LIFAN620

LIFAN 620

Mainterance Manual of Lifan Sedan

Chongqing Lifan Passenger Vehicle Co.,ltd

2008.12

Foreword

LF620 Service Manual on common treatment of troubles is to help you correctly use and maintain your love sedan.

This manual, with illustrative figures and easy-going words, thoroughly introduces the structure features, use and maintenance of LF620 sedan, which will be a good guide for wide users and maintenance technicians. Meanwhile, *LF620 Spare Parts List* will also be referred if necessary. For any questions and doubts, please do not hesitate to contact the service stations of Chongqing Lifan Passenger Vehicle Co., Ltd.

The figures, notes, specifications etc contained in the manual will take effect as of the date of printing, which can be modified and terminated at any moment by Chongqing Lifan Passenger Vehicle Co., Ltd. without any notice in advance.

Any comment on any thing improper in the manual shall be preferred, and no responsibility on any thing improper shall be undertaken by Chongqing Lifan Passenger Vehicle Co., Ltd.

Great appreciation for your support!

Compiled by: Chai Lichao
Du Tianchuan
October, 2008

Content

Part1 Introduction

Chapter I Entire Vehicle Overview

LF620 sedans are devised to give expression to the human orientation with features of portable operation, comfortable ride, spacious inner room, excellent dynamic quality and economical efficiency. The high tech and low price endow them with the stronger market competition.

I. Engine assembly

1. Either the engine of TRITEC1.6L or LF 481Q3 is adopted, which is a single overhead camshaft multi-point electronic injection engine with 16 valves.

II. Chassis

1. The McPherson independent suspension is applied in the front suspension; and the dependent trailing arm suspension is adopted by the rear suspension. It also enjoys the design of the elastic elements and the shock damper of the front and rear suspensions, director elements and stable ones of the front sub-frame suspension.
2. Steering gear: The steering column employs the angular adjustable mode.
3. Operation system: Clutch pedal mechanism, hydraulic clutch operating device.
4. Both the front and rear brake gears are the vented disc brakes with reasonable load layout and the Anti-Lock Brake System, namely ABS safety device. It is used to prevent sliding and dragging on the road due to locked wheel when the vehicle brakes so as to improve the vehicle's directional stability, steering control ability and shorten the braking distance so that the braking will be more efficient and safer. It greatly promotes the safety and reliability of the vehicle in various road conditions and the reasonable distribution of the front and rear braking force.
5. 195/60R15 tires are used; the tire rim, 6J.

III. Body:

1. An integral body is adopted which has passed the frontal impact test and qualified by the state testing institutions. Exterior design is fashionable with excellent aerodynamic performance with streamline figure.
2. The dash board, exterior trims and lighting equipments employ the novel craftworks and materials.
3. A/C system: It gives full expression to the ergonomic, after the filtration, offering clean and fresh air evenly and noiselessly.

IV. Electric equipment

The electric equipment design of LF620 sedans absorbs all the electric options so as to meet diversified customers' needs.

1. Engine and electronic fan

The engine is equipped with a starter and a generator. Double electronic fans at two speed-adjusting levels are arranged.

2. Power start, charging systems

The power start system mainly deals with the model and specs size confirmation of the engine, battery and generator and voltage regulator, etc.

3. Ignition and electronic injection system

① Ignition switch: Only the mature products can be employed and the corresponding current is set to satisfy the functional requirement.

② The engine is the mature product of the TRITEC and the electronic injection system adopts the multi-point electronic injection system supplied and calibrated by the SUN & TECK or the Delphi. The key components of this type's system include the sensor, the engine control unit, the air inlet pressure temperature sensor, the throttle valve assembly, the knock sensor, the oxygen sensor, camshaft position sensor, crankshaft position sensor, coolant temperature sensor, weak acceleration sensor, canCV canister control valve, fuel rail assembly, ignition coil, and the catalytic converter etc.

4. Warning signal

The design for the control of the circuit system has been devised correspondingly to satisfy the requirement of the entire vehicle and the state legal regulations.

The warning signal devices are used to warn and hint signals to the surrounding environment, including the horn, steering indicator, emergent lamp switch, reversing lamp and brake lamp and switches, front and rear fog light and so on.

5. Instrument assembly

1) Instrument cluster: Instrument cluster of the electronic odometer. The instruments include the water thermometer, engine tachometer, speed odometer and the fuel gauge.

2）Indicators include: The battery charge indicators, engineer oil pressure indicator, brake fluid level indicator, engine malfunction detecting indicator, handbrake indicator, safety belt indicator, fuel warning indicator, instrument lighting light, high beam indicator, steering (emergency) light, ABS indicator, door ajar indicator. Reverse radar display, fuel flow sensor, engine oil pressure sensor, vehicle speed sensor, handbrake switch, door lamp switch, brake shoe sensor, safety belt contact switch, brake fluid level sensor, parking brake (handbrake) switch etc.

6. Auxiliary electrical devices

(1) Front windshield wiper system: controlled by a combination switch handle. The wiper motor and the connecting rod are collocated in front of the dash panel.

(2) Radio: Four speakers with adjustable high pitch function. CD player, DVD player, and backup monitor are optional.

(3) Audio system

Single disc CD player and optional DVD on the dash board, six speakers with radio reception, disc playing and time display functions simultaneously. This novel and nice CD, DVD player own six interfaces respectively so six disc players are acceptable according to the customers' needs.

(4) Cigarette lighter: one, installed for convenience, collocated according to the formative necessity.

(5) Rear defrosting: The heating-type glass is employed for the rear window and controlled by the switch.

(6) Self-closing four-door window functions: four-door collocation, master control at driver side and independent control for right doors and windows, the operating switch collocated on the door armrest.

(7) Central lock: for four doors, unified switch. Remote control, mature products selected according to the body structure and modeling and adoption of the BCM centralized control.

(8) Electronic anti-theft device: Controlled collectively by the BCM so as to realize the function of

electronic anti-theft.

(9) A/C system: JSS-120 swinging-vane type compressor with delivery capacity 120ml/r and excellent refrigerating effect, consisted of the condenser, evaporator, thermostat, sensor, pressure switch and blower, etc.

7. Safe anti-theft device

(1) Air bag: The electric double air bags are located on the steering wheel and the dash board of the co-driver room respectively.

(2) The ABS safety device of the Anti-Lock Brake System guarantees the safety and reliability of the vehicle's brake system.

(3) Anti-theft device (optional)

The anti-theft system is mainly controlled by the body controller BCM, connected to the engine ECU by a communication link. When the ignition key is plugged in, if the signal detected is correct, the ignition system will work normally; otherwise, the engine can not work. This is the anti-theft system in common use.

8. Other electric devices:

The other electrical devices mainly include the harness, center control box, relay, safety lever, interface, switch, corresponding fixing bracket and the strapping components.

Chapter II Main Technical Parameters of Lifan Vehicles

I. Basic performance parameters

1. Complete vehicle basic parameter (Table 1)
2. Complete vehicle performance index (Table 2)

Table 1 Complete Vehicle Main Parameter

Item			LF7162 sedan
Type			3 compartments, 4 doors, 5 seats and 2 covers
Drive model			Front lateral engine, front-wheel drive
External dimension	Length	mm	4545
	Width	mm	1705
	Height (idle load)	mm	1495
Wheel base		mm	2605
Track	Front track (idle load)	mm	1470
	Rear track (idle load)	mm	1460
Front suspension		mm	935
Rear suspension		mm	995
Trafficability characteristic	Approach angle	(°)	20
	Departure angle	(°)	23
	Minimum ground clearance	mm	170
	Minimum turning radius	m	10.2
Luggage boot capability		L	(300)
Mass	Complete vehicle weight	kg	1150
	Axle load distribution (front/rear)	kg	710/440
	Full load weight	kg	1555
	Axle load distribution (front/rear)	kg	810/745
	Full load distribution percentage (front/rear)	%	51/49
	Mass center height (no/full)	mm	593

Table 2　Complete Vehicle Performance Parameter

Item			LF7160
Performance parameter	Maximum vehicle speed	Km/h	≥180km/h (BMW 1.6) ≥170km/h (Domestic vehicle 1.6)
	Acceleration performance (0-100km)	s	＜15.5
	Fuel consumption of uniform speed traveling	L/90km	5.64
	Maximum climbing angle	(%)	≥35
Number of passengers		People	5

II. Structure and Parameter of Main Assemblies

1. Main technical parameters of engine assembly (Table 3, Table 4)

Table 3　Main Performance Parameter of TRITEC1.6L Engine

Item	Parameter
Engine type	Four-stroke electronic gasoline injection engine
Delivery capacity	1598cc
Engine model	4 cylinders in line
Camshaft model	Single overhead camshaft
Rocker arm model	Rocker arm shaft with midpoint support , 8mm chain driven by hydraulic force
Combustion chamber	Single cylinder 4 valves
cylinder bore ×stroke	77mm×85.8mm
Compression ratio	10.5 : 1
Supply system	Multipoint fuel injection system
Maximum torque	157Nm/4550rpm
Maximum power	87Kw/5600rpm
External dimension	440×564×670
Minimum fuel consumption	248g/Kw.h

Table 4 Main Performance Parameter of LF481Q3 Engine

Item		Unit	Model and parameter
Model			Four-stroke, water cooling, 4 cylinders in line, 16 valves, double overhead camshafts and multipoint electronic injection
Cylinder bore		mm	81
Stroke		mm	77
Total delivery capacity		L	1.6
Compression ratio			9.5:1
Lubricant capacity		L	4
Fuel No.			93# unleaded gasoline
Engine oil No.			Not lower than SG grade (GB11121-1995)
Starting mode			Electric start
Lubricating mode			Pressure and splash combined type
Cooling mode			Forced circulating water cooling
Rated rotation speed		r/min	6000
Rated power		Kw	78
Maximum torque (3505000_r/min)		N·m /rmp	137N·m / 3500rmp
Minimum fuel consumption		g/kw.h	≤270
Minimum idle load stabilized rotation speed (idle speed)		r/min	800±50
Emission limit at idle speed		Low idle speed	CO≤0.3%, HC≤80ppm
		High idle speed	CO≤0.2%, HC≤60ppm
Ignition advance angle (idle speed)			5±3º
Intake valve clearance (cool)		mm	0.20～0.25
Exhaust valve clearance (cool)			0.25～0.30
External dimension	Without transmission		650×605×640
	With transmission		1010×605×640

2. Model and parameter of main assemblies of chassis (Table 5)

Table 5 Model and Parameter of Main Assemblies

Name	Structure and parameter	
Exhaust system	Three-way catalytic converter (one section) and muffler (two sections)	
Intake system	Intake pipeline and air cleaner	
Fuel supply system	Including fuel pump, fuel cleaner, pressure regulator, accelerator pedal, fuel tank	
Cooling system	Ribbon-tubular radiator and electronic fan	
Clutch pedal force	≤140N	
Clutch pedal maximum play	≤100mm	
Drive shaft	Model	Tri-pin sliding bush end, Rzeppa fixing end
Suspension	Front suspension	MacPherson independent suspension
	Rear suspension	dependent suspension with a torsion beam
Tire	Tire type	Radial ply tire
	Tire specification	195/60 R15
	Rim specification	6J×15
	Tire pressure	2.3MPA
	Steering gear model	Rack and pinion hydraulic power steering
	Steering equipment	Pipe angle can be adjusted, steering wheel external diameter 375mm
Wheel alignment	Front wheel camber	0°30′±45′ (idle load)
	Front wheel toe-in	-2～2
	Kingpin inclination angle	3º±30′ (idle load)
	Kingpin caster	11°15′±45′ (idle load)
Brake system	Structure model	Hydraulic dual-pipe, with vacuum booster and ABS
	Driving brake	Disc brakes for both front and rear wheels
	Parking brake	Mechanical cable rear wheel rim brake

3. Vehicle body structure model and parameter (Table 6)

Table 6 Vehicle Body and Inner and Outer Trim

Name		Structure and parameter
Vehicle body	Vehicle model	Integral body, 3 compartments, 4 doors, 2 covers and 5 seats
	Body-in-white	All metal closed type structure
	Door assembly	Framed, 4 doors open in regular direction, card lock, with side bumper
	Engine hood	Open backward, bent arm hinge
	Front and rear bumpers	Injection molding
Inner and outer trims	Inner trim	Injection molding with surface texture
	Dash board	Injection molding with surface texture
	A, B and C pillars and indoor shield	Injection molding framework, knitted surface
	Windshield	Front windshield: laminated glass, rear window: Toughened glass
	Rearview mirror	Outer rearview mirror: Convex mirror in both left and right, manual/automatic adjustment
		Inner rearview mirror: Anti dazzle
	Seat	Front seat: independent seat, adjustable back and forth position, backrest angle, headrest and so on; rear seat with safe belt: dependent seat, unadjusted
A/C	Structure model	Compressive refrigeration, water heating
	Operation	Adjusted with knob to control air flow direction, to control and adjust air flow speed, temperature and air circulation; luxurious ones with electric adjustment
	Refrigerant	Model R134a, filling 500g ± 50g

4. Structure and parameter of electrical system (Table 7)

Table 7 Structure and Parameter of Electrical System

Name	Structure and parameter	
Start	Wire	Single wire, negative pole grounded, direct current 12V
	Generator	Integral type, AC, built-in voltage regulator, specification 14V/80A
	Motor	solenoid-operated (with generator), power 1.2kw
	Electronic fan	Without speed regulation single fan
	Battery	Maintenance-free plumbic acid battery, capacity 60Ah
Illumination and signal	Front combination lamp	Headlamp (55/55W, white, 2 lamps), position lamp (0.8W, LED, white), steering light (21W, amber, 2 lights, both combination switch)
	Side steering light	12V, 0.6W, amber, 2 lights
	Front and rear fog lights	Front fog light (55W, white, 2 lights), rear fog light (3W, LED, red, combination switch), rear position lamp (1W, LED, red)
	Rear combination lamp	Brake lamp (1.2W, red, 2 lamps, contact closed switch), Reversing lamp (21W, white, 2 lamps), steering light (21W, amber, 2 lamps, combination switch), rear position lamp (0.8W, LED, red)
	Rear license plate lamp	5W, white, 2 lamps
	High-mounted brake lamp	LED, LED, red, 1 lamp
	Inner combination roof light	5W, white, 2 lights
	Door lamp	6.2W, white, 4 lamps
Instrument system	Instrument cluster	Instrument cluster with electronic odometer, including LCD water thermostat, fuel gauge, vehicle odometer, engine rotation speed
	Indicator	Including battery charge indicator, engine oil pressure indicator, fuel warning indicator, brake fluid level indicator, engine fault indicator, handbrake indicator, anti-theft indicator, safe belt indicator, electronic airbag indicator, instrument illumination light, high beam indicator, fog light indicator, steering light (emergency lamp) indicator, ABS indicator, door ajar indicator.
		Brake indicator, anti-theft indicator, safe belt indicator, electronic airbag indicator, instrument illumination light, high beam indicator, fog light indicator, steering light (emergency lamp) indicator, ABS indicator, door ajar indicator.
Electric assistant system		Including CD (or DVD) player, cigar lighter, rear defroster, wiper and washer, remote door lock, anti-theft system, airbag, window regulator.

5. Lubricant, fuel, steering fluid, brake fluid, coolant, refrigerant and capacity

(1) Lubricant

Table 8 Lubricant

	Lubricant	No.	Weight
Bearing and button head pin	Lithium base grease	7022	0.34kg

(2) Fuel

Table 9 Fuel No. and Fuel Tank Capacity

Name	Performance index
Fuel No.	93# or better unleaded gasoline for vehicle
Fuel tank capacity (L)	58L

(3) Steering fluid, brake fluid, coolant and refrigerant

Table 10 Steering Fluid, Brake Fluid, Coolant and Refrigerant

Name	No.	Capacity or mass
Power steering fluid	ESSO ATED	0.825L
Brake fluid	DOT4	0.72L
Coolant	Antifreeze G11	8.5L
Refrigerant	R134a	500g±50g
Windshield cleaning solvent	NFC-60	As necessary

Chapter III Lifan Vehicle Maintenance Routine

LF620 Maintenance Plan can make the vehicle run stably, safely and economically and reduce faults. Maintenance interval varies according to the odometer or time interval. Please refer to the plan. Those items that have exceeded the deadline should also be maintained in the same interval. Rubber hoses (in cooling and heating system, brake system and fuel system) should be specially maintained. In case of aging, cracking or damage, replace the hose. Only professional technician can check the vehicle.

Basic maintenance items:

I. Electric equipments on vehicle body

1. Check all the inner and outer lamps and electric equipments: Instrumentation console indicator, headlamp, front fog light, rear fog light, front position lamp, rear position lamp, front steering light, rear steering light, brake lamp, reversing lamp, license plate lamp, luggage boot lamp, cigar lighter, horn, power window regulator, power exterior rearview mirror and ventilation system.
2. Airbag: Visually check if its surface is damaged.
3. Self-check: Read the fault information of all systems in memorizer with Lifan special diagnostic tools.

II. Outer vehicle body

1. Door limiter, fixed pin, door lock, engine hood, luggage boot cover hinge and buckle: Check the function and lubricate.
2. Window: Check the function; clean the lead rail and smear special grease.
3. Wiper/cleaning equipment: Adding washing liquid; adjust the nozzle if necessary when checking the function.

III. Engine compartment

1. Visually check if there is damage or leak for all parts.
2. Cooling system: Check the antifreeze and refill if necessary. Standard value: -25℃ (-35℃ in cold area)
3. Power steering system: Check if there is any leak; check the steering hydraulic oil level; and refill if necessary.
4. Brake system: Check if there is any leak in brake pipeline; check the brake fluid level; and refill if necessary.
5. Replace brake fluid: Every other 2 years or every 50,000km.
6. Air cleaner: Clean the filter element every 7,500km and replace the filter element every 30,000km.
7. Engine cleaner: Replace the element every 7,500km.
8. Gasoline filter: Replace it every 30,000km.
9. Battery: Check if the positive and negative poles of the battery are tightly connected; check the electric eye.

IV. Engine and vehicle body bottom

1. Vehicle body bottom: Check if the fuel pipe, brake oil pipe and bottom protection layer are damaged; check if the exhaust pipe leaks and if fastening is reliable.
2. Steering tie rod: Check the clearance; check if the connection is reliable and if dustproof cover is damaged.
3. Brake lining: Check the thickness.
4. Parking brake: Check and adjust the length of cable if necessary.
5. Tire (including spare tire): Check the worn condition of tire; check the tire pressure.
6. Wheel alignment: Check with wheel aligner.
7. Wheel fixing bolt: Check according to specified torque.
8. Headlamp: Check and a.
9. Trial run: Check the performance.

Abbreviations in this manual

A

AC	Alternating current
ACC	Air conditioning clutch
ACMC	Air conditioning magnetic clutch
ACT	Air charge temperature
A/C	Air conditioning
ABDC	After bottom dead center
ABS	Anti-lock brake system
A/D	Aanalog/digit
A/F	Air/fuel ratio
AFS	Air flow meter (air flow sensor)
A-ELR	Automatic/emergency locking retractor (of safety belt)
ATDC	After top dead center
API	American Petrol Institude
ATF	Automatic transmission fluid
ALR	Automatic locking retractor (of safety belt)
ASD	Automatic switching-over device
A/T	Automatic transmission

B

BATT	Battery
B＋	Battery positive pole
BBDC	Before bottom dead center

BOO	Brake on-off
BTDS	Before top dead center

C

CAB	ABS control unit with electromagnetic coil
CANP	Canister Purge exhaust valve
CMP Sensor	Camshaft position sensor (crankshaft turning angle sensor)
CO	Carbon monoxide
CKT	Circuit
CPP Switch	Clutch pedal position switch (clutch switch)
CPS	Crankshaft position sensor
CPU	Central processing unit
CVT	Continuously variable transmission
CRS	Child restraint system
CTS	Coolant temperature sensor

D

DC	Direct current
DLC	Digit link connector (series data link)
DOHC	Double overhead camshaft engine
DOJ	Double offset joint
DRL	Daytime running light
DTC	Diagnostic trouble code, diagnostic code
DS	Detonation sensor

E

ECA	Electronic control assembly
EBCM	Electronic control module (anti-lock brake module)
ECM	Engine control module
ECT	Engine coolant temperature
ECT Sensor	Engine coolant temperature sensor
EFE Heater	Early fuel evaporation heater
EFI	Electronic fuel injection
EGR	Exhaust gas recirculation
EGRT Sensor	EGR temperature sensor
EMI	Electro magnetic interference

ELR	Emergency locking retractor
EPS	Electric power steering
EST	Electronic spark timing
EVAP	Evaporative system
EVAP Canister	Evaporative system canister

F

FP	Fuel pump
FPC	Fuel pump control ECU

G

GEN	Engine
GND	Grounding

H

HC	Hydrocarbon
HO2S	Heated oxygen sensor
HUC	Hydraulic unit control with solenoid valve

I

IAC Valve	Idle air control valve
IAT Sensor	Intake air temperature sensor
ICM	Ignition Control Module
ICU	Integrated control unit, composed of four parts
IG	Ignition
In	Inch
ISC Actuator	Idle speed control actuator

L

L	Left
LH	Left hand
LSPV	Load sensor proportion valve

M

Max	Maximum
MAF Sensor	Mass air flow sensor
MAP Sensor	Manifold absolute pressure sensor
MFI	Multipoint fuel injection

Min	Minimum
MIL	Malfunction indicator light, engine check light
M/T	Manual transmission

N

N	Neutral
Ne	Engine rotation speed, engine efficient power
NOx	Nitrogen oxides

O

OBD	On-board diagnostics
O/D	Over-speed driving
OHC	Overhead camshaft

P

P	Parking
PCM	Power control module
PCV	Positive crankcase vent
PDC	Power distribution control
PIM	Pressure of intake manifold
PNP	Park/neutral position
P/N	Park/neutral
PSPS	Power steering pressure switch
P/S	Power steering
PSP Switch	Power steering pressure switch
PSW	Position of throttle wide-open
PWR	Power

R

R	Right
RAM	Random memorizer
RH	Right hand

Part II System Repair

Chapter I Electronic Injection System

Section I Introduction

I. Fundamentals

The electronic injection system is a multi-point fuel injection system with electronic control unit (ECU). With various sensors installed on different parts of the engine to measure each working parameter of the engine, the ECU can precisely control the fuel injection volume by controlling the fuel injector according to the pre-set control program in the computer, and achieve the most favorable air-fuel mixture for the engine under any working condition. With the control program in the ECU and relevant actuator, such functions as fuel increase at start, fuel increase at warm-up, fuel increase at acceleration, fuel increase at full load, fuel decrease at deceleration, fuel cut at idle speed, and automatic idle speed control are available in this system, which can achieve special air-fuel mixture for the engine under the special working condition. Therefore, the engine enjoys good performances in fuel efficiency and exhaust emission, and the service performance of the vehicle is improved at the same time. Besides, the trouble diagnostic mode in the ECU can make the researching of troubles much easier.

II. Structure of electronic control system

The electronic control system is divided into the following three parts:

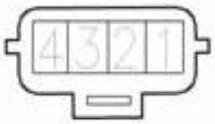
(1) Sensor---Convert various non-electrics physical quantities of the engine into electrics physical quantities, and then send them to the ECU. The sensors on the engine include: ① Intake pressure/temperature sensor, ② Throttle position sensor, ③ Coolant temperature sensor, ④ Heated oxygen sensor (front and rear oxygen sensor, only front oxygen senor available under National III Emission Standard, front and rear oxygen sensor available under National III Emission Standard+EOBD and in National IV Emission Standard), ⑤ Knock sensor, ⑥ Crankshaft position sensor, ⑦ Weak acceleration sensor (unavailable under National III Emission Standard (Simplified), available under National III Emission Standard +EOBD and under National IV Emission Standard).

(2) Electronic control unit (ECU) is the “brain” for the whole electronic control system, which analyses and processes all the information from sensors, sends orders to actuator, and makes the engine work under the best condition.

(3) Actuator is to perform the orders from the ECU. The actuator is the “hand” and “leg” of the electronic control system, which include: ① Fuel pump, ② Fuel injector, ③ Ignition coil, ④ Idle speed actuator with stepper motor, ⑤ Canister control valve.

Section II Principle of controlling and actuating components

1. Intake pressure/temperature sensor (Fig. 1-1)



1. Pin 1, 5V power supply-
2. Pin 2, intake air temperature signal
3. Pin 3, 5V power supply+
4. Pin 4, intake air pressure signal

Fig. 1-1

(1) Function: Measure the absolute pressure of the 0.1~0.2bar intake manifold and the temperature of the intake air flow, and provide load information for the engine.

(2) Structure and principle: The sensor consists of intake manifold absolute pressure sensor and intake air temperature sensor, which is installed on the pressurizer tank.

(3) Intake air pressure sensor: made by a silicon chip. There is a pressure diaphragm on the silicon chip and are 4 piezoelectric resistances on the diaphragm. The 4 piezoelectric resistances build up a wheatstone bridge. Besides the pressure diaphragm, there is also a signal process circuit on the chip. The silicon chip and a metal housing build up a closed referential space, in which the absolute pressure of the air is approximately zero. Then, a microelectronic mechanical system is established. There is a zero pressure on the active side of the silicon chip and an absolute pressure of the intake manifold on the back side of the chip. The thickness of the silicon chip is only several microns (μm), and the form of the chip will be mechanically changed with the change of the absolute pressure of the intake manifold. Then, the 4 piezoelectric resistances and their resistance values will be also changed. After treated by the signal process circuit on the chip, the pressure signal, which is linearly related to pressure, will be formed.

(4) Intake air temperature sensor: Made by a resistance with negative temperature coefficient (NTC). Similar to water temperature sensor, the resistance value will decrease with the increase of the intake air temperature. The change of the intake air temperature will be supervised and measured by a comparative electric circuit within the ECU.

(5) Connection of wiring diagram (Fig. 1-2)

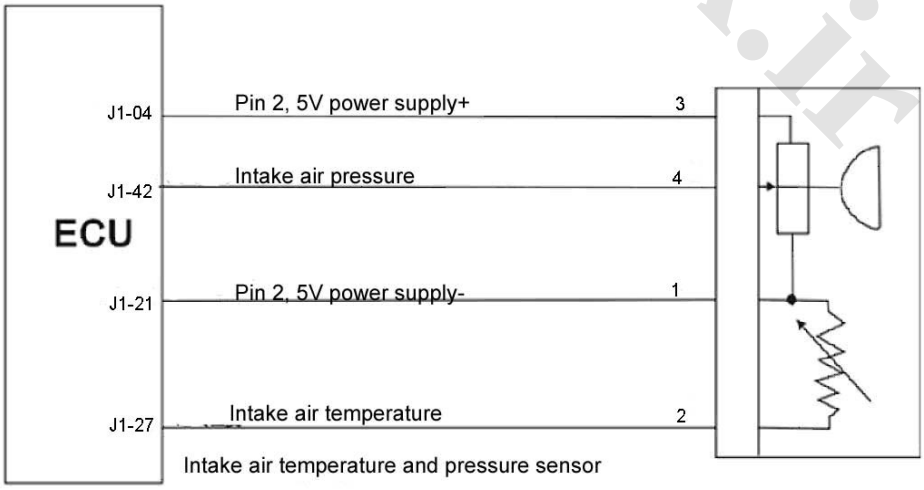
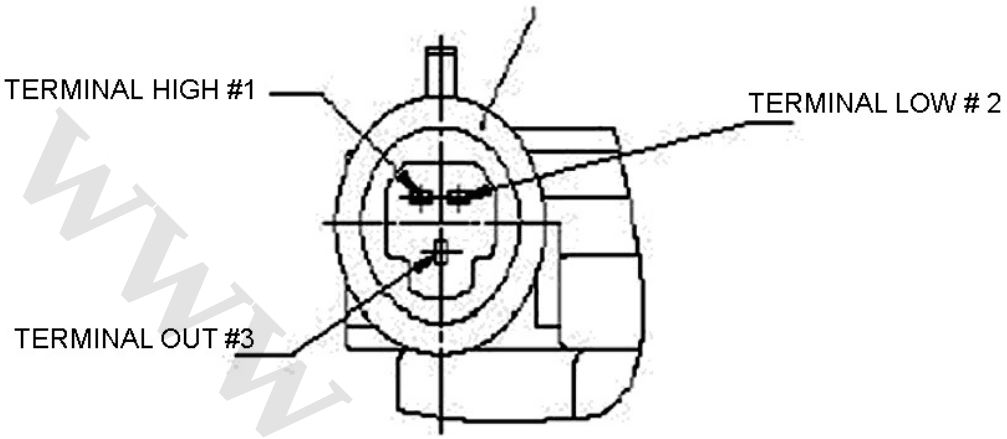


Fig. 1-2

(6) Trouble diagnosis: The electronic devices of the intake air pressure sensor can diagnose such troubles as open/short circuit and the damage of senor. When the ECU detects that the signal output by the sensor is beyond its normal signal curve, the sensor will be in trouble. For example, when the intake air pressure is higher or lower than its limit, the ECU will confirm that the sensor is in trouble (The pressure lower than the limit at start will be excluded by the ECU.), then the engine MIL will be lighted and the operation under trouble mode will be applied.

2. Throttle position sensor figure (Fig. 1-3)



Position sensor outline

Pin: 1. Voltage input 2. Signal ground 3. Signal output

Fig. 1-3

(1) Function: To provide throttle-alternator position information to the ECU. According to this information, the ECU can obtain other information on engine load, working condition (start, idle speed, backing, partial load, and full load), acceleration and deceleration. With the three-wire sensor, the ECU can detect the opening of throttle through the change of pressure.

(2) Structure and principle: As an angle sensor with linear output, the sensor is made by two arc sliding contact resistances and two sliding contact arms. The turning shaft of the sliding contact arm shares the same axis with the throttle shaft. Power supply voltage (US) of 5V is added to the both ends of the sliding contact resistance. When the throttle turns, the arm turns and moves on the sliding contact resistance. Then, the electric potential (UP) at the contact point will be led out as an output voltage. Actually, it is an angle sensor and the real value adopted by the ECU is the value of Up/Us, and the value fluctuation of the sensor caused by the fluctuation of the generator voltage will be avoided.

(3) Connection of wiring diagram (Fig. 1-4)

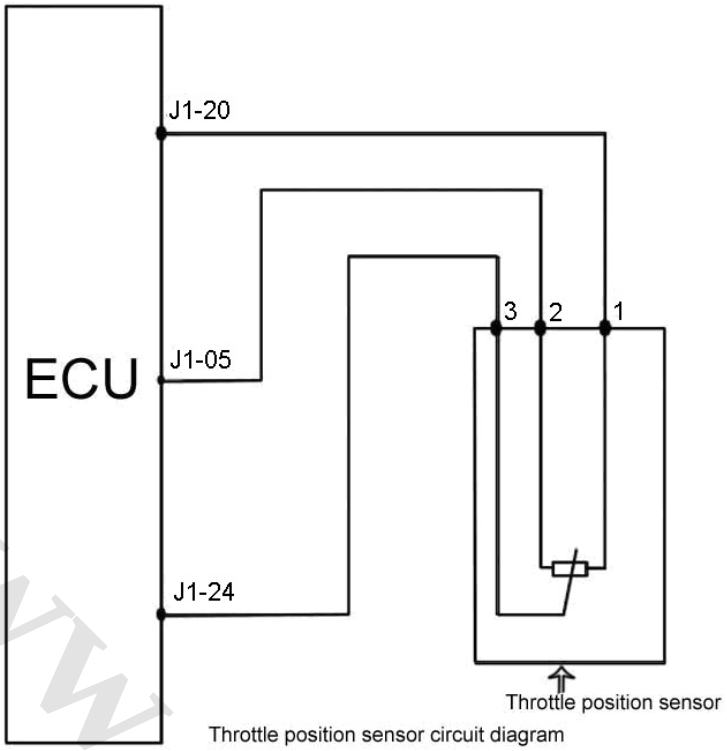
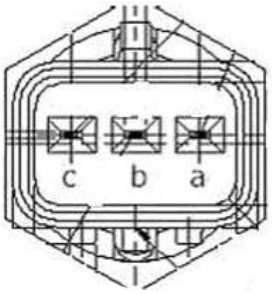


Fig. 1-4

(4) Trouble diagnosis: By monitoring the throttle-alternator position, when the signal higher or lower than its limit, the ECU will confirm that the throttle position sensor is in trouble, then the engine operation under trouble mode will be applied, and the engine MIL will be lighted (Knock on sensor and internal dirt will contribute to engine troubles.)

(5) Installation: Fastening torque for installation screw is 1.5N·m～2.5N·m.

3. Coolant temperature sensor (Fig. 1-5)



Coolant temperature sensor

Pin: 3 pins available, equivalent.

a Electronic injection system water temperature signal pin, resistance at 20℃: 2.45KΩ

b Instrument water temperature pin, resistance at 80℃, 0.05 KΩ

c Signal ground

Fig. 1-5

(1) Function: To provide information on coolant temperature. To provide water temperature signal for the ECU, and to control ignition timing and fuel injection pulse width at start, idle speed, and normal operation.

(2) Structure and principle: Made by a thermistance with NTC. The resistance value will decrease with the increase of the coolant temperature (not a linear relation). The thermistance with NTC is installed within a copper sleeve. With a voltage division circuit, the resistance value of the thermistance is converted into a changing voltage and then provided to the ECU, and then the change of water temperature can be monitored (internal structure of ECU).

(3) Connection of wiring diagram (Fig. 1-6)

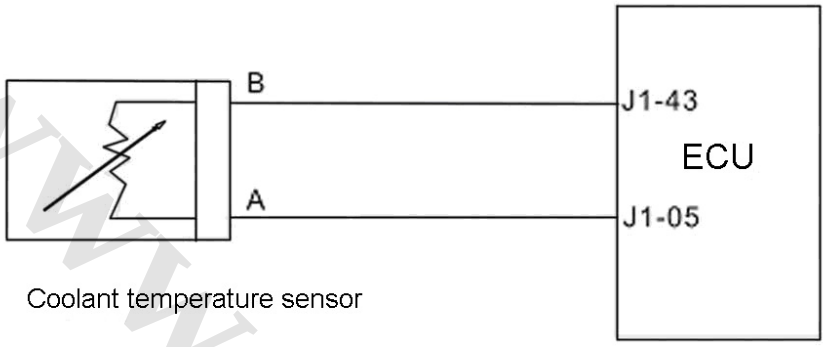


Fig. 1-6

(4) Trouble diagnosis: When the coolant temperature is higher than its upper limit, or lower than its bottom limit, the engine MIL will be lighted and the engine operation under trouble mode will be applied. Then, the ECU will carry out the ignition and fuel injection control as per the water temperature set under the engine water temperature trouble mode, and make the fan run at a high speed at the same time.

(5) Limit data: 2.5±5%KΩ

(6) Installation note: Tightening torque is 15±2N·m.

4. Shock sensor Fig. KS1-7

KS1-7

(1) Function: To provide engine knock information for the ECU for knock control.

(2) Structure and principle: As a vibration acceleration sensor, installed on the cylinder block of the engine. The sense element of the sensor is a piezoelectric element. The vibration of the cylinder block of the engine can be transferred to the piezoelectric crystal through the mass block within the sensor. Under the mass block vibration pressure, voltage will be produced at the two

polars of the piezoelectric crystal, and the the vibration signal will be changed into alternately changing voltage signal and be put out. Since the frequency of the vibration signal caused by the engine knock is much higher than that of the vibration signal caused by normal engine shock, the ECU can tell knock signal or non-knock signal after processing the signal with wave filtering technology. When the load, rotation speed, and coolant temperature exceed the threshold value and no trouble information record is available for the shock sensor, the signal of the shock sensor will be used for shock closed loop control. When the shock closed loop control is activated, the signal of the shock sensor will be sent to the ECU for amplification and wave filtering, and then accumulated. If the accumulation exceeds the limit within a certain crank angle, the ECU will confirm that shock occurs and decrease the ignition advance angle at this moment. If shock still occurs at the next cycle, the ECU will further decrease the ignition advance angle. If no shock occurs at the following cycles, the ECU will recover the original normal ignition advance angle.

(3) Connection of wiring diagram (Fig. 1-7)

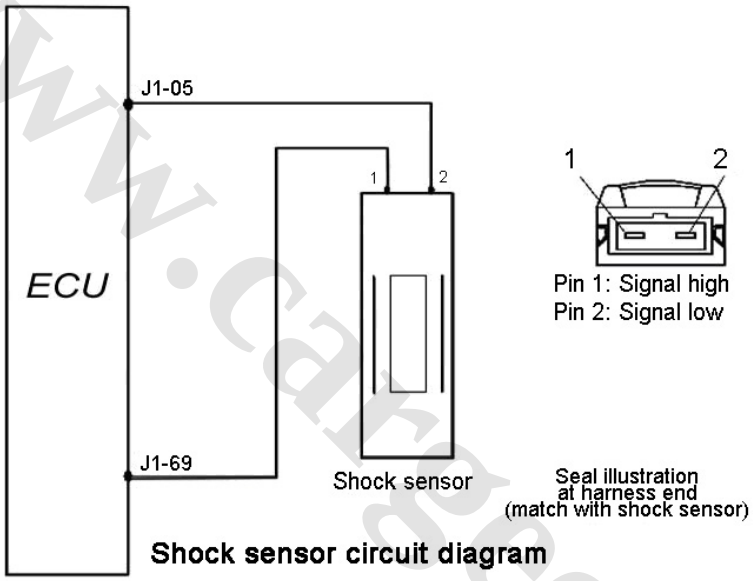


Fig. 1-7

(4) Trouble diagnosis: The ECU will monitor the sensors, actuators, power amplifying circuit and detecting circuit. In case of any of the following situations, like shock sensor trouble, shock control data process circuit trouble, unreliable cylinder judgement signal, incorrect shock sensor trouble mark level, and shock closed loop control closed, the ignition advance angle stored in the ECU will be decreased for a safety angle. When the trouble frequency is lower than the set value, the trouble mark level will be repositioned.

(5) Installation notes: The tightening torque for installation is 20±5N·m.

5. Oxygen sensor (Fig. 1-8)

Fig. 1-8

(1) Function: To provide the information that whether oxygen in the cylinder is too high after the fuel is burned with the air in the cylinder. With this information, the ECU can carry out closed loop control for the fuel ration. Therefore, the three main toxic elements (HC, CO, and NOX) of the engine exhaust can be best converted and purified in the three-way catalytic converter.

(2) Structure and principle: The sense element of the oxygen sensor is a ceramic pipe with holes and gaps. The pipe is surrounded by engine exhaust and the air flows within the pipe. The ceramic pipe wall is a kind of solid electrolyte with electric heating tube inside, which begins work when the ceramic pipe has been heated to 300℃ (a feature of a solid electrolyte). With such a special material, the oxygen ions can freely go through the ceramic pipe. Then, the concentration difference of the mixture will be converted into potential difference, which will be put out in the form of electric signal. If the concentration of the mixture is relatively high, the concentration difference of the oxygen ions inside and outside the ceramic pipe will be relatively high, and the potential difference will be relatively high as well. At the same time, a lot of oxygen ions will move to the outside from the inside, and the voltage output will be relatively high. If the concentration of the mixture is relatively low, the concentration difference of the oxygen ions inside and outside the ceramic pipe will be relatively low, and the potential difference will be relatively low as well. At the same time, little oxygen ions will move to the outside from the inside, and the voltage output will be relatively low. The working voltage of the oxygen sensor fluctuates from 0.1V to 0.9V, which will be changed for 5-8 times within 10 seconds. In case of lower than the changing frequency, the oxygen sensor shall be renewed, as it can not be repaired.

(3) Connection of wiring diagram: See oxygen sensor circuit diagram (Fig. 1-9)

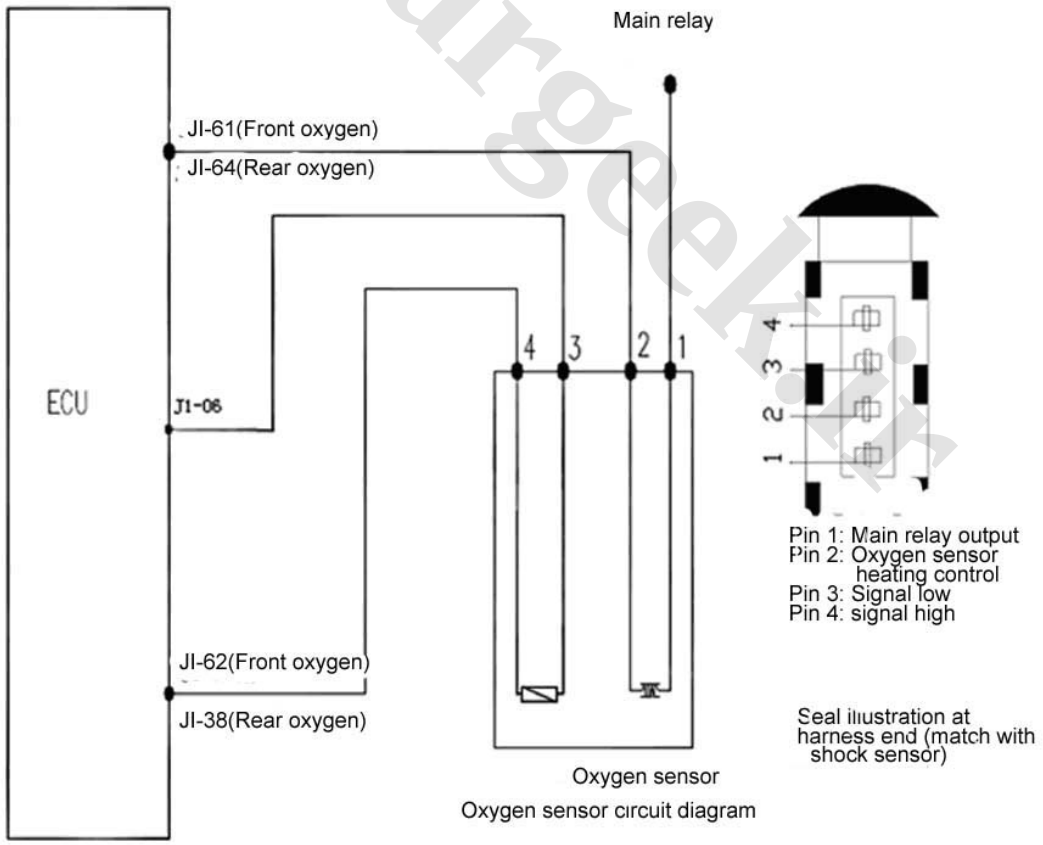


Fig. 1-9

(4) Trouble diagnosis: The ECU will monitor the sensors, actuators, power amplifying circuit and detecting circuit. In case of any of the following situations, like unreliable battery voltage, unreliable air intake manifold absolute pressure singal, unreliable engine coolant temperature signal, fuel injector driving stage trouble, incorrect oxygen sensor trouble mark level, and fuel ration closed loop control closed, the fuel ration will be confirmed according to the basic fuel injection time stored in the ECU.

(5) Installation notes: The tightening torque of the oxygen sensor is 50～60N·m. Apply anti-rust oil to the renewed oxygen sensor to prevent difficult removal due to rust.

6. Electronic control unit (Fig. 1-6)

(1) Function: The ECU is the key part of the electronic control system of the engine. The sensors provide various signals to the ECU, and the ECU calculates the signals and sends orders to the actuators like fuel injector, ignition coil etc to control the engine.

(2) Structure: Made by a shielded housing and printed circuit board, many electronic control units integrated on the board to control the electronic injection system.

(3) Installation: Fixed under the instrument panel sundries box with bolt, the double interfaces ECU is adopted.

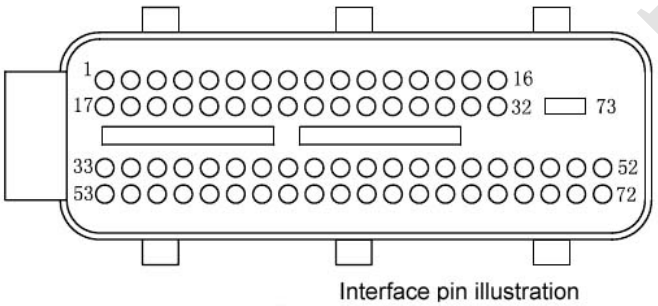
(4) LF481Q3 engine controller pin (see Table 1-1, Fig. 1-10)

Table 1-1

Pin Number	Definition	Pin Number	Definition	Pin Number	Definition
J1-01	Ignition switch	J1-02	Main relay rear power supply	J1-03	Vehicle speed
J1-04	Pin 2, 5V power supply+	J1-05	Pin 1, 5V power supply-	J1-06	Oxygen sensor signal low
J1-07	Not used	J1-08	Not used	J1-09	Medium-voltage switch
J1-10	Not used	J1-11	Serial data	J1-12	Crankshaft 58 teeth signal high
J1-13	Not used	J1-14	CAN line negative	J1-15	CAN line positive
J1-16	Not used	J1-17	Power supply 1	J1-18	Power supply 2
J1-19	Not used	J1-20	Pin 1, 5V power supply+	J1-21	Pin 2, 5V power supply-
J1-22	Trouble indicator	J1-23	Not used	J1-24	Throttle position
J1-25	Not used	J1-26	Not used	J1-27	Intake air temperature
J1-28	Crankshaft 58 teeth signal low	J1-29	Not used	J1-30	Not used
J1-31	Engine trouble indicator	J1-32	Ignition switch A	J1-33	Idle speed phase B output positive

Table 1-1 (Continued)

Pin Number	Definition	Pin Number	Definition	Pin Number	Definition
J1-34	Idle speed phase A output negative	J1-35	Acceleration signal	J1-36	Power steering signal
J1-37	Not used	J1-38	Rear oxygen sensor signal high	J1-39	A/C demand (+)
J1-40	Not used	J1-41	Not used	J1-42	Intake air pressure
J1-43	Coolant temperature	J1-44	Not used	J1-45	Tachometer
J1-46	A/C compressor clutch relay control	J1-47	Fuel pump relay control	J1-48	Not used
J1-49	Instrument power supply	J1-50	High speed fan relay control	J1-51	Not used
J1-52	Ignition coil B	J1-53	Idle speed phase A output negative	J1-54	Idle speed phase A output positive
J1-55	Fuel injector of cylinder 1	J1-56	Fuel injector of cylinder 3	J1-57	
J1-58	Not used	J1-59	Not used	J1-60	Not used
J1-61	Front oxygen sensor heating control	J1-62	Front oxygen sensor signal high	J1-63	Canister solenoid valve control
J1-64	Rear oxygen sensor heating control	J1-65	Not used	J1-66	Not used
J1-67	Low speed fan relay control	J1-68	Not used	J1-69	Knock signal
J1-70	Fuel injector of cylinder 2	J1-71	Fuel injector of cylinder 4	J1-72	Not used
J1-73	System ground wire				



Interface pin illustration

Fig. 1-10

(5) TRITEC 1. 6 engine controller pin (see Table 1-2)

Table 1-2

S/N	Mark	Name	Resistance value	Tolerance
J1-01	V-IGK	Ignition switch	11.9K	±0.1%
J1-02	V-EL	Main relay output	1.8K	±0.1%
J1-03	VS	Vehicle speed sensor	∞	
J1-04	TMAP-VCC	Pressure/temperature sensor power supply	189.2K	±10K
J1-05	TPS-GND	Throttle position negaive	0.6	0.2Ω
J1-06	VSL-U-1B	Front oxygen sensor grounding end	∞	
J1-07				
J1-08				
J1-09	ACCIN	A/C compressor switch input	9.9K	±0.1K
J1-10	CAM	Camshaft input positive	5.0K	±0.1K
J1-11	K-LINE	Diagnostic line	143.2K	±1K
J1-12	CRK	Crankshaft sensor input negative	55.2K	±1K
J1-13				
J1-14	CANL	CAN low	∞	
J1-15	CANH	CAN high	18M	±2M
J1-16				
J1-17	VBAT	Battery voltage positive	∞	
J1-18	VBAT	Battery voltage positive	∞	
J1-19				
J1-20	TPSVCC	Throttle position positive	∞	
J1-21	TMPGND	Temperature/pressure low	0Ω	±0. 5Ω
J1-22		Exhaust MIL	65.5M	±1M
J1-23	AD4	AD4	1.8M	±0.2M
J1-24	TPS	Throttle position sensor signal	∞	
J1-25				
J1-26	EVAP	Evaporated liquor temperature sensor signal	6.2K	±0.1K
J1-27	TIA	Intake air temperature signal	3.3K	±0.2K
J1-28	CRKGND	Crankshaft sensor low	55.5K	±0.5K
J1-29				
J1-30				
J1-31	MIL	Malfunction indicator light	56.7K	±0.7K
J1-32	IGC	Ignition coil 1,4	1.3M	±0.5M
J1-33	STPBH	Stepper motor B+	20.3K	±O.2K
J1-34	STPBL	Stepper motor B-	20.5K	±0.1K

Table 1-2 continued

J1-35		Acceleration signal	48.8K	±0.5K
J1-36	PSTE	Power assisted steering	7.1M	±0.2M
S/N	Mark	Name	Resistance value	Tolerance
J1-37				
J1-38	VLS-DN-A	Rear oxygen signal	42.6K	±0.3K
J1-39	ACIN	A/C demand	9.9K	±0.2K
J1-40				
J1-41	P/N	Park/Neutral switch	13.3M	±0.5M
J1-42	MAP	Manifold	51.1K	±0.2K
J1-43	TCO	Coolant sensor	3.4K	±0.1K
J1-44				
J1-45	ESS	Tachometer	∞	
J1-46	ACCIN	A/C compressor relay clutch switch	∞	
J1-47	RLY-EFP	Fuel pump relay control	∞	
J1-48				
J1-49	FUEL-IN	Fuel position sensor	3.3K	±0.1K
J1-50	RLY-FAN-H	High speed fan relay	∞	
J1-51				
J1-52	IGC2	Ignition coil of cylinder 2,3	1.2M	±0.1M
J1-53	STPAL	Stepper motor A-	20.4K	±0.5K
J1-54	STPAH	Stepper motor A+	20.5K	±0.5K
J1-55	IV0	Injector 1	1.3M	±0.2M
J1-56	IV2	Injector 3	1.3M	±0.2M
J1-57				
J1-58	RLY-MAIN	Main relay control	∞	
J1-59				
J1-60				
J1-61	VLS-UP	Front oxygen heating control	1.3M	±0.1M
J1-62	VLS-UP	Front oxygen signal	42.3K	±0.1K
J1-63	CPPWM	Canister solenoid valve	1.4M	±0.1K
J1-64	VLS-DN	Rear oxygen heating control	1.3M	±0.1M
J1-65				
J1-66				
J1-67	FANL	Low speed fan control	∞	
J1-68				
J1-69	KNKS	Shock sensor signal	99.3K	±0.5K
J1-70	IV1	Injector 2	1.3M	±0.2M
J1-71	IV3	Injector 4	1.3M	±0.2M
J1-72				
J1-73	GND	System ground wire	0.0Ω	

7. Electric fuel pump (Fig. 1-11)

Fig. 1-11

(1) Function: To deliver fuel in the oil tank to the engine with a certain oil pressure and volume, not greatly affected by temperature and voltage.

(2) Structure and principle: The fuel pump consists of DC motor, vane pump, and end cap (integrating check valve, pressure release valve and anti-electromagnetic interference element), which shares the same axle and housing with the motor. The bump and motor in the housing is surrounded by gasoline, which can be used for cooling and lubricating material. The battery supplies power for the electric fuel pump through a relay. The relay is connected with the fuel pump only when the engine starts and operates. When the engine stops due to some troubles, the fuel pump will stop automatically. The maximum pressure at the outlet of the fuel pump will be decided by the pressure release valve. As no-oil-return system is adopted, the fuel pressure regulator is installed on the fuel pump assembly. The fuel pressure regulator can adjust the pressure of the fuel pump to 380 kPa to meet the demand of the system.

(3) Connection of the wiring diagram (Fig. 1-12)

Notes: The temperature of the fuel greatly affects the performance of the fuel pump. When operates under a high temperature for a long time, the pressure of the fuel pump will decrease sharply. Therefore, if the engine fails to start up after warm-up, please carefully check the fuel pump for working performance under a high temperatue.

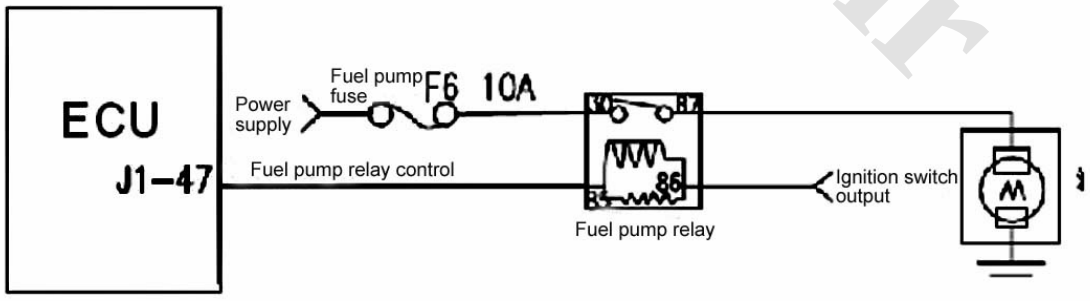


Fig. 1-12

8. Electro-magnetic injector (Fig. 1-13)

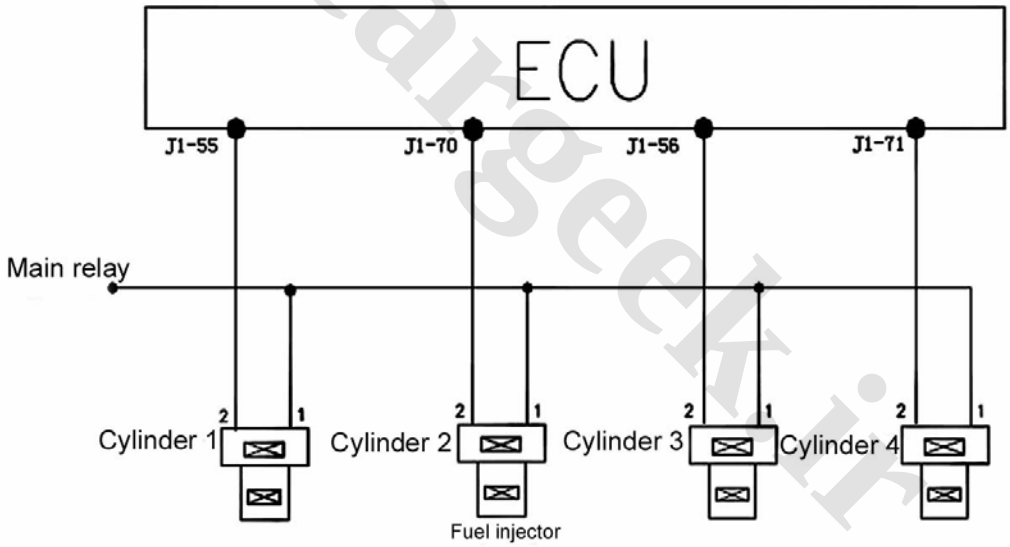
Electro-magnetic injector Figure

Fig1-13

(1) Function: According to the orde from the ECU, the injector will carry out fuel injection and atomization within a required time for the engine

(2) Structure and principle: The ECU will send electric pulse to the fuel injector coil to form magnetic force. When the magnetic force is high enough to overcome the joint force of return spring pressure, pintle valve gravity, and friction, the pintle valve begins to rise and the fuel injection starts. The maximum rise of the pintle valve will not exceed 0.1mm. When the fuel injection pulse stops, the pressure of the return spring will close the pintle valve.

(3) Connection of the wiring diagram (Fig. 1-14)



Electro-magnetic injector circuit diagram

Fig1-14

Installation notes: The plugs for certain fuel injectors should be selected as per requirement. To facilitate installation, it is recommended to apply clean silicon-free oil on the surface of the upper O-ring connected to the fuel distribution pipe. Take care not to pollute the internal of the injector and the injection hole by the oil. Install the injector vertically into the injector seat and fix the injector on the seat with a clip.

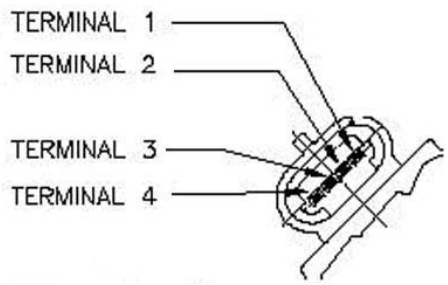
Note: For vehicles out of use for a long time, the adhesive gasoline within the injector can make

the vehicle fail to start.

(4) Trouble diagnosis: The electronic injection system will carry out trouble diagnosis for the driving stage of the fuel injector. When the driving stage of the injector is short or overloaded to the battery voltage, as well as short and open to the ground, the trouble mark level will be positioned. At this moment, the closed loop control and the self-learning pre-control of the oxygen sensor will be closed, while the self-learning data last time will be effective. The trouble mark level will be repositioned after the trouble being removed.

9. Idle speed actuator stepper motor (Fig. 1-15)

Idle speed actuator stepper motor figure



Pin:

Pin 1, to ECU19 pin
Pin 2, to ECU20 pin
Pin 3, to ECU35 pin
Pin 4, to ECU36 pin

Pin 1 and 2 share a same coil, and pin 3 and 4 share a same coil. The resistances of the two coils are the same. Check the resistance of the coil for normal operation.

Fig1-15

(1) Function: A by-pass air intake passage will be provided by the idle speed actuator with stepper motor. When the throttle is closed, air will enter into the engine through this by-pass passage. With a stepper motor, the ECU can adjust the size of the passage, and then confirm the air volume into the engine. At the same time, the ECU can also adjust the fuel injection volume on the basis of the air volume. With the stepper motor, the ECU can change the working condition for the engine according to actual situations.

(2) Structure and principle: As a mini-size motor, the stepper motor consists of several steel stators in a circle and one rotator. Every stator is winded with a coil. The rotator is a permanent magnet, and at the center of the magnet, there is a nut. All the coils of the stators are connected with the power supply constantly. As long as the current direction of one of the coils changes, the rotator will turn for an angle. When the current direction of the coil of each stator changes in a certain proper sequence, a rotary magnetic field will be formed, and the rotator of the permanent magnet will rotate in a certain direction.

(3) Connection of wiring diagram (Fig. 1-16)

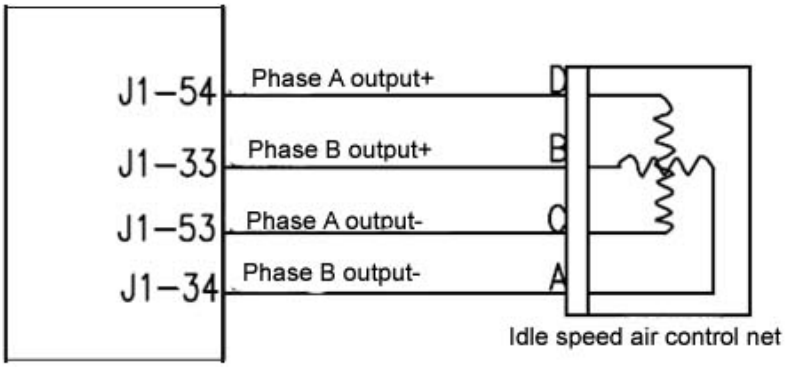


Fig. 1-16

(4) Trouble diagnosis: The short and open circuit of the two coils of the idle speed stepper motor will be monitored by the ECU. When such troubles occur, the engine MIL will be lighted and the engine will be operated under trouble mode. If the engine fails to work normally after check the steps of the stepper motor with a diagnostic instrument, the intake air pressure should be checked to ensure the normal operation of the piston of the stepper motor.

10. Ignition coil (Fig. 1-17)

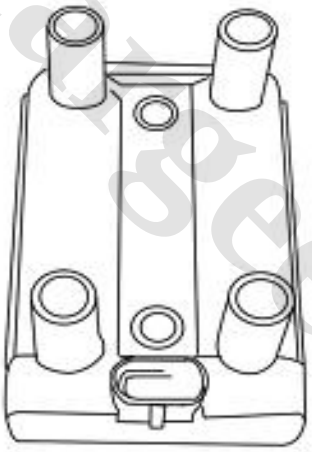


Fig. 1-17

(1) Function: To convert primary winding low voltage electricity into secondary winding high voltage electricity, to produce spark to burn the mixture of fuel and air in the cylinder.

(2) Separate ignition (grouped ignition): Based on the signal from the crankshaft/camshaft position sensor, the ECU controls the grounding of the three ignition coils respectively for the ignition of the engine.

(3) Structure and principle: Consists of primary winding, secondary winding, iron core, housing, etc. When the battery is connected with the primary winding, the primary winding will be charged. When the circuit of the primary winding is cut down by the ECU, the charge will stop. Meanwhile, the high voltage electricity will be induced in the secondary winding.

(4) Wiring diagram of the parts (Fig. 1-18)

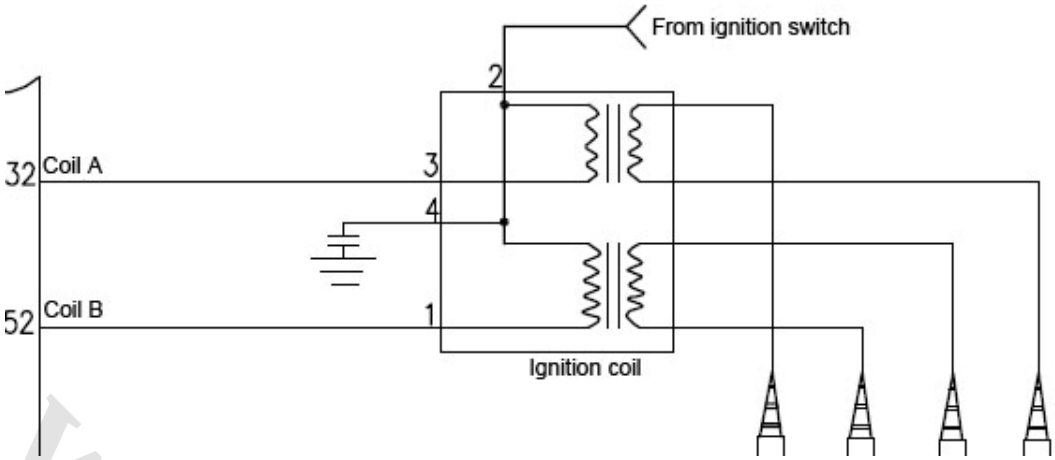


Fig. 1-18

(5) Trouble diagnosis: The ECU will not carry out trouble diagnosis for the ignition coil. Therefore, when trouble occurs on the ignition coil, no diagnostic trouble code will be produced. Only the resistance of the ignition coil can be checked for the normal operation of the coil. Under normal situation, the heat emitted by the coil under operation will be high, and the over-high temperature of the coil will increase its resistance value, which will cause such troubles as unstable running, automatic misfiring for the engine.

Primary winding: 0.47Ω; **secondary winding:** 8Ω

11. Canister control valve (Fig. 1-19)

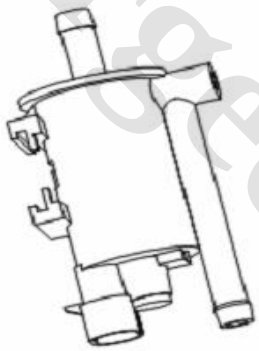


Fig. 1-19

(1) Function: To control the air flow to clean the canister. The canister control valve is controlled by the ECU based on the engine load, electric pulse duration and frequency (duty cycle). The over-accumulated gasoline vapor in the activated canister will cause gasoline leakage and environmental pollution. Thus, the canister solenoid valve is designed to be opened properly to introduce the over-accumulated gasoline vapor into the intake pipe for combustion.

(2) Structure and principle: Consists of solenoid coil, armature, valves, etc. A filter is considered for the inlet hole. The air volume flows through the canister control valve is affected by the duty cycle of the electric pulse output by the ECU, meanwhile, it is also affected by the pressure

difference between the inlet and outlet hole. When no electric pulse is produced, the canister control valve will be closed. According to the signals from each sensor, the ECU can control the time for power connection of the canister solenoid valve, and then control the volume of the cleaning air flow.

(3) Trouble diagnosis: The ECU will carry out trouble diagnosis for the driving stage of the canister control valve. When the driving stage of the canister control valve is short or overloaded to the battery voltage, as well as short and open to the ground, the fuel ration closed loop control self-learning and the idle speed air ration self-learning will be closed, while the self-leaning data at that moment will be effective. When the canister solenoid valve is under trouble, the engine is likely to experience unstable idle speed or over-high idle speed.

(4) Parts circuit (Fig. 1-20)

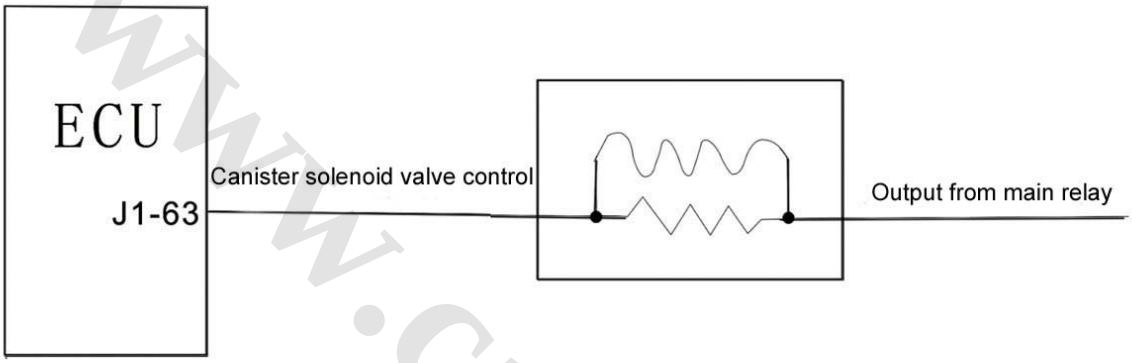


Fig. 1-20

Section III Steps for Trouble Diagnosis with DTC

I LF Self-developed Engine (LF481Q3)

1. A/C evaporator outlet temperature sensor (see Table 1-3)

Table 1-3

Diagnostic Trouble Code (DTC)	Trouble Location or Type
P1535	A/C evaporator temperature circuit high input---short or open to power supply
P1536	A/C evaporator temperature circuit high input---short to ground
P1545	A/C high pressure switch or relay circuit trouble

S/N	Operation	Test Results	Actions
1	Ignition switch in position ON.		Next step
2	Disconnect the A/C evaporator outlet temperature sensor from the harness. Measure the voltage between the two pins with a multimeter. Is the voltage about 5V?	Yes	Next step
		No	4
3	Check for open or short circuit between the two pins with a multimeter.	Yes	Replace sensor
		No	Replace ECU
4	Connect an adapter between the ECU and the harness. Check for open or short circuit between pin J1-09, J1-3ofthe ECU and the pin (1), (2) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Replace ECU

2. Throttle position sensor (see Table 1-4)

Table 1-4

Diagnostic Trouble Code (DTC)	Trouble Location or Type
P0122	Throttle/pedal position sensor/switch A circuit input low
P0123	Throttle/pedal position sensor/switch A circuit input high

S/N	Operation	Test Results	Actions
1	Ignition switch in position ON.		Next step
2	Disconnect the throttle position sensor from the harness. Measure the voltage between pin (1) and pin (2) with a multimeter. Is the voltage about 5V?	Yes	Next step
		No	5
3	Measure the resistance between pin (1) and pin (2) with a multimeter. Is the resistance between 1.6k and 2.4k?	Yes	Next step
		No	Replace sensor
4	Slowly turn the throttle position sensor from one side to the other side. Check for open or short circuit or a jump resistance between pin (1) (-) and pin (3) (+) with a multimeter.	Yes	Replace sensor
		No	Replace ECU
5	Connect an adapter between the ECU and the harness. Check for open or short circuit between pin J1-20, J1-05, J1-24 of the ECU and the pin (1), (2), (3) of the sensor with a multimeter.	Yes	Repair or replace harness

3. Shock sensor (see Table 1-5)

Table 1-5

Diagnostic Trouble Code (DTC)	Trouble Location or Type		
P0325	Shock sensor 1 circuit trouble		
S/N	**Operation**	**Test Results**	**Actions**
1	Turn off the ignition switch, and stop the engine.		Next step
2	Disconnect the shock sensor from the harness. Measure the resistance between pin (1) and pin (2) with a multimeter. Is the resistance greater than 1MΩ	Yes	Next step
		No	Renew sensor
3	Gently knock around the shock sensor with a small hammer. Check for AC signal output between pin (1) and pin (2) with a multimeter.	Yes	Next step
		No	Replace sensor
4	Turn on the ignition switch, and do not start the engine.		Next step
5	Connect an adapter between the ECU and the harness. Check for open or short circuit between pin J1-05, J1-69 of the ECU and the pin (1), (2) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Replace ECU

4. Intake manifold absolute pressure temperature sensor (see Table 1-6)

Table 1-6

Diagnostic Trouble Code (DTC)	Trouble Location or Type		
P0107	Intake manifold absolute pressure/atmospheric pressure circuit input low		
P0108	Intake manifold absolute pressure/atmospheric pressure circuit input high		
S/N	**Operation**	**Test Results**	**Actions**
1	Ignition switch in position ON.		Next step
2	Disconnect the intake manifold absolute pressure/intake air temperature sensor from the harness. Measure the voltage between pin (1) and pin (3) with a multimeter. Is the voltage about 5V?	Yes	4
		No	Next step
3	Connect an adapter between the ECU and the harness. Check for open or short circuit between pin J1-21, J1-27, J1-42 of the ECU and the pin (1), (3), (4) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Next step
4	Turn on the ignition switch, and do not start the engine.		Next step
5	In neutral position, start the engine, and keep idle speed. Step on the accelerator. Through the adapter, measure the voltage between pin (4) and pin (1) with a multimeter, namely between pin J1-42 and pin J1-21 of the ECU. Does the voltage gradually increase to 4V?	Yes	Replace ECU
		No	Replace ECU Replace sensor

5. Oxygen sensor (see Table 1-7)

Table 1-7

Diagnostic Trouble Code (DTC)	Trouble Location or Type
P0031	Heated oxygen sensor heater control circuit low (front)
P0032	Heated oxygen sensor heater control circuit high (front)
P0037	Heated oxygen sensor heater control circuit low (rear)
P0038	Heated oxygen sensor heater control circuit high (rear)
P0130	Oxygen sensor circuit trouble (front)
P0131	Oxygen sensor circuit voltage low (front)
P0132	Sensor circuit voltage high (front)
P0134	Unactivated oxygen sensor (front)
P0136	Oxygen sensor circuit trouble (rear)
P0137	Oxygen sensor circuit voltage low (rear)
P0138	Oxygen sensor circuit voltage high (rear)
P0140	Unactivated oxygen sensor (rear)
P1166	Oxygen sensor controller self-adaptive trouble diagnosis

S/N	Operation	Test Results	Actions
1	Ignition switch in position ON.		Next step
2	Disconnect the oxygen sensor from the harness. Measure the voltage between pin (1) (+) and pin (2) (-) with a multimeter. Is the voltage about 12V?	Yes	Next step
		No	4
3	Measure the resistance between pin (1) and pin (2) with a multimeter. Is the resistance between 6k and 25k?	Yes	Replace ECU
		No	Next step Replace sensor
4	Check the fuse for the oxygen sensor heated circuit. Is the fuse OK?	Yes	Replace fuse
		No	Next step
5	Check for open or short circuit between pin (1) of the oxygen sensor and the pin J1-02 of the main relay, as well as between pin (2) of the oxygen sensor and the pin J1-61 (front)/J1-64 (rear) of the ECU with a multimeter.	Yes	Repair or replace harness
		No	Next step
6	Connect the oxygen sensor, keep neutral position, start the engine, and keep idle speed until the coolant reaches normal temperatue.		Next step
7	Disconnect the oxygen sensor from the harness. Measure the voltage between pin (4) (+) and pin (3) (-) with a multimeter. Is the voltage between 0.1V and 0.9V?	Yes	Next step
		No	Replace sensor
8	Connect an adapter between the ECU and the harness. Check for open or short circuit between pin J1-06, pin J1-62 (front)/ J1-38 (rear) of the ECU and pin (3), pin (4) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Replace ECU

6. Intake manifold air temperarure sensor (see Table 1-8)

Table 1-8

Diagnostic Trouble Code (DTC)	Trouble Location or Type
P0112	Intake air temperature circuit input low
P0113	Intake air temperature circuit input high

S/N	Operation	Test Results	Actions
1	Ignition switch in position ON.		Next step
2	Disconnect the intake manifold absolute pressure/intake air temperature sensor from the harness. Measure the voltage between pin (1) and pin (2) with a multimeter. Is the voltage about 5V?	Yes	Next step
		No	As per S/N 4
3	Measure the resistance between pin (1) and pin (2) with a multimeter. Does the resistance match with its temperature? (refer to relevant part of the manual)	Yes	Replace ECU
		No	Replace sensor
4	Connect an adapter between the ECU and the harness. Check for open or short circuit between pin J1-21, J1-04, J1-27 of the ECU and the pin (1), (3), (2) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Replace ECU

7. Coolant temperature sensor (see Table 1-9)

Table 1-9

Diagnostic Trouble Code (DTC)	Trouble Location or Type
P0116	Engine coolant temperature circuit range/performance
P0117	Engine coolant temperature circuit input low
P0118	Engine coolant temperature circuit input high
P0119	Engine coolant temperature circuit breaks at interval

S/N	Operation	Test Results	Actions
1	Ignition switch in position ON.		Next step
2	Disconnect the coolant temperature sensor from the harness. Measure the voltage between pin (1) (+) and pin (3) (-) with a multimeter. Is the voltage about 5V?	Yes	Next step
		No	As per S/N 4
3	Measure the resistance between pin (1) and pin (3) with a multimeter. Does the resistance match with its temperature? (refer to relevant part of the manual)	Yes	Replace ECU
		No	Replace sensor
4	Connect an adapter between the ECU and the harness. Check for open or short circuit between pin J1-05, J1-43 of the ECU and the pin (1), (3) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	ECU Replace ECU

8. Fuel injector (see Table 1-10)

Table 1-10

Diagnostic Trouble Code (DTC)	Trouble Location or Type
P0261	Cyinder 1 fuel injector circuit low
P0264	Cyinder 2 fuel injector circuit low
P0267	Cyinder 3 fuel injector circuit low
P0270	Cyinder 4 fuel injector circuit low
P0262	Cyinder 1 fuel injector circuit high
P0265	Cyinder 2 fuel injector circuit high
P0268	Cyinder 3 fuel injector circuit high
P0271	Cyinder 4 fuel injector circuit high

S/N	Operation	Test Results	Actions
1	Ignition switch in position ON, do not start the engine.		Next step
2	Disconnect the electromagnetic fuel injector from the harness. Connect the two pins of the multimeter with the pin (1) (+) and the engine respectively.		Next step
3	Ignition switch in position ON. Check if the volatage of 12V can be read in the multimeter for about 1 second.	Yes	Repeat 2
		Yes (all)	As per S/N 6
		No	Next step
4	Check for open or short circuit between pin J1-02 of the main relay and pin (1) of solenoid fuel injector with a multimete	Yes	Repair or replace harness
		No	Next step
5	Repair or replace the fuel pump relay/main relay and relevant circuit.	Yes	Repair or replace harness
6	Connect an adapter between the ECU and the harness. Check for open or short circuit between pin J1-55, pin J1-70, J1-56, J1-71 of the ECU and pin (2) of the solenoid fuel injector with a multimeter.	No	Next step
7	Measure the resistance between pin (1) and pin (2) of the solenoid fuel injector with a multimeter. Is the resistance between 12Ω and 16Ω under the temperature of 20^0C?	Yes	Repeat 7
		Yes (all)	Next step
		No	Replace electro-magnetic fuel injector
8	Connect the solenoid fuel injector, keep neutral position, start the engine and keep idle speed. Disconnect the electromagnetic fuel injector in sequence. Check the engine for vibration when each connector is removed.	Yes	Repeat 8
		No	Replace ECU

9. Canister control valve driving stage (see Table 1-11)

Table 1-11

Diagnostic Trouble Code (DTC)	Trouble Location or Type
P0444	Evaporative emission control system, canister control valve circuit open
P0445	Evaporative emission control system, canister control valve circuit short

S/N	Operation	Test Results	Actions
1	Start the engine, keep idle speed until the coolant reaches normal temperature.		Next step
2	Disconnect the canister control valve from the harness. Measure the voltage between the two pins with a multimeter. Is the voltage about 12V?	Yes	Next step
		No	5 (check hot wire)
3	Connect the canister control valve, increase the engine rotation speed to 1500r/m, touch the valve with your hand, and check the valve for slight vibration and shock.	Yes	Next step
		No	7 (check ground wire)
4	Measure the resistance between pin (1) and pin (2) with a multimeter. Is the resistance between 22 and 30?	Yes	Replace ECU
		No	Check canister control valve
5	Check for open or short circuit between pin J1-02 of the main relay and the pin (1) of the canister control valve with a multimeter.	Yes	Repair or replace harness
		No	Next step
6	Repari or replace the main relay and its circuit.		
7	Stop the engine. Check for open or short circuit between pin J1-63 of the ECU and the pin (2) of the canister control valve with a multimeter.	Yes	Repair or replace harness
		No	Replace ECU

10. Malfunction indicator light (MIL) driving stage (see Table 1-12)

Table 1-12

Diagnostic Trouble Code (DTC)		Trouble Location or Type	
P0650		MIL control circuit	
S/N	**Operation**	**Test Results**	**Actions**
1	Ignition switch in position ON.		Next step
2	Open the instrument panel, remove the MIL bulb, and measure the voltage of the jack. Is the voltage about 12V?	Yes	Next step
		No	5 (check hot wire)
3	Check the MIL bulb for normal operation with a multimeter.	Yes	Next step
		No	Replace bulb
4	Connect an adapter between the ECU and the harness. Check for open or short circuit between pin J1-63 of the ECU and the input connector of the MIL bulb with a multimeter.	Yes	Repair or replace harness
		No	Replace ECU
5	Check the fuse for the heating circuit of the oxygen sensor. Is the fuse OK?	Yes	Replace fuse
6	Check for open or short circuit between pin 87 of the main relay and pin (1) of the MIL jack with a multimeter.	Yes	Repair or replace harness
		No	Next step
7	Repair or replace the main relay and its circuit.		

11. Driving stage of stepper motor coil 1 and 2 (see Table 1-13)

Table 1-13

S/N	Operation	Test Results	Actions
1	Turn on the ignition switch, and do not start the engine.		Next step
2	Disconnect the stepper motor from the harness. Measure the resistance between pin (1) and pin (2), as well as between pin (3) and pin (4) of the stepper motor with a multimeter. Is the resistance between 40Ω and 80Ω?	Yes	Next step
		No	Replace idle speed actuator
3	Measure the resistance between pin (1) and pin (2), as well as between pin (3) and pin (4) of the stepper motor with a multimeter. Is the resistance infinite?	Yes	Next step
		No	Replace idle speed actuator
4	Measure the resistance between pin (1) and pin (2), as well as between pin (3) and pin (4) of the stepper motor connected with the harness with a multimeter. Is the resistance about 12V?	Yes	Replace idle speed actuator
		No	Next step
5	Connect an adapter between the ECU and the harness. Check for open or short circuit between pin J1-34, J1-33, J1-53, J1-54 of the ECU and the pin (1), (2), (3), (4) of the stepper motor with a multimeter.	Yes	Repair or replace harness
		No	Replace ECU

II. LF TRITEC Engine

1. DTC: P0112, Intake Air Temperature Sensor Temperature Too Low (see Table 1-14)

Table 1-14

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Check the “intake air temperature” as per the data flow. Does it match with the temperature within the intake pipe (related to the temperature of the engine at that moment)? Note: If the temperature is often -40℃, open circuit may occur.	Yes	Go to step 5
		No	Next step
3	Disconnect the intake air temperature sensor from the harness. Measure the resistance between pin 1# and pin 2# of the sensor with a multimeter. Does the resistance match with its temperature (refer to relevant part of the manual)?	Yes	Next step
		No	Replace sensor
4	Disconnect the intake air temperature sensor from the harness. Measure the voltage between pin 1# and pin 2# with a multimeter. Is the voltage about 5V?	Yes	Go to step 5
		No	Next step
5	Check for open circuit or short to the power supply between pin 17#, 40# of the ECU and the pin 1#, 2# of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Next step
6	Start the engine, and keep idle speed. Check the “intake air temperature” on the diagnostic instrument. At this moment, the temperature will increase with the rise of the engine intake air temperature.	Yes	Diagnosis help
		No	Replace sensor

2. DTC: P0113, Intake Air Temperature Sensor Temperature Too High (see Table 1-15)

Table 1-15

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Check the “intake air temperature” as per the data flow. Does it match with the temperature within the intake pipe (related to the temperature of the engine at that moment)? Note: If the temperature is often -40℃, open circuit may occur.	Yes	Go to step 5
		No	Next step
3	Disconnect the intake air temperature sensor from the harness. Measure the resistance between pin 1# and pin 2# of the sensor with a multimeter. Does the resistance match with its temperature (refer to relevant part of the manual)?	Yes	Next step
		No	Replace sensor
4	Disconnect the intake air temperature sensor from the harness. Measure the voltage between pin 1# and pin 2# with a multimeter. Is the voltage about 5V?	Yes	Go to step 5
		No	Next step
5	Check for short to the ground between pin 17#, 40# of the ECU and the pin 1#, 2# of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Next step
6	Start the engine, and keep idle speed. Check the “intake air temperature” on the diagnostic instrument. At this moment, the temperature will increase with the rise of the engine intake air temperature.	Yes	Diagnosis help
		No	Replace sensor

3. DTC: P0117, Engine Coolant Temperature Sensor Temperature Too Low (see Table 1-16)

Table 1-16

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Check the “coolant temperature” as per the data flow. Does it match with the temperature of the engine (related to the temperature of the engine at that moment)? Note: If the temperature is often -40℃, open circuit may occur.	Yes	Go to step 6
		No	Next step
3	Disconnect the coolant temperature sensor from the harness. Measure the resistance between pin 1# and pin 2# of the sensor with a multimeter. Does the resistance match with its temperature (refer to relevant part of the manual)?	Yes	Next step
		No	Replace sensor
4	Check for open circuit or short to the power supply between pin 39#, 35# of the ECU and the pin 1#, 2# of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Next step
5	Start the engine, and keep idle speed. Check the “coolant temperature” on the diagnostic instrument. At this moment, the temperature will increase with the rise of the engine coolant temperature.	Yes	Diagnosis help
		No	Replace sensor

4. DTC: P0118, Engine Coolant Temperature Sensor Temperature Too High (see Table 1-17)

Table 1-17

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Check the “coolant temperature” as per the data flow. Does it match with the temperature of the engine (related to the temperature of the engine at that moment)? Note: If the temperature is often -40℃, open circuit may occur.	Yes	Go to step 6
		No	Next step
3	Disconnect the coolant temperature sensor from the harness. Measure the resistance between pin 1# and pin 2# of the sensor with a multimeter. Does the resistance match with its temperature (refer to relevant part of the manual)?	Yes	Next step
		No	Replace sensor
4	Disconnect the coolant temperature sensor from the harness. Measure the voltage between pin 1# and pin 2# with a multimeter. Is the voltage about 5V?	Yes	Go to step 6
		No	Next step
5	Check for short to ground between pin 39#, 35# of the ECU and the pin 1#, 2# of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Next step
6	Start the engine, and keep idle speed. Check the “coolant temperature” on the diagnostic instrument. At this moment, the temperature will increase with the rise of the engine coolant temperature.	Yes	Diagnosis help
		No	Replace sensor

5. DTC: P0122, Throttle Position Sensor Circuit Voltage Too Low (see Table 1-18)

Table 1-18

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Check the “throttle absolute openning” as per the data flow. Does it within 4%-10% (related to vehicle model)?	Yes	Next step
		No	Go to step 5
3	Step on the accelerator, and check the “throttle absolute openning” as per the data flow. Does it increase to about 85-95% with the widening of the throttle opening (related to vehicle model)?	Yes	Next step
		No	Go to step 5
4	Repeat step 3, and check the “throttle absolute openning” as per the data flow. Does jump occur during the process?	Yes	Replace sensor
		No	Next step
5	Disconnect the throttle position sensor from the harness. Check for short to ground between pin 17#, 32#, 16# of the ECU and the pin 1#, 2#, 3# of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Next step
6	Measure the voltage between pin 1# and pin 2# with a multimeter. Is the voltage about 5V?	Yes	Replace sensor
		No	Diagnosis help

6. DTC: P0123, Throttle Position Sensor Circuit Voltage Too High (see Table 1-19)

Table 1-19

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Check the “throttle absolute openning” as per the data flow. Does it within 4%-10% (related to vehicle model)?	Yes	Next step
		No	Go to step 5
3	Step on the accelerator, and check the “throttle absolute openning” as per the data flow. Does it increase to about 85-95% with the widening of the throttle opening (related to vehicle model)?	Yes	Next step
		No	Go to step 5
4	Repeat step 3, and check the “throttle absolute openning” as per the data flow. Does jump occur during the process?	Yes	Replace sensor
		No	Next step
5	Disconnect the throttle position sensor from the harness. Check for open circuit or short to power supply between pin 17#, 32#, 16# of the ECU and the pin 1#, 2#, 3# of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Next step
6	Measure the voltage between pin 1# and pin 2# with a multimeter. Is the voltage about 5V?	Yes	Replace sensor
		No	Diagnosis help

7. DTC: P0130, Upper Oxygen Sensor Signal Circuit Trouble (see Table 1-20)
(Note: If the trouble of P0135 occurs simultaneously, please remove the trouble of P0135 at first, and then go to the following steps.)

Table 1-20

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Start the engine, and keep idle speed until the coolant reaches normal temperature. Check the “oxygen sensor voltage” on the diagnostic instrument, and the voltage should change quickly within 100mV~900mV?	Yes	Diagnosis help
		No	Next step
3	Check for short to ground between pin 36#, 18# of the ECU and pin A# (to the grey connection line of the oxygen sensor), B# (to the black connection line of the oxygen sensor) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Next step
4	A. Check the intake air system for serious leakage; B. Check if the fuel injector is blocke C. Check the spark plug for over-sized gap; D. Check the distribution line for overhigh resistance; E. Check the intake valve guide for abrasion.	Yes	Check and repair as per diagnosis
		No	Diagnosis help

8. DTC: P0132, Upper Oxygen Sensor Circuit Voltage Too High (see Table 1-21)
(Note: If the trouble of P0135 occurs simultaneously, please remove the trouble of P0135 at first, and then go to the following steps.)

Table 1-21

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Start the engine, and keep idle speed until the coolant reaches normal temperature. Check the “oxygen sensor voltage” on the diagnostic instrument, and the voltage should change quickly within 100mV~900mV?	Yes	Diagnosis help
		No	Next step
3	Check for short to power supply between pin 36#, 18# of the ECU and pin A# (to the grey connection line of the oxygen sensor), B# (to the black connection line of the oxygen sensor) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Diagnosis help

9. DTC: P0134, Upper Oxygen Sensor Signal Circuit Trouble (see Table 1-22)
(Note: If the trouble of P0135 occurs simultaneously, please remove the trouble of P0135 at first, and then go to the following steps.)

Table 1-22

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Start the engine, and keep idle speed until the coolant reaches normal temperature. Check the “oxygen sensor voltage” on the diagnostic instrument, and the voltage should change quickly within 100mV~900mV?	Yes	Diagnosis help
		No	Next step
3	Check for open circuit between pin 36#, 18# of the ECU and pin A# (to the grey connection line of the oxygen sensor), B# (to the black connection line of the oxygen sensor) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Diagnosis help

10. DTC: P0135, Upper Oxygen Sensor Heating Circuit Trouble (see Table 1-23)

Table 1-23

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Disconnect the oxygen sensor from the harness. Check the voltage between the pin C# (to the white connection line of the oxygen sensor) and the pin D# (to the white connection line of the oxygen sensor) with a multimeter. Is the voltage about 12V?	Yes	Next step
		No	Go to step 4
3	Check the resistance between the pin C# (white) and the pin D# (white) of the oxygen sensor with a multimeter. Is the resistance between 1Ω and 6Ω under the temperature of 20℃?	Yes	Next step
		No	Replace sensor
4	Check the 8A fuse in the oxygen sensor heating circuit. Is the fuse OK?	Yes	Replace fuse
		No	Next step
5	Check for open circuit, short to power supply or ground between the pin 1# of the ECU, pin 87# of the main relay and the pin C# (to the white connection line of the oxygen sensor) and the pin D# (to the white connection line of the oxygen sensor) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Diagnosis help

11. DTC: P0171, Air Fuel Ratio Closed Loop Control Self-adaptation Upper Limit Break (see Table (1-24)

(Note: If the DTC related to intake air pressure sensor, canister control valve, oxygen sensor is produced, please remove these troubles at first, and then go to the following steps.)

Table 1-24

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Start the engine, and keep idle speed until the coolant reaches the normal temperature. Check the “oxygen sensor voltage” on the diagnostic instrument. At this moment, does it keeps around 100mV for a long time under certain working conditions?	Yes	Next step
		No	Diagnosis help
3	Connect the fuel pressure gauge to the intake end of the fuel system. Check if the fuel pressure keeps around 380kPa.	Yes	Next step
		No	Check and repair fuel system
4	Check for short to ground between pin 36#, 18# of the ECU and pin A# (to the grey connection line of the oxygen sensor), B# (to the black connection line of the oxygen sensor) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Next step
5	A. Check the intake air system for serious leakage; B. Check if the fuel injector is blocked; C. Check the spark plug for over-sized gap D. Check the distribution line for overhigh resistance; E. Check the valve for over-sized gap.	Yes	Check and repair as per diagnosis
		No	Diagnosis help

12. DTC: P0172, Air Fuel Ratio Closed Loop Control Self-adaptation Bottom Limit Break (see Table 1-25)

(Note: If the DTC related to intake air pressure sensor, canister control valve, oxygen sensor is produced, please remove these troubles at first, and then go to the following steps.)

Table 1-25

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Start the engine, and keep idle speed until the coolant reaches the normal temperature. Check the “oxygen sensor voltage” on the diagnostic instrument. At this moment, does it keeps around 900mV for a long time under certain working conditions?	Yes	Next step
		No	Diagnosis help
3	Connect the fuel pressure gauge to the intake end of the fuel system. Check if the fuel pressure keeps around 380kPa.	Yes	Next step
		No	Check and repair fuel system
4	Check for short to power supply between pin 36#, 18# of the ECU and pin A# (to the grey connection line of the oxygen sensor), B# (to the black connection line of the oxygen sensor) of the sensor with a multimeter.	Yes	Repair or replace harness
		No	Next step
5	A. Check the fuel injector for leakage; B. Check the exhaust pipe for leakage; C. Check the ignition timing for normal operation; D. Check the intake valve guide for abrasion; E. Check if the valve gap is too narrow.	Yes	Check and repair as per diagnosis
		No	Diagnosis help

13. DTC: P0204, 4-cylinder Feul Injector Circuit Trouble (see Table 1-26)

Table 1-26

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Disconnect the 4-cylinder fuel injector from the harness. Check the voltage between pin 1# of the injector and the negative pole of the power supply with a multimeter. Is the voltage about 12V?	Yes	Go to step 4
		No	Next step
3	Check for open circuit or short to ground between the pin 1# of the 4-cylinder fuel injector and the main relay with a multimeter.	Yes	Repair or replace harness
		No	Next step
4	Check for resistance between the pin 1#, and the pin 2# of the 4-cylinder fuel injector with a multimeter. Is the resistance between 11Ω and 16Ω under the temperatue of 20℃?	Yes	Next step
		No	Replace fuel injector
5	Check the voltage between pin 2# of the injector and the negative pole of the power supply with a multimeter. Is the voltage about 3.7V?	Yes	Diagnosis help
		No	Next step
6	Check for short to power supply or ground between the pin 2# of the injector and the pin 47# of the ECU.	Yes	Repair or replace harness
		No	Diagnosis help

14. DTC: P0230, Fuel Pump Control Circuit Trouble (see Table 1-27)

Table 1-27

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Disconnect the fuel pump relay, and turn the ignition switch to ON. Measure the resistance between pin 30#, 86# of the relay (power supply end) and the power supply negative pole. Is the voltage about 12V?	Yes	Go to step 4
		No	Next step
3	Check for open circuit or short to ground at the power supply end of the relay.	Yes	Repair or replace harness
		No	Go to step 2
4	Measure the voltage between the pin 85# of the relay (control end) and the power supply negative pole with a multimeter. Is the voltage about 3.7V?	Yes	Replace fuel pump relay
		No	Next step
5	Check for open circuit or short to power supply or ground between the pin 85# of the relay (control end) and the pin 69# of the ECU.	Yes	Repair or replace harness
		No	Diagnosis help

15. DTC: P0325, Shock Sensor Circuit Trouble (see Table 1-28)

Table 1-28

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Disconnect the shock sensor from the harness. Measure the resistance between pin 1# and pin 2# with a multimeter. Is the resistance greater than 1MΩ?	Yes	Next step
		No	Replace sensor
3	Check for open circuit or short to power supply or ground between the pin 1#, 2# of the shock sensor and the pin 19#, 20# of the ECU.	Yes	Repair or replace harness
		No	Next step
4	Replace the shock absorber as required. Make the rotation speed of the engine exceed 2200r/m. Check again for DTC P0325.	Yes	Diagnosis help
		No	Check if by accident

16. DTC: P0335, Crankshaft Position Sensor Signal Trouble (see Table 1-29)

Table 1-29

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Disconnect the rotation speed sensor from the harness. Measure the resistance between pin 2# and pin 3# with a multimeter. Is the resistance between 770Ω and 950Ω under the temperature of 20℃?	Yes	Next step
		No	Replace sensor
3	Check for open circuit or short to power supply or ground between the pin 2#, 3# of the rotation speed sensor and the pin 34#, 15# of the ECU.	Yes	Repair or replace harness
		No	Next step
4	Check the fly wheel singal panel for normal operation.	Yes	Diagnosis help
		No	Replace signal panel

17. DTC: P0336, Crankshaft Position Sensor Signal Abnormal (see Table 1-30)

Table 1-30

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Disconnect the rotation speed sensor from the harness. Measure the resistance between pin 2# and pin 3# with a multimeter. Is the resistance between 770Ω and 950Ω under the temperature of 20℃?	Yes	Next step
		No	Replace sensor
3	Check for open circuit or short to power supply or ground between the pin 2#, 3# of the rotation speed sensor and the pin 34#, 15# of the ECU.	Yes	Repair or replace harness
		No	Next step
4	Check the fly wheel singal panel for normal operation.	Yes	Diagnosis help
		No	Replace signal panel

18. DTC: P0340, Phase Sensor Signal Trouble (see Table 1-31)

Table 1-31

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Disconnect the phase sensor from the harness. Measure the voltage between pin 3# and pin 1# with a multimeter. Is the voltage about 12V?	Yes	Go to step 4
		No	Next step
3	Check for open circuit or short to ground between the pin 3# of the phase sensor and the pin 87# of the main relay. Check the pin 1# of the phase sensor for abnormal grounding.	Yes	Repair or replace harness
		No	Next step
4	Measure the voltage between the pin 2# of the phase sensor and the power supply negative pole. Is the voltage about 9.9V?	Yes	Go to step 6
		No	Next step
5	Check for open circuit or short to power supply or ground between the pin 2# of the phase sensor and the pin 79# of the ECU.	Yes	Repair or replace harness
		No	Next step
6	Check the fly wheel singal panel for normal operation.	Yes	Diagnosis help
		No	Replace signal panel

19. DTC: P0443, Canister Control Valve Driving Stage Control Circuit Trouble (see Table 1-32)

Table 1-32

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Disconnect the canister control valve from the harness. Measure the voltage between the pin 1# of the control valve and the power supply negative pole with a multimeter. Is the voltage about 12V?	Yes	Go to step 4
		No	Next step
3	Check for open circuit or short to ground at the power supply end of the control valve.	Yes	Repair or replace harness
		No	Go to step 2
4	Measure the resistance between pin 1# and pin 2# with a multimeter. Is the resistance between 22Ω and 30Ω under the temperature of 20℃?	Yes	Next step
		No	Replace control valve
5	Measure the voltage between the pin 1# of the control valve and the power supply negative pole with a multimeter. Is the voltage about 3.7V?	Yes	Diagnosis help
		No	Next step
6	Check for open circuit between the pin 2# of the control valve and the pin 46# of the ECU.	Yes	Repair or replace harness
		No	Diagnosis help

20. DTC: P0444, Canister Control Valve Driving Stage Control Circuit Voltage Too Low (see Table 1-33)

Table 1-33

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Disconnect the canister control valve from the harness. Measure the voltage between the pin 1# of the control valve and the power supply negative pole with a multimeter. Is the voltage about 12V?	Yes	Go to step 4
		No	Next step
3	Check for open circuit or short to ground at the power supply end of the control valve.	Yes	Repair or replace harness
		No	Go to step 2
4	Measure the resistance between pin 1# and pin 2# with a multimeter. Is the resistance between 22Ω and 30Ω under the temperature of 20℃?	Yes	Next step
		No	Replace control valve
5	Measure the voltage between the pin 1# of the control valve and the power supply negative pole with a multimeter. Is the voltage about 3.7V?	Yes	Diagnosis help
		No	Next step
6	Check for short to ground between the pin 2# of the control valve and the pin 46# of the ECU.	Yes	Repair or replace harness
		No	Diagnosis help

21. DTC: P0445, Canister Control Valve Driving Stage Control Circuit Voltage Too High (see Table 1-34)

Table 1-34

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Disconnect the canister control valve from the harness. Measure the voltage between the pin 1# of the control valve and the power supply negative pole with a multimeter. Is the voltage about 12V?	Yes	Go to step 4
		No	Next step
3	Check for open circuit or short to ground at the power supply end of the control valve.	Yes	Repair or replace harness
		No	Go to step 2
4	Measure the resistance between pin 1# and pin 2# with a multimeter. Is the resistance between 22Ω and 30Ω under the temperature of 20℃?	Yes	Next step
		No	Replace control valve
5	Measure the voltage between the pin 1# of the control valve and the power supply negative pole with a multimeter. Is the voltage about 3.7V?	Yes	Diagnosis help
		No	Next step
6	Check for short to power supply between the pin 2# of the control valve and the pin 46# of the ECU.	Yes	Repair or replace harness
		No	Diagnosis help

22. DTC: P0480, A/C Condenser Cooling Fan A Relay Control Circuit Trouble (see Table 1-35)

Table 1-35

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Disconnect A/C condenser cooling fan relay, and turn the ignition switch to ON. Check the voltage between the pin 30#, 85# of the relay (power supply end) and the power supply negative pole. Is the voltage about 12V?	Yes	Go to step 4
		No	Next step
3	Check for open circuit or short to ground at the power supply end of the A/C condenser cooling fan relay.	Yes	Repair or replace harness
		No	Go to step 2
4	Check the voltage between the pin 86# of the relay (control end) and the power supply negative pole. Is the voltage between 3.7V?	Yes	Replace relay
		No	Next step
5	Check for open circuit or short to power supply or ground between the pin 86# of relay control end and the pin 50# of the ECU.	Yes	Repair or replace harness
		No	Diagnosis help

23. DTC: P0481, A/C Condenser Cooling Fan B Relay Control Circuit Trouble (see Table 1-36)

Table 1-36

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Disconnect A/C condenser cooling fan relay, and turn the ignition switch to ON. Check the voltage between the pin 30#, 85# of the relay (power supply end) and the power supply negative pole. Is the voltage about 12V?	Yes	Go to step 4
		No	Next step
3	Check for open circuit or short to ground at the power supply end of the A/C condenser cooling fan relay.	Yes	Repair or replace harness
		No	Go to step 2
4	Check the voltage between the pin 86# of the relay (control end) and the power supply negative pole. Is the voltage between 3.7V?	Yes	Replace relay
		No	Next step
5	Check for open circuit or short to power supply or ground between the pin 86# of relay control end and the pin 68# of the ECU.	Yes	Repair or replace harness
		No	Diagnosis help

24. DTC: P0500, Vehicle Speed Signal Abnormal (see Table 1-37)

Table 1-37

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	If equipped with ABS system, please check the system for DTC.	Yes	Check ABS system
		No	Next step
3	Check the speedometer hand for normal operation.	Yes	Next step
		No	Check instrument line
4	Check the vehicle speed sensor for normal operation.	Yes	Next step
		No	Replace vehicle speed sensor
5	Check for open circuit or short to power supply or ground between the vehicle speed sensor signal line and the pin 59# of the ECU.	Yes	Repair or replace harness
		No	Diagnosis help

25. DTC: P0506, Idle Speed Too Low (see Table 1-38)

Table 1-38

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Check the throttle adjusting bolt, accelerator cable, throttle for normal operation.	Yes	Next step
		No	Necessary check, repair and maintenance
3	Check the idle speed regulator for normal operation.	Yes	Next step
		No	Necessary check, repair and maintenance
4	A. Check if the pressure of the fuel supply system is too low; B. Check if the fuel injector is blocked; C. Check if the exhaust system is blocked.	Yes	Necessary check and repair
		No	Diagnosis help

26. DTC: P0507, Idle Speed Too High (see Table 1-39)

Table 1-39

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Check the throttle adjusting bolt, accelerator cable, throttle for normal operation.	Yes	Next step
		No	Necessary check, repair and maintenance
3	Check the idle speed regulator for normal operation.	Yes	Next step
		No	Necessary check, repair and maintenance
4	A. Check the system for leakage; B. Check the fuel injector for leakage; C. Check if the pressure of the fuel supply system is too high.	Yes	Necessary check and repair
		No	Diagnosis help

27. DTC: P0508, Idle Speed Regulator Control Circuit Voltage Too Low (see Table 1-40)

Table 1-40

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Disconnect the idle speed regulator. Check the resistance between pin A and pin D, as well as between pin B and pin C of the regulator. Is the resistance about 53±5.3Ω under the temperature of 20℃?	Yes	Next step
		No	Replace stepper motor
3	Check for short to ground between the pin A, B, C, D of the regulator and the pin 65#, 66#, 67#, 64# of the ECU.	Yes	Repair or replace harness

28. DTC: P0509, Idle Speed Regulator Control Circuit Voltage Too High (see Table 1-41)

Table 1-41

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Disconnect the idle speed regulator. Check the resistance between pin A and pin D, as well as between pin B and pin C of the regulator. Is the resistance about 53±5.3Ω under the temperature of 20℃?	Yes	Next step
		No	Replace stepper motor
3	Check for short to power supply between the pin A, B, C, D of the regulator and the pin 65#, 66#, 67#, 64# of the ECU.	Yes	Repair or replace harness
		No	Diagnosis help

29. DTC: P0511, Idle Speed Regulator Control Circuit Trouble (see Table 1-42)

Table 1-42

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Disconnect the idle speed regulator. Check the resistance between pin A and pin D, as well as between pin B and pin C of the regulator. Is the resistance about 53±5.3Ω under the temperature of 20℃?	Yes	Next step
		No	Replace stepper motor
3	Check for open circuit between the pin A, B, C, D of the regulator and the pin 65#, 66#, 67#, 64# of the ECU.	Yes	Repair or replace harness
		No	Diagnosis help

30. DTC: P0560, System Voltage Signal Abnormal (see Table 1-43)

Table 1-43

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Check the volatage with a multimeter. Is the voltage about 12V?	Yes	Next step
		No	Replace battery
3	Check for open circuit or short to ground between pin 44#, 45#, 63# of the ECU and the pin 87# of the main relay respectively.	Yes	Repair or replace harness
		No	Next step
4	Start the engine, check if the generator charging voltage is within 9-16V under different rotation speed.	Yes	Next step
		No	Replace engine
5	Check the grounding point of the engine harness for normal operation.	Yes	Diagnosis help
		No	Repair or replace harness

31. DTC: P0562, System Voltage Too Low (see Table 1-44)

Table 1-44

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Check the volatage with a multimeter. Is the voltage about 12V?	Yes	Next step
		No	Replace battery
3	Check the resistance between the pin 44#, 45#, 63# of the ECU and the pin 87# of the main relay repectively. Is the resistance too high?	Yes	Repair or replace harness
		No	Next step
4	Start the engine, check if the generator charging voltage is within 9-16V under different rotation speed.	Yes	Next step
		No	Replace engine
5	Check the grounding point of the engine harness for normal operation.	Yes	Diagnosis help
		No	Repair or replace harness

32. DTC: P0601, Electronic Control Unit Check Code Unprogrammed (see Table 1-45)

Table 1-45

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Clear the DTC, and check once again if the trouble is stable.	Yes	Next step
		No	Normal
3	Replace ECU.	End	

33. DTC: P0602, Electronic Control Unit Diagnostic Data Identification Code Unprogrammed (see Table 1-46)

Table 1-46

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Clear the DTC, and check once again if the trouble is stable.	Yes	Next step
		No	Normal
3	Replace the ECU.	End	

34. DTC: P0645, A/C Compressor Relay Control Circuit Trouble (see Table 1-47)

Table 1-47

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Disconnect the A/C compressor relay, and turn the ignition switch to ON. Measure the voltage between pin 30#, 86# of the relay (power supply end) and the power supply negative pole. Is the voltage about 12V?	Yes	4 Go to step
		No	Next step
3	Check for open circuit or short to ground at the power supply end of the relay.	Yes	Repair or replace harness
		No	Go to step 2
4	Measure the voltage between the pin 86# of the relay (control end) and the power supply negative pole with a multimeter. Is the voltage about 3.7V?	Yes	Replace relay
		No	Next step
5	Check for open circuit between the pin 86# of the relay (control end) and the 70# of the ECU with a multimeter.	Yes	Repair or replace harness
		No	Diagnosis help

35. DTC: P0646, A/C Compressor Relay Control Circuit Voltage Too Low (see Table 1-48)

Table 1-48

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Disconnect the A/C compressor relay, and turn the ignition switch to ON. Measure the voltage between pin 30#, 85# of the relay (power supply end) and the power supply negative pole. Is the voltage about 12V?	Yes	Go to step 4
		No	Next step
3	Check for open circuit or short to ground at the power supply end of the relay.	Yes	Repair or replace harness
		No	Go to step 2
4	Measure the voltage between the pin 86# of the relay (control end) and the power supply negative pole with a multimeter. Is the voltage about 3.7V?	Yes	Replace relay
		No	Next step
5	Check for short to ground between the pin 86# of the relay (control end) and the 70# of the ECU with a multimeter.	Yes	Repair or replace harness
		No	Diagnosis help

36. DTC: P0647, A/C Compressor Relay Control Circuit Voltage Too High (see Table 1-49)

Table 1-49

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to OFF.		Next step
2	Disconnect the A/C compressor relay, and turn the ignition switch to ON. Measure the voltage between pin 30#, 85# of the relay (power supply end) and the power supply negative pole. Is the voltage about 12V?	Yes	Go to step 4
		No	Next step
3	Check for open circuit or short to ground at the power supply end of the relay.	Yes	Repair or replace harness
		No	Go to step 2
4	Measure the voltage between the pin 86# of the relay (control end) and the power supply negative pole with a multimeter. Is the voltage about 3.7V?	Yes	Replace relay
		No	Next step
5	Check for short to power supply between the pin 86# of the relay (control end) and the 70# of the ECU with a multimeter.	Yes	Repair or replace harness
		No	Diagnosis help

37. DTC: P1651, Malfunction Indicator Light Control Circuit Trouble (see Table 1-50)

Table 1-50

S/N	Operation	Test Results	Actions
1	Connect the diagnostic instrument and adapter, and turn the ignition switch to ON.		Next step
2	Carry out action tests for the MIL of the engine with a diagnostic instrument. Check if it is always keep dark or light.	Yes	Next step
		No	Normal
3	Check for open circuit or short to ground at the power supply end of the engine MIL.	Yes	Repair or replace harness
		No	Next step
4	Check for open circuit or short to power supply or ground between the pin 29# of the engine MIL (control end) and the 29# of the ECU with a multimeter.	Yes	Repair or replace harness
		No	Diagnosis help

Section IV

Steps for Trouble Diagnosis Based on Engine Symptom

Before the steps for trouble diagnosis based on engine symptom, carry out the following primary checks at first:

1. Check the ECU and MIL for abnormal condition (for vehicles without MIL, skip this step);
2. To confirm no trouble information record found with a trouble diagnostic instrument or flasher;
3. Check the idle speed data after warm-up of the electronic control system with a trouble diagnostic instrument for normal range;
4. Confirm the concern of the user and the actual location of the symptom.

