



APPLICATION

LINE-UP \ REGION	REGION	KOREA	GENERAL AREA	MIDDLE EAST	EC	NORTH AMERICA	AUS
DDC 2.0 DSL	MT	O	O	O	O	-	-
	AT	O	O	O	O	-	-
β-2.0 CVT	MT	-	O	O	O	O	S
	AT	-	O	O	O	O	O
δ-2.7 V6	AT	-	O	O	O	O	O

* O: Optional Item, S; Standard Item



Enhanced Vehicle Dynamics

- Improved dynamics during acceleration and deceleration
- Rapid activation and deactivation
- Fully controllable torque transfer characteristics

Enhanced Vehicle Driving Comfort and Transparency

- No wind-up during tight cornering and parking
- Optimal traction during acceleration

Enhanced Vehicle System Compatibility

- On-line communication with the CAN system

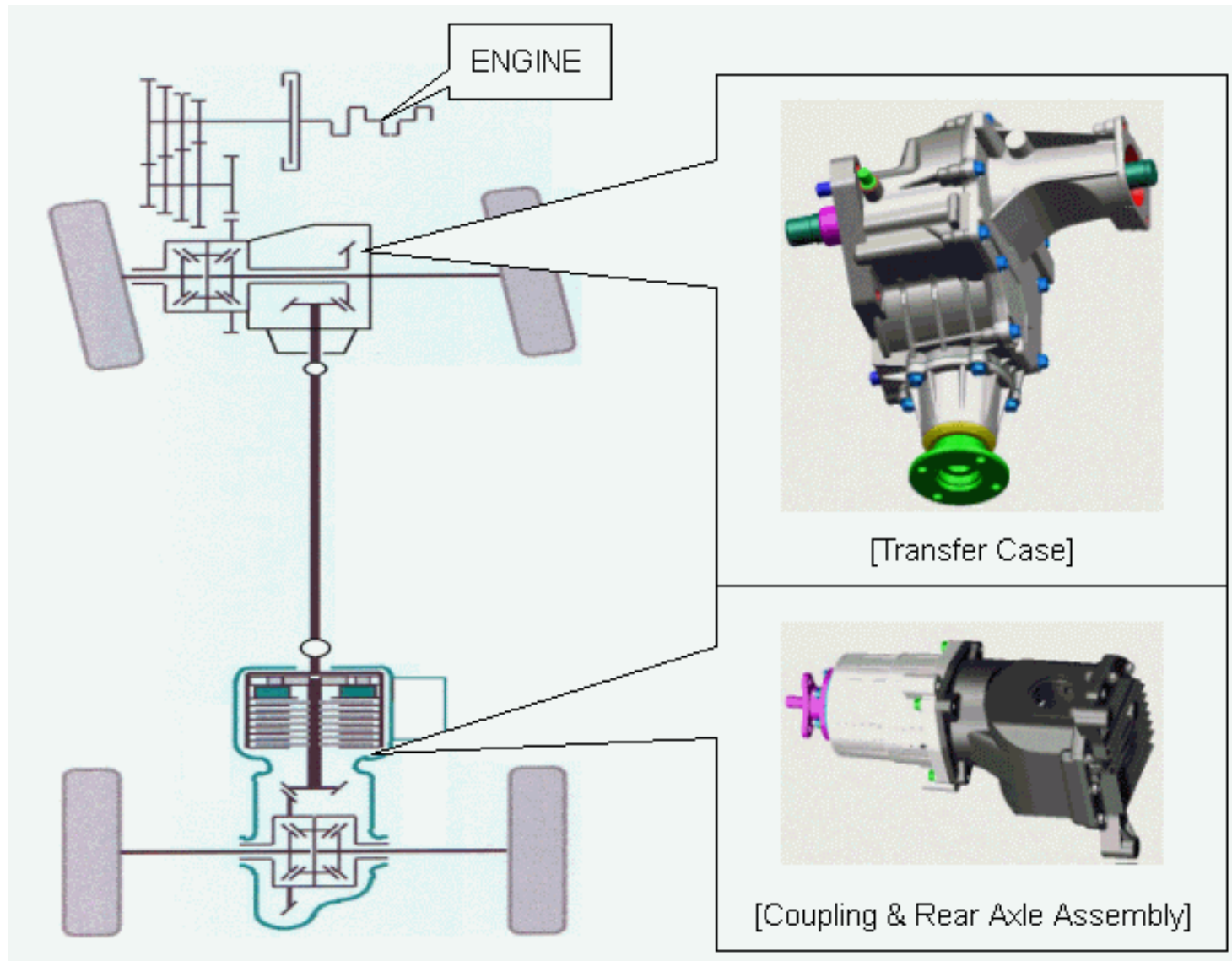
Better Fuel Consumption

- Compared with 4WD

Variable Torque Control

- **At Parking:** Low or zero torque transfer
(for easy and comfortable maneuverability)
- **Acceleration:** High torque transfer for maximum traction
- **High speed driving:** Reduced torque transfer, to minimum
- **Driving on slippery/wet roads:** Swift activation of the coupling
(for maximum traction and safety depending on the slip of the wheels)
- **ABS:** Immediate deactivation on ABS signal
- **ESP/TCS:** Immediate deactivation on ESP/TCS signal
- **Off-road:** Rapid activation with high torque transfer for maximum traction

