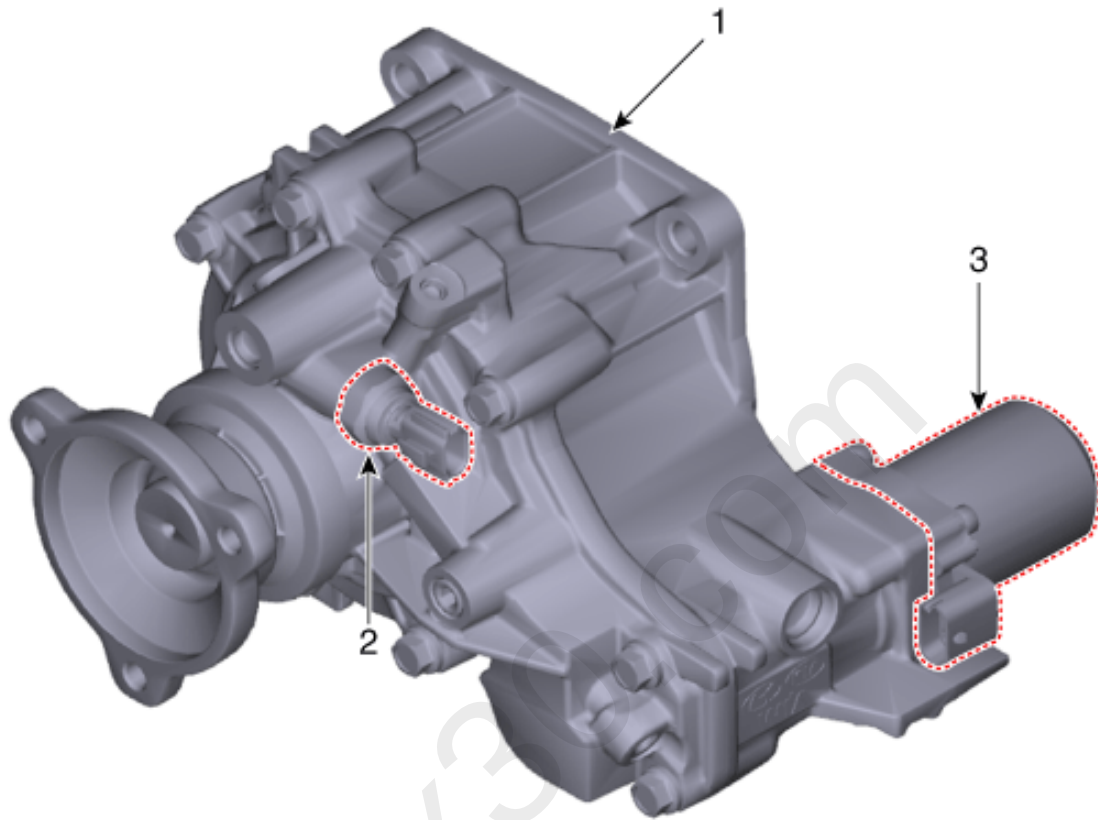


Component
Location



1. Coupling assembly
2. Pressure sensor

3. Oil hydraulic motor

Description

4WD ECU processes signals from various sensors and determines the current road and driving conditions. The ECU then utilizes this information to implement precision control over the 4WD coupling's multi-plate clutch and variably adjust the amount of torque delivered to the rear wheels.

Four Wheel Drive (4WD) transfer mode selection

1. AUTO MODE:

- When driving in 4WD AUTO mode, the vehicle operates similar to conventional 2WD vehicles under normal operating conditions. However, if the system determines that there is a need for the 4WD mode, the engine's driving power is distributed to all four wheels automatically without driver intervention.
- When driving on normal roads and pavement, the vehicle moves similar to conventional 2WD vehicles.

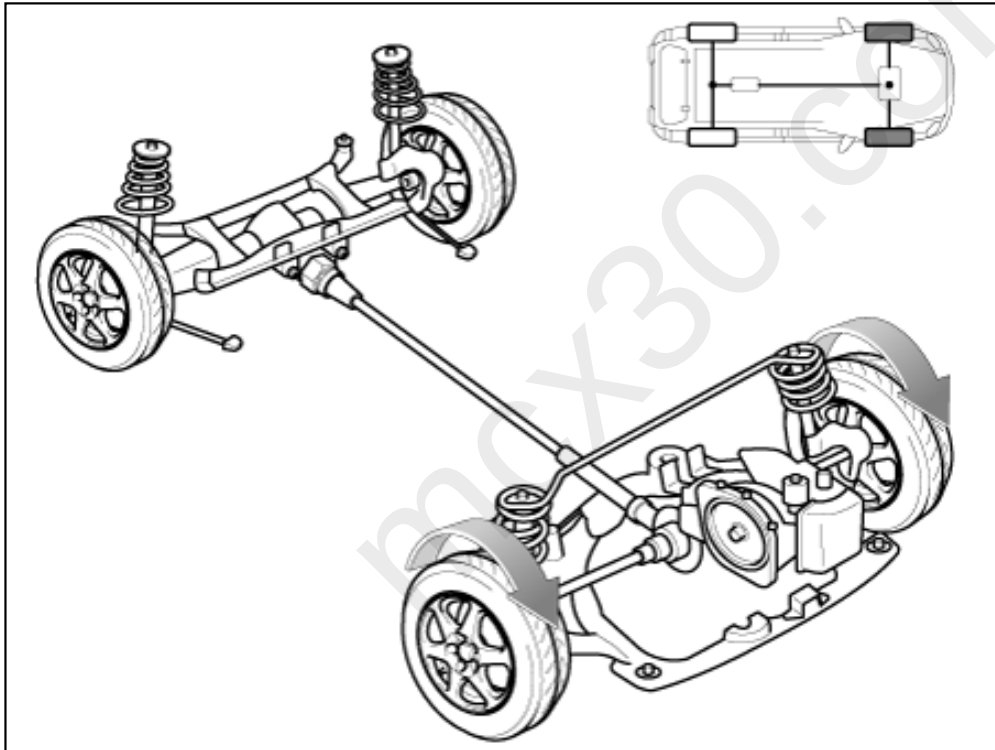
2. LOCK MODE:

- This mode is used for climbing or descending sharp grades, off-road driving, driving on sandy and muddy roads, etc., to maximize traction.
- However, binding may occur in LOCK MODE when circling and it does not operate when the vehicle speed is over 60 km/h.

Electronic Coupling - 4WD Control (By Driving Condition)

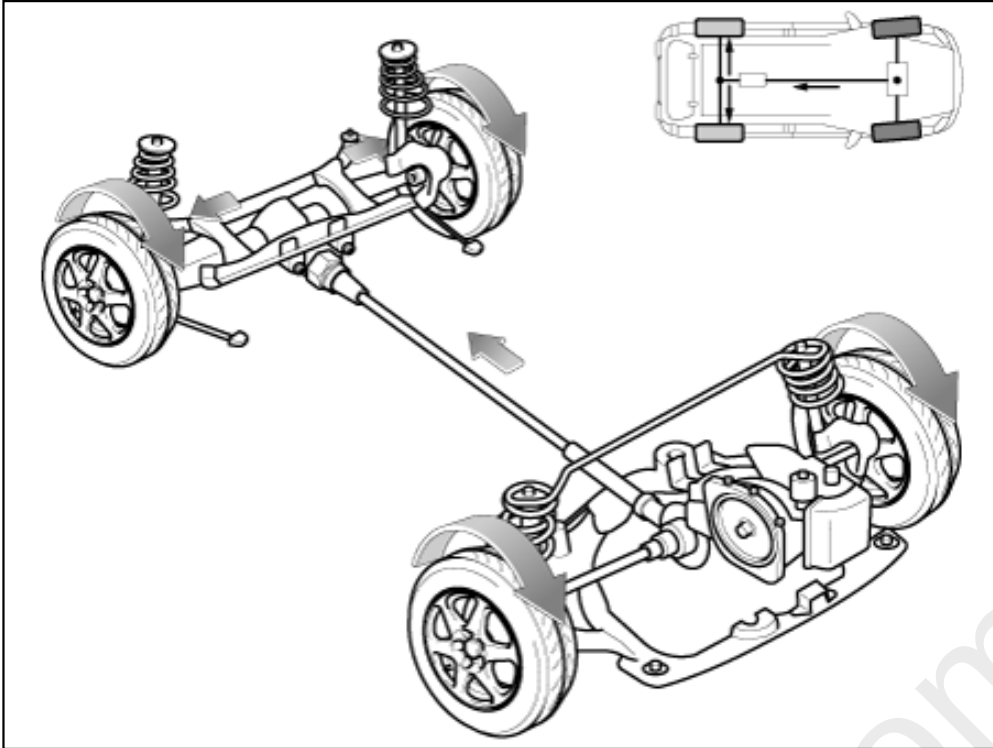
1. Cruising (Auto Mode)

- Power is delivered mostly to the front wheels.



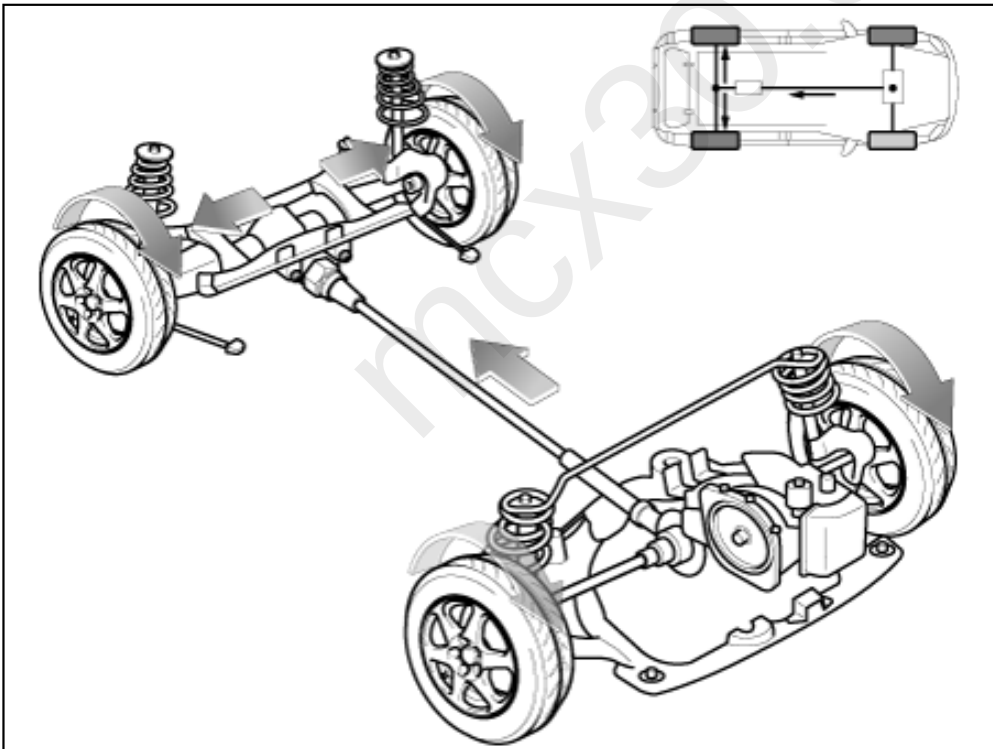
2. Cornering (Auto Mode)

–Adjusts the amount of power to the rear wheels based on the turning radius and cornering speed.



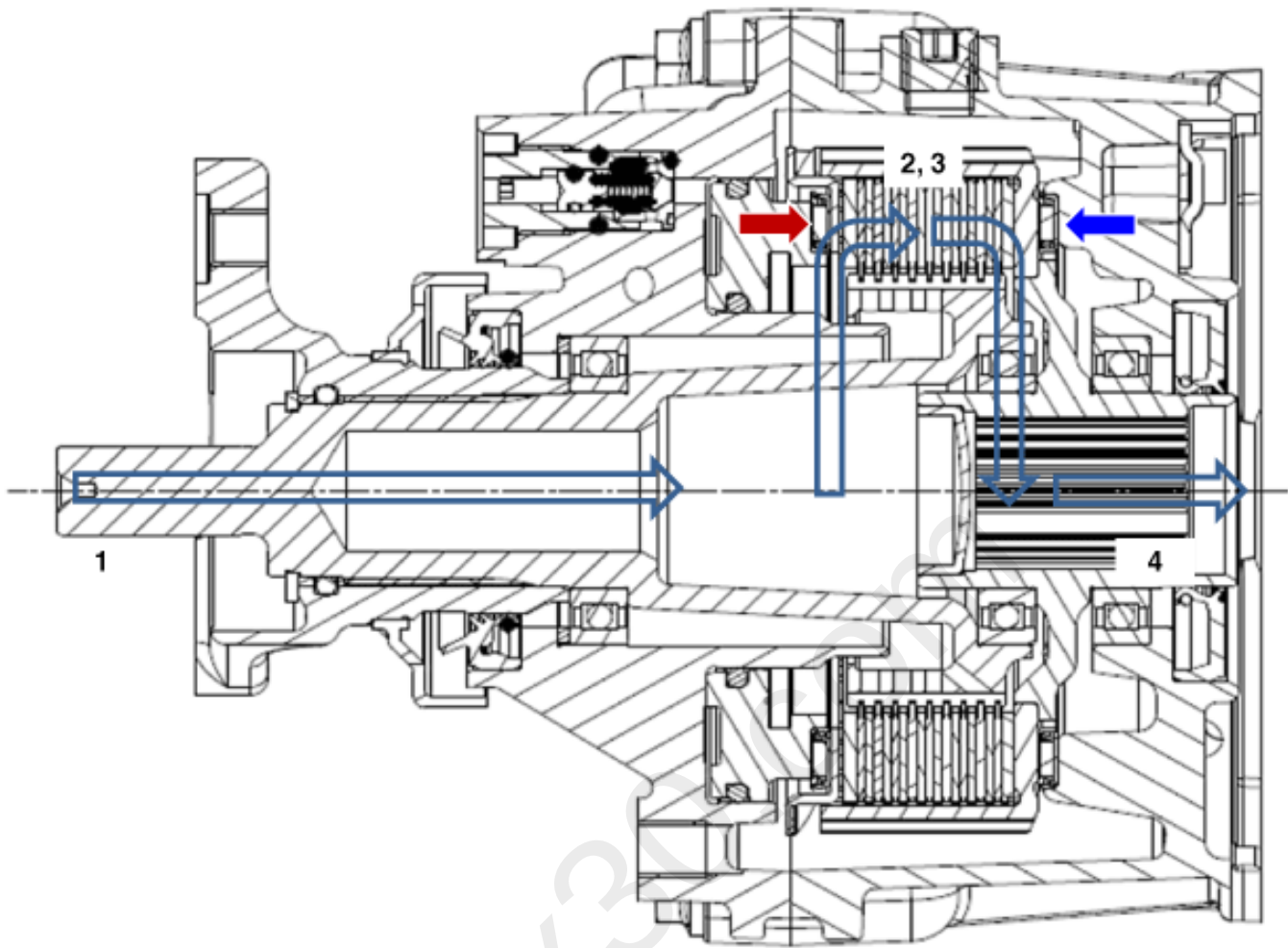
3. Wheel Slip (Auto Mode)

–If one or both of the front wheels lose traction, the system transfers an appropriate amount of power to the rear wheels based on the slip amount at the front wheels.



Operation

Electronic Coupling



1. The power is delivered in the following order:
Transmission -> Transfer -> Propeller shaft
2. AWD ECU calculates the necessary amount of rear-wheel torque and sends the corresponding driving current to the actuator (electronic motor and hydraulic pump).
3. The piston operates by the oil pressure and the friction is generated. Then, the clutch is engaged.
4. The power is delivered to the differential by the engaged clutch and the driving power is generated in to the rear wheel.

Inspection



- All units are filled up with coupling fluid (ultra-low viscosity ATF) prior to shipping. Inspection, fill-up, and replacement of coupling fluid is therefore not necessary (zero maintenance, lifetime fluid).