Then, check the appreance:

1. Check the harness grounding for cleanness and tightness;
2. Check the vacuum pipe for break, twist and correct connection;
3. Check if the pipe is blocked; check if the inlet pipe is extruded or damaged;
4. Check the sealing between the throttle body and the intake manifold for damage;
5. Check the high voltage wire of the ignition system for break, aging and wrong connection;
6. Check the lead for correct connection and check the connector for looseness.

Key note: In case of the above-mentioned conditions, repair these troubles at first. Otherwise, the following trouble diagnosis and maintenance will be affected.

Diagnosis help:

1. To confirm no trouble record found for the engine;
2. To confirm the concern of the user;
3. No abnormal condition is found after check following the above-mentioned steps;
4. During check and maintenance, do not ignore the impact on the system from the vehicle maintenance, cylinder pressure, mechanical ignition timing, fuel condition, and so on.
5. Replace the ECU, and then carry out tests.

If the trouble is removed at this moment, the trouble is produced within the ECU. If the trouble can not be removed at this moment, replace the original ECU, and repeat the steps.

I. LF481Q3 engine

1. If the engine fails to run or runs slowly at start, carry out the trouble diagnosis and removal as per Table 1-51.

Table 1-51

S/N	Operation	Test Results	Actions
1	Measure the voltage between the two terminals of the battery with a multimeter. Is the voltage about 10-12.5V?	Yes	Next step
		No	Repair or replace battery
2	Turn the ignition switch to ON. Measure the voltage between the ignition switch and the terminal of the battery positive pole. Is the voltage about 10-12.5V?	Yes	Next step
		No	Repair terminal or replace lead
3	Turn the ignition switch to START. Measure the voltage of the terminal of the ignition switch to connect with the positive pole of the start motor with a multimeter. Is the voltage greater than 8V?	Yes	Next step
		No	Repair or replace ignition switch
4	Keep the ignition switch in START. Measure voltage of the terminal of the positive pole of the start motor with a multimeter. Is the voltage greater than 8V?	Yes	Next step
		No	Repair terminal or replace lead
5	Check the start motor for open or short circuit with a multimeter.	Yes	Repair or replace start motor
		No	Next step
6	Check if the engine is locked for lack of lubrication.	Yes	Remove the trouble
		No	Next step
7	In winter, check if the start motor is affected by high resistance as improper engine lubricant and gear box oil is applied.	Yes	Replace the oil
		No	Repair or replace timing belt

2. If the engine can not be successfully started, carry out the trouble diagnosis and removal as per Table 1-52.

Table 1-52

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Take out the spark plug, and make the electrode of the spark plug 5-10mm from the engine block. Run the engine with the start motor, and check if the blue white high voltage fire is produced.	Yes	8
		No	Next step
3	Check if the resistance of the high pressure wire is normal (about 16k̃/m, if too low, the wire is in trouble).	Yes	Next step
		No	Repair or replace the high pressure wire
4	Check each ignition coil for damage or crack.	Yes	Replace
		No	Next step
5	Check the ignition coil for looseness or damage.	Yes	Replace
		No	Next step
6	Check the ignition coil for normal operation.	Yes	Next step
		No	Replace
7	Check if the interfaces of the high pressure coil are well connected.	Yes	Next step
		No	Connect
8	Turn the ignition switch to ON. Check if the fuel pump relay and the fuel pump can keep running for 3 seconds.	Yes	Next step
		No	Check and repair fuel pump circuit
9	Connect the fuel pressure gauge valve. Short-circuit the pin J1-47 and the pin J1-73 of the fuel bump relay, and run the fuel pump. Check if the fuel pressure is about 300kPa.	Yes	Next step
		No	13
10	Take out the fuel distribution pipe together with the fuel injector. Disconnect the fuel injector from the harness. Check the fuel injector for fuel injection with the voltage of 12V directly from the battery.	Yes	12
		No	Next step
11	Clean the fuel injector and check the fuel injector for fuel injection.	Yes	Next step
		No	Replace fuel injector
12	Check if the fuel is wrong or contains water.	Yes	Replace fuel
		No	18
13	Check if the fuel pressure is lower than 300kPa.	Yes	Next step
		No	17
14	Close the fuel gauge valve. Turn on the ignition switch again and keep the fuel pump working for 3 seconds. Check if fuel pressure can be produced.	Yes	Next step
		No	16

Table 1-52 (Continued)

S/N	Operation	Test Results	Actions
15	Check the fuel intake pipe for leakage or blockage.	Yes	Replace or repair fuel intake pipe
		No	Replace fuel pump
16	Check if the fuel return pipe is blocked or bent.	Yes	Repair or replace fuel return pipe
		No	Replace fuel pressure regulator
17	Connect an adapter between the ECU and the harness. Check the pin J1-73 of the ECU for voltage. Check the positive power supply line of the above-mentioned ECU pin and the groud wire of the pin J1-01, J1-17, J1-18 connected to the ECU for normal operation.	Yes	Next step
		No	Repair or replace harness
18	Check the parts and components of the intake system for leakage.	Yes	Repair
		No	Next step
19	Check if the intake manifold absolute pressure and temperature sensor is blocked.	Yes	Repair or replace
		No	Next step
20	Check if the coolant temperature sensor for normal operation.	Yes	Next step
		No	Repair or replace
21	Check if the gap between the piston and the cylinder is too wide. Check the cylinder for leakage.	Yes	Remove mechanical trouble
		No	Replace ECU

3. Hard to start after warm-up

Table 1-53

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Connect the fuel pressure gauge valve (the connection point is related to the vehicle model). Short-circuit the pin J1-47 and the pin J1-73 of the fuel bump relay, and run the fuel pump. Check if the fuel pressure is about 300kPa.	Yes	Next step
		No	9
3	Disconnect the fuel pipe, and turn the ignition switch. Check if the pressure of the fuel system still keeps between 150kPa and 200kPa after 1 hour.	Yes	Next step
		No	Repair fuel system leakage
4	Connect the fuel pipe. Block the fuel return pipe, and turn off the fuel pressure gauge valve. Turn off the ignition switch. Check if the pressure of the fuel system still keeps between 150kPa and 200kPa after 1 hour.	Yes	Replace fuel pressure regulator (inbuilt)
		No	Next step

Table 1-53 (Continued)

S/N	Operation	Test Results	Actions
5	Check the fuel injector and the fuel pipe for leakage.	Yes	Replace fuel injector and fuel pipe
		No	Next step
6	Take out the water temperature sensor, and start the engine. Is the engine OK?	Yes	Check the coolant temperature and line
		No	Next step
7	Connect an adapter between the ECU and the harness. Check the pin J1-73 of the ECU for voltage. Check the positive power supply line of the above-mentioned ECU pin and the groud wire of the pin J1-01, J1-17, J1-18 connected to the ECU for normal operation.	Yes	Repair or replace harness
		No	Next step
8	Replace the fuel. Start the vehicle after warm-up. Is it OK?	Yes	End
		No	Replace ECU
9	Check if the fuel pipe is blocked or bent. Check the fuel pump pressure regulation valve for normal operation.	Yes	Next step
		No	Repair or replace
10	Check the interfaces of the fuel pump at both ends for battery voltage with a multimeter.	Yes	Next step
		No	Repair or replace fuel pump relay and lead
11	Check if the resistance of the fuel pump is correct with a multimeter.	Yes	Next step
		No	Replace fuel pump
12	Check if the fuel pump is locked.	Yes	Replace fuel pump
			Replace ECU

4. With normal rotation speed, difficult to start

Table 1-54

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Check the air filter for smoothness.	Yes	Next step
		No	Replace
3	After successful start, check if the intake air manifold pressure is between 35 kPa and 65kPa at idle speed.	Yes	Next step
		No	Remove leakage for the air intake system
4	Gently step on the throttle, and check if the vehicle can be started easily.	Yes	Check and replace throttle and idle speed passage

Table 1-54 (Continued 1)

S/N	Operation	Test Results	Actions
5	Connect the fuel pressure gauge valve. Short-circuit the pin 30 and the pin 87 of the fuel bump relay, and run the fuel pump. Check if the fuel pressure is about 300kPa.	Yes	Next step
		No	9
6	Connect the battery and the fuel injector with a special connector. With the voltage supply of 12V, check the fuel injector for normal operation.	Yes	8
		No	Next step
7	Wash the fuel injector and check the fuel injector again for normal operation.	Yes	Next step
		No	Replace fuel injector
8	Replace the fuel. Check if the fuel is wrong or contains water.	Yes	Replace fuel
		No	14
9	250kPa Check if the fuel pressure is lower than 250kPa.	Yes	Next step
		No	13
10	Close the fuel gauge valve. Turn on the ignition switch again and keep the fuel pump working for 3 seconds. Check if fuel pressure can be produced.	Yes	Next step
		No	12
11	Turn on the fuel gauge valve, and block the fuel return pipe. Check if the fuel pressure is quickly produced.	Yes	Replace fuel pressure regulator
		No	Repair or replace fuel injector or fuel pipe
12	Check the fuel intake pipe for leakage or blockage.	Yes	Repair or replace fuel intake pipe
		No	Replace fuel pump
13	Check if the fuel return pipe is blocked or bent.	Yes	Repair or replace fuel return pipe Repair or replace fuel return pipe
		No	Replace fuel pressure regulator
14	Before the engine coolant reaches 35°C, take out the idle speed actuator connector, and check if the rotation speed of the engine is decreased.	Yes	Next step
		No	Replace idle speed actuator
15	Turn the ignition switch to ON. Check the voltage of the following pins of the ECU. Is the voltage of the pin J1-12 (crankshaft position sensor) is about 12V? Is the empty pin and the pin J1-54 (idle speed stepper motor A+) is 0V?	Yes	Next step
		No	Check harness and interface
16	Keep the engine at idle speed. After the coolant reaches normal temperature, ground the pin 51 of the ECU with a short-connected line. Check if the ignition advance angle is a 6.75° crank angle.	Yes	Next step
		No	Adjust ignition advance angle

Table 1-54 (Continued 2)

S/N	Operation	Test Results	Actions
17	Check if the compressed pressure of the engine cylinder is normal.	Yes	Next step
		No	Remove the trouble
18	Check if the intake air manifold absolute pressure and temperature sensor is blocked.	Yes	Repair or replace
		No	Next step
19	Check if the coolant temperature sensor for normal operation.	Yes	Replace ECU
		No	Repair or replace

5. Difficult cold start

Table 1-55

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Check the coolant for normal temperature with a multimeter (resistance: between XX and XX)	Yes	Next step
		No	Replace sensor
3	Turn on the ignition switch. Connect an adapter between the ECU and the harness, and check the voltage of the following pins of the ECU. Is the voltage of the pin J1-12 (crankshaft position sensor) is about 12V? Is the empty pin and the pin J1-54 (idle speed stepper motor A+) is 0V?	Yes	Next step
		No	Check harness and interface
4	Check the air filter for smoothness.	Yes	Next step
		No	Replace
5	After start, check if the pressure of the intake air manifold at idle speed is between 35kPa and 65kPa.	Yes	Next step
		No	Remove leakage for the air intake system
6	Gently step on the throttle, and check if the vehicle can be started easily.	Yes	Check throttle and idle speed passage
		No	Next step
7	Before the engine coolant reaches 35°C, take out the idle speed actuator connector, and check if the rotation speed of the engine is decreased.	Yes	Next step
		No	Replace idle speed actuator
8	Connect the fuel pressure gauge valve (the connection point is related to the vehicle model). Carry out direct grounding for the pin 86 of the fuel pump relay. Turn on the ignition switch and run the fuel pump relay and fuel pump. Check if the fuel pressure is between 250kPa and 300kPa.	Yes	Next step
		No	12
9	Connect the battery and the fuel injector with a special connector. With the voltage supply of 12V, check the fuel injector for normal operation.	Yes	11
		No	Next step

Table 1-55 (Continued)

S/N	Operation	Test Results	Actions
10	Clean the fuel injector and check the fuel injector for normal operation.	Yes	Next step
		No	Replace fuel injector
11	Check if the fuel is wrong or contains water.	Yes	Renew fuel
		No	17
12	Check if the fuel pressure is lower than 250kPa.	Yes	Next step
		No	16
13	Close the fuel gauge valve. Turn on the ignition switch again and keep the fuel pump working for 3 seconds. Check if fuel pressure can be produced.	Yes	Next step
		No	15
14	Turn on the fuel gauge valve, and block the fuel return pipe. Check if the fuel pressure is quickly produced.	Yes	Replace fuel pressure regulator
		No	Repair or replace fuel injector or fuel pipe
15	Check the fuel intake pipe for leakage or blockage.	Yes	Repair or replace fuel intake pipe
		No	Replace fuel pump
16	Check if the fuel return pipe is blocked or bent.	Yes	Repair or replace fuel return pipe
		No	Replace fuel pressure regulator
17	Check if the cylinder pressure of the engine is normal.	Yes	Next step
		No	emove the trouble
18	Check the air intake system of the engine for leakage.	Yes	Repair
		No	Next step
19	Check if the intake air manifold absolute pressure and temperature sensor is blocked.	Yes	Repair or replace
		No	Replace ECU

6. Unstable idle speed at any time

Table 1-56

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Check if the idle speed actuator or the stepper motor idle speed actuator is locked.	Yes	Replace idle speed actuator
		No	Next step
3	Turn the ignition switch to ON. Connect an adapter between the ECU and the harness. Check the voltage of the pin J1-27, J1-43 (signal output end of the intake air temperature sensor and coolant temperature sensor), J1-54, J1-33, J1-53, J1-34 (signal output end of the stepper motor), J1-54, and J1-53 of the ECU. Is the voltage normal?	Yes	Check harness and interface
		No	Next step
4	Run the engine at an idle speed. Cut off each cylinder in sequence. Check if the rotation speed of the engine is dcreased or fluctuated.	Yes	8
		No	Next step
5	Check the fuel injector of each cylinder for normal operation.	Yes	Next step
		No	Check fuel injector and harness
6	Check the resistance of the high voltage wire for each cylinder. Is the resistance OK?	Yes	Next step
		No	Replace
7	Check the ignition coil for damage or crack.	Yes	Replace
		No	Next step
8	Check the spark plug for normal operation.	Yes	Next step
		No	Replace spark plug
9	Connect the fuel pressure gauge valve. Short-circuit the pin J1-47 and the pin J1-73 of the fuel bump relay, and run the fuel pump. Check if the fuel pressure is about 380kPa.	Yes	Next step
		No	13
10	Connect the battery and the fuel injector with a special connector. With the voltage supply of 12V, check the fuel injector for normal operation.	Yes	12
		No	Next step
11	Clean the fuel injector and check the fuel injector for normal operation.	Yes	Next step
		No	Replace fuel injector

Table 1-56 (Continued)

S/N	Operation	Test Results	Actions
12	Check if the fuel is wrong or contains water.	Yes	Replace fuel
		No	18
13	Check if the fuel pressure is lower than 380kPa.	Yes	Next step
		No	17
14	Close the fuel gauge valve. Turn on the ignition switch again and keep the fuel pump working for 3 seconds. Check if fuel pressure can be produced.	Yes	Next step
		No	16
15	Turn on the fuel gauge valve, and block the fuel return pipe. Check if the fuel pressure is quickly produced.	Yes	Replace fuel pressure regulator
		No	Repair or replace fuel injector or fuel pipe
16	Check the fuel intake pipe for leakage or blockage.	Yes	Repair or replace fuel return pipe
		No	Replace fuel pump
17	Check if the fuel return pipe is blocked or bent.	Yes	Repair or replace fuel return pipe
		No	Replace fuel pressure regulator
18	Check if the sense hole of the intake air manifold pressure and temperature sensor is blocked.	Yes	Clean up
		No	Next step
19	Run the engine at an idle speed. After the coolant reaches the temperature activated by the closed loop control, check the oxygen sensor for normal operation.	Yes	Next step
		No	Check oxygen sensor and harness
20	Check the intake air system of the engine for leakage.	Yes	Repair the leakage
		No	Next step
21	Check if the cylinder pressure of the engine is normal.	Yes	Next step
		No	Remove the trouble

7. Unstable idle speed during warm-up

Table 1-57

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Check the air filter for smoothness.	Yes	Next step
		No	Replace
3	Run the engine at an idle speed. Check if the intake air manifold pressure is between 35kPa and 65kPa during warm up.	Yes	Next step
		No	Remove leakage for the air intake system
4	Stop the engine, and turn on the ignition switch. Connect an adapter between the ECU and the harness. Check the pin J1-27 and J1-35 of the ECU (signal output end of the intake air temperature sensor and coolant temperature sensor).	Yes	Next step
		No	Check and repair
5	Take out he connector of the idle speed actuator after warm-up. Check if the rotation speed of the engine is changed.	Yes	Next step
		No	Replace idle speed actuator
6	Check the coolant temperature sensor for normal operation.	Yes	Next step
		No	Replace

8. Unstable idle speed after warm-up

Table 1-58

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Turn the ignition switch to ON. Connect an adapter between the ECU and the harness. Check the voltage of the pin J1-42 (intake air manifold absolute pressure sensor output), J1-27 (intake air temperature sensor output), J1-43 (coolant temperature sensor output), J1-62, J1-06, J1-38 (oxygen sensor output), J1-54, J1-33, J1-53, J1-34 (output to idle speed actuator) of the the ECU. Is the voltage normal?	Yes	Next step
		No	Repair or replace harness
3	Check the air filter for smoothness.	Yes	Next step
		No	Replace

Table 1-58 (Continued)

S/N	Operation	Test Results	Actions
4	Check if the intake air manifold pressure is between 35kPa and 65kPa under idle speed.	Yes	Next step
		No	Remove leakage for the air intake system
5	Connect the fuel pressure gauge valve. Short-circuit the pin 30 and the pin 87 of the fuel bump relay, and run the fuel pump. Check if the fuel pressure is about 300kPa.	Yes	Next step
		No	9
6	Connect the battery and the fuel injector with a special connector. With the voltage supply of 12V, check the fuel injector for normal operation.	Yes	8
		No	Next step
7	Clean the fuel injector and check the fuel injector for normal operation.	Yes	Replace
		No	Replace fuel injector
8	Check if the fuel is wrong or contains water.	Yes	Replace fuel
		No	14
9	Check if the fuel pressure is lower than 250kPa.	Yes	Next step
		No	13
10	Close the fuel gauge valve. Turn on the ignition switch again and keep the fuel pump working for 3 seconds. Check if fuel pressure can be produced.	Yes	Next step
		No	12
11	Turn on the fuel gauge valve, and block the fuel return pipe. Check if the fuel pressure is quickly produced.	Yes	Replace fuel pressure regulator
		No	Repair or replace fuel injector or fuel pipe
12	Check the fuel intake pipe for leakage or blockage.	Yes	Repair or replace fuel intake pipe
		No	Replace fuel pump
13	Check if the fuel return pipe is blocked or bent.	Yes	Repair or replace fuel return pipe
		No	Replace fuel pressure regulator
15	Take out the coolant temperature sensor, and check the engine for normal operation.	Yes	Replace coolant temperature sensor
		No	Next step
16	Check the compressed pressure.	Yes	Next step
		No	Remove the trouble
17	Check the resistance of the high voltage wire for each cylinder. Is the resistance OK?	Yes	Next step
		No	Replace
18	Check the ignition coil for damage or crack.	Yes	Replace
		No	Next step
19	Check the spark plug for normal operation.	Yes	Replace ECU
		No	Replace spark plug

9. Unstable idle speed or flameout under load (A/C etc)

Table 1-59

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Turn on the A/C switch. Connect an adapter between the ECU and the harness. Check the pin J1-09 and J1-39 (A/C switch) of the ECU for signal input.	Yes	Next step
		No	Check and repair A/C circuit
3	Check the A/C system pressure, electromagnetic clutch of the compressor, A/C pump for normal operation.	Yes	Next step
		No	Repair or replace
4	Turn the ignition switch to ON. Check the voltage of the pin 19, 20, 35, 36 (output to idle speed actuator) of the ECU. Is it OK?	Yes	Next step
		No	Check the control circuit
5	Remove the stepper motor. Check if the stepper motor is locked or blocked.	Yes	Repair or replace stepper motor
		No	Next step
6	Start the engine, and run the A/C. Check if the idle speed actuator is under normal operation as per the steps of the motor on the trouble diagnostic instrument.	Yes	Replace ECU
		No	Replace idle speed actuator

10. Unstable periodicity (self-learning after power cutoff of the ECU)

Table 1-60

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Check the air filter for smoothness.	Yes	Next step
		No	Replace
3	Run the engine at an idle speed. Check if the intake air pressure is between 35kPa and 65kPa.	Yes	Next step
		No	Check air intake and leakage
4	Run the engine at an idle speed. Cut off each cylinder in sequence. Check if the rotation speed of the engine is dcreased or fluctuated.	Yes	7
		No	Next step
5	Turn the ignition switch to ON. Connect an adapter between the ECU and the harness. Check the voltage of the pin J1-42 (intake air manifold absolute pressure sensor output), J1-27 (intake air temperature sensor output), J1-43 (coolant temperature sensor output), J1-62, J1-06, J1-38 (oxygen sensor output), J1-01 (ignition switch), J1-54, J1-33, J1-53, J1-34 (output to idle speed actuator). Is it OK?	Yes	Next step
		No	Repair or replace harness

Table 1-60 (Continued)

S/N	Operation	Test Results	Actions
6	Run the engine at an idle speed. Check if the ignition advance angle is normal after the coolant reaches normal operation.	Yes	Next step
		No	Adjust ignition advance angle
7	Check if the sense hole of the intake air manifold pressure and temperature sensor is blocked.	Yes	Clean up
		No	Next step
8	Check if the fuel is wrong or contains water.	Yes	Replace fuel
		No	Next step
9	Connect the battery and the fuel injector with a special connector. With the voltage supply of 12V, check the fuel injector for normal operation.	Yes	Next step
		No	Check and repair fuel injector and relevant harness
10	Check the resistance of the high voltage wire for each cylinder. Is the resistance OK?	Yes	Next step
		No	Replace
11	Check the ignition coil for damage or crack.	Yes	Replace
		No	Next step
12	Check the spark plug for normal operation.	Yes	Replace ECU
		No	Replace spark plug

11. Idle speed too high

Table 1-61

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Check if the cable connected the the accelerator pedal is locked or tightened.	Yes	Adjust or replace
		No	Next step
3	Check the canister control valve, fuel pressure regulator, crankcase compulsory ventilation vacuum pipe, and the vacuum booster tube of the brake system for reliable installation or damage.	Yes	Adjust or replace
		No	Next step
4	Run the engine at an idle speed, keep neutral position, step on the brake pedal, and check if the idle speed is too high.	Yes	Next step
		No	6
5	Clamp the vacuum booster tube. Check if the idle speed beome normal.	Yes	Repair or replace vacuum booster
		No	Next step
6	Replace the PVC valve. Clamp the crankcase compulsory ventilation vacuum tube. Check if the idle speed become normal.	Yes	Replace PVC valve
		No	Next step
7	Clamp the canister control valve tube. Check if the idle speed become normal.	Yes	Replace canister control valve
		No	Next step
8	Check if the idle speed actuator is blocked or locked.	Yes	Repair or replace
		No	Next step
9	Repair or replace. Check the other parts of the intake air pipe for leakage.	Yes	Repair or replace
		No	Next step
10	Check the fuel injector seal ring for damage.	Yes	Next step
		No	Replace seal ring
11	Check the intake air manifold absolute pressure and intake air temperature sensor for damage.	Yes	Replace ECU
		No	Replace sensor

12. Ineffective acceleration or flameout

Table 1-62

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Check the air filter for smoothness.	Yes	Next step
		No	Replace
3	Run the engine at an idle speed. Check if the rotation speed is normal.	Yes	Next step
		No	Next step: Check and repair as per idle speed trouble items
4	Run the engine at an idle speed. Check if the intake air pressure is between 35kPa and 65kPa.	Yes	Next step
		No	Check and repair
5	Run the engine at an idle speed. Check if the ignition advance angle is normal after the coolant reaches normal operation.	Yes	Next step
		No	Adjust ignition advance angle
6	Connect the fuel pressure gauge valve. Short-circuit the pin J1-47 and the pin J1-73 of the fuel bump relay, and run the fuel pump. Check if the fuel pressure is about 300kPa.	Yes	Next step
		No	10
7	Connect the battery and the fuel injector with a special connector. With the voltage supply of 12V, check the fuel injector for normal operation.	Yes	9
		No	Next step
8	Wash the fuel injector and check the fuel injector again for normal operation.	Yes	Next step
		No	Replace fuel injector
9	Check if the fuel is wrong or contains water.	Yes	Replace fuel
		No	15
10	Check if the fuel pressure is lower than 250kPa.	Yes	Next step
		No	14
11	Close the fuel gauge valve. Turn on the ignition switch again and keep the fuel pump working for 3 seconds. Check if fuel pressure can be produced.	Yes	Next step
		No	13

Table 1-62 (Continued)

S/N	Operation	Test Results	Actions
12	Turn on the fuel gauge valve, and block the fuel return pipe. Check if the fuel pressure is quickly produced.	Yes	Replace fuel pressure regulator
		No	Repair or replace fuel injector or fuel pipe
13	Check the fuel intake pipe for leakage or blockage.	Yes	Repair or replace fuel intake pipe
		No	Replace fuel pump
14	Check if the fuel return pipe is blocked or bent.	Yes	Repair or replace fuel return pipe
		No	Replace fuel pressure regulator
15	Turn the ignition switch to ON. Connect an adapter between the ECU and the harness. Check the voltage of the pin J1-24 (signal output end of the throttle position sensor), J1-05 (grounding end), J1-20 (as the power supply for 4.5-5V sensor). Is it OK?	Yes	Next step
		No	Repair or replace harness
16	Check the ignition coil, distributor, high voltage wire, and spark plug for normal operation.	Yes	Replace ECU
		No	Repair or replace relevant parts

13. Slow acceleration

Table 1-63

S/N	Operation	Test Results	Actions
1	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
2	Check the air filter for smoothness.	Yes	Next step
		No	Replace
3	Run the engine at an idle speed. Check if the rotation speed is normal.	Yes	Next step
		No	Check and repair as per idle speed trouble items
4	Run the engine at an idle speed. Check if the intake air pressure is between 35kPa and 65kPa.	Yes	Next step
		No	Check and repair

Table 1-63 (Continued)

S/N	Operation	Test Results	Actions
5	Turn the ignition switch to ON. Connect an adapter between the ECU and the harness. Check the voltage of the pin J1-24 (signal output end of the throttle position sensor), J1-05 (grounding end), J1-20 (as the power supply for 4.5-5V sensor). Is it OK?	Yes	Next step
		No	Repair or replace harness
6	Run the engine at an idle speed. Check if the ignition advance angle is normal after the coolant reaches normal operation.	Yes	Next step
		No	Adjust ignition advance angle
7	Connect the fuel pressure gauge valve. Short-circuit the pin J1-47 and the pin J1-73 of the fuel bump relay, and run the fuel pump. Check if the fuel pressure is between 250 kPa and 300kPa.	Yes	Next step
		No	11
8	Connect the battery and the fuel injector with a special connector. With the voltage supply of 12V, check the fuel injector for normal operation.	No	10
		No	Next step
9	Wash the fuel injector and check the fuel injector again for normal operation.	Yes	Next step
		No	Replace fuel injector
10	Check if the fuel is wrong or contains water.	Yes	Replace fuel
		No	16
11	Check if the fuel pressure is lower than 250kPa.	Yes	Next step
		No	15
12	Close the fuel gauge valve. Turn on the ignition switch again and keep the fuel pump working for 3 seconds. Check if fuel pressure can be produced.	Yes	Next step
		No	14
13	Turn on the fuel gauge valve, and block the fuel return pipe. Check if the fuel pressure is quickly produced.	Yes	Replace fuel pressure regulator
		No	Repair or replace fuel injector or fuel pipe
14	Check the fuel intake pipe for leakage or blockage.	Yes	Repair or replace fuel intake pipe
		No	Replace fuel pump
15	Check if the fuel return pipe is blocked or bent.	Yes	Repair or replace fuel return pipe
		No	Replace pressure regulator
16	Check if the exhaust system is blocked.	Yes	Replace or clean up
		No	Replace ECU

14. Poor acceleration

Table 1-64

S/N	Operation	Test Results	Actions
1	Check the clutch, tyre pressure, brake, tyre size and four-wheel alignment for normal operation.	Yes	Repair
		No	Next step
2	Check if the throttle can be fully opened.	Yes	Next step
		No	Replace or repair throttle
3	Turn the ignition switch to ON. Check if there is trouble information records with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
4	Run the engine at an idle speed. Check if the ignition advance angle is normal after the coolant reaches normal operation.	Yes	Next step
		No	Adjust ignition advance angle
5	Turn the ignition switch to ON. Connect an adapter between the ECU and the harness. Check the voltage of the pin J1-42 (intake air manifold absolute pressure sensor output), J1-27 (intake air temperature sensor output), J1-43 (coolant temperature sensor output), J1-62, J1-06, J1-38 (oxygen sensor output), J1-01 (ignition switch), J1-54, J1-33, J1-53, J1-34 (output to idle speed actuator) of the ECU. Is it OK?	Yes	Next step
		No	Repair or replace harness
6	Run the engine at an idle speed. Check if the intake air pressure is between 35kPa and 65kPa.	Yes	Next step
		No	Check and repair
7	Connect the fuel pressure gauge valve. Short-circuit the pin J1-47 and the pin J1-73 of the fuel bump relay, and run the fuel pump. Check if the fuel pressure is about 300kPa.	Yes	Next step
		No	11
8	Connect the battery and the fuel injector with a special connector. With the voltage supply of 12V, check the fuel injector for normal operation.	Yes	10
		No	Next step
9	Wash the fuel injector and check the fuel injector again for normal operation.	Yes	Next step
		No	Replace fuel injector
10	Chek if the fuel is wrong or contains water.	Yes	Replace fuel
		No	16

Table 1-64 (Continued)

S/N	Operation	Test Results	Actions
11	Check if the fuel pressure is lower than 250kPa.	Yes	Next step
		No	15
12	Close the fuel gauge valve. Turn on the ignition switch again and keep the fuel pump working for 3 seconds. Check if fuel pressure can be produced.	Yes	Next step
		No	14
13	Turn on the fuel gauge valve, and block the fuel return pipe. Check if the fuel pressure is quickly produced.	Yes	Replace pressure regulator
		No	Repair or replace fuel injector or fuel pipe
14	Check the fuel intake pipe for leakage or blockage.	Yes	Repair or replace fuel intake pipe
		No	Replace fuel pump
15	Check if the fuel return pipe is blocked or bent.	Yes	Repair or replace fuel return pipe
		No	Replace pressure regulator
16	Check the data of the intake air manifold absolute pressure and intake air temperature sensor. Is it OK?	Yes	Next step
		No	Replace sensor
17	Check the spark plug, high voltage wire, distributor, ignition coil for normal operation.	No	Next step
		No	Replace or adjust
18	Does it caused by A/C system?	Yes	Check A/C system
		No	Replace ECU

15. A/C system trouble

Table 1-65

S/N	Operation	Test Results	Actions
1	Check if the refrigerant of the A/C system is enough. Check the A/C belt, clutch, pressure switch for normal operation.	Yes	Next step
		No	Remove the trouble
2	Run the engine at an idle speed. Turn on the A/C switch. Check if the A/C thermal resistance is under trouble with a diagnostic instrument.	Yes	Remove the trouble
		No	Next step
3	Turn on the A/C switch. Connect an adapter between the ECU and the harness. Check the pin J1-09 and J1-39 (A/C switch) of the ECU for signal input.	Yes	Next step
		No	Check harness
4	If the vehicle adopts low-level control, turn off the A/C and check if it still keeps operation.	Yes	Replace bulb or repair harness
		No	Next step
5	Check the pin J1-46 (grounding end connected to the vibration absorption coil of the A/C relay) of the ECU for low-level output.	Yes	Repair A/C relay and harness
		No	Replace ECU

17. Cylinder misfiring

Table 1-66

S/N	Operation	Test Results	Actions
1	Start the engine, and run the engine under idle speed. Check the sound for air leakage of the air intake pipe.	Yes	Next step
		No	Check and repair the leakage
2	Stop the engine and carry out visual inspection for the exhaust pipe, three-way catalystor and the muffler.	Yes	Next step
		No	Repair or replace
3	Take out the connector of each ignition coil in sequence. Check if no decrease of the rotation speed of the engine is produced at any moment for the cylinder.	Yes	5
		No	Next step
4	Check if there is running sound for each fuel injector at idle speed.	Yes	Next step
		No	Check fuel injector and relevant circuits

Table 1-66 (Continued)

S/N	Operation	Test Results	Actions
5	Remove the ignition metal wire from the spark plug. Install the wire to a normal spark plug. Place the bottom end of the spark plug towards the gound, and then turn to the engine. Check if the spark is normal.	Yes	Next step
		No	Check ignition coil, giant transistor, and their circuits
6	Remove the spark plug. Check the place for dirts.	No	Next step
		Yes	Repair or replace spark plug (standard type)
7	Check the pressure of the compressor. Standard: 1275kPa/300rpm; minimum: 981kPa/300rpm; difference among cylinders: 98kPa/300rpm.	Yes	Next step
		No	Check piston, piston ring, air intake valve, valve seat and cylinder head gasket
8	Install all the removed parts. Release the fuel pressure to 0. Install fuel pressure gauge. Check if the pressure is normal.	Yes	Next step
		No	Check as per fuel pressure test method
9	Check the ignition time (15°±5°BDTC). The target idle speed is M/T:800±50rpm.	Yes	Next step
		No	Basic check
10	Start the engine for warm-up. After the engine reaches normal operation speed, measure the voltage between the pin J1-62 (front oxygen sensor high signal) or J1-06 (front oxygen sensor low signal) of the ECU and the ground. Under the rotation speed of 2000rpm, the changes between 0V-0.3V and 0.6V-1.0V should be no less than 5 times, at least one time higher than 0.6V, at least one time lower than 0.3V, an no higher than 1V.	Yes	Next step
		No	Renew front oxygen sensor
11	Check the intake air sensor signal with a diagnostic instrument. (2.0-6.0gm/sec, at idle speed, 7.0-20.0gm/sec, at 2500rpm)	Yes	Replace ECU
		No	Check the connector of the air intake temperature sensor circuit for rust or looseness.

II. TRITEC 1.6 engine

1. Fail to run or run slowly at start

Common trouble location：

1. Battery; 2. Start motor; 3. Harness or ignition switch; 4. Mechanical paof the engine.

Diagnosis Flow

Table 1-67

S/N	Operation	Test Results	Actions
1	Check the voltage between the two terminals of the battery with a multimeter. Is the voltage between 8～12V at start?	Yes	Next step
		No	Replace battery
2	Keep the ignition switch in START. Check the voltage of the positive terminal of the start motor with a multimeter. Is the voltage greater than 8V?	Yes	Next step
		No	Repair or replace harness
3	Remove the start motor. Check the working condition of the start motor, especially for open circuit or lock due to poor lubrication.	Yes	Repair or replace start motor
		No	Next step
4	If the trouble occurs in winter, check if the start motor is affected by high resistance as improper engine lubricant and gear box oil is applied.	Yes	Renew proper lubricant
		No	Next step
5	Check the start motor for poor rotation. Is it caused by the great mechanical resistance inside the engine?	Yes	Remove the resistance within the engine
		No	Repeat the above-mentioned step

2. Start failure of the engine

Common trouble location:

1. No fuel in the tank; 2. Fuel pump; 3. Rotation speed sensor;
4. Ignition coil; 5. Mechanical part of the engine

Diagnosis Flow

Table 1-68

S/N	Operation	Test Results	Actions
1	Connect the fuel pressure gauge (the connection point is the front end of the intake pipe of the fuel distribution pipe assembly), and start the engine. Check if the fuel pressure of the engine under full working condition is about 350kPa.	Yes	Next step
		No	Check and repair fuel supply system
2	Connect the electronic injection system diagnostic instrument, and check the rotation speed of the engine. Start the engine, and check if there is rotation speed signal output.	Yes	Next step
		No	Check and repair rotation speed sensor line
3	Draw out the wire of one of the cylinders, and connect with the spark plug. Keep the electrode of the spark plug about 5mm from the engine body. Start the engine, and and check if the blue white high voltage fire is produced.	Yes	Next step
		No	Check and repair ignition system
4	Check the pressure of each cylinder of the engine. Check if the pressure is enough.	Yes	Remove the mechanical troubles for the engine
		No	Next step
5	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help
		No	Check and repair relevant line

3. Difficult to start after warm-up

Common trouble location:

1. Fuel with water; 2. Fuel pump; 3. Coolant temperature sensor;
4. Fuel pressure regulator vacuum pipe; 5. Ignition coil.

Diagnosis Flow

Table 1-69

S/N	Operation	Test Results	Actions
1	Connect the fuel pressure gauge (the connection point is the front end of the intake pipe of the fuel distribution pipe assembly), and start the engine. Check if the fuel pressure of the engine under full working condition is about 350kPa.	Yes	Next step
		No	Check and repair fuel supply system
2	Draw out the wire of one of the cylinders, and connect with the spark plug. Keep the electrode of the spark plug about 5mm from the engine body. Start the engine, and and check if the blue white high voltage fire is produced.	Yes	Next step
		No	Check and repair ignition system
3	Disconnect the coolant temperature sensor, and start the engine. Is it OK? Connect a 300Ω resistance in series at the connection point of the coolant temperature sensor to replace the sensor, and start the engine. Is it OK?	Yes	Replace sensor
		No	Next step
4	Check the fuel pressure regulator vacuum pipe for looseness or leakage.	Yes	Check, repair or replace
		No	Next step
5	Check the fuel for normal operation.	Yes	Replace fuel
		No	Next step
6	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help

4. Difficult cold start

Common trouble location:

1. Fuel with water; 2. Fuel pump; 3. Coolant temperature sensor; 4. Fuel injector;
5. Ignition coil; 6. Throttle body and idle speed by-pass air way;
7. Mechanical part of the engine.

Diagnosis Flow

Table 1-70

S/N	Operation	Test Results	Actions
1	Connect the fuel pressure gauge (the connection point is the front end of the intake pipe of the fuel distribution pipe assembly), and start the engine. Check if the fuel pressure of the engine under full working condition is about 380kPa.	Yes	Next step
		No	Check and repair fuel supply system
2	Draw out the wire of one of the cylinders, and connect with the spark plug. Keep the electrode of the spark plug about 5mm from the engine body. Start the engine, and and check if the blue white high voltage fire is produced.	Yes	Next step
		No	Check and repair ignition system
3	Disconnect the coolant temperature sensor, and start the engine. Is it OK? Connect a 2500Ω resistance in series at the connection point of the coolant temperature sensor to replace the sensor, and start the engine. Is it OK?	Yes	Replace sensor
		No	Next step
4	Gently step on the accelerator. Does it can be started easily?	Yes	Wash throttle and idle speed air way
		No	Next step
5	Remove the fuel injector. Check the fuel injector for leakage or blockage with a special fuel injector cleaner & analyzer.	Yes	Remove the trouble
		No	Next step
6	Check the fuel for normal operation.	Yes	Replace fuel
		No	Next step
7	Check the pressure of each cylinder of the engine. Check if the pressure is enough.	Yes	Remove the mechanical troubles for the engine
		No	Next step
8	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help
		No	Check and repair relevant line

5. With normal rotation speed, difficult to start at any time

Common trouble location:

1. Fuel with water; 2. Fuel pump; 3. Coolant temperature sensor;
4. Fuel injector; 5. Ignition coil; 6. Throttle body and idle speed by-pass air way;
7. Intake air way; 8. Ignition timing; 9. Spark plug. 10: Mechanical part of the engine.

Diagnosis Flow

Table 1-71

S/N	Operation	Test Results	Actions
1	Check the air filter for blockage and the intake air way for leakage.	Yes	Check and repair air intake system
		No	Next step
2	Connect the fuel pressure gauge (the connection point is the front end of the intake pipe of the fuel distribution pipe assembly), and start the engine. Check if the fuel pressure of the engine under full working condition is about 350kPa.	Yes	Next step
		No	Check and repair fuel supply system
3	Draw out the wire of one of the cylinders, and connect with the spark plug. Keep the electrode of the spark plug about 5mm from the engine body. Start the engine, and and check if the blue white high voltage fire is produced.	Yes	Next step
		No	Check and repair ignition system
4	park plug for each cylinder. Check if its model and gap can meet with starndards.	Yes	Next step
		No	Adjust or replace
5	Disconnect the coolant temperature sensor, and start the engine. Is it OK?	Yes	Replace sensor
		No	Next step
6	Gently step on the accelerator. Does it can be started easily?	Yes	Wash throttle and idle speed air way
		No	Next step
7	Remove the fuel injector. Check the fuel injector for leakage or blockage with a special fuel injector cleaner & analyzer.	Yes	Remove the trouble
		No	Next step
8	Check the fuel for normal operation.	Yes	Replace fuel
		No	Next step
9	Check the pressure of each cylinder of the engine. Check if the pressure is enough.	Yes	Remove the mechanical troubles for the engine
		No	Next step

Table 1-71 (Continued)

S/N	Operation	Test Results	Actions
10	Check if the ignition sequence and timing of the engine can meet with the standards.	Yes	Next step
		No	Check and repair ignition timing
11	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help
		No	Check and repair relevant line

6. With normal start, unstable idle speed at any time

Common trouble location:

1. Fuel with water; 2. Fuel injector; 3. Spark plug;
4. Throttle body and idle speed by-pass air way; 5. Intake air way;
6. Idle speed regulator; 7. Ignition timing;
8. Spark plug; 9. Mechanical part of engine.

Diagnosis Flow

Table 1-72

S/N	Operation	Test Results	Actions
1	Check the air filter for blockage and the intake air way for leakage.	Yes	Check and repair air intake system
		No	Next step
2	Check if the idle speed regulator is blocked.	Yes	Wash and replace
		No	Next step
3	Check the spark plug for each cylinder. Check if its model and gap can meet with starndards.	Yes	Next step
		No	Adjust or replace
4	Check the throttle body and idle speed by-pass air way for carbon deposition.	Yes	Wash
		No	Next step
5	Remove the fuel injector. Check the fuel injector for leakage, blockage or abnormal flow with a special fuel injector cleaner & analyzer.	Yes	Remove the trouble
		No	Next step
6	Check the fuel for normal operation.	Yes	Replace fuel
		No	Next step

Table 1-72 (Continued)

S/N	Operation	Test Results	Actions
7	Check the pressure for each cylinder of the engine. Are they great different?	Yes	Remove the mechanical troubles for the engine
		No	Next step
8	Check if the ignition sequence and timing of the engine can meet with the standards.	Yes	Next step
		No	Check and repair ignition timing
9	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help
		No	Check and repair relevant line

7. With normal start, unstable idle speed during warm-up

Common trouble location:

1. Fuel with water; 2. Coolant temperature sensor; 3. Spark plug;
4. Throttle body and idle speed by-pass air way; 5. Intake air way;
6. Idle speed regulator; 7. Mechanical part of the engine.

Diagnosis Flow

Table 1-73

S/N	Operation	Test Results	Actions
1	Check the air filter for blockage and the intake air way for leakage.	Yes	Check and repair air intake system
		No	Next step
2	Check the spark plug for each cylinder. Check if its model and gap can meet with starndards.	Yes	Next step
		No	Adjust or replace
3	Remove the idle speed regulator. Check the throttle body, idle speed regulator, and idle speed by-pass air way for carbon deposition.	Yes	Wash relevant parts
		No	Next step
4	Disconnect the coolant temperature sensor, and start the engine. Check the engine under warm-up for unstable idle speed.	Yes	Replace sensor
		No	Next step

Table 1-73 (Continued)

S/N	Operation	Test Results	Actions
5	Remove the fuel injector. Check the fuel injector for leakage, blockage or abnormal flow with a special fuel injector cleaner & analyzer.	Yes	Remove the trouble
		No	Next step
6	Check the fuel for normal operation.	Yes	Replace fuel
		No	Next step
7	Check the pressure for each cylinder of the engine. Are they great different?	Yes	Remove the mechanical troubles for the engine
		No	Next step
8	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help
		No	Check and repair relevant line

8. With normal start, unstable idle speed after warm-up

Common trouble location:

1. Fuel with water; 2. Coolant temperature sensor; 3. Spark plug;
4. Throttle body and idle speed by-pass air way; 5. Intake air way;
6. Idle speed regulator; 7. Mechanical part of the engine.

Diagnosis Flow

Table 1-74

S/N	Operation	Test Results	Actions
1	Check the air filter for blockage and the intake air way for leakage.	Yes	Check and repair air intake system
		No	Next step
2	Check the spark plug for each cylinder. Check if its model and gap can meet with starndards.	Yes	Next step
		No	Adjust or replace
3	Remove the idle speed regulator. Check the throttle body, idle speed regulator, and idle speed by-pass air way for carbon deposition.	Yes	Wash relevant parts
		No	Next step

Table 1-74 (Continued)

S/N	Operation	Test Results	Actions
4	Disconnect the coolant temperature sensor, and start the engine. Check the engine under warm-up for unstable idle speed.	Yes	Replace sensor
		No	Next step
5	Remove the fuel injector. Check the fuel injector for leakage, blockage or abnormal flow with a special fuel injector cleaner & analyzer.	Yes	Remove the trouble
		No	Next step
6	Check the fuel for normal operation.	Yes	Replace fuel
		No	Next step
7	Check the pressure for each cylinder of the engine. Are they great different?	Yes	Remove the mechanical troubles for the engine
		No	Next step
8	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help
		No	Check and repair relevant line

9. With normal start, unstable idle speed or flameout under partial load (with A/C on, etc)

Common trouble location:

1. A/C system; 2. Idle speed regulator; 3. Fuel injector

Diagnosis Flow

Table 1-75

S/N	Operation	Test Results	Actions
1	Check if the accelerator cable is locked or over tightened.	Yes	Adjust
		No	Next step
2	Check the air intake system and the connected vacuum pipe for leakage.	Yes	Check and repair air intake system
		No	Next step
3	Remove the idle speed regulator. Check the throttle body, idle speed regulator, and idle speed by-pass air way for carbon deposition.	Yes	Wash relevant parts
		No	Next step
4	Disconnect the coolant temperature sensor and start the engine. Check the idle speed of the engine. Is it too fast?	Yes	Replace sensor
		No	Next step
5	Check if the ignition timing of the engine can meet with standards.	Yes	Next step
		No	Check and repair ignition timing
6	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help
		No	Check and repair relevant line

10. With normal start, idle speed too fast

Common trouble location: 1. Throttle body and idle speed by-pass air way; 2. Vacuum pipe; 3. Idle speed regulator; 4. Coolant temperature sensor; 5. Ignition timing

Diagnosis Flow

Table 1-76

S/N	Operation	Test Results	Actions
1	Check if the accelerator cable is locked or over tightened.	Yes	Adjust
		No	Next step
2	Check the air intake system and the connected vacuum pipe for leakage.	Yes	Check and repair air intake system
		No	Next step
3	Remove the idle speed regulator. Check the throttle body, idle speed regulator, and idle speed by-pass air way for carbon deposition.	Yes	Wash relevant parts
		No	Next step
4	Disconnect the coolant temperature sensor and start the engine. Check the idle speed of the engine. Is it too fast?	Yes	Replace sensor
		No	Next step
5	Check if the ignition timing of the engine can meet with standards.	Yes	Next step
		No	Check and repair ignition timing
6	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help
		No	Check and repair relevant line

11. Unfavorable rotation speed or flameout during acceleration

Common trouble location:

1. Fuel with water; 2. Intake air pressure sensor and throttle position sensor;
3. Spark plug; 4. Throttle body and idle speed by-pass air way;
5. Intake air way; 6. Idle speed regulator;
7. Fuel injector; 8. Ignition timing; 9. Exhaust pipe.

Diagnosis Flow

Table 1-77

S/N	Operation	Test Results	Actions
1	Check if the air filter is blocked.	Yes	Check and repair air intake system
		No	Next step
2	Connect the fuel pressure gauge (the connection point is the front end of the intake pipe of the fuel distribution pipe assembly), and start the engine. Check if the fuel pressure of the engine under full working condition is about 350kPa.	Yes	Next step
		No	Check and repair fuel supply system
3	Check the spark plug for each cylinder. Check if its model and gap can meet with starndards.	Yes	Next step
		No	Adjust or replace
4	Remove the idle speed regulator. Check the throttle body, idle speed regulator, and idle speed by-pass air way for carbon deposition.	Yes	Wash relevant parts
		No	Next step
5	Check the intake air pressure sensor, throttle position sensor and the lines for normal operation.	Yes	Next step
		No	Replace sensor
6	Remove the fuel injector. Check the fuel injector for leakage or blockage with a special fuel injector cleaner & analyzer.	Yes	Remove the trouble
		No	Next step
7	Check the fuel for normal operation.	Yes	Replace fuel
		No	Next step
8	Check if the ignition sequence and timing of the engine can meet with the standards.	Yes	Next step
		No	Check and repair ignition timing

Table 1-77 (Continued)

S/N	Operation	Test Results	Actions
9	Check the exhaust pipe for smoothness.	Yes	Next step
		No	Repair or replace exhaust pipe
10	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help
		No	Check and repair relevant line

12. Weak acceleration

Common trouble location:

1. Fuel with water; 2. Intake air pressure sensor and throttle position sensor;
3. Spark plug; 4. Ignition coil; 5. Throttle body and idle speed by-pass air way;
6. Intake air way; 7. Idle speed regulator; 8. Fuel injector;
9. Ignition timing; 10. Exhaust pipe.

Diagnosis Flow

Table 1-78

S/N	Operation	Test Results	Actions
1	Check the clutch, tyre pressure, brake, tyre size and four-wheel alignment for normal operation.	Yes	Repair
		No	Next step
2	Check if the air filter is blocked.	Yes	Check and repair air intake system
		No	Next step
3	Connect the fuel pressure gauge (the connection point is the front end of the intake pipe of the fuel distribution pipe assembly), and start the engine. Check if the fuel pressure of the engine under full working condition is about 350kPa.	Yes	Next step
		No	Check and repair fuel supply system
4	Draw out the wire of one of the cylinders, and connect with the spark plug. Keep the electrode of the spark plug about 5mm from the engine body. Start the engine, and and check if the high voltage fire is normal.	Yes	Next step
		No	Check and repair ignition system

Table 1-78 (Continued)

S/N	Operation	Test Results	Actions
5	Check the spark plug for each cylinder. Check if its model and gap can meet with starndards.	Yes	Next step
		No	Adjust or replace
6	Remove the idle speed regulator. Check the throttle body, idle speed regulator, and idle speed by-pass air way for carbon deposition.	Yes	Wash relevant parts
		No	Next step
7	Check the intake air pressure sensor, throttle position sensor and the lines for normal operation.	Yes	Next step
		No	Replace sensor
8	Remove the fuel injector. Check the fuel injector for leakage or blockage with a special fuel injector cleaner & analyzer.	Yes	Remove the trouble
		No	Next step
9	Check the fuel for normal operation.	Yes	Replace fuel
		No	Next step
10	Check if the ignition sequence and timing of the engine can meet with the standards.	Yes	Next step
		No	Check and repair ignition timing
11	Check the exhaust pipe for smoothness.	Yes	Next step
		No	Repair or replace exhaust pipe
12	Connect the electronic injection system adapter. Turn on the ignition switch. Check the power supply of the pin 12#, 13#, 44#, 45#, 63#. Check the grounding of the pin 3#, 51#, 53#, 61#, 80#. Are they OK?	Yes	Diagnosis help
		No	Check and repair relevant line

Section V Security Items for System Maintenance

1. Security items for the diagnosis and maintenance of the fuel injection electronic control system

(1) Remove and install requirements for the controller

① Remove the controller before welding and paint baking;

② Turn the ignition switch to OFF when remove the controller to avoid damage;

③ When the engine is running or the electrical system is under operation, do not disconnect with the battery;

④ Do not start the engine with high electricity from charger;

⑤ The ambient temperature of the controller shall not exceed 80^0C.

(2) Requirements on cleanness:

① Before operate the oil supply and injection system, please abide by the following demands:

② The parts and components removed should be covered and placed in a clean field, and do not use the cloth scattering fibers.

(3) Connect and disconnect the harness (including the harness of the trouble diagnostic instrument) only after turn off the ignition switch.

To ensure correct wire connection when measuring the voltage or grounding of the electronic control system.

To disconnect the power supply wire or the harness of the controller connector from the battery can erase the relevant diagnosis and self-learning information.

(4) Notes for fuel supply system maintenance

① Take care when remove and install the fuel pump for a fuel tank fully or partially filled.

② Before the maintenance, the device to absorb the gasoline leaked should be installed near the fuel tank mouth.

③ To avoid direct contact with the gasoline;

④ Before loosening the connection parts, thoroughly clean these parts and the surrounding areas.

⑤ To avoid fuel injection at the loosened part, place a cloth around the connection part;

⑥ Carefully cover or close the opened parts and components if not repaired at once.

⑦ Take out the spare parts just before the installation. The spare parts without packaging shall not be used.

⑧ Take care not to damage the O-ring when installing the fuel injector. To facilitate assembly, apply a little lubricant to the O-ring.

After the system being opened, try not to use compressed air and make the vehicle move.

2. Security measures

To avoid personal injury and damage the fuel injection and ignition device:

Do not connect or disconnect the ignition harness if the engine is under operation or at a rotation speed for start-up; disconnect the harness connector from the hall sensor (distributor) if the engine is driven by the starting motor yet not actually started (like compressed pressure check, etc).

Chapter II Chassis System

Section I Suspension and Axle

I. Overview

1. Front axle and front suspension, Fig. 2-1.

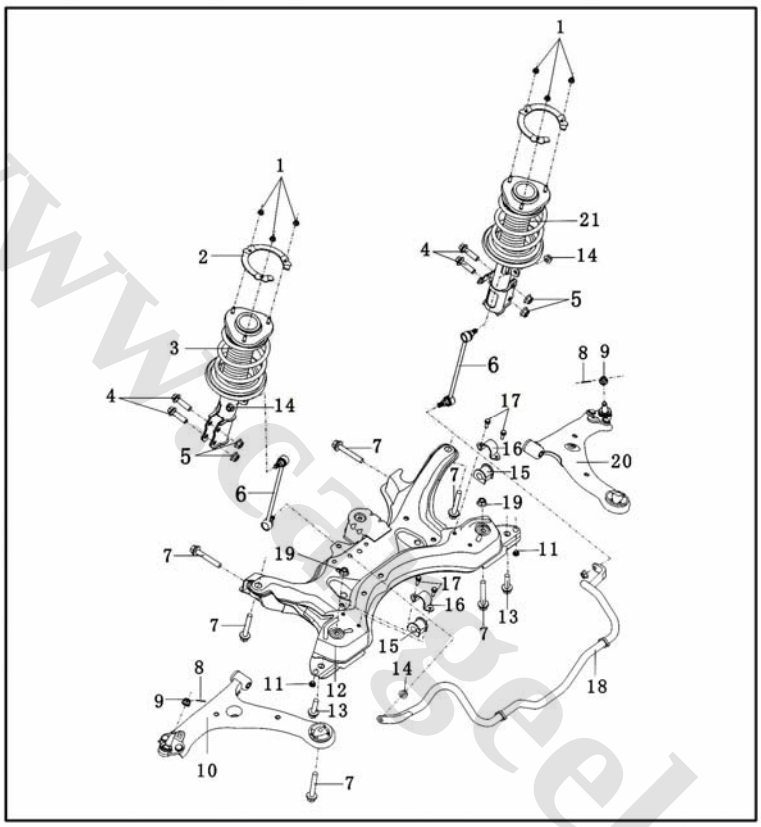


Fig. 2-1

1. Hexagon flange nut (36 N·m)
2. Front shock damper upper pressure plate
3. Left front shock damper assembly
4. Hexagon flange bolt (240 N·m)
5. Hexagon flange nut 4 (240 N·m)
6. Front stabilizer bar connecting rod assembly
7. Hexagon bolt with flat washer (horizontal: 180 N·m; vertical: 210 N·m)
8. Cotter pin
9. Hexagon flange slotted nut (100 N·m)
10. Left front lower arm assembly
11. Sub-frame rubber plug
12. Sub-frame assembly
13. Hexagon bolt with flat washer (210 N·m)
14. Hexagon flange nut (75 N·m)
15. Front stabilizer rod rubber mount
16. Front stabilizer rod hoop
17. Hexagon bolt with taper washer (23 N·m)
18. Front stabilizer rod assembly
19. Hexagon flange nut
20. Right front lower arm assembly
21. Right front shock damper assembly
22. Hexagon flange nut (75 N·m)

They can receive larger traction under the same conditions. As the main indicator for automobile performance, the dynamic power should be strengthened by all means thus to determine the drive axle. Generally, autos are driven by rear axles because 2/3 weight of the entire vehicle is burdened by the rear axle which thus can receive better traction. When the sedan, special for passenger use, is fully loaded, the front axle together with the engine, transmission, driver and co-driver will weight more than the passengers on the rear axle. The fat person always sits at the co-driver seat and loads more on the front axle. Therefore, more traction will be achieved by the front axle rather than the rear one.

When the vehicle is driven by the front axle, the increasing weight on the front axle will gain more steering resistance, thus the steering response is stronger and operation becomes easier. The engine is laterally placed, convenient for front axle drive and simplifying the main reducer, reducing the cost and achieving an easy maintenance. Therefore, the front axle of LF620 sedan is the steering drive axle, namely functioning as both a steering axle and a drive axle. It is composed of steering knuckle, sub-frame assembly, left and right front lower arms assembly and their suspensions. It is used to:

(1) Bear all force and torque, such as weight, payload, traction, brake force, inertia force, centrifugal force, lateral force and fatigue stress under alternating impact, etc.

(2) Reduce the impact from vibration, and advance the riding comfort and driving stability.

(3) Realize the steering.

(4) Transfer the engine torque to the left and right wheels after the torque is increased through deceleration and then transform it to the forward traction.

The front suspension of LF620 sedan is a McPherson independent suspension. Refer to Fig. 2-1 for its structure.

It consists of coil spring, integrated asymmetric bidirectional canister-type shock damper, stabilizer bar and triangle lower arm. The offset coil spring is connected with the canister shock damper, thus to form the spring bracket of the suspension. The top of the bracket is flexibly connected with the vehicle body. The limit stop is installed in the shock damper and the thrust ball bearing is fixed on the boss ring over the shock damper. The front suspension kingpin center, center lines of the shock damper and coil spring are not overlapped, and form a negative offset distance of kingpin distance, namely the kingpin inclination angle is larger than that of the piston rod. Such a design enjoys the following features:

(1) Avoiding the lateral misalignment of the steering wheel during the distortion of the strut type independent suspension, and reducing the wear and tear of the steering wheel.

(2) While a flexible distortion happens to the suspension, the location parameters of the steering wheels will complement each other although that of the kingpin change, and then improve the stability of the vehicle.

(3) Compact structure. The shock damper, coil spring and steering kingpin are integrated, which produces a small dimension and less space and is helpful for the location of the vehicle with a front-built engine and front drive.

(4) There will be less change in the location of the front wheel during the usage period. Thus please do not adjust the inclination and caster angle of the kingpin.

(5) The non-payload is lighter, which helps to decrease the impact load on the suspension and improve the driving smoothness of the vehicle.

(6) The left and right wheels are independently hinged, which assists the wheels to contact the

road surface better, reduces the vehicle vibration due to uneven road surface and enhances the comfort and driving stability.

2. Rear suspension. Refer to Fig. 2-2.

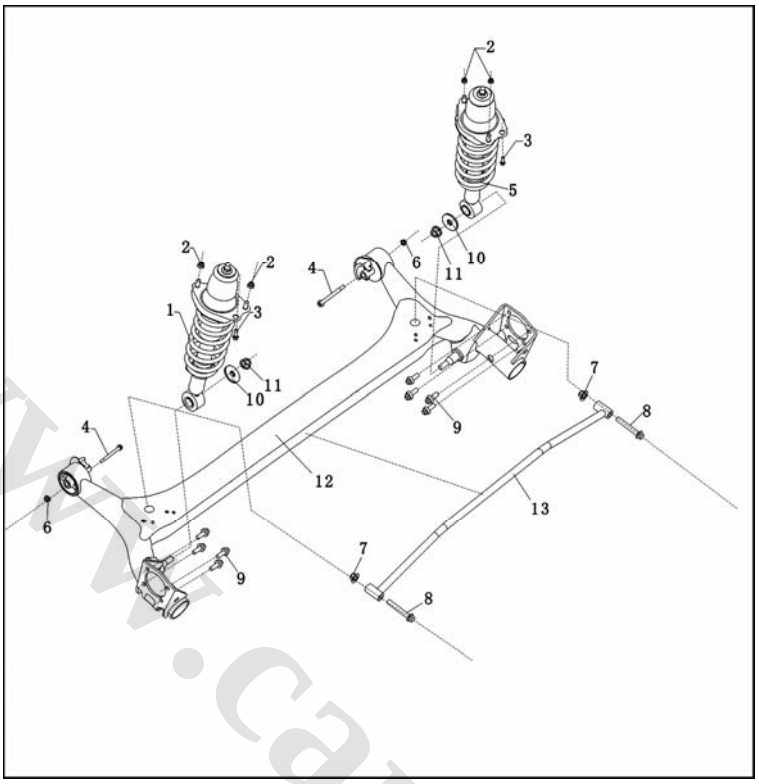


Fig. 2-2

1. Left rear shock damper assembly
2. Hexagon flange nut (75N·m)
3. Hexagon flange bolt (75N·m)
4. Hexagon flange bolt (85N·m)
5. Right rear shock damper assembly
6. Hexagon flange nut
7. Hexagon flange bolt (75N·m)
8. Hexagon flange bolt
9. Hexagon flange bolt
10. Big washer
11. Hexagon flange nut
12. Rear axle welding components (120N·m)
13. Rear stabilizer rod components

The rear axle of the suspension is a trailing axle, functioning as:

(1) Bearing all force and torque, such as weight, payload, traction, brake force, inertia force, centrifugal force, lateral force and fatigue stress under alternating impact, etc.

(2) Reducing vibration and impact, and improving the vehicle comfort and driving stability.

The rear axle assembly of LF620 sedan is shown in Fig. 2-2.

The rear axle assembly is composed of rear axle welding component 13, left rear shock damper 1, right rear shock damper 6, rear stabilizer bar component 14 and the left and right bushes of rear axle.

The rear suspension is a trailing arm suspension with a torsion bar. The main axis of the body is directly connected with the body and then with the suspension system; then the component is installed on the body. And the spring and shock damper are installed near the vehicle axis. The supporting arm moves around the axis of the center line of the vehicle body, namely parallel to the vehicle axle which moves up and down, parallel to the vehicle body and no camber angle. The

most prominent advantage lies in the large space between the left and right wheels together with no camber angle of the body, and a sunken rear wheel of the swing arm suspension to balance the vehicle body.

3. Specifications of wheel alignment parameters

If the wheels enjoy good geometric alignment, the fuel economic efficiency and tire service life will be improved.

(1) Kingpin caster angle: It refers to the angle between the highest point of the wheel steering center and the vertical direction in the view at the side of the vehicle, as shown in Fig. 2-3. The caster angle is positive (+), while the front rake angle is negative. The retroversion of the kingpin will influence the control on the direction of the steering mechanism, but not on the wear and tear of the wheels. In case of a larger positive kingpin caster angle of a wheel than that of other wheels, this wheel will drive towards the center line of the vehicle and the vehicle will move forwards towards the side with a smaller positive kingpin caster angle.

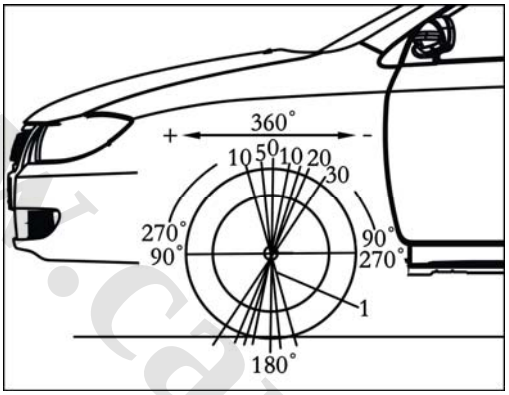


Fig. 2-3

(2) Wheel camber angle: Extroversion is viewed from the front of the vehicle. It refers to the angle of the wheel off the vertical direction as shown in Fig. 2-4. If the top point of the angle is towards outside, the camber angle is positive (+); while towards inside, it is negative (-). Extroversion will not only influence the control on the direction, but also the wear and tear of the wheels. An excessive extroversion will result in a worn wheel and cause the vehicle to move towards the largest camber angle or to one side.

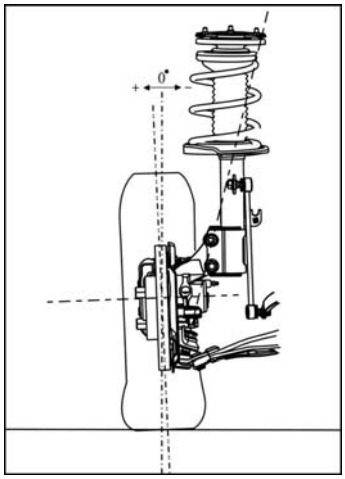


Fig. 2-4

(3) Toe-in of wheel: It refers to that the weel moves inward off the geometric center line/thrust line.

The negative toe-in means that the wheel moves outward, as shown in Fig. 2-5.

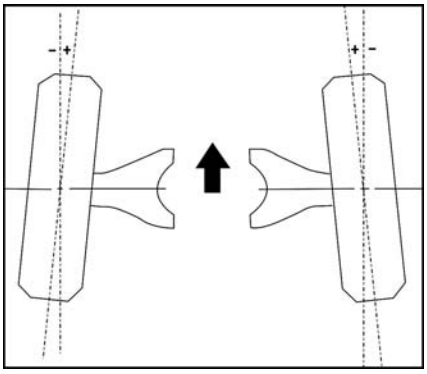


Fig. 2-5

The toe-in is designed to ensure a parallel roll of the wheels. The toe-in can also complement the little excursion of the wheel supporting system during driving forwards. Only with a proper toe-in can the wheels run in parallel on the road surface.

(4) Thrust angle: The front wheels direct or steer the vehicle while the rear wheels control the same rut. The rut is related with the thrust angle which is the angle between the rut of the rear wheels and the center line of the vehicle body (as shown in Fig. 2-6).

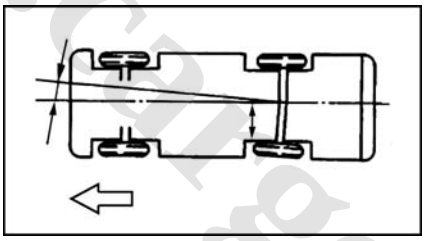


Fig. 2-6

(5) Wheel alignment parameters standard, Table 2-1.

Table 2-1

Name	Idle load	Full road
Front wheel camber angle	0°38′±30′	-0°55′±30′
Front wheel toe-in	-2-2	-2-2
Kingpin inclination angle	11°15′±45′	10°30′±30′
Kingpin caster angle	3°00′±30′	4°00′±30′
Rear wheel camber angle	1°50′±30′	-1°55′±30′
Rear wheel toe-in	-2-2	2-6

II. Fault Elimination Table, Table 2-2.

Table 2-2

Fault	Possible Cause	Action
Leaning to one side	Incorrect vehicle height (high or low front or rear)	Check if the load is abnormal, if the ring spring is sunken or is not standard spring.
	Worn or broken steering gear or connecting rod.	Check the steering system.
	Brake system.	Check the brake.
	Incorrect wheel alignment.	Adjust the wheel alignment.
	Worn front wheel bearing.	Check the front wheel bearing. See this chapter.
	Wheel and tire.	Wheel transposition or replacement.
Unaligned steering wheel	Incorrect vehicle height (high or low front or rear).	Check if the load is abnormal, if the ring spring is sunken or is not standard spring.
	Steering gear or connecting rod.	Check the steering system.
	Suspension lower support arm ball joint.	Carry out the test of ball joint in this chapter.
	Incorrect wheel alignment.	Adjust the wheel alignment.
Incorrect track	Incorrect rear caster angle.	Check the rear caster angle.
	Damaged rear suspension.	Check the rear suspension.
Uncomfortable riding	Front or rear balance connecting rod, connector or bush.	Check or install new suspension components if necessary.
	Front suspension lower support arm bush.	Check or install new suspension components if necessary.
	Rear suspension arm bush.	Check or install new suspension components if necessary.
	Front bracket with spring.	Check the front bracket with spring.
	Rear shock damper.	Check the rear shock damper.
Too large noise	Worn front wheel bearing.	Check the wheel bearing.
	Suspension lower support arm ball joint.	Carry out the test of ball joint in this chapter.
	Damaged suspension.	Check the suspension.
Improper worn tire	Incorrect tire pressure.	Adjust the tire pressure.
	Incorrect wheel alignment.	Adjust the wheel alignment.
Vibration	Damaged or worn front wheel bearing	Check the front wheel bearing.
	Wheel and tire.	Check the tire. Balance the tire or install a new one if necessary.
	Incorrect wheel alignment.	Adjust the wheel alignment.
	Abnormal steering system operation.	Check the steering system.

III. Maintenance

i. Wheel alignment adjustment

1. Front wheel extroversion adjustment

The front wheel extroversion is adjusted as shown in Fig. 2-7. Raise the vehicle, and dismantle the support from the vehicle. Fix the support on the bench clamp and gouge holes on the side panel. The extroversion can be adjusted by the bolt hole between the file support and steering knuckle.

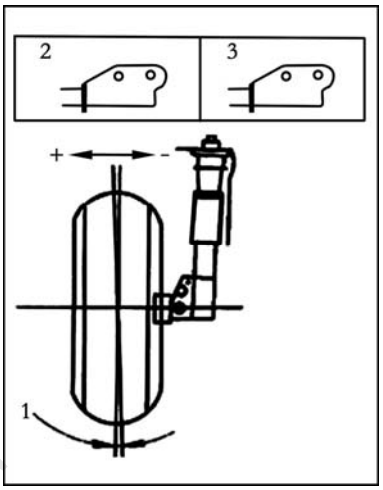


Fig. 2-7

1. Camber angle 2. File upper bolt hole 3. File lower bolt hole

2. Front wheel toe-in adjustment, Fig. 2-8.

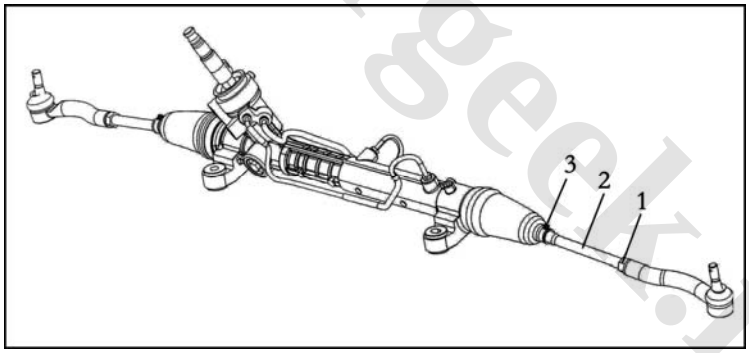


Fig. 2-8

1. Locking hexagon nut 2. Steering tie rod shaft 3. Seal clamp

Details as below:

(1) Dismantle the small boot clamp on the steering stabilizer bar.

(2) Adjust the steering wheel to the front center position.

(3) As shown in Fig. 2-8, release the hexagon bolt, and revolve the steering stabilizer bar for a proper toe-in angle.

(4) Confirm that each steering stabilizer bar revolves for the same turns.

(5) Tighten the locking nut.

(6) Install the boot clamp.

ii. Replacement of parts and components assembly

1. Replacement of front brake wheel hub assembly

(1) Disassembly of front brake wheel hub assembly

1) Raise and properly support the vehicle and dismantle the wheel assembly.

2) As per Fig. 2-9, disconnect the wheel speed sensor connector, and remove the sensor from the bracket.

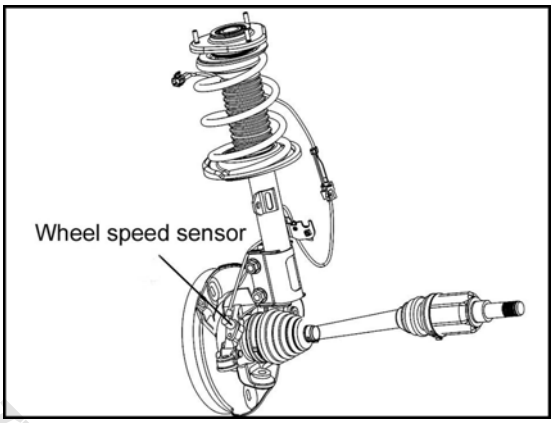


Fig. 2-9

3) Remove the brake caliper bracket and brake caliper, and then secure the brake caliper on the vehicle body to avoid bend or even damage of brake pipeline due to the weight of brake caliper, and then dismantle the brake disk.

4) Remove the nuts of drive shaft.

5) As shown in Fig. 2-10, connect the removal tools of hub center shaft to the separating drive shaft on the wheel bearing/wheel hub and the wheel bearing by 3 wheel nuts.

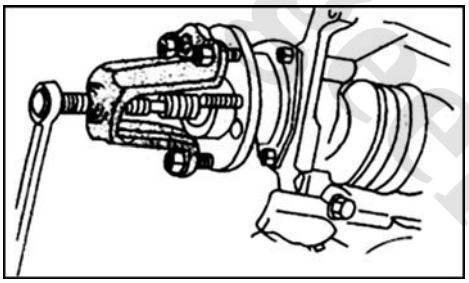


Fig. 2-10

6) According to Fig. 2-11, remove the wheel bearing.

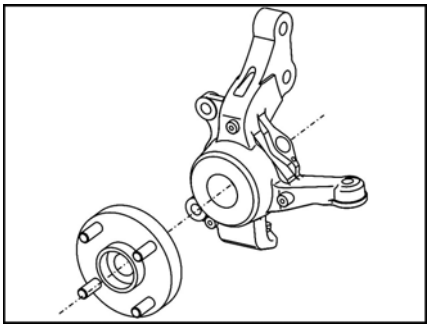


Fig. 2-11

(2) Installation of front brake wheel hub assembly

To install, reverse the removal procedure. When installing front wheel speed sensor, please ensure that the connector clip is well matched.

2. Replacement of front stabilizer bar

(1) Disassembly of front stabilizer bar. Disconnect the related connections. Lower the whole front sub-frame according to Fig. 2-12.

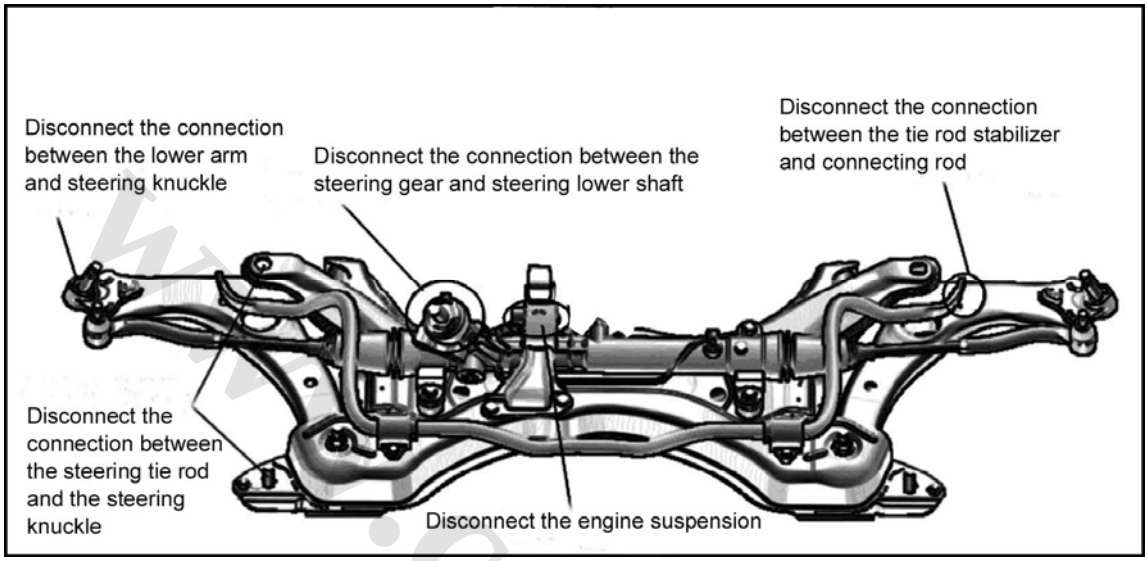


Fig. 2-12

Remove the front stabilizer bar as shown in Fig. 2-13.

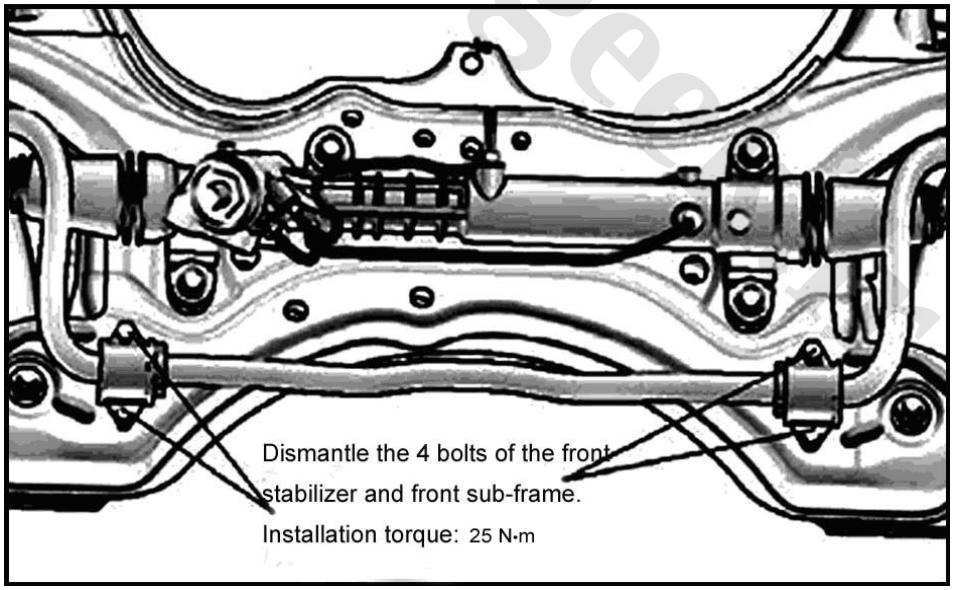


Fig. 2-13

(2) Installation: Install the front stabilizer, reverse the removal procedure.

3. Replacement of steering knuckle.

The steering knuckle is replaced together with the brake gear assembly according to related sections about brake gear.

4. Replacement of lower arm assembly

(1) Disassembly of the lower arm assembly

1) Revolve the steering wheel to move the relevant front wheel to the minimum side position.

2) According to Fig. 2-14, dismantle the cotter pin and slotted nut from the ball head bolt, and knock the steering knuckle to remove the ball pin of the lower arm from the steering knuckle.

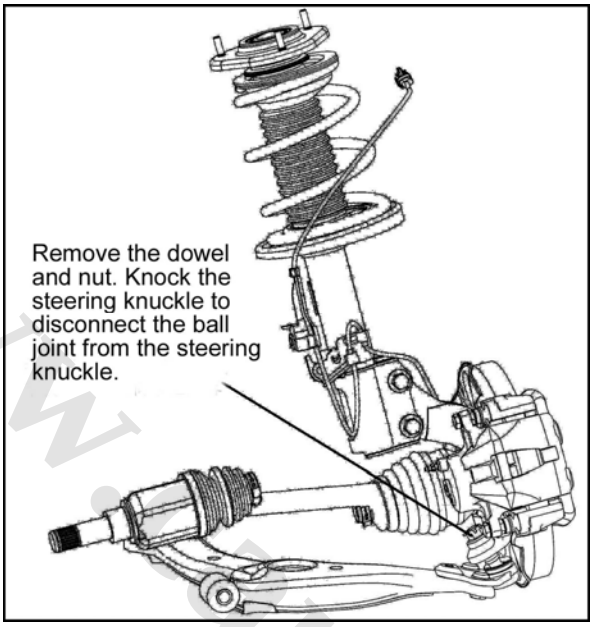


Fig. 2-14

3) Dismantle the 2 bolts and nuts, and remove the front lower arm assembly according to Fig. 2-15. Please do not rotate the locking nut because any rotation will cause damage to it.

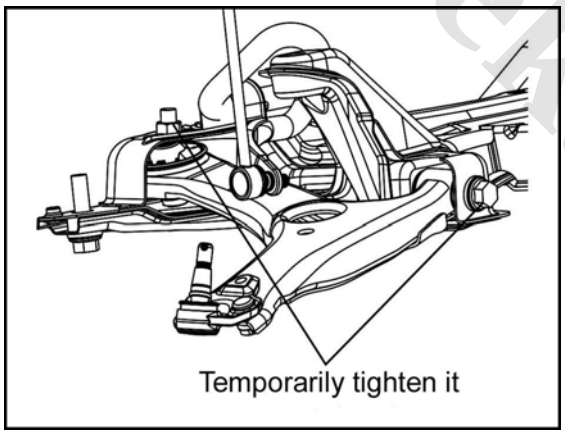


Fig. 2-15

4) Check the lower arm assembly

① Before installing nuts, shake the ball pin bolt for over 5 times as described in Fig. 2-16.

② Use a torque wrench to rotate the nuts at a speed of a turn for each 2-4s, and record the

tightening torque reading at the fifth turn. Tightening torque: 0.05～1.98Nm.

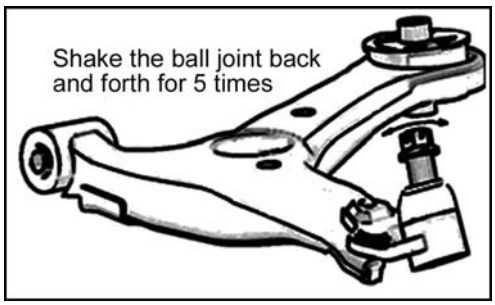


Fig. 2-16

(2) Installation

1) Temporarily screw down the front suspension lower arm assembly. Fasten the front suspension lower arm assembly by 2 bolts and nuts. No need to use torque tools, as shown in Fig. 2-17.

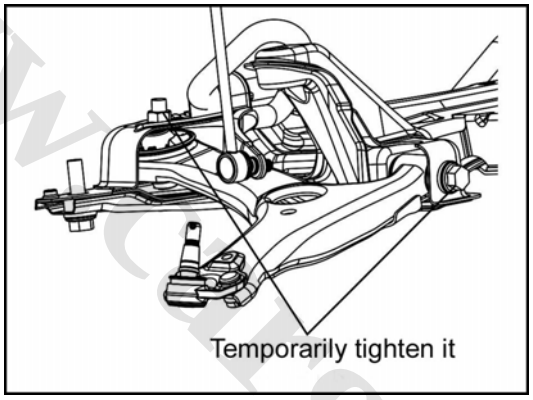


Fig. 2-17

2) Install the front suspension lower arm onto the steering knuckle by nuts. Tightening torque: 100 N·m. Follow Fig. 2-18.

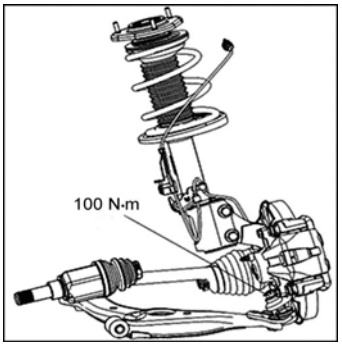


Fig. 2-18

3) Install the cotter pin. Note: In case that the hole of cotter pin is not correctly aligned, please further tighten the nut according to the hole of cotter pin.

4) Fully tighten the front suspension lower arm assembly. Secure the lower arm by 2 bolts as shown in Fig. 2-17.

5. Replacement of shock damper

(1) Disassembly of front shock damper assembly.

1) Dismantle the front wheel.

2) Disconnect the brake hose. Remove the bolt, brake hose and ABS vehicle speed sensor harness clip from the shock damper bracket (of vehicle with ABS) according to Fig. 2-19.

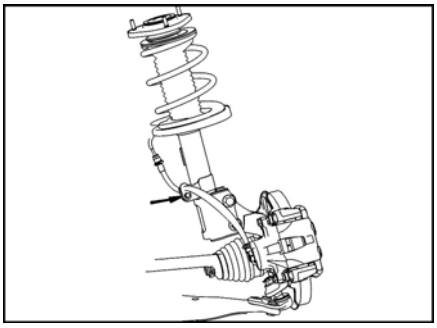


Fig. 2-19

3) Dismantle the front shock damper with coil spring.

① Remove the nuts connecting the connecting rod of front stabilizer bar and the front shock damper. Then dismantle the shock damper from the steering knuckle after removing the 2 nuts and bolts connecting the front shock damper assembly and the steering knuckle, as shown in Fig. 2-20.

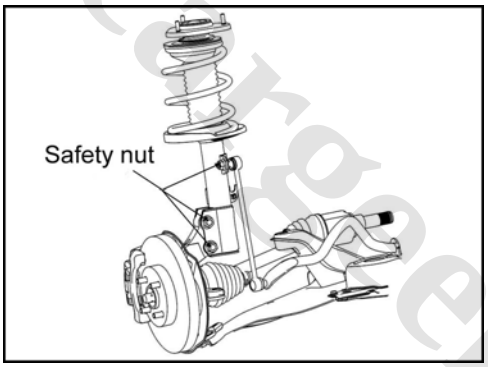


Fig. 2-20

② Dismantle the front shock damper with coil sprint, and then the 3 nuts on the suspension bracket according to Fig. 2-21.

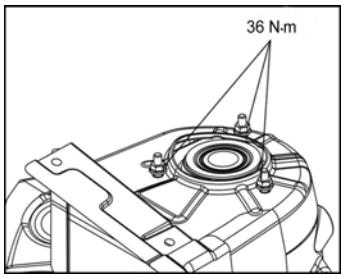


Fig. 2-21

(2) Installation of front shock damper assembly.

To install, reverse the removal procedure

(3) Disassembly of the rear shock damper assembly

1) Dismantle the rear wheel.

2) Dismantle the left and right rear shock damper assembly according to Fig. 2-22.

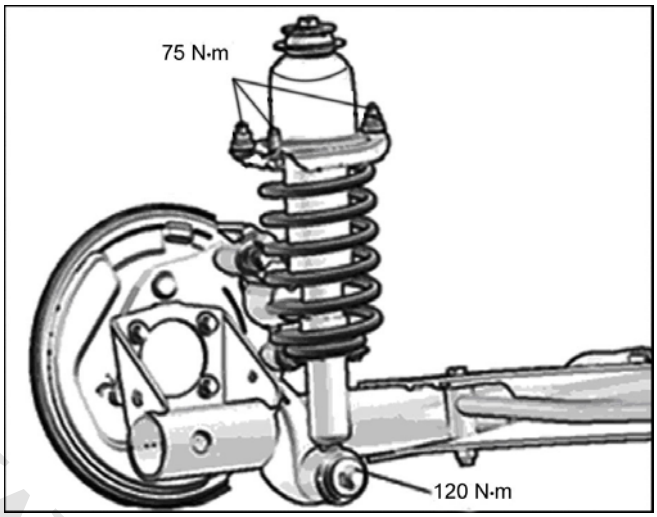


Fig. 2-22

① Raise the rear axle frame by a jack.

② Dismantle the thickened flange nut connecting the rear shock damper from the rear sub-frame assembly.

③ Dismantle a bolt and 2 nuts connecting the rear shock damper assembly and the vehicle body.

④ Dismantle the rear shock damper from the vehicle body.

(4) Installation of rear shock damper assembly

To install, reverse the removal procedure.

(5) Inspection of shock damper assembly. Check if there is abnormal resistance or noise when pressing or pulling the push rod of shock damper. In case of any abnormal situation, please replace the shock damper with a new one.

Section II Steering System

The steering system is a special mechanism to change or maintain the driving direction of a vehicle. It is used to change the direction at a proper time according to the requirement of the driver during driving, and cooperate with the driving system to keep the vehicle moving stably in case that the vehicle moves off the driving direction due to the accidental impact from the road surface. It is one of the important systems to keep safe driving. Therefore, check and maintenance of the steering system in time is an effective measure to ensure safe driving and fewer accidents.

The steering wheel of LF620 sedan is composed of steering wheel 1, steering column 2, power steering pump 5, oil tank 4, steering gear 3, etc. Follow Fig. 2-23.

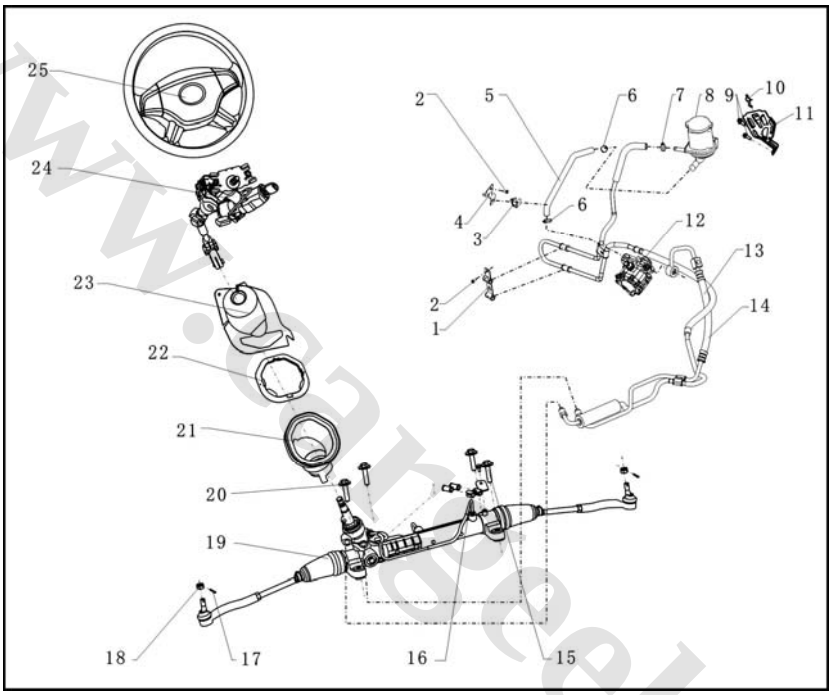


Fig. 2-23

1. Return line bracket
2. Hex bolt with flat washer
3. Return line clamp
4. Return line bracket B
5. Steering oil pump intake pipe
6. A-type worm-driven tube hoop
7. A-type worm-driven tube hoop
8. Power steering oil can assembly
9. Hex bolt with flat washer (75N·m)
10. Power steering oil can clip
11. Power steering oil can bracket
12. Power steering oil pump assembly
13. Steering return line assembly
14. Steering gear intake pipe assembly
15. Hexagon flange bolt (75N·m)
16. Oil pipeline bracket A component
17. Cotter pin
18. Hex slotted thin nut (75N·m)
19. Steering gear and tie-rod assembly
20. Hexagon flange bolt (75N·m)
21. Acoustic hood on the steering gear
22. Collar of acoustic hood on the steering gear
23. Steering column dustproof cap components
24. Steering column and adjustment mechanism assembly
25. Steering wheel assembly

I. Fault Diagnosis of Steering System

1. Note for inspection

(1) Take extra care while replacing the components. Incorrect operation may affect the performance of the steering system and lead to driving accident.

(2) Notes for SRS system. This vehicle is equipped with SRS, like driver air bag and front passenger air bag. If failing to repair the air bag in correct order, the unexpected deployment of air bag during the maintenance may lead to serious accident. Read the notes for supplement restraint system before maintenance (including removal or installation, and check or replacement of components).

II. Fault Elimination Table

With the help of Fault Elimination Table (as shown in Table 2-3), it is more convenient to discover the fault. The Table indicates the frequent faults. Eliminate all faults according to measures provided in this Table. Check each component in sequence. Repair or renew these components if necessary.

Table 2-3

Fault	Possible Cause	Actions
When the steering wheel is fixed and in straight forward direction, the vehicle moves between two sides.	Incorrect tire size or pressure.	Check the tire size and adjust the tire pressure.
	Over loaded or uneven loaded.	Adjust the load.
	Loose or worn tie-rod or its end	Replace the steering gear or tie-rod end with a new one if necessary.
	Loose or broken bolts of the steering gear	Lock the bolt or install a new one.
	Loose or worn suspension ball joint.	Replace the suspension ball joint assembly with a new one.
	Loose bolts between the steering column shaft universal joint and the pinion shaft.	Lock the bolts of pinion shaft. Lock the steering column shaft universal joint.
	Loose or broken steering column shaft universal joint.	Install a new steering column shaft universal joint.
	Improperly adjusted toe.	Adjust it if necessary.
	Loose or broken rear suspension.	Lock or install new rear suspension components.
The vehicle leans to one side when running on smooth road surface.	Incorrect tire pressure.	Adjust the tire pressure.
	Incorrect tire size or different tire/tread types.	Install new tires if necessary.
	Over loaded or uneven loaded.	Adjust the load.
	Improperly toe adjustment.	Adjust it if necessary.
	Broken front suspension components.	Install new front suspension components if necessary.
	Broken rear suspension components.	Install new rear suspension components if necessary.

Table 2-3 (Continued 1)

Fault	Possible Cause	Actions
The vehicle leans to one side when running on smooth road surface.	Unbalanced action of steering gear valve.	In case of a vehicle speed below 50 km/h (30mph), turn the transmission to NEUTRAL, and turn the ignition switch to position I (engine OFF-sliding). In case that the vehicle does not lean to one side when stopping, install a new steering gear. In case that the vehicle does not move when stopping, interchange the front wheel assembly In case that the vehicle does not lean to the other side, exchange the front and rear wheels at the same side. In case the vehicle leans in the same direction, check the front suspension components and adjust the toe.
	Check if the front/rear brake is normal.	Adjust it if necessary.
	Check if the rear suspension components are bent and if the front/rear suspension ring spring is broken or sunken.	Install new rear suspension components if necessary.
	Check if the rear suspension components or bolts are loose or worn.	Install new rear suspension components if necessary. Lock all bolts.
Feedback (whine or knock sound of the steering gear)-the steering wheel feels rough when driving on the rough road.	Steering gear input shaft connector.	Install a new universal joint if necessary.
	Loose/worn tie-rod.	Install a new steering gear if necessary.
	Loose or broken steering gear bolts.	Lock or install new fixing bolts if necessary.
	Loose bolts and the steering column shaft and universal joint.	Lock bolts.
	Loose suspension boot, bolts or ball joints.	Lock or install new bolts or ball joints if necessary.
	Bad steering column shaft.	Install new steering column if necessary.
After steering, the steering wheel will not go back to the central position without the assistance of the driver. Besides, it may feel obstructed or unsmooth when the driver turns the steering wheel to the central position.	Incorrect tire pressure.	Adjust the tire pressure.
	Incorrect tire size or type.	Install new tires if necessary.
	Unaligned steering column or the protecting hood rubs the steering wheel.	Align the steering column.
	Blocked steering column universal joint.	Install a new universal joint.
	The sealed pad of the soleplatofsteering column shaft may be torn	Install a new sealed pad if necessary.

Table 2-3 (Continued 2)

Fault	Possible Cause	Actions
After steering, the steering wheel will not go back to the central position without the assistance of the driver. Besides, it may feel obstructed or unsmooth when the driver turns the steering wheel to the central position.	Blocked or broken tie-rod.	Install a new steering gear if necessary.
	Broken or worn front suspension components.	Install new front suspension components if necessary.
	Incorrect toe adjustment.	Adjust it if necessary.
	Blocked column bearing.	Install a new steering column.
	Contaminated steering oil.	Wash the power steering system.
Steering feels heavy when steering and parking at the road side	Insufficient power steering pump oil.	Refill the oil if necessary and check if there is oil breakage.
	Incorrect tension of the accessory drive belt.	Check the tension of the accessory drive belt.
	Leakage in the hose or outer cooler.	Repair or install a new hose or cooler if necessary.
	Incorrect engine idle speed.	Refer to the air discharge of power system.
	Loose or distorted power steering pump belt pulley.	Install a new power steering pump belt pulley.
	Power steering pump flow or pressure out of specification.	Check the pump flow and pressure. Refer to the pump flow and pressure test in this chapter.
	Obstructed hose or cooler pipeline.	Clean the hose or cooler or install a new one if necessary.
	Contaminated steering shaft.	Check if there are foreign materials or contamination in the system. Wash the power steering system.
	Air in steering oil.	Discharge the air in the system.
Oil leakage	Excessively filled system.	Correct the fluid level height.
	Leakage in components.	Find out the suspicious component and repair it if necessary.
The accessory drive belt utters a long shriek (especially while the steering wheel turns to the end and parking the vehicle at the original position)	Check if the tension of the accessory drive belt is correct or if the belt skids.	Install a new accessory drive belt if necessary.
Chatter from the steering pump	Loose or broken accessory drive belt.	Install a new accessory drive belt.
Noise from power steering pump	Insufficient oil and possible leakage.	Refill the oil to the specified height. Discharge the air in the system.
	Power steering pump.	Check if there is a leakage. Repair it if necessary. Install a new power steering pump if necessary.

Table 2-3 (Continued 3)

Fault	Possible Cause	Actions
Swish noise	Oil at a temperature below 54°C (130°F) flow into the bypass valve of the housing of pump valve.	Normal.
Sob noise	With air in the oil and leakage in the system.	Purify the air in the system.
	Check O-ring oil seal of one-way valve cap.	Install a new power steering pump if necessary.
Leakage in power steering pump or fuel tank	Too much oil.	Correct the fluid level height if necessary.
	Lost, loose or broken filler cap or lost O-ring seal.	Install a new filler cap or O-ring seal if necessary.
	Loose or broken hose connector.	Install a new hose connector if necessary.
	Leakage in shaft seal: Broken oil seal. Broken rotor shaft, e.g. groove or bruise. Worn bush or sleeve of shaft.	Install a new power steering pump.
	Inlet tube.	Install a new power steering pump.
	Perforated housing.	Install a new power steering pump.
	Loose nuts of outlet pipe connector or plug valve.	Lock it if necessary.
	Broken connector, nuts or plug of outlet pipe.	Install a new power steering pump.
Abnormal noise	Power steering oil (insufficient).	Refill the oil if necessary and check if the system has a leakage.
	Universal joint (worn).	Replace it if necessary.
	Power steering vane pump (faulty).	Check and replace it if necessary.
	Steering gear (faulty).	Replace it if necessary.
Insufficient return	Tire (improper inflation).	Adjust the tire pressure.
	Front wheel alignment (incorrect).	Align the wheels.
	Steering column (bent).	Align it and replace it if necessary.
	Steering gear (malfunction).	Replace it if necessary.

Table 2-3 (Continued 4)

Fault	Possible Cause	Actions
Over large clearance	Steering knuckle (worn).	Replace it if necessary.
	Suspension arm ball joint (worn).	Replace it if necessary.
	Intermediate shaft, and slip joint/yoke (worn).	Replace it if necessary.
	Front wheel bearing (worn).	Replace it if necessary.
	Steering gear (malfunction).	Replace it if necessary.
Heavy steering	Tire (improper inflation).	Adjust the tire pressure.
	Power steering oil (little).	Refill the oil if necessary and check if there is a leakage in the system.
	Front wheel alignment (incorrect)	Align the wheels.
	Steering knuckle (worn).	Replace it if necessary.
	Suspension arm ball joint (worn).	Replace it if necessary.
	Steering column (bent).	Check and replace it if necessary.
	Power steering vane pump (malfunction).	Replace it if necessary.
	Steering gear (malfunction).	Replace it if necessary.

III. Maintenance

1. Check the free play of steering wheel

The methods for checking the free play of steering wheel are as follows:

(1) Make sure that the road wheels are in the straight ahead position.

(2) Gently turn the steering wheel, and check its free play. As shown in Fig. 2-24, the free play of steering wheel ≤ 20°.

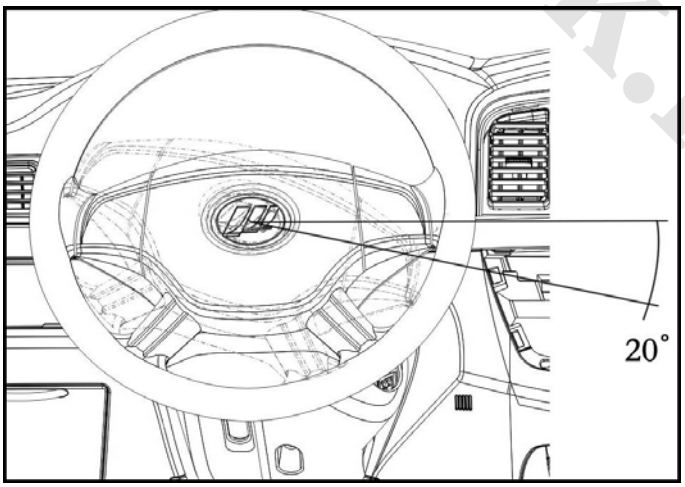


Fig. 2-24

2. Steering wheel and column as shown in Fig. 2-25.

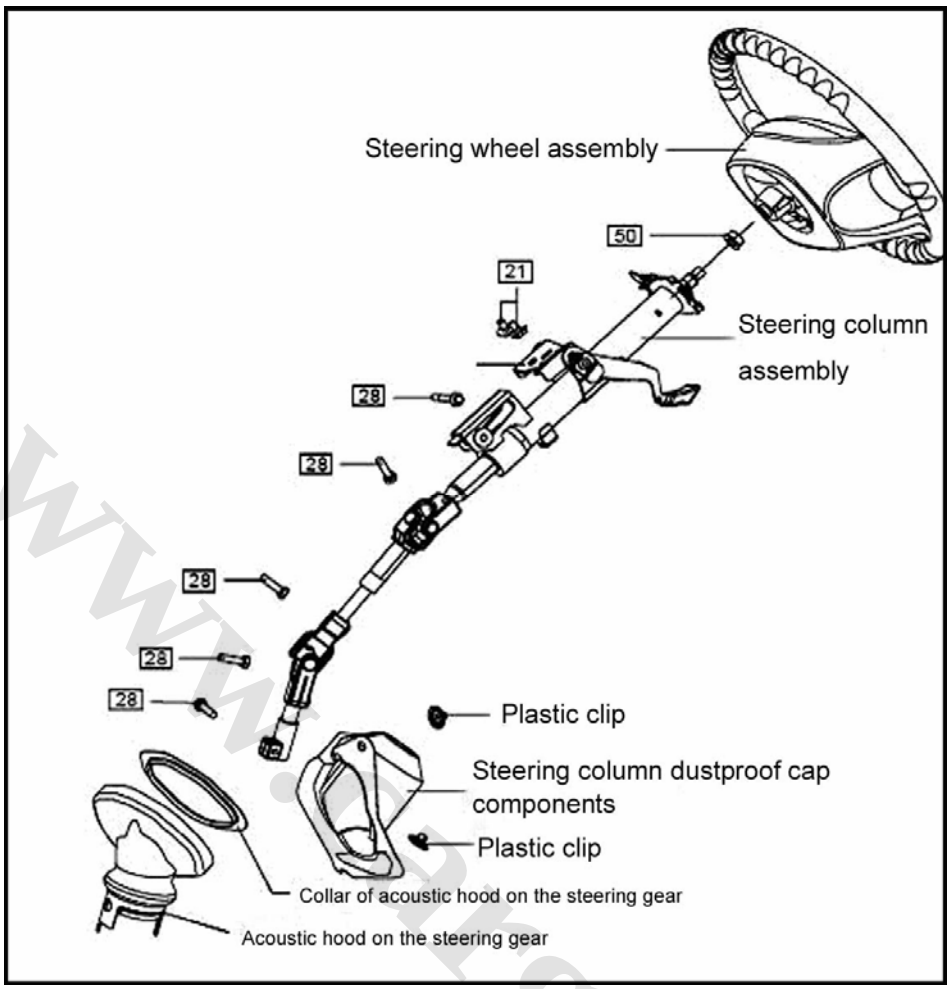


Fig. 2-25

3. Removal and installation of steering wheel and column assembly

Note:

① Follow the notes for the maintenance of steering pump.

② Disconnect the negative terminal of the battery.

③ Make sure that the front wheels are in the straight ahead position.

(1) Removal

1) Remove the horn button assembly.

Note: Disconnect the connector of air bag in case that the ignition switch is at position “ON”.

2) Loosen the two bolts with socket wrench or screwdriver until the bolt head is locked into the bolt housing, as shown in Fig. 2-26.

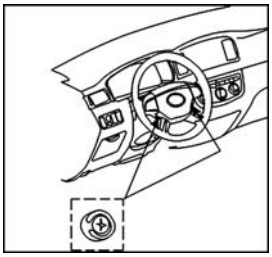


Fig. 2-26

3) Push out the horn button assembly from the steering wheel, as shown in Fig. 2-27.

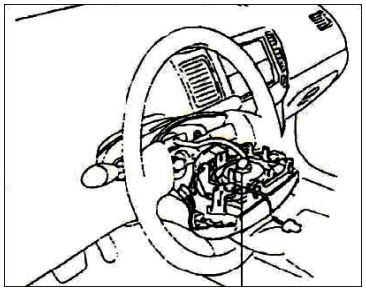


Fig. 2-27

4) Use a screwdriver to release the locked part of the air bag connector and then remove the air bag connector.

Note: Do not drag the air bag harness when removing the horn button assembly; make the upper surface upward when placing the assembly; do not disassemble the horn button assembly.

5) Disconnect the connector.

6) Remove the fixing nut of the steering wheel, as shown in Fig. 2-28.

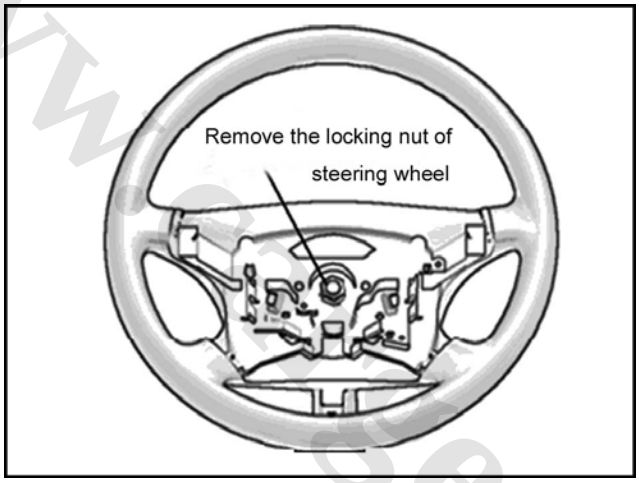


Fig. 2-28

7) Mark the matching place on the steering wheel assembly and the main shaft assembly.

8) Use a special tool to remove the steering wheel assembly.

9) Remove the lower cap of the steering column. Remove the three bolts, the upper & lower caps of the steering column, as shown in Fig. 2-29.

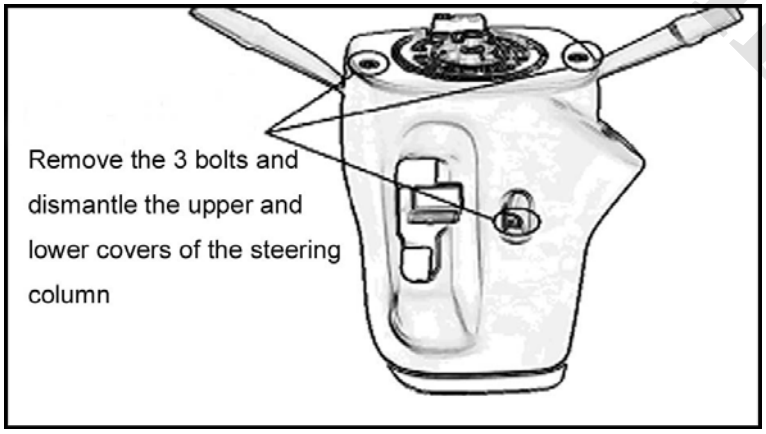


Fig. 2-29

10) Locate the ignition switch at position ACC, and dismantle the coil spring assembly. Note: The combination switch is connected to the installation plate by a metal clip and 2 plastic clips. Firstly prize the metal clip from the installation hole by a screwdriver and then remove the 2 plastic clips. See structure drawing in Fig. 2-30.

