locking Switch     |
| 4. Left Front Window Switch                         |                              |
| 5. Left Rear Window Switch                          |                              |

## 11.5.5 Disassemble View

### 11.5.5.1 Disassemble View

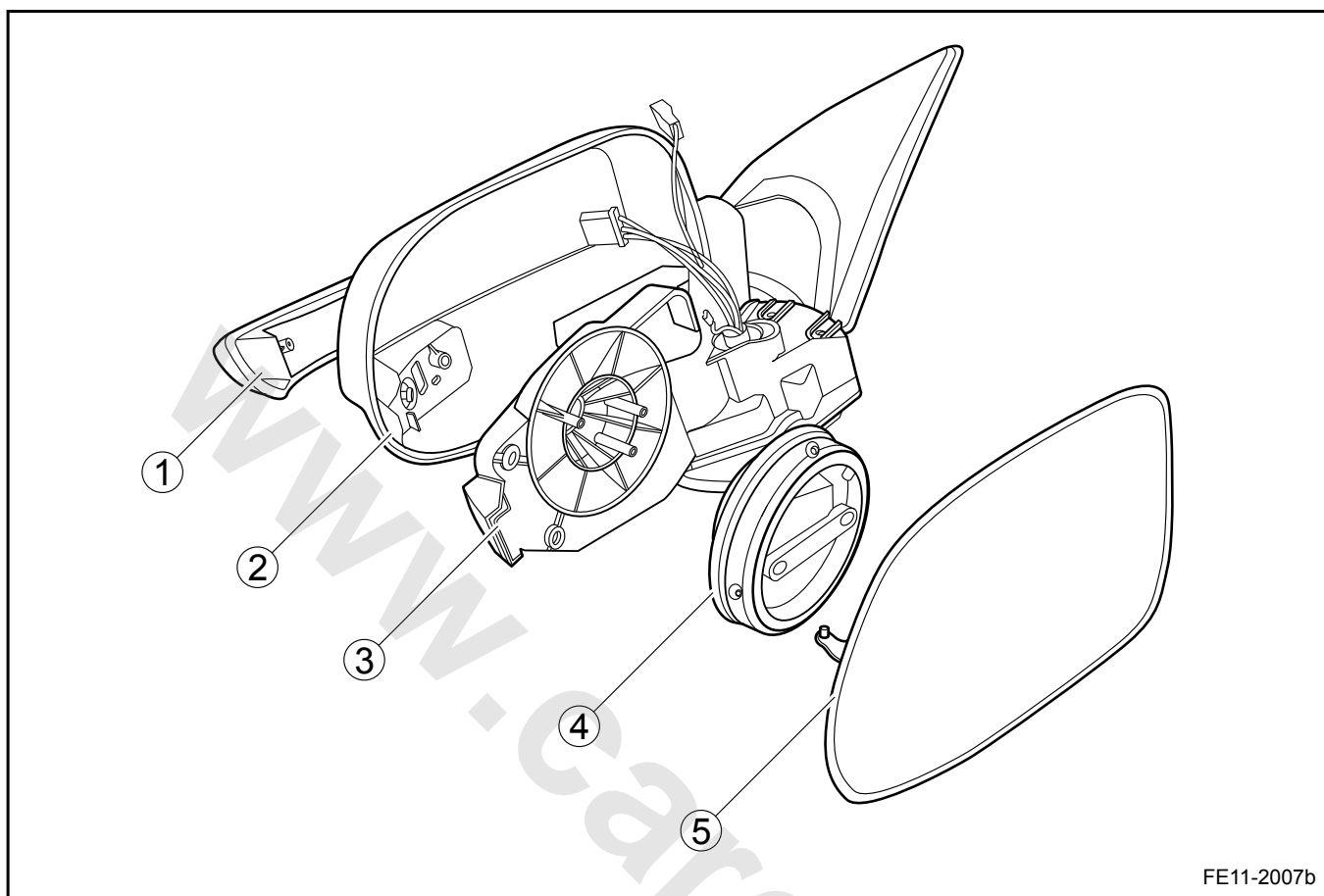
Window Regulator Assembly



#### Legend

- 1. Window Motor
- 2. Window Regulator Rail
- 3. Electric Window

## Outside Rearview Mirror Assembly



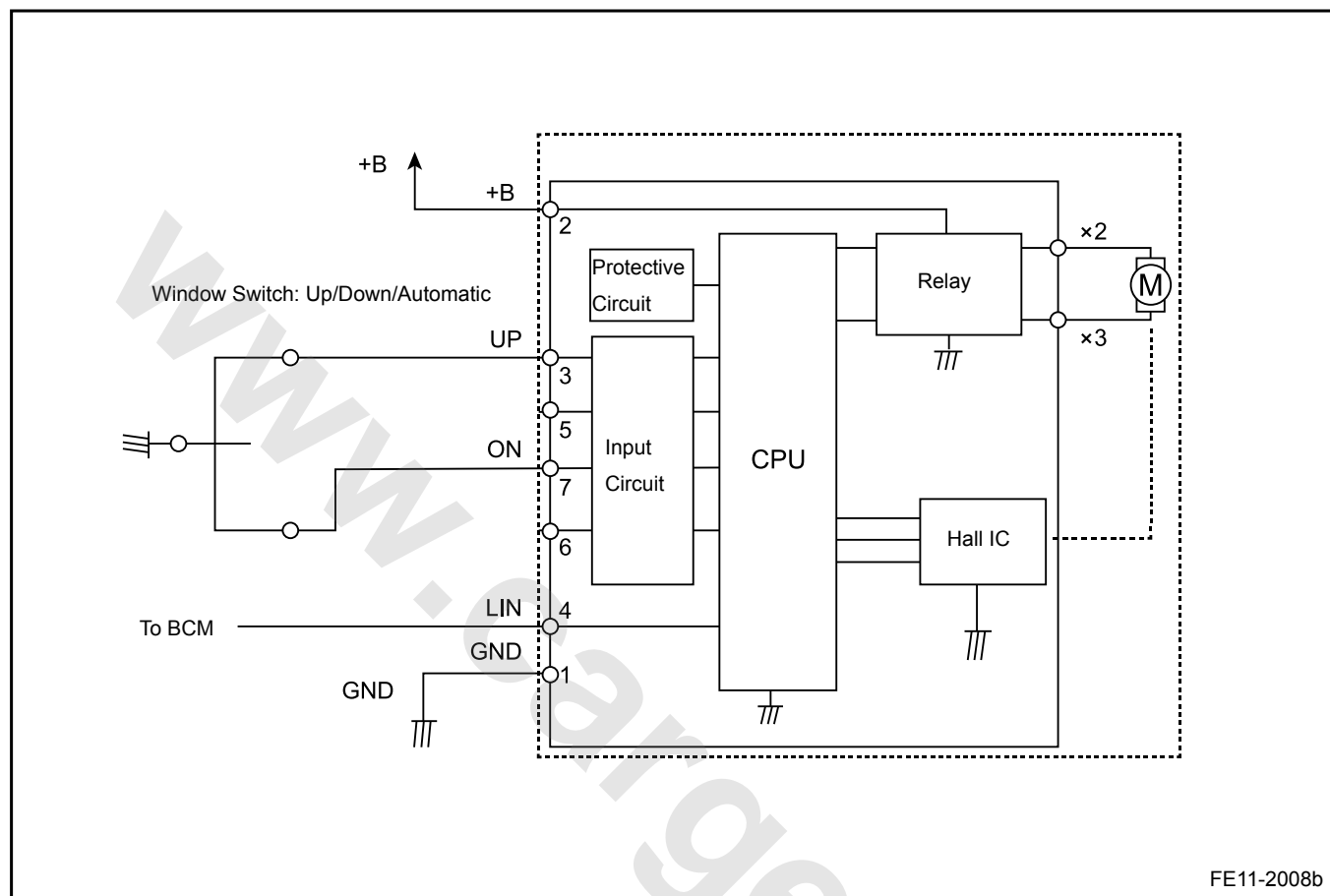
## Legend

- |  |   |
|--|---|
| 1. Electric Outside Rearview Mirror Turn Signal Lamp | 5. Outside Rearview Mirror Adjust Motor Glass (With Heating Wire) |
| 2. Outside Rearview Mirror Cover                     |   |
| 3. Outside Rearview Mirror Adjust Motor Bracket      |   |
| 4. Outside Rearview Mirror Adjust Motor              |   |

## 11.5.6 Schematic

## 11.5.6.1 Schematic

Schematic With Express Down (If Equipped)



## 11.5.7 Diagnostic Information and Procedures

### 11.5.7.1 Diagnosis Description

Refer to [11.5.2 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.5.7.2 Visual Inspection

- Check installed aftermarket equipments that may affect the power windows and power mirrors operations.
- Check the easy to access system components to identify whether there is a significant damage or potential malfunction.
- Check whether the window initialization failed.

### 11.5.7.3 Control Module Diagnostic Information

Power window control module reports the following failures through the LIN bus:

- Motor / Relay Malfunction
- Hall Sensor Malfunction
- Thermal Protection Triggered
- Up Button Is Pressed
- Down Button Is Pressed

### 11.5.7.4 Glass Regulator Initialization (If Window Express Down Feature Is Available)

- To initialize the system, the glass must be up all the way to the top, and the switch is pressed to lift the window glass until the control module stops the glass motor (within 1s after the glass reaches the top). Each time the system lost initialization, repeat these steps to restore the window express down function.
- Initialization, all system functions must be operational.
- Initialization, the control module voltage should not drop to below 9 V.
- When the control module supply voltage drops momentarily, but the voltage is still higher than 6V, the initialization is effective.
- Every time the glass is lift to the top till stop using automatic mode (at the top position); system will obtain the latest top position and overwrite the previous value to calculate the top position.

#### Note

- Only when the new value is in the calibrated value range, it overwrites the original value, otherwise the control module will ignore the new value.
- If the initialization process has not been implemented or have been lost, system does not provide automatic up, express down and comfort closing function. Manual up, down and auto-down feature can be operated.

In the following circumstances, the initialization will be lost (If window express down is available is equipped)

- Power supply is cut off.
- When the glass is moving up, the power supply voltage drops below 6 V.
- Control module can not detect logical Hall sensor signals.
- Window glass moves to a location outside the operating range.

## 11.5.7.5 Window Regulator Control Module Terminal List (Without The Express Down)

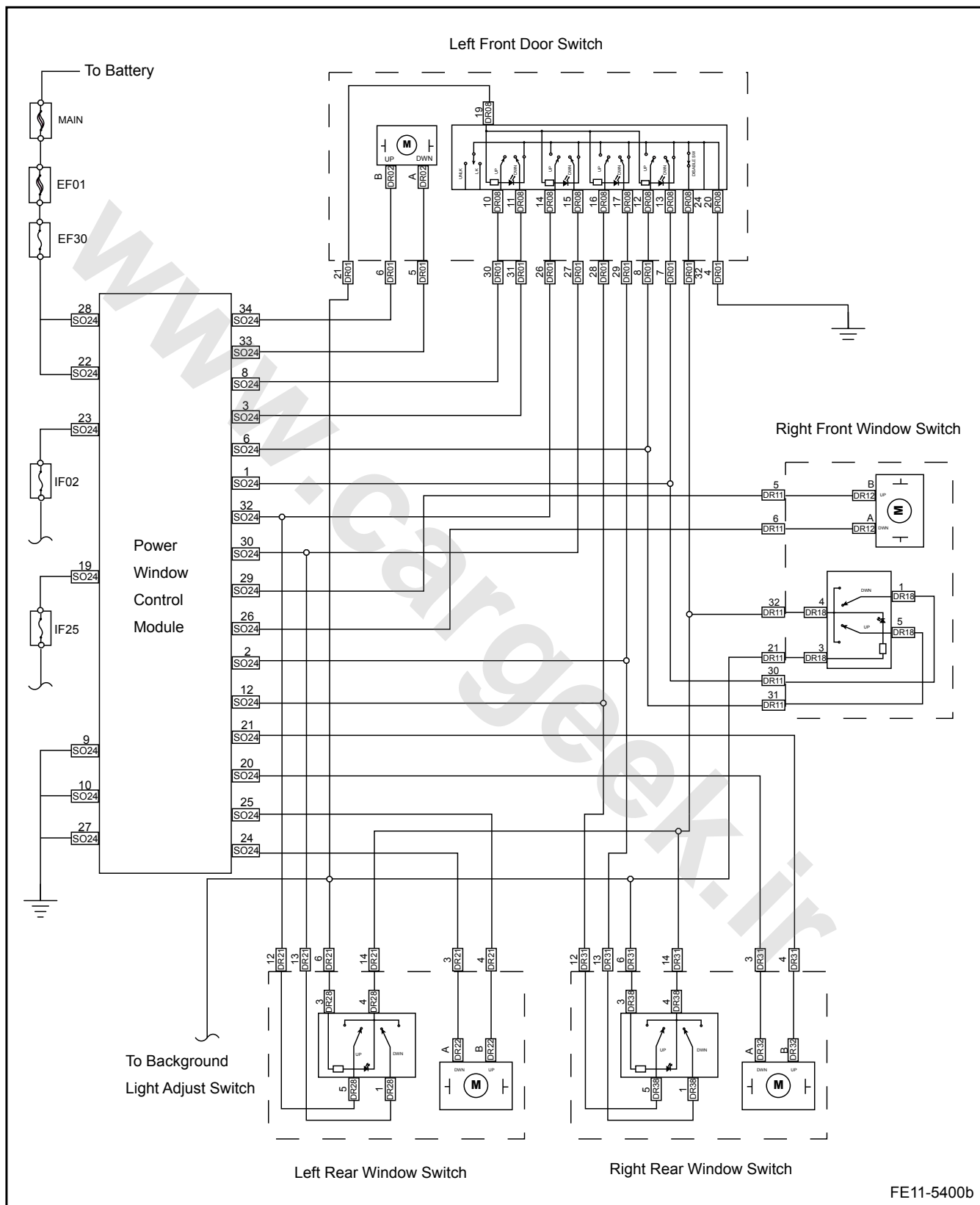
Terminal ID	Wiring Color	Terminal Instructions	Status	Specified Conditions
1	L/W	Right Front Window Regulator Down Input	Right Front Window Down	GND
2	L / Y	Right Rear Window Regulator Down Input	Right Rear Window Down	GND
3	L	Left Front Window Regulator Down Input	Left Front Window Down	GND
4	--	--	--	--
5	--	--	--	--
6	R/W	Right Front Window Regulator Up Input	Right Front Window Up	GND
7	--	--	--	--
8	V	Left Front Window Regulator Up Input	Left Front Window Up	GND
9	B	Control Module Ground	Always	GND
10	B	Control Module Ground	Always	GND
11	-	-	-	-
12	R/B	Right Rear Window Regulator Up Input	Right Rear Window Up	GND
13	--	--	--	--
14	--	--	--	--
15	--	--	--	--
16	--	--	--	--
17	--	--	--	--
18	--	--	--	--
19	R	Ignition Power Supply	Ignition Switch On	+12 V
20	V / L	Right Rear Window Regulator Down Output	Right Rear Window Down	+12 V
21	L/W	Right Rear Window Regulator Up Output	Right Rear Window Up	+12 V
22	R/W	Right Side Window Regulator Motor Power Supply	Always	+12 V
23	G/W	Control Module Power Supply	Always	+12 V
24	V	Left Rear Window Regulator Down Output	Left Rear Window Down	+12 V
25	L	Left Rear Window Regulator Up Output	Left Rear Window Up	+12 V
26	W/G	Right Front Window Regulator Down Output	Right Front Window Down	+12 V
27	B	Signal Ground	Always	GND

Terminal ID	Wiring Color	Terminal Instructions	Status	Specified Conditions
28	R/W	Left Side Window Regulator Motor Power Supply	Always	+12 V
29	Y/B	Right Front Window Regulator Up Output	Right Front Window Up	+12 V
30	L/B	Left Rear Window Regulator Down Input	Left Rear Window Down	GND
31	--	--	--	--
32	L/R	Left Rear Window Regulator Up Input	Left Rear Window Up	GND
33	G/B	Left Front Window Regulator Down Output	Left Front Window Down	+12 V
34	R/B	Left Front Window Regulator Up Output	Left front window up	+12 V
35	--	--	--	--



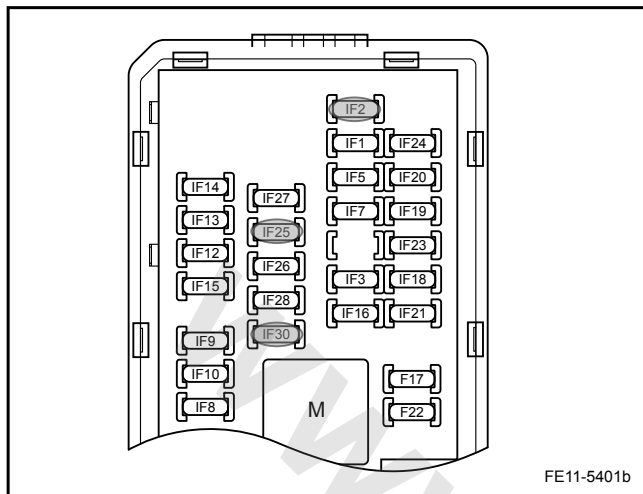
## 11.5.7.6 All Electric Windows Inoperative (Without Window Express Down Function)

Schematic:



## Diagnostic Steps:

Step 1	Check the fuses IF2, IF25 and EF30.
--------	-------------------------------------



- (a) Check whether fuses IF2, IF25 and EF30 are blown.  
 (b) Fuse Rating:

IF2	15 A
IF25	10 A
EF30	30 A

Are fuses normal?

No

Go to step 3

Yes

Step 2	Check fuses IF2, IF25 and EF30 circuits.
--------	--

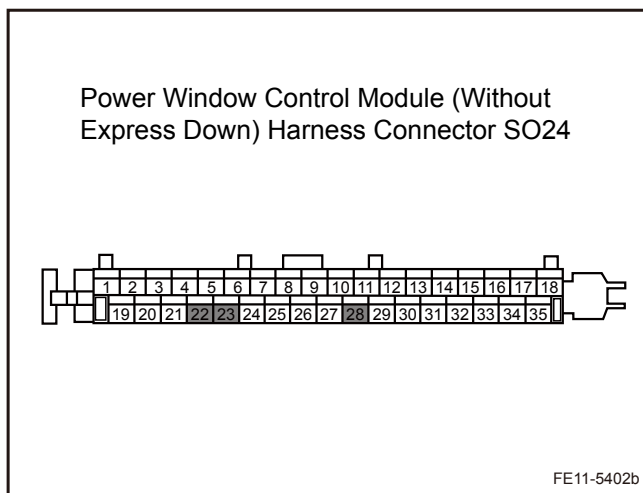
- (a) Check whether there is a short circuit.  
 (b) Repair the circuits. Confirm that there are no short circuits.  
 (c) Replace with fuses with rated current.  
 Is the window regulator working properly?

Yes

System normal

No

Step 3	Check the regulator control module power supply circuits.
--------	---



- (a) Measure regulator control module harness connector SO24 terminals No.22,23,28 voltage with a multimeter.  
 Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 5

No

Step 4	Repair the window regulator control module power supply open circuits.
--------	--

- (a) Repair the open circuit between the window regulator control module harness connector SO24 terminal No.23 and fuse

IF2; Repair the open circuit between the window regulator control module harness connector SO24 terminal No.22,28 and fuse EF30.

Is the window regulator working properly?

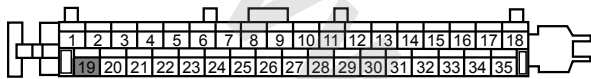
Yes

System normal

No

**Step 5** Check the window regulator control module ignition power supply circuit.

Power Window Control Module (Without Express Down) Harness Connector SO24



FE11-5403 b

- (a) Turn on the ignition switch.
- (b) Check the window regulator control module harness connector SO24 terminal No.19 voltage with a multimeter.  
Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 7

No

**Step 6** Repair the window regulator control module ignition power supply open circuit.

- (a) Repair the open circuit between the window regulator control module harness connector SO24 terminal No.19 and fuse IF25.

Is the window regulator working properly?

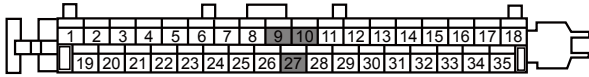
Yes

System normal

No

**Step 7** Check the window regulator control module ground circuit.

### Power Window Control Module (Without Express Down) Harness Connector SO24



FE11-5404 b

- (a) Disconnect the window regulator control module harness connector.
- (b) Test continuity between the window regulator control module harness connector SO24 terminals No.9,10,27 and ground with a multimeter.

Test Terminal	Continuity
SO249-Body Ground	Less than 1 $\Omega$
SO2410-Body Ground	Less than 1 $\Omega$
SO2427-Body Ground	Less than 1 $\Omega$

Is the resistance specified value?

Yes

Go to step 9

No

**Step 8** Repair the window regulator control module and the ground open circuit.

- (a) Repair the open circuit between the window regulator control module harness connector SO24 terminals No.9,10,27 and ground.

Is the window regulator working properly?

Yes

System normal

No

**Step 9** Replace the window regulator control module.

- (a) Replace the window regulator control module. Refer to [11.5.8.8 Window Regulator Module Replacement \(If equipped\)](#).
- (b) Confirm the repair completed.

Next

**Step 10** System normal.

### 11.5.7.7 Left Front Window Regulator Inoperative (Without Window Express Down Function)

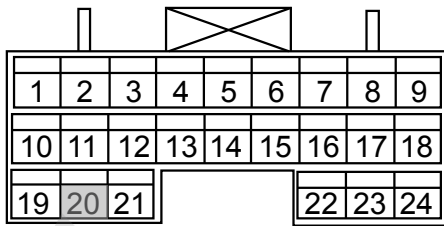
Schematic:

Refer to [11.5.7.6 All Electric Windows Inoperative \(Without Window Express Down Function\)](#).

Diagnostic Steps:

**Step 1** Check the left front window lift switch ground circuit.

Left Front Window Switch Harness Connector DR08



FE11-5405b

- Disconnect the left front window switch wiring harness connector.
- Check the resistance between the left front window switch wiring harness connector DR08 terminal No.20 and the ground.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 3

No

**Step 2** Repair the left front window switch ground circuit open.

- Repair the left front window switch ground circuit open.
- Is the left front window regulator working correctly?

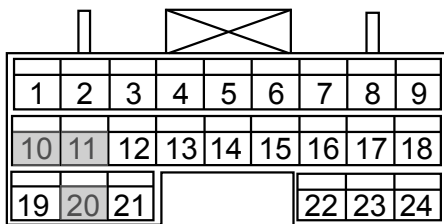
Yes

System normal

No

**Step 3** Check the left front window switch.

Left Front Window Switch Harness Connector DR08



FE11-5406b

- Connect the left front window switch wiring harness connector.
- Operate the left front window switch button.
- Test continuity between the left the front door switch wiring harness connector DR08 terminal No.20 and terminal No. 10,11 with a multimeter.

Test Terminal	Test Conditions	Continuity
DR08 (20)-DR01 (10)	Down	10 k $\Omega$ or higher
DR08 (20)-DR01 (10)	Up	Less than 1 $\Omega$
DR08 (20)-DR01 (11)	Down	Less than 1 $\Omega$
DR08 (20)-DR01 (11)	Up	10 k $\Omega$ or higher

Is the resistance between terminals specified value?

Yes

Go to step 5

No

**Step 4** Replace the left front window switch.

- Replace the left front window switch. Refer to [11.5.8.4 Left Front Window Switch Replacement](#).

Is the window regulator working properly?

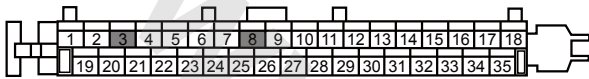
Yes

System normal

No

**Step 5** Check the window regulator control module left front signal circuit.

Power Window Control Module (Without Express Down) Harness Connector SO24



FE11-5407b

- (a) Operate the left front window switch button.  
 (b) Test continuity between the window regulator control module harness connector SO24 terminals 3,8 and the ground with a multimeter.

Test Terminal	Test Conditions	Continuity
SO2 (48) - Body Ground	Press	10 kΩ or higher
SO2 (48) - Body Ground	Filed	Less than 1 Ω
SO2 (43) - Body Ground	Press	Less than 1 Ω
SO2 (43) - Body Ground	Filed	10 kΩ or higher

Is the voltage specified value?

Yes

Go to step 7

No

**Step 6** Repair the window regulator control module left front signal circuit open circuit.

- (a) Repair the open circuit between the window regulator control module harness connector SO24 terminal No.3,8 and the left front door wiring harness connector DR08 terminal No.11,10 respectively.

Is the left front window regulator working properly?

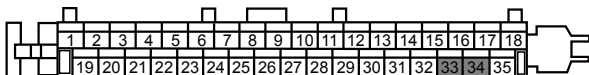
Yes

System normal

No

**Step 7** Check the window regulator left front control module control circuit.

Power Window Control Module (Without Express Down) Harness Connector SO24



FE11-5408b

- (a) Operate the left front window switch button.  
 (b) Measure the left front window regulator motor wiring harness connector SO24 terminals No.33,34 voltage with a multimeter.

Test Terminal	Test Conditions	Standard Value
SO24 (33)-SO24 (34)	Down	11-14 V
SO24 (33)-SO24 (34)	Up	11-14 V

Is the voltage specified value?

Yes

Go to step 9

No

Step 8 Replace the window regulator control module.

- (a) Replace the window regulator control module. Refer to [11.5.8.8 Window Regulator Module Replacement \(If equipped\)](#).

IS the left front window regulator working properly?

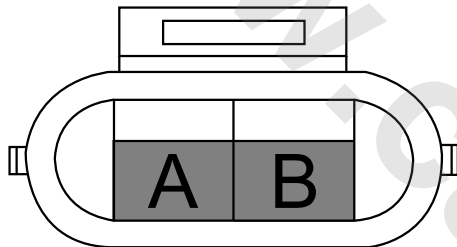
Yes

System normal

No

Step 9 Check the left front window regulator control motor circuit.

Driver Door Window Motor Harness Connector DR02



FE11-5409b

- (a) Operate the left front window switch button.  
 (b) Test continuity between the left front window regulator motor harness connector DR02 terminals A, B and the ground with a multimeter.

Test Terminal	Test Conditions	Standard Value
DR02 (A)-DR02 (B)	Down	11-14 V
DR02 (A)-DR02 (B)	Up	11-14 V

Is the resistance specified value?

Yes

Go to step 11

No

Step 10 Repair the left front window regulator motor control circuit open.

- (a) Repair the open circuit between the window regulator motor harness connector DR02 terminals A,B and the left front window regulator control module wiring harness connector SO24 terminals No.33,34 respectively.

Is the left front window regulator working correctly?

Yes

System normal

No

Step 11 Replace the left front window regulator motor.

- (a) Replace the left front window regulator motor. Refer to [11.5.8.3 Left Front Window Regulator Motor Replacement](#).  
 Confirm the repair completed.

Next

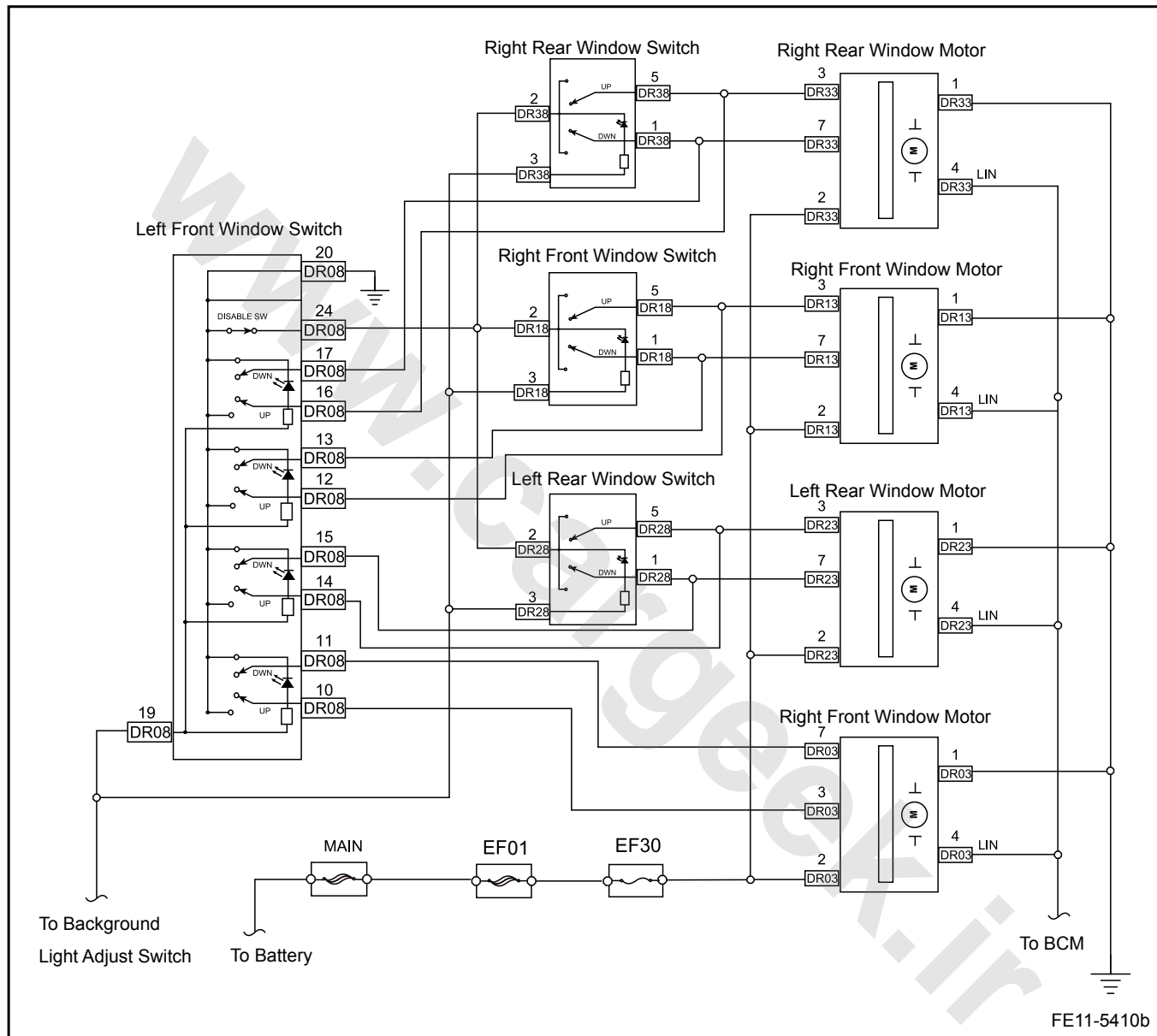
Step 12 System normal.

## Note

Other single window regulator inoperative diagnostic is similar.

## 11.5.7.8 Window Regulator Inoperative (With Window Express Down Function)

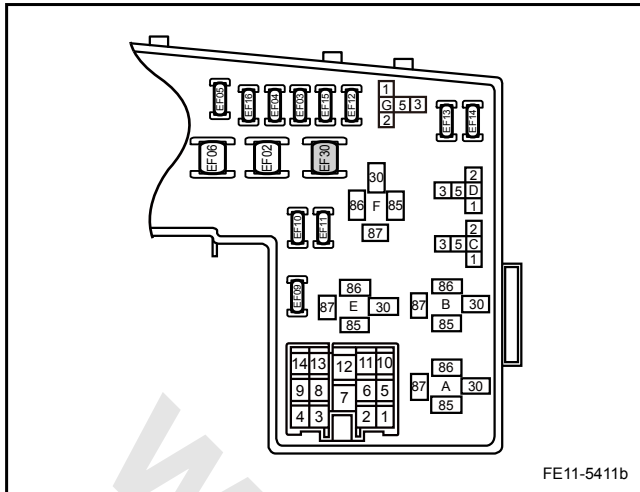
Schematic:



## Diagnostic Steps:

Step 1	Check the fuse EF30.
--------	----------------------





(a) Check whether the fuse EF30 is blown.

Fuse Rated Current: 30 A

Is the fuse blown?

No

Go to step 3

Yes

Step 2 Check the fuse EF30 circuit.

(a) Check whether there is a short circuit.

(b) Repair the circuits. Confirm that there are no short circuits.

(c) Replace with fuses with rated current.

Is the window regulator working properly?

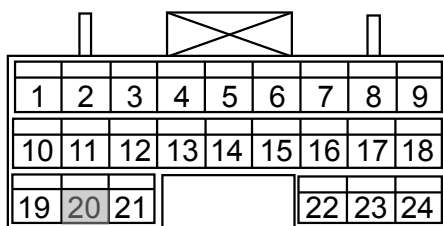
Yes

System normal

No

Step 3 Check the left front door combination switch ground circuit.

Left Front Window Switch Harness Connector DR08



FE11-5405b

(a) Disconnect the left front window switch wiring harness connector.

(b) Measure resistance between the left front window switch wiring harness connector DR08 terminal No.20 and the ground.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 5

No

Step 4 Repair the left front door combination switch ground circuit open.

(a) Repair the left front door combination switch ground circuit open.

Is the window regulator working properly?

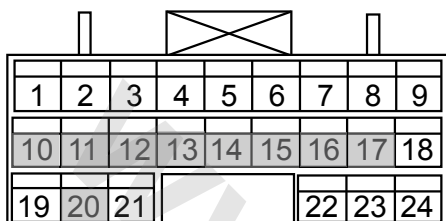
Yes

System normal

No

Step 5 Check the left front window switch.

Left Front Window Switch Harness Connector DR08



FE11-5412b

- Connect the left front window regulator switch wiring harness connector.
- Operate the window switch.
- Test continuity between the left front window switch wiring harness connector DR08 corresponding terminals with a multimeter.

Test Terminal	Test Conditions	Continuity
DR08 (20)-DR08 (11)	Down	Less than 1 $\Omega$
DR08 (20)-DR08 (15)	Down	Less than 1 $\Omega$
DR08 (20)-DR08 (17)	Down	Less than 1 $\Omega$
DR08 (20)-DR08 (13)	Down	Less than 1 $\Omega$
DR08 (20)-DR08 (10)	Up	Less than 1 $\Omega$
DR08 (20)-DR08 (14)	Up	Less than 1 $\Omega$
DR08 (20)-DR08 (16)	Up	Less than 1 $\Omega$
DR08 (20)-DR08 (12)	Up	Less than 1 $\Omega$

Is the resistance specified value?

Yes

Go to step 7

No

Step 6 Replace the left front window switch.

- Replace the left front window switch. Refer to [11.5.8.4 Left Front Window Switch Replacement](#).

Is the window regulator working properly?

Yes

System normal

No

Step 7 Check the faulty window regulator motor control signal circuit.

- Operate the faulty window switch.
- Test continuity between the window regulator motor corresponding wiring harness connector terminals No.3,7 and the ground with a multimeter.

Test Terminal	Test Location	Test Condition	Continuity
DR03 (7)-DR08 (11)	Left Front Window	Down	Less than 1 $\Omega$

Test Terminal	Test Location	Test Condition	Continuity
DR03 (3)- DR08 (10)	Left Front Window	Up	Less than 1 $\Omega$
DR23 (7)- DR08 (15)	Left Rear Window	Down	Less than 1 $\Omega$
DR23 (3)- DR08 (14)	Left Rear Window	Up	Less than 1 $\Omega$
DR13 (7)- DR08 (13)	Right Front Window	Down	Less than 1 $\Omega$
DR13 (3)- DR08 (12)	Right Front Window	Up	Less than 1 $\Omega$
DR33 (7)- DR08 (17)	Right Rear Window	Down	Less than 1 $\Omega$
DR33 (3)- DR08 (16)	Right Rear Window	Up	Less than 1 $\Omega$

Is the resistance specified value?

Yes

Go to step 9

No

Step 8 Repair the faulty window regulator motor control signal circuit open.

(a) Repair the faulty window regulator motor control signal circuit open.

(b) Replace the faulty window switch.

Is the window regulator working properly?

Yes

System normal

No

Step 9 Replace the faulty window regulator motor.

(a) Replace the faulty window regulator motor. Refer to [11.5.8.3 Left Front Window Regulator Motor Replacement](#).

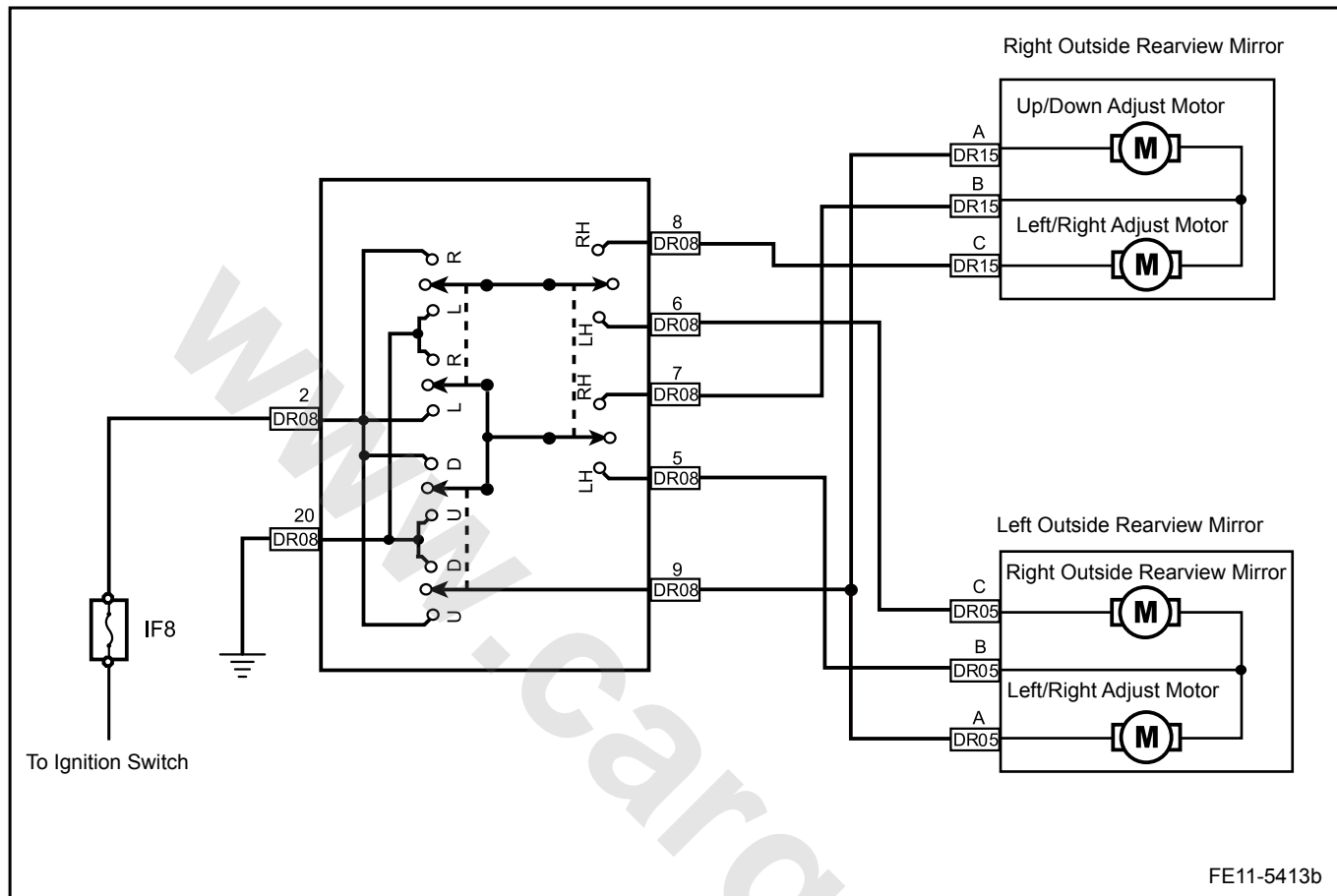
Confirm the repair completed.

Next

Step 10 System normal.

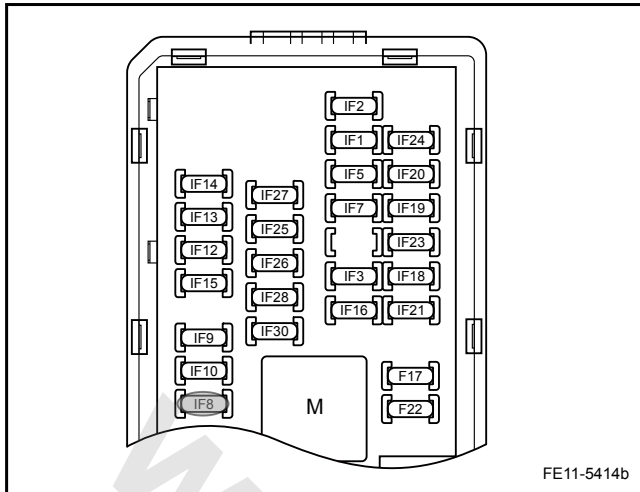
## 11.5.7.9 Electric Rearview Mirror Can Not Be Adjusted

Schematic:



Diagnostic Steps:

Step 1	Check the left and right outside electric rearview mirror working status.
<p>(a) Adjust the outside electric rearview mirror on both sides. Both sides outside rearview mirrors can not work.</p> <p>No</p> <p>Go to step 10</p>	
Yes	
Step 2	Check the fuse IF8.



(a) Is the fuse IF8 blown?

Fuse Rated Current: 10 A

Is the fuse blown?

No

Go to step 3

Yes

Step 3 Check the fuse IF8 circuit.

- (a) Check whether there is a short circuit.  
 (b) Repair circuits, Confirm that there are no short circuits.  
 (c) Replace with fuses with rated current.  
 Confirm the electric rearview mirror is working correctly.

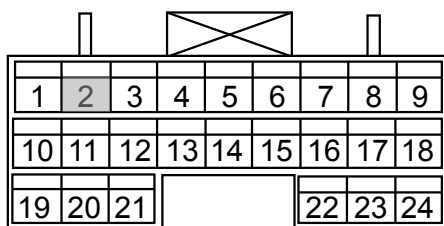
Yes

System normal

No

Step 4 Check the left front window switch power supply circuit.

Left Font Window Switch Harness Connector DR08



- (a) Disconnect the left front window switch wiring harness connector.  
 (b) Check the left front window switch wiring harness connector DR08 terminal No.2 voltage.  
 Voltage Standard Value: 11-14 V

Is the voltage normal?

Yes

Go to step 6

No

Step 5 Repair the left front window switch power supply circuit open.

- (a) Repair the left front window switch power supply circuit open.  
 Confirm electric rearview mirror is working correctly.

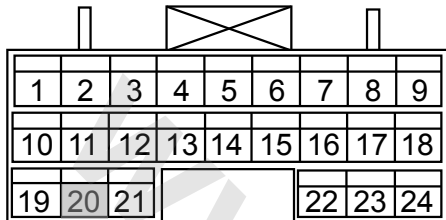
Yes

System normal

No

Step 6 Check the left front window switch ground circuit.

Left Front Window Switch Harness Connector DR08



FE11-5405b

- (a) Disconnect the left front window switch wiring harness connector.
- (b) Check resistance between the left front window switch wiring harness connector DR08 terminal No.20 and the ground.  
Standard Resistance: Less than 1  $\Omega$

Yes

Go to step 8

No

Step 7 Repair the left front window switch ground circuit open.

- (a) Repair the left front window switch ground circuit open.  
Confirm electric rearview mirror is working correctly.

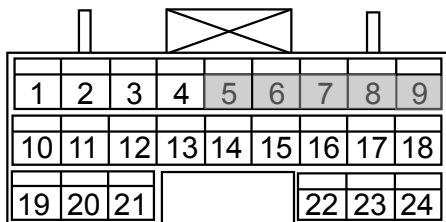
Yes

System normal

No

Step 8 Check the left front window regulator switch.

Left Font Window Switch Harness Connector DR08



FE11-5416b

- (a) Connect left front window switch wiring harness connector.
- (b) Operate the electric mirror adjust button.
- (c) Measure the left front door combination switch wiring harness connector DR08 corresponding terminals voltage with a multimeter.

Test Terminal	Test Conditions	Standard Value
DR08 (9)-DR08 (5)	Left, Upward	11-14 V
DR08 (9)-DR08 (5)	Left, Downward	- (11-14) V
DR08 (6)-DR08 (5)	Left, Right	11-14 V
DR08 (6)-DR08 (5)	Left, Left	- (11-14) V
DR08 (9)-DR08 (7)	Right, Upward	11-14 V
DR08 (9)-DR08 (7)	Right, Downward	- (11-14) V
DR08 (8)-DR08 (7)	Right, Right	11-14 V

Test Terminal	Test Conditions	Standard Value
DR08 (8)-DR08 (7)	Right, Left	- (11-14) V

Is the voltage specified value?

Yes

Go to step 10

No

Step 9 Replace the left front window switch.

- (a) Replace the left front window switch. Refer to [11.5.8.4 Left Front Window Switch Replacement](#).

Confirm the electric rearview mirror is working correctly.

Yes

System normal

No

Step 10 Check the fault electric mirror working status.

- (a) Select the faulty mirror.  
(b) Adjust upward, downward, left, right.

Confirm the electric rearview mirror can be adjusted upward or downward.

Yes

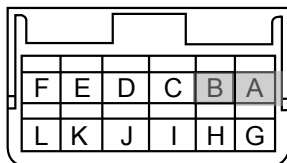
Go to step 14

No

Step 11 Check the faulty mirror upward and downward control signal circuits.

Driver Side Outside Rearview Mirror  
Harness Connector DR05

Passenger Side Outside Rearview  
Mirror Harness Connector DR15



FE11-5417b

- (a) Operate the electric rearview mirror upward and downward.  
(b) Measure voltage between the faulty electric mirror harness connector DR05 (left) or DR15 (right) terminal A and B with a multimeter.

Test Terminal	Test Conditions	Continuity
DR05 (A)-DR05 (B)	Up	11-14 V
DR05 (A)-DR05 (B)	Down	- (11-14) V
DR15 (A)-DR15 (B)	Up	11-14 V
DR15 (A)-DR15 (B)	Down	- (11-14) V

Is the voltage specified value?

Yes

Go to step 13

No

Step 12 Repair the faulty electric mirror upward and downward control signals open circuit.

- (a) Repair the faulty electric mirror upward and downward control signals open circuit.

Confirm the electric rearview mirror is working correctly.

Yes

System normal

Step 13 Replace the faulty electrical outside rearview mirror motor.

- (a) Replace the faulty electrical outside rearview mirror motor.  
Refer to [11.5.8.5 Electric Outside Rearview Mirror Adjust Motor Replacement](#).

Confirm whether the electric rearview mirror can be adjusted to left and right.

Yes

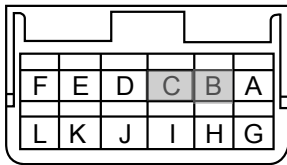
System normal

No

Step 14 Check the faulty electric mirror left and right control signal circuit.

Driver Side Outside Rearview Mirror Harness Connector DR05

Passenger Side Outside Rearview Mirror Harness Connector DR15



FE11-5418b

- (a) Operate the electric mirror left and right adjust buttons.  
(b) Measure voltage between the faulty electric mirror harness connector DR05 (left) or DR15 (right) terminal C and B with a multimeter.

Test Terminal	Test Conditions	Continuity
DR05 (C)-DR05 (B)	Right	11-14 V
DR05 (C)-DR05 (B)	Left	- (11-14) V
DR15 (C)-DR15 (B)	Right	11-14 V
DR15 (C)-DR15 (B)	Left	- (11-14) V

Is the voltage specified value?

Yes

Go to step 16

No

Step 15 Repair the faulty electric mirror control signal circuit open.

- (a) Repair the faulty electric mirror control signal circuit open.  
Confirm the electric rearview mirror is working correctly.

Yes

System normal

No

Step 16 Replace the faulty electric rearview mirror motor assembly.

- (a) Replace the faulty electric rearview mirror motor assembly.  
Refer to [11.5.8.5 Electric Outside Rearview Mirror Adjust Motor Replacement](#).



---

Confirm the repair completed.

Next

Step 17	System normal.
---------	----------------

### 11.5.7.10 Electric Rearview Mirror Can Not Be Heated

Refer to [11.12.6.4 Electric Rearview Mirror Defroster Inoperative.](#)

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## 11.5.8 Removal and Installation

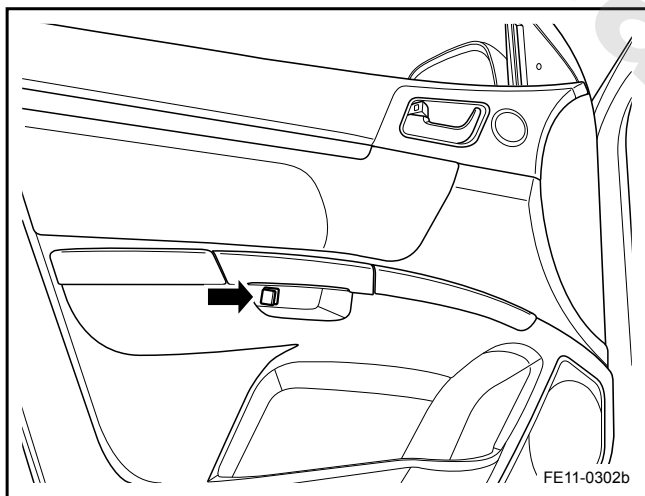
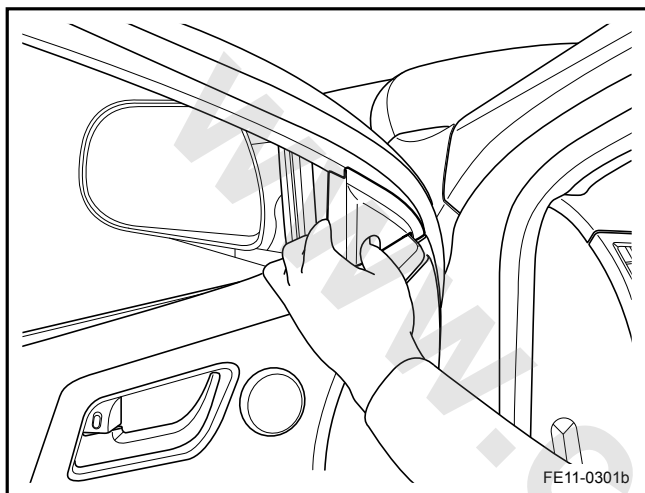
### 11.5.8.1 Outside Rearview Mirror Replacement

#### Removal Procedure

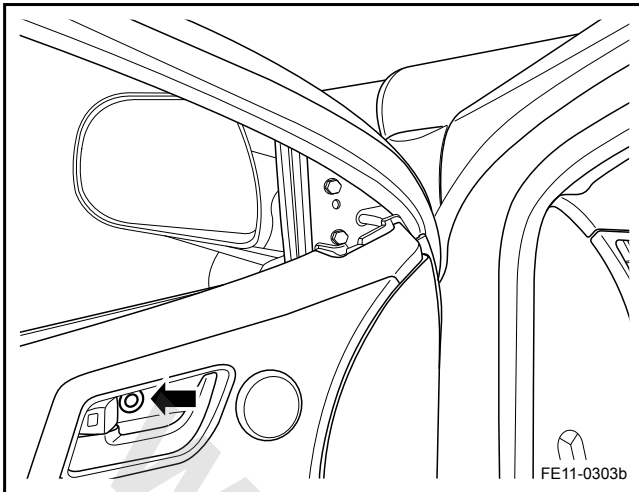
#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

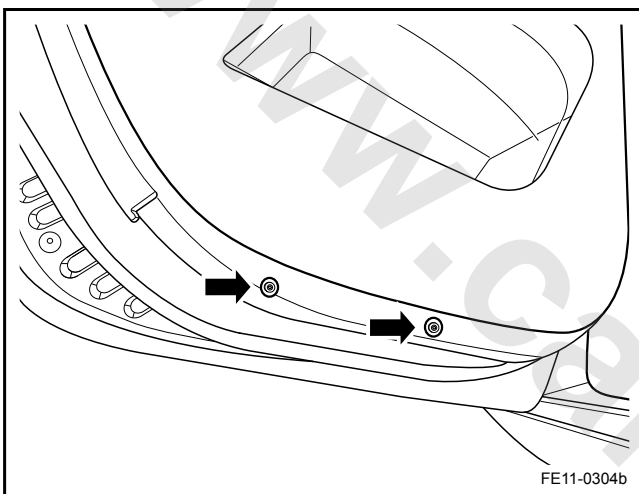
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the front door triangle trim panel.



3. Remove the front door armrest retaining screw cover.



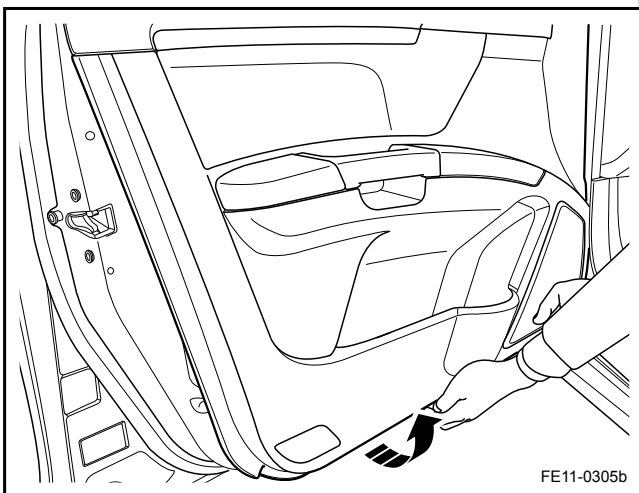
4. Remove the front door inside handle retaining screw cover.



5. Remove the front door trim panel retaining screw.

**Note**

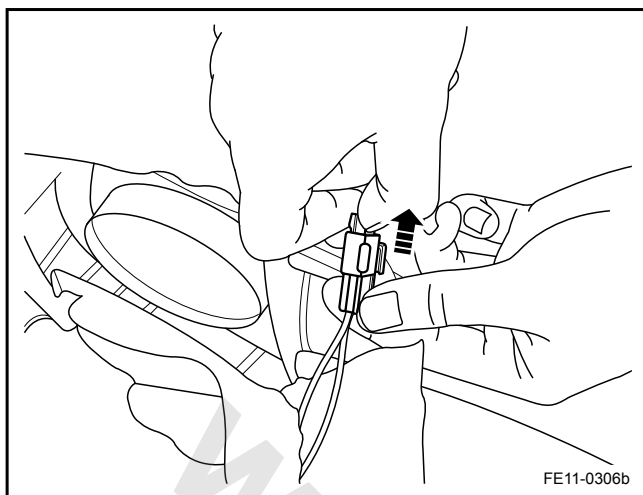
There are two retaining screws at the lower side of the front door trim panel.



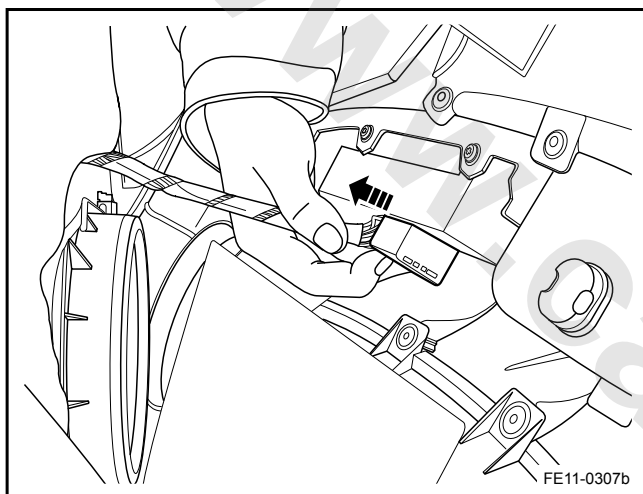
6. Remove the front door trim panel.

**Note**

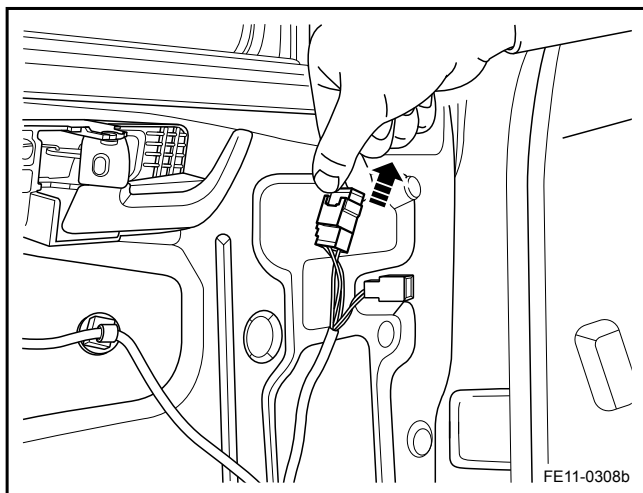
Do not to damage the the wiring harness connectors inside the front door trim panel.



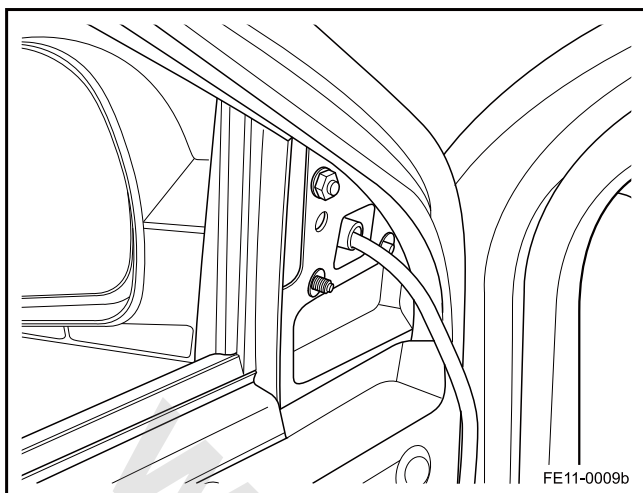
7. Disconnect the front tweeter harness connector.



8. Disconnect the front window switch harness connector and remove the front door trim panel.



9. Disconnect outside rearview mirror harness connector, loose the outside rearview mirror bracket nut.
10. Leave the nut on the top and remove the other two rearview mirror bracket nuts.
11. Hold the outside rearview mirror and remove the remaining nut.



12. Remove the outside rearview mirror assembly.

#### Installation Procedure:

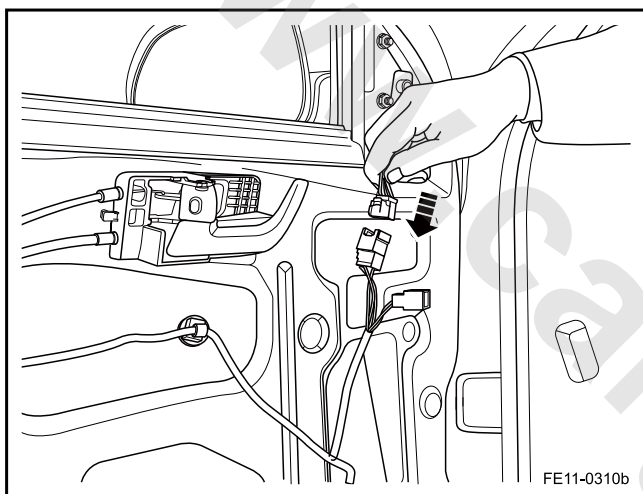
1. Install the outside rearview mirror assembly and tighten the retaining nuts.

Torque: 6 Nm (Metric) 4.4 lb-ft (US English)

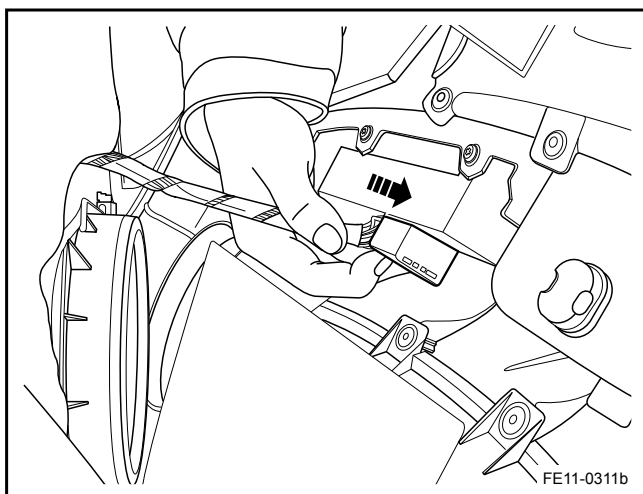
#### Note

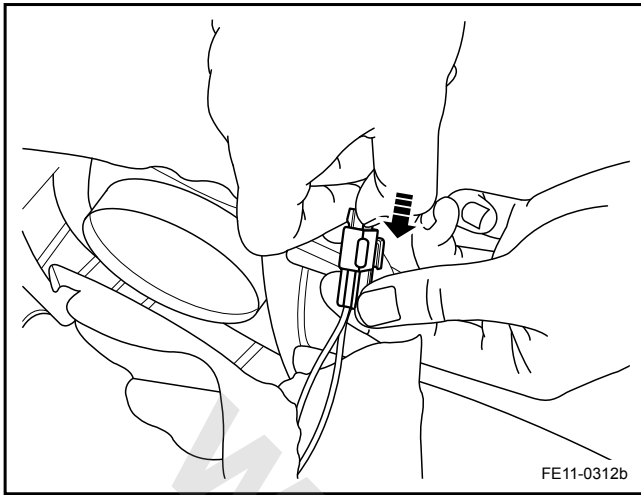
"Fastener Notice" in "Warnings and Notices"

2. Connect the outside rearview mirror harness connector.



3. Connect the front window switch wiring harness connector.





4. Connect the front tweeter harness connector.
5. Install the new clips to the front door trim panel.
6. Install the front door trim panel.  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)
7. Install the front door armrest retaining screw cover.  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)
8. Install the front door handle retaining screw cover.
9. Install the front door triangular panel.
10. Connect the battery negative cable.

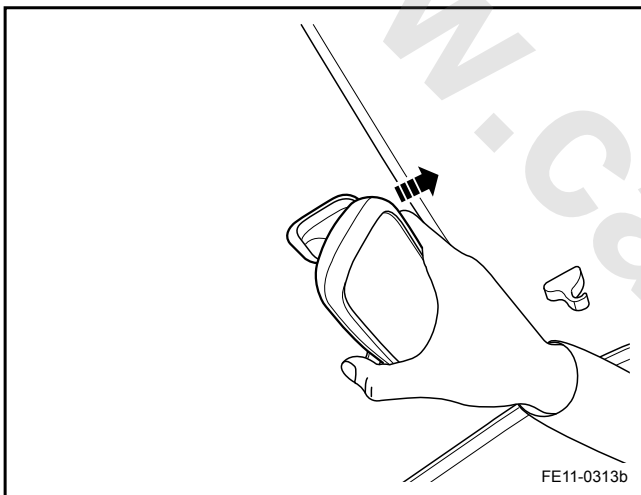
### 11.5.8.2 Inside Rearview Mirror Replacement

#### Removal Procedure

1. Remove the inside rearview mirror from the retaining bracket.
2. Remove the inside rearview mirror bracket.

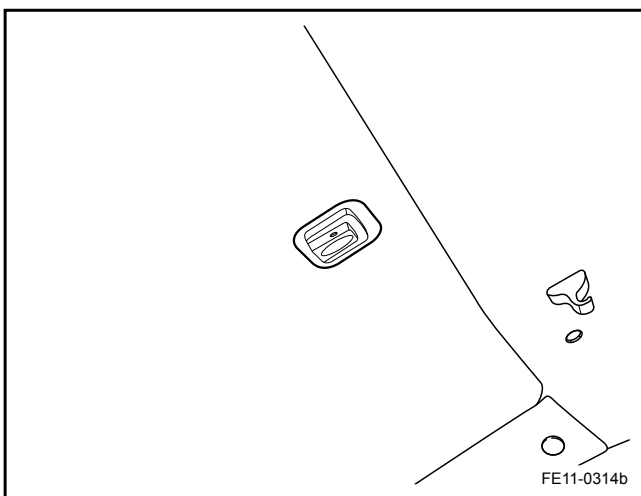
#### Note

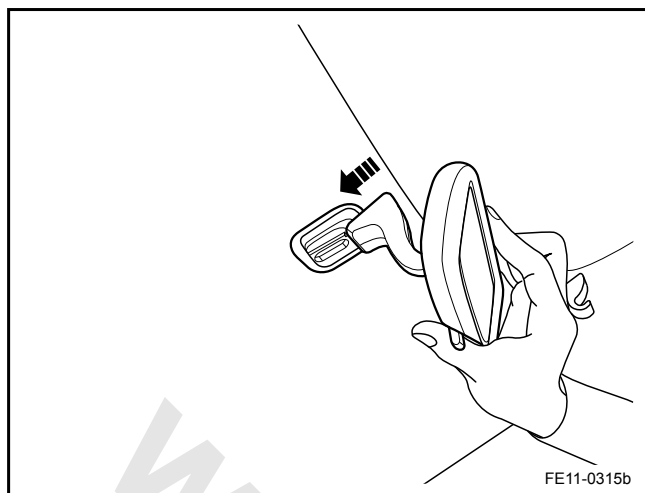
The inside rearview mirror is bonded to the windshield using a special adhesive.



#### Installation Procedure:

1. Use dedicated cleaning agent to clean the inside rearview mirror bracket installation surface.
2. Apply the adhesive according to the adhesive requirements.
3. Position the inside rearview mirror bracket to the marked position, with the constant pressure to press the bracket on the glass for 1-2 min.
4. Use dedicated cleaning agent to remove excess adhesive after 5 min.





5. Install the inside rearview mirror.

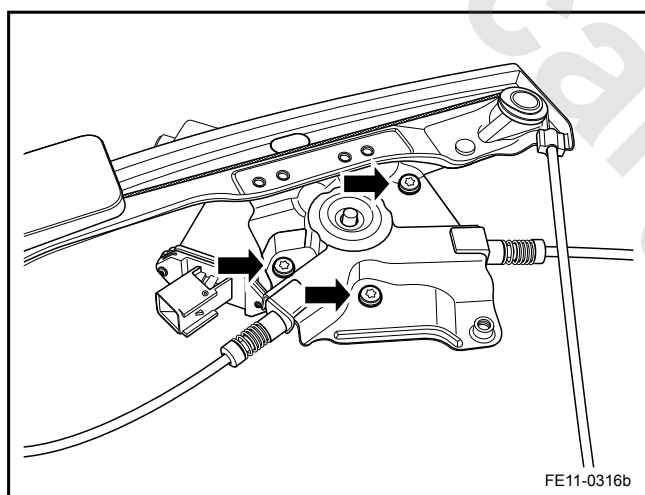
### 11.5.8.3 Left Front Window Regulator Motor Replacement

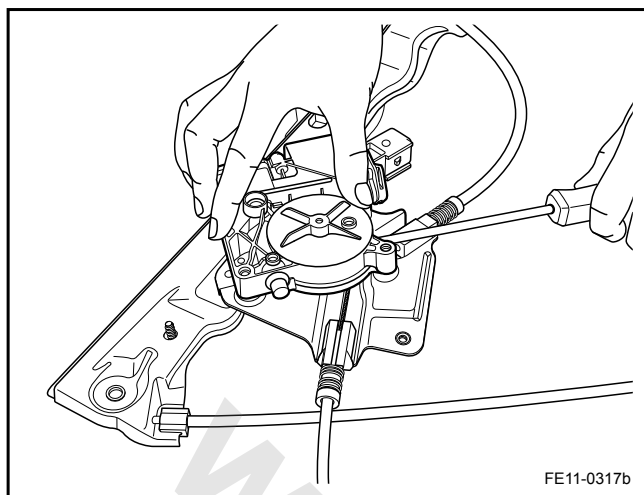
#### Removal Procedure

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the left front window regulator. Refer to [11.5.8.6 Front Door Window Regulator Replacement](#).
3. Remove the left front window regulator motor retaining screws.

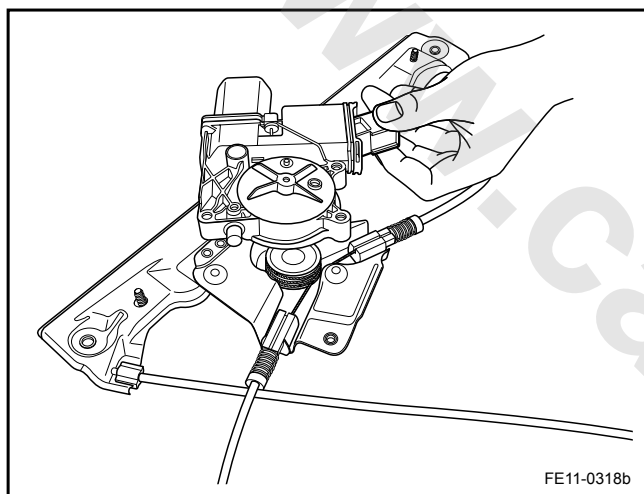




4. Remove the left front window regulator motor from the regulator.

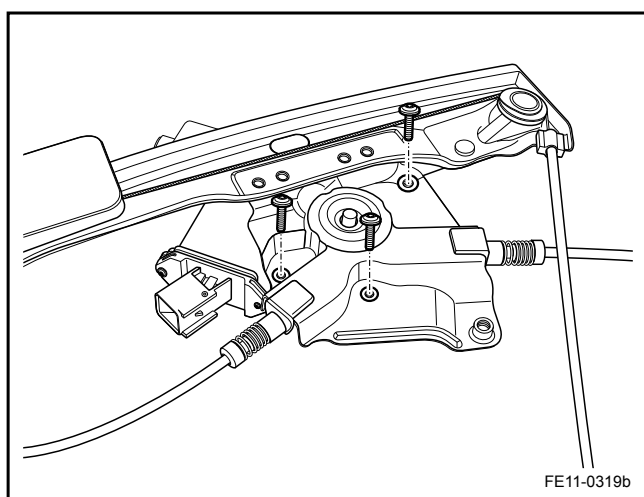
**Note**

To avoid the cable pop-up, use a flat blade screwdriver.



**Installation Procedure:**

1. Install the left front window regulator motor to the regulator.



2. Install the left front window regulator motor retaining screws.  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)
3. Install the left front window regulator assembly.
4. Connect the battery negative cable.

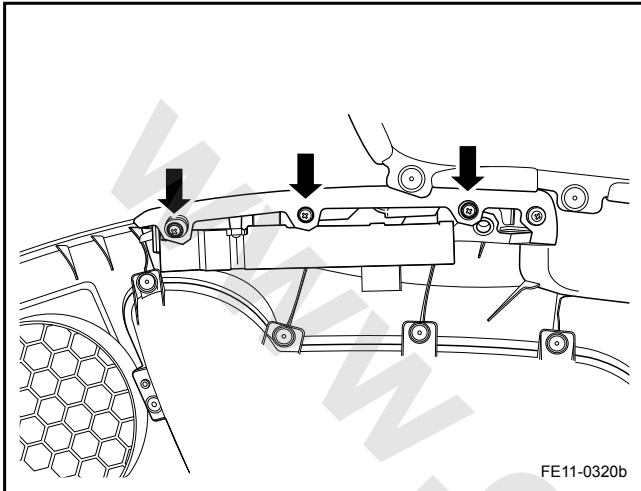


### 11.5.8.4 Left Front Window Switch Replacement

#### Removal Procedure

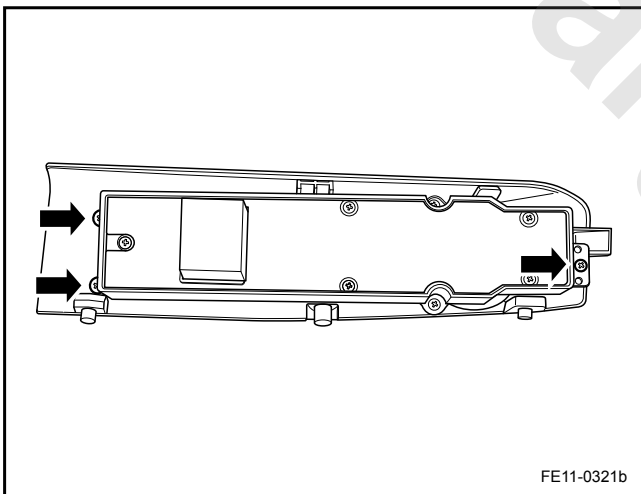
#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices"



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the left front door trim panel. Refer to [11.5.8.1 Outside Rearview Mirror Replacement](#).
3. Remove the left front window switch panel to the door trim panel retaining screws and remove the switch panel.
4. Remove the left front window switch retaining screws.
5. Remove the left front window switch from the switch panel.

#### Installation Procedure:



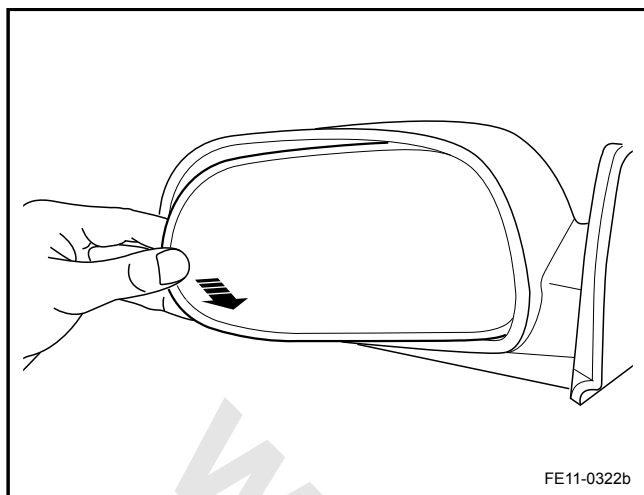
1. Install the left front window switch to the switch panel.  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)
2. Install the left front window switch panel to the door trim panel retaining screws.  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)
3. Install the left front door trim panel.
4. Connect the battery negative cable.

### 11.5.8.5 Electric Outside Rearview Mirror Adjust Motor Replacement

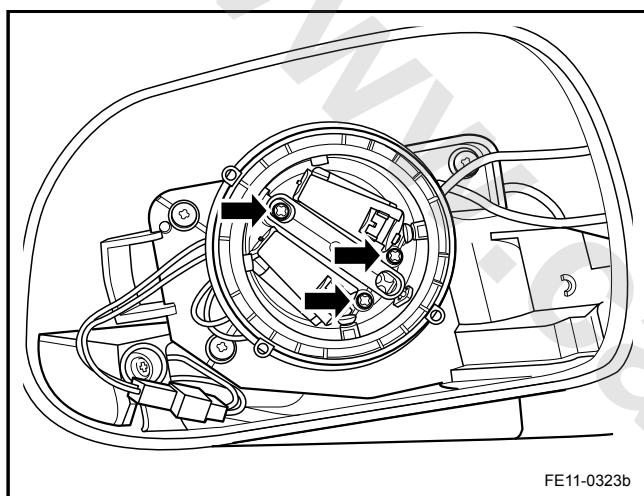
#### Removal Procedure

#### Warning!

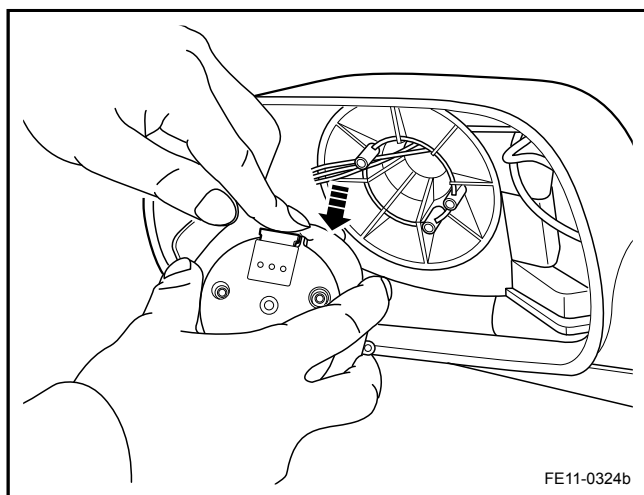
Refer to "Battery Disconnect Warning" in "Warnings and Notices"



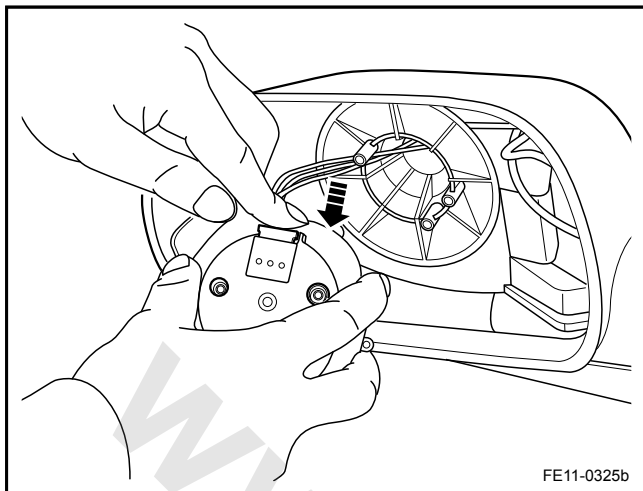
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the electric outside rearview mirror glass.



3. Disconnect the electric outside rearview mirror defroster wiring harness connector.
4. Remove the electric rearview mirror adjust motor retaining screws.

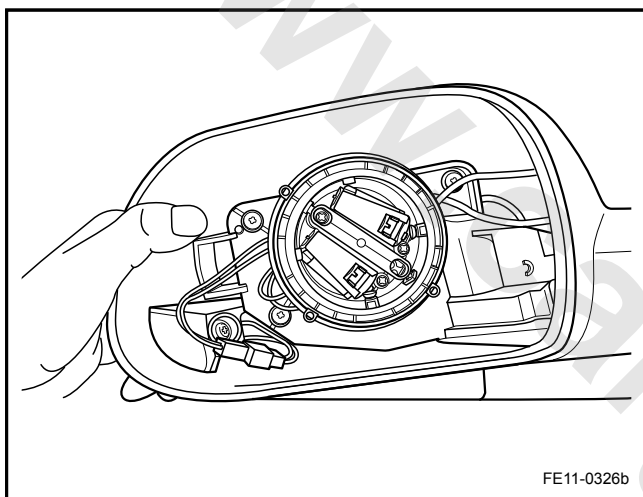


5. Remove the electric rearview mirror adjust motor from the electric rearview mirror bracket.
6. Disconnect the electric rearview mirror adjust motor wiring harness connector.

**Installation Procedure:**

1. Connect the electric rearview mirror adjust motor wiring harness connector.
2. Install the electric rearview mirror adjust motor to the electric rearview mirror motor bracket.
3. Install the electric rearview mirror adjust motor retaining screws.

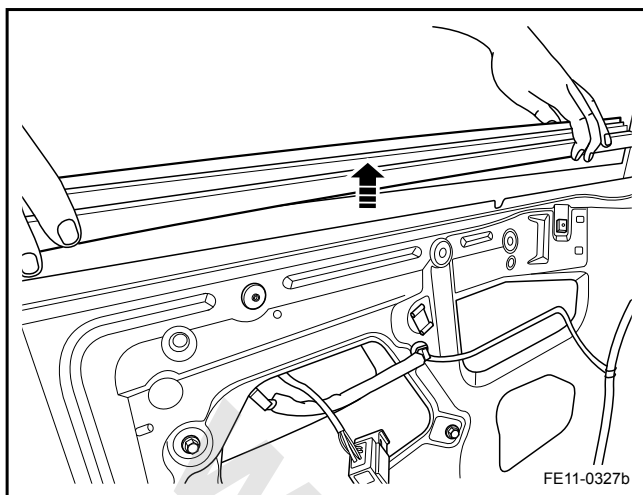
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)



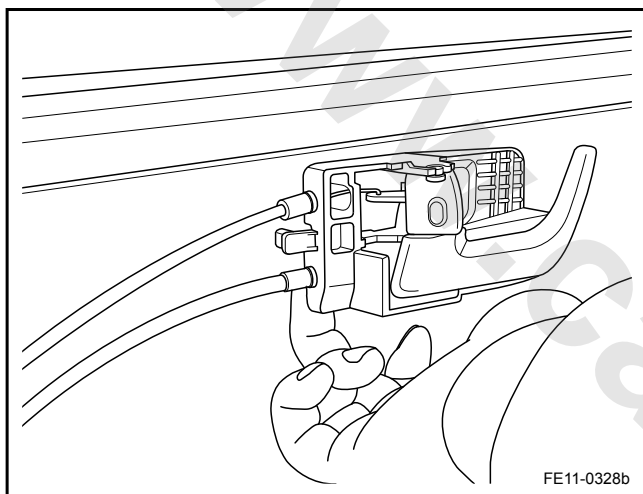
4. Connect the outside rearview mirror defroster wiring harness connector.
5. Install the outside rearview mirror glass.
6. Connect the battery negative cable.

**11.5.8.6 Front Door Window Regulator Replacement****Removal Procedure****Warning!**

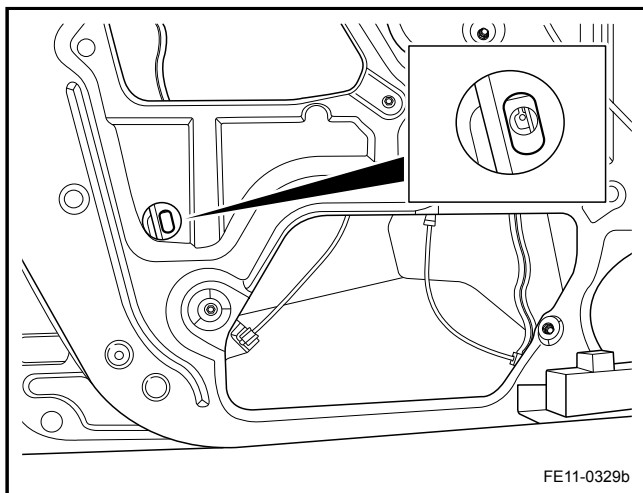
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



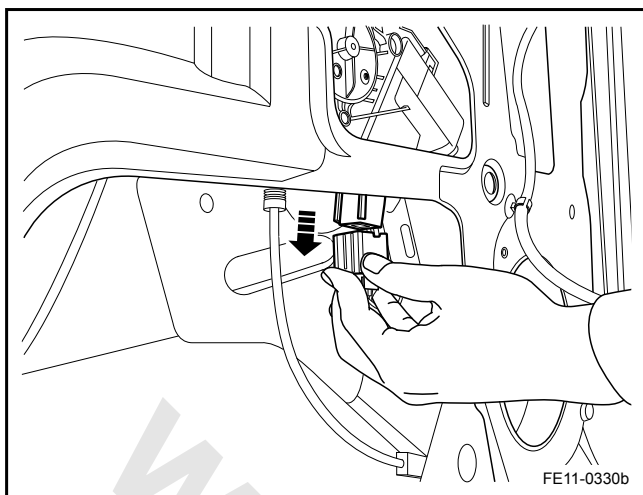
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the front door trim panel. Refer to [11.5.8.1 Outside Rearview Mirror Replacement](#).
3. Remove the front door window inner seal strip.



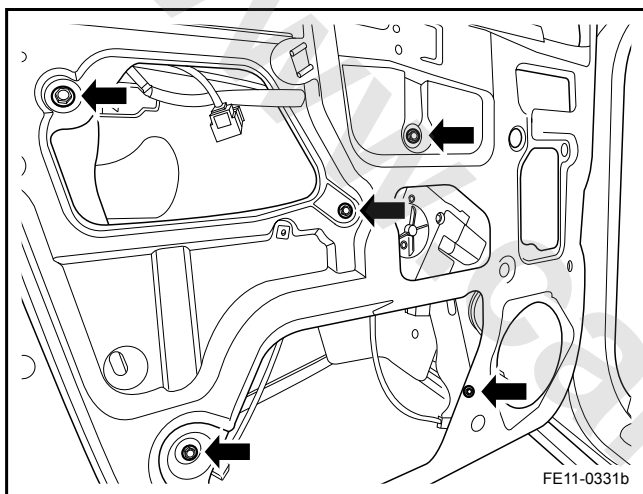
4. Remove the front door inside handle from the slot.



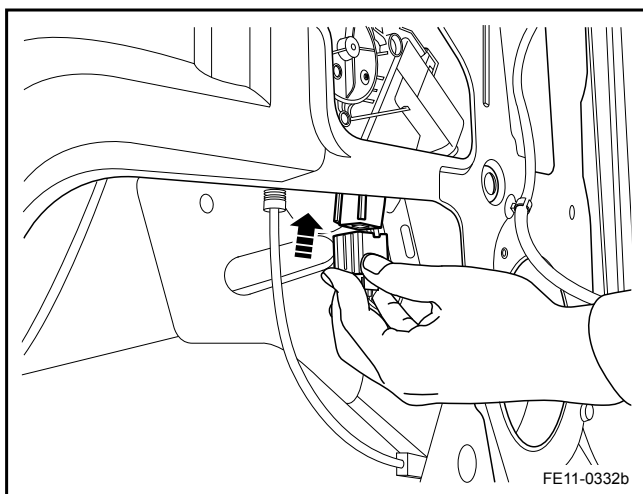
5. Remove the front door water deflector.
6. Hold the window regulator with a thin steel bar to release the window glass, otherwise the glass can not be removed.
7. Remove the front door window glass from the front door.



8. Disconnect the front door window regulator wiring harness connector.

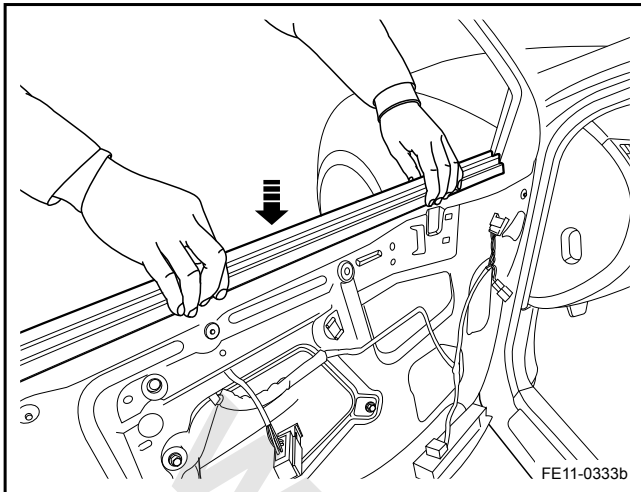


9. Remove the front door window regulator retaining nuts and bolts.
10. Remove the front door window regulator from the front door.



#### Installation Procedure:

1. Install and tighten the front door window regulator retaining nuts and bolts.  
Torque: 8 Nm (Metric) 6 lb-ft (US English)
2. Connect the front door window regulator wiring harness connector.

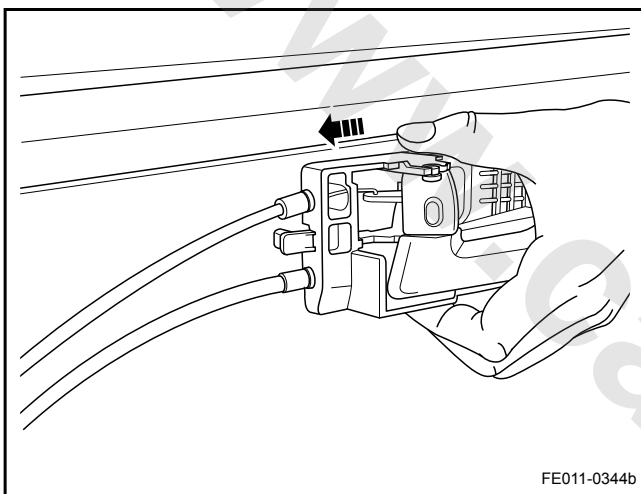


3. Install the front door water deflector.
4. Install the front door window glass into the front door and adjust the glass position in relation to the window regulator.

#### Note

The glass can not be properly installed caused by incorrect position.

5. Install the front door window inner seal strip.



6. Install the front door inside door handle to the slot.
7. Install the front door trim panel.
8. Connect the battery negative cable.

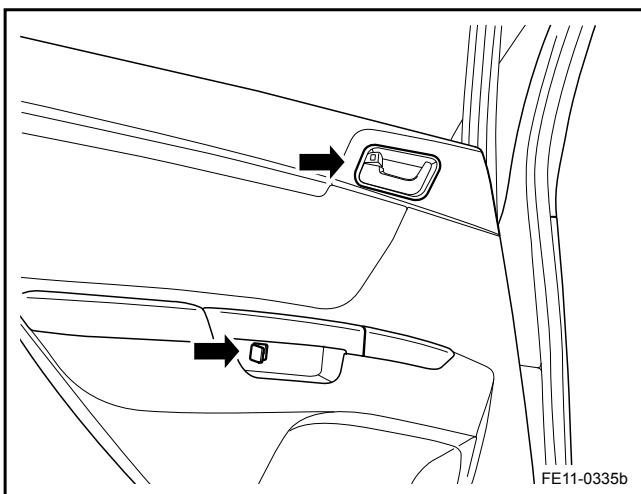
### 11.5.8.7 Rear Window Regulator Replacement

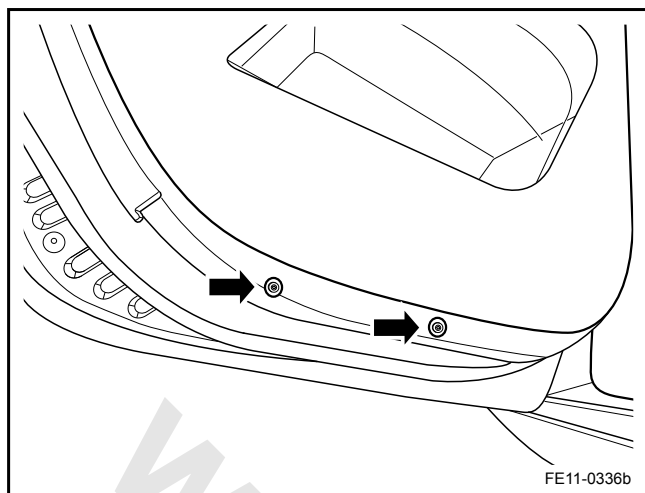
#### Removal Procedure

#### Warning!

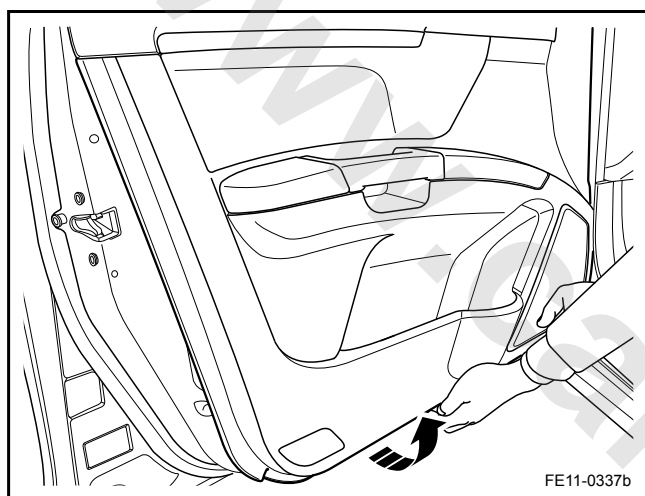
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the rear door armrest and inside door handle covers and remove the retaining screws.





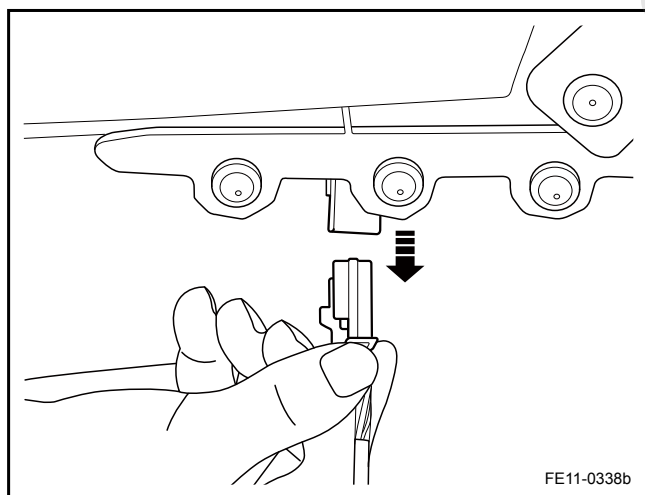
3. Remove the rear door trim panel lower retaining screws.



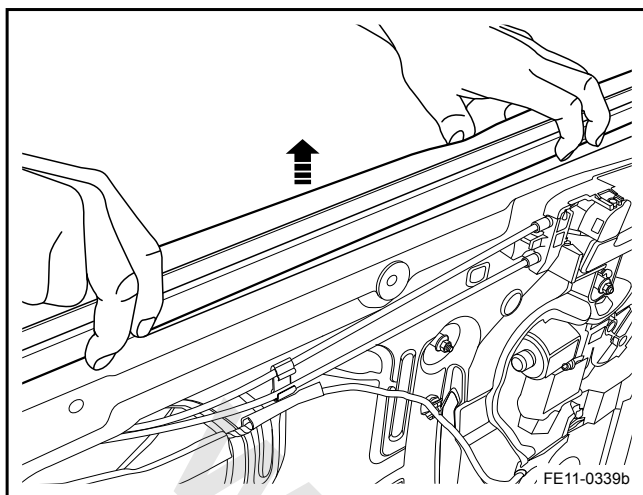
4. Remove the rear door trim panel.

**Note**

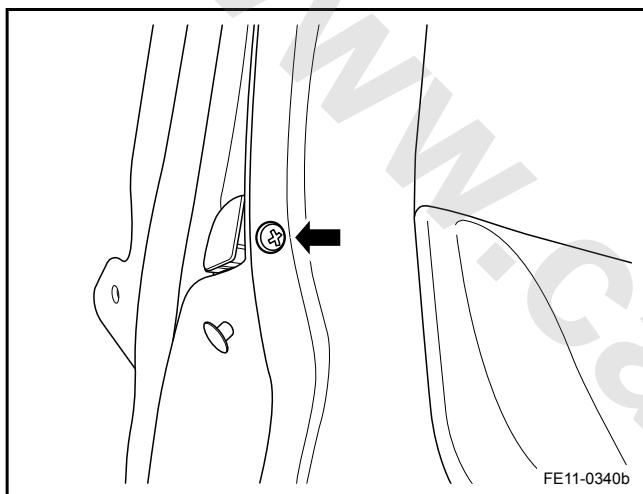
Do not damage the wiring harness connectors inside the rear door trim panel.



5. Disconnect the rear door window switch wiring harness connector and remove the rear door trim panel.



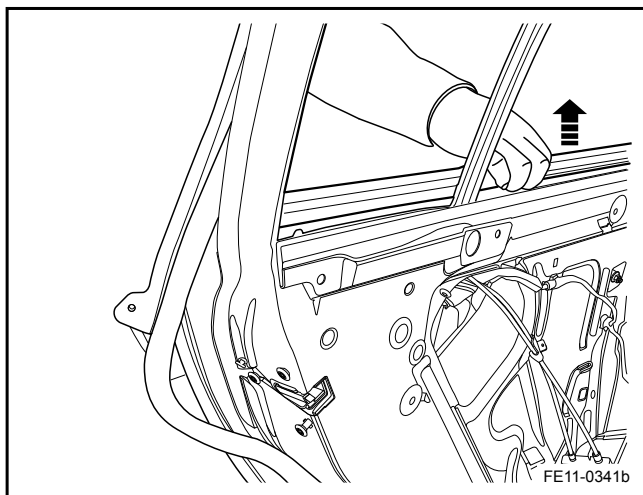
6. Remove the rear door window inner seal strip.



7. Remove the rear door window outer seal strip retaining screws from both sides.

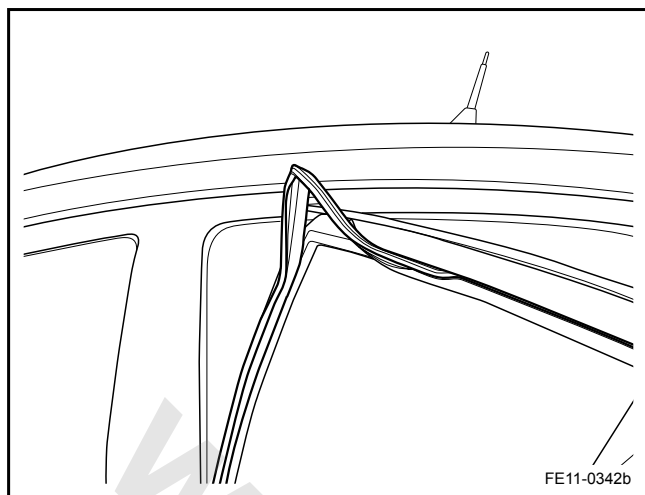
**Note**

Forgetting to remove the retaining screws may damage the rear door window outer seal strip.

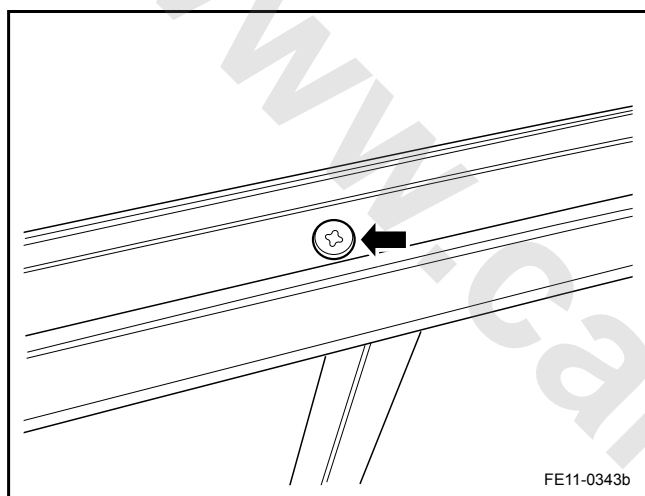


8. Remove the rear door window outer seal strip.

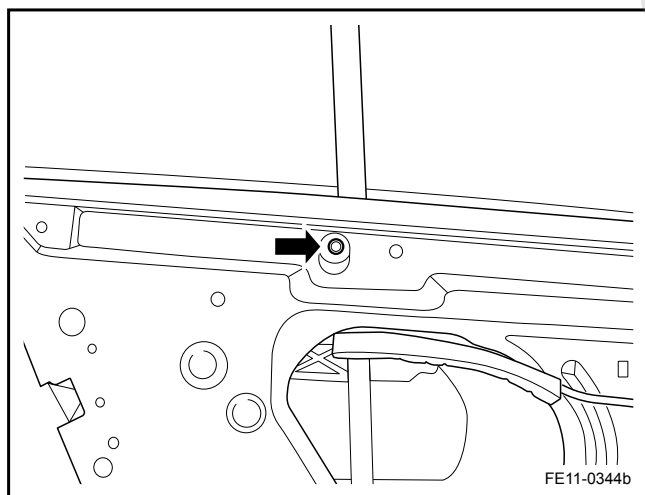




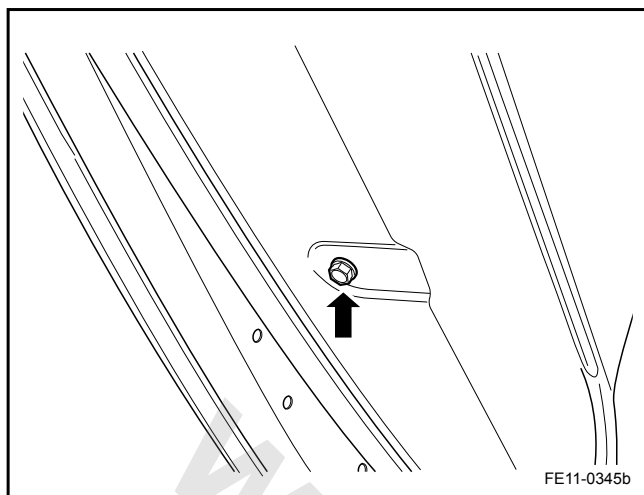
9. Remove the rear door window glass guide rail.



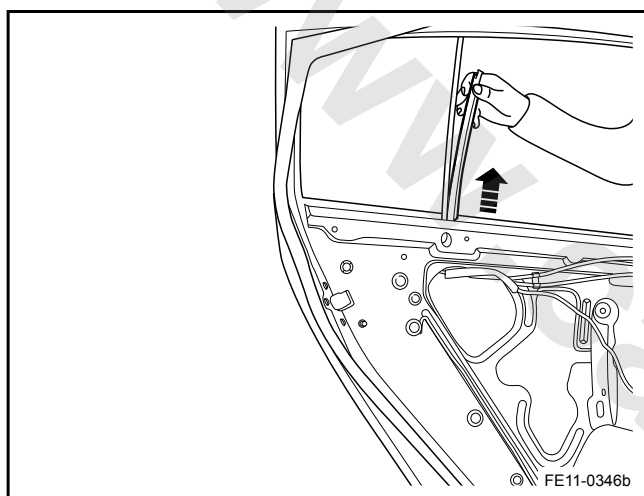
10. Remove the rear door window channel upper retaining bolt.



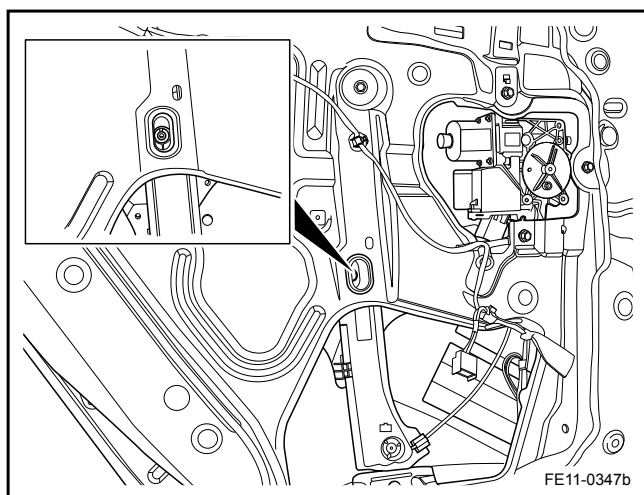
11. Remove the rear door window channel middle retaining bolt.



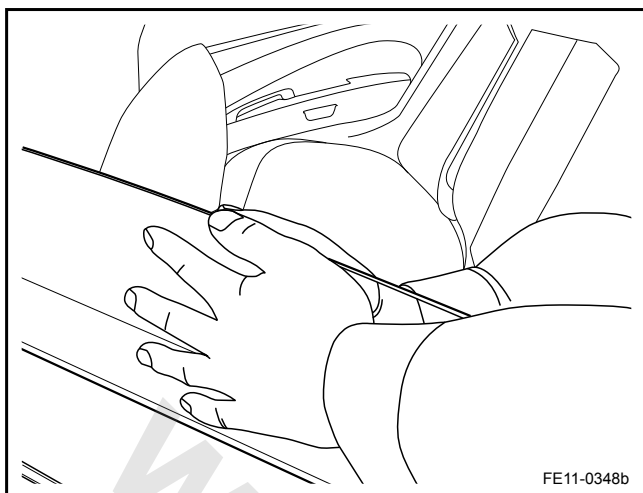
12. Remove the rear door window channel lower retaining bolt.



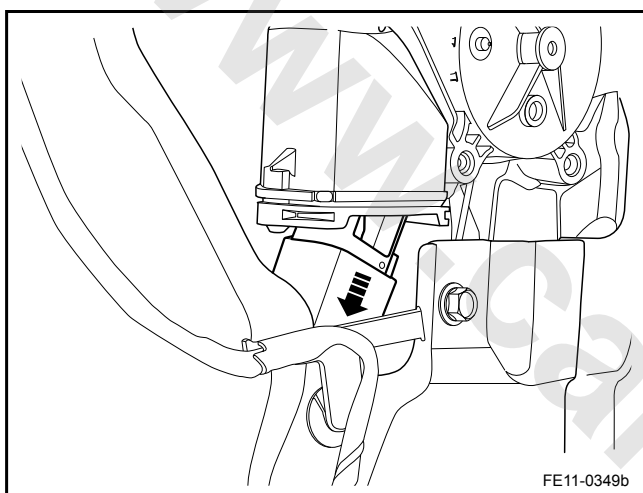
13. Remove the rear door window channel.



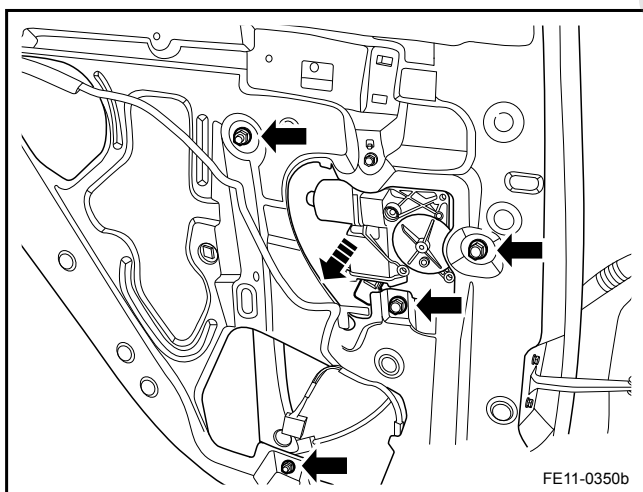
14. Remove the rear door water deflector.
15. Remove the rear door window retaining pin with a screwdriver, otherwise the glass can not be removed.



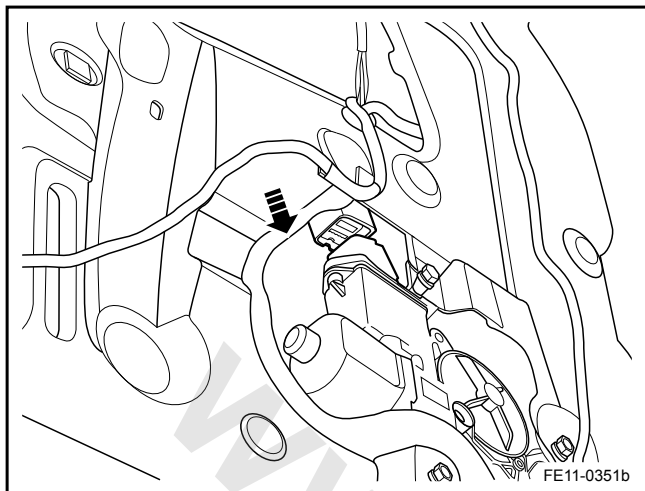
16. Carefully lift the rear door window glass upward to remove the glass.



17. Disconnect the rear door window glass wiring harness connector.



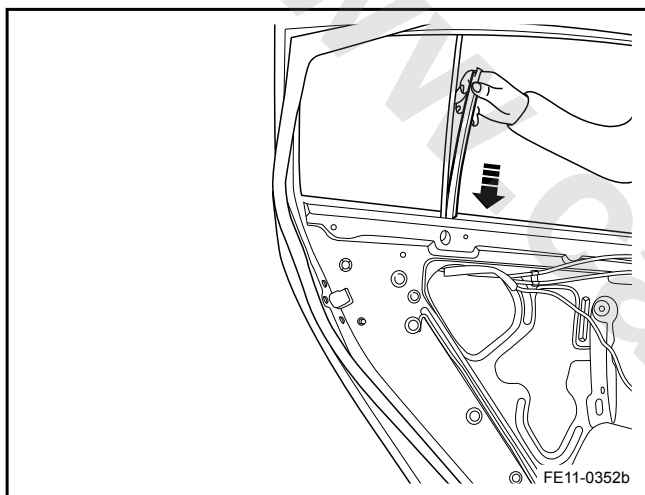
18. Remove the rear door window regulator retaining nuts and window retaining bolts.
19. Remove the rear door window regulator.

**Installation Procedure:**

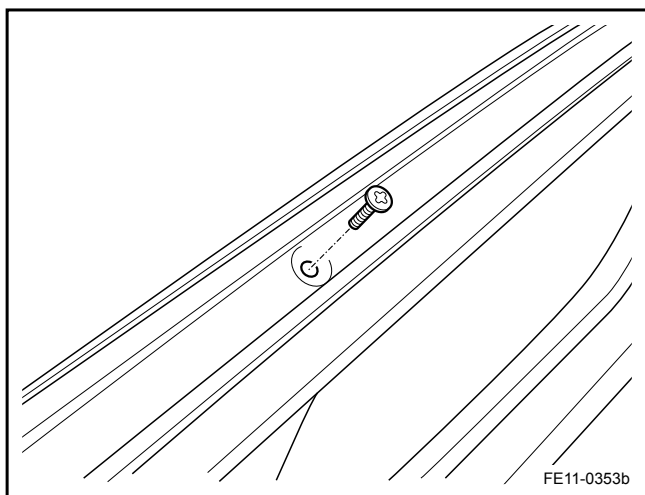
1. Install the rear window regulator.
2. Install the rear window regulator retaining bolts.  
Torque: 8 Nm (Metric) 6 lb-ft (US English)
3. Connect the rear door window regulator wiring harness connector.
4. Install the rear door window glass into the rear door and adjust the glass position.
5. Install the rear door window glass locating pin to the regulator bracket to retain the glass.
6. Install the rear door water deflector.
7. Install the rear door window channel.

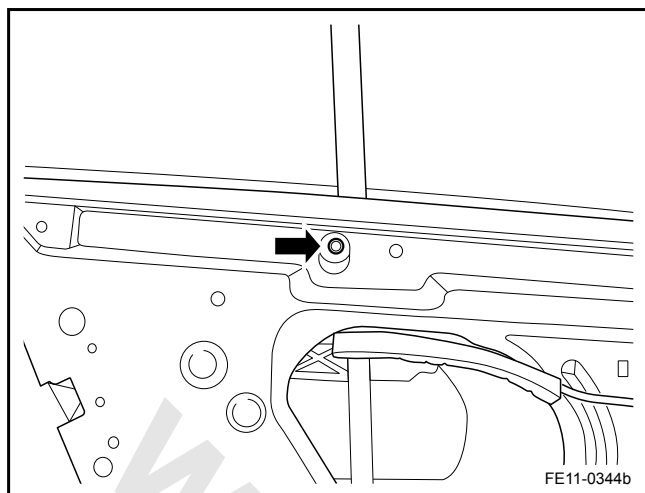
**Note**

Revolving the rear door window channel to fit the glass into the channel.

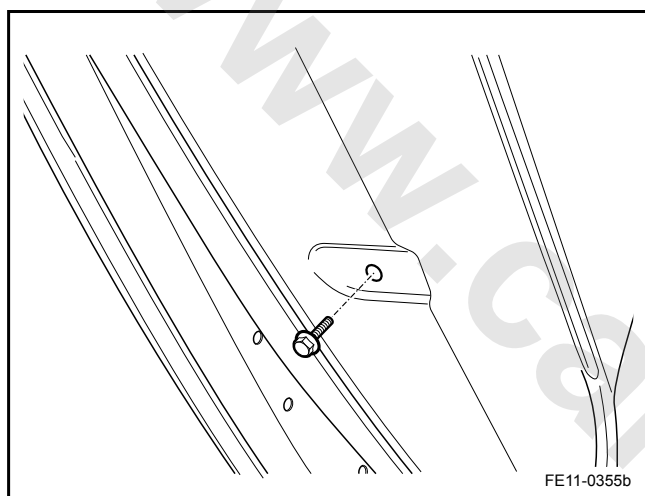


8. Install the rear door window channel upper retaining bolt.



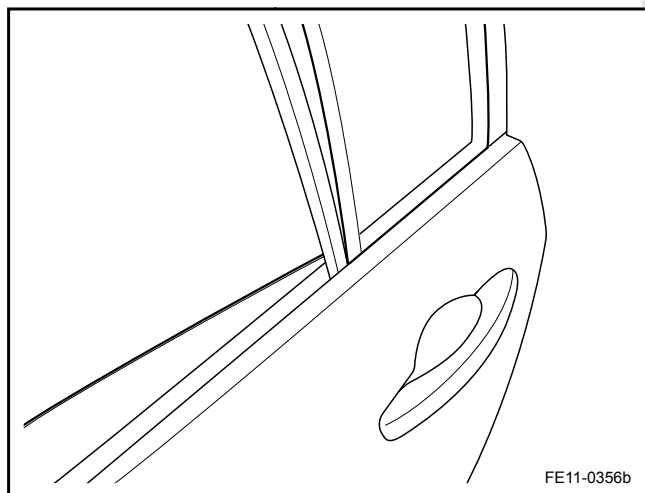


9. Install the rear door window channel middle retaining bolt.

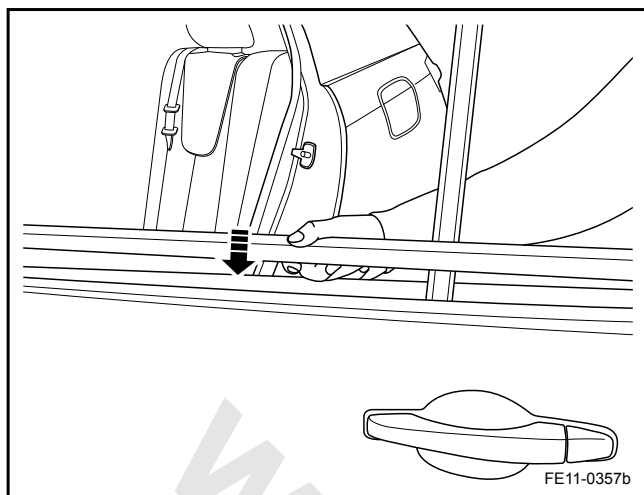


10. Install the rear door window channel lower retaining bolt.

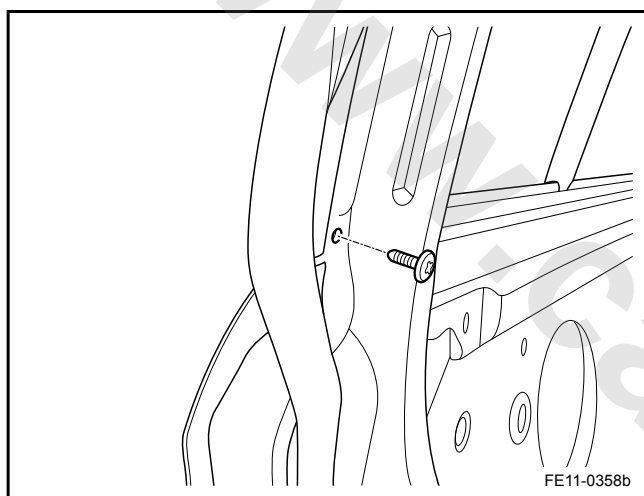
Torque: 8 Nm (Metric) 6 lb-ft (US English)



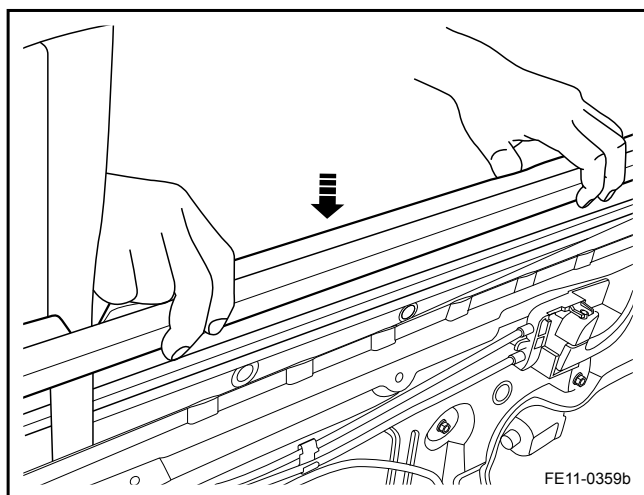
11. Lift the rear window glass to the position as shown in the graphic and install the rear door window guide rail.



12. Install the rear door window outer seal strip.

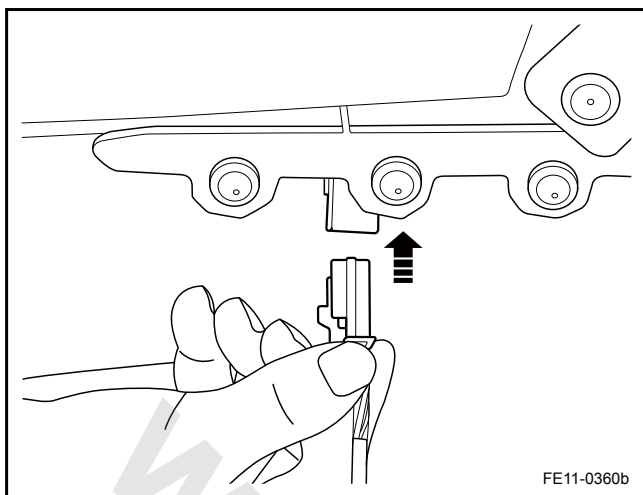


13. Tighten the rear door window outer seal strip retaining screw.



14. Install the rear door window inner seal strip.

15. Install the rear door inside door handle to the slot.



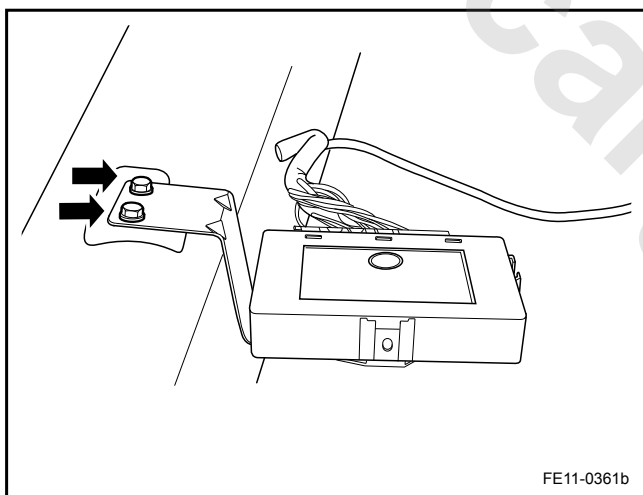
16. Connect the rear door window switch wiring harness connector.
17. Install the rear door trim panel clips.
18. Install the rear door trim panel.
19. Tighten the rear door trim panel retaining screw.  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)
20. Install the rear door armrest retaining screw cover.
21. Install the rear door handle retaining screw cover.

#### 11.5.8.8 Window Regulator Module Replacement (If equipped)

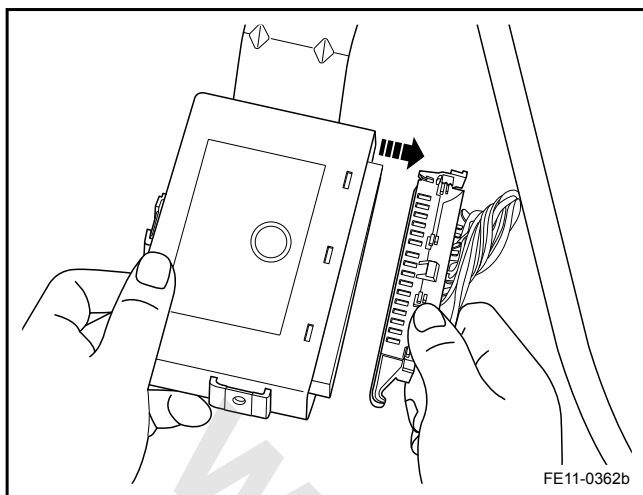
##### Removal Procedure

##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



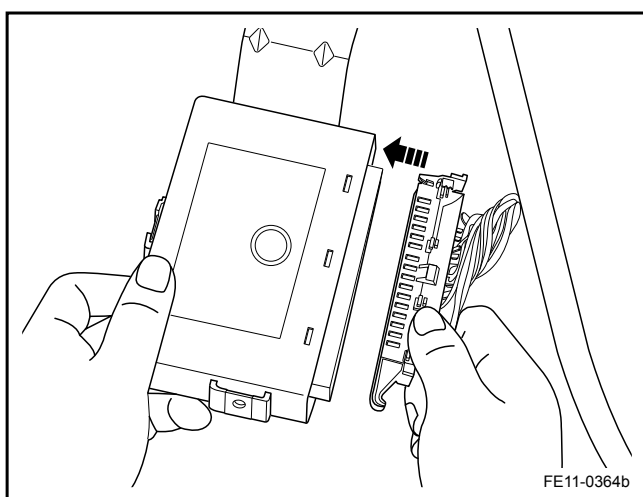
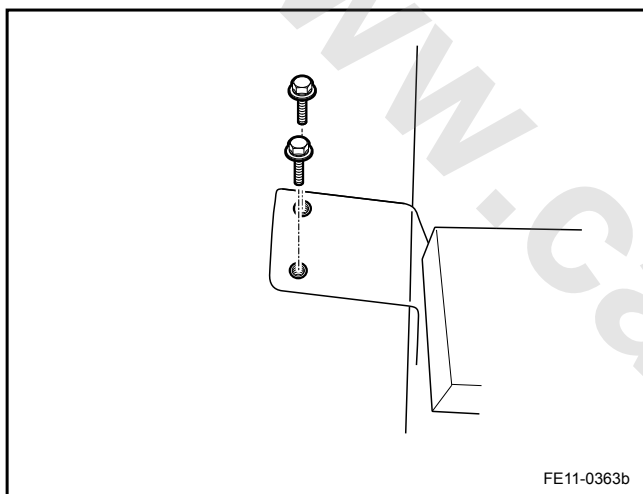
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the left front seat. Refer to [11.11.8.1 Front Electric Seat Replacement](#).



3. Disconnect the power window module harness connector.

#### Installation Procedure:

1. Install the window regulator module retaining bolts.  
Torque: 15 Nm (Metric) 11 lb-ft (US English)



2. Connect the window regulator module harness connector.
3. Install the left front seat.
4. Connect the battery negative cable.



### 11.5.8.9 Windshield Replacement

#### Removal Procedure

1. Remove the wiper arms. Refer to [11.6.8.2 Wiper Arm Replacement](#).
2. Remove the air inlet duct. [12.10.1.3 Air Inlet Grille Panel Replacement](#).
3. Remove the left / right front A pillar garnish moldings. Refer to [12.9.1.3 Windshield Garnish Molding Replacement](#).
4. Remove the inside rearview mirror. Refer to [11.5.8.2 Inside Rearview Mirror Replacement](#).
5. Remove the seal around the windshield.
6. Cut the windshield glass adhesive with a thin steel wire.

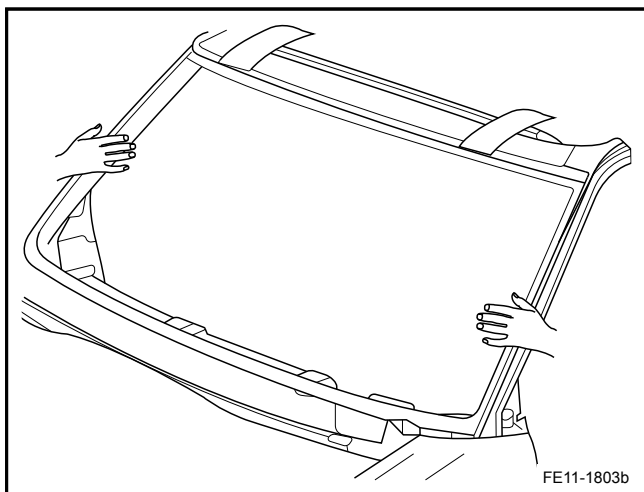
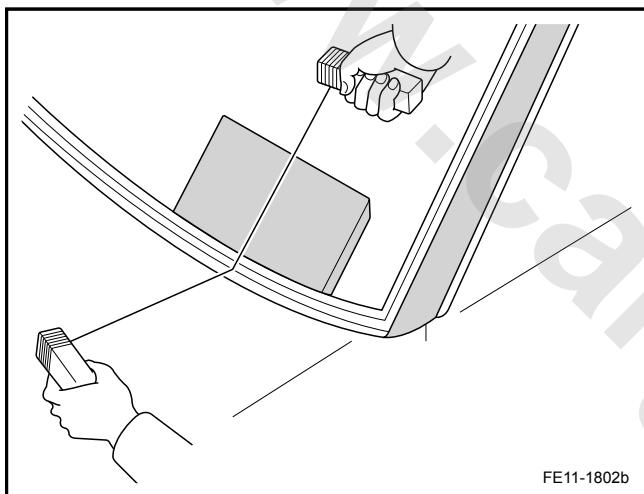
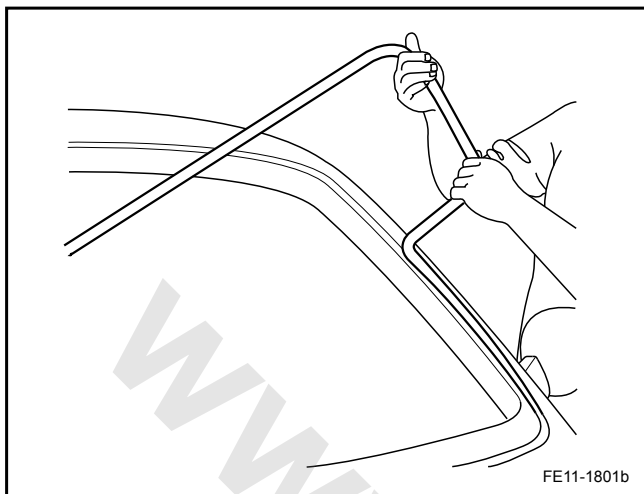
#### Note

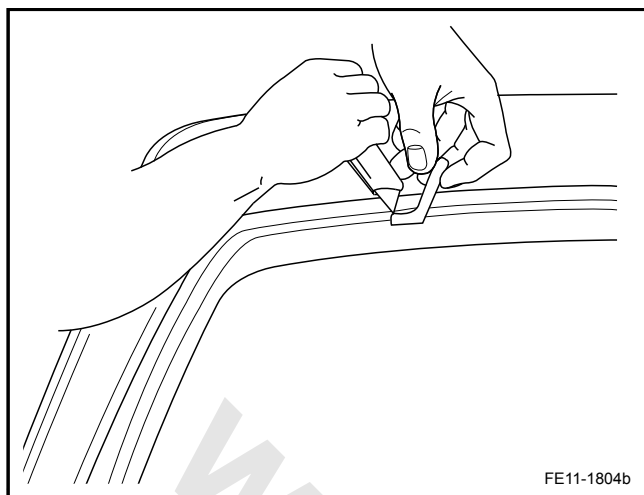
Wrap both end of the fine steel wire around a wood handle, operate by with two people to facilitate the removal. Place a piece of plastic on the instrument panel to protect the instrument panel.

7. Remove windshield from the frame.

#### Note

It takes two people to complete this step.

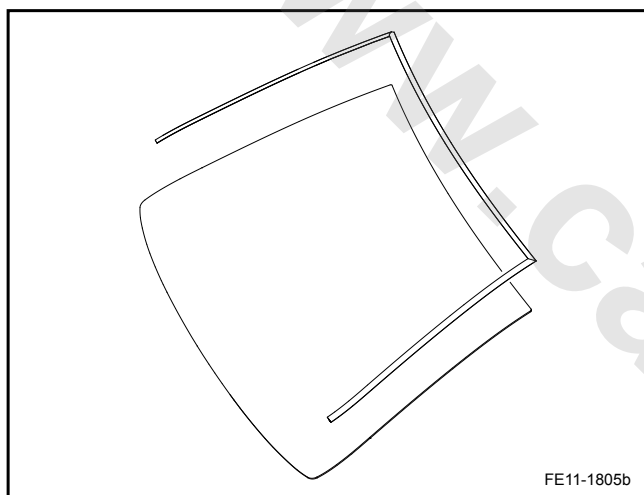




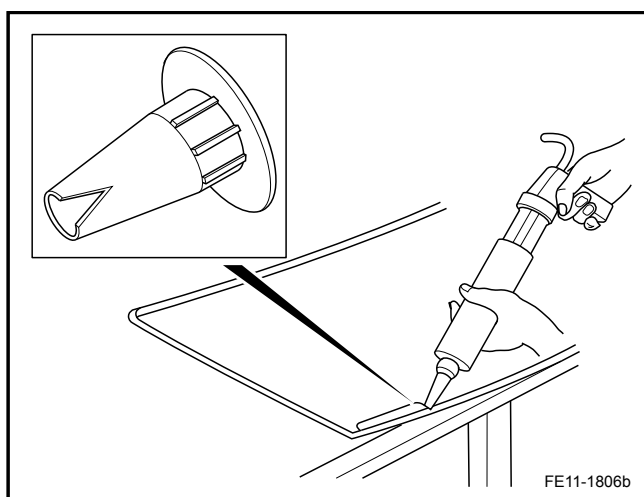
8. Remove the glue residue on the windshield with a blade.
9. Remove the glue residue on the windshield frame with a blade.
10. Clean the windshield inner surface with a cloth stained soaked with industrial ethanol and water mixture with 50/50 volume ratio.

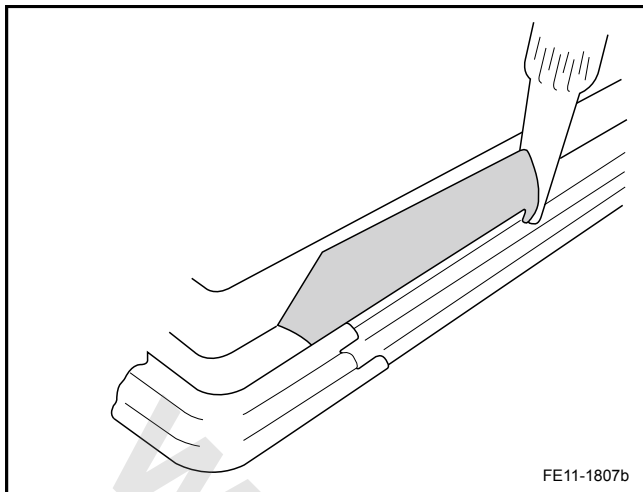
#### Installation Procedure:

1. Apply the new glass seal strip to the windshield.

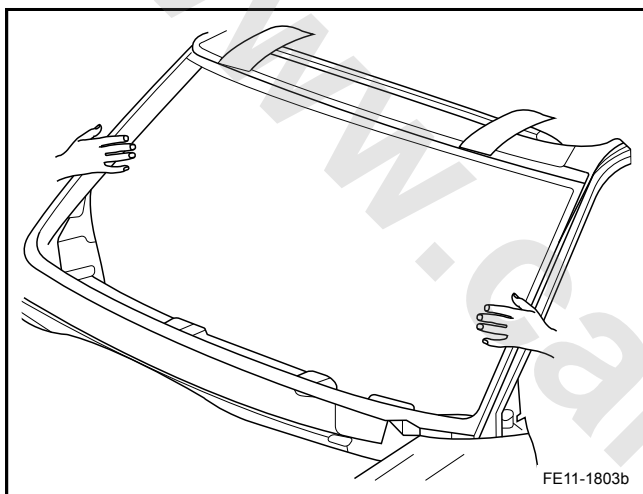


2. Spray the dedicated Geely glass sealant, with 8 mm (0.3 in) Width 8 mm (0.3 in) height.





3. With a double-pipe gun evenly apply glass sealant to the window glass edge to make sure that the sealant width is even.

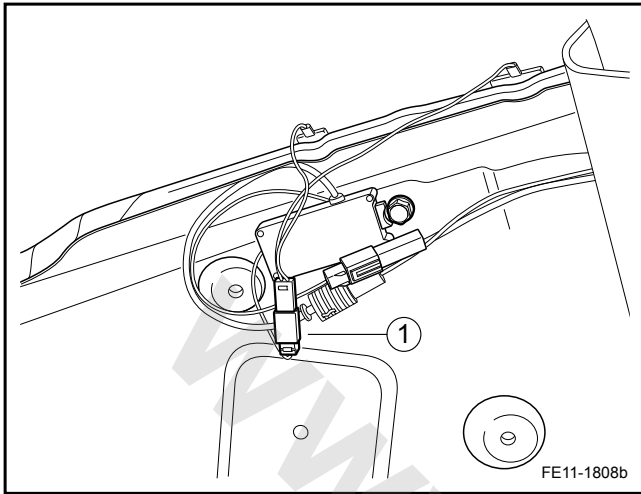


4. With the help of an assistant, install the windshield glass to the windshield frame.
5. Press the windshield glass to bond the adhesive to the seal strip, the windshield and the windshield frame to retain the windshield.
6. Let adhesive dry 24 h.
7. spray water onto the windshield to check for water leaks. If it leaks, dry the windshield and apply adhesives to the leaking location. If it still leaks, remove the windshield and repeat the entire repair procedure.
8. Install the inside rearview mirror.
9. Install the left / right A pillar garnish moldings.
10. Install the air inlet duct.
11. Install the wiper arms.

## 11.5.8.10 Rear Window Replacement (Sedan)

## Removal Procedure

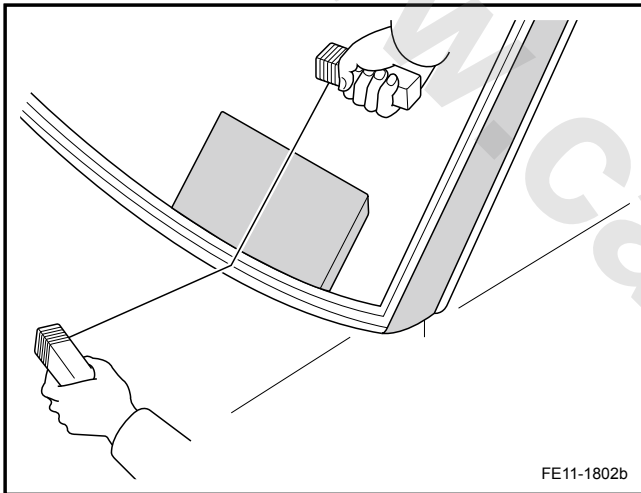
1. Remove the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the left / right rear upper quarter panel. Refer to [12.9.1.5 Rear Quarter Upper Trim Panel Replacement \(Sedan\)](#).
3. Remove the rear parcel shelf. Refer to [12.9.1.7 Rear Parcel Shelf Replacement \(Sedan\)](#).
4. Disconnect the rear window defroster electrical connector (1).



5. Cut the rear window glass adhesive with a thin steel wire.

**Note**

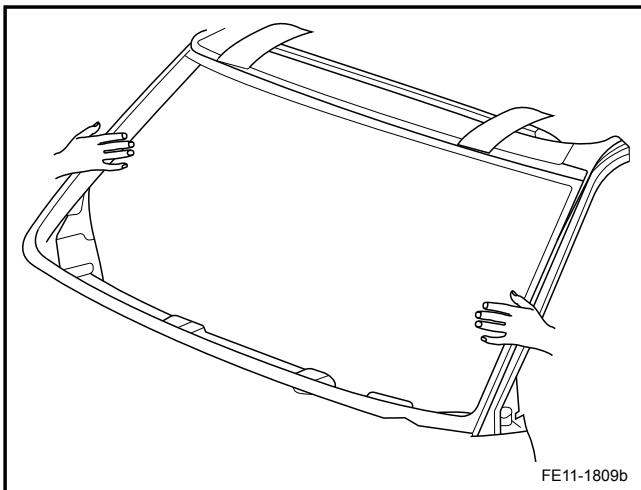
Wrap both end of the fine steel wire around a wood handle, operate by with two people to facilitate the removal.

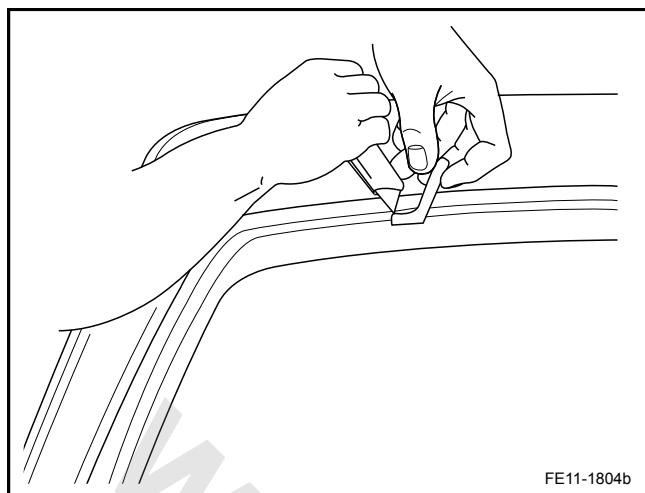


6. Remove the rear window glass from the rear window frame.

**Note**

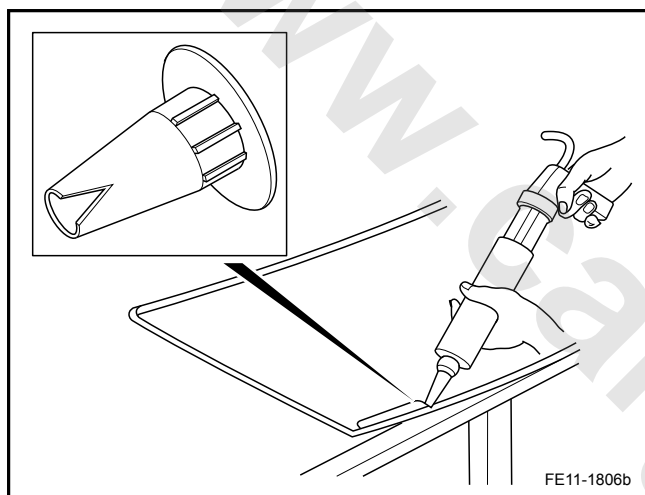
It takes two people to complete this step.



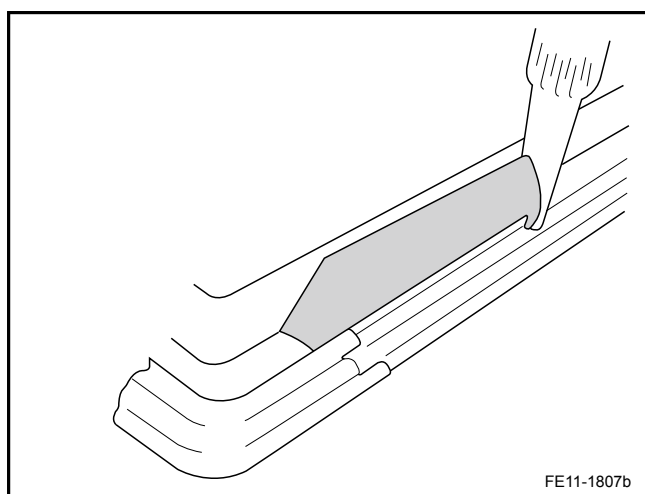


7. Removed the adhesive on the rear window glass with a blade.
8. Removed the adhesive on the rear window frame with a blade.
9. Clean the windshield inner surface with a cloth stained soaked with industrial ethanol and water mixture with 50/50 volume ratio.

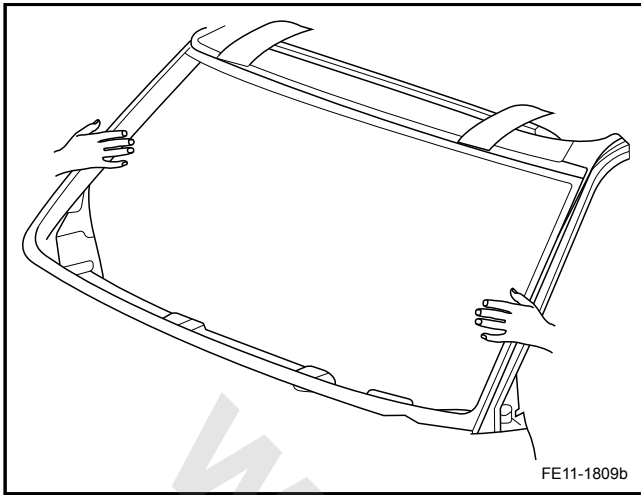
#### Installation Procedure:



1. Spray the dedicated Geely glass sealant, with 8 mm (0.3 in) width 8 mm (0.3 in) height.



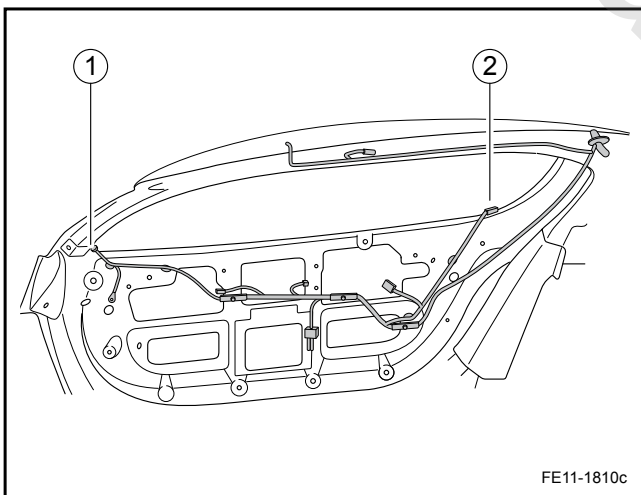
2. With a double-pipe gun evenly apply glass sealant to the window glass edge to make sure that the sealant width is even.



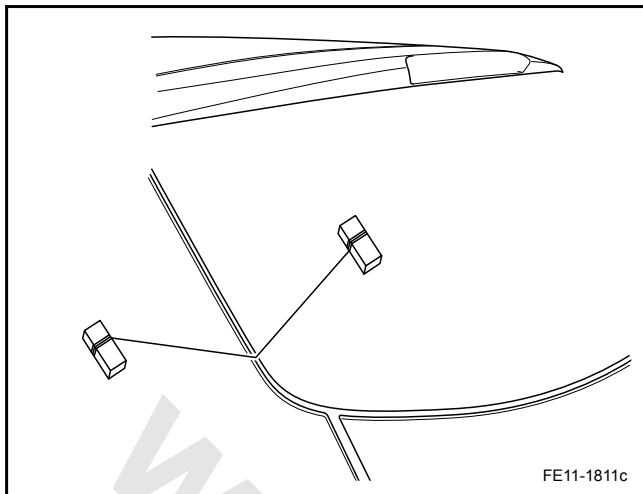
3. With the help of an assistant, install the rear window glass to the rear window frame.
4. Press the rear window glass to bond the adhesive to the seal strip, the rear window glass and the rear window frame to retain the rear window.
5. Let adhesive dry 24 h.
6. Spray water onto the rear window to check for water leaks. If it leaks, dry the rear window and apply adhesives to the leaking location. If it still leaks, remove the rear window and repeat the entire repair procedure.
7. Connect the rear window defroster wiring harness connector.
8. Install the rear parcel shelf.
9. Install left / right rear upper quarter panel.
10. Connect the battery negative cable.

#### 11.5.8.11 Rear Window Replacement (Hatchback)

##### Removal Procedure



1. Remove the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the wiper arm. Refer to [11.6.8.3 Rear Wiper Arm Replacement \(Hatchback\)](#).
3. Remove the hatchback trim panel. Refer to [12.9.1.15 Hatchback Inner Trim Panel Replacement \(Hatchback\)](#).
4. Remove the high mounted brake lamp. Refer to the [11.4.8.10 High Mounted Brake Lamp Replacement \(Hatchback\)](#).
5. Disconnect Defroster harness connectors (1) and (2).



6. Cut the rear window glass adhesive with a thin steel wire.

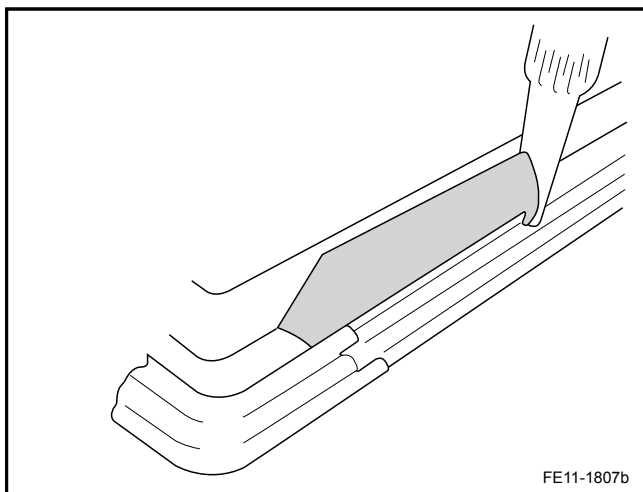
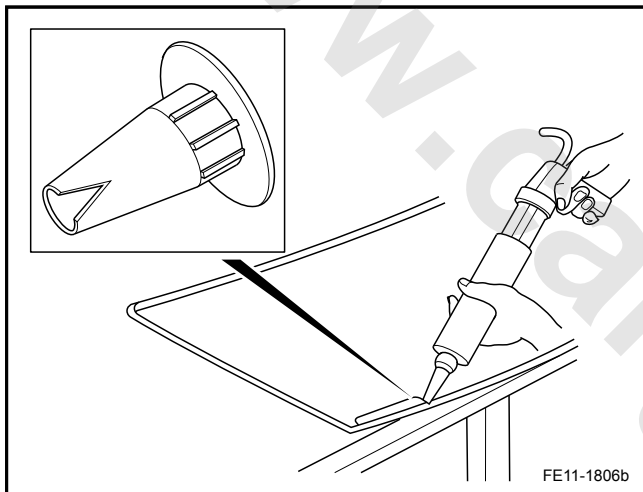
#### Note

Wrap both end of the fine steel wire around a wood handle, operate by with two people to facilitate the removal.

7. Removed the adhesive on the rear window glass with a blade.
8. Removed the adhesive on the rear window frame with a blade.
9. Clean the windshield inner surface with a cloth stained soaked with industrial ethanol and water mixture with 50/50 volume ratio.

#### Installation Procedure:

1. Spray the dedicated Geely glass sealant, with 8 mm (0.3 in) width 8 mm (0.3 in) height.



2. With a double-pipe gun evenly apply glass sealant to the window glass edge to make sure that the sealant width is even.
3. With the help of an assistant, install the rear window glass to the rear window frame.
4. Press the rear window glass to bond the adhesive to the seal strip, the rear window glass and the rear window frame to retain the rear window.
5. Let adhesive dry 24 h.
6. Spray water onto the rear window to check for water leaks. If it leaks, dry the rear window and apply adhesives to the leaking location. If it still leaks, remove the rear window and repeat the entire repair procedure.

7. Connect the rear window defroster wiring harness connector.
8. Install the wiper arms.
9. Install the hatchback trim panel.
10. Install the high mounted brake lamp.
11. Connect the battery negative cable.

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## 11.6 Wipers / Washers System

### 11.6.1 Specifications

#### 11.6.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Front Fender Liner Screws	ST4.8	6-8	4.4-6
Washer Fluid Tank Retaining Bolts	M6 × 20	8-11	6-8
Wiper Retaining Bracket	M6 × 20	8-11	6-8
Wiper Motor Bolts	M6 × 20	8-11	6-8
Wiper Arm Connecting Rod Nut	M8	8-9	6-7
Wiper Arm Nut	M8	14-16	10-12
Rear Wiper Motor Bolt	M6 × 20	8-11	6-8
Rear Wiper Arm Nut	M6	8-11	6-8

## 11.6.2 Description and Operation

### 11.6.2.1 Description and Operation

Wipers / washers system consists of the following components:

- Central Controller
- Wipers / Washers Switch
- Washer Fluid Tank
- Washer Pump
- Wiper Motor
- Wiper Arm and Connecting Rod Installation
- IF27 20A Wiper / Washer Switch Fuse
- Rear Washer Pump (Hatchback)
- Rear Wiper Motor (Hatchback)
- Rear Wiper Arm (Hatchback)
- IF28 10 A Rear Wiper Fuse (Hatchback)
- Rear Wiper Relay (Hatchback)

Wiper / washer system can achieve high-speed, low speed, intermittent three kinds of wiper speed, and can wiper switch off automatically after the reset function.

### Front Wiper / Washer System

Front wiper system consists of a wiper motor, linkage, wiper arm, wiper blades as well as the wiper / washer switch. Front wiper circuit has a self-cut-off device, which consists of a worm gear and a cam plate. The device aims at temporarily maintain the circuit integrity when the wiper / washer switch is off until the wiper arm is back to the original position. Wiper system consists of a permanent magnet motor. The front wiper motor is installed on the front fender and directly connected with the front wiper rod. The front wiper motor speed has two stages (high-speed and low speed), and it can operate intermittently. Wiper switch is a wiper / washer system component. Front wiper switch is installed on the steering column right side lever.

### Windshield Washer System

Windshield washer system consists of a washer fluid tank, washer pump, hoses, nozzles and wiper / washer switch. Windshield washer fluid tank is installed below the right front headlamp assembly, in the front of the right front fender. Washer pump is retained on the washer fluid tank, which sends

washing liquid through the hose to the two nozzles installed on the engine hood. Wiper switch is also a washing / washer switch component.

### Rear Wiper / Washer System (Hatchback)

Windshield wiper system consists of a rear wiper motor, wiper arm and wiper blades. Rear wiper motor is located in the hatchback, and directly connected to the rear window wiper arms and equipped with a separate washer pump, hoses and nozzles. Rear washer system shares the same washer tank and the same washer pump with the windshield washer system. Washer pump sends washing fluid through the hose to the rear nozzle installed on the hatchback. Rear window washer nozzle passes through the high mounted brake lamp cover and retained inside this cover.

### 11.6.3 System Working Principle

#### 11.6.3.1 System Working Principle

Front wiper system is directly controlled by the wiper / washer switch. Front wiper motor wiring harness connector terminal No.4 is the high-speed wiper input, terminal No.1 is the low-speed wiper input. Different signals from the IF27 20A wiper / wash switch power supply through wiper / washer switch to the wiper motor input achieve different wiper speed.

The wiper / washer switch has a built-in integrated circuit, which monitors the wiper motor return switch signal. Once the wiper switch is off, the power from the IF27 20A wiper / wash switch fuse is cut off. This IC can send output voltage through the wiper / washer switch contact circuit to the front wiper motor low-speed input terminal No.1, until the wiper arms are back to the original position. Reset switch signals change and cut off the voltage output, so the wiper arm reset is achieved.

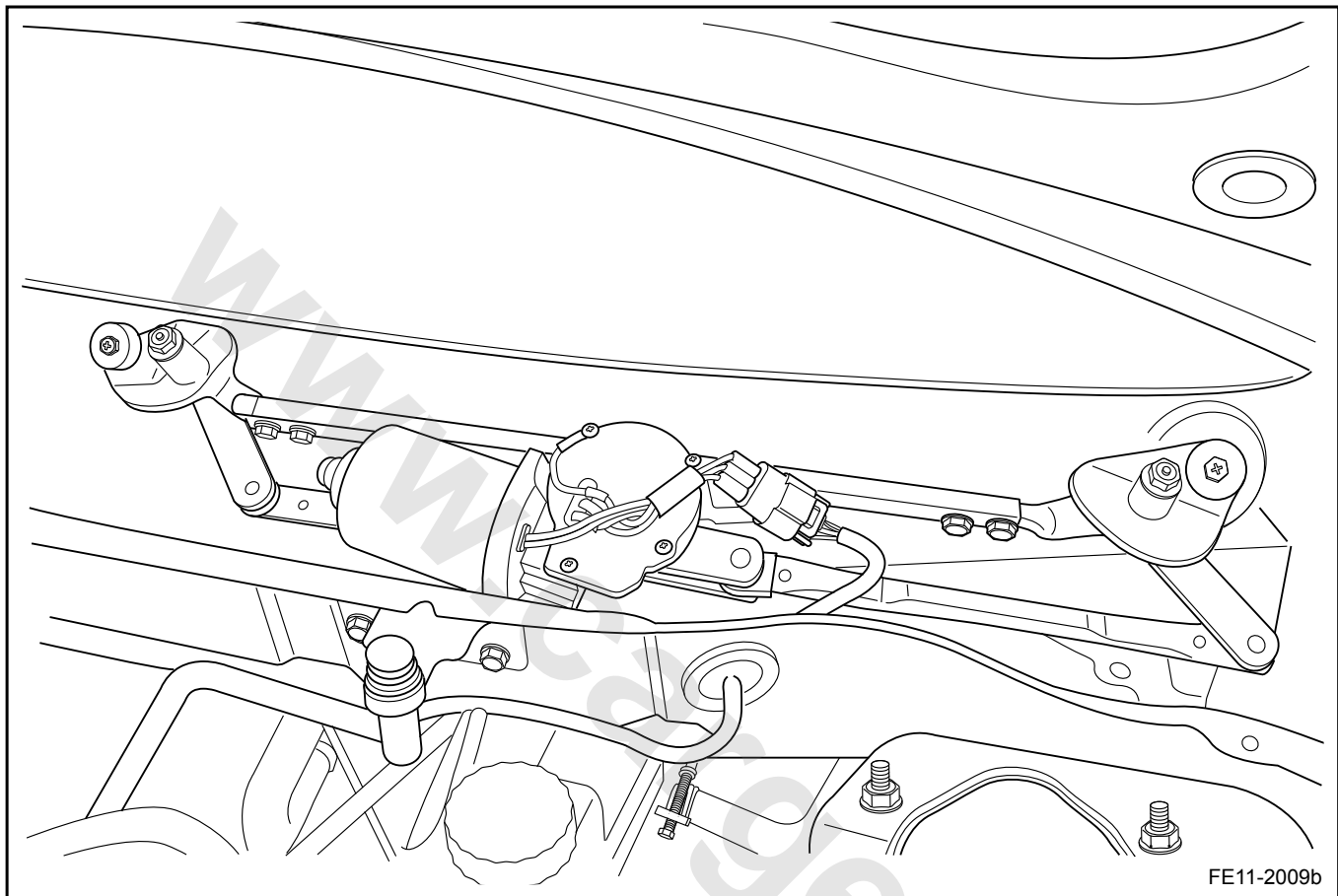
The rear wiper system is controlled by the central controller. The integrated rear wiper switch sends continuous and intermittent wiper requests to the central controller. The central controller controls the rear wiper relay pull-in to achieve rear wiper control.

Front and rear washer pump is driven directly by the wash switch. The switch built-in integrated circuit can monitor the front washer pump signal, and after 2s continued washing the rear wipers will be automatically enabled. The rear wiper system is controlled by the central controller.

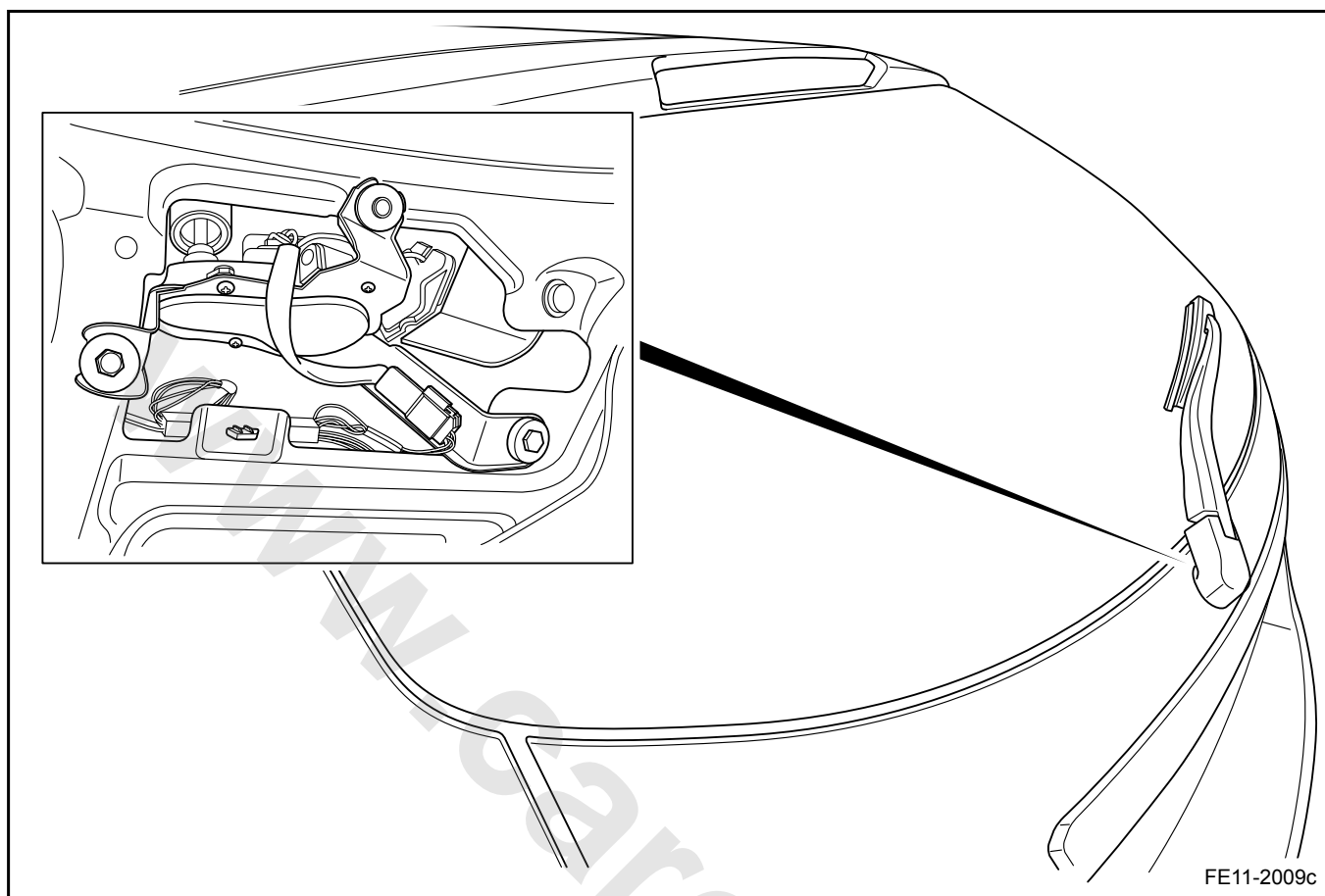
## 11.6.4 Component Locator

### 11.6.4.1 Component Locator

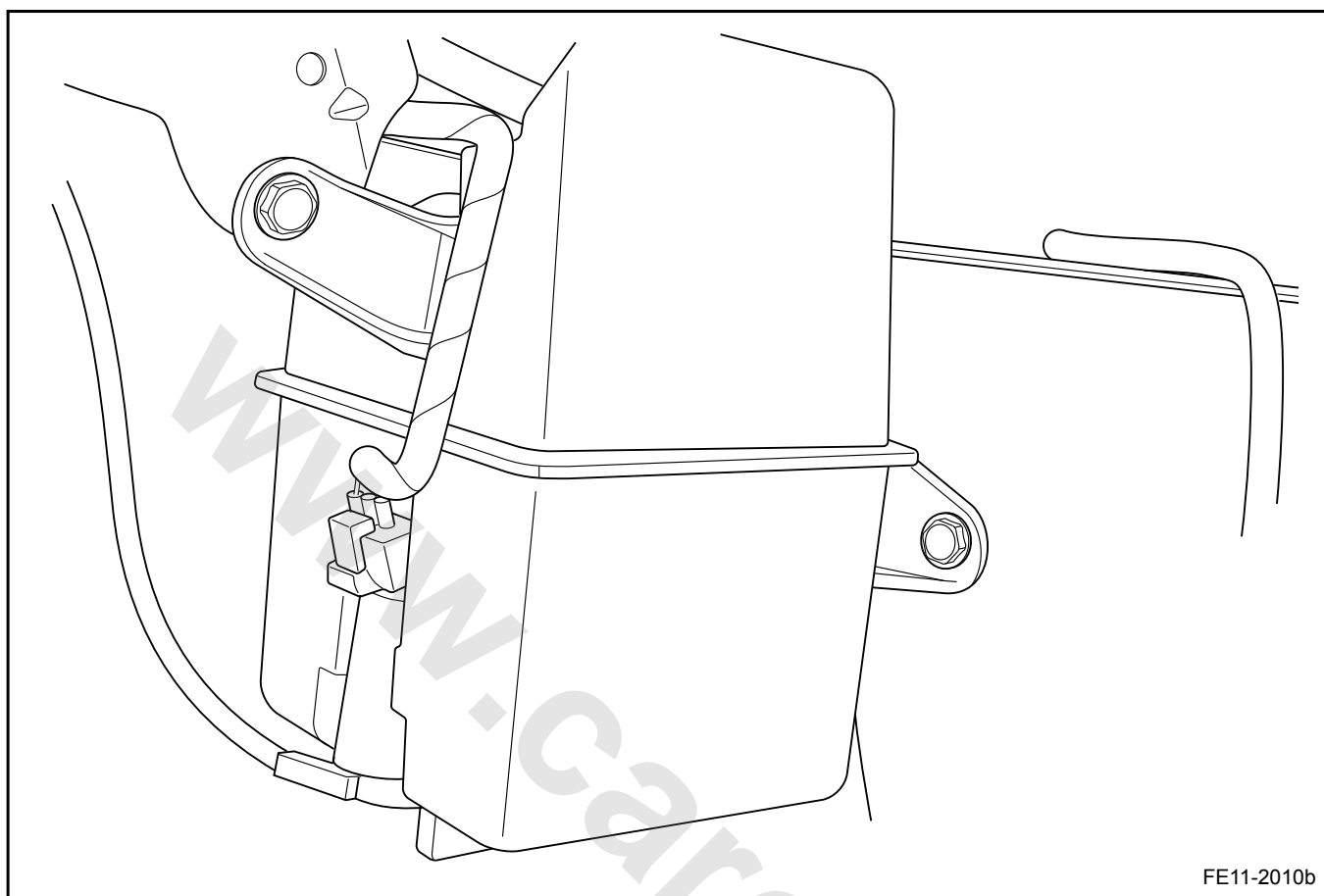
Front Wiper Motor



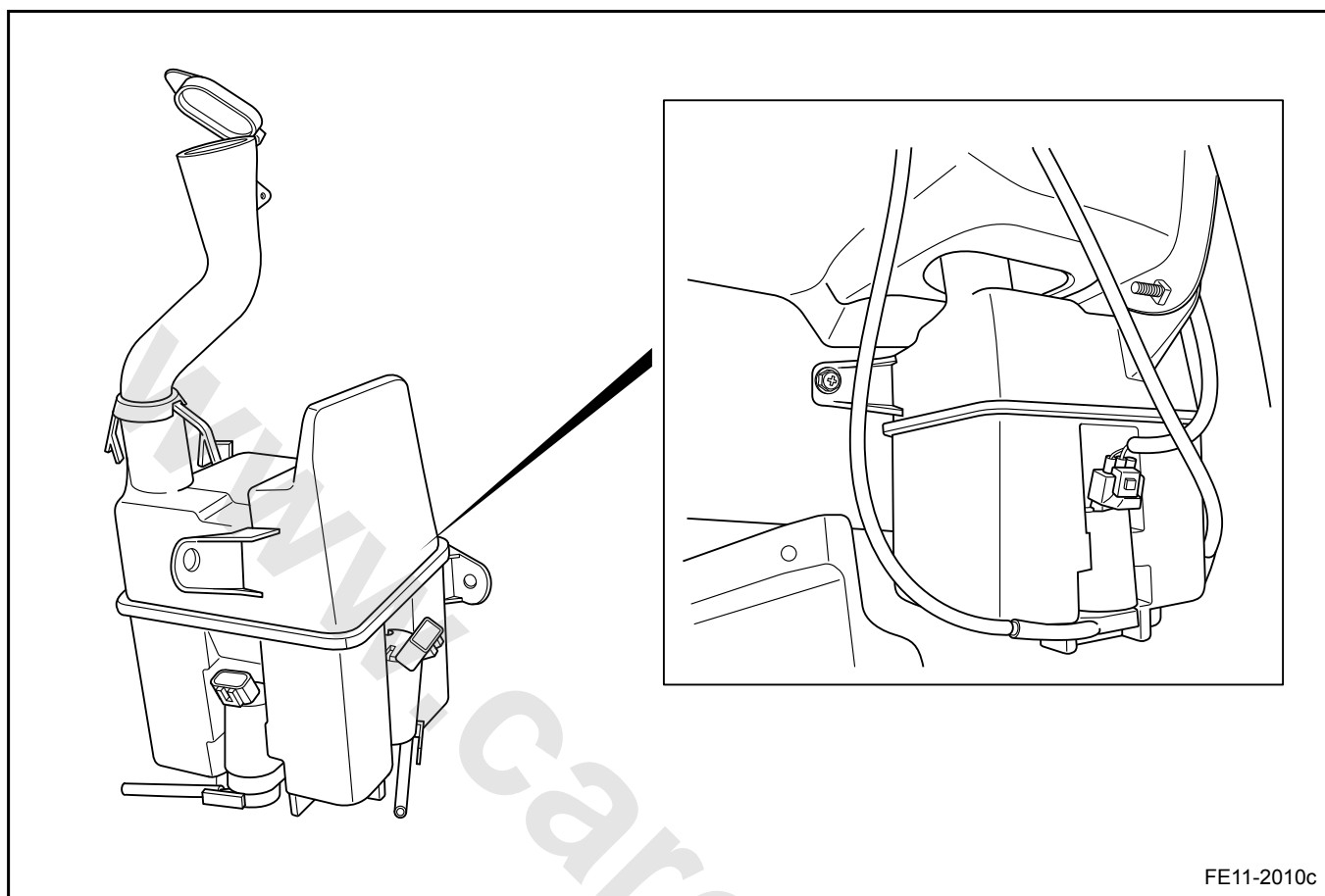
Rear Wiper Motor (Hatchback)



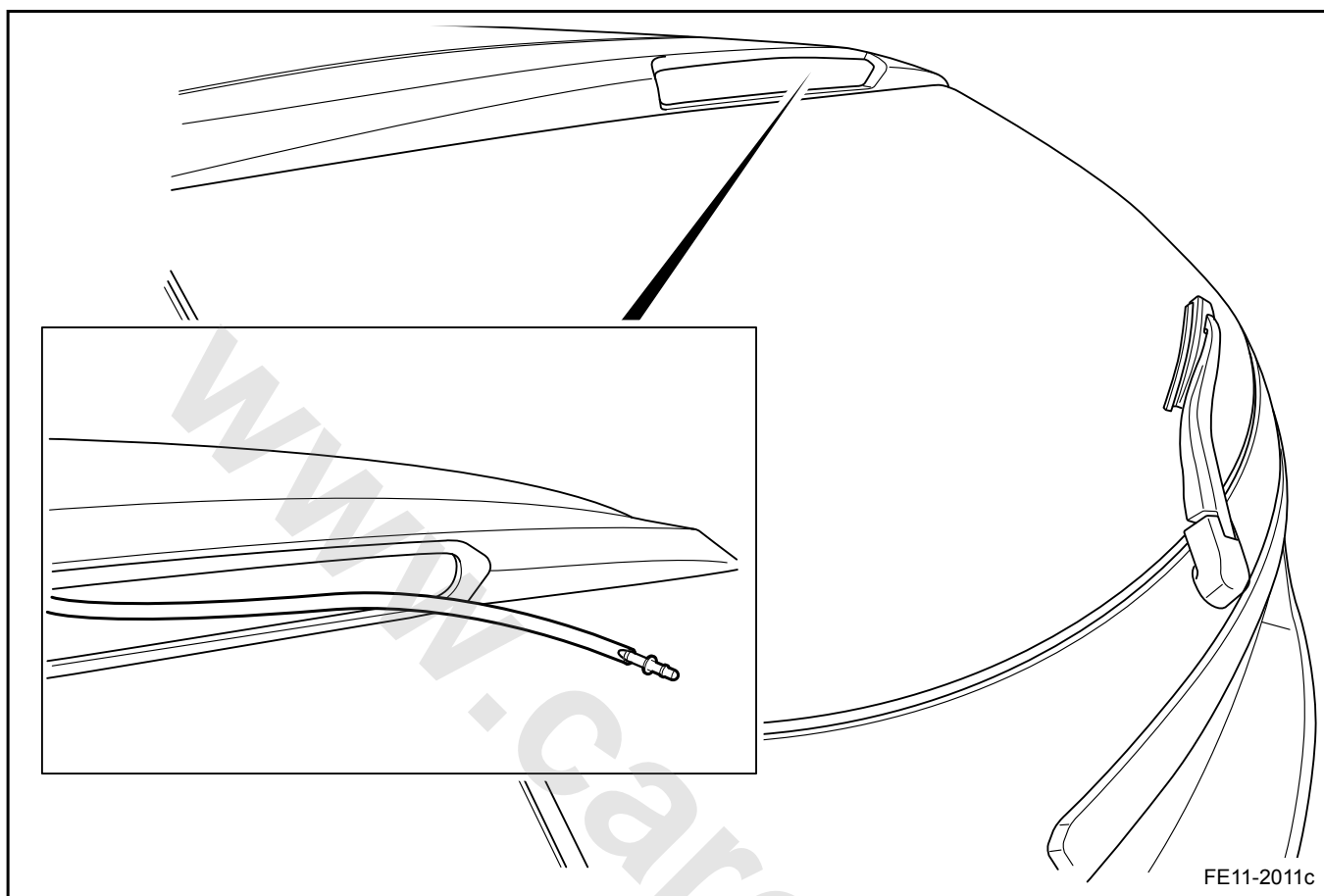
Washer Fluid Tank (Sedan)



Washer Fluid Tank (Hatchback)



Rear Washer Nozzle (Hatchback)

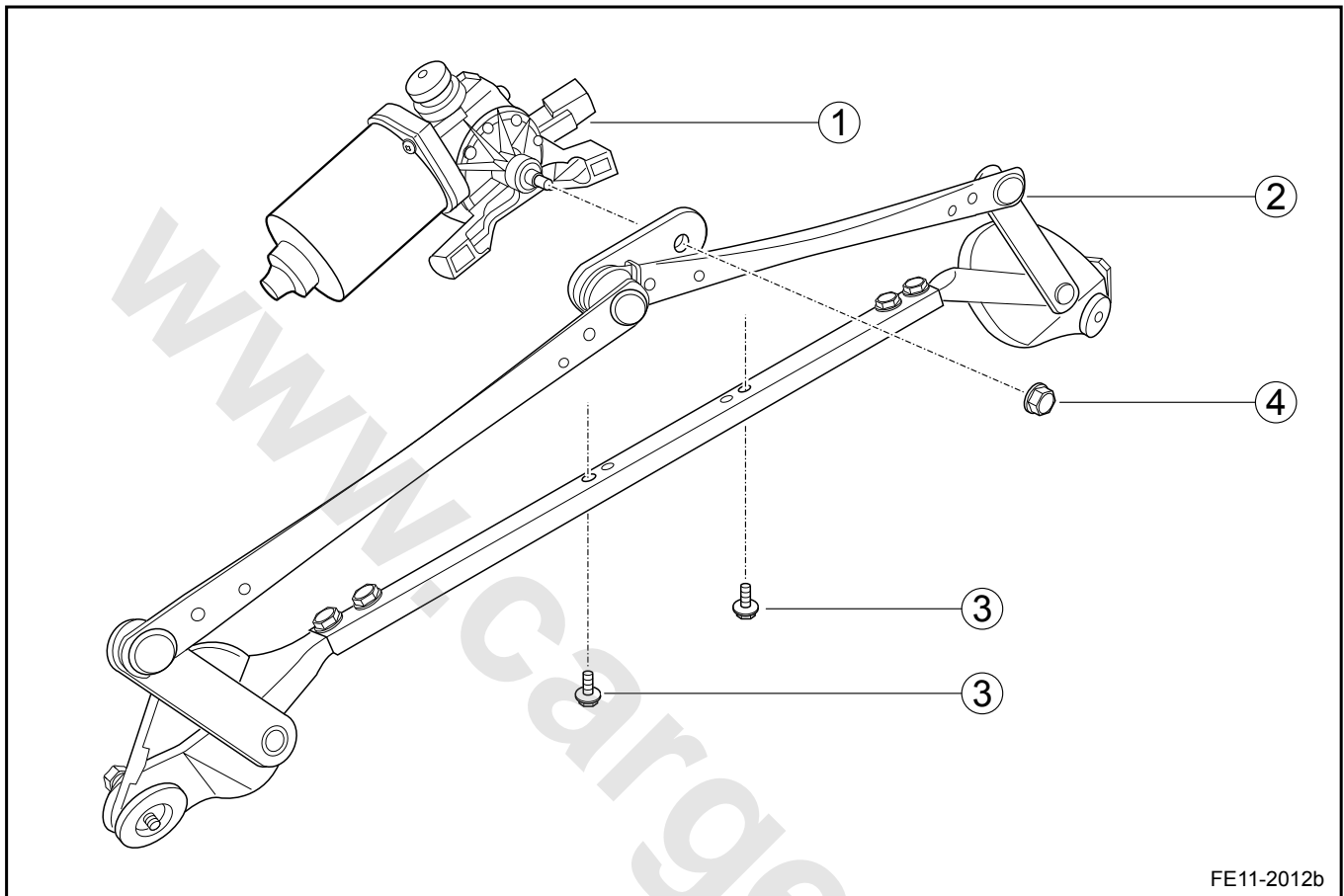




## 11.6.5 Disassemble View

## 11.6.5.1 Disassemble View

Wiper Assembly



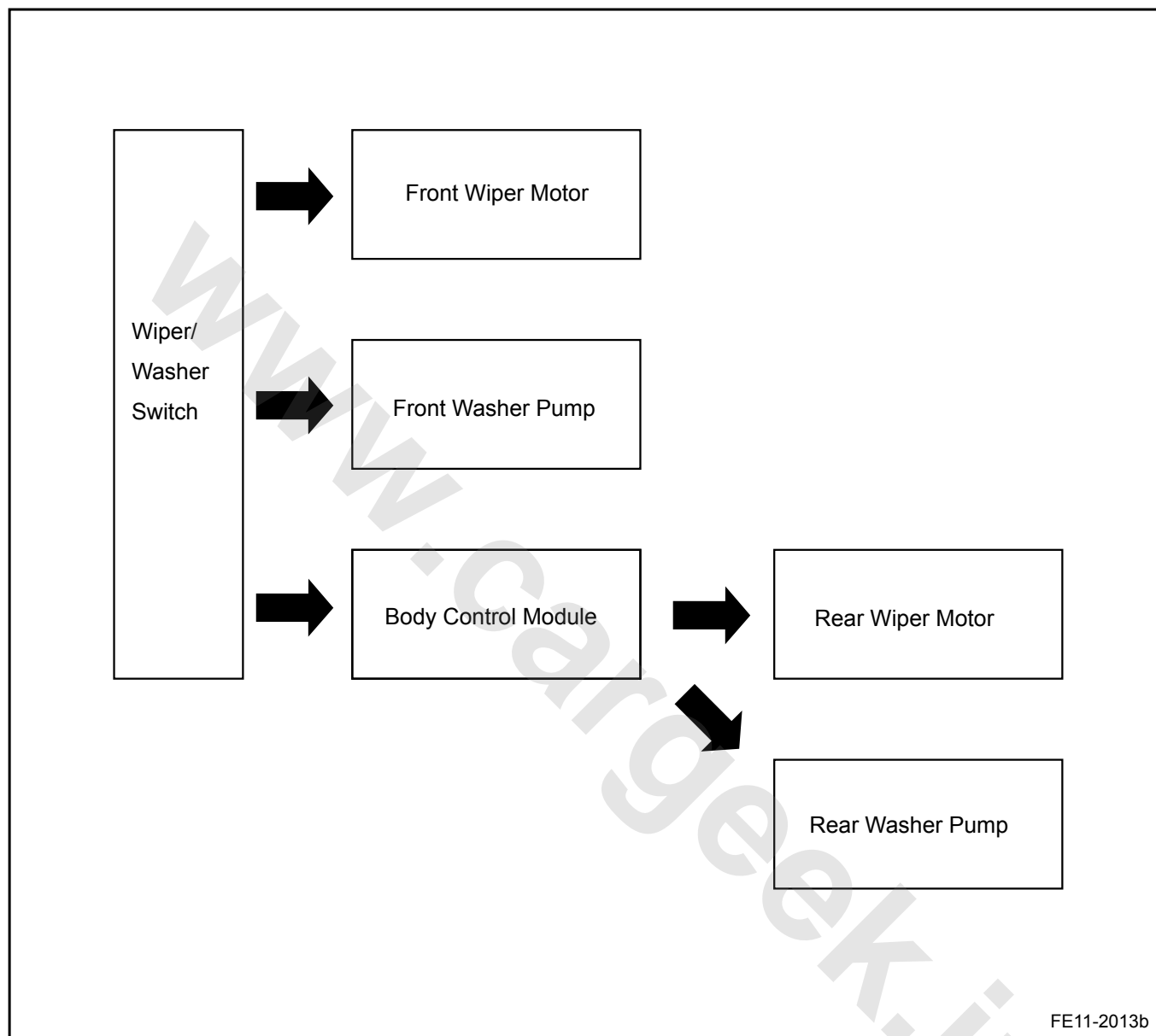
## Legend

- 1. Wiper Motor
- 2. Wiper Rod
- 3. Wiper Motor Retaining Bolts

- 4. Wiper Rod Retaining Nut

## 11.6.6 Schematic

## 11.6.6.1 Schematic



## 11.6.7 Diagnostic Information and Procedures

### 11.6.7.1 Diagnosis Description

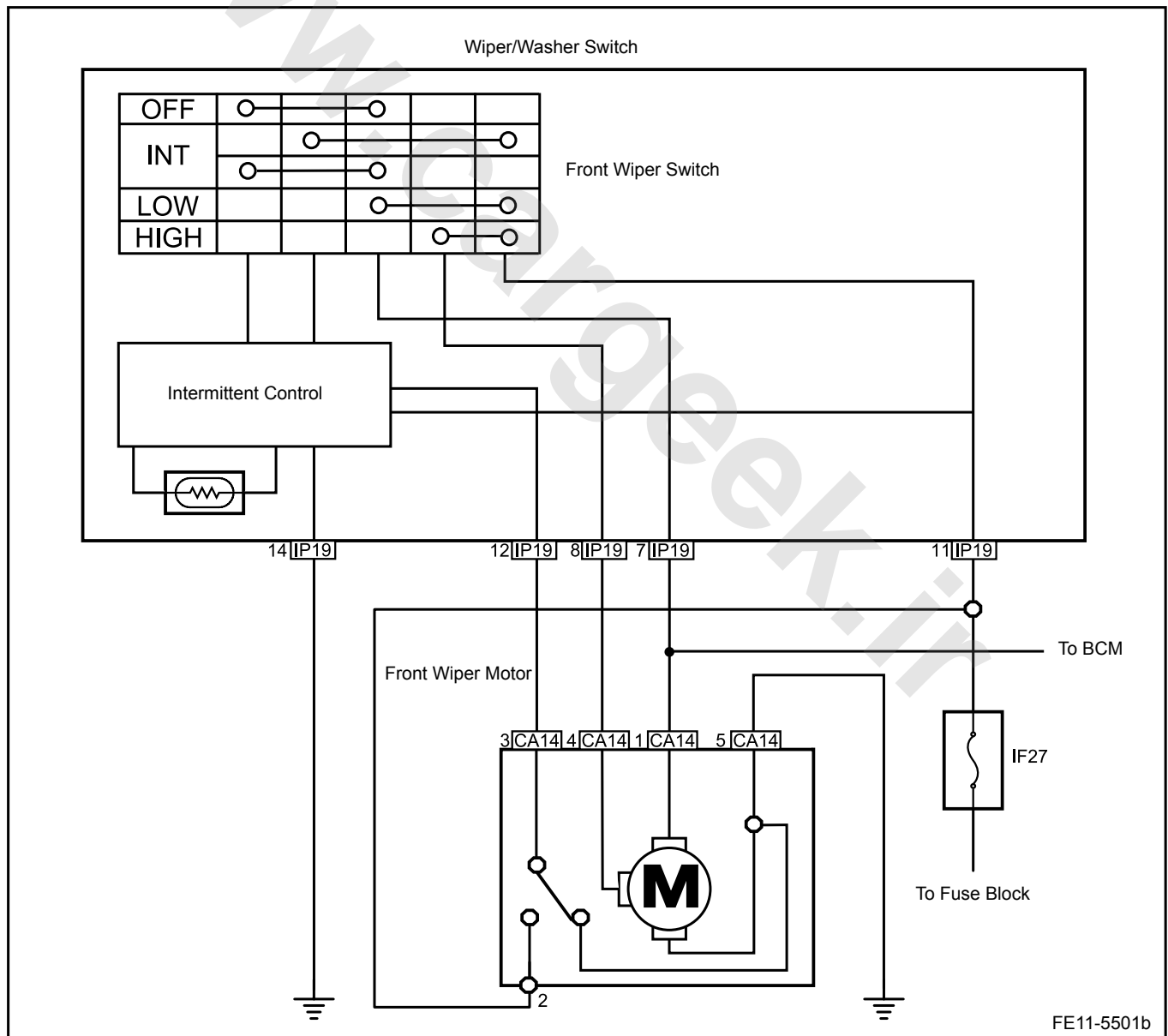
Refer to [11.6.2 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.6.7.2 Visual Inspection

- Check installed after market equipment that may affect windshield wiper system operation.
- Check the easy to access system components to identify whether there is a significant damage or potential malfunction.
- Check whether the washer fluid level is correct.

