

SPORTAGE(SL) > 2013 > G 2.4 DOHC > 4 Wheel Drive (4WD) System

4 Wheel Drive (4WD) System > General Information > Specifications

Specifications

Tightening Torques

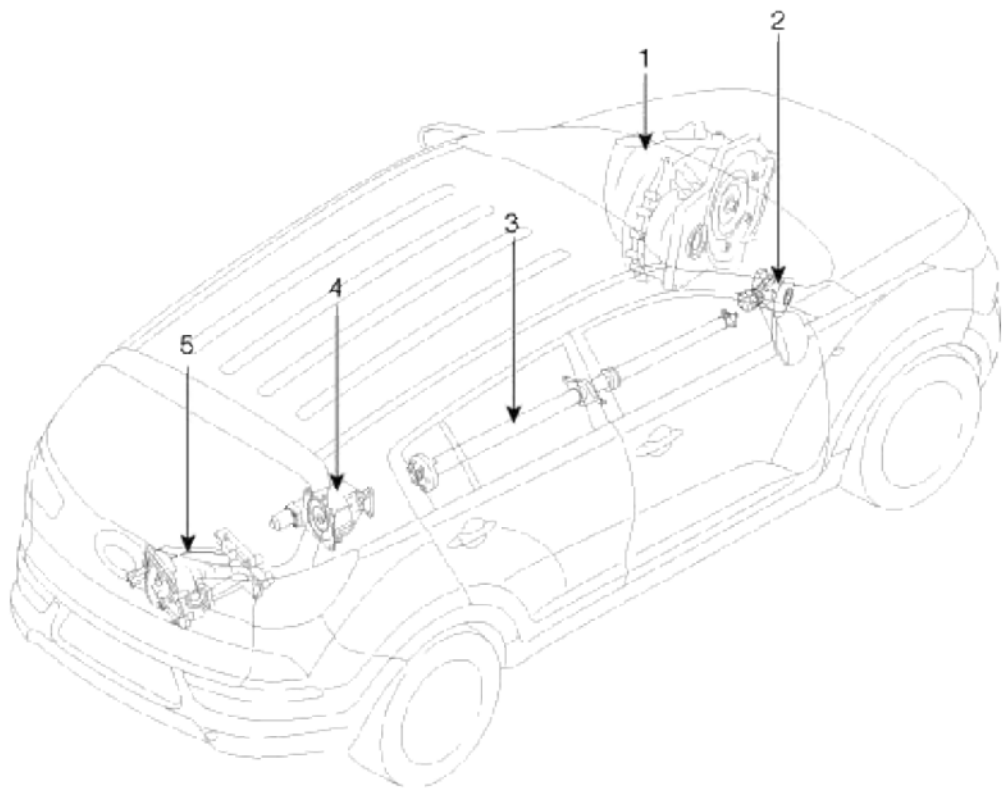
Items	N.m	Kgf.m	lb-ft
Transfer assembly mounting bolts	60.8~65.7	6.2~6.7	44.8~48.5
4WD ECM mounting nuts	9.8~11.8	1.0~1.2	7.2~8.7
Coupling assembly mounting bolts	56.9~64.7	5.8~6.6	42.0~47.7
Propeller shaft mounting bolts	49.0~68.6	5.0~7.0	36.2~50.6
Transfer oil drain plug	39.2~58.8	4.0~6.0	28.9~43.4
Transfer oil filler plug	39.2~58.8	4.0~6.0	28.9~43.4

Lubricants

Items	Specification	Capacity
Transfer oil	HYPOID GEAR OIL API GL-5, SAE 75W/90 (SHELL SPIRAX X or equivalent)	0.6L (0.16 U.S.gal., 0.63 U.S.qt, 0.53 Imp.qt.)
Coupling oil	SHELL TF0870	0.485L(0.13 U.S.gal.,0.51U.S.qt,0.43Imp.qt.)

4 Wheel Drive (4WD) System > Transfer Assembly > Front Wheel Transfer Assembly > Components and Components Location

Components Location



1. Automatic transaxle	4. Coupling assembly
2. Transfer assembly	5. Differential assembly
3. Propeller shaft	

4 Wheel Drive (4WD) System > Transfer Assembly > Front Wheel Transfer Assembly > Repair procedures

Inspection

Transfer Oil Inspection

Transfer oil should be inspected and refilled every 30 months or 37,500 miles.

Transfer Oil Replacement

1. Transfer oil is not replaced in normal condition. But it should be replaced every 75,000 miles in severe driving conditions.

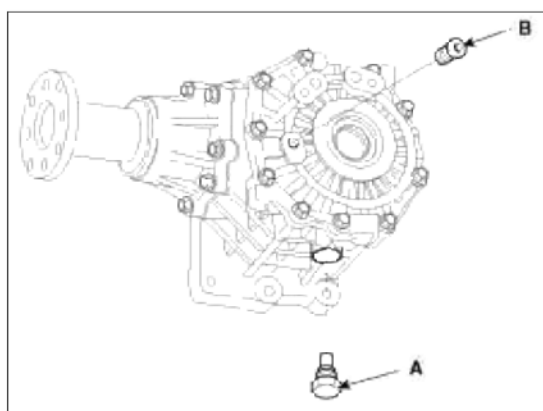
NOTE

Severe driving conditions

- 1. Driving in dusty, rough roads
- 2. Driving in mountains areas
- 3. Driving for patrol car, taxi, commercial car or vehicle towing
- 4. Driving over 170Km/h

CAUTION

Transfer oil should be replaced if the transfer assembly is fall into the water.



Tightening torque

Oil drain plug(A) :

39.2~58.8N.m (4.0~6.0kgf.m, 28.9~43.4lb-ft)

Filler plug(B) :

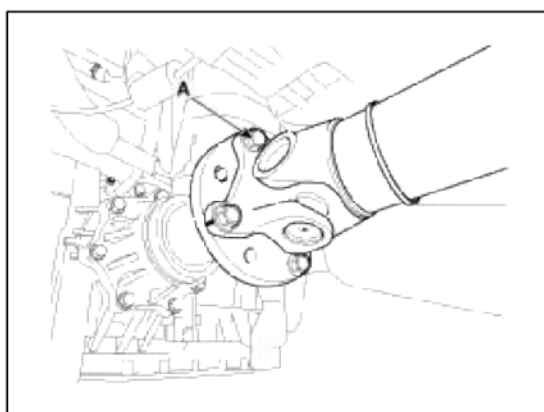
39.2~58.8N.m (4.0~6.0kgf.m, 28.9~43.4lb-ft)

Removal

1. Lift up the vehicle.
2. Remove the propeller shaft bolts.(A-4ea)

Tightening torque :

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

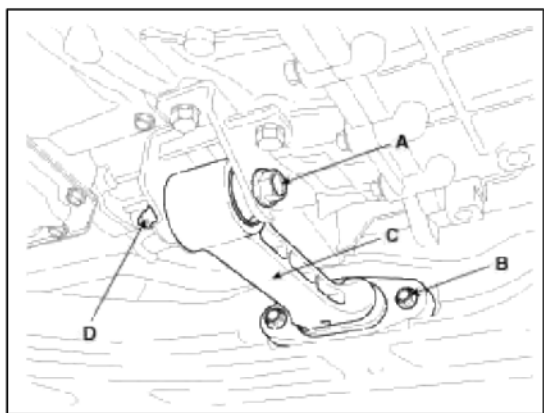


3. Remove the right driveshaft (passenger side) from the transfer case. (Refer to "Drive shaft" in DS group)
4. Remove the roll rod bracket(C) after removing bolt(A,B).

Tightening torque :

(B) 49.0~63.7N.m (5.0~6.5kgf.m, 36.2~47.0lb-ft)

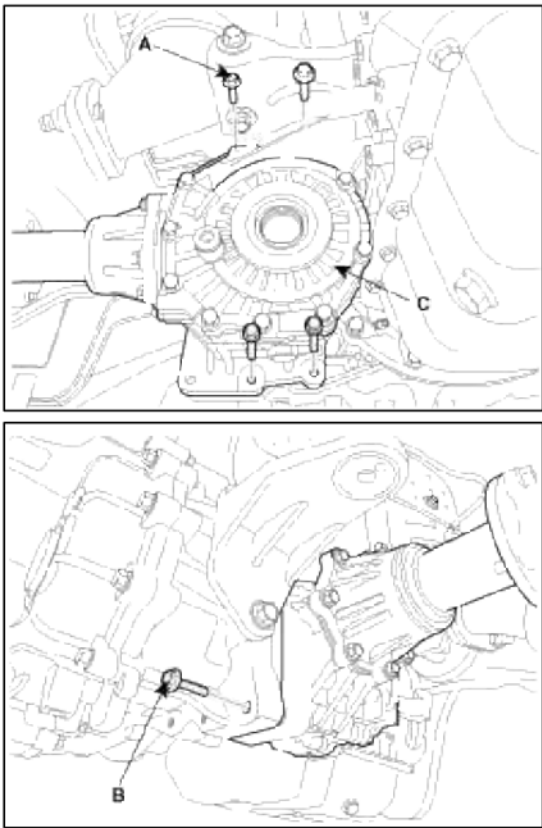
(D) 107.9~127.5N.m (11~13kgf.m, 79.6~94.1lb-ft)



5. Remove the sub frame. ("Front suspension system" in SS group)

6. Remove the transfer case up and down mounting bolt (A-4ea, B-1ea).

Tightening torque :
(A, B) 60.8~65.7N.m (6.2~6.7kgf.m, 44.8~48.5lb-ft)



7. Remove the transfer case (C) with the lever after supporting the transfer case with a jack.

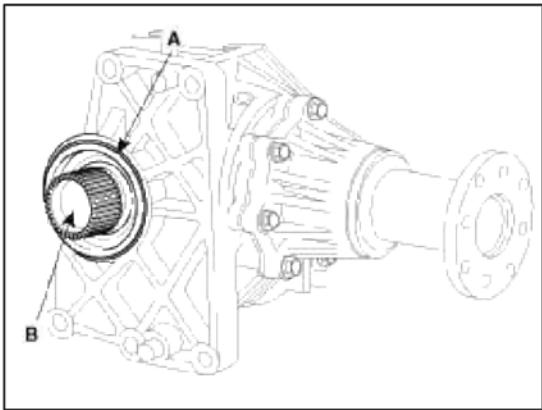
Installation

1. Installation is the reverse of removal.

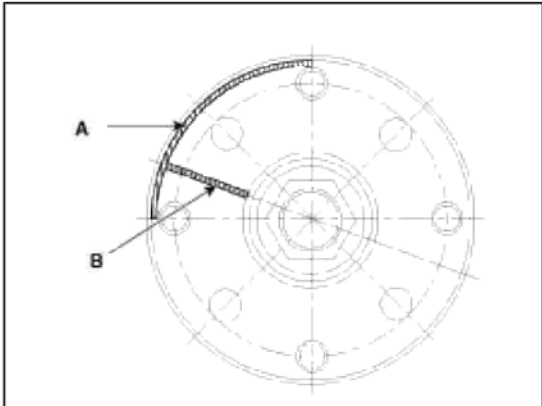
NOTE

- 1. Be careful not to damage the O-ring (A). If the O-ring is damaged, replace with a new one.
- 2. Smear and cover splines (B) with molybdenum type high pressure grease.