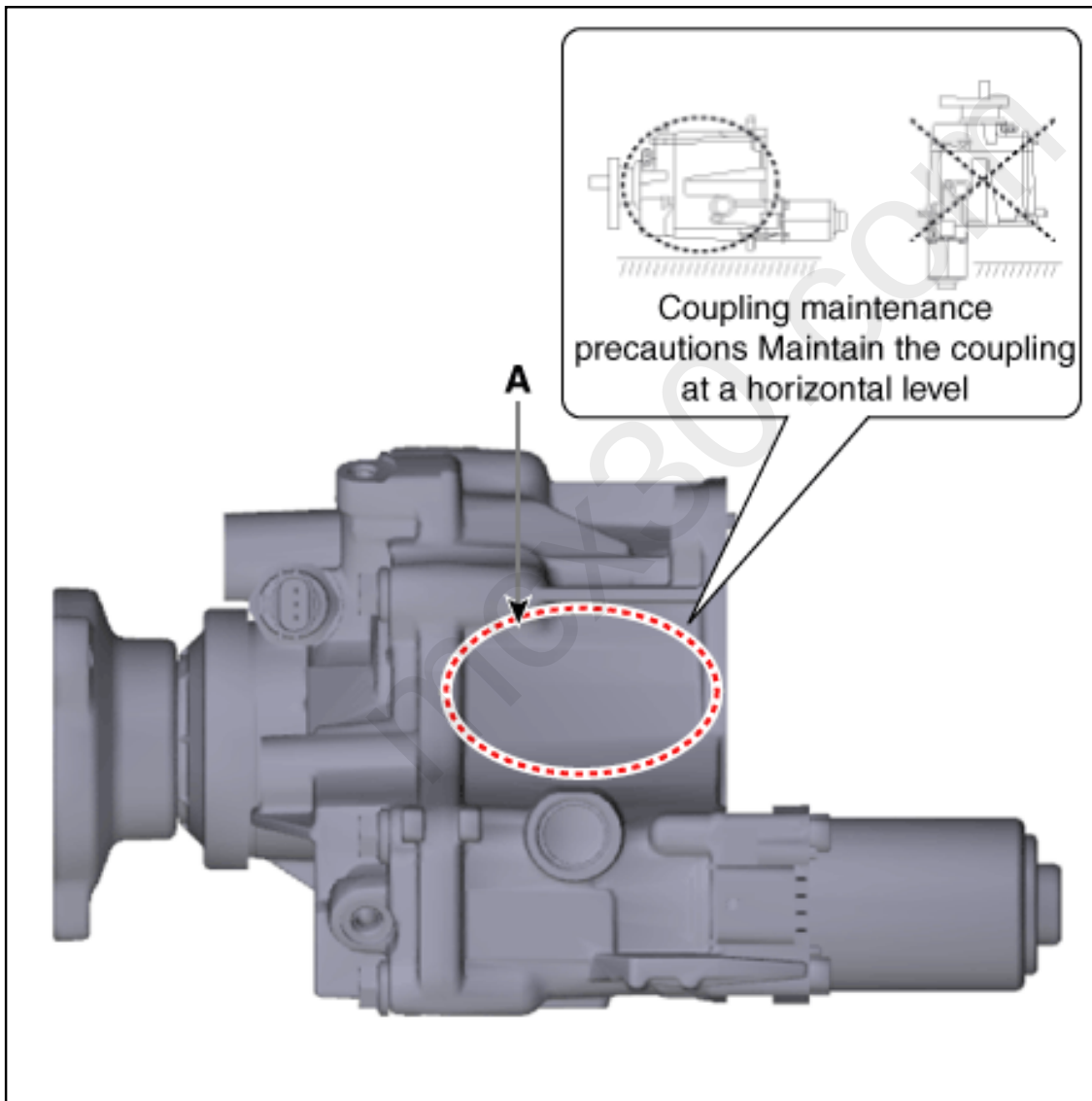
Removal



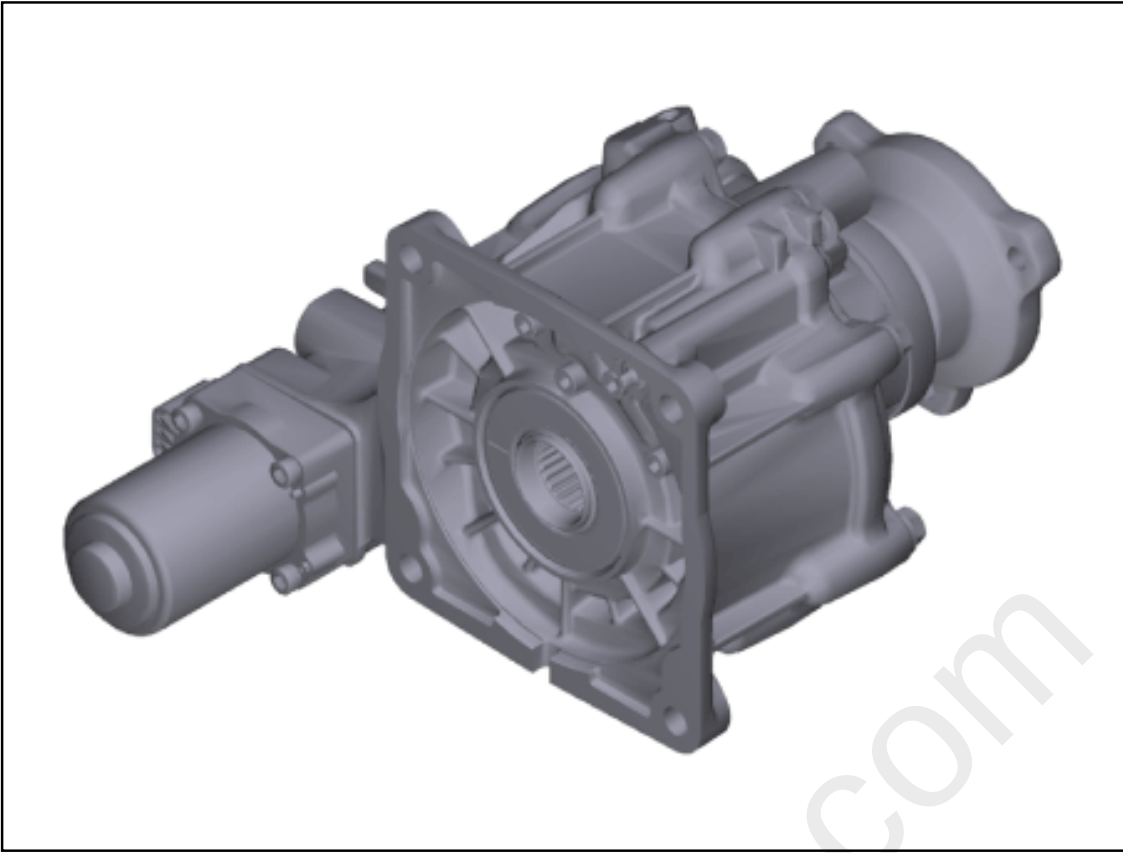
Coupling Maintenance Precautions

Maintain the coupling at a horizontal level.

- Refer to the handling caution level (A) when servicing the coupling (removal, installation, replacement, etc.).



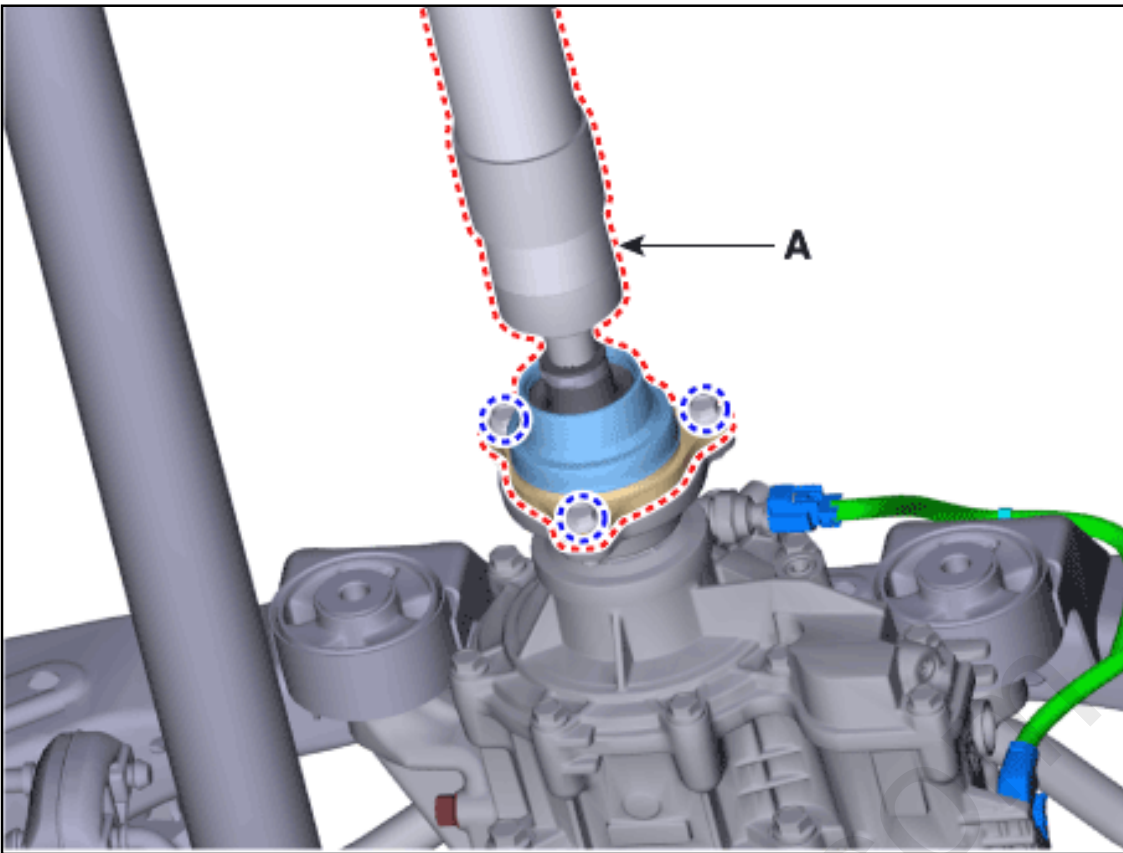
- Always maintain a horizontal posture.



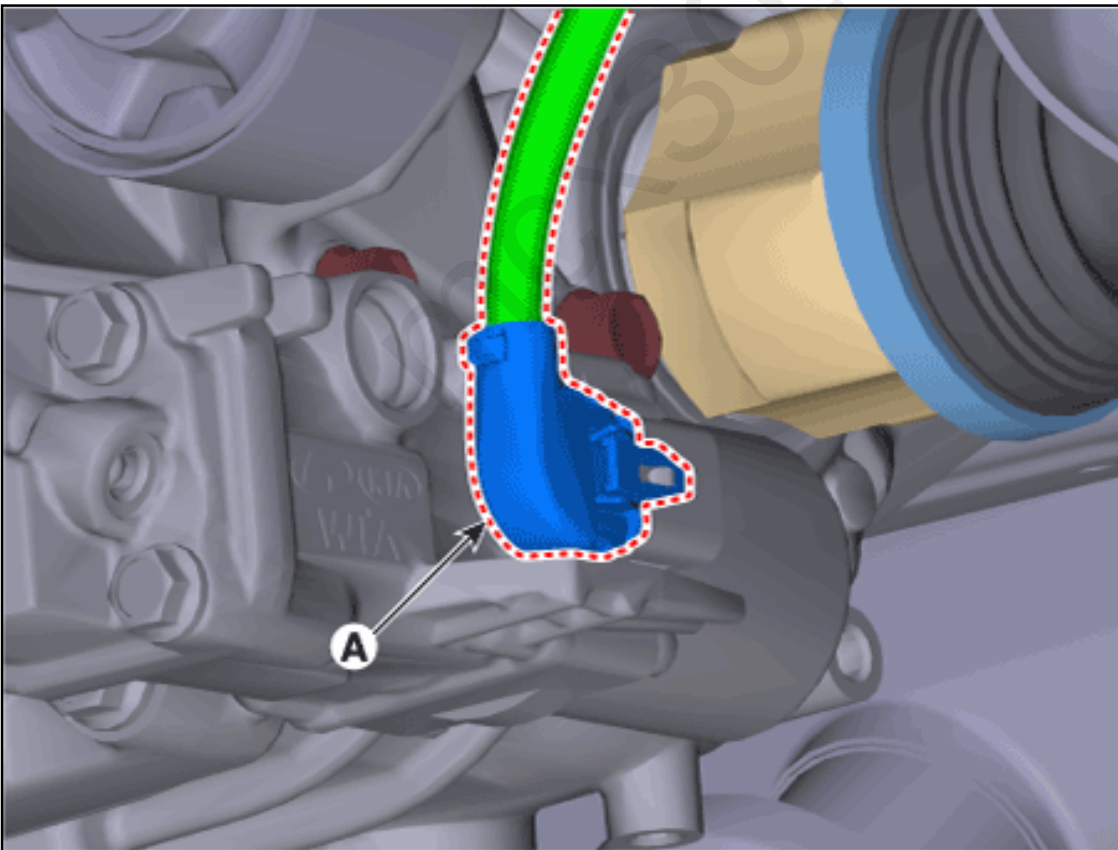
1. Loosen the rear propeller shaft assembly mounting bolts and then removing the rear propeller shaft assembly (A).

Tightening torque :

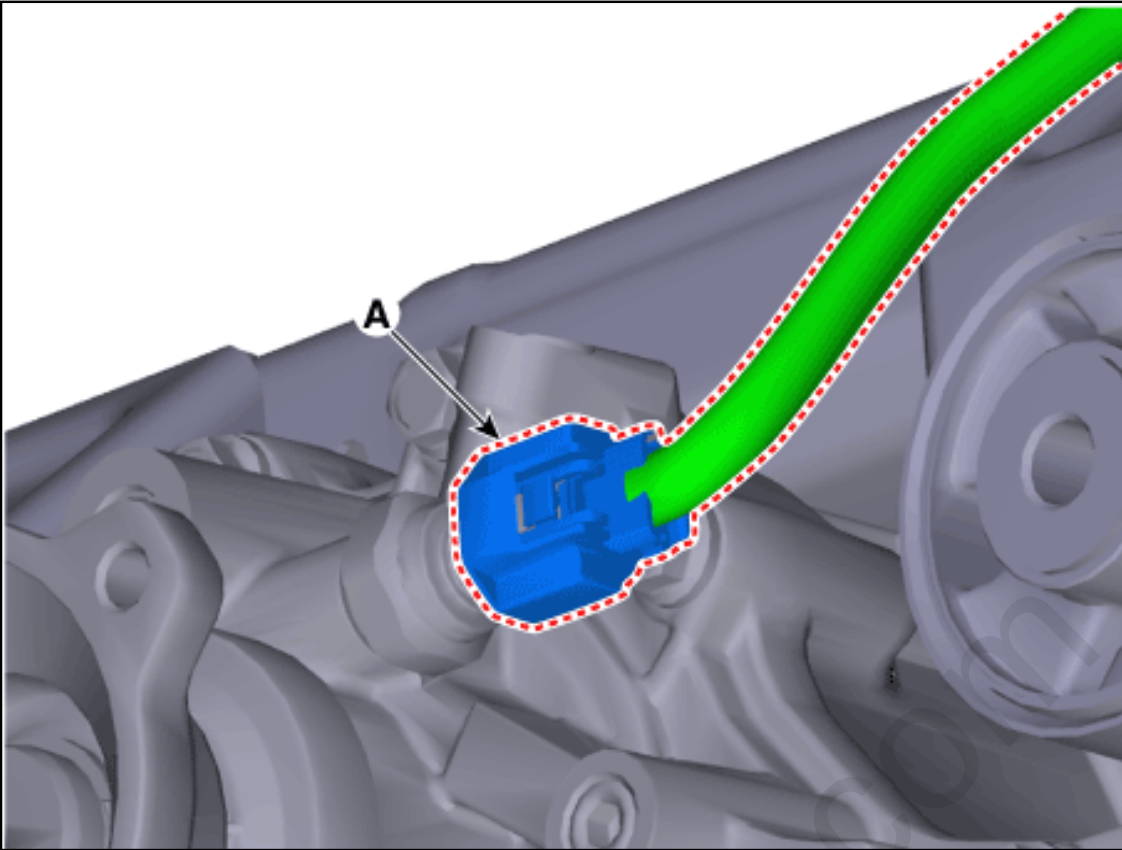
49.0 - 68.6N.m (5.0 - 7.0kgf.m, 36.2 - 50.6lb-ft)



2. Using a flat tool, separate the propeller shaft from 4WD coupling assembly.
3. Disconnect the oil hydraulic motor connector (A).