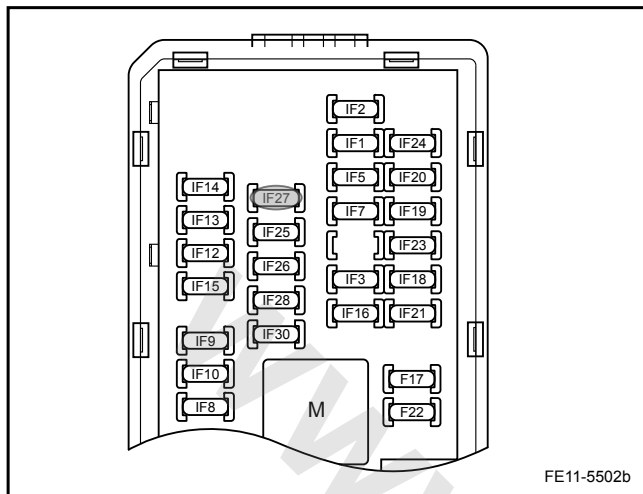
### 11.6.7.3 Wiper Inoperative At All Speed

Schematic:



## Diagnostic Steps:

Step 1	Check the fuse IF27.
--------	----------------------



(a) Is the fuse IF27 blown?

Fuse Rating: 20 A

Is the fuse blown?

No

Go to step 3

Yes

Step 2	Repair the fuse IF27 circuit.
--------	-------------------------------

(a) Check whether the IF27 circuit is a short circuit.

(b) Repair the circuits. Confirm that there are no short circuits.

(c) Replace with fuses with rated current.

Are the wipers working properly?

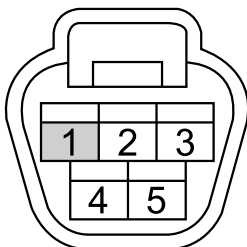
Yes

System normal

No

Step 3	Check the wiper motor harness connector terminal No.1 voltage.
--------	--

Front Wiper Motor Harness Connector CA14



(a) Turn on the ignition switch.

(b) Turn the wiper switch to "LOW" position.

(c) Measure the wiper motor harness connector terminal No.1 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

No

Go to step 5

Yes

Step 4	Replace the wiper motor.
--------	--------------------------

(a) Replace the wiper motor. Refer to [11.6.8.9 Wiper Motor Replacement](#).

Are the wipers working properly?

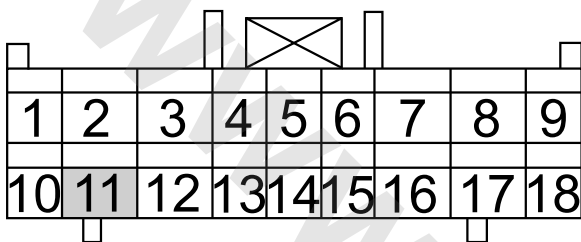
Yes

System normal

No

Step 5 Check the wiper switch wiring harness connector terminal No.11 voltage.

Wiper Switch Harness Connector IP19



FE11-5504b

- Disconnect the wiper switch wiring harness connector.
- Turn on the ignition switch.
- Measure terminal No.11 voltage with a multimeter.

Standard Voltage: 11-14 V

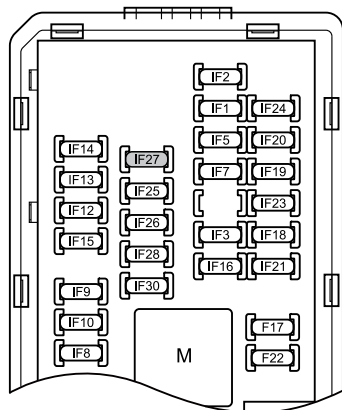
Is the voltage specified value?

Yes

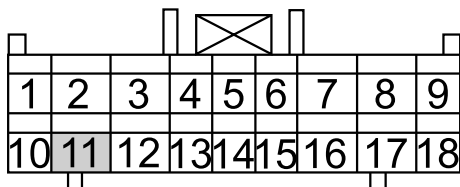
Go to step 7

No

Step 6 Repair the wiper switch wiring harness connector circuit.



Wiper Switch Harness Connector IP19



FE11-5505b

- Check and repair the open circuit between the wiper switch wiring harness connector terminal No.11 and the fuse IF27.

Are the wipers working properly?

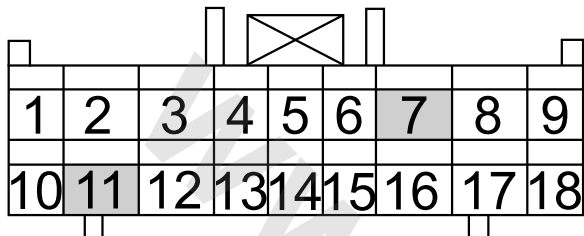
Yes

System normal

No

Step 7 Check the wiper switch continuity.

Wiper Switch Harness Connector IP19



FE55-5506b

- (a) Turn the wiper switch to "LOW" position.  
 (b) Measure resistance between the wiper switch terminal No.11 and 7 with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 9

No

Step 8 Replace the wiper switch.

- (a) Replace the wiper switch. Refer to [11.6.8.8 Wiper and Washer Switch Replacement](#).

Is the wiper switch working correctly?

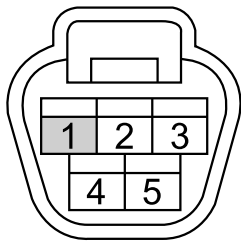
Yes

System normal

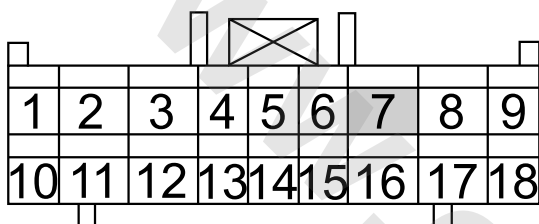
No

Step 9 Check wiper switch and wiper motor circuit.

Front Wiper Motor Harness Connector CA14



Wiper Switch Harness Connector IP19



FE11-5507b

Next

Step 10	System normal.
---------	----------------

#### 11.6.7.4 Wiper Inoperative At High Speed

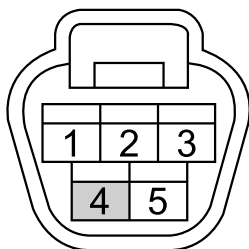
Schematic:

Refer to [11.6.7.3 Wiper Inoperative At All Speed](#).

Diagnostic Steps:

Step 1	Check the wiper motor harness connector terminal No.4 voltage.
--------	--

Front Wiper Motor Harness Connector CA14



FE11-5508b

- Turn on the ignition switch.
- Turn the wiper switch to "HI" (high speed) position.
- Measure the wiper motor wiring harness connector terminal No.4 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

No

Go to step 3

Yes

Step 2 Replace the wiper motor.

- (a) Replace the wiper motor repair. Refer to [11.6.8.9 Wiper Motor Replacement](#).

Is the wiper motor working correctly?

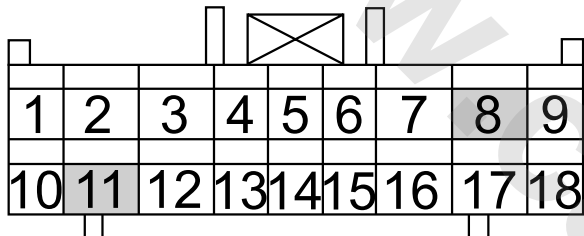
Yes

System normal

No

Step 3 the wiper switch continuity.

Wiper Switch Harness Connector IP19



FE11-5509b

- (a) Turn the wiper switch to "HI" (high speed) position.  
 (b) Measure resistance between the wiper switch terminals No. 11 and 8 and check the wiper switch continuity with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 5

No

Step 4 Replace the wiper switch.

- (a) Replace the wiper switch. Refer to [11.6.8.8 Wiper and Washer Switch Replacement](#)

Are the wipers working properly?

Yes

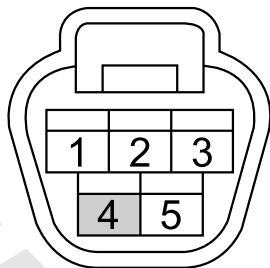
System normal

No

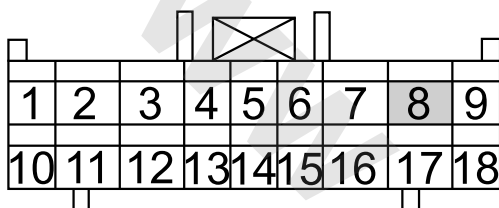
Step 5 Check the circuit between the wiper switch wiring harness connector terminal No.8 and the wiper motor wiring harness connector terminal No.4.



Front Wiper Motor Harness Connector CA14



Wiper Switch Harness Connector IP19



FE11-5510b

Next

Step 6	System normal.
--------	----------------

### 11.6.7.5 Wiper Inoperative At Low Speed

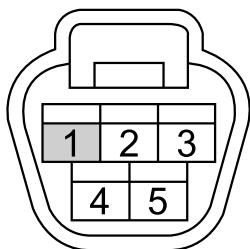
Schematic:

Refer to [11.6.7.3 Wiper Inoperative At All Speed.](#)

Diagnostic Steps:

Step 1	Measure the wiper motor harness connector terminal No.1 voltage.
--------	--

Front Wiper Motor Harness Connector CA14



FE11-5503b

- Turn on the ignition switch.
- Turn the wiper switch to "LOW" (low speed) position.
- Measure the wiper motor harness connector terminal No.1 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

No

Go to step 3

Yes

Step 2 Replace the wiper motor.

- (a) Replace the wiper motor repair. Refer to [11.6.8.9 Wiper Motor Replacement](#).

Is the wiper motor working correctly?

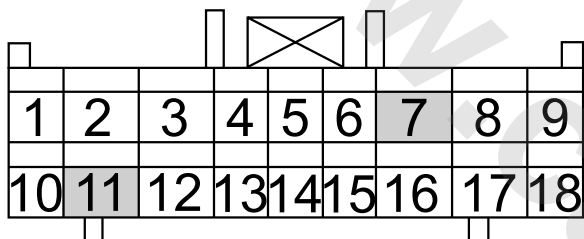
Yes

System normal

No

Step 3 Check the wiper switch.

Wiper Switch Harness Connector IP19



- (a) Turn the wiper switch to "LOW" (low speed) position.  
 (b) Measure resistance between wiper switch terminals No.11 and 7 and check the wiper switch Continuity with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 5

No

Step 4 Replace the wiper switch.

- (a) Replace the wiper switch. Refer to [11.6.8.8 Wiper and Washer Switch Replacement](#).

Are the wipers working properly?

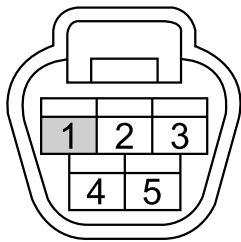
Yes

System normal

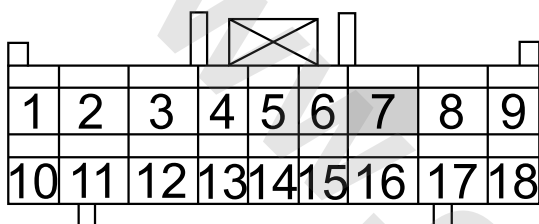
No

Step 5 Check the circuit between the wiper switch wiring harness connector terminal No.7 and the wiper motor wiring harness connector terminal No.1.

Front Wiper Motor Harness Connector CA14



Wiper Switch Harness Connector IP19



FE11-5507b

- (a) Check the circuit between the wiper switch wiring harness connector terminal No.7 and the wiper motor wiring harness connector terminal No.1.
- (b) Repair the open circuit between the wiper switch wiring harness connector terminal No.7 and the wiper motor wiring harness connector terminal No.1.

Confirm the repair completed.

Next

Step 6 System normal.

### 11.6.7.6 Wiper Inoperative At Intermittent

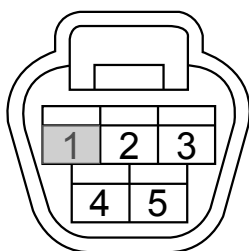
Schematic:

Refer to [11.6.7.3 Wiper Inoperative At All Speed](#).

Diagnostic Steps:

Step 1 Measure the wiper motor harness connector terminal No.1 voltage.

Front Wiper Motor Harness Connector CA14



FE11-5503b

- (a) Turn on the ignition switch.
- (b) Turn the wiper switch to "INT" (intermittent) position, measure the wiper motor harness connector terminal No.1 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

No

Go to step 3

Yes

Step 2 Replace the wiper motor.

- (a) Replace the wiper motor repair. Refer to [11.6.8.9 Wiper Motor Replacement](#).

Is the wiper motor working correctly?

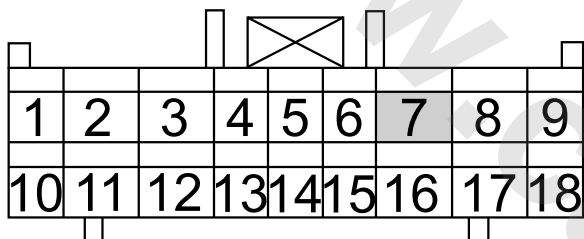
Yes

System normal

No

Step 3 Measure the wiper switch wiring harness connector terminal No.7 voltage.

Wiper Switch Harness Connector IP19



FE55-5511b

- (a) Turn on the ignition switch.  
 (b) Turn the wiper switch to "INT" (intermittent) position.  
 (c) Measure the wiper motor wiring harness connector terminal No.7 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 5

No

Step 4 Replace the wiper switch.

- (a) Refer to [11.6.8.8 Wiper and Washer Switch Replacement](#).

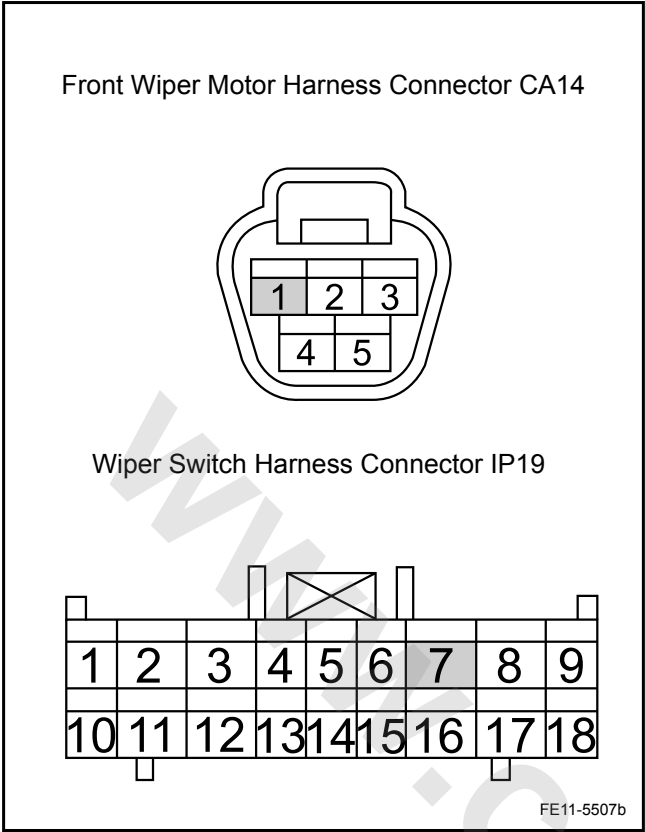
Are the wipers working properly?

Yes

System normal

No

Step 5 Check the circuit between the wiper switch wiring harness connector terminal No.7 and the wiper motor connector terminal No.1.



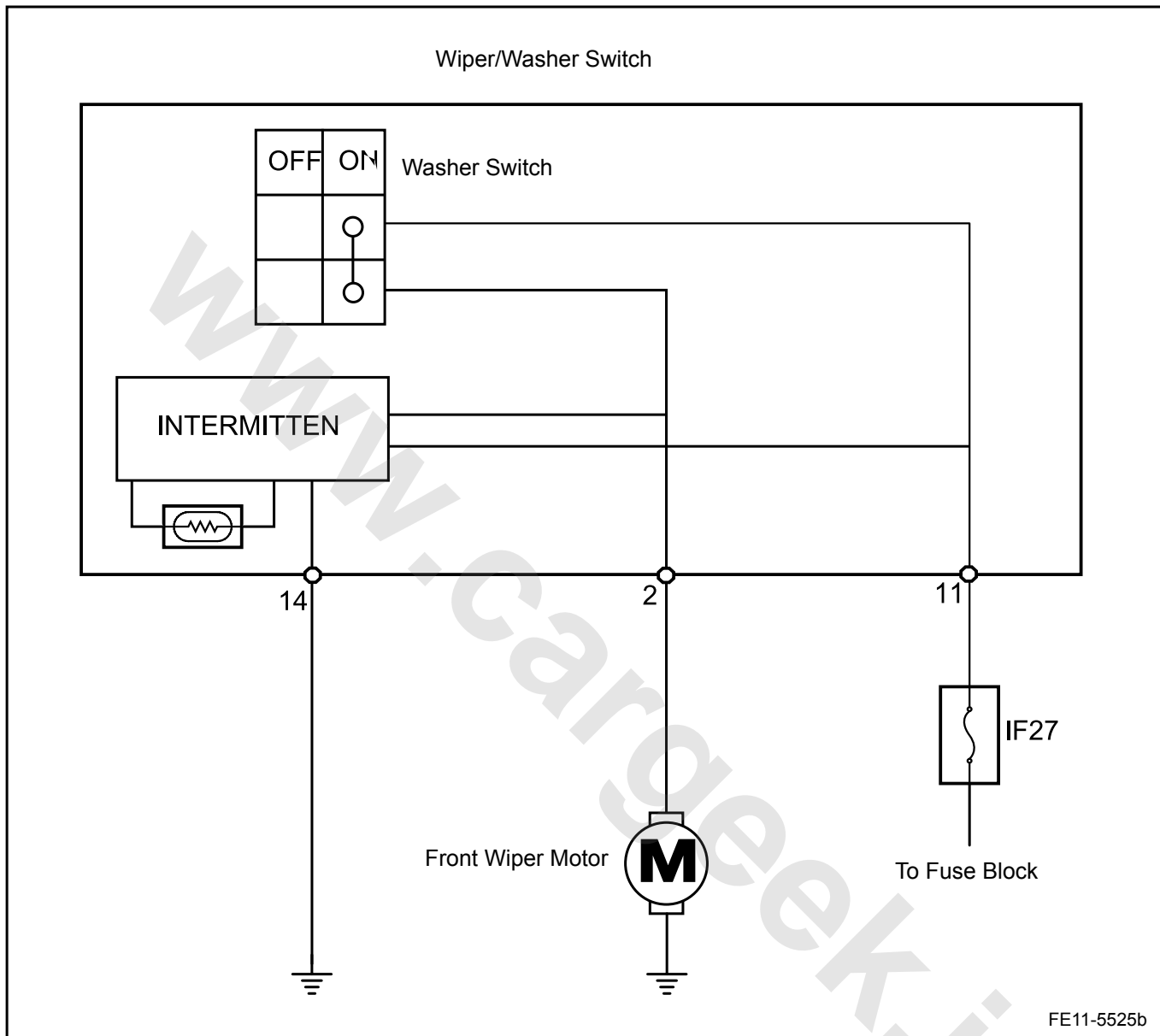
- (a) Check the circuit between the wiper switch wiring harness connector terminal No.7 and the wiper motor connector terminal No.1.
  - (b) Repair the open circuit between the wiper switch wiring harness connector terminal No.7 and the wiper motor connector terminal No.1.
- Confirm the repair completed.

Next

Step 6	System normal.
--------	----------------

## 11.6.7.7 Front Washer Inoperative

Schematic:



Diagnostic Steps:

Step 1	Check the windshield wipers working status.
--------	---

(a) Turn on the ignition switch.

(b) Turn the wiper switch to "LOW" (low speed) position.

Confirm that the windshield wipers work after the switch is turned on.

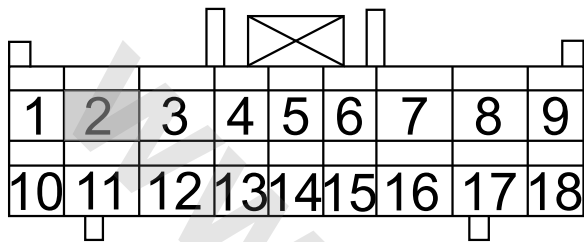
Yes

Go to step 3

No

Step 2 Measure the wiper switch wiring harness connector terminal No.2 voltage.

Wiper Switch Harness Connector IP19



FE11-5512b

- (a) Turn on the ignition switch.
- (b) Turn on the washer switch.
- (c) Measure the wiper / washer switch terminal No.2 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 8

No

Step 3 Replace the wiper switch.

- (a) Replace the wiper switch. Refer to [11.6.8.8 Wiper and Washer Switch Replacement](#).

Is the wiper switch working correctly?

Yes

System normal

No

Step 4 Check whether the washer fluid is sufficient.

- (a) Add washer fluid.

Yes

Go to step 6

No

Step 5 Add windshield washer fluid.

- (a) Add windshield washer fluid.

Confirm that the windshield washer is working correctly.

No

Step 6 Check the windshield washer hose and nozzle.

- (a) Check the windshield washer hose and nozzle for blockage or damage.

No

Go to step 8

Yes

Step 7 Repair or replace the damaged windshield washer hose and nozzle.

(a) Repair or replace the damaged windshield washer hose and nozzle.

Is the windshield washer working correctly?

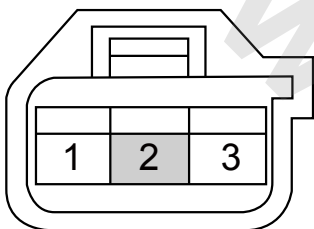
Yes

System normal

No

Step 8 Check the windshield washer motor power supply.

Washer Motor Harness Connector CA24



FE11-5513b

- (a) Turn on the ignition switch.
- (b) Turn on the windshield washer switch.
- (c) Measure the Windshield Washer Pump harness connector pin 2 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

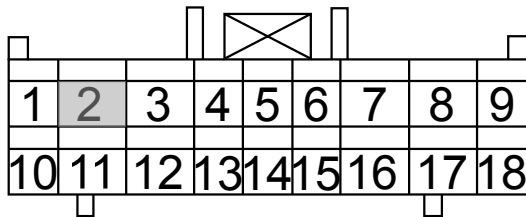
Go to step 10

No

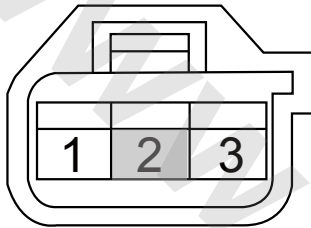
Step 9 Check the circuit between the windshield washer motor and the windshield washer switch.



Wiper Switch Harness Connector IP19



Washer Motor Harness Connector CA24



FE11-5514b

- (a) Check and repair the open circuit between the windshield washer motor and the windshield washer switch.

Is the windshield washer working correctly?

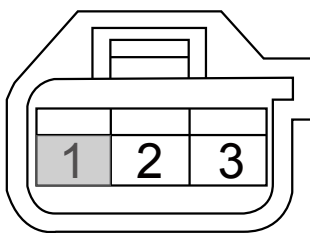
Yes

System normal

No

Step 10 Check the windshield washer motor ground circuit.

Washer Motor Harness Connector CA24



FE11-5515b

- (a) Test continuity between the windshield washer electrical ground circuit (pin 1) and the body ground with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 12

No

Step 11 Repair the Windshield Washer motor ground circuit.

- (a) Repair the Windshield Washer motor ground circuit. Confirm whether the Windshield washer ground circuit is normal.

Yes

System normal



## Diagnostic Steps:

## Note

Before carry out this diagnostic procedure, make sure that the rear wiper motor ground circuit is not faulty.

Step 1	Use scan tool active test function and check the rear wipers working status.
--------	--

- (a) Select as the following sequence: body control module / active test / rear wipers output control.

Are the rear wipers working properly?

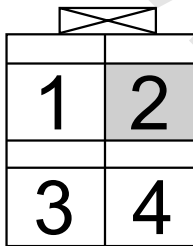
Yes

Go to step 6

No

Step 2	Measure the rear wiper motor wiring harness connector terminal No.2 voltage.
--------	--

Rear Wiper Motor Harness Connector SO47



FE11-5522c

- (a) Disconnect the wiper motor wiring harness connector.  
 (b) Turn on the ignition switch.  
 (c) Activate the wiper switch, measure the wiper motor harness connector terminal No.2 voltage with a multimeter.

Standard Voltage: 11-14 V

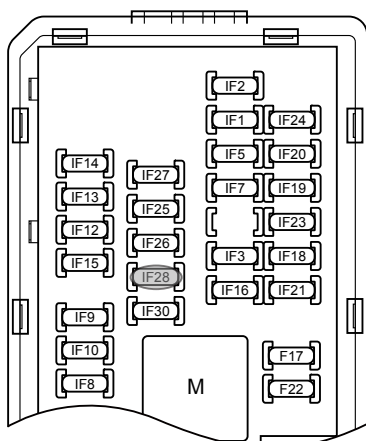
Is the voltage specified value?

Yes

Replace the wiper motor. Refer to [11.6.8.11 Rear Wiper Motor Replacement \(Hatchback\)](#)

No

Step 3	Check the fuse IF28.
--------	----------------------



FE11-5529c

- (a) Check the fuse IF28.

Fuse Rating: 10 A

Is the fuse normal?

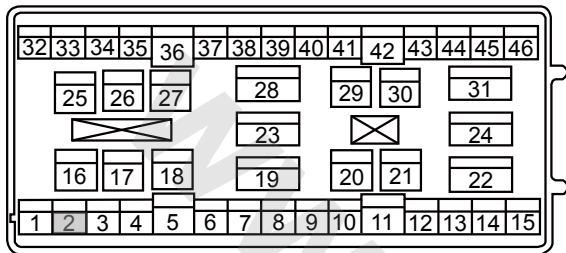
No

Check the circuits and replace the fuse, confirm the fault has been fixed.

Yes

Step 4 Check the rear wiper relay control circuit.

I/P Fuse Block Harness Connector IP05



FE11-5530c

- (a) Find the wiring harness connector IP05 terminal No.2.

**Note**

**Do not disconnect the wiring harness connector IP05.**

- (b) Connect the wiring harness connector IP05 terminal No.2 to the ground.  
 (c) Turn the ignition switch to the ON position.  
 Confirm that wipers are working properly.

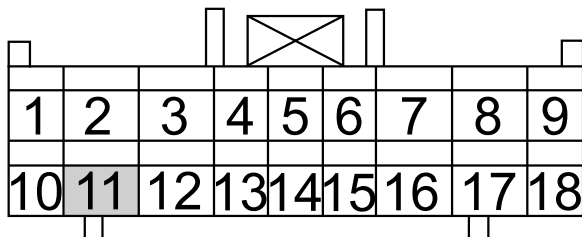
No

Go to step 10

Yes

Step 5 Measure the wiper switch wiring harness connector terminal No.11 voltage.

Wiper Harness Connector IP19



FE11-5531c

- (a) Turn the ignition switch to the ON position.  
 (b) Measure the wiper switch harness connector IP19 terminal No.11 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

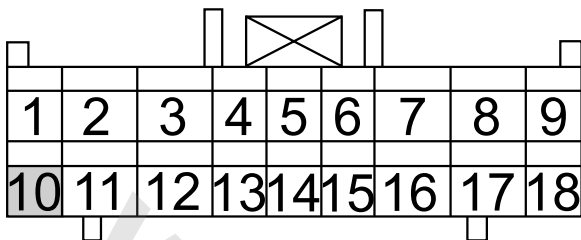
No

Check the wiper switch power supply circuit open.

Yes

Step 6 Check the wiper switch wiring harness connector terminal No.10 voltage.

Wiper Harness Connector IP19



FE11-5523c

- Turn the ignition switch to the ON position.
- Operate the rear wiper switch to normal position.
- Measure the wiper switch harness connector IP19 terminal No.10 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 8

No

Step 7 Replace the wiper switch.

- Replace the wiper switch. Refer to [11.6.8 Wiper and Washer Switch Replacement](#).

Confirm that wipers are working correctly.

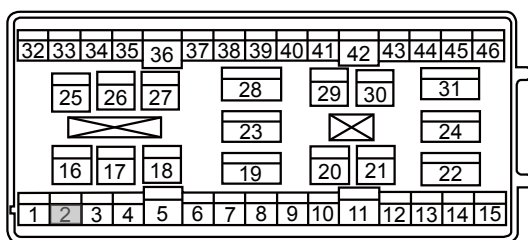
Yes

System normal

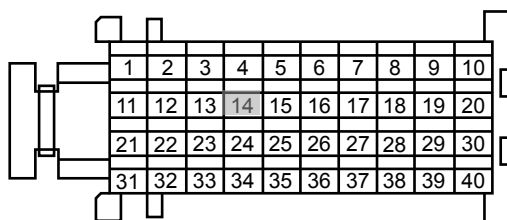
No

Step 8 Test continuity between the body control module (BCM) IP29 terminal No.14 and I/P fuse block wiring harness connector IP05 terminal No.2.

I/P Fuse Block Harness Connector IP05



Body Control Module 1 Harness Connector IP29



FE11-5526c

- Disconnect the I/P fuse block wiring harness connector IP02.
- Disconnect the I/P fuse block wiring harness connector IP29.
- Measure resistance between IP02 terminal No.2 and IP29 terminal No.14.

Standard Resistance values: Less than 1 Ω

Is the resistance specified value?

No

Check the open circuit between IP02 terminal No.2 and IP29 terminal No.14.

Yes

Step 9 Replace the body control module (BCM).

- (a) Replace the body control module (BCM). Refer to [11.10.8.1 BCM Replacement](#).

Confirm the wipers are working correctly.

Yes

System normal

No

Step 10 Measure the I/P fuse block fuse C05 terminal I voltage.

I/P Fuse Harness Connector C05

A	B	C	D	E
F	G	H	I	J

FE11-5527c

- (a) Turn the ignition switch to the ON position.  
 (b) Operate the rear wiper switch to normal position.  
 (c) Measure the I/P fuse block fuse C05 terminal I voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 12

No

Step 11 Replace the I/P fuse block.

- (a) Replace the I/P fuse block.

Confirm the wipers are working correctly.

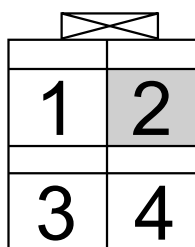
Yes

System normal

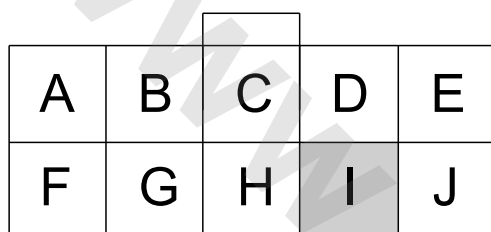
No

Step 12 Repair the circuit between the I/P block C05 terminal I and the rear wiper motor wiring harness connector terminal No.2.

Rear Wiper Motor Harness Connector SO47



I/P Fuse Harness Connector C05



FE11-5528c

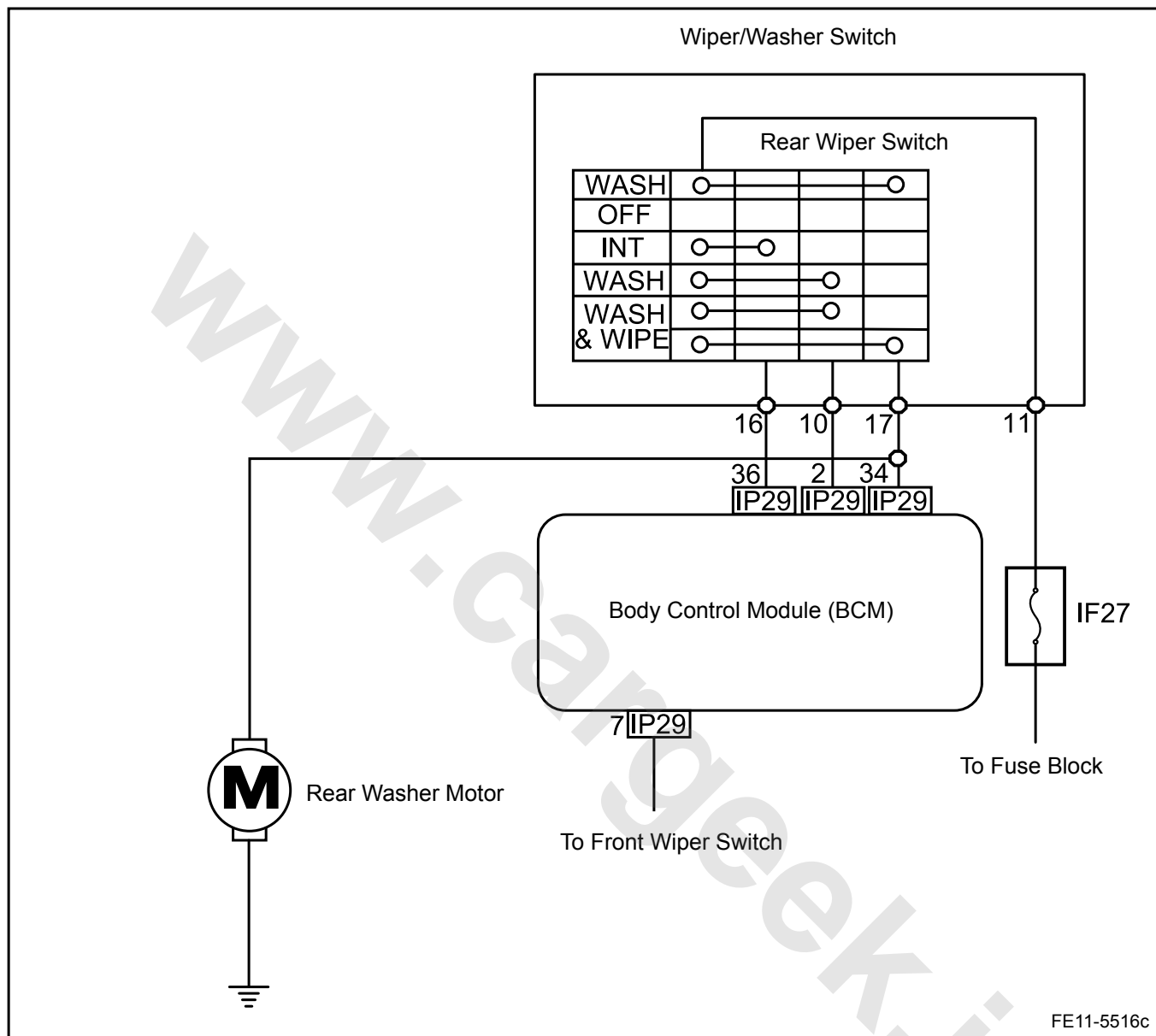
Next

Step 13 System normal.

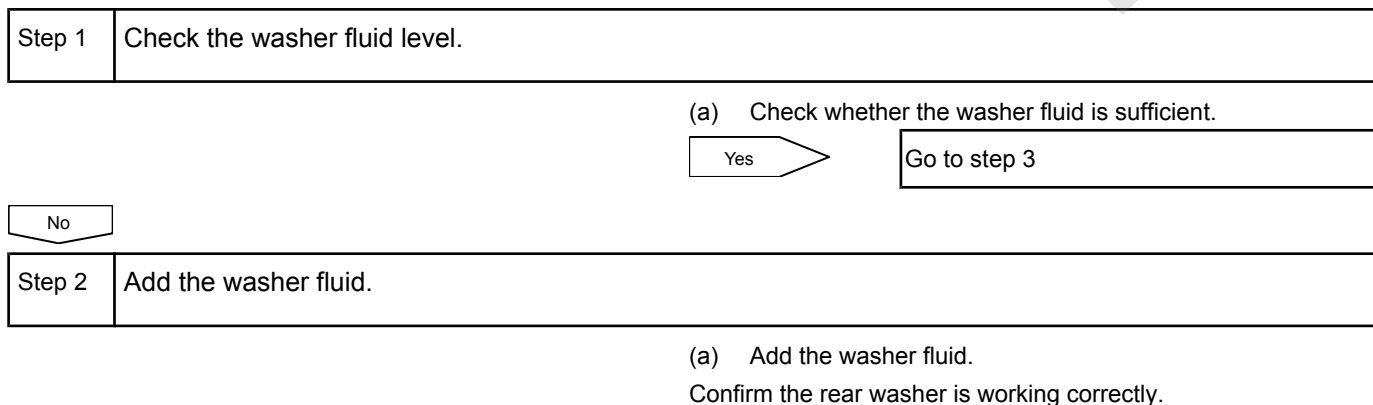
- (a) Repair the circuit between the I/P block C05 terminal I and the rear wiper motor wiring harness connector terminal No.2. Confirm the repair completed.

## 11.6.7.9 Rear Washer Inoperative (Hatchback)

Schematic:



Diagnostic Steps:





Yes

System normal

No

Step 3

Check the rear washer hose and nozzle.

- (a) Check the windshield washer hose and nozzle for blockage / damage / leaking.

No

Go to step 5

Yes

Step 4

Repair hoses and nozzles.

- (a) Repair or replace the blocked / damaged / leaking hose and nozzle scrubbers. Refer to [11.6.8.7 Washer Fluid Tank Replacement](#).

Confirm the washer is working properly.

Yes

System normal

No

Step 5

Operating the wipers, check the wiper working status.

- (a) If the rear wipers are inoperative, the rear wipers circuit is faulty. First repair the wipers inoperative. For detailed procedures. Refer to [11.6.7.8 Rear Window Wipers Inoperative \(Hatchback\)](#), and then to the "A"

wiper

- (b) If the rear wipers work, the wiper switch power supply circuit is normal, to "B"

A

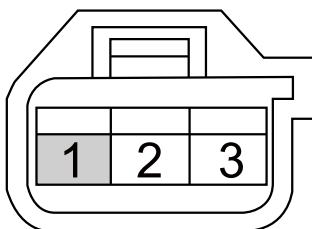
Go to step 10

B

Step 6

Check the rear washer motor ground circuit.

Rear Washer Motor Harness Connector



FE11-5517c

- (a) Disconnect the rear washer motor wiring harness connector.  
 (b) Check the continuity between the rear washer motor terminal No.1 and the ground with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$

Yes

Go to step 8

No

**Step 7** Repair the rear washer motor ground circuit.

- (a) Repair the rear washer motor ground circuit resistance too high or open circuit.

Is the ground circuit normal?

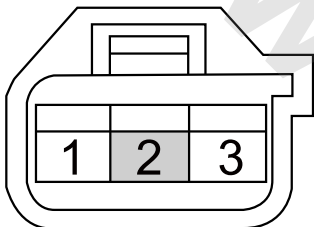
Yes

System normal

No

**Step 8** Measure the rear washer motor terminal No.2 voltage.

Rear Washer Motor Harness Connector



FE11-5518c

- (a) Turn on the ignition switch.  
(b) Turn on the rear washer.  
(c) Measure rear washer motor connector terminal No.2 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

No

Go to step 10

Yes

**Step 9** Replace the rear washer motor.

- (a) Replace the rear washer motor. Refer to [11.6.8.10 Rear Washer Pump and Hose Replacement \(Hatchback\)](#).

Confirm the rear wipers are working correctly.

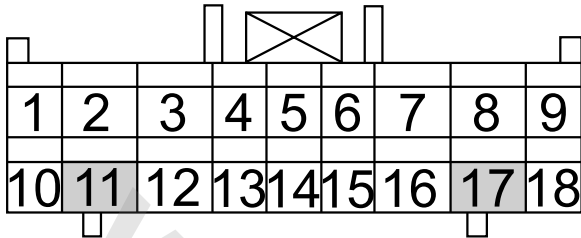
Yes

System normal

No

**Step 10** Check the circuit between the rear wiper switch wiring harness connector terminals No.11 and 17.

Wiper Switch Harness Connector IP19

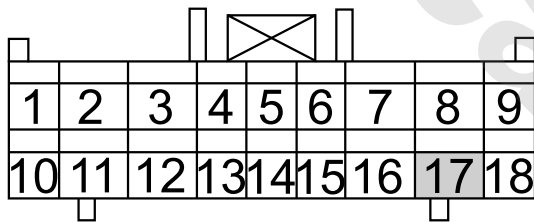


FE11-5519c

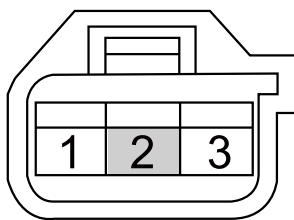
Yes

Step 11 Check the circuit between the rear wiper switch wiring harness connector terminal No.17 and the rear washer pump connector terminal No.2.

Wiper Switch Harness Connector IP19



Rear Washer Motor Harness Connector CA25



FE11-5520c

No

Step 12 Replace the wiper switch.

- Disconnect the rear wiper switch.
- Turn on the rear washer switch.
- Connect a multimeter between the rear wiper switch terminals 11 and 17.

Resistance Standard Value: Less than 1  $\Omega$ 

Is the resistance specified value?

No

Go to step 12

- Check the circuit between the rear wiper switch wiring harness connector terminal No.17 and the rear washer pump connector terminal No.2.
- Repair the open circuit between the rear wiper switch wiring harness connector terminal No.17 and the rear washer pump connector terminal No.2.

Confirm whether the wipers are work properly.

Yes

System normal

- Replace the wiper switch. Refer to [11.6.8 Wiper and Washer Switch Replacement](#).

Confirm the repair completed.

Next

Step 13 System normal.

[www.cargeek.ir](http://www.cargeek.ir)

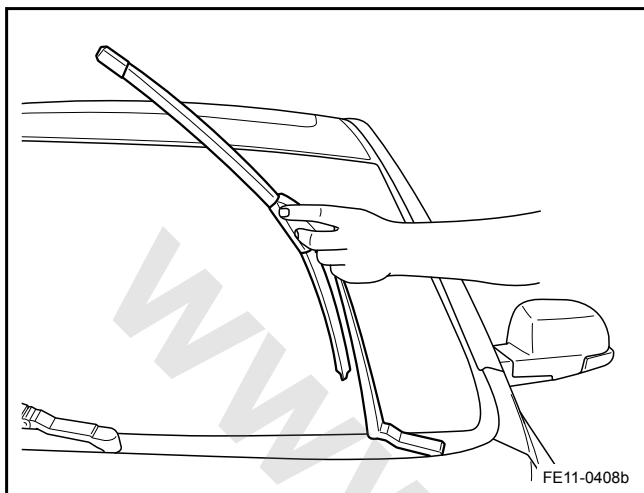
## 11.6.8 Removal and Installation

### 11.6.8.1 Wiper Blade Replacement

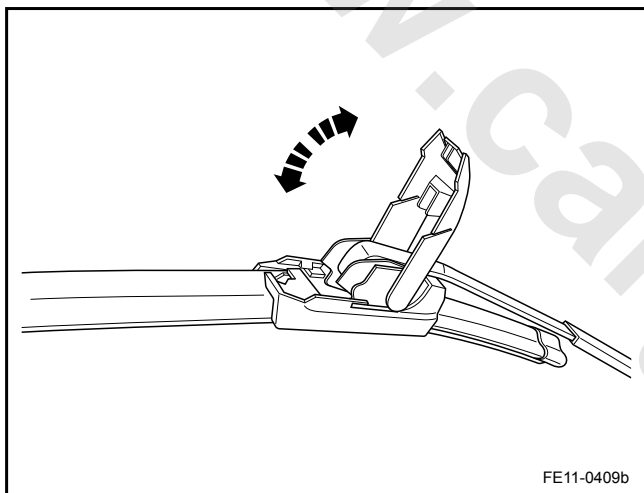
#### Removal Procedure

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).

2. Lift the wiper arm.



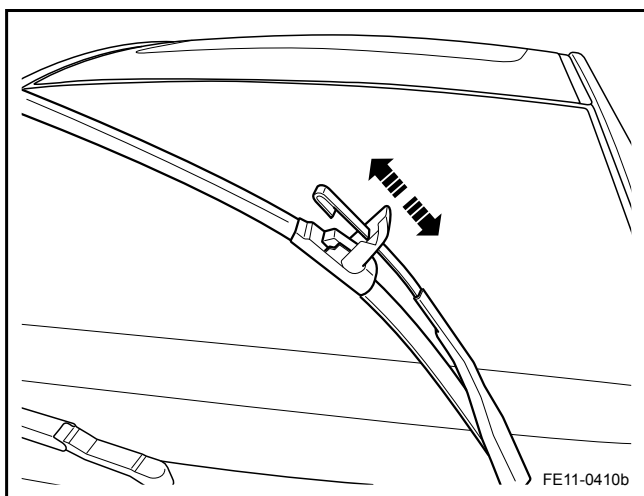
3. Move the retaining clip upward.



4. Hold the wiper arm, move the wiper blade downward to remove the wiper blade.

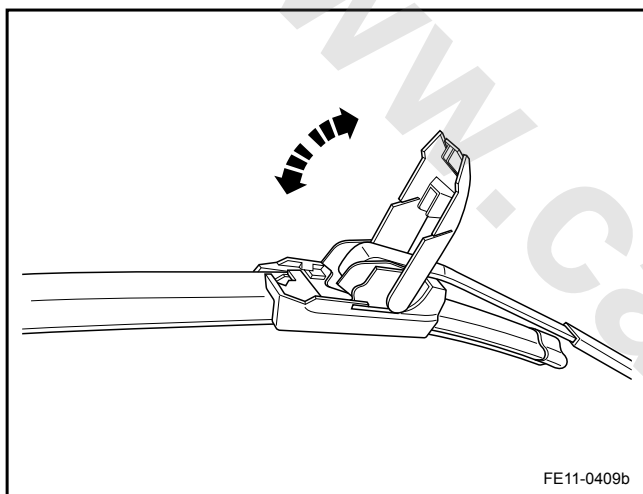
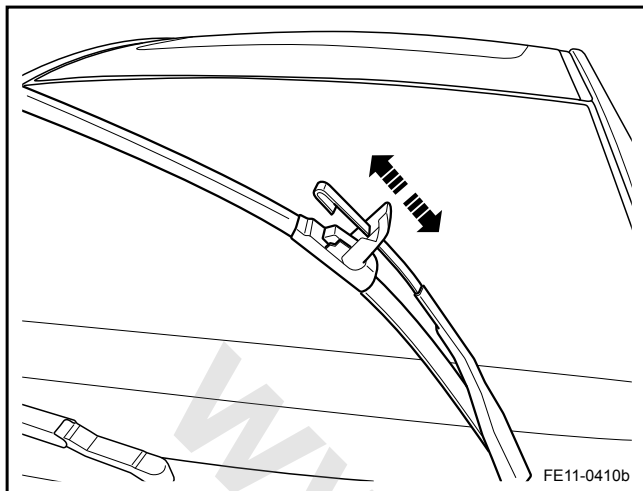
#### Note

If new parts are not immediately replaced, put down the wiper arm gently to prevent the damage to the windshield.



## Installation Procedure:

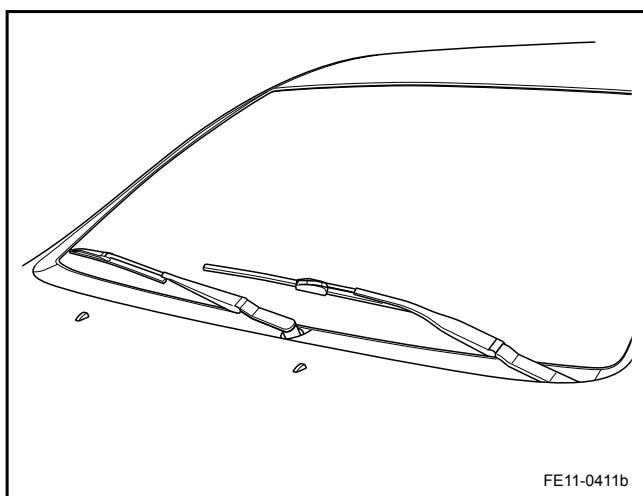
1. Install the wiper blade, until the wiper blade arm is tightened with the wipers.
2. Move the wiper blade retaining clip, until the clip is back to its original position.
3. Lower the wiper arm gently.
4. Connect the battery negative cable.

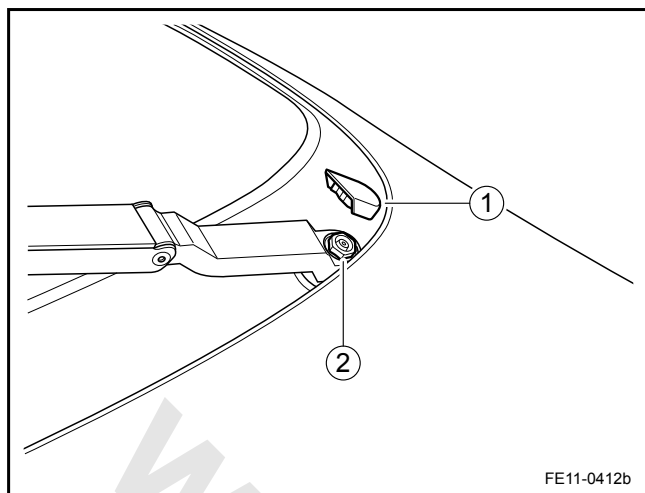


## 11.6.8.2 Wiper Arm Replacement

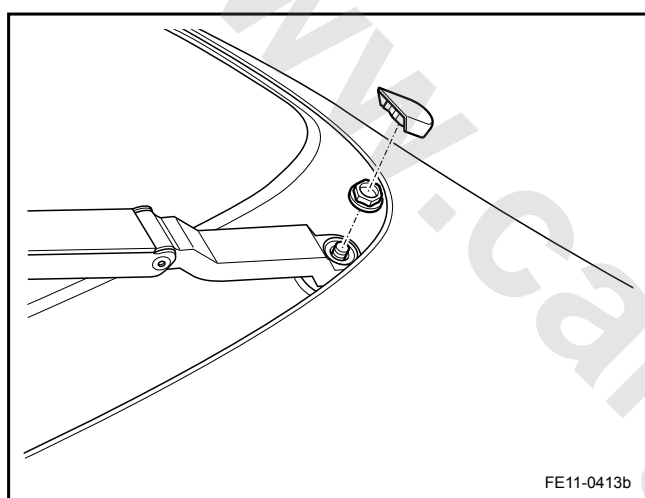
## Removal Procedure

1. Before removal place the wiper arm at its initial position.





2. Remove the wiper arm nut cover (1).
3. Remove the wiper arm nut (2).



#### Installation Procedure:

1. Install the wiper arm.
2. Tighten the wiper arm nut.

#### Note

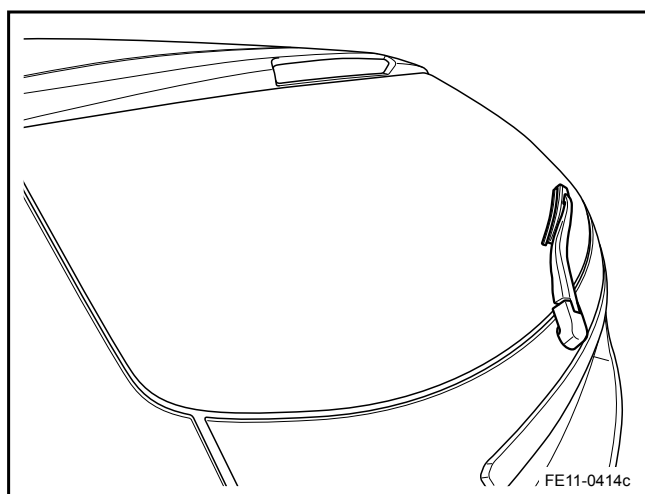
Refer to "Fastener Notice" in "Warnings and Notices".

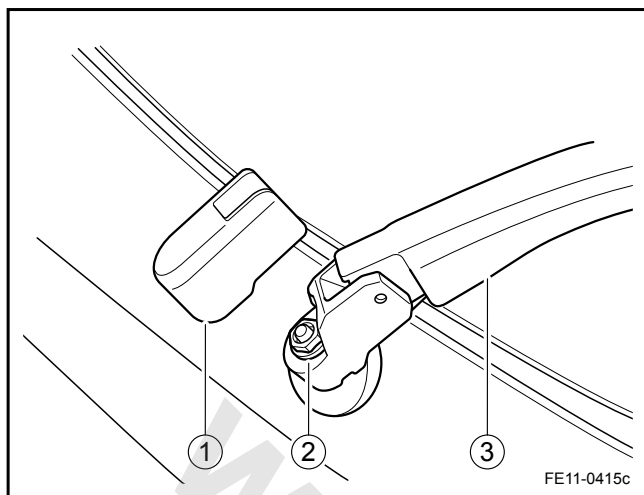
Torque: 60 Nm (Metric) 44 lb-ft (US English)

### 11.6.8.3 Rear Wiper Arm Replacement (Hatchback)

#### Removal Procedure

1. Before removal place the wiper arm at its initial position.





2. Remove the wiper arm nut cover (1).
3. Remove the wiper arm nut (2).
4. Remove the wiper arm (3).

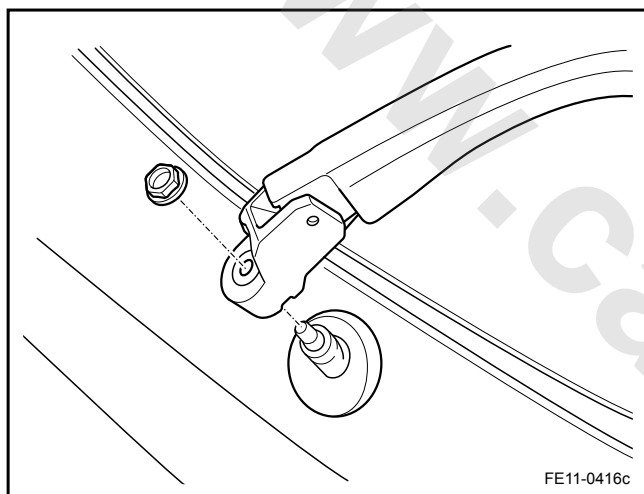
#### Installation Procedure:

1. Install the wiper arm.
2. Tighten the wiper arm nut.

#### Note

Refer to "Fastener Notice" in "Warnings and Notices".

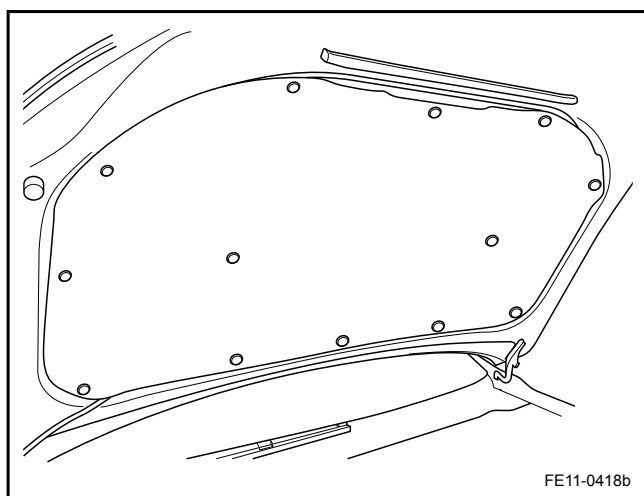
Torque: 45 Nm (Metric) 33 lb-ft (US English)



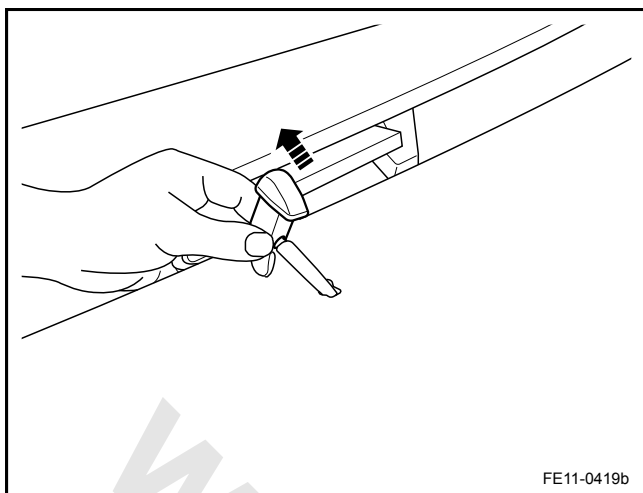
#### 11.6.8.4 Wiper Nozzle Replacement

##### Removal Procedure

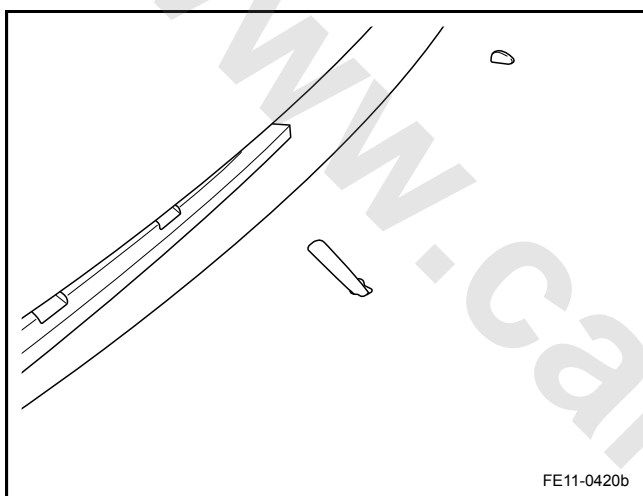
1. Open the hood.
2. Remove the hood insulation pad. Refer to [12.10.1.2 Hood Sound Insulation Pad Replacement](#).







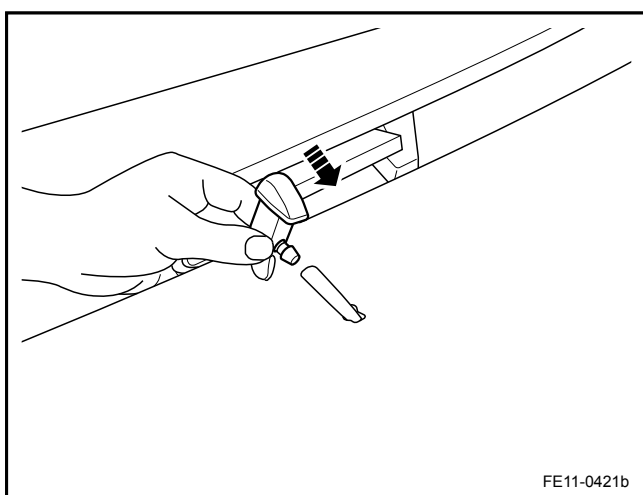
3. Disconnect the nozzle pipe.



4. Remove the nozzle from the engine hood.

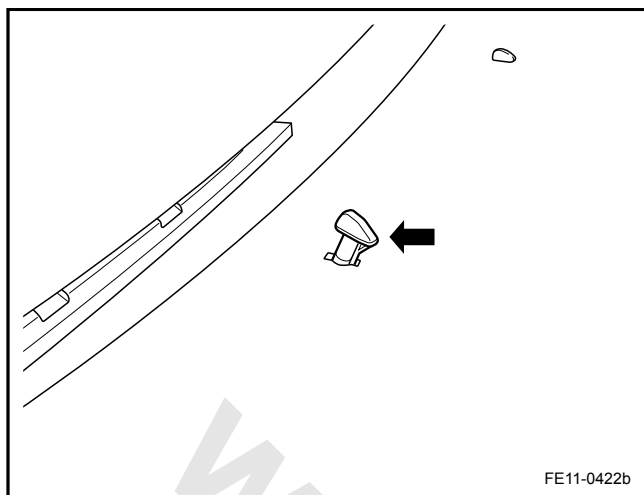
**Note**

Prevent the hose falling into the engine compartment.

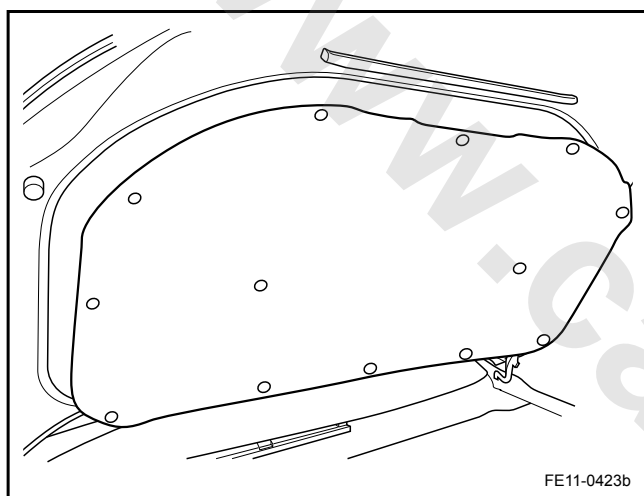


**Installation Procedure:**

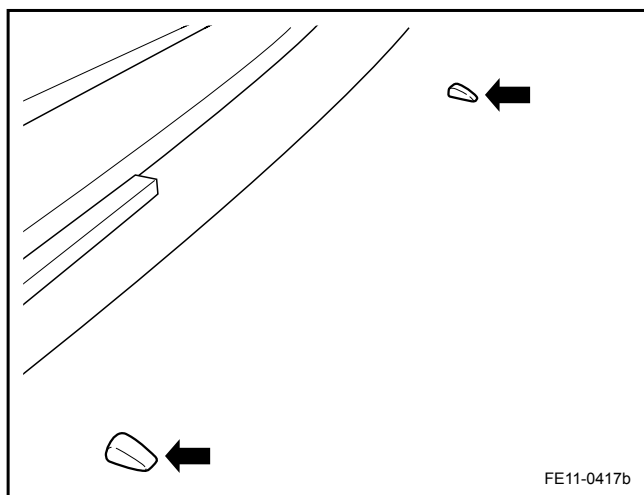
1. Install the nozzle to the engine hood.



2. Install the the spray nozzle to the hose, and press the nozzle into the engine hood.



3. Install the engine hood insulation pad.



4. Close the engine hood.

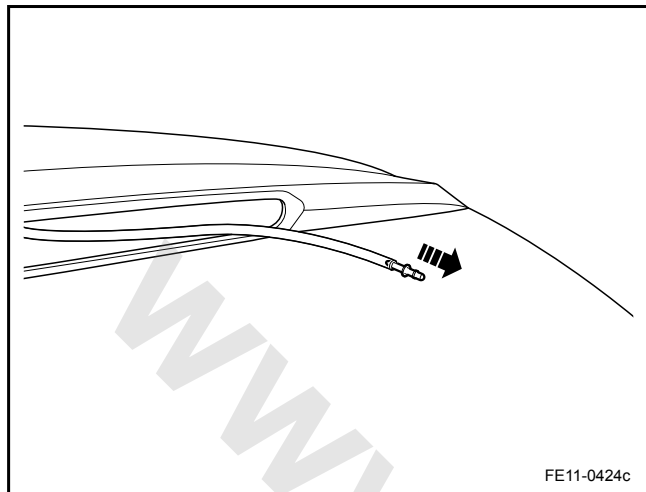
**Note**

Adjust the spray angle to the right position after installation.

### 11.6.8.5 Rear Wiper Nozzle Replacement (Hatchback)

#### Removal Procedure

1. Remove the hatchback trim panel. Refer to [12.9.1.15 Hatchback Inner Trim Panel Replacement \(Hatchback\)](#).
2. Remove the high mounted brake lamp. Refer to the [11.4.8.10 High Mounted Brake Lamp Replacement \(Hatchback\)](#).
3. pull out the nozzle.

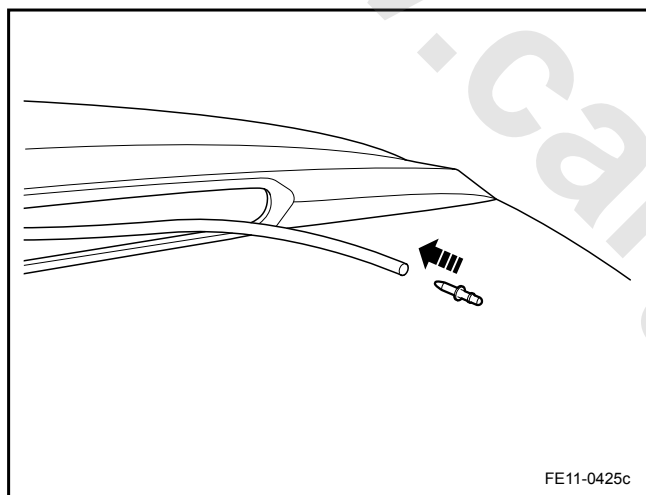


#### Installation Procedure:

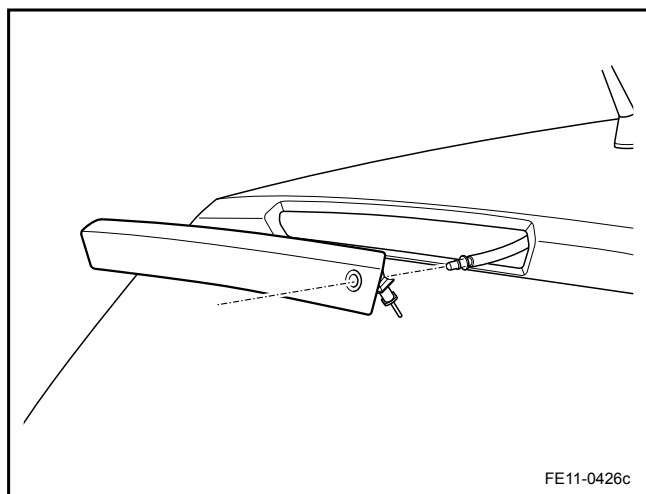
1. Connect the spray nozzle and the hose.

#### Note

Hose can not be squeezed or folded.



2. Run the nozzle through the high mounted brake lamp.
3. Install the high mounted brake lamp.
4. Install the hatchback trim panel.



## 11.6.8.6 Washer Motor and Hose Replacement

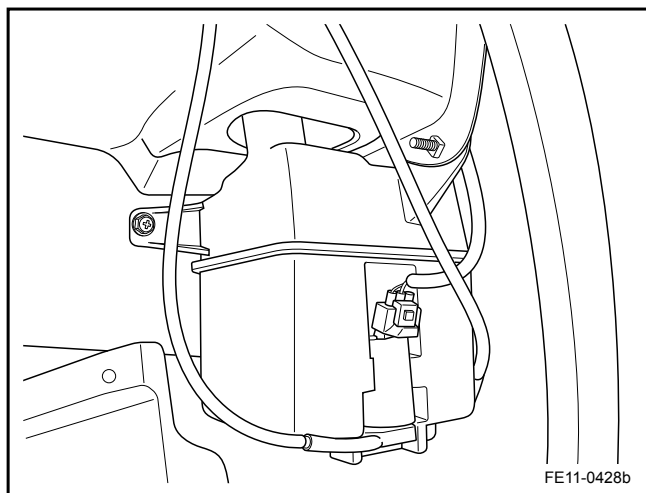
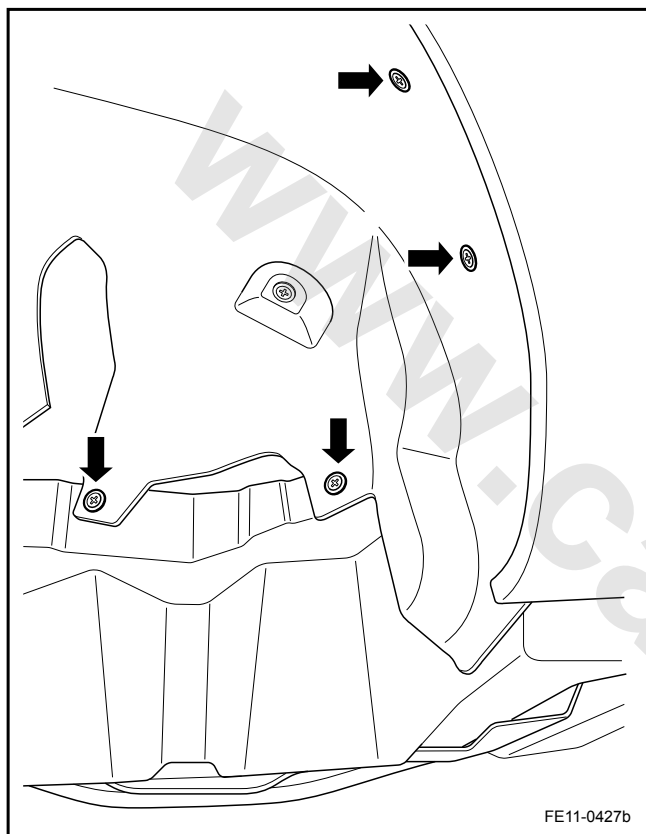
## Wash Motor Replacement

## Removal Procedure

## Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

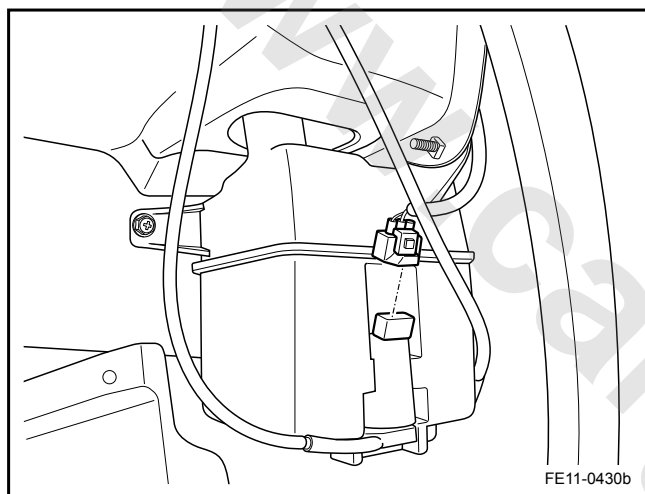
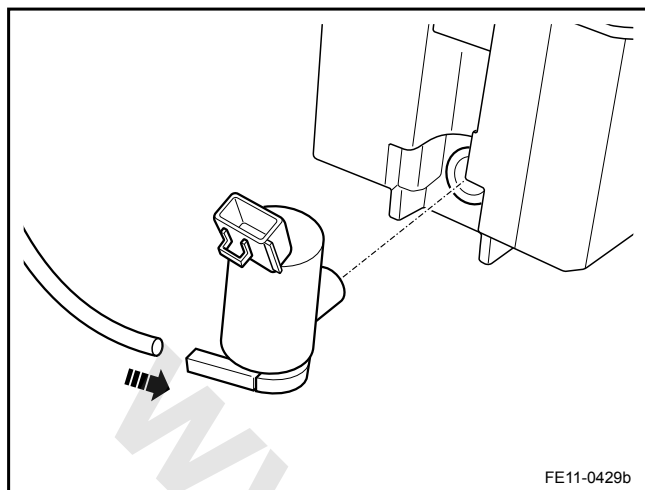
1. Turn the front wheels to the right end for access.
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Remove the right front fender. Refer to [12.10.1.8 Front Wheelhouse Liner Replacement](#).



4. Disconnect the washer motor wiring harness connector.
5. Disconnect the washer hose from the washer motor.
6. Pull out the washer motor.

## Installation Procedure:

1. Install the washer motor.
2. Connect the washer hose.

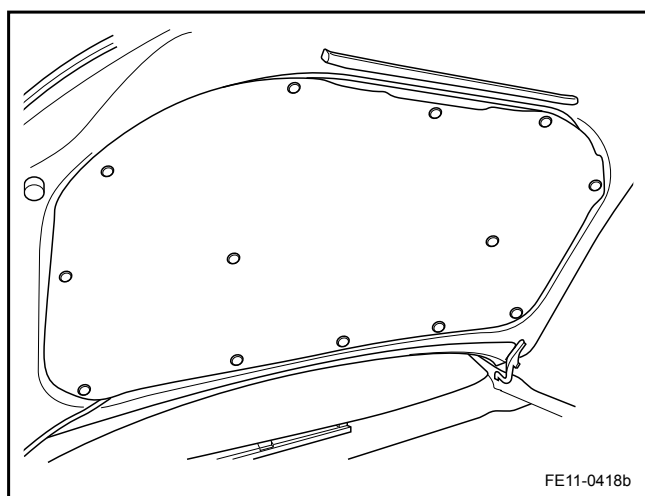


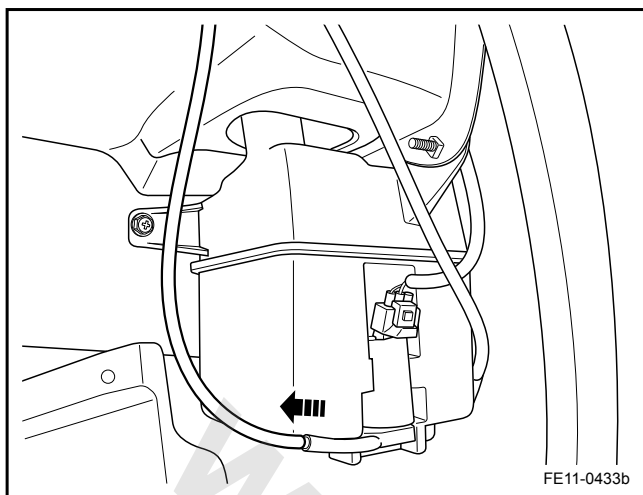
3. Connect the washer motor wiring harness connector.
4. Install the right front fender.
5. Connect the battery negative cable.
6. Turn the front wheels back to straight.

## Hose Replacement

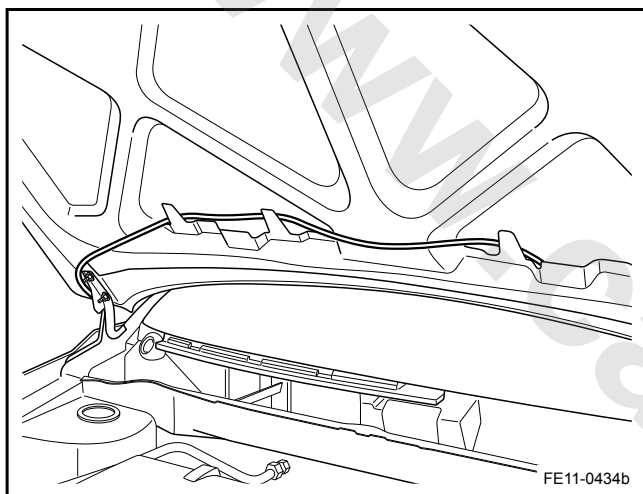
## Removal Procedure

1. Turn the front wheels to the right end for access.
2. Remove the engine hood insulation pad. Refer to [12.10.1.2 Hood Sound Insulation Pad Replacement](#).
3. Disconnect the washer hose and the nozzle. Refer to [11.6.8.4 Wiper Nozzle Replacement](#).

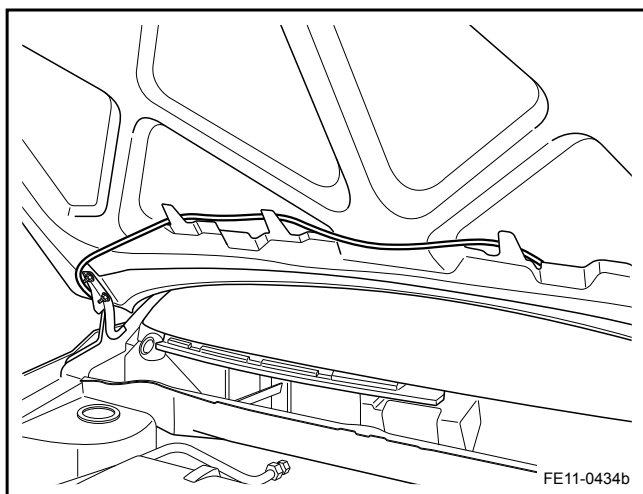




4. Remove the front fender. Refer to [12.10.1.8 Front Wheelhouse Liner Replacement](#).
5. Disconnect the washer hose from the motor.

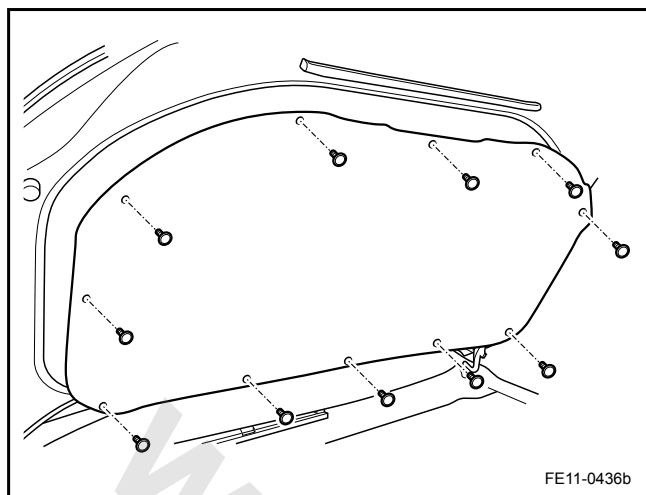


6. Remove the washer hose.



#### Installation Procedure:

1. Install the washer hose to the washer pump.
2. Run through and install the hose.
3. Install the front fender.
4. Connect the washer hose to the nozzle.



5. Install the engine hood insulation pad.

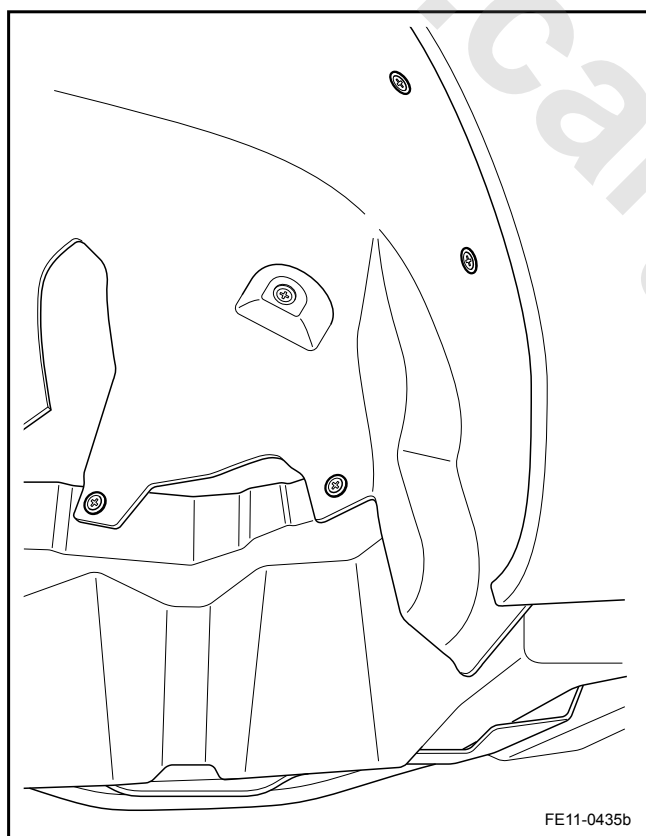
### 11.6.8.7 Washer Fluid Tank Replacement

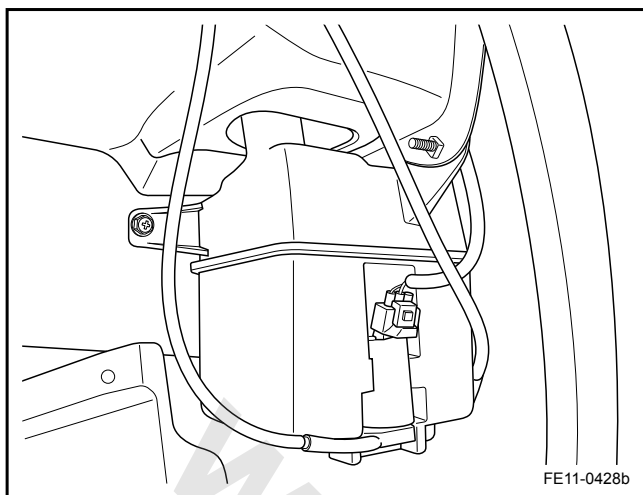
#### Removal Procedure

#### Warning!

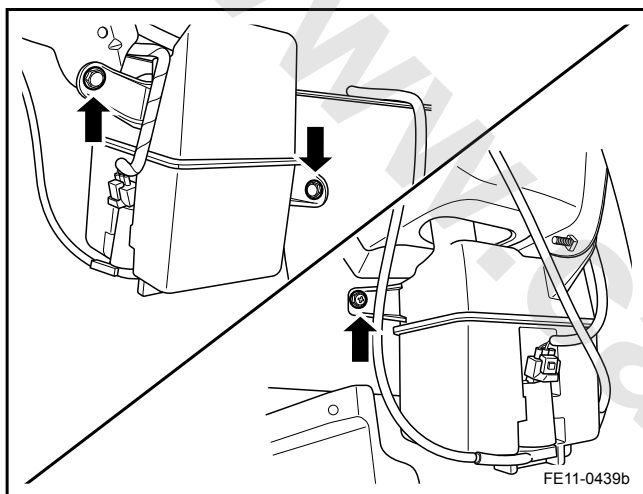
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Turn the front wheels to the right end for access.
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Remove the right front fender. Refer to [12.10.1.8 Front Wheelhouse Liner Replacement](#).

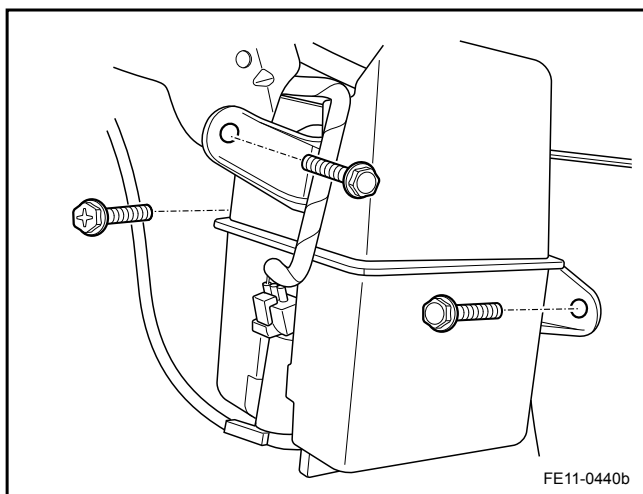




4. Disconnect the washer pump harness connector.
5. Disconnect the washer pump hose.



6. Remove the washer tank bolts.
7. Remove the washer tank.



#### Installation Procedure:

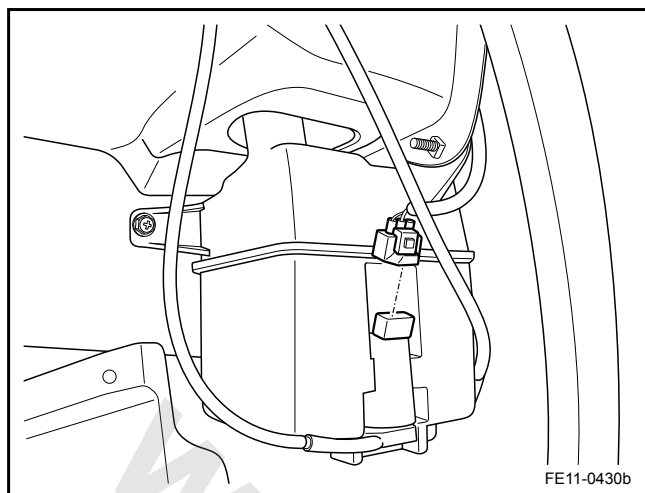
1. Install the washer fluid tank and tighten the retaining bolts.

#### Note

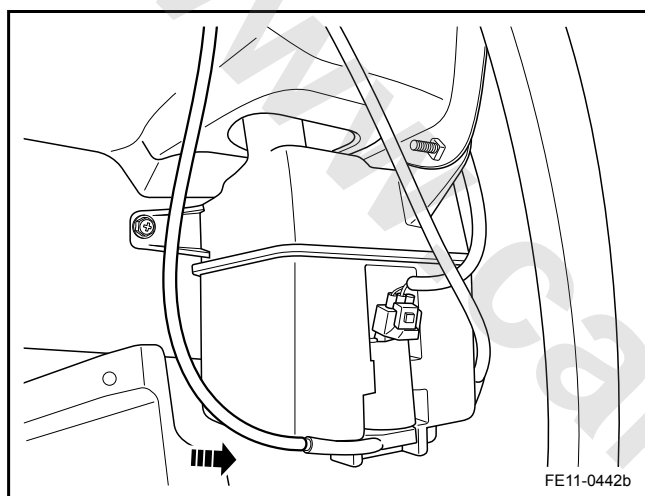
"Fastener Notice" in "Warnings and Notices"

Torque: 10 Nm (Metric) 8 lb-ft (US English)





2. Connect the washer pump harness connector.



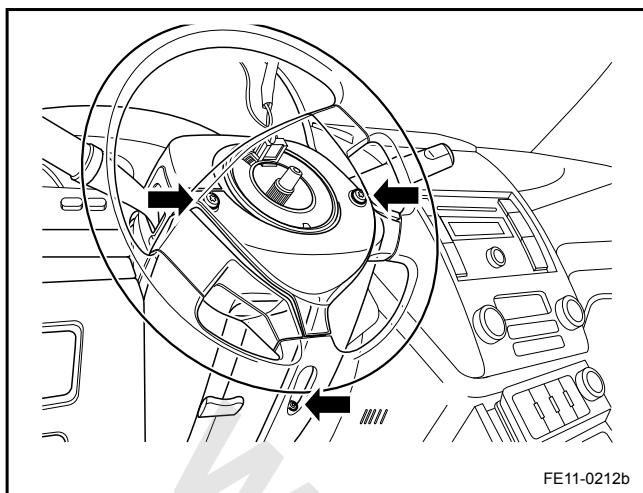
3. Connect the washer hose to the washer pump.
4. Install the right front fender.
5. Connect the battery negative cable.

#### 11.6.8.8 Wiper and Washer Switch Replacement

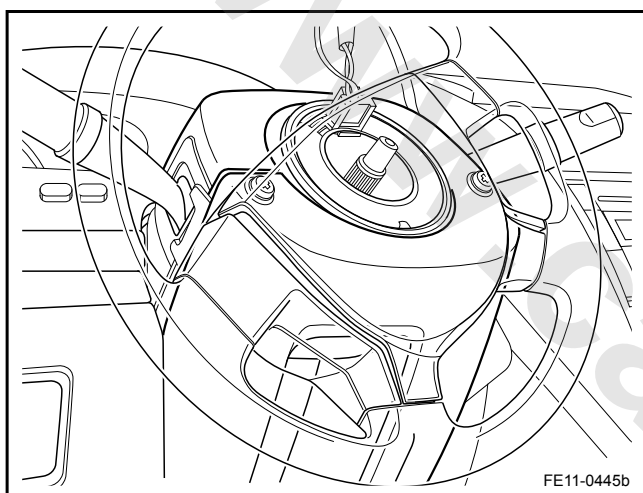
##### Removal Procedure

##### Warning!

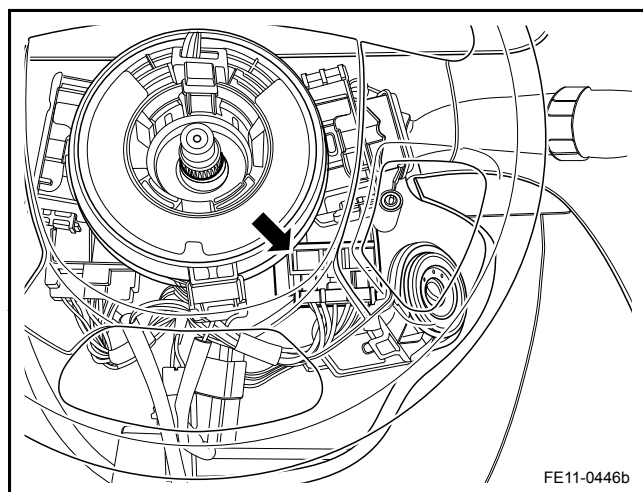
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



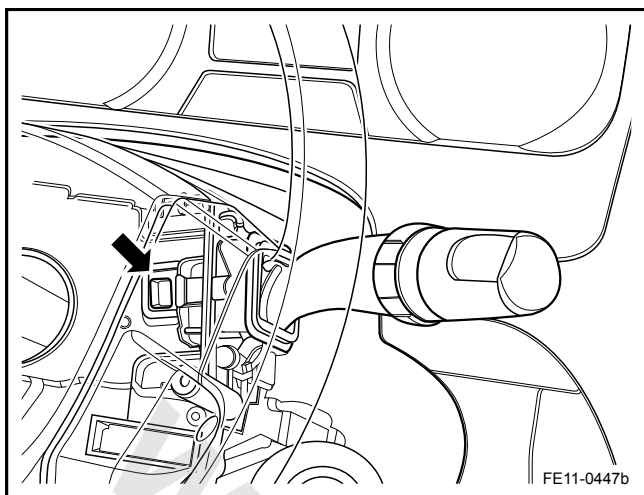
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Turn Left and right to loosen the steering wheel, Remove the steering column upper and lower retaining screws.



3. Remove the steering column upper and lower shield panels.

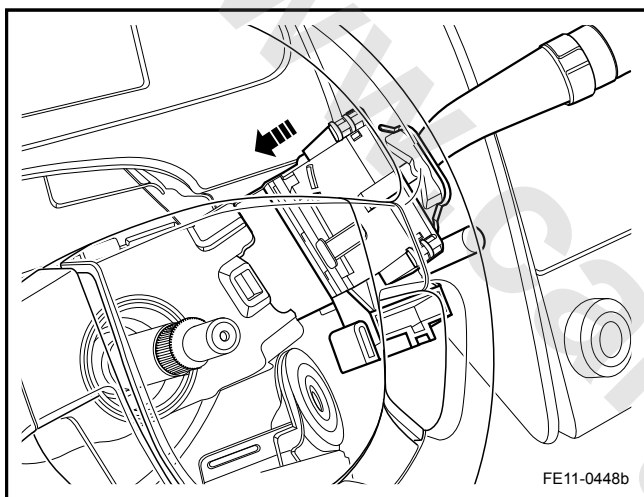


4. Disconnect the wiper switch wiring harness connector.

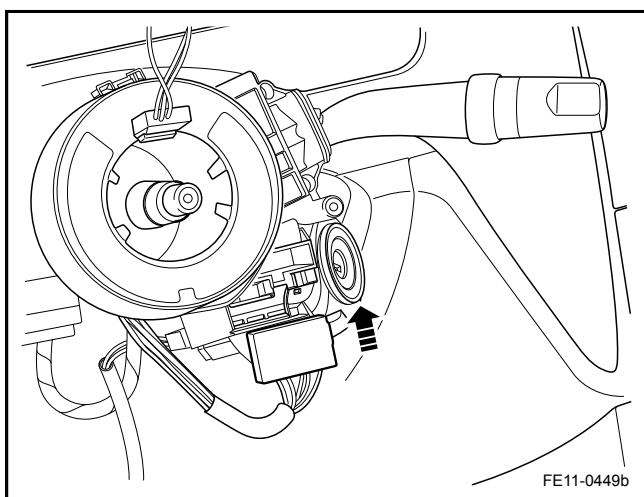


5. Press the switch tongue at the top to remove the wiper switch.
6. Remove the wiper switch.

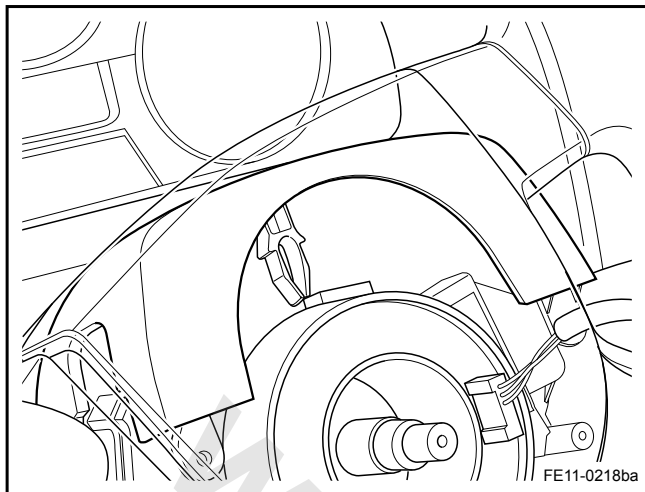
#### Installation Procedure:



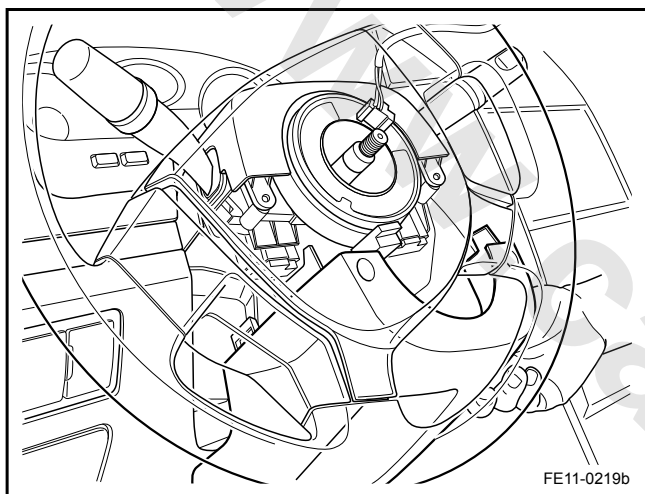
1. Install the wiper switch into the switch housing.



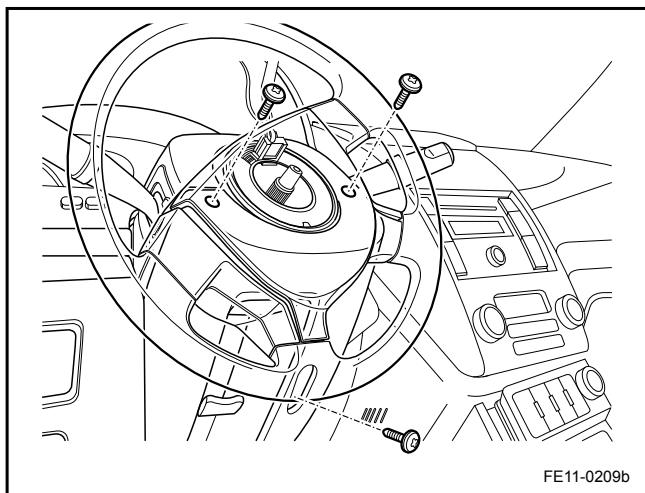
2. Connect the wiper switch harness connector.



3. Install the steering column upper shield panel.



4. Install the steering column lower shield panel.



5. Install the steering column upper and lower shield panel screws.

#### Note

Refer to "Fastener Notice" in the "Warnings and Notices".

Torque: 8.8 Nm (Metric) 6.5 lb-ft (US English)

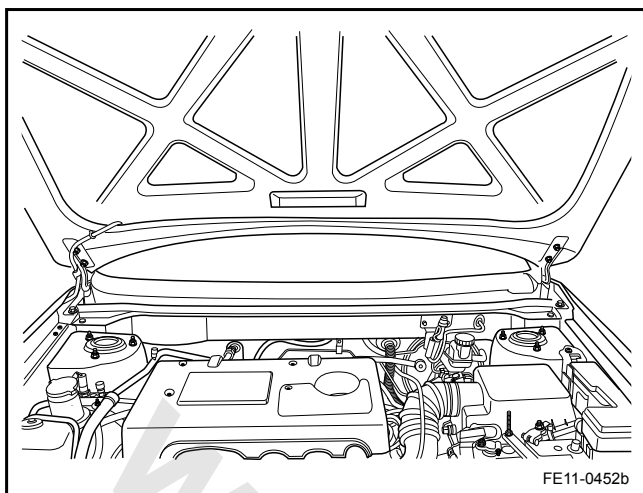
6. Connect the battery negative cable.

### 11.6.8.9 Wiper Motor Replacement

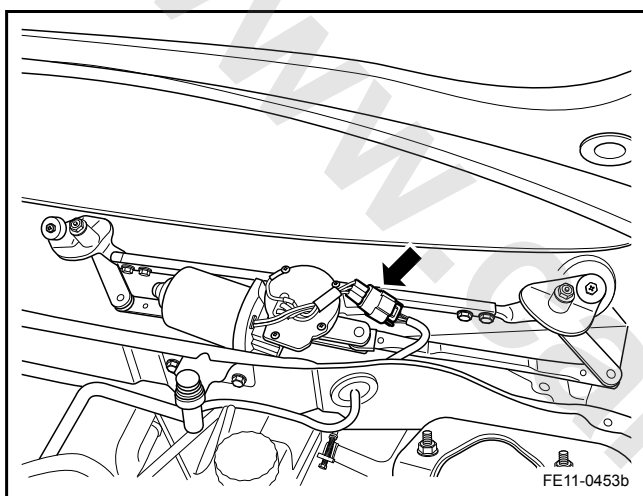
#### Removal Procedure

#### Warning!

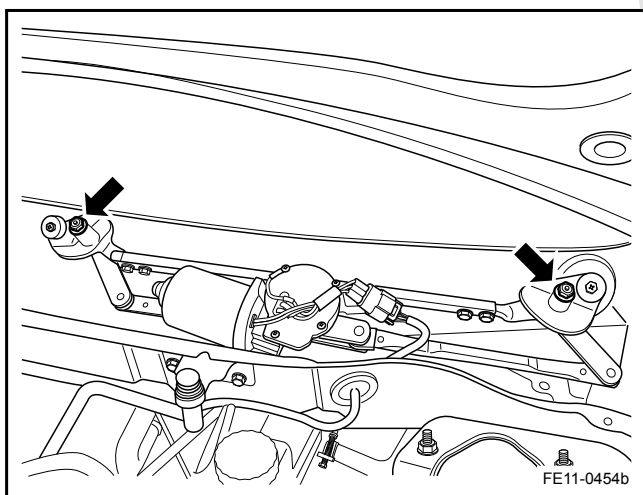
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



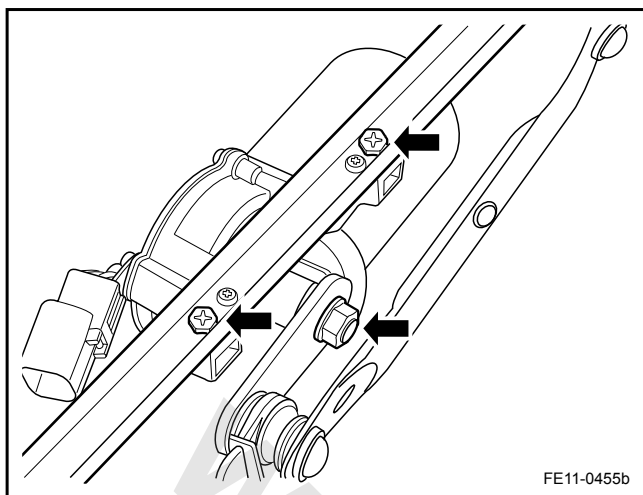
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the wiper blade. Refer to [11.6.8.1 Wiper Blade Replacement](#).
3. Remove the wiper arm. Refer to [11.6.8.2 Wiper Arm Replacement](#).
4. Remove the Air Inlet Duct. Refer to [12.10.1.3 Air Inlet Grille Panel Replacement](#).



5. Disconnect the wiper motor wiring harness connector.



6. Remove the wiper rod retaining nut, remove the wipers and the wiper motor rod.



7. Remove the wiper motor bolts and nuts.

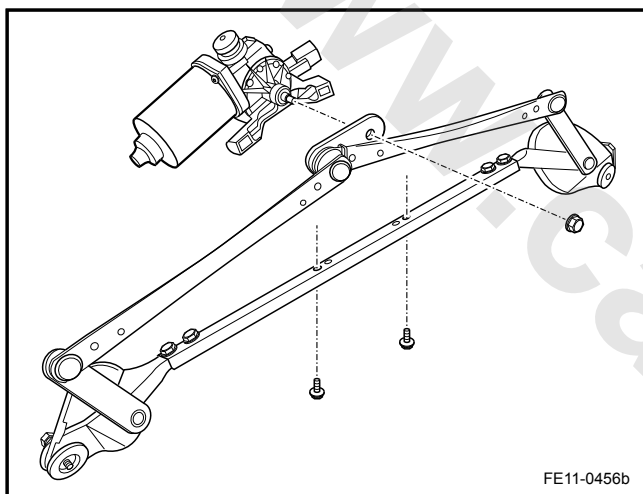
#### Installation Procedure:

1. Install the wiper motor retaining bolts and nuts.

#### Note

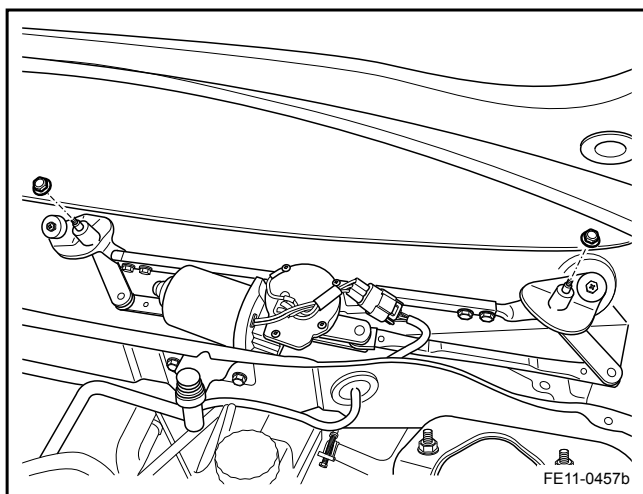
Refer to "Fastener Notice" in "Warnings and Notices".

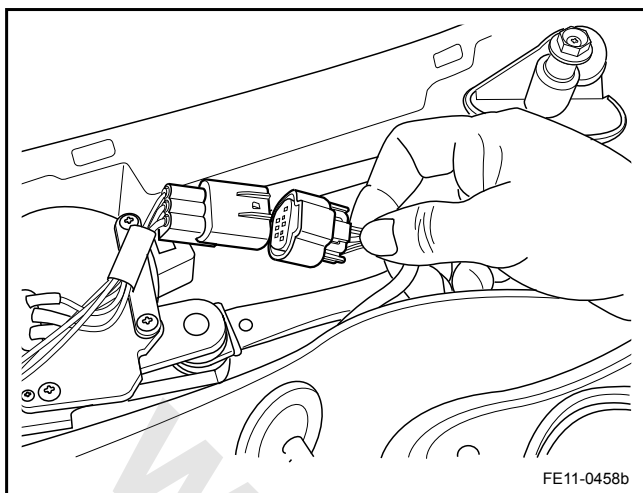
Torque: 8 Nm (Metric) 6 lb-ft (US English)



2. Install the wiper arm connecting rod retaining bolts.

Torque: 20.5 Nm (Metric) 15 lb-ft (US English)





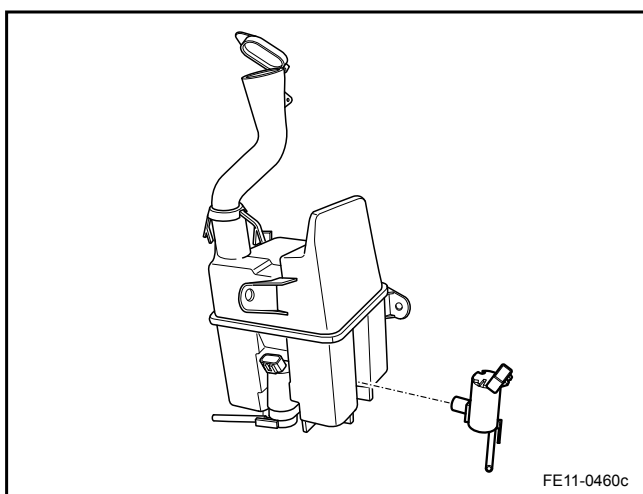
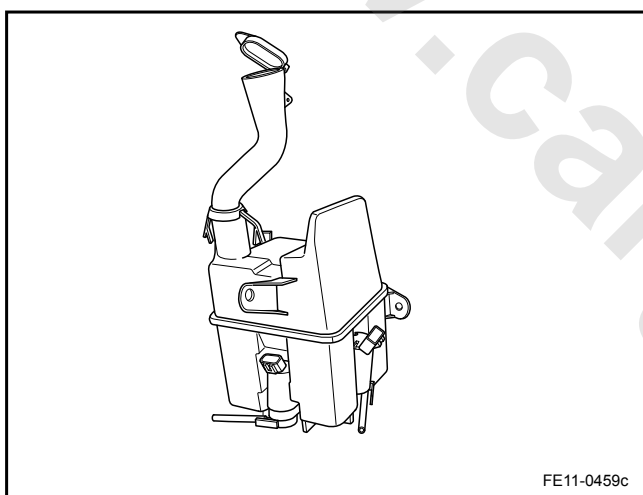
3. Connect the wiper motor wiring harness connector.
4. Install the air inlet duct.
5. Install the wiper arm.
6. Install the wiper blade.
7. Connect the battery negative cable.

#### 11.6.8.10 Rear Washer Pump and Hose Replacement (Hatchback)

Replace the rear washer pump.

##### Removal Procedure

1. Remove the washer fluid tank. Refer to [11.6.8.7 Washer Fluid Tank Replacement](#).



2. Remove the washer pump. pull the pump from the washer fluid tank.



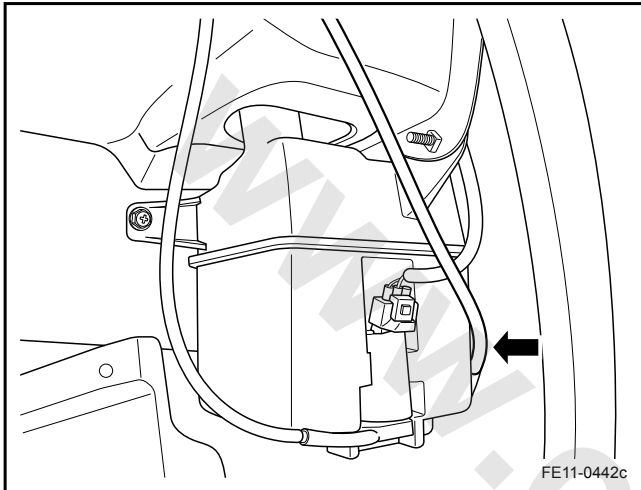
## Installation Procedure:

1. Install the washer pump. Press the washer pump into the tank.
2. Install the washer fluid tank.

## Hose Replacement

## Removal Procedure

1. Turn the front wheel to the right end to gain access.
2. Disconnect the hose from nozzle.
3. Disconnect the hose from the pump.
4. Remove the rear washer hose.



## Installation Procedure:

1. Install the hose to the rear washer pump.
2. Install the hose.
3. Install the right front fender.
4. Install the other end of the hose to the nozzle.

## 11.6.8.11 Rear Wiper Motor Replacement (Hatchback)

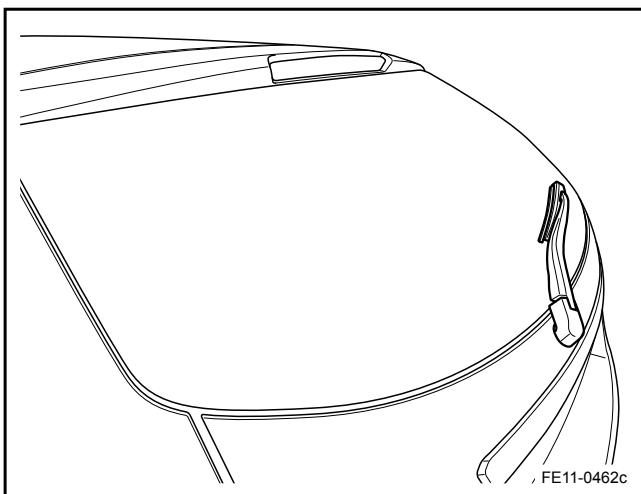
## Removal Procedure

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).

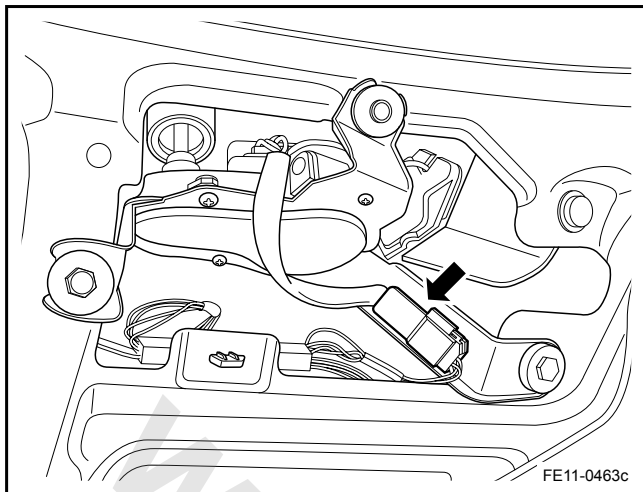
## Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

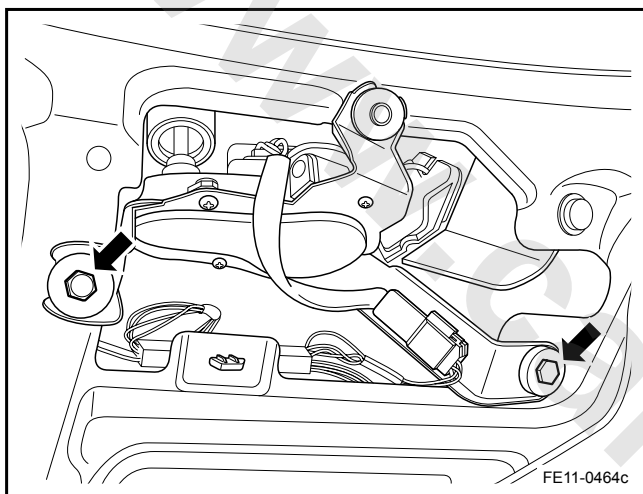
2. Remove the rear wiper blade. Refer to [11.6.8.1 Wiper Blade Replacement](#).
3. Remove the rear wiper arm. Refer to [11.6.8.3 Rear Wiper Arm Replacement \(Hatchback\)](#).



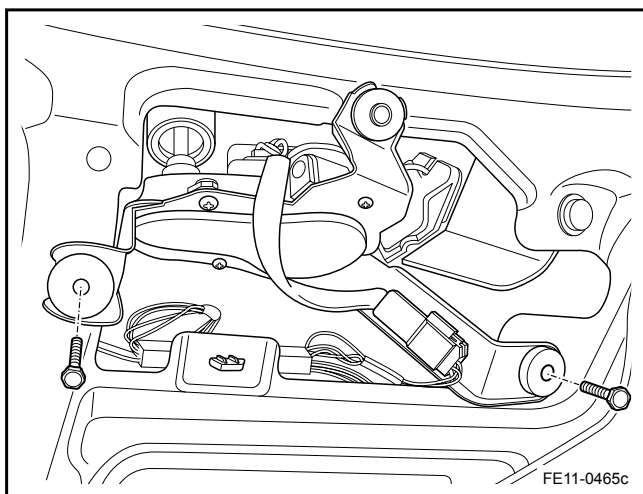




4. Remove the hatchback trim panel. Refer to [12.9.1.15 Hatchback Inner Trim Panel Replacement \(Hatchback\)](#)
5. Disconnect the rear wiper motor wiring harness connector.



6. Remove the wiper motor retaining bolts.
7. Remove the wiper motor.



#### Installation Procedure:

1. Install and tighten the rear wiper motor retaining bolts.

#### Note

Refer to "Fastener Notice" in "Warnings and Notices".

Torque: 20 Nm (Metric) 15 lb-ft (US English)

2. Connect the rear wiper motor wiring harness connector.
3. Install the rear door trim panel.
4. Install the rear wiper arm.
5. Install the rear wiper blade.

## 11.7 Instrument / Driver Information System

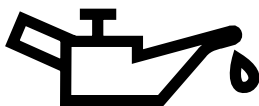
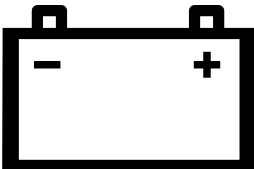
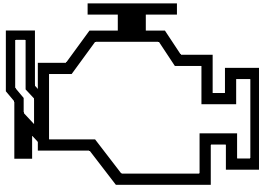
### 11.7.1 Specifications





#### 11.7.1.1 Fastener Tightening Specifications

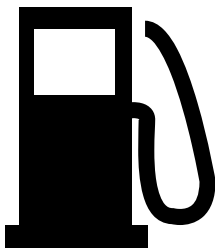
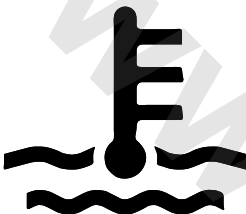
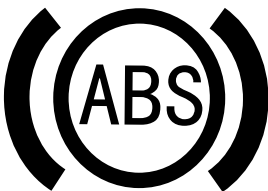


Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Instrument Cluster Self-Tapping Screws	ST4.8 × 13	3-4	2-3



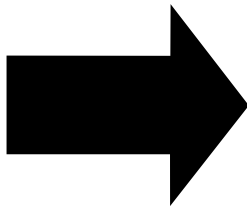
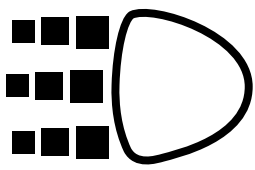
#### 11.7.1.2 Indicator Descriptions

Instrument cluster has 18 warning lamps to provide a warning or reminder.

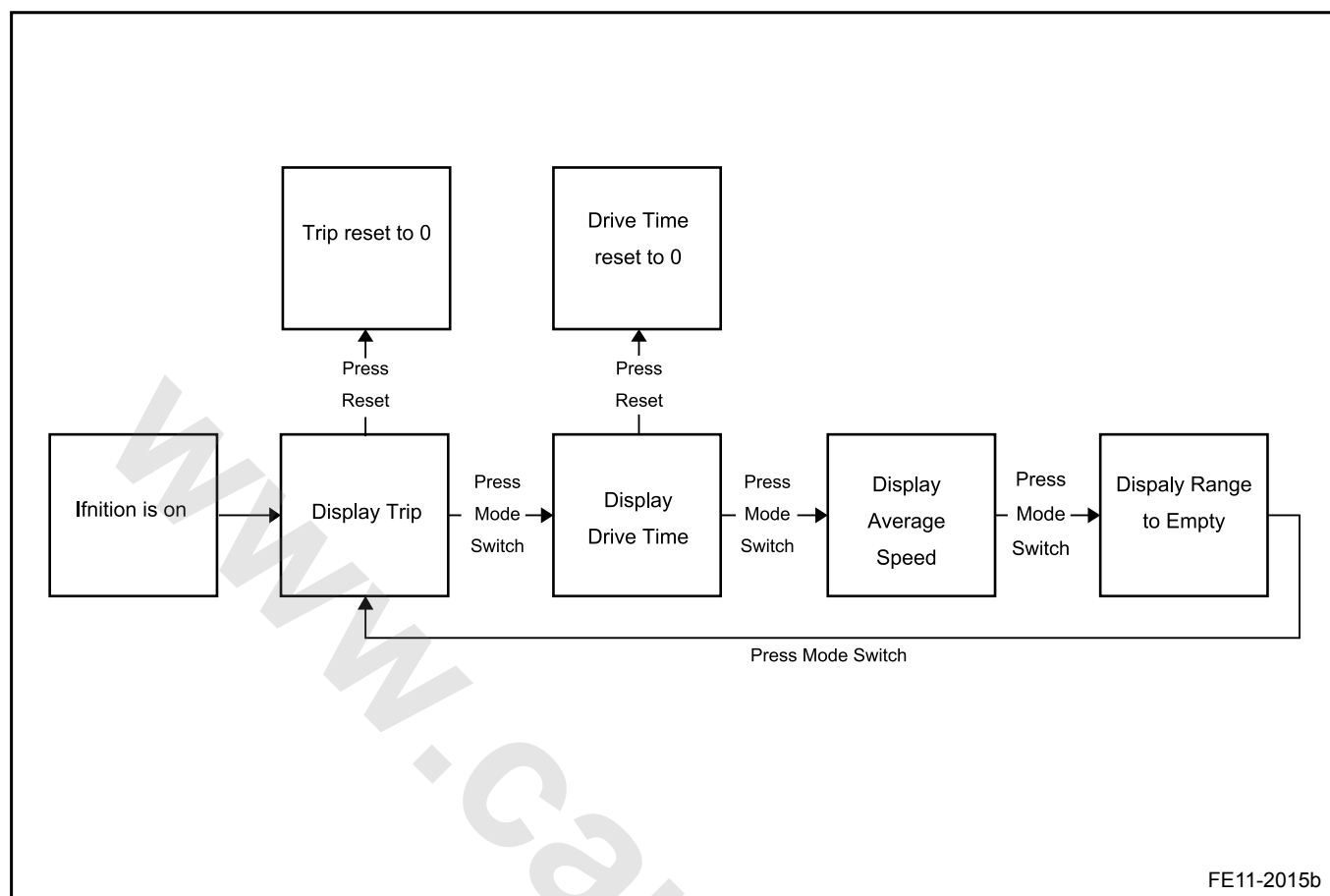
Symbols	Indicator	Color
	Engine Oil Pressure Warning Lamp	Red
	Battery Charging Indicator	Red
	Engine Emission Fault Warning Lamp	Yellow

Symbols	Indicator	Color
	Driver Seat Belt Warning Lamp	Red
	Airbag Fault Warning Lamp	Red
	Tire Pressure Warning Lamp	Yellow
TPMS	Tire Pressure Management System Indicator	Yellow
	Headlamp High Beam Indicator	Blue

Symbols	Indicator	Color
	Fuel Level Too Low Warning Lamp	Yellow
	Engine Overheating Warning Lamp	Red
	ABS Failure Warning Lamp	Yellow
	EBD Fault Warning Lamp	Yellow
	Park Brake Indicator	Red

Symbols	Indicator	Color
	Brake Failure / Brake Fluid Low Warning Lamp	Red
	Left Turn Indicator	Green
	Right Turn Indicator	Green
	Daylight Running Light (If Equipped)	Grass Green





When the engine is turned off, the primary LCD shows trip meter by default, and the model can not be switched. When the ignition is turned on again, the primary LCD display is in the previous mode.

### 11.7.3 System Working Principle

#### 11.7.3.1 System Working Principle

##### Wake up and Sleep

When the engine is turned off, if the sleeping conditions are met (engine shut down, no warning lamp alarm, no buzzer alarm, main control Sleep CAN message four conditions are simultaneously satisfied), instrument panel will enter a power saving sleep mode, all the instrument functions and CAN bus communication stops running. If the wake-up conditions are met (CAN network communication, ignition switch signal, reverse lamp switch one of the signals), the entire CAN bus will return to normal operating mode.

##### Lighting

General Lighting Rules:

- Instrument panel has white translucent lighting, LCD has white backlight.
- Lighting level is adjusted by an external PWM input signal, after engine shut down lights brightness can still be adjusted.

Lighting logic:

Ignition Signal	Parking Signal Light	LCD Lighting	Instrument Panel Lighting
Off	VCC	On, Brightness Adjustable	On, Brightness Adjustable
Off	GND	On, Brightness Is Not Adjustable	Off
On	VCC	On, Brightness Adjustable	On, Brightness Is Not Adjustable
On	GND	On, Brightness Is Not Adjustable	Off

##### Note

When the instrument cluster enters into the sleep mode, backlight will be off. If the parking lights are turned on, instrument cluster will be awakened, LCD and instrument cluster lighting will be enabled. In this case, when the CAN network is in the sleep mode, the meter only shows trip meter, odometer, ODO icon, fuel icons, the water temperature icons, mode can not be switched,

non CAN based messages on the LED and sound alarm; When the CAN network is awake, the instrument cluster will start all defined functions.

##### Warning Lamps Control

- Two warning lamps in the instrument cluster are powered by battery, they are:

- Headlamp High Beam Indicator
- Daytime Running Light (If equipped)

##### Note

Other warning lamps in the instrument cluster are powered by the ignition power supply.

- The following warning lamps are directly controlled by the hardware:

- Headlamp High Beam Indicator
- Daytime Running Light (If equipped)
- Battery Charging Indicator
- Tire Pressure Warning Lamp
- Brake Malfunction / Low Brake Fluid Warning Lamp
- Park Brake Indicator
- Tire Pressure Management System Indicator
- Engine Oil Pressure Warning Lamp

##### Note

The rest warning lamps are controlled by signals from the CAN bus.

##### Buzzer

##### Buzzer Function

In the following five cases, the buzzer will sound, prompt the driver the corresponding warning message. Buzzer tones frequency parameter is stored in EEPROM.



Function	Trigger conditions	Frequency	Time and Interval
Keys are not pulled warning	When the ignition is off, the key is not pulled out, the driver door open.	651.0 Hz	Buzzer sound 2 min, until the driver door is closed or the key being pulled out. 500 ms off, 500 ms open.

Function	Trigger conditions	Frequency	Time and Interval
Seat Belt Not Tightened Warning	<ol style="list-style-type: none"> <li>When the ignition is turned on, the drive seat belt is not tightened, buzzer will sound for 4 s.</li> <li>After the ignition is turned on, if the drive seat belt is not tightened, when the vehicle speed reaches 25 km/h. The acoustic signal is activated for 30 s.</li> <li>If the seat belt is fastened within 30 s, the visual signal and the acoustic signal will be off.</li> <li>If the speed is less than 25 km/h, acoustic signals will be activated until the seat belt is fastened or 30 s elapsed.</li> <li>The next time the speed exceeds 25 km/h, whether or not the driver seat belt is fastened, the acoustic signals will not be activated.</li> </ol>	578.7 Hz	Buzzer sounds 4 s, 500 ms off, 500 ms on.

Function	Trigger conditions	Frequency	Time and Interval
Door Not Open Warning	when the speed is greater than 10 km/h, if a door opens. Refer to <a href="#">11.7.3.1 Door Status Display</a> .	868.0 Hz	Buzzer sounds, 500 ms off, 500 ms on.
Reverse Radar Warning	when the vehicle is reversing.	578.7 Hz	Buzzer on and off is determined by the reverse radar input signal. If the signal is low, the buzzer sound. Otherwise the buzzer will be off.
Light Not Turned Off Warning	If the following four conditions are met: 1. Ignition Off 2. Driver Door Open 3. Key Pulled Out 4. Park lamp or low beam lamps are not turned off	651.0Hz	Buzzer will sound 2 min, 500 ms off, 500 ms on. If any one of four conditions is no longer valid, the buzzer will be off.

### Self-Test

When the ignition switch is turned on, there are seven LED warning lamps under the control of the software. These alarm lamps are:

- Engine Overheating Warning Lamp
- Fuel Level Too Low Warning Lamp
- ABS Failure Warning Lamp
- Engine Emissions Failure Warning Lamp

- Engine System Failure Warning Lamp
- Airbag Fault Warning Lamp
- EBD Fault Warning Lamp

When the engine speed is greater than 300 rpm, self-test is interrupted.

### Gages

After the engine is shut down, all gages return to zero.

#### Speedometer

There are two kinds speed signals used to calculate the speed. One is obtained from the EMS module CAN message signal, the other is the vehicle speed sensor frequency signal. When the ignition system is turned on, the instrument cluster system determines calculate the speed with which speed signal. Priority is as following: CAN bus through the acquisition from the EMS speed signal is greater than the speed sensor.

Specific speed signal switching in the following strategies:

- If the ICU can not receive messages in continuous five cycles, or EMS received CAN speed message is not valid, the system switched to using the frequency sent from the speed sensor signal to calculate speed within 50 ms.
- If the CAN speed message is back to normal, and maintains continuous five cycles, the system switches back to using the CAN speed signal to calculate speed within 50 ms.

#### Engine Tachometer

Engine speed data is from the CAN bus, sent by EMS. Instrument micro-controller accepts the signal, calculates the engine speed, and then drives a stepper motor to point to the appropriate location (rpm/min).

The behavioral characteristics of the engine tachometer is as following:

- When the engine is turned off, if the battery has been connected, the engine tachometer pointer is back to the "0" position.
- If the battery is disconnected, the engine tachometer pointer does not return to the "0" position; When the battery is connected again, the engine tachometer pointer is back to the "0" location
- If the engine speed signal from the CAN is invalid or missing for 5 s, the engine tachometer pointer will return to "0" position.

### Fuel Gage

Fuel gage input signal is from the fuel level sensor, one end of the fuel gage is connected to fuel sensor terminal.

Fuel sensor resistance parameters are as following:

Fuel	Resistance
Full	40 ( ± 2 Ω )
3/4	60( ± 2 Ω )
1/2	90( ± 2 Ω )
1/4	140( ± 2 Ω )
Threshold	190 ( ± 2 Ω )
Empty	300 ( ± 2 Ω )

According to the total fuel tank capacity (55 L), LCD display is divided into eight equal interval value (slightly different in the low fuel alarm mode). When the fuel amount decreases, if the current fuel level falls into the appropriate range, the corresponding LCD segment will be lit.

Fuel Tank Capacity (L/pt)	LCD Segment Display
5-10/8.8-17.6	Empty (The First Segment)
10-13.5/17.6-23.8	First and Second Segment Light
13.6-20.25/23.9-35.6	First To The Third Segment Light
20.26-27.0/35.7-47.5	First To The Fourth Segment Light
27.1-33.75/47.7-59.4	First To The Fifth Segment Light
33.76-40.5/59.4-71.3	First To The Sixth Segment Light
40.6-47.25/71.4-83.1	First To The Seventh Segment Light
47.26-55.0/83.2-96.8	Full (All Light)

When the fuel level is lower than the threshold, low fuel level warning lamp light.

### Engine Coolant Temperature Gage

Engine coolant temperature information is from the CAN bus. Micro-controller calculates the engine coolant temperature,

and then displays on LCD according to the message sent from the EMS.

If the CAN message from the EMS is lost continuously for one minute, or the temperature value is invalid for one minute, LCD thermometer will show the minimum, and the temperature warning lamp will be on.

Temperature is displayed in eight segments on LCD. The temperature corresponding relationships may be adjusted in the programming and stored in EEPROM. The default comparison is shown below.

Temperature °C ( °F)	LCD Segment Display
$T \leq 50$ ( $T \leq 122$ )	Low Temperature Sign (All Off)
$50 < T \leq 70$ ( $122 < T \leq 158$ )	First Segment Light
$70 < T \leq 80$ ( $158 < T \leq 176$ )	First and Second Segment Light
$80 < T \leq 90$ ( $176 < T \leq 194$ )	First To The Third Segment Light
$90 < T \leq 100$ ( $194 < T \leq 212$ )	First To The Fourth Segment Light
$100 < T \leq 110$ ( $212 < T \leq 230$ )	First To The Fifth Segment Light
$110 < T \leq 120$ ( $230 < T \leq 248$ )	First To The Sixth Segment Light
$120 < T \leq 124$ ( $248 < T \leq 255$ )	First To The Seventh Segment Light
$124 < T \leq 130$ ( $255 < T \leq 266$ )	High Temperature Sign (All Light)

When the engine temperature reaches 124°C (255 °F), the engine overheating warning lamps will be flashing at 1Hz frequency. For detailed alarm policy, please refer to the table:

Previous Alarm Status	Temperature T °C ( °F)	Next Status
No Overheating Alarm	$T \geq 124$ ( $T \geq 255$ )	An Overheating Alarm
Overheating Alarm	$T < 121$ ( $T < 250$ )	Overheating Lifted

## Door Status Display

Four doors information is from the CAN bus, sent by the BCM module. Instrument cluster shows each door information on LCD display. When the vehicle speed is greater than 10 km/h, if a door opens, the corresponding LCD segment will be blinking, body icon shows on LCD, buzzer will ring until all doors are closed; when the speed is less than or equal to 10 km/h, if a door opens, the corresponding LCD segment will be lit (not blinking), body icon shows on LCD, but the buzzer does not ring.

When the engine is shut down, if a door opens and there is no other alarm, the LCD will show the door open status for 4 s. The instrument panel goes into sleep mode, while there is no LCD information display, no backlight.

When the engine is shut down, if the engine hood opens or the rear compartment lid opens and there is no other alarm, then the LCD backlight illuminates. LED shows corresponding status, also shows the status of each door. After 4 s, the instrument panel goes to sleep. At the same time there is no LCD information display, no backlight.

If the key is not pulled out or park lamps are not turned off, although the engine is shut down, the LCD will be backlight on. LCD shows the status of each door until the alarm expires or the alarm is deactivated. After the alarm, instrument panel goes to sleep. At the same time there is no LCD information display, no backlight.

When the engine is shut down, if the hazard warning lamp is enabled, then the LCD backlight will be on, the right and left turn signal lamps start flashing. LCD shows the status of each door until the hazard warning lamp is turned off. If there is no other alarm, the instrument panel goes to sleep. At the same time there is no LCD information display, no backlight.

## Odometer

Display Range: 6 digits, maximum 999,999 km

Accuracy: 1 km

Odometer shows the total vehicle mileage. When the total mileage reaches the maximum reading (999,999 km), the display remains unchanged. In order to prevent a total mileage value loss, micro-controller updates the value stored in EEPROM once every 2 km. When battery power supply is off, the total mileage maximum error is 1 km. If reading from the EEPROM fails, the corresponding display position shows "Err".

After the ignition is turned on, the micro-controller checks the RAM for the total mileage value. If the RAM value is missing or invalid, a total mileage reading from the EEPROM will be

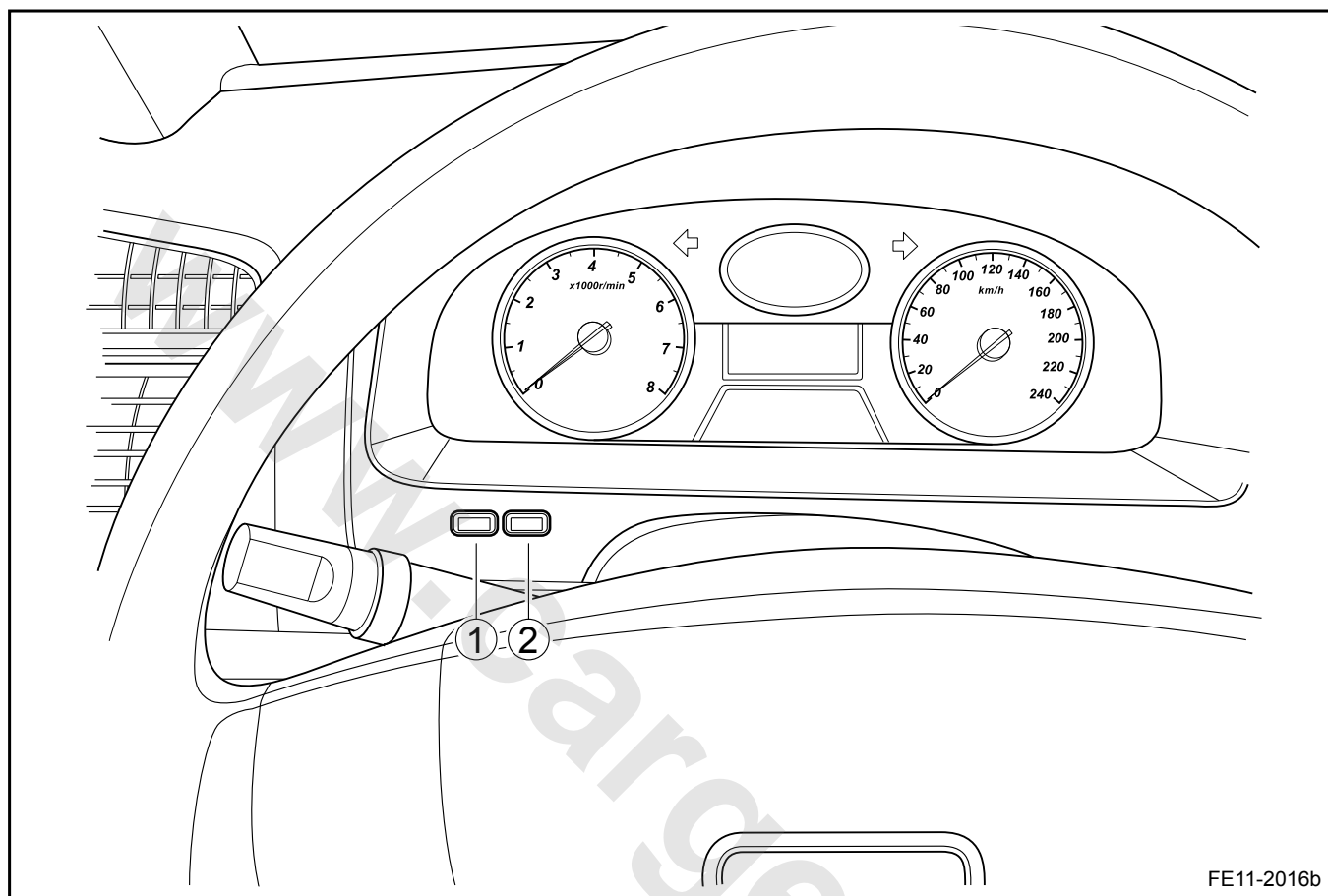
displayed on the LCD. The value of the total mileage is stored in RAM, and its accuracy is 1 km.

In the event of the battery power-down, the engine will be shut down. Press the mode switch button, ignition on, and maintain for 20 s. The odometer value is cleared (only when the reading is less than 256 km). This operation can only be operated once.

## 11.7.4 Component Locator

## 11.7.4.1 Component Locator

Instrument Cluster Front End

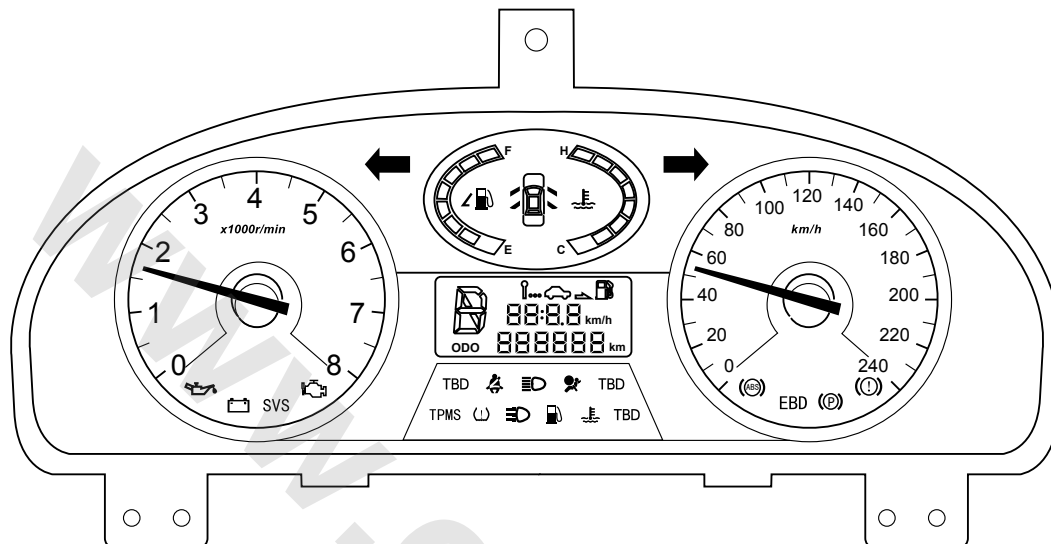


## Legend

1. Mode Switch Button

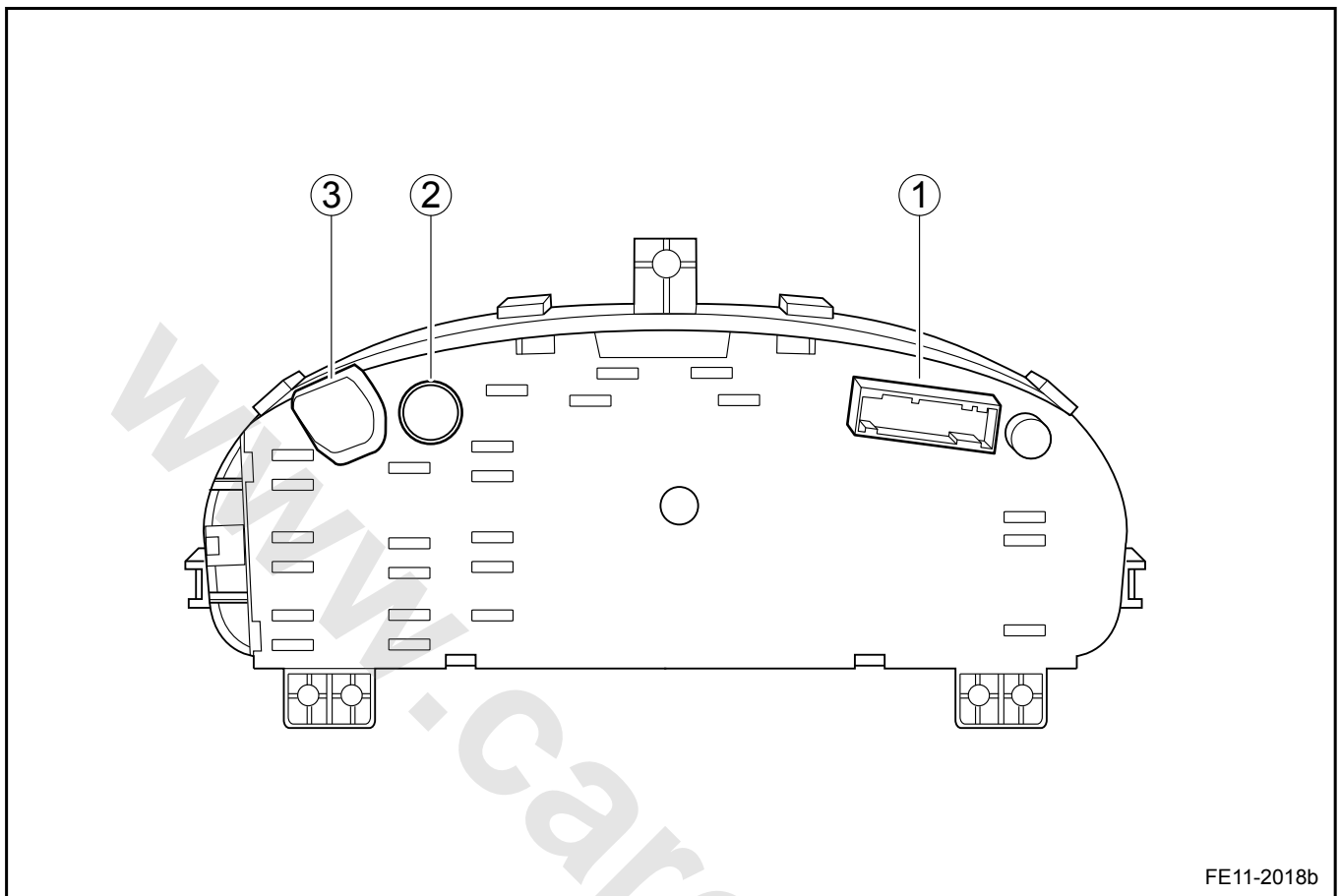
2. Reset Button

Warning Lamps, Gage



FE11-2017b

## Instrument Cluster Rear End



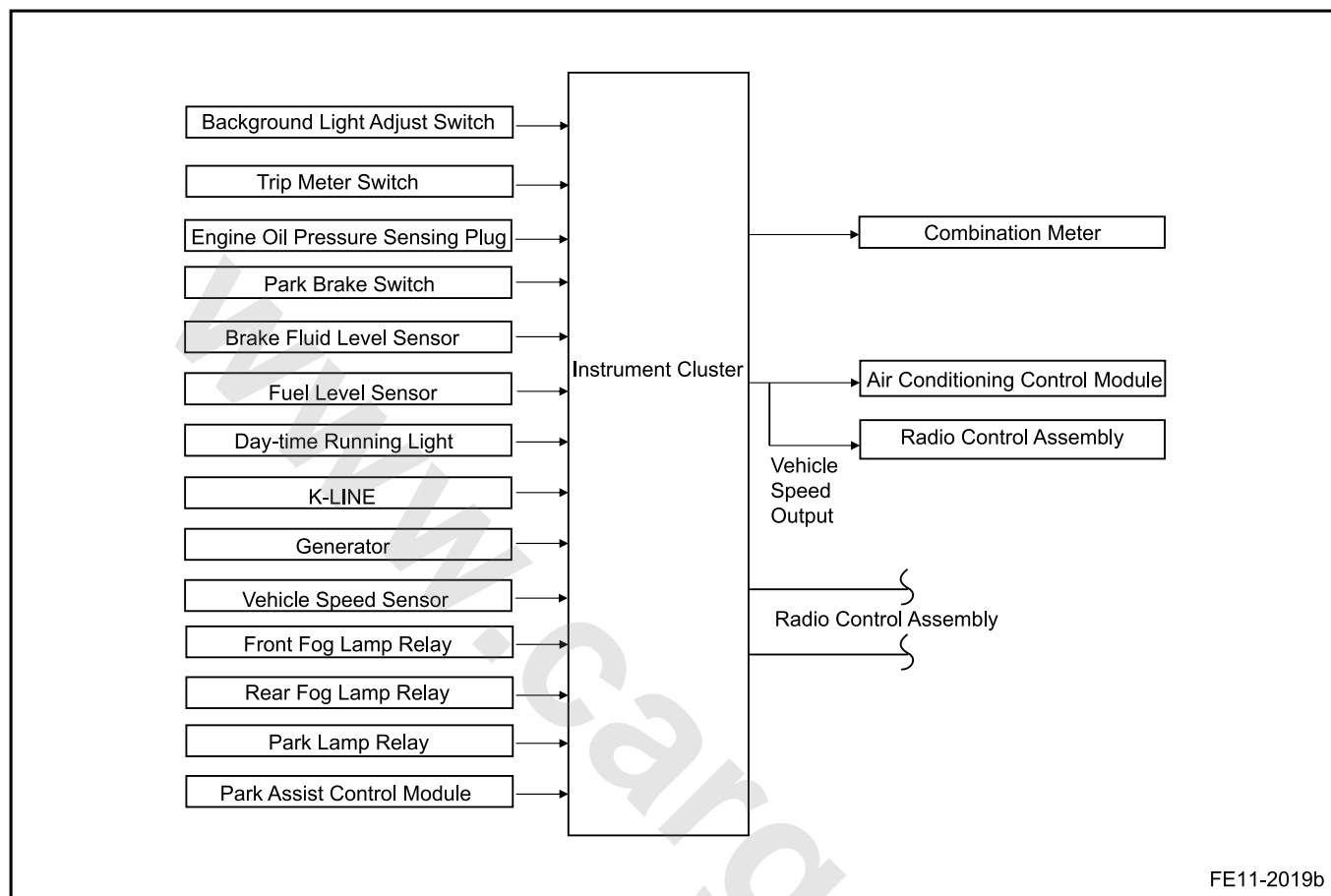
FE11-2018b

## Legend

- |  |  |
|--|--|
| 1. Instrument Cluster Wiring Harness Connector (32-Pin Blue) | 3. Multi-Meter Wiring Harness Connector (12-Pin White) |
| 2. Buzzer  |  |

## 11.7.5 Schematic

## 11.7.5.1 Schematic





## 11.7.6 Diagnostic Information and Procedures

### 11.7.6.1 Diagnosis Description

The instrument supports CAN-based bus OBD and standard KWP2000 protocol.

OBD can be K-wire serial communications and CAN communications.

Refer to [11.7.2 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.7.6.2 Visual Inspection

- Check installed after market equipment that may affect system operation.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- Check whether all sensors are normal.

### 11.7.6.3 Fault Diagnostic Code (DTC) List

DTC code	Description
U1303	Fuel sensor input signal circuit high-voltage, or the wiring harness connector is disconnected
U1304	Fuel sensor input signal circuit is short to ground.
U129C	Meter voltage is higher than normal.
U129D	Meter voltage is lower than normal.
U150F	EEPROM Checksum Error
U1400	ABS Message Time Out, ABS Communication Lost
U1410	airbag control module Message Time Out, airbag control module Communication Lost
U1420	BCM Message Time Out, BCM Communication Lost
U1430	EMS Message Time Out, EMS Communication Lost
U1501	CAN Network System Integrity Test Failure
U1601	CAN Bus Off

### 11.7.6.4 Instrument Active Test List

Test Parts	Test Items
Buzzer Test	Door Buzzer
	Seat Belt Beep
	Reverse Radar Buzzer
	Key Does Not Pull Buzzer
	Lights Are Not Off Beep
LCD Test	Vertical Section, Horizontal Section
	Special Section, Symbols

Test Parts	Test Items
LCD Test	Remove All
Digital Output	Driver Seat Belt Warning
	Passenger Seat Belt Warning
	ABS Warning
	Low Fuel Warning
	Coolant Temperature Warning
	Left Turn Signal
	Right Turn Signal
	Hood Open Warning
	Trunk Open Warning
	EBD Alarm
	Airbag Alarm
	MIL Alarm

## 11.7.6.5 Meter Terminal List

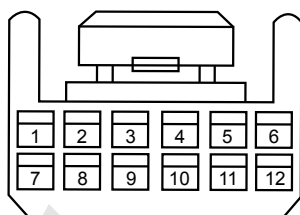
Instrument Cluster Harness Connector IP03															
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

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Terminal ID	Terminal Definition	Diameter / Color	Specified Conditions (Voltage, Current, Waveform, etc.)
1	Front Fog Lamp On Signal	0.85 R/O	20 mA
2	Rear Fog Lamp On Signal	0.5 R/W	20 mA
3	Tire Pressure Management System Malfunction Lamp	0.3W	20 mA
4	Reserved	Reserved	-
5	Low Tire Pressure Warning	0.3 L	20 mA

Terminal ID	Terminal Definition	Diameter / Color	Specified Conditions (Voltage, Current, Waveform, etc.)
6	Daytime Running Light On Signal	0.85 O/L	20 mA
7	High Beam Light Signal	0.85 O/W	20 mA
8	Reserved	Reserved	-
9	Reserved	Reserved	-
10	Park Brake Switch Signal	0.5 B/R	20 mA
11	Brake Fluid Level Sensor Signal	0.5 B/Y	20 mA
12	--	--	--
13	Charging Indicator	0.5 Y	200 mA
14	Engine Oil Pressure Switch Signal	0.5 B/R	20 mA
15	Sensor Ground	0.5 B	Ground / 1 A
16	Chassis Ground	0.5 B	Ground / 1 A
17	Reset	0.3 W/R	1 mA
18	Subtotal Button	0.3W	1 mA
19	Reverse Radar Buzzer	0.5 L	1 mA
20	Park Lamp On	0.5 R/G	1 mA
21	Diagnosis	0.5 Gr/P	1 mA
22	Vehicle Speed Input	0.3 Y	PWM Waveform / 1 mA
23	Vehicle Speed Output	0.3 G	PWM Waveform / 1 mA
24	Ignition	0.5 R/O	Ignition Voltage / 1 A
25	--	--	--
26	Backlight Adjustment Switch	0.3 O/Y	1 mA
27	--	--	--
28	--	--	--
29	Fuel Sensor Signal	0.5 R	-
30	CAN_H	0.5 L/W	PWM Waveform / 100 mA
31	CAN Low	0.5 Gr/V	PWM Waveform / 100 mA
32	Battery Power Supply	0.85 R	Battery Voltage / 1 A

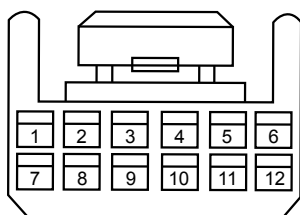
Combination Meter to Instrument Cluster Harness  
Connector IP02



FE11-5602b

Terminal ID	Terminal Definition	Diameter / Color	Specified Conditions (Voltage, Current, Waveform, Etc.)
1	Seat Belt	0.3 Gr	5 V/20 mA
2	Ground	0.5 B	GND, Current 1 A
3	5 V Power Supply	0.5 R	5 V / 1 A
4	Lighting Adjustment	0.3 O/Y	5 V / 160 mA
5	Power Supply	0.5 Y	Battery Power Supply / 1 A
6	Clock Switch	0.3 G	5 V / 1 mA
7	Trunk	0.3 W	5 V / 20 mA
8	Hood	0.3 W/R	5 V / 20 mA
9	Rear Fog Lamps	0.5 R/W	14 V / 20 mA
10	Front Fog Lamps	0.5 R/O	14 V / 20 mA
11	Communication Clock	0.3 B/Y	5 V / 2 mA
12	Data Communications	0.3 O/L	5 V / 2 mA

Instrument Cluster Harness Connector IP01



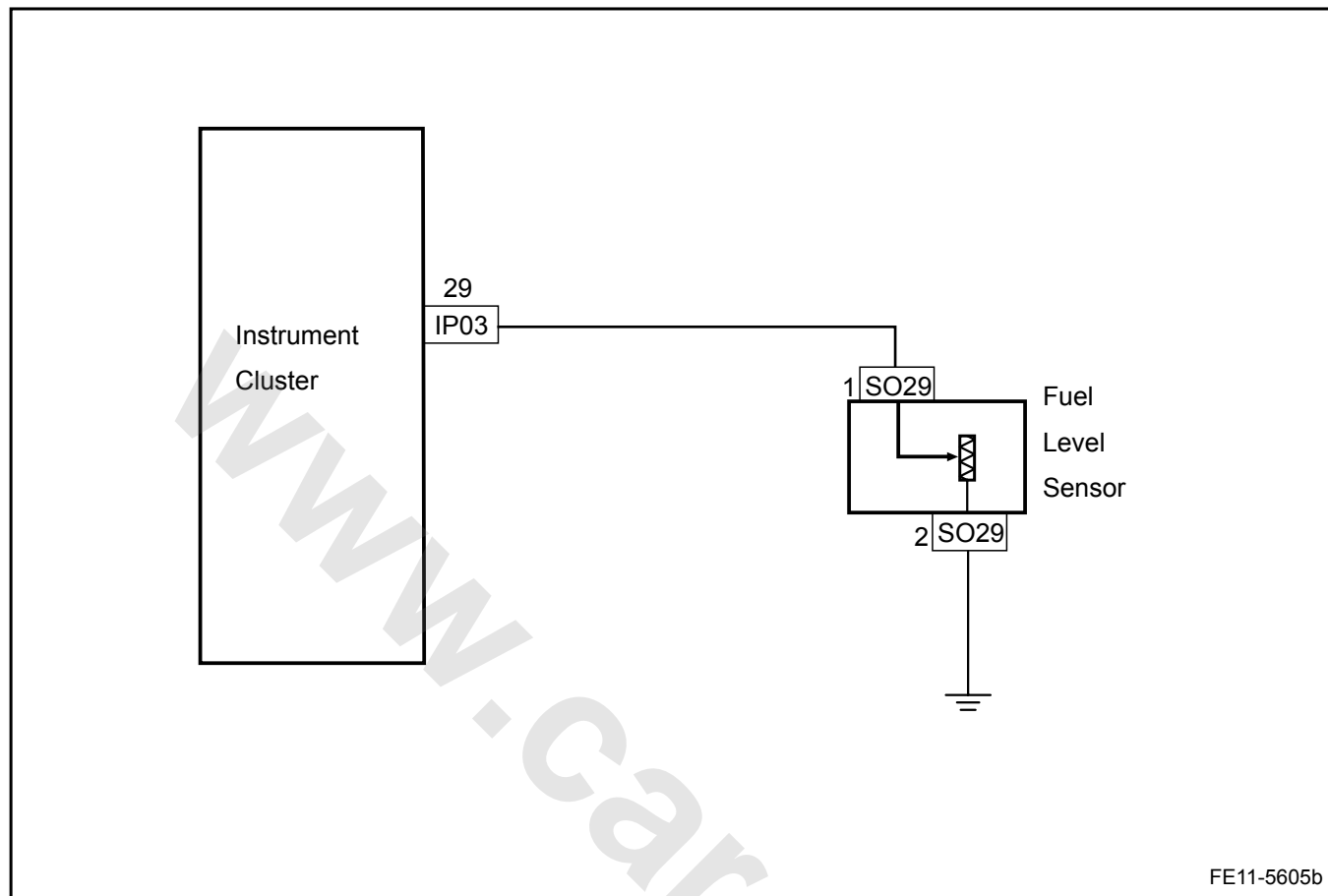
FE11-5603b

Terminal ID	Terminal Definition	Diameter / Color	Specified Conditions (Voltage, Current, Waveform, Etc.)
1	Clock Switch	0.3 Gr	5 V / 1 mA
2	Power Supply	0.5 Y	Battery Power Supply / 1A
3	Lighting Adjustment	0.3 O/Y	5 V / 160 mA
4	5 V Power Supply	0.5 R	5 V / 1 A
5	Ground	0.5 B	GND, Current 1 A
6	Seat Belt	0.3 Gr	5 V / 20 mA
7	Communication Data	0.3 O/L	5 V / 2 mA
8	Communication Clock	0.3 B/Y	5 V / 2 mA
9	Front Fog Lamps	0.5 R/O	14 V / 20 mA
10	Rear Fog Lamps	0.5 R/W	14 V / 20 mA
11	Hood	0.3 W/R	5 V / 20 mA
12	Trunk	0.3 O/L	5 V / 20 mA

## 11.7.6.6 DTC U1303 U1304

DTC	U1303	Fuel level sensor input signal circuit high-voltage, or wiring harness connector is disconnected.
DTC	U1304	Fuel level sensor input signal circuit is short to ground.

Schematic:



Diagnostic Steps:

Step 1	Check whether there is any DTC Code other than U1303 U1304.
--------	---

Is there any DTC Code other than U1303 U1304?

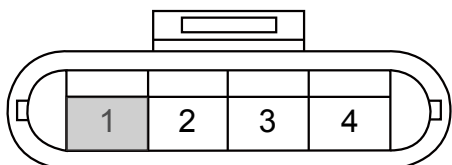
Yes

to [11.7.6.3 Fault Diagnostic Code \(DTC\) List](#),  
according to repair DTC Code

No

Step 2	Check the sensor circuit.
--------	---------------------------

Fuel Pump Harness Connector SO29



FE11-5606b

- Turn the ignition switch to "OFF" position.
- Disconnect instrument cluster harness connector IP03.
- Disconnect the fuel level sensor wiring harness connector SO29.
- Measure resistance between the fuel level sensor wiring harness connector SO29 terminal No.1 and a reliable ground.
- Measure voltage between the fuel level sensor wiring harness connector SO29 terminal No.1 and a reliable ground.

Standard Value:

Connector Terminal	Standard Value:
Resistance Between SO29 (1) and A Reliable Ground	10 k $\Omega$ or higher
Voltage Between SO29 (1) and A Reliable Ground	0 V

Is the value specified value?

No

Repair open circuit or short circuit between the SO29 terminal No.1 and IP03 terminal No. 29.

Yes

Step 3 Check the fuel sensor resistance.

- Turn the ignition switch to "OFF" position.
- Disconnect the fuel level sensor wiring harness connector SO29.
- Remove the fuel pump. Refer to [2.3.8.3 Fuel Pump Assembly Replacement](#).
- Measure the fuel level sensor resistance according to the following table.

Fuel	Resistance
Full	40( $\pm$ 2 $\Omega$ )
3/4	60( $\pm$ 2 $\Omega$ )
1/2	90( $\pm$ 2 $\Omega$ )
1/4	140( $\pm$ 2 $\Omega$ )
Threshold	190 ( $\pm$ 2 $\Omega$ )
Empty	300 ( $\pm$ 2 $\Omega$ )

Is the value specified value?

No

Replace the fuel level sensor. Refer to [2.3.8.4 Fuel Level Sensor Replacement](#)

Yes

Step 4 Check whether the engine tachometer, speedometer are working as per normal?

No

Replace the fuel level sensor. Refer to [2.3.8.4 Fuel Level Sensor Replacement](#)

Yes

Step 5 Replace the instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#).

Next

Step 6 Use scan tool to confirm whether the DTC Code is stored again.

- (a) Connect scan tool to the datalink connector.
- (b) Turn the ignition switch to "ON" position.
- (c) Clear the DTC code.
- (d) Read the DTC Code again, confirm the system has no DTC code.

Is the value specified value?

No

Go to step 1

Yes

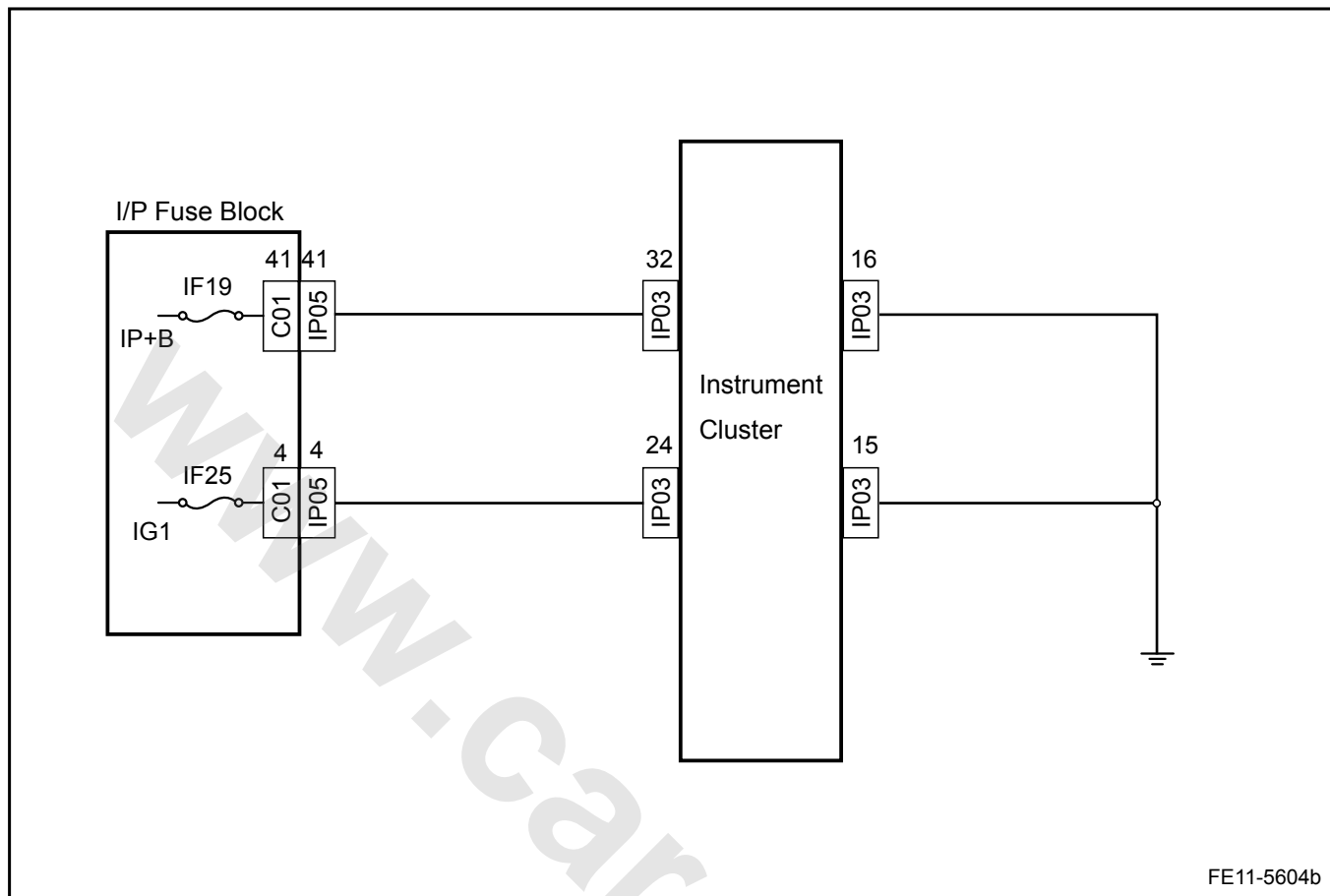
Step 7 Diagnostic Completed.

#### 11.7.6.7 DTC U129C U129D

DTC	U129C	Meter voltage Higher Than Normal.
DTC	U129D	Meter voltage Lower Than Normal.



Schematic:



Diagnostic Steps:

Step 1	Check I/P fuse block fuses IF19 and IF25.
--------	---

- (a) Turn the ignition switch to "OFF" position.
  - (b) Remove I/P fuse block fuses IF19 and IF25.
  - (c) Test these two fuses continuity with a multimeter.
- Conducted?

Yes

Check whether there is a short. replace the fuse.

No

Step 2	Check the meter power supply voltage.
--------	---------------------------------------

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the meter harness connector IP03.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure voltage between the meter harness connector IP03 terminal No.24 and a reliable ground.
- (e) Measure voltage between ECM harness connector IP03 terminal No.32 and a reliable ground.

Standard Value: :11-14 V

Is the voltage normal?

No

Repair the open circuit between fuse IF19 and IP03 terminal No.32 . repair the open circuit between fuse IF25 and IP03 terminal No.24.

Yes

Step 3 Check the instrument ground circuit.

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the meter harness connector IP03.
- (c) Turn the ignition switch to "ON" position.
- (d) Measure resistance between the gage wiring harness connector IP03 terminal No.24 and a reliable ground.
- (e) Measure resistance between ECM harness connector EN01 terminal No.32 and a reliable ground.

Standard Value: Less than 1  $\Omega$ 

Is the resistance normal?

No

ECM ground circuit is faulty. Repair the faulty part.

Yes

Step 4 Check the charging system.

- (a) Check the battery voltage.  
Standard Value: 11-14 V
- (b) Check the generator charging voltage.  
Standard Value: 11.5-14.5 V

Normal?

No

Repair the faulty part.

Yes

Step 5 Replace the instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#).

Next

Step 6 Use scan tool to confirm whether the DTC Code is stored again.

- (a) Connect scan tool to the datalink connector.
  - (b) Turn the ignition switch to "ON" position.
  - (c) Clear the DTC codes.
  - (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
  - (e) Read control system DTC code again.
- DTC codes still exist?

Yes

Go to step 1

No

Step 7	Diagnostic completed.
--------	-----------------------

## 11.7.6.8 DTC U150F

DTC	U150F	EEPROM Checksum Error
-----	-------	-----------------------

Diagnostic Steps:

Step 1	Check whether the meter power supply circuit and ground circuit are normal.
--------	---

Refer to [11.7.6.7 DTC U129C U129D](#).

Yes

Fault site

No

Step 2	Replace the instrument cluster. Refer to <a href="#">11.7.7.1 Instrument Cluster Replacement</a> .
--------	--

Next

Step 3	Use scan tool to confirm whether the DTC Code is stored again.
--------	--

- (a) Connect scan tool to the datalink connector.
  - (b) Turn the ignition switch to "ON" position.
  - (c) Clear DTC codes.
  - (d) Start and run the engine at idle speed to warm up the engine for at least 5 min.
  - (e) Read the control system DTC Code again.
- DTC codes still exist?

Yes

Go to step 1

No

Step 4	Diagnostic completed.
--------	-----------------------

## 11.7.6.9 DTC U1400 U1410 U1420 U1430 U1501 U1601

DTC	U1400	ABS Message Time Out, ABS Communication Lost
DTC	U1410	airbag control module Message Time Out, airbag control module Communication Lost
DTC	U1420	BCM Message Time Out, BCM Communication Lost
DTC	U1430	EMS Message Time Out, EMS Communication Lost
DTC	U1501	CAN Network System Integrity Test Failure
DTC	U1601	CAN Bus Off

Diagnostic Steps:

Refer to "Data Communications System" in the [11.17.7 Diagnostic Information and Procedures](#).

## 11.7.7 Removal and Installation

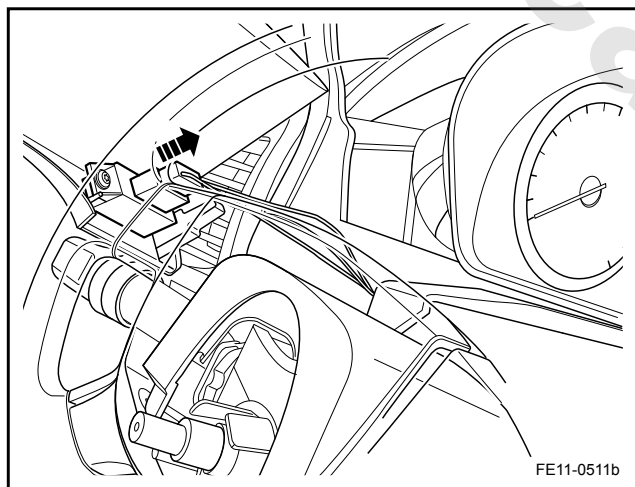
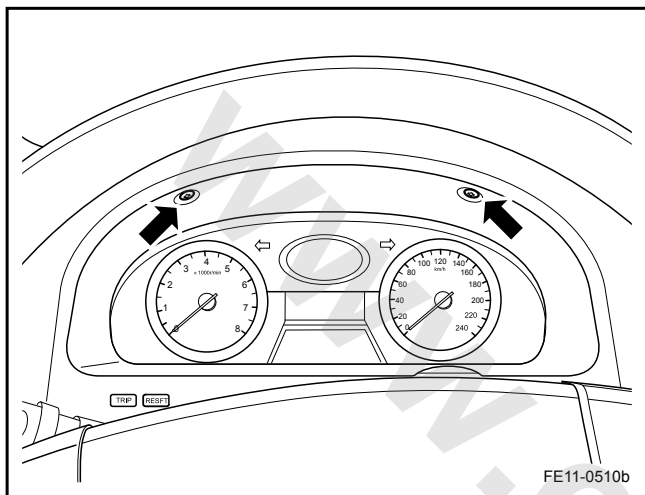
### 11.7.7.1 Instrument Cluster Replacement

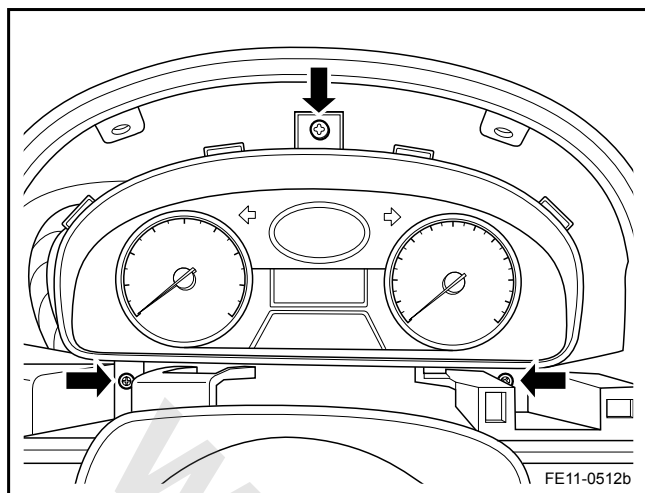
#### Removal Procedure

#### Warning!

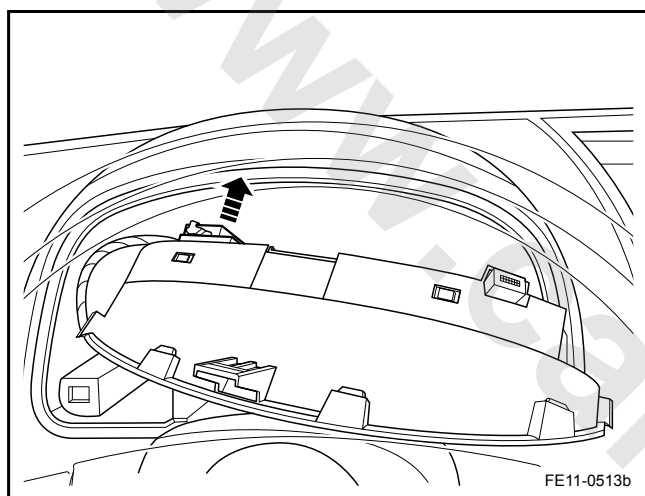
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Adjust the steering wheel to the lowest position, remove the instrument cluster panel screws.
3. Disconnect the odometer reset switch connector, remove the instrument cluster panel.



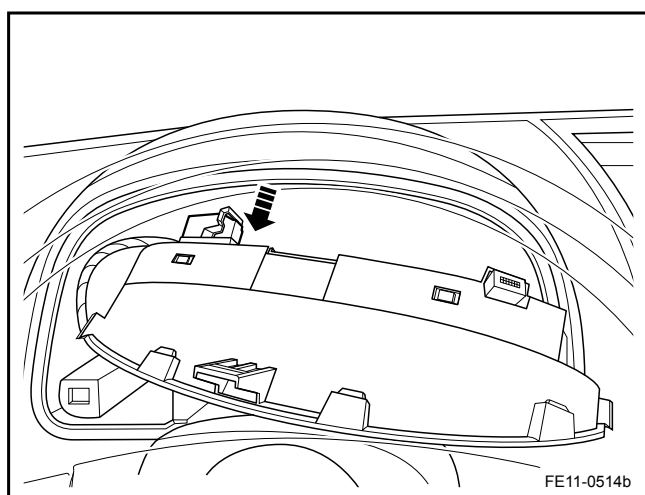


4. Remove the instrument cluster retaining screw, remove the instrument cluster.

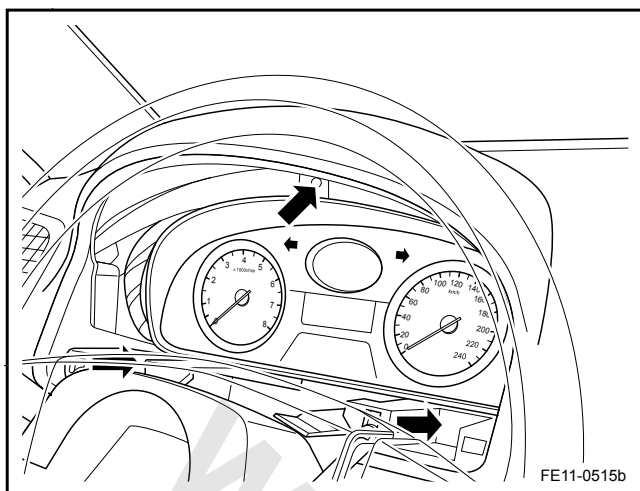


5. Disconnect the instrument cluster harness connector.

#### Installation Procedure:



1. Connect the instrument cluster harness connector.

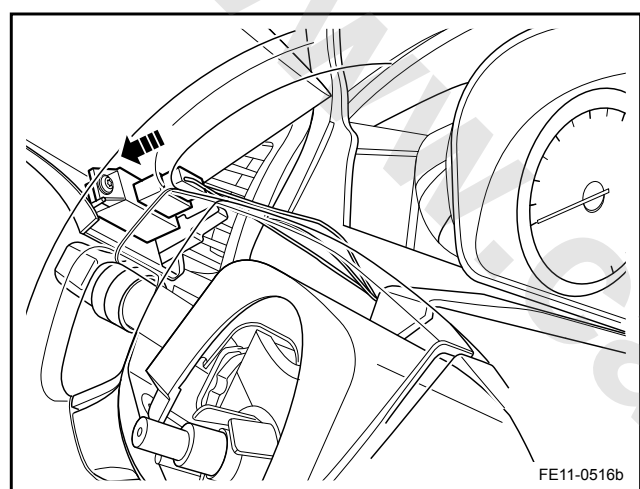


2. Install the instrument cluster and tighten the retaining screws.

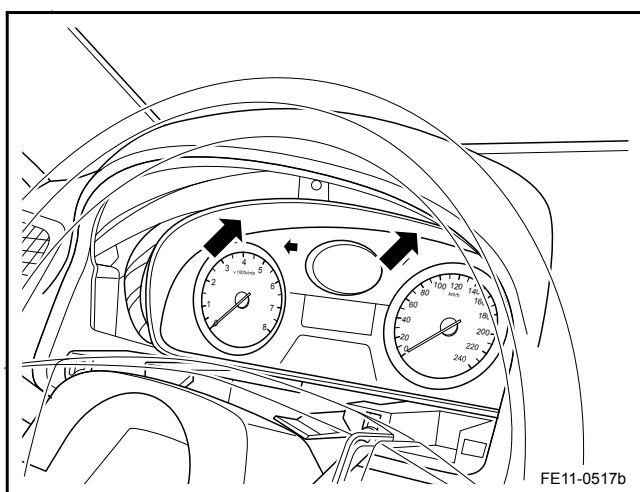
Torque: 9.8 Nm (Metric) 7.3 lb-ft (US English)

**Note**

Refer to "Fastener Notice" in "Warnings and Notices".



3. Connect the odometer reset switch connector.



4. Install the instrument cluster panel.

Torque: 3 Nm (Metric) 2.2 lb-ft (US English)

**Note**

Refer to "Fastener Notice" in "Warnings and Notices".

5. Connect the battery negative cable.

## 11.8 Sunroof

### 11.8.1 Specifications

#### 11.8.1.1 Fastener Tightening Specifications

Applications	Specifications	Specifications	
		Metric (Nm)	US English (lb-ft)
Doom Lamp With Sunroof Switch Assembly Screw	M5 × 8	3-4	2-3
Doom Lamp With Sunroof Switch Mounting Bracket Assembly Retaining Bolts	M6 × 16	4-5	3-4
Sunroof Assembly Bolts	M6 × 12	7-9	5-7

#### 11.8.1.2 Sunroof Motor Specification

Parameters	Rating
Working Voltage Range	9-16 V
Normal Working Voltage	125-135 V
Maximum Locked-Rotor Current	25 A
Waiting Current	20 mA
Sleep Current	1 mA

## 11.8.2 Description and Operation

### 11.8.2.1 Description and Operation

#### System Components

- Sunroof Control Module
- Sunroof Switch
- Sunroof Motor With Pressure Sensor and Limit Sensor
- Sunroof
- Sunroof Visor

#### Manual Operation

Electric sunroof is operated by sunroof switch located in the dome lamp area. When the sunroof switch is pressed to move the sunroof to a certain location, it will send a message to the sunroof control module. The module will control the motor direction to perform the corresponding operation to move the sunroof glass to the requested location. Hold the button 40-500ms, the sunroof glass will continue to move until the button is released.

#### Fast Operation

Fast operating mode allows sunroof automatically open or close without the need to hold the switch. this function is activated when the switch signal is more than 500ms, and can be achieved when sliding and tilting.

#### Over-Flap

- This function is only activated in the tilt mode
- When the sunroof glass is tilted to the fully closed position, the control module controls the motor to stop at the Over-Flap, and then move back to full closed position.

#### Soft Stop

- When the sunroof glass is sliding to open, it will stop at a default location before the fully open position. This default location is used to reduce wind-induced vibration.
- When the glass stopped at this location, the user can continue to manipulate through the sunroof switch to the fully open position of sunroof.

#### Express Down Function

When the sunroof closing is hindered, it will return to 200 mm (7.87 in) before the normal closed position. This feature is only activated in the fast-sliding closing and tilt mode.

#### Sleep Mode

- After the sunroof motor stops rotating 30 s and there is no open or close operation, the sunroof will enter sleep mode to reduce power consumption.
- When opening or closing operation is executed, sunroof will automatically be awakened.



