



# **Automatic Transaxle System**

General Information



## Specifications

Transaxle model		A4CF2
Engine model		Gasoline 2.0L
T/con		3 elements 2 phases 1 stage
T/con size (Φ)		236
O/PUMP type		Parachoid
T/M CASE type		Separated
Friction elements		Clutch: 3EA
		Brake: 2EA
		OWC : 1EA
Planetary gear		2EA
Gear ratio	1st	2.919
	2nd	1.551
	3rd	1.000
	4th	0.713
	Reverse	2.480
Final gear ratio		4.375
Fluid pressure balance piston		3EA
Stall speed		2,500~3,200 rpm
Accumulator		4EA
Solenoid valve		6EA (PWM:5EA, VFS:1EA)
Shift lever position		6 range (P,R,N,D,2,L)
Oil filter		1EA

## Tightening Torques

Item	N.m	kgf.m	lb-ft
Control cable bracket	19~23	1.9~2.3	14~17
Input speed sensor	10~12	1.0~1.2	7~8
Output speed sensor	10~12	1.0~1.2	7~8
Manual control lever	17~21	1.0~2.1	13~15
Inhibitor switch	10~12	1.0~1.2	7~8
Oil pan	10~12	1.0~1.2	7~8
Valve body mounting bolt	10~12	1.0~1.2	7~8
Oil drain plug	35~45	3.5~4.5	25~32
Pressure check plug	8~10	0.8~1.0	6~7
Front roll stopper bracket subframe bolt	50~65	5.0~6.5	36~47
Rear roll stopper bracket subframe bolt	50~65	5.0~6.5	36~47
Transaxle mounting sub bracket bolt	60~80	6.0~8.0	43~58

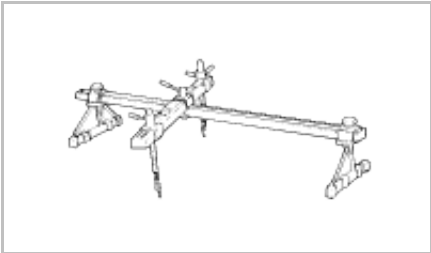
**Lubricants*****AutoLibrary***

<b>Item</b>	<b>Specified lubricant</b>	<b>Quantity</b>
Transaxle fluid liter (US qt, Imp.qt)	GENUINE DIAMOND ATF SP-III or SK ATF SP -III	6.6 (6.9, 5.81)

**Sealant**

<b>Item</b>	<b>Specified sealant</b>
Rear cover Torque converter housing Oil pan	LOCTITE FMD-546

**Special Service Tools**

<b>Tool (Number and name)</b>	<b>Illustration</b>	<b>Use</b>
09200-38001 Engine support fixture		Removal and installation of the transaxle.



# **Automatic Transaxle System**

Automatic Transaxle System



## Description

The new small sized automatic transaxle (A4CF2) is for gasoline 2.0 engine.

The transaxle (A4CF2) has improved on the durability, fuel consumption and efficiency by the new main features as follows:

The new main features

1. The hydraulic centrifugal oil pressure balance piston.
2. The full line pressure variable control system.
3. The long travel damper clutch.
4. The disc type return spring.
5. The ultra flat torque converter.

## Functions

Item	Contents
Components	The full line pressure variable control operates in the valve body to improve the fuel consumption.
	The long travel damper clutch is applied to the torque converter to improve the engine revolution change reduction capability and the fuel consumption. (17~20°)
	The oil pump of the trochocentric type is changed to parachoid type to improve the processing and the capacity efficiency at the low RPM range.
	The disc type return spring is applied to the low&reverse brake to improve the durability and reduce the length.
	The hydraulic centrifugal oil pressure balance piston is applied to the inside of clutch to improve the durability and the shift control capability.
	The low noise gear and the gear teeth face grinding are applied to the transfer driven gear to improve the noise and the durability.
Electronic control system	The oil pressure value set by TCM is coupled with the engine torque so that the stable shift feeling can be improved.
	The engine torque reduction control operates effectively to improve the shift feeling and the durability.
	It can be the skip shift of 1↔3 and 2↔4 when shifting.
	The reverse clutch, not L/R brake is controlled when controlling the N→R shift so that the N→R shift feeling can be improved.
	The range of the damper clutch direct control expands to improve the fuel consumption.
	The current control chip is installed into the TCM to regulate the solenoid control current and control the oil pressure securely according to the change of the temperature and voltage.
	The FPC(Flexible Printed Circuit) harness is composed of the thin and flat copper in the insulating film like electric wire.
	The tachometer is operated by the change of the frequency forwarded from the TCM to the instrument cluster, not vehicle speed sensor.

## Mechanical system

### Function

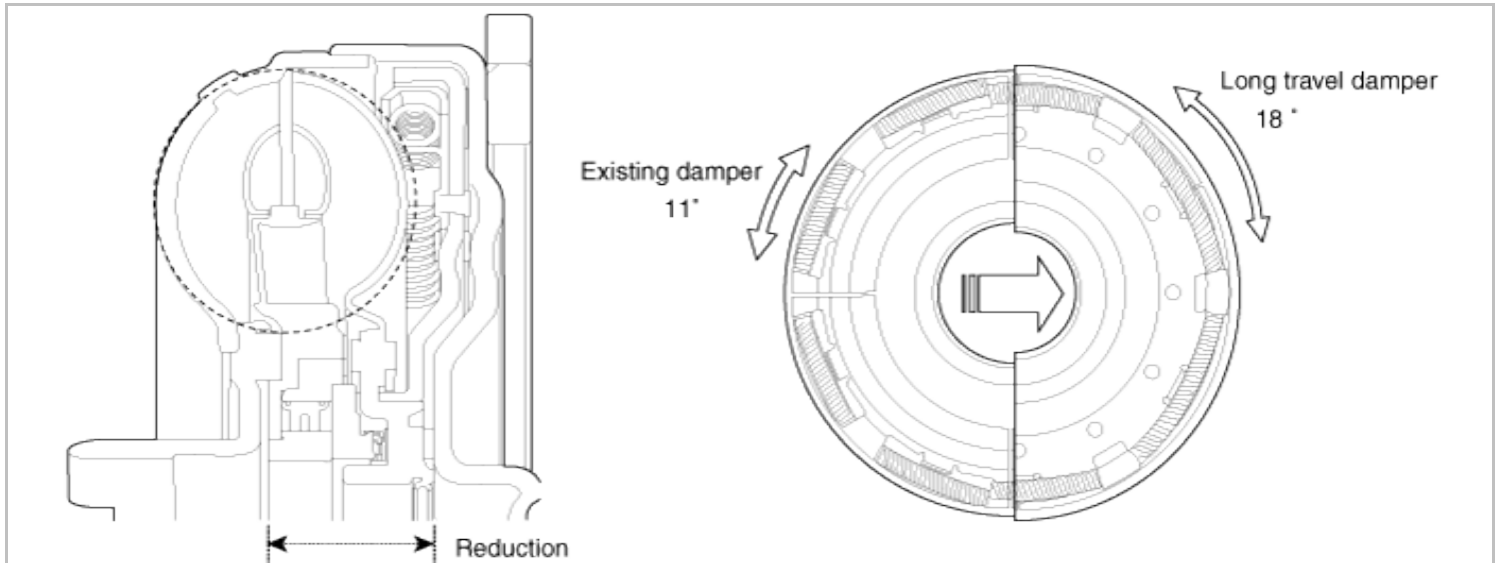
### Torque Converter

The torque converter, as the power plant which delivers the power of engine to the automatic transaxle, consists of 3

elements, 2 phases and 1 stage type.

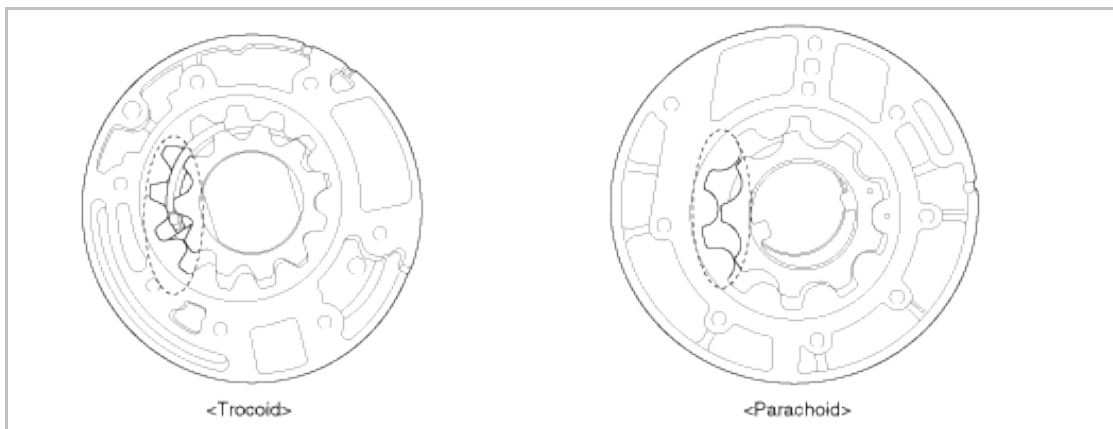
## *AutoLibrary*

- The flowing section form of the torque converter changes the round type to the flat type to reduce the length of the torque converter.
- The maximum operating degree of the damper clutch installed inside the transaxle increases from  $11^\circ$  to  $18^\circ$  to improve the engine revolution change reduction capability and the fuel consumption.



## **Oil Pump**

The oil pump is made of the aluminum (the reaction shaft support) to loose the weight and selects the parachoid type to improve the processing and the capacity efficiency at the low RPM range.

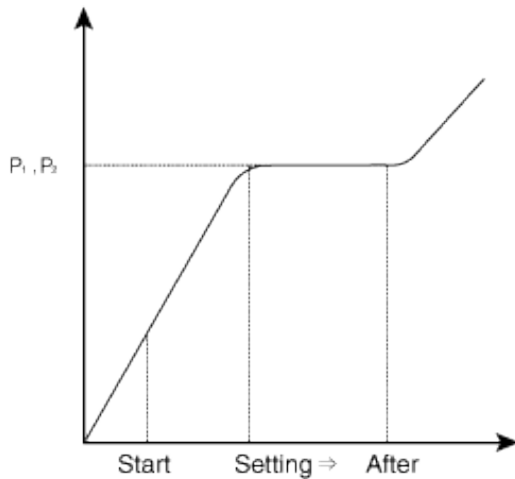
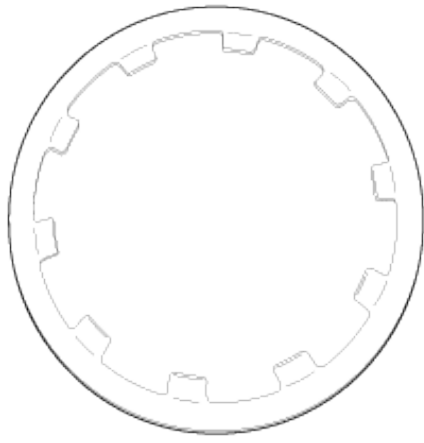


## **Brakes**

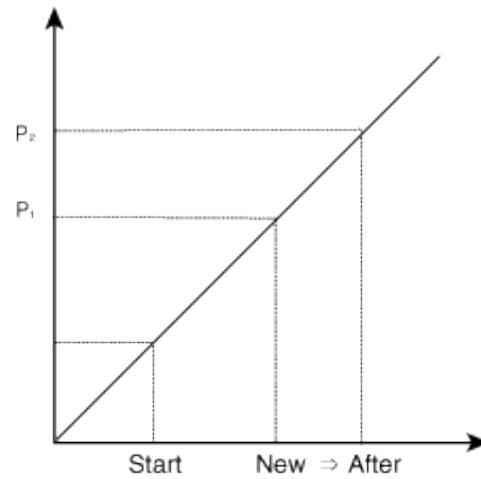
The automatic transaxle (A4CF2) uses the low and reverse brake and the second brake. The low and reverse brake is fixed by the low and reverse annulus gear and overdrive planetary carrier.

- The disc type return spring is applied to the low and reverse brake and it minimizes the slip of the friction material from the uniform spring operation power to improve the durability and reduce the length.

The overdrive sun gear is held on the transaxle case by the second brake.



<Disc type return spring>



<Coil type return spring>

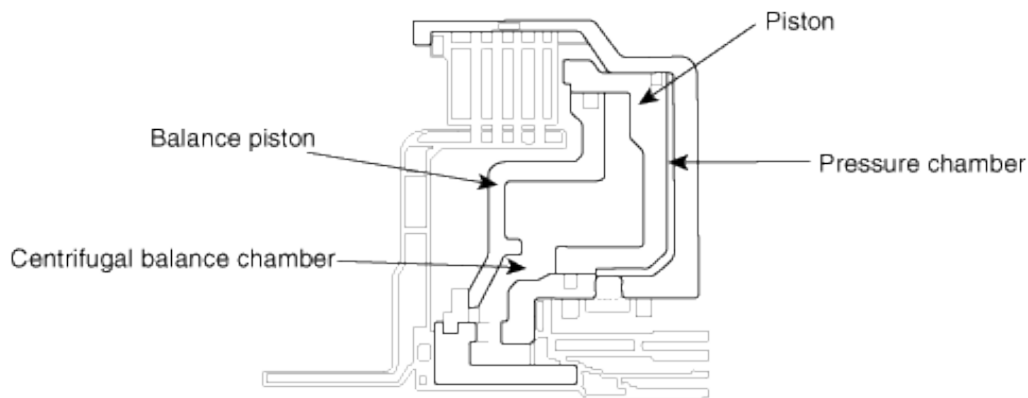
## Clutch

The multiple clutches and the one way clutch are used as the transaxle device.

The retainer of each clutch is composed of the precision sheet metal parts to realize the productivity and the light weight.

The hydraulic centrifugal oil pressure balance device places inside the clutch assembly.

Generally the oil remained in the piston oil pressure chamber pushes the piston by the centrifugal force. But to prevent the piston from being pushed, the oil filled in between the piston and the return spring retainer occurs the centrifugal force and both of the power is offset so that the piston don't move. In result, it improves the durability and the shift control ability.

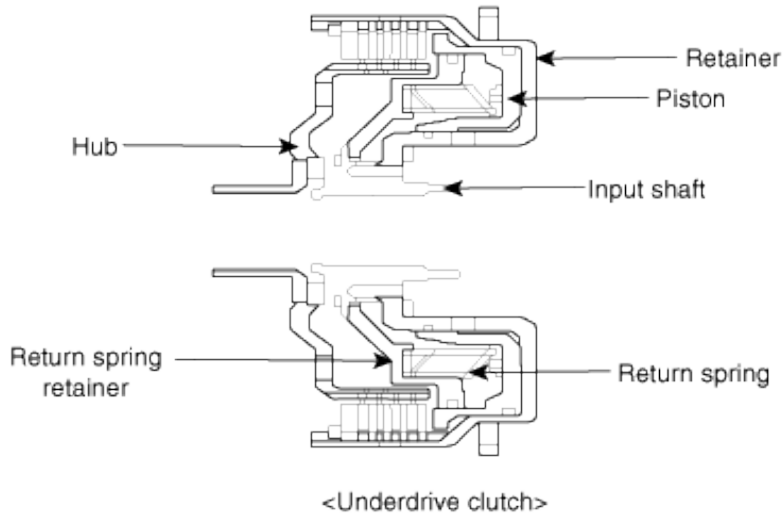


<Centrifugal balance device>

### 1. Underdrive Clutch

The driving force of input shaft is delivered to the underdrive sun gear.

The operating oil pressure in the underdrive clutch *AutoLibrary* operates between the piston and the retainer and pushes the piston to the clutch discs to deliver the driving force from the retainer to the hub.



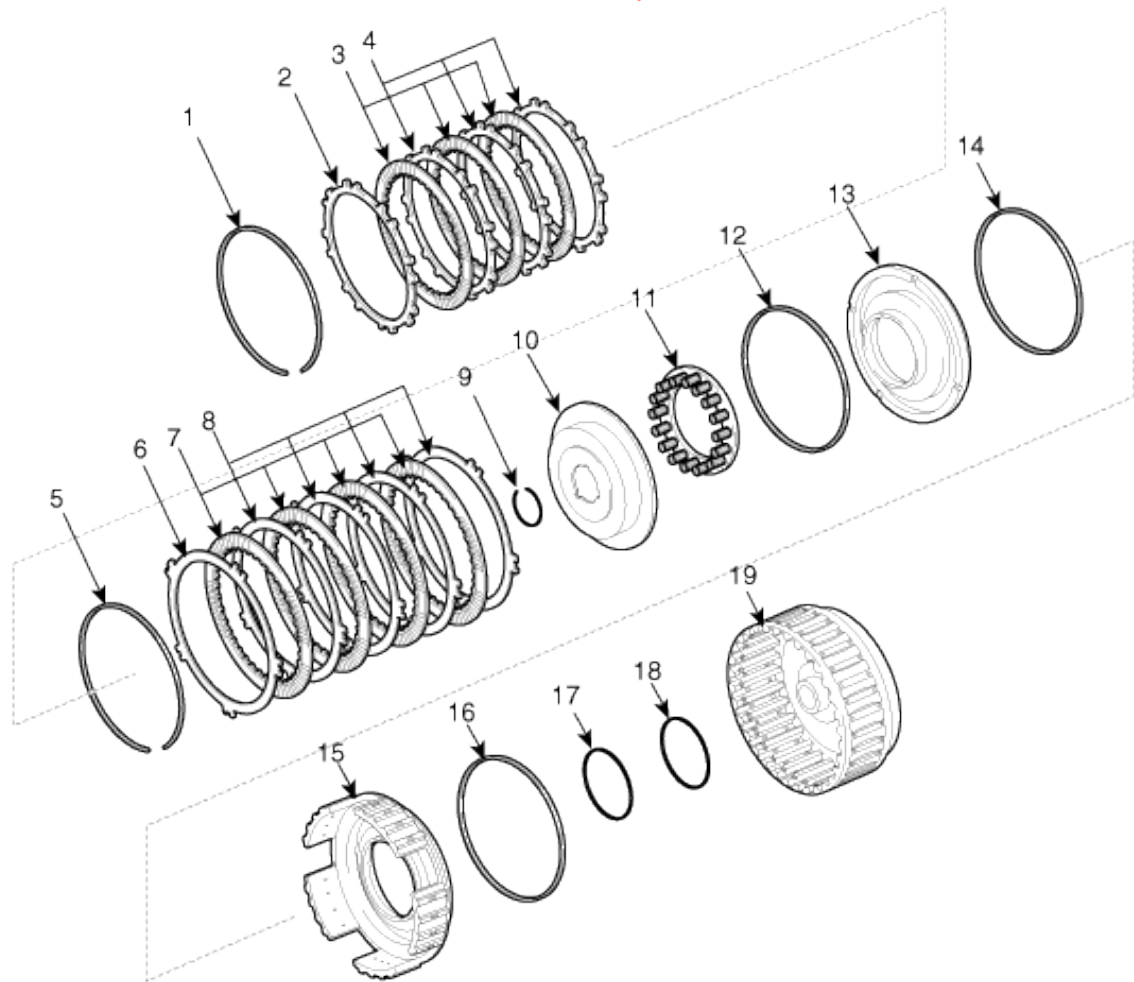
## 2. Reverse clutch and overdrive clutch

The reverse clutch delivers the driving force of input shaft to the reverse sun gear.