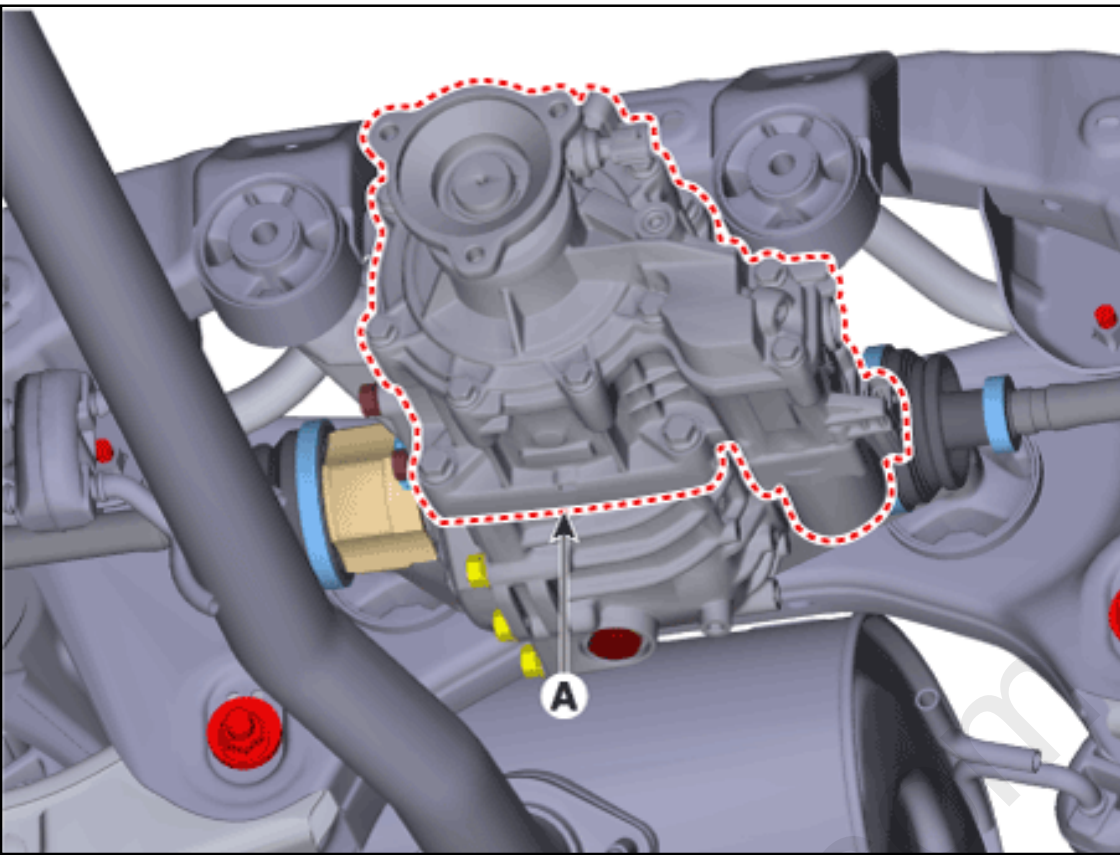
4. Disconnect the pressure sensor connector (A).



5. Loosen the bolts and then removing the coupling assembly (A).

Tightening torque :

58.9 - 64.7 N.m (5.8 - 6.6kgf.m, 41.9 - 47.7 lb-ft)

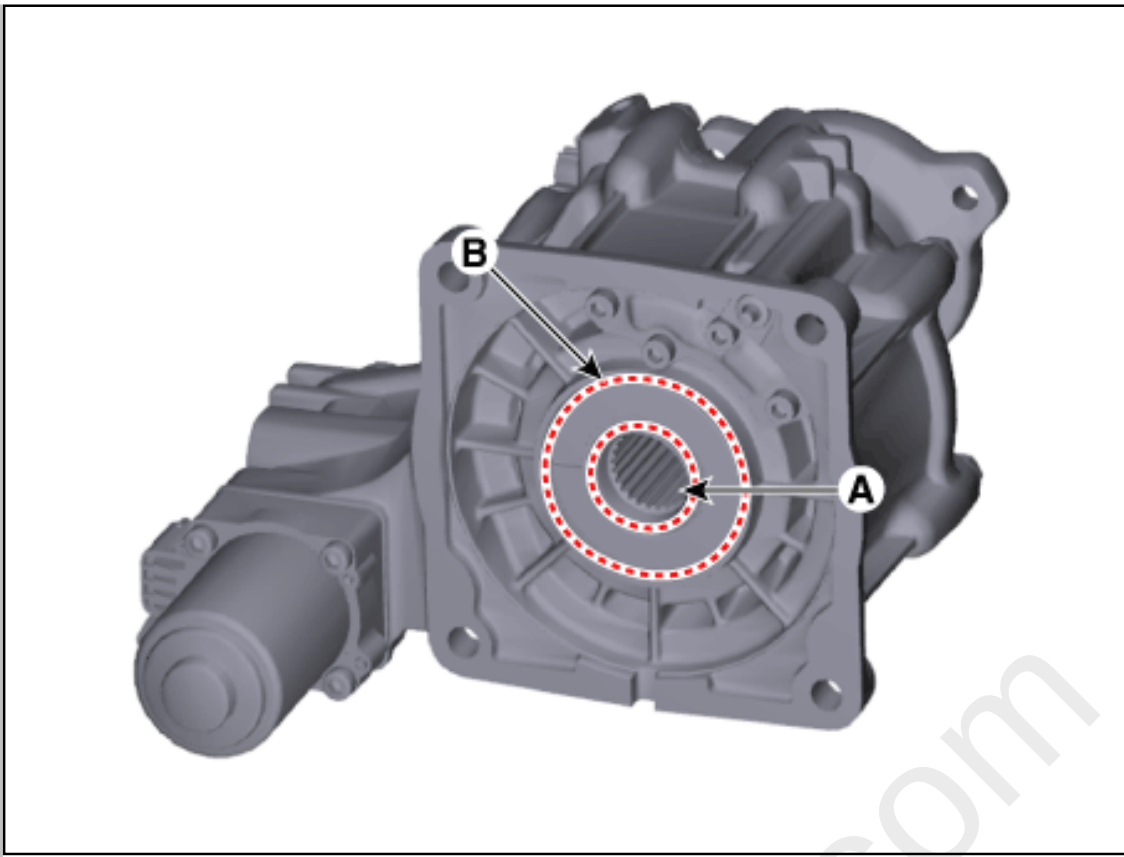


Installation

1. To install, reverse the removal procedures.



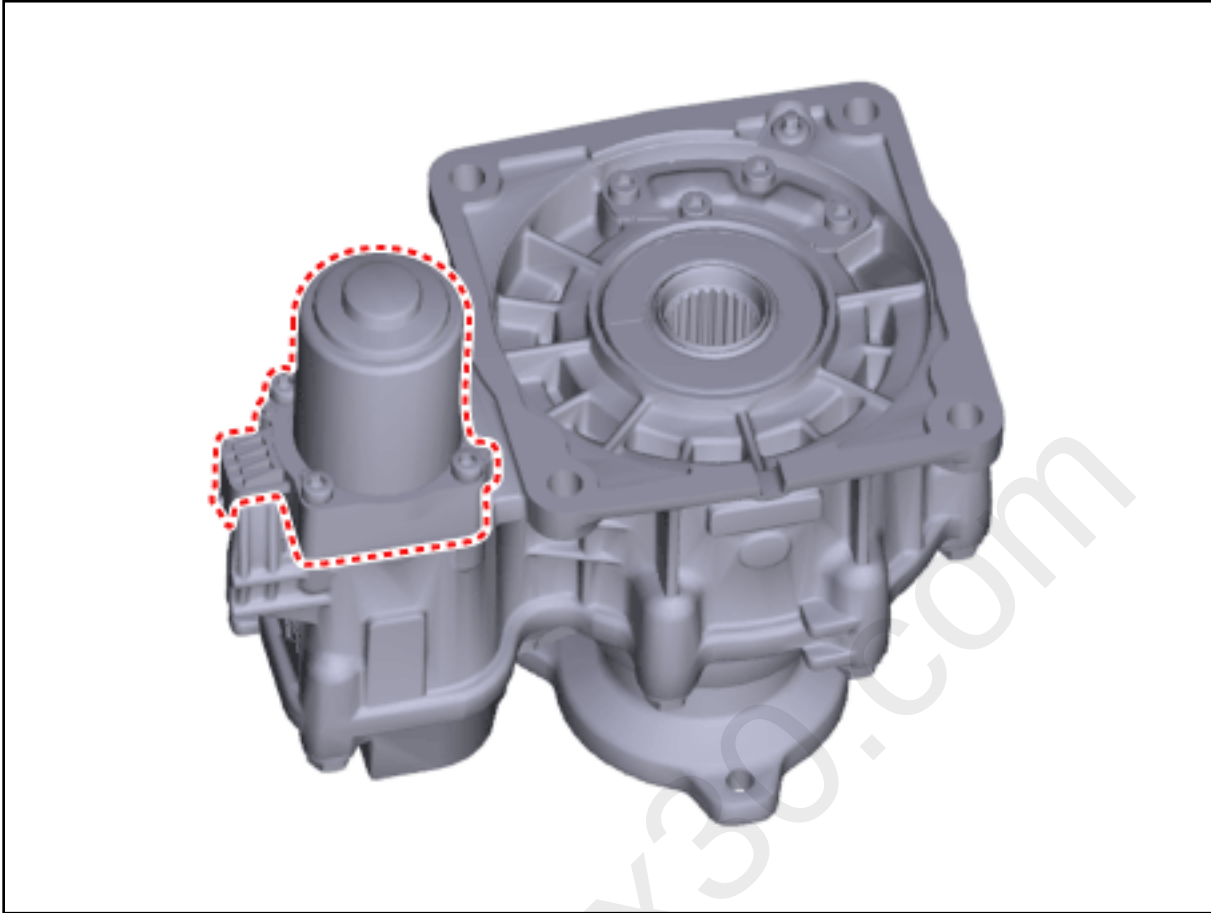
- Smear the splines (A) with molybdenum type high pressure grease.
- When install the coupling, be careful not to damage the oil seal (B).



2. After replacing the coupling, reset the 4WD ECU's clutch learing using the diagnostic tool.
(Refer to 4WD Control System - "Repair procedures")

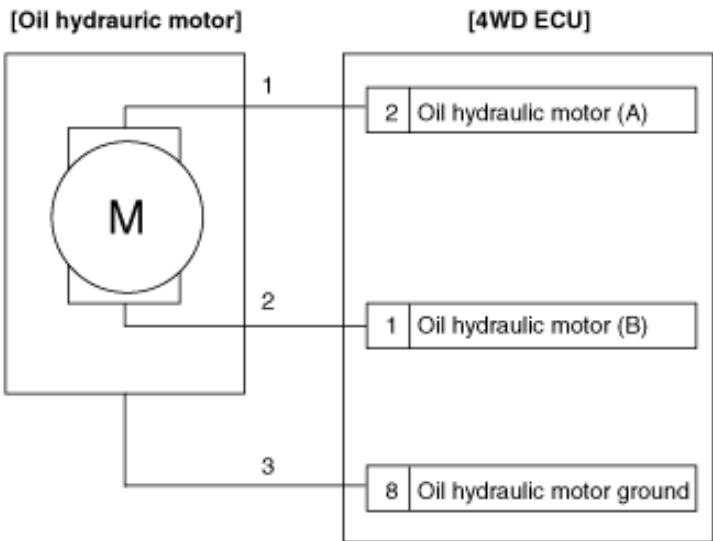
Description

The 4WD ECM controls the Pump Motor Pump (Actuator) to generating an oil pressure. The pressure engages a multiple disk clutch to transfer torque to the rear wheels. The torque to the rear wheels varies according to the pressure on the clutch.



Circuit
Diagram

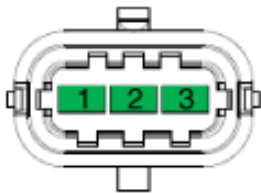
[Circuit diagram]



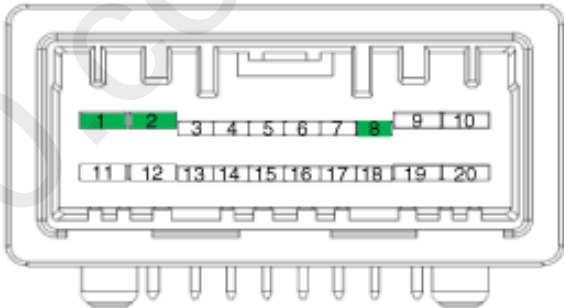
[Connection Information]

Terminal	Connected to	Function
1	AWD ECU (2)	Oil hydraulic motor (A) output
2	AWD ECU (8)	Oil hydraulic motor ground
3	AWD ECU (1)	Oil hydraulic motor (B) output

[Harness connector]



[Oil hydraulic motor]



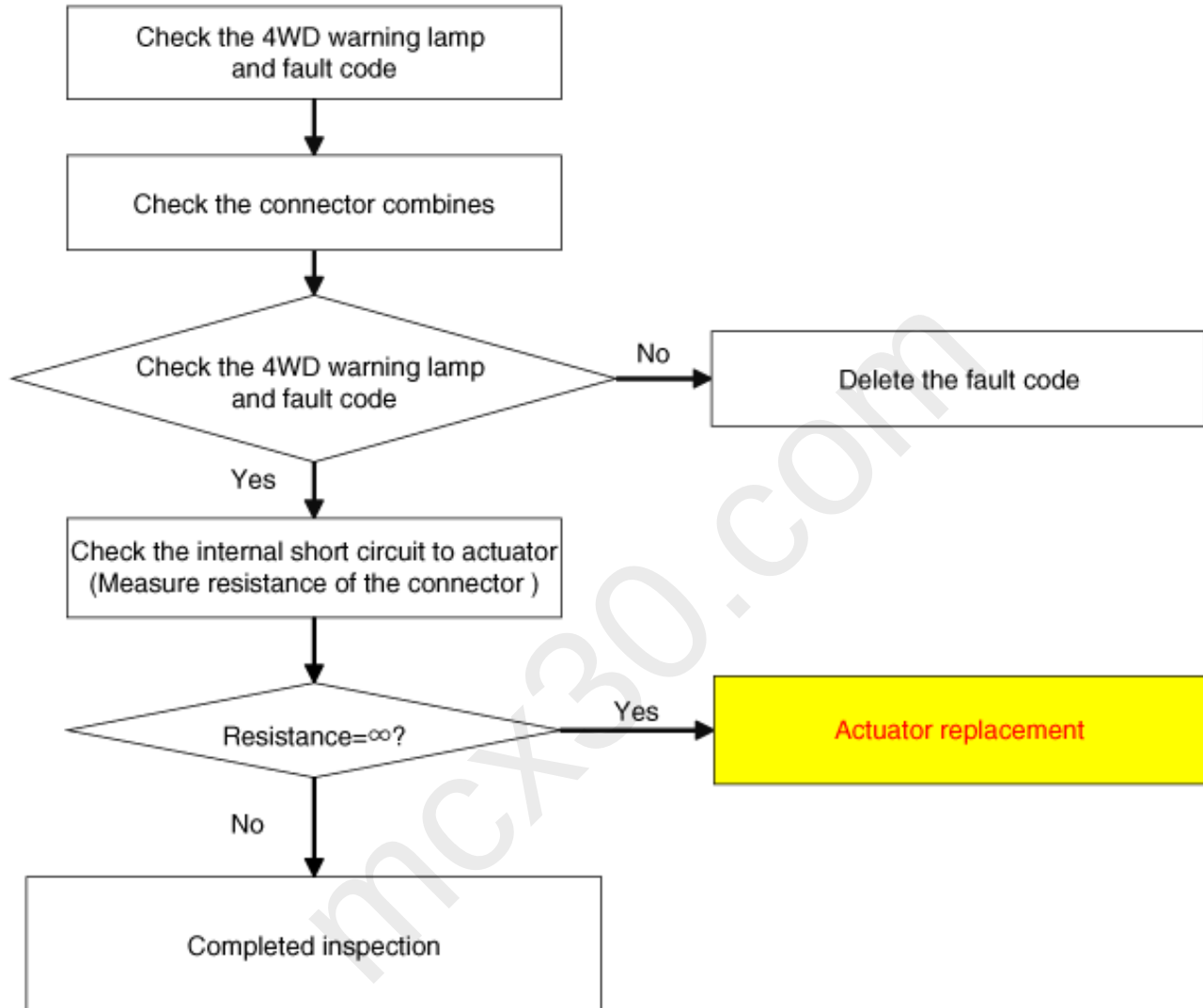
[4WD ECU]

Inspection



- If you have trouble code related to the oil hydraulic motor (actuator), check oil hydraulic motor (actuator) according to the inspection process.