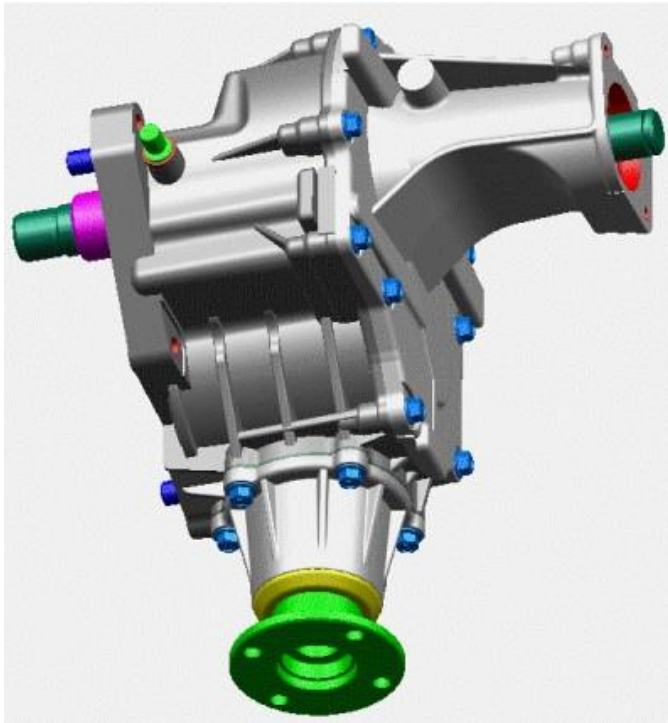
LAYOUT OF JM 4WD SYSTEM



T/M & TRANSFER CASE

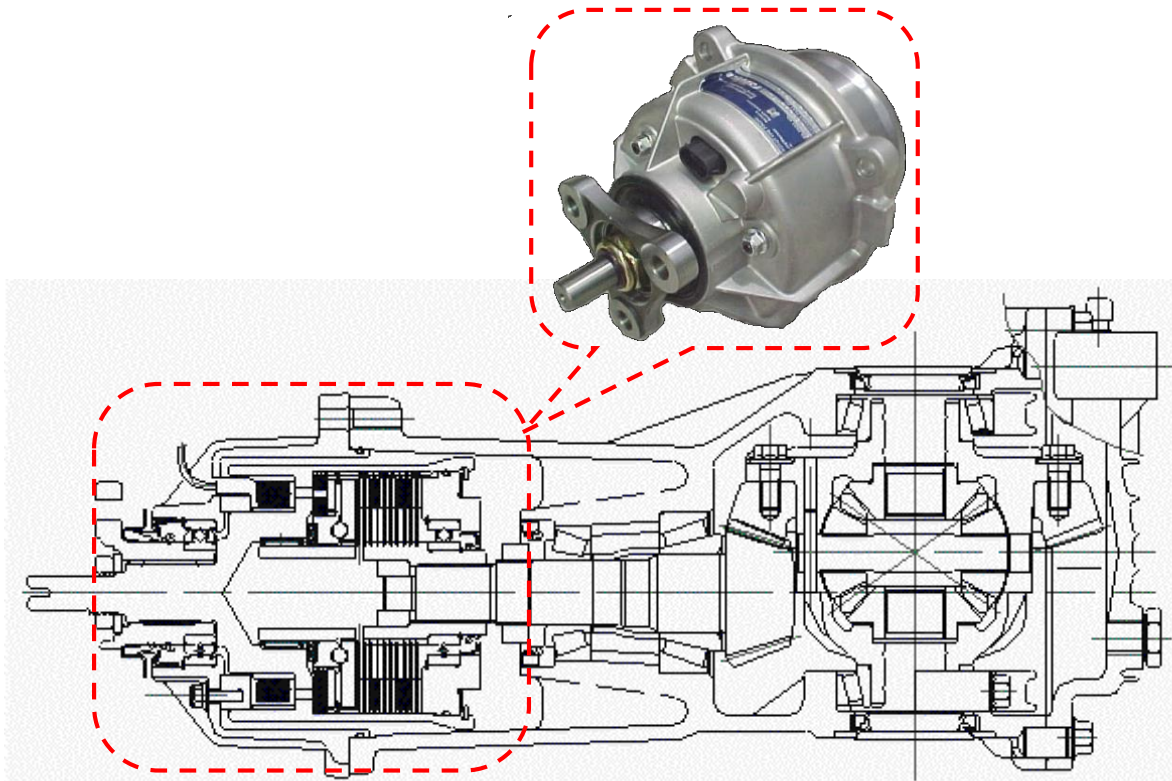
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- 4WD Transfer Case:** Santa Fe base modification
- T/M Case:** Modification of 4WD transfer matching part
- T/M Differential for 4WD:** Modification of transfer matching part



COUPLING & REAR AXLE ASSEMBLY

- **Coupling:** Same as Santa Fe
- **Rear Axle:** Santa Fe base modification
- **Control Unit:** Santa Fe base modification

