

# Automatic Transaxle (F4A42)

**GENERAL**

**AUTOMATIC TRANSAXLE SYSTEM**  
AUTOMATIC TRANSAXLE

**AUTOMATIC TRANSAXLE CONTROL SYSTEM**

SHIFT LEVER

## GENERAL

### SPECIFICATION EF2E291E

Item	F4A42	
Torque converter type	3-element, 1-stage, 2-phase type	
Transaxle type	4-speed forward, 1-speed reverse	
Engine displacement	2.4L GSL	
Gear ratio	1st	2.842
	2nd	1.529
	3rd	1.000
	4th	0.712
	Reverse	2.480
Final gear ratio	3.770	
Shift pattern	Variable	
Shift range	4range ( P-R-N-D) + Sports mode	
Shift range valve	PWM ; 5EA(Duty control) , VFS	
Stall speed	2100~2900rpm	
Planetary gear	2EA(Output planetary/Overdrive planetary)	
Clutch	3EA	
Brake	2EA	
OWC	1EA	

### SERVICE STANDARD

Items	Standard value
Output shaft preload	0.01-0.09 mm (0.0004-0.0035 in)
Brake reaction plate end play	0-0.16 mm (0-0.0063 in)
Low and reverse brake end play	1.65-2.11mm (0.065-0.083 in)
Second brake end play	0.79-1.25 mm (0.0311-0.0492 in)
Underdrive sun gear end play	0.25-0.45 mm (0.0098-0.0177 in)
Input shaft end play	0.70-1.20 mm (0.0276-0.0472 in)
Differential case preload	0.045-0.105 mm (0.0018-0.0041 in)
Underdrive clutch end play(wave disk)	1.6-1.8 mm (0.0630-0.0709 in)
Overdrive clutch return spring retainer end play	0-0.09 mm (0-0.0035 in)
Overdrive clutch end play(wave disk)	1.6-1.8 mm (0.0630-0.0709 in)
Reverse clutch end play	1.5-1.7 mm (0.0590-0.0609 in)
Backlash between differential side gear and pinion	0.025-0.150 mm (0.001-0.006 in)

## TIGHTENING TORQUE

ITEM	N-m	kgf-cm	lbf-ft
Wiring harness bracket	20 ~ 26	200 ~ 260	14 ~ 18
Control cable bracket bolt	20 ~ 26	200 ~ 260	14 ~ 18
Eye bolt	27 ~ 33	270 ~ 330	20 ~ 25
Oil cooler feed tube	10 ~ 12	100 ~120	7 ~ 8
Input shaft speed sensor	10 ~ 12	100 ~ 120	7 ~ 8
Output shaft speed sensor	10 ~ 12	100 ~ 120	7 ~ 8
Manual control lever	18 ~ 25	180 ~ 250	13 ~ 18
Transaxle range switch	10 ~ 12	100 ~ 120	7 ~ 8
Speedometer gear	4 ~ 6	40 ~ 60	3 ~ 4
Valve body cover	8 ~ 10	80 ~ 100	6 ~ 7
Valve body mounting bolt	10 ~ 12	100 ~ 120	7 ~ 8
Oil temperature sensor	10 ~ 12	100 ~ 120	7 ~ 8
Manual control shaft detent	5 ~ 7	50 ~ 70	4 ~ 5
Rear cover	20 ~ 26	200 ~ 260	14 ~ 18
Torque converter housing	42 ~ 54	420 ~ 540	29 ~ 38
Oil pump	20 ~ 26	200 ~ 260	14 ~ 18
Transfer drive gear	16 ~ 22	160 ~ 220	11 ~ 15
Output shaft lock nut	160 ~ 180	1600 ~ 1800	110 ~ 126
Output shaft bearing retainer	20 ~ 26	200 ~ 260	14 ~ 18
Oil filler plug	29 ~ 34	290 ~ 340	21.4 ~ 25.1
Oil drain plug	40 ~ 50	400 ~ 500	29 ~ 36
Transfer drive gear lock nut	180 ~ 210	1800 ~ 2100	126 ~ 147
Differential drive gear to subframe bolts	130 ~ 140	1300 ~ 1400	91 ~ 98
Valve body	10 ~ 12	100 ~ 120	7 ~ 8
Solenoid valve support	5 ~ 7	50 ~ 70	4 ~ 5
Plate	5 ~ 7	50 ~ 70	4 ~ 5
Pressure check plug	8 ~ 10	80 ~ 100	6 ~ 7
Front roll stopper bracket to subframe bolts	40 ~ 55	400 ~ 550	29 ~ 40
Front roll stopper insulator bolt and nut	50 ~ 65	500 ~ 650	36 ~ 47
Front roll stopper bracket to transaxle bolts	60 ~ 80	600 ~ 800	43 ~ 58
Rear roll stopper bracket	40 ~ 55	400 ~ 550	29 ~ 40
Rear roll stopper insulator bolt and nut	50 ~ 65	500 ~ 650	36 ~ 47
Rear roll stopper bracket to transaxle bolts	60 ~ 80	600 ~ 800	43 ~ 58
Transaxle mounting sub bracket nut	60 ~ 80	600 ~ 800	43 ~ 58
Transaxle mounting bracket bolts	40 ~ 55	400 ~ 550	29 ~ 40
Transaxle mounting insulator bolt	90 ~ 110	900 ~ 1100	65 ~ 80

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**AUTOMATIC TRANSAXLE (F4A42)**

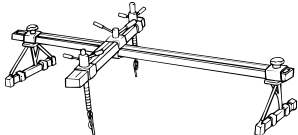
**LUBRICANT**

Item	Specified lubricant	Quantity
Transmission oil	Diamond ATF SP-III	7.8ℓ (8.2 Us qt, 6.9Imp.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** E1CA2B47

TOOL (Number and name)	Illustration	Use
09200 - 38001 Engine support fixture	 D0038001	Removal and installation of transaxle.

# **AUTOMATIC TRANSAXLE SYSTEM**

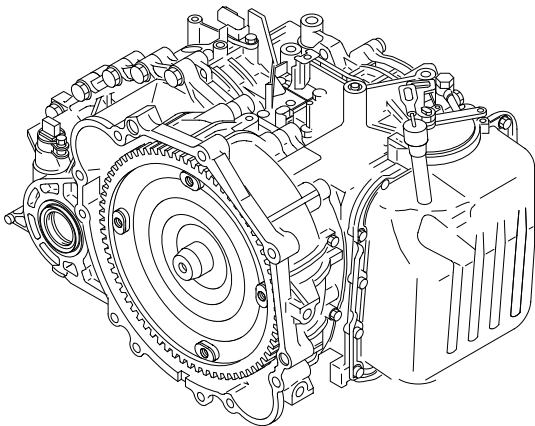
## **DESCRIPTION** EE73B93F

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.

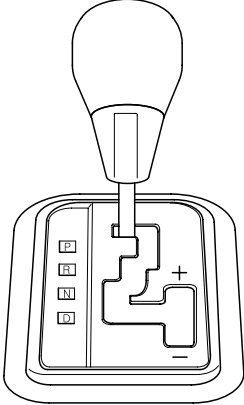
## **CHARACTERISTICS**

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.



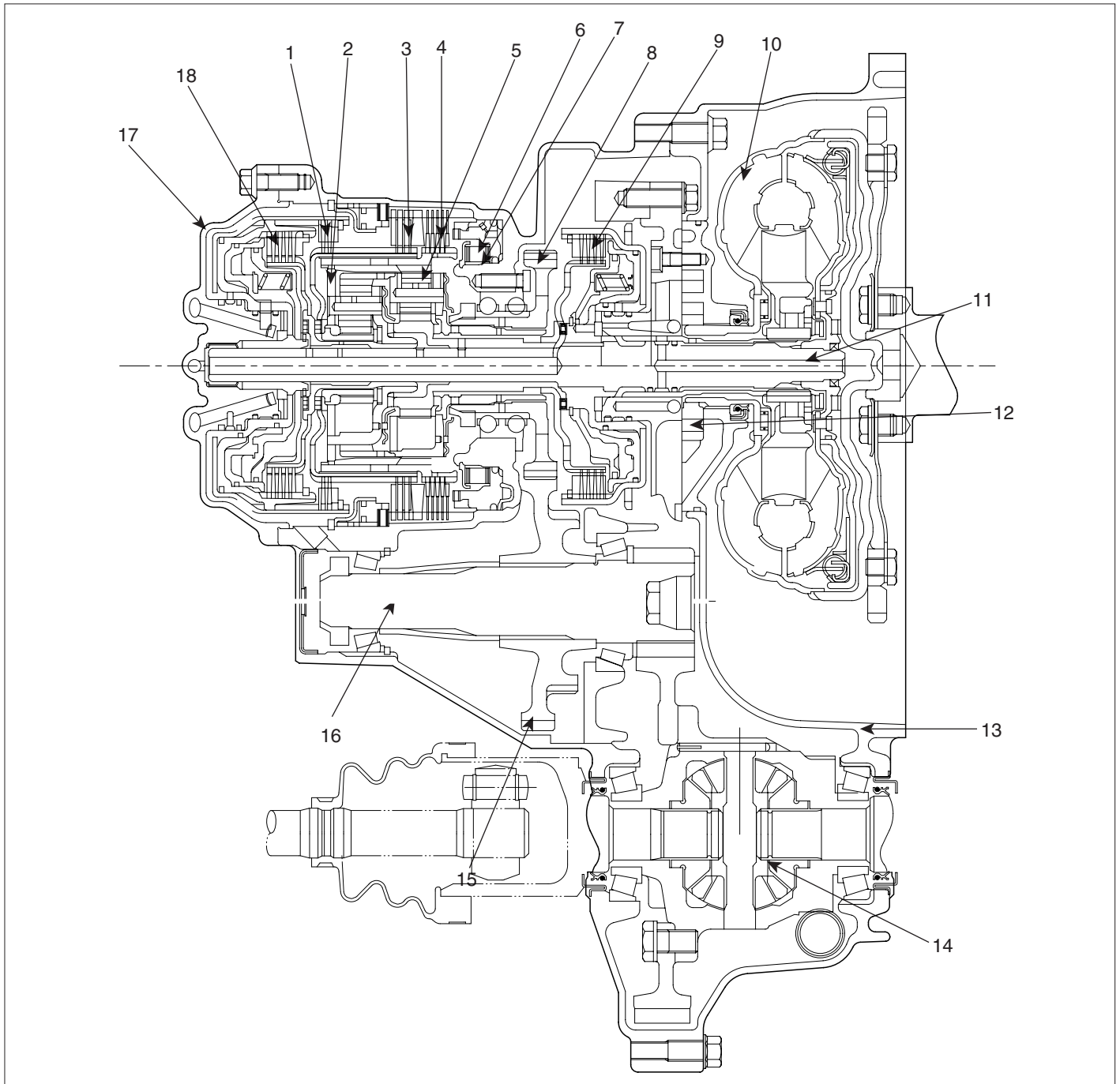
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Item	Details
Weight Reduction	<ol style="list-style-type: none"><li>1. Aluminum oil pump<ul style="list-style-type: none"><li>- 2.3kg Approx</li></ul></li><li>2. Pressed parts<ul style="list-style-type: none"><li>- Retainer and hub of brakes and clutches</li><li>- Carrier of planetary gear set</li></ul></li></ol>
Better shift quality	<ol style="list-style-type: none"><li>1. Independent control of clutches and brakes enabled better control of hydraulic pressure and skip shift possible (4 to 2, 3 to 1)</li><li>2. During N to D or N to R shift, feedback control adopted.</li><li>3. When starting from Creep condition, reduction of shock.(Creep condition is controlled with 1st gear)</li><li>4. Solenoid valve frequency is increased for more accurate control. 35Hz to 61.3Hz except DCSSV that is 35Hz and VFS that is 600Hz.</li><li>5. HIVEC adoption for better shift feeling.</li><li>6. Variable shift pattern.</li></ol>
Increase in Power train efficiency	<ol style="list-style-type: none"><li>1. Fully Variable Line Pressure</li><li>2. VFS(Variable Force Solenoid)</li></ol>
Dynamic drive by sports mode	<ul style="list-style-type: none"><li>- Manual shifting possible</li><li>- Step gate type shift lever</li></ul>  <p>The diagram shows a top-down view of a step-gate type shift lever. It features a central vertical shaft with a bulbous knob on top. The base of the lever is a rectangular housing with a gear pattern. The gear pattern includes a central 'N' (Neutral) position, a '+' (Drive) position to the right, and a '-' (Reverse) position to the left. The gear pattern is designed for manual shifting.</p>

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**AUTOMATIC TRANSAXLE SYSTEM**

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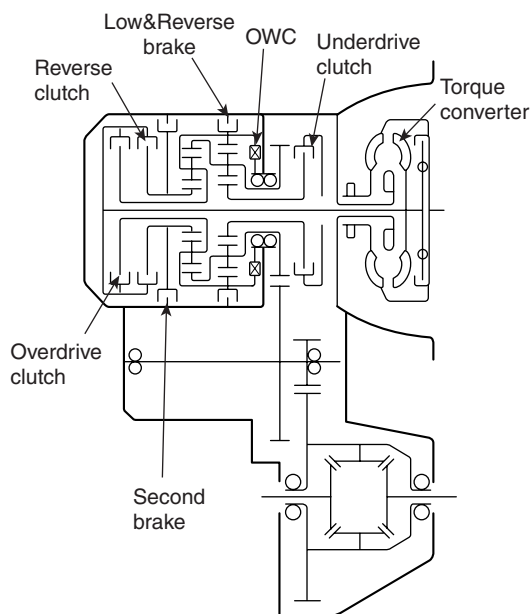
- |                                 |                          |
|---------------------------------|--------------------------|
| 1. Reverse clutch               | 10. Torque converter     |
| 2. Overdrive planetary gear set | 11. Input shaft          |
| 3. Second brake                 | 12. Oil pump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

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**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



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**OPERATING ELEMENTS**

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

- 1) O : 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 a 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).

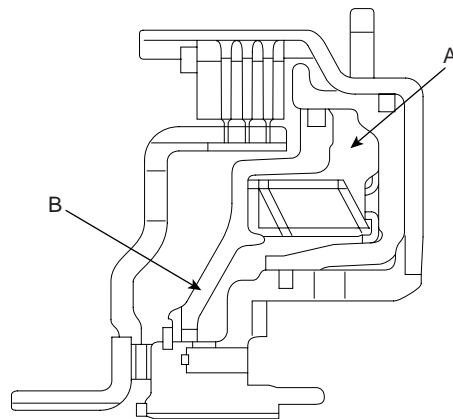
The components comprising the under clutch are as illustrated below.

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.

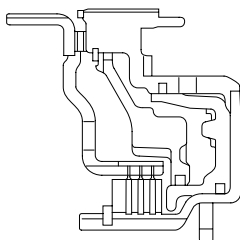
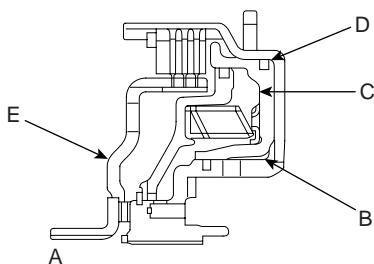
At high speed, fluid remaining in the piston pressure chamber is subjected to centrifugal force and attempts to push the piston.

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.



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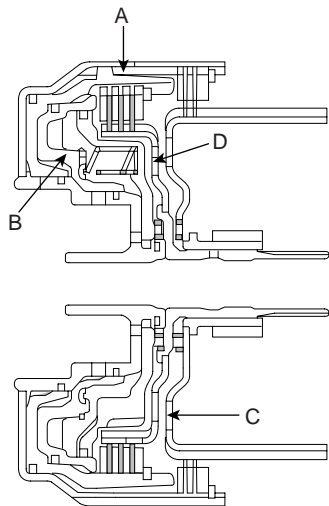
**AT -10**

**AUTOMATIC TRANSAXLE (F4A42)**

**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.



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**BRAKES**

The gear changing mechanism utilizes two multi-disc brakes.

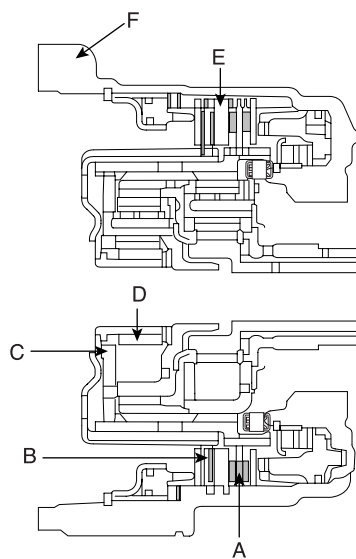
**LOW & REVERSE BRAKE AND SECOND BRAKE**

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.



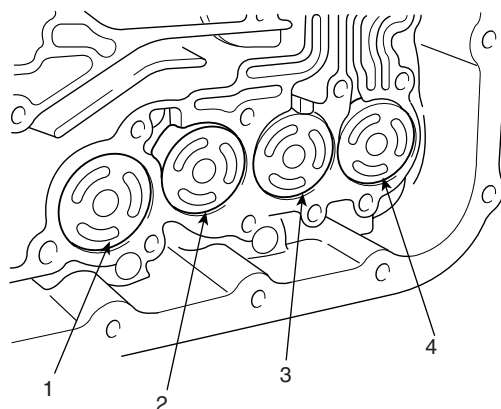
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**OWC**

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 new concept, because this OWC already has been installed on the:

**ACCUMULATORS**

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



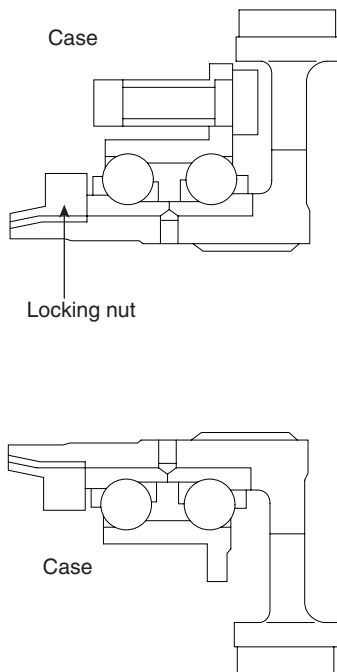
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**OBJECTIVE**

- \* 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**

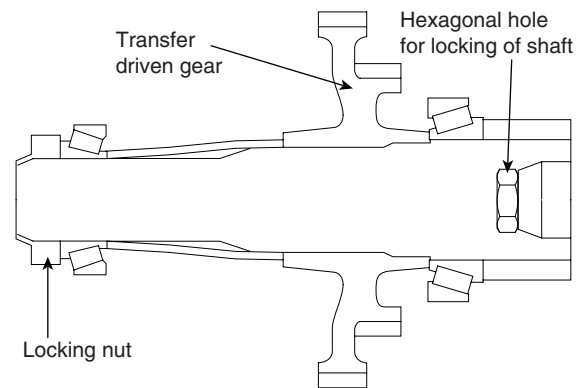
With the transfer drive gear, increased tooth height and a higher contact ratio have reduced gear noise. Also, the bearing that supports the drive gear is a pre-loaded type that eliminates rattle, and the rigidity of the gear mounting has been increased by bolting the bearing directly onto the case.



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**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.



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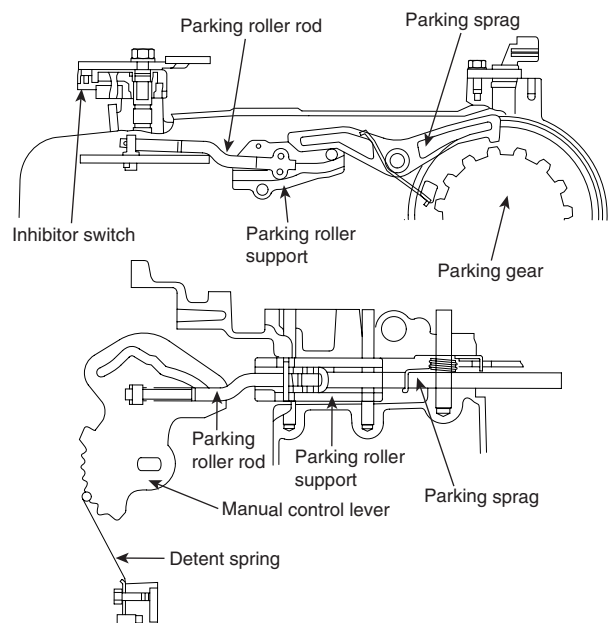
**MANUAL CONTROL SYSTEM**

**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.



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**AT -12**

**AUTOMATIC TRANSAXLE (F4A42)**

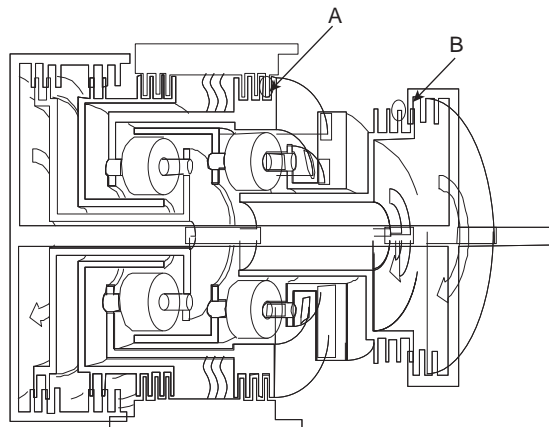
**POWER TRAIN** EBBADCC7

**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**

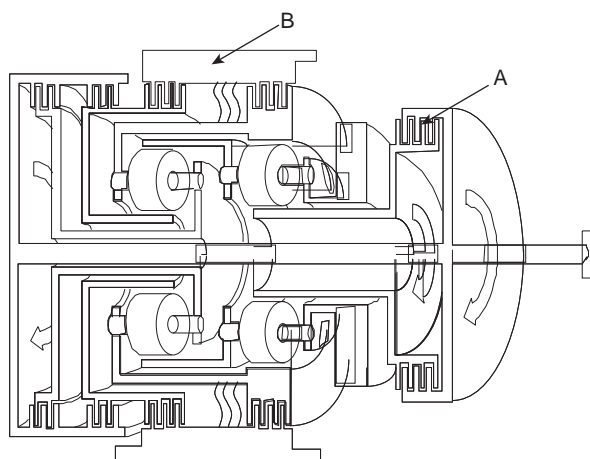
Hydraulic pressure is applied to the LR brake(A) and the RED brake, so power is not transmitted from the input shaft to the UD clutch or OD clutch.



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**2ND GEAR POWER FLOW**

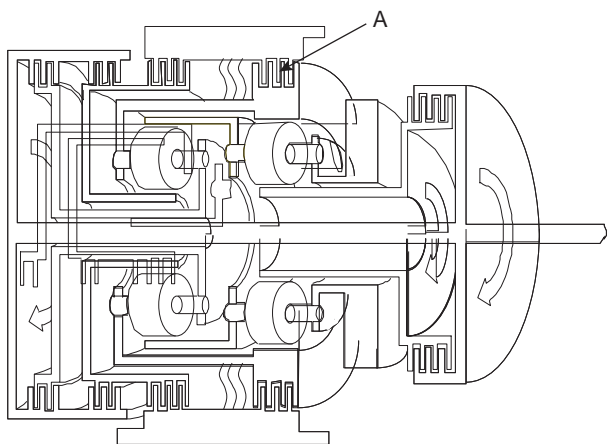
Hydraulic pressure is applied to the UD clutch(A) the 2nd brake(B) and the one way clutch(OWC), then the UD clutch transmits driving force from the input shaft to the UD sun gear, and the 2nd brake locks the reverse sun gear to the case. The UD sun gear of the planetary gear drives the output pinion 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.