Oil Hydraulic Motor (Actuator) Inspection Procedure



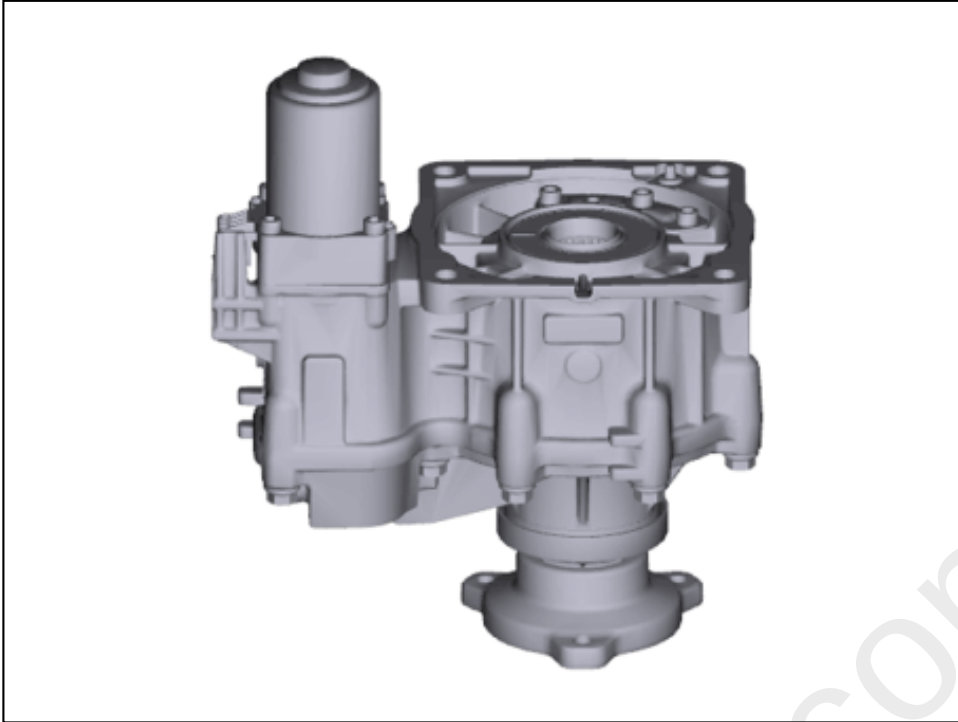
Removal

1. Remove the coupling assembly.
(Refer to 4 Wheel Drive (4WD) System - "Direct Electro Hydraulic Actuator Coupling")

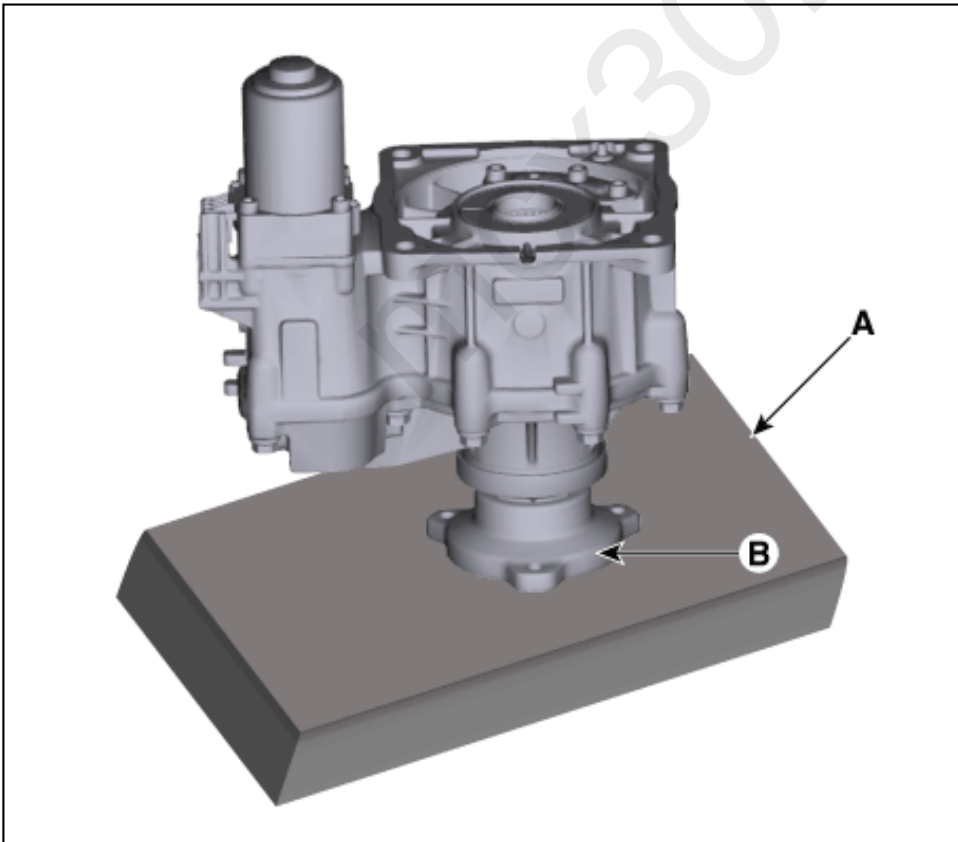
2. Keep going perpendicular state after remove the coupling assembly.



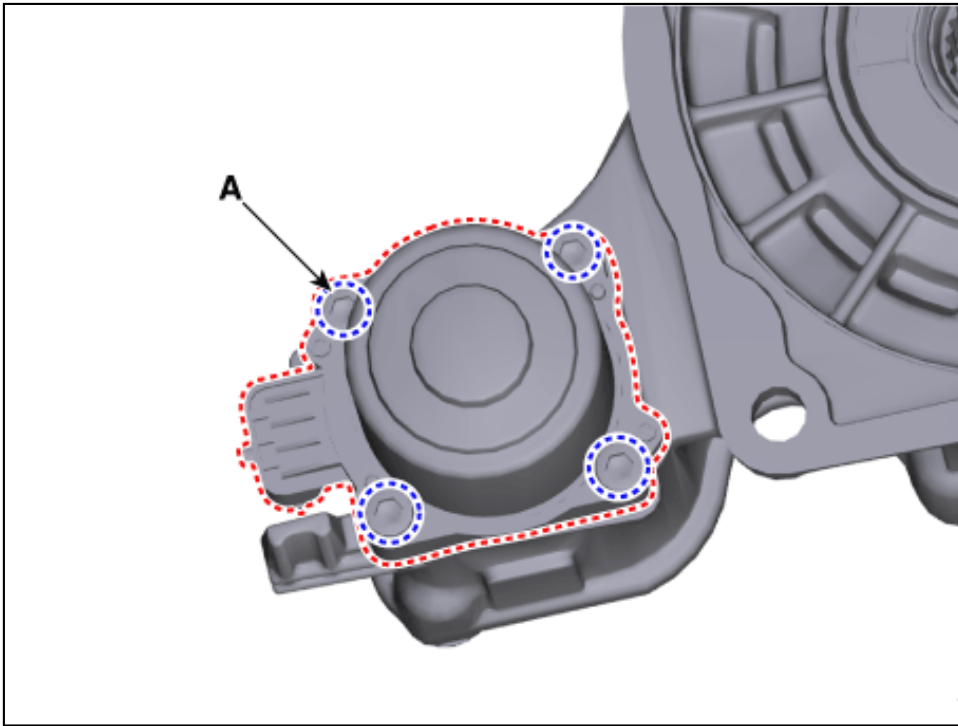
- Keep going perpendicular state during remove (install) the hydraulic motor (actuators).



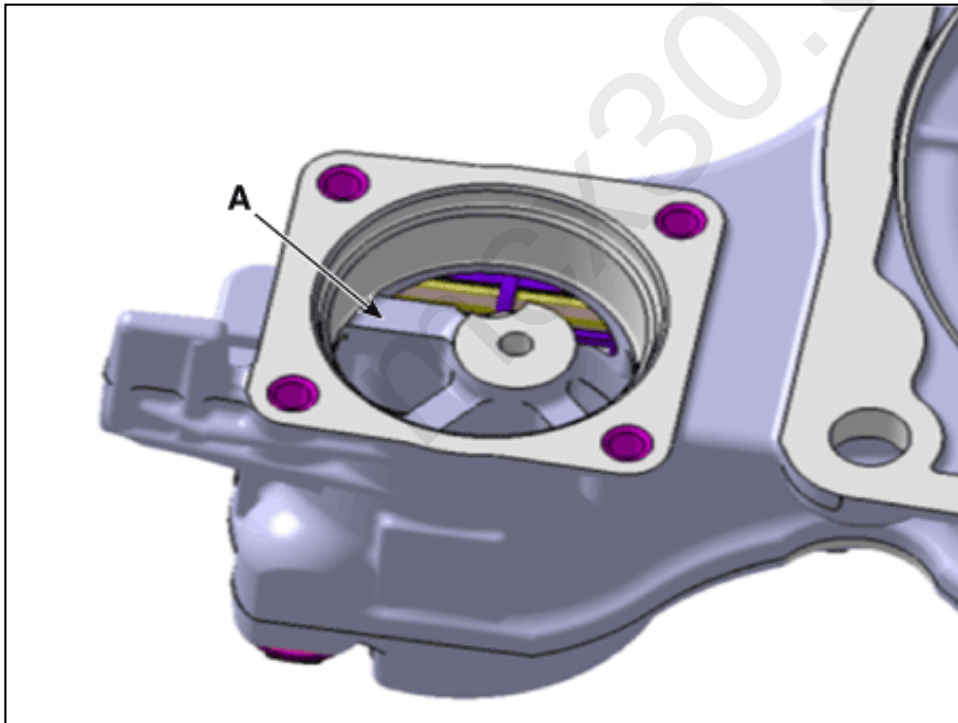
- Use a tool (A) that allows the auxiliary operator to hold or seat the coupling in a vertical position.
- So that the input shaft side (B) is not damaged.



3. Remove the hydraulic motor (A) after loosening bolts with hex wrench.

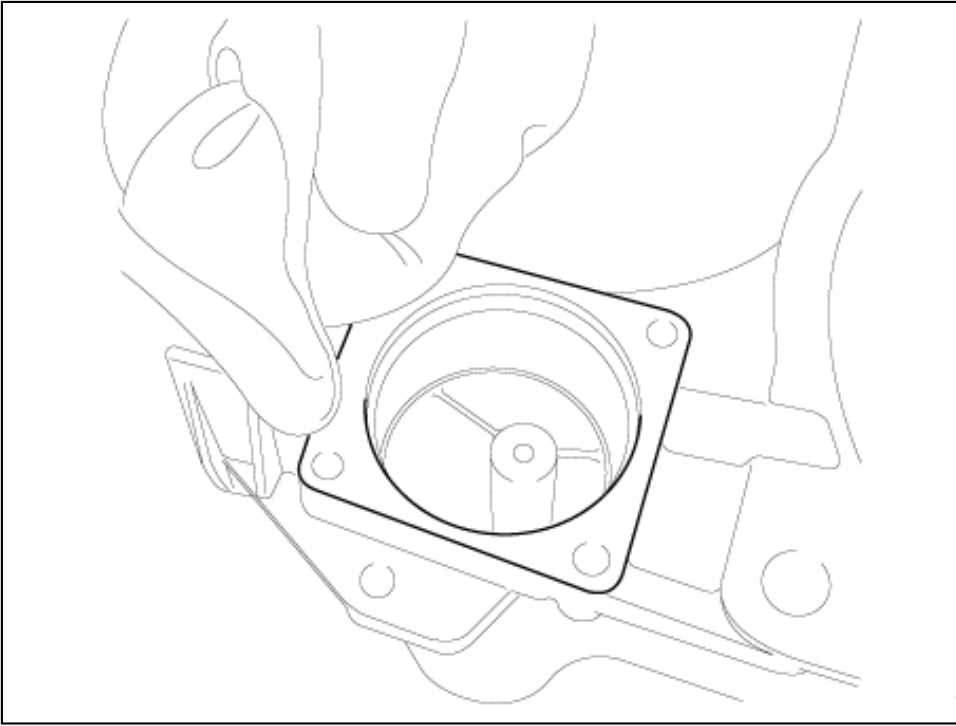


- Remove the hydraulic motor (actuators) after dropping residual oil as much as possible inside the coupling. (about 5-10 sec)



Installation

1. Before installation, wipe the surface with a clean cloth.



2. Check the O-rings (A) of the new hydraulic motor (actuators).



- ☐ • You have to prevent any dust from entering inside hydraulic motors (actuators) and housing.

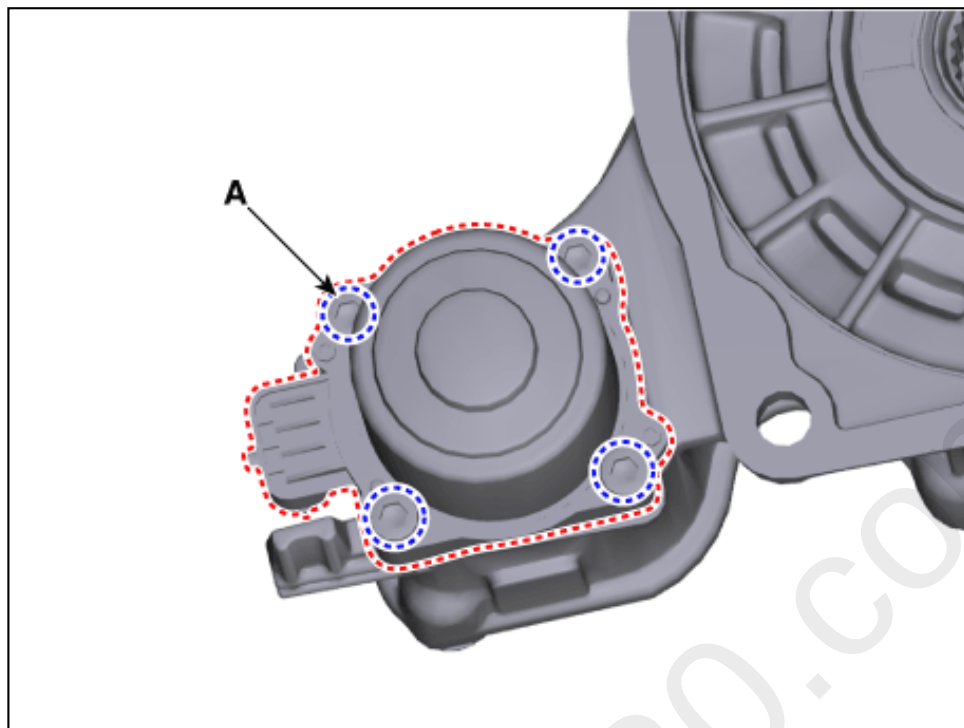
3. Tighten the bolts after install the hydraulic motor.



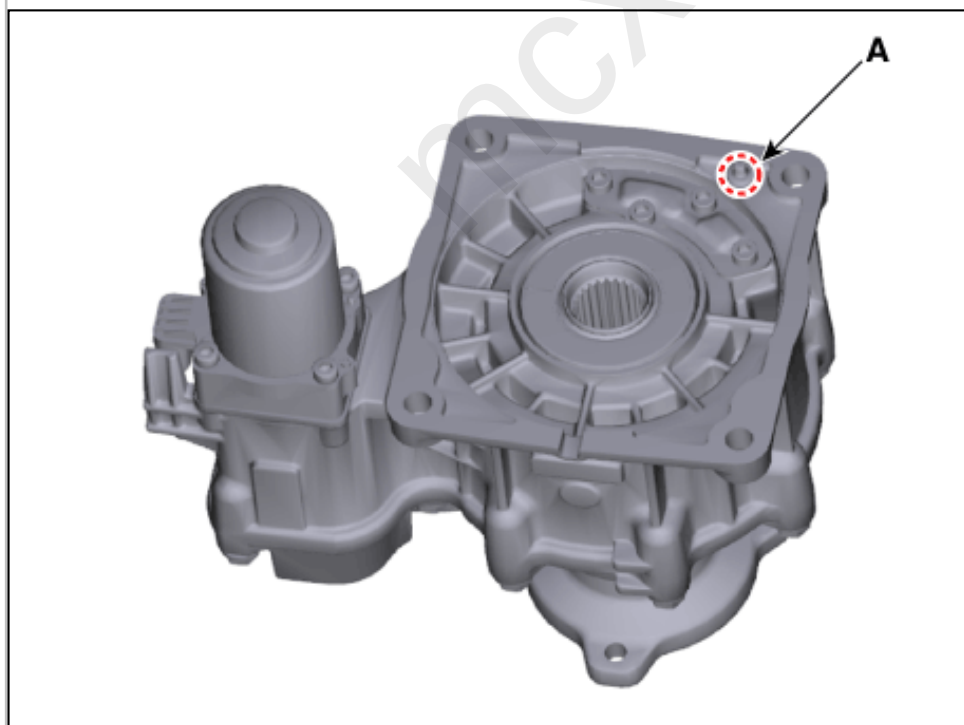
- When installing, motor connector (A) has to toward in the direction of outside of the coupling.