TECHLUBE MEGAMAX - ALPHA OR EQUIVALENT



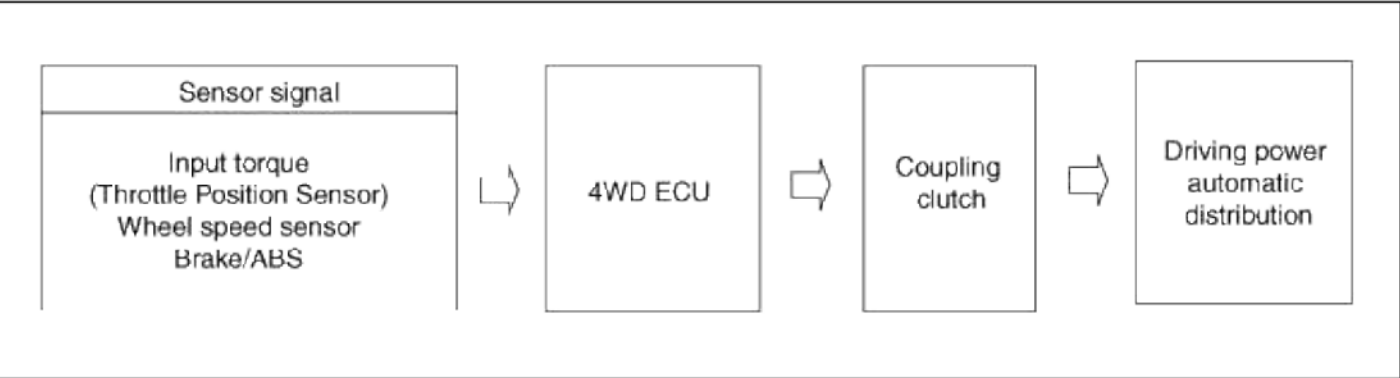
3. Install the propeller shaft near runout marking (Transfer assembly 1ea(A), propeller shaft 1ea(B)).



4 Wheel Drive (4WD) System > 4WD Control System > 4WD ECU > Description and Operation

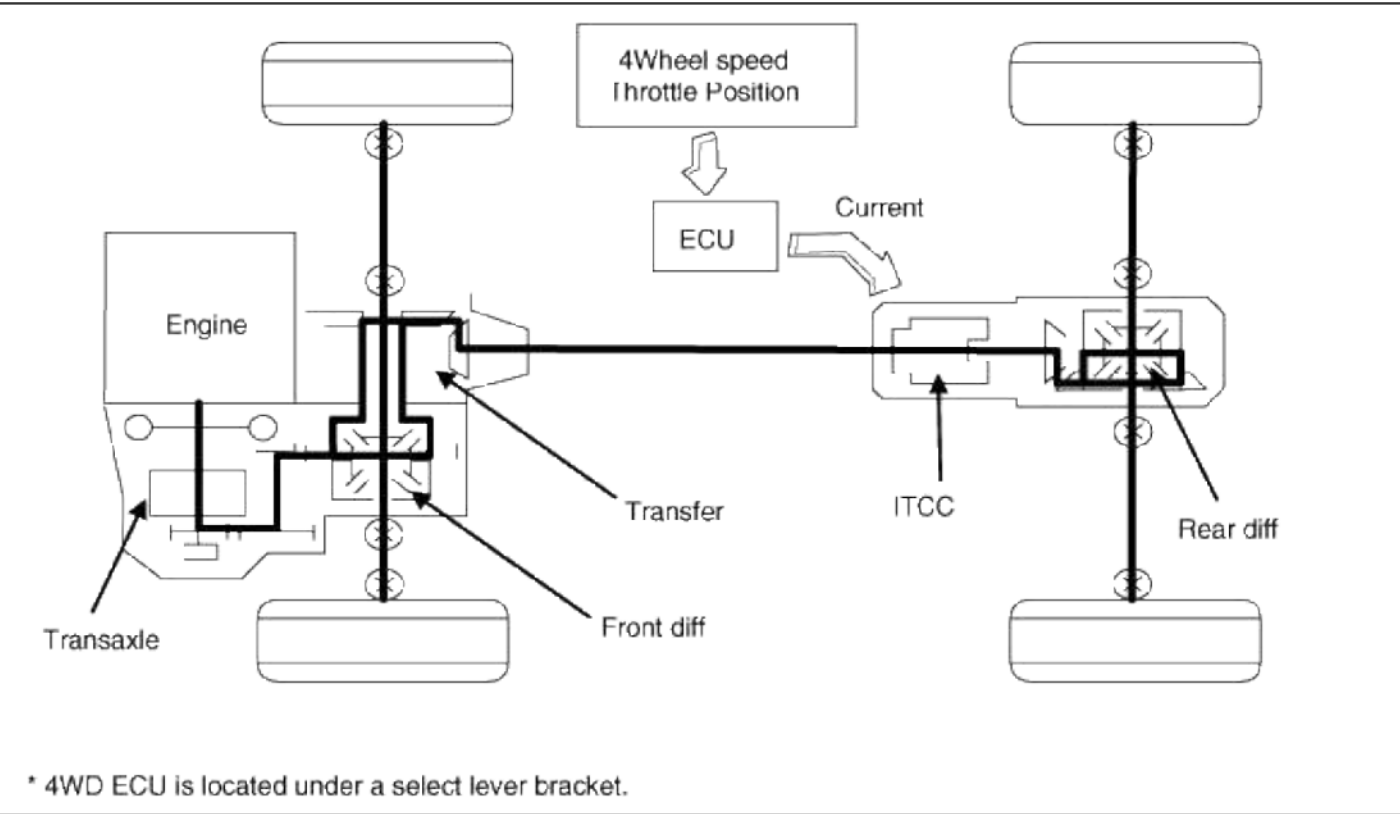
Description

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.