The overdrive clutch delivers the driving force of input shaft to the overdrive planetary carrier and the low and reverse annulus gear.

The operating oil pressure of the reverse clutch operates between the reverse clutch retainer and reverse clutch piston and it has the whole overdrive clutch moved to deliver through the hub splines.

## Structure Of The Reverse And The Overdrive Clutch



- 1. Snap ring
- 2. Clutch reaction plate
- 3. Clutch disc
- 4. Clutch plate
- 5. Snap ring
- 6. Clutch reaction plate
- 7. Clutch disc

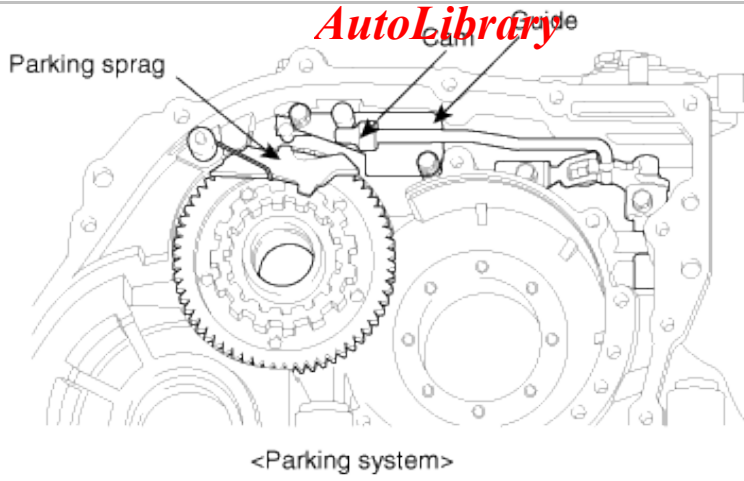
- 8. Clutch plate
- 9. Snap ring
- 10. Spring retainer
- 11. Return spring
- 12. D-ring
- 13. Overdrive clutch piston
- 14. D-ring

- 15. Reverse clutch piston
- 16. D-ring
- 17. D-ring
- 18. D-ring
- 19. Reverse clutch retainer

## **Parking System**

The parking system for A4CF2 model is the cam type.

The roller type installed to the existing new generation AT needs support to move the roller when operating the parking system. The cam type for A4CF2 model doesn't need the support and the structure is simpler. It only needs the guide to prevent from moving the cam idly.



## Operation

### Hydraulic Control System

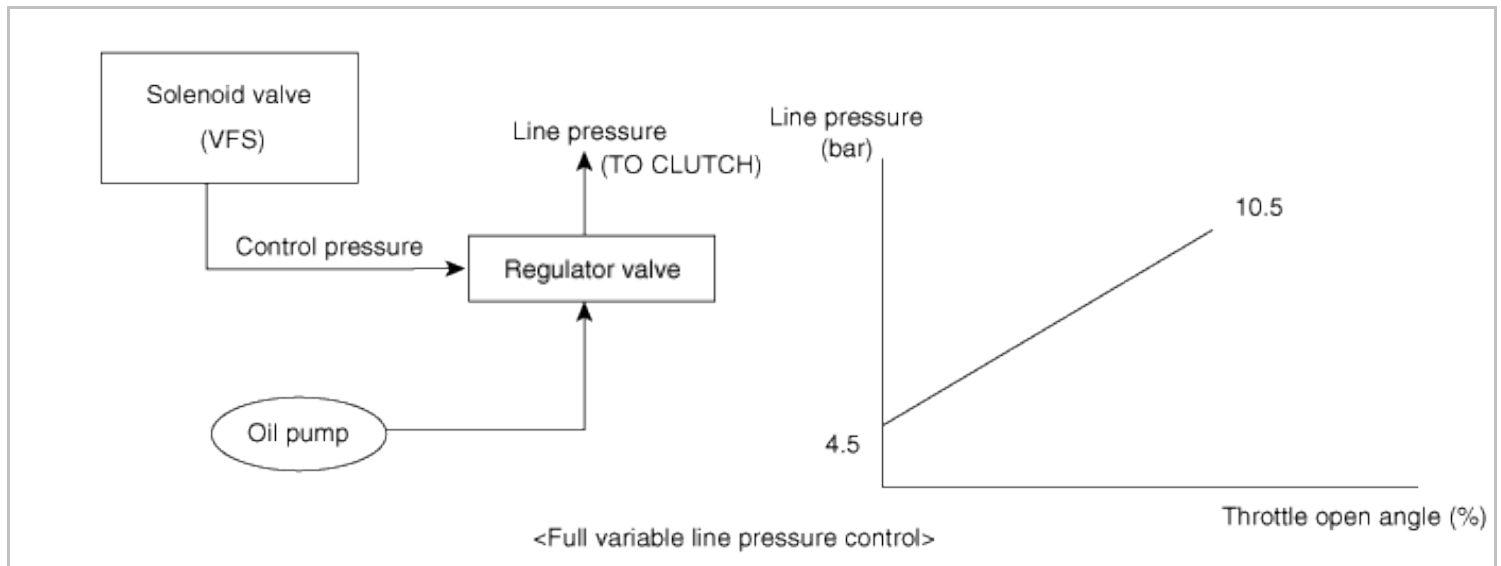
#### Main Features

The VFS (Variable Force Solenoid) installed in the valve body is applied to transaxle. VFS varies the line pressure from 4.5bar to 10.5bar according to throttle open angle and shift range to improve the fuel consumption and shift ability.

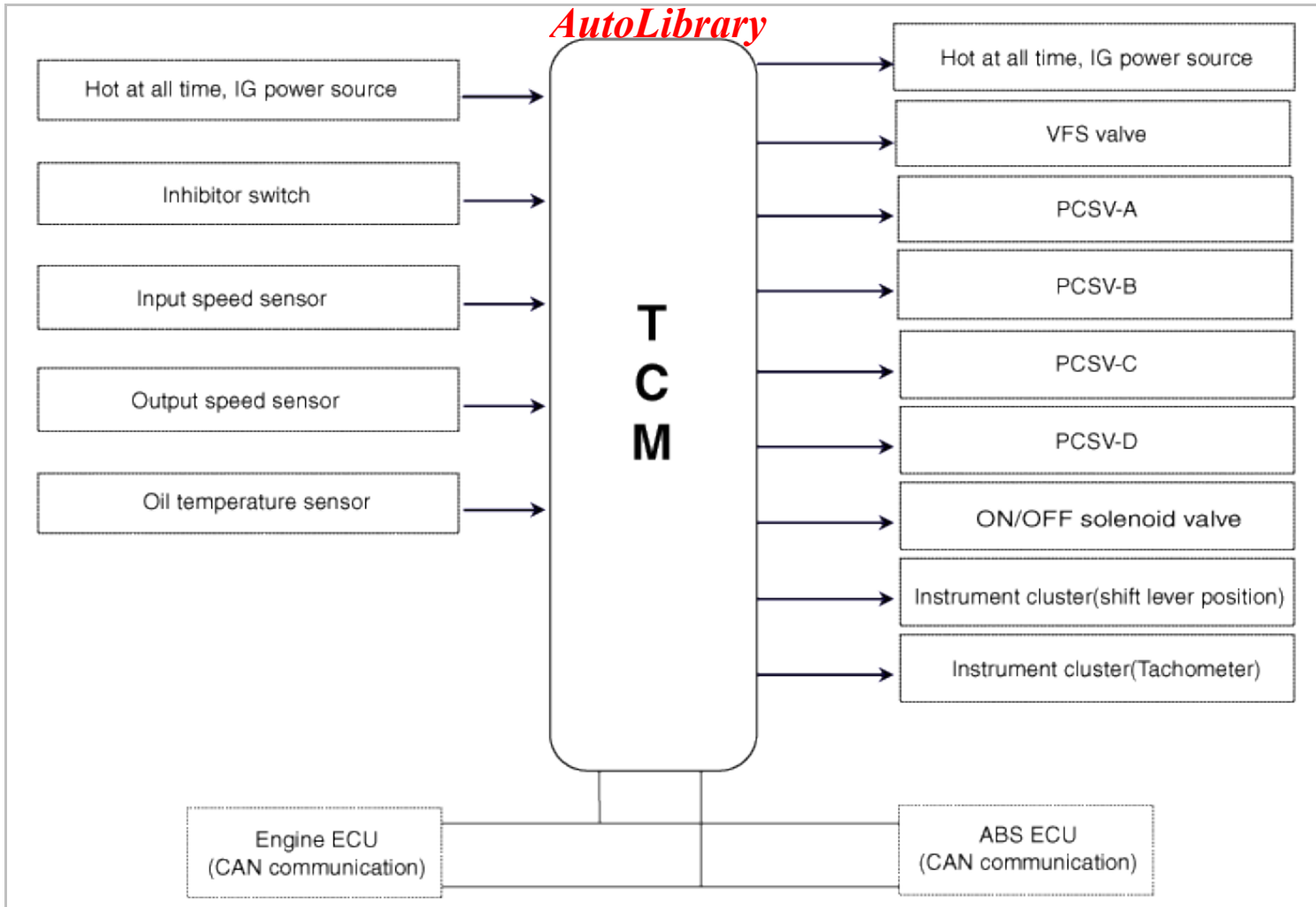
And the reducing valve which is installed in the valve body makes the solenoid control pressure using the reducing pressure instead of the line pressure like the HIVEC transaxle.

The material of spool valve in the valve body is changed from the steel to aluminum to reduce the oil leakage by the thermal expansion between the valve body and spool valve at the high temperature.

The switch valve, the solenoid valve and the fail safe valve are operated to drive the vehicle at the 3rd speed and reverse even through the malfunction of the electronic control parts occur.



### Electronic Control System

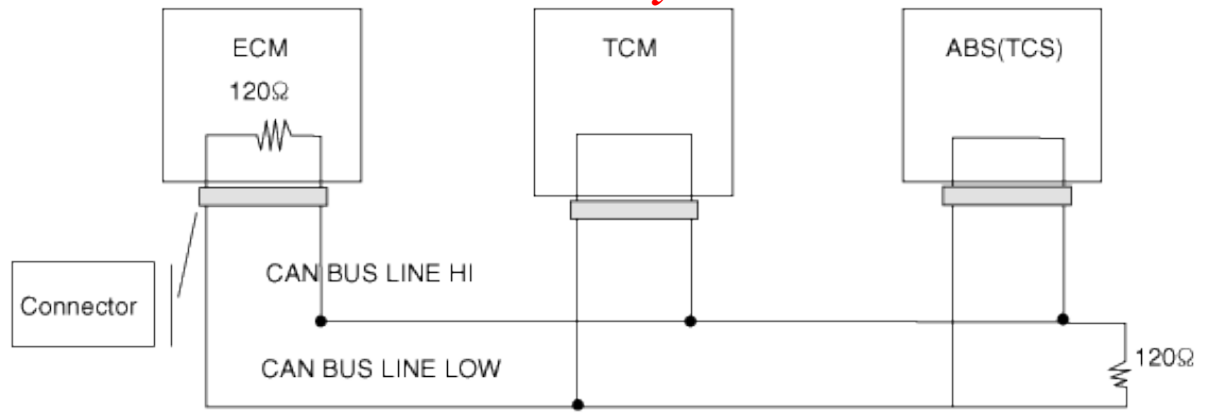


**Sensor And Actuator Function**

Item	Function
Input speed sensor	Detect the input shaft rpm(TURBINE RPM) at the OD/RVS retainer
Output speed sensor	Detect the output shaft rpm(T/F DRIVEN GEAR RPM) at the T/F driven gear
Engine rpm signal	Receive the engine rpm via CAN communication with ECM
Fluid temperature sensor	Detect the temperature of ATF through the thermistor
Brake switch	Detect the brake operation at the contact switch of the brake pedal
ON/OFF solenoid valve (SCSV-A)	Control the hydraulic passage for the shift control
VFS solenoid valve	Change the line pressure from 4.5 bar to 10.5 bar according to throttle open angle and shift ranges
PCSV-A(SCSV-B)	Control the OD or L/R hydraulic pressure to the pressure control valve for shift control
PCSV-B(SCSV-C)	Control the 2/4 or REV hydraulic pressure to the pressure control valve for shift control
PCSV-C(SCSV-D)	Control the UD hydraulic pressure to the pressure control valve for shift control
PCSV-D(DCCV)	Control the hydraulic pressure for the damper clutch control
Cluster	Send the signal of the current position of shift lever and vehicle speed

**CAN Communication**

**Layout**



**ECM- TCM CAN Communication error management**

No.	Item	Error management
1	Engine rpm	3,000 RPM
2	Engine torque	80%
3	Vehicle speed	0 km/h
4	A/C Switch	OFF
5	Engine coolant temperature	70°C
6	TPS	50%
7	Shift range hold signal	OFF



## Basic Inspection Adjustment

### Transaxle Fluid Level

#### Inspection

1. Drive the vehicle until the fluid reaches normal operating temperature [70~80°C(158~176°F)].
2. Place the vehicle on a level surface.
3. Move the gear selector lever through all gear positions. This will fill the torque converter with trans fluid. Set the selector lever to the "N" (Neutral) position.
4. Before removing the oil level gauge, wipe all contaminants from around the oil level gauge. Then take out the oil level gauge and check the condition of the fluid.

#### NOTICE

If the fluid smells as if it is burning, it means that the fluid has been contaminated by fine particles from the bushes and friction materials, a transmission overhaul may be necessary.

5. Check that the fluid level is in the "HOT" mark on the oil level gauge. If fluid level is low, add automatic transaxle fluid until the level reaches the "HOT" mark.

#### Automatic transaxle fluid :

DIAMOND ATF SP-III, SK ATF SP-III

Automatic transaxle fluid capacity:

6.8liter(7.2 US qt, 5.98Imp.qt)

#### NOTICE

Low fluid level can cause a variety of abnormal conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles, which are compressible. Therefore, pressures will be erratic, causing delayed shifting, slipping clutches and brakes, etc. Improper filling can also raise fluid level too high. When the transaxle has too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid. In either case, air bubbles can cause overheating, and fluid oxidation, which can interfere with normal valve, clutch, and brake operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.

6. Insert the oil level gauge securely.

#### NOTICE

When new, automatic transmission fluid should be red, The red dye is added so the assembly plant can identify it as transmission fluid and distinguish it from engine oil or antifreeze. The red dye, which is not an indicator of fluid quality, is not permanent. As the vehicle is driven the transmission fluid will begin to look darker. The color may eventually appear light brown.

### Replacement

If you have a fluid changer, use this changer to replace the fluid. If you do not have a fluid replace the fluid by the following procedure.

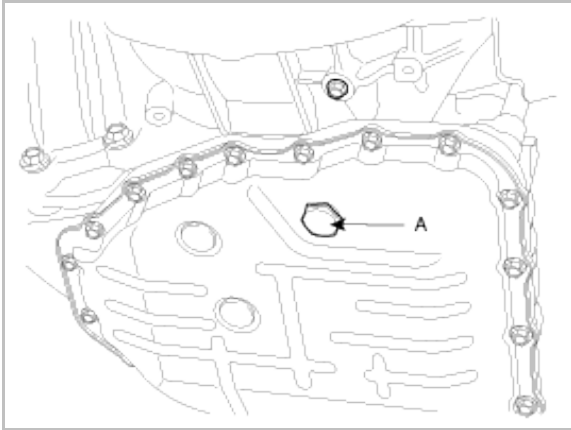
1. Disconnect the hose, which connects the transmission and the oil cooler (inside the radiator).
2. Start the engine and let the fluid drain out.

**Running conditions :** "N" range with engine idling

#### CAUTION

The engine should be stopped within one minute after it is started. If the fluid has all drained out before then, the engine should be stopped at that point.

3. Remove the drain plug(A) from the bottom of the transmission case to drain the fluid.



4. Install the drain plug via the gasket, and tighten it the specified torque.

**Tightening torque :**

40~50 N.m (4.0~5.0kgf.m, 28.9~36.2lb-ft)

5. Pour the new fluid in through the oil filler tube.

**CAUTION**

Stop pouring if the full volume of fluid cannot be poured in.

6. Repeat the procedure in step (2).

**NOTICE**

Check the old fluid for contamination. If it has been contaminated, repeat the steps (5) and (6).

7. Pour the new fluid in through the oil filler tube.
8. Reconnect the hose, which was disconnected in step (1) above, and firmly replace the oil level gauge.  
(In case of this "replace", this means after wiping off any dirt around the oil level gauge, insert it into the filler tube.)
9. Start the engine and run it at idle for 1~2 minutes.
10. Move the select lever through all positions, and then move it to the "N" or "P" position.
11. Drive the vehicle until the fluid temperature rises to the normal temperature (70~80°C(158~176°F)), and then check the fluid level again. The fluid level must be at the HOT mark.
12. Firmly insert the oil level gauge into the oil filler tube.

### Torque Converter Stall Test

This test measures the maximum engine speed when the select lever is at the "D" or "R" position and the torque converter stalls to test the operation of the torque converter, starter motor and one-way clutch operation and the holding performance of the clutches and brakes in the transmission.

**CAUTION**

Do not let anybody stand in front of or behind the vehicle while this test is being carried out.

1. Check the automatic transmission fluid level and temperature and the engine coolant temperature.
  - A. Fluid level : At the HOT mark on the oil level gauge
  - B. Fluid temperature : 80~100°C (176~212°F)
  - C. Engine coolant temperature : 80~100°C (176~212°F)
2. Check both rear wheels (left and right).

3. Pull the parking brake lever on, with the brake pedal fully depressed.
4. Start the engine.
5. Move the select lever to the "D" position, fully depress the accelerator pedal and take a reading of the maximum engine speed at this time.