Tightening torque:

9.8 - 11.7 N·m (1.0 - 1.2 kgf·m, 7.2 - 8.6 lb·ft)

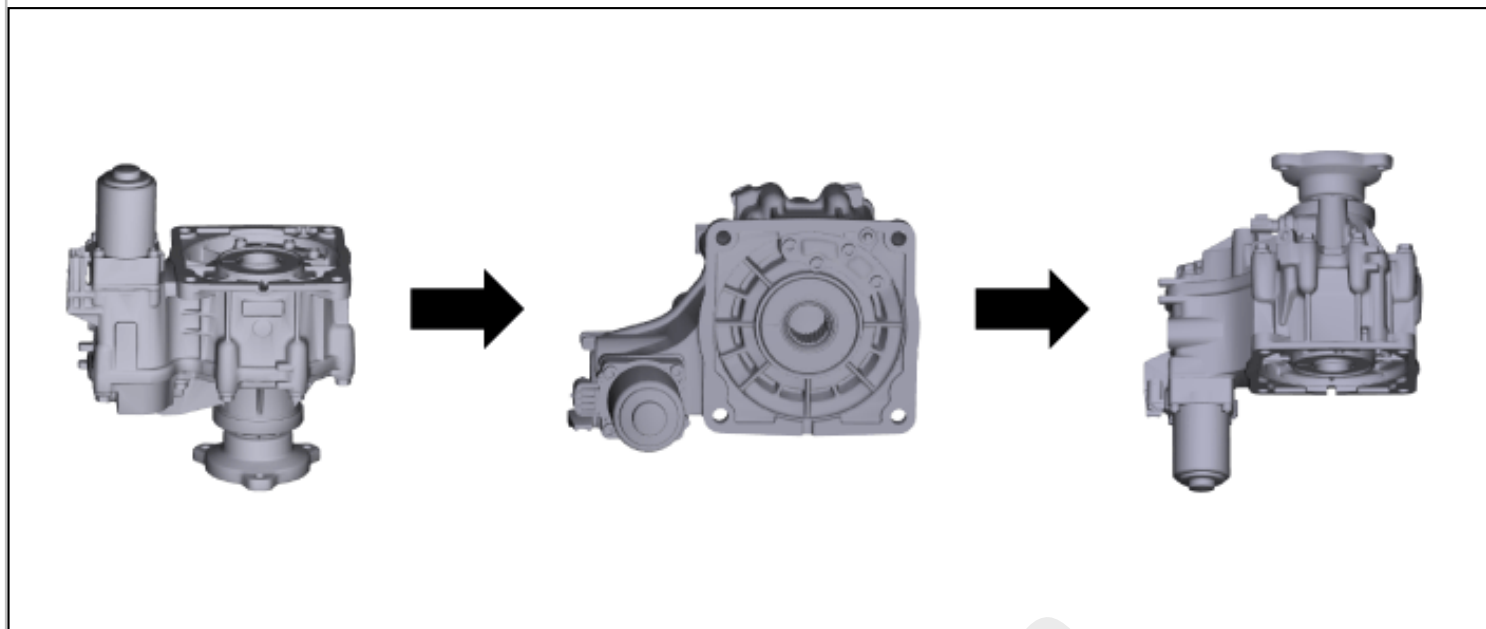


- When installing, oil can be reflux by the pressure in air breather hole (A).

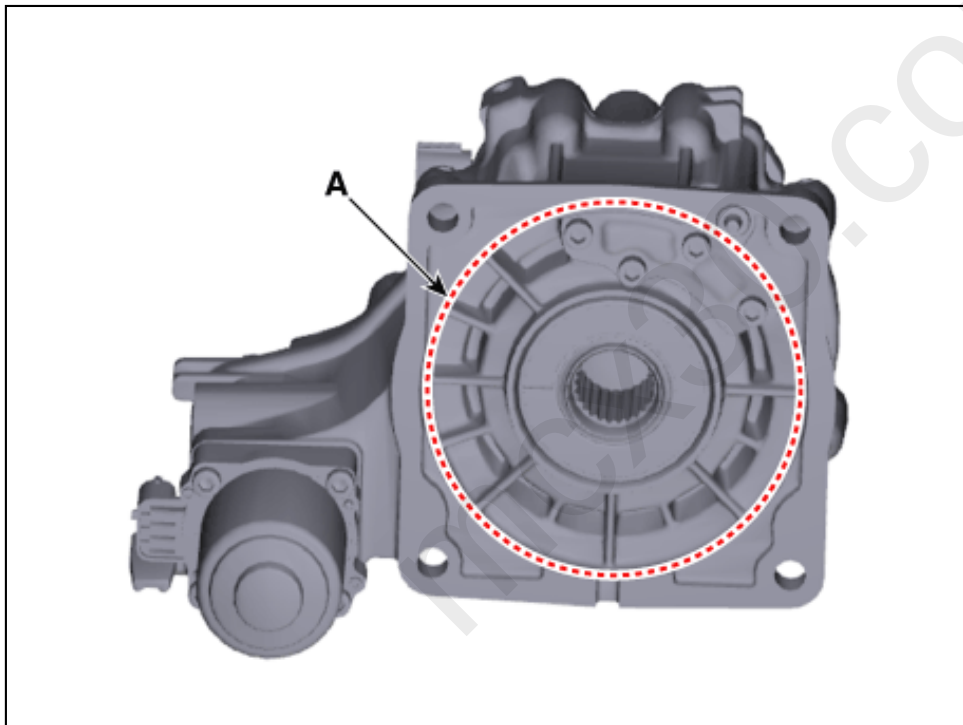


- Change direction in the direction of the arrow and lay on the floor as shown in the illustration.
※ The reflux oil will flow to the bottom.

- You have to prevent additional backflow in according to order as shown in the illustration.



4. Wipe the flowed oil to around the surface with a clean cloth.

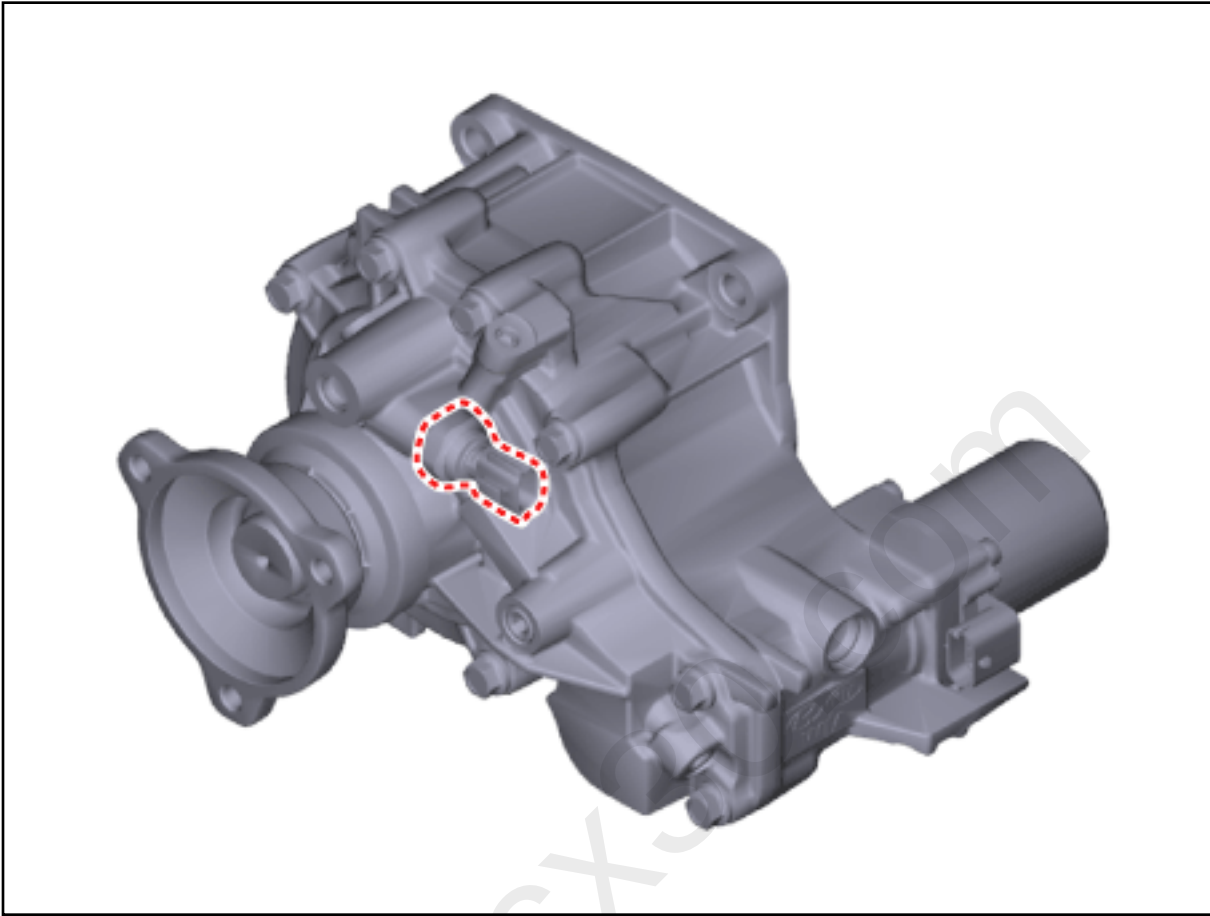


5. Install the coupling assembly.
(Refer to 4 Wheel Drive (4WD) System - "Direct Electro Hydraulic Actuator Coupling")

Description

The 4WD ECU makes a Motor Pump(Actuator) turn round for generating an oil pressure. And then it presses a multiple disk clutch and transfers the generated torque into rear wheels. Its torque value varies according to a pressure status.

•Component location

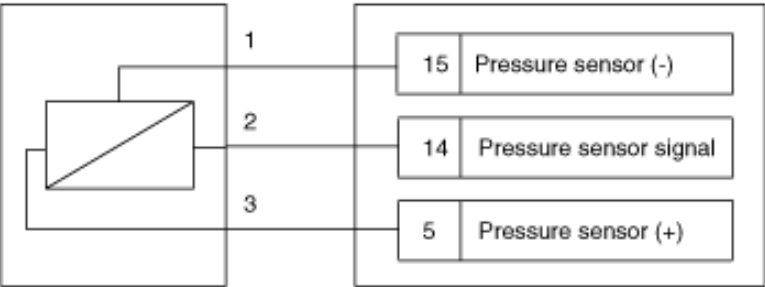


[Circuit diagram]

[Connection Information]

[Pressure sensor]

[4WD ECU]

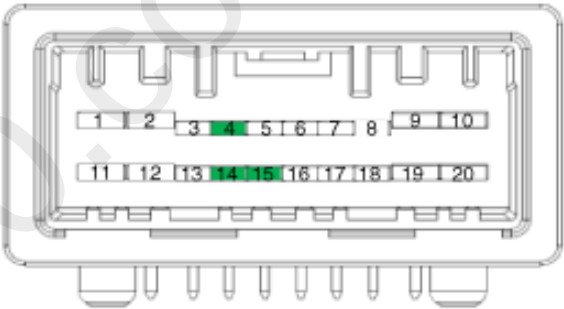


Terminal	Connected to	Function
1	4WD ECU (15)	Pressure sensor (-)
2	4WD ECU (14)	Pressure sensor signal
3	4WD ECU (5)	Pressure sensor (+)

[Harness connector]



[Pressure sensor]



[4WD ECU]

Inspection

Measure the resistance of pressure sensor

- 1. Turn ignition switch OFF.
- 2. Disconnect the pressure sensor connector.
- 3. Measure resistance between sensor terminal and terminal.
- 4. Check the measured resistance. (Refer to table)

[Table 1]

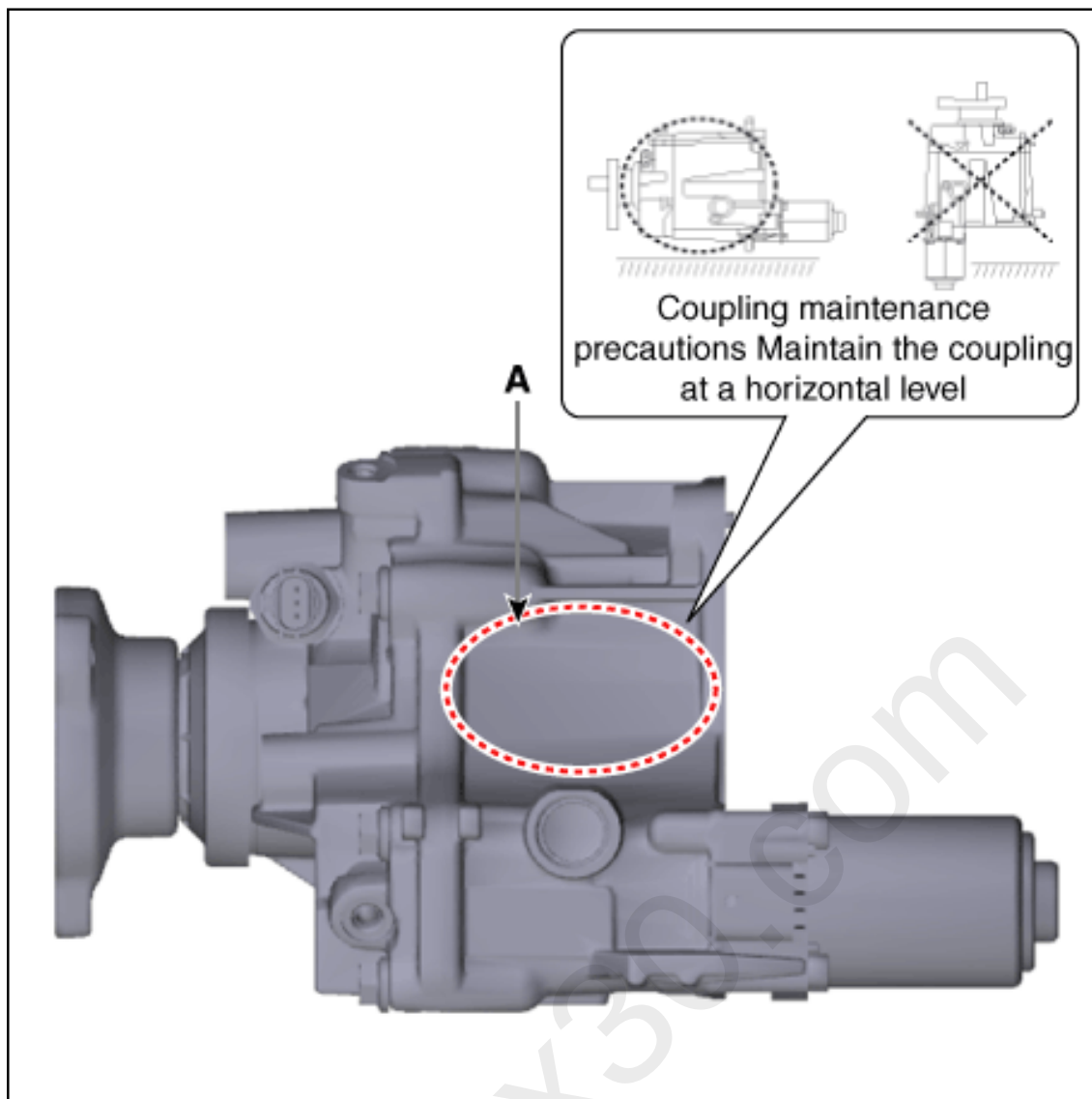
Terminal	Resistance
PIN 2 – PIN 3	1.59 - 2.39 kΩ
PIN 1 – PIN 3	152 - 231.6 kΩ
PIN 1 – PIN 2	153.52 - 233.88 kΩ

Removal

- 1. Remove the coupling assembly.
(Refer to 4 Wheel Drive (4WD) System - "Direct Electro Hydraulic Actuator Coupling")



- Keep it level with the sticker (A) on the top of the coupling.