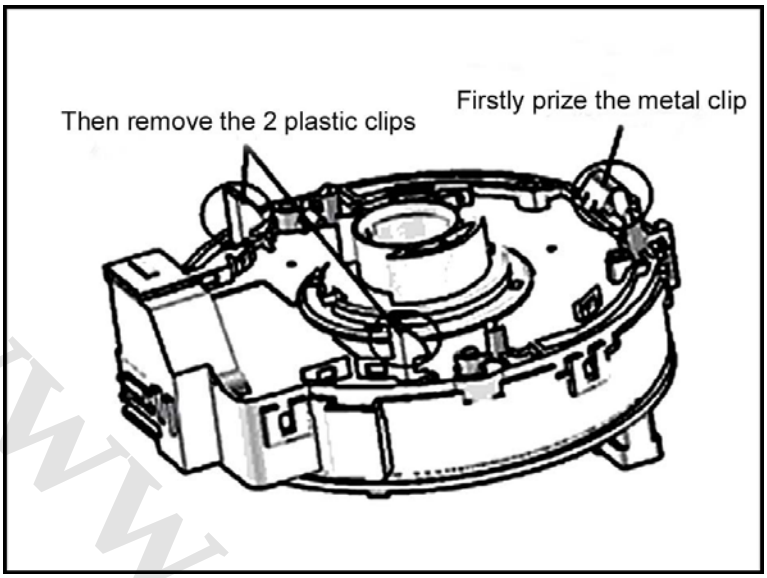


Fig2-30

11) Remove the left combination switch (headlamp dimmer switch assembly), as shown in Fig. 2-31.

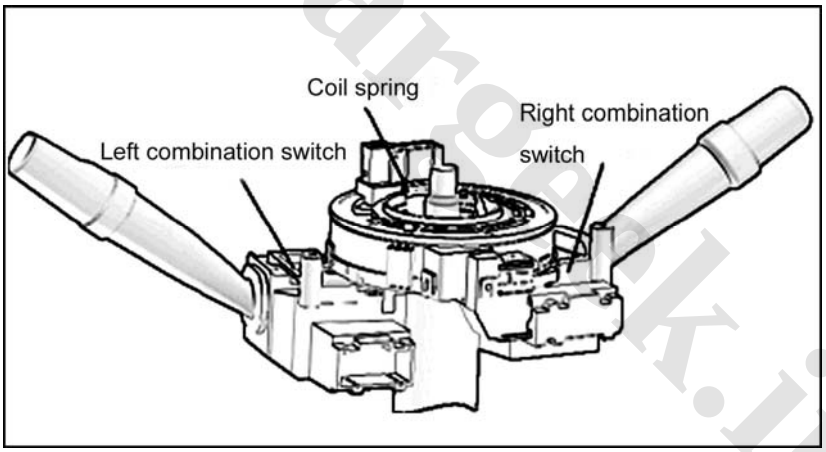


Fig. 2-31

12) Remove the right combination switch (wiper switch assembly).

13) Remove the dustproof cap of the steering column.

14) Disconnect No. 2 steering intermediate shaft assembly, as shown in Fig. 2-32.

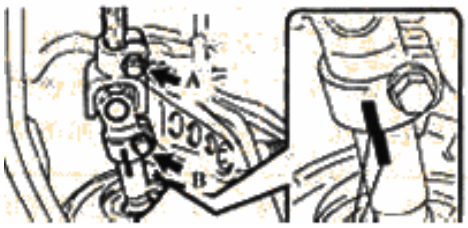


Fig. 2-32

① Mark the matching place on the slip yoke and intermediate shaft.
② Loosen the bolt A and B, and then disconnect the intermediate shaft.
15) Remove the steering column assembly, as shown in Fig. 2-33.

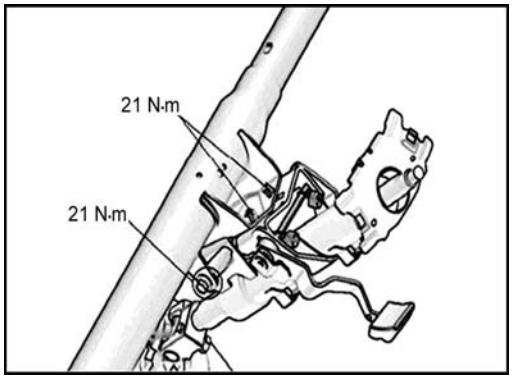


Fig. 2-33

① Disconnect the connector and harness clip from the steering column assembly.
② Remove the 3 bolts and the steering column assembly.
16) Remove No. 2 steering intermediate shaft assembly.
① Mark the matching place on the main shaft and intermediate shaft, as shown in Fig. 2-34.

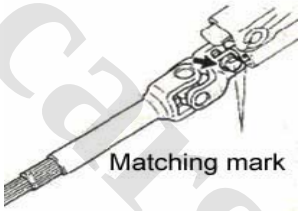


Fig. 2-34

② Remove the bolt and intermediate shaft.
17) Dismantle the switch support from the steering column, as shown in Fig. 2-35.

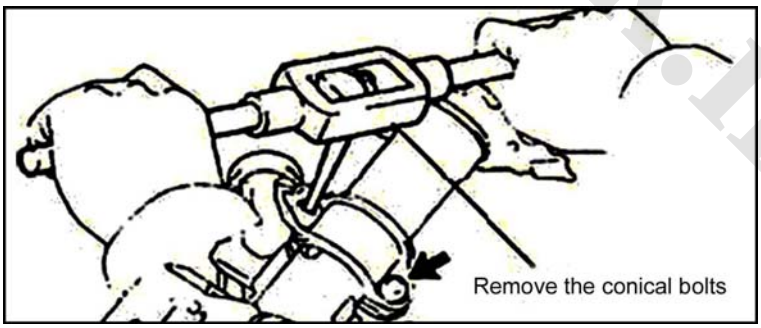


Fig. 2-35

① Use a center punch to make center marks on the two conical bolts.
② Drill the two bolts by a 3-4mm drill.
③ Remove 2 bolts and switch support assembly on the steering column by a screwdriver.
18) Remove the steering column upper clip board.

19) Remove the ignition switch lock core assembly as shown in Fig. 2-36.

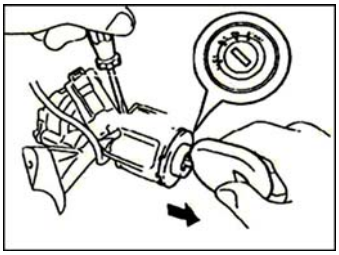


Fig. 2-36

① Turn the ignition switch to position ACC.

② Press down the lock by a screwdriver and pull out the lock core.

20) Dismantle the unlocked warning switch assembly.

① Disconnect the unlocked warning switch from the ignition switch assembly.

② Dismantle the unlocked warning switch assembly.

21) Remove the ignition switch assembly. Remove the 2 bolts and also the ignition switch assembly from the steering column bracket.

(2) Installation

1) To install the ignition switch assembly and the unlocked warning switch assembly, reverse the removal procedure.

2) Install the ignition switch lock core assembly.

① Make sure that the ignition switch is at position ACC.

② Install the ignition switch lock core assembly.

3) Check the action of steering lock.

① Check the steering locking mechanism with the key out.

② Check the steering locking mechanism for its activeness with the key in position ACC.

4) Install the switch support on the steering column.

(1) Adopt two new conical bolts for the temporary installation of the switch support assembly and the clip on the steering column.

(2) Screw up the two conical bolts till their nut heads disconnect.

5) Install No. 2 steering intermediate shaft assembly.

① Align the matching mark on the intermediate shaft and main shaft.

② Install the intermediate shaft with bolt. Tightening torque: 36N·m.

6) Install the steering column assembly.

① Install the steering column assembly with three bolts. Tightening torque: 21N·m.

② Connect the connector to the harness clip.

7) Connect No. 2 steering intermediate shaft assembly.

① Align the matching mark on the intermediate shaft and slip yoke.

② Install the bolt B and screw down bolt A. Tightening torque: 28N·m.

8) Install the cover board of the steering column hole.

9) Install wiper switch. Install the wiper switch assembly and connector.

10) Install the headlamp dimmer switch assembly. Install the headlamp dimmer switch assembly and connector.

11) Make the front wheel in the straight ahead position.

12) Install the clock spring when the key is at position ACC.

13) Check the inter-locking of the key.

14) Install the upper cap of the steering column. Install the upper & lower caps of the steering column with three bolts.
15) Align the clock spring.
① Make sure the ignition switch at position OFF.
② Make sure the negative terminal of the battery is disconnected. Note: Operate 90s later.
③ Rotate the cable disc counterclockwise with hand till it can not be rotated any more.
④ Rotate the cable disc clockwise about 2.5 circles, and align the mark.
Note: The cable disc can be turned around the center about 2.5 circles.
16) Install the steering wheel assembly.
① Align the matching mark on the steering wheel assembly and steering main shaft assembly.
② Install the steering wheel with fastening nut. Tightening torque: 50N·m.
③ Connect the connector.
17) Check the horn button assembly.
18) Install the horn button assembly.
Note:
① Do not use the air bag components removed from another vehicle. Renew as required.
A. Make sure that the horn button assembly is installed with specified tightening torque.
B. When dropped or crack, depress or other defects detected on the housing or connector, replace a new horn button assembly.
C. Make sure that the wire is not interfered and clipped by other components when install the horn button assembly.
② Connect the air bag connector.
③ Install the horn button after clipping the bolt groove to the bolt cap.
④ Install two box bolts with torque socket wrench. Tightening torque: 8.8N·m.
19) Align the steering wheel.
4. Inspection for the power steering device
(1) Check the oil level for the power steering gear
① Park the vehicle in a flat place, and turn the steering wheel for several times without moving the vehicle after starting the engine, in order to increase the oil temperature (to 50-60℃).
② Start the engine and turn the steering wheel from lock to lock several times.
③ No air bubble, flocculent deposits in the oil.
④ Stop the engine and check the fluid level for any change. Discharge air if the level change exceeds 5mm.
5. Replacement of power steering fluid
Removal and inspection are required if fault occurs in the power steering device. At the same time, replace the power steering fluid. Replace the fluid in time as well if it goes bad. The steps are as below:
(1) Raise the front wheel with a jack or hoist the complete vehicle with a lifter.
(2) Disconnect the return hose from the steering fluid reservoir. Connect a plastic tube with the return hose, and collect the fluid with proper container. Avoid splashing the fluid to the vehicle body and components, or wipe up immediately.
(3) With idle operation of the engine, repeatedly turn the steering wheel from lock to lock, to discharge the fluid; intermittently start the engine several times, to confirm that it has been totally discharged.

(4) Connect the return hose, and fix with clip.
(5) Fill the reservoir with the specified oil, neither higher than the maximum level, nor lower than the minimum level.
Oil: ESSOATF.D. Filling amount for reference: 0.825L.
(6) With idle operation of the engine, repeatedly turn the steering wheel from lock to lock, to discharge the air for the steering system.
(7) Check the oil level again. Fill the reservoir with the specified oil if necessary, in order to make the oil reach the maximum level.
6. Air discharging of the power steering system
(1) Raise the front wheel by a jack.
(2) Intermittently start the engine for several times, and meanwhile turn the steering wheel from lock to lock for 5 to 8 times to raise the oil temperature, and then make the steering wheel in the straight ahead position and note the fluid level in the reservoir.
(3) Note the fluid level in the reservoir again in 3 to 5 minutes later after the engine misfires, and compare the level with that in (2). If the gap is below 5mm and there is no bubble or emulsification in the fluid, the air inside the system has been discharged completely. Otherwise, repeat step (4) and step (5) until the air is discharged completely.
(4) Check the fluid level. Fill the fluid reservoir with oil to the regulated level as necessary.
Note:
① During discharging air, the fluid should be higher than the minimum level of the reservoir. Otherwise, fill more fluid.
② The air will be micronized and dissolved in the fluid if it is discharged with the engine on. Therefore, discharge the air while starting the engine.
③ The fast increasing fluid level after the engine stops indicates an incomplete air discharging.
④ An incomplete air discharging in the system will cause a vibration noise from the pump and abnormal sound from the flow control valve which may affect the service life of the pump and other components.
7. Oil pressure checking (see Fig. 2-37)

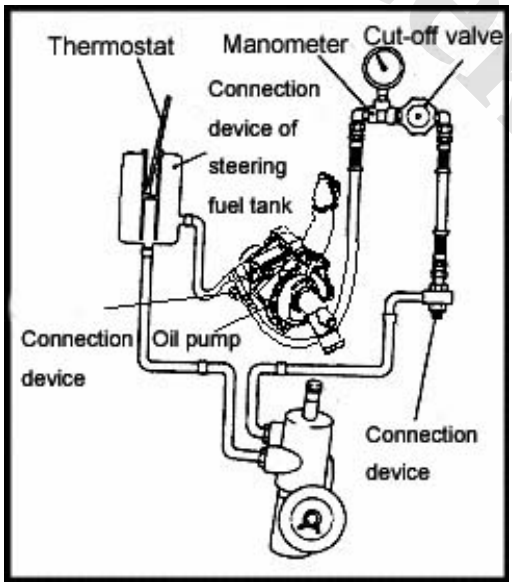


Fig.2-37

(1) Disconnect the oil pump from the high pressure hose, and install the special tool.

(2) Discharge the air and turn the steering wheel for several times to raise the fluid temperature to 50-60℃.
(3) Start the engine and keep it rotating at a speed of 1000±100r/min.
(4) Close the cut-off valve of the pressure gauge completely and check if the safety pressure of the oil pump is within the standard value. Standard value: 8MPa.
(5) Replace the oil pump in case of a deflection from the standard value.
(6) Open the cut-off valve of the pressure gauge completely and check if the oil pressure is within the standard value without load.
Standard value: 0.2-0.7MPa.
(7) Any deflection from the standard value can be considered to be caused by a poor fuel line or steering gear. Repair it and measure the pressure again.
(8) Check if the oil pressure is within the standard value in a state of turning the steering wheel from lock to lock. Standard value: 7.9MPa.
(9) In case of an oil pressure lower than the standard value, remove and install the steering gear; in case of a higher one, replace the oil pump.
(10) Tighten the high pressure hose with specified tightening torque after removing the special tool. Tightening torque: 55±5N·m.
(11) Air discharging
8. Inspection of the power steering gear: see Fig. 2-38.

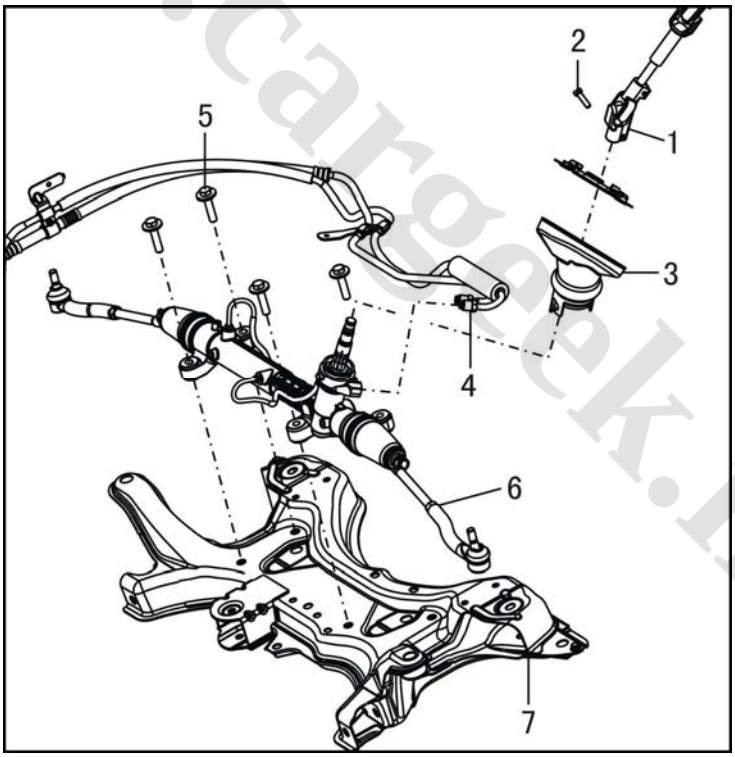


Fig. 2-38

1. Lower steering shaft
2. Bolt
3. Acoustic hood on the steering gear
4. Oil pipeline connector of steering gear
5. Bolt
6. Steering gear assembly
7. Sub-frame

(1) Removal

① Discharge steering fluid.
② Dismantle the high pressure oil outlet pipe connected to the steering oil pump, screw off the hollow bolt, and remove the hose bracket connected to the engine.
③ Disconnect the steering gear from the steering lower shaft.
④ Dismantle the connectors between steering gear and the return oil pipeline, and remove the front sub-frame and steering assembly from the vehicle body.
⑤ Dismantle the steering gear assembly from the front sub-frame.
(2) Inspection of the power steering gear
Note: The internal components of the steering gear can not be disassembled, but replaced or returned for repair by the producer.
1) Inspection of the shaking resistance of the steering tie-rod
① Shake the steering tie-rod forcibly for 10 times.
② Put one end of the steering tie-rod downwards, measure the shaking resistance by a spring scale and compare it with the standard value.
Standard value: 1.5-4.9N·m.
③ In case of a value above the standard one, replace the steering tie-rod.
④ In case of a value below the standard one, check if the ball joint is loose or creak can be heard. If shaking smoothly, it is all right; if any looseness detected or abnormal sound heard, replace the steering tie-rod.
2) Inspection of steering tie-rod ball joint end and dustproof cap
① Press the dustproof cap forcibly by finger and check if there is any crack or damage on the dustproof cap.
② In case of any crack or damage detected on the dustproof cap, replace the steering tie-rod outer joint; however, if caused by maintenance, only replace the dustproof cap.
3) Installation of power steering gear
To install, reverse the removal procedure.

Section III Brake System

The brake system is used to transform the force on the brake pedal from the driver to braking force of all wheels. Then the hydraulic system will distribute the braking force to each wheel. The vacuum brake booster is used to decrease the force from the pedal and increase the hydraulic pressure. The parking brake operates by rear wheels and controls the operation manually.
LF620 sedan has two brake systems, namely driving brake system and parking brake system. The driving brake system is an engine vacuum booster ABS hydraulic brake system. And the parking brake is to control the rear brake by cable system which utilizes the self-adjusting ratchet and pawl structure. The ABS is controlled by the hydraulic control unit (HCU) in the hydraulic system, and only works when the vehicle speed sensor detects that the wheels are locked.

I. Fault Diagnosis

The fault elimination of brake system is shown in Table 2-4. The figures in the Table refer to the sequence of possible faults. Check all components and parts in sequence. Replace related parts if necessary.

Table 2-4

Fault	Possible Cause	Actions
Brake runs off or drifts	Alignment angle of wheels	Check the alignment angle of wheels.
	Brake pad	Check and install a new component if necessary.
	Brake disc	Check and install a new component if necessary.
	Brake caliper	Check and install a new component if necessary.
Red brake warning lamp is lighted continuously	Brake fluid level sensor	Refer to WDS.
	Parking brake control device	Release and adjust the parking brake.
	Excessively worn brake pad	Check and install a new component if necessary.
	Main piston rod of braking master pump	Install a new braking master pump.
Vibration during brake action	Brake pad	Check and install a new component if necessary.
	Brake caliper	Check and install a new component if necessary.
	Brake disc	Check and install a new component if necessary.
Rapidly sunken pedal	With air in system	Discharge the air in system.
	Braking master pump	Check the braking master pump.
	Brake disc	Check and install a new component if necessary.
	Brake pad	Check and install a new component if necessary.
Slowly sunken pedal	Brake caliper	Check and install a new component if necessary.
	Brake master pump	Check the brake master pump.

Table 2-4

Fault	Possible Cause	Actions
Low-position or soft pedal	With air in system	Discharge the air in system.
	Brake pad	Check and install a new component if necessary.
	Brake booster	Check the booster components.
Locked pedal when gently stepping down the pedal	Brake pad	Check and install a new component if necessary.
	Brake disc	Check and install a new component if necessary.
	Brake booster	Check the booster components.
Too long/unstable brake pedal travel	Insufficiently lubricated sliding part	Lubricate it if necessary.
	Brake pad	Check and install a new component if necessary.
	Brake disc	Check and install a new component if necessary.
	Wheel bearing	Check the wheel bearing or install a new one.
	Brake pedal	Check and repair the brake pedal.
Brake daggles	Brake booster	Check and repair booster components.
	Brake caliper	Check and install new components if necessary.
	Electronic stability control system (if equipped)	Refer to WDS.
	Brake pedal	Check and repair the brake pedal.
Slow or incomplete return of the pedal	Electronic stability control system (if equipped)	Refer to WDS.
	Brake master pump	Carry out test of brake master pump components in this chapter.
	Brake pedal	Check and repair the brake pedal.

II. Inspection of Brake system, Table 2-4.

i. Air discharging of brake fluid

Please purify the air if repairing the brake system or considering air in the brake pipeline.

Note: Do not splash the brake fluid on the paint, otherwise clean it immediately.

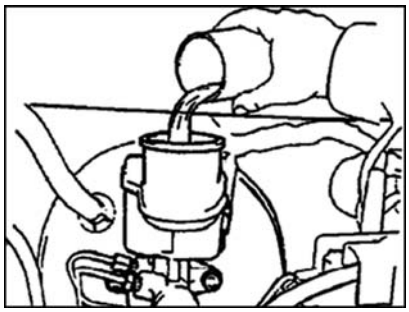


Fig. 2-39

1. Refill brake fluid into the reservoir (as shown in Fig. 2-39)

Brake fluid: DOT4, filling amount: 0.72L.

2. Discharge the air in the brake master pump

Note: Discharge the air in the brake master pump if it has been dismantled or the reservoir is empty.

1) Disconnect the oil pipeline connector from the brake master pump.

2) Slowly step down the pedal and maintain without movement, as shown in Fig. 2-40.

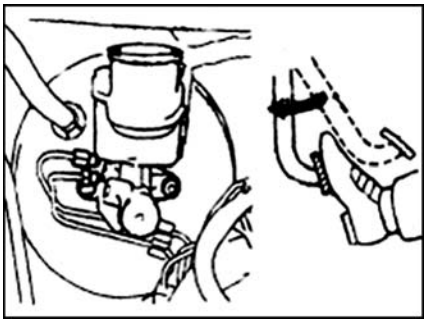


Fig. 2-40

3) Block up the hole from outside by fingers, and release the brake pedal as Fig. 2-41.

4) Repeat step 2) and 3) for 3 or 4 times.

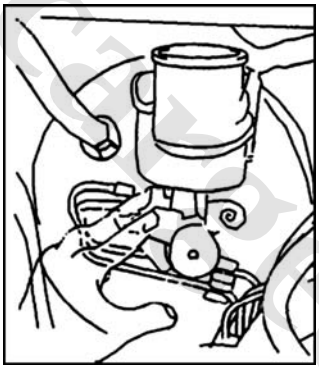


Fig. 2-41

3. Air discharging of brake oil pipe (Fig. 2-42)

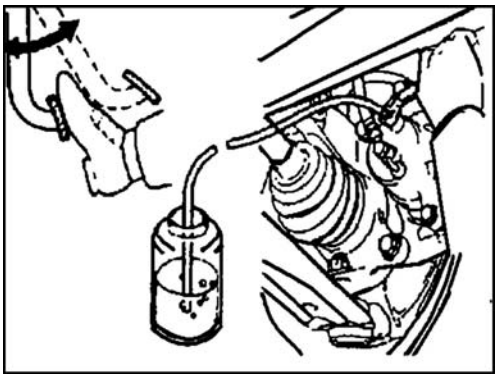


Fig. 2-42

1) Connect the plastic pipe to the brake caliper and slave cylinder.

2) Step down the pedal for times and then keep it stepped down, and then screw off the air discharging bolt.
3) Screw down the air discharging bolt immediately when the brake fluid flows out, and release the brake pedal.
4) Repeat step 2) and 3) until all air in brake fluid flow out.
5) Repeat the above steps to exhaust air from each brake slave cylinder. Tightening torque: 8.0N·m.
4. Check the oil level in the reservoir
Check the oil level. Refill brake fluid if necessary. Brake fluid: DOT4
ii. Inspection of brake pedal
1. Check the pedal height as shown in Fig. 2-43. Height above floor: 136mm-146mm.

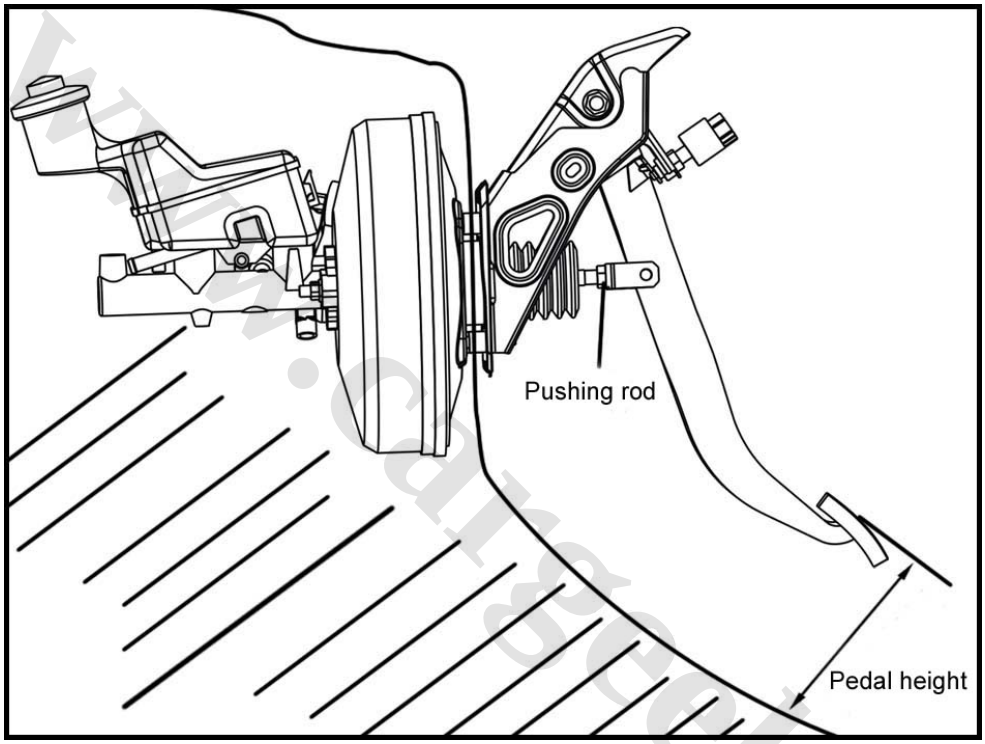


Fig. 2-43

2. Adjust the pedal height.
1) Remove the central console cover.
2) Dismantle the connector from the brake lamp switch.
3) Release the brake lamp switch locking nut and dismantle the brake lamp switch.
4) Release the locking nut of U connector.
5) Rotate the push rod of pedal, and adjust the pedal height.
6) Screw down the locking nut of the push rod. Tightening torque: 26N·m.
7) Install the brake lamp switch.
8) Insert the connector of brake lamp switch.
9) Push down the brake pedal for 5-15mm, and then turn the brake lamp switch until the lamp goes out. Then lock the nut.
10) After installation, step down the brake pedal for 5-15 mm, and then check if the lamp is lighted (it should be lighted).
3. Check the free play of the pedal

1) Stop the engine, step down the pedal repeatedly until there is no vacuum in booster.
2) Step down the pedal until resistance is felt. Measure the distance shown in Fig. 2-44. Free play of pedal: 1-6mm. In case of clearance out of specifications, check the clearance of the brake lamp switch. In case of an incorrect clearance, diagnose the brake system. Brake lamp clearance: 0.5-2.4mm.

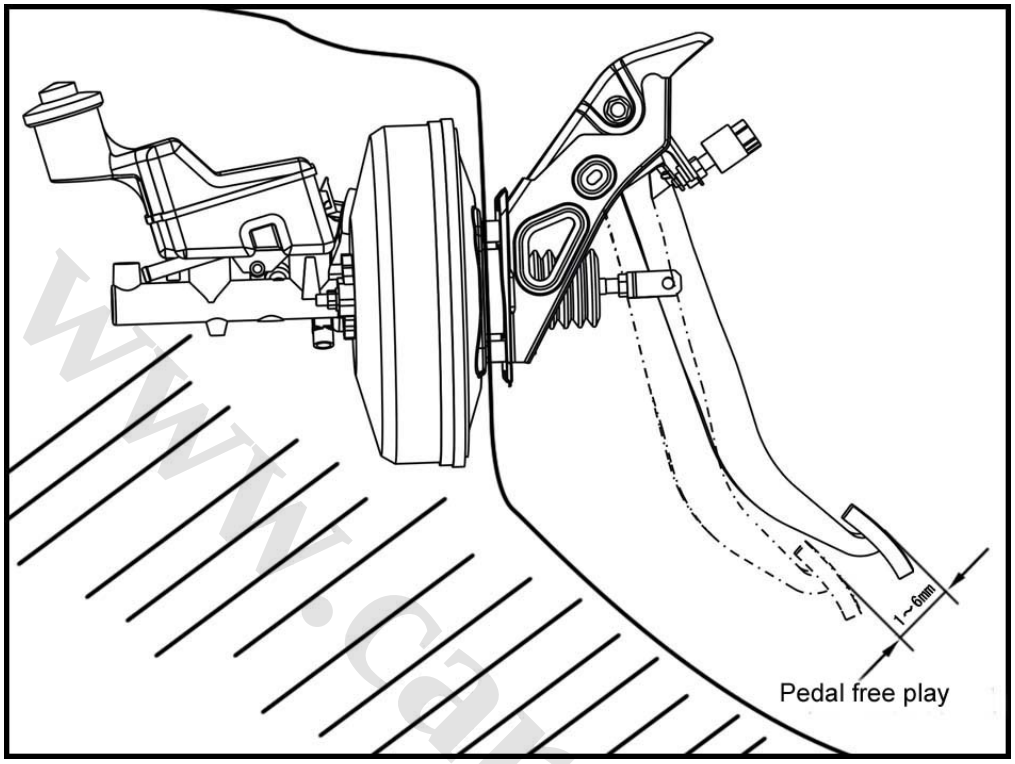


Fig. 2-44

4. Check the braking distance. Fig. 2-45.
Loosen the push rod of the parking brake. When the engine runs, step down the pedal. Measure the braking distance as shown in Fig. 2-45. Step down the pedal by a force of 140N. The braking distance should be over 55mm above the floor. In case of a distance out of specifications, diagnose the brake system.

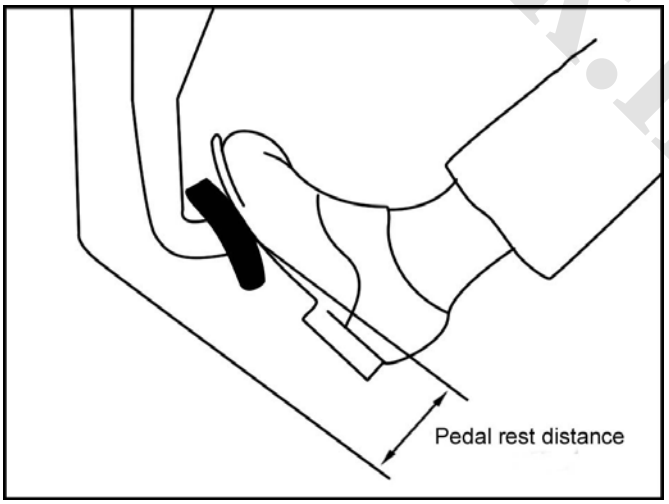


Fig. 2-45

5. Removal and installation. See Fig. 2-46.

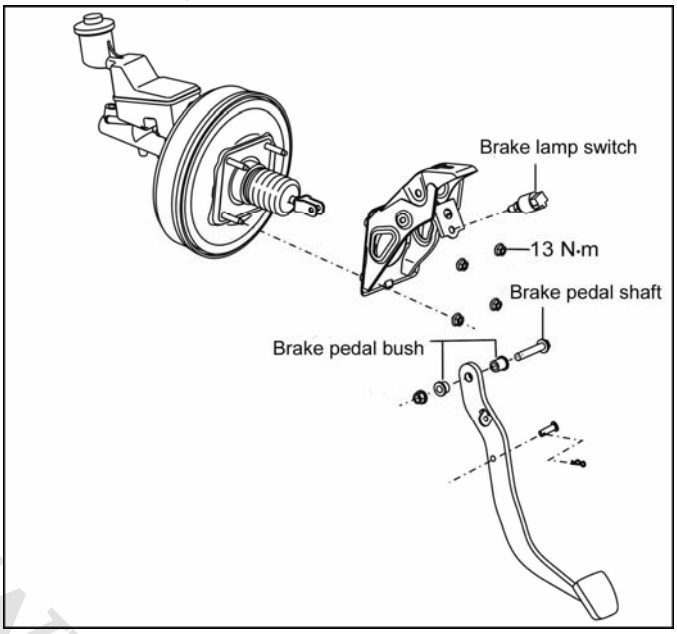


Fig. 2-46

(1) Removal

1) Remove the components of instrument cluster.

2) Disconnect the U connector of the push rod of brake master pump. Dismantle the clip and push rod pin, and disconnect the brake master pump from the brake pedal.

3) Remove the brake pedal support.

① Remove the bolts from the brake pedal support. See Fig. 2-47.

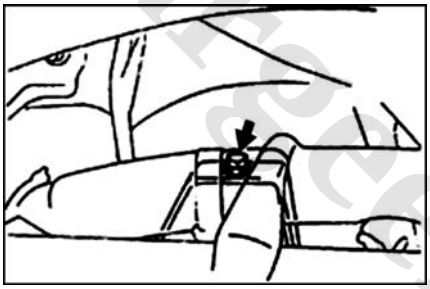


Fig. 2-47

② Disconnect the connector of the brake lamp.

③ Remove 4 nuts and the brake pedal support. See Fig. 2-48.

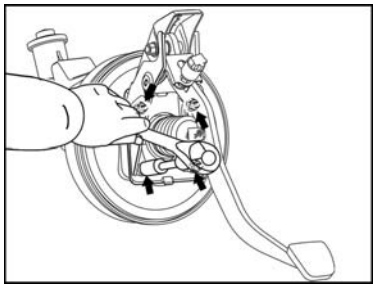


Fig. 2-48

4) Remove the brake pedal assembly.

① Remove the bolts and nuts from the brake pedal support.

② Remove the brake pedal and 2 bushes.

5) Remove the brake lamp components.
① Release the brake lamp switch and locking nuts.
② Remove the brake lamp switch from the brake pedal support.
6） Remove the pad of brake pedal from the brake pedal.
(2) Installation
1) Install the brake pedal pad on the pedal.
2) Install the brake lamp components on the brake pedal.
3) Install the brake pedal.
① Smear lithium base glycol grease on the head face and side on the 2 new bushes.
② Install the brake pedal and 2 bushes onto the brake pedal support by bolts and nuts. Tightening torque: 37N·m.
4) Install the brake pedal support.
① Install the brake pedal support by 4 nuts. Tightening torque: 13N·m.
② Connect the connector of brake lamp switch.
③ Encase the bolts into the brake pedal support. Tightening torque: 20N·m.
5) Connect the U connector of push rod of the brake master pump.
① Smear lithium base glycol grease on the push rod pin.
② Connect the clip of push rod pin to the push rod of brake master pump.
6) Install the instrument cluster components.
7) Check and adjust the height of the brake pedal.
8) Check the free play of the brake pedal.
9) Check the braking distance of the brake pedal. After assembly, check and adjust the height, free play and braking distance of the brake pedal.
iii. Inspection of brake master pump and vacuum booster
On-vehicle inspection
1. Inspect the vacuum booster
1) Check the air tightness. See Fig. 2-49.

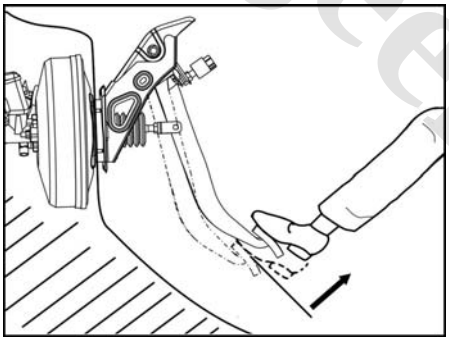


Fig. 2-49

① Start the engine and then stop it after 1-2 min, and slowly step down the pedal for several times.
Note: It proves good air tightness in case that the pedal drops greatly at the first trample rises gradually after the second or third trample.
② When the engine is running, step down the brake pedal and then stop the engine. Note: It proves good air tightness if the braking distance has no change at 30s after the pedal is stepped down.
2) Operation Inspection.
① When the ignition switch is at position OFF, step down the pedal for times, and then check if the

braking distance is changed.

② Step down the pedal and start the engine. Note: The operation is normal if the pedal drops slightly.

2. Check the vacuum one-way valve.

1) Glide the clip and disconnect the vacuum pipe.

2) Remove the vacuum one-way valve.

3) Check if the way from the booster to engine is ventilated.

4) Replace the vacuum one-way valve in case of a fault.

3. Check if there is brake fluid leakage outside the brake master pump.

4. After the engine stops, step down the pedal for times and keep brake force. Check if the pedal falls and if there is pressure leakage inside the brake master pump. Replace the brake master pump in case of a fault.

iv. Inspection of driving brake

1. Inspection of the front brake gear

(1) Removal

1) Remove the front wheel.

2) Discharge the brake fluid. Note: Do not splash the brake fluid on the paint, otherwise clean it immediately.

3) Remove the front disc brake caliper.

① Remove the connector bolts and washer from the front disc brake caliper, and then disconnect the hose. See Fig. 2-50.

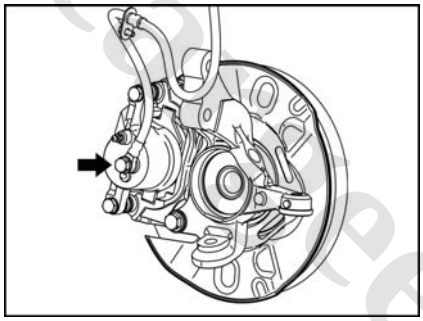


Fig. 2-50

② Remove the 2 bolts after securing the sliding pin of the slave cylinder of front disc brake. See Fig. 2-51.

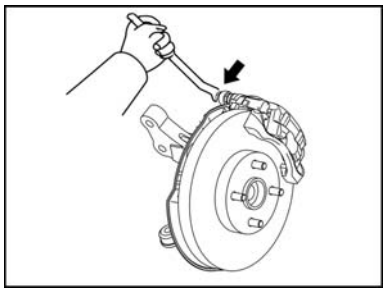


Fig. 2-51

4) Remove the front brake pad suite.

① Remove the 2 brake pads with silencer pads.

② Remove No.1 and No. 2 silencer pads from each brake pad.

5) Remove the front brake pad holding piece. Remove the 2 lining pads from the support of the

brake master pump.

6) Remove the sliding pin of the slave cylinder of front disc brake. Remove the sliding pin from the support of the disc brake master pump.

7) Remove the dustproof cover of the front disc sliding pin. Remove the 2 dustproof cover from the support of the slave cylinder of front disc brake. See Fig. 2-52.

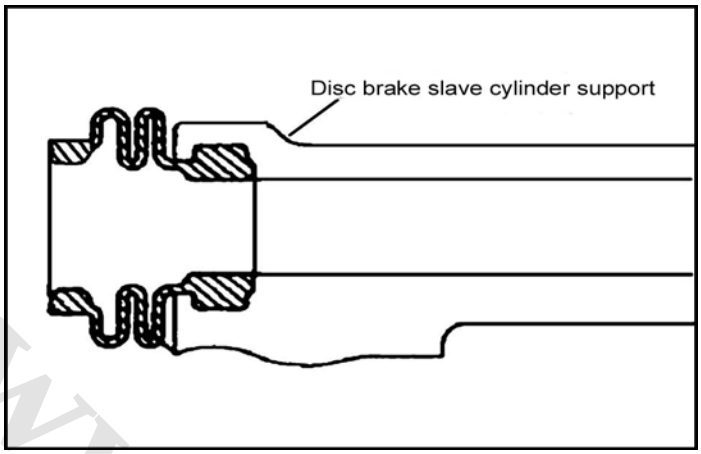


Fig. 2-52

8) Remove the support of slave cylinder of left front disc brake. Take off the support after removing the 2 bolts.

9) Remove the dustproof cover of the brake slave cylinder. Remove the fixing ring and dustproof cover by a screwdriver. See Fig. 2-53.

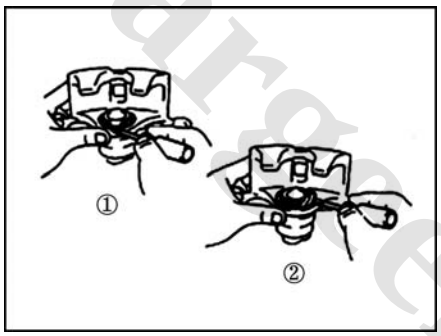


Fig. 2-53

Note: Do not splash the brake fluid.

10) Remove the air discharging bolt of the front disc brake gear.

11) Remove the piston in the slave cylinder of front brake.

① Place a cloth or equivalent between the slave cylinder and piston.

② Blow out the piston from the slave cylinder by compressed air. See Fig. 2-54. Note: Do not put your hand before the piston when blowing the compressed air.

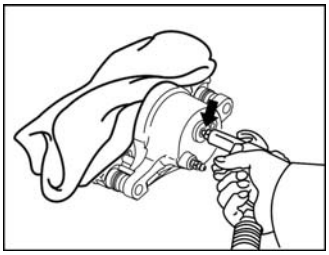


Fig. 2-54

12) Remove the oil seal of piston. Take out the oil seal from the brake slave cylinder by a screwdriver. See Fig. 2-55.

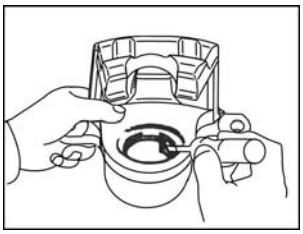


Fig. 2-55

(2) Inspection

1) Inspect eh brake slave cylinder and piston. Check if the piston is rusty or scratched.

2) Check the lining thickness of the brake pad. Measure the thickness by a ruler. See Fig. 2-56. Standard thickness: 11.0mm; min thickness: 1.0mm.

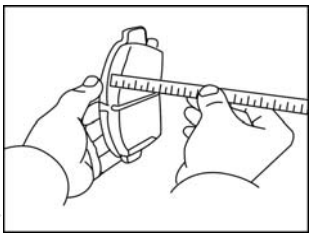


Fig. 2-56

3) Check the sheet steel of the front brake wear indicator. Make sure that the sheet steel is sufficiently flexible and free of rust, dirt and other foreign material, and has no crack or wear.

4) Check the thickness of the brake disc. Measure the thickness of the brake disc by a micrometer caliper. Standard: 25.0mm; min: 23.0mm.

5) Take off the front brake disc.

① Mark on the brake disc and wheel hub.

② Take off the brake disc.

6) Install brake disc. Note: Install it through the part with min thickness.

7) Check the brake disc swaying.

① Temporarily tighten the brake disc. Tightening torque: 103N·m.

② Measure the swaying of brake disc at 10mm away from the outer edge of brake disc by a dial indicator. See Fig. 2-57. Max: 0.05mm.

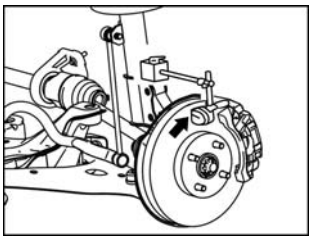


Fig. 2-57

③ In case that the swaying of brake disc reaches or exceeds the limit, check the axial clearance of the bearing and the swaying of wheel hub. If both bearing and hub are normal, adjust the swaying of brake disc.

(3) Installation

1) Temporarily screw down the air discharging bolt on the front brake slave cylinder.

2) Install the oil seal of piston.

① Smear the lithium base glycol grease on the new oil seal of the piston.

② Insert the new oil seal into the brake slave cylinder.

3) Install brake piston.

① Smear the lithium base glycol grease on the brake piston.

② Install the piston into the front disc brake slave cylinder.

Note: Do not forcibly spin the piston into the brake slave cylinder.

4) Install the dustproof cover of brake slave cylinder.

① Smear the lithium base glycol grease on the dustproof cover of the new brake slave cylinder, and install it into the brake pump. Note: Install the dustproof cover into the groove between the slave cylinder and piston.

② Install the retaining ring by a screwdriver. Note: Do not damage the dustproof cover of the slave cylinder.

5) Install the support of left front brake slave cylinder. Tighten the support by 2 bolts. Tightening torque: 88N·m.

6) Install the dustproof cover of the front disc brake bush.

① Smear the lithium base glycol grease on the surface of 2 new dustproof covers.

② Install the 2 dustproof covers into the support of front disc brake slave cylinder.

7) Install the sliding pin of the front disc brake slave cylinder.

① Smear the lithium base glycol grease on the sliding part of the 2 sliding pins and the surface of oil seal.

② Install the 2 sliding pins into the support of the front disc brake slave cylinder.

8) Install the components of brake pad.

Note: The silencer pad must be replaced at the same time while the wear brake pad is replaced.

① Smear grease for disc brake on the two sides of each silencer pad. See Fig. 2-58.

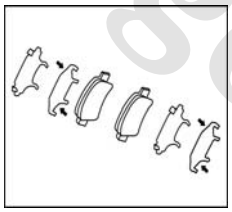


Fig. 2-58

② Install silencer pad on each brake pad.

③ The wear indicator is upwards. Install the inside brake pad, and then the outside.

Note: The friction surface between the brake pad and the brake disc should be free of engine oil or grease.

9) Install the front disc brake slave cylinder.

① Install the front disc brake slave cylinder by 2 bolts. See Fig. 2-59. Tightening torque: 34N·m.

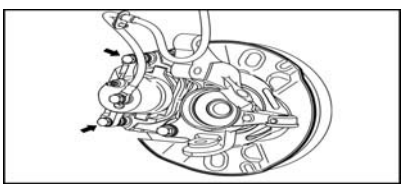


Fig. 2-59

② Install the new washer and hose by joint bolt. Tightening torque: 30N·m. Note: Secure the hose tightly in the locking hole of the brake slave cylinder.

10) Discharge the air in the brake slave cylinder.

11) Discharge the air in the brake pipeline.

12) Check if there is brake fluid leakage.

13) Install the front wheel. Tightening torque: 103N·m.

2. Inspection of rear brake gear

Disassembly Diagram of rear brake gear components.

See Fig. 2-60.

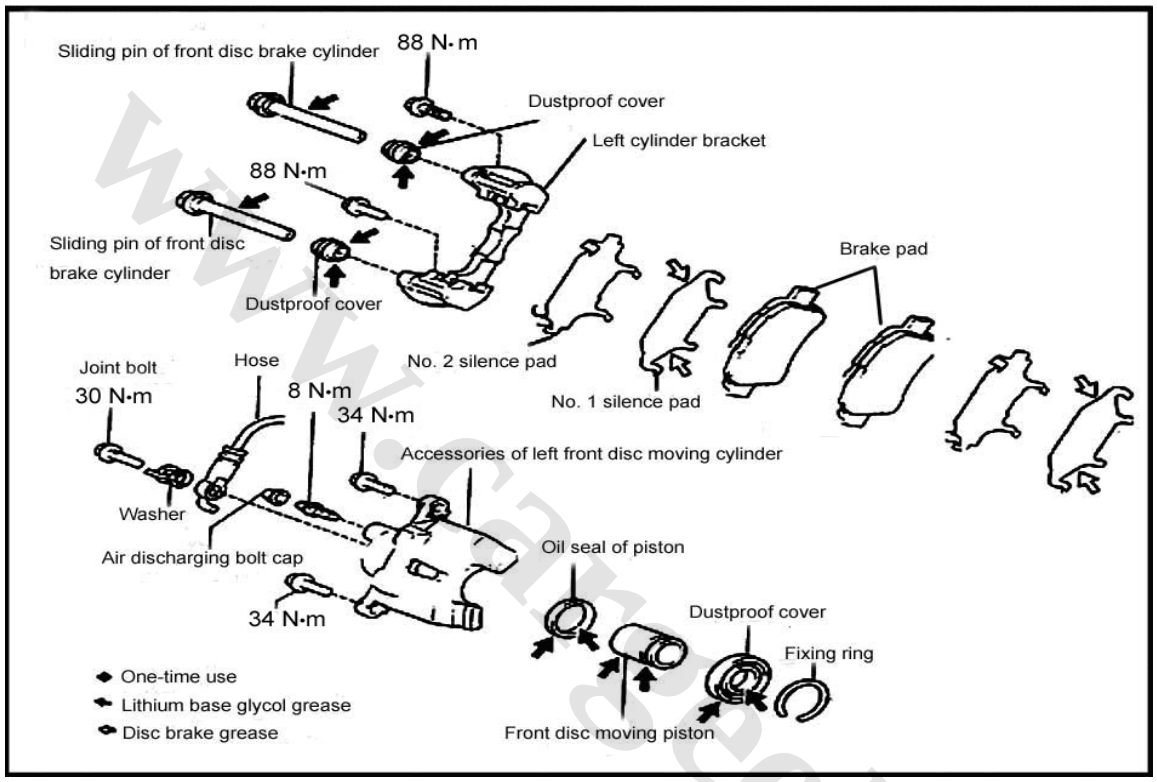


Fig. 2-60

(1) Disassembly

1) Remove the rear wheel.

2) Discharge the brake fluid.

Note: Do not splash the brake fluid on the paint, otherwise wash it immediately.

3) Dismantle the slave cylinder of the rear disc brake.

① Remove the joint bolt and washer from the slave cylinder of the rear disc brake, and then disconnect the hose. See Fig. 2-61.

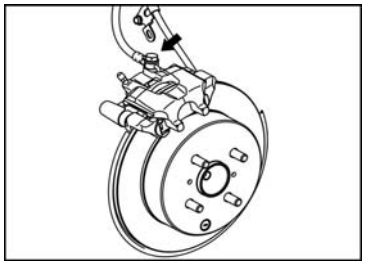


Fig. 2-61

② Dismantle the 2 bolts after securing the sliding pin of the slave cylinder of the rear disc brake. See Fig. 2-62.

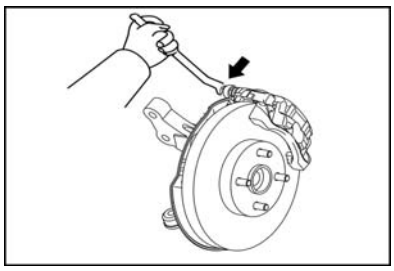


Fig. 2-62

4) Dismantle the rear brake pad suite.

① Dismantle the brake pad with 2 silencer pads.

② Dismantle No. 1 and No. 2 silence pad from each brake pad.

5) Dismantle the rear brake pad holding piece. Remove the 2 friction pads from the support of the brake master pump.

6) Remove the sliding pin of the slave cylinder of the rear disc brake. Remove the sliding pin from the support of the disc brake master pump.

7) Dismantle the dustproof cover of the rear brake sliding pin. Remove the 2 dustproof covers from the support of the rear disc brake slave cylinder. See Fig. 2-63.

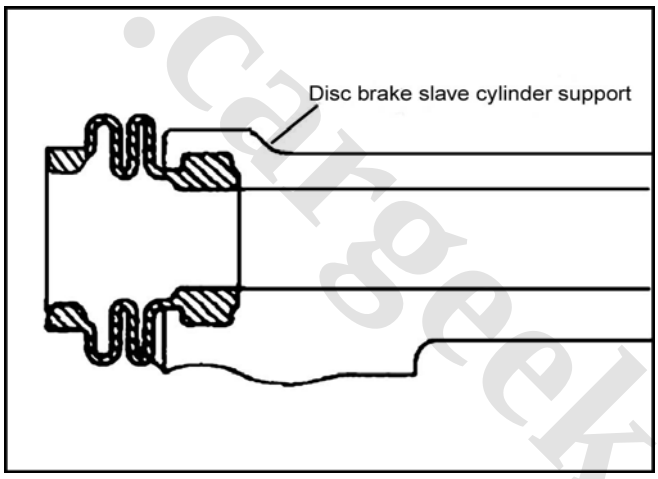


Fig. 2-63

8) Dismantle the left rear disc brake slave cylinder support. Remove the 2 bolts and then take off the support.

9) Dismantle the dustproof cover of the brake slave cylinder. Remove the fixing ring and dustproof cover by a screwdriver. See Fig. 2-64.

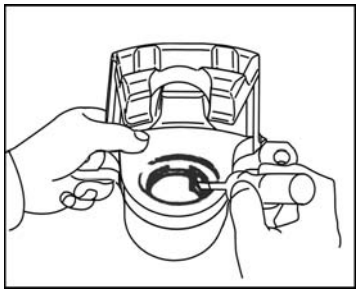


Fig. 2-64

10) Dismantle the air discharging bolt of the rear disc brake gear.

11) Dismantle the piston of the rear brake slave cylinder.

① Place a cloth or equivalent between the slave cylinder and piston.

② Blow out the piston from the brake slave cylinder by compressed air. See Fig. 2-65.

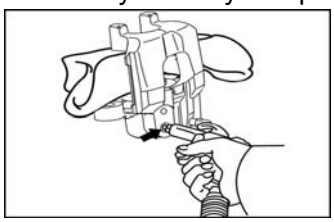


Fig. 2-65

Note: Do not put your hand before the piston when blowing the compressed air. Do not splash the brake fluid.

12) Remove the oil seal of piston. Take out the oil seal from the slave cylinder. See Fig. 2-66.

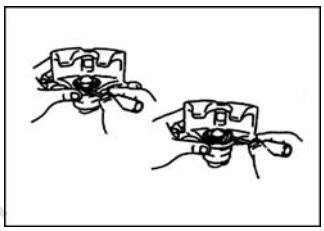


Fig. 2-66

(2) Inspection

1) Check the slave cylinder and piston. Check if the piston is rusty or scratched.

2) Check the thickness of the lining of brake pad. Measure the thickness by a ruler. See Fig. 2-67. Standard: 10.0mm; min: 1.0mm.

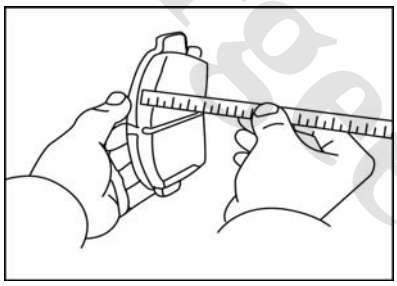


Fig. 2-67

3) Check the sheet steel of the front brake wear indicator. Make sure that the sheet steel is enough flexible and free of rust, dirt and other foreign material, and has no crack or wear.

4) Check the thickness of the brake disc. Measure the thickness of the brake disc by a micrometer screw. Standard: 9.0mm; min: 8.0mm.

5) Take off the rear brake disc.

① Mark on the brake disc and wheel hub.

② Take off the brake disc.

6) Install brake disc. Note: Install it through the part with min thickness.

7) Check the brake disc swaying.

① Temporarily tighten the brake disc. Tightening torque: 103N·m.

② Measure the swaying of brake disc at 10mm away from the outer edge of brake disc by a dial indicator. See Fig. 2-68. Max: 0.05mm.

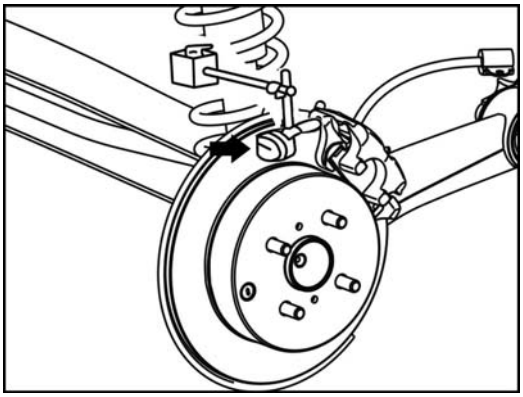


Fig.2-68

③ In case that the swaying of brake disc reaches or exceeds the limit, check the axial clearance of the bearing and the swaying of wheel hub. If both bearing and hub are normal, adjust the swaying of brake disc.

(3) Installation

1) Temporarily screw down the air discharging bolt on the rear brake slave cylinder.

2) Install the oil seal of piston.

① Smear the lithium base glycol grease on the new oil seal of the piston.

② Insert the new oil seal into the brake slave cylinder.

3) Install brake piston.

① Smear the lithium base glycol grease on the brake piston.

② Install the piston into the front disc brake slave cylinder. Note: Do not forcibly spin the piston into the brake slave cylinder.

4) Install the dustproof cover of brake slave cylinder.

① Smear the lithium base glycol grease on the dustproof cover of the new brake slave cylinder, and install it into the brake pump. **Note:** Install the dustproof cover into the groove between the slave cylinder and piston.

② Install the retaining ring by a screwdriver. **Note:** Do not damage the dustproof cover of the slave cylinder.

5) Install the support of left rear brake slave cylinder. Tighten the support by 2 bolts. Tightening torque: 88N·m.

6) Install the dustproof cover of the rear disc brake bush.

① Smear the lithium base glycol grease on the surface of 2 new dustproof covers.

② Install the 2 dustproof covers into the support of front disc brake slave cylinder.

7) Install the sliding pin of the rear disc brake slave cylinder.

① Smear the lithium base glycol grease on the sliding part of the 2 sliding pins and the surface of oil seal.

② Install the 2 sliding pins into the support of the front disc brake slave cylinder.

8) Install the rear brake pad holding piece. Remove the 2 holding pieces from the rear disc brake slave cylinder support.

9) Install the components of brake pad. Note: The silencer pad must be replaced at the same time while the wear brake pad is replaced.

① Smear grease for disc brake on the two sides of each silencer pad. See Fig. 2-69.

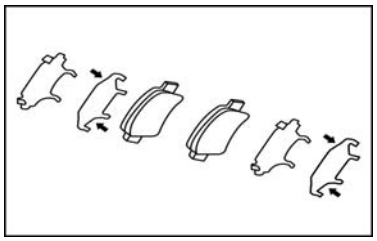


Fig. 2-69

② Install silencer pad on each brake pad.

③ The wear indicator is upwards. Install the inside brake pad, and then the outside.

Note: The friction surface between the brake pad and the brake disc should be free of engine oil or grease.

10) Install the rear disc brake slave cylinder.

① Install the rear disc brake slave cylinder by 2 bolts. See Fig. 2-70. Tightening torque: 34N·m.

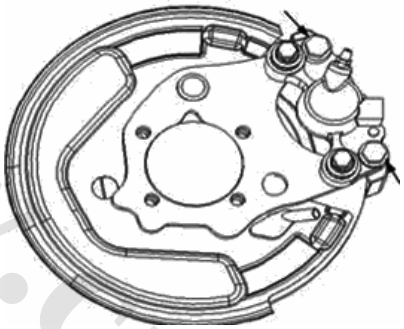


Fig. 2-70

② Install the new washer and hose by joint bolt. Tightening torque: 30N·m. **Note:** Secure the hose tightly in the locking hole of the brake slave cylinder.

11) Fill brake fluid into the reservoir.

12) Discharge the air in the brake slave cylinder.

13) Discharge the air in the brake pipeline.

14) Check the brake fluid level in reservoir.

15) Check if there is brake fluid leakage.

16) Install the rear wheel. Tightening torque: 103N·m.

v. Inspection of parking brake system

Parking system as shown in Fig. 2-71

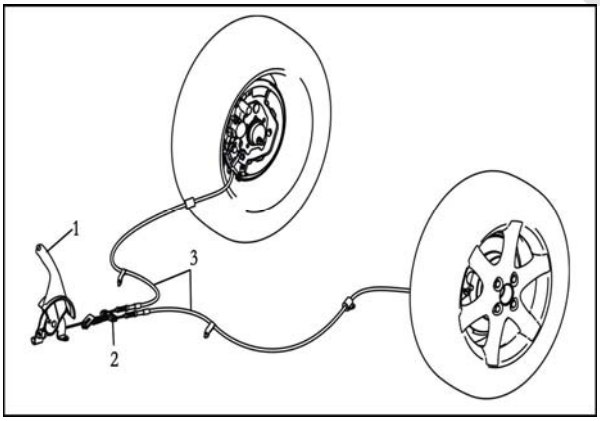


Fig. 2-71

1. Parking brake control lever assembly

2. Front and rear cables support
3. Parking brake cable

1. Fault elimination

Table 2-5

Fault	Possible Cause	Action
Inactive parking brake	1. Parking brake cable 2. Parking brake control	1. Check the parking cable and adjustment 2. Check the parking brake control
Unreleased parking brake	1. Parking brake cable 2. Parking brake control	2. Check the parking cable 2. Check the parking brake control
Blocked brake	1) Parking brake rod play (maladjusted)	Adjust it
	2) Parking brake cable (blocked)	Adjust it
	3) Parking brake shoe clearance (maladjusted)	Adjust it
	4) Parking brake lining (cracked or distorted)	Replace it if necessary
	5) Pull-back or tensioned spring (broken)	Replace it

Table 2-5 indicates the possible causes for faults. The figure indicates the sequence of the possible faults. Inspect all components in order and replace them if necessary.

2. Adjustment

(1) Remove the rear wheel.

(2) Adjust the brake shoe clearance.

(3) Install the rear wheel. Tightening torque: 103N·m.

(4) Check the parking brake rod play. Hold the rod and count the number of clicks. Parking brake rod play: 6-9 clicks under 200N force.

(5) Adjust the parking brake rod play. See Fig.2-72.

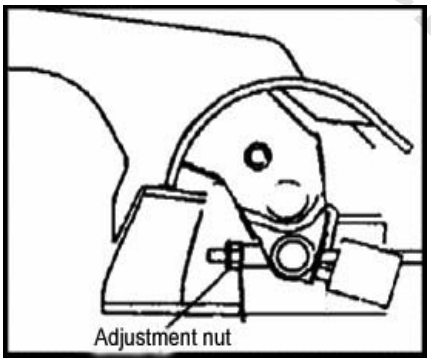


Fig. 2-72

1) Remove the glove box cover.

2) Rotate the No. 1 adjustment nut cable until the pulling rod play is normal.

3) Install the glove box cover.

3. Accessories of parking brake rod

Disassembly of parts and components as shown in Fig. 2-73

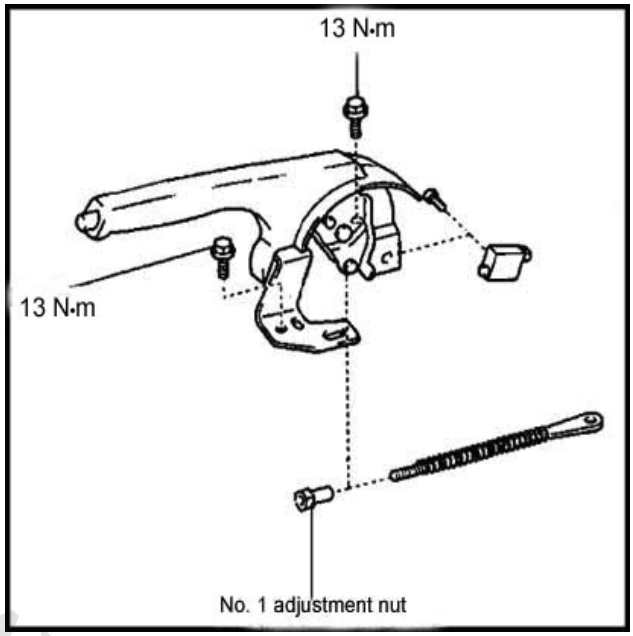


Fig. 2-73

(1) Removal

1) Remove the trim strip of the instrument cluster and air conditioning control panel as shown in Fig. 2-74.

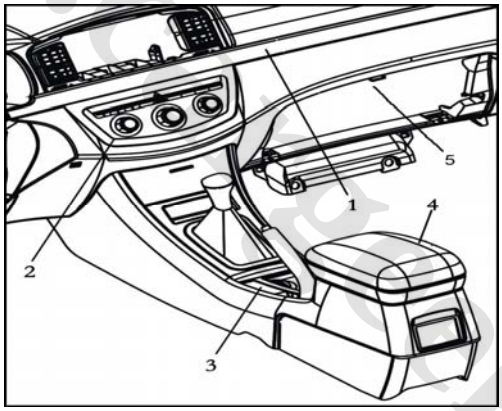


Fig. 2-74

1. Trim strip of the instrument cluster
2. Air conditioning control panel
3. Bolt
4. Hand brake cover
5. Auxiliary fascia console sundries box

2) Remove the two bolts of the fixed fascia console and auxiliary fascia console beneath the position of the air conditioning control panel.

3) Remove bolt 3 (both left and right).

4) Dismantle the floor brake cover.

5) Open the auxiliary fascia console sundries box cover, and dismantle the two bolts at the bottom.

6) Remove the lead of No. 1 adjustment nut.

7) Remove the accessories of the parking brake rod as shown in Fig. 2-75.

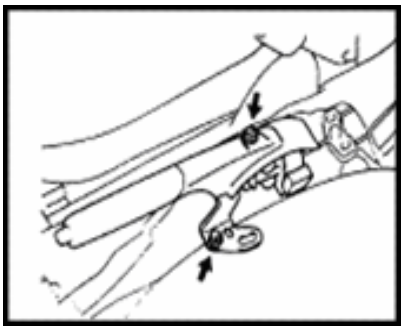


Fig. 2-75

① Dismantle the connector of the parking brake rod switch.

② Take off the parking brake rod after removing the 2 bolts.

8) Dismantle the parking brake switch components. Remove the bolts and parking brake switch components.

(2) Installation

1) Install the parking brake switch components.

2) Install the parking brake switch components by bolts.

① Install the parking brake cable onto the rod and install the lead of No. 1 adjustment nut.

② Tighten the parking brake rod by 2 bolts. Tightening torque: 13N·m.

③ Connect the connector of parking brake switch.

3) Open the auxiliary fascia console sundries box cover, and dismantle the two bolts at the bottom.

4) Dismantle the floor brake cover.

5) Remove and replace bolt 3 (both left and right).

6) Install the two bolts of the fixed fascia console and auxiliary fascia console beneath the air conditioning control panel.

7) Install the trim strip of the instrument cluster and air conditioning control panel.

8) Check the parking brake rod play.

9) Adjust the parking brake rod play.

4. Accessories of parking brake rod

Disassembly of parts and components (as shown in Fig. 2-76)

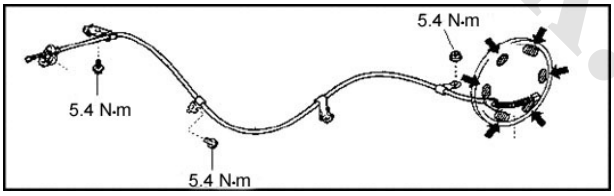


Fig. 2-76

(1) Removal

Remove the No. 2 parking brake cable components by the same way with the right side.

1) Remove the trim strip of the instrument cluster and air conditioning control panel.

2) Remove the two bolts of the fixed fascia console and auxiliary fascia console beneath the position of the air conditioning control panel.

3) Remove and replace the bolt 3 (both left and right)

4) Remove the floor brake cover.

5) Open the auxiliary fascia console sundries box cover, and dismantle the two bolts at the bottom.

6) Remove the No. 1 adjustment nut lead.
7) Remove the accessories of the parking brake rod as shown in Fig. 2-76.
① Dismantle the connector of the parking brake rod switch.
② Take off the parking brake rod after removing the 2 bolts.
8) Dismantle the parking brake switch components. Remove the bolts and parking brake switch components.
9) Dismantle the components of the front exhaust pipe.
10) Dismantle the No. 2 front floor heat-insulating pad. Remove the 2 bolts and take off the front floor hear-insulating pad.
11) Disassemble the No. 3 parking brake cable components.
① Remove the No. 3 parking brake cable from the vehicle body after removing the 4 bolts.
② Remove the cable components after disconnecting the components of No. 3 parking brake cable from the parking brake balancer.
12) Remove the rear wheel.
13) Remove the accessories of the brake disc.
14) Remove the front brake shoe.
15) Remove the left rear self-adjusting rod.
16) Remove the rear brake shoe.
17) Remove the components of No. 3 parking brake cable. Disconnect the components of No. 3 parking brake cable from the soleplate after removing the bolts, as shown in Fig. 2-77.

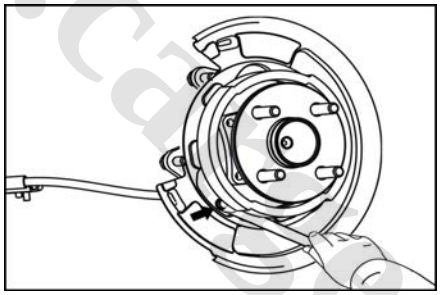


Fig. 2-77

(2) Installation
1) Install components of No. 3 parking brake cable, as shown in Fig. 2-78.

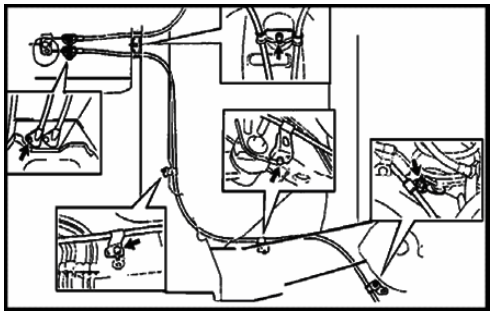


Fig. 2-78

① Connect the components of No. 3 parking brake cable to the balancer.
② Tighten the No. 3 parking brake cable by 4 bolts. Tightening torque: 5.4N·m.
2) Install the components of No. 3 parking brake cable. Tighten the components of No. 3 parking

brake cable to the soleplate by bolts. Tightening torque: 7.8N·m.
3) Smear the heat-resistant grease.
4) Install the brake shoe.
5) Install the pull-back spring of brake shoe.
6) Install the self-adjusting rod of LR brake.
7) Install the front brake shoe.
8) Inspect the installation of brake disc.
9) Install the accessories of brake disc.
10) Adjust the brake shoe clearance.
11) Install the rear wheel. Tightening torque: 103N·m.
12) Temporarily tighten the adjustment nut lead.
13) Install the No. 2 front floor heat-insulating pad. Tighten the No. 2 front floor heat-insulating pad by 2 bolts. Tightening torque: 5.5N·m.
14) Install the components of the front exhaust pipe.
15) Install the front floor rod by 2 bolts.
16) Check the parking brake rod play.
17) Adjust the parking brake rod play.
18) Check if there is air leakage.
19) Install the accessories of auxiliary fascia console sundries box.
20) Install floor shift lever components.
21) Install the auxiliary fascia console.
22) Install the accessories of the auxiliary fascia console.

Section IV Fuel System

I. Removal and Installation

1. Operation before removal

① Suck the fuel

② Avoid fuel flowing to the floor

③ Remove the secondary muffler

2. Operation after installation

① Fill fuel

② Confirm if there is fuel leakage

③ Install the secondary muffler

3 .Removal procedures as shown in Fig. 2-79

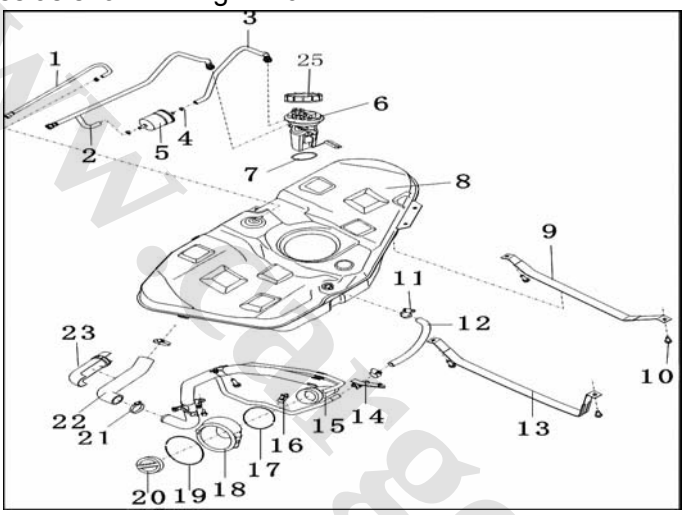


Fig. 2-79

1. Components of hose connecting fuel tank and canister
2. Components of fuel tank return pipe
3. Components of fuel tank/filter hose
4. Steel band type flexible ring clamps
5. Fuel filter
6. Fuel pump assembly
7. Oil pump seal
8. Fuel tank assembly
9. Components of right fixing strap of fuel tank
10. Hex bolt with flat washer (40N·m)
11. B-type worm-driven hoop
12. Oil return hose
13. Components of left fixing strap of fuel tank
14. Air return tube mount B
15. Upper components of filler tube
16. Air return tube mount A
17. Snap spring under the oil filler shield
18. Oil filler shield
19. Snap spring above the oil filler shield
20. Components of oil filler cap
21. B-type worm-driven hoop
22. Lower section of filler tube
23. Filler tube lower shield

4. Notes for fuel tank removal

(1) Raise the vehicle by a lifter. Assistant support should be provided when supporting/raising the fuel tank by a jack to avoid the fuel tank turning over.

(2) Do not attempt to repair a certain section of the rubber tube, but replace the entire tube instead.

(3) Cover the accessory and block the hole when the fuel system works to avoid dust and other dirties entering the fuel system from open pipeline or entries.
(4) Take care to keep all components of fuel system clean.

Note:

(1) Reinstall the 4 M10 fixing bolts used for fuel tank, and tighten them by a tightening torque of 40N·m.
(2) Tighten all the clips and replace them if necessary.
(3) Check and conform all hoses are not circled or damaged during removal and installation.
(4) Open the ignition switch for 2s, and then close it for 10s. Then open it again and check if there is oil leakage.

II. Electric Fuel Pump

1. Replacement of fuel filter

Removal of fuel filter

(1) Release the pressure of fuel system.
(2) Discharge the extra fuel into a suitable container.
(3) Dismantle the oil pipelines at the two sides of the fuel filter. Fig. 2-80 shows a fuel filter after removal.

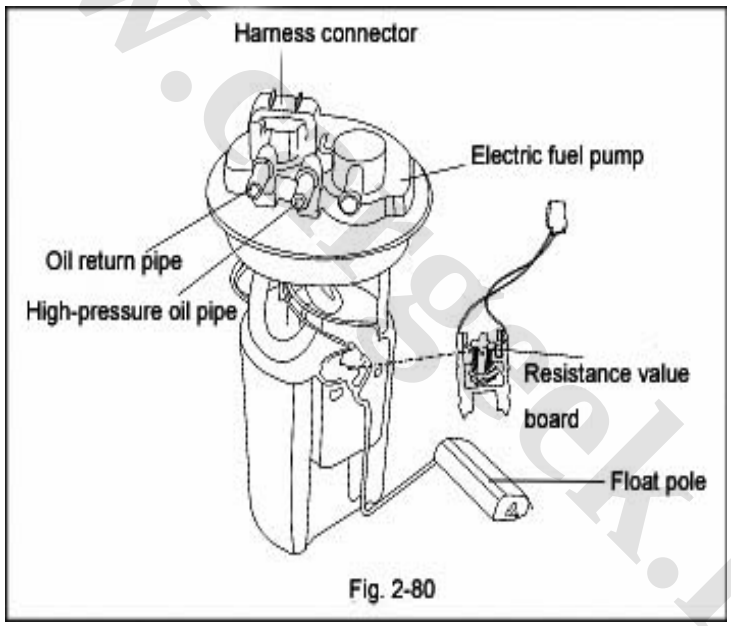


Fig. 2-80

2. Installation of fuel filter

(1) Remove the shield of the new fuel filter.
(2) Connect the fuel hoses at the two ends of the fuel filter.
(3) Screw down the cap of oil filling pipe of the fuel tank.
(4) Reconnect the battery negative pole cable.
(5) Open the ignition switch for 2s, and then close it for 10s. Then open it again and check if there is fuel leakage.

Note:

After the high pressure pipe is connected, pull it in negative direction and check if it has been connected and if there is an about 3mm clearance.

Section V Engine Cooling System

Warning:

Do not open the cover of radiator or loose the bolt for drainage when the engine runs or the radiator is too hot, to avoid serious hurt caused by the boiling coolant and steam. Besides, the engine and cooling system may also be damaged. Stop the engine and wait till it is cool. Otherwise, extra care should be taken when you open the cover. Place a thick cloth on the cover, and rotate it counterclockwise slowly and repeat this operation until the pressure is discharged. When you ensure there is no pressure, press down the radiator cover by the cloth and then open it.

I. Maintenance Standards Details

Maintenance standards value refers to the standard valve opening pressure of the radiator cover: 74-103kpa. Limit: 64kpa.

II. Coolant

The coolant is antifreezer G11 with 8.5 L capacity.

III. On-vehicle Maintenance as Shown in Fig. 2-81.

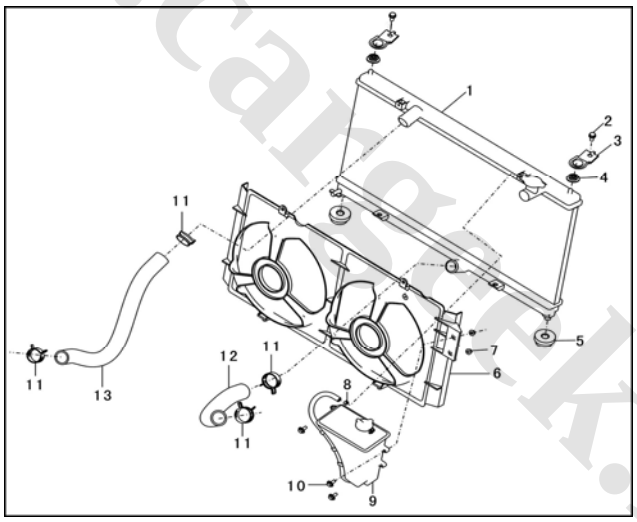


Fig. 2-81

1. Radiator assembly 2. Hex bolt with flat washer 3. Upper installation support 4. Upper installation bush 5. Lower installation bush 6. Electric fan with a fan cowl 7. Hexagon flange nut 8. Steel band type flexible ring clamps 9. Fuel tank assembly with overflow pipe 10. Bolts with flat washer 11. B-type worm-driven hose hoop 12. Radiator water outlet pipe 13. Radiator water inlet pipe

1. Inspection of the valve opening pressure of the radiator cover

Standard: 74-103kPa

Limit: 64kPa

2. Inspection of coolant

(1) Check if the coolant level is between “F” and “L”;

(2) Check if the coolant is mixed with engine oil.

3. Replacement of coolant

(1) Dismantle the bolt for drainage and radiator cover in order. Discharge the coolant in the radiator, warm air blower and engine;

(2) Dismantle the drain valve of the cylinder body, and discharge the coolant in the water-cooled jacket;

(3) Dismantle the coolant reservoir and discharge the coolant;

(4) After the coolant is discharged, fill water from the radiator cover and clean the coolant pipeline;

(5) Screw down the drain valve of the cylinder body by a specified tightening torque: 40±5N·m.

(6) Confirm that the drain bolt of radiator has been screwed down;

(7) Install coolant reservoir;

(8) Fill the coolant to the radiator opening, and fill coolant into the reservoir to level “F”;

Coolant: antifreezer G11. Total capacity: 8.5L

(9) Install the radiator cover;

(10) Start the engine and warm it up till the thermostat is opened;

(11) Stop the engine after it runs at a high speed for several times;

(12) When the engine is cool, remove the radiator cover, and then fill the coolant to the water filler of the radiator. The coolant in reservoir should also reach level “F”.

IV. Water Pump

1. Removal and installation

(1) Clean the foreign materials on the gasket by a scraper or a wire brush.

(2) Operation after installation and before removal:

① Discharge and filling of coolant. Smear sealant smoothly. It is not needed at some place.

② Removal and installation of timing belt cover.

(3) Install the water pump when the sealant is still damp.

Notes for installation:

2. Installation of water pump

V. Water Inlet and Outlet Hose

1. Operation after installation and before removal

(1) Discharge and filling of coolant (refer to related details in this chapter).

(2) Removal and installation of engine cover (refer to related details in this chapter).

(3) Removal and installation of lower housing plate.

(4) Removal and installation of battery and the bracket. To disassemble according to Fig. 2-81.

2. Notes for removal

(1) Disconnect the water inlet pipe and outlet pipe. Make alignment marks on the inlet and outlet pipes of the radiator.

(2) Removal of water inlet pipe. Remove the installation bolt of the pressurizer tank resonator and stagger the pressurizer tank resonator.

3. Notes for installation

(1) Firstly moisten the outer and inside installation surface of O ring, and then insert them.

(2) Installation of thermostat assembly (refer to details about engine)

1) Clean the foreign material on the gasket by a scraper or a wire brush.

2) Smear the specified sealant evenly. Sealant and sealing is not need at some place.
3) Install the thermostat when the sealant is still damp (within 15 min).
(3) Connection of radiator water outlet and inlet pipes
1) Insert the water outlet and inlet pipes into the connectors or projected part of the drain pipe connector.
2) Install according to the alignment mark on the water inlet pipe and clamp.

VI. Radiator

Removal and installation of radiator
(1) Operation before removal
Discharge the coolant
1) Remove the bolt for drainage and the cover of radiator in order, and then discharge the coolant in the radiator, warm air blower and engine;
2) Dismantle the drain valve of the cylinder body, and discharge the coolant in the water-cooled jacket;
3) Dismantle the coolant reservoir and discharge the coolant;
4) After the coolant is discharged, fill water from the radiator cover and clean the coolant pipeline;
5) Remove the lower housing plate;
6) Remove the air cleaner;
7) Remove the battery and bracket.
(2) Operation after removal:
1) Smear the specified sealant on the screw thread of the drain valve on the cylinder body.
Sealant: Clear out the old sealant before using the new one LT5699. Tightening torque: 40±5N·m
2) Confirm that the bolt for drainage of the radiator cover has been screwed down;
3) Install the coolant reservoir;
4) Fill the coolant to the radiator opening, and fill coolant into the reservoir to level “F”;
Coolant: ShellFreeze Guardd. Total capacity: 7L
5) Install the radiator cover;
6) Start the engine and warm it up till the thermostat is opened;
7) Stop the engine after it runs at a high speed for several times;
8) When the engine is cool, remove the radiator cover, and then fill the coolant to the water filler of the radiator. The coolant in reservoir should also reach level “F”.
9) ATF supplement and inspection;
10) Install the lower housing plate;
11) Install battery and bracket;
12) Install the air cleaner.
(3) Removal steps (Fig. 2-82)
Removal and installation of electronic fan assembly
Removal of water inlet and outlet pipes of radiator. Firstly make alignment marks on the inlet and outlet pipes and clamps of radiator.
Notes for installation:
Installation of radiator outlet pipe. Insert the hose into the radiator and the projected part of the engine according to the alignment mark on the pipe clamp of the radiator.

Section VI Intake and Exhaust System

I. Air Cleaner Assembly

Removal and installation (Fig. 2-82 shows the air cleaner assembly of sedan with TRITEC1.6L engine).

Note: The filter core is made from waste paper and resin. Notes for operation:

① Do not inflict severe collision and load after assembly and removal.

② The core should be well cooperated with the housing below the air cleaner during assembly.

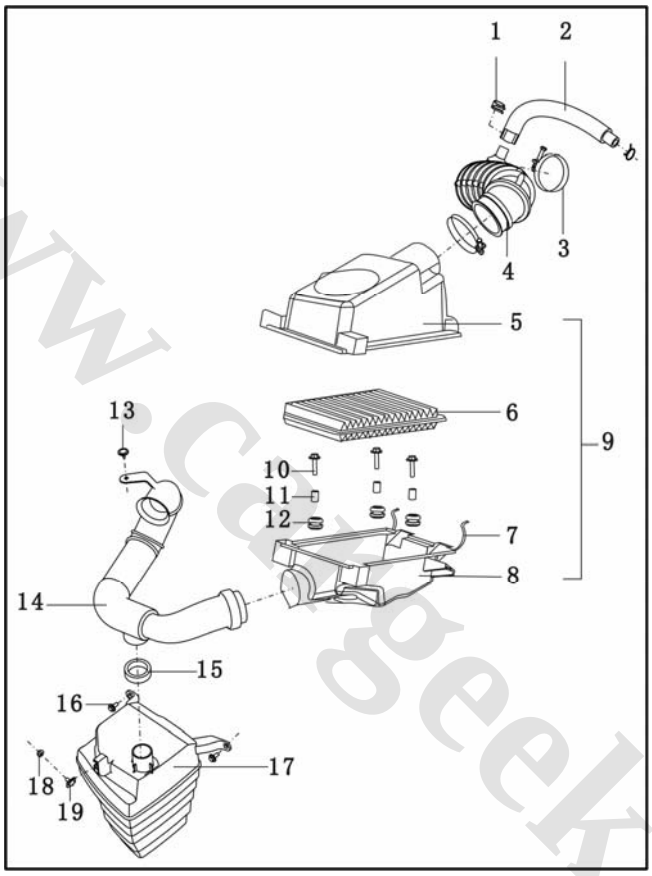


Fig. 2-82

1. Steel band type flexible ring clamps
2. Crankshaft ventiduct
3. B-type worm-driven hoop
4. Engine intake hose assembly
5. Air cleaner upper cover
6. Air cleaner filter core components
7. Spring clip
8. Air cleaner lower cover
9. Air cleaner assembly
10. Hexagon bolt with flat washer
11. Liner tube
12. Anti-vibration pad
13. Snap button
14. Air cleaner intake pipe assembly
15. Spongy cushion of cavity resonator
16. Hexagon flange bolt
17. Cavity resonator assembly
18. Hexagon flange nut
19. Bearing weldment bolt

II. Removal and Installation of Exhaust Pipe and Muffler

1. Removal and installation (Fig. 2-83 shows the exhaust system of the TRITEC1.6L engine)

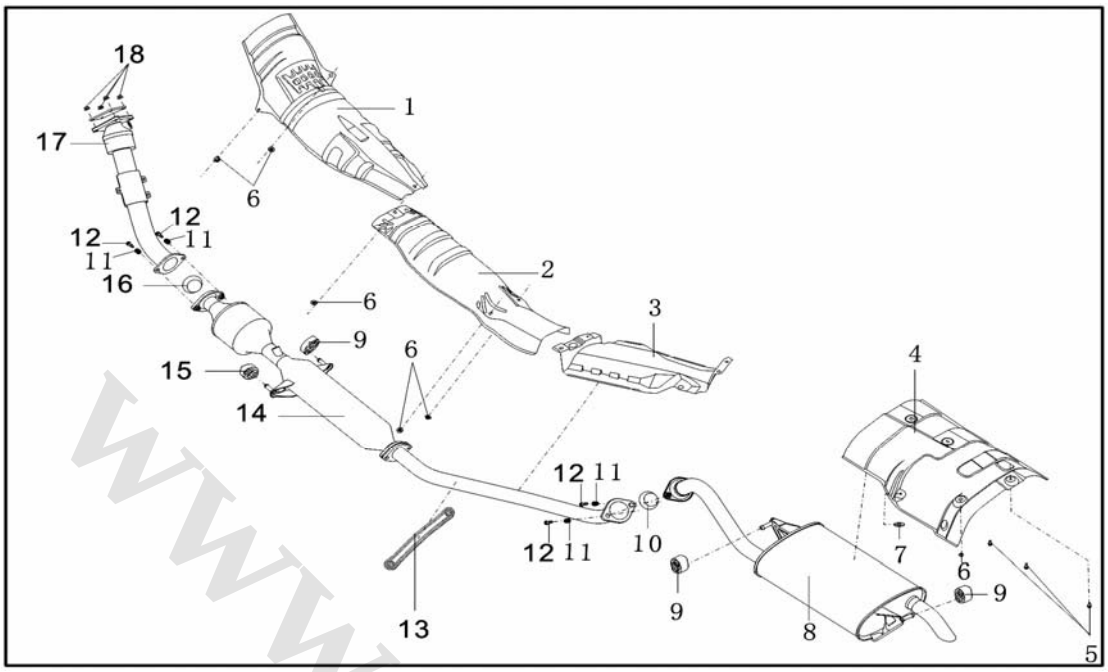


Fig. 2-83

1. Front floor lower heat-insulating pad of exhaust pipe
2. Dash panel lower heat-insulating pad of exhaust pipe
3. Lower heat-insulating pad 1 of exhaust pipe fuel tank
4. Right rear girder lower heat-insulating pad 1 of exhaust pipe
5. Hexagon bolt with flat washer
6. Hexagon nut with taper washer
7. Heat-insulating anti-vibration pad
8. Rear muffler assembly 1
9. Rear muffler rubber suspension block 2
10. Ball sealed pad 1
11. Compressed spring 2
12. Compressed spring bolt 2
13. Exhaust pipe anti-disconnection bracket 1
14. Exhaust pipe with pre-purifier assembly 1
15. Rubber suspension block
16. Ball sealed pad 1
17. Exhaust pipe assembly 1
18. Hexagon flange nut

1. Warning

Too hot engine and exhaust system may cause severe hurt. Stop the engine until the engine and exhaust system are cool. And then remove the exhaust system.

1) Disconnect the battery negative pole harness.
2) See Fig. 2-83 for removal order.
3) To install, reverse the removal procedure.

2. Inspection

Start the engine and check if there is leakage in the components of the exhaust system assemblies. In case of a leakage, repair or replace it as necessary.

Check all components or assemblies. In case of open weld or damage, replace it if necessary.

Chapter III ABS

Section I Function and Composition of ABS

I. Function of ABS

① To improve stability of the vehicle;
② To ensure steering performance of the vehicle;
③ To guarantee shortest braking distance.

II. ABS Composition (in Fig. 3-1)

The ABS of LF620 sedan is composed of electronic control unit, hydraulic control unit, sensor and motor.

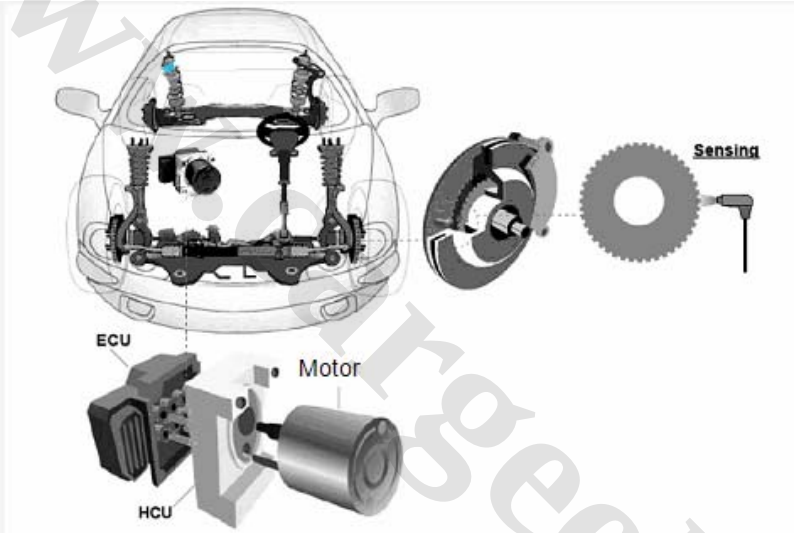


Fig. 3-1

1. Electronic control unit (ECU)

Electronic control unit is actually a microprocessor, which calculates the speed of the 4 wheels and speed increase and decrease according to the signal from the sensor so as to determine the slide situation and drive the solenoid valve and motor to increase, decrease and maintain the pressure and so on.

2. Hydraulic control unit (HCU)

Hydraulic control unit is composed of two hydraulic circuits and solenoid valve, which calculates and determines slide situation to decide the ABS operation according to the signal from the sensor, and then controls the program to start the solenoid valve and motor to increase, decrease and maintain the pressure and so on.

3. Sensing

The sensing sends the signal from the gear rotation detection to ECU.

4. Motor

The motor rotates according to the signal of ECU. And the bearing transfers the rotation into straight reciprocating motion to cycle the brake fluid.

Section II Principle of ABS

I. Control Principle of ABS

Fig. 3-2 shows the control principle of ABS.

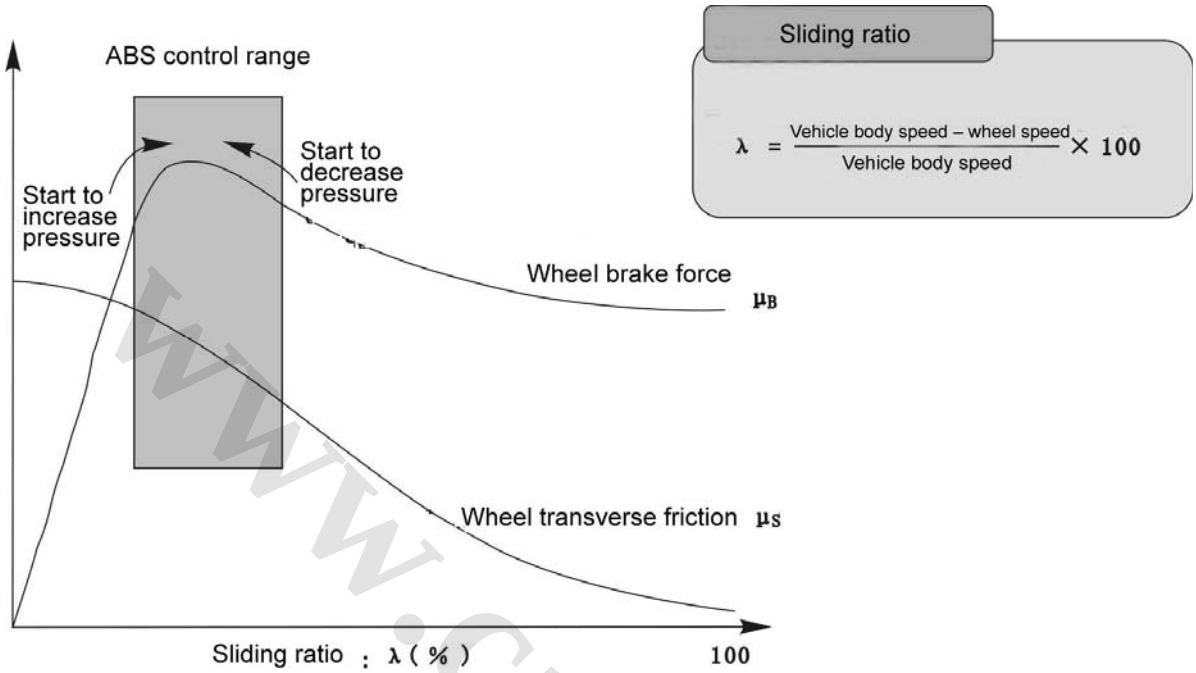


Fig. 3-2

II. Operating Mode of ABS

1. Operating condition of regular brake (Table 3-1 and Fig. 3-3).

Table 3-1

Solenoid valve	Electricity	Solenoid valve condition
Normally opened valve	Off	Open
Normally closed valve	Off	Closed

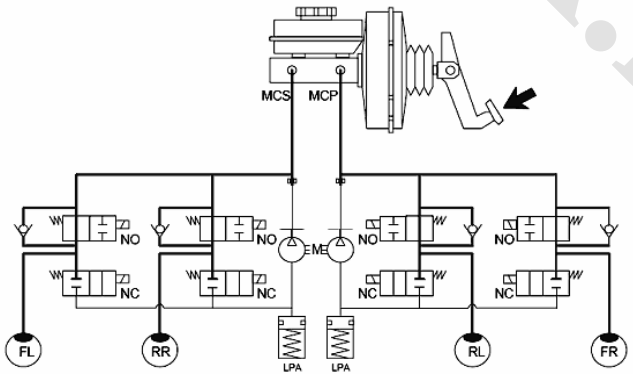


Fig. 3-3

The pressure of master pump will be transmitted to wheel slave cylinder through normally opened valve to apply the brake. If no further braking is needed, the driver can reduce the pressure to the brake pedal, which allows the brake fluid return to master pump for pressure decrease.

2. ABS operation (pressure decrease) condition (Table 3-2 and Fig. 3-4).

Table 3-2

Solenoid valve	Electricity	Solenoid valve condition
Normally opened valve	On	Closed
Normally closed valve	On	Open

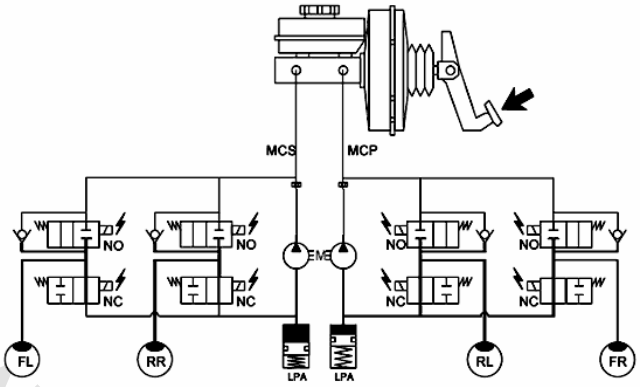


Fig. 3-4

If a vehicle is equipped with ABS and the braking pressure is too large, the friction coefficient will be decreased and the wheel speed will be decreased much quickly than the vehicle body. Finally the wheel will be locked, which makes ECU send HCU a signal of pressure decrease to wheel. In order to decrease the pressure of wheel slave cylinder, the normally opened valve will close and the normally closed valve will open. Then the brake oil from wheel slave cylinder will return to low pressure accumulator (LPA) temporarily, and return to master pump with the oil pump started by the motor. High pressure accumulator (HPA) between LPA and master pump will decrease the high pressure pulse produced by oil pump with the help of metering jet fluid resistance.

3. ABS operation (maintaining) condition (Table 3-3 and Fig. 3-5).

Table 3-3

Solenoid valve	Electricity	Solenoid valve condition
Normally opened valve	On	Closed
Normally closed valve	Off	Closed

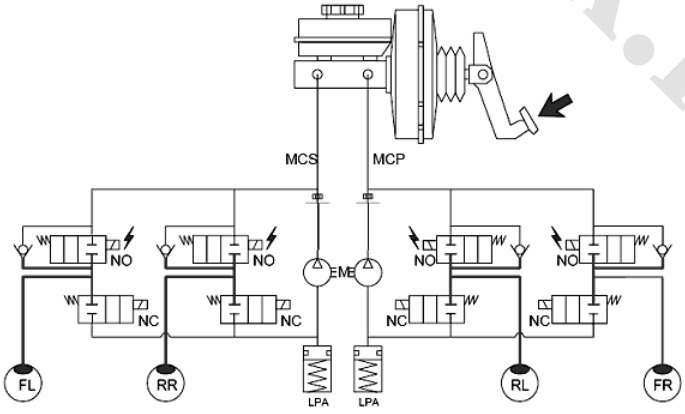


Fig. 3-5

The pressure of wheel slave cylinder is maintained by the closed normally opened valve and normally closed valve, when proper pressure is applied to the salve cylinder through increase or decrease of pressure.

4. ABS operation (pressure increase) condition (Table 3-4 and Fig. 3-6).

Table 3-4

Solenoid valve	Electricity	Solenoid valve condition
Normally opened valve	Off	Open
Normally closed valve	Off	Closed

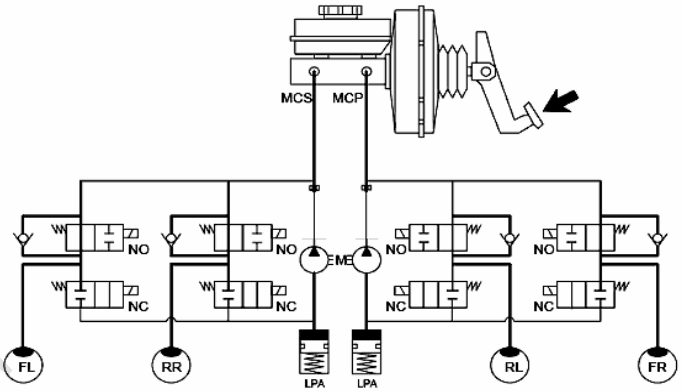


Fig. 3-6

When the pressure is decreased, if too much brake fluid is discharged or friction coefficient is increased, the pressure to every wheel should be increased. ECU will send HCU a signal of pressure increase to wheel. In order to increase the pressure of wheel slave cylinder, the normally opened valve will open and the normally closed valve will close. In case of pressure decrease, the brake fluid in LPA will flow out under the pressure increase condition with rotation of motor and then into wheel slave cylinders through the master pump and the normally opened valve. HPA between LPA and master pump will decrease the high pressure pulse produced by oil pump with the help of metering jet fluid resistance.

Concerning operations described in item 2-4 above, ABS will work until the vehicle has been completely stopped according to locking condition, so as to guarantee the safety and steering performance.

III. EBD Control Mode (Fig. 3-7)

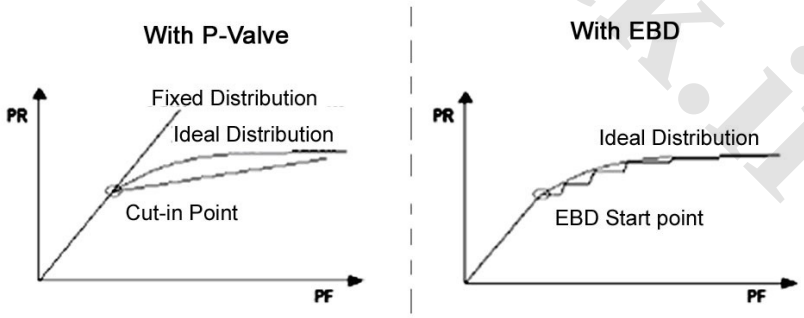


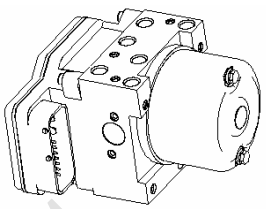
Fig. 3-7

EBD is to guarantee the operation stability. Rear wheel will be stopped after front wheel. As front brake does more work than rear brake, the rear wheel will stop first if it receives equal pressure. In order to prevent it, the equipment, pressure reducing valve (P-Valve), to decrease the pressure of rear wheel is needed. A special P-Valve is not necessary for the vehicle with ABS, as ABS can control the rear wheel braking pressure with supplementary procedures and improve the operation stability.

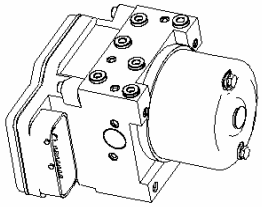
Section III Removal and Installation of ABS

I. Spare Parts Supply Condition

1. Difference between dry HECU and wet HECU (Fig. 3-8)



Dry



Wet

Fig. 3-8

The biggest difference between dry HECU and wet HECU is the second circuit (between normally closed valve and master pump) of dry HECU does not exhaust. As a result, only regular exhaust and filling will be necessary for brake system after replacement in case of wet HECU; regular exhaust and filling and that to the second circuit will be necessary for brake system after replacement in case of dry HECU. Besides, there is a seal bolt for wet HECU and protection film for dry HECU.

2. Notes

If the bolt on wet HECU is off (e.g. during transportation), regular exhaust and filling for brake system is necessary for first circuit, but not necessary for the second circuit.

II. Notes on Removal and Installation

1. Notes on HECU installation

(1) Remove the protection film on HECU, and confirm pipelines of master pump and wheel slave cylinder before operation (master pump: MCP and MCS; wheel slave cylinder: FR, FL, RR and RL).

(2) Make sure the brake pipe is tightened and torque is 14N·m with a special tool, torque wrench or other equipments.

(3) No foreign material is allowed in HECU holes and brake pipes, as shown in Fig. 3-9.

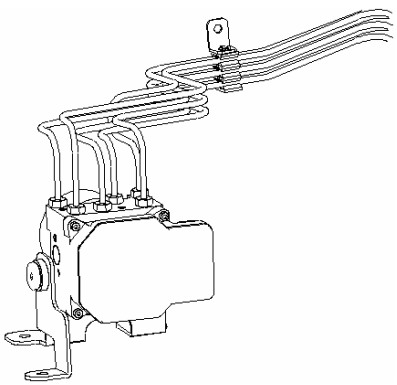


Fig. 3-9

2. Notes on HECU bracket assembly

(1) As installation error may occur for the frictional resistance of buffer pad when tightening (3) bolts, lubricant not affecting physical property of buffer pad is preferred.

(2) For easy operation, (3) bolts can be inserted into the buffer pad on bracket and then to HECU.

(3) Make sure the tightening torque of (3) bolts is 20N·m with a special tool, torque wrench, as shown in Fig. 3-10.

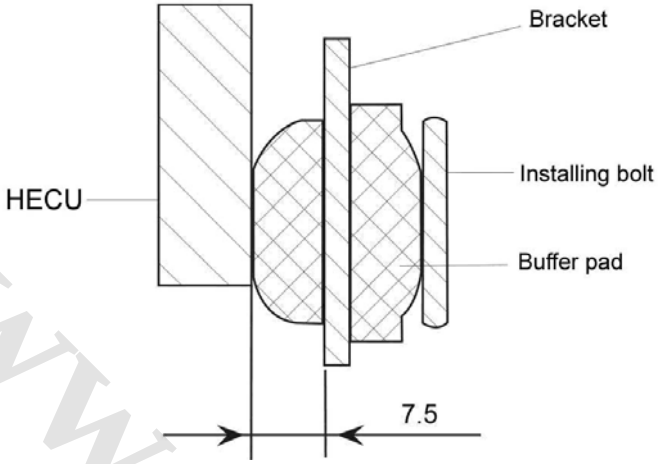


Fig. 3-10

3. Notes on HECU and bracket assembly installation

(1) Install brake pipe and bracket part to HECU and then install HECU to vehicle body with bolt special for vehicle body fastness.

(2) Make sure the tightening torque of bolt special for vehicle body fastness is 23N·m with a special tool or torque wrench.

(3) Make sure again the pipelines of master pump and wheel slave cylinder are installed correctly (master pump: MCP and MCS; wheel slave cylinder: FR, FL, RR and RL).

(4) Tighten the loose brake pipe with a specified torque (140N·m) by a special tool or torque wrench.

4. Other notes

(1) Use diagnostic instrument to find out fault reason before repair.

(2) Wrap off spare part only before installation.

(3) Use original part only.

(4) Pay attention to cleanliness. Only use cloth except tweed.

(5) Clean the surface with cleanser without mineral oil before removal.

(6) Do not use compressed air or move the vehicle when system is opened.

(7) Block the hydraulic pressure outlets with plugs as soon as possible after removal of ABS assembly.

(8) Remove other parts hindering operation.

(9) Use DOT#4 brake fluid.

(10) Soak the seal component with brake fluid, not with engine oil or brake unguent.

(11) Check for leakage of connectors of all hydraulic pipes.

5. Replacement of HECU

(1) Remove connecting piece of pin 25 and wire harness of HECU in engine compartment when engine stops, as shown in Fig. 3-11.

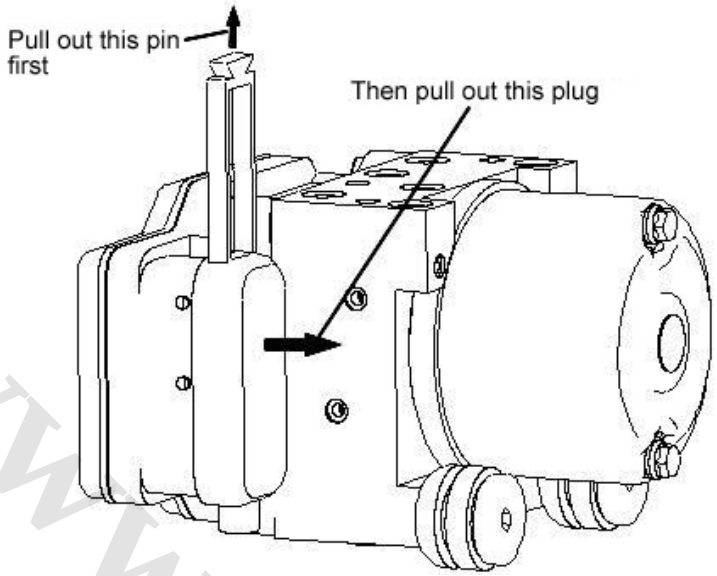


Fig. 3-11

(2) Remove the 6 M10×1 nuts of brake pipe of HECU with wrench 10 in a counterclockwise (clockwise when installing) direction. Tightening torque of brake pipe is 14N·m.

(3) Remove the 3 bolts or nuts on bracket with wrench13 in a counterclockwise (clockwise when installing) direction. Tightening torque of bolts or nuts for bracket fastness is 23N·m.

(4) Remove the 3 M6 bolts in HECU with 5mm hexagonal wrench in a counterclockwise direction after removal of products, as shown in Fig. 3-12.

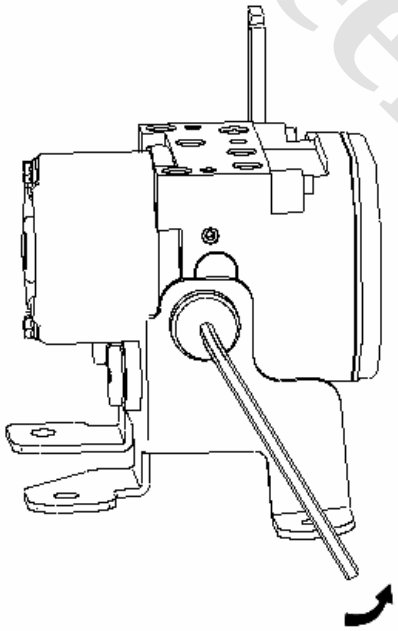


Fig. 3-12

(5) Remove the 6 bolts on wet HECU with 6mm hexagonal wrench in a counterclockwise direction, as in Fig. 3-13.

