General Information

SPECIFICATION

Item		F4A51-2
Torque converter type		3-element, 1-stage, 2-phase type
Transaxle type		4-speed forward, 1-speed reverse
Engine displacement		Diesel 2.0L
Gear ratio	1st	2.842
	2nd	1.495
	3rd	1.000
	4th	0.731
	Reverse	2.720
Final gear ratio		4.520
Shift pattern	Variable	
Shift range	4range (P-R-N-D) + Sports mode	
Shift range valve	PWM ; 5EA(Duty control) , VFS	
Planetary gear	2EA(Output planetary/Overdrive planetary)	
Clutch	3EA	
Brake	2EA	
OWC	1EA	

TIGHTENING TORQUE

ITEM	Nm	kgf.m	lb-ft
Control cable nut	8 ~ 12	0.8 ~ 1.2	5.8 ~ 8.6
Input shaft speed sensor	10 ~ 12	1.0 ~1.2	7 ~ 8
Output shaft speed sensor	10 ~ 12	1.0 ~1.2	7 ~ 8
Manual control lever	18 ~ 25	1.8 ~ 2.5	13 ~ 18
Transaxle range switch	10 ~ 12	1.0 ~1.2	7 ~ 8
Valve body cover	10 ~ 12	1.0 ~1.2	7 ~ 8
Valve body mounting bolt	10 ~ 12	1.0 ~1.2	7 ~ 8
Oil temperature sensor	10 ~ 12	1.0 ~1.2	7 ~ 8
Oil filler plug	29 ~ 34	2.9 ~ 3.4	21.4 ~ 25.1
Oil drain plug	40 ~ 50	4.0 ~ 5.0	29 ~ 36
Solenoid valve support	5 ~ 7	0.5 ~ 0.7	4 ~ 5
Pressure check plug	8 ~ 10	0.8 ~ 1.0	6 ~ 7
Transaxle mounting sub bracket nut	60 ~ 80	6.0 ~ 8.0	43 ~ 58
Transaxle mounting bracket bolts	40 ~ 55	4.0 ~ 5.5	29 ~ 40
Transaxle mounting insulator bolt	90 ~ 110	9.0 ~ 11	65 ~ 80

ITEM	Nm	kgf.m	lb-ft
Transaxle and engine mounting bolt	65 ~ 85	6.5 ~ 8.5	47 ~ 61.5
Drive plate bolt	46 ~ 53	4.6 ~ 5.3	33.3 ~ 38.3

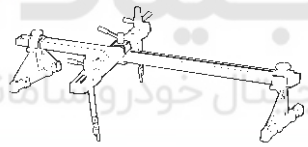
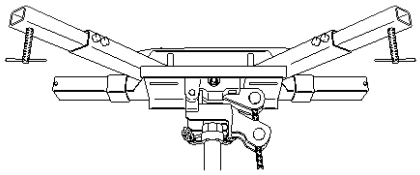
LUBRICANT

Item	Specified lubricant	Quantity
Transmission oil	Diamond ATF SP-III	8.5ℓ(8.98 Us qt, 7.48Imp.qt)

SEALANT

Item	Specified Sealant
Rear cover Torque converter housing Valve body cover	Three Bond - TB 1281B or LOCTITE - FMD - 546
Transmission case side cover	Three Bond - TB 1389 or LOCTITE - 518
Side cover	Three Bond - TB 1389 or LOCTITE - 518/587

SPECIAL TOOLS

TOOL (Number and name)	Illustration	Use
09200-38001 Engine support fixture		Removal and installation of transaxle.
09624-38000 Crossmember supporter		Supporting of the crossmember.

Automatic Transaxle System

Description

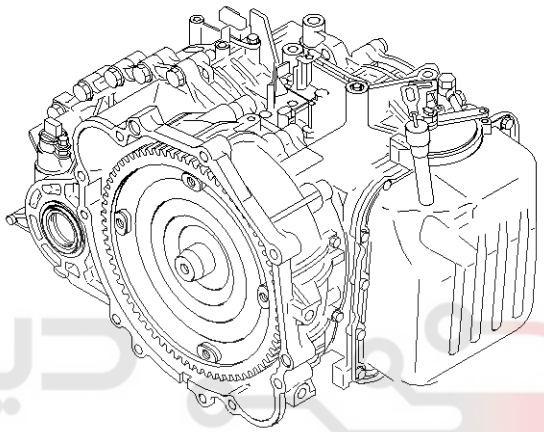
The automatic transmission is a combination of 3-element 2-phase 1-stage torque converter and double shaft electrocally-controlled unit which provides 4 speeds forward and 1 reverse. To improve the efficiency of power transmission, the line pressure control was changed applying "Variable Force Solenoid (VFS) valve" on this model.

However, adopting VFS on this model, the line pressure is variably changed according to TPS and the vehicle speed, this will enable more improved efficiency of power transmission and fuel consumption.

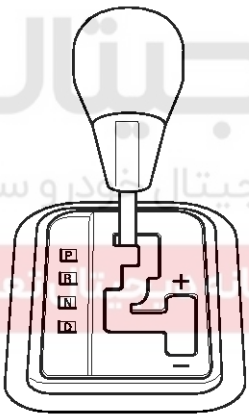
Characteristics

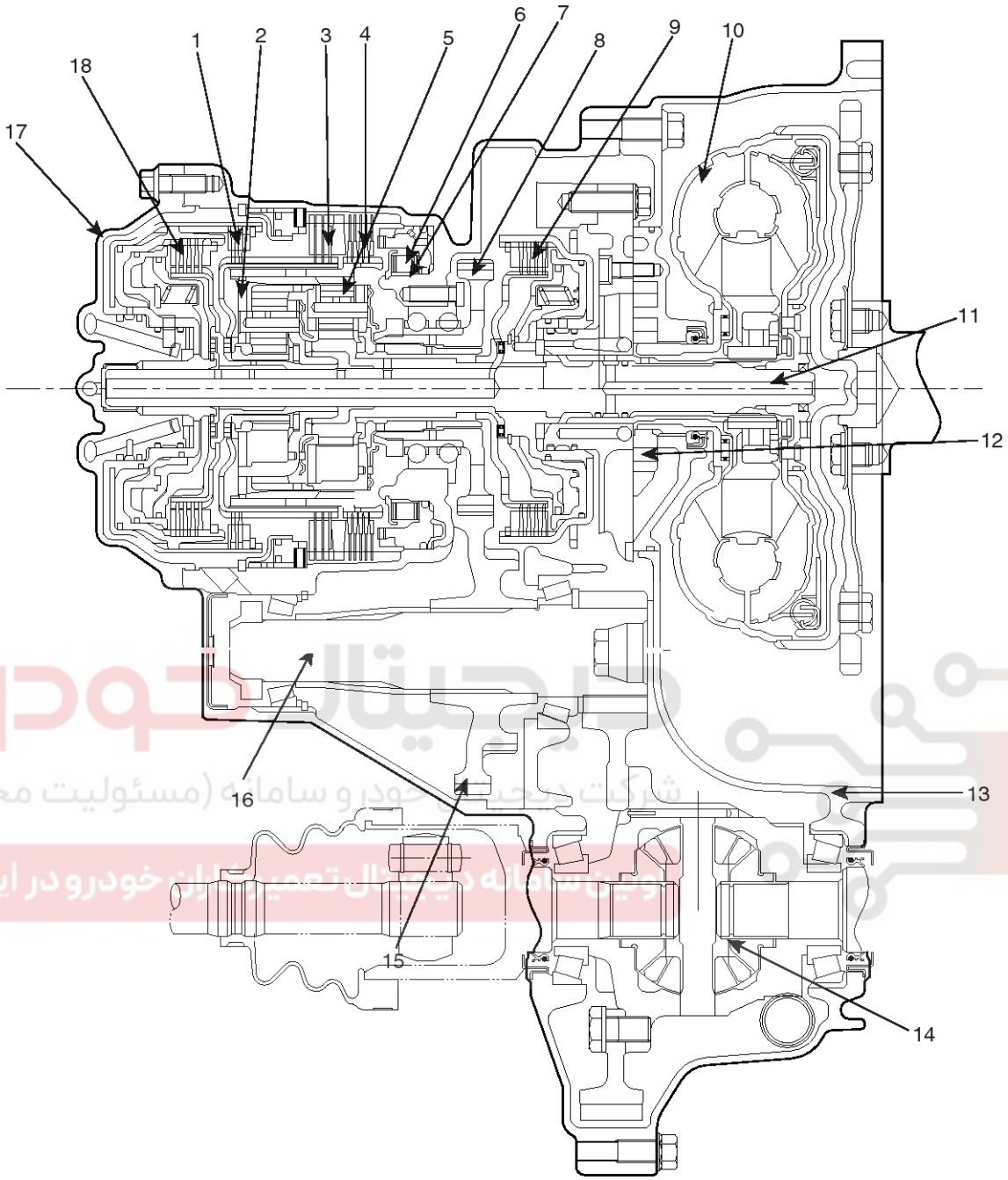
Some of the characteristics include:

- ▶Different power transfer
- ▶Different component layout
- ▶New shift logic(HIVEC) to improve shift feeling
- ▶Position of Valve Body
- ▶Variable shift pattern
- ▶Communication protocol and method
- ▶Step gate type shift lever.



EKRF071A

Item	Details
Weight Reduction	1. Aluminum oil pump - 2.3kg Approx 2. Pressed parts - Retainer and hub of brakes and clutches - Carrier of planetary gear set
Better shift quality	1. Independent control of clutches and brakes enabled better control of hydraulic pressure and skiped shifts (4 to 2, 3 to 1) 2. During N to D or N to R shift, feedback control adopted. 3. When starting from Creep condition, reduction of shock.(Creep condition is controlled with 1st gear) 4. Solenoid valve frequency is increased for more accurate control. 35Hz to 61.3 Hz except DCCSV that is 35Hz and VFS that is 600Hz. 5. HIVEC adoption for better shift feeling. 6. Variable shift pattern.
Increase in Power train efficiency	1. Fully Variable Line Pressure 2. VFS(Variable Force Solenoid)
Dynamic drive by sports mode	- Manual shifting possible - Step gate type shift lever 



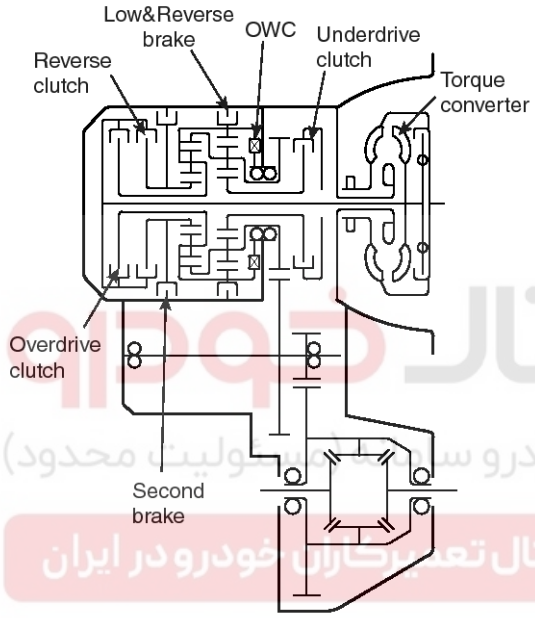
1. Reverse clutch
2. Overdrive planetary gear set
3. Second brake
4. Low-reverse brake
5. Output plantary gear set
6. Oneway clutch
7. Oneway clutch inner race
8. Transfer drive gear
9. Underdrive clutch
10. Torque converter
11. Input shaft
12. Oil pump
13. Converter housing
14. Differential
15. Transfer driven gear
16. Output shaft
17. Rear cover
18. Overdrive clutch

EKRF001A

MECHANICAL SYSTEM

OPERATION COMPONENTS AND FUNCTION

Operating Element	Symbol	Function
Under drive clutch	UD	Connect input shaft and under drive sun gear
Reverse clutch	REV	Connect input shaft and reverse sun gear
Overdrive clutch	OD	Connect input shaft and over drive carrier
Low & Reverse brake	LR	Hold LR annulus gear and OD carrier
Second brake	2ND	Hold reverse sun gear
One way clutch	OWC	Restrict the rotating direction of low & reverse annulus gear



EKRF002A

Operating elements

	UD/C	OD/C	REV/C	2ND/B	LR/B	OWC
P					●	
R			●		●	
N					●	
D1	●				●	○
D2	●			●		
D3	●	●				
D4		●		●		

1) ○ : OWC is operated when shifts from 1st gear to 2nd gear.

2) L & R brake is released in 1st gear when the vehicle speed is more than 5KPH approximately.

Torque converter and shaft

The torque converter consists of an impeller(pump), turbine and stator assembly in a single unit. The pump is connected to the engine crankshaft and turns as the engine turns. This drawing force is transmitted to the turbine through the oil which is recycled by the stator.

The transmission has two parallel shafts ; the input shaft and the output shaft. Both shafts are in line with the engine crankshaft. The input shaft includes the overdrive clutch, reverse clutch, underdrive clutch, one way clutch, 2ND brake, low & reverse brake, overdrive planetary carrier, output planetary carrier and transfer drive gear. The output shaft includes the transfer driven gear.

CLUTCHES

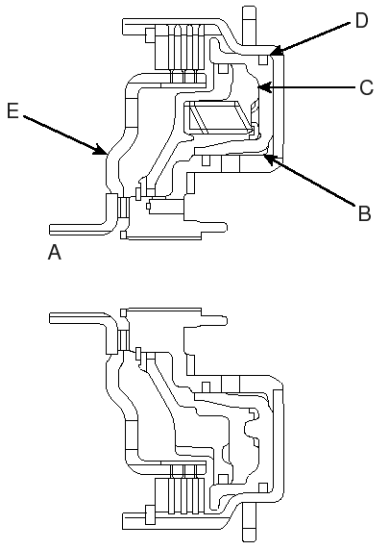
The gear changing mechanism utilizes three multi-disc clutches. The retainers of these clutches are fabricated from high-precision sheet metal for lightness and ease of production. Also, more responsive gearshifts at high engine speeds are achieved by a pressure-balanced piston mechanism that cancels out centrifugal hydraulic pressure. This mechanism replaces the conventional ball check valve.

UNDERDRIVE CLUTCH

The underdrive clutch operates in 1st, 2nd, and 3rd gears and transmits driving force from the input shaft to the underdrive sun gear(A).

The components comprising the under clutch are as illustrated below.

Hydraulic pressure acts in the piston pressure chamber(B) (between the piston(c) and retainer) and thus pushes the piston(C). In turn, the piston depresses the clutch discs and thereby transmits driving force from the retainer(D) to the hub(E) side.

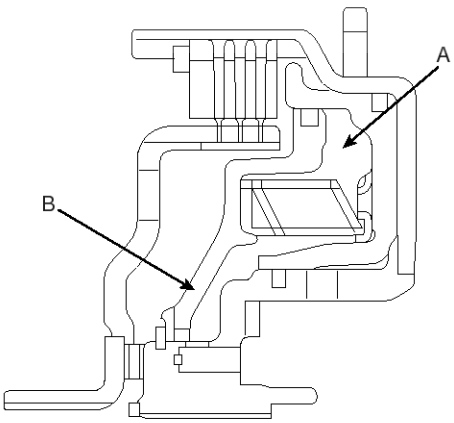


EKRF002B

At high speed, fluid remaining in the piston pressure chamber is subjected to centrifugal force and attempts to push the piston.

However, fluid in the balance fluid chamber(A) (the space between the piston and return spring retainer(B)) is also subjected to centrifugal force.

Thus, the hydraulic pressure on one side of the piston cancels out the hydraulic pressure on the other side, and the piston does not move.

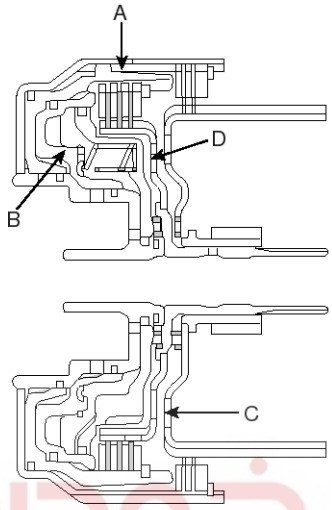


EKRF002C

REVERSE CLUTCH AND OVERDRIVE CLUTCH

The reverse clutch(C) operates when the reverse gear is selected and transmits driving force from the input shaft to the reverse sun gear.

The overdrive clutch(D) operates in 3rd and 4th gears and transmits driving force from the input shaft to the overdrive planetary carrier and low-reverse annulus gear.



EKRF002D

BRAKES

The gear changing mechanism utilizes two multi-disc brakes.

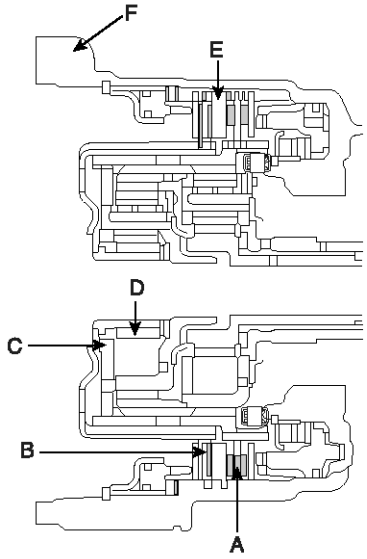
LOW & REVERSE BRAKE AND SECOND BRAKE

The low & reverse brake(A) operates in 1st and reverse gears, when the vehicle is parked, and during manual operation. It locks the low & reverse annulus gear and overdrive planetary carrier to the case.

The second(C) brake(B) operates in 2nd and 4th gears and locks the reverse sun gear(D) to the case.

The components comprising the low & reverse brake and second brake are as illustrated below.

As shown, the discs and plates of the two brakes are arranged on either side of the rear cushion plate(E), which is itself secured to the case(F) by a snap ring.



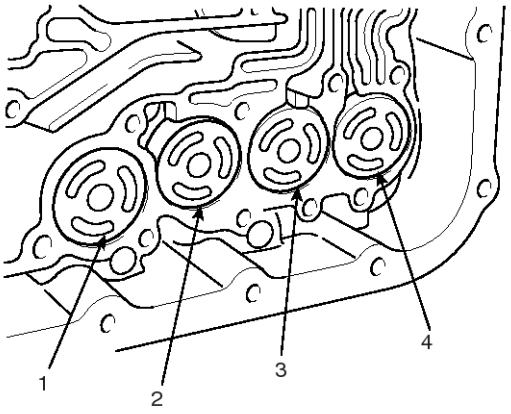
EKRF002E

OWC

To improve the shift feeling from 1st to 2nd gear, OWC was adopted on the low & reverse brake annulus gear. Instead of hydraulic fixing by Low & reverse brake at the 1st gear, this mechanical fixing device was used. This structure is not a new concept, because this OWC already has been installed on the previous models.

ACCUMULATORS

Number	Function Name	Color
1	Low & Reverse Brake	None
2	Underdrive Clutch	Yellow
3	Second Brake	Blue
4	Overdrive Clutch	None



EKRF002F

Objective

* Energy (hydraulic pressure) storage

* Impact and pulsation damping when solenoid valves operating

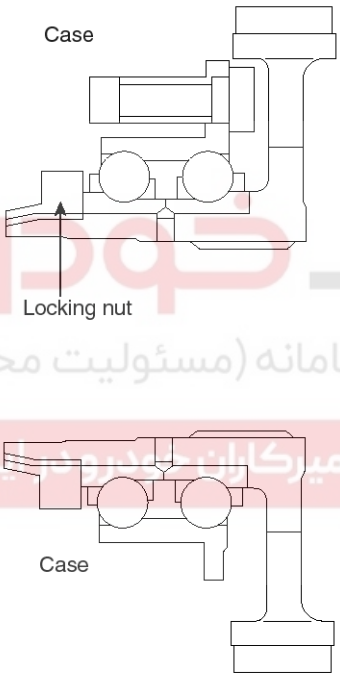
* Operation as spring element

* Smooth shifting by preventing sudden operation of clutches and brakes

TRANSFER DRIVE GEAR

With the transfer drive gear, increased tooth height and a higher contact ratio have reduced gear noise.

Also, the bearing that supports the drive gear is a preloaded type that eliminates rattle, and the rigidity of the gear mounting has been increased by bolting the bearing directly onto the case.

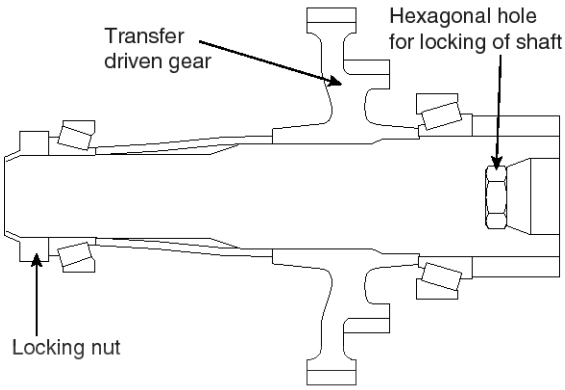


EKRF002G

OUTPUT SHAFT/TRANSFER DRIVEN GEAR

As shown in the illustration below, the transfer driven gear is press-fitted onto the output shaft, and the output shaft is secured by a locking nut and supported by bearings.

The locking nut has a left-handed thread, and a hexagonal hole in the other end of the shaft enables the shaft to be held in position for locking nut removal.



EKRF002H

MANUAL CONTROL SYSTEM

MANUAL CONTROL LEVER

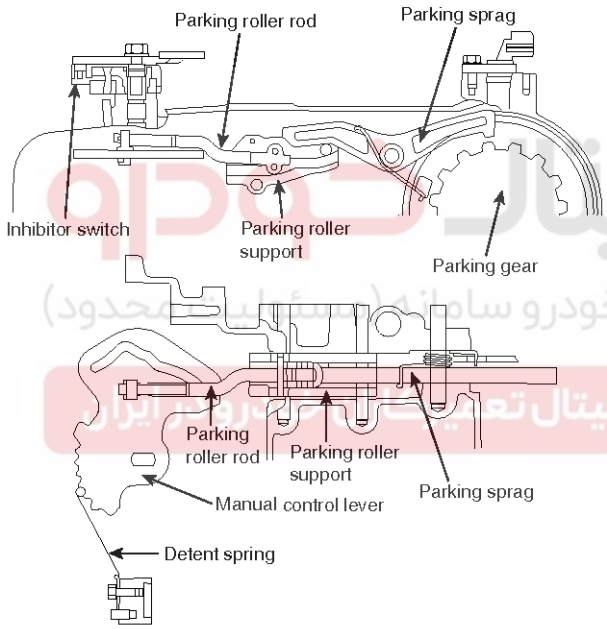
The manual control lever is fitted to the top of the valve body and is linked to the parking roller rod and manual control valve pin.

A detent mechanism is provided to improve the gear shift feeling during manual selection.

PARKING MECHANISM

When the manual control lever is moved to the parking position, the parking roller rod moves along the parking roller support and pushes up the parking sprag.

As a result, the parking sprag meshes with the transfer driven gear (parking gear), thereby locking the output shaft. To minimize the operating force required, a roller is fitted to the end of the rod.



EKRF002I

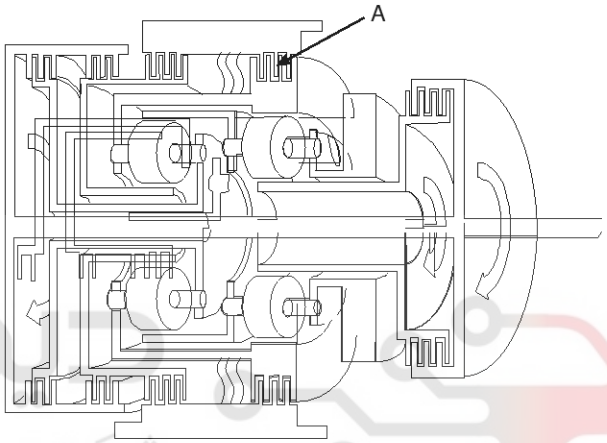
POWER TRAIN

P POSITION

Hydraulic pressure is applied to the LR brake and the RED brake, so power is not transmitted from the input shaft to the UD clutch or OD clutch, and the output shaft is locked by the park brake pawl interlocking the park gear.

N POSITION

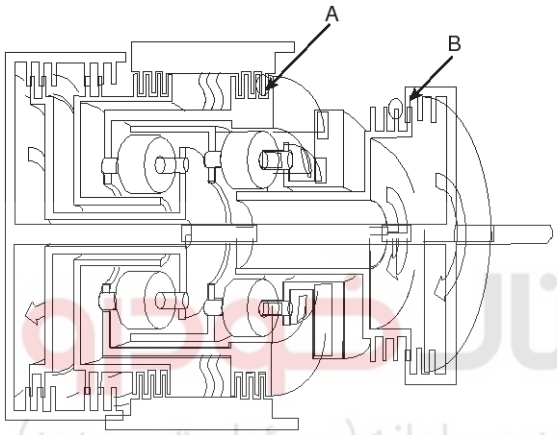
Hydraulic pressure is applied to the LR brake(A) and the RED brake, so power is not transmitted from the input shaft to the UD clutch or OD clutch.



EKRF003A

1st GEAR POWER FLOW

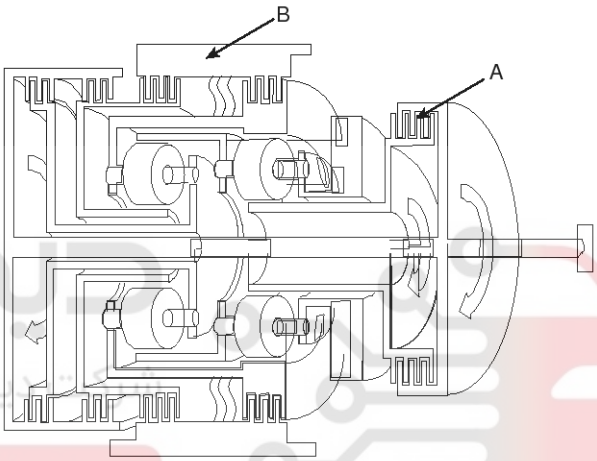
Hydraulic pressure is applied to the UD clutch(B) the LR brake(A) and the one way clutch(OWC), then the UD clutch transmits driving force from the input shaft to the UD sun gear, and the LR brake locks the LR annulus gear to the case.The UD sun gear of the planetary gear drives the output pinion gear, and the LR brake locks the annulus gear, and the output pinion drives the output carriers, and the output carrier drives the transfer drive gear, and the transfer drive gear drives the transfer driven gear of the output shaft, and power is transmitted to the differential gear through the differential drive gear.



EKRF003B

2nd GEAR POWER FLOW

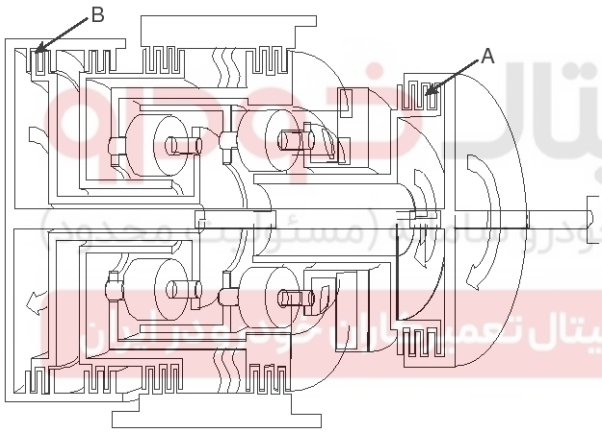
Hydraulic pressure is applied to the UD clutch(A) the 2nd brake(B) and the one way clutch(OWC), then the UD clutch transmits driving force from the input shaft to the UD sun gear, and the 2nd brake locks the reverse sun gear to the case.The UD sun gear of the planetary gear drives the output pinion gear and the LR annulus gear, and the LR annulus gear drives the OD planetary carriers, and OD planetary carriers drives OD pinion gear, and the OD pinion gear drives the output carriers, and the output carrier drives the transfer drive gear, and the transfer drive gear drives the transfer driven gear of the output shaft, and power is transmitted to the differential gear through the differential drive gear.