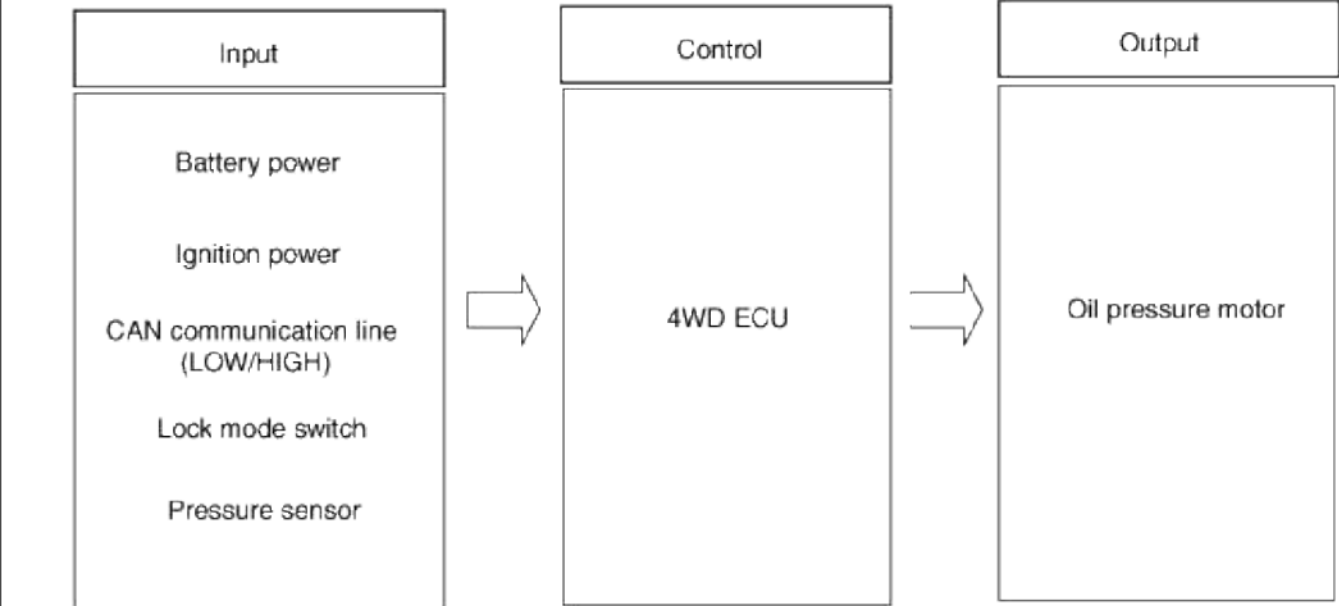


4 Wheel Drive (4WD) System > 4WD Control System > 4WD ECU > Flow Diagram

Power Flow Diagram



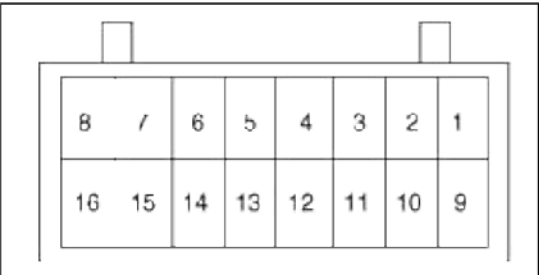
4WD ECU Input&Output Diagram



4 Wheel Drive (4WD) System > 4WD Control System > 4WD ECU > Schematic Diagrams

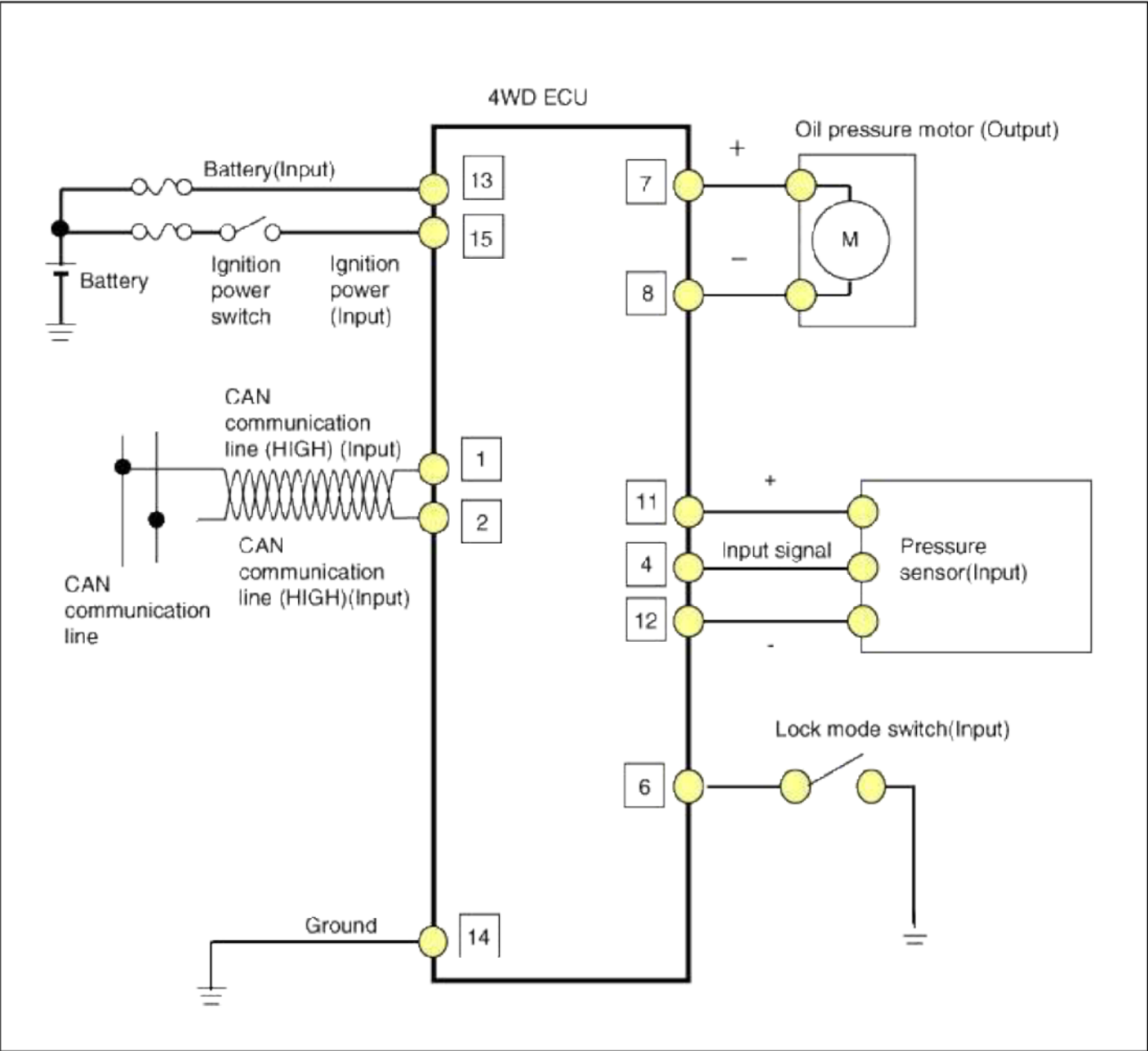
Circuit Diagram

4WD ECU Connector



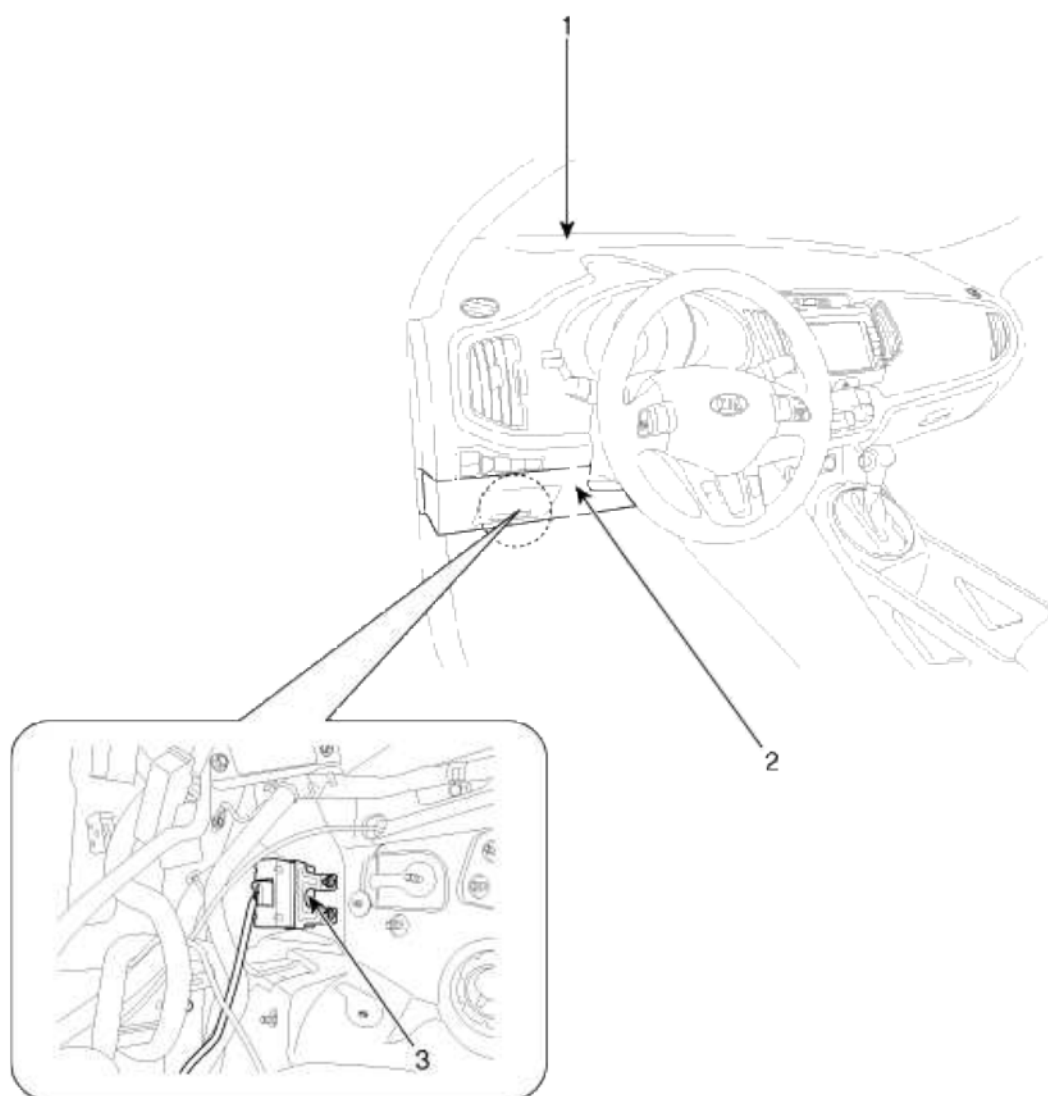
Pin	Function
1	Oil pressure motor A
2	Oil pressure motor B
3	Lock mode switch
4	-
5	Input sensor signal(+)
6	-
7	CAN communication line (High)
8	CAN communication line (Low)
9	-
10	-
11	-
12	IG power
13	Ground
14	Battery power
15	Input sensor signal(-)
16	Pressure sensor(Input)
17	-
18	-

4WD ECU Circuit Diagram



4 Wheel Drive (4WD) System > 4WD Control System > 4WD ECU > Components and Components Location

Component Location



- 1. Crash pad
- 2. Crash lower panel
- 3. 4WD ECU

4 Wheel Drive (4WD) System > 4WD Control System > 4WD ECU > Repair procedures

Replacement

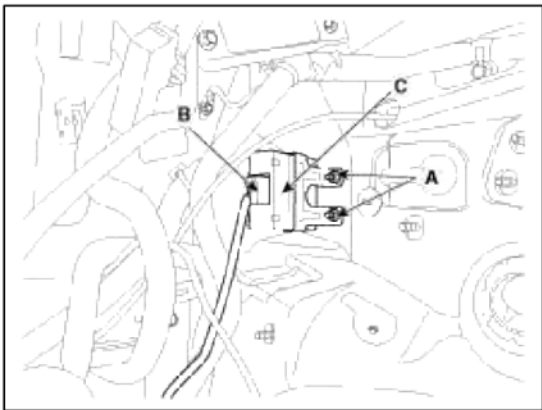
CAUTION

Prior to replacing the 4WD ECU, check the 4WD ECU's clutch learning with the GDS tool. (Refer to "Coupling assembly" in 4WD group)

1. Remove the lower panel. (Refer to "Crash Pad" in BD group)
2. Remove the IPM. (Refer to "Fuses and Relays" in BE group)
3. Remove the parking brake pedal. (Refer to "Parking Brake System" in BR group)

4. Remove the 4WD ECU(C) after removing the nut (A-2ea) and the connector (B).

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



5. Installation is the reverse of removal.

CAUTION

Prior to installing a new ECU, upload the original ECU's clutch learning to the replacement ECU using the GDS tool. (Refer to " Coupling assembly " in 4WD group)

4 Wheel Drive (4WD) System > Coupling Assembly > Direct Electro Hydraulic Actuator Coupling > Description and Operation

Description

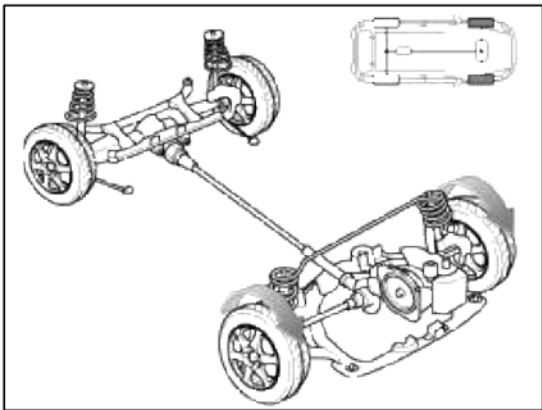
4WD ECU processes signals from various sensors and determines the current road and driving conditions. The ECU then utilizes this information to implement precision control over the 4WD coupling's multi-plate clutch and variably adjust the amount of torque delivered to the rear wheels.

Four Wheel Drive (4WD) transfer mode selection

- 1. AUTO MODE:
 - A. 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.
 - B. When driving on normal roads and pavement, the vehicle moves similar to conventional 2WD vehicles.
- 2. LOCK MODE:
 - A. This mode is used for climbing or descending sharp grades, off-road driving, driving on sandy and muddy roads, etc., to maximize traction.
 - B. This mode automatically begins to deactivate at speeds above 30 km/h (19 mph) and is shifted to 4WD AUTO mode at speed above 40 km/h (25 mph). If the vehicle speed decelerates to below 30 km/h (19 mph), however, the transfer mode is shifted into 4WD LOCK mode again.

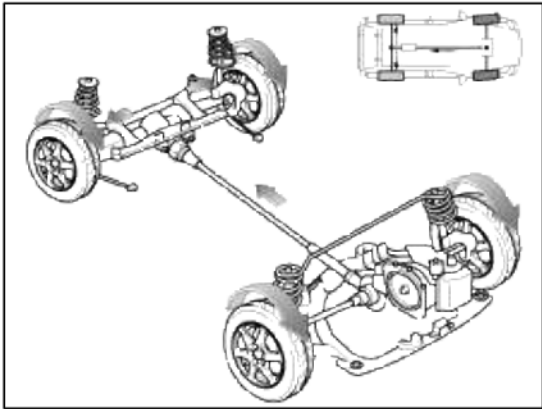
Electronic Coupling - 4WD Control (By Driving Condition)

- 1. Cruising (Auto Mode)
 - Power is delivered mostly to the front wheels.