#### CAUTION

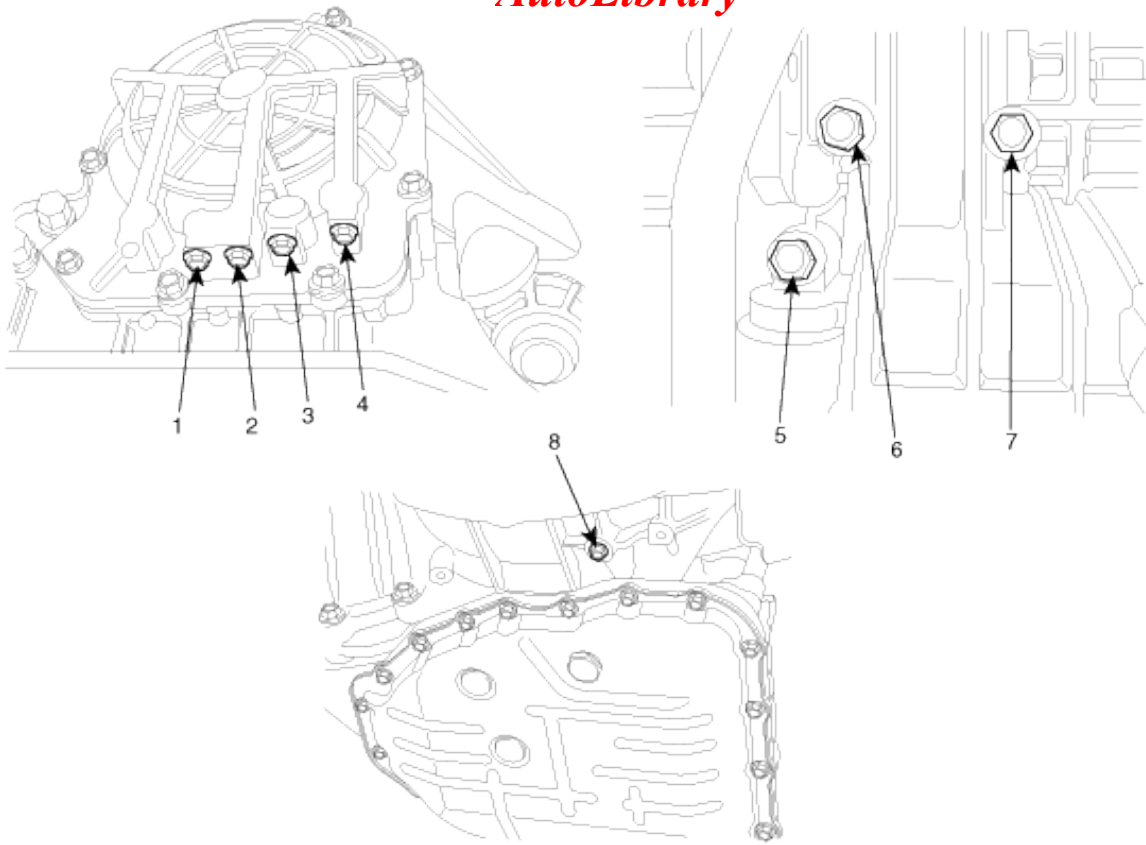
- The throttle should not be left fully open for any more than 5 seconds.
- If carrying out the stall test two or more times, move the select lever to the "N" position and run the engine at 1,000 r/min to let the automatic transaxle fluid cool down before carrying out subsequent tests.
- Move the select lever to the "R" position and carry out the same test again.

Stall rpm : 2,500~3,200 RPM

Range	Condition	Passable cause
R range slip	Reverse	REV in D range normal L/R in D range abnormal
D1 rang slip	D range 1st/ Sports mode 1st	L/R in reverse range abnormal UD in reverse range normal
D3 range slip	3rd gear hold	OD in 3rd gear slip (1st and 2nd gear normal)
Forwarding, reverse slip	D range, R range	Torque converter Oil pump, Manual valve in the valve Driving device abnormal

## Hydraulic Pressure Test

1. Warm up the engine until the automatic transaxle fluid temperature is 80~100°C(176~212°F).
2. Jack up the vehicle so that the wheels are free to turn.
3. Connect the special tools(09452-21500, 09452-21000) oil pressure gauge to each pressure discharge port.
4. Measure the hydraulic pressure at each port under the conditions given in the standard hydraulic pressure table, and check that the measured values are within the standard value ranges.
5. If a value is outside the standard range, correct the problem while referring to the hydraulic pressure test diagnosis table.
  - A. Bottom side



**Torques : 8~10Nm(80~100kgf.cm, 6~7lb-ft)**

- 1. RED pressure port
- 2. OD pressure port
- 3. 2/4 pressure port
- 4. REV pressure port

- 5. DA pressure port
- 6. UD pressure port
- 7. LR pressure port
- 8. DR pressure port

### **Standard Hydraulic Pressure Table**

No.	Shift range position	Operation					Measuring	Oil pressure (kgf/cm <sup>2</sup> )				
		PCSV-A	PCSV-B	PCSV-C	PCSV-D	ON/OFF		LR	2-4(2ND)	UD	OD	REV
1	D	0	100	0	0	ON	LR	10.5±0.2	0	10.5±0.2	0	0
2	↑	50	↑	↑	↑	↑	↑	5.6±0.4	↑	↑	↑	↑
3	↑	75	↑	↑	↑	↑	↑	1.0±0.3	↑	↑	↑	↑
4	↑	100	↑	↑	↑	↑	↑	0	↑	↑	↑	↑
5	↑	↑	0	↑	100	OFF	2-4(2ND)	0	10.5±0.2	↑	↑	↑
6	↑	↑	50	↑	↑	↑	↑	↑	5.3±0.4	↑	↑	↑
7	↑	↑	75	↑	↑	↑	↑	↑	0.9±0.3	↑	↑	↑
8	↑	↑	100	↑	↑	↑	↑	↑	0	↑	↑	↑
9	↑	0	↑	↑	↑	↑	OD	↑	↑	↑	10.5±0.2	↑
10	↑	50	↑	↑	↑	↑	↑	↑	↑	↑	5.6±0.4	↑
11	↑	75	↑	↑	↑	↑	↑	↑	↑	↑	1.0±0.3	↑
12	↑	100	↑	↑	↑	↑	↑	↑	↑	↑	0	↑
13	↑	↑	↑	0	0	↑	UD	↑	↑	10.5±0.2	↑	↑
14	↑	↑	↑	50	↑	↑	↑	↑	↑	5.8±0.4	↑	↑
15	↑	↑	↑	75	↑	↑	↑	↑	↑	1.0±0.3	↑	↑
16	↑	0	↑	100	↑	↑	↑	↑	↑	0	↑	↑
17	R	↑	0	↑	↑	ON	REV	17.7±0.8	↑	↑	↑	17.7±0.8
18	↑	↑	50	↑	↑	↑	↑	↑	↑	↑	↑	8.7±0.8
19	↑	↑	75	↑	↑	↑	↑	↑	↑	↑	↑	0.9±0.5
20	↑	↑	100	↑	↑	↑	↑	↑	↑	↑	↑	0

[Measure condition]

- Oil pump revolution : 2500rpm
- LPCSV Duty ratio : 0%

Note) The oil pressure values of "0" marked on the above table must measure less than 0.1kgf/cm<sup>2</sup> when testing.

※ The values are subject to change according to vehicle model or condition.



## Troubleshooting

### Diagnostic Trouble Codes (Inspection Procedure)

Check the Diagnostic Trouble Codes

1. Turn the ignition switch to OFF.
2. Connect the Hi-scan tool to the DLC connector for diagnosis.
3. Turn the ignition switch to ON.
4. Check the diagnostic trouble codes using the Hi-scan tool.
5. Read the output diagnostic trouble codes. Then follow the remedy procedures according to the "DIAGNOSTIC TROUBLE CODE DESCRIPTION" on the following pages.

#### NOTICE

- A maximum of 5 diagnostic trouble codes (in the sequence of occurrence) can be stored in the Random Access Memory (RAM) incorporated within the control module.
- The same diagnostic trouble code can be stored one time only.
- If the number of stored diagnostic trouble codes or diagnostic trouble patterns exceeds 5, already stored diagnostic trouble codes will be erased in sequence, beginning with the oldest.
- Do not disconnect the battery until all diagnostic trouble codes or diagnostic trouble patterns have been read out, because all stored diagnostic trouble codes or diagnostic trouble patterns will be cancelled when the battery is disconnected.
- All diagnostic trouble codes are deleted from memory the 200th time the ATF temperature reaches 50°C(122°F) after memorization of the most recent diagnostic code.

6. Delete the diagnostic trouble code.
7. Disconnect the Hi-scan tool.

#### NOTICE

DTC cleaning should only be done with the scan tool.

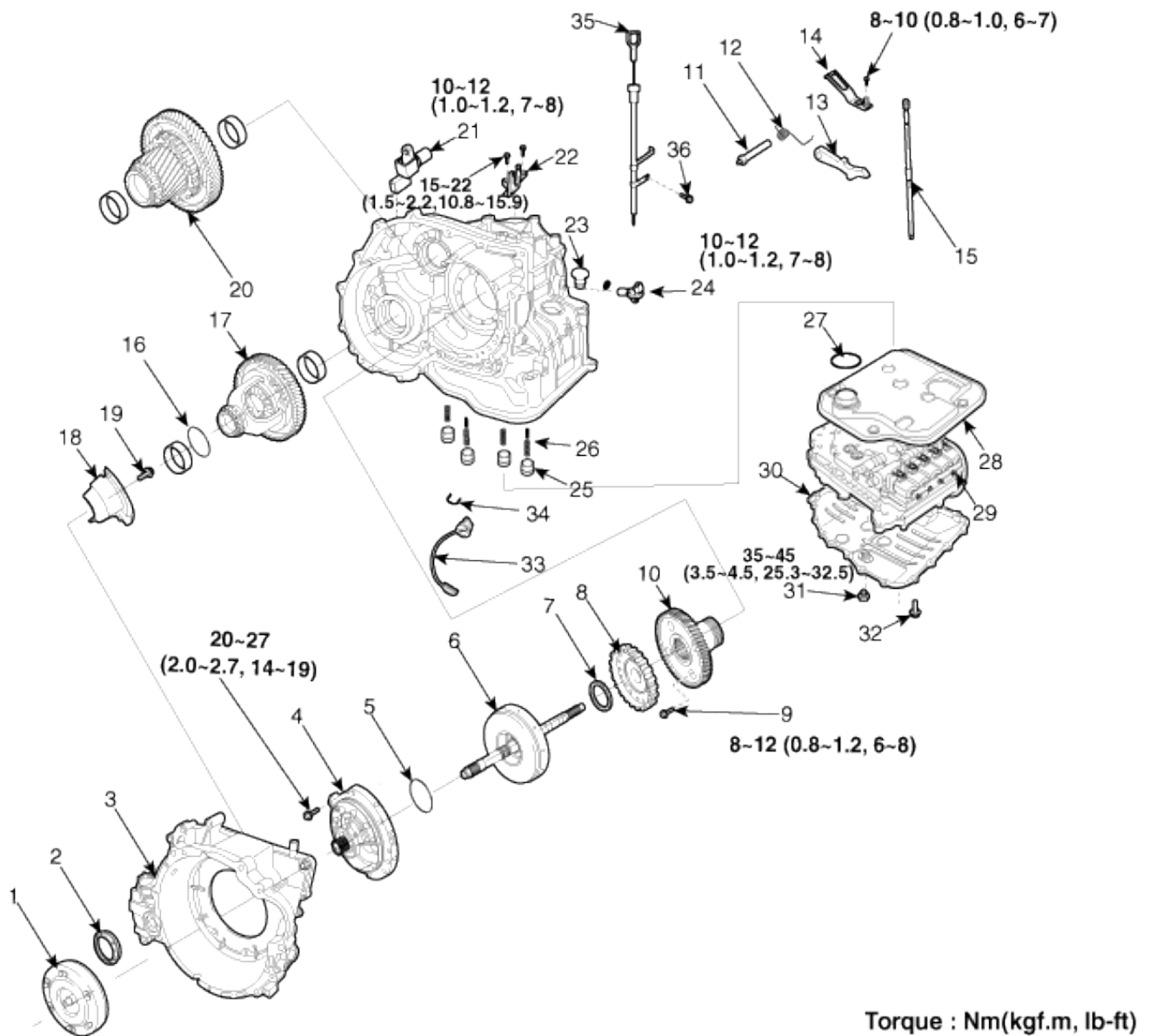


# **Automatic Transaxle System**

Automatic Transaxle System - Automatic  
Transaxle



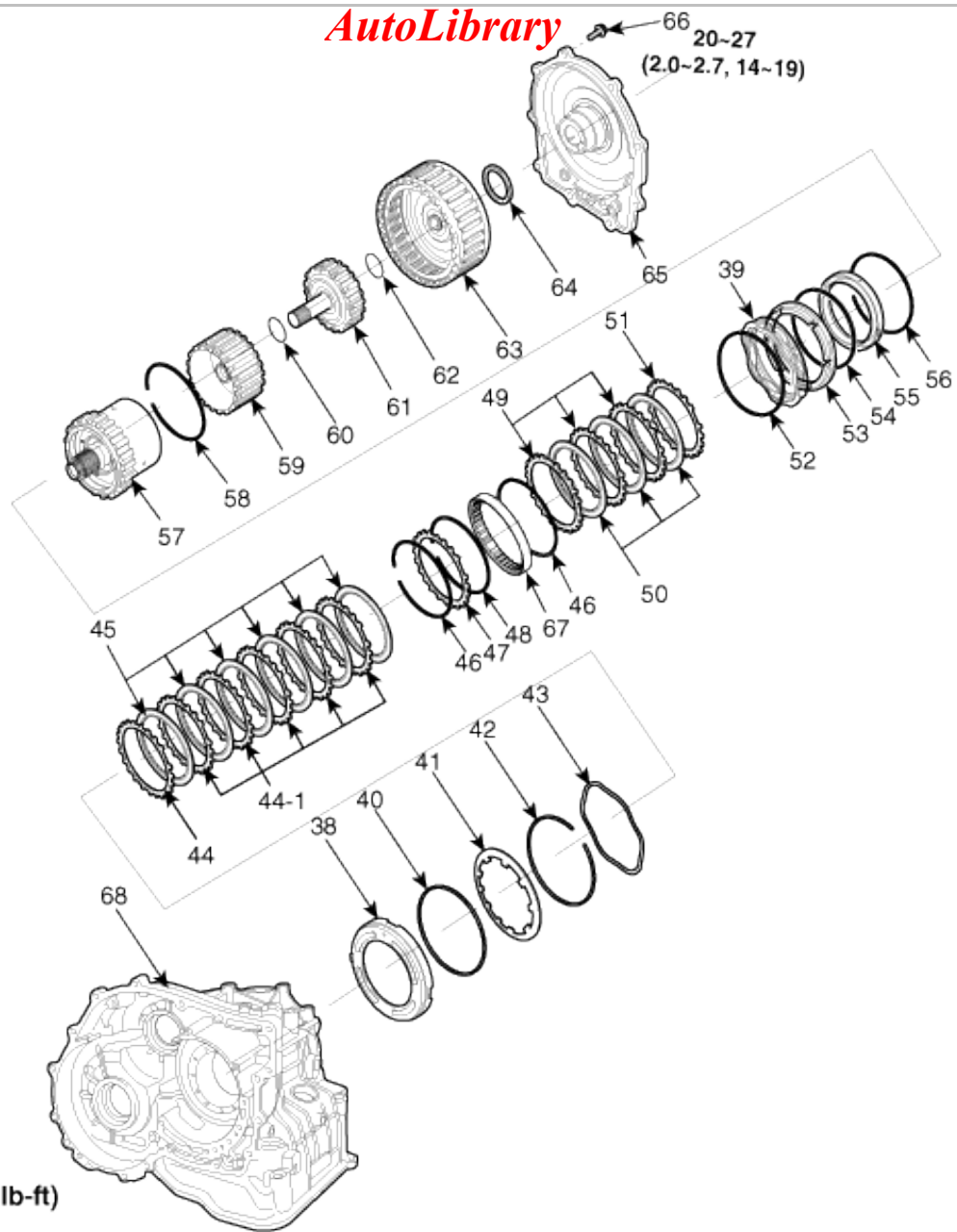
## Components (1)



Torque : Nm(kgf.m, lb-ft)

1. Torque converter	13. Parking sprag	25. Accumulator piston
2. Differential oil seal	14. Detent spring	26. Coil spring
3. Converter housing	15. Manual control shaft	27. O-ring
4. Oil pump	16. Spacer	28. Oil filter
5. Thrust washer	17. Differential	29. Valve body
6. Underdrive(U/D) clutch	18. Oil separate	30. Oil pan
7. Thrust bearing	19. Oil separate mounting bolt	31. Drain plug
8. Underdrive(U/D) clutch hub	20. Transfer driven gear	32. Valve body cover bolt
9. Transfer drive gear mounting bolt	21. Output speed sensor	33. Valve body connector
10. Transfer drive gear	22. Shift cable bracket	34. Valve body connector mounting clip
11. Parking sprag shaft	23. Plug	35. Oil level gauge
12. Sprag spring	24. Input speed sensor	36. Oil level gauge bracket bolt

## Components (2)



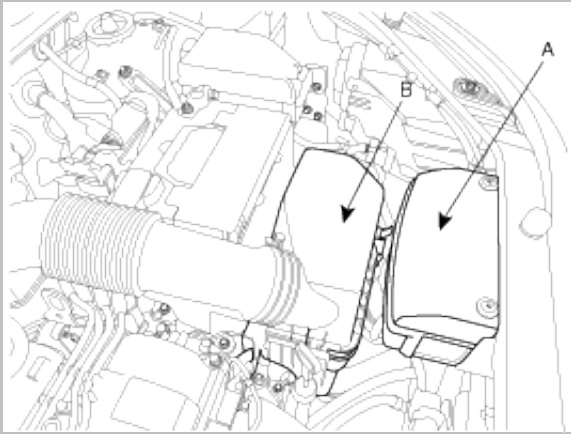
Torque : Nm(kgf.m, lb-ft)

38. Low & reverse brake piston	49. 2ND brake plate	59. Reverse sun gear
39. 2ND brake return spring	50. 2ND brake disc	60. Thrust bearing
40. Low & reverse brake spring retainer	51. 2ND brake pressure plate	61. Overdrive(O/D) hub
41. Low & reverse brake return spring	52. Snap ring	62. Thrust bearing
42. Snap ring	53. 2ND brake piston	63. Reverse & Overdrive(O/D) clutch
43. Wave spring	54. D-ring	64. Thrust bearing
44. Low & reverse pressure plate	55. 2ND brake retainer	65. Rear cover
44-1. Low & reverse brake plate	56. D-ring	66. Rear cover bolt
45. Low & reverse brake disc	57. Low & reverse planetary gear set	67. One way clutch inner race
46. Snap ring	58. Snap ring	68. Transmission case

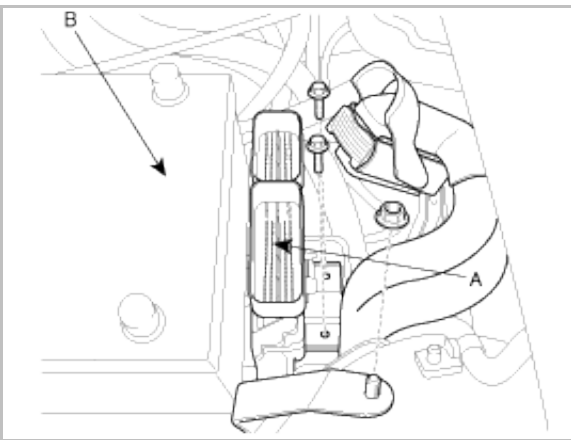


## Removal

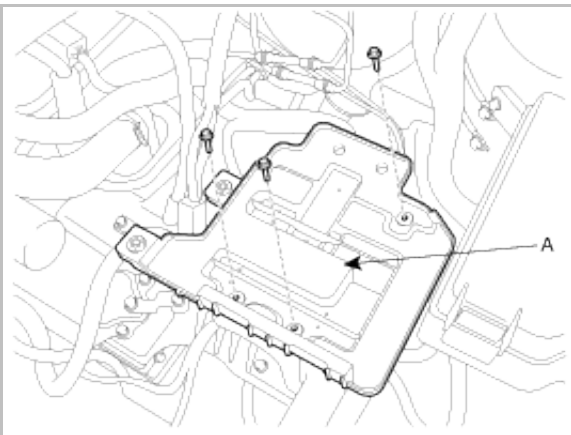
1. Disconnect battery terminals. Remove the air duct (A) and air cleaner assembly (B).