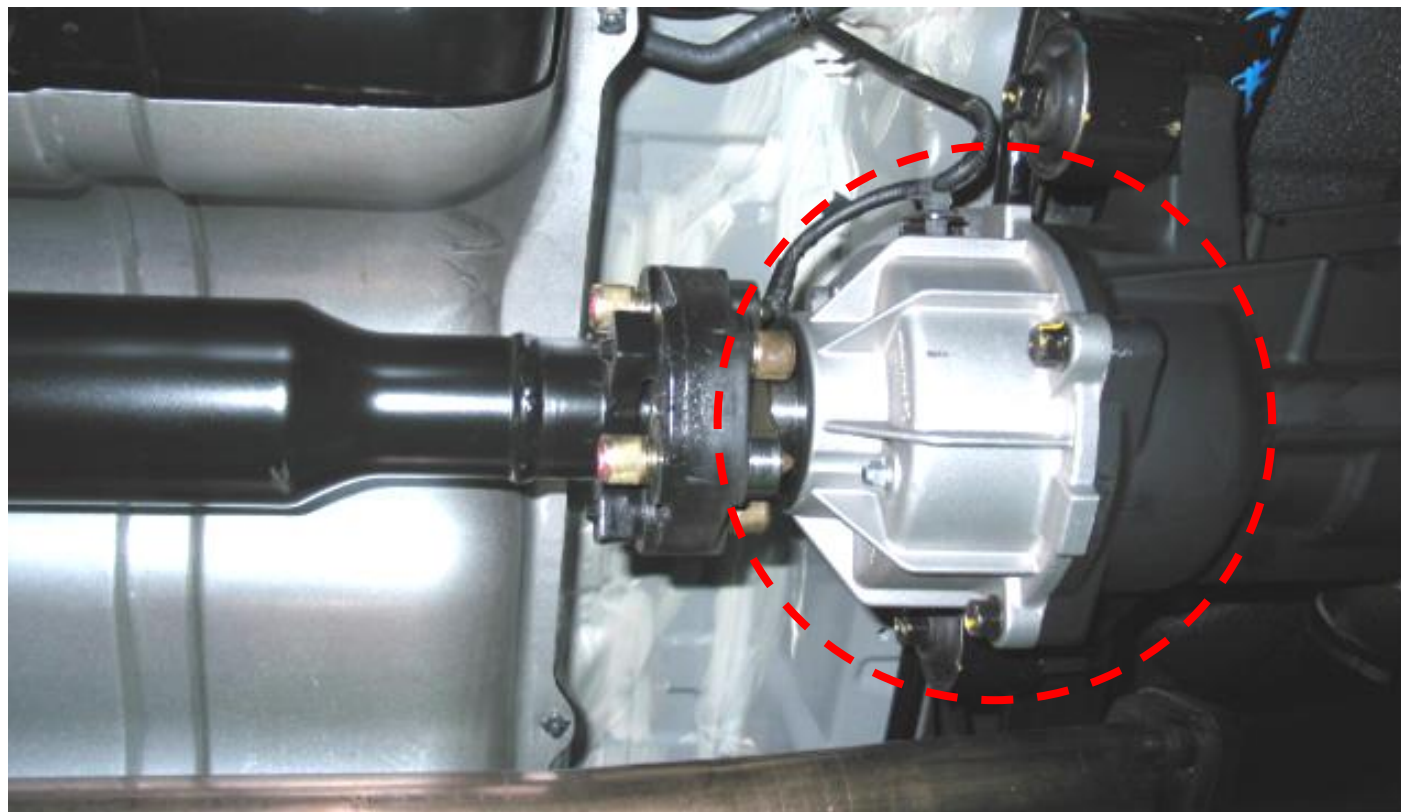


SPECIFICATION

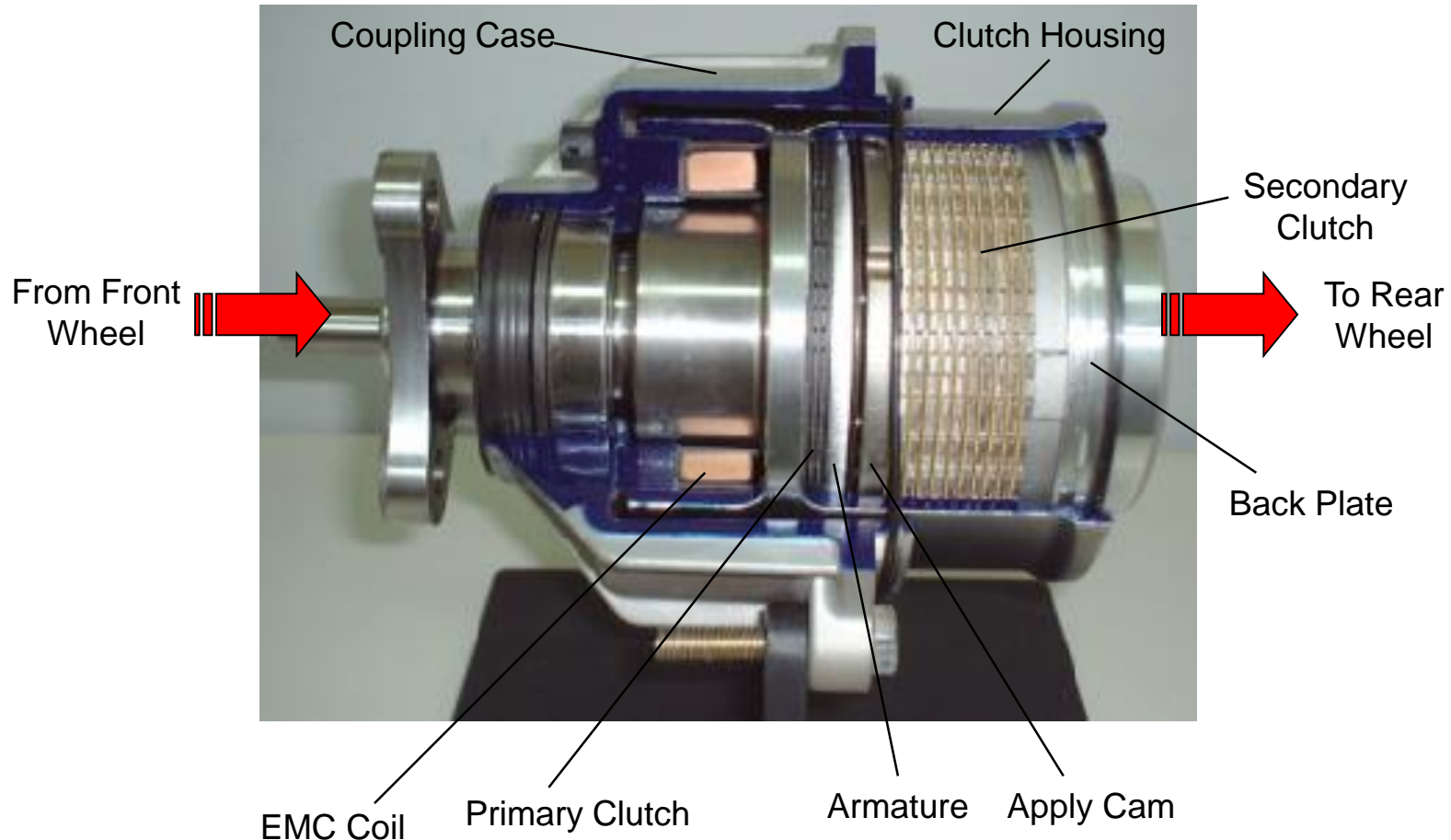
ITM	Feature	Self-contained, compact, light-weight, torque transfer device for on-demand 4WD
	Torque	2000 Nm
	Weight	8 kg
	Size	150mm Long, 140mm OD, 120mm ID
	Housing	Aluminum
	Operating Voltage	12 volts
	Operating Temperature	-40 °C ~ 150 °C
	4WD Coupling Oil	Mobil Fluid – LT (0.15L)
	Primary Clutch	Disc (3 EA), Plate (3 EA)
	Secondary Clutch	Disc (10 EA), Plate (10 EA)

LOCATION OF ITM COUPLING

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STRUCTURE OF COUPLING



COMPONENTS OF COUPLING



[Housing]



Primary Clutch



[Primary Clutch]



Armature

Base Cam



[Armature]



[Base Cam]