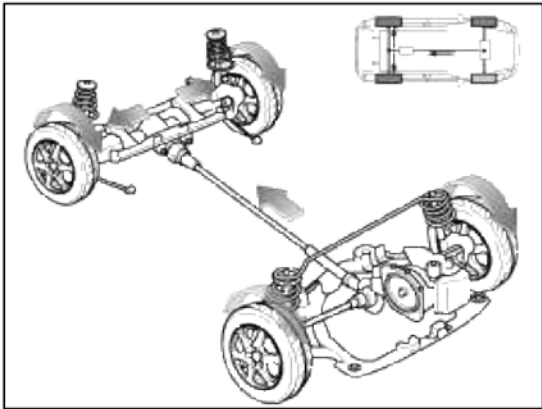
2. Cornering (Auto Mode)

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



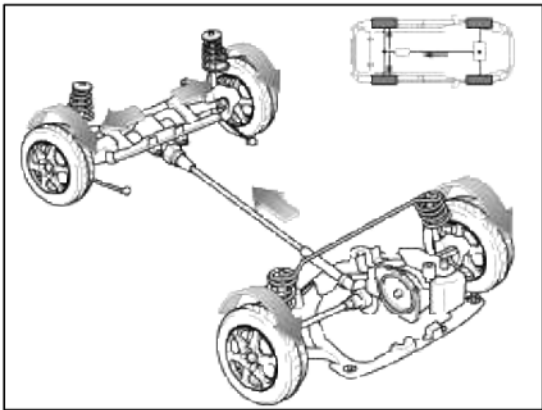
3. Wheel Slip (Auto Mode)

- 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.



4. Lock Mode

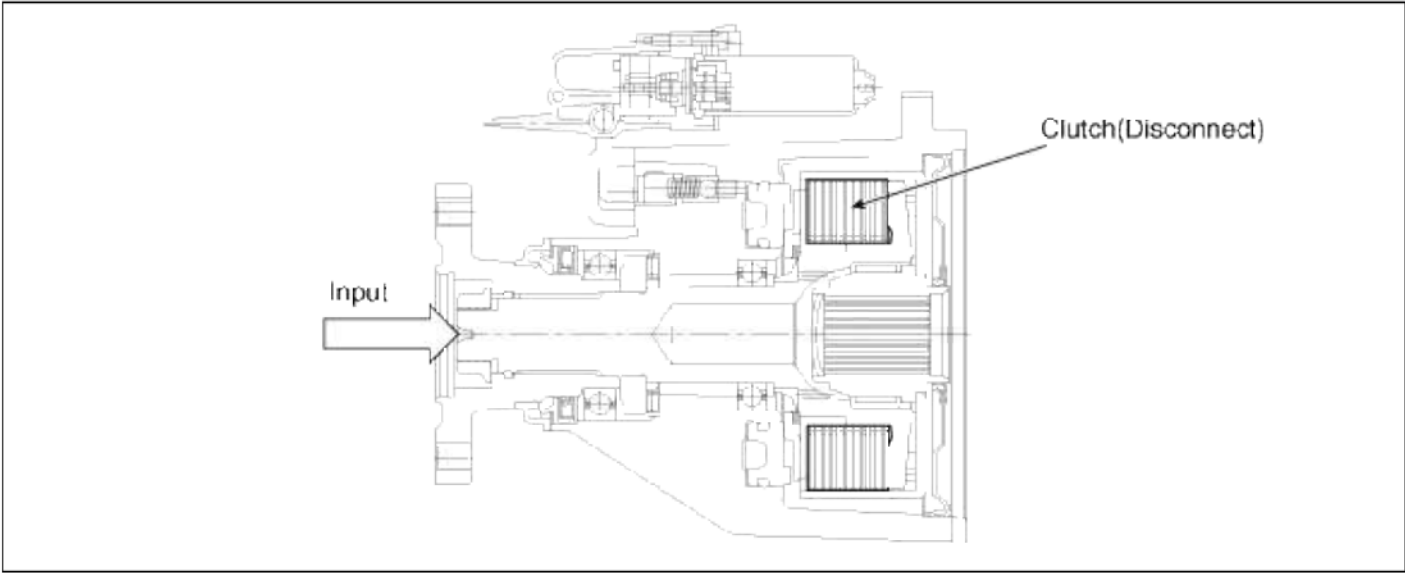
- Maximizes rough terrain performance (active only at speeds below 40 km/h).



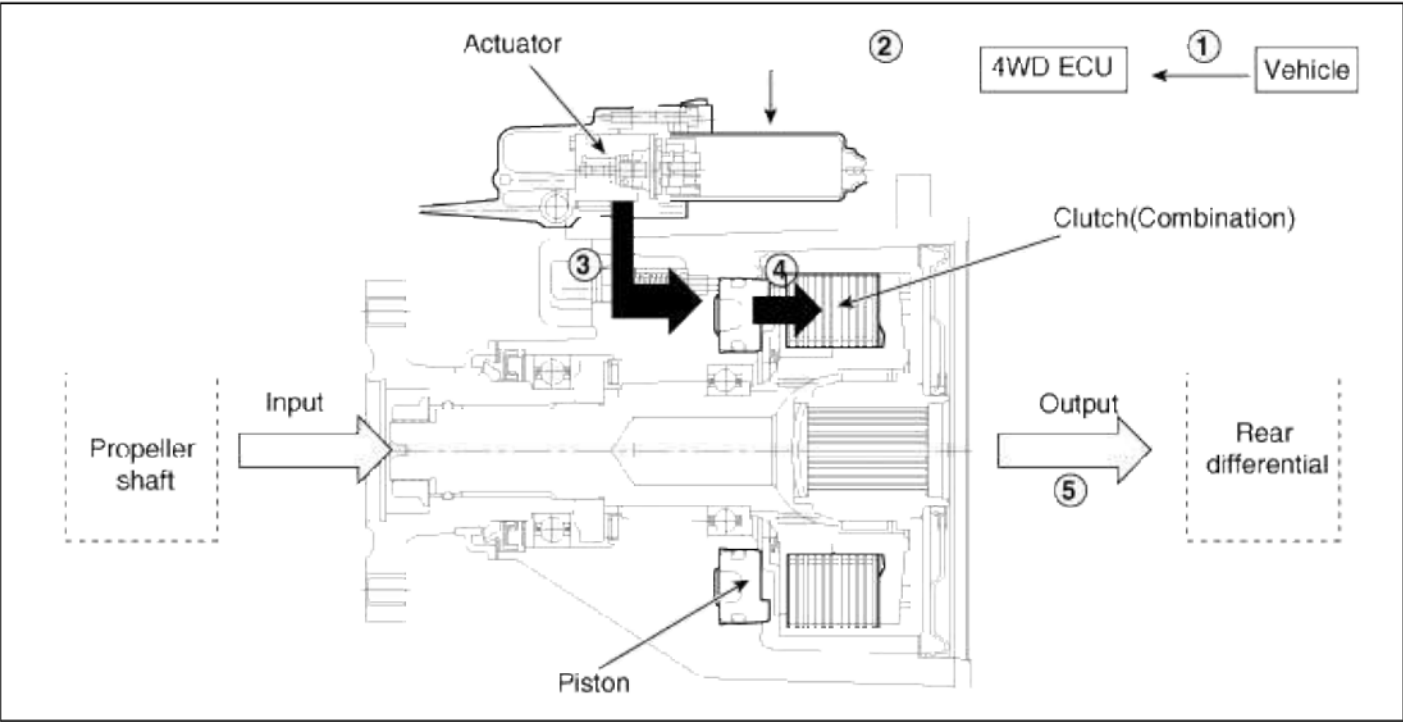
Operation

Electronic Coupling

[Inactive]



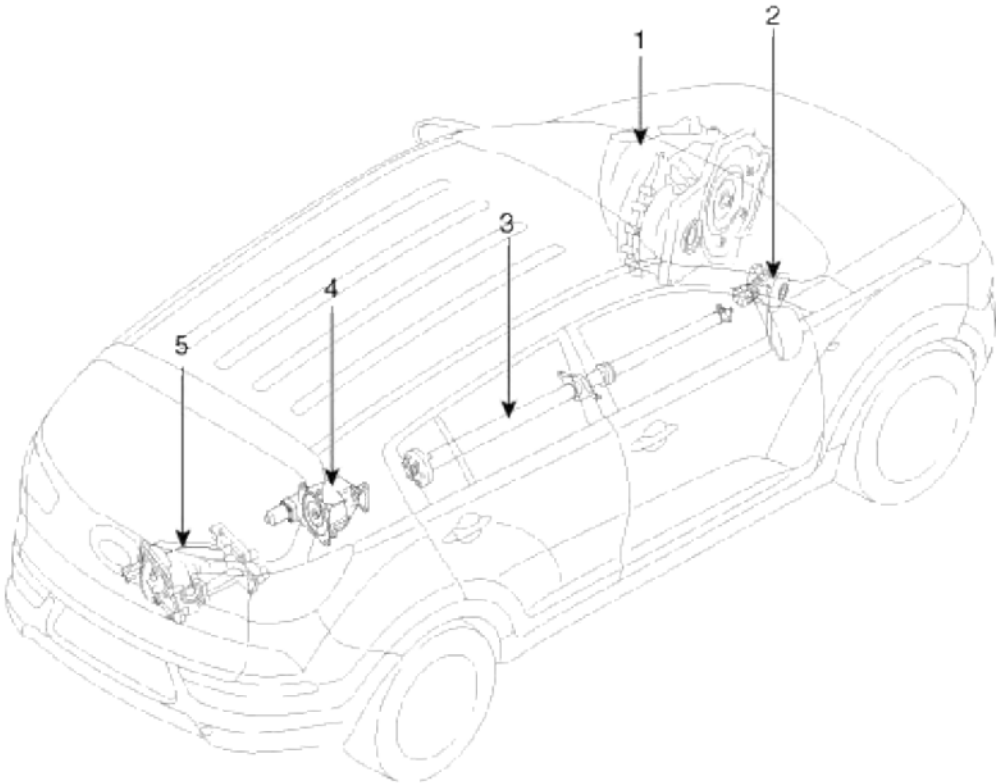
[Active]



- Operation Order**
- 1. 4WD ECU receives CAN signals from the vehicle's sensors.
 - 2. 4WD ECU calculates the necessary amount of rear-wheel torque and sends the corresponding driving current to the actuator (electronic motor and hydraulic pump).
 - 3. Hydraulic pressure generated by the actuator moves the piston.
 - 4. Friction from the piston's movement engages the clutch.
 - 5. Power is delivered to the rear wheels.