EKRF003C

3rd GEAR POWER FLOW

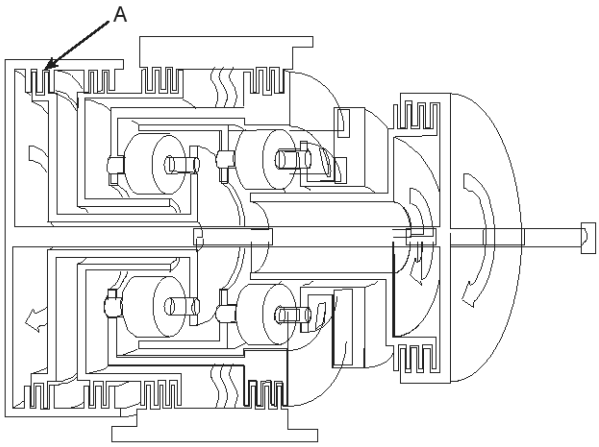
Hydraulic pressure is applied to the UD clutch(A) and the OD clutch(B), then the UD clutch transmits driving force from the input shaft to the UD sun gear, and the OD clutch transmits driving force from the input shaft to the overdrive planetary carrier and low & reverse annulus gear.The UD sun gear of the planetary gear drives the output pinion gear and the LR annulus gear, and the LR annulus gear drives the OD pinion gear through the OD planetary carrier, and the OD pinion gear drives the reverse sun gear and the output carrier.The OD clutch drives the OD carrier, and the OD carrier drives the OD pinion gear, and the OD pinion gear drives the reverse sun gear and the output carrier, and the output carrier drives the transfer drive gear, and the transfer drive gear drives the transfer driven gear of the output shaft, and power is transmitted to the differential gear through the differential drive gear.



EKRF003D

4th GEAR POWER FLOW

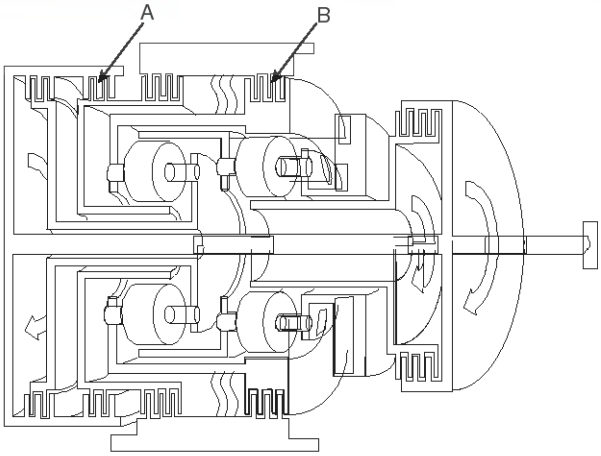
Hydraulic pressure is applied to the OD clutch(A) and the 2nd brake(B), then the OD clutch transmits driving force from the input shaft to the OD planetary carrier and LR annulus gear, and the 2nd brake locks the reverse sun gear to the case.The OD clutch drives the OD carrier, and the OD carrier drives the OD pinion gear and the LR annulus gear, and the OD pinion gear drives the output carrier, and the output carrier drives the transfer drive gear, and the transfer drive gear drives the transfer driven gear of the output shaft, and power is transmitted to the differential gear through the differential drive gear.



EKRF003E

Reverse GEAR POWER FLOW

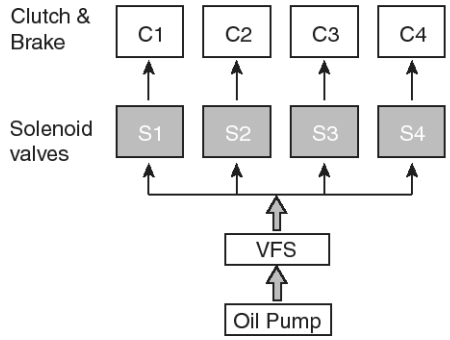
Hydraulic pressure is applied to the reverse clutch(A) and the LR brake(B), then the reverse clutch transmits driving force from the input shaft to the reverse sun gear, and the LR brake locks the LR annulus gear and OD planetary carrier to the case.The reverse clutch drives the reverse sun gear, and the reverse sun gear drives the output carrier through the OD pinion gear, and the output carrier drives the transfer drive gear, and the transfer drive gear drives the transfer driven gear of the output shaft, and power is transmitted to the differential gear through the differential drive gear.



EKRF003F

Hydraulic Control System

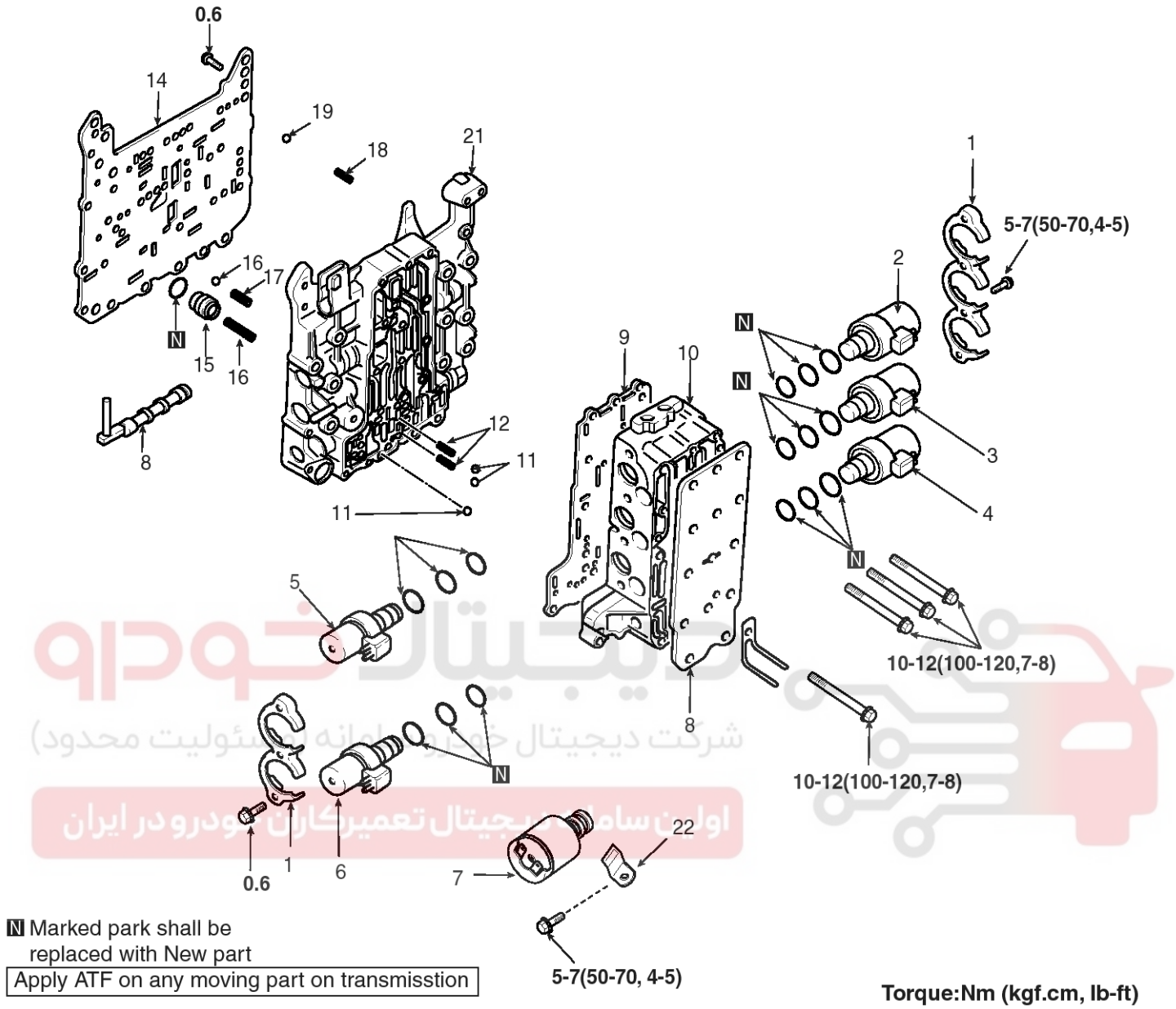
DESCRIPTION



Each clutch and brake have a Solenoid valve for independent control of hydraulic pressure

EKRF003G

- Better and smoother shift quality.
- In order to prevent ATF leakage from the valve body or each elements, the exhaust ports have been grouped into only one with an addition of a check ball.
- If a failure occurs in its electric control, the switch valve and fail safe valve is able to move to enable 3rd speed drive or reverse.
- The hydraulic system consists of oil pump, regulator valve, solenoid valves, pressure control valve and valve body.
- In order to control the optimal line pressure and inprove the efficiency of power transmission according to maximize the efficiency of the oil pump, VFS(Variable Force Solenoid) valve has been added in the valve body hydralic circuit.



N Marked park shall be replaced with New part

Apply ATF on any moving part on transmisstion

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

Disassembly steps
1. Solenoid valve support
2. UD clutch solenoid valve
3. 2nd brake solenoid valve
4. Damper clutch control solenoid\oid valve
5. OD clutch solenoid valve
6. Low and reverse brake solenoid valve
7. VFS solenoid valve
8. Manual valve
9. Cover
10. Plate
11. Outside valve body assembly
12. Steel ball (Orifice check ball)
13. Spring
14. Plate
15. Damping valve
16. Damping valve spring
17. Steel ball (line relief)
18. Spring
19. Steel ball (Orifice check ball)
20. Spring
21. Inside valve body assembly
22. VFS plate

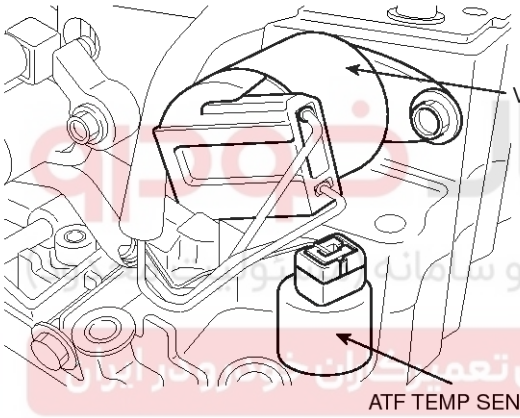
EKRF003H

VFS (Variable Force Solenoid)

VRS Function

The spool rod in VFS is not duty cycled like one of PWM, it minutely vibrates at the range between the control port and exhaust port to control the hydraulic pressure. That is, it uses the equilibrium effect between the spring force and the magnetic force, the spring force is mechanical characteristics decided at the stage of design and the magnetic force is controlled by TCM. This electrical magnetic force is proportional to the current. So TCM will control the current.

In case of VFS valve, the electrical 'time constant' is considered to decide the frequency for the current not to be fluctuated even though turns on or off the input signal. The electrical 'time constant' is much more fast than one of mechanical so the frequency of VFS is extremely higher than the conventional PWM type.



EKRF081A

Characteristics of Bosch VFS:

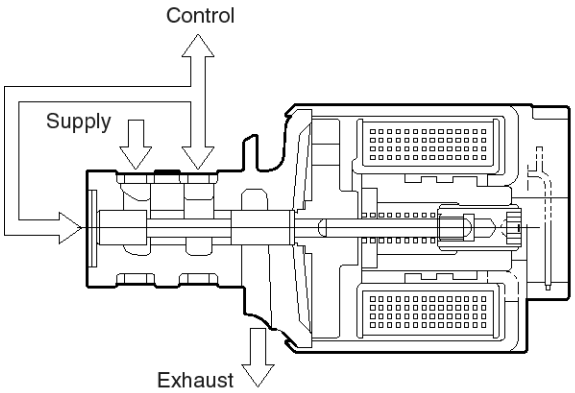
Supply pressure : 700～1600kPa

Control pressure: typically 600～0 kPa

Current range: typically 0～1,000 mA

Dither frequency: Up to 600 Hz

Dimension: 32 mm protrusion reach 42 mm

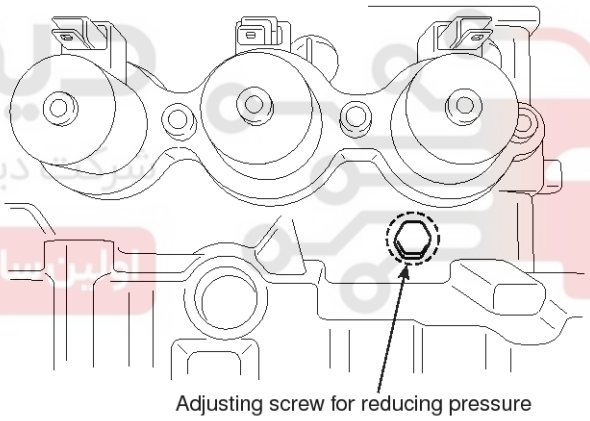


EKRF082A

The reducing pressure will be supplied to the 'Supply' port of the VFS valve on the above illustration to control the line pressure.

Reducing pressure

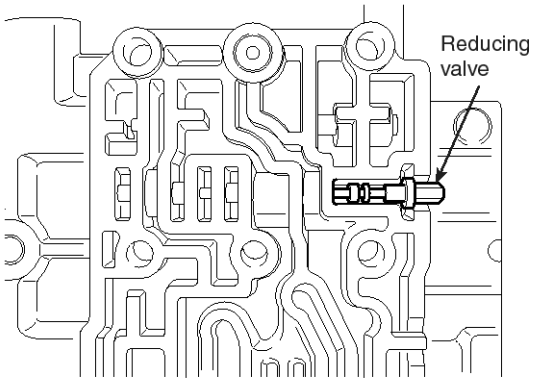
Function



EKRF083A

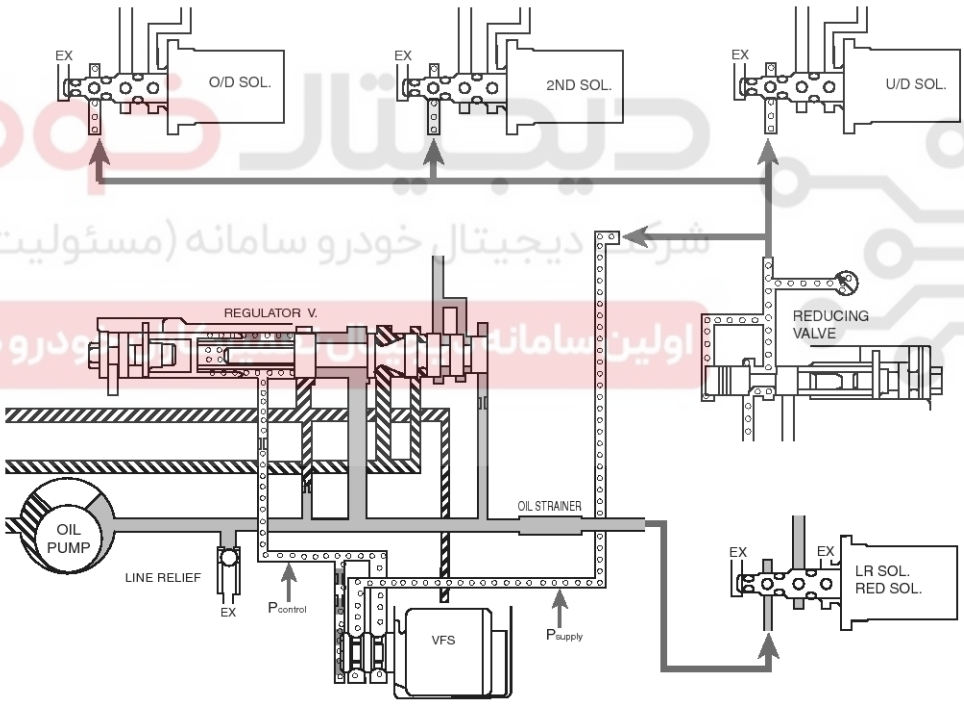
As same as one of Alpha or Beta automatic transaxle system, this reducing valve length can be adjusted by rotating the screw on the picture. As you rotate the screw toward clockwise by 90˚, the reducing pressure will increase about 1.0bar. However, the reducing pressure is used just as a 'supply pressure' for the solenoid valves (except Low & Reverse, Reduction and Damper Clutch control solen), so this may not be handled to rotate in the field service shop. VFS is operated based on the 'supply pressure' and it outputs the 'control pressure' to control the regulator valve indirectly. While developing the VFS system, the line pressure was used as a 'supply pressure' for VFS and other solenoid valves but it has been changed into additional 'reducing pressure' because the line pressure is variably changed by VFS so the control pressure becomes unstable and some

hydraulic pressure oscillation occurred. That is why the reducing pressure has been added in the hydraulic circuit of VFS system for both 4th and 5th speed A/T.



<Valve body>

EKRF084A



EKRF085A

The reducing pressure is about 6.5bar and this value does not be changed regardless of the driving or engine load condition. Be sure that the conventional line pressure is used for the 'supply pressure' of Low & Reverse, Reduction solenoid because the variable line pressure is not available at reverse range.

HYDRULIC PRESSURE TABLE

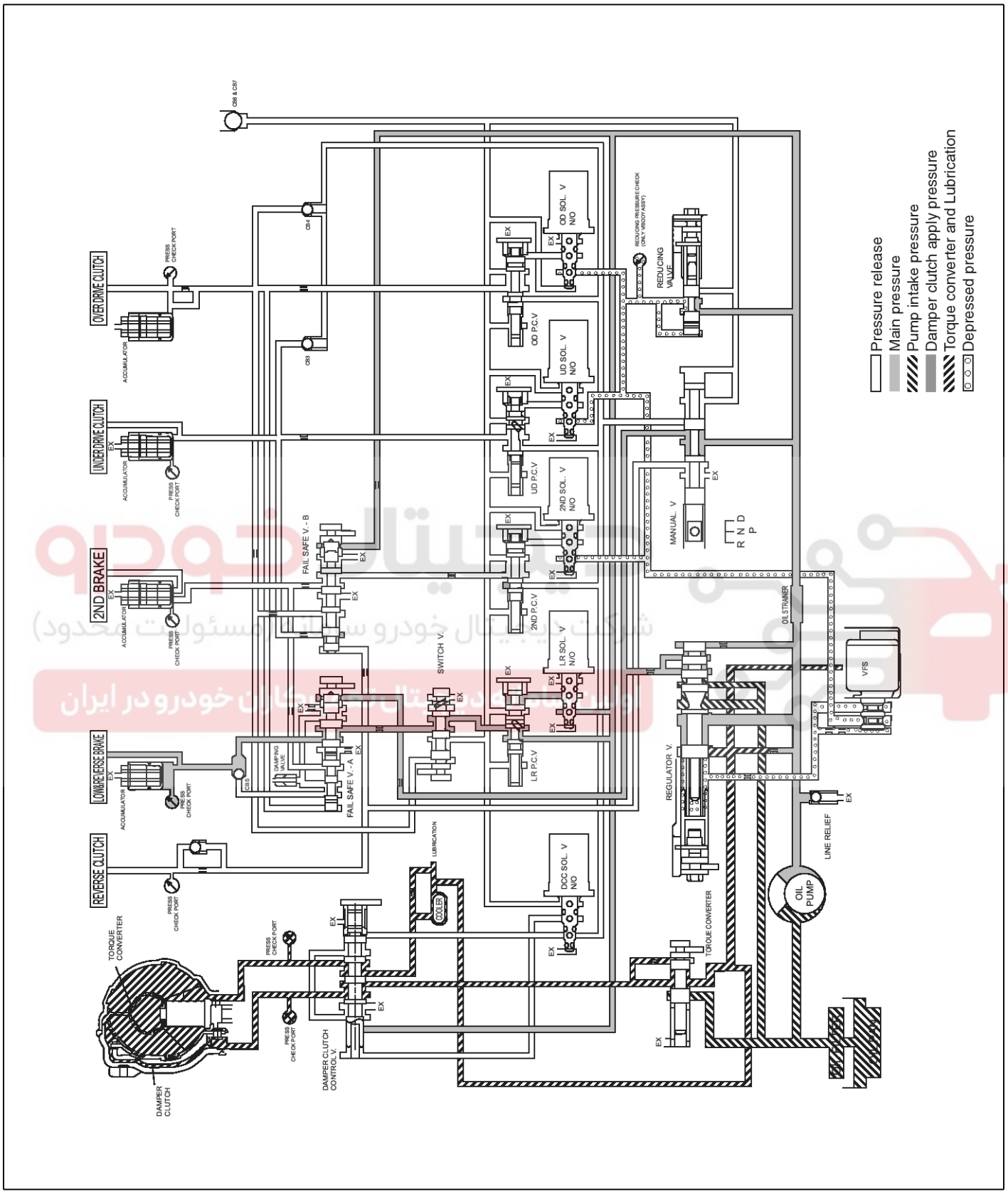
Under the constant current amount of VFS (200mA), the line pressure will become as below table. Be sure that the following data can be achieved by specific special facility or device to check the performance of A/T assembly (not on the vehicle), however we can refer the maximum pressure value according to each element.

Solenoid valve Duty(%)					Measured Element	Pressure kPa(Psi)
LR	2ND	UD	OD	RED*		
0	100	0	100	0	LR	1030±20(149±3)
60	↑	↑	↑	↑		520±40(75±6)
75	↑	↑	↑	↑		230±40(33±6)
100	↑	↑	↑	↑		0
100	0	0	100	0	2ND	1030±20(149±3)
↑	60	↑	↑	↑		550±40(80±6)
↑	75	↑	↑	↑		220±40(32±6)
↑	100	↑	↑	↑		0
100	100	0	0	0	OD	1030±20(149±3)
↑	↑	↑	60	↑		520±40(75±6)
↑	↑	↑	75	↑		210±40(30±6)
↑	↑	↑	100	↑		0
100	100	0	0	0	UD	1030±20(149±3)
↑	↑	60	↑	↑		470±40(68±6)
↑	↑	75	↑	↑		170±40(25±6)
↑	↑	100	↑	↑		0
100	0	100	0	100	DIR*	0
75	↑	↑	↑	↑		270±40(39±6)
60	↑	↑	↑	↑		540±40(78±6)
0	↑	↑	↑	↑		1030±20(149±3)

Measuring condition:

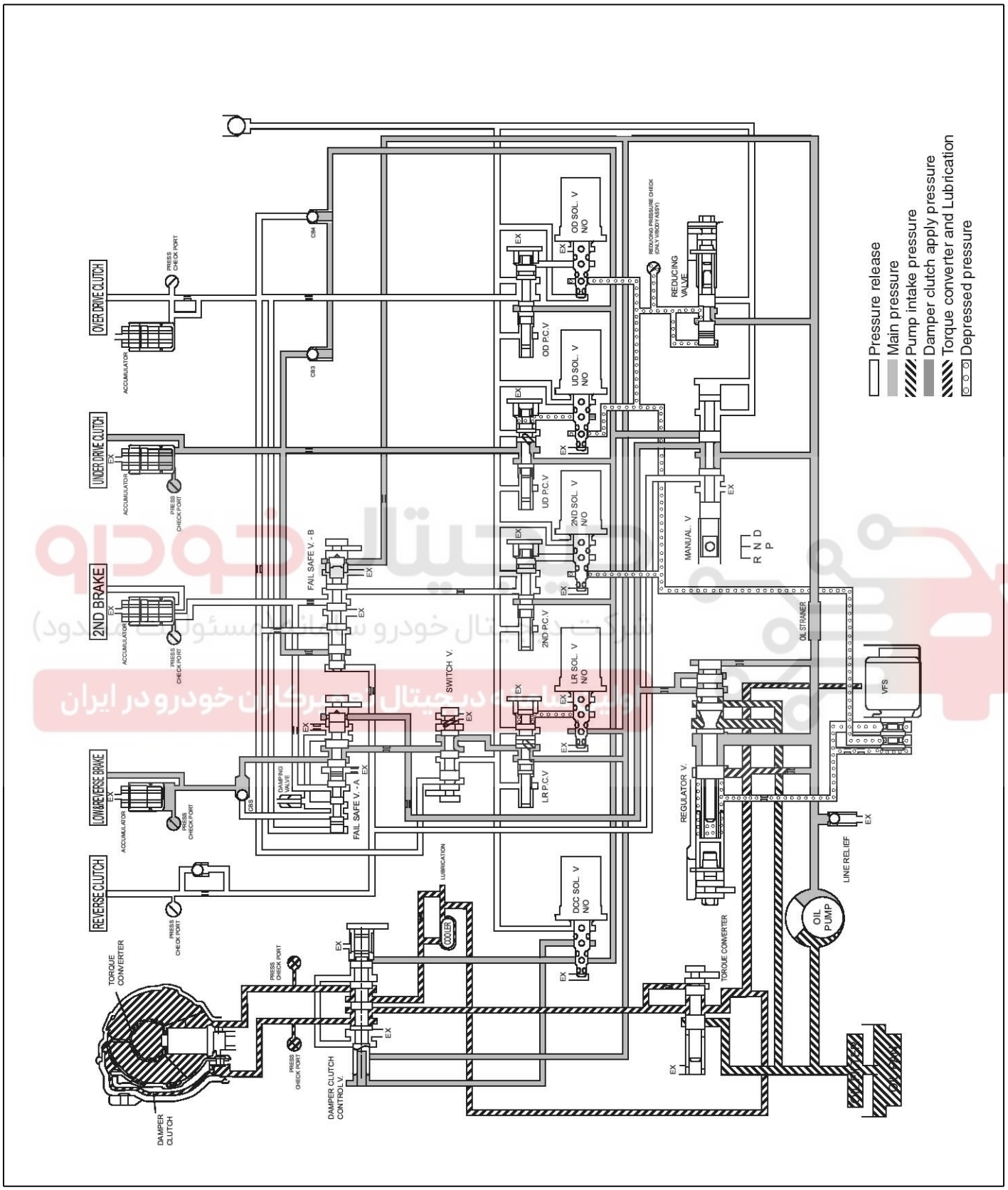
1. PG-A (Input speed): 2,500rpm
2. Manual valve position: D
3. DCC Solenoid duty: 0%