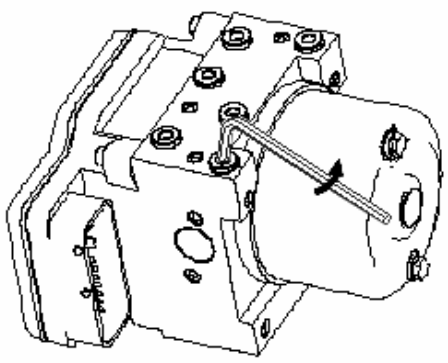


Fig. 3-13

(6) Assemble the wet HECU and bracket with a 5mm tool (hexagonal wrench) by tightening the 3 inserted nuts M6 in clockwise direction, as shown in Fig. 3-14.

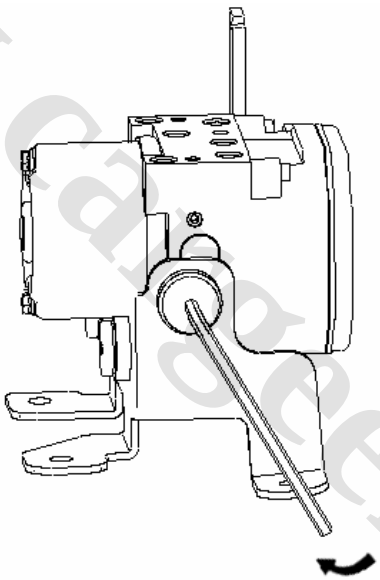


Fig. 3-14

(7) To install spare HECU, reverse the removal procedures of item (1) - (3) above.

Section IV Fault Diagnosis and Troubleshooting

I. Fault Detection Procedure (Fig. 3-15)

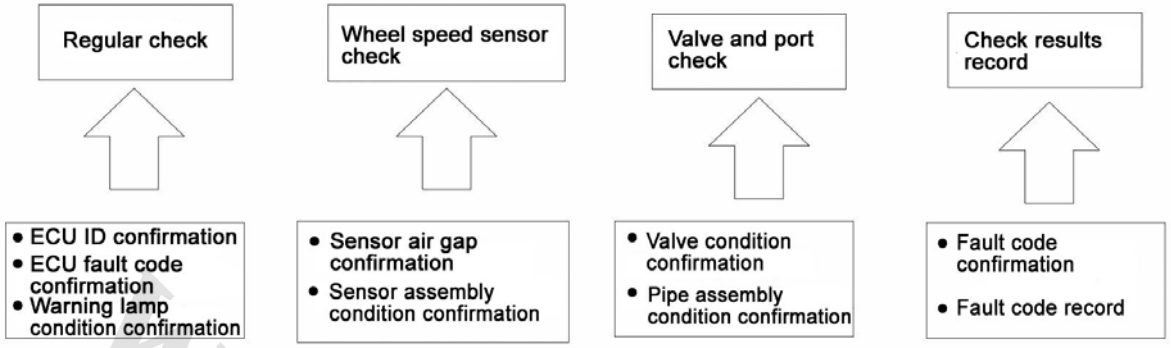


Fig. 3-15

II. Notes on Fault Diagnosis (Table 3-5)

As ABS is controlled by the electronic hydraulic pressure, the phenomena in the following table are normal under normal working condition of ABS, not faults.

Table 3-5

Phenomenon	Description
System self-check sound	Sometimes there will be sound like collision from the engine compartment after engine is started. It is normal because it is caused by the ABS self-check.
ABS working sound	1. Motor sound in ABS hydraulic unit; 2. Sound with brake pedal vibration; 3. Suspension impact sound caused by braking or screak caused by friction between wheel and ground when ABS works. Note: Wheel may screak when ABS is working normally.
ABS works, but the braking distance is long.	Sometimes the braking distance of the vehicle with ABS will be longer than that of the vehicle without ABS on snow or sandstone road. The driver should be more careful when driving on these roads.

III. Key Points on Maintenance of Dynamic Faults

Instantaneous poor contact may occur in the electronic control system, electrical circuit and signal input and output areas, which may cause occasional dynamic fault or DTC during ECU self-check. If fault cause continues, the abnormal part can be detected with reference to DTC table. As sometimes fault cause vanishes itself, it is difficult to figure out the real cause.

In such a situation, faults can be simulated to check if the fault occurs again.

1. When vibration may be the main reason:

(1) Shake the connector lightly in all directions;

(2) Shake the harness lightly in all directions;

(3) Shake the sensor lightly in all directions;

(4) Shake the other moving parts (like wheel bearing) lightly.

Note: If the harness is twisted off or fractured for tight pull, it must be replaced with new parts. Especially when vehicle is moving, the sensor will move up and down, which may cause instantaneous open/short circuit. As a result, sensor signal check must be carried out when vehicle is moving.

2. When overheating or supercooling may be the main reason:

Heat the possibly faulted part with a blower; check for cold welding phenomenon with a cold spray.

3. When overlarge contact resistance of power supply circuit may be the main reason:

Open all electrical switches, including the headlight and rear defrosting lamp. If fault does not show again, it can only be diagnosed and repaired when it comes out next time. Generally the occasional dynamic fault will only get worse, not better.

IV. ABS Fault Diagnosis and Troubleshooting

1. Check ABS warning lamp

Check if ABS warning lamp is turned on in the following ways

(1) Turn the vehicle key to connect the circuit, and then ABS warning lamp is turned on and then turned off after 3 seconds.

(2) Fault exists if not the same with the situation in (1); check the DTC and refer to DTC Check Table.

(3) Refer to No DTC Fault Table if the warning lamp can not be turned on.

2. Regular Fault Table (Table 3-6).

Table 3-6

Location	Reason	Structure	Warning lamp	
			ABS	EBD
Vehicle harness	Brake pipe installation error	Wheel locked, braking deviation	Off	Off
	Oil leakage of brake gear	ABS and EBD abnormal start		
	Wire installation error	Unable to brake		
	Exhaust fault	ABS performance decreased		
Motor	Motor fault	ABS unable to start	On	Off
ECU	ECU power cord fault	ABS and EBD unable to start	On	On
	Control valve power cord fault	ABS and EBD unable to start		
	ECU poor grounding	ABS and EBD unable to start		
	ECU fault	ABS and EBD unable to start		
	Motor power cord fault	ABS unable to start	On	Off
Wheel speed sensor	Sensor open/short circuit	One fault: ABS unable to start	On	Off
		Two faults: ABS/EBD unable to start	On	On
	Gear ring fault	One fault: ABS wrong start	On	Off
	Sensor disturbance fault			
	Air gap fault	Two faults: ABS and EBD unable to start	On	On

3. DTC read and deletion without fault diagnostic instrument

(1) Purpose and condition of DTC read without diagnostic instrument

If no diagnostic instrument is available, ABS fault condition can be indicated and DTC can be read through ABS warning lamp, so as to confirm and eliminate the fault. If the DTC is a 2 digital code, refer to the number in the bracket of DTC Table in Section 24.

The use conditions are:
1) Speed is less than 2 km/h;
2) Not connected to fault diagnostic instrument;
3) Wire L (pin 7 in the internal diagnosis interface) is always grounded during diagnosis.
Besides, restore ECU mode of ABS to normal mode (diagnosis mode before) after DTC read. Method: after diagnosis, disconnect wire L from ground, turn the key to off-power condition, and connect again.
(2) Method of DTC read without fault diagnostic instrument
Read in the following steps if meeting the conditions of DTC read without fault diagnostic instrument. The procedures in Fig. 3-16 are:

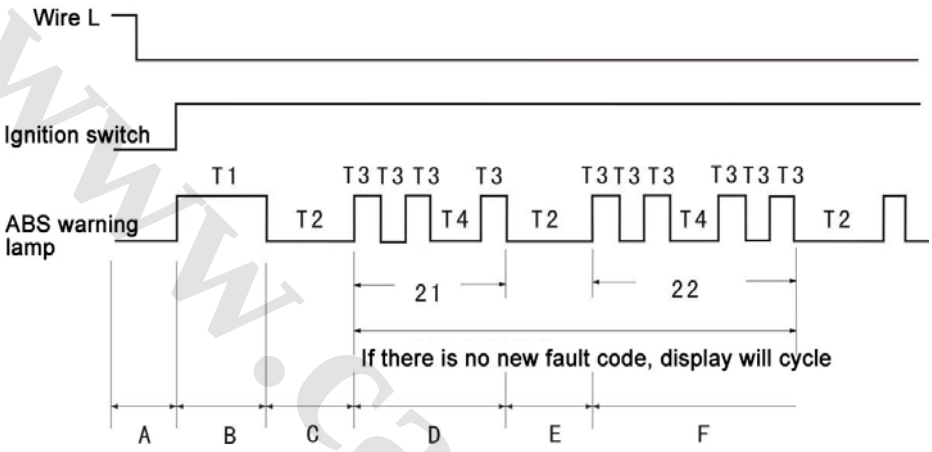


Fig. 3-16

1) Ground wire L and turn the vehicle key to connect the circuit;
2) ABS warning lamp is turned on and then turned off after 3 seconds, which indicates the start of diagnosis;
3) ABS warning lamp is turned off for 3 seconds, which indicates the DTC display stage;
4) DTC read;
5) ABS warning lamp is turned off for 3 seconds, which indicates the next DTC display or circular display stage;
6) New DTC display and read, or circular display of previous DTC.
The meaning of marks in Fig. 3-16 is listed in Table 3-7.

Table 3-7

Symbol	Symbol description	Duration
T1	Symbol of diagnosis start; warning lamp flickers	3.0s
T2	Interval of different DTC	3.0s
T3	Warning lamp flash interval in case of DTC	0.5s
T4	Interval of different digital place of a DTC (the ten's place is displayed before the interval and the unit's place is after the interval)	1.5s

Take the procedure illustrated in Fig. 3-16 for example. In the display area of the first DTC, as warning lamp blinks twice (each on and off is T3, 0.5 second) before T4 (1.5 seconds before warning lamp is turned on), the first mark (ten's place) of the 2 digital code is 2; as warning lamp

blinks once after T4 (1.5 seconds after warning lamp is turned off), the second mark of the 2 digital code (unit's place) is 1; as then warning lamp is turned off for 3 seconds (T2), the display of the first DTC is finished, and the DTC is 21. Detailed description of the fault can be found in the DTC Table of Section 2.4. It is the same with DTC 22.

(3) Deletion of DTC without fault diagnostic instrument

After DTC read and fault elimination according to DTC Table, previous DTC should be deleted before next DTC check. The conditions of DTC deletion are the same with that of DTC read, as shown in Fig. 3-17.

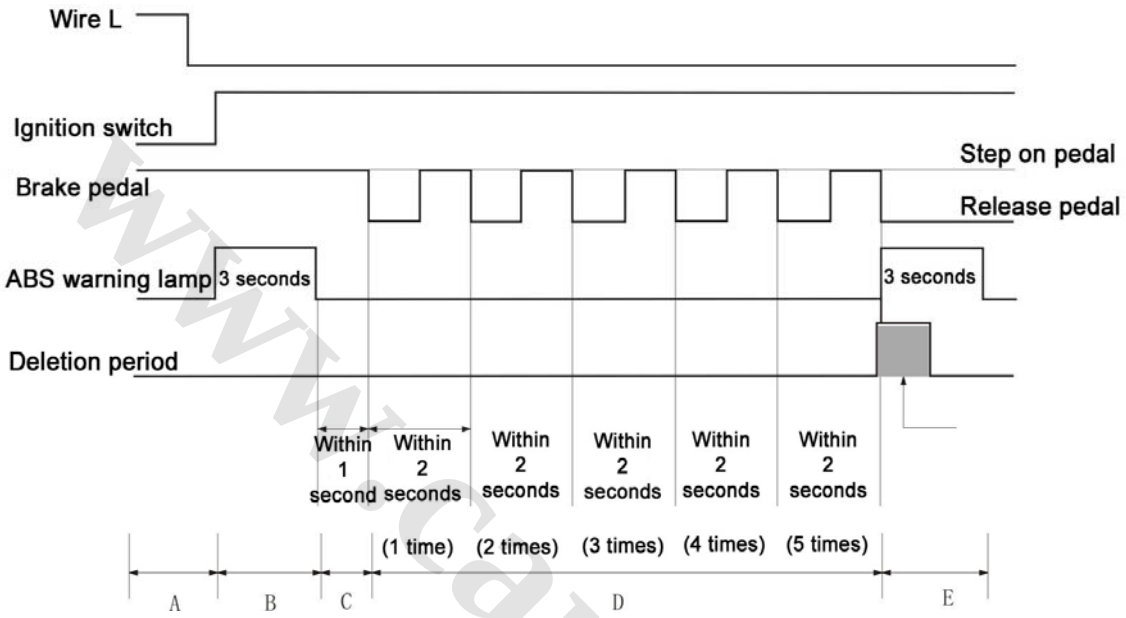


Fig. 3-17

Procedures in the figure are:

1) Step on the brake pedal, ground wire L and then turn the vehicle key to connect the circuit;

2) ABS warning lamp is turned on, and then is turned off after 3 seconds;

3) Release the brake pedal within 1 second after ABS warning light is turned off;

4) Release the pedal for about 1 second, and then press it again for about 1 second. Repeat this procedure for 5 times; warning lamp is not turned off during this process;

5) ABS warning lamp is turned on, and then turned off after 3 seconds; DTC is deleted in this process.

After DTC deletion, restore ECU mode of ABS to normal mode. Operation process is the same with that of DTC diagnosis. If no DTC is in ECU of ABS, ground wire L and turn the key to connect the circuit; the ABS warning lamp will flash in a way illustrated in Fig. 3-18, and meanings of symbols are the same with that above.

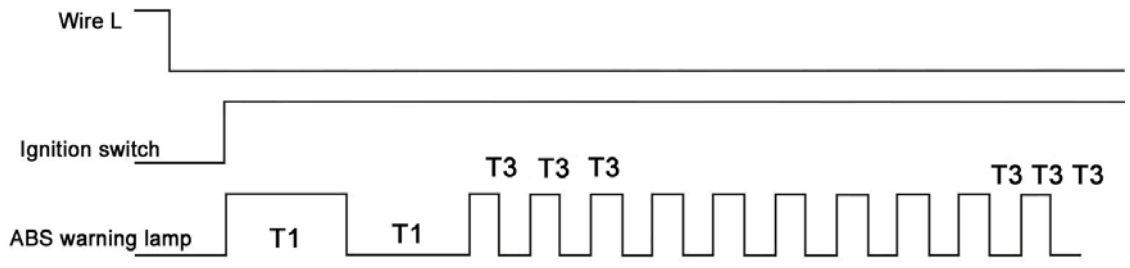


Fig. 3-18

4. DTC Table

(1) DTC content is in Table 3-8.

(2) See Table3-9, Table 3-10, Table 3-11, Table 3-12, Table 3-13, Table 3-14 and Table 3-15 for DTC Table.

Table 3-8

DTC	Content	DTC	Content
C1 200	Left front sensor open/short circuit	C1 206	Left rear sensor open/short circuit
C1 201	Left front sensor or gear ring disturbance	C1 207	Left rear sensor or gear ring disturbance
C1 202	Left front sensor air gap error	C1 208	Left rear sensor air gap error
C1 203	Right front sensor open/short circuit	C1 209	Right rear sensor open/short circuit
C1 204	Right front sensor or gear ring disturbance	C1 210	Right rear sensor or gear ring disturbance
C1 205	Right front sensor air gap error	C1 211	Right rear sensor air gap error
C1 101	Too high battery voltage (17V above)	C2 112	Fault in solenoid valve fuse or relay
C1 102	Too low battery voltage (9.4V below)	C2 402	Fault in motor fuse or motor
C1 604	Fault in ECU internal circuit or solenoid valve coil		

Table 3-9

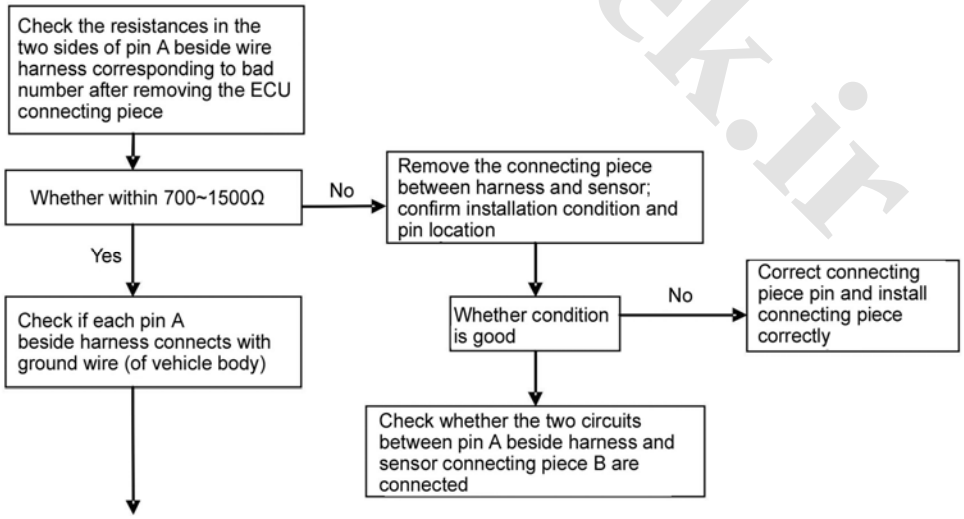
DTC	C1 200 C1 203 C1 206 C1 209	Note: If faults corresponding to more than 2 DTC can be confirmed, delete the DTC (that can be deleted), drive the vehicle at a speed of over 40 km/h, confirm the fault corresponding to this DTC again and refer to the recorded DTC (and confirm the same DTC).
Cause	Sensor open/short circuit: fault due to sensor battery positive or negative pole short circuit or open circuit	
Elimination procedure		

Table 3-9 (continued)

Elimination procedure

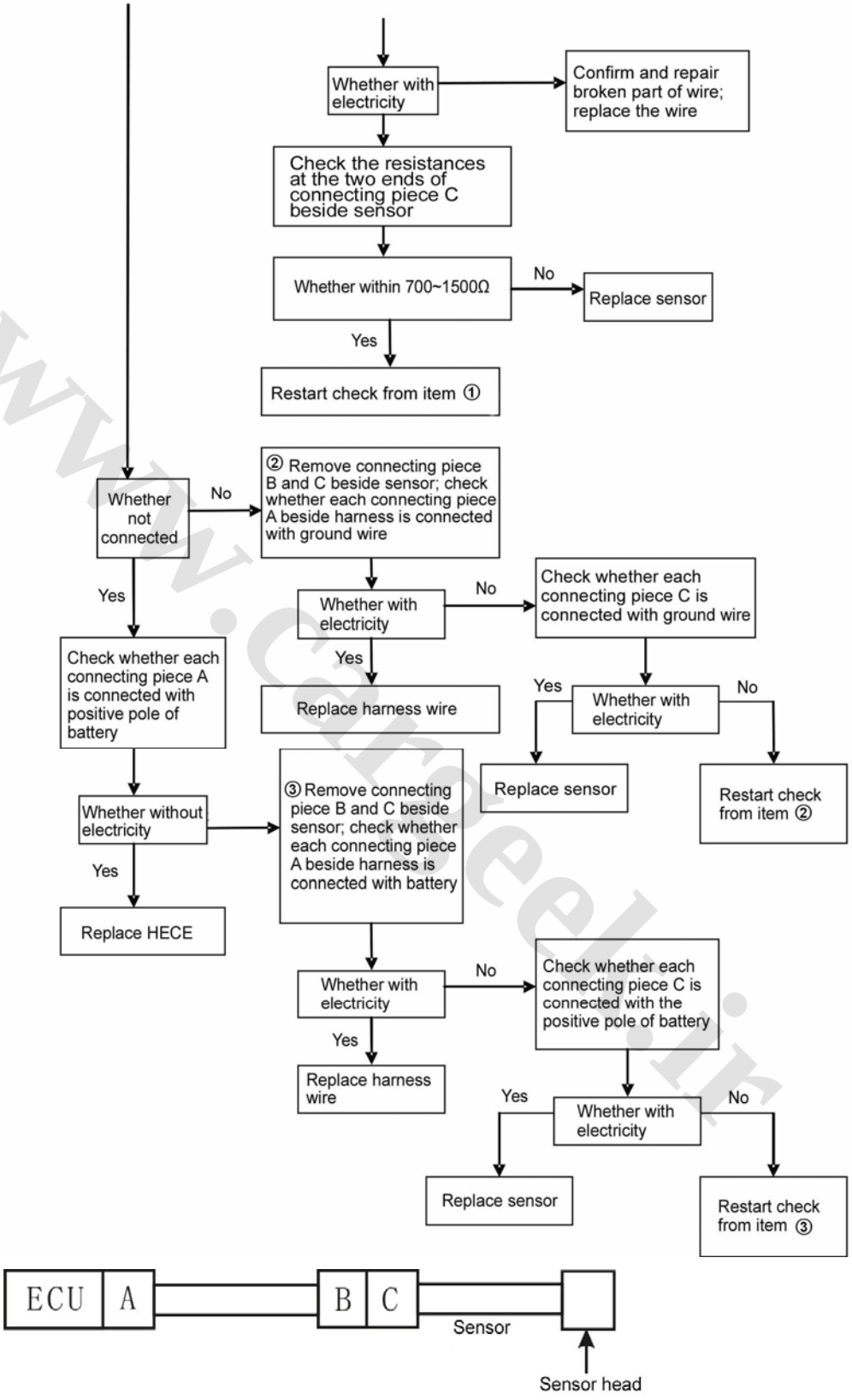
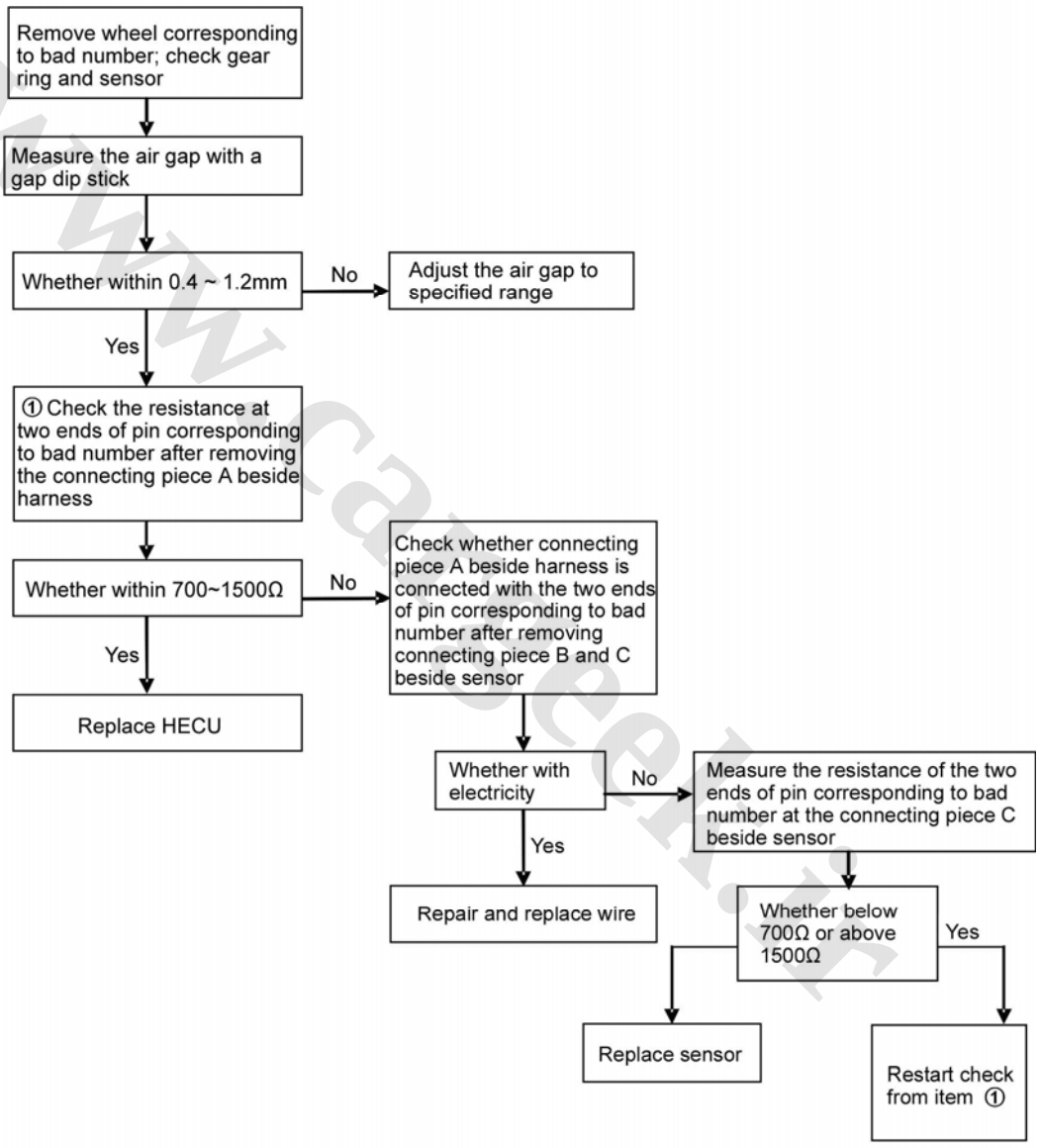


Table 3-10

<table>
<tr><td>DTC</td><td>C1 202 C1 205
C1 208 C1 211</td><td rowspan="2">Note: ① Air gap is the gap between gear ring and sensor; ② If faults corresponding to more than 2 DTC can be confirmed, delete the DTC (that can be deleted), drive the vehicle at a speed of over 40 km/h, confirm the fault corresponding to this DTC again and refer to the recorded DTC (and confirm the same DTC).</td></tr>
<tr><td>Cause</td><td>Air gap error: no signal because of air gap too large or sensor short circuit (resistance is 0), or gear ring is not properly installed.</td></tr>
<tr><td>Elimination procedure</td><td colspan="2"> 

※. Air gap adjustment method
☞ Not to adjust the type of air gap, but to set automatically according to the tolerance of relevant part. As a result, confirm the part with abnormal air gap and replace or adjust to specified air gap (by burnishing the mounting surface contact area of sensor); a thin washer should be placed on the mounting surface of sensor to adjust to specified air gap.</td></tr>
</table>

Table 3-11

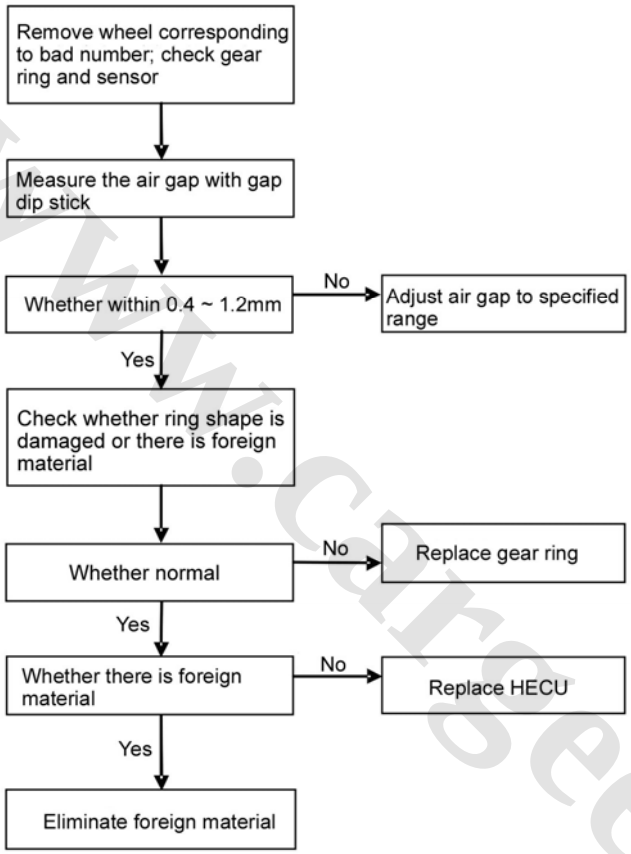
<table>
<tr><td>DTC</td><td>C1 201 C1 204
C1 207 C1 210</td><td rowspan="2">Note: ① Foreign materials, like engine oil and scrap iron in gear may cause asymmetrical sensor signal;
② Air gap means the gap between gear ring and sensor;
③ If faults corresponding to more than 2 DTC can be confirmed, delete the DTC (that can be deleted), drive the vehicle at a speed of over 40 km/h, confirm the fault corresponding to this DTC again and refer to the recorded DTC (and confirm the same fault code).</td></tr>
<tr><td>Cause</td><td>Gear ring or sensor disturbance:
If nonstandard gear ring is installed</td></tr>
<tr><td>Elimination procedure</td><td colspan="2"> 
</td></tr>
</table>

Table 3-12

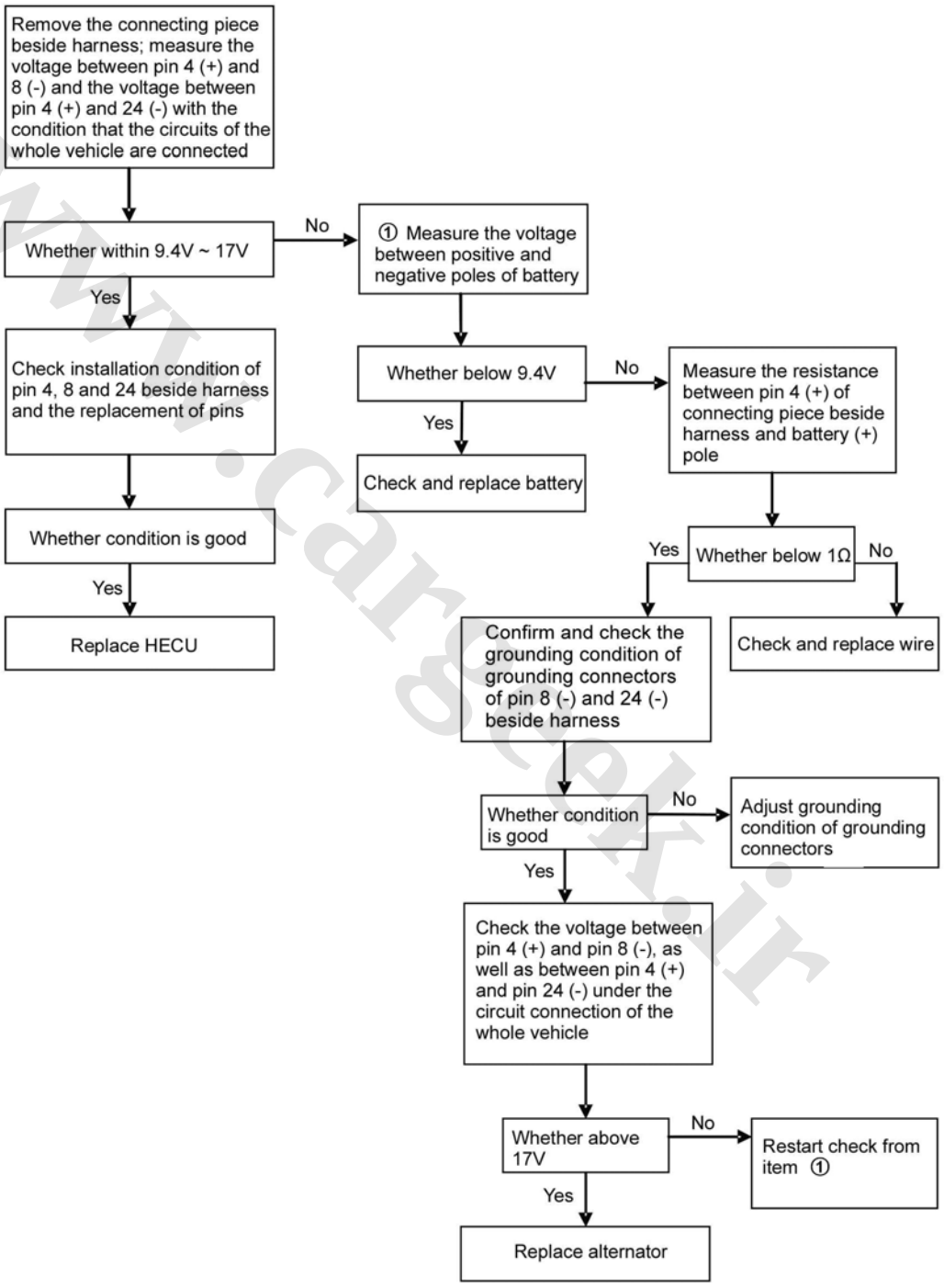
DTC	C1 101 C1 102	Note: If faults corresponding to more than 2 DTC can be confirmed, delete the DTC (that can be deleted), drive the vehicle at a speed of over 40 km/h, confirm the fault corresponding to this DTC again and refer to the recorded DTC (and confirm the same fault code).
Cause	Battery voltage abnormal: Occurring when voltage too high or too low	
Elimination procedure		

Table 3-13

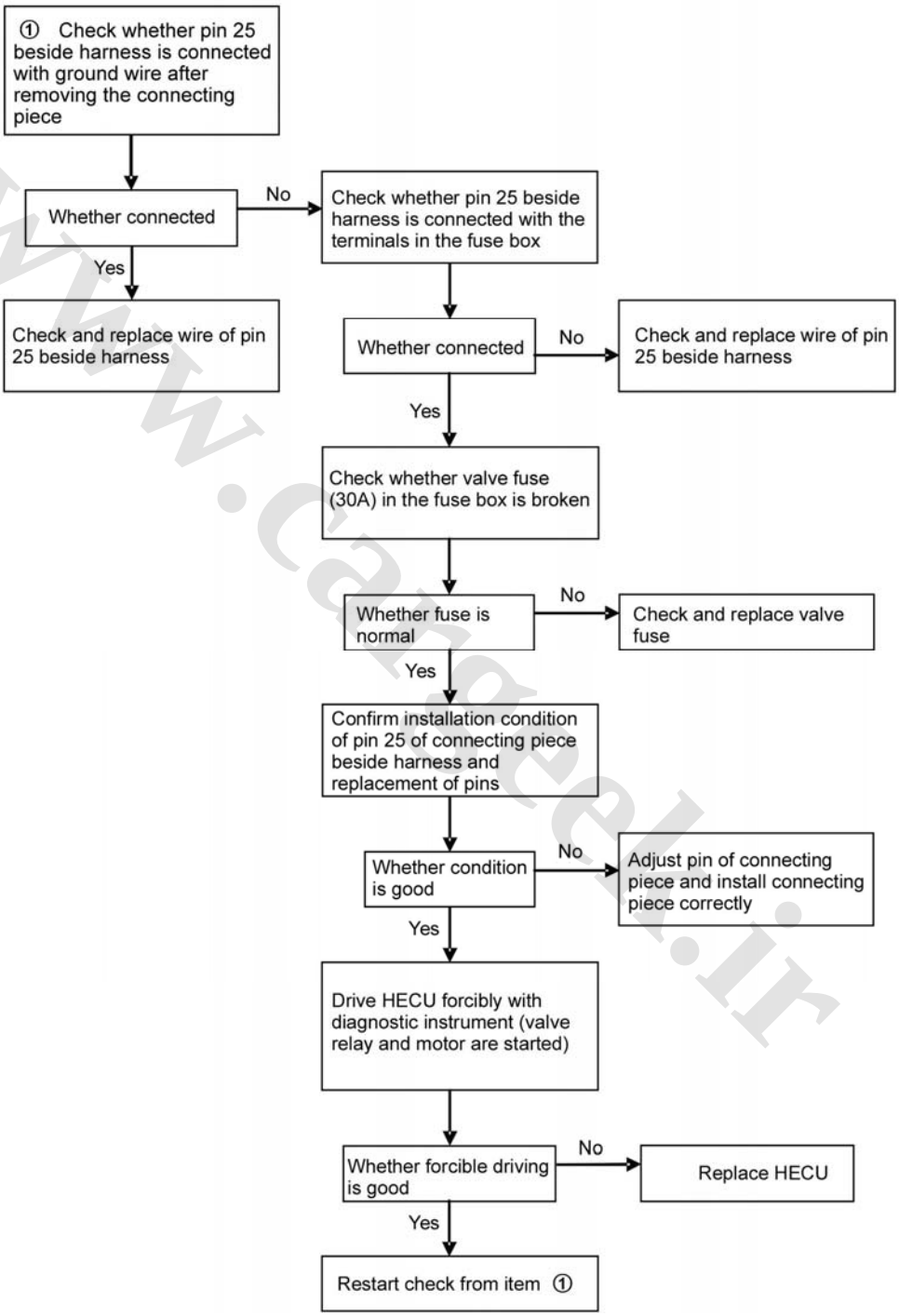
DTC	C2402	Note: If faults corresponding to more than 2 DTC can be confirmed, delete the DTC (that can be deleted), drive the vehicle at a speed of over 40 km/h, confirm the fault corresponding to this DTC again and refer to the recorded DTC (and confirm the same fault code).
Cause	Motor fuse/motor fault	
Elimination procedure		

Table 3-14

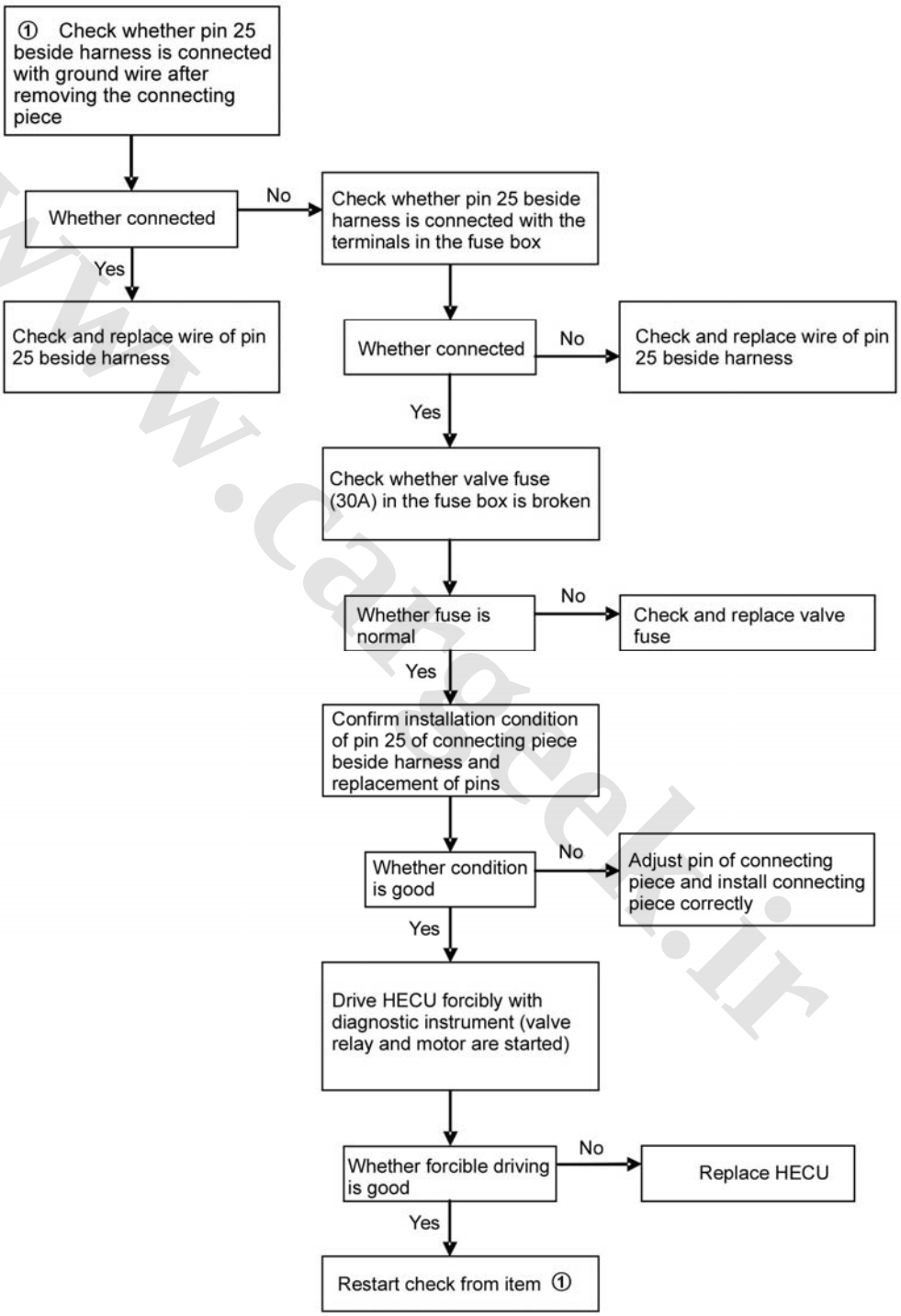
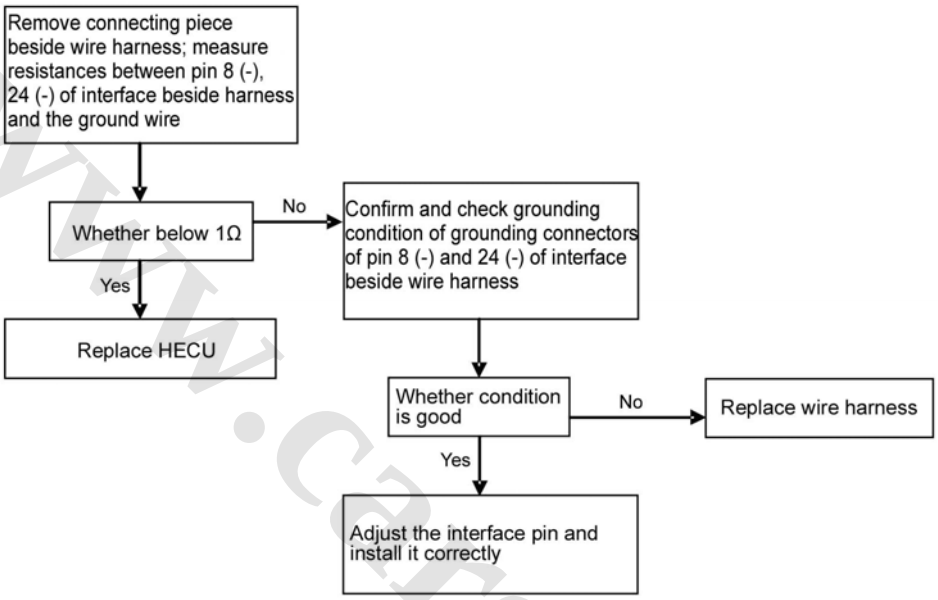
<table>
<tr><td>DTC</td><td>C2112</td><td rowspan="2">Note: If faults corresponding to more than 2 DTC can be confirmed, delete the DTC (that can be deleted), drive the vehicle at a speed of over 40 km/h, confirm the fault corresponding to this DTC again and refer to the recorded DTC (and confirm the same fault code).</td></tr>
<tr><td>Cause</td><td>Valve fuse and relay faults:
a) Main replay or fuse disconnection
b) Main relay short circuit</td></tr>
<tr><td>Elimination procedure</td><td colspan="2"> 
</td></tr>
</table>

Table 3-15

<table>
<tr><td>DTC</td><td>C1 604</td><td rowspan="2">Note: If faults corresponding to more than 2 DTC can be confirmed, delete the DTC (that can be deleted), drive the vehicle at a speed of over 40 km/h, confirm the fault corresponding to this DTC again and refer to the recorded DTC (and confirm the same fault code).</td></tr>
<tr><td>Cause</td><td>ECU internal circuit and valve coil faults</td></tr>
<tr><td>Elimination procedure</td><td colspan="2"> 
</td></tr>
</table>

5. No DTC Fault Table is in Table 3-16, Table 3-17, Table 3-18, Table 3-19 and Table 3-20.

Table 3-16

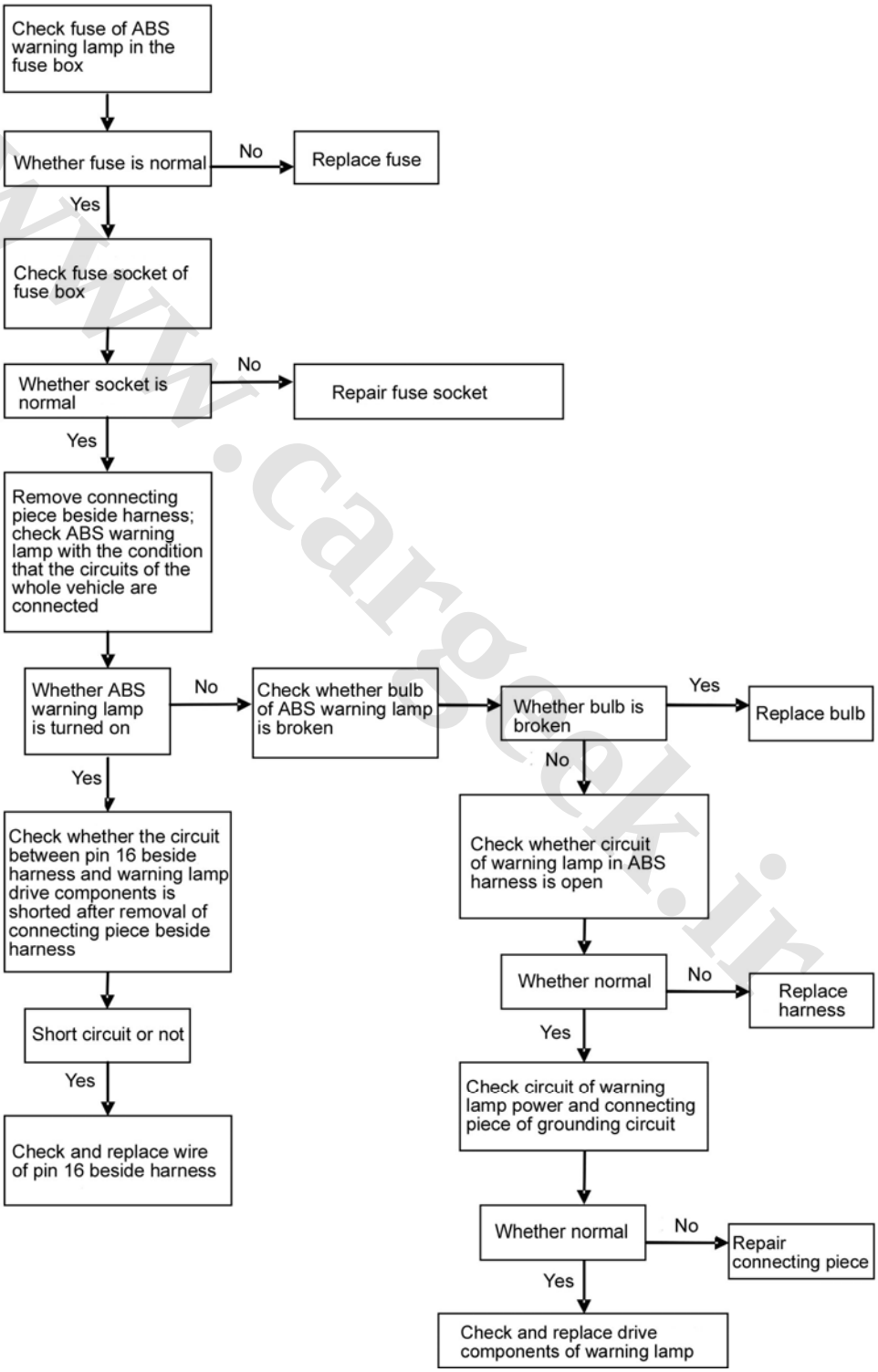
Fault	Start the engine, but ABS warning lamp can not be turned on
Cause	① Fuse is blew out ② Bulb of ABS warning lamp is broken ③ Circuit is open ④ Warning lamp controller is broken
Elimination procedure	

Table 3-17

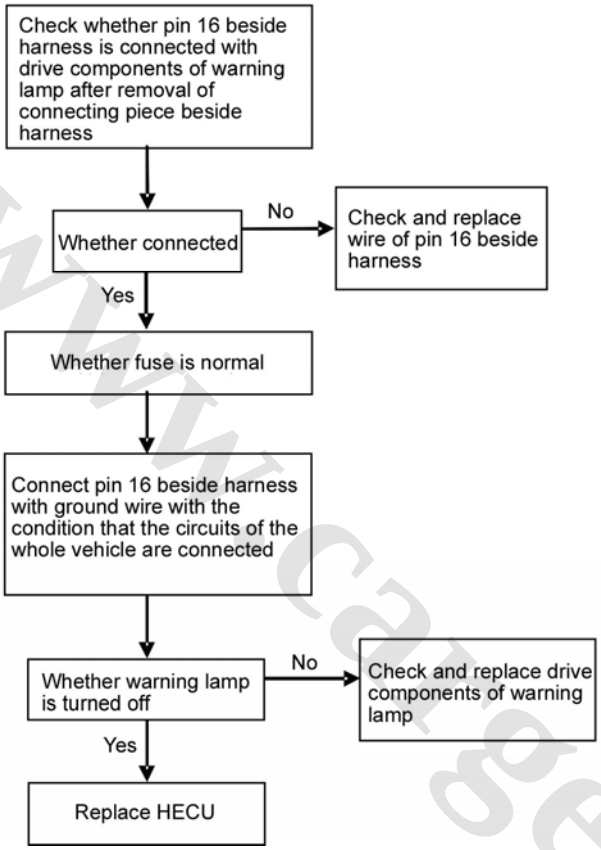
Fault	Start the engine, but ABS warning lamp is always on
Cause	① Controller of ABS warning lamp is broken ② Return circuit of warning lamp controller is open ③ ECU is broken
Elimination procedure	

Table 3-18

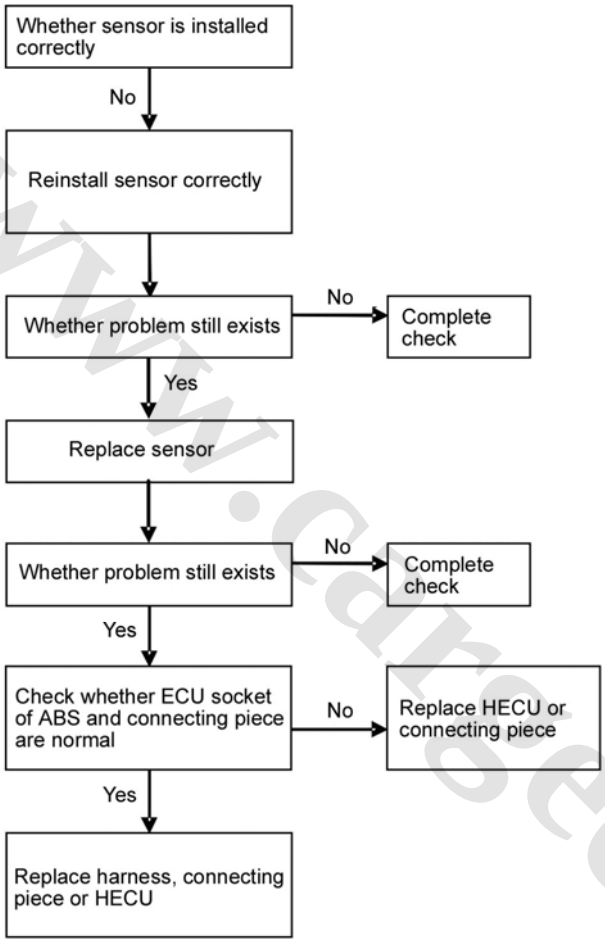
Fault	ABS works abnormally
Cause	① Sensor is damaged ② Sensor is not properly installed ③ Foreign material adheres to sensor ④ Wire harness of sensor is broken ⑤ Gear ring is broken ⑥ Wheel axle is broken ⑦ HCU of ABS is broken ⑧ ECU of ABS is broken
Elimination procedure	

Table 3-19

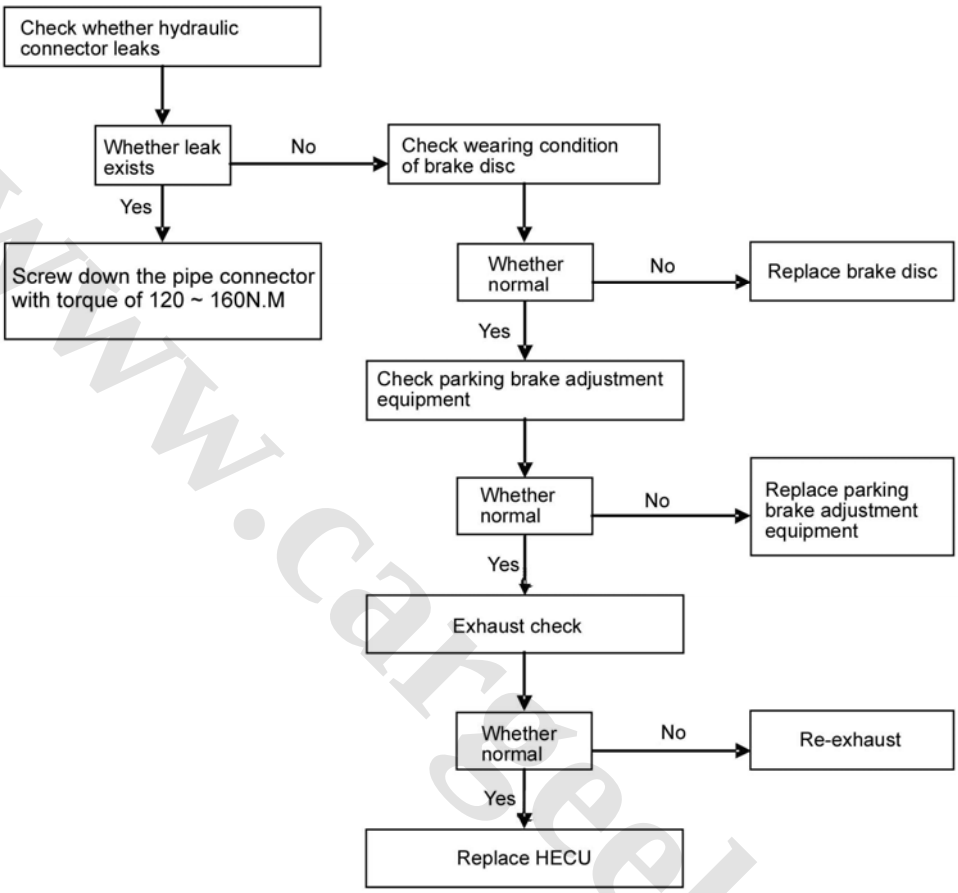
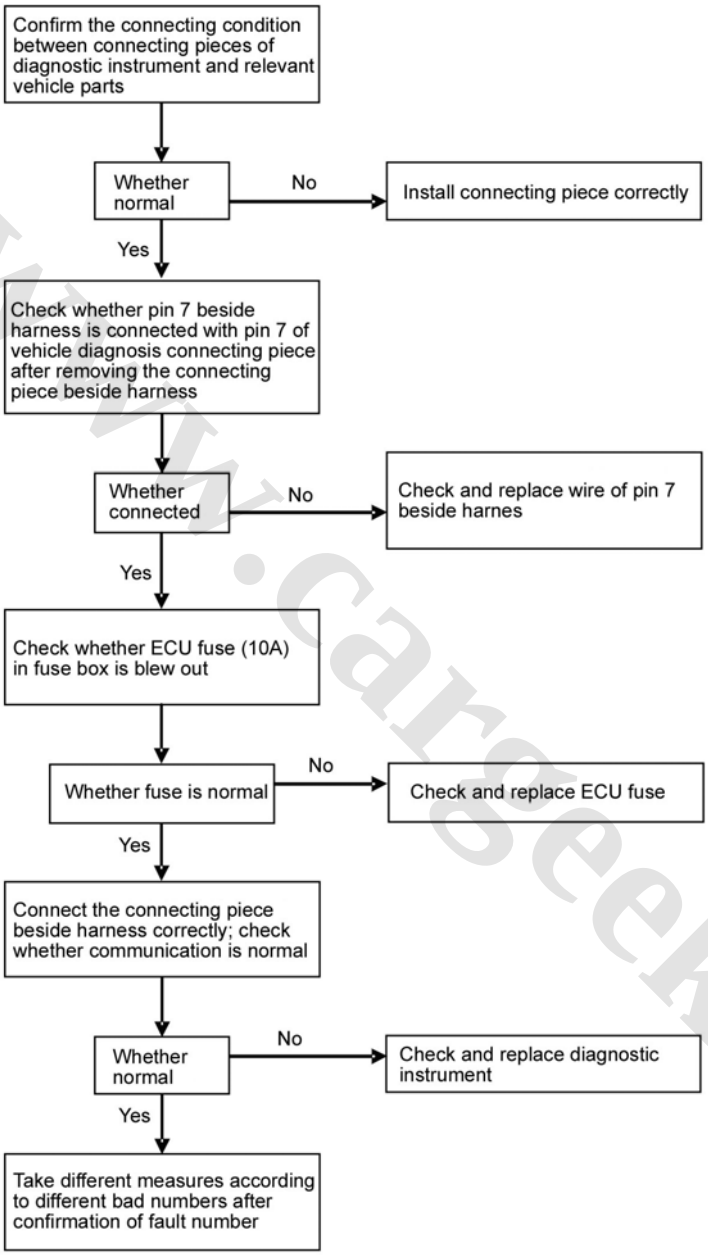
Fault	Brake pedal play is too long
Cause	① Parking brake is not properly adjusted ② Brake fluid leaks ③ Friction plate of brake is severely worn ④ Normally closed valve can not be closed tightly ⑤ Air is in the system
Elimination procedure	

Table 3-20

Fault	No fault code output (unable to communicate with fault diagnostic instrument)
Cause	① Fault diagnostic instrument is broken ② Fuse is blew out ③ Diagnosis wire is broken or connector is loose ④ ECU is broken
Elimination procedure	

V. Exhaust and Filling

1. Regular operation procedures (Fig. 3-19).

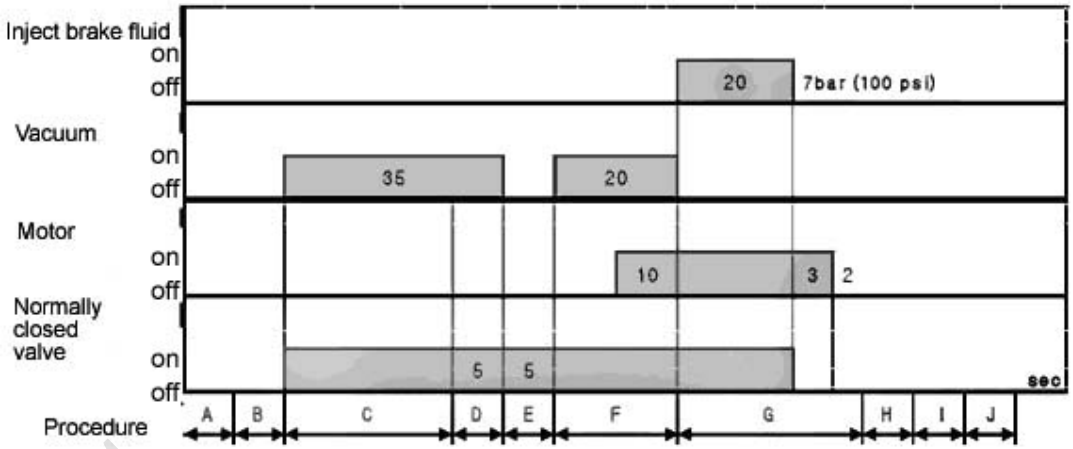


Fig. 3-19

Regular operation procedures of exhaust and filling:

A. Move vacuum device and brake oil filling device;

B. Start after connection of vacuum, brake oil filling devices and SDL;

C. Drive normally closed solenoid valve and use the first vacuum;

D. Excessive leak experiment;

E. Minim leak experiment after first vacuum separation;

F. Use the second vacuum and drive motor;

G. Reduce brake oil pressure after filling and pressure increase maintenance of brake oil, stop normally closed solenoid valve and motor and adjust brake oil level;

H. Disconnect the connection of vacuum equipment and brake fluid filling equipment;

I. Cover the oil can lid/disconnect SDL;

J. Step into next step.

2. Equipment check

(1) The lower the vacuum degree, the better. Confirm that the oil gun should supply max l vacuum of 1mmHg.

(2) Check whether vacuum is formed in the bleed screw of hydraulic equipment (drum brake or caliper) of rear wheel within the specified time. (Should below 5 ~ 10 mmHg after vacuum connection for 20 ~ 25 seconds.)

(3) Check whether working voltage to HECU is 10 ~ 12V as specified.

(4) Check cycle time (C/T) and if solenoid valve working time is in compliance with specification.

1) C/T is below 90: keep solenoid valve working;

2) C/T is between 90 ~ 180 seconds: repeat the process of solenoid valve working for 2 seconds and then stopping for 2 seconds;

3) C/T is above 180 seconds: set total working time of solenoid valve below 90 seconds.

3. Notes on exhaust and oil filling

(1) When filling brake oil, if not to maintain the filling pressure for a certain period, the oil level of the oil can will fall after finish of filling. As a result, additional brake oil or filling pressure for a certain period is necessary.

(2) Usually the marked time of regular operation is the cycle time.

(3) As the inside of spare HECU is wet, exhaust mode operation is not necessary (exhaust mode operation is defined in item 5 (6)); exhaust can be carried out to all wheels directly (in order to meet performance and pedal sentience, exhaust mode operation is preferred).

(4) HECU voltage of 10 ~ 12V is preferred during exhaust mode operation. As battery on vehicle is used when using diagnostic instruments, there should be no problem. (If exhaust mode operation is repeated with high voltage, ECU coil may be damaged.)

4. Exhaust fault confirm methods (Table 3-21)

Table 3-21

Difference / Type	ECU operation	Leak experiment		Remark
		Excessive leak	Minim leak	
Case 1	Normal	O.K	O.K	Normal operation, no rework
Case 2	Normal	O.K	N.G	Abnormal operation, rework
Case 3	Normal	N.G	N.G	Abnormal operation, rework
Case 4	No	O.K	O.K	Abnormal operation, rework
Case 5	No	O.K	N.G	Abnormal operation, rework
Case 6	No	N.G	N.G	Abnormal operation, rework

Case 1: Condition after normal operation.

Case 2: Bad connection condition of brake gear (HECU hole/brake pipe/brake hose); rework is necessary.

Case 3: Similar to Case 2; but severe leak may make rework unable to be carried out.

Case 4: Exhaust fault of HECU internal circuit; spongy pedal or enlargement of pedal play may occur after one ABS operation. Rework is necessary.

Case 5: Synthetic fault of Case 2 and Case 4; rework is necessary.

Case 6: Similar to Case 5; but severe leak may make rework unable to be carried out.

5. Measures for exhaust and filling faults (dry inside of brake system).

(1) Fault confirmation. Confirm all connections from the master pump to wheel slave cylinder: HECU hole, brake connection, brake hose connection, bleed screw of caliper and drum brake, etc.

(2) Reassemble according to specification for leak prevention after fault confirmation.

(3) Connect the reassembled equipment to connecting piece of pin 25 of ECU or connect diagnostic instrument to wire K (pin 7). Special wire should be applied when connecting to connecting piece; vehicle circuit should be connected or started when connecting to wire K (pin 7). The oil can of the master pump should be connected to uninterruptible brake oil supply equipment, or there should be always brake oil in the oil can.

(4) Diagnose HECU with the reassembled equipment and diagnostic instrument to check whether there is still a DTC. DTC should be deleted first if it exists. (If fault of item (1) is not confirmed, fault confirmation is also necessary.) If DTC can not be deleted, refer to “DTC Check Table” in Section 24 (If there is fault in HU, motor and ECU, exhaust and filling in HECU can not be operated).

(5) After stepping on the brake pedal, open the bleed screw on the caliper or drum brake to exhaust the inside air. This operation should be carried out for all wheels before that the brake fluid exhausted through the bleed screw contains no air and the brake pedal is hard enough. When using the reassembled equipment that can form vacuum or is filled with brake fluid, refer to item (10).

(6) Operate the exhaust mode with the reassembled equipment or diagnostic instrument and step on the brake pedal, if there is no reaction force, repeat stepping on and releasing the pedal until the exhaust mode is finished. (Exhaust mode: repeat the process of start and stop of normally closed solenoid valve with interval of 2 seconds for 1 minute, and keep motor working. The repeat of stepping on and releasing of pedal should be carried out on the normally closed solenoid valve while motor is operating.)

(7) Rework of operation of item ⑤ (exhaust) should be carried out for all wheels.
(8) Measure the play of brake pedal; if not in compliance with specification, repeat the processes in item ⑥ (exhaust mode) and item ⑤ (exhaust). If the brake pedal play still does not comply with specification after over 10 repeats of exhaust mode and exhaust operation, replace with spare HECU (wet) and then restart the operation.
(9) Connect the reassembled equipment and diagnostic instrument to HECU to recheck whether there is still a DTC. If yes, delete the DTC, and then disconnect the reassembled equipment or diagnostic instrument.
(10) When using other reassembled equipments (that can produce vacuum or is filled with liquid), the methods are as follows.
1) Operate in process as described in item (1) - (4) above;
2) The inside of brake system will form vacuum after the vacuum pump works for about 60s.
3) Exhaust mode in item ⑥ above should be conducted 10 seconds before vacuum separation.
4) Do not repeat stepping on and releasing the pedal.
5) Fill brake fluid for over 20 seconds during vacuum separation (7bar/100Psi above).
6) End brake fluid filling and exhaust mode.
7) Operate in process described in item ⑧ - ⑨.
6. Measures for faults in inspection and ABS operation experiment (wet inside of brake system).
(1) Connect reassembled equipment or diagnostic instrument. The following conditions should be met:
1) Special wire should be applied when connecting to pin 25 connecting piece of ECU.
2) When connecting to wire K (pin 7), the circuit of vehicle should be connected or the vehicle should be started.
3) Oil can of the master pump should be connected to uninterruptible brake oil supply equipment, or there should be always brake oil in oil can.
(2) Diagnose HECU with reassembled equipment and diagnostic instrument to check if there is still a DTC.
1) DTC should be deleted first if it exists.
2) If DTC can not be deleted, refer to “DTC Check Table” in Section 24 (If there is fault in HU, motor and ECU, exhaust and filling in HECU can not be operated).
(3) After stepping on brake pedal, open the bleed screw on the caliper or drum brake to exhaust the air inside.
This operation should be carried out for all wheels before that the brake fluid exhausted through the bleed screw contains no air and brake pedal is hard enough.
(4) Operate the exhaust mode with the reassembled equipment or diagnostic instrument and step on brake pedal, if there is no reaction force, repeat stepping on and releasing the pedal until exhaust mode is finished.
(5) Rework of operation of item (3) (exhaust) should be carried out for all wheels.
(6) Measure the play of brake pedal; if not in compliance with specification, repeat the processes in item (4) (exhaust mode) and item (3) (exhaust). If the brake pedal play still does not comply with specification after over 10 repeats of exhaust mode and exhaust operation, replace with spare HECU (wet) and then restart the operation.
(7) Connect the reassembled equipment and diagnostic instrument to HECU to recheck whether there is still a DTC. If there is still a DTC, disconnect the reassembled equipment or diagnostic instrument.

Appendix I:

Fault Cases and Mistaken Repair Cases

HECU mistaken repair cases:

1. HECU replacement concerning ABS working sound

Case of HECU replacement for misjudging sounds of solenoid valve and motor as fault when ABS is working

It is normal that there is noise during brake pressure decrease or increase when ABS is working. The volume of noise varies according to different pressures to all wheels. It is not a fault, which should be explained to clients.

When ECU diagnoses whether motor is working at the vehicle speed of 10 km/h for the first time after start, a sensitive client may hear noise, which is also a normal ABS working condition.

2. HECU replacement concerning EBD working sound

Case of HECU replacement for misjudging “click” sound from rear wheel as fault when braking.

ABS can work as EBD. When rear wheel is blocked before front wheel, ABS will reduce the brake pressure of rear wheel, which may cause noise. It is normal.

3. HECU replacement concerning braking deviation

Case of HECU replacement concerning the phenomenon that vehicle drifts to one side when braking

ABS is an auxiliary brake equipment to calculate the speeds of all wheels by ECU and maintain the best brake force and operation stability. When a fault occurs to HECU, ECU will turn on the warning lamp after diagnosis. As a result, if braking deviation occurs while ABS warning lamp is not turned on, other hydraulic brake equipments should be checked.

Braking deviation may occur when ABS is working if brake hose is mistakenly assembled.

4. Case of replacement concerning that ABS works during low speed (below 40 km/h) brake

Case of HECU and sensor replacement concerning that ABS works during every low speed brake

ABS may work during low speed braking according to road condition and brake pressure. If ABS works every time, check whether the air gap of sensors of all wheels is too large, whether the ring gear is disturbed and damaged.

Air gap adjustment method: After confirmation of part with abnormal air gap, replace or burnish the mounting surface (contact area) of sensor and adjust to the specified air gap; when disturbance occurs, a thin washer should be placed on the surface of sensor and then adjust to specified air gap.

Appendix II:

ABS Common Sense

1. If braking distance will be shorter after installing ABS?
According to experimental statistics, the braking distance will be shorter (about 5% ~ 20%) on most roads; but it can be longer on some special roads (like snow, non-asphalt and uneven roads), but with stable steering.
2. What are the main purposes of ABS?
The main purpose of ABS is to prevent block. The functions are as follows:
(1) To stabilize the vehicle when braking
(2) To control the direction of the vehicle during braking to avoid collision
(3) To maintain the best brake pressure regardless of the skill of driver
3. Why ABS warning lamp is turned on?
After the vehicle is started, warning lamp will be turned off if no fault is detected by the self-diagnosis of ECU of ABS. If warning lamp is turned on or can not be turned off when vehicle is running, the ABS is abnormal and ABS check in appointed service factory is necessary. When warning lamp is turned on and ABS is abnormal, the brake system still has the basic braking ability.
4. Will no accident happen if ABS is installed?
ABS is an equipment to improve driving safety, not to avoid accident caused by driving mistake or traffic condition. As a result, do not depend too much on ABS. Please always drive safely.
5. Is it caused by ABS that the vehicle drifts to one side when running on a slippery road?
This is because the friction coefficients of the left and right wheels are different. ABS can stabilize the vehicle in this situation, but the driver should also control the steering wheel to avoid accident.
6. The vehicle will drift before braking when turning on a slippery road. Does ABS work if to brake now?
Definitely ABS will work effectively and may stabilize the vehicle according to the speed, but the position of vehicle can only be adjusted slightly even ABS works because the outward force is too large for the inertia. Usually there are two kinds of forces during turning: one is needed when running and braking; the other is needed when turning and stabilizing. Actually running, braking and turning of the vehicle are coordinated by the two kinds of forces above; and they are in inverse proportion to each other. As a result, the brake force will increase while the turning and stabilizing force will decrease if to brake when turning. The two kinds of forces can be adjusted to the best on the vehicle with ABS; but they can not be adjusted on the vehicle without ABS, which will weaken its steering performance and stability.
If the two kinds of forces are too small (For example, the vehicle will leave the running route as the speed is too high when drifting), the force to adjust the vehicle is too small, the ABS effect is not obvious. In a word, deceleration in advance and safe turning is the best solution.

Appendix III: ABS Interior Hydraulic Pressure Flow Diagram

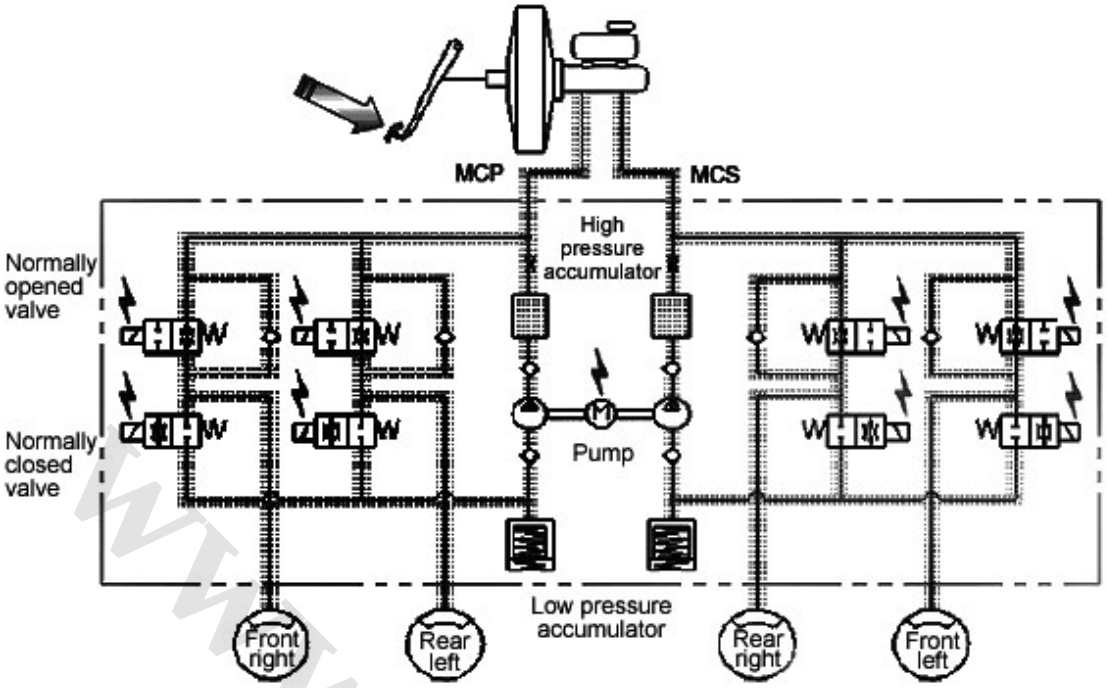


Fig. 3-20

Appendix IV: MGH-25 ABS ECU Connecting Piece Pin Layout

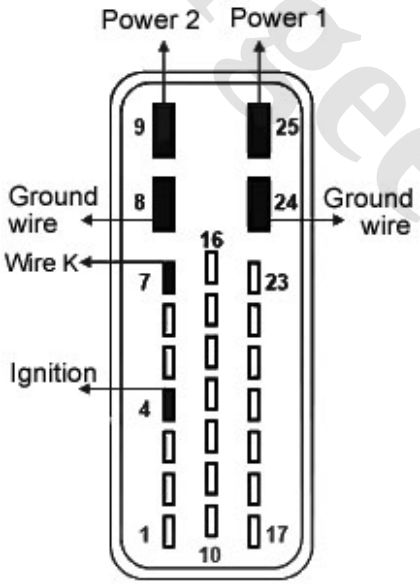


Fig. 3-21

Appendix V: Electric Circuit Diagram

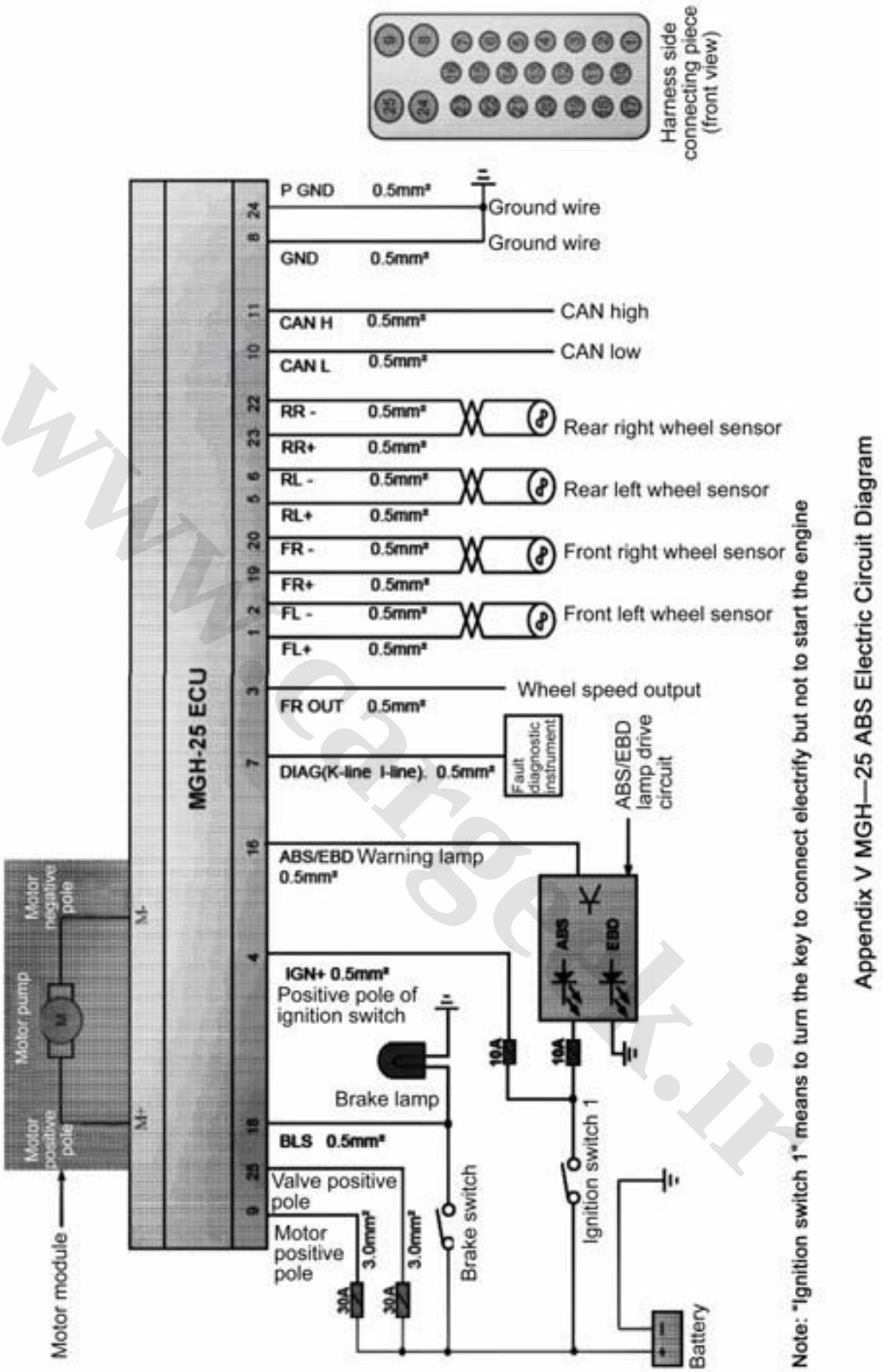


Fig. 3-22

Chapter IV Electrical System

General Rules Trouble Shooting

I. Appearance inspection before repair

1. Check for relevant fuses and relays.
2. Check for possible damage, charging state, surface cleanness and harness interface tightening of battery;

Notes:

(1) When the battery has a loose earth connection, do not attempt to start up the engine, or the connection will be seriously damaged.

(2) If the earth connection is not disconnected, quick charge is forbidden, otherwise damage will bring to diodes of AC generator.

3. Check for belt tightness of AC generator;

II. Operating condition of harness interface

1. Clean and tight interface terminal.
2. All interfaces equipped with pushing separated latch fitting (A). (Fig. 4-1)

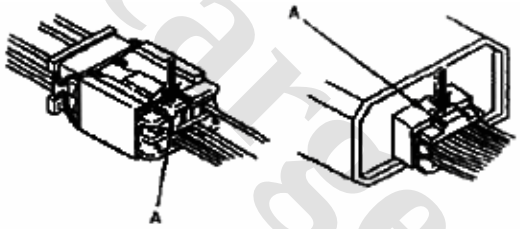


Fig. 4-1

3. Some interfaces have clips for fixing the interface onto the vehicle body or other assembly, noted that the clips secure through reverse buckling.
4. Some interfaces are equipped with double self-locking, which must be unlocked before removing the interface from its mount (A).
5. To separate interfaces, pulling the harness should be avoided, instead, grab the interface (for the ones with self-locking, unlocking is required) to remove it from the mount (A). (Fig. 4-2)

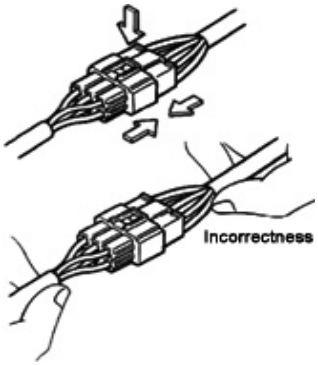


Fig. 4-2

6. As for the ones with protective plastic or rubber sleeve, install the sleeve while removing. (Fig. 4-3)

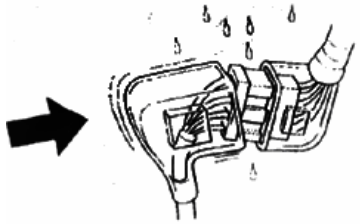


Fig. 4-3

7. Before connecting interfaces, make sure the terminal (B) locates at its origin, free from bending or other distortion; regarding some multihole interfaces, make sure the socket is filled with grease (waterproof interface excluded). (Fig. 4-4)

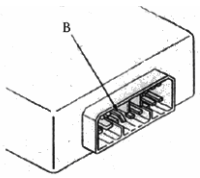


Fig. 4-4

III. Before repair

1. Check for tightness of retainer (A) and rubber seal (B). (Fig. 4-5)

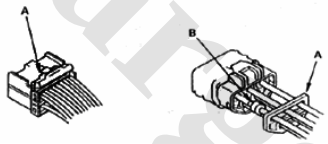


Fig. 4-5

2. Insert the interface directly, to ensure reliable locking.
3. Secure the lead at designated mounting position with the help of the binding belt for each lead.
4. Remove the wire clip with care, be aware not to damage its latch fitting (A). (Fig. 4-6)

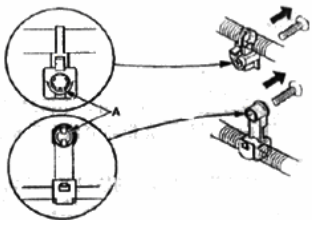


Fig. 4-6

5. Slide the pliers down to the bottom of the wire clip, through the hole at a certain angle, and then seize up the expansion piece, so as to loose the wire clip. (Fig. 4-7)

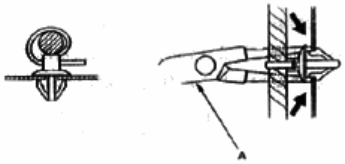


Fig. 4-7

6. After fixing the wire clip, make sure that it does not interfere with other movable components.
7. Keep the harness away from exhaust pipes and other heating components, edge components, and screws or bolt mounting positions.
8. Locate the gum cover right into the groove of corresponding mounting hole, and be aware not to distort the gum cover (B). (Fig. 4-8)

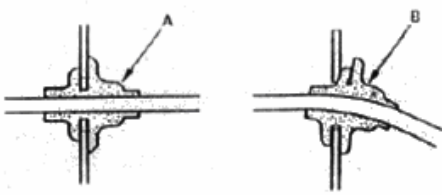


Fig. 4-8

9. Use of lead or interface with cracking insulation is forbidden, in case of cracking, do replace it with a new one or wrap the cracking with electrical adhesive tape to ensure a good insulation.
10. After installing each part, make sure that no lead is caught below the part.
11. When using electrical instrument for equipment testing, follow the guidance of this manual.
12. Make the probe of tester cut in from the lead side (waterproof interface excluded). (Fig. 4-9)

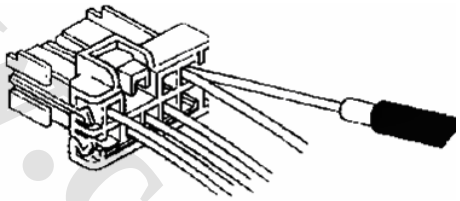


Fig. 4-9

13. Apply the probe with conical tip. (Fig. 4-10)

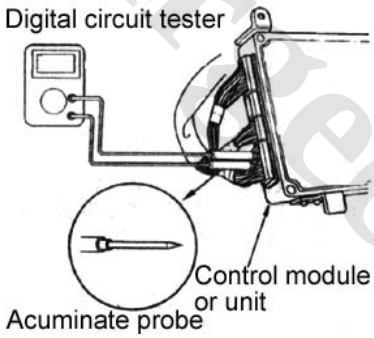


Fig. 4-10

Note: Perforating the lead insulation should be avoided, since the perforation will lead to poor electrical connection or intermittent electrical connection fault.
14. When testing the interface terminal of any control module or unit, insert the acuminate probe gently into the interface from the lead side till get to the terminal face of lead. (Fig. 4-11)

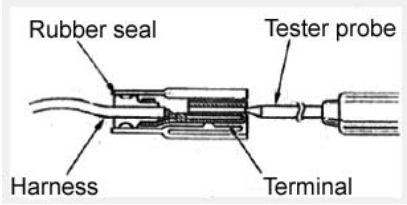


Fig. 4-11

15. Some interfaces have back filled with grease, make refill when necessary, if the grease is

contaminated, change it. Refer to Fig. 4-12.

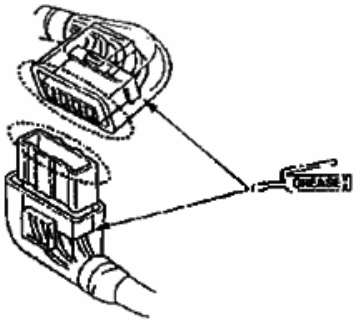


Fig. 4-12

IV. Troubleshooting and steps

1. Fault verification

Switch on all components of faulty circuit to verify the fault, and pay attention to symptoms. Before locate the fault, do not start dismantling or testing.

2. Analysis based on principles

Refer to the schematic diagram to determine the faulty circuit. Start from the power supply, and check each component along the current path, till the earth, to figure out the operating principle of circuit. If there is more than one faulty circuit at the same time, then fuse or earth is likely cause. Figure out one cause or more of the fault, basing on symptoms and understanding to the operating principle of circuit.

3. Insulate the malfunction during circuit testing, to check up the diagnosis made in step 2. Mind that organized and concise steps are critical for troubleshooting, i.e. first test the most probably faulty point by way of the approachable points.

4. Trouble handling

Repair at once when the fault is identified. Use the right tools in accordance with safe operation steps.

5. Confirmation of normal operation

Switch on all components along the repaired loop under all operating modes to make sure that all faults are eliminated. If the fault is a blown fuse, then testing of all circuits connected by the fuse is required. Make sure no new fault arises, and the original fault does not occur again.

V. Troubleshooting with DTC

1. Vehicle entry

① Make registration

② Clean the car

③ Make a record of current environment

2. Trouble record and analysis

Make an inquiry on trouble details, like the status and environment when the trouble occurs.

3. Symptom verification and DTC inspection

① Check the battery voltage during engine flameout

② Check the harness, connector, and fuse

③ Run the engine at normal operating conditions, verify symptoms and conditions, make DTC inspection according to the DTC attached.

4. Use of DTC or trouble symptom table

Work out investigational procedures and scope of systems and components concerned with the help of DTC or trouble symptom table based on DTC data or symptoms.

5. Electrical check

Locate and figure out further causes of trouble in this way.

6. Repair

Repair damaged systems and components.

7. Validation test

Make sure if the fault is eliminated under identical environment or conditions.

8. Maintenance record

Record and file off for treatment.

VI. Fuse check and replacement

A type (blade) Fig. 4-13

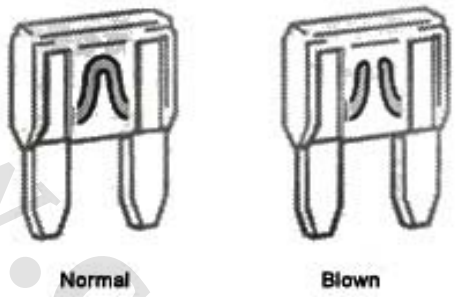


Fig. 4-13

B type blade Fig. 4-14

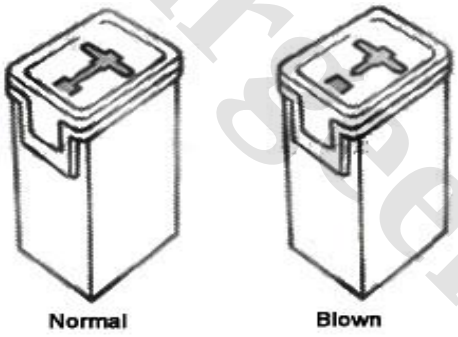


Fig. 4-14

C type blade Fig. 4-15

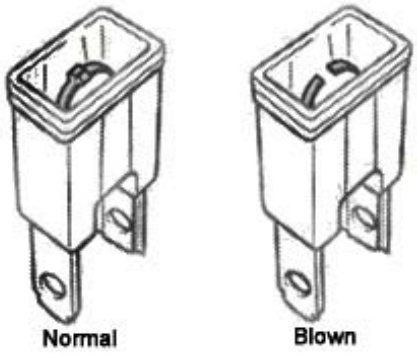


Fig. 4-15

Section I Instrument Cluster

I. Overview

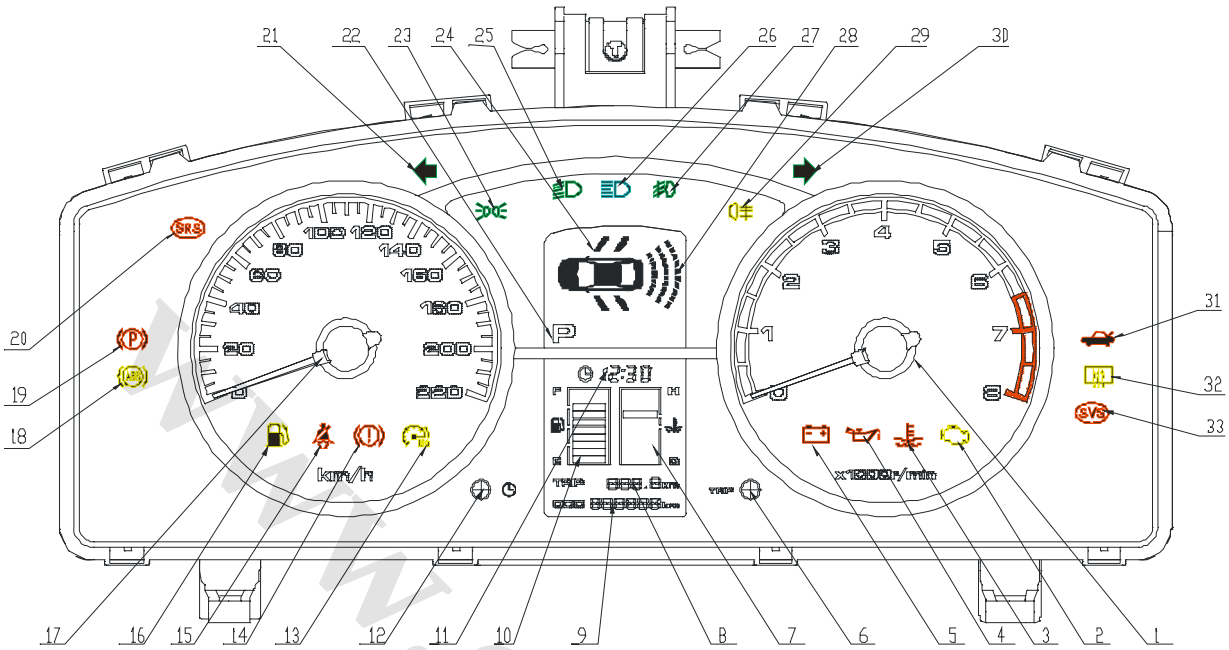


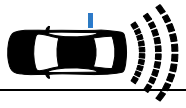
Fig. 4-16

1. Engine tachometer
2. Engine OBD indication
3. Engine coolant overheated indication
4. Oil pressure insufficient indication
5. Charging warning
6. Subtotal odometer adjusting rod
7. Engine coolant temperature indication
8. Subtotal odometer
9. Accumulated odometer
10. Fuel indication
11. Clock
12. Clock adjusting rod
13. 120km/h speed warning
14. Brake fluid warning
15. Seat belt reminder
16. Insufficient fuel warning
17. Speedometer
18. ABS fault warning
19. Parking brake on-position indication
20. Air bag fault warning
21. Steering light indication, L
22. Shift indication
23. Position lamp indication
24. Door ajar indicator
25. Headlight low beam indication
26. Headlight high beam indication
27. Front fog light indication
28. Reverse radar indication
29. Rear fog light indication
30. Steering light indication, R
31. Luggage boot ajar indication
32. Rear defroster indication
33. Trouble indication beyond engine OBD

The instrument cluster as shown in Fig. 4-16 falls into electromechanical equipment, locating right ahead of the driver, above the steering column, composed of installation parts, electrical connections and so on. All circuits of the instrument cluster combine to form a single harness, which is connected by interfaces at the back of cluster housing. All instruments and indicators are under good protection behind a transparent plastic sheet, obviously seen in front of gauge cover.

Behind the transparent plastic sheet are protective cover and panel of instrument cluster. The light screen is integrated into the protective cover, to keep the instrument face unaffected from ambient illumination and reflection, so as to ease the dazzle. The instrument cluster panel and dial enjoy multi-layer structures. In the panel close to the center, there are two big round opening, through which, two master instruments (tachometer and speedometer) can be seen; on the centers of the two master instruments, there are LCD displays, each display has two isometric square panes, through which, two minor instruments (fuel gauge and engine coolant temperature gauge) can be seen; there is a display under the two minor instruments, through which mileage can be read. Vocal warning is also integrated into the instrument cluster. Dark coloring of the panel facilitates to recognize that the face and instrument dial face consist of multiple layers with surface layer or covering layer. The surface layer is semitransparent of dark color, which can prevent the vagueness of cluster component encapsuled with unlighted indicators, while the semitransparent feature makes indicators and icons visible when lighted. Graphs, graduations, and figures are also semitransparent, lighted from the back; while the white instrument pointer is lighted from the inside. Below the plastic sheet of instrument cluster along the central position is a little plastic button switch for odometer and mileometer, which protrudes over the sheet surface through the special hole penetrating the sheet. By utilizing integrated circuit and PCI data bus, partial information from the network of instruments and indicators are controlled by the instrument cluster, and some information is directly input from corresponding instrument and indicator for function.

Table 4-1

				
Insufficient fuel warning	Engine coolant overheated indication	Battery charging warning	Oil pressure insufficient indication	Brake system fault warning
				
Parking brake on-position indication	Engine OBD indication	ABS fault warning	Seat belt reminder indication	Air bag fault warning
				
Rear defroster indication	Steering light indication, L	Steering light indication, R	Hazard warning light indication	Headlight high beam indication
				
Headlight low beam indication	Position lamp indication	Front fog light indication	Rear fog light indication	Trouble indication beyond engine OBD
				……
120km/h speed warning	Luggage boot ajar indication	Door ajar indication	Reverse radar range display indication	……

The instrument cluster is lit to have necessary visibility by adjustable LED from the back. Each indicator of instrument cluster is lit by special LED. All LED are wholly welded to the circuit board at the back of the cluster housing. The instrument cluster is connected to the electrical system of the complete vehicle with connecting circuits, which are integrated into the vehicle harness and go along different paths, secured in varied ways.

II. Placement

As shown in Fig. 4-17 and Fig. 4-18

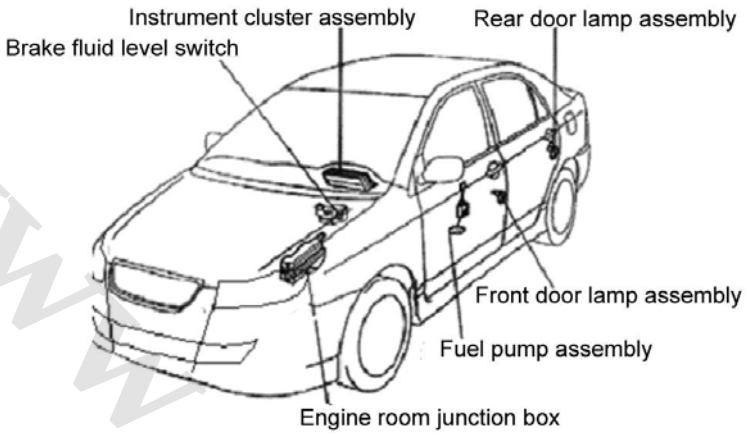


Fig. 4-17

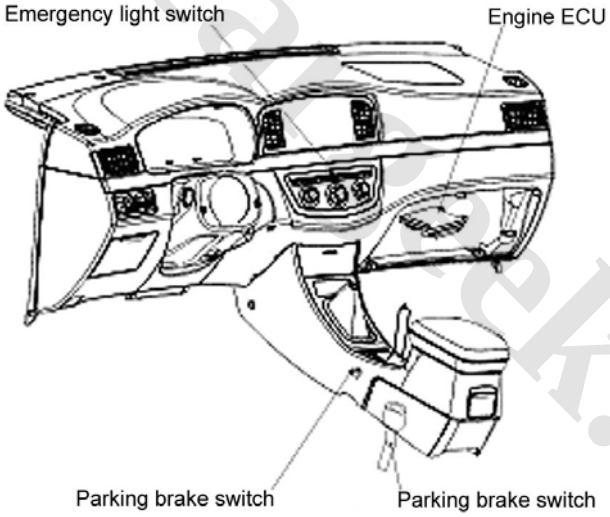


Fig. 4-18

III. Terminal end voltage

1. As shown in Fig. 4-19

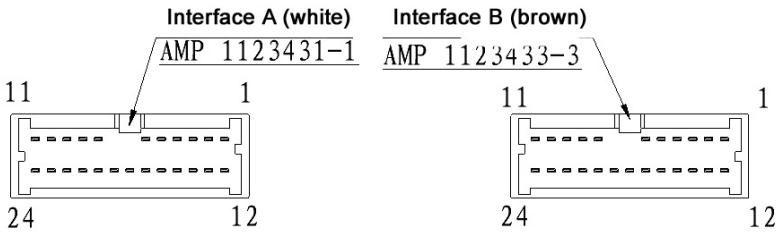


Fig. 4-19

2. For terminal description, refer to Table 4-2

Table 4-2

Testing terminal	Wire color	Terminal description	Test condition	Standard value
A1—body	Y/W	SRS air bag fault signal	Ignition switch ON, indicator lit → unlit	Less than 1V→10～14V
A3—body	Y/B	Parking brake indication signal	Braking indicator unlit → lit	10～14V→less than 1V
A4—body	W/G	ABS brake indication signal	Ignition switch ON, indicator lit → unlit	Less than 1V→10～14V
A6—body	Y/U	Driver's seat belt status signal	Ignition switch ON, driver's seat belt buckle open → in	10～14 V → less than 1V
A7—body	R/Y	BCM fault warning signal	BCM Malfunction indicator light unlit → lit	Less than 1V→10～14V
A9—body	B	Instrument cluster grounding	Always	Less than 1Ω
A10—body	W/B	LIA BA9 signal input	Reverse radar in operation	LIA signal
A12—body	V/W	Braking fault indication signal	Braking indicator unlit → lit	Less than 1V→10～14V
A13—body	S	Front door open, close status indication, L	Door open lit → door close unlit	Less than 1V→10～14V
A14—body	S/B	Front door open, close status indication, R	Door open lit → door close unlit	Less than 1V→10～14V
A15—body	S/G	Rear door open, close status indication, L	Door open lit → door close unlit	Less than 1V→10～14V
A16—body	S/Y	Rear door open, close status indication, R	Door open lit → door close unlit	Less than 1V→10～14V
A17—body	R	Lamplet power signal	Lamplet switch OFF→ON	Less than 1V→10～14V
A18—body	G/Y	Battery power B+	Always	Less than 1Ω
A19—body	V/B	Engine power IG1	Always	Less than 1Ω
A20—body	V/B	Engine power IG1	Always	Less than 1Ω
A21—body	O/G	Speed signal (input)	Ignition switch ON, turn the driving wheel slowly	Pulse signal generated

Table 4-2 (Continued)

Testing terminal	Wire color	Terminal description	Test condition	Standard value
A22—body	W/B	Engine rotation speed signal	Engine runs	Pulse signal generated
A23—body	W/U	Fuel indication signal	Always	Less than 1Ω
A24—body	N	Engine coolant temperature signal	Engine runs, coolant temperature rises	Pulse signal generated
B3—body	R/B	Low beam indication signal	Ignition switch ACC, low beam unlit → lit	Less than 1V→10～14V
B4—body	P/G	High beam indication signal	Ignition switch ACC, high beam unlit → lit	Less than 1V→10～14V
B5—body	Y/W	Front fog light indication signal	Ignition switch ON, front fog light unlit → lit	Less than 1V→10～14V
B6—body	G/R	Lamplet power signal	Lamplet switch OFF→ON	Less than 1V→10～14V
B8—body	V/G	Generator charging indicator signal	Engine runs, charging indicator unlit → lit	Less than 1V→10～14V
B9—body	B/W	Oil pressure signal	Oil pressure warning lamp lit → unlit	Less than 1V→10～14V
B10—body	G/B	Engine fault signal	Ignition switch ON, indicator lit → unlit	Less than 1V→10～14V
B11—body	Lg/W	Rear fog light power signal	Ignition switch ON, rear fog light unlit → lit	Less than 1V→10～14V
B12—body	S/V	Luggage boot ajar warning indication signal	Luggage boot opens → closes	Less than 1V→10～14V
B13—body	N/W	Rear defroster indication	Rear defroster indicator unlit → lit	Less than 1V→10～14V
B14—body	G	SVS trouble warning beyond engine OBD	SVS indicator lit → unlit	Less than 1V→10～14V
B19—body	R/Y	Steering signal, L	Ignition switch ON, steering signal, L OFF→ON	Less than 1V→10～14V
B20—body	N/Y	Steering signal, R	Ignition switch ON, steering signal, R OFF→ON	Less than 1V→10～14V
B21—body	G	Self-locking output signal	Unlock → lock	Less than 1V→10～14V

IV. Trouble Symptom Table 4-3

Table 4-3

Symptom	Cause	Symptom	Cause
1 Instrument cluster does not work	1 Faulty fuse 2 Faulty wiring and connector 3 Faulty instrument cluster	2 Speedometer fault	1 Faulty speed sensor 2 Faulty wiring and connector 3 Faulty instrument cluster
3 Tachometer fault	1 Faulty engine or ECM 2 Faulty wiring and connector 3 Faulty instrument cluster	4 Fuel gauge fault	1 Faulty fuel level sensor 2 Faulty wiring and connector 3 Faulty instrument cluster
5 Water thermometer fault	1 Faulty coolant temperature sensor 2 Faulty wiring and connector 3 Faulty instrument cluster	6 Reverse radar alarm buzzer does not work properly	1 Faulty instrument cluster 2 Faulty BCM controller 3 Faulty reverse radar probe 4 Faulty reversing switch 5 Faulty key unlocking alarm switch 6 Faulty wiring and connector
7 Seat belt reminder buzzer does not work properly	1 Faulty door lamp switch of four doors 2 Faulty air bag ECU 3 Faulty wiring and connector 4 Faulty instrument cluster	8 Door ajar buzzer does not work properly	1 Faulty door lamp switch of four doors 2 Faulty wiring and connector 3 Faulty instrument cluster

V. Electrical check

1. Instrument cluster doesn't work

(1) Check steps

1) Check the power (60A) fuse of driver's cabin (located on the distribution box inside the engine room). If it is in a normal condition, go to step 2), if not, change the fuse of instrument.

2) Check the live (10A) fuse of instrument cluster (located on the fuse box of instrument desk). If it is in a normal condition, go to step 3), if not, change the fuse of instrument.

3) Check the ignition (5A) fuse of instrument cluster (located on the fuse box of instrument desk). If it is in a normal condition, go to step 4), if not, change the fuse of instrument.

4) Check the instrument cluster.

① Remove the instrument cluster, ignition switch on-position, check the voltage between connector terminals A18, A19 and A20 of instrument cluster and the body, normally around 10～14V.

② Check the resistance between connector terminal A9 and the body, normally less than 1Ω. If it is in a normal condition, replace the instrument cluster, if not, repair or change the wire and connector.

(2) Check the circuit as shown in Fig. 4-20.

2. Speedometer fault

(1) Check steps

1) Check the power input end of speed sensor.

Ignition switch ON-position, check the voltage between 1-T2 and the body, normally around 10～14V.

If it is in a normal condition, go to step 2), if not, repair or change the fuse, wire and connector.

2) Check the ground end of speed sensor as shown in Fig. 4-20.

Check the resistance between 2-T2 and the body, normally less than 1Ω. If it is in a normal condition, go to step 3), if not, repair or change the wire and connector.

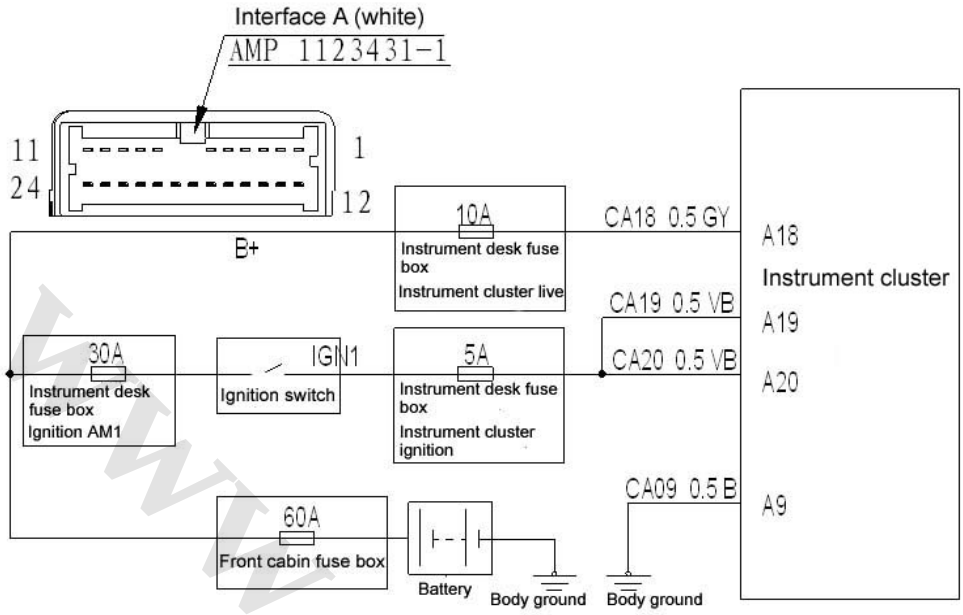


Fig. 4-20

3) Check the instrument cluster.

Shift lever N-position, lift front wheels with lifter, ignition switch ON-position, check the voltage between harness terminals A21 and A9 of instrument cluster when wheels turn slowly, normally, pulsed voltage peaking around 5～14V generated.

If it is in a normal condition, replace the instrument cluster, if not, repair or change the wire and connector as well as the speed sensor.

(2) Check the circuit as shown in Fig. 4-21.

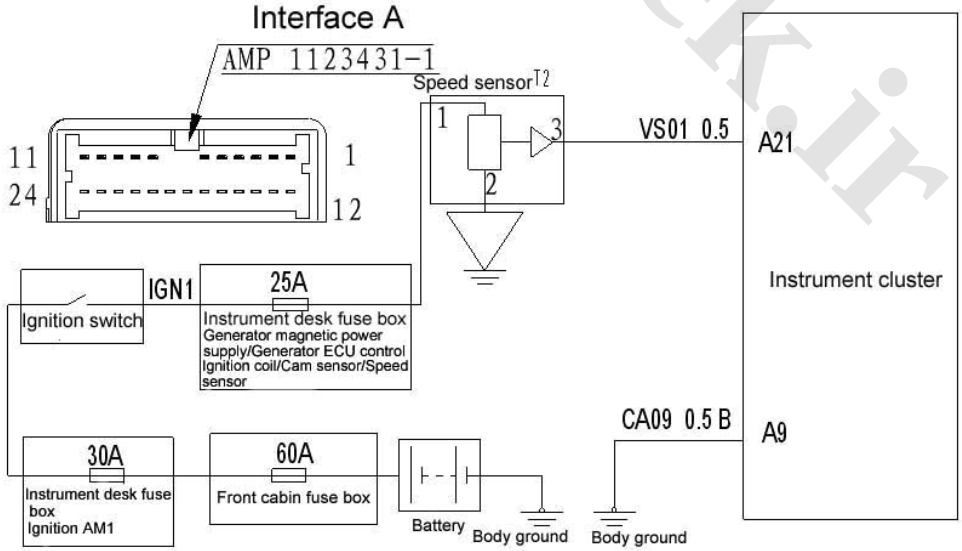


Fig. 4-21

3. Tachometer fault

(1) Check steps

1) Check rotation speed signal output of engine ECM.

Check the voltage between connector terminals A22 and A9 of instrument cluster when engine runs, normally, pulsed voltage peaking around 5V generated.

If it is in a normal condition, replace the instrument cluster, if not, repair or change the wire, connector or electronic injection system.

2) Check the circuit as shown in Fig. 4-22.