4 Wheel Drive (4WD) System > Coupling Assembly > Direct Electro Hydraulic Actuator Coupling > Components and Components Location

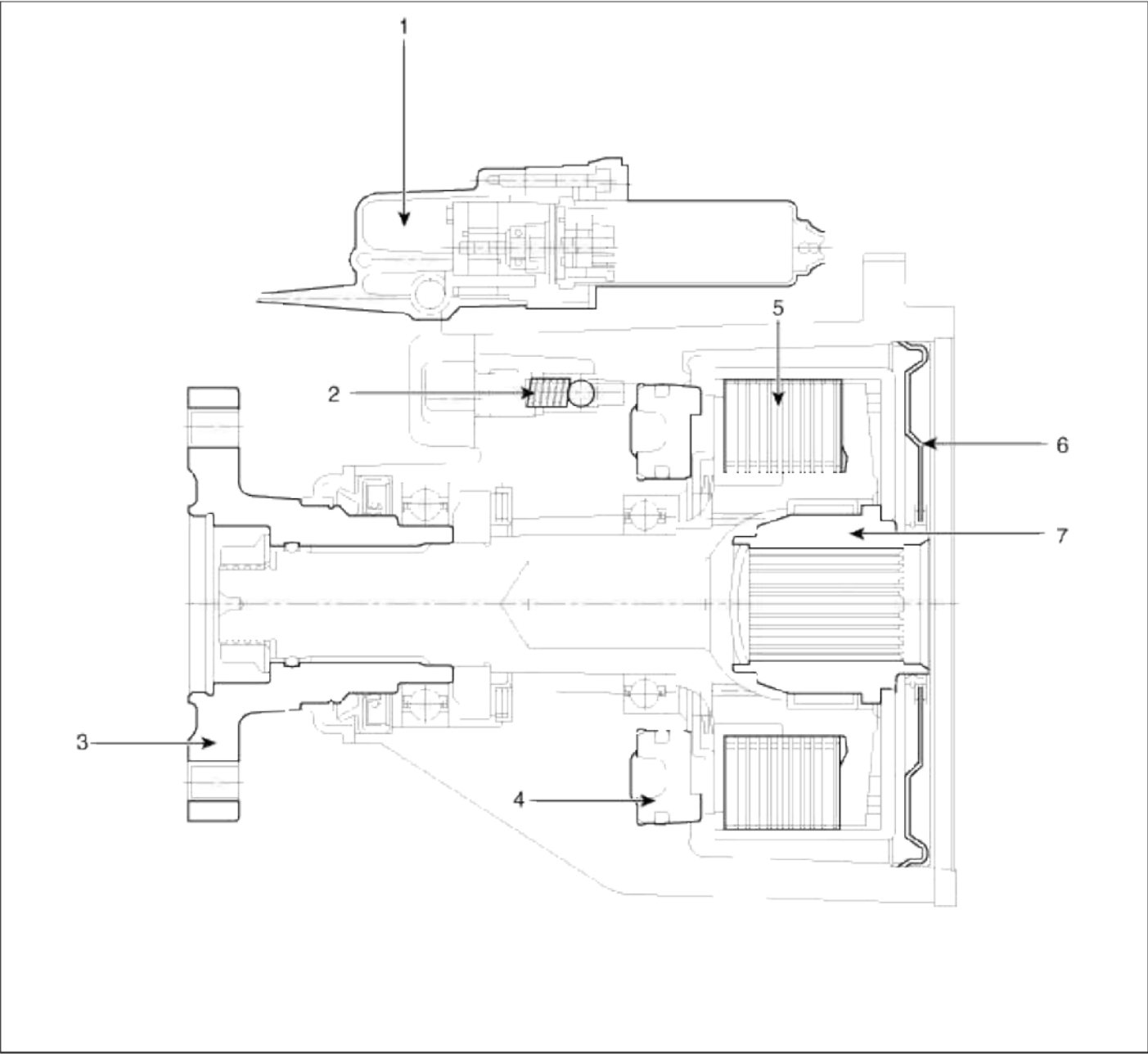
Component Location



1. Automatic transaxle	4. Coupling assembly
2. Transfer assembly	5. Differential assembly
3. Propeller shaft	

Components

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1. Actuator	5. Clutch pack
2. Bleed valve	6. Oil seal cover
3. Flange & Input shaft	7. Hub
4. Piston	

4 Wheel Drive (4WD) System > Coupling Assembly > Direct Electro Hydraulic Actuator Coupling > Repair procedures

Inspection

NOTE

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).

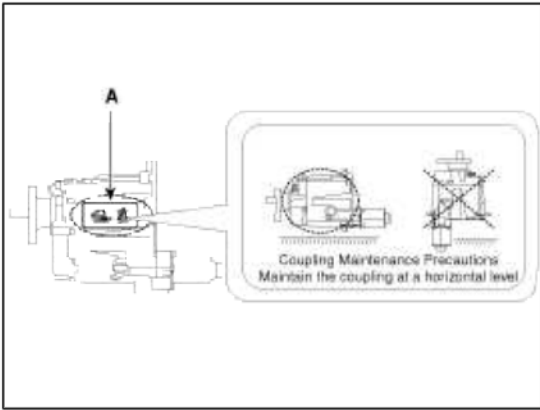
Removal

CAUTION

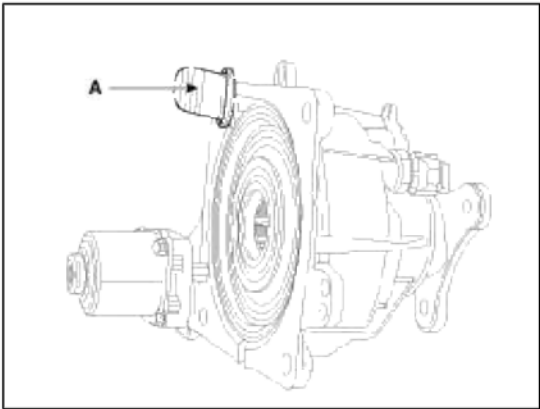
Coupling Maintenance Precautions

Maintain the coupling at a horizontal level.

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



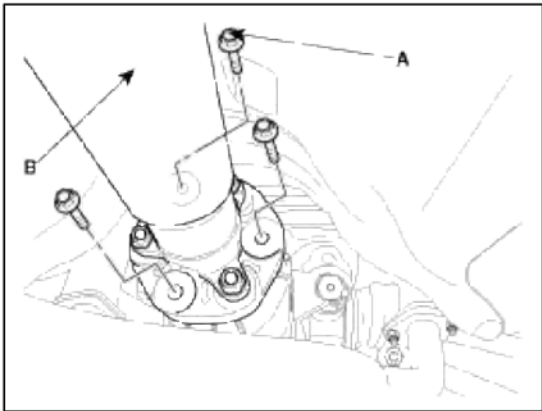
- Remove the dipstick and then mount the coupling assembly to the rear differential assembly.
- Maintain the coupling at a horizontal level after removing the dipstick to prevent the fluid from spilling out.



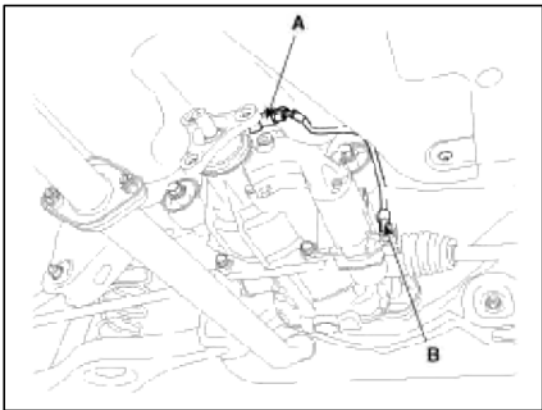
1. Remove the 4WD coupling assembly bolts (A-3ea) mounted to the rear propeller shaft (B).

Tightening torque :

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

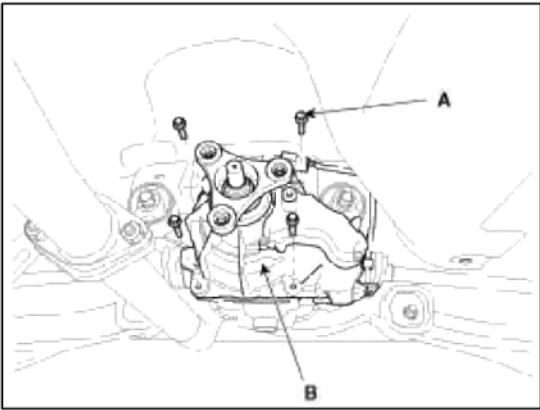


2. Using a flat tool, separate the propellar shaft from 4WD coupling assembly.
3. Remove the electric magnetic clutch connector(A).



4. Remove the 4WD coupling assembly mounting bolts (A-4ea).

Tightening torque :
58.8~63.7N.m (6.0~6.5kgf.m, 43.4~47.0lb-ft)



5. Using a flat tool, separate the 4WD coupling assembly from the rear differential carrier assembly.

Installation

1. Installation is the reverse of removal.

NOTE

- Grease the spline hole (A) of the coupling assembly.

Grease

Extreme Pressure(EP) grease containing molybdenum disulfide(MoS2)

- When installation the coupling, be careful not to damage the oil seal (B).

A technical line drawing of a rear differential carrier assembly. It shows a large circular housing with a central spline hole labeled 'A' and an oil seal labeled 'B'.

CAUTION

After replacing the coupling, reset the 4WD ECU's clutch learning using the GDS tool. (Refer to " Coupling assembly " in 4WD group)