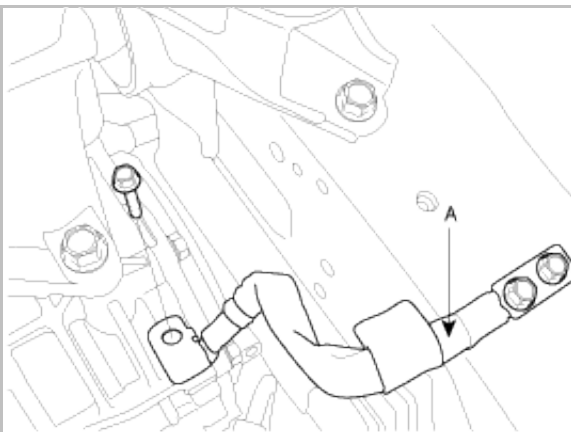
2. Remove the battery (B) after removing the PCM (A) and PCM connector.



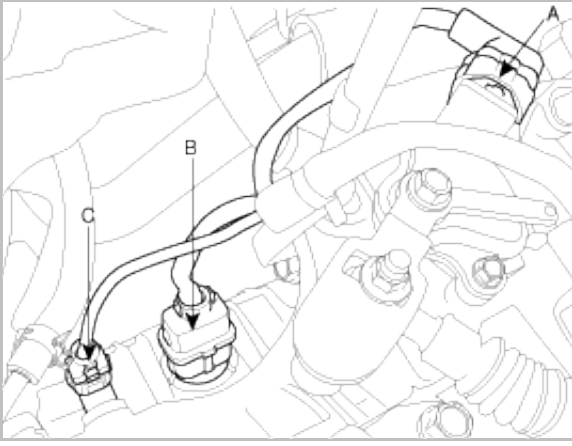
3. Remove the battery tray (A).



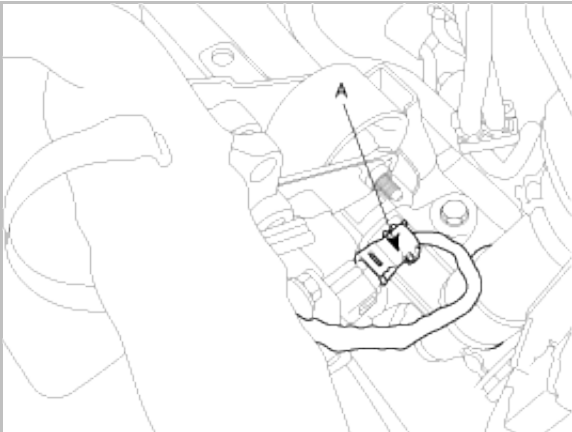
4. Remove the ground cable (A) from transaxle.



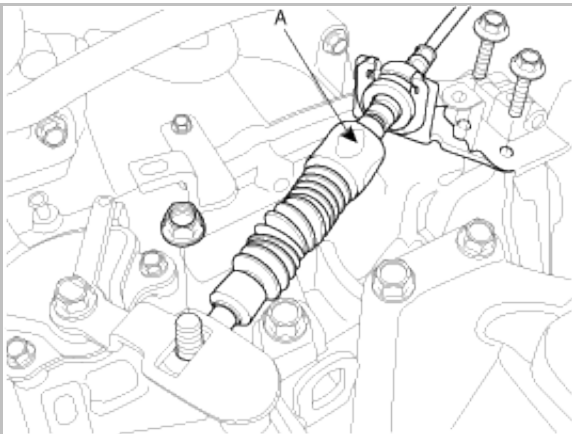
5. Disconnect the inhibitor switch connector (A), solenoid valve connector (B) and the input speed sensor connector (C).



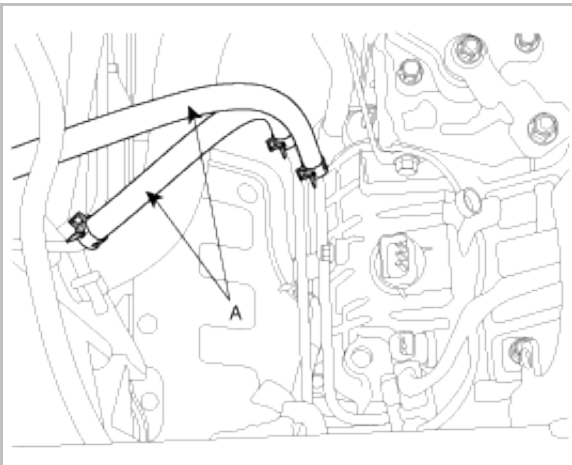
6. Disconnect the output speed sensor connector (A).



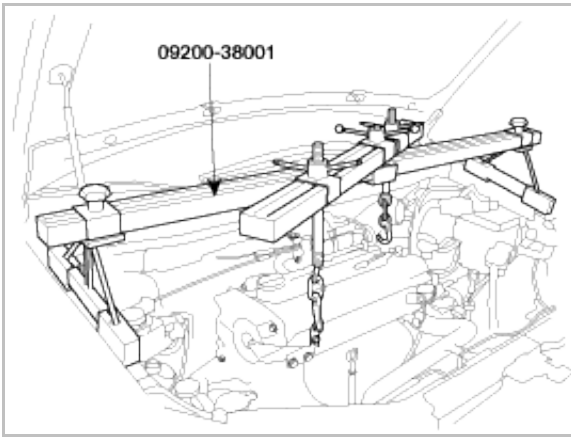
7. Remove the shift cable assembly (A).



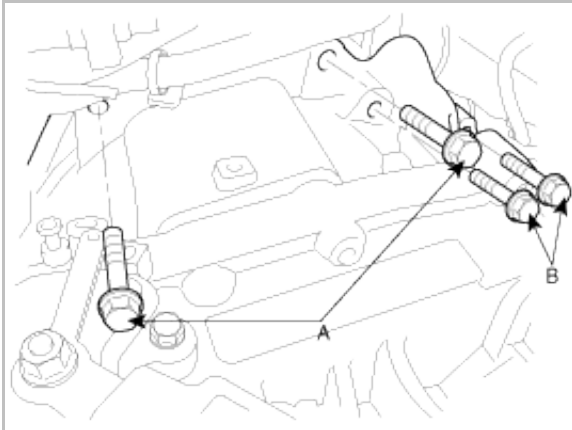
8. Remove the oil cooler hoses (A).



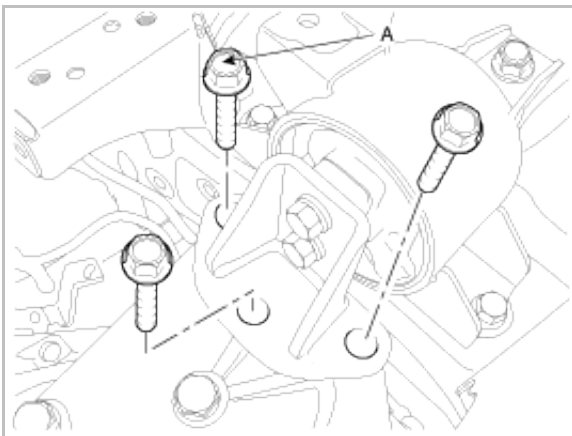
9. Install the special tools (09200-38001), the engine support fixture and the adapter on the engine assembly.



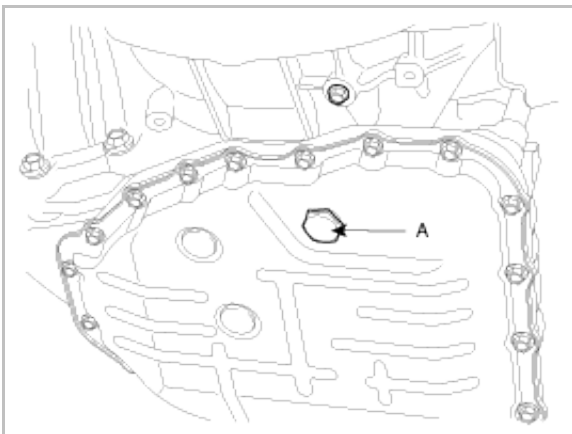
10. Remove the transaxle upper mounting bolts (A-2ea) and the starter motor mounting bolts (B-2ea).



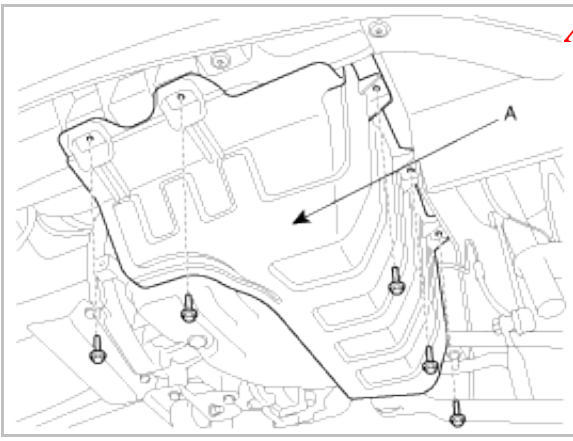
11. Remove the transaxle mounting support bracket bolts (A-3ea).



12. Drain the transaxle fluid by removing the oil drain plug (A).

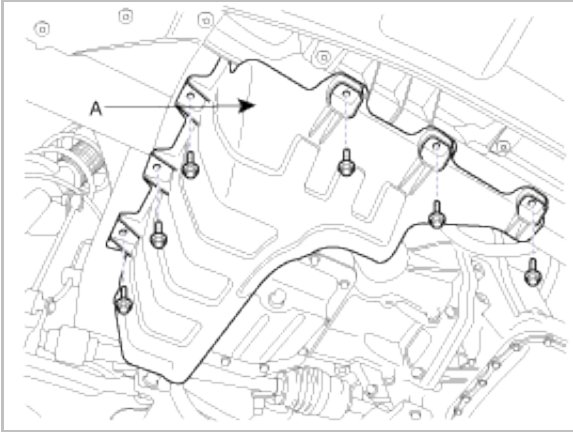


13. Remove the under cover (A).



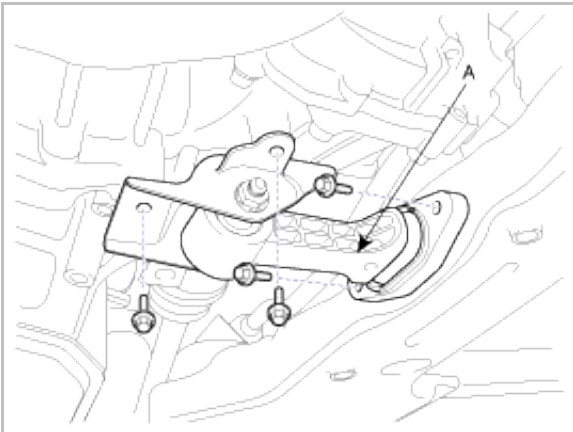
14. Remove the front wheels and tires. (refer to removal in SS group)

15. Remove the side mud cover (A).

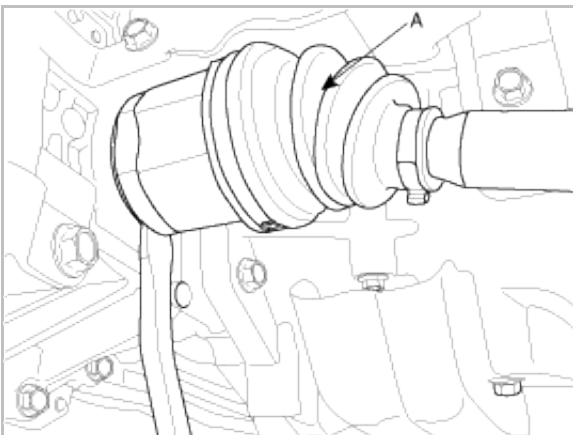


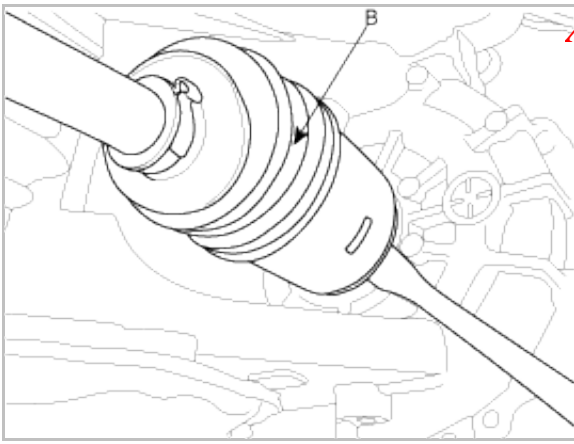
16. Remove the lower arm ball joint mounting nut, the stabilizer link mounting nut, and the tie rod end mounting nut from the front knuckles. (refer to Front suspension system in SS group)

17. Remove the roll stopper bracket by removing bolts (A).

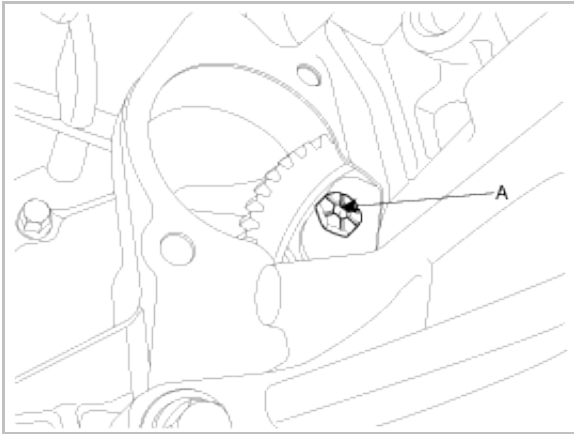


18. Disconnect the drive shafts (A,B) from the transaxle. (refer to removal in DS group)



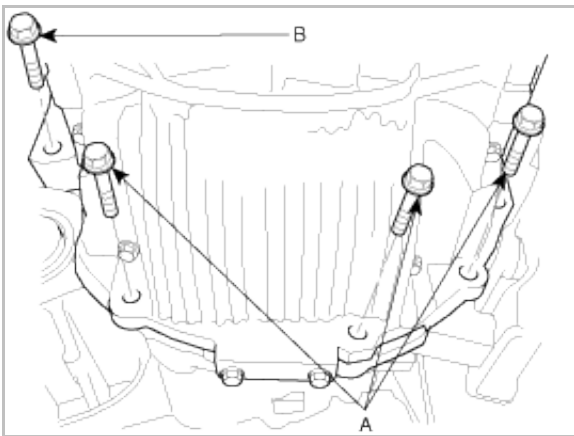


19. Remove the torque converter assembly mounting bolts (A-4ea).



20. Remove the mounting bolt both in the transaxle side and the engine side.

21. Remove the transaxle lower mounting bolts(A-3ea, B-1ea).



22. Lowering the jack slowly, remove the transaxle.

**CAUTION**

When removing the transaxle assembly, be careful not to damage any surrounding parts or body components.

**Installation**

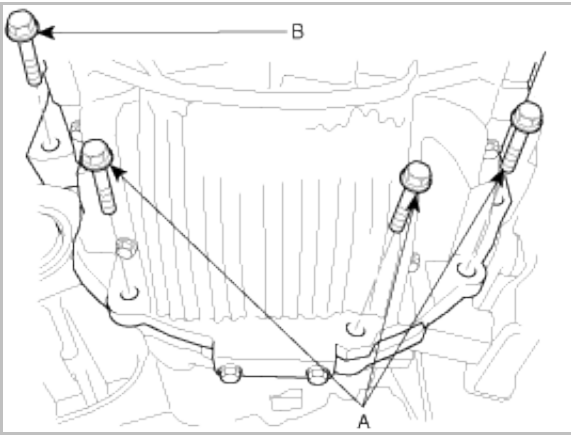
1. Lowering the vehicle or lifting up a jack, install the transmission assembly.

**CAUTION**

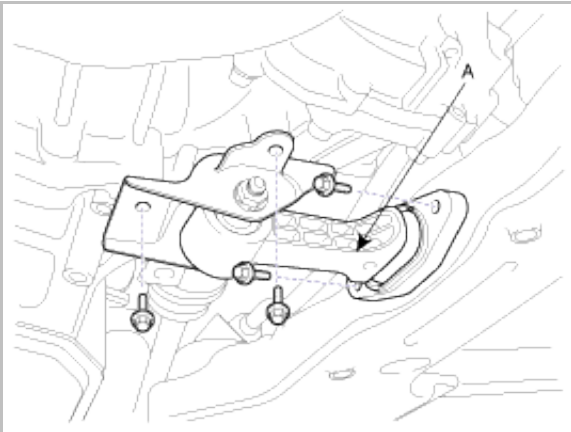
Be careful not to damage tubes, hoses or wire.