COMPONENTS OF COUPLING

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Apply Cam

Base Cam



Back Plate

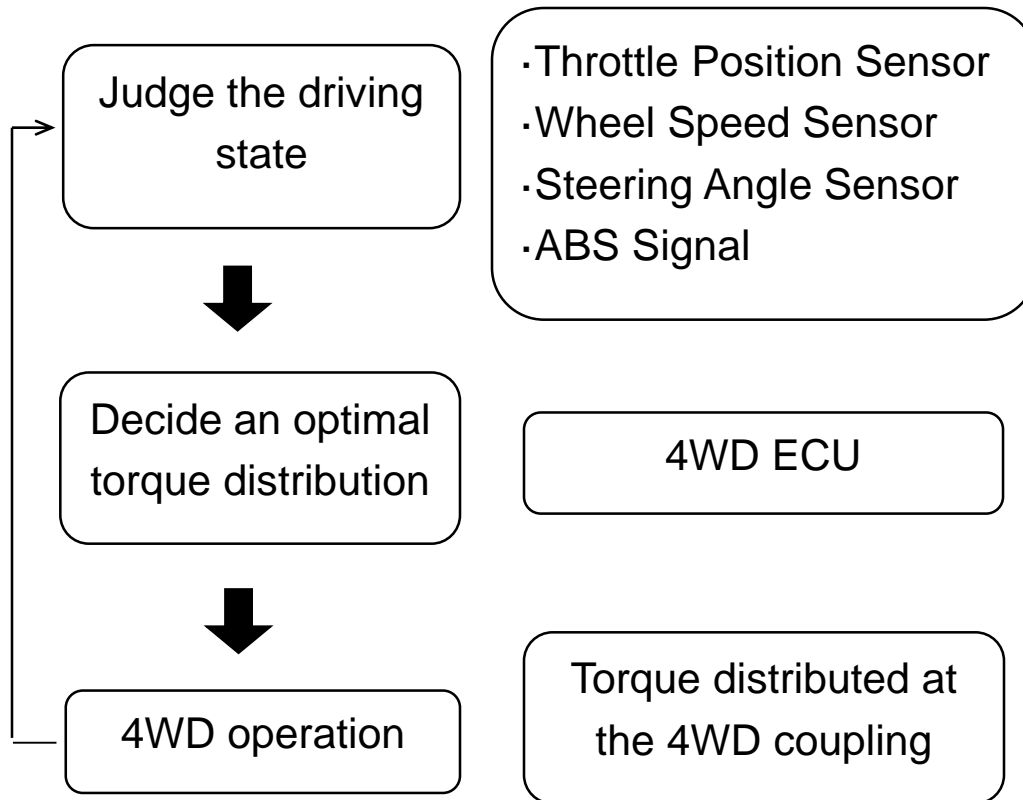
To rear differential



EMC connector

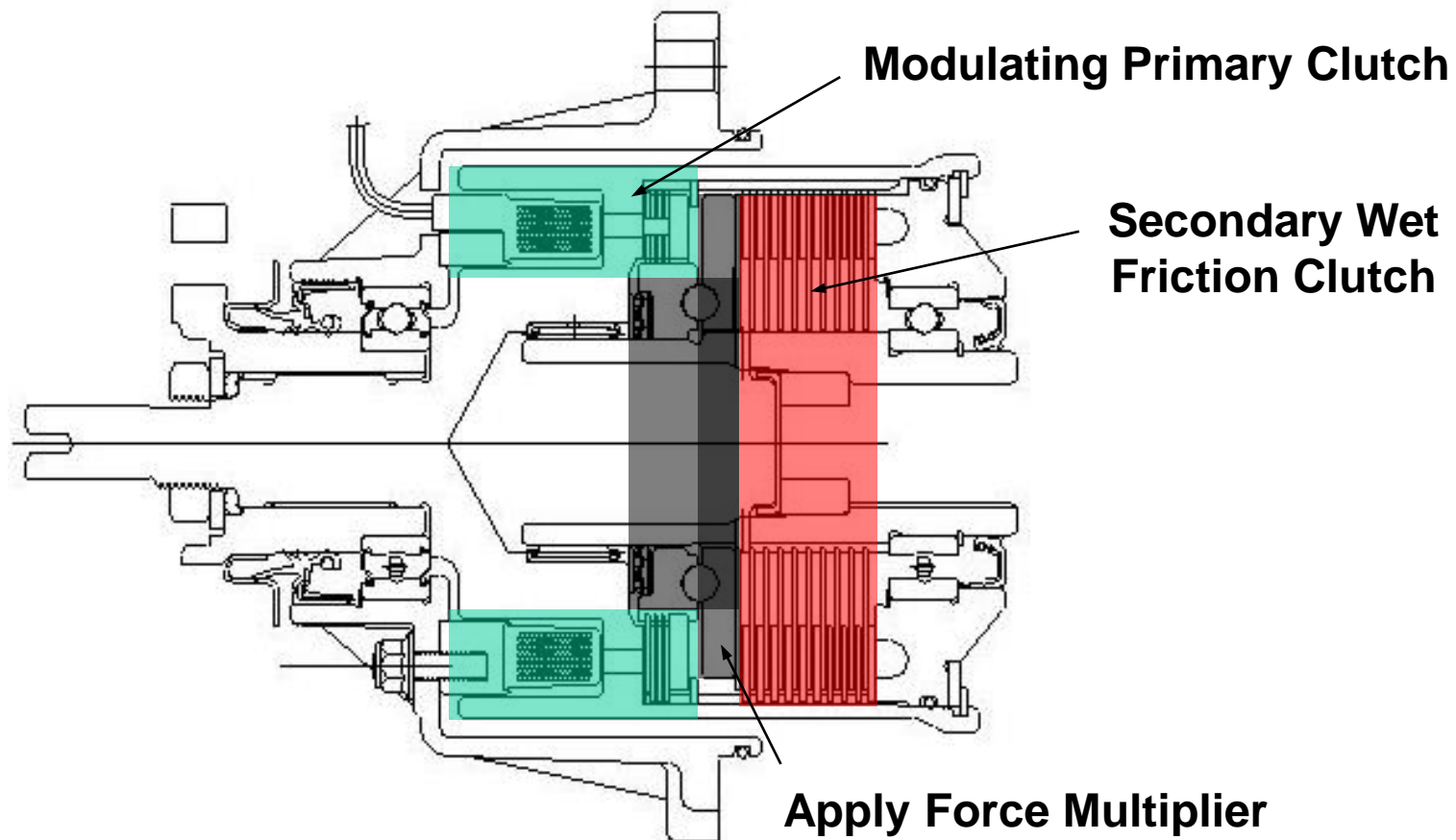


OPERATION OF COUPLING



[Operating Chart]