Adjustment

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

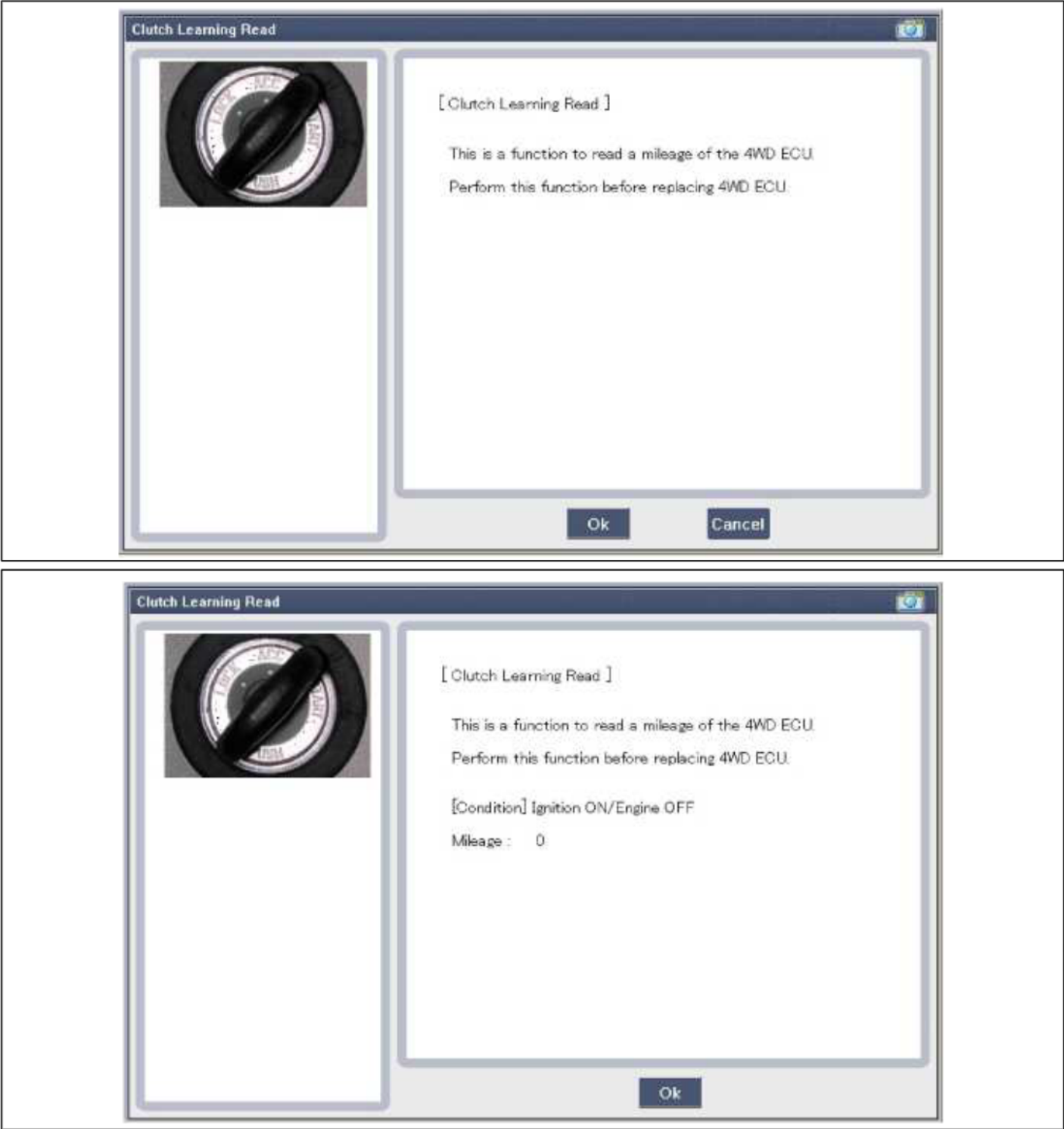
1. Simultaneous replacement of 4WD ECU (Controller) and coupling
- A. Does not require compensation.

- 2. Replacement of coupling only
 - A. Reset the 4WD ECU's (Controller) clutch learning.

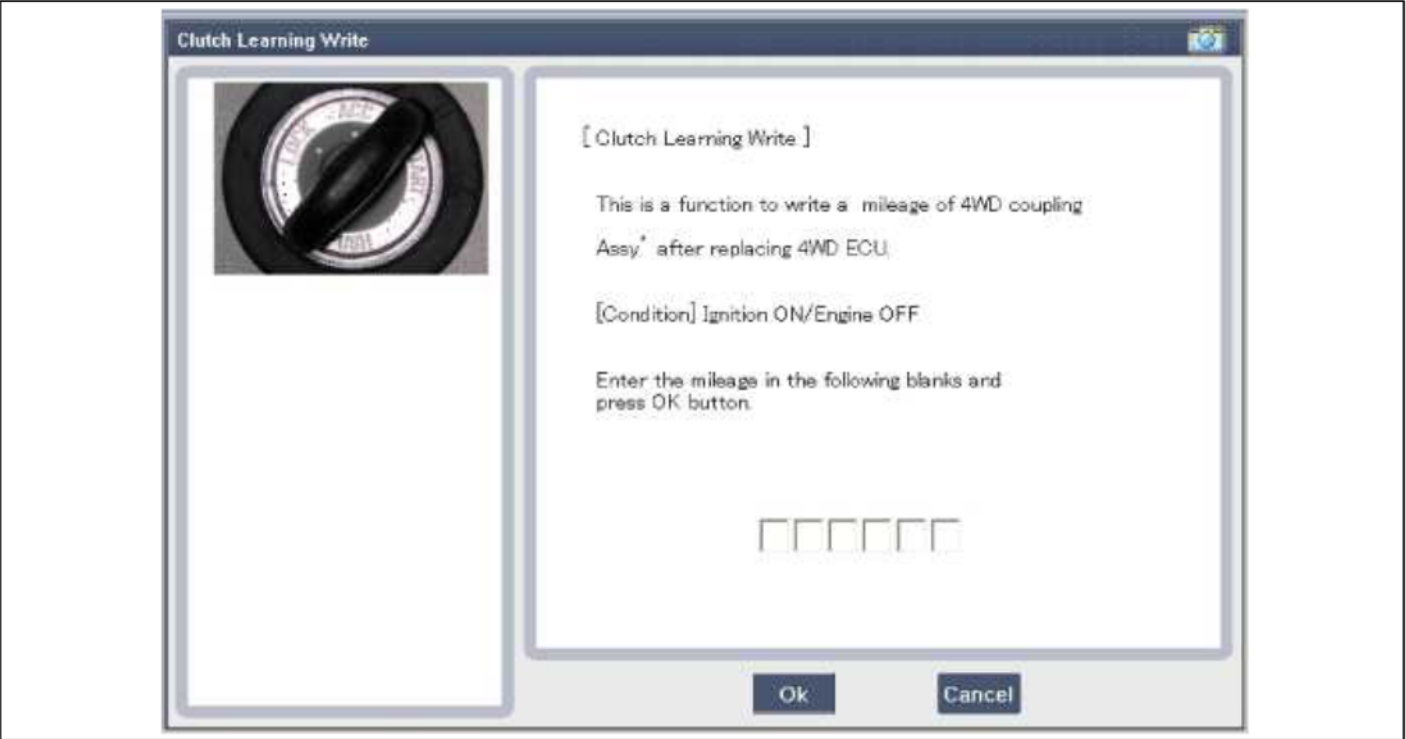


- 3. Replacement of 4WD ECU (Controller) only

A. Before replacement: Check the ECU's clutch learing.



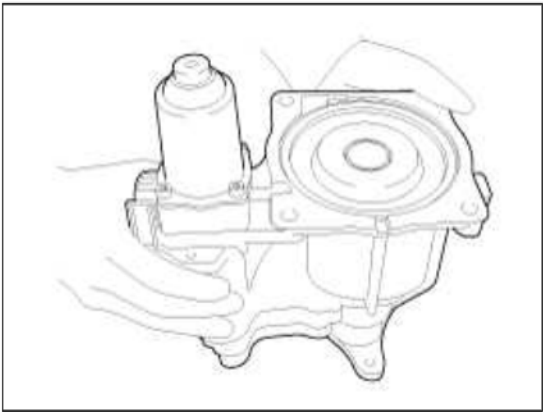
B. After replacement: Enter the original ECU's clutch learing into the replacement ECU.



4 Wheel Drive (4WD) System > Coupling Assembly > Oil hydraulic Motor(Actuator) > Description and Operation

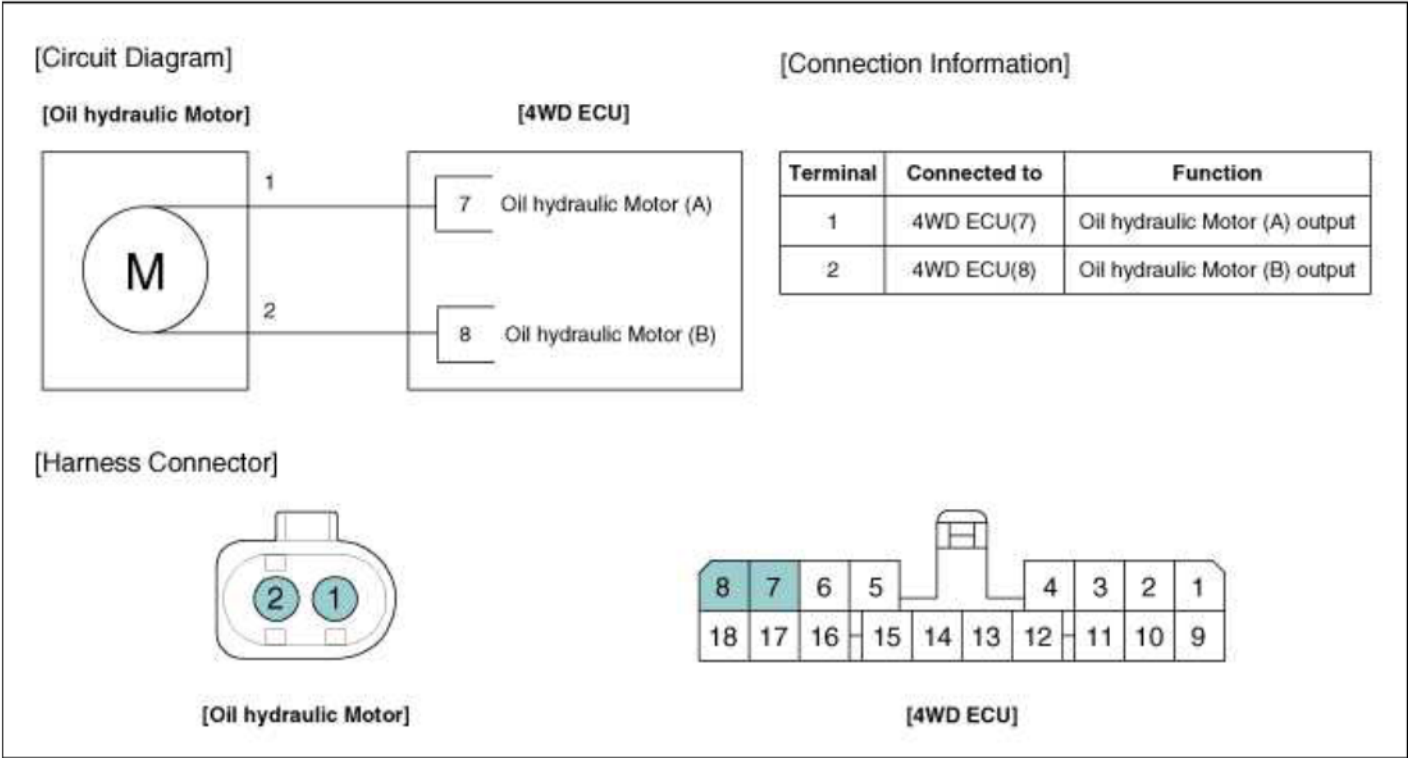
Description

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.