2. Install the transaxle lower mounting bolts (A-3ea, B-1ea).

**Tightening torque :**  
43-49N.m (4.3-4.9kgf.m, 31.1-35.4lb-ft)



3. Install the roll stopper bracket by removing bolts (A).

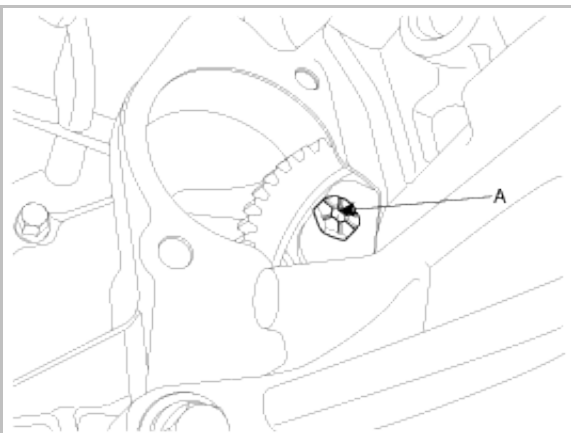


4. Install the mounting bolt both in the transaxle side and the engine side.

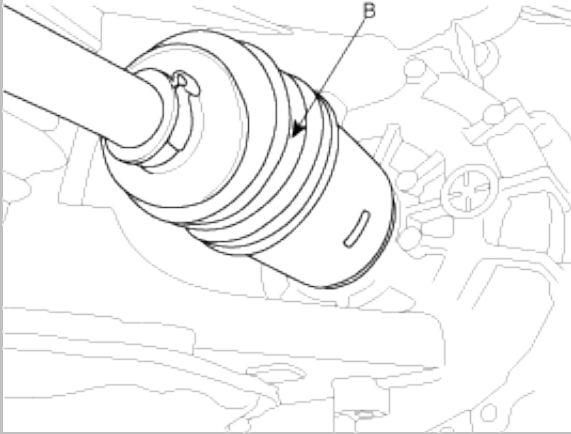
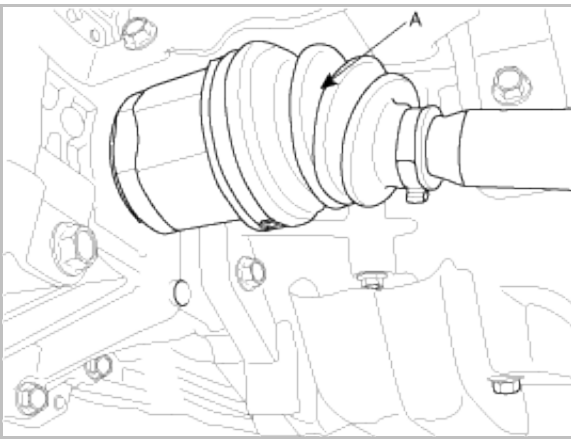
**Tightening torque :**  
[A] 43-55N.m (4.3-5.5kgf.m, 31.1-39.8lb-ft)  
[B] 30-42N.m (3.0-4.2kgf.m, 21.7-30.4lb-ft)

5. Install the torque converter assembly mounting bolts (A-4ea).

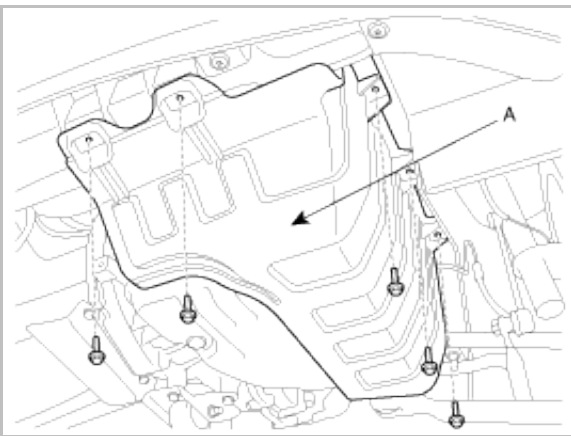
**Tightening torque :**  
46-53N.m (4.6-5.3kgf.m, 33.3-38.3lb-ft)



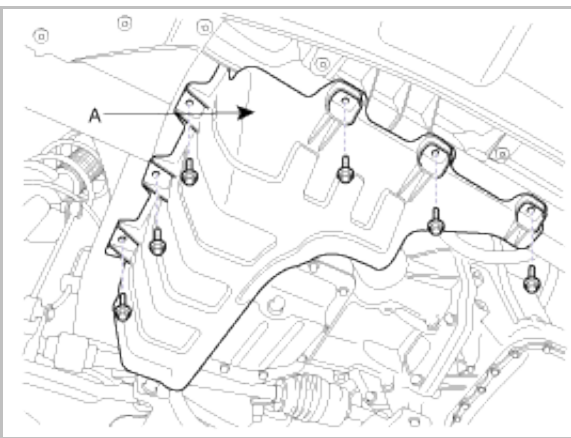
6. Disconnect the drive shafts (A,B) from the transaxle (refer to removal in DS group)



7. Install the under cover (A).



8. Install the side mud cover (A).



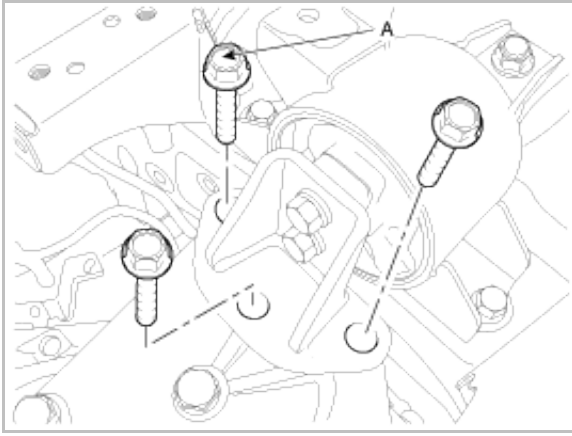
9. Install the lower arm ball joint mounting nut, the stabilizer link mounting nut, and the tie rod end mounting nut to the front knuckles. (refer to Front suspension system in SS group)

10. Install the front wheels and tires. (refer to removal in SS group)

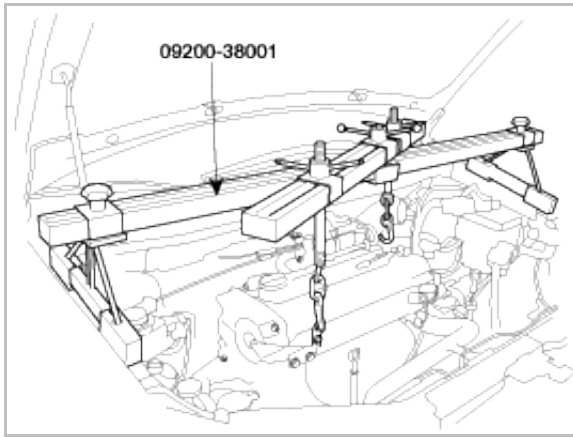
11. Install the transaxle mounting support bracket bolts (A-3ea).

**Tightening torque :**

90-110N.m (9.0-11.0kgf.m, 65.1-79.6lb-ft)



12. Supporting the sub frame with a jack and the special tool (09624-38000), install the mounting bolts. (see SS group).

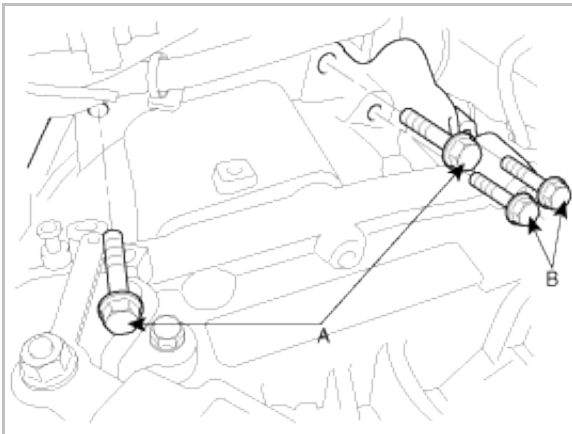


13. Install the transaxle upper mounting bolts (A-2ea) the starter motor mounting bolts (B-2ea).

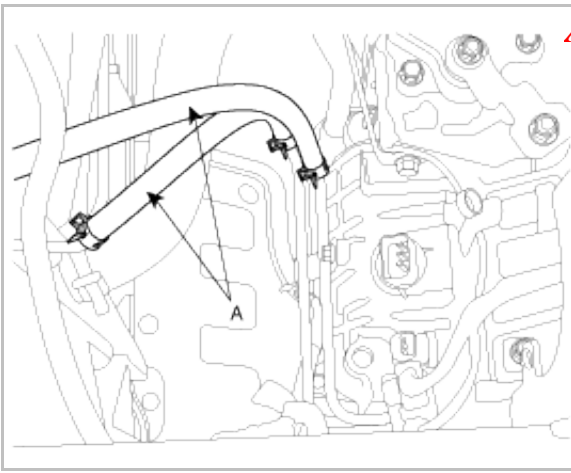
**Tightening torque :**

[A] 60-80N.m (6.0-8.0kgf.m, 43.4-57.7lb-ft)

[B] 39-60N.m (3.9-6.0kgf.m, 28.2-43.4lb-ft)



14. Connect the transaxle oil cooler hoses (A) to the tubes by fastening the clamps.



15. Install the shift cable assembly (A).

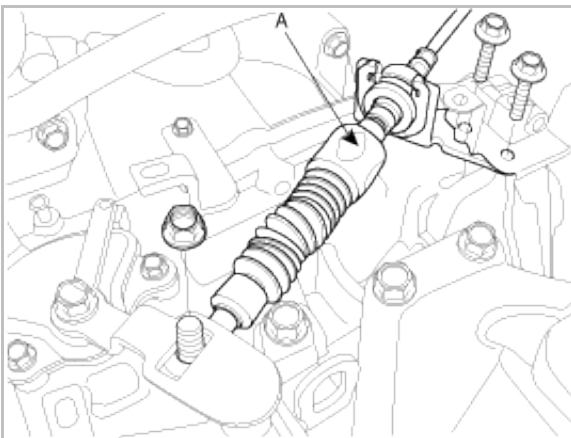
---

**Tightening torque :**

Bracket bolts : 15-22N.m (1.5-2.2kgf.m, 10.8-15.9lb-ft)

Nut : 10-14N.m (1.0-1.4kgf.m, 7.2-10.1lb-ft)

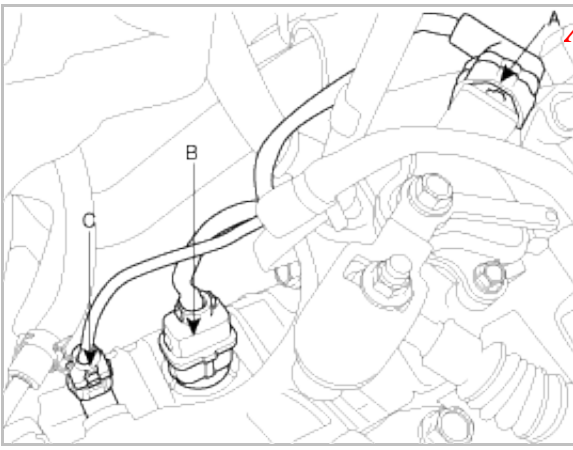
---



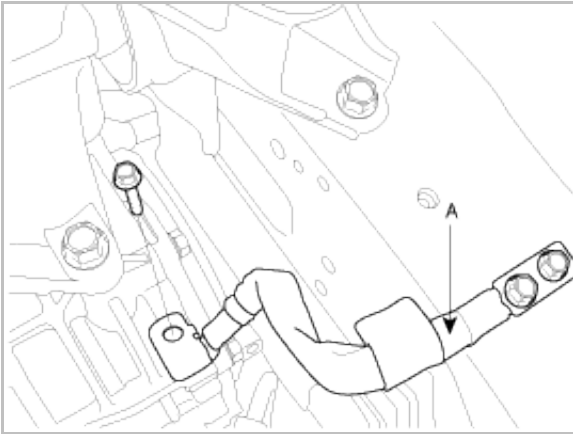
16. Install the output speed sensor connector (A).



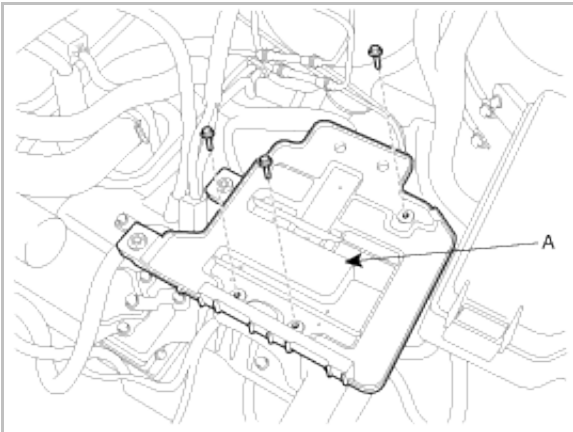
17. Connect the inhibitor switch connector (A), solenoid valve connector (B) and the input speed sensor connector (C).



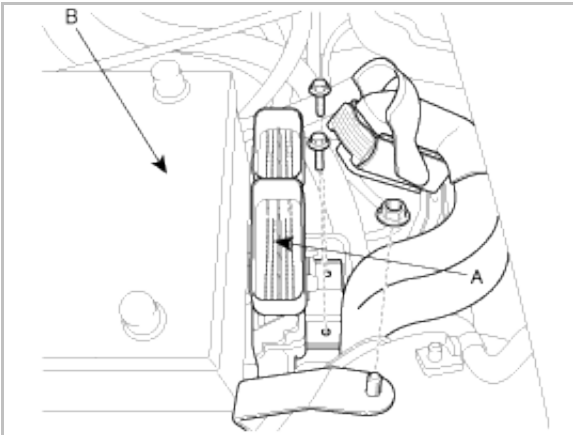
18. Install the ground cable (A) to transaxle.



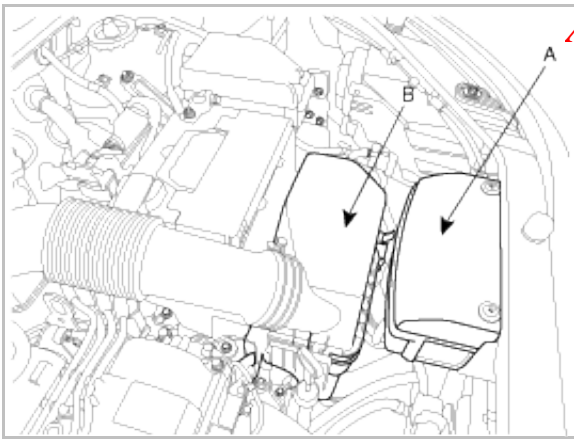
19. Install the battery tray (A).



20. Install the PCM (A) and PCM connector after installing the battery (B).



21. Install the air duct (A) or air cleaner assembly (B).



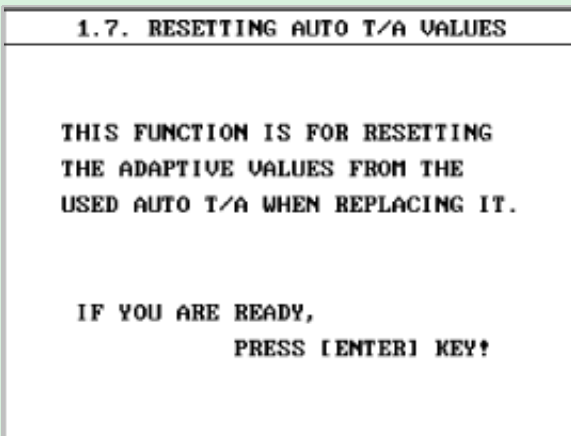
22. After completing the installation perform the following procedure;

- A. Adjust the shift cable.
- B. Refill the transaxle fluid.
- C. Clean the battery posts and cable terminals with sandpaper and grease them to prevent corrosion before installing.

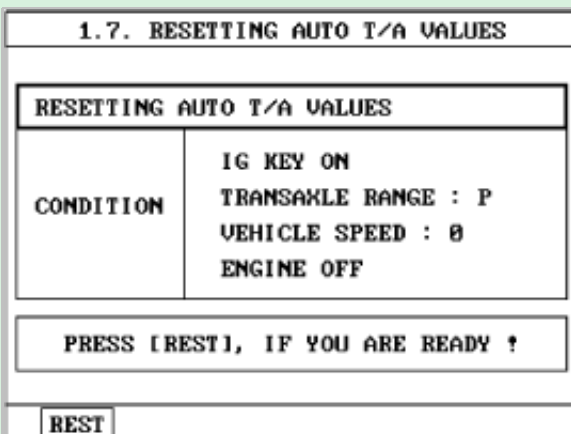
**NOTICE**

When replacing the automatic transaxle, reset the automatic transaxle's values by using the High- Scan Pro.

- 1. Connect the Hi-Scan Pro connector to the data link connector under the crash pad and power cable to the cigar jack under the center facia.
- 2. Turn the ignition switch on and power on the Hi-Scan Pro.
- 3. Select the vehicle's name.
- 4. Select 'AUTOMATIC TRANSAXLE'.
- 5. Select 'RESETTING AUTO T/A VALUES' and perform the procedure



6. Perform the procedure by pressing F1 (REST).





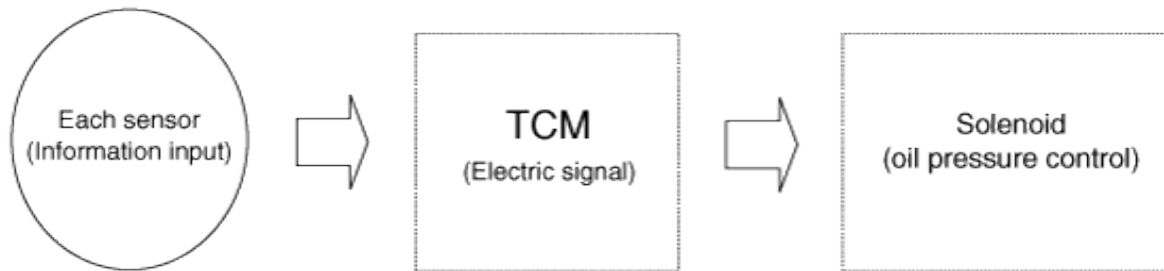
# **Automatic Transaxle System**

Valve Body System - Solenoid Valve



## Description

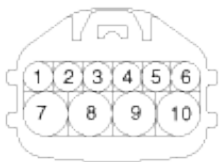
TCM calculates the best condition using the information from all kinds of sensors. If the solenoid valve receives the information on the oil pressure, the solenoid valve actuates according to the driving signal. All kinds of regulators in the valve body are controlled to change the oil passage and also the line pressure is controlled by TCM.