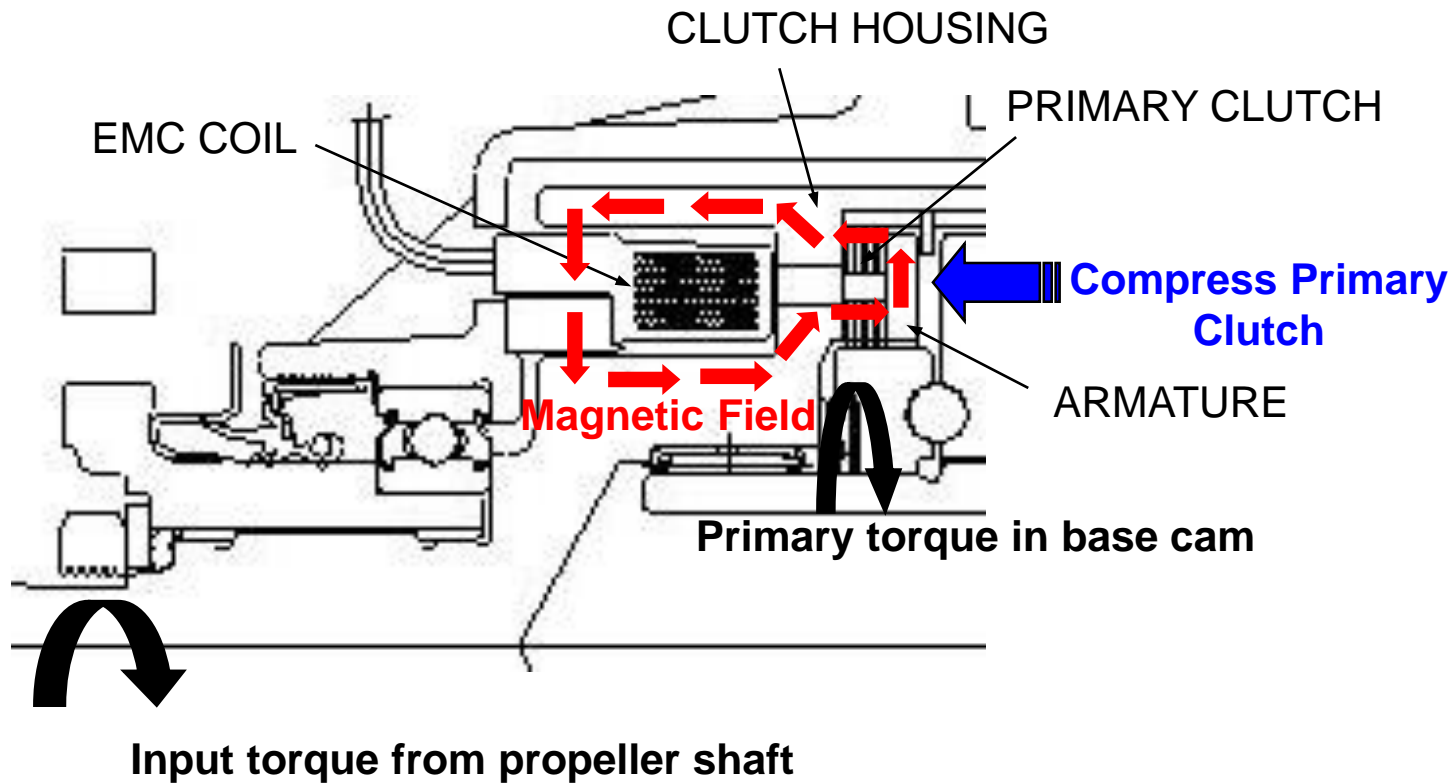
OPERATION OF COUPLING



OPERATION OF COUPLING

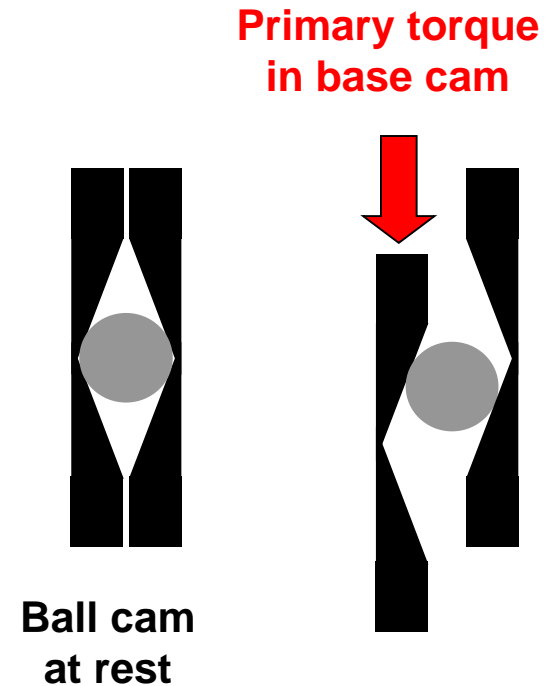
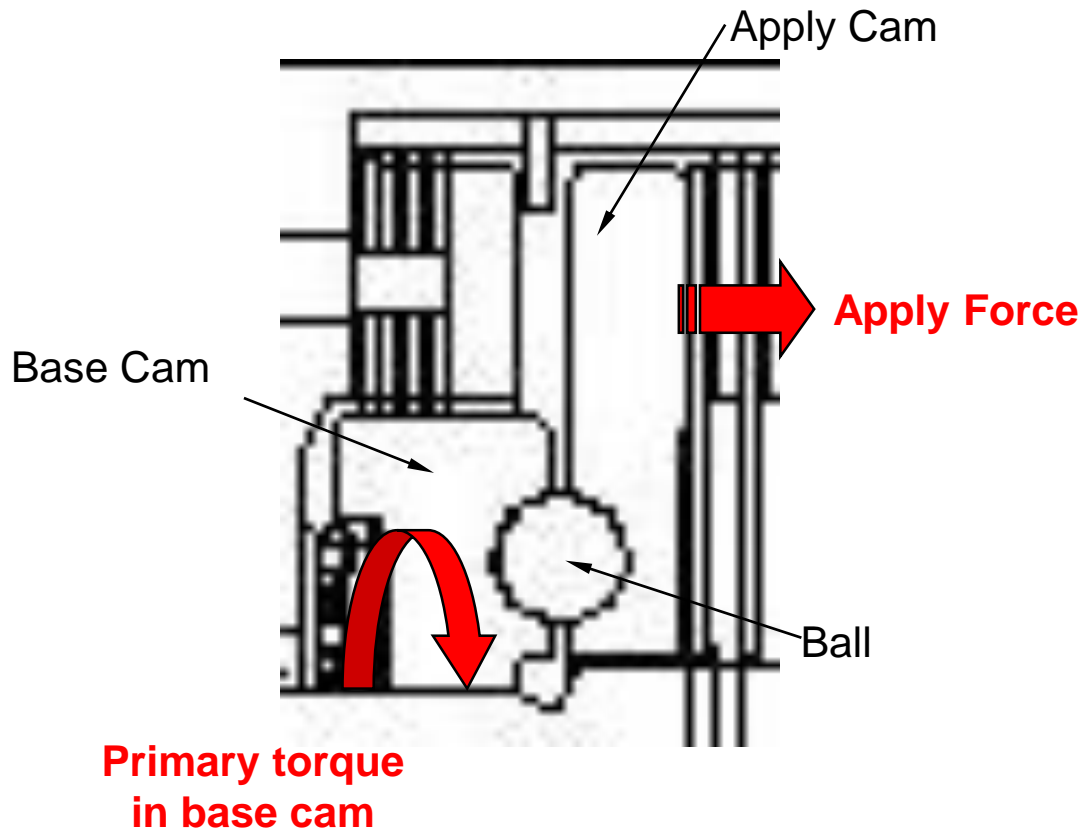
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MODULATING PRIMARY CLUTCH



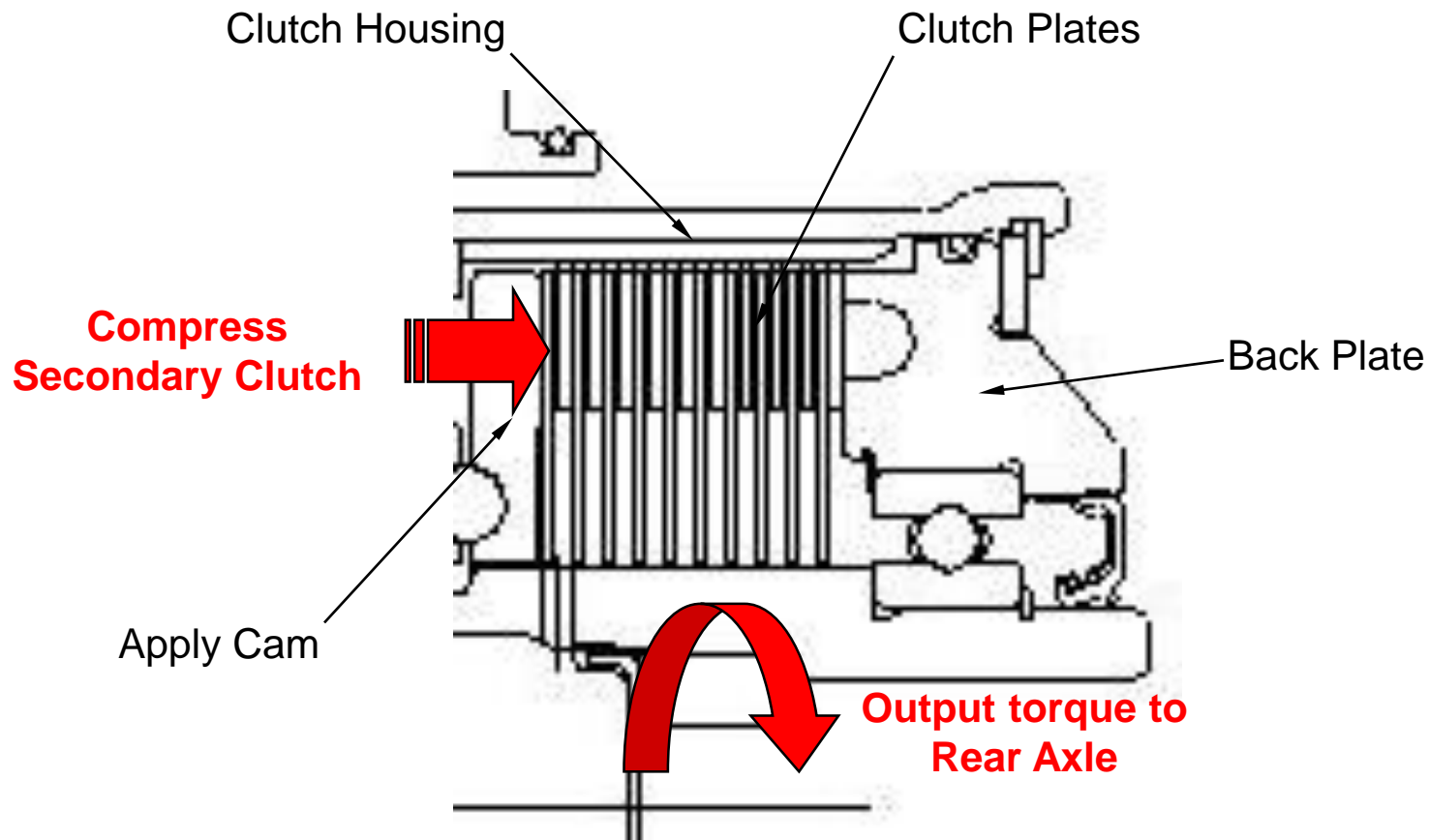
OPERATION OF COUPLING

APPLY FORCE AMPLIFIER



OPERATION OF COUPLING

DARY WET FRICTION CLUTCH



INPUTS AND OUTPUTS

INPUTS

BATTERY & IGNITION1

STEERING ANGLE SENSOR
(ESP by CAN)