4 Wheel Drive (4WD) System > Coupling Assembly > Oil hydraulic Motor(Actuator) > Schematic Diagrams

Circuit Diagram



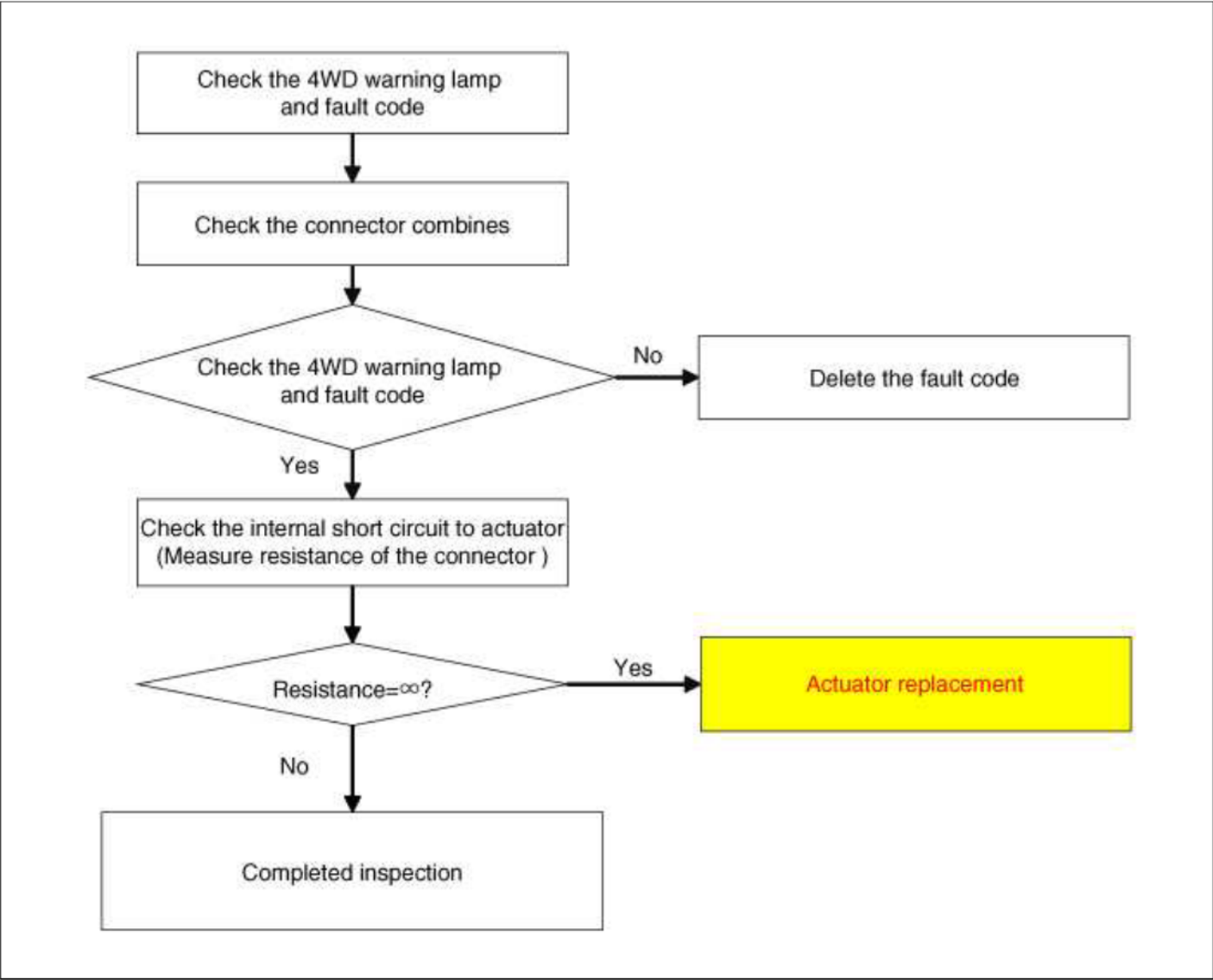
4 Wheel Drive (4WD) System > Coupling Assembly > Oil hydraulic Motor(Actuator) > Repair procedures

Inspection

NOTE

If you have trouble code related to the oil hydraulic motor(actuator) (P1825, P1826, P1827, P1828), check oil hydraulic motor (actuator) according to the inspection process.

Oil Hydraulic Motor (Actuator) Inspection Procedure

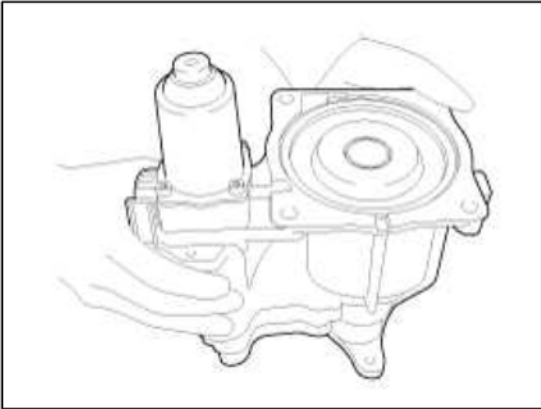


Removal

- 1. Remove the coupling assembly.
(Refer to "coupling assembly" in 4WD group)
- 2. Keep going perpendicular state after remove the coupling assembly.

NOTE

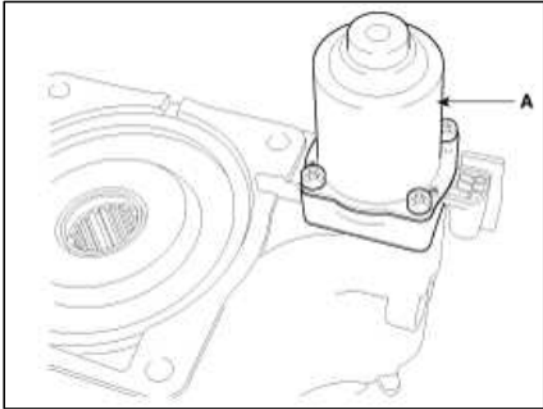
- Keep going perpendicular state during remove(install) the hydraulic motor (actuators).



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

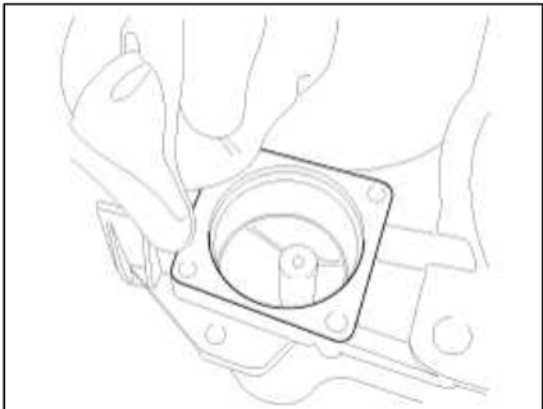
CAUTION

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

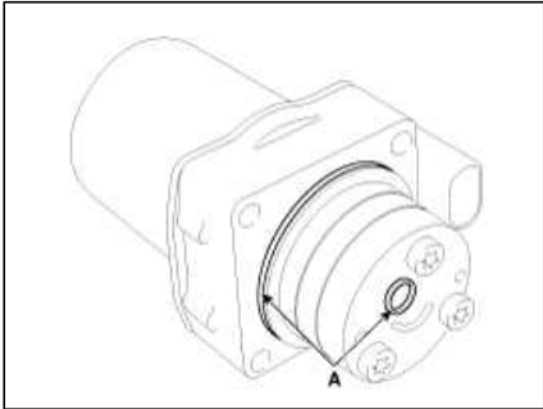


Installation

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



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



CAUTION

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

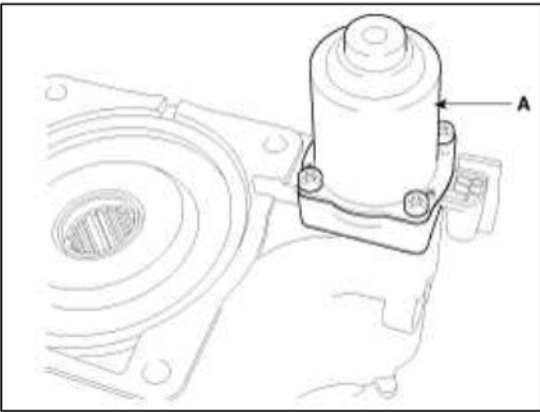
3. Tighten the bolts after install the hydraulic motor (actuators).

CAUTION

- When installing, motor connector has to toward in the direction of outside of the Coupling.

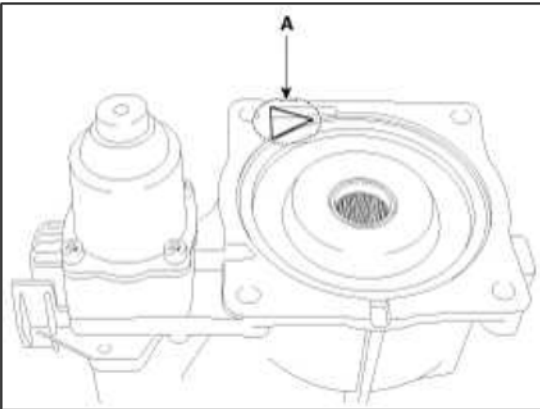
Tightening torque:

8.8 ~ 10.8 N.m (0.9 ~ 1.1 kgf.m, 6.5 ~ 8.0 lb-ft)

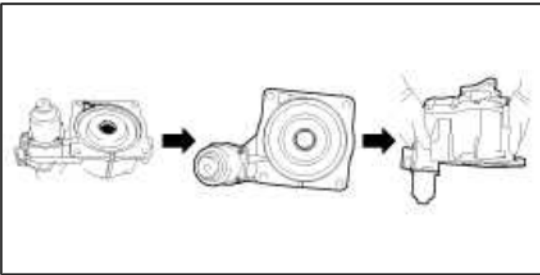


NOTE

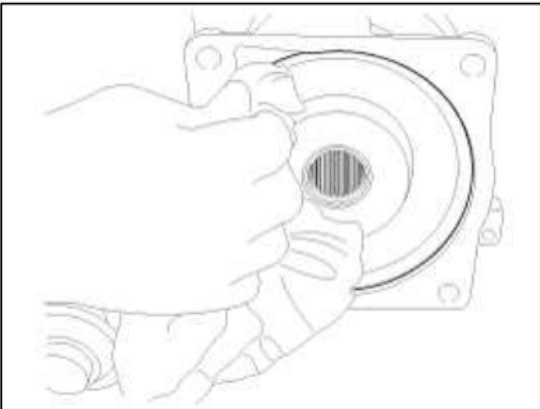
- When installing, oil can be reflux by the pressure in air breather hole.(Oil reflux weight: about 5 ~ 10ml)



- 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. Measure the weight of the coupling.

Coupling assembly weight:
8.18 ~ 8.23kg (Current oil capacity 490ml)

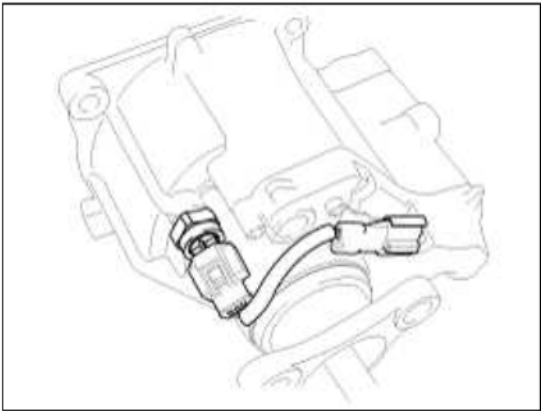
CAUTION

- If the weight of the coupling assembly is less than 8.18kg, must be replace the coupling assembly because of suspect excessive reflux.