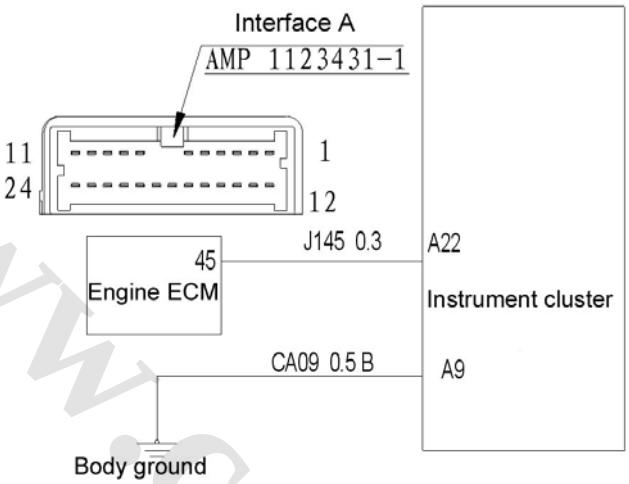


Fig. 4-22

4. Fuel gauge fault

(1) Check steps

1) Check the resistance of fuel level sensor.

Disconnect fuel pump harness connector F11, check the resistance between connector terminals 2-F11 and 3-F11 of fuel level sensor when the floater of fuel level sensor is between E and F. Resistance corresponding to floater position F is around 1～5Ω, while resistance corresponding to floater position E is around 112～116Ω.

If it is in a normal condition, go to step 2), if not, change the fuel level sensor (located on fuel pump).

2) Check the wiring and connector between instrument cluster and fuel pump.

① Disconnect the instrument cluster harness connector, fuel pump harness connector F11 remains disconnected.

② Measure the impedance between A23 and 3-F11, normally less than 1Ω.

③ Measure the impedance between harness terminal A9 and the body, normally less than 1Ω.

④ Measure the impedance between instrument cluster terminal A23 and the body, normally more than 100KΩ.

⑤ Measure the impedance between instrument cluster terminal A9 and the body, normally more than 100KΩ.

If it is in a normal condition, replace the instrument cluster, if not, repair or change the wire and connector.

(2) Check the circuit as shown in Fig. 4-23.

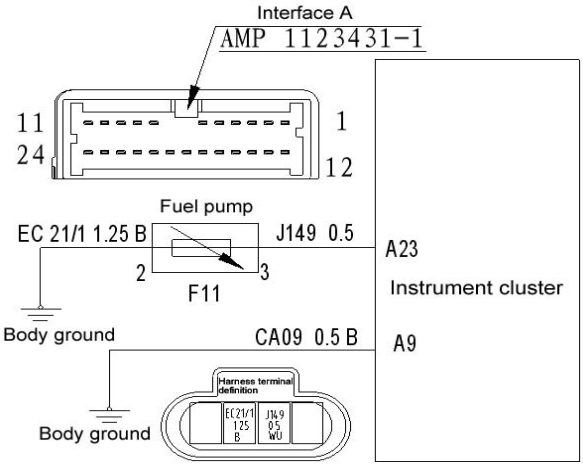


Fig. 4-23

5. Water thermometer fault

(1) Check steps

1) Check the coolant temperature sensor.

Disconnect the harness connector of engine coolant temperature sensor when the coolant temperature is at 90℃, the resistance between the signal wire terminal of coolant temperature sensor and the body should be around 75～98Ω.

If it is in a normal condition, go to step 2), if not, change the coolant temperature sensor.

2) Check the wiring and connector between the instrument cluster and the coolant temperature sensor.

① Disconnect the harness connector of instrument cluster, the harness connector of engine coolant temperature sensor remains disconnected.

② Check the impedance between the harness terminal of instrument cluster foot A24 and engine ECM harness foot 65, normally less than 1Ω.

③ Measure the impedance between the instrument cluster foot A24 and the body, normally more than 100KΩ.

If it is in a normal condition, replace the instrument cluster, if not, repair or change the wire and connector.

(2) Check the circuit as shown in Fig. 4-24.

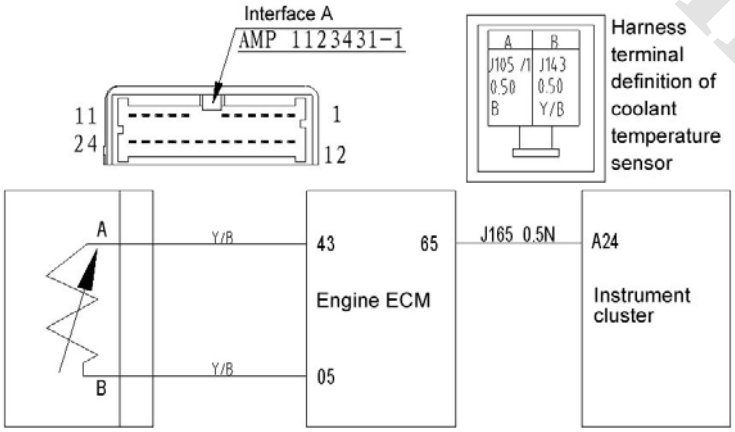


Fig. 4-24

6. Door lamp alarm buzzer does not work properly

(1) Check steps

1) Check left front door lamp switch

Open → close left front door, check the on off state between the instrument cluster A13 and the body, normally should be from on (and resistance less than 1Ω) → off (resistance more than 100 KΩ).

If it is in a normal condition, go to step 2), if not, change left front door lamp switch.

2) Check right front door lamp switch.

Open → close right front door, check the on off state between the instrument cluster A14 and the body, normally should be from on (and resistance less than 1Ω) → off (resistance more than 100 KΩ).

If it is in a normal condition, go to step 3), if not, change right front door lamp switch.

3) Check left rear door lamp switch

Open → close right front door, check the on off state between the instrument cluster A15 and the body, normally should be from on (and resistance less than 1Ω) → off (resistance more than 100 KΩ).

If it is in a normal condition, go to step 4), if not, change left rear door lamp switch.

4) Check right rear door lamp switch

Open → close right front door, check the on off state between the instrument cluster A16 and the body, normally should be from on (and resistance less than 1Ω) → off (resistance more than 100 KΩ).

If it is in a normal condition, go to step 5), if not, change right rear door lamp switch.

5) Check luggage boot lamp switch

Open → close luggage hood, check the on off state between the instrument cluster B12 and the body, normally should be from on (and resistance less than 1Ω) → off (resistance more than 100 KΩ).

If it is in a normal condition, forward to the next step, if not, change luggage boot lamp switch.

(2) Check the circuit as shown in Fig. 4-25

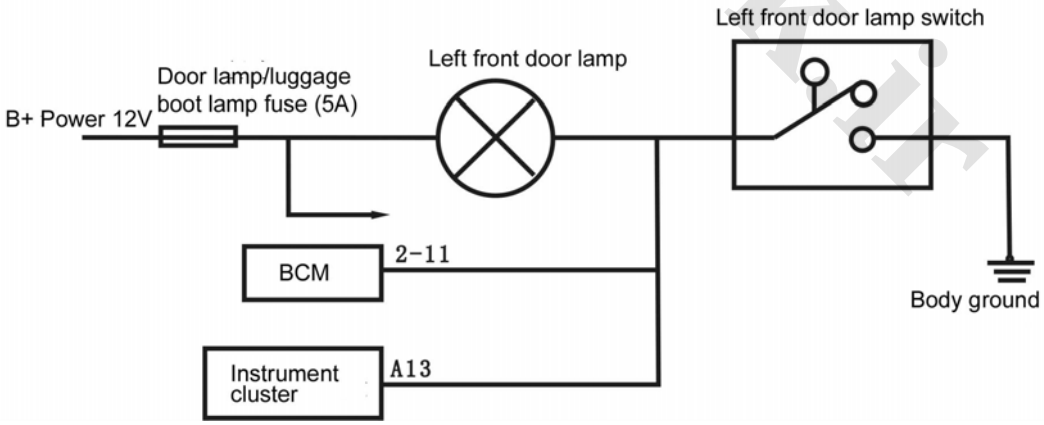


Fig. 4-25

7. Driver's seat belt reminder buzzer does not work properly, as shown in Table 4-4.

Table 4-4

Symptom	Cause
Driver's seat belt reminder buzzer does not work properly	1 Faulty instrument cluster 2 Faulty air bag ECU 3 Faulty wiring and connector 4 Faulty seat belt buckle switch

VI. System component check

1. Check the speedometer as shown in Fig. 4-26.

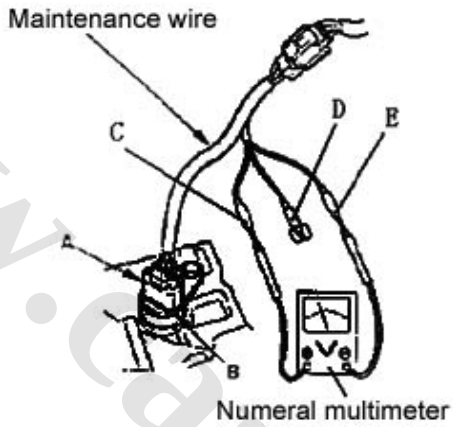


Fig. 4-26

A: Speed sensor maintenance wire socket

B: Speed sensor

C: Speed sensor signal serial port

D: Speed sensor power serial port

E: Speed sensor ground serial port

(1) Prepare maintenance wire and numeral multimeter;

(2) Lift the front of vehicle, reliable support required;

(3) Ignition switch ON-position, shift lever neutral-position;

(4) Turn the wheel, check with multimeter if the voltage is within 0-5V or exceeding the range, if no signal is detected, change the speed sensor, if the condition is normal, go to step (5);

(5) Observe the speedometer, if the pointer does not work properly, change the instrument cluster.

2. Check the output status of speed signal

(1) Prepare maintenance wire and numeral multimeter;

(2) Lift the front of vehicle, reliable support required;

(3) Ignition switch ON-position, shift lever neutral-position;

(4) Drive the car at 10km/h, and check the voltage between connector terminals 10-C7 and 1-C7 of instrument cluster, normally around 5～14V with a vibration frequency of 14 times/s, if the response is abnormal, change the instrument cluster or speed sensor.

Note: Do check the output signal with ignition switch ON-position and harness connector connected.

3. Check the tachometer

Start the engine at DC 13.5V±0.5V, ambient temperature 25℃±5℃, externally connect with trouble diagnostic instrument to measure the rotation speed, the value measured should correspond to the instrument display within a permissible range, as shown in the table below.

Tachometer permissible range (see Table 4-5)

Table 4-5

Value measured (rpm)	Instrument display (rpm)
1000	900～1100
3000	2800～3200
5000	4800～5200

4. Check the fuel gauge

(1) Disconnect the harness connector of fuel level sensor, ignition switch ON-position, check the pointer of fuel gauge, normally at position E;

(2) Connect the connector terminals 2-F11 and 3-F11 at the side of fuel level sensor wire, ignition switch ON-position, check the pointer of fuel gauge, normally at position F;

5. Check the fuel level warning lamp, disconnect the harness connector of fuel level sensor, ignition switch ON-position, normally the pointer of fuel gauge should be at position E, fuel level warning lamp lit.

6. Check the water thermometer

(1) Disconnect the harness connector of coolant temperature sensor, ignition switch ON-position, check the pointer of water thermometer, normally at position C;

(2) Connect the connector terminal at the side of coolant temperature sensor wire to the body, and check the pointer of water thermometer, normally at position H;

7. Check the seat belt reminder warning lamp

(1) Ignition switch ON-position, driver's seat belt buckle open, check the seat belt reminder warning lamp, normally lit;

(2) Ignition switch ON-position, driver's seat belt buckle in, check the seat belt reminder warning lamp, normally unlit;

(3) Disconnect the buckle switch connector, and connect the connector terminal at the side of buckle switch wire to the body. Ignition switch ON-position, driver's seat belt buckle in, check the seat belt reminder warning lamp, normally lit;

8. Check the oil pressure warning lamp

Disconnect the harness connector of oil pressure warning lamp, ignition switch ON-position, connect the connector terminal at the side of oil pressure warning lamp switch wire and the body, normally, the warning lamp should be lit.

9. Check the oil pressure warning lamp switch

Disconnect the harness connector of oil pressure warning lamp, and check the conductivity between the terminal of oil pressure warning lamp switch and the body. When the engine shuts down, the wiring between terminal and body should be conducted; when the engine runs, the wiring between terminal and body should be not conducted.

10. Check the door lamp alarm buzzer

Check the working condition: Ignition switch at ON (IG1) position, if one of the four doors is unclosed, it will buzz, till one condition is eliminated, buzz stops.

11. Check the brake warning lamp

(1) Check the parking brake warning lamp: Disconnect the parking brake switch

Connect the connector terminal at the side of parking brake switch wire and the body with harness connector, ignition switch ON-position, check the parking brake warning lamp, normally lit;

(2) Check the brake fluid level warning lamp: Disconnect the connector of brake fluid level warning lamp, short-connect the connector terminal at the side of parking brake switch wire, ignition switch ON-position, check the brake fluid level warning lamp, normally lit.

12. Check the brake fluid level warning switch: Remove the fluid reservoir lid and the cleaner, disconnect the harness connector of brake fluid level warning switch, and check the conductivity between the terminals of brake fluid level warning switch, normally not conducted while floater is rising. Suck out the brake fluid in reservoir, and check the conductivity between the terminals of brake fluid level warning switch, normally conducted while the floater is descending.

Section II Power Window

I. Overview

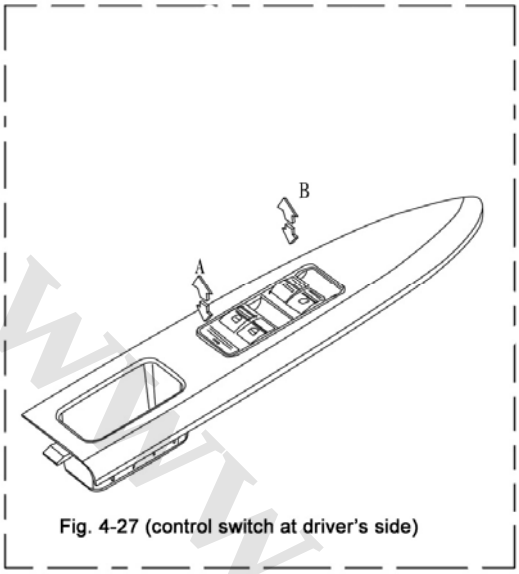


Fig. 4-27 (control switch at driver's side)

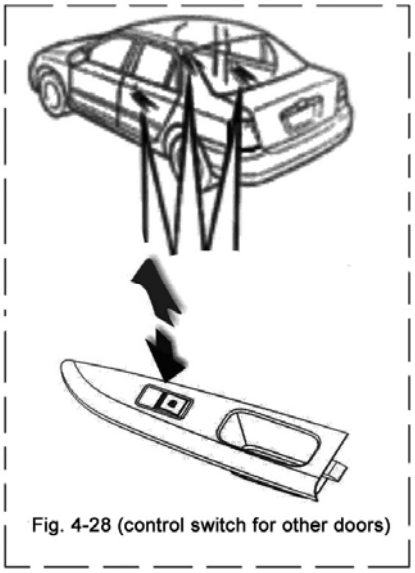


Fig. 4-28 (control switch for other doors)

System operation: Operate the switch on door trim panel to make the window ascend or descend, as shown in Fig. 4-27 and Fig. 4-28. The driver can operate switches of all windows by operating the main switch on front door trim panel at driver's side; the safety switch of power window locates on front door trim panel at driver's side, the driver can inactivate the switches of all windows through key A. Only when the ignition switch locates at ON position, can the power window system work.

(1) Inching up

EX: Lift the window glass controller for ≥300ms, corresponding window glass will rise, and then release the switch, rise stops.

LX/DX: Lift the window glass controller switch, corresponding window glass will rise, and then release the switch, rise stops.

(2) Inching down

EX/LX/DX: Press the window glass controller for ≥300ms, corresponding window glass will descend, and then release the switch, descending stops.

(3) Automatic up

EX: Lift the window glass controller for ≤300ms, corresponding window glass will rise, the window lifter will power off till reach the top. If the detection signal is lost when reach the top, then the window lifter will work for 8 seconds at one time and stop to protect the motor. If another rise or descending operation is ordered during the rise, then the rise stops, and the window lifter will power off till reach the top.

If something is caught by rising window glass, the rise immediately stops and descending starts automatically, during the descending, all operations are useless, and the window lifter will power off till touch the bottom.

(4) Automatic down:

EX/LX/DX: Press the window glass controller for ≤300ms, corresponding window glass will descend, the window lifter will power off till touch the bottom. If the detection signal is lost when touch the bottom, then the window lifter will work for 8 seconds at one time and stop to protect the motor. If another rise or descending operation is ordered during the descending, then the descending stops, and the window lifter will power off till touch the bottom.

Certain functions of power window system depend on the control of its electronic module, which is integrated into the switch component of left front door glass frame riser as well as the BCM body controller.

System components as follows:

(1) Power window switch

(2) Power window motor

(3) BCM body controller

The latest technology, technique and material are applied to the power window system, for example, to ensure good waterproof performance, hermetic design is adopted together with waterproof and breathable film (the motor is easy to have differential pressure compared to the outside when temperature rises during motor running, then the weakest point of sealing is likely to break up, therefore, the motor needs an apparatus which can breathe to balance the pressure difference, so as to relieve the impact on the weakest point of sealing, and the breathable film is the right one, because it can not only balance the pressure difference by gas, but also can prevent liquid water from entering the motor, to perfectly meet hermetic requirements); regarding overheat protection, polymer PTC overcurrent protector is used to promptly and effectively protect the motor from burning resulting from external fault (such as a switch fault); considering acoustic treatment, special design is adopted on the rotating shaft of super shock absorption and fine abrasion resistance to prevent the metallic impact and rubbing noise from occurring during high speed rotation; with respect to power ground, interface is directly connected without lead wire, so faults like poor contact of the wire are avoided; the structure of bipolar DC with permanent magnetism is applied to have bilateral rotation, overheat protection device equipped inside, independent from external electrical protection; when the motor powers on, under the effect of magnetic force, the motor rotates, and decelerates through a big turbine reducer to generate low speed high pulling torque at output gear, when the motor is jammed or an electrical fault occurs, the overheat protection device can cut off the power immediately, to protect the motor. To protect the motor from probable overheat damage resulting from continual rise or descending operation of power window, automatic protection of circuit is available, and after a stop of five minutes, the circuit will recover automatically.

II. Placement (See Fig. 4-29)

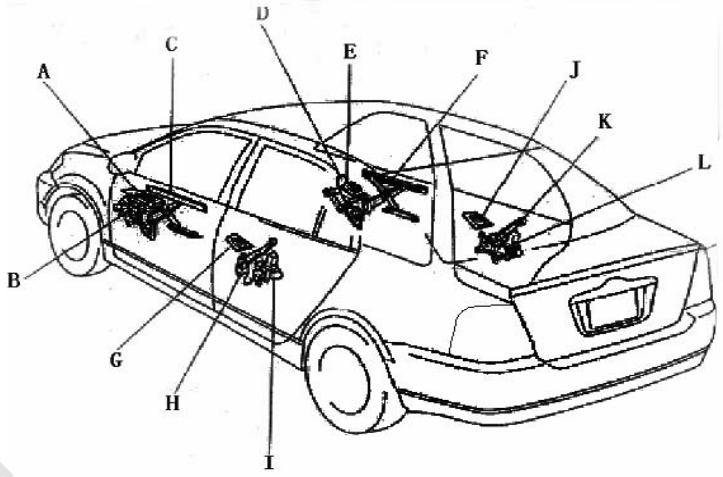


Fig. 4-29

A: Balustrade panel switch of left front door
B: Motor of left front door glass frame riser
C: Bracket of left front door glass frame riser
D: Balustrade panel switch of right front door
E: Motor of right front door glass frame riser
F: Bracket of right front door glass frame riser
G: Balustrade panel switch of left rear door
H: Bracket of left rear door glass frame riser
I: Motor of left rear door glass frame riser
J: Balustrade panel switch of right rear door
K: Bracket of right rear door glass frame riser
L: Motor of right rear door glass frame riser

1. Switch of left front door glass frame riser (See Fig. 4-30 and Fig. 4-31)

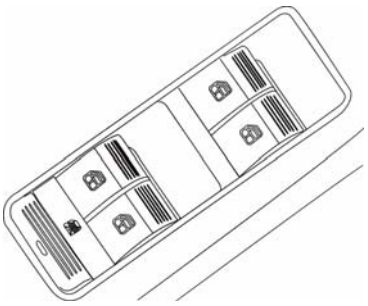
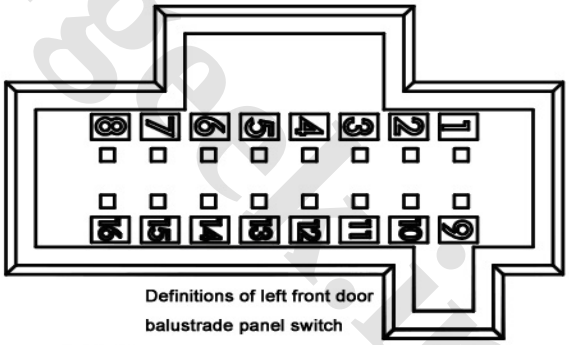


Fig. 4-30



Definitions of left front door balustrade panel switch

1. Left rear up
2. Left rear down
3. Child lock (safety switch)
4. NC
5. NC
6. J+12V
7. Left front up
8. Left front down
9. Right rear up
10. Right rear down
11. NC
12. Ground
13. NC
14. Backlight power
15. Right front up
16. Right front down

Fig. 4-31

2. Definitions of balustrade panel switches of right front, left rear and right rear doors (See Fig. 4-32 and Fig. 4-33)

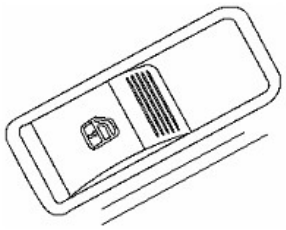
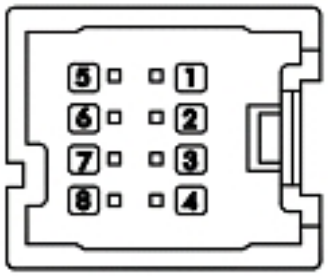


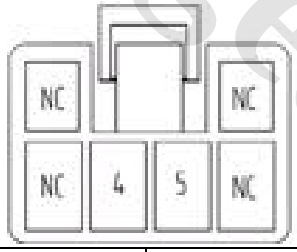
Fig. 4-32



1. Glass up
2. NC
3. NC
4. NC
5. Child lock (safety switch)
6. Ground
7. Glass down
8. Backlight power

Fig. 4-33

3. Definitions of glass frame riser (See Fig. 4-34 and Fig. 4-35)



	Terminal ⑤	Terminal ④	
Turn right CW	+	-	Glass up
Turn left CCW	-	+	Glass down

Fig. 4-34

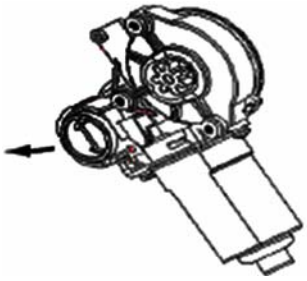


Fig. 4-35

4. Switch of left front glass frame riser (Fig. 4-36 and Table 4-6)

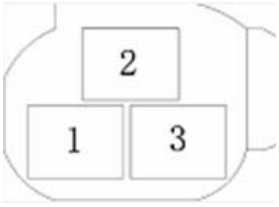


Fig. 4-36

Table 4-6

Testing terminal	Wire color	Terminal description	Test condition	Standard value
1—body	P/B	Left rear door glass frame riser motor up	Ignition ON-position, rise-stop glass	4～5V →Less than 1V
2—body	P	Left rear door glass frame riser motor down	Ignition ON-position, descend-stop glass	4～5V →Less than 1V
3—body	G	Safety switch	Press safety switch, always	10～14V
6—body	W/R	Live power input B+	Always	10～14V
7—body	N/B	Left front door glass frame riser motor up	Ignition ON-position, rise-stop glass	4～5V →Less than 1V
8—body	N	Left front door glass frame riser motor down	Ignition ON-position, descend-stop glass	4～5V →Less than 1V
9—body	Y/B	Right rear door glass frame riser motor up	Ignition ON-position, rise-stop glass	4～5V →Less than 1V
10—body	Y	Right rear door glass frame riser motor down	Ignition ON-position, descend-stop glass	4～5V →Less than 1V
12—body	B	Electrical ground	Always	Less than 1Ω
14—body	R	Backlight power	Lamplet on, backlight dim-bright	Pulse signal generated
15—body	U/G	Right front glass frame riser motor up	Ignition ON-position, rise-stop glass	4～5V →Less than 1V
16—body	U/Y	Right front glass frame riser motor down	Ignition ON-position, descend-stop glass	4～5V →Less than 1V

5. Power window circuit (Fig. 4-37)

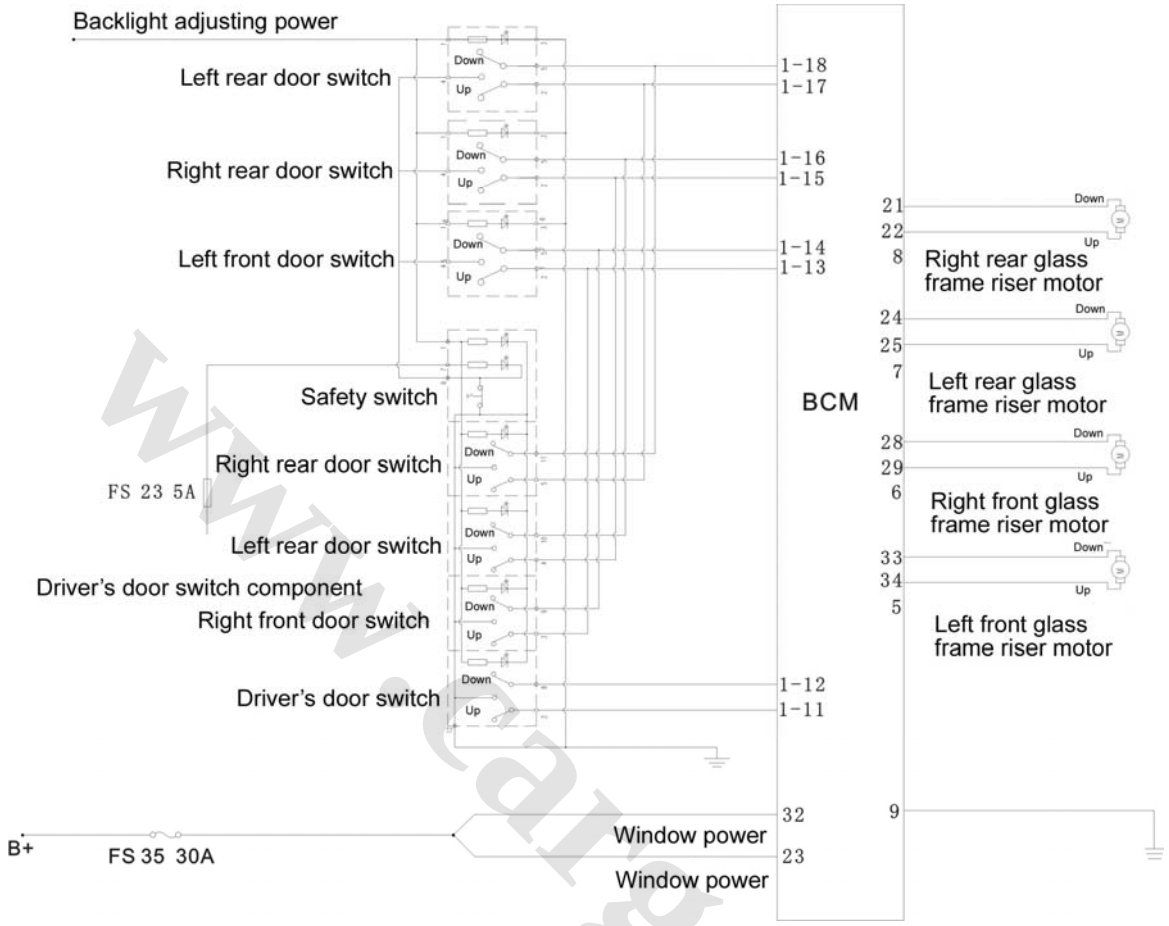


Fig. 4-37

6. Power window trouble symptom table (Table 4-7)

Table 4-7

Symptom	Cause
All power windows do not work	1. Faulty BCM controller 2. Faulty glass frame riser power fuse 3. Faulty wiring
One power window does not work	1. Faulty glass frame riser switch of corresponding door 2. Faulty glass frame riser motor 3. Faulty wiring
Window locking system does not work	1. Faulty safety switch of left front door glass frame riser switches 2. Faulty wiring

III. Component check

1. Check balustrade panel switch of left front door. For the check of left front door glass frame riser switch, refer to the table above. As for the rest doors: check the conductivity between terminals of glass frame riser switch connector.

(1) Check if glass frame riser switch is normal

Press the safety switch on balustrade panel switch of left front door, and locate the switch of left front door glass frame riser switch at UP, normally terminal 3 and terminal 12 conducted, terminal 7 and terminal 12 conducted; locate the switch at DOWN, normally terminal 3 and terminal 12 conducted, terminal 8 and terminal 12 conducted. Check the rest riser buttons as per steps aforesaid. If the conductivity is not qualified, then change corresponding glass frame riser switch.

(2) Check if safety switch is normal

If only press the safety switch on balustrade panel switch of left front door, normally terminal 3 and terminal 12 conducted; if the safety switch on balustrade panel switch of left front door is not pressed, normally terminal 3 and terminal 12 not conducted. If the conductivity is not qualified, then change corresponding glass frame riser switch.

(3) Check if the backlight of balustrade panel switch of left front door is normal

Connect terminal 14 (10～14V) to power, terminal 12 grounded, observe if the backlight is lit, lit means qualified, while unlit unqualified.

2. Check glass frame riser motor

Connect battery positive to terminal 5 of glass frame riser motor, negative to terminal 4, glass rises. Connect battery positive to terminal 4 of glass frame riser motor, negative to terminal 5, glass descends.

Section III BCM Central Lock, Burglar Alarm System

I. Overview

The central lock system is part of BCM (body control module), jointly used with burglar alarm system, mainly responsible for the control of four door-lock motors, remote keyless entry and inner lighting control, inactive car start after entering burglar alarm, car locating and so forth. Refer to use's manual to find more, its control principle as shown in Fig. 4-38 and Fig. 4-39.

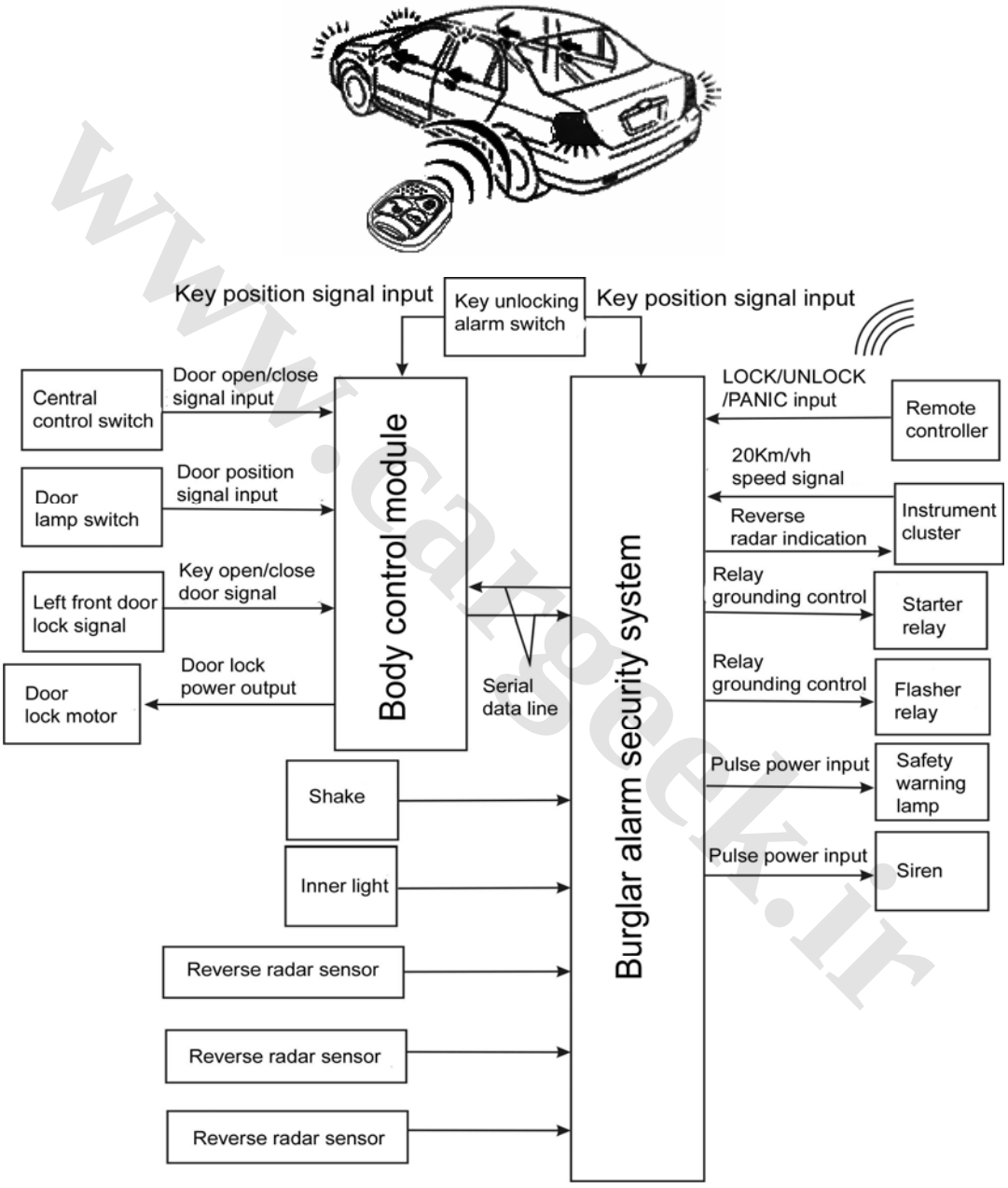


Fig. 4-38

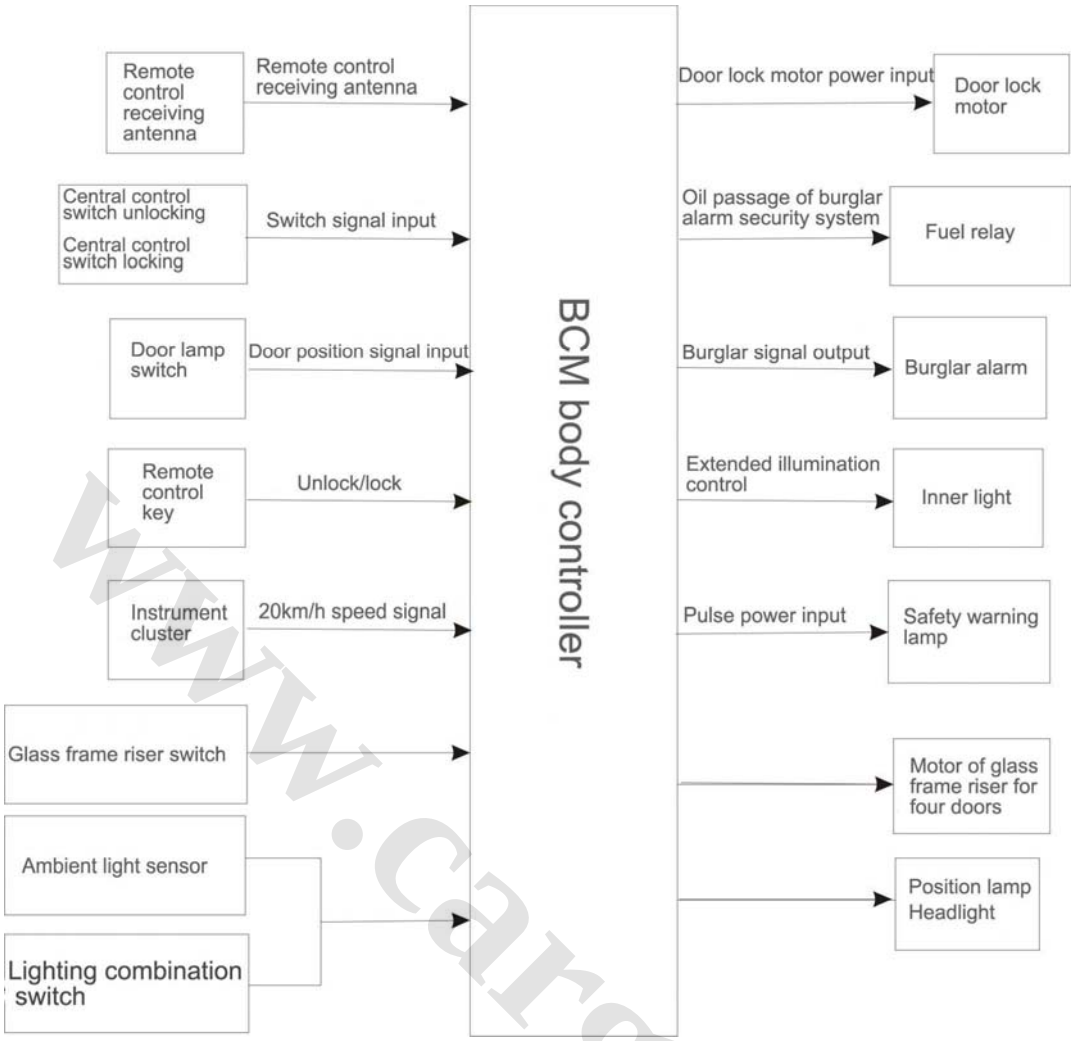


Fig. 4-39

The control logic of central lock conforms to Q/LFQ J07.009-2008 Logic Technology Specifications on LF7162 Sedan Central Control Lock/Burglar Alarm System.

Alarm setting condition: Ignition switch disconnected, ignition key pulled out, four doors and luggage boot well closed.

Remote control condition: Remote control operation is useless when ignition key is in ignition lock.

1. Locking operation

Under door unlocking status, locking operation can be realized through many ways, and different ways bring about varied results.

(1) Automatic locking upon driving

When the car drives to 20km/h, automatic locking of four doors will act simultaneously, during one driving circle (car does not stop and ignition switch is closed) when the speed reduces to less than 20km/h and then up to 20km/h again, locking operation will not be implemented again no matter whether door unlocking is performed or not.

(2) Locking through dashboard

Operate the keyswitch for locking on dashboard, locking of four doors will act simultaneously.

(3) Locking through remote control

Press the locking key on remote controller (prompt operation), locking of four doors will act

simultaneously, the steering light flashes for once and annunciator sounds for once.

(4) Locking through inserting door lock key

Insert door lock key into door lockhole, turn it counterclockwise, locking of four doors will act simultaneously.

(5) Locking by door locking button

Door locking button may display the status of door lock, i.e. red mark outward means unlocking; red mark inward means locking. Move the door locking button inside the car, only the corresponding door will lock, and the rest doors will not lock.

(6) Logical flow of door locking operation

As shown in Fig. 4-40.

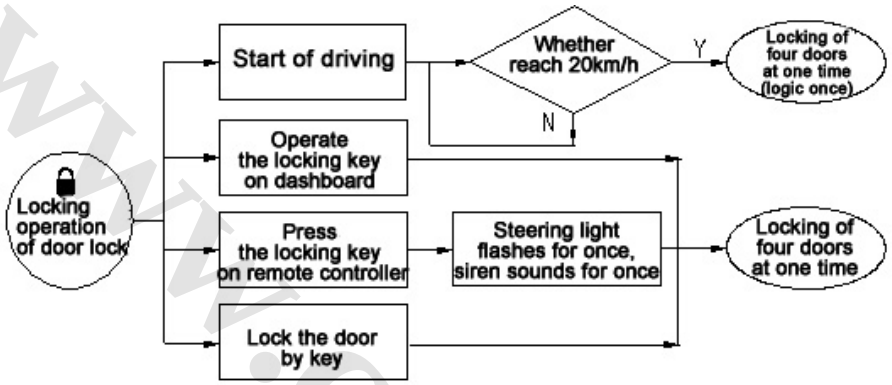


Fig. 4-40

2. Unlocking operation

Under door locking status, unlocking operation can be realized through many ways, and different ways bring about varied results.

(1) Unlocking through dashboard

The unlocking switch on dashboard only implements door unlocking, two-time unlocking available. First-time unlocking is for driver's door, while second-time unlocking is for the rest three doors.

(2) Unlocking through key

Insert door lock key into door lockhole, turn it clockwise, locking of four doors will act simultaneously.

(3) Unlocking by ignition key

After car stops, ignition key returns from "ON" to "ACC", locking of four doors will act simultaneously.

(4) Unlocking by air bag

During a collision, simultaneous to the triggering of ignition of air bag, air bag SDM sends out unlocking signal, independent unlocking of four doors will act simultaneously, the steering light sends out danger warning (ignition lock closes).

(5) Unlocking through remote control

Press the unlocking key on remote controller, independent unlocking of four doors will act simultaneously, the steering light flashes for twice and annunciator sounds for twice.

(6) Logical flow of door unlocking operation

As shown in Fig. 4-41.

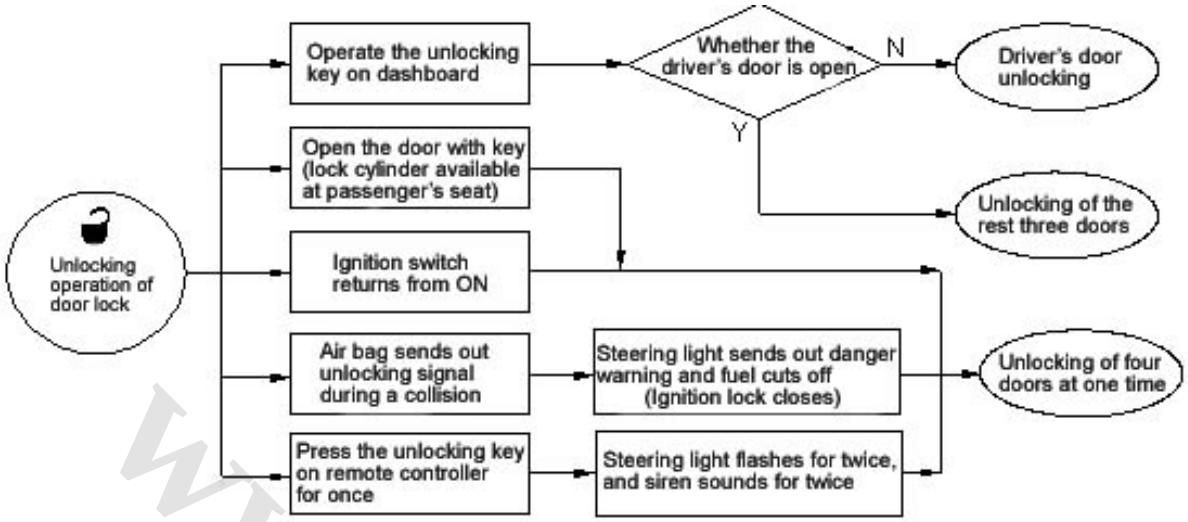


Fig. 4-41

Note 1: When the key is inserted into ignition lock, it's useless to press the locking key and unlocking key of remote controller.

3. Alarm setting

Alarm setting condition: Ignition switch connected, ignition key pulled out, four doors and luggage boot closed.

(1) Alarm setting by remote locking control

1) When alarm setting condition is met, press the locking key on remote controller (prompt operation), locking of four doors will act simultaneously, the steering light flashes for once and annunciator sounds for once; burglar indicator flashes, together with system fuel cut-off, and brake to indicate state of alert;

2) If the alarm setting condition with four doors and luggage boot closed is not qualified, the steering light flashes for ten seconds to indicate door close; after ten seconds, the burglar indicator flashes, together with system fuel cut-off and brake to indicate state of alert.

(2) Alarm setting by two-time remote unlocking control

① When alarm setting condition is met, press the unlocking key on remote controller, unlocking of four doors will act simultaneously, the steering light flashes for twice and annunciator sounds for twice, burglar indicator goes out, and fuel supply recovers.

② If any of the doors is not opened within 30 seconds, the four doors lock, burglar indicator flashes, together with fuel cut-off and brake to indicate state of alert.

(3) Logical flow of alarm setting

As shown in Fig. 4-42.

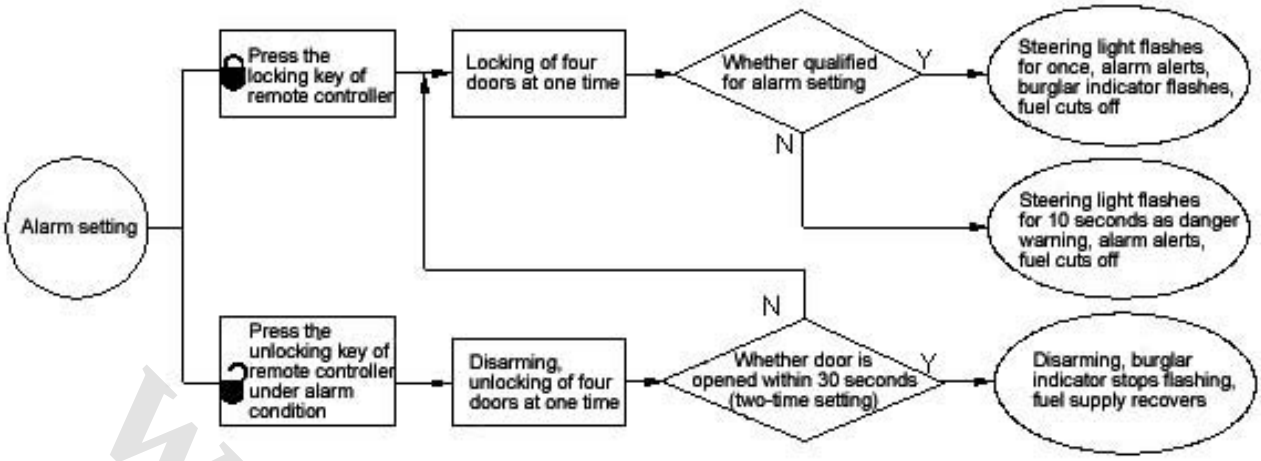


Fig. 4-42

4. Disarming

Under alarm setting condition is met, unauthorized entry or burglar behavior will be detected and the car immobilized, only upon correct disarming by authorized person, can the car recover.

(1) Disarming operation through unlocking key of remote controller

Press the unlocking key of remote controller, unlocking of four doors will act simultaneously, when the system is at alert state, the steering light flashes for twice, annunciator sounds for twice; burglar indicator stops flashing, fuel supply recovers upon disarming.

If the car is at disarming state, unlocking of four doors will act simultaneously.

(2) Logical flow of disarming operation

As shown in Fig. 4-43.

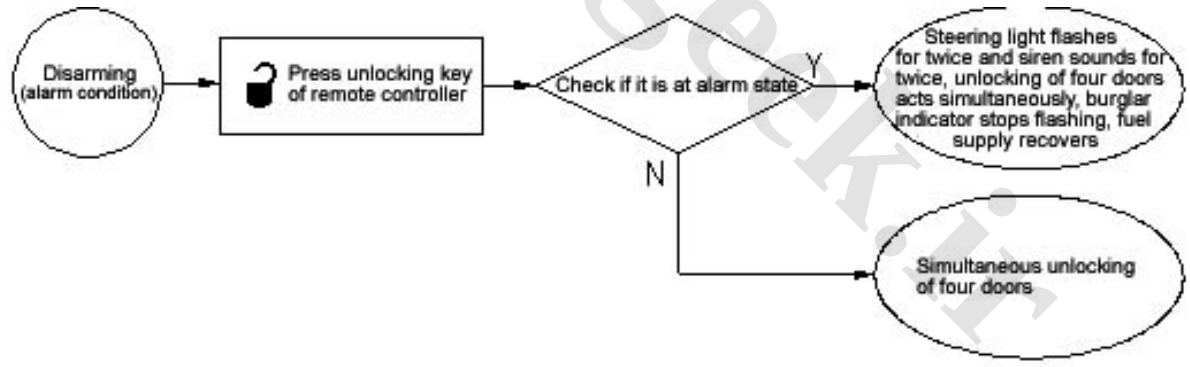


Fig. 4-43

5. Locking indication

If the car is unlocked with alarm setting when it is not used, the system will determine the situation and offer an indication.

(1) Locking alarm setting indication

1) When the ignition switch is connected, ignition key is pulled out, four doors and luggage boot are closed, if the locking key of remote controller is pressed for alarm setting within ten seconds, alarm setting will be implemented.

2) If the locking key of remote controller is not pressed for alarm setting within ten seconds, the steering light flashes for three times and annunciator sounds for three times for locking indication with alarm setting implemented.

(2) Logical flow of locking alarm setting indication

As shown in Fig. 4-44.

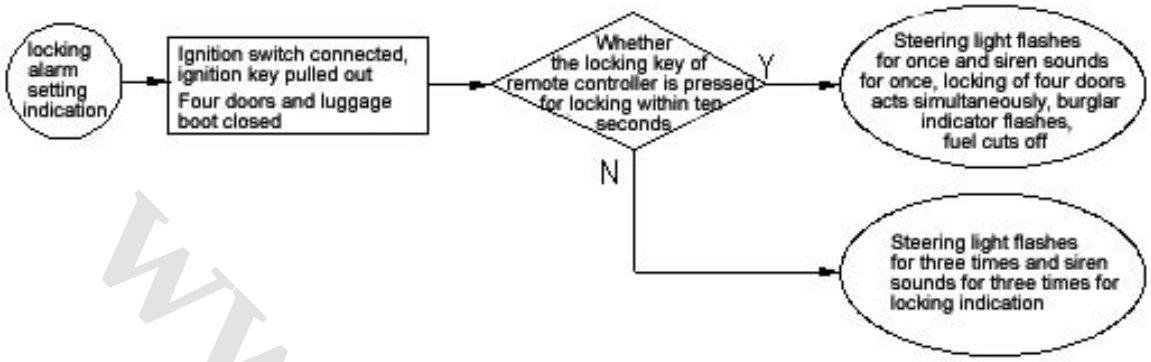


Fig. 4-44

6. Car locating

When there are too many cars at a parking lot, it's difficult to find your car in time, and car locating is furnished for your convenience.

(1) Operation

When the car is at alert state, press the unlocking key of remote controller for ≥2S, a car locating indication will occur, with the steering light flashing and annunciator sounding for 15 seconds and stopping afterward.

Within the 15S, if any key on the remote controller is pressed, the car locating is ended.

If the unlocking key is pressed for ＜2S, the car will still be at alert state.

(2) Logical flow of car locating operation

As shown in Fig. 4-45.

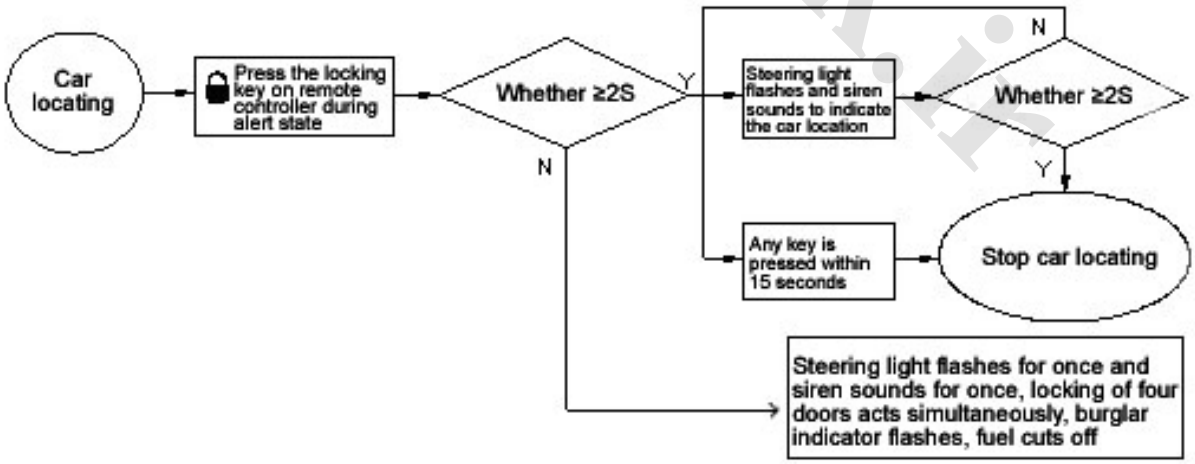


Fig. 4-45

7. Open the luggage boot through electrical operation (EX)

(1) Press the luggage boot key on remote controller when it is not alerted

When it is not alerted, the luggage boot opening key on central console is available for luggage hood springing up, the luggage boot indicator on instrument cluster (No. 31 in Fig. 49) is lit, the luggage hood can be opened by hand, to close, press the hood by hand, the luggage boot indicator on instrument cluster (No. 31 in Fig. 49) goes out, do make sure the luggage hood is locked. If the luggage hood is not closed within 60 seconds, the steering light will flash to give an indication.

(2) To open the luggage boot during alert state

1) It's useless to press the luggage boot key on remote controller when the ignition key is inserted into ignition lock, only when the key is pulled out, can such remote operation be implemented.

2) During alert state, it is necessary to disarm first, then press the luggage boot key on remote controller, the luggage hood springs up, the luggage boot indicator on instrument cluster is lit, the luggage hood can be opened by hand, to close, press the hood by hand, the luggage boot indicator on instrument cluster goes out, do make sure the luggage hood is locked. If the luggage hood is not closed within 60 seconds, the steering light will flash to give an indication.

II. Placement (As shown in Fig. 4-46)

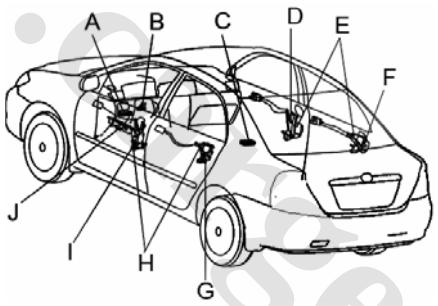


Fig. 4-46

A: Body control module
B: Unlocking alarm switch
C: Burglar alarm security system
D: Central control actuator of right front door
E: Door lamp switch
F: Central control actuator of right rear door
G: Central control actuator of left rear door
H: Door lamp switch
I: Central control actuator of left front door
J: Switch component of left front door glass frame riser

III. Lock end

1. For pin definition of central door lock of body control module (BCM), refer to Fig. 4-47, Table 4-8, Fig. 4-48, Table 4-9, Fig. 4-49, and Table 4-10.

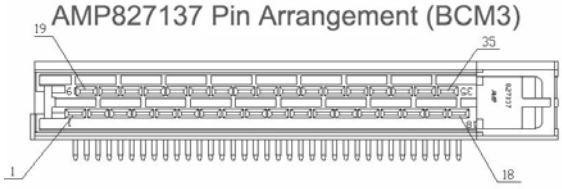


Fig. 4-47

Table 4-8

Testing terminal	Wire color	Terminal description	Test condition	Standard value
(3-1)—body	S/B	Central lock power	Always	Less than 1Ω
(3-2)—body	Y/B	Locking of left front door lock	Always	Less than 1Ω
(3-3)—body	W/B	Unlocking of left front door lock	Always	Less than 1Ω
(3-4)—body	B	Grounding	Always	Less than 1Ω
(3-9)—body	B	Grounding	Always	Less than 1Ω
(3-10)—body	B	Grounding	Always	Less than 1Ω
(3-13)—body	G/W	Annunciator power output	When pressing the unlocking or locking key on remote controller (refer to the user's guide to find more), intermittent	10～14V
(3-19)—body	N/G	Locking of the rest three doors	Always	Less than 1Ω
(3-20)—body	N/W	Unlocking of the rest three doors	Always	Less than 1Ω
(3-27)—body	B	Grounding	Always	Less than 1Ω

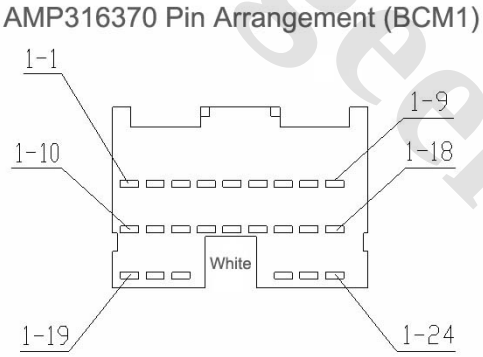


Fig. 4-48

Table 4-9

Testing terminal	Wire color	Terminal description	Test condition	Standard value
(1-1)—body	B/R	Extended illumination control output of inner light	When roof light is at “DOOR” position, the roof light is lit upon unlocking by remote controller or opening of any door. If no door is opened within 30 seconds after unlocking by remote controller, it goes out, and refer to the user’s guide to find more.	Less than 1 V
(1-2)—body	Y/G	Keyhole illumination control output	If open the left front door when the ignition key is pulled out, the key ring indicator will be lightened for 30 seconds, if the left front door is closed within 30 seconds, the key ring indicator will be lit for another 15 seconds and go out; upon key inserted into ignition lock, the indicator goes out immediately; after the key is pulled out, the indicator is lightened, and goes out after 15 seconds. Refer to the user’s guide to find more.	Less than 1 V
(1-4)—body	V/G	Fuel relay control line +	Before engine start → After engine start	Less than 1V→10～14V
(1-20)—body	B/Y	Locking by key	Active low	Less than 1Ω
(1-22)—body	W/Y	Unlocking by key	Active low	Less than 1Ω

AMP316370 Pin Arrangement (BCM2)

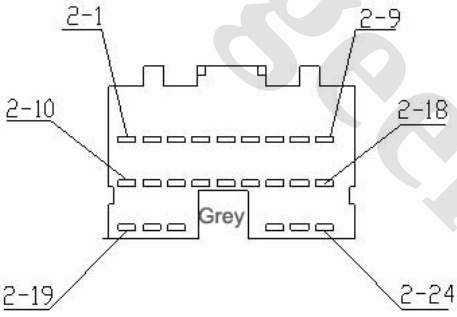


Fig. 4-49

Table 4-10

Testing terminal	Wire color	Terminal description	Test condition	Standard value
(2-1)—body	U/W	Unlocking of central control switch	Active low	Less than 1Ω
(2-2)—body	G/U	Locking of central control switch	Active low	Less than 1Ω
(2-17)—body	W	Remote control receiving antenna of BCM	Always	Less than 1Ω

IV. Circuit check (Fig. 4-50)

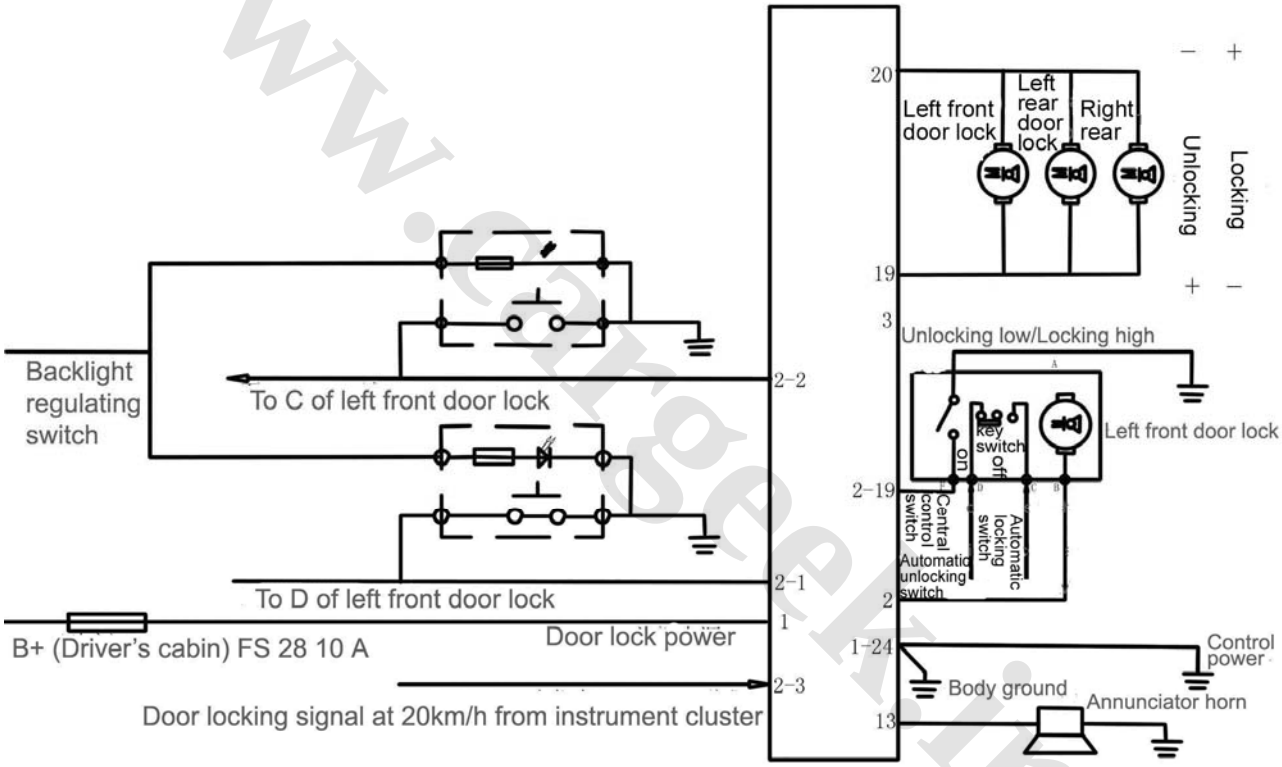


Fig. 4-50

V. Burglar alarm

During alert state, if the key is inserted into ignition lock, ignition switch short-connected, four doors and backdoor open, then the fuel control output is inactivated, the annunciator sounds continuously and steering light flashes; after 20 seconds, the annunciator stops, only flash continues; after another 10 seconds, flash stops; alarm can only be stopped by pressing unlocking key, after which, the ignition switch recovers its control over oil passage.

For central lock trouble symptoms of body control module, refer to Table 4-11.

Table 4-11

Symptom	Cause	Symptom	Cause
Door lock control system does not work	1 Faulty power supply fuse 2 Faulty body control module 3 Faulty wiring	Door lock locking/unlocking fault (apply central control switch and key)	1 Faulty air conditioning controller 2 Faulty body control module 3 Faulty wiring 4 Faulty door key locking/unlocking switch
Only one door lock does not work	1 Faulty door lock motor 2 Faulty wiring	All four door locks do not work	1 Faulty body control module 2 Faulty switch control device 3 Faulty door lock motor 4 Faulty wiring
Remote control fails	1 Faulty door lamp switch 2 Faulty key locking and unlocking switch of door 3 Faulty body control module (receiving) 4 Weak battery or faulty remote controller (sending) 5 Faulty wiring	Locking by mistake (key at ignition switch, automatic locking available at stop)	1 Faulty fastener 2 Faulty body control module 3 Faulty wiring

VI. Component check

1. Basic check

(1) When locking the door at driver's side using key, all doors should be locked; when unlocking the door at driver's side using key, all doors should be unlocked.

(2) Security check

① If the burglar alarm system is still not activated, and the unlocking key on the remote controller is pressed, then only unlocking will be implemented.

② If the burglar alarm system is activated, upon unlocking by remote control, then the steering signal lamp flashes for twice and annunciator sounds for twice, burglar alarm indicator goes out.

③ If the burglar alarm system is activated, and no door is opened after unlocking by remote control, then alert state will recover together with automatic locking, the steering light does not flash and annunciator does not sound.

2. Check of left front door central lock actuator as shown in Fig. 4-51

Left front door central lock actuator

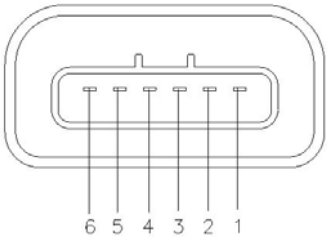


Fig. 4-51

(1) Check the conductivity of locking/unlocking switch of left front door central lock actuator:
When the locking/unlocking switch of left front door central lock actuator is at locking position, actuator terminals 2 and 4 should be conducted; when it is at middle position, actuator terminals 2 and 4 should be not conducted, terminals 2 and 3 not conducted either; when it is at unlocking position, actuator terminals 2 and 3 should be conducted. If the conductivity is unqualified, change the locking/unlocking switch.
(2) Check the working status for locking/unlocking of left front door central lock actuator motor
Connect battery positive to terminal 5 of left front door central lock actuator, negative to terminal 6, the control lever of left front door central lock actuator will locate to locking position. Contrarily, the control lever of actuator will locate to unlocking position. If the condition aforesaid is not met, change the locking/unlocking of left front door central lock actuator motor.
3. Check the central lock actuator for right front door, left rear door and right rear door as shown in Fig. 4-52

Central lock actuator for right front door, left rear door and right rear door

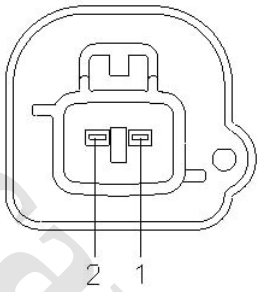


Fig. 4-52

Connect battery positive to terminal 1 of the central lock actuator, negative to terminal 2, the control lever of central lock actuator will locate to locking position. Contrarily, the control lever of central lock actuator will locate to unlocking position. If the condition aforesaid is not met, change the central lock actuator.
4. Check the cause for incapability of remote keyless entry system
Check steps
(1) Control check
1) Basic check
① Within a range of 1m, press the key on remote controller for around 1s and check if all door locks are unlocked or locked, at the moment, the key is not inserted into the ignition lock cylinder and all doors are locked.
② Press the key on remote controller for three times and check if the LED on the controller flashes for three times as well; if press the key and hold on, the LED should light constantly. Note: If press the key for more than three times and the LED still does not light up, a dead battery might be the case.
2) Automatic locking check
① When the car is at burglar alarm state, press the unlocking key on remote controller, if no door is opened within 30 seconds upon unlocking, automatic locking of all doors will be implemented, burglar alarm be activated again, steering light not flash, and annunciator not sound.
② Under the condition above, if any door is opened within 30 seconds upon unlocking, automatic

locking of all doors will not be implemented.

3) Security check

① When the key is inserted into the ignition lock cylinder and the locking or unlocking key on remote controller is pressed, no door lock will be locked or unlocked.

② If an unregistered remote controlled is applied for operation, then the door lock should not be locked or unlocked; when an registered remote controller is applied, the door lock should be available for locking and unlocking.

4) When the key is not inserted into the ignition lock cylinder, and the door is open or ajar, close the door by remote control, the door lock will be locked with a warning generated.

5) Steering signal lamp flash check

① Press the locking key on remote controller: Burglar alarm is alerted (burglar indicator flashes and fuel cuts off), locking implemented; if it is qualified for alarm setting, the steering light flashes for once and annunciator sounds for once; if alarm setting condition is not met, the steering light flashes for ten seconds, annunciator does not sound, door closing indicated, the flash will stop upon closing the door.

② Press the unlocking key on remote controller: Disarm during burglar alarm, unlocking of four doors will be implemented, the steering light flashes for twice and annunciator sounds for twice; if not under burglar alarm, only unlocking will be implemented.

③ If press for unlocking by remote control under burglar alarm and no door is opened within 30 seconds, automatic locking will be implemented with burglar alarm alerted, without flashing of steering light or sounding of annunciator.

④ Lock setting indication: Ignition switch disconnected, ignition key pulled out, all doors closed, if locking is not implemented within 10 seconds, then the steering light flashes for three times and annunciator sounds for three times for locking indication.

⑤ Car locating: Press the locking key on remote controller for more than 2 seconds, car locating will be implemented; the steering light flashes for 15 seconds, annunciator sounds for every 0.2s with a 0.6 intermission, stops after 15 seconds. If any key is pressed within the 15 seconds, car locating will be ended together with corresponding action.

⑥ Burglar alarm: During alert state, if the key is inserted into ignition lock, ignition switch short-connected, doors and backdoor open, then the fuel control output is inactivated, the annunciator sounds continuously and steering light flashes; after 20 seconds, the annunciator stops, only flash continues; after another 10 seconds, flash stops; alarm can only be stopped by pressing unlocking key, after which, the ignition switch recovers its control over oil passage.

⑦ Damaged bulb indication: If main light bulb is damaged, the flash frequency of steering light will be doubled.

⑧ Press the luggage boot key on remote controller (EX): Under alert state, first disarm and then unlock the luggage boot. If unlocking is not implemented within 60 seconds and luggage boot is not closed, the steering light flashes to indicate probable wrong opening. The flash stops upon unlocking or closing of luggage boot.

If it is qualified for the conditions aforesaid, then the system is in a normal state; if not, proceed to the next step.

(2) Remote controller battery check

Upon pressing the remote controller switch three times, the LED of remote controller should light for three times.

If it is the case, proceed to the next step; if not, insufficient battery capacity is indicated, change a battery with designated specification.

(3) Back inner light check

The back inner light at position ON, check if the light is lit.

The back inner light at position DOOR, check if the light is lit.

If it is in a normal state, proceed to the next step; if not, repair or change the back inner light.

(4) Control range check of remote controller

At 1m away from the driver's door, press the switch of a new or normal remote controller of a same car model, check if the system is in a normal state.

Hint: The back inner light at position DOOR, press the remote controller switch, the back inner light will flash again and again.

If it is the case, change the remote controller. If not, proceed to the next step.

(5) Check of ignition switch unlocking alarm switch

During the ignition switch is inserted with key, and the key is then pulled, check the conductivity between terminals 2 and 1 of the switch, normally from conducted → not conducted.

If it is the case, proceed to the next step; if not, change the ignition switch unlocking alarm switch.

(6) Body controller check

Ignition switch open, pull out the fuel relay and check the conductivity from the fuel control line of body controller to fuel relay, as well as the voltage between terminal pin BCM (1-4) of fuel control line of body controller and the body, normally around 10～14V.

If it is in normal condition, proceed to the next step; if not, change the body controller.

(7) Check of automatic window closing of four doors by remote control

Disconnect interface BCM3 of body controller, and check the voltage between central lock power pin BCM (3-1), steering light power pin BCM (3-35), glass frame riser power pins BCM (3-23) and BCM (3-32) of body controller terminal, and the body respectively, normally around 10～12V. Check the resistance between body controller terminals BCM (3-4), BCM (3-9), BCM (3-10) and BCM (3-27), and the body respectively, normally less than 1Ω. Check the conductivity between body controller terminals BCM (3-33) and BCM (3-34), and the left front door glass frame riser motor. Check the conductivity between glass frame riser motors of right front, left rear and right rear doors, and their corresponding terminal in BCM. If it is normal, proceed to the next step; if not, repair or change the glass frame riser motor.

Section IV Electric Side Mirror

I. Overview

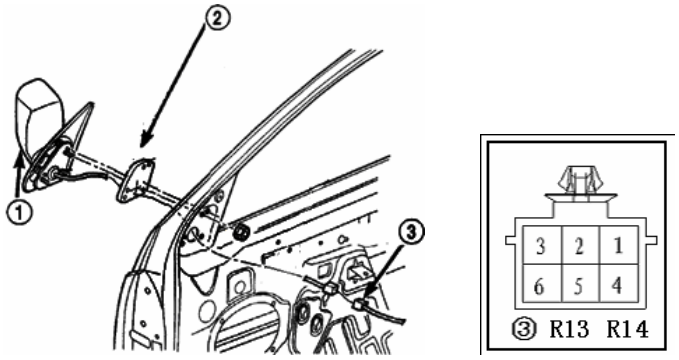


Fig. 4-53

① Electric side mirror ② Sealed pad ③ Electrical interface

By operating the electric switcher on the dashboard at the left side of the driver's seat, the left and right electric side mirrors can be ordered for turning to left, right or up and down, with adjustable angle over 7 degrees. During car stop, the driver can fold up the side mirror, to protect it from possible damage, with adjustable angle over 85 degrees. When the side mirror is bumped from the back, the mirror cover will turn outwardly to protect the mirror, maximally to 105 degrees. If the mirror is smashed, little pieces of glass will remain in mirror cradle, to ensure good security.

Consist of the following:

(1) Left and right electric side mirrors

(2) Electric side mirror switch component

II. Placement

1. As shown in Fig. 4-54.

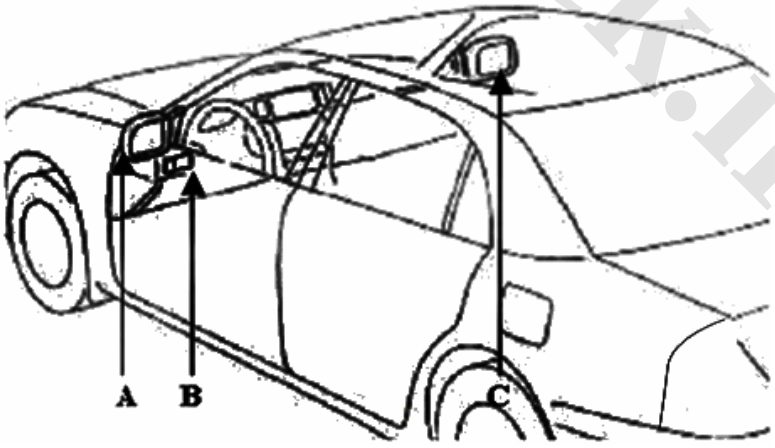


Fig. 4-54

A: Left electric side mirror B: Electric side mirror switch C: Right electric side mirror

2. Exploded view Fig. 4-55

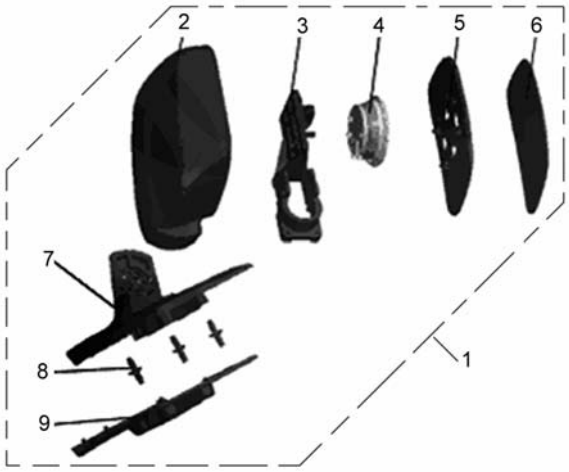


Fig. 4-55

1: Electric side mirror 2: Side mirror cover 3: Bracket 4: Commutator 5: Mirror extension unit 6: Mirror 7: Base 8: Mounting bolt 9: Seating washer

III. Terminal end voltage

1. For electric side mirror switch, refer to Fig. 4-56 and Fig. 4-57.

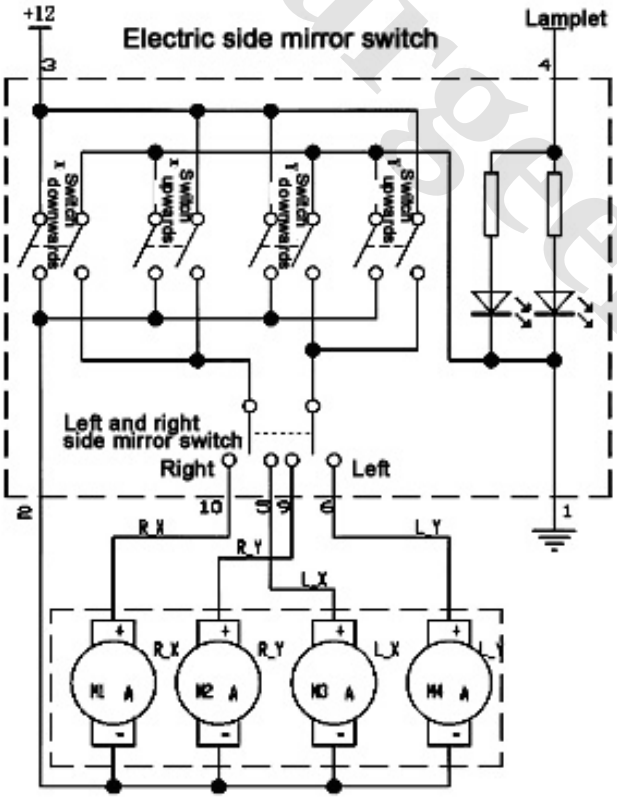


Fig. 4-56

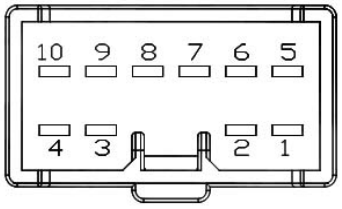


Fig. 4-57

Ignition switch ACC, select left electric side mirror for left and right adjustment
Left: 2-3 conducted, resistance less than 1Ω, 5-1 conducted, resistance less than 1Ω
Right: 5-3 conducted, resistance less than 1Ω, 2-1 conducted, resistance less than 1Ω

Ignition switch ACC, select left electric side mirror for up and down adjustment
Up: 6-3 conducted, resistance less than 1Ω, 1-2 conducted, resistance less than 1Ω
Down: 2-3 conducted, resistance less than 1Ω, 1-6 conducted, resistance less than 1Ω

Ignition switch ACC, select right electric side mirror for left and right adjustment
Left: 3-2 conducted, resistance less than 1Ω, 1-10 conducted, resistance less than 1Ω
Right: 3-10 conducted, resistance less than 1Ω, 1-2 conducted, resistance less than 1Ω

Ignition switch ACC, select right electric side mirror for up and down adjustment
Up: 9-3 conducted, resistance less than 1Ω, 1-2 conducted, resistance less than 1Ω
Down: 2-3 conducted, resistance less than 1Ω, 1-9 conducted, resistance less than 1Ω

2. Electric side mirror motor
(1) Ignition switch ACC, select electric side mirror switch for left and right adjustment
5 (+) 1 (-) Motor turns left
5 (-) 1 (+) Motor turns right
(2) Ignition switch ACC, select electric side mirror switch for up and down adjustment
4 (-) 5 (+) Motor turns down
4 (+) 5 (-) Motor turns up

IV. Trouble Symptom Table 4-12

Table 4-12

Symptom	Cause	Symptom	Cause
Side mirror does not work	1. Faulty fuse 2. Faulty side mirror switch 3. Faulty side mirror motor 4. Faulty wiring	Side mirror does not work properly	1. Faulty side mirror switch 2. Faulty side mirror motor

V. Component check

1. Switch check, check items as mentioned before, if the conductivity is unqualified, change the side mirror switch.

2. Mirror check, check items as mentioned before, if corresponding requirement is not met, change the side mirror motor, wire connector of side mirror motor ③.

VI. Burglar indicator

Check if the burglar indicator is at fault:

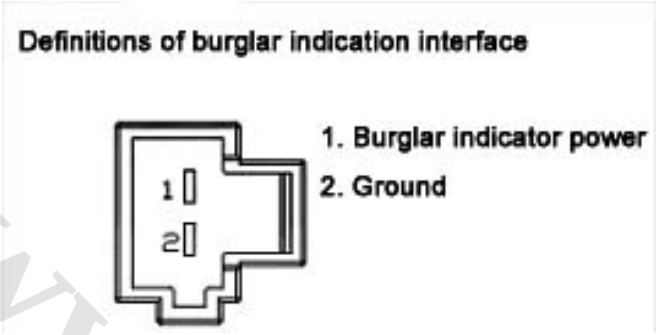


Fig. 4-58

As shown in Fig. 4-58, pin 2 grounded, pin 1 connected to (10～14V) power, burglar indicator should be lit.

If it is normal, forward to other fault check and repair; if not, change the burglar indicator.

VII. Backlight regulating switch

Check if the backlight regulating switch is at fault:

As shown in Fig. 4-58, pin 3 grounded, pin 2 connected to (10～14V) power, pin 1 randomly connected to a switch with backlight, adjust the backlight regulating switch manually, there should be change in brightness.

If it is normal, forward to other fault check and repair; if not, change the backlight regulating switch.

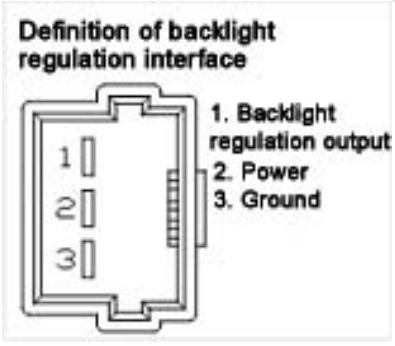


Fig. 4-59

Section V Illumination System

I. Overview

The illumination system is to offer lighting for night driving, consists of outer lights of headlight, backup light, license plate lamp, fog light etc, and inner ones of dashboard light, inner light, luggage boot lamp, door lamp, various backlights etc. Each light is installed at required position, equipped with control switch, wire, fuse protector and so forth, to make up the illumination system, which also enjoys signal indication, comes out with light signals to warn the driver of another car and the foot passenger, to ensure safe driving, including signals for steering, brake, danger warning, outline marker etc. The components as shown in Table 4-13

Note: Do not use bulbs without specifications indicated in the table below, or the car lamps will be damaged. Do not touch the halogen lamp or get it contacted by oily surface, or the bulb's life will be shortened.

Table 4-13

Name	Model	Technical parameter
Low beam of front combination lamp	H1	12V55W
High beam of front combination lamp	H3	12V55W
Position lamp of front combination lamp	LED	12V 0.8W
Steering light of front combination lamp	PY21W	12V21W
Side turn signal light	WY5W	12V5W
Front fog light	H3	12V55W
Position lamp of rear combination lamp	LED	12V1W
Brake lamp of rear combination lamp	LED	12V1.2W
Backup light of rear combination lamp	P21W	12V21W
Steering light of rear combination lamp	PY21W	12V21W
Rear fog light of rear combination lamp	LED	12V3W
License plate lamp	W5W	12V5W
High-mounted brake lamp	LED	12V0.5W
Rear roof light	(Q)-12V5W	12V5W
Luggage boot lamp	W5W	12V5W
Door lamp	LED	12V0.24W

II. Placement

1. Headlight assembly (Fig. 4-60)

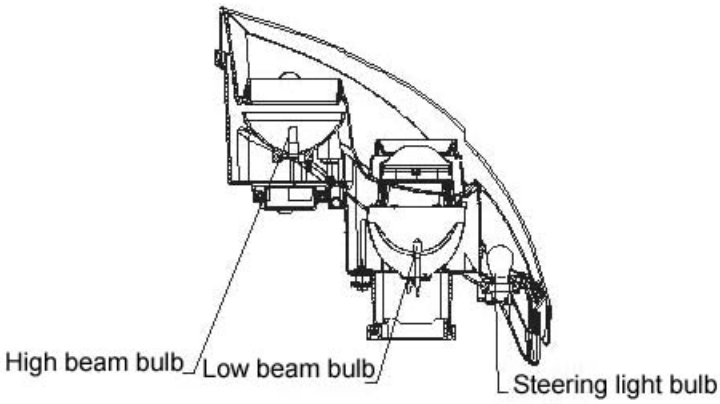


Fig. 4-60

1.1 Front combination lamp interface (Fig. 4-61)

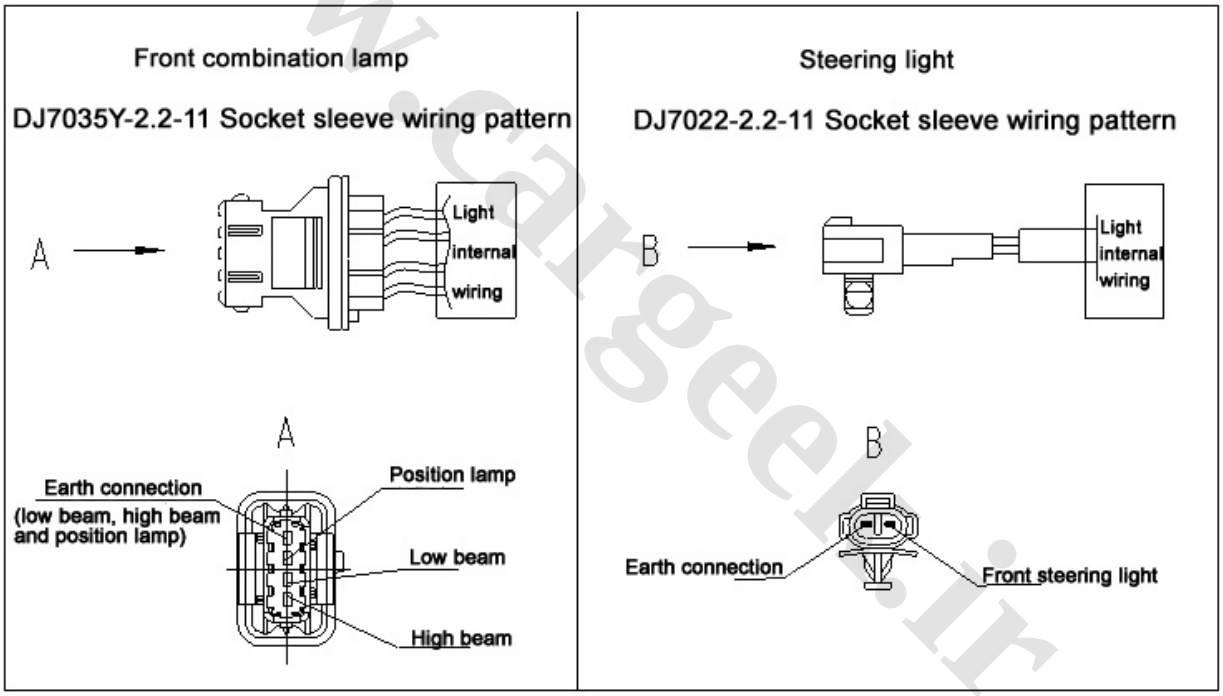


Fig. 4-61

1.2 Headlight checking circuit (Fig. 4-62)

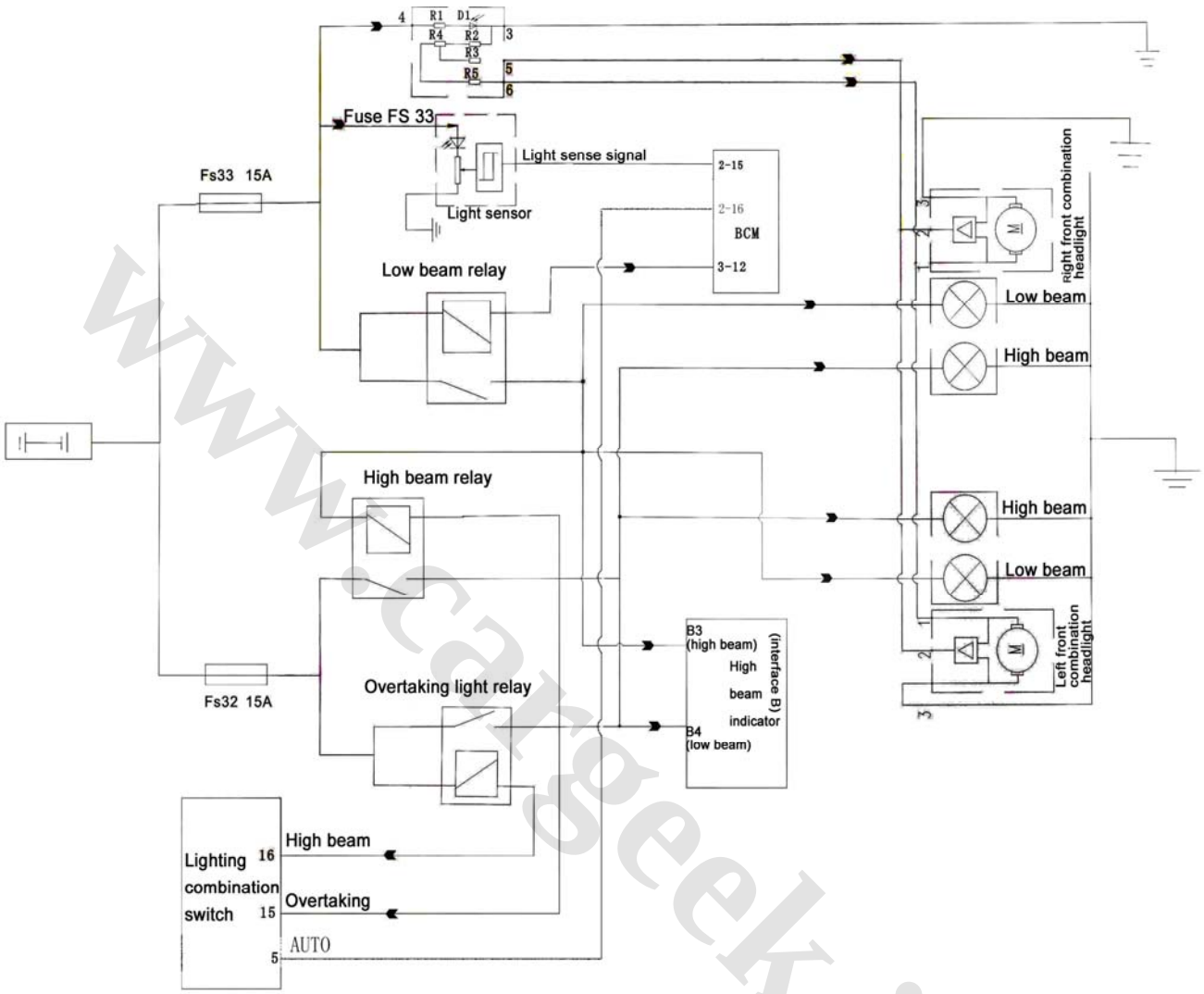


Fig. 4-62

2. Rear combination lamp (Fig. 4-63, Fig. 4-64 and Fig. 4-65)

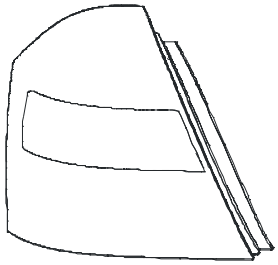


Fig. 4-63

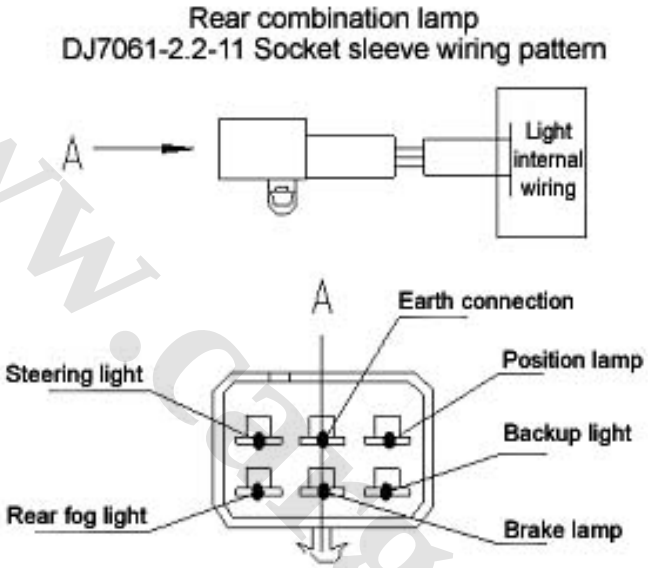


Fig. 4-64

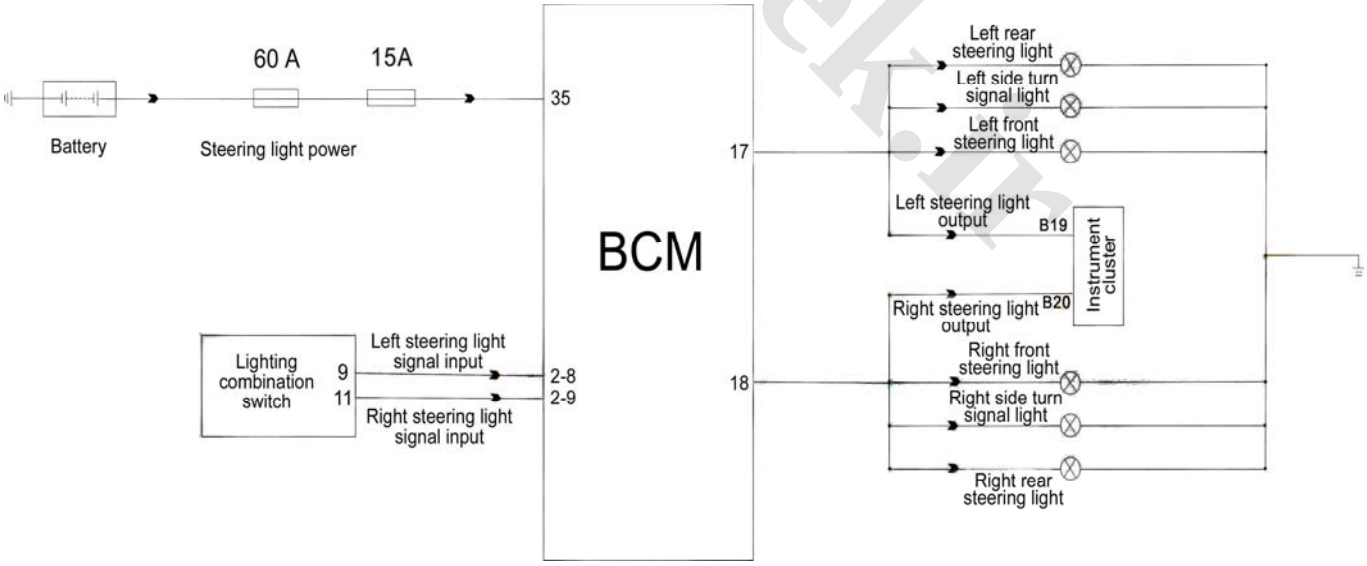


Fig. 4-65

3. Front fog light (Fig. 4-66 and Fig. 4-67)

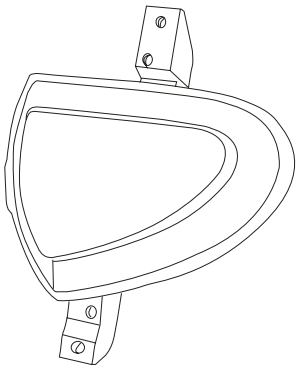


Fig. 4-66

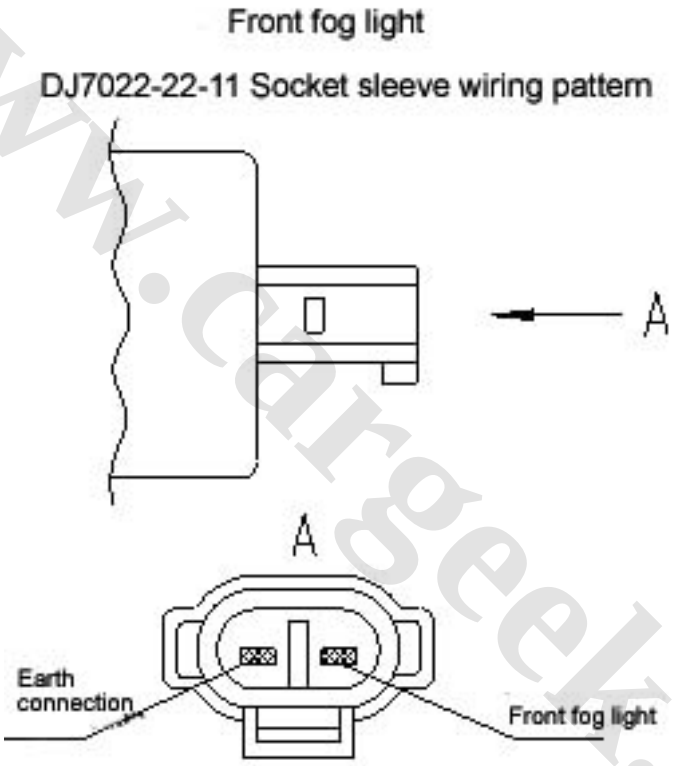


Fig. 4-67

4. Side turn signal light (Fig. 4-68)

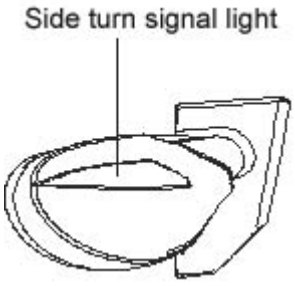


Fig. 4-68

5. High-mounted brake lamp (Fig. 4-69)

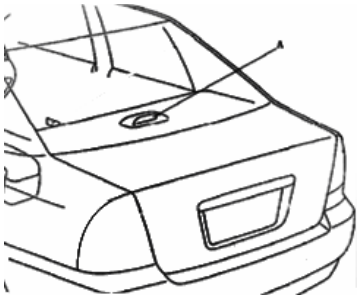


Fig. 4-69

6. Rear roof light (Fig. 4-70 and Fig. 4-71)

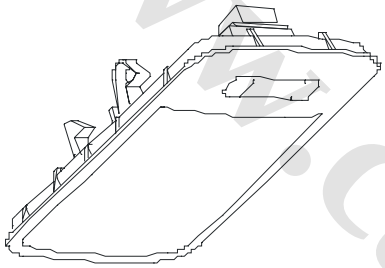


Fig. 4-70

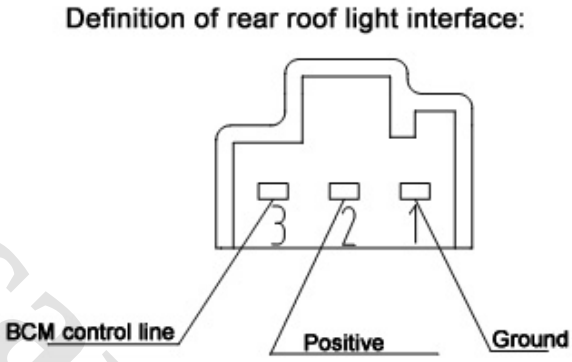


Fig. 4-71

7. Luggage boot lamp (Fig. 4-72 and Fig. 4-73)

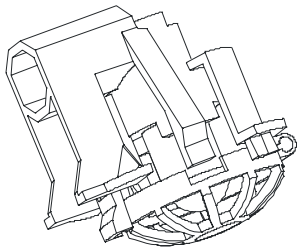


Fig. 4-72

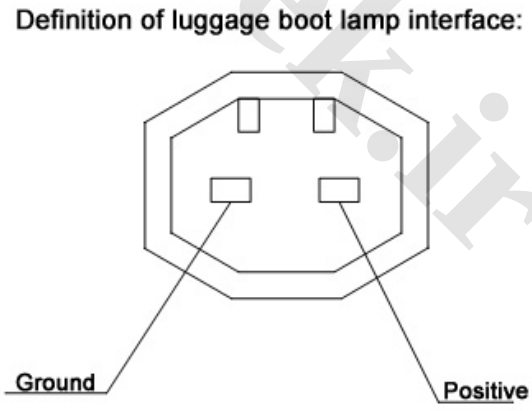


Fig. 4-73

III. Check and repair

1. Disassemble and assemble left and right of front combination lamp in the same steps, disassembling steps are contrary to assembling steps.

(1) Remove radiator grille
(2) Remove left front fender inner panel
(3) Remove right front fender inner panel
(4) Remove front bumper
(5) Remove left headlight
Remove the three screws to pull out the left front combination lamp assembly as per the direction shown in the Fig., disconnect the bracket at the side of the car, and disconnect each electrical connector lug of lamp socket, as shown in Fig. 4-74.

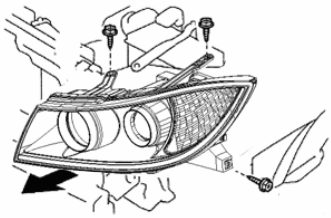


Fig. 4-74

(6) Remove low beam bulb of left headlight
As shown in Fig. 4-75, take off the square shape sealing cover, remove the clamp spring, then low beam bulb of left headlight is removable.

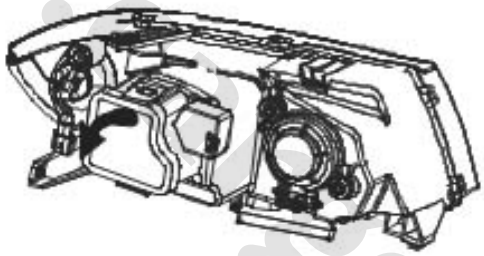


Fig. 4-75

(7) Remove high beam bulb of left headlight as shown in Fig. 4-76, take off the sealing cover and clamp spring, then the bulb is removable.

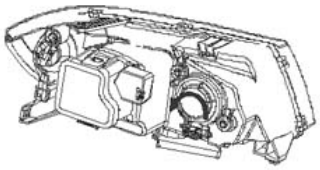


Fig. 4-76

(8) Remove steering light of left headlight as shown in Fig. 4-77.

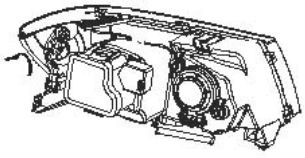


Fig. 4-77

2. Focusing adjustment of front combination lamp

(1) Car preparation: Ensure the part around front combination lamp is not damaged or distorted, fuel tank filled. Make sure unladen mass of complete vehicle: Fill coolant to designated level; charge the tire to proper pressure, put spare wheel, jack, and tool kit to original position, and empty the luggage boot, a man of common weight (75kg) seated at driver's seat.

(2) Focusing preparation: Park the car at a dark place, to observe the boundary between brightness and darkness of the light. The boundary is quite obvious, below which the light of front combination lamp is visible, while above which the light is invisible. The car midline is angulated at 90 degrees to the wall, a distance of 3m between the car and wall available. Park the car on a level ground, several jounces operated to stabilitate the chassis. A thick white paper (2m×4m) is furnished as screen, on the central of which a vertical line is drawn (V-line), as shown in Fig. 4-78, set the screen (erect the screen on the ground, to align the V-line to car midline). As shown in Fig. 4-79, base lines are drawn on the screen (H line, left V line, right V line). The base lines differ from low beam as well as high beam check: Line out the center mark of front combination lamp bulb on the screen, H line (height of front combination lamp) is drawn a horizontal across the screen to traverse the center mark, left V line and right V line (center marks of left combination lamp and right combination lamp respectively) are drawn two verticals to cut H line at their respective center mark.

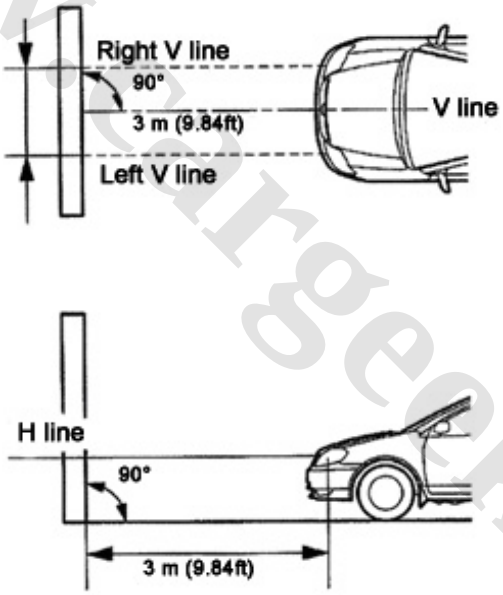


Fig. 4-78

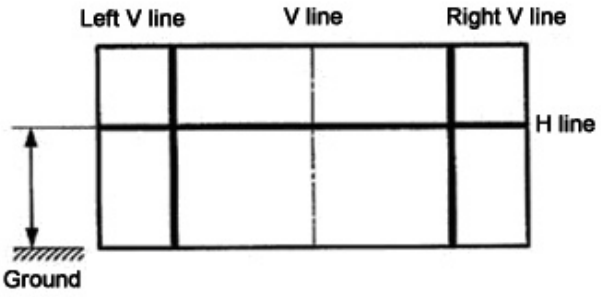


Fig. 4-79

(3) Check: When checking one side of front combination lamp, cover the other side or disconnect the electrical connector plug to prevent the unchecked front combination lamp interfere the focusing check.

Note: Do not cover the front combination lamp for more than 3 minutes, because the glass block of front combination is made of synthetic resin, which is vulnerable to overheating. Start the engine, to exceed 1500 rpm.

As shown in Fig. 4-80 and Fig. 4-81, turn on the front combination lamp to make the boundary within designated area.

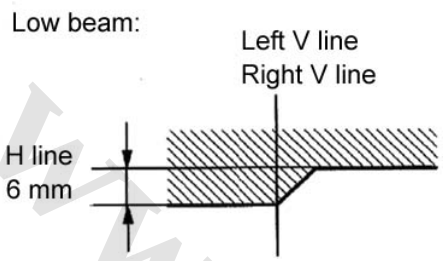


Fig. 4-80

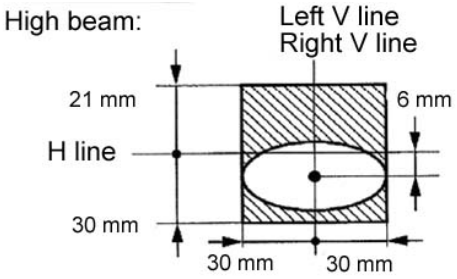


Fig. 4-81

(4) Vertical focusing adjustment: Turn screw A for focusing adjustment using a screwdriver, to focus the light within designated range, when turning the screw A clockwise, the focusing light moves upward, contrarily, downward;

Horizontal focusing adjustment: Turn screw B for focusing adjustment using a screwdriver, to focus the light within designated range, when turning the screw B clockwise, the focusing light moves upward, contrarily, downward. As shown in Fig. 4-82.

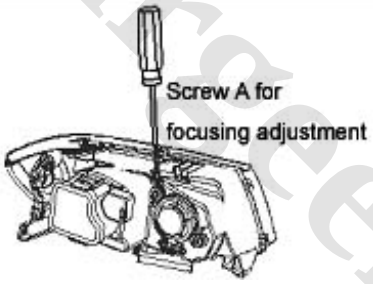


Fig. 4-82

(5) Low beam adjustment: As shown in the Fig., vertically move the screw for focusing adjustment to adjust the focusing of low beam, when turning the screw clockwise, the focusing light moves upward, contrarily, downward. As shown in Fig. 4-83.

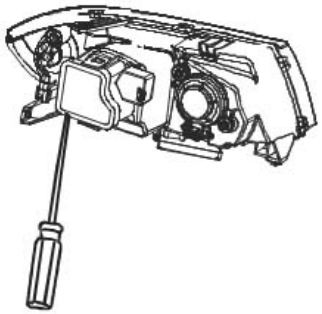


Fig. 4-83

3. Check left combination switch (light control) as shown in Fig. 4-84 and Fig. 4-85.

Left combination switch (light control)

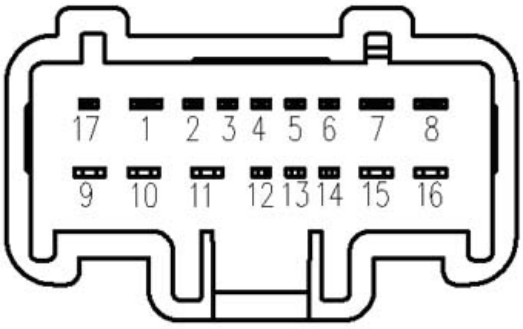


Fig. 4-84

Logical function of lighting combination switch

Load current	P \ T	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0.5A	Rear fog light ON	●	●				●	●										●
0.5A	Front fog light	●	●	⊣	●		●	●										
	Front fog light OFF						●	●										
0.5A	AUTO					●	●	●										
0.5A	Lamplet			⊣	●		●	●										
0.5A	Headlight			●			●	●										
	OFF						●	●										
18A	High beam flashes						●	●								●	●	
10A	High beam						●	●								●		
	High beam OFF						●	●	●									
5A	Left cornering lamp						●	●		●	●			●	●			
	Cornering lamp OFF						●	●										
5A	Right cornering lamp						●	●			●	●	●	●				

Fig. 4-85

(1) Check the conductivity of control switch of front and rear fog lights

When the light control switch is at OFF, terminals should be not conducted with each other, when the switch is at front fog light position, terminals 1 and 2, 4, 6 and 7 should be conducted, when the switch is at rear fog light position, terminals 1 and 2, 17 should be conducted.

(2) Check the conductivity of dipswitch of headlight: When the dipswitch is at overtaking flash position, terminals 7 and 15, 16 should be conducted, when the dipswitch is at front headlight position, terminals 6 and 4, and terminals 4 and 3 should be conducted, when the dipswitch is at high beam position, terminals 7 and 15 should be conducted.

(3) Check the conductivity of signal switch of steering light: When the signal switch is at turn right position, terminals 10 and 11, and terminals 12 and 13 should be conducted, when the signal switch is at neutral position, terminals should be not conducted with each other, when the signal switch is at turn left position, terminals 9 and 10, and terminals 13 and 14 should be conducted.