WHEEL SPEED SENSOR
(ABS/TCS, ESP by CAN)

ABS ACTIVE (by CAN)

TPS (by CAN)

4WD LOCK SWITCH



**4WD
CONTROL
MODULE
(ITMCM)**



OUTPUTS

EMC

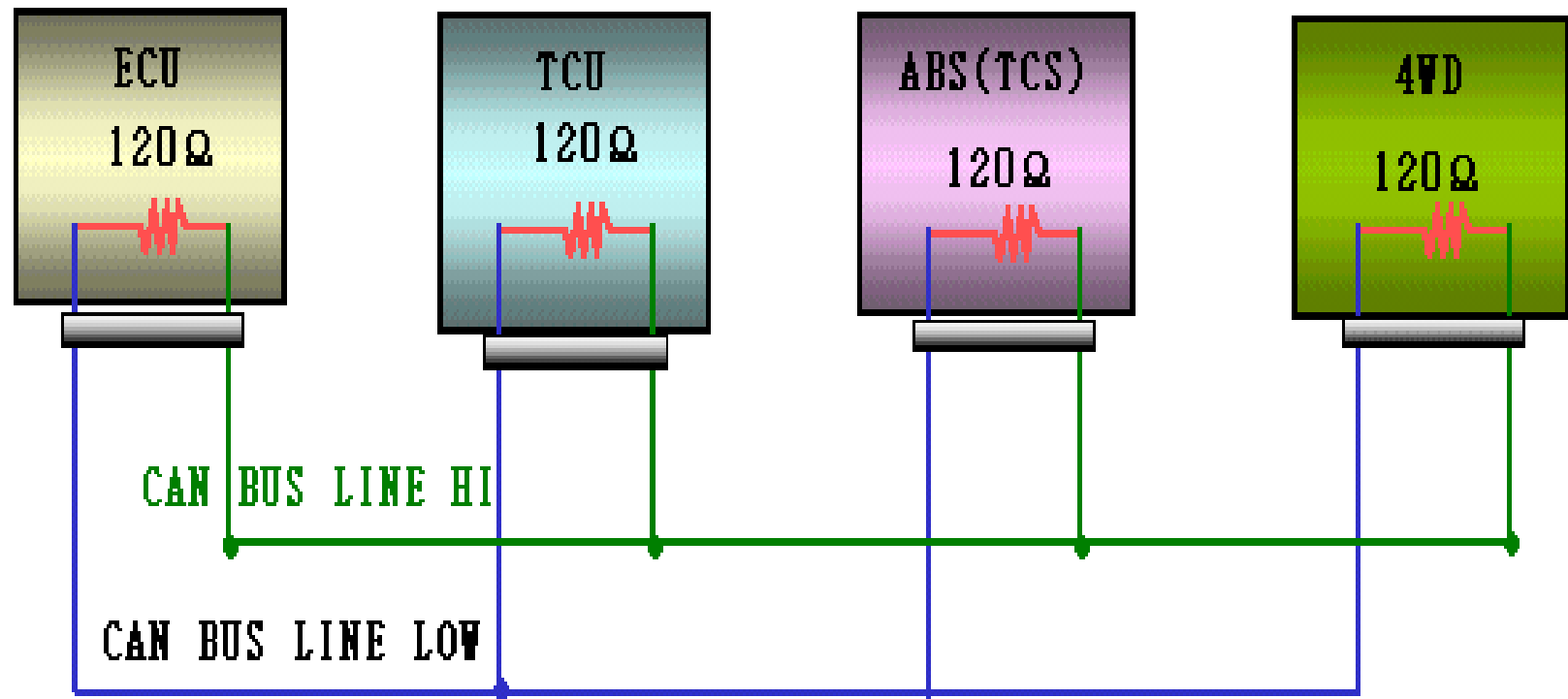
4WD WARNING LAMP

4WD LOCK LAMP

DIAGNOSIS

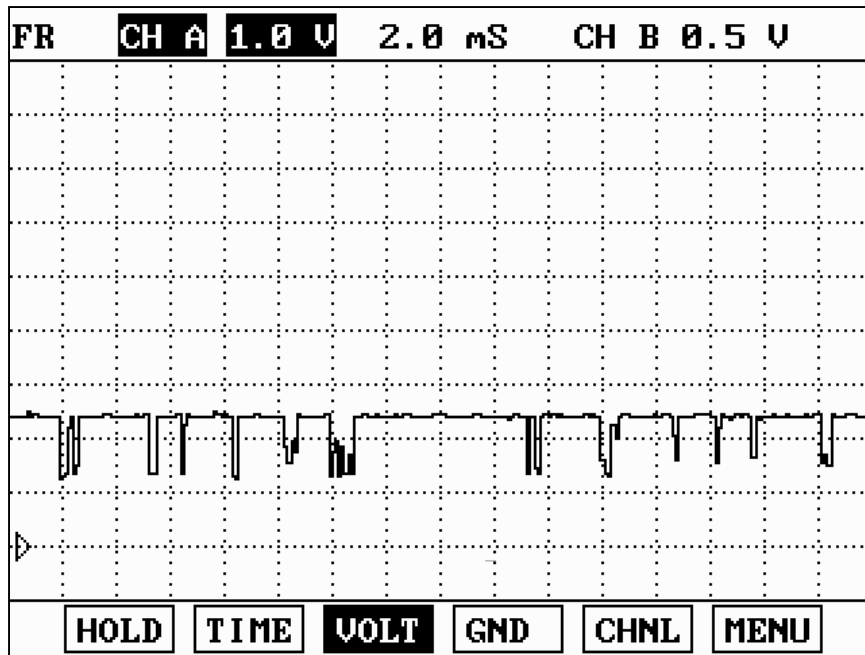


CAN COMMUNICATION

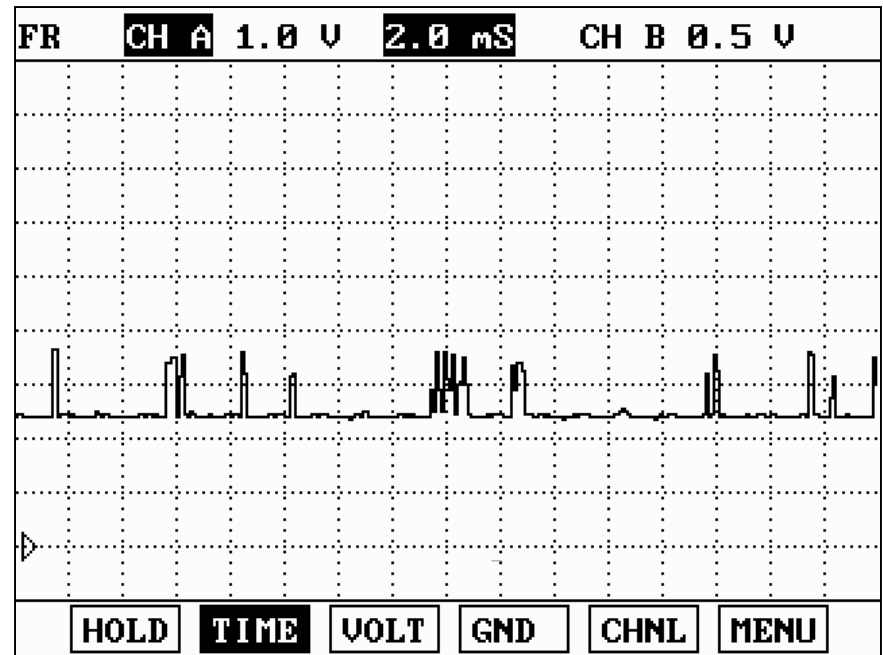


CAN COMMUNICATION

OUTPUT SIGNAL



[CAN-LOW]