N-P



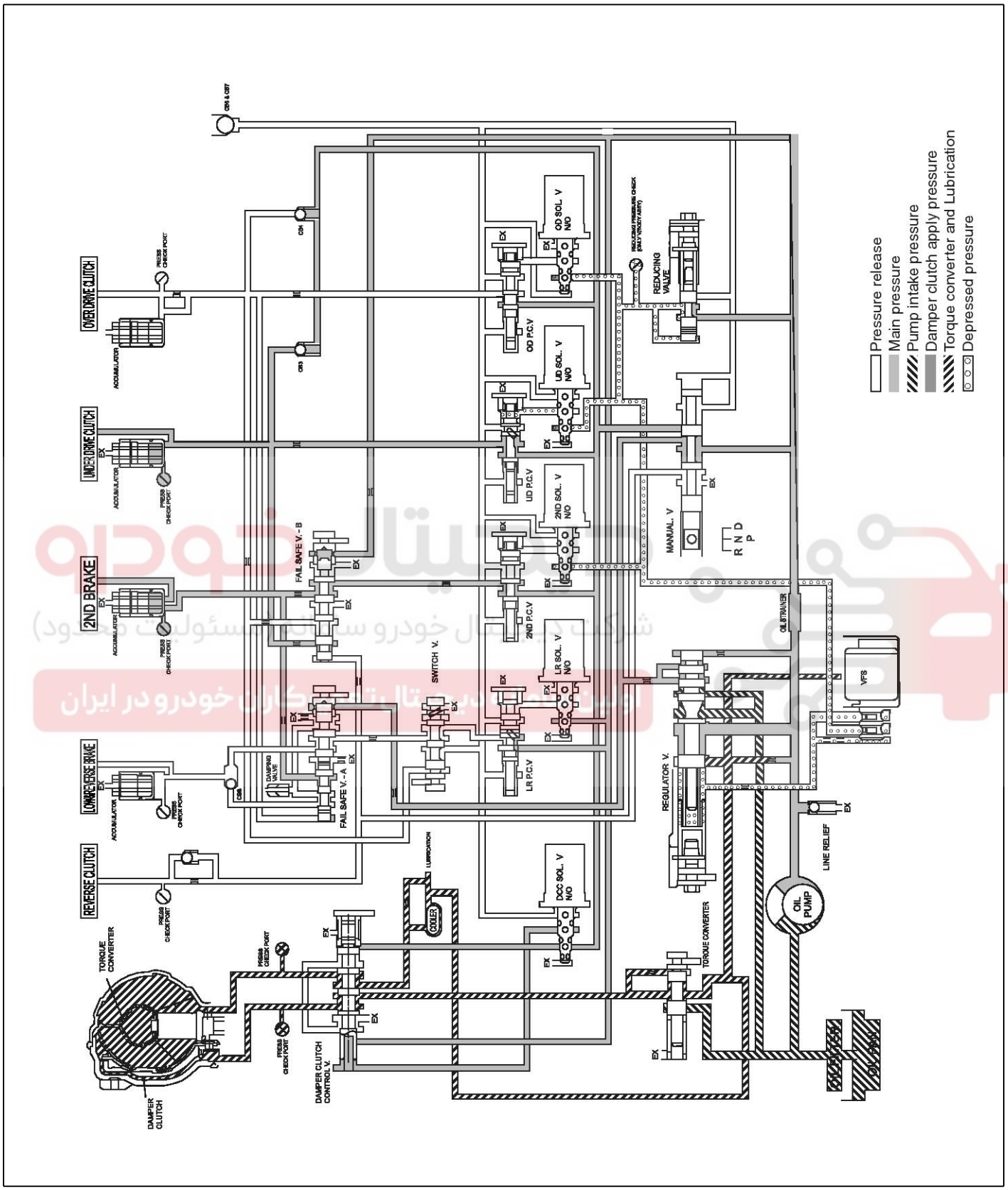
EKRF017H

D 1ST gear



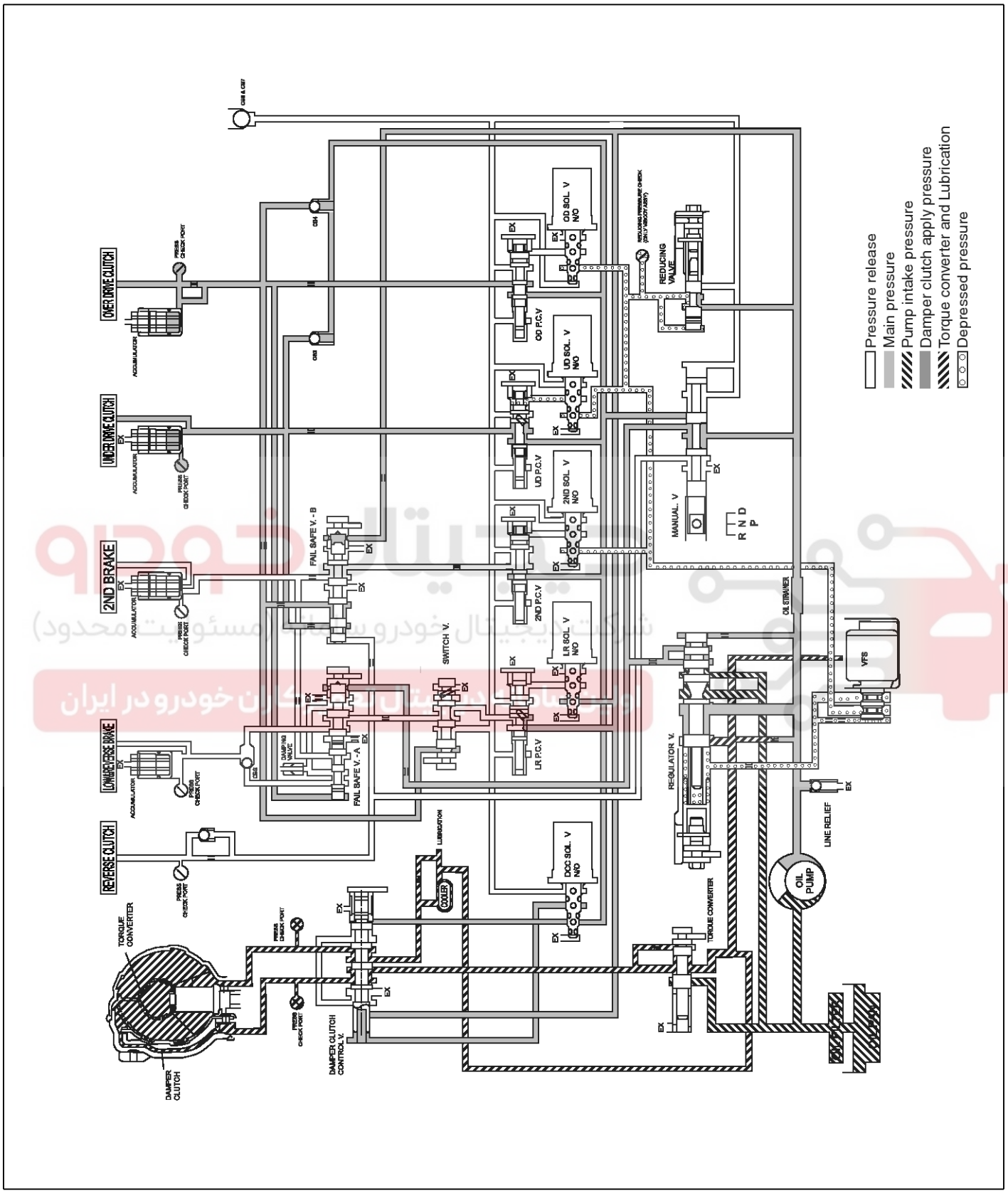
EKRF017I

D 2ND gear



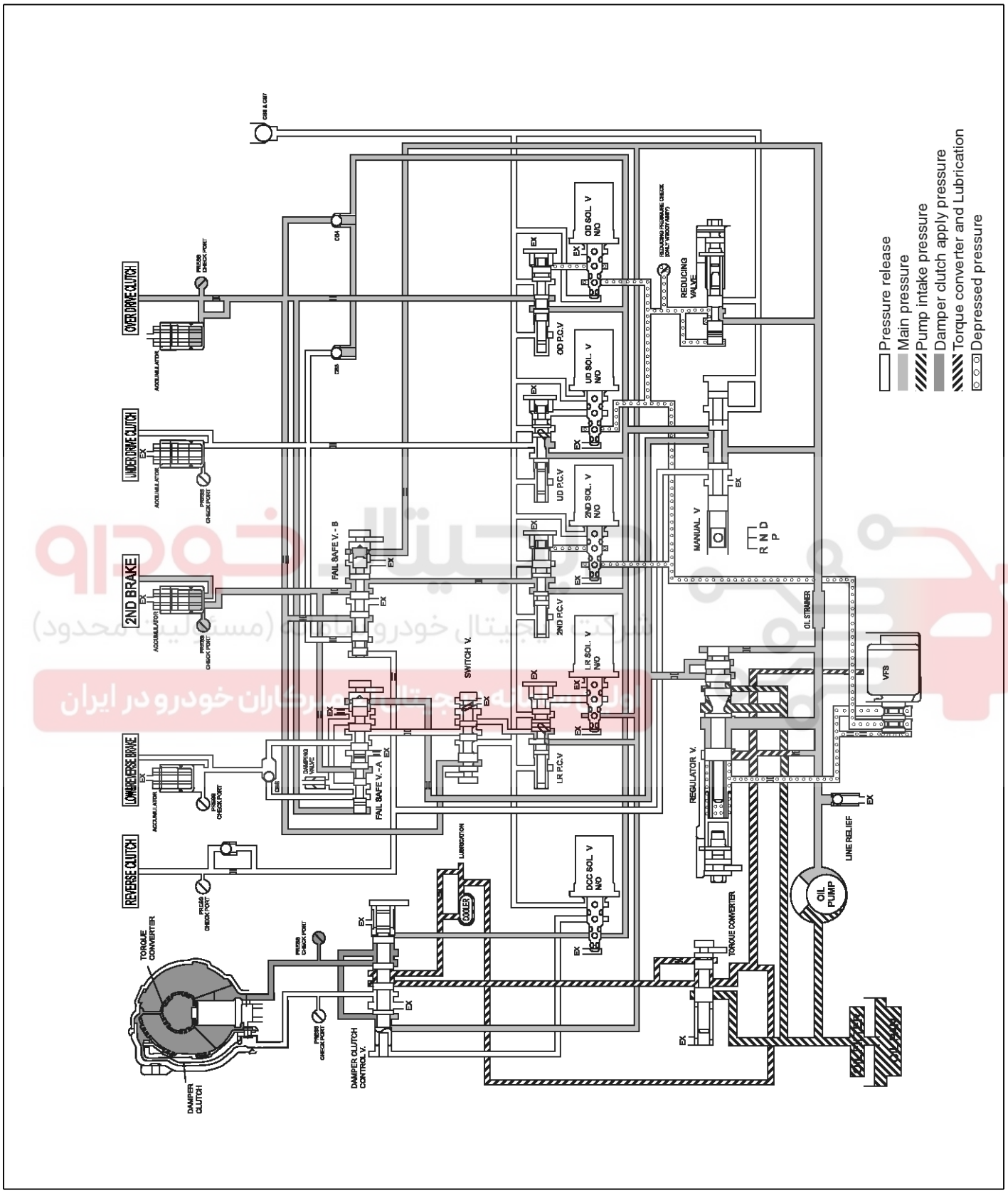
EKRF017J

D 3nd gear



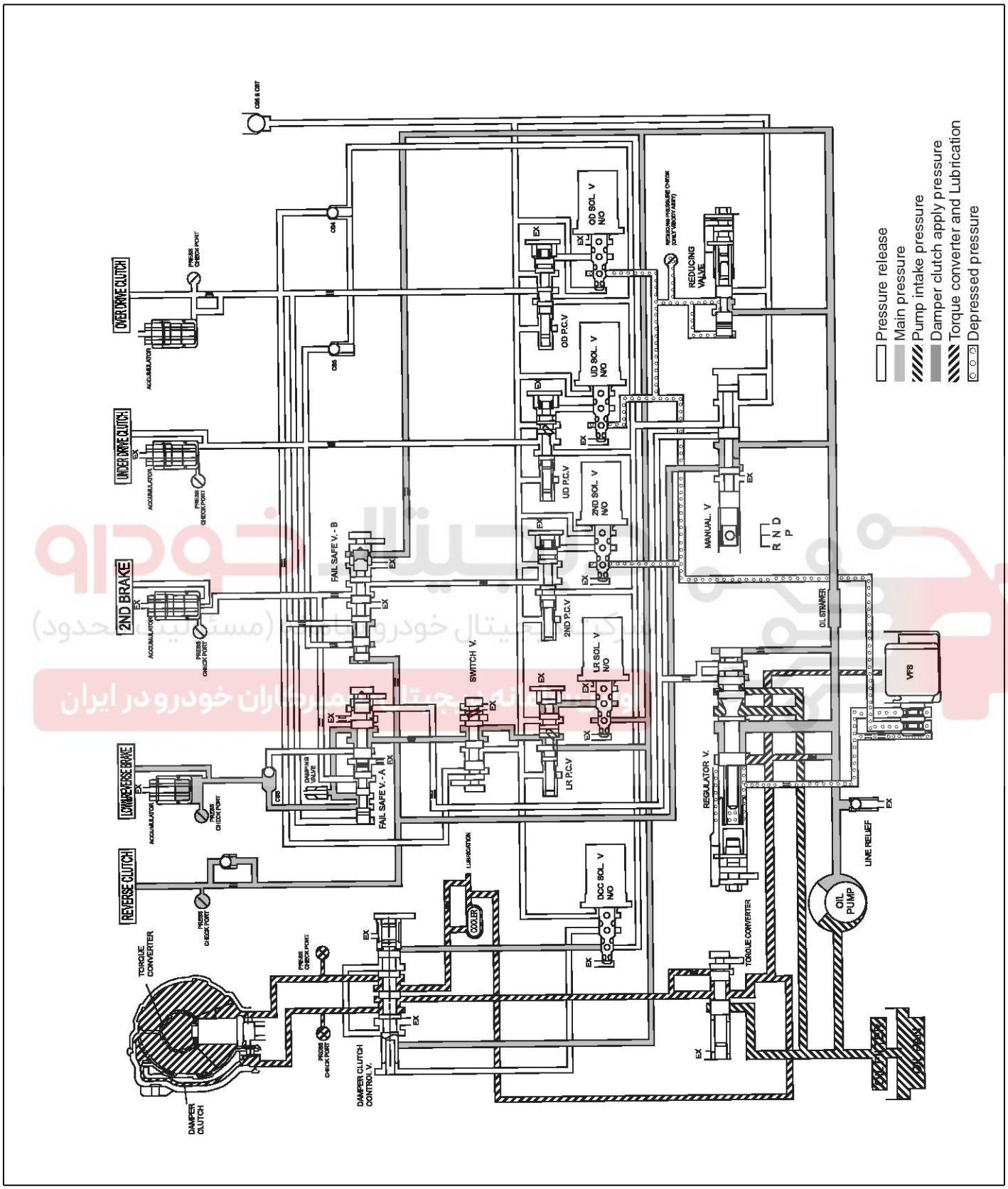
EKRF017K

D 4th gear



EKRF017L

Reverse



EKRF017M

Electronic Control System

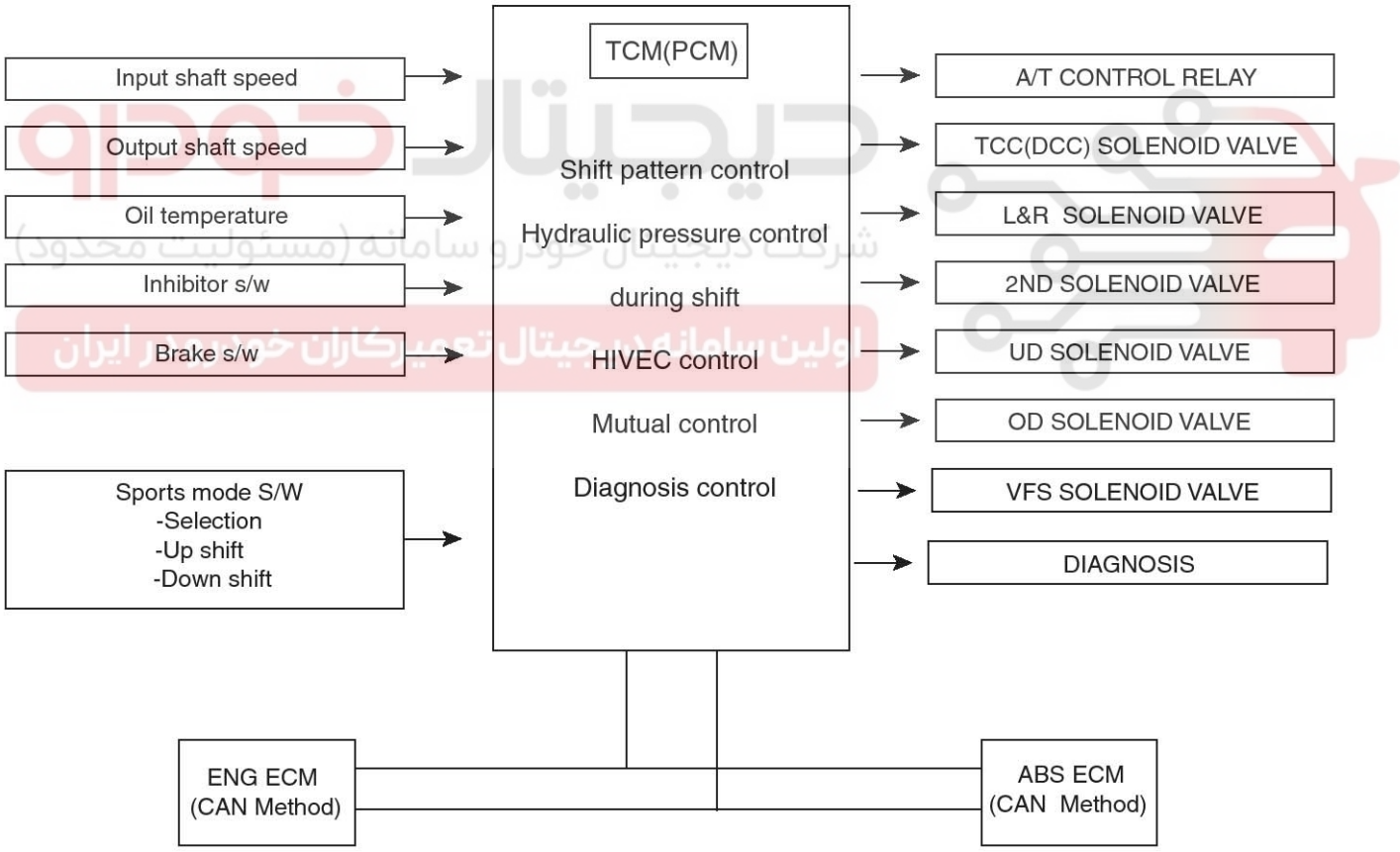
DESCRIPTION

The electronic control system used in the new generation auto transaxle is far superior to the previous systems. This system is able to adopt a variable shift pattern for smooth and problem free shifting.

A solenoid valve is applied to each of the clutches and brakes and is independently controlled. Feedback control and correction control is performed in all gears as well as utilization of mutual control system to increase shift feeling.

The torque converter damper clutch uses a partial lock up and full lock-up system. An additional control method called the HIVEC system (neural network) is adopted to increase shift feeling.

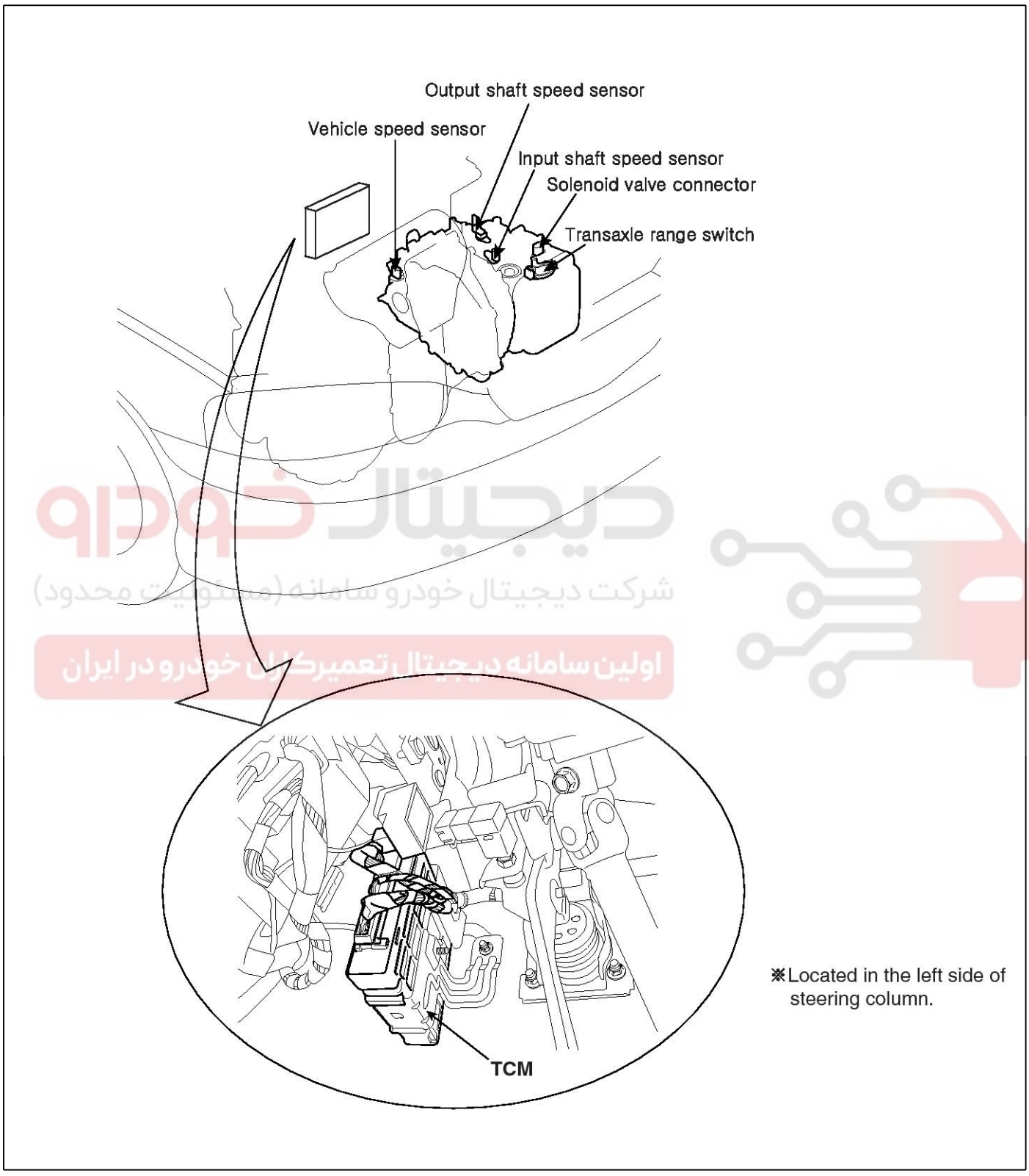
Block Diagram (CAN)



EKRF004G

ELECTRIC CONTROL LOCATION

The TCM(PCM) is located on the intake manifold in the engine room.



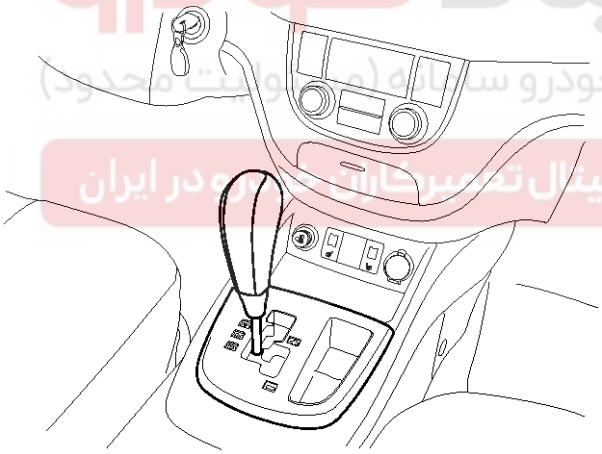
SMGAT6002L

OPERATING COMPONENTS AND FUNCTIONS

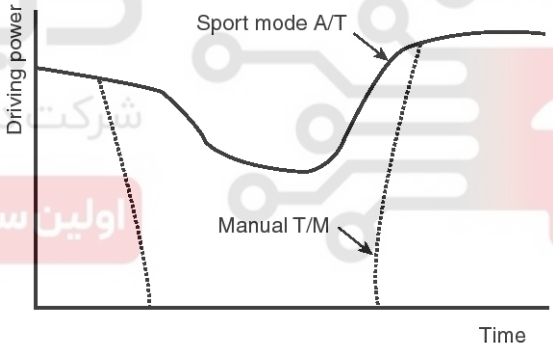
Sensor	Function
Input shaft speed sensor	Detect turbine speed at UD retainer
Output shaft speed sensor	Detect T/F drive gear speed at T/F driven gear (4A/T)
Crank angle sensor	Detect engine speed
TPS(Gasoline)	Throttle opening ratio by potentiometer
Air conditioner switch	A/C load by thermister
Inhibitor switch	Select lever position by contact switch
Brake switch	Brake pedal position
Vehicle speed sensor	Detect vehicle speed by speedometer driven gear
Sport mode switch	Sport mode On/Off signal
Sport mode up-shift switch	Sport mode up-shift signal
Sport mode downshift switch	Sport mode downshift signal
Request of torque reduction	Send the request of torque reduction to ECM
ABS-ECM, Engine ECM	In case of CAN communication

Sports Mode

Sports Mode Switch



SCMAT6509L



EKRF005C

Sports mode allows the manual up-shift and downshift with the accelerator pedal is depressed. The prompt response and shift would be obtained due to the continuous shifting without cutting of driving power. The shifting time is also decreased about 0.1sec during up-shift, 0.2sec during downshift. As the selector lever is pushed upward or downward one time, the gear is up shifted or downshifted by one gear.

Signals of sports mode switch

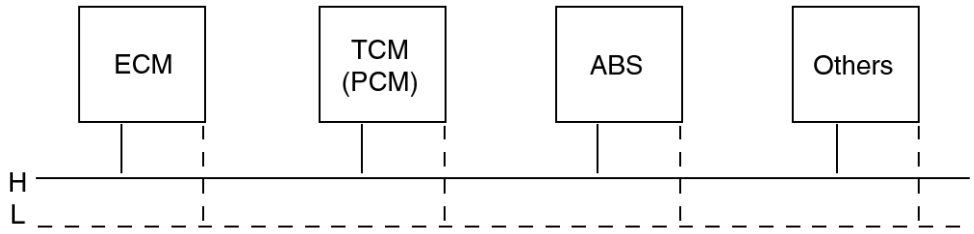
Items	Mode S/W	UP S/W	DOWN S/W
D range selection	OFF	OFF	OFF
Sports mode selection	ON	OFF	OFF
Sports mode up-shift selection	ON	ON	OFF

Sports mode downshift selection	ON	OFF	ON

Controller Area Network (CAN)

Previously, for different computers in the vehicle to share the same information, each signal required a different pin and wiring. However, with the introduction of a CAN system, only two lines are required to achieve the same function. The information is in digital format. This method does not use an integrated ECM.