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**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

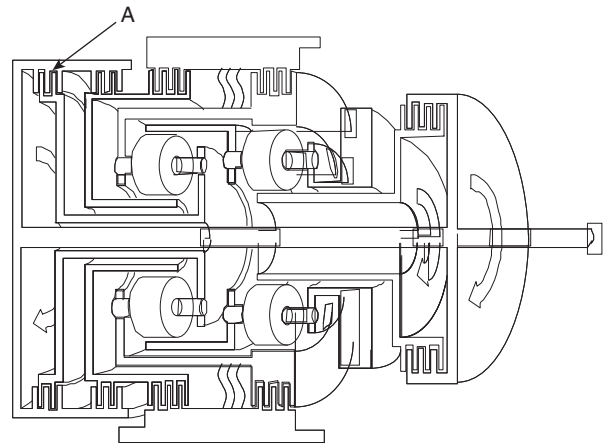


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**1ST GEAR POWER FLOW**

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 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.

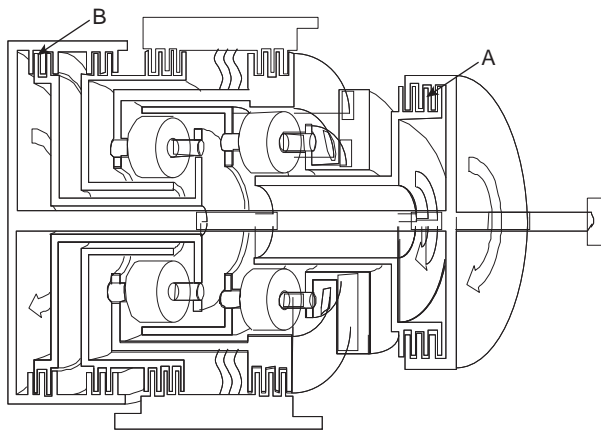
planetary carrier and low & reverse annulus gear. The UD sun gear of the planetary gear drives the output pinion gear and the LR annulus gear, and the LR annulus gear drives the OD pinion gear through the OD planetary carrier, and the OD pinion gear drives the reverse sun gear and the output carrier. 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.



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**REV GEAR POWER FLOW**

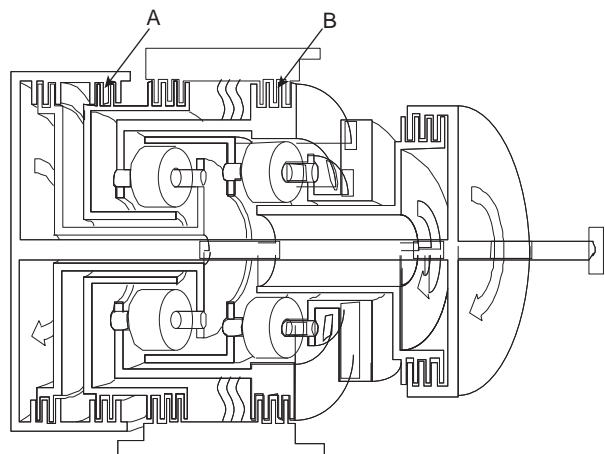
Hydraulic pressure is applied to the reverse clutch(A) and the LR brake(B), then the reverse clutch transmits driving force from the input shaft to the reverse sun gear, and the LR brake locks the LR annulus gear and OD planetary carrier to the case. The reverse clutch drives the reverse sun gear, and 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.



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**4TH GEAR POWER FLOW**

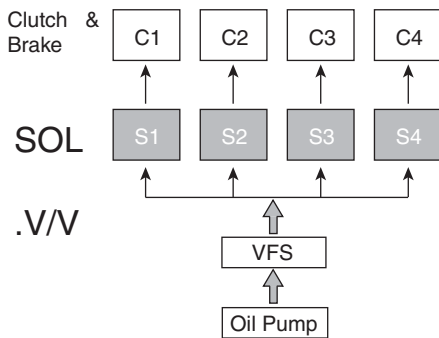
Hydraulic pressure is applied to the OD clutch(A) and the 2nd brake(B), then the OD clutch transmits driving force from the input shaft to the OD planetary carrier and LR annulus gear, and the 2nd brake locks the reverse sun gear to the case. The OD clutch drives the OD carrier, and the OD carrier drives 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.



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HYDRAULIC CONTROL SYSTEM

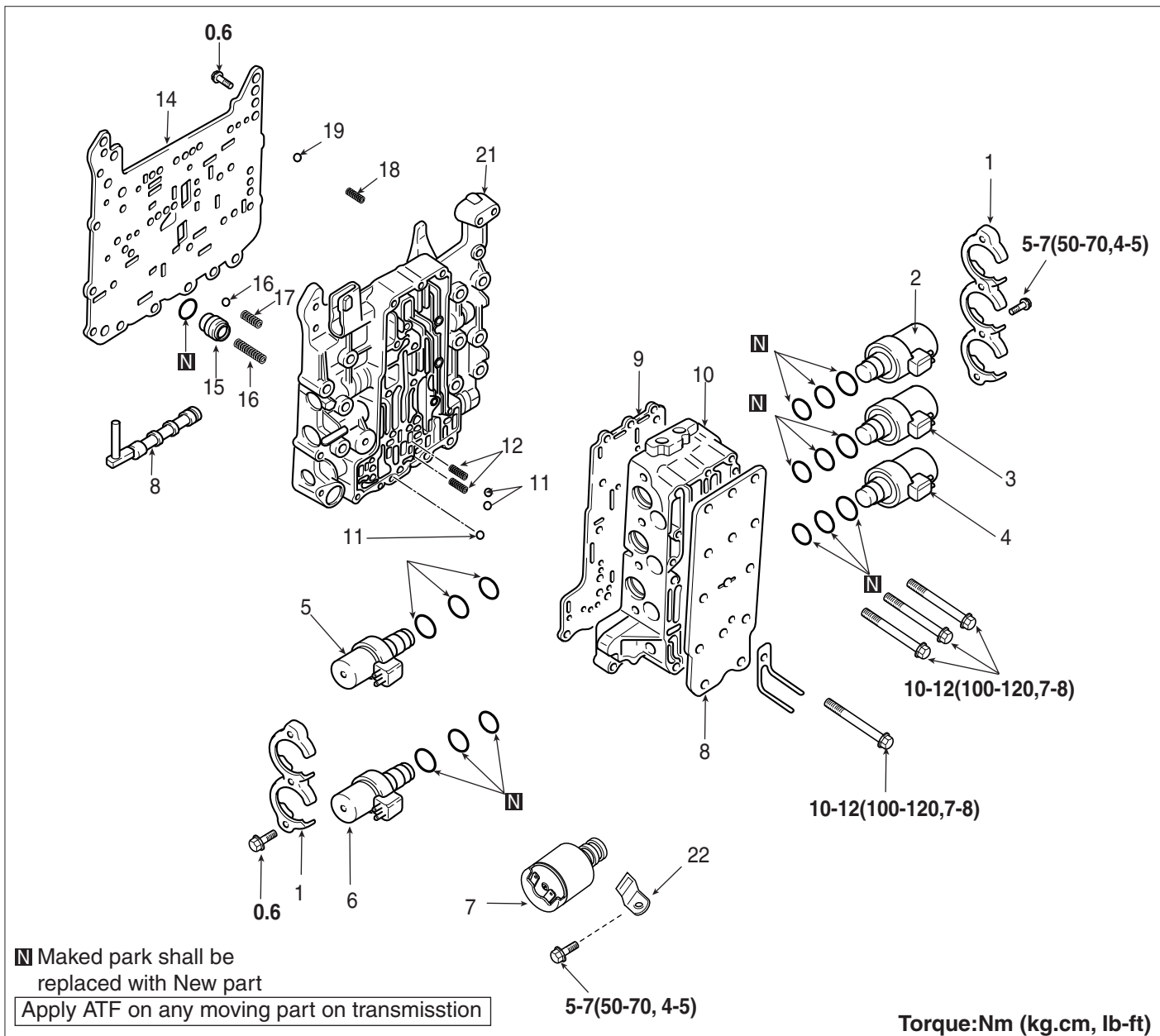
DESCRIPTION



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

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- 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 optimum line pressure and improve the efficiency of power transmission according to maximize the efficiency of oil pump, VFS(Variable Force Solenoid) valve has been added in the valve body hydraulic circuit.



**Disassembly steps**

- 1. Solenoid valve support
- 2. UD clutch solenoid valve
- 3. 2nd brake solenoid valve
- 4. Damper clutch control solenoid 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

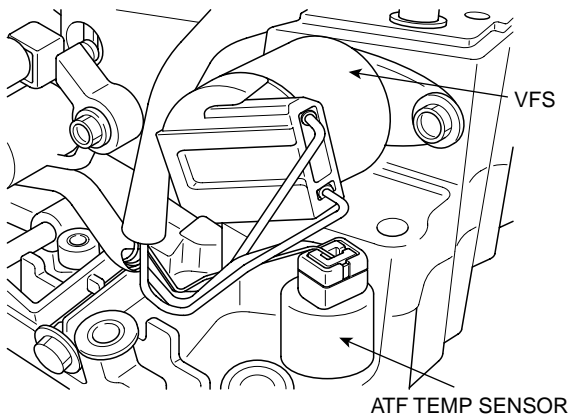
- 12. Still ball (Orifice check ball)
- 13. Spring
- 14. Plate
- 15. Damping valve
- 16. Damping valve spring
- 17. Steel ball (line relief)
- 18. Spring
- 19. Steel ball (Orifice check ball)
- 20. Spring
- 21. Inside valve body assembly
- 22. VFS plate

**VFS (VARIABLE FORCE SOLENOID)**

**VRS Function**

The spool rod in VFS does not go and come back 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.



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**Characteristics of Bosch VFS:**

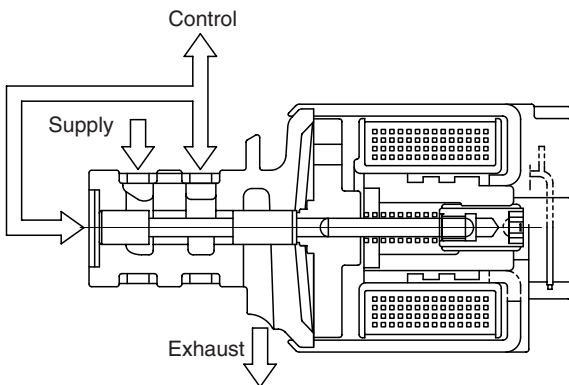
Supply pressure : 700~1600kPa

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

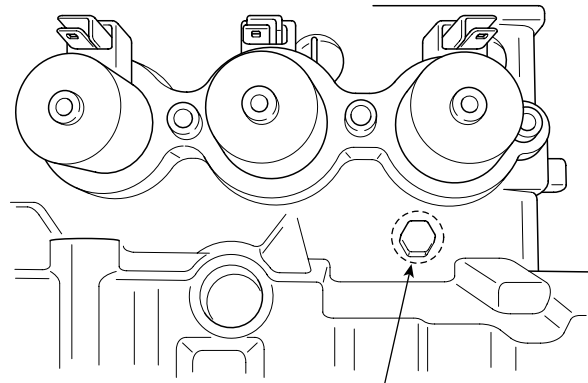


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The reducing pressure will be supplied to the 'Supply' port of the VFS valve on the above illustration to control the line pressure.

**REDUCING PRESSURE**

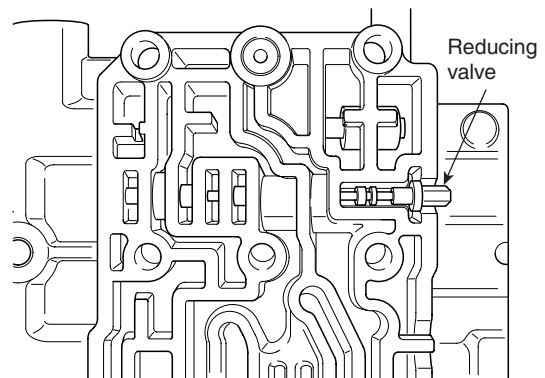
**FUNCTION**



Adjusting screw for reducing pressure

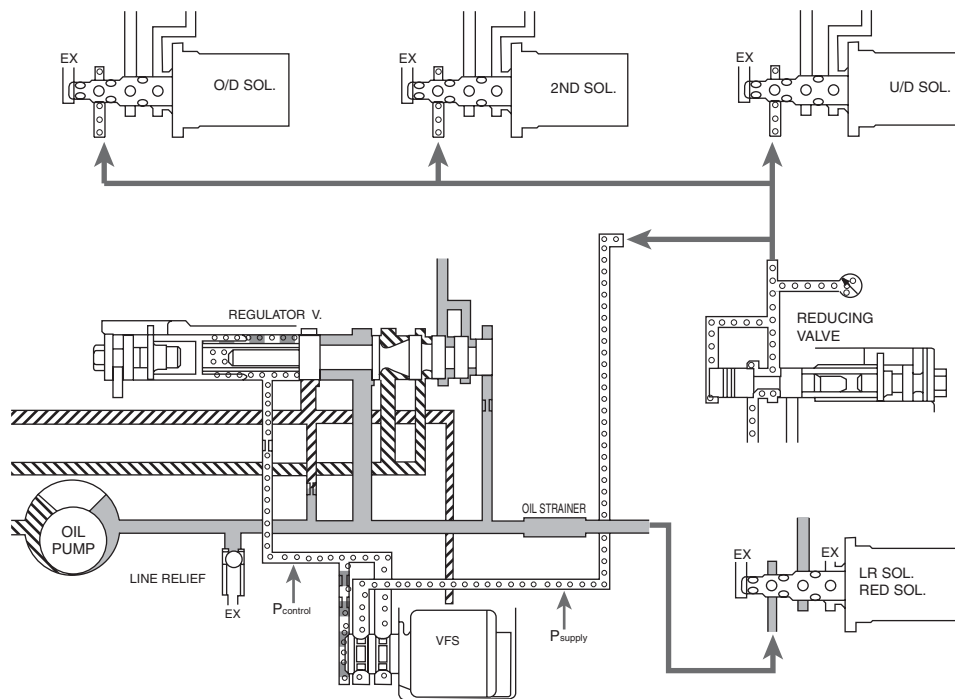
EKRF083A

As same as one of Alpha or Beta automatic transaxle system, this reducing valve length can be adjusted rotating the screw on the picture. As 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 L & R, RED and DCC solenoids), 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 LR and RED solenoid because the variable line pressure is not available at reverse range.

**HYDRULIC PRESSURE TABLE**

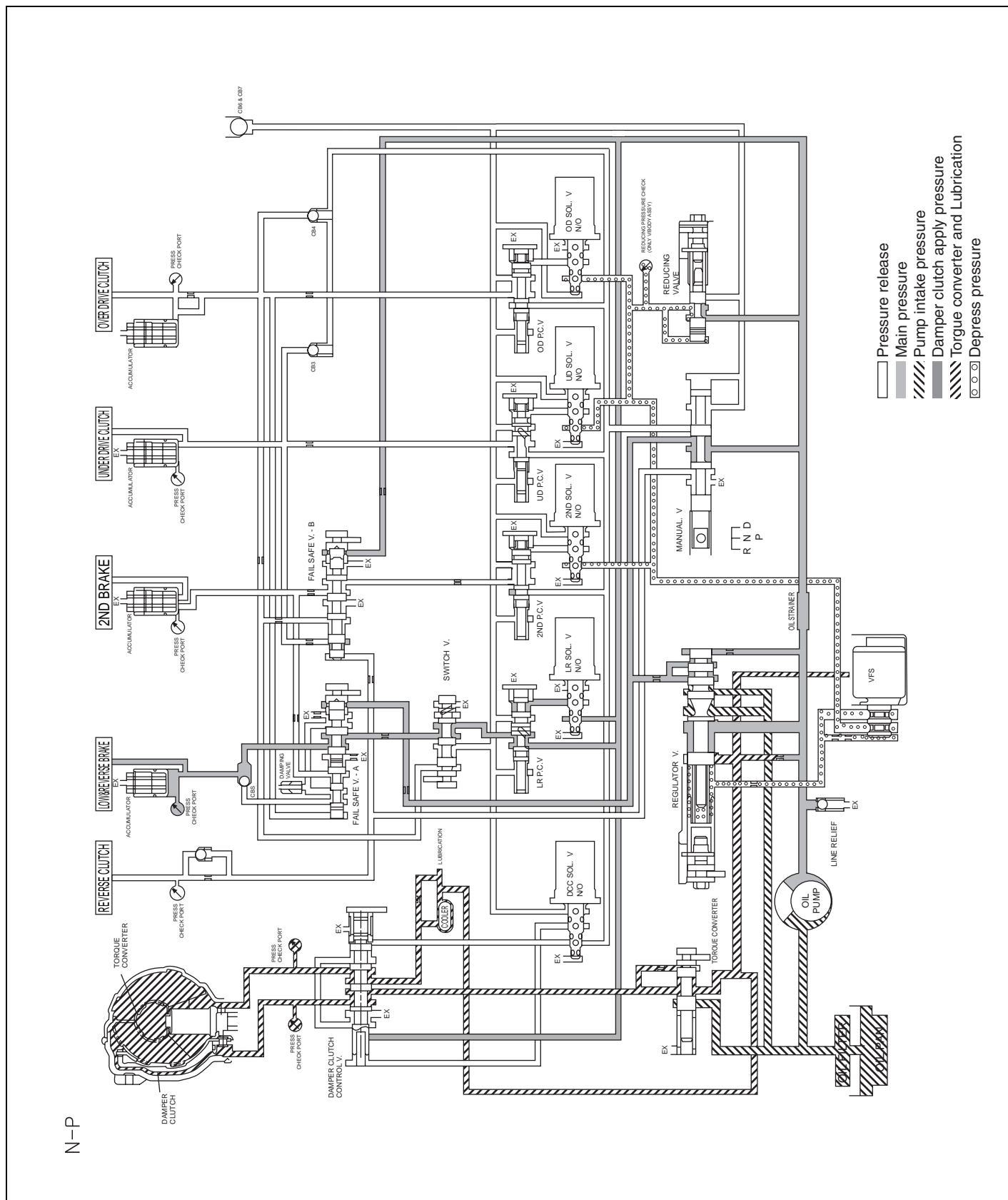
Under the constant current amount of VFS (200mA), the line pressure will become as below table. Be sure that the following data can be achieved by specific special facility or

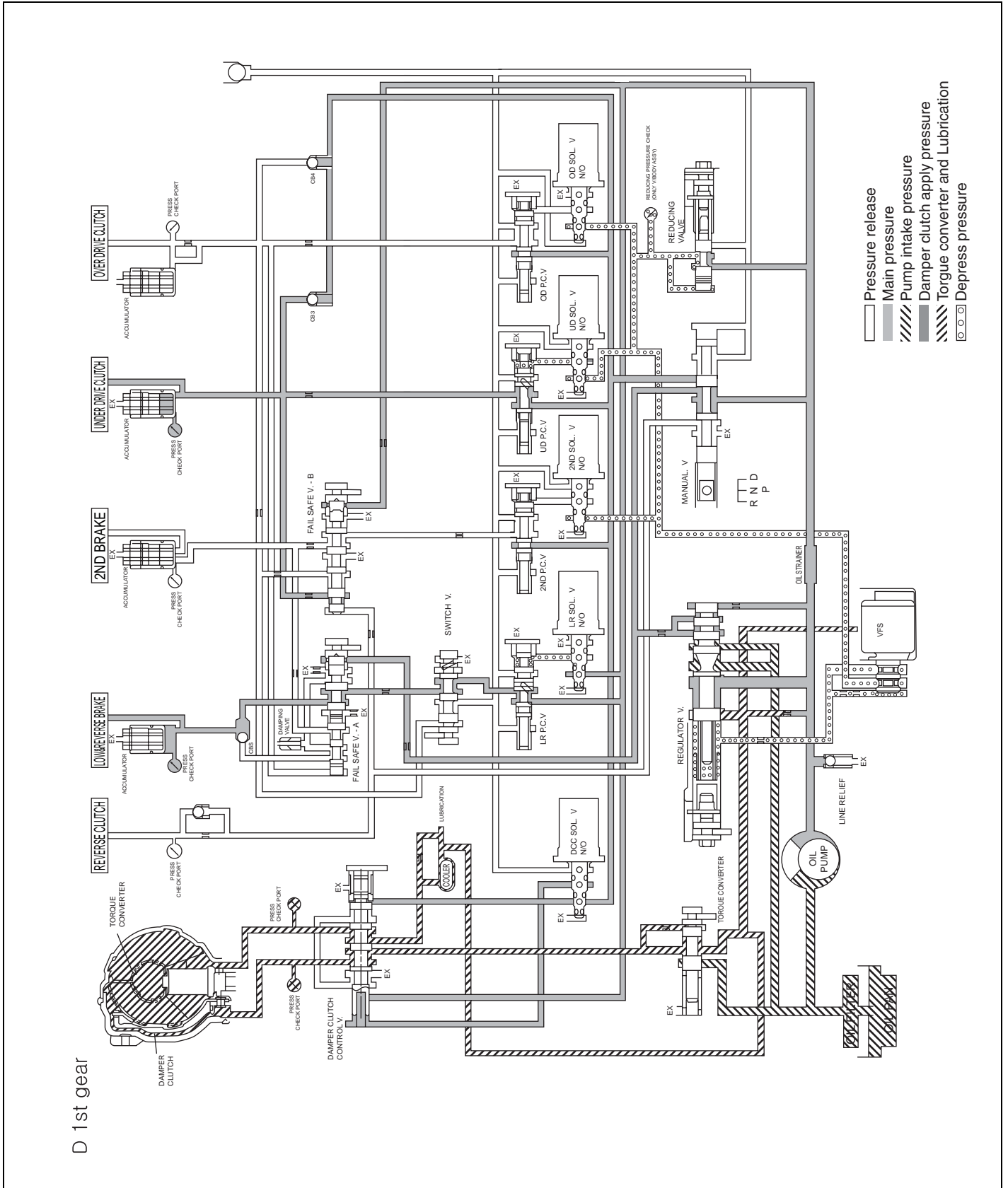
device to check the performance of A/T assembly (not on the vehicle), however we can refer the maximum pressure value according to the each element.