## 11.8.3 System Working Principle

### 11.8.3.1 System Working Principle

Sunroof motor and control module are integrated with a total of 8-pin wiring harness connector. Terminals are defined as following:

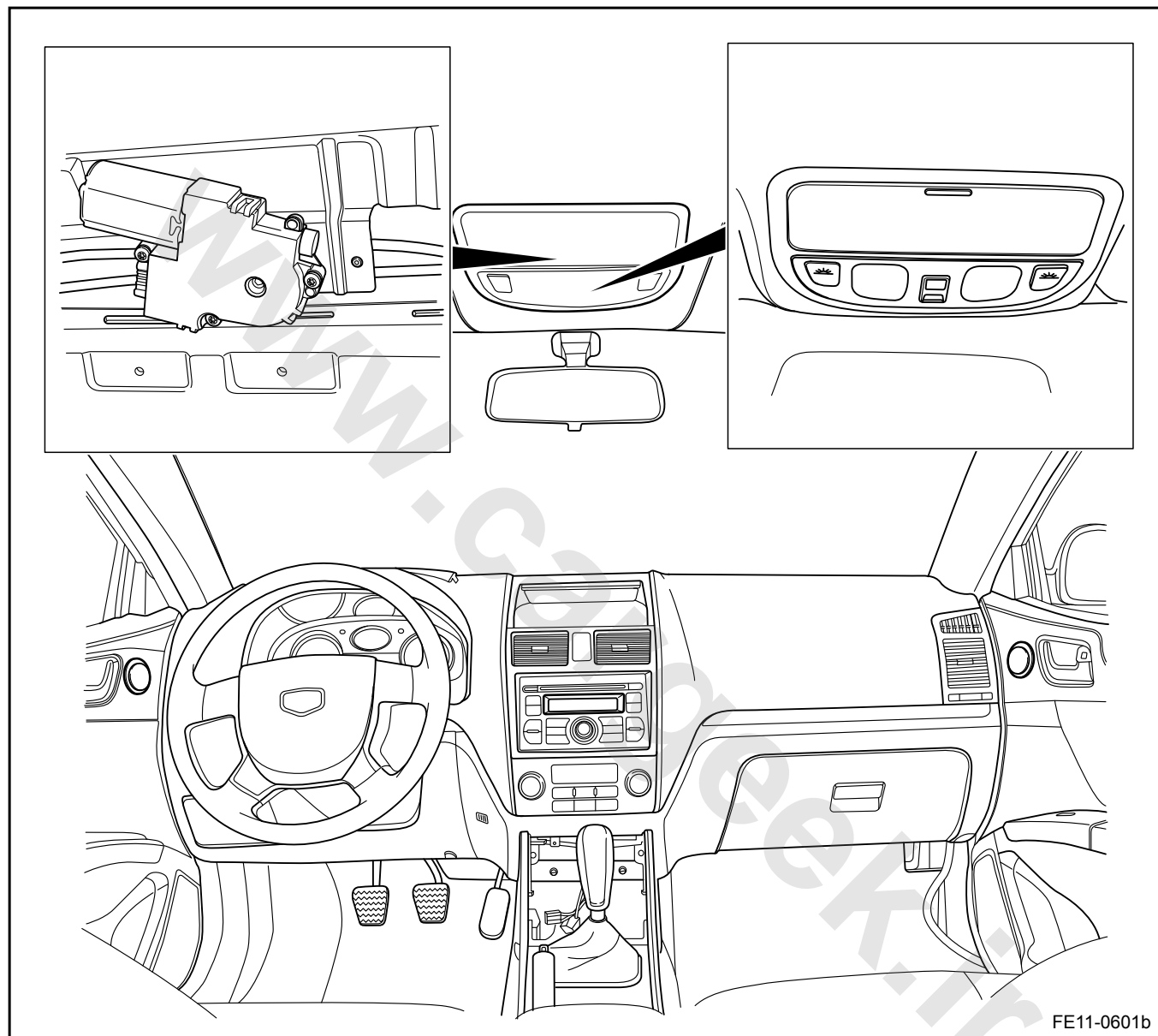
Terminal ID	Terminal Definition	Wire Color	Terminal Status	Description
1	+ B	2.0 W/L	Power Supply	Battery Power Supply
2	Ground	2.0 B	Power Supply	Ground
3	IG1	0.5 R/L	Power Supply	Ignition Power Supply
4	Tilt Switch	0.3 W	Output	Tilt Signal Output
5	Slide Switch	0.3 L	Output	Slide Signal Output
6	ACC	0.5 R/G	Power Supply	Accessory Power Supply
7	Alarm	0.3 L/R	Output	Alarm Signal Output
8	Spare	-	-	Empty

Tilt switch and slide switch are ground signals, when the switch is pressed, the signal circuit will have a low voltage.

## 11.8.4 Component Locator

### 11.8.4.1 Component Locator

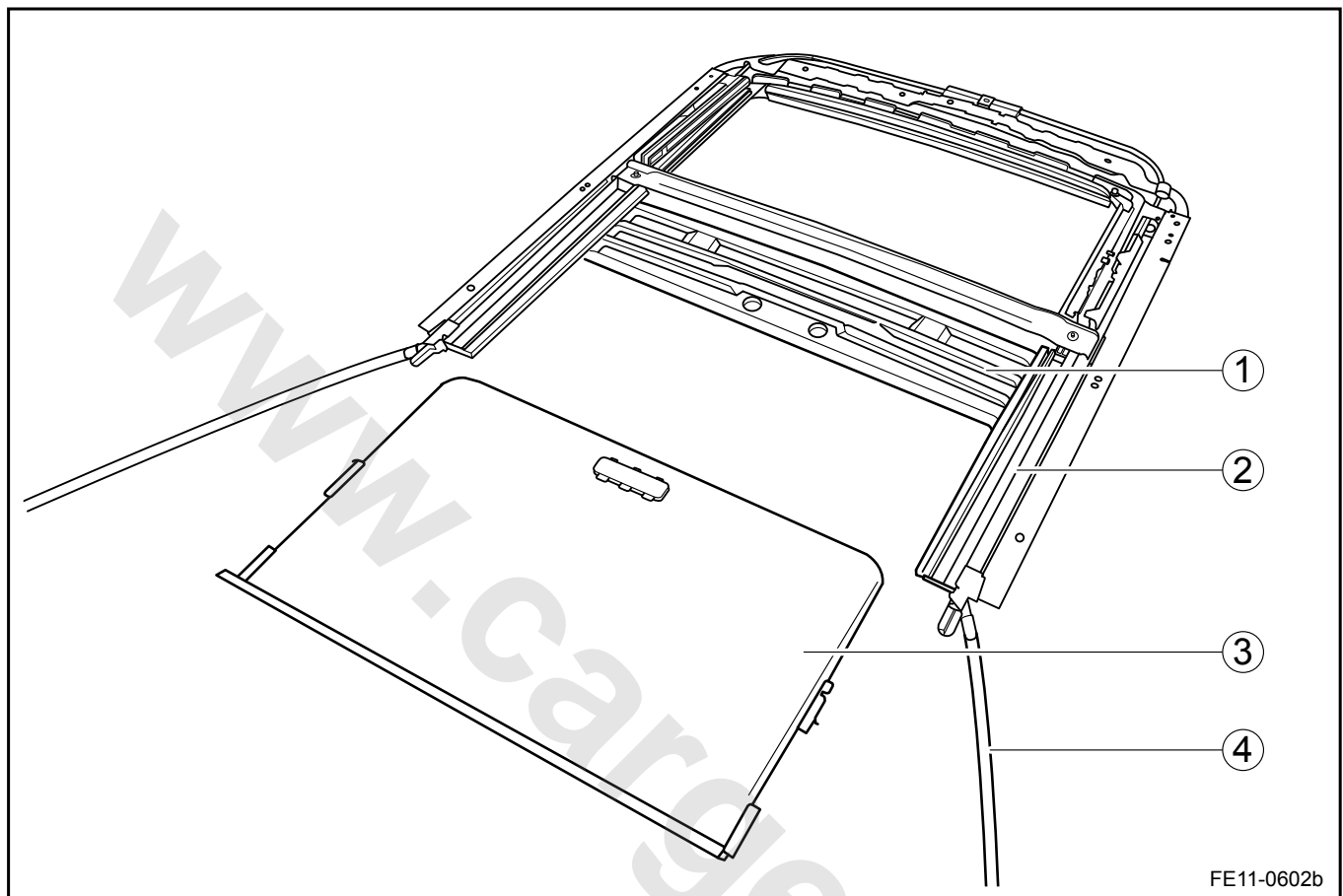
#### Sunroof Switch Assembly



## 11.8.5 Disassemble View

## 11.8.5.1 Disassemble View

Sunroof Disassemble View



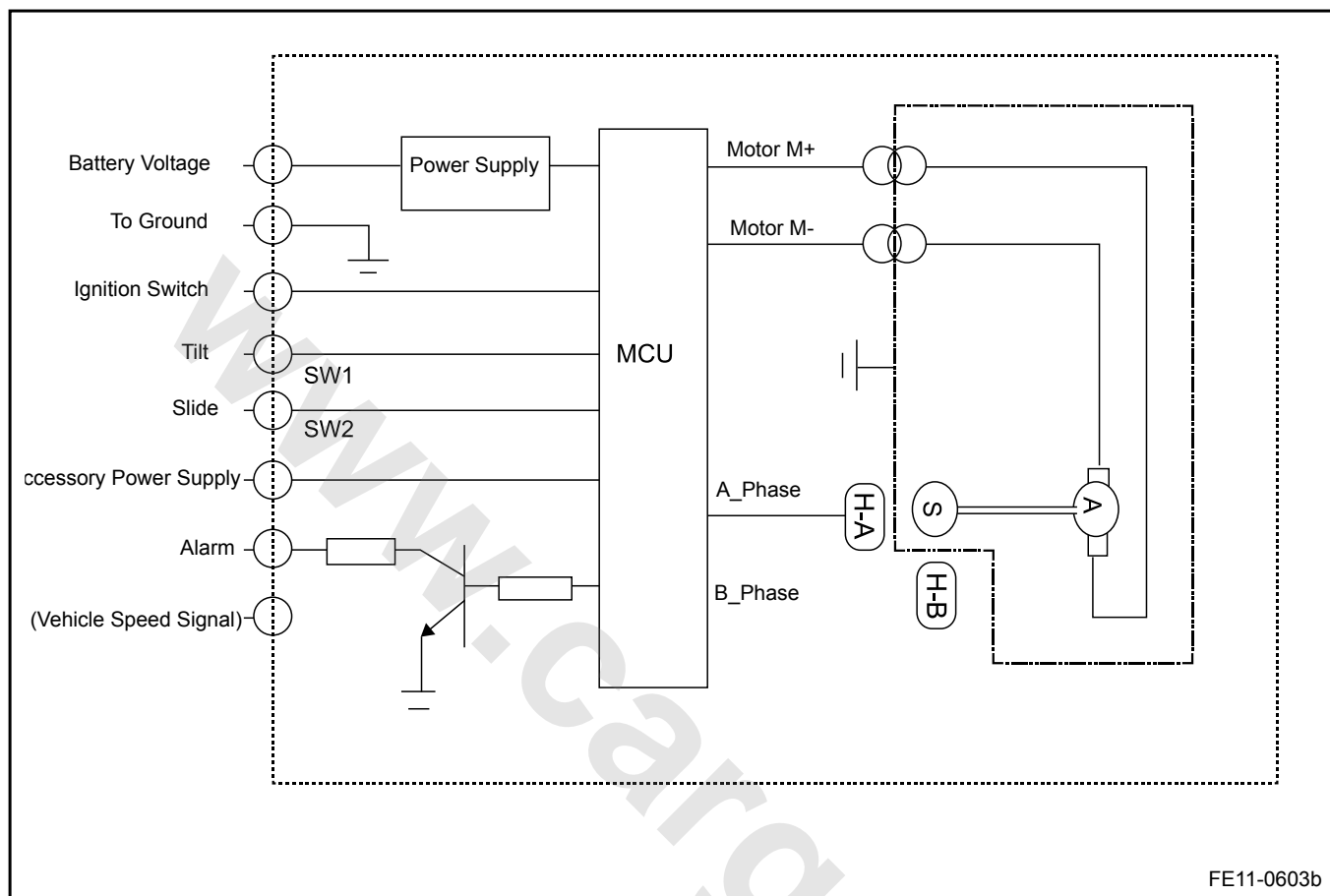
## Legend

- 1. Roof Stiffener
- 2. Sunroof Frame
- 3. Sunroof Visor

- 4. Sunroof Aqueduct

## 11.8.6 Schematic

## 11.8.6.1 Schematic



## 11.8.7 Diagnostic Information and Procedures

### 11.8.7.1 Diagnosis Description

Refer to [11.8.2 Description and Operation](#) get familiar with the contents of system functions and operation of a later start system diagnostics, so that will help in the event of failure determine the correct troubleshooting steps, more importantly, so would also help to determine whether the customer describe the situation of normal operation.

### 11.8.7.2 Visual Inspection

- Check installed after market equipment that may affect system normal operations.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- Check whether the sunroof initialization is no longer valid.

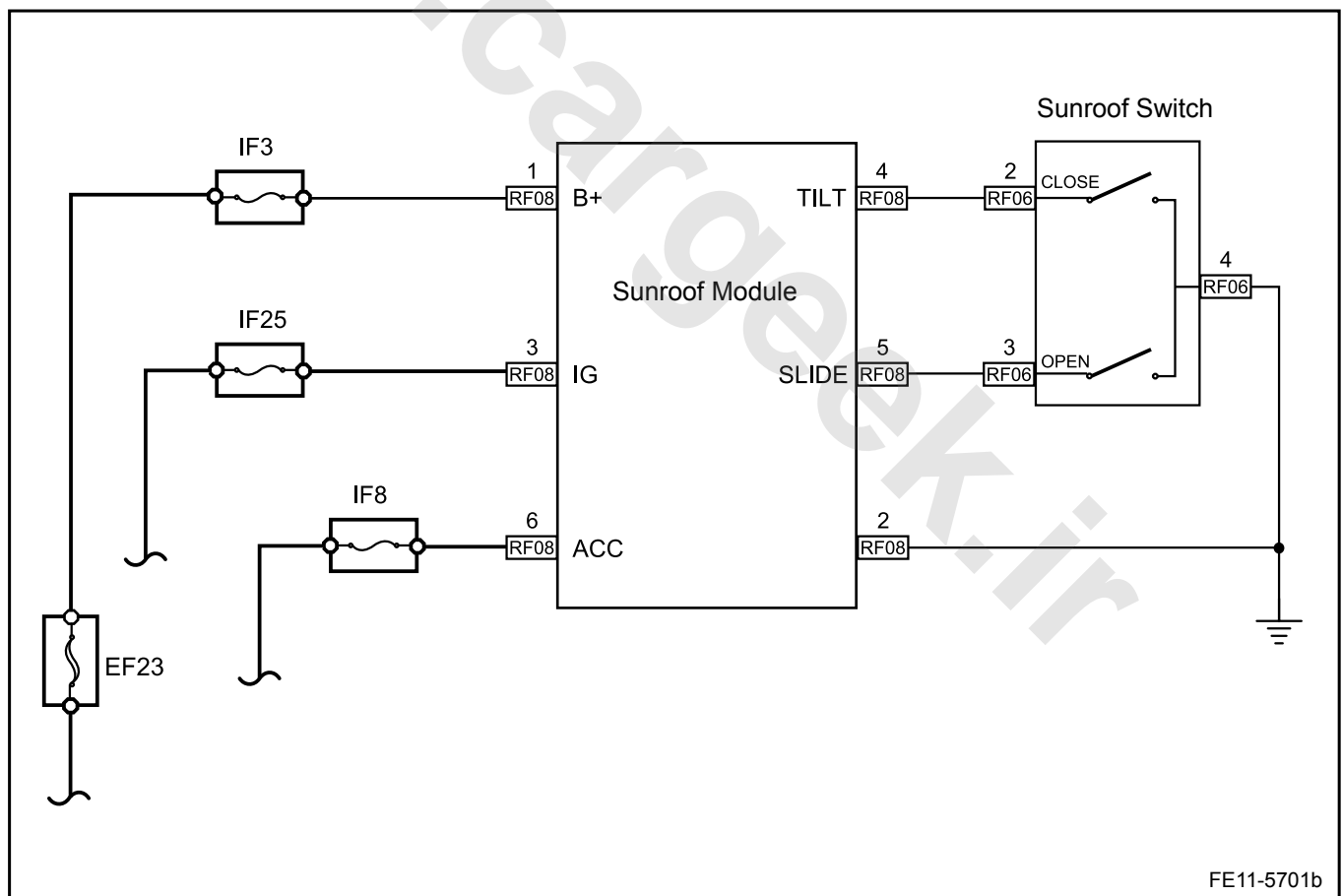
### 11.8.7.3 Sunroof Initialization

When the initial position is lost, perform this procedure:

At the completely tilt position, press the tilt button for more than 5s, sunroof will perform the initialization.

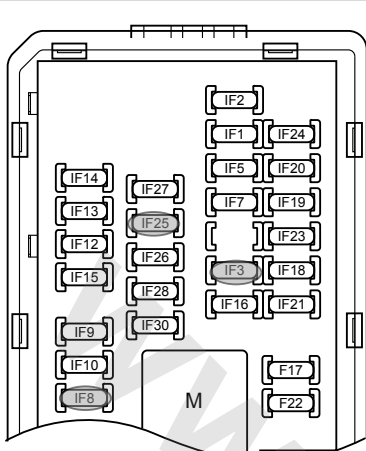
### 11.8.7.4 Sunroof Inoperative

Schematic:



## Diagnostic Steps:

Step 1	Check the fuses, IF3, IF25, IF8.
--------	----------------------------------



(a) Check whether the fuses, IF3, IF25 and IF8 are blown.  
Fuse Rating: Respectively 30 A, 10 A, 10 A

No

Go to step 3

Yes

Step 2	Check the fuses, IF3, IF25, IF8 circuits.
--------	---

(a) Check the fuses IF3, IF25 and IF8 for short circuits.  
 (b) Repair the circuits. Confirm that there are no short circuits.  
 (c) Replace with fuses with rated current.

Is the sunroof working correctly?

Yes

System normal

No

Step 3	Carry out the sunroof initialization.
--------	---------------------------------------

(a) Carry out the sunroof initialization. Refer to [11.8.7.3 Sunroof Initialization](#).

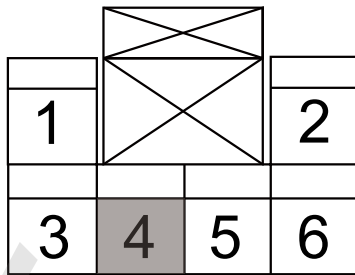
Is the sunroof working properly?

Yes

System normal

No

Step 4	Check the sunroof switch harness connector RF06 ground circuit.
--------	---

Interior Light + Sunroof Switch Harness  
Connector RF06

FE11-5703b

No

**Step 5** Repair the open circuit between the sunroof switch harness connector RF06 and body ground.

- (a) Remove the sunroof switch. Refer to [11.8.8.3 Sunroof Switch Assembly Replacement](#).

- (b) Measure resistance between the sunroof switch harness connector RF06 and body ground with a multimeter.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 6

No

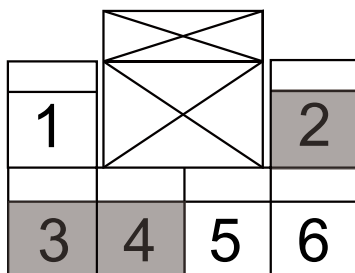
**Step 6** Check the sunroof switch assembly.

- (a) Confirm the open circuit between the sunroof switch harness connector RF06 and body ground repair is completed.

Is the sunroof working properly?

Yes

System normal

Interior Light + Sunroof Switch Harness  
Connector RF06

FE11-5704b

No

**Step 7** Replace the sunroof switch.

- (a) Press the sunroof switch, while measure resistance between the switch RF06 terminals 2,3 and 4 with a multimeter.

- (b) Measure resistance between sunroof switch harness connector RF06 terminals 4 and body ground with a multimeter.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 8

- (a) Install a new sunroof switch. Refer to [11.8.8.3 Sunroof Switch Assembly Replacement](#).

Is the sunroof working properly?

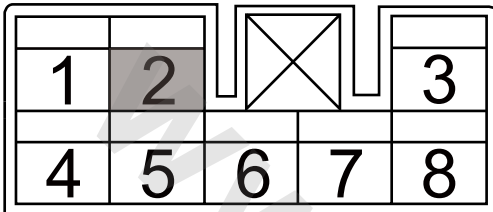
Yes

System normal

No

Step 8 Check the sunroof assembly harness connector RF08 terminal No.2 and the body ground circuit.

Sunroof Module Harness Connector RF08



FE11-5705b

- (a) Disconnect the roof harness connector. Refer to [11.8.8.2 Sunroof Motor Replacement](#).
- (b) Measure resistance between the sunroof switch harness connector RF08 terminal No.2 and the body ground with a multimeter.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 10

No

Step 9 Repair the open circuit between the sunroof assembly harness connector RF08 and body ground.

- (a) Confirm the open circuit between the sunroof assembly harness connector RF08 and body ground repair is completed.

Is the sunroof working properly?

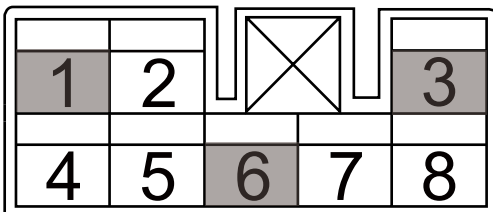
Yes

System normal

No

Step 10 Check the sunroof module assembly connector RF08 terminals No.1,3,6 voltage.

Sunroof Module Harness Connector RF08



FE11-5706b

- (a) Turn the ignition switch to the ON position, measure the sunroof module assembly connector RF08 terminals No. 1,3,6 voltage with a multimeter.

Standard Voltage: 11-14 V

Yes

Go to step 12

No

Step 11 Check the circuits between the sunroof assembly connector RF08 terminal No.1,3,6 and fuses IF-3, IF-25, IP-8 respectively.



- (a) Disconnect the roof assembly connector RF08.  
 (b) Measure resistance between the sunroof assembly connector RF08 terminals No.1,3,6, fuse IF-3, IF-25, IP-24 respectively, with a multimeter.  
 Resistance Standard Value: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 13

No

Step 12 Repair the open circuits between the sunroof assembly connector RF08 terminals and fuses IF-3, IF-25, IP-8.

- (a) Confirm the open circuits between the sunroof assembly connector RF08 terminals and fuses IF-3, IF-25, IP-8 repair is completed.

Is the sunroof working properly?

Yes

System normal

No

Step 13 Replace the sunroof motor assembly.

- (a) Replace the sunroof motor assembly. Refer to [11.8.8.2 Sunroof Motor Replacement](#).

Confirm the repair completed.

Next

Step 14 System normal.

### 11.8.7.5 Sunroof Can Not Open

Schematic:

Refer to [11.8.7.4 Sunroof Inoperative](#).

Diagnostic Steps:

Step 1 Send a ground signal to the sunroof module.

- (a) Remove the sunroof switch. Refer to [11.8.8.3 Sunroof Switch Assembly Replacement](#).  
 (b) Connect the roof antenna switch harness connector RF06 terminal No.3 and body ground with a suitable antenna.

Is the sunroof motor working properly?

Yes

Go to step 5

No

Step 2 Check resistance between the sunroof switch and the sunroof module.

- (a) Disconnect the sunroof module harness connector.

- (b) Measure resistance between the sunroof module harness connector terminal No.5 and sunroof switch wiring harness connector RF08 terminal No.3 with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 4

No

Step 3 Repair the wiring harness between the sunroof switch and the sunroof module assembly.

Is the sunroof working properly?

Yes

System normal

No

Step 4 Replace the sunroof motor.

- (a) Replace the sunroof motor. Refer to [11.8.8.2 Sunroof Motor Replacement](#).

Confirm the repair completed.

Yes

System normal

No

Step 5 Check the circuit between the sunroof switch harness connector RF06 and body ground.

- (a) Remove the sunroof switch. Refer to [11.8.8.3 Sunroof Switch Assembly Replacement](#).

- (b) Measure resistance between the sunroof switch harness connector RF06 terminal No.4 and body ground with a multimeter.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 7

No

Step 6 Repair the circuit between the sunroof switch harness connector RF06 and body ground.

Confirm the repair completed.

Yes

System normal

No

Step 7 Replace the sunroof switch assembly.

- (a) Install a new sunroof switch. Refer to [11.8.8.3 Sunroof Switch Assembly Replacement](#).

Confirm the repair completed.

Next

Step 8	System normal.
--------	----------------

### 11.8.7.6 Sunroof Can Not Close

Schematic:

Refer to [11.8.7.4 Sunroof Inoperative.](#)

Diagnostic Steps:

Step 1	Send a ground signal to the sunroof module.
--------	---

- (a) Remove the sunroof switch. Refer to [11.8.8.3 Sunroof Switch Assembly Replacement.](#)
- (b) Connect the sunroof antenna switch harness connector RF06 terminal No.2 and body ground with a suitable antenna. Confirm the sunroof motor is working.

Yes

Go to step 5

No

Step 2	Check resistance between the sunroof switch and the sunroof module.
--------	---

- (a) Disconnect the sunroof module assembly harness connector.
- (b) Measure resistance between the sunroof module harness connector RF08 terminal No.4 and the sunroof switch wiring harness connector RF06 terminal No.2 with a multimeter.  
Resistance Standard Value: Less than 1  $\Omega$   
Is the resistance specified value?

Yes

Go to step 4

No

Step 3	Repair the wiring harness between the sunroof switch and the sunroof module
--------	---

Is the sunroof working properly?

Yes

System normal

No

Step 4	Replace the sunroof motor.
--------	----------------------------

- (a) Replace the sunroof motor. Refer to [11.8.8.2 Sunroof Motor Replacement.](#)  
Confirm the repair completed.

Yes

System normal

No

Step 5	Check the circuit between the sunroof switch harness connector RF06 and body ground.
--------	--

(a) Remove the sunroof switch. Refer to [11.8.8.3 Sunroof Switch Assembly Replacement](#).

(b) Measure resistance between the sunroof switch harness connector RF06 terminal No.4 and body ground with a multimeter.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 7

No

Step 6	Repair the circuit between the sunroof switch harness connector RF06 and body ground.
--------	---

Confirm the repair completed.

Yes

System normal

No

Step 7	Replace the sunroof switch.
--------	-----------------------------

(a) Install a new sunroof switch.. Refer to [11.8.8.3 Sunroof Switch Assembly Replacement](#).

Confirm the repair completed.

Next

Step 8	System normal.
--------	----------------

### 11.8.7.7 Sunroof Anti-trap Function Inoperative

Schematic:

Refer to [11.8.7.4 Sunroof Inoperative](#).

Diagnostic Steps:

Step 1	Carry out the sunroof initialization.
--------	---------------------------------------

Is the sunroof working properly?

Yes

System normal

No

Step 2	Replace the sunroof switch assembly.
--------	--------------------------------------

(a) Install a new sunroof switch. Refer to [11.8.8.3 Sunroof Switch Assembly Replacement](#).

Is the sunroof working properly?

Next

Step 3	System normal.
--------	----------------

### 11.8.7.8 Sunroof Can Not Operate Intermittently

Schematic:

Refer to [11.8.7.4 Sunroof Inoperative.](#)

Fault Symptom Table:

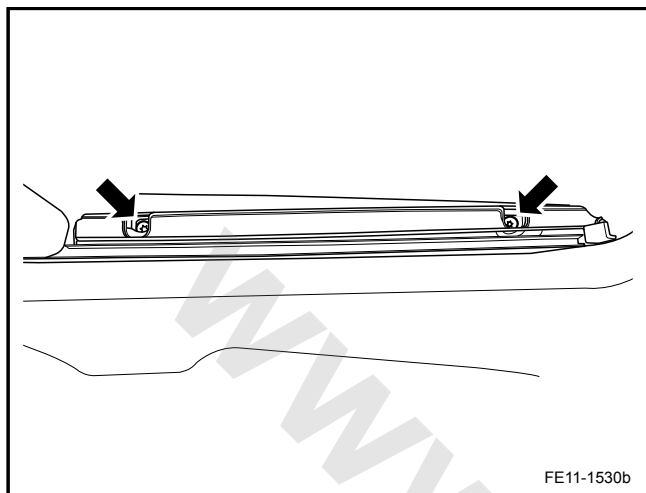
Symptoms	Suspected Faulty Part	Repair Procedure
Insulation Inner Layer Wire Poor Connection	Sunroof Module and The Sunroof Switch Slide Switch	Refer to <a href="#">11.8.7.5 Sunroof Can Not Open.</a>
Harness Connector Male and Female Terminals Poor Connection	<ol style="list-style-type: none"> <li>1. Sunroof Switch</li> <li>2. Sunroof Motor Wire Harness Connector</li> <li>3. Sunroof Switch Harness Connector</li> <li>4. Sunroof Motor</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean connector male and female terminals.</li> <li>2. Replace the sunroof switch. Refer to <a href="#">11.8.8.3 Sunroof Switch Assembly Replacement.</a></li> <li>3. Replace the wiring harness.</li> <li>4. Replace the sunroof motor. Refer to <a href="#">11.8.8.2 Sunroof Motor Replacement.</a></li> </ol>
Ground Poor Connection	G7A Ground	<ol style="list-style-type: none"> <li>1. Ground Fasteners.</li> <li>2. Clean the ground connection.</li> </ol>
Sunroof Switch Poor Connection	<ol style="list-style-type: none"> <li>1. Slide Switch</li> <li>2. Tilt Switch</li> </ol>	Replace the sunroof switch. Refer to <a href="#">11.8.8.3 Sunroof Switch Assembly Replacement.</a>

## 11.8.8 Removal and Installation

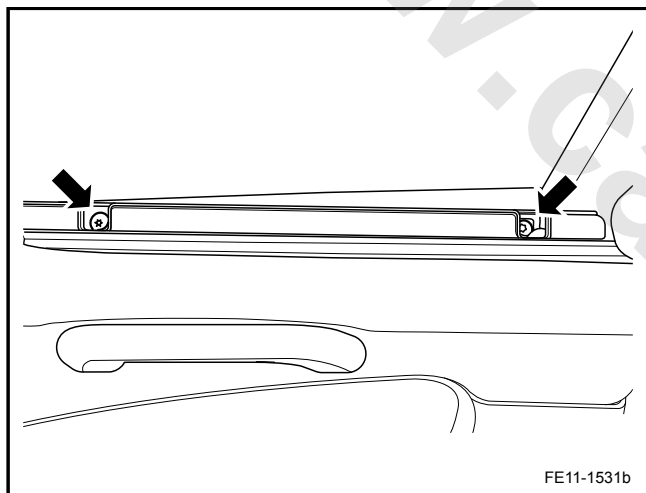
### 11.8.8.1 Sunroof Glass Replacement

#### Removal Procedure

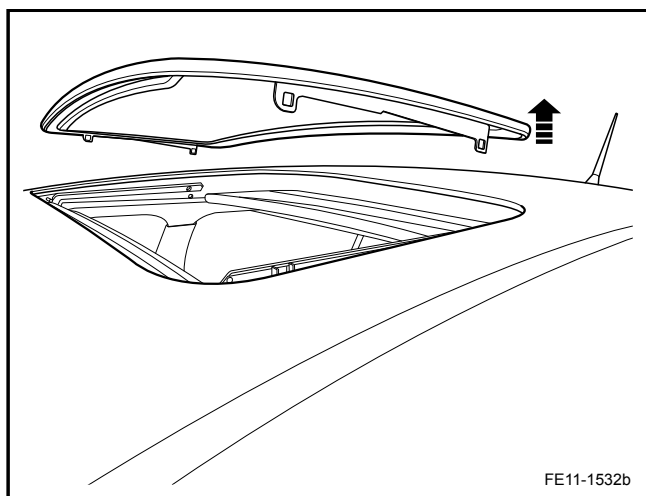
1. Tilt the sunroof for access to remove the sunroof retaining bolts and remove the left side sunroof retaining bolts.



2. Remove the right side sunroof retaining bolts.

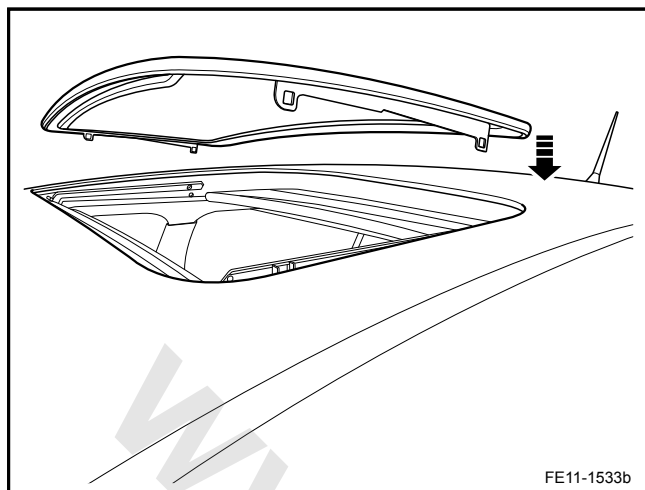


3. Pull the sunroof window upward to remove the sunroof window glass.



## Installation Procedure:

1. Install the sunroof window glass, do not tighten the retaining bolts at this stage.

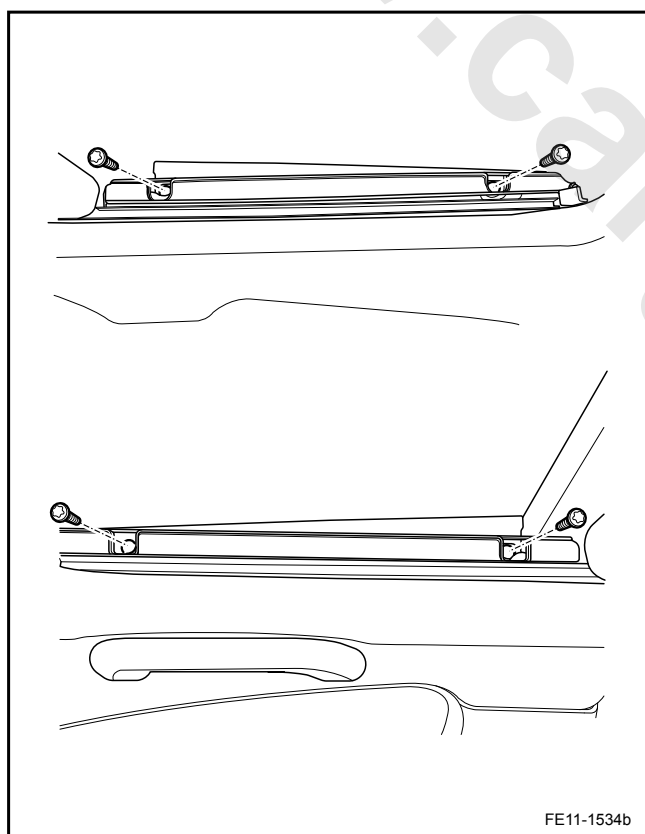


## Note

Note: After installation, carry out water leaking test. check whether there is water leaking to confirm the correct installation.

2. Adjust the sunroof window to make it even with the roof and make sure the surrounding gaps are consistent and tighten the retaining bolts.

Torque: 4 Nm (Metric) 3 lb-ft (US English)



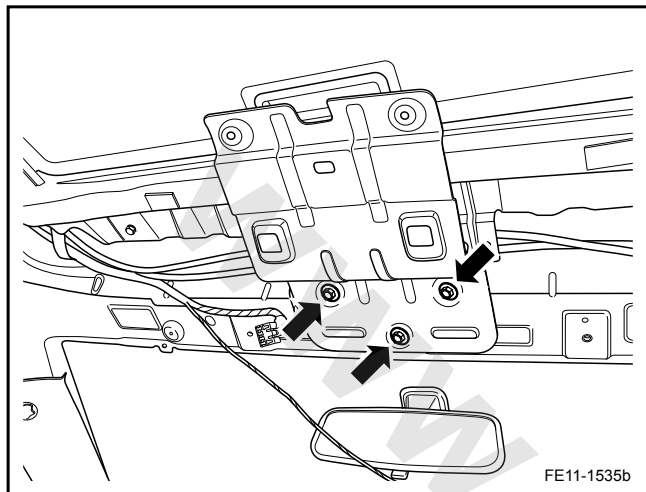
### 11.8.8.2 Sunroof Motor Replacement

#### Removal Procedure

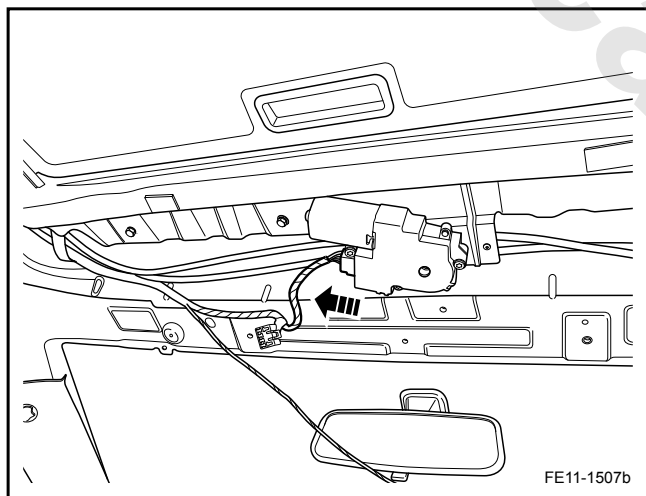
#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

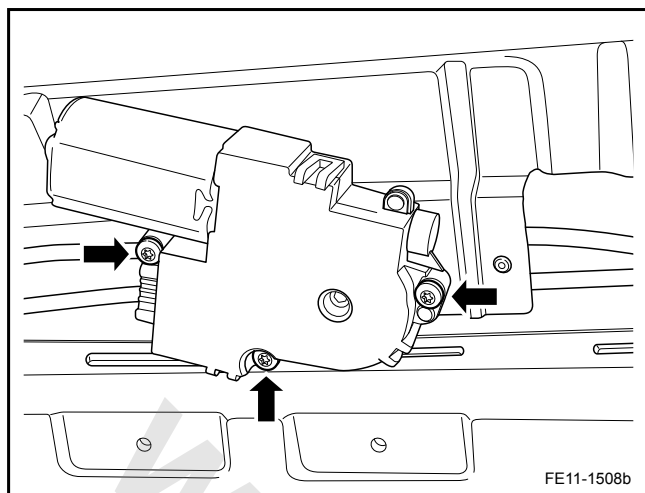
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the headliner. Refer to [12.9.1.1 Headliner Replacement](#).



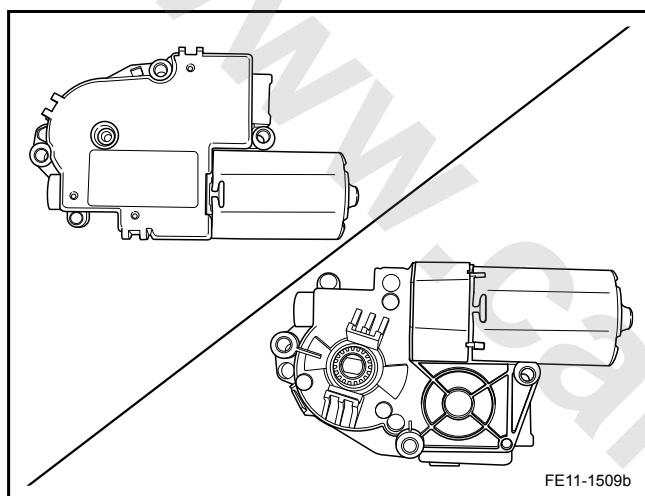
3. Remove the sunroof switch bottom retaining bolts.
4. Disconnect the sunroof motor wiring harness connector.







5. Remove the sunroof motor retaining bolts.



6. Pull downward to remove the sunroof motor.

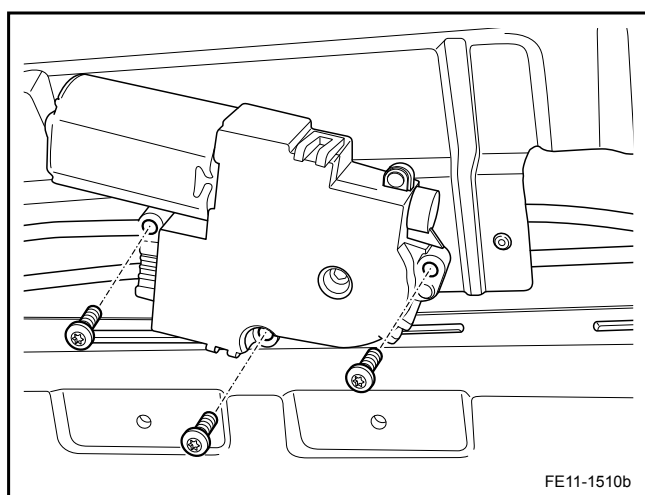
#### Note

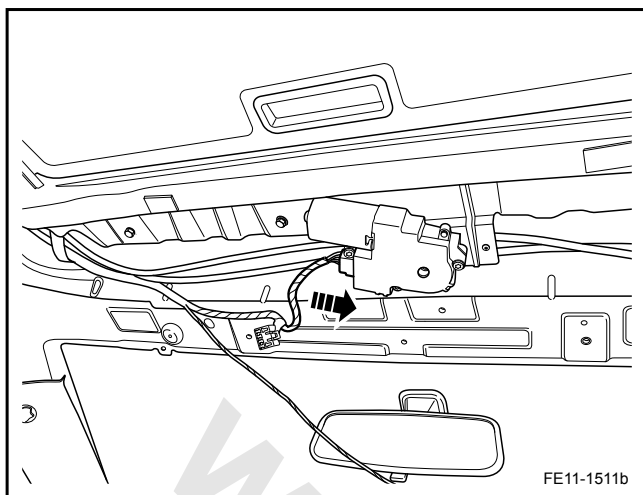
Prevent the motor rack and pinion gears misalignment.

#### Installation Procedure:

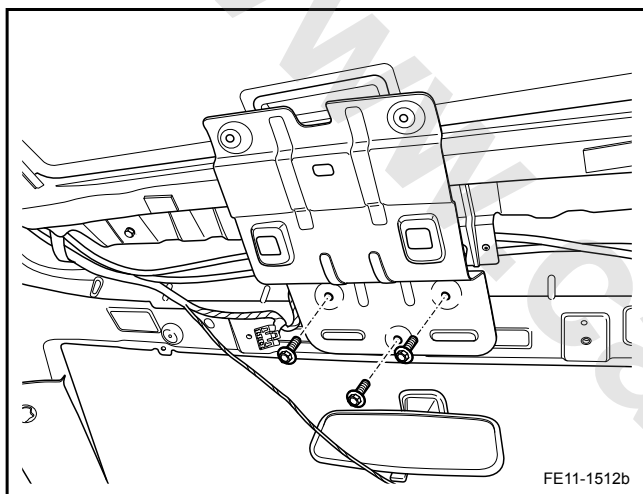
1. Install the sunroof motor and tighten the retaining bolts.

Torque: 5 Nm (Metric) 3.7 lb-ft (US English)





2. Connect the electrical wiring harness connector.



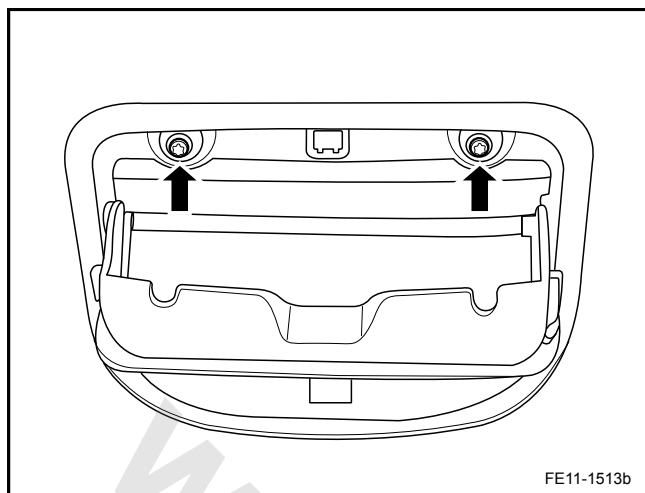
3. Install the sunroof switch bottom panel.  
Torque: 7 Nm (Metric) 5.2 lb-ft (US English)
4. Install the headliner.
5. Connect the battery negative cable.

### 11.8.8.3 Sunroof Switch Assembly Replacement

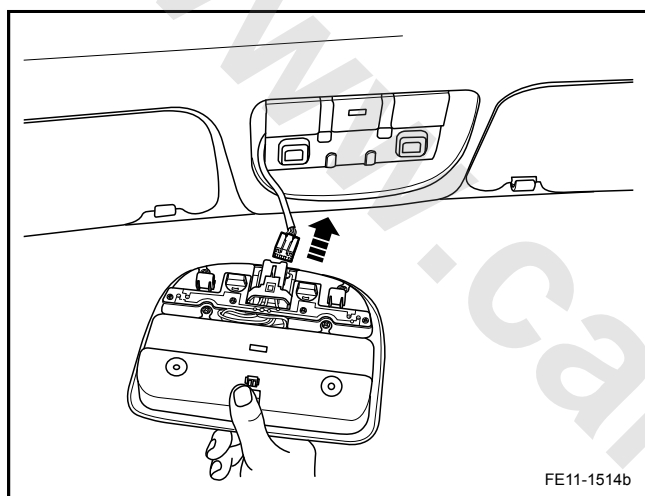
#### Removal Procedure

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



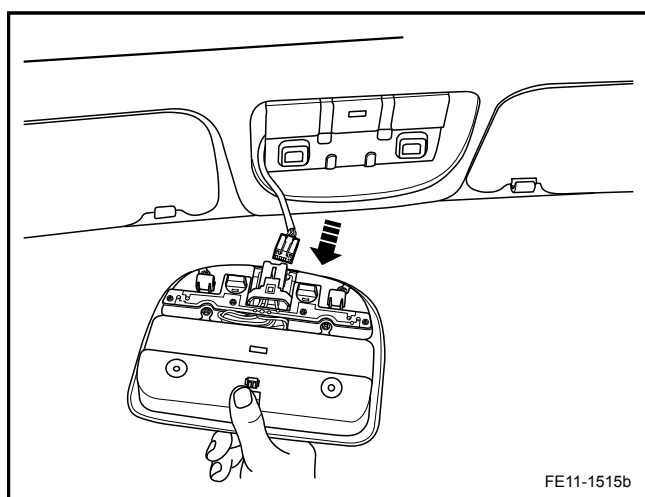
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the sunroof switch assembly retaining screws, remove the sunroof switch assembly.

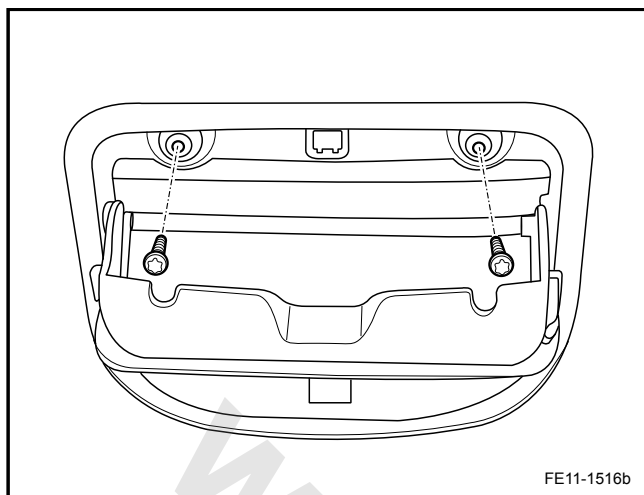


3. Disconnect the sunroof switch assembly wiring harness connector.

#### Installation Procedure:

1. Connect the sunroof switch assembly wiring harness connector.





2. Install the sunroof switch assembly and tighten the retaining screws.

Torque: 4 Nm (Metric) 3 lb-ft (US English)

#### Note

Refer to "Fastener Notice" in "Warnings and Notices".

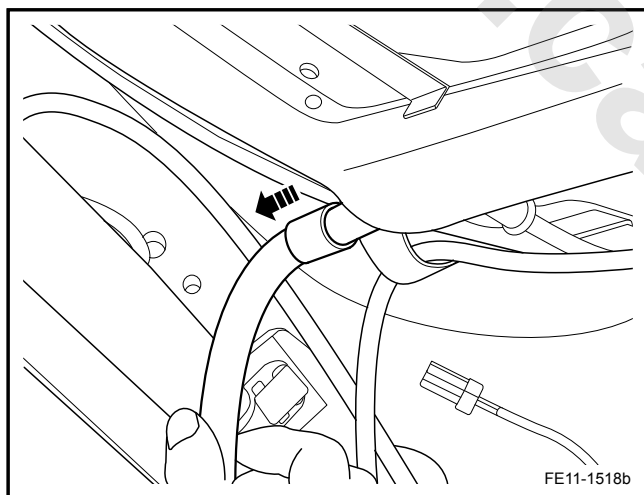
3. Connect the battery negative cable.

### 11.8.8.4 Sunroof Frame Replacement

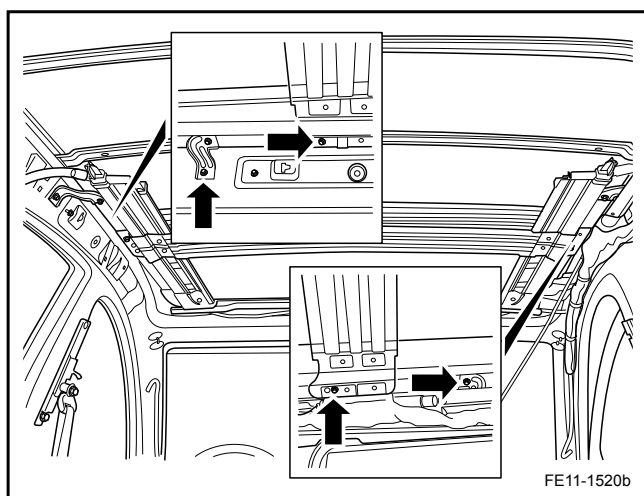
#### Removal Procedure

#### Warning!

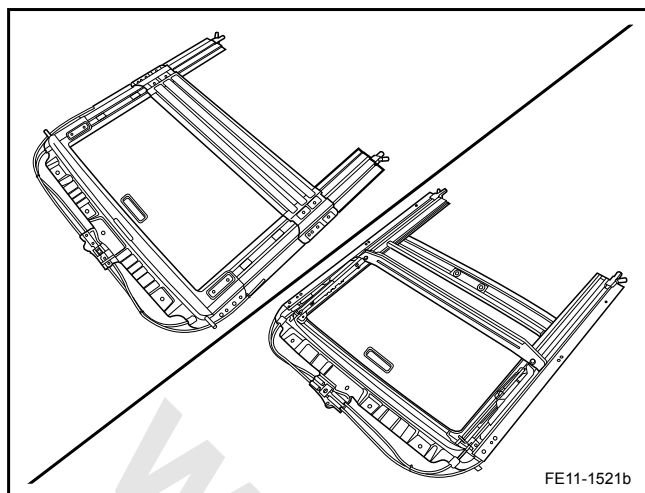
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the sunroof window. Refer to [11.8.8.1 Sunroof Glass Replacement](#).
3. Remove the headliner. Refer to [12.9.1.1 Headliner Replacement](#).
4. Remove the sunroof motor. Refer to [11.8.8.2 Sunroof Motor Replacement](#).
5. Remove the sunroof frame front retaining bolts.



6. Remove the sunroof frame rear side retaining bolts.

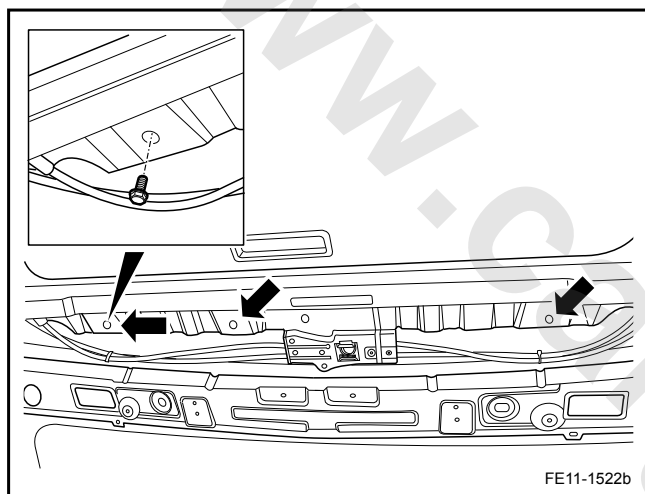


7. Remove the sunroof frame.

#### Installation Procedure:

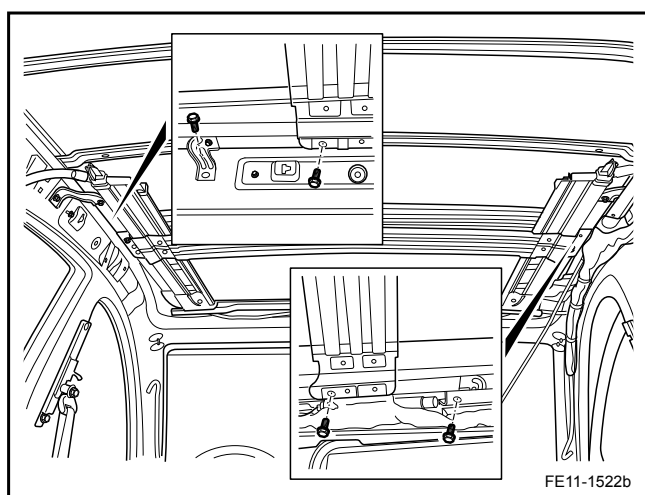
1. Install the sunroof frame, tighten the sunroof frame front retaining bolts.

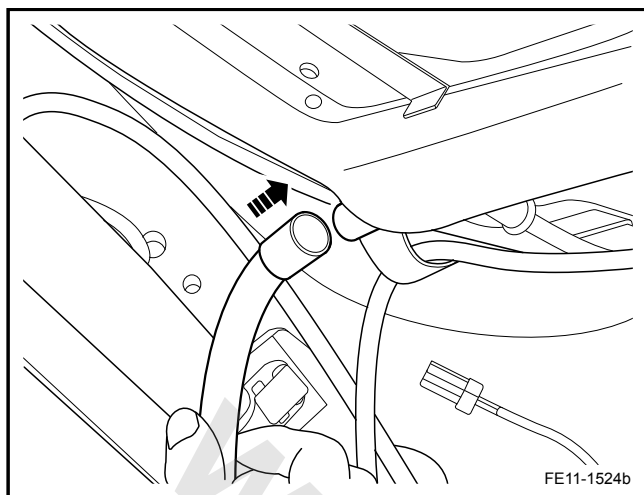
Torque: 10 Nm (Metric) 7 lb-ft (US English)



2. Tighten the sunroof frame rear side retaining bolts.

Torque: 10 Nm (Metric) 7 lb-ft (US English)





3. Install the sunroof front and rear drain pipes.
4. Install the sunroof motor.
5. Install the headliner.
6. Install the sunroof window.
7. Connect the battery negative cable.

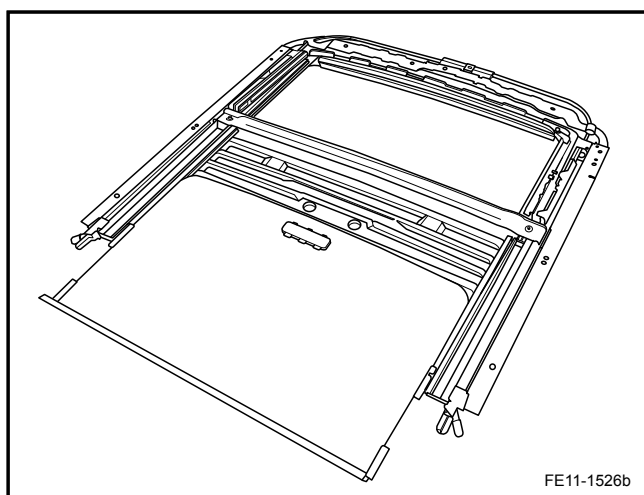
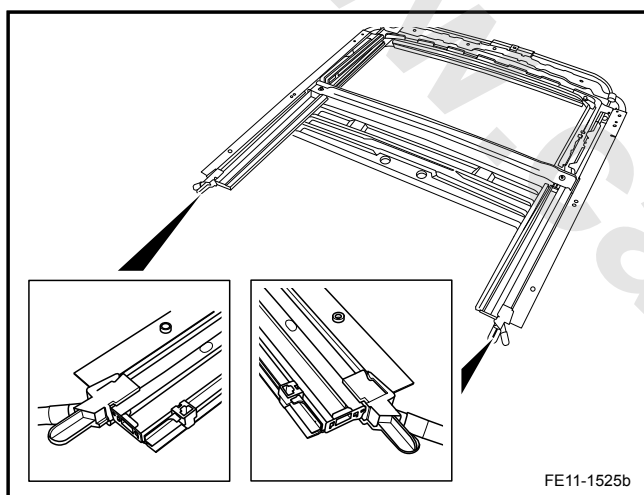
#### Note

During the installation, do not to be squeeze the drain pipes.

### 11.8.8.5 Sunroof Visor Replacement

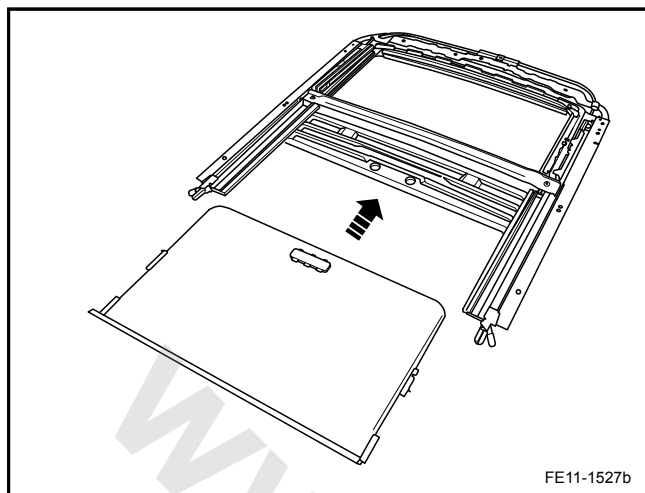
#### Removal Procedure

1. Remove the sunroof frame. Refer to [11.8.8.4 Sunroof Frame Replacement](#).
2. Remove the sunroof visor limit tangs.
3. Remove the sunroof visor.

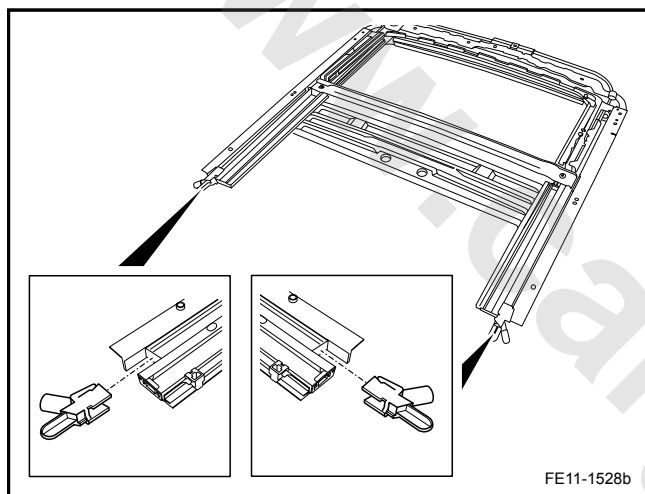


Installation Procedure:

1. Insert the sunroof visor.



2. Install the sunroof visor limit tangs.
3. Install the sunroof frame.



## 11.9 Central Locking

### 11.9.1 Specifications

#### 11.9.1.1 Fasteners Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Left Front Door Lock Retaining Bolts	M6 × 10	4-5	3-4
Left Rear Door Lock Retaining Bolts	M6 × 10	4-5	3-4
Left Front Door Lock Seat Retaining Bolts	M6 × 16	20-26	14.8-19.2
Left Rear Door Lock Seat Retaining Bolts	M6 × 16	20-26	14.8-19.2
Rear Compartment Lock Seat Retaining Bolts	M6 × 12	13-17	9.6-12.6
Rear Compartment Lid Lock Assembly Bolts	M6 × 12	13-17	9.6-12.6



## 11.9.2 Description and Operation

### 11.9.2.1 Description and Operation

Electric door locks use a solenoid valve within each door lock. Door locks can only be controlled by combination switch on the left front inside door handle the driver door switch (remote control key operation). When using the actuator or cylinder lock to unlock the driver door, all door locks will be unlocked.

#### Lock and Unlock

- Turn the key on the driver door lock to unlocking position, all four locks are unlocked.
- Turn the key on the driver door lock to locking position, all four locks are locked.
- Inside unlocking / lock switch (driver door): unlock four doors; lock four doors.
- The rear compartment lid can be opened by the remote control or the unlock switch (sedan); Hatchback can be unlocked by the remote control or unlock switch (hatchback). At speeds up to 5kph the rear compartment / hatchback unlocking function is prohibited.

#### Auto Locking

- Turn the ignition switch to the "ON" position. When the speed is above 20 km/h, all four doors will automatically lock. If the speed is more than 20 km/h again, auto-lock will not react. Only when the ignition switch is turned off or then any door is unlocked and locked, the automatic locking feature will be activated.
- After pressing the remote unlock button 15 s, if none of all four doors, engine hood, rear compartment lid is opened, all doors will automatically lock. If the unlock button is pressed inside the 15 s, it will start 15 s timer again.

#### Key In Lock Reminder

If the key is inserted in the ignition "OFF"(ACC position will not be detected) position, the door can not be locked; if the driver door is open, BCM will send a CAN periodic alarm signal to the instrument to warn that the key is not removed.

#### Auto Unlocking

- When the doors are locked, after pulling out the ignition key, all four doors automatically unlock. When door are not locked, after pulling out the ignition key, all four door locks will not respond.

- After receiving the airbag deployed signal from the CAN (3 or more collision signals are received), four doors will automatically unlock. This function is not guaranteed in the following circumstances, such as battery voltage low or the wiring harness damaged by the collision causing the lack of door locks motor control power supply.

#### Super Locking (If Equipped)

Achieve super-Lock function in one the following two ways:

- Press the by remote control "locking" key twice in 300ms.
- In 3s turn the key in the lock from the "Lock" to "Unlock" position twice. Flash once to confirm the above two ways.

##### Note

At this point the door can only be unlocked by the valid key or remote control.

#### Super Unlocking (If Equipped)

Dual lock unlocking will change the lock motor from dual locking to central locking status. Under the dual locking status, there are ways to unlock the dual locking:

- Driver door metal key unlock dual locking

Turn the driver door metal keys to the unlocked position, dual locking status will be disabled, the lock motor will be in central locking status.

- Remote Control Dual Locking Unlock

Use the remote control to unlock, the dual locking status disabled. The lock motor will be in central locking status. Flash twice to confirm.

### 11.9.3 System Working Principle

#### 11.9.3.1 System Working Principle

##### Door Lock Switch

- System has two lock switches, one is located in the left front door combination switch and the other is in the left front door key cylinder. Other key cylinders can only be used to unlock a single door and can not activate the central locking function.
- The two lock switch locking signals input to the BCM share a common input terminal, but the unlocking signal is input individually.

##### Locking Operation

When the BCM receives locking input signal or the automatic locking requirements are met, the BCM locking output terminal will send power supply to control the door motor to lock four doors. For hatchback model, the locking command is also sent to the hatchback lock motor.

##### Unlocking Operation

When the BCM receives unlocking input signal or the automatic unlocking requirements are met, the BCM unlocking output terminal will send power supply to control the door motor to unlock four doors. For hatchback model, the unlocking command is also sent to the hatchback lock motor. (rear compartment (hatchback) unlocks separately).

##### Super Locking (If Equipped)

On the vehicle with the super locking feature, in addition to door lock there is also a super locking motor. If BCM receives the super locking input signal, it will immediately send power from the super locking output terminal to control the super locking motor to activate super locking.

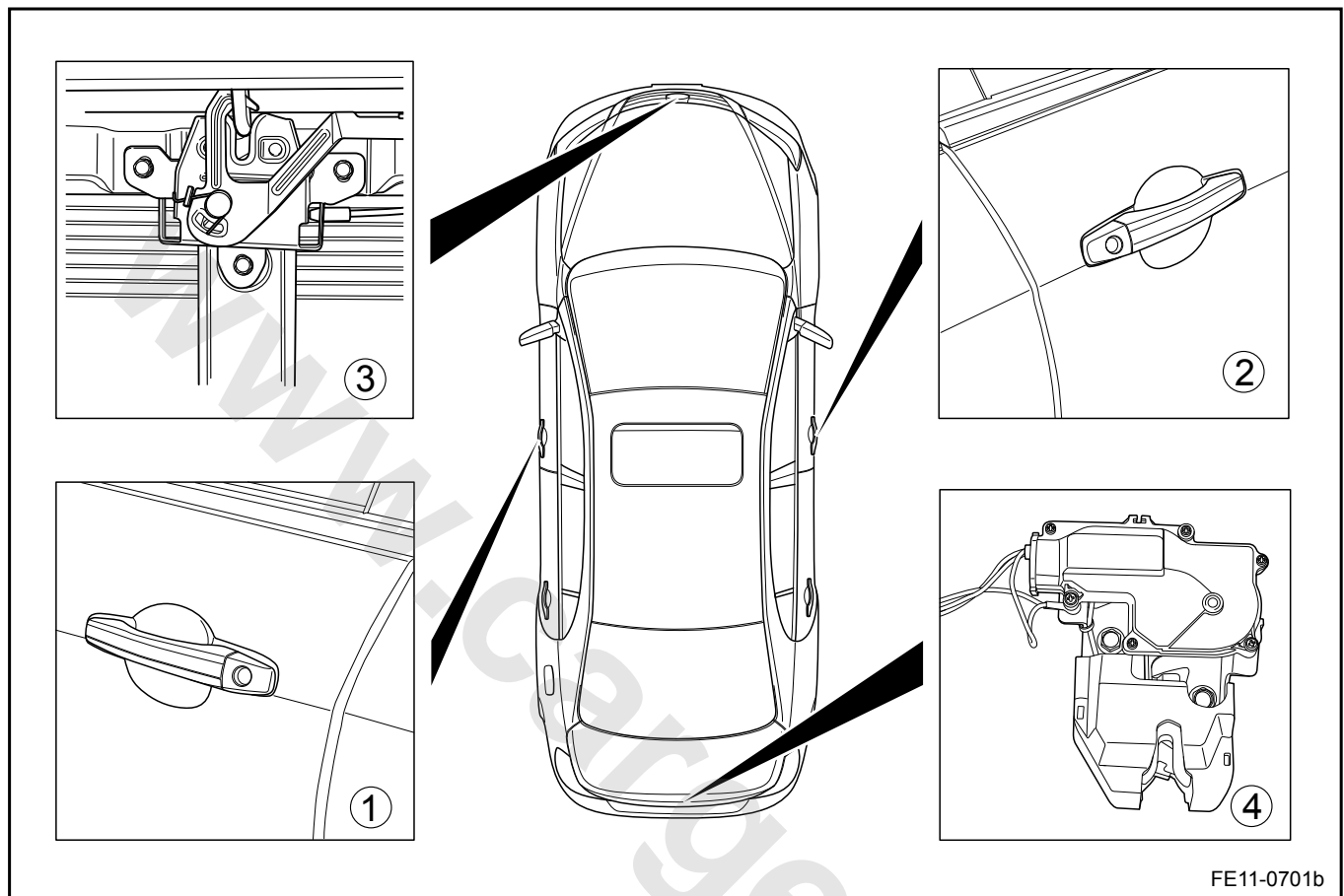
##### Note

Even on the vehicle with the super locking feature, the rear compartment (hatchback) lock does not have the super locking feature.

## 11.9.4 Component Locator

## 11.9.4.1 Component Locator

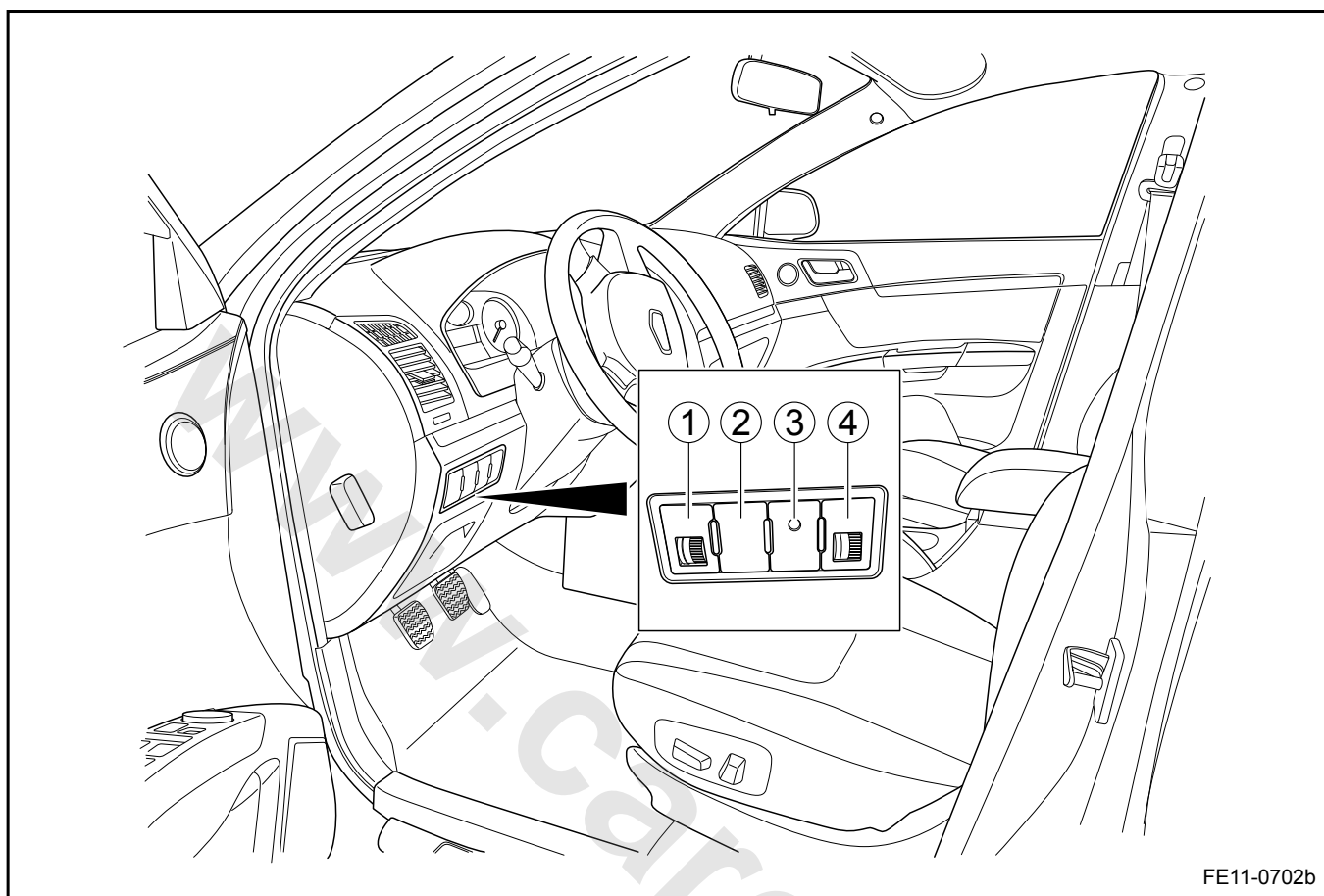
## Entire Vehicle Mechanical Cylinder



## Legend

- 1. Driver Door Cylinder
- 2. Passenger Door Cylinder
- 3. Hood Ajar Switch
- 4. Rear Compartment Lid Lock Assembly

Rear Compartment Lid Release Button



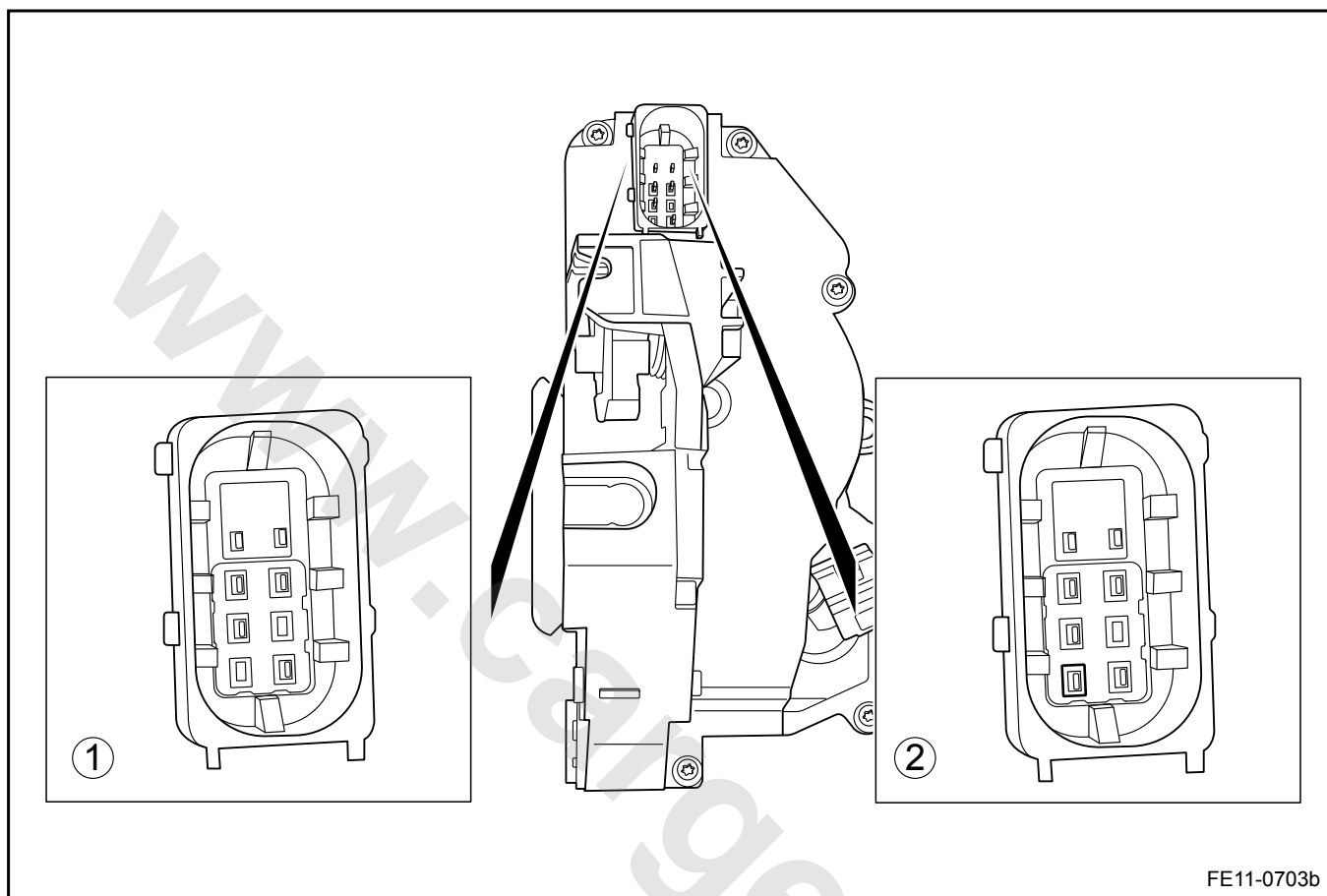
Legend

- 1. Dimmer Switch
- 2. Rear Compartment Lid Release Button
- 3. Remote Anti-theft Indicator
- 4. Headlamp Height Adjustment Switch

## 11.9.5 Disassemble View

## 11.9.5.1 Disassemble View

Left Front Door Lock Assembly With or Without Super Locking Function



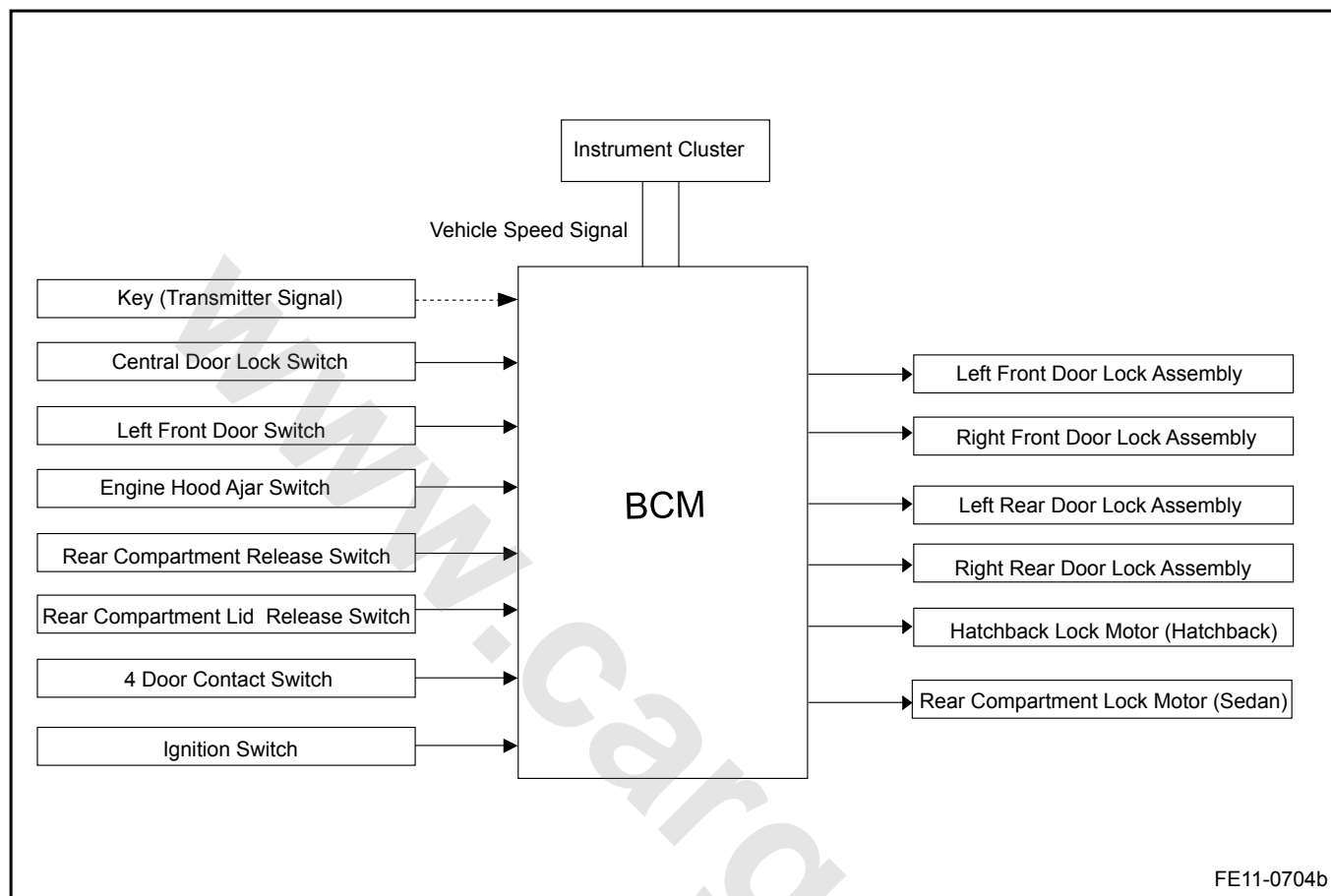
## Legend

1. Door Lock Motor Terminal Without The Express Down Function

2. Door Lock Motor Terminal With Express Down Function

## 11.9.6 Schematic

## 11.9.6.1 Schematic



## 11.9.7 Diagnostic Information and Procedures

### 11.9.7.1 Diagnosis Description

Refer to [11.9.2 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.9.7.2 Visual Inspection

- Check installed after market equipment that may affect Central Locking operation.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- If all door locks are inoperative, check the power supply circuit and the ground circuit for poor connection or open circuit before replacing bulbs.

### 11.9.7.3 Symptom List

Symptoms	Suspected Faulty Parts	Repair Procedure
Mechanical key can not lock / unlock the door	<ol style="list-style-type: none"> <li>1. Central Locking Power Supply Malfunction</li> <li>2. Left Front Door Unlock / Lock Switch Poor Connection</li> <li>3. Wiring Harness Connector Poor Connection</li> <li>4. Ground Poor Connection</li> <li>5. Harness Malfunction</li> <li>6. Central Locking Motor Malfunction</li> <li>7. BCM Malfunction</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the power supply circuit.</li> <li>2. Check wiring harnesses and connectors.</li> <li>3. Check ground malfunction</li> <li>4. Replace the door lock motor.</li> <li>5. Check the BCM, if necessary, replace the BCM.</li> </ol>
Central locking switch can not lock / unlock doors	<ol style="list-style-type: none"> <li>1. Central Locking Power Supply Malfunction</li> <li>2. Left Front Door Combination Switch Central Locking Switch Malfunction</li> <li>3. Wiring Harness Connector Poor Connection</li> <li>4. Ground Poor Connection</li> <li>5. Harness Malfunction</li> <li>6. Central Locking Motor Malfunction</li> <li>7. BCM Malfunction</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the power supply circuit.</li> <li>2. Check wiring harnesses and connectors.</li> <li>3. Check ground malfunction</li> <li>4. Check the left front door window switch.</li> <li>5. Replace the lock motor.</li> <li>6. Check the BCM, if necessary, replace the BCM.</li> </ol>

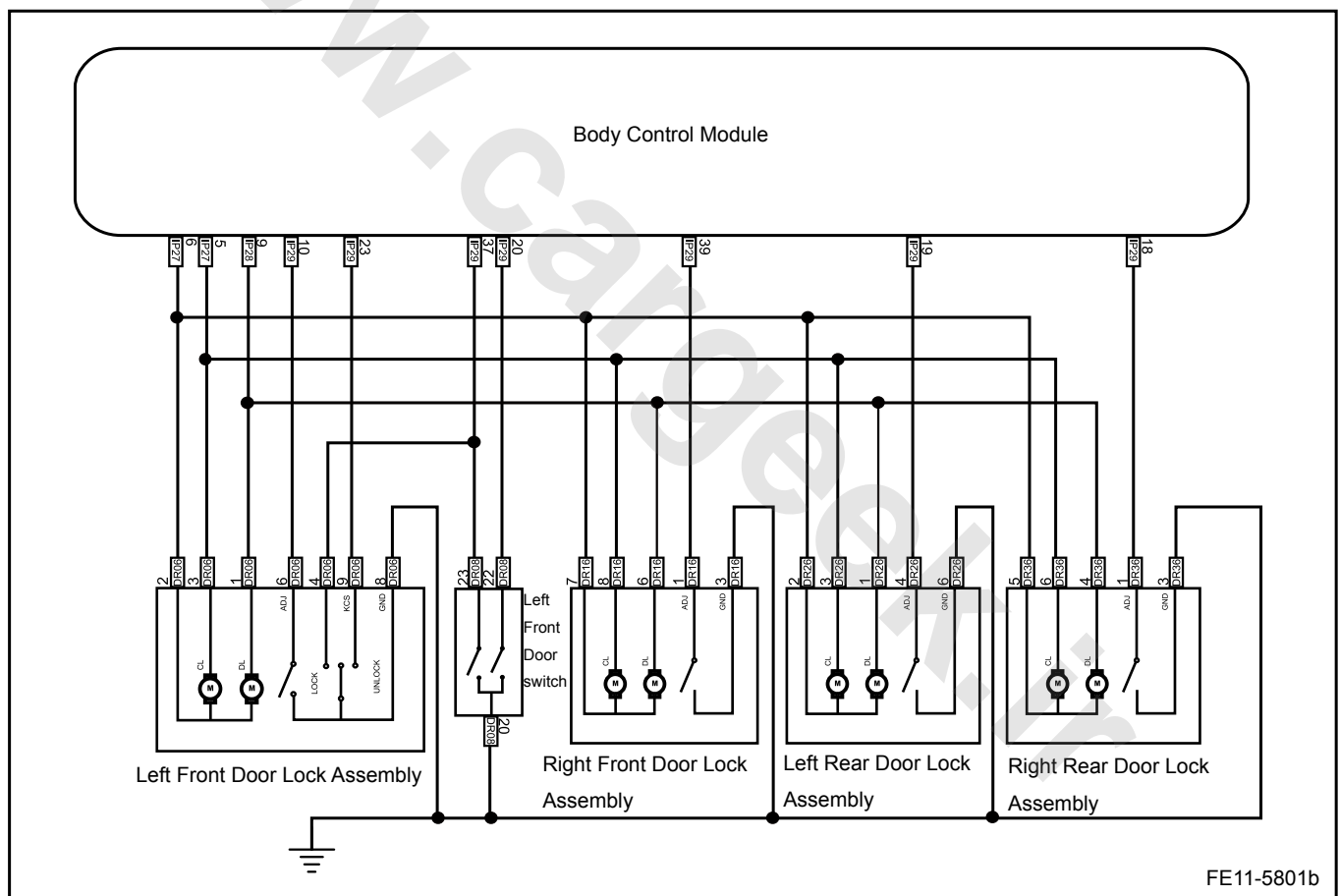
Symptoms	Suspected Faulty Parts	Repair Procedure
Only the left front door can not be locked / unlocked	<ol style="list-style-type: none"> <li>1. Central Locking Power Supply Malfunction</li> <li>2. Left Front Door Lock Harness Connector Poor Connection</li> <li>3. Left Front Door Lock Ground Poor Connection</li> <li>4. Harness Malfunction</li> <li>5. Left The Front Door Central Locking Motor Poor Connection</li> <li>6. BCM Poor Connection</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the power supply circuit.</li> <li>2. Check wiring harnesses and connectors.</li> <li>3. Check ground malfunction</li> <li>4. Replace the lock motor.</li> <li>5. Check the BCM, if necessary, replace the BCM.</li> </ol>
Remote control does not lock / unlock doors	<ol style="list-style-type: none"> <li>1. Electromagnetic Interference</li> <li>2. Remote Malfunction</li> <li>3. Central Locking Power Supply Malfunction</li> <li>4. Wiring Harness Connector Poor Connection</li> <li>5. Ground Poor Connection</li> <li>6. Harness Malfunction</li> <li>7. Central Locking Motor Malfunction</li> <li>8. BCM Malfunction</li> </ol>	<ol style="list-style-type: none"> <li>1. Move to a non-interference environment.</li> <li>2. Check the remote control battery, if necessary, replace the remote control.</li> <li>3. Check the power supply circuit.</li> <li>4. Check the wiring harnesses and connectors.</li> <li>5. Check the ground.</li> <li>6. Replace the door lock motor.</li> <li>7. Check the BCM, if necessary, replace the BCM.</li> </ol>
Auto locking is not activated in central locking anti-theft mode.	<ol style="list-style-type: none"> <li>1. Insufficient Power Supply Voltage</li> <li>2. Wiring Harness Connectors Poor Connection</li> <li>3. Ground Poor Connection</li> <li>4. Harness Malfunction</li> <li>5. Central Locking Motor Contact Switch Malfunction</li> <li>6. BCM Malfunction</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the power supply circuit.</li> <li>2. Check the wiring harnesses and connectors.</li> <li>3. Check the ground.</li> <li>4. Replace the lock motor.</li> <li>5. Check the BCM, if necessary, replace the BCM.</li> </ol>



Symptoms	Suspected Faulty Parts	Repair Procedure
Door lock operated during driving	<ol style="list-style-type: none"> <li>1. Mechanical Lock Mechanism Malfunction</li> <li>2. Wiring Harness Connectors Poor Connection</li> <li>3. Ground Poor Connection</li> <li>4. Harness Malfunction</li> <li>5. Central Locking Motor Contact Switch Malfunction</li> <li>6. BCM Malfunction</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust mechanical lock mechanism , if necessary, replace the lock body.</li> <li>2. Check the wiring harnesses and connectors.</li> <li>3. Check the ground.</li> <li>4. Replace the lock motor.</li> <li>5. Check the BCM, if necessary, replace the BCM.</li> </ol>

#### 11.9.7.4 Mechanical Key / Central Locking Switch Can Not Lock All Doors

Schematic:



Diagnostic Steps:

#### Note

When there is not a remote control, use the scan tool special setting function to drive door locks. Select as the following sequence: body control module / BCM special setting function / locking, unlocking dual-locking (all doors) / locking all the doors.

Step 1 Check the remote locking.

Is the remote locking working?

Yes

Go to step 3

No

Step 2 Check remote anti-theft system for possible malfunction.

(a) Check and repair the remote anti-theft system for possible malfunction

Is the remote locking working?

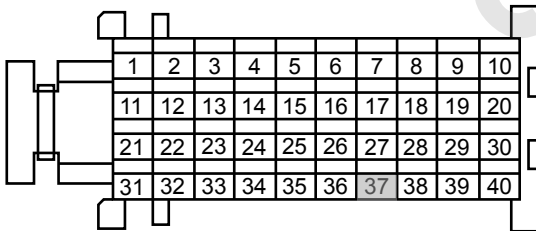
Yes

System normal

No

Step 3 Check the mechanical key or the control button locking.

Body Control Module 1 Harness Connector IP29



FE11-5802b

(a) Use the mechanical key or the left front combination switch to repeatedly lock and unlock, at the same time measure the BCM harness connector IP29 terminal No.37 voltage with a multimeter.

Is the voltage between 0 V and 10 V?

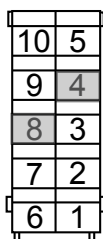
Yes

Go to step 10

No

Step 4 Check the left front door lock assembly.

Left Front Door Lock Motor Harness Connector DR06



FE11-5803b

- (a) Remove the left front door lock assembly. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#).
- (b) Simulate the mechanical key locking action, measure resistance between the left front door lock assembly DR06 terminals No.4 and 8 with a multimeter.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 6

No

Step 5 Replace the left front door lock motor assembly.

- (a) Replace the left front door lock motor assembly. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#).  
Use a key to lock the door, confirm whether the door can be locked.

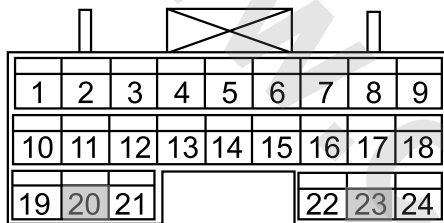
Yes

System normal

No

Step 6 Check the left front combination switch control locking button.

Left Front Window Switch Harness Connector DR08



FE11-5804b

- (a) Remove the left front combination switch.  
(b) Press the central locking button to lock, while test continuity between the left front combination switch assembly DR08 terminal No.23 and 20 with a multimeter.  
Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 8

No

Step 7 Replace the left front window switch.

- (a) Replace the left front window switch. Refer to [11.5.8.4 Left Front Window Switch Replacement](#).

Use the Central Locking button to lock doors. Confirm whether it is working.

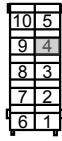
Yes

System normal

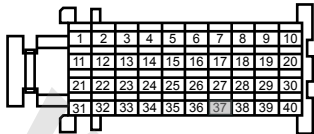
No

Step 8 Check the circuit between the BCM harness connector IP29 and the left front door motor harness connector DR06.

Left Front Door Lock Motor Harness Connector DR06



Body Control Module 1 Harness Connector IP29



FE11-5805b

- Disconnect the BCM harness connector. Refer to [11.10.8.1 BCM Replacement](#).
- Disconnect the left front door motor wire harness connector. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#).
- Measure resistance between the BCM harness connector IP29 terminal No.37 and the left front door motor wire harness connector DR06 terminal No.4 with a multimeter.  
Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 10

No

**Step 9** Repair the open circuit between the BCM harness connector IP29 and the left front motor wire harness connector DR06.

- Confirm the open circuit between the BCM harness connector IP29 and the left front motor wire harness connector DR06 repair is completed.

Is the electric door lock working?

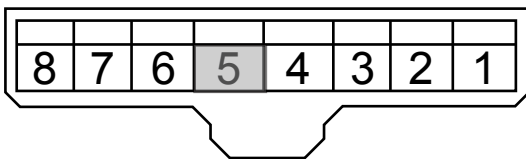
Yes

System normal

No

**Step 10** Measure the BCM harness connector IP27 terminals No.5 voltage.

Body Control Module 3 Harness Connector IP27



FE11-5813b

- Use a mechanical key or the central locking control button to lock doors while measure the BCM harness connector IP27 terminal No.5 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

No

Go to step 12

Yes

**Step 11** Measure the BCM harness connector IP27 terminal No.6 voltage.

- Use a mechanical key or the central locking control button to repeatedly lock and unlock several times, while measure the BCM harness connector IP27 terminal No.6 voltage with a multimeter.

Is the power supply voltage between 0 V and the power supply voltage?

Yes

Go to step 13

No

Step 12 Replace the BCM.

(a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#).

Is the electric door lock working?

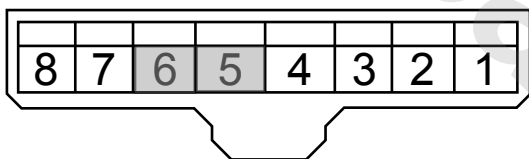
Yes

System normal

No

Step 13 Repair the open circuit between the BCM harness connector IP27 and the electric door lock harness connector.

Body Control Module 3 Harness Connector IP27



FE11-5807b

(a) Confirm the open circuit between the BCM harness connector IP27 terminals No.6 and 5 and the electric door lock assembly harness connector corresponding terminals repair is completed.

Confirm the repair completed.

Next

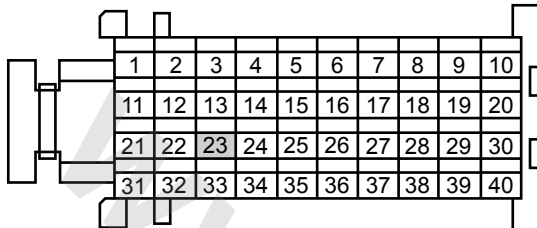
Step 14 System normal.



No

Step 3 Use a mechanical key to unlock.

Body Control Module 1 Harness Connector IP29



FE11-5808b

- (a) Use the mechanical key to repeatedly lock and unlock, at the same time measure BCM harness connector IP29 terminal No.23 voltage with a multimeter.

Is the voltage between 0 V and 10 V?

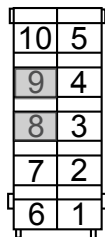
Yes

Go to step 5

No

Step 4 Check the left front door lock assembly.

Left Front Door Lock Motor Harness Connector DR06



FE11-5809b

- (a) Remove the left front door lock assembly. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#).
- (b) Simulate mechanical key locking action, measure resistance between the left front door lock assembly DR06 terminals No. 4 and 8 with a multimeter.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

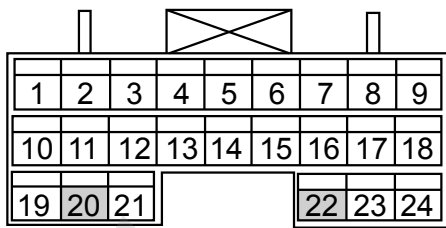
No

Replace the left front door lock assembly. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#) to confirm completion of the repairs

Yes

Step 5 Use the Central Locking button to unlock.

Left Front Window Switch Harness Connector DR08



FE11-5810b

- (a) Use the Central Locking button to repeatedly lock and unlock, while measure BCM harness connector IP29 terminal No.20 voltage with a multimeter.

Is the voltage between 0 V and 10 V?

Yes

Go to step 7

No

Step 6 Check the Central Locking button assembly.

- (a) Remove the left front door window switch assembly.  
 (b) Press the central locking unlock button, measure resistor between the left front door lock assembly DR06 terminals No. 9 and 8 with a multimeter.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

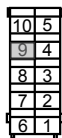
Yes

Replace the left front door window switch assembly. Refer to [11.5.8.4 Left Front Window Switch Replacement](#) to confirm completion of the repairs

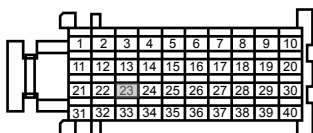
No

Step 7 Check the circuit between the BCM harness connector IP29 and the left front motor assembly harness connector DR06.

Left Front Door Lock Motor Harness Connector DR06



Body Control Module 1 Harness Connector IP29



FE11-5811b

- (a) Disconnect BCM harness connector.  
 (b) Disconnect the left front door lock motor assembly wire harness connector. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#).  
 (c) Measure resistance between BCM harness connector IP29 terminal No.23 and the left front motor wire harness connector assembly DR06 terminal No.9 with a multimeter.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 9



No

**Step 8** Repair the open circuit between the BCM harness connector IP29 and the left front motor wire harness connector assembly DR09.

- (a) Confirm the open circuit between the BCM harness connector IP29 and the left front motor wire harness connector assembly DR09 repair is completed.

Is normal electric door locking working?

Is the resistance specified value?

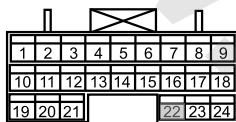
Yes

System normal

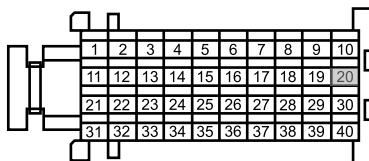
No

**Step 9** Check the circuit between the BCM harness connector IP29 and the left front window switch assembly wiring harness connector DR08.

Left Front Window Switch Harness Connector DR08



Body Control Module 1 Harness Connector IP29



FE11-5812b

- (a) Disconnect BCM harness connector.  
 (b) Disconnect the left front door lock motor assembly wire harness connector. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#).  
 (c) Disconnect the left front door combination switch wiring harness connector. Measure resistance between the BCM harness connector IP29 terminal No.20 and the left front window switch wiring harness connector DR08 terminal No. 22 with a multimeter.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 11

No

**Step 10** Repair the open circuit between the BCM harness connector IP29 and the left front window switch wiring harness connector DR08.

- (a) Confirm the open circuit between the BCM harness connector IP29 and the left front window switch wiring harness connector DR08 repair is completed.

Is the electric door locking working?

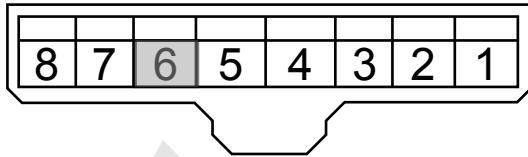
Yes

System normal

No

**Step 11** Measure the BCM harness connector IP27 terminals No.6 voltage.

## Body Control Module 3 Harness Connector IP27



FE11-5806b

- (a) Use a mechanical key or the central locking control button to repeatedly lock, while measure the BCM harness connector IP27 terminal No.6 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

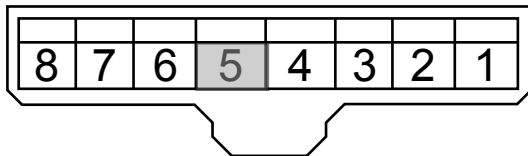
No

Go to step 13

Yes

Step 12 Measure the BCM harness connector IP27 terminal No.5 voltage.

## Body Control Module 3 Harness Connector IP27



FE11-5813b

- (a) Use a mechanical key or the central locking control button to repeatedly lock and unlock several times, while measure the BCM harness connector IP27 terminal No.5 voltage with a multimeter.

- (b) Is the voltage between 0 V and the power supply voltage?

Yes

Go to step 14

No

Step 13 Replace the BCM.

- (a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#).

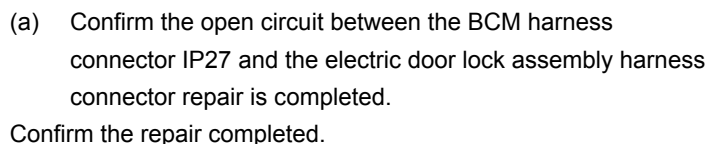
Is the electric door locking working?

Yes

System normal

No

Step 14 Repair the open circuit between the BCM harness connector IP27 and the electric door lock assembly harness connector.



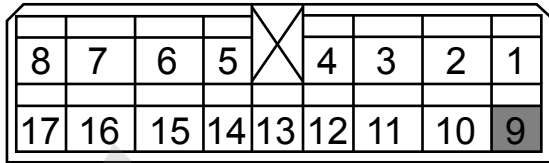
Step 15	System normal.
---------	----------------

Schematic:

## Diagnostic Steps:

Step 1	Use the remote key to perform the super locking.
Is the remote control super locking working?	
Yes	Go to step 3
No	
Step 2	Check for remote anti-theft system potential malfunction.
(a) Check and repair the remote anti-theft system potential malfunction.	
Is the super-locking working?	
Yes	System normal
No	
Step 3	Use a mechanical keys to lock and unlock.
Is the mechanical key working?	
Yes	Go to step 5
No	
Step 4	Repair the locking and unlocking malfunction.
(a) Repair the locking and unlocking malfunction. Refer to <a href="#">11.9.7.4 Mechanical Key / Central Locking Switch Can Not Lock All Doors</a> , <a href="#">11.9.7.5 Mechanical key / Central Locking Switch Can Not Unlock All Doors</a> .	
Confirm the lock and unlocking are working properly.	
Confirm the Super Lock function is normal.	
Yes	System normal
No	
Step 5	Measure the BCM harness connector IP28 terminal No.9 voltage.

## Body Control Module 2 Harness Connector IP28



FE11-5814b

- (a) Perform the super locking, while measure the BCM harness connector IP28 terminal No.9 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 7

No

Step 6 Replace the BCM.

- (a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#).

Confirm the Super Locking function is normal.

Yes

System normal

No

Step 7 Check the circuit between the BCM harness connector IP28 and the electric door lock assembly harness connector.

- (a) Disconnect the BCM harness connector IP28 and the electric door lock assembly harness connector.

- (b) Measure resistance between the BCM harness connector IP28 and the electric door lock assembly super-locking harness connector with a multimeter

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 9

No

Step 8 Check the open circuit between the BCM harness connector IP28 and the electric door lock harness connector.

- (a) Repair the circuit between the BCM harness connector IP28 and the electric door lock assembly super-locking harness connector.

Confirm Super Locking function is normal.

Yes

System normal

No

Step 9	Replace the lock motor.
--------	-------------------------

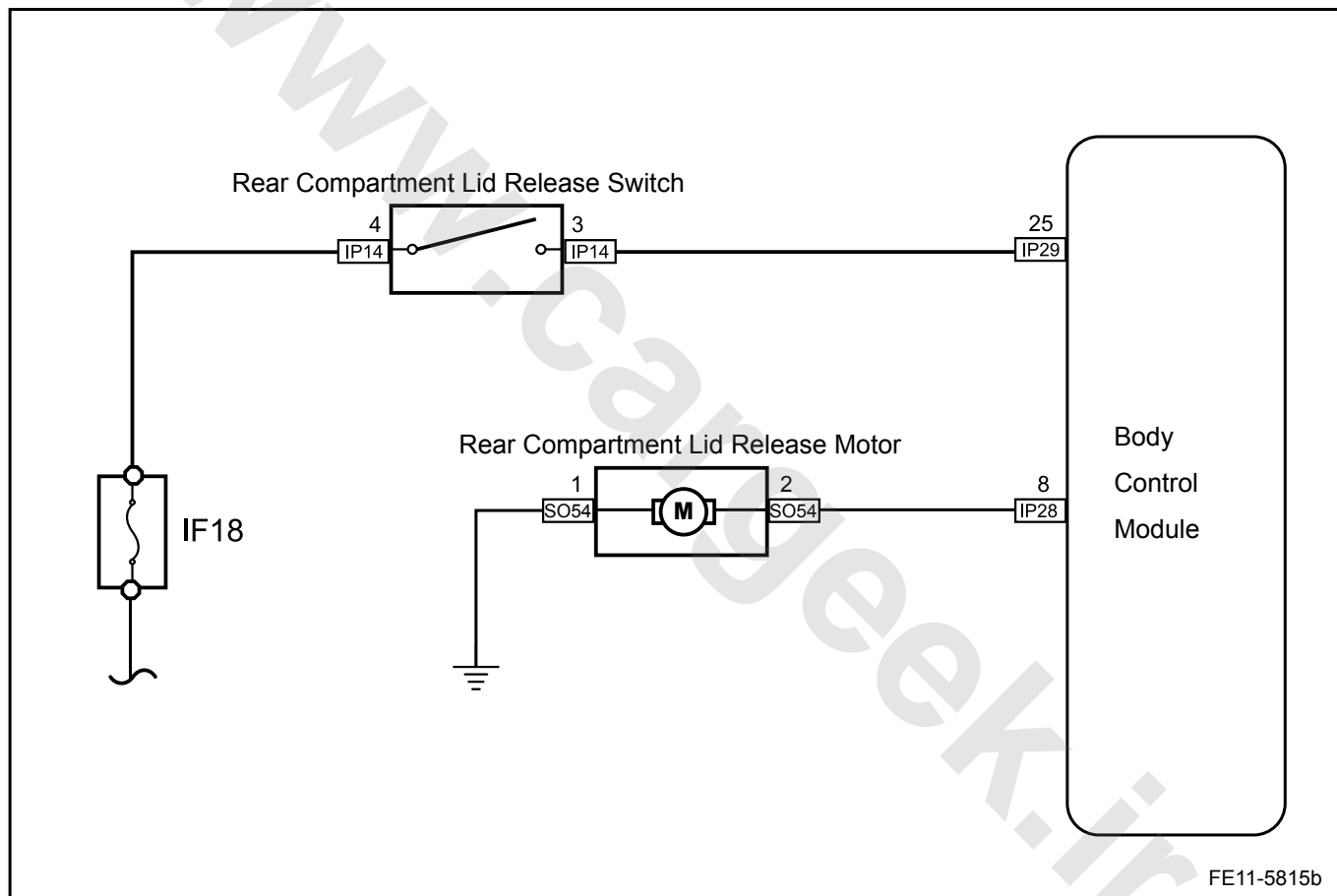
- (a) Replace the lock motor.  
Confirm the repair is completed.

Next

Step 10	System normal.
---------	----------------

### 11.9.7.7 Rear Compartment Lid Can Not Be Opened (Sedan)

Schematic:



Diagnostic Steps:

#### Note

When there is not a remote control key, use the scan tool special setting function to drive the door locks. Select as the following sequence: body control module / BCM special set features / rear compartment Lid (rear compartment) open control.

Step 1	Use the remote key to open the rear compartment lid.
--------	--

Is the remote key working?

Yes

Go to step 3

No

Step 2

Check the remote anti-theft system for potential malfunction.

- (a) Check and repair the remote anti-theft system for potential malfunction.

Is the rear compartment lid working correctly?

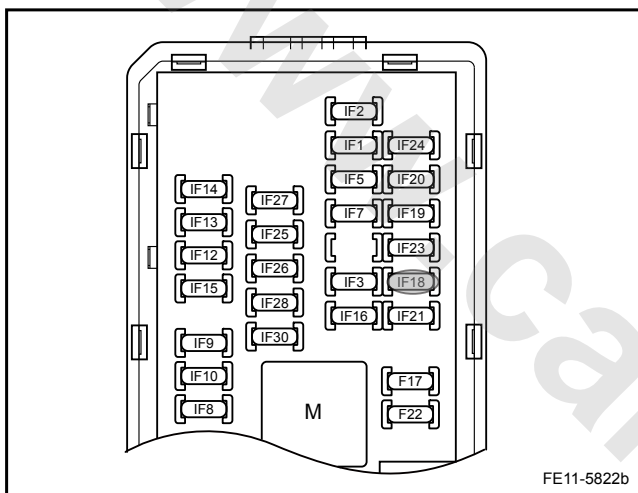
Yes

System normal

No

Step 3

Check the fuse IF18.



- (a) Is the fuse IF18 blown?

Fuse Rating: 20 A

Yes

Go to step 5

No

Step 4

Check fuse IF18 circuit.

- (a) Check whether the fuse IF18 circuit is short.  
 (b) Repair the circuits. Confirm that there are no short circuits.  
 (c) Replace with fuses with rated current.

Confirm rear compartment lid is working correctly.

Yes

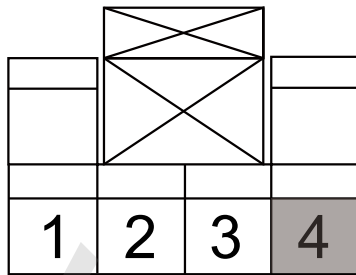
System normal

No

Step 5

Measure the wiring harness connector IP14 terminal No.4 voltage.

## Rear Compartment Lid Release Switch Harness Connector IP14



FE11-5816b

- (a) Disconnect the rear compartment wiring harness connector IP14.
- (b) Measure harness connector IP14 terminal No. 4 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 7

No

Step 6 Check the open circuit between the wiring harness connector IP14 and the fuse IF18.

- (a) Check and repair the open circuit between the wiring harness connector IP14 and the fuse IF18.

Confirm rear compartment lid is working correctly.

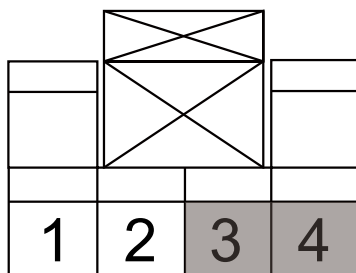
Yes

System normal

No

Step 7 Check the rear compartment lid release switch.

## Rear Compartment Lid Release Switch Harness Connector IP14



FE11-5817b

- (a) Press the rear compartment lid release switch, measure resistance between the rear compartment lid release switch terminals No.3 and 4.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 9

No

Step 8 Replace the rear compartment lid release switch.

- (a) Replace the rear compartment lid release switch. Refer to [11.9.8.4 Rear Compartment Lock Assembly Replacement \(Sedan\)](#).

Confirm the rear compartment lid is working correctly.



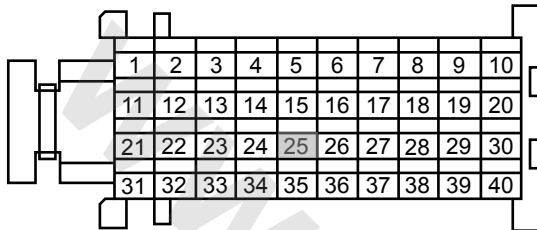
Yes

System normal

No

Step 9 Measure BCM harness connector IP29 terminal No.25 voltage.

Body Control Module 1 Harness Connector IP29



FE11-5818b

- (a) Press the rear compartment lid release switch, measure the BCM harness connector IP29 terminal No.25 voltage.

Standard Voltage: 11-14 V

Yes

Go to step 11

No

Step 10 Repair the open circuit between the rear compartment lid release switch wiring harness connector IP14 and the BCM harness connector IP29.

- (a) Confirm the open circuit between the rear compartment lid release switch wiring harness connector IP14 terminal No.3 and the BCM harness connector IP29 terminal No.25 repair is completed.

Confirm the rear compartment lid is working correctly.

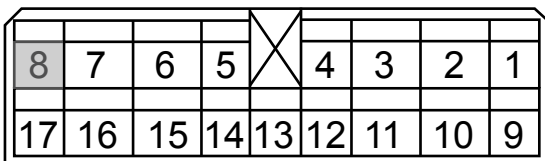
Yes

System normal

No

Step 11 Measure the BCM harness connector IP28 terminal No.8 output voltage.

Body Control Module 2 Harness Connector IP28



FE11-5819b

- (a) Press the rear compartment lid release switch, measure the BCM harness connector IP28 terminal No.8 voltage.

Standard Voltage: 11-14 V

Is the voltage specified value?

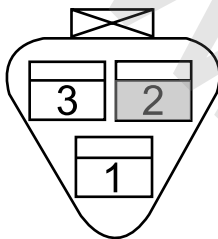
Yes

Go to step 13

**Step 12** Replace the BCM.

- (a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#).  
Confirm the rear compartment lid is working correctly.

System normal

**Step 13** Measure rear compartment lock assembly harness connector SO54 terminal No.2 voltage.Rear Compartment Lock Harness  
Connector SO54

FE11-5820b

- (a) Press the rear compartment lid release switch, at the same time measure the rear compartment lock assembly harness connector terminal No.2 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Go to step 15

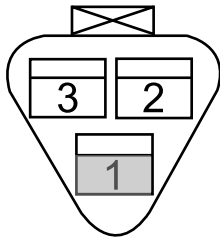
**Step 14** Repair the open circuit between the BCM harness connector IP28 and the rear compartment door lock assembly harness connector SO54.

- (a) Confirm the open circuit between the BCM harness connector IP28 and the rear compartment door lock assembly harness connector SO54 repair is completed.  
Confirm the rear compartment lid is working correctly.

System normal

**Step 15** Check the circuit between the rear compartment lock assembly harness connector SO54 and body ground.

Rear Compartment Lock Harness Connector SO54



FE11-5821b

- (a) Measure resistance between the rear compartment lock assembly harness connector SO54 and body ground with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 17

No

Step 16 Repair the open circuit between the rear compartment lock harness connector SO54 and the body ground.

- (a) Confirm the open circuit between the rear compartment lock harness connector SO54 and the body ground repair is completed.

Confirm the rear compartment lid is working correctly.

Yes

System normal

No

Step 17 Replace the rear compartment lock assembly.

- (a) Replace the rear compartment lock assembly. Refer to [11.9.8.4 Rear Compartment Lock Assembly Replacement \(Sedan\)](#).

Confirm the repair completed.

Next

Step 18 System normal.

### 11.9.7.8 Doors Automatically Lock (20 km/h) Inoperative

Diagnostic Steps:

Step 1 Check DTC.

- (a) Connect scan tool.

- (b) Read the DTC.

Confirm DTC.

No

Go to step 3

Yes

Step 2 Clear DTC.

(a) Use scan tool to clear DTC.

Is the system working correctly?

Yes

System normal

No

Step 3 Carry out the Central Lock active test.

(a) Use scan tool to carry out the Central Locking active locking function.

Is the Central Locking working?

No

Refer to [11.9.7.4 Mechanical Key / Central Locking Switch Can Not Lock All Doors](#)

Yes

Step 4 Confirm the vehicle speed signal.

(a) Connect scan tool to the ABS system, read data when the actual vehicle speed reaches 20 km/h or above.

Is the speed signal data more than 20 km/h?

No

Check the data communications network. check the ABS system, the vehicle speed sensor and the ECM circuit.

Yes

Step 5 Check the BCM circuit.

(a) Check the BCM power supply, ground and data communication circuits.

(b) Repair the BCM-related circuits.

Is the system working properly?

Yes

System normal

No

Step 6 Replace the BCM.

(a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#). Confirm the repair completed.

Next

Step 7 System normal.

### 11.9.7.9 Vehicle Door Lock Operated During Driving

Schematic:

Refer to [11.9.7.4 Mechanical Key / Central Locking Switch Can Not Lock All Doors](#).

## Diagnostic Steps:

Step 1	Carry out the Central Locking active test.
--------	--

(a) Use scan tool to test the Central Lock active locking function.  
Is the Central Locking working properly?

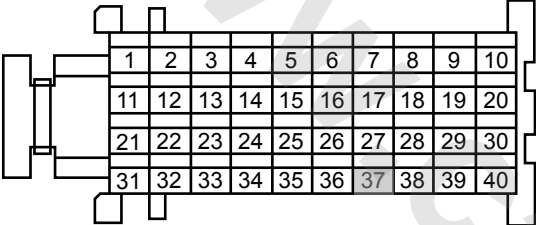
No ➤

Refer to [11.9.7.4 Mechanical Key / Central Locking Switch Can Not Lock All Doors](#)

Yes ➤

Step 2	Use a mechanical key to lock.
--------	-------------------------------

Body Control Module 1 Harness Connector IP29



FE11-5802b

(a) Use the mechanical key to lock, unlock repeatedly, at the same time measured the BCM harness connector IP29 terminal No.37 voltage with a multimeter.  
Is the voltage between 0 V and 10 V?

No ➤

Go to step 5

Yes ➤

Step 3	Use a mechanical key to unlock.
--------	---------------------------------

(a) Use the mechanical key to lock, unlock repeatedly, at the same time measure the BCM harness connector IP29 terminal No.23 voltage with a multimeter.  
Is the voltage between 0 V and 10 V?

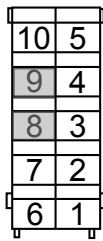
No ➤

Go to step 5

Yes ➤

Step 4	Check the left front door lock assembly.
--------	--

Left Front Door Lock Motor Harness  
Connector DR06



FE11-5809b

- (a) Remove the left front motor assembly. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#).
- (b) Use a mechanical key to simulate the unlock action, Measure resistance between the left front door lock assembly DR06 terminals No.9 and 8 with a multimeter.

Standard Resistance: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 6

No

Step 5 Replace the left front motor assembly.

- (a) Replace the left front door lock motor assembly. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#). Use the key to lock, confirm the electrical door locks are working properly.

Yes

System normal

No

Step 6 Replace the BCM.

- (a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#). Confirm the repair completed.

Next

Step 7 System normal.

### 11.9.7.10 Left Front Door Lock Inoperative

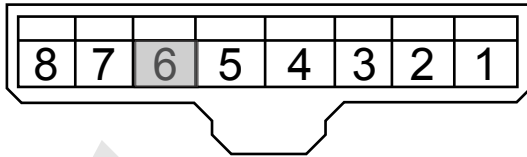
Schematic:

Refer to [11.9.7.4 Mechanical Key / Central Locking Switch Can Not Lock All Doors](#).

Diagnostic Steps:

Step 1 Measure the BCM harness connector IP27 terminal No.6 voltage.

## Body Control Module 3 Harness Connector IP27



FE11-5806b

- (a) Turn on the ignition switch.
- (b) Use a mechanical key or the central locking control button to repeatedly lock and unlock several times, at the same time measure the BCM harness connector IP27 terminal No.6 voltage with a multimeter.

Is the voltage between 0 V and power supply voltage?

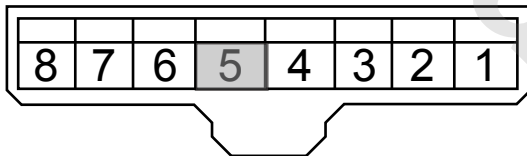
No

Go to step 3

Yes

Step 2 Measure the BCM harness connector IP27 terminal No.5 voltage.

## Body Control Module 3 Harness Connector IP27



FE11-5813b

- (a) Turn on the ignition switch.
- (b) Use a mechanical key or the central locking control button to repeatedly lock and unlock several times, at the same time measure the BCM harness connector IP27 terminal No.5 voltage with a multimeter.

Is the voltage between 0 V and power supply voltage?

Yes

Go to step 4

No

Step 3 Replace the BCM.

- (a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#).

Is the left front door electric door lock working properly?

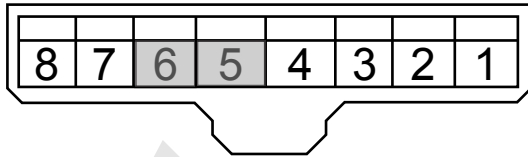
Yes

System normal

No

Step 4 Repair the open circuit between the BCM harness connector IP27 and the electric door lock harness connector.

## Body Control Module 3 Harness Connector IP27



FE11-5807b

- (a) Repair the open circuit between the BCM harness connector IP27 terminals No.6 and 5 and the electric door lock assembly harness connector corresponding terminals respectively.

Is the left front door electric door lock working properly?

Yes

System normal

No

Step 5 Replace the left front door lock assembly.

- (a) Replace the left front door lock motor assembly. Refer to [11.9.8.1 Left Front Door Lock Assembly Replacement](#).

Confirm the repair completed.

Next

Step 6 System normal.

### 11.9.7.11 Right Front Door Lock Inoperative, Left Rear Door Lock Inoperative, Right Rear Door Lock Inoperative

Repair Procedures are similar to the left front door lock inoperative.



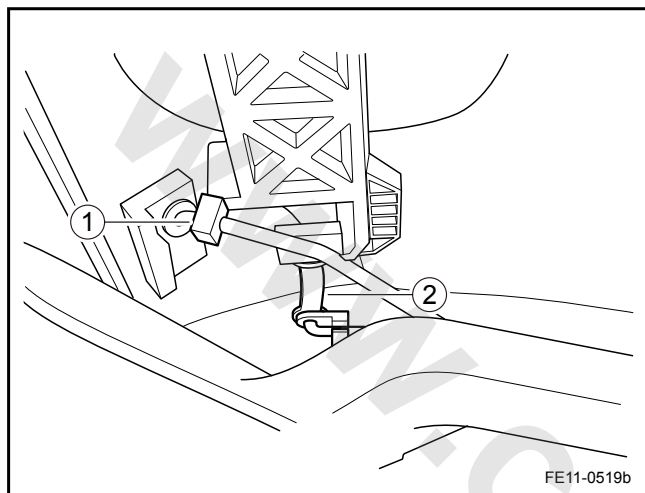
## 11.9.8 Removal and Installation

### 11.9.8.1 Left Front Door Lock Assembly Replacement

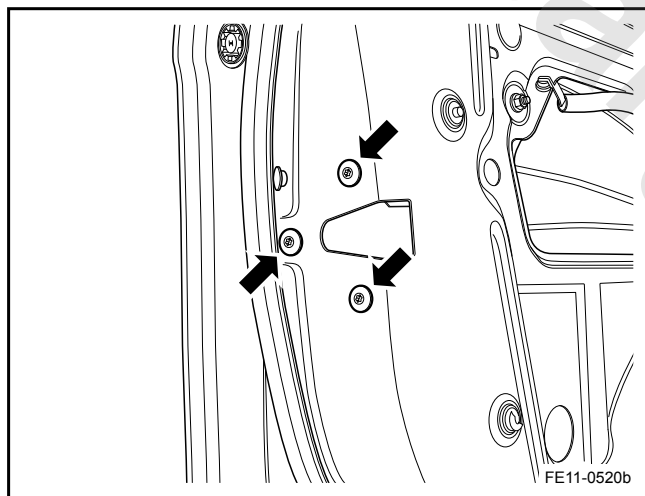
#### Removal Procedure

#### Warning!

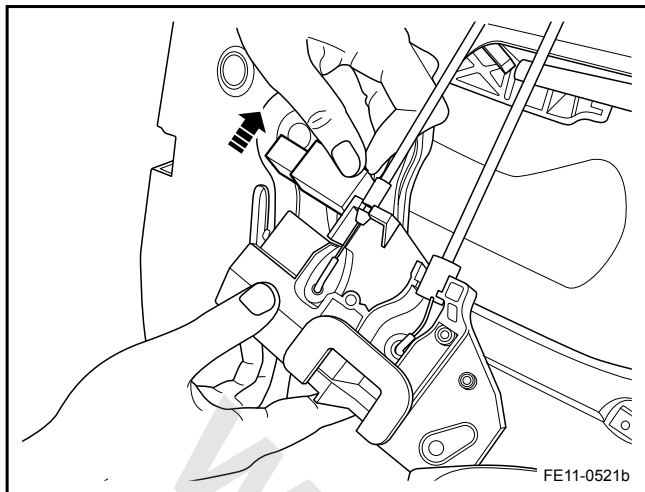
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



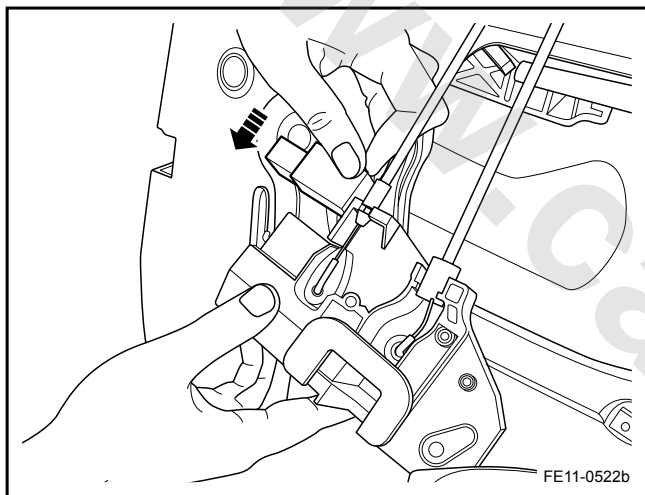
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the left front door triangle panel. Refer to [11.5.8.1 Outside Rearview Mirror Replacement](#).
3. Remove the left front door trim panel. Refer to [11.5.8.1 Outside Rearview Mirror Replacement](#).
4. Remove the left front door outside open handle (1).
5. Remove the left front door lock rod (2).



6. Remove the left front door lock assembly retaining bolts.



7. Disconnect the left front door lock assembly harness connector.
8. Remove the left front door lock assembly.



#### Installation Procedure:

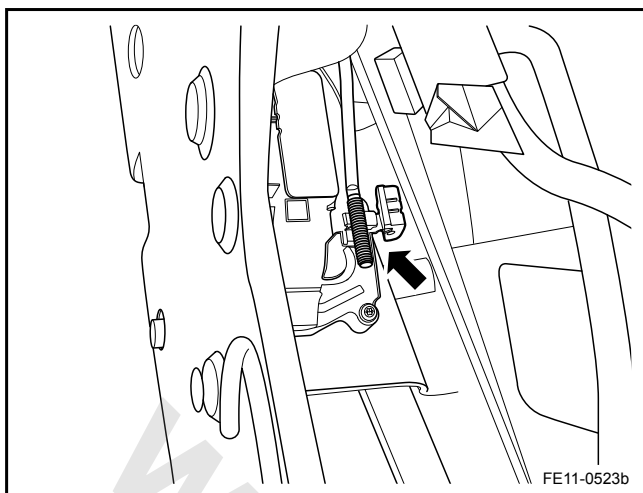
1. Connect the left front door lock assembly connector.
2. Install the left front door lock assembly.
3. Install the left front door lock assembly retaining bolts.  
Torque: 15 Nm (Metric) 11 lb-ft (US English)
4. Install the left front door inside handle cable.
5. Install the left front door outside handle cable and the cylinder rod.
6. Install the left front door trim panel.
7. Install the left front door triangle panel.
8. Connect the battery negative cable.

#### 11.9.8.2 Rear Door Lock Block Replacement

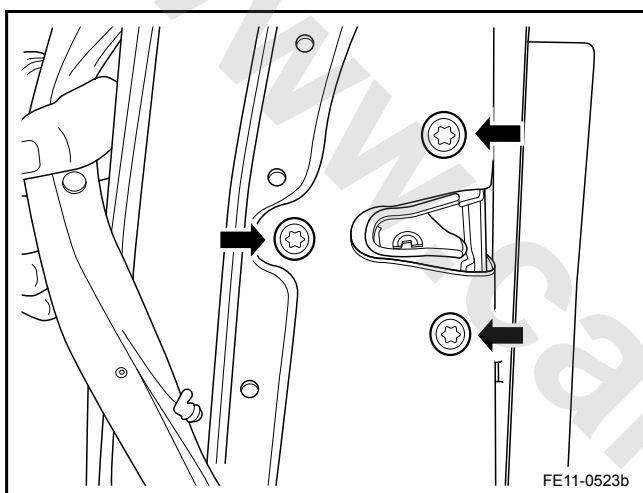
##### Installation Procedure:

##### Warning!

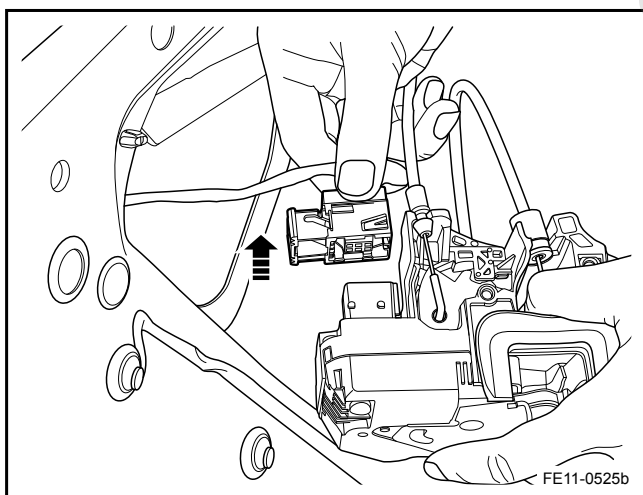
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the rear door window guide rail. Refer to [11.5.8.7 Rear Window Regulator Replacement](#).
3. Disconnect the door lock rod retaining tang.



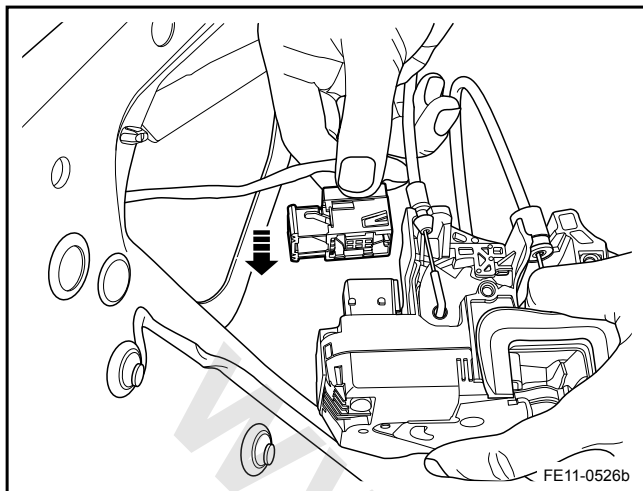
4. Remove the rear door lock retaining screws.



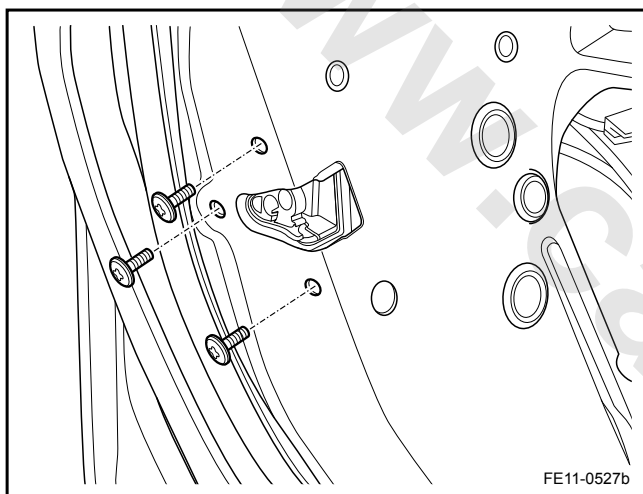
5. Disconnect the rear door lock harness connector and remove the rear door lock assembly.

## Installation Procedure:

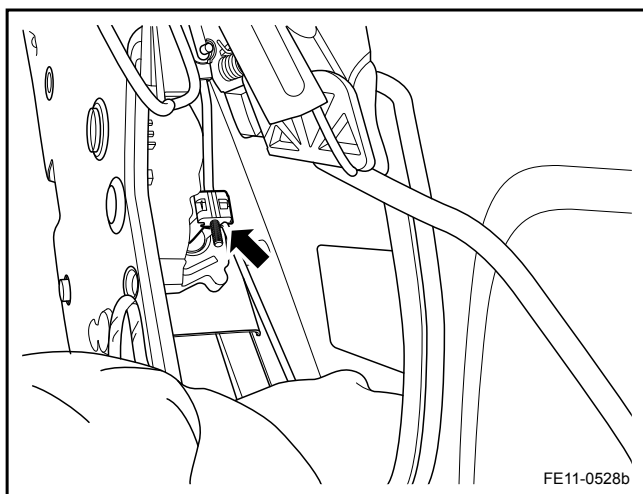
1. Connect the rear door lock assembly harness connector.



2. Install the rear door lock assembly.
3. Install the rear door lock assembly retaining screws.  
Torque: 15 Nm (Metric) 11 lb-ft (US English)



4. Connect the rear door lock rod.
5. Install the rear door window guide rail.
6. Install the rear door trim panel.
7. Connect the battery negative cable.



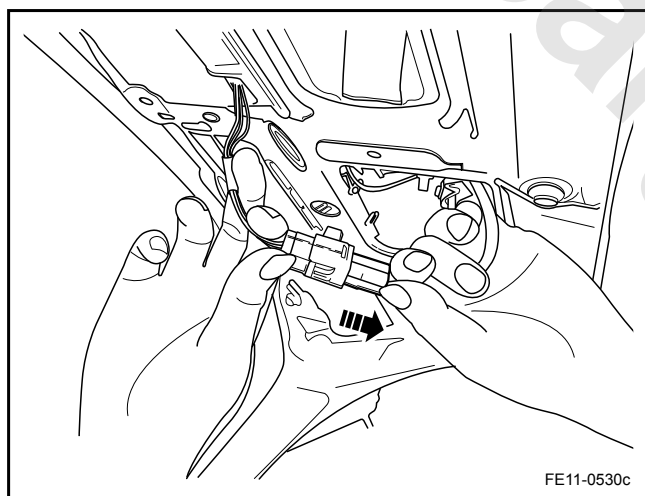
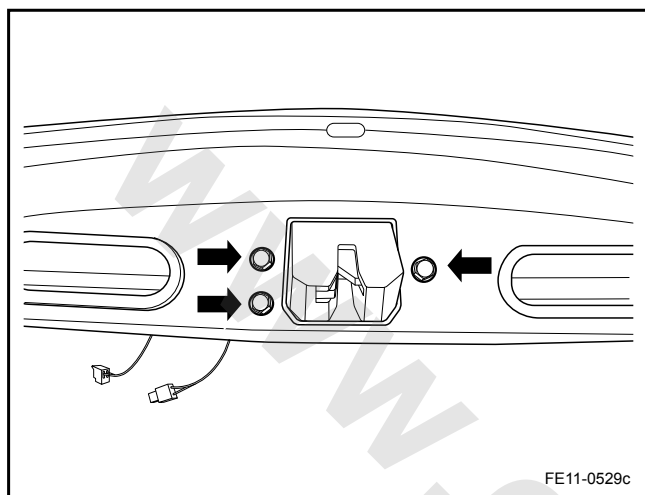
### 11.9.8.3 Hatchback Lock Assembly Replacement (Hatchback)

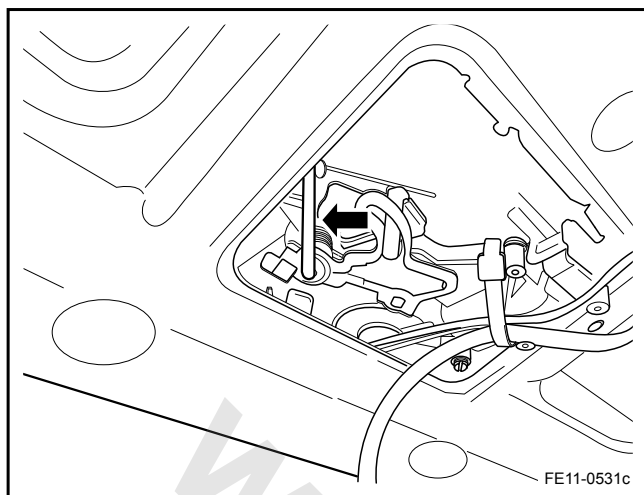
#### Removal Procedure

#### Warning!

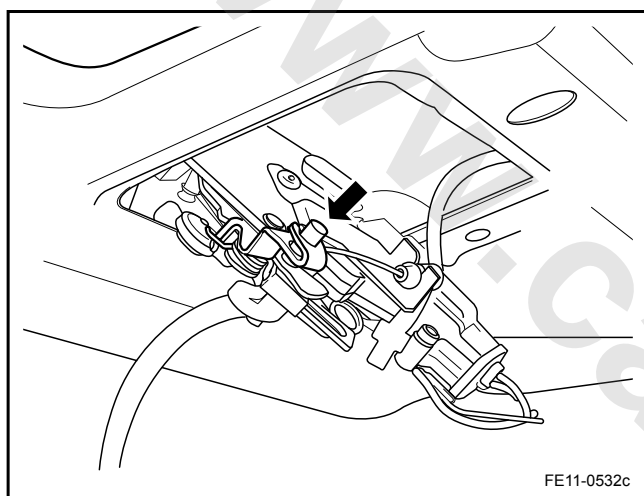
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the hatchback trim panel. Refer to [12.9.1.15 Hatchback Inner Trim Panel Replacement \(Hatchback\)](#).
3. Remove the hatchback side trim panels. Refer to [12.9.1.15 Hatchback Inner Trim Panel Replacement \(Hatchback\)](#).
4. Remove the hatchback lower trim panel. Refer to [12.9.1.15 Hatchback Inner Trim Panel Replacement \(Hatchback\)](#).
5. Remove the hatchback retaining bolts.
6. Disconnect the hatchback assembly harness connector.



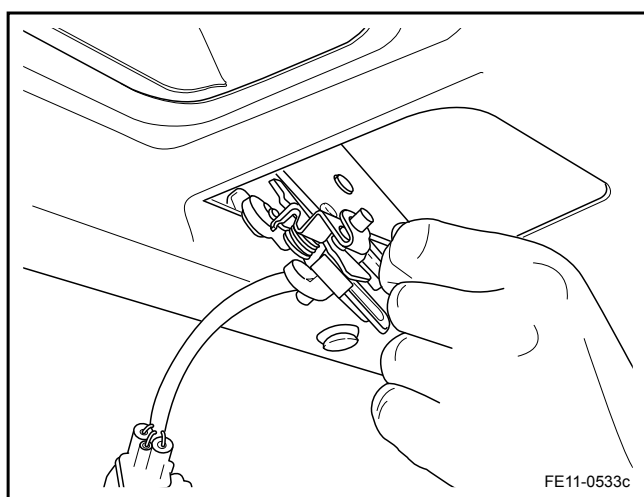


7. Disconnect the hatchback rod.



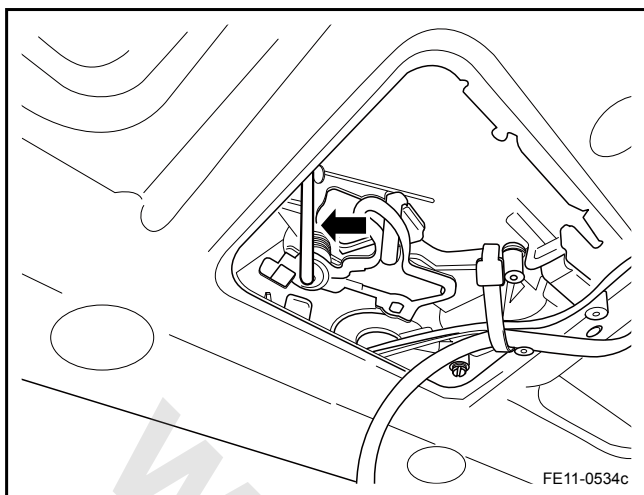
8. Disconnect the hatchback lock cable.

9. Remove the hatchback lock assembly.

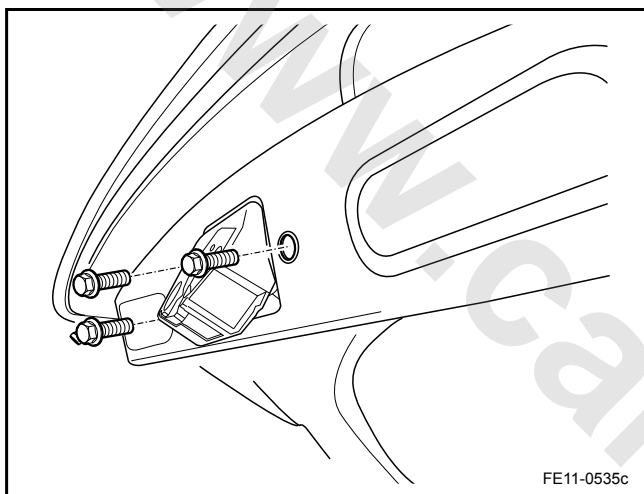


#### Installation Procedure:

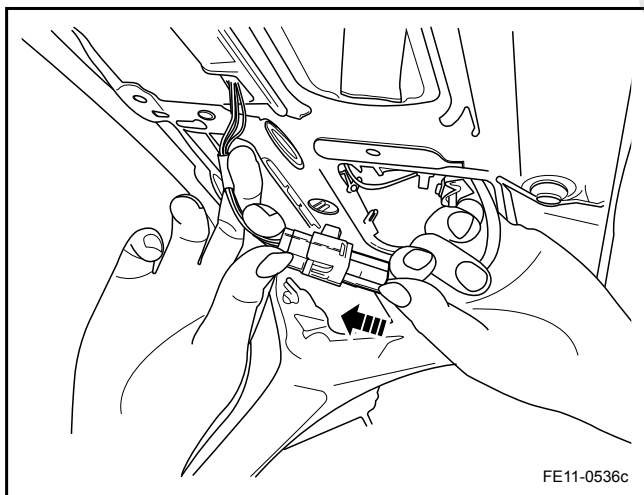
1. Connect the hatchback lock cable.



2. Connect the hatchback rod.



3. Install the hatchback retaining bolts.  
Torque: 15 Nm (Metric) 11 lb-ft (US English)



4. Connect the hatchback harness connector.
5. Install the hatchback lower trim panel.
6. Install the hatchback side trim panels.
7. Install the hatchback upper trim panel.
8. Connect the battery negative cable.

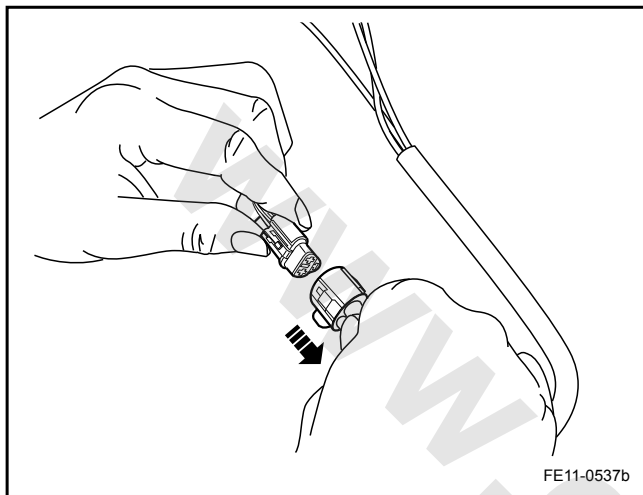
### 11.9.8.4 Rear Compartment Lock Assembly Replacement (Sedan)

#### Removal Procedure

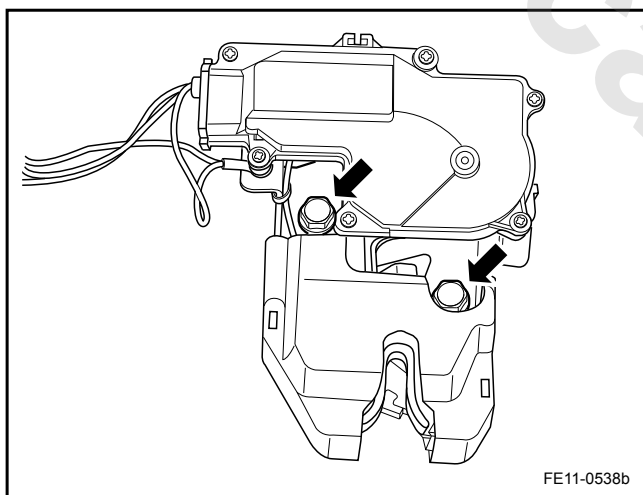
#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

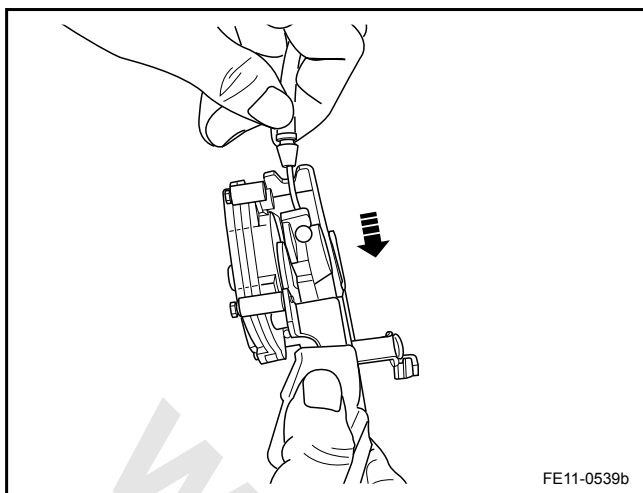
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the rear compartment trim panel. Refer to [12.9.1.9 Rear Compartment Trim Panel Replacement](#).
3. Disconnect the rear compartment lock harness connector.



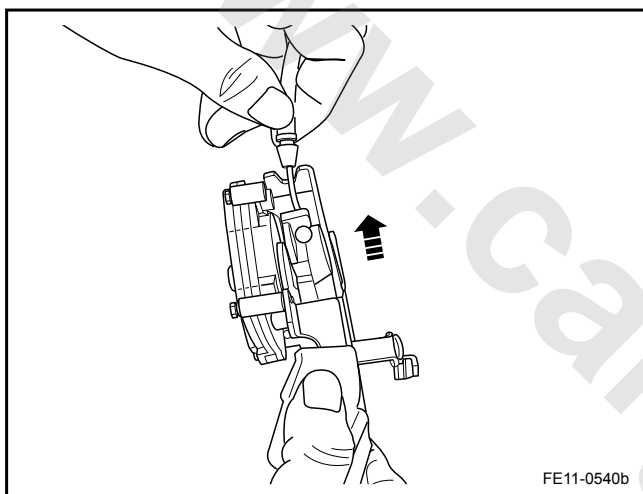
4. Remove the rear compartment lock retaining bolts.





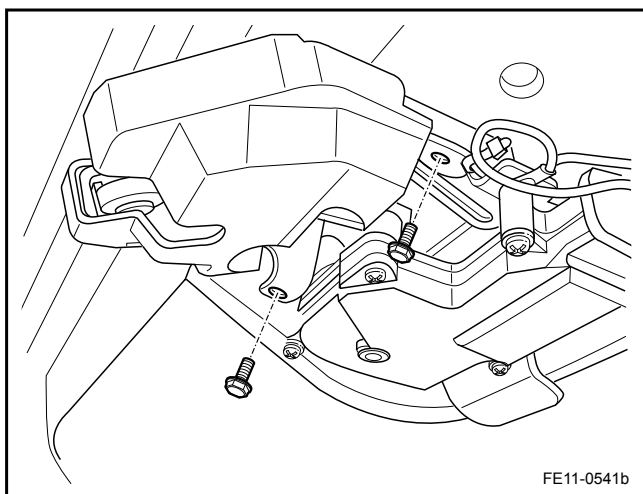


5. Disconnect the rear compartment lock cable.
6. Disconnect the rear compartment lock cylinder cable.
7. Remove the rear compartment lock assembly.

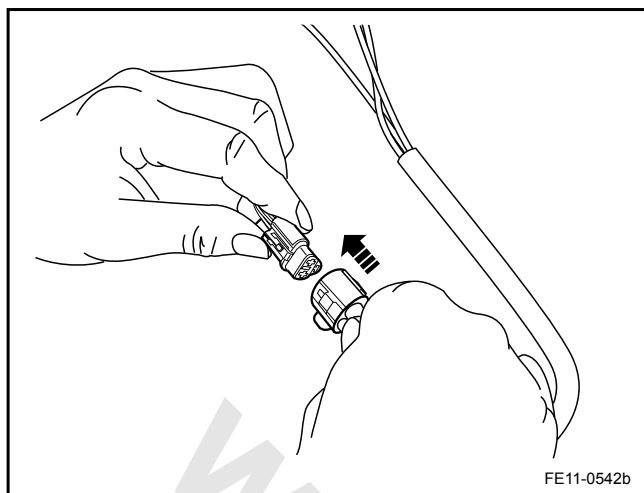


#### Installation Procedure:

1. Connect the rear compartment lock cable.
2. Connect the rear compartment lock cylinder cable.



3. Install the rear compartment lock retaining bolts.  
Torque: 15 Nm (Metric) 11 lb-ft (US English)



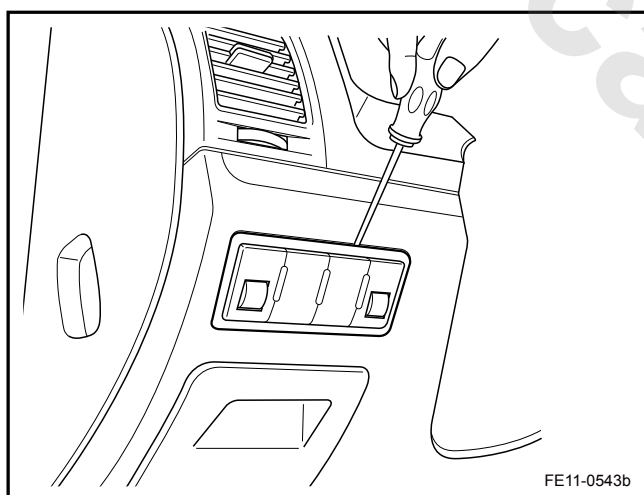
4. Connect the rear compartment lock assembly harness connector.
5. Install the rear compartment trim panel.
6. Connect the battery negative cable.

#### 11.9.8.5 Rear Compartment Lid Release Switch Replacement

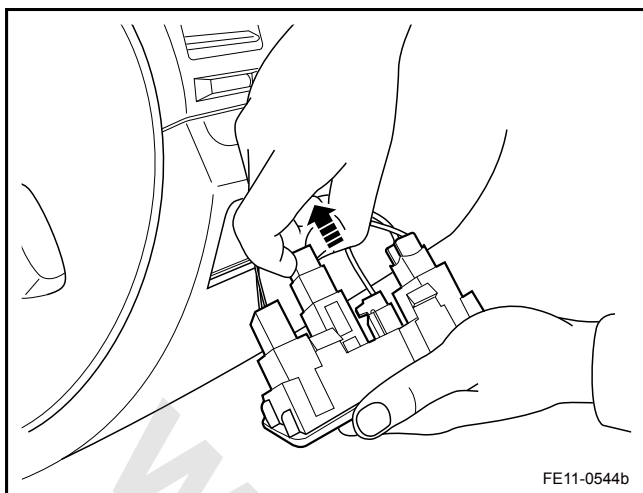
##### Removal Procedure

##### Warning!

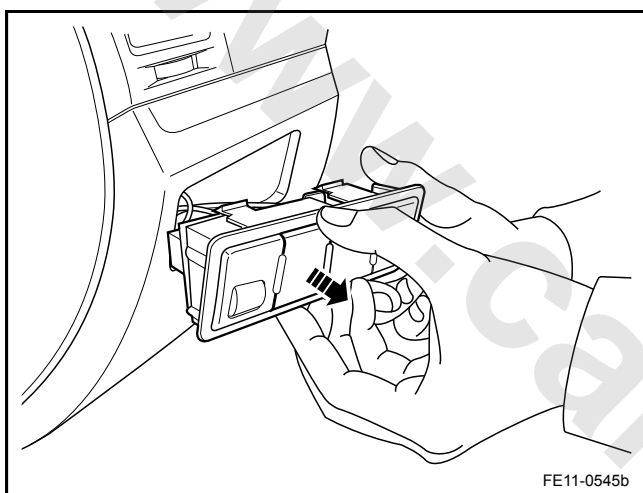
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the dimmer switch.



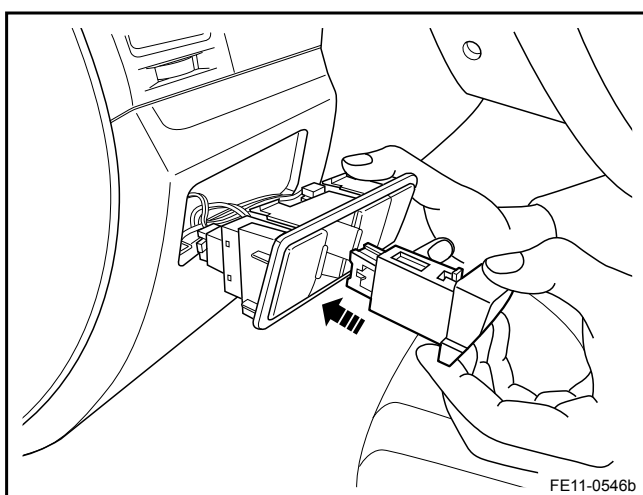
3. Disconnect the rear compartment lid release switch wiring harness connector.

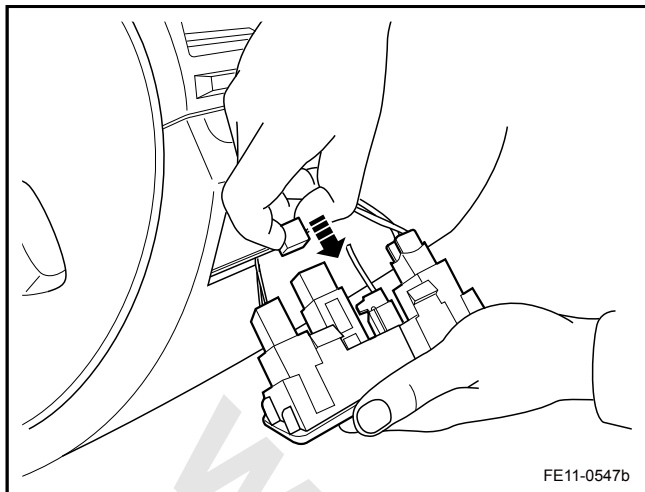


4. Release the rear compartment lid release switch clip and remove the rear compartment lid release switch.

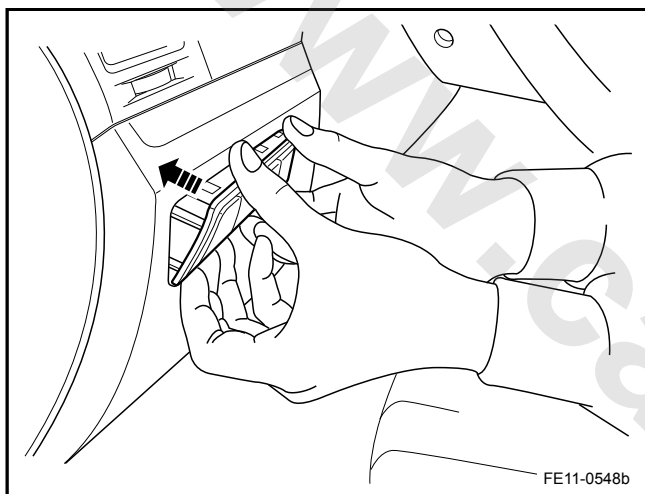
#### Installation Procedure:

1. Install the rear compartment lid release switch in to the dimmer switch panel.





2. Connect the rear compartment lid release switch wiring harness connector.



3. Install the dimmer switch.
4. Connect the battery negative cable.

## 11.10 Remote Anti-theft System

### 11.10.1 Specifications

#### 11.10.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
BCM Retaining Bolts	M8 × 16	8-11	6-8

## 11.10.2 Description and Operation

### 11.10.2.1 Description and Operation

Remote anti-theft system is an auxiliary vehicle alarm device. The alarm system is triggered when there is a forcible intrusion. The system is used in conjunction with the central locking system. Radio frequency interference or run out of battery power can make the system inoperative. Remote anti-theft system allows the operation of the following components.

- Door Lock
- Anti-theft Horn
- Turn Signal

Remote anti-theft system consists of the following main components:

- Transmitter (Remote Control Key)
- RF Receiver (BCM)
- Door Contact Switch
- Hood Ajar Switch
- Rear Compartment Lid (Hatchback) Contact Switch

When the button on the transmitter is pressed, the transmitter sends a signal to BCM. Then, BCM implements the corresponding functions.

### Remote Anti-theft

Remote anti-theft system operates independently from the engine anti-theft system. Remote anti-theft system is designed to sound the alarm when a door, the rear compartment lid or the engine hood is forced open. In the alarm system, the alarm horn will sound intermittently, while turn signal lamps will flash. After 30 s, the horn will stop working, only turn signal lamps flash 5 min. When all doors are closed, the alarm will continue to sound for 30 s. After 30 s, the horn and the lamps will stop and the doors are locked, the system returns enabled. Remote anti-theft system will not affect the engine to start or work properly.

### Rolling Code

Remote anti-theft system uses rolling code technology. The technology prevents any person recording the message sent

from the transmitter and use the information to get into the vehicle. The term "Rolling Code" indicates the way the remote anti-theft system sending and receiving signals. Transmitter transmits signals in different order each time. Transmitter and RF receiver synchronize according to the corresponding order. If a programmed transmitter sending a signal that is not consistent with the RF expected signal, the synchronization will fail. This usually occurs when the vehicle remote control transmitter button is pressed outside the 255 times range.

### Remote Control Door Lock

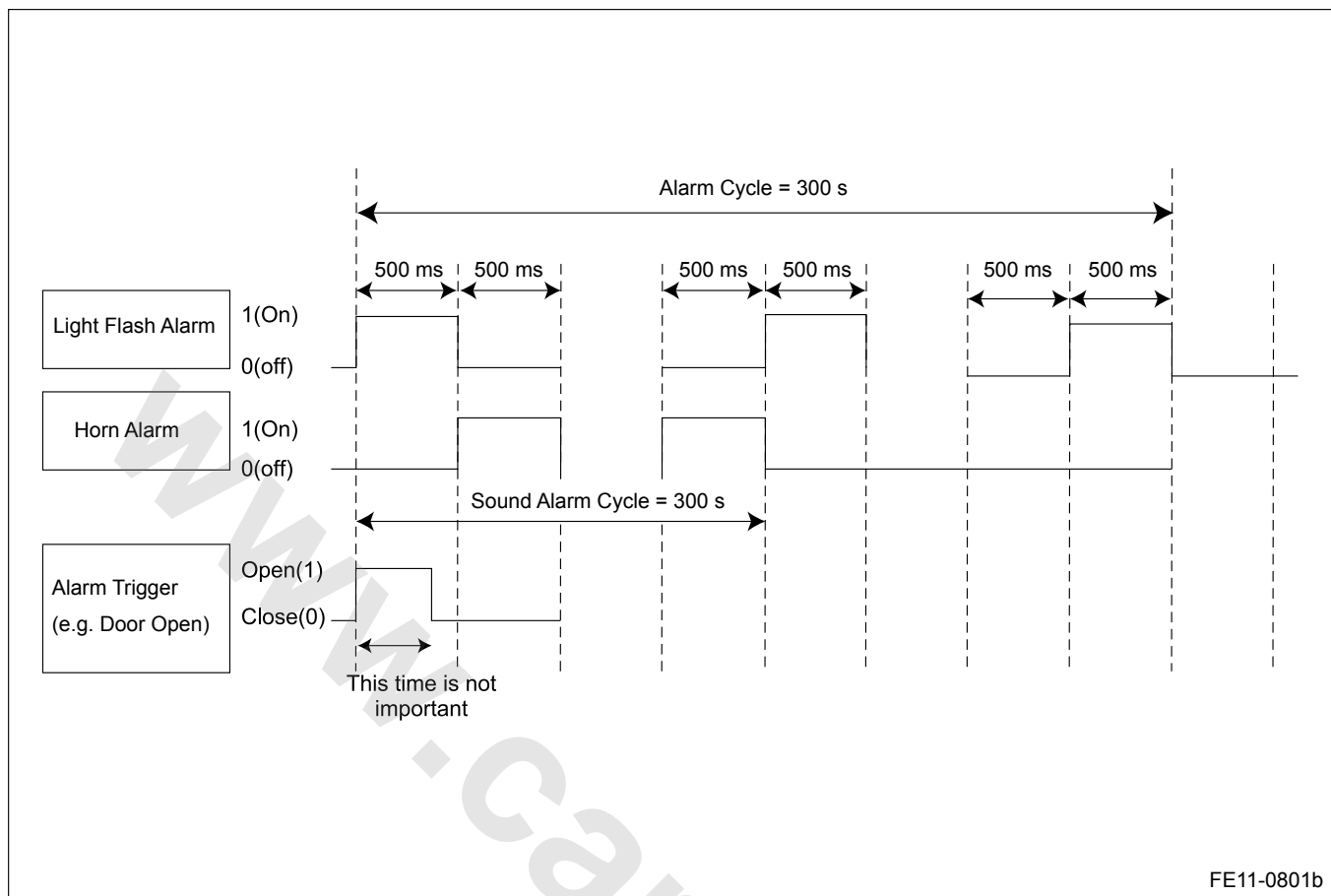
- When the ignition key is not inserted, press the unlock button on the remote control, four doors unlock, turn signal lamps flash.
- When the ignition key is not inserted, press the lock button on the remote control, four doors lock, turn signal lamps flash.

### Anti-theft Activated

- When the ignition key is pulled out, close all doors / rear compartment lid / engine hood with remote control door lock (press lock button once), turn signal lamps flash once. The anti-theft mode will be activated in 3 s.
- Automatic locking, the anti-theft mode will be activated automatically.

### Anti-theft Activation Failure

Using the remote control lock button to lock the doors, but if any door / rear compartment lid / engine hood is not closed properly, turn signal lamps will flash 3 times, the anti-theft horn will sound twice, 2 s each time, in 10 s, the anti-theft alarm will be activated (alarm loop is as following: left and right turn signal lamps flash, anti-theft alarm horn sound, after 30 s the horn will stop working, only the left and right turn signal lamps flash 5 min). If in 10 s, the lock button is pressed, the anti-theft alarm will not be activated, but the system will still be in anti-theft mode (If no other trigger conditions, horns will not sound and turn signal lamps will not flash). In the anti-theft alarm mode, if the remote control unlock key is pressed, it will stop the alarm loop, and the anti-theft status will be lifted. If the lock button is pressed again, the system will resume its original status. As shown below:



#### Note

In the anti-theft or alarm mode, BCM will prohibit the starter relay coil to work.

#### Lift Anti-theft

Using the remote control or by releasing CAN signals received from the EMS to lift anti-theft or alarm mode (turn signal lamps flash / horn sound). When the radio remote control is not powered, in the anti-theft mode, insert the key into the ignition switch, start the engine and lift the anti-theft or alarm at the same time.

#### Mute Mode

- In the anti-theft mode, press the remote control "lock" "unlock" button at the same time for more than two 2 s, turn signal lamps flash twice, the mode is activated. In mute mode, the alarm horns do not sound.
- Press the remote control "lock" "unlock" button at the same time for more than two 2 s, turn signal lamps flash twice, the mode is deactivated.

#### Locating Vehicle Feature

In the anti-theft mode, press the lock button twice within 500ms, horns sound three times, turn signal lamps flash three times (in the absence of dual lock).

#### Remote Control Learn

In the anti-theft lifted status, open the driver door, turn the key from "OFF" to "ON" 6 times within 10 s, and stops at the "OFF" position, at this time, anti-theft indicator light indicating the system is in learn mode. Hold any key on the remote control, if the anti-theft lights flash once, it indicates a successful learn. Four keys can be learned. After 10 s or after the completion of four keys learn, or at least the completion of one key learn, turn the ignition lock to "ON" to exit.

### 11.10.3 System Working Principle

#### 11.10.3.1 System Working Principle

##### Hood Ajar Switch

There is a contact switch under the engine hood. When the engine hood is closed, the switch is opened; once the engine hood is opened, this switch is closed and sends a ground signal to the BCM. Based on this signal, BCM sends "Engine hood is not closed warning lamp" message through CAN bus to the instrument panel.

##### Rear Compartment (Hatchback) Contact Switch

In the rear compartment (rear door), there is a touch switch, when the rear compartment (back gate) is closed for this switch off; Once the rear compartment (back gate) is opened, this switch is closed, and BCM transmits signals to the ground, BCM based on this signal sent through the CAN bus to the instrument light "rear compartment (rear door) is not closed warning lamp" information.

##### Door Contact Switch

In each door lock assembly, there is a contact switch. When a door is closed, the switch is opened; once a door is opened, the door contact switch is closed and sends a ground signal to BCM. Based on this signal, BCM sends a "Door open" message through the CAN bus to the instrument.

##### Anti-theft Indicator

Anti-theft indicator is a light-emitting diode, its power supply is supplied through the circuit. When the system enters anti-theft mode, BCM provides ground circuit to control their flashing.

##### Anti-theft Horn

Anti-theft horns are located in the rear compartment (rear of the body on a Hatchback) left side interior panel, and have ground circuits. When the system enters the anti-theft alarm trigger mode, BCM provides ground power, controls the horn sound.

##### Turn Signal

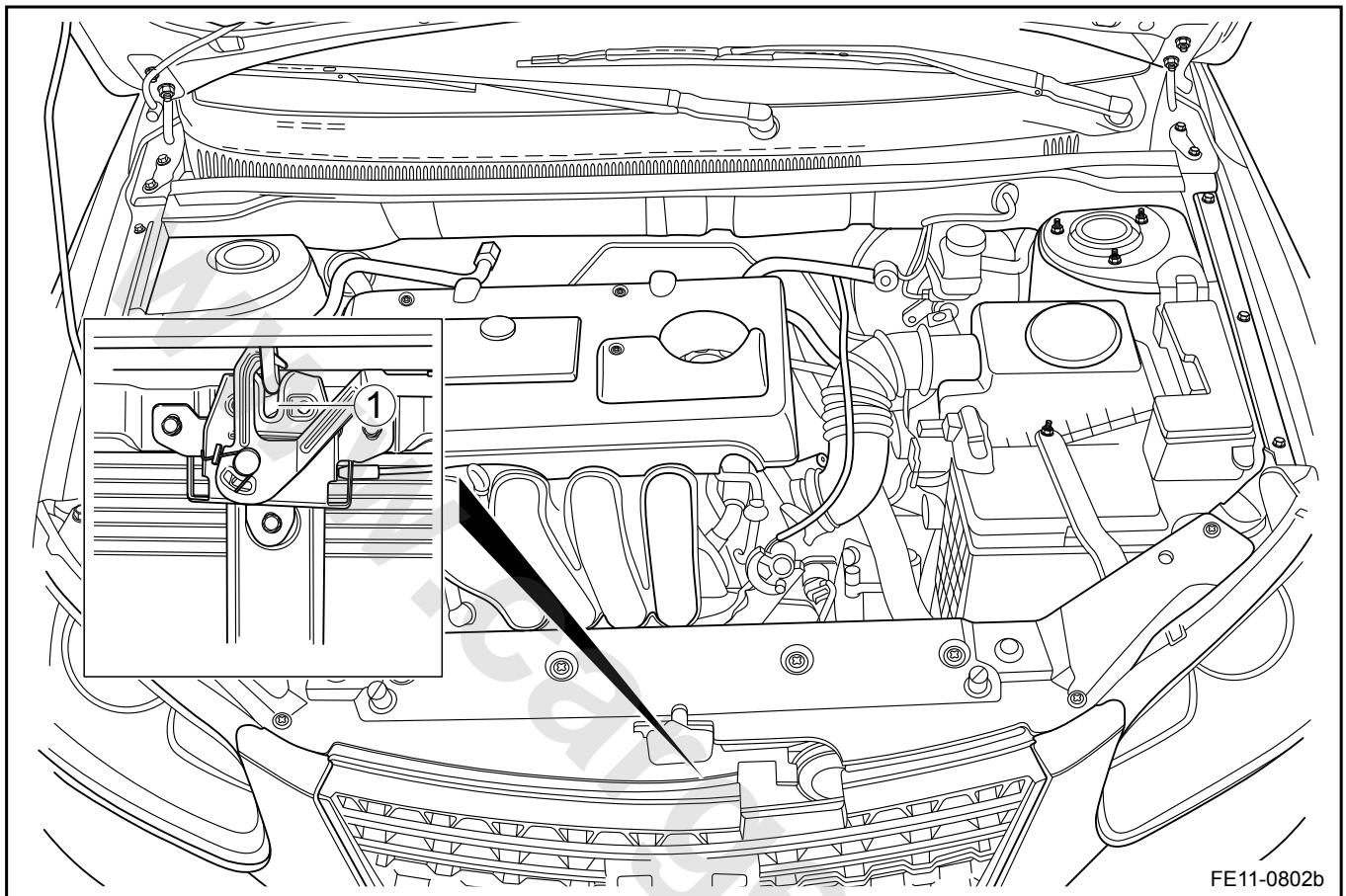
Refer to [11.4.2.1 Exterior Lighting Description and Operation](#)



## 11.10.4 Component Locator

### 11.10.4.1 Component Locator

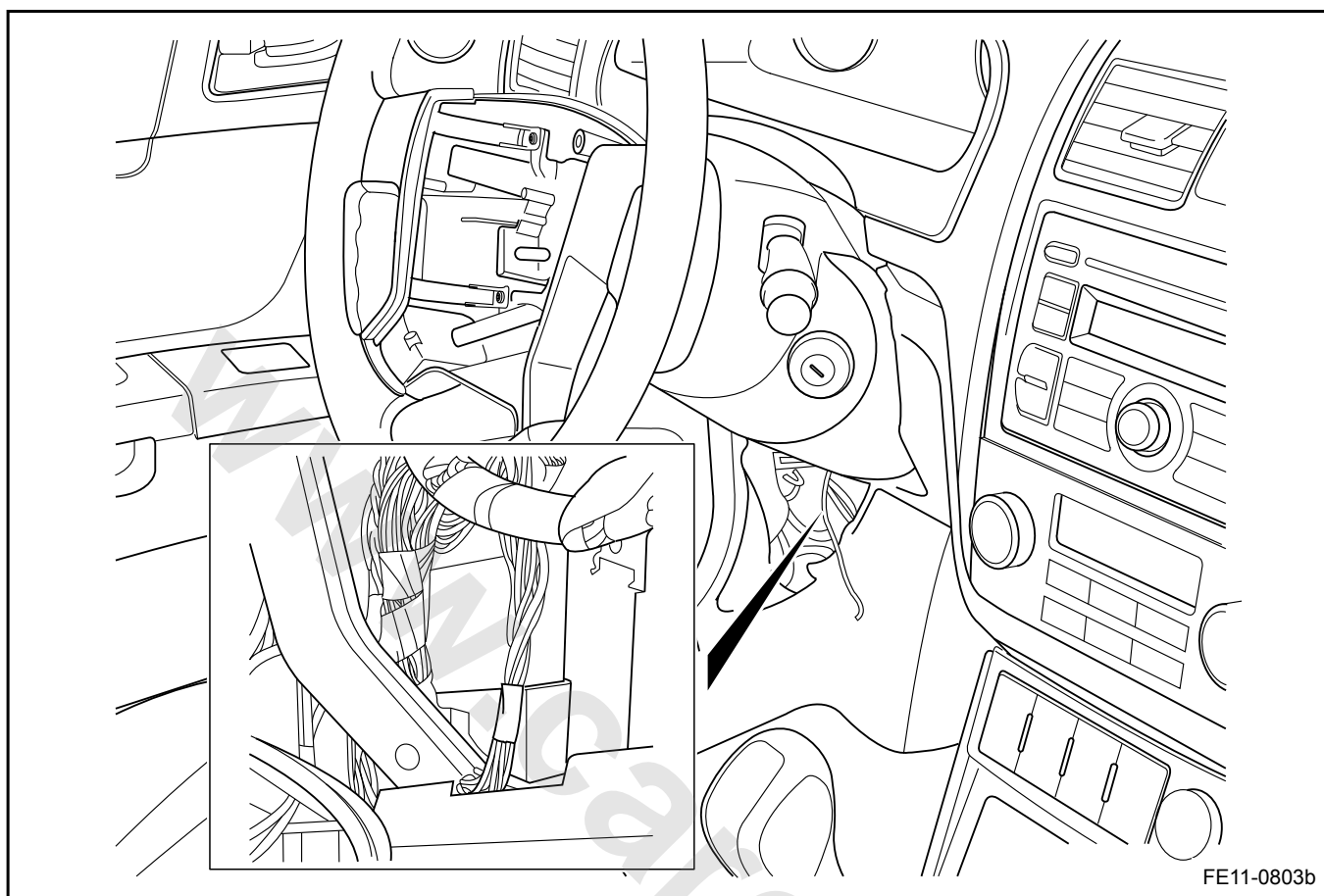
#### Hood Ajar Switch

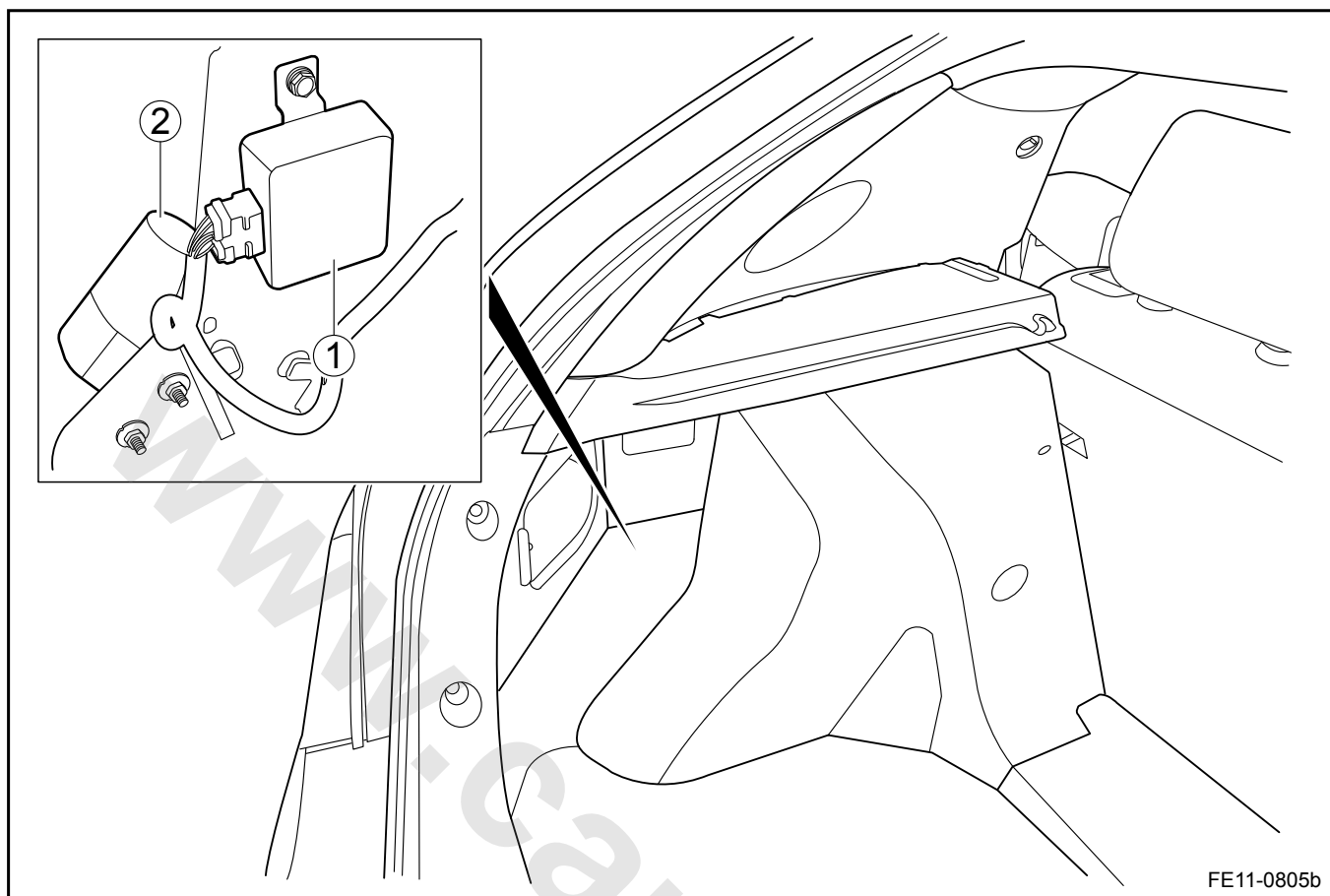


#### Legend

1. Hood Ajar Switch

BCM





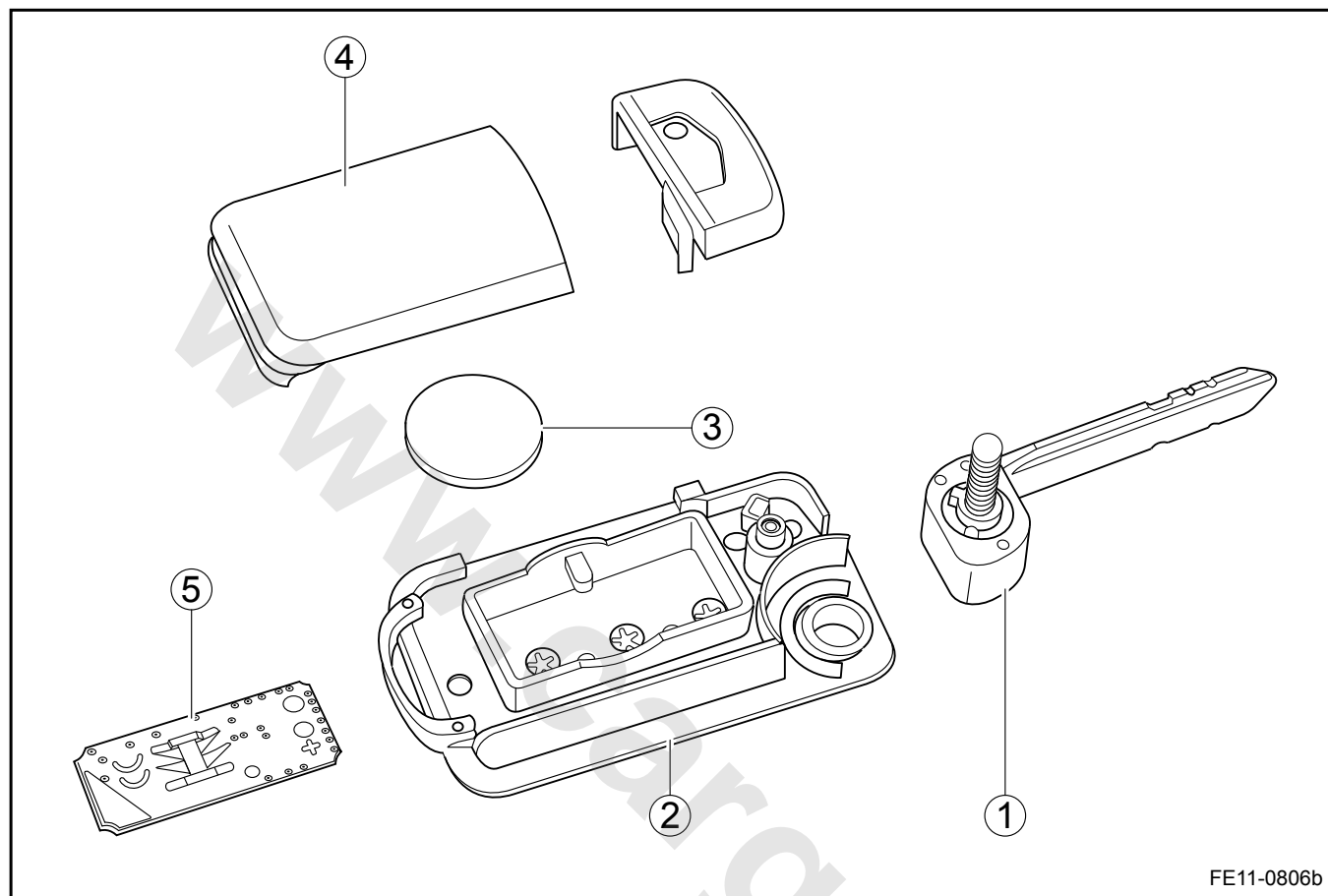
Legend

1. Reverse Radar Module

2. Alarm Horn

## 11.10.5 Disassemble View

### 11.10.5.1 Remote Key

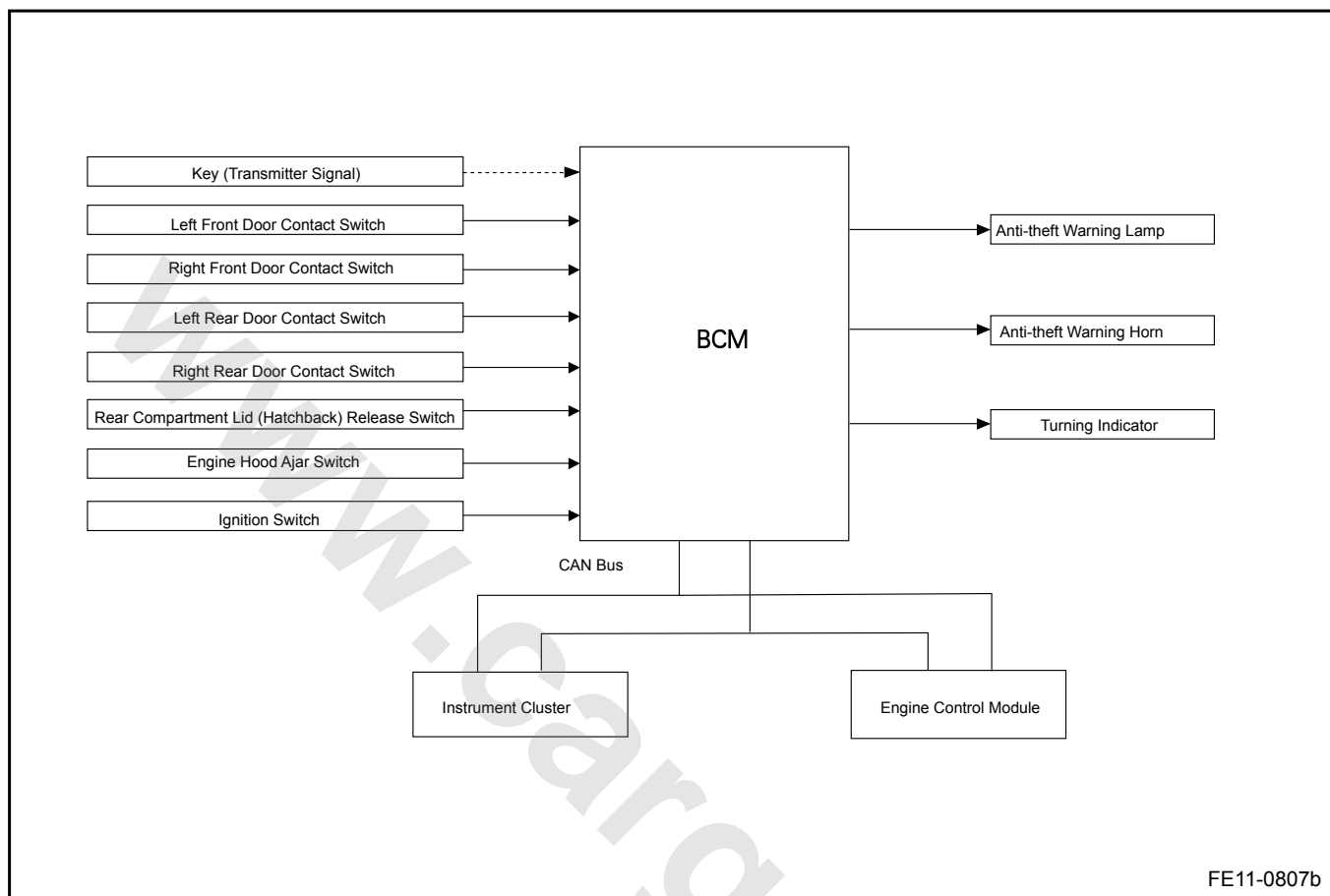


#### Legend

- |                               |                               |
|-------------------------------|-------------------------------|
| 1. Mechanical Key             | 5. Remote Keyless Transmitter |
| 2. Remote Keyless Entry Block |                               |
| 3. Battery                    |                               |
| 4. Remote Key Cover           |                               |

## 11.10.6 Schematic

## 11.10.6.1 Schematic



## 11.10.7 Diagnostic Information and Procedures

### 11.10.7.1 Diagnosis Description

Refer to [11.9.2.1 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it also help to determine whether the customer described situation is normal.