Frequency: 500Kbit/sec



EKRF005D

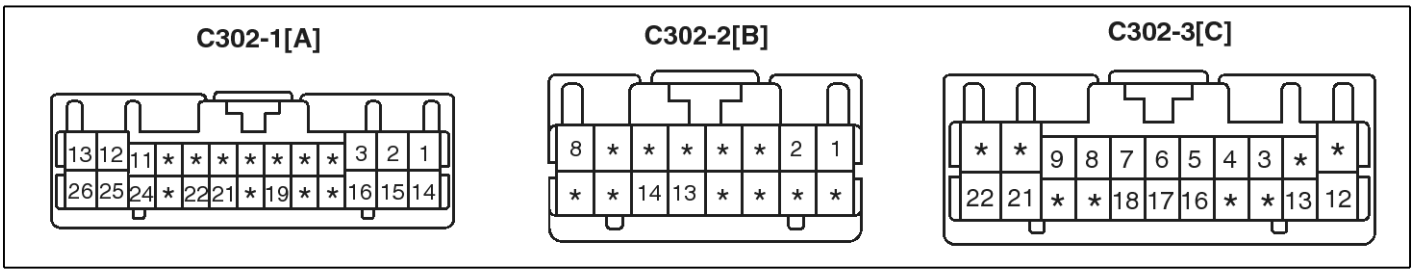
Input signals to TCM(PCM) through 'CAN communication'

- Engine rpm, TPS signal
- A/CON signal, Engine coolant temperature
- Quantity of intake airflow, Vehicle speed
- Shift holding signal (FTCS ON)

Output signals from TCM(PCM) through 'CAN communication'

- Request signal for torque reduction
- ATF temperature, TCM(PCM) type, TCM(PCM) error or not
- Damper clutch ON, OFF / Gear position

TCM PIN DESCRIPITION



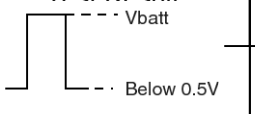
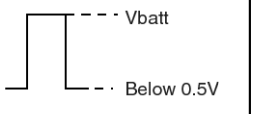
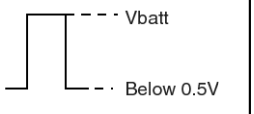
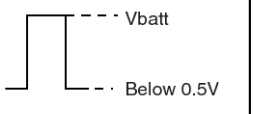
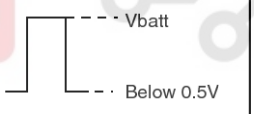
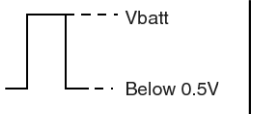
SMGAT6003L

Terminal Number	Desctiption	Terminal Number	Desctiption
A1	UD solenoid valve	B7	-
A2	Power 1 (Solenoid valve)	B8	Memory power
A3	Power 2 (Solenoid valve)	B9	-
A4	-	B10	-
A5	-	B11	-
A6	-	B12	-
A7	-	B13	Sensor ground
A8	-	B14	Oil temperature sensor
A9	-	B15	-
A10	-	B16	-
A11	ON/START input	C1	-
A12	Ground 1	C2	-
A13	Ground 2	C3	CAN HIGH
A14	OD solenoid valve	C4	CAN LOW
A15	DCC solenoid valve	C5	Inhibitor switch (P)
A16	2ND solenoid valve	C6	Inhibitor switch (N)
A17	-	C7	Sport mode select switch
A18	-	C8	Sport mode DOWN switch
A19	Power (Flash ROM)	C9	Stop lamp switch
A20	-	C10	-
A21	Shift position signal (PWM)	C11	-
A22	VFS solenoid valve	C12	LR solenoid valve
A23	-	C13	K-LINE
A24	ON/START input	C14	-
A25	Ground 3	C15	-
A26	Ground 4	C16	Inhibitor switch (R)
B1	Input speed sensor	C17	Inhibitor switch (D)

B2	Output speed sensor	C18	Sport mode UP switch
B3	-	C19	-
B4	-	C20	-
B5	-	C21	AT Control relay
B6	-	C22	Sensor ground

TCM INPUT/OUTPUT SIGNAL VOLTAGE CHECK SHEET

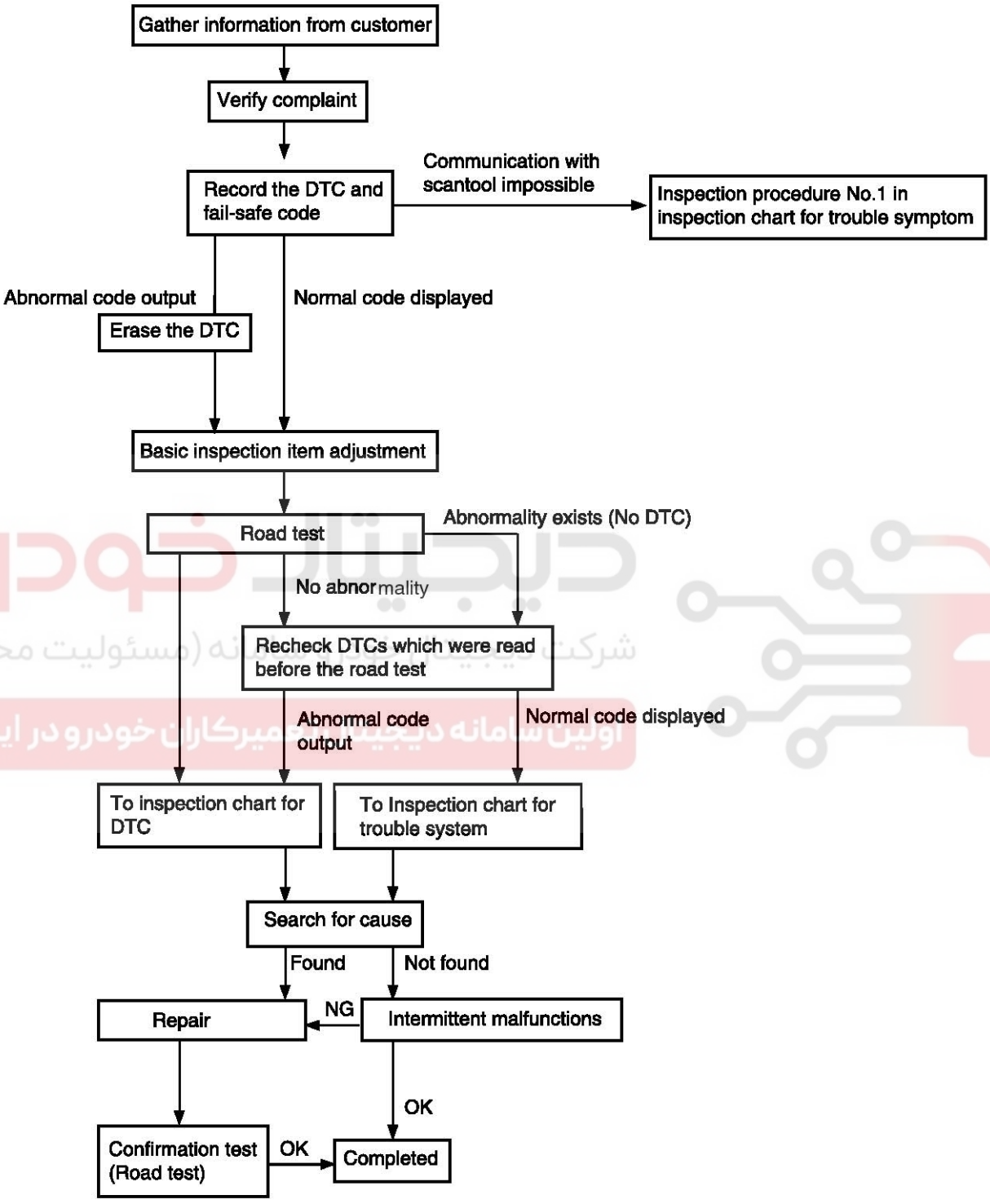
PIN No.	Signal	Condition	Input/Output Valve		Test Result	Remark
			Type	**LEVEL**		
C05	P-SW	P ON	Static signal	Vlow < 1.8V Vhigh > 4.2V Active : high	12.37V (Vbatt Level)	Inhibitor SW(P)
		Others			0.2V	
C16	R-SW	R ON	Static signal	Vlow < 1.8V Vhigh > 4.2V Active : high	12.37V (Vbatt Level)	Inhibitor SW (R)
		Others			0.2V	
C06	N-SW	N ON	Static signal	Vlow < 1.8V Vhigh > 4.2V Active : high	12.37V (Vbatt Level)	Inhibitor SW (N)
		Others			0.2V	
C17	D-SW	—	Static signal	Vlow < 1.8V Vhigh > 4.2V Active : high	—	Inhibitor SW (D)
C09	Sport mode(S-EL)	SEL ON	Static signal	Vlow < 1.8V Vhigh > 4.2V Active : high	12.37V (Vbatt Level)	Sport mode (SEL)
		Others			0.2V	
C18	Sport mode (UP)	UP ON	Static signal	Vlow < 1.8V Vhigh > 4.2V Active : high	12.37V (Vbatt Level)	Sport mode (UP)
		Others			0.2V	
C08	Sport mode (DOWN)	DOWN ON	Static signal	Vlow < 1.8V Vhigh > 4.2V Active : high	12.37V (Vbatt Level)	Sport mode (DOWN)
		Others			0.2V	

PIN No.	Signal	Condition	Input/Output Valve		Test Result	Remark
A14	Solenoid valve(OD)	—	PWM	signal : 3.0 < Isol < 5.0A supply : V_ATREL		1st,2nd: 2kHz, 30% P duty 3rd,4th:100% P duty
A16	Solenoid valve(2ND)	—	PWM	signal : 3.0 < Isol < 5.0A supply : V_ATREL		1st,3rd: 2kHz, 30% P duty 2nd, 4th: 100% Pduty
A15	Solenoid valve(DCC)	—	PWM	signal : 3.0 < Isol < 5.0A supply : V_ATREL		1st,2nd: 100% P duty
A22	VFS	—	PWM	signal : 0 < Isol <1.0A supply : V_ATREL		0~100% duty 600Hz
A12, 13, 25, 26	Power GND	always	power	-	GND level	—
C21	A/T Relay	A/T ON	Static signal	Normal load current 1.1A	11.4V(Vbatt Level)	—
		A/T OFF			0.2V	
C09	BRAKE SW	Brake ON	sens	Vlow < 1.0V Vhigh > 6V	12.37V (Vbatt Level)	Detect BW input with open status detection function
		Brake OFF			0.2V	
C12	Solenoid valve(LR)	—	PWM	Signal: 3.0 < Isol < 5.0A Supply : V_ATREL.		2nd,3rd,4th : 2kHz, 30% P duty 1st :100% P duty
A1	Solenoid valve(UD)	—	PWM	Signal: 3.0 < Isol < 5.0A Supply : V_ATREL.		4th:2kHz, 30% Pduty 1st,2nd,3rd : 100% P duty
A2, 3	Power (Solenoid valve)	ON	power	—	12.4V (Vbatt Level)	Batt. Voltage after A/T RELAY
		OFF			0.2V	
A21	Shift position signal	—	PWM	3.0 < I < 5.0A	50 Hz	D Duty : 50%(P) N Duty : 37.5%(P) R Duty : 25%(P) P Duty : 12.5%(P)
B14	Oil Temperature sensor	—	analog	V = -0.3~VB.	85°C(181°C) —> 0.8 V	—
B13	sensor GND	always	power	—	GND level	—

PIN No.	Signal	Condition	Input/Output Valve		Test Result	Remark
B1	Output speed	No signal : 1009rp-m	pulse	Vlow ＜1.8V Vhigh ＞4.2V		Duty 50%, 1.116kHz
B2	Input speed	No signal : 2068rpm	pulse	Vlow ＜1.8V Vhigh ＞4.2V		Duty 50%, 2.049kHz

TROUBLESHOOTING

DIAGNOSIS FLOW



EKRF007A

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Probable cause
Communication with HI-SCAN is not possible If communication with the HI-SCAN is not possible, the cause is probably a defective diagnosis line or the TCM(PCM) is not functioning.		- Malfunction diagnosis line - Malfunction of connector - Malfunction of the TCM(PCM)
Driving impossible	**Starting impossible** Starting is not possible when the selector lever is in P or N range. In such cases, the cause is probably a defective engine system, torque converter or oil pump.	- Malfunction of the engine system - Malfunction of the torque converter - Malfunction of the oil pump
	Does not move forward If the vehicle does not move forward when the selector lever is shifted from N to D, 3, 2 or L range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the underdrive clutch or valve body.	- Abnormal line pressure - Malfunction of the underdrive solenoid valve - Malfunction of the underdrive clutch - Malfunction of the valve body
	Does not reverse If the vehicle does not reverse when the selector lever is shifted from N to R range while the engine is idling, the cause is probably abnormal pressure in the reverse clutch or low and reverse brake or a malfunction of the reverse clutch, low and reverse brake or valve body.	- Abnormal reverse clutch pressure - Abnormal low and reverse brake pressure - Malfunction of the low and reverse brake solenoid valve - Malfunction of the reverse clutch - Malfunction of the low and reverse brake - Malfunction of the valve body
	Does not move (forward or reverse) If the vehicle does not move forward or reverse when the selector lever is shifted to any position while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the power train, oil pump or valve body.	- Abnormal line pressure - Malfunction of power train - Malfunction of the oil pump - Malfunction of the valve body
Malfunction when starting	**Engine stalling when shifting** If the engine stalls when the selector lever is shifted from N to D or R range while the engine is idling, the cause is probably a malfunction of the engine system, damper clutch solenoid valve, valve body or torque converter (damper clutch malfunction).	- Malfunction of the engine system - Malfunction of the damper clutch control solenoid valve - Malfunction of the valve body - Malfunction of the torque converter (Malfunction of the damper clutch)
	Shocks when changing from N to D and large time lag If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range while the engine is idling, the cause is probably abnormal underdrive clutch pressure or a malfunction of the underdrive clutch, valve body or idle position switch.	- Abnormal underdrive clutch pressure - Abnormal low and reverse brake pressure - Malfunction of the underdrive solenoid valve - Malfunction of the valve body - Malfunction of the idle position switch

Trouble symptom		Probable cause
Malfunction when starting	**Shocks when changing from N to R and large time lag** If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to R range while the engine is idling, the cause is probably abnormal reverse clutch pressure or low and reverse brake pressure, or a malfunction of the reverse clutch, low and reverse brake, valve body or idle position switch.	- Abnormal reverse clutch pressure - Abnormal low and reverse brake pressure - Malfunction of the low and reverse solenoid valve - Malfunction of the reverse clutch - Malfunction of the low and reverse brake - Malfunction of the valve body - Malfunction of the idle position switch
	Shocks when changing from N to D, N to R and large time lag If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range and from N to R range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the oil pump or valve body.	- Abnormal line pressure - Malfunction of the oil pump - Malfunction of the valve body
Malfunction when shifting	**Shocks and running up** If shocks occur when driving due to up shifting or down shifting and the transmission speed becomes higher than the engine speed, the cause is probably abnormal line pressure or a malfunction of a solenoid valve, oil pump, valve body or of a brake or clutch.	- Abnormal line pressure - Malfunction of each solenoid valve - Malfunction of the oil pump - Malfunction of the valve body - Malfunction of each brake or each clutch
Displaced shifting points	**All points** If all shift points are displaced while driving, the cause is probably a malfunction of the output shaft speed sensor, TPS or of a solenoid valve .	- Malfunction of the output shaft speed sensor - Malfunction of the throttle position sensor - Malfunction of each solenoid valve - Abnormal line pressure - Malfunction of the valve body - Malfunction of the TCM(PCM)
	Some points If some of the shift points are displaced while driving, the cause is probably a malfunction of the valve body, or it is related to control and is not an abnormality.	- Malfunction of the valve body
Does not shift	**No diagnosis codes** If shifting does not occur while driving and no diagnosis codes are output, the cause is probably a malfunction of the transaxle range switch, or TCM(PCM)	- Malfunction of the transaxle range - Malfunction of the TCM(PCM)
Malfunction while driving	**Poor acceleration** If acceleration is poor even if down shifting occurs while driving, the cause is probably a malfunction of the engine system or of a brake or clutch.	- Malfunction of the engine system - Malfunction of the brake or clutch

Trouble symptom		Probable cause
Malfunction while driving	**Vibration** If vibration occurs when driving at constant speed or when accelerating and deceleration in top range, the cause is probably abnormal damper clutch pressure or a malfunction of the engine system, damper clutch control solenoid valve, torque converter or valve body.	- Abnormal damper clutch pressure - Malfunction of the engine system - Malfunction of the damper clutch control solenoid valve - Malfunction of the torque converter - Malfunction of the valve body
Transaxle range switch system The cause is probably a malfunction of the inhibitor switch circuit, ignition switch circuit or a defective TCM(PCM).		- Malfunction of the transaxle range switch - Malfunction of the ignition switch - Malfunction of connector - Malfunction of the TCM(PCM)
Idle position switch system The cause is probably a defective idle position switch circuit, or a defective TCM(PCM).		- Malfunction of the triple pressure switch - Malfunction of connector - Malfunction of the TCM(PCM)
Triple pressure switch system The cause is probably a defective dual pressure switch circuit or a defective TCM(PCM).		- Malfunction of the triple pressure switch - Malfunction of connector - Malfunction of A/C system - Malfunction of the TCM(PCM)
Vehicle speed sensor system The cause is probably a defective vehicle speed sensor circuit or a defective TCM(PCM).		- Malfunction of the vehicle speed sensor - Malfunction of connector - Malfunction of the TCM(PCM)

Failsafe

Activation and deactivation of error failsafe is coordinated Error failsafe Management.

Once Error failsafe is activated, it will be kept until ignition key OFF.

In every new TCM start, TCM start with No Error failsafe and No Error present.

0. Mechanical Limp Home Mode
- Switch off A/T relay

1. Electrical Limp Home Mode
- Keep 2nd / 3rd gear

2. Prohibit Intelligent Shift
- Fuzzy SAT(Siements Adaptive Transmission) shift pattern (Medium Driver, Sporty Driver) will not be used

3. Prohibit Adaptive Control
- No learning is done

6. Prohibit Torque Reduction Request
- No torque reduction is sent to ECU

7. Prohibit Lockup Control
- Stay in non-lockup control state

8. Substitute Input Value Oil Temperature
- Set oil temperature(tf) to 80˚ C (192˚F)

9. Substitute Value Speed Ratio
- Set speed ratio to 0.7

10. Substitute CAN Input Value
- Set engine torque to 42%
- Set throttle position to 50%
- Set accelerator pedal signal to 50%
- Set engine speed (Ne) to 3000 rpm
- Set vehicle speed to 0 km/h
- Set status of air condition relay to OFF

11. Prohibit VFS control
- Stop the Line Pressure Control till IG Off

Failsafe according to the DTC

NOTICE

- *Refer the detail description in the previous page for the indicated number on the 'Failsafe' column.*

Items	Type of error	Failsafe	OBD-II relevant DTC	DTC
Oil temperature sensor	Short to ground	2, 3, 7, 8, 11	P0712	P0712
	Open or short to B+		P0713	P0713
	Stuck signal		P0711	P0711
	Sensor fail		P0711	P0711
PG-A	Short to ground	1,11	P0717	P0717
	Open or short to B+			
PG-B	Short to ground		P0722	P0722
	Open or short to B+			
	Sensor fail		P0721	P0721
Brake switch	Open	2	—	P0713
	Short to B+			
LR Solenoid valve	Short to B+	0,11	P0750	P0750
	Open or short to ground			
2nd Solenoid valve	Short to B+		P0760	P0760
	Open or short to ground			
UD Solenoid valve	Short to B+		P0755	P0755
	Open or short to ground			
OD Solenoid valve	Short to B+		P0765	P0765
	Open or short to ground			
	Open or short to B+		P0765	P0765
DCC Solenoid valve	Short to B+		P0743	P0743
	Open or short to ground			
1st speed asynchronous	Synchronous error	0,11	P0731	P0731
2nd speed asynchronous	Synchronous error		P0732	P0732
3rd speed asynchronous	Synchronous error		P0733	P0733
4th speed asynchronous	Synchronous error		P0734	P0734
Reverse speed asynchronous	Synchronous error		—	—
CAN	No ID from ECM	2,3,6,7,9,10,11	—	P1604
	CAN BUS off		—	P1603
Damper clutch	Abnormal system	7	P0741	P0741
A/T relay	Short to ground or open	0,11	P0885	P0885

Inhibitor switch	Short to ground or open	—	P0707	P0707
	Short to B+ or short between switches		P0708	P0708
VFS	Short to B+	11	—	P0748
	Short to ground	0,11		
	Open	11		
CKP sensor	Sensor error	Ne=3,000rpm 7,9	—	—
TPS sensor	Sensor error	TPS=50%	—	—

SERVICE DATA LIST(WITH SCAN TOOL)

No.	ITEM NAME	UNIT	DATA	Data Description	Failure
1	ENGINE RPM	rpm	700 rpm	Current Engine rpm	0 rpm
2	VEHICLE SPEED	km/h	0km/h	Current Vehicle speed	0km/h
3	THROTTLE P.SENSOR	%	12.5%	Current TPS open angle	0%
4	INPUT SPEED(PG-A)	rpm	700 rpm	Input speed rpm. Always output rpm when turning start ON	0 rpm
5	OUTPUT SPEED(PG-B)	rpm	0 rpm	Output speed rpm. Always output rpm when driving	0 rpm
6	DCC(TCC) SOLENOID DUTY	%	0%	Control 0% → 100% when operating Damper Clutch	
7	DAMPER CLUTCH SLIP	rpm	260 rpm	Current Damper clutch slip ratio	0 rpm
8	LR SOLENOID DUTY	%	100%	Control 100% → 0% when operating brake	0%
9	UD SOLENOID DUTY	%	100%	Control 100% → 0% when operating clutch	0%
10	2ND SOLENOID DUTY	%	100%	Control 100% → 0% when operating clutch	0%
11	OD SOLENOID DUTY	%	100%	Control 100% → 0% when operating clutch	0%
12	VFS SOLENOID DUTY	%	0~400%	—	
13	OIL TEMPERATURE	°C	40°C	Current Oil temperature	80°C
14	SHIFT POSITION	N,P,REV/1st G/…/5th G	D	Current shift position	P, N
15	SELECT LEVEL	P,N/R/D/SPORTS	D	Current shift lever position	P, N
16	A/CON SWITCH	OFF/ON/-/NOT SUPP	OFF	-	
17	IDLE STATUS	OFF/ON/-/NOT SUPP	ON	When idling, ON	
18	BRAKE SWITCH	OFF/ON/-/NOT SUPP	ON	When braking, ON	

No.	ITEM NAME	UNIT	DATA	Data Description	Failure
19	AUTO CRUISE SWITCH	OFF/ON/-/N-OT SUPP			
20	AUTO CRUISE RELEA-SE	—	—		
21	SPORT MODE SELECT SW	OFF/ON/-/N-OT SUPP	ON	When selecting sport mode, ON	
22	SPORT MODE UP SW	OFF/ON/-/N-OT SUPP	ON	When Selecting Sport mode up, ON	
23	SPORT MODE DOWN SW	OFF/ON/-/N-OT SUPP	ON	When selecting sport mode down, ON	
24	A/T CONTROL RELAY VOLT	V	12.9V		0V
25	ENGINE TORQUE	%	20%		
26	HIVEC MODE	A/B/C/D/E/F/G/H/I/J/K	F	A/B/C/D is control mode, F is release m-ode	F

HIVEC -SAT(SIEMENS ADAPTIVE TRANSMISSION CONTROL) Mode (Shift Patten)

Shift patten	Description(Help)	SCAN DISPLAY
ECONOMY	Economy Driver shift patten for flat road	A
MEDIUM	Shift patten for medium road	B
SPORTS	Shift patten for sport road	C
LOAD 1	Shift patten for low land, slow grade and slope	D
LOAD 2	Shift patten for low land, steep grade and slope	E
LOAD 3	Shift patten for downhill road	F
LOAD 1 HI ALT	Shift patten for high land, steep grade and slope	G
LOAD 2 HI ALT	Shift patten for low land, steep grade and slope	H
HI TEMP	Shift patten for high temperture ATF	I
WARM UP	Shift patten for exhaust gas decrease	J
HOLD	Shift patten for when hold, switch on	K

Actuator inspection

NO	ITEM NAME	Actuator Driving	Condition
1	LR SOLENOID(SCSV A)	Solenoid valve driver for 5sec.	1. IG Key ON 2. Inhibitor SW normal 3. P range 4. Vehicle speed 0km/h 5. Engine stop 6. No failure 7. TPS < 1V
2	UD SOLENOID(SCSV B)		
3	2ND SOLENOID(SCSV C)		
4	OD SOLENOID(SCSV D)		
5	TORQUE CONVERTER SOLENOID VALVE		
6	A/T CONTROL RELAY	OFF for 3 sec.	-
7	INTELLIGENT SHIFT PROHIBIT	Prohibit until IG off	-
8	CLEAR LEARNING VALUE	-	-

ROAD TEST

No.	Condition	Operation	Judgment value	Check item
1	Ignition switch : OFF	Ignition switch (1) ON	Battery voltage (mV)	Control relay
2	• Ignition switch : O-N • Engine : Stopped • Selector lever position : P	Selector lever position (1) P, (2) R, (3) N, (4) D	(1) P, (2) R, (3) N, (4) D	Transaxle range switch
		Accelerator pedal (1) Released (2) Half depressed (3) Depressed	(1) 400~1,000 mV (2)Gradually rises from (1) (3) 4,500~5,000 mV	Throttle position sensor
		Brake pedal (1) Depressed (2) Released	(1) ON (2) OFF	Brake switch
3	• Ignition switch : ST • Engine : Stopped	Starting test with lever P or N range	Starting should be possible	Starting possible or impossible
4	Warming up	Drive for 15 minutes or more so that the automatic fluid temperature becomes 70~90°C	Gradually rises to 70~90°C	Oil temperature sensor

No.	Condition	Operation	Judgment value	Check item
5	• Engine : Idling • Selector lever position : N	A/C switch (1) ON (2) OFF	(1) ON (2) OFF	Triple pressure switch
		Accelerator pedal (1) Released (2) Half depressed	(1) ON (2) OFF	Idle position switch
			(1) 600~900 rpm (2) Gradually rises from (1)	
			(1) Data changes	Communication with engine-ECU
		Selector lever position (1) N→D (2) N→R	Should be no abnormal shifting shocks Time lag should be within 2 seconds	Malfunction when starting
6	Selector lever position : N (Carry out on a flat and straight road)	Selector lever position and vehicle speed 1. Idling in 1st gear (Vehicle stopped) 2. Driving at constant speed of 20 km/h in 1st gear 3. Driving at constant speed of 30 km/h in 2nd gear 4. Driving at 50 km/h in 3rd gear with accelerator fully closed 5. Driving at constant speed of 50 km/h in 4th gear	(2) 1st, (4) 3rd, (3) 2nd, (5) 4th	Shift condition
			(2) 0%, (4) 100%, (3) 100%, (5) 100%	Low and reverse solenoid valve
			(2) 0%, (4) 0%, (3) 0%	Underdrive solenoid valve
			(1) 100%, (2) 0%, (3) 100%	Second solenoid valve
			(2) 100%, (3) 100%, (4) 0%	Overdrive solenoid valve
			(1) 0km/h (4) 50km/h	Vehicle speed sensor
			(4) 1,800 ~ 2,100rpm	Input shaft speed sensor
			(4) 1,800 ~ 2,100rpm	Output shaft speed sensor

No.	Condition	Operation	Judgment value	Check item
7	Selector lever position : D (Carry out on a flat and straight road)	• Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %). • Gently decelerate to a standstill. • Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%). • While driving at 60 km/h in 4th gear, shift down to 3rd gear. • While driving at 40 km/h in 3rd gear, shift down to 2nd gear. • While driving at 20 km/h in 2nd gear, shift down to 1st gear.	For (1), (2) and (3), the reading should be the same as the specified output shaft torque , and no abnormal shocks should occur. For (4), (5) and (6), downshifting should occur immediately after the shifting operation is made.	Malfunction when shifting Displaced shift points Does not shift Does not shift from 1 to 2 or 2 to 1 Does not shift from 2 to 3 or 3 to 2 Does not shift from 3 to 4 or 4 to 3
8	Selector lever position : N (Carry out on a flat and straight road)	Move selector lever to R range drive at constant speed of 10km/h	The ratio between input and output shaft speed sensor data should be the same as the gear ratio when reversing.	Does not shift

TORQUE CONVERTER STALL TEST

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

⚠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.
   - Fluid level : At the HOT mark on the oil level gauge
   - Fluid temperature : 80~100°C (176~212°F)
   - Engine coolant temperature : 80~100°C(176~212°F)
2. Prevent all the wheels from moving during the test.
3. Pull the parking brake lever up, with the brake pedal fully depressed.
4. Start the engine.
5. Move the selector lever to the "D" position, fully depress the accelerator pedal and take a reading of the maximum engine speed at this time.