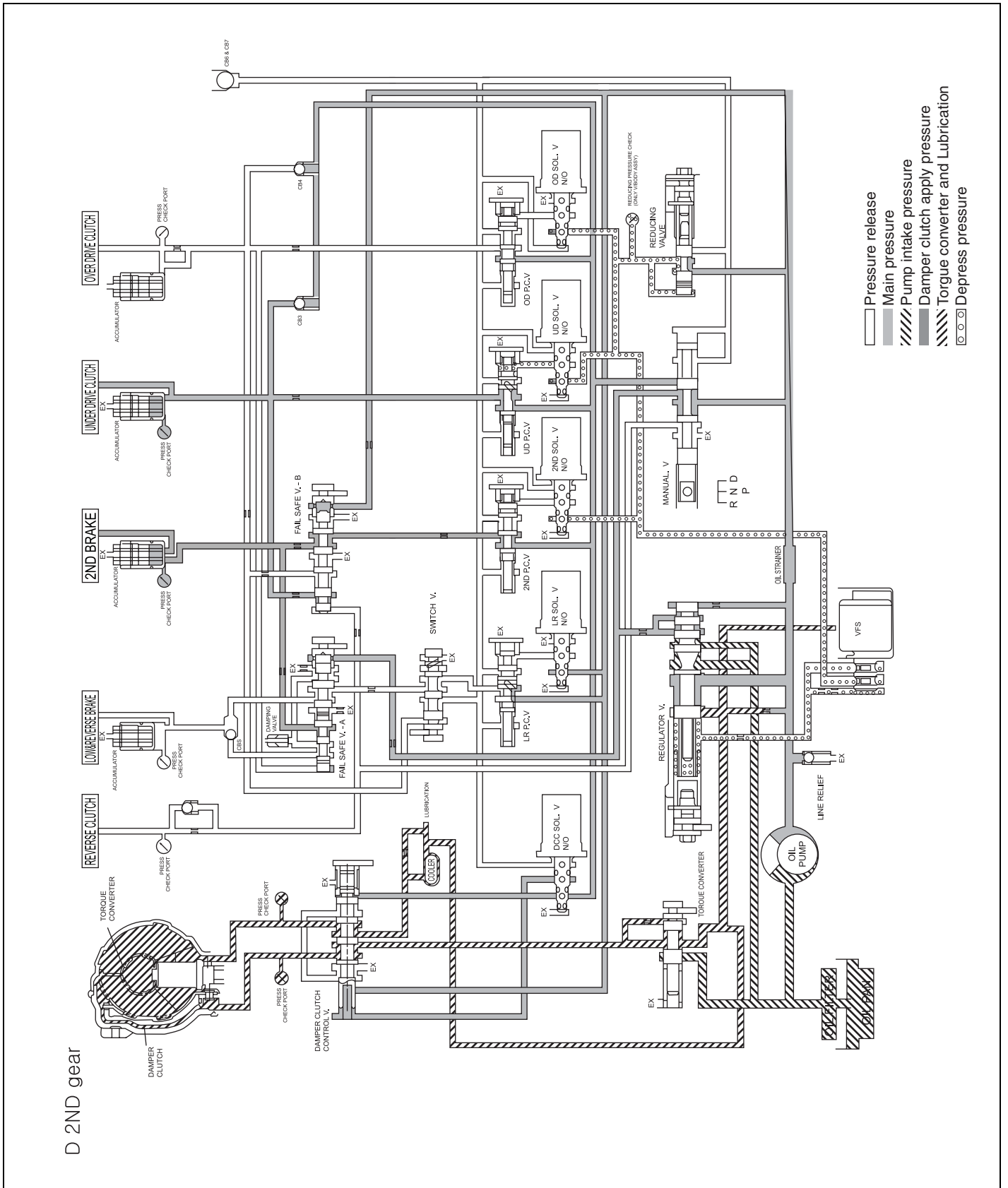
Solenoid valve Duty( %)					Measured Element	Pressure kPa(Psi)
LR	2ND	UD	OD	RED*		
0	100	0	100	0	LR	1030±20(149±3)
60	↑	↑	↑	↑		520±40(75±6)
75	↑	↑	↑	↑		230±40(33±6)
100	↑	↑	↑	↑		0
100	0	0	100	0	2ND	1030±20(149±3)
↑	60	↑	↑	↑		550±40(80±6)
↑	75	↑	↑	↑		220±40(32±6)
↑	100	↑	↑	↑		0
100	100	0	0	0	OD	1030±20(149±3)
↑	↑	↑	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:

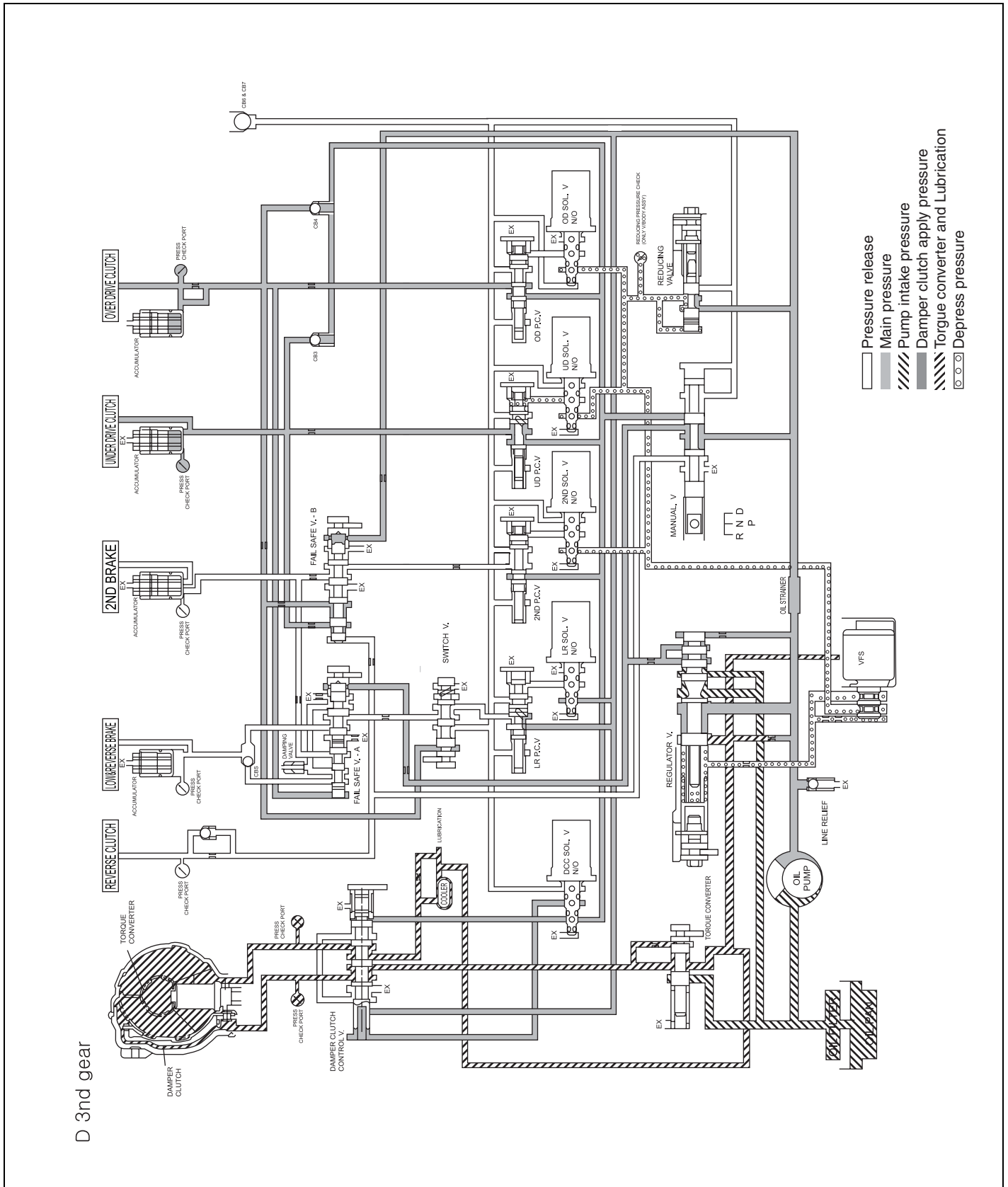
1. PG-A( Input speed): 2,500rpm
2. Manual valve position: D
3. DCC Solenoid duty: 0%

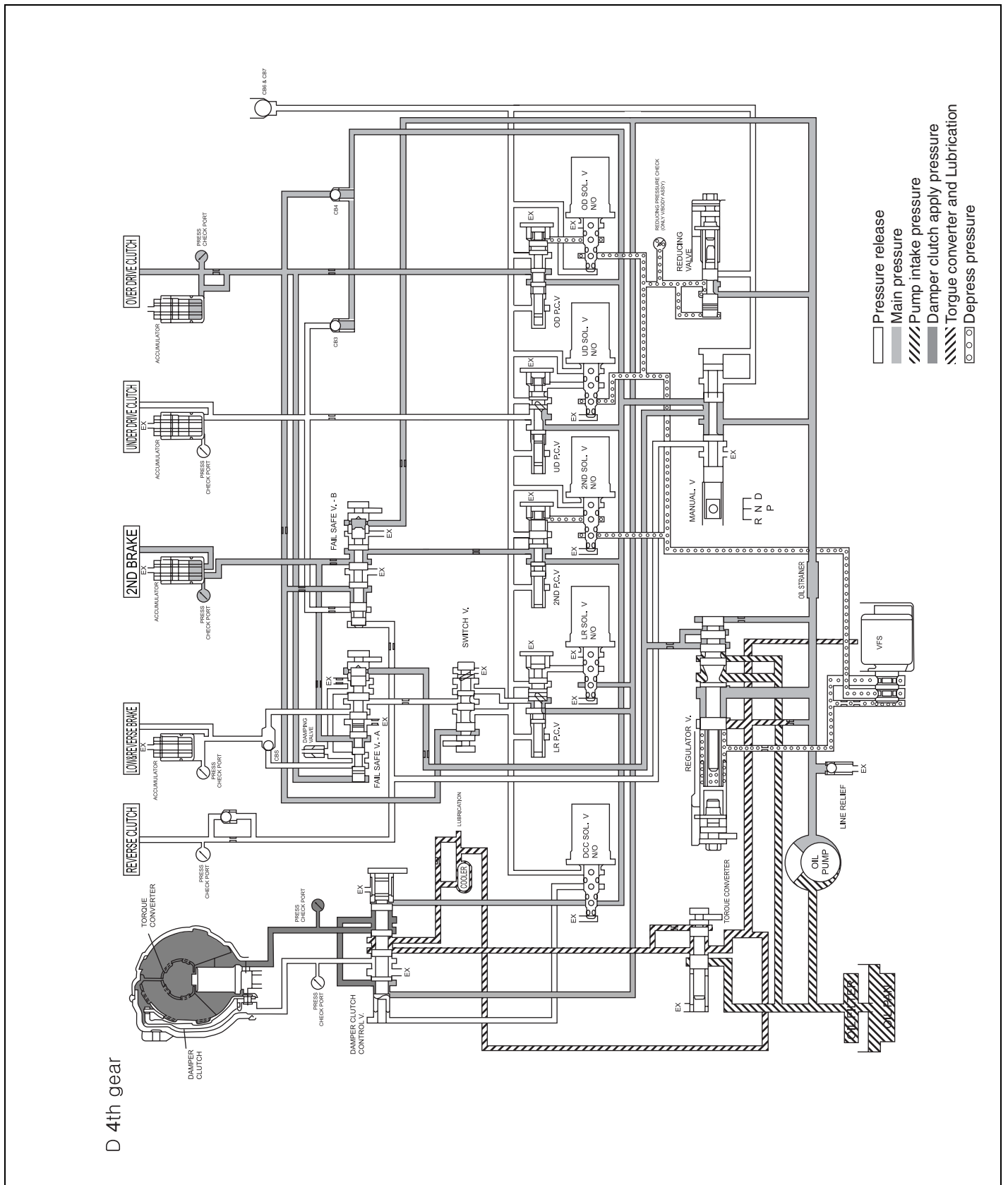




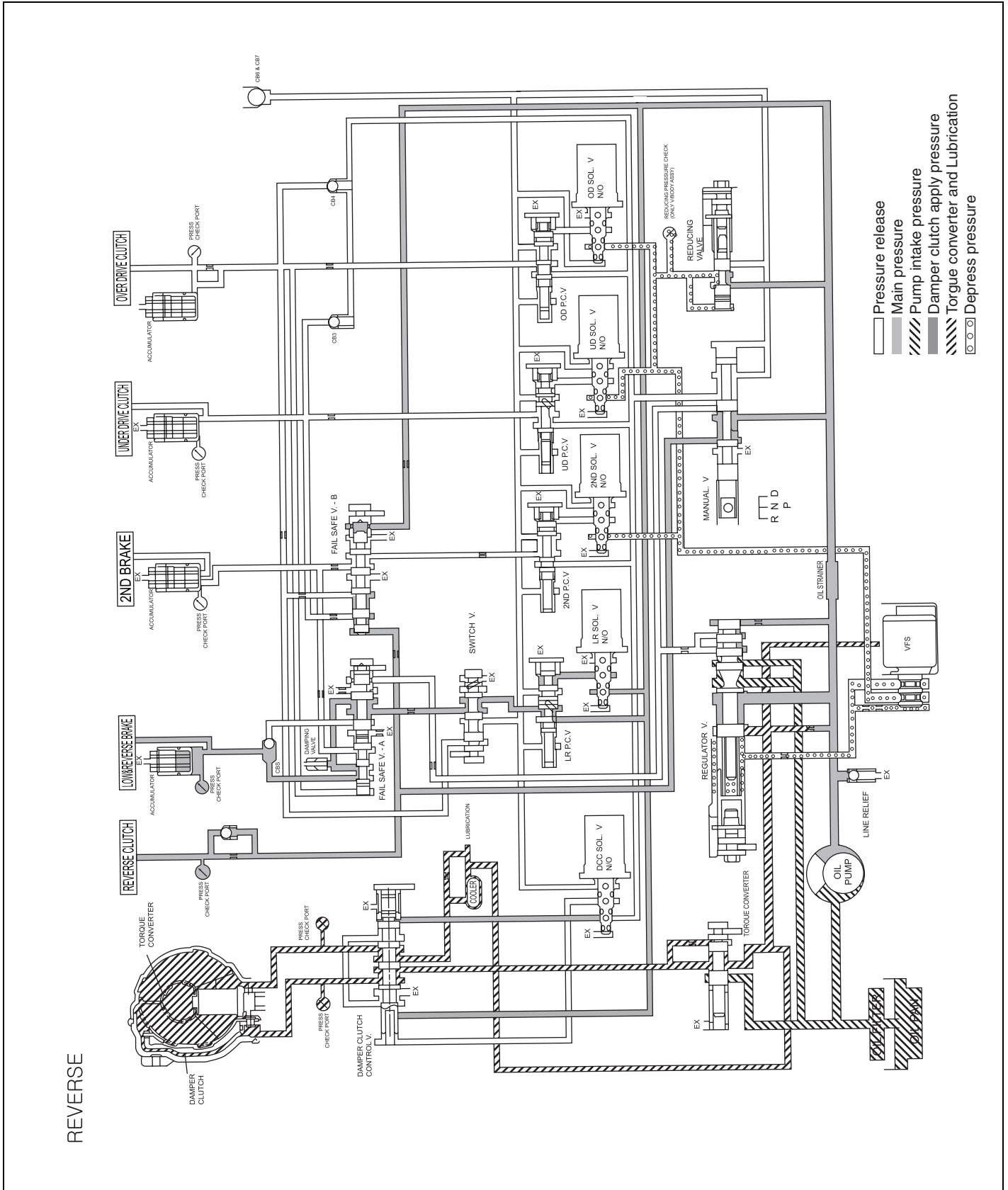


D 2ND gear





D 4th gear



## AUTOMATIC TRANSAXLE SYSTEM

### ELECTRONIC CONTROL SYSTEM

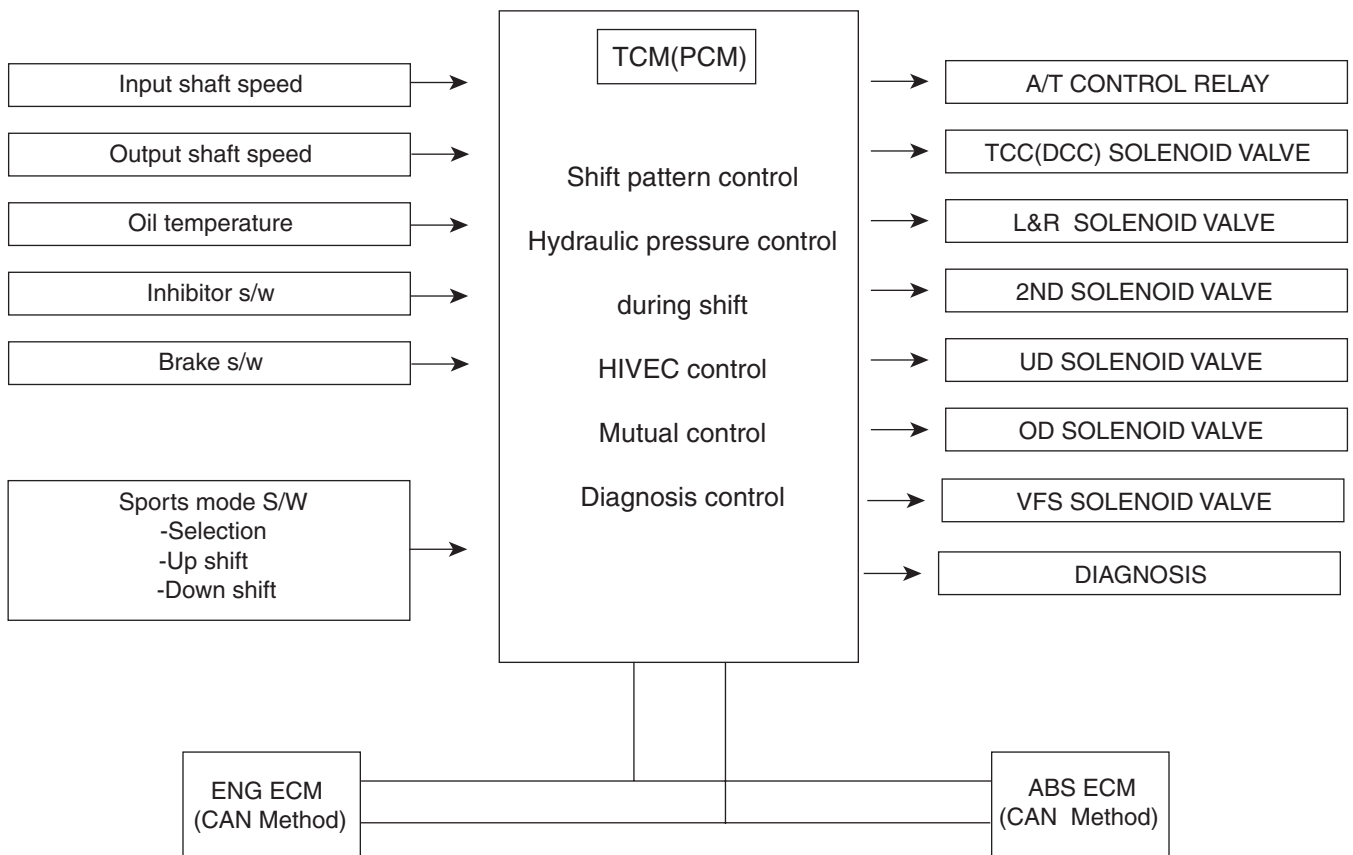
#### DESCRIPTION

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.

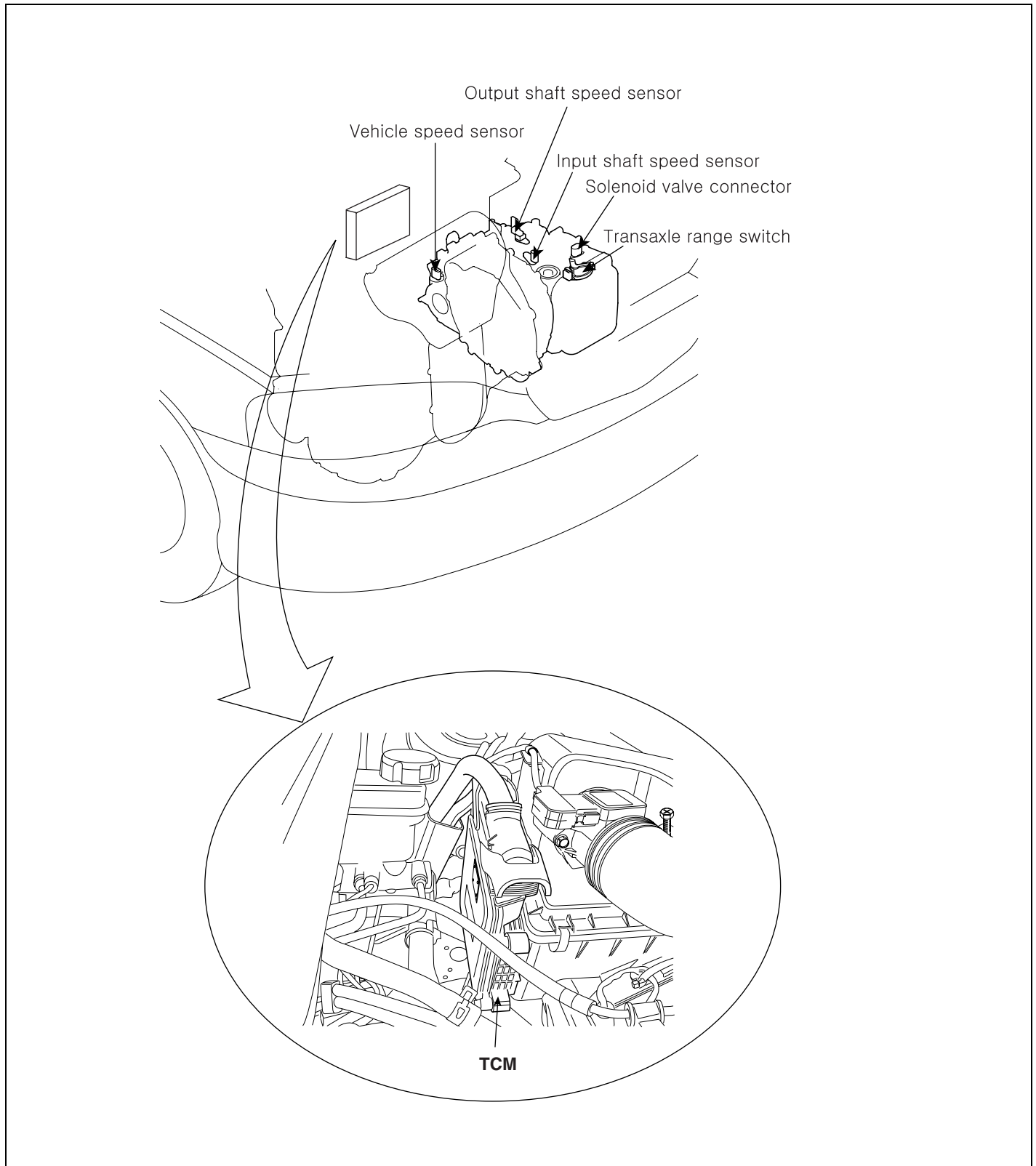
#### BLOCK DIAGRAM (CAN)



EKRF004G

**ELECTRIC CONTROL LOCATION**

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

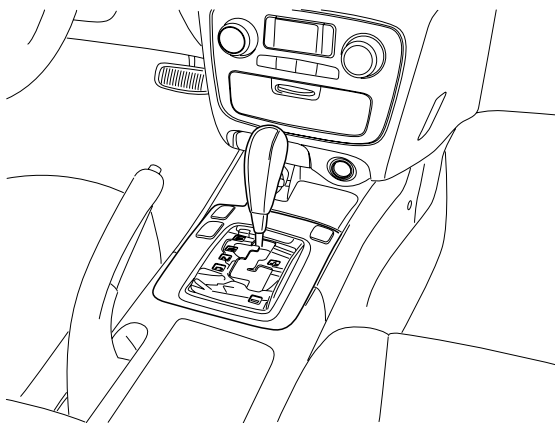


**OPERATING COMPONENTS AND FUNCTIONS**

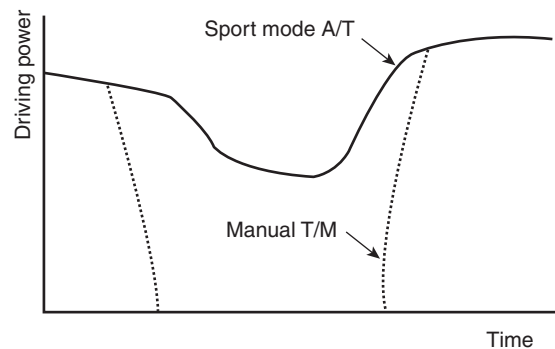
Sensor	Function
Input shaft speed sensor	Detect turbine speed at UD retainer
Output shaft speed sensor	Detect T/F drive gear speed at T/F driven gear (4A/T)
Crank angle sensor	Detect engine speed
TPS(Gasoline)	Throttle opening ratio by potentiometer
Air conditioner switch	A/C load by thermister
Inhibitor 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
Vehicle speed sensor	Vehicle speed
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**