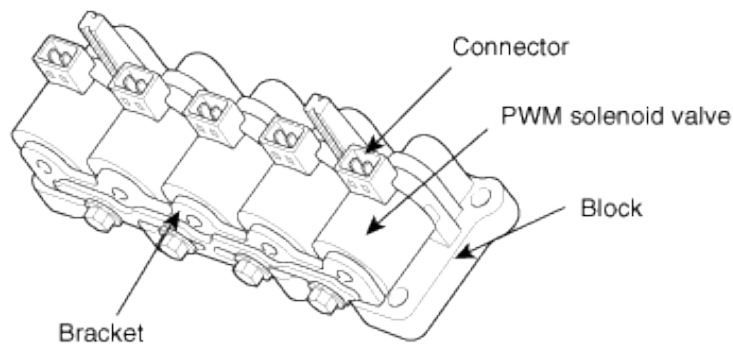
### • PWM (Pulse Width Modulation) Solenoid Valve

Structure and functions

PWM solenoid valve is composed of five solenoid valves and the oil capacity in the solenoid valve is changed by the electric duty value of TCM. The oil pressure of the valve body and the torque converter engages or disengages the damper clutch. The solenoid valves send the operating oil pressure to the clutches and brakes at each range and also control the strength and weakness of oil pressure to reduce shock when shifting.



1. PCSV-A (OD & LR)
2. PCSV-B (2-4 brake)
3. ON-OFF solenoid
4. PCSV-D (DCC solenoid)
7. Ground
8. PCSV-C (UD)
9. VFS
10. VFS ground

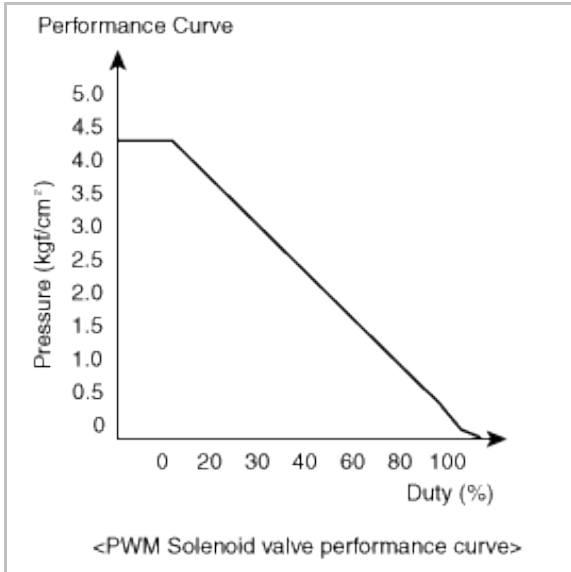


<PWM block assembly>

### PWM (Pulse Width Modulation) solenoid

Range	PWM solenoid valve				
	PCSV-A (SCSV-B)	PCSV-B (SCSV-C)	PCSV-C (SCSV-D)	PCSV-D (DCCV)	ON, OFF (SCSV-A)
N, P	OFF	ON	ON	OFF	ON
1st	ON	ON	OFF	OFF	ON
2nd	ON	OFF	OFF	ON	OFF
3rd	OFF	ON	OFF	ON	OFF
4th	OFF	OFF	ON	ON	OFF
Reverse	OFF	OFF	ON	OFF	ON

## PWM (Pulse Width Modulation) Solenoid Valve Control Feature

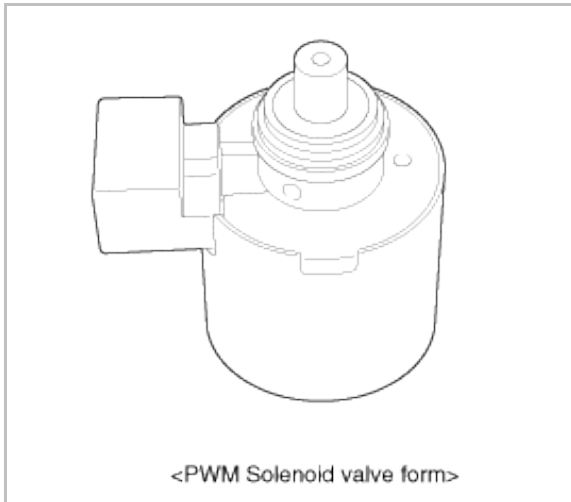


PWM solenoid valve is controlled linearly according to the duty ratio.

### Oil pressure range:

0~4.3 kgf/cm<sup>2</sup> (0~422kpa, 0~61.2psi)

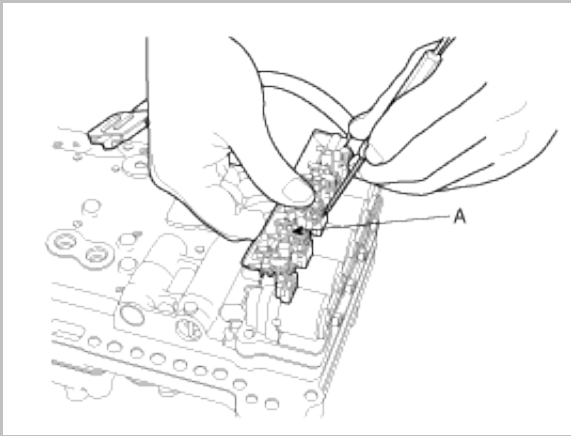
Type	3way & Normal High
Input voltage	12V
Coil resistance	3.2±0.2Ω (at 25°C, 77°F)
Cycle	50Hz



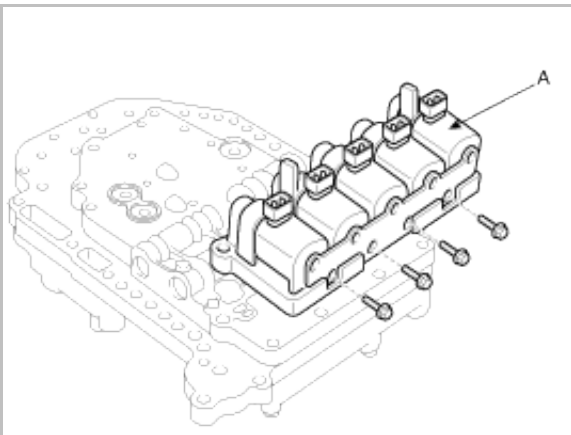


## Removal

1. Remove the battery terminal.
2. Lift the vehicle.
3. Remove the under cover.
4. Loosen the drain plug and drain the transaxle oil.
5. Remove the oil pan. (Refer to Automatic transaxle's disassembly in overhaul manual)
6. Remove the oil filter.
7. Remove the valve body. (Refer to Valve body's disassembly in overhaul manual)
8. Disconnect the main harness(A) from valve body.



9. Remove the solenoid valve assembly(A).



## Installation

1. Install the solenoid valve.

### CAUTION

Apply the ATF oil or White Vaseline to the O-ring to prevent damage.

2. Connect the solenoid valve connector to the valve body.

### CAUTION

When connecting the solenoid valve connector, check the connector for rust, dirt, or oil, then clean and reconnect it.

3. Install the valve body. (Refer to Valve body's reassembly in overhaul manual)

**Tightening torque :**

10~12N.m(1.0~1.2kgf.m, 7~8lb-ft)

4. Install the oil filter.

**Tightening torque :**

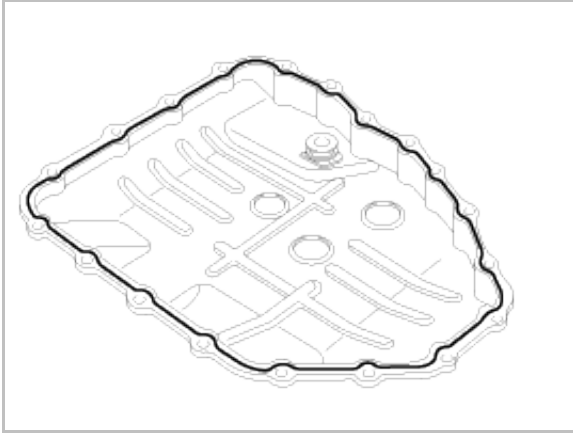
10~12N.m(1.0~1.2kgf.m, 7~8lb-ft)

---

5. Continue to apply liquid gasket at application points at the oil pan with  $\varnothing 2.5\text{mm}$  (0.098in) thickness.

**Liquid gasket Part name :** Threebond 1281B

---



6. Tighten the mounting bolt with the specified torque after installing the oil pan.

**Tightening torque :**

10~12N.m(1.0~1.2kgf.m, 7~8lb-ft)

---

7. Install the drain plug.

**Tightening torque :**

40~50N.m(4.0~5.0kgf.m, 28.9~36.2lb-ft)

---

8. Installation is the reverse of the removal.



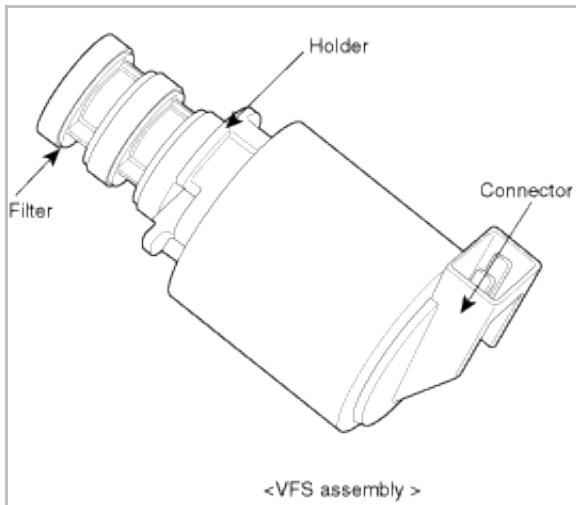
# **Automatic Transaxle System**

Valve Body System - VFS (Variable Force Solenoid) Valve

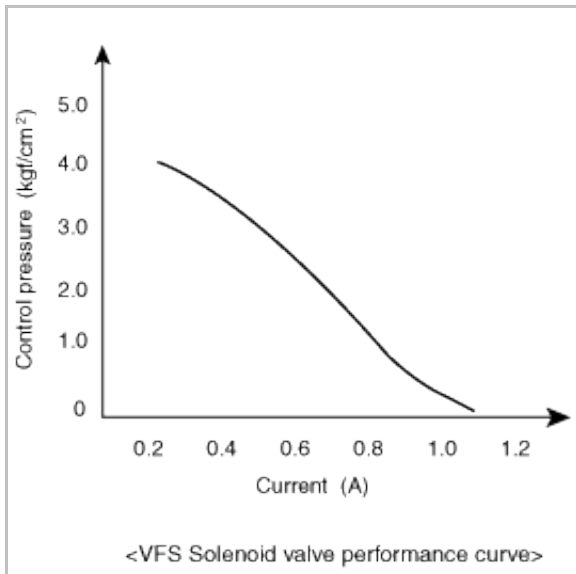


## Description

VFS valve controls the regulator valve and varies the line pressure from 4.5bar to 10.5bar according to the throttle open angle and the shift range. The holder is installed on the upper side of the case and the filter is installed to the two places on the holder outside to prevent in the strange material from flowing in the VFS.



## VFS (Variable Force Solenoid) Valve Control Feature



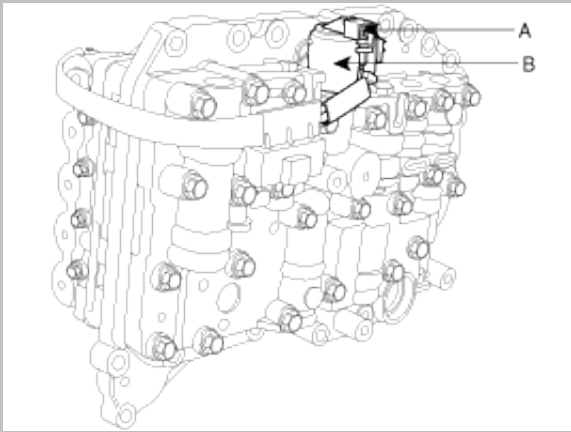
PWM solenoid valve is linear controlled according to the current value.

type	3way & Normal High
Input voltage	12V
Coil resistance	3.5±0.2Ω(at 25°C, 77°F)
Operating current	0 ~ 1200 mA



## Removal

1. Remove the battery terminal.
2. Lift the vehicle.
3. Remove the under cover.
4. Loosen the drain plug and drain the transaxle oil.
5. Remove the oil pan. (Refer to Automatic transaxle's disassembly in overhaul manual)
6. Remove the oil filter.
7. Remove the valve body. (Refer to Valve body's disassembly in overhaul manual)
8. Disconnect the VFS solenoid valve connector (A).



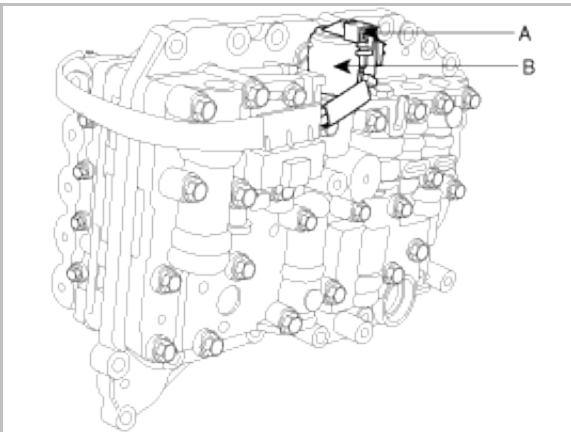
9. Remove the solenoid valve assembly (B).

## Installation

1. Install the solenoid valve (B).

### CAUTION

Apply the ATF oil or White Vaseline to the O-ring not to be damaged.



2. Connect the solenoid valve connector (A).

### CAUTION

When connecting the solenoid valve connector, check the connector for rust, dirt, or oil, then reconnect it.

3. Install the valve body. (Refer to Valve body's reassembly in overhaul manual)

### Tightening torque :

10~12N.m(1.0~1.2kgf.m, 7~8lb-ft)

4. Install the oil filter.

**Tightening torque :**

5~7N.m(0.5~0.7kgf.m, 4~5lb-ft)

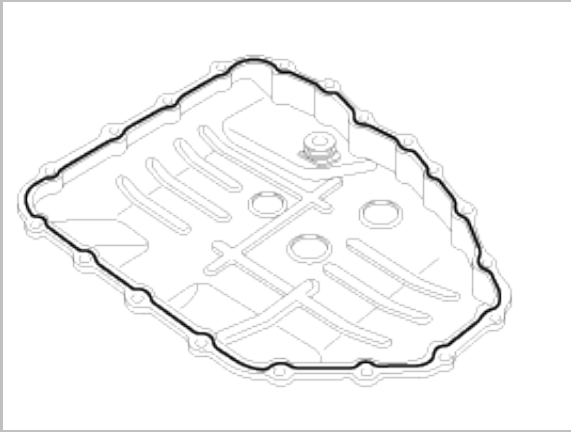
---

5. Continue to apply liquid gasket at application points at the oil pan with  $\varnothing 2.5\text{mm}$  (0.098in) thickness.

---

**Liquid gasket Part name :** Threebond 1281B

---



6. Tighten the mounting bolt with the specified torque after installing the oil pan.

---

**Tightening torque :**

10~12N.m(1.0~1.2kgf.m, 7~8lb-ft)

---

7. Install the drain plug.

---

**Tightening torque :**

40~50N.m(4.0~5.0kgf.m, 28.9~36.2lb-ft)

---

8. Installation is the reverse of the removal.

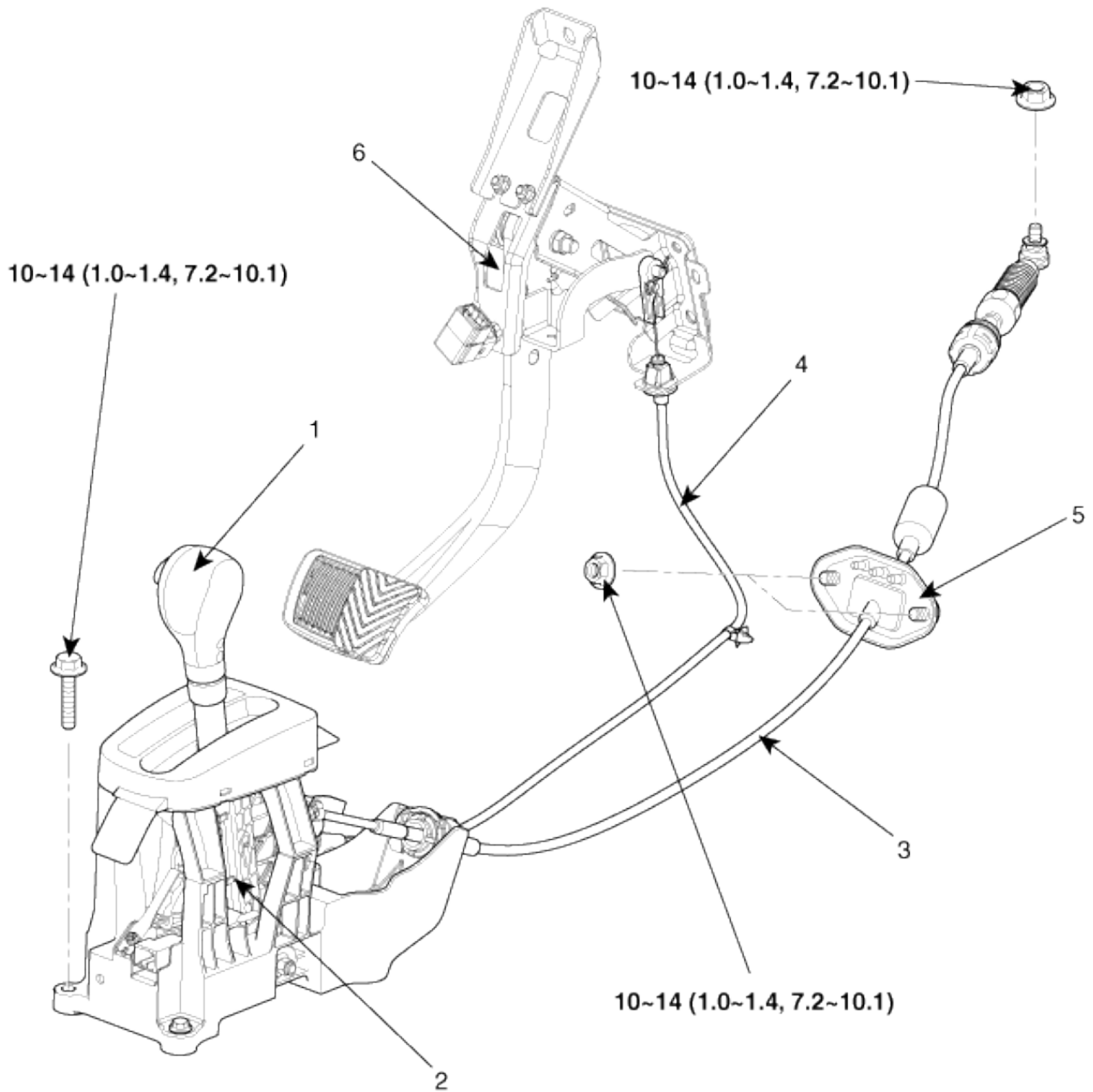


# **Automatic Transaxle System**

Automatic Transaxle Control System - Shift  
Lever



**Components**



**Torques : Nm (kgf.m, lb-ft)**

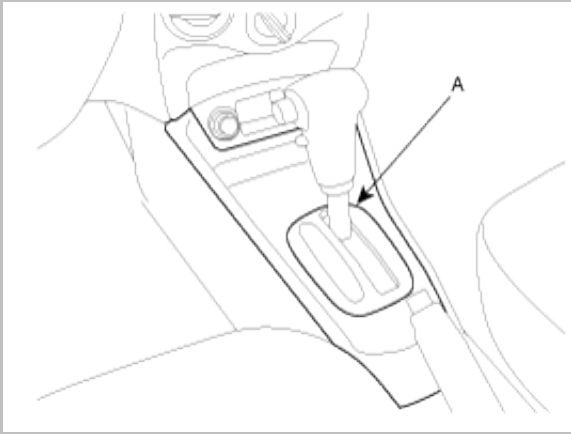
- 1. Shift lever knob
- 2. Shift lever assembly
- 3. Control cable assembly

- 4. Shift lock cably assembly
- 5. Retainer
- 6. Brake pedal assembly

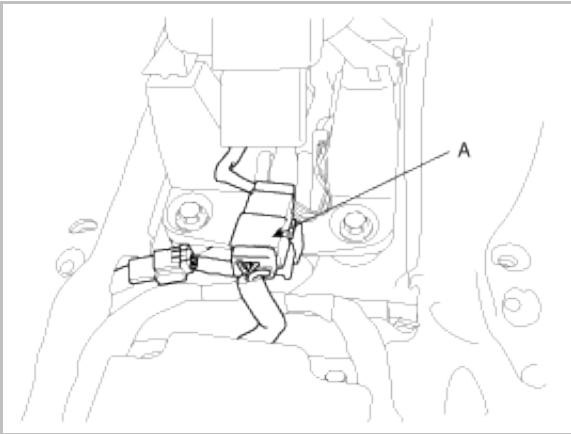


## Removal

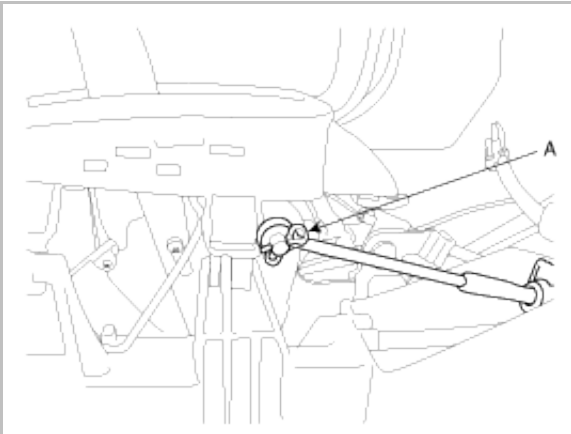
1. Remove the center console cover (A).