### 11.10.7.2 Visual Inspection

- Check installed after market equipment that may affect the remote anti-theft system operations.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- If the remote control is inoperative, confirm the remote control battery has power before check the system.

### 11.10.7.3 Remote Control Inoperative

- Confirm the remote control battery has power.
- Deactivate the anti-theft function, unlock the driver door. Turn the key to ON and OFF 6 times in 10 s and leave the key at the OFF position. At this time, the anti-theft indicator is on indicating the key learn mode. Press and hold key key on the remote control, if the anti-theft light flash once, then the key learn is successful. Four keys can be learned. The key learn process will end after 10 s or after four keys learn, or the ignition key is turned to "ON" after at least one key learn.

#### Note

After the first key learn, the previous id will be cleared.

### 11.10.7.4 Symptom Table

Suggestion:

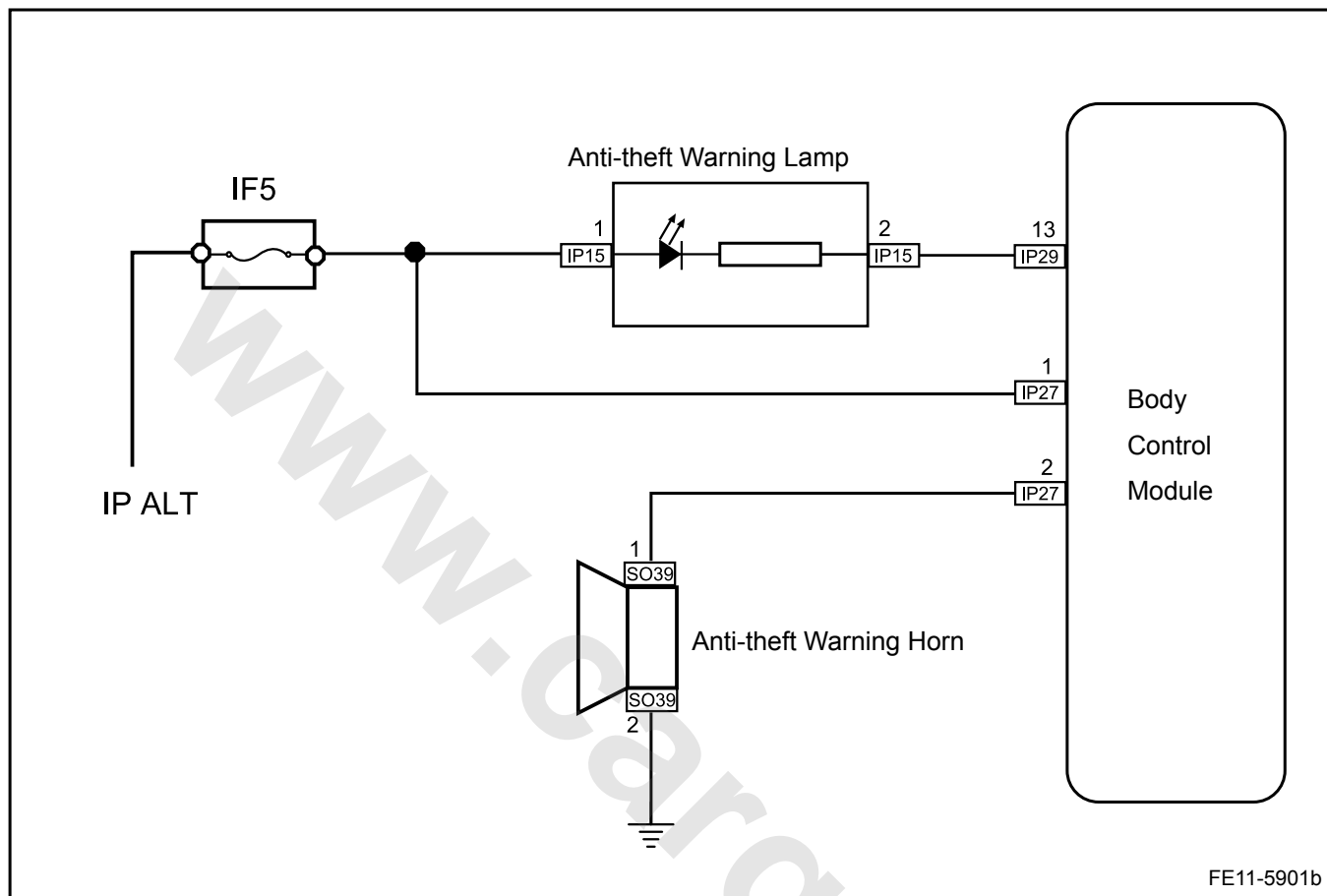
- Before the anti-theft system diagnostic: Make sure door lock control system and the remote control door lock control system are working correctly.
- Diagnostic steps are in the following table.
- Check the fuses and relays before check suspected parts.

Symptoms	Suspected Parts	Measures / Refer to
Remote Control Can Not Lock Doors	1. Alarm Indicator Circuit	Refer to <a href="#">11.10.7.5 Anti-theft Indicator Inoperative</a> .
	2. The Door Key Lock / Unlock Switch Circuit	Refer to <a href="#">11.9.6.1 Schematic</a> .
	3. Door Controlled Lamp Switch Circuit	Refer to <a href="#">11.4.7.10 Courtesy Lamp Inoperative</a> .
	4. Rear Compartment Controlled Lamp Switch Circuit	Refer to <a href="#">11.4.7.11 Rear Compartment Lamp Inoperative</a> .
	5. Hood Controlled Lamp Switch Circuit	Refer to <a href="#">11.4.7.11 Rear Compartment Lamp Inoperative</a> inspection methods, check the hood controlled lamp switch control circuit.

Symptoms	Suspected Parts	Measures / Refer to
	6. If the above circuits are normal but the symptoms still occur, replace the BCM	Refer to <a href="#">11.10.8.1 BCM Replacement</a> .
Set up the anti-theft system, the security indicator does not blink	1. Alarm Indicator Circuit	Refer to <a href="#">11.10.7.5 Anti-theft Indicator Inoperative</a> .
	2. If the anti-theft indicator light circuit is normal, replace the BCM	Refer to <a href="#">11.10.8.1 BCM Replacement</a> .
When the remote control has no power, in the alarm mode with the ignition switch is at ON position, the alarm sound can not be canceled.	1. Ignition Switch Circuit	Refer to <a href="#">2.10.7.3 Check Ignition Switch</a> .
	2. CAN-Bus Circuit	Refer to <a href="#">11.17 Data Communication System</a> .
	3. Replace the remote control battery. If the remote control system is working properly, replace the BCM	Refer to <a href="#">11.10.8.1 BCM Replacement</a> .
Even if the door is open, the alarm system can still be set.	1. Door Controlled Lamp Switch Circuit	Refer to <a href="#">11.4.7.10 Courtesy Lamp Inoperative</a> .
	2. If the door controlled lamp switch circuit is normal, but the symptoms still occur, replace the BCM	Refer to <a href="#">11.10.8.1 BCM Replacement</a> .
When the anti-theft alarm system is in working condition, the vehicle anti-theft horn is inoperative.	1. Horn Circuit	Refer to <a href="#">11.10.7.6 Anti-theft Horn Inoperative</a> .
	2. If the horn circuit is normal, replace the BCM	Refer to <a href="#">11.10.8.1 BCM Replacement</a> .
When the anti-theft alarm system is in working condition, the hazard warning lamps do not blink.	1. Hazard Warning Lamps Circuit	Operate the turn signal (hazard warning lamps), if all the turning lights do not work, check the turn signal circuit.
	2. If all the turn signal lamps do not work, replace the BCM	If all turn signal lamps do not work, replace the BCM. Refer to <a href="#">11.10.8.1 BCM Replacement</a> .

## 11.10.7.5 Anti-theft Indicator Inoperative

Schematic:

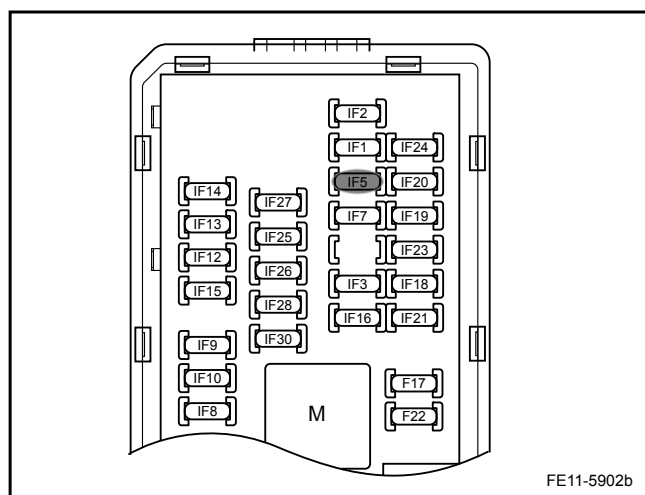


Diagnostic Steps:

## Note

Before carry out this diagnostic procedure, Select on the scan tool as the following sequence: Body Control / BCM special set function / anti-theft indicator. Use scan tool to drive the anti-theft indicator, which helps with quick diagnostic.

Step 1	Check the fuse IF5.
--------	---------------------



(a) Check whether the fuse IF5 is blown.

Fuse Rating: 10 A



No

Go to step 3

Yes

Step 2

Check the fuse IF5 circuit.

- (a) Check whether the fuse IF5 circuit is short.
- (b) Repair the circuits. Confirm that there are no short circuits.
- (c) Replace with fuses with rated current.

Is the anti-theft indicator working correctly?

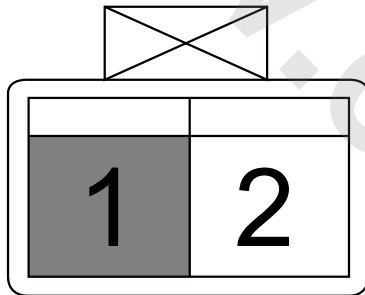
Yes

System normal

No

Step 3

Measure the alarm indicator harness connector IP15 terminal No.1 voltage.

Anti-theft Warning Lamp Harness  
Connector IP15

FE11-5903b

- (a) Measure IP15-1 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 5

No

Step 4

Repair the open circuit between the anti-theft indicator wiring harness connector IP15 and the fuse IF5.

- (a) Confirm the open circuit between the anti-theft indicator wiring harness connector IP15 and the fuse IF5 repair is completed.

Is the anti-theft indicator working correctly?

Yes

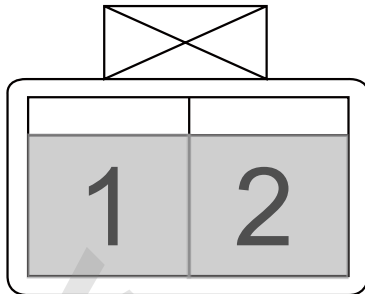
System normal

No

Step 5

Check the alarm indicator.

Anti-theft Warning Lamp Harness Connector IP15



FE11-5904b

- (a) Disconnect the anti-theft indicator wiring harness connector. Refer to [11.10.8.2 Anti-theft Indicator Lamp Replacement](#).
- (b) Test continuity between the anti-theft light IP15 terminal No. 1 and 2 is consistent with a multimeter.

Yes

Go to step 7

No

Step 6 Replace the anti-theft indicator.

- (a) Replace the anti-theft indicator. Refer to [11.10.8.2 Anti-theft Indicator Lamp Replacement](#).

Is the anti-theft indicator working correctly?

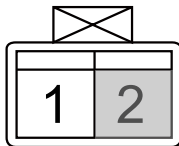
Yes

System normal

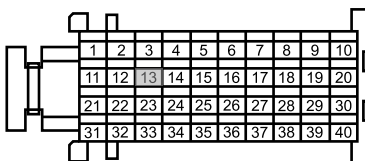
No

Step 7 Check the circuit between the BCM harness connector IP29 and the anti-theft indicator harness connector IP15.

Anti-theft Warning Lamp Harness Connector IP15



Body Control Module 1 Harness Connector IP29



FE11-5910b

- (a) Disconnect the anti-theft indicator wiring harness connector IP15 and the BCM harness connector IP29.
- (b) Measure resistance between the BCM harness connector IP29 terminal No.13 and the anti-theft indicator wiring harness connector IP15 terminal No.2 with a multimeter. Standard Resistance: Less than 1 Ω

Is the resistance specified value?

Yes

Go to step 9

No

Step 8 Repair the open circuit between the BCM harness connector IP29 and the anti-theft indicator harness connector IP15.

- (a) Confirm the open circuit between the BCM harness connector IP29 and the anti-theft indicator harness connector IP15 repair is completed.

Is the anti-theft indicator working correctly?

Yes

System normal

No

Step 9	Replace the BCM
--------	-----------------

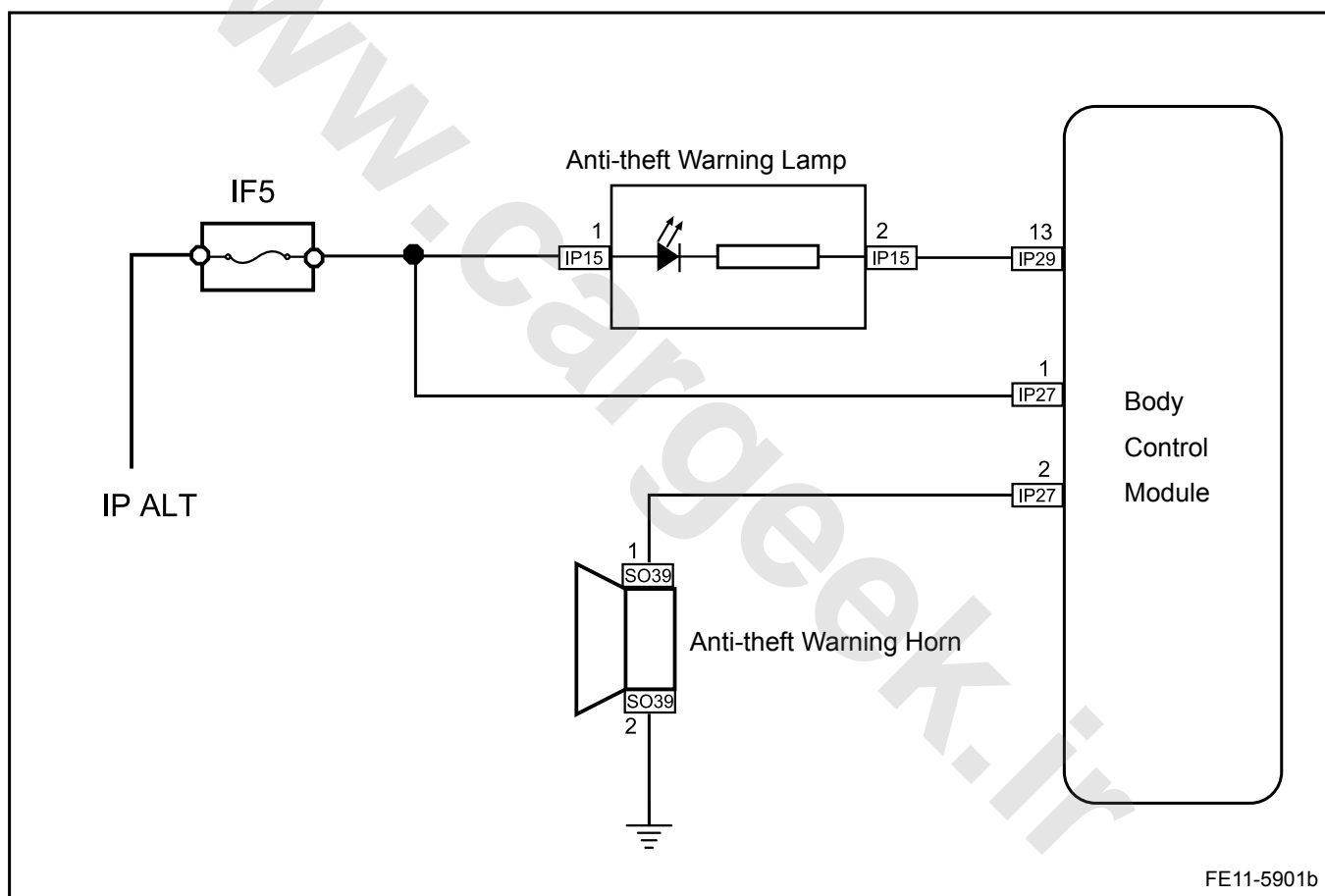
(a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#).  
Confirm the repair completed.

Next

Step 10	System normal.
---------	----------------

### 11.10.7.6 Anti-theft Horn Inoperative

Schematic:



Diagnostic Steps:

#### Note

Before carry out this diagnostic procedure, Use scan tool to select as the following sequence: Body Control System / Active Test / Alarm Horn output control. Drive the anti-theft alarm horn, so it will facilitate quick diagnostic.

Step 1	Check the circuit between the alarm horn wiring harness connector SO39 and the body ground.
--------	---

Anti-theft Horn Harness Connector S039



FE11-5906b

- (a) Disconnect the anti-theft horn wiring harness connector SO39. Refer to [11.10.8.3 Anti-theft Horn Replacement](#).
- (b) Measure resistance between anti-theft horn harness connector SO39 terminal No.2 and the body ground with a multimeter.

Standard Resistance: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 3

No

**Step 2** Repair the open circuit between the anti-theft horn harness connector SO39 terminal No.2 and the body ground.

- (a) Confirm the open circuit between the anti-theft horn harness connector SO39 terminal No.2 and the body ground. repair is completed.

Is the anti-theft indicator working correctly?

Yes

System normal

No

**Step 3** Measure the alarm horn harness SO39 terminal No.1 voltage.

Anti-theft Horn Harness Connector S039



FE11-5907b

- (a) Connect the anti-theft horn wiring harness connector, enter the anti-theft alarm system and trigger the anti-theft system.
- (b) Measure anti-theft horn harness connector SO39 terminal No.1 voltage.

Standard Voltage: 11-14 V

Is the voltage specified value?

No

Go to step 5

Yes

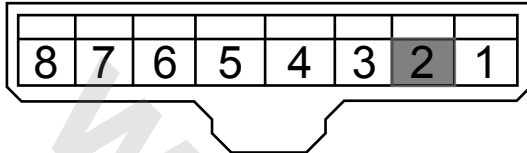
**Step 4** Replace the anti-theft horn.

- (a) Replace the anti-theft horn. Refer to [11.10.8.3 Anti-theft Horn Replacement](#).

Is the horn working properly?

Step 5 Measure the BCM harness connector IP27 terminal No.2 voltage.

Body Control Module 3 Harness  
Connector IP27



FE11-5908b

- (a) Connect the anti-theft horn wiring harness connector, enter the anti-theft alarm system and trigger the anti-theft system.

Standard Voltage: 11-14 V

Is the voltage specified value?

No

Go to step 7

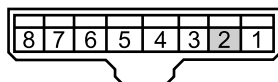
Yes

Step 6 Repair the open circuit between the BCM harness connector IP27 and the anti-theft horn wiring harness connector SO39.

Anti-theft Horn Harness Connector S039



Body Control Module 3 Harness Connector IP27



FE11-5909b

- (a) Confirm the open circuit between the BCM harness connector IP27 and the anti-theft horn wiring harness connector SO39 repair is completed.

Is the horn working properly?

Yes

System normal

No

Step 7 Replace the BCM.

- (a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#).  
Confirm the repair completed.

Next

Step 8 System normal.

## 11.10.8 Removal and Installation

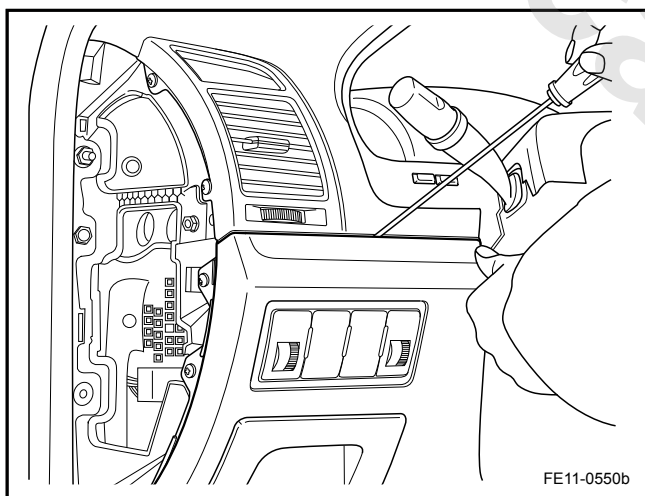
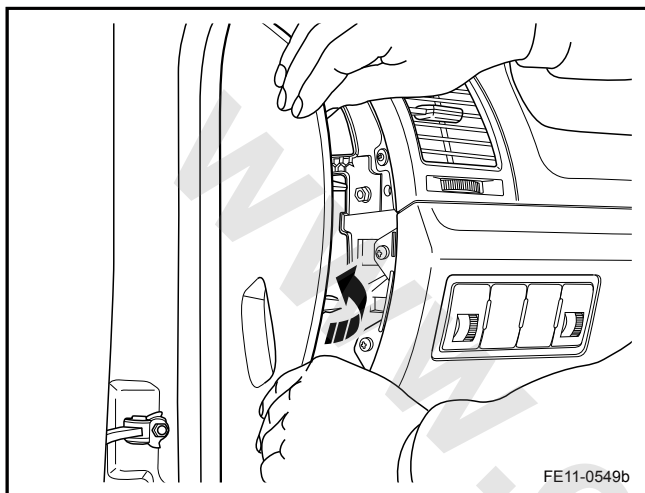
### 11.10.8.1 BCM Replacement

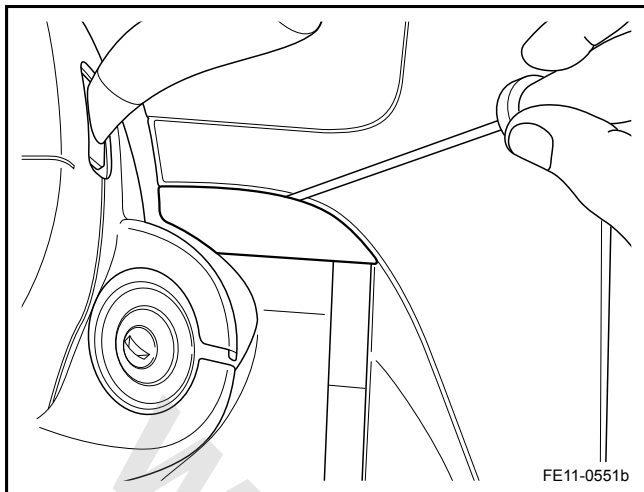
#### Removal Procedure

#### Warning!

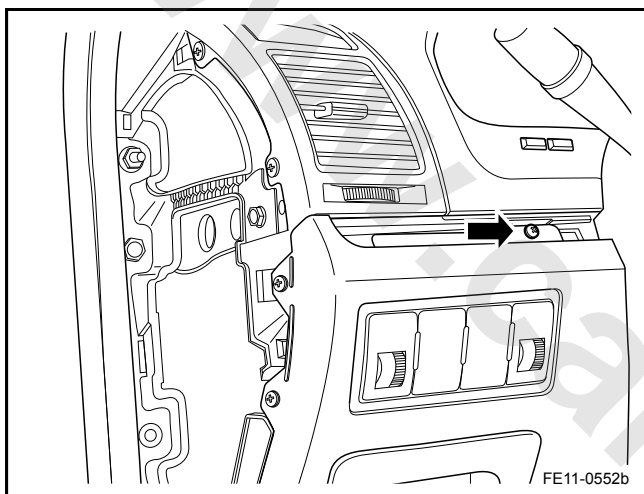
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the instrument panel left outer panel.
3. Remove the instrument panel steering wheel left side panel.

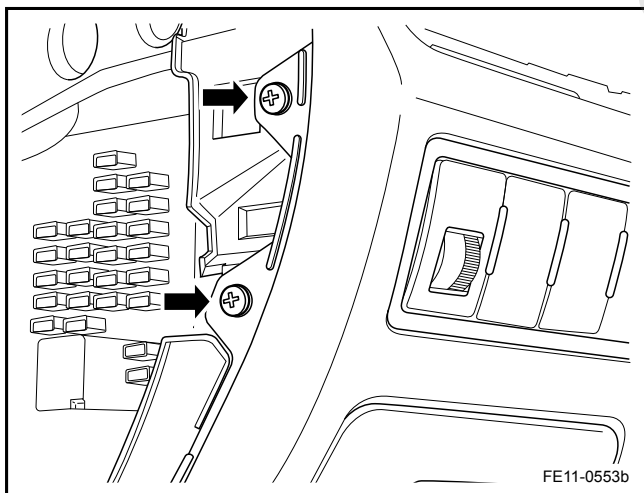




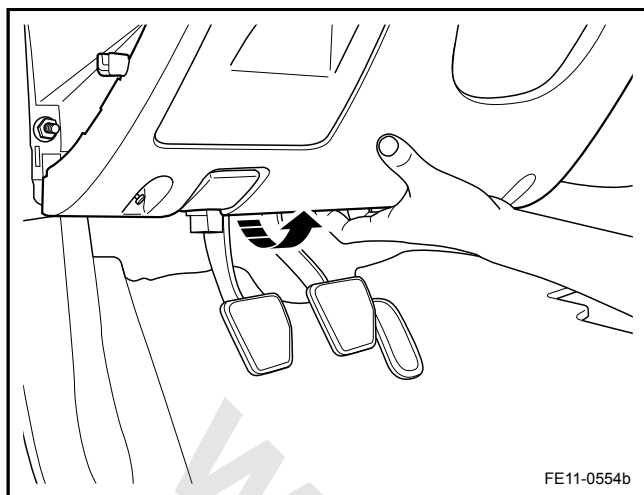
4. Remove the instrument panel steering wheel right side panel.



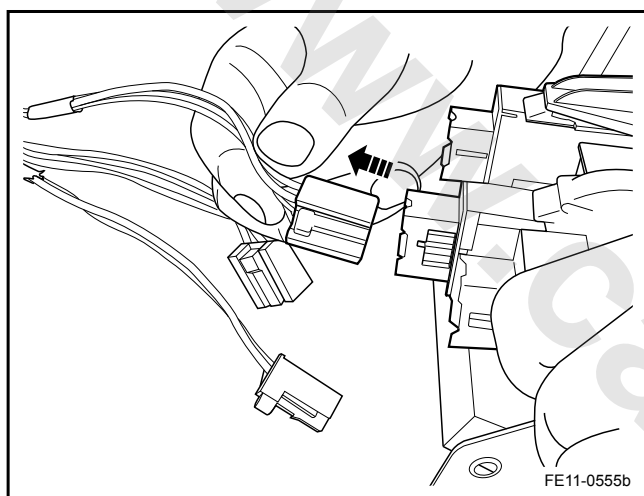
5. Remove the instrument panel trim driver side lower panel front retaining screws.



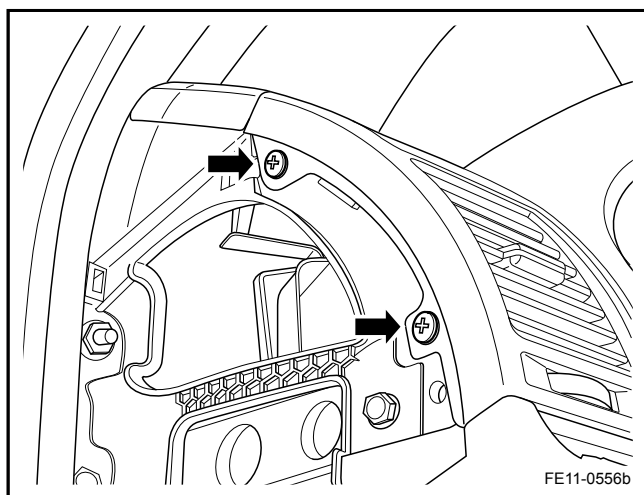
6. Remove the instrument panel trim driver side lower panel side retaining screws.



7. Remove the instrument panel trim driver side lower panel.

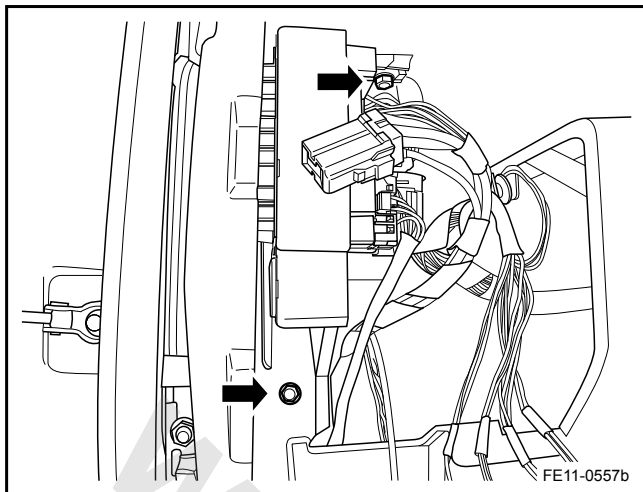


8. Disconnect headlamp switch wiring harness connectors.

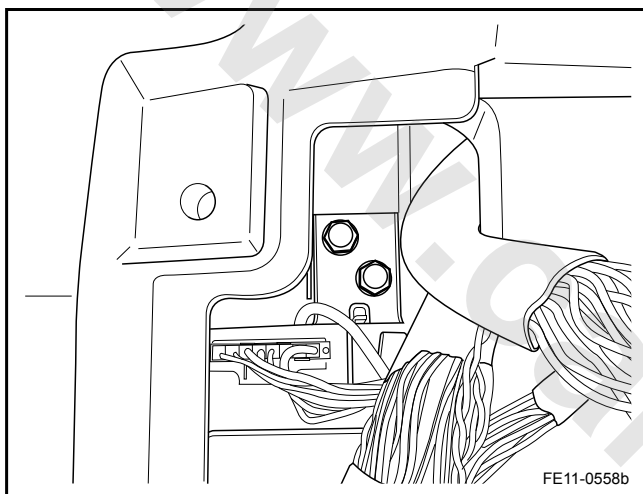


9. Remove the instrument panel left side air duct panel retaining screws.

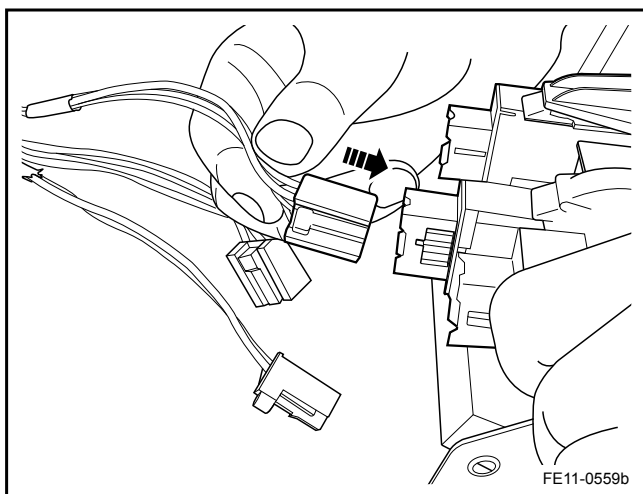




10. Remove the instrument panel left side air duct panel.
11. Remove the I/P fuse block bracket retaining bolts.

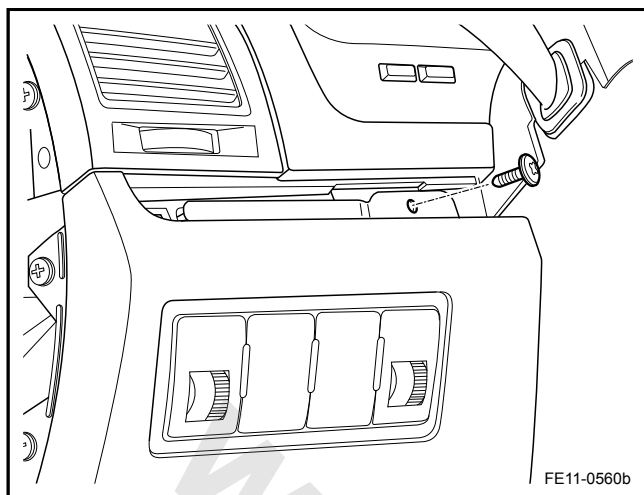


12. Remove the BCM bracket retaining bolts.
13. Disconnect the BCM harness connector and remove the BCM.



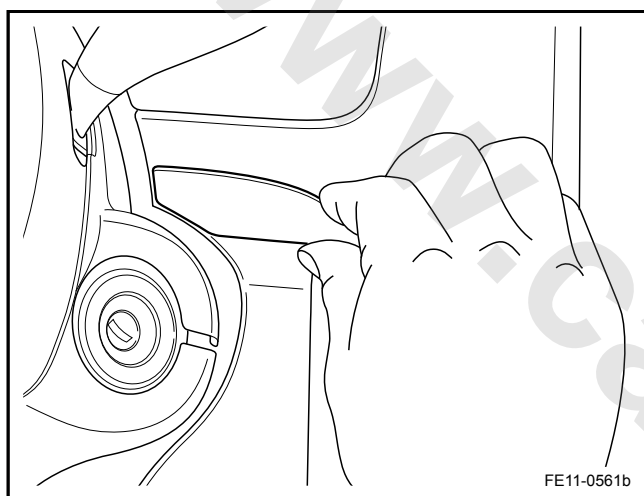
#### Installation Procedure:

1. Connect the BCM harness connector.
2. Install the BCM bracket retaining bolts.  
Torque: 15 Nm (Metric) 11 lb-ft (US English)
3. Install the I/P fuse block bracket retaining bolts.  
Torque: 10 Nm (Metric) 7 lb-ft (US English)
4. Install the instrument panel left side air duct panel.  
Torque: 8 Nm (Metric) 6 lb-ft (US English).
5. Connect all headlamp switch harness connectors.

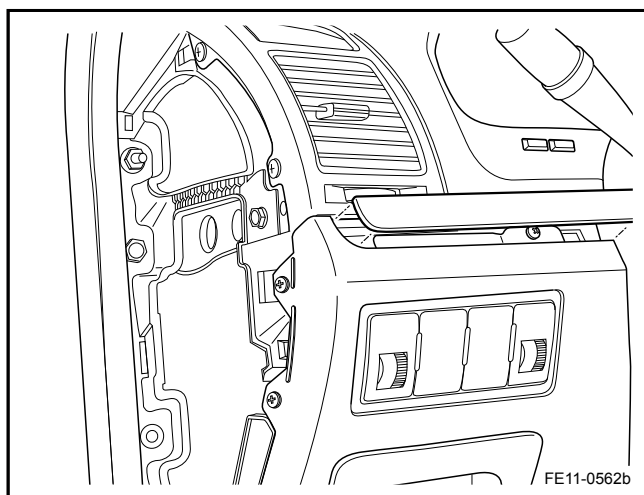


6. Install the Instrument panel driver side lower panel.

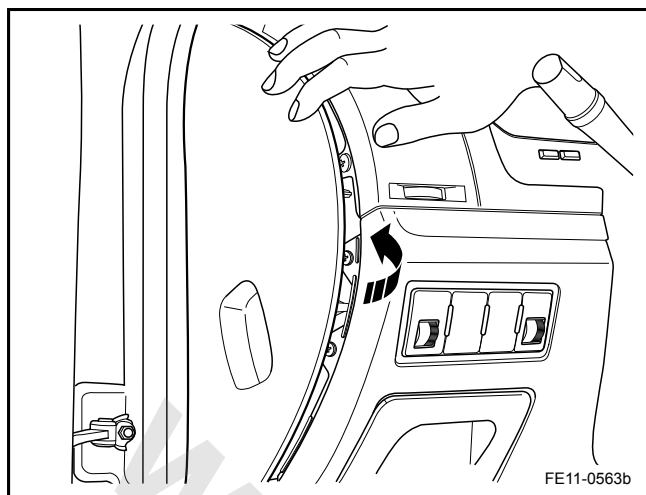
Torque: 10 Nm (Metric) 7 lb-ft (US English)



7. Install the instrument panel steering wheel right side panel.



8. Install the instrument panel steering wheel left side panel.



9. Install the Instrument panel left outer panel.
10. Connect the battery negative cable.

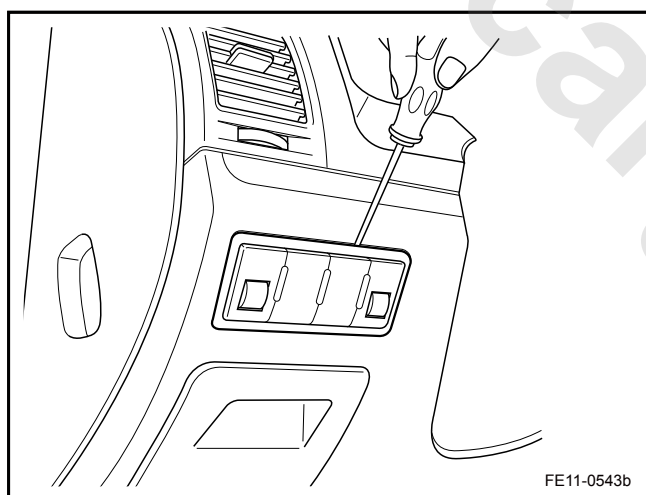
### 11.10.8.2 Anti-theft Indicator Lamp Replacement

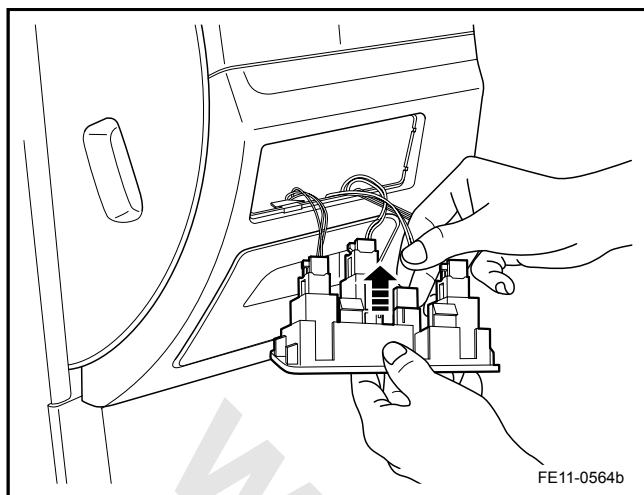
#### Removal Procedure

#### Warning!

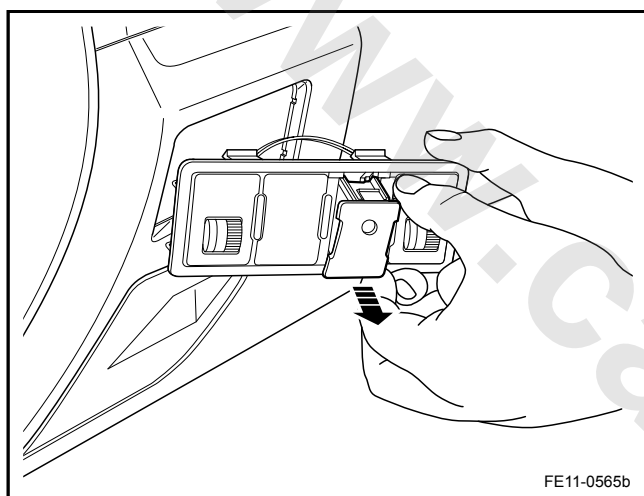
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the dimmer switch.

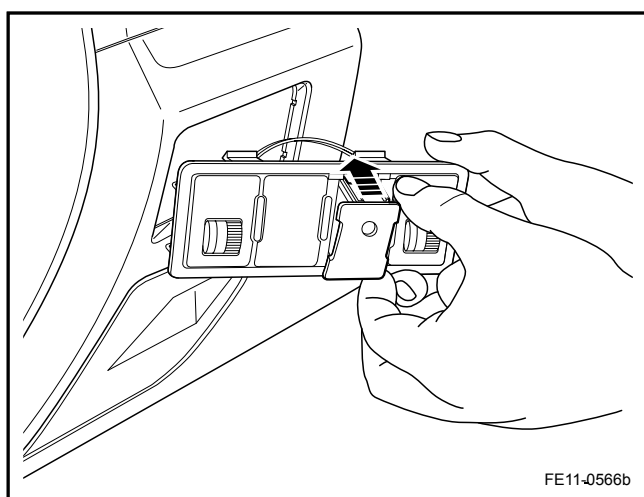




3. Disconnect the anti-theft indicator lamp wiring harness connector.

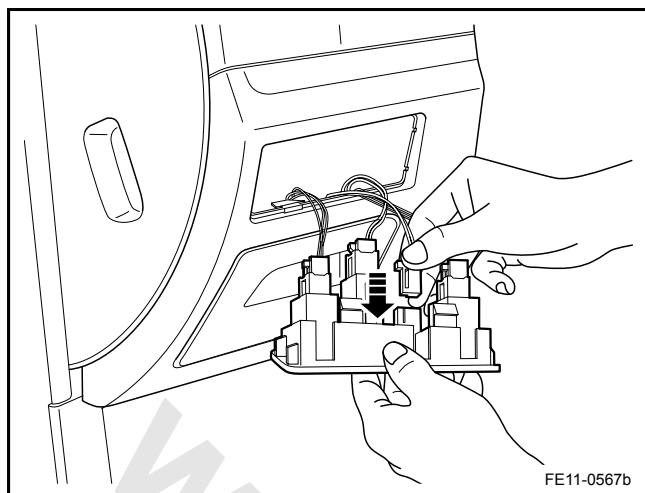


4. Release the clip and remove the anti-theft alarm lamp.

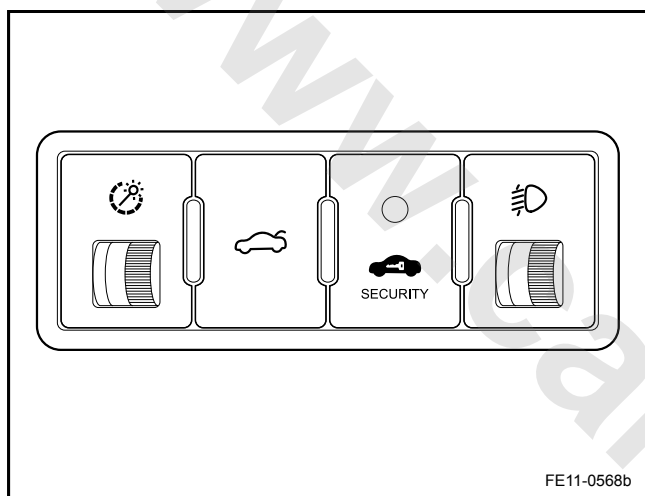


#### Installation Procedure:

1. Install the anti-theft lamp to the dimmer switch bracket.



2. Connect the anti-theft indicator lamp wiring harness connector.



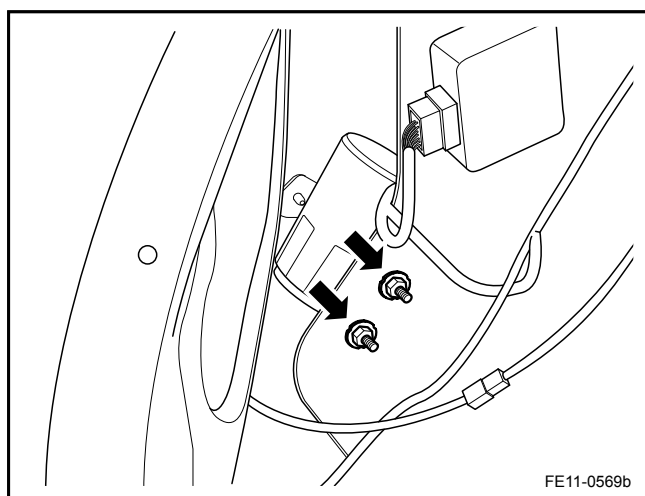
3. Install the dimmer switch to the instrument panel.
4. Connect the battery negative cable.

### 11.10.8.3 Anti-theft Horn Replacement

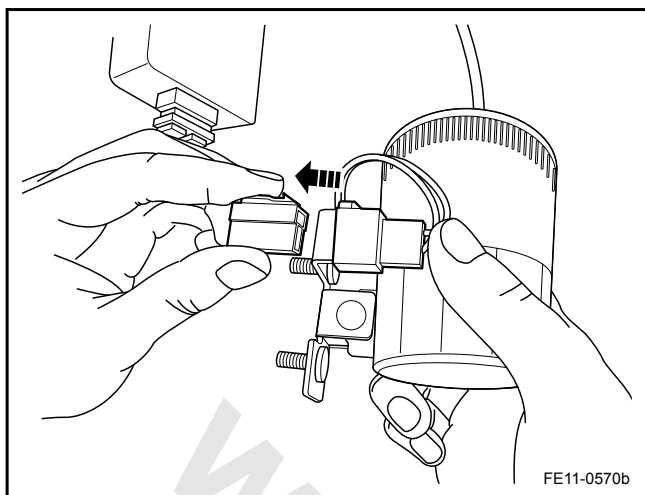
#### Removal Procedure

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

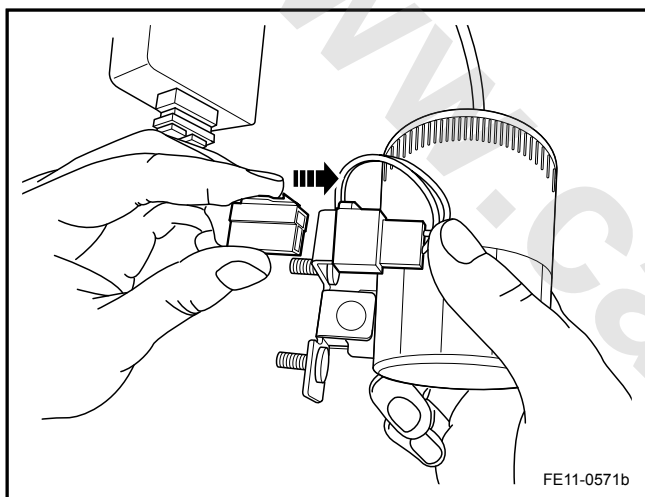


1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the left rear compartment trim panel. Refer to [12.9.1.9 Rear Compartment Trim Panel Replacement](#).
3. Remove the anti-theft horn retaining bolts.

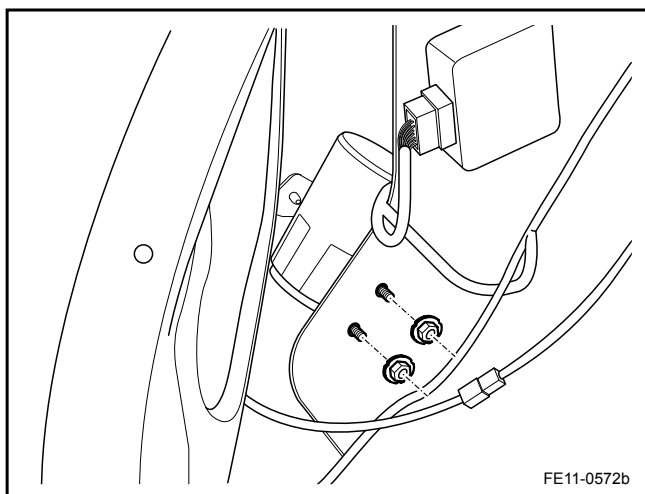


4. Disconnect the anti-theft horn wiring harness connector.
5. Remove the anti-theft horn.

#### Installation Procedure:



1. Connect the anti-theft horn wiring harness connector.



2. Install the anti-theft horn retaining bolts.  
Torque: 10 Nm (Metric) 7 lb-ft (US English)
3. Install the left rear compartment trim panel.
4. Connect the battery negative cable.

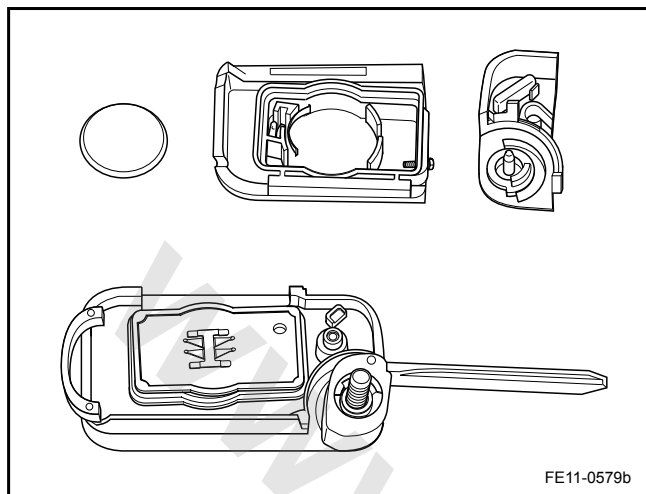
#### 11.10.8.4 Hood Ajar Switch Replacement

For removal and installation procedures. Refer to [12.2.3.2 Hood Latch Replacement](#).

### 11.10.8.5 Remote Control Emitter Battery Replacement

#### Removal Procedure

1. Remove the remote transmitter cover screw.
2. Remove the transmitter cover.
3. Remove the remote control transmitter battery.



#### Installation Procedure:

1. Install the remote control transmitter battery.
2. Install the transmitter cover.
3. Tighten the remote transmitter cover screw.

Torque: 2 Nm (Metric) 1.5 lb-ft (US English)

## 11.11 Electric Seats

### 11.11.1 Specifications

#### 11.11.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Electric Seat Assembly Retaining Bolts	M10 × 36	39-53	28.9-39.2
Electric Seat Side Trim Retaining Screws	ST4.8 × 16	3-4	2-3
Electric Seat Back Retaining Bolts	M10 × 20	25-35	18.5-25.9
Electric Seat Cushion Bracket Retaining Nut	M8	20-25	14.8-18.5
Electric Seat Back Adjustment Motor Retaining Bolts	M8 × 10	8.5-11.5	6.3-8.5



## 11.11.2 Description and Operation

### 11.11.2.1 Description and Operation

Driver and passenger power seat system, each includes the following components:

- Electric Seat Adjustment Switch
- Electric Seat Heating Switch (If Equipped)
- Electric Seat Heaters (Such As Equipment)
- Seat Front and Back Adjust Motor
- Seat Height Adjust Motor
- Seat Back Adjust Motor
- Seat Circuit Breaker

Through the seat adjustment switches, the seats can be adjusted to the front and back, seat cushion upward and downward, seat back forward and rearward.

A high-spec vehicle front seat is equipped with heaters. The electric seat heating can be turned on or off through the seat heating switch.

### 11.11.3 System Working Principle

#### 11.11.3.1 System Working Principle

##### Seat Adjuster Switch

seat adjuster switch motor to provides the power and ground circuit for the selected seat, drives motor to adjust the seat.

##### Motor

All seats motors work independently. The motor includes an electronic circuit breaker (PTC). The circuit breaker disconnects the circuit in overload situation and only resets when the circuit voltage is cut off. There are three seat adjustment motors. They are forward and backward adjustment motor, height adjustment motor, and seat back adjustment motor. forward and backward adjustment motor moves the whole seat forward and backward. Height adjustment motor moves the seat cushion upward or downward. Seat back adjustment motor moves the seat back forward or backward.

##### Forward and Backward Adjustment

When operating the seat adjustment switch to move whole seat forward, the battery positive voltage passes through the switch contacts and the motor forward control circuit to the motor. The ground circuit is through the backward switch contacts and the motor backward control circuit. Motor runs in order to drive the entire seat forward until the switch is released. Move the seat backward is similar. The difference is that the positive battery voltage and ground circuit is through the opposite circuits, to reverse the motor operation.

##### Height Adjustment

When the operating the seat adjustment switch to move the seat cushion upward, the battery positive voltage passes through the switch contacts and the motor upward control circuit to the motor. The ground circuit is through the downward switch contacts and the motor downward control circuit. Motor runs in order to drive the seat cushion upward until the switch is released. Move the seat downward is similar. The difference is that the positive battery voltage and ground circuit is through the opposite circuits, to reverse the motor operation.

##### Seat Back Adjustment

When operating the seat adjustment switch to move the seat back forward, the battery positive voltage passes through the switch contacts and the motor forward control circuit to the motor. The ground circuit is through the backward switch

contacts and the motor backward control circuit. Motor runs in order to drive the seat back forward until the switch is released. Move the seat backward is similar. The difference is that the positive battery voltage and ground circuit is through the opposite circuits, to reverse the motor operation.

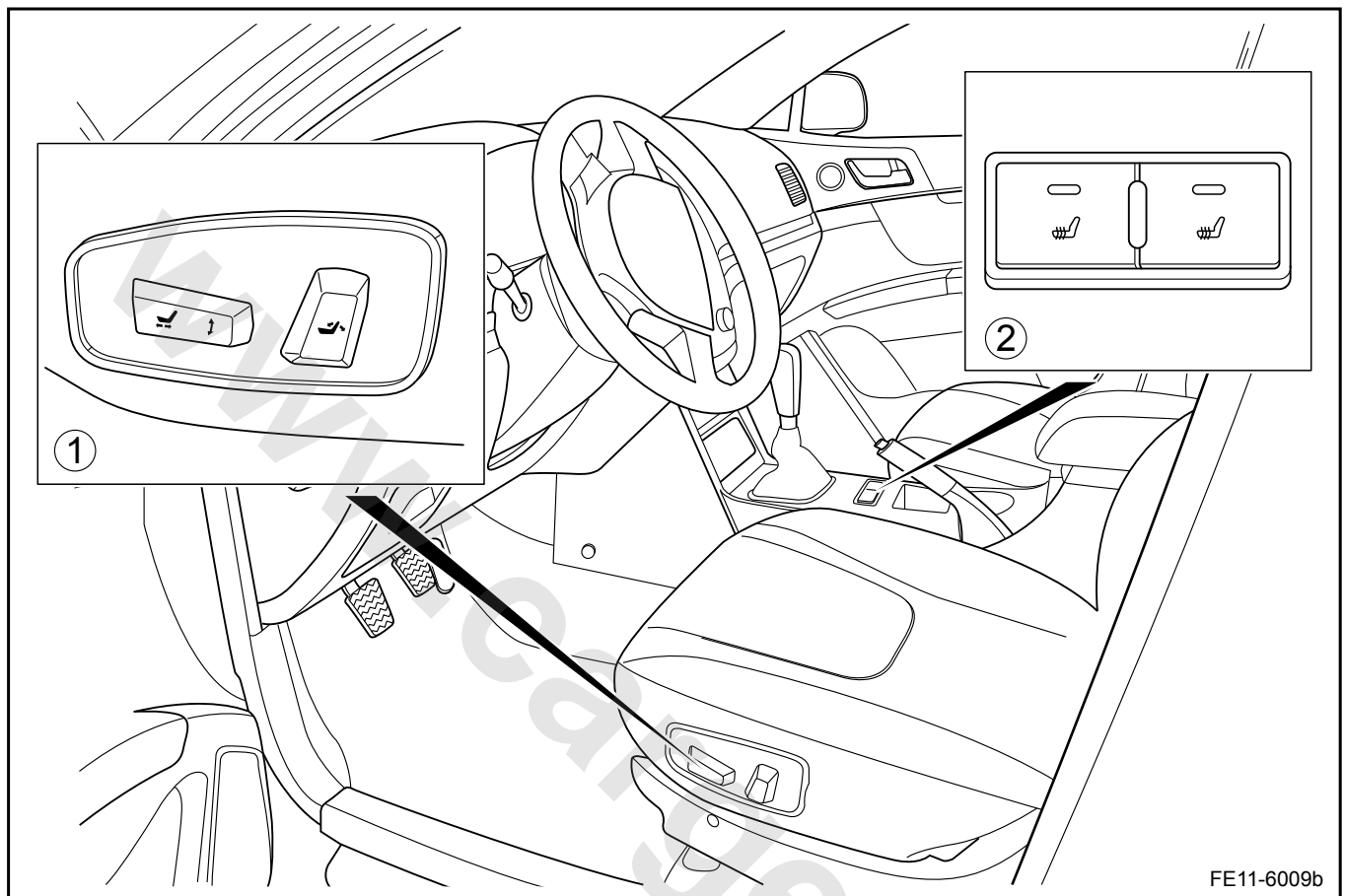
##### Seat Heating (If Equipped)

BCM receives the voltage signal from CAN bus. when the battery voltage is greater than 10.7 V, and the ignition lock switch is at the "ON" position, the seat heater enable relay is activated, seat heating is able to work. at this time if the seat heating switch is pressed, the seat heating starts. When the battery voltage is less than 10.3 V, BCM will disconnect the heated seats relay, seat heaters are not allowed work.

## 11.11.4 Component Locator

## 11.11.4.1 Component Locator

## Electric Seat Heating Switch, Electric Seat Adjustment Switch



FE11-6009b

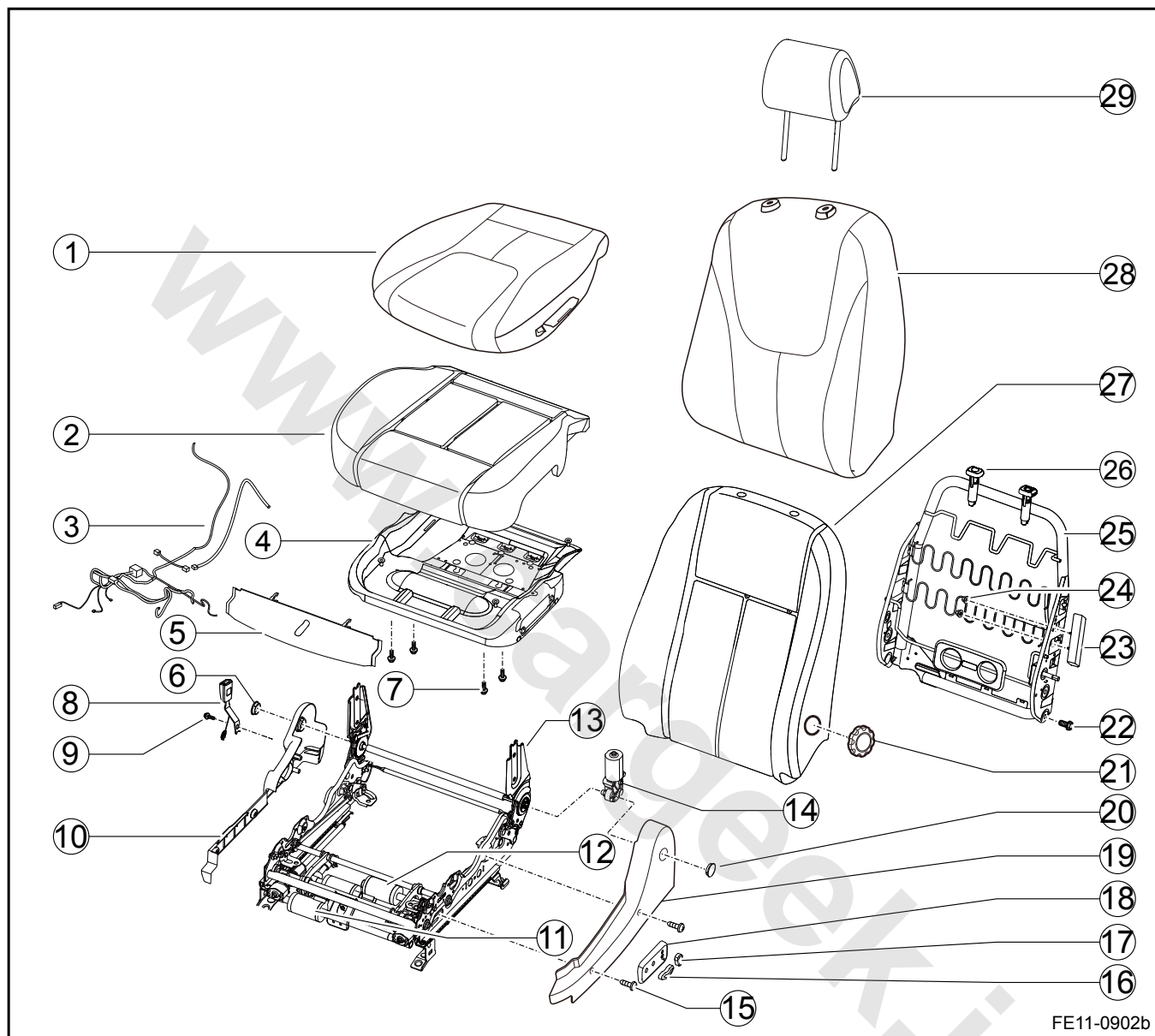
## Legend

1. Electric Seat Adjustment Switches

2. Electric Seat Heating Switches

## 11.11.5 Disassemble View

## 11.11.5.1 Disassemble View



## Legend

- |                                    |  |
|------------------------------------|--|
| 1. Seat Cover                      | 12. Seat Recliner Motor                        |
| 2. Seat Foam                       | 13. Left Front Seat Slide Rail Assembly        |
| 3. Harness                         | 14. Left Front Seat Slide Rail Assembly        |
| 4. Seat Frame                      | 15. Regulator Left Outer Cover Retaining Screw |
| 5. Left Front Seat Front Cover     | 16. Four-Way Adjustable Switch                 |
| 6. Plug                            | 17. Seat Back Adjustment Handle                |
| 7. Seat Frame Retaining Bolt       | 18. Adjustment Switch Base                     |
| 8. Seat Belt Buckle                | 19. Regulator Left Outer Trim Panel            |
| 9. Seat Belt Buckle Retaining Bolt | 20. Plug                                       |
| 10. Seat Adjuster Outer Trim Panel | 21. Seat Back Lumbar Adjustment Handle         |
| 11. Electric Motor                 | 22. Seat Back Frame Retaining Bolts            |

23. Side Airbag

24. Side Airbag Retaining Nut

25. Seat Back Frame

26. Headrest Guide Sleeve (With Control) / Headrest Guide  
Sleeve (Without Control)

27. Seat Back Foam

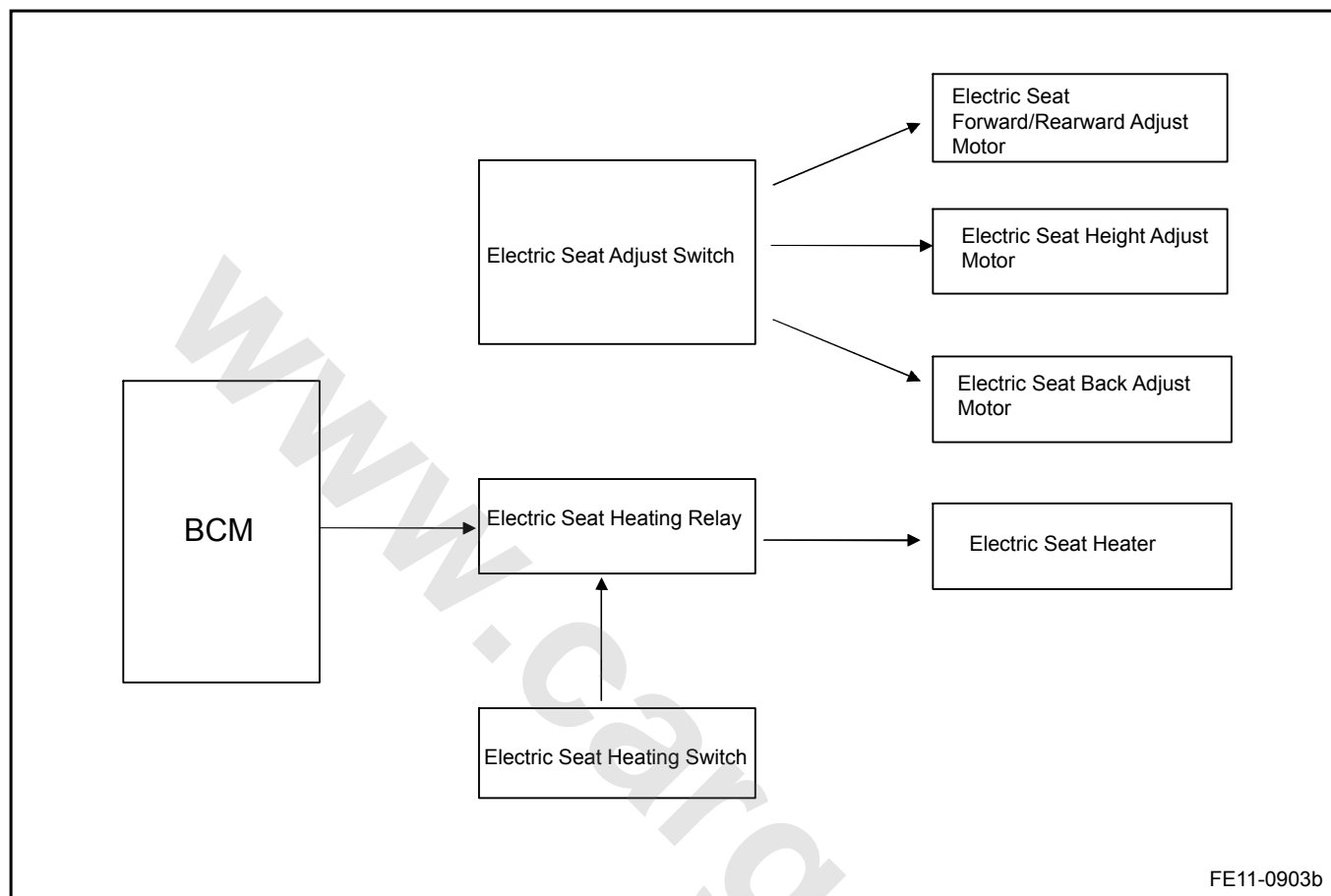
28. Seat Back Cover

29. Headrest

[www.cargeek.ir](http://www.cargeek.ir)

## 11.11.6 Schematic

## 11.11.6.1 Schematic



### 11.11.7 Diagnostic Information and Procedures

#### 11.11.7.1 Diagnosis Description

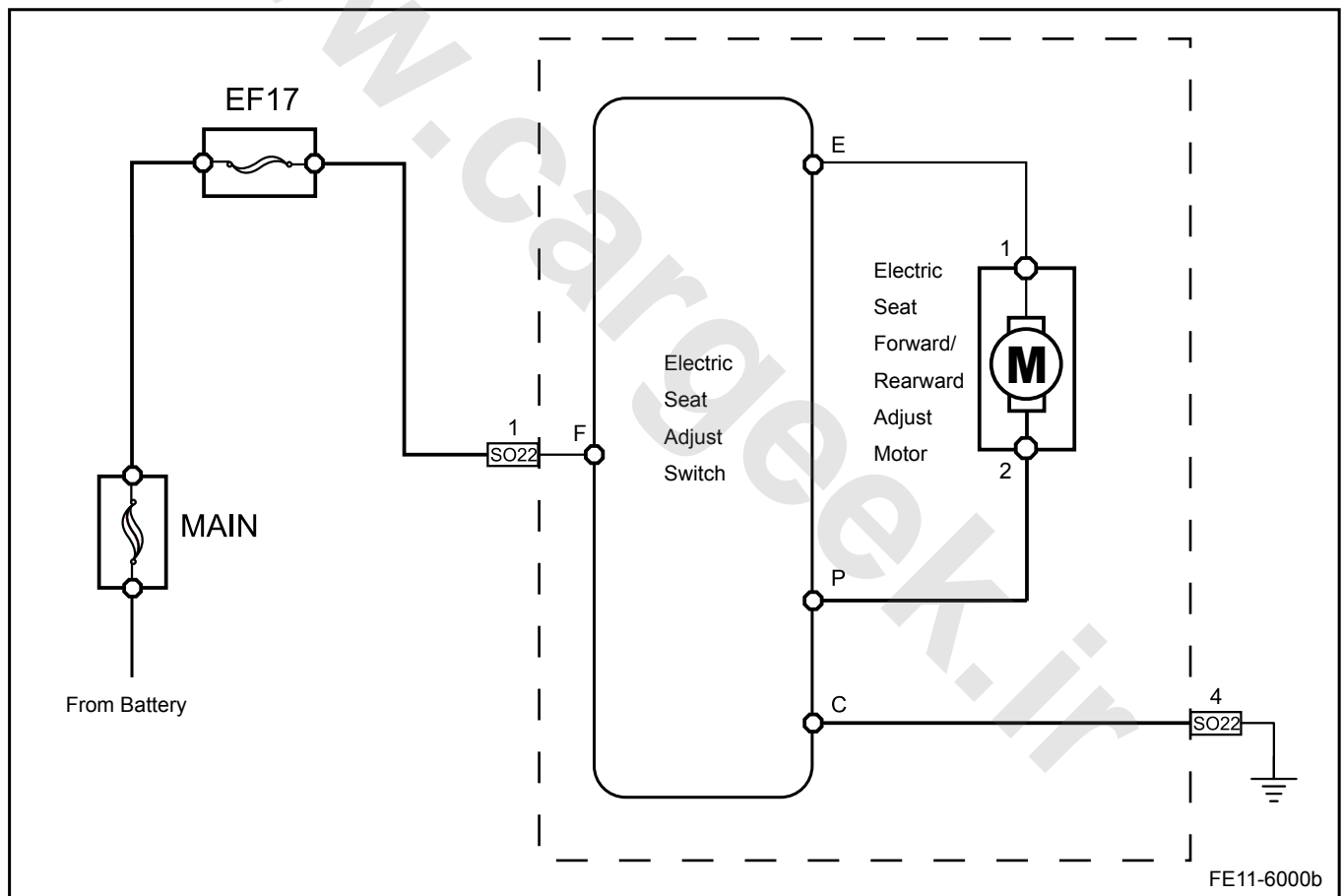
Refer to [11.11.2.1 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

#### 11.11.7.2 Visual Inspection

- Check the installed after market equipment that may affect the seats operations.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- If electric seats are inoperative, check and repair the power supply or ground circuit poor connection, or open circuit before carry out the diagnostics.

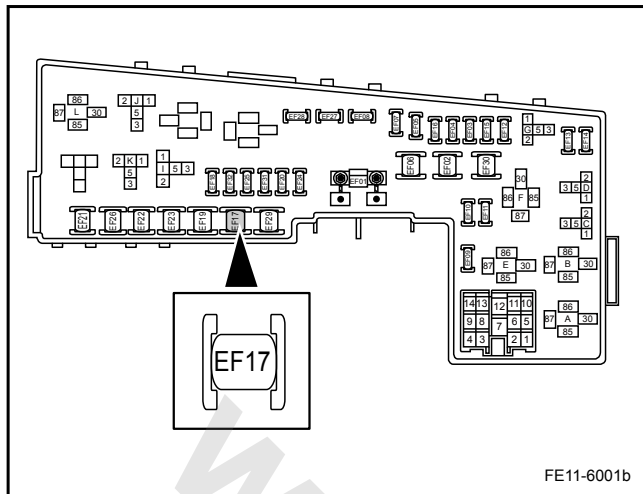
#### 11.11.7.3 Electric Seat Can Not Be Adjusted Forward and Rearward

Schematic:



Diagnostic Steps:

Step 1	Check the fuse EF17.
--------	----------------------



(a) Whether the fuse EF17 is blown.

Fuse Rating: 30 A

No

Go to step 3

Yes

Step 2 Check the fuse EF17 circuit.

- (a) Check whether there is a short circuit.  
 (b) Repair the circuits. Confirm that there are no short circuits.  
 (c) Replace with fuses with rated current.  
 Is the electric seat working correctly?

Yes

System normal

No

Step 3 Check the electric seat forward and rearward adjustment switch.

- (a) Operate the electric seat forward and rearward adjustment switch.  
 (b) At the same time, measure voltage between the electric seat adjustment switch socket P and E with a multimeter.

Test Terminal	Test Conditions	Standard Voltage
P-E	Forward	11-14 V
P-E	Rearward	11-14 V

Is the voltage specified value?

Yes

Go to step 5

No

Step 4 Replace the electric seat adjustment switches.

- (a) Replace the electric seat adjustment switches. Refer to [11.11.8.9 Electric Seat Adjustment Switch Replacement](#).

Is the electric seat working correctly?

Yes

System normal



No

Step 5 Check the electric seat forward and rearward adjustment motor.

- (a) Operate the electric seat forward and rearward adjustment switch.

**Note**

Do not disconnect the electric seat forward and rearward adjustment motor wiring harness connector.

- (b) At the same time, measure the electric seat forward and rearward adjustment motor wiring harness connector terminal No.1 and 2 voltage with a multimeter.

Test Terminal	Test Conditions	Standard Voltage
1-2	Forward	11-14 V
1-2	Rearward	11-14 V

Is the voltage specified value?

Yes

Go to step 7

No

Step 6 Replace the electric seat forward and rearward adjustment motor.

- (a) Replace the electric seat forward and rearward adjustment motor. Refer to [11.11.8 Electric Seat Frame Assembly Replacement](#).

Is the electric seat working correctly?

Yes

System normal

No

Step 7 Repair the open circuit between the electric seat adjustment switch and the electric seat forward and rearward motor.

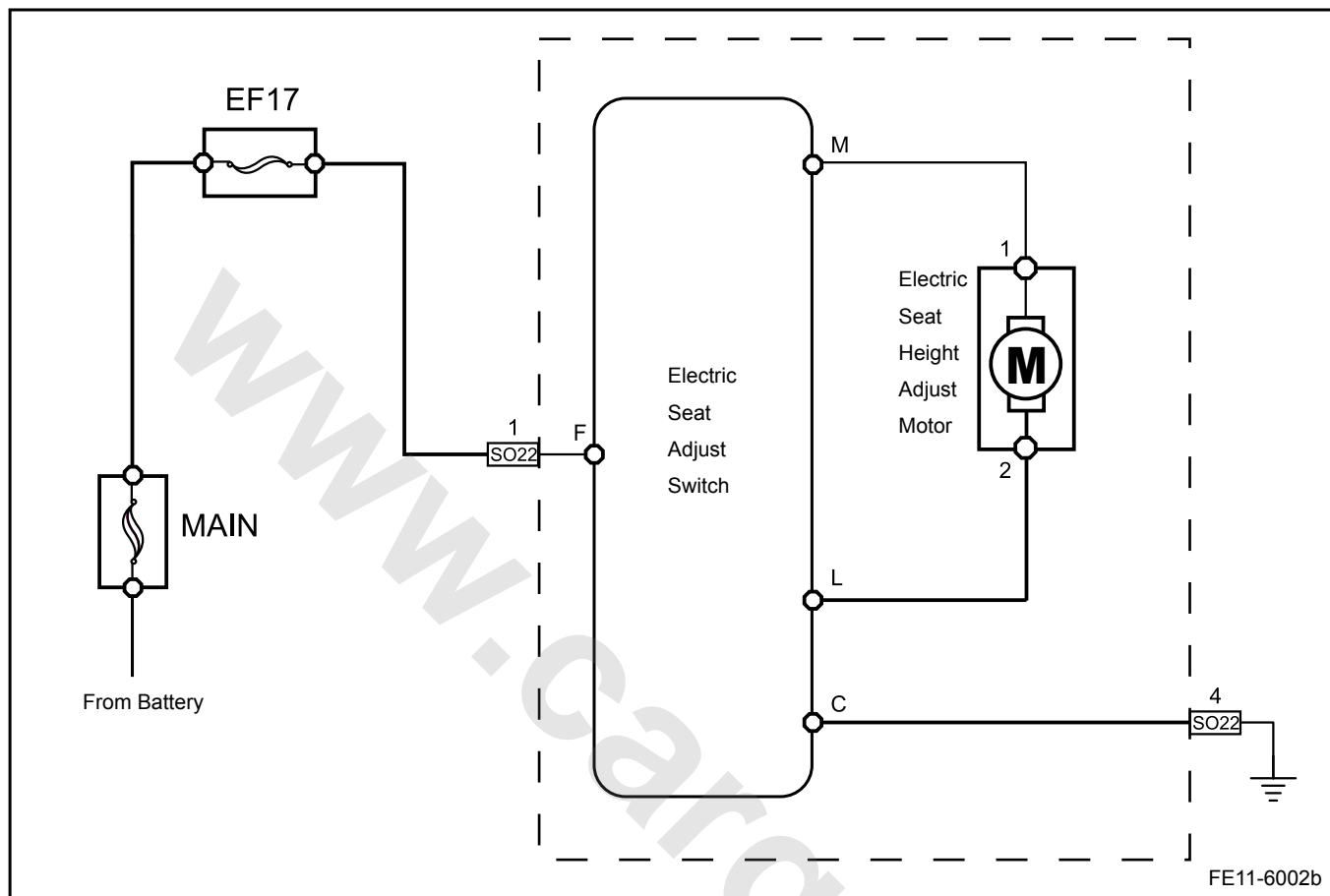
- (a) Check the circuit between the electric seat adjustment switch and the electric seat forward and rearward motor.
- (b) Repair the open circuit.
- Confirm the repair completed.

Next

Step 8 System normal.

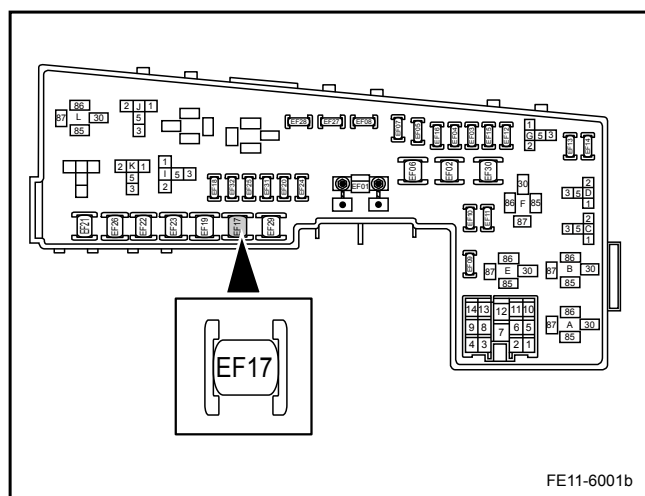
## 11.11.7.4 Electric Seat Height Can Not Be Adjusted

Schematic:



Diagnostic Steps:

Step 1	Check the EF17 fuse.
--------	----------------------



(a) Whether the fuse EF17 is blown.  
Check the Fuse Rated Current: 30 A

No

Go to step 3

Yes

Step 2 Check the fuse EF17 circuit.

- (a) Check whether there is a short circuit.
- (b) Repair the circuits. Confirm that there are no short circuits.
- (c) Replace with fuses with rated current.

Is the electric seat working correctly?

Yes

System normal

No

Step 3 Check the electrical seat height adjustment switch.

- (a) Operate the electric seat height adjustment switch.
- (b) At the same time, measure voltage between the electric seat adjustment switch socket M and L with a multimeter.

Test Terminal	Test Conditions	Standard Voltage
M-L	Up	11-14 V
M-L	Down	11-14 V

Is the voltage specified value?

Yes

Go to step 5

No

Step 4 Replace the electric seat adjustment switch.

- (a) Replace the electric seat adjustment switch. Refer to [11.11.8.9 Electric Seat Adjustment Switch Replacement](#).

Is the electric seat working correctly?

Yes

System normal

No

Step 5 Check the electric seat height adjustment motor.

- (a) Operate the electric seat forward and rearward adjustment switch.

#### Note

**Do not disconnect the height adjustment motor harness connector.**

- (b) At the same time, measure voltage between the electric seat height adjustment motor wiring harness connector terminals No.1 and 2 with a multimeter.

Test Terminal	Test Conditions	Standard Voltage
1-2	Up	11-14 V

1-2

Down

11-14 V

Is the voltage specified value?

Yes

Go to step 7

No

Step 6 Replace the electric seat height adjustment motor.

- (a) Replace the electric seat height adjustment motor. Refer to [11.11.8.8 Electric Seat Frame Assembly Replacement](#).

Is the electric seat working correctly?

Yes

System normal

No

Step 7 Repair the open circuit between the electric seat adjustment switch and the electric seat height adjustment motor.

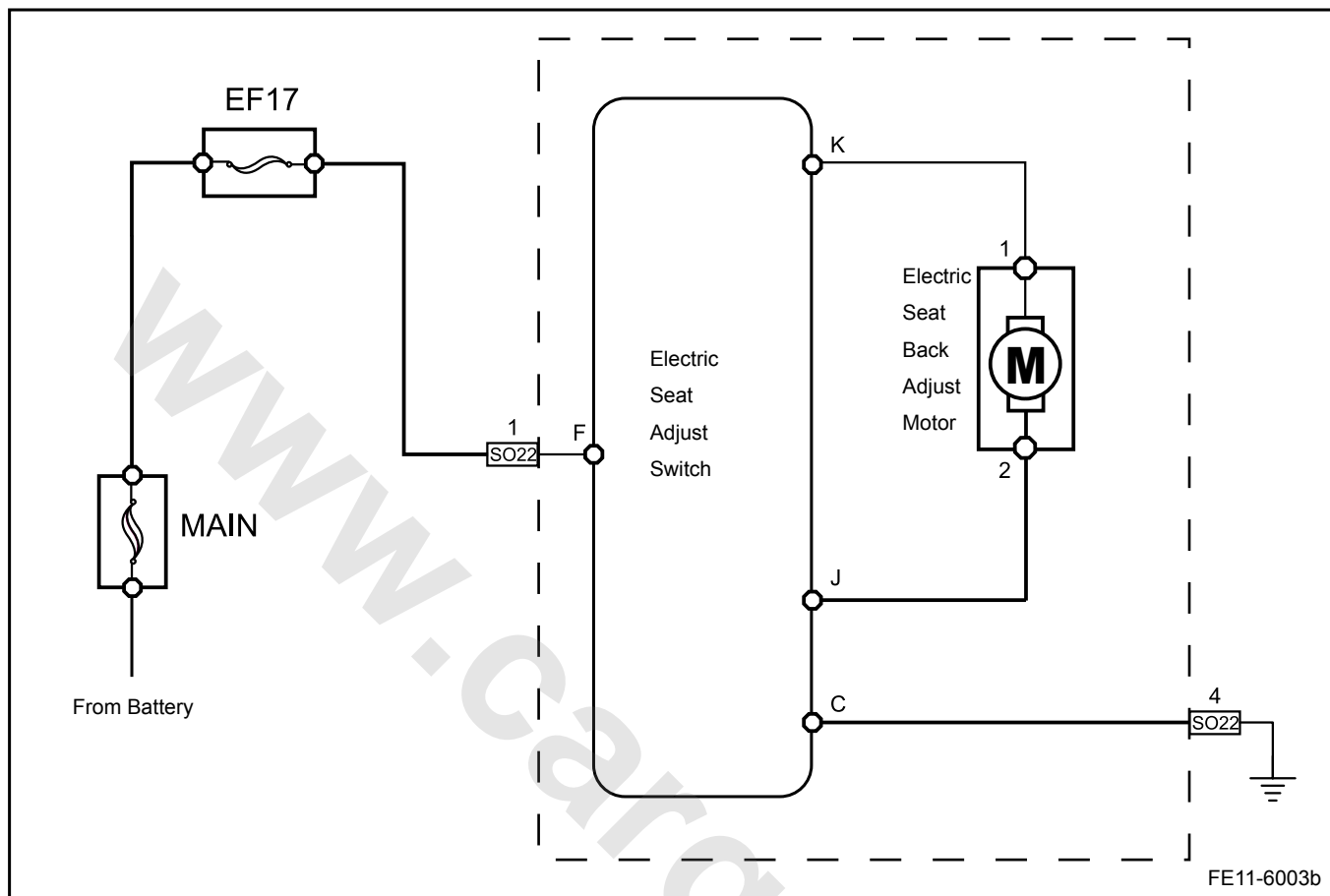
- (a) Check the circuit between the electric seat adjustment switch and height adjustment motor.
- (b) Repair the open circuit.
- Confirm the repair completed.

Next

Step 8 System normal.

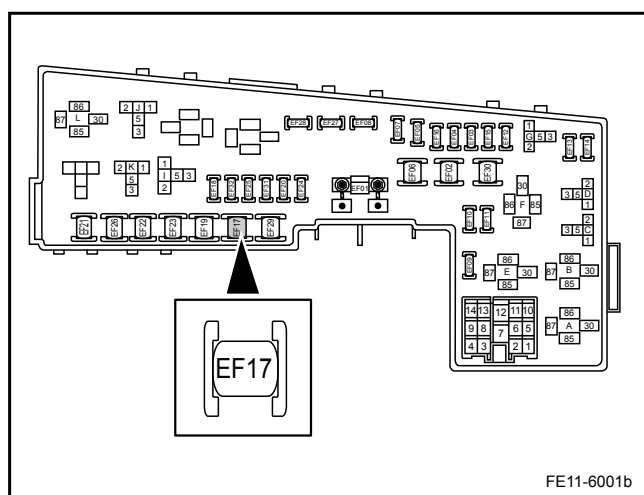
## 11.11.7.5 Electric Seat Back Can Not Be Adjusted

Schematic:



Diagnostic Steps:

Step 1	Check the EF17 fuse.
--------	----------------------



(a) Check whether the fuse EF17 is blown.

Fuse Rated Current: 30 A

No

Go to step 3

Yes

Step 2	Check the fuse EF17 circuit.
--------	------------------------------

- (a) Check whether there is a short circuit.
- (b) Repair the circuits. Confirm that there are no short circuits.
- (c) Replace with fuses with rated current.

Is the electric seat working correctly?

Yes

System normal

No

Step 3 Check the electric seat back adjustment switch.

- (a) Operate the electric seat back adjustment switch.
- (b) At the same time, measure voltage between electric seat adjustment switch sockets K and J with a multimeter.

Test Terminal	Test Conditions	Standard Voltage
K-J	Forward	11-14 V
K-J	Rearward	11-14 V

Is the voltage specified value?

Yes

Go to step 5

No

Step 4 Replace the electric seat adjustment switches.

- (a) Replace the electric seat adjustment switches. Refer to [11.11.8.9 Electric Seat Adjustment Switch Replacement](#).

Is the electric seat working correctly?

Yes

System normal

No

Step 5 Check the seat back adjustment motor.

- (a) Operate the electric seat forward and rearward adjustment switch.
- (b) At the same time, measure voltage between the electric seat back adjustment motor harness connector terminals No.1 and 2 with a multimeter.

Test Terminal	Test Conditions	Standard Voltage
1-2	Forward	11-14 V
1-2	Rearward	11-14 V

Is the voltage specified value?

Yes

Go to step 7

No

Step 6 Replace the power seat back adjustment motor.

- (a) Replace the power seat back adjustment motor. Refer to [11.11.8.3 Electric Seat Back Adjustment Motor Replacement](#).

Is the electric seat working correctly?

Yes

System normal

No

Step 7 Repair the open circuit between the electric seat adjustment switch and the electric seat back adjustment motor.

- (a) Check the circuit between the electric seat adjustment switch and the electric seat back adjustment motor.  
(b) Repair the open circuit.

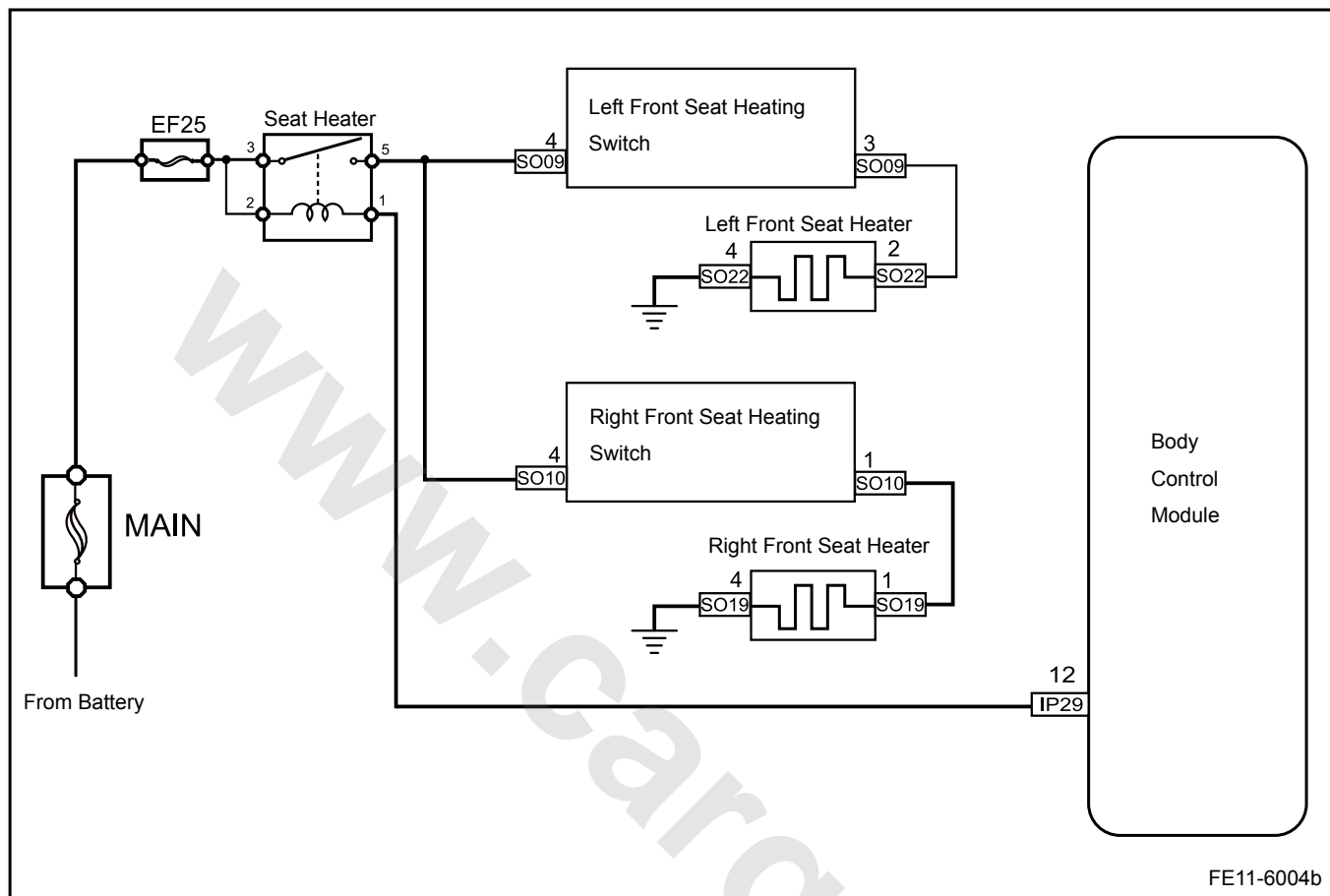
Confirm the repair completed.

Next

Step 8 System normal.

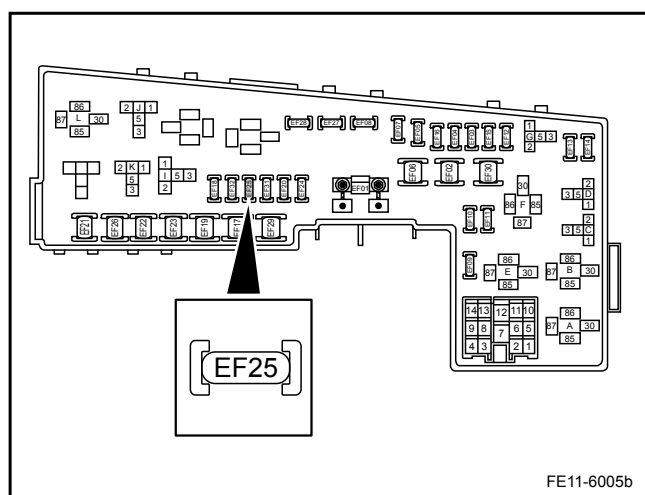
## 11.11.7.6 Left Front Electric Seat Can Not Be Heated

Schematic:

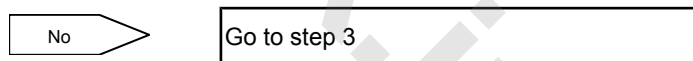


Diagnostic Steps:

Step 1	Check the fuse EF25.
--------	----------------------



- (a) Check whether the fuse EF25 is blown.  
Fuse Rated Current: 15 A





Yes

Step 2 Check the fuse EF25 circuit.

- (a) Check whether there is a short circuit.
- (b) Repair the circuits. Confirm that there are no short circuits.
- (c) Replace with fuses with rated current.

Is the heating function working correctly.

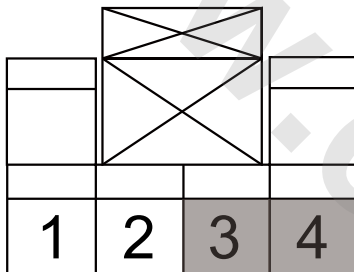
Yes

System normal

No

Step 3 Check the left front seat heating switch.

Left Front Seat Heating Switch Harness Connector SO09



FE11-6006b

- (a) Press the left front seat heating switch.
- (b) At the same time, test continuity between the left front seat heating switch wiring harness connector SO09 terminals No. 3 and 4 with a multimeter.

Test Terminal	Test Conditions	Continuity
3-4	Release	10 kΩ or higher
3-4	Press	Less than 1 Ω

Is the resistance specified value?

Yes

Go to step 5

No

Step 4 Replace the left front seat heating switch.

- (a) Replace the left front seat heating switch. Refer to [11.11.8.7 Seat Heating Switch Replacement](#).

Is the heating function working correctly.

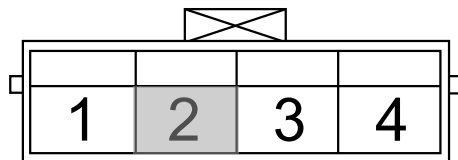
Yes

System normal

No

Step 5 Check the left front seat heater.

## Left Front Seat Harness Connector SO22



FE11-6007b

- (a) Press the left front seat heating switch.  
 (b) At the same time, measure the left front seat harness connector SO22 terminals No.2 voltage with a multimeter.  
 Standard Voltage: 11-14 V  
 Is the voltage specified value?

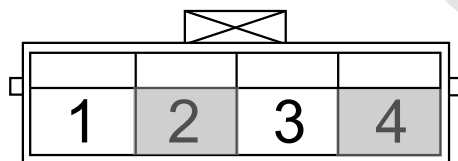
Yes

Go to step 7

No

Step 6 Check the left front seat heater circuit.

## Left Front Seat Harness Connector SO22



FE11-6008b

- (a) Disconnect the left front seat harness connector SO22.  
 (b) Check terminals No.2 and 4 continuity with a multimeter.

Test Terminal	Continuity
SO09 3-SO22 2	Less than 1 $\Omega$
Body Ground-SO22 4	Less than 1 $\Omega$

Is the resistance specified value?

Yes

Go to step 8

No

Step 7 Repair the left front seat heater open circuit.

- (a) Repair the open circuit.  
 Is the heating function working correctly?

Yes

System normal

No

Step 8 Replace the left front seat heater.

- (a) Replace the left front seat heater. Refer to [11.11.8.6 Electric Seat Cushion Replacement](#).  
 Confirm the repair completed.

Next

Step 9 System normal.

Note

Right front seat can not be heated diagnostic steps are similar.

[www.cargeek.ir](http://www.cargeek.ir)

### 11.11.8 Removal and Installation

#### 11.11.8.1 Front Electric Seat Replacement

##### Removal Procedure

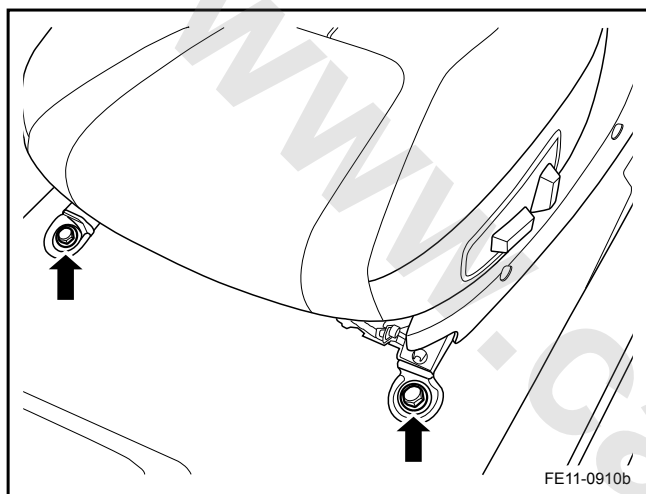
##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

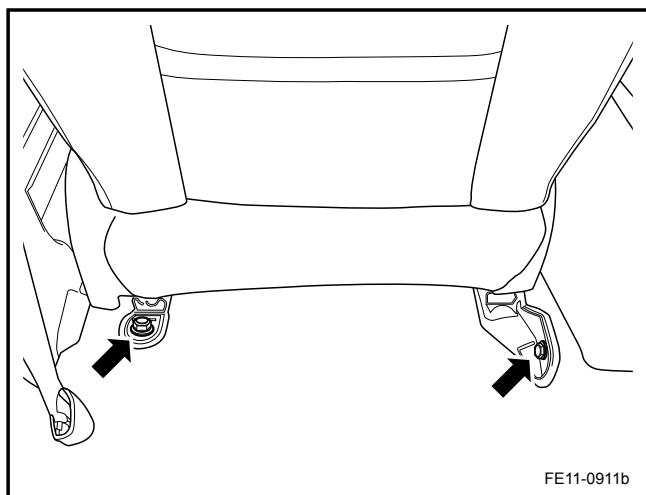
##### Warning!

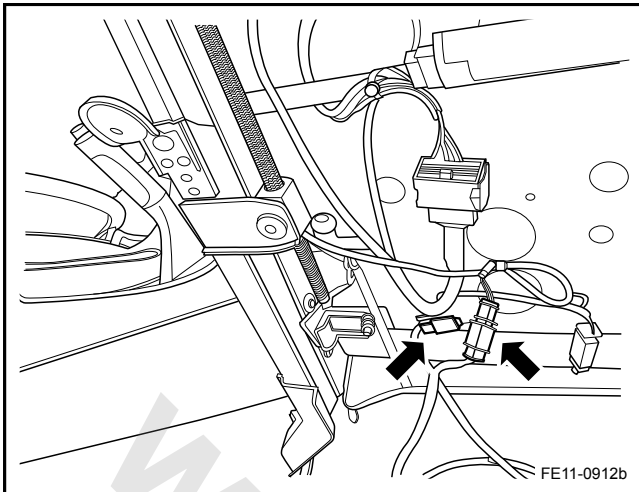
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the front seat front retaining bolts.

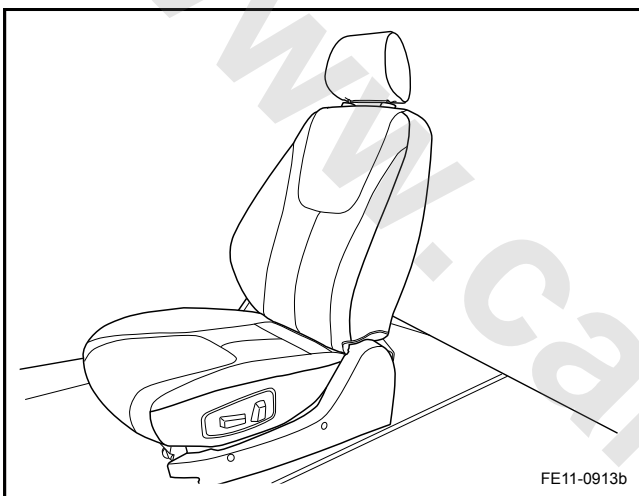


3. Remove the front seat rear retaining bolts.





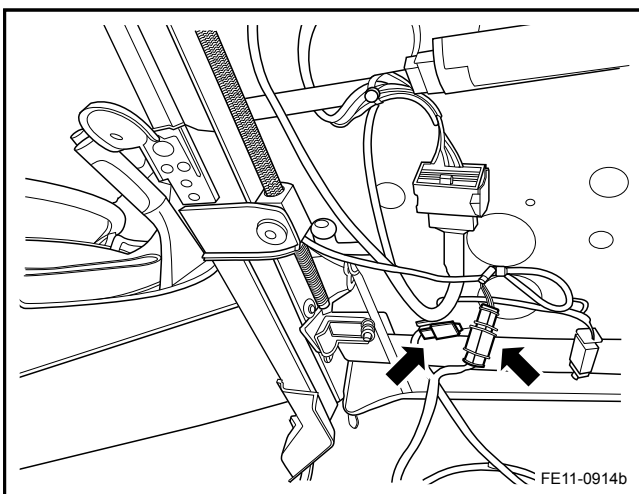
4. Disconnect the front seat bottom harness connector.

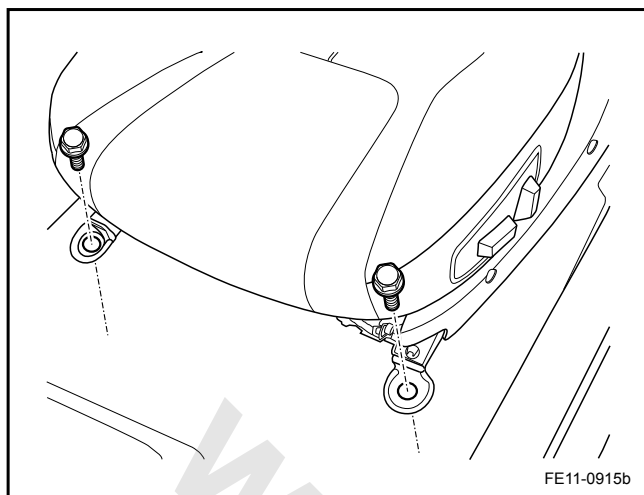


5. Remove the front seat.

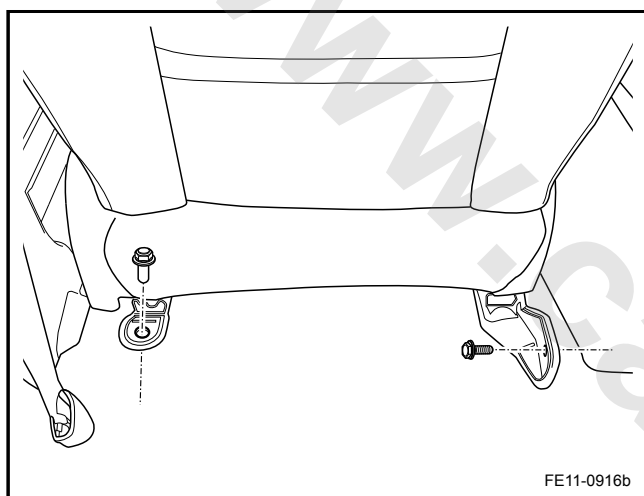
#### Installation Procedure:

1. Install the front seat.
2. Connect the front seat bottom harness connector.





3. Install the front seat front retaining bolts.  
Torque: 47 Nm (Metric) 35 lb-ft (US English)

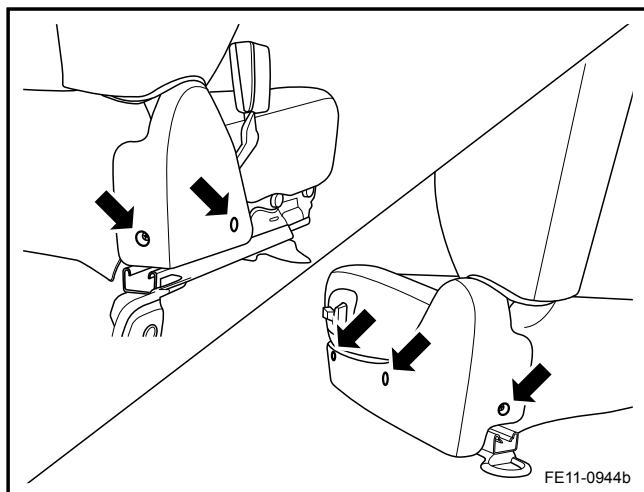


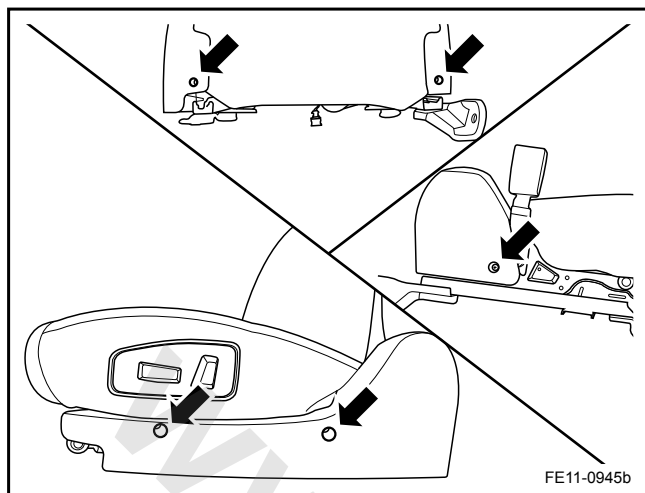
4. Install the front seat rear retaining bolts.  
Torque: 47 Nm (Metric) 35 lb-ft (US English)
5. Connect the battery negative cable.

### 11.11.8.2 Seat Side Trim Panel Replacement

#### Removal Procedure

1. Remove the electric seat. Refer to [11.11.8.1 Front Electric Seat Replacement](#).
2. Remove the seat side trim panel screws.





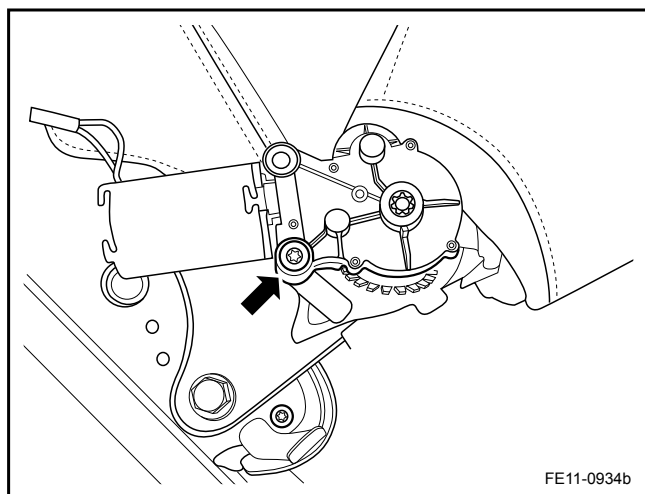
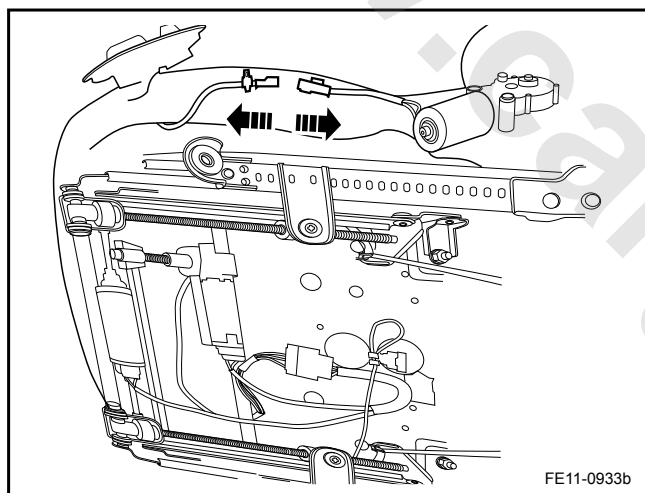
## Installation Procedure:

1. Install the seat side trim panel and tighten the retaining screws.  
Torque: 3.5 Nm (Metric) 2.6 lb-ft (US English)
2. Install the electric seat.

## 11.11.8.3 Electric Seat Back Adjustment Motor Replacement

## Removal Procedure

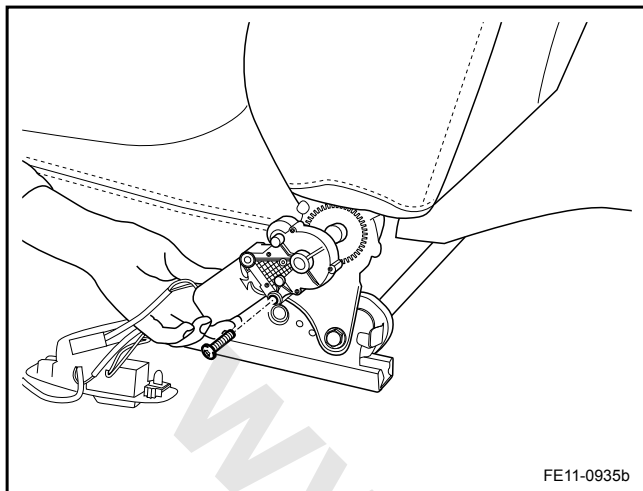
1. Remove the electric seat. Refer to [11.11.8.1 Front Electric Seat Replacement](#).
2. Remove the seat side trim panel. Refer to [11.11.8.2 Seat Side Trim Panel Replacement](#).
3. Disconnect the seat back adjustment motor wiring harness connector.
4. Remove the seat back adjustment motor retaining bolts and remove the adjustment motor.



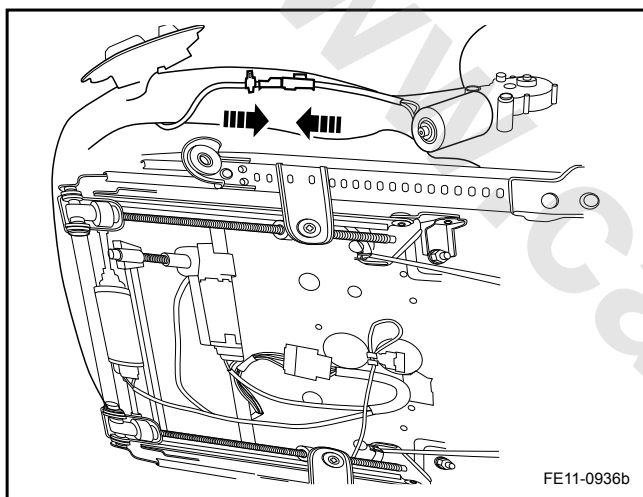
## Installation Procedure:

1. Insert the motor and tighten the adjustment motor retaining bolts.

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)



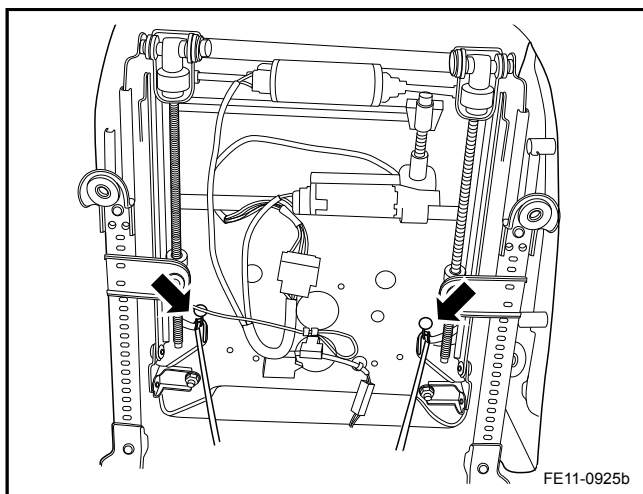
2. Connect the seat back adjustment motor wiring harness connector.
3. Install the seat side trim panel.
4. Install the electric seat.



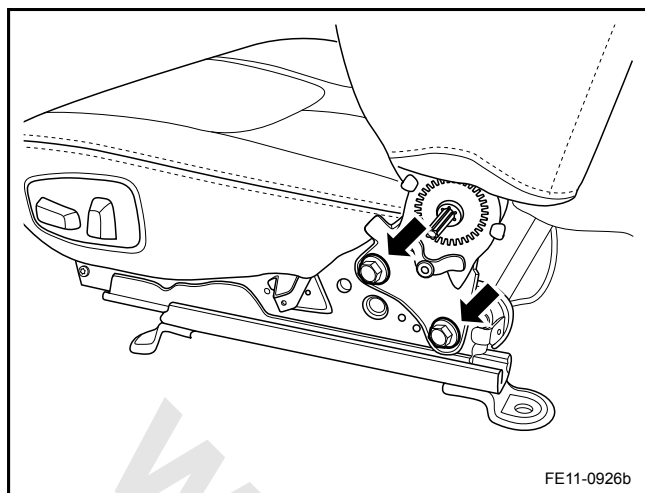
## 11.11.8.4 Electric Seat Back Replacement

## Removal Procedure

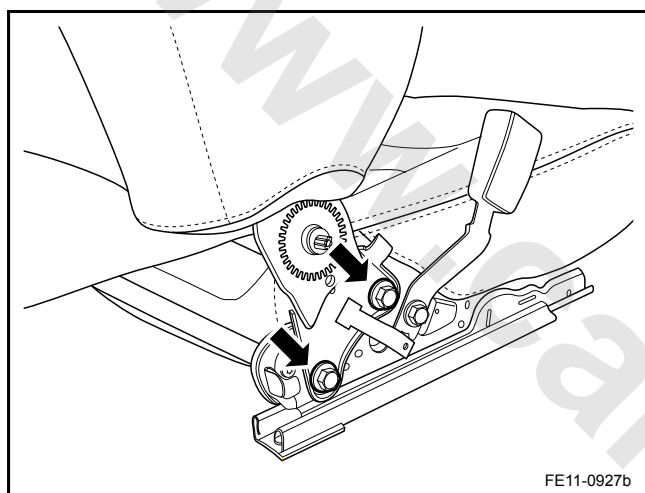
1. Remove the electric seat. Refer to [11.11.8.1 Front Electric Seat Replacement](#).
2. Remove the seat side trim panel. Refer to [11.11.8.2 Seat Side Trim Panel Replacement](#).
3. Remove the electric seat back adjustment motor. Refer to [11.11.8.3 Electric Seat Back Adjustment Motor Replacement](#).
4. Remove the seat back cover clips.



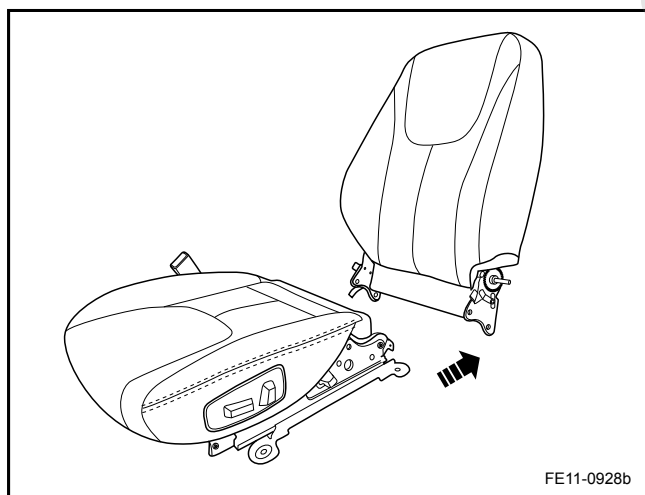




5. Remove the seat back left side retaining bolts.



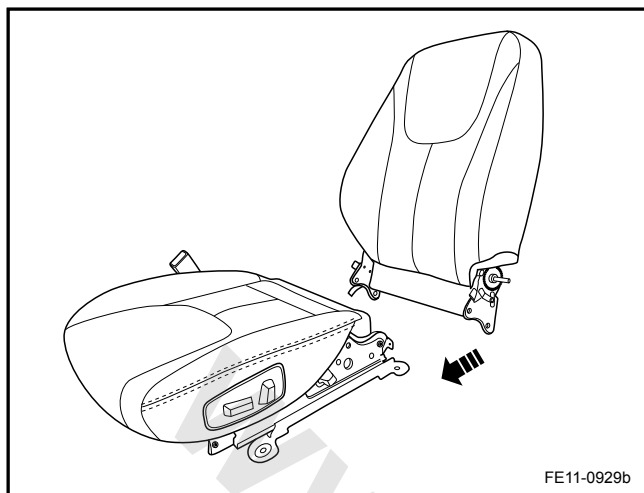
6. Remove the seat back right side retaining bolts.



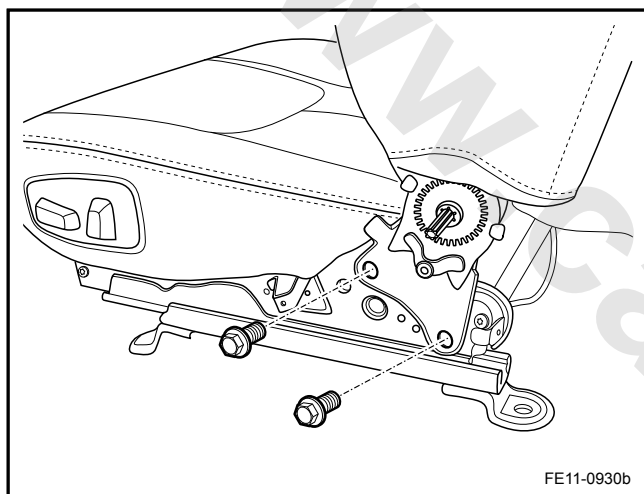
7. Remove the seat back.

Installation Procedure:

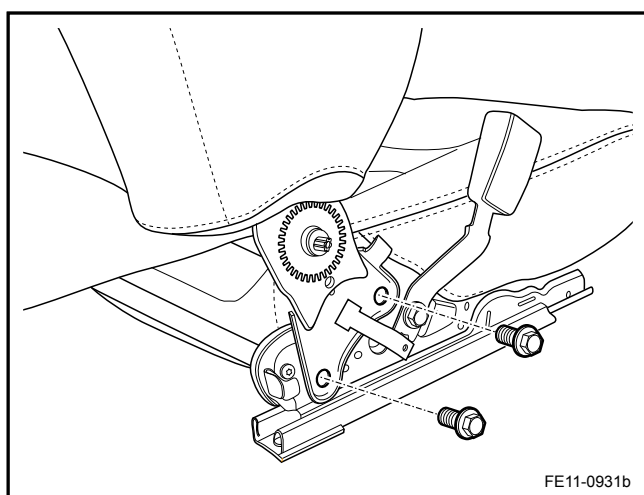
1. Install seat back.

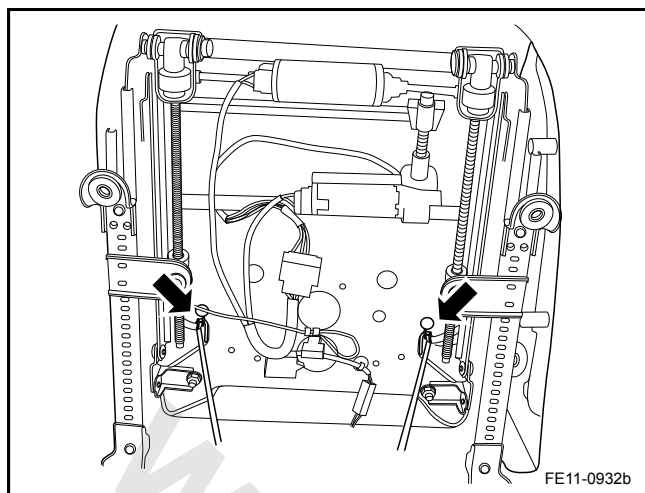


2. Install the seat back left side retaining bolts.  
Torque: 30 Nm (Metric) 22 lb-ft (US English)



3. Install the seat back right side retaining bolts.  
Torque: 30 Nm (Metric) 22 lb-ft (US English)



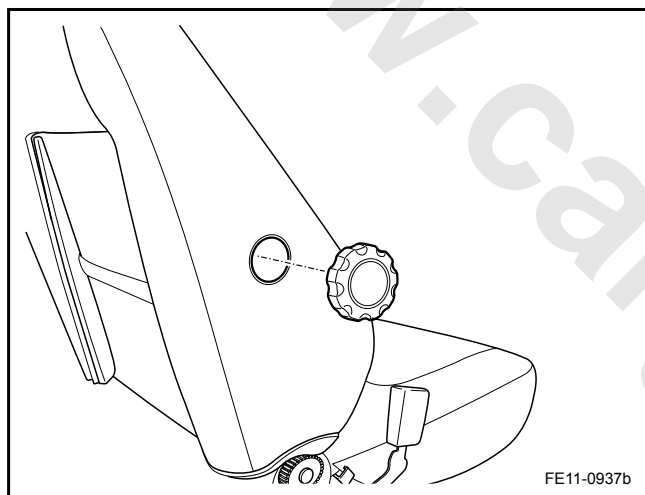


4. Install the seat back cover and clips.
5. Install the electric seat back adjustment motor.
6. Install the seat side trim panel.
7. Install the electric seat.

#### 11.11.8.5 Front Seat Lumbar Support Knob Replacement

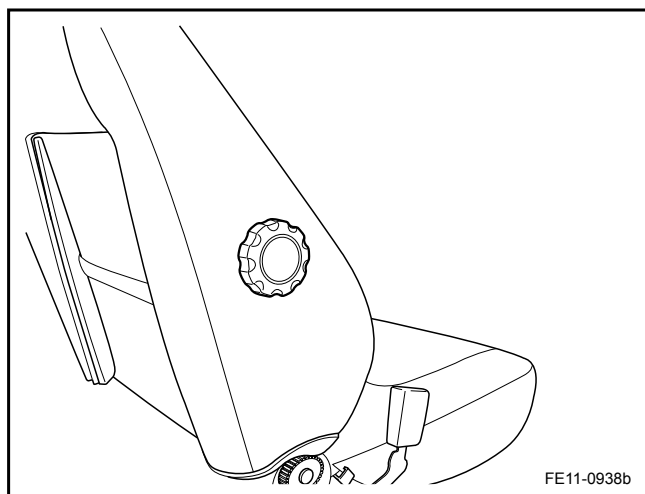
##### Removal Procedure

1. Pull the lumbar support knob.



##### Installation Procedure:

1. Press the lumbar support knob into position.



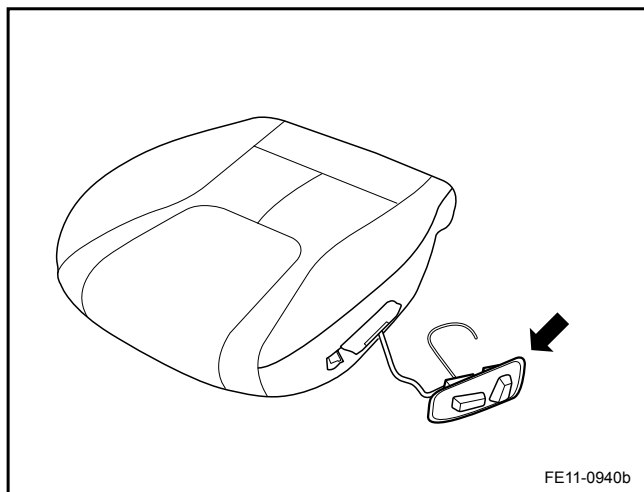
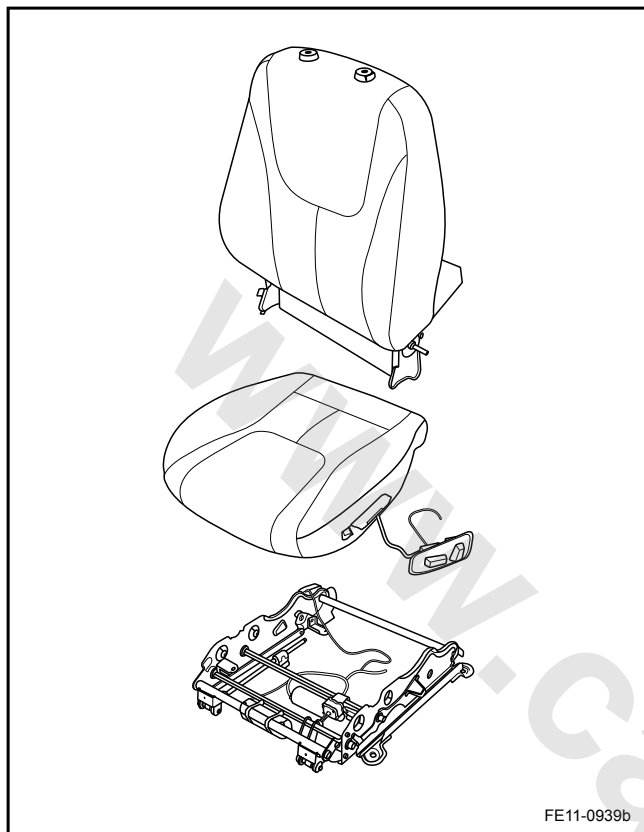
### 11.11.8.6 Electric Seat Cushion Replacement

#### Removal Procedure

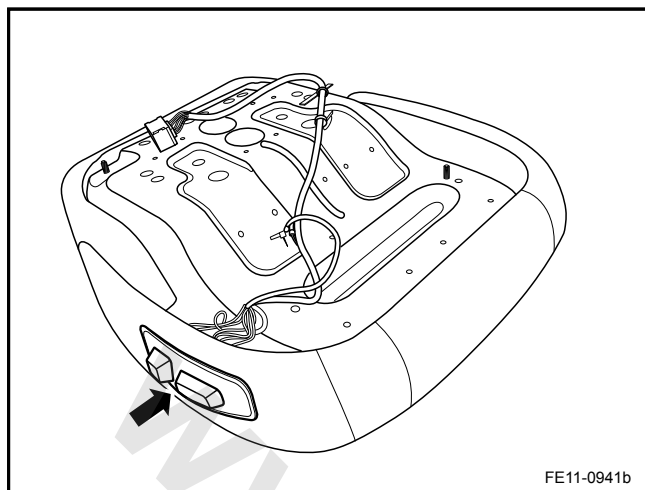
1. Remove the electric seat adjustment assembly. Refer to [11.11.8.8 Electric Seat Frame Assembly Replacement](#).

#### Note

Heaters and cushions are integrated.



2. Remove the seat adjustment switch panel, pull out seat adjustment switch wiring harness.

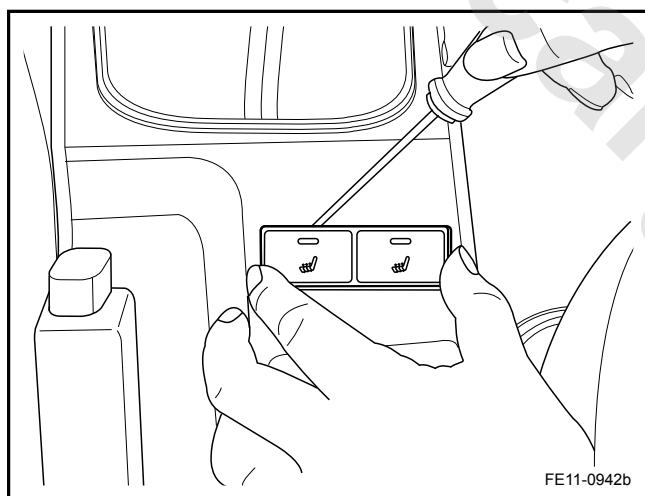
**Installation Procedure:**

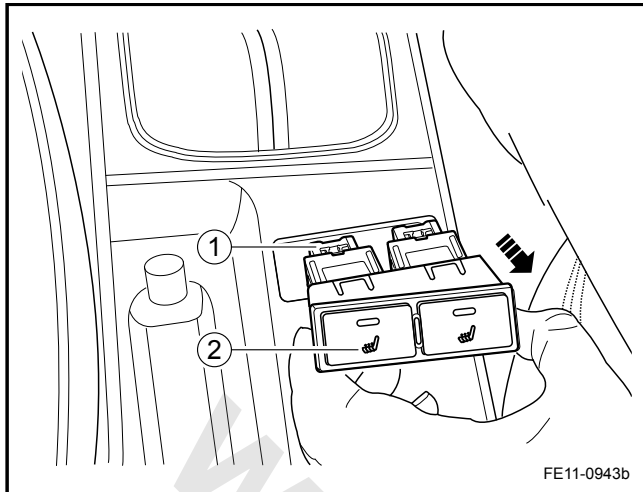
1. Run through the seat adjustment switch wiring harness and install the seat adjustment switch panel.
2. Install the electric seat adjustment switch assembly.

**11.11.8.7 Seat Heating Switch Replacement****Removal Procedure****Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the seat heating switch panel.





3. Disconnect the seat heating switch wiring harness connector (1).
4. Remove the seat heating switch (2).

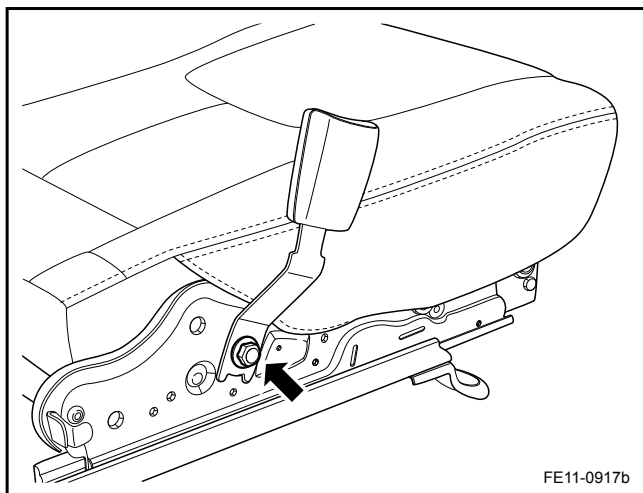
#### Installation Procedure:

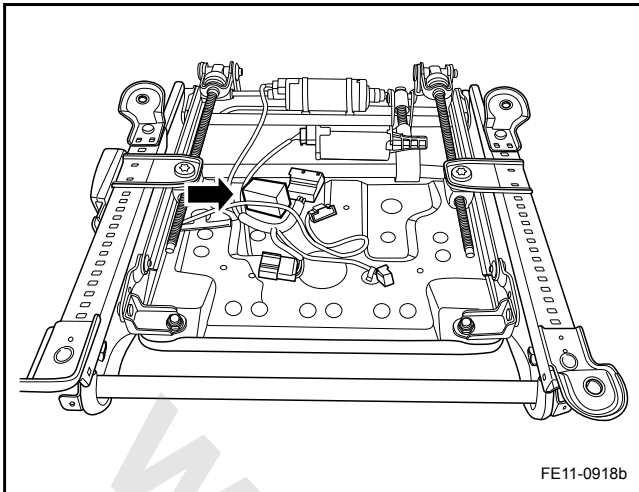
1. Press the seat heating switch into position.
2. Connect the seat heating switch wiring harness connector.
3. Install the seat heating switch panel.
4. Connect the battery negative cable.

#### 11.11.8.8 Electric Seat Frame Assembly Replacement

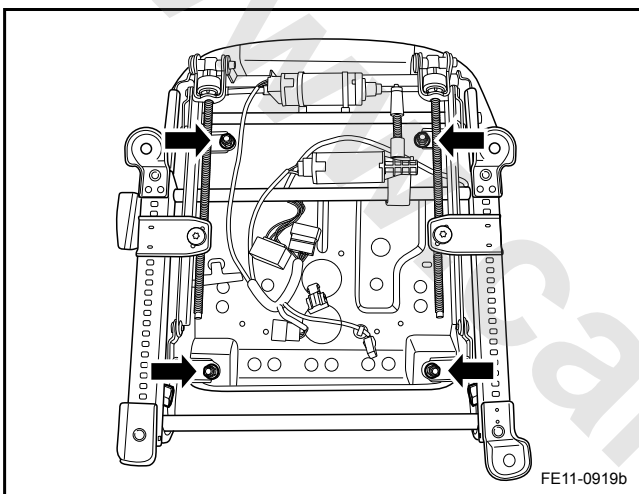
##### Removal Procedure

1. Remove the electric seat. Refer to [11.11.8.1 Front Electric Seat Replacement](#).
2. Remove the seat side trim panel. Refer to [11.11.8.2 Seat Side Trim Panel Replacement](#).
3. Remove the electric seat back adjustment motor. Refer to [11.11.8.3 Electric Seat Back Adjustment Motor Replacement](#).
4. Remove the electric seat back. Refer to [11.11.8.4 Electric Seat Back Replacement](#).
5. Remove the seat belt buckle, remove the seat belt warning switch harness.

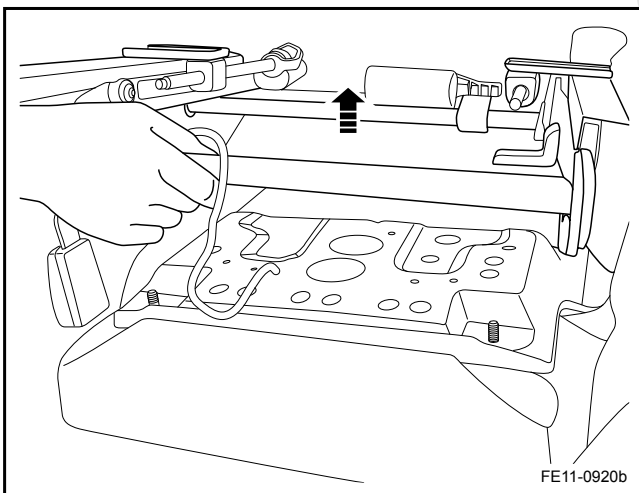




6. Remove the harness retaining clip, disconnect the wiring harness connector between the seat adjustment switch and the seat adjustment motor.



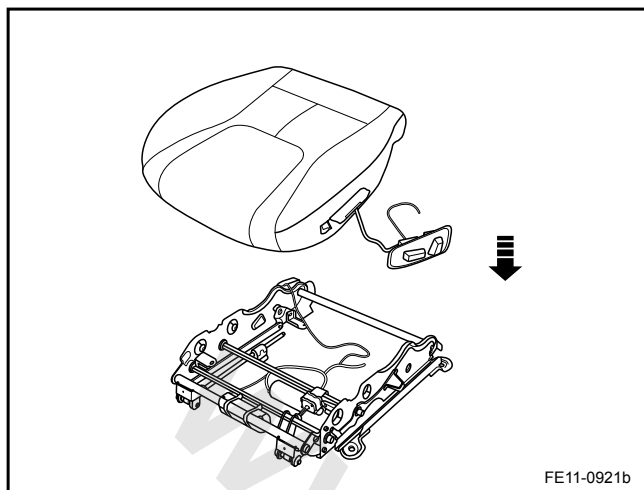
7. Remove the seat cushion to seat frame retaining nut.



8. Separate the seat cushion and seat frame.

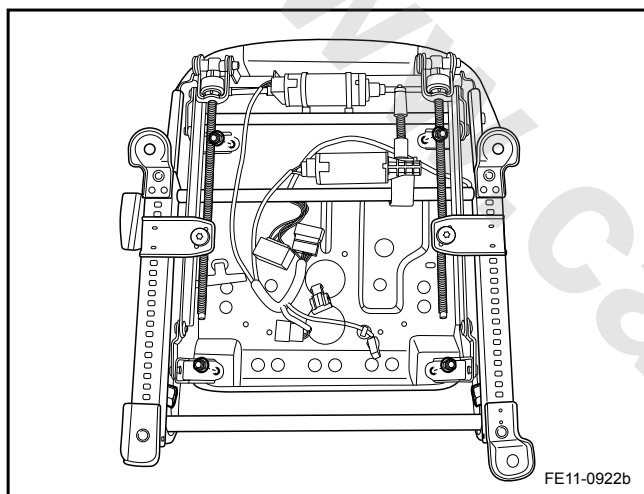
Installation Procedure:

1. Assemble the seat cushion and the seat frame.

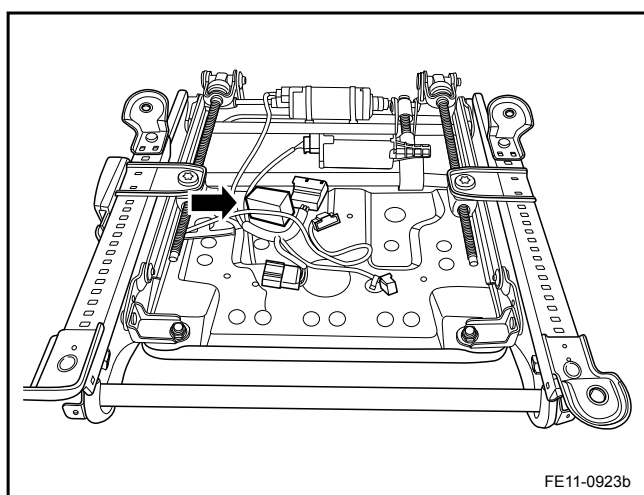


2. Install the seat cushion and seat frame assembly.

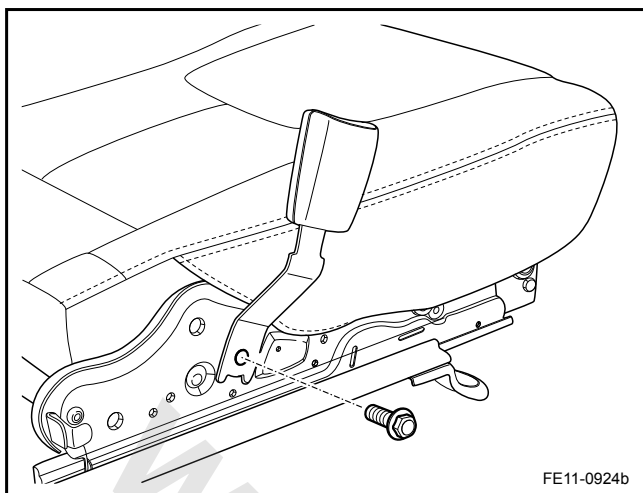
Torque: 20 Nm (Metric) 15 lb-ft (US English)



3. Connect the wiring harness connector between the seat adjustment switch and the seat adjustment motor.







4. Install the seat belts buckle, run through the seat belt warning switch harness, retain the seat bottom wiring harness.
5. Install the electric seat back.
6. Install the electric seat back adjustment motor.
7. Install the seat side trim panel.
8. Install the electric seat.

#### 11.11.8.9 Electric Seat Adjustment Switch Replacement

1. Refer to [11.11.8.6 Electric Seat Cushion Replacement](#).

## 11.12 Defrosting

### 11.12.1 Specifications

#### 11.12.1.1 Defroster Working Condition Requirements

Ignition Switch Status	Battery Voltage (V)	Defrost Working Condition
OFF	-	OFF
ON	>10.7	Normal
ACC / ON / START	<10.3	Stop Working

## 11.12.2 Description and Operation

### 11.12.2.1 Description and Operation

Defroster system main components include following:

- Defrost Button (Air-Conditioning Panel)
- Air-Conditioning Control Module
- Left and Right Outside Rearview Mirror Heater
- Rear Window Heater

Defrost button is located on the air-conditioning control panel.

The rear window heater is located on the rear window. The left and right rearview mirrors are integrated with heaters.

### 11.12.3 System Working Principle

#### 11.12.3.1 Working Principle

The defrost button located on the air-conditioning control panel sends defrosting request signals to the air-conditioning control module. air-conditioning control module receives the defrosting signal and then send it to the BCM. BCM controls the rear window defroster grille and the left and right rearview mirror heaters.

BCM monitor the voltage signal. When the battery voltage is greater than 10.7 V, and the ignition lock switch is at "ON", it allows the rear defroster / heated mirrors to work. When the battery voltage is less than 10.3 V, BCM does not allow the rear defroster / heated mirrors to work.

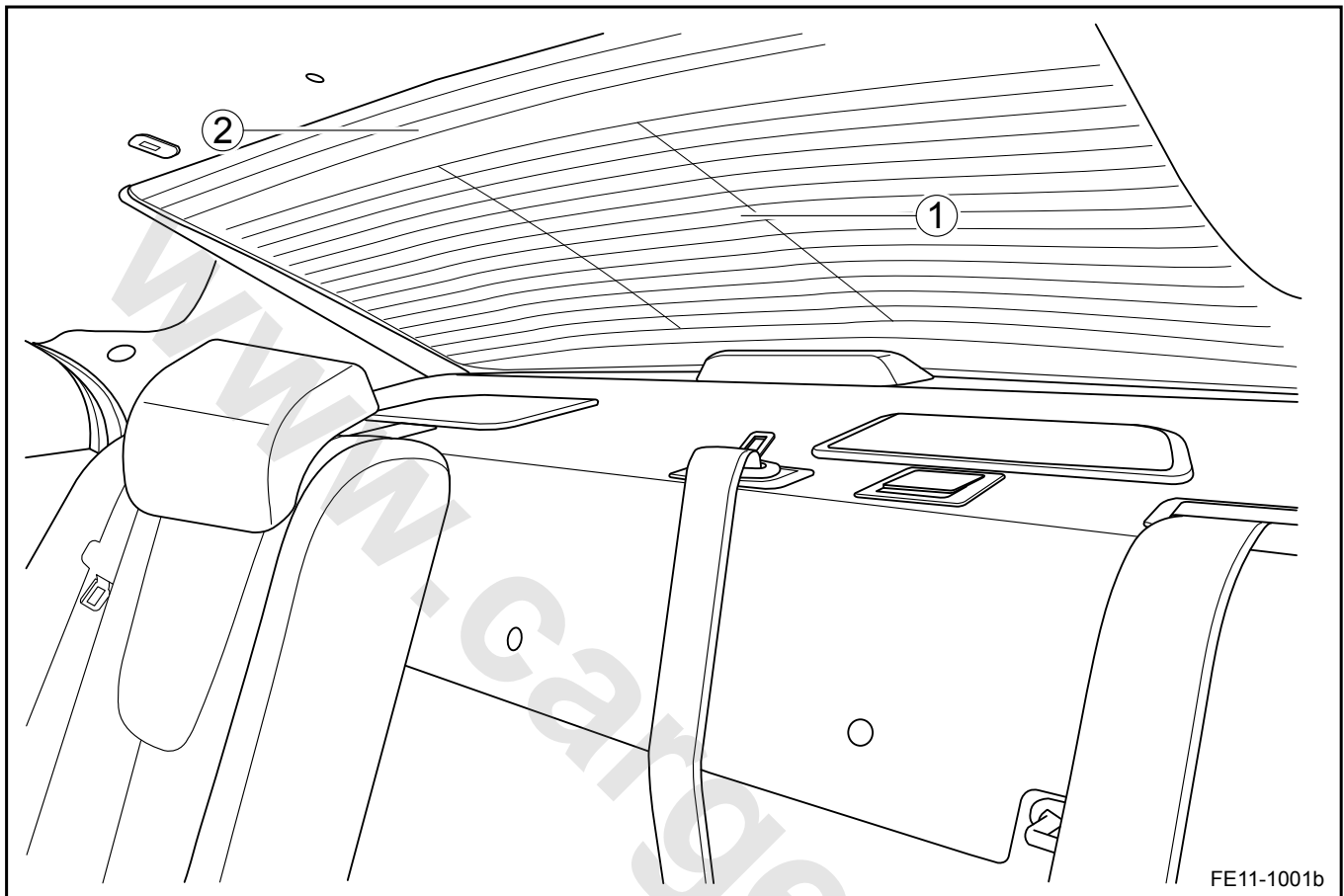
The rear defroster / rearview mirror heating switch is a push button switch. After pressing the defrost / mirror heating switch, the rear defroster / heated mirrors work for 12 min; if the heating switch is pressed again during heating, the heating stops. Press the rear defrost / mirror heating switch again, the rear defroster / heated rearview mirror work 12 min (accumulative run 12 min) stops. The reset time parameter is 36 min. Before the 36 min, the heating time is not accumulative.

In the low voltage status, the rear defroster / heated rearview mirror do not work. but previous timer (12 min) will not be interrupted and will still be included in the next cycle. The rear defroster / heated mirror working signal is sent to the ECM through a dedicated circuit. ECM increase the engine speed according to the demand.

## 11.12.4 Component Locator

## 11.12.4.1 Component Locator

Rear Window Defroster Grille (Sedan)



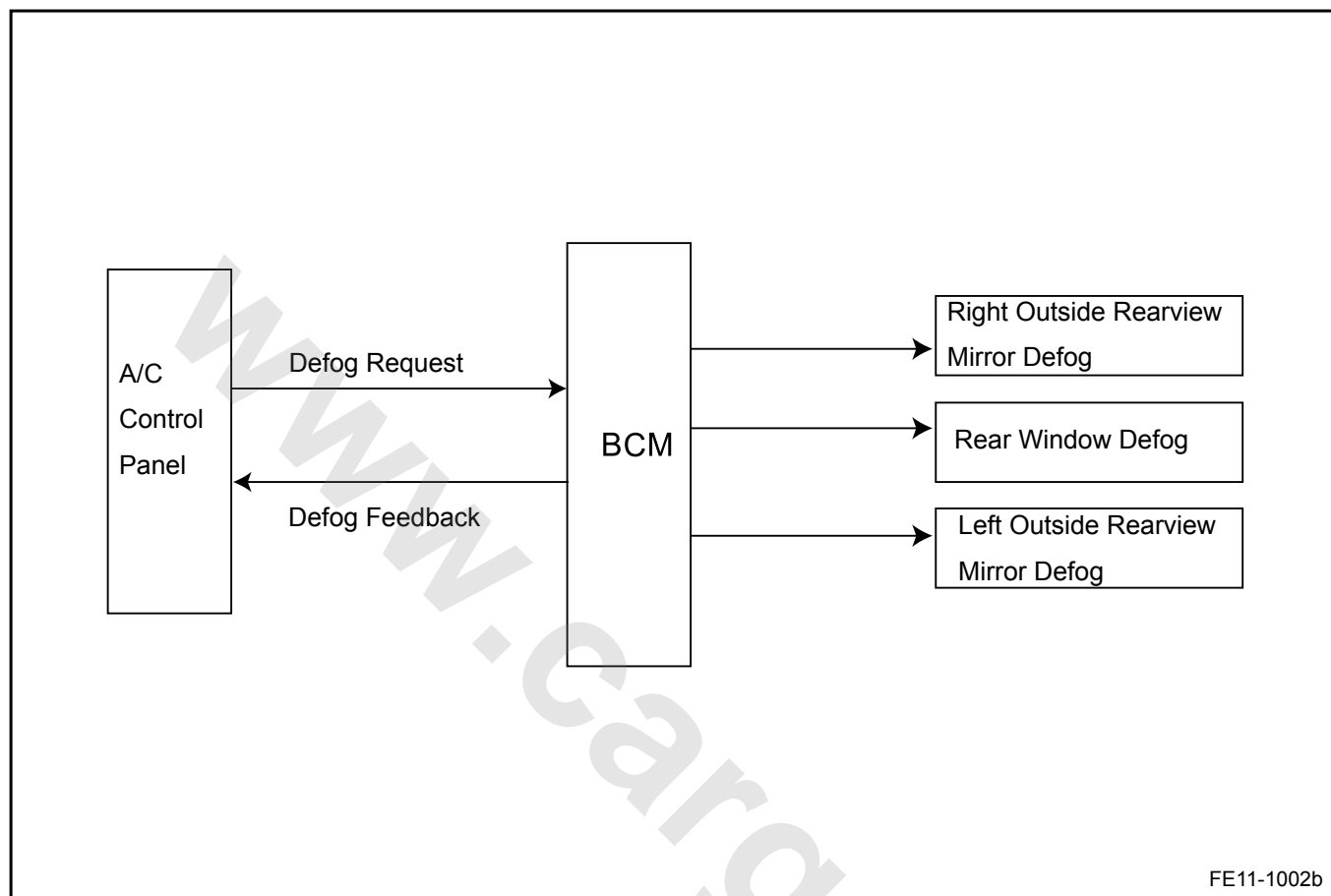
## Legend

1. Rear Window Defroster Grille

2. Radio Antenna

## 11.12.5 Schematic

## 11.12.5.1 Schematic



## 11.12.6 Diagnostic Information and Procedures

### 11.12.6.1 Diagnosis Description

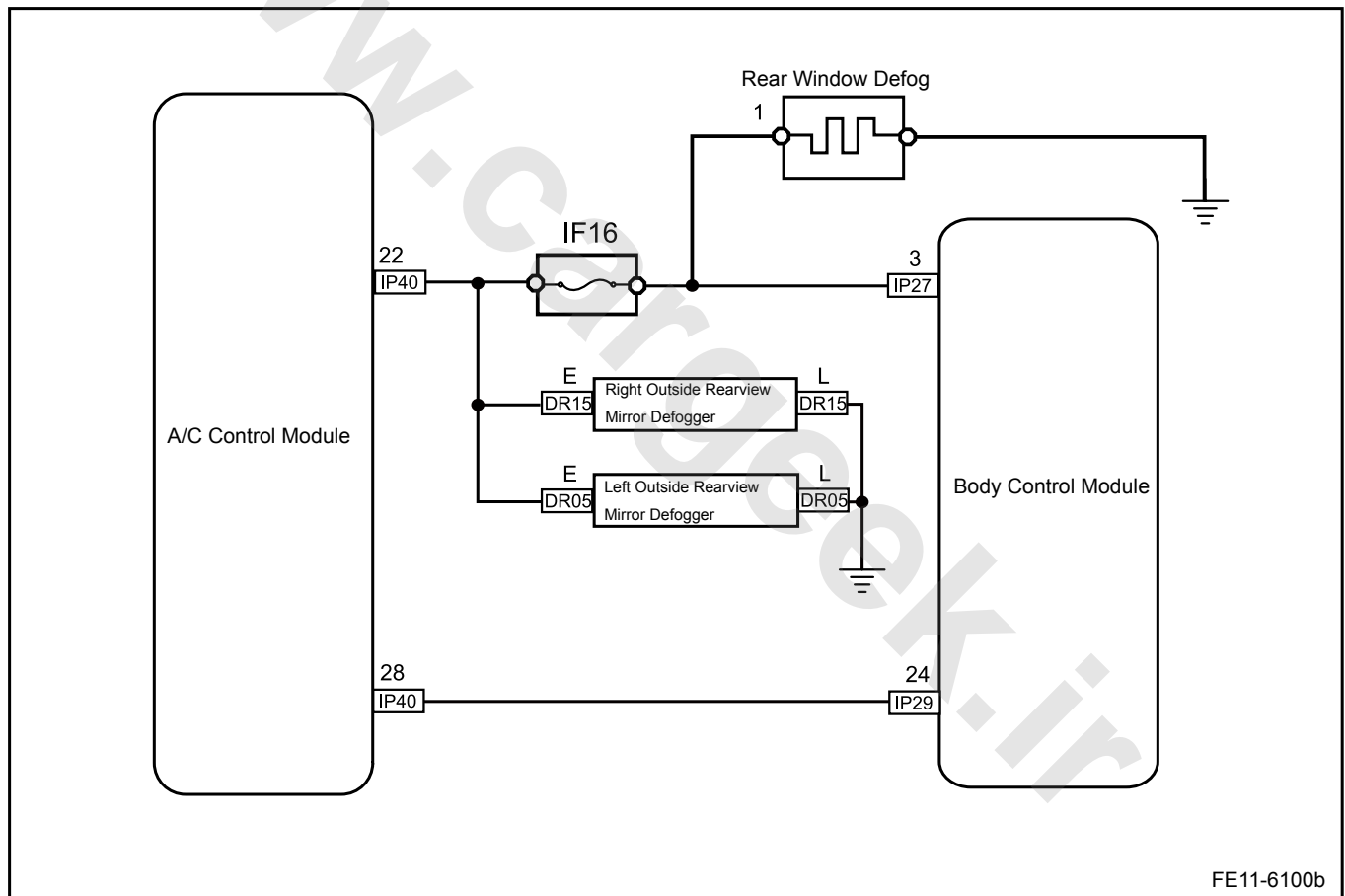
Refer to [11.12.2.1 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.12.6.2 Visual Inspection

- Check installed aftermarket equipment that may affect the defrosting operation.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- If all the defroster are inoperative, check and repair the power supply or ground circuit poor connection, or open circuit.

### 11.12.6.3 Rear Window Defroster Inoperative

Schematic:



Diagnostic Steps:

Step 1	Use scan tool active test function to check the defroster working status.
--------	---

- (a) Select as the following sequence: Body Control Module / active test / rear defroster output control.  
Is the rear defroster working properly?

No

Go to step 6

Yes

Step 2 Check the defrost button.

A/C Control Panel Harness Connector IP40

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

FE11-6105b

- (a) Press the defrost button.  
 (b) At the same time, test continuity between the air-conditioning control module harness connector IP40 terminal No.28 and the body ground with a multimeter.

Test Terminal	Test Conditions	Continuity
IP40 28 - Body Ground	Release	10 kΩ or higher
IP40 28 - Body Ground	Press	Less than 1 Ω

Is the resistance specified value?

Yes

Go to step 4

No

Step 3 Replace the air-conditioning control panel.

- (a) Replace the air-conditioning control panel. Refer to [8.2.8.1 Air-conditioning Control Panel Replacement](#).

Is the rear window defrosting function working correctly?

Yes

System normal

No

Step 4 Check the defrost request signal.

Body Control Module 1 Harness Connector IP29

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

FE11-6102b

- (a) Press the defrost button.  
 (b) At the same time, test continuity between the BCM harness connector IP29 terminal No.24 and the ground with a multimeter.

Test Terminal	Test Conditions	Continuity
IP29 24 - Body Ground	Release	10 kΩ or higher
IP29 24 - Body Ground	Press	Less than 1 Ω

Is the resistance specified value?

Yes

Go to step 6



No

Step 5 Repair the defrost request signal open circuit.

(a) Repair the open circuit.

Is the rear window defrosting function working correctly?

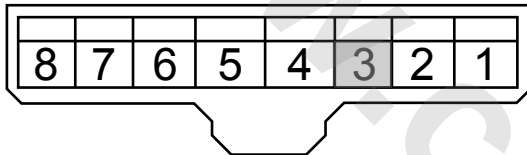
Yes

System normal

No

Step 6 Check the BCM defrost power output.

Body Control Module 3 Harness  
Connector IP27



FE11-6103b

(a) Press the defrost button.

(b) At the same time, measure the BCM harness connector IP27 terminal No.3 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 8

No

Step 7 Replace the BCM.

(a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#).

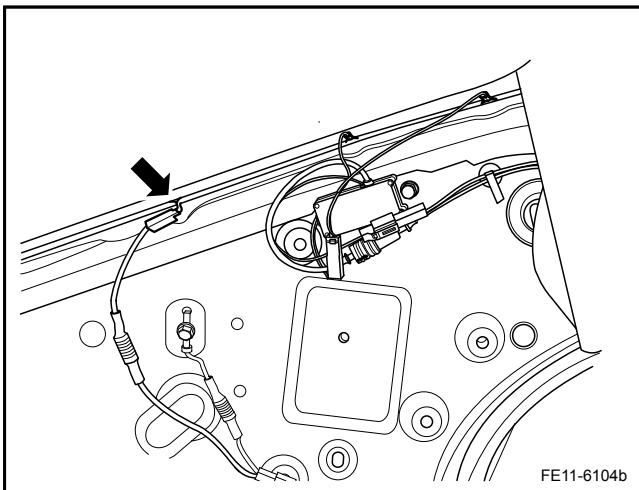
Is the rear window defrosting function working correctly?

Yes

System normal

No

Step 8 Measure the rear Window defroster grid supply voltage.



FE11-6104b

(a) Press the defrost button.

(b) At the same time, measure the rear window defrost grille harness connector terminal No.1 voltage with a multimeter.

Test Terminal	Test Conditions	Standard Voltage
Terminal 1	Release	0 V
Terminal 1	Press	11-14 V

Is the voltage specified value?

Yes

Go to step 10

No

Step 9 Repair the rear window defrosting grid power supply circuit.

- (a) Repair the open circuit between the BCM harness connector IP27 terminal No.3 and the rear window defroster grille harness connector terminal No.1.

Is the rear window defrosting function working correctly?

Yes

System normal

No

Step 10 Check the rear window defroster grille grounded circuit.

- (a) Disconnect the rear window defroster grille wiring harness connector.
- (b) Measure resistance between the rear window defroster grille harness connector terminal No.1 and the ground with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$

Yes

Go to step 12

No

Step 11 Repair the rear window defroster grille ground circuit.

- (a) Repair the open circuit.

Is the rear window defrosting function working correctly?

Yes

System normal

No

Step 12 Replace the rear window defroster grille.

- (a) Replace the rear window defroster grille. Refer to [11.5.8.10 Rear Window Replacement \(Sedan\)](#).

Confirm the repair completed.

Next

Step 13 System normal.

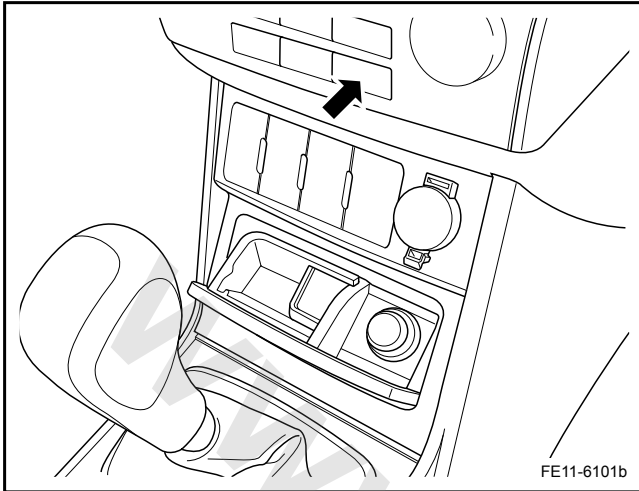
#### 11.12.6.4 Electric Rearview Mirror Defroster Inoperative

Schematic:

Refer to [11.12.6.3 Rear Window Defroster Inoperative](#).

## Diagnostic Steps:

Step 1	Check the defrost button.
--------	---------------------------



- (a) Press the defrost button.  
 (b) At the same time, test continuity between the air-conditioning control module harness connector IP40 terminals No.28 and the body ground with a multimeter.

Test Terminal	Test Conditions	Continuity
IP40 28 - Body Ground	Release	10 kΩ or higher
IP40 28 - Body Ground	Press	Less than 1 Ω

Is the resistance specified value?

Yes

Go to step 3

No

Step 2	Replace the air-conditioning control panel.
--------	---

- (a) Replace the air-conditioning control panel. Refer to [8.2.8.1 Air-conditioning Control Panel Replacement](#).

Is the rearview mirror defrost function working correctly?

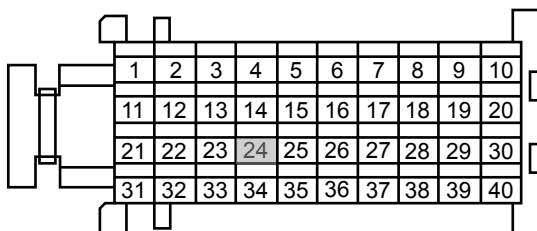
Yes

System normal

No

Step 3	Check the defrost request signal.
--------	-----------------------------------

Body Control Module 1 Harness Connector IP29



- (a) Press the defrost button.  
 (b) At the same time, test continuity between the BCM harness connector IP29 terminal No.24 and the body ground with a multimeter.

Test Terminal	Test Conditions	Continuity
IP29 24 - Body Ground	Release	10 kΩ or higher
IP29 24 - Body Ground	Press	Less than 1 Ω

Is the resistance specified value?

Yes

Go to step 5

No

Step 4	Repair the defrost request signal open circuit.
--------	---

- (a) Repair the open circuit.

Is the rearview mirror defrost function working correctly?

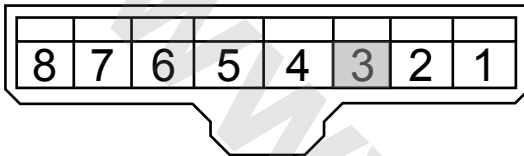
Yes

System normal

No

Step 5 Check the BCM defrost power output.

Body Control Module 3 Harness  
Connector IP27



FE11-6103b

- (a) Press the defrost button.  
(b) At the same time, measure the BCM harness connector IP27 terminal No.3 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the rearview mirror defrost function working correctly?

Yes

Go to step 7

No

Step 6 Replace the BCM.

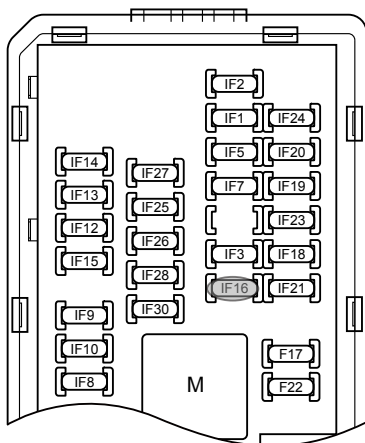
- (a) Replace the BCM. Refer to [11.10.8.1 BCM Replacement](#).  
Is the rearview mirror defrost function working correctly?

Yes

System normal

No

Step 7 Check the fuse IF16.



FE11-6106b

- (a) Check whether the fuse IF16 is blown.  
Fuse Rated Current: 10 A

No

Go to step 9

Yes

Step 8 Check the fuse IF16 circuit.

- (a) Check whether there is a short circuit.  
(b) Repair the circuits. Confirm that there are no short circuits.

(c) Replace with fuses with rated current.

Is the rearview mirror defrost function working correctly?

Yes

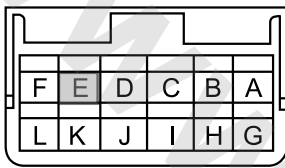
System normal

No

Step 9 Check the rearview mirror defrost supply voltage.

Left Outside Rearview Mirror Harness Connector DR05

Right Outside Rearview Mirror Harness Connector DR15



FE11-6107b

(a) Press the defrost button.

(b) Measure the electric rearview mirror harness connector DR05 (left) or DR15 (right) terminal E voltage with a multimeter.

Standard Voltage: 11-14 V

Yes

Go to step 11

No

Step 10 Repair rearview mirror defrost power supply open circuit.

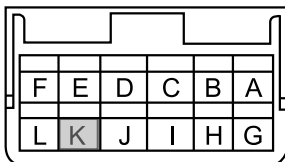
(a) Repair the open circuit between the rearview mirror defroster harness connector DR05 (left) or DR15 (right) terminal E and the BCM harness connector IP27 terminal No.3.

Is the rearview mirror defrost function working correctly?

Step 11 Check the rearview mirror defrost ground circuit.

Left Outside Rearview Mirror Harness Connector DR05

Right Outside Rearview Mirror Harness Connector DR15



FE11-6108b

(a) Disconnect the rearview mirror harness connector.

(b) Measure resistance between the mirror harness connector DR05 (left) or DR15 (right) terminal K and the ground with a multimeter.

Resistance Standard Value: Less than 1 Ω

Yes

Go to step 13

No

Step 12 Repair the rearview mirror defrost ground circuit open.

(a) Repair the open circuit.

Is the rearview mirror defrost function working correctly?

Yes

System normal

No

Step 13 Replace the rearview mirror glass.

(a) Replace the rearview mirror glass. Refer to [11.5.8.1 Outside Rearview Mirror Replacement](#).

Confirm the repair completed.

Next

Step 14 System normal.

### 11.12.7 Removal and Installation

#### 11.12.7.1 Rear Window Defrost Grille Replacement

Refer to [11.5.8.10 Rear Window Replacement \(Sedan\)](#).

#### 11.12.7.2 Electric Rearview Mirror Heater Replacement

Refer to [11.5.8.1 Outside Rearview Mirror Replacement](#).

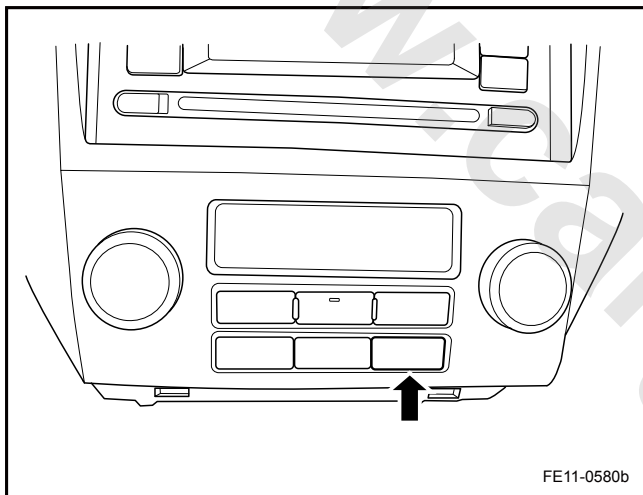
#### 11.12.7.3 Rear Window Defrost Switch Replacement

##### Removal Procedure

##### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the air-conditioning control panel.. Refer to [8.2.8.1 Air-conditioning Control Panel Replacement](#).



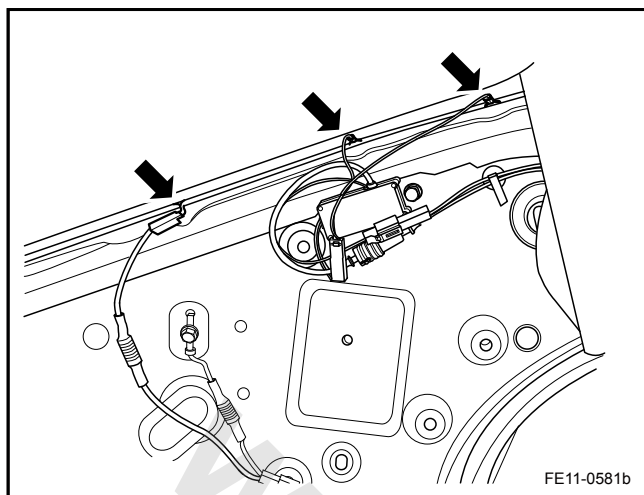
##### Installation Procedure:

1. Install the air-conditioning control panel.
2. Connect the battery negative cable.

#### 11.12.7.4 Rear Window Defroster Lead Repair

##### Note

By re-soldering the rear window defroster lead or terminal can be re-connected. 3% silver and rosin welding electrodes.



1. Before welding, polish parts with fine steel.
2. Using a brush, apply a small amount of rosin in the lead wires and repair parts.
3. Dipping the tip of the solder to make sure adequate welding material.
4. Use only enough melting heat, do not overheat the wire.



## 11.13 Horn

### 11.13.1 Specifications

#### 11.13.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Horn Assembly Retaining Bolts	M8 × 14	8-11	6-8
Horn Bracket Retaining Nuts	M12	8-11	6-8

#### 11.13.1.2 Speaker Specifications

Sound Level	105-118 dB	
Audio	Treble	290-330
	Bass	370-410

## 11.13.2 Description and Operation

### 11.13.2.1 Description and Operation

Horns are located in the engine compartment, retaining to the vehicle on both sides in front of the radiator. The right side horn is a tweeter, the left one is a woofer, controlled by the steering wheel horn switch. When the steering wheel horn button is pressed, the horn circuit is supplied with power, so the horns sound.

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### 11.13.3 System Working Principle

#### 11.13.3.1 System Working Principle

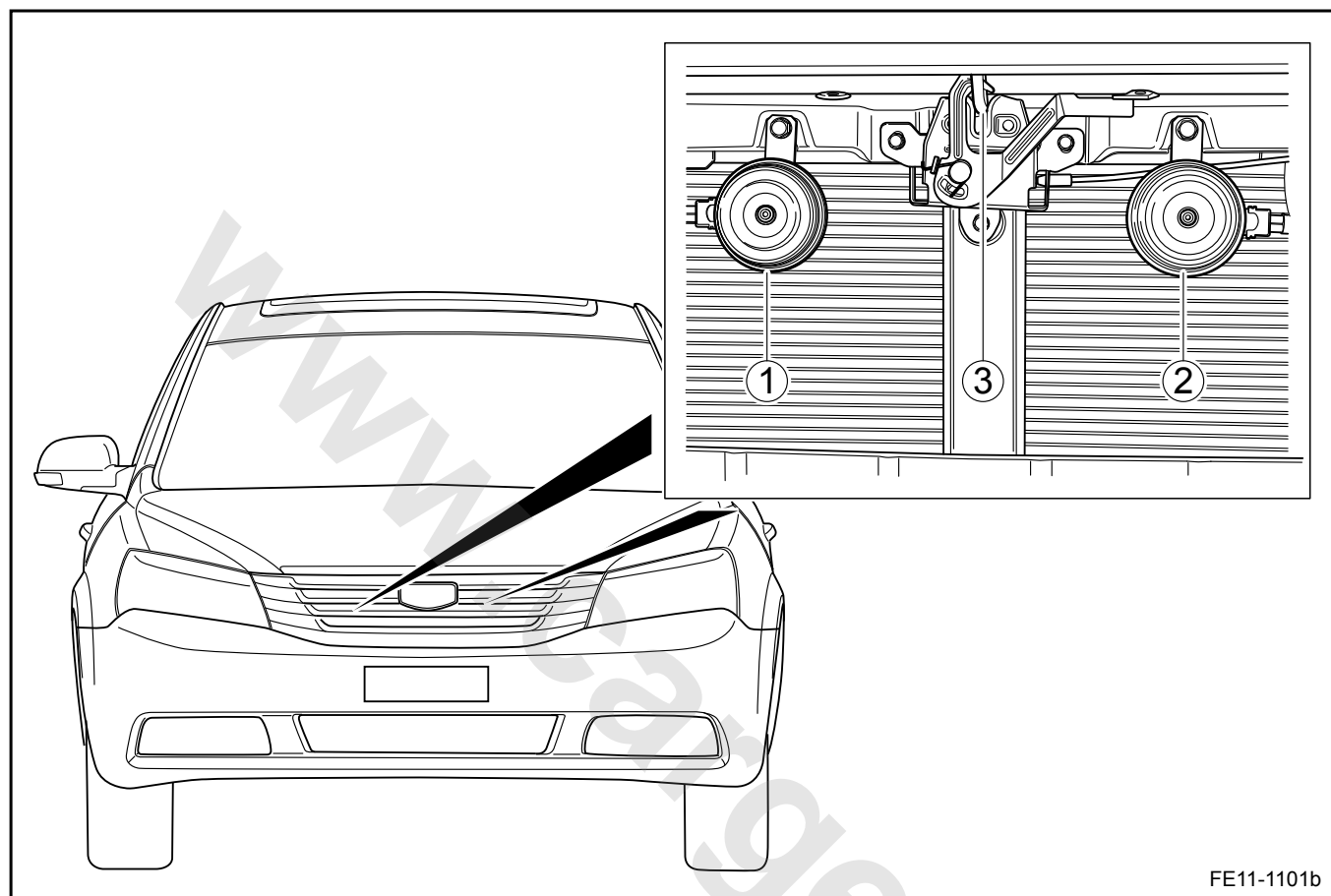
Horn control mode is the power supply, namely, horn switch controls the horn relay pull-in. The power is supplied from the relay to the horn. Horns are often grounded.

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### 11.13.4 Component Locator

#### 11.13.4.1 Component Locator

##### Horn



FE11-1101b

#### Legend

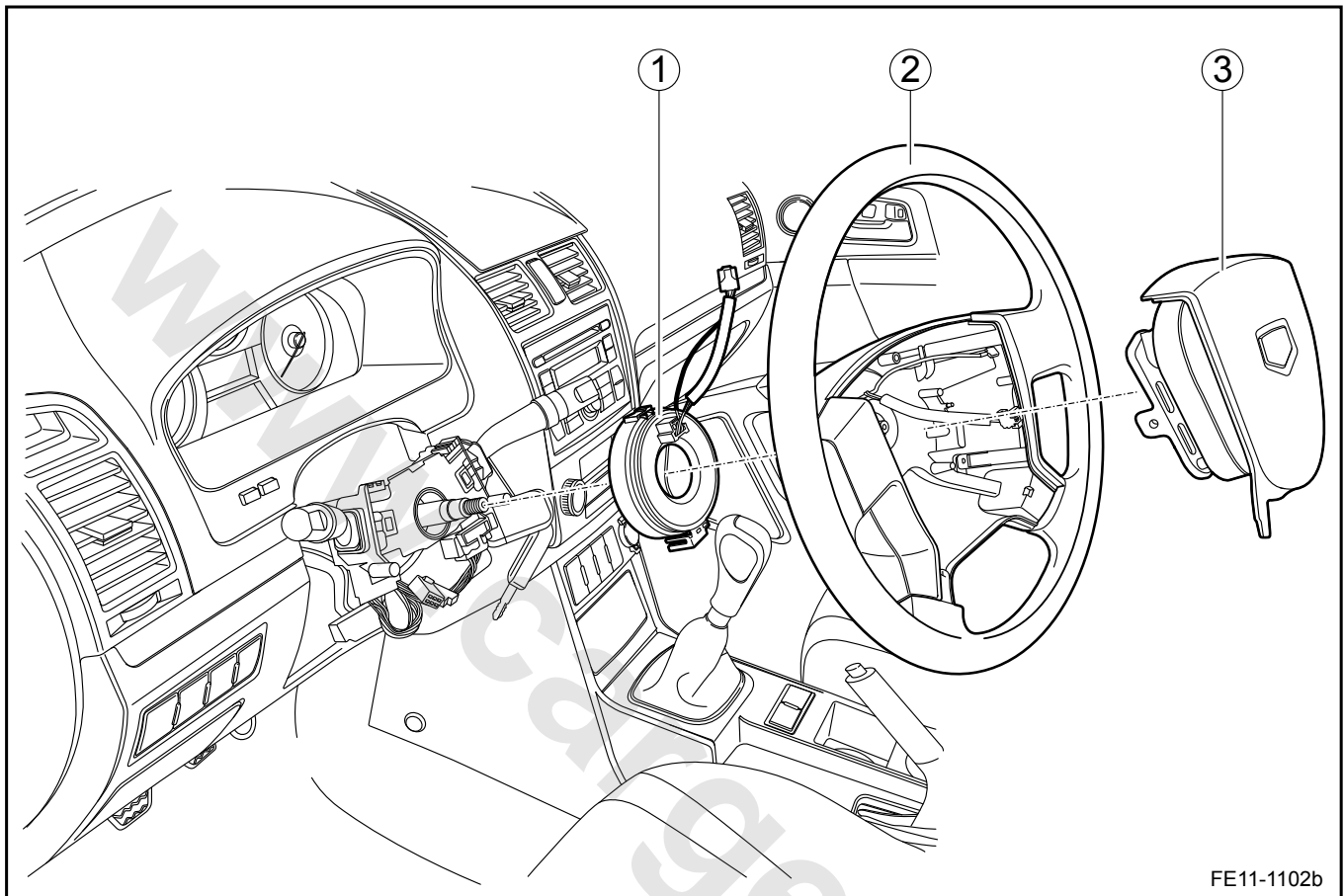
- 1. Tweeter
- 2. Subwoofer

- 3. Hood Latch

### 11.13.5 Disassemble View

#### 11.13.5.1 Disassemble View

Horn Switch

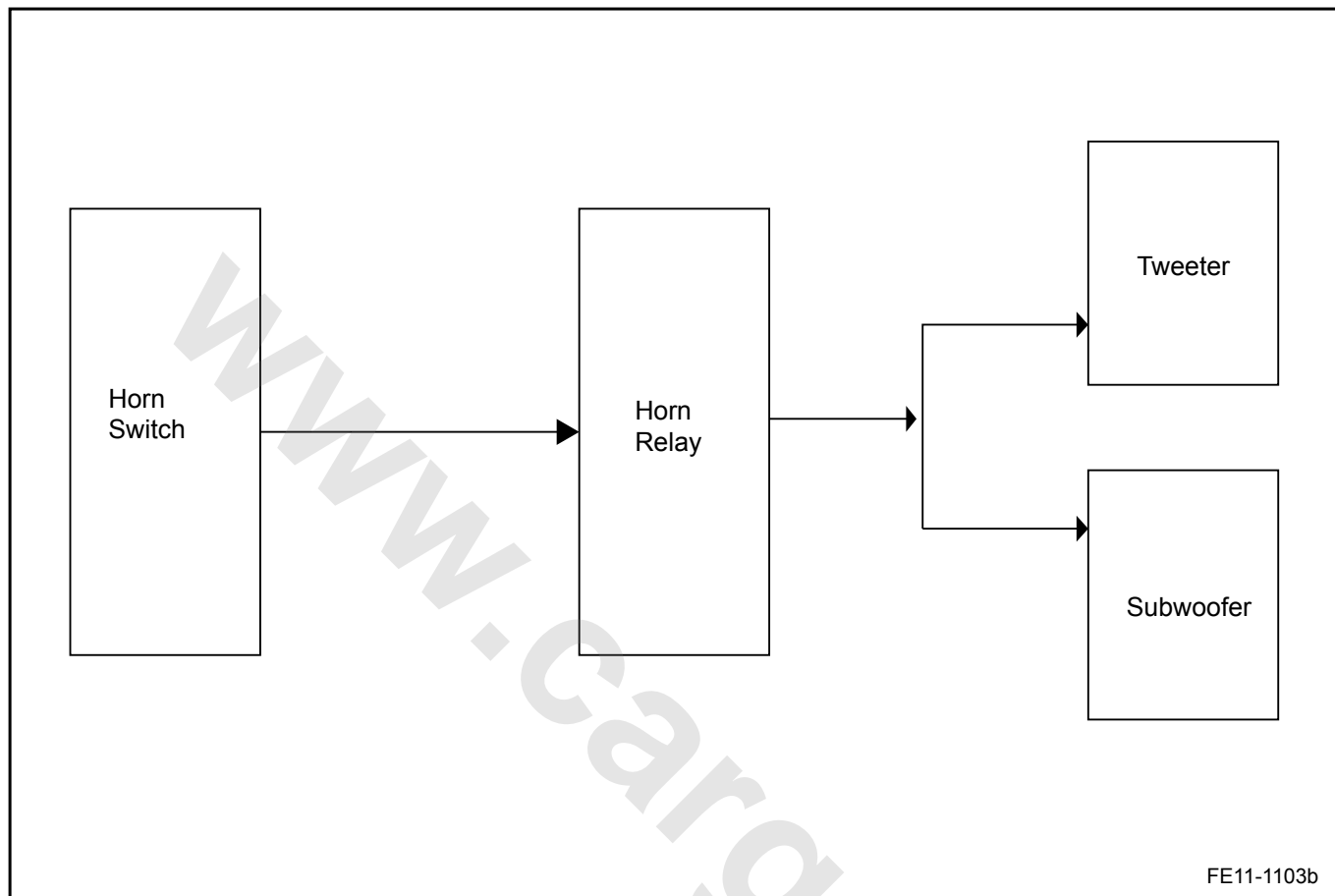


#### Legend

- 1. Clock Spring
- 2. Steering Wheel
- 3. Driver Front Airbag (Horn Switch)

## 11.13.6 Schematic

## 11.13.6.1 Schematic



## 11.13.7 Diagnostic Information and Procedures

### 11.13.7.1 Diagnosis Description

Refer to [11.13.2.1 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.13.7.2 Visual Inspection

- Check installed aftermarket equipment that may affect the horn operation.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- If the two speakers are inoperative, check and repair the power supply or switch ground circuit poor connection or open circuit before replace the horn.