(4) Check the conductivity of front fog light switch: When the switch is at OFF, terminals 1 and 2, 4 should be not conducted, when the switch is at ON, terminals 1 and 2, 4 should be conducted.
(5) Check the conductivity of control switch of front headlight before AUTO is lightened: When the switch is at AUTO, terminals 5 and 6, 7 should be conducted.
4. Check front fog light relay as shown in Fig. 4-86.

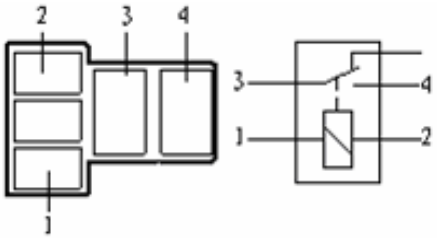


Fig. 4-86

The relay falls into a normally open one. Check the front fog light relay, the resistance between terminals 1 and 2 should be around 60～90Ω, while terminals 3 and 4 should be not conducted; apply the battery voltage between terminals 1 and 2 of the relay, terminals 3 and 4 should be conducted.
5. Check emergency alarm switch (electrical air conditioning) as shown in Fig. 4-87.

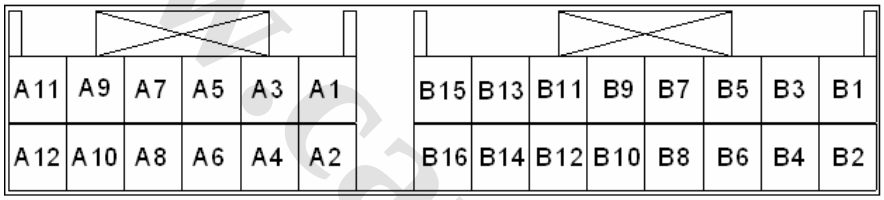


Fig. 4-87

(1) Check the conductivity of emergency light switch: The emergency light switch (electrical air conditioning controller) is installed onto the real vehicle, and then pressed, if the switch flashes, it is normally, if not, change the switch.
(2) Check the luminated light for emergency light switch: Connect the battery positive to terminal B5 of emergency switch, negative to terminal B15, and the luminated light should be lightened.
6. Check the rear roof light: When the switch is at OFF, terminals should be not conducted with each other, when the switch is at DOOR, terminals 2 and 3 should be conducted, when the switch is at ON, terminals 2 and 1 should be conducted, as shown in Fig. 4-88.

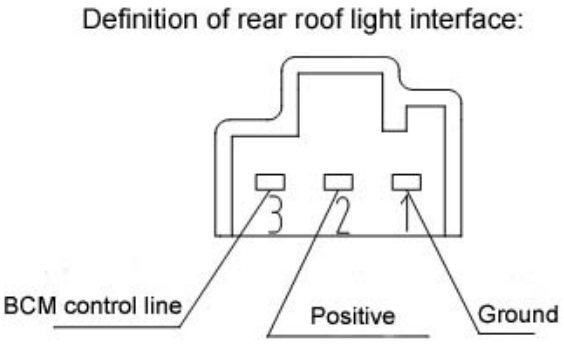


Fig. 4-88

7. Check the flash signal control
(1) The flash signal is controlled by BCM body controller, as required in the table, check the

voltage as well as conductivity between terminals of flash wire connector. If the check results can not meet the requirements in the table, check corresponding circuit. To find more, refer to Fig. 4-89 and Table 4-14.

Schematic circuit diagram of flash signal control:

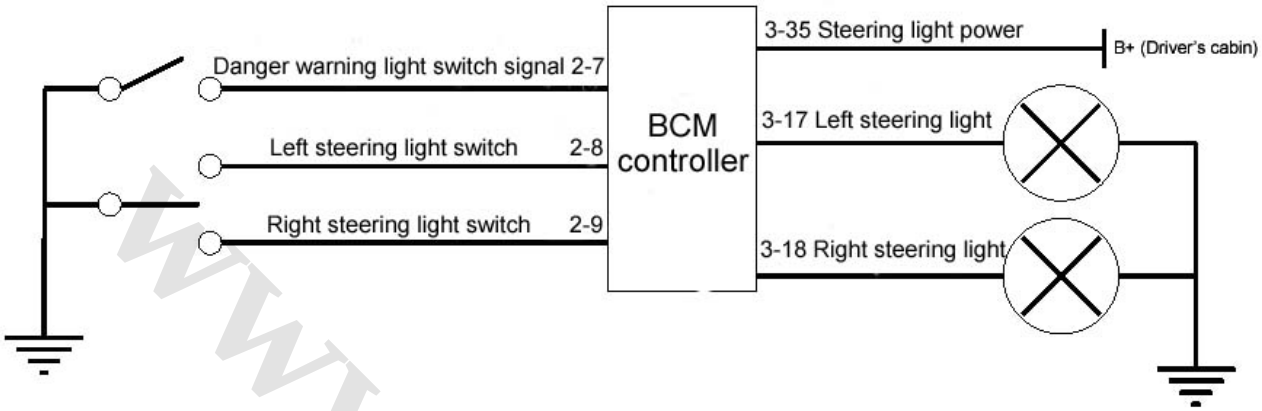


Fig. 4-89

Table 4-14

Testing terminal	Wire color	Test condition	Standard value
(2-7)—body	B/R	Press the emergency light switch, always	Less than 1Ω
(2-8)—body	N/R	Left combination switch at turn left, always	Less than 1Ω
(2-9)—body	N/B	Left combination switch at turn right, always	Less than 1Ω
(3-17)—body	R/Y	Left combination switch at turn left, always	10～14V
(3-18)—body	N/Y	Left combination switch at turn right, always	10～14V
(3-35)—body	R/G	Steering light constant power input	10～14V

8. Check the operation status of inner light delay system

(1) Main components: Ignition key ring indicator, rear roof light.

(2) The ignition key is pulled out.

(3) When the roof light switch is at “DOOR”, upon unlocking by remote control or opening of any door, the roof light is lightened. If no door is opened within 30 seconds after unlocking by remote control, the light goes out; (open the door) 8 seconds after close the door, linear weakening occurs to the brightness, the light gradually goes out within another 5 seconds; press the locking key on remote controller after the door is closed, the roof light goes out immediately.

(4) Open the left front door when the ignition key is pulled out, the key ring indicator will lighten for 30 seconds, if the left front door is closed within the 30 seconds, the key ring indicator will go out 15 seconds after the closing; when the key is inserted into the ignition lock, the indicator goes out immediately; when the key is pulled out, the indicator lightens and goes out after 15 seconds.

Section VI Wiper and Washer

I. Overview

The wiper system is composed of wiper blade arm, connecting rod mechanism, blade and wiper motor. It enjoys one-step wiping, intermittent wiping, slow-speed wiping and high-speed wiping. The washer system is composed of pump, detergent pot, filler and nozzle. Both the wiper and washer systems attempt to provide a convenient, safe and reliable means to ensure the view of the windshield. All components of this system transform the electricity generated by the circuit system to mechanical movement of the wiper blade, so as to wipe the water drops on the outer windshield and also to movement of the washer system, so as to spray the detergent in the detergent pot onto the concerned area. The combination of these two systems can wipe the rain drop, snow, insects, mud water or other tiny materials on the outer windshield, so as to offer a way to the driver to keep a clear view even under a severe driving environment. The driver can use the combination switch at the right side of the steering column under the steering wheel to start all the functions of the wiper and washer system. The wiper system allows the driver to choose different modes, like high/low speed continuous wiping and intermittent wiping. Push the right combination switch control lever forwards and then release it to select the defogging mode of the wiper system and carry out a complete wiper operation. Pull it upwards to start the washer system which then sprays the detergent to the windshield by the nozzle as shown in Fig. 4-90.

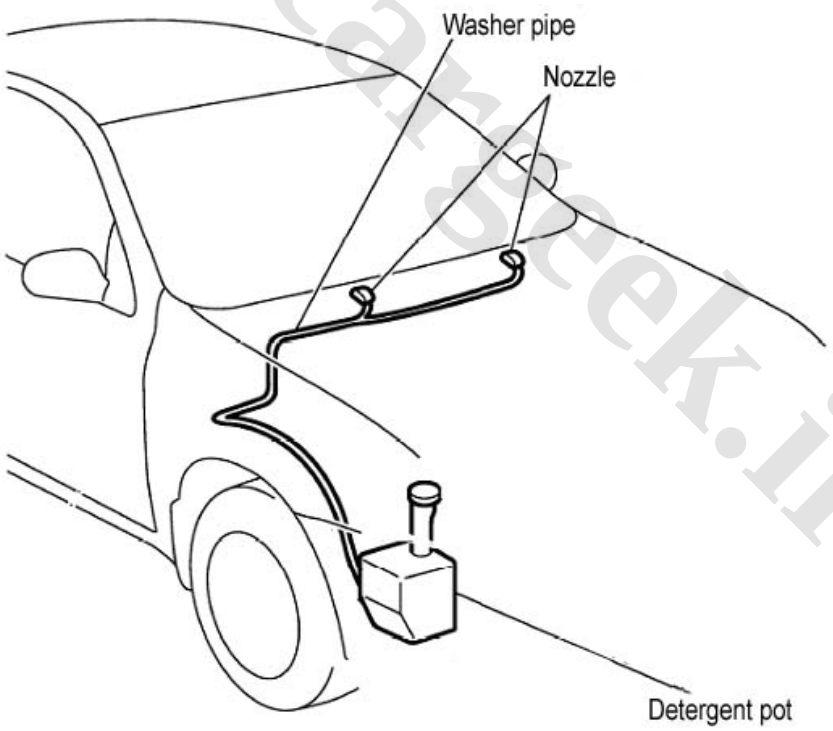


Fig. 4-90

II. Layout Diagram of Wiper and Washer System

1. Layout diagram of wiper and washer system Fig. 4-91 and Fig. 4-92

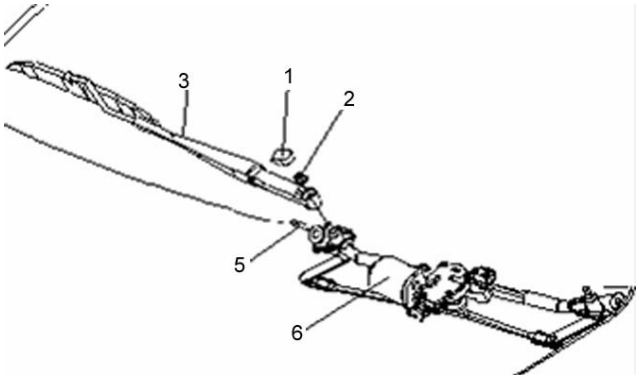


Fig. 4-91

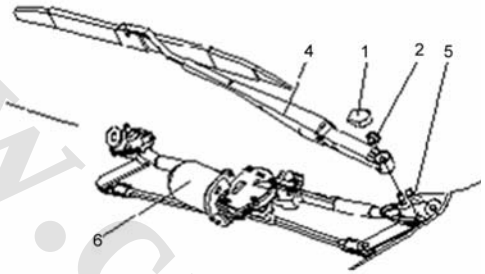


Fig. 4-92

1. Rocker arm cap pattern
2. Hexagon nut with taper spring gasket
3. Right rocker arm with blade
4. Left rocker arm with blade
5. Installing bolt of wiper motor and bracket assembly
6. Wiper motor and bracket assembly

2. Layout of main wiper blade Fig. 4-93

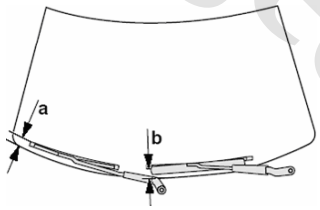


Fig. 4-93

Blade stop position: a=50-70mm b=40-60mm

Blade wiping angle: right blade =92°±3° left blade =82°±3°

3. Layout of washer nozzle Fig. 4-94 and Fig. 4-95

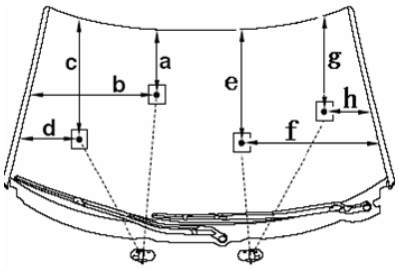


Fig. 4-94

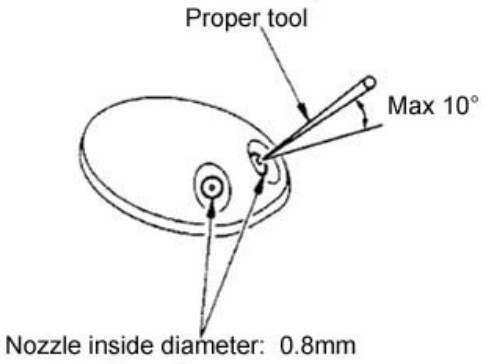


Fig. 4-95

Spraying position adjustment: a=485mm b=675mm c=450mm d=330mm e=530mm f=500mm g=210mm h=245mm

Spraying position adjustment area: a 60×60 square area

Use the special tool (a thin probe) for nozzle

Adjustment scope: ±10°

4. Sketch map of wiper motor as shown in Fig. 4-96

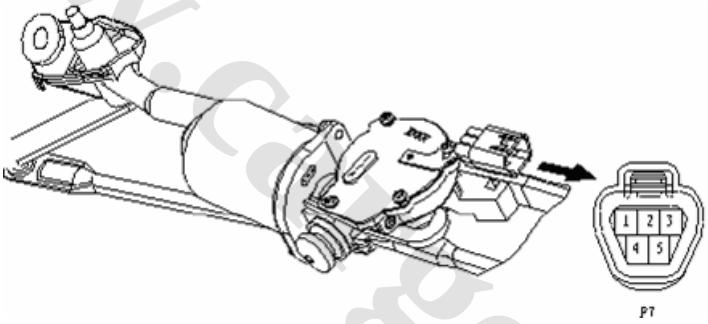


Fig. 4-96

III. Circuit Maintenance of Wiper and Washer System

1. Map of harness end interface. See Fig. 4-97, 4-98 and 4-99 and Table 4-15, 4-16 and 4-17.

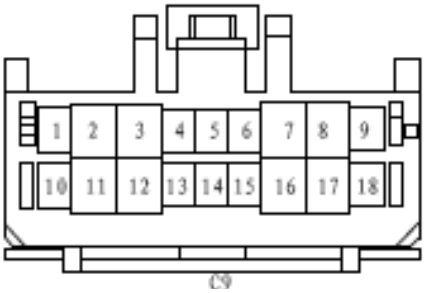


Fig. 4-97

Table 4-15

Testing terminal	Wire color	Terminal description	Test condition	Standard value
1-body	B/U	High-speed power output of wiper motor	Ignition switch ON; the right combination switch is at high-speed wiping position, always	10～14V
2-body	Y/U	Low-speed power output of wiper motor	Ignition switch ON; the right combination switch is at low-speed wiping position, always	10～14V
3-body	G/B	Power output of wiper motor	Ignition switch ON; the right combination switch is at washing position, always	10～14V
8-body	B	Right combination ground signal	Always	＜1Ω
10- body	Y/G	Return control of right combination switch	Right combination switch is at OFF or INT, always	＜1Ω
11-body	R/B	Power input of right combination switch	Ignition switch ON, always	10～14V

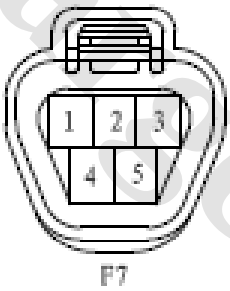


Fig. 4-98

Table 4-16

Testing terminal	Wire color	Terminal description	Test condition	Standard value
1	Y/U	Low-speed input of wiper motor	1 (+) 5 (-), always	Motor runs at low speed
2	U	Power input of wiper motor	Ignition switch is at ACC, always	10～14V
3	Y/G	Return signal of wiper motor	Motor returns to the end, always	＜1Ω
4	B/U	High-speed input of wiper motor	4 (+) 5 (-), always	Motor runs at high speed
5	B	Motor ground signal	Always	＜1Ω

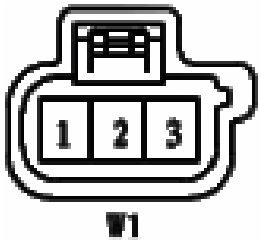


Fig. 4-99

Table 4-17

Testing terminal	Wire color	Terminal description	Test condition	Standard value
1－body	G/B	Power input of washer motor	Ignition switch is at ON; right combination switch is at washing position, always	10～14V
2－body	B	Washer motor grounding	Always	＜1Ω

2. Check circuit as shown in Fig. 4-100

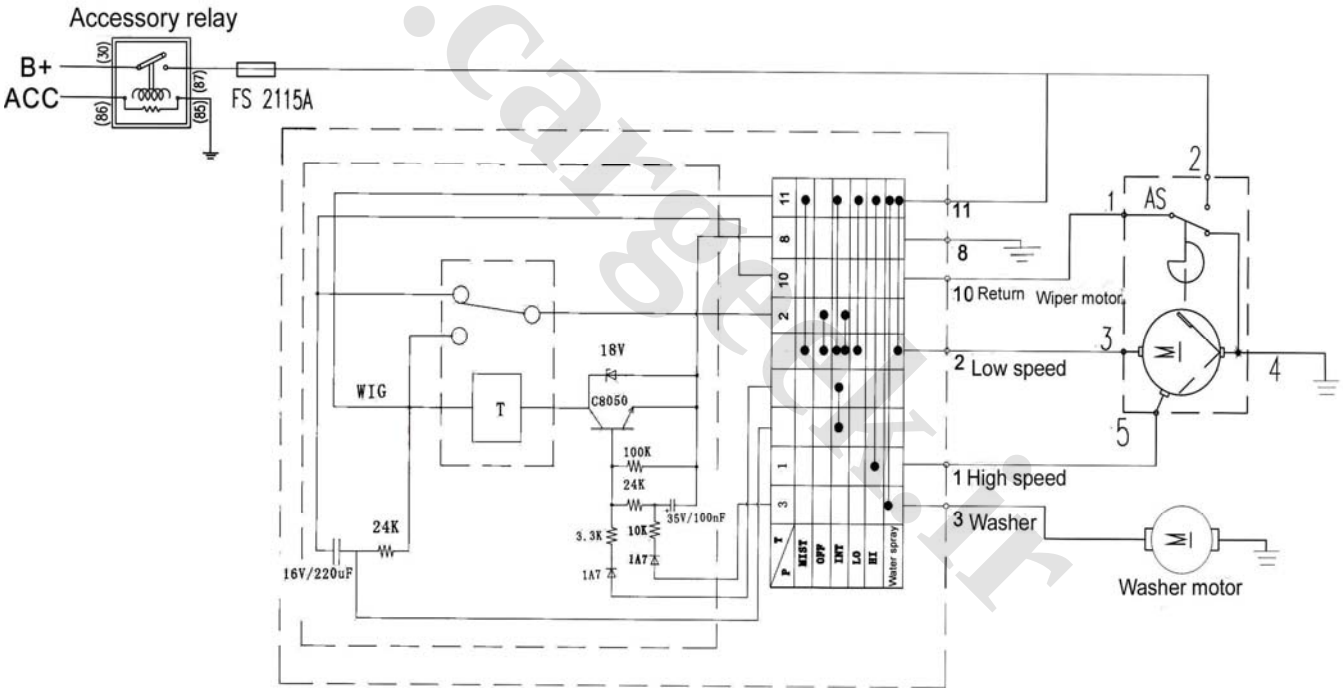


Fig. 4-100

IV. Fault Table of Wiper and Washer System (as shown in Table 4-18)

Table 4-18

Fault	Cause	Fault	Cause
Inactive wiper and washer	1 Fault in accessory relay 2 Fault in wiper fuse 3 Fault in wiper combination switch assembly 4 Fault in wiring	Inactive wiper at LO or HI	1 Fault in wiper combination switch assembly 2 Fault in wiper motor 3 Fault in wiring
Inactive wiper at INT	1 Fault in wiper combination switch assembly 2 Fault in wiper motor 3 Fault in wiring	Inactive washer motor	1 Fault in wiper combination switch assembly 2 Fault in washer motor 3 Fault in wiring
Inactive wiper while wiper combination switch assemble at MIST	1 Fault in wiper combination switch assembly 2 Fault in wiper motor 3 Fault in wiring	No detergent spraying	1 Fault in washing hose 2 Fault in nozzle
Inactive or wrong positioned wiper while right combination switch is at OFF	1 Fault in wiper combination switch assembly 2 Fault in wiper motor 3 Fault in wiring	While the wiper combination switch assembly is at OFF, the blade moves downwards, but then upwards a little and stops at last.	The crank of wiper motor is not at the resetting position

V. Inspection of Wiper and Washer System Components

1. Check the wiper combination switch assembly

(1) Check the conductivity between terminals of the wiper switch as shown in Fig. 4-101

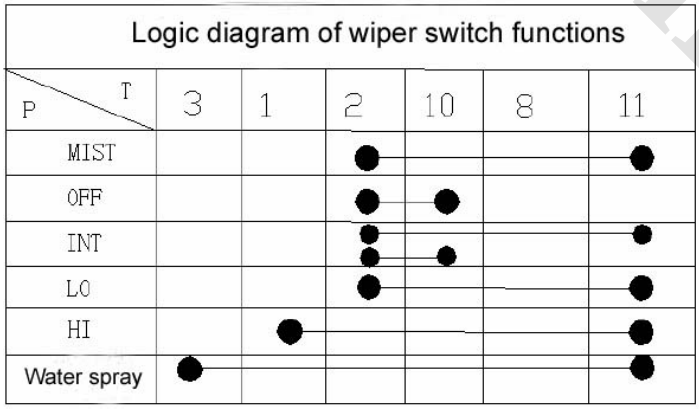


Fig. 4-101

① Check the conductivity between terminals of wiper connector of the wiper combination switch assembly. When the wiper is at MIST, the terminal 2 and terminal 11 should be conducted. When at OFF, terminal 2 and terminal 10 should be conducted; when at INT, terminal 2 and terminal 10 should be conducted as well as terminal 2 and terminal 11; when at LO, terminal 2 and terminal 11 should be conducted; when at HI, terminal 11 and terminal 1 should be conducted.

② Check the conductivity between terminals of washer connector of the wiper combination switch assembly. When the washer is at OFF, the terminals should be not conducted; at ON, terminal 3 and terminal 11 should be conducted.

(2) Check the operation of wiper position of the wiper combination switch assembly

Locate the wiper combination switch assembly at OFF, connect the battery positive pole with terminal 11 of the wiper switch connector, and connect the negative pole with the terminal 8. Connect the test probe of the positive pole of voltmeter with the terminal 3 of right combination switch connector; and test probe of negative pole with terminal 8; locate the right combination switch at OFF→ON→OFF of washing position; check the voltage between terminal 3 and 8 of the wiper switch connector which should be less than 1V→10～14V→less than 1V.

2. Check wiper motor

(1) Low-speed operation: Connect the battery positive pole with the terminal 1 of wiper motor connector; negative pole with terminal 5. The motor should run at low speed. See F7 for wiper motor connector.

(2) High-speed operation: Connect the battery positive pole with the terminal 4 of wiper motor connector; negative pole with terminal 5. The motor should run at high speed. See F7 for wiper motor connector.

(3) Automatic stop: Connect the battery positive pole with the terminal 1 of wiper motor connector; negative pole with terminal 5. When the motor runs at low speed, disconnect terminal 1 to make the wiper motor stop at any position except the automatic stop position. Shortly connect terminal 1 and 3, and connect the positive pole with the terminal 2, and then restart the motor and run it at low speed. The motor should stop at the automatic stop position. See F7 for wiper motor connector.

3. Check the motor of spraying cleaner

Firstly install the motor and water pump onto the water tank of the spraying cleaner, and then fill water. Connect the battery positive pole with the terminal 1 of motor of spraying cleaner, and negative pole with terminal 2. The water should be sprayed from the water tank. See W1 for motor connector of the spraying cleaner.

Note:

As shown in Fig. 4-102, before installing the wiper arm, firstly clean the pivot area to avoid the possibility of a loose arm.

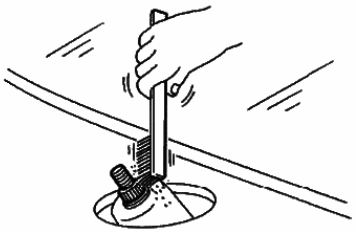


Fig. 4-102

4. Check the washer nozzle

Blow air to the direction of washer spraying and confirm the airflow only pass in a single way, rather than in a reverse direction. See Fig. 4-103.

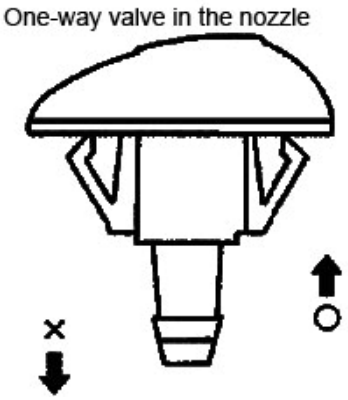


Fig. 4-103

Section VII Audio System

I. Overview

This system combines digital video and various devices to decorate your car to be a tiny music theater and satisfy you with CD music, USB interface, AM/FM radio. It is composed of: (1) antenna amplifier, (2) AM/FM printed antenna, (3) CD assembly, (4) speaker and (5) USB interface.

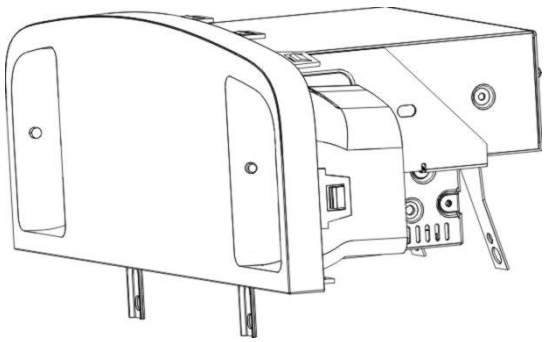


Fig. 4-104

Operating principle: This system is to provide entertainment programs and information by receiving, modulating and amplifying the AM/FM radio signal at commercial frequency from the local radio station. Through the printed antenna, the electromagnetic signals from the radio station will then form weak current modulation signal and then transfer to the radio by the antenna amplifier and cable. Then the radio will modulate and amplify the weak signals received to stronger current signal, and then transfer it to the speaker which will then transform the strong signal to air vibration to revert the signal to sound. The user can select the audio system of other models to supply equipments with sound and video like cassette, CD or VCD. No matter what type you choose, the components of the audio system will amplify and adjust the audio signal within the car to cater for all people in the car.

The audio system resists the radio frequency interference and electromagnetic wave interference by the inner circuit.

Outer measures:

(1) Grounded antenna amplifier housing

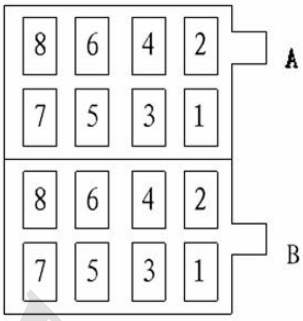
(2) Grounded radio housing

(3) Grounded engine and vehicle body

(4) Resistor type spark plug

(5) Radio anti-noise secondary ignition coil

II. Definitions of Interfaces of Audio System



Wire A interface :

A	Definition
1	Steering wheel control (—)
2	Steering wheel control(+)
3	Empty
4	Power ACC (+)
5	Backlight adjustment switch (+)
6	Reversing switch(–)
7	Vehicle battery (B+)
8	Grounding (GND–)

Wire B interface:

B	Definition
1	Right rear horn (+)
2	Right rear horn (–)
3	Right front horn(+)
4	Right front horn(–)
5	Left front horn (+)
6	Left front horn (–)
7	Left rear horn (+)
8	Left rear horn (–)

Fig. 4-105

Table 4-19

Testing terminal	Wire color	Terminal description	Test condition	Standard value
A1—body	W/G	Steering wheel control (-) (reserved)	-	-
A2—body	Y/W	Steering wheel control (+) (reserved)	-	-
A4—body	Y	Power input while ignition switch at ACC	Ignition switch at ACC, always	10～14V
A5—body	R	Backlight signal input of audio system	Combination switch at lamplet position	10～14V
A6—body	G/N	Reverse signal input	Always	＜1Ω
A7—body	W/Y	Normal power input of audio system	Always	10～14V
A8—body	B	Audio system grounding	Always	＜1Ω
B1—body	V	Right rear speaker drive output (+)	Audio system in process	-
B2—body	V/B	Right rear speaker drive output (-)	Audio system in process	-
B3—body	Gr	Right front speaker drive output (+)	Audio system in process	-
B4—body	Gr/B	Right front speaker drive output (-)	Audio system in process	-
B5—body	W	Left front speaker drive output (+)	Audio system in process	-
B6—body	W/B	Left front speaker drive output (-)	Audio system in process	-
B7—body	N	Left rear speaker drive output (+)	Audio system in process	-
B8—body	N/B	Left rear speaker drive output (-)	Audio system in process	-

Radio assembly of audio system: Fig. 4-106

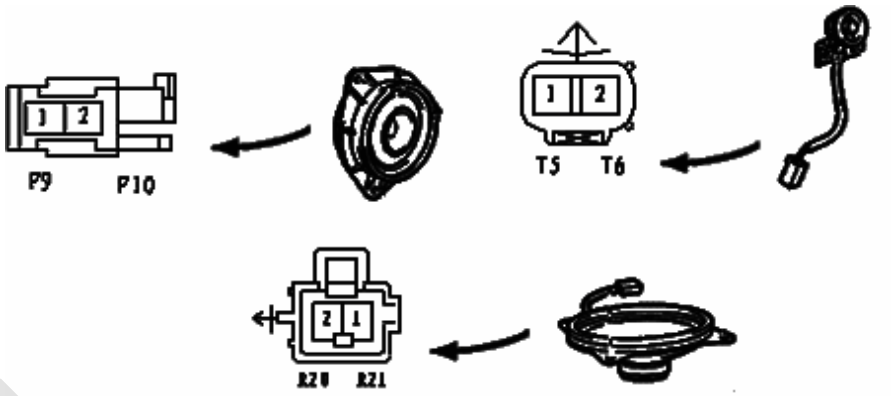


Fig. 4-106

(Definition of harness terminal of speaker) Refer to Fig. 4-107 and Table 4-20.

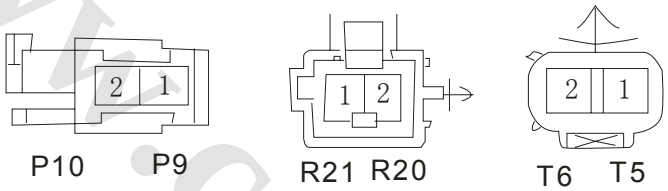


Fig. 4-107

Table 4-20

Testing terminal	Wire color	Terminal description	Test condition	Standard value
1-body	—	Speaker drive input	Audio system in process	—
2-body	—	Speaker drive input	Audio system in process	—

III. Fault Table of Audio System

Table 4-21

Fault	Cause	Fault	Cause
Press down power switch, audio system does not work	1. Fault in audio system power circuit 2. Fault in CD player assembly	Audio system night illumination system can not work	1. Fault in audio system illumination circuit 2. Fault in CD player assembly
No speaker voice in all modes	1. Fault in speaker circuit 2. Fault in audio system power circuit 3. Fault in CD player assembly	Poor tonal quality in all modes (volume is too low)	1. Fault in speaker circuit 2. Fault in audio system power circuit 3. Fault in CD player assembly
Can not receive radiobroadcast (poor reception)	1. Fault in antenna circuit 2. Fault in CD player assembly	Can not put in CD or CD can not come out immediately after putting it in	1. Fault in CD disk 2. Fault in audio system power circuit 3. Fault in CD player assembly
Although has powered on, CD still can not work	1. Fault in CD disk 2. Fault in audio system power circuit 3. Fault in CD disk	Can not take out CD/VCD	1. Fault in CD disk 2. Fault in audio system power circuit 3. Fault in CD player assembly
Poor tonal quality when playing CD	1. Fault in CD disk 2. Fault in CD player assembly	Intermittent voice when playing CD	1. Fault in CD disk 2. Improper installation of CD player assembly
Touching panel switch does not work	1. Fault in audio system power circuit 2. Fault in CD player assembly 3. Fault in wiring harness connecting circuit		

IV. Audio system component check

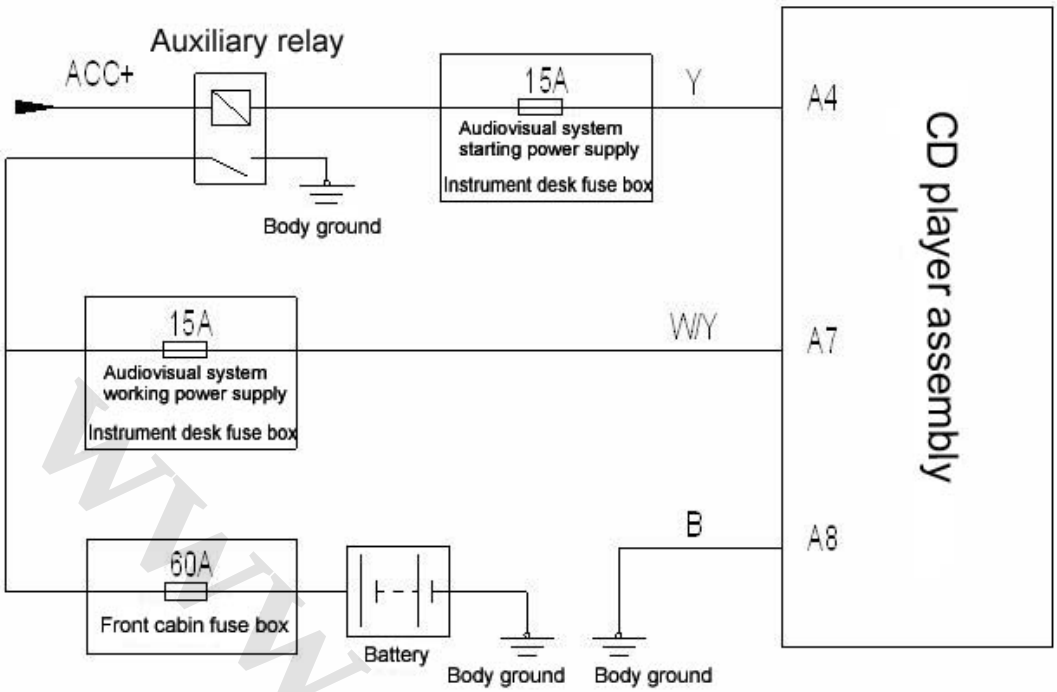


Fig. 4-108

1. Press down power switch, can not start audio system:

According to the circuit diagram Fig. 4-108, ① check the environment of CAB, for possible features causing electrical short-circuit, and keep CAB dry and ventilative; ② Test the voltage between audio system assembly connector terminal A7 and vehicle body, the voltage shall be 10-14V. ③ Test the resistance between audio system assembly connector terminal A8 and vehicle body, the resistance shall be less than 1Ω. ④ Turn ignition switch to ACC, and test the voltage between audio system assembly connector terminal A4 and vehicle body, the voltage shall be 10~14V. If all above is normal, check and replace audio system assembly; if not, repair or replace wiring and connector.

2. Audio system night illumination system can not work:

Turn the light control gears of light combination switch assembly to lamplet or fog light, test voltage between audio system assembly connector terminal A5 and vehicle body according to the circuit diagram Fig. 4-108, the voltage shall be 10~14V. If the voltage is normal, check and replace CD player assembly; if not, repair and replace wiring and connector.

3. No speaker voice in all modes:

Check according to the circuit diagram Fig. 4-108, detailed steps as follows:

(1) Check display device

Turn ignition switch to ACC, make audio system in ON position, the display device is lightened. If all above is normal, proceed to next step; if not, proceed to 5th step.

(2) Adjust volume controller and adjust sound balance

Operate audio system volume control knob and adjust sound balance to identify which speaker is silent. If one specific speaker is silent, proceed to next step; if all the speakers are silent, check and replace audio system.

(3) Check speaker

Disconnect speaker connector, test the resistance between speaker terminals, the resistance shall be 2~9Ω. If it is normal, proceed to the next step; if not, replace speaker.

(4) Check connector between audio system and speaker

If it is normal, proceed to the next step; if not, repair or replace wiring and connector.

(5) Check CD player assembly

① Test the voltage between audio system assembly connector terminal A7 and vehicle body, the voltage shall be 10~14V.

② Test the voltage between audio system assembly connector terminal A8 and vehicle body, the voltage shall be less than 1Ω.

③ Turn ignition switch to ACC, test the voltage between audio system assembly connector terminal A4 and vehicle body, the voltage shall be 10~14V.

If all above is normal, check and replace CD player assembly; if not, repair or replace wiring and connector.

4. Can not put in CD or CD comes out immediately after putting in, can not play CD disk

Check according to circuit diagram Fig. 4-108, detailed steps as follows:

(1) Make sure the CD disk is normal, and has no deformation, crack, flaw, burr or other defects.

If it is normal, proceed to the next step; if not, fault of CD disk exists.

(2) Check if CD is put in with wrong side. If it is normal, proceed to the next step; if not, put in the CD disk correctly.

(3) Replace the fault CD with a normal CD, check whether the same fault appears again.

If it is normal, fault of CD disk exists; if not, proceed to the next step.

(4) Check whether radio automatic search works normally.

If it is normal, repair or replace CD player assembly; if not, proceed to 6th step.

(5) Check whether CAB temperature and humidity change severely.

If they do change severely, the cause of condensing is temperature and humidity change (rest for a while before use); if not, check and replace CD player assembly.

(6) Check CD player assembly

① Test the voltage between audio system assembly connector terminal A7 and vehicle body, the voltage shall be 10~14V.

② Test the resistance between audio system assembly connector A8 and vehicle body, the resistance shall be less than 1Ω.

③ Turn ignition switch to ACC, test the voltage between audio system assembly connector terminal A4 and vehicle body, the voltage shall be 10~14V.

If it is normal, repair or replace CD player assembly; if not, repair or replace wiring or connector.

5. Can not take out CD disk

Check according to circuit diagram Fig. 4-108, detailed steps as follows:

(1) Check whether radio automatic search works normally:

If it works normally, repair or replace CD player assembly; if not, proceed to 5th step.

(2) Press down CD player of audio system assembly, press eject or close switch for 2s or even longer, and check whether CD disk comes out.

If it is normal, proceed to the next step; if not, repair or replace CD player assembly.

(3) Check whether the sound is Intermittent when driving on road of poor condition

If it is normal, proceed to the next step; if not, fault of CD disk exists.

(4) Check the installation of CD player assembly
If it is normal, fault of CD disk exists; if not, proceed to the next step.
(5) Check CD player assembly
① Check the voltage between audio system assembly connector terminal A7 and vehicle body, the voltage shall be 10~14V.
② Check the resistance between audio system assembly connector terminal A8 and vehicle body, the resistance shall be less than 1Ω.
③ Turn ignition switch to ACC, check the voltage between audio system assembly connector terminal A4 and vehicle body, the voltage shall be 10~14V.
If it is normal, repair or replace CD player assembly; if not, repair or replace wiring or connector.
6. Poor tonal quality only when playing CD (volume is too low)
Check the installation of CD player assembly. If it is normal, fault of CD disk exists; if not, check and repair CD player assembly.
7. Can not receive radiobroadcast (poor reception)
Check according to the circuit diagram Fig. 4-108, detailed steps as follows:
(1) Check whether radio automatic search works normally.
If it works normally, repair or replace CD player assembly; if not, proceed to the next step.
(2) Check whether any jamming equipment is working (e.g. wiper, air conditioner blower, glass frame riser).
If any jamming equipment is working, the influence is from the jamming equipment; if not, proceed to the next step.
(3) Make noise check for printed antenna.
Turn ignition switch to ACC, start radio and select AM mode, check whether the speaker noise is caused by putting screwdriver on the antenna. If it is normal, repair or replace CD player assembly; if not, proceed to the next step.
(4) Check audio system antenna assembly.
Disassemble the aerial plug of audio system assembly, after connect radio connector, turn ignition switch to ACC, start radio and select AM mode. Check whether speaker noise is caused by putting metal matters like fine flat blade screwdriver or tenuous wire on the antenna base of radio assembly. If it is normal, proceed to the next step; if not, repair or replace CD player assembly.
8. Touching panel switch does not work
Check according to the circuit diagram Fig. 4-108, detailed steps as follows:
(1) Check touching panel for stains; if stains exist, clean the surface stains; if not, proceed to the next step.
(2) Check whether touch switch works well. If it works well, proceed to the next step; if not repair or replace CD player assembly.
(3) Check multimedia player assembly.
① Test the voltage between audio system assembly connector terminal A7 and vehicle body, the voltage shall be 10~14V.
② Test the voltage between audio system assembly connector terminal A8 and vehicle body, the voltage shall be less than 1Ω.
③ Turn ignition switch to ACC, test the voltage between audio system assembly connector terminal A4 and vehicle body, the voltage shall be 10~14V. If it is normal, proceed to the next step; if not, repair or replace wiring and connector.

Section VIII Reverse Radar System

I. Overview

Vehicle reverse radar system is a kind of vehicle monitoring system imitating bat detection principles. By installing several ultrasonic radar probes, receive and send signals, and send feedback information to controller. According to signal reentrant time, controller can calculate the distance to the tested barrier, and trigger different sound and indicator warning according to different distances to remind driver for the distance between the barrier and vehicle, and increase backup convenience and safety.

1. The warning mode applied by this reverse radar system is instrument cluster display screen LCD, as shown in Fig. 4-109.

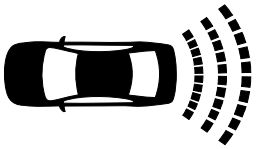


Fig. 4-109

2. Radar detection range: see Fig. 4-110.

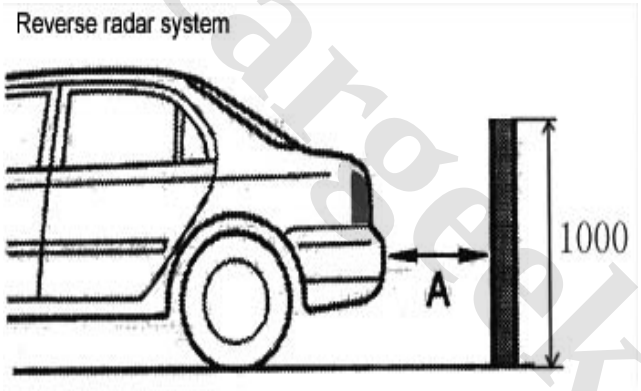


Fig. 4-110

The reverse radar distance in LCD applies segment display and is controlled by instrument cluster, specific distance detection and display as follows:

a. When detection distance S is greater than 1.5m, no light in all 3 sections:  (No warning);

b. When detection distance S greater than 1m and equal or less than 1.5m, light in outermost layer:  (warning: time interval of 1s);

c. When detection distance S is greater than 0.5m and equal and less than 1m, light in 2 outer layers:  (warning: time interval of 0.5s);

d. When detection distance S is less than 0.5m, light in all 3 layers:  (warning: constant warning).

3. System components:

(1) Reverse radar (2) Reverse probe (3) Reverse indicator (on automatic panel)

II. Reverse radar system terminal: See Fig. 4-111 and Table 4-22.

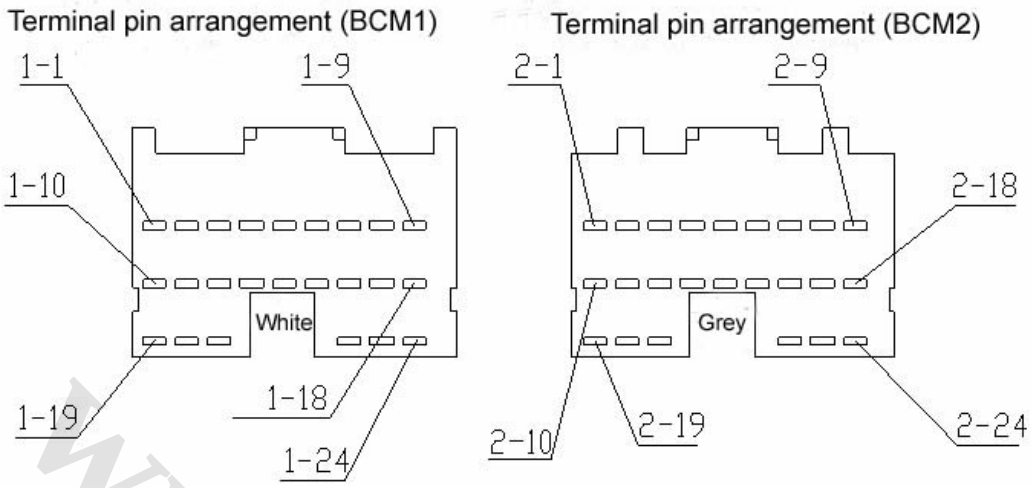


Fig. 4-111

Table 4-22

Testing terminal	Wire color	Terminal description	Test condition	Standard value
BCM (1-8) - body	G/N	Input reverse signal	Turn ignition switch to ON, take reverse gear, always	10～14V 10~14V
BCM (1-19) - body	W/B	Input reverse LIN signal to instrument	Data transmission	Pulse signal generated
BCM (2-18) - body	R/Y	Output BCM fault warning to instrument cluster indicator	When reverse radar warns barriers	10~14V
BCM (2-20) - body	B	Ultrasonic probe power negative	Always	Less than 1Ω
BCM (2-21) - body	G	Ultrasonic probe power positive	Always	10~14V
BCM (2-22) - body	Y	Ultrasonic probe 1 signal wire	When probe works after BCM sends out starting signal	Pulse signal generated
BCM (2-23) - body	R/W	Ultrasonic probe 2 signal wire	When probe works after BCM sends out starting signal	Pulse signal generated
BCM (2-24) - body	Y/R	Ultrasonic probe 3 signal wire	When probe works after BCM sends out starting signal	Pulse signal generated

Check circuit as shown in Fig. 4-112

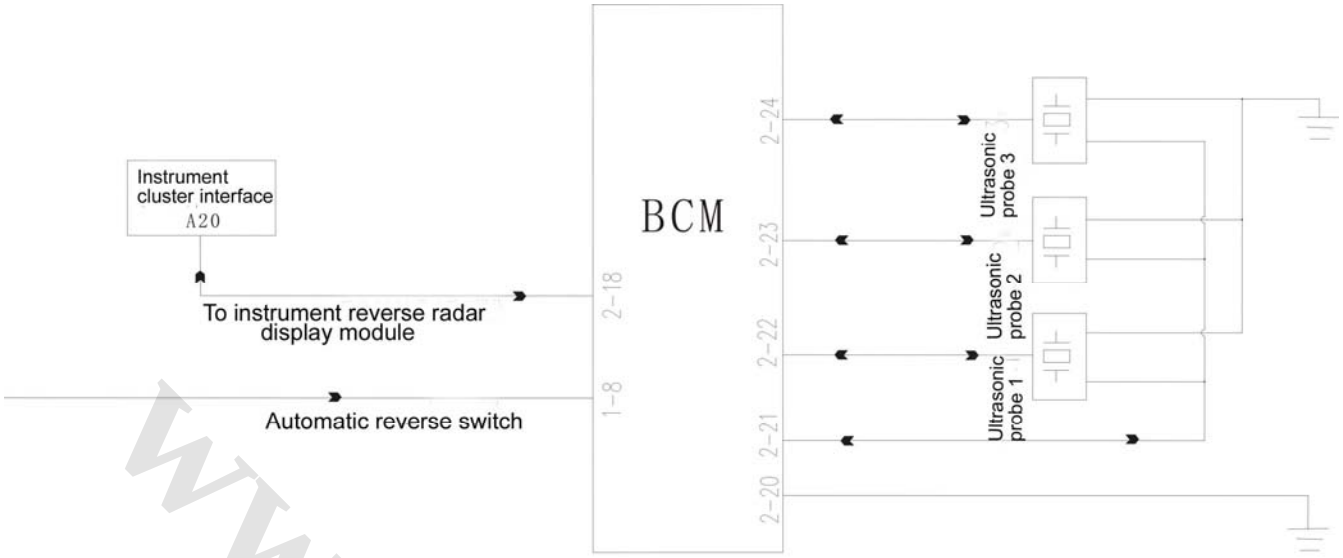


Fig. 4-112

III. Reverse radar system notes

The system is the driving auxiliary equipment; the use of rearview mirror is indispensable. Driver shall be at his/her own risk for accident caused by overspeed reverse and his/her negligence.

1. Testing function of sensor can not work normally in the following conditions

(1) Sensor covered by earth or snow (back to normal, after cleaning foreign matters with water)

(2) Sensor covered by hand

(3) For low external temperature, sensor fault caused by sensor freezing

2. Sensor detection range will change in the following conditions

(1) Sensor covered by earth or snow (back to normal, after cleaning foreign matters with water)

(2) Vehicle in insolation or low temperature condition

3. Detecting mistake might appear in the following conditions

(1) Driving on uneven road, gravel road or grass

(2) Influenced by sound made by other auto horns, motorcycle engine, air braking system of oversize vehicles or influenced by sound wave of other vehicles with probes

(3) Vehicle with water stain made in rain

(4) Relatively great inclination of vehicle

(5) Sensor covered by earth or snow

(6) Vehicle with drawbar

(7) Another vehicle with probe is approaching

(8) Driving to higher or square curb

4. Sensor can not detect because of the shape or features of barriers

(1) Wirelike objects, e.g. wire or rope

(2) Objects can absorb sound wave greatly, e.g. cotton, snow accumulation, etc.

(3) Objects with sharp edge

(4) Object is too low

(5) Object is too high or the upper part of object is bulging

(6) Sensor is hit or knocked heavily

(7) Vehicle is close to stairs too much, system can not correctly detect the distance between bottom stair and the vehicle rear, causing damage on rear mudguard (Fig. 4-113)

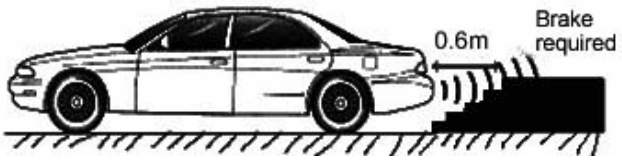


Fig. 4-113

(8) As shown in Fig. 4-114, when driving approaching the wall, warning mistake is caused by inaccurate distance detecting

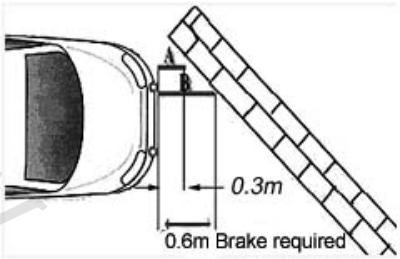


Fig. 4-114

IV. Self-diagnosis and troubleshooting

1. Prior examination

(1) Position ignition switch to ON, position shift lever to reverse, make parking brake to guarantee vehicle safety, check reverse radar system

(2) Switch on reverse indicator switch

(3) Move a cylinder object with 60mm diameter around the sensor, measure the sensor detection range

(4) When detecting a barrier, check indicator and the warning condition of buzzer

A. When detection distance S is greater than 1.5m, no light in 3 sections.

B. When detection distance S is greater than 1m, and equal or less than 1.5m, light in outermost layer. (Warning: time interval of 1s)

C. When detection distance S is greater than 0.5m, and equal or less than 1m, light in outer 2 layers. (Warning: time interval of 0.5s)

D. When detection distance S is less than 0.5m, light in all 3 layers. (Warning: constant warning)

Test height: 528 + -10MM

2. Self-checking function check

(1) Check self-checking function of LCD indicator and buzzer: about 0.4s after turning ignition switch to ON, positioning shift lever to reverse gear, check indicator and buzzer operation, the operation time shall be 0.8±0.2s, now system is in normal testing operation.

(2) If the LCD indicator is not on or buzzer does not make sound as stipulated, wiring might be in disconnection.

3. Fault table, Table 4-23

Table 4-23

Fault	Cause	Fault	Cause
Totally can not work (can not self-check)	1.Fault in power circuit 2.Fault in reverse radar	Buzzer does not work (can self-check)	1. Fault in buzzer drive circuit 2. Fault in reverse radar
Sometimes LCD indicator does not work (can self-check)	1.Fault in indicator drive circuit 2.Fault in reverse radar	Open circuit or freezing indicated in self-checking	1. Fault in sensor or sensor influenced by external environment 2. Fault in sensor circuit
When in reverse gear, system does not work (can self-check)	1.Fault in reverse gear switch circuit 2.Fault in reverse radar	Volume of buzzer is too low	1. Fault in buzzer drive circuit 2. Fault in reverse radar

V. Troubleshooting

1. Totally do not work

(1) Check circuit as shown in Fig. 4-115

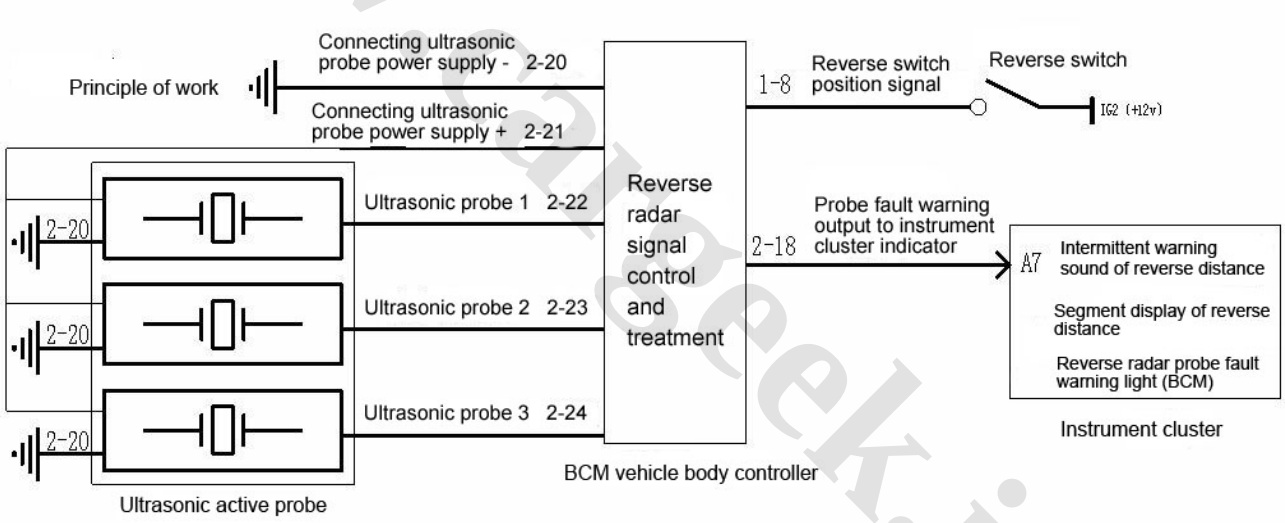


Fig. 4-115

(2) Check step

1) Disconnect reverse radar probe wire harness connector, check the impedance of foot 3 in the previous figure and vehicle body, the impedance shall be less than 1Ω.

2) Turn ignition switch to ON, take reverse gear, check the voltage of foot 1 in the previous figure and vehicle body, the voltage shall be 10-14V. If it is normal, replace reverse radar; if not, proceed to the next step.

2. Buzzer does not work, check whether it is damaged.

(1) Check circuit as shown in Fig. 4-115

(2) Check step

1) Check whether output signal exists

① Disconnect instrument cluster connector.

② After starting engine, take reverse gear, check whether square signal output exists in BCM (1-19) with oscillograph. If it is normal, proceed to the next step; if not, check whether BCM controller and probe are damaged.

2) Check wire harness or connector

① Disconnect BCM vehicle body controller connector

② Disconnect instrument cluster connector

③ Check the impedance of BCM vehicle controller sleeve BCM (1-19) and instrument cluster A10, the impedance shall be less than 1Ω.

If it is normal, proceed to the next step; if not, repair or replace wiring and connector.

3) Check for instrument cluster buzzer does not work

① Turn ignition switch to ON, open one of the four vehicle doors, buzzer shall give off a sound.

② If vehicle speed signal is sent to instrument and wire harness is normal, replace instrument cluster.

If it is normal, continue other troubleshooting; if not, replace instrument cluster.

3. When in reverse gear, system does not work

(1) Check circuit: see Fig. 4-115

(2) Check step

1) Check reverse radar

① Turn ignition switch to ON, put shift lever from non-reverse gear to reverse gear.

② Test the voltage between BCM (1-8) and vehicle body, the voltage should be over 8V.

If it is normal, check reverse radar probe and BCM controller; if not, proceed to the next step.

2) Check reverse switch

① Disconnect reverse switch wire harness connector.

② Gear to reverse gear and measure the resistance between BCM (1-8) and IG2, if the resistance is more than 100KΩ while the resistance between reversing switch interface harness and BCM is less than 1Ω, then the reversing switch is broken, replacement required.

If it is normal, proceed to the next step; if not, replace reverse switch.

3) Check wire harness or connector

Check whether the wire from wire harness of reverse switch interface to BCM is in good connection.

If it is normal, continue other troubleshooting; if not, repair or replace wiring and connector.

Section IX Power Supply and Other Electrical System

I. Overview

This section covers battery, power distribution network, rear defrost system, electric horn system and electronic clock.

II. Battery

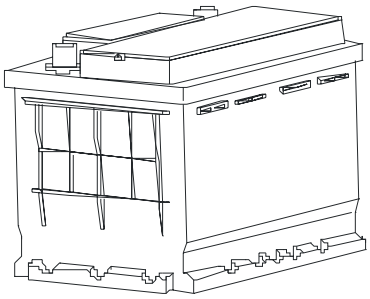


Fig. 4-116

Note：

①: If an auxiliary battery and a jumper cable are required for engine starting, please apply the battery of 12V.

②: After connecting battery cable, make sure the cable is fastened to the battery tightly to ensure a good contact.

How to use battery

①: Battery surface (especially the top) shall always keep dry and clean. If the surfaces are wet or electrolyzed, battery will make electric discharge.

②: Shall remove the negative cable for long time not using intention.

Note: Do not make electrolyte contact with skin, eye, textile or painted surface. After contacting, wash with water for 15min and seek for medical assistance.

③: Sulphation of battery. If battery is not used for a long time and the proportion of electrolyte is less than 1.1, sole battery pole plate sulphation caused by complete electric discharge will happen. Compared with normal battery, although sulphation battery has higher voltage in early stage of charging, the electric current is not stable.

To protect battery, the battery shall be maintained in good charging state. Note: For battery maintenance, operate according to notes on the battery.

III. Power switch system

1. If the fuse is blown, renew it after clearing the related fault causes.
2. Employ the fuse with the designated specifications, no fuse exceeding the given specifications can be accepted.
3. Don’t install the fuse obliquely, ensure it to install correctly in the fuse box.

Relay mainly includes: normally open, normally closed and the mixed type.

IV. The rear defrosting system includes: rear window glass heating net, rear window defroster relay, rear window defroster switch: in combination with the emergency light switch, inner integration on the air conditioner controller (for electrical air conditioning)

1. Fault table, Table 4-24.

Table 4-24

Fault	Cause
Deficiency of rear defrosting system	1. Fault in rear defrosting relay 2. Fault in rear defrosting fuse 3. Fault in rear defrosting switch 4. Fault in wiring

2. Check the rear defrosting switch (for electrical air conditioning), shown in Fig. 4-117.

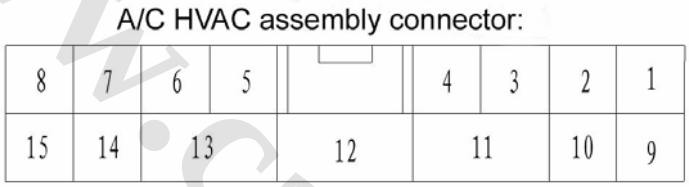


Fig. 4-117

When the defrosting switch is positioned at ON, the terminal 15 and 12 shall be connected; while at OFF, shall not be connected. If the continuity is out of the specification, renew the defrosting switch.

Check the luminous indicator light of rear defrosting switch (for electrical air conditioning). Connect the battery positive with the terminal 3 on the air conditioning HVAC assembly end connector, while the negative with the terminal 9, when the rear defrosting switch luminous indicator shall be lit. If the process is out of the specification, renew the defrosting switch.

V. Electric horn system composition

The horn system is started by the horn switch hidden under the ornamental cap of the central air bag module in the steering wheel. Press the air bag module ornamental cap and the horn relay can be started, which will lead the necessary electricity to the horn.

1. Check circuit as shown in Fig. 4-118

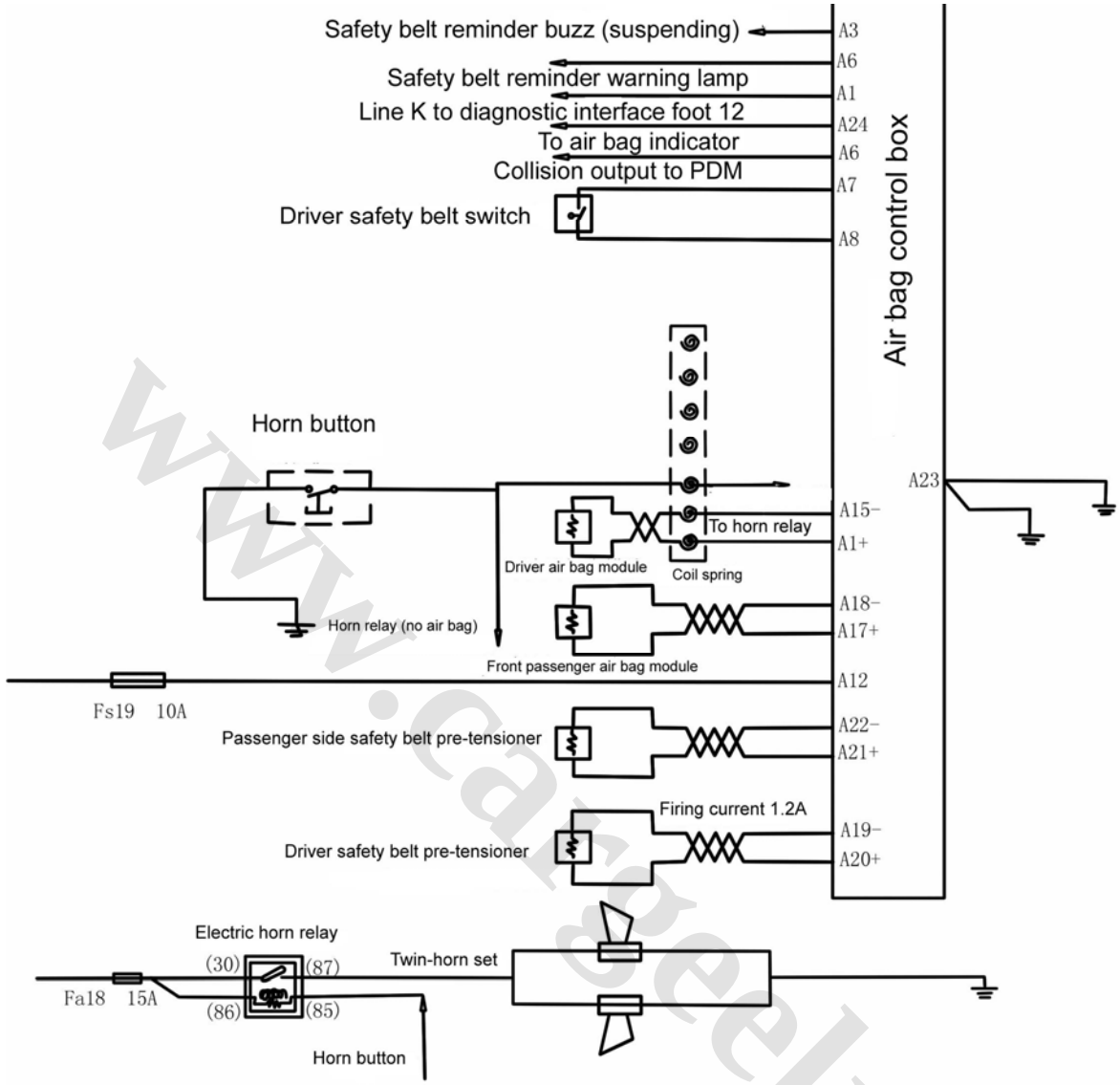


Fig. 118

2. Fault table, Table 4-25

Table 4-25

Fault	Cause
Deficiency of the two horns	1. Fuse blown 2. Deficiency of horn relay 3. Deficiency of horn switch 4. Deficiency of horn 5. Fault in clock spring 6. Fault in wiring
Deficiency of one horn	1. Deficiency of horn 2. Fault in wiring
Horn keeps chirping	1. Deficiency of horn relay 2. Deficiency of horn switch 3. Fault in clock spring 4. Fault in wiring

Chapter V Air Bag

Section I

Composition, Principle and Safety Rules for Maintenance

I. Composition & layout of air bag system

LF7162 adopts electronic double-air-bag system, with air bag in the central ornamental cap of steering wheel and in the dash board in front of the passenger respectively. The whole air bag system is mainly composed of driver air bag module (DAB), front passenger air bag module (PAB), air bag clock spring (SRS CS), air bag electronic control unit (SRS ECU), safety belt pre-tensioners for driver side and front passenger side (deluxe scheme), air bag harness, warning label, and so on. Air bag system layout for LF7162 is illustrated in Fig. 5-1.

1. Air bag ECU (Electronic Control Unit)

The air bag ECU assembly is installed at the central axis of the vehicle, under the central control panel, as shown in Fig. 5-1.

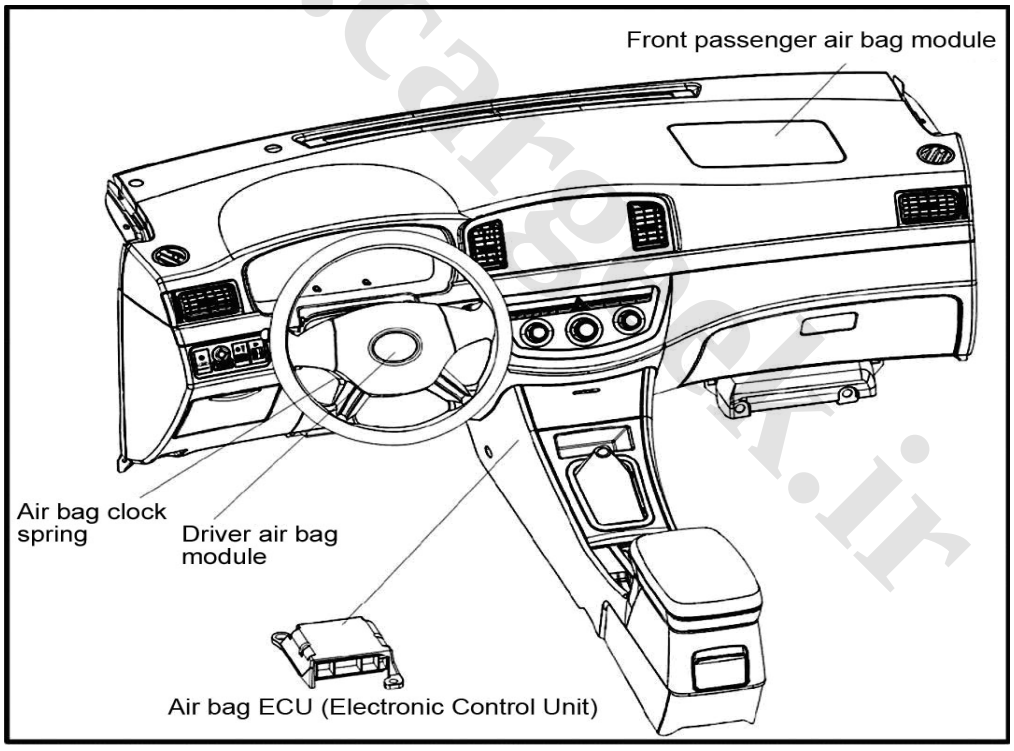


Fig. 5-1

The air bag ECU can keep in operation for over 100ms under the circumstances that the battery voltage drops too low or the power supply disconnects because of collision. Two models of the air bag are involved in the LF7162: the two circuits and four circuits which must work simultaneously with the front pre-tensioned safety belt.

2. Driver air bag module

The un-removable driver air bag module, containing gas generator, bag, ornamental cap and a series of auxiliary components, is installed in the central ornamental cap of the steering wheel, as shown in Fig. 5-2.

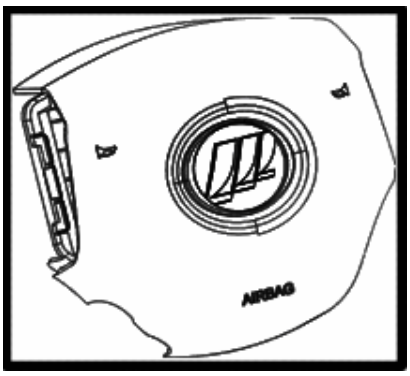


Fig. 5-2

The main functions of the driver air bag module: Under normal usage, the driver air bag module shall receive ignition signal from SRS ECU (Supplement Restraint System Electronic Control Unit) after certain collision and then spark the gas generator and produce abundant air rapidly for the deployment of air bag. With all of these, the driver can be protected.

3. Air bag clock spring

Driver air bag module, whose communication with ECU is carried out through air bag clock spring, is installed on the steering wheel and turns simultaneously with the steering wheel. The clock spring, comprising of swirly cable, turnplate, housing, harness and auxiliary components etc., is installed on the combination switch, as shown in Fig. 5-3.

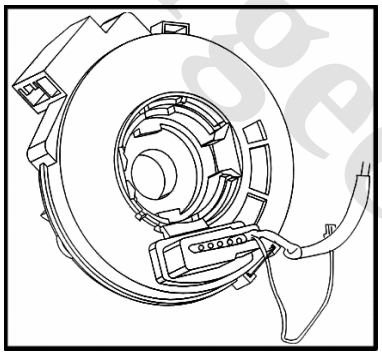


Fig. 5-3

The working principle of air bag clock spring: The installation housing of the clock spring is fixed on the steering column, and the upper part of the clock spring turn plate is inserted into the steering wheel, and the swirly cable is installed between the turnplate and installation housing. When the steering wheel turns left or right, the clock spring turnplate will turn simultaneously with the steering wheel, turning the output end of the cable and stretching or tightening the swirly cable. For this reason, the harness is prevented from being wound upon the steering column. Beyond that, the continuity of the harness and the connection of the electronic signal are assured. Thus, the harness of the clock spring is also the bridge for supplying electricity from the vehicle body to the related functional components of steering wheel.

4. Front passenger air bag module

The front passenger air bag module, comprising of gas generator, bag and a series of auxiliary components, etc, is installed above the sundries box of dash board, as shown in Fig. 5-4.

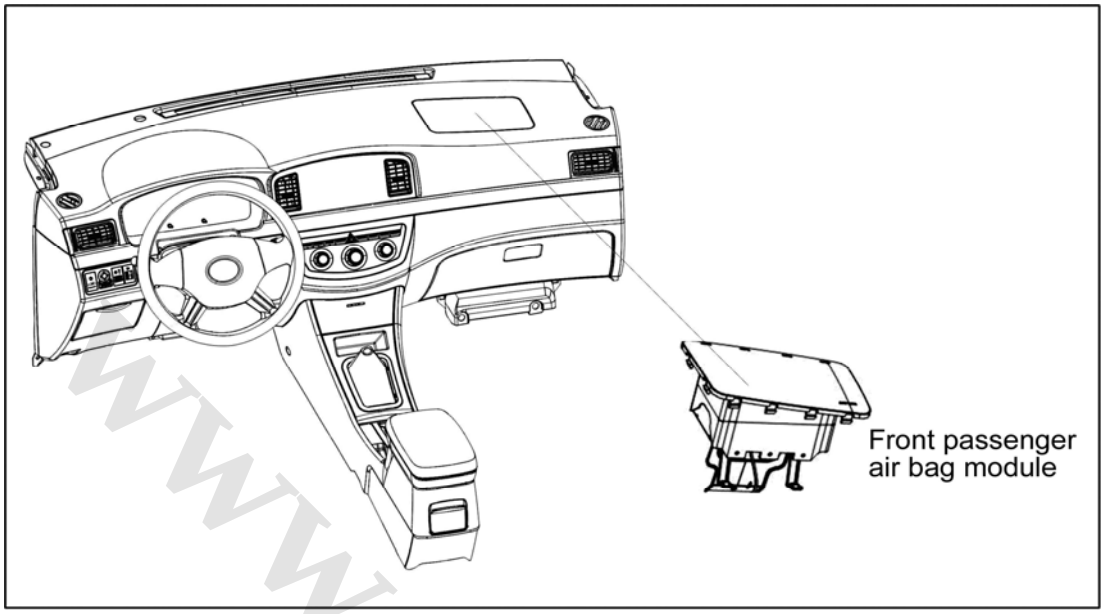


Fig. 5-4

The main function of front passenger air bag module: Under normal usage, the front passenger air bag module shall receive ignition signal from SRS ECU (Supplement Restraint System Electronic Control Unit) after certain collision and then spark the gas generator and produce abundant air rapidly for the deployment of air bag. With all of these, the passenger can be protected.

5. Air bag harness

Air bag harness is used to connect the air bag ECU, clock spring and dash board harness, as shown in Fig. 5-5.

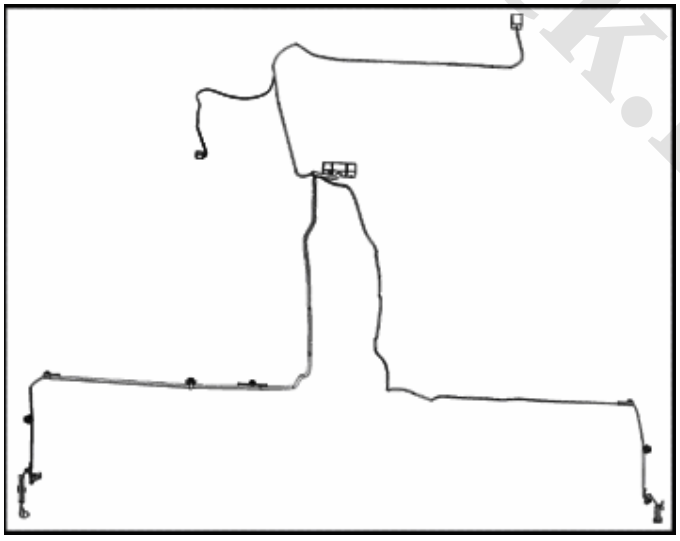


Fig. 5-5

6. SRS warning lamp

SRS warning lamp can be observed in the instrument cluster, as shown in Fig. 5-6.

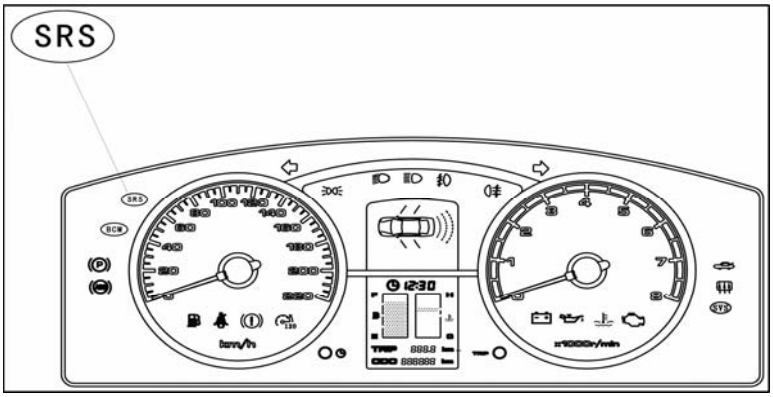


Fig. 5-6

When the self-diagnostic circuit of air bag ECU assembly detects fault, the SRS warning lamp shall be illuminated so as to inform the driver of the malfunction of air bag system. Under normal circumstances, the illumination of the warning lamp will last for 5s before run out when the ignition switch has been turned to the position ON. However, in the special conditions, such as the circuit contact malfunctions, intermittent faults, if the faults recorded by the air bag ECU are over 8 times, the warning lamp will be lighted. Generally speaking, the driver should check the car in the service station in time once the SRS warning lamp shows the abnormal signal.

When the self-diagnostic circuit of air bag ECU assembly detects fault, the SRS warning lamp shall be illuminated so as to inform the driver of the malfunction of air bag system. Under normal circumstances, the illumination of the warning lamp will last for 5s before run out when the ignition switch has been turned to the position ON.

II. Working principle of air bag system

When frontal collision accident occurs, the collision sensor shall produce signal for the collision, and the air bag ECU shall detect and analyze the collision signal to determine the necessity for ignition requirement. If necessary, the ignition impulse shall be sent out immediately, the ignition pipe in each air bag module will be ignited, and then the gas generating material in each of the air bag module shall be ignited by the ignition pipe. Therefore, abundant gas generated in extremely short time shall inflate the air bag suddenly, forcedly open the ornamental cap, and the fully inflated air bag will be formed. By this way, the impact upon the driver and passenger arising from the collision accident shall be absorbed, and the injury of the driver and the passenger shall be avoided or lessened.

III. Safety rules for air bag maintenance

During the maintenance of air bag system, unexpected deployment may occur if correct operation procedure is not carried out, which shall lead to serious accident. Beyond that, the air bag may fail to deploy if the maintenance operation is incorrect. Therefore, please carefully read the following notes and take correct operation procedure.

1. Inspection, installation and maintenance shall be carried out by professionals.

2. Inspecting lamp, common voltmeter and ohmmeter shall not be used during inspection, and special voltmeter and ohmmeter (minimal 10kΩ/V) shall be used for measuring voltage and

resistance.

3. Read out the flash DTC (Diagnostic Trouble Code) before removing the battery ground line when clear off air bag system fault.

4. Remove the negative ground line of the battery before carrying out specific maintenance. Then wait for over 3min and perform maintenance operation, or the air bag may be unexpectedly deployed. The negative electrode removed shall be wrapped with insulating tape for insulation.

Note: Wait for over 3min before carrying out any operation after disconnecting the battery, or the unexpected deployment of air bag may result in serious accident!

5. After slight collision, check driver air bag module and air bag ECU assembly even if the air bag has not been deployed.

6. Remove air bag ECU assembly before maintenance if the sensor can be vibrated during the maintenance.

7. Forbid to reuse the air bag system components removed from other vehicles. Renew if necessary.

8. Disassembling and repairing for repeated usage or other reasons of driver and front passenger air bag modules and air bag ECU assembly are not allowed.

9. If accidentally dropped, vibrated or knocked, driver air bag module, front passenger air bag modules and air bag ECU assembly shall be renewed. If crack, impress or other damages are discovered on the housing, support or interface, also renew these components.

10. Direct contact with hot air or flame of driver air bag module, front passenger air bag module and air bag ECU assembly is unallowable.

11. Remove such components as air bag ECU, air bag module, clock spring, and so on, during spray-painting operation, or these components may be affected due to the high temperature (above 93℃).

12. The air bag ECU interface, interfaces for the connection between air bag ECU assembly and clock spring, clock spring and driver air bag module, as well as front passenger air bag module and air bag ECU assembly, are all provided with protection mechanism for the unexpected development of air bag. Operate as per the maintenance requirements to avoid the unexpected deployment of air bag and the damage of components.

13. Pay attention to the warning label on the component of the air bag system and the relative positions inside the vehicle. Follow the operation requirements specified on the label.

14. During the maintenance of the air bag system, the air bag module must be immediately installed after being taken out from the transportation device. Return the module to the transportation device if the installation is terminated. It is not allowed to place the module unattended. Keep the deploying side of the air bag upwards when storing the removed air bag module.

15. Electrical inspection shall be carried out first after finishing the maintenance of the air bag system. Connect the air bag with the circuit only after ensuring the electrical system is all right.

16. Nobody is allowed to stay in the vehicle when connecting the air bag system with the power supply. Do not connect with the power supply before well fixing the air bag ECU.

17. Check the operation of SRS warning lamp after finishing the maintenance of the air bag system.

18. Refer to the Instruction Manual for the service-life of the air bag. Renew the air bag and label when it is out of its service-life.

Section II Diagnosis & Fault Clearing

LF7162 air bag system can carry out self-diagnosis, and the basic diagnostic procedure is as follows:

I. Self-diagnosis of SRS warning lamp circuit

1. Turn the ignition switch to position ACC or ON, and check SRS warning lamp for illumination.
2. The system is ok if the warning lamp keeps light for about 5s and then dark for over 5s.
3. The continuous illumination of the warning lamp indicates that single fault or multiple faults have been detected, then read out DTC and clear off the faults as per part II in this section.
4. If SRS warning lamp illuminates sometimes after connected with the ignition switch for 5s, or SRS warning lamp illuminates again even the ignition switch has been turned to position LOCK, check SRS warning lamp circuit for short circuit as per Section 2.5.

II. Read out fault

Read out the fault by special hand-held diagnostic instrument

(1) Connect to the fault diagnostic interface of the vehicle.

(2) Read out the fault as per the indication shown in the diagnostic instrument, as shown in DTC Table 5-1

DTC Table 5-1

DTC Description	Lifan DTC	Bosch DTC in EEPROM
Electronic Control Unit (ECU) Internal Fault	tbd	9000
Configuration Fault	tbd	9001
Driver Airbag Resistance High	tbd	8026
Driver Airbag Resistance Low	tbd	8022
Driver Airbag Short to GND or Cross Coupling	tbd	8024
Driver Airbag Short to Battery	tbd	8025
Passenger Airbag Resistance High	tbd	8017
Passenger Airbag Resistance Low	tbd	8016
Passenger Airbag Short to GND or Cross Coupling	tbd	8018
Passenger Airbag Short to Battery	tbd	8019
Driver Belt Pretensioner Resistance High	tbd	8065
Driver Belt Pretensioner Resistance Low	tbd	8064
Driver Belt Pretensioner Short to GND or Cross Coupling	tbd	8066

DTC Table 5-1 (Continued)

DTC Description	Lifan DTC	Bosch DTC in EEPROM
Driver Belt Pretensioner Short to Battery	tbd	8067
Passenger Belt Pretensioner Resistance High	tbd	8058
Passenger Belt Pretensioner Resistance Low	tbd	8057
Passenger Belt Pretensioner Short to GND or Cross Coupling	tbd	8059
Passenger Belt Pretensioner Short to Battery	tbd	8060
Battery Voltage High	tbd	9328
Battery Voltage Low	tbd	9327
Driver Buckle Switch Circuit Fault	tbd	8097
System Warning Lamp Short to GND or Open	tbd	8671
System Warning Lamp Short to Battery	tbd	8673
Driver Buckle Switch Warning Lamp Circuit Fault	tbd	8595

III. Fault checking and repairing (as shown in Table 5-2)

Table 5-2

S/N	Possible Faults	Areas	Fault Clearing Methods
1	Ground wire deficient	Earth wire Harness	1. Preparation before checking; 2. Check the earth wire, if normal, go to the step 3; if loose or disconnected, repair it; 3. Check the harness, if normal, the parts with faults have been recovered; if not, repair or renew the harness.
2	Voltage too high	Battery	1. Preparation before checking; 2. Check the battery voltage, if normal, the parts with faults have been recovered; if too low, charge or renew the battery.
3	DAB inexistence	Driver air bag module Clock spring Harness Air bag ECU	1. Preparation before checking; 2. Check the driver air bag circuit, if normal, go to the step 3; if not, go to 5; 3. Check the air bag ECU, if normal, go to 4; if not, renew the air bag ECU; 4. Check the driver air bag module, if normal, the parts with faults have been recovered; if not, renew the driver air bag module; 5. Check the clock spring, if normal, go to 6; if not, renew the clock spring; 6. Check the harness between the air bag ECU and clock spring, if normal, the parts with faults have been recovered; if not, repair or renew the harness.

Table 5-2 (Continued)

S/N	Possible Faults	Areas	Fault Clearing Methods
4	PAB inexistence	Front passenger air bag module Harness Air bag ECU	1. Preparation before checking; 2. Check the front passenger air bag circuit, if normal, go to 3; if not, repair or renew the harness or interface between the air bag ECU and front passenger air bag module; 3. Check the air bag ECU, if normal, go to 4; if not, renew the air bag ECU; 4. Check the front passenger air bag module, if normal, the parts with faults have been recovered; if not, renew the front passenger air bag module.
5	LPSB inexistence	1. Driver safety belt pre-tensioner 2. Harness 3. Air bag ECU	1. Preparation before checking; 2. Check driver safety belt pre-tensioner, if normal, go to 3; if not, repair or renew the harness or interface between air bag ECU and driver safety belt pre-tensioner module; 3. Check air bag ECU, if normal, go to 4; if not, renew the air bag ECU; 4. Check the driver safety belt pre-tensioner, if normal, the parts with faults have been recovered; if not, renew the driver safety belt pre-tensioner.
6	RPSB inexistence	1. Front passenger safety belt pre-tensioner 2. Harness 3. Air bag ECU	1. Preparation before checking; 2. Check front passenger safety belt pre-tensioner circuit, if normal, go to 3; if not, repair or renew the harness or interface between air bag ECU and front passenger safety belt pre-tensioner module; 3. Check the air bag ECU, if normal, go to 4; if not, renew air bag ECU; 4. Check front passenger safety belt pre-tensioner, if normal, the parts with faults have been recovered; if not, renew the front passenger safety belt pre-tensioner.
7	Simultaneous over 2 faults shown	Related components	Diagnose and clear the fault one by one according to the flash DTC.

1. Air bag circuit (as shown in Fig. 5-7 and Table 5-3)

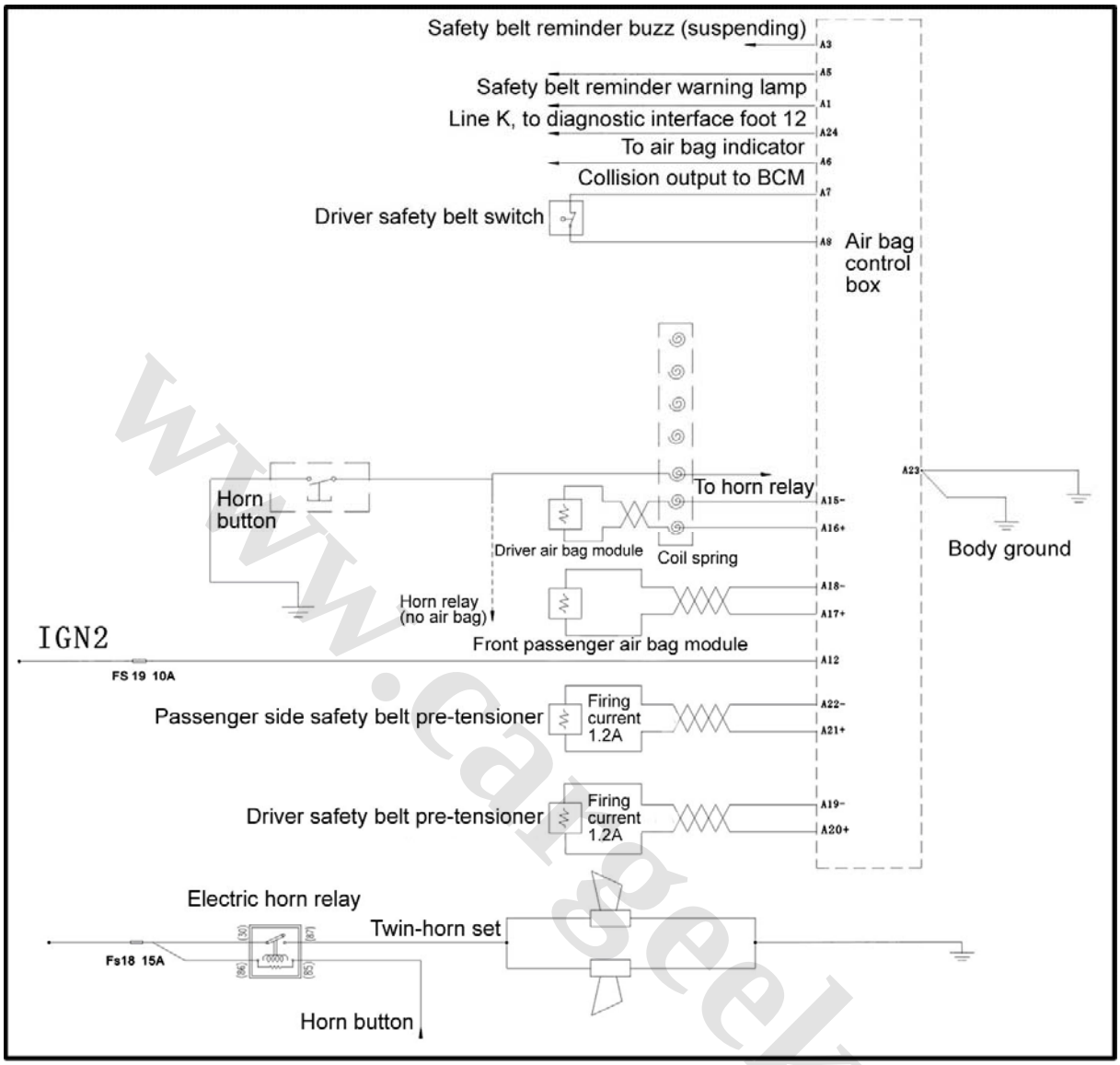


Fig. 5-7

Table 5-3 Names of Air Bag ECU Pins and Terminals

No.	Name
A1	K line, diagnostic interface 12 feet
A3	Safety belt reminder buzz output
A5	Collision output to BCM
A7	Driver safety belt switch
A8	
A12	Power line
A14	Driver's safety belt reminder warning lamp
A15-	Driver air bag module
A16+	
A17+	Front passenger air bag module
A18-	
A19-	Driver safety belt pre-tensioner
A20+	
A21+	Passenger side safety belt pre-tensioner
A22-	
A23	GND
A24	To air bag indicator

2. Preparation before checking

Before maintenance, carefully read the section 1.3 about the safety rules for air bag maintenance. In addition, following preparation work shall be carried out.

(1) Remove the negative ground wire from the battery and wait for at least 3min.

(2) Remove the driver and front passenger air bag modules, keep the air bag module upwards when storing the module (See the removal methods in Section IV).

(3) Disconnect the interface of the driver and front passenger air bag modules, air bag ECU interface, as shown in Fig. 5-8.

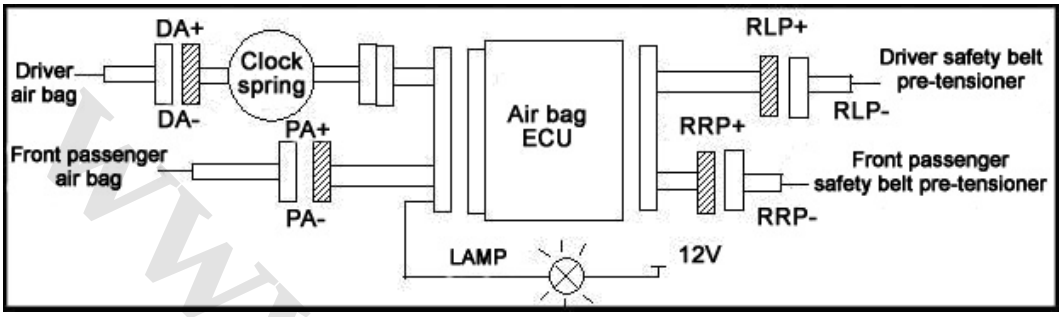


Fig. 5-8

3. Check for too low or too high voltage

(1) Connect the negative ground wire on the battery, turn on the ignition switch at the position of ON.

(2) Measure the PW voltage at the end of the air bag harness.

(3) Normal voltage: 10~14V.

4. Check for harness and interface

(1) Exam the connection of the air bag harness. Check if the resistance is below 1Ω.

(2) Check whether the other harnesses and the corresponding terminals are connected.

(3) Check all the leads of the harness for damage.

(4) Check the interface of the harness for damage.

5. Check for air bag ECU

(1) Connect the air bag ECU with the air bag harness. See Fig. 5-8.

(2) Connect the negative ground wire to the battery, and wait for at least 3min.

(3) Turn the ignition switch to the position of ACC or ON and wait for at least 20s.

(4) Eliminate the flash DTC by the diagnostic instrument and read out the flash DTC.

6. Check for the driver air bag module

(1) Turn the ignition switch to position LOCK.

(2) Remove the negative ground wire from the battery and wait for at least 3min.

(3) Connect the driver air bag module. See Fig. 5-9.

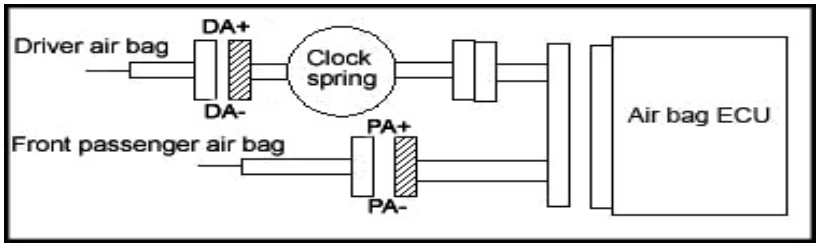


Fig. 5-9

(4) Connect the negative ground wire on the battery and wait for at least 3min.
(5) Turn the ignition switch to the position of ACC or ON and wait for at least 20s.
(6) Eliminate the flash DTC by the diagnostic instrument and read out the flash DTC.

7. Check for driver air bag circuit

(1) Measure the resistance between the DA+ and DA- at one side of the clock spring. Normal resistance shall be above 1MΩ.
(2) Measure the resistance between the DA+ at one side of the clock spring and DA+ at one side of the air bag ECU. Normal resistance shall be within 1MΩ.
(3) Measure the resistance between DA- at one side of the clock spring and DA- at one side of the air bag ECU. Normal resistance shall be within 1MΩ.

8. Check for front passenger air bag module

(1) Turn the ignition switch to position LOCK.
(2) Remove the negative ground wire from the battery and wait for at least 3min.
(3) Connect the interface of the front passenger air bag module.
(4) Connect the negative ground wire on the battery and wait for at least 3min.
(5) Turn the ignition switch to the position of ACC or ON and wait for at least 20s.
(6) Eliminate the flash DTC by the diagnostic instrument and read out the flash DTC.

9. Check for front passenger air bag circuit

(1) Measure the resistance between the PA+ and PA- at one side of the air bag ECU. Normal resistance shall be above 1MΩ.
(2) Measure the resistance between the PA+ at one side of the air bag ECU and PA+ at one side of the front passenger air bag module. Normal resistance shall be within 1MΩ.
(3) Measure the resistance between the PA- at one side of the air bag ECU and PA- at one side of the front passenger air bag module. Normal resistance shall be within 1MΩ.

10. Check for driver safety belt pre-tensioner

(1) Turn the ignition switch to position LOCK.
(2) Remove the negative ground wire from the battery and wait for at least 3min.
(3) Connect the interface on the driver safety belt pre-tensioner. See Fig. 5-10.

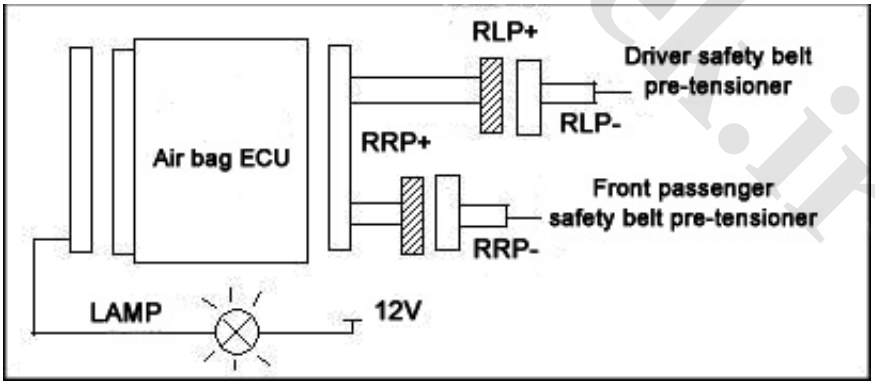


Fig. 5-10

(4) Connect the negative ground wire on the battery and wait for at least 3min.
(5) Turn the ignition switch to the position of ACC or ON and wait for at least 20s.
(6) Eliminate the flash DTC by the diagnostic instrument and read out the flash DTC.

11. Check for driver safety belt pre-tensioner

(1) Measure the resistance between the RLP+ and RLP- at one side of the air bag ECU. Normal resistance shall be above 1MΩ.

(2) Measure the resistance between the RLP+ at one side of the air bag ECU and RLP+ at one side of the driver safety belt pre-tensioner. Normal resistance shall be within 1Ω.

(3) Measure the resistance between the RLP- at one side of the air bag ECU and RLP- at one side of the driver safety belt pre-tensioner. Normal resistance shall be within 1Ω.

12. Check for front passenger safety belt pre-tensioner

(1) Turn the ignition switch to position LOCK.

(2) Remove the negative ground wire from the battery and wait for at least 3min.

(3) Connect the interface on the front passenger safety belt pre-tensioner. See Fig. 5-10.

(4) Connect the negative ground wire on the battery and wait for at least 3min.

(5) Turn the ignition switch to the position of ACC or ON and wait for at least 20s.

(6) Eliminate the flash DTC by the diagnostic instrument and read out the flash DTC.

13. Check for front passenger safety belt pre-tensioner circuit

(1) Measure the resistance between the RRP+ and RRP- at one side of the air bag ECU. Normal resistance shall be above 1MΩ.

(2) Measure the resistance between the RRP+ at one side of the air bag ECU and RRP+ at one side of the front passenger safety belt pre-tensioner. Normal resistance shall be within 1Ω.

(3) Measure the resistance between the RRP- at one side of the air bag ECU and RRP- at one side of the front passenger safety belt pre-tensioner. Normal resistance shall be within 1Ω.

14. Check for clock spring

(1) Unplug the interface between the air bag ECU and the clock spring. See Fig. 5-10.

(2) Measure the resistance at one side of the air bag ECU. Normal resistance shall be above 1Ω.

(3) Measure the resistance between the A+ at one side of the clock spring and A+ at one side of the air bag ECU. Normal resistance shall be within 1Ω.

(4) Measure the resistance between the A- at one side of the clock spring and A- at one side of the air bag ECU. Normal resistance shall be within 1Ω.

IV. Check for SRS warning lamp circuit fault

In the normal conditions, when the ignition switch turns from the position LOCK to ACC or ON, the SRS warning lamp shall keep lighting for 5s, and then go out automatically; if there is any faults in the air bag system, the SRS warning lamp will keep lighting and never go out. Read out the flash DTC according to the normal process.

Provided that the lamp keeps lighting when the ignition switch is at the position of LOCK, or keeps dark when the switch is at the position of ACC or ON, there must be malfunctions in the SRS warning lamp circuit. With reference to the air bag system wiring diagram (see Fig. 5-7), check the circuit as per the following process.

1. Check for constant illumination when ignition switch at LOCK

(1) Turn the ignition switch to position LOCK.

(2) Remove the negative ground wire from the battery and wait for at least 3min.

(3) Unplug the air bag ECU interface.

(4) Connect the ground wire to the battery negative pole and wait for at least 3min.

(5) Check whether the SRS warning lamp goes out or not. If it goes out, the air bag ECU shall be

renewed; if not, check the SRS warning lamp circuit.

2. Check for SRS warning lamp circuit

Before checking the SRS warning lamp circuit, exam the fuse of the engine ECU; if the fuse has been burned out, it shall be renewed; if it works normally, go to the following checking process.

(1) Preparation before checking.

(2) Connect the negative ground wire on the battery and wait for at least 3min.

(3) Turn the ignition switch to position ACC or ON.

(4) Measure the voltage between the LA pin of the air bag ECU and the vehicle body.

(5) Normal voltage: 0~4V. If the voltage is abnormal, check the SRS warning lamp or repair the SRS warning lamp circuit. If normal, go to the following process.

(6) Remove the negative ground wire from the battery and wait for at least 3min.

(7) Connect the air bag ECU interface. See Fig. 5-11.

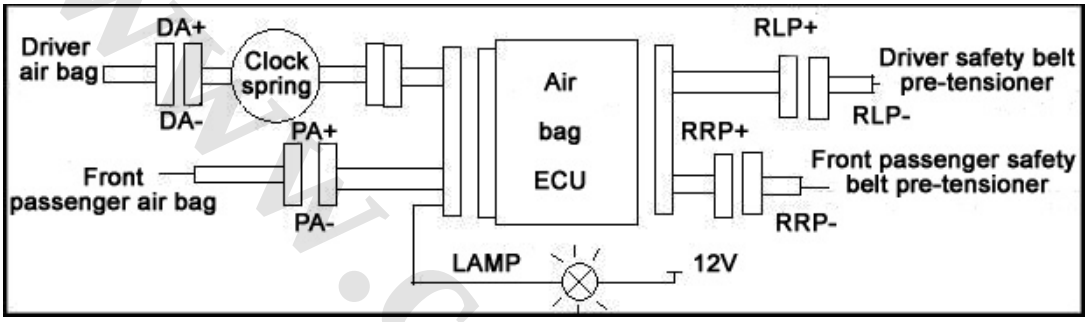


Fig. 5-11

(8) Connect the negative ground wire on the battery and wait for at least 3min.

(9) Turn the ignition switch to position ACC or ON.

(10) Observe whether the SRS warning lamp is lighted or not; if lighted, the malfunctions have been cleared; if not, check the LA terminal of the air bag ECU. If normal, the air bag ECU shall be renewed.

Section III Diagnosis of Vehicles after Collision

Check and maintain the vehicles after collision even without the deployment of air bag. Refer to Section IV for related methods of removal and installation.

I. Diagnosis, with the deployment of air bag

1. In the case that the air bag of the vehicle has been deployed after a collision, carry out a system fault diagnosis according to the methods in Section II. Renew the following Components.
(1) Air bag ECU.
(2) Driver air bag module.
(3) Front passenger air bag module.
(4) Driver safety belt pre-tesioner module.
(5) Front passenger safety belt pre-tensioner module.
Note: The old air bag ECU, driver air bag module, front passenger air bag module, driver safety belt pre-tensioner module and front passenger safety belt pre-tensioner module removed are required to be recovered.
2. Check the following components. Renew as required.
(1) Clock spring. Check the interface and harness of the clock spring for damage and the circuit performance of the clock spring as per 2.3.10. Renew as required.
(2) Steering wheel, steering column and steering lower shaft components. Check the steering wheel, steering column and steering lower shaft components for distortion and anything abnormal. Repair or replace if necessary.
(3) Harness. Check the harness of the air bag for firmness, the harness and interface for damage, and the terminal for distortion. Renew as required.

II. Diagnosis, without the deployment of air bag

In the case that the air bag of the vehicle has not been deployed after a collision of low speed, carry out a system fault diagnosis according to the methods in Section II and check the following components.
1. Air bag ECU. Check the air bag ECU box and bracket for depression, crack and distortion, the interface for damage and the terminal for distortion. Check the air bag ECU for normal installation. Renew if necessary.
2. Driver air bag module. Check the ornamental cap for depression, crack and distortion, the harness and interface for damage and the terminal for distortion. Also check the gas generator housing for depression, crack and distortion, the pushbutton switch contact piece of the steering wheel horn for distortion. Check the module for normal installation. Renew if necessary.
3. Front passenger air bag module. Check the ornamental cap for depression, crack and distortion, the harness and interface for damage and the terminal for distortion. Also check the gas generator housing for depression, crack and distortion. Check the module for normal installation. Renew if necessary.
4. Driver safety belt pre-tensioner. Check the pre-tensioner for depression, crack and distortion, the harness and interface for damage and the terminal for distortion. Check the pre-tensioner for normal installation. Renew if necessary.

5. Front passenger safety belt pre-tensioner. Check the front passenger safety belt pre-tensioner for depression, crack and distortion, the harness and interface for damage and the terminal for distortion. Check the pre-tensioner for normal installation. Renew if necessary.
6. Clock spring. Check the interface and harness of the clock spring for damage and the circuit performance of the clock spring as per 2.3.14. Renew as required.
7. Harness. Check the air bag harness for firmness, the harness and interface for damage and the terminal for distortion. Renew if necessary.
Note: Replace the entire air bag components if they are soaked by water.
8. Press the SST switch and deploy the air bag. With the LED lamp of the SST switch on, the air bag deploys simultaneously.

Section IV Removal and Installation

During the process of repair for LF7162 air bag system, removal and installation of driver air bag module, front passenger air bag module, air bag clock spring, air bag ECU and air bag harness may be involved. Some removal processes and notes are introduced as follows.

Note: Make the following preparations before removal and installation:
1. Locate the ignition switch in position ON, and encrypt the air bag SRS ECU with diagnostic instrument.
2. Locate the ignition switch in position LOCK.
3. Remove the negative ground wire from the battery and wait for at least 3min.

I. Removal and installation of air bag ECU assembly

Note: Forbid to open the housing of air bag ECU assembly unless absolutely necessary. The integrated circuit may be damaged in the case of contacting with its terminal.
1. Tips for removal of air bag ECU assembly
(1) Unplug the interface. Note: Unplug the interface under the state of installation for ECU assembly.
(2) Remove the screws with wrench and take off the air bag ECU assembly.
2. Tips for installation of air bag ECU assembly
(1) Install the air bag ECU assembly with wrench in the correct direction. Note: Make sure the tightening torque is 8 N·m.
(2) Connect the interface.
3. Check after installation
After installation, check the air bag ECU assembly for its tightness.

II. Notes for removal, installation and maintenance of driver air bag module (DAB)

1. Removal process and notes
(1) Locate the ignition switch in position LOCK.
(2) Disconnect the battery negative cable for more than 3min.
(3) Remove the two hexagon flange bolts at the left and right sides of steering wheel hub.
(4) Pull the driver air bag module from the steering wheel, and disconnect the interface of clock spring with the terminal of gas generator.
Note: The black spring plate should be picked up with a minitype flat tip screwdriver.
(5) Disconnect the interface of horn wire, and take out the air bag module. Removal is finished.
Note: Take care not to haul the air bag harness when removing the driver air bag module and keep the ornamental cap upwards when storing the module. Disassembling the driver air bag module is not allowed. Do not knock the air bag module. If knocked, install a new one. Forbid exposing the module under the temperature over 90°C, and contact with lubricants, lubricant grease as well as water. Seal the old module removed in a sealing bag, and return it to Lifan Passenger Car Co., Ltd.

2. Installation process and notes

(1) Install a new driver air bag module, and plug the interface between the clock spring and gas generator.

Note: Engage the black interface buckle in the gas generator. Then plug the horn wire interface.

(2) Place the whole module in the steering wheel, adjust the position of the air bag module and ensure the equality of the gap at the four corners. And then screw two hexagon bolts into the corresponding position using hexagon socket wrench at the torque of 8 N·m.

(3) Check the middle of steering wheel. After installation, gently revolve the steering wheel to left and right, making sure that no noise or something abnormal exists.

3. Note for maintenance

For the driver air bag module of the LF7162, there is no need for maintenance of any part except repairing and changing the horn. If trouble occurs, install a new one.

Note: Make sure that new component is installed by the professionals at the designated service center.

III. Notes for removal, installation and maintenance of front passenger air bag module (PAB)

1. Removal process and notes

(1) Locate the ignition switch in position LOCK.

(2) Disconnect the negative cable of the battery for more than 3min.

(3) Remove the trim strip of the sundries box door in the sundries box of dash board, unscrew the bolts connecting front passenger air bag module with tubular beam by the wrench.

Note: When handling the air bag interface, take care not to damage the air bag harness.

(4) When dismantling the sundries box of dash board, gently uplift the dash board, and pick up the interface in the air generator terminal of front passenger air bag with a mini-type straight screwdriver.

(5) Remove the front passenger air bag module. Dismantle the nuts fixing the front passenger air bag module and dash board with a wrench, draw out the ropes tied on the front passenger air bag from the gap, take out the front passenger air bag module from the top of the dash board. Seal the old front passenger air bag module removed in a sealing bag, and return it to Chongqing Lifan Passenger Vehicle Co., Ltd.

Note: Forbid to disassemble the front passenger air bag module.

2. Installation process and notes

(1) Install a new front passenger air bag module. Place the module mount rightly into the corresponding bolts on the dash board. And tighten the three flange locknuts with the wrench at the torque of 8 N·m.

(2) Unscrew the bolts on the draw cord ring, then put the draw cord on the dash board into the draw cord ring of the air bag module, screw the bolts at the torque of 8N·m.

(3) After installing the dash board at the corresponding position in the car, plug the interface of air bag harness into the corresponding air generator terminal of front passenger air bag module.

(4) Fix the dash board on the car.

(5) At this moment, the installing hole at the bottom of the air bag module shall directly face the installing hole at the tubular beam. Fix them with the bolt.

(6) Install the sundries box.

(7) After installation, watch the surface of dash board for its levelness. Check the clearance also. Reinstall and adjust if unqualified.

Note: The installation and adjustment of the module must be operated by professionals to avoid danger!

3. Notes for maintenance

For the driver air bag module of this model, there is no need of maintenance for front passenger air bag module. Install a new one when trouble occurs.