4 Wheel Drive (4WD) System > Coupling Assembly > Pressure Sensor > Description and Operation

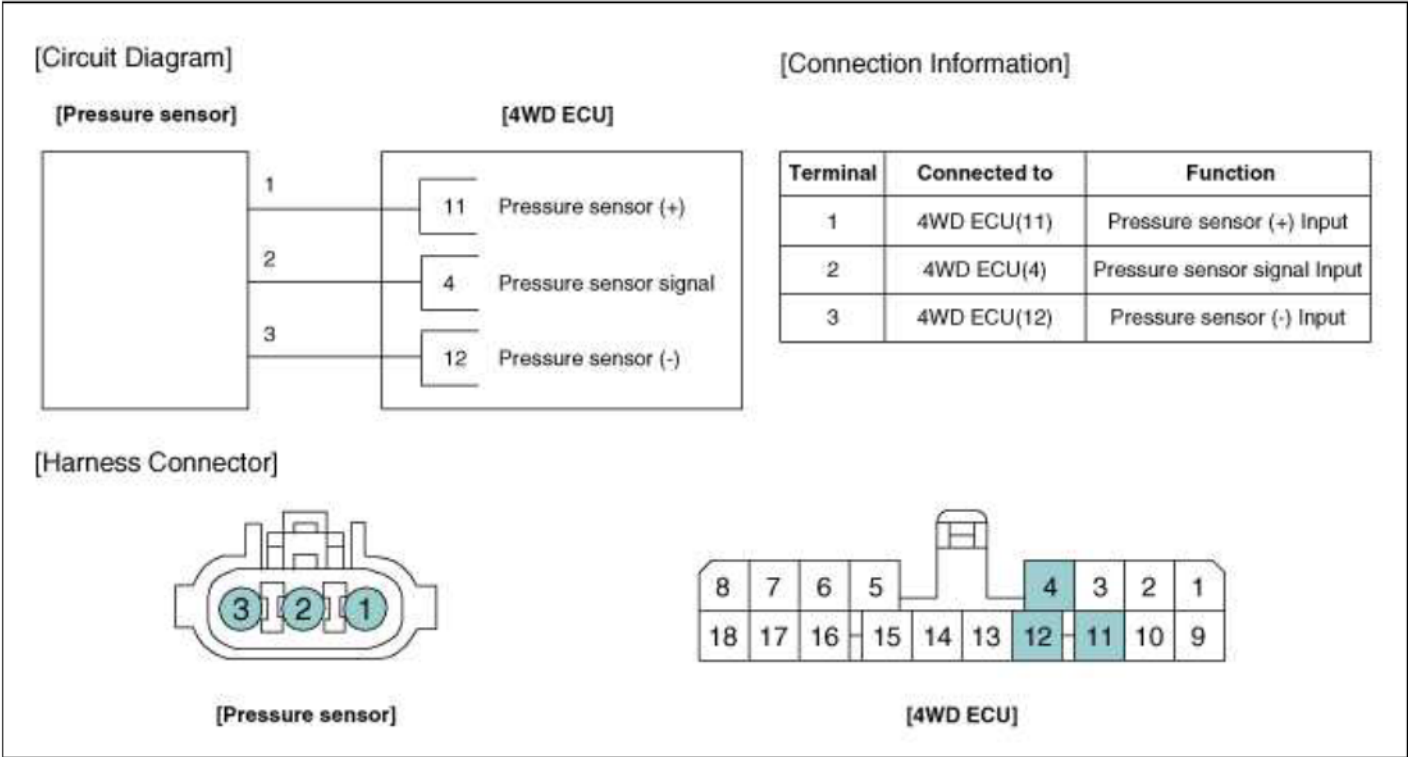
Description

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.



4 Wheel Drive (4WD) System > Coupling Assembly > Pressure Sensor > Schematic Diagrams

Circuit Diagram



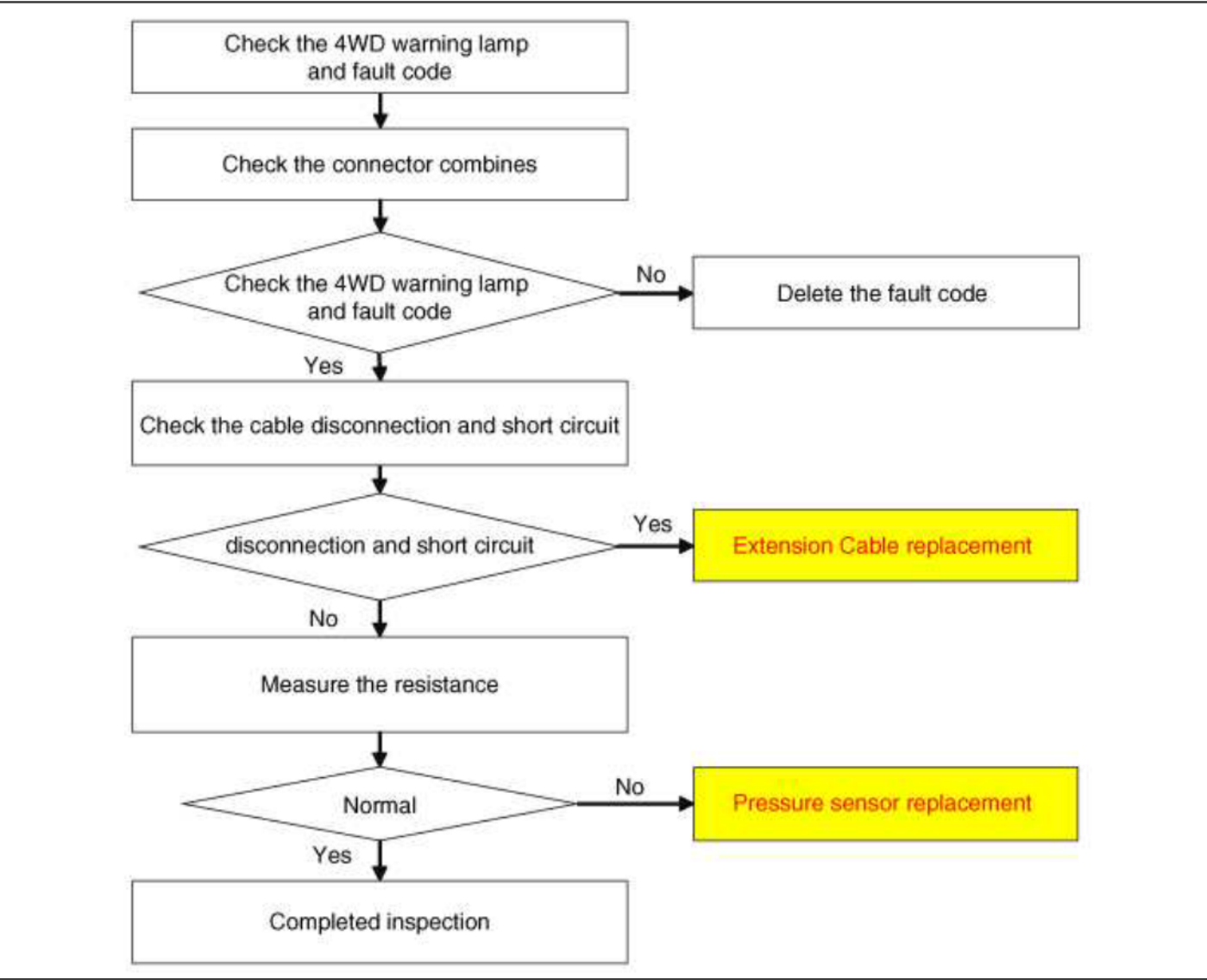
4 Wheel Drive (4WD) System > Coupling Assembly > Pressure Sensor > Repair procedures

Inspection

NOTE

If you have trouble code related to the pressure sensor (P1825, P1826, P1827, P1828), check pressure sensor according to the inspection process.

Pressure Sensor Inspection Procedure



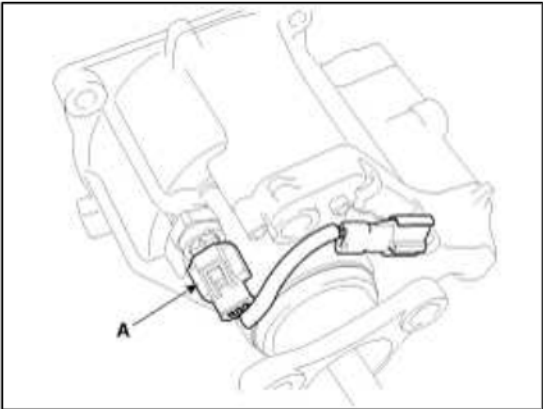
Measure the resistance of pressure sensor

- 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)

Terminal	Resistance
PIN 2 – PIN 3	2.755 ~ 4.133 kΩ
PIN 1 – PIN 3	1.892 ~ 2.838 kΩ
PIN 1 – PIN 2	1.714 ~ 2.838 kΩ

Removal

- 1. Remove the coupling assembly.
(Refer to "coupling assembly" in 4WD group)
- 2. Remove the extension Cable (A).



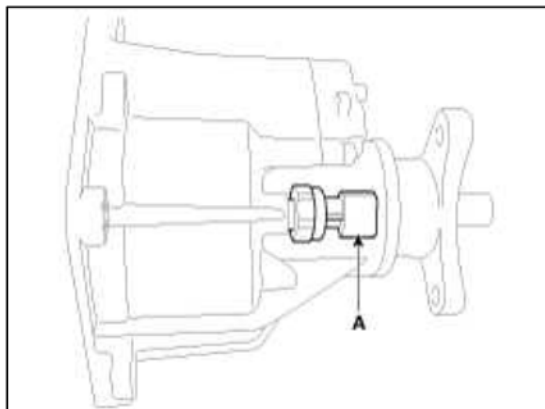
3. Remove the pressure sensor (A) with 24mm socket.

CAUTION

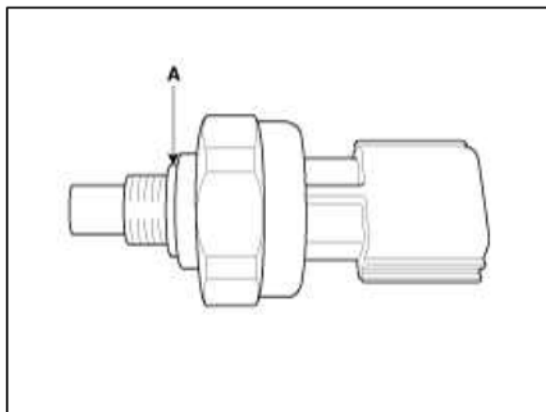
- Keep going horizontal state to prevent leaks during remove the pressure sensor.

Tightening torque:

7.8 ~ 9.8 N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2 lb-ft)

**Installation****CAUTION**

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



1. Installation is the reverse of removal.