Stall speed : 2,100~2,900rpm

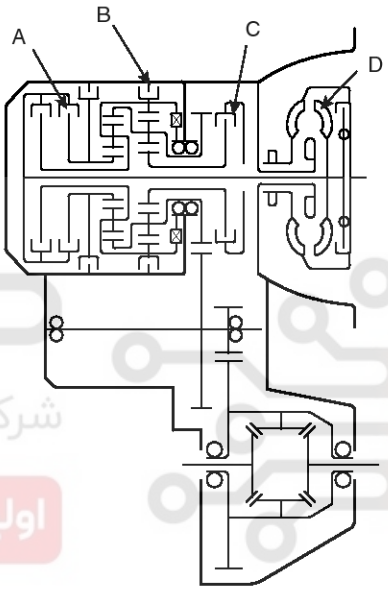
⚠CAUTION

- **The throttle should not be left fully open for any more than five seconds.**
- **If carrying out the stall test two or more times, move the selector 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.**

6. Move the selector lever to the "R" position and carry out the same test again.

TORQUE CONVERTER STALL TEST CONCLUSION

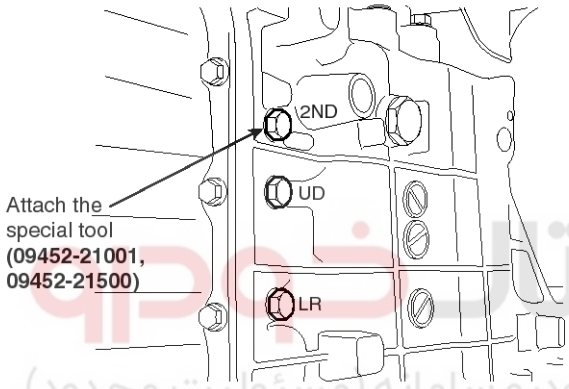
1. Stall speed is too high in both "D" and "R" ranges
   - Low line pressure
   - Low & reverse brake(B) slippage
2. Stall speed is to high in "D" range only
   - Underdrive clutch(C) slippage
3. Stall speed is too high in "R" range only
   - Reverse clutch(A) slippage
4. Stall speed too low in both "D" and "R" ranges
   - Malfunction of torque converter(D)
   - Insufficient engine output



EKRF007F

HYDRAULIC PRESSURE TEST

1. Warm up the engine until the automatic transaxle fluid temperature is 80-100˚C.
2. Lift up the vehicle so that the wheels are free to turn.
3. Connect the special tool (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.



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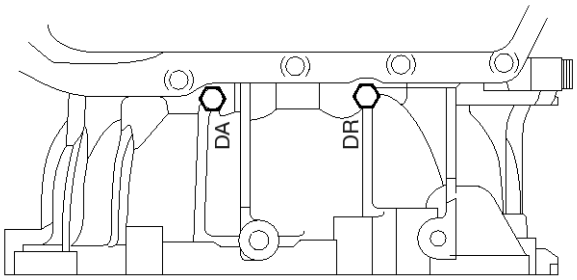

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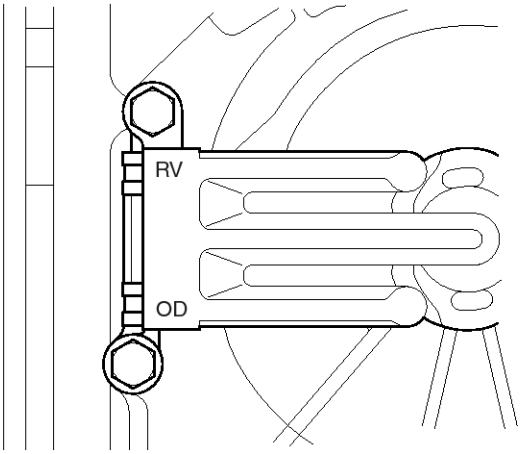


EKRF007I

STANDARD HYDRAULIC PRESSURE TEST

Measurement condition			Standard hydraulic pressure kPa (psi)						
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Overdrive clutch pressure	Low & reverse brake pressure	Second brake pressure	Damper clutch Apply pressure (DA)	Damper clutch Release pressure (DR)
P	-	2,500	-	-	-	260-340 (38-50)	-	-	-
R	Reverse	2,500	-	1,270-1,770 (185-256)	-	1,270-1,770 (185-256)	-	-	-
N	-	2,500	-	-	-	260-340 (38-50)	-	-	-
D	1st gear	2,500	430-510 (62-74)	-	-	1,010-1,050 (146-152)	-	-	-
	2nd gear	2,500	430-510 (62-74)	-	-	-	430-510 (62-74)	-	-
	3rd gear	2,500	430-510 (62-74)	-	430-510 (62-74)	-	-	More than 730 (100)	0-10 (0-1)
	4th gear	2,500	-	-	430-510 (62-74)	-	780-880 (110-130)	More than 730 (100)	0-10 (0-1)

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

※ Depress the acceleration pedal "GENTLY" under no load when measuring the hydraulic pressure.

SERVICE ADJUSTMENT PROCEDURE

Automatic transaxle fluid

INSPECTION

1. Drive the vehicle until the fluid reaches normal operating temperature [70~80°C].
2. Place the vehicle on a level surface.
3. Move the selector lever through all gear positions. This will fill the torque converter and the hudraulic system with fluid and move the selector lever to the "N" (Neutral) or "P"(Park) 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

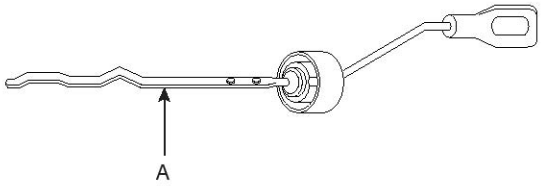
   If the fluid smells as if it is burning, it means that the fluid has been contaminated by fine particles from the bushes and friction materials, a transaxle overhaul may be necessary.
5. Check that the fluid level is at the HOT mark on the oil level gauge. If the fluid level is low, add automatic transaxle fluid until the level reaches the "HOT" mark.

Auto transaxle fluid:
DIAMOND ATF SP-III, SK ATF SP-III
Quantity : 8.5ℓ (8.98 US qt, 7.48 Imp.qt)

NOTICE

Low fluid level can cause a variety of a abnormal conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles, which are compressable. 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 acuise 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(A) securely.



EKRF008A

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, replace it using the following procedure.

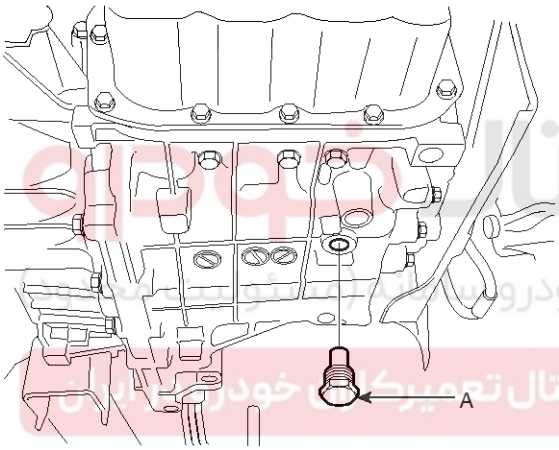
1. Disconnect the hose which connects the transmission and the oil cooler which is within the radiator only in 2.4L engine(3.3L-the oil cooler is separated).
2. Start the engine and let the fluid drain out.

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



EKRF073A

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

TORQUE :
40~50Nm (4.0~5.0 kgf.m, 29~36 lb-ft)

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

CAUTION

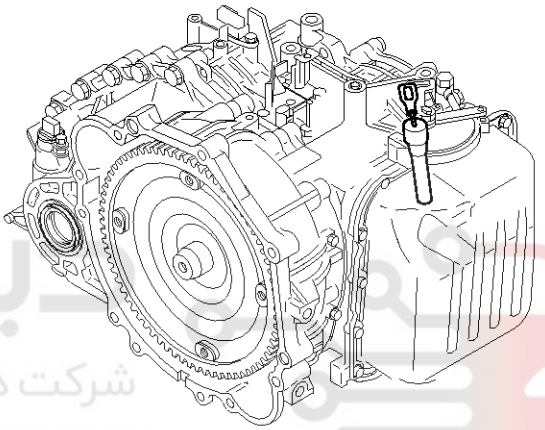
Stop pouring if the full volume of fluid cannot be poured in.

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" position.
11. Drive the vehicle until the fluid temperature rises to the normal temperature (70~80˚C), and then check the fluid level again. The fluid level must be at the HOT mark.
12. Firmly insert the oil level gauge(A) into the oil filler tube.



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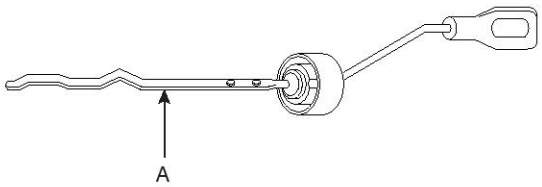
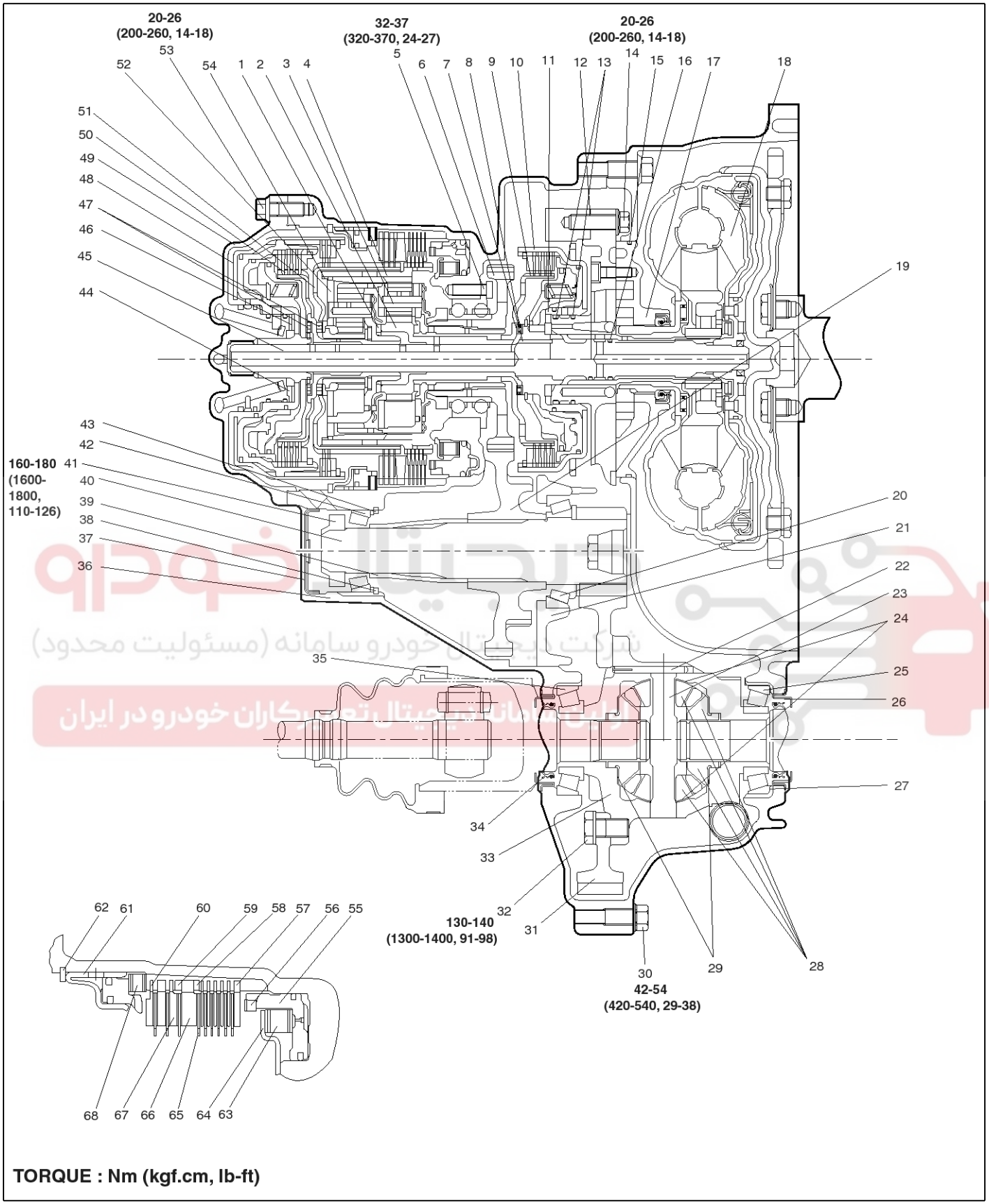


EKRF008A

Automatic Transaxle

COMPONENTS (1)

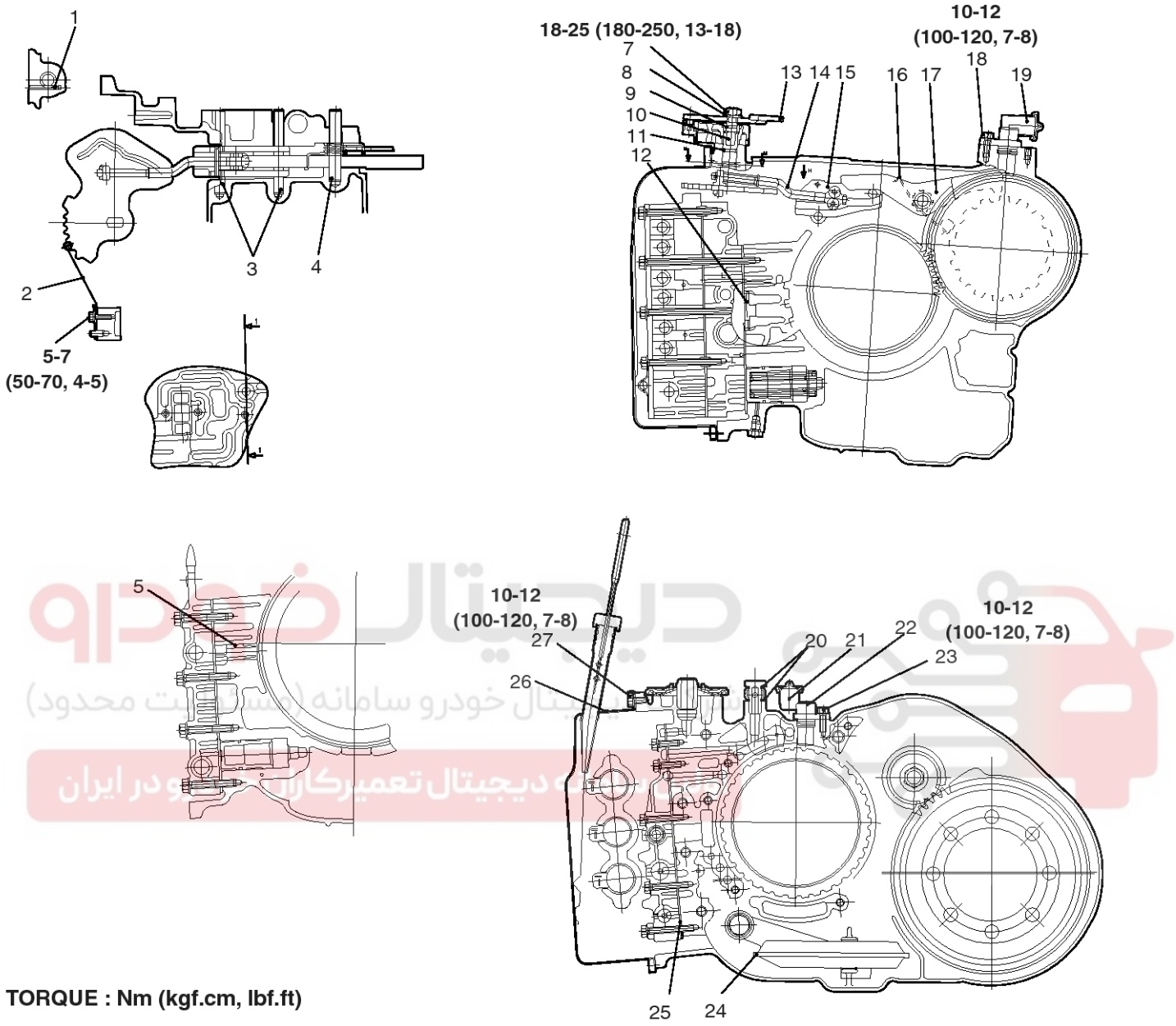


EKRF012A

1. Thrust bearing
2. Underdrive sun gear
3. Output carrier
4. Low and reverse annulus gear
5. Bolt
6. Transfer drive gear
7. Snap ring
8. Thrust bearing
9. Underdrive clutch hub
10 . Underdrive clutch
11. Thrust washer
12. Oil pump gasket
13. Seal ring
14. Flange bolt
15. O-ring
16. Seal ring
17. Oil pump
18. Torque converter
19. Transfer driven gear
20. Taper roller bearing
21. Bearing retainer
22. Lock pin
23. Pinion shaft
24. Washer
25. Taper roller bearing
26. Oil seal
27. Differential spacer
28. Differential gear
29. Differential spacer set
30. Flange bolt
31. Differential drive gear
32. Fly wheel bolt
33. Differential case
34. Oil seal
35. Transmission case
36. One-way Clutch Inner Race
37. Sealing cap
38. Output spacer set
39. Collar
40. Output shaft
41. Locking pin
42. Roller bearing
43. Snap ring
44. Thrust race
45. Input shaft
46. Thrust bearing
47. Thrust bearing
48. Return & O/D clutch
49. Rear cover
50. O/D clutch hub
51. Return sun gear
52. Output carrier
53. Flange bolt
54. Snap ring
55. Low and reverse brake piston
56. Wave spring
57. Brake pressure plate
58. Snap ring
59. Snap ring set
60. Brake pressure plate
61. 2nd brake retainer
62. Snap ring
63. 2nd brake return spring
64. Brake disc
65. Brake reaction plate
66. Brake plate
67. Brake spring retainer
68. Low and reverse return spring

EKRF012B

COMPONENTS (2)

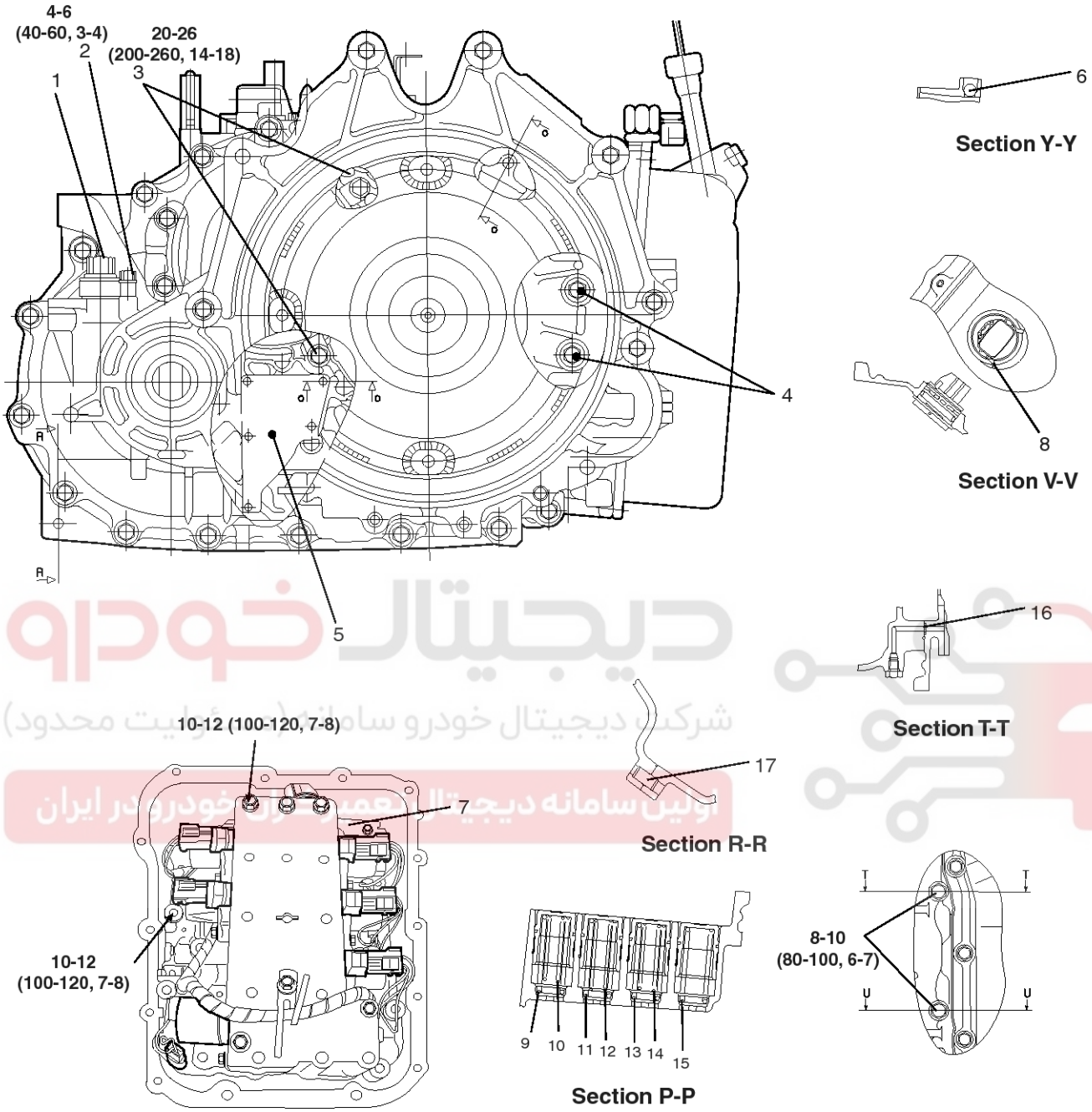


TORQUE : Nm (kgf.cm, lbf.ft)

1. Roller
2. Detent spring
3. Parking roller shaft
4. Parking spring shaft
5. Oil seal
6. 2nd brake retainer
7. Flange nut
8. Spring washer
9. Oil ring
10. Manual control shaft
11. Oil ring
12. Oil strainer
13. Manual control lever
14. Parking roller rod
15. Parking roller shaft
16. Parking sprag
17. Parking sprag shaft
18. Flange bolt
19. Output speed sensor
20. Eye bolt
21. Gasket
22. Input speed sensor
23. Flange bolt
24. Oil filter
25. Valve body gasket
26. Valve body
27. Flange bolt

EKRF012C

COMPONENTS (3)

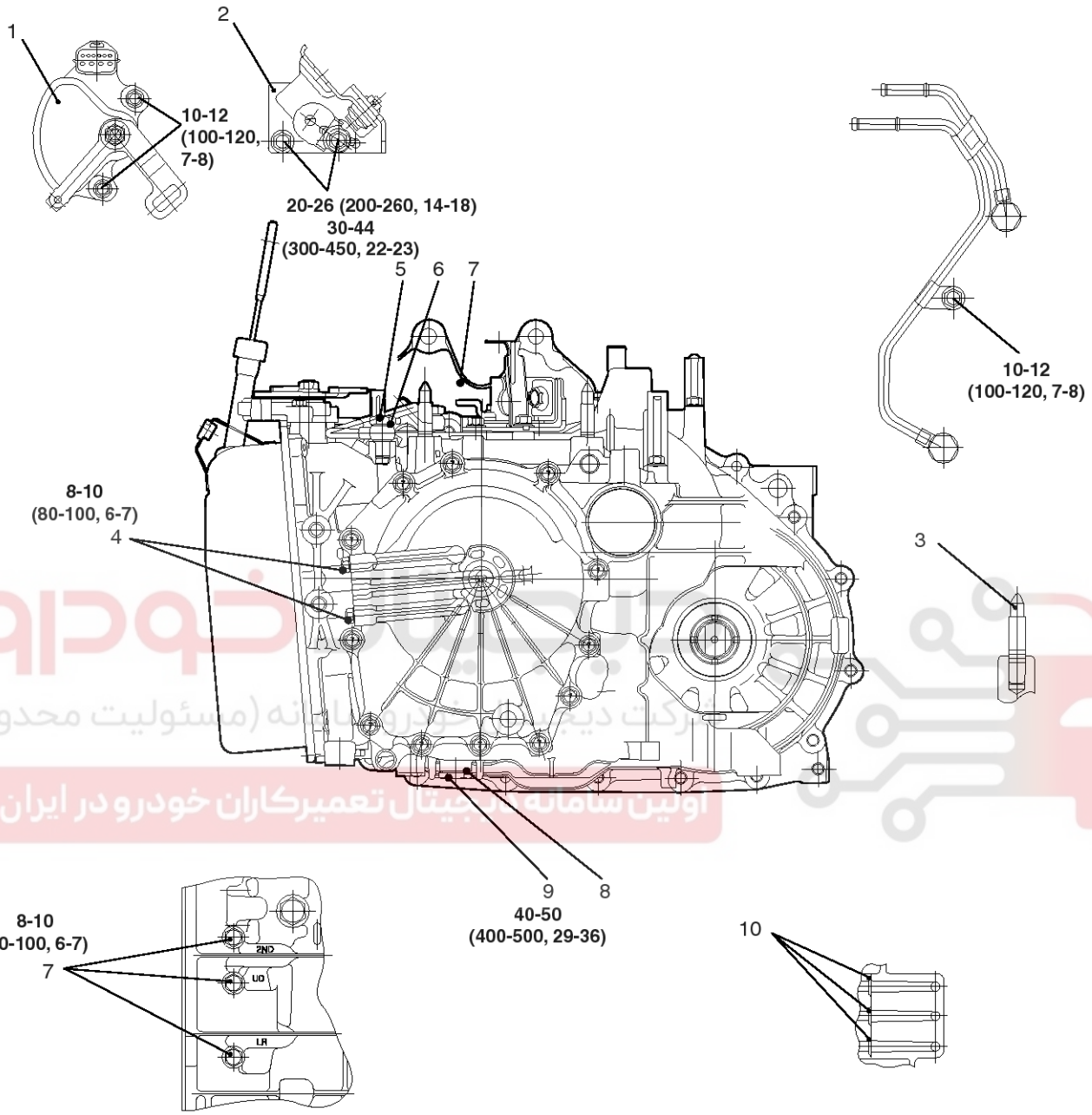


TORQUE : Nm (kgf.cm, lbf.ft)

1. Vehicle speed sensor
2. Washer
3. Seal bolt
4. Flange bolt
5. Oil guide
6. Steel ball
7. Harness
8. Snap ring
9. Coil spring
10. Coil spring
11. Coil spring
12. Coil spring
13. Coil spring
14. Coil spring
15. Coil spring
16. O-ring
17. Dowel pin

EKRF091A

COMPONENTS (4)



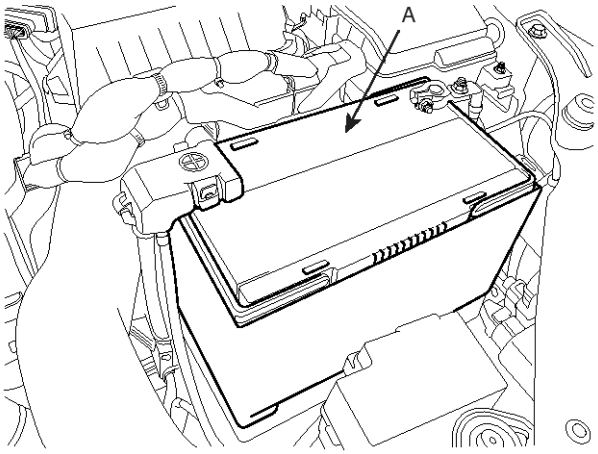
TORQUE : Nm (kgf.cm, lbf.ft)

1. Inhibitor switch
2. Control cable bracket
3. Stud
4. Pressure check plug
5. Eye bolt
6. Gasket
7. Converter housing
8. Gasket
9. Magnet plug
10. Accumulator piston

EKRF012D

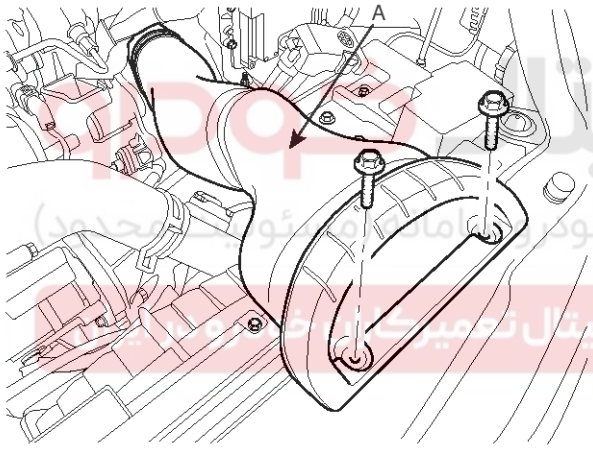
REMOVAL

1. Remove the battery (A) with the mounting plate and a bolt.



SMGMT6100D

2. Remove the air duct(A).



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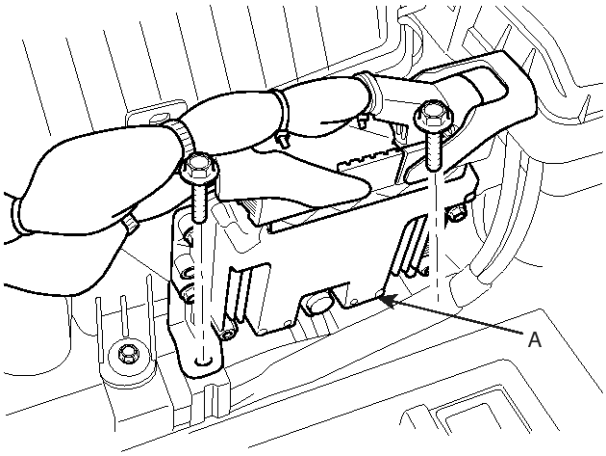
3. Remove the ECM (A).