Note: Make sure that new component is installed by the professionals at the designated service center!

IV. Notes for removal, installation and maintenance of clock spring

1. Removal process and notes

(1) Make sure that the road wheels are in the straight ahead position.

(2) Locate the ignition switch in position LOCK.

(3) Disconnect the negative cable of battery for more than 3min.

(4) Dismantle the driver air bag module. Remove the M12 nuts fixing steering wheel with Φ19 socket, and take down the steering wheel gently.

(5) Remove the screws on the cover of combination switch with cross screwdriver, and then take down the cover of combination switch gently.

(6) Unplug the interface connected in the input jack of clock spring.

(7) Remove the clock spring from the steering column, and pay attention to the two buckles fastening the clock spring on the steering column. Seal the old clock spring removed in a sealing bag, and return it to Chongqing Lifan Passenger Vehicle Co., Ltd.

2. The installation process and notes

Install a new air bag clock spring. Do not remove the lock piece before installing the steering wheel.

(1) Locate the clock spring to the steering column shaft.

(2) Press the clock spring downward with proper pressure, making the two plastic buckles and a metal buckle engage in the corresponding mount of the steering column.

Note: Uneven force shall be avoided when engaging the two plastic buckles! If the buckles are broken, a new clock spring is needed.

(3) Check whether the buckles of the clock spring are engaged in the corresponding position.

(4) Install the covers at the front and back of combination switch for the steering wheel, and tighten the 2 installation screws.

(5) Make sure that the road wheels are in the straight ahead position (refer to the installation instruction of clock spring) and install the steering wheel. Then align the steering wheel with the mark on the main shaft of steering column, and tighten the installation nuts of steering wheel. Adjust the direction if the steering wheel is new, and then unplug the lock piece of clock spring.

Note: Callback for the lock piece of clock spring is needed!

(6) Connect the battery negative pole and turn the ignition switch to the position ON.

3. Notes for maintenance

For the air bag clock spring of LF7162, no maintenance and calibration is needed!

Section V Scrapping Tips for Air Bag Module

When scrapping the air bag module, remove the air bag module first. If scrapping the vehicle equipped with air bag system, or the air bag module, the air bag module should always be deployed as the following operation procedure. If something abnormal appears in the process of deployment, contact the service center of Lifan Passenger Car Co., Ltd. When lacking in the conditions of scrapping, please deliver the module to related departments for disposal.

1. When deploying the air bag, loud noise will be heard. Therefore, the air bag should be deployed in an outside open area with no nuisance to others.
2. When deploying the air bag, the operation shall be carried out by the professionals.
3. After the air bag is deployed, the air bag module will become very hot. Thus, do not touch it until at least 30min later after the deployment.
4. When handling the deployed air bag module, put on gloves and safety glasses. After finishing the operation, wash hands cleanly.
5. Forbid to water the deployed air bag module.
6. After the deployment of air bag module, the gas generator will be with a high temperature, and should be handled after being cooled for more than 30min.
7. Put on gloves and safety glasses to remove the deployed air bag module.
8. Put the air bag into a plastic bag, fasten the mouth of the bag, and then dispose as scrap. See Fig. 5-12.

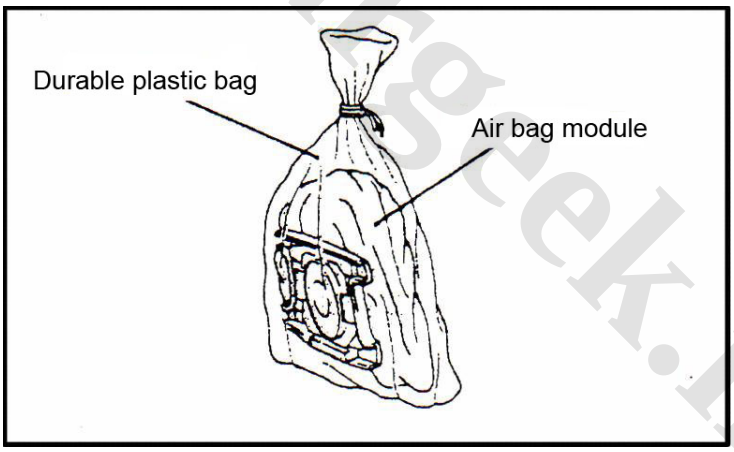


Fig. 5-12

9. After operation, do not forget to wash hands.

Note: Environmental protection treatment for the scrapped air bag module is needed.

Chapter VI A/C System

Section I Introduction

This series of sedan has a full air conditioning system with functions of refrigeration, heating and ventilation. The air conditioner can be used to reduce the temperature of the vehicle in summer, heating and defrost the windscreen in winter. The air conditioning system is fully functional and easy to operate with the compact conformation.

I. Principle of compressor refrigeration of air conditioner

The refrigeration system consists of compressor, evaporator, supercooling condenser with drier-receiver, expansion valve, blower and control mechanism, etc., see Figure 6-1:

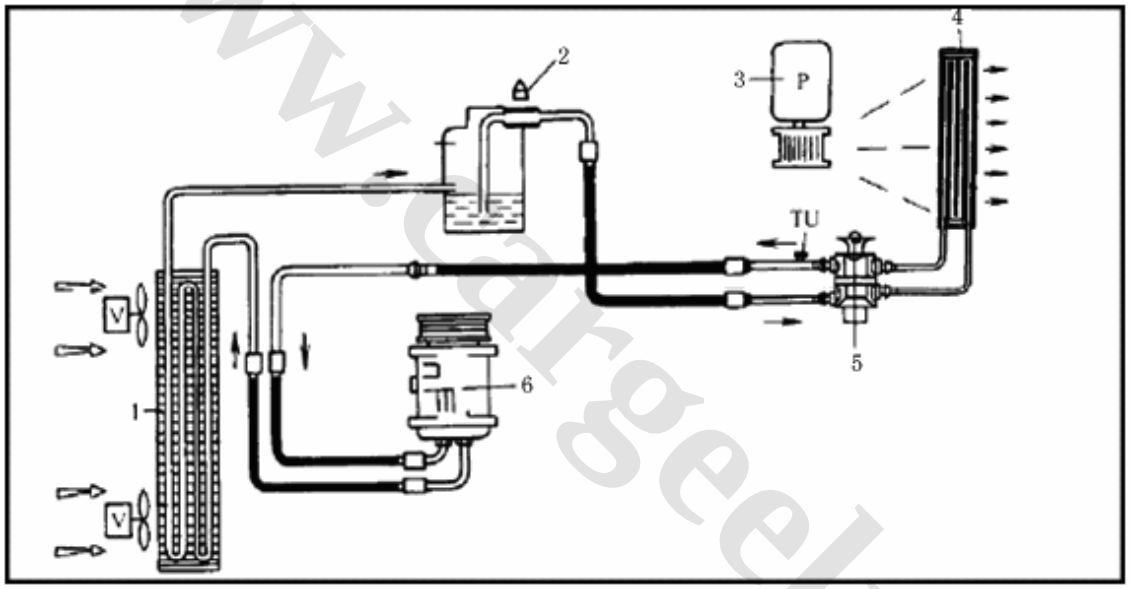


Figure 6-1

1. Supercooling condenser with drier-receiver 2. Pressure switch
3. Blower 4. Evaporator 5. Expansion valve 6. Compressor

See the principle of compressor refrigeration of vehicle in the illustration. Driven by the engine, the compressor extracts the gaseous refrigerant from the evaporator and presses into the condenser. The high pressure gaseous refrigerant makes liquefaction and heat exchange (release heat) in condenser. Heat will be taken away by the air out of the vehicle. After the throttling action of expansion valve, high pressure liquid refrigerant can reduce its pressure; low pressure liquid refrigerant makes gasification and heat exchange (absorb heat) in evaporator. The cooled air near the evaporator is blown into the vehicle by the blower. Gaseous refrigerant is extracted by the compressor again and pumped into the condenser. Refrigerant repeats the closed circulation and discharges heat from the inside to the outside of the vehicle and makes the temperature inside the vehicle reduce to a comfortable temperature. See Figure 6-2:

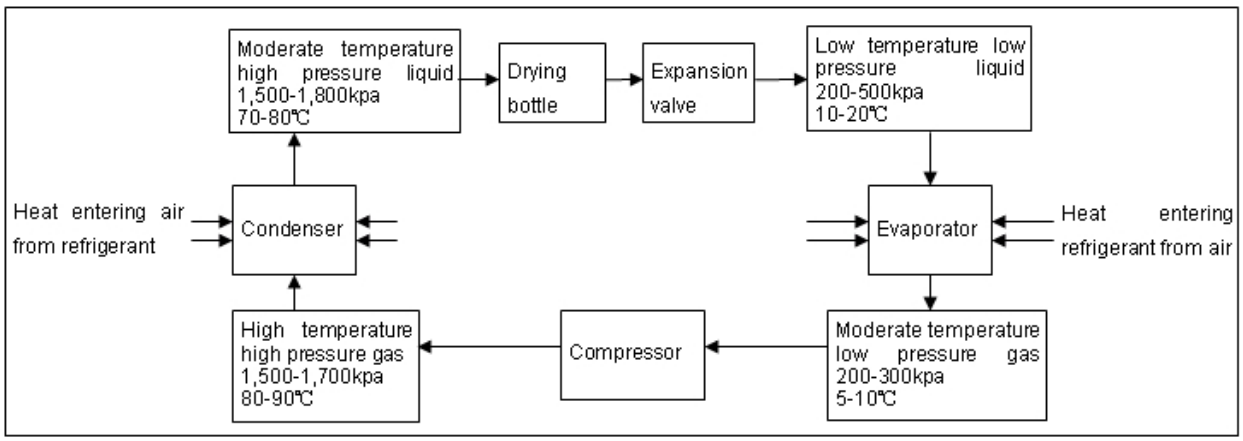


Figure 6-2

II. Principle of heating system

Water heating is applied for the heating system, with the coolant of engine as the heat source. Heating system mainly consists of heat exchanger, coolant pipeline, blower, air duct, air vent, and control mechanism, etc. The housing of warm air heating set and the housing of evaporator are combined together, using the same blower and air duct with refrigeration system. See Figure 6-3:

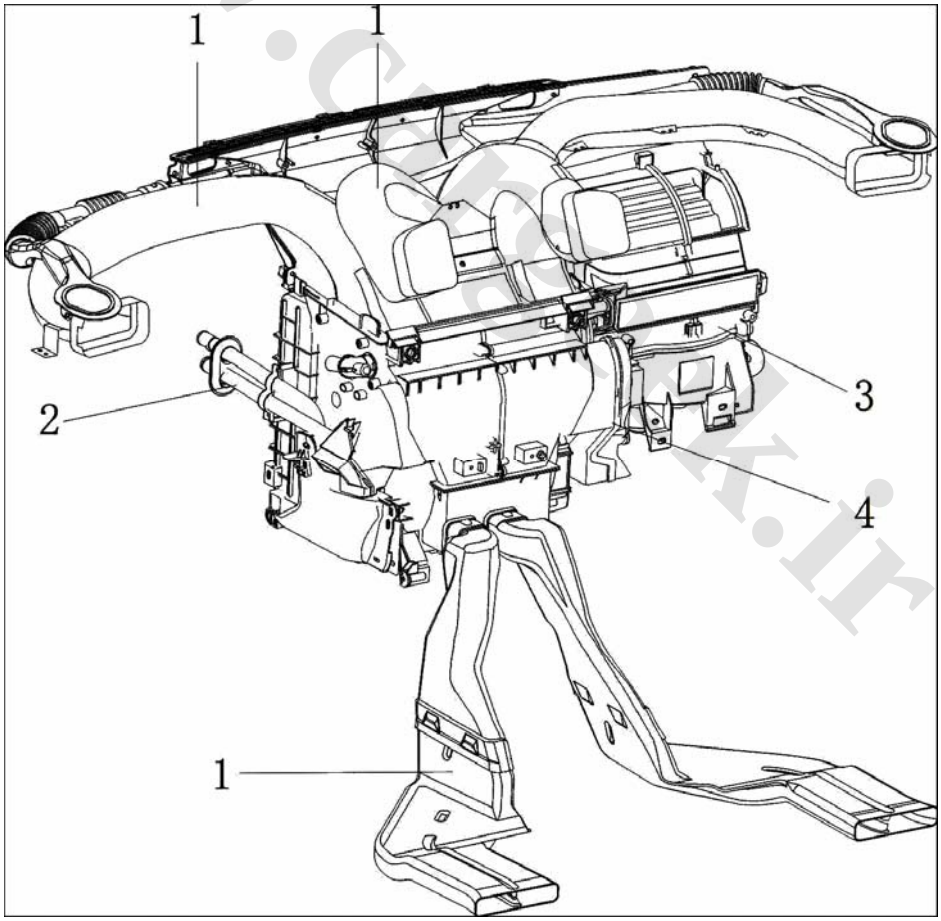


Figure 6-3

1. Air duct 2. Coolant pipeline 3. Blower 4. Heat exchanger

When engine works, heated by the high temperature of the engine cylinder, the coolant is pumped into the heat exchanger through water pipe by the water pump of the cooling system. Air from blower can take the heat given off by the coolant into the vehicle or the windscreen to raise the temperature in the vehicle or defrost. After the cooling process in the heat exchanger, coolant is pumped back by water pump. Repeating the circulation can make warm air heating. See Figure 6-4:

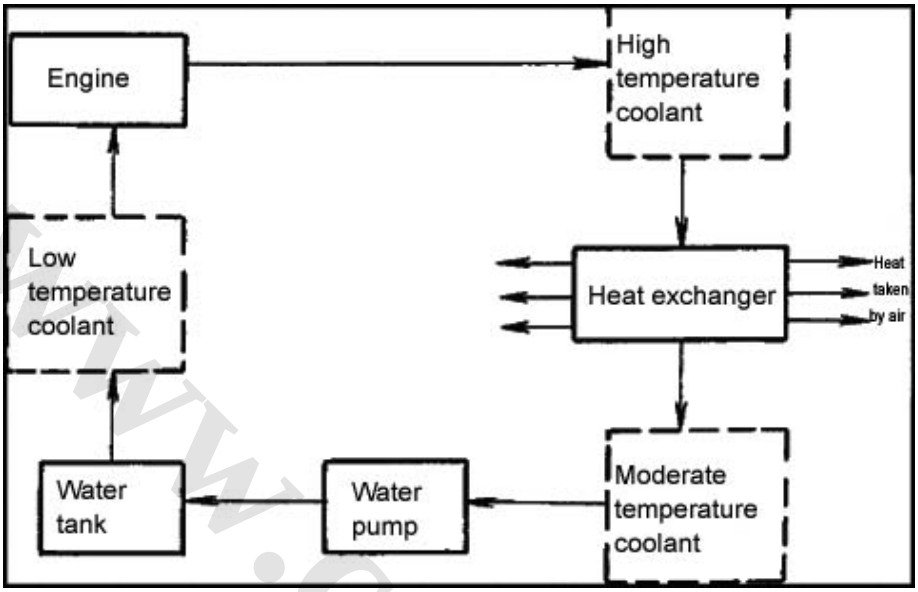


Figure 6-4

III. Air conditioning control system

Air conditioning system includes power control circuit, compressor clutch control circuit and safety protection control circuit and data communication circuit. It mainly consists of air conditioning switch, air conditioning controller (electrical air conditioning system), coolant temperature sensor, pressure switch, solenoid valve and temperature controller, etc. Air conditioning control system is to guarantee the effective work of air conditioning system under any circumstances, and guarantee the safe operation of the air conditioning system and the engine.

1. Refrigeration temperature control

It mainly consists of evaporator temperature sensor, A/C controller and relevant circuits, etc. When the temperature of evaporator changes, the resistance of sensor changes accordingly, making A/C controller receive the relevant voltage signal of the temperature. Amplified by the amplifying circuit, the signal is to control the work of electromagnetic clutch relay: when connecting electromagnetic clutch relay, compressor electromagnetic clutch connects, compressor starts to work, and the temperature will decrease; when disconnecting the electromagnetic clutch relay, compressor electromagnetic clutch disconnects, compressor stops working, and the temperature will increase. By controlling compressor, air conditioning control system maintains the refrigeration temperature in the set range.

2. To reduce the engine load under certain circumstances, electronic fuel injection engine also controls the compressor: when engine starts, drives off, suddenly accelerates and overspeeds, the air conditioner compressor stops working.

3. Security protection control

Security protection control mainly guarantees the normal operation of the system. Monitoring the system pressure and temperature by the pressure switch installed on the high-pressure hard pipe can realize the security protection control. Functions of security protection control as follows:

(1) Low pressure protection: for pressure below 0.196±0.02 MPa, pressure switch (between 1-A4 and 3-A4) switches off, the power of compressor clutch is cut off, and compressor stops working;

(2) Over pressure protection: for pressure over 3.14±0.2 MPa, pressure switch (between 1-A4 and 3-A4) switches off, the power of compressor clutch is cut off, and compressor stops working;

(3) Control high pressure: for pressure over or equal to 1.77±0.1 MPa, pressure switch (between 2-A4 and 4-A4) switches on, a trigger signal is sent to engine ECM to make the electronic fan work at high speed;

(4) Low temperature protection: for temperature below 2℃ sensed by evaporator temperature sensor, the power of compressor clutch is cut off, and compressor stops working;

(5) High temperature protection: for temperature over 110.25℃ sensed by coolant temperature sensor, apply overheat protection for compressor; the power of compressor clutch is cut off, and compressor stops working.

4. Engine cooling system (electronic fan) control. Engine cooling system control consists of coolant temperature sensor, engine ECM, 1#, 2#, 3# electronic fan control relay, cooling fan, cooling fan regulation resistance, condensation fan and relevant circuits. Depending on relevant temperature sensors and switching signals, engine ECM controls the on off state of relevant fan control relay circuits, as follows:

(1) For coolant temperature of 93℃~96℃, engine ECM electrifies 1# relay and 3# relay; the 2 electronic fans are connected in parallel and work at low speed simultaneously.

(2) For coolant temperature of 98℃~100℃, engine ECM electrifies 2# relay; cooling fan works at high speed.

(3) For coolant temperature reaching 110℃, instrument cluster lightens the warning lamp.

(4) For air conditioner switch closing, electronic fan works at low speed no matter coolant temperature is high or low.

(5) For the pressure of air conditioning refrigeration system over or equal to 1.77±0.1MPa, electronic fan works at high speed.

(6) For abnormal coolant temperature signals (broken coolant temperature sensor), engine ECM will judge the engine runs with heavy load, electronic fan works at high speed.

Section II System Layout

Heating and air conditioning electronic control system layout 1 (Figure 6-5)

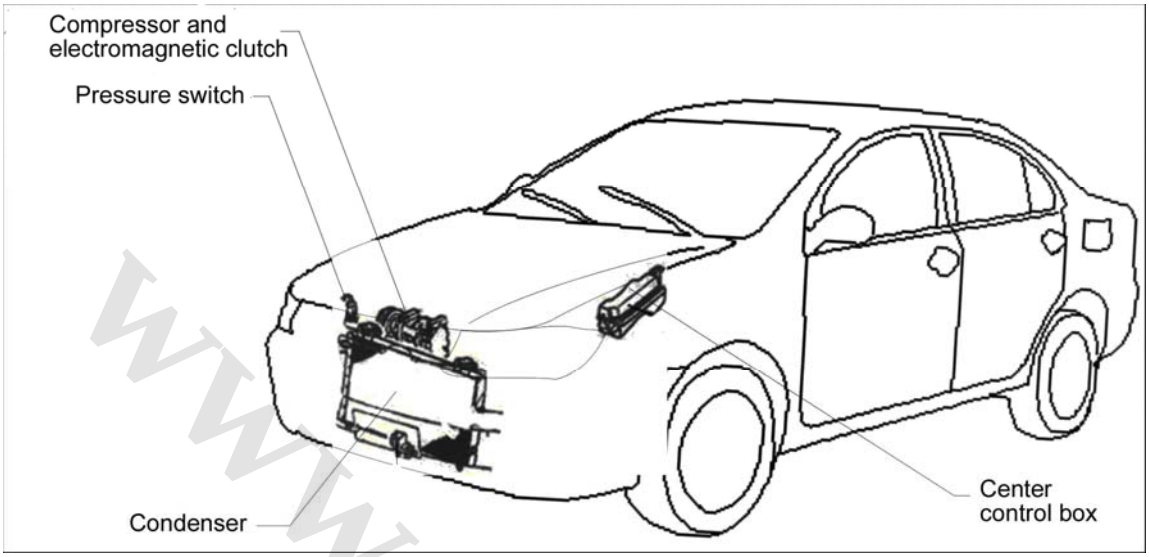


Figure 6-5

Heating and air conditioning electronic control system layout 2 (Figure 6-6)

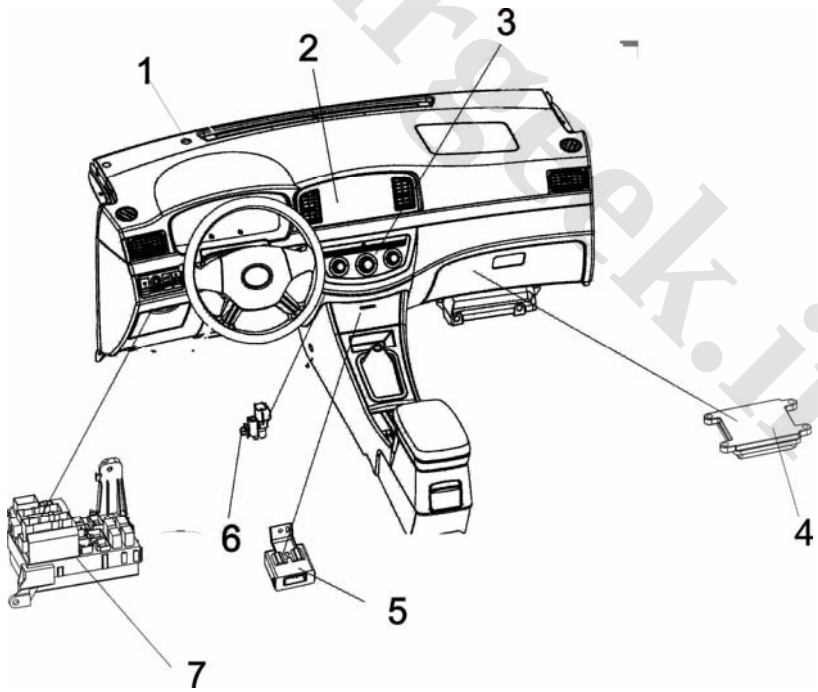


Figure 6-6

① Sunlight sensor ② Instrument cluster ③ Air conditioning control module
④ Engine ECU ⑤ Air conditioning controller ⑥ Room temperature sensor ⑦ Junction box assembly

Electrical air conditioning controller, as shown in Figure 6-7.

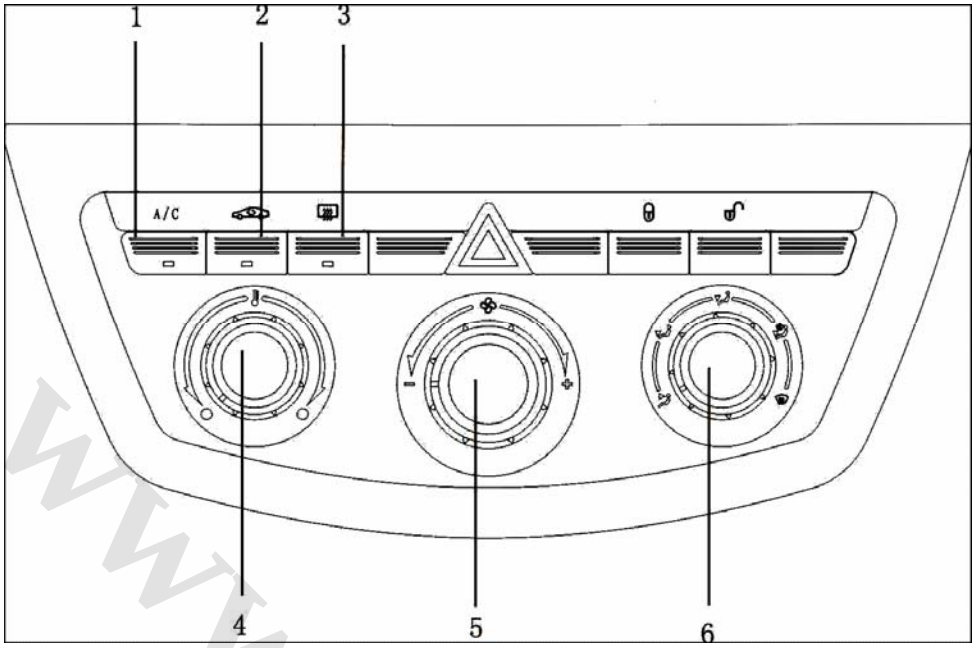


Figure 6-7

1. “A/C” switch 2. Internal and external recycling modes option button

3. Cool/warm wind regulation knob 4. Air regulation knob 5. Air blowing mode option knob

Heating and air conditioning electronic control system layout 2 (Figure 6-8)

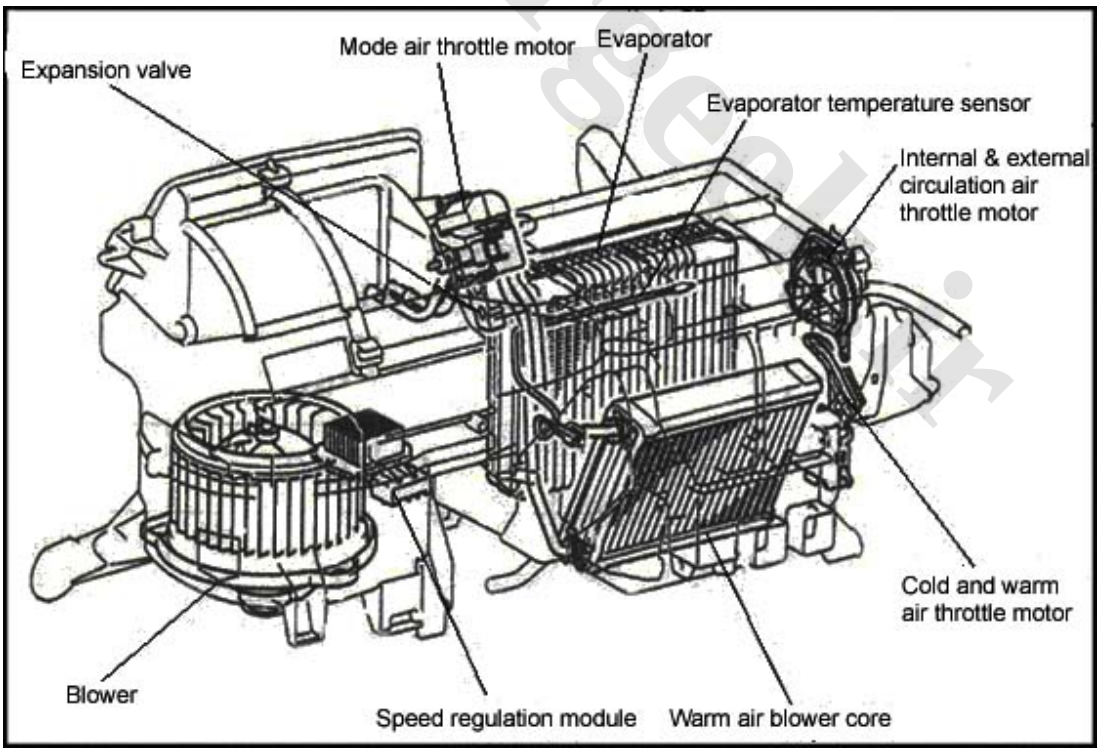


Figure 6-8

Exploded view of air conditioner parts as shown in Figure 6-9.

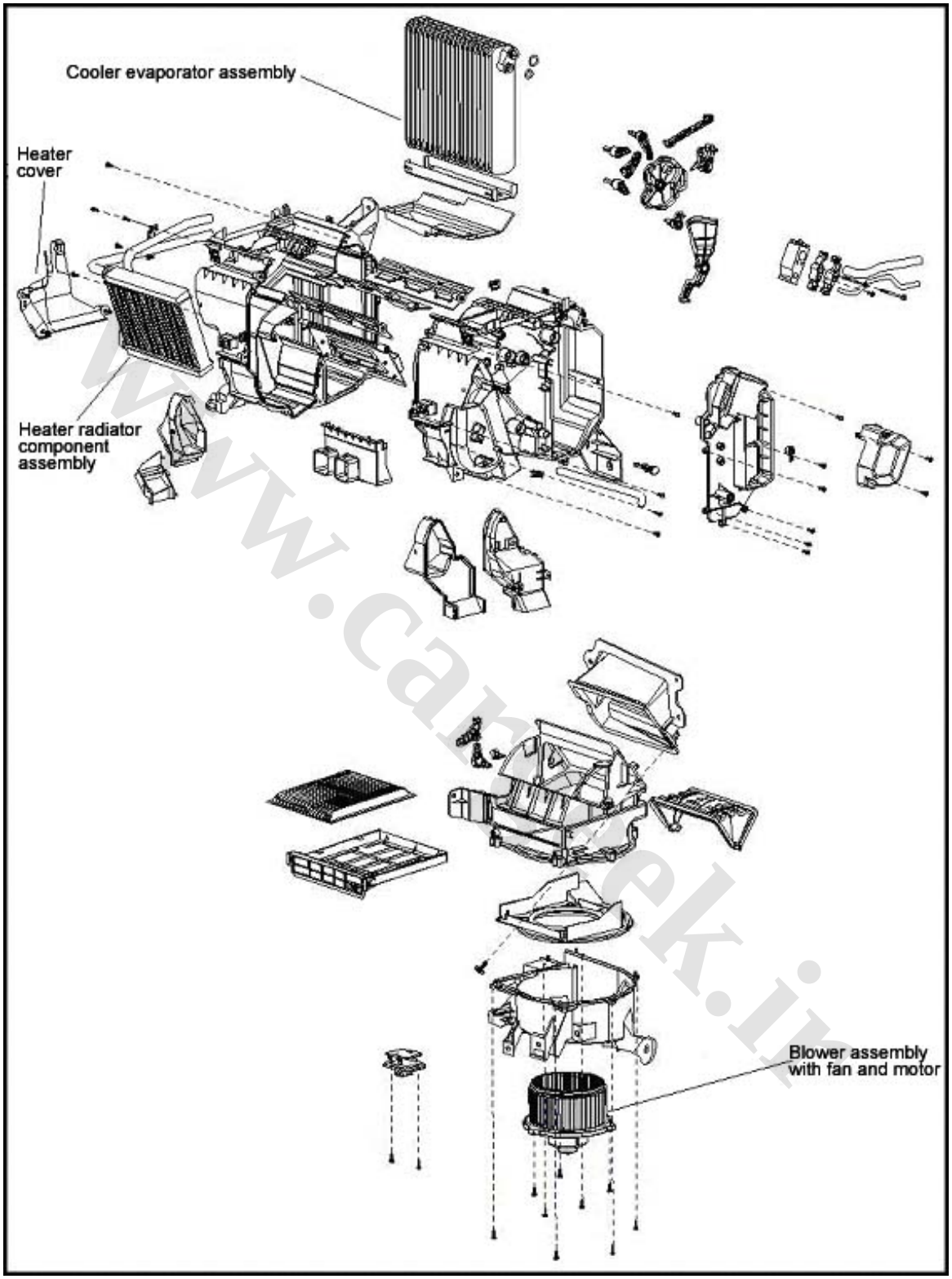


Figure 6-9

Exploded view of air conditioner parts as shown in Figure 6-10.

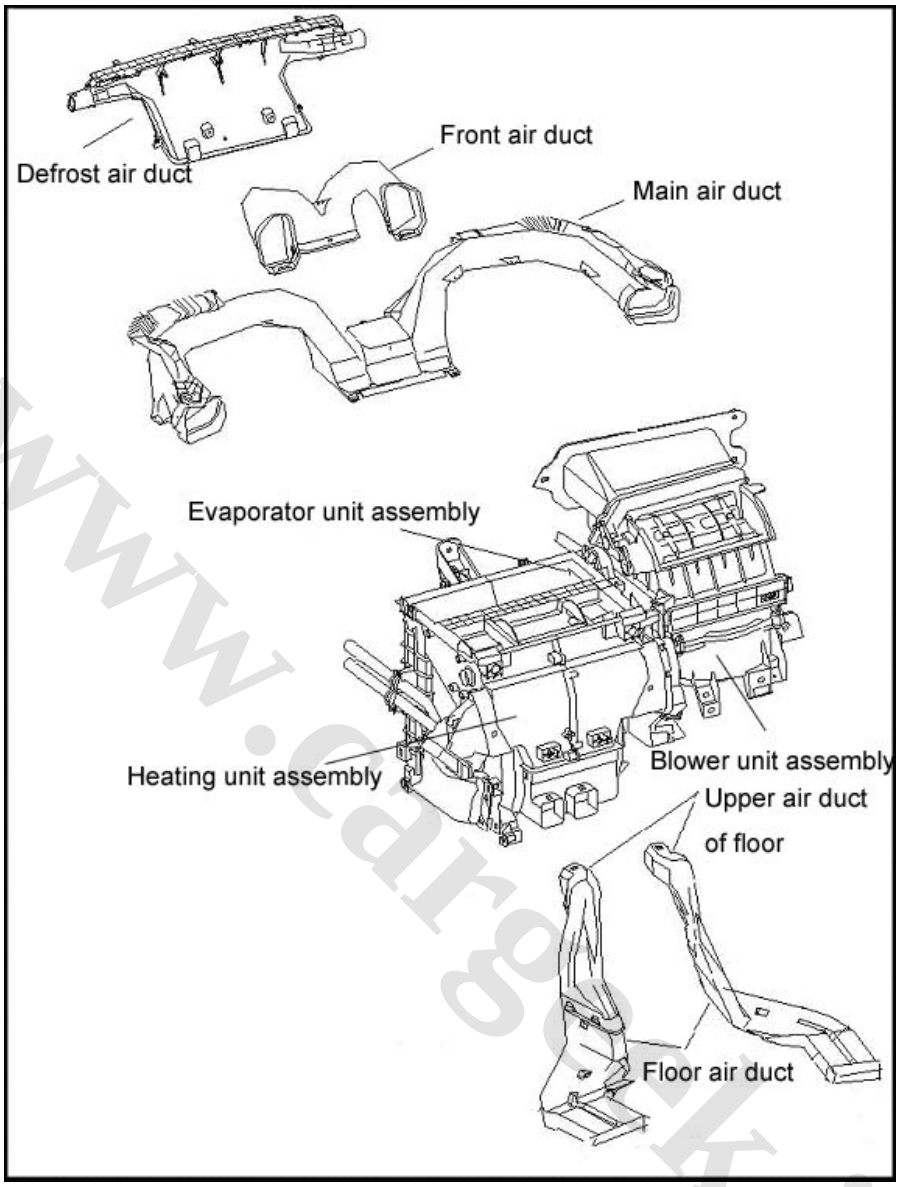


Figure 6-10

Section III Component Maintenance

I. Performance parameter of LF7162 electrical air conditioning system

Table 6-1

Compressor	Model		WXH-086
Condenser assembly	Type		Parallel flow
	Specification L×W×D mm		590×370×16mm
	Heat transfer capacity		≥4.5m/s frontal velocity
HVAC assembly	Evaporator core	Type	Cascading style
		Specification D×H×W mm	38×250×258
		Refrigerating capacity	Intake air flow rate (m³/h) 450, refrigerating capacity ≥4.1Kw
	Radiator core		Cascading style
		Specification D×H×W mm	27×220×180
		Heating capacity	For 6L/h flow rate, 350 m³/h air flow rate, heating capacity ≥4.24.1Kw
	Air flow regulation		4th gear
	Maximum air flow		Refrigerating face blowing ≥450m³/h
			Heating foot blowing ≥300 m³/h
Refrigerant	Type		R134a
	Injection quantity		500g±50g
Lubricant	Type		PAG56
	Injection quantity		120ml
Air conditioning system	Maximum refrigerating capacity		Compressor 1800 revolutions, ≥4.0K
	Temperature regulating range		18℃～32℃

II. Inspection of air conditioner compressor belt

New belt is that used on the engine for not more than 5 min. Used belt is that used on the engine for more than 5 min. Install the drive belt and check whether the belt is well contacted with the belt groove (Figure 6-11).

Check whether the belt slides in the belt groove by hand.

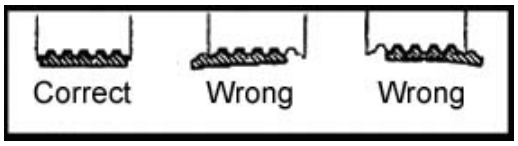


Figure 6-11

III. Inspection of air filter

1. Remove sundries box as shown in Figure 6-12. For detail, please refer to the removal method of sundries box.

Figure 6-12

2. Take out the filter as shown in Figure 6-13.

Figure 6-13

3. Take out filter element upwards, and check the ventilation property. Change the filter element for bad ventilation property, as shown in Figure 6-14.

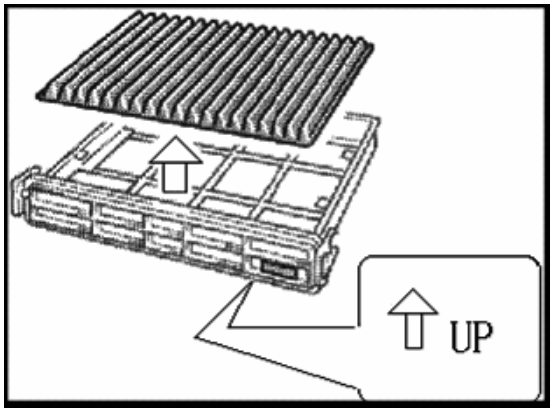


Figure 6-14

IV. Inspection for evaporator housing

1. Disassemble air duct

(1) Disassemble upper air duct of the housing

① Remove the cover board of dashboard (please refer to the disassemble method of dashboard)

② Disassemble guard staples of the two sides of the air duct, as shown in Figure 6-15.

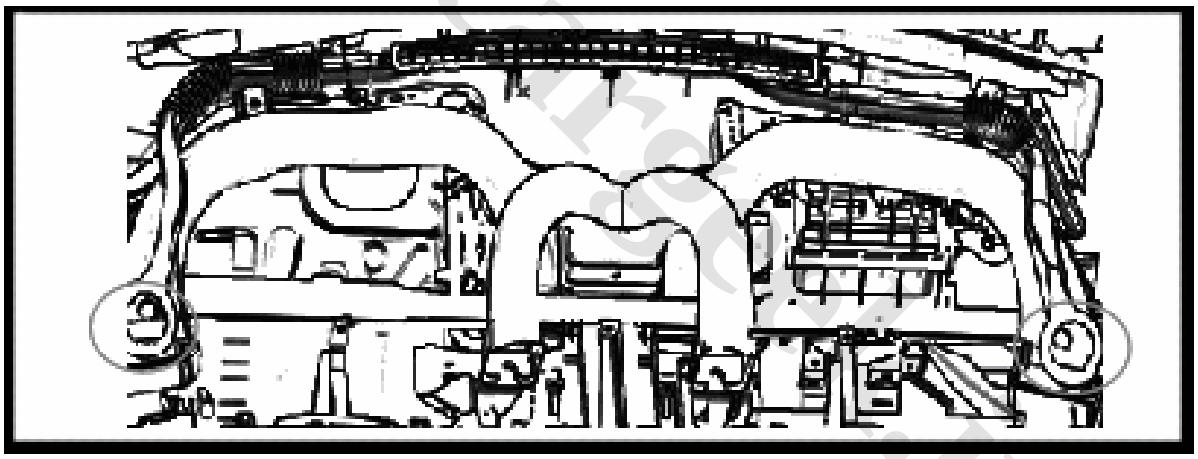


Figure 6-15

(2) Disassemble lower air duct of the housing

① Move seat backwards

② Pull away the carpet, disassemble left and right upper air ducts, and then take out all the air ducts.

Disconnect the upper air duct on the left floor. According to the position indicated by the arrowhead, move the upper air duct on the left floor sideways to loosen it, as shown in Figure 6-16.

Figure 6-16

Disconnect the upper air duct on the right floor. According to the position indicated by the arrowhead, move the upper air duct on the right floor sideways to loosen it, as shown in Figure 6-17.

Figure 6-17

2. Disassemble housing

(1) Discharge coolant from the system.

(2) Disconnect air conditioner pipeline assembly (as shown in Figure 6-18).

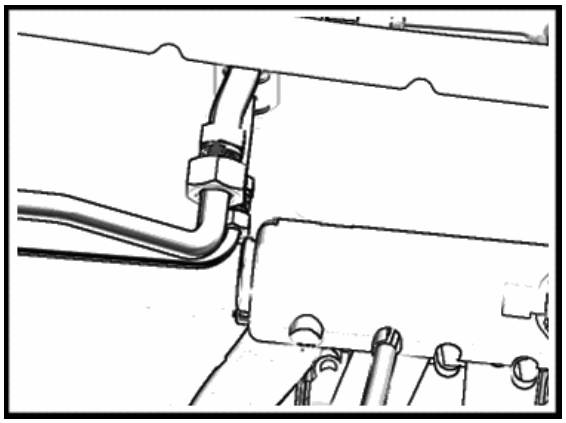


Figure 6-18

Clamp the two ends of M16's pipe with 24mm and 27mm open end wrenches; clamp the two ends of M8's pipe with 17mm and 19mm open end wrenches; then disassemble nuts and disconnect air conditioner pipeline assembly.

(3) Remove clamp from air conditioner pipeline assembly.

Disassemble the hoop of heater inlet and outlet pipes from the heater unit (as shown in Figure 6-19).

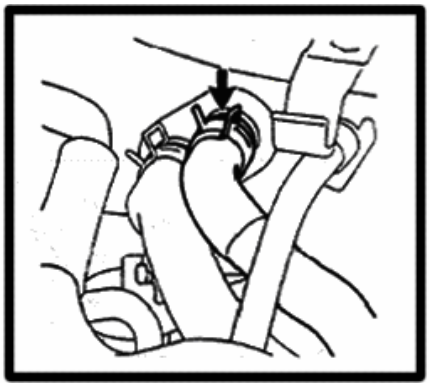


Figure 6-19

(4) Remove the lower shield of dashboard (please refer to the disassemble method of dashboard)

(5) Disassemble the air duct and wire harness from the top and the bottom of air conditioner housing.

(6) Disassemble steering wheel and steering column (please refer to the disassemble methods of steering wheel and steering column)

(7) Disassemble the lower shield of dashboard and air conditioning controller (please refer to the disassemble methods of the lower shield of dashboard and air conditioning controller)

(8) Loosen the screw connected to the hollow beam mounting.

(9) Disassemble the hollow beam (please refer to the disassemble method of hollow beam)

(10) Disassemble 3 nuts in Figure 6-20.

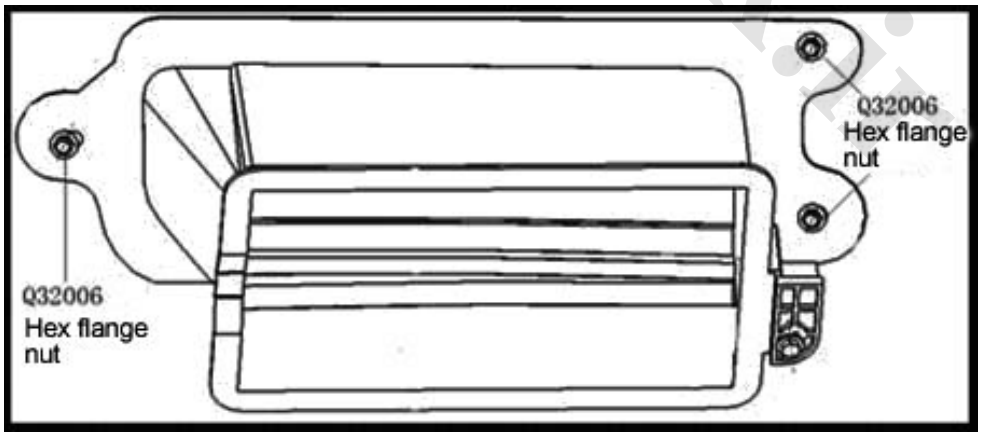


Figure 6-20

(11) Disassemble nuts in Figure 6-21.

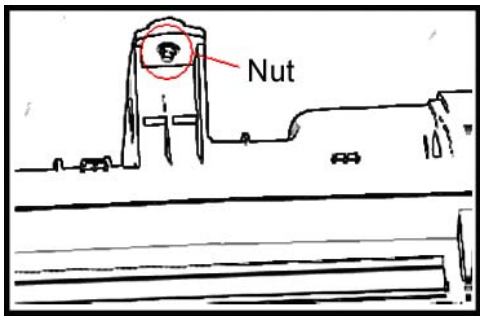


Figure 6-21

(12) Disassemble bolts and nuts in the following figure, then the air conditioner housing can be taken out. See Figure 6-22.

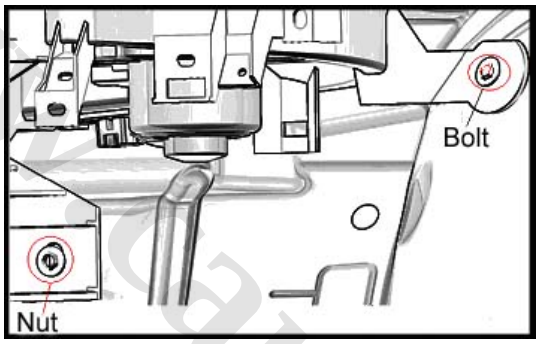


Figure 6-22

(13) Disassemble evaporator unit assembly.

1) Disassemble the inlet and outlet cover board of evaporator
2) Take off 2 inlet and outlet pipes and their retaining clamps as well as expansion valves
3) Disassemble the right pipe plate of evaporator
4) Evaporator can be taken out
5) Disassemble 2 O-shape rings from evaporator core (Figure 6-23)

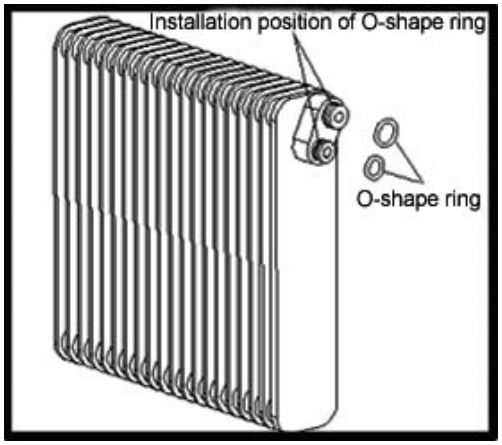


Figure 6-23

(14) Disassemble heater unit.

1) Disassemble the inlet and outlet cover board of heater and lower air outlet of the CAB, as shown in Figure 6-24.

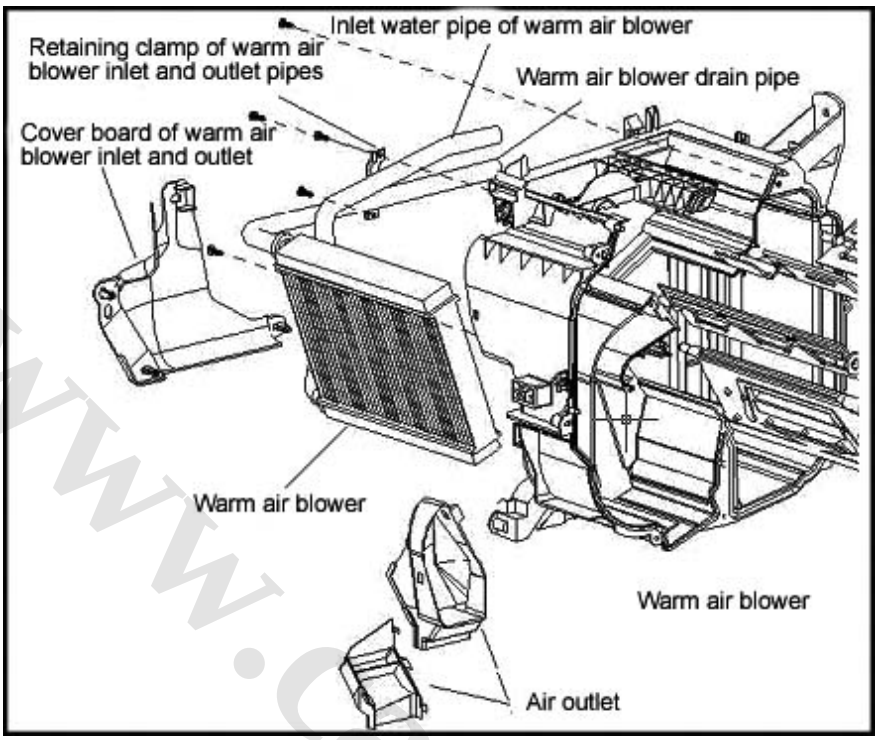


Figure 6-24

2) Disassemble 2 bolts of the retaining clamp of heater core inlet and outlet pipes, take off the retaining clamp.

(15) Disassemble cooler connection, and disconnect the joint.

(16) Disassemble fan resistor. Disassemble 2 screws and blower resistor,

(17) Disassemble blower assembly with fan resistor. Disassemble 3 screws and blower assembly with motor, as shown in Figure 6-25.

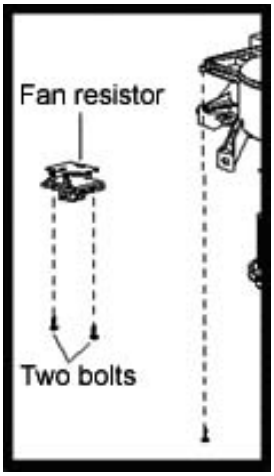


Figure 6-25

(18) Disassemble evaporator temperature sensor.

1) Take out the evaporator, as shown in Figure 6-26.

2) Disassemble the evaporator temperature sensor from the plunger piston of the evaporator right housing.

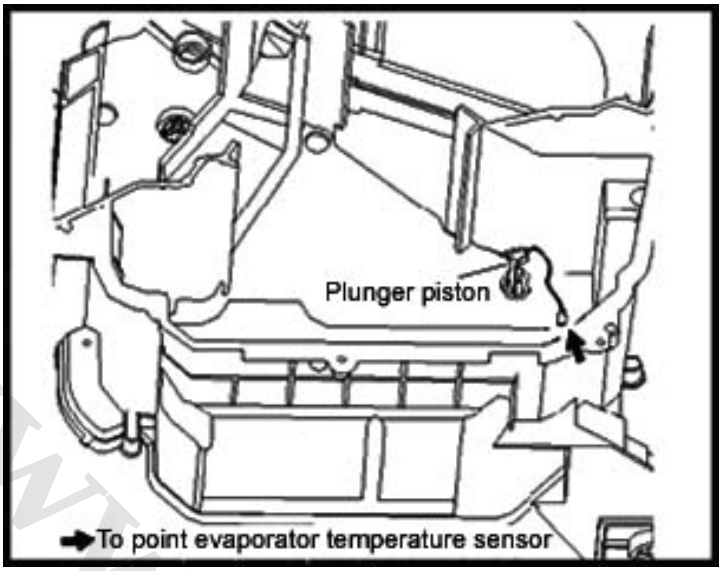


Figure 6-26

3. Installation notes

(1) Install the evaporator assembly

1) Coat the 2 new O-shape rings and the interface of expansion valve surface with sufficient compressor oil; compressor oil: PAG56

2) Install 2 new O-shape rings to evaporator assembly.

(2) Install 2 inlet and outlet pipes, retaining clamp and expansion valve; install 2 hex bolts with 5.0mm hex wrench

Tightening torque: 3.5 N·m

V. Inspection of compressor assembly

1. Removal and Installation

Before compressor removal, refrigerant should be emptied first. After the removal and installation of compressor, fill refrigerant into the compressor, and check the tensity of compressor driving belt.

(1) Disassemble air conditioner pipeline。

For keeping foreign matters like dust away from entering, the disassembled pipeline and pipe joint of evaporator should be sealed with plunger piston. All the hoses should be sealed completely, or compressor lubricants and receiver-drier will absorb vapor.

(2) Removal of compressor driving belt

Loosen the retaining bolt of steering pump (for specific details, please refer to the removal of steering pump), loosen the adjusting bolt, and remove the driving belt.

(3) Removal of compressor

For this operation, be cautious for compressor lubricants splash, key points for installation

Check:

Action test of electromagnetic clutch

Connect battery positive to the connector clip of electromagnetic clutch directly, negative to the body of compressor. If the electromagnetic clutch is normal, you will hear a rattle. If the belt pulley does not touch the armature (no rattle), fault exists, Figure 6-27.

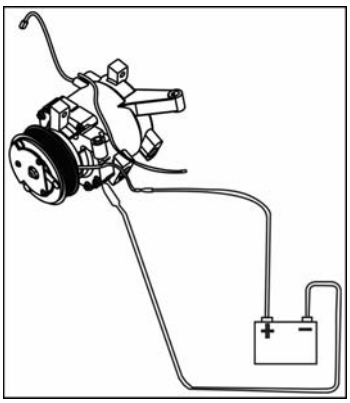


Figure 6-27

2. Disassembly and Assembly:

Disassemble self-locking nut according to disassembly essentials as shown in Figure 6-28

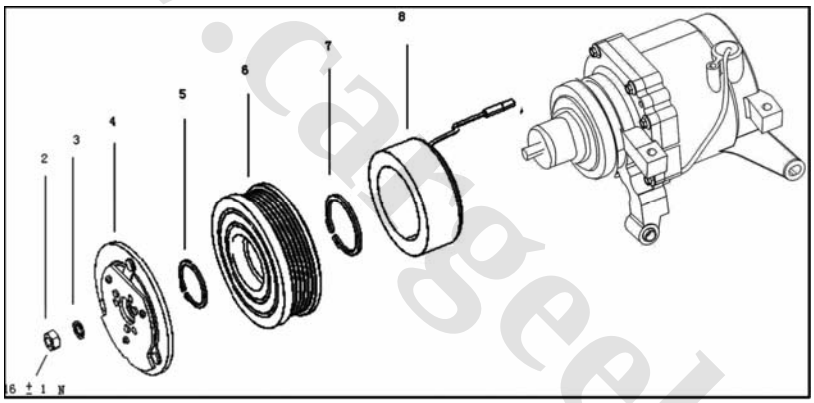


Figure 6-28

1. Compressor overheating protection switch; 2. Self-locking nut; 3. Washer; 4. Armature head; 5. Snap ring; 6. Rotor; 7. Snap ring; 8. Clutch coil;

Assembly essentials for clutch coil: see Figure 6-20 and Figure 6-30

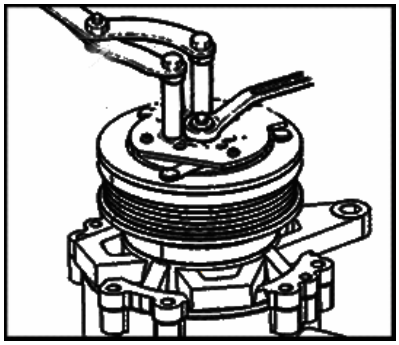


Figure 6-29

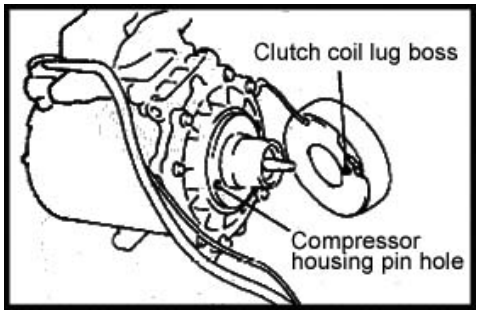


Figure 6-30

When installing clutch coil to compressor housing, aim the compressor housing pin hole to the clutch coil lug boss.
Assembly of snap ring; see Figure 6-31.

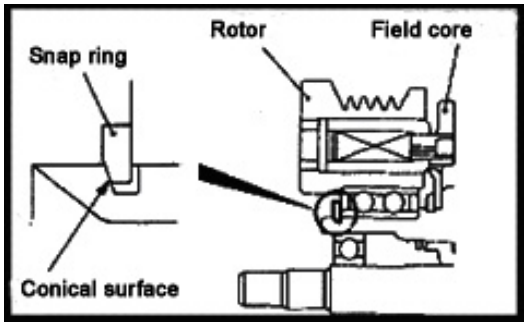


Figure 6-31

Note: install snap ring with its conical surface towards outside.
In the installation of self-locking nut, special tools are applied to fasten the electromagnetic clutch. Then screw the nut with the same method of disassembly. Adjust the clearance of clutch according to Figure 6-32.

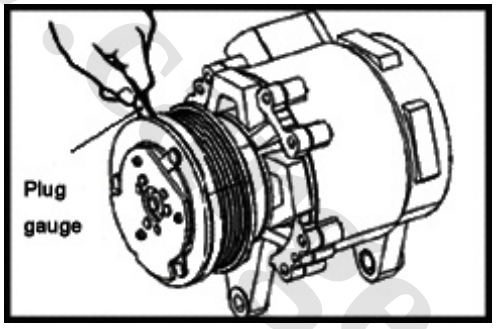


Figure 6-32

Check whether the deviation of electromagnetic clutch clearance is within standard value. If it is not within standard value, adjust with washer. Standard value: 0.3-0.5mm. Check compressor overheating protection switch, as shown in Figure 6-33.

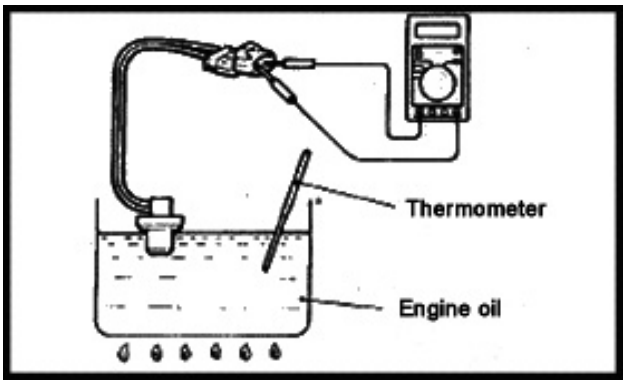


Figure 6-33

Put the metal part of engine overheating protection switch into engine oil, heat with gas stove until reaching standard temperature, check whether switch terminals are on, as shown in Figure 6-34.

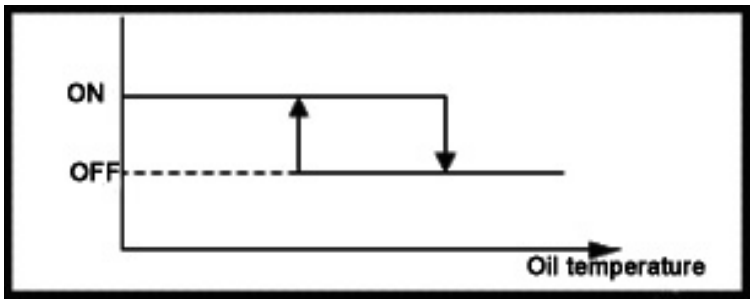


Figure 6-34

Compressor overheating protection switch

On: Lower than 105℃

Off: Higher than 130℃ (in OFF mode, the lowest temperature is 125℃)

Note: When heating, temperature should not exceed necessary temperature.

VI. Inspection for condenser assembly with reservoir

1. On-vehicle check

(1) Check condenser assembly

1) Check whether the condenser thermal sink surface is dirty. If it is dirty, brush it with banister brush. Do not wash with water-cannon in order to avoid possible damage to the thermal sink. Note: Do not damage condenser assembly thermal sink.

2) For bend of condenser thermal sink, make it straight with screwdriver or pliers.

(2) Check the leak of condenser refrigerant

1) Check gas leak at pipeline joint with halide leak detector.

2) If gas leak exists at the joint, check tightening torque of the joint.

2. Disassembly and assembly from vehicle

(1) For details of water tank removal, please refer to the removal of water tank.

(2) Disconnect 2 pipelines connecting condenser, remove 2 screws from the upper part of condenser, and take out condenser.

(3) Coat sufficient compressor oil to the interfaces of cover and O-shape ring. Compressor oil: PAG56

(4) Install the cover and filter to condenser assembly with 10mm hex wrench tightening torque: 12N·m

(5) Install the condenser assembly with reservoir

(6) Install air conditioner pipeline assembly

1) Open the upper pipeline plug of the pipeline, connect every parts of condenser assembly;

2) Install a new O-ring seal at pipeline joint and coat sufficient compressor oil on the joint; compressor oil: PAG56

3) Apply bolts to connect air conditioner pipeline assembly and the condenser assembly with reservoir; note: tighten according to torque requirement.

4) Inject refrigerant. Specified quantity: 500g

5) Engine warm up

6) Check the existence of refrigerant leak

VII. Replacement of air conditioner amplifier assembly

1. Disassembly

(1) Disassemble auxiliary dashboard assembly

(2) Disassemble air conditioner amplifier assembly

1) Disconnect the connector

2) Remove air conditioner amplifier assembly

2. Installation

To install, reverse the removal procedure.

VIII. Removal and repair of refrigeration pipeline

1. Common faults for refrigeration pipeline, insufficient refrigeration or no refrigeration caused by stoppage or leak of refrigeration pipeline.

(1) Weak refrigerant flow or complete blockage caused by pipe bending or deformation.

(2) Leak caused by damage or loose of pipe joint.

2. Disassembly of refrigeration system

Cautions for pipeline disassembly:

(1) When loosening, two wrenches should be applied to avoid damaging pipe fittings. Figure 6-35.

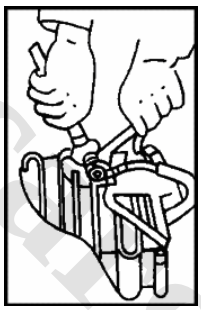


Figure 6-35

(2) For disassembled pipes, pipe joints should be sealed with plugs or cloth to avoid pollution in the pipes.

3. Main content of the inspection of refrigeration system pipeline:

(1) Check possible loose and leak of pipeline joints, tighten the joint for existing loose; if leak still exists after tightening with specified torque, it is a must to check the damage of O-ring seal and pipes.

(2) Check possible sag, bend deformation, rupture of pipeline or damage on pipe joint thread, etc. If any of the problems aforesaid exists, replace the pipe.

(3) Check whether the pipeline is dirty. If the pipeline is dirty, wash it with pure alcohol. Install it after complete drying.

Note: Do not clean pipes by applying compressed air.

4. Pipeline installation of refrigerating system

Two wrenches should be applied to install the pipeline of refrigerating system, tightening with specified tightening torque. Loose tightening can not make pipeline sealed completely. Over tight tightening will break pipe joint thread easily.

Cautions for installation:

(1) Suitable O-ring seal should be applied. Be cautious of not dropping or damaging the O-ring seal;

(2) For installation, coat the O-ring seal with some compressor oil;
(3) Before connection, coat some compressor oil on pipe joint;
(4) After pipe installation, it is necessary to check the correctness of pipeline layout, whether the pipelines will collide with other parts. After completing the installation, check the existence of leak, vacuumize pipes, inject refrigerant and check the performance of air conditioning system.

Note:

(1) When disassembling pipeline, be cautious that both butt joints should be sealed. The seal material applied should resist the corrosion of R134a to prevent foreign matters and water entering pipes.
(2) For pipeline installation, restore all the buckles and pipe straps to the original positions, as shown in Figure 6-36.

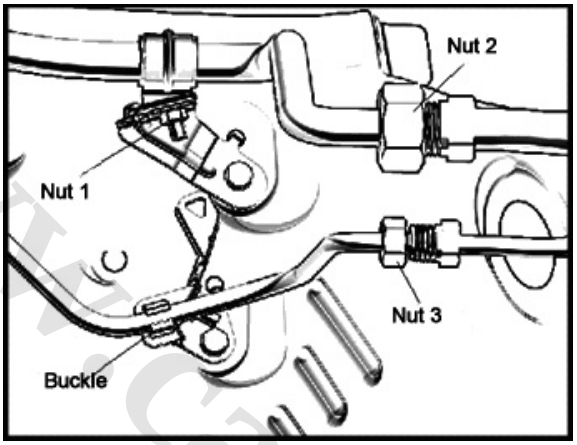


Figure 6-36

IX. Removal and repair of condenser fan (Figure 6-37)

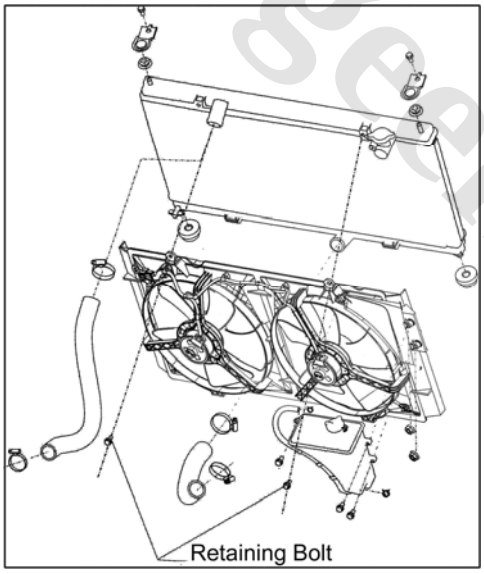


Figure 6-37

1. Remove the connecting pipe of swelling water kettle and water tank.
2. After removing the 2 retaining bolts in the figure, the fan assembly can be removed.
3. Install in the reverse order

Section IV Fault Diagnosis

I. Fault diagnosis of system

i. Direct observation check

1. For checking faults like stop working or abnormal working of air conditioning system, some apparent symptoms will appear by applying direct observation check. Direct observation check (of looking, touching and listening) can diagnose faults accurately and easily, and quickly eliminate faults.

(1) Carefully observe the existence of damage of pipelines, crack or oil stain on the surface of condenser and evaporator. If oil stain exists on condenser, evaporator or their respective pipelines, apply soap bubble leak detection. Key leak inspection areas include:

① Every joint of pipeline and every joint of valve;

② Joint between hoses;

③ Compressor oil seal, front and rear cover board, sealant pad, etc.

④ Scratch and deformation on the surfaces of condenser and evaporator;

(2) Observe the inspection window. Observing the inspection window of pipeline can check refrigerant. Before observation, start engine and turn on air conditioning system, and make engine work for 5 min at fast idle speed (1500~2000r/min). Then circulation condition of refrigerant can be viewed through the inspection window:

① For normal circulation with one air bubble occasionally, refrigerant is in normal condition.

② For clarity and no bubble viewed, full refrigerant and no refrigerant can both be possible. If the air outlet is cold, the refrigerant is in normal condition; if not, probably no refrigerant remains.

③ For relatively more bubbles, refrigerant is insufficient.

(3) Check electric circuits. Check whether disconnection of relevant circuits exists.

2. Check fault by touching with hands

(1) Check the high-pressure end of air conditioner refrigerating system. Switch on the air conditioner; make refrigerating compressor work for 10~20min, touch pipelines and parts of the high-pressure end of air conditioning system. From compressor outlet → condenser → drying chamber to expansion valve inlet, normally, temperature felt by touching should change from hot to warm. If certain part in the middle of the process is especially hot, the heat emission of the part is in poor condition; if the parts are cold, faults like blockage, no refrigerant, compressor stopping working or working in poor condition or so forth might exist.

(2) Check the low-pressure end of air conditioner refrigerating system. Switch on the air conditioner; make refrigerating compressor work for 10~20min, touch pipelines and parts of the low-pressure end of air conditioning system. From condenser to compressor inlet, normally, temperature felt by touching should change from cool to cold. If it is not cold or frost appears, the refrigerating system is in abnormal condition.

(3) Check temperature difference at compressor outlet. Switch on the air conditioner; make refrigerating compressor work for 10~20min, touch the two ends of compressor inlet and outlet. Obvious temperature difference should exist between the high-pressure end and the low-pressure end of compressor. If temperature difference is not obvious or no temperature difference exists, probably no refrigerant exists or refrigerant is extremely insufficient.

(4) Check circuits. Check whether the wire connector is in good connection. No connector of air

conditioning system circuits should be loose or hot. If some connector is loose or the surface temperature of connector felt by touching is relatively high (hot), the inside of connector is in poor contact, which makes air conditioning system stop working or work in abnormal condition.

3. Check fault by listening

Listen carefully for abnormal noises of compressor and whether compressor is working normally to identify whether no refrigeration or poor refrigeration of air conditioning system is caused by faults of compressor or compressor control circuit.

4. Common Faults and Elimination Methods

(1) Air conditioning system is not refrigerating, both compressor and blower stop working.

1) Control circuit fuse protector is blown—after finding out causes, replace with fuse protector of the same specification.

2) Disconnection of control line or earth wire—check whether each terminal or earth strap connection is loose or disconnected, reconnect them firmly.

3) Damage of blower relay—Check whether blower relay coil is damaged and check the intactness of contact terminal. If damage exists, repair or replace it.

4) Damage of electromagnetic clutch coil—check whether electric current exists in clutch coil. If no electric current exists, repair or replace it.

5) Damage of electronic temperature controller—check whether thermal resistor temperature sensor is damaged, and check whether thermal resistor characteristics are normal, then check the amplifying part. If fault of temperature controller exists, repair or replace it.

6) Fault of pressure switch—inject 300KPa (G) refrigerant into refrigerating system. If refrigerating system starts to work again, low-pressure switch is in normal condition; if not, fault of low-pressure switch exists. Short connect the pressure switch. If the system starts to work, fault of the pressure switch exists. Short-circuit method can also be applied to check high-pressure switch. Repair or replace pressure switches with faults.

7) Blower stops working—check whether blower circuit is in normal condition, whether fan blades are blocked and whether blower motor is damaged.

(2) Insufficient refrigerating capacity

1) Too little refrigerant—both high pressure and low pressure are relatively lower. Make leak detection, repair and inject refrigerant again till pressure is back to normal;

2) Excessive refrigerant—both high pressure and low pressure are relatively higher and pressure meter dithers severely. Get cooling medium back, re-vacuumize and inject refrigerant with definite quantity;

3) Moisture exists in system—after air conditioner working for a period, low pressure becomes vacuum, frost and ice plug appear on expansion valve, outlet air is not cold. Stop air conditioner and restart it later. After air conditioner works normally for a short time, above faults appear again. Inleak of damp air or moisture in refrigerant or refrigerant oil is too much. Replace drier and extend vacuumizing time, fill in dry cooling medium and lubricants again;

4) Dirty matters exist in system—low pressure side appears to be in vacuum, pressure of high pressure side is on the lower side, moisture condensation and frost appear on front and rear pipelines of drier-receiver or expansion valve and outlet air is not cold. If the condition is not improved after power off, the fault is dirty matter blockage. Replace drier-receiver and parts blocked by dirty matters;

Compressor is damaged, inleakage exists—low pressure is over high while high pressure over low,

sometime accompanying abnormal knocking. Change the compressor.
5) Compressor drive belt is too loose—compressor rotation speed is too slow, outlet air is not cold, noise of belt skidding can be heard. Strain the drive belt or replace it.
6) Compressor clutch skidding—compressor can not work normally. Disassemble the clutch, repair or replace it;
7) Little heat releasing air flow of condenser—both high pressure and low pressure are too high. Check whether blower is working normally and whether wind speed switch is in normal condition;
8) Condenser fins are blocked by dust—high pressure is too high, together with poor heat eliminating effect. Clean dust on the condenser;
9) Evaporator fins are blocked by dust—air output decreases. Clean the dust by blowing with nitrogen and compressed air;
10) Evaporator air cleaner is blocked by dust or foreign matters—air output decreases. Clean or replace the air cleaner;
11) Too big jaw opening of expansion valve—both high pressure and low pressure are too high, excessive refrigerant flows through evaporator and can not evaporate completely. Replace expansion valve;
12) Leakage of expansion valve power head—both high pressure and low pressure are on the lower side. Replace expansion valve;
13) Improper adjustment of thermostat—frequent starting, influencing air conditioning effect. Replace or re-adjust the thermostat;
14) Too much lubricant in system—both high pressure and low pressure are on the higher side, clouding stripes appear in sightglass. Expel redundant lubricant.
15) Fresh air door of air conditioner is not closed completely—a lot of high temperature air enters vehicle from the outside. Close the fresh air door completely;
16) HVAC cool & warm air door is not closed completely—air is heated. Close the cool & warm air door completely;
17) Air supply pipeline is blocked—air output is little, noises increase. Eliminate blockage in the pipeline.
3. Intermittent temperature decreasing of air conditioner
The main reasons are system ice plug, faults of temperature controller and relay and compressor clutch skidding and poor contact of coils, etc.:
1) Faults of controller and relay, compressor clutch skidding and poor contact of coils, etc.
2) Unfirm contact of compressor clutch coil, poor ground connection and loose connection—clutch separates too early when working. Fasten the joint.
3) Abnormal temperature controller—severe frost appears on evaporator surface, no cool air vented. Replace the temperature controller.
4. Noise of air conditioner is too loud
1) Noises of blower, compressor, drive belt and part collision, etc.
2) Noise of expansion valve operation.
5. Insufficient warm air of air conditioner
1) Damage of blower motor—check the blower motor, repair or replace it;
2) Air leakage of heater—replace sealant pad;
3) Abnormal jaw opening of cool & warm air door—check the working mode of the cool & warm air door;

4) Dust deposit or deformation of heater fins, and poor ventilation—clean or replace the heater;
5) The hot-water pipe of heater is blocked by scale deposit—replace the heater;
6) Insufficient engine cooling water—check whether leakage exists in cooling system, repair it and replenish cooling water;
7) Failure of engine thermostat—replace the thermostat;
8) Air exists in the heater core barrel—expel air in the pipe.
ii. Fault diagnosis table of air conditioning system

Table 6-2

Phenomenon & state	Cause analysis	Measure
Both high pressure and lower pressure are high	1. Air leaks into the system.	Re-vacuumize and reinject refrigerant.
	2. Excessive refrigerant refill.	Expel redundant refrigerant.
	3. Excessive lubricant	Expel redundant lubricant or replace with new lubricant.
	4. Poor heat eliminating effect.	Wash and clean dust on the condenser surface or replace with a new condenser.
	5. Abnormal common cooling fan of condenser and water tank	Inspect the condenser or replace with a new one.
Both high pressure and low pressure are low	1. Insufficient refrigerant.	Replenish refrigerant.
	2. Leakage of refrigerant exists.	Make leak detection, replace leaking parts.
	3. O-shape ring is damaged.	Replace the O-shape ring.
High pressure is normal, low pressure high	1. Jaw opening of expansion valve is too big, or expansion valve is damaged.	Adjust the jaw opening of expansion valve, or replace with a new expansion valve.
	2. Excessive refrigerant refill.	Expel redundant refrigerant.
	3. Fault of compressor exists.	Replace the compressor.
High pressure is normal, low pressure low	1. Insufficient refrigerant.	Replenish refrigerant.
	2. Ice plug of expansion valve exists.	Replace with a new drier-receiver.
	3. Dust exists on evaporator surface or blockage exists in the evaporator.	Clean the evaporator surface or replace with a new one.
High pressure is low, low pressure high	1. Compressor efficiency decreases.	Inspect the compressor or replace with a new one.
	2. Air duct is blocked.	Adjust jaw opening of expansion valve or replace with a new expansion valve.
High pressure is low, low pressure negative	1. Stop the machine, low pressure increases quickly—system ice plug.	Replace with a new drier-receiver.
	2. Stop the machine, low pressure increases slowly—system ice plug.	Clean the system.

Table 6-2 (Continued)

Phenomenon & state		Cause analysis	Measure
Insufficient air output	Normal voltage	1. Inlet air cleaner is blocked.	Replace with a new inlet air cleaner core.
		2. Air duct is blocked.	Clean air duct.
		3. Evaporator surface dust	Clean the evaporator surface.
		4. Blower motor works stagnantly.	Inspect the blower motor, or replace with a new one.
	Insufficient voltage	1. Vehicle power supply voltage is unstable.	Inspection.
		2. Fault of power grounding exists	
High pressure can not reach a certain value		Clutch or belt is skidding.	Inspect or replace the clutch or the belt.
Evaporator is frozen		1. Poor evaporator temperature sensor.	Replace it or check the correctness of the sensing head position.
		2. Evaporator temperature sensor wire harness and insert are in poor condition.	Inspection.
		3. Excessive refrigerant.	Expel some of the refrigerant.
		4. Air capacity passing through evaporator is insufficient.	Check whether blower speed is normal.
		5. Failure of expansion valve.	Replace it.

iii. Check of refrigerant

1. Check refrigerant quantity, observing through the observing glass window on the air conditioner pipe

Note: If refrigerant is sufficient and ambient temperature is higher than normal, viewing air bubbles through the observing glass window can be identified to be in normal condition.

Test condition:

① Engine speed: 1500r/min;

② Blower speed control speed: HI “high”;

③ Air conditioner switch: on;;

④ Temperature control panel: MAX COLD “maximum refrigeration”;

⑤ Fully open the vehicle door.

iv. Refrigerant injection, as shown in Figure 6-38.

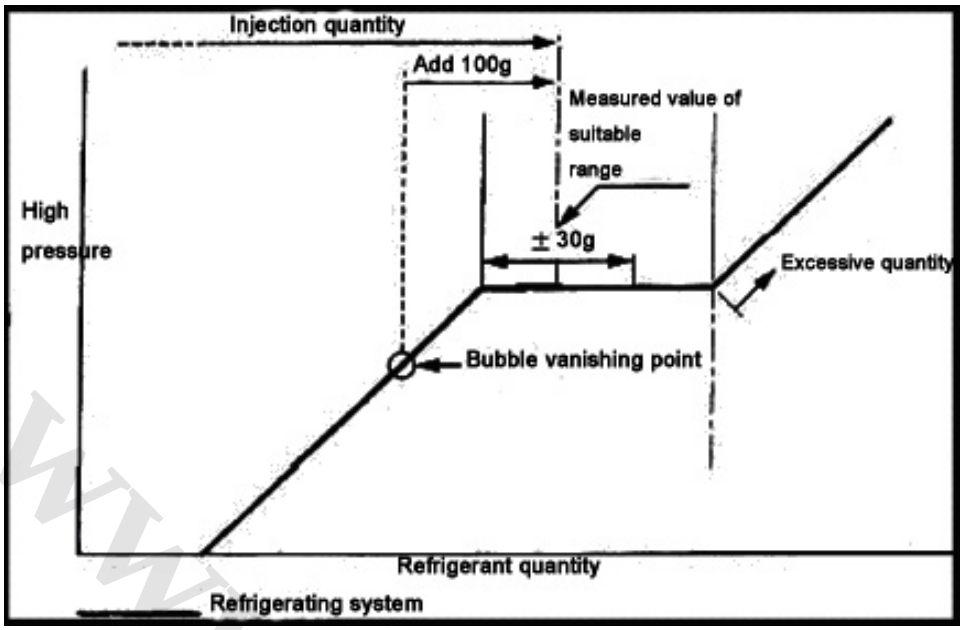


Figure 6-38

1. Expel refrigerant from refrigerating system.

① Switch on air conditioner.

② When engine runs at 1000r/min, make air conditioner compressor work 5~6min, circulate refrigerant and collect residual oil of all parts to the compressor.

③ Engine misfiring.

④ Expel refrigerant

Note: For refrigerant expelling, press down the one-way valve, and expel slowly to avoid taking compressor oil out.

2. Inject refrigerant

① Vacuumize with vacuum pump.

② Add in HFC-134a (R134a). Standard: 500g±50g.

3. Engine warming up.

4. Check the leakage of refrigerant. Check the leakage of refrigerant with gas leak detector.

II. Fault diagnosis flow

Poor refrigerating effect, see Figure 6-39

Abnormal ATC see Figure 6-40

Poor heating effect see Figure 6-41

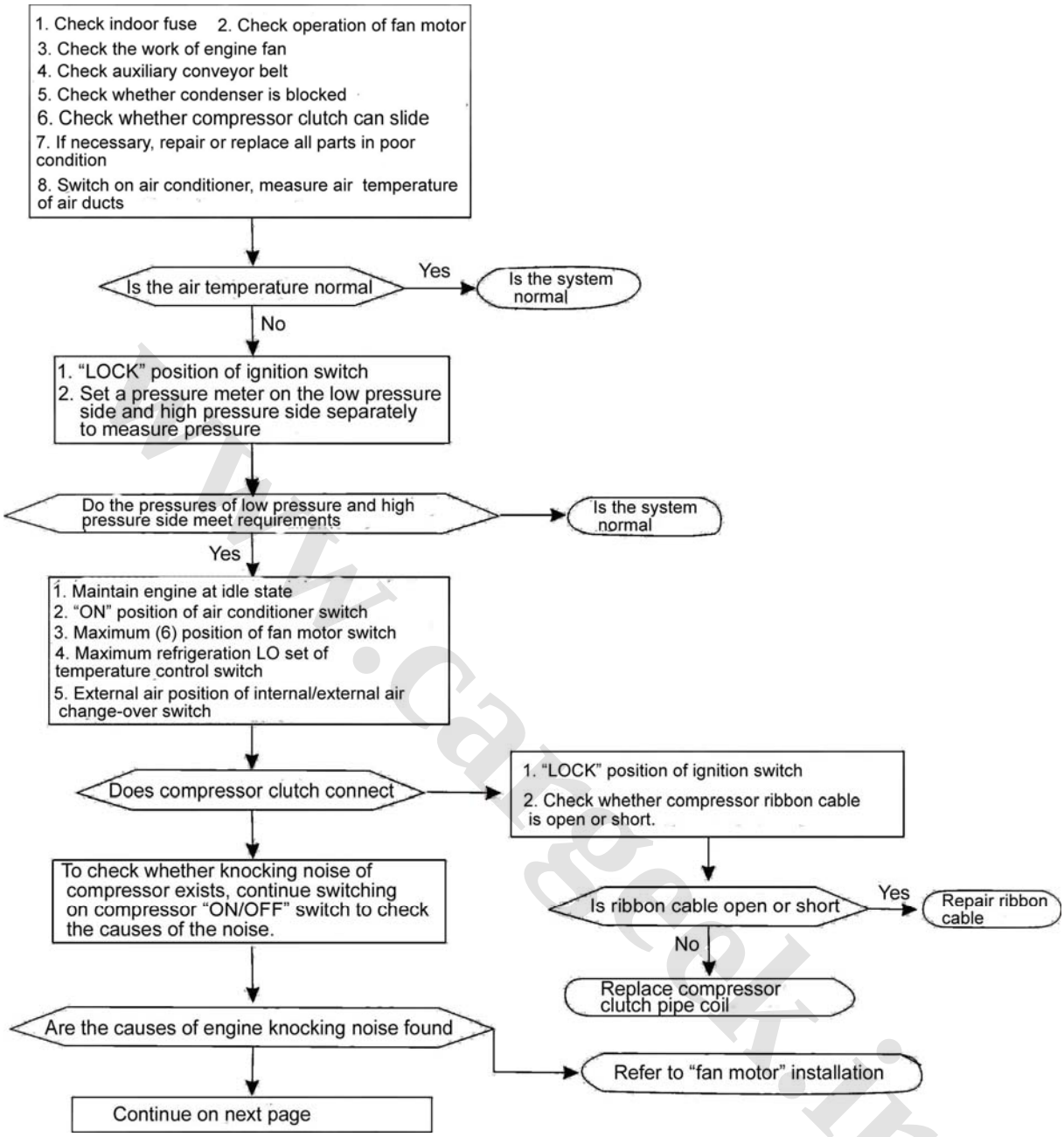


Figure 6-39

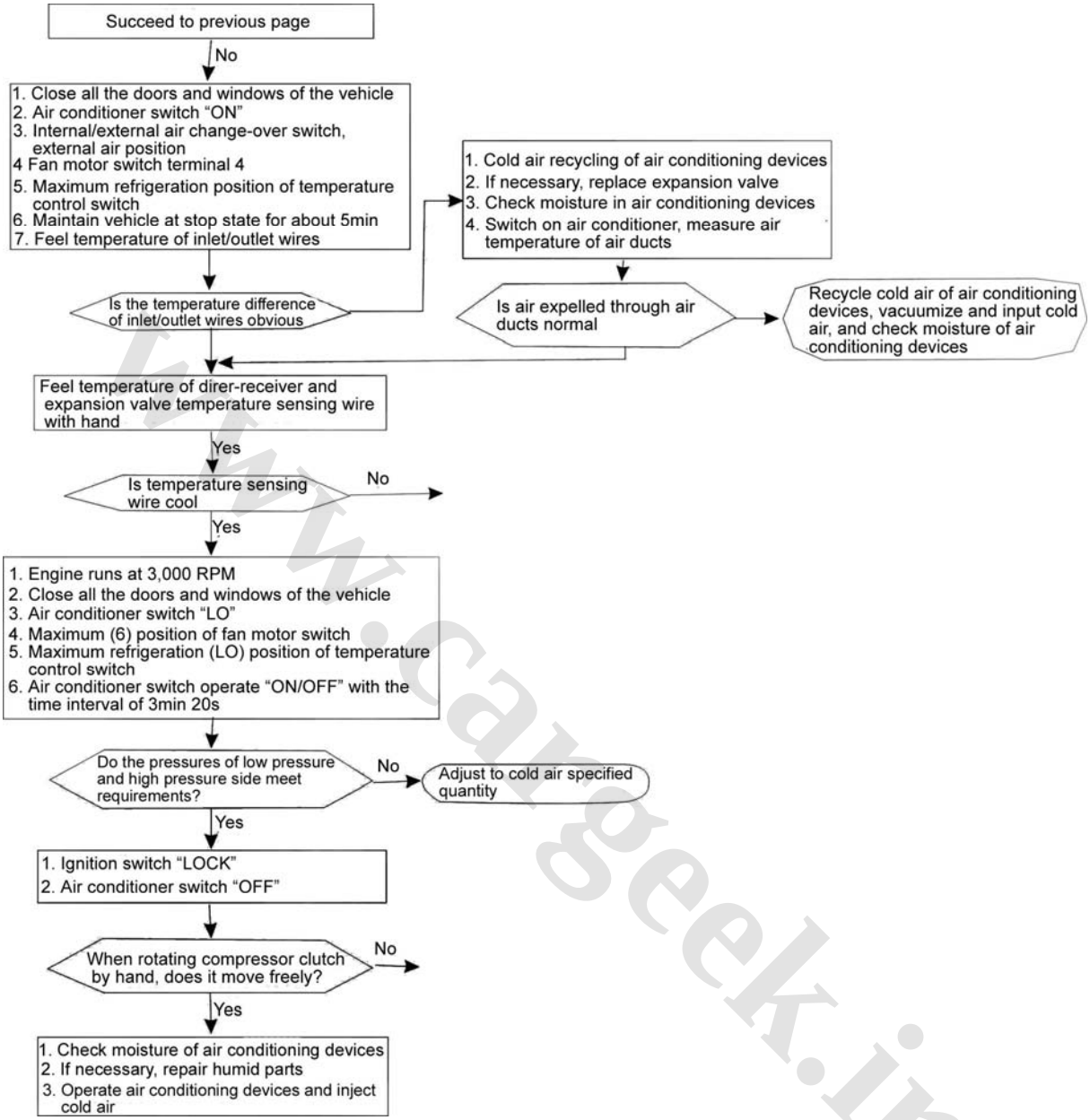


Figure 6-39 (Continued)

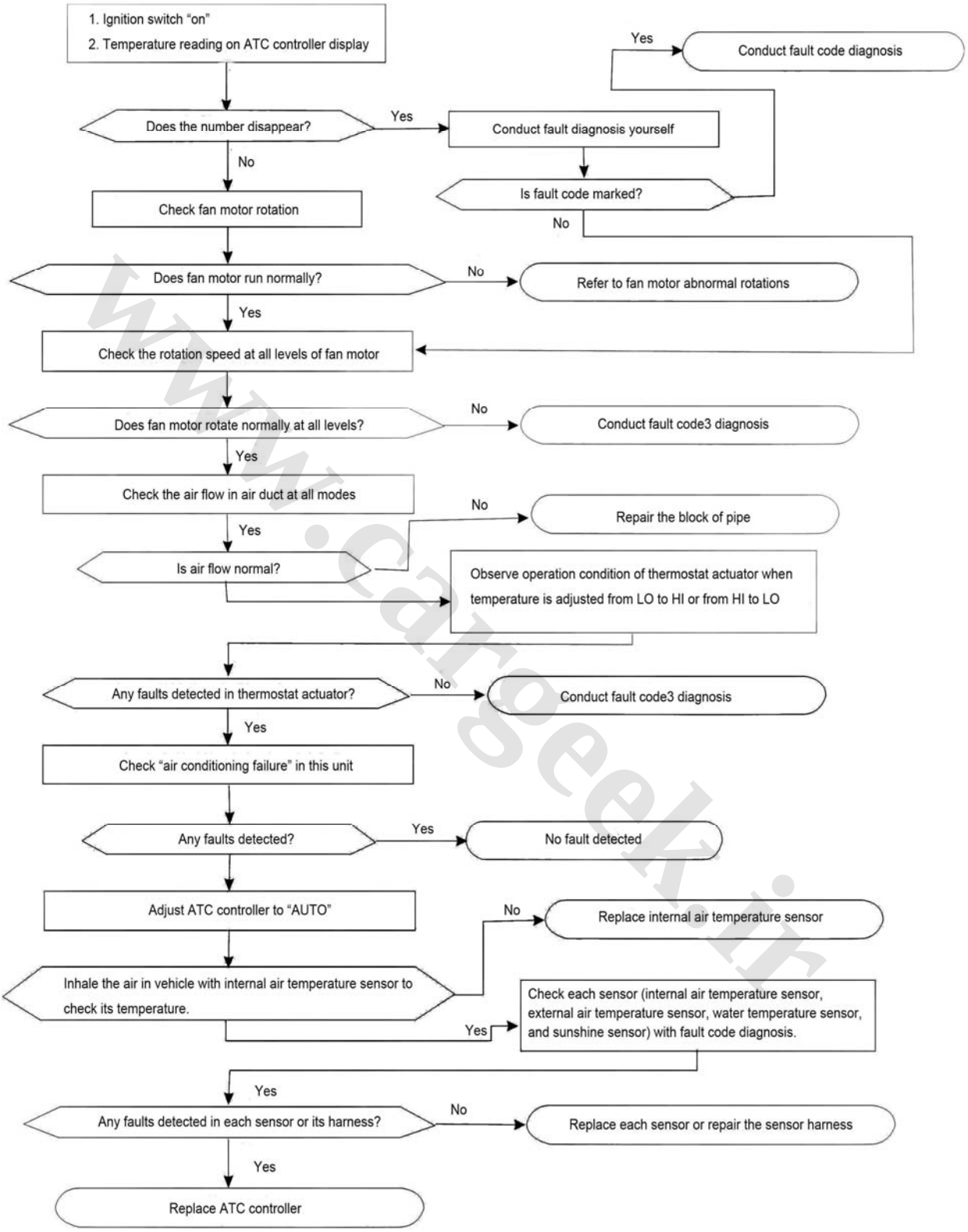


Fig. 6-40

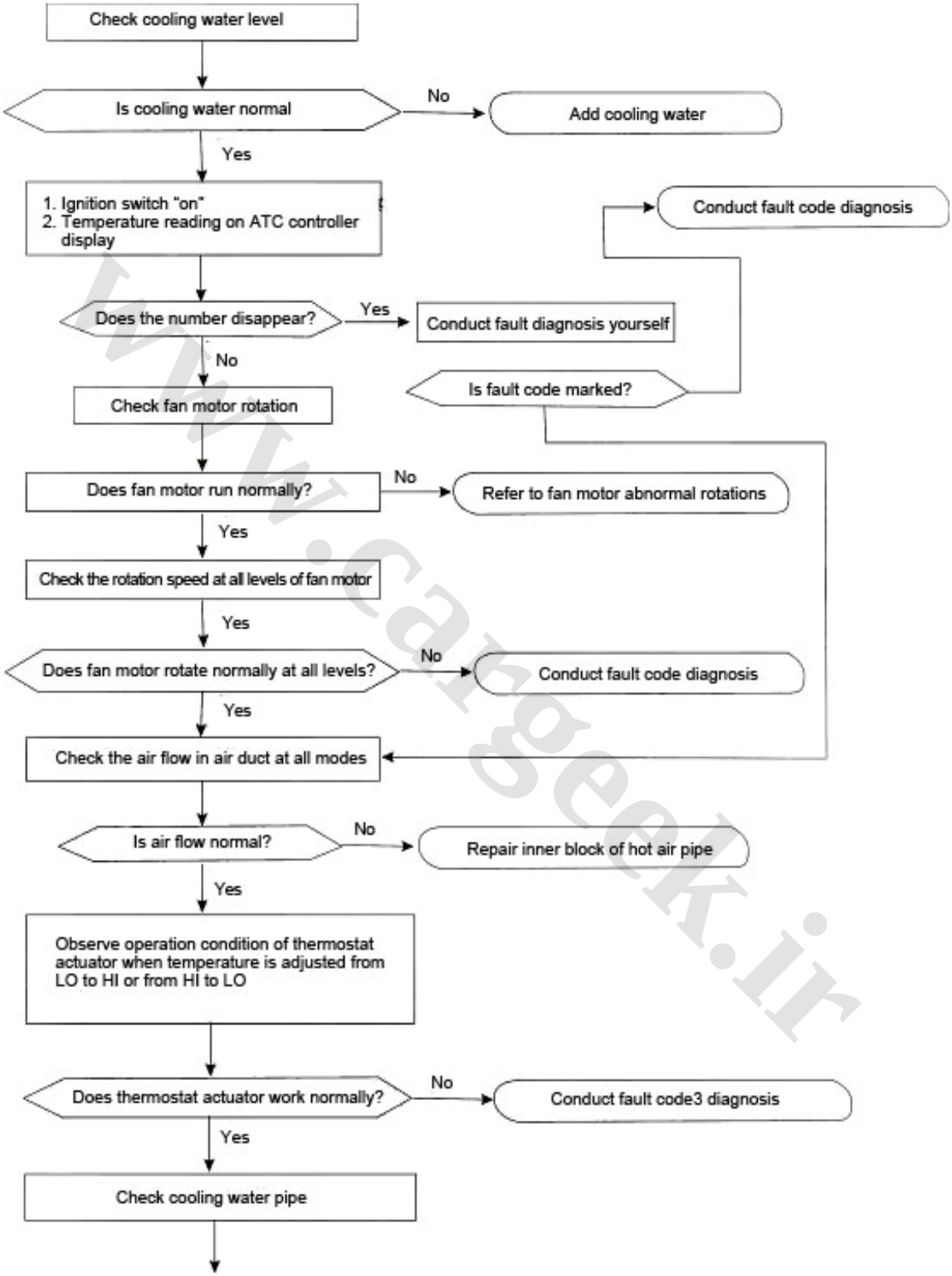


Fig. 6-41

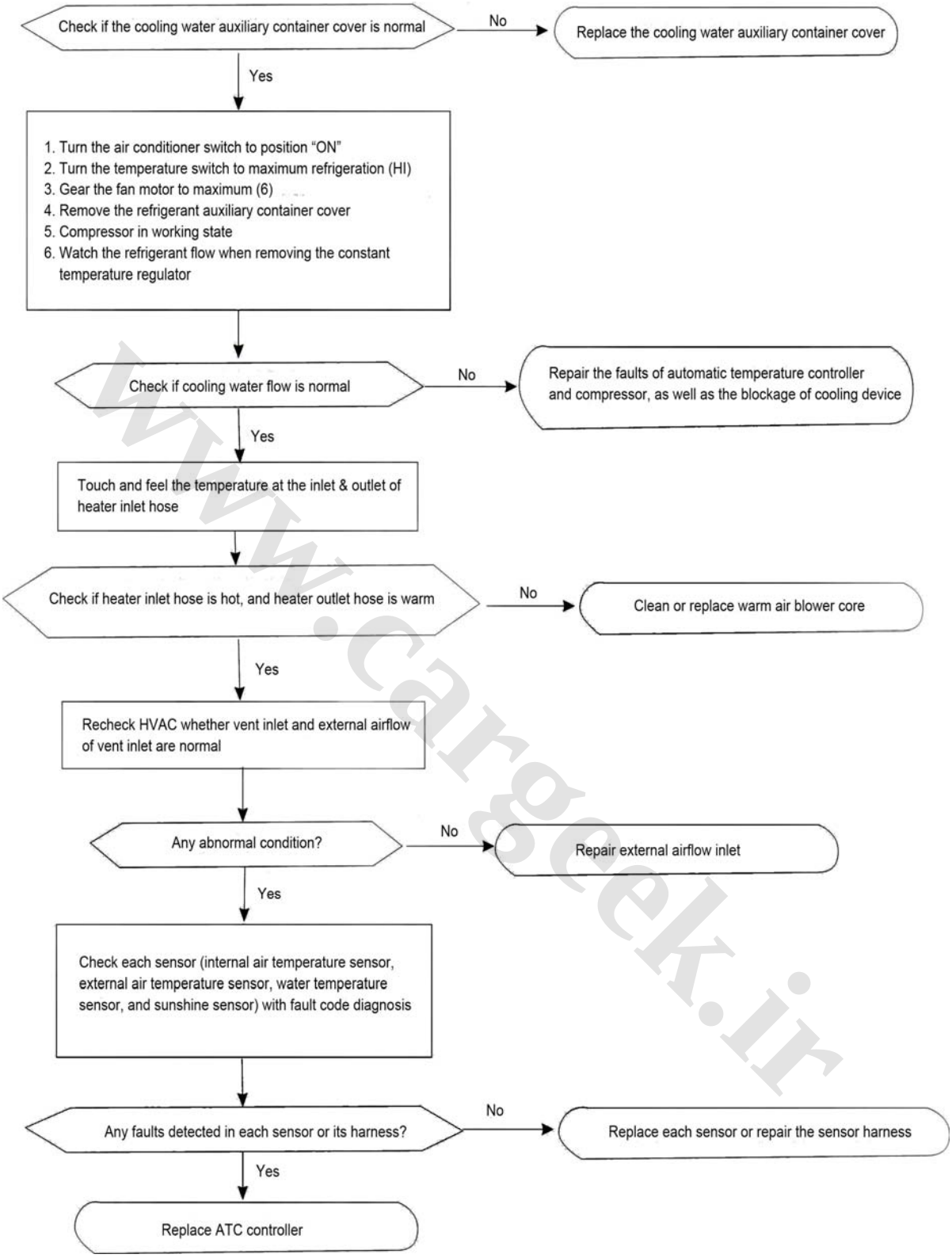


Fig. 6-41 (Continued)

Section V Precautions of Air Conditioning System

I. Apply pure R-134a refrigerant

(1) Must apply authentic R-134a cooling medium with qualified standard of component, moisture content, foreign matters and foul gas. 13.6kg canned cooling medium is recommend for service station;

(2) Refrigerant charge must comply with the provision of complete vehicle factory, both excess and lack will reduce the refrigerating effect.

(3) Before injecting refrigerant, completely check whether every pipe O-ring seal is in good condition and whether leakage of every part exists;

(4) Before compressor starts working, can inject from the low pressure side and high pressure side simultaneously; after compressor starts working, can only inject from the low pressure side slowly; Figure 6-42.

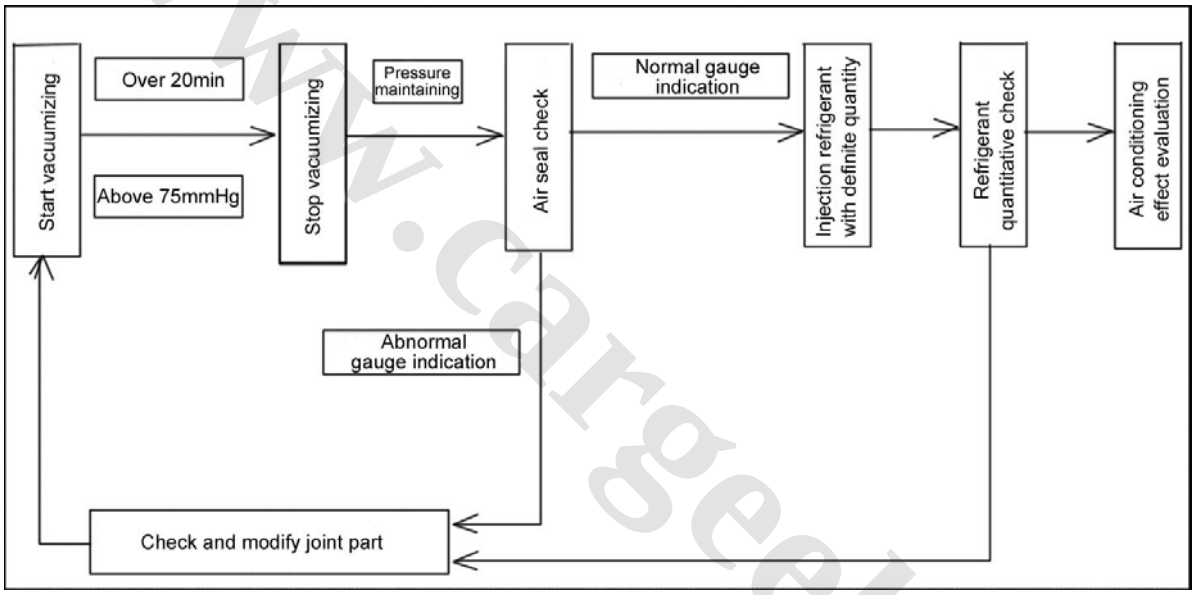


Figure 6-42

(5) After filling in R-134a cooling medium, apply electronic leak detector for leakage inspection.

II. Add lubricant correctly

1. Must apply lubricant with type and brand stipulated by compressor manufacturer. Do not mix lubricant of different types and brands, or compressor will be damaged;

2. The injection quantity should full comply with the stipulation. Lubricant has bad influence on heat transmission, excessive lubricant will reduce the air conditioning effect greatly; generally, it is not necessary to add lubricant, for that has been injected by compressor manufacturer; properly add lubricant when replacing parts: condenser 20ml; drier-receiver 30ml; evaporator 30ml; pipeline 10ml/m.

3. Lubricant has great water absorption power, thus it is necessary to reduce the time of contacting air as much as possible;

4. Before injection, quality of lubricant in pipelines should be checked first. If lubricant is black or carbon granule precipitation exists, clean and blow the entire air conditioning system completely,

and replace all the lubricant; Note: Water, corrosive agents or combustible & explosive agents are forbidden to clean air conditioning system. Cleaning agents of R-141b and methane are recommended.

5. Lubricant should be injected from compressor exhaust vent before vacuumizing.

III. Sufficient vacuumizing time and vacuum degree

1. Vacuumize for over 20min with strong power vacuum pump;
2. Maintain the system absolute pressure below 1000Pa;
3. Before refrigerant injection, should maintain pressure for over 5min and make air tightness examination; if the examination result is qualified, continue vacuumizing for 5min.

Chapter VII Auxiliary Component System

Section I Cable

I. Inner control handle and cable assembly of engine hood

During the installation, the inner control handle and cable assembly of the engine hood penetrate the part 1 first and then part 2, connect with the part 4 along part 3 and finally install the inner control handle and dash board. Make sure that the cable keeps along the harness after going through the part 2. There is a front wheel housing cover stem on part 2. The cable will come through the cover stem and be fixed on part 3 by a buckle as shown in Fig. 7-1.

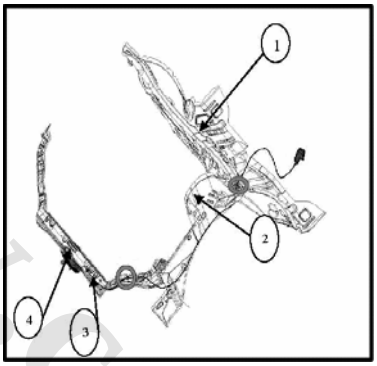


Fig. 7-1

1. Dash panel 2. Housing plate of left front wheel
3. Header crossbar assembly of water tank 4. Locking device assembly of engine hood

II. Inner control handle and cable assembly of fuel tank

During the installation, the inner control handle is fixed on the part 1 with the bolt first; next the cable penetrates the back of part 1, goes through the holes on the part 2, 3, 4, 7, 6 in order to circle to the other side of the metal sheet, and finally the end of pin shaft will be installed on the part 8. The direction of the cable must keep along the harness after running through the back of the part 1. When fixing the end of pin shaft, put the pin shaft alignment sleeve on the part 8 first and then install the end of pin shaft on the pin shaft alignment sleeve on the other side of the part 8, as shown in Fig. 7-2.

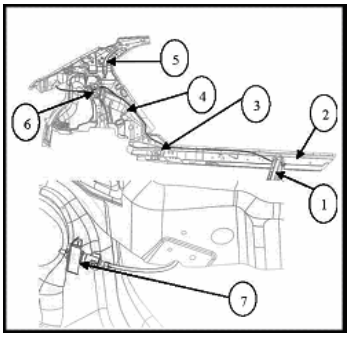


Fig. 7-2

1. Left front seats beam 2. Middle section of left door sill inner plate
3. Rear section of left door sill inner plate 4. Left rear wheel housing inner plate 5. Left C pillar inner panel
6. Left junction panel of luggage compartment front reinforced beam 7. Filler lock bracket

Section II Windshield

I. Introduction

The windshield is installed by the one-component Polyurethane sealant. As for its renewing, what is essential is to use the adhesive which can offer the surface cementing strength, and adopt the appropriate process.

Note:

① When using the base coat and glass sealant produced by other manufacturers, their Instruction Manual must be referred. The adhesive performance of the glass sealant will be impacted due to the misusing or neglect in the following operations. Therefore, please read carefully the instruction and trademark provided by the glass sealant manufacturer before operating, and abide by the process and the notes during the whole operation.

② The scuffed or damaged surface of the coating must be recoated, or the corrosion will expand.

Tools needed in this process:

1. Awl 2. Piano wire 3. Brushes used for primer coating (2) 4. Cutting tool
5. Rubber adhesive disc 6. Sealant gun (used for sealant filling) 7. Putty knife (used for finishing the adhesive parts)

II. Front windshield

1. Front windshield removal

(1) Clear the inner and outer surfaces and surrounding parts of the glass.

(2) Remove the wiper arm.

(3) Remove the coping side sealing strip.

(4) Cover the car body around the glass with the adhesive tape to protect the car body.

(5) Remove (or cut off) the sealing strip around the windshield so that the brim of the windshield can be revealed.

(6) Drill a hole with the awl to penetrate the adhesive and make the piano wire run through it.

(7) Decompose the adhesive around the glass with the piano wire and pay attention to the two fixed points on the front windshield.

Note: The piano wire shall be as close to the glass as possible so as to protect the car body.

(8) Finish the adhesive for the vehicle body connection parts with the knife to make sure that the thickness of each part is 1-2mm.

Note: Clear the grease for the vehicle body connection parts with the alcohol or similar stuffs before finishing the body with the cutting tool.

(9) Eliminate the old sealing strip and adhesive before renewing the glass.

2. Front windshield installation:

(1) Clean the vehicle body (or windshield brim) needed to adhere and connect to the windshield with the cleaning agent. (Dry at least for 10 minutes.)

(2) Completely clean the old strip, the paint and the surface with the metal. If the paint and the surface with the metal are completely exposed, never coat the primer on the adhesive remained on the body.

Note:

① The correct operation and drying time shall be practiced as per the Instruction Manual of the

primer manufacturer.

② Don't touch the body and old adhesive surfaces to adhere and connect with the glass.

(3) Install the new strip on the glass. For convenience, heat the strip at the temperature of 35℃ one and a half hours.

(4) Clean the glass surface to adhere and connect to the body with the clean cloth. If the cleaning agent has been used, dry at least 10 minutes.

(5) Coat the glass surface to adhere and connect to the body with the enough primer at the thickness of 15mm with new brushes.

Note:

①The correct operation and drying time shall be practiced as per the Instruction Manual of the manufacturer.

② Don't touch the primer coating surface.

(6) Attach the windshield tent on the front windshield and coat it the adhesive.

Note:

① Start from the hemline of the glass.

② Don't ruin the primer.

③ After coating, press the glass on the body as soon as possible.

④ After coating, use the rubber adhesive disc to install and convey the glass.

⑤ Complete the step 6 and 7 within 10 minutes to guarantee the agglutinate strength.

⑥The correct operation and drying time shall be practiced as per the Instruction Manual of the manufacturer.

⑦ Don't touch the body to agglutinate with the glass and the old adhesive surface.

(7) Hold the rubber adhesive disc, press the glass on the body and clap the glass surface and surrounding areas of the strip so as to glue the glass on the body completely.

Note: Don't damage the glass surface or body.

(8) Install the coping side sealing strip.

(9) After the solidifying of the adhesive, check whether the window leaks or not through splashing water in the hose on it. If the window leaks, dry the glass and fill the leaking position with the adhesive. After filling, if it keeps leaking, remove the glass and reinstall as per above steps.