EKRF005B



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**

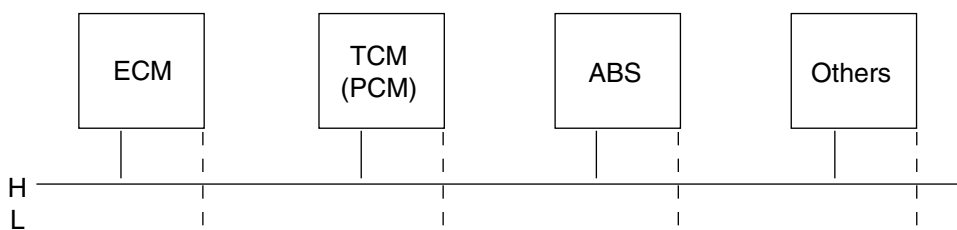
Items	Mode S/W	UP S/W	DOWN S/W
D range selection	OFF	OFF	OFF
Sports mode selection	ON	OFF	OFF
Sports mode up-shift selection	ON	ON	OFF
Sports mode downshift selection	ON	OFF	ON

**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 a integrated ECM.

Frequency: 500Kbit/sec



EKRF005D

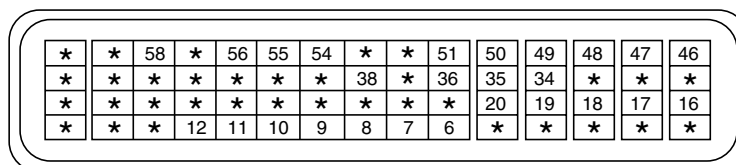
**Input signals to TCM(PCM) through ‘ CAN communication’**

- 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 DESCRIPTION**



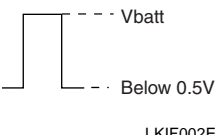
TCM harness connector (C45)

EKRF006A

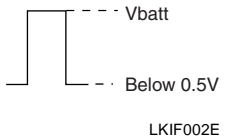
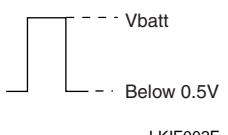
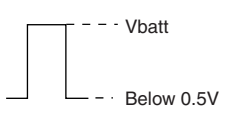
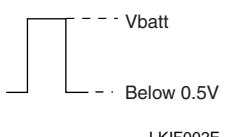
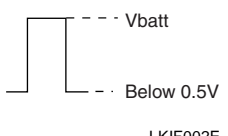
Terminal Number	Description	Terminal Number	Description
Gasoline(C45)		Gasoline(C45)	
1	—	31	—
2	—	32	—
3	—	33	—
4	—	34	Ground 1
5	INHIBITOR SW(P)	35	Ground 2
6	INHIBITOR SW(R)	36	—
7	INHIBITOR SW(N)	37	—
8	INHIBITOR SW(D)	38	Brake SW
9	Sports mode SEL SW	39	Auto cruse SW
10	Sports mode UP SW	40	—
11	Sports mode DOWN SW	41	—
12	—	42	—
13	—	43	—
14	—	44	—
15	—	45	—
16	OD Solenoid Valve	46	LR Solenoid valve
17	2ND Solenoid Valve	47	—
18	DCC(TCC) Solenoid Valve	48	Solenoid valve
19	VFS Solenoid Valve	49	Power 1 (Solenoid valve)
20	Ground 3	50	Power 2 (Solenoid valve)
21	—	51	—
22	—	52	Auto cruse Relay Signal
23	—	53	—
24	—	54	Oil temperature Sensor

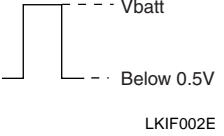
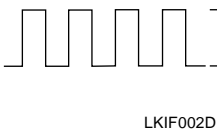
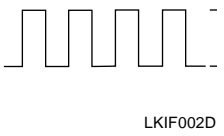
25	—	55	Sensor Ground
26	—	56	Output speed sensor
27	—	57	—
28	—	57	Input speed sensor
29	—	59	—
30	—	60	—

**TCM INPUT/OUTPUT SIGNAL VOLTAGE CHECK SHEET**

PIN No.	Signal	Condition	Input/Output Valve		Test Result	Remarkt
			Type	LEVEL Test Result		
6	P-SW	P ON	Static signal	Vlow < 1.8V Vhigh > 4.2V	12.37V (Vbatt Level)	Inhibitor SW(P)
		Others		Active : high	0.2V	
7	R-SW	R ON	Static signal	Vlow < 1.8V Vhigh > 4.2V	12.37V (Vbatt Level)	Inhibitor SW (R)
		Others		Active : high	0.2V	
8	N-SW	N ON	Static signal	Vlow < 1.8V Vhigh > 4.2V	12.37V (Vbatt Level)	Inhibitor SW (N)
		Others		Active : high	0.2V	
9	D-SW	—	Static signal	Vlow < 1.8V Vhigh > 4.2V Active : high	—	Inhibitor SW (D)
10	Sport mode(SEL)	SEL ON	Static signal	Vlow < 1.8V Vhigh > 4.2V	12.37V (Vbatt Level)	Sport mode (SEL)
		Others		Active : high	0.2V	
11	Sport mode (UP)	UP ON	Static signal	Vlow < 1.8V Vhigh > 4.2V	12.37V (Vbatt Level)	Sport mode (UP)
		Others		Active : high	0.2V	
12	Sport mode (DOWN)	DOWN ON	Static signal	Vlow < 1.8V Vhigh > 4.2V	12.37V (Vbatt Level)	Sport mode (DOWN)
		Others		Active : high	0.2V	
16	Solenoid valve(OD)	—	PWM	signal : 3.0 < Isol < 5.0A supply : V_ATREL		1st,2nd: 2kHz, 30% P duty 3rd,4th:100% P duty

**AUTOMATIC TRANSAXLE SYSTEM**

PIN No.	Signal	Condition	Input/Output Valve		Test Result	Remarkt
			Type	LEVEL Test Result		
17	Solenoid valve(2ND)	—	PWM	signal : 3.0 < Isol < 5.0A supply : V_ATREL		1st,3rd: 2kHz, 30% P duty 2nd, 4th: 100% P duty
18	Solenoid valve(DCC)	—	PWM	signal : 3.0 < Isol < 5.0A supply : V_ATREL		1st,2nd: 100% P duty
19	VFS	—	PWM	signal : 0 < Isol < 1.0A supply : V_ATREL		0~100% duty 600Hz
20,34,35	Power GND	always	power	—	GND level	—
36	A/T Relay	A/T ON	Static signal	Norminal load curret 1.1A	11.4V(Vbtt Level)	—
		A/T OFF			0.2V	
38	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	
39	Auto cruise	—	Open collector input	Vlow < 1.8V Vhigh > 4.2V	not used	N.A
40	Hold SW	Hold ON	Static signal	Vlow < 1.8V Vhigh > 4.2V	12.37V (Vbatt Level)	—
		Hold OFF			0.2V	
46	Solenoid valve(LR)	—	PWM	Signal: 3.0 < Isol < 5.0A Supply : V_ATREL.		2nd,3rd,4th : 2kHz, 30%P duty 1st :100% P duty
47	Solenoid valve(RED)	—	PWM	Signal: 3.0 < Isol < 5.0A Supply : V_ATREL.	not used	5AT ONLY
48	Solenoid valve(UD)	—	PWM	Signal: 3.0 < Isol < 5.0A Supply : V_ATREL.		4th:2kHz, 30% P duty 1st,2nd,3rd : 100% P duty
49,50	V_ATREL	ON	power	—	12.4V (Vbatt Level)	Batt. Voltage after A/T RELAY
		OFF			0.2V	

PIN No.	Signal	Condition	Input/Output Valve		Test Result	Remarkt
			Type	LEVEL Test Result		
51	Trip computer	—	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)
52	Auto Cruise Release	—	Static signal	$V_{low} < 0.5V$ $V_{low} = V_{batt}$	 LKIF002E	—
54	Oil Temperature sensor	—	analog	$V = -0.3 \sim V_B$	$85^{\circ}C(181^{\circ}C) - > 0.8V$	—
55	sensor GND	always	power	—	GND level	—
56	Output speed	No signal : 1009rpm	pulse	$V_{low} < 1.8V$ $V_{high} > 4.2V$	 LKIF002D	Duty 50%, 1.116kHz
58	Input speed	No signal : 2068rpm	pulse	$V_{low} < 1.8V$ $V_{high} > 4.2V$	 LKIF002D	Duty 50%, 2.049kHz

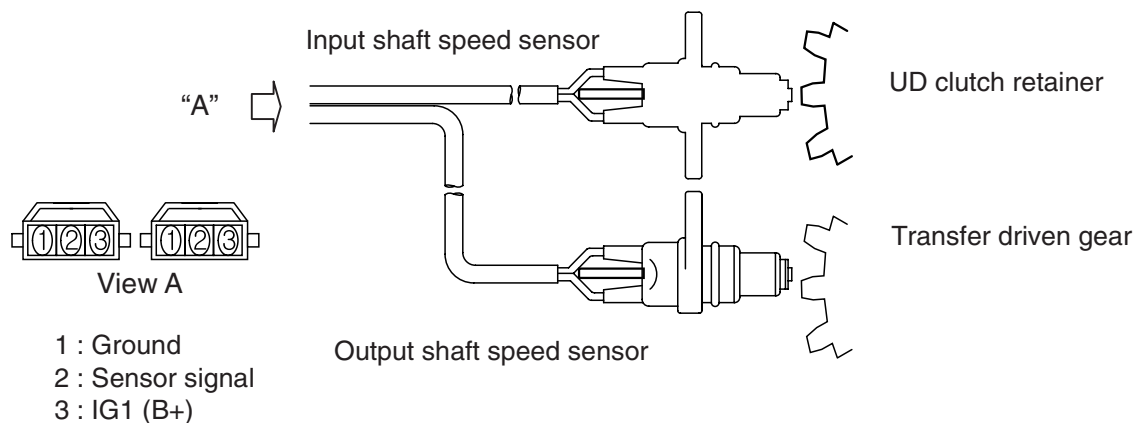
**AUTOMATIC TRANSAXLE SYSTEM**

**SENSORS**

**Input shaft & Output shaft speed sensor**

- Type: Hall sensor

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

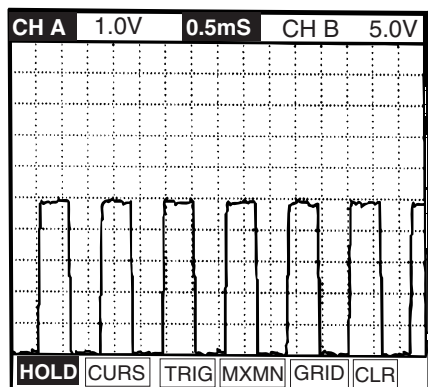


EKRF018A

**HALL TYPE SENSOR: SPECIFICATION**

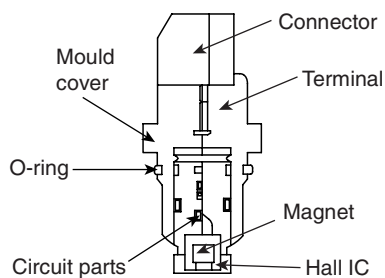
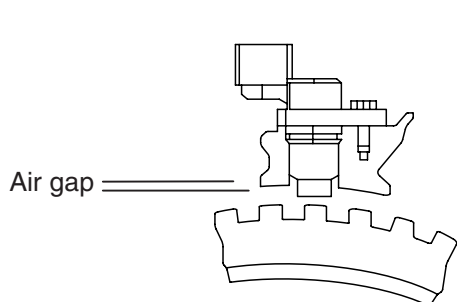
Air gap (mm)	Input shaft speed sensor	1.3
	Output shaft speed sensor	0.85
Coil Resistance	Input shaft speed sensor	over 1MΩ
	Output shaft speed sensor	over 1MΩ
Peak-Peak Voltage	High	4.8~5.2V
	Low	0.8V

**WAVE FORM WITH HIGH-SCAN**

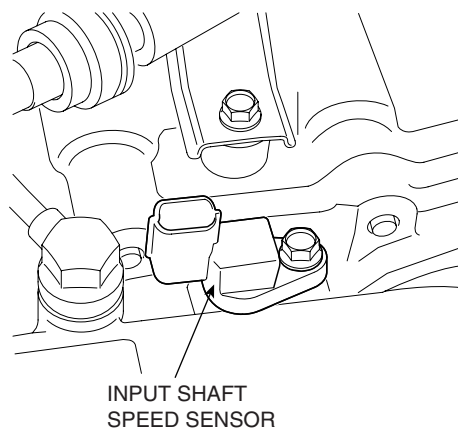
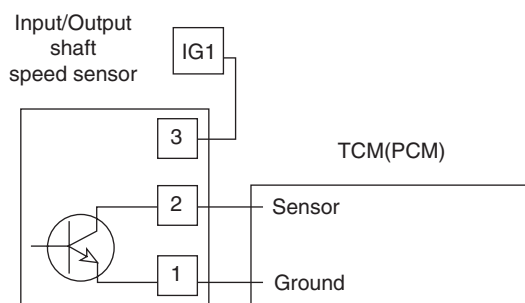


EKRF018B

HALL TYPE SENSOR: STRUCTURE & INTERFACE

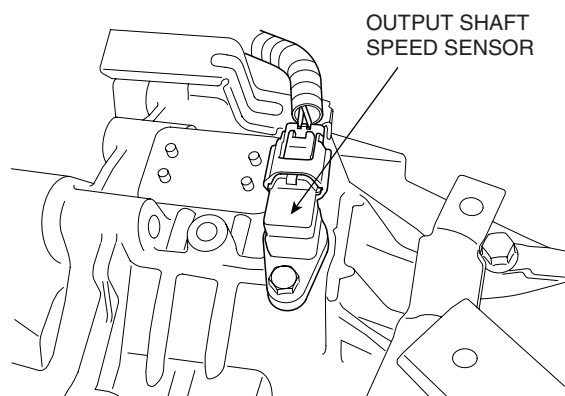


EKRF018E



EKRF018C

EKRF018D



EKRF018F

**AUTOMATIC TRANSAXLE SYSTEM**

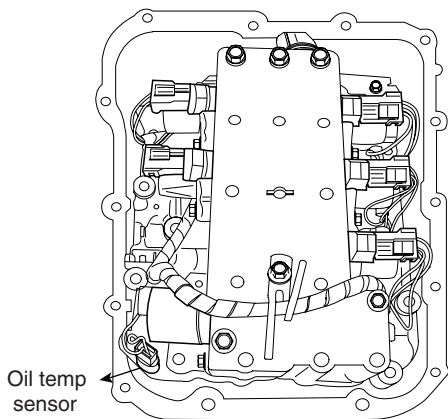
**Oil Temperature Sensor**

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		



**INHIBITOR SWITCH - CONTINUITY CHECK(SPORTS MODE)**

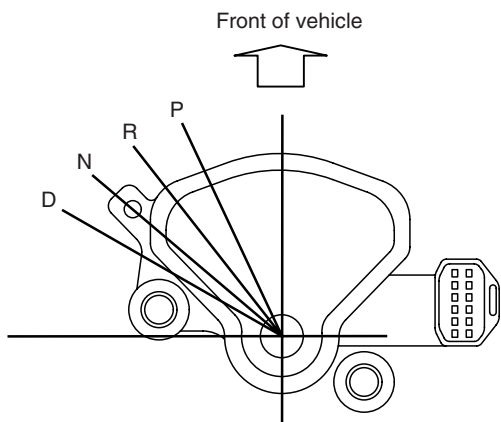
Range	Terminal Number									
	1	2	3	4	5	6	7	8	9	10
P			○	—				○	○	○
R							○	○		
N				○	—			○	○	○
D	○	—						○		

EKRF018G

EKRF018I

**Inhibitor Switch**

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



EKRF018H

**AT -36**

**AUTOMATIC TRANSAXLE (F4A42)**

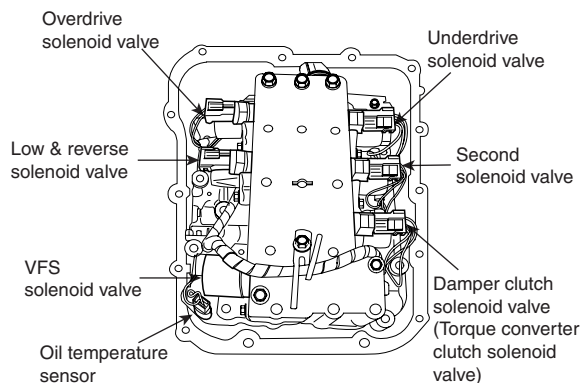
**ACTUATORS**

**LOCATION**

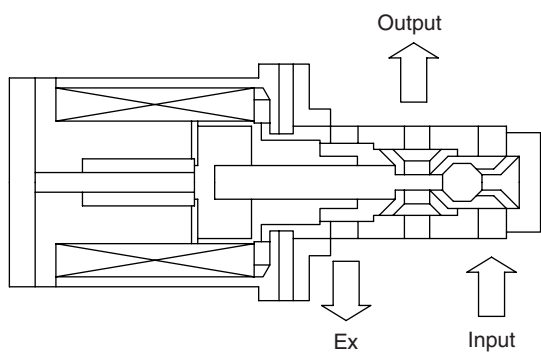
**Solenoid Valve for Pressure Control**

- 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)**

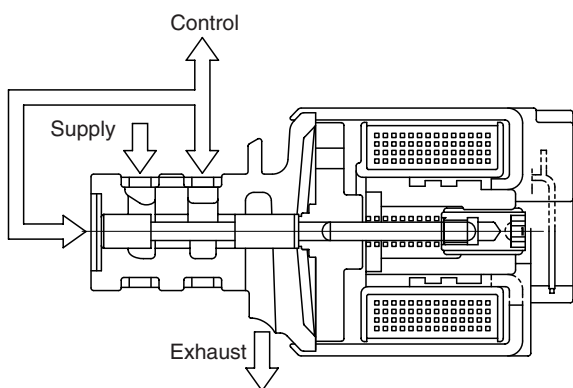


EKRF018K



EKRF018J

**(VFS)**



EKRF082A

**VFS CONTROL PRESSURE**

Input Current(mA)	Control Pressure (No line pressure)			
	Increasing Current			Decreasing Current
	MAX. (Kgf/cm <sup>2</sup> ) [ Kpa ]	MIN. (Kgf/cm <sup>2</sup> ) [ Kpa ]	△ (Kgf/cm <sup>2</sup> ) [ Kpa ]	MIN. (Kgf/cm <sup>2</sup> ) [ 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/cm<sup>2</sup>)  
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.

**SOLENOID VALVES SCHEDULE**

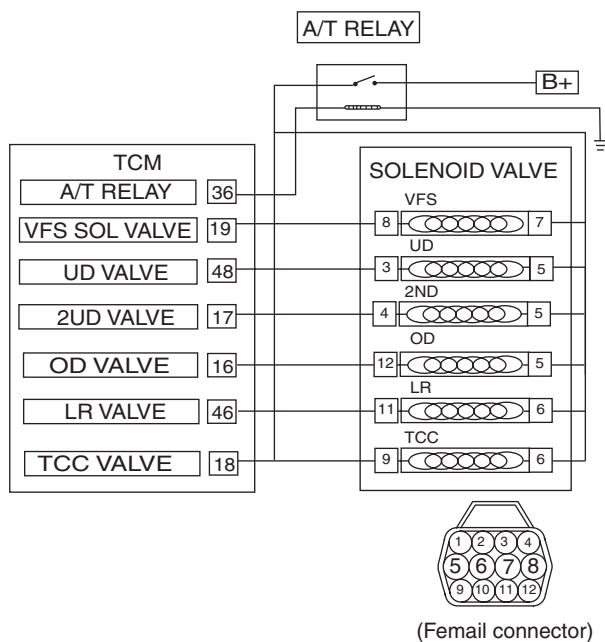
Position	Solenoid valves				
Operation	LR	2ND	UD	OD	* DCC
1st gear	OFF	ON	OFF	ON	OFF
2nd gear	ON	OFF	OFF	ON	OFF
3rd gear	ON	ON	OFF	OFF	ON
4th gear	ON	OFF	ON	OFF	ON
Reverse	OFF	ON	ON	ON	OFF
N, P (STD. mode)	OFF	ON	ON	ON	OFF
N, P (Hold mode)	ON	OFF	ON	ON	OFF

\*: Reference value.

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

**A/T Control Relay**

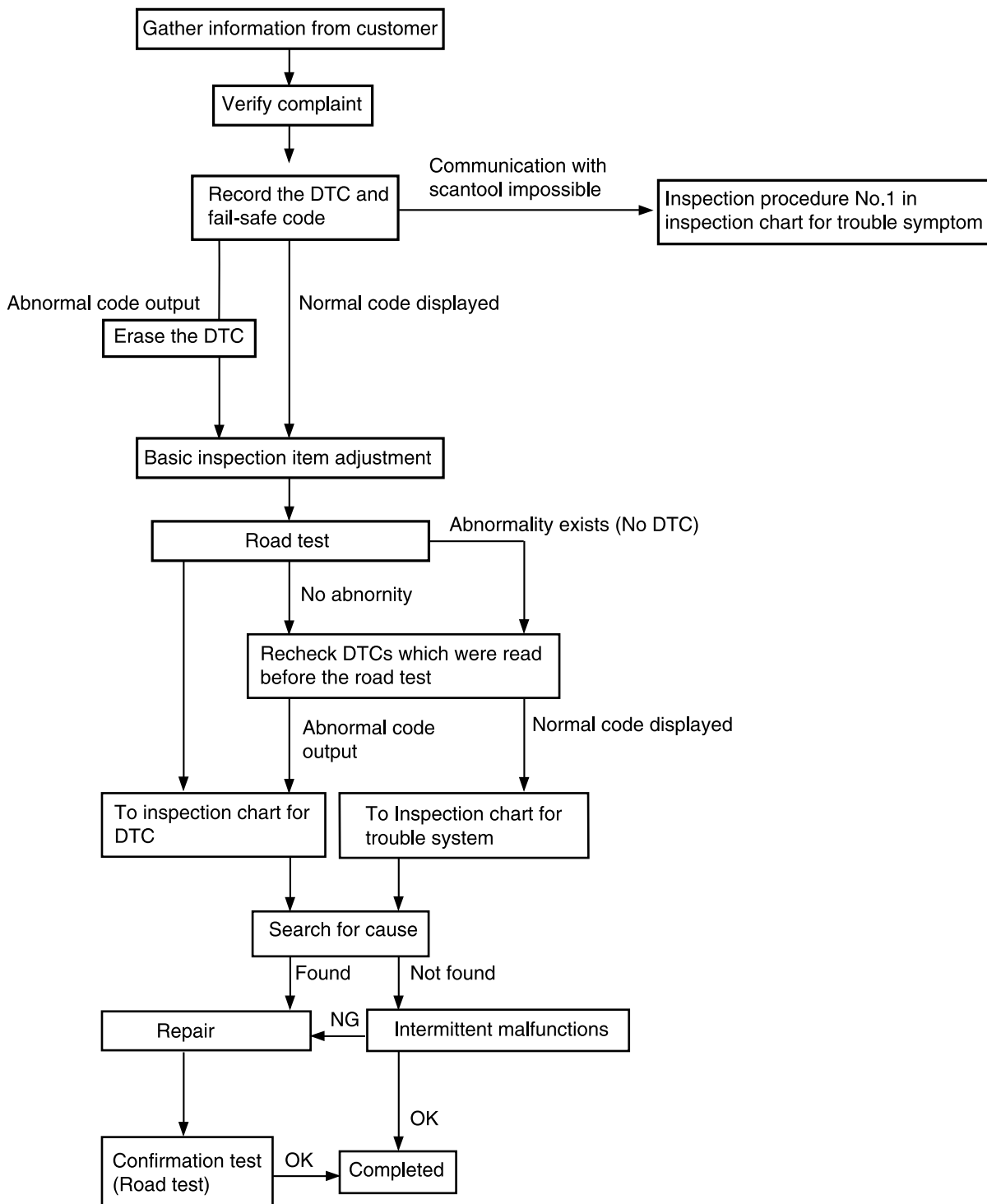
The control relay supplies power to the solenoid valves. As soon as the A/T control relay is ON, the battery voltage is directly supplied to solenoid valves and each solenoid valve is operated when the TCM grounds the opposite terminal. ⚠ (-) Control At fail safe condition, the power is cut causing 3 gear hold.