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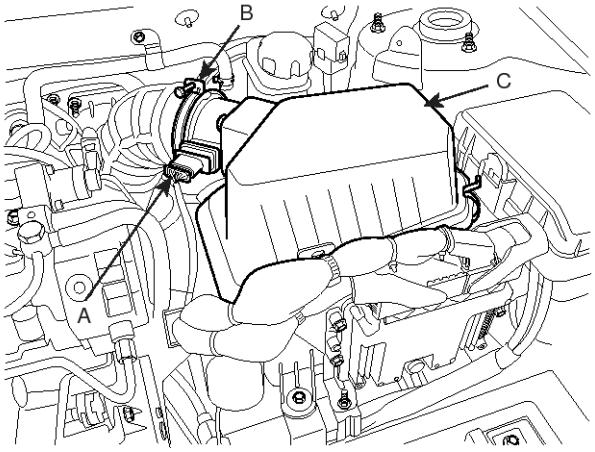
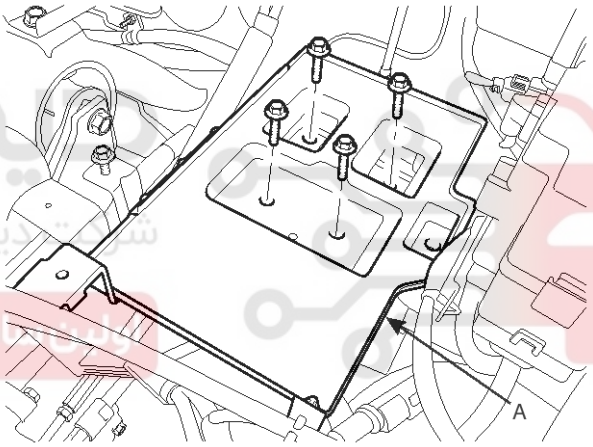
4. Remove the air cleaner assembly (C) after disconnecting the air flow sensor connector (A) and loosening the clamp (B).



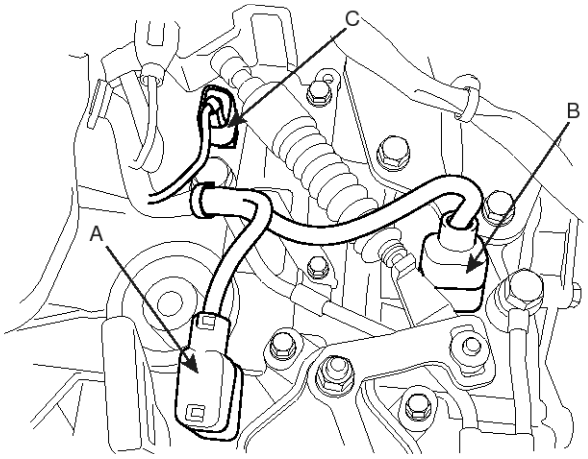
SMGMT6102D

5. Remove the battery tray (A).



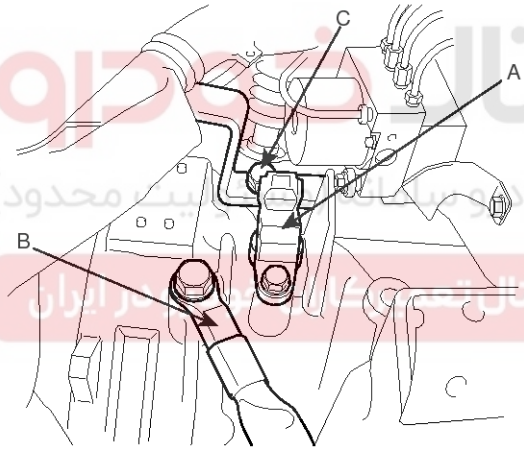
SMGMT6104D

6. Disconnect the inhibiter switch connector (A), solenoid valve connector (B) and the input shaft speed sensor connector (C).



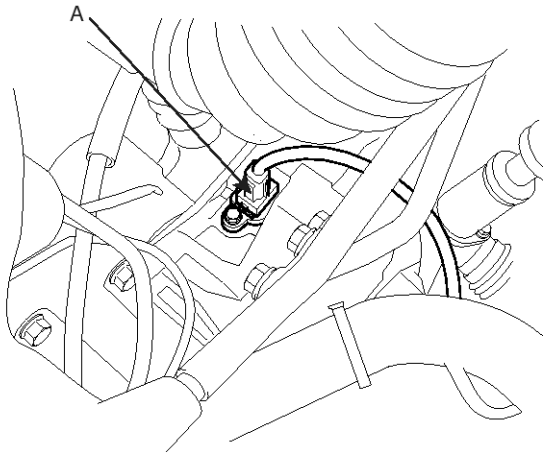
SNFAT6007D

7. Disconnect the output shaft speed sensor connector (A), the ground (B), and the bracket bolt (C).



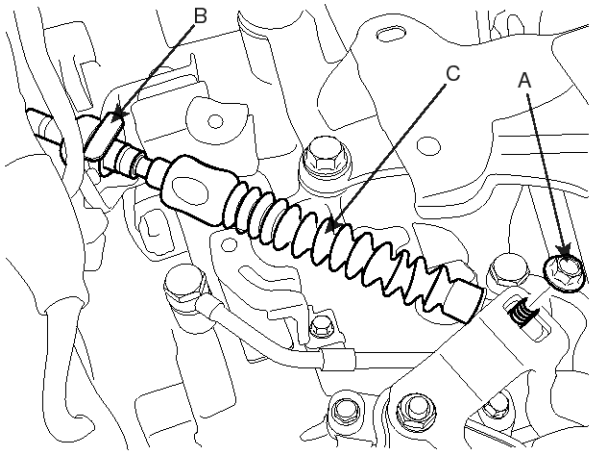
SNFAT6006D

8. Disconnect the vehicle speed sensor connector (A).



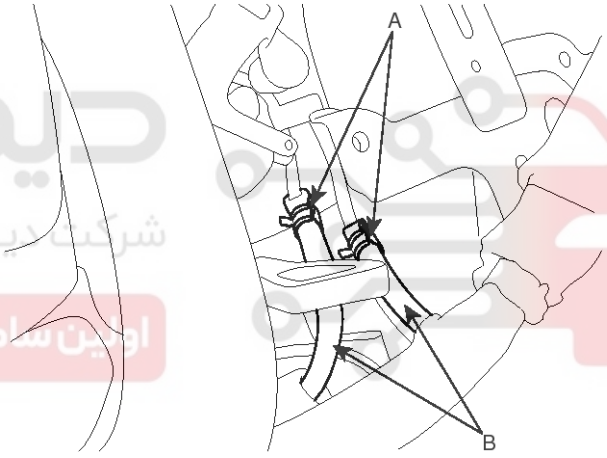
SNFAT6005D

9. Remove the control cable assembly(C) by removing the nut (A) and clip (B).



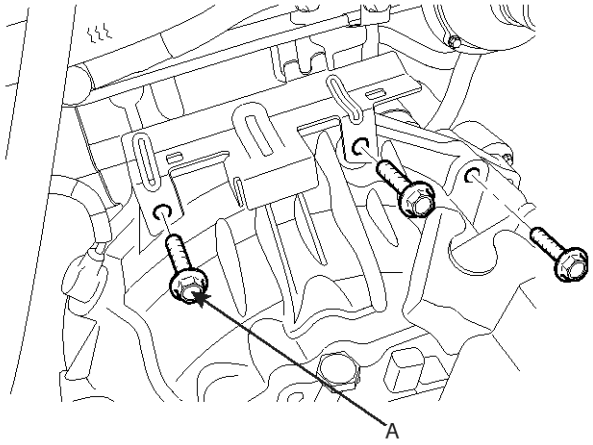
SCMAT6012D

10. Disconnect the transaxle oil cooler hoses (B) from the tubes by loosening the clamps (A).



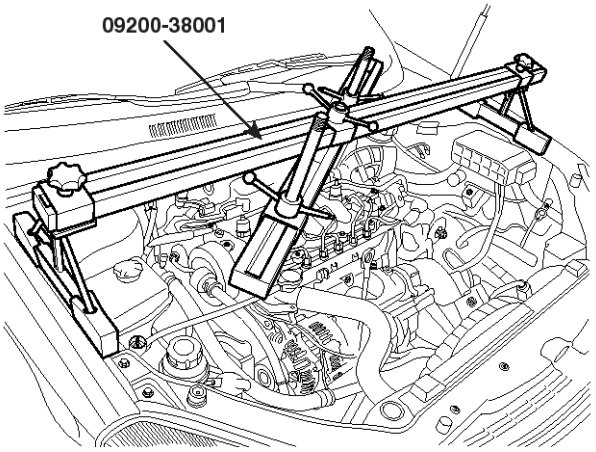
SCMAT6013D

11. Remove the transaxle mounting bolts (A).



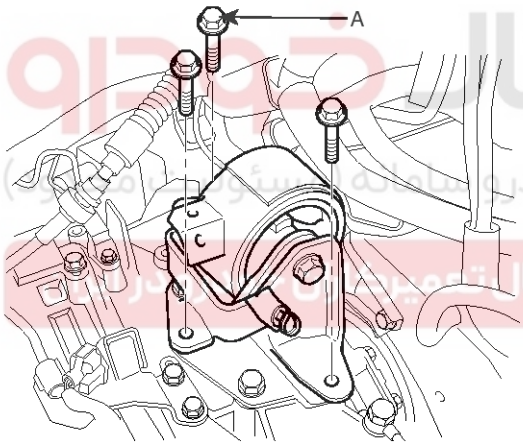
AKKF002O

12. Remove the starter motor by disconnecting the connector. (see EE group)
13. Using the SST(09200-38001), hold the engine and transaxle assembly safely.



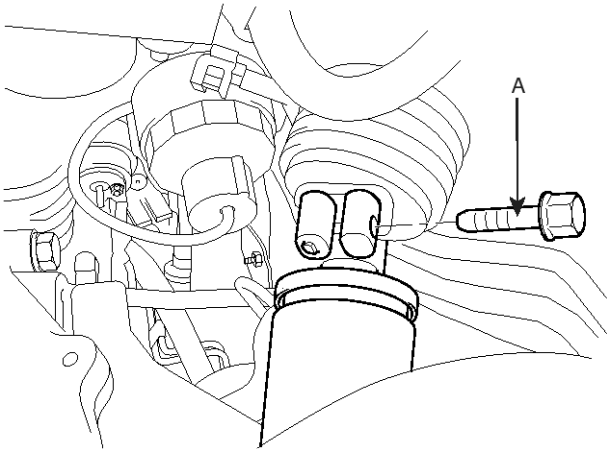
SMGMT6111D

14. Remove the transaxle insulator mounting bolts (A).



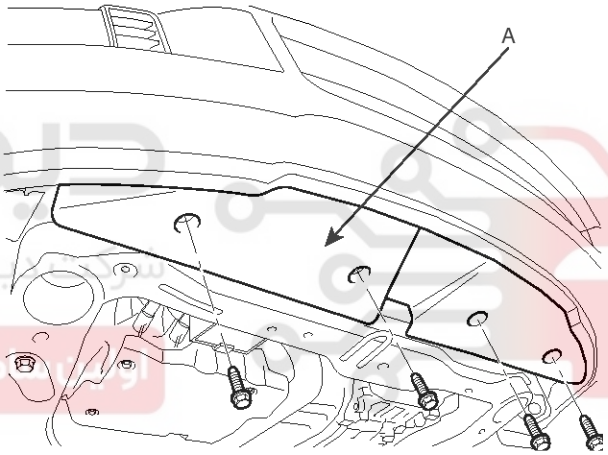
SNFAT6001D

15. Remove the front wheels. (see SS group)
16. Lifting up the vehicle, remove the under cover.
17. Remove the power steering column joint bolt (A). (see ST group).



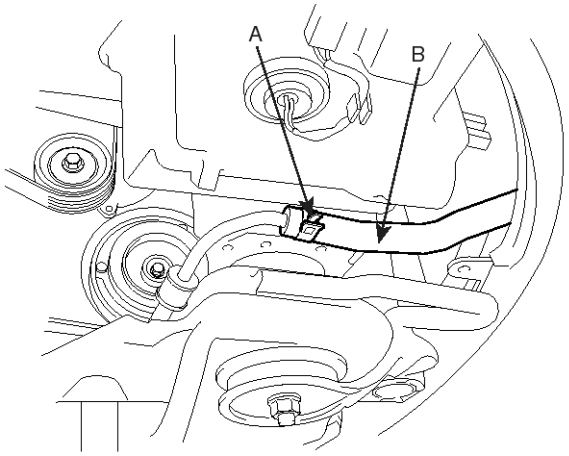
SNFAT6002D

18. Remove the front under cover (A).



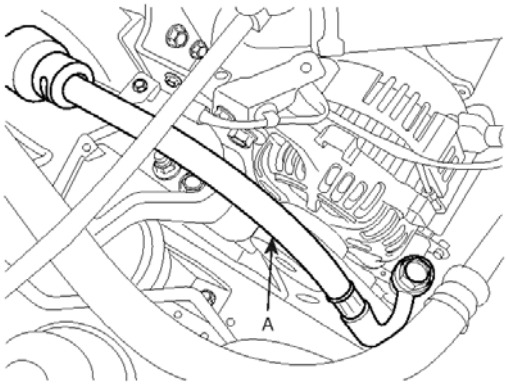
SNFAT6004D

19. Drain power steering fluid through the return tube(B) by loosening the clamp (A). (see ST group)



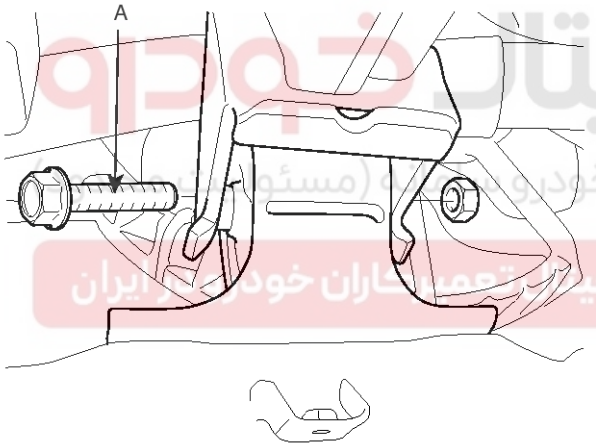
SCMAT6017D

20. Drain the transaxle fluid.
21. Disconnect the power steering pressure tube (A) from the power steering oil pump.

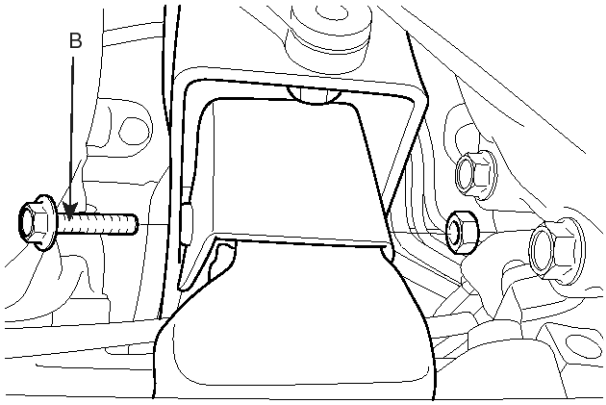


SMGMT6120D

22. Disconnect the lower arm, the tie rod end ball joint, and the stabilizer link from the front knuckle. (see SS group)
23. Disconnect the roll stopper bracket bolts(A,B).

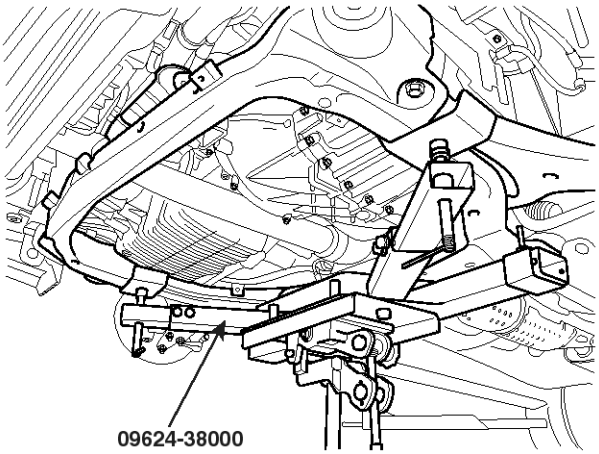


SNFAT6013D



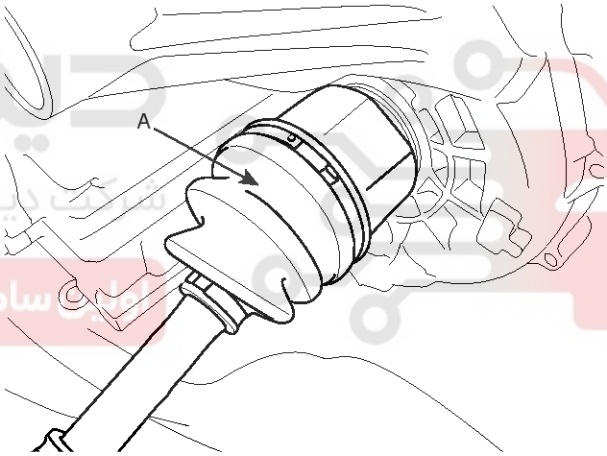
SNFAT6014D

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

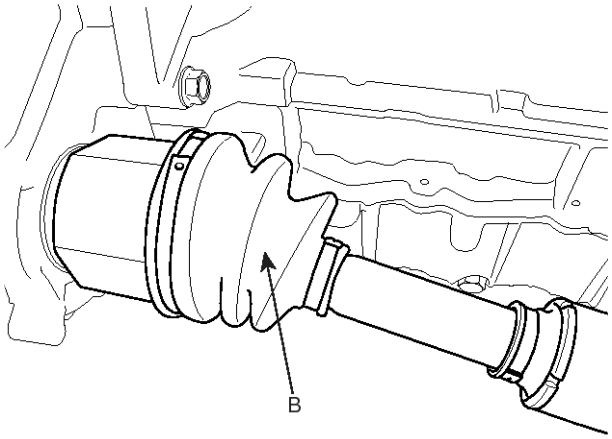


SMGMT6114D

25. Disconnect the driveshafts(A, B) from the transaxle. (see DS group)

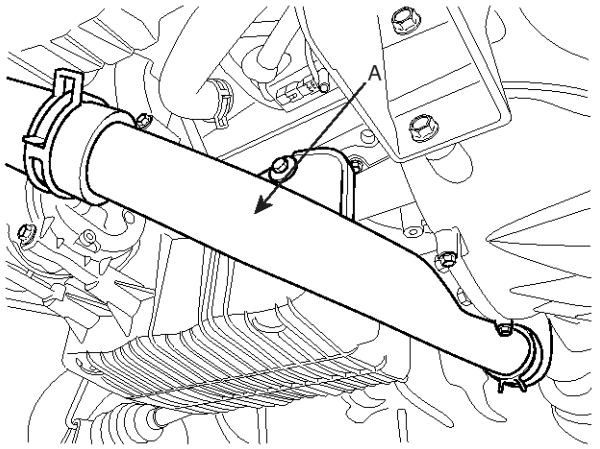


SNFAT6015D



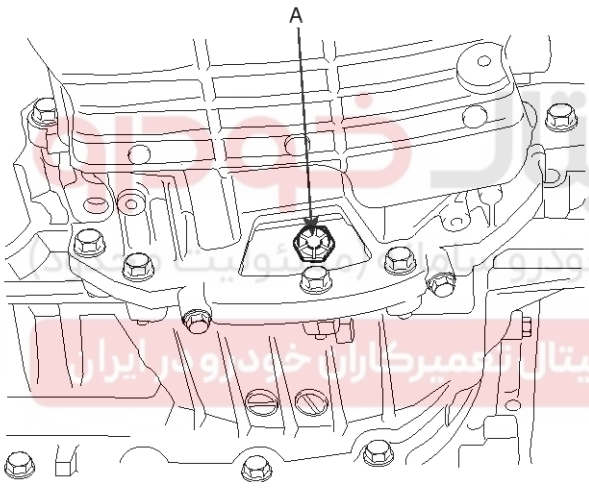
SMGAT6001L

26. Remove the intercooler tube (A) by removing the two bolts and loosening the clamps.



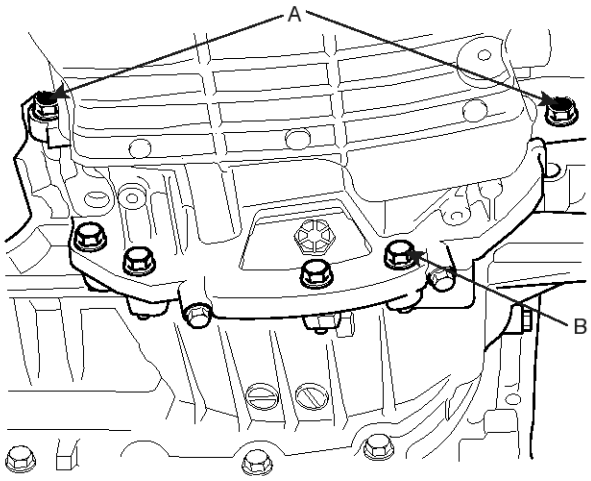
SMGMT6119D

27. Remove the drive plate bolts (A).



SNFAT6003D

28. Supporting the transaxle with a jack, remove the transaxle lower mounting bolts (A-2ea, B-4ea).

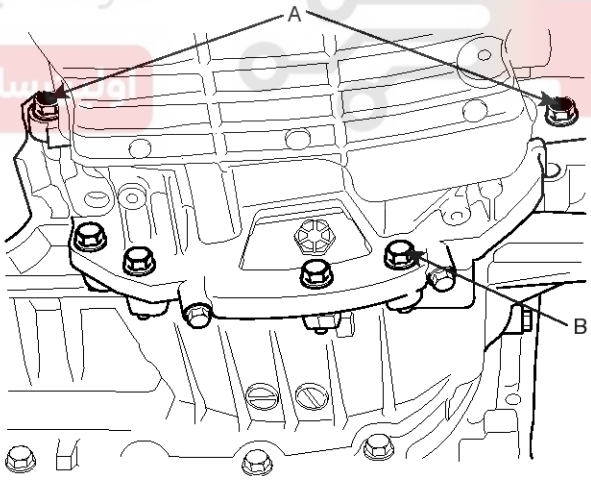


SNFAT6018D

INSTALLATION

1. Install the transaxle lower mounting bolts (A-2ea, B-4ea) after fitting the transaxle assembly into the engine assembly.

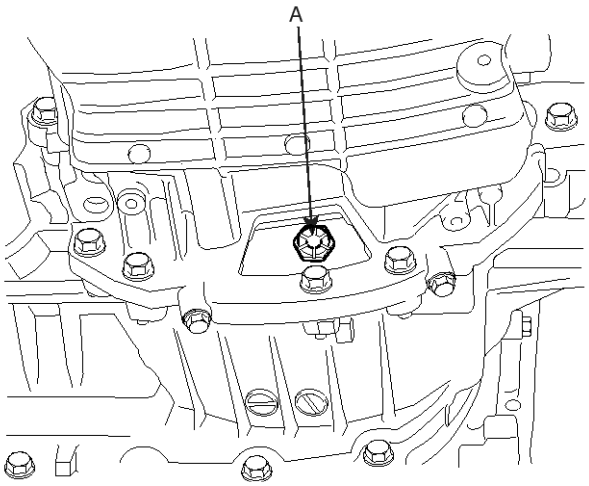
TORQUE :
[A] 65-85Nm (6.5-8.5kgf.m,47.0-61.5lb-ft)
[B] 30-42Nm (3.0-4.2kgf.m,21.7-30.4lb-ft)



SNFAT6018D

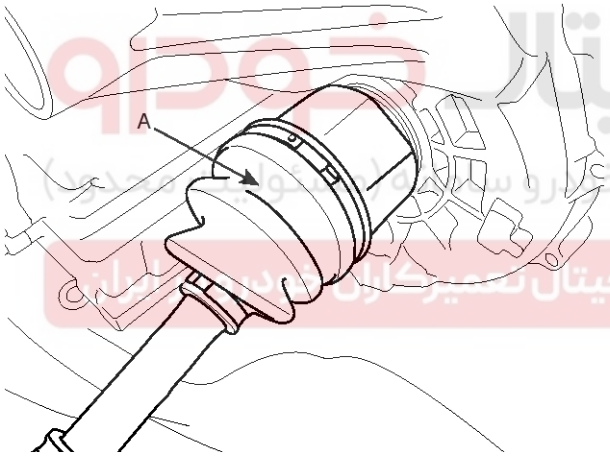
2. Install the drive plate bolts (A) by rotating the timing gear.