Note:

① Don't use the high-pressure water.

② When drying, don't let the adhesive coating parts expose directly to the compressed air. Don't use the infrared ray bulb and the similar stuffs to dry.

③ Before the adhesive complete solidifying, the sudden closing the car door may result in glass looseness or falling off. Therefore, before the adhesive part completely adheres to the door, open or close the door in a correct way.

④ If the strip does not completely glue, press it with the adhesive tape until all the adhesive parts installed closely.

⑤ Every adhesive has its own solidifying time. Do not forget to refer to the Instruction Manual of the manufacturer, check the solidifying time of the adhesive used and observe the necessary measures taken before the complete adherence of the adhesive parts.

⑥ Before complete adherence of the adhesive parts, forbid to drive so as to guarantee the complete and full solidifying.

(10) Install the windshield wiper.

III. Rear windshield

1. Rear windshield removal:

(1) Clear the inner and outer surfaces and surrounding parts of the glass.

(2) Disconnect the interface connected to the rear windshield.

Note: When disconnecting the interface, don't pull the cable wire but loosen the lock card of the interface first, and then hold the interface and loosen the interface.

(3) Remove the coping side sealing strip.

(4) Cover the body around the glass with the adhesive tape so as to protect the body.

(5) Remove (or cut off) the sealing strip around the rear windshield until the brim of the rear windshield is revealed.

(6) Drill a hole with the awl to penetrate the adhesive and make the piano wire run through it.

(7) Decompose the adhesive around the glass with the piano wire and pay attention to the two fixed points on the rear windshield. The fixed points are 176mm away from the glass brim.

Note: The piano wire shall be as close to the glass as possible so as to protect the car body.

(8) Finish the adhesive for the vehicle body connection parts with the knife to make sure that the thickness of each part is 1-2mm.

Note: Clear the grease for the vehicle body connection parts with the alcohol or similar stuffs before finishing the body with the cutting tool.

(9) Eliminate the old sealing strip and adhesive before renewing the glass.

2. Rear windshield installation:

(1) Clean the vehicle body (or windshield brim) needed to adhere and connect to the windshield with the cleaning agent. (Dry at least for 10 minutes.)

(2) Completely clean the old strip, the paint and the surface with the metal. If the paint and the surface with the metal are completely exposed, never coat the primer on the adhesive remained on the body.

Note:

① The correct operation and drying time shall be practiced as per the Instruction Manual of the primer manufacturer.

② Don't touch the boy and old adhesive surfaces to adhere and connect with the glass.

(3) Install the new strip on the glass. For convenience, heat the strip at the temperature of 35℃ one and a half hours.

(4) Clean the glass surface to adhere and connect to the body with the clean cloth. If the cleaning agent has been used, dry at least for 10 minutes.

(5) Coat the glass surface to adhere and connect to the body with the enough primer at the thickness of 15mm with new brushes.

Note:

①The correct operation and drying time shall be practiced as per the Instruction Manual of the manufacturer.

② Don't touch the primer coating surface.

(6) Coat the rear windshield with the adhesive.

Note:

① Start from the hemline of the glass.

② Don't ruin the primer.

③ After coating, press the glass on the body as soon as possible.

④ After coating, use the rubber adhesive disc to install and convey the glass.
⑤ Complete the step 6 and 7 within 10 minutes to guarantee the agglutinate strength.
⑥The correct operation and drying time shall be practiced as per the Instruction Manual of the manufacturer.
(7) Hold the rubber adhesive disc, press the glass on the body and clap the glass surface and surrounding areas of the strip so as to glue the glass on the body completely.
Note: Don't damage the glass surface or body.
(8) Install the coping side sealing strip.
(9) After the solidifying of the adhesive, check whether the window leaks or not through splashing water in the hose on it. If the window leaks, dry the glass and fill the leaking position with the adhesive. After filling, if it keeps leaking, remove the glass and reinstall as per above steps.
Note:
① Don't use the high-pressure water.
② When drying, don't let the adhesive coating parts expose directly to the compressed air. Don't use the infrared ray bulb and the similar stuffs to dry.
③ Before the adhesive complete solidifying, the sudden closing the car door may result in glass looseness or falling off. Therefore, before the adhesive part completely adheres to the door, open or close the door in a correct way. The correct operation and drying time must conform to the Instrument Manual of the manufacturer. Don't touch the surface of the primer coating surface.
④ If the strip does not completely glue, press it with the adhesive tape until all the adhesive parts installed closely.
⑤ Every adhesive has its own solidifying time. Do not forget to refer to the Instruction Manual of the manufacturer, check the solidifying time of the adhesive used and observe the necessary measures taken before the complete adherence of the adhesive parts.
⑥ Before complete adherence of the adhesive parts, forbid to drive so as to guarantee the complete and full solidifying.
(10) Install all the interfaces connecting to the rear windshield.

Section III Safety Belt

Note:

(1) The fasteners removed must be reinstalled in the original position. If any fasteners need renewing, the ones with the same part No. are required. However, if there is no such fastener with the same part No., the ones with the same dimension and intensity (or higher intensity) are acceptable. The non-recyclable fasteners and the ones need locking by the screw thread, shall be eliminated from the car. If reinstalling fasteners with designated tightening torques, fasten them to the given torques. Violating the requirement above may cause the damage of the components or the system.

(2) The safety belt and its auxiliary components may influence the key components and the system. Therefore, carefully checking and renewing with the components from the original manufacturer are necessary.

(3) If it is necessary to renew the safety belt, renew the buckle lock and belt together, to ensure the inosculation between the lock tongue and the buckle lock.

I. Front seat safety belt

1. Removal: As shown in Fig. 7-3

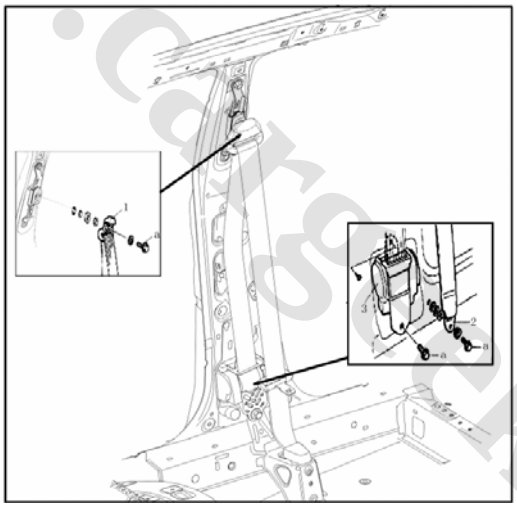


Fig. 7-3

a. Bolt tightening torque: 45N·m

1. Upper fixing bolt 2. Lower fixing bolt 3. Tensioning retractor

(1) Disconnect the cathode cable from the battery.

(2) Deactivate the air bag system.

(3) Remove the B pillar guard panel assembly.

(4) Remove the safety belt assembly from the vehicle body.

2. Installation: The process of installation is opposite with that of removal; however, the following points must be taken into consideration:

(1) The bolt for fixing the safety belt ring shall be the British system fine screw thread (7/16-20UNF). The screw thread with different dimension or metric screw thread will be never

acceptable.
(2) Make sure that screw the fixing bolt to the designated torque, refer to the Fig. above.
(3) Tightening torque (a): 45N·m

II. Rear seat safety belt:

1. Removal, as shown in Fig. 7-4.

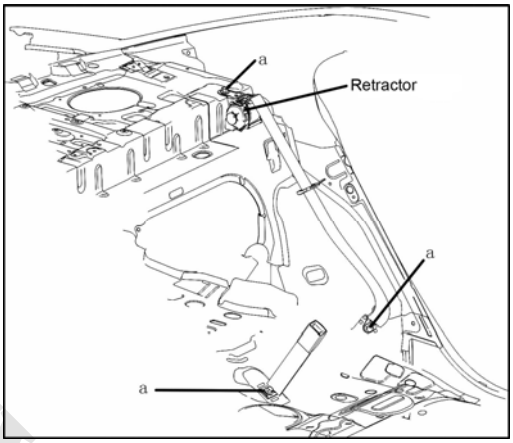


Fig. 7-4

a. Fastener torque 45N·m

(1) Disconnect the cathode cable from the battery
(2) Deactivate the air bag system.
(3) Remove the rear seat side back.
(4) Remove the rack board guard panel assembly.
(5) Remove the fixing bolt of the rear safety belt retractor.
(6) Remove the rear seat cushion.
(7) Remove the fixing bolt at the lower end of the s
(8) Remove the rear safety belt assembly from the body.
2. Installation: The order of the installation is opposite with that of the removal.

III. Notes for safety belt maintenance:

Read the following notes before repairing and renewing the safety belt:
1. The safety belt shall connect normally to the retractor and buckle lock.
2. Don’t let the sharp and destructive stuffs approach to the safety belt.
3. Avoid bending or damaging any parts of the buckle lock or lock plate.
4. Don’t blanch or dye the belt (only the cleanout with the mild soap and warm water is acceptable).
5. Hold the pre-tightening screw to avoid the floss when installing the safety belt.
6. Don’t try to repair the retractor or the retractor cap; renew the deficient assembly with the new one.
7. Keep the belt dry and clean.
8. Renew the deficient components if necessary.
9. Renew the belt cut off or damaged by other ways.
10. Don’t fill the hole of the ornamental panel, gone through by the safety belt, with any stuffs.

Section IV Front Side Door

I. Decomposition Diagram. See Fig. 7-5:

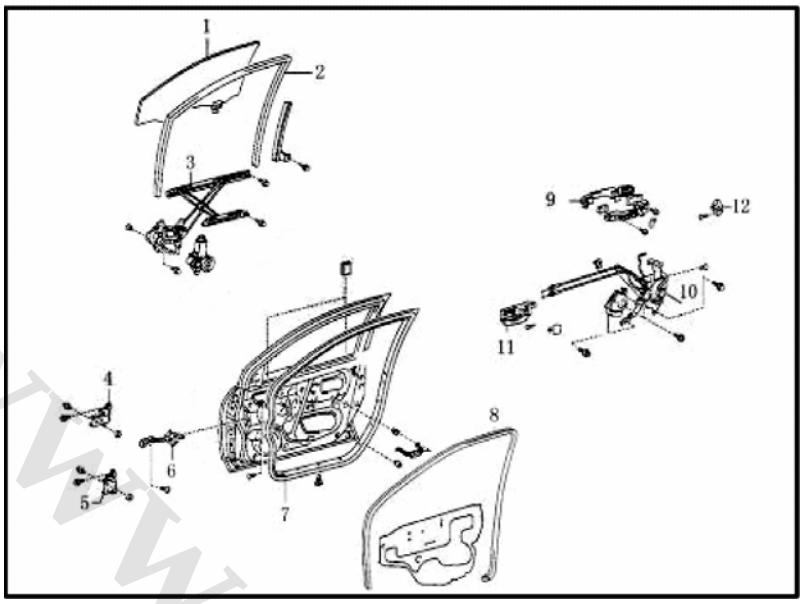


Fig. 7-5

1. Right front safety belt retractor
2. Safety belt head guard cap
3. Hexangular flange bolt (a)
4. Hexangular flange bolt (b)
5. Hexangular flange bolt (c)
6. Hexangular flange bolt (d)
7. Safety belt altitude controller assembly
8. Left front safety belt retractor
9. Rear seat safety belt retractor assembly
10. Hexangular flange bolt (e)
11. Rear seat double connection lock buckle assembly
12. Rear seat lock buckle and waist belt assembly

II. Front side door glass, as shown in Fig. 7-5:

1. Removal:

(1) Remove the front side door glass frame riser switch assembly.

(2) Remove the front side door guard panel.

(3) Remove the front side door sealing film.

(4) Connect the glass frame riser switch, lower the glass to the reasonable position (reveal the two installing holes of the glass).

(5) Dismantle the bolts for glass installation.

(6) Dismantle the glass of the front door.

2. Installation: install the glass of the door as per the opposite process, and pay attention to the following notes:

(1) Check whether the top of the glass and the sliding channel contact evenly or not, and the up-and-down movement is stable or not during the installation.

(2) Adhere the door sealing film firmly with the adhesive.

III. Glass frame riser:

1. Removal

(1) Remove the front side door glass referring to the front side door glass removal process.
(2) Disconnect the motor harness of the electric glass frame riser.
(3) Remove the bolt of the glass frame riser, and take out the glass frame riser.
2. Exam:
1) Check whether the components for movement and rotation of the glass frame riser need lubricating or not.
2) Check whether the trolley is frayed or damaged.
3. Installation:
Install the front window glass frame riser as per the reverse order.
Note: During the installation of the glass, check whether the top of the glass and the sliding channel contact evenly or not, and the up-and-down movement is stable or not.

IV. Front side door lock:

1. Removal:
(1) Remove the front side door glass frame riser switch assembly.
(2) Remove the front side door ornamental guard panel.
(3) Remove the front side door sealing film.
(4) Remove the front side door inner handle and door lock assembly after disconnect the joints of every controlling rod.
(5) Remove the door handle.
2. Installation: Installing as per the reverse order, and pay attention to the following points:
① Install and adjust the locking ring. Move the locking ring up and down so as to make its axis nearly line with the door lock groove, and screw the bolt tightly.
Note: The locking ring shall be placed in a horizontal position and moved up and down, and don't adjust the door lock.
② Make the door keep contact with the body when closed.
Note: Inject the oil or grease lubricant into the joint of the locking ring regularly.

V. Front side door assembly:

1. Removal:
(1) Remove the front fender.
(2) Disconnect the door harness. Remove the door limiter. Use the jack and underlay a piece of wood between the jack and the door plate to support the door plate. Unscrew the hinge bolt so as to remove the door assembly.
2. Installation: install the front side door as per the reverse order. Pay attention to the following points:
(1) Coat the hinge installing surface with the sealant and the rotation components with grease lubricant.
(2) The induration of the strip will lead to the leakage. In such conditions, renew the strip.
(3) Adjust the position of the door locking ring according to "door lock installation", so as to locate the door correctly.
(4) Keep the door contact with the body when closed.
(5) Check the door gap through opening and closing the door after installation. When the gap exists, adjust the door.

Section V Rear Side Door

I. Decomposition Diagram. See Fig. 7-6:

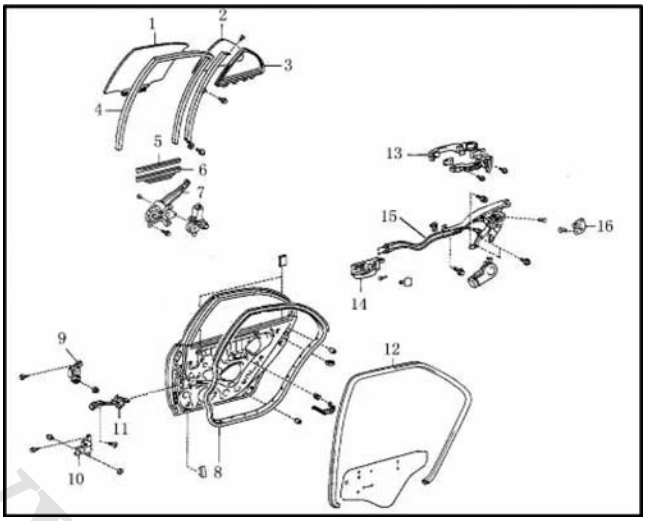


Fig .7-6

1. Right rear side window assembly
2. Right rear side door angle window assembly
3. Right rear side door angle window glass seal
4. Right rear side door window glass sealing strip
5. Right rear side window glass supporting bracket treadle bar
6. Right rear side window glass supporting bracket assembly
7. Right rear window glass frame riser assembly
8. Right rear side door sealing strip
9. Right rear side door top hinge assembly
10. Right rear side door bottom hinge assembly
11. Right rear side door limiter assembly
12. Right rear side door frame sealing strip
13. Right rear side door outside handle assembly
14. Right side door inner handle assembly
15. Right rear side door lock
16. Side door locking ring

II. Rear side door glass

1. Removal:

(1) Remove the rear side door glass frame riser switch assembly.

(2) Remove the rear side door ornamental guard panel.

(3) Remove the rear side door sealing film.

(4) Remove the rear door movable guide rail and the triangle window glass to avoid the damage.

(5) Dismantle the rear door glass.

2. Installation: install the glass of the door as per the opposite process, and pay attention to the following notes:

(1) Check whether the top of the glass and the sliding channel contact evenly or not, and the up-and-down movement is stable or not during the installation.

(2) Adhere the door sealing film firmly with the adhesive.

III. Glass frame riser:

1. Removal:

1) Remove the rear side door glass referring to the rear side door glass removal process.

2) Disconnect the motor harness of the electric glass frame riser.
3) Remove the bolt of the glass frame riser, and take out the glass frame riser.
2. Exam:
1) Check whether the components for movement and rotation of the glass frame riser need lubricating or not.
2) Check whether the trolley is frayed or damaged.
3. Installation: Install the front window glass frame riser as per the reverse order.
Note: During the installation of the glass, check whether the top of the glass and the sliding channel contact evenly or not, and the up-and-down movement is stable or not.

IV. Rear side door lock:

1. Removal:
(1) Remove the rear side door glass frame riser switch assembly.
(2) Remove the rear side door ornamental guard panel.
(3) Remove the rear side door sealing film.
(4) Remove the movable guide rail of the rear side door and the triangle window glass to avoid damage.
(5) Remove the front side door inner handle, rear door lock assembly in order after disconnecting the joints of every controlling rod. (The rear door outside handle is removed at last.)
2. Installation: Installing as per the reverse order, and pay attention to the following points:
① Install and adjust the locking ring. Move the locking ring up and down so as to make its axis nearly line with the door lock groove, and screw the bolt tightly.
Note: The locking ring shall be placed in a horizontal position and moved up and down, and don't adjust the door lock.
② Make the door keep contact with the body when closed.
Note: Inject the oil or grease lubricant into the joint of the locking ring regularly.

V. Rear side door assembly:

1. Removal:
(1) Disconnect the door harness.
(2) Remove the door limiter.
(3) Use the jack and underlay a piece of wood between the jack and the door plate to support the door plate.
(4) Unscrew the hinge bolt so as to remove the door assembly. (When removing the rear door top and bottom hinges, unscrew the bolts.)
2. Installation: install the rear side door as per the reverse order.
(1) Coat the hinge installing surface with the sealant and the rotation components with grease lubricant.
(2) The induration of the sealing strip will lead to the leakage. In such conditions, renew the strip.
(3) Adjust the position of the door locking ring according to "door lock installation", so as to locate the door correctly.
(4) Keep the door contact with the boy when closed.
(5) Check the door gap through opening and closing the door after installation. When the gap exists, adjust the door.

Section VI Seat Assembly

I. Structure of the driver seat assembly:

The assembly structure as shown in Fig. 7-7.

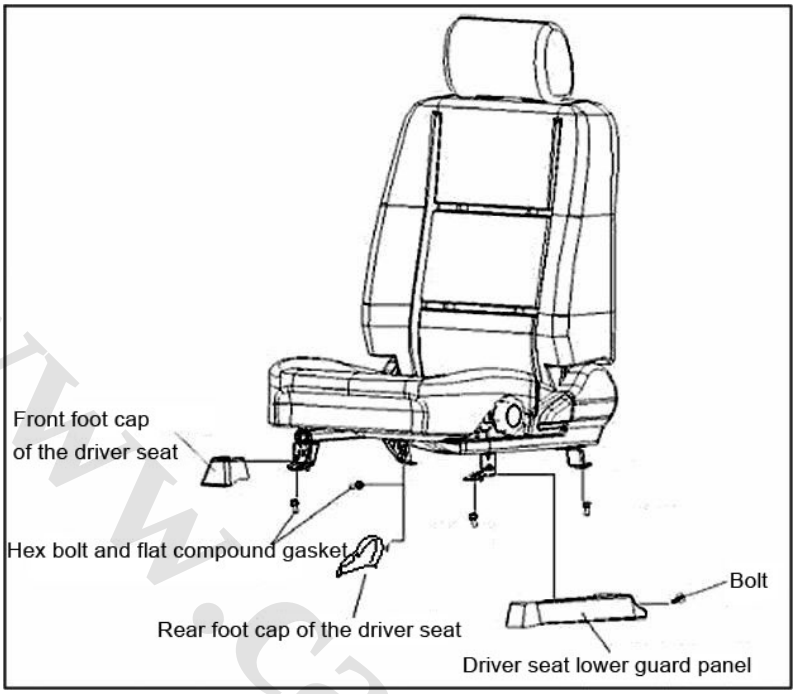


Fig. 7-7

Fix the bolt at the torque of 20.4N·m

II. Components and maintenance of the driver seat:

Note: The process of installation and that of removal are reverse. Therefore, only the extra steps for the installation will be referred.

1. Removal

(1) Remove the driver seat lower guard panel

① Remove one bolt;

② Remove the driver seat lower guard panel.

(2) Remove the right front foot cap of the driver seat.

(3) Remove the right rear foot cap of the driver seat.

(4) Remove the front two bolts of the driver seat.

(5) Remove the rear two bolts of the driver seat and the whole assembly.

2. Installation

Installing as per the reverse order, and pay attention to the following points:

(1) Remove the glass frame riser switch assembly of the rear side door.

III. Structure of the front passenger seat assembly:

1. The assembly structure as shown in Fig. 7-8.

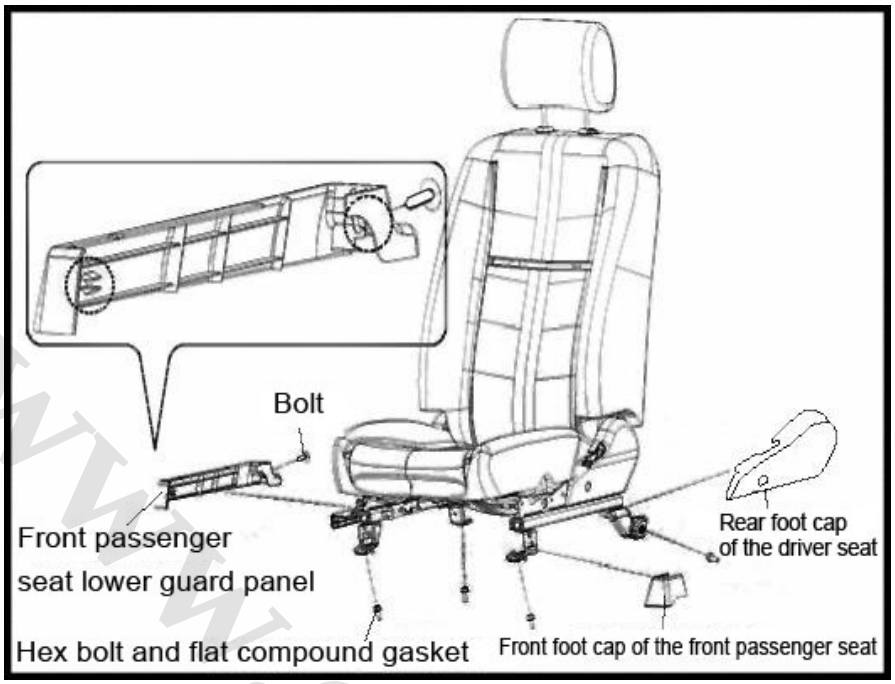


Fig. 7-8

Note:

The process of installation and that of removal are reverse. Therefore, only the extra steps of the installation will be referred.

1. Removal

(1) Remove the front passenger seat lower guard panel

a. Remove one bolt

b. Remove the left front foot cap of the front passenger seat.

(2) Remove the left rear foot cap of the front passenger seat.

(3) Remove the two bolts of the front passenger seat front slide rail.

(4) Remove the rear two bolts of the front passenger seat and the whole assembly.

Torque: 20.4N·m

2. Installation

Installing as per the reverse order, and pay attention to the following points:

Fix the bolt at the torque of 20.4N·m

IV. Components and maintenance of the rear seat assembly

1. The assembly structure as shown in Fig. 7-9.

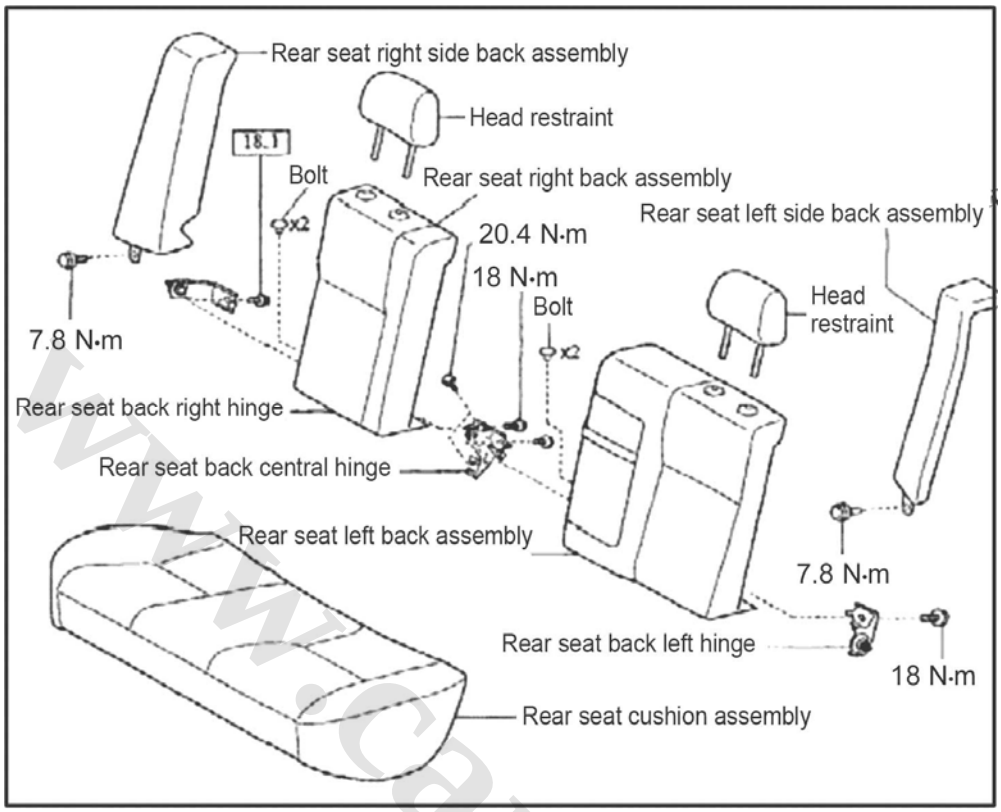


Fig. 7-9

2. Removal

Note:

The process of installation and that of removal are reverse. Therefore, only the extra steps of the installation will be referred.

(1) Remove the head restraint.

(2) Seat cushion assembly, pull upwardly the two bulging parts in the front of the seat cushion and remove them, as shown in Fig. 7-10.

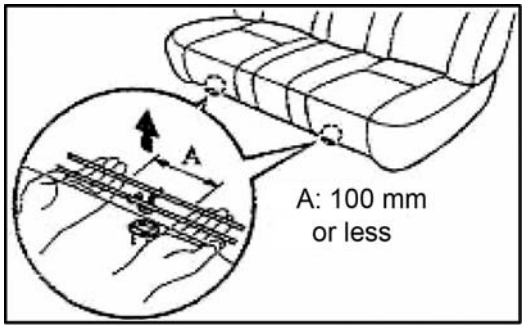


Fig. 7-10

Note: The pad bracket is easy to be deformed. In order to avoid the deforming, make sure the hands beside the two pothooks as shown in the Fig.

(3) Remove the left rear seat back assembly, as shown in Fig. 7-11.

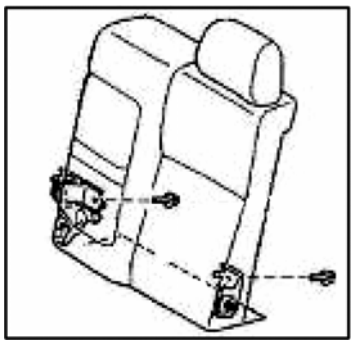


Fig. 7-11

① Open the front part of the rear seat back cover.
② Incline the seat back assembly.
③ Remove the two bolts and the seat back.
(4) Remove the right rear seat side back assembly, as shown in Fig. 7-12.

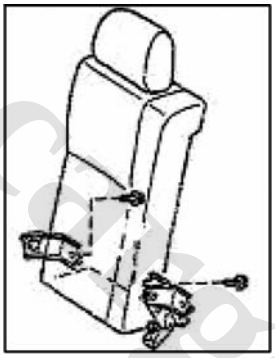


Fig. 7-12

① Open the front part of the rear seat back cover.
② Incline the seat back assembly.
③ Remove the two bolts and the seat back.
(5) Remove the left rear seat side back assembly, bolts and the seat back assembly, as shown in Fig. 7-13.

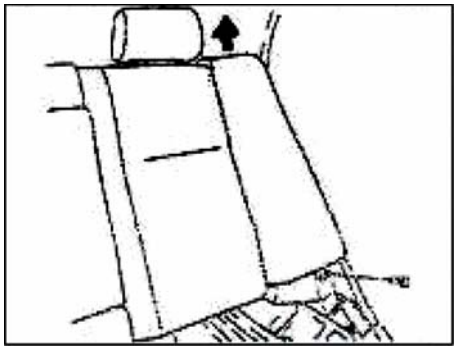


Fig. 7-13

① Remove the bottom fixing bolts on the left side back of the rear seat.
② Pull out the left side back and the Fig. 7-13 may be referred.

(6) Remove the rear seat right side back assembly, bolts and side seat back.

① Remove the bottom fixing bolts on the rear seat right side back.

② Pull out the right side back.

(7) Remove the left hinge of the rear seat back, bolts and hinge.

(8) Remove the right hinge of the rear seat back, bolts and hinge.

(9) Remove the central hinge of the rear seat back, as shown in Fig. 7-14.

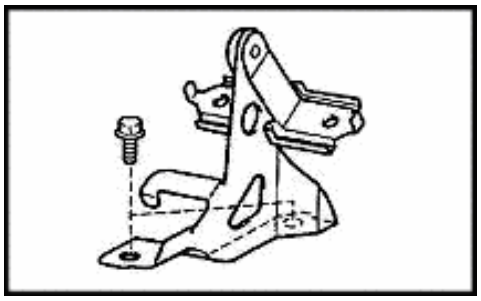


Fig. 7-14

① Remove the two bolts and hinge.

② Take out of the hinge.

(10) Remove the armrest assembly.

① Pick up the armrest hinge cover with the screwdriver. Note: Encase the sharp part of the screwdriver before working.

② Remove the bolts and the armrest.

(11) Install the central hinge of the rear seat back with two bolts at the torque of 20.4N·m.

(12) Install the left hinge of the rear seat back with bolts at the torque of 18.1N·m.

(13) Install the side back hinge of the rear seat with bolts at the torque of 18.1N·m.

(14) Install the left rear side seat side back assembly with bolts at the torque of 7.8N·m.

Note: Hang the pothook on the upper side of the side back on the body first when installing.

(15) Install the right rear seat side back assembly with bolts at the toque of 7.8N·m.

Note: Hang the pothook on the upper side of the side back on the body first when installing.

(16) Install the left rear seat back assembly with two bolts at the torque of 18.1N·m.

(17) Install the right rear seat back assembly with two bolts at the torque of 18.1N·m.

(18) Install the rear seat cushion assembly, as shown in Fig. 7-15.

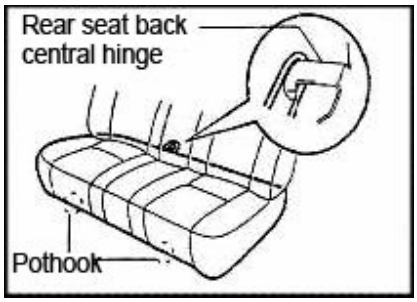


Fig. 7-15

① Hang a pothook on the body firmly (rear side).

② Put the seat frame carrier on the two pothooks (front side).

Note: Confirm the fastness of the seat.

V. Components and maintenance of the rear seat assembly

1. Structure of the components as shown in Fig. 7-16.

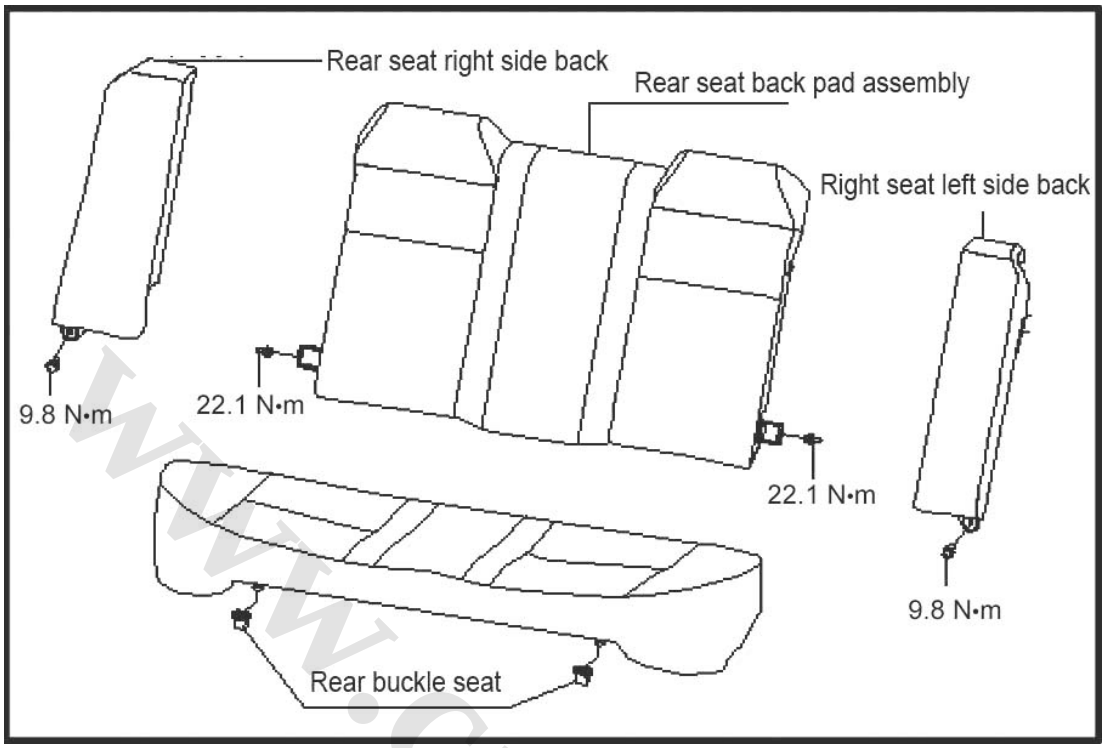


Fig. 7-16

2. Removal

(1) Remove the rear seat back pad assembly

① Lift the unlocking button to unlock the back pad and push over the back pad, as shown in Fig. 7-17.

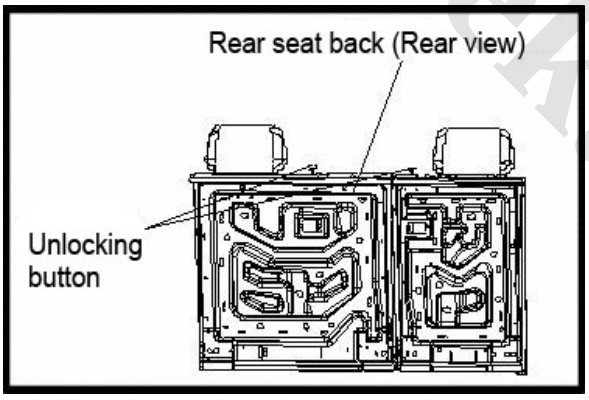


Fig. 7-17

② Incline the seat back assembly.

③ Remove the two side bracket flange bolts connecting to the body at the left and right side.

Note: Removing the bolts first is acceptable.

(2) Remove the left side back of the left rear seat.

① Remove the bolts.

② Hold the side back assembly upwardly along the direction of the arrowhead so as to separate the armrest pothook with the body, as shown in Fig. 7-18.

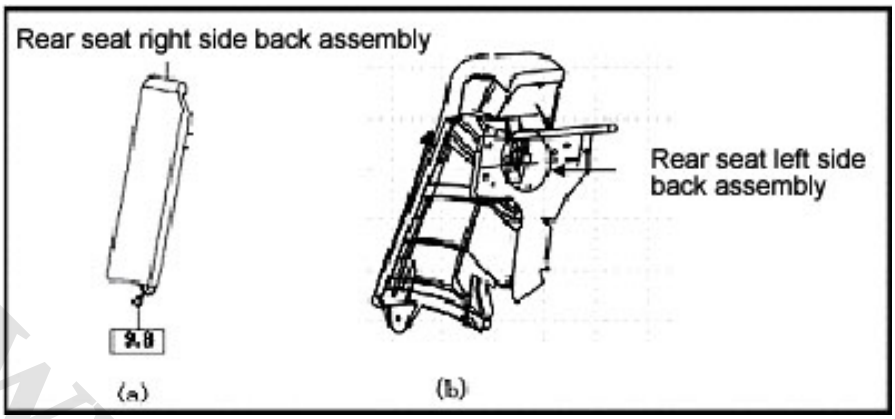


Fig. 7-18

Note: If the pothook is damaged during the removal, renew the side back assembly.

(3) Remove the right side back assembly in accordance with the process of the left side back, mentioned above.

(4) Remove the rear seat cushion assembly, referring to the Fig. 7-10.

Pull upwardly the two bulging parts in the front of the seat cushion and remove them.

Note: The pad bracket is easy to be deformed. In order to avoid the deforming, make sure the hands beside the two pothooks as shown in the figure.

3. Installation process:

(1) Install the rear seat cushion, referring to Fig. 7-15.

① Push the cushion backwardly to make the back pad pin the cushion.

② Put the frame pothook of the seat on the two buckle seat assemblies (front side).

Note: Confirm the fastness of the seat cushion.

(2) Install the left armrest assembly.

① Reverse to the removal steps, press the armrest along the direction shown in Fig. 7-19 so as to fix the pothook on the body.

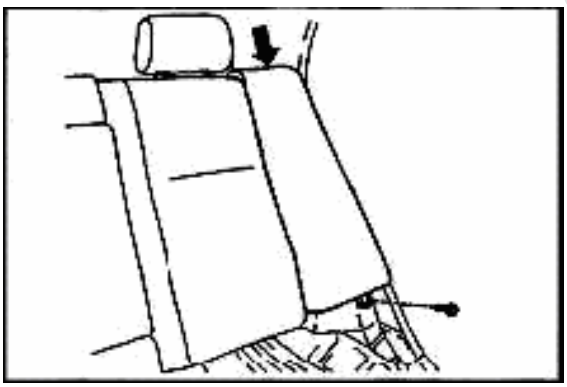


Fig. 7-19

② Install the hinge with bolts at the torque of 9.8N·m.

(3) Installing the right rear seat side back assembly shall conform to the steps of left armrest

installation.

Torque: 9.8N·m

(4) Install the rear seat back pad assembly, as shown in Fig. 7-20.

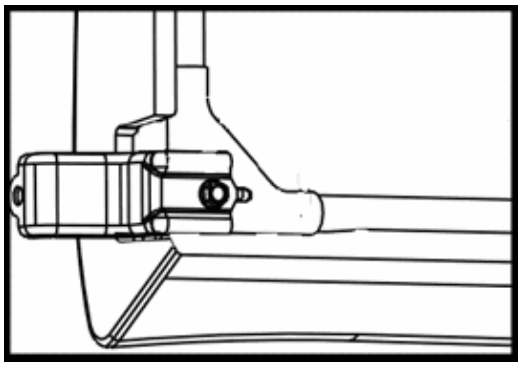


Fig. 7-20

Use a side hinge flange bolt at the left side as well as the right side to install it. After installation, the rear back pad can be turned.

Torque: 22.1N·m

Note: Check whether the side connecting plate is firm with the back pad or not before installation. (If loose, screw it at the torque of 22.1N·m)

Section VII Inside & Outside Decorations

I. Roof

1. Roof (standard scheme) removal:

As shown in Fig. 7-21, first remove the A, B, C pillars, dismantle the roof light, sun visor and the inner rearview mirror, remove 8 with the buckle clamp, and dismantle 6 with the sleeve, take out of 7 buttressing the roof and then the roof can be removed. Meanwhile, 1, 2, 3 will be adhered on the roof metal sheet.

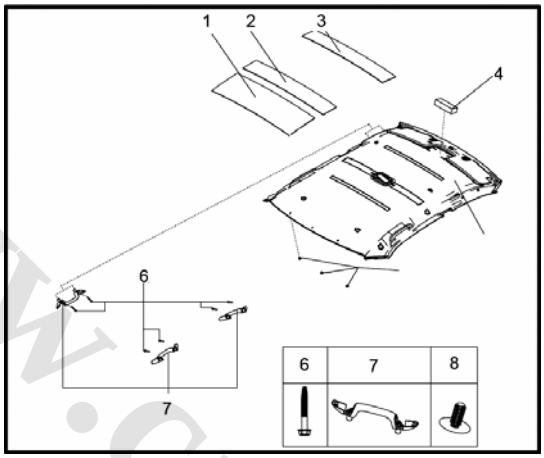


Fig. 7-21

1. Roof rear heat-insulating pad
2. Roof middle heat-insulating pad
3. Roof front heat-insulating pad
4. Roof guard panel front heat-insulating pad
5. Roof guard panel
6. Installing bolt
7. Roof armrest
8. Roof fixing buckle

II. Rack board, as shown in Fig. 7-22

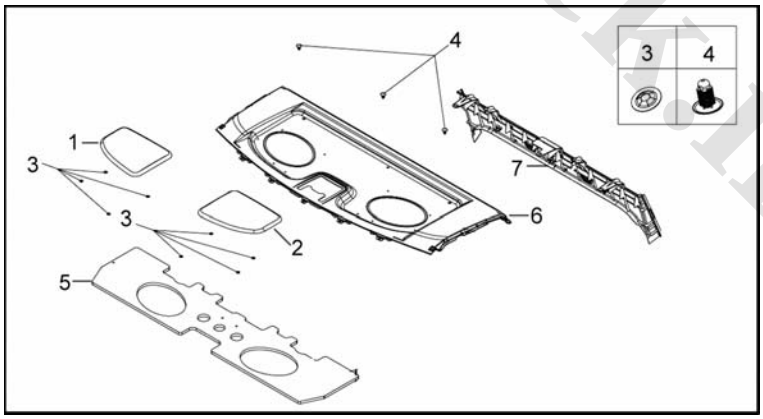


Fig. 7-22

1. Rack board upper guard panel left audio cover
2. Rack board upper guard panel right audio cover
3. Audio cover installing buckle
4. Guard panel installing buckle
5. Rack board felt pad
6. Rack board upper guard panel
7. Rear seat ornament board

Removal of the rack board: First, remove the C pillar and high-mounted brake lamp; second, turn over the rear seats and take out of the safety belt from 4 and remove 6, 7 and 5 successively. 1 and 2 are fixed on 6 through 3 and 4.

(**Note:** The rear sun visor device is added at 4 in the luxury scheme so the buckle is installed on the lower place of the rear sun visor device. When removing the 4 for fixing 7, uplift 7 directly and the buckle here can be taken out; 1 and 2 are welded on 7; four small pads replace 5 in certain standard scheme.)

III. Front side door

1. Removal of the front side door, as shown in Fig. 7-23:

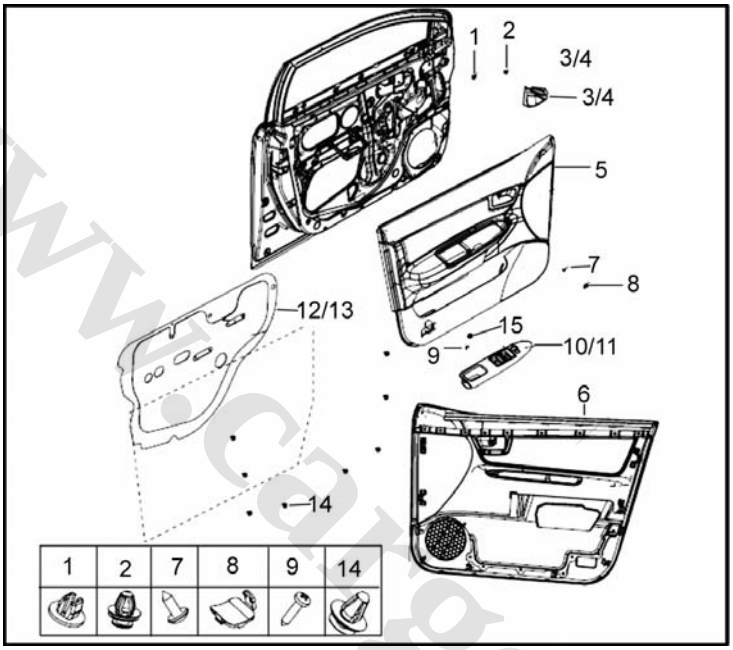


Fig. 7-23

1. Plastic square nut
2. Small audio cover buckle on door superior angle
3. Small audio cover on left front side door superior angle
4. Small audio cover on right front side door superior angle
5. Left front side door guard panel assembly
6. Right front side door guard panel assembly
7. Fixing compound bolts
8. Door handle seat installing bolt cover stem
9. Front side door armrest seat bolt
10. Left front side door armrest seat
11. Right front side door armrest seat
12. Left front side door sealing felt pad assembly
13. Right front side door sealing felt pad assembly
14. Front door guard panel fixing buckle
15. Bolt caulking calking

Remove 3 and 4, unscrew 15 and 9 with the cross-tip screwdriver, open 8 and unscrew 7 as well. Take out of 5 and 6 from 10 and 11, and unfix the harness. Pull out 5 and 6 to observe whether 14 remains on the metal sheet, if it does, take it with the buckle clamp and return it to the 5 and 6. If it is necessary to remove 12 and 13, dismantle the door handle and armrest seat installing bracket first, and tear out 12 and 13, if it is necessary to return them, glue recoating is required. If 1 needs renewing, dismantle it with the flat blade screwdriver.

IV. Rear side door guard panel

1. Installation of rear side door

① Glue the door horn mouth cap to the lower side round mouth at the position as shown in the figure.

② Glue the rear side door sealing felt pad assembly on the door inner metal sheet and after confirming that its hole position directly faces with that of the metal sheet, press them tightly.

③ Install the armrest seat installing bracket.

④ Confirm the non-installation of the inner handle installing bolts, install seven door plate fixing buckles on the door plate bracket. Put the upper body buckle seat into the place between the door plate and the glass first. As shown in Fig. 7-24: then lead the buckle to aim at the installing hole of the buckle and press the buckle in; after this, the door guard panel is installed on the door inner plate.

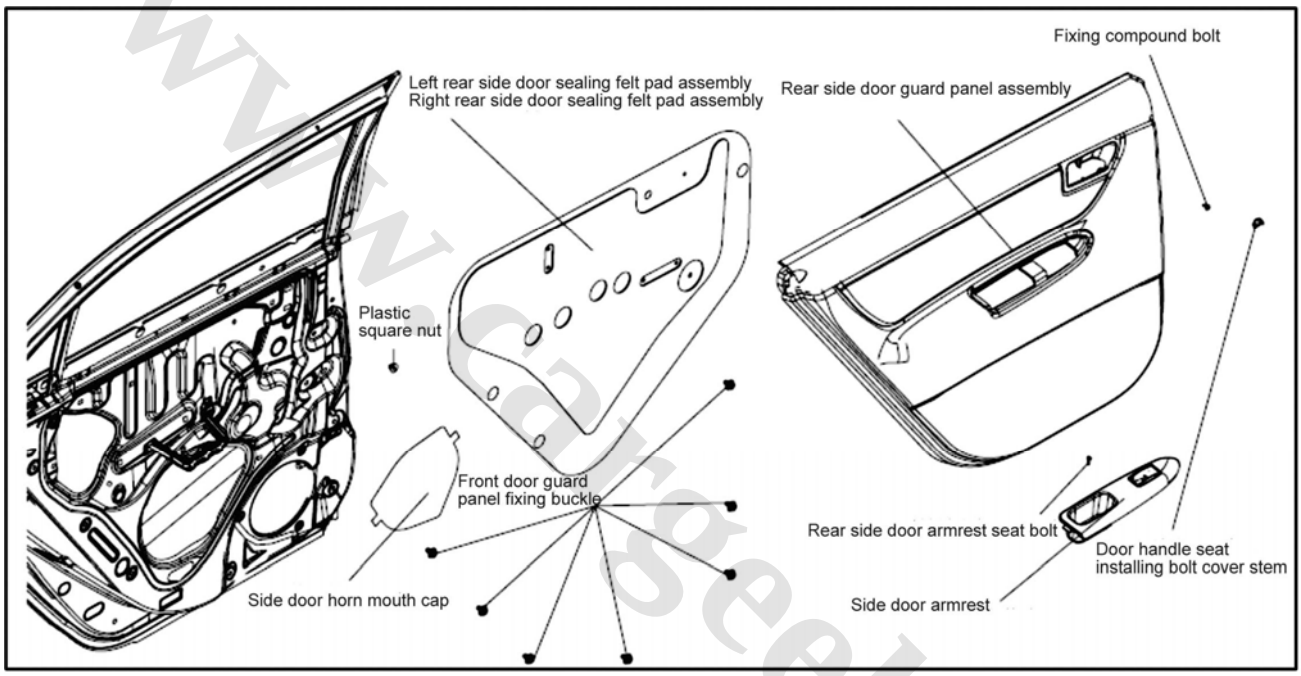


Fig. 7-24

⑤ Install the inner handle cover stem after the installation of the bolts.

⑥ After installing the harness on the corresponding armrest seat of the door plate, fix the rear side of the armrest seat in the installing hole of the door plate first and then press the snap spring at the front side into the installing hole of the door plate. Firm the armrest seat with the armrest seat bolts.

V. Rear wall

1. Removal of rear wall, as shown in Fig. 7-25:

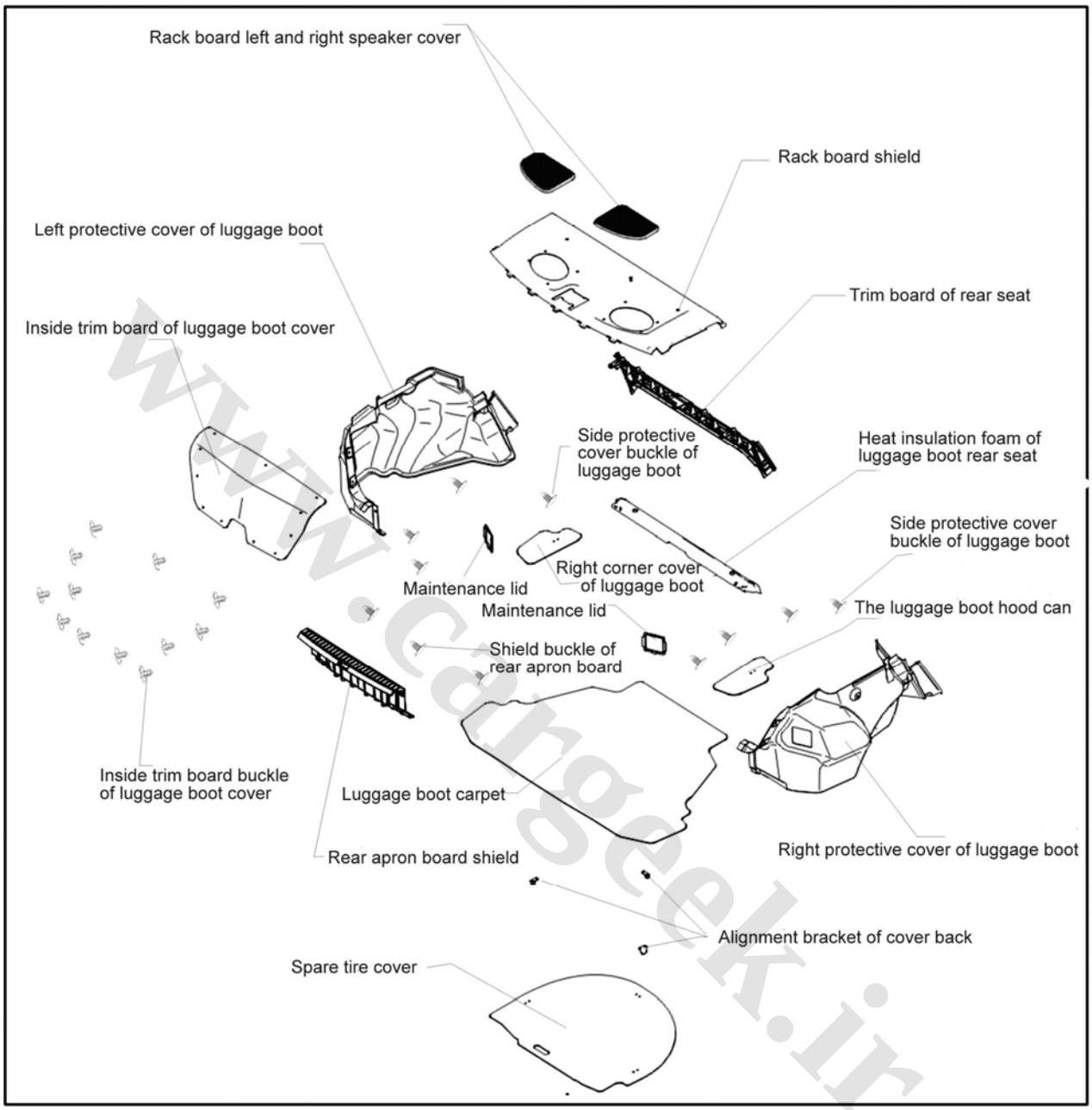


Fig. 7-25

The luggage boot hood can be removed after dismantling the 11 fixing buckles. The luggage carpet is on the top of the inner luggage boot. Uncovering the carpet, the caudal cover board and spare tire cover board can be revealed, all of which are not fixed by the fasteners. The left and right protective covers and the rear skirt plate is firmed by the plastic buckles so they can be dismantled after removing the buckles. The cover boards for check and maintenance are clipped on the left and right protective covers respectively.

(**Note:** The rear skirt plate has its own buckle corner so don't damage the corner when removing.)

Removal of rear wall air opening, as shown in Fig. 7-26.

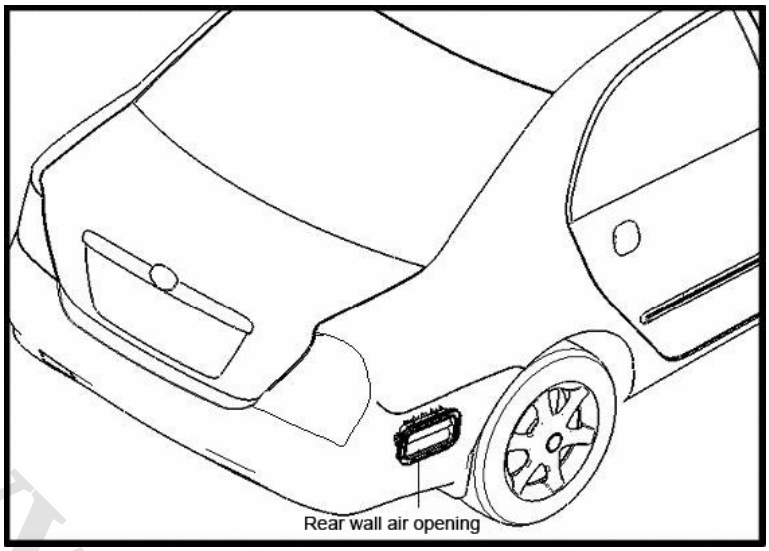


Fig. 7-26

The four buckle corners of the air opening will be unveiled after the other components of the rear wall are removed. Support the buckle corners with hands or tools to push them outward and the rear wall air opening will be dismantled.

VI. Side wall

1. Assembly of side wall, as shown in Fig. 7-27.

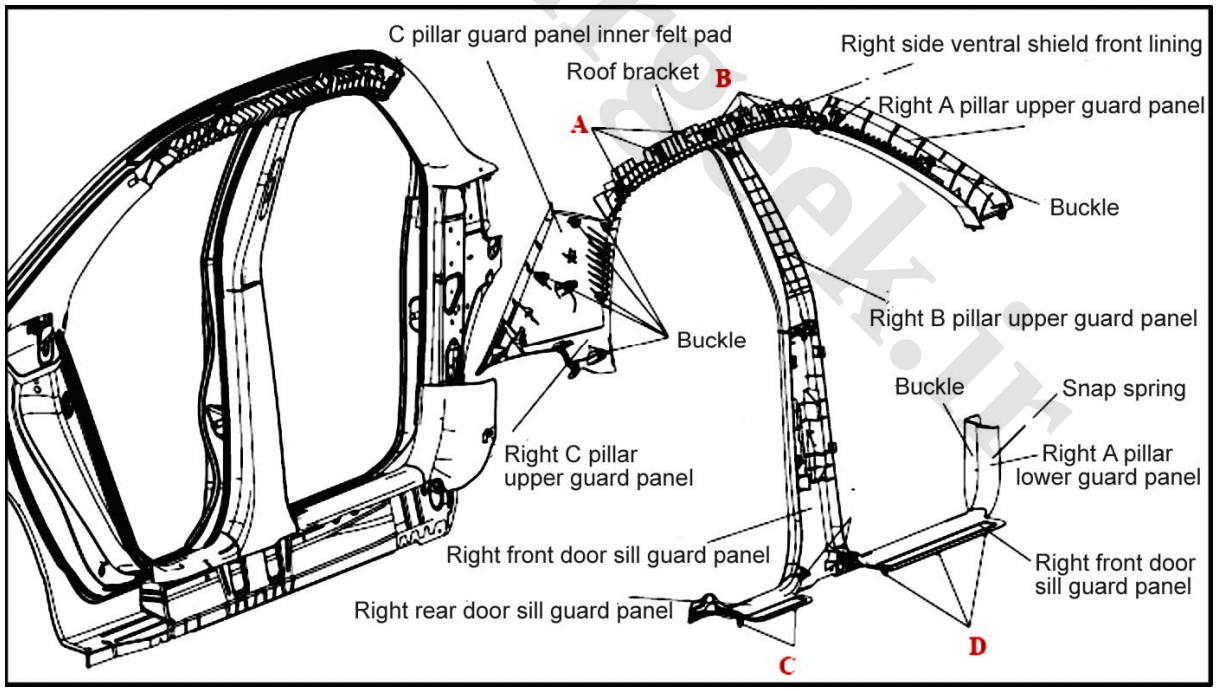


Fig. 7-27

(1) The front and rear linings of the ventral shield are fixed on the body through 4 places (A in the Fig.) and 3 places (B in the Fig.) respectively. During the installation, fix the buckles in the buckle holes directly and then install the roof. After that, the A, B, C pillar guard panels can be installed.

(2) Fix the buckle on the buckle installing bracket (Total: 2) of the A pillar upper guard panel. First put the front small buckle foot into the corresponding installing holes on the dash board, the two buckles into the buckle holes of the A pillar metal sheet so that the A pillar upper guard panel can be fixed.

(3) Firm the inner felt pad of the C pillar upper guard panel and five fixing buckles on the C pillar upper guard panel. First put the rear side small buckle foot into the metal sheet hole of the C pillar and five buckles into the buckle hole of the C pillar metal sheet so that the C pillar upper guard panel can be firmed.

(4) Make the small buckle foot on the lower part of the B pillar upper guard panel into the metal sheet hole of the B pillar and press the buckle on the upper side into the corresponding round holes of the B pillar so that the B pillar can be fixed, as shown in Fig. 7-28.

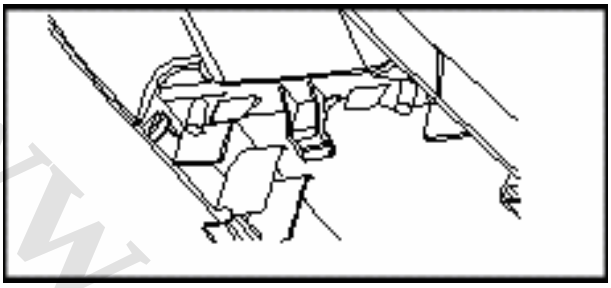


Fig. 7-28

(5) Install the two fixing buckles into the buckle bracket of the B pillar lower guard panel and the column at the upper side of the B pillar lower guard panel into the B pillar upper guard panel holes, and put the buckle foot in the appropriate position (as shown in the following figure). Two fixing buckles shall be installed in the buckle holes.

(6) Make the snap spring fixed on the A pillar lower guard panel clip the brim of the metal sheet and press ahead. Install the buckles on the bolt from the inner side and press the A pillar lower guard panel inward tightly.

(7) Install the front and rear door sill guard panel, press the end of the door sealing strip under the door sill guard panel and put the small column connecting to the B pillar lower guard panel into the corresponding round hole on the B pillar lower guard panel, and place the buckles (3 buckles see D; 2 buckles see C.) under it into the corresponding installing holes of the body, and the small buckle foot connecting to the B pillar lower guard panel, in position. See Fig. 7-29.

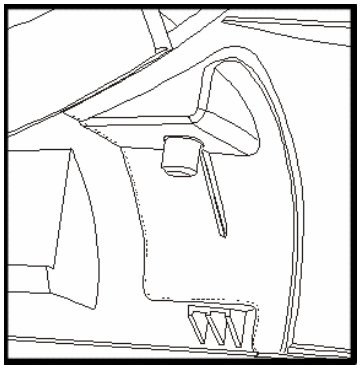


Fig. 7-29

Note: The buckles at the lower side of the door sill guard panel shall aim at the metal sheet buckle

holes precisely, or the buckles will be bent. The door sill guard panel will match with the thread clip below.

VII. Heat-insulating pad

1. Installation of heat-insulating pad of front wall

(1) First install five buckles on the buckle installing holes of the heat-insulating pad of front wall, open the upper mouth of the pad and hang it on the beam under the windshield (see Fig. 7-30), and after gluing its surface with the dash panel, place the five buckles into the corresponding bolts on the dash panel.

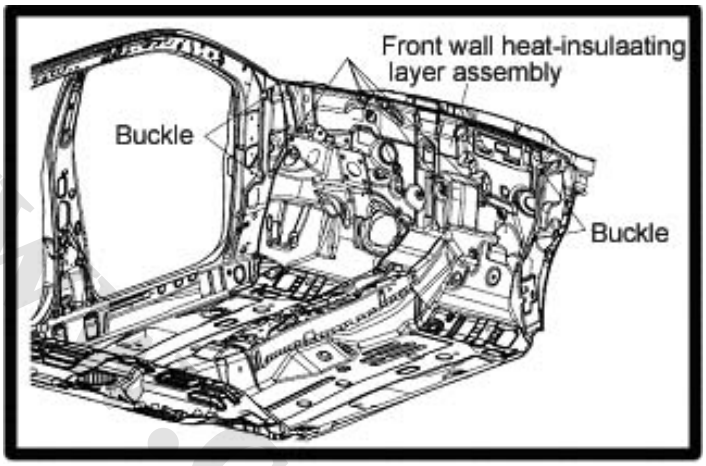


Fig. 7-30

(2) Install two buckles on the each side respectively.

Engine room heat-insulating layer, see Fig. 7-31.

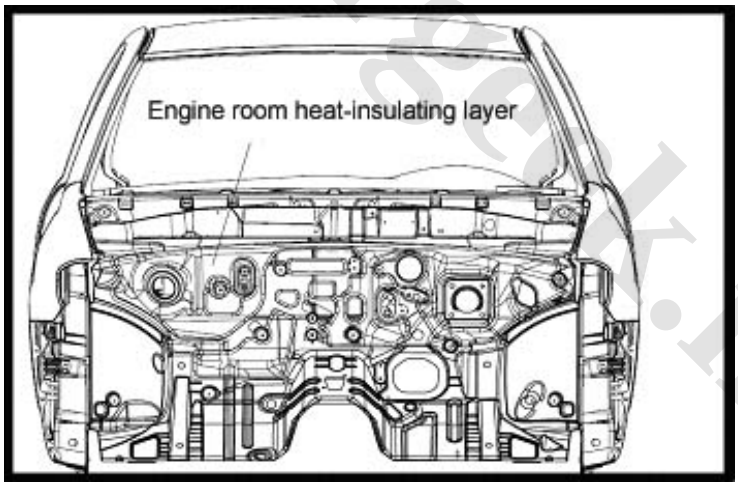


Fig. 7-31

Engine room heat-insulating layer installation: Joint the engine room heat-insulating layer with the front side of the dash panel; after the installation of the other components of the dash panel, the layer can be fixed. The installation of the auxiliary fascia console heat-insulating layer, see Fig. 7-32: Joint the auxiliary fascia console heat-insulating layer on the central passage cover board; if matched well, they can be fixed by two fixing buckles, as shown in the above figure.

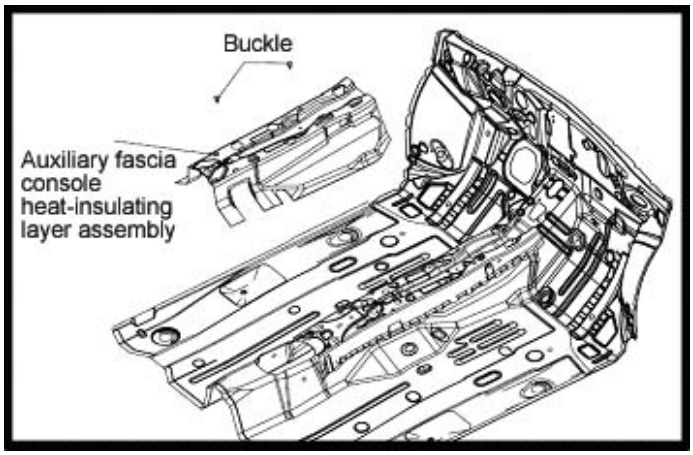


Fig. 7-32

VIII. Carpet

Installation of the carpet, as shown in Fig. 7-33:

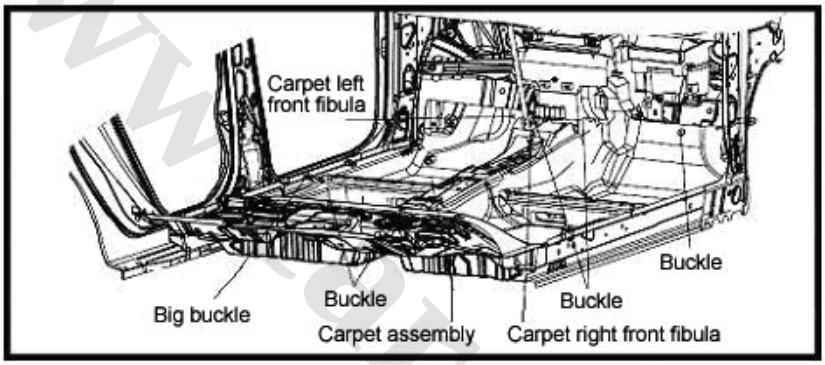


Fig. 7-33

a. Clean the surface of the floor.

b. Put the carpet in, stretch out the inner control handle first. Glue the front right fibula of the carpet first and the left one second.

c. Install the buckles.

d. Install at the two square holes at rear side of the carpet.

IX. Fascia console frame (Fig. 7-34, Fig. 7-35)

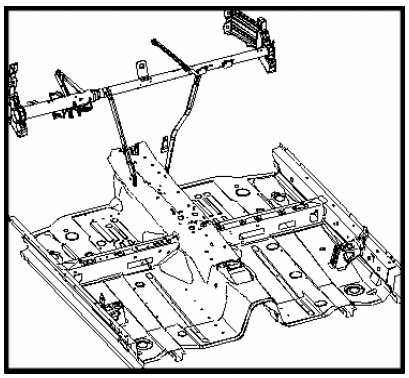


Fig. 7-34

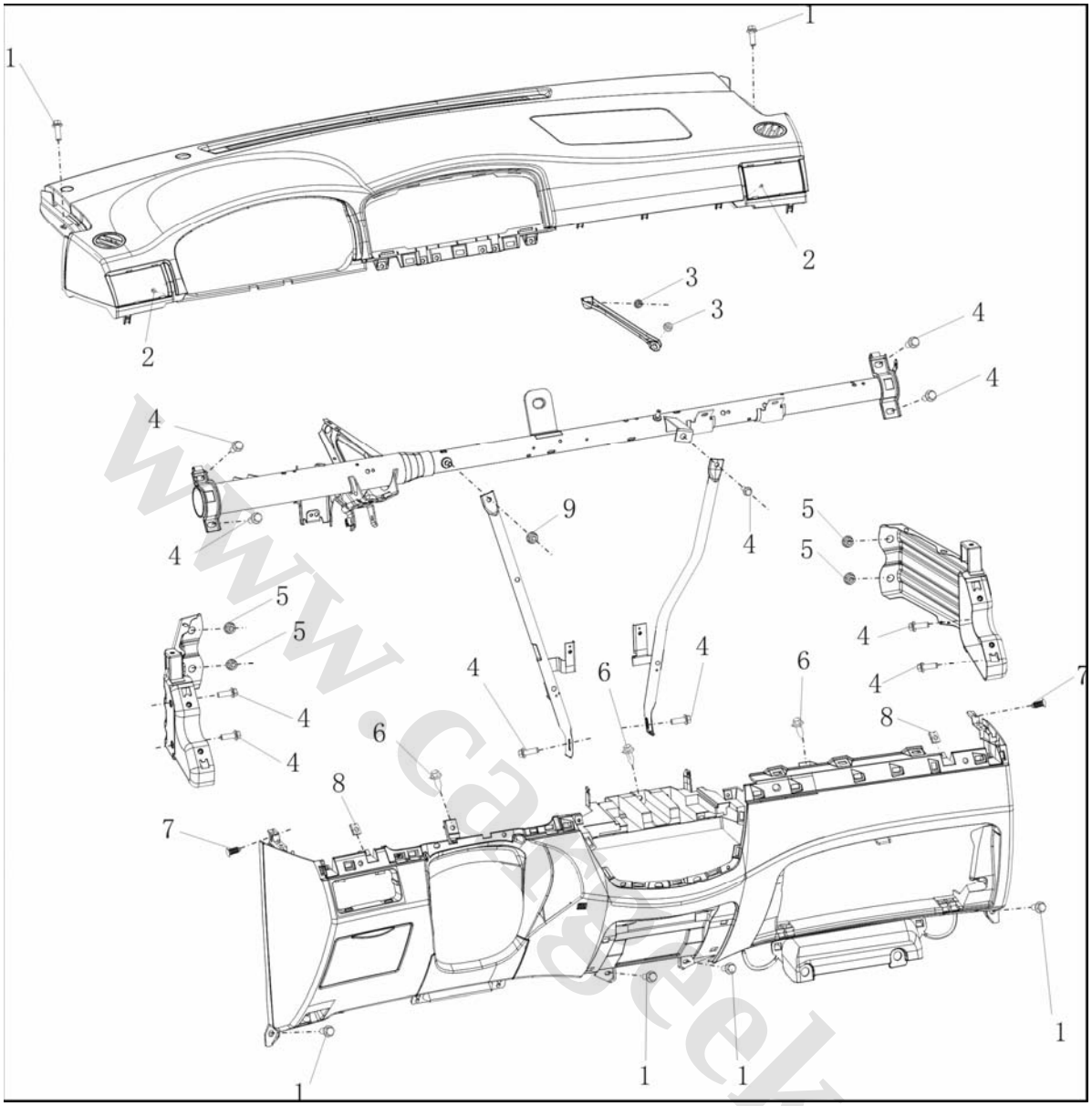


Fig. 7-35

1. Hexangular flange bolt
2. Screw
3. Hexangular flange bolt
4. Hexangular flange bolt
5. Hexangular flange nut
6. Screw
7. Plastic buckle
8. Snap spring nut
9. Hexangular flange nut

X. Main instrument desk, as shown in Fig. 7-36

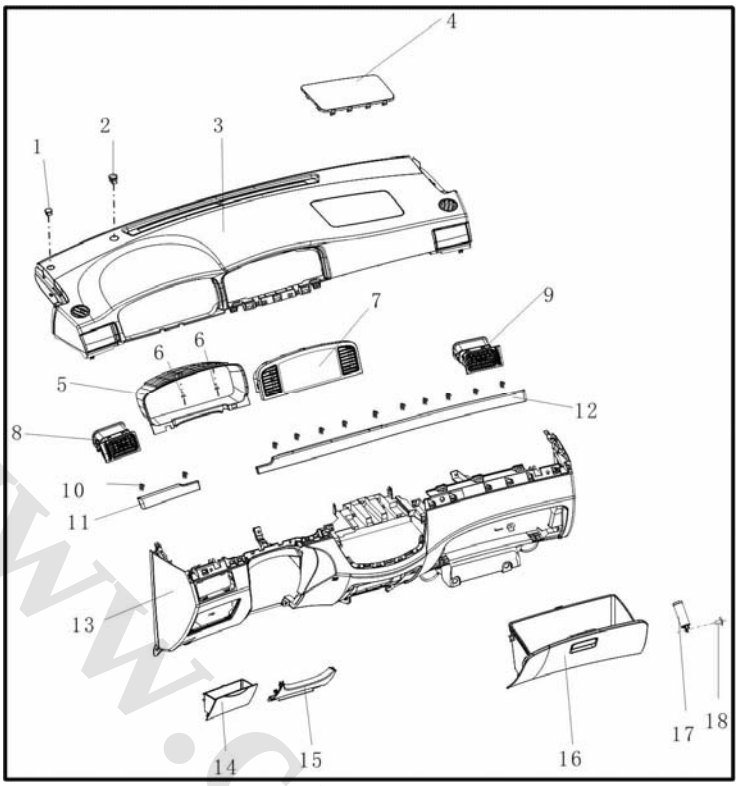


Fig. 7-36

1. Sunshine sensor cover stem
2. Optical sensor cover stem
3. Instrument panel upper guard panel
4. Front passenger air bag cover board
5. Instrument cluster face shield
6. Screw
7. Middle vent small assembly
8. Left vent small assembly
9. Right vent small assembly
10. Instrument panel trim strip fastening buckle
11. Instrument panel left trim strip
12. Instrument panel right trim strip
13. Instrument panel lower guard panel
14. Left small sundries box
15. Steering wheel lower guard panel
16. Sundries case
17. Pneumatic pullback spring
18. Self-tapping screw

1. Detailed installation notes

(1) Right sundries box

After pneumatic pullback spring and sundries box are fastened, insert the pneumatic pullback spring hole into the buckle corner (as shown in the circle of Fig. 7-37).

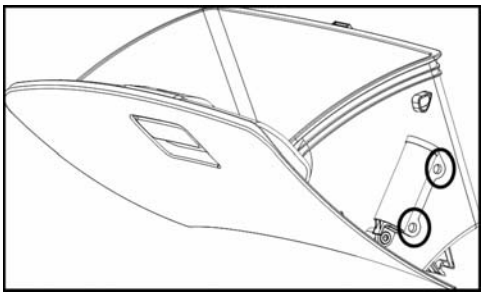


Fig. 7-37

Then insert lower part of sundries box as shown in Fig. 7-38.

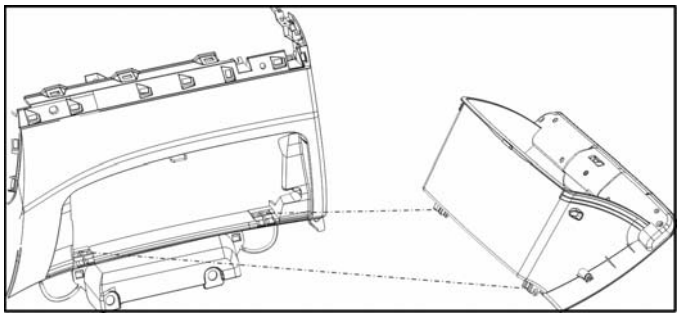


Fig. 7-38

2. Connect fascia console upper guard panel with vehicle body

As shown in Fig. 7-39, seen from back side, there are 5 buckles attaching to vehicle body in front part of instrument panel.

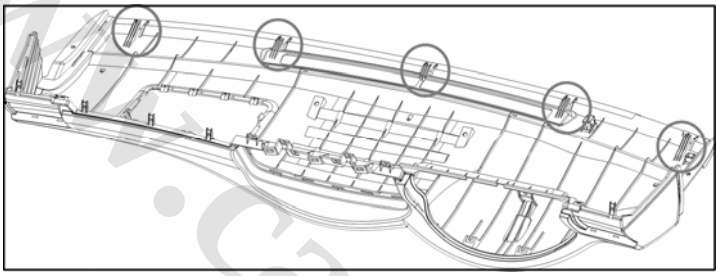


Fig. 7-39

The 5 buckles on upper guard panel of fascia console must be inserted into the lower part of beam under windshield

There are 5 buckles and 4 screws on upper and down guard panels of fascia console as connecting equipments. The 4 screws and A type spring nut are fastened to the lower part of the left and right A/C vent and the middle of CD and A/C panel. The 4 screws are shown in Fig. 7-40 and Fig. 7-41.

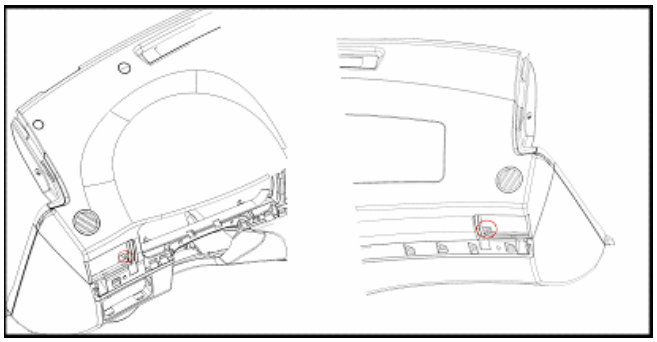


Fig. 7-40

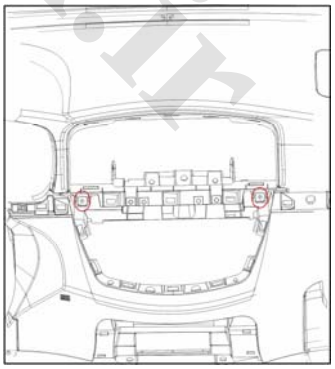


Fig. 7-41

Seen from back side, 5 buckles and 4 screws are needed to connect the upper and lower guard panels.

XI. Auxiliary fascia console (Fig. 7-42)

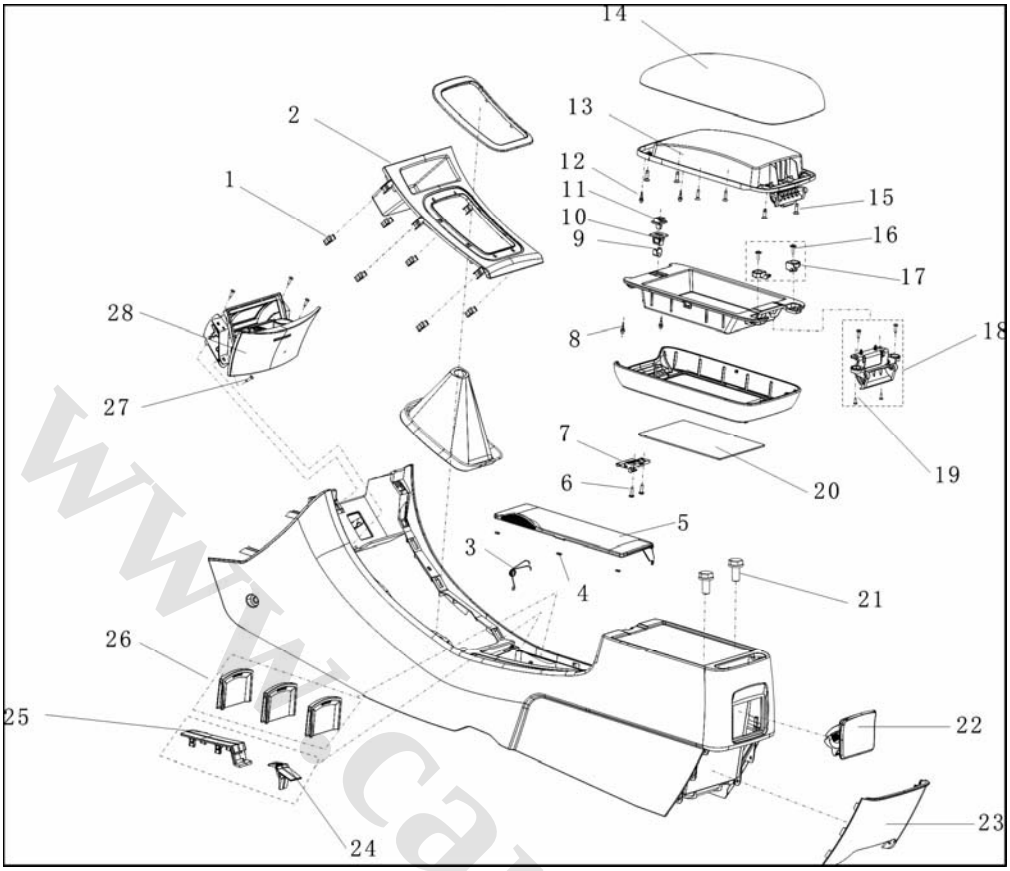


Fig. 7-42

1. Buckle 2. Middle and lower face shield 3. Outer panel spring of front cup salver cover
4. Buffer pad of front cup salver cover 5. Outer panel of front cup salver cover
6. Mounting screw 7. Spring switch mechanism of sundries box on auxiliary fascia console
8. Buffer pad of sundries box cover
9. Lower buckle seat spring of switch of small sundries box cover on auxiliary fascia console
10. Lower buckle seat of switch of small sundries box cover on auxiliary fascia console
11. Upper buckle of switch of small sundries box cover on auxiliary fascia console
12. Buffer pad of sundries box cover
13. Inner panel of upper cover of small sundries box cover on auxiliary fascia console
14. Small sundries box on auxiliary fascia console
15. Connecting screw of inner and outer panels of upper cover of sundries box cover on auxiliary fascia console
16. Upper retroflex hinge mounting screw of sundries box on auxiliary fascia console
17. Upper retroflex hinge mechanism of sundries box on auxiliary fascia console
18. Lower retroflex hinge mechanism of sundries box on auxiliary fascia console
19. Mounting screw of lower retroflex hinge mechanism of sundries box on auxiliary fascia console
20. Inner felt pad of sundries box on auxiliary fascia console 21. Installing bolt
22. Small assembly of rear ashtray 23. Rear guard panel of auxiliary fascia console passage
24. Rubber stopper of handbrake cover board 25. Handbrake cover board
26. Front cup salver clapboard 27. Installing screw 28. Front ashtray assembly

1. Removal

1) Remove trim strip of instrument panel and A/C control panel.

2) Remove the two screws fastening instrument panel and auxiliary fascia console under the A/C control panel.

3) Remove and replace screw 3 (2 screws in left and right)

4) Remove floor type handbrake cover board.

5) Open sundries case cover of auxiliary fascia console and remove the two bolts in the bottom.

6) Remove auxiliary fascia console assembly.

XII. Front bumper components replacement (Fig. 7-43)

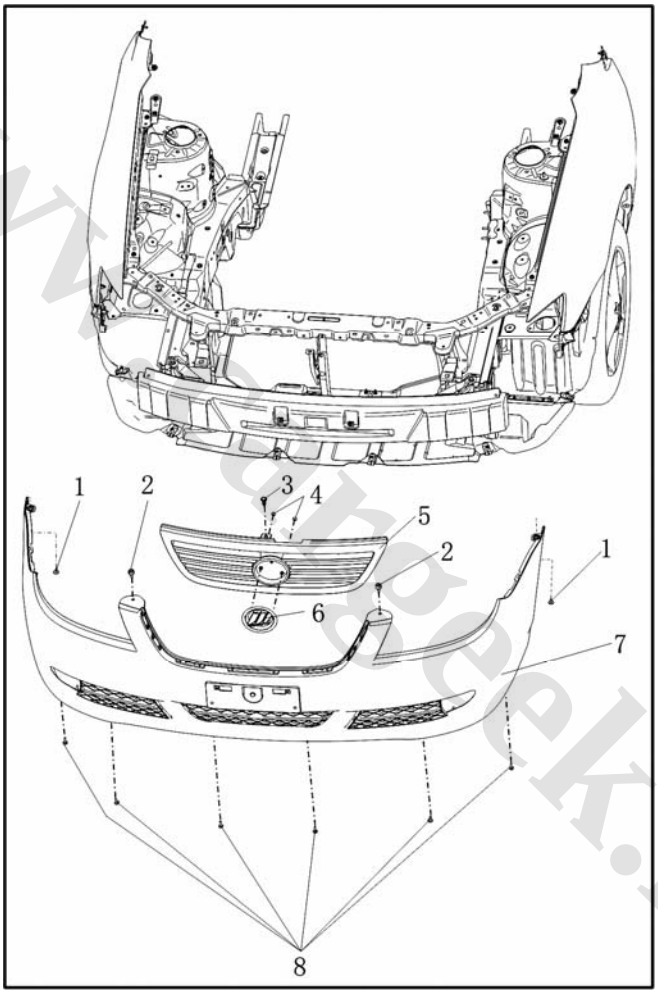


Fig. 7-43

1. Cross slot recessed hexangular head self-tapping screw 2. Rubber head bolt 3. Plastic buckle 4. Cross slot cup head self-tapping screw 5. Front grille 6. Mark 7. Front bumper 8. Cross slot hexangular head self-tapping screw

1. Remove front grille

Remove the mounting buckle of front grille and two rubber head bolts.

2. Disconnect the 3 jack catches and remove grille with a screwdriver.

Note: Wrap the screwdriver tip with adhesive tape before use.

3. Remove mudguard of left front wheel.
(a) Remove 2 screws.
(b) Remove mudguard of left front wheel.
Notes:
It is not necessary to completely remove the mudguard of left front wheel; the bumper can be removed in Step 4 if it is partly removed.
4. Remove mudguard of right front wheel. Notes: the same with Step 2.
5. Remove the other 2 screws connecting front bumper and engine mudguard.
6. Remove front bumper.
① Put protecting tape on the fender.
② Remove the 2 self-tapping screws connecting the left and right corners of front bumper and the fender.
③ Disconnect the 4 jack catches at left and right and the bumper with a screwdriver.
Notes:
Wrap the screwdriver tip with adhesive tape before use.
Disconnect the 2 fog light interfaces (optional).
7. Remove left fog light assembly
Remove screw and fog light.
8. Remove right fog light assembly.
Remove screw and fog light.
9. System with clearance sonar: Remove sonar retainer and sonar with screwdriver.
Notes: Wrap the screwdriver tip with adhesive tape before use.
10. Remove left connection bracket of front bumper with needle nose pliers.
11. Remove right connection bracket of front bumper.
Notes: the same with Step 8
12. Remove front bumper framework
Jack catch
Front bumper
Front grille
Left connection bracket of front bumper
Notes:
Wrap the screwdriver tip with adhesive tape before use.
Remove 4 nuts, 4 bolts and front bumper framework.
13. Install left connection bracket of front bumper.
14. Install right connection bracket of front bumper.
15. Install front bumper framework.
Install front bumper framework with 4 nuts and 4 bolts.
16. Install left connection bracket of front bumper.
17. Install right connection bracket of front bumper.
18. Install front bumper framework.
19. Install front grille with 2 bolts.

XIII. Rear bumper components (Fig. 7-44)

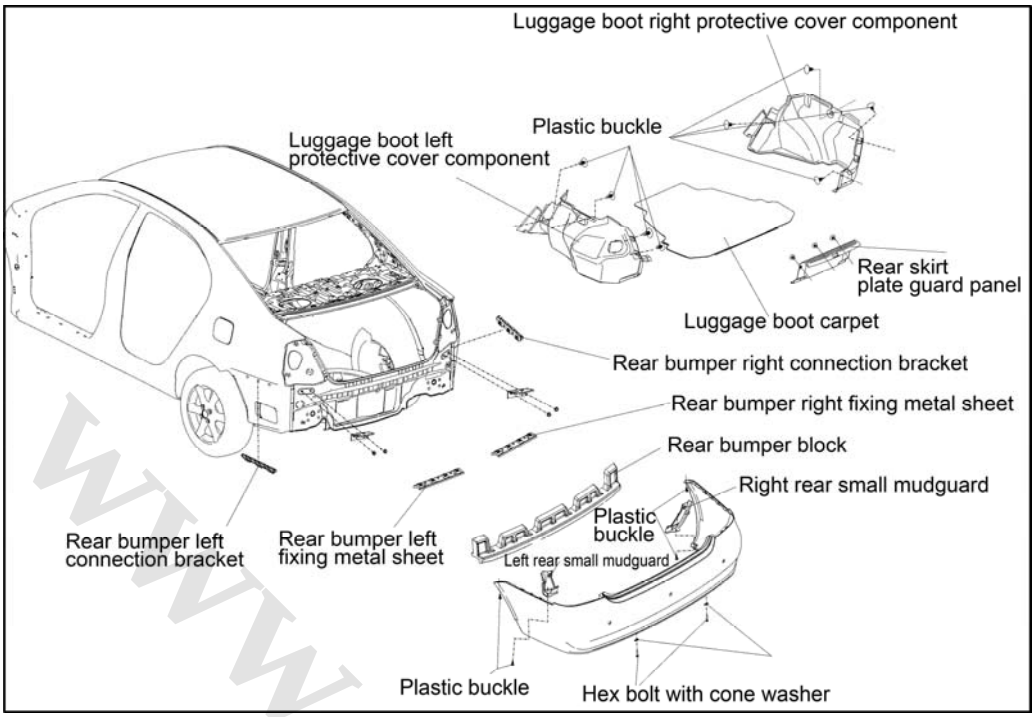


Fig. 7-44

1. Remove rear wall pedal

① Remove 3 buckles.

② Disconnect the 8 jack catches and rear skirt plate with screwdriver. Notes: Wrap the screwdriver tip with adhesive tape before use.

2. Remove floor felt pad in luggage boot.

3. Remove left felt pad in luggage boot.

Remove 4 buckles and left felt pad in luggage boot with buckle detacher. Notes: Wrap the screwdriver tip with adhesive tape before use.

4. Remove right felt pad in luggage boot. Notes: the same with Step 3

5. Remove left rear combination headlamp.

① Remove the 3 nuts fastening the combination headlamp with spanner.

② Disconnect interfaces of combination lamp.

③ Remove the combination headlamp. Notes: Do not scratch vehicle body paint and anticorrosion paint in the vehicle.

6. Remove right rear combination headlamp. Notes: the same with Step 5.

7. Remove left rear small mudguard

① Remove 2 screws and left rear small mudguard.

② Remove BL234 snap button and matching washer Q40208. Notes: Turn the sub-button with a cross-tip screwdriver in counter-clockwise direction.

8. Remove right rear small mudguard. Notes: the same with Step 7.

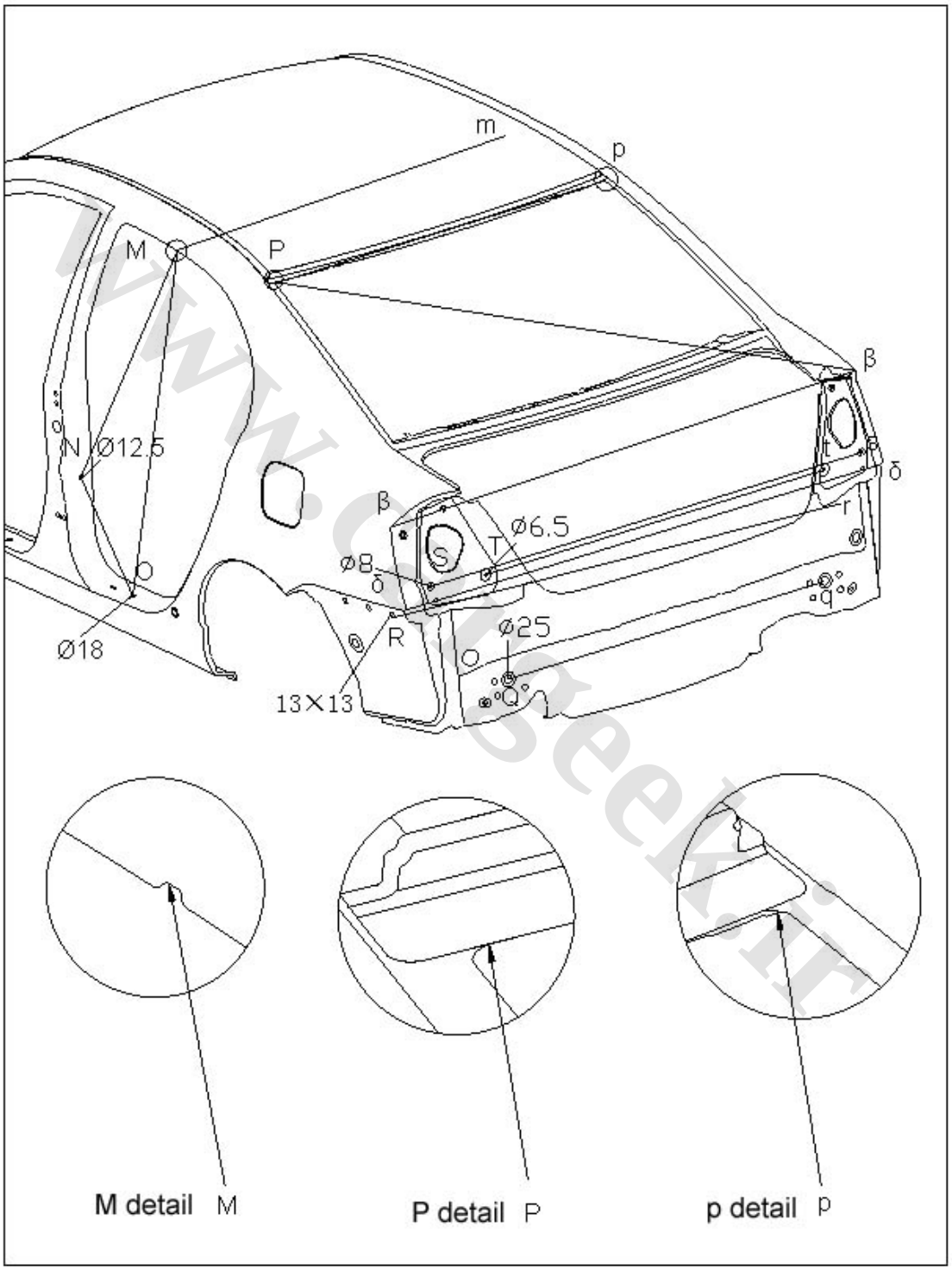
9. Remove rear bumper

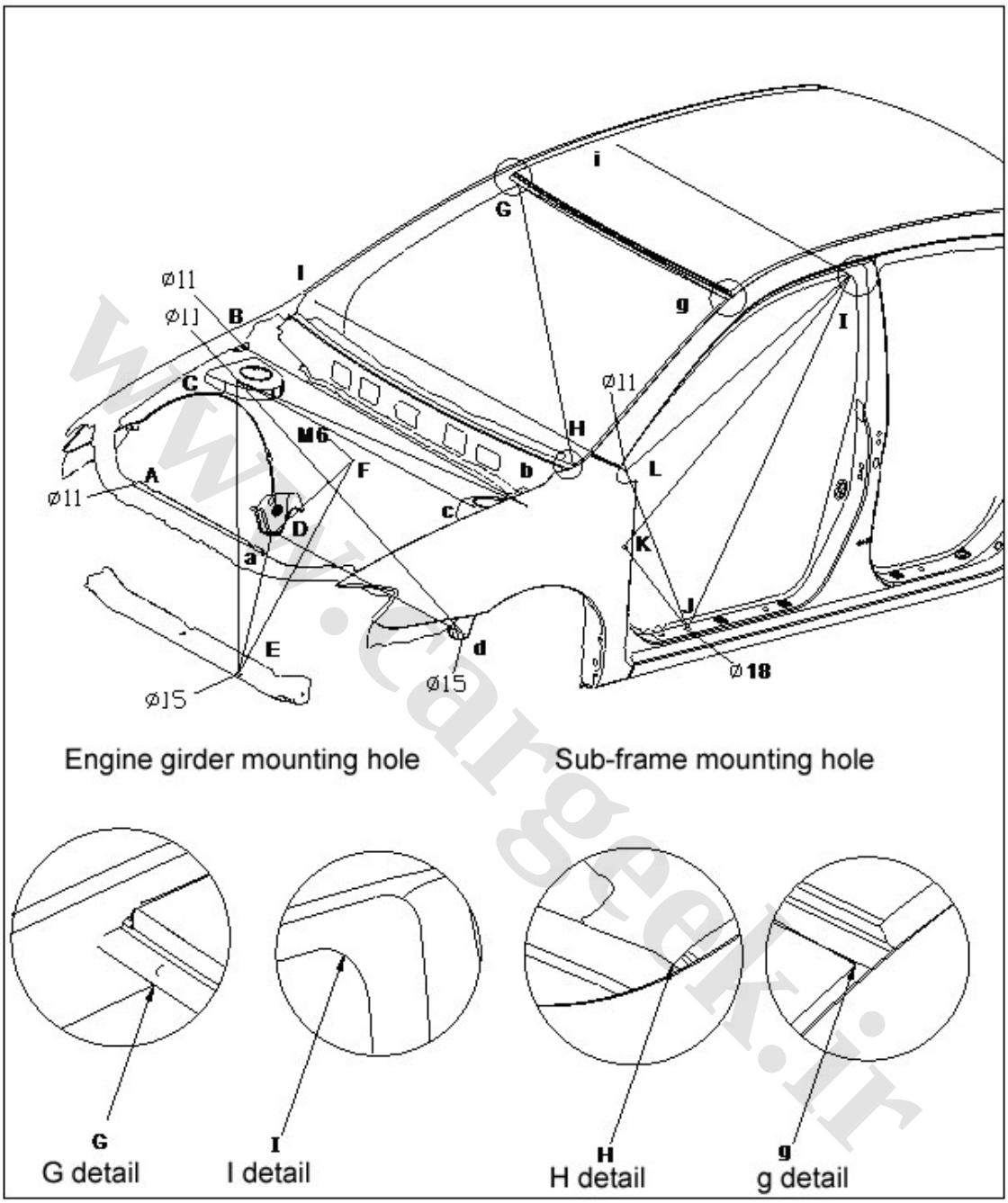
① Remove the 2 self-tapping screws in the left side of rear bumper with Phillips screwdriver.

② Remove the 2 self-tapping screws in the right side of rear bumper with Phillips screwdriver.

③ Remove the 2 bolts in the left side of rear bumper.
④ Remove the 2 bolts in the right side of rear bumper.
⑤ Remove the 2 BL1409 snap buttons in the bottom of rear bumper.
⑥ Put protecting tape under the side wall plate.
⑦ Disconnect the rear bumper and left and right connection brackets. Notes: Disconnect the 4 jack catches in the left and right with screwdriver.
⑧ After disconnecting rear bumper and left and right connecting pieces of rear wall, remove rear bumper. Notes: Pull backwards lightly the rear bumper with holding its two sides by hands and shake lightly from side to side to disconnect rear bumper from the jack catches of left and right connecting pieces of rear wall of rear bumper.
⑨ System with radar probe: Disconnect interfaces of probe wire.
10. System with radar probe: Remove the probe.
11. Remove left connection bracket of rear bumper.
12. Remove the right connection bracket of rear bumper.
13. Remove framework of rear bumper: Rear bumper framework can be removed after the removal of 6 nuts.
14. Remove left mounting bracket of rear bumper framework: Remove the 3 bolts and left mounting bracket of rear bumper framework.
15. Remove right mounting bracket of rear bumper framework: Remove the 3 bolts and right mounting bracket of rear bumper framework.
16. Install left mounting bracket of rear bumper framework: Install with 3 bolts; fixing torque: 11.5N·m.
17. Install right mounting bracket of rear bumper framework: Install with 3 bolts; fixing torque: 11.5N·m.
18. Install rear bumper with 4 buckles and 4 screws and 4 blots in the 2 sides. To install, reverse the removal steps.

Chapter VIII Vehicle Body Dimension

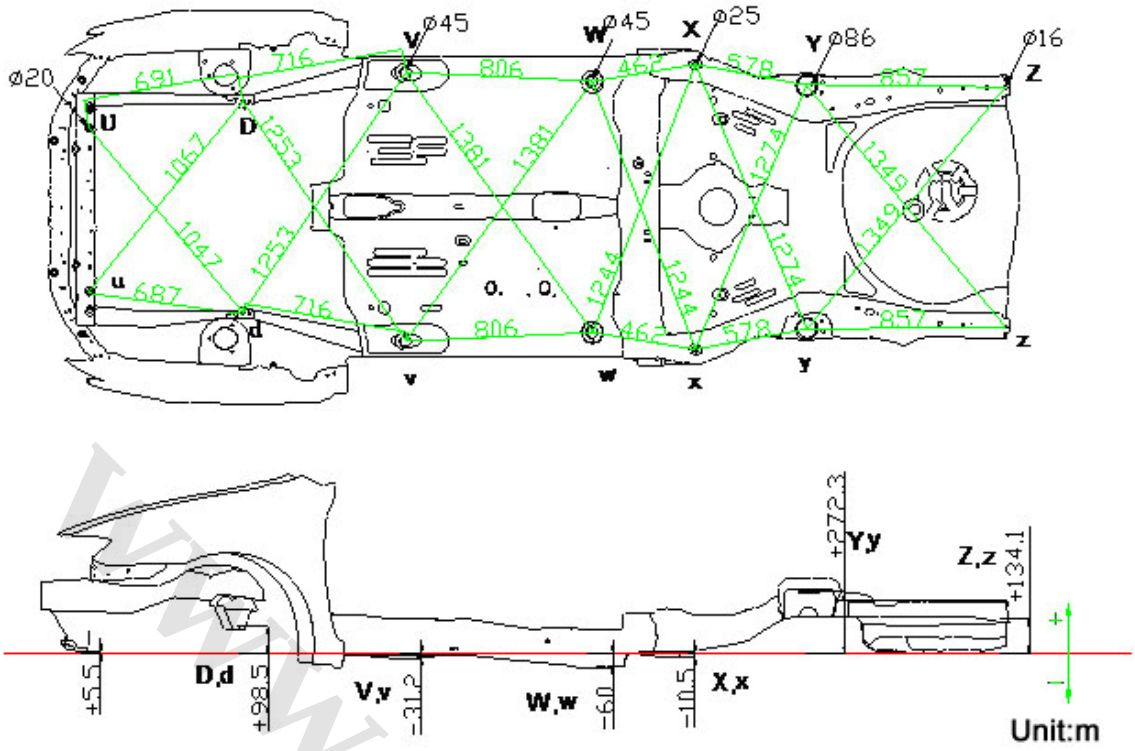




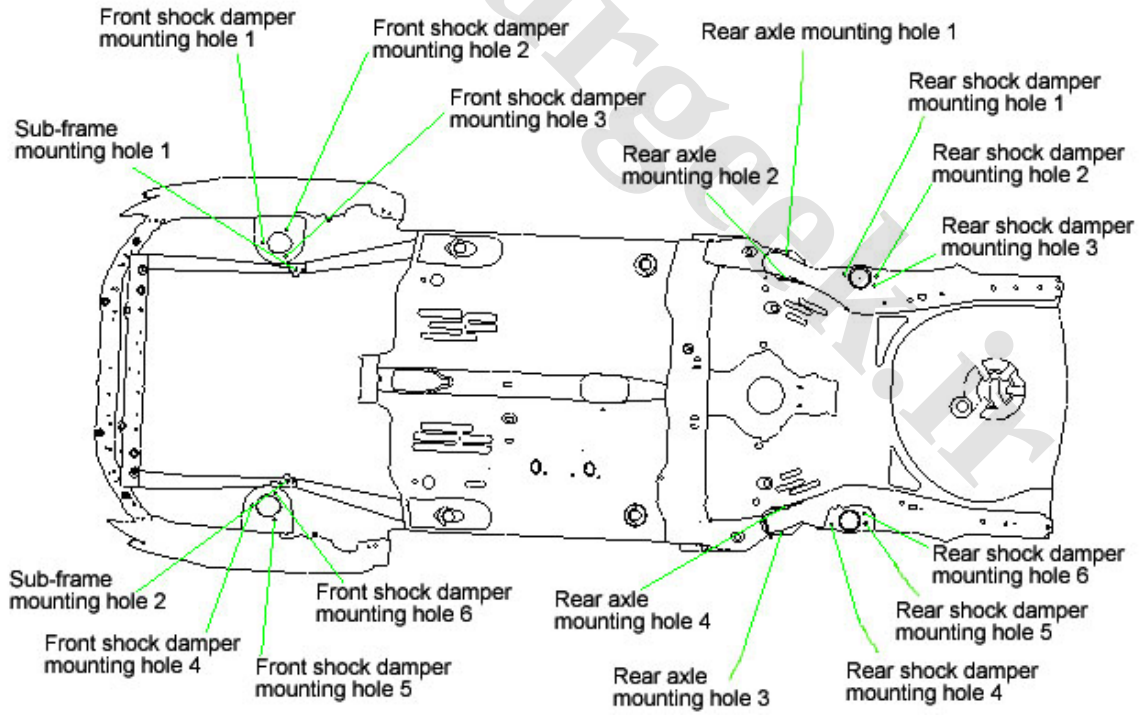
S/N	Measuring point	Dimension parameter (mm)	Remark	S/N	Measuring point	Dimension parameter (mm)	Remark
1	A-a	690		17	I-K	1223.6	
2	A-B	835.2		18	I-L	1146.4	
3	A-C	685.2		19	L-l	1490.6	
4	B-b	1365		20	M-m	1126.5	
5	C-c	1136.6		21	M-N	834.7	
6	C-b	1256.4		22	M-O	1024.9	
7	C-d	1147.4		23	N-O	374.8	
8	C-E	952.8		24	P-p	1066.6	
9	C-F	706		25	Q-q	1028	
10	D-d	911.5		26	R-r	1524.9	
11	D-E	888		27	S-s	1398	
12	D-F	507.9		28	T-t	1097	
13	E-F	848.8		29	β - β	1506.7	
14	G-H	1437.9		30	δ - δ	1550.2	
15	I-i	1130.4		31	P- β	1608.7	
16	I-J	1255.2		32	G-g	1056.4	

Hole usage description

S/N	Remark	S/N	Remark
A, a	Engine radiator assembly mounting hole	Q, q	Rear panel weld positioning hole
B, b	Fender mounting hole	R, r	Rear bumper connecting piece mounting hole
C, c	Front shock damper assembly mounting hole	S, s	Tail lamp mounting hole
D, d	Sub-frame assembly mounting hole	T, t	Tail lamp mounting hole
E, e	Engine girder mounting hole	U, u	Engine radiator assembly mounting hole
F	Four-way proportional valve mounting hole	V, v	Front floor weld positioning hole
J	Door sill technical hole	W, w	Front floor weld positioning hole
K	Front door limiter mounting hole	X, x	Rubber cover stem mounting hole
L	Fender mounting hole	Y, y	Rear shock damper assembly mounting hole
N	Rear door limiter mounting hole	Z, z	Rear towing eye hook
O	Door sill technical hole		



Front and rear shock dampers and sub-frame rear axle mounting holes coordinate:



Front and rear shock dampers and front and rear sub-frames mounting holes coordinate:

Hole name	X (mm)	Y (mm)	Z (mm)
Sub-frame mounting hole 1	56.9	-455.6	113.0
Sub-frame mounting hole 2	56.9	455.6	113.0
Front shock damper mounting hole 1	-39.7	-568.3	621.4
Front shock damper mounting hole 2	59.3	-625.5	619.2
Front shock damper mounting hole 3	59.2	-511.3	614.4
Front shock damper mounting hole 4	-39.7	568.3	621.4
Front shock damper mounting hole 5	59.3	625.5	619.2
Front shock damper mounting hole 6	59.2	511.3	614.4
Rear axle mounting hole 1	2196.5	-616	0
Rear axle mounting hole 2	2196.5	-512	0
Rear axle mounting hole 3	2196.5	616	0
Rear axle mounting hole 4	2196.5	512	0
Rear shock damper mounting hole 1	2442	-537.1	280.5
Rear shock damper mounting hole 2	2583.5	-536.1	280.4
Rear shock damper mounting hole 3	2576	-491.9	275.9
Rear shock damper mounting hole 4	2442	537.1	280.5
Rear shock damper mounting hole 5	2583.5	536.1	280.4
Rear shock damper mounting hole 6	2576	491.9	275.9

Vehicle body coordinates origin: X0 is in the center of front axle; Y0 is in the bilateral symmetry center; and Z0 is in the upper surface of middle floor.

LIFAN MOTORS

Chongqing Lifan Industry(group) Imp.&Exp.co.,Ltd.
Chongqing Lifan Passenger Vehicle Co.,ltd.
Add:NO.60 Zhangjiawan,Shangqiao,Shapingba
District,Chongqing,China.
Website: www.lifan.com/enauto
E-mail: iecauto@lifan. com
Dec,2008