EKRF006B

**TROUBLESHOOTING** E713CB20

**DIAGNOSIS FLOW**



EKRF007A

**INSPECTION CHART FOR TROUBLE SYMPTOMS**

<b>Trouble symptom</b>		<b>Probable cause</b>
<b>Communication with HI-SCAN is not possible</b> If communication with the HI-SCAN is not possible, the cause is probably a defective diagnosis line or the TCM(PCM) is not functioning.		<ul style="list-style-type: none"><li>- Malfunction diagnosis line</li><li>- Malfunction of connector</li><li>- Malfunction of the TCM(PCM)</li></ul>
<b>Driving impossible</b>	<b>Starting impossible</b> 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.	<ul style="list-style-type: none"><li>- Malfunction of the engine system</li><li>- Malfunction of the torque converter</li><li>- Malfunction of the oil pump</li></ul>
	<b>Does not move forward</b> 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.	<ul style="list-style-type: none"><li>- Abnormal line pressure</li><li>- Malfunction of the underdrive solenoid valve</li><li>- Malfunction of the underdrive clutch</li><li>- Malfunction of the valve body</li></ul>
	<b>Does not reverse</b> 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.	<ul style="list-style-type: none"><li>- Abnormal reverse clutch pressure</li><li>- Abnormal low and reverse brake pressure</li><li>- Malfunction of the low and reverse brake solenoid valve</li><li>- Malfunction of the reverse clutch</li><li>- Malfunction of the low and reverse brake</li><li>- Malfunction of the valve body</li></ul>
	<b>Does not move (forward or reverse)</b> 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.	<ul style="list-style-type: none"><li>- Abnormal line pressure</li><li>- Malfunction of power train</li><li>- Malfunction of the oil pump</li><li>- Malfunction of the valve body</li></ul>

<b>Trouble symptom</b>		<b>Probable cause</b>
<b>Malfunction when starting</b>	<b>Engine stalling when shifting</b> 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).	<ul style="list-style-type: none"><li>- Malfunction of the engine system</li><li>- Malfunction of the damper clutch control solenoid valve</li><li>- Malfunction of the valve body</li><li>- Malfunction of the torque converter (Malfunction of the damper clutch)</li></ul>
	<b>Shocks when changing from N to D and large time lag</b> 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.	<ul style="list-style-type: none"><li>- Abnormal underdrive clutch pressure</li><li>- Abnormal low and reverse brake pressure</li><li>- Malfunction of the underdrive solenoid valve</li><li>- Malfunction of the valve body</li><li>- Malfunction of the idle position switch</li></ul>
<b>Malfunction when starting</b>	<b>Shocks when changing from N to R and large time lag</b> 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.	<ul style="list-style-type: none"><li>- Abnormal reverse clutch pressure</li><li>- Abnormal low and reverse brake pressure</li><li>- Malfunction of the low and reverse solenoid valve</li><li>- Malfunction of the reverse clutch</li><li>- Malfunction of the low and reverse brake</li><li>- Malfunction of the valve body</li><li>- Malfunction of the idle position switch</li></ul>
	<b>Shocks when changing from N to D, N to R and large time lag</b> 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.	<ul style="list-style-type: none"><li>- Abnormal line pressure</li><li>- Malfunction of the oil pump</li><li>- Malfunction of the valve body</li></ul>
<b>Malfunction when shifting</b>	<b>Shocks and running up</b> 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.	<ul style="list-style-type: none"><li>- Abnormal line pressure</li><li>- Malfunction of each solenoid valve</li><li>- Malfunction of the oil pump</li><li>- Malfunction of the valve body</li><li>- Malfunction of each brake or each clutch</li></ul>

Trouble symptom		Probable cause
<b>Displaced shifting points</b>	<b>All points</b> 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.	<ul style="list-style-type: none"> <li>- Malfunction of the output shaft speed sensor</li> <li>- Malfunction of the throttle position sensor</li> <li>- Malfunction of each solenoid valve</li> <li>- Abnormal line pressure</li> <li>- Malfunction of the valve body</li> <li>- Malfunction of the TCM(PCM)</li> </ul>
	<b>Some points</b> 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.	<ul style="list-style-type: none"> <li>- Malfunction of the valve body</li> </ul>
<b>Does not shift</b>	<b>No diagnosis codes</b> 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)	<ul style="list-style-type: none"> <li>- Malfunction of the transaxle range</li> <li>- Malfunction of the TCM(PCM)</li> </ul>
<b>Malfunction while driving</b>	<b>Poor acceleration</b> 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.	<ul style="list-style-type: none"> <li>- Malfunction of the engine system</li> <li>- Malfunction of the brake or clutch</li> </ul>
<b>Malfunction while driving</b>	<b>Vibration</b> 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.	<ul style="list-style-type: none"> <li>- Abnormal damper clutch pressure</li> <li>- Malfunction of the engine system</li> <li>- Malfunction of the damper clutch control solenoid valve</li> <li>- Malfunction of the torque converter</li> <li>- Malfunction of the valve body</li> </ul>
<b>Transaxle range switch system</b> The cause is probably a malfunction of the inhibitor switch circuit, ignition switch circuit or a defective TCM(PCM).		<ul style="list-style-type: none"> <li>- Malfunction of the transaxle range switch</li> <li>- Malfunction of the ignition switch</li> <li>- Malfunction of connector</li> <li>- Malfunction of the TCM(PCM)</li> </ul>
<b>Idle position switch system</b> The cause is probably a defective idle position switch circuit, or a defective TCM(PCM).		<ul style="list-style-type: none"> <li>- Malfunction of the triple pressure switch</li> <li>- Malfunction of connector</li> <li>- Malfunction of the TCM(PCM)</li> </ul>
<b>Triple pressure switch system</b> The cause is probably a defective dual pressure switch circuit or a defective TCM(PCM).		<ul style="list-style-type: none"> <li>- Malfunction of the triple pressure switch</li> <li>- Malfunction of connector</li> <li>- Malfunction of A/C system</li> <li>- Malfunction of the TCM(PCM)</li> </ul>
<b>Vehicle speed sensor system</b> The cause is probably a defective vehicle speed sensor circuit or a defective TCM(PCM).		<ul style="list-style-type: none"> <li>- Malfunction of the vehicle speed sensor</li> <li>- Malfunction of connector</li> <li>- Malfunction of the TCM(PCM)</li> </ul>

## AUTOMATIC TRANSAXLE SYSTEM

### HOW TO USE SCAN TOOL

#### INSTRUCTION

With the advent of electronic control vehicles, the system efficiency increases with the complexities, as you would realize.

As medical diagnostic devices do, the advanced testers can help identify and fix the problems.

The scan tool can provide you with the versatile and user friendly monitoring capabilities.

#### SCAN TOOL FUNCTION

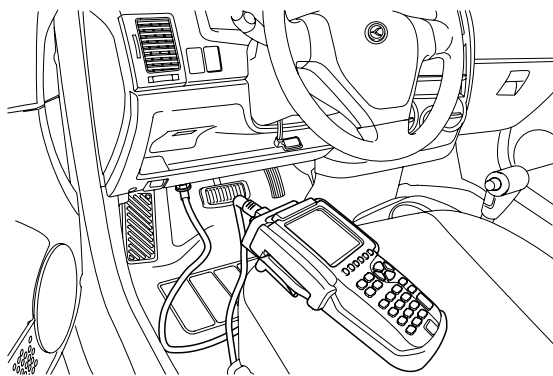
Scan tool offers the following functionality:

- Diagnostic trouble codes
- Freeze frame data
- Current data
- Actuation test

#### HOW TO CONNECT

For vehicles with 16 pin Data Link Connector(DLC), power is supplied from the DLC terminal through the DLC CABLE without the need for an additional power supply.

For connections between the Hi-scan and these vehicle data link terminals the DLC CABLE 16 is all that is required.



EKRF007B

#### HOW TO SELECT VEHICLE AND SYSTEM

##### OPERATION FLOW

1. Select "HUNDAI VEHICLE DIAGNOSIS"
2. Select "VEHICLE NAME"

EKRF007E

1. HYUNDAI VEHICLE DIAGNOSIS		
01. ATOS F/LIFT	04-05	11. ELANTRA 01-03
02. ATOS	98-04	12. ELANTRA 96-00
03. GETZ	04-05	13. ELANTRA 92-95
04. ACCENT	03-05	14. HD COUPE 02-05
05. ACCENT	00-02	15. HD COUPE 97-01
06. ACCENT	95-99	<b>16. SONATA 05-</b>
07. EXCEL	90-94	17. SONATA 99-04
08. SCOUPE	91-96	18. SONATA 94-98
09. MATRIX	02-05	19. SONATA 89-93
10. ELANTRA	04-05	20. XG 99-05

EKRF007C

3. Select "AUTOMATIC TRANSAXLE SYSTEM"

1. HYUNDAI VEHICLE DIAGNOSIS ▼		
MODEL :	SONATA	05-

- 01. ENGINE
- 02. AUTOMATIC TRANSAXLE**
- 03. ANTI-LOCK BRAKE SYSTEM
- 04. SRS-AIRBAG
- 05. ELEC.CONTROL SUSPENSION
- 06. IMMOBILIZER
- 07. ELEC.POWER STEERING
- 08. FULL AUTO AIR/CON.

EKRF007D

4. Select the engine model.

1. HYUNDAI VEHICLE DIAGNOSIS		
MODEL :	SONATA	05-
SYSTEM :	AUTOMATIC TRANSAXLE	
<b>01. GASOLINE</b>		

**BASIC APPLICATION**

Having connected and turned on scan tool, the vehicle and system selection must be made from the 1.0 HUNDAI VEHICLE DIAGNOSIS SCREEN.

The support functions vary according to vehicles. Therefore, the correct selection must be made.

Selection may be made by scrolling up or down the screen and pressing ENTER, or by using the numeric keypad to select the appropriate option number and pressing ENTER.

**HOW TO READ DTC**

**OPERATION FLOW**

1. Select vehicle and system  
(Refer to How to select vehicle and system)
2. Select 1.1 DIAGNOSTIC TROUBLE CODES

**MODE APPLICATION**

At this level, Diagnostic trouble codes(DTC) are displayed for the selected TCM.

**HOW TO ERASE DTC**

**OPERATION FLOW**

1. Select "1.1 DIAGNOSTIC TROUBLE CODES"  
(Refer to How to read DTC)
2. Select "ERAS" key on the Diagnostic Trouble codes mode.
3. Select "1.2.2. ERASE FAULT CODE"

**MODE APPLICATION**

"ERAS"

This soft function key will clear the DTC currently held in the memory of the selected TCM.

If this option is selected, a message requesting confirmation of the ERAS request will be displayed.

The YES or NO key should be used to confirm or cancel the request to clear the current DTC.

**DTC TROUBLESHOOTING INDEX**

DTC No.	DESCRIPTION	SEE PAGE
P0703	BRAKE SWITCH CIRCUIT	AT- 65
P0707	TRANS.RANGE SENSOR-LOW	AT- 73
P0708	TRANS.RANGE SENSOR-HIGH	AT- 79
P0711	FLUID TEMPERATURE.SENSOR RATIONALITY	AT- 83
P0712	FLUID TEMPERATURE.SENSOR CIRCUIT-LOW	AT- 90
P0713	FLUID TEMPERATURE.SENSOR CIRCUIT-HIGH	AT- 94
P0717	INPUT SPEED SENSOR CIRCUIT	AT- 96
P0721	OUTPUT SPEED SENSOR	AT-105
P0722	OUTPUT SPEED SENSOR CIRCUIT	AT-113
P0731	Gear 1 Incorrect Ratio	AT-115
P0732	Gear 2 Incorrect Ratio	AT-122
P0733	Gear 3 Incorrect Ratio	AT-127
P0734	Gear 4 Incorrect Ratio	AT-132
P0736	REVERSE INCORRECT RATIO	AT-136
P0741	Torque Converter Clutch Circuit Stuck off	AT-141
P0743	DCC(TCC) Solenoid - Open or ground short(Torque Converter Clutch Circuit Electrical)	AT-146
P0748	Pressure control Solenoid A - Electrical	AT-152
P0750	LR Solenoid - Open or ground short(SCSV "A" CIRCUIT MAL.)	AT-157
P0755	UD Solenoid - Open or ground short(SCSV "B" CIRCUIT MAL.)	AT-163
P0760	2ND Solenoid - Open or ground short(SCSV "C" CIRCUIT MAL.)	AT-169
P0765	OD Solenoid - Open or ground short(SCSV "D" CIRCUIT MAL.)	AT-174
P0885	A/T RELAY CIRCUIT MAL	AT-180

## AUTOMATIC TRANSAXLE SYSTEM

AT -45

U0001	CAN COMMUNICATION BUS OFF	AT-188
U0100	NO ID From ECU	AT-190

### 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(Siemens 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

 **NOTE**

- 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
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+				
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	P0736		P0736	
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	

**AUTOMATIC TRANSAXLE SYSTEM**

**AT -47**

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/-/NOT SUPP			
20	AUTO CRUCISE RELEASE	—	—		
21	SPORT MODE SELECT SW	OFF/ON/-/NOT SUPP	ON	When selecting sport mode, ON	
22	SPORT MODE UP SW	OFF/ON/-/NOT SUPP	ON	When Selecting Sport mode up, ON	
23	SPORT MODE DOWN SW	OFF/ON/-/NOT 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 mode	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 exghust 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	-	-

**AUTOMATIC TRANSAXLE SYSTEM**

**ROAD TEST**

No.	Condition	Operation	Judgment value	Check item
1	Ignition switch : OFF	Ignition switch (1) ON	Battery voltage (mV)	Control relay
2	<ul style="list-style-type: none"> <li>Ignition switch : ON</li> <li>Engine : Stopped</li> <li>Selector lever position : P</li> </ul>	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	<ul style="list-style-type: none"> <li>Ignition switch : ST</li> <li>Engine : Stopped</li> </ul>	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
5	<ul style="list-style-type: none"> <li>Engine : Idling</li> <li>Selector lever position : N</li> </ul>	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

No.	Condition	Operation	Judgment value	Check item
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
7	Selector lever position : D (Carry out on a flat and straight road)	<ul style="list-style-type: none"> <li>Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %).</li> <li>Gently decelerate to a standstill.</li> <li>Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%).</li> <li>While driving at 60 km/h in 4th gear, shift down to 3rd gear.</li> <li>While driving at 40 km/h in 3rd gear, shift down to 2nd gear.</li> <li>While driving at 20 km/h in 2nd gear, shift down to 1st gear.</li> </ul>	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 wheel 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.

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Stall speed : 2,100~2,900rpm

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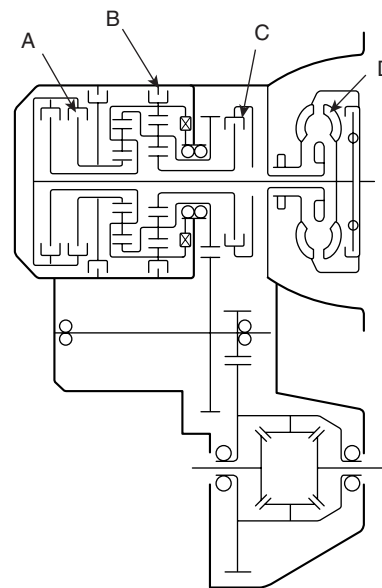
**CAUTION**

- **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



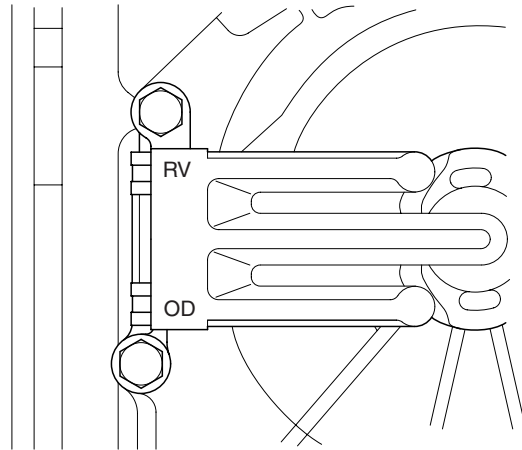
EKRF007F

**AT -52**

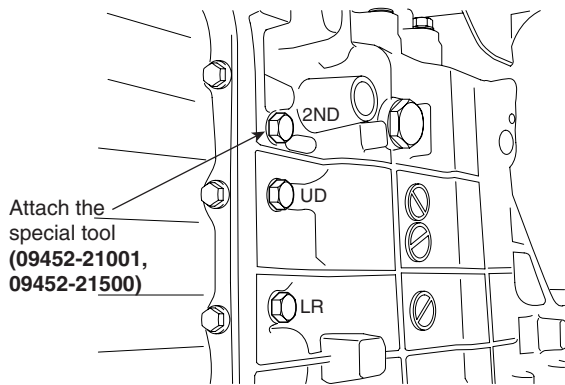
**AUTOMATIC TRANSAXLE (F4A42)**

**HYDRAULIC PRESSURE TEST**

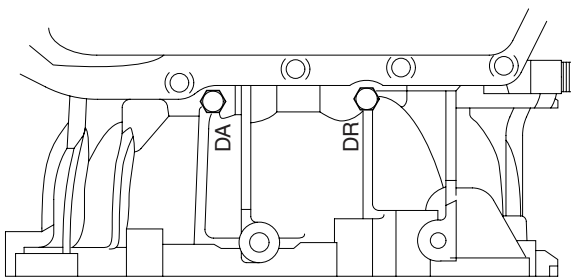
1. Warm up the engine until the automatic transaxle fluid temperature is 80-100°C.
2. Lift up the vehicle so that the wheels are free to turn.
3. Connect the special tool (oil pressure gauge) to each pressure discharge port.
4. Measure the hydraulic pressure at each port under the conditions given in 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.



EKRF007I



EKRF007G



EKRF007H

**AUTOMATIC TRANSAXLE SYSTEM**

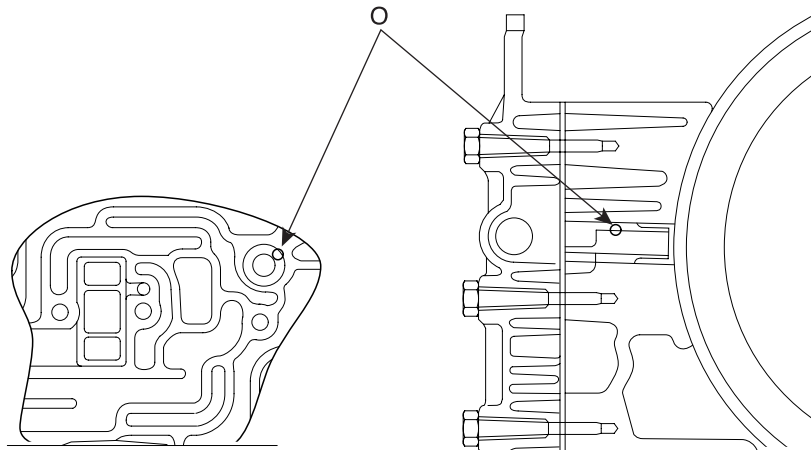
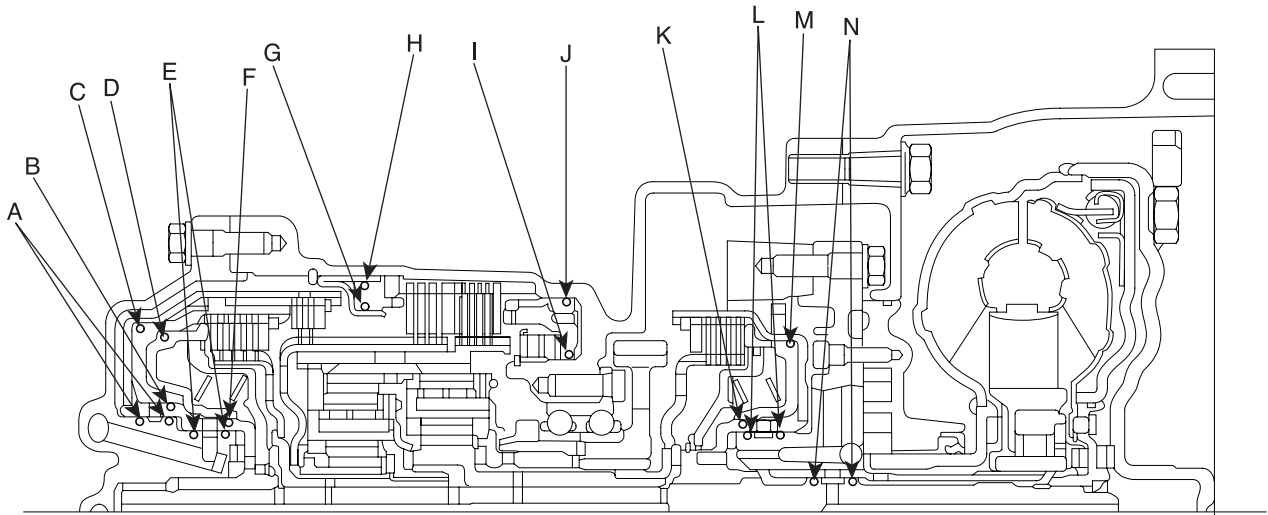
**STANDARD HYDRAULIC PRESSURE TEST**

Measurement condition			Standard hydraulic pressure kPa (psi)						
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Over-drive 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.