[CAN-HIGH]

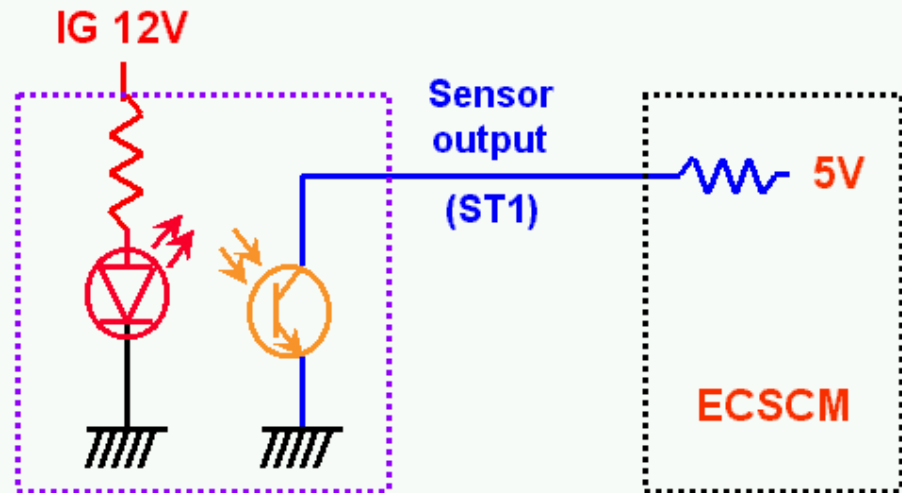
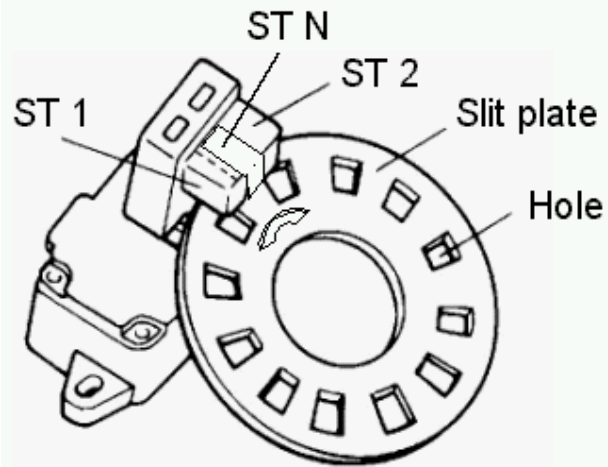
STEERING ANGLE SENSOR

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Application

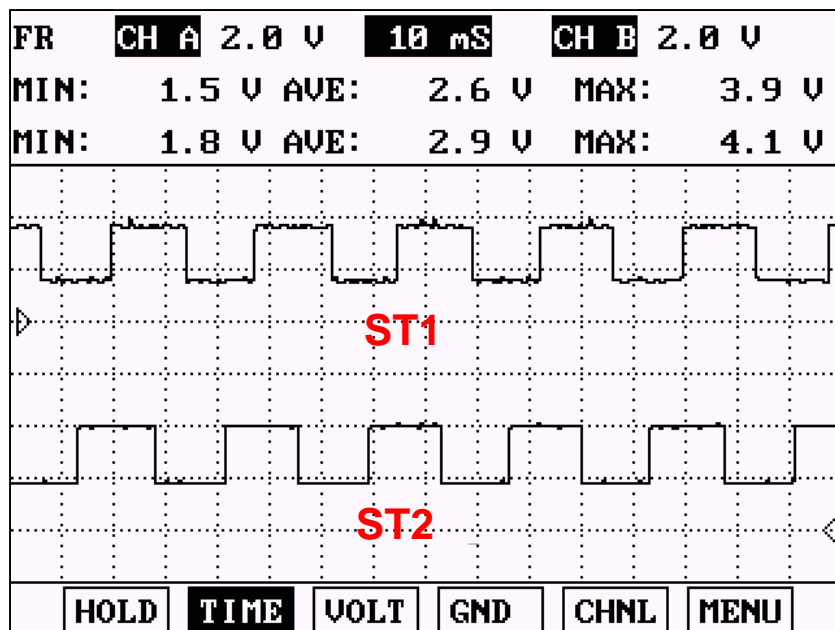
- Location: Inside steering wheel
- Calculate the steering amount and direction
- 3 Input Signals (ST 1, ST 2, ST N)
- ST N detects the neutral position of steering wheel
- Output voltage : $1.3 \leq V_{OL} \leq 2.0V$, $3.0 \leq V_{OH} \leq 4.1V$



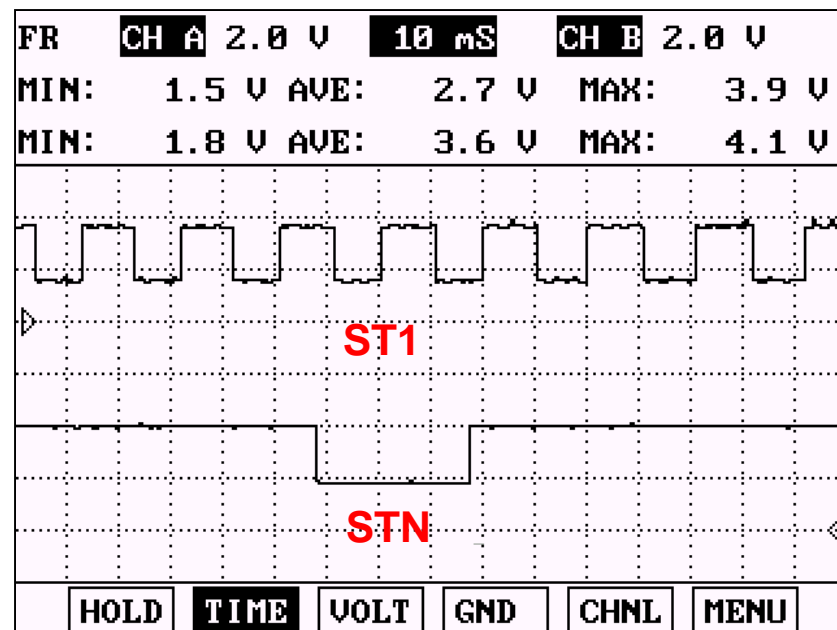
STEERING ANGLE SENSOR

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OUTPUT SIGNAL



[Steering sensor output, ST1/ST2]



[Steering sensor output, ST1/STN]