TORQUE : 46-53Nm (4.6-5.3kgf.m, 33.3-38.3lb-ft)

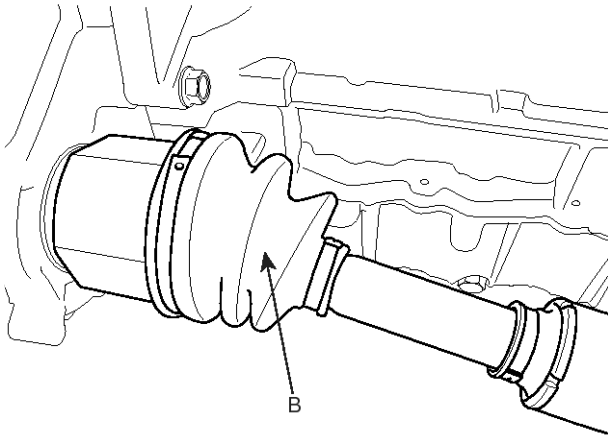


SNFAT6003D

3. Connect the driveshafts (A, B) to the transaxle.

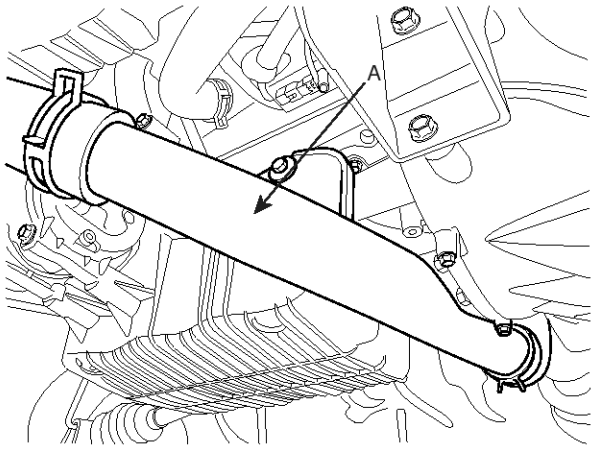


SNFAT6015D



SMGAT6001L

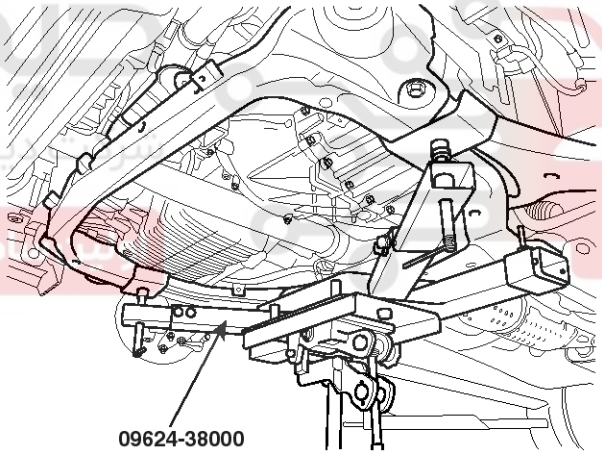
4. Install the intercooler tube (A) by installing the two bolts and tightening the clamps.



SMGMT6119D

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

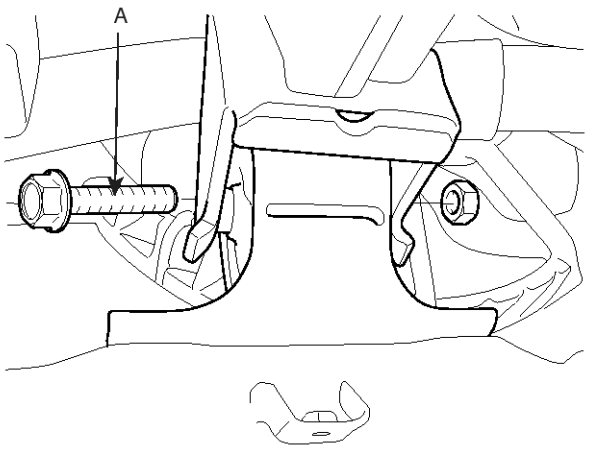
TORQUE : 140-160Nm(14-16kgf.m, 101-118lb-ft)



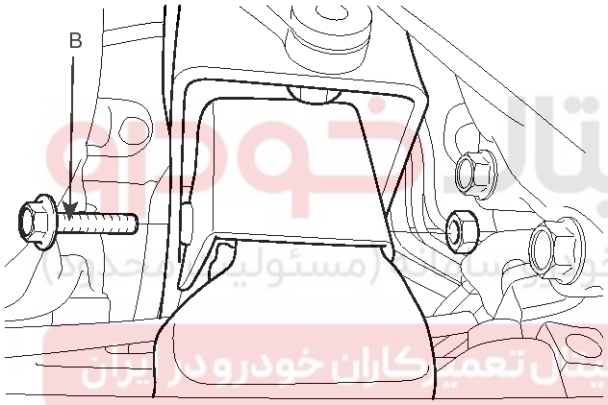
SMGMT6114D

6. Install the roll stopper bracket bolts (A,B).

TORQUE : 50-65Nm(5-6.5kgf.m, 36.2-47.0lb-ft)



SNFAT6013D



SNFAT6014D

7. Install the tie rod end to the knuckle. (see ST group)

TORQUE : 24-34Nm(2.4-3.4kgf.m, 17.4-24.6lb-ft)

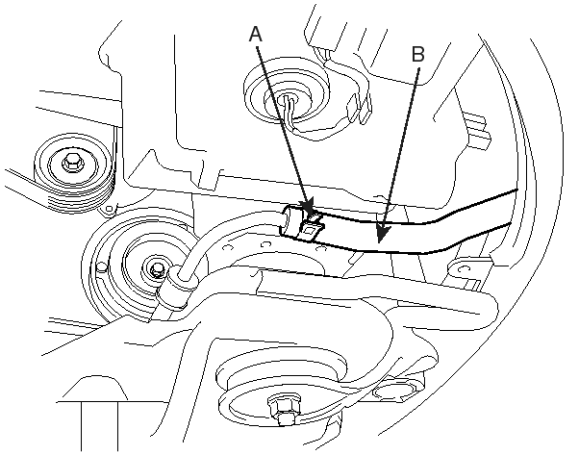
8. Install the stabilizer link mounting bolt. (see SS group)

TORQUE : 100-120Nm(10-12kgf.m, 72.3-86.8lb-ft)

9. Install the lower arm ball joint assembly mounting bolts. (see SS group)

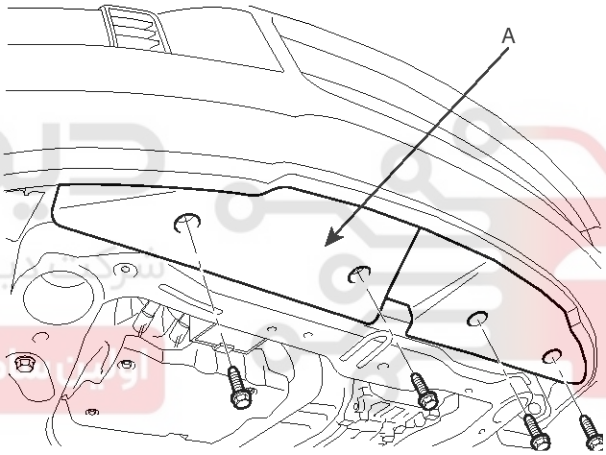
TORQUE : 100-120Nm(10-12kgf.m, 72.3-86.8lb-ft)

10. Connect the the power steering return hose(A) by tightening the clamp(B).



SCMAT6017D

11. Install the front under cover (A).



SNFAT6004D

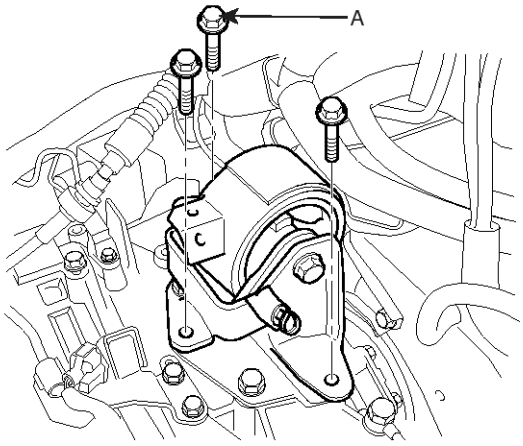
12. Lifting up the vehicle, install the under shield cover.

13. Install the front wheels & tires. (see SS group).

TORQUE : 90-110Nm(9-11kgf.m, 65.1-79.5lb-ft)

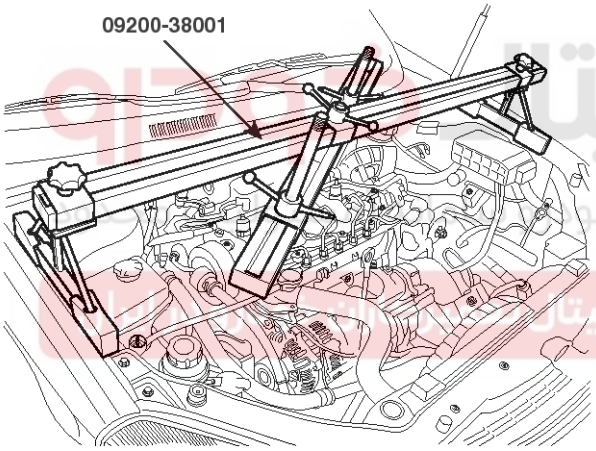
14. Install the transaxle insulator mounting bracket bolts (A).

TORQUE : 60-80Nm(6.0-8.0kgf.m, 43.4-57.9lb-ft)



SNFAT6001D

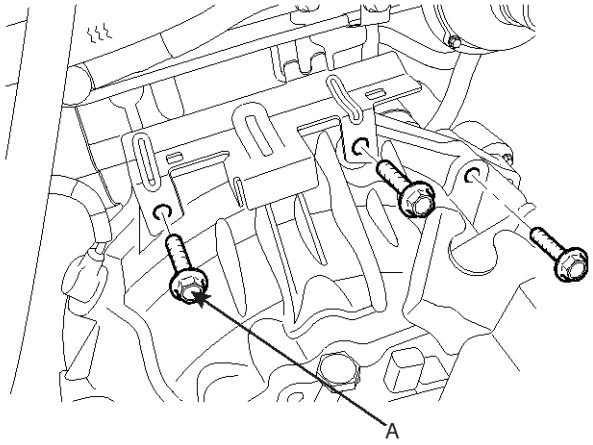
15. Remove the special tool (09200-38001).



SMGMT6111D

16. Install the transaxle upper mounting bolts (A-3ea).

TORQUE : 43-55Nm(4.3-5.5kgf.m, 31.1-39.8lb-ft)



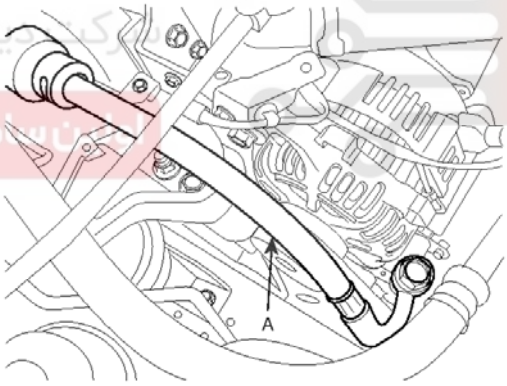
AKKF002O

17. Install the starter motor and connect the connector. (see EE group)

TORQUE : 43-55Nm(4.3-5.5kgf.m, 31.1-39.8lb-ft)

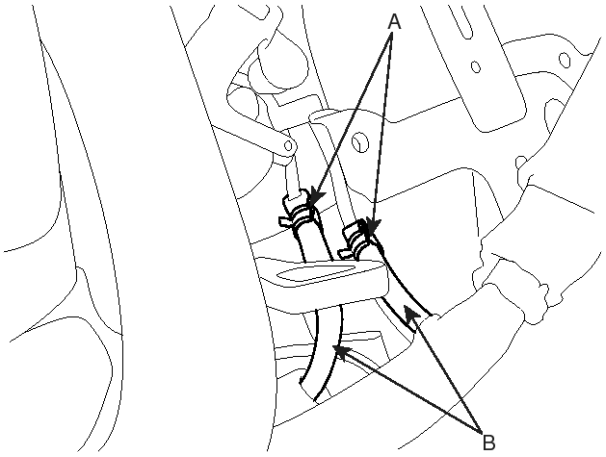
18. Connect the power steering pressure bolt (A). (see ST group)

TORQUE : 55-65Nm(5.5-6.5kgf.m,39.8-47.0lb-ft)



SMGMT6120D

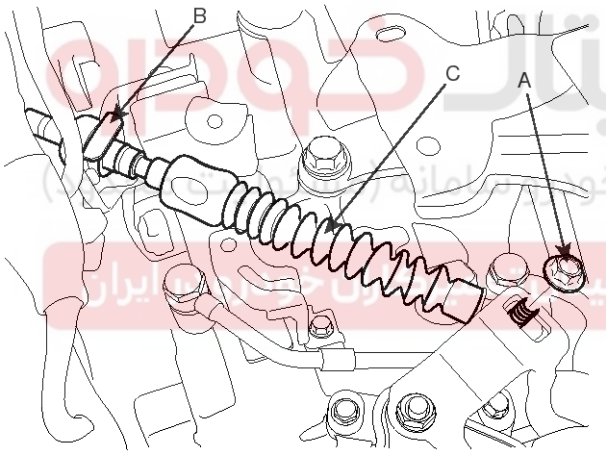
19. Connect the transaxle oil cooler hoses (B) to the tubes by tightening the clamps (A).



SCMAT6013D

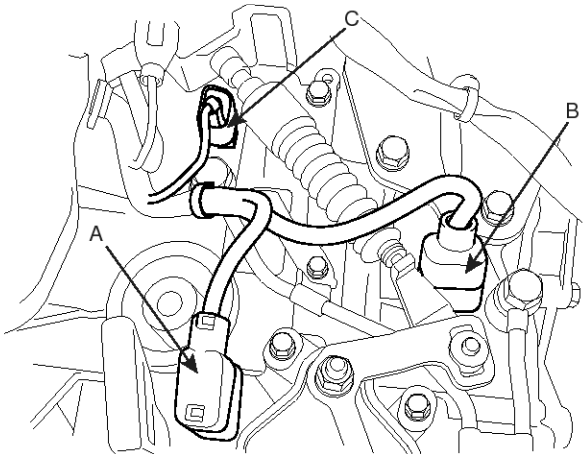
20. Install the control cable assembly (C) by installing the nut (A) and clip (B).

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



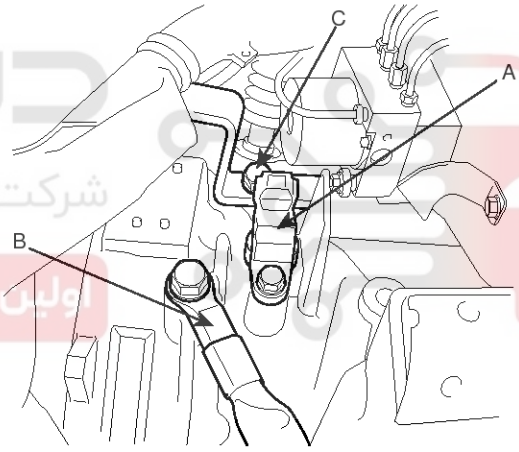
SCMAT6012D

21. Connect the inhibiter switch connector (A), solenoid valve connector (B) and the input shaft speed sensor connector (C).



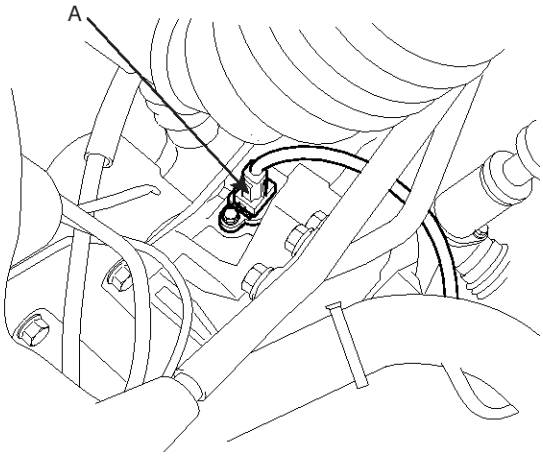
SNFAT6007D

22. Connect the output shaft speed sensor connector (A), the ground (B), and the bracket bolt (C).



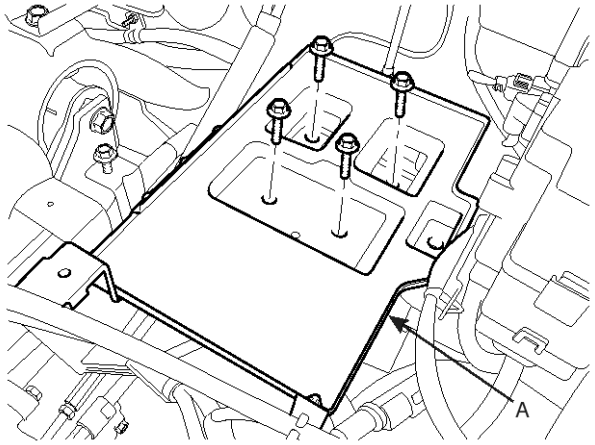
SNFAT6006D

23. Connect the vehicle speed sensor connector (A).



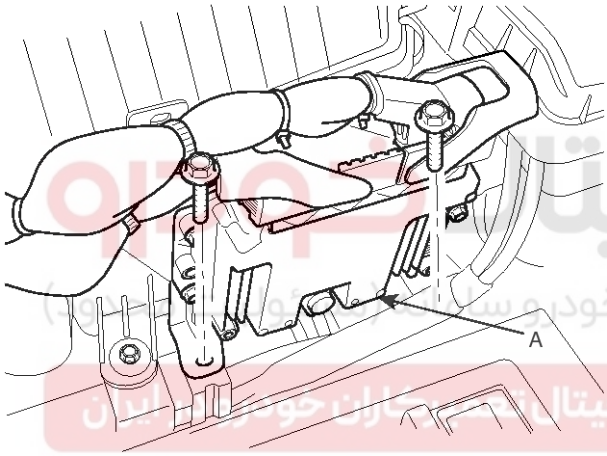
SNFAT6005D

24. Install the battery tray (A).



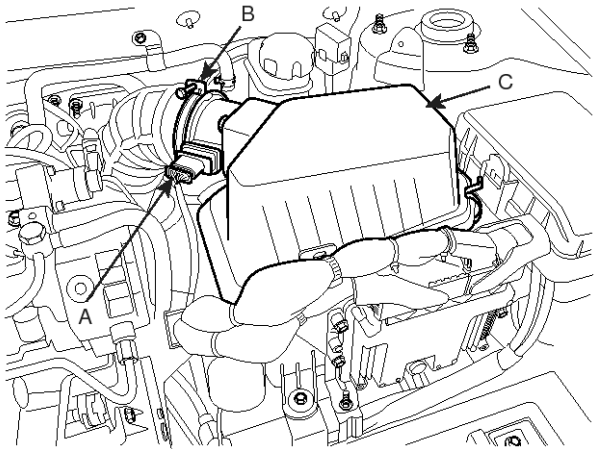
SMGMT6104D

25. Install the ECM (A)



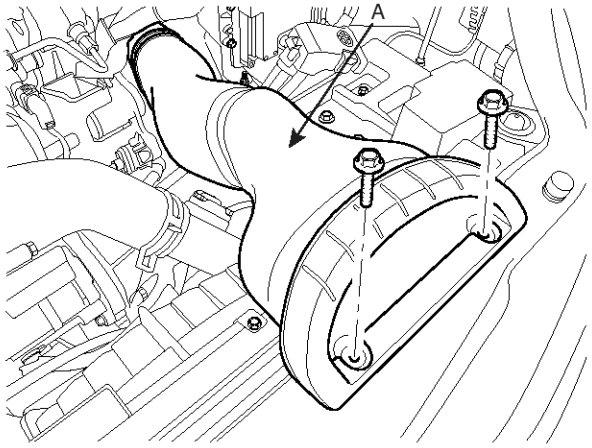
SMGMT6103D

26. Install the air cleaner assembly (C) and connect the air flow sensor connector (A) and tightening the clamp (B).



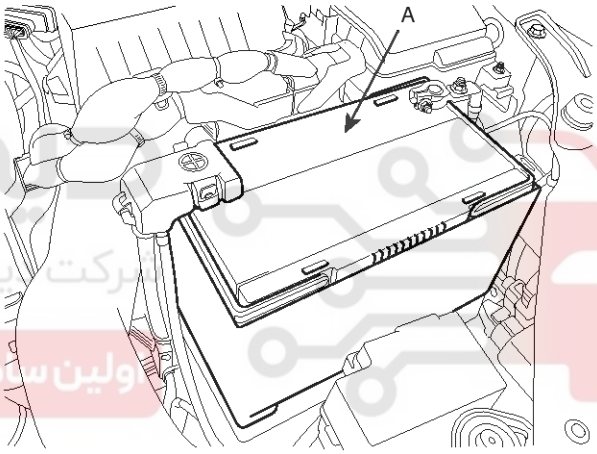
SMGMT6102D

27. Install the air duct(A).



SMGMT6101D

28. Install the battery (A) with the mounting plate and a bolt.



SMGMT6100D

29. Refill the automatic transaxle fluid. (see 'SERVICE ADJUSTMENT PROCEDURE')

30. Refill the power steering fluid and bleed the air. (see ST group)

Valve Body System

Solenoid valve

DESCRIPTION

Actuators

Solenoid Valve for Pressure Control

- Sensor type: Normal open 3-way
- Operating temperature : -30˚C～130˚C(-22˚F～266˚F)
- Frequency:

LR, 2ND, UD, OD: 61.27Hz (at the ATF temp. above -20˚C(-4˚F))

DCC: 30.64Hz

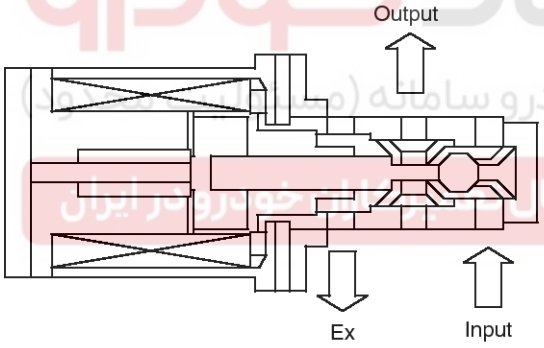
- Internal resistance:

3.0 ± 0.5 Ω (LR, 2ND, UD, OD, TCC)

4.35 ± 0.5 Ω (VFS)

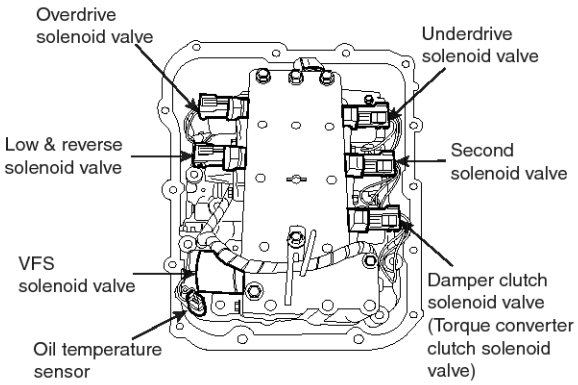
- Surge voltage: 56 V (Except VFS)

(LR, 2ND, UD, OD, DCC)



EKRF018J

Location



EKRF018K

Solenoid Valves Schedule

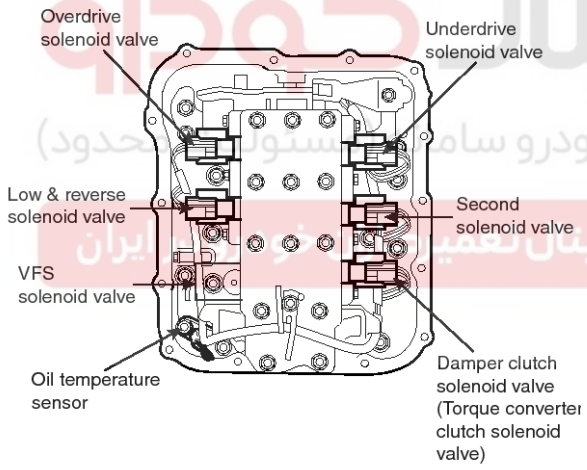
Position	Solenoid valves				
Operation	LR	2ND	UD	OD	* DCC
1st gear	OFF	ON	OFF	ON	OFF
2nd gear	ON	OFF	OFF	ON	OFF
3rd gear	ON	ON	OFF	OFF	ON
4th gear	ON	OFF	ON	OFF	ON
Reverse	OFF	ON	ON	ON	OFF
N, P (STD. mode)	OFF	ON	ON	ON	OFF
N, P (Hold mode)	ON	OFF	ON	ON	OFF

*: Reference value.

(DCC solenoid valve will be ON when the operating condition is satisfied)

INSPECTION

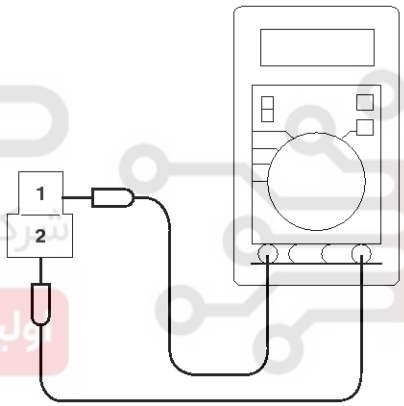
1. If the value is out of specification according to the chart below, remove the valve body cover.



EKRF011A

2. Measure the resistance again after disconnecting solenoid valve connector.

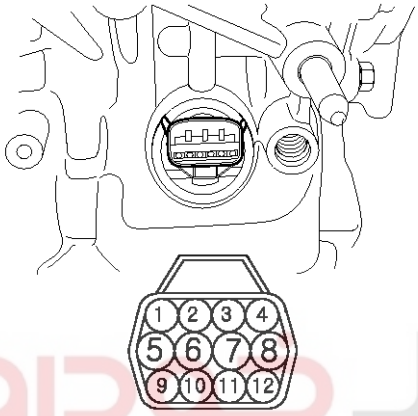
Specification (20˚C):
2.5 ~ 3.5 Ω (LR, 2ND, UD, OD, TCC)



EKRF011B

3. If the value is out of specification replace the solenoid valve.

Pin No.	Name	Resistance
6 & 9	DCC (TCC)	2.5~3.5Ω (20˚C)
6 & 11	LR	
4 & 5	2ND	
3 & 5	UD	
5 & 12	OD	



EKRF011C

VFS(Variable Force Solenoid) Valve

DESCRIPTION

Actuators

Solenoid Valve for Pressure Control

- Sensor type: Normal open 3-way
- Operating temperature : -30°C～130°C(-22°F~266°F)
- Frequency:

LR, 2ND, UD, OD: 61.27Hz (at the ATF temp. above -20°C(-4°F))

DCC: 30.64Hz

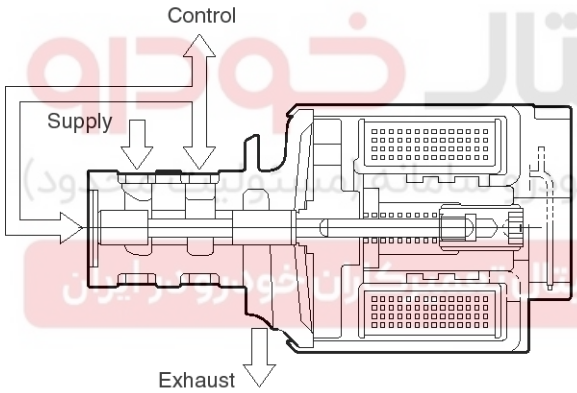
- Internal resistance:

3.0 ± 0.5 Ω (LR, 2ND, UD, OD, TCC)

4.35 ± 0.5 Ω (VFS)

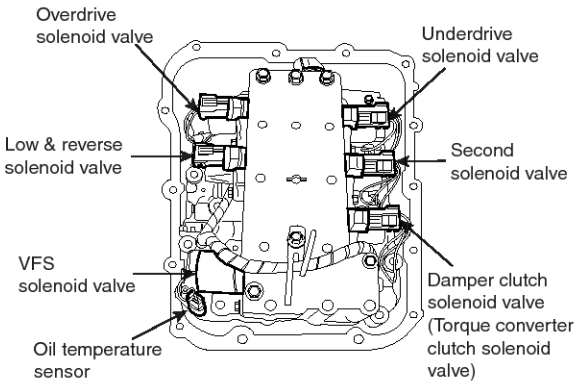
- Surge voltage: 56 V (Except VFS)

(VFS)



EKRF082A

Location



EKRF018K

VFS Control pressure

Input Current(mA)	Control Pressure (No line pressure)			
	Increasing Current			Decreasing Current
	MAX. (Kgf/㎠) [Kpa]	MIN. (Kgf/㎠) [Kpa]	△ (Kgf/㎠) [Kpa]	MIN. (Kgf/㎠) [Kpa]
100	6.52 [639]	5.87 [575]	[64]	
200	6.23 [611]	5.70 [559]	[52]	5.43 [532]
300	5.76 [564]	5.24 [514]	[50]	4.49 [484]
400	5.08 [498]	4.59 [450]	[48]	4.30 [421]
500	4.24 [416]	3.78 [370]	[46]	3.52 [345]
700	2.29 [224]	1.82 [178]	[46]	1.51 [148]
800	1.41 [138]	0.09 [88]	[50]	0.58 [57]
900	0.65 [64]	0.14 [14]	[50]	0 [0]
1,000	0.24 [24]	0 [0]	[24]	
1,100	0.24 [24]	0 [0]	[24]	

*Test condition:

Ps : Supply Pressure (Ps = 7.1 ± 0.3 KGf/㎠)

Pc : Control Pressure

Pex : Exhaust Pressure (Atmosphere pressure)

ATF : DIAMOND ATF SP-III

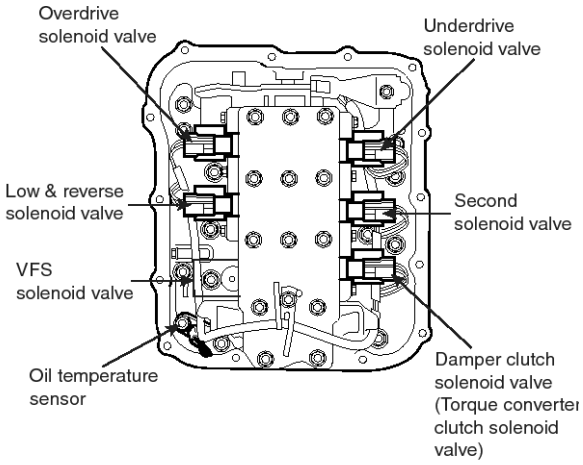
ATF temperature : 30 ± 3°C (86°F)

- Coil resistance : 4.35 ± 35Ω
- Dither Frequency : 600 ± 20Hz

In case of VFS solenoid valve, the relation between Duty and oil pressure can't be expressed.