OIL SEAL LOCATION



**HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE**

Trouble symptom	Probable cause
All hydraulic pressures are high	Incorrect transmission control cable adjustment
	Malfunction of the regulator valve
All hydraulic pressures are low	Incorrect transmission control cable adjustment
	Malfunction of the oil pump
	Clogged oil filter
	Clogged oil cooler
	Malfunction of the regulator valve
	Malfunction of the relief valve
Hydraulic pressure is abnormal in "R" range only	Incorrect valve body installation
	Malfunction of the regulator valve
	Clogged orifice
Hydraulic pressure is abnormal in "3" or "4" range only	Incorrect valve body installation
	Malfunction of the regulator valve
	Clogged orifice
	Incorrect valve body installation
	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of the regulator valve
	Malfunction of the switch valve
Only underdrive hydraulic pressure is abnormal	Clogged orifice
	Incorrect valve body installation
	Malfunction of the oil seal K
	Malfunction of the oil seal L
	Malfunction of the oil seal M
	Malfunction of the underdrive solenoid valve
	Malfunction of the underdrive pressure control valve
Only reverse clutch hydraulic pressure is abnormal	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation
	Malfunction of the oil seal A
	Malfunction of the oil seal B
	Malfunction of the oil seal C
	Clogged orifice
	Incorrect valve body installation

Trouble symptom	Probable cause
Only overdrive hydraulic pressure is abnormal	Malfunction of the oil seal D
	Malfunction of the oil seal E
	Malfunction of the oil seal F
	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction check ball
	Clogged orifice
	Incorrect valve body installation
Only low and reverse hydraulic pressure is abnormal	Malfunction of the oil seal I
	Malfunction of the oil seal J
	Malfunction of the low and reverse solenoid valve
	Malfunction of the low and reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve A
	Malfunction of check ball
	Clogged orifice
Incorrect valve body installation	
Only second hydraulic pressure is abnormal	Malfunction of the oil seal G
	Malfunction of the oil seal H
	Malfunction of the oil seal O
	Malfunction of the second solenoid valve
	Malfunction of the second pressure control valve
	Malfunction of the fail safe valve B
	Clogged orifice
	Incorrect valve body installation
Only reverse clutch hydraulic pressure is abnormal	Malfunction of the oil cooler
	Malfunction of the oil seal N
	Malfunction of the damper clutch control solenoid valve
	Malfunction of the damper clutch control valve
	Malfunction of the torque converter pressure control valve
	Clogged orifice
Pressure applied to non operating element	Incorrect valve body installation
	Incorrect transmission control cable adjustment
	Malfunction of the manual valve
	Malfunction of check ball
	Incorrect valve body installation

**SERVICE ADJUSTMENT**

**PROCEDURE** E58DBDF8

**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 position. This will fill the torque converter and the hydraulic 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.

**NOTE**

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.

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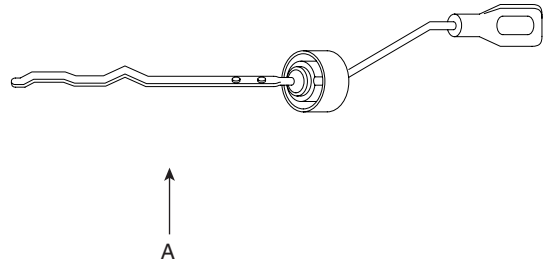
Auto transaxle fluid:  
DIAMOND ATF SP-III, SK ATF SP-III  
Quantity : 7.8ℓ (8.2 US qt, 6.9 Imp.qt)

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**NOTE**

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 acuse the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid. In either case, air bubbles can cause overheating, and fluid oxidation, which can interfere with normal valve, clutch, and brake operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.

6. Insert the oil level gauge securely.



EKRF008A

**NOTE**

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.

**AT -58**

**AUTOMATIC TRANSAXLE (F4A42)**

**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 2.0L engine(2.7L-the oil cooler is separated).
2. Start the engine and let the fluid drain out.

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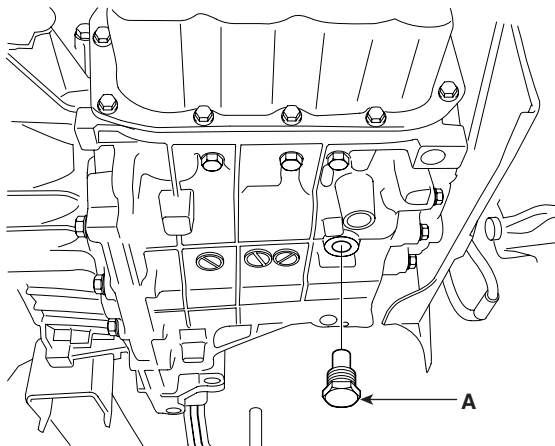
Running conditions : "N" range with engine idling.

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**⚠ CAUTION**

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

3. Remove the drain plug 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 (400 ~ 500 kgf.cm, 29 ~ 36 lbf.ft)

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

**⚠ CAUTION**

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

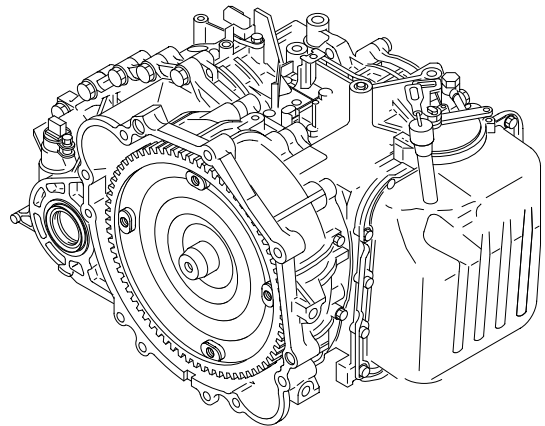
6. Repeat the procedure in step (2).

**📖 NOTE**

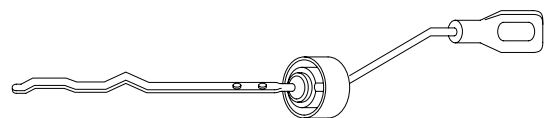
Check the old fluid for contamination. If it has been contaminated, repeat the steps (5) and (6).

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 into the oil filler tube.



EKRF008B

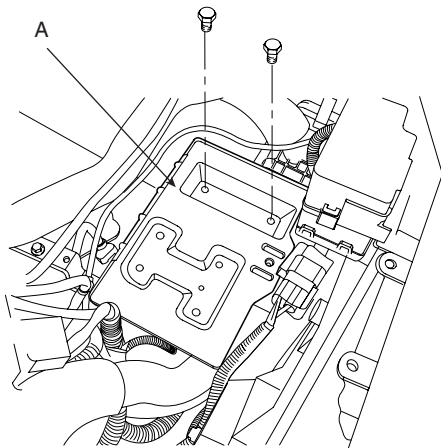


↑  
A

EKRF008A

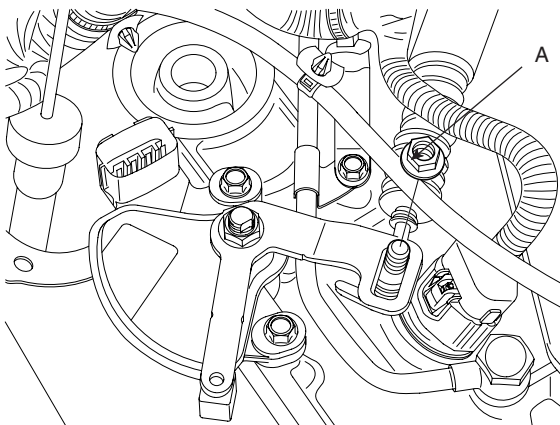
**TRANSAXLE RANGE SWITCH (INHIBITOR SWITCH)  
REPLACEMENT**

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(A).



EKRF008D

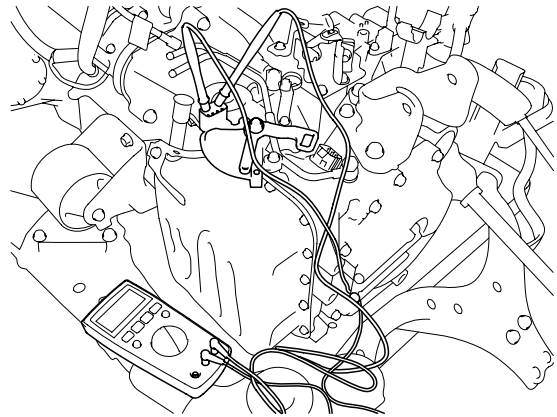
6. Remove the inhibitor switch connector.
7. Remove the shift cable mounting nut(A).



EKRF008E

8. Remove the inhibitor switch loosening the mounting bolts.

9. Referring to 'INSPECTION', check for continuity. If there is an error, replace the inhibitor switch.



EKRF008F

10. After tightening the shift cable mounting nut, connect the inhibitor 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 inhibitor switch if it does not work properly.
4. If the inhibitor 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 inhibitor switch.

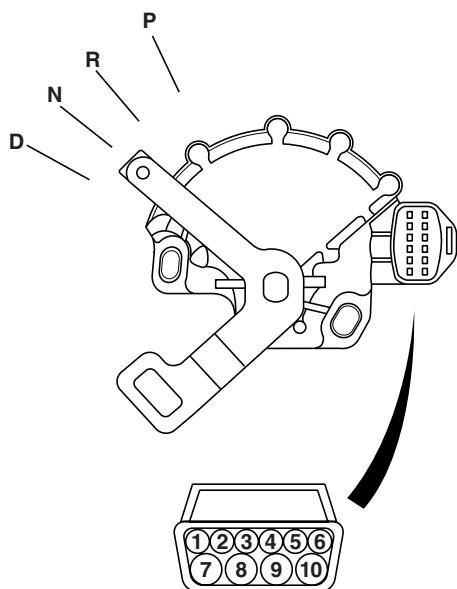
**AT -60**

**AUTOMATIC TRANSAXLE (F4A42)**

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

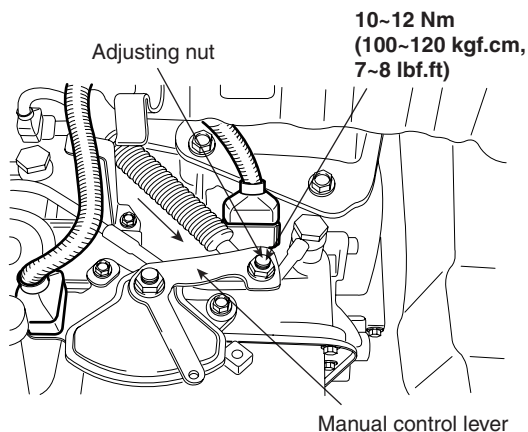


EKRF008H

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

**ADJUSTMENT**

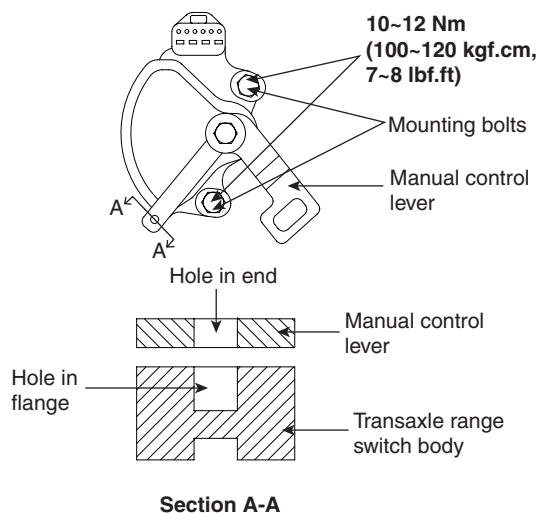
1. Set the select lever to the "N" position.
2. Loosen the control cable to manual control lever coupling nut to free the cable and lever.
3. Set the manual control lever to the neutral position.



EKRF009A

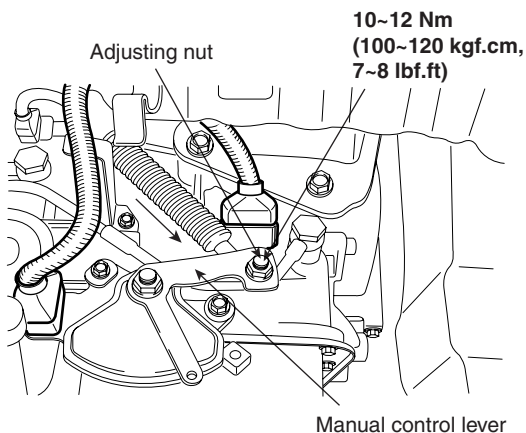
4. Loosen the transaxle range switch body mounting bolts and then turn the transaxle range switch body so the hole in the end of the manual control lever and the hole (cross section A-A in the figure) in the flange of the transaxle range switch body are aligned.
5. Tighten the transaxle range switch 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 (100~120kgf.cm, 7~8lbf.ft)



EKRF009B

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



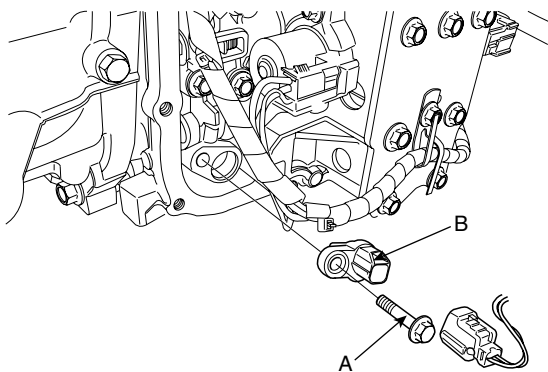
EKRF090A

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

**OIL TEMPERATURE SENSOR**

**REPLACEMENT**

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

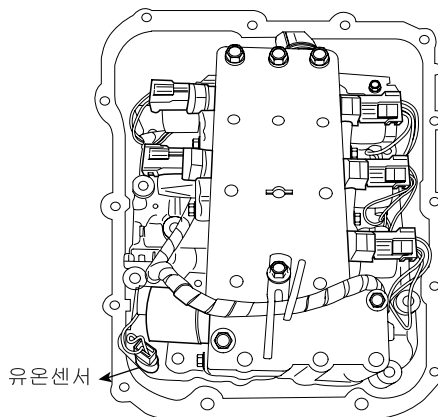


EKRF009C

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

**INSPECTION**

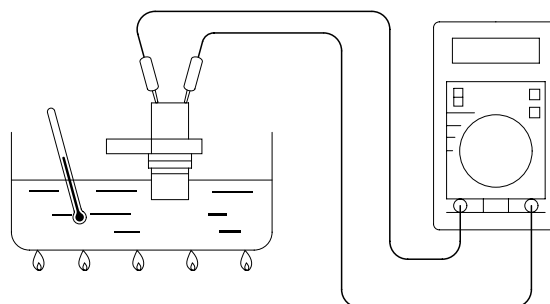
- Remove the oil temperature sensor(A).



EKRF009D

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

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



EKRF009E

- If the value is out of the specification, replace the oil temperature sensor.

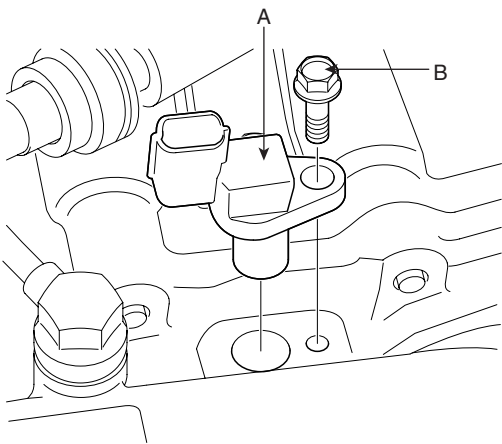
**AT -62**

**AUTOMATIC TRANSAXLE (F4A42)**

**INPUT SHAFT SPEED SENSOR**

**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).



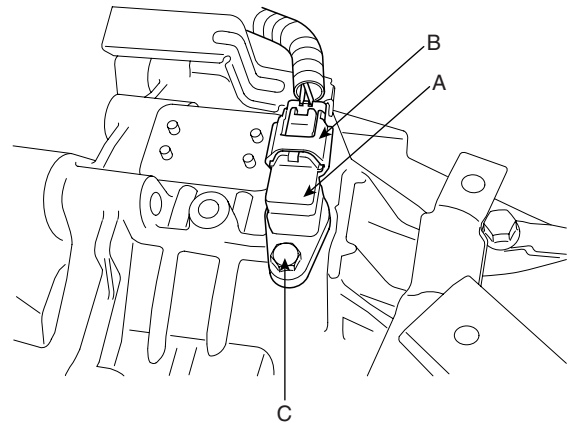
EKRF009F

- 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 SHAFT SPEED SENSOR**

**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.

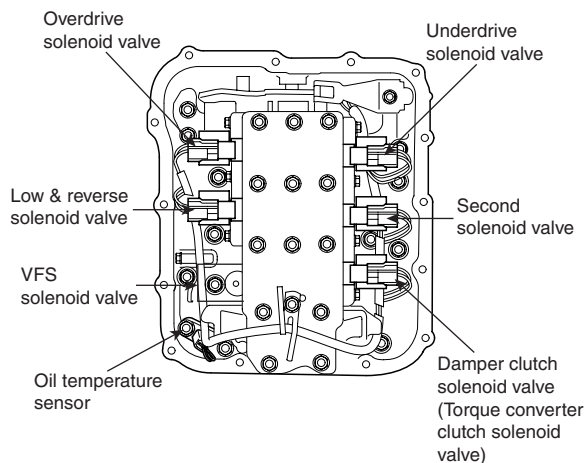
**AUTOMATIC TRANSAXLE SYSTEM**

**SOLENOID VALVE**

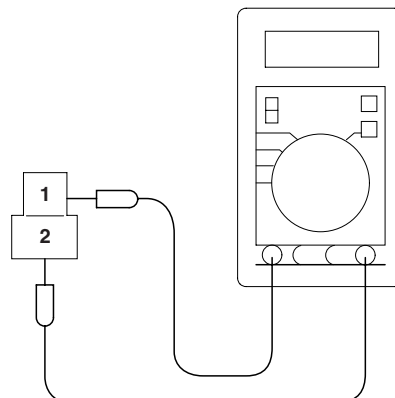
**INSPECTION**

1. If the value is out of specification, remove the valve body cover.

Specification (20°C):  
 2.5 ~ 3.5 Ω (LR, 2ND, UD, OD, TCC)  
 4.3 ~ 4.4Ω (VFS)



EKRF011A

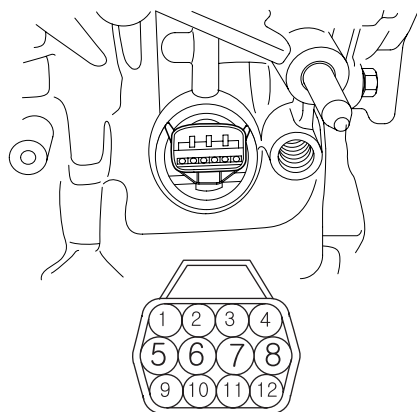


EKRF011B

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

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	
7 & 8	VFS	4.3~4.4Ω (20°C)

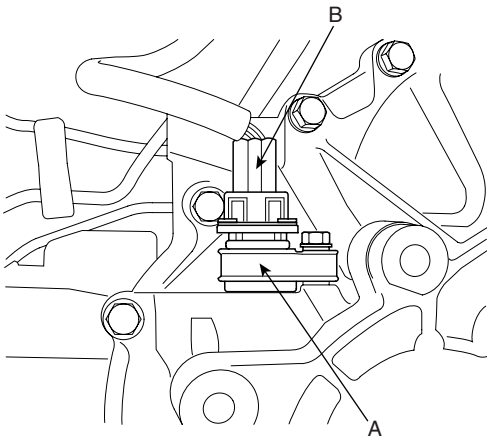


EKRF011C

**VEHICLE SPEED SENSOR**

**REPLACEMENT**

1. Lift up the vehicle.
2. Remove the vehicle speed sensor(A).

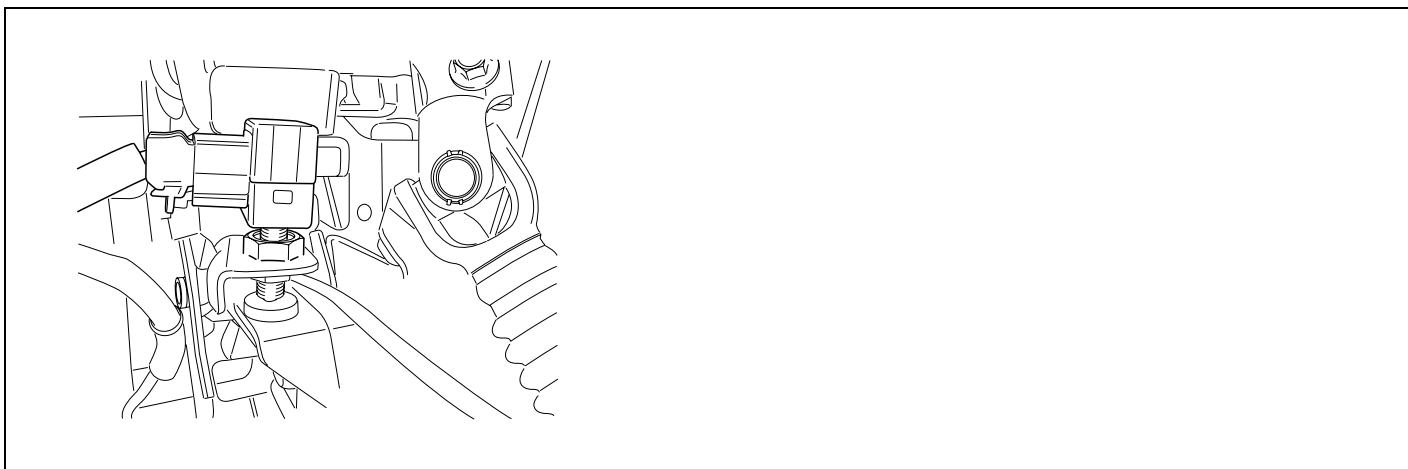


EKRF010B

- 1) Disconnect the vehicle speed sensor connector(B).
  - 2) Remove the bolt (10 mm(0.4 in)).
  - 3) Inspect the vehicle speed sensor bore.
3. Inspect the O-ring for nicks or cut. Install a new O-ring as necessary.
  4. Apply a light coat of automatic transaxle fluid to the O-ring seal before installation.
  5. Install the vehicle speed sensor.
  6. Connect the vehicle speed sensor connector.
  7. Installation is the reverse of removal.

**DTC P0703 BRAKE S/W MALFUNCTION**

**COMPONENT LOCATION** E9E661DA



KKRE004V

**GENERAL DESCRIPTION** EB08ED89

The HIVEC Automatic Transmission's function, of intelligence control, is based on the Fuzzy Control System. The Fuzzy Control System determines optimal gear positions as related to driver's intention and current driving conditions. The Brake Switch provides important information by deciding whether the vehicle is decelerating by the depression of the brake pedal, or if the speed is decreasing because the vehicle is running on the uphill.

**DTC DESCRIPTION** EA259FCE

The TCM(PCM) sets this code if a Brake Switch signal is input continuously, for an extended period of time, when the vehicle is supposed to be running (moving).