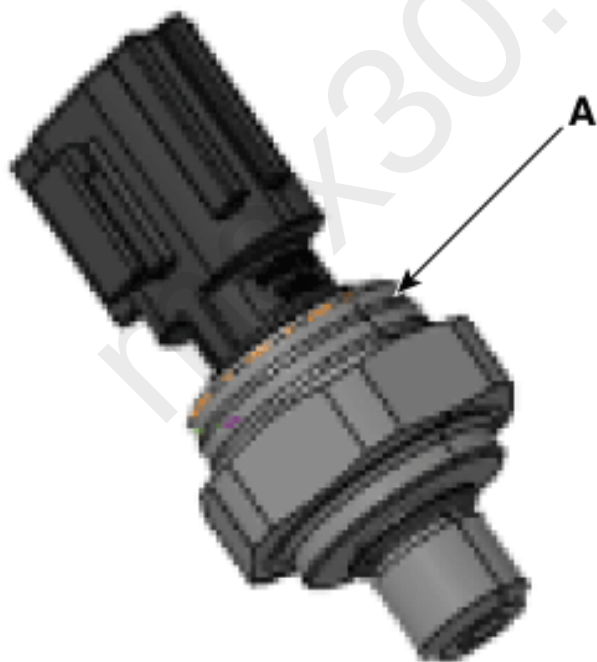
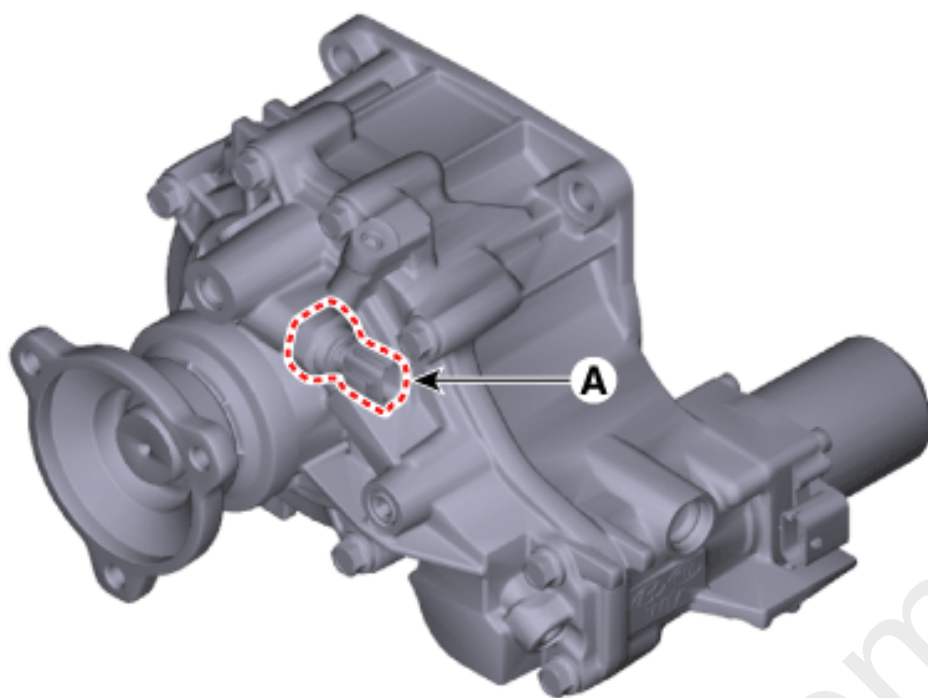
2. Remove the pressure sensor (A).



- Keep going horizontal state to prevent leaks during remove the pressure sensor.

Tightening torque:

10.8 - 14.7 N.m (1.1 - 1.5 kgf.m, 8.0 - 10.8 lb-ft)

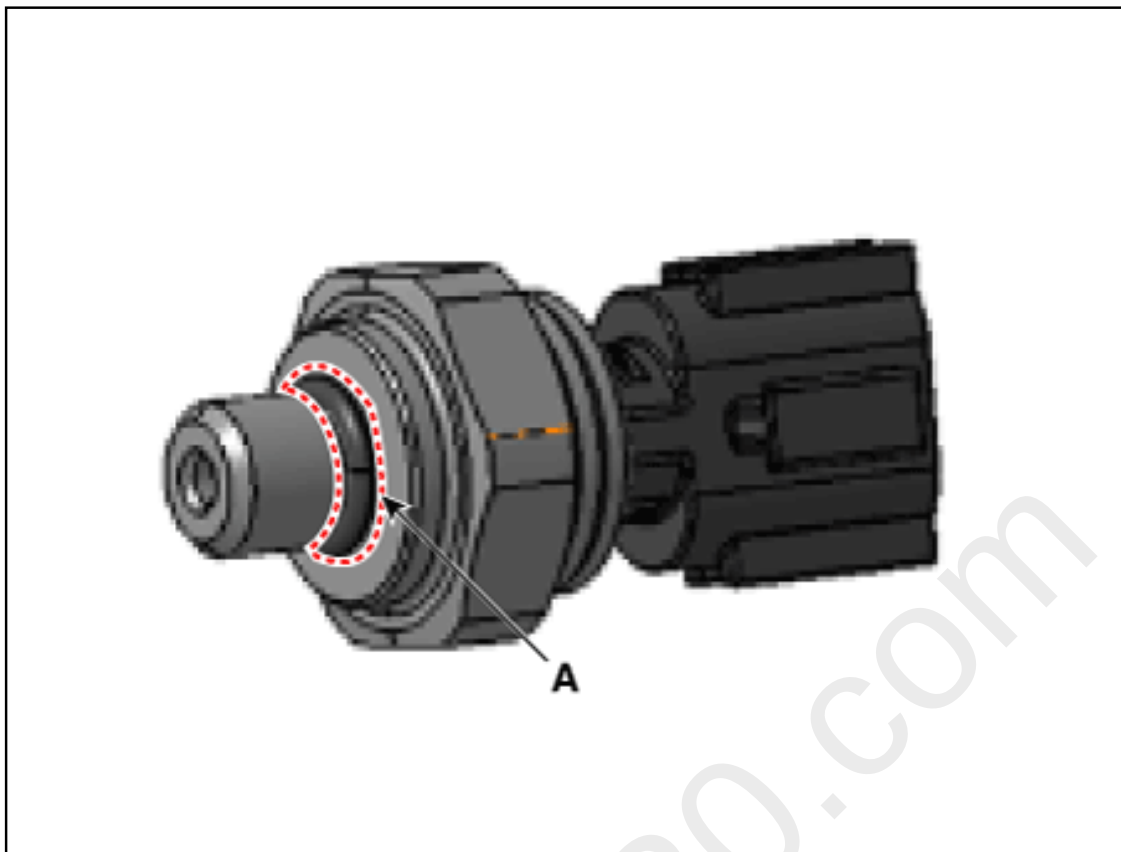


Installation

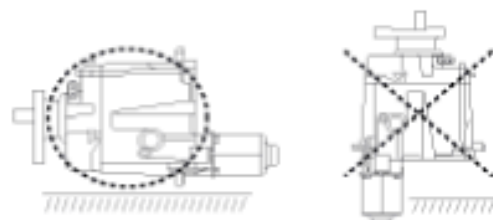
1. To install, reverse the removal procedure.



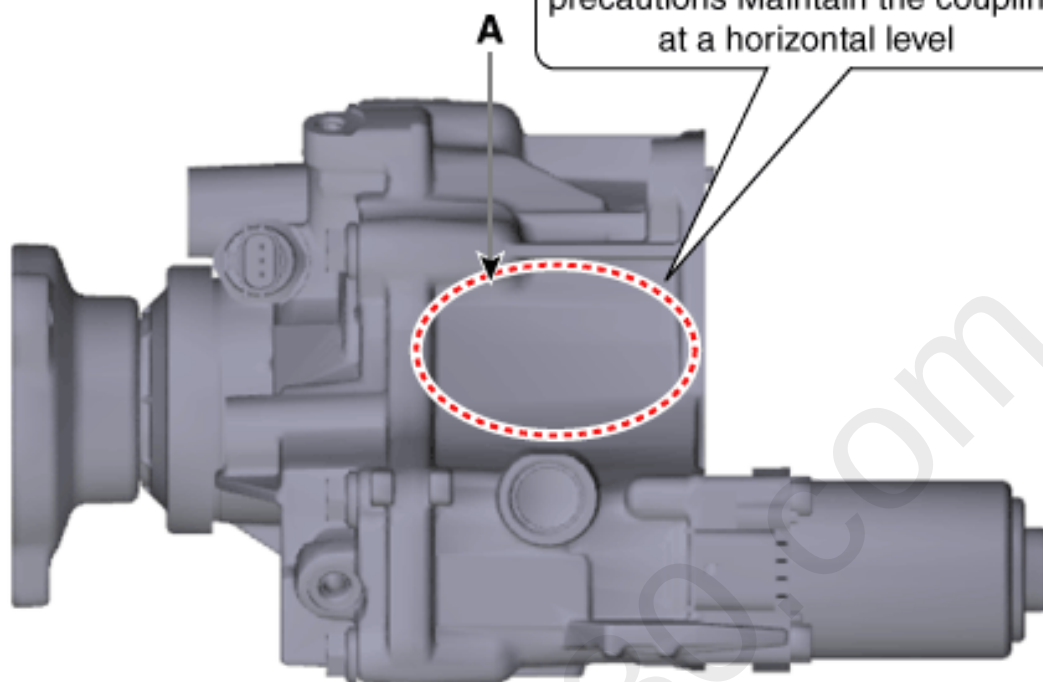
- Check the cleanliness of the pressure sensor before installation.
- Check the pressure sensor O-ring (A).



- Keep it level with the sticker (A) on the top of the coupling.



Coupling maintenance
precautions Maintain the coupling
at a horizontal level



Description

The friction material inside the coupling will degrade over time. Therefore, corresponding compensation values must be referenced and entered after replacing the controller or the coupling.

Compensation Requirement and Procedure

- 1. Simultaneous replacement of 4WD ECU (Controller) and coupling
 - Does not require compensation.
- 2. Replacement of coupling only
 - Reset the 4WD ECU's (Controller) clutch learning.

SystemsComponentsUnfold All

■ Engine Control

■ Automatic Transaxle

■ ABS/ESP

■ Forward Collision-Avoidance Assist

■ Airbag(Event #1)

■ Airbag(Event #2)

■ Air Conditioner

■ 4WD Control

- System Identification
- Clutch Learning Reset
- Adaptive Value BackUp & Input (ECU replacement)
- Adaptive Value BackUp & Input (ECU & Tranfer Assy replacement at once)
- Air Bleeding Mode

■ Motor Driven Power Steering

■ Rear View Monitor

■ Surround View Monitor

■ Parking Assist

!

Do not touch any system buttons while performing this function.



• Clutch Learning Reset

Purpose	To reset adapted clutch wear value on the 4WD ECU after 4WD coupling assembly is replaced.
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	PCM/ECM, 4WD ECU
Concerned DTC	-
Fail Safe	-
Etc	-

OK



Do not touch any system buttons while performing this function.

S/W Management

■ Clutch Learning Reset

● [Clutch Learning Reset]

This is a function to reset the learned driven value into 4WD ECU after replacing 4WD coupling Assy'.

●[Condition] Ignition ON/Engine OFF

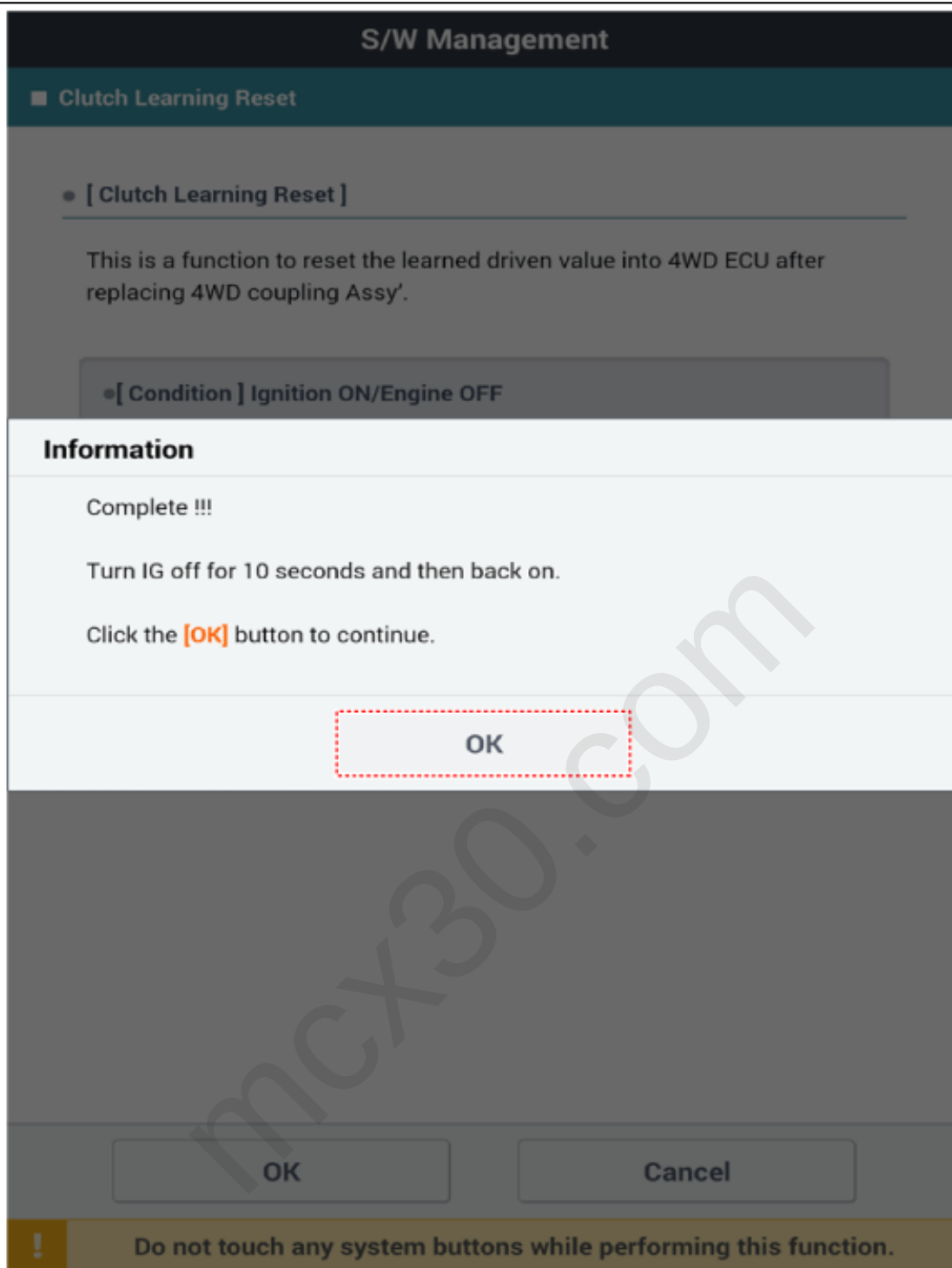
If it is ready, Press **[OK]** button.

OK

Cancel



Do not touch any system buttons while performing this function.



3. Replacement of 4WD ECU (Controller) only
 - Before replacement: Check the ECU's clutch learning.

■ Engine Control	↓
■ Automatic Transaxle	↓
■ ABS/ESP	↓
■ Forward Collision-Avoidance Assist	↓
■ Airbag(Event #1)	↓
■ Airbag(Event #2)	↓
■ Air Conditioner	↓
■ 4WD Control	↑
■ System Identification	☰
■ Clutch Learning Reset	☰
■ Adaptive Value BackUp & Input (ECU replacement)	☰
■ Adaptive Value BackUp & Input (ECU & Tranfer Assy replacement at once)	☰
■ Air Bleeding Mode	☰
■ Motor Driven Power Steering	↓
■ Rear View Monitor	↓
■ Surround View Monitor	↓
■ Parking Assist	↓



Do not touch any system buttons while performing this function.



• ECU Data Back-up & Writing

Purpose	To back up the adaptive data stored in old ECU, and write the backed-up data into new ECU.
Enable Condition	1. Engine Off 2. Ignition Switch On 3. Shift Lever P 4. Vehicle speed : 0
Concerned Component	ECU
Concerned DTC	
Fail Safe	-
Etc	Procedure 1. Back Up(Back up data from the old ECU to the Diagnostic equipment) 2. Exchange the old ECU to the new ECU 3. Input(Input the backed up data to the new ECU using Diagnostic equipment)

OK



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU replacement)

● [ECU learned data back-up & Writing(ECU exchange)]

This function is used to back up the learned data stored in 'Old ECU' then write the backed-up data into 'New ECU'.

●[Condition]

1. IG ON
2. Shift Lever : P
3. Vehicle Speed : 0 Km/h
4. Engine Stop

OK

Cancel



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU replacement)

● [ECU Learned Data Back-up & Writing(ECU exchange)]

If you want to back up the learned data from 'Old ECU'.

Please click **[back-up]** button.

If you want to enter the 'backed-up' data to 'New ECU',

Please click **[Write]** button

1. Back-up(Old ECU -> Scan Tool)
2. Exchange ECU
3. Write(Scan Tool -> New ECU)

BackUp

Write



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU replacement)

- [ECU learned data back-up & Writing(ECU exchange)]

Data read from ECU is displayed

Do you want to back-up this data?(into Scan Tool)

Learned Value :

[illegible]

OK

Cancel

Do not touch any system buttons while performing this function.

[illegible]

[illegible]

S/W Management

■ Adaptive Value BackUp & Input (ECU replacement)

● [ECU Learned Data Back-up & Writing(ECU exchange)]

If you want to back up the learned data from 'Old ECU'.

Please click **[back-up]** button.

If you want to enter the 'backed-up' data to 'New ECU',

Please click **[Write]** button

1. Back-up(Old ECU -> Scan Tool)
2. Exchange ECU
3. Write(Scan Tool -> New ECU)

BackUp

Write



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU replacement)

- [ECU learned data back-up & Writing(ECU exchange)]

The displayed data below is the data backed-up from 'Old ECU'.

If you want to write this data into 'New ECU', please push **[OK]** button.

Data :

[illegible]

OK

Cancel

Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU replacement)

- [ECU learned data back-up & Writing(ECU exchange)]

Data has been written like the table below

Please check the value in the table

If you push **[OK]** button, writing process will be finished.

Data :

[illegible]

OK

Do not touch any system buttons while performing this function.

- After replacement: Enter the original ECU's clutch learning into the replacement ECU.