#### Warning!

For horn and the clock spring removal and inspection, please strictly abide by the airbag system safety operation. Refer to "SIR Warning."

### 11.13.7.3 Horn Switch Contact Adjustment

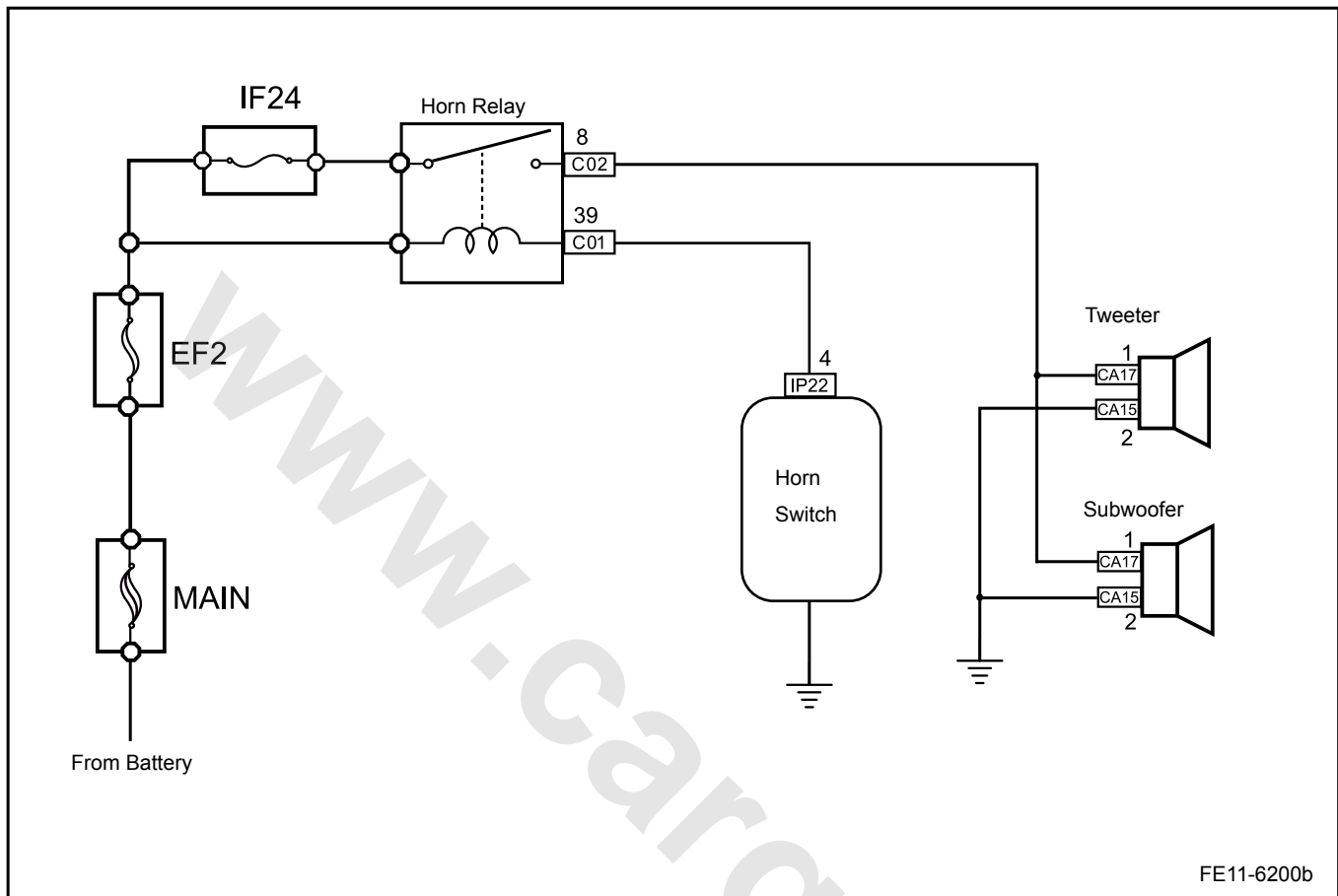
When horns are intermittent inoperative, or one side of the steering wheel horn push switch is inoperative, it is likely that the horn contact switch has poor connection. At this time, adjust the driver front airbag horn switch contact.

#### Warning!

For airbag module removal, please strictly abide by the airbag system safety operation. Refer to "SIR Warning."

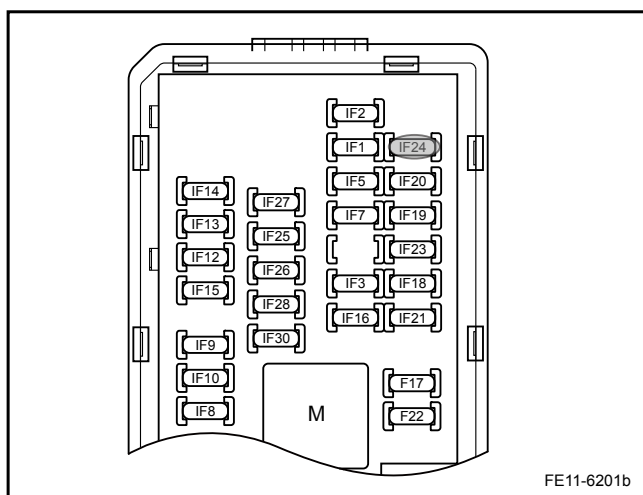
## 11.13.7.4 Horn Inoperative

Schematic:



## Diagnostic Steps:

Step 1	Check the fuse IF24.
--------	----------------------



(a) Check whether the fuse IF24 is blown.

Fuse Rated Current: 10 A

No

Go to step 3



Yes

Step 2 Check fuse IF24 circuit.

- (a) Check whether there is a short circuit.
- (b) Repair the circuits. Confirm that there are no short circuits.
- (c) Replace with fuses with rated current.

Is horn working properly?

Yes

System normal

No

Step 3 Check the horn switch.

- (a) Press the horn switch.
- (b) At the same time, test continuity between the horn switch harness connector terminal No.1 and the ground with a multimeter.

Test Terminal	Test Conditions	Continuity
Terminal No.1 - Body Ground	Release	10 kΩ or higher
Terminal No.1 - Body Ground	Press	Less than 1 Ω

Is the resistance specified value?

Yes

Go to step 5

No

Step 4 Adjust the horn switch contacts.

- (a) Adjust the horn switch contacts. Refer to [11.13.7.3 Horn Switch Contact Adjustment](#).

Is horn working properly?

Yes

System normal

No

Step 5 Check the clock spring.

- (a) Press the horn switch.
- (b) At the same time, test continuity between the clock spring harness connector IP22 terminal No.4 and the ground with a multimeter.

Test Terminal	Test Conditions	Continuity
Terminal 4 - Body Ground	Release	10 kΩ or higher

Terminal 4 - Body Ground

Press

Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 7

No

Step 6    Repair clock spring open circuit.

- (a) Repair the open circuit between the clock spring harness connector IP22 terminal No.4 and the horn switch harness connector terminal No.1.

- (b) If necessary, replace the clock spring.

Is horn working properly?

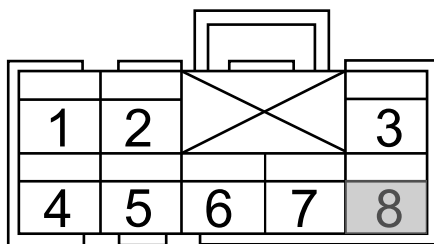
Yes

System normal

No

Step 7    Check the horn relay.

To I/P Fuse Block 3 Harness  
Connector IP10



FE11-6202b

- (a) Press the horn switch.

- (b) Measure the I/P fuse block wiring harness connector IP10 terminal No.8 voltage with a multimeter.

Standard Voltage: 11-14 V

Yes

Go to step 9

No

Step 8    Replace the I/P fuse block.

- (a) Check whether there is a short circuit.  
(b) Repair the circuits. Confirm that there are no short circuits.  
(c) Replace the I/P fuse block.

Is horn working properly?

Yes

System normal

No

Step 9    Check the horn power supply circuit.

- (a) Press the horn button.

- (b) Measure the horn harness connector terminal No.1 voltage with a multimeter.

Standard Voltage: 11-14 V

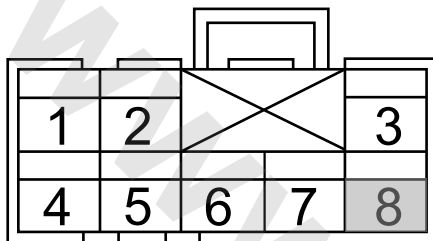
Yes

Go to step 11

No

Step 10 Repair the horn power supply circuit open.

To I/P Fuse Block 3 Harness  
Connector IP10



FE11-6202b

- (a) Repair the open circuit between the horn harness connector terminal No.1 and the I/P fuse block wiring harness connector IP10 terminal No.8.

Is horn working properly?

Yes

System normal

No

Step 11 Check the horn ground circuit.

- (a) Disconnect the horn wiring harness connector.  
(b) Measure resistance between the harness connector terminal No.2 and ground with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$ 

Yes

Go to step 13

No

Step 12 Repair the horn ground circuit open.

- (a) Repair the open circuit.  
Is horn working properly?

Yes

System normal

No

Step 13 Replace the horn.

- (a) Replace the horn. Refer to [11.13.8.1 Horn Replacement](#).  
Confirm the repair completed.

Next

Step 14 System normal.

## 11.13.8 Removal and Installation

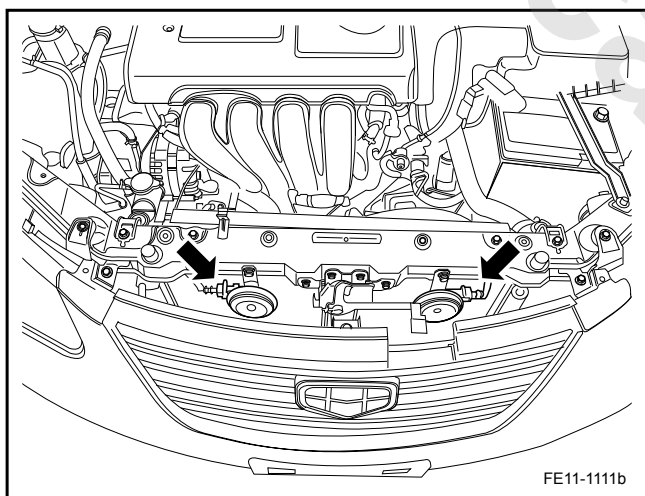
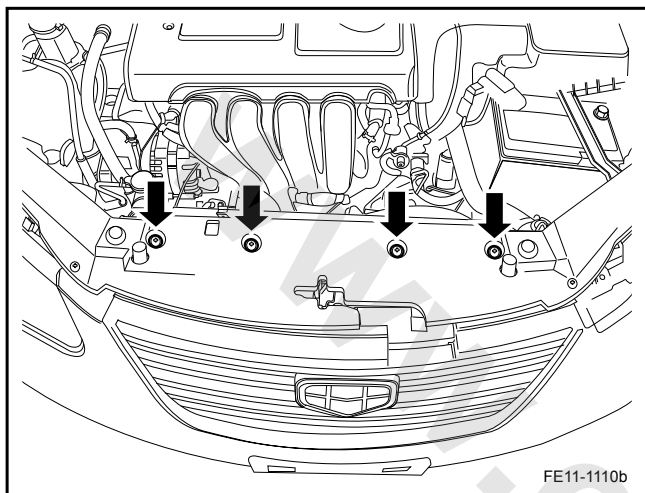
### 11.13.8.1 Horn Replacement

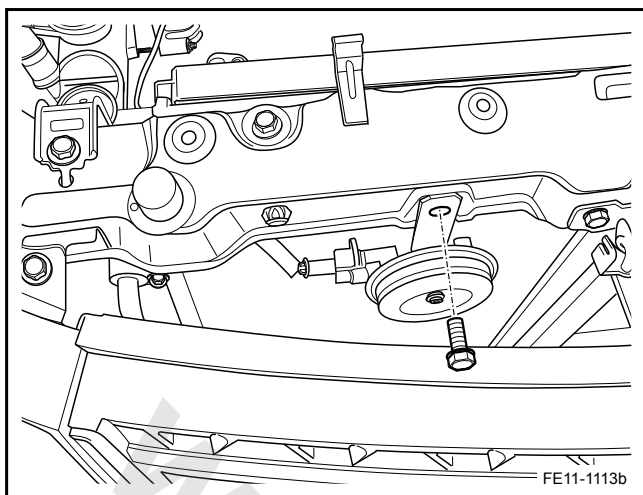
#### Removal Procedure

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the radiator upper grille retaining clips.
3. Disconnect the horn wiring harness connector.





4. Remove the horn retaining bolts.

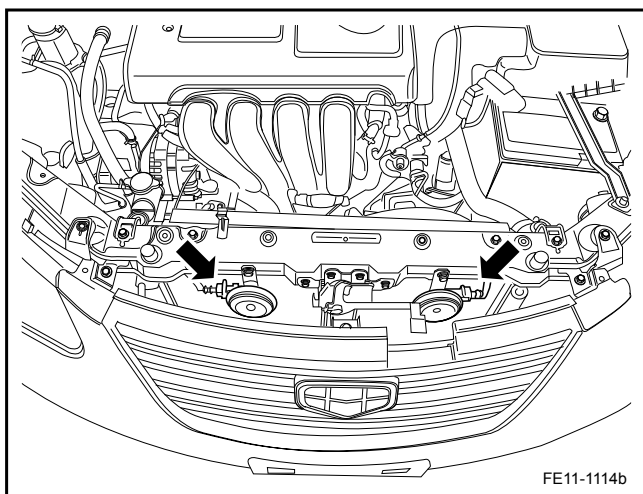
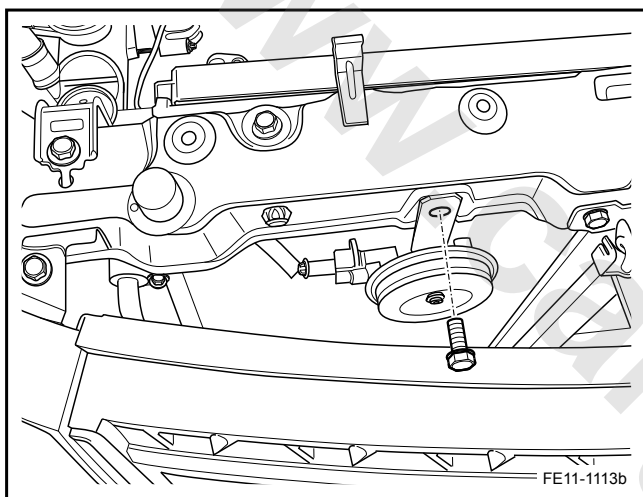
#### Installation Procedure:

1. Tighten the horn retaining bolts.

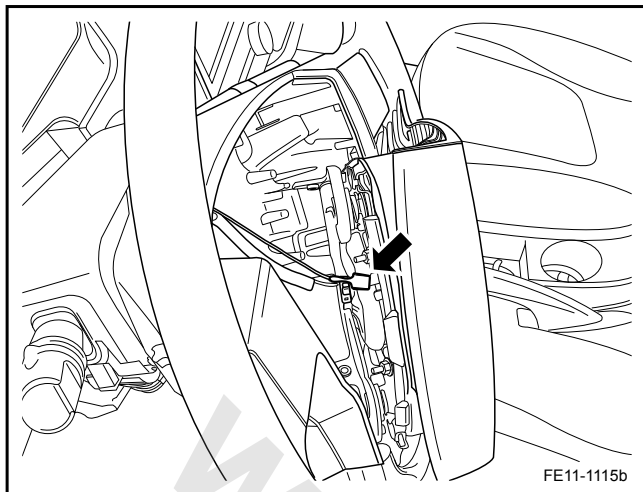
#### Note

Refer to "Fastener Notice" in "Warnings and Notices".

Torque: 8-11 Nm (Metric) 6-8 lb-ft (US English)



2. Connect the horn wiring harness connector.
3. Install the radiator upper grille.
4. Connect the battery negative cable.



5. When removing the horn button, please note that the driver front airbag and the horn button is an integrated part.

**Warning!**

For horn and the clock spring removal and inspection, please strictly abide by the airbag system safety operation. Refer to "SIR Warning."

## 11.14 Reverse Radar

### 11.14.1 Specifications

#### 11.14.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Reverse Radar Module Retaining Bolts	M6 × 16	8-11	6-8

## 11.14.2 Description and Operation

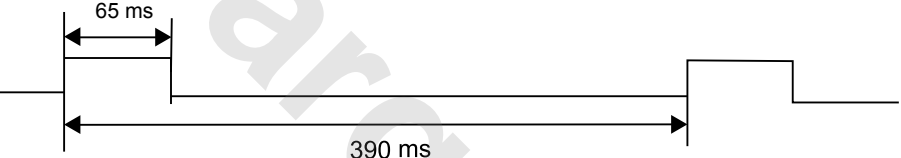
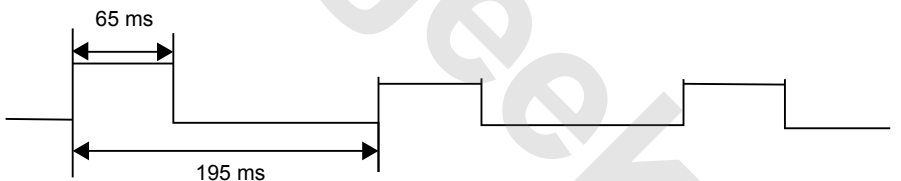
### 11.14.2.1 Description and Operation

1. When reversing (speed less than 5 km/h), reverse radar system detects the distance between obstacles and the vehicle and sends out corresponding alarm signals to ensure the parking safety. However, the obstacles within 30 cm to rear bumper (11.8 in) are not guaranteed to be detected.
2. Reverse sensor control unit converts the signal traveling time from the sensor to the obstacle, and then from the obstacle to the sensor signal to determine the obstacle distance.
3. Reverse radar system consists of sensors on the rear bumper, a control unit and a built-in buzzer in the instrument cluster.

#### Note

1. According to the distance to obstacles, the system can give the driver the corresponding alarm signal (buzzer) and thus provide confidence for the driver safe parking, but this process does not mean that careless parking, or the driver can avoid parking failures.
2. This system's ability to detect distance and obstacles is limited, the driver must be careful when the obstacle is not detected. In particular, when driving across the obstacles, the driver can not solely rely on the system.

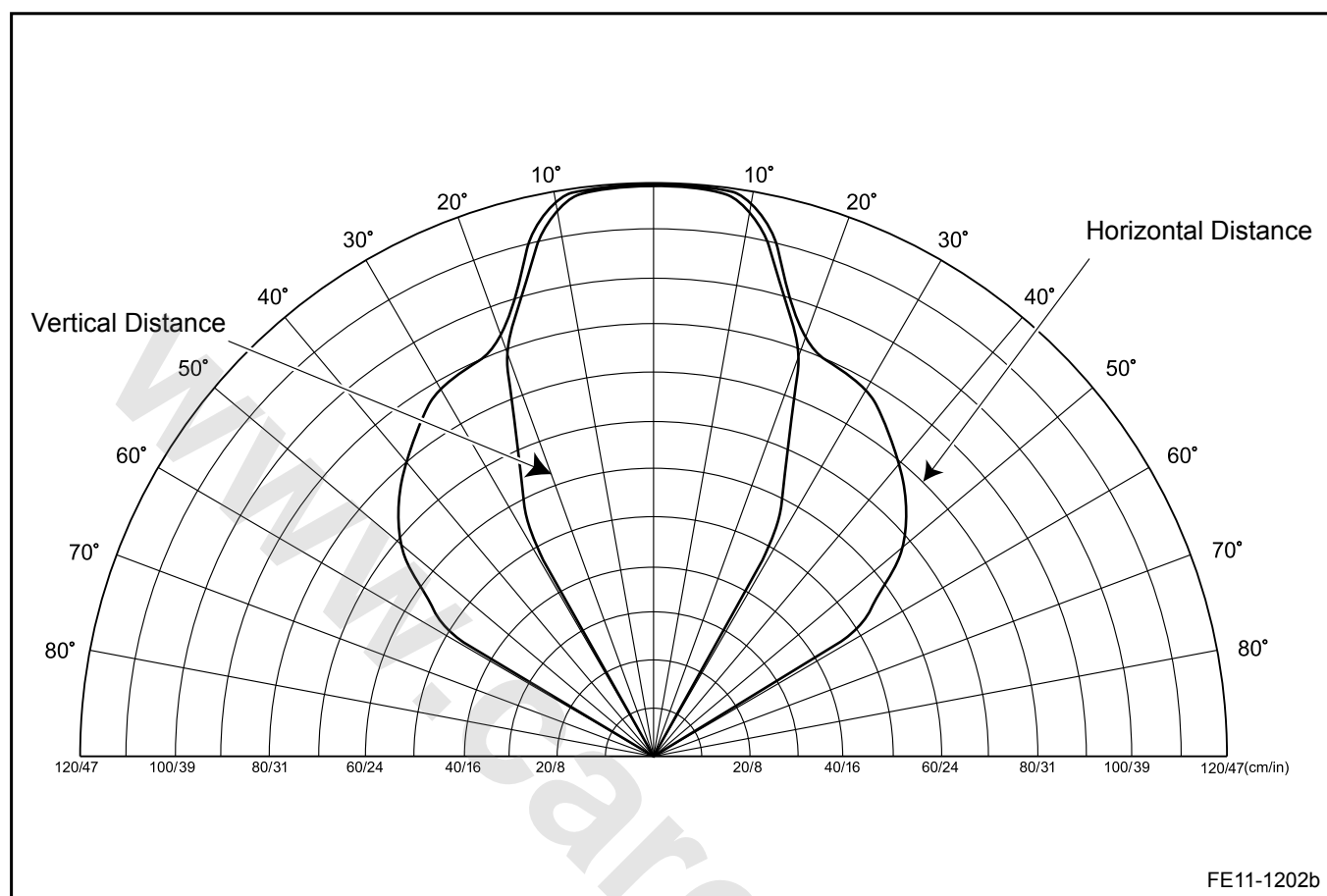
### 11.14.2.2 Alert Tone Level

Detect Distance (cm/in)	Distance Error (cm/in)	Alarm (+/-10%)
80-140 / 31-55	$\pm 15 / \pm 6$	
41-80 / 16-31	$\pm 15 / \pm 6$	
0-40 / 0-16	$\pm 10 / \pm 4$	Continuous

FE11-1201b



## 11.14.2.3 Detection Area



For the reversing radar system, when the reversing speed is less than 5 km/h, the detection area is a straight line from the rear bumper 140 cm (55 in), the corner distance is 60 cm (24 in).

### 11.14.3 System Working Principle

#### 11.14.3.1 Reverse Radar Control Unit Functions

- Produce TX Signal To Drive The Sensor Work
- Receive The RX Signal From The Obstacle
- Compare The RX Signal With The Reference Level
- Send Alarm According To The Detected Obstacles Distance
- Sensor Fault Diagnosis
- Drive Buzzer Alarm
- Provide Sensor Drive Voltage

#### 11.14.3.2 Sensor-Driven Sequence

Five-Step Cycle:

Left Corner Sensor=Left Corner Sensor;

Left Middle Sensor=Left Middle Sensor;

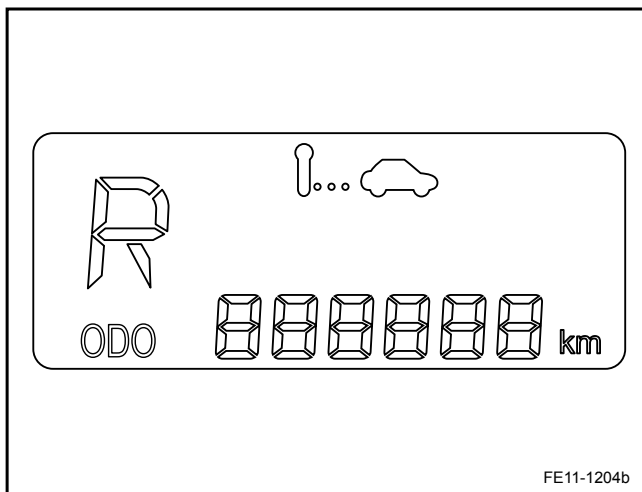
Right Middle Sensor=Right Middle Sensor;

Right Corner Sensor=Right Corner Sensor;

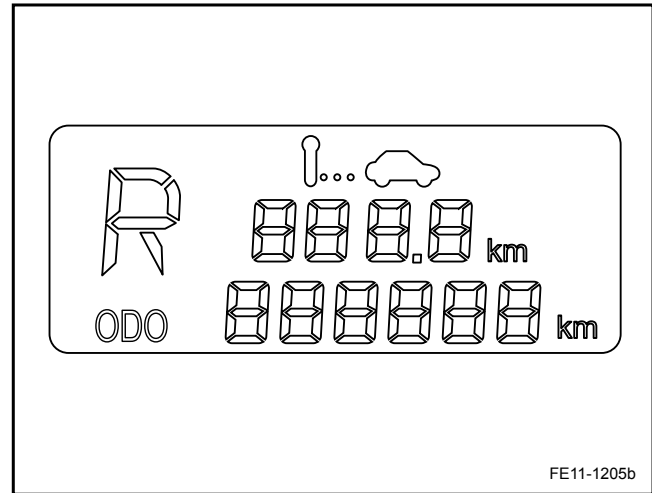
Right Middle Sensor=Right Middle Sensor.

#### 11.14.3.3 Reverse Radar Display

Reverse radar indicator in the instrument cluster is on the LCD lower half right side. When reversing, the reverse radar indicator blinks with 1Hz frequency on the LCD.



Reverse radar sign and odometer sign share a car icon on the LCD. Displaying the reverse radar and the odometer have conflict. When reverse radar is displayed, the odometer display will be temporarily unavailable, as shown above. This principle also applies to travel time and reverse radar conflict.

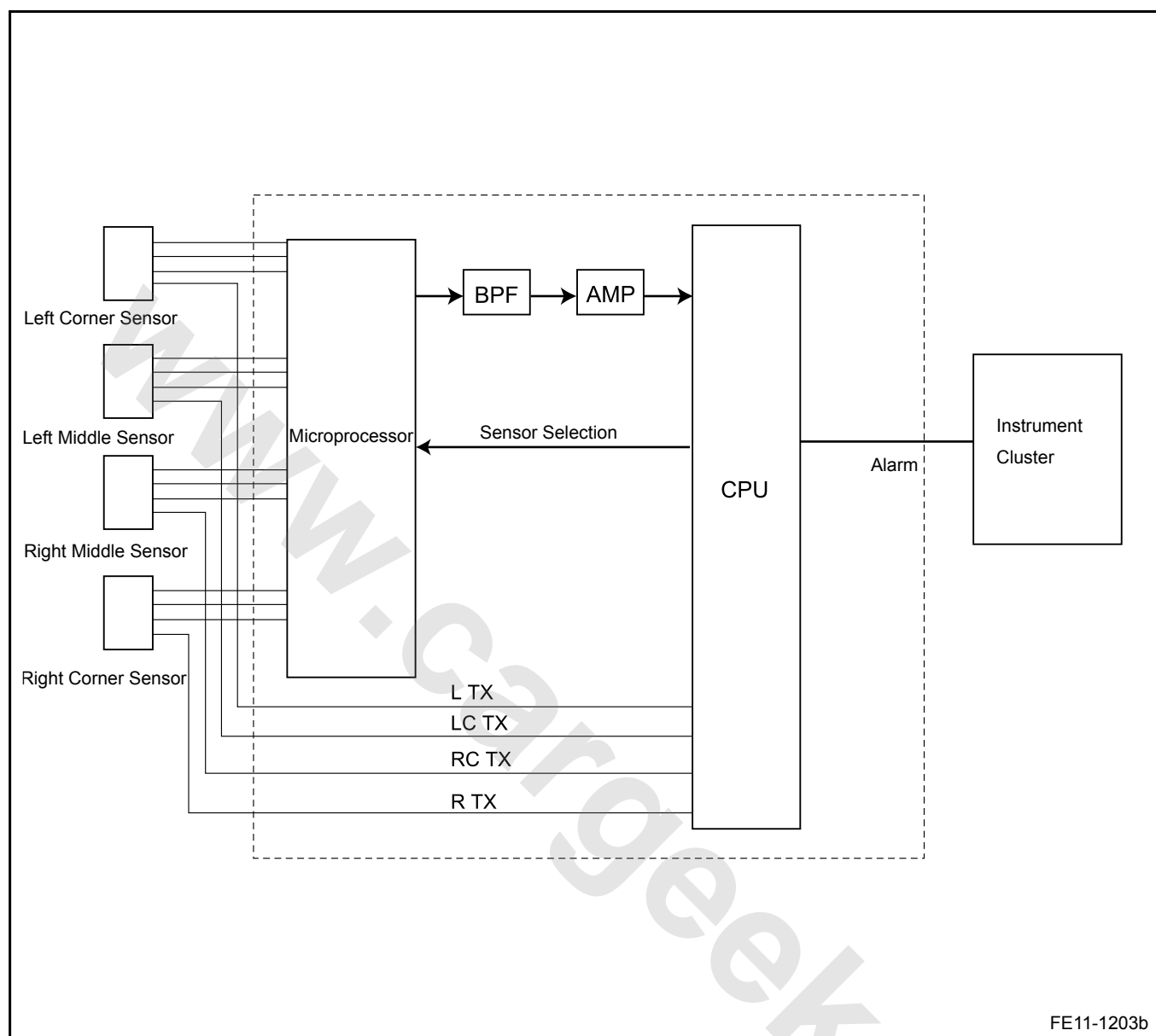


When reversing, if the the middle row does not display the time or odometer, then there is no conflict, the middle row displays the normal value, as shown above.

#### 11.14.3.4 Buzzer Driver

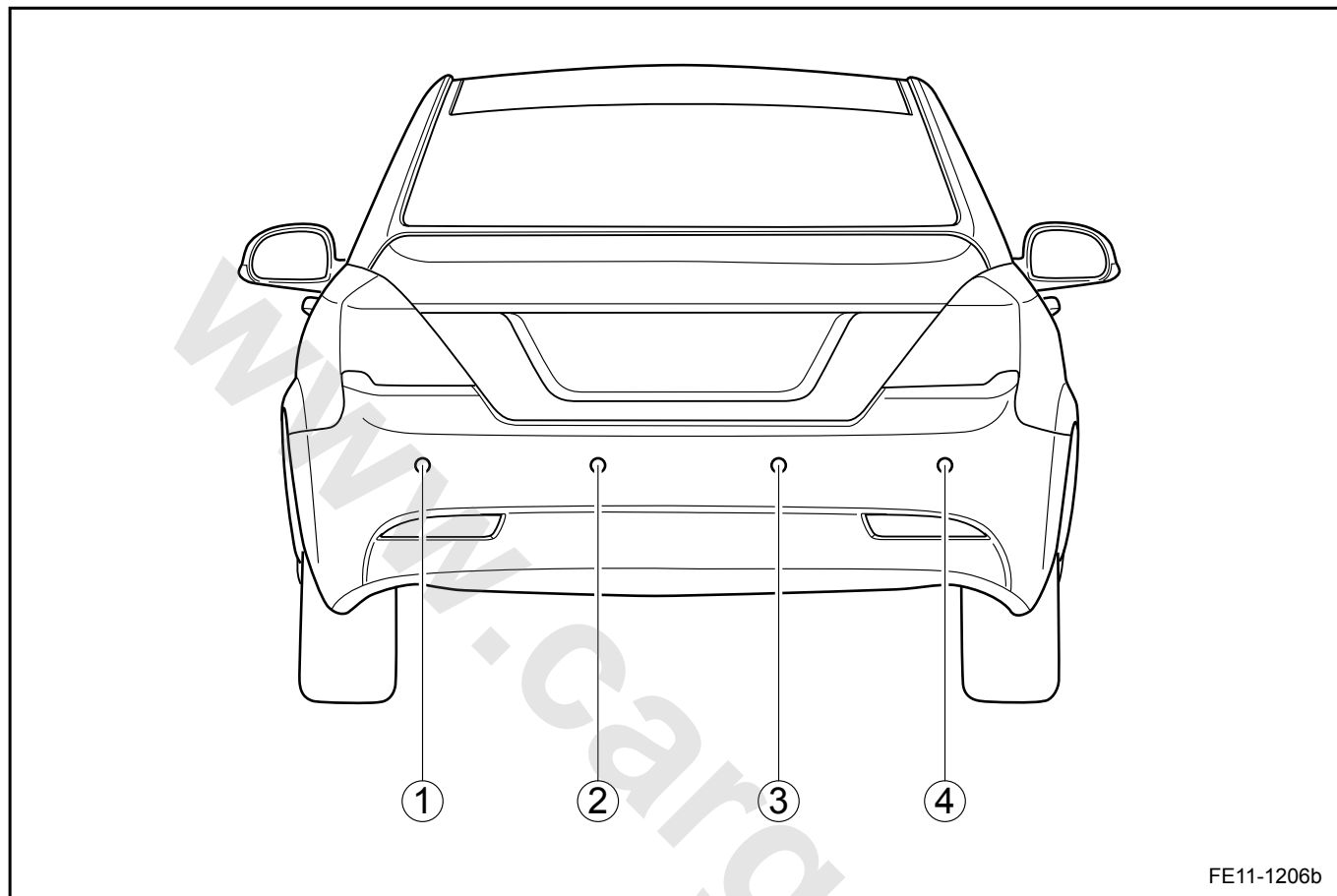
Buzzer is integrated within the instrument cluster, and connected to the reverse radar control module through cable.

Buzzer Driver Diagram



#### 11.14.4 Component Locator

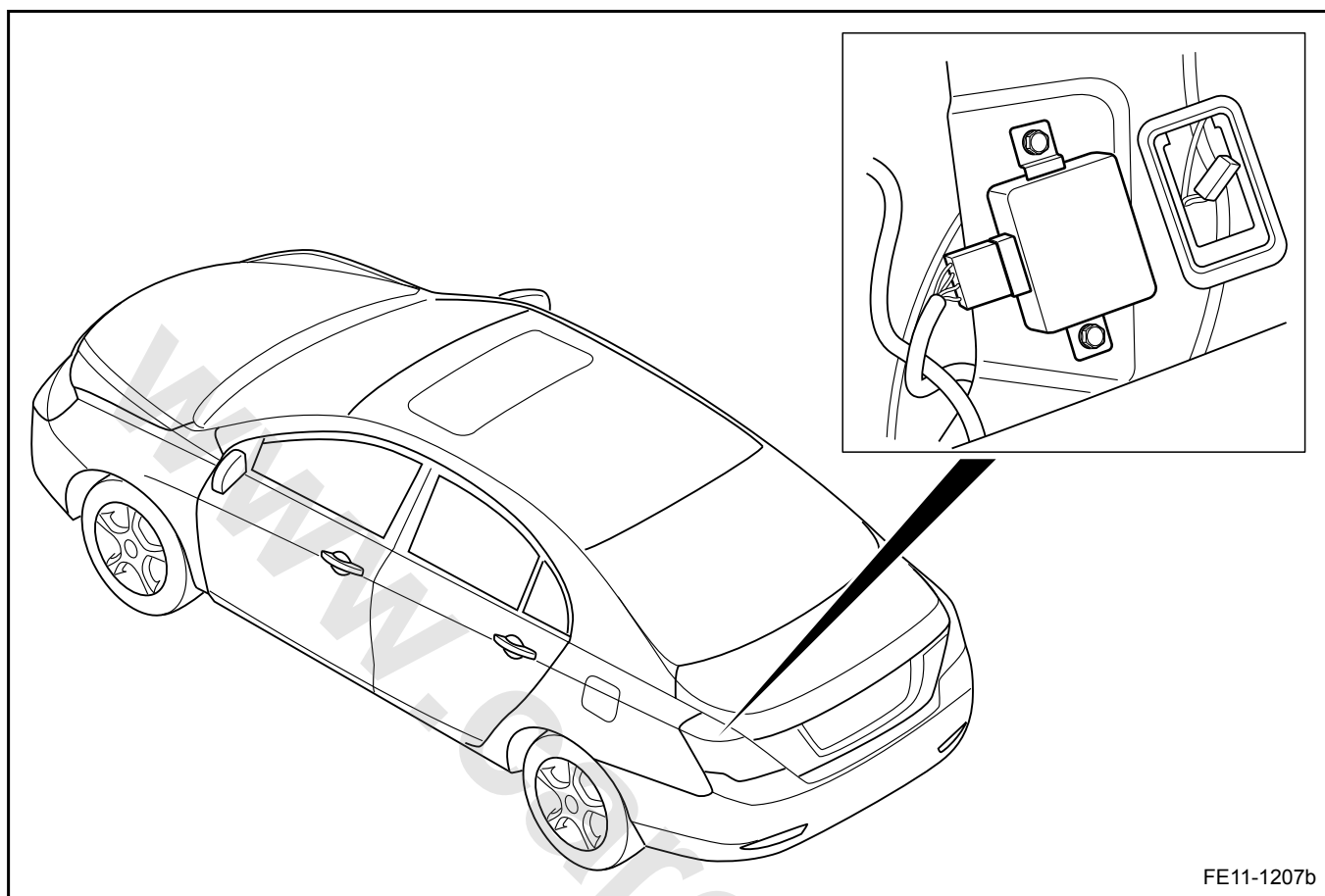
##### 11.14.4.1 Component Locator



#### Legend

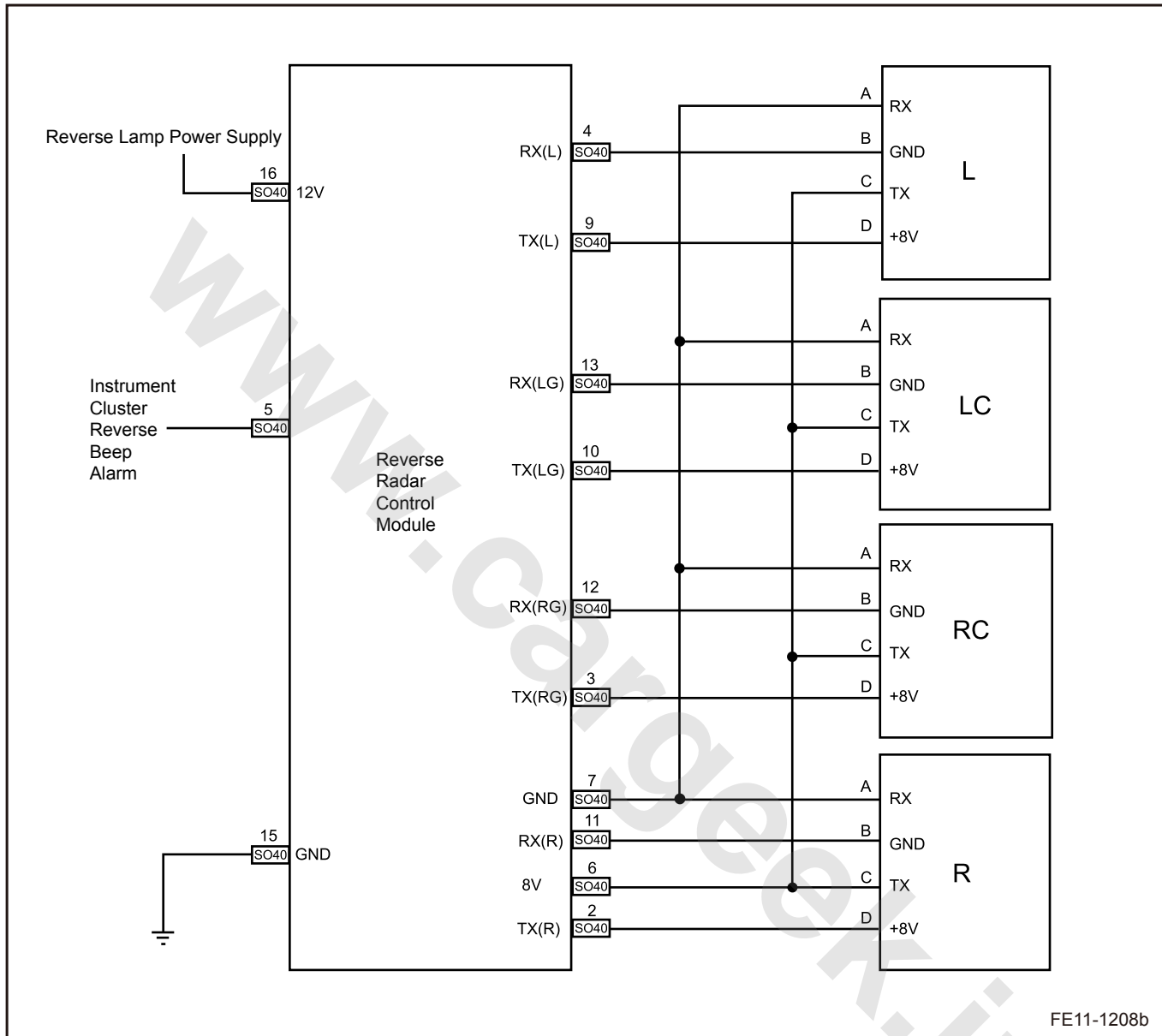
- |                        |                        |
|------------------------|------------------------|
| 1. Left Corner Sensor  | 4. Right Corner Sensor |
| 2. Left Middle Sensor  |                        |
| 3. Right Middle Sensor |                        |

Reverse Radar Control Module

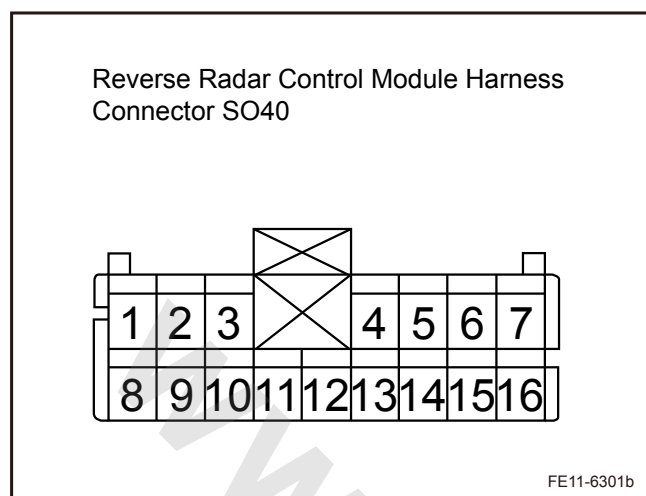


## 11.14.5 Schematic

## 11.14.5.1 Schematic



### 11.14.5.2 Reverse Radar Control Module Terminal List



Terminal ID	Wiring Color	Terminal Descriptions	Status	Specified Conditions
1	--	Empty	--	--
2	R/W	The Right Corner Sensor Data Output	Gear In Reverse	0-5 V 40 KHz, 50% PWM
3	L/G	Right Middle Sensor Data Output	Gear In Reverse	0-5 V 40 KHz, 50% PWM
4	Br/R	Left Corner Sensor Data Input	Gear In Reverse	0-3.5 V
5	L	Buzzer Drive Signal	Trigger Alarm	Data Signals
6	P	Sensor Power Supply	Gear In Reverse	8 V
7	O	Sensor Ground	Always	GND
8	--	Empty	--	--
9	L / Y	Left Corner Sensor Data Output	Gear In Reverse	0-5V 40 KHz, 50% PWM
10	Gr	Left Middle Sensor Data Output	Gear In Reverse	0-5V 40 KHz, 50% PWM
11	Y	Right Corner Sensor Data Input	Gear In Reverse	0-3.5 V
12	W	Right Middle Sensor Data Input	Gear In Reverse	0-3.5 V
13	R	Left Middle Sensor Data Input	Gear In Reverse	0-3.5 V
14	--	Empty	--	--
15	B	Control Module Ground	Always	GND

16	R	Control Module Power Supply	Gear In Reverse	12 V
----	---	--------------------------------	-----------------	------

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## 11.14.6 Diagnostic Information and Procedures

### 11.14.6.1 Diagnosis Description

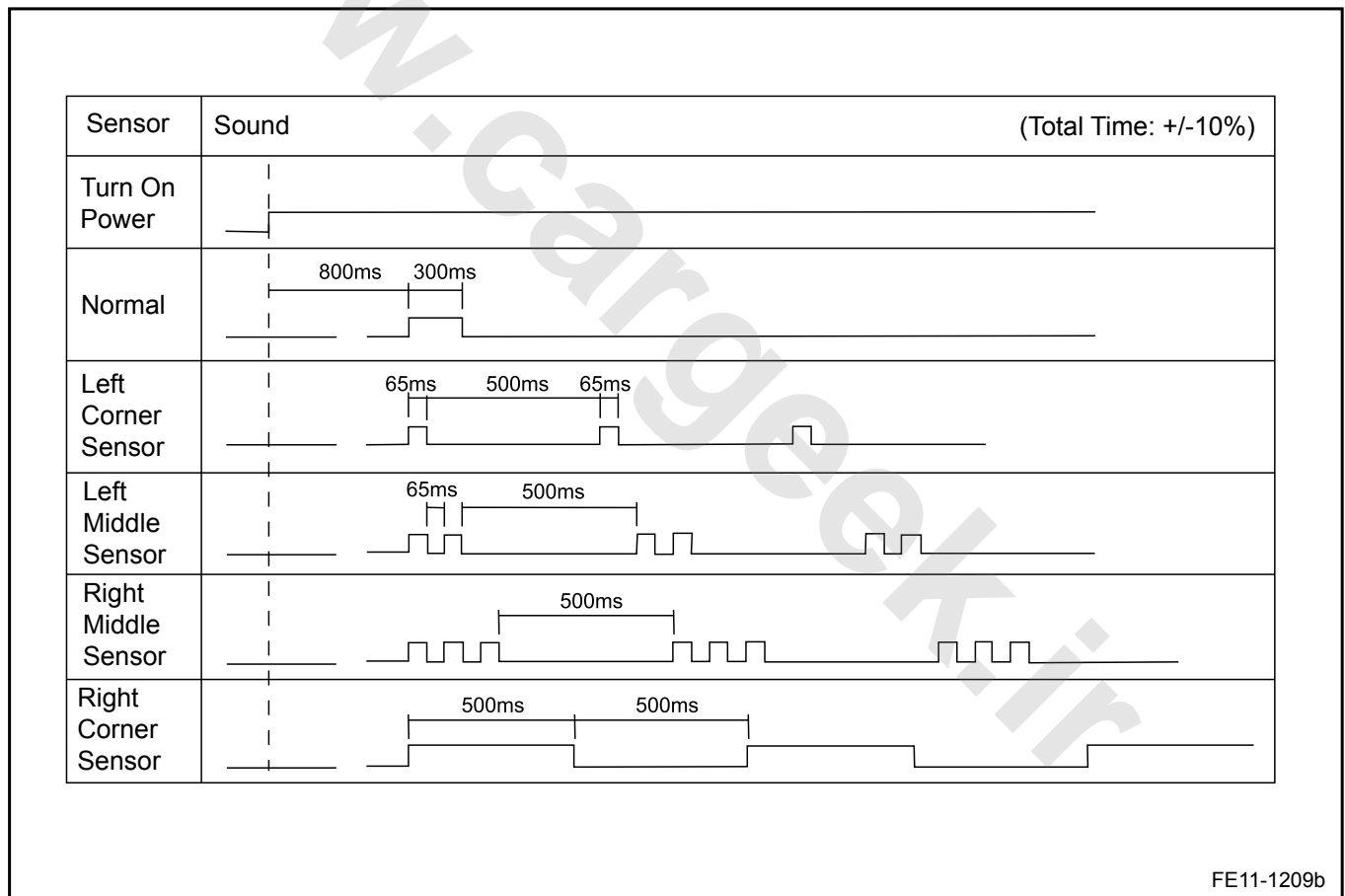
Refer to [11.14.2.1 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.14.6.2 Visual Inspection

- Check the installed after market equipment that may affect the reverse radar system operation.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- Check whether the the reverse radar control module and the wiring harness connectors are installed correctly.

### 11.14.6.3 Sensor Malfunction Diagnostic

After each ignition cycle, if there is a sensor malfunction, the system will send out corresponding alarm sound, the waveform is shown as below:



### 11.14.6.4 The System May Not Work Properly Because

1. The sensor external assembly is frozen.
2. Sensor surface has snow or water droplets.

### 11.14.6.5 The Sensor Detecting Ability May Drop Because

1. The snow or water falls on the sensor probe.
2. Very hot or cold days.
3. There is an obstacle, and its diameter is less than 14 cm (5.5 in) and its length is less than 1 m (39 in).

### 11.14.6.6 The False Alarm May Be Triggered Because

1. On an uneven road, cobblestone pavement and lawn.
2. The system is close to other ultrasonic sources such as vehicles horn, motorcycle engine noise, commercial vehicle air brake etc.
3. Heavy rain and water splashing.
4. Close to a radio equipment such as a Walkman and so on.
5. The sensor is covered by snow etc.

### 11.14.6.7 The System Can Not Detect The Following Objects

1. Objects with sharp corners and ropes.
2. Objects that can absorb ultrasonic, such as cotton, snow and sponges.

### 11.14.6.8 Possible Scenarios

1. According to vehicle speed and the obstacles shape, alarm levels may not be continuous.
2. When the sensor height and rear bumper changes, or the vehicle towed objects are in the detecting area, the system may send a false alarm.
3. The system may not detect objects within 30 cm (11.8 in).
4. When the sensor error is detected, check whether the sensor surface is covered by dust, snow, water, etc.. If it is the case, remove the dust, snow, water, etc from the sensor surface.
5. Avoid sensor surface being squeezed, impacted and scratched and so on.
6. If a vehicle is loaned to others to use, please notify the user of these Notices.

### 11.14.6.9 Fault Symptom List

Symptoms	Suspected Parts	Refer to Page
System is unable to self-test (buzzer does not ring)	1. Reverse Radar Control Module Power Supply Circuit	Refer to <a href="#">11.14.6.10 System Unable to Self-test (Buzzer Did Not Ring)</a> .
	2. Harness and Connectors	
	3. Instrument Cluster	
Gear at R, buzzer rings	1. Harness and Connectors	Refer to <a href="#">11.14.6.11 Buzzer Continuously Ring with Gear at R.</a>
	2. Reverse Radar Control Module	
	3. Harness and Connectors	
	4. Reverse Radar Control Module	
Self Test Right Corner Sensor Malfunction	1. Sensor	Refer to <a href="#">11.14.6.12 Self-test Right Corner Sensor Malfunction.</a>
	2. Harness and Connectors	

Symptoms	Suspected Parts	Refer to Page
	3. Reverse Radar Control Module	
Self Test Right Middle Sensor Malfunction	1. Sensor	Refer to <a href="#">11.14.6.13 Self-test Right Middle Sensor Malfunction</a> .
	2. Harness and Connectors	
	3. Reverse Radar Control Module	
Self Test Left Middle Sensor Malfunction	1. Sensor	Refer to <a href="#">11.14.6.14 Self-test Left Middle Sensor Malfunction</a> .
	2. Harness and Connectors	
	3. Reverse Radar Control Module	
Self Test Left Corner Sensor Malfunction	1. Sensor	Refer to <a href="#">11.14.6.15 Self-test Left Corner Sensor Malfunction</a> .
	2. Harness and Connectors	
	3. Reverse Radar Control Module	

### 11.14.6.10 System Unable to Self-test (Buzzer Did Not Ring)

Diagnostic Steps:

#### Note

It is prohibited to start the vehicle during this diagnostic procedure, otherwise it will result in vehicle damage and personal injury.

Step 1	Check whether reverse lamps are working.
--------	--

- (a) Turn the ignition switch to "ON" position.
  - (b) Put gear at "R" position.
  - (c) Observe whether reverse lamps are lit.
- Are reverse lamps on?

No

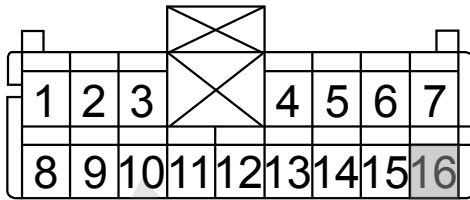
Check the reverse lamp circuit. Refer to [11.4.7.9 Reverse Lamp Inoperative](#)

Yes

#### Note

It is prohibited to start the vehicle during this diagnostic procedure, otherwise it will result in vehicle damage and personal injury.

Step 2	Check whether the reverse sensor control module power supply is normal.
--------	---

Reverse Radar Control Module Harness  
Connector SO40

FE11-6302b

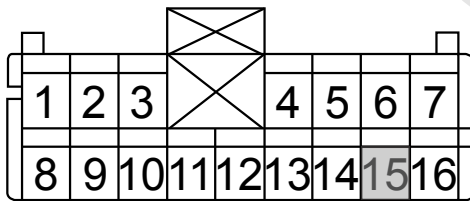
- Turn the ignition to the "OFF" position.
- Disconnect the reverse radar control module harness connector SO40.
- Turn the ignition switch to "ON" position.
- Put gear at "R".
- Measure voltage between reverse radar harness connector SO40 terminal No.16 and a reliable ground.  
Standard Value: 11.5-12.5 V  
Is the voltage normal?

No

The circuit between SO40 terminal No.16 and SO02 terminal No.13 is open.

Yes

Step 3 Check whether the reverse sensor control module ground circuit is normal.

Reverse Radar Control Module Harness  
Connector SO40

FE11-6303b

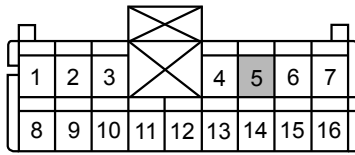
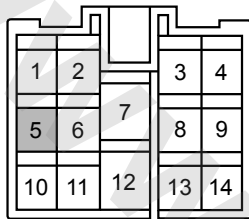
- Turn the ignition to "OFF" position.
- Disconnect the radar control module harness connector SO40.
- Measure resistance between the reverse radar harness connector SO40 terminal No.15 and a reliable ground.  
Standard Value: Less than 1  $\Omega$   
Is the resistance specified value?

No

The circuit between SO40 terminal No.15 and ground is open.

Yes

Step 4 Check whether the reverse sensor control module buzzer drive circuit is normal.

Reverse Radar Control Module Harness  
Connector SO40To Instrument Cluster Harness  
Connector SO03

FE11-6304b

- Turn the ignition to the "OFF" position.
- Disconnect the radar control module harness connector SO40.
- Disconnect the floor harness connector SO03 and instrument wiring harness connector IP10.
- Measure resistance between the reverse radar harness connector SO40 terminal No.5 and the floor wiring harness connector SO03 terminal No.5.  
Standard Value: Less than 1  $\Omega$   
Is the resistance specified value?

No

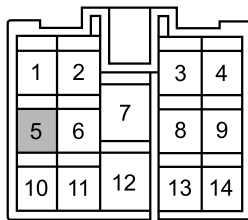
Circuit between SO40 terminal 5 and SO03 terminal 5 is open.

Yes

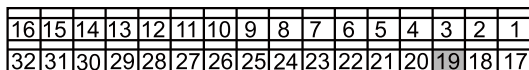
## Step 5

Check whether the reverse sensor control module buzzer drive circuit is normal.

## To Instrument Cluster Harness Connector SO03



## Instrument Cluster Harness Connector IP03



FE11-6305b

- Turn the ignition to the "OFF" position.
- Disconnect the meter harness connector IP03.
- Disconnect the floor harness connector SO03 and instrument cluster wiring harness connector IP10.
- Measure resistance between the floor wiring harness connector SO40 terminal No.5 and the instrument wiring harness connector IP03 terminal No.19.  
Standard Value: Less than 1  $\Omega$   
Is the resistance specified value?

No

The circuit between the SO40 terminal No.5 and SO03 terminal No.5 is open.

Yes

Step 6 Check whether other instrument cluster warning sounds are normal.

No

Replace the instrument cluster. Refer to [11.7.7.1 Instrument Cluster Replacement](#)

Yes

Step 7 Replace the reverse radar control module. Refer to [11.14.7.1 Reverse Radar Module Replacement](#).

Next

Step 8 Verify the repair result.

Next

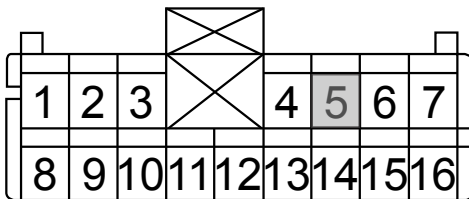
Step 9 Diagnostic completed.

### 11.14.6.11 Buzzer Continuously Ring with Gear at R

Diagnostic Steps:

Step 1 Check the reverse radar module buzzer drive circuit.

Reverse Radar Module Harness Connector SO40



FE11-6306b

- Turn the ignition switch to "OFF" position.
  - Disconnect the radar control module harness connector SO40.
  - Disconnect the instrument cluster harness connector IP03.
  - Measure resistance between the reverse radar harness connector SO40 terminal No.5 and a reliable ground.
  - Turn the ignition switch to "ON" position.
  - Measure voltage between the reverse radar harness connector SO40 terminal No.5 and a reliable ground.
- Standard Value:

Test Items	Specified Conditions
Resistance Between SO40 (5) and A Reliable Ground	10 kΩ or higher
Voltage Between SO40 (5) and A Reliable Ground	0 V

Is the value specified value?

No

Go to step 3

Yes

Step 2 Check whether the reverse radar control module power supply circuit is normal.

Refer to [11.14.6.10 System Unable to Self-test \(Buzzer Did Not Ring\)](#).

No

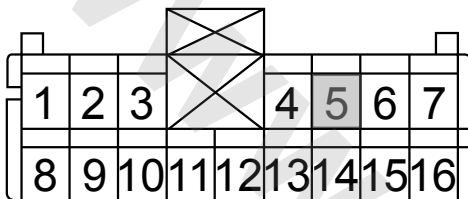
Repair the faulty part.

Yes

Go to step 5

Step 3 Check and repair the buzzer drive circuit floor wiring harness.

Reverse Radar Module Harness Connector SO40



FE11-6306b

- Turn the ignition to the "OFF" position.
- Disconnect the radar control module harness connector SO40.
- Disconnect floor harness connector SO03.
- Measure resistance between the reverse radar harness connector SO40 terminal No.5 and a reliable ground.
- Turn the ignition switch to "ON" position.
- Measure voltage between the reverse radar harness connector SO40 terminal No.5 and a reliable ground.

Standard Value:

Test Items	Specified Conditions
SO40 (5) and A Reliable Ground	10 kΩ or higher
Resistance Between SO40 (5) and A Reliable Ground	0 V

Is the value specified value?

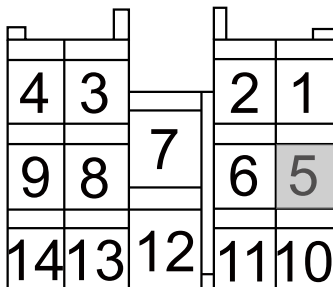
No

Repair the circuit between the SO40 terminal No.5 and the SO03 terminal No.5.

Yes

Step 4 Check and repair the buzzer drive circuit instrument panel wiring harness.

To Floor Harness Connector IP10



FE11-6307b

- Turn the ignition to the "OFF" position.
- Disconnect the floor harness connector SO03 and the instrument cluster wiring harness connector IP10.
- Disconnect the instrument cluster harness connector IP03.
- Measure resistance between the wiring harness connector IP10 terminal No.5 and a reliable ground.
- Turn the ignition switch to "ON" position.
- Measure voltage between harness connector IP10 terminal No.5 and a reliable ground.

Standard Value:

Test Items	Specified Conditions
Resistance Between SO40 (5) and A Reliable Ground	10 kΩ or higher

Resistance Between SO40 (5) and A Reliable Ground	0 V
--	-----

Is the value specified value?

No

The circuit between the SO40 terminal No.5 and SO03 terminal No.5 is faulty.

Yes

Step 5 Replace the reverse radar control module. Refer to [11.14.7.1 Reverse Radar Module Replacement](#).

Next

Step 6 Verify the repair result.

Next

Step 7 Diagnostic completed.

### 11.14.6.12 Self-test Right Corner Sensor Malfunction

Diagnostic Steps:

Step 1 Carry out the initial inspection.

- (a) Check whether the sensor surface is covered by impurities.
- (b) Check whether the sensor surface is damaged or abnormal.
- (c) Incorrectly spray the rear bumper will cause excessive paint covering the sensor surface. check whether this situation exists.

Is the sensor surface normal?

No

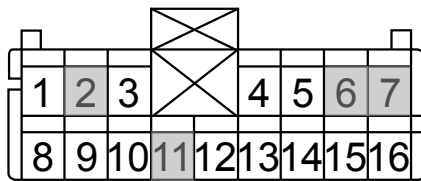
Clean the sensor surface, if necessary, replace the sensor.

Yes

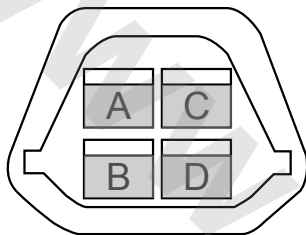
Step 2 Check the wiring harness and connectors.



Reverse Radar Module Harness Connector SO40



Reverse Radar Module Harness Connector SO45



FE11-6308b

- Turn the ignition switch to "OFF" position.
- Disconnect the radar control module harness connector SO40.
- Disconnect the right corner sensor SO45.
- Test the terminals continuity according to the following table.

Test Items	Specified Value
SO45 (D)-SO40 (2) Resistance Value	Less than 1 $\Omega$
SO45 (C)-SO40 (6) Resistance Value	
SO45 (B)-SO40 (11) Resistance Value	
SO45 (A)-SO40 (7) Resistance Value	
Resistance Between SO45 (D) and A Reliable Ground	10 k $\Omega$ or higher
Resistance Between SO45 (C) and A Reliable Ground	
Resistance Between SO45 (B) and A Reliable Ground	
Resistance Between SO45 (A) and A Reliable Ground	
Resistance Between SO45 (D) and A Reliable Ground	0 V
Resistance Between SO45 (C) and A Reliable Ground	
Resistance Between SO45 (B) and A Reliable Ground	
Resistance Between SO45 (A) and A Reliable Ground	
Resistance Between Any Two Of SO45 Terminals (A, B, C, D)	10 k $\Omega$ or higher

Are the test results normal?

No

Repair the faulty circuits.

Yes

Step 3

Check whether reverse radar control module power supply circuits are normal.

Refer to [11.14.6.10 System Unable to Self-test \(Buzzer Did Not Ring\)](#).

No

Repair the faulty circuit.

Yes

Step 4 Replace the right corner sensor. Refer to [11.14.7.2 Reverse Radar Sensor Replacement](#).

Next

Step 5 Check the reverse radar self-test function to confirm the fault has been fixed.

### 11.14.6.13 Self-test Right Middle Sensor Malfunction

Diagnostic Steps:

Step 1 Carry out the following initial inspection.

- (a) Check whether the sensor surface is covered by impurities.
- (b) Check whether the sensor surface is damaged or abnormal.
- (c) Incorrectly spray the rear bumper will cause excessive paint covering the sensor surface. check whether this situation exists.

Is the sensor surface normal?

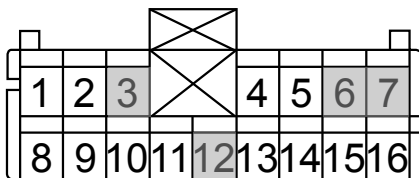
No

Clean the sensor surface, if necessary, replace the sensor.

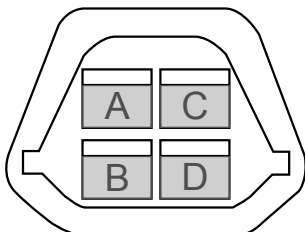
Yes

Step 2 Check the wiring harness and connectors.

Reverse Radar Module Harness Connector SO40



Reverse Radar Module Harness Connector SO44



FE11-6309b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the radar control module harness connector SO40.
- (c) Disconnect the right middle sensor SO44.
- (d) Test the terminals continuity according to the following table.

Test Items	Specified Value
SO44 (D)-SO40 (3) Resistance Value	Less than 1 $\Omega$
SO44 (C)-SO40 (6) Resistance Value	
SO44 (B)-SO40 (12) Resistance Value	
SO44 (A)-SO40 (7) Resistance Value	
Resistance Between SO44 (D) and A Reliable Ground	10 k $\Omega$ or higher
Resistance Between SO44 (C) and A Reliable Ground	
Resistance Between SO44 (B) and A Reliable Ground	
Resistance Between SO44 (A) and A Reliable Ground	

Resistance Between SO44 (D) and A Reliable Ground	0 V
Resistance Between SO44 (C) and A Reliable Ground	
Resistance Between SO44 (B) and A Reliable Ground	
Resistance Between SO44 (A) and A Reliable Ground	
Resistance Between Any Two Of SO44 Terminals (A, B, C, D)	10 kΩ or higher

Are the test results correct?

No

Repair the faulty part.

Yes

Step 3

Check whether the reverse sensor control module power supply circuits are normal.

Refer to [11.14.6.10 System Unable to Self-test \(Buzzer Did Not Ring\)](#).

No

Repair the faulty circuit.

Yes

Step 4

Replace the right middle sensor. Refer to [11.14.7.2 Reverse Radar Sensor Replacement](#).

Next

Step 5

Check the reverse radar self-test function to confirm the fault has been fixed.

### 11.14.6.14 Self-test Left Middle Sensor Malfunction

Diagnostic Steps:

Step 1

Carry out the following initial inspection.

- (a) Check whether the sensor surface is covered by impurities.
- (b) Check whether the sensor surface is damaged or abnormal.
- (c) Incorrectly spray the rear bumper will cause excessive paint covering the sensor surface. check whether this situation exists.

Is the sensor surface normal?

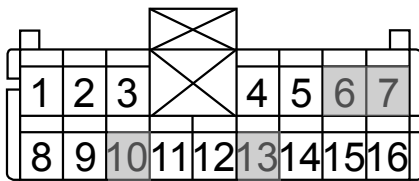
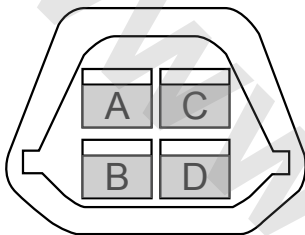
No

Clean the sensor surface, if necessary, replace the sensor.

Yes

Step 2

Check the wiring harness and connectors.

Reverse Radar Module Harness  
Connector SO40Reverse Radar Module Harness  
Connector SO43

FE11-6310b

- Turn the ignition switch to "OFF" position.
- Disconnect the radar control module harness connector SO40.
- Disconnect the left middle sensor SO43.
- Test the terminals continuity according to the following table.

Test Items	Specified Value
SO43 (D)-SO40 (10) Resistance Value	Less than 1 $\Omega$
SO43 (C)-SO40 (6) Resistance Value	
SO43 (B)-SO40 (13) Resistance Value	
SO43 (A)-SO40 (7) Resistance Value	
Resistance Between SO43 (D) and A Reliable Ground	10 k $\Omega$ or higher
Resistance Between SO43 (C) and A Reliable Ground	
Resistance Between SO43 (B) and A Reliable Ground	
Resistance Between SO43 (A) and A Reliable Ground	
Resistance Between SO43 (D) and A Reliable Ground	0 V
Resistance Between SO43 (C) and A Reliable Ground	
Resistance Between SO43 (B) and A Reliable Ground	
Resistance Between SO43 (A) and A Reliable Ground	
Resistance Between Any Two Of SO43 Terminals (A, B, C, D)	10 k $\Omega$ or higher

Are the test results correct?

No

Repair the faulty circuit.

Yes

Step 3

Check whether the reverse sensor control module power supply circuits are normal.

Refer to [11.14.6.10 System Unable to Self-test \(Buzzer Did Not Ring\)](#).

No

Repair the faulty circuit.

Yes

Step 4 Replace the left middle sensor. Refer to [11.14.7.2 Reverse Radar Sensor Replacement](#).

Next

Step 5 Check the reverse radar self-test function to confirm the fault has been fixed.

### 11.14.6.15 Self-test Left Corner Sensor Malfunction

Diagnostic Steps:

Step 1 Carry out the following initial inspection.

- (a) Check whether the sensor surface is covered by impurities.
- (b) Check whether the sensor surface is damaged or abnormal.
- (c) Incorrectly spray the rear bumper will cause excessive paint covering the sensor surface. check whether this situation exists.

Is the sensor surface checks normal?

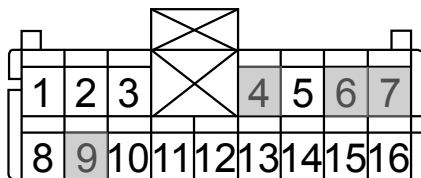
No

Clean the sensor surface, if necessary, replace the sensor.

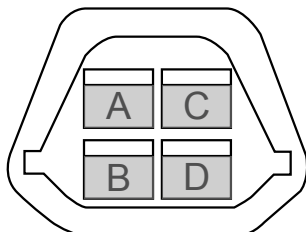
Yes

Step 2 Check the wiring harness and connectors.

Reverse Radar Control Module Harness Connector SO40



Reverse Radar Control Module Harness Connector SO42



FE11-6311b

- (a) Turn the ignition switch to "OFF" position.
- (b) Disconnect the radar control module harness connector SO40.
- (c) Disconnect right middle sensor SO42.
- (d) Test the terminals continuity according to the following table.

Test Items	Specified Value
SO42 (D)-SO40 (9) Resistance Value	Less than 1 $\Omega$
SO42 (C)-SO40 (6) Resistance Value	
SO42 (B)-SO40 (4) Resistance Value	
SO42 (A)-SO40 (7) Resistance Value	
Resistance Between SO42 (D) and A Reliable Ground	10 k $\Omega$ or higher
Resistance Between SO42 (C) and A Reliable Ground	
Resistance Between SO42 (B) and A Reliable Ground	

Resistance Between SO42 (A) and A Reliable Ground	0 V
Resistance Between SO42 (D) and A Reliable Ground	
Resistance Between SO42 (C) and A Reliable Ground	
Resistance Between SO42 (B) and A Reliable Ground	
Resistance Between SO42 (A) and A Reliable Ground	
Resistance Between Any Two Of SO42 Terminals (A, B, C, D)	10 kΩ or higher

Are the test results correct?

No

Repair the faulty circuit.

Yes

Step 3 Check whether the reverse sensor control module power supply circuits are normal.

Refer to [11.14.6.10 System Unable to Self-test \(Buzzer Did Not Ring\)](#).

No

Repair the faulty circuit.

Yes

Step 4 Replace the left corner sensor. Refer to [11.14.7.2 Reverse Radar Sensor Replacement](#).

Next

Step 5 Check the reverse radar self-test function to confirm fault has been fixed.

## 11.14.7 Removal and Installation

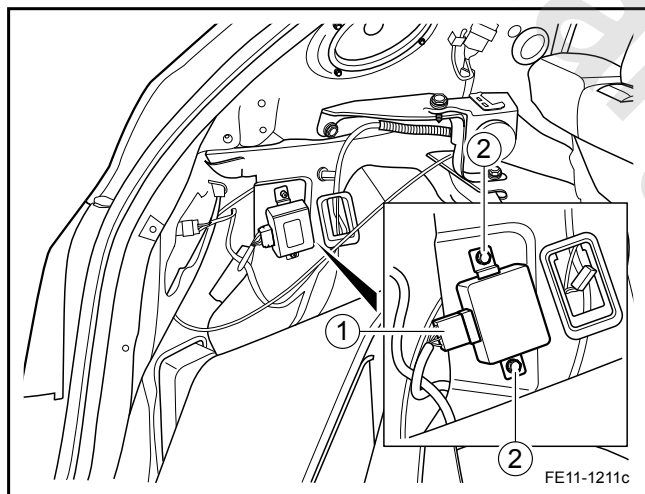
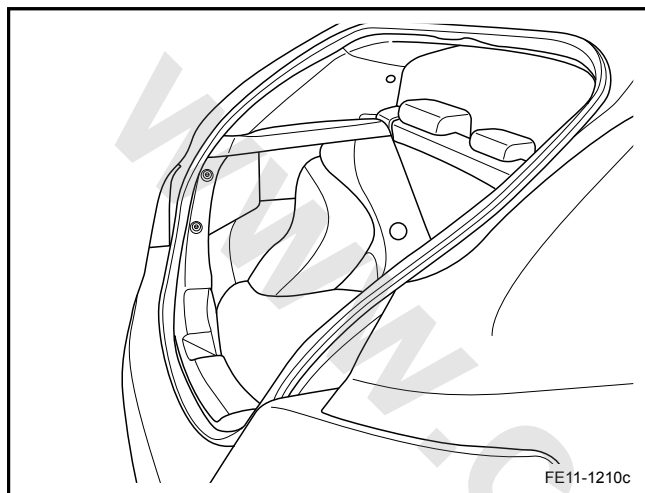
### 11.14.7.1 Reverse Radar Module Replacement

#### Removal Procedure

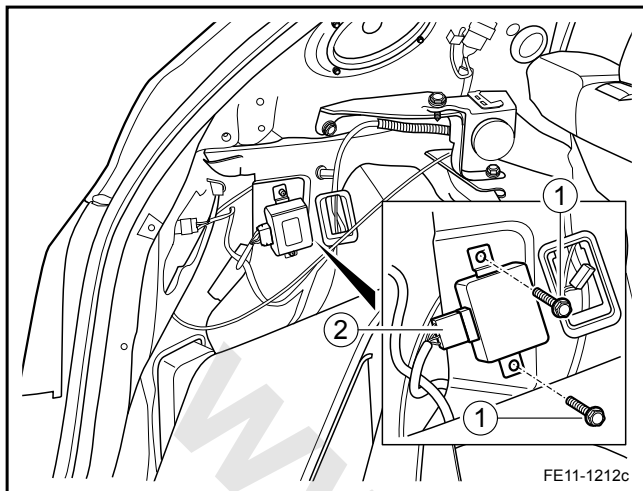
#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the hatchback left panel. Refer to [12.9.1.8 Rear Parcel Shelf Replacement \(Hatchback\)](#).



3. Disconnect the radar module harness connector (1).
4. Remove the reverse radar module retaining bolt (2).



## Installation Procedure:

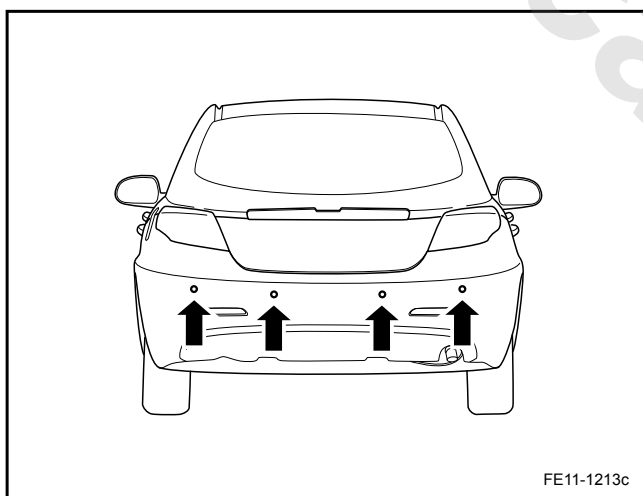
1. Tighten the reverse radar module retaining bolts (1).  
Torque: 8-11 Nm (Metric) 6-8 lb-ft (US English)
2. Connect the reverse radar module harness connector (2).
3. Install the hatchback left panel.
4. Connect the battery negative cable.

## 11.14.7.2 Reverse Radar Sensor Replacement

## Removal Procedure

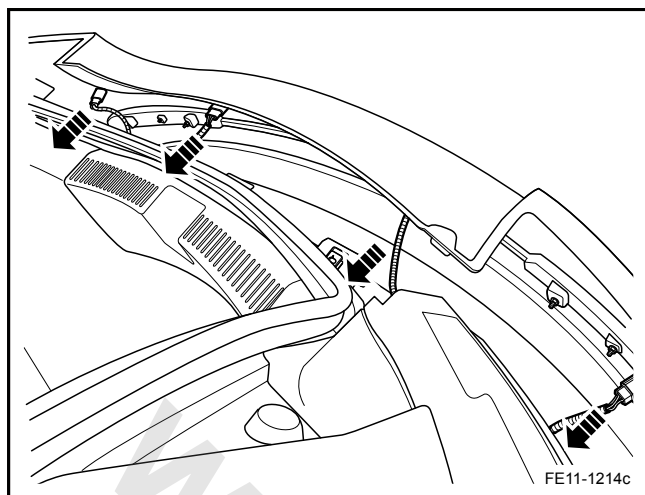
## Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

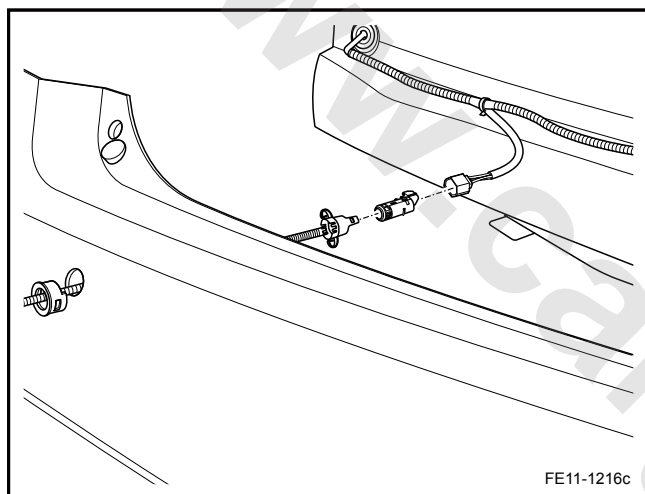


1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the rear bumper. Refer to [12.4.3.3 Rear Bumper Replacement \(Sedan\)](#).



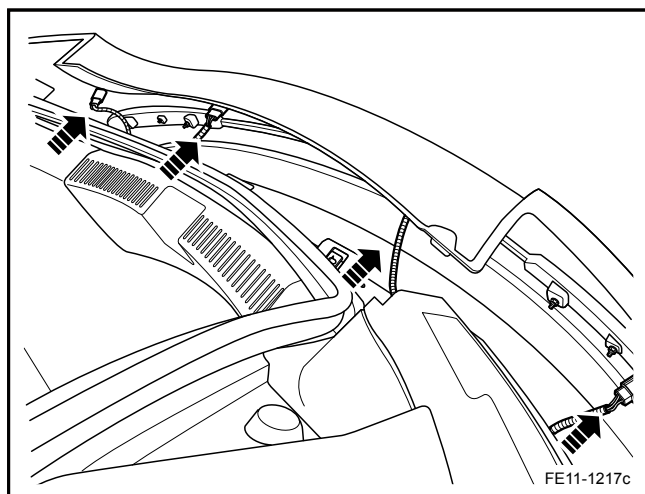


3. Disconnect the reverse radar sensor harness connectors.
4. Remove the reverse radar sensors.



Installation Procedure:

1. Install the reverse radar sensors to the rear bumper.
2. Connect the reverse radar sensor harness connectors.



3. Install rear bumper.
4. Connect the battery negative cable.

## 11.15 Instrument Cluster




### 11.15.1 Specifications

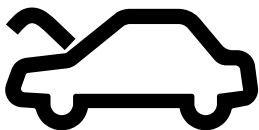


#### 11.15.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Instrument Cluster Self-Tapping Screws	ST4.2 × 9.5	3-4	2-3

#### 11.15.1.2 Indicator Descriptions

The instrument cluster has a total of five warning lamps to provide a warning or a reminder.

Symbols	Indicator	Color
	Passenger Seat Belts Are Not Tighten Warning Lamps	Red
	Front Fog Lamps On	Green
	Rear Fog Lamps On	Yellow

Symbols	Indicator	Color
	Hood Is Not Closed Warning Lamp	Red
	Rear Compartment Lid (Hatchback) Is Not Closed Warning Lamp	Red
	Clock	Blue Background With White Text

## 11.15.2 Description and Operation

### 11.15.2.1 Description and Operation

The time is displayed as a 24-hour clock on the LCD screen. Even if the engine is shut down, the time is still displayed. set the time Through the time adjustment button (Refer to [11.15.4.1 Component Locator](#)).

Clock error is less than  $\pm 10$  s per month.

### Trigger Clock Settings

Pressing and holding (greater than 2 s) the time adjustment button, it will enter the clock setting mode. The number of hours and a colon blink at 1Hz frequency. This mode is hours configuration mode. When the hour is set, the number will no longer blink.

### Set Up Hours

In the hours setting mode, the number of hours will increase with a short rod press (more than 300 ms and less than 2 s). If

press and hold the adjustment rod more than 2 s, the number of hours will increase at 5 h/s rate.

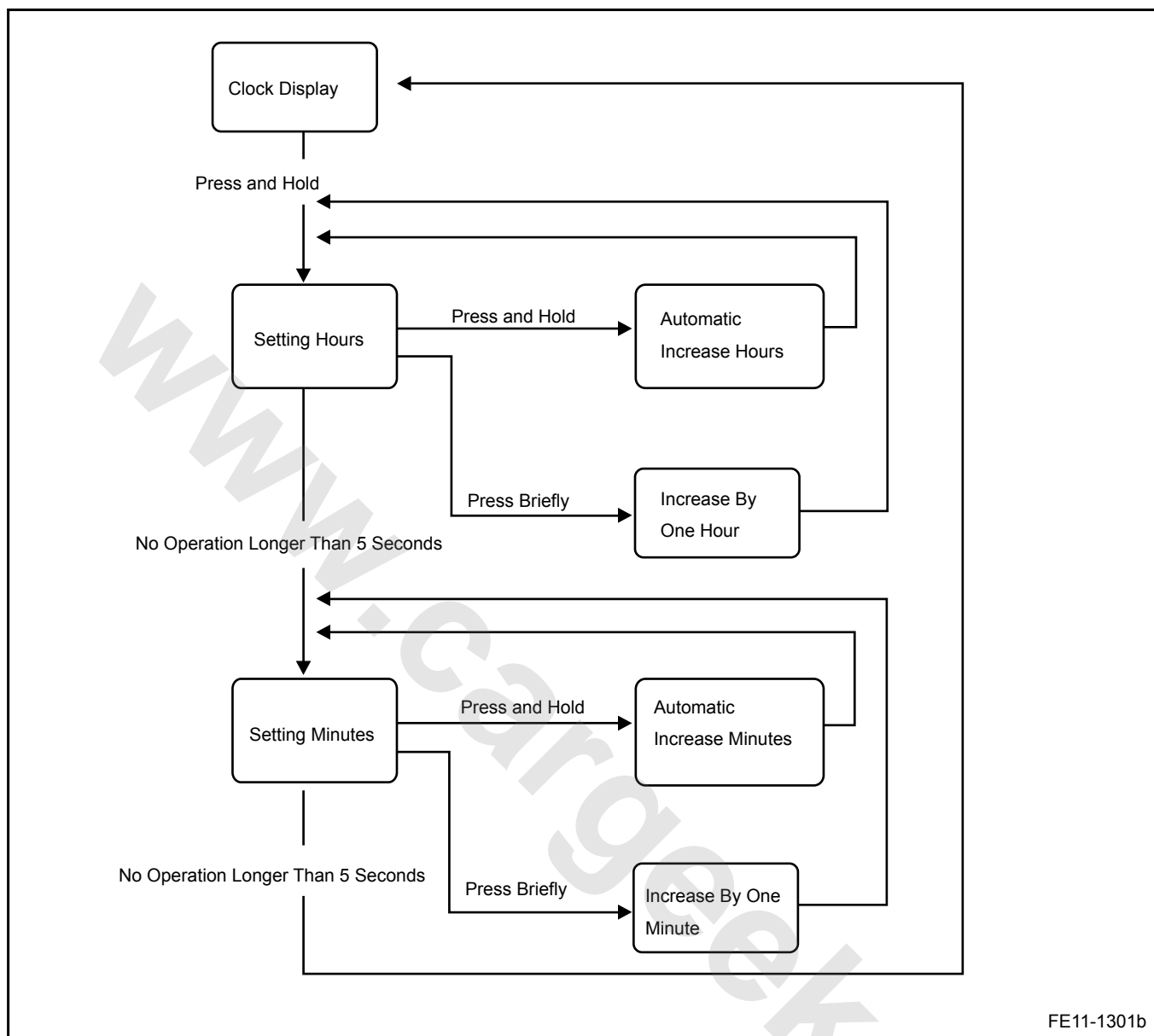
If the rod is not pressed in 5 s, it will enter the minutes setting mode. The number of minutes and a colon blink at 1 Hz frequency, as described above.

### Set Up Minutes

In the minutes setting mode, the number of minutes will increase with a short rod press (more than 300ms and less than 2 s). If press and hold the adjustment rod more than 2 s, the number of minutes will increase at 5 h/s rate.

If the rod is not pressed in 5 s, the setting mode will end, the clock will not blink.

Clock Settings Flowchart



### 11.15.3 System Working Principle

#### 11.15.3.1 Warning Lamps Control

The instrument cluster has two warning lamps and their power is supplied by the battery (the battery is inside the instrument cluster). they are:

- Front Fog Lamp Indicator
- Rear Fog Lamp Indicator
- Hood Not Closed Warning Lamp
- Rear Compartment Lid (Hatchback) Not Closed Warning Lamp

The following instrument cluster warning lamps are directly controlled by the hardware:

- Front Fog Lamp Indicator
- Rear Fog Lamp Indicator

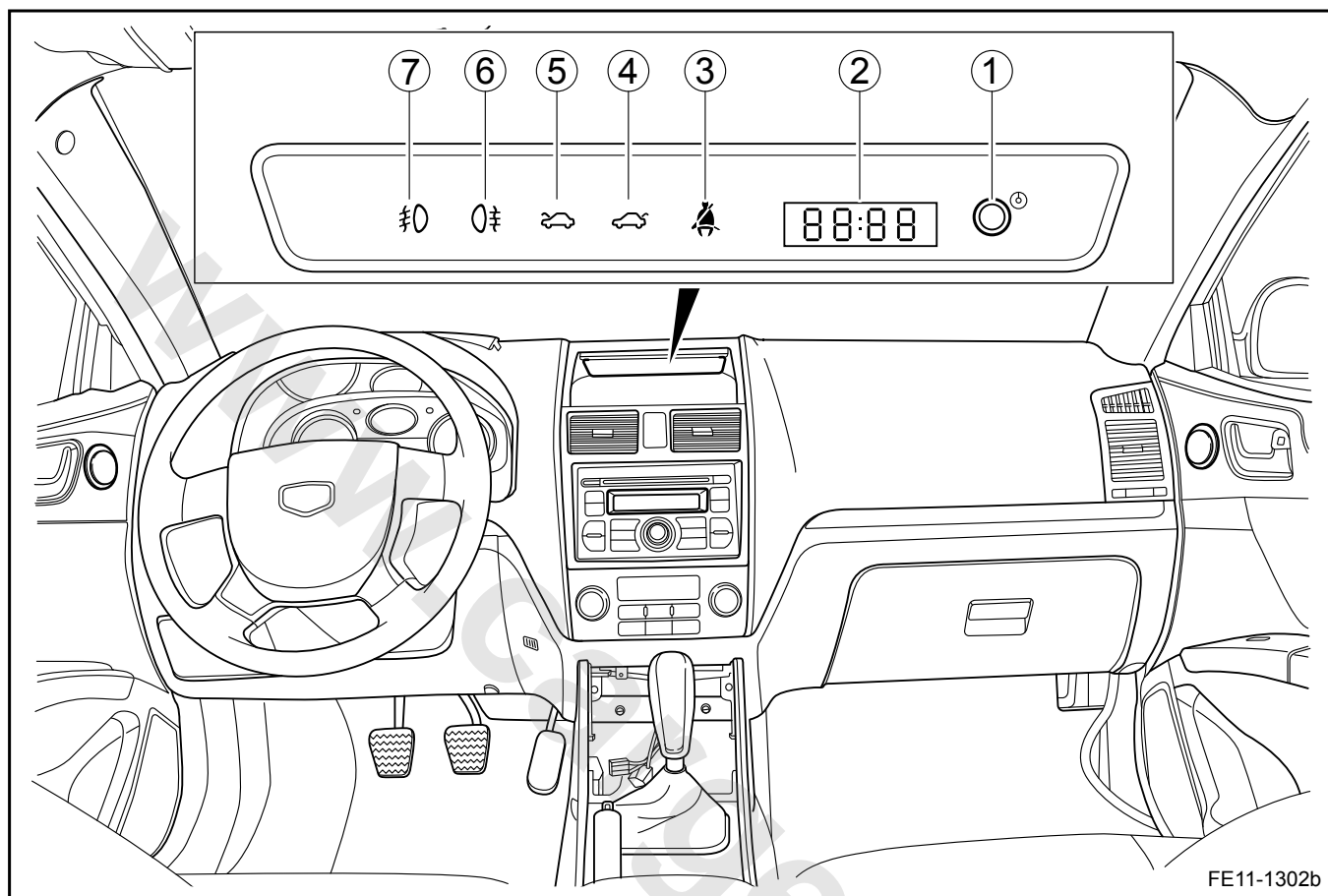
#### Note

Other warning lamps are controlled by the CAN bus signal.

### 11.15.4 Component Locator

#### 11.15.4.1 Component Locator

Instrument Cluster



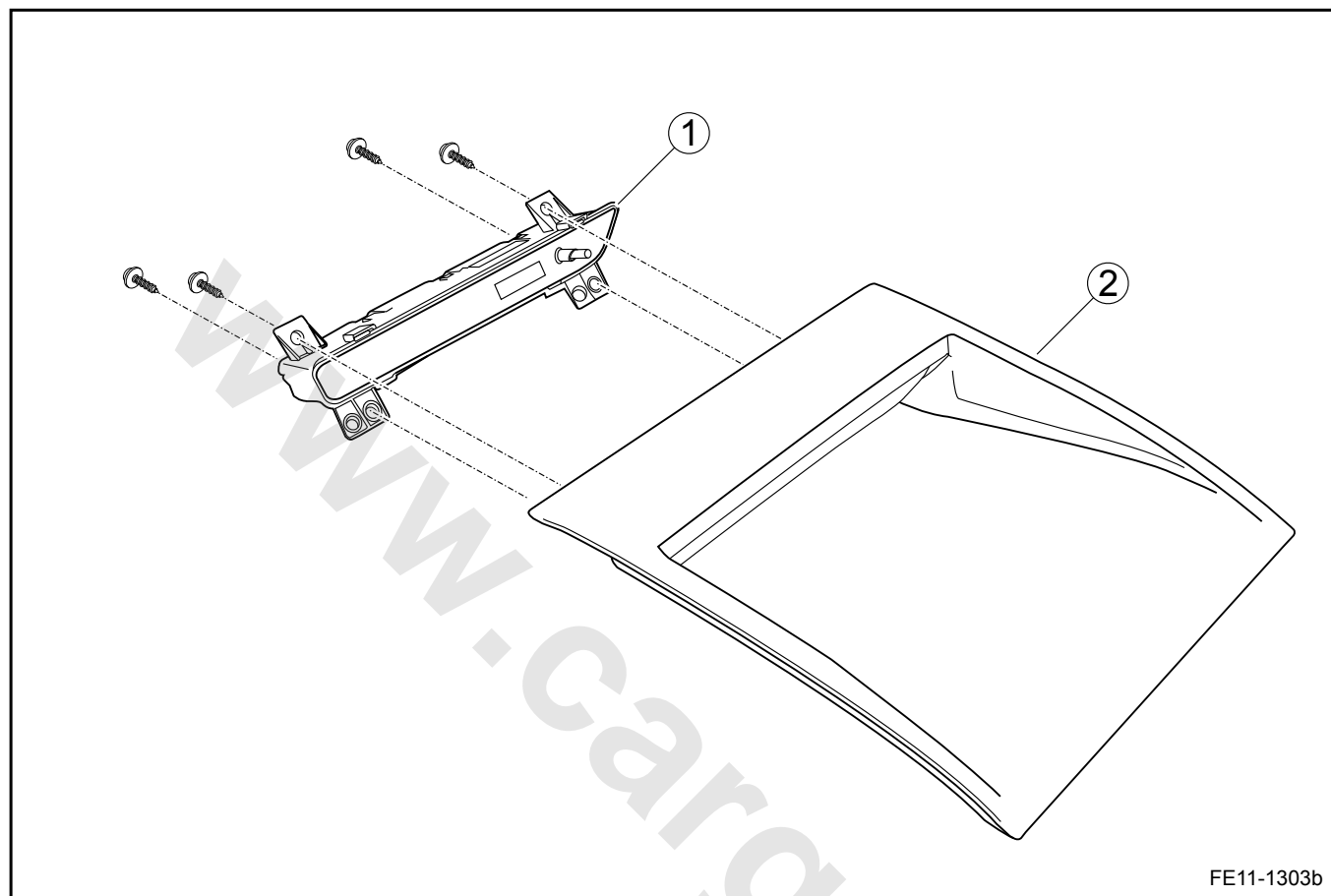
FE11-1302b

#### Legend

- |   |                                 |
|---|---------------------------------|
| 1. Time Adjustment Button                                   | 5. Hood Not Closed Warning Lamp |
| 2. Clock Display  | 6. Rear Fog Lamp Indicator      |
| 3. Passenger Seat Belts Not Tightened Warning Lamps         | 7. Front Fog Lamp Indicator     |
| 4. Rear Compartment Lid (Hatchback) Not Closed Warning Lamp |                                 |

### 11.15.5 Disassemble View

#### 11.15.5.1 Disassemble View



#### Legend

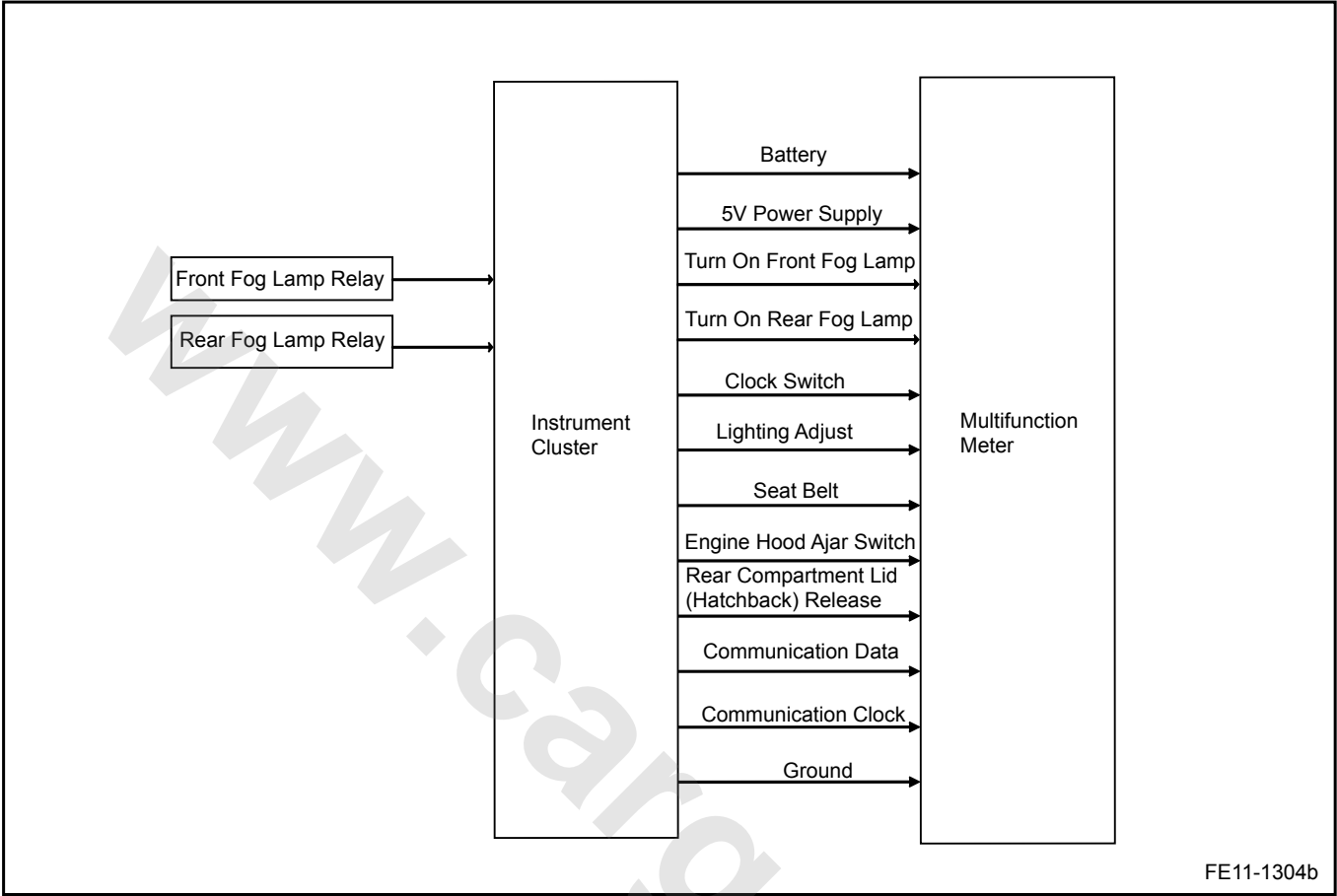
1. Instrument Cluster

2. Instrument Cluster Shroud



11.15.6 Schematic

11.15.6.1 Schematic



## 11.15.7 Diagnostic Information and Procedures

### 11.15.7.1 Diagnostic Information and Procedures

Refer to [11.7.6.1 Diagnosis Description](#).

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## 11.15.8 Removal and Installation

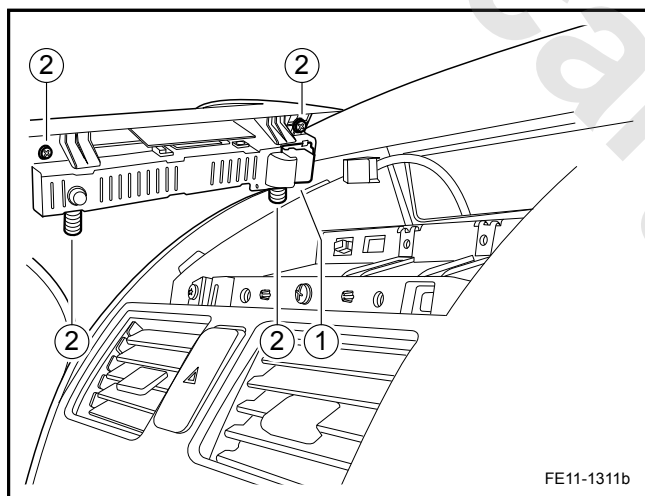
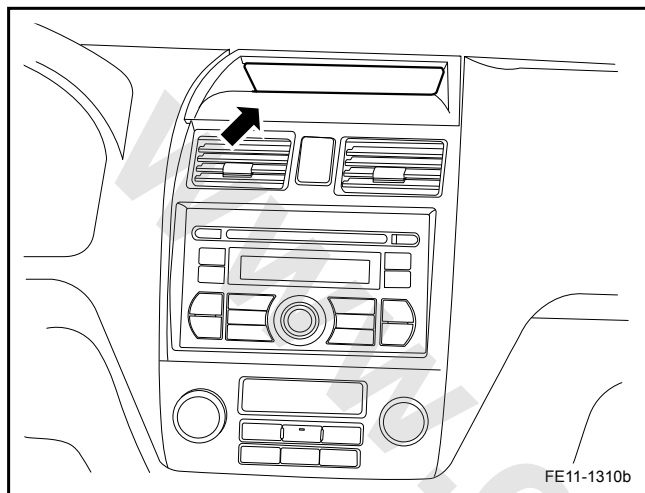
### 11.15.8.1 Instrument Cluster Replacement

#### Removal Procedure

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the instrument panel panel.

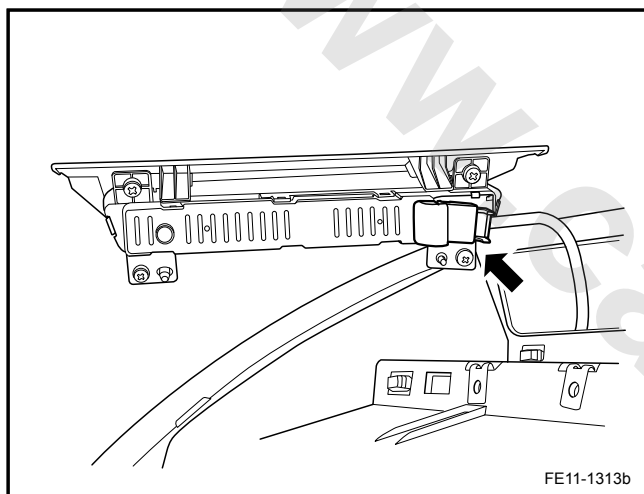
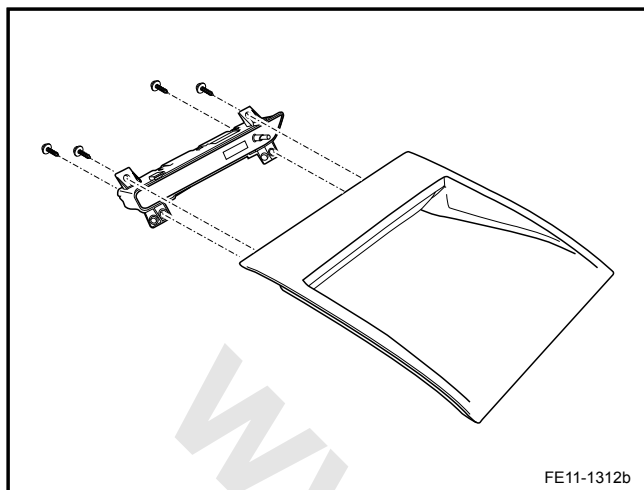


3. Disconnect the display harness connector (1).
4. Remove the screws and the display (2).

## Installation Procedure:

1. Install the display.

Torque: 3 Nm (Metric) 2 lb-ft (US English)



2. Connect the display harness connector.
3. Install the instrument cluster panel.
4. Connect the battery negative cable.

## 11.16 Cigarette Lighter

### 11.16.1 Specifications

#### 11.16.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Center Console Panel Retaining Bolts	M6 × 20	8-11	6-8
Center Console Panel Retaining Screws	ST4.2 × 16	3-4	2-3

## 11.16.2 Description and Operation

### 11.16.2.1 Description and Operation

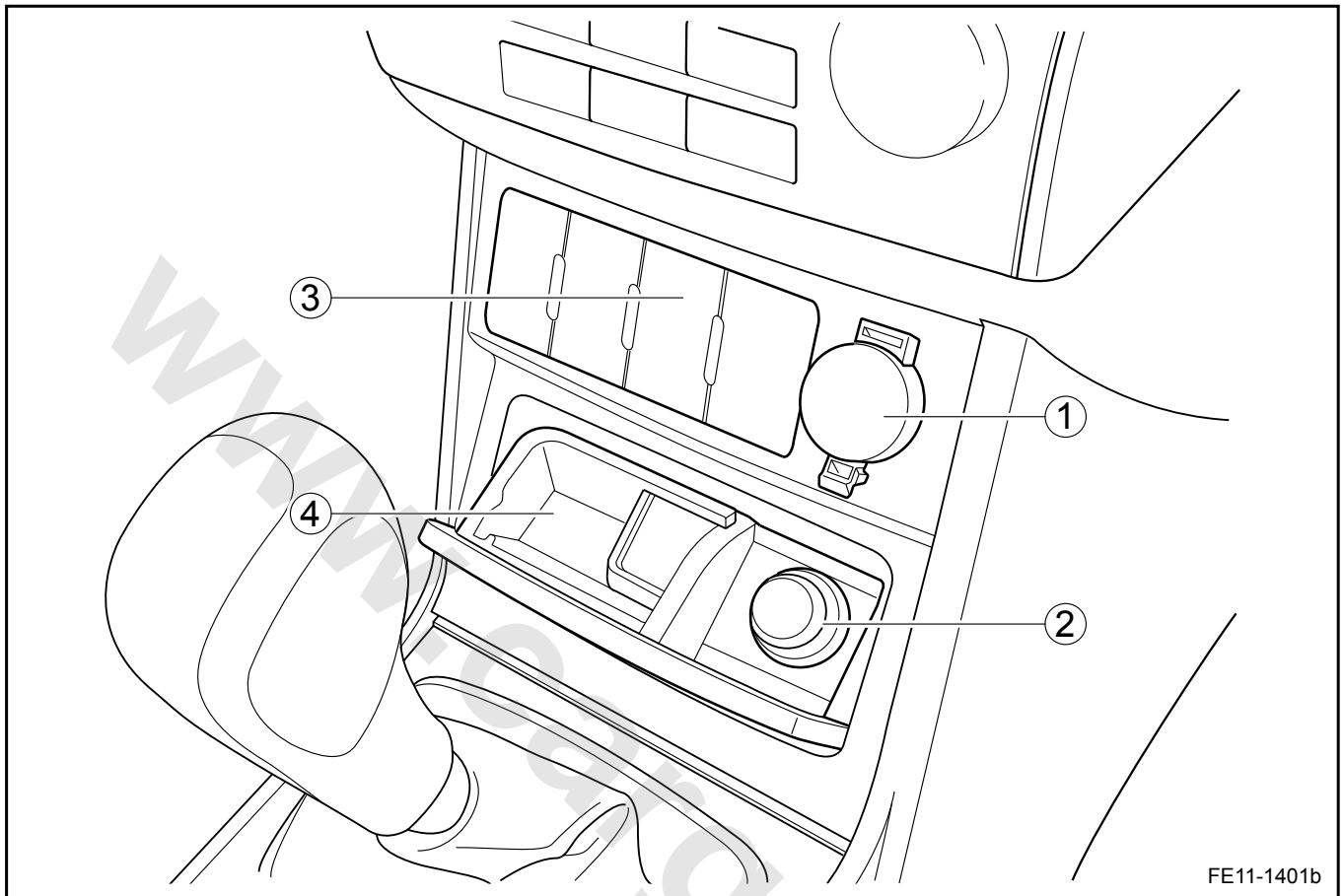
In addition to a cigarette lighter, this vehicle is equipped with a spare power outlet installed at right side of the rear fog lamp switch.

The cigarette lighter and the spare power outlet power is all from the ACC. On the cigar-lighter panel there is also a lamp to facilitate the use in the evening.

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### 11.16.3 Component Locator

#### 11.16.3.1 Component Locator



#### Legend

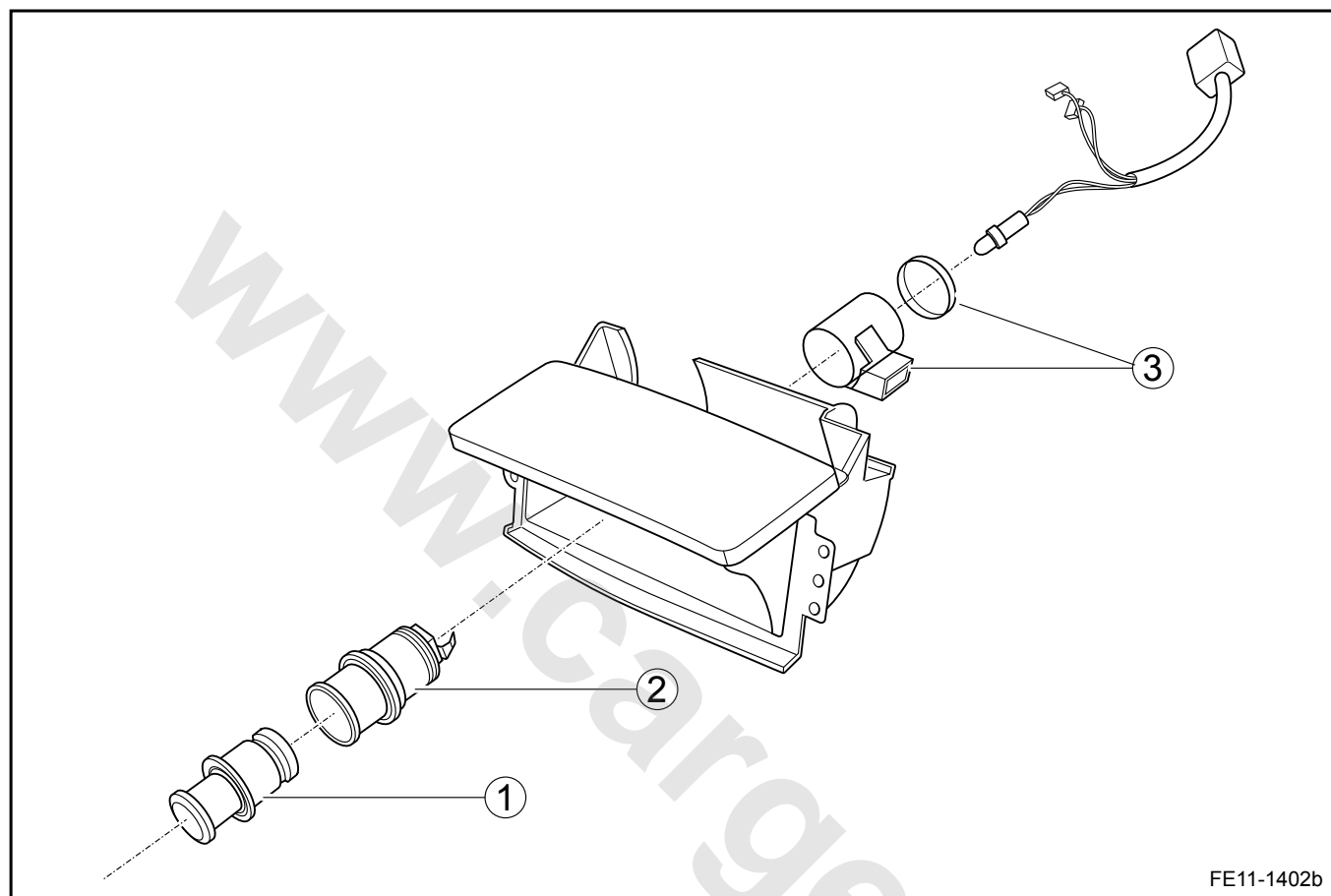
- 1. Spare Power Outlet
- 2. Cigarette Lighter
- 3. Rear Fog Lamp Switch

- 4. Ashtray

### 11.16.4 Disassemble View

#### 11.16.4.1 Disassemble View

Cigarette Lighter



FE11-1402b

#### Legend

- 1. Cigarette Lighter
- 2. Cigarette Lighter Socket
- 3. Cigarette Lighter Retaining Bracket



## 11.16.5 Diagnostic Information and Procedures

### 11.16.5.1 Diagnosis Description

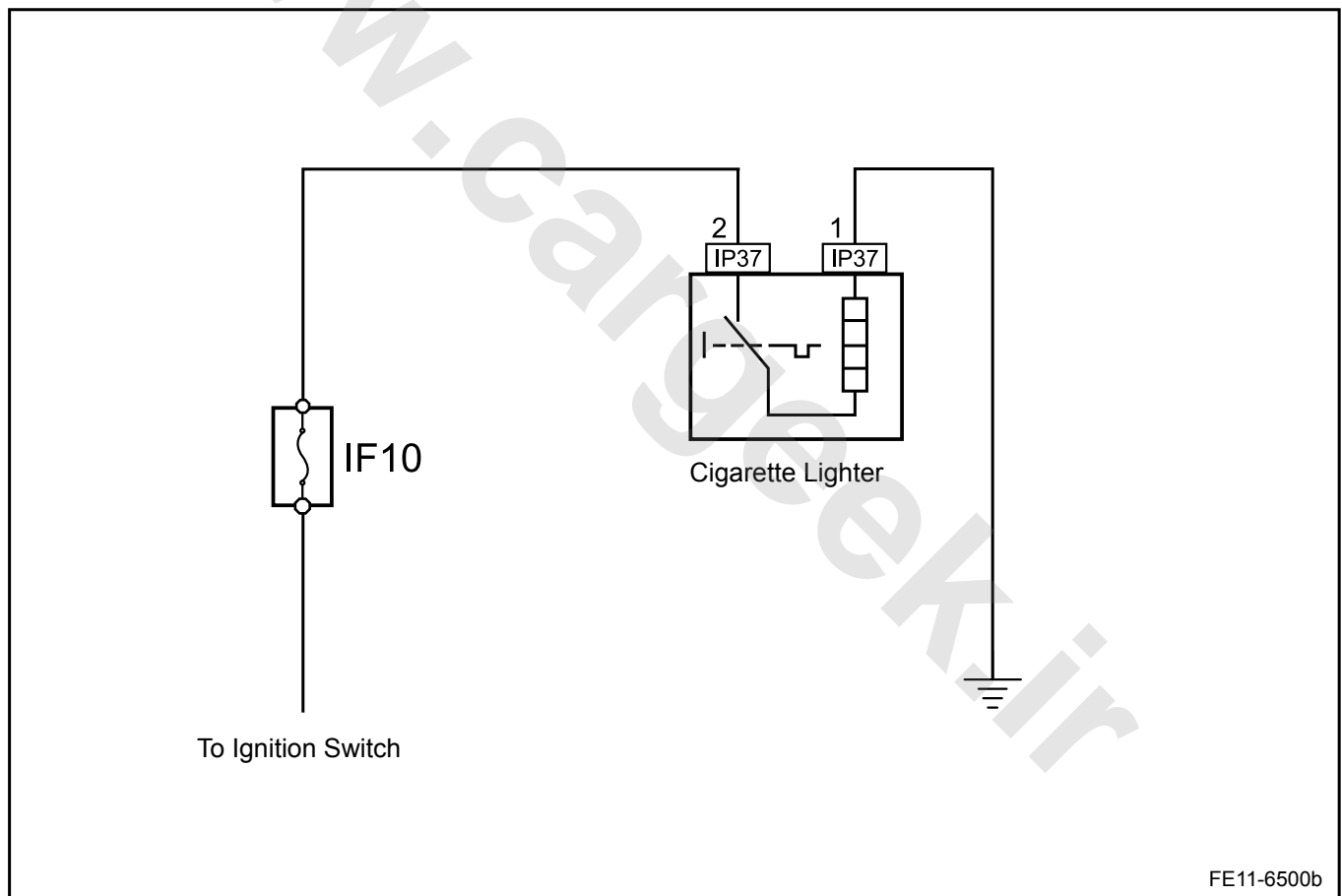
Refer to [11.16.2.1 Description and Operation](#) get familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.16.5.2 Visual Inspection

- Check installed after market equipment that may affect the cigarette lighter, spare power outlet operation.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- If the cigarette lighter and the backup power outlet are inoperative, check and repair the ACC power supply or ground poor connection or open circuit before carry out the diagnostic.

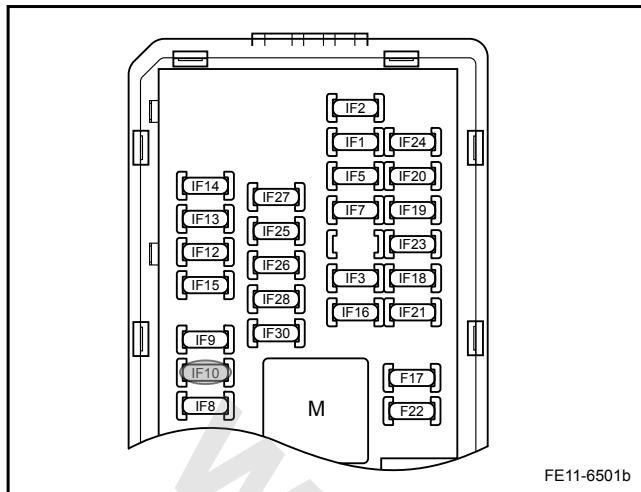
### 11.16.5.3 Cigarette Lighter Inoperative

Schematic:



Diagnostic Steps:

Step 1	Check the fuse IF10.
--------	----------------------



(a) Check whether the fuse IF10 is blown.

Fuse Rated Current: 15 A

No

Go to step 3

Yes

Step 2 Check the fuse IF10 circuit.

- (a) Check whether there is a short circuit.  
 (b) Repair the circuits. Confirm that there are no short circuits.  
 (c) Replace with fuses with rated current.  
 Confirm the cigarette lighter is working properly.

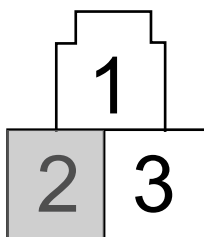
Yes

System normal

No

Step 3 Check the cigarette lighter power supply circuit.

Cigarette Lighter + Lighting Harness  
Connector IP37



- (a) Turn the ignition switch to the ACC position.  
 (b) At the same time, measure the cigarette lighter wiring harness connector IP37 terminal No.2 voltage with a multimeter.  
 Standard Voltage: 11-14 V  
 Is the voltage specified value?

Yes

Go to step 5

No

Step 4 Repair the cigarette lighter power supply circuit open.

- (a) Repair the circuit between the cigarette lighter wiring harness connector IP37 terminal No.2 and the fuse IF10.  
 Confirm the cigarette lighter is working properly.

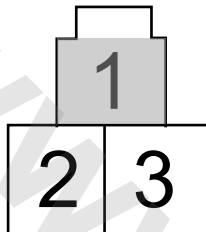
Yes

System normal

No

Step 5 Check the cigarette lighter ground circuit.

Cigarette Lighter + Lighting Harness  
Connector IP37



FE11-6503b

- (a) Disconnect the cigarette lighter wiring harness connector.
- (b) At the same time, measure resistance between the cigarette lighter wiring harness connector IP37 terminal No.1 and the ground with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$ 

Is the resistance specified value?

Yes

Go to step 7

No

Step 6 Repair the cigarette lighter ground circuit open.

- (a) Repair the open circuit between the cigarette lighter wiring harness connector IP37 terminal No.1 and ground.
- Confirm the cigarette lighter is working properly.

Yes

System normal

No

Step 7 Replace the cigarette lighter.

- (a) Replace the cigarette lighter. Refer to [11.16.6.1 Cigarette Lighter Replacement](#).

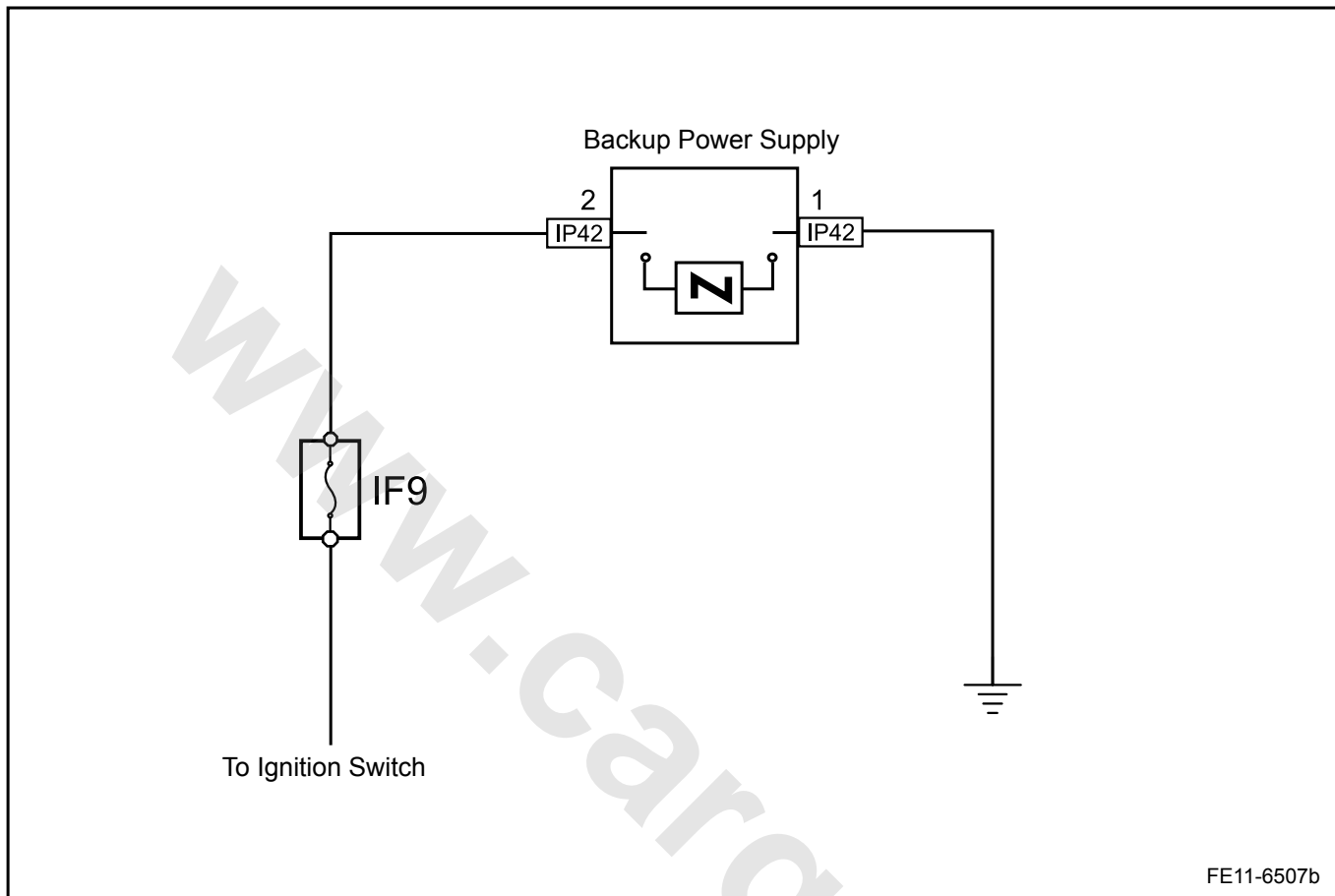
Confirm the repair completed.

Next

Step 8 System normal.

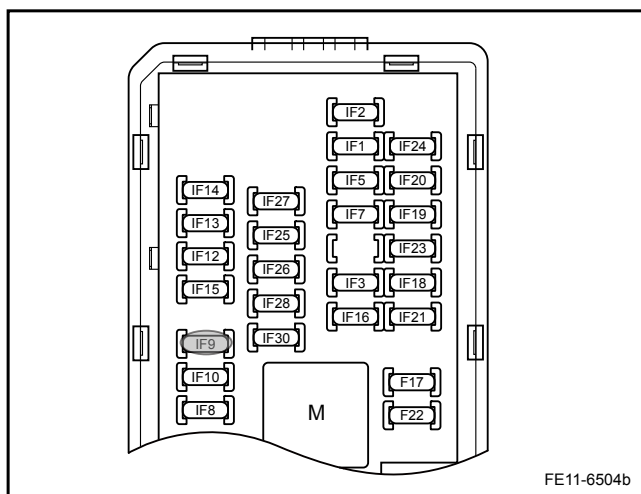
## 11.16.5.4 Spare Power Outlet Inoperative

Schematic:



Diagnostic Steps:

Step 1	Check the fuse IF9.
--------	---------------------



(a) Check whether the fuse IF9 is blown.

Fuse Rated Current: 15 A

No

Go to step 3

Yes

**Step 2** Check fuse IF9 circuit.

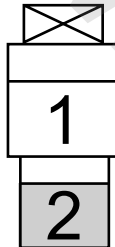
- (a) Check whether there is a short circuit.
- (b) Repair the circuits. Confirm that there are no short circuits.
- (c) Replace with fuses with rated current.

Is the spare power outlet working correctly?

Yes

System normal

No

**Step 3** Check the spare power outlet power supply circuit.Backup Power Supply Harness  
Connector IP42

FE11-6505b

- (a) Turn the ignition switch to the ACC file.
- (b) At the same time, measure the spare power outlet wiring harness connector IP42 terminal No.2 voltage with a multimeter.

Standard Voltage: 11-14 V

Is the voltage specified value?

Yes

Go to step 5

No

**Step 4** Repair the spare power outlet power supply circuit open.

Repair

- (a) Repair the open circuit between the spare power outlet harness connector IP42 terminal No.2 and the fuse IF9.

Confirm the spare power outlet is working properly.

Yes

System normal

No

**Step 5** Check the spare power outlet ground circuit.

Backup Power Supply Harness  
Connector IP42



FE11-6506b

- (a) Disconnect the spare power outlet wiring harness connector.
- (b) At the same time, measure resistance between the spare power outlet wiring harness connector IP42 terminal No.1 and the ground with a multimeter.

Resistance Standard Value: Less than 1  $\Omega$

Is the resistance specified value?

Yes

Go to step 7

No

Step 6 Repair the spare power outlet ground circuit open.

Repair

- (a) Repair the open circuit between the spare power outlet harness connector IP42 terminal No.1 and the ground.

Confirm the spare power outlet is working properly.

Yes

System normal

No

Step 7 Replace the spare power outlet.

- (a) Replace the standby power outlet. Refer to [11.16.6.2 Spare Power Outlet Replacement](#).

Confirm the repair completed.

Next

Step 8 System normal.

## 11.16.6 Removal and Installation

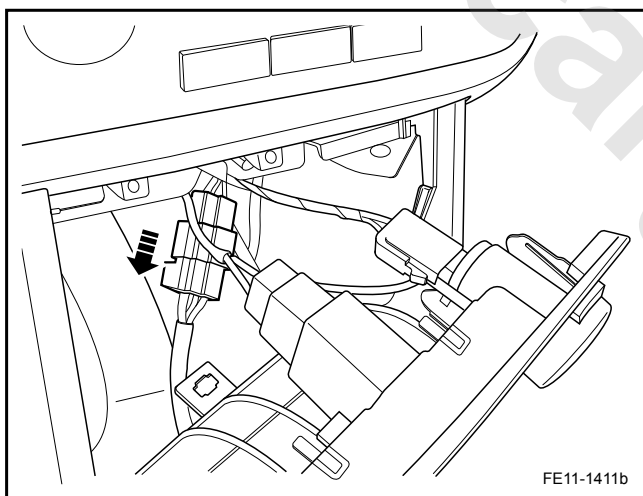
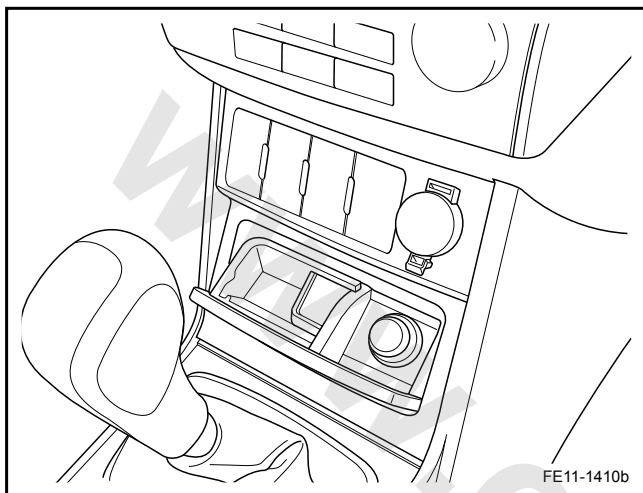
### 11.16.6.1 Cigarette Lighter Replacement

#### Removal Procedure

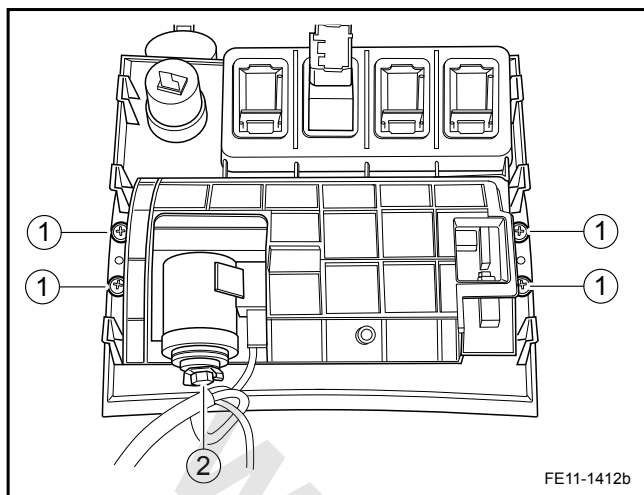
#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

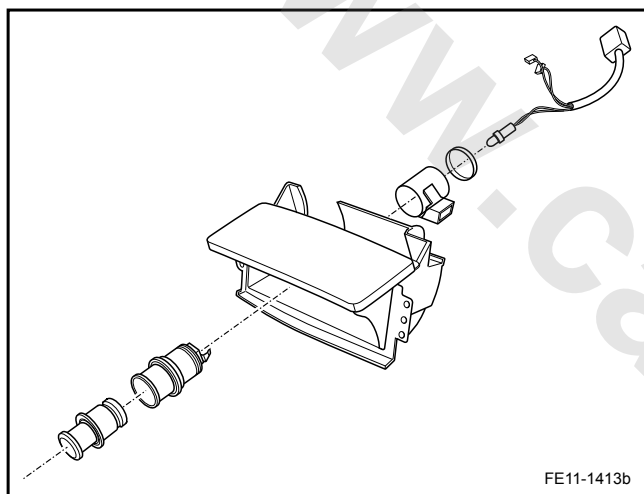
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Pry out the cigarette lighter panel.



3. Disconnect the wiring harness connector from the back of the panel.

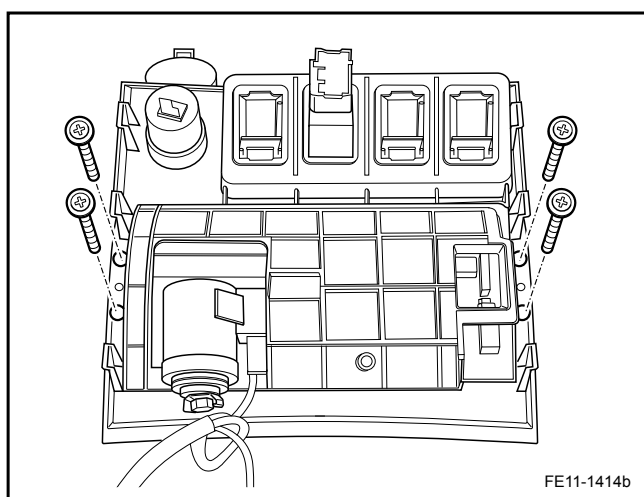


4. Remove the ashtray screws (1).
5. Remove the cigarette lighter retaining nut (2).



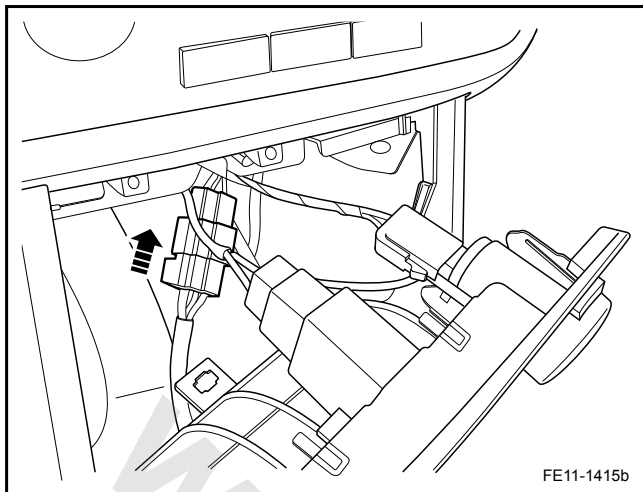
#### Installation Procedure:

1. Install the cigarette lighter.
2. Tighten the cigarette lighter locking nut.



3. Install the ashtray to the cigarette lighter panel.
4. Tighten the retaining screws.





5. Connect the harness connector from the back of the panel.
6. Install the cigarette lighter panel.
7. Connect the battery negative cable.

### 11.16.6.2 Spare Power Outlet Replacement

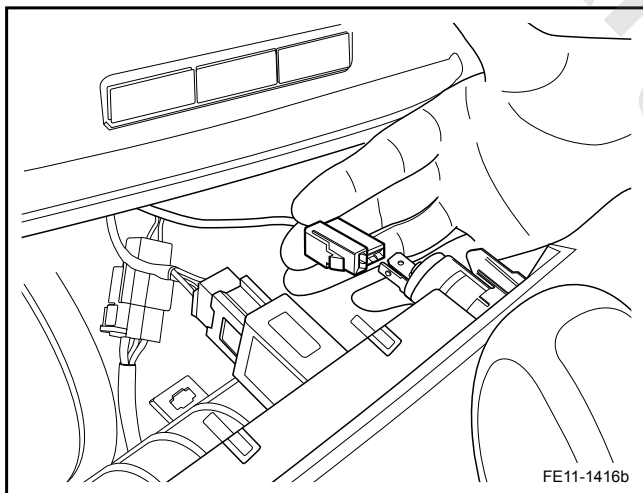
#### Removal Procedure

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

#### Note

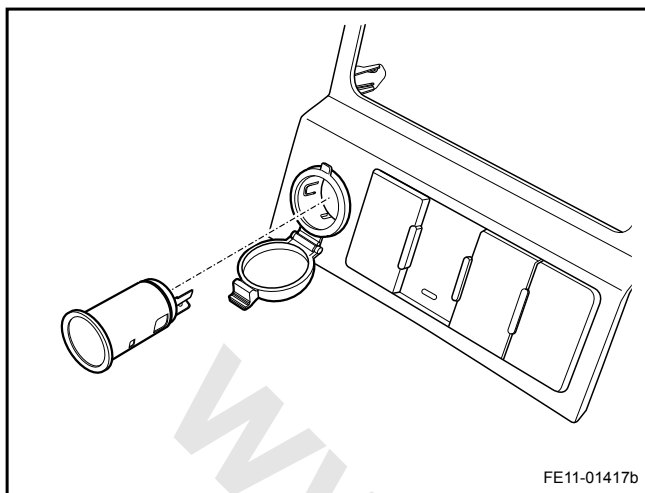
To remove the interior trim panels, please use the trim panel removal special tools, otherwise the trim panels will be easily scratched.



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the cigarette lighter panel. Refer to [11.16.6.1 Cigarette Lighter Replacement](#).
3. Disconnect the wiring harness connector from the back of the panel.
4. Remove the spare power outlet.

Installation Procedure:

1. Install the spare power outlet.
2. Connect the spare power outlet harness connector.
3. Install the cigarette lighter panel.
4. Connect the battery negative cable.



## 11.17 Data Communication System

### 11.17.1 Specifications

#### 11.17.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
ECM Retaining Bolts	M6 × 18	8-10	6-7
ECM Bracket Retaining Bolts	M6 × 16	8-10	6-7
ABS Retaining Bolts	M8 × 20	35	26
airbag control module Bracket Retaining Nuts	M6	8-10	6-7
BCM Bracket Retaining Nuts	M8	8-10	6-7
Instrument Cluster Self-Tapping Screws	ST4.8 × 13	3-4	2-3
Air-Conditioning Self-Tapping Screws	ST6.3 × 19	5-7	4-5
Air-Conditioning Retaining Nuts	M6	5-7	4-5
IMMO Bracket Retaining Nuts	M6	8-10	6-7
TPMS Retaining Bolts	M6 × 16	8-10	6-7

## 11.17.2 Description and Operation

### 11.17.2.1 System Working Principle

#### Overview

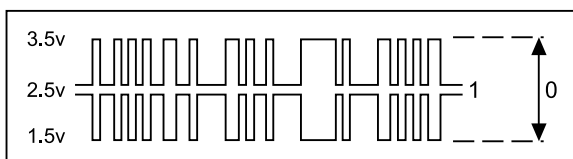
This vehicle uses three types data communication:

- CAN Bus
- K Bus
- LIN Bus

#### CAN Bus Description

- CAN is the Controller Area Network acronym, stands for Controller Area Network bus, the control devices connected to each other and exchange data .

CAN bus communication medium is a twisted-pair, in which high-speed CAN bus communication speed is 500 kbps. Twisted-pair terminals are two 120  $\Omega$  resistors, one end is in the engine control module (ECM), the other side is in the body control module (BCM). High-speed CAN bus is a differential bus. High-speed CAN bus serial data bus (H) and high-speed CAN bus serial data bus (L) from a stationary or idle-level drive to the opposite limit. About 2.5 V idle level is considered to transmit data and interpreted as a hidden logic 1. The extreme limit of line-driven, high-speed CAN bus serial data bus (H) would increase the 1V and the high-speed CAN bus serial data bus (L) will reduce 1 V. Limit voltage difference 2 V is considered dominant transmission of data and explain the logic 0 (as shown).



FE11-1504b

- If the communication signal is lost, the program will target the control module losing communication to set DTC codes. The fault diagnosis codes can be read by scan tool.

#### Note

**Serial data loss does not mean that the module is faulty.**

- The advantages of CAN bus:
  1. Reduce the number of sensors and signal wires.
  2. Reduce the number of wires in wiring harness.
  3. Greatly reduces the weight of the wire harness.
  4. Reduce the number of control devices pins.
  5. Improve the reliability and durability.
- In this vehicle, high-speed CAN bus allows BCM, ECM, ABS, airbag control module, IP Cluster communication.

#### LIN Bus Description

- LIN is used for automotive distributed electronic control system and is a new type of low-cost serial communication system, mainly for smart sensors and actuators serial communication.
- LIN bus features:
  - Based on UART data format
  - Single-master multi-structural
  - Single transmission :0-12 V
  - Communication speed: 19.2 kbps

#### K Bus Description

- K bus is for communication between the vehicle ECM and the external test equipment. Transfer rate is 10.47 kbps. Voltage is between 0 V and 12 V: 12 V, logic "1"; 0 V, logic "0".

#### Data Link Connector Description

Datalink connector (DLC) is the result of consultation between automotive manufacturers and regulations. scan tool must be used to communicate with the vehicle and for vehicle communication system programming.

The connector must meet the following conditions:

- Connect all scan tools 16-pin connector.
- Always use No.16-pin to provide power to scan tool.
- Always use No.4-pin as the scan tool ground.

- The rest pins are for vehicle serial data communications.  
The vehicle is controlled by a microprocessor, which communicates to scan tool through the serial data circuit.

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### 11.17.3 System Working Principle

#### 11.17.3.1 System Working Principle

#### Data Communication System Components

Use scan tool to access the following control module data circuits:

- ECM
- ABS
- TPMS
- IP Cluster
- IMMO
- ACU
- BCM

— HVAC

#### LIN Bus Applications

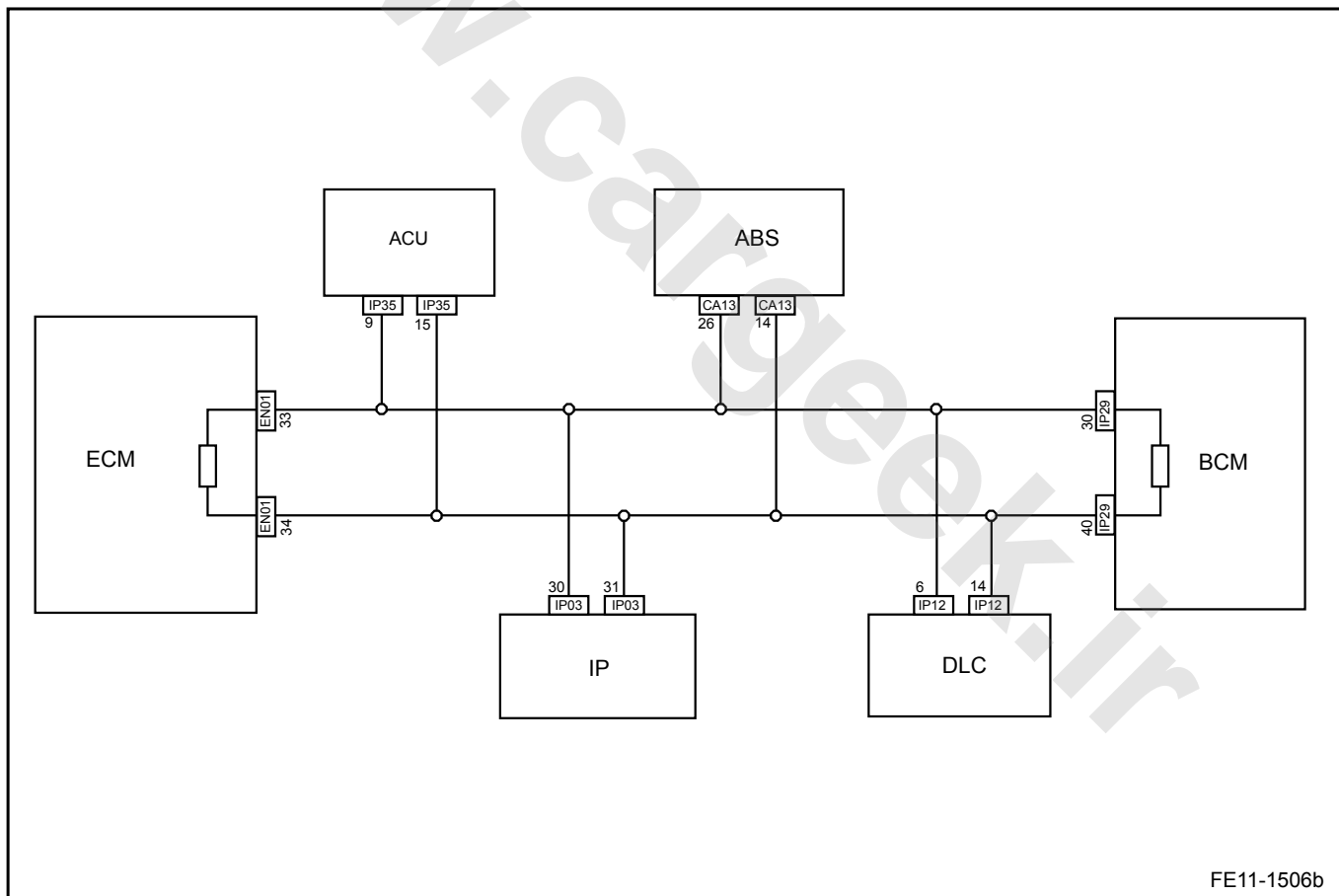
The vehicle with express window down function is equipped with a LIN bus, connecting BCM and windows regulators, to achieve power windows remote control and express window down function. Refer to [11.5.2.1 Description and Operation](#).

#### K Bus Applications

This vehicle uses the K-bus to achieve the ECM, ABS, TPMS, IMMO, and HVAC fault diagnosis.

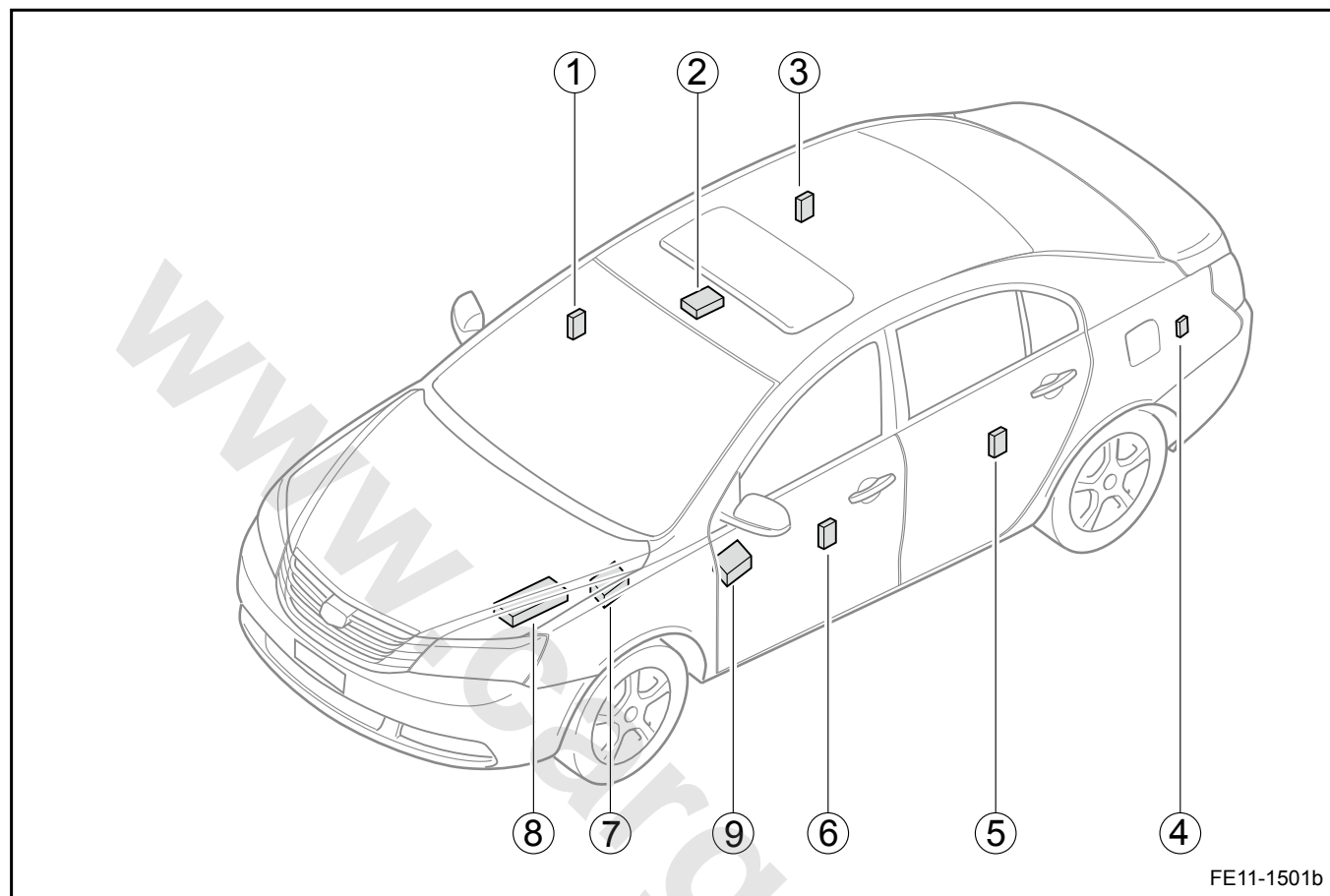
#### CAN Bus Applications

In this vehicle, ABS, airbag control module, BCM, ECM, and IP Cluster five modules are parallel connected to the CAN bus for a CAN bus network architecture, terminal resistors are set within the BCM and ECM. Refer to figure below:



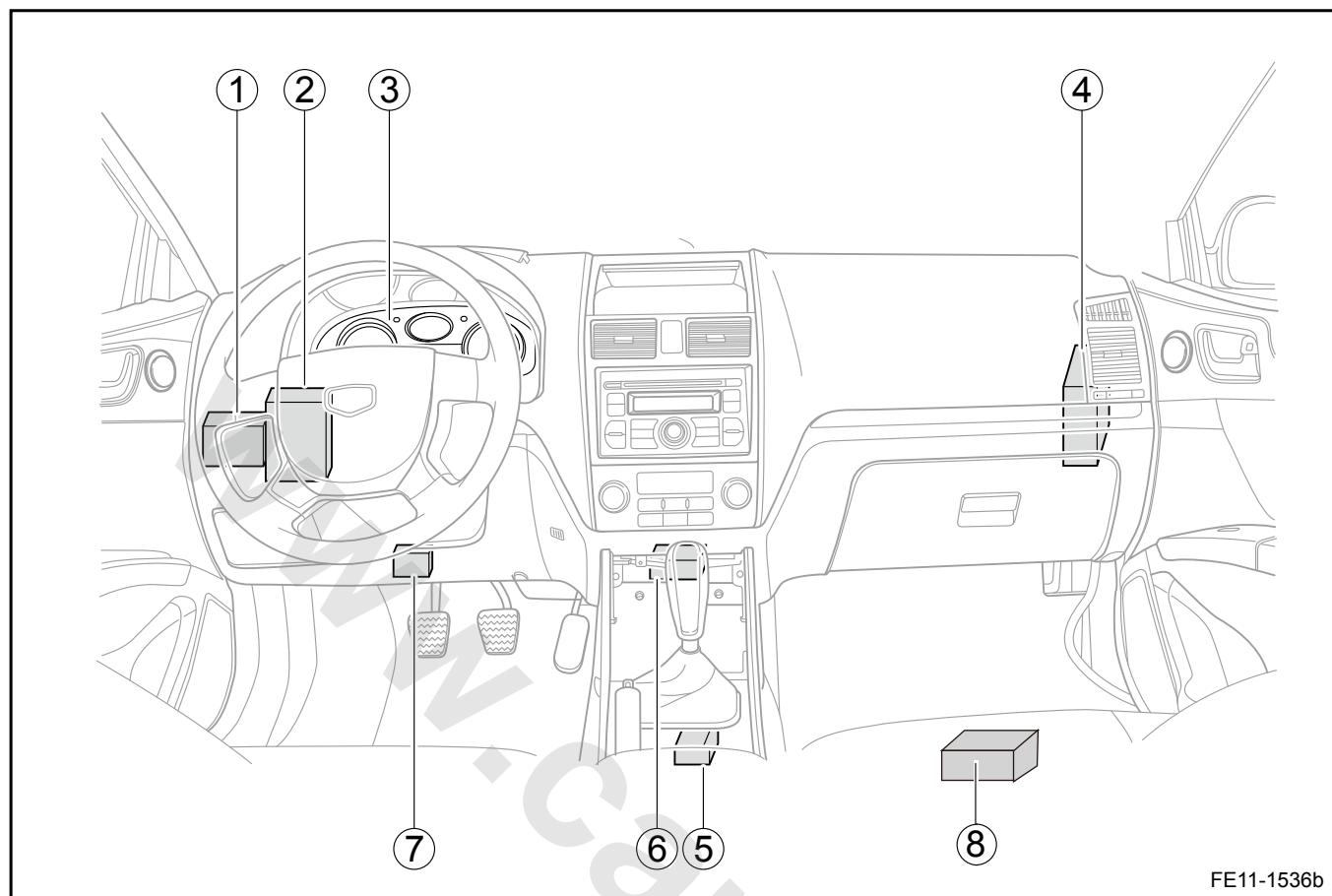
## 11.17.4 Component Locator

## 11.17.4.1 Module Position



## Legend

- |  |   |
|--|---|
| 1. Right Front Window Regulator Motor With Module Assembly (Express Down Function) | 6. Left Front Window Regulator Motor With Module Assembly (Express Down Function) |
| 2. Sunroof Motor With Module Assembly  | 7. ABS Control Module   |
| 3. Right Rear Window Regulator Motor With Module Assembly (Express Down Function)  | 8. Underhood Fuse Block   |
| 4. Reverse Radar Control Module  | 9. Window Regulator Control Module (Without The Express Down Function)            |
| 5. Left Rear Window Regulator Motor With Module Assembly (Express Down Function)   |   |



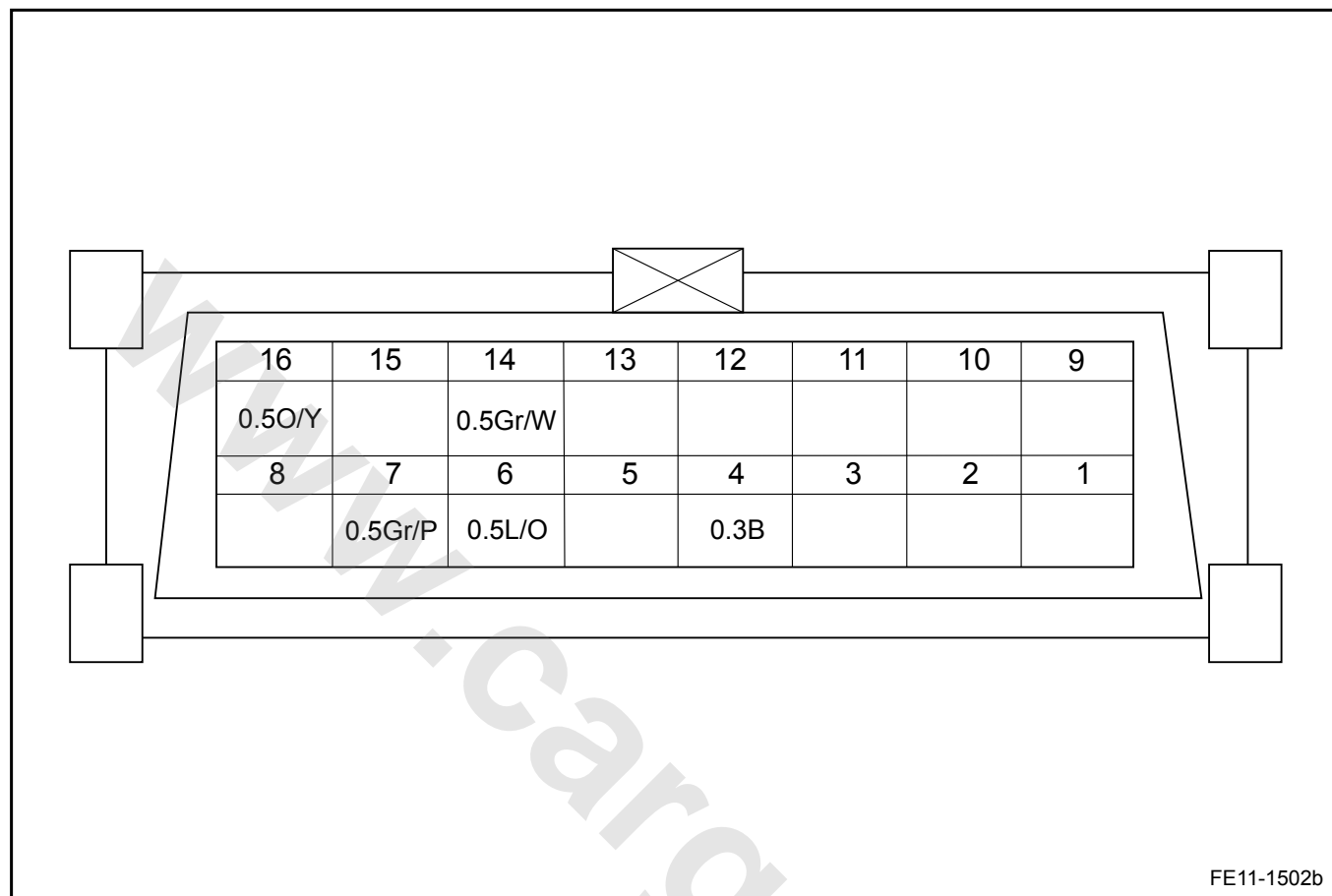
#### Legend

- |  |                                     |
|--|-------------------------------------|
| 1. I/P Fuse Block                          | 6. Airbag Control Module            |
| 2. Body Control Module                     | 7. Engine Anti-theft Control Module |
| 3. Instrument Cluster                      | 8. Transmission Control Module      |
| 4. Engine Control Module                   |                                     |
| 5. Tire Pressure Monitoring Control Module |                                     |



## 11.17.5 Disassemble View

## 11.17.5.1 Data Link Connector



## Legend

1. PIN 4 - Ground
2. PIN 6 - CAN\_H
3. PIN 7 - K Bus
4. PIN 14 - CAN\_L
5. PIN 16 - Power Supply



## 11.17.7 Diagnostic Information and Procedures

### 11.17.7.1 Diagnosis Description

Refer to [11.17.2.1 System Working Principle](#) get familiar with the system functions and operation before start system diagnostics, so that in the event of failure it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

### 11.17.7.2 Visual Inspection

- Check the installed after market equipment that may affect data communication system.
- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.
- If the data communication system has a fault, before repair check whether all data communication system control module harness connectors have been correctly connected.

### 11.17.7.3 CAN Bus Fault Prevention

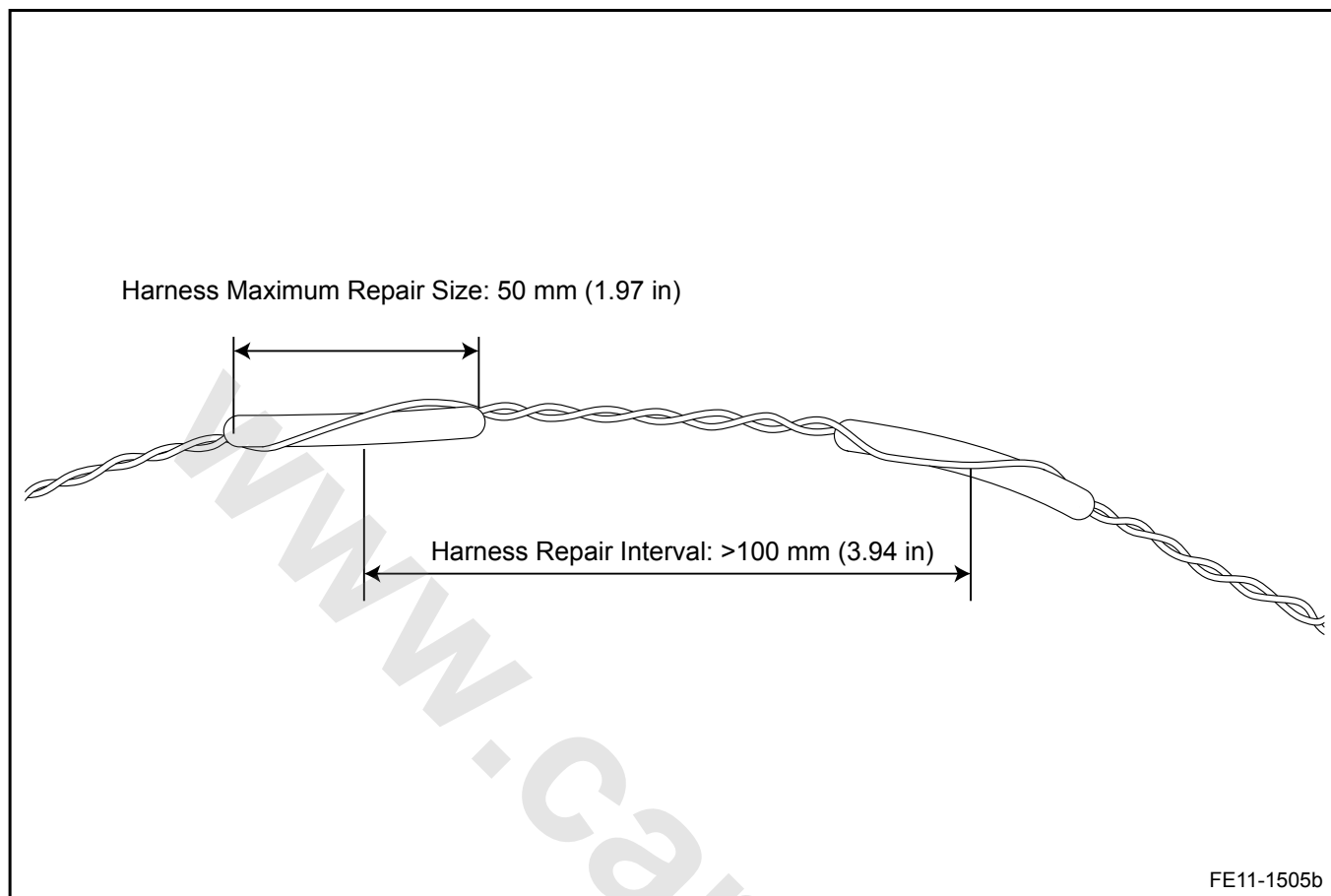
- Do not stretch CAN bus wiring harness.
- Do not open the CAN bus wiring harness more than 4 cm (1.6 in).
- Do not connect CAN bus wiring harness with other wiring harness.
- Use manufacturers recommended scan tool.

### 11.17.7.4 CAN Bus Integrity Diagnosis

To check whether CAN bus is normal, perform the CAN bus integrity diagnosis to confirm whether the fault is due to the physical CAN bus circuit open. For specific operations. Refer to [11.17.8.1 CAN Bus Network Integrity Checking](#).

### 11.17.7.5 CAN Bus Wiring Harness Repair Specification

- CAN\_H and CAN\_L two lines must be articulated way.
- When CAN bus circuit fault occurs, the length of wire joints should not exceed L1: 50 mm (1.97 in).
- If the circuit is open at two or more places. The distance between the two places must be more than L2: 100 mm (3.94 in), then it is allowed to repair. Otherwise replace the CAN bus wiring harness.



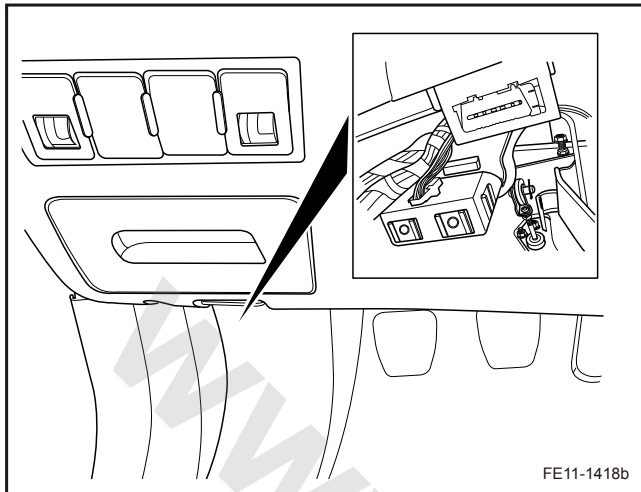
#### 11.17.7.6 CAN Bus Signal Diagnostic

Use the oscilloscope dual-channel input to monitor the signal on the CAN bus, the signal should have the following features:

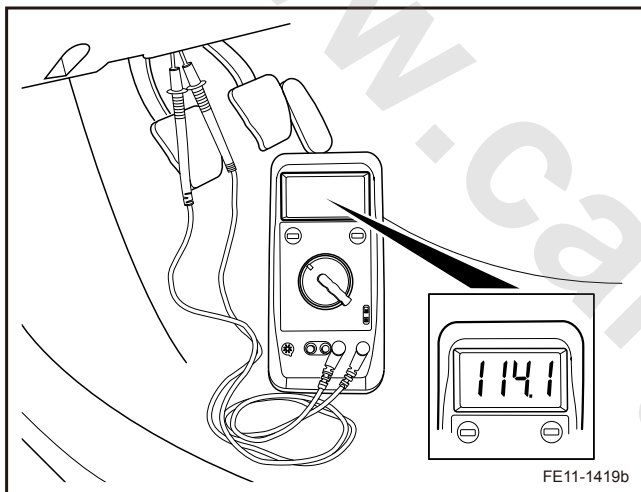
1. CAN\_H bus voltage signal is 2.5-3.5 V, CAN\_L bus voltage signal is 1.5-2.5 V.
2. Two signals mirror each other.
3. Signals start to transfer with the ignition switch is turned to on, but stops 2 s after the ignition is switched off.

## 11.17.8 Removal and Installation

### 11.17.8.1 CAN Bus Network Integrity Checking



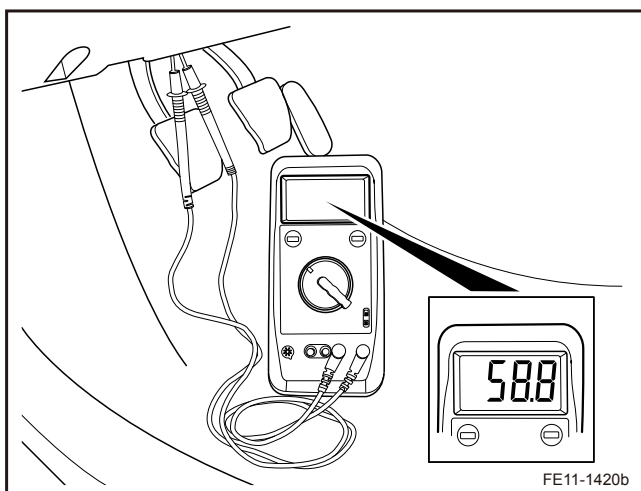
1. Turn off the ignition switch, use a multimeter to measure the datalink connector terminals PIN6 and PIN14 resistance.



2. If the multimeter shows about 110-125  $\Omega$  resistance or non-conduction, the CAN bus is incomplete.
3. Check the ECM and the BCM harness connectors, confirm the CAN bus connection is normal. If there are undesirable situations such as open circuit or connection, carry out repairs.

#### Note

CAN bus repairs must follow the repair specification. Refer to [11.17.7.5 CAN Bus Wiring Harness Repair Specification](#).



4. If the multimeter shows that the resistance is about 55-63  $\Omega$ , it means the from the BCM to ECM the CAN bus is complete.

### 11.17.8.2 Scan Tool Can Not Be Turned On

For diagnostic steps. Refer to [2.2.7.2 Control System Check](#).

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## 12 Body, Sheet Metal and Painting

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## 12.1 Warnings and Notices

### 12.1.1 Warnings and Notices

#### Collision Sectioning Warning

##### Warning!

Warning: Sectioning should be performed only in the recommended areas. Failure to do so may compromise the structural integrity of the vehicle and cause personal injury if the vehicle is in a collision.

#### Cracked Window Warning

##### Warning!

Warning: If a window is cracked but still intact, crisscross the window with masking tape in order to reduce the risk of damage or personal injury.

#### Glass and Sheet Metal Handling Warning

##### Warning!

Warning: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

#### Safety Glasses and Compressed Air Warning

##### Warning!

Warning: Wear safety glasses when using compressed air in order to prevent eye injury.

#### Exterior Trim Emblem Removal Notice

##### Note

Notice: Use a plastic, flat-bladed tool to prevent paint damage when removing an emblem/name plate.

#### Machined Surface Damage Notice

##### Note

Notice: Do not nick, scratch or damage the sealing surface. The sealing surface is a machined surface. Damage to the machined surface can cause leakage.

#### Sealant Notice

##### Note

Notice: Do not allow the RTV sealant to enter any blind threaded hole. RTV sealant that is allowed to enter a blind threaded hole can cause hydraulic lock of the fastener when the fastener is tightened. Hydraulic lock

of a fastener can lead to damage to the fastener and/or the components. Hydraulic lock of a fastener can also prevent the proper clamping loads to be obtained when the fastener is tightened. Improper clamping loads can prevent proper sealing of the components allowing leakage to occur. Preventing proper fastener tightening can allow the components to loosen or separate leading to extensive engine damage.

#### Window Edge Damage Notice

##### Note

Avoid damage to the window from impacting objects due to an exposed edge. The window must be 1 mm (0.025 in) below the surface of the sheet metal to avoid window damage.

## 12.2 Body Front End

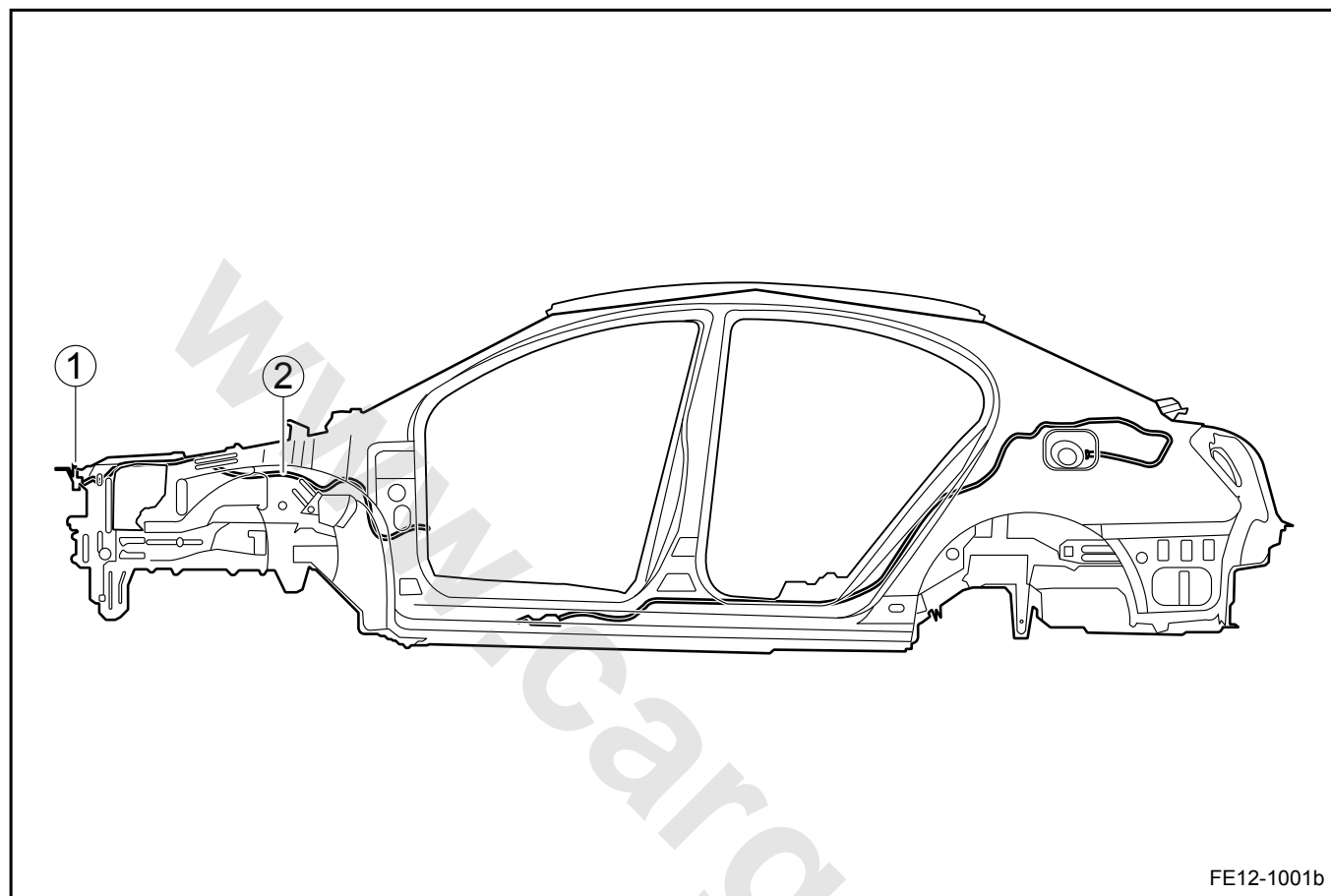
### 12.2.1 Specifications

#### 12.2.1.1 Fastener Tightening Specifications

Application	Model	Specification	
		Metric (Nm)	US English (lb-ft)
Hood Hinge to Cowl Panel Brace Retaining Bolts	M8	23-26	17-19.2
Hood Hinge to Hood Retaining Bolts	M8 × 20	23-26	17-19.2
Hood Latch Retaining Bolts	M6 × 12	9-13	6.7-9.6

## 12.2.2 Component Locator

### 12.2.2.1 Component Views



#### Legend

1. Hood Latch

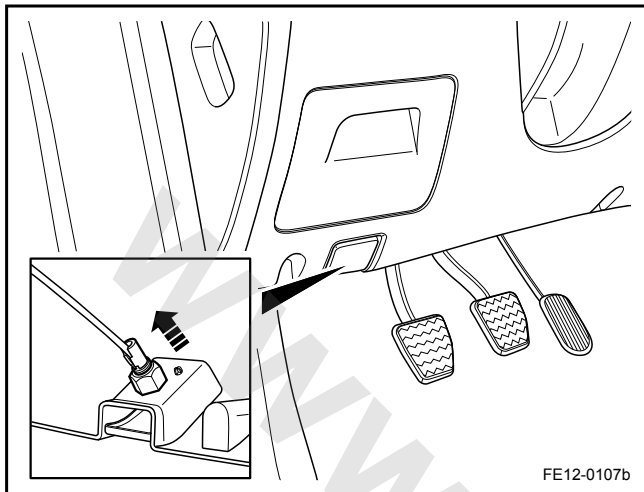
2. Hood Latch Release Cable

## 12.2.3 Removal and Installation

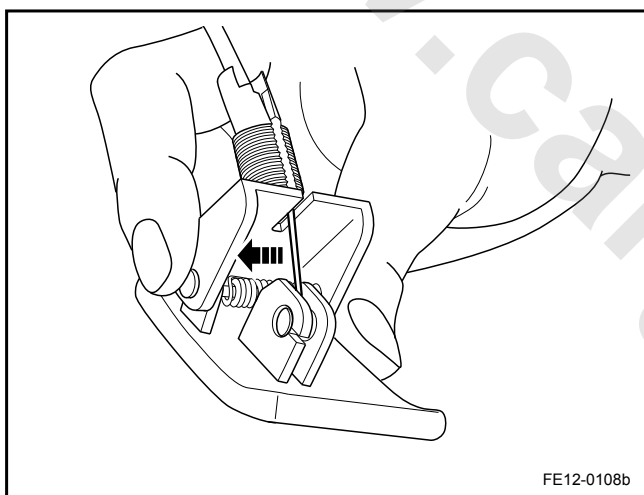
### 12.2.3.1 Hood Latch Release Cable Replacement

#### Removal Procedure:

1. Remove the hood release handle retaining nut.

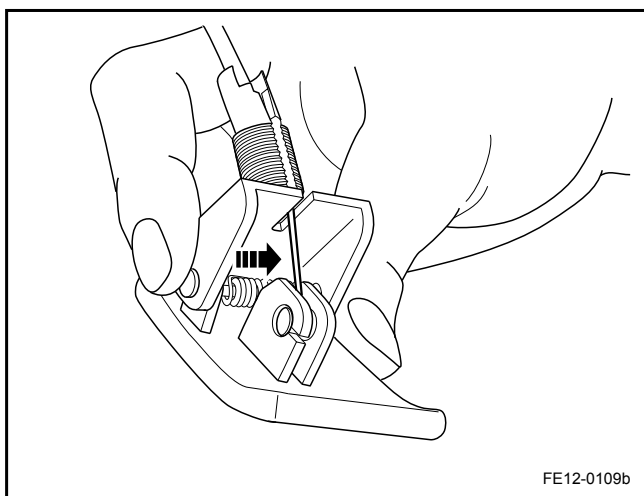


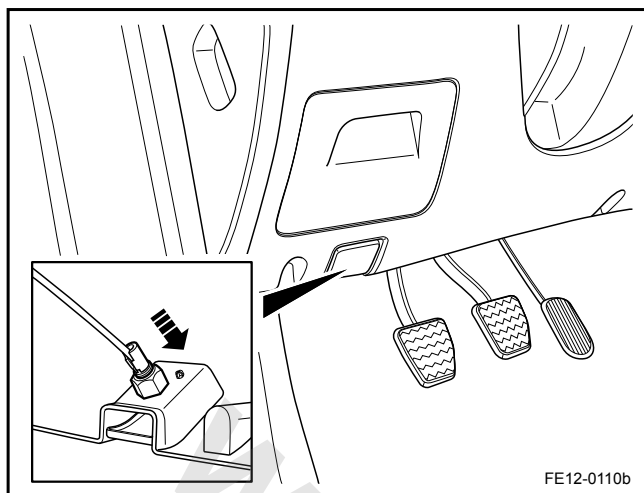
2. Disconnect the hood release cable from the hood release handle.
3. Remove the hood latch. Refer to [12.2.3.2 Hood Latch Replacement](#).
4. Remove the left front fender in order to remove the hood latch release cable. Refer to [12.10.1.8 Front Wheelhouse Liner Replacement](#).
5. Detach the hood latch release cable barrel from the hood release handle.



#### Installation Procedure:

1. Route the string and the hood release cable into the passenger compartment.
2. Install the hood latch.
3. Attach the hood release cable barrel to the hood release handle.