**DTC DETECTING CONDITION** EFAC4FDE

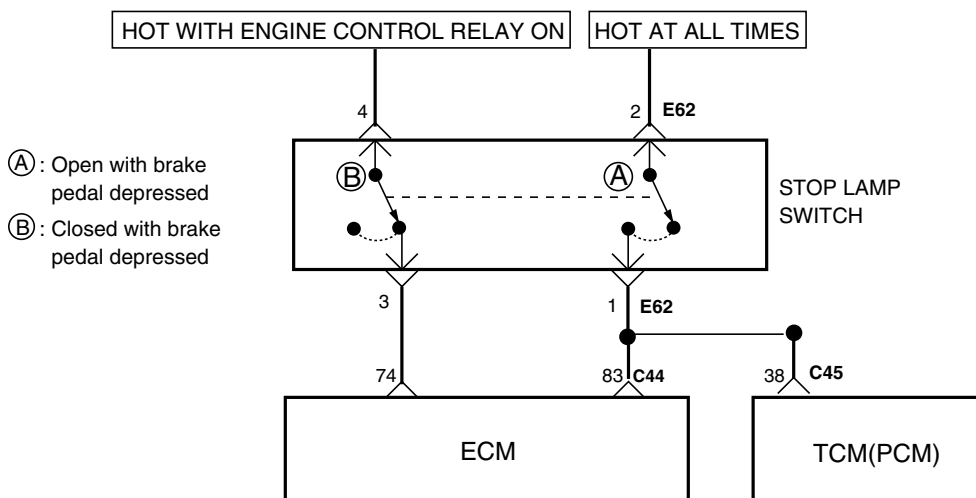
Item		Detecting Condition & Fail Safe	Possible cause
Case 1	DTC Strategy	<ul style="list-style-type: none"><li>• check for Short to Battery</li></ul>	<ul style="list-style-type: none"><li>• Short to battery in circuit</li><li>• Faulty Brake SWITCH Adjustment</li><li>• Faulty Brake SWITCH</li><li>• Faulty TCM(PCM)</li></ul>
	Enable Conditions	<ul style="list-style-type: none"><li>• Output speed <math>\geq</math> 240rpm</li><li>• Brake Switch "ON"</li></ul>	
	Threshold value	<ul style="list-style-type: none"><li>• Short to Battery</li></ul>	
	Diagnostic Time	<ul style="list-style-type: none"><li>• More than 5 min.</li></ul>	
Case 2	DTC Strategy	<ul style="list-style-type: none"><li>• check for Voltage range</li></ul>	
	Enable Conditions	<ul style="list-style-type: none"><li>• <math>2.24\text{ V} \leq \text{Input voltage} \leq 2.76\text{ V}</math></li></ul>	
	Threshold value	<ul style="list-style-type: none"><li>• Open</li></ul>	
	Diagnostic Time	<ul style="list-style-type: none"><li>• More than 5 min.</li></ul>	
Fail safe		<ul style="list-style-type: none"><li>• Intelligent-Shift is inhibited</li></ul>	

**SPECIFICATION** E4E4354C

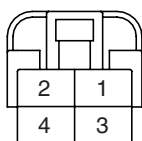
BRAKE	DATA VALUE
Operation	ON
Non-operation	OFF

**SCHEMATIC DIAGRAM** EC86ADCF

**[Circuit Diagram]**



**[Harness Connector]**



**E62**

94	93	92	91	90	89	*	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	6	5
72	71	70	69	*	67	66	65	64	63	62	61	60	59	58	57	56	55	*	53	52	51	4	3
*	*	48	47	*	*	*	*	42	41	40	39	38	37	36	35	34	33	*	*	30	29	2	1
28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7		

**C44**

*	*	58	*	56	55	54	*	*	51	50	49	48	47	46
*	*	*	*	*	*	*	38	*	36	35	34	*	*	*
*	*	*	*	*	*	*	*	*	*	20	19	18	17	16
*	*	*	12	11	10	9	8	7	6	*	*	*	*	*

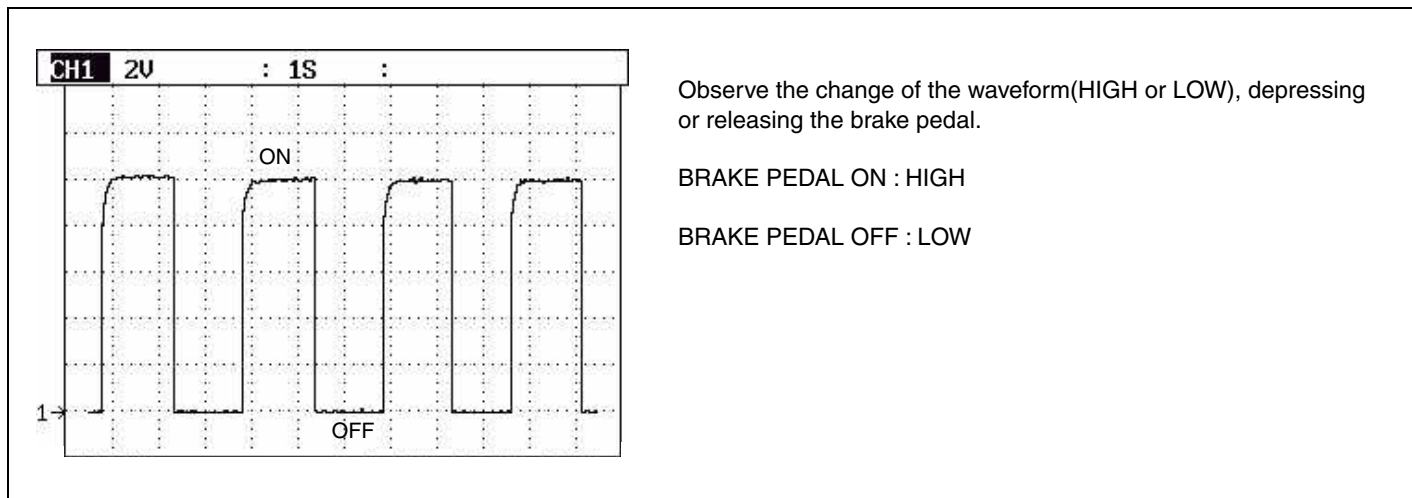
**C45**

**[Connection Information]**

Terminal	Connection	Function
E62 No.1	C44 No.83	ECM
	C45 No.38	TCM
E62 No.2	Hot at all times	
E62 No.4	Hot with engine control relay ON	
E62 No.3	C44 No.74	ECM

WAVEFORM INSPECTION

E7BC6BED



LKIF110D

MONITOR SCANTOOL DATA

E7B6A3A3

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "BRAKE LAMP SWITCH" parameter on the scantool.
4. Depress and release Foot Brake.

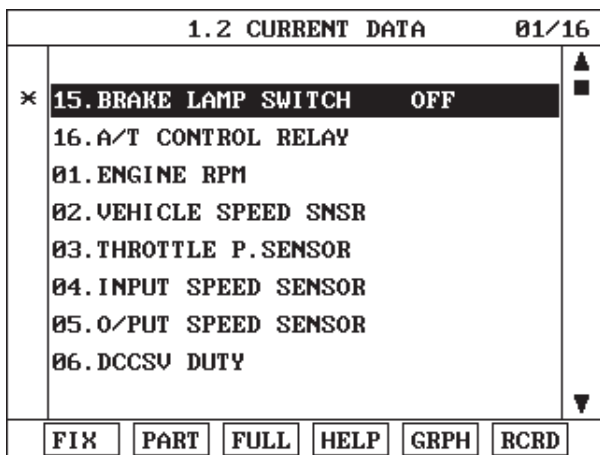


FIG.1)

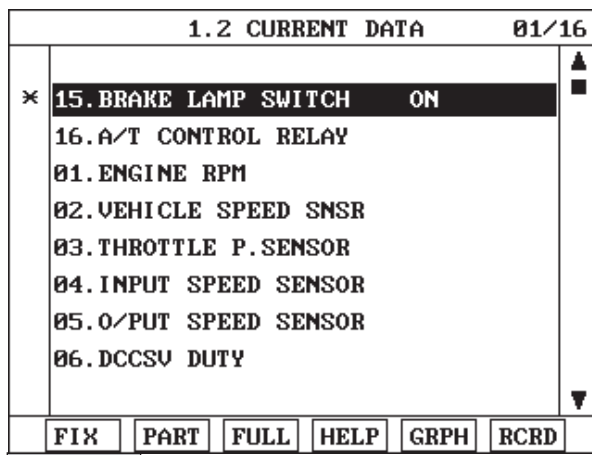


FIG.2)

FIG1) Release foot brake status.

FIG2) Depress foot brake status.

ELQE001A

5. Does "STOP LAMP SWITCH" follow the reference data?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "W/Harness Inspection" procedure.

**TERMINAL & CONNECTOR INSPECTION** EABFEFF2

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

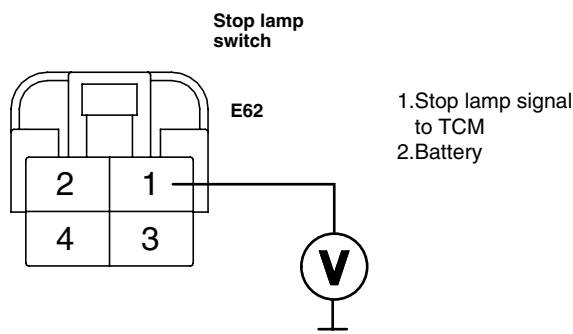
▶ Repair as necessary and go to "Verification vehicle Repair" procedure.

**NO**

▶ Go to "Signal circuit inspection" procedure.

**SIGNAL CIRCUIT INSPECTION** EF3D04DB

1. Ignition "ON" & "OFF".
2. Disconnect "STOP LAMP SWITCH" connector.
3. Measure voltage between terminal "1" of the sensor harness connector and chassis ground.



---

Specification : 0V

---

4. Is voltage within specifications?

**YES**

▶ Go to "Component Inspection" procedure.

**NO**

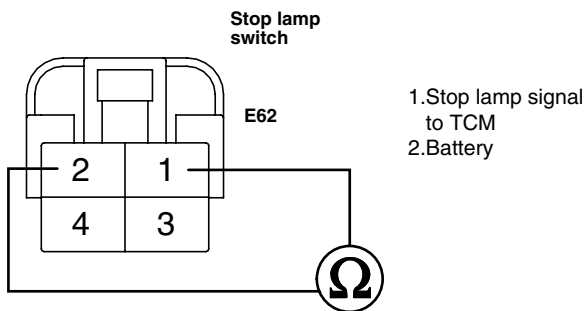
▶ Check for Short to power circuit in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**COMPONENT INSPECTION** E41FC661

1. Check "STOP LAMP SWITCH".

- 1) Ignition "OFF".
- 2) Disconnect "STOP LAMP SWITCH" connector and Remove "STOP LAMP SWITCH".
- 3) Measure resistance between terminal "1" and "2" of the STOP LAMP SWITCH when plunger of the STOP LAMP SWITCH is pushed in.

Specification : Infinite



EKRF401C

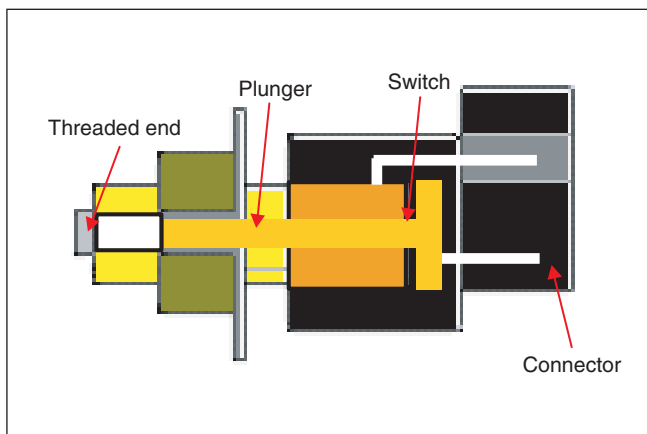


FIG.1)

FIG.1) Brake pedal is released-∞Ω

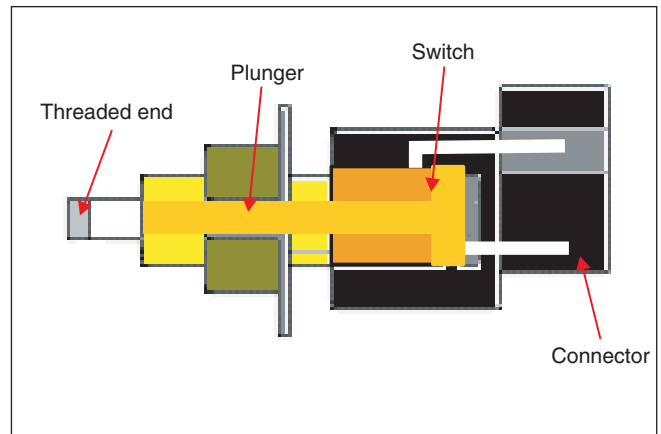


FIG.2)

FIG.2) Brake pedal is depressed-0Ω

ELQE004A

4) Is resistance within specifications?

**YES**

▶ Go to "Adjust STOP LAMP SWITCH" as below.

**NO**

▶ Replace "STOP LAMP SWITCH" as necessary and Go to "Verification Vehicle Repair" procedure.

2. Adjust "STOP LAMP SWITCH" Clearance.

- 1) Ignition "OFF".
- 2) Reinstall "STOP LAMP SWITCH".
- 3) Adjust "STOP LAMP SWITCH" Clearance.

---

Specification : 0.9mm(0.04in)

---

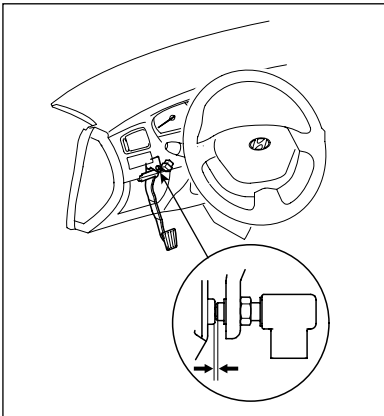


FIG.1)

FIG 1)method of adjust : Screw in the "STOP LAMP SWITCH" until its plunger is fully de-pressed(threaded end (A) touching the pad (B) on the pedal arm). Then back off the switch 3/4 turn to make 0.9mm(0.04In) of clearance between the threaded end and pad Tighten the locknut firmly. Connect the "STOP LAMP SWITCH" connector. Make sure that the stop lamp goes off when the pedal is released.

ELQE005A

4) After Adjusting, Has problem been solved?

**YES**

▶ Go to "Verification Vehicle Repair" procedure.

**NO**

▶ Substitute with a known-good TCM(PCM) and check for proper operation. If the problem is corrected, replace TCM/PCM as necessary and go to "Verification Vehicle Repair" procedure.

**VERIFICATION OF VEHICLE REPAIR** E5053FAD

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present?

**YES**

- ▶ Go to the applicable troubleshooting procedure.

**NO**

- ▶ System performing to specification at this time.

**DTC P0707 TRANSAXLE RANGE SWITCH - LOW INPUT**

**COMPONENT LOCATION** E2C2EDC5



EKKE108A

**GENERAL DESCRIPTION** E43E252C

The Transaxle Range Switch sends the shift lever position information to the TCM(PCM) using a 12V (battery voltage) signal. When the shift lever is in the D (Drive) position the output signal of Transaxle Range Switch is 12V and in all other positions the voltage is 0V. The TCM(PCM) judges the shift lever position by reading all signals, for the Transaxle Range Switch, simultaneously.

**DTC DESCRIPTION** E85E5DFB

The TCM(PCM) sets this code when the Transaxle Range Switch has no output signal for more than 30 seconds.

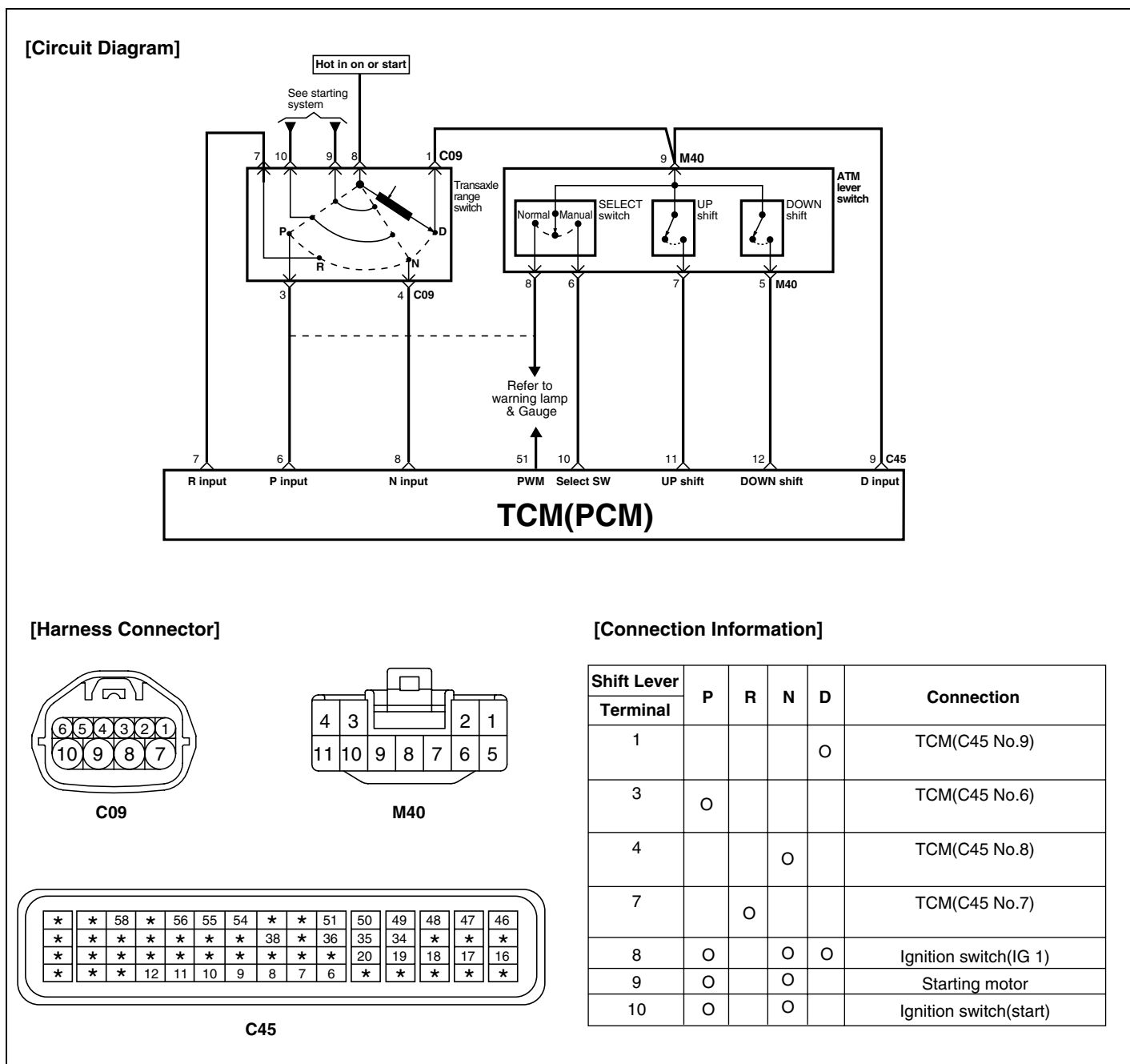
**DTC DETECTING CONDITION** E6F8D8F4

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Check for No signal</li></ul>	<ul style="list-style-type: none"><li>• Open or short in circuit</li><li>• Faulty TRANSAXLE RANGE SWITCH</li><li>• Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• Engine speed <math>\geq</math> 400rpm and TPS <math>\geq</math> 10%</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• No signal detected</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• More than 30sec</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• Recognition as previous signal<ul style="list-style-type: none"><li>- When P-D or R-D or D-R SHIFT is detected, it is regarded as N-D or N-R though "N" signal is not detected.</li><li>- When sports mode S/W is ON without P,R,N, D-RANGE signals, it is regarded as sports mode.(DTC is not set)</li></ul></li></ul>	

**SPECIFICATION** E211E349

Inspection condition	Reference value	
* IG KEY : ON or Engine stall	Shift lever : P	P,N
	Shift lever : R	R
	Shift lever : N	P,N
	Shift lever : D	D

**SCHEMATIC DIAGRAM** EB63BDCD

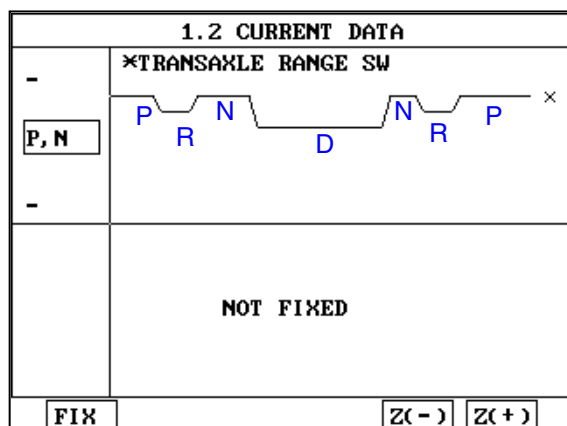


## AUTOMATIC TRANSAXLE SYSTEM

AT -75

### MONITOR SCANTOOL DATA EA6DEEC6

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "TRANSAXLE RANGE SWITCH" parameter on the scantool.
4. Move selector lever from "P" range to other range.



ELQE006A

5. Does "TRANSAXLE RANGE SWITCH" follow the reference data?

**YES**

► Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

► Go to "TERMINAL & CONNECTOR INSPECTION" procedure.

### TERMINAL & CONNECTOR INSPECTION EBDBAAC8

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

► Repair as necessary and go to "Verification vehicle Repair" procedure.

**NO**

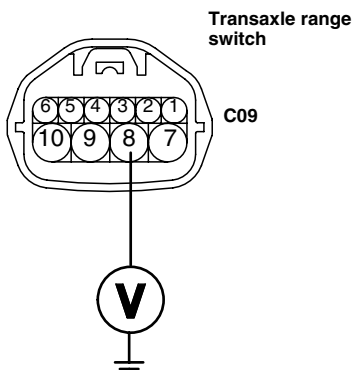
► Go to "Power Supply circuit inspection" procedure.

**POWER SUPPLY CIRCUIT INSPECTION** ED0DF1A5

1. CHECK POWER TO RANGE SWITCH

- 1) Disconnect "TRANSAXLE RANGE SWITCH" connector.
- 2) Ignition "ON" & Engine "OFF".
- 3) Measure voltage between terminal "8" of the sensor harness connector and chassis ground.

Specification : approx. B+



- 1. D Range
- 3. P Range
- 4. N Range
- 7. R Range
- 8. Power supply IG1
- 9. Starting circuit
- 10. Starting circuit

EKRF402B

4) Is voltage within specifications?

**YES**

▶ Go to "Signal circuit inspection" procedure.

**NO**

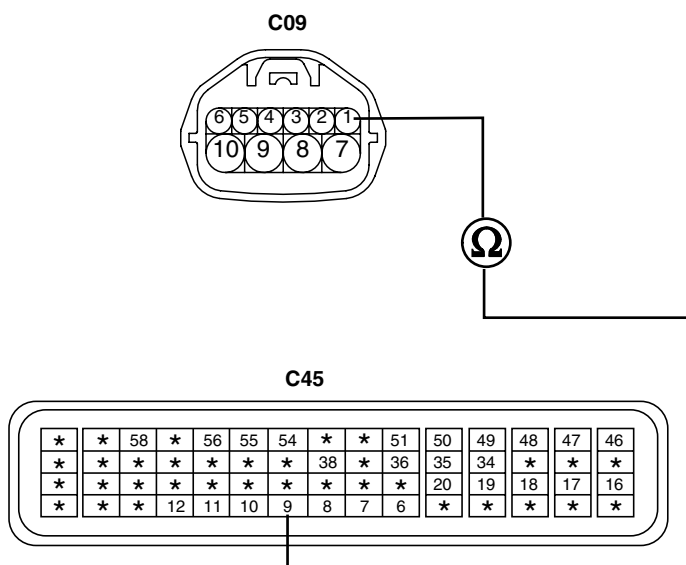
- ▶ Check that Fuse 24-10A is installed or not blown.
- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**SIGNAL CIRCUIT INSPECTION** ECCE6AA4

1. Ignition "OFF".
2. Disconnect "TRANSAXLE RANGE SWITCH" and "TCM(PCM)" connector.
3. Measure resistance between each terminal of the sensor harness connector and TCM(PCM)harness connector as below.