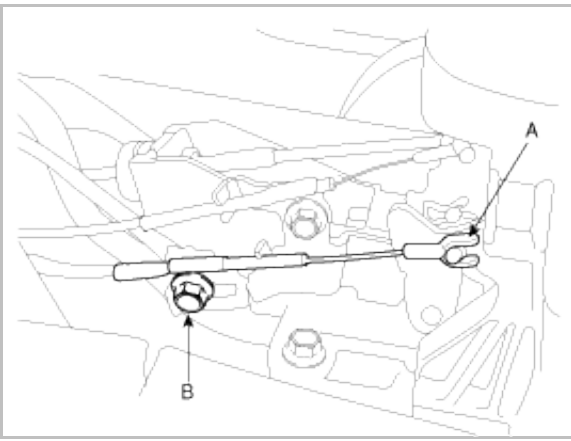
2. Remove the center console. (refer to Console in BD group)
3. Disconnect the connector (A).



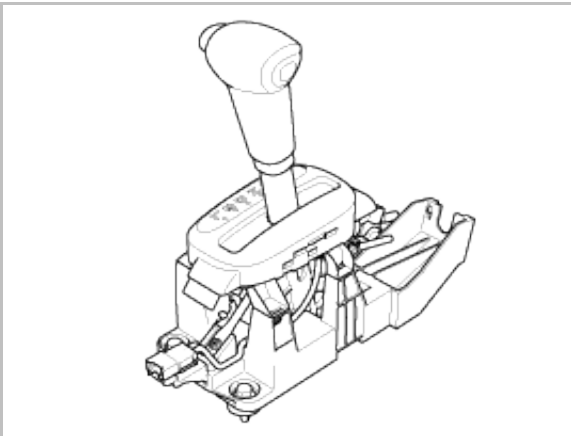
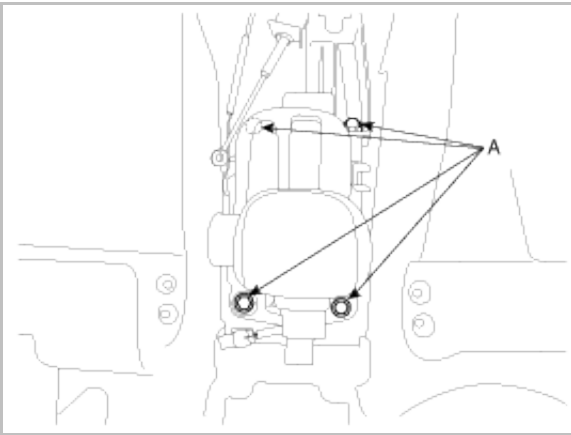
4. Remove the cotter pin (A) from the shift cable.



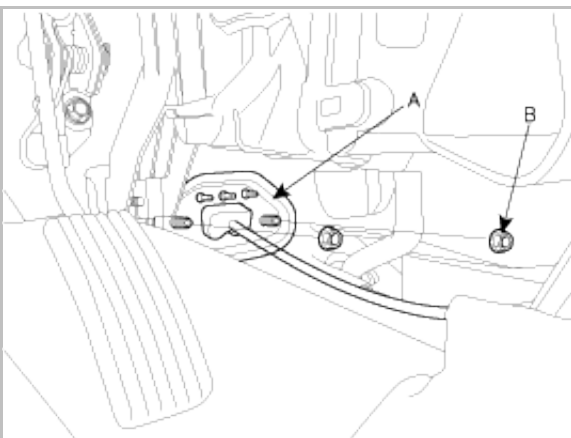
5. Remove the shift cable holder.
6. Remove the shift lock cable (A).
7. Remove the shift lock cable mounting nut (B).



8. Remove the shift lever assembly by removing the bolts(4ea).



9. Remove the retainer (A) and nuts (B).



10. Remove the shift cable assembly from the transaxle. (refer to Automatic transaxle's removal)

11. Remove the shift cable assembly.

## Inspection

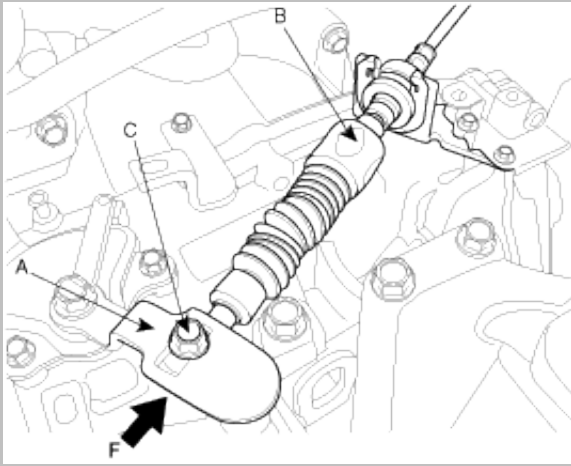
1. Check the shift cable for proper operation and for damage.

2. Check the boots for damage if boots are applied.
3. Check the boots for wear, abrasion, sticking, restricted movement or damage if boots are applied.
4. Check for the weak or damaged spring.

## Adjustment

### Adjusting the shift cable

1. Set the room side lever and the manual lever (A) to N position.
2. Push the shift cable (B) lightly to "F" direction shown to eliminate the free play.



3. Tighten the adjusting nut (C).

---

**Tightening torque :**

10~14N.m (1.0~1.4kgf.m, 7.2~10.1lb-ft)

---

4. Check that this part operates at each range of the manual lever corresponding to each position of the room lever.

## Installation

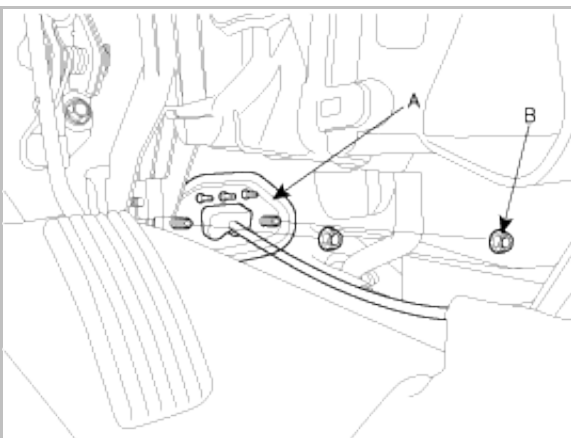
1. Install the shift cable assembly while the manual lever on the transaxle is placed in the neutral position. (refer to Automatic Transaxle Installation)
2. Install the retainer (A) and nuts (B).

---

**Tightening torque :**

10~14N.m (1.0~1.4kgf.m, 7.2~10.1lb-ft)

---



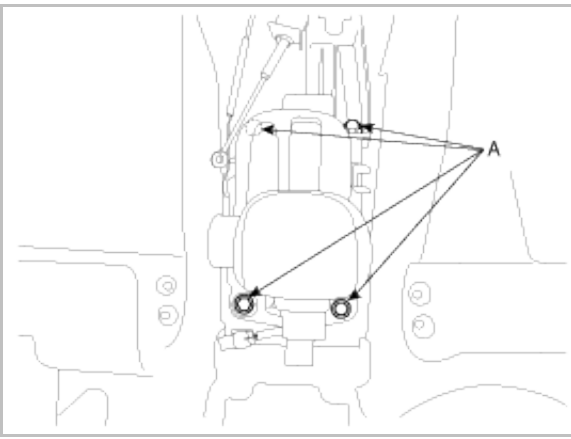
3. Install the shift lever assembly (A).

---

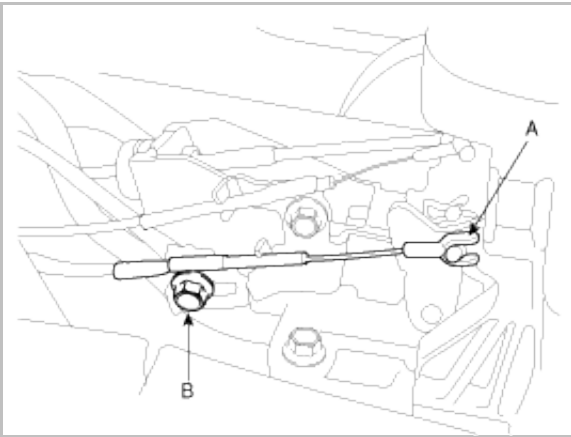
**Tightening torque :**

10~14N.m (1.0~1.4kgf.m, 7.2~10.1lb-ft)

---



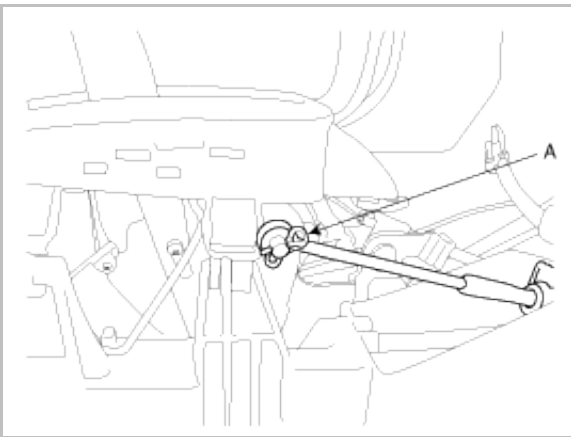
4. Install the shift lock cable mounting nut (B).



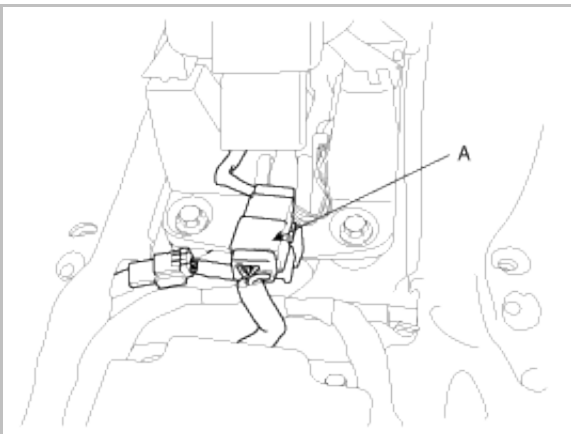
5. Install the shift lock cable (A).

6. Install the shift cable holder.

7. Insert the cotter pin (A) from the shift cable.



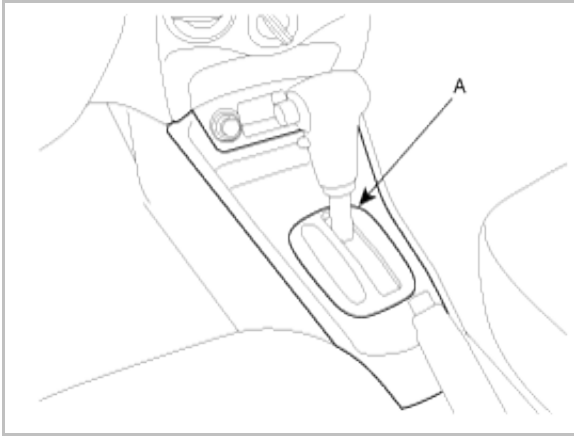
8. Connect the connector (A).



9. Install the center console. (refer to Console in BD group)

10. Install the center console cover (A).

*AutoLibrary*



*AutoLibrary*




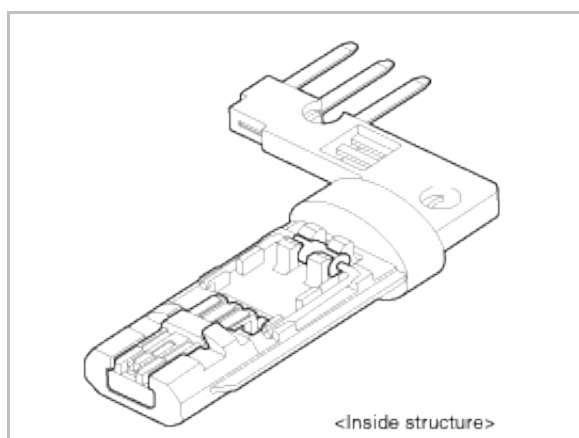
# **Automatic Transaxle System**

Automatic Transaxle Control System - Input  
Speed Sensor



## Description

Sensor type	<ol style="list-style-type: none"> <li>1. Type : HALL SENSOR</li> <li>2. Operating voltage : DC 12V</li> <li>3. Current consumption : 22mA (Max)</li> </ol>
Function	<ol style="list-style-type: none"> <li>1. Input speed sensor: Detect the input shaft rotation at the OD &amp; REV retainer side to control oil pressure when shifting.</li> <li>2. Feedback control, clutch-clutch control, damper clutch control, shift range control, incorrect ratio control and sensor trouble detection signal.</li> </ol>
Connector	 <ol style="list-style-type: none"> <li>1. Ground</li> <li>2. Signal</li> <li>3. Power source</li> </ol>

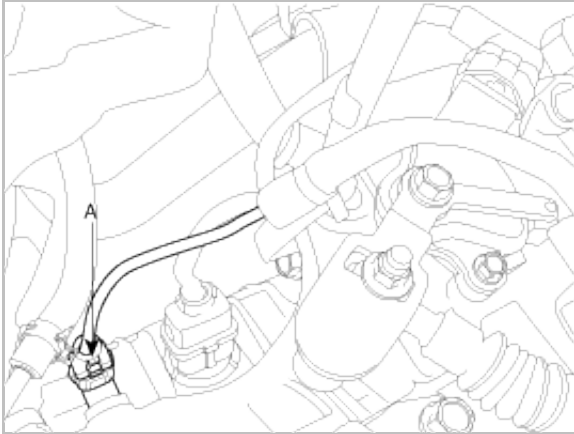


Item	Inspection item	Standard value
Air gap	Input speed sensor	0.035in(0.9mm)
Sensor resistance	Input speed sensor	Over 1 MΩ
Output voltage	HIGH	Over 4.8V
	LOW	Below 0.8V

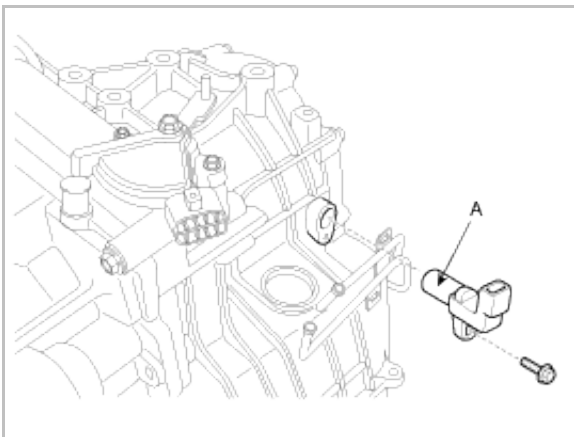


## Removal

1. Remove the battery terminal.
2. Remove the battery and battery tray.
3. Remove the air duct.
4. Remove the air cleaner assembly. (Refer to Automatic transaxle's Removal)
5. Remove the input speed sensor connector (A).



6. Remove the input speed sensor(A).



## Installation

1. Install the new O-ring to the input speed sensor.
2. Install the input speed sensor (A).

---

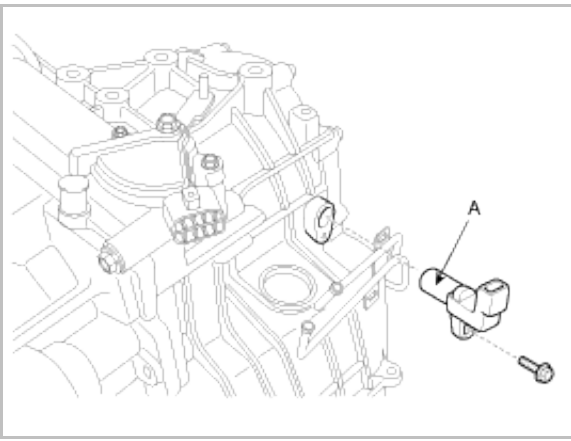
**Tightening torque :**

10~12N.m(1.0~1.2kgf.m, 7~8lb-ft)

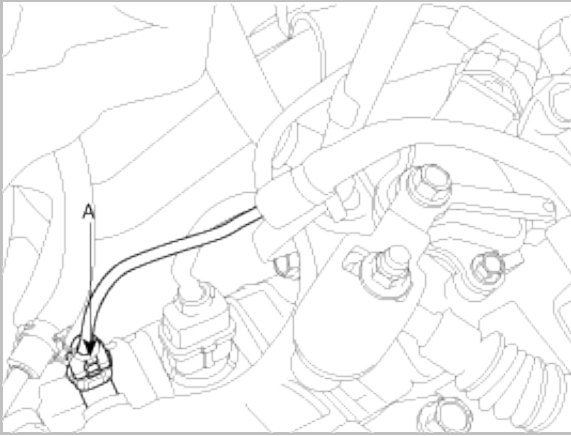
---

**CAUTION**

While installing the input shaft speed sensor, do not allow dust or other foreign particles to enter the transaxle.