■ Engine Control	↓
■ Automatic Transaxle	↓
■ ABS/ESP	↓
■ Forward Collision-Avoidance Assist	↓
■ Airbag(Event #1)	↓
■ Airbag(Event #2)	↓
■ Air Conditioner	↓
■ 4WD Control	↑
■ System Identification	☰
■ Clutch Learning Reset	☰
■ Adaptive Value BackUp & Input (ECU replacement)	☰
■ Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)	☰
■ Air Bleeding Mode	☰
■ Motor Driven Power Steering	↓
■ Rear View Monitor	↓
■ Surround View Monitor	↓
■ Parking Assist	↓



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)

● [Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)]

This function is used to back up the learned data stored in 'Old ECU' then write the backed-up data into 'New ECU'.

● [Condition]

1. IG ON
2. Shift Lever : P
3. Vehicle Speed : 0 Km/h
4. Engine Stop

OK

Cancel



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)

● [Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)]

If you want to back up the learned data from 'Old ECU'.

Please click **[back-up]** button.

If you want to enter the 'backed-up' data to 'New ECU',

Please click **[Write]** button

1. Back-up(Old ECU -> Scan Tool)
2. Exchange ECU
3. Write(Scan Tool -> New ECU)

BackUp

Write



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)

● [Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)]

Data read from ECU is displayed

Do you want to back-up this data?(into Scan Tool)

Learned Value : 0000000101059AFFE9

OK

Cancel



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)

● [Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)]

Data read from ECU is displayed

Do you want to back-up this data?(into Scan Tool)

Learned Value : 0000000101059AFFE9

Information

Succeed to back up the studied value of the old ECU.

Click **[OK]** and replace the ECUs after IG Off.

OK

OK

Cancel



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)

● [Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)]

If you want to back up the learned data from 'Old ECU'.

Please click **[back-up]** button.

If you want to enter the 'backed-up' data to 'New ECU',

Please click **[Write]** button

1. Back-up(Old ECU -> Scan Tool)
2. Exchange ECU
3. Write(Scan Tool -> New ECU)

BackUp

Write



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)

● [Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)]

The displayed data below is the data backed-up from 'Old ECU'.

If you want to write this data into 'New ECU', please push **[OK]** button.

Data : 00000000101059AFFE9

OK

Cancel



Do not touch any system buttons while performing this function.

S/W Management

■ Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)

● [Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once)]

Data has been written like the table below

Please check the value in the table

If you push **[OK]** button, writing process will be finished.

Data : 0000000101059AFFE9

OK



Do not touch any system buttons while performing this function.

–Perform the following procedure in case of the appearance of failure code (P182900, P183600).

- Engine Control 
- Automatic Transaxle 
- ABS/ESP 
- Forward Collision-Avoidance Assist 
- Airbag(Event #1) 
- Airbag(Event #2) 
- Air Conditioner 
- 4WD Control 
 - System Identification 
 - Clutch Learning Reset 
 - Adaptive Value BackUp & Input (ECU replacement) 
 - Adaptive Value BackUp & Input (ECU & Transfer Assy replacement at once) 
 - Air Bleeding Mode 
- Motor Driven Power Steering 
- Rear View Monitor 
- Surround View Monitor 
- Parking Assist 



Do not touch any system buttons while performing this function.



• Air Bleeding Mode

Purpose	This function discharges air from the oil when DTC P182900 or P183600 occurs.
Enable Condition	1. Engine Idle 2. Shift lever: P
Concerned Component	-
Concerned DTC	P182900, P183600
Fail Safe	-
Etc	-

OK

Do not touch any system buttons while performing this function.

S/W Management

■ Air Bleeding Mode

● [Air Bleeding]

This function discharges air from the oil when DTC P182900 or P183600 occurs.

● [Test Condition]

1. Engine at idle
2. Shift Lever - P

[OK] button : Continue to proceed.

[Cancel] button : End the function.

OK

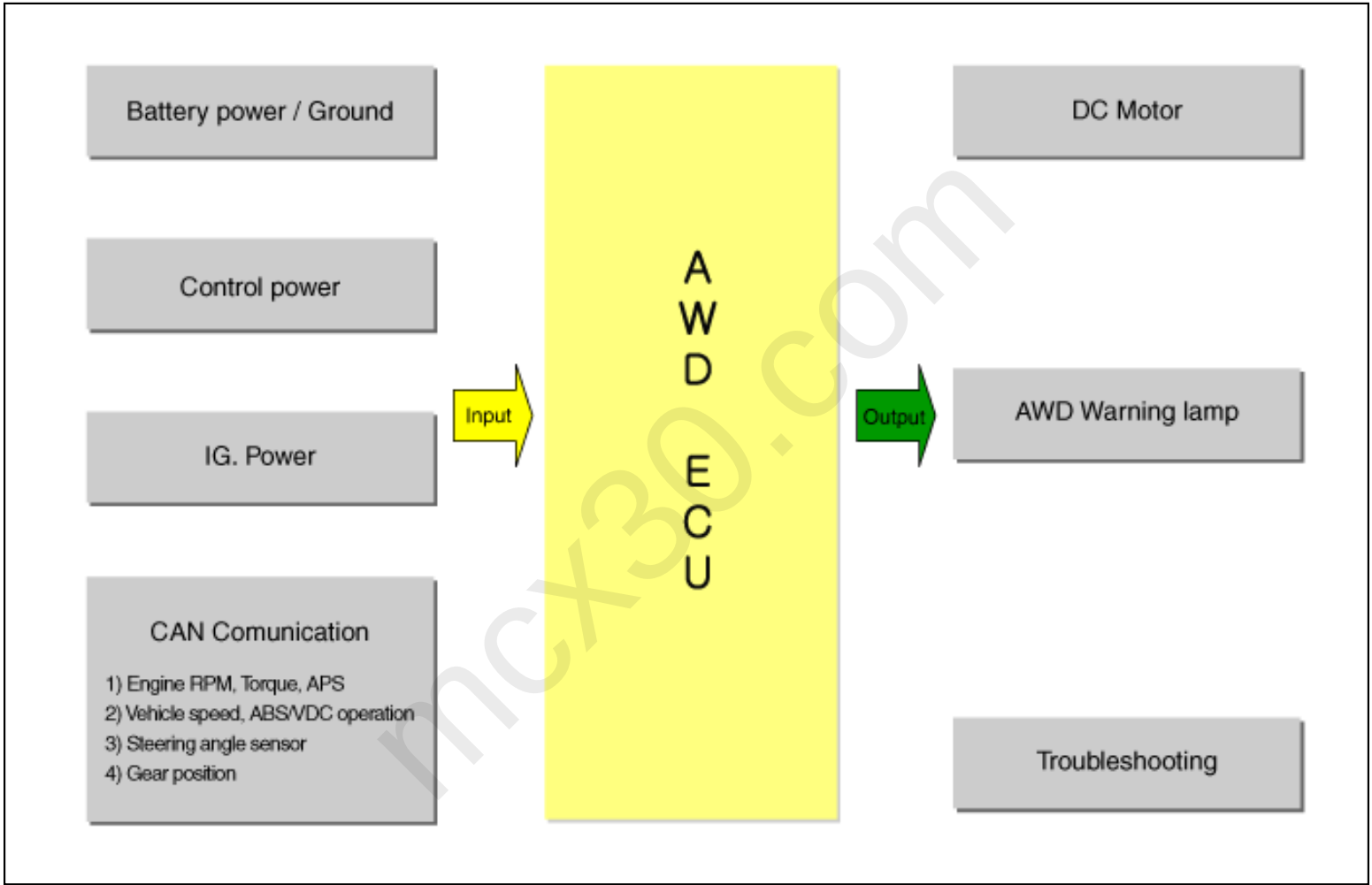
Cancel



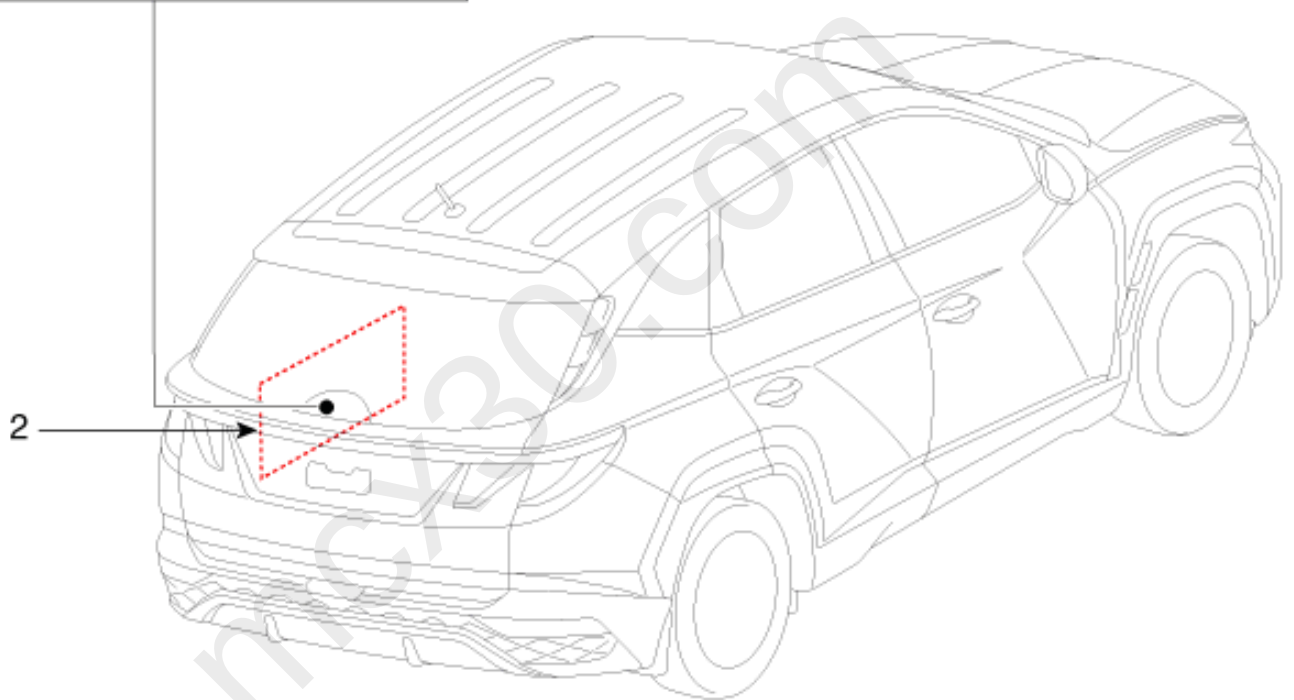
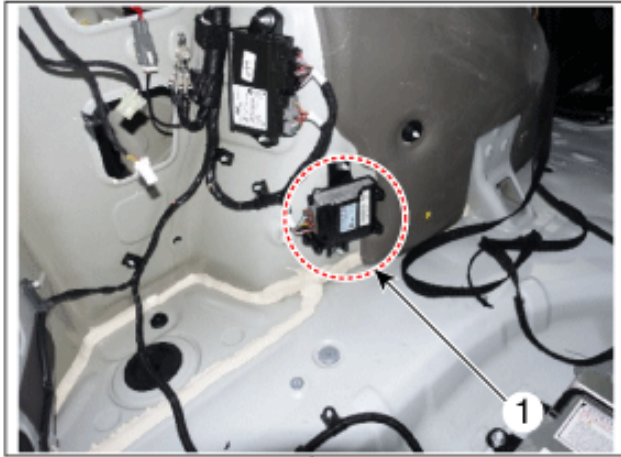
Do not touch any system buttons while performing this function.

Description

The AWD ECU distributes the driving force to the front/rear wheel through controlling the multi plate clutch on the AWD transfer case by analyzing the input information, i.e. the wheel speed, accelerator and steering angle depending on the road condition and driving state. The AWD vehicle has different power transmitting conditions depending on the driving/road conditions. The vehicle speed is transmitted through CAN communication from ABS/ESP ECU. The information from the CAN communication includes the APS which indicates the driver's intention of acceleration, engine torque, ABS/ESP operation signal and gear position. The AWD ECU controls the BLDC motor, warning lamp and indicating lamp and communicates with the tester equipment. When a vehicle runs at normal speed higher than 60KPH on regular roads, it is controlled under the 2WD conditions. The ECU decides the driving force on the front and rear wheel by receiving the signals from all sensors depending on the driving conditions, i.e. abrupt starting, turning and driving on the low friction road, and the optimized torque which is proper to the driving condition is transmitted to the front wheel through calculating and controlling the transmitted torque data.