Specification : Shown below

Pin No of "TRANSAXLE RANGE SWITCH"	C09 No.1	C09 No.3	C09 No.4	C09 No.7
Pin No of "TCM(PCM)" harness	C45 No.9	C45 No.6	C45 No.8	C45 No.7
Specification	0Ω	0Ω	0Ω	0Ω



- 1. D Range
- 3. P Range
- 4. N Range
- 7. R Range
- 8. Power supply IG1
- 9. Starting circuit
- 10. Starting circuit

- 6. P Range
- 7. R Range
- 8. N Range
- 9. D Range

EKRF402C

4. Is resistance within specifications?

**YES**

► Go to "Component inspection" procedure.

**NO**

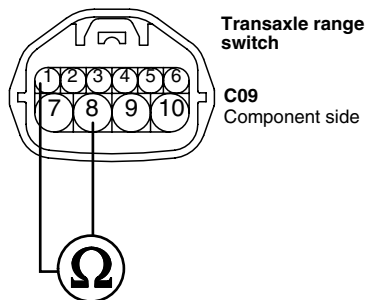
► Check for Open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**COMPONENT INSPECTION**

EC3DCB59

1. Ignition "OFF".
2. Remove "TRANSAXLE RANGE SWITCH".
3. Measure the resistance between each terminal of the sensor.

Specification : approx. 0 Ω



- 1. D Range
- 3. P Range
- 4. N Range
- 7. R Range
- 8. Power supply IG1
- 9. Starting circuit
- 10. Starting circuit

EKRF402D

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

[ RANGE SWITCH continuity check table ]

ELQE011A

4. Is resistance within specifications?

**YES**

▶ Substitute with a known-good TCM(PCM) and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "Verification of Vehicle Repair" procedure.

**NO**

▶ Replace "TRANSAXLE RANGE SWITCH" as necessary and Go to "Verification Vehicle Repair" procedure.

**VERIFICATION OF VEHICLE REPAIR** E9A4407B

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present?

**YES**

▶ Go to the applicable troubleshooting procedure.

**NO**

▶ System performing to specification at this time.

**DTC P0708 TRANSAXLE RANGE SWITCH - HIGH INPUT**

**COMPONENT LOCATION** E782BED1

Refer to DTC P0707.

**GENERAL DESCRIPTION** EC87FCAB

Refer to DTC P0707.

**DTC DESCRIPTION** EDCBFF5E

The TCM sets this code when the Transaxle Range Switch outputs multiple signals for more than 30 seconds.

**DTC DETECTING CONDITION** E8C5EBD6

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Check for multiple signals</li></ul>	<ul style="list-style-type: none"><li>• Open or short in TRANSAXLE RANGE SWITCH</li><li>• Faulty TRANSAXLE RANGE SWITCH</li><li>• Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• Always</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• Multiple signal</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• More than 30sec</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• Recognition as previous signal<ul style="list-style-type: none"><li>- When signal is input "D" and "N" at the same time, TCM(PCM) regards it as "N" RANGE.</li><li>- After TCM(PCM) Reset, If the if the TCM(PCM) detects multiple signal or no signal, then it holds the 3rd gear position.</li></ul></li></ul>	

**SPECIFICATION** E4CFEB5A

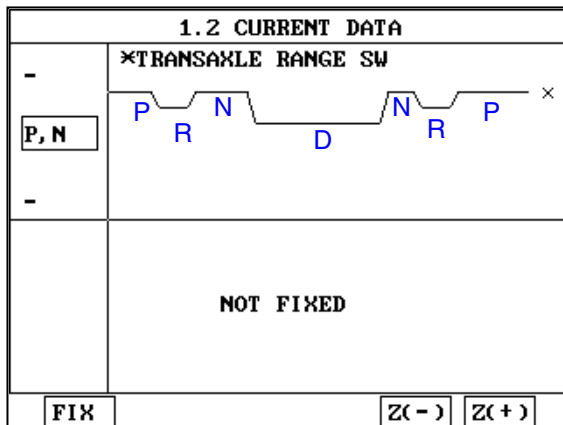
Refer to DTC P0707.

**SCHEMATIC DIAGRAM** E7FDEBB8

Refer to DTC P0707.

**MONITOR SCANTOOL DATA** E94D16A9

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "TRANSAXLE RANGE SWITCH" parameter on the scantool.
4. Move selector lever from "P" range to "L" range.



ELQE006A

5. Does "TRANSAXLE RANGE SWITCH" follow the reference data?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "TERMINAL & CONNECTOR INSPECTION" procedure.

**TERMINAL & CONNECTOR INSPECTION** ECDA92EB

Refer to DTC P0707.

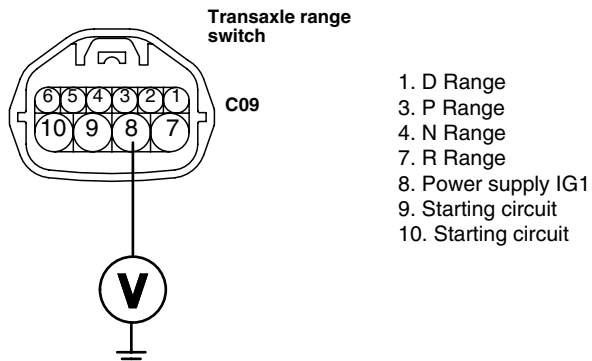
**POWER SUPPLY CIRCUIT INSPECTION** EC0FEC11

1. Disconnect "TRANSAXLE RANGE SWITCH" connector.
2. Ignition "ON" & Engine "OFF".
3. Measure voltage between each terminal "8" of the sensor harness connector and chassis ground.

---

Specification : Approx. B+

---



EKRF403A

4. Is voltage within specifications?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Check for Short in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

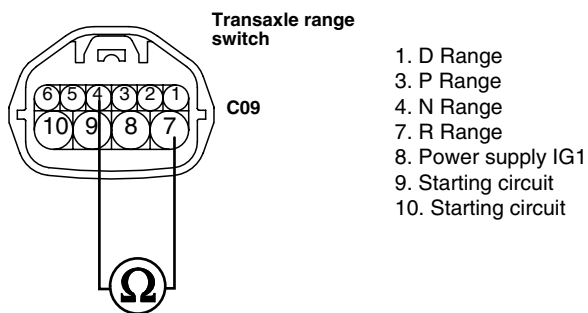
**SIGNAL CIRCUIT INSPECTION** E3E0F705

1. Ignition "OFF".
2. Disconnect "TRANSAXLE RANGE SWITCH" and "TCM(PCM)" connector.
3. Measure resistance between each terminals of the sensor harness to check for Short.

---

Specification : Infinite

---



EKRF403B

4. Is resistance within specifications?

**YES**

- ▶ Go to "Component inspection" procedure.

**NO**

- ▶ Check for Open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**COMPONENT INSPECTION** E5EB521B

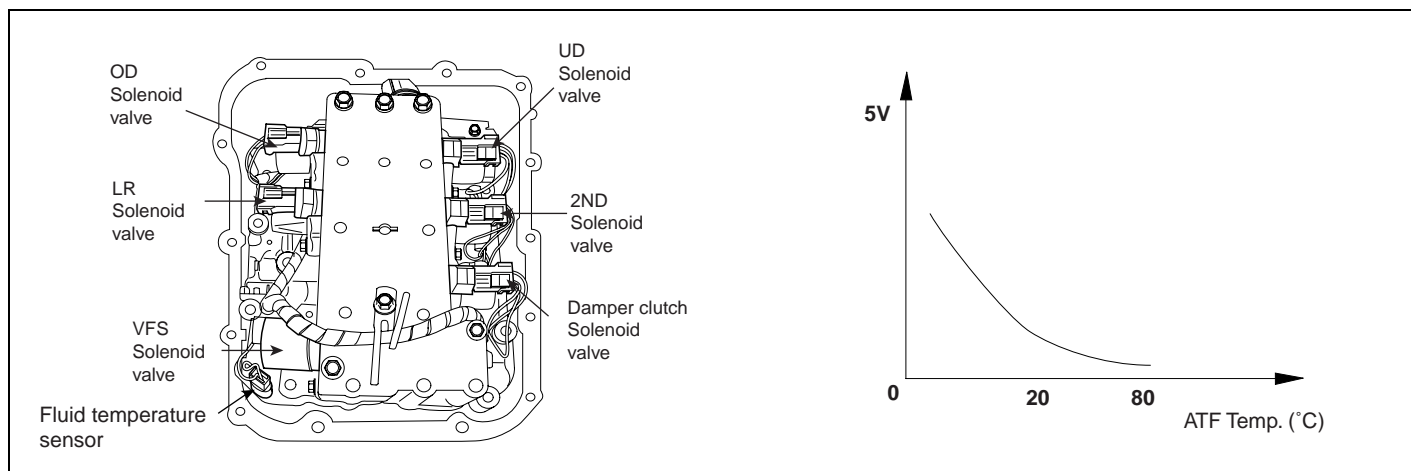
Refer to DTC P0707.

**VERIFICATION OF VEHICLE REPAIR** E3BA992C

Refer to DTC P0707.

**DTC P0711 TRANSAXLE FLUID TEMPERATURE SENSOR RATIONALITY**

**COMPONENT LOCATION** E201CDBE



EKRF404A

**GENERAL DESCRIPTION** EBED20D7

The automatic TRANSAXLE fluid(ATF) temperature sensor is installed in the Valve Body. This sensor uses a thermistor whose resistance changes according to the temperature changes. The TCM(PCM) supplies a 5V reference voltage to the sensor, and the output voltage.

**DTC DESCRIPTION** E3BE07C8

This DTC code is set when the ATF temperature output voltage is lower than a value generated by thermistor resistance, in a normal operating range, for approximately 1 second or longer. The TCM(PCM) regards the ATF temperature as fixed at a value of 80°C(176°F).

DTC DETECTING CONDITION

EDA70E59

Item		Detecting Condition & Fail Safe	Possible cause
DTC Strategy		<ul style="list-style-type: none"> <li>Check rationality</li> </ul>	<ul style="list-style-type: none"> <li>Sensor signal circuit is short to ground</li> <li>Faulty sensor</li> <li>Faulty TCM(PCM)</li> </ul>
Enable Conditions	Case 1	<ul style="list-style-type: none"> <li>Engine speed <math>\geq</math> 1000rpm and Output speed <math>\geq</math> 1000rpm for 5min cumulative and Engine coolant temperature has changed by more than 40°C(104°F) since start up and other OTS related error is not detected. In condition that Oil TEMP is not changed more than 2°C(35.6°F)</li> </ul>	
	Case 2	<ul style="list-style-type: none"> <li>OTS output at IG-OFF <math>\geq</math> 50°C(122°F) and the engine coolant temperature at IG-OFF <math>\geq</math> 73.5°C(164.3°F) and the engine coolant temperature have decreased over 34°C(93.2°F) from IG-OFF of the previous trip. In condition that OTS TEMP is not changed morethan 2°C(35.6°F)</li> </ul>	
	Case 3	<ul style="list-style-type: none"> <li>Output speed <math>\geq</math> 1000rpm, Engine speed <math>\geq</math> 1000rpm for 5min cumulative and the engine coolant temperature <math>\geq</math> 73.5°C. In condition that OTS output <math>\leq</math> -23.5°C(-10.3°F)</li> </ul>	
Threshold value		<ul style="list-style-type: none"> <li>-</li> </ul>	
Diagnostic Time		<ul style="list-style-type: none"> <li>-</li> </ul>	
Fail Safe		<ul style="list-style-type: none"> <li>Learning control and Intelligent shift are inhibited</li> <li>Fluid temperature is regarded as 80°C(176°F)</li> </ul>	

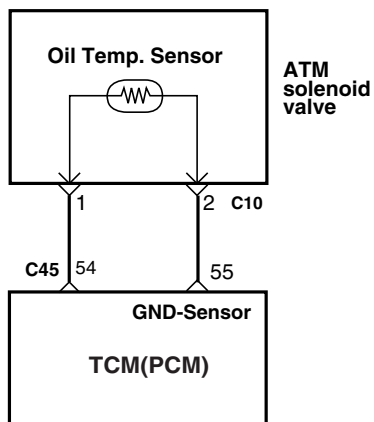
SPECIFICATION

E9B3B28E

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		

**SCHEMATIC DIAGRAM** EB34DCAF

[Circuit Diagram]



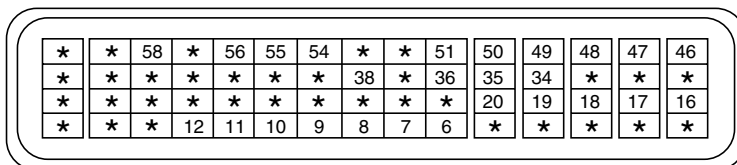
[Connection Information]

Terminal	Connection	Function
1	C45 No.54	Sensor signal
2	C45 No.55	Sensor ground

[Harness Connector]



**C10**



**C45**

**MONITOR SCANTOOL DATA** EA751ECB

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "TRANSAXLE FLUID TEMPERATURE SENSOR" parameter on the scantool.

Specification : Increasing Gradually

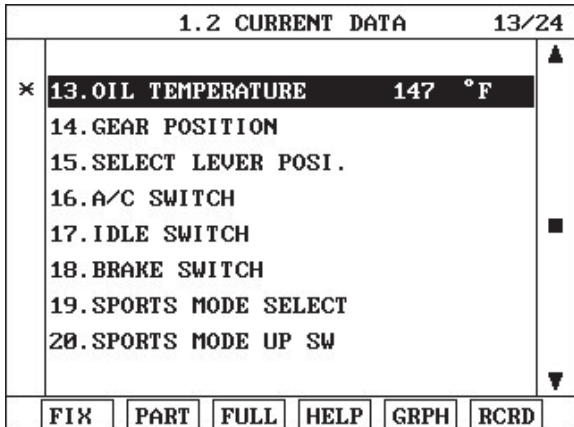


FIG.1)

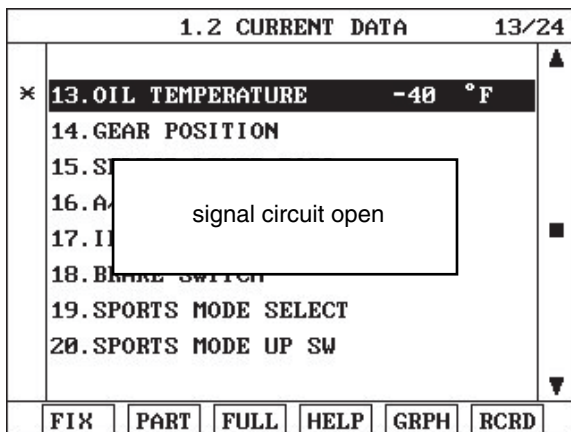


FIG.2)

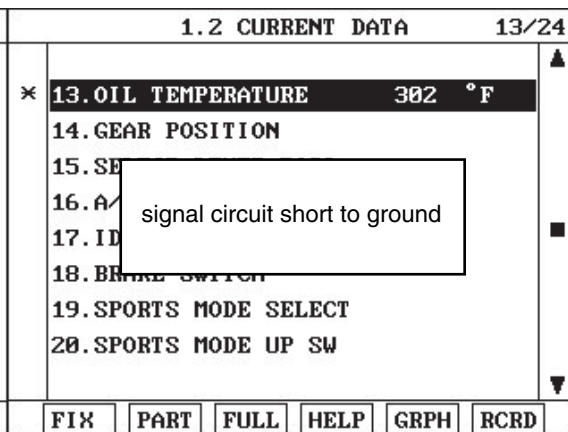


FIG.3)

FIG.1) Normal

FIG.2) Signal harness Open

FIG.3) Signal harness Short

ELQE013A

4. Does "TRANSAXLE FLUID TEMPERATURE SENSOR " follow the reference data?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "Terminal & Connector Inspection" procedure.

**TERMINAL & CONNECTOR INSPECTION** E84EE6B0

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

▶ Repair as necessary and go to "Verification vehicle Repair" procedure.

**NO**

▶ Go to "Component inspection" procedure.

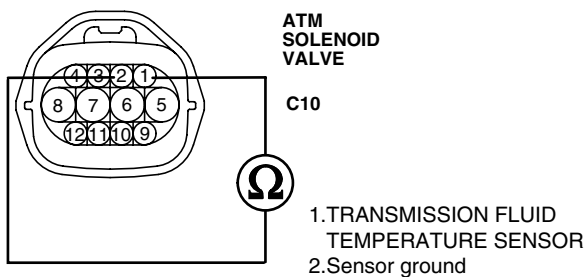
**COMPONENT INSPECTION** EDAE2C13

1. CHECK "TRANSAXLE FLUID TEMPERATURE SENSOR"
  - 1) Ignition "OFF".
  - 2) Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
  - 3) Measure the resistance between terminals "1" and "2" of the "TRANSMISSION FLUID TEMPERATURE SENSOR".

Specification : Refer to "Reference data"

**[REFERENCE DATA]**

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		



4) Is resistance within specifications?

**YES**

▶ Go to "CHECK TCM(PCM)" as below.

**NO**

▶ Replace "TRANSAXLE FLUID TEMPERATURE SENSOR" as necessary and Go to "Verification Vehicle Repair" procedure.

2. CHECK TCM

- 1) Ignition "ON" & Engine "OFF".
- 2) Connect "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
- 3) Install scantool and select a SIMU-SCAN.
- 4) Simulate voltage (0→5V) to "TRANSMISSION FLUID TEMPERATURE SENSOR" signal circuit.

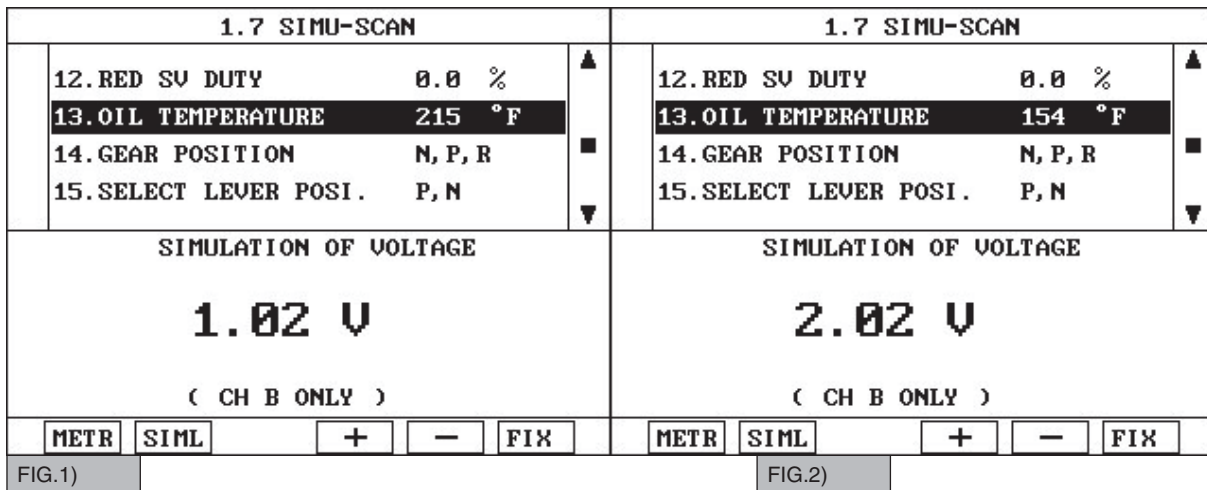


FIG.1) INPUT 1.02V → 215°F  
FIG.2) INPUT 2.02V → 154°F

※ The values are subject to change according to vehicle model

ELQE016A

5) Is FLUID TEMP. SENSOR signal value changed according to simulation voltage?

**YES**

▶ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

**NO**

▶ Substitute with a known-good TCM(PCM) and check for proper operation. If the problem is corrected, replace TCM(PCM) as necessary and then go to "Verification of Vehicle Repair" procedure.

**VERIFICATION OF VEHICLE REPAIR** E7F72AB0

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present?

**YES**

- ▶ Go to the applicable troubleshooting procedure.

**NO**

- ▶ System performing to specification at this time.

AT -90

AUTOMATIC TRANSAXLE (F4A42)

**DTC P0712 FLUID(OIL) TEMPERATURE SENSOR CIRCUIT - LOW**

**COMPONENT LOCATION** EEE8E8D0

Refer to DTC P0711.

**GENERAL DESCRIPTION** EB0594C3

The automatic TRANSAXLE fluid(ATF) temperature sensor is installed in the Valve Body. This sensor uses a thermistor whose resistance changes according to the temperature changes. The TCM(PCM) supplies a 5V reference voltage to the sensor, and the output voltage of the sensor changes when the ATF temperature varies. The automatic TRANSAXLE fluid(ATF) temperature provides very important data for the TCM(PCM)'s control of the Torque Converter Clutch, and is also used for many other purposes.

**DTC DESCRIPTION** EEACCB02

Refer to DTC P0711.

**DTC DETECTING CONDITION** EBF8F0B1

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	<ul style="list-style-type: none"><li>• Check for Voltage range</li></ul>	<ul style="list-style-type: none"><li>• Sensor signal circuit is short to ground</li><li>• Faulty sensor</li><li>• Faulty TCM(PCM)</li></ul>
Enable Conditions	<ul style="list-style-type: none"><li>• Always</li></ul>	
Threshold value	<ul style="list-style-type: none"><li>• Voltage &lt; 0.05V</li></ul>	
Diagnostic Time	<ul style="list-style-type: none"><li>• More than 1sec</li></ul>	
Fail Safe	<ul style="list-style-type: none"><li>• Learning control and Intelligent shift are inhibited</li><li>• Fluid temperature is regarded as 80°C(176°F)</li></ul>	

**SPECIFICATION** EC3E1EDE

Refer to DTC P0711.

**SCHEMATIC DIAGRAM** E0383C86

Refer to DTC P0711.

**MONITOR SCANTOOL DATA** E6EAEEAF

Refer to DTC P0711.

**TERMINAL & CONNECTOR INSPECTION** E6078553

Refer to DTC P0711.

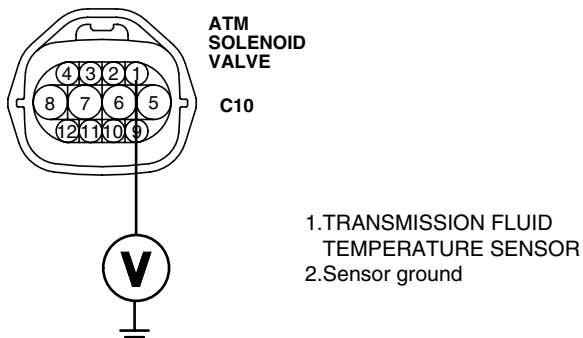
**SIGNAL CIRCUIT INSPECTION** E99A69C6

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
3. Measure the voltage between terminal "1" of the "TRANSMISSION FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

---

Specification : Approx. 5V

---



EKRF405A

4. Is voltage within specifications?

**YES**

- ▶ Go to "Component Inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure .

**COMPONENT INSPECTION** E4C5A5CF

1. CHECK "TRANSAXLE FLUID TEMPERATURE SENSOR"

- 1) Ignition "OFF".
- 2) Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
- 3) Measure the resistance between terminals "1" and "2" of the "TRANSMISSION FLUID TEMPERATURE SENSOR".