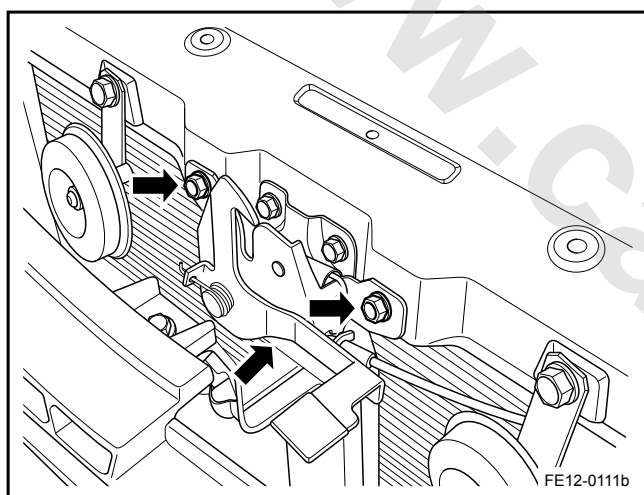




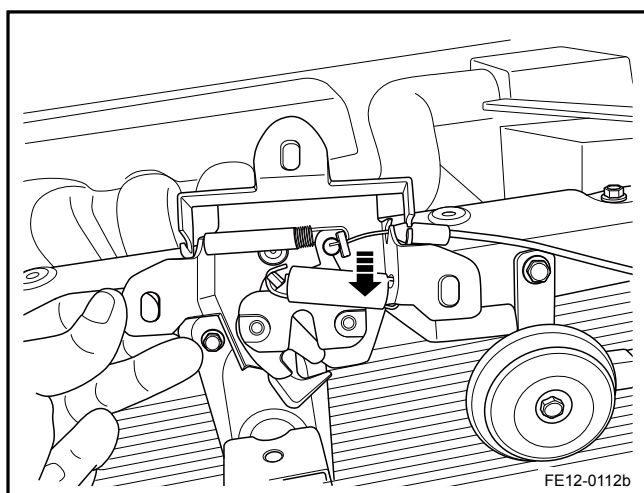
4. Install the hood release handle and tighten the retaining nut.
5. Install the left front fender.

### 12.2.3.2 Hood Latch Replacement

#### Removal Procedure:



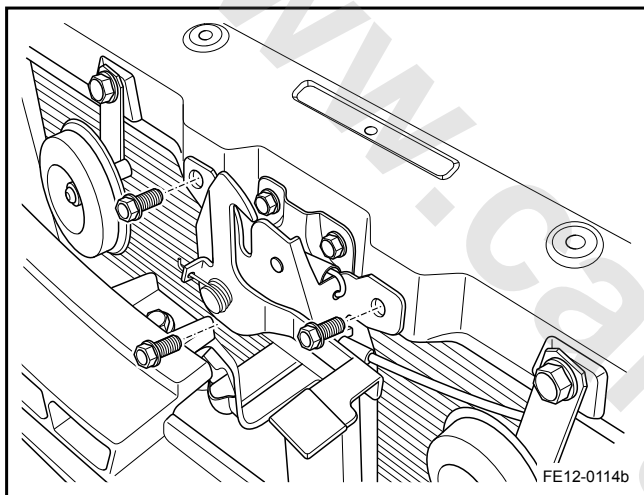
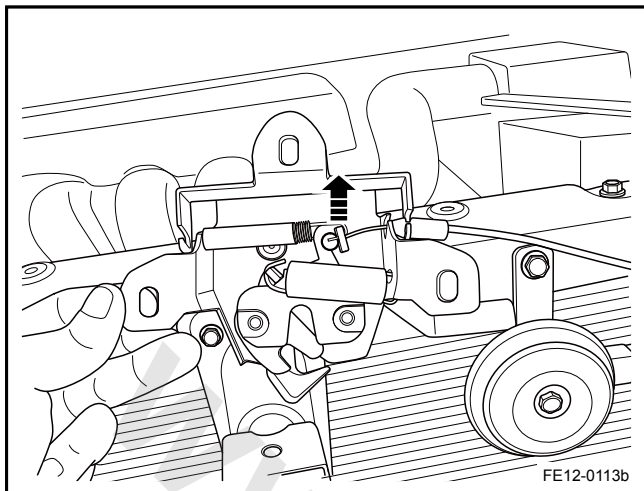
1. Open the hood and install a suitable hood brace to the vehicle.
2. Remove the radiator grille.
3. Remove the hood latch to front end module retaining bolts and washers.



4. Detach the hood latch from the front end module and disconnect the hood release cable from the hood latch.

## Installation Procedure:

1. Connect the hood release cable to the hood cable latch.



2. Install and tighten the hood latch to front end module retaining bolts.

**Note**

Refer to "Fastener Notices" in the "Warnings and Notices".

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

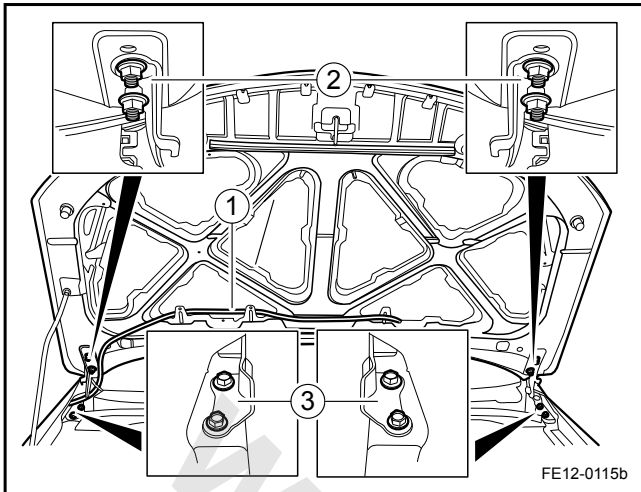
3. Install the radiator grille.
4. Remove the hood brace and close the hood.

### 12.2.3.3 Hood and Hinge Replacement

## Removal Procedure:

**Note**

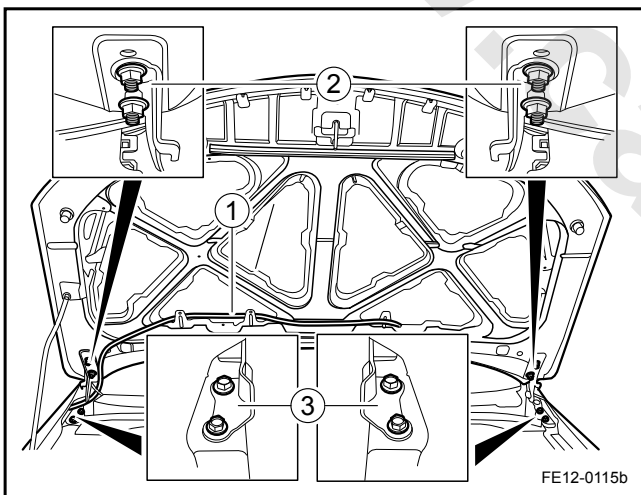
Install protective covers on the front fender and the windshield to avoid damage to the paint, glass and panels.



1. Lift and support the hood.
2. Mark the location of the hinge on the hood assembly to assist installation.
3. Remove the hood insulator. Refer to [12.10.1.2 Hood Sound Insulation Pad Replacement](#).
4. Disconnect washer hose (1).
5. With the aid of an assistant, remove the hood to the hood hinge retaining bolts (2), repeat this procedure for the opposite side.
6. With the aid of an assistant, remove the hood.
7. Remove the hood hinge to dash and cowl panel brace retaining nuts (3).
8. Remove hood hinges.

#### Installation Procedure:

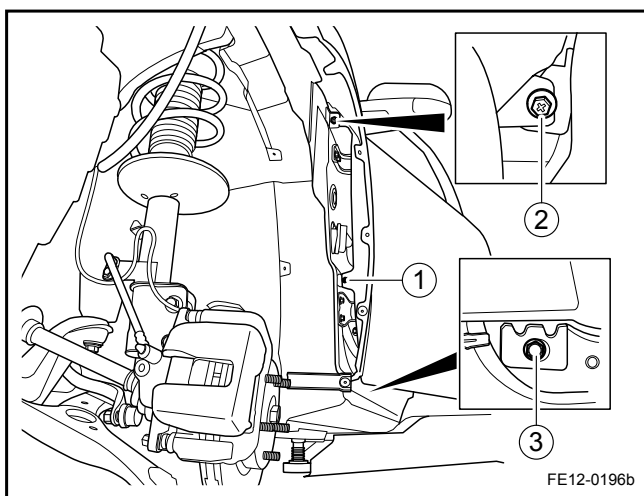
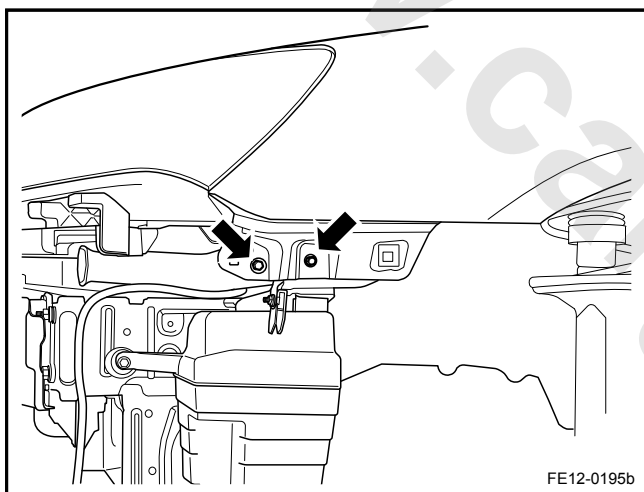
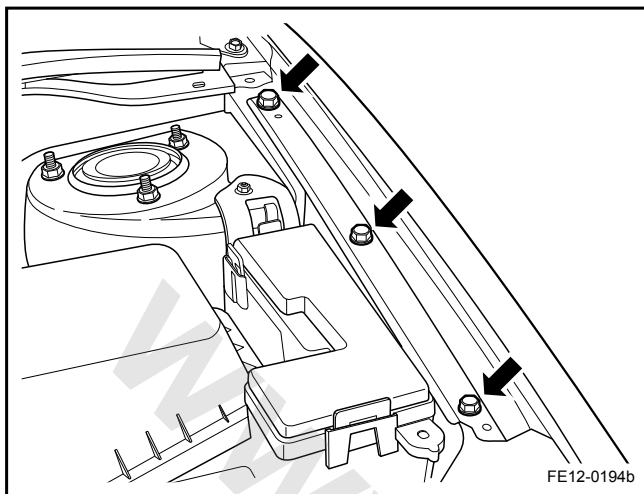
1. Install hood hinges and tighten the retaining nuts (3).  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)
2. With the aid of an assistant, position the hood to the marks on the hood, repeat this procedure for the opposite side.
3. Install the hood hinges and tighten the retaining bolts (2).  
Torque: 25 Nm (Metric) 18.5lb-ft (US English)
4. Connect the windshield washer hose.
5. Install the hood insulator.
6. Check the hood is installed correctly.



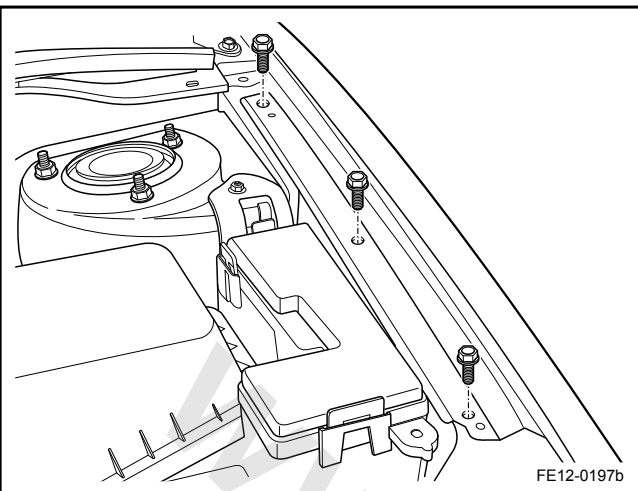


### 12.2.3.4 Front Fender Replacement

#### Removal Procedure:



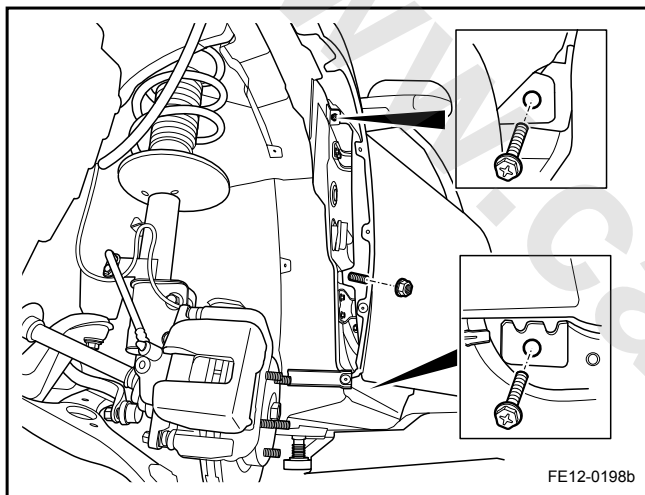
1. Remove the front bumper fascia and front bumper fascia bracket. Refer to [12.4.3.1 Front Bumper Replacement](#).
2. Lift the vehicle. Refer to [1.3.1.1 Lifting and Jacking the Vehicle](#).
3. Remove the left front wheel. Refer to [4.4.5.1 Wheel Replacement](#).
4. Remove the front fender. Refer to [12.10.1.8 Front Wheelhouse Liner Replacement](#).
5. Remove the rocker panel molding. Refer to [12.10.1.9 Rocker Panel Molding Replacement](#).
6. Remove the front fender to front end module retaining bolts.
7. Remove the front fender to bumper side retaining bolts.
8. Remove the front fender to door pillar retaining bolts (2) and nuts (1).
9. Remove the front fender to inner wheelhouse retaining bolts (3).
10. Remove the front fender.



## Installation Procedure:

1. Install the front fender and tighten the front fender to front end module retaining bolts.

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

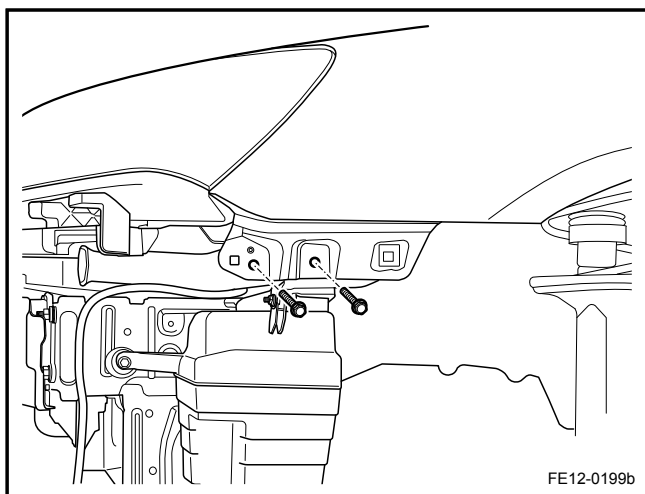


2. Install the front fender to inner wheelhouse retaining bolts and tighten the bolts.

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

3. Install and tighten the front fender to door pillar retaining bolts (2) and nuts (1).

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)



4. Install and tighten the front fender to bumper side retaining bolts.

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

5. Install the rocker panel molding.
6. Install the left front fender.
7. Install the left front wheel.
8. Install the front bumper fascia and front bumper fascia brackets.
9. Lower the vehicle.

## 12.3 Body Rear End

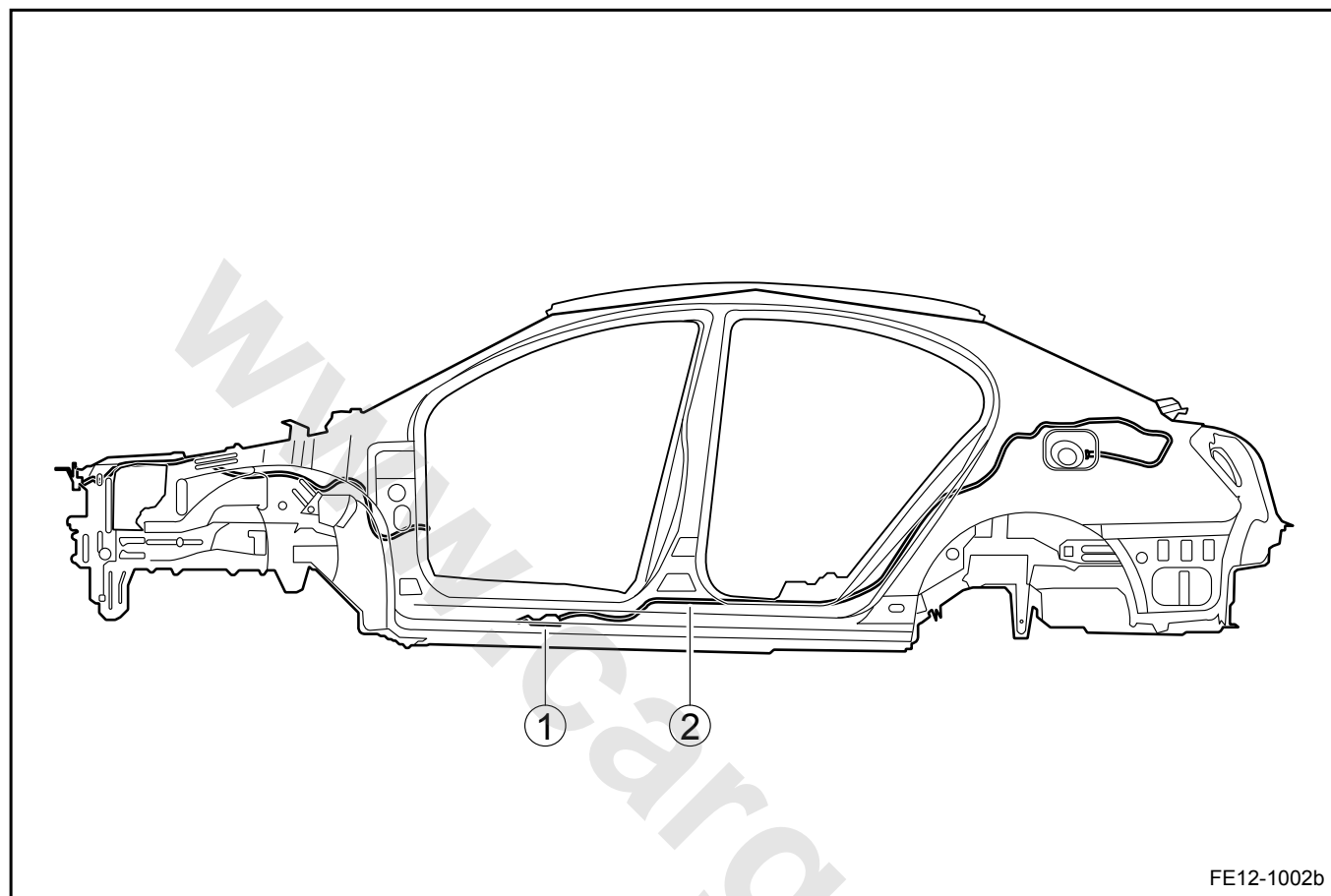
### 12.3.1 Specifications

#### 12.3.1.1 Fastener Tightening Specifications

Application	Model	Specification	
		Metric (Nm)	US English (lb-ft)
Rear Compartment Lid Lock Actuator Retaining Bolts	M6 × 10	9-13	6.7-9.6
Rear Compartment Lid Hinge Retaining Bolts	M8 × 35	9-13	6.7-9.6
Rear Compartment Lid Latch Striker Retaining Bolts	M6 × 12	9-13	6.7-9.6
Fuel Filler Door Release Actuator Retaining Screws	M6 × 20	9-13	6.7-9.6
Hatchback Open Handle Retaining Nut	M6	9-13	6.7-9.6
Hatchback Latch Retaining Bolts	M8 × 22	23-30	17-22.2
Hatchback Latch Striker Nuts	M6	9-13	6.7-9.6
Hatchback to Hinge Retaining Bolts	M8 × 35	23-30	17-22.2
Hinge to Body Retaining Nuts	M8	23-30	17-22.2

## 12.3.2 Component Locator

### 12.3.2.1 Component Views



#### Legend

1. Fuel Filler Door Release Handle

2. Fuel Filler Door Release Cable

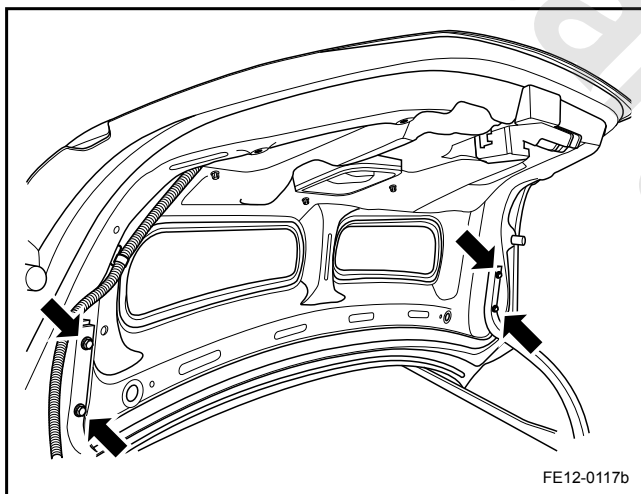
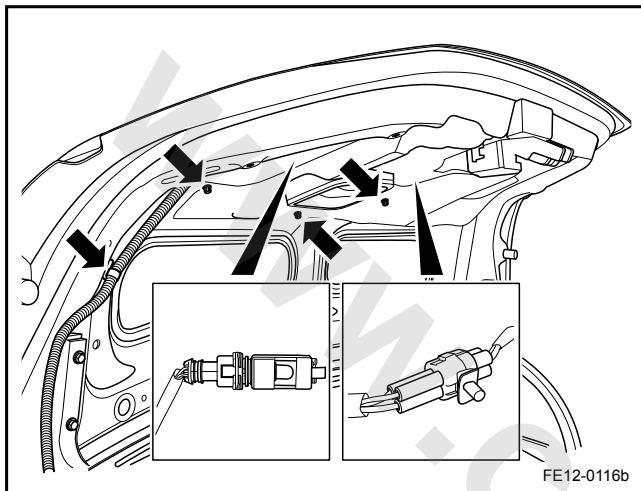
### 12.3.3 Removal and Installation

#### 12.3.3.1 Rear Compartment Lid Replacement (Sedan)

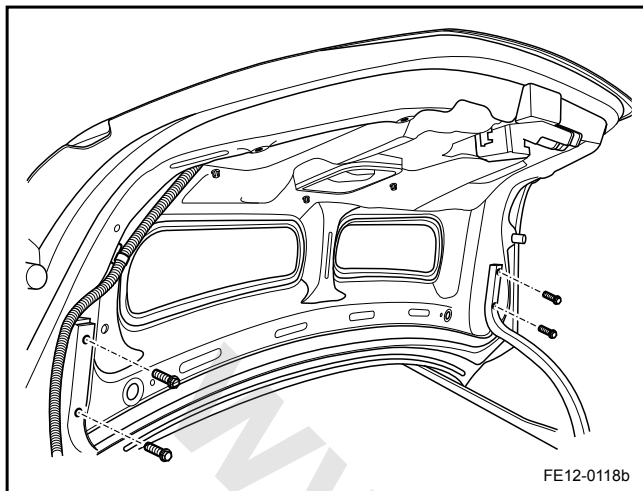
Removal Procedure:

Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Open and Support the rear compartment lid with a suitable brace.
3. Remove the rear compartment lid inner panel trim. Refer to [12.9.1.9 Rear Compartment Trim Panel Replacement](#).
4. Remove all the rear compartment lid wiring harness retaining clips, rear compartment latch connectors and two license plate lamp harness connectors.
5. Remove rear compartment lid hinges retaining bolts and hinges assembly.
6. With the aid of an assistant, remove the rear compartment lid.



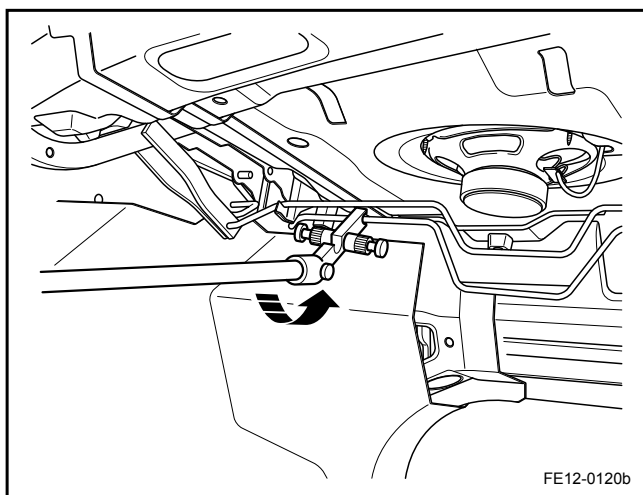
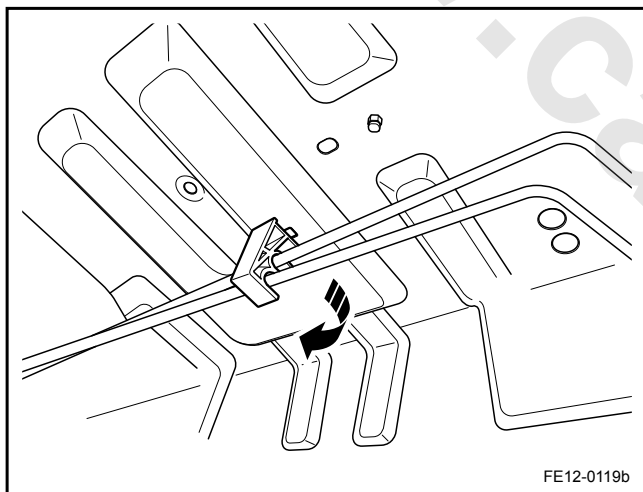
## Installation Procedure:

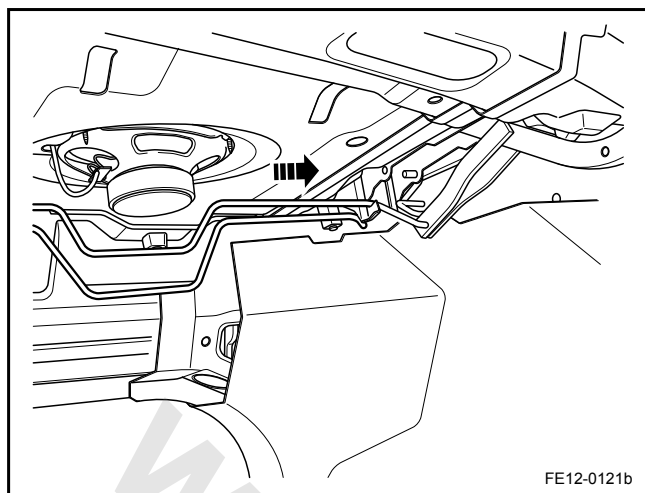
1. Install the rear compartment lid to hinges and tighten the retaining bolts.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
2. Install the wiring harness clips onto the rear compartment lid.
3. Connected the rear compartment lid latch and two license plate lamp harness connectors.
4. Install the rear compartment lid inner panel trim.
5. Close the rear compartment lid.
6. Connect the battery negative cable.

## 12.3.3.2 Rear Compartment Lid Torsion Spring Replacement (Sedan)

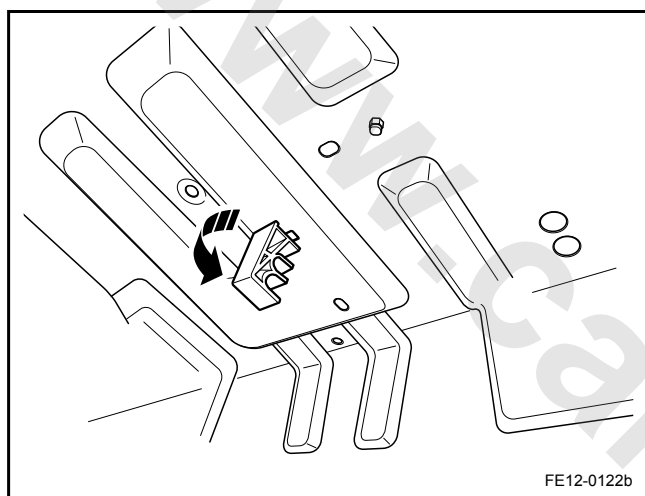
## Removal Procedure:

1. Detach the rear compartment lid torsion spring from the rear compartment lid torsion spring bracket (Left).
2. Detach the rear compartment lid torsion spring from the rear compartment lid hinge (Left).





3. Pull the rear compartment lid torsion spring (Left) to the right side to remove it.

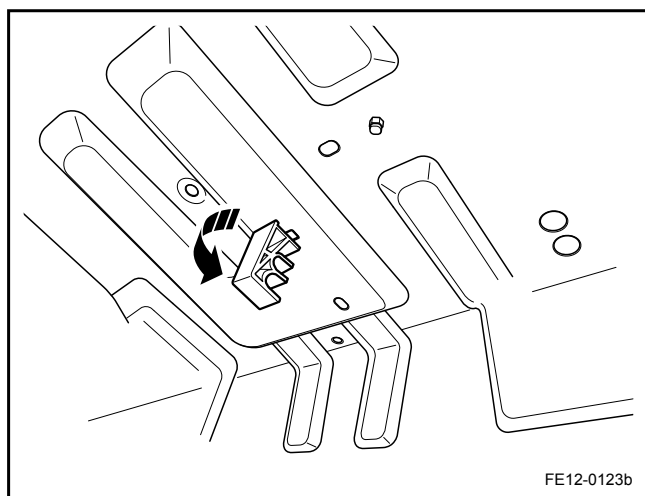


4. Remove the rear compartment lid torsion spring (Right), similar to the rear compartment lid torsion spring (Left).
5. Remove the rear compartment lid torsion spring bracket.

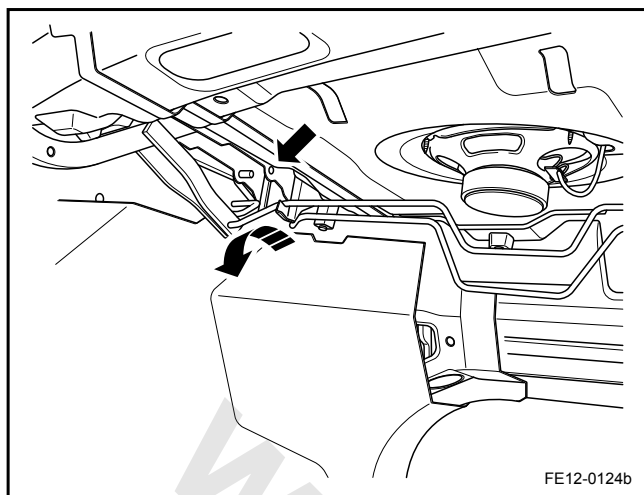
#### Installation Procedure:

##### Note

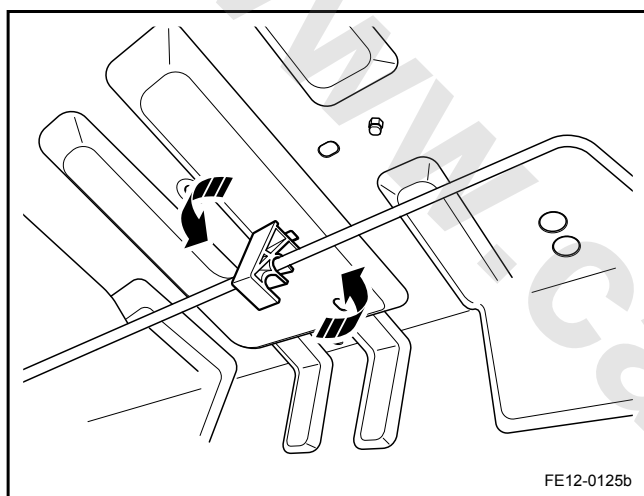
Install the rear compartment lid torsion spring (Right) first, and then install the left side spring.



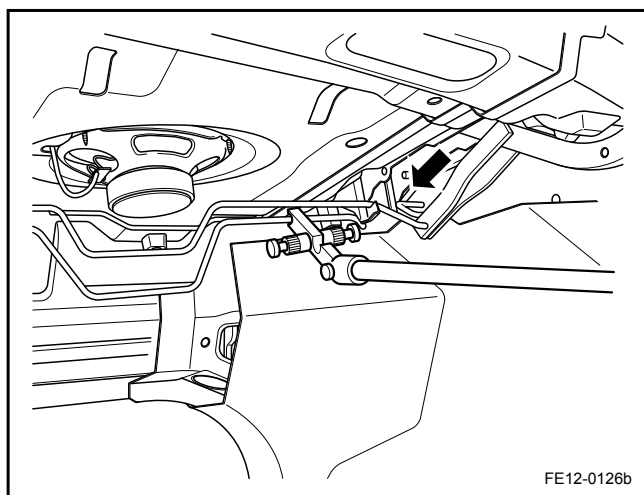
1. Install the rear compartment lid torsion spring bracket.



2. Install the top left end of the rear compartment lid torsion spring (Right) into the mounting hole.



3. Attach the rear compartment lid torsion spring (Right) to the rear compartment lid torsion spring bracket.



4. Install the top right end of the rear compartment lid torsion spring (Right) into the mounting hole first, then install the rear compartment lid torsion spring (Right) to the hinge and the body.
5. Install the rear compartment lid torsion spring (Left), similar to the rear compartment lid torsion spring (Right).

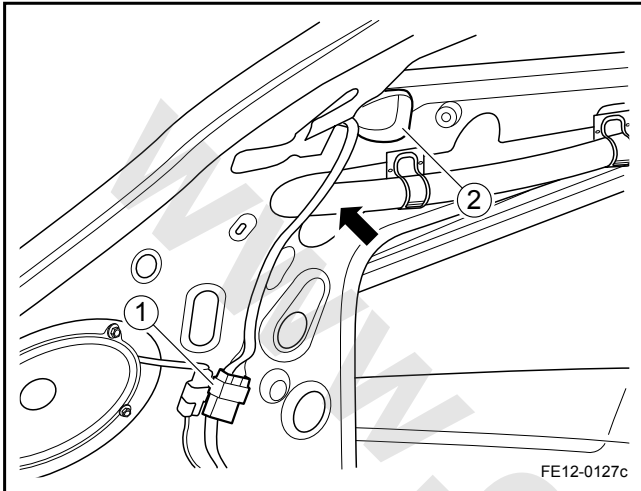


### 12.3.3.3 Hatchback and Hatchback Hinge Replacement (Hatchback)

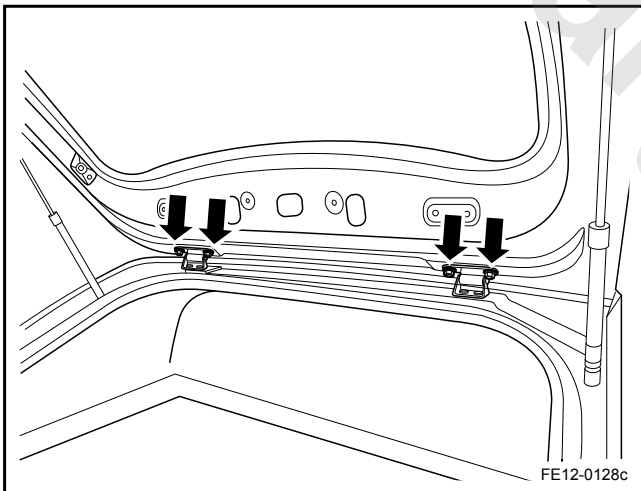
Removal Procedure:

**Warning!**

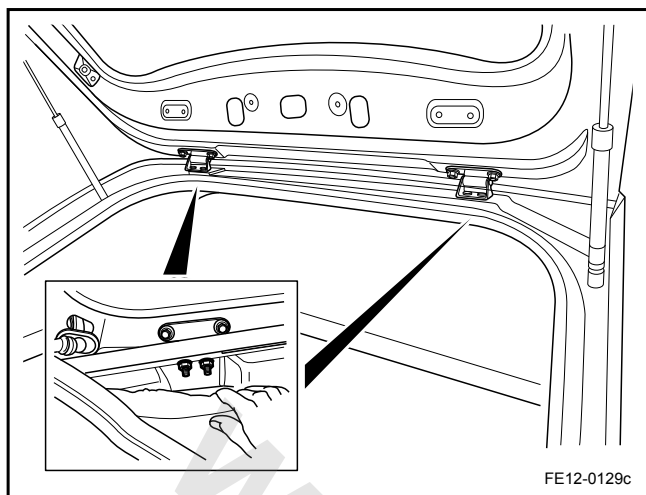
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Open and use a suitable brace to support the hatchback.
2. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
3. Remove the body lock pillar upper trim panel. Refer to [12.9.1.6 Rear Quarter Upper Trim Panel Replacement \(Hatchback\)](#).
4. Remove wiring harness connector 1 and rear window washer hose 2.
5. Remove the hatchback trim panel. Refer to [12.9.1.9 Rear Compartment Trim Panel Replacement](#).
6. Remove the hatchback strut. Refer to [12.3.3.4 Hatchback Strut Replacement \(Hatchback\)](#).



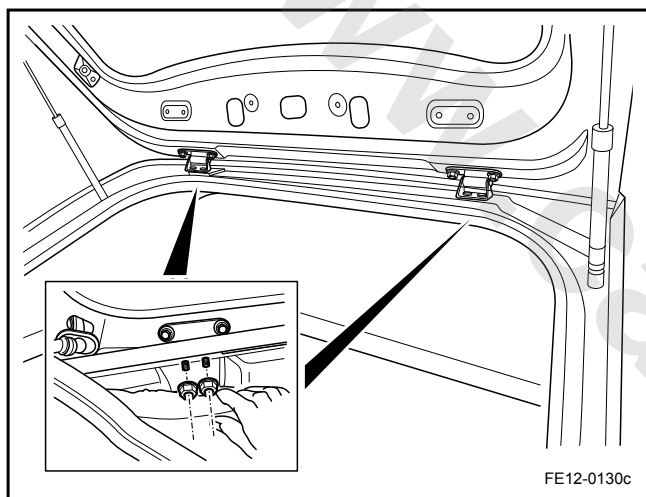
7. Remove the left and right hatchback to the hinges retaining bolts.
8. With the aid of an assistant, remove the hatchback.



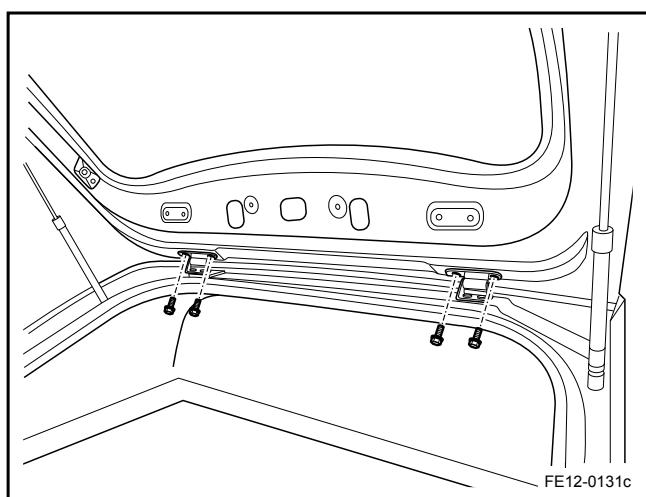
9. Remove the hatchback hinge retaining nuts, two on each side.
10. Remove the hatchback hinges.

#### Installation Procedure:

1. Install the hatchback hinge retaining nuts and tighten.  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)



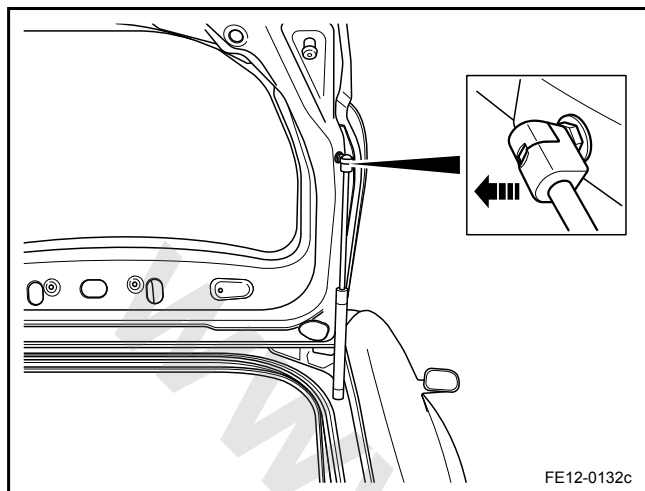
2. Install the hatchback to the hinges and tighten the retaining bolts.  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)
3. Route the hatchback wiring harness to rear compartment and connect wiring harness connectors and rear window washer hoses.
4. Install the body lock pillar upper trim panel.
5. Install the hatchback trim panel.



### 12.3.3.4 Hatchback Strut Replacement (Hatchback)

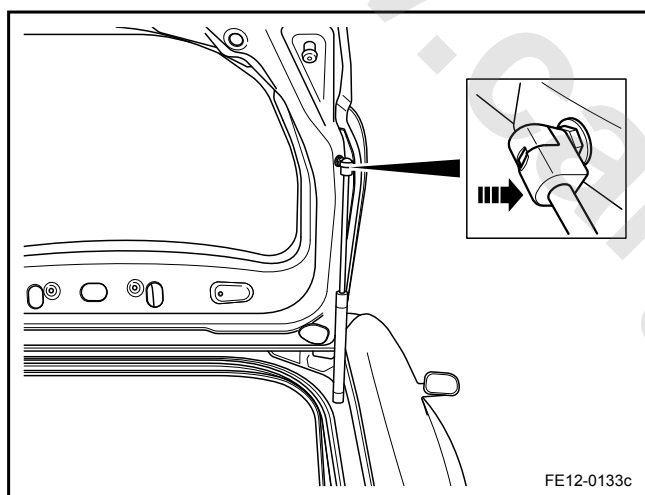
#### Removal Procedure:

1. Open and use a suitable brace to support the hatchback.
2. Using a flat blade screwdriver, release the hatchback strut to upper strut stud retaining clip and detach the hatchback strut from the upper strut stud. Remove the hatchback strut from the lower strut stud in the same way.
3. Remove the hatchback strut from the vehicle.



#### Installation Procedure:

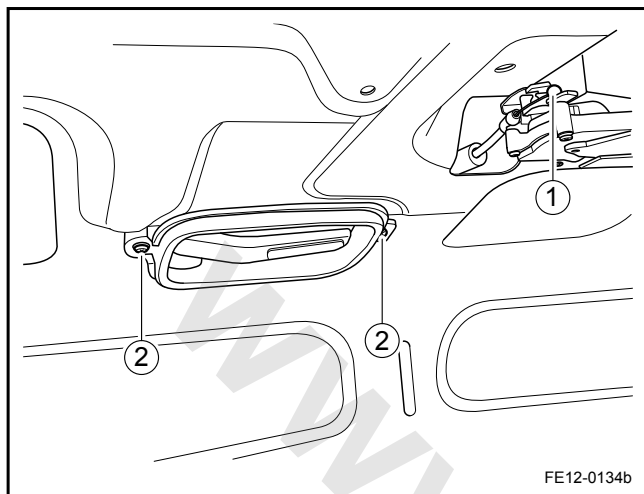
1. Press the end of the hatchback strut into the strut studs. Please note that the strut rod is on the hatchback.
2. Close the hatchback.



### 12.3.3.5 Emergency Exit Open Handle Assembly Replacement (Sedan)

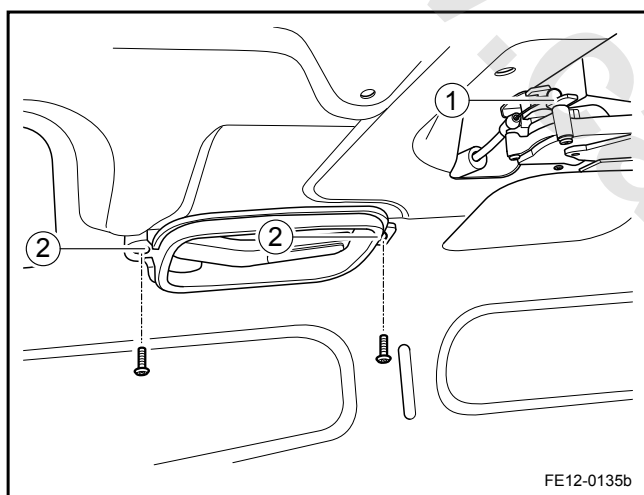
#### Removal Procedure:

1. Remove the rear compartment lid inner panel trim. Refer to [12.9.1.14 Rear Compartment Lid Inner Trim Panel Replacement](#).
2. Disconnect the emergency exit open handle release cable (1) from the rear compartment lid latch.
3. Remove the emergency exit open handle retaining screws (2).
4. Remove the emergency exit open handle assembly.



#### Installation Procedure:

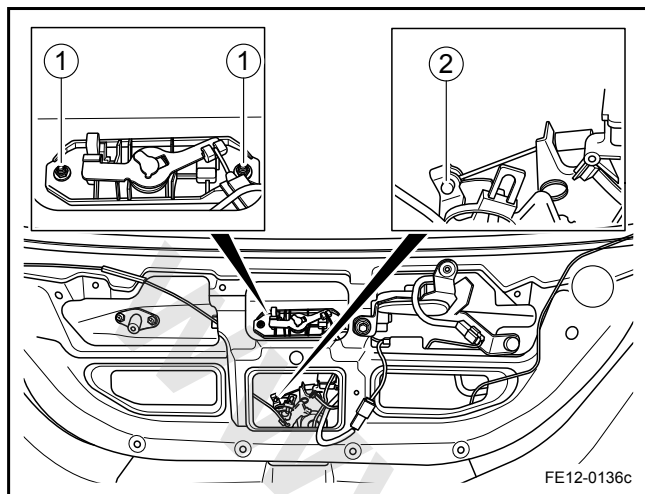
1. Install the emergency exit open handle and tighten the retaining screws (2).  
Torque: 4 Nm (Metric) 2.96 lb-ft (US English)
2. Connect the emergency exit open handle release cable (1) to the rear compartment lid latch.
3. Install the rear compartment lid inner panel trim.



### 12.3.3.6 Hatchback Release Handle Replacement (Hatchback)

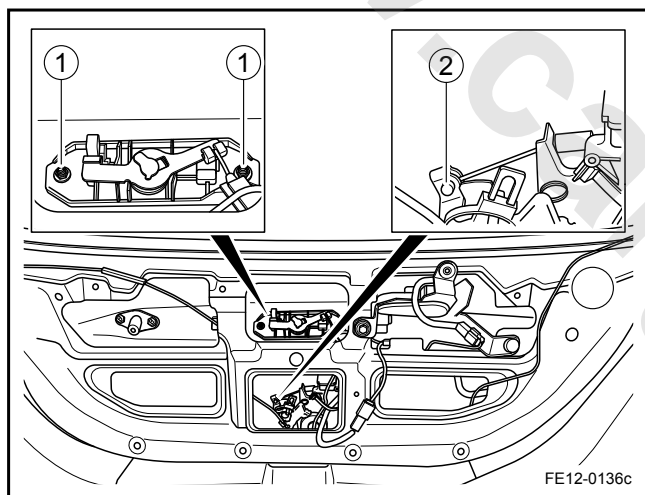
#### Removal Procedure:

1. Remove hatchback inner trim panel. Refer to [12.9.1.15 Hatchback Inner Trim Panel Replacement \(Hatchback\)](#).
2. Remove hatchback release handle retaining nuts (1).
3. Disconnect the hatchback release cable (2) from the hatchback latch.
4. Remove the hatchback release handle.



#### Installation Procedure:

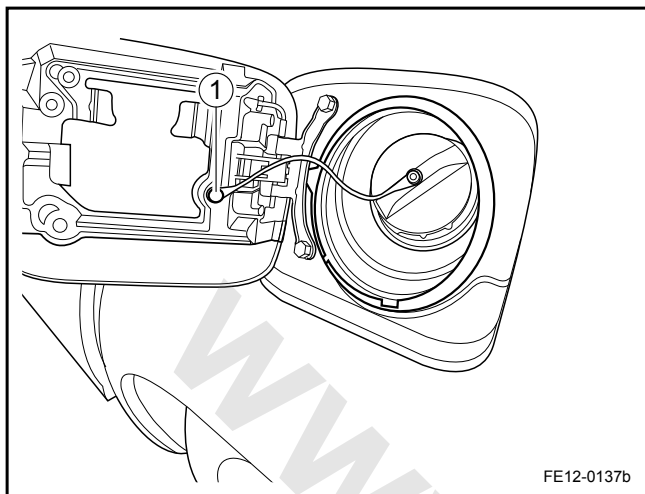
1. Install the hatchback release handle and tighten the retaining nuts (1).
2. Connect the hatchback release cable (2) to the hatchback latch.
3. Install hatchback inner trim panel.



### 12.3.3.7 Fuel Tank Filler Door Replacement

#### Removal Procedure:

1. Open the fuel filler cap.
2. Remove the fixed fuel filler gasket.
3. Disconnect the fuel filler cap release cable.

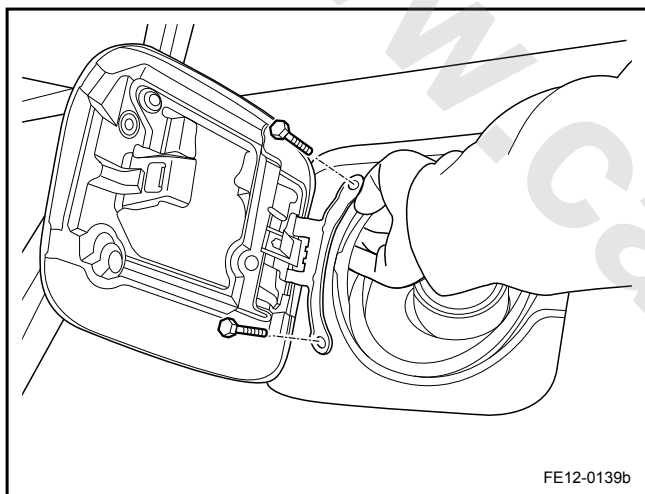


4. Remove the fuel tank filler door to rear quarter panel retaining torx screws.

#### Note

Hold the nuts from the back to remove the torx screws, otherwise the nuts may fall.

5. Remove the fuel filler cap.

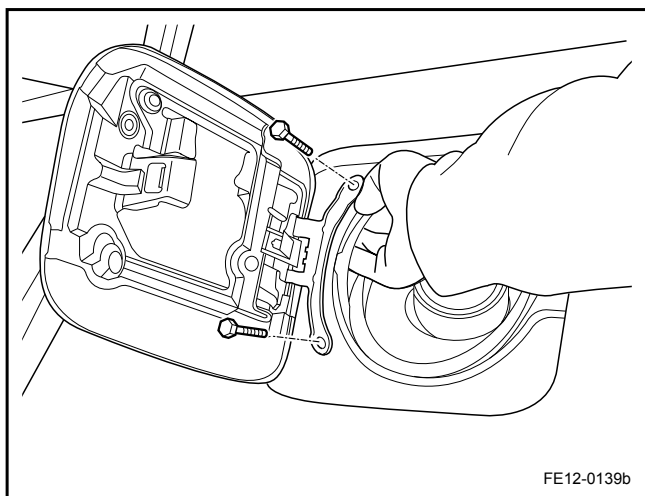


#### Installation Procedure:

1. Install the fuel filler cap and tighten the retaining torx screws.

Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

2. Connect the fuel filler cap release cable.
3. Install the fixed fuel filler gasket.
4. Close the fuel filler cap.



### 12.3.3.8 Fuel Filler Cap Release Handle Replacement

#### Removal Procedure:

1. Remove the driver electric seat. Refer to [11.11.8.1 Front Electric Seat Replacement](#).
2. Remove the driver door and the left rear door sill nameplate. Refer to [12.9.1.2 Left and Right Door Sill Nameplate Replacement](#).
3. Remove center pillar lower trim panel. Refer to [12.9.1.4 Center Pillar Trim Panel Replacement](#).
4. Remove the rear seat back bolster. Refer to [12.7.3.6 Rear Seat Armrest Assembly Replacement](#).
5. Lift the car carpet and remove the fuel filler cap release handle retaining bolts.
6. Remove the rear compartment trim panel. Refer to [12.9.1.9 Rear Compartment Trim Panel Replacement](#).
7. Disconnect the fuel filler cap release cable (1) from inside the vehicle.

#### Note

Rotate the fuel filler door lock actuator counter clockwise to loose the cable (1), and then pull the cable out of the fuel filler door lock actuator (2).

8. Remove the fuel filler door lock actuator (2).
9. From the driver side, pull the fuel filler cap release cable with the handle out of the vehicle.

#### Installation Procedure:

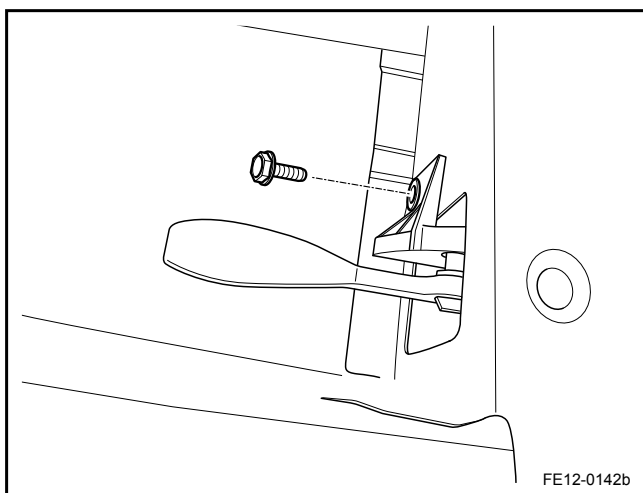
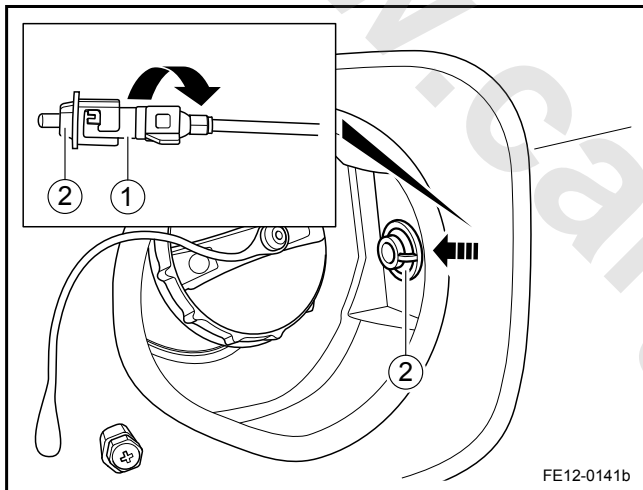
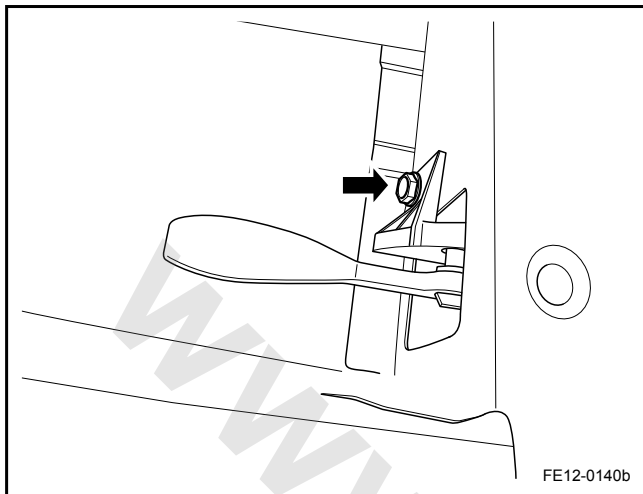
1. Install and tighten the fuel filler cap release handle retaining bolts.

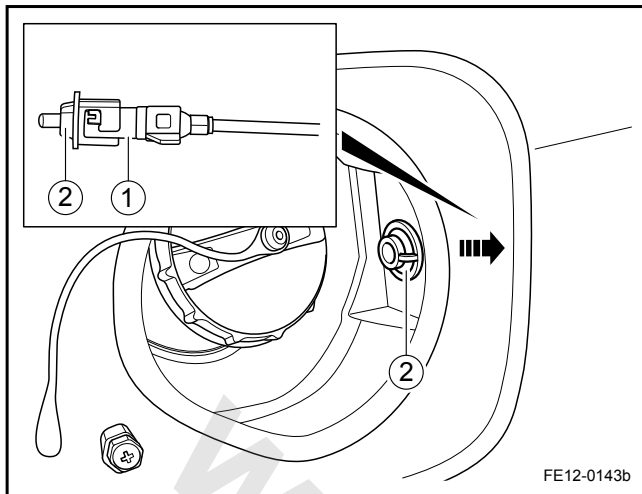
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

2. Route the release cable.

#### Note

Route the release cable the same as before removal.



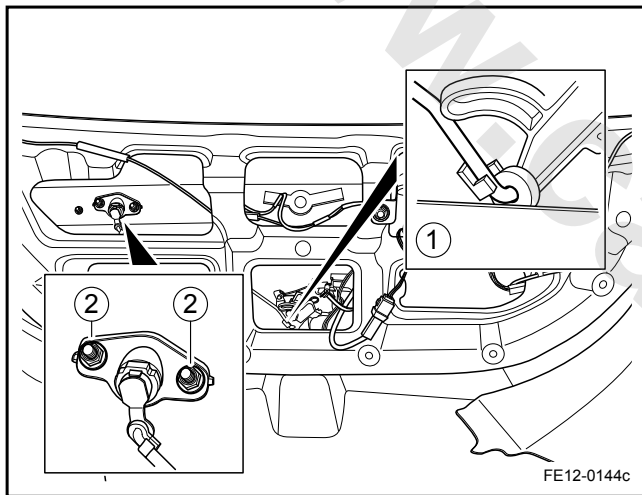


3. Install the fuel filler door lock actuator (2) to the fuel filler neck.
4. Connect the fuel filler cap release cable (1) to the fuel filler door lock actuator (2).
5. Install the rear compartment trim panel.
6. Install the rear seat back bolster.
7. Install the center pillar lower trim panel.
8. Install the driver door and the left rear door sill nameplate.
9. Install the driver electric seat.

### 12.3.3.9 Hatchback Latch Replacement

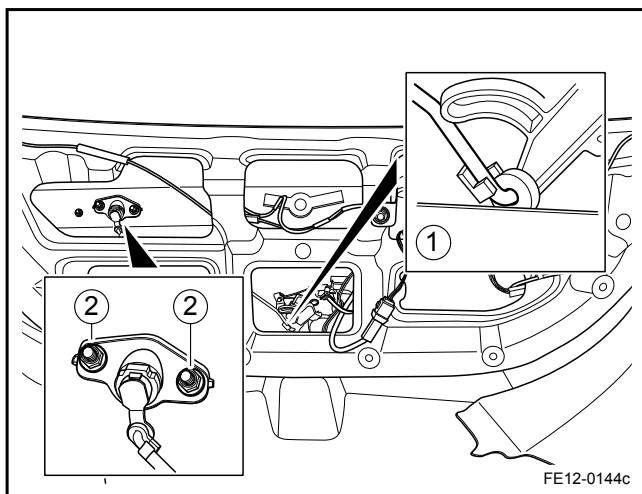
#### Removal Procedure:

1. Remove the hatchback inner trim panel. Refer to [12.9.1.15 Hatchback Inner Trim Panel Replacement \(Hatchback\)](#).
2. Disconnect the latch release cable from the hatchback latch.
3. Remove the hatchback latch retaining nut (2).
4. Remove the hatchback latch.



#### Installation Procedure:

1. Install and tighten the hatchback latch retaining nut.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
2. Connect the latch release cable to the hatchback latch.
3. Install the hatchback inner trim panel.





## 12.4 Bumpers

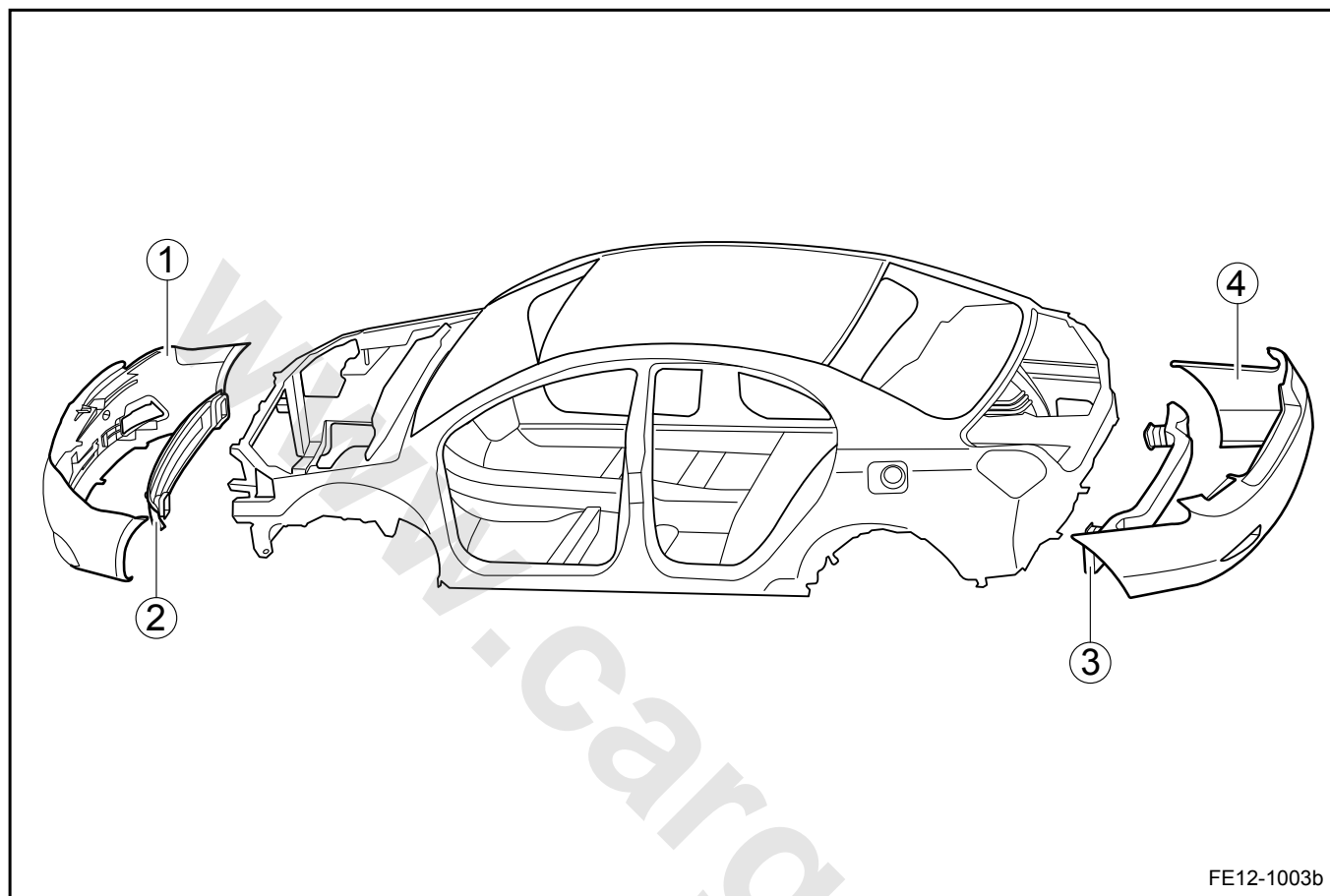
### 12.4.1 Specifications

#### 12.4.1.1 Fastener Tightening Specifications

Application	Model	Specification	
		Metric (Nm)	US English (lb-ft)
Front Bumper Retaining Bolts	M6 × 16	9-13	6.7-9.6
Rear Bumper Retaining Bolts	M6 × 16	9-13	6.7-9.6
Rear Bumper Retaining Bolts	M6 × 12	9-13	6.7-9.6
Front/Rear Impact Bar Retaining Nuts	M10	70	51.80

## 12.4.2 Component Locator

## 12.4.2.1 Component Views



## Legend

- 1. Front Bumper Assembly
- 2. Front Impact Bar
- 3. Rear Impact Bar

- 4. Rear Bumper Assembly

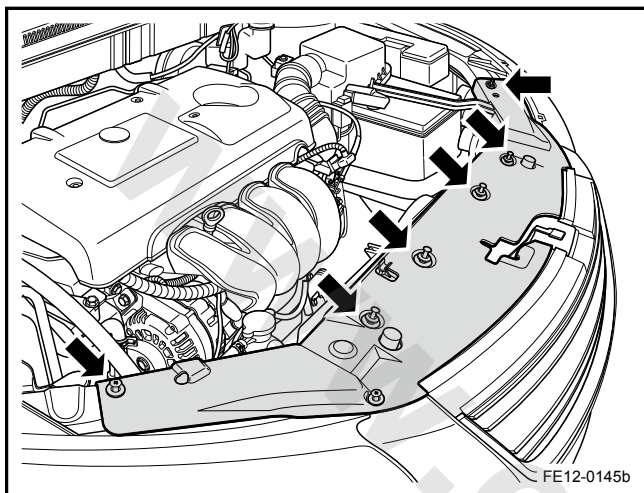
### 12.4.3 Removal and Installation

#### 12.4.3.1 Front Bumper Replacement

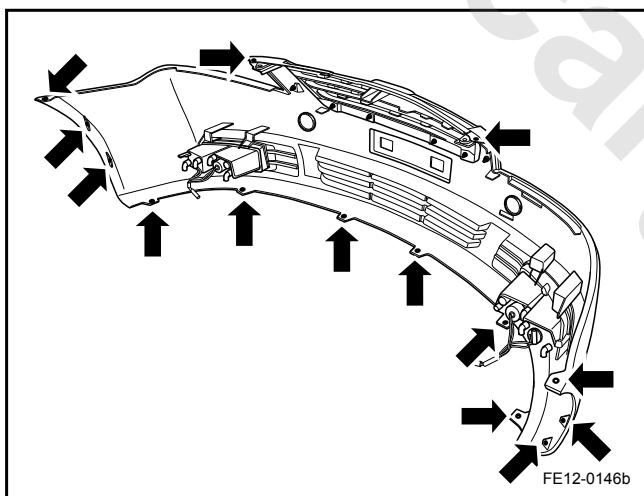
Removal Procedure:

**Warning!**

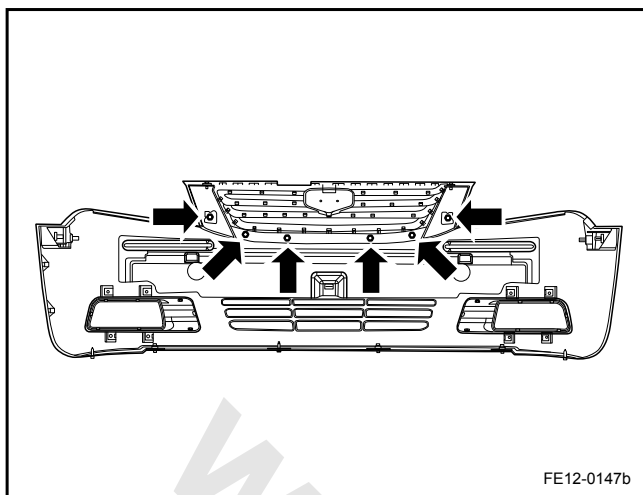
Refer to "Battery Disconnect Warning" in "Warnings and Notices"



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the radiator grille panel from the front end module.



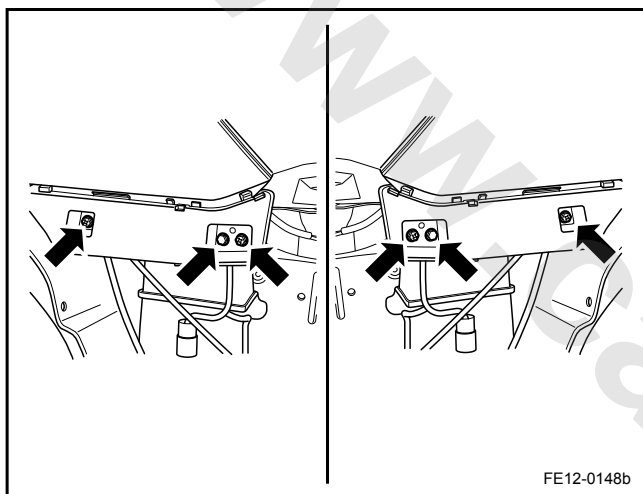
3. Remove the front bumper retaining screws from the sides and the bottom.
4. Remove the front bumper.
5. Disconnect the front fog lamp harness connectors.
6. prior to remove  
Remove the front fog lamps. Refer to [11.4.8.7 Front Fog Lamp Replacement](#).
7. Remove the front fog lamp covers before removal.



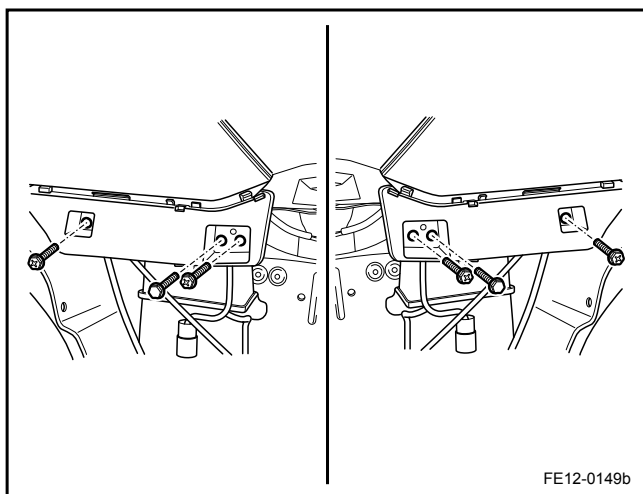
8. Remove the six radiator grille panel to the front bumper retaining screws and remove the radiator grille panel.

**Note**

Hatchback radiator grille has two retaining screws.



9. Remove the front bumper fascia reinforcements from both sides.



**Installation Procedure:**

1. Install the front bumper fascia reinforcements.  
Torque :9-13 Nm (Metric) 6.7-9.6 lb-ft (US English)
2. Install the front fog lamp covers.
3. Install the radiator grille panel to the front bumper.
4. Install the front fog lamps.
5. Connect the front fog lamp harness connectors.
6. Install the front bumper.
7. Install the front bumper side and bottom retaining screws.
8. Install the radiator grille panel to the front end module.

**Note**

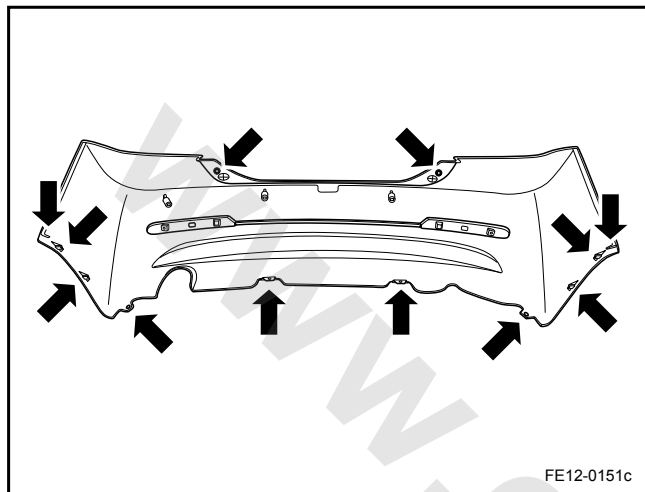
The replacement procedure for Hatchback is similar to that of sedan.

### 12.4.3.2 Rear Bumper Replacement (Hatchback)

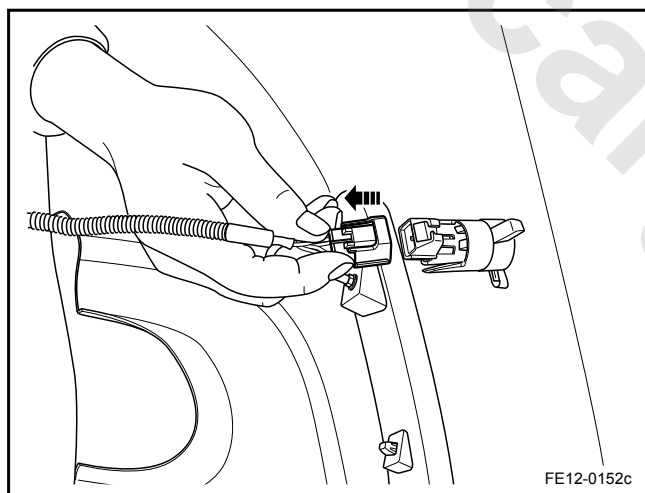
Removal Procedure:

Warning!

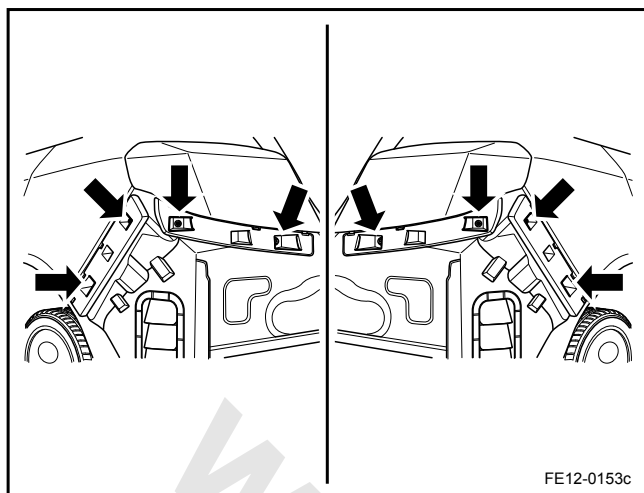
Refer to "Battery Disconnect Warning" in "Warnings and Notices".



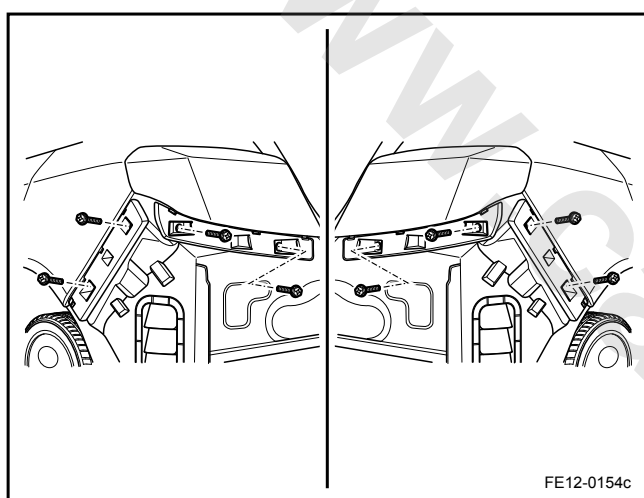
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the two rear bumper upper retaining screws, six rear bumper to rear wheelhouse liner retaining bolts and four rear bumper to spare wheel carrier retaining bolts. Pull the rear bumper from sides to loosen the rear bumper.



3. Disconnect four rear park assist sensor harness connectors and remove the rear bumper.
4. Remove four rear park assist sensors. Refer to [11.14.7.2 Reverse Radar Sensor Replacement](#).

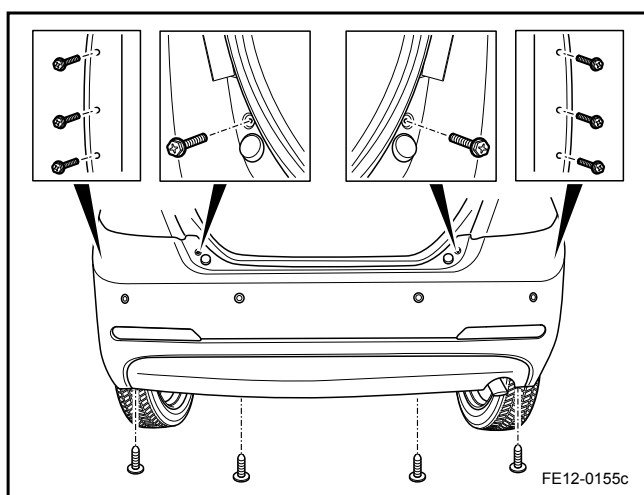


5. Remove the rear bumper brackets.



#### Installation Procedure:

1. Install the rear bumper brackets..  
Torque: 11 Nm (Metric) 8.1 lb-ft (US English)
2. Install four rear park assist sensors.
3. Connect four rear park assist sensor harness connectors.

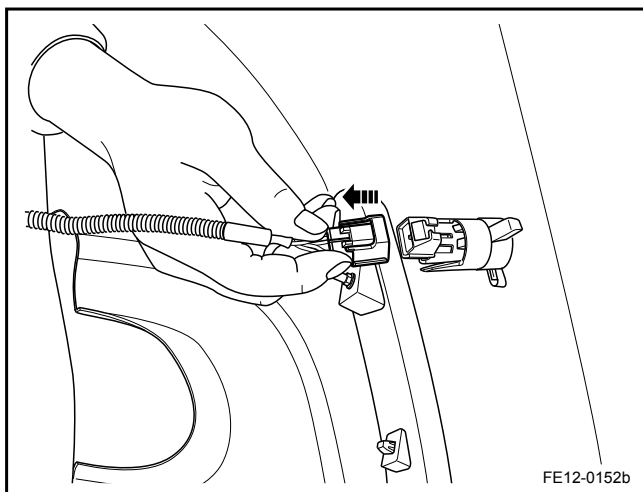
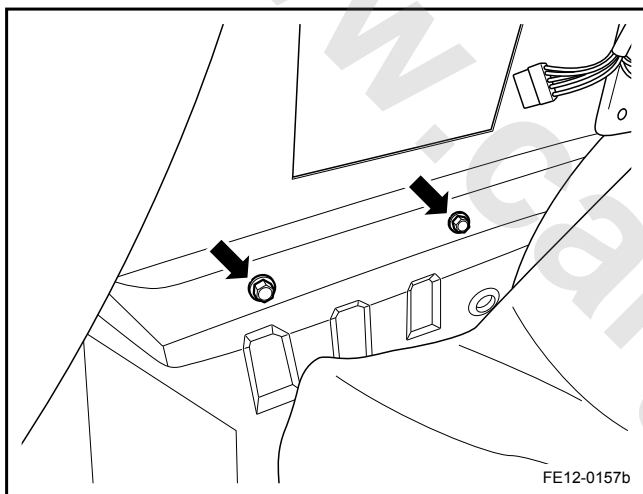
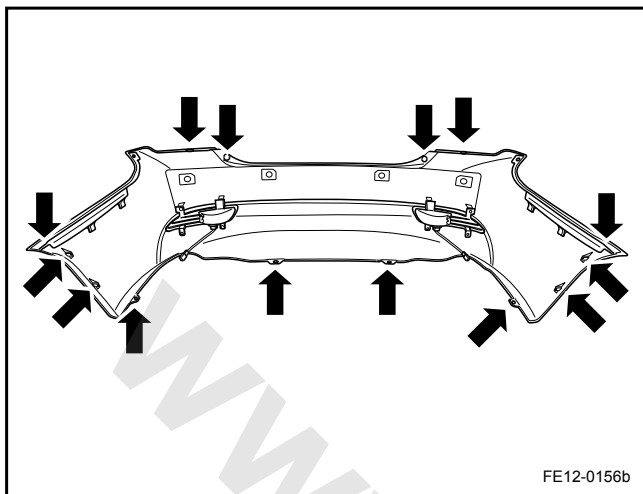


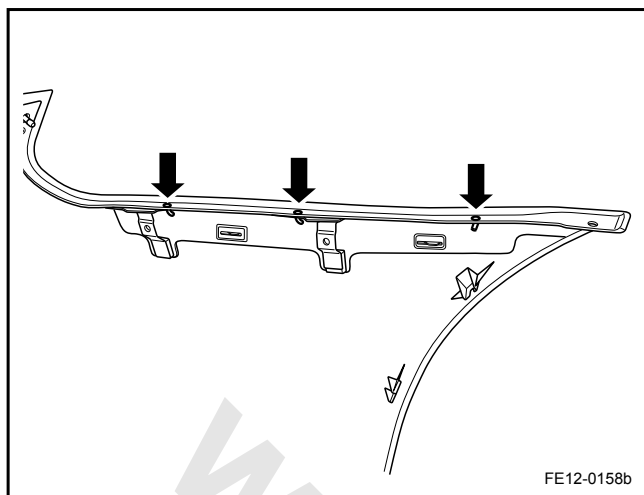
4. Install the two rear bumper upper retaining screws, six rear bumper to rear wheelhouse liner retaining bolts and four rear bumper to spare wheel carrier retaining bolts.
5. Connect the battery negative cable.

### 12.4.3.3 Rear Bumper Replacement (Sedan)

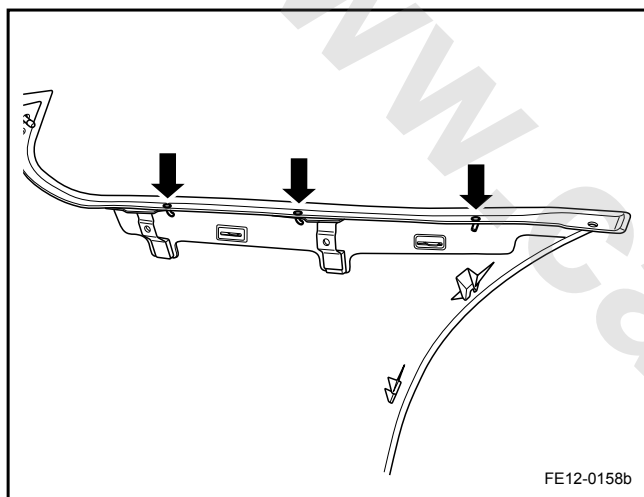
#### Removal Procedure:

1. Remove the two rear bumper upper retaining screws, two clips, six rear bumper to rear wheelhouse liner retaining bolts and four rear bumper to spare wheel carrier retaining bolts.
2. Remove the rear compartment trim panel. Refer to [12.9.1.9 Rear Compartment Trim Panel Replacement](#).
3. Remove the rear bumper left and right retaining bolts.
4. Remove four rear park assist sensor harness connectors.
5. Remove four rear park assist sensors. Refer to [11.14.7.2 Reverse Radar Sensor Replacement](#).



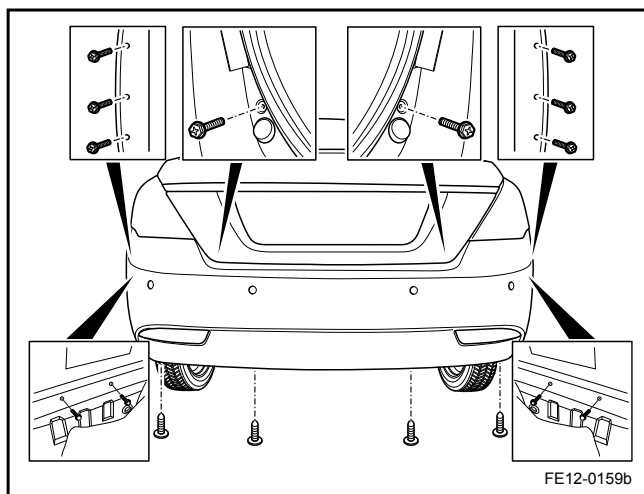


6. Remove the rivets from the rear bumper mounting brackets and remove the rear bumper mounting brackets.



#### Installation Procedure:

1. Install the rear bumper mounting brackets to the rear bumper.
2. Install four rear park assist sensors.
3. Connect four rear park assist sensor harness connectors.



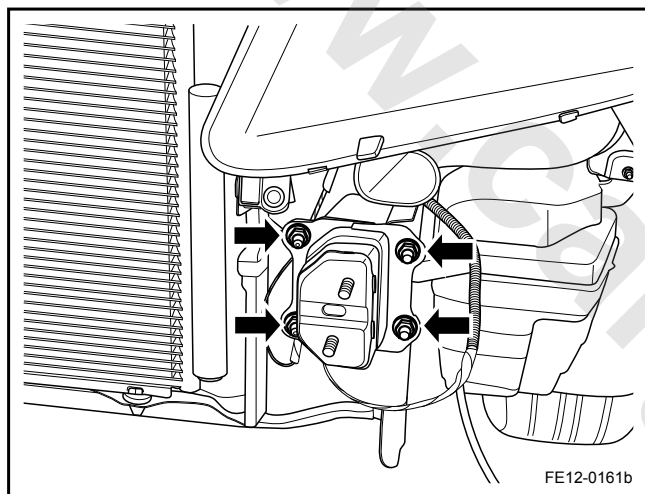
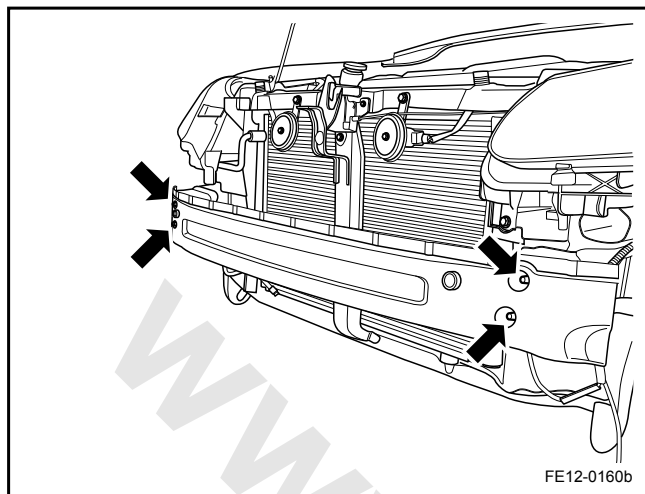
4. Install the rear bumper left and right retaining bolts.
5. Install the two rear bumper upper retaining screws, two clips, six rear bumper to rear wheelhouse liner retaining bolts and four rear bumper to spare wheel carrier retaining bolts.
6. Install the rear compartment trim panel.



### 12.4.3.4 Front Impact Bar Replacement

#### Removal Procedure:

1. Remove the front bumper. Refer to [12.4.3.1 Front Bumper Replacement](#).
2. Remove the front impact bar retaining nuts.

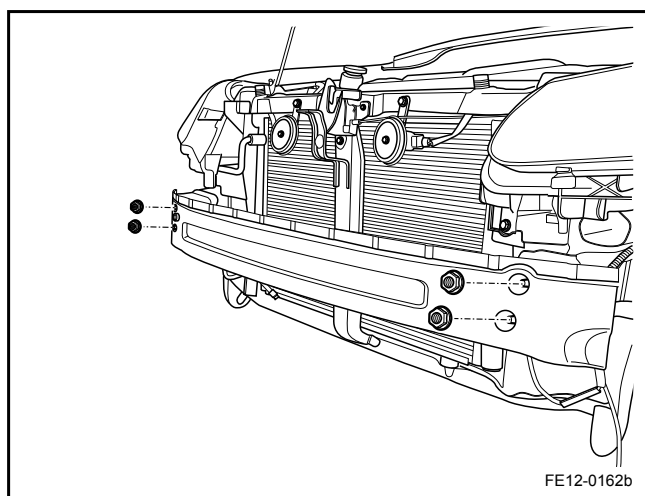


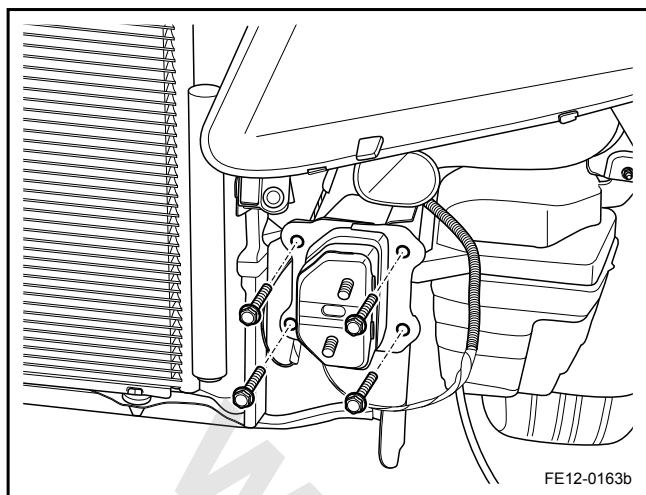
3. Remove four retaining nuts from each side of the front bumper energy absorber.

#### Installation Procedure:

1. Install four retaining nuts on each side of the front bumper energy absorber.

Torque: 70 Nm (Metric) 51.8 lb-ft (US English)

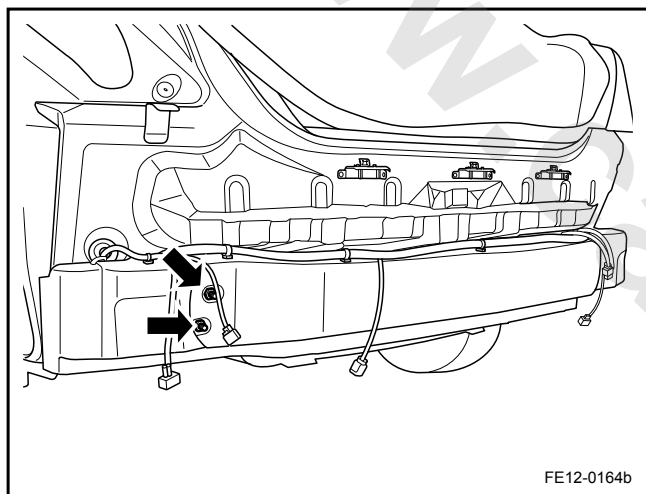




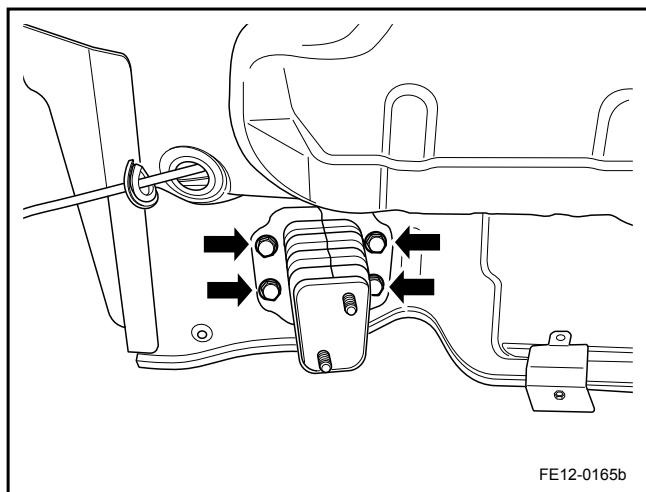
2. Install four front impact bar retaining nuts.  
Torque: 70 Nm (Metric) 51.8 lb-ft (US English)
3. Install the front bumper.

#### 12.4.3.5 Rear Impact Bar Replacement

Removal Procedure:



1. Remove the rear bumper. Refer to [12.4.3.3 Rear Bumper Replacement \(Sedan\)](#).
2. Unclip the wiring harness clips.
3. Remove four retaining nuts from the rear impact bar .

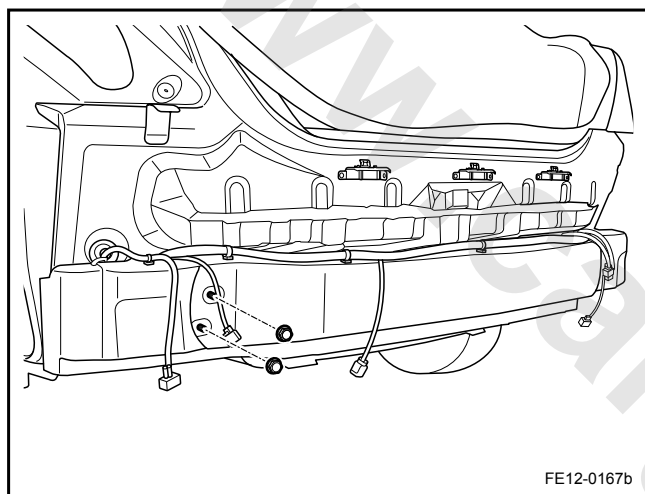
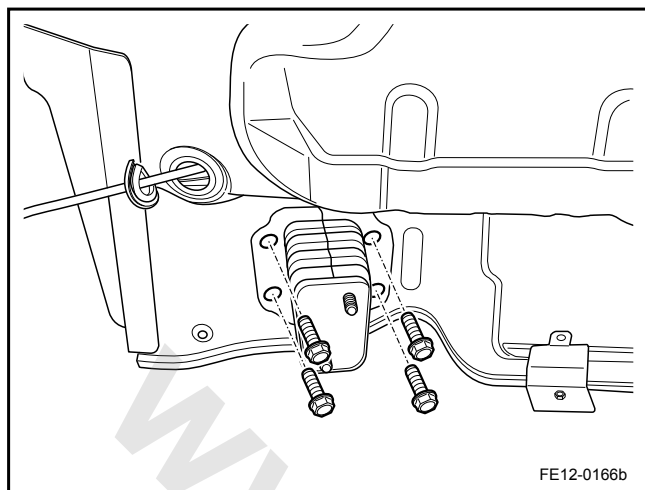


4. Remove four retaining bolts from each side of the rear bumper energy absorber.

## Installation Procedure:

1. Install four retaining bolts on each side of the rear bumper energy absorber.

Torque: 70 Nm (Metric) 51.8 lb-ft (US English)



2. Install four rear impact bar retaining nuts.  
Torque: 70 Nm (Metric) 51.8 lb-ft (US English)
3. Clip the wiring harness clips.
4. Install the rear bumper.

## 12.5 Doors

### 12.5.1 Specifications

#### 12.5.1.1 Fastener Tightening Specifications

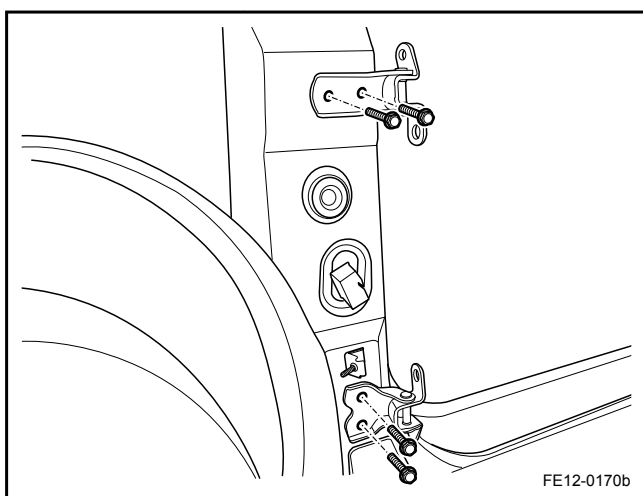
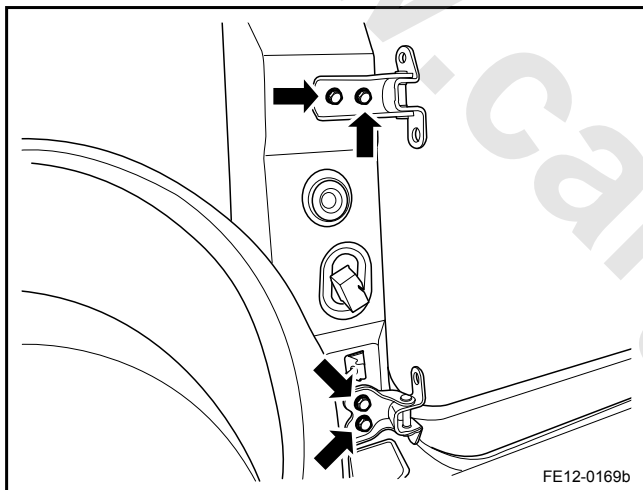
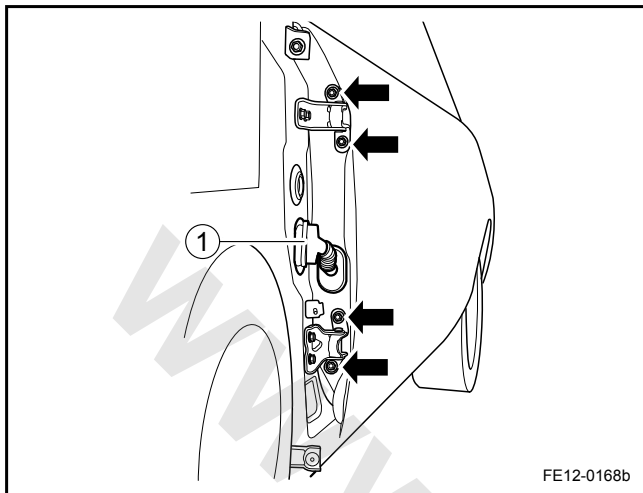
Application	Model	Specification	
		Metric (Nm)	US English (lb-ft)
Left Front Door Assembly Retaining Bolts	M8 × 23	30-38	22.1-28.0
Right Front Door Assembly Retaining Bolts	M8 × 23	30-38	22.1-28.0
Left Rear Door Assembly Retaining Bolts	M8 × 23	30-38	22.1-28.0
Right Rear Door Assembly Retaining Bolts	M8 × 23	30-38	22.1-28.0
Car Lock Retaining Bolts	M6 × 12	9-13	6.7-9.6
Door Check Link Retaining Bolts	M6 × 16	23-26	17.0-19.2

## 12.5.2 Removal and Installation

### 12.5.2.1 Front Door Hinge Replacement

#### Removal Procedure:

1. Remove the front fender. Refer to [12.2.3.4 Front Fender Replacement](#).
2. Remove the front door wiring harness dust cover and disconnect harness connector (1).
3. Remove the front door check link. Refer to [12.5.2.2 Front Door Check Link Replacement](#).
4. Use a cleaning cloth to clean the door hinge surface and use an oil pen or other marking tools to mark the door hinge position on the front door surface.
5. Remove the front door hinge to the front door retaining bolts.
6. Remove the front door.
7. Use a cleaning cloth to clean the door hinge surface and use an oil pen or other marking tools to mark the door hinge position on the body surface.
8. Remove the front door hinge to the body retaining bolts.
9. Remove the front door hinges.



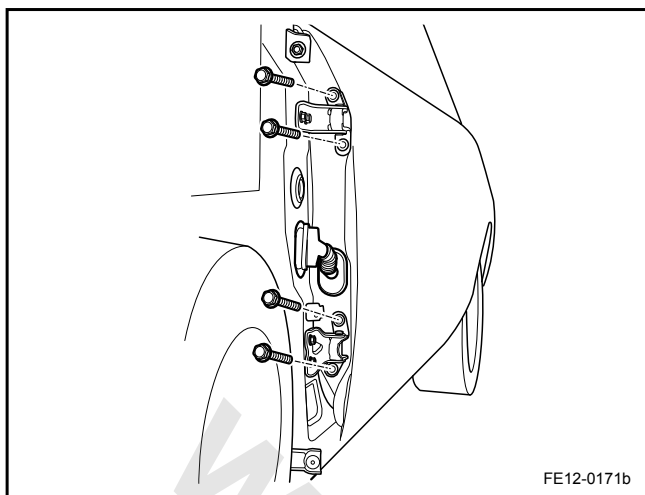
#### Installation Procedure:

1. Install the front door hinge to the front door retaining bolts and tighten to the specified torque after tuning.

Torque: 25 Nm (Metric) 18.5 lb-ft (US English)

#### Note

Refer to "Fastener Notices" in "Warnings and Notices".

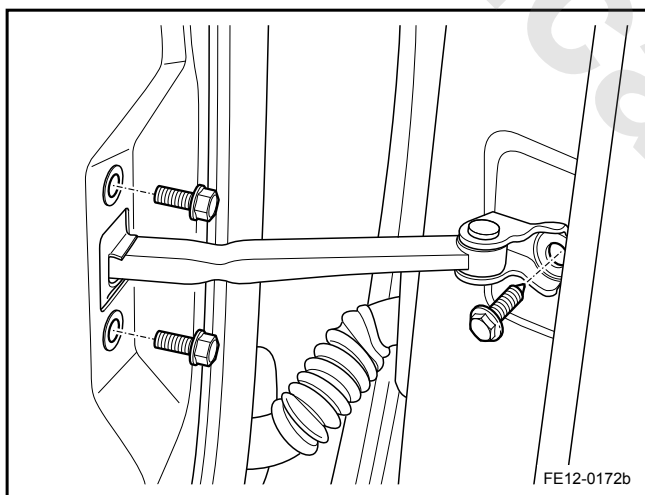


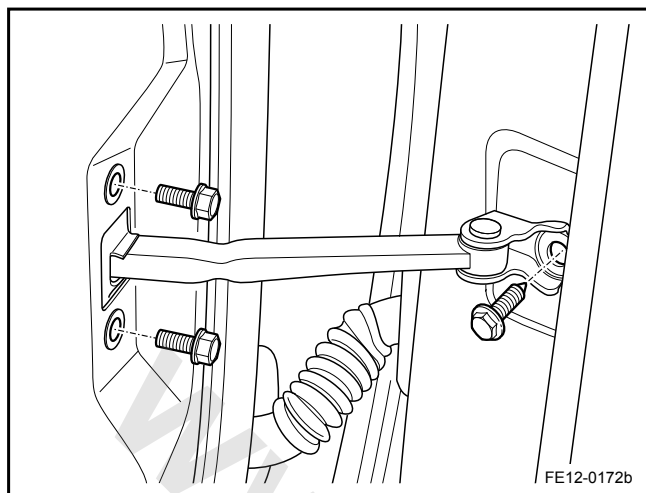
2. Install the front door.
3. Connect the front door wiring harness connector and the dust cover.
4. Install the front door check link.
5. Close the front door and inspect the door Clearance, adjust if necessary.
6. Install the front door hinge to the front door retaining bolts.  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)
7. Install the front fender.
8. Install the front fender liner.
9. Install the front wheel.
10. Lower the vehicle.

### 12.5.2.2 Front Door Check Link Replacement

#### Removal Procedure:

1. Remove the front door trim panel. Refer to [12.9.1.12 Front Side Door Trim Panel Replacement](#).
2. Remove the front door check link retaining bolts (2 M6, 1 M8).
3. Remove the front door check link from inside of the front door.





## Installation Procedure:

1. Install and tighten the front check link retaining bolts (M6).  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
2. Tighten the retaining bolt (M8).  
Torque: 25 Nm (Metric) 18.5 lb-ft (US English)
3. Install the front door trim panel.

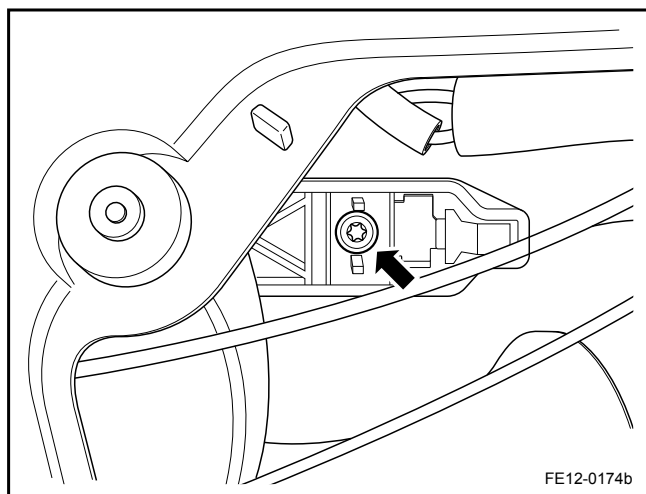
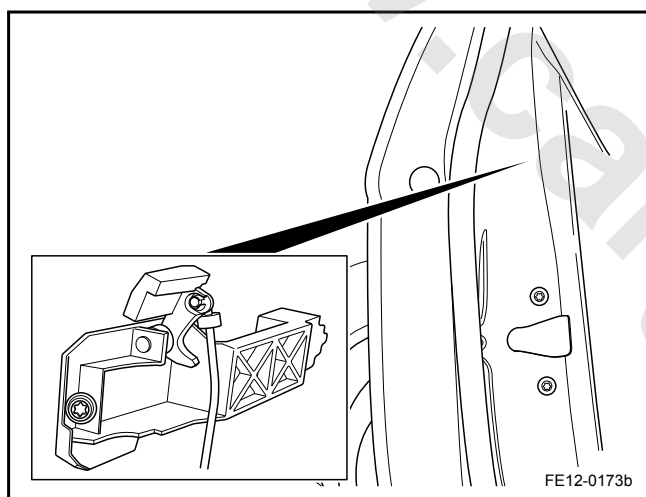
## 12.5.2.3 Front Door Outside Handle Replacement

## Removal Procedure:

1. Remove the front door trim panel. Refer to [12.9.1.12 Front Side Door Trim Panel Replacement](#).
2. Remove the front door lock cylinder. Refer to [12.5.2.5 Front Door Lock Cylinder Replacement](#).
3. Disconnect the front door outside handle rod.
4. Remove the front door outside handle.

**Note**

Do not discard the seal gasket.

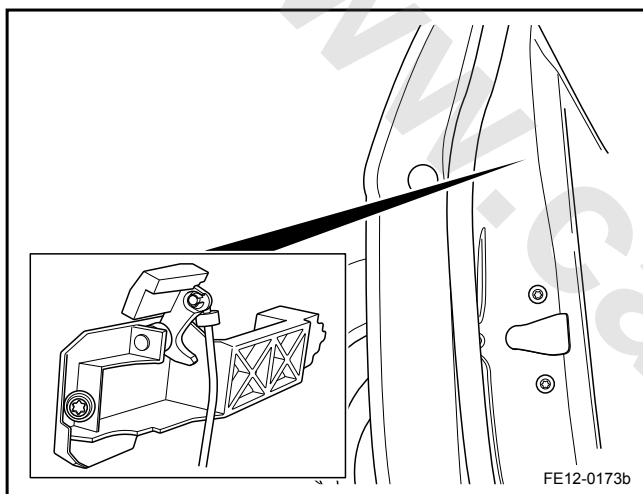
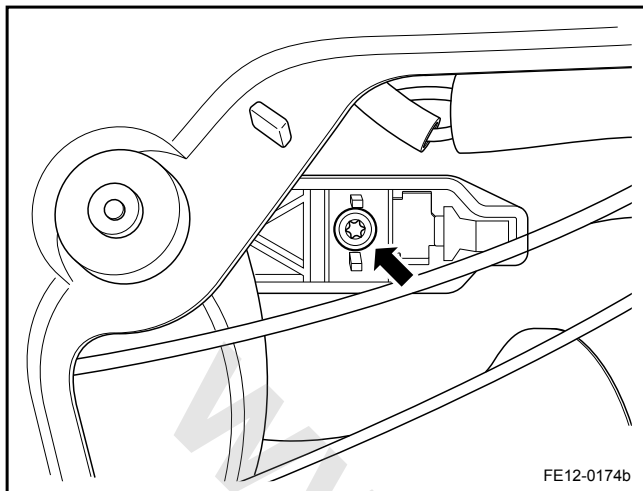


5. Loosen the front door outside handle retaining bolt.
6. Remove the inner part of the front door outside handle.

## Installation Procedure:

1. Install the inner part of the front door outside handle and tighten the retaining screws.

Torque: 8 Nm (Metric) 5.9 lb-ft (US English)

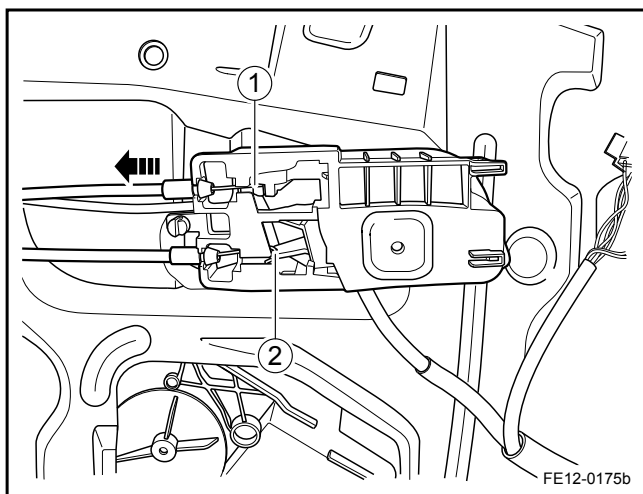


2. Install the front door outside handle and the seal gasket.
3. Connect the front door outside handle rod.
4. Install the front door lock cylinder.
5. Install the front door trim panel.

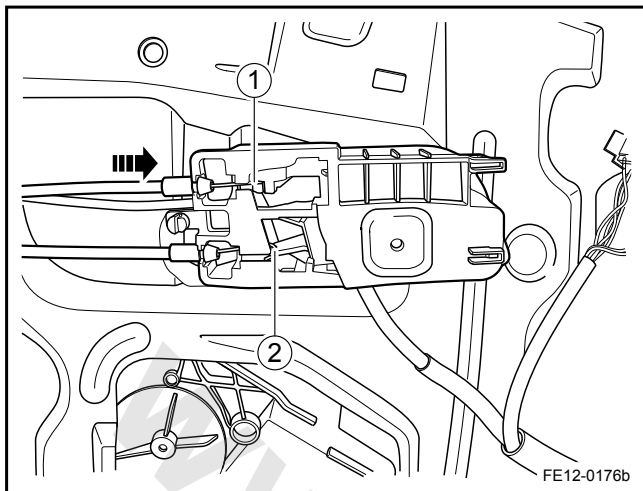
### 12.5.2.4 Front Door Inside Handle Replacement

## Removal Procedure:

1. Remove the front door trim panel. Refer to [12.9.1.12 Front Side Door Trim Panel Replacement](#).
2. Remove the front door inside handle.
3. Disconnect the inside door lock cable (1) and the inside door handle cable (2).







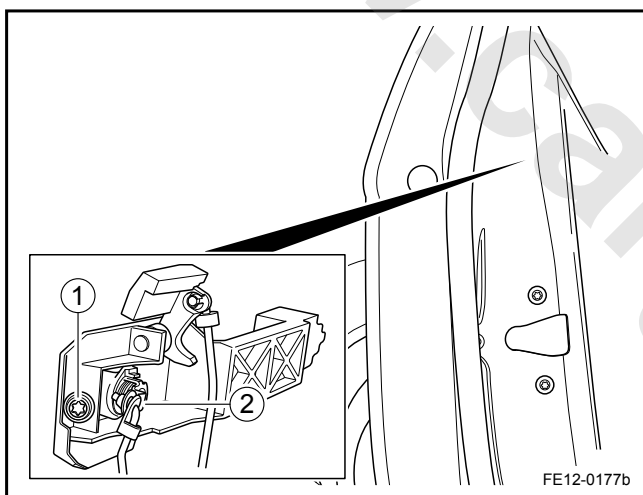
## Installation Procedure:

1. Connect the inside door lock cable (1) and the inside door handle cable (2).
2. Install the front door inside handle.
3. Install the front door trim panel.

## 12.5.2.5 Front Door Lock Cylinder Replacement

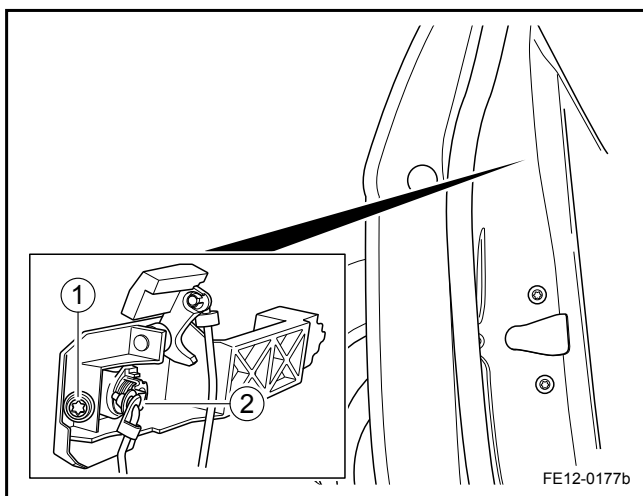
## Removal Procedure:

1. Remove the front door trim panel. Refer to [12.9.1.12 Front Side Door Trim Panel Replacement](#).
2. Remove the lock actuating rod (2).
3. Remove the door lock cylinder retaining bolt (1).
4. Remove the door lock cylinder and the cover.
5. Separate the door lock cylinder and the cover.



## Installation Procedure:

1. Install the front door lock cylinder.
2. Install the lock actuating rod (2).
3. Install and tighten the door lock cylinder retaining bolt (1).  
Torque: 8 Nm (Metric) 5.9 lb-ft (US English)
4. Install the front door lock cylinder cover.
5. Install the front door trim panel.



## 12.6 Frame and Underbody

### 12.6.1 Specifications

#### 12.6.1.1 Fastener Tightening Specifications

Application	Model	Specification	
		Metric (Nm)	US English (lb-ft)
Cross Member to Subframe Retaining Bolts	M10 × 18	65-85	47.9-62.7
Front Subframe to Body Retaining Bolts	M14 × 55	160-200	118.4-148
Front Subframe to Body Retaining Bolts	M14 × 95	160-200	118.4-148

## 12.6.2 Description and Operation

### 12.6.2.1 Frame and Underbody

The subframe is isolated from the vehicle body by the rubber bushings. It provides support to the powertrain, the front suspension lower control arms and the power steering gear assembly. Any misalignment will lead the front wheels misalignment. The subframe is bolted to the vehicle body by the rubber bushings. The vehicle underbody must be properly positioned in order to ensure proper suspension and wheels alignment. The individual underbody components contribute directly to the overall strength of unibody. Use proper metal bonding techniques during service repair operations to the unibody. The components must be corrosion protected whenever body repair operations damage or destroy the original sealing surfaces. Refer to the "Anti-Corrosion Treatment and Repair" in Collision Repair Description and Operation. [12.12.2.4 Anti-Corrosion Treatment](#).

### 12.6.3 Diagnostic Information and Procedures

#### 12.6.3.1 Diagnostic Information and Procedures

##### Inspect the Vehicle Underbody

If the vehicle underbody dimensions do not meet the standard, use the body frame correction tool to ensure correct body components dimensions. Refer to "[12.12.1 Specifications](#)."

##### Inspect the Frame and the Vehicle Body Positioning

If the frame can not be correctly installed to the vehicle body, the frame and body positioning is incorrect. Confirm the correct positioning before carry out the body frame replacement.

## 12.6.4 Removal and Installation

### 12.6.4.1 Frame Repair

Check for the possible damage to the frame by the following.

- Check if the frame can be correctly installed to the vehicle body.
- Check if the steering arms have the right geometric relationship.
- Check the wheels alignment.

If there is any form of damage to the frame, replace the frame.  
Do not attempt to repair the frame.

### 12.6.4.2 Subframe Replacement

Removal Procedure:

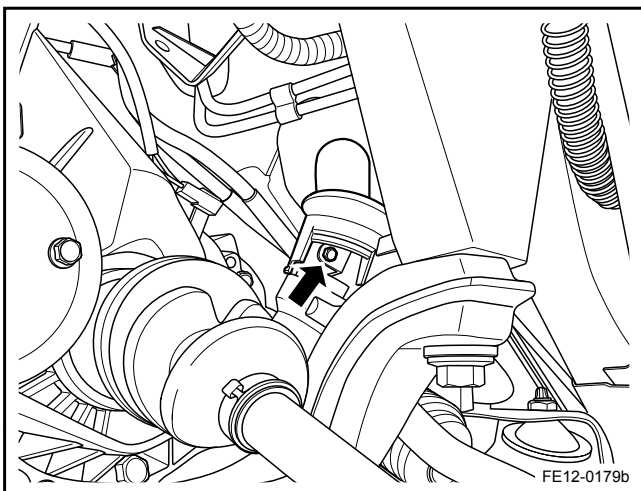
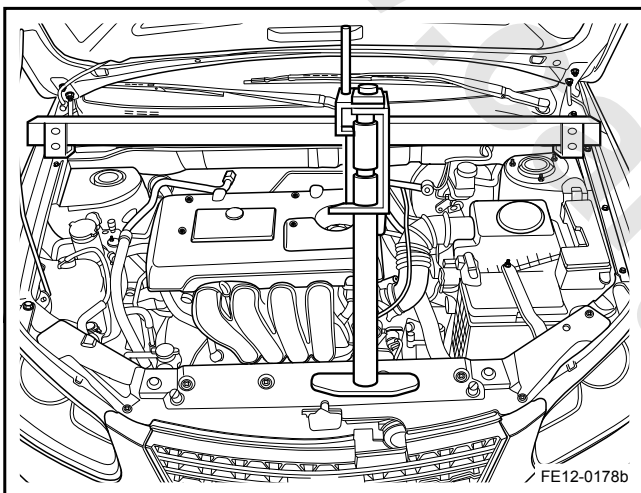
**Warning!**

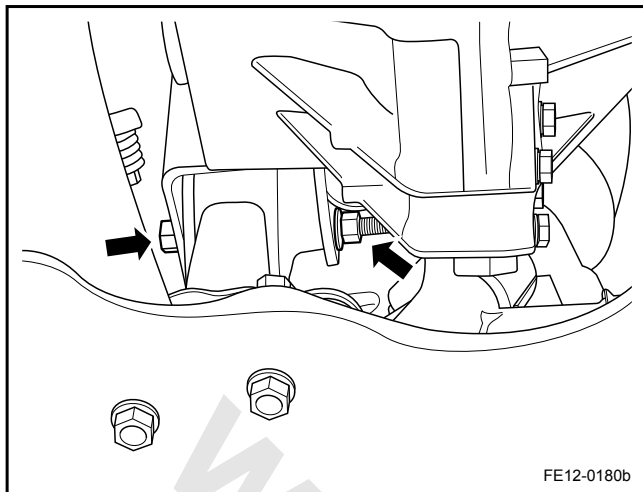
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the front wheels. Refer to [4.4.5.1 Wheel Replacement](#).
3. Use a suitable tool to raise and support the engine.
4. Raise and support the vehicle. Refer to [1.3.1.1 Lifting and Jacking the Vehicle](#).
5. Remove the steering column. Refer to [7.3.6.4 Mechanical Steering Column Assembly Replacement](#).

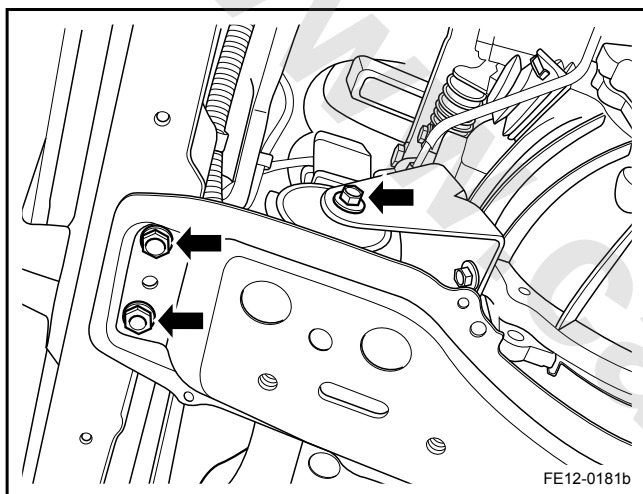
**Note**

Before removing the steering column universal joints, make sure straighten and lock the steering wheel.

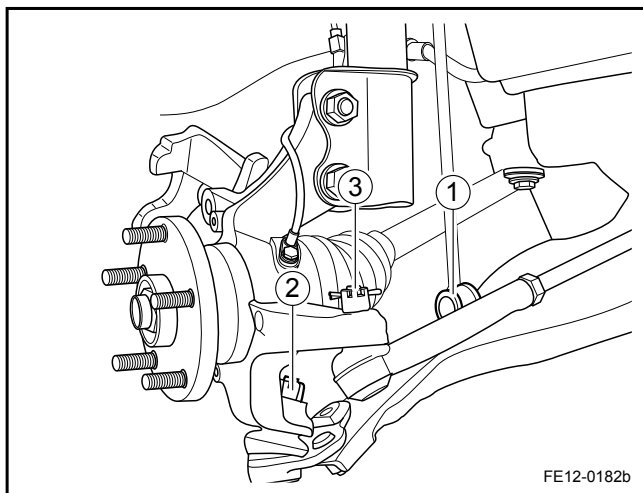




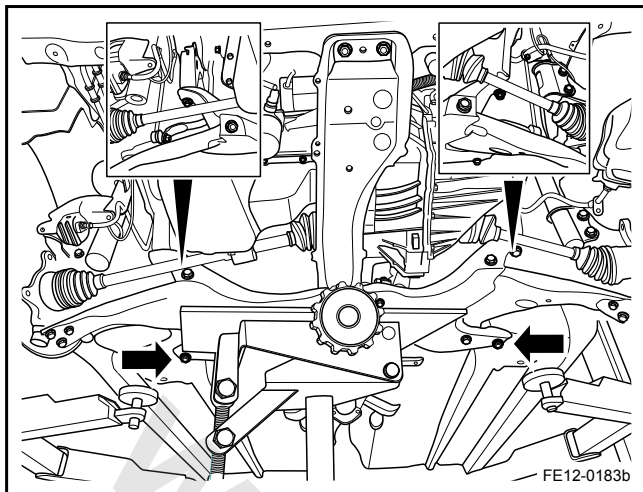
6. Disconnect the power steering gear inlet pipe/outlet pipe. Refer to [7.2.8.6 Power Steering Outlet Pipe Replacement](#).
7. Remove the cross member retaining bolts.



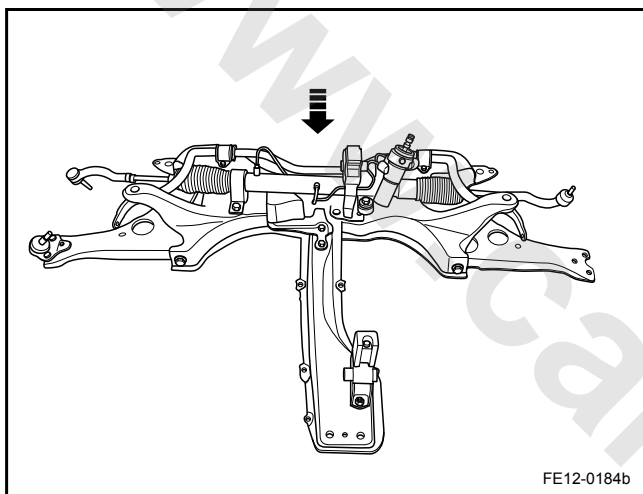
8. Remove the engine rear support retaining bolt and cross member retaining bolts.



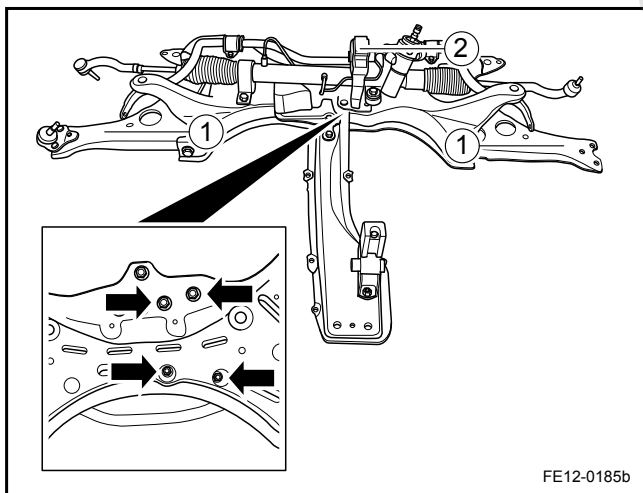
9. Remove the stabilizer shaft link to stabilizer bar retaining nut (1). Refer to [4.2.7.6 Stabilizer Bar Link Replacement](#).
10. Remove the lower control arm to steering knuckle retaining bolt (2). Refer to [4.2.7.7 Lower Control Arm Ball Joint Replacement](#).
11. Remove the steering linkage outer tie rod end to steering knuckle retaining nut (4). Refer to [7.2.8.11 Steering Bar and Ball Joint Replacement](#).



12. Jack and support the vehicle subframe.
13. Remove the subframe retaining bolts.



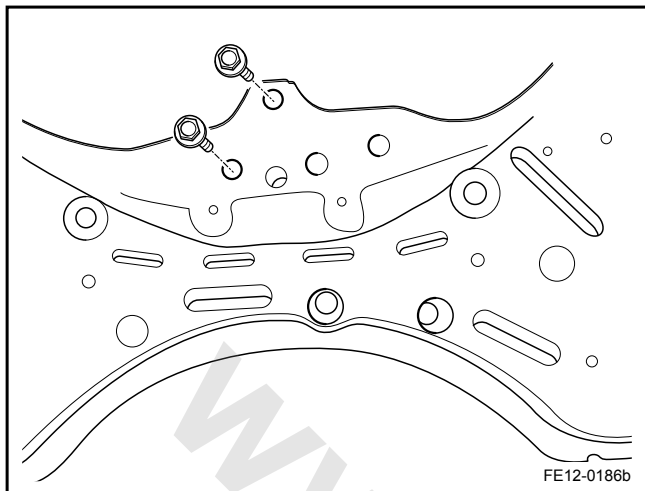
14. Remove the subframe together with the steering assembly, the stabilizer bar, the front lower control arms, the engine rear insulator pad and the engine rear insulator.



15. Remove the front lower control arms (1).
16. Remove the rear engine insulator (2).
17. Remove the steering assembly. Refer to [7.2.8.13 Power Steering Gear Assembly Replacement](#).
18. Remove the stabilizer bar. Refer to [4.2.7.5 Stabilizer Bar Replacement](#).
19. Remove the cross member. Refer to [12.6.4.3 Cross Member Replacement](#).

## Installation Procedure:

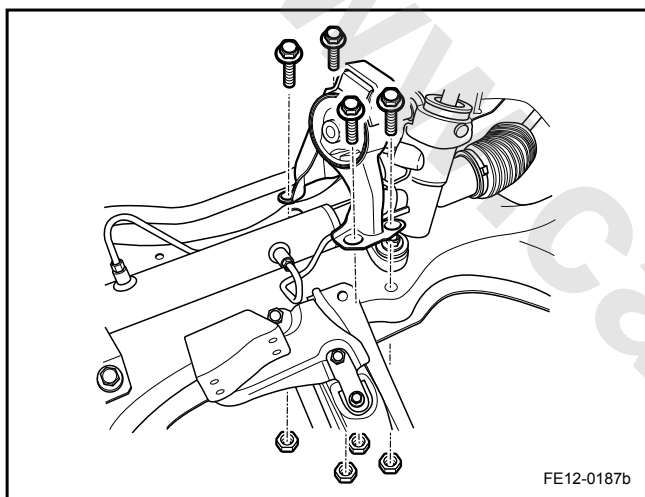
1. Install the cross member to the subframe. Do not tighten the engine rear insulator bolts at this stage.



2. Install the stabilizer bar.
3. Install the steering assembly.
4. Install the engine rear isolator bracket and tighten the retaining nuts and bolts. Tighten the engine rear insulator retaining bolts.

Torque: 75 Nm (Metric) 55.5lbf-ft (US English)

5. Install the front lower control arms.

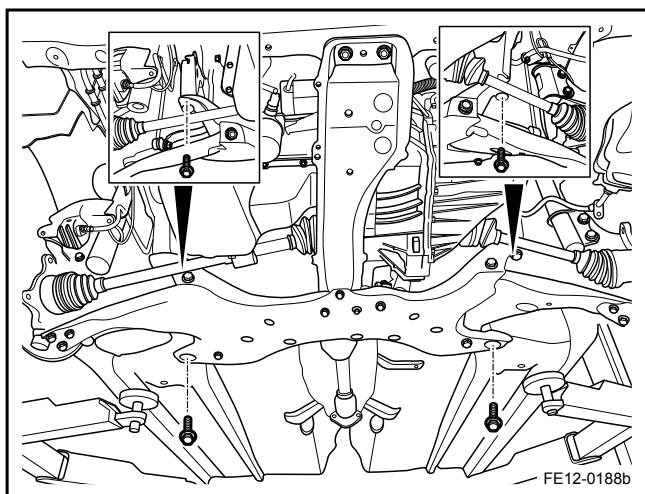


6. Using a jack, raise and support the subframe together with the steering assembly, the stabilizer bar, the front lower control arms, the engine rear insulator bracket and the engine rear insulator.

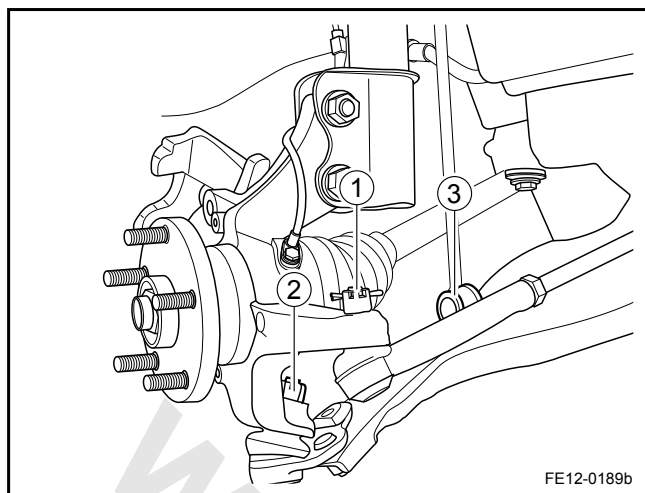
7. Install the subframe retaining bolts.

Torque: 180 Nm (Metric) 133.2 lb-ft (US English)

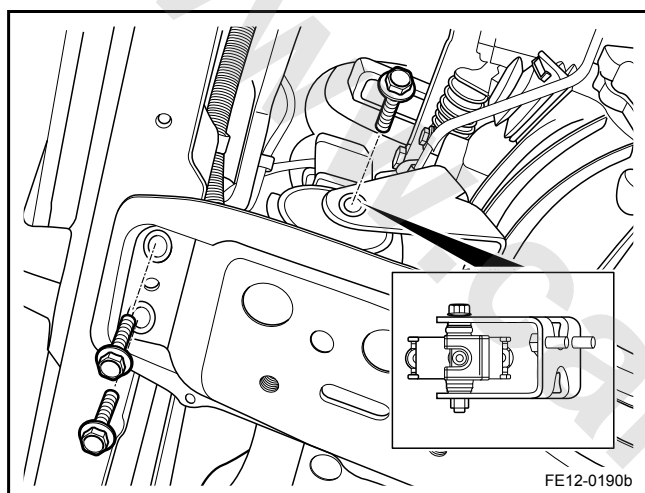
8. Remove the jack.







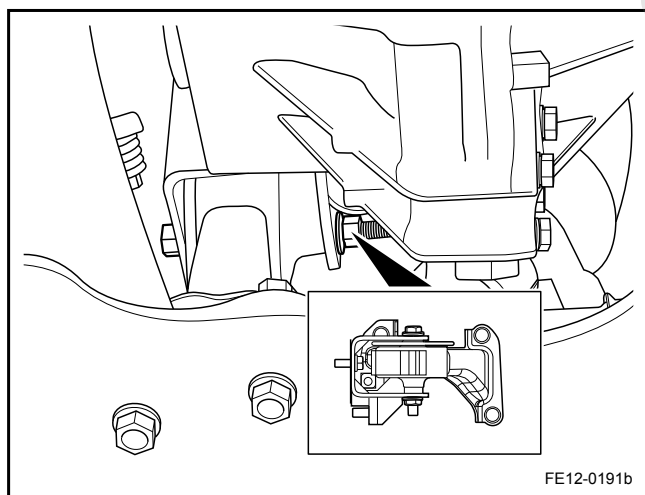
9. Install the steering linkage outer tie rod end to steering knuckle retaining nut (1).
10. Install the lower control arm to steering knuckle retaining bolt (2).
11. Install the stabilizer shaft link to stabilizer bar retaining nut (3).



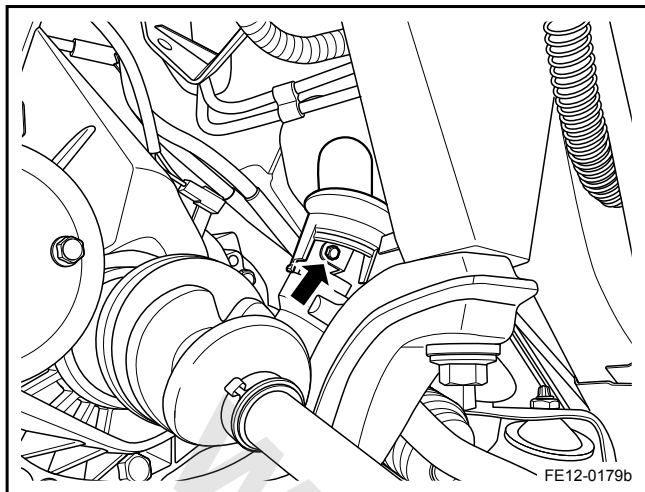
12. Install the engine front insulator bracket retaining bolts and cross member front retaining bolts.

The engine front insulator bracket bolts Torque: 61 Nm (Metric) 45.1 lb-ft (US English)

The cross member front retaining bolts Torque: 75 Nm (Metric) 55.5 lb-ft (US English)



13. Install the engine rear insulator bracket retaining bolts  
Torque: 84 Nm (Metric) 62.2 lb-ft (US English)

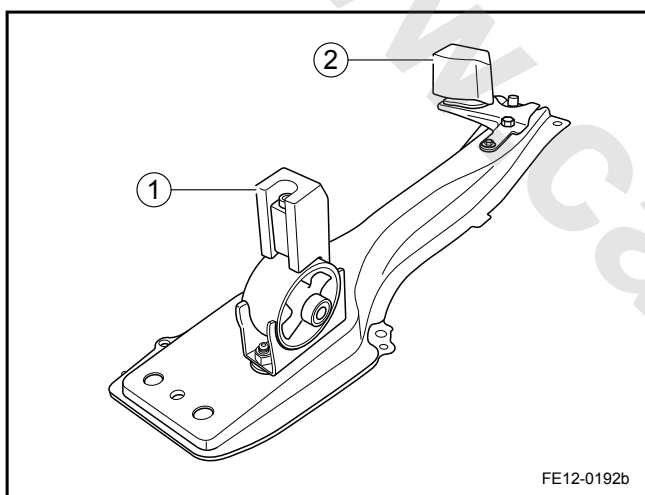


14. Connect the power steering gear inlet pipe/outlet pipe.
15. Install the steering column universal joints
16. Lower the vehicle.
17. Remove the special tool.
18. Install the front wheels.

### 12.6.4.3 Cross Member Replacement

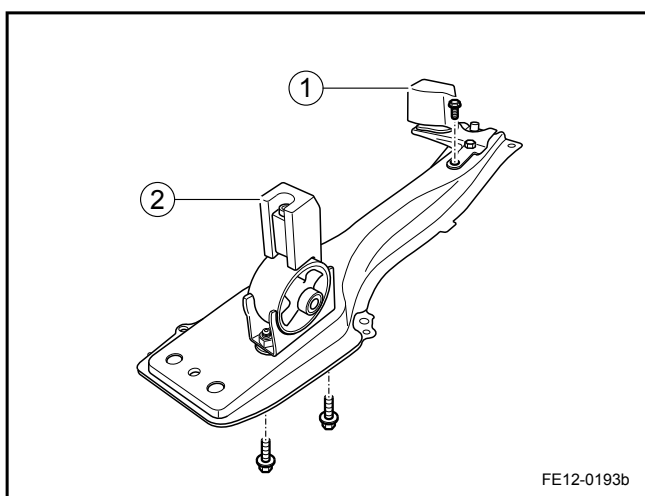
#### Removal Procedure:

1. Remove the subframe. Refer to [12.6.4.2 Subframe Replacement](#).
2. Remove the cross member from the subframe.
3. Remove the engine front insulator (1) from the cross member.
4. Remove the engine rear insulator (2) from the cross member.



#### Installation Procedure:

1. Install the engine rear insulator (2) to the cross member.
2. Install the engine front insulator (1) to the cross member.
3. Install the cross member the subframe.
4. Install the subframe.



## 12.7 Seats

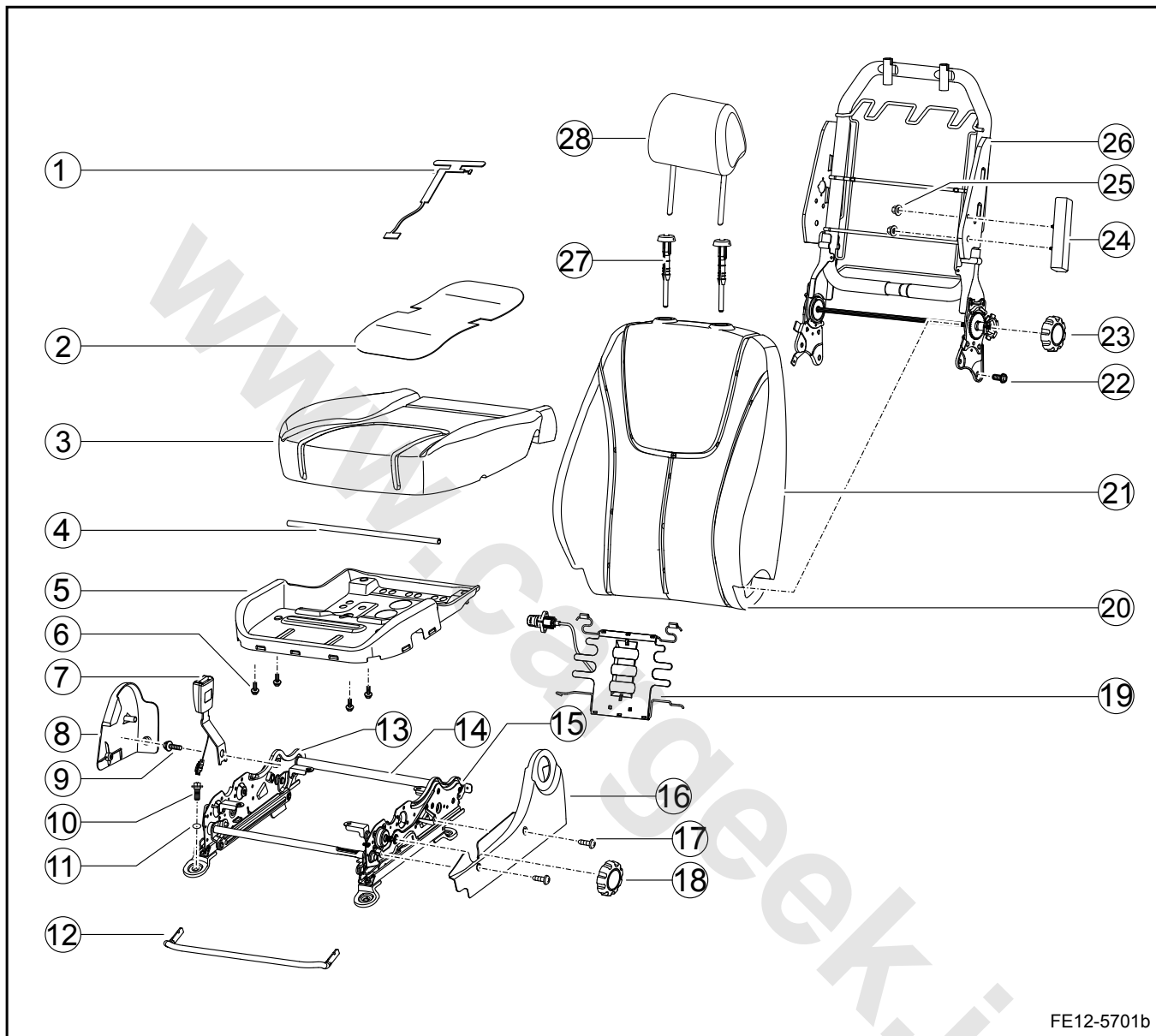
### 12.7.1 Specifications

#### 12.7.1.1 Fastener Tightening Specifications

Application	Model	Specification	
		Metric (Nm)	US English (lb-ft)
Rear Seat Back to Body Retaining Bolts	M8 × 20	20-25	14.8-18.4
Rear Seat Back to Seat Bases Retaining Bolts	M10 × 22	25-35	18.4-25.8
Rear Seat Armrest Retaining Bolts	M6 × 14	9-13	6.7-9.6

## 12.7.2 Disassemble View

## 12.7.2.1 Disassemble View



## Legend

- |   |   |
|---|---|
| 1. Passenger Recognition Sensor                     | 12. Front Seat Adjuster Rod                             |
| 2. Heater   | 13. Front Seat Inner Rail                               |
| 3. Front Seat Cushion Pad                           | 14. Four-way Manual Adjuster                            |
| 4. Front Seat Adjuster Rod                          | 15. Front Seat Outer Rail                               |
| 5. Front Seat Cushion Pad Frame                     | 16. Front Seat Cushion Outer Trim Panel                 |
| 6. Front Seat Cushion Pad Frame Retaining Bolts     | 17. Front Seat Cushion Outer Trim Panel Retaining Screw |
| 7. Seat Belt Buckle and Pretensioner                | 18. Recliner Adjusting Knob                             |
| 8. Front Seat Cushion Inner Trim Panel              | 19. Heater  |
| 9. Seat Belt Buckle and Pretensioner Retaining Bolt | 20. Seat Back Cushion Assembly                          |
| 10. Bolt  | 21. Seat Back Cushion Assembly                          |
| 11. Washer  | 22. Seat Back to Body Retaining Bolt                    |

23. Lumbar Support Knob

24. Side Airbag

25. Side Airbag Retaining Nut

26. Seat Back and Adjuster Assembly

27. Head Restraint Guide

28. Head Restraint

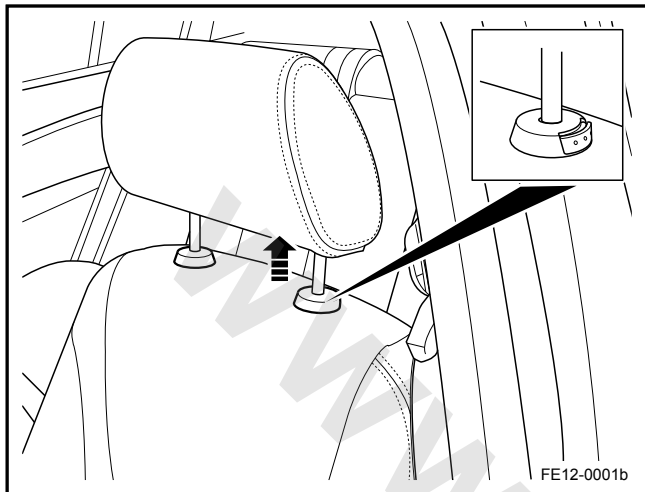
[www.cargeek.ir](http://www.cargeek.ir)

### 12.7.3 Removal and Installation

#### 12.7.3.1 Front Seat Head Restraint Replacement

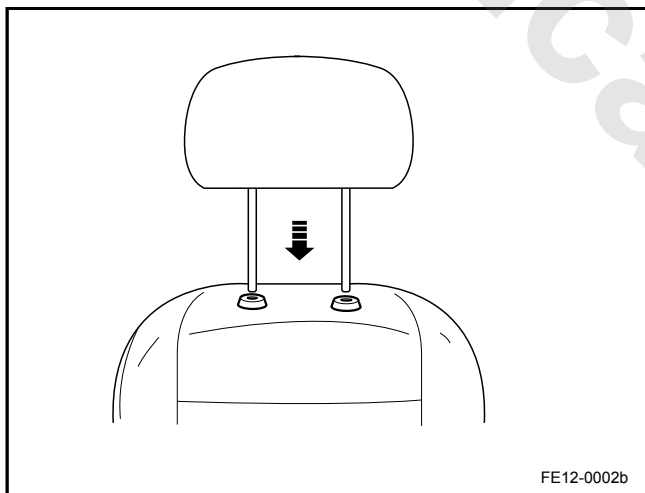
##### Removal Procedure:

1. Depress the head restraint height adjuster button and remove the head restraint.



##### Installation Procedure:

1. Install the head restraint by pushing it into the head restraint guides



#### 12.7.3.2 Front Seat Replacement

Refer to [11.11.8.1 Front Electric Seat Replacement](#).

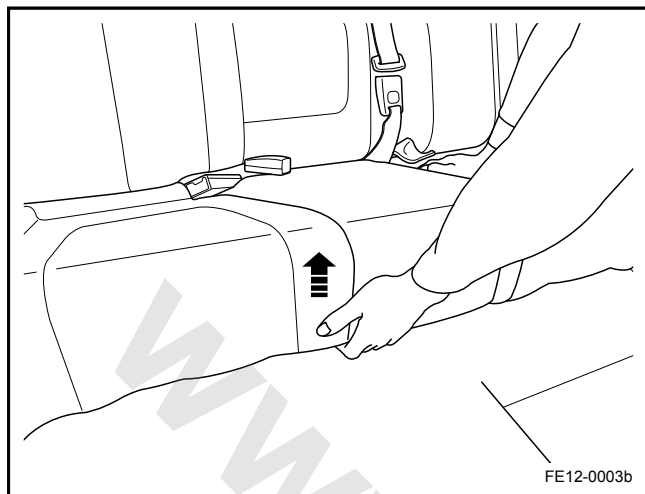
#### 12.7.3.3 Rear Seat Head Restraint Replacement

The rear head restraint replacement is similar to that of the front seat. Refer to [12.7.3.1 Front Seat Head Restraint Replacement](#).

### 12.7.3.4 Rear Seat Cushion Replacement

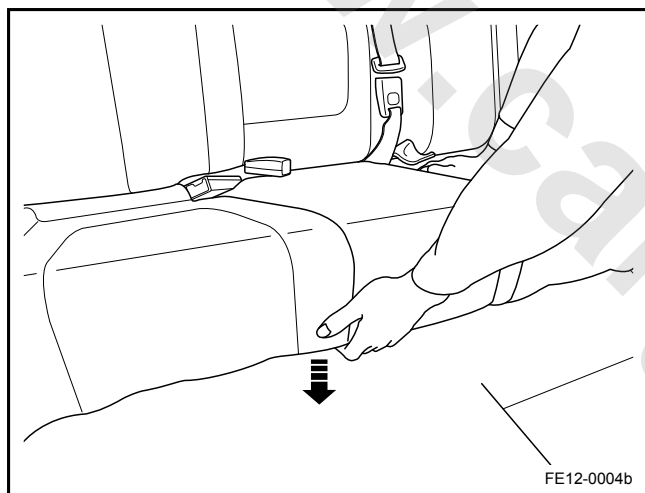
#### Removal Procedure:

1. Lift the rear seat cushion by grasping the base in the area of the rear seat cushion to body retainers and remove the rear seat cushion from the floor.



#### Installation Procedure:

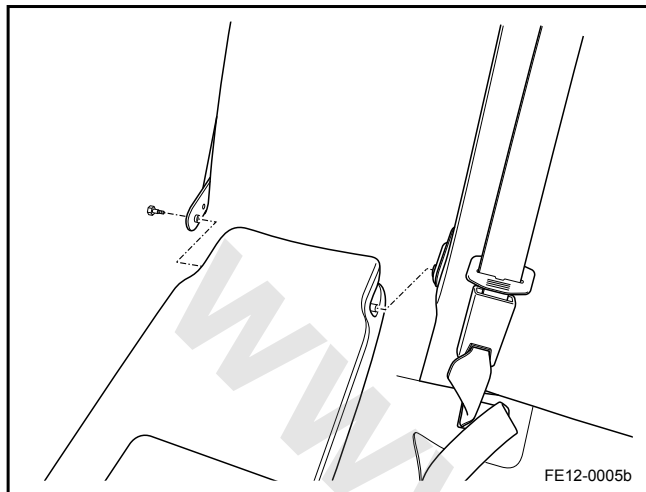
1. Install the rear seat cushion to the floor.



### 12.7.3.5 Rear Seat center Armrest Replacement

#### Removal Procedure:

1. Pull down the rear seat back.
2. Remove the rear seat center armrest retaining bolts and remove the rear seat center armrest.



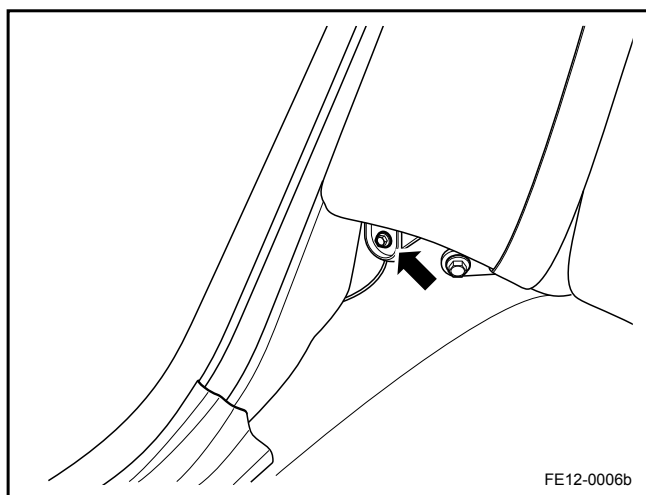
#### Installation Procedure:

1. Install and tighten the rear seat center armrest retaining bolts  
Torque: 15 Nm (Metric) 11 lb-ft (US English)
2. Pull the rear seat back to the upright position.

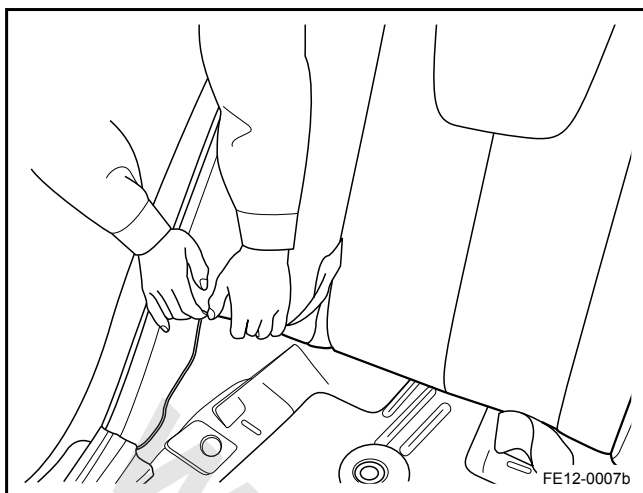
### 12.7.3.6 Rear Seat Armrest Assembly Replacement

#### Removal Procedure:

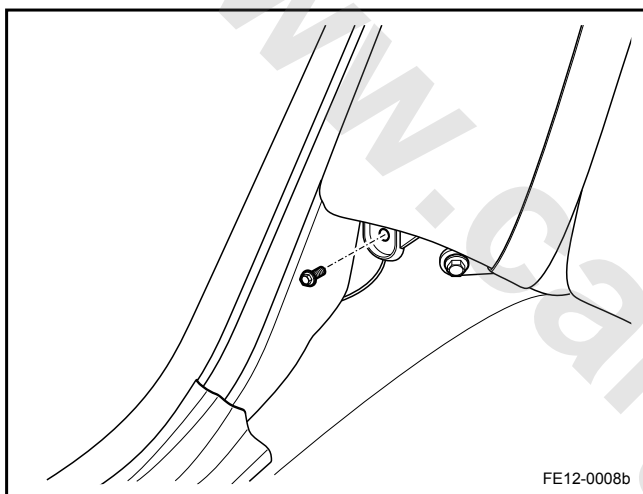
1. Remove the rear seat cushion. Refer to [12.7.3.4 Rear Seat Cushion Replacement](#).
2. Remove the rear seat right side armrest retaining bolts.







3. Lift the right side armrest and remove the armrest.



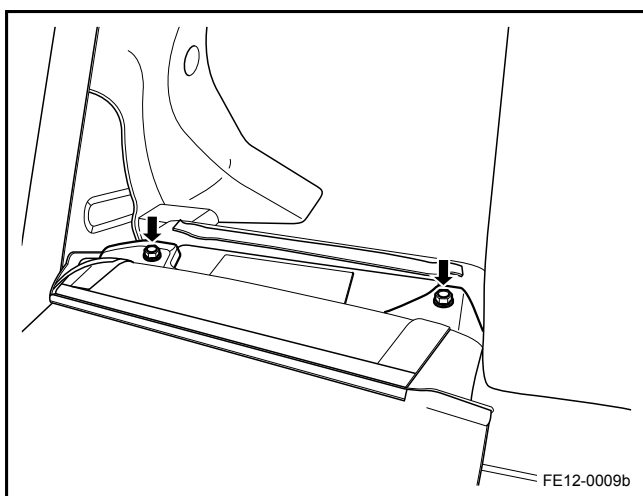
#### Installation Procedure:

1. Install the rear seat right side armrest retaining bolts.  
Torque: 13 Nm (Metric) 9.6 lb-ft (US English)
2. Install the rear seat cushion.

### 12.7.3.7 Rear Seat Back Replacement

#### Removal Procedure:

1. Fold down the right side rear seat back.
2. Remove the right side rear seat back retaining bolts.



Installation Procedure:

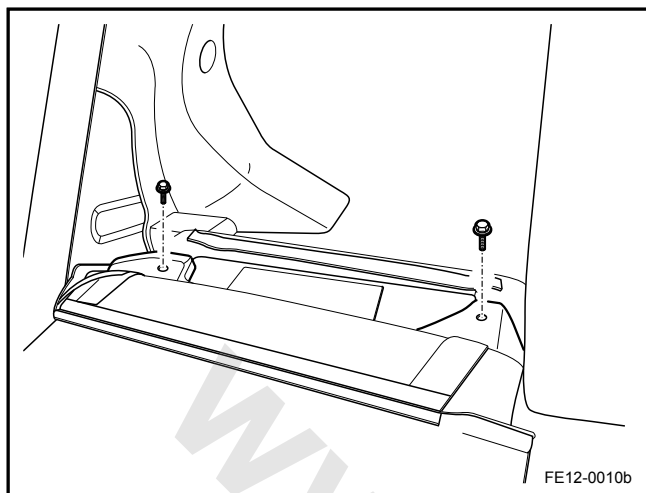
1. Install and tighten the right side rear seat back retaining bolts.

Torque: 27 Nm (Metric) 19.9 lb-ft (US English)

2. Pull the right side rear seat back to the upright position.

**Note**

For the left side rear seat back replacement, please refer to the above procedure.



## 12.8 Instrument Panel, Gages and Console

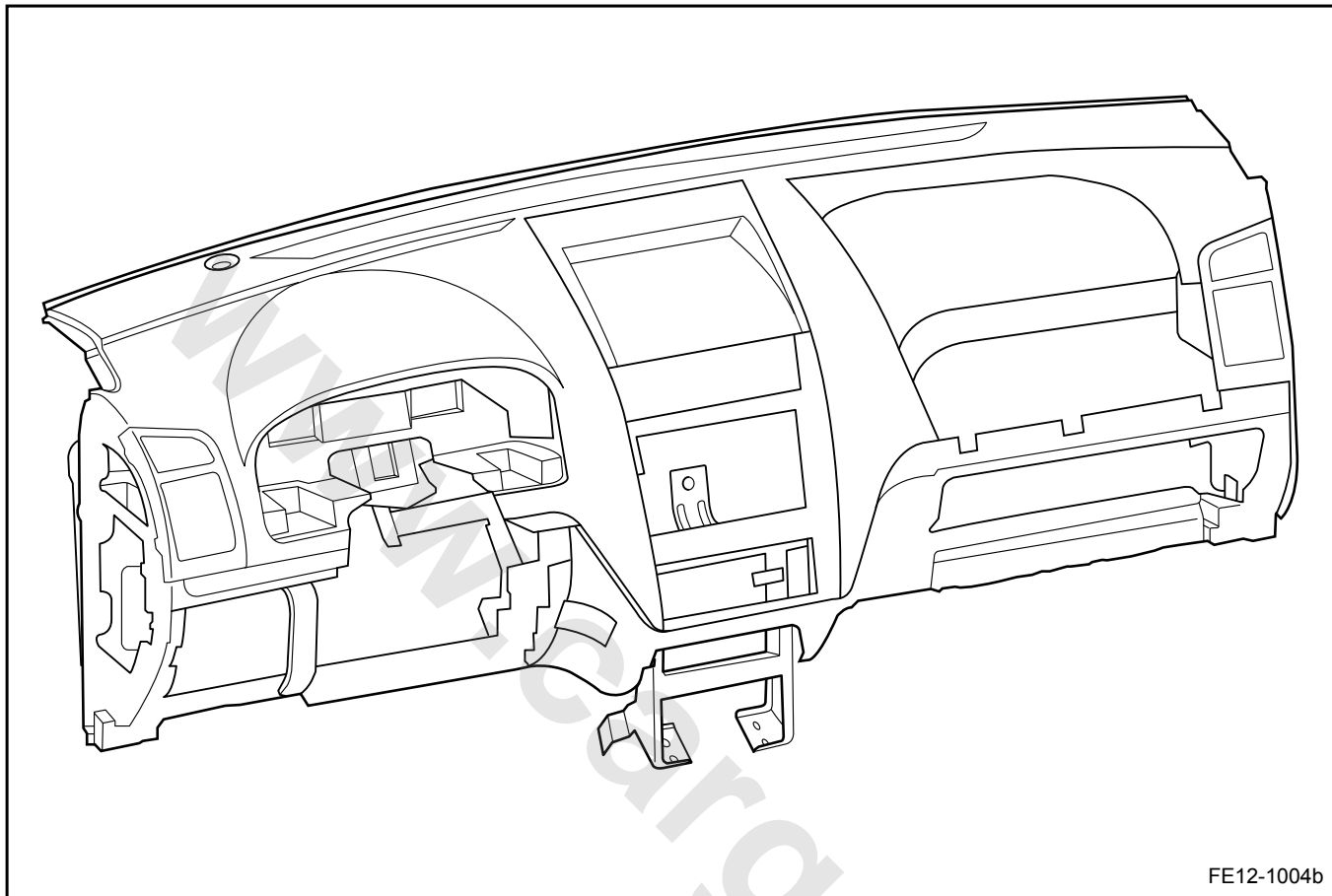
### 12.8.1 Specifications

#### 12.8.1.1 Fastener Tightening Specifications

Application	Model	Specification	
		Metric (Nm)	US English (lb-ft)
Instrument Panel Left Mounting Bracket Retaining Bolts	M8 × 30	23-30	17.0-22.2
Instrument Panel Right Mounting Bracket Retaining Bolts	M8 × 30	23-30	17.0-22.2
Instrument Panel Lower Right Mounting Bracket Retaining Bolts	M6 × 20	9-13	6.7-9.6
I/P Retainer Bolt	M8 × 16	21	15.5
I/P Retainer Nut	M8	21	15.5

## 12.8.2 Component Locator

### 12.8.2.1 Component Views



### 12.8.3 Removal and Installation

#### 12.8.3.1 Instrument Panel Replacement

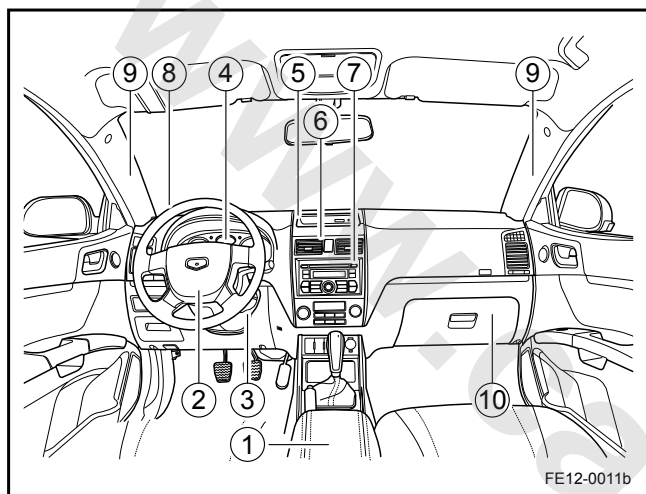
Removal Procedure:

Warning!

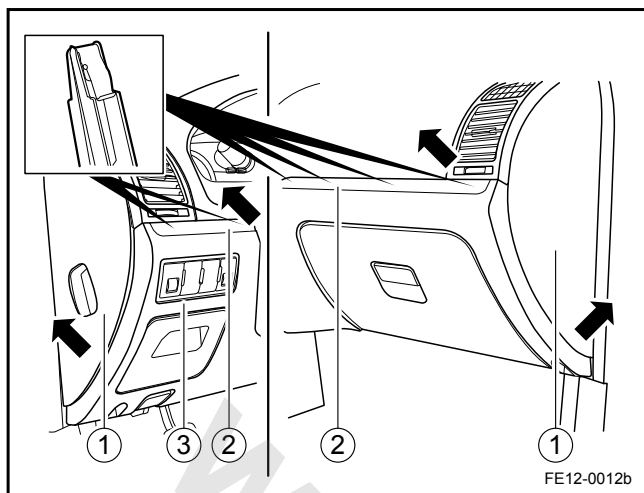
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

Note

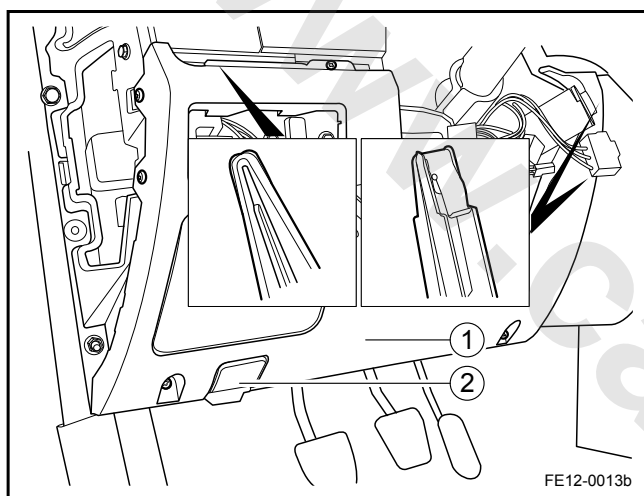
Please use special tools to remove interior panels, otherwise panels will be easily scratched.



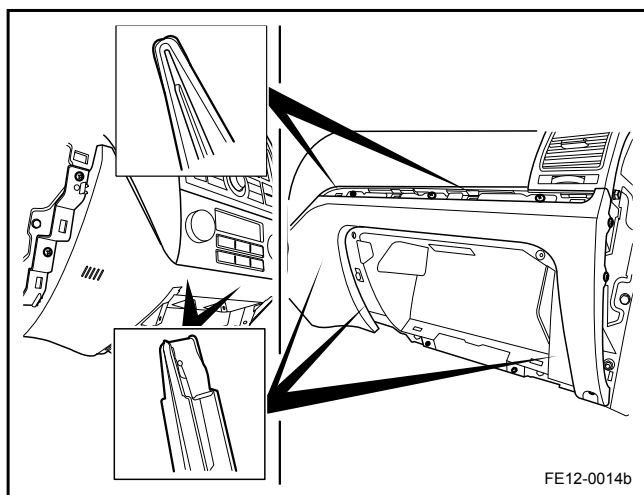
1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the center console cup holder (1). Refer to [3.3.8.9 Shift Lever Replacement](#).
3. Remove the steering wheel (2). Refer to [7.3.6.3 Steering Wheel Replacement](#).
4. Remove the headlamp switch cover (3). Refer to [11.4.8.1 Headlamp Switch Replacement](#).
5. Remove the instrument cluster trim panel (4). Refer to [11.7.7.1 Instrument Cluster Replacement](#).
6. Remove the multi-function clock (5). Refer to [11.15.8.1 Instrument Cluster Replacement](#).
7. Remove the instrument panel center air outlet deflector (6). Refer to [8.2.8.11 Instrument Panel Air Duct Replacement](#).
8. Remove the radio control assembly (7). Refer to [11.2.7.5 Radio Control Replacement](#).
9. Remove the ambient light sensor (8). Refer to [11.4.8.20 Ambient and Sun Light Sensor Replacement](#).
10. Remove the windshield garnish molding (9). Refer to [12.9.1.3 Windshield Garnish Molding Replacement](#).
11. Remove the glove box (10). Refer to [12.8.3.2 Glove Box Replacement](#).



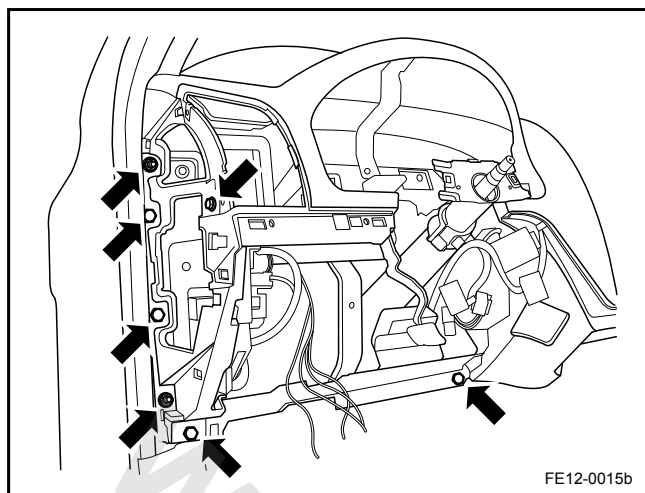
12. Remove the instrument panel outer trim covers (1) and the instrument panel trim panels (2).



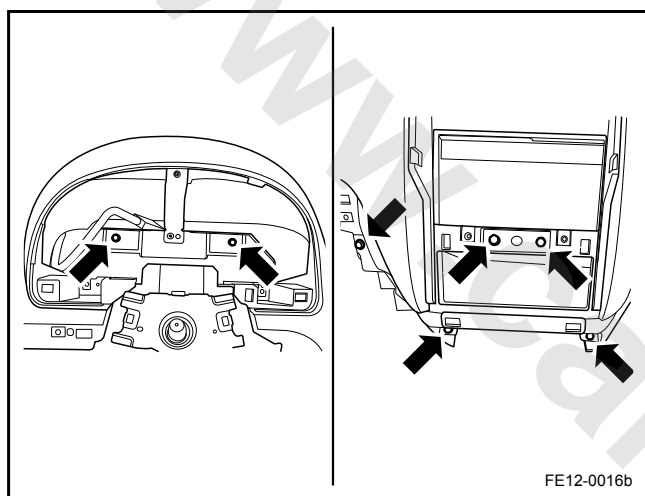
13. Remove the instrument panel lower left trim retaining screws and pull out the instrument panel lower left trim (1) (with clips). Disconnect the headlamp height adjust switch harness connector. Remove the hood release handle (2).



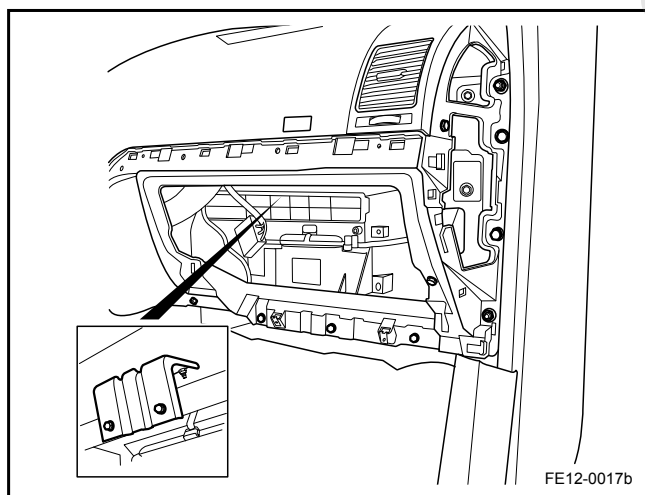
14. Remove the instrument panel lower right trim retaining screws, pull out the instrument panel lower right trim (with clips) and disconnect the harness connector on the back.



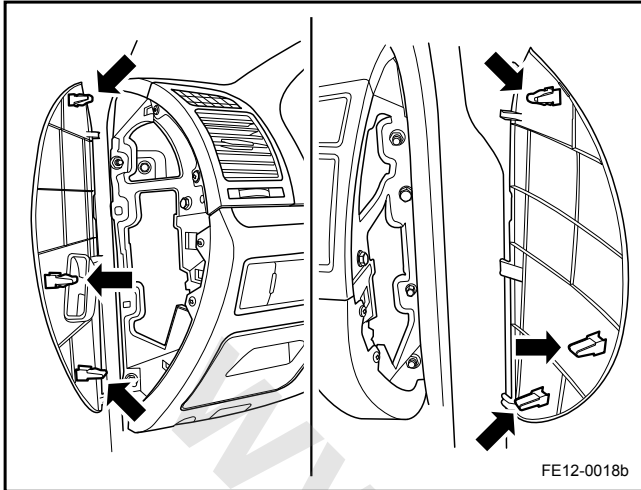
15. Remove the instrument panel left side retaining bolts.



16. Remove the instrument panel center retaining bolts.



17. Remove the instrument panel right side retaining bolts.
18. Disconnect the passenger airbag harness connector from the back of the instrument panel. Remove the passenger airbag. Refer to [9.2.7.4 Passenger Front Airbag Replacement](#).
19. Remove the instrument panel.
20. Remove the instrument panel outer air outlet upper duct. Refer to [8.2.8.12 Air-conditioning Ventilation Pipe Replacement](#).



## Installation Procedure:

1. Install the instrument panel outer air outlet upper duct and the passenger airbag to the instrument panel.
2. Install the instrument panel.
3. Connect the passenger airbag harness connector.
4. Install the instrument panel right, center and left retaining bolts.

Torque: 7 Nm (Metric) 5.1 lb-ft (US English)

5. Connect the instrument panel lower right trim harness connector on the back, install and tighten the instrument panel lower right trim retaining screws.

Torque: 4 Nm (Metric) 2.9 lb-ft (US English)

Torque: 6 Nm (Metric) 4.4 lb-ft (US English)

6. Install the hood release handle. Install and tighten the instrument panel lower left trim retaining screws. Connect the headlamp height adjust switch harness connector and install the headlamp height adjust switch cover.

Torque: 4 Nm (Metric) 2.9 lb-ft (US English)

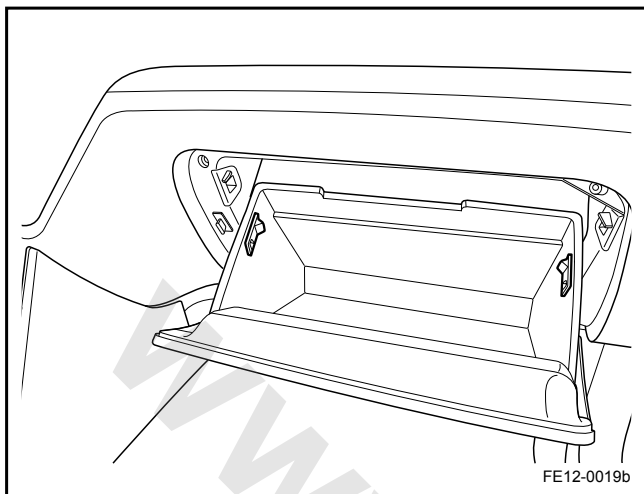
7. Install the instrument panel trim panels.
8. Install the glove box.
9. Install the instrument panel outer trim covers.
10. Install the ambient light sensor.
11. Install the radio control assembly.
12. Install the instrument panel center air outlet deflector.
13. Install the multi-function clock.
14. Install the instrument cluster trim panel.
15. Install the headlamp switch cover.
16. Install the steering wheel.
17. Install the center console cup holder.



### 12.8.3.2 Glove Box Replacement

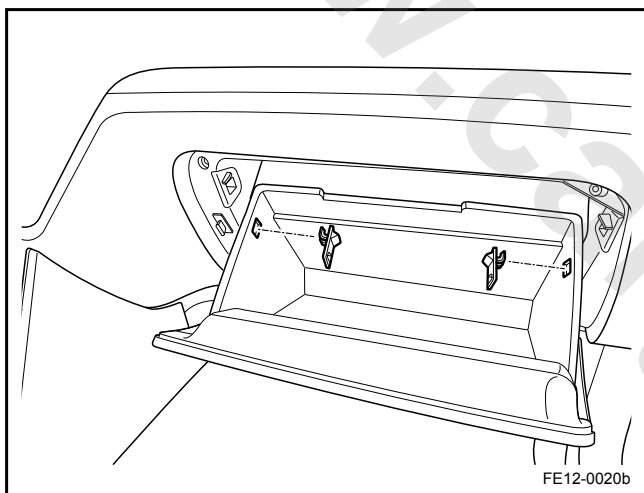
#### Removal Procedure:

1. Remove the glove box clips on both sides.
2. Remove the glove box.



#### Installation Procedure:

1. Install the glove box.
2. Install the glove box clips on both sides.



### 12.8.3.3 Instrument Panel Carrier Replacement

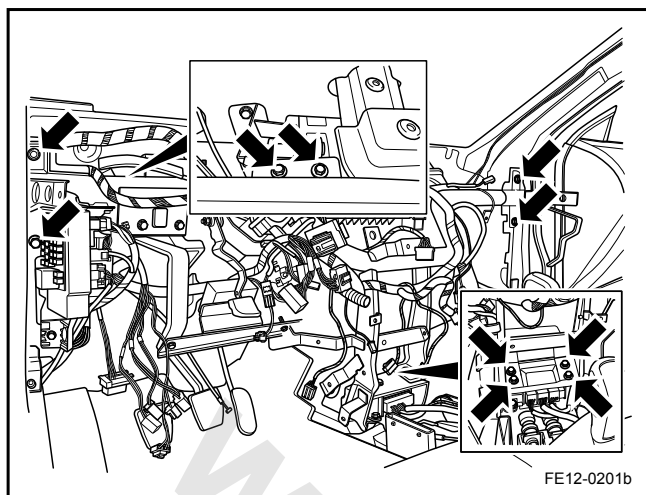
#### Removal Procedure:

#### Warning!

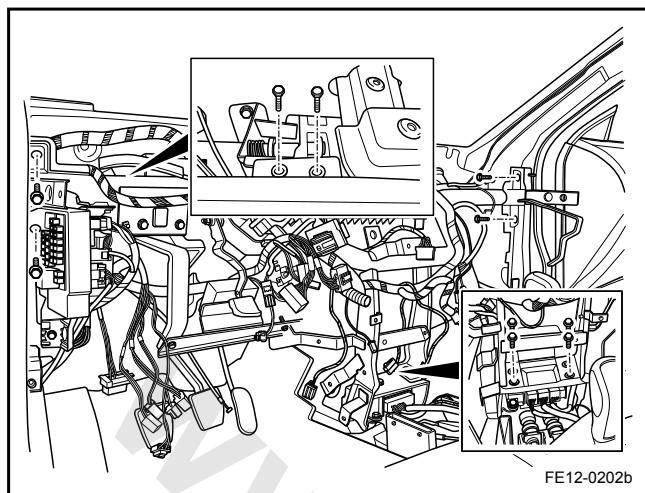
Refer to "Battery Disconnect Warning" in "Warnings and Notices".

#### Note

Please use special tools to remove interior panels, otherwise panels will be easily scratched.



1. Disconnect the negative battery cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the center console cup holder. Refer to [3.3.8.9 Shift Lever Replacement](#).
3. Remove the steering wheel. Refer to [7.3.6.3 Steering Wheel Replacement](#).
4. Remove the headlamp switch covers. Refer to [11.4.8.1 Headlamp Switch Replacement](#).
5. Remove the instrument cluster trim panel. Refer to [11.7.7.1 Instrument Cluster Replacement](#).
6. Remove the multi-function clock. Refer to [11.15.8.1 Instrument Cluster Replacement](#).
7. Remove the instrument panel center air outlet deflector. Refer to [8.2.8.11 Instrument Panel Air Duct Replacement](#).
8. Remove the radio control assembly. Refer to [11.2.7.5 Radio Control Replacement](#).
9. Remove the ambient light sensor. Refer to [11.4.8.20 Ambient and Sun Light Sensor Replacement](#).
10. Remove the instrument panel outer trim covers. Refer to [12.9.1.3 Windshield Garnish Molding Replacement](#).
11. Remove the glove box. Refer to [12.8.3.2 Glove Box Replacement](#).
12. Remove the instrument panel. Refer to [12.8.3.1 Instrument Panel Replacement](#).
13. Remove the steering wheel column. Refer to [7.3.6.4 Mechanical Steering Column Assembly Replacement](#).
14. Remove the instrument panel wiring harness retaining bolts and clips.
15. Remove the instrument panel carrier retaining bolts.
16. Remove the instrument panel carrier.



## Installation Procedure:

1. Install the instrument panel carrier.
2. Install and tighten the instrument panel carrier retaining bolts.  
Torque: 21 Nm (Metric) 15.5 lb-ft (US English)
3. Install the instrument panel wiring harness.
4. Install the steering wheel column.
5. Install the instrument panel.
6. Install the glove box.
7. Install the instrument panel outer trim covers.
8. Install the ambient light sensor.
9. Install the radio control assembly.
10. Install the instrument panel center air outlet deflector.
11. Install the multi-function clock.
12. Install the instrument cluster trim panel.
13. Install the headlamp switch covers.
14. Install the steering wheel.
15. Install the center console cup holder.