3. Check the connector for dust, dirt, or oil, and then connect the input speed sensor connector (A) securely.



4. Installation is the reverse of removal.

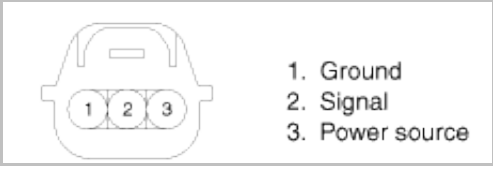


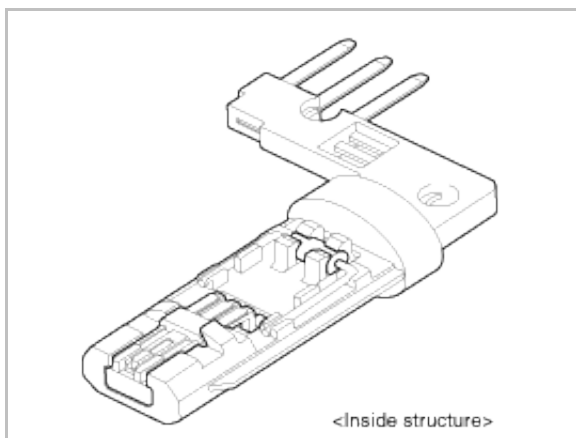
# **Automatic Transaxle System**

Automatic Transaxle Control System -  
Output Speed Sensor



## Description

Sensor type	<ol style="list-style-type: none"> <li>1. Type : HALL SENSOR</li> <li>2. Output voltage : DC 12V</li> <li>3. Current consumption : 22mA (Max)</li> </ol>
Function	<ol style="list-style-type: none"> <li>1. Output speed sensor : Detect the output shaft rpm(T/F DRIVEN GEAR RPM) at the T/F driven gear</li> <li>2. Feedback control, clutch-clutch control, damper clutch control, shift range control, incorrect ratio control and sensor trouble detection signal.</li> </ol>
Connector	 <ol style="list-style-type: none"> <li>1. Ground</li> <li>2. Signal</li> <li>3. Power source</li> </ol>

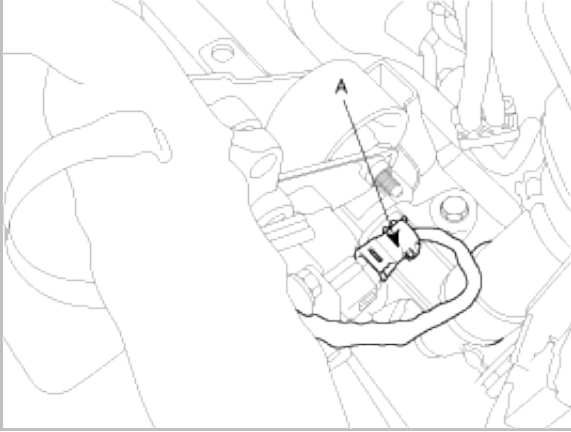


Item	Inspection item	Standard value
Air gap	Output speed sensor	0.025in(0.65mm)
Sensor resistance	Output speed sensor	Over 1 MΩ
Output voltage	HIGH	Over 4.8V
	LOW	Below 0.8V

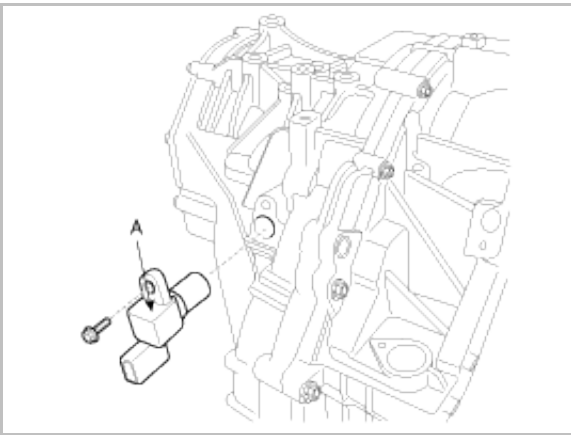


## Removal

1. Remove the battery terminal.
2. Remove the battery and battery tray.
3. Remove the air duct.
4. Remove the air cleaner assembly. (Refer to Automatic transaxle's Removal)
5. Remove the output speed sensor connector(A).



6. Remove the output speed sensor(A).



## Installation

1. Install the new O-ring to the output shaft speed sensor.
2. Remove the output speed sensor (A).

---

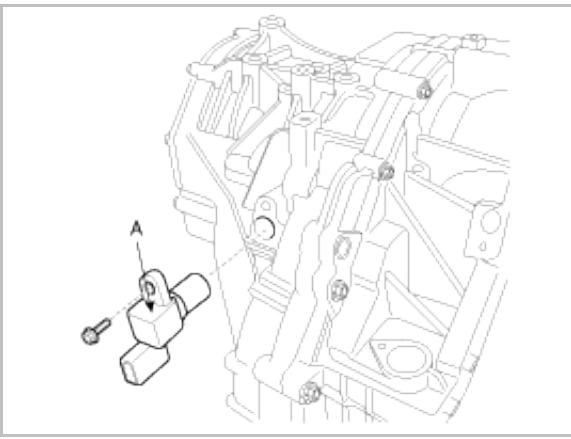
**Tightening torque :**

10~12N.m(1.0~1.2kgf.m, 7~8lb-ft)

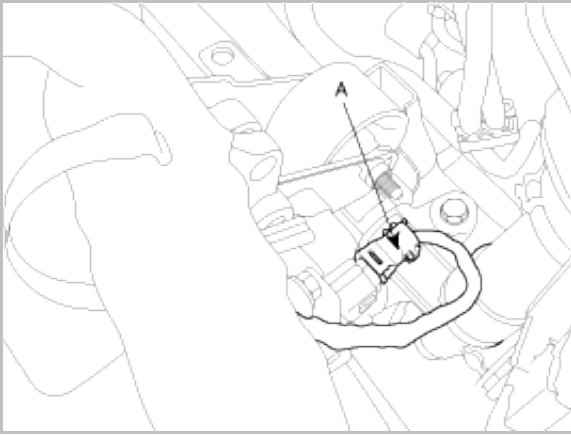
---

**CAUTION**

While installing the output speed sensor, do not allow dust or other foreign particles to enter the transaxle.



3. Check the connector for dust, dirt, or oil, then connect the output speed sensor connector (A) securely.



4. Installation is the reverse of removal.

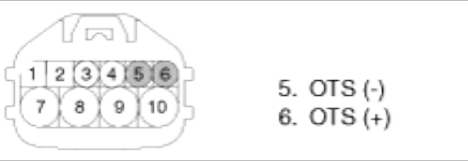


# **Automatic Transaxle System**

Automatic Transaxle Control System -  
Transaxle Oil Temperature Sensor

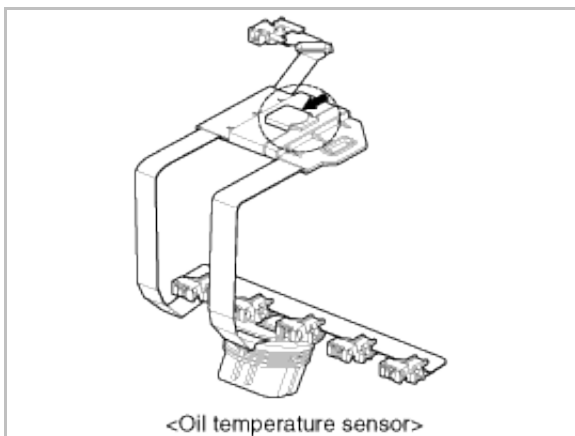


## Description

Sensor type	<ol style="list-style-type: none"> <li>Type : Thermister</li> <li>Use available temperature : -40~160°C(-40~320°F)</li> </ol>
Function and feature	<ol style="list-style-type: none"> <li>Detect the temperature of ATF through the thermistor which is exposed outside.</li> <li>When shifting the range, it is used as the oil pressure control information.</li> </ol>
Connector	 <p>5. OTS (-) 6. OTS (+)</p>

Temp.[°C(°F)]	Resistance (KΩ)	Temp.[°C(°F)]	Resistance (KΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.4	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		

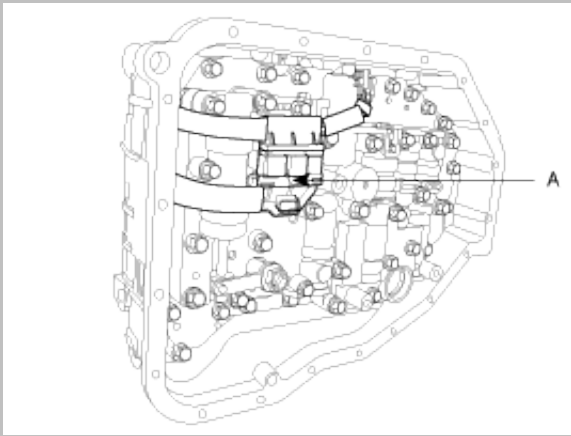
## Installation Location





## Removal

1. Remove the battery terminal.
2. Lift the vehicle.
3. Remove the under cover.
4. Loosen the drain plug and drain the transaxle oil.
5. Remove the oil pan. (Refer to Automatic transaxle's disassembly in overhaul manual)
6. Remove the oil filter.
7. Remove the valve body. (Refer to Valve body's disassembly in overhaul manual)
8. Disconnect the main harness connector (A) from the valve body and remove oil temperature sensor.

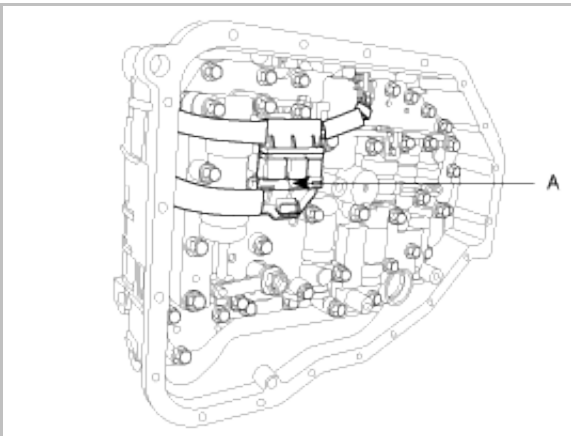


## Installation

1. Install oil temperature sensor and connect the main harness connector (A) to the valve body.

### CAUTION

When connecting the oil temperature connector, check the connector for rust, dirt, or oil, then reconnect it.



2. Install the valve body. (Refer to Valve body's reassembly in overhaul manual)

### Tightening torque :

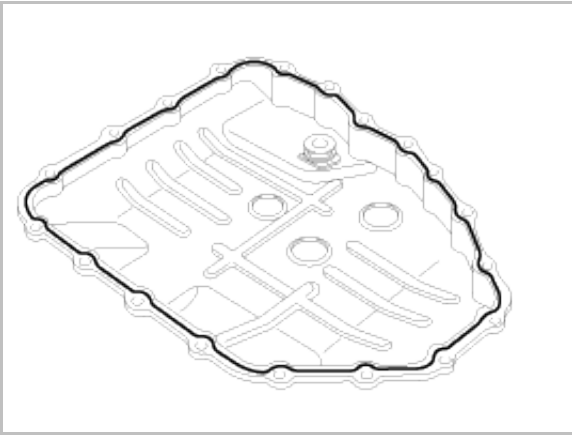
10~12N.m(1.0~1.2kgf.m, 7~8lb-ft)

3. Install the oil filter.

### Tightening torque :

5~7N.m(0.5~0.7kgf.m, 4~5lb-ft)

4. Continue to apply liquid gasket at application points at the oil pan with  $\varnothing 0.098$ in(2.5mm) thickness.



5. Tighten the mounting bolt with the specified torque after installing the oil pan.
- 

**Tightening torque :**

10~12N.m(1.0~1.2kgf.m, 7~8lb-ft)

---

6. Install the drain plug.
- 

**Tightening torque :**

40~50N.m(4.0~5.0kgf.m, 28.9~36.2lb-ft)

---

7. Installation is the reverse of the removal.



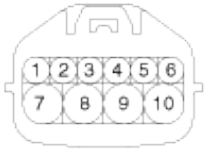
# **Automatic Transaxle System**

Automatic Transaxle Control System -  
Inhibiter Switch

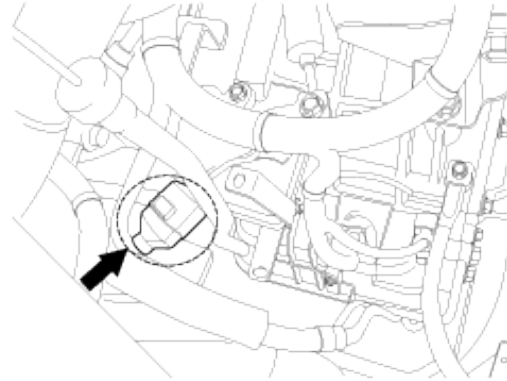


**Description**

Sensor type	1. Type : ROTARY 2. Available temperature range : -40~150°C(-40~320°F) 3. Tightening torque : 10~12N.m(1.0~1.2kgf.m, 7~8lb-ft )
Function	Detect the position of select lever through the contact switch. It makes starting possible in "P" and "N".



- 1. P range
- 2. D range
- 3. L range
- 5. 2 range
- 6. N range
- 7. R range
- 8. Power supply IG1
- 9. Start circuit
- 10. Start circuit



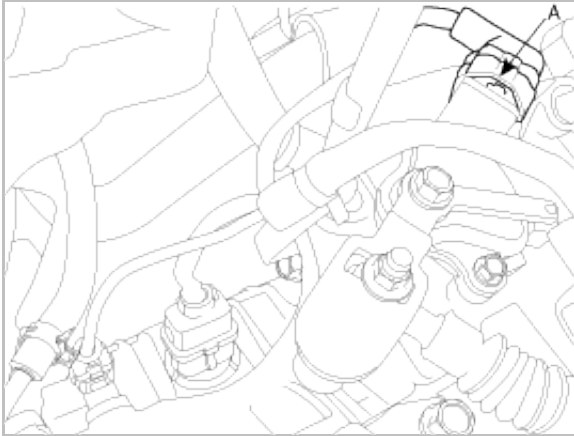
<Installation location>

Shift lever \ Terminal No.	P	R	N	D	2	L
1	●					
2				●		
3						●
4						
5					●	
6			●			
7		●				
8	●	●	●	●	●	●
9	●		●			
10	●		●			

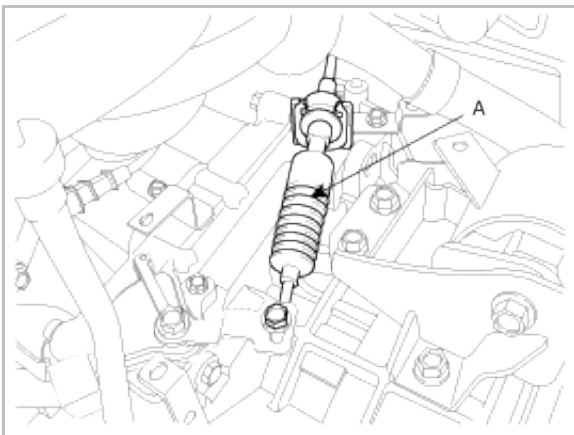


## Removal

1. Remove the battery terminal.
2. Remove the battery and battery tray.
3. Remove the air duct.
4. Remove the air cleaner assembly. (Refer to Automatic transaxle's Removal)
5. Disconnect the inhibitor switch connector (A).



6. Remove the control cable(A) from the manual control lever.



7. Remove the inhibitor switch and manual control lever.

## Installation

1. Set the inhibitor switch to the "N" position.
2. Set the inhibitor switch control shaft to the "N" position.
3. Install the inhibitor switch and manual control lever.

---

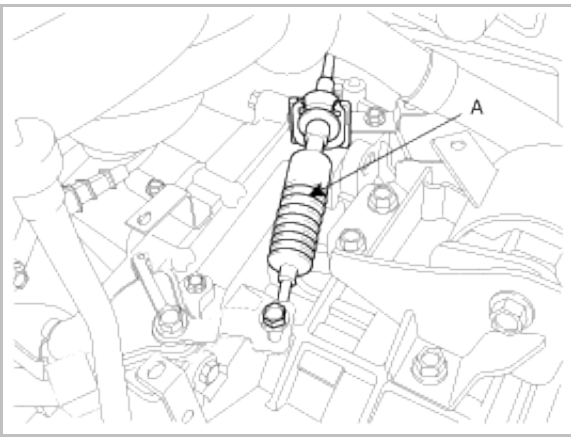
**Tightening torque :**

Shaft nut: 17~21N.m(1.7~2.1kgf.m, 12~15lb-ft)

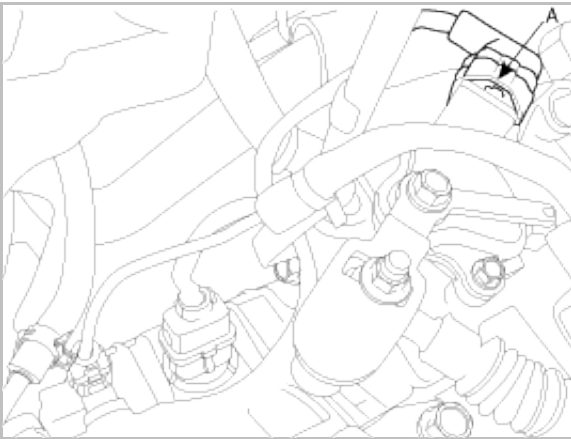
Bolt(2EA): 10~12N.m(1.0~1.2kgf.m, 7~8lb-ft )

---

4. Install the control cable (A) to the manual control lever.



5. Connect the inhibitor switch connector (A).



6. Installation is the reverse of the removal.

7. Turn the ignition switch ON after installation.

Move the shift lever from "P" range to "L" range, and verify that the A/T gear position indicator follows the transaxle range switch.