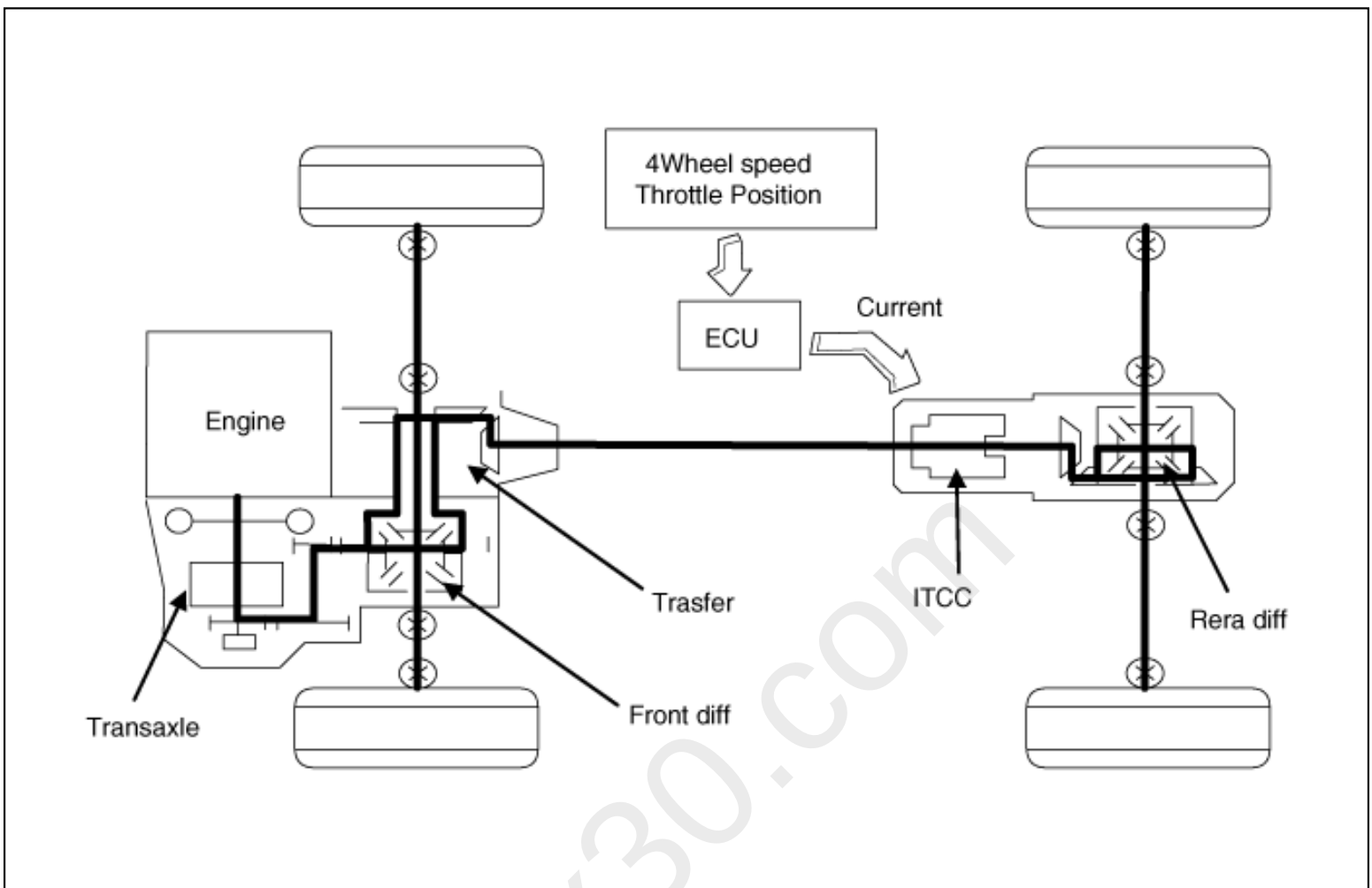
Components
Location



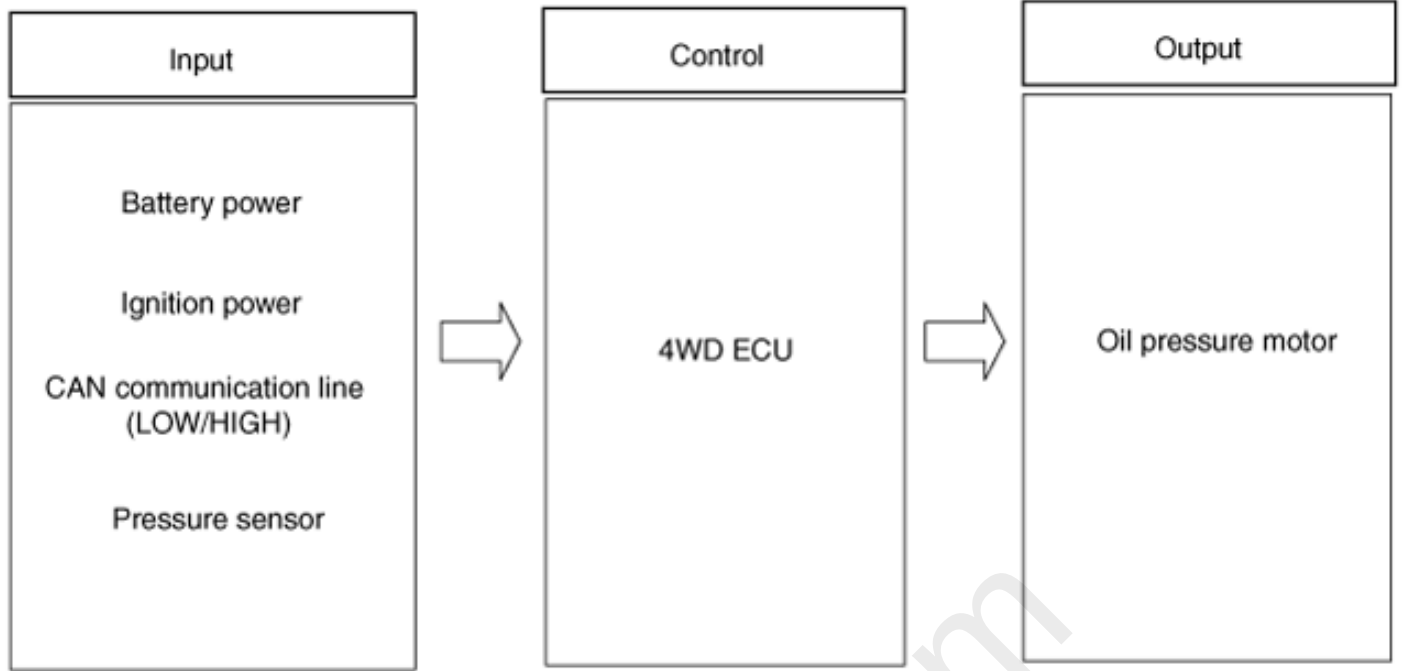
1. 4WD ECU

2. Luggage side trim **[Left side]**

Power Flow
Diagram

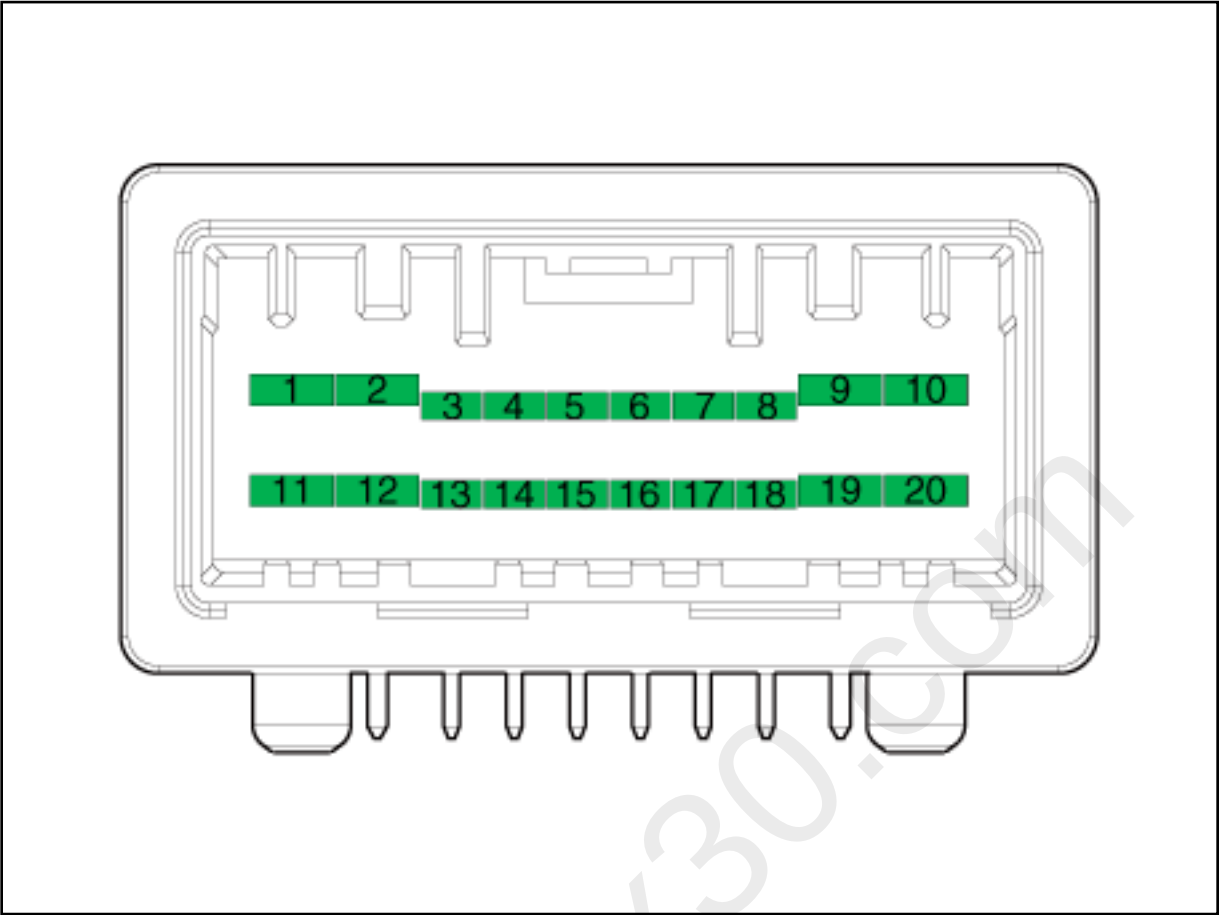


4WD ECU Input&Output
Diagram



Circuit
Diagram

4WD ECU Connector



4WD ECU Pin Function

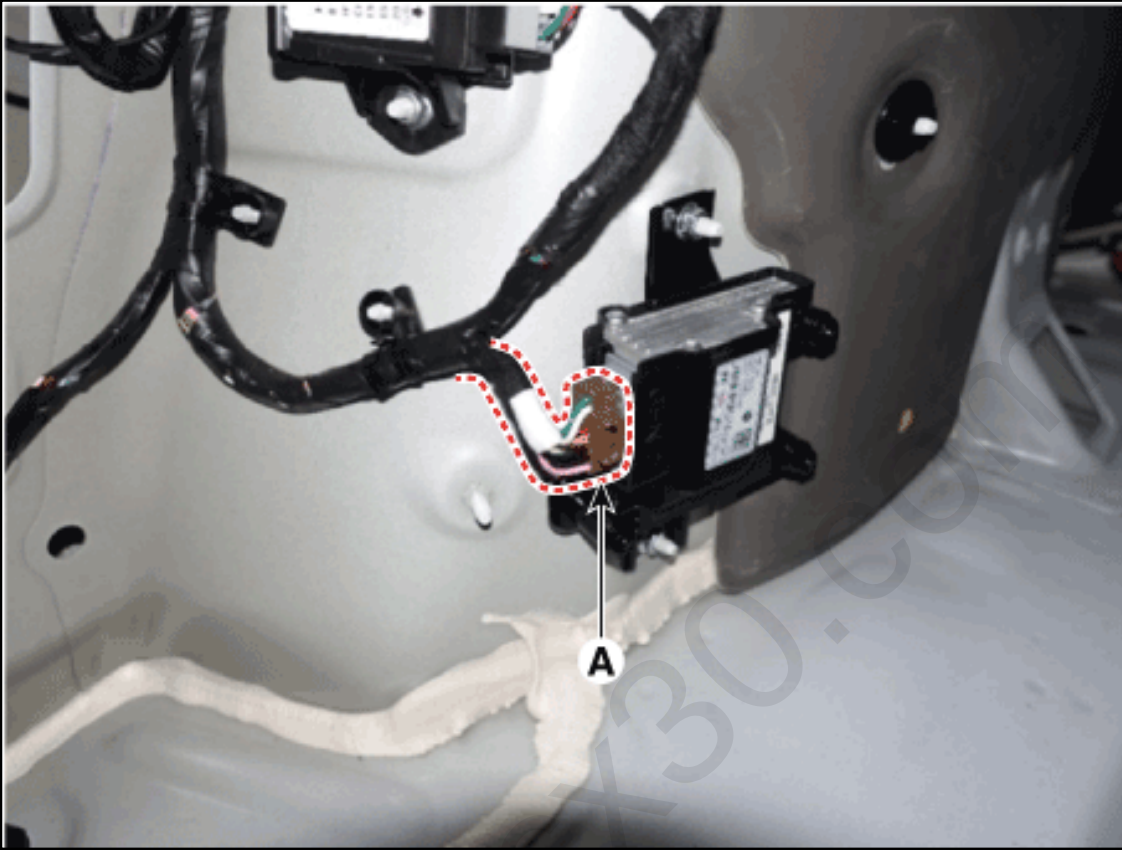
Pin	Function
1	Motor B
2	Motor A
3	-
4	-
5	Pressure sensor (power)
6	-
7	IG1
8	Motor shield wire ground
9	Battery ground
10	Battery power

11	-
12	-
13	-
14	Pressure sensor signal
15	Pressure sensor ground
16	-
17	CAN 1 HIGH
18	CAN 1 LOW
19	CAN 2 HIGH
20	-

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Removal

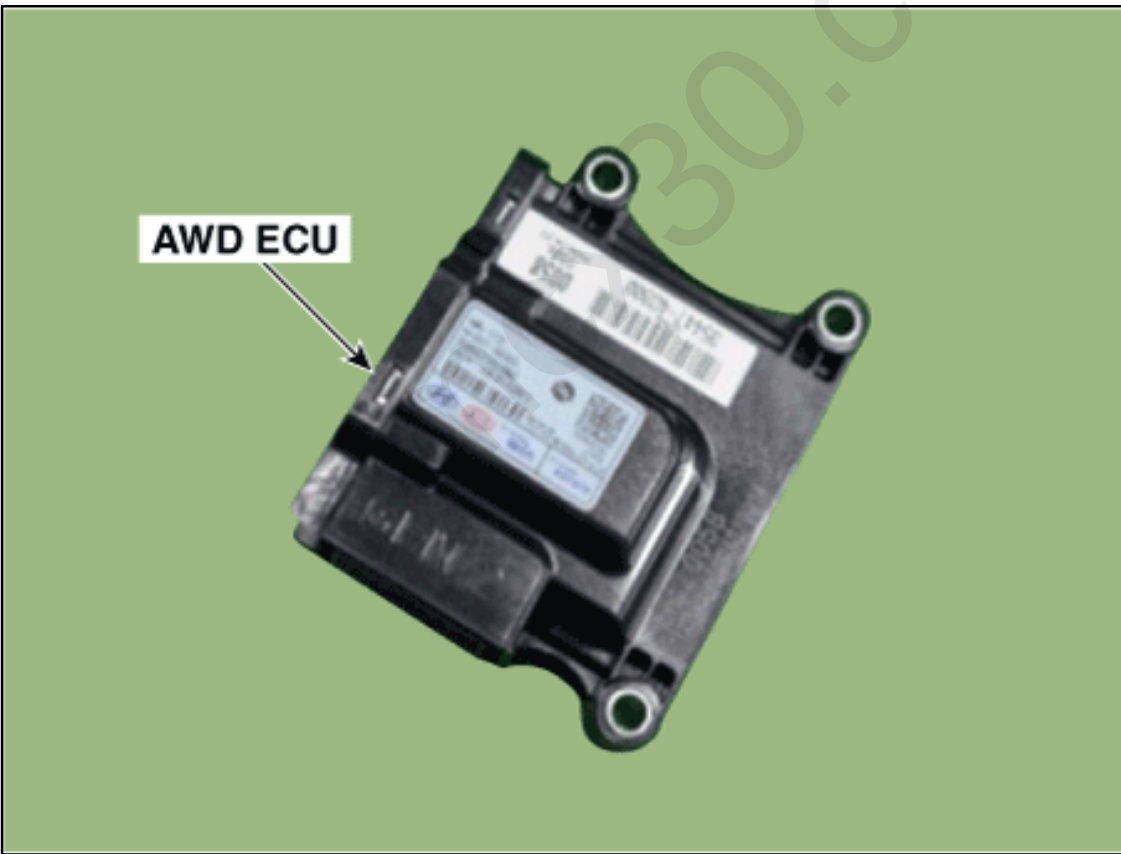
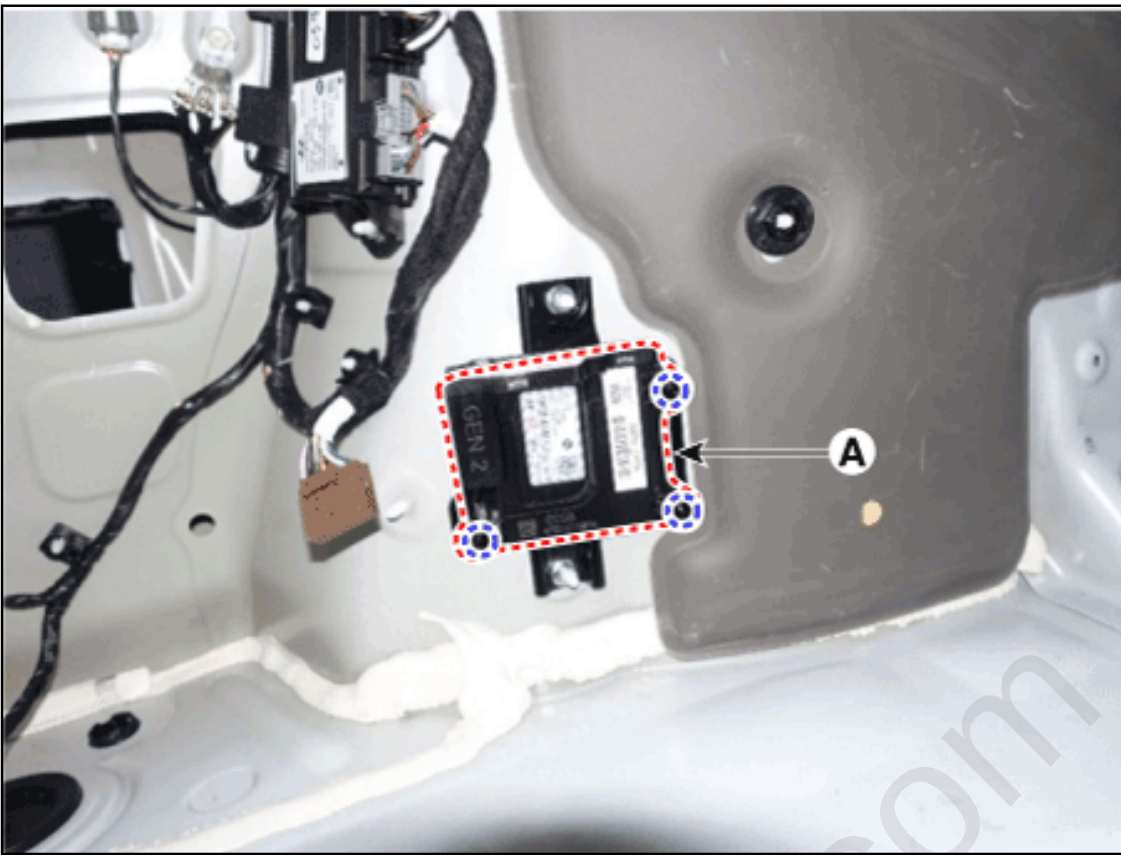
1. Prior to replacing the 4WD ECU, check the 4WD ECU's clutch learning with the diagnostic tool.
(Refer to 4WD Control System - "Repair Procedures")
2. Turn OFF ignition switch and the disconnect the negative (-) battery cable.
3. Remove the luggage side trim. **[Left side]**
(Refer to Body (Interior and Exterior) - "Luggage Side Trim")
4. Disconnect the 4WD ECU connector (A).



5. Loosen the nuts and then removing the 4WD ECU (A).

Tightening torque:

9.8 - 11.8 N.m (1.0 - 1.2 kgf.m, 7.2 - 8.7 lb.ft)



Installation

1. To install, reverse the removal procedures.

2. Prior to installing a new ECU, upload the original ECU's clutch learning to the replacement ECU using the diagnostic tool.

(Refer to 4WD Control System - "Repair Procedures")

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