## 12.9 Interior Trim

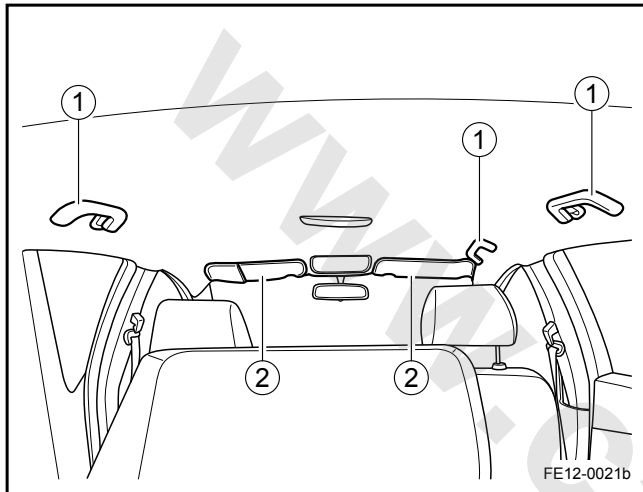
### 12.9.1 Removal and Installation

#### 12.9.1.1 Headliner Replacement

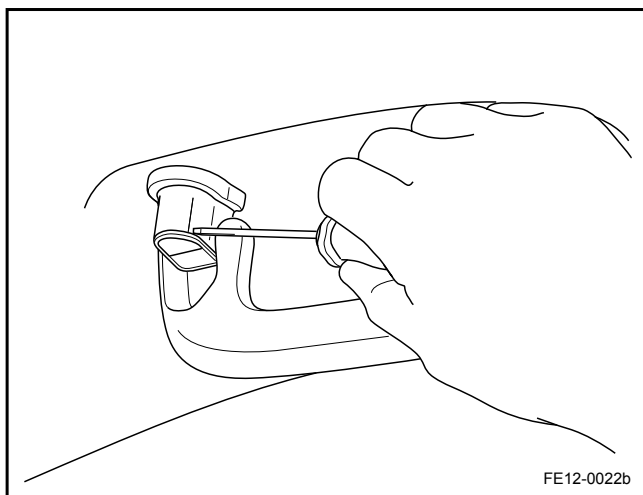
Removal Procedure:

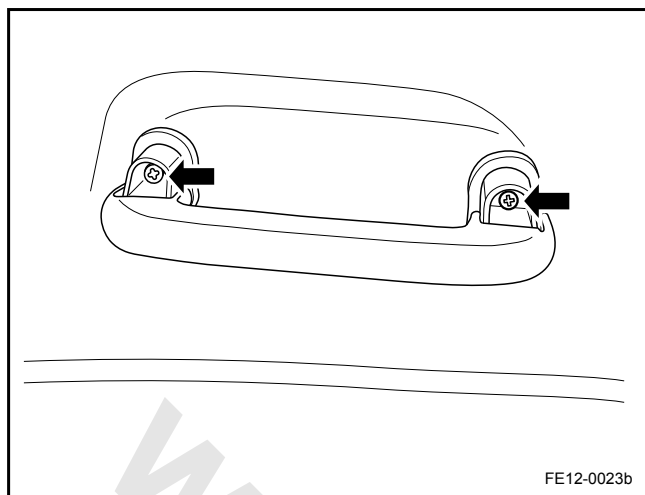
Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

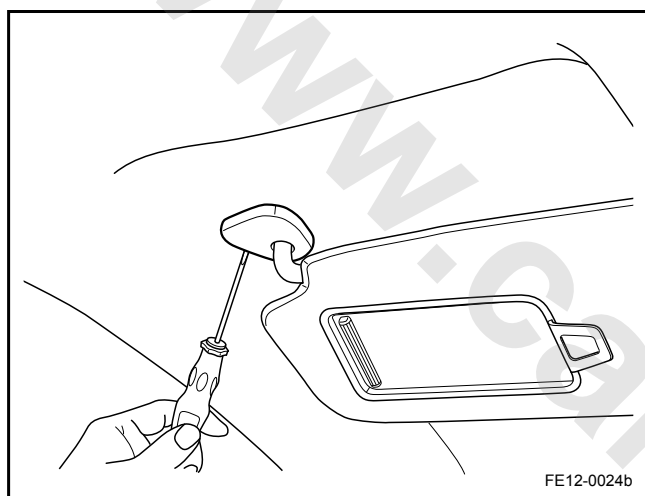


1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the front and rear door sill trim plate. Refer to [12.9.1.2 Left and Right Door Sill Nameplate Replacement](#).
3. Remove the windshield garnish molding. Refer to [12.9.1.3 Windshield Garnish Molding Replacement](#). Remove the center pillar upper trim panel. Refer to [12.9.1.3 Windshield Garnish Molding Replacement](#). Remove the quarter upper trim panel. Refer to [12.9.1.3 Windshield Garnish Molding Replacement](#).
4. Remove the dome lamp. Refer to [11.4.8.4 Dome Lamp and Reading Lamp Replacement](#).
5. Remove the door seal strips. Refer to [12.9.1.16 Vehicle Inner Side Seal Replacement](#).
6. Remove the assist handles and sunshades.
7. Prise open the right front assist handle retaining screw covers.

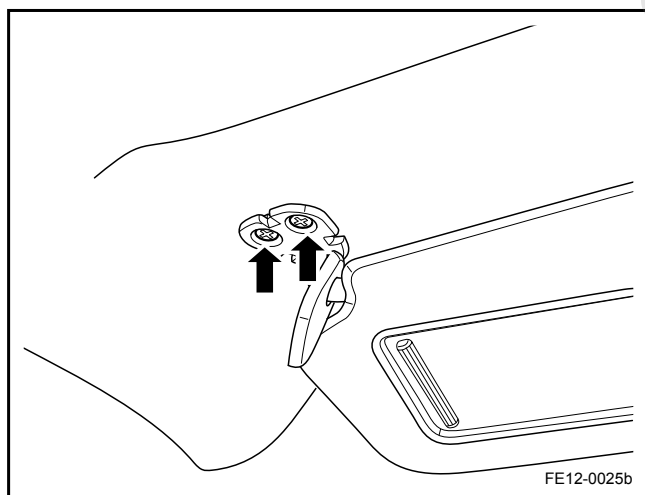




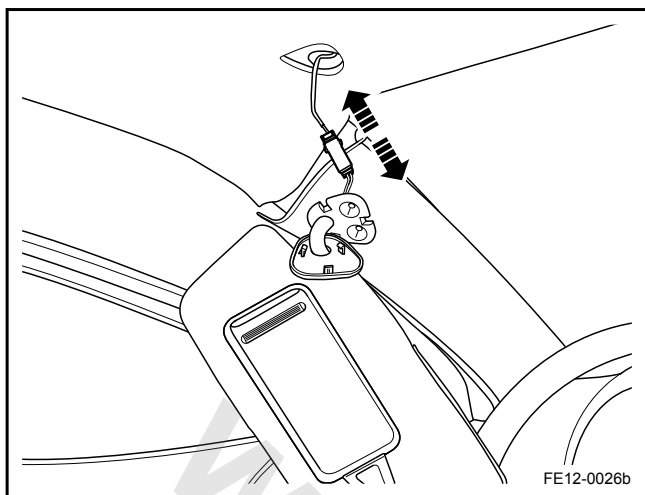
8. Remove the right front assist handle retaining screws. The removal for the left rear and right rear assist handles is the same.



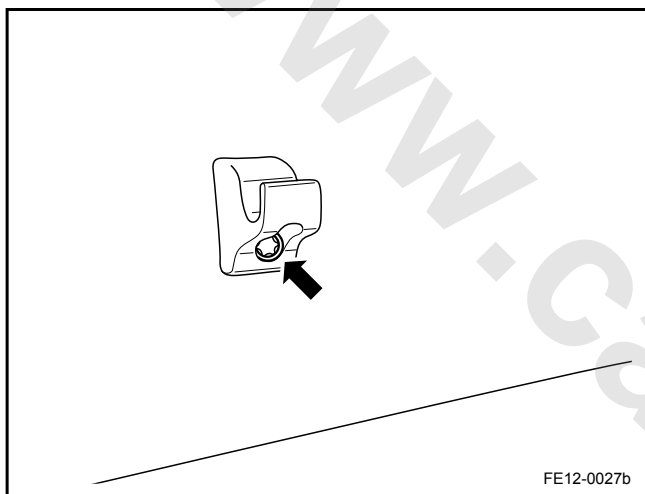
9. Pry open the sunshade retaining screw covers.



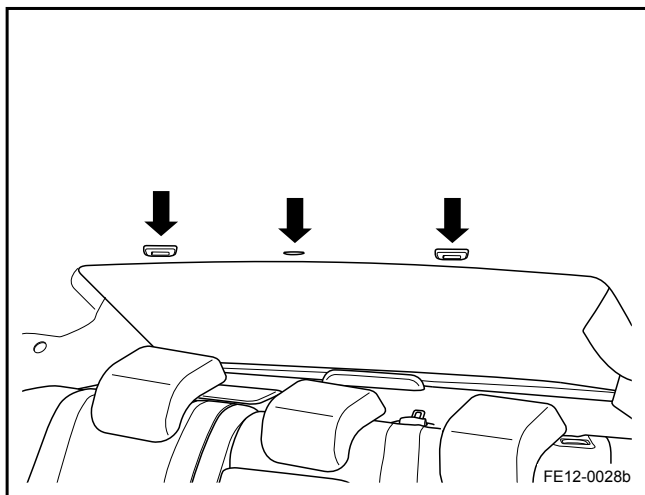
10. Remove the sunshade retaining screws, rotate the sunshade clockwise 90 ° and then remove the sunshade.



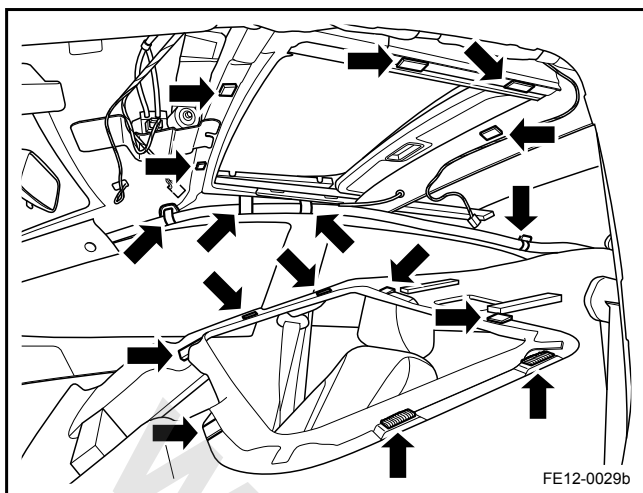
11. Disconnect the left sunshade harness connector.



12. Remove the left sunshade retaining bolt and remove the sunshade hook. The removal of the right sunshade is the same.



13. Remove the headliner rear retaining clips.



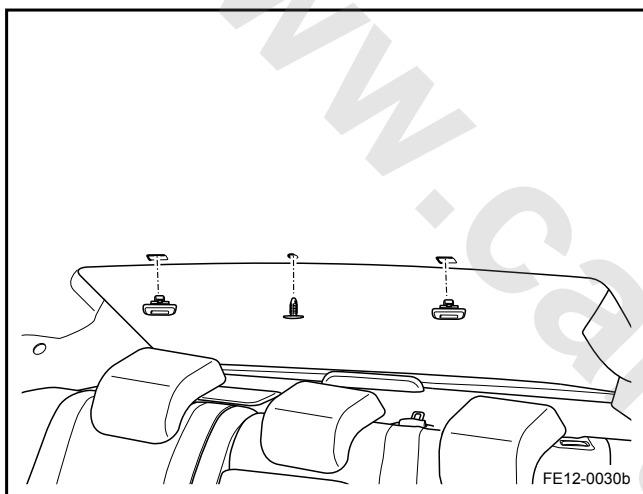
14. Fold down the rear seat and remove the headliner via the trunk.

#### Note

Due to the seal between the headliner and the roof, pull the headliner out at an angle. Do not squeeze or disassemble the headliner. The headliner removal is the same for vehicles with or without sunroof.

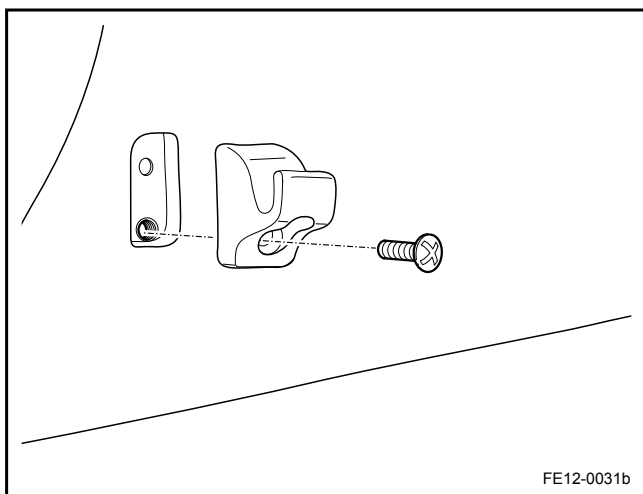
#### Installation Procedure:

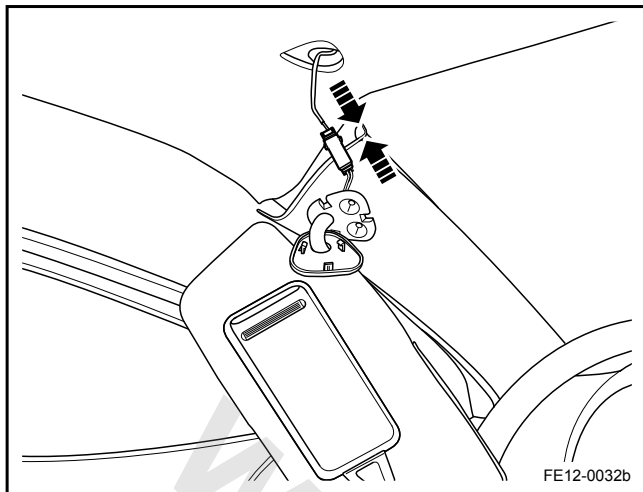
1. Pull the rear seat to the upright position. Place the headliner back into the vehicle via the trunk as per removal.
2. Place the headliner to the roof. Engage the headliner rear retaining clips.



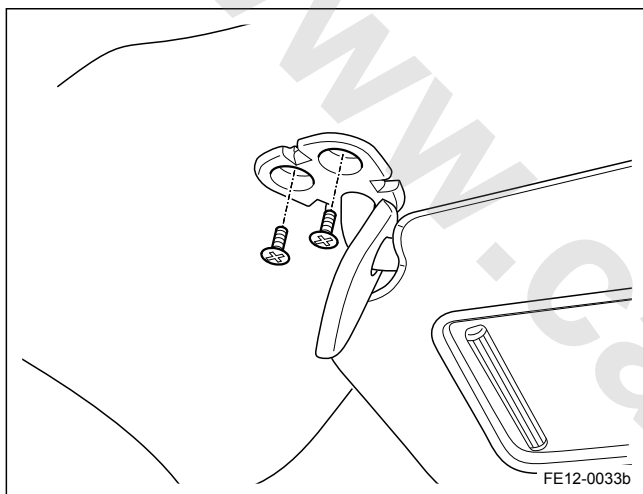
3. Install the sunshade hook.

Torque: 5 Nm (Metric) 3.7 lb-ft (US English)



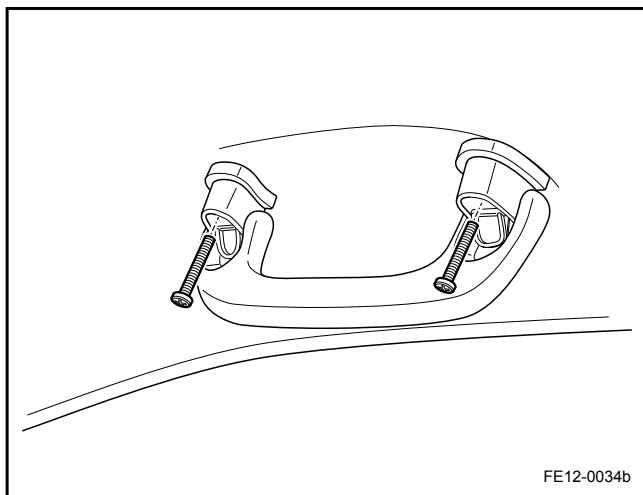


4. Connect the left sunshade harness connector and run the harness through the sunshade hook.



5. Install and tighten the left sunshade retaining bolt. The right sunshade installation is the same.

Torque: 5 Nm (Metric) 3.7 lb-ft (US English)



6. Install the right front assist handle retaining screws. The left rear and right rear assist handle installations are the same.

Torque: 5 Nm (Metric) 3.7 lb-ft (US English)

7. Install the door seal strips.
8. Install the dome lamp.
9. Install the windshield garnish molding, install the center pillar upper trim panel and install the quarter upper trim panel.
10. Install the front and rear door sill trim plate.



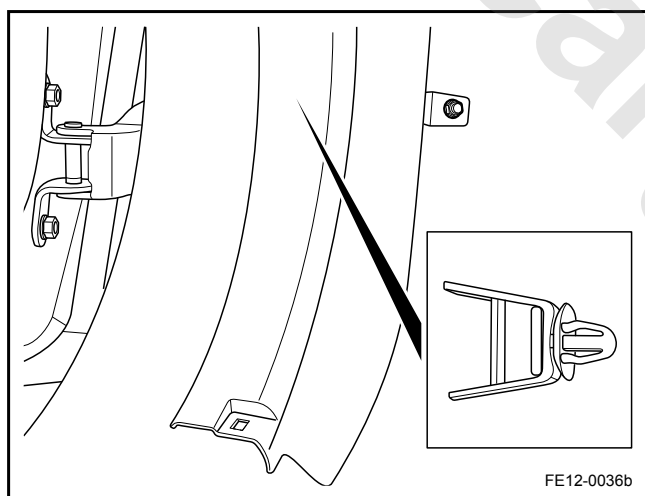
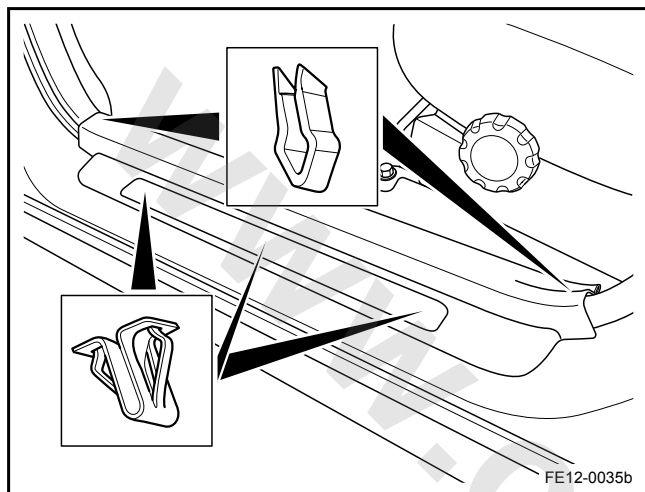
### 12.9.1.2 Left and Right Door Sill Nameplate Replacement

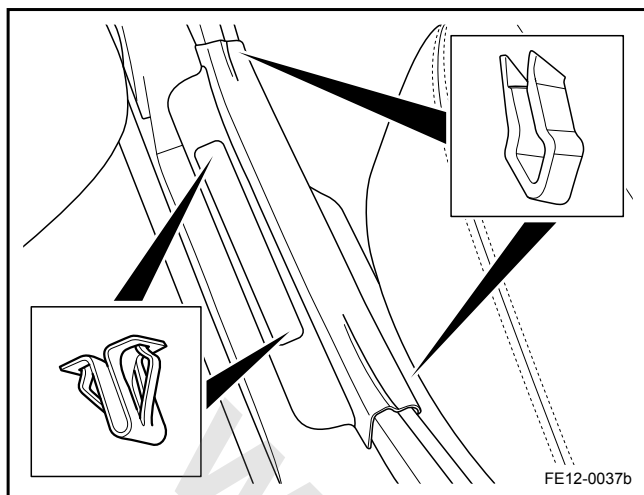
Removal Procedure:

#### Note

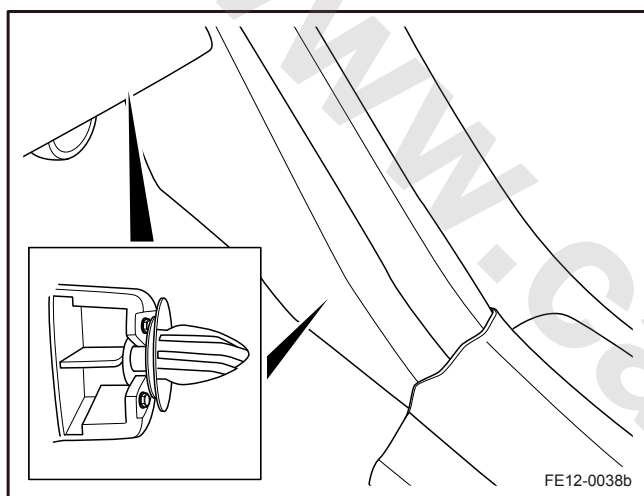
To remove left/right door sill nameplate, please use interior trim panel removal tools. Otherwise, it is easy to scratch door sill nameplate.

1. Disengage the front door sill trim plate retaining clips and loose the front door sill trim plate.

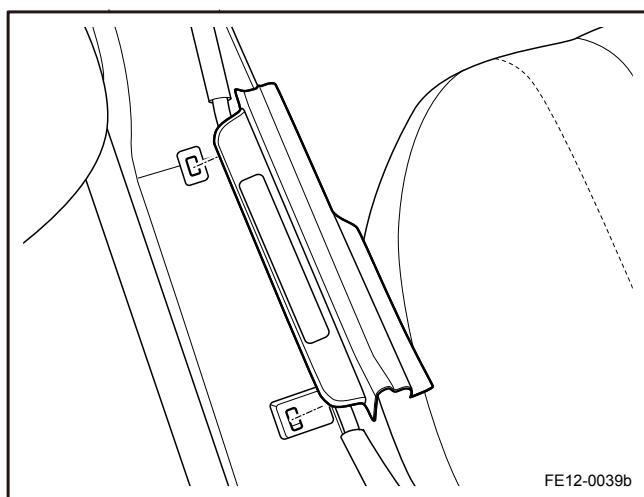




3. Disengage the rear door sill nameplate retaining clips and loose the rear door sill nameplate.

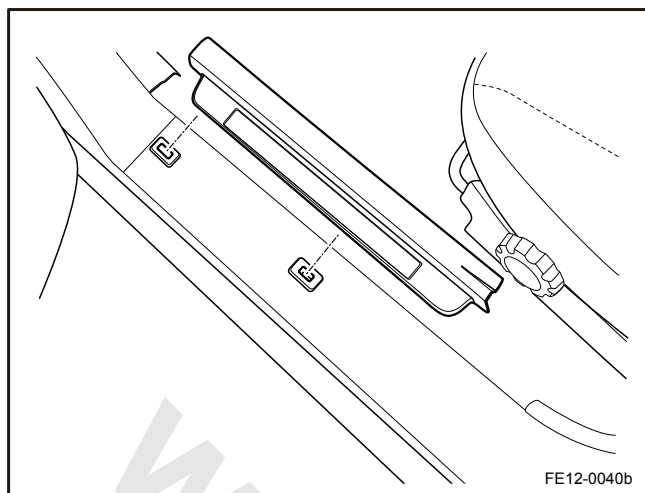


4. Lift the rear seat cushion, disengage the body lock pillar trim retaining clips and remove the rear door sill trim plate.



#### Installation Procedure:

1. Install the body lock pillar trim and install the rear seat cushion.
2. Press the rear door sill nameplate into position.



3. Install the front door sill nameplate and tighten the retaining nut.

Torque: 4 Nm (Metric) 3.0 lb-ft (US English)

4. Press the front door sill nameplate into position.

#### Note

Left and right door sill nameplate replacements are the same.

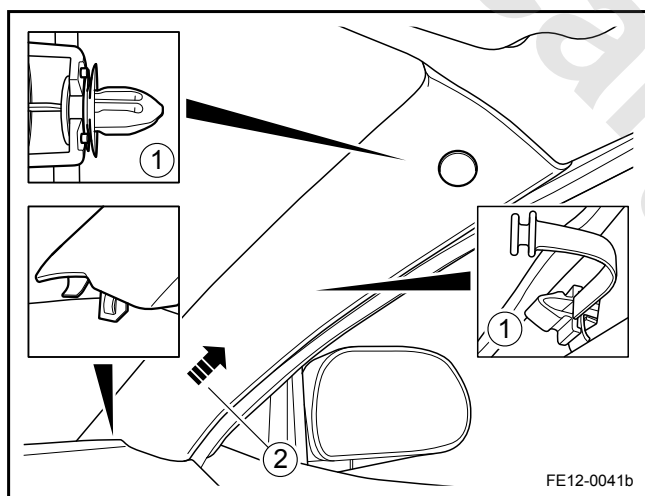
### 12.9.1.3 Windshield Garnish Molding Replacement

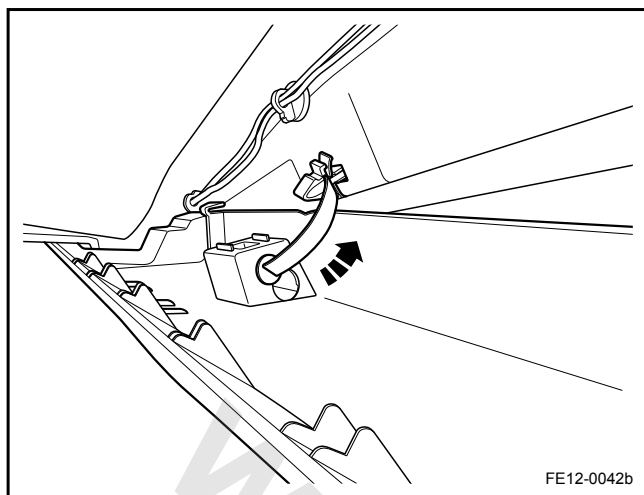
Removal Procedure:

#### Note

To remove windshield garnish molding, please use interior trim panel removal tools. Otherwise, the windshield garnish molding will easily be scratched.

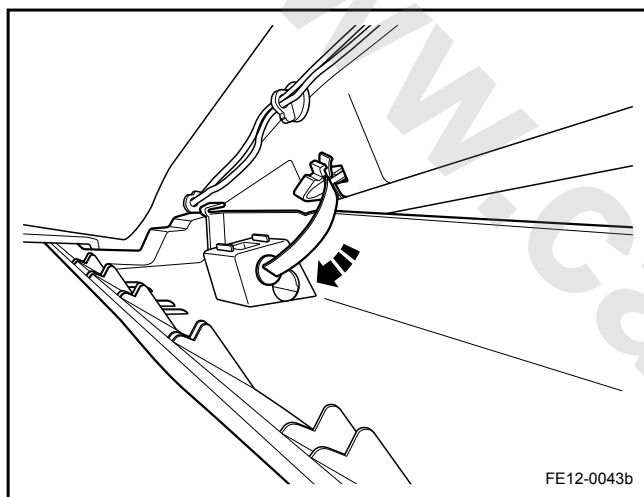
1. Unclip the retaining clip (1) and a D-shape clip from the windshield garnish molding.
2. Pull upward to disengage the windshield garnish molding (2) from the A pillar body panel.



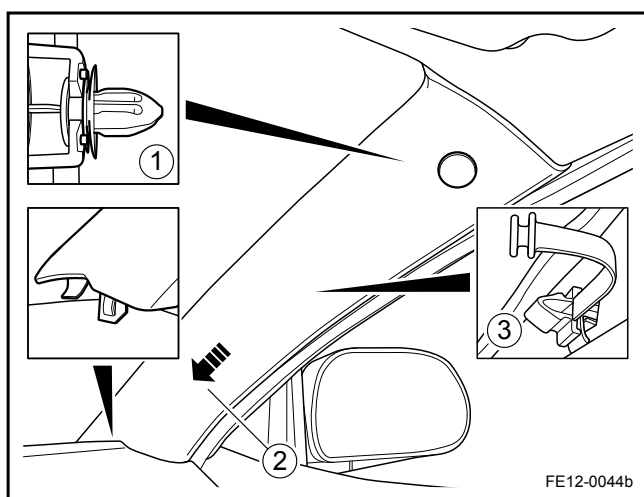


3. Disengage the clip from the windshield garnish molding and remove the windshield garnish molding from the vehicle.

#### Installation Procedure:



1. Engage the clip to the windshield garnish molding.



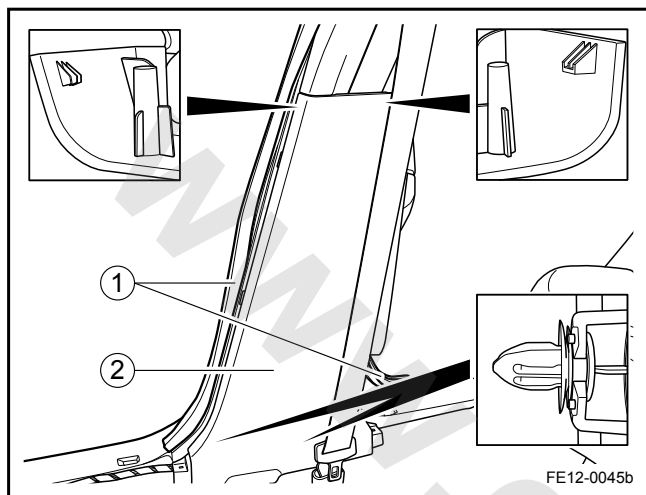
2. Insert the windshield garnish molding (2) lower end into the instrument panel.
3. Press the the windshield garnish molding to secure the D-shape clip (1) and the retaining clips (2), (3).

### 12.9.1.4 Center Pillar Trim Panel Replacement

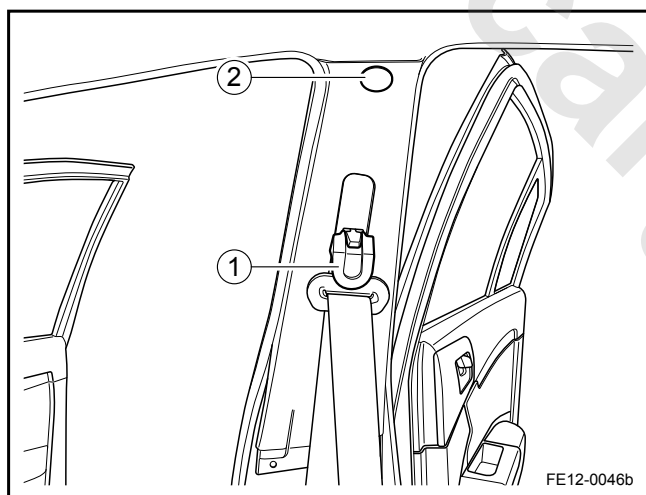
Removal Procedure:

#### Note

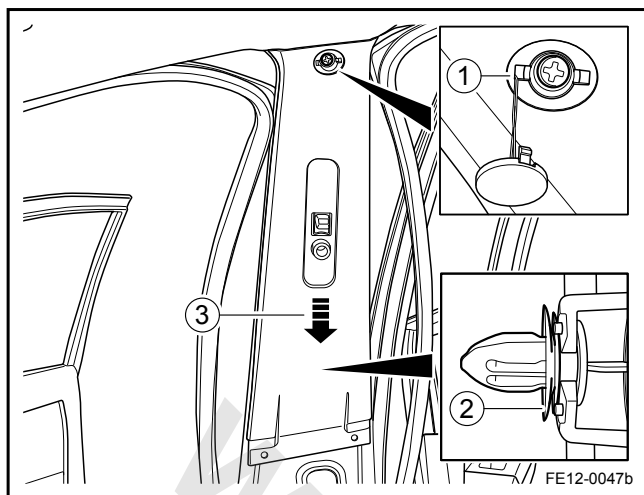
To remove the center pillar trim panel, please use interior trim panel removal tools. Otherwise, the center pillar trim panel will easily be scratched.



1. Remove the left and right door sill nameplate. Refer to [12.9.1.2 Left and Right Door Sill Nameplate Replacement](#).
2. Remove the door seal (1).
3. Detach the D-shape retaining clips from the center pillar lower trim panel, detach the retaining tangs from the upper part of the center pillar lower trim panel, and remove the center pillar lower trim panel (2).

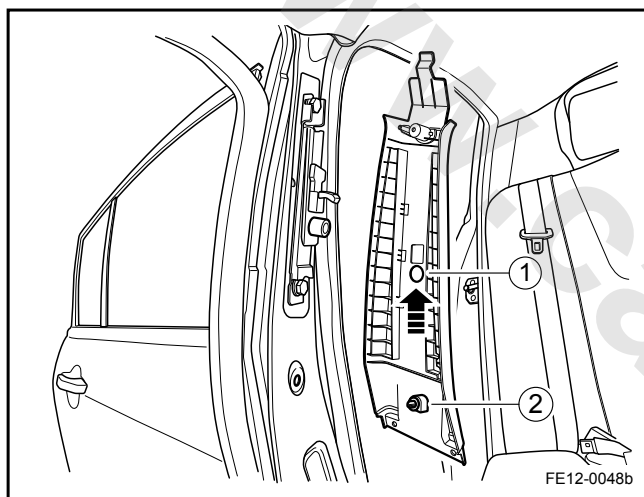


4. Remove the front seat belt height adjuster bolt and remove the seat belt (1). Refer to [9.3.7.5 Front Seat Belt Height Adjuster Replacement](#).
5. Remove the center pillar upper trim panel retaining screw cover (2).

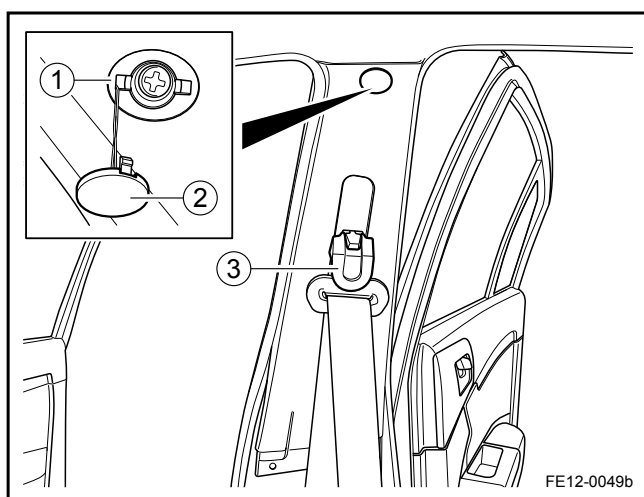


6. Remove the center pillar upper trim panel retaining screw and washer assembly (1).
7. Detach the center pillar upper trim panel clip (2) from the lower part of the panel.
8. Remove the center pillar upper trim panel (3) from the center pillar.

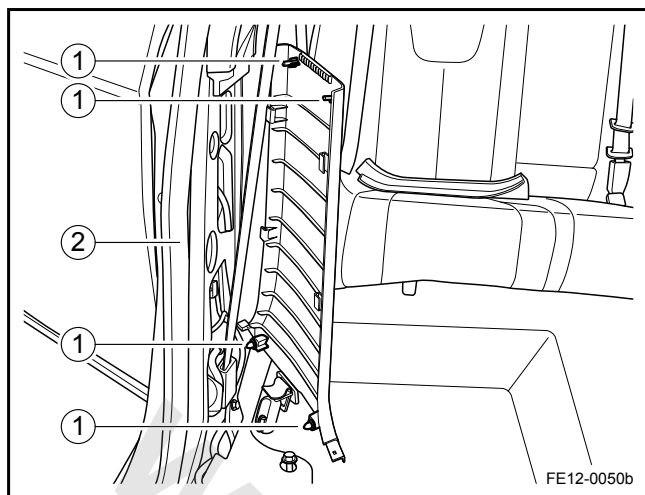
#### Installation Procedure:



1. Install the center pillar upper trim panel to the mounting hole (1).
2. Press the lower part of the center pillar lower trim panel to secure the retaining clip (2).



3. Install the center pillar upper trim panel retaining screw and washer assembly (1).  
Torque: 3.5 Nm (Metric) 2.6 lb-ft (US English)
4. Install the center pillar upper trim panel retaining screw cover (2).
5. Install the seat belts (3).



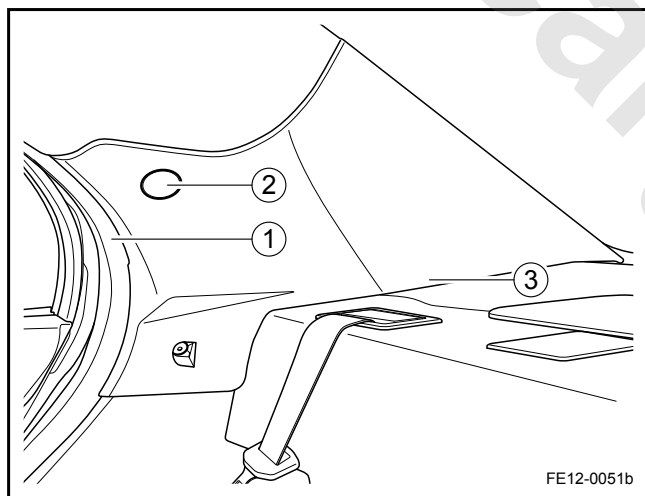
6. Press the lower part of the center pillar upper trim panel to secure the clips and the retaining tang (1).
7. Install the door seal (2).
8. Install the left and right door sill nameplate.

#### 12.9.1.5 Rear Quarter Upper Trim Panel Replacement (Sedan)

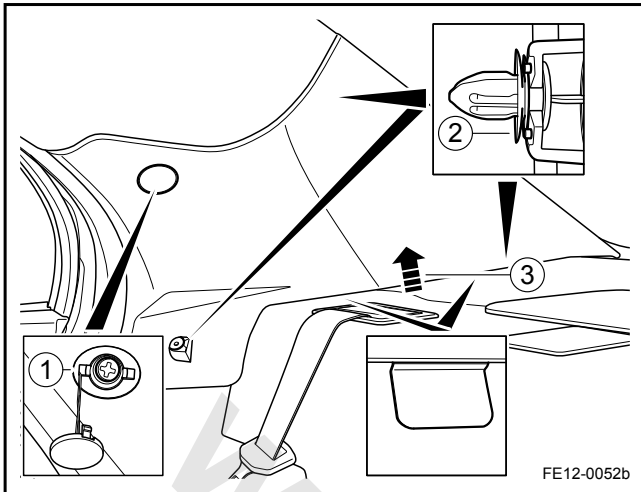
Removal Procedure:

##### Note

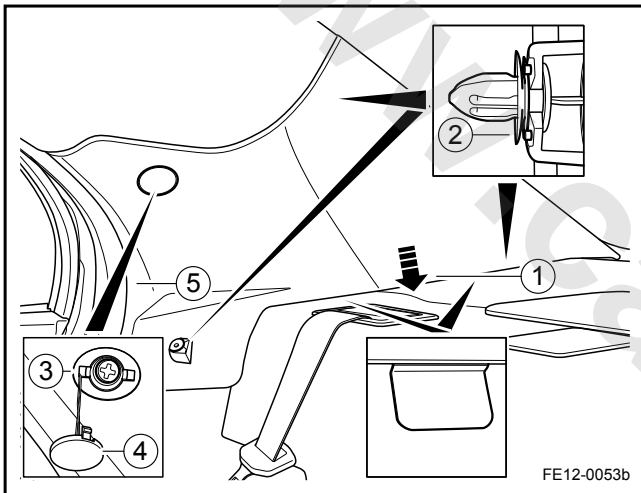
To remove the rear quarter upper trim panel, please use interior trim panel removal tools. Otherwise, the rear quarter upper trim panel will easily be scratched.



1. Fold down the rear seat back and remove the rear seat armrest. Refer to [12.7.3.6 Rear Seat Armrest Assembly Replacement](#).
2. Remove the rear door seal and the rear compartment lid seal (1).
3. Remove the rear quarter upper trim panel retaining screw cover (2).



4. Remove the rear quarter upper trim panel retaining screw and washer assembly (1).
5. Remove the rear quarter upper trim panel retaining clips (2).
6. Pull upward to remove the rear quarter upper trim panel.



#### Installation Procedure:

1. Install the rear quarter upper trim panel to the rear parcel shelf mounting hole (1).
2. Press the rear quarter upper trim panel to secure the retaining clip (2).
3. Install the rear quarter upper trim panel retaining screw and washer assembly (3)  
Torque: 3.5 Nm (Metric) 2.6 lb-ft (US English)
4. Install the rear quarter upper trim panel retaining screw cover (4).
5. Install the door seal (5).
6. Install the rear seat armrest and pull the rear seat back to the upright position.

#### Note

The rear quarter upper trim panel replacement is the same for both sides.

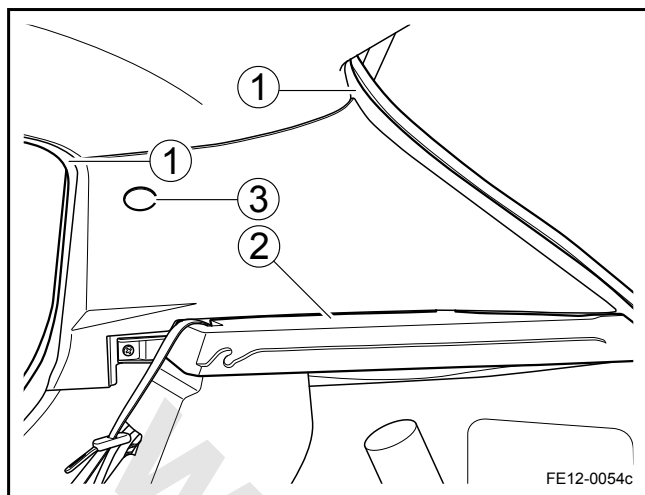
### 12.9.1.6 Rear Quarter Upper Trim Panel Replacement (Hatchback)

#### Removal Procedure:

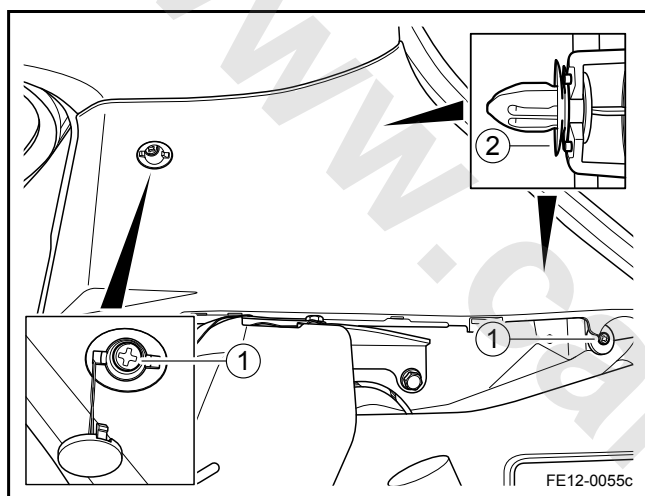
#### Note

To remove the rear quarter upper trim panel, please use interior trim panel removal tools. Otherwise, the rear quarter upper trim panel will easily be scratched.





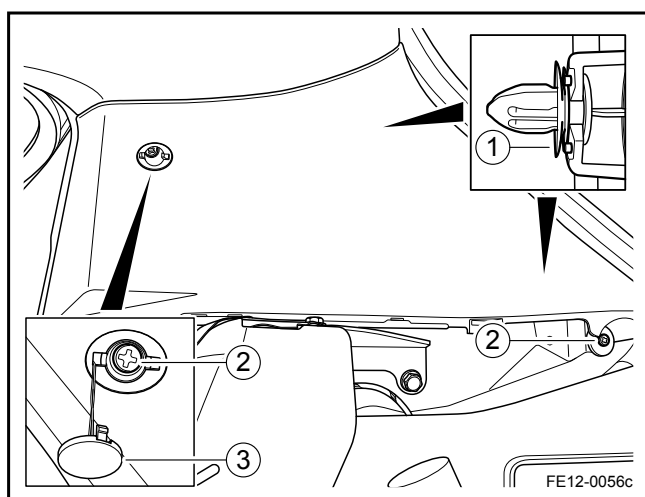
1. Fold down the rear seat back and remove the rear seat armrest. Refer to [12.7.3.6 Rear Seat Armrest Assembly Replacement](#).
2. Remove the rear door seal and the hatchback seal (1).
3. Remove the rear parcel shelf mounting bracket (2). Refer to [12.9.1.8 Rear Parcel Shelf Replacement \(Hatchback\)](#).
4. Remove the rear quarter upper trim panel retaining screw cover (3).

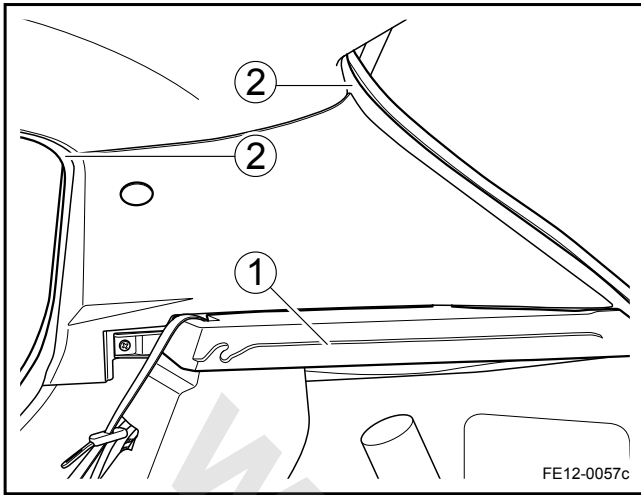


5. Remove the rear quarter upper trim panel retaining screw and washer assembly (1).
6. Remove the rear quarter upper trim panel retaining clips (2) and remove the rear quarter upper trim panel.

#### Installation Procedure:

1. Press the rear quarter upper trim panel to secure the retaining clip (1).
2. Install the rear quarter upper trim panel retaining screw and washer assembly (2).  
Torque: 3.5 Nm (Metric) 2.6 lb-ft (US English)
3. Install the rear quarter upper trim panel retaining screw cover (3).





4. Install the rear parcel shelf (1).
5. Install the rear door seal and the hatchback seal (2).
6. Install the rear seat armrest and lift the rear seat back to the upright position.

#### Note

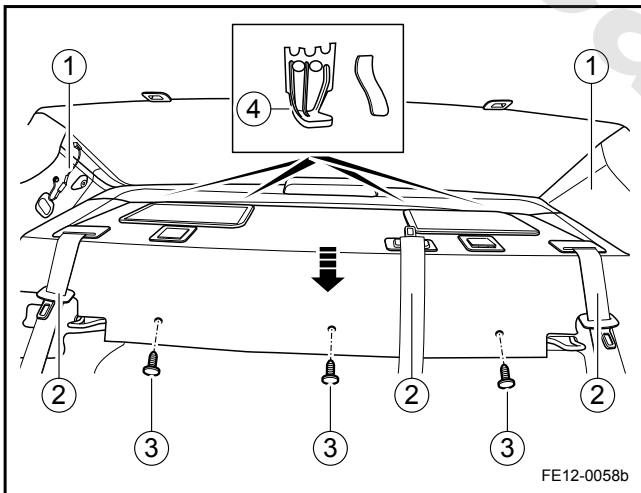
The rear quarter upper trim panel replacement is the same for both sides.

### 12.9.1.7 Rear Parcel Shelf Replacement (Sedan)

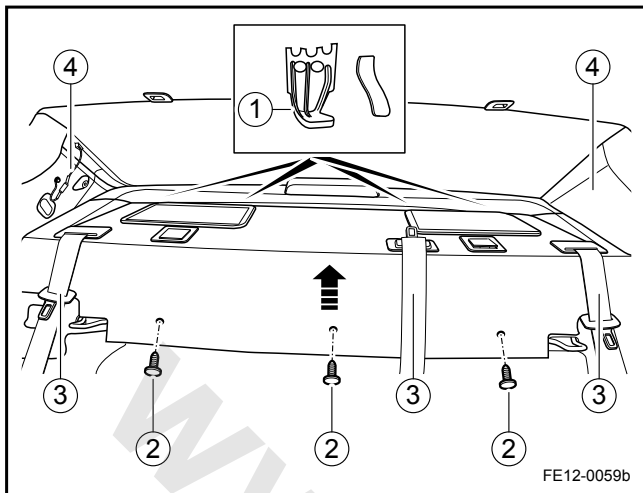
#### Removal Procedure:

#### Note

To remove the rear parcel shelf, please use interior trim panel removal tools. Otherwise, the rear parcel shelf panel will easily be scratched.



1. Fold down the rear seat back and remove the rear seat armrest. Refer to [12.7.3.6 Rear Seat Armrest Assembly Replacement](#).
2. Remove the rear quarter upper trim panel. Refer to [12.9.1.5 Rear Quarter Upper Trim Panel Replacement \(Sedan\)](#).
3. Remove the rear seat belt buckle retaining bolt (2). Refer to [9.3.7.4 Rear Seat Belt Retractor Replacement](#).
4. Remove the rear parcel shelf retaining clips (3).
5. Lift the rear parcel shelf to detach the D-shape retaining tangs from the vehicle body.
6. Lift the rear parcel shelf to detach the D-shape retaining tangs from the vehicle body mounting hole (4) and pull the rear parcel shelf forward.
7. Disconnect the center high mounted brake lamp harness connector, slide the center seat belt through the center seat belt slot and remove the rear parcel shelf trim panel.



## Installation Procedure:

1. Slide the center seat belt through the center seat belt slot, connect the center high mounted brake lamp harness connector and install the rear parcel shelf trim panel.
2. Push back the rear parcel shelf trim panel to engage the retaining tangs to the slots on the vehicle body.
3. Push back the rear parcel shelf trim panel to engage the D-shape retaining clips and press the rear parcel shelf trim panel to secure the D-shape retaining clips.
4. Install the rear parcel shelf retaining clips (2).
5. Install the rear seat belt buckle retaining bolt (3).
6. Install the rear quarter upper trim panels (4).
7. Install the rear seat armrest and pull the rear seat back to the upright position.

## Note

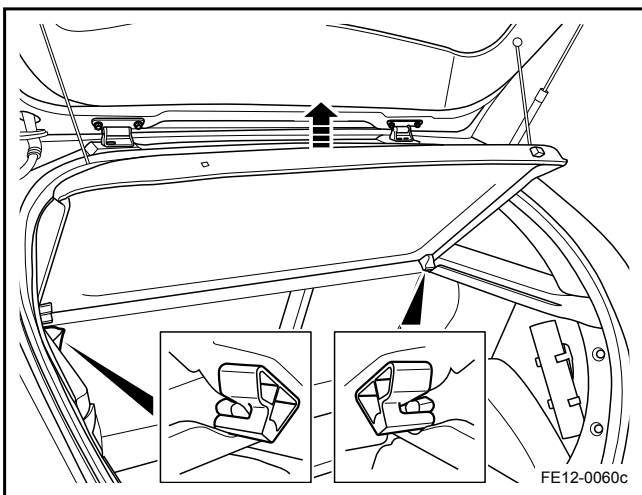
## 12.9.1.8 Rear Parcel Shelf Replacement (Hatchback)

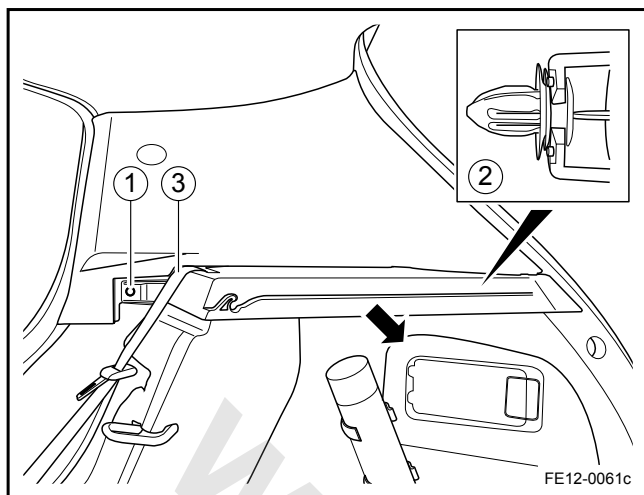
## Removal Procedure:

## Note

To remove the rear parcel shelf, please use interior trim panel removal tools. Otherwise, the rear parcel shelf panel will easily be scratched.

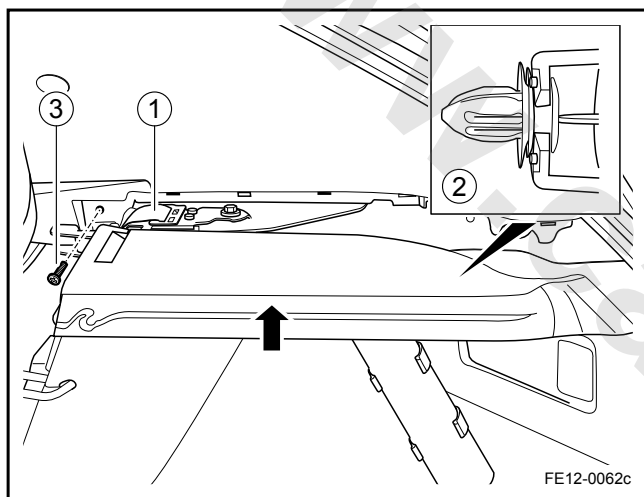
1. Lift the rear parcel shelf and tilt upward at about 45 °, pull rearward to detach the rear parcel shelf from the mounting bracket.



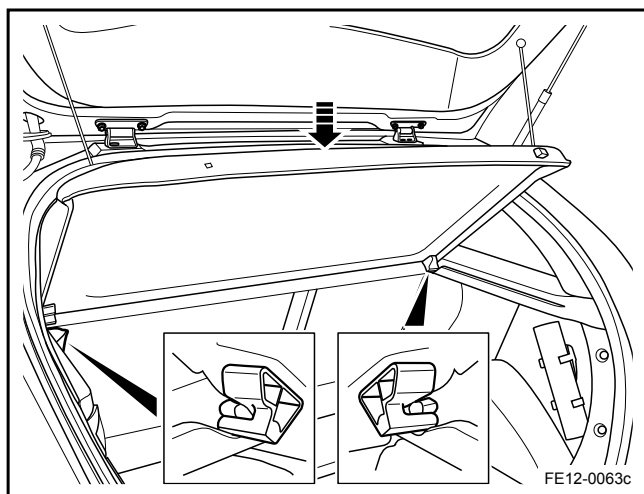


2. Fold down the rear seat back and remove the rear seat armrest. Refer to [12.7.3.6 Rear Seat Armrest Assembly Replacement](#).
3. Remove the rear parcel shelf mounting bracket retaining bolt (1).
4. Disengage the rear parcel shelf front retaining tangs (2).
5. Slide the rear seat belt through the rear seat belt slot (3).

#### Installation Procedure:



1. Slide the rear seat belt through the rear seat belt slot (1).
2. Attach the rear parcel shelf mounting bracket retaining clip (2).
3. Install the rear parcel shelf mounting bracket retaining bolt (3).  
Torque: 3.5 Nm (Metric) 2.6 lb-ft (US English)
4. Install the rear seat armrest and pull the rear seat back to the upright position.



5. Install the rear parcel shelf to the mounting bracket with the rear parcel shelf tilting approximately 45 ° and push down the rear parcel shelf into the rack.

#### Note

The rear parcel shelf replacement is the same for both sides.

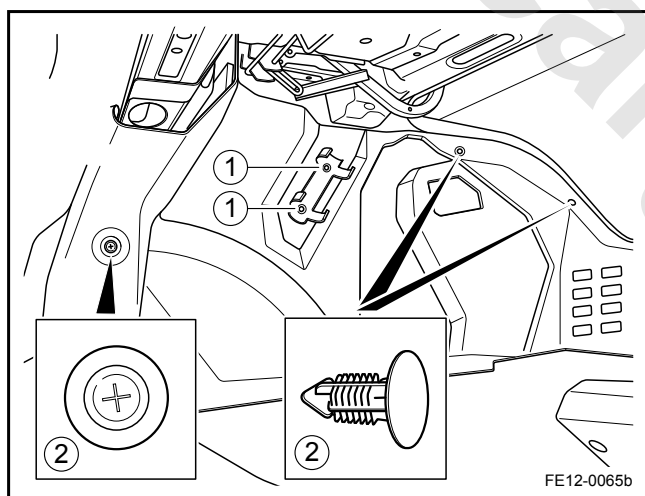
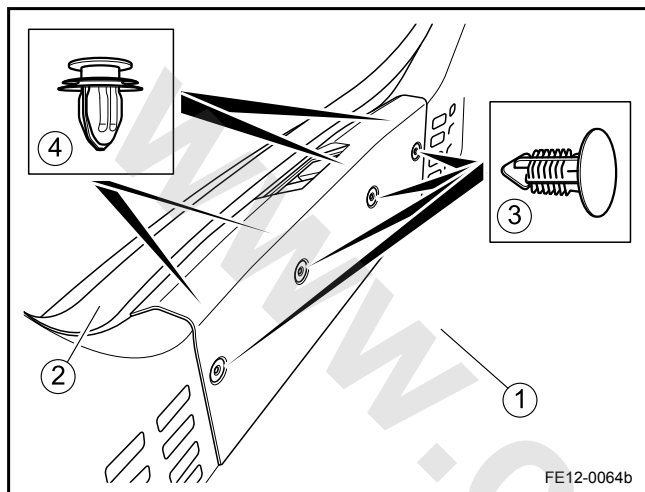
### 12.9.1.9 Rear Compartment Trim Panel Replacement

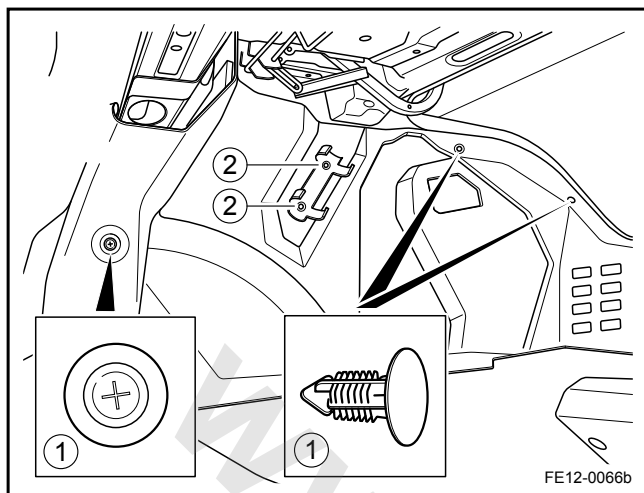
Removal Procedure:

#### Note

To remove the rear compartment trim panel, please use interior trim panel removal tools. Otherwise, the rear compartment trim panel will easily be scratched.

1. Remove the rear compartment floor carpet.
2. Remove the rear compartment lid seal (2). Refer to [12.9.1.16 Vehicle Inner Side Seal Replacement](#).
3. Remove the end panel side clips (3).
4. Remove the end panel upper clips (4).
5. Remove the fire extinguisher mounting bracket retaining bolt (1).
6. Remove the retaining clips from the rear of the rear compartment trim panel and remove the retaining clip (2) from the front of the rear compartment trim panel.

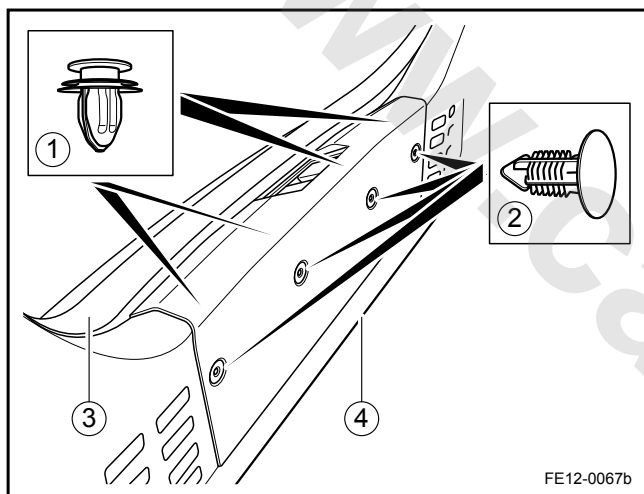




## Installation Procedure:

1. Install the retaining clips to the rear of the rear compartment trim panel and install the retaining clip (2) to the front of the rear compartment trim panel.
2. Install and tighten the fire extinguisher mounting bracket retaining bolt (2).

Torque: 13 Nm (Metric) 9.6 lb-ft (US English)



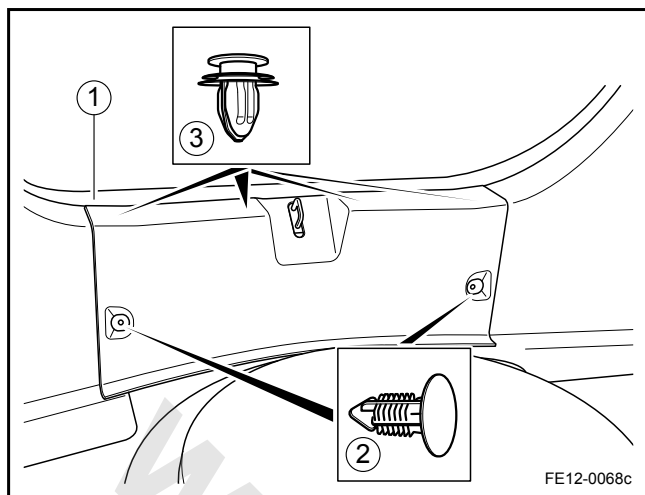
3. Install the end panel upper clips (1).
4. Install the end panel side clips (2).
5. Install the rear compartment lid seal (3).
6. Install the rear compartment floor carpet (4).

### 12.9.1.10 Rear Compartment Trim Panel Replacement (Hatchback)

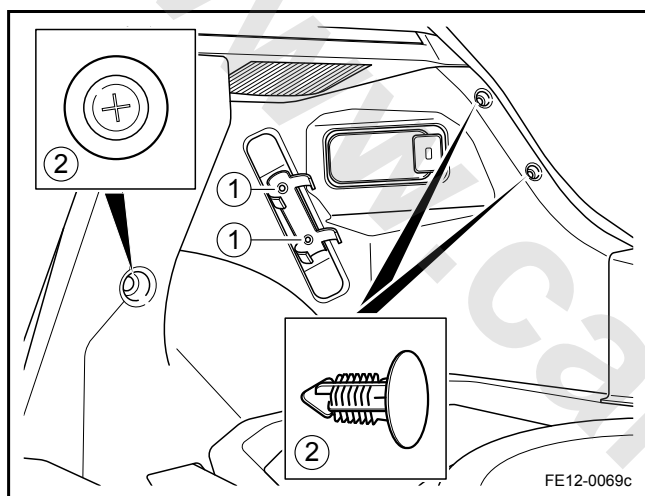
## Removal Procedure:

## Note

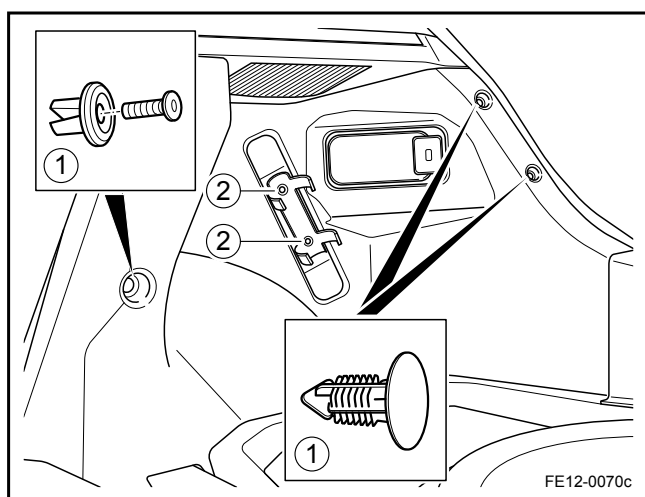
To remove the rear compartment trim panel, please use interior trim panel removal tools. Otherwise, the rear compartment trim panel will easily be scratched.



1. Remove the rear compartment floor carpet.
2. Remove the hatchback seal (1). Refer to [12.9.1.16 Vehicle Inner Side Seal Replacement](#).
3. Remove the end panel side clips (2).
4. Remove the end panel upper clips (3).

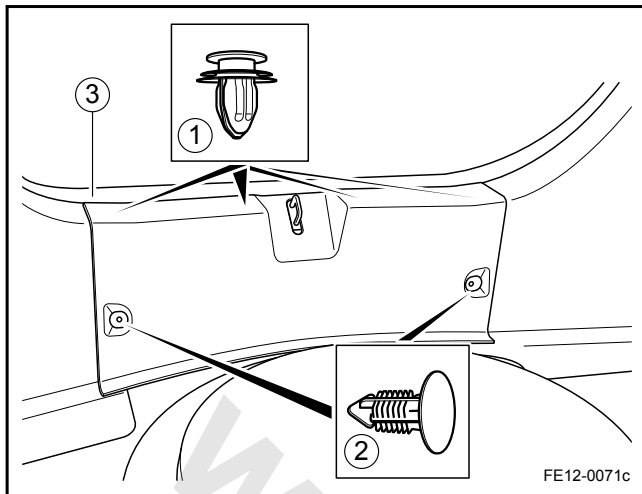


5. Remove the fire extinguisher mounting bracket retaining bolt (1).
6. Remove the retaining clips (2) from the side of the rear compartment trim panel.
7. Remove the parcel shelf mounting bracket and the rear compartment trim panel. Refer to [12.9.1.8 Rear Parcel Shelf Replacement \(Hatchback\)](#).



#### Installation Procedure:

1. Install the parcel shelf mounting bracket and the rear compartment trim panel.
2. Install the retaining clips (1) from the side of the rear compartment trim panel.
3. Install the fire extinguisher mounting bracket retaining bolt (2).



4. Press the end panel to secure the upper retaining clips (1).
5. Attach the end panel side clips (2).
6. Install the hatchback seal (3).
7. Install the rear compartment floor carpet.

#### Note

The removal and installation methods are similar for both sides of rear compartment trim panel.

### 12.9.1.11 Passenger Compartment Floor Carpet Replacement

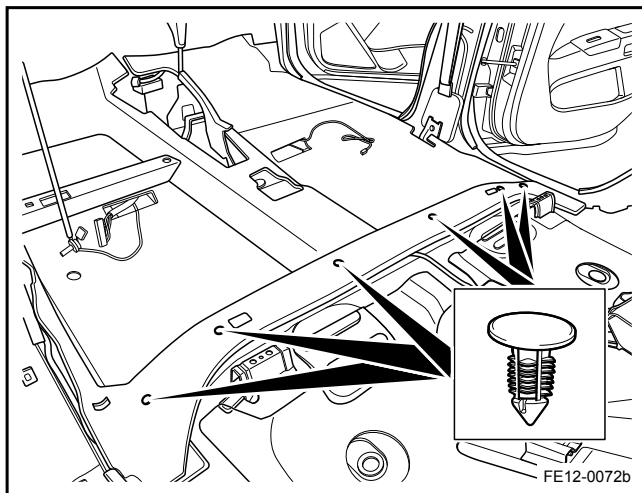
#### Removal Procedure:

#### Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".

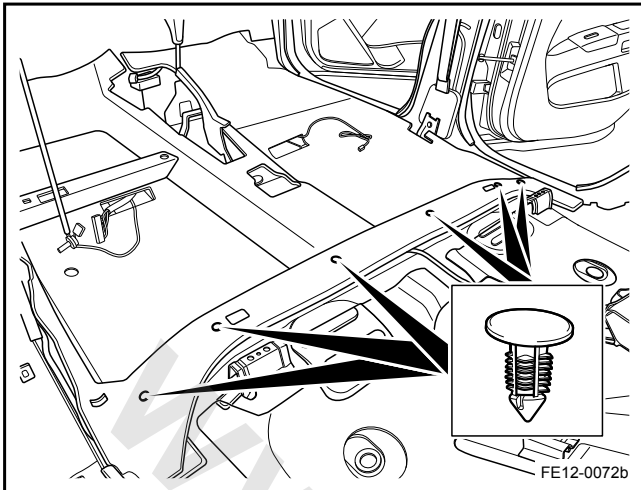
#### Note

To remove the passenger compartment floor carpet, please use interior trim panel removal tools. Otherwise, the passenger compartment floor carpet will easily be scratched.



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the rear seat cushion. Refer to [12.7.3.4 Rear Seat Cushion Replacement](#).
3. Remove the left and right door sill nameplate. Refer to [12.9.1.2 Left and Right Door Sill Nameplate Replacement](#).
4. Remove the front seat belts retaining bolts from the left and right center pillar lower trim panels.
5. Remove the left and right center pillar lower trim panels. Refer to [12.9.1.4 Center Pillar Trim Panel Replacement](#).
6. Remove the left and right front seats. Refer to [11.11.8.1 Front Electric Seat Replacement](#).
7. Remove the center console. Refer to [3.3.8.9 Shift Lever Replacement](#).
8. Remove the passenger compartment floor carpet.





## Installation Procedure:

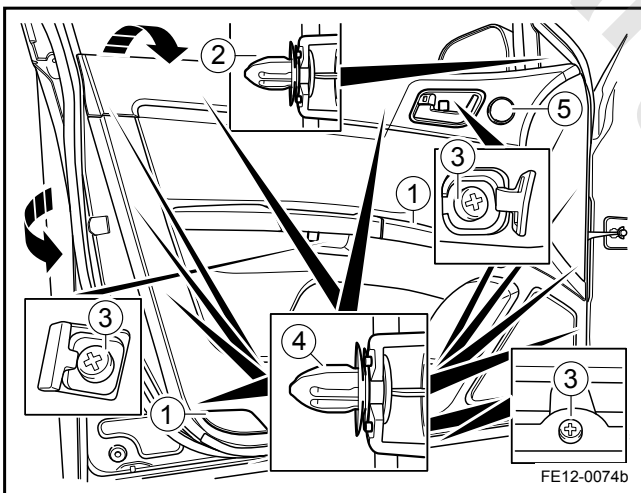
1. Install the passenger compartment floor carpet.
2. Install the center console.
3. Install the left and right front seats.
4. Install the left and right center pillar lower trim panels.
5. Install the left and right front door sill nameplate.
6. Install the front seat belts retaining bolts to the left and right center pillar lower trim panels.
7. Install the left and right rear door sill nameplate.
8. Install the rear seat cushion.
9. Connect the battery negative cable.

### 12.9.1.12 Front Side Door Trim Panel Replacement

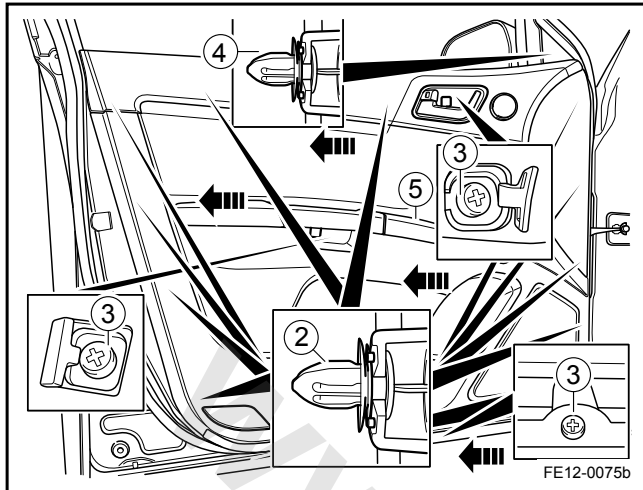
## Removal Procedure:

**Warning!**

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the front side door trim panel corner ornament retaining clip (2) and remove the corner ornament.
3. Remove the front side door trim panel retaining screws (3).
4. Detach the front side door trim panel retaining clips (4).
5. Disconnect the front side door trim panel lamp connector, the front door window switch connector and the tweeter connector and remove the front side door trim panel (5).



## Installation Procedure:

1. Connect the front side door trim panel lamp connector, the front door window switch connector and the tweeter connector.
2. Press the front side door trim panel to secure the retaining clips (2).
3. Install the front side door trim panel retaining screws (3).  
Torque: 3.5 Nm (Metric) 2.6 lb-ft (US English)
4. Press the front side door trim panel corner ornament to secure the corner ornament retaining clip (4).

## Note

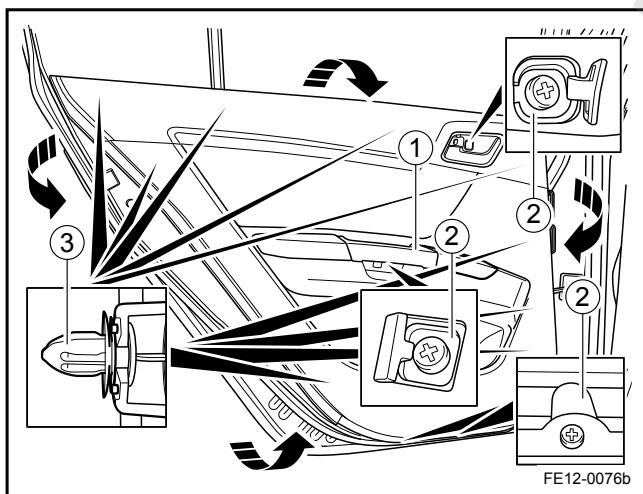
The replacement of the left and right front door trim panels are similar.

## 12.9.1.13 Rear Side Door Trim Panel Replacement

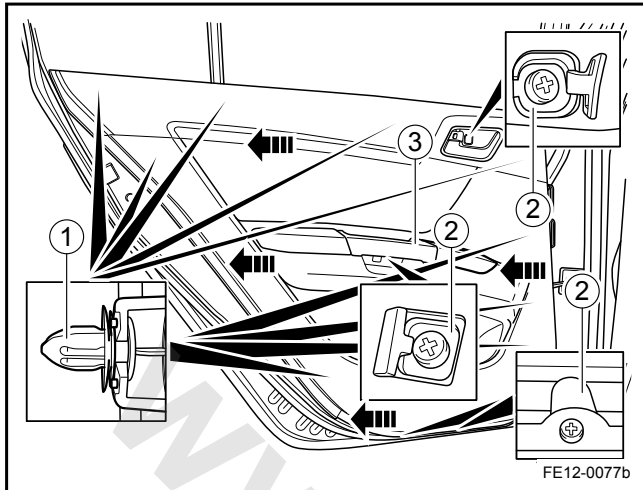
## Removal Procedure:

## Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable. Refer to [2.11.8.1 Battery Disconnection](#).
2. Remove the rear side door trim panel retaining screws (2).
3. Detach the rear side door trim panel retaining clips (3), disconnect the wiring harness connectors and remove the rear side door trim panel.



## Installation Procedure:

1. Connect the wiring harness connectors on the rear side door trim panel.
2. Press the rear side door trim panel to secure the retaining clips (1).
3. Install the rear side door trim panel retaining screws (2).  
Torque: 3.5 Nm (Metric) 2.6 lb-ft (US English)

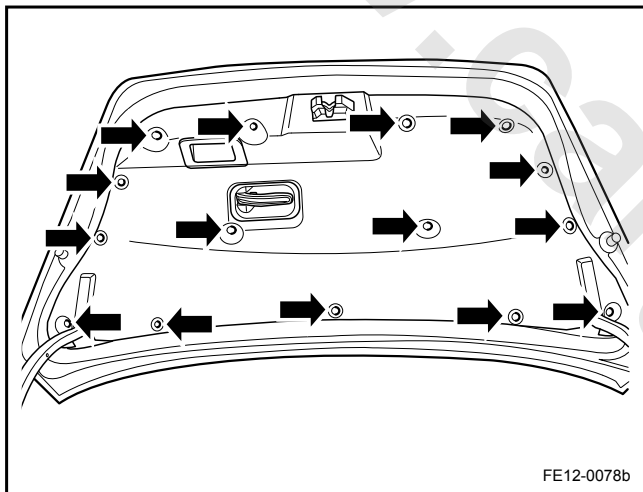
## Note

The replacement of the left and right rear side door trim panels are similar.

### 12.9.1.14 Rear Compartment Lid Inner Trim Panel Replacement

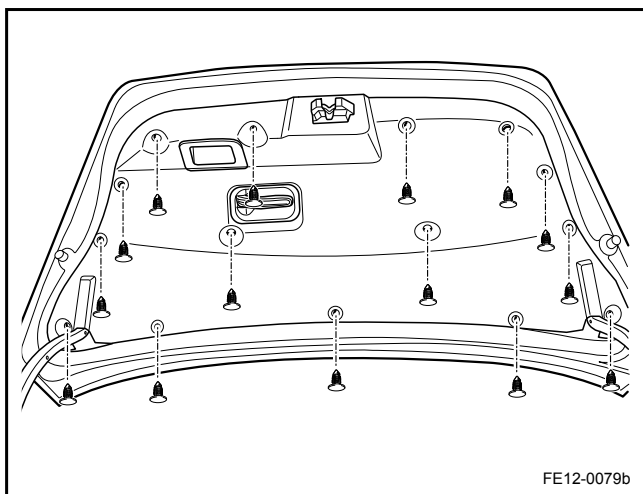
## Removal Procedure:

1. Remove the emergency exit door handle retaining screw and remove the handle.
2. Remove the rear compartment lid inner trim panel retaining clips.
3. Remove the rear compartment lid inner trim panel.



## Installation Procedure:

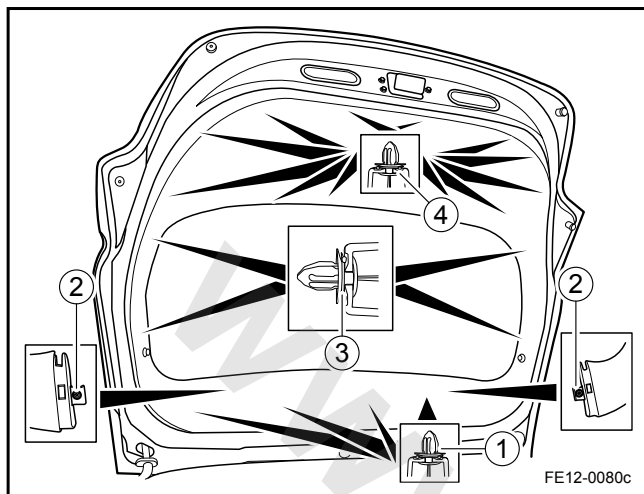
1. Install the rear compartment lid inner trim panel.
2. Install the rear compartment lid inner trim panel retaining clips.
3. Install the emergency exit door handle retaining screw.  
Torque: 3.5 Nm (Metric) 2.6 lb-ft (US English)



### 12.9.1.15 Hatchback Inner Trim Panel Replacement (Hatchback)

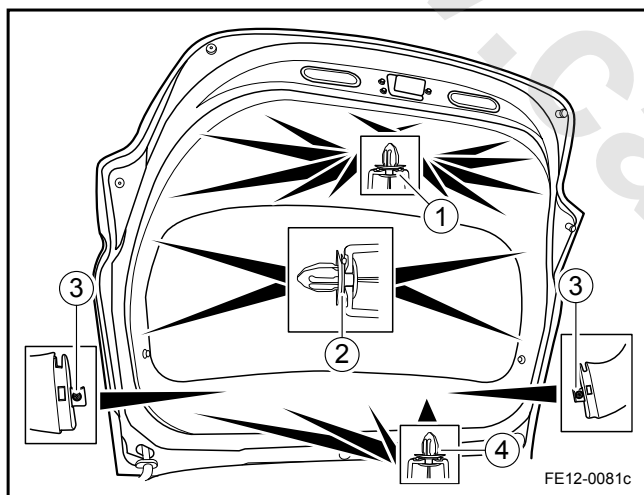
#### Removal Procedure:

1. Detach the retaining clips (1) from the hatchback upper inner trim panel and remove the hatchback upper inner trim panel.
2. Remove the hatchback side inner trim panel retaining screws (2).
3. Detach the retaining clips from the hatchback side inner trim panel and remove the hatchback side inner trim panels (3).
4. Detach the retaining clips (4) from the hatchback lower inner trim panel.



#### Installation Procedure:

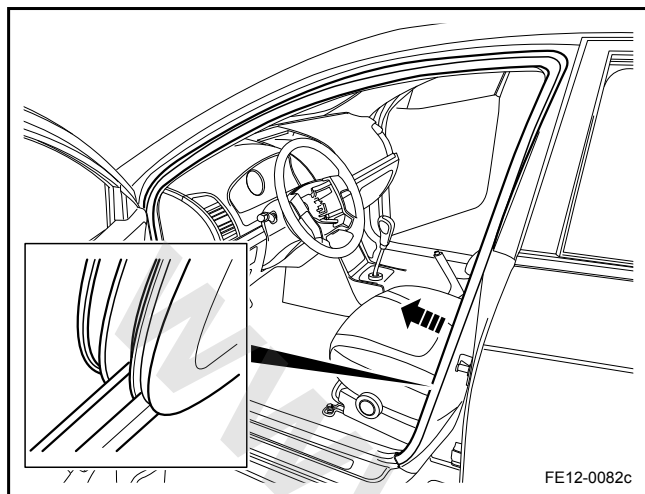
1. Press the hatchback lower inner trim panel to secure the retaining clips (1).
2. Press the hatchback side inner trim panels to secure the retaining clips (2).
3. Install the hatchback side inner trim panel retaining screws (3).  
Torque: 3.5 Nm (Metric) 2.6 lb-ft (US English)
4. Press the hatchback upper inner trim panel to secure the retaining clips (4).



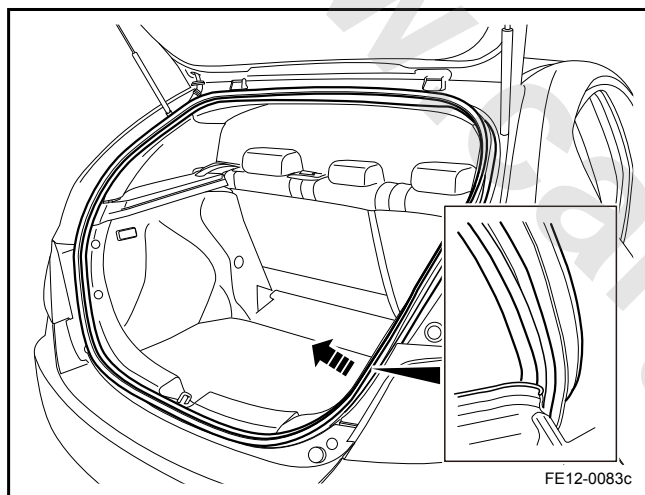
### 12.9.1.16 Vehicle Inner Side Seal Replacement

#### Removal Procedure:

1. Remove the door seals.

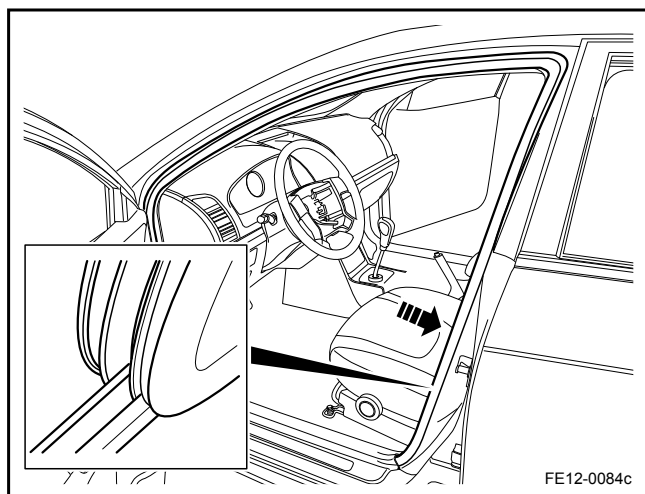


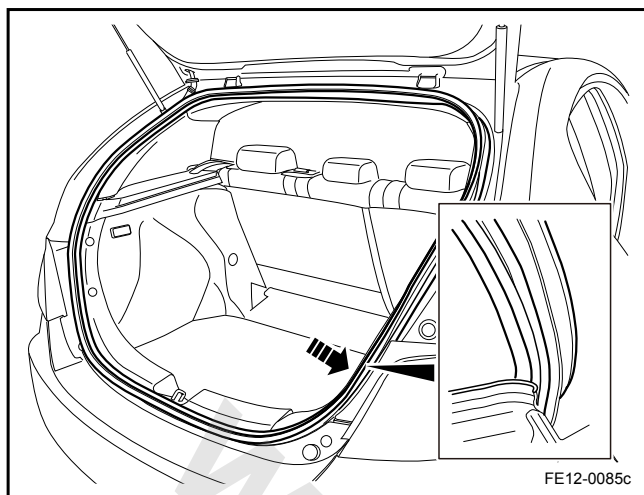
2. Remove the hatchback seal.



#### Installation Procedure:

1. Install the door seals.





2. Install the hatchback seal.

## 12.10 Exterior Trim

### 12.10.1 Removal and Installation

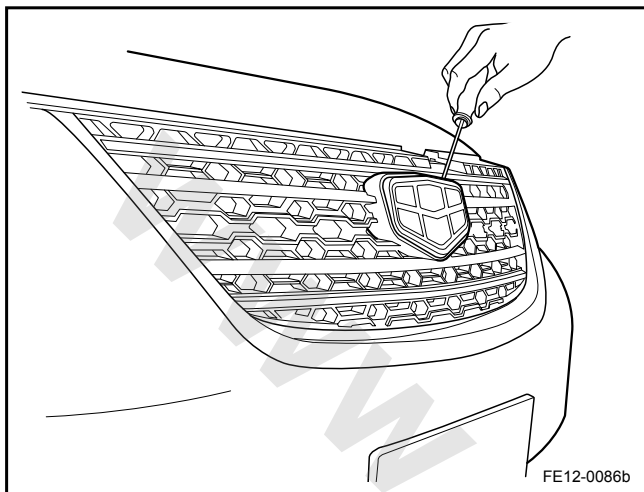
#### 12.10.1.1 Front and Rear Emblem Replacement

Removal Procedure:

1. Use a flat blade screwdriver to remove the front emblem.

**Note**

Wrap the screwdriver blade with tape to protect components.

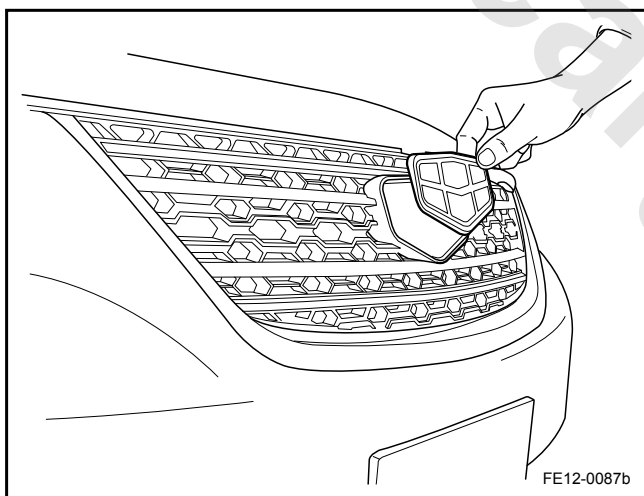


Installation Procedure:

1. Use a suitable cleaning solution to clean the emblem attached surface.
2. Install the front emblem to the specified location.

**Note**

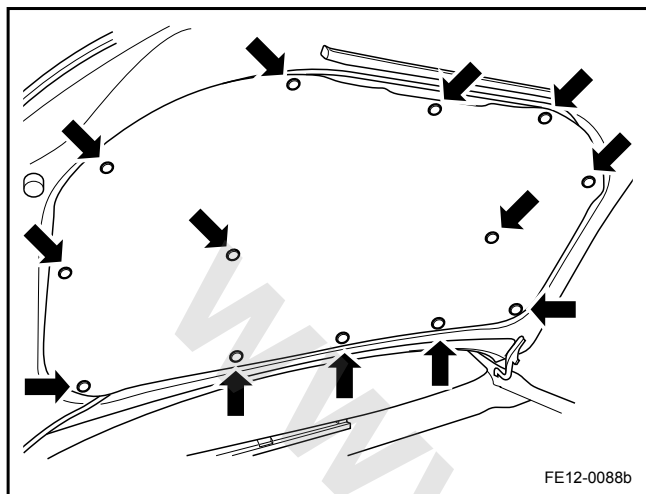
For rear emblem replacement, please refer to the front emblem replacement procedure.



### 12.10.1.2 Hood Sound Insulation Pad Replacement

#### Removal Procedure:

1. Remove the hood inner panel retaining clips and remove the hood sound insulation pad.



#### Installation Procedure:

1. Install the hood inner panel retaining clips and install the hood sound insulation pad.

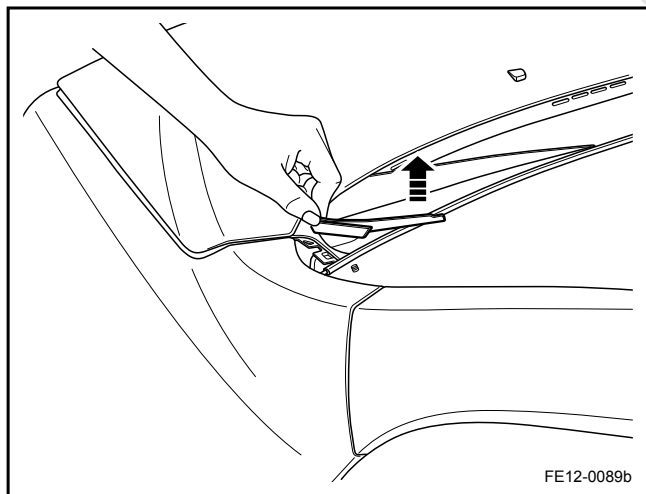
### 12.10.1.3 Air Inlet Grille Panel Replacement

#### Removal Procedure:

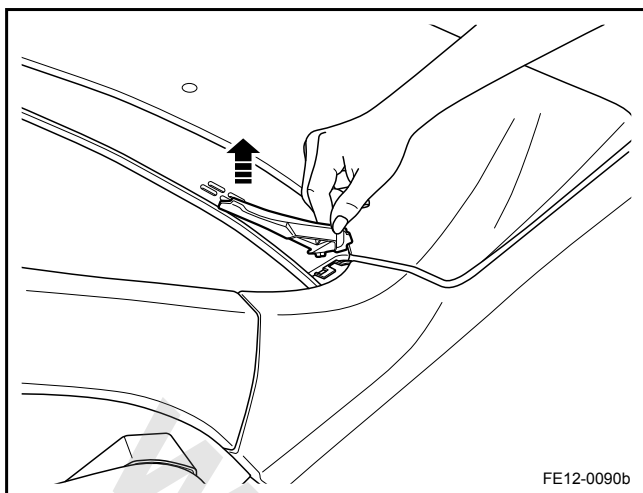
1. Remove the front wipers. Refer to [11.6.8.2 Wiper Arm Replacement](#).
2. Remove the air inlet grille panel left side ornament panel.

#### Note

The air inlet grille panel left side ornament panel back has a double-sided stick tape.



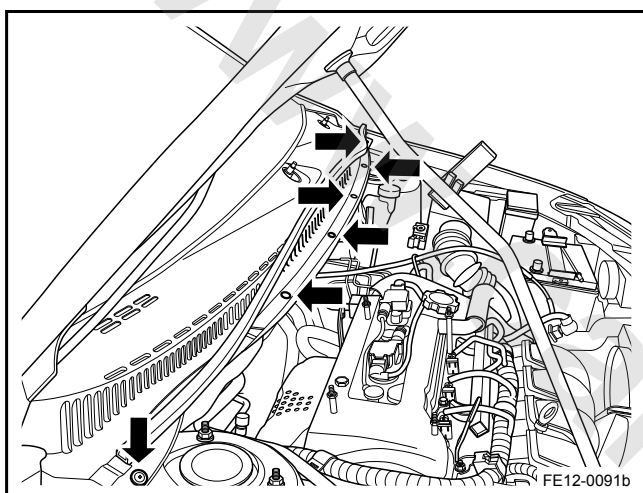




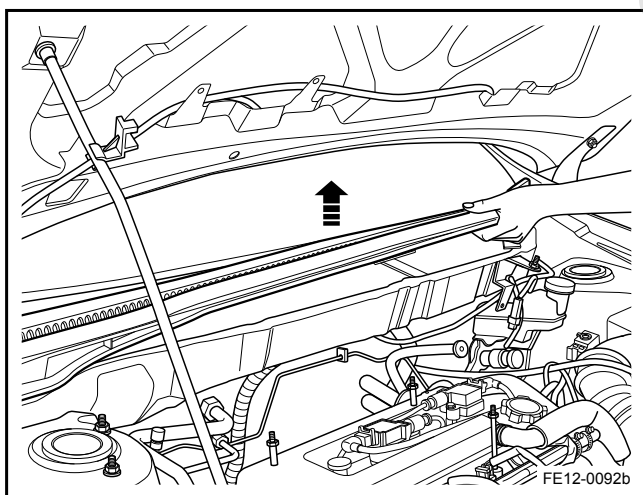
3. Remove the air inlet grille panel right side ornament panel.

**Note**

The air inlet grille panel right side ornament panel back has a double-sided stick tape.



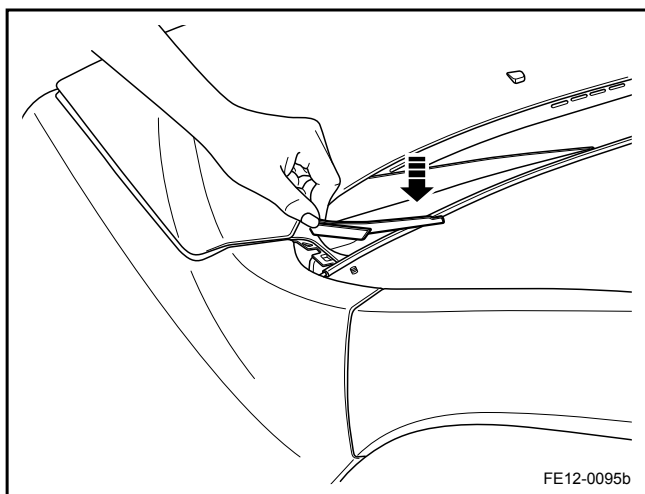
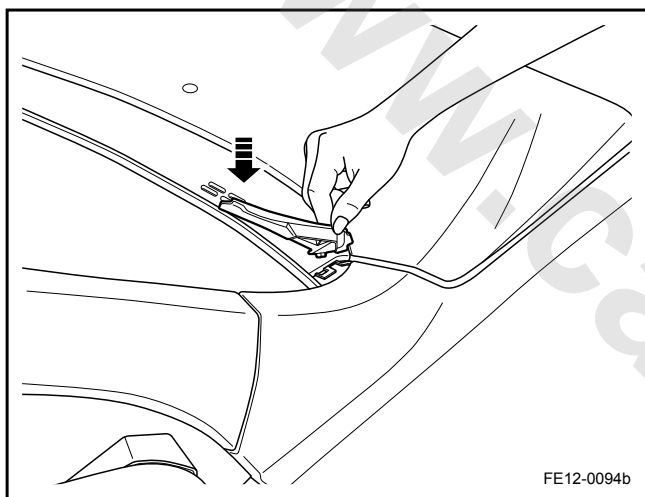
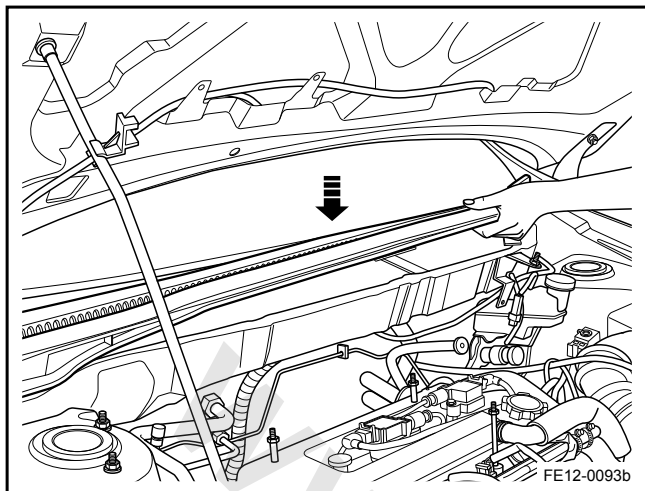
4. Remove the air inlet grille panel retaining clips.



5. Remove the hood seal and the retaining clip.
6. Remove the air inlet grille panel.

Installation Procedure:

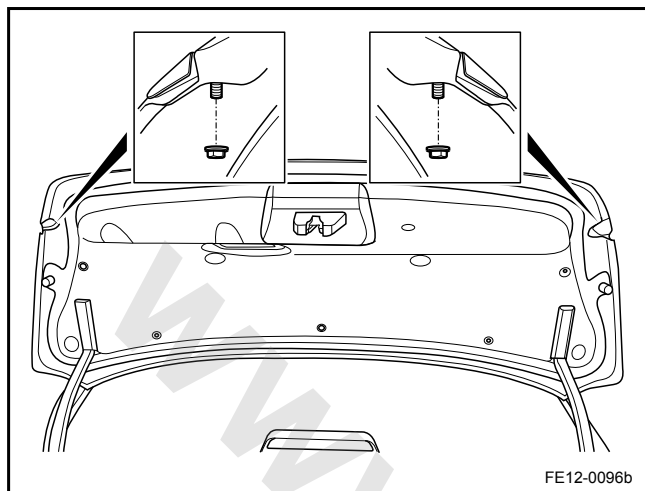
1. Install the air inlet grille panel.
2. Install the air inlet grille panel retaining clips.
3. Install the hood seal and the retaining clip.
4. Install the air inlet grille panel right side ornament panel.
5. Install the air inlet grille panel left side ornament panel.
6. Install the front wipers.



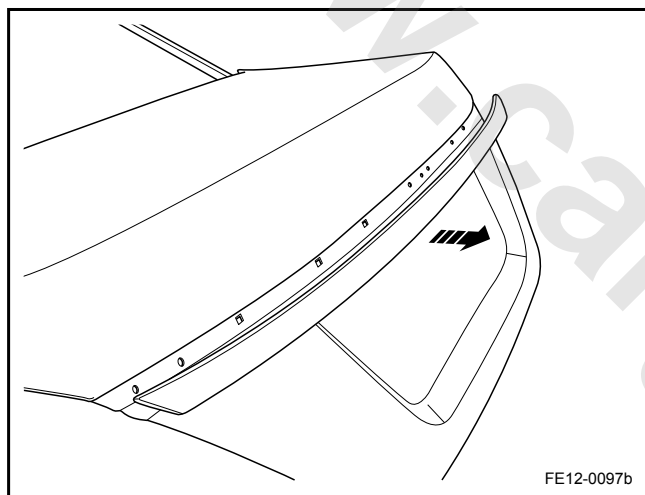
### 12.10.1.4 Rear Compartment Lid Applique Replacement

#### Removal Procedure:

1. Open the rear compartment lid and remove the rear compartment lid applique retaining nuts.

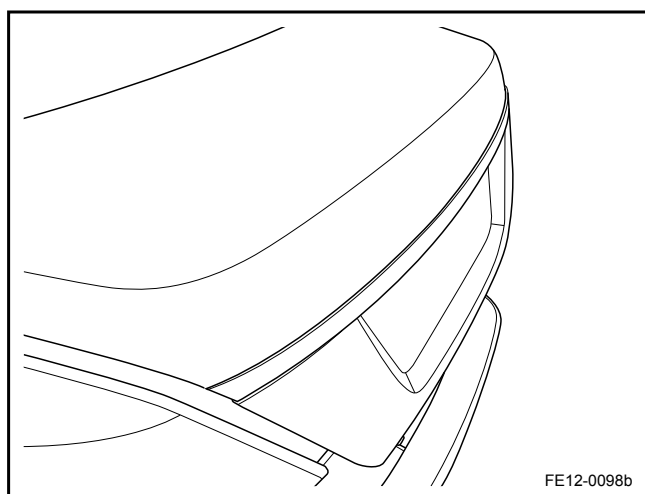


2. Remove the rear compartment lid.



#### Installation Procedure:

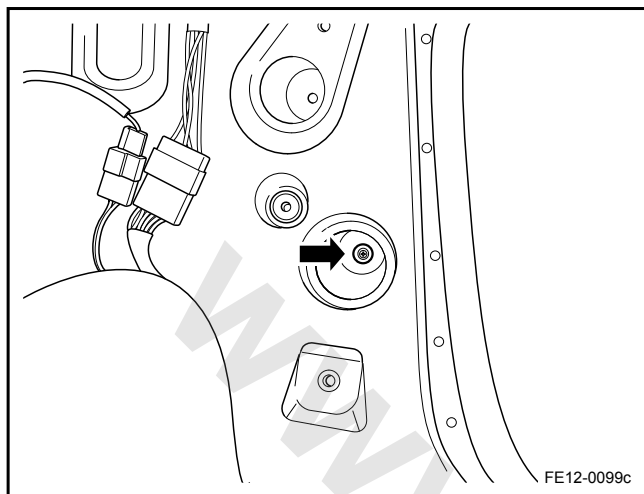
1. Install the rear compartment lid applique retaining nuts.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
2. Close the rear compartment lid.



### 12.10.1.5 Hatchback Outside ornament Panel replacement (Hatchback)

#### Removal Procedure:

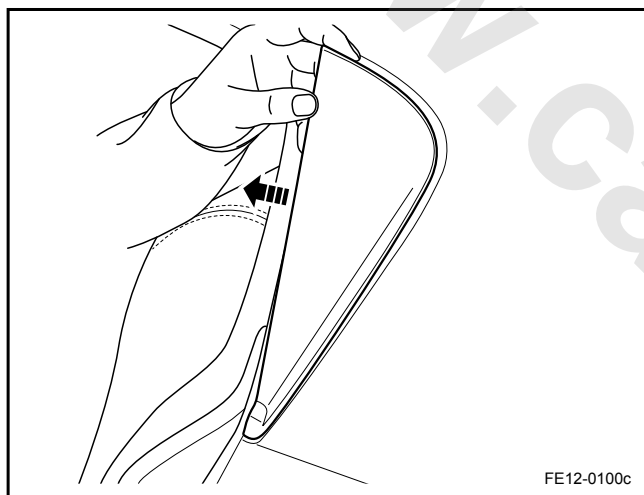
1. Remove the rear quarter upper trim panels. Refer to [12.9.1.10 Rear Compartment Trim Panel Replacement \(Hatchback\)](#).
2. Remove the hatchback outside ornament panel retaining screw.



3. Remove the hatchback outside ornament panel.

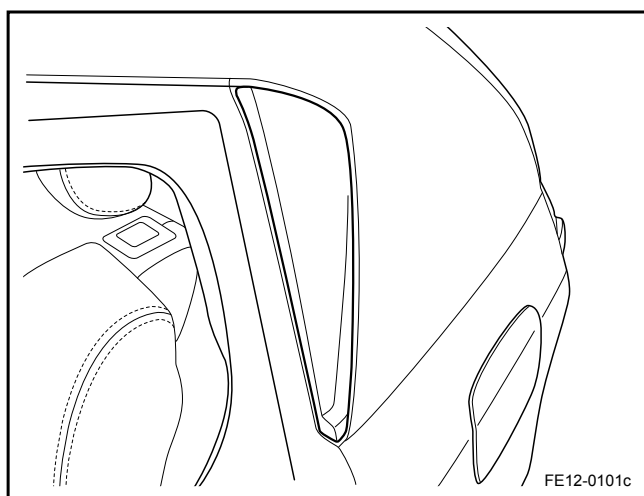
#### Note

The hatchback outside ornament panel back has a double-sided stick tape.



#### Installation Procedure:

1. Install and tighten the hatchback outside ornament panel retaining screw.  
Torque: 2 Nm (Metric) 1.5 lb-ft (US English)
2. Install the rear quarter upper trim panels.



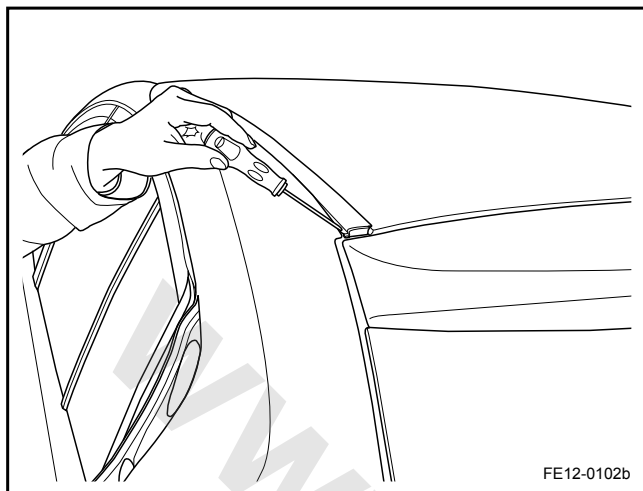
### 12.10.1.6 Roof Ornament Panel Replacement

#### Removal Procedure:

1. Use a flat blade screwdriver to remove the roof ornament panel.

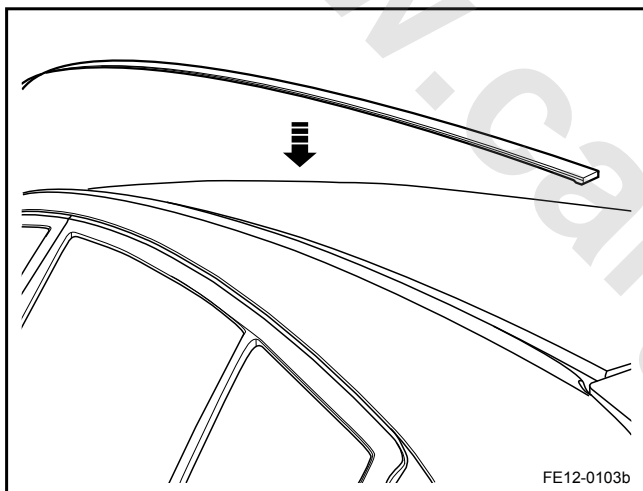
#### Note

Wrap the screwdriver blade with a tape to protect components.



#### Installation Procedure:

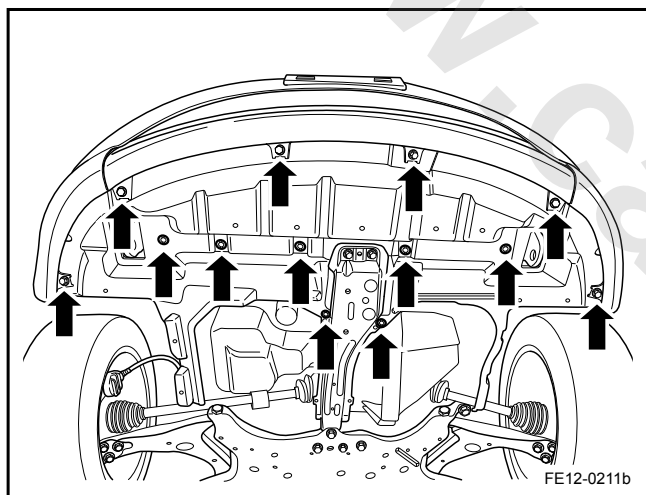
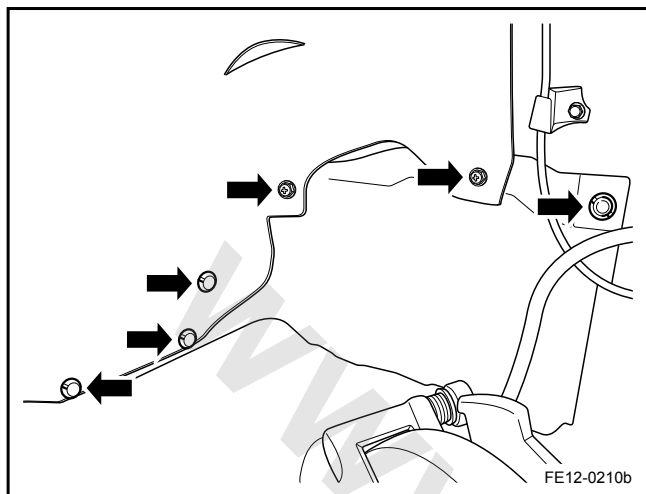
1. Install the roof ornament panel to the roof weld joint.



### 12.10.1.7 Left and Right Engine Bottom Shield Replacement

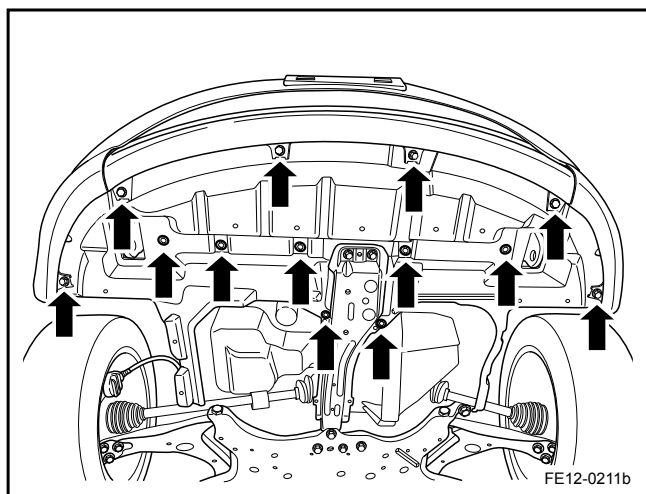
#### Removal Procedure:

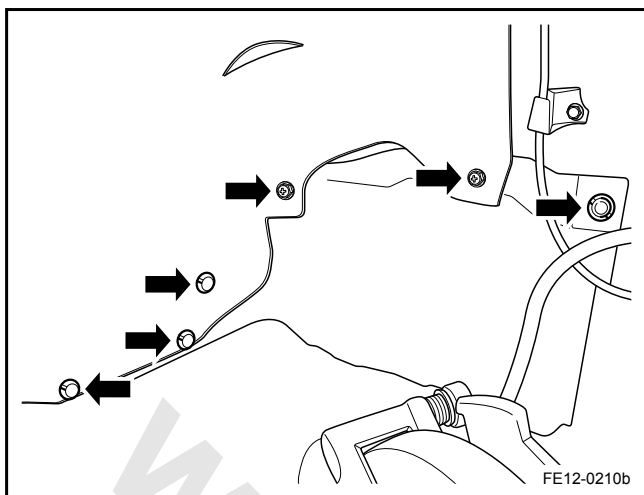
1. Lift and support the vehicle.
2. Remove the left and right engine bottom shield retaining screws and clips on both sides.
3. Remove all the engine bottom shield retaining screws and clips except one retaining clip to stabilize the engine bottom shield.
4. Use a hand to support the engine bottom shield and remove the last retaining clip.



#### Installation Procedure:

1. Install the right engine bottom shield and the retaining clips.
2. Install the left engine bottom shield and the retaining clips.



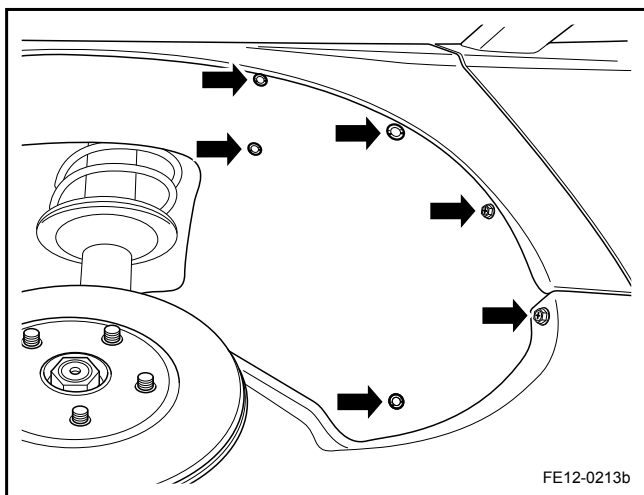
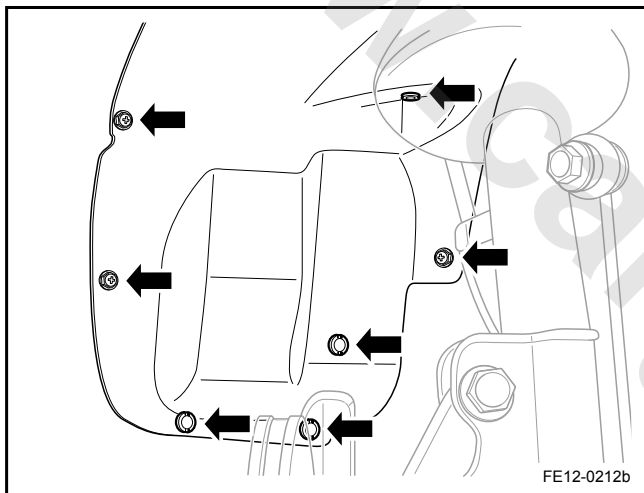


3. Install the right engine bottom shield retaining screws.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
4. Install the left engine bottom shield retaining screws.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
5. Lower the vehicle.

### 12.10.1.8 Front Wheelhouse Liner Replacement

Removal Procedure:

1. Remove the front wheel. Refer to [4.4.5.1 Wheel Replacement](#).
2. Remove the front wheelhouse liner front retaining screws and clips.
3. Remove the front wheelhouse liner rear retaining screws and clips and remove the front wheelhouse.



## Installation Procedure:

1. Install the front wheelhouse liner front retaining screws and clips.
2. Install the front wheelhouse liner rear retaining screws and clips.
3. Tighten the retaining screws.  
Torque: 10 Nm (Metric) 7.4 lb-ft (US English)
4. Install the front wheels.

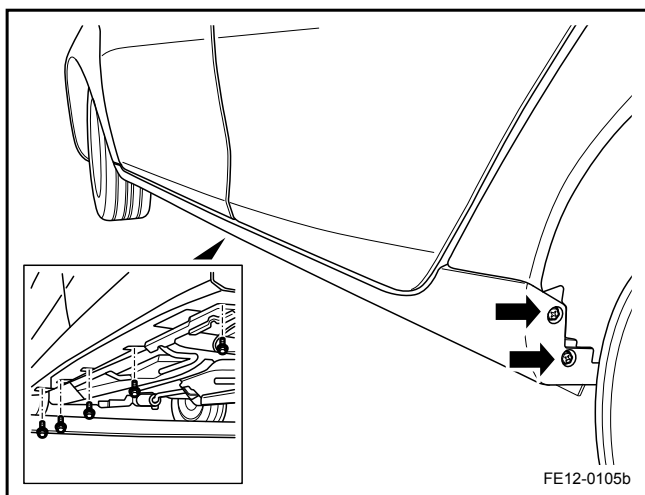
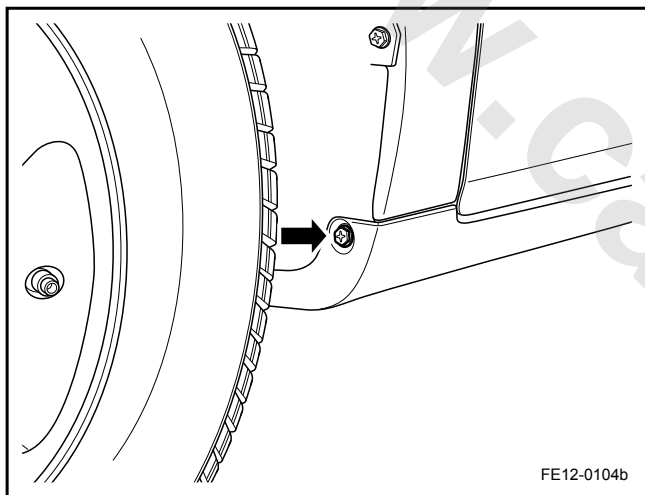
## Note

For rear wheelhouse liner replacement, please refer to the front wheelhouse liner replacement.

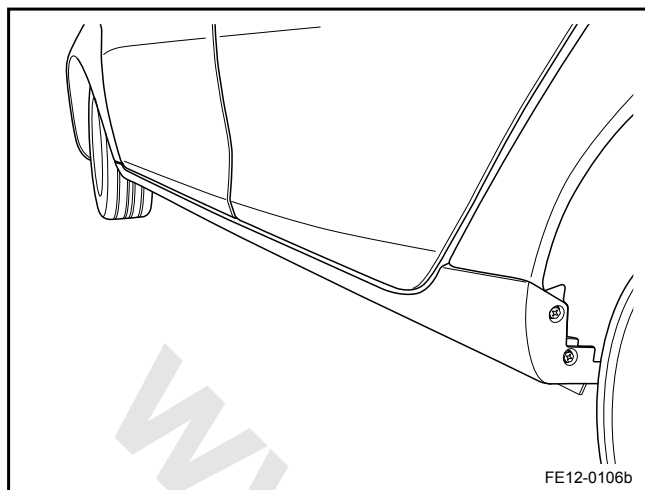
## 12.10.1.9 Rocker Panel Molding Replacement

## Removal Procedure:

1. lift and support the vehicle.
2. Remove the rocker panel molding front retaining screw.
3. Remove the rocker panel molding middle and rear retaining screws.
4. Detach the rocker panel molding bottom retaining clips and remove the rocker panel molding.





**Installation Procedure:**

1. Press the rocker panel molding to secure the bottom retaining clips.
2. Tighten the rocker panel molding retaining screws.

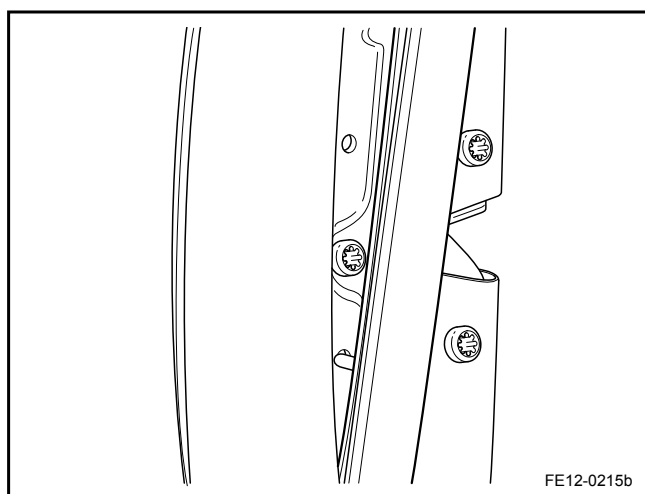
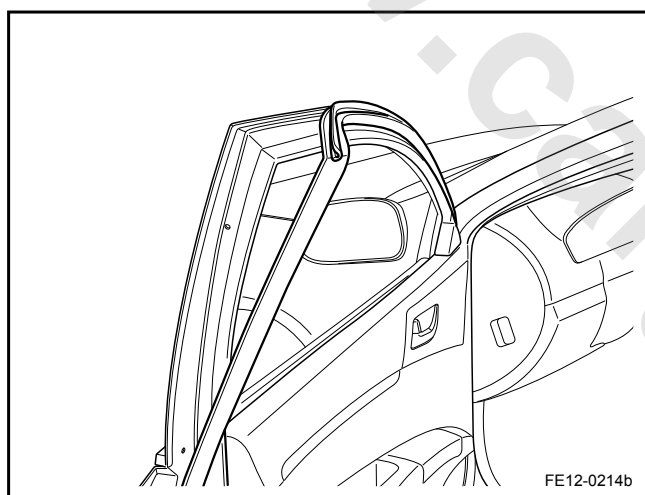
Torque: 12 Nm (Metric) 8.8 lb-ft (US English)

**Note**

Two technicians are needed for the rocker panel molding replacement.

**12.10.1.10 Vehicle Inner Side Seal Replacement****Removal Procedure:**

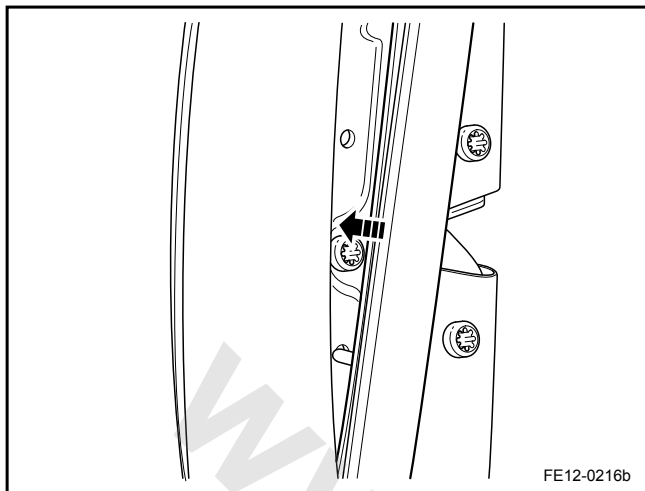
1. Remove the door seals.



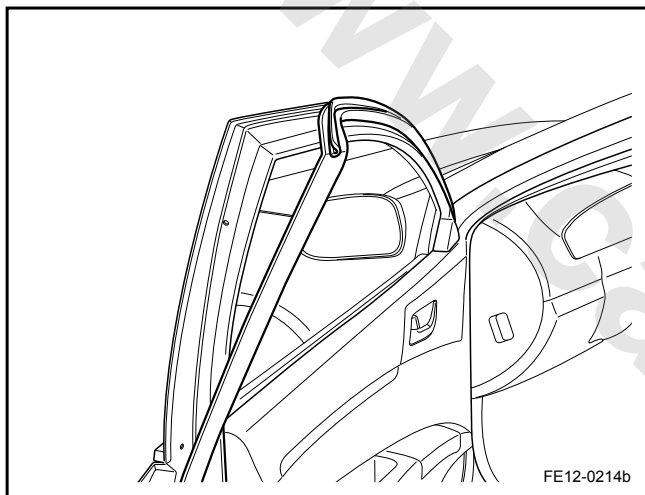
2. Remove the door seal strips side and rear retaining clips and remove the door seal strips.

Installation Procedure:

1. Install the door seal strips side and rear retaining clips.



2. Install the door seals to door seal strip slots.



## 12.11 Plastic Panel Information and Repair

### 12.11.1 Description and Operation

#### 12.11.1.1 Description and Operation

The current interior and exterior cover part materials are mainly modified PP, ABS, PC + ABS, PVC (artificial leather material), all of which are thermoplastic materials or modified thermoplastic materials. Some interior and exterior non-cover part materials are POM, PA type and HDPE type materials. Thermosetting plastics are rarely used in interior and exterior parts. Only the ashtray is made from thermosetting plastics. Thermosetting plastics are mainly used in electrical and electronic structural components. Ideally the thermoplastic components are repaired with a hot iron welding, but usually the thermoplastic components are replaced. Thermosetting plastics can be repaired with epoxy resin, or other more rigid two-component repair materials. This chapter is only a brief introduction to its repair practices and repair is not recommended.

#### Plastic Types:

Thermosetting plastic is defined as a type of plastic that can be cured or have insoluble (melt) properties when heated, such as phenolic, epoxy plastics. Thermoplastic is defined as a type of plastic that can be repeatedly hardened after heated and soften after cooled within a specific temperature, such as polyethylene, PTFE and etc. Thermoplastics and thermosetting plastics can be either hard plastics or soft plastics.

### 12.11.2 Removal and Installation

#### 12.11.2.1 Plastic Repair Notices

1. Apply protective cream to any exposed skin to avoid skin irritation.
2. Wear rubber gloves.
3. When use compressed air or sanding, wear protective goggles.
4. Remove any mixture that comes into contact with skin immediately, as the mixture will become solid very quickly.
5. When grinding or sanding, wear a dust mask and protective goggles.
6. Wash the skin with cold water to minimize irritation caused by resin dust.
7. Avoid dropping repair materials onto clothes.
8. Use repair materials in a well ventilated environment, as the dust produced during repairs is toxic.
9. After use, close all the repair material containers. Dust or moisture will contaminate the repair materials and weaken the repair quality.

#### 12.11.2.2 Thermosetting Plastic Dent Repair

1. Clean the area to be repaired.
2. Heat the dent part with a blower until the appropriate tools can be used to press flat the dent.
3. Grind the dent area with sandpaper/emery paper.
4. Clean the dent area with cleaning agent and leave it dry 5 min.
5. Apply a thin layer of adhesive and leave it dry 10 min.
6. Fill the uneven surface with adhesive and smooth out with putty knife.
7. Use an infrared light to accelerate the curing process and raise the temperature to 60-70°C (140-158 °F), heat 15 min.
8. Polish the dent area with sanding paper.
9. Remove dust debris.
10. Apply a thin layer of adhesive and leave it dry 10 min.
11. Restore the plastic surface according to the plastic surface repair process.

#### 12.11.2.3 Thermosetting Plastic Scratch Repair

1. Clean the area to be repaired.

2. Use sanding paper to remove protruding material.
3. Clean the area with cleaning agent and leave it dry 5 min.
4. Apply a thin layer of adhesive and leave it dry 10 min.
5. Fill the uneven surface with adhesive and smooth out with putty knife.
6. Use an infrared light to accelerate the curing process and raise the temperature to 60-70°C (140-158 °F), heat 15 min.
7. Polish the dent area with sanding paper.
8. Remove dust debris.
9. Apply a thin layer of adhesive and leave it dry 10 min.
10. Restore the plastic surface according to the plastic surface repair process.

#### 12.11.2.4 Thermosetting Plastic Crack Repair (length less than 100 mm)

1. Clean the area to be repaired.
2. Pry open the crack tip 5 mm (0.19 in) long, and polish it into a V-shape crack to eliminate stress and protruding materials.
3. Clean the area with cleaning agent and leave it dry 5 min.
4. Apply a thin layer of adhesive and leave it dry 10 min.
5. Apply the adhesive to the back of the repair part, overlapping the damaged part at least 20 mm (0.79 in).
6. Use an infrared light to accelerate the curing process and raise the temperature to 60-70°C (140-158 °F), heat 15 min.
7. Fill the crack area with adhesive and smooth out with putty knife.
8. Use an infrared light to accelerate the crack tip curing process.
9. Polish the dent area with sanding paper.
10. Apply a thin layer of adhesive and leave it dry 10 min.
11. Remove dust debris.
12. Apply a thin layer of adhesive and leave it dry 10 min.
13. Restore the plastic surface according to the plastic surface repair process.

## 12.12 Collision Repair

### 12.12.1 Specifications

#### 12.12.1.1 Collision Repair Materials

Vehicle body collisions will lead to structural deformation, metal penel cracking and solder joints seal off. Collisions will also cause damage to the engine, chassis and other components.

To carry out body collision repair, materials such as adhesives, sealants, anti-loose agent, surface protection materials, anti-corrosion materials and other chemical materials may be used. Please strictly follow the product instructions, scope of use and the standard operation instructions. During the body repair process, choose repair materials that suit the application. The following table lists the repair materials that maybe used in the body repairs for reference.

Products	Type	Application	Recommended Model
Body Sealant	Single Unit Polyurethane	Body skin, interior and exterior trim panels, body structure and other components bonding. This seal has a strong cohesive force. It also has good adhesion with metal and a variety of lacquer and so on have a good adhesion.	Tianshan Kesaisi New: 1922,1923
Seam Sealant	Single Unit Polyurethane Based	1. Room temperature curing adhesive used for sealing the body welds. 2. Room temperature curing adhesive used for doors, hood and trunk (hatchback) hem.	China's Auto Parts and Accessory Corp: C8802
Anti-Collision Primer	Rubber and Resin	Cured at room temperature, form a layer of anti-collision coating under the vehicle body. Around the wheelhouse form a layer of permanently elastic anti-aging, anti-corrosion protection coating, crack free at low temperature. These products can replace PVC coating with excellent anti-rust, noise, anti-stoning, anti-oxidation, protective coating and other functions.	China's Auto Parts and Accessory Corp: C312DW
Windshield Sealant	Single Unit Polyurethane	Room temperature curing polyurethane adhesives for the automotive window direct bonding, sealing. The adhesive has excellent adhesion properties, and it reacts with moisture in the air to become solid and has high strength, anti-aging, anti-vibration fatigue, low temperature resistant and non-corrosive characteristics.	China's Auto Parts and Accessory Corp: C8802 Tianshan Kesaisi New: 1956,1924
Primer	-	The primer is applied before applying glue on the windshield and the body and, so that the windshield glass and the body are firmly bonded.	-
Cleaner	-	Clean all floor coatings and surfaces contacting adhesives.	-
Pressure Sensitive Tape	Acrylic Acid Tape	Used as the anti-scratch panels, nameplates, shield, fenders, door protection, a variety of decorative body adhesive strips. This tape has excellent weathering resistance and durability.	3M 4229P, 4215,4221 L

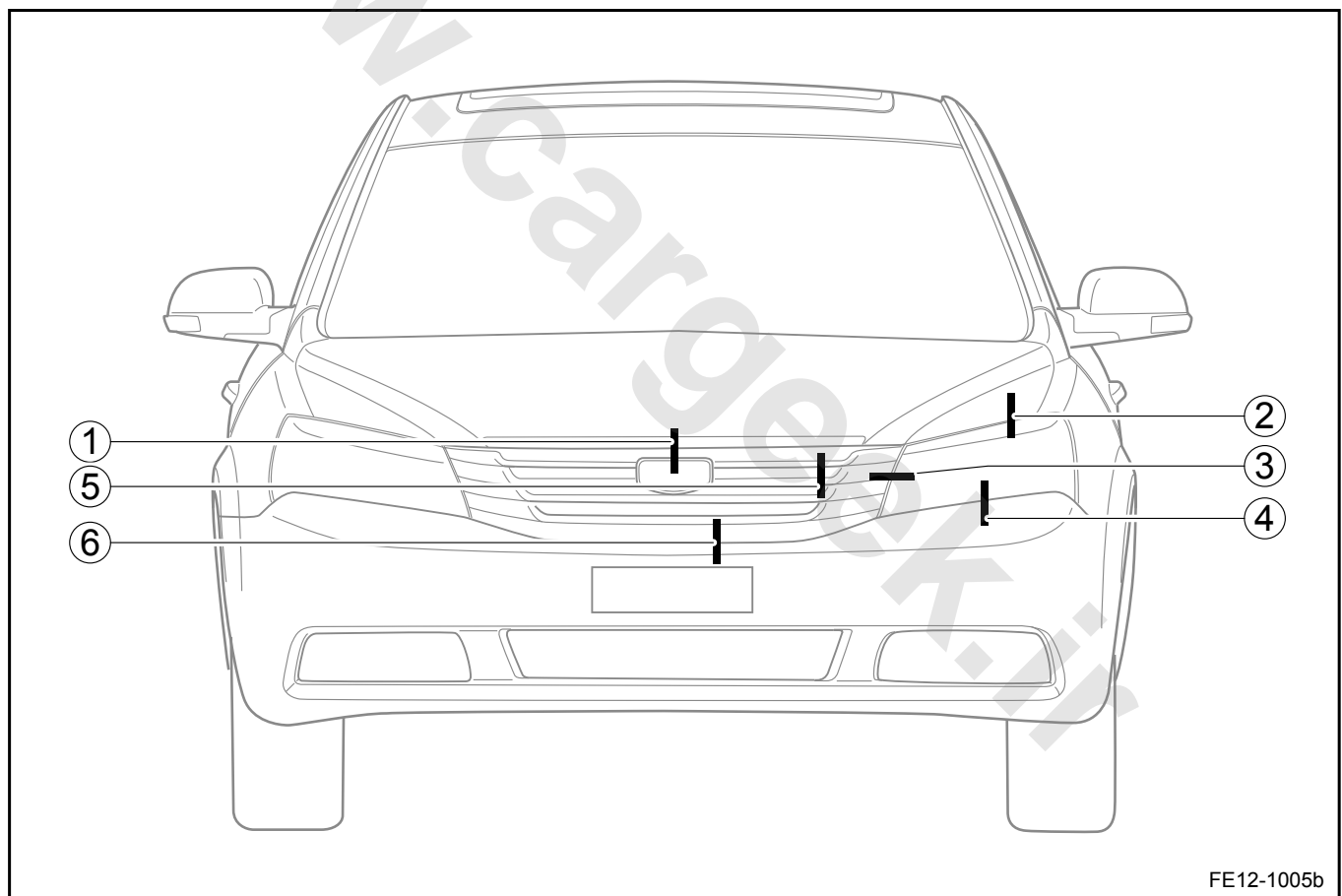
Heat-Sensitive Adhesive Tape	Acrylic Acid Tape	Mainly used in automotive rubber seal system. This material has a strong binding force and strong sealing performance, to avoid the bonding clearance changes and corrosions.	3M 4237P
Tape Glue	-	According to different bonding surfaces, choose different glue. Bonded surfaces should be clean, dry thoroughly. Brush the glue to the mating surface evenly. When the glue is dry, it has a strong adhesion.	3M C-100, K-500/520, N-200

### 12.12.1.2 Body Surface Clearance and Tolerance (Sedan)

— Clearance is always measured with the mm/inch unit.

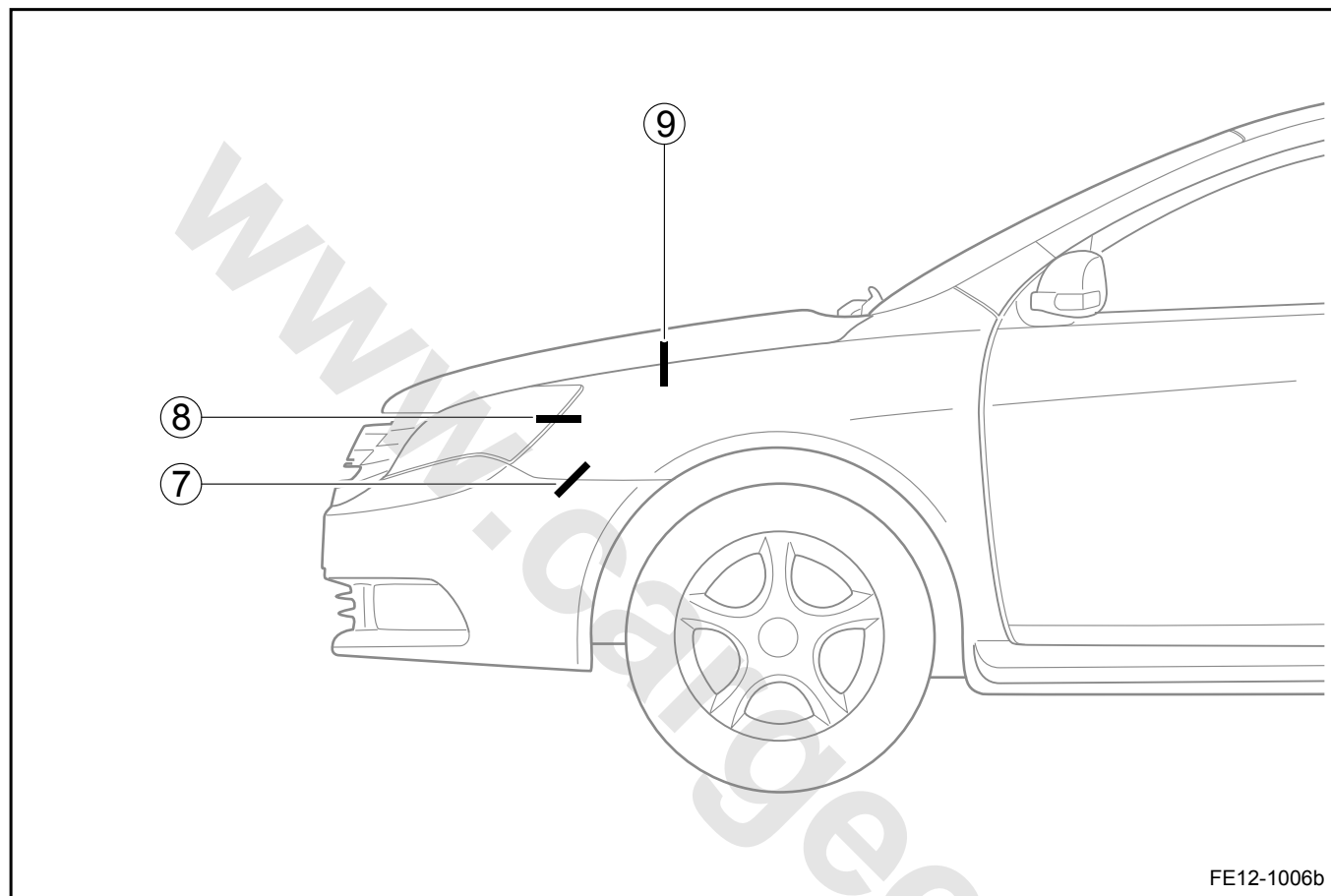
- To adjust or check the clearance, you should use a plastic clearance adjustment ruler.

#### Engine Assembly and Surrounding Surfaces Clearance and Tolerance



Serial Number	Panel	Adjacent Panel	Specifications	
			Clearance	Tolerance
1	Hood Outer Panel	Hood Ornament	$-0.25 \pm 0.25/-0.01 \pm 0.01$	$-0.25 \pm 0.25/-0.01 \pm 0.01$
2	Hood Outer Panel	Headlamp	$5.0 \pm 1.0/0.2 \pm 0.04$	$-1.5 \pm 1.0/-0.06 \pm 0.04$

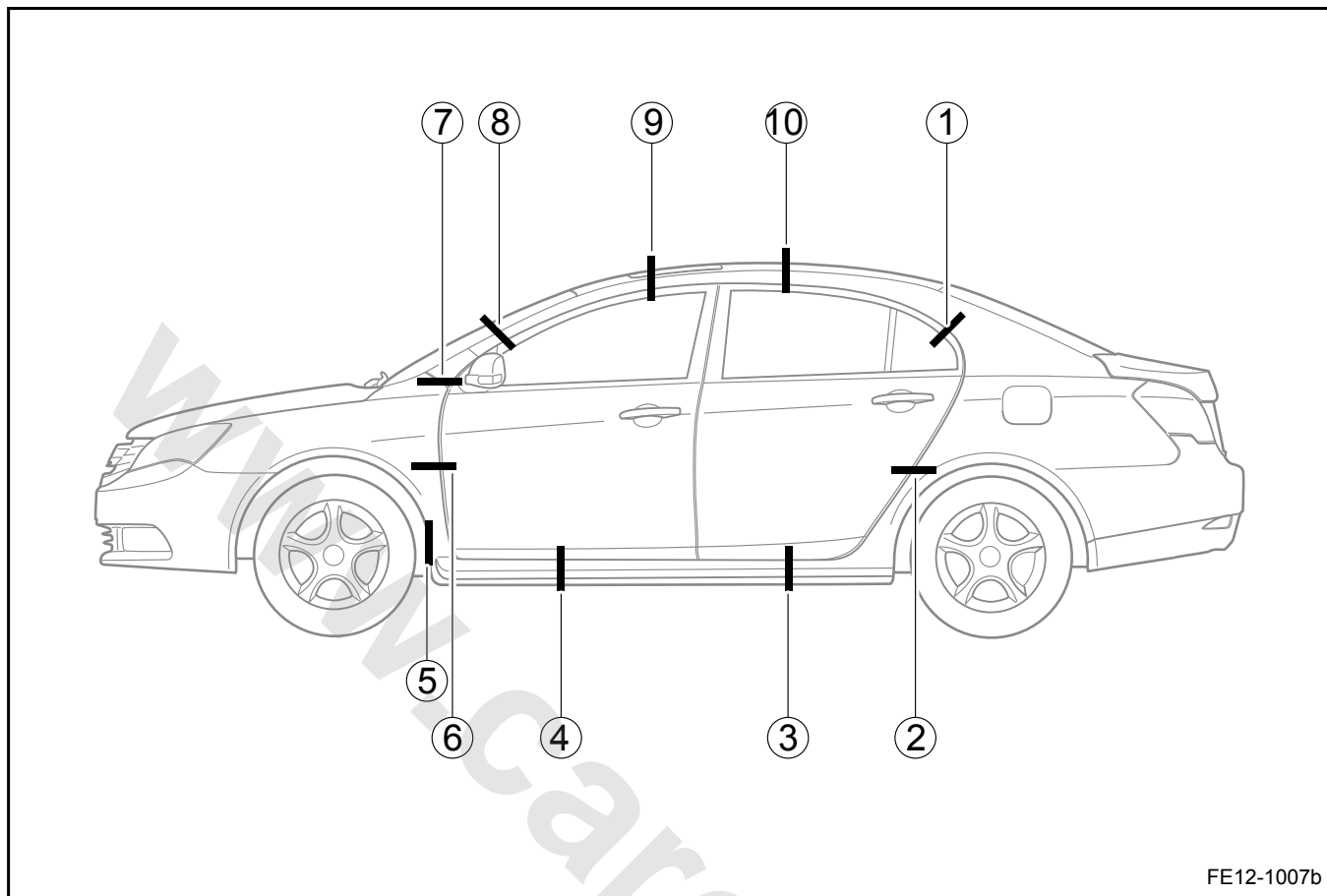
3	Radiator Grille	Headlamp	$3.0 \pm 1.5/0.12 \pm 0.06$	$-2.0 \pm 2.0/-0.08 \pm 0.08$
4	Headlamp	Front Bumper	$2.5 \pm 1.8/0.1 \pm 0.07$	$-1.0 \pm 1.0/-0.04 \pm 0.04$
5	Hood Ornament	Radiator Grille	$5.0 \pm 1.0/0.2 \pm 0.04$	$-1.5 \pm 1.5/-0.06 \pm 0.06$
6	Front Bumper	Radiator Grille	$1.0 \pm 1.0/0.04 \pm 0.04$	$-1.0 \pm 1.0/-0.04 \pm 0.04$



Serial Number	Panel	Adjacent Panel	Specifications	
			Clearance	Tolerance
7	Front Fender	Front Bumper	$0.5 \pm 0.5/0.02 \pm 0.02$	$0 \pm 1.5 / 0 \pm 0.06$
8	Front Fender	Headlamp	$1.5 \pm 1.0/0.06 \pm 0.04$	$0 \pm 0.7 / 0 \pm 0.03$
9	Front Fender	Hood	$3.5 \pm 1.0/0.14 \pm 0.04$	$0.75 \pm 0.75/0.03 \pm 0.03$



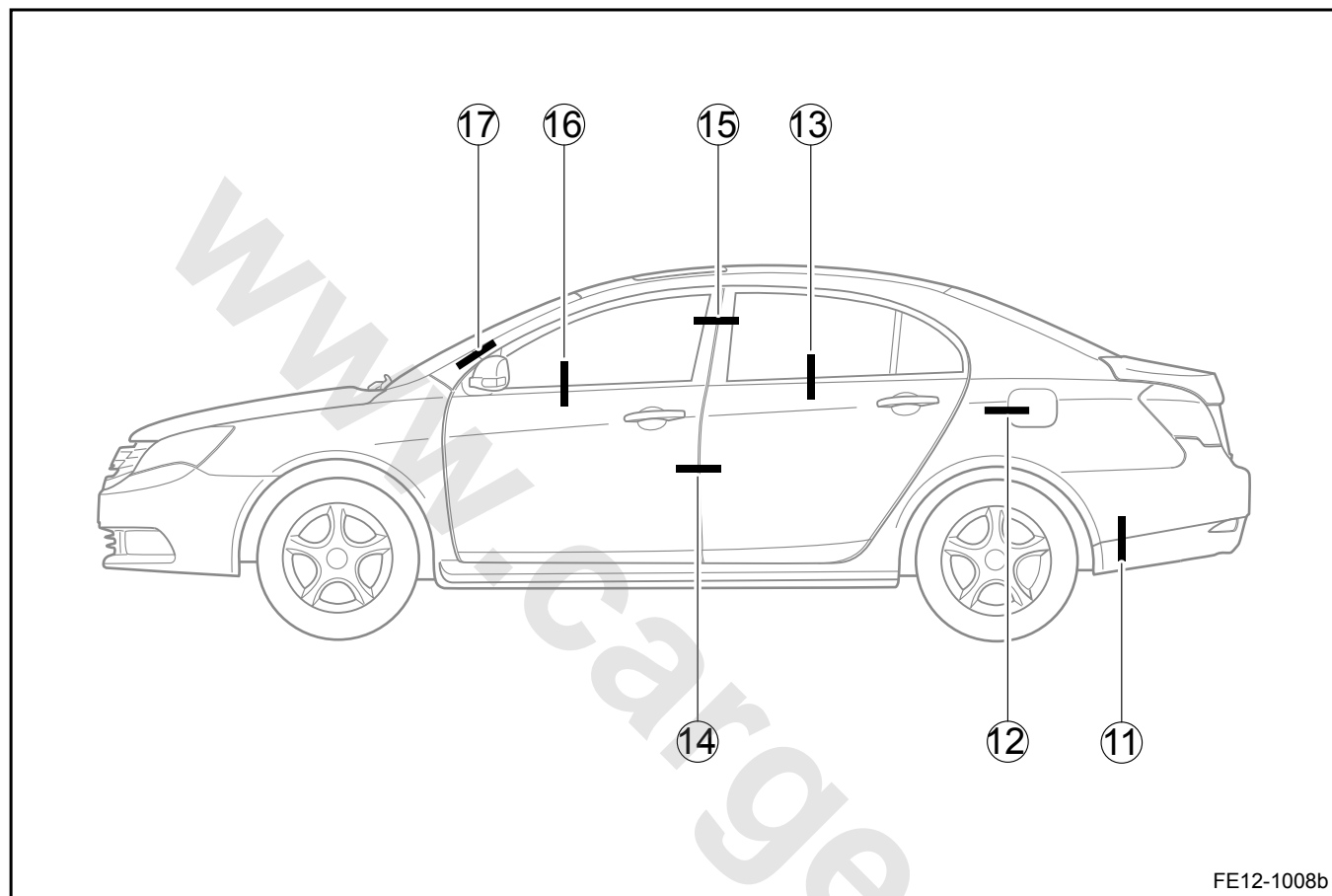
## Front and Rear Doors and Surrounding Surfaces Clearance and Tolerance



FE12-1007b

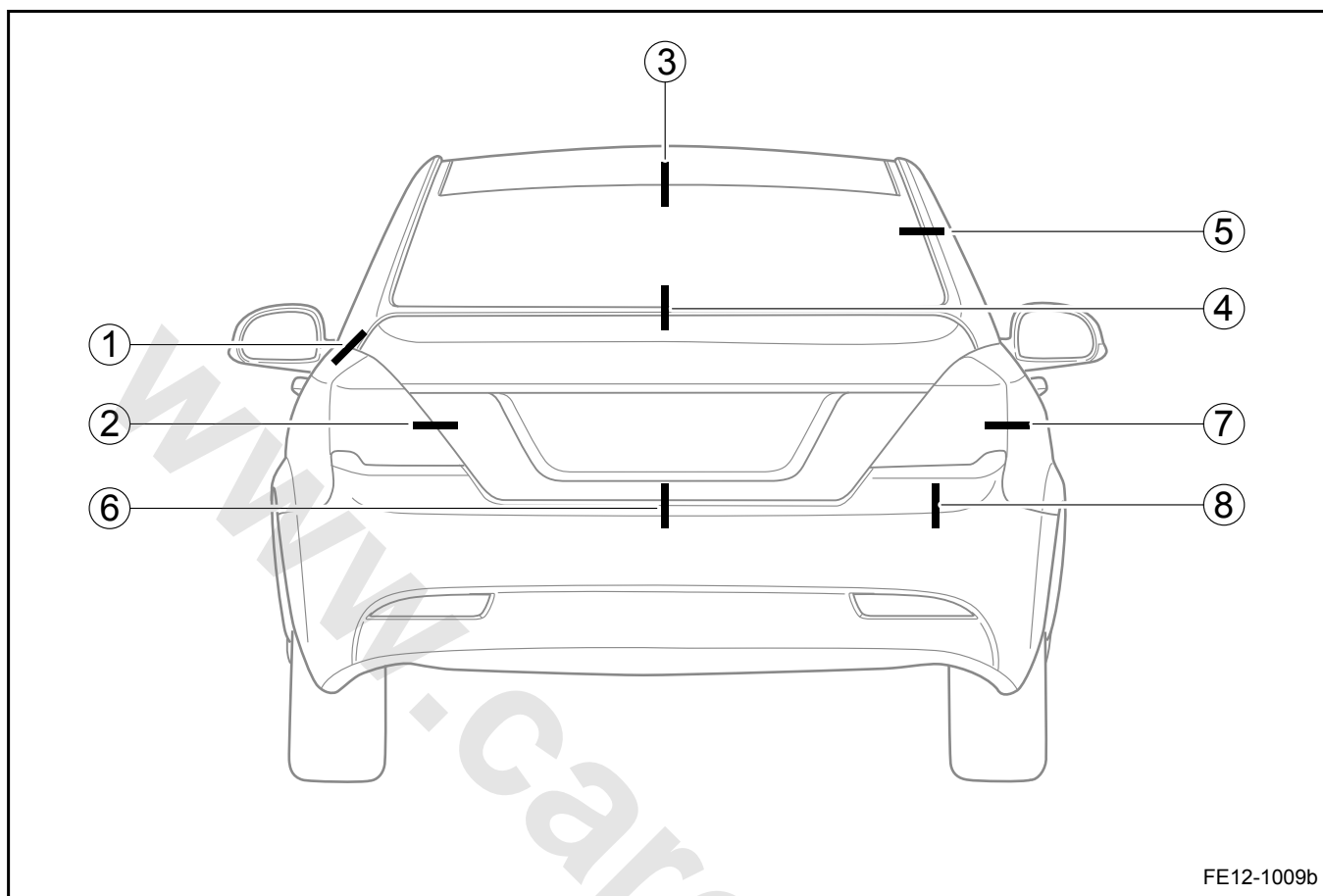
Serial Number	Panel	Adjacent Panel	Specifications	
			Clearance	Tolerance
1	Rear Door Frame Outer Panel	Side Outer Panel	$5.0 \pm 1.0/0.2 \pm 0.04$	$3.0 \pm 1.0/0.12 \pm 0.04$
2	Rear Door Outer Panel	Side Outer Panel	$4.0 \pm 1.0/0.16 \pm 0.04$	$0.25 \pm 0.75/0.01 \pm 0.03$
3	Rear Door Outer Panel	Rocker Panel Molding	$5.0 \pm 1.5/0.2 \pm 0.06$	$3.5 \pm 1.5/0.14 \pm 0.06$
4	Front Door Outer Panel	Rocker Panel Molding	$5.0 \pm 1.5/0.2 \pm 0.06$	$3.5 \pm 1.5/0.14 \pm 0.06$
5	Front Fender	Side Outer Panel	$0.75 \pm 0.75/0.03 \pm 0.03$	$-0.5 \pm 1.0/0.02 \pm 0.04$
6	Front Door Outer Panel	Front Fender	$4.0 \pm 1.0/0.16 \pm 0.04$	$0.25 \pm 0.75/0.01 \pm 0.03$
7	Front Fender	Outside Rearview Mirror Mounting Panel	$5.0 \pm 1.0/0.2 \pm 0.04$	$0 \pm 1.5 / 0 \pm 0.06$
8	Front Door Frame Outer Panel	Side Outer Panel	$5.0 \pm 1.0/0.2 \pm 0.04$	$3.0 \pm 1.0/0.12 \pm 0.04$

9	Front Door Frame Outer Panel	Side Outer Panel	$5.0 \pm 1.0/0.2 \pm 0.04$	$3.0 \pm 1.0/0.12 \pm 0.04$
10	Rear Door Frame Outer Panel	Side Outer Panel	$5.0 \pm 1.0/0.2 \pm 0.04$	$3.0 \pm 1.0/0.12 \pm 0.04$



Serial Number	Panel	Adjacent Panel	Specifications	
			Clearance	Tolerance
11	Side Outer Panel	Rear Bumper	$0.5 \pm 0.5/0.02 \pm 0.02$	$0 \pm 1.5 / 0 \pm 0.06$
12	Side Outer Panel	Fuel Filler Lid Outer Panel	$3.5 \pm 1.0/0.14 \pm 0.04$	$-0.25 \pm 1.25/-0.01 \pm 0.05$
13	Rear Door Outer Panel	Rear Window Seal Strip	$-0.25 \pm 0.25/-0.01 \pm 0.01$	-
14	Front Door Outer Panel	Rear Door Outer Panel	$4.0 \pm 1.0/0.16 \pm 0.04$	$0.25 \pm 0.75/0.01 \pm 0.03$
15	Front Door Frame	Front Door Frame	$4.0 \pm 1.0/0.16 \pm 0.04$	$0.25 \pm 0.75/0.01 \pm 0.03$
16	Front Door Outer Panel	Front Window Seal Strip	$-0.25 \pm 0.25/-0.01 \pm 0.01$	-
17	Front Door Outer Panel	Front Fender	$1.5 \pm 1.0/0.06 \pm 0.04$	$-0.25 \pm 1.25/-0.01 \pm 0.05$

## Rear Compartment Assembly and Surrounding Surfaces Clearance and Tolerance



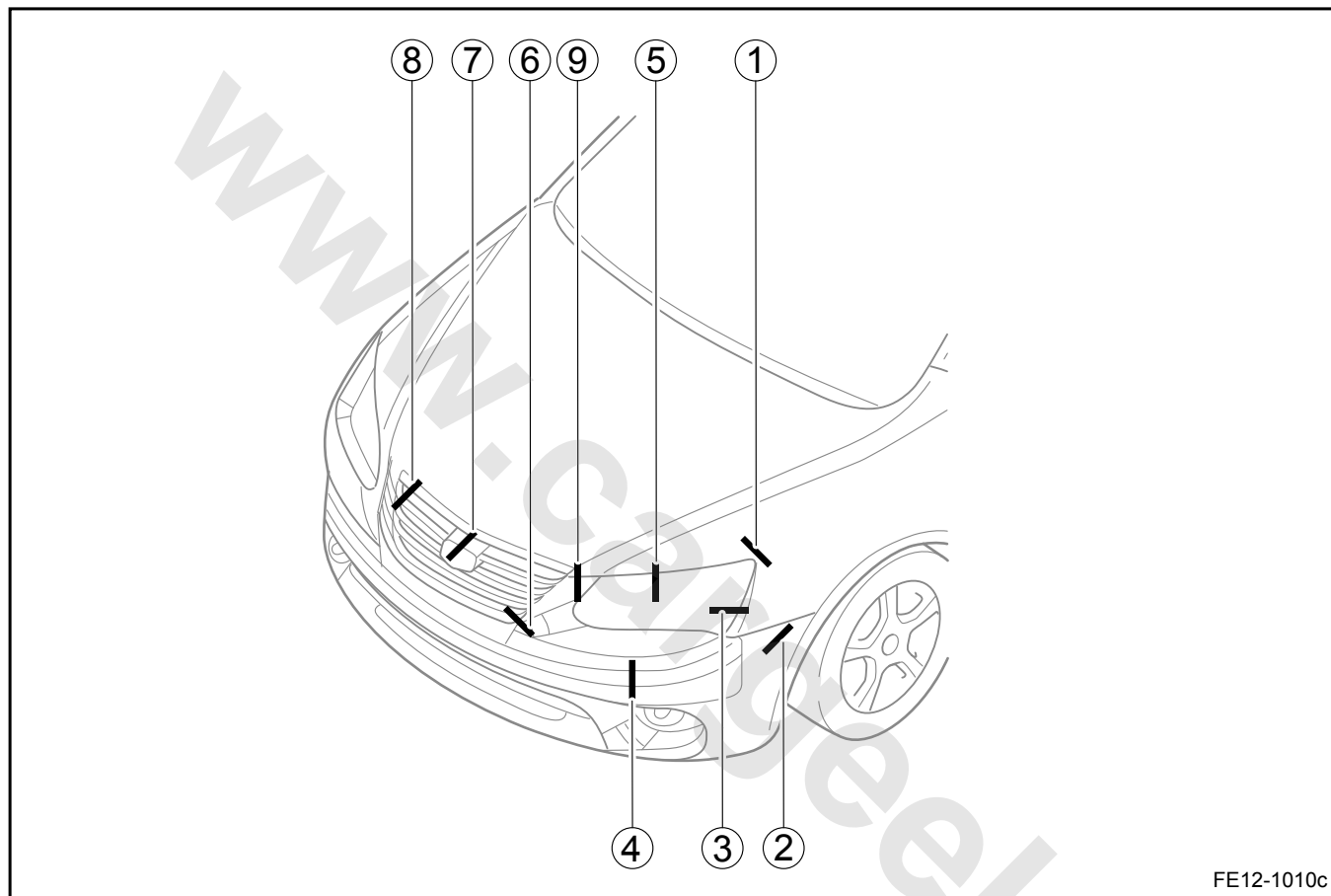
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Serial Number	Panel	Adjacent Panel	Specifications	
			Clearance	Tolerance
1	Rear Compartment Lid Outer Panel	Side Outer Panel	$4.0 \pm 1.0/0.2 \pm 0.04$	$0.75 \pm 0.75/0.03 \pm 0.03$
2	Rear Compartment Lid Outer Panel	Tail Lamp	$4.0 \pm 1.0/0.16 \pm 0.04$	$1.0 \pm 1.0/0.04 \pm 0.04$
3	Roof Outer Panel	Rear Window	$5.0 \pm 1.5/0.2 \pm 0.06$	$-2.5 \pm 1.5/-0.1 \pm 0.06$
4	Rear Compartment Lid Outer Panel	Rear Window	$11.0 \pm 1.2/0.43 \pm 0.05$	-
5	Side Outer Panel	Rear Window	$5.0 \pm 1.5/0.2 \pm 0.06$	-
6	Rear Compartment Lid Outer Panel	Rear Bumper	$6.0 \pm 1.5/0.24 \pm 0.06$	-
7	Side Outer Panel	Tail Lamp	$2.0 \pm 1.0/0.08 \pm 0.04$	$1.5 \pm 1.0/0.06 \pm 0.04$
8	Tail Lamp	Rear Bumper	$2.0 \pm 1.0/0.08 \pm 0.04$	$0 \pm 1.0/0 \pm 0.04$

### 12.12.1.3 Body Surface Clearance and Tolerance (Hatchback)

- To adjust or check the clearance, you should use a plastic clearance adjustment ruler.
- Clearance is always measured with the mm/inch unit.

#### Engine Compartment Assembly and Surrounding Surfaces Clearance and Tolerance

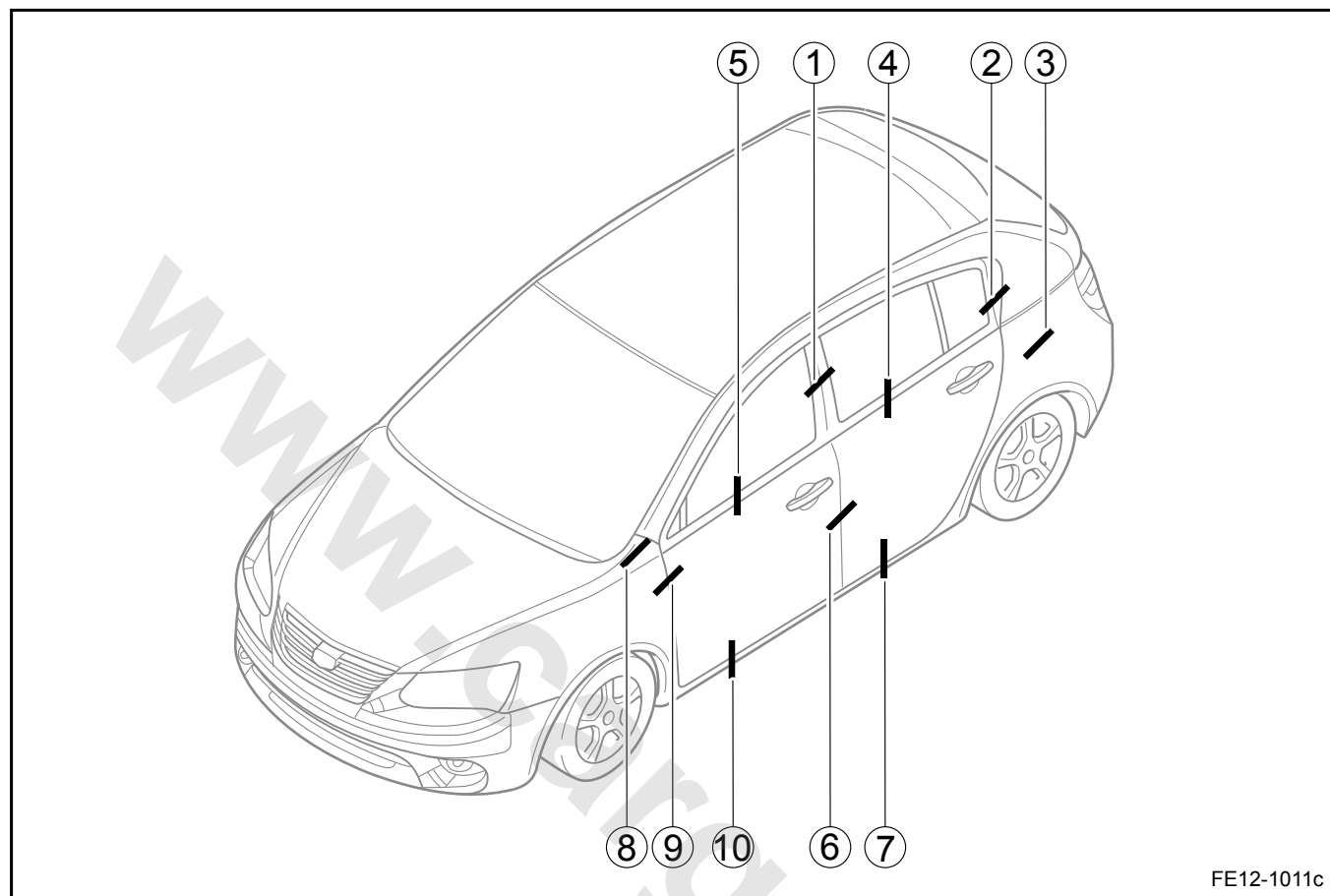


FE12-1010c

Serial Number	Panel	Adjacent Panel	Specifications	
			Clearance (mm/in)	Tolerance (mm/in)
1	Front Fender	Hood Outer Panel	$3.5 \pm 1.0/0.14 \pm 0.04$	$0.75 \pm 0.75/0.03 \pm 0.03$
2	Front Fender	Front Bumper	$0.5 \pm 0.5/0.02 \pm 0.02$	$0 \pm 1.5/0 \pm 0.06$
3	Front Fender	Headlamp	$1.5 \pm 1.0/0.06 \pm 0.04$	$-0.85 \pm 0.85/-0.03 \pm 0.03$
4	Headlamp	Front Bumper	$2.5 \pm 1.8/0.1 \pm 0.07$	$-1.2 \pm 1.2/-0.05 \pm 0.05$
5	Hood Outer Panel	Headlamp	$5.0 \pm 1.0/0.2 \pm 0.04$	$-1.5 \pm 1.0/-0.06 \pm 0.04$
6	Radiator Grille	Front Bumper	$3.0 \pm 1.5/0.12 \pm 0.06$	$2.0 \pm 1.0/0.1 \pm 0.04$
7	Hood Ornament	Radiator Grille	$3.0 \pm 1.5/0.12 \pm 0.06$	$2.5 \pm 1.5/0.1 \pm 0.06$
8	Hood Outer Panel	Hood Ornament	$-0.25 \pm 0.25/-0.01 \pm 0.01$	$-0.25 \pm 0.25/-0.01 \pm 0.01$

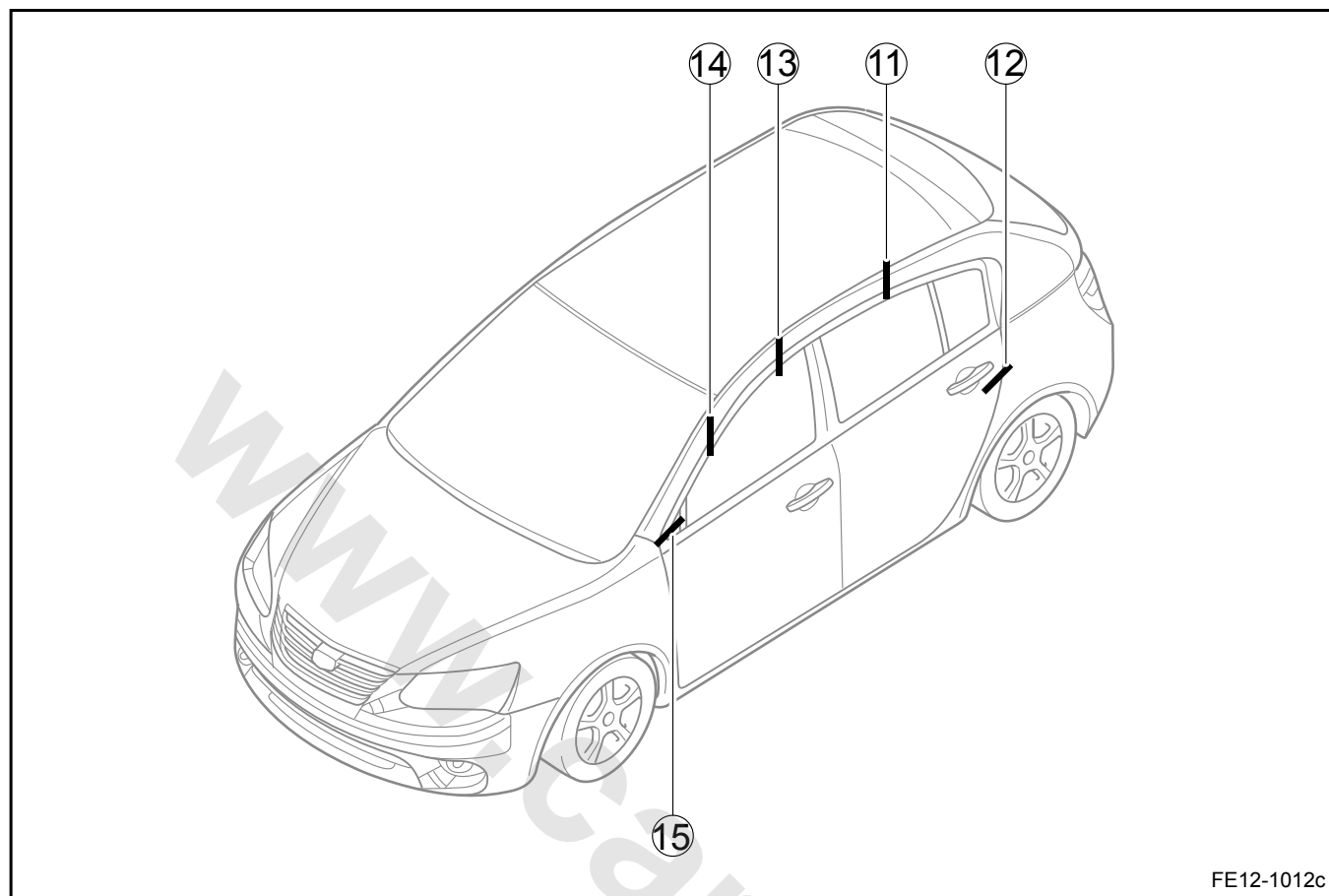
9	Front Bumper	Hood Outer Panel	$7.5 \pm 1.0/0.3 \pm 0.04$	$4.0 \pm 1.0/0.16 \pm 0.04$
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## Front and Rear Doors and Surrounding Surfaces Clearance and Tolerance



FE12-1011c

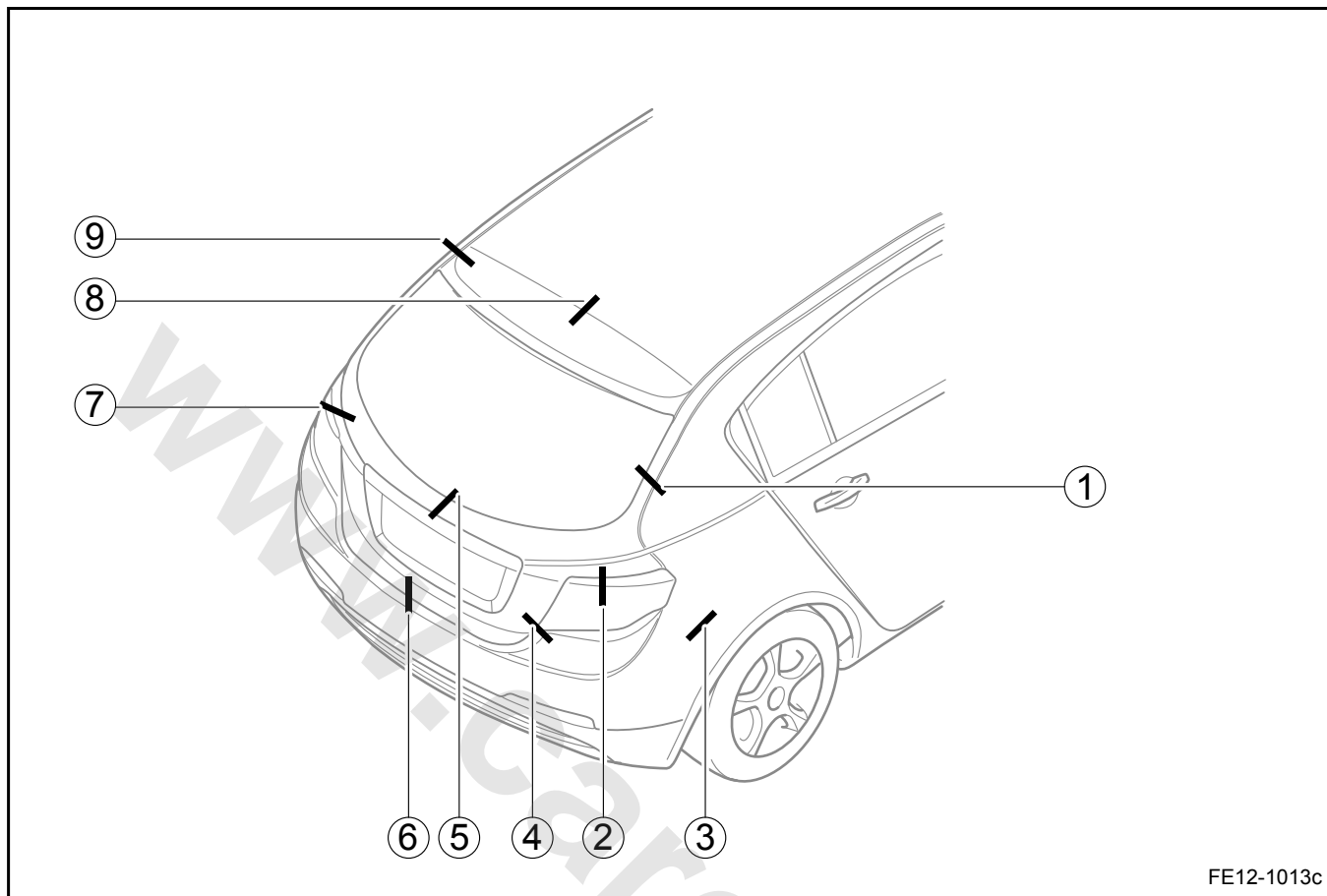
Serial Number	Panel	Adjacent Panel	Specifications	
			Clearance (mm/in)	Tolerance (mm/in)
1	Front Door Frame	Rear Door Frame	$4.0 \pm 1.0/0.16 \pm 0.04$	$0.25 \pm 0.75/0.01 \pm 0.03$
2	Rear Door Outer Panel	Side Outer Panel	$5.0 \pm 1.0/0.2 \pm 0.04$	$3.0 \pm 1.0/0.12 \pm 0.04$
3	Side Outer Panel	Fuel Filler Lid Outer Panel	$3.5 \pm 1.0/0.14 \pm 0.04$	$-0.75 \pm 1.25/-0.03 \pm 0.05$
4	Rear Door Outer Panel	Rear Window Seal Strip	$2.5 \pm 1.8/0.1 \pm 0.07$	-
5	Front Door Outer Panel	Front Window Seal Strip	$5.0 \pm 1.0/0.2 \pm 0.04$	-
6	Front Door Outer Panel	Rear Door Outer Panel	$4.0 \pm 1.0/0.16 \pm 0.04$	$0.25 \pm 0.75/0.01 \pm 0.03$
7	Rear Door Outer Panel	Rocker Panel Molding	$5.0 \pm 1.5/0.2 \pm 0.06$	$3.5 \pm 1.5/0.14 \pm 0.06$
8	Side Outer Panel	Front Fender	$1.5 \pm 1.0/0.06 \pm 0.04$	$-0.5 \pm 1.0/-0.02 \pm 0.04$
9	Front Door Outer Panel	Front Fender	$4.0 \pm 1.0/0.16 \pm 0.04$	$0.25 \pm 0.75/0.01 \pm 0.03$
10	Front Door Outer Panel	Rocker Panel Molding	$5.0 \pm 1.5/0.2 \pm 0.06$	$3.5 \pm 1.5/0.14 \pm 0.06$



FE12-1012c

Serial Number	Panel	Adjacent Panel	Specifications	
			Clearance (mm/in)	Tolerance (mm/in)
11	Rear Door Frame Outer Panel	Side Outer Panel	$5.0 \pm 1.0/0.2 \pm 0.04$	$5.0 \pm 1.0/0.2 \pm 0.04$
12	Rear Door Outer Panel	Side Outer Panel	$4.0 \pm 1.0/0.16 \pm 0.04$	$0.25 \pm 0.75/0.01 \pm 0.03$
13	Front Door Frame Outer Panel	Side Outer Panel	$5.0 \pm 1.0/0.2 \pm 0.04$	$3.0 \pm 1.0/0.12 \pm 0.04$
14	Front Door Frame Outer Panel	Side Outer Panel	$5.0 \pm 1.0/0.2 \pm 0.04$	$3.0 \pm 1.0/0.12 \pm 0.04$
15	Front Fender	Outside Rearview Mirror Mounting Panel	$5.0 \pm 1.0/0.2 \pm 0.04$	$-0.5 \pm 1.0/-0.02 \pm 0.04$

## Hatchback Assembly and Surrounding Surfaces Clearance and Tolerance



FE12-1013c

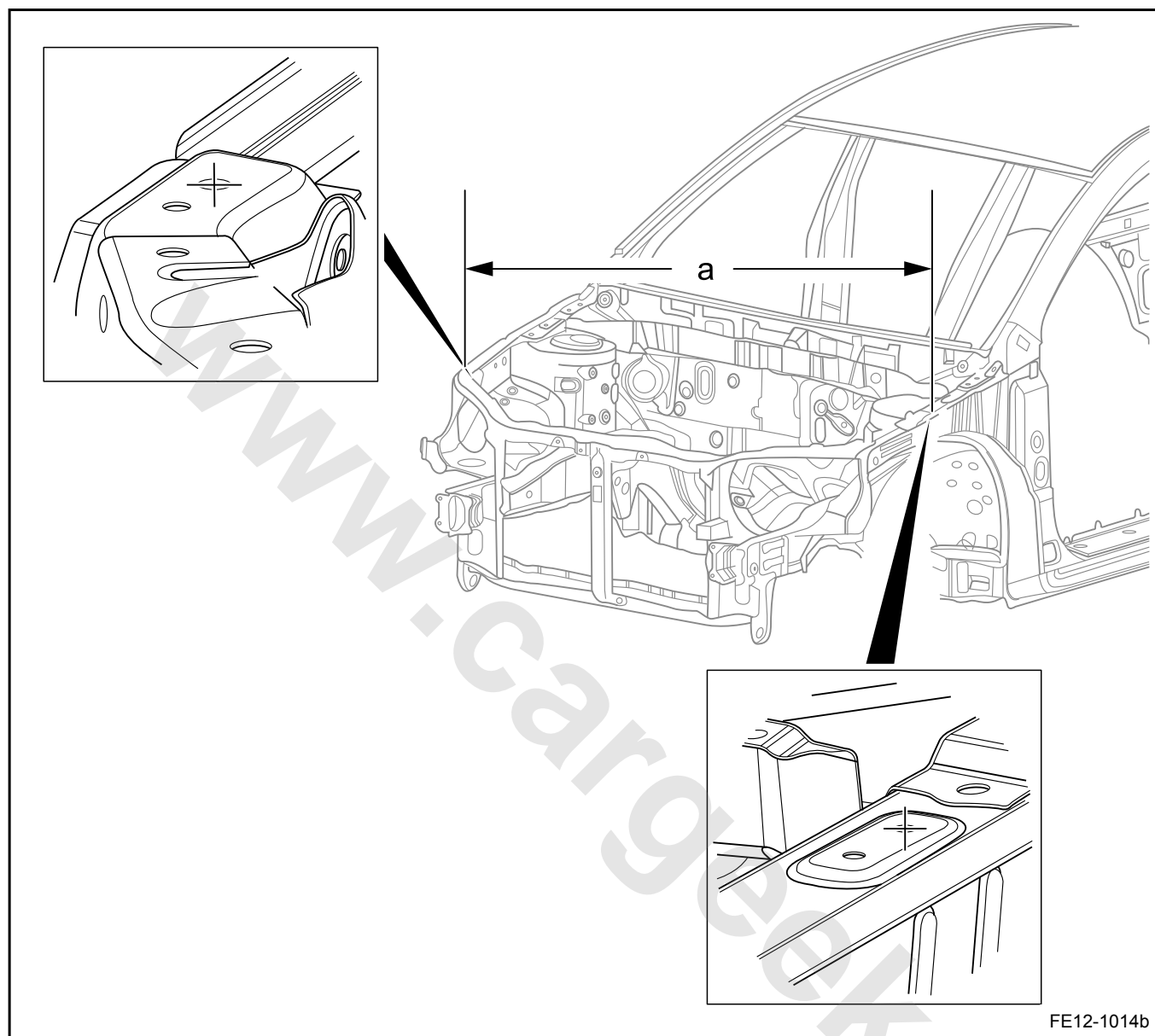
Serial Number	Panel	Adjacent Panel	Specifications	
			Clearance (mm/in)	Tolerance (mm/in)
1	Side Outer Panel	Rear Window	$4.0 \pm 1.0/0.16 \pm 0.04$	$-1.0 \pm 1.0/-0.04 \pm 0.04$
2	Side Outer Panel	Tail Lamp	$2.0 \pm 1.0/0.08 \pm 0.04$	$1.5 \pm 1.0/0.06 \pm 0.04$
3	Side Outer Panel	Rear Bumper	$0.5 \pm 0.5/0.02 \pm 0.02$	$0.25 \pm 1.25/0.01 \pm 0.05$
4	Hatchback Outer Panel	Tail Lamp	$4.0 \pm 1.0/0.16 \pm 0.04$	-
5	Rear Window	Hatchback Outer Panel	$2.0 \pm 1.0/0.08 \pm 0.04$	-
6	Hatchback Outer Panel	Rear Bumper	$6.0 \pm 1.5/0.24 \pm 0.06$	-
7	Hatchback Outer Panel	Side Outer Panel	$4.0 \pm 1.0/0.2 \pm 0.04$	$0.75 \pm 0.75/0.03 \pm 0.03$
8	Hatchback Outer Panel	Roof Outer Panel	$7.5 \pm 0.5/0.3 \pm 0.02$	$2.25 \pm 0.25/0.1 \pm 0.01$
9	Hatchback Outer Panel (Spoiler)	Side Outer Panel	$4.0 \pm 1.0/0.2 \pm 0.04$	$0.75 \pm 0.75/0.03 \pm 0.03$

## 12.12.1.4 Body Dimensions

— Body dimensions are used for the body inspection.

— Please use an extension ruler to measure body dimensions.