INSPECTION

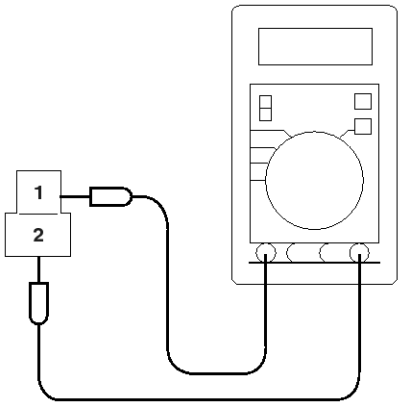
1. If the value is out of specification according to the chart below, remove the valve body cover.



EKRF011A

2. Measure the resistance again after disconnecting solenoid valve connector.

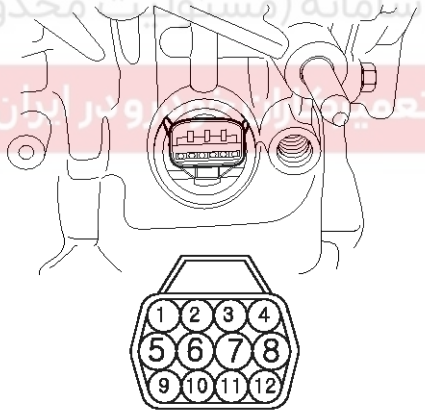
Specification (20˚C):
4.3 ~ 4.4Ω (VFS)



EKRF011B

3. If the value is out of specification replace the solenoid valve.

Pin No.	Name	Resistance
7 & 8	VFS	4.3~4.4Ω (20˚C)



EKRF011C

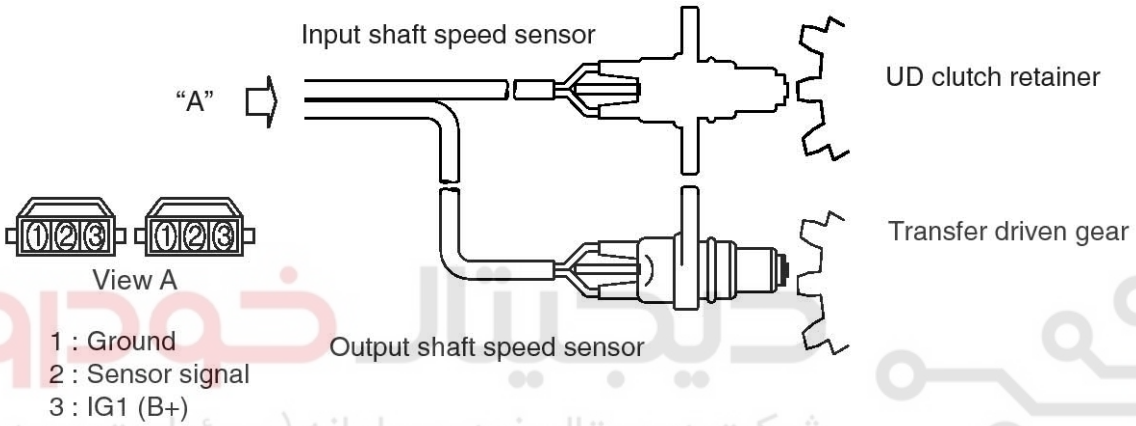
Automatic Transaxle Control System

Input Speed Sensor

DESCRIPTION

Input shaft speed sensor

- Type: Hall sensor
- Current consumption: 22mA (MAX.)
- Sensor body and sensor connector have been unified as one.

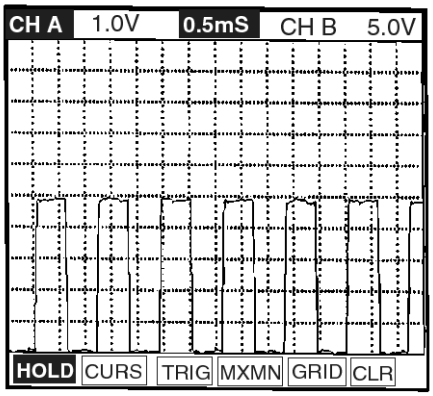


EKRF018A

Hall type sensor: specification

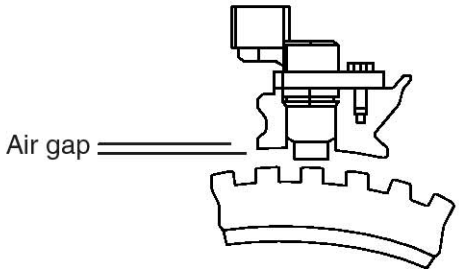
Air gap (mm)	Input shaft speed sensor	1.3
Coil Resistance	Input shaft speed sensor	over 1MΩ
Peak-Peak Voltage	High	4.8~5.2V
	Low	0.8V

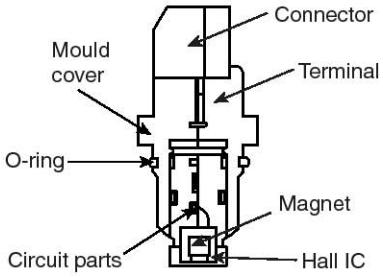
Wave Form With High-scan



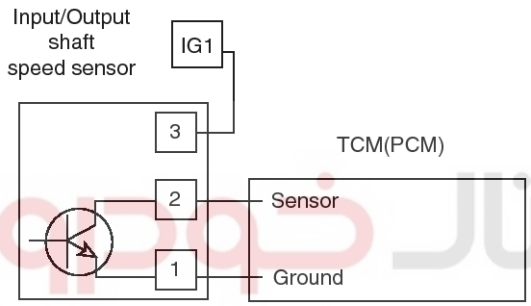
EKRF018B

Hall Type Sensor: Structure & Interface

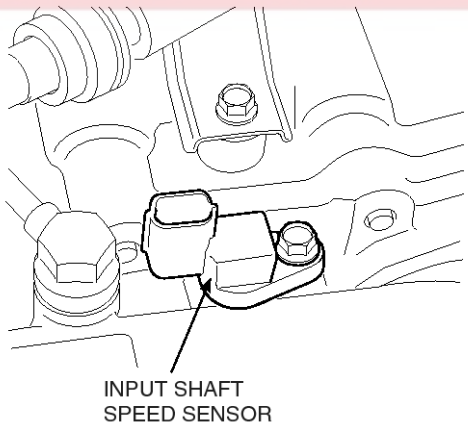




EKRF018E



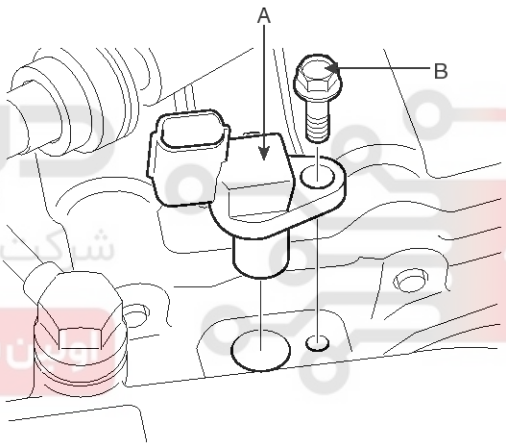
EKRF018C



EKRF018D

REPLACEMENT

1. Remove the battery and air cleaner (see "Transaxle range switch replacement").
2. Remove the transaxle range switch connector.
3. Remove the control cable to transaxle range switch mounting nut.
4. Remove the input shaft speed sensor(A).
   1) Disconnect the input shaft speed sensor connector.
   2) Remove the bolt(B).



EKRF009F

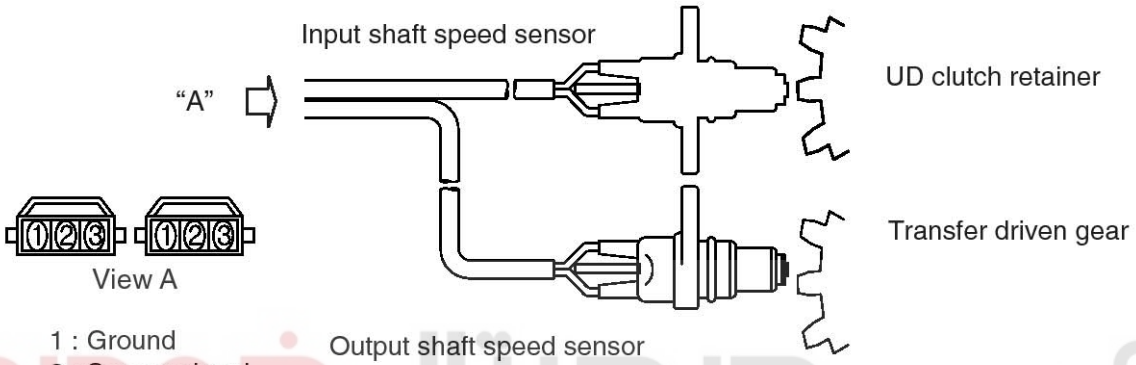
   3) Inspect the input shaft speed sensor bore.
5. Apply a light coat of automatic transaxle fluid to the O-ring seal before installation.
6. Install the input shaft speed sensor.
7. Install the control cable mounting bracket.
8. Connect the input shaft speed sensor connector.
9. Install the holder of the control cable.
10. Adjust the control cable to transaxle range switch and tighten the transaxle manual lever to the control cable mounting nut. (see "Automatic transaxle shift control installation")
11. Installation is the reverse of removal.

Output Speed Sensor

DESCRIPTION

Output shaft speed sensor

- Type: Hall sensor
- Current consumption: 22mA (MAX.)
- Sensor body and sensor connector have been unified as one.

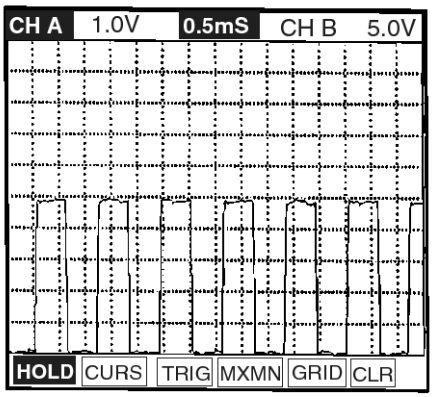


EKRF018A

Hall type sensor: specification

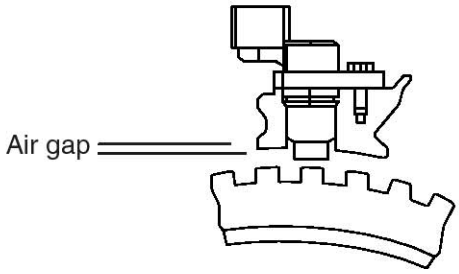
Air gap (mm)	Output shaft speed sensor	0.85
Coil Resistance	Output shaft speed sensor	over 1MΩ
Peak-Peak Voltage	High	4.8~5.2V
	Low	0.8V

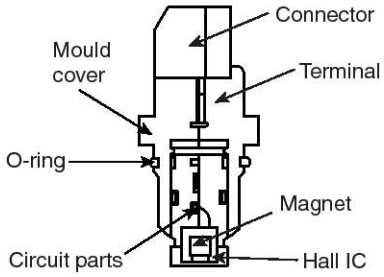
Wave Form With High-scan



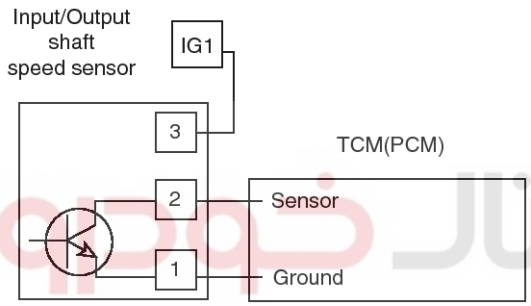
EKRF018B

Hall Type Sensor: Structure & Interface

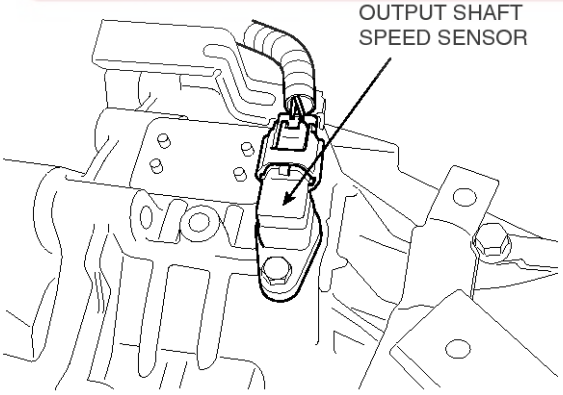




EKRF018E



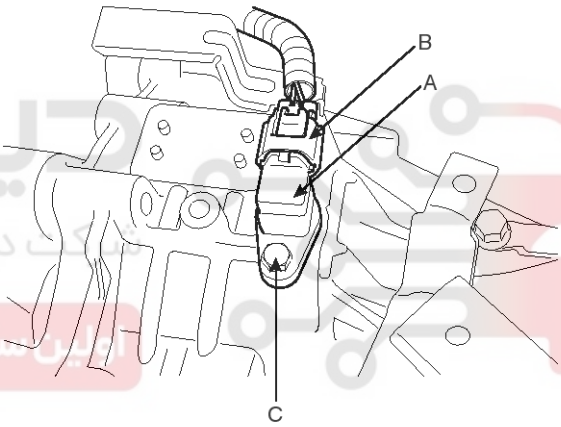
EKRF018C



EKRF018F

REPLACEMENT

1. Remove the battery and air cleaner. (see "Transaxle range switch replacement")
2. Remove the output shaft speed sensor(A).



EKRF010A

   1) Disconnect the output shaft speed sensor connector(B).
   2) Remove the bolt(C).
   3) Inspect the output shaft speed sensor bore.
3. Apply a light coat of automatic transaxle fluid to the O-ring seal before installation.
4. Installation is the reverse of removal.

Transaxle Oil Temperature Sensor

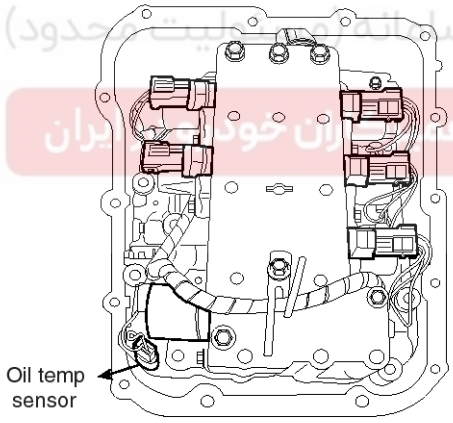
DESCRIPTION

Oil Temperature Sensor

The oil temperature sensor is of the thermistor type, and senses the automatic transaxle fluid temperature. Using the signal from this sensor, TCM(PCM) controls the shift pattern optimally during shift. In order to operate the damper clutch, this signal is also referred.

- Range of temperature : -40˚C～145˚C
- Type: Separated type (High / Low temperature)
- Standard value of internal resistance

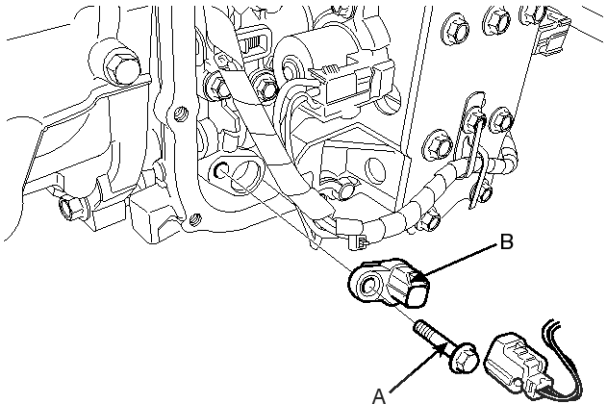
Temp.[˚C(˚F)]	Resistance(kΩ)	Temp.[˚C(˚F)]	Resistance(kΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		



EKRF018G

REPLACEMENT

1. Remove the automatic transaxle assembly.
2. Remove the valve body cover(refer to the overhaul manual).
3. Disconnect the oil temperature sensor connector.
4. Remove the oil temperature sensor(B), loosening the mounting bolt(A).

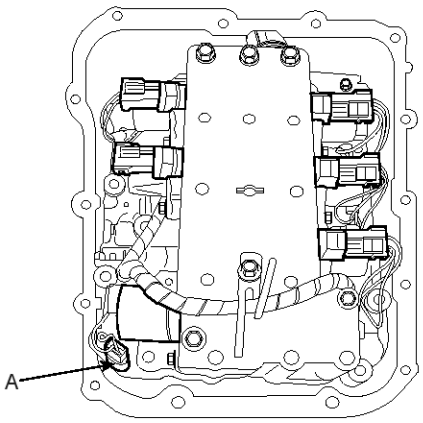


EKRF009C

5. Replace the sensor with the new one and reassemble the rest of the parts.

INSPECTION

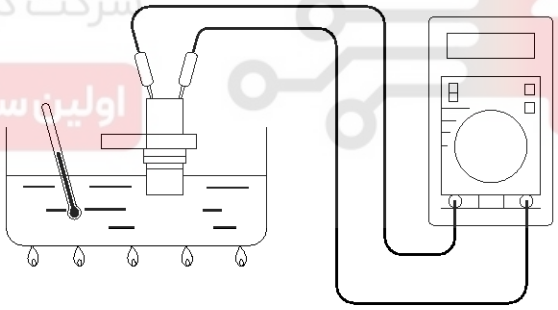
1. Remove the oil temperature sensor(A).



EKRF009D

2. Measure the resistance between the terminal 1 and 2 of the sensor connector.

Temp.[˚C(˚F)]	Resistance(KΩ)
0(32) 100(212)	18.6 0.63



EKRF009E

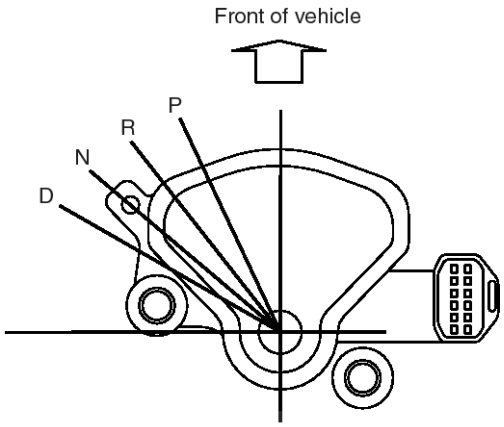
3. If the value is out of the specfication, replace the oil temperature sensor.

Inhibiter Switch

DESCRIPTION

Inhibitor Switch

- Type: Rotary contact type
- Range of temperature : -40˚C～145˚C(-40˚F～293˚F)



EKRF018H

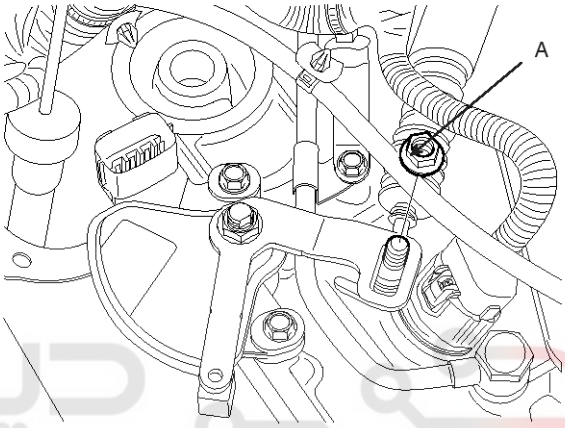
Inhibitor Switch - Continuity check(Sports mode)

Range	Terminal Number									
	1	2	3	4	5	6	7	8	9	10
P			○					○	○	○
R							○	○		
N				○				○	○	○
D	○							○		

EKRF018I

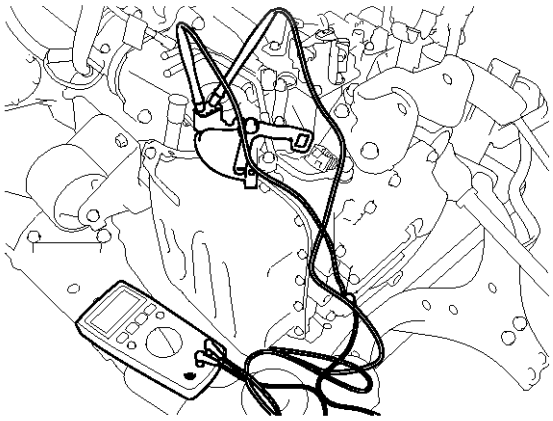
REPLACEMENT

1. Pull up the parking brake.
2. Position the shift lever in 'N' range.
3. Remove the air cleaner assembly.
4. Remove the battery.
5. Remove the battery tray.
6. Remove the inhibiter switch connector.
7. Remove the shift cable mounting nut(A).



EKRF008E

8. Remove the inhibiter switch loosening the mounting bolts.
9. Refering to 'INSPECTION', check for continuity. If there is an error, replace the inhibiter switch.



EKRF008F

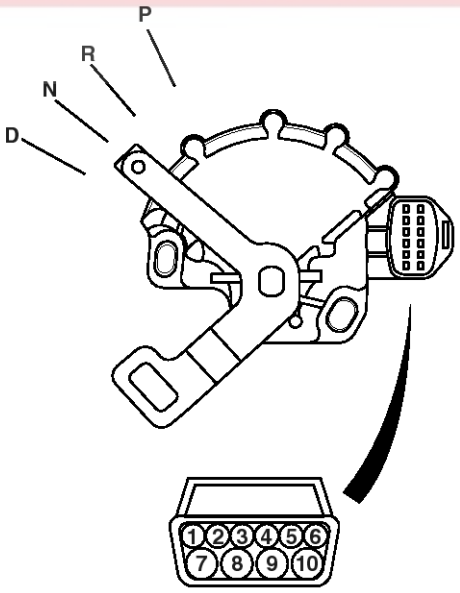
10. After tightening the shift cable mounting nut, connect the inhibiter switch.
11. Install the battery, battery tray and the air cleaner assembly.

INSPECTION

1. Check for the starter motor when the ignition switch is at 'START' position and the shift lever at 'P' or 'N' range.
2. Check for the rear lamp when the ignition switch if it does not work properly.
3. Check for the inhibiter switch if it does not work properly.
4. If the inhibiter switch is not fixed in a proper position, reassemble it in the right position.
5. Re-check 1 and 2 procedures.
6. Using a scan tool, confirm the DTCs.
7. Disconnect the battery (-) terminal and the inhibiter switch.
8. Check for continuity between terminals at the switch connector.

Range	Terminal Number									
	1	2	3	4	5	6	7	8	9	10
P			○					○	○	○
R							○	○		
N				○				○	○	○
D	○							○		

EKRF008G

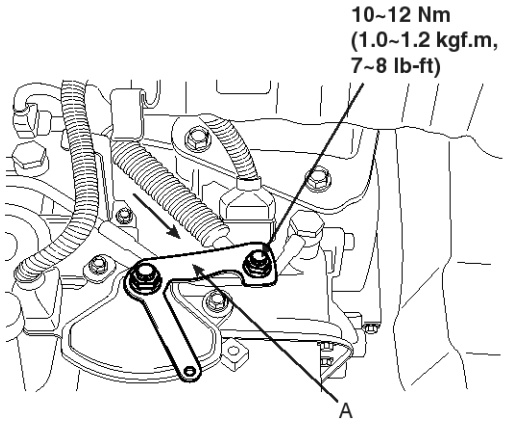


EKRF008H

9. If there is not continuity between the terminals in the table above for each switch position, replace the inhibiter switch.

ADJUSTMENT

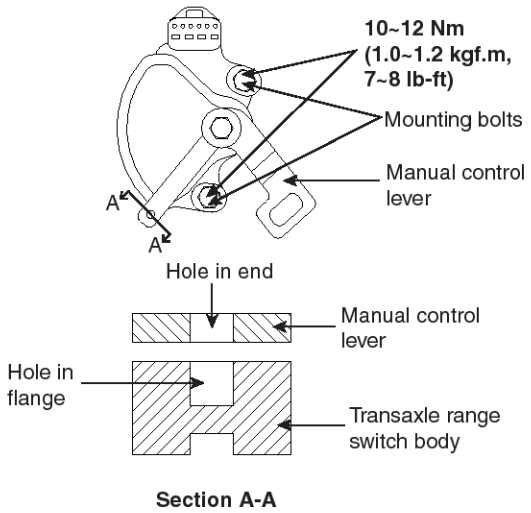
1. Set the select lever to the "N" position.
2. Loosen the control cable to manual control lever coupling nut to free the cable and lever.
3. Set the manual control lever to the neutral position.



EKRF009A

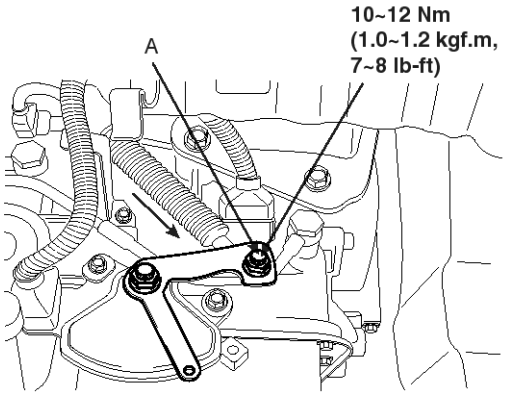
4. Loosen the transaxle range switch body mounting bolts and then turn the transaxle range switch body so the hole in the end of the manual control lever and the hole (cross section A-A in the figure) in the flange of the transaxle range switch body flange are aligned.
5. Tighten the transaxle range switch body mounting bolts to the specified torque. Make sure at this time that the position of the switch body did not move.

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



EKRF009B

6. Gently pull the transmission control cable in the direction of the arrow, and then tighten the adjusting nut.



EKRF090A

7. Check that the select lever is in the "N" position.