ACTIVE WHEEL SPEED SENSOR

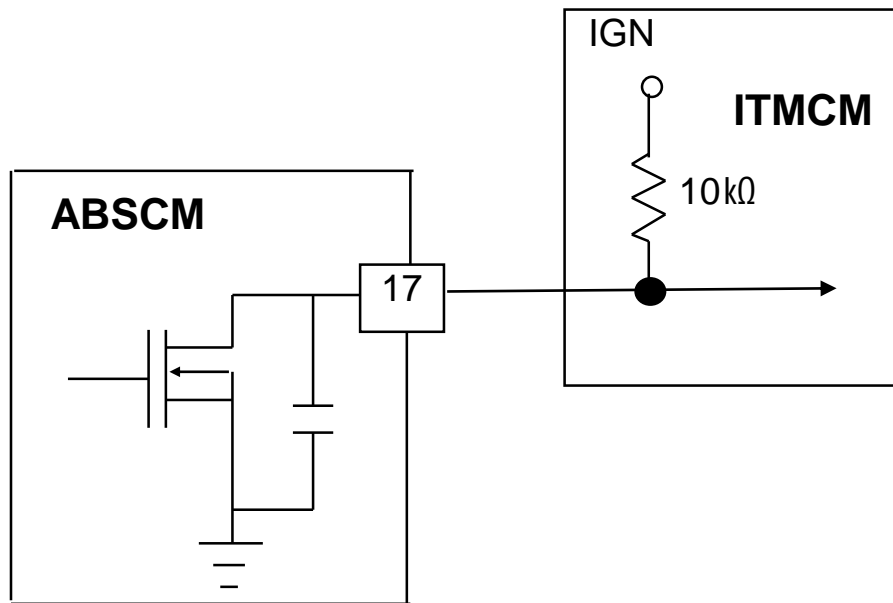


- Type: Hall Effect
- Components: HALL IC, Capacitor, Magnet
- Output signal: Digital (Open Collector Type circuit integrated)
- Good characteristics against temperature variation and noise
- Low RPM Detection: 0 RPM can be detected
- Air gap sensitivity: stable output pulse width against air-gap change
- Supplying power: DC 12V

OUTPUT SIGNAL		MAX	TYPICAL	MIN
LOWER SIGNAL	I_{LOW} (mA)	5.9	7	8.4
UPPER SIGNAL	I_{HIGH} (mA)	11.8	14	16.8
SIGNAL RATIO	I_{HIGH} / I_{LOW}	1.85 or more		
OPERATING FREQUENCY		1 ~ 2500 Hz		
OPERATING DUTY		30~70%		

ABS ACTIVE SIGNAL

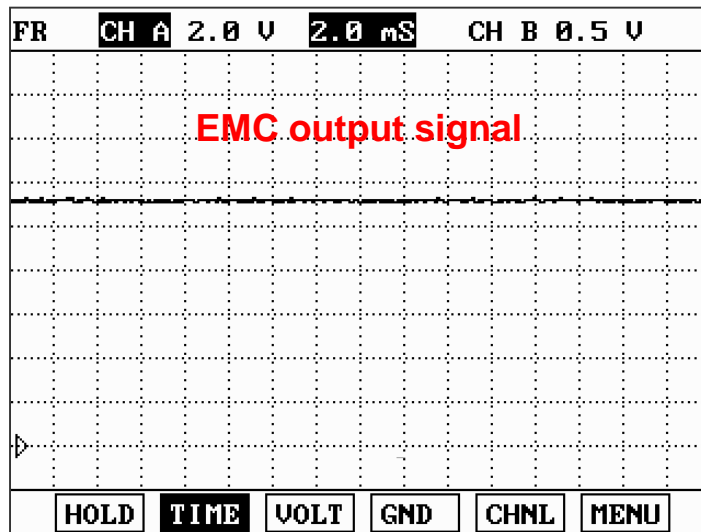
- Type : ABSCM side --- OPEN COLLECTOR TYPE
- ITMCM side --- 12V PULL UP
(NO ABS CONTROL $\geq 9.0V$, ABS IN CONTROL $< 0.5V$)
- PULL UP resistance = $10k\Omega$



4WD LOCK SWITCH



[4WD LOCK Switch]



[When '4WD LOCK' is selected]



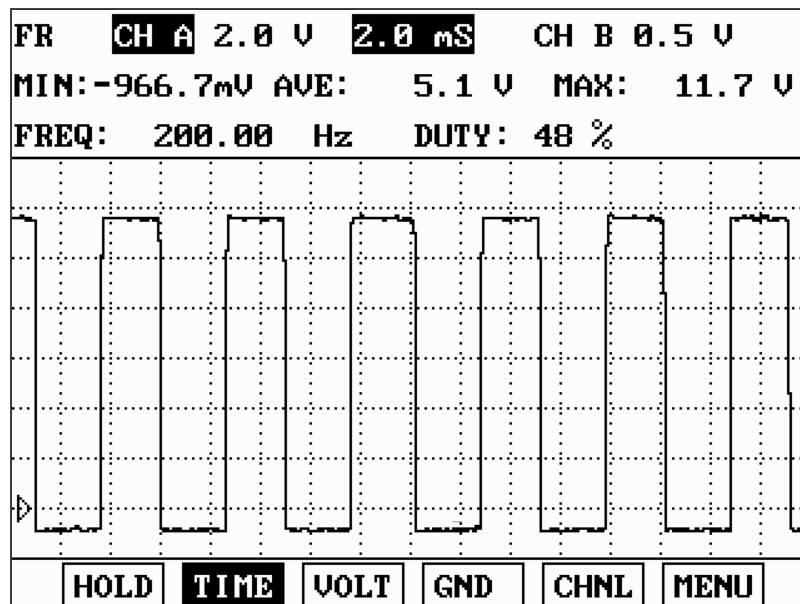
[4WD LOCK Lamp]

This switch is selected 4WD LOCK lamp comes on. The ITMCM applies maximum current to the EMC resulting in 50 to 50 torque distribution.

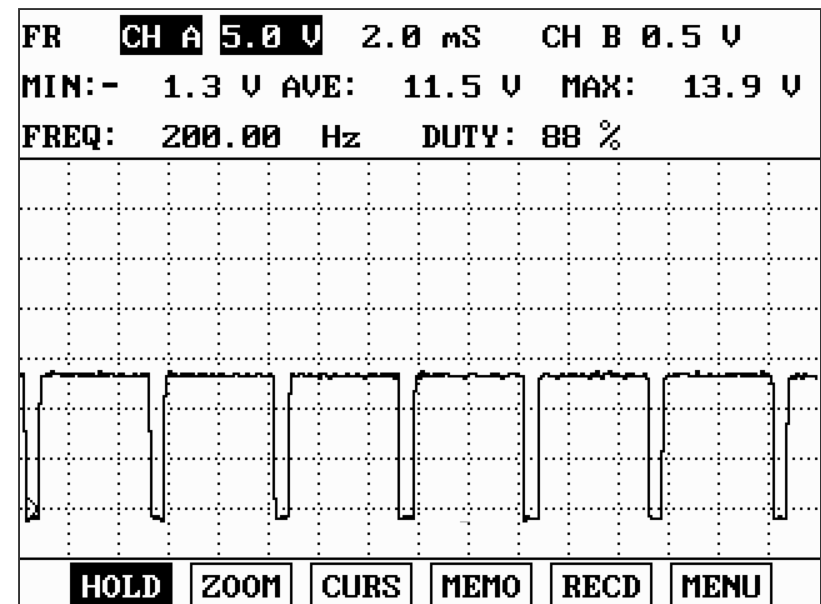
EMC (Electro Magnetic Clutch)

The ITMCM varies the applied current to the EMC to make a torque distribution to the rear wheels.

The EMC current increases then the magnetic force increases. Stronger magnetic force results in higher pressing force to secondary clutch.



[IG ON, with WOT]



[Maximum duty ratio]

4WD WARNING LAMP

4WD warning lamp blinks (2Hz) when a system failure is detected.