Body Front

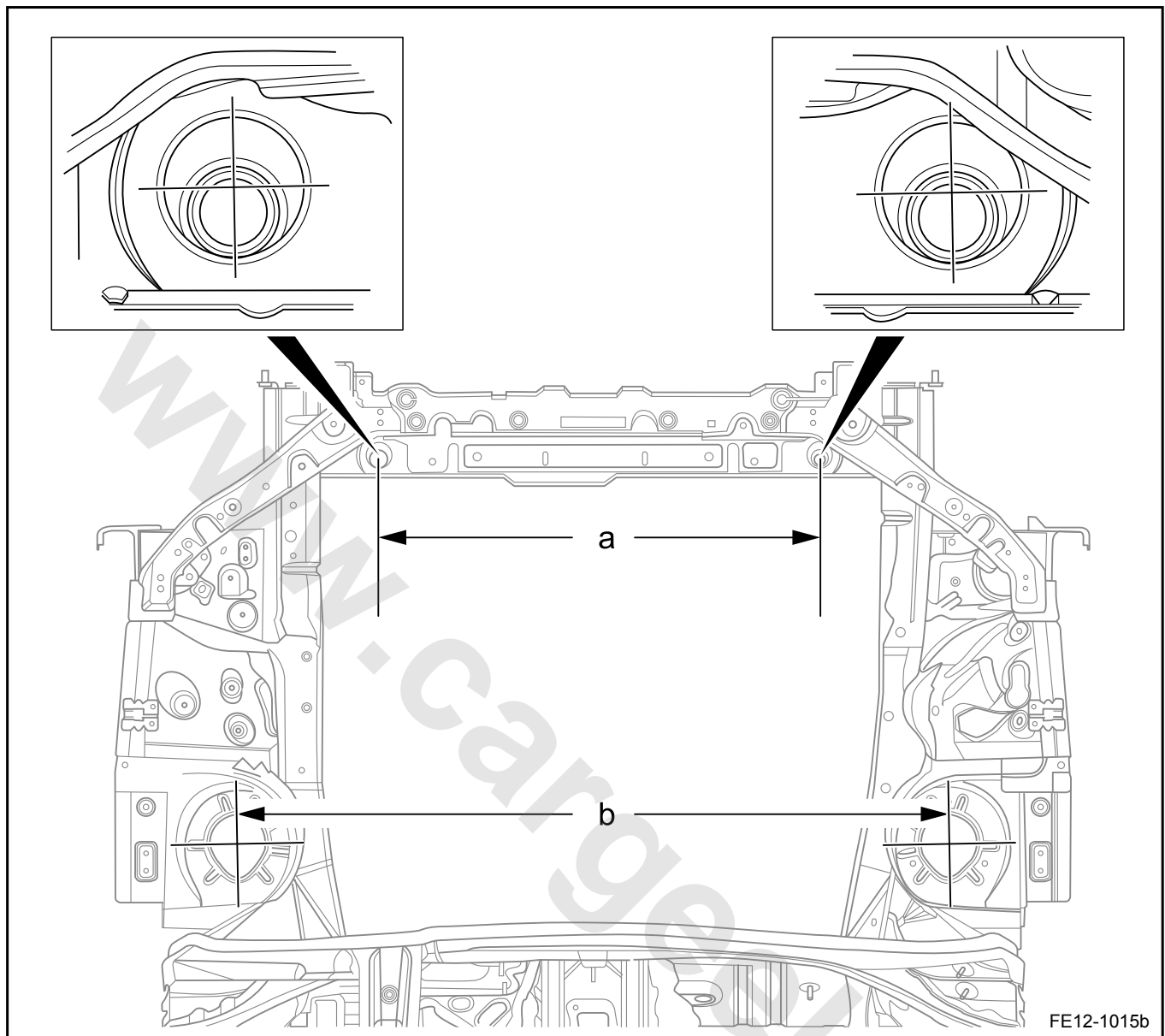


FE12-1014b

Front Fender Mounting Hole (Front) to Front Fender Mounting Hole (Rear) Diagonal Dimension

Dimension a=1,478 mm (58.2 in)



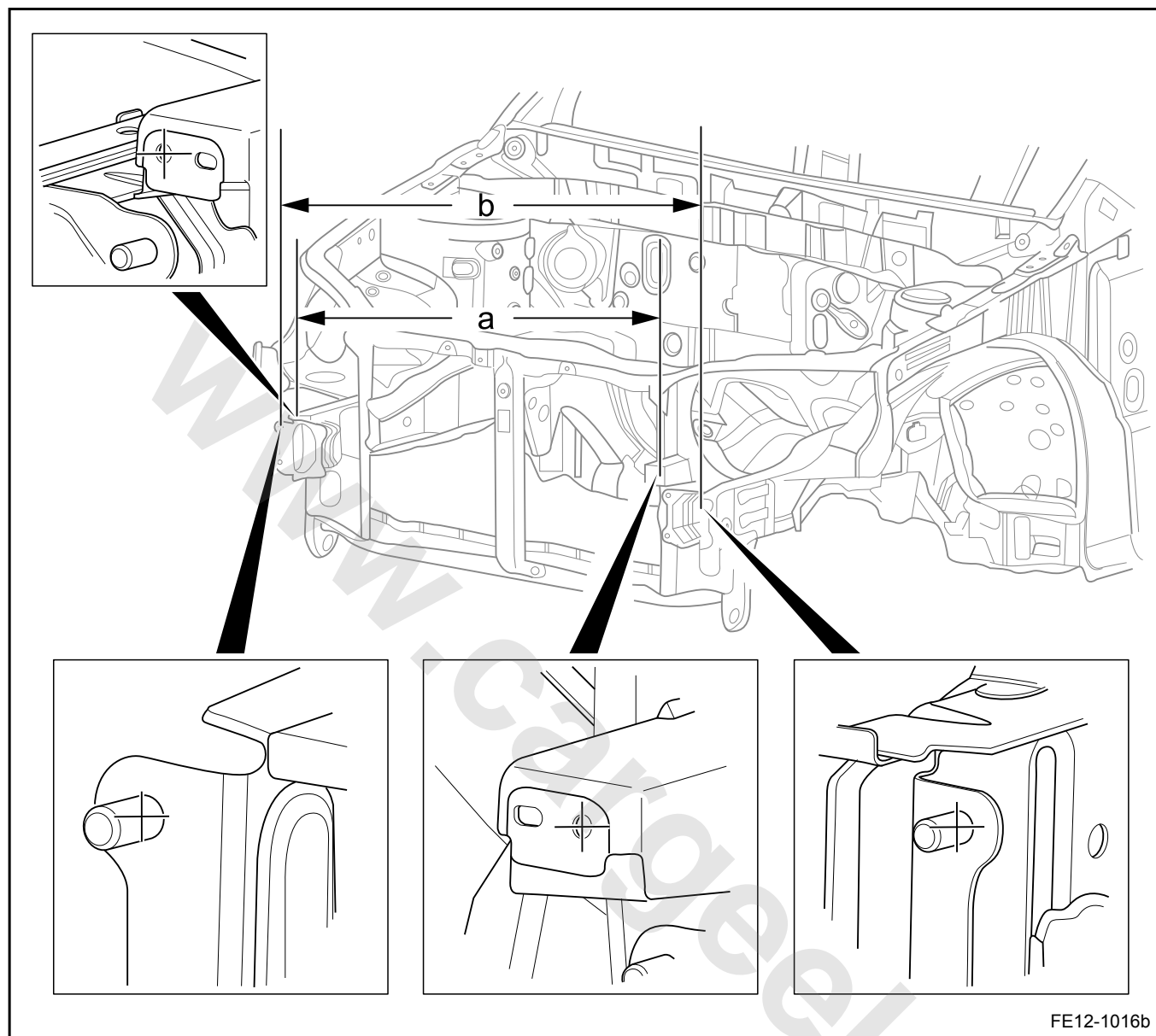


FE12-1015b

Radiator Mounting Hole to Radiator Mounting Hole Dimension  
Dimension a=705 mm (27.8 in)

Dimension b=1,136 mm (44.7 in)

Front Shock Absorber Center Hole to Front Shock Absorber  
Center Hole Dimension

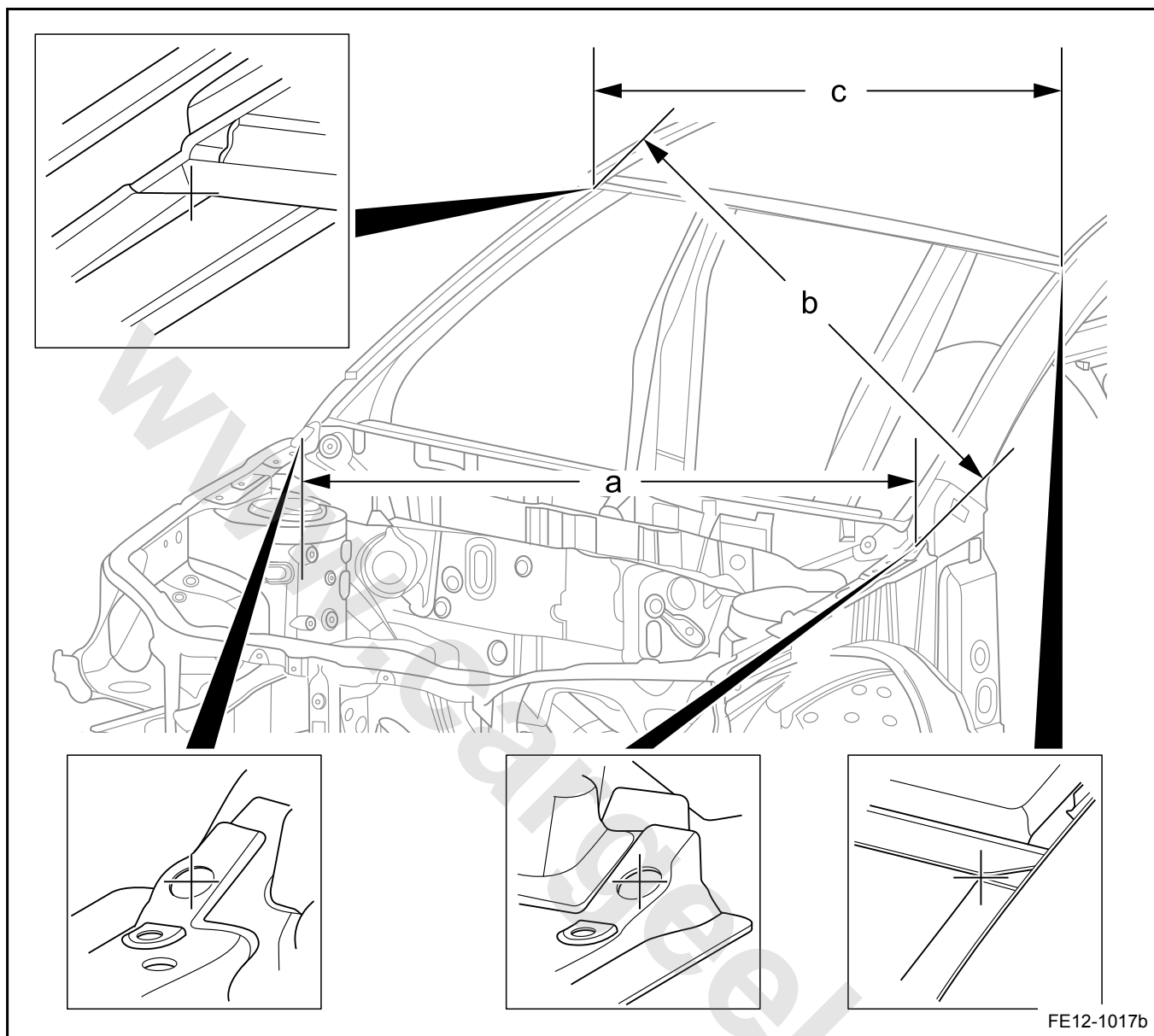


Headlamp Mounting Hole to Headlamp Mounting Hole  
Dimension

Dimension b=1,071 mm (42.2 in)

Dimension a=834 mm (32.8 in)

Front Side Rail Mounting Hole to Front Side Rail Mounting Hole  
Dimension



Body Side and Body Front Joint to Body Side and Body Front Joint Dimension

dimensions a=1,459 mm (57.4 in)

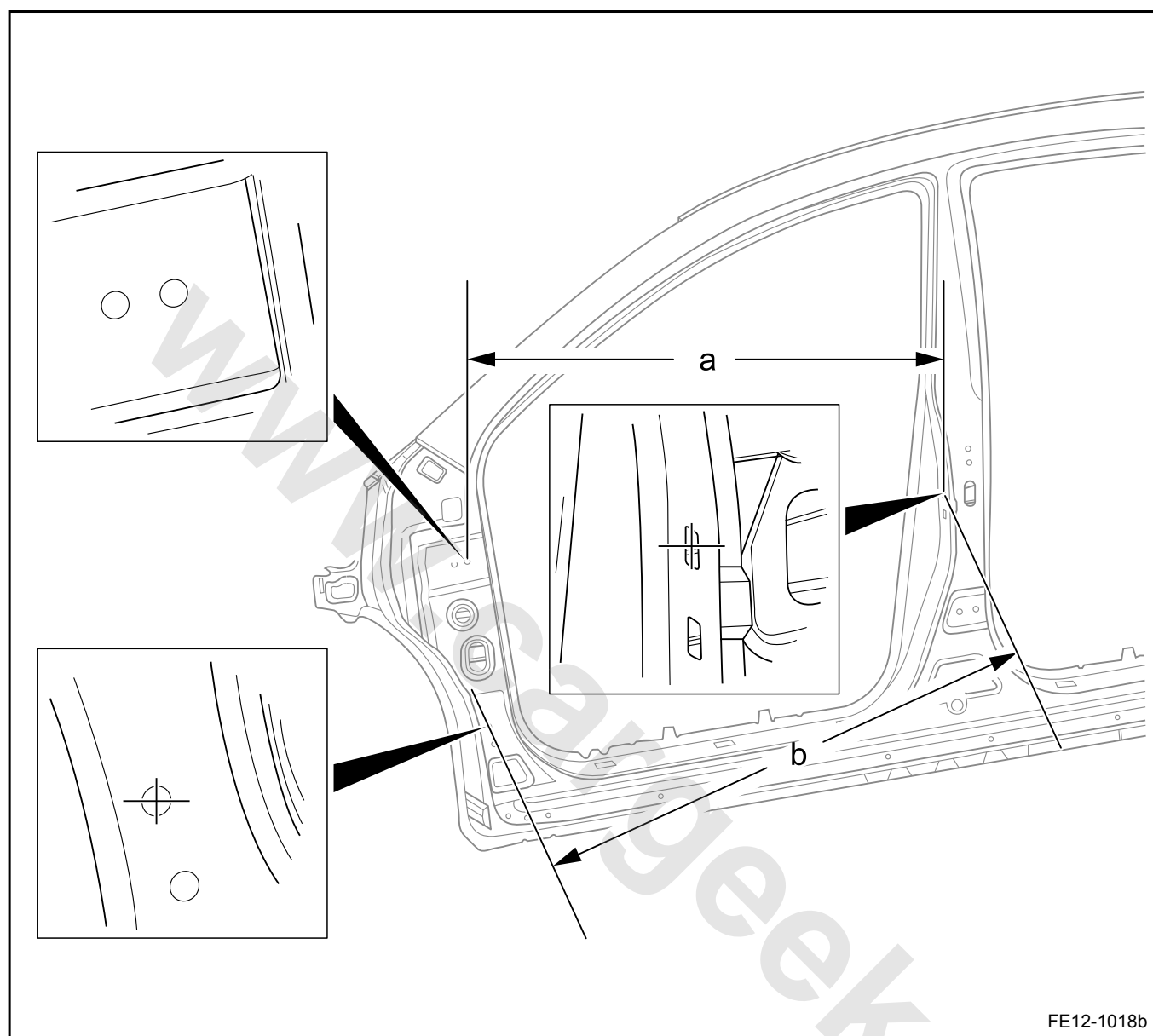
Body Side and Body Front Joint to Body Side and Roof Joint Dimension

Dimension b=1,514 mm (59.6 in)

Body Side and Roof Joint to Body Side and Roof Joint Dimension

Dimension c=1,073 mm (42.2 in)

Body Middle



Front Door Upper Hinge Mounting Hole to Front Door Lock Mounting Hole Dimension

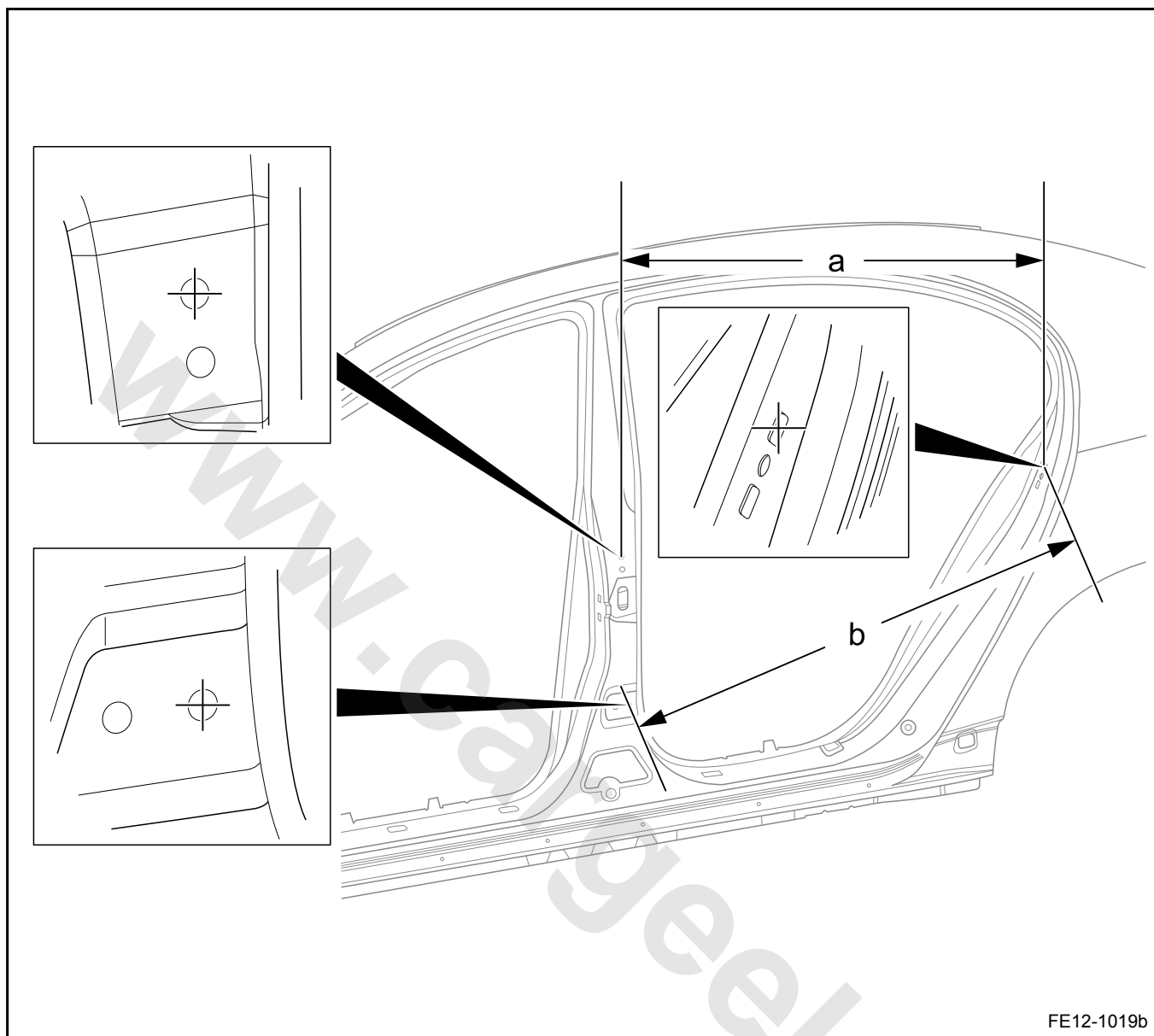
Sedan: Dimension a=1,009 mm (39.7 in)

Hatchback: Dimension a=1,005 mm (39.6 in)

Sedan: Dimension b=1,047 mm (41.2 in)

Hatchback: Dimension b=1,043 mm (41.1 in)

Front Door Lower Hinge Mounting Hole to Front Door Lock Mounting Hole Dimension



FE12-1019b

Rear Door Upper Hinge Mounting Hole to Rear Door Lock Mounting Hole Dimension

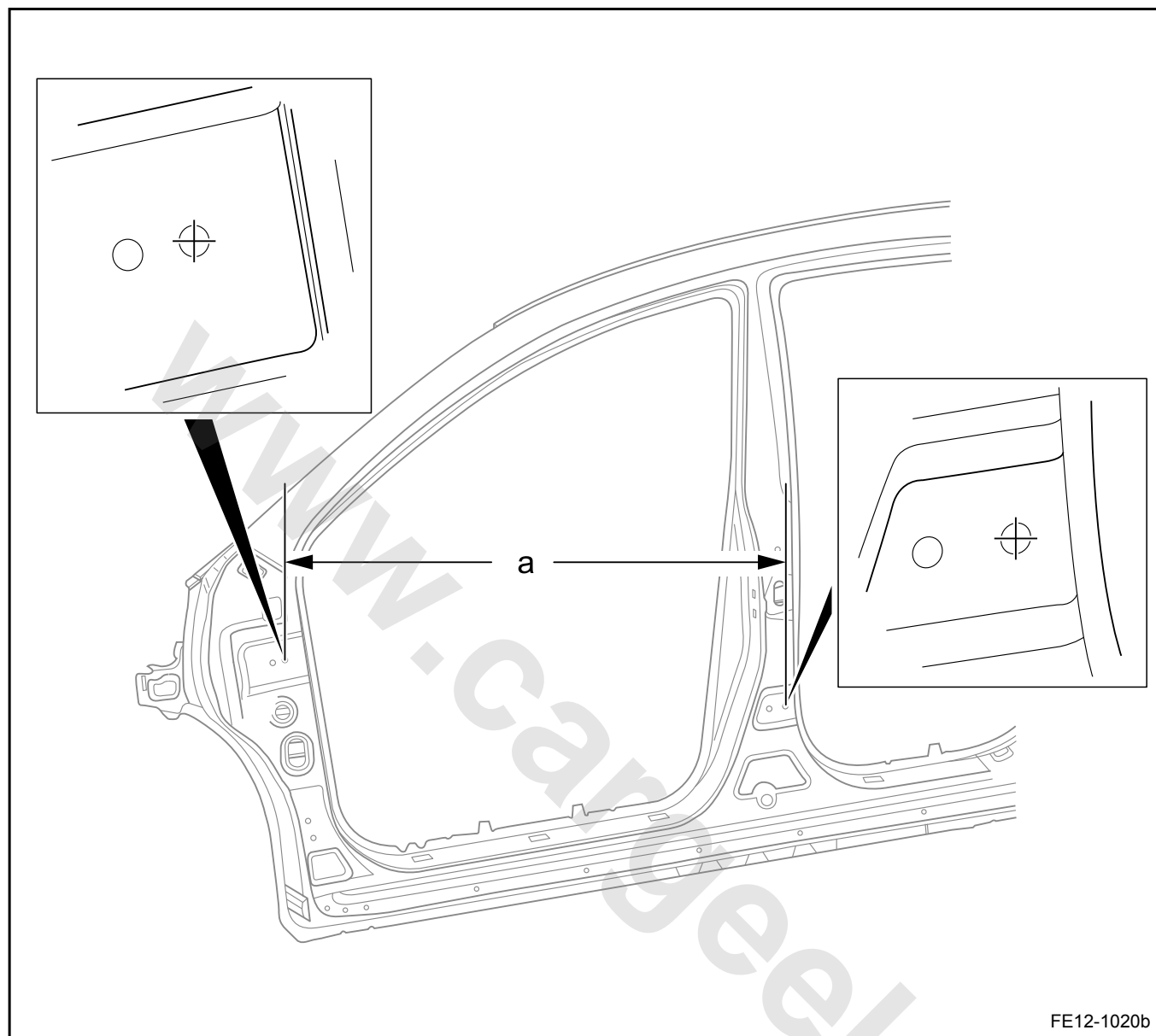
Sedan: Dimension a=979 mm (38.5 in)

Hatchback: Dimension a=977 mm (38.4 in)

Sedan: Dimension b=1,057 mm (41.6 in)

Hatchback: Dimension b=1,056 mm (41.6 in)

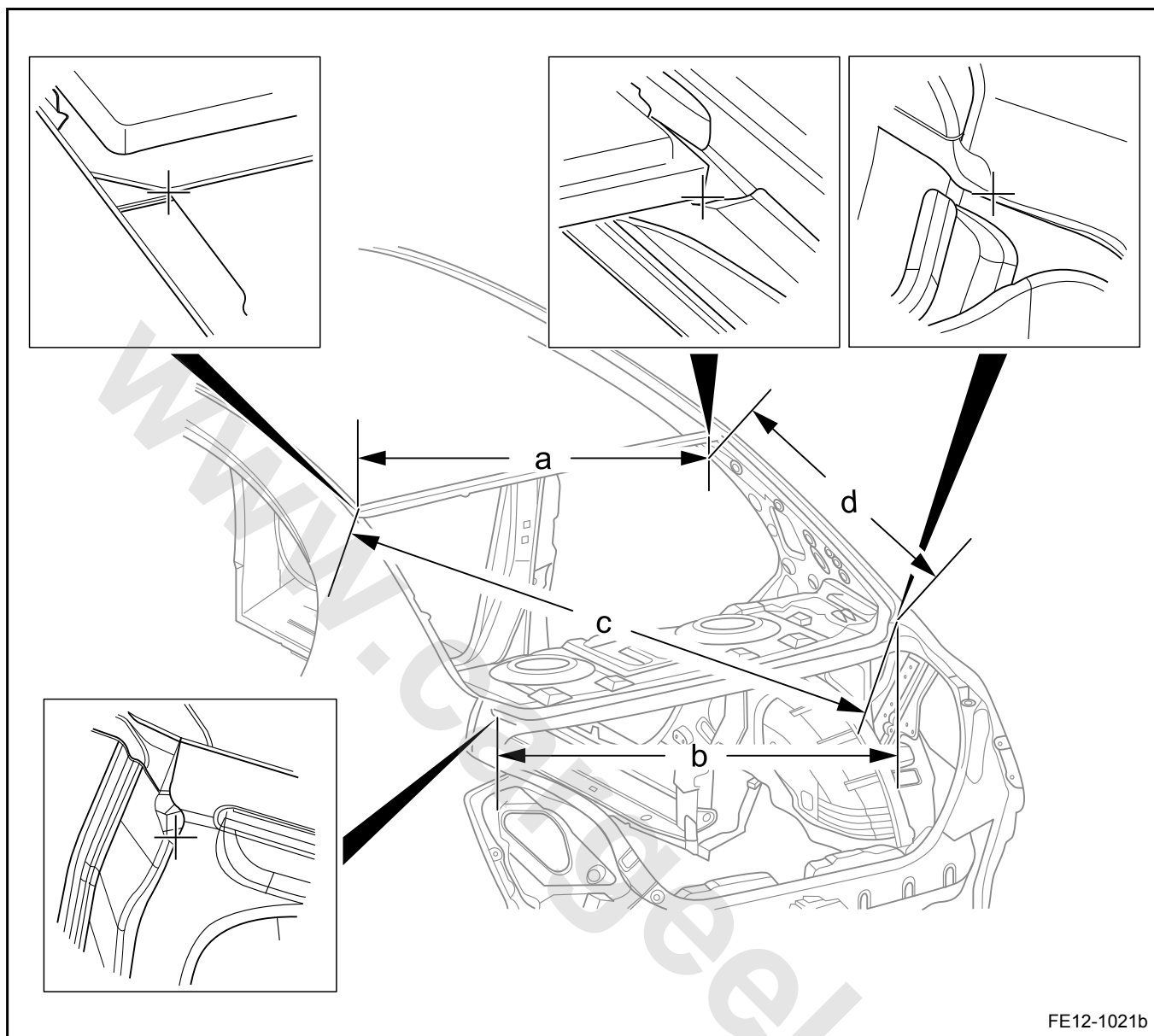
Rear Door Lower Hinge Mounting Hole to Rear Door Lock Mounting Hole Dimension



FE12-1020b

Front Door Upper Hinge Mounting Hole to Rear Door Lower  
Hinge Mounting Hole Dimension

Dimension a=1,071 mm (42.2 in)



FE12-1021b

Rear Side Outer Panel and Roof Joint to Rear Side Outer Panel and Roof Joint Dimension

Dimension a=1,043 mm (41.1 in)

Rear Side Outer Panel and Rear Parcel Shelf Panel Joint to Rear Side Outer Panel and Rear Parcel Shelf Panel Joint Dimension

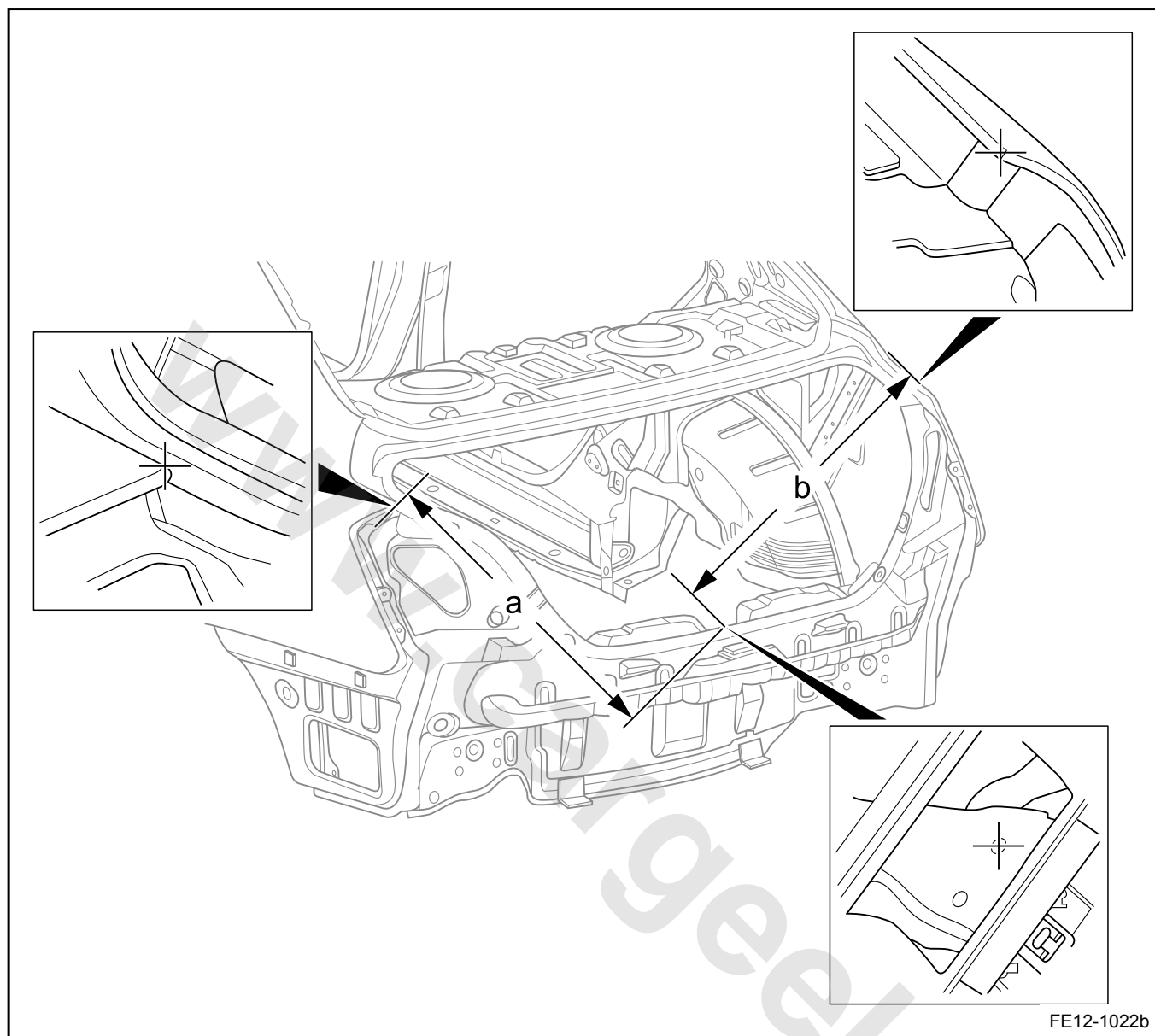
Dimension b=1,210 mm (47.6 in)

Rear Side Outer Panel and Roof Joint to Rear Side Outer Panel and Rear Parcel Shelf Panel Joint Diagonal Dimension

Dimension c=1,318 mm (51.9 in)

Rear Side Outer Panel and Roof Joint to Rear Side Outer Panel and Rear Parcel Shelf Panel Joint Longitudinal Dimension

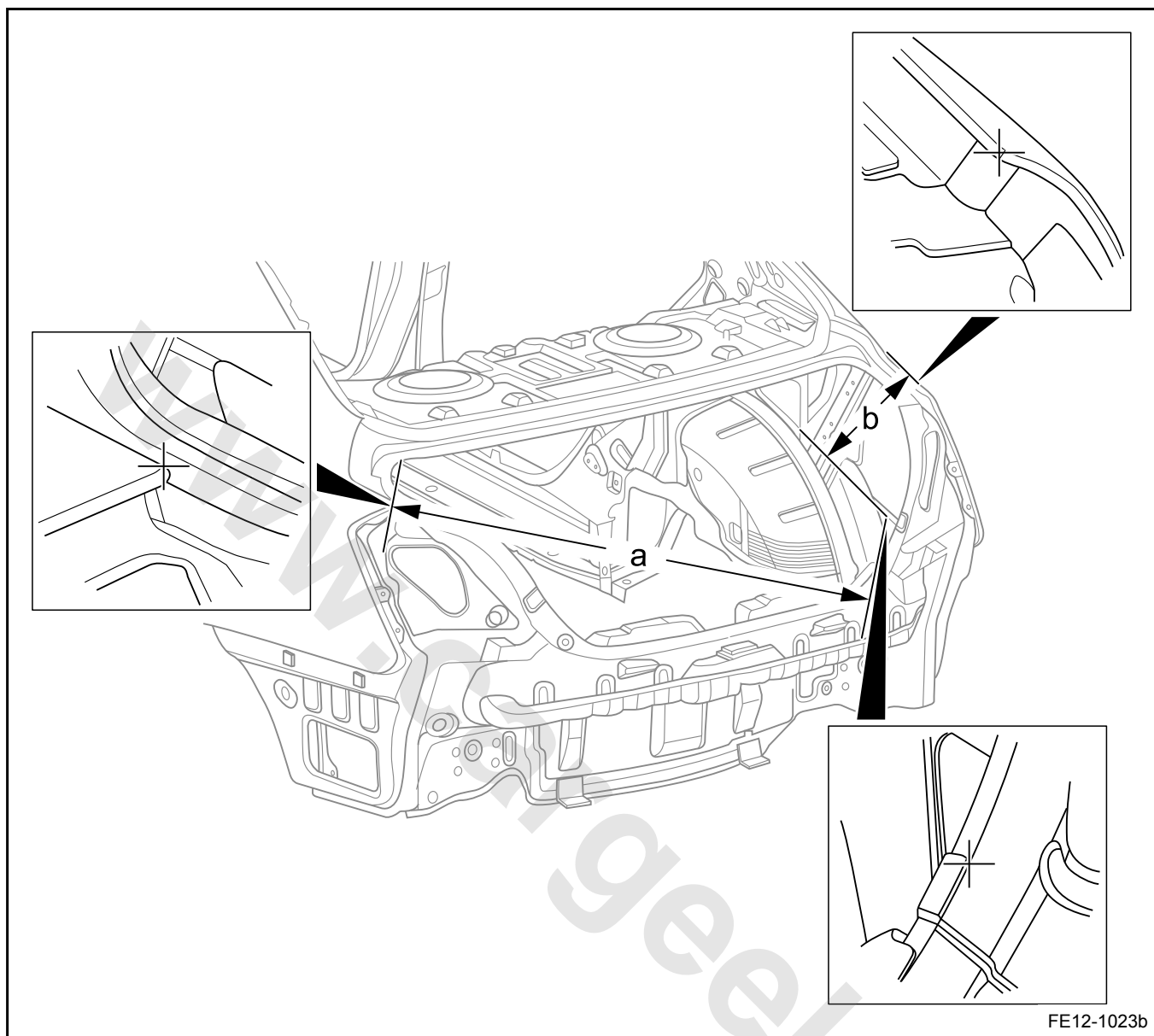
Dimension d=688 mm (27.1 in)



Rear Side Outer Panel and Tail Lamp Filler Panel Joint to Rear  
Compartment Lid Lock Mounting Hole Dimension  
Dimension a=809 mm (31.9 in)

Dimension b=777 mm (30.6 in)



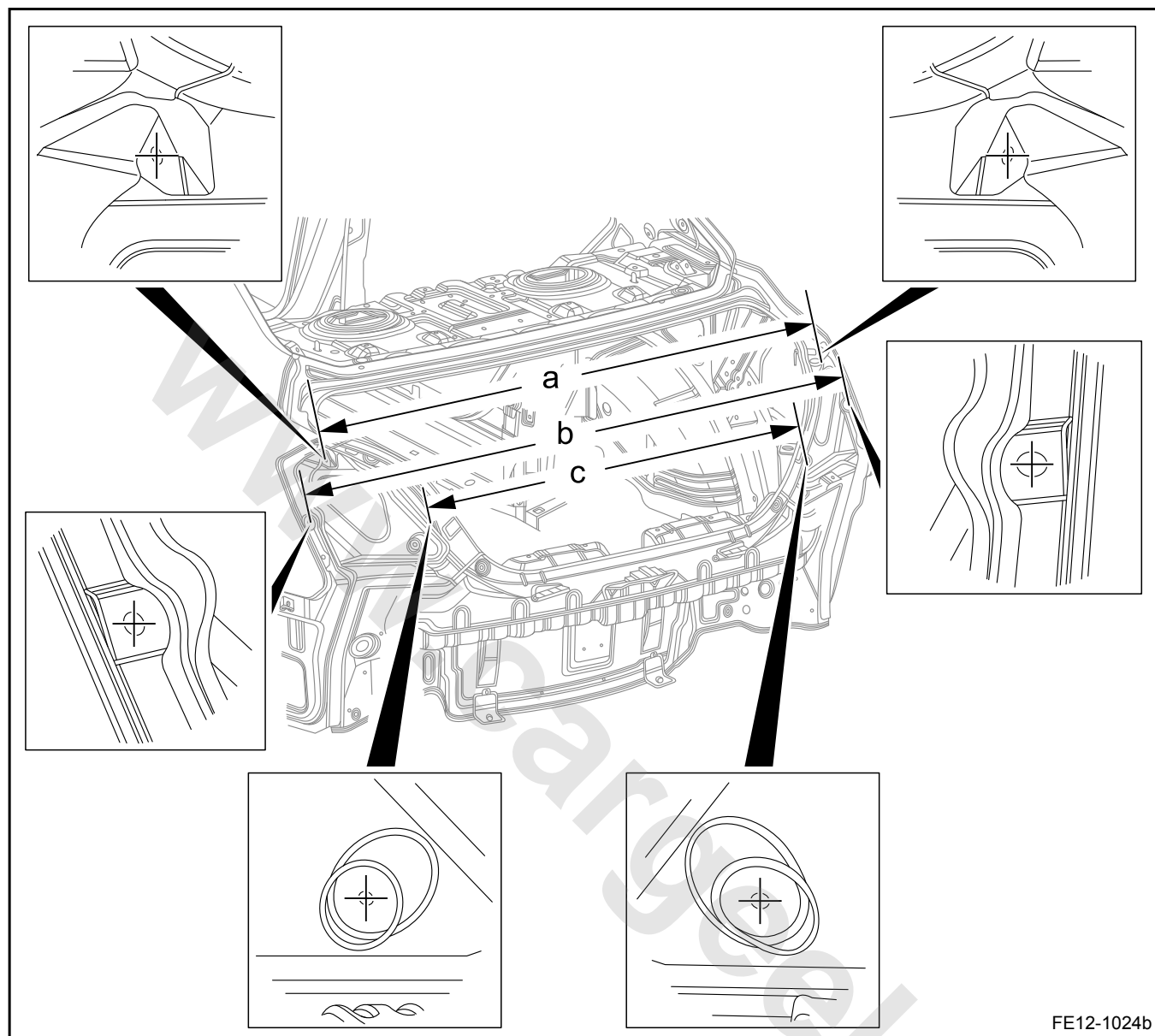


Rear Side Outer Panel and Tail Lamp Filler Panel Joint to Ail  
Lamp Filler Panel and Rear End Panel Joint Diagonal  
Dimension

Dimension a=1,153 mm (45.4 in)

Dimension b=423 mm (16.7 in)

Rear Side Outer Panel and Tail Lamp Filler Panel Joint to Ail  
Lamp Filler Panel and Rear End Panel Joint Longitudinal  
Dimension



Tail Lamp Upper Mounting Hole to Tail Lamp Upper Mounting Hole Dimension

Dimension a=1,369 mm (53.9 in)

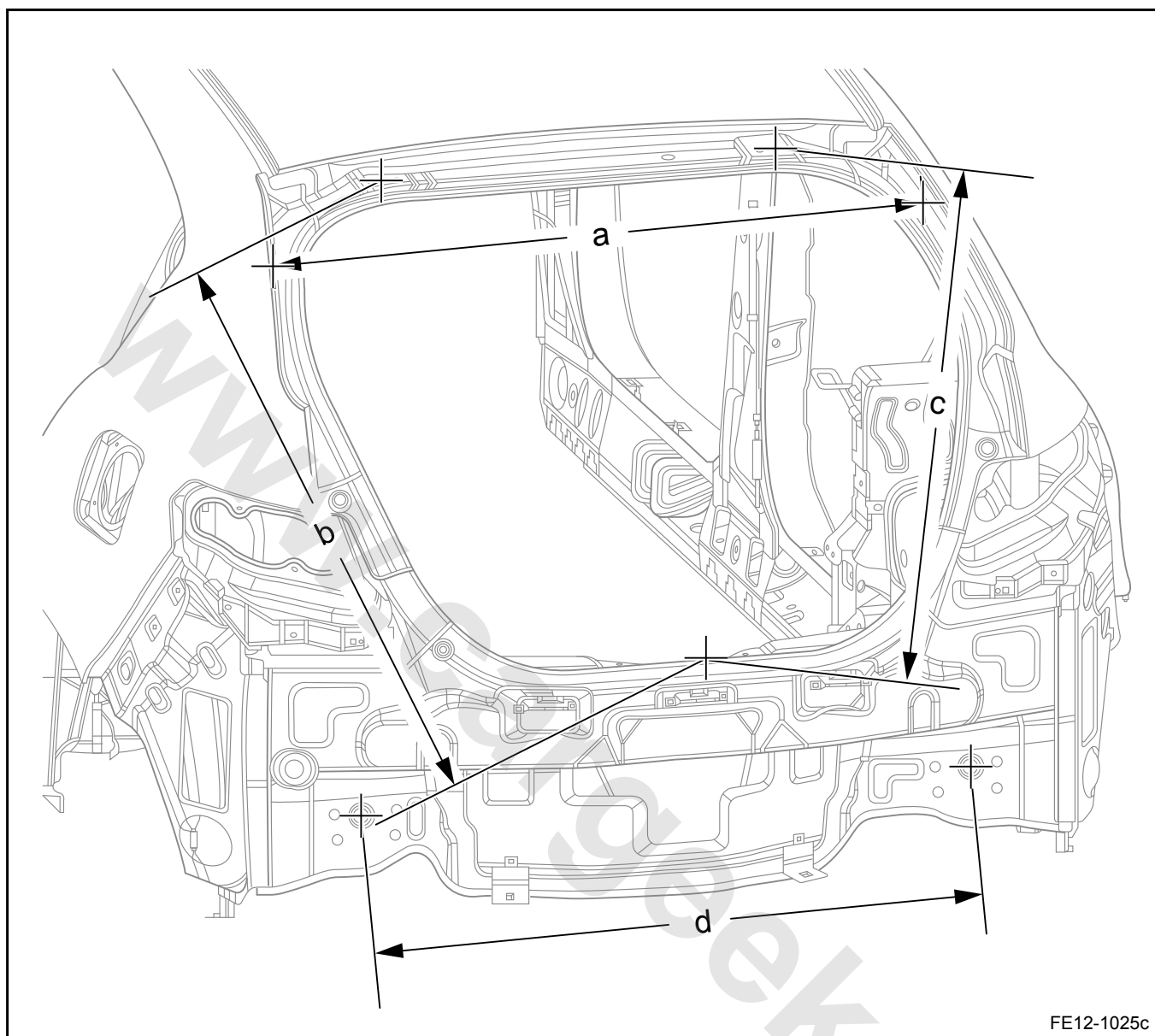
Tail Lamp Middle Mounting Hole to Tail Lamp Middle Mounting Hole Dimension

Dimension b=1,491 mm (58.7 in)

Tail Lamp Lower Mounting Hole to Tail Lamp Lower Mounting Hole Dimension

Dimension c=1,078 mm (42.4 in)

## Body Rear (Hatchback)



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Hatchback Strut Mounting Hole to Hatchback Strut Mounting Hole Dimension

Dimension a=1,084 mm (42.7 in)

Hatchback Left Hinge Mounting Hole and Hatchback Lock Right Mounting Hole Dimension

Dimension b=970 mm (38.2 in)

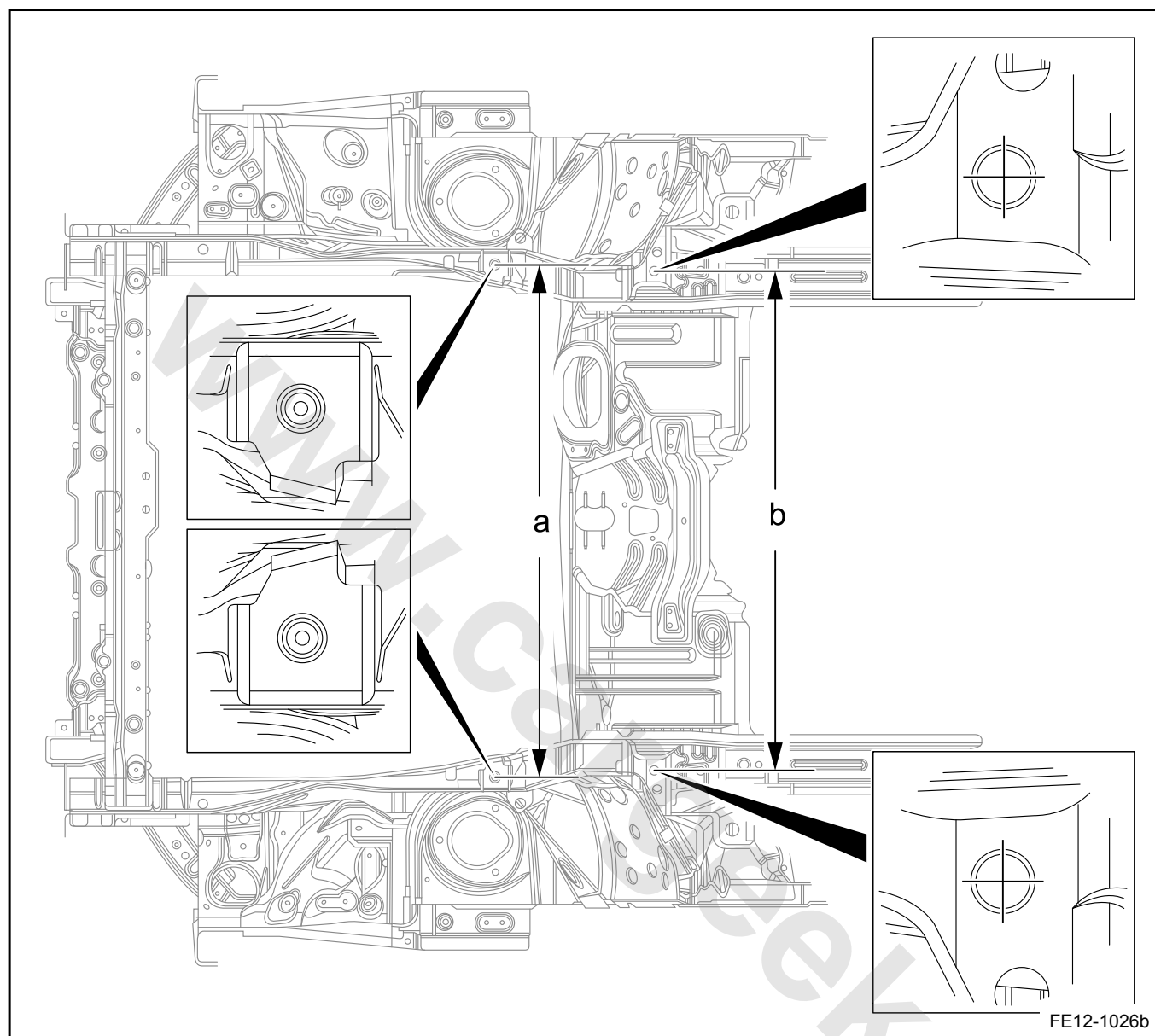
Hatchback Right Hinge Mounting Hole and Hatchback Lock Right Mounting Hole Dimension

Dimension c=956 mm (37.6 in)

Rear End Panel Mounting Hole to Rear End Panel Mounting Hole Dimension

Dimension d=1,027 mm (40.4 in)

Underbody



Front Suspension Front Mounting Hole to Front Suspension

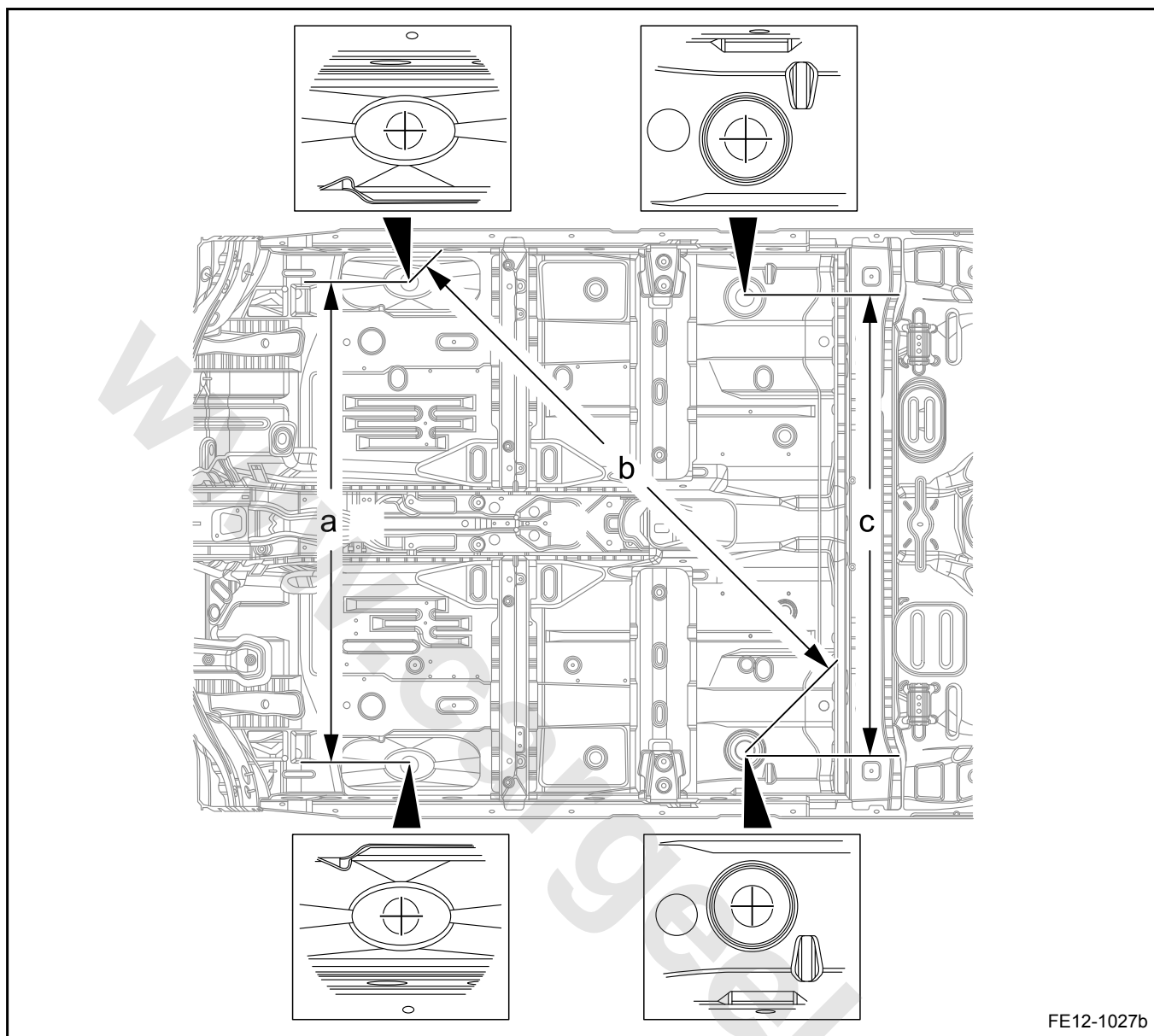
Dimension b=890 mm (35.0 in)

Front Mounting Hole Dimension

Dimension a=911 mm (35.9 in)

Front Suspension Rear Mounting Hole to Front Suspension

Rear Mounting Hole Dimension



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Front Floor Front Mounting Hole to Front Floor Front Mounting Hole Dimension

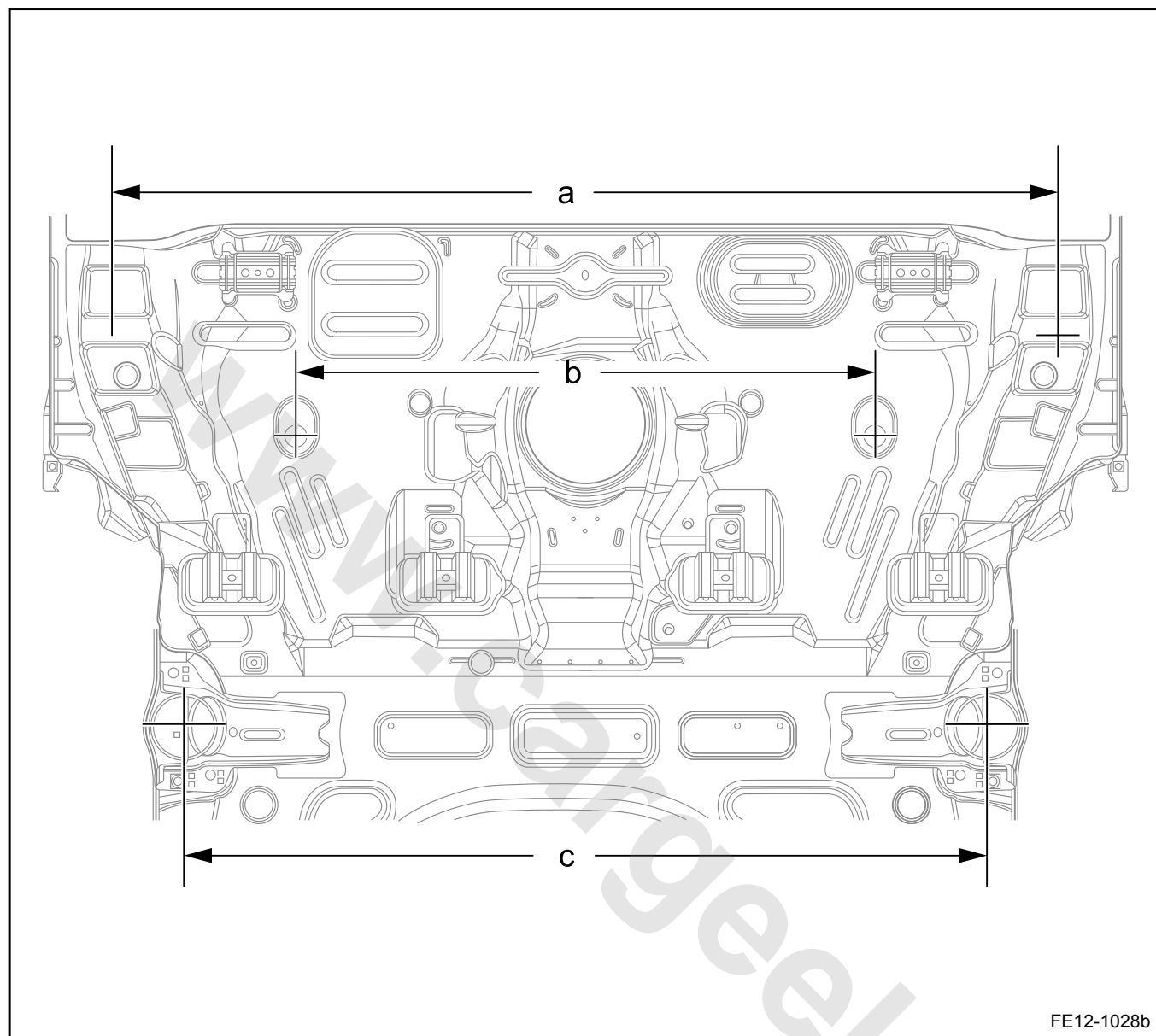
Dimension a=1,157 mm (45.6 in)

Front Floor Front Mounting Hole to Front Floor Rear Mounting Hole Diagonal Dimension

Dimension b=1,380 mm (54.3 in)

Front Floor Rear Mounting Hole to Front Floor Rear Mounting Hole Dimension

Dimension c=1,085 mm (42.7 in)



Rear End Panel Mounting Hole to Rear End Panel Mounting Hole Dimension

Dimension a=1,228 mm (48.3 in)

Middle Floor Panel Mounting Hole to Middle Floor Panel Mounting Hole Dimension

Dimension b=759 mm (29.9 in)

Rear Shock Absorber Datum Hole to Rear Shock Absorber Datum Hole

Dimension c=1,052 mm (41.4 in)



## 12.12.2 Description and Operation

### 12.12.2.1 Safety Instructions

When carry out body sheet metal repairs, you must strictly follow the safety instructions as below:

1. When carry out body sheet metal welding, cutting, grinding operation, you must wear protective clothing, protective goggles, gloves and working shoes.
2. The welding area must be well ventilated.
3. Before carry out welding, you must disconnect the battery negative cable and cover the battery negative terminal.
4. If a spark may be produced when carry out welding near a battery, you must remove the battery.
5. Before remove vehicle components, you must lift and support the vehicle on a hoist to avoid the vehicle gravity center changing affecting operational safety.
6. When connect the welding equipment ground cable directly to the parts to be welded, you must ensure that no conductive parts between ground and the welding spot.
7. The ground cable and the welding electrodes must not come into contact with the electronic control unit or the wires.
8. An unprotected vehicle must not be parked in the welding repair area, as the welding sparks could trigger a fire, damage to the vehicle body paint or the windows.
9. When grinding or welding near a fuel tank or other fuel containers, you must be extra careful and remove any suspicious components that may affect the safety.
10. You must not weld, braze or solder any components of refrigerant air conditioning systems, or weld components that may cause air-conditioning system temperatures rise, as this may lead to air-conditioning system explosion. If the refrigerant hose must be near the welding area, you must recycle refrigerant, as welding generated ultraviolet is not visible and will penetrate the refrigerant hose causing refrigerant decay.
11. When carry out airbag system calibration, you must disconnect battery negative cable. The airbag components ambient temperature must not exceed 100°C (212 °F).

### 12.12.2.2 The State of Parts

Before deliver the repaired vehicle or components to the paint shop for painting, all the surface must be even, all the seals must be filled and the surface must be polished with sand paper. The preparation process must be completed by the

sheet metal repair technician. Body and floor components are mainly formed by steel pressing, so the damaged components must be restored with the same approach. If a damaged component can not be restored, its adjacent components should be adjusted. Remove the damaged component. Replace components to protect the integral structure. Do not cut a single component, as cutting and welding will affect the vehicle body stiffness, driving safety and maintenance convenience.

### 12.12.2.3 Welding Types Description

Commonly used welding types are spot welding, gas shielded welding and brazing. During spot welding, you must not reduce the number of solder joints. If the spot welding can not be used, drill and use gas-shielded welding. When using spot welding, if it is to connect three-layer panels, only replace the outer panel, then weld on the original solder joints. When using spot welding, you can weld single seam, double seams, double biased seams. When using gas-shielded arc welding, you can carry out overlap welding, continuous welding and intermittent welding. Brazing is commonly used in welding and repair low tensile strength components, or areas with small thickness.

### 12.12.2.4 Anti-Corrosion Treatment

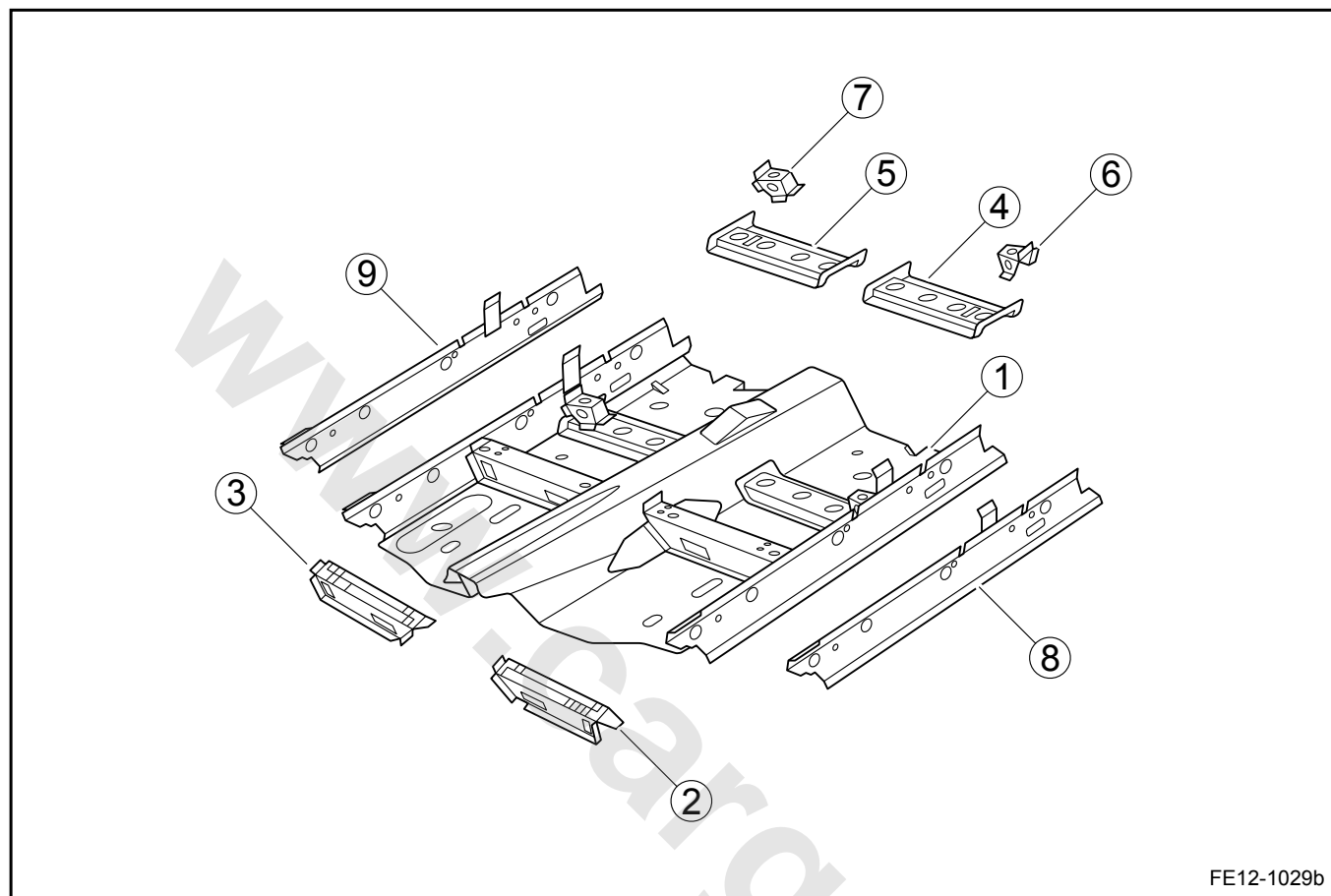
1. After repair, you must use approved materials to restore the anti-corrosion coating .
2. Before apply the sealant, all welding seams must be coated with primer inside and outside.
3. Primer coated metal sheet panels must be applied with sealant.
4. Overlapping pieces of sheet metal, metal edge, welding joints and weld seams must be applied with sealant.
5. The vehicle underbody must be applied with long lasting coating agent.
6. After spray painting, you must use cavity protection materials to treat cavities in the area.
7. After the cavity protective material is dry, clean the water ducts.

### 12.12.2.5 Scrapped Components Environmentally Friendly Disposal Approach

1. After maintenance or repair, collect different type of waste materials separately.
2. Separate the waste materials and check whether the materials can be reused.

## 12.12.3 Disassemble View

## 12.12.3.1 Front Floor

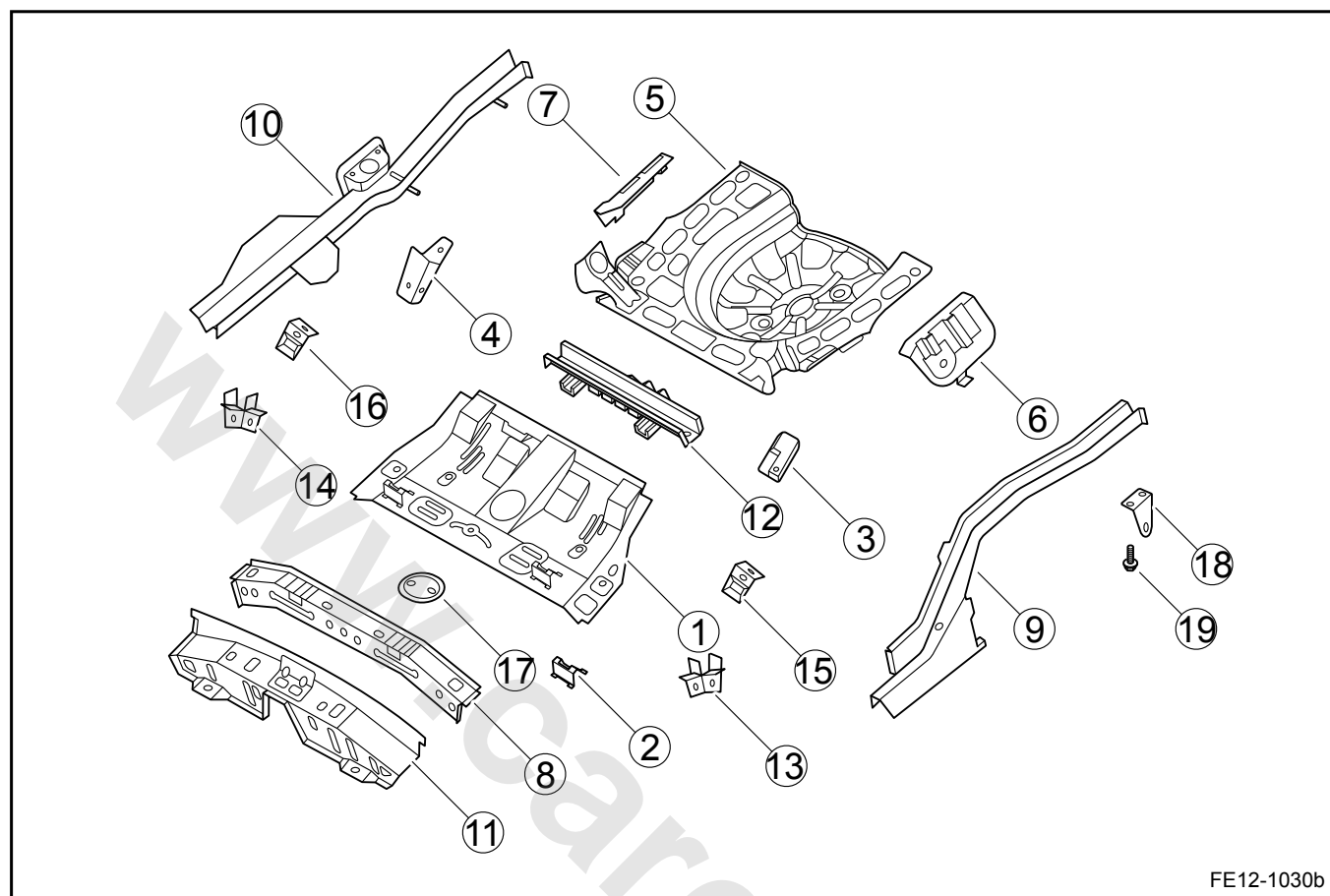


## Legend

- |                                     |   |
|-------------------------------------|---|
| 1. Front Floor Assembly             | 7. Right Front Seat Bracket Assembly    |
| 2. Left Upper Panel Assembly I      | 8. Left Body Side Outer Panel Assembly  |
| 3. Right Upper Panel Assembly I     | 9. Right Body Side Outer Panel Assembly |
| 4. Left Upper Panel II              |   |
| 5. Right Upper Panel II             |   |
| 6. Left Front Seat Bracket Assembly |   |



## 12.12.3.2 Body Rear Floor (Sedan)

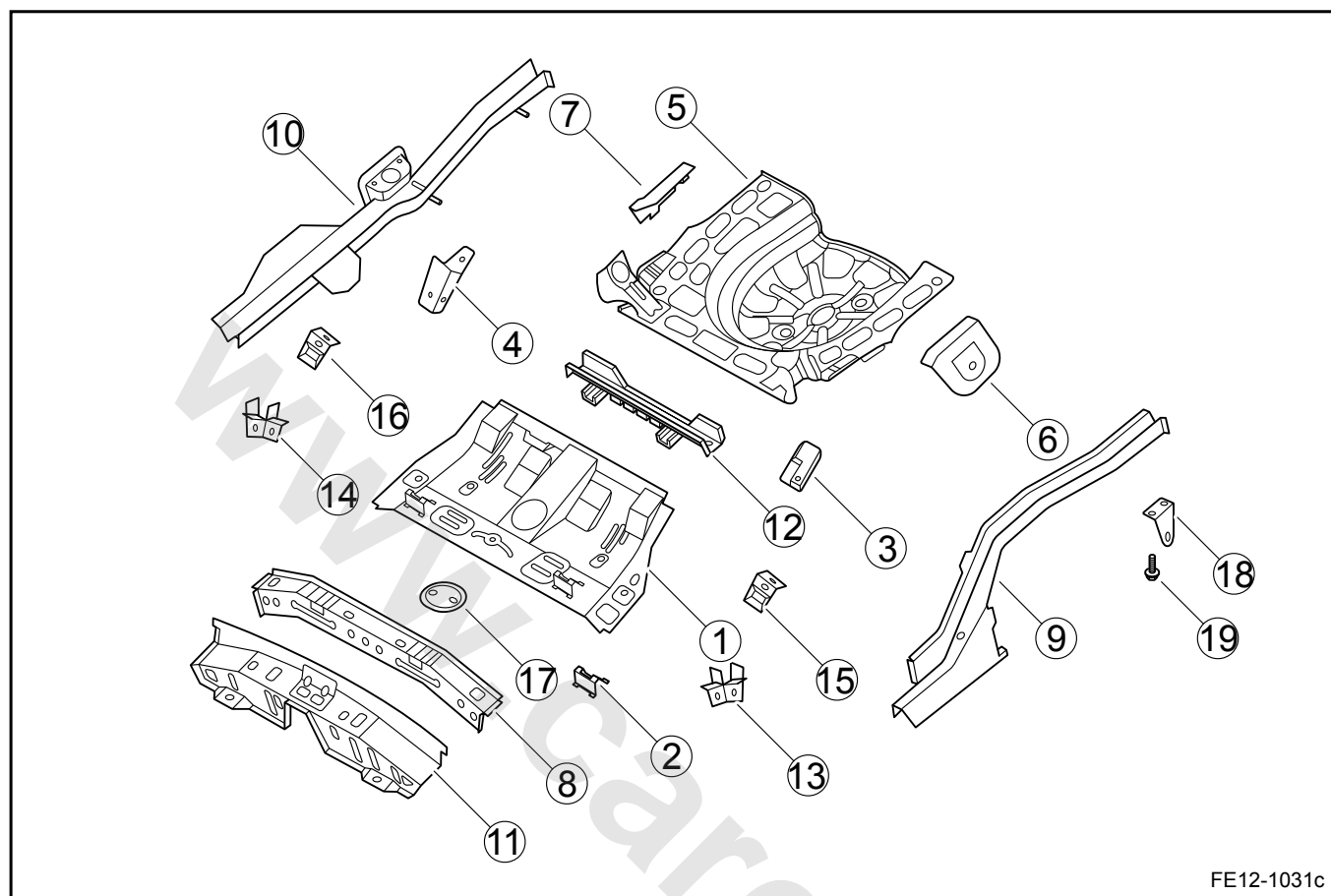


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## Legend

- |  |  |
|--|--|
| 1. Middle Floor Assembly                       | 13. Left Rear Suspension Bracket Assembly                |
| 2. Rear Seat Bracket                           | 14. Right Rear Suspension Bracket Assembly               |
| 3. Middle Floor Seat Left Support              | 15. Left Rear Suspension Reinforcement Bracket Assembly  |
| 4. Middle Floor Seat Right Support             | 16. Right Rear Suspension Reinforcement Bracket Assembly |
| 5. Rear Compartment Floor Assembly             | 17. Middle Floor Fuel Tank Inspection Cap                |
| 6. Rear Compartment Left Side Panel Assembly   | 18. Rear Towing Bracket                                  |
| 7. Rear Compartment Right Side Panel Assembly  | 19. Hex Head Bolt and Flat Pad Assembly (Domestic)       |
| 8. Middle Floor Rear Seat Cross Panel Assembly | Hex Head Bolt and Washer Assembly M12 × 1.25 × 30        |
| 9. Middle Floor Left Side Panel Assembly       | (Export)   |
| 10. Middle Floor Right Side Panel Assembly     |  |
| 11. Middle Floor Front Cross Panel Assembly    |  |
| 12. Middle Floor Cross Panel Assembly          |  |

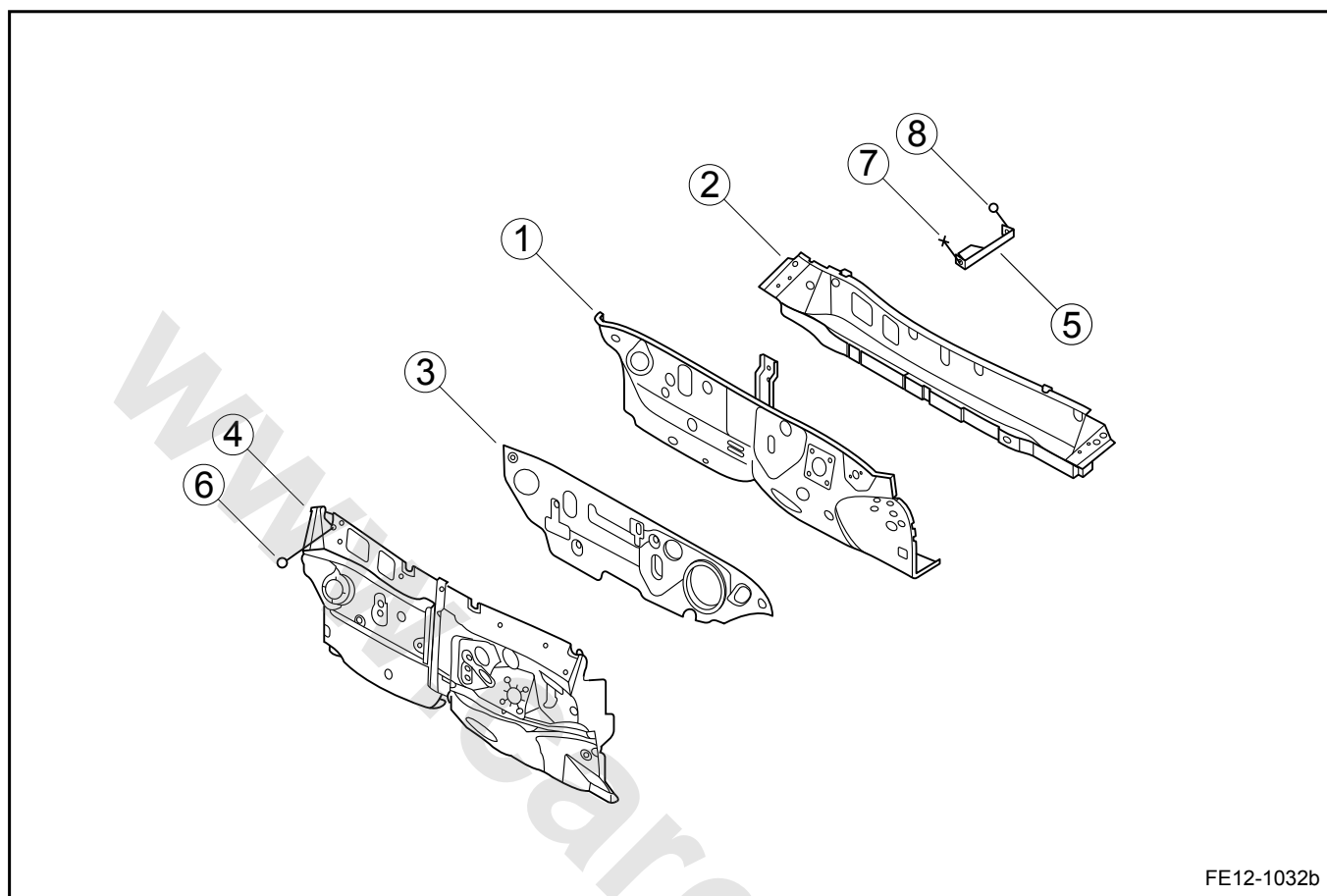
## 12.12.3.3 Body Rear Floor (Hatchback)



## Legend

- |  |  |
|--|--|
| 1. Middle Floor Assembly                       | 13. Left Rear Suspension Bracket Assembly                |
| 2. Rear Seat Bracket                           | 14. Right Rear Suspension Bracket Assembly               |
| 3. Middle Floor Seat Left Support              | 15. Left Rear Suspension Reinforcement Bracket Assembly  |
| 4. Middle Floor Seat Right Support             | 16. Right Rear Suspension Reinforcement Bracket Assembly |
| 5. Rear Compartment Floor Assembly             | 17. Middle Floor Fuel Tank Inspection Cap                |
| 6. Rear Compartment Left Side Panel Assembly   | 18. Rear Towing Bracket                                  |
| 7. Rear Compartment Right Side Panel Assembly  | 19. Hex Head Bolt and Flat Pad Assembly (Domestic)       |
| 8. Middle Floor Rear Seat Cross Panel Assembly | Hex Head Bolt and Washer Assembly M12 × 1.25 × 30        |
| 9. Middle Floor Left Side Panel Assembly       | (Export)   |
| 10. Middle Floor Right Side Panel Assembly     |  |
| 11. Middle Floor Front Cross Panel Assembly    |  |
| 12. Middle Floor Cross Panel Assembly          |  |

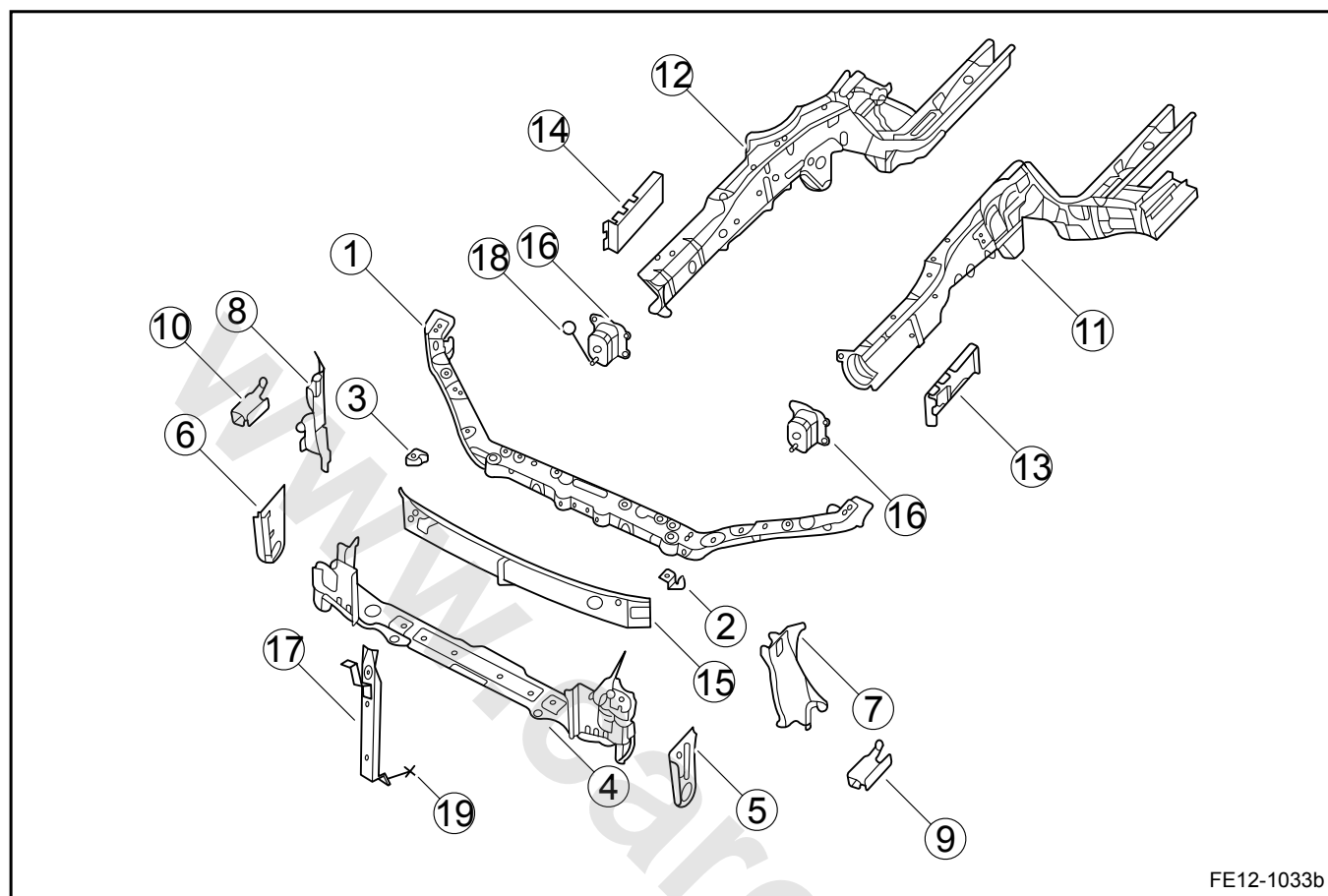
## 12.12.3.4 Firewall



## Legend

- |  |   |
|--|---|
| 1. Passenger Compartment Lower Front Panel Assembly        | 6. Clip   |
| 2. Passenger Compartment Upper Front Panel Assembly        | 7. Hex Head Bolt and Washer Assembly (Domestic) |
| 3. Passenger Compartment Front Panel Outer Heat Insulator  | 8. Hex Head Bolt and Washer Assembly (Export)   |
| 4. Passenger Compartment Front Panel Outer Sound Insulator | 9. Hex Flange Nut (Domestic)                    |
| 5. GPS Mounting Panel Assembly                             | 10. Hex Flange Nut (Export)                     |

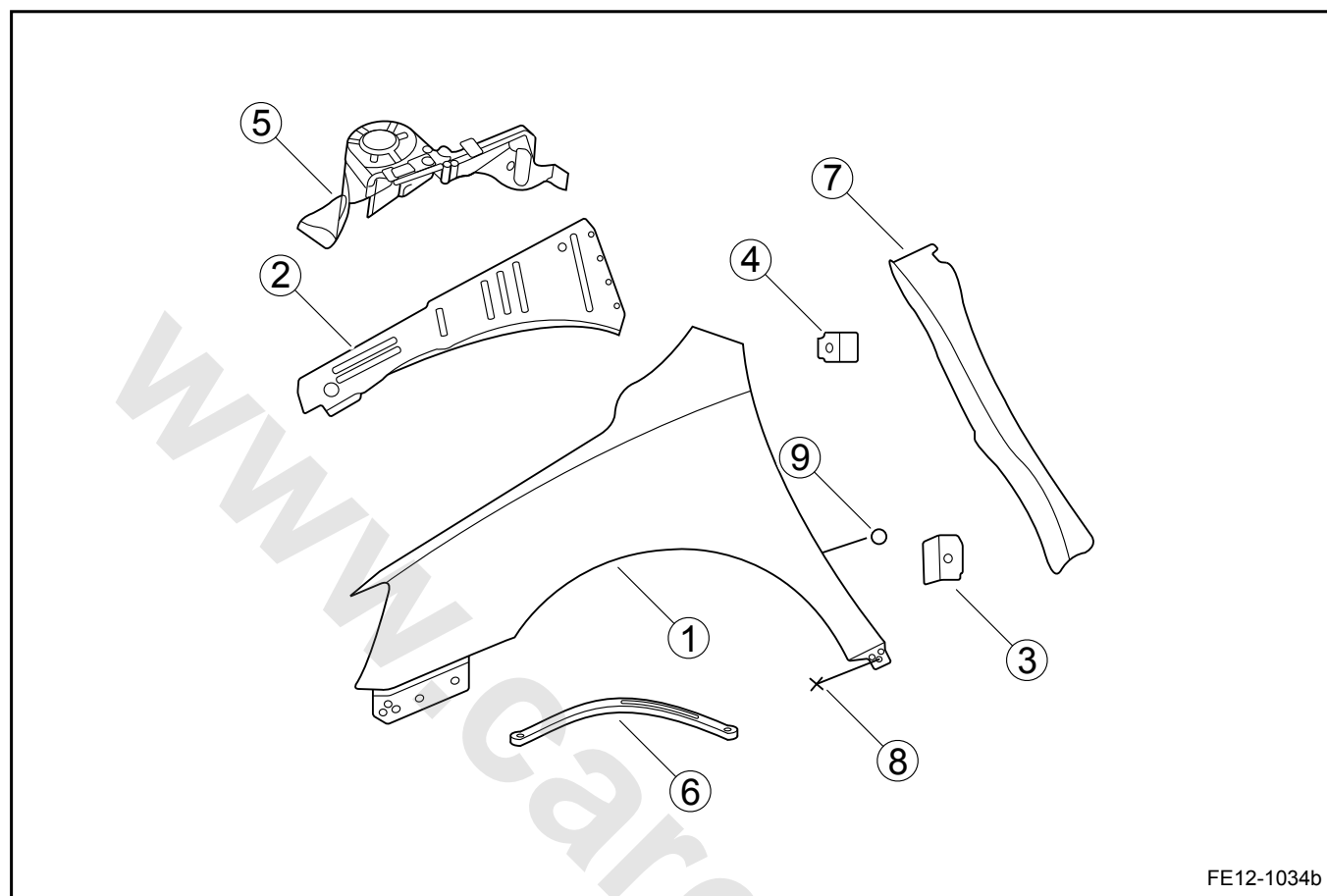
## 12.12.3.5 Engine Compartment



## Legend

- |  |   |
|--|---|
| 1. Radiator Upper Panel Assembly               | 14. Right Front Side Rail Front Side Panel      |
| 2. Radiator Upper Panel Left Bracket Assembly  | 15. Front Cross Panel Assembly                  |
| 3. Radiator Upper Panel Right Bracket Assembly | 16. Front Cross Panel Energy Absorbing Panel    |
| 4. Radiator Lower Panel Assembly               | 17. Radiator Center Support                     |
| 5. Left Front Towing Hook Panel                | 18. Hexagon Flange Nut                          |
| 6. Right Front Towing Hook Panel               | Hex Flange Nut (Export)                         |
| 7. Radiator Cross Panel Left Support           | 19. Hexagon Head Bolt, Washer and Spring Washer |
| 8. Radiator Cross Panel Right Support          | Assembly (Domestic)                             |
| 9. Left Front Headlamp Mount Panel             | Hexagon Head Bolt, Washer and Spring Washer     |
| 10. Right Front Headlamp Mount Panel           | Assembly (Export)                               |
| 11. Left Front Side Rail Assembly              |   |
| 12. Right Front Side Rail Assembly             |   |
| 13. Left Front Side Rail Front Side Panel      |   |

## 12.12.3.6 Front Fender

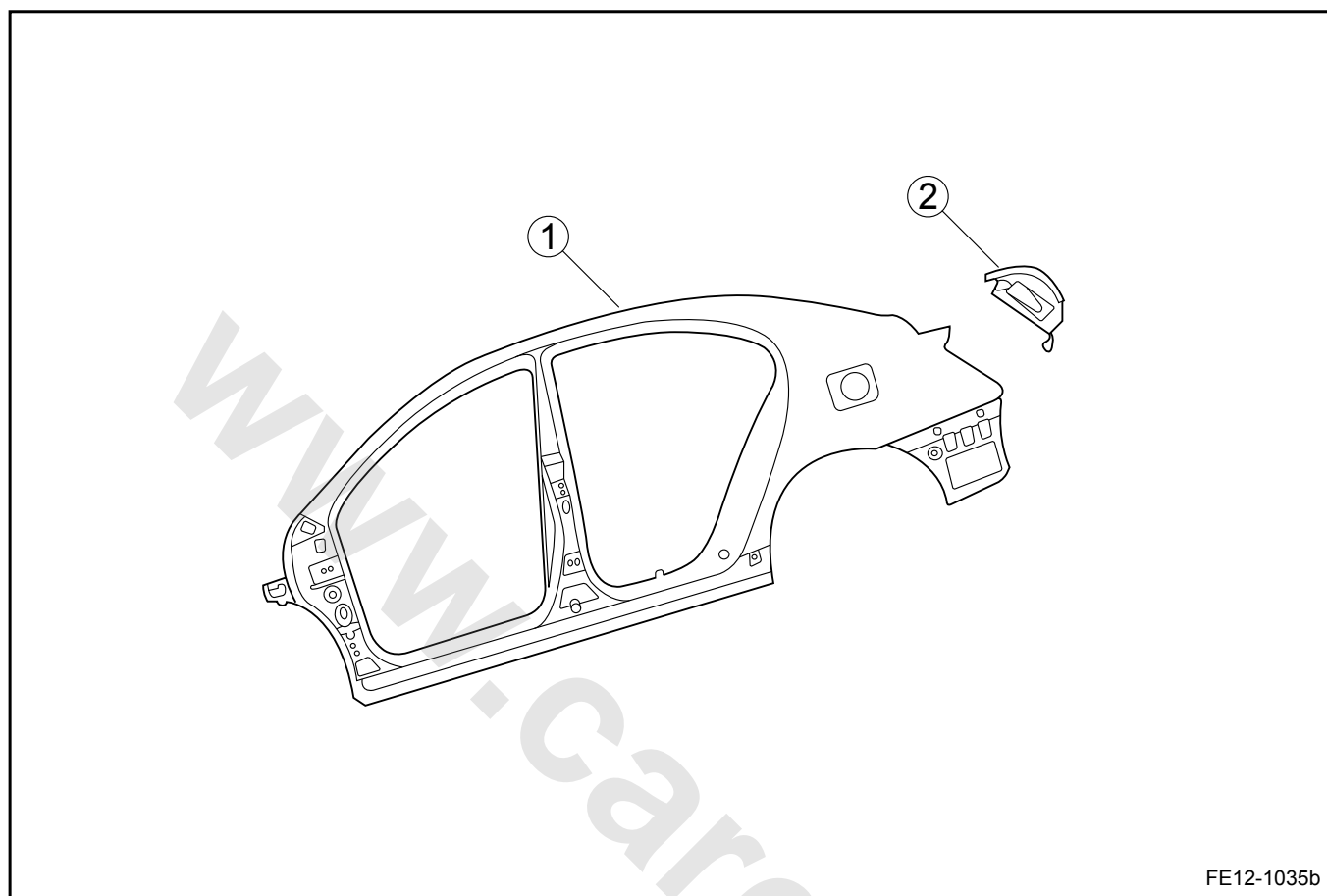


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## Legend

- |   |  |
|---|--|
| 1. Left Front Fender                          | 7. Hexagon Flange Bolt (Domestic)<br>Hexagon Flange Bolt - Increased Series (Export) |
| 2. Left Front Fender Cover Panel              | 8. Hex Flange Nut (Domestic)<br>Hex Flange Nut (Export)                              |
| 3. Left Front Fender Lower Mounting Support   |  |
| 4. Left Front Fender Upper Mounting Support   |  |
| 5. Left Front Shock Absorber Mounting Support |  |
| 6. Left Front Fender Lower Inner Panel        |  |

12.12.3.7 Body Side Outer Panel (Sedan)

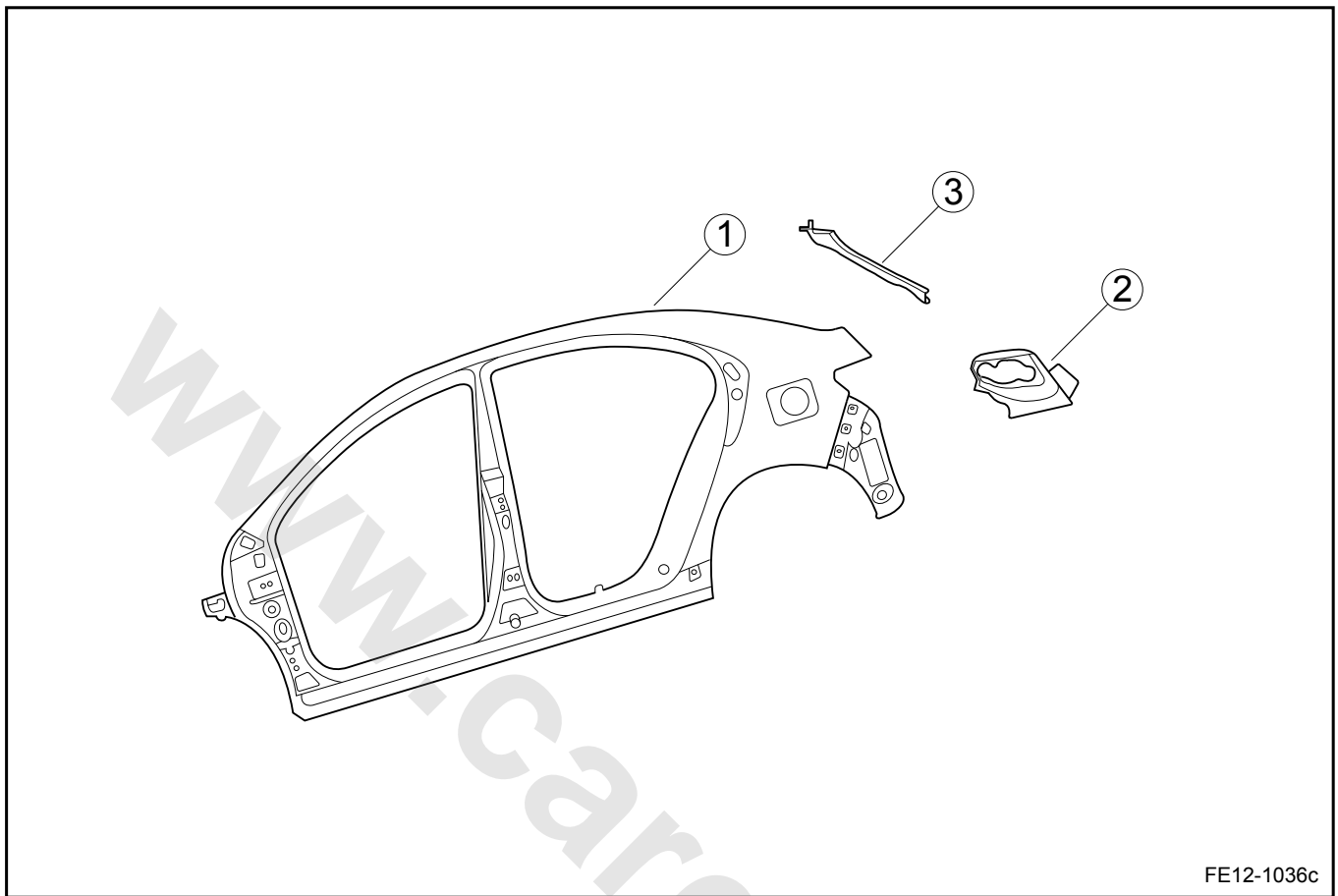


Legend

1. Left Body Side Outer Panel

2. Left Tail Lamp Mounting Panel

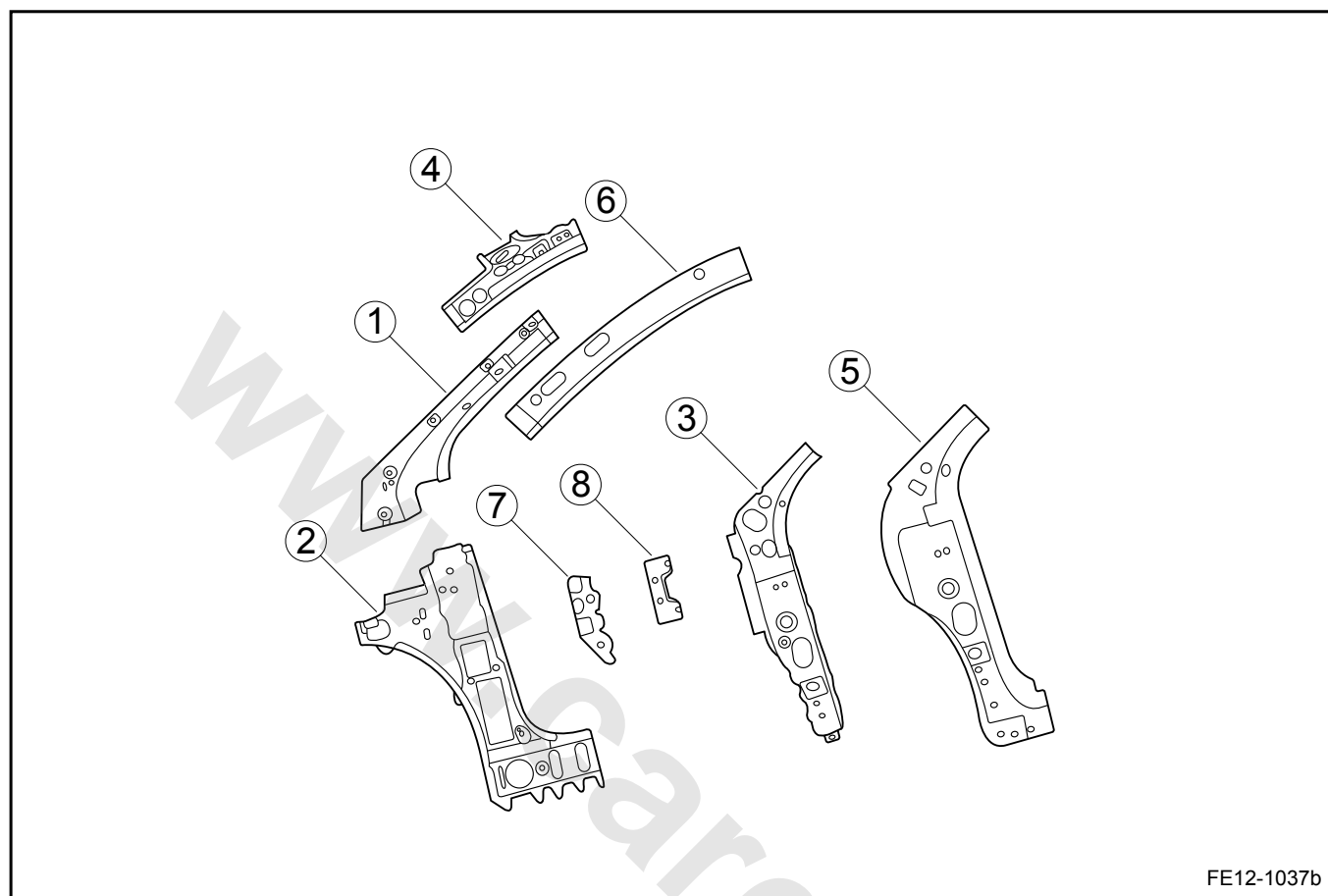
## 12.12.3.8 Body Side Outer Panel (Hatchback)



## Legend

- 1. Left Body Side Outer Panel
- 2. Left Tail Lamp Mounting Panel
- 3. Left Tail Lamp Upper Corner Mounting Panel

## 12.12.3.9 Body Front Pillars

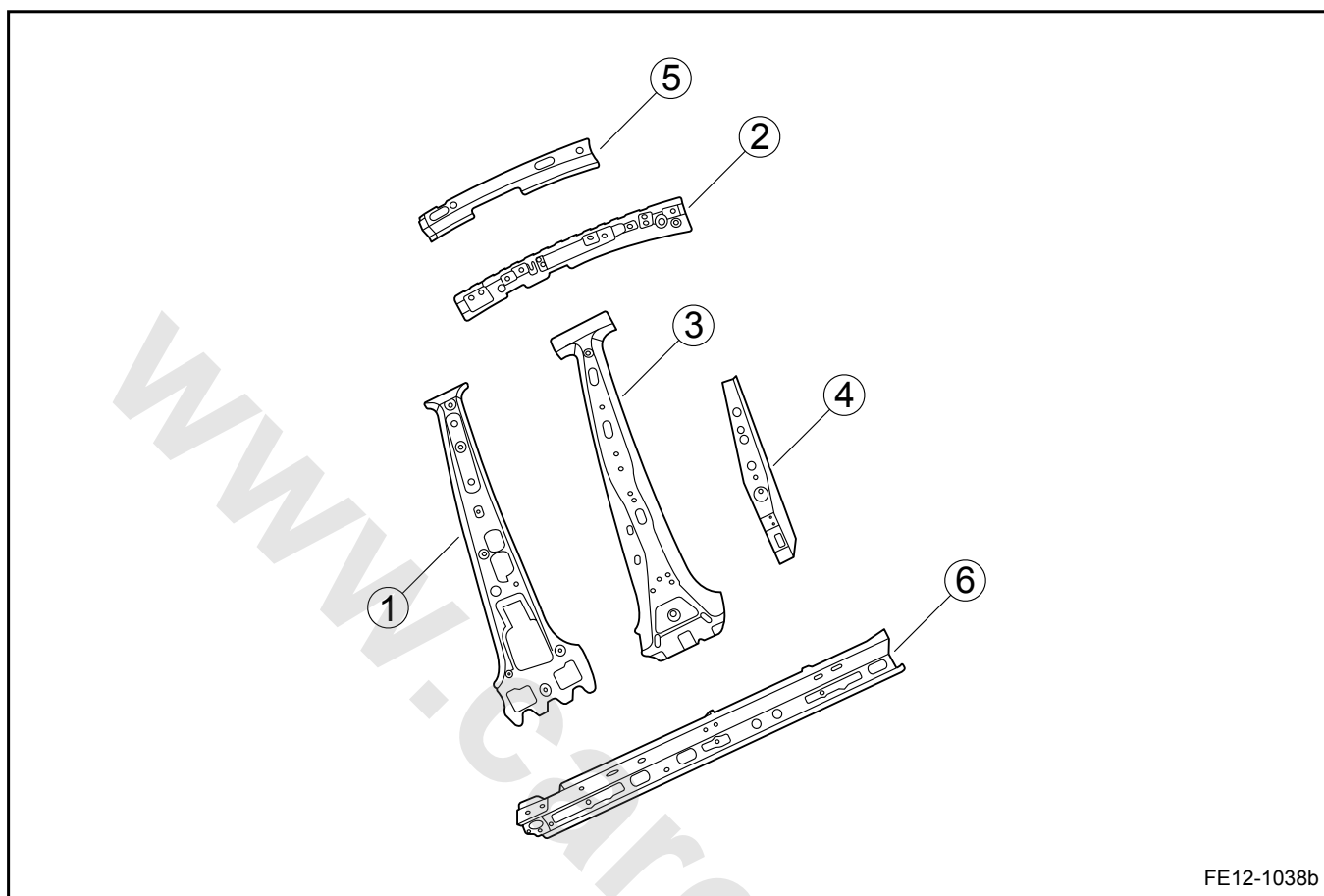


## Legend

- |   |  |
|---|--|
| 1. Left A-Pillar Inner Upper Panel          | 6. Left A-Pillar Upper Reinforcement Panel     |
| 2. Left A-Pillar Inner Lower Panel          | 7. Left I/P Mounting Panel Reinforcement Panel |
| 3. Left A-Pillar Lower Hinge Mounting Panel | 8. Left I/P Mounting Panel                     |
| 4. Left Front Cross Panel Assembly          |  |
| 5. Left A-Pillar Lower Reinforcement Panel  |  |



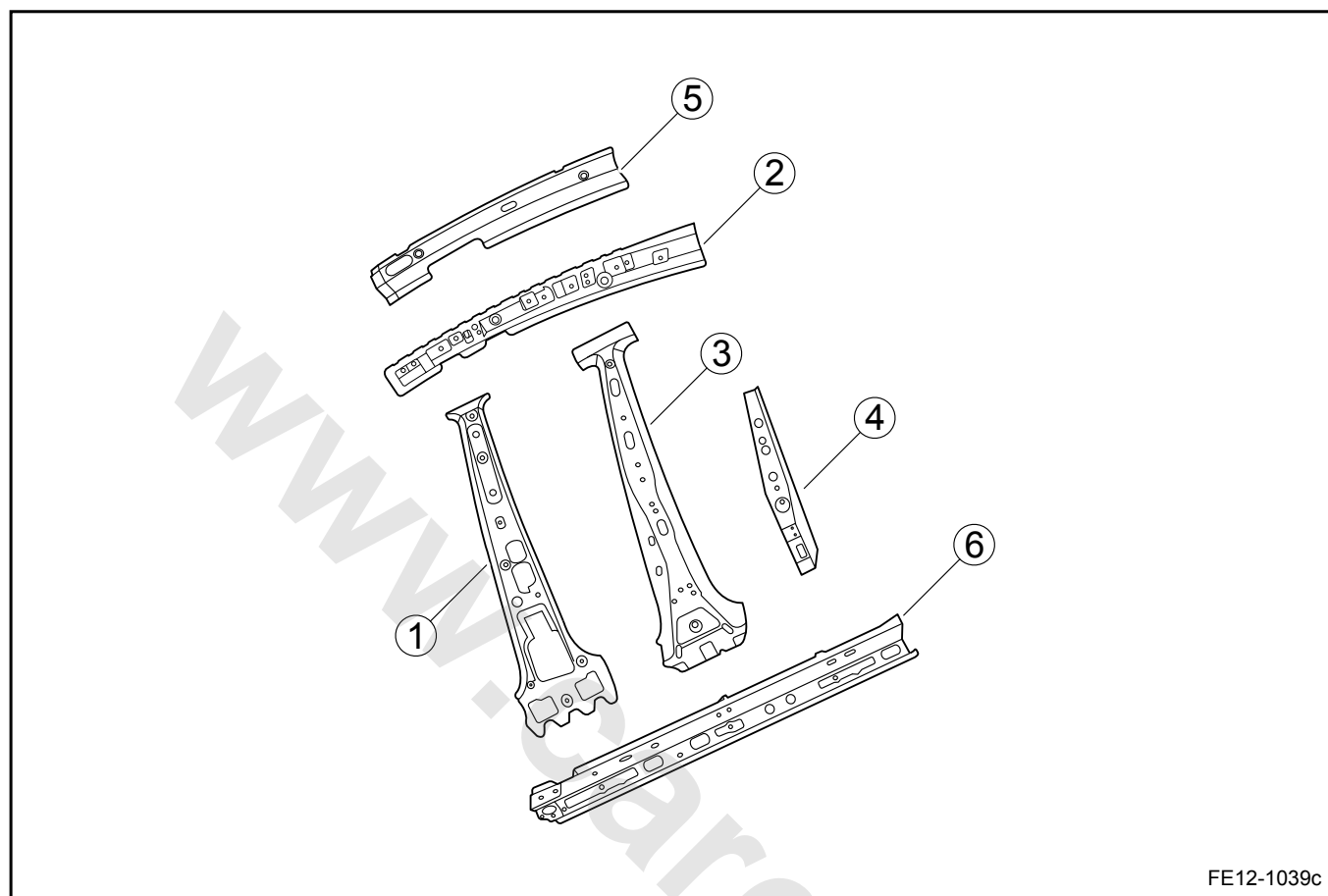
## 12.12.3.10 Body Middle Pillars (Sedan)



## Legend

- |   |  |
|---|--|
| 1. Left Center Pillar Inner Panel Assembly      | 5. Left Upper Side Panel Reinforcement Panel |
| 2. Left Upper Side Panel Assembly               | 6. Left Rocker Panel Reinforcement Panel     |
| 3. Left Center Pillar Outer Reinforcement Panel |  |
| 4. Left Center Pillar Lower Reinforcement Panel |  |

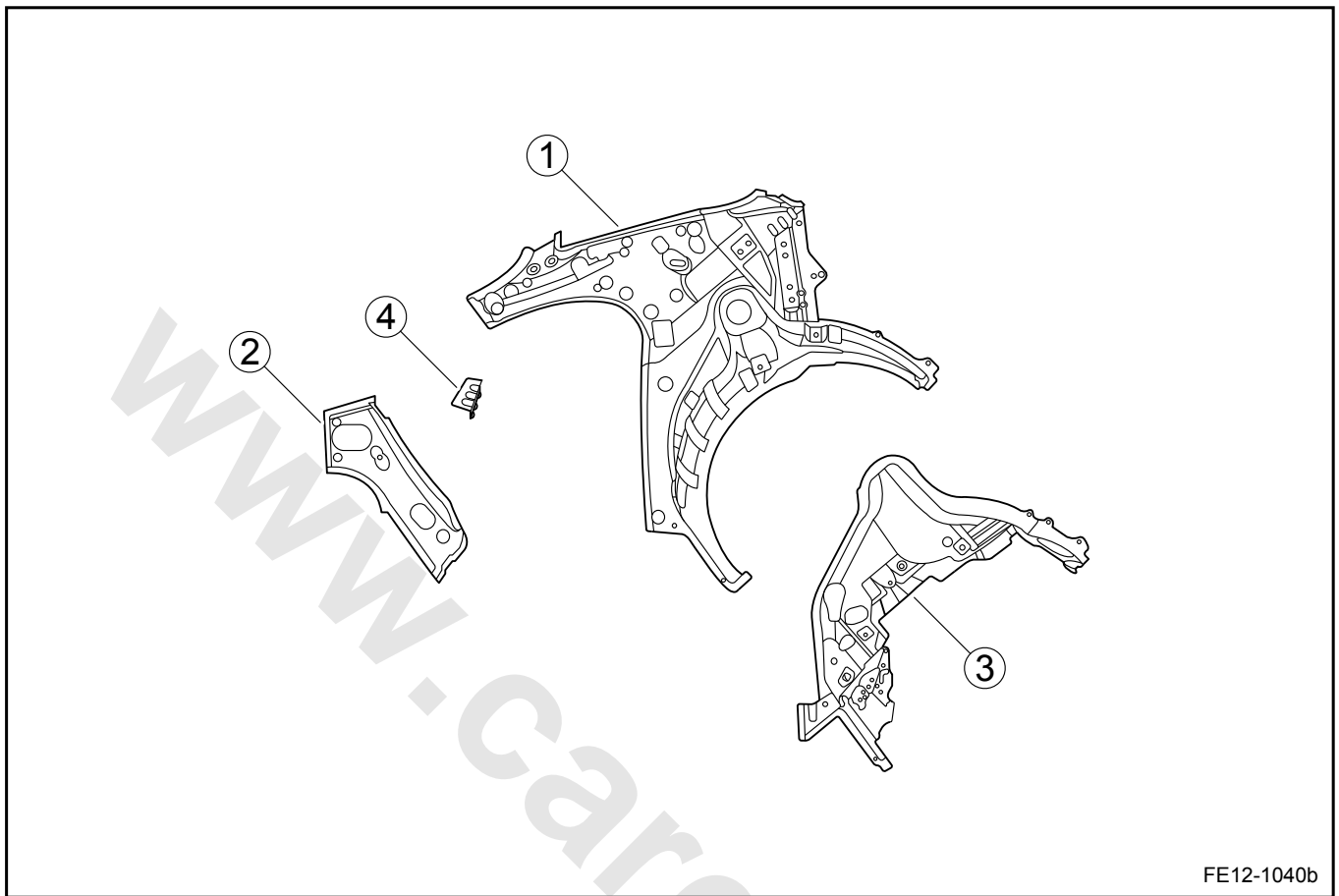
## 12.12.3.11 Body Middle Pillars (Sedan)



## Legend

- |   |  |
|---|--|
| 1. Left Center Pillar Inner Panel Assembly      | 5. Left Upper Side Panel Reinforcement Panel |
| 2. Left Upper Side Panel Assembly               | 6. Left Rocker Panel Reinforcement Panel     |
| 3. Left Center Pillar Outer Reinforcement Panel |  |
| 4. Left Center Pillar Lower Reinforcement Panel |  |

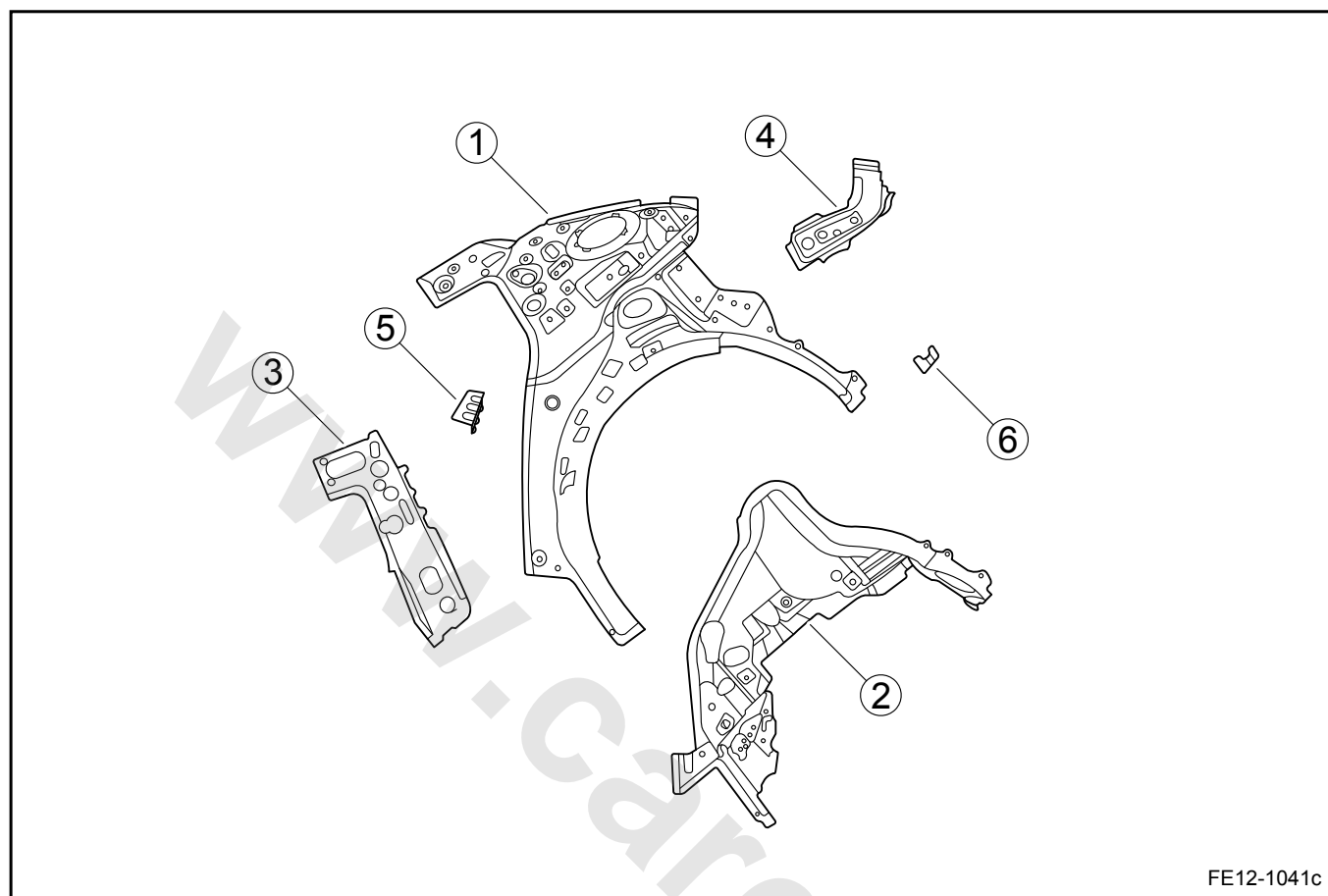
## 12.12.3.12 Body Rear Pillars (Sedan)



## Legend

- 1. Left Rear Pillar Inner Panel Assembly
- 2. Left Rear Pillar Reinforcement Panel
- 3. Left Rear Wheelhouse Panel
- 4. Left Rear Door Lock Mounting Panel

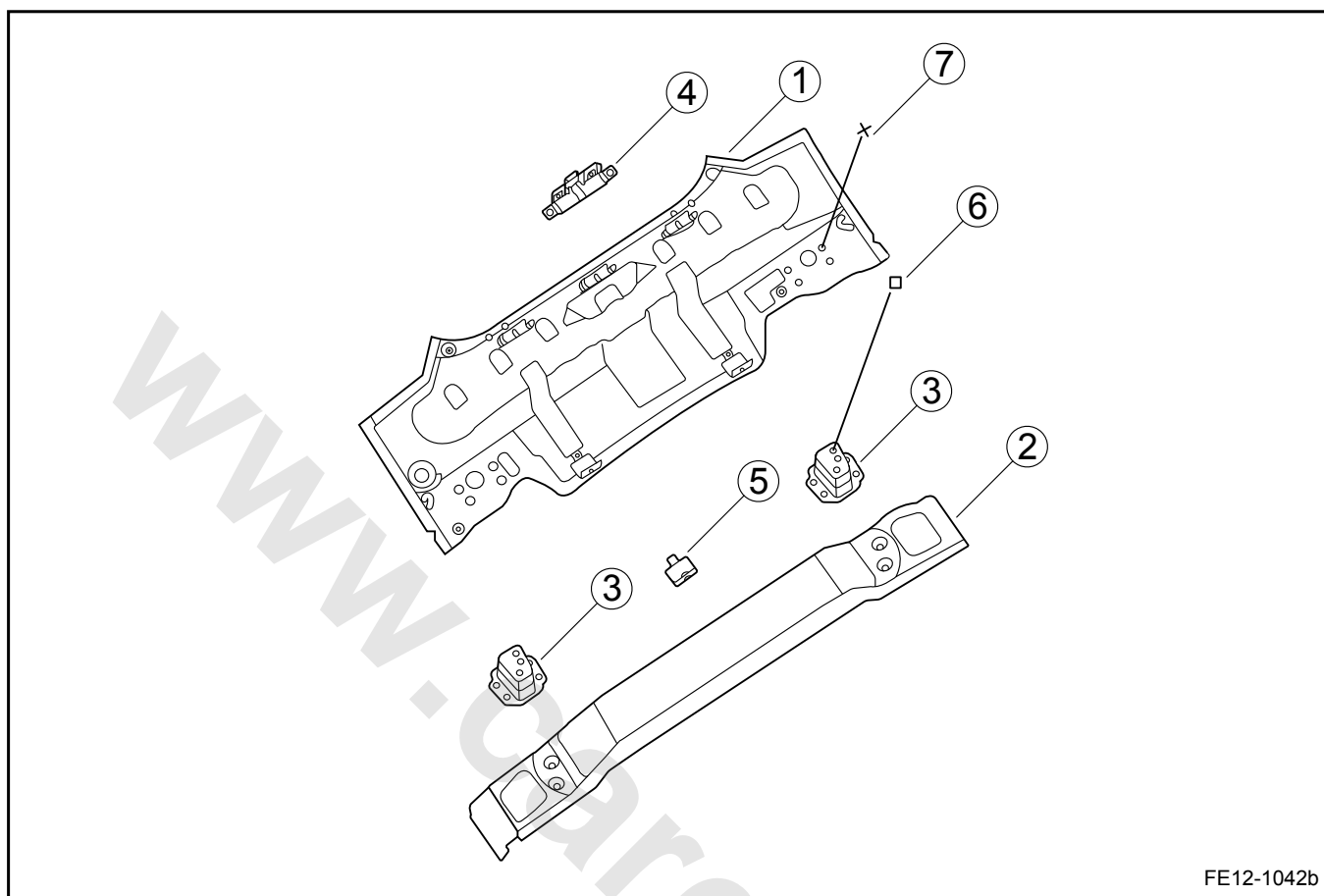
### 12.12.3.13 Body Rear Pillars (Hatchback)



#### Legend

- |   |                                       |
|---|---------------------------------------|
| 1. Left Rear Pillar Inner Panel Assembly    | 5. Left Rear Door Lock Mounting Panel |
| 2. Left Rear Wheelhouse Panel               | 6. Left Rear Bumper Mounting Panel    |
| 3. Left Rear Pillar 1st Reinforcement Panel |                                       |
| 4. Left Rear Pillar 2nd Reinforcement Panel |                                       |

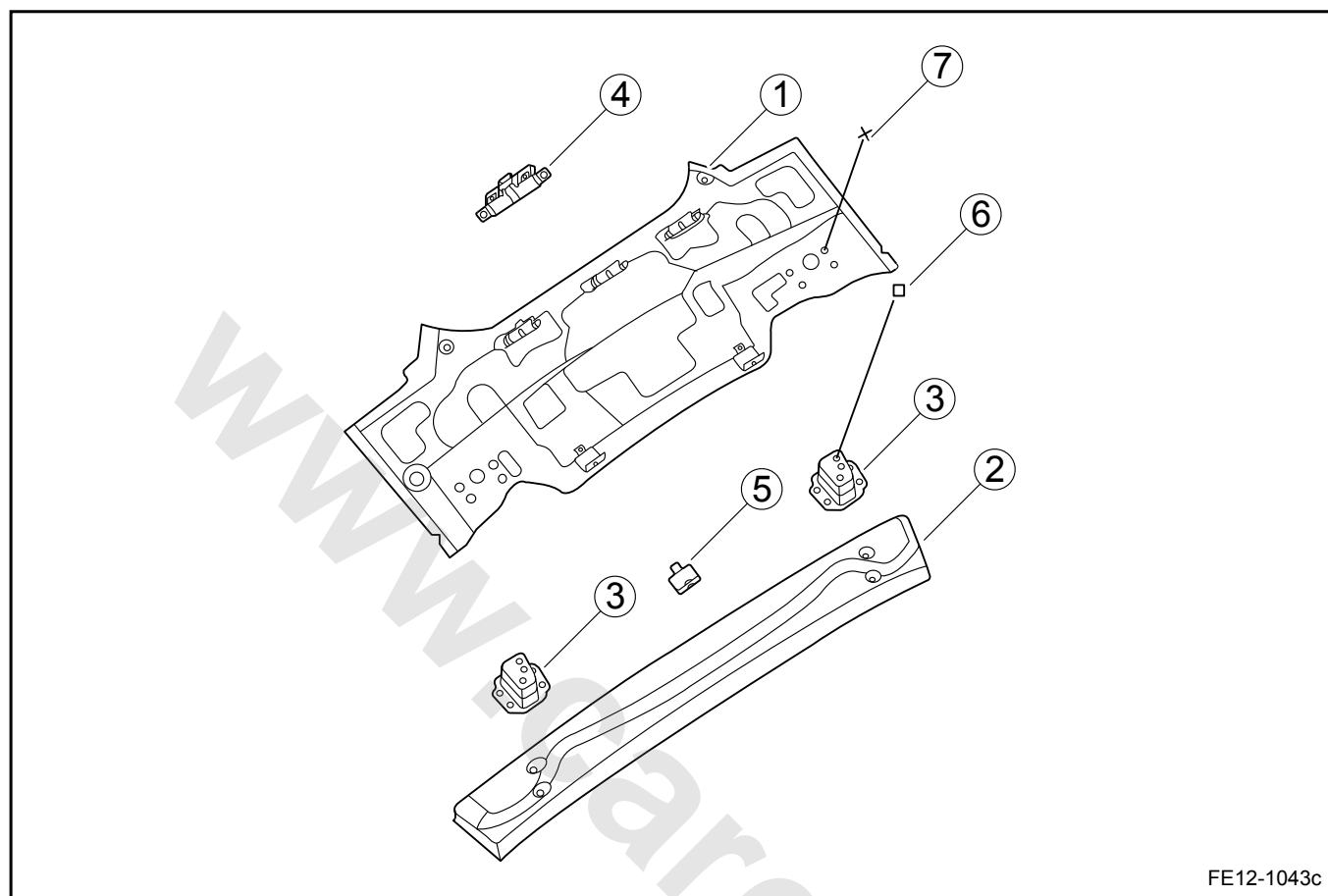
## 12.12.3.14 Body Rear End (Sedan)



## Legend

- |   |  |
|---|--|
| 1. Rear End Panel Assembly                    | 7. Hex Head Bolt, Spring Washer and Washer Assembly (Domestic) |
| 2. Rear Cross Panel Assembly                  | Hex Head Bolt, Spring Washer and Washer Assembly (Export)      |
| 3. Rear Cross Panel Energy Absorbing Assembly |  |
| 4. Rear Bumper Mounting Panel                 |  |
| 5. Rear Bumper Lower Mounting Panel           |  |
| 6. Hexagon Flange Nut                         |  |

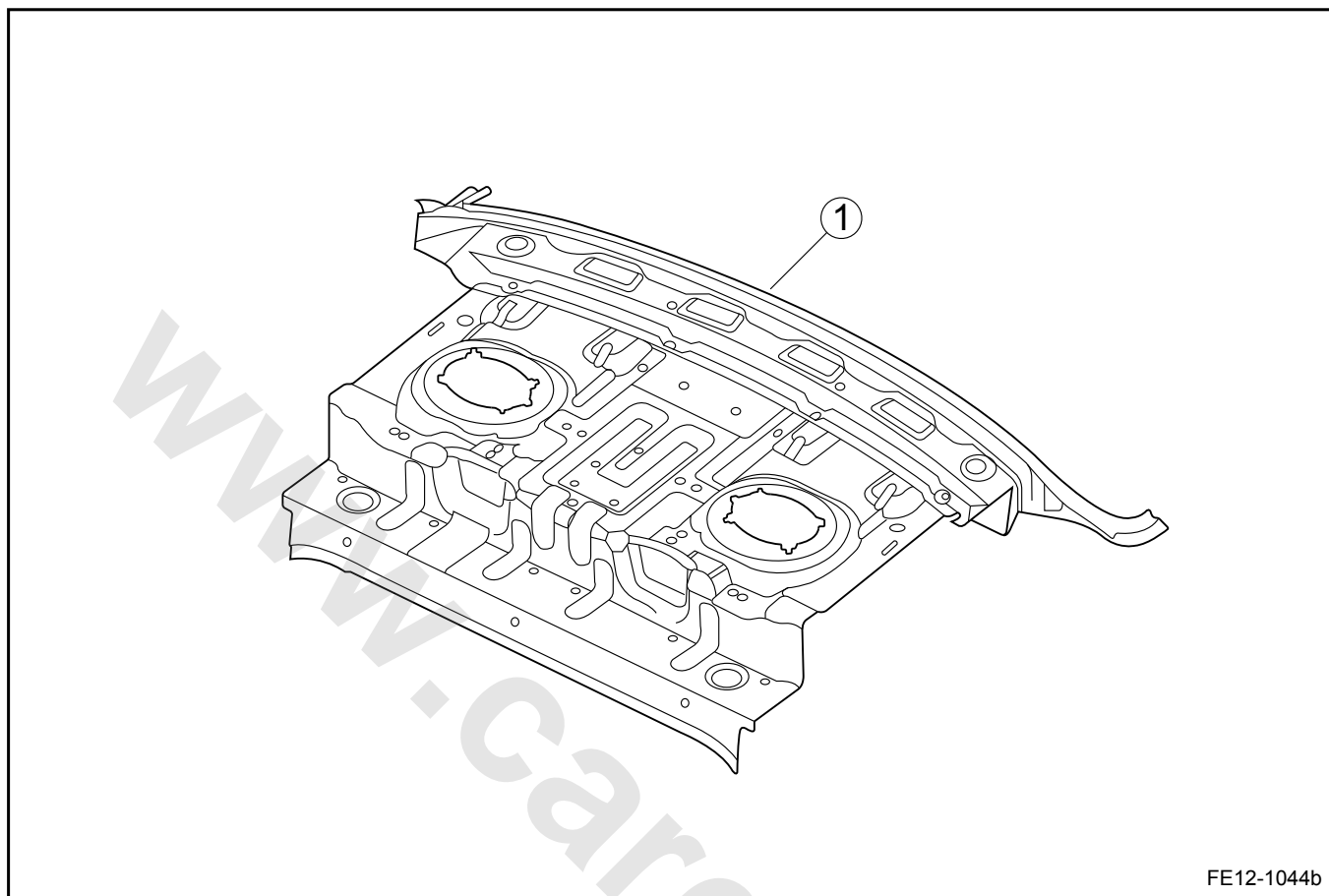
### 12.12.3.15 Body Rear End (Hatchback)



#### Legend

- |   |   |
|---|---|
| 1. Rear End Panel Assembly                    | 6. Hexagon Flange Nut                               |
| 2. Rear Cross Panel Assembly                  | 7. Hex Head Bolt, Spring Washer and Washer Assembly |
| 3. Rear Cross Panel Energy Absorbing Assembly |   |
| 4. Rear Bumper Mounting Panel                 |   |
| 5. Rear Bumper Lower Mounting Panel           |   |

### 12.12.3.16 Rear Parcel Shelf Panel (Sedan)



#### Legend

- 1. Rear Parcel Shelf Panel Assembly

## 12.12.4 Diagnostic Information and Procedures

### 12.12.4.1 Diagnostic Information and Procedures

#### Vehicle Diagnostics

In the body repair process, professional technician will use panel calibrator, electronic measurement systems, sheet metal repair machines, welding machines and a variety of cutting tools such as grinding. The repair will ensure that the vehicle will be restored to the original conditions such as geometric dimensions and performance. However, some drive system faults or installation errors that may lead to serious consequences may not be identified in the repair process. Therefore, in addition to make the necessary body geometry inspection, you must pay particular attention to the following components:

- Check to ensure that the steering mechanism and the steering rod can be correctly operated within the wheel turning range. Visual inspect whether there are bent or cracked pieces.
- Check all the running gear components (such as the fork tubes, vertical arm, sliding suspension arm, steering knuckle, stabilizer bar, body frame and the overhang), whether there are bending, distortion and cracking.
- Check whether the wheel and tire are damaged, rotating concentrically and unbalanced. Check tire tread and the sidewalls incisions and tire pressure.
- Check for damages in engine, gearbox and exhaust system mountings.
- Road test to make sure the vehicle's driving performance, and then deliver the vehicle to the customer.



## 12.12.5 Removal and Installation

### 12.12.5.1 Removal and Installation

#### Note

Before remove any key components from the vehicle body, you must use a universal-type body frame correction calibration to correct body, and then determine the damaged components that need to be replaced. Before welding, the parts must be accurately positioned, and then you must measure to ensure that components meet the body dimension requirements. In the welding process, you must measure related dimensions frequently to ensure proper assembly.

Before removal, you must understand the body sheet metal parts correlations. Please refer to the "Body Sheet Metal Parts Map" below. It is not recommended to cut a single part, as cutting and welding will affect the vehicle stiffness, driving safety and maintenance convenience.

#### Removal Procedure:

1. Remove all the parts relevant to the component that needs to be replaced.
2. Apply sealant and anti-corrosion material when necessary.
3. Locate, mark and drill all the factory solder joints on the component that needs to be replaced.
4. Remove the damaged component that needs to be replaced.
5. Remove material residue.

#### Installation Procedure:

1. Treat the mating surface when necessary.
2. According to the original welding type, you must choose the correct welding techniques. Use shielded welding at areas that are not convenient for welding. If you choose to plug welding, please drill holes in the new components for plug welding seam. Determine the diameter and spacing according to the original plug weld hole solder joints.
3. Temporarily put the new component on the vehicle.
4. Install the new component with the correct mountings and tighten (correct position the repair board).

5. Frequently measure the location of the new component to ensure that the assembly dimensions are correct.
6. Weld.
7. Clear all welded surfaces.
8. Spray primer.
9. If necessary, spray sealant and anti-corrosion material.
10. Install all the relevant sheet metals and components.

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## 12.13 Paint/Coatings

### 12.13.1 Specifications

#### 12.13.1.1 Specifications

Refer to the material supplier's technical specifications.

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## 12.13.2 Description and Operation

### 12.13.2.1 Paint Coating Description

Paint is a liquid mixture. It can be used in a variety of substrates. After the paint is dry, it will form a solid film to protect the substrate and make the exterior more appealing. Vehicles from the factory will already have the following spraying paint, so the vehicle body skins will be corrosion resistant and shining.

1. Electrophoresis Primer
2. Middle Paint
3. Color Paint
4. Lacquer (Transparent Outer Coating)

Electrophoresis Primer Main Functions:

1. Rust-Proof
2. Enhancing Adhesion
3. Providing Filling

Middle Paint Main Functions:

1. Filling
2. Isolation/Tightness
3. Foil Color Paint

Color Paint Main Functions:

1. Adding color
2. Giving Luster

Lacquer Main Functions:

Clear lacquer finish is located in the outermost layer and has the following main functions:

1. Containing anti-UV materials and resistant to the sun's ultraviolet rays.
2. Resistant to environmental dust (acid rain) on the finished surfaces.
3. Resistant to friction.
4. Providing better gloss lacquer.

The requirement for spray paint is to restore the repaired parts to the original conditions. In the repair process, you must strictly follow manufacturer's instructions. Please refer to the [12.13.4.4 Rigid Surface Spray Paint Process](#).

### 12.13.2.2 Routine Vehicle Paint Maintenance

For routine vehicle paint maintenance, please follow the principles listed below:

1. Do not touch the body paint with a greasy hand or wipe the body paint with a greasy cloth. Do not place a greasy tool on the vehicle body. Do not place a cloth soaked with organic solvent on the vehicle body to avoid chemical reaction.
2. Do not spray paint if the paint surface has no significant scratches, in order to prevent paint mismatching.
3. A long-term parked vehicle should be parked in the garage or a well-ventilated place. Cover the vehicle body with a specialized cover in winter. Choose a cool place for temporary parking.
4. Avoid strong impact, knocking and scratches on the body paint. If paint damage, dent or peeling is found, repair the paint work immediately ideally at a Geely authorized service station.
5. Clean the body decorative parts with a good quality detergent. Do not apply excessive wax, to avoid penetrating paint and reveal the paintwork. For some special highly corrosive traces (such as asphalt, bird droppings, insects, etc.), remove immediately. In this regard, clean the surface with special cleaning agents. Do not scrap with a blade or use gasoline, to avoid damage to the paint.
6. Before and after use the vehicle, remove the dust on the body to minimize the static electricity dust attached to the vehicle body.
7. After the rain, rinse the vehicle body. After the rain, the rain drops on the vehicle body will gradually reduce, so the concentration of acid will increase gradually. If you do not rinse with water, over time the water stains will damage the paintwork.
8. Wash the vehicle after the engine cools down. Do not wash the vehicle in the hot sun or high temperatures, to avoid leaving behind traces of dried cleaning agent. Wash the vehicle with special washing agent. Do not use strong alkaline detergent or soap water to prevent washing off oil paint or speeding up the paint aging. If washing the vehicle in a car washing place, prevent car wash workers using de-waxing detergent, to avoid damage to the paint. If driving in coastal or polluted areas, wash the vehicle once a day.
9. Use clean soft cloth or sponges to wipe the vehicle to prevent the mixing of metal debris and sand. Do not use dry cloth, dry towel or dry sponge cleaning in order to avoid scratches. Wipe the vehicle body along the direction of flow gently from top to bottom. Do not wipe in circles and in horizontal direction.

10. Apply wax to protect the paint from time to time on a regular basis (quarterly) at a Geely authorized service station, to restore the body gloss finish. In addition, paint protection film can be used. 3M paint protection film (Rhino skin) is a colorless transparent paint protection film, with super toughness. It can be used to protect the vehicle bumper, hood, front and rear doors, mirrors and other paint surfaces to protect the car from a minor collision or paint scratch.

### 12.13.2.3 Warnings and Notices in the Paint Mixing and Spray Paint Operations

#### Warning!

In the paint mixing and spray paint process, the solvent vapor can cause severe respiratory diseases. The paint, equipment and safety devices manufacturers operation instructions must be strictly followed. To carry out the operation, the technician should wear special labor protection supplies, such as gas masks, anti-static clothing, protective goggles and gloves, to prevent injury.

#### Note

Do not use different manufacturers' paint and replacement products together. Mixing incompatible products will cause the following:

1. Primer layer peeling
2. Poor bonding between different layers of coating
3. Cure insufficiently
4. Reduced gloss
5. Poor color accuracy
6. Coating damage (pits, bubbles, orange peel-like tarnish).

### 12.13.2.4 Clear coats Maintenance and Repair Notices

#### Note

1. Avoid washing the vehicle in direct sunlight.
2. Avoid using strong soaps and chemical detergents.
3. Use brush-less automatic car wash equipment.
4. Avoid using acid and alkali products.
5. Do not use a brush or a broom to clear snow or ice.
6. After thoroughly cleaning, immediately wipe clean water stains. Do not leave the water stains dry on the surface. Recommend using soft chamois leather to wipe the surface dry.

7. When the defects on the surface can be eliminated by polishing, polish the vehicle body.
8. If the surface conditions are not serious, the repair area should be kept as small as possible.
9. Avoid applying excessive clear lacquer, as it may lead to paint premature damage.
10. Strictly follow the polishing equipment manufacturer's recommendations when using an electric polishing equipment. Do not use wax or silicone products to cover a swirl mark (it will soon be revealed and lead to customer's complaint).

### 12.13.2.5 Anti-Corrosion Treatment Notices

#### Note

1. When spraying sound insulation or anti-corrosion material, you must take preventive measures to avoid spraying into the open components (such as door locks, window channel, window regulator and the seat belt retractor), any moving parts, rotating parts, especially the parking brake pull cable. After spraying, ensure open all the body discharge holes.
2. When repair body with a naked flame, you must remove the foam insulation materials. Re-install sound insulation material to avoid inhaling harmful dust.
3. When carrying out this operation, you should wear special protective goggles and gloves to prevent injury.
4. Before the vehicle leaving the factory, the electro-coating paint were carried out on the body sheet metal. After repair and/or replacement, all exposed metal surfaces must be treated with anti-rust primer.
5. If during the welding or heating operation, the original coatings or anti-corrosion materials are burnt, the surfaces must be cleaned and treated with anti-corrosion materials.
6. Collision repair will expose metal panels, so these metal surfaces must be applied with special anti-corrosion materials.

7. The sealant can prevent water and dust entering the vehicle, and it also has anti-corrosion function. The original sealed joints are apparent. If they are damaged, they should be corrected by re-sealing. The new joints should be re-sealed. The sealant must maintain flexibility after curing and painting. Openings joints should be filled with high viscosity filler. Follow the selected materials instructions.
8. Insulation materials can control the general noise level inside the vehicle. When the insulator is damaged during repair, replace it with the same material.

## 12.13.3 Diagnostic Information and Procedures

## 12.13.3.1 Common Paint Defects and Treatment

## Note

Adding black box in the table indicates the treatment.

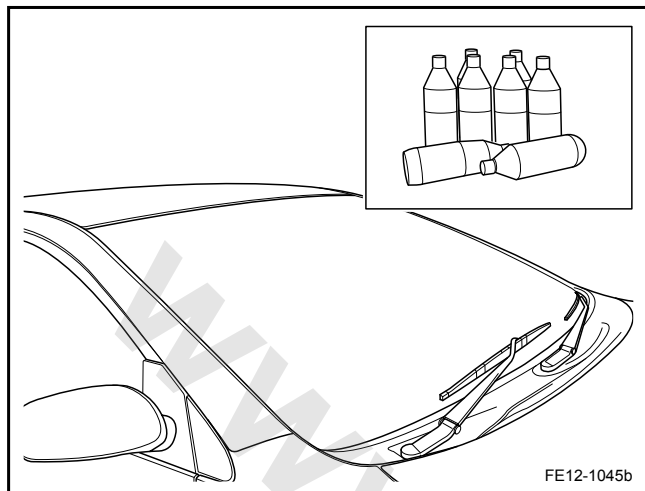
Defects	Causes	Treatment
Powder	<ol style="list-style-type: none"> <li>1. Film subject to strong erosions, such as the strong ultraviolet radiation.</li> <li>2. Incorrect ratio in the paint mixture.</li> <li>3. Coating low resistance to sun and bad weather.</li> <li>4. Vehicle is not cleaned regularly or thoroughly.</li> <li>5. Incorrect choice of car cleaning agents or polishing wax too coarse.</li> </ol>	<ol style="list-style-type: none"> <li>1. Polishing</li> <li>2. Conventional grinding and polishing</li> <li>3. Deep grinding and finesse polishing</li> <li>4. Local paint repair</li> </ol>
Plastic Paint Peeling	<ol style="list-style-type: none"> <li>1. Poor adhesion between the coating and the substrate or outer coating too hard</li> <li>2. Coating too thick or erosion caused by water vapor, acid and alkali in the air</li> <li>3. Under coating treated incorrectly; pinholes and defects in the outer paint layer</li> </ol>	<ol style="list-style-type: none"> <li>1. Polishing</li> <li>2. Conventional grinding and polishing</li> <li>3. Deep grinding and finesse polishing</li> <li>4. Local paint repair</li> </ol>
Cracking	<ol style="list-style-type: none"> <li>1. Primer inadequately stirred</li> <li>2. Spray paint too thick</li> <li>3. Middle coating too thick</li> </ol>	<ol style="list-style-type: none"> <li>1. Polishing</li> <li>2. Conventional grinding and polishing</li> <li>3. Deep grinding and finesse polishing</li> <li>4. Local paint repair</li> </ol>
Bird Droppings Erosion	<ol style="list-style-type: none"> <li>1. Bird droppings erosion</li> </ol>	<ol style="list-style-type: none"> <li>1. Polishing (mild erosion)</li> <li>2. Conventional grinding and polishing (medium erosion)</li> <li>3. Deep grinding and finesse polishing</li> <li>4. Local paint repair (severe erosion)</li> </ol>
Scratch	<ol style="list-style-type: none"> <li>1. Film with low hardness</li> <li>2. Hard objects scratch</li> </ol>	<ol style="list-style-type: none"> <li>1. Polishing (minor scratches)</li> <li>2. Conventional grinding and polishing (thick scarring)</li> <li>3. Deep grinding and finesse polishing</li> <li>4. Local paint repair (scratched)</li> </ol>

Defects	Causes	Treatment
Corrosion	<ol style="list-style-type: none"> <li>Thin film edges</li> <li>Corrosion at minor collided areas</li> <li>Acid and alkali erosion</li> </ol>	<ol style="list-style-type: none"> <li>Polishing</li> <li>Conventional grinding and polishing</li> <li>Deep grinding and finesse polishing</li> <li>Local paint repair (serious rusted metals need to be repaired before painting)</li> </ol>
Paint Peeling	<ol style="list-style-type: none"> <li>Poor adhesion between the coating and the substrate or outer coating too hard</li> <li>Coating too thick or erosion caused by water vapor, acid and alkali in the air</li> <li>Under coating treated incorrectly</li> <li>Pinholes and defects in the outer paint layer</li> </ol>	<ol style="list-style-type: none"> <li>Polishing</li> <li>Conventional grinding and polishing</li> <li>Deep grinding and finesse polishing</li> <li>Local paint repair (serious rusted metals need to be repaired before painting)</li> </ol>
Acid Rain Erosion	<ol style="list-style-type: none"> <li>Acid rain erosion</li> </ol>	<ol style="list-style-type: none"> <li>Polishing (mild erosion)</li> <li>Conventional grinding and polishing (medium erosion)</li> <li>Deep grinding and finesse polishing</li> <li>Local paint repair (severe erosion)</li> </ol>
Gloss	<ol style="list-style-type: none"> <li>Film eroded by the acid, alkali, electric arc, sea water and other strong corrosive salty spray</li> <li>Incorrect maintenance methods in harsh conditions</li> <li>Poor paint durability</li> <li>Incorrect paint mixture ratio, paint durability deterioration</li> </ol>	<ol style="list-style-type: none"> <li>Polishing (mild loss of light)</li> <li>Conventional grinding and polishing (moderate loss of light)</li> <li>Deep grinding and finesse polishing</li> <li>Local paint repair (severe loss of light)</li> </ol>
Bubbling	<ol style="list-style-type: none"> <li>Film exposed to a humid environment for a long; water vapor infiltration into paint film; water and gas bubbling when temperature rises</li> <li>Corrosion caused by infiltrated materials</li> <li>Fuel, acid, alkali and other erosion</li> </ol>	<ol style="list-style-type: none"> <li>Polishing</li> <li>Conventional grinding and polishing</li> <li>Deep grinding and finesse polishing</li> <li>Local paint repair (serious rusted metals need to be repaired before painting)</li> </ol>

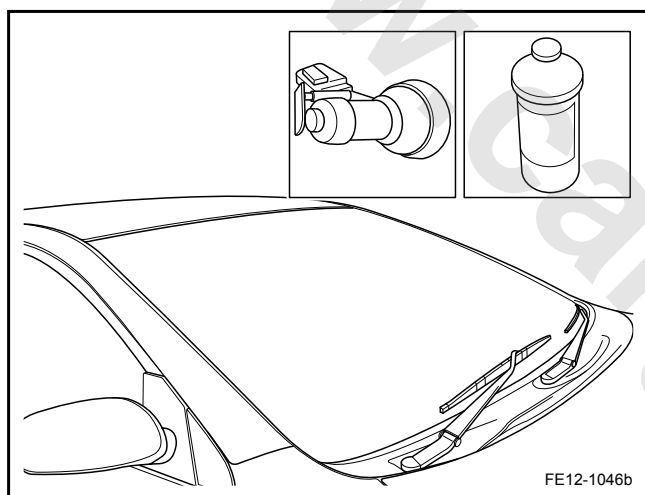


## 12.13.4 Removal and Installation

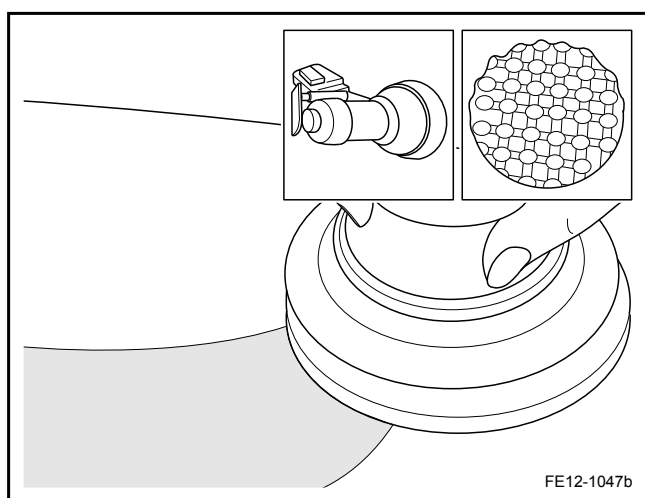
## 12.13.4.1 Common Coating Film Defect Treatment Example



1. Before polishing, clean the surface with de-greasing materials.



2. Firstly fully soak a sponge and squeeze excessive water.
3. Apply a small amount of polishing wax to the surface and adjust the polishing machine speed.



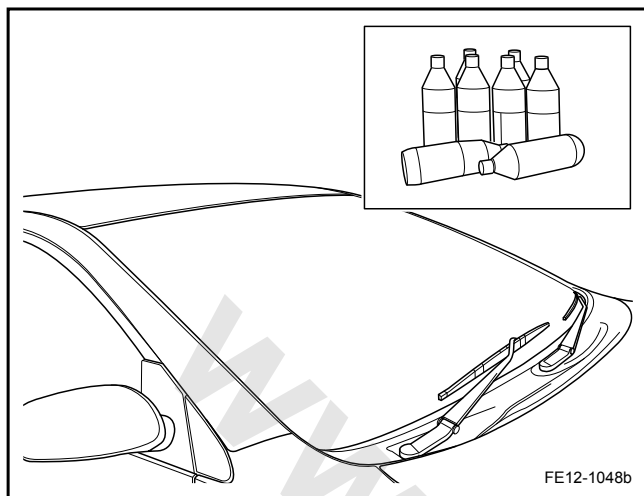
4. Put the sponge onto the surface, turn on the machine with a speed at 2,500-3,000 r/min. Gently press the sponge to polish for 3-5 s.

**Note**

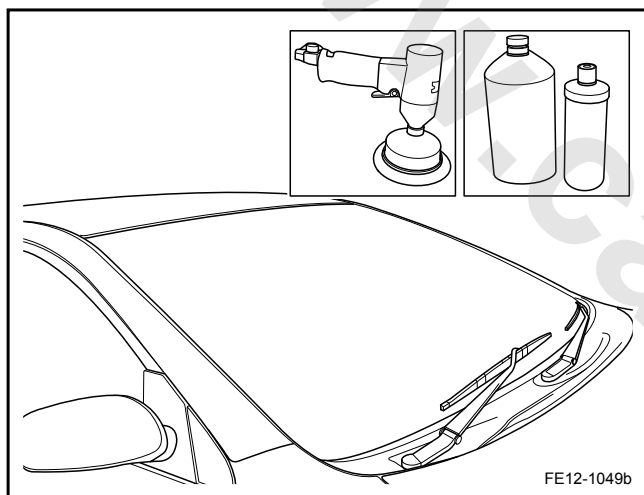
During operation, keep the machine stable and move gently. Do not work too long to avoid overheating, as the paint will be damaged by the heat.

5. Use a cleaning cloth to wipe the excessive wax.

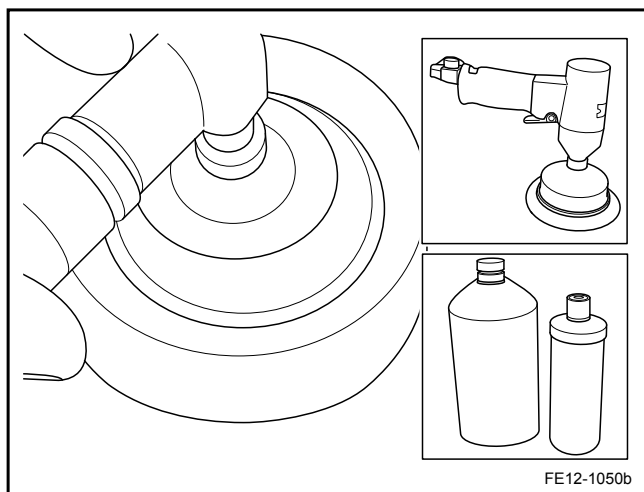
### 12.13.4.2 Conventional Grind and Polishing Treatment Example



1. Before polishing, clean the surface with de greasing materials.



2. Apply a small amount of polishing wax to the surface and adjust the polishing machine speed.



3. Put the wool ball onto the surface, turn on the machine with a speed at 2,500-3,000 r/ min.

#### Note

During operation, keep the machine stable and move gently. Do not polish too long. Keep the polishing time as short as possible, the polishing area as small as possible.

4. Firstly fully soak a sponge and squeeze excessive water. Apply a small amount of polishing wax to the surface. Put the sponge onto the surface, turn on the machine with a speed at 2,500-3,000 r/min. Gently press the sponge to polish for 3-5 s.

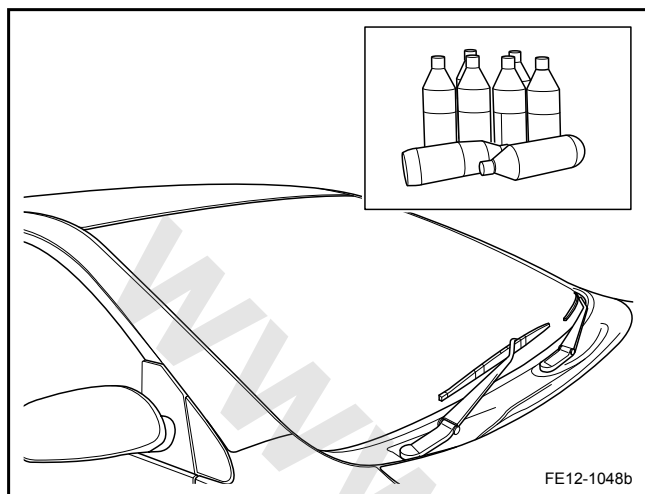
#### Note

During operation, keep the machine stable and move gently. Do not work too long to avoid

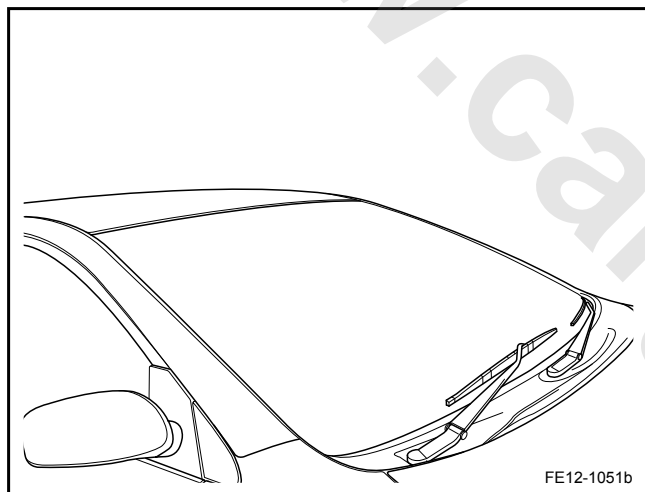
overheating, as the paint will be damaged by the heat.

#### 12.13.4.3 Deep Polishing Treatment Example

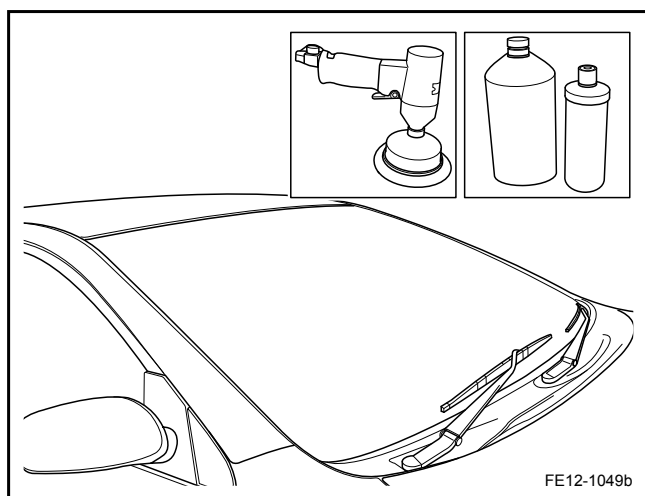
1. Sand the surface with a piece of 2000# sanding paper. Press the sand paper very close to the surface and sand in circles.

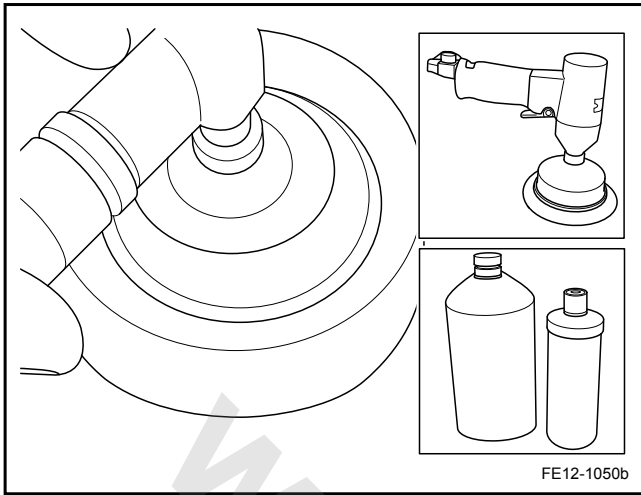


2. Remove the polishing power from the surface.



3. Apply an appropriate amount of polishing paste to the surface and adjust the speed polishing machine.

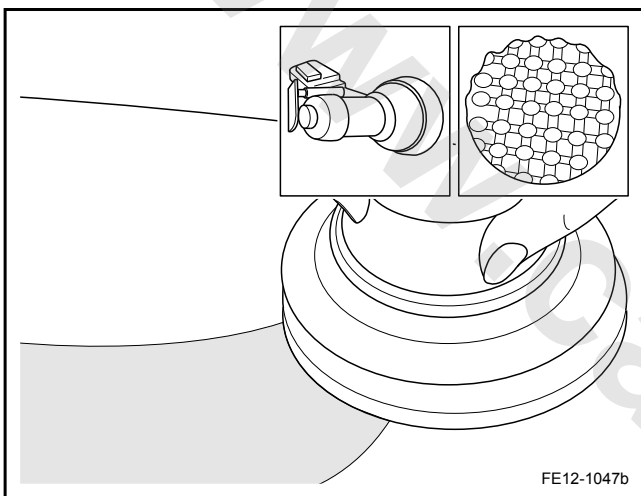




4. Put the wool ball onto the surface, turn on the machine with a speed at 2,500-3,000 r/ min.

#### Note

During operation, keep the machine stable and move gently. Do not polish too deep. Do not polish too long. Keep the polishing time as short as possible, the polishing area as small as possible.



5. Firstly fully soak a sponge and squeeze excessive water. Apply a small amount of polishing wax to the surface. Put the sponge onto the surface, turn on the machine with a speed at 2,500-3,000 r/min. Gently press the sponge to polish for 3-5 s.

#### Note

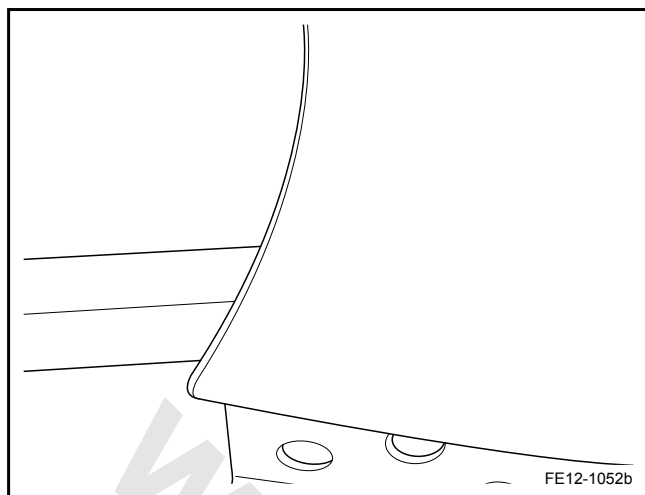
During operation, keep the machine stable and move gently. Do not work too long to avoid overheating, as the paint will be damaged by the heat.

### 12.13.4.4 Rigid Surface Spray Paint Process

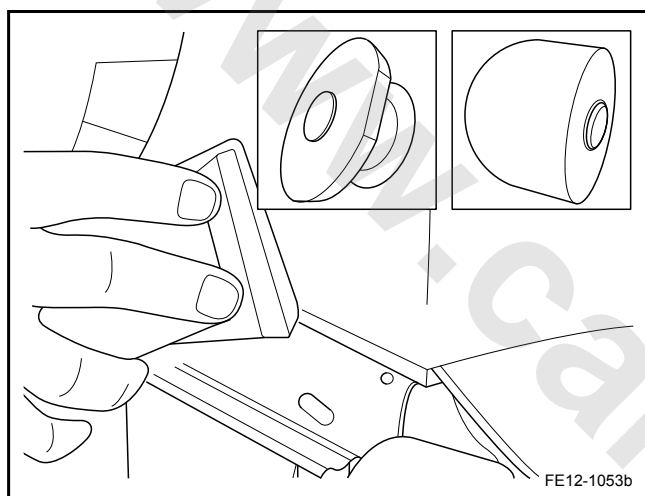
Use the front fender as an example to explain the local paint spray process.

#### Note

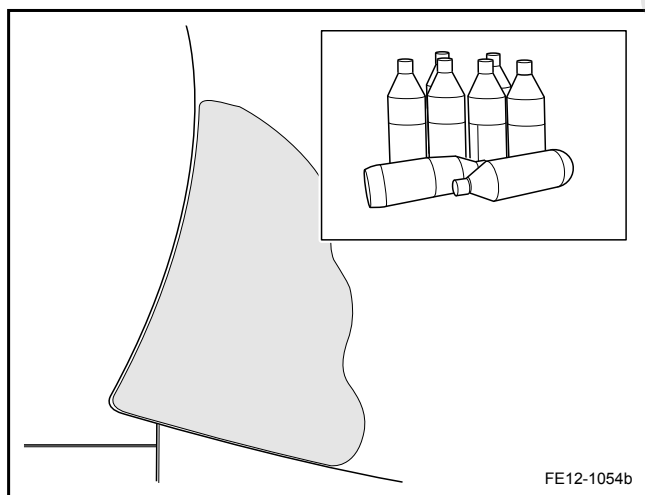
All rigid surface paint repairs must comply with Geely standards. Confirm the repair area and choose the repair techniques, such as local repair, block repair and the whole vehicle repair. If it is a collision repair, according to the sheet metal damage carry out sheet metal repair or replacement the parts and then carry out painting.



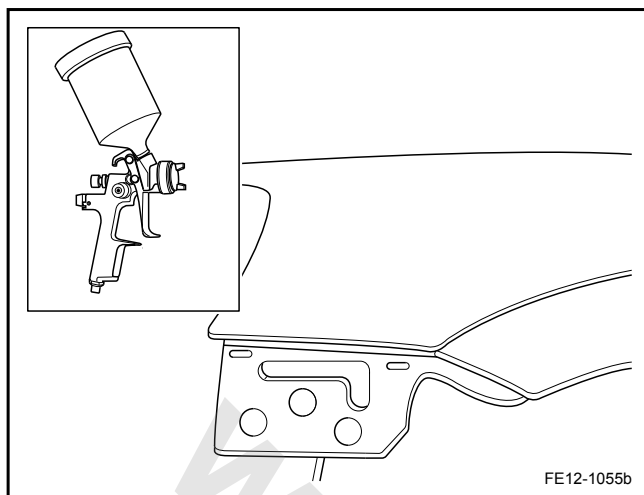
1. For serious fender scratches, use the local paint spray process.



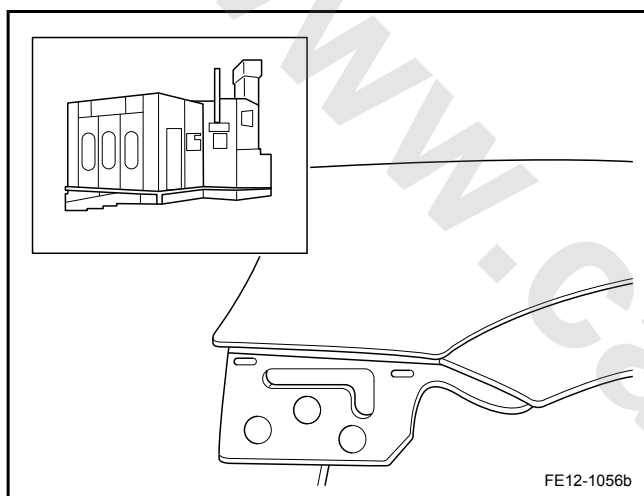
2. Sand the damaged surface with a piece of P500# wet sanding paper in circles.



3. Clean the surface with the de-greasing agents.

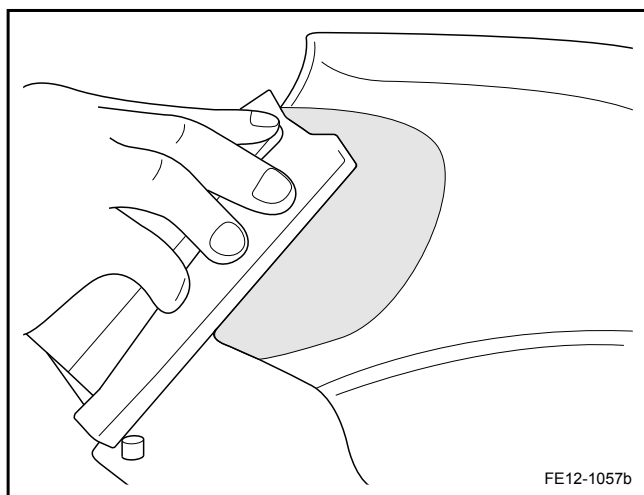


4. For primer painting, control the painting area. Gradually paint the edges. Do not overlap the the paint.

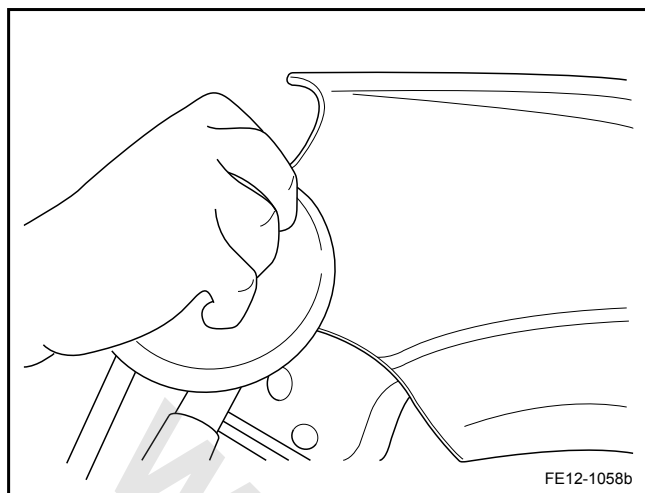


5. Leave the surface dry 4-5 min and then heat to dry 20-30 min.

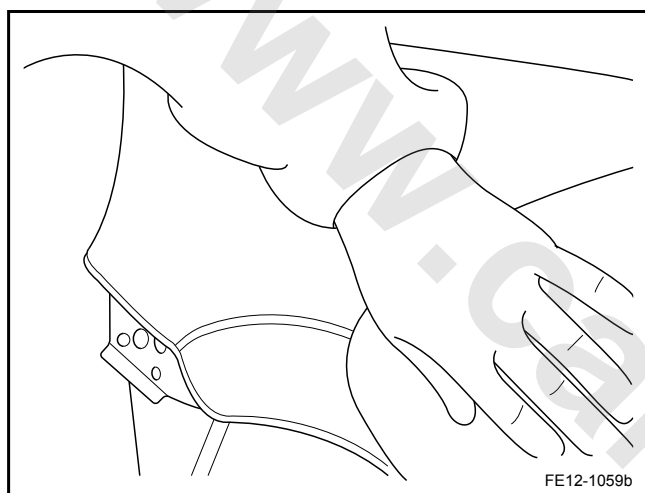
Paint room temperature at 70-80°C (158-176 °F)



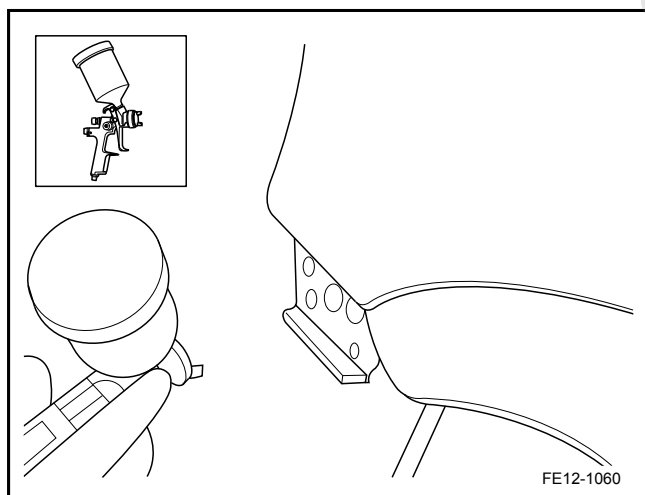
6. After drying, sand the surface with a piece of P800-1,000# sanding paper.



7. Sand the surface with a piece of 2000# fine sanding paper and expand the polishing area.



8. After finish polishing, remove the dust with a cloth to prepare for painting work.



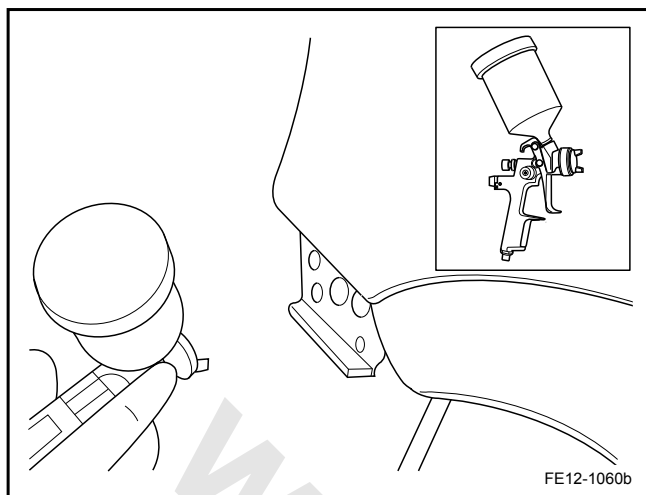
9. Spray the background color paint.

Air pressure 150-200 kPa (21.8-29.0 psi)

Spray distance 20-30 cm (7.87-11.81 in)

**Note**

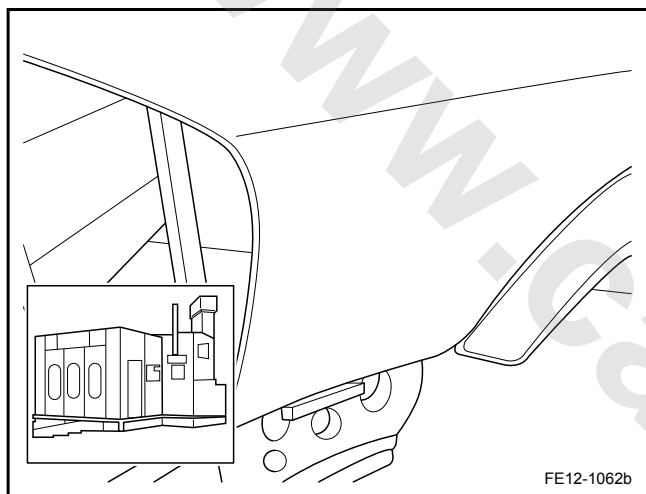
Spray a layer slightly wider than the previous layer in order to make the transition.



10. Leave the surface dry 2-3 min before spray the second layer of background paint until the layer joints become insignificant.

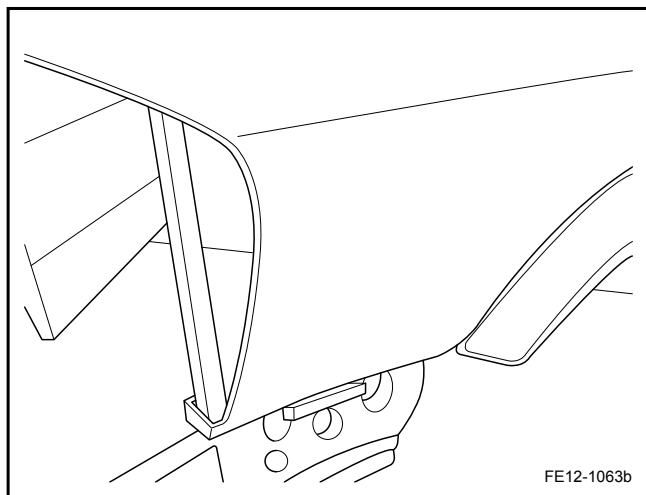
Air Pressure 150-200 kPa (21.8-29.0 psi)

Spray Distance 20-30 cm (7.87-11.81 in)



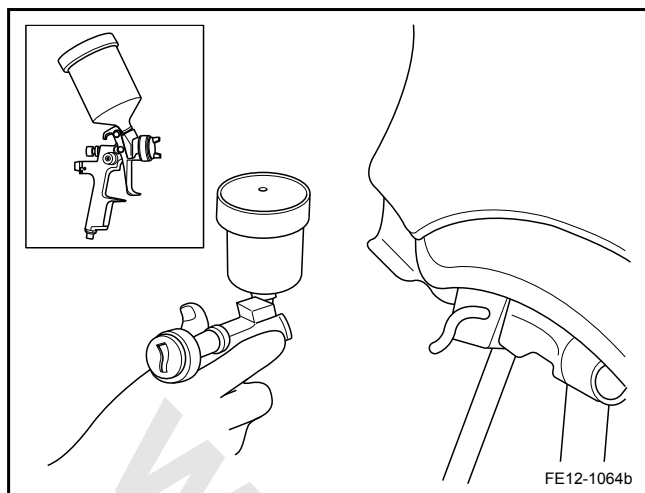
11. Leave the surface dry 4-5 min and then heat to dry 20-30 min.

Paint room temperature 70-80 at 70-80°C (158-176 °F)



12. After drying, remove the dust with a cloth to prepare for painting work.

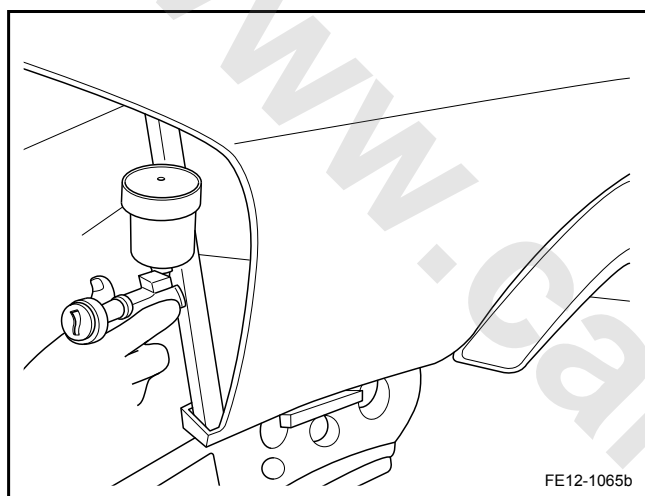




13. Spray clear lacquer to cover the whole background painting area.

Air Pressure 150-200 kPa (21.8-29.0 psi)

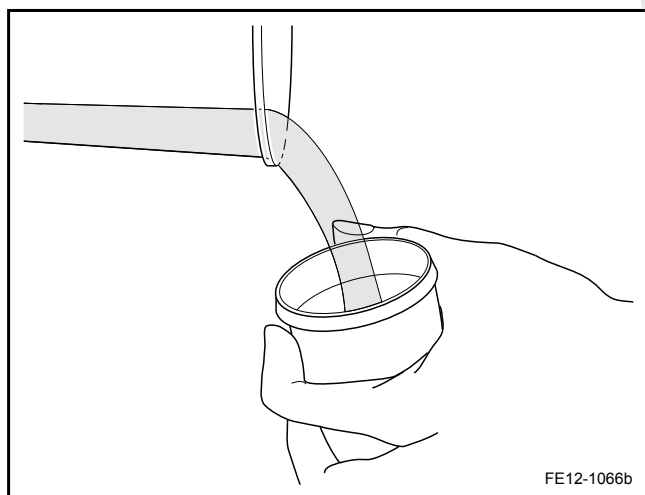
Spray Distance 20-30 cm (7.87-11.81 in)



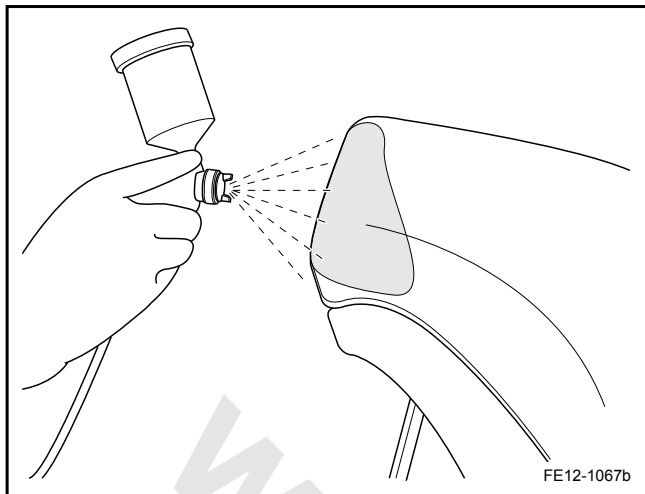
14. Leave the surface dry 2-3min and then spray paint the second layer of clear lacquer to cover the area of the first layer of clear lacquer.

Air Pressure 150-200 kPa (21.8-29.0 psi)

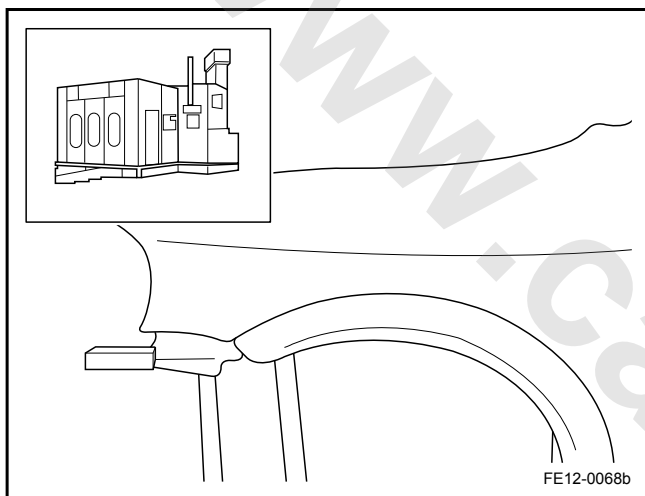
Spray Distance 20-30 cm (7.87-11.81 in)



15. After spraying the clear lacquer, add blending thinner or other additives to the original clear lacquer.



16. Spray the paint interface 2-3 times with the blending thinner or the diluted clear lacquer.



17. Dry the paint in the paint room 20-30 min.  
Paint room temperature 70-80°C (158-176 °F)

#### 12.13.4.5 Spray Paint on the Repaired Rigid Sheet Metal Surface Procedure

Spray paint on the repaired rigid sheet metal surface process is similar to spray paint on the sheet metal surface. There are only a few additional steps between grinding and spray paint background as following:

1. Apply Putty.
2. Putty grinding.
3. Removing dust, de-greasing, cleaning.
4. Filling Scratch gray eyes filled.
5. Sanding the old paint surface.
6. Cleaning, de-greasing and covering adjacent areas.

For the painting process, please refer to [12.13.4.4 Rigid Surface Spray Paint Process](#).

#### 12.13.4.6 Plastic Surface Paint Repair Process

There are three basic requirements for the plastic surface paint repair:

1. Paint and the plastics have a certain adhesion, without loss of mechanical properties.
2. Paint film should have sufficient flexibility and allow the plastic deformation without rupture.
3. Plastic pieces can reflect some of the original particles and rough surface texture.

Plastic surface paint repair process:

Refer to the above mentioned local paint repair procedure for plastic primer paint repair. Please note that use low temperature baking.

Baking conditions 70-80°C (158-176 °F), 20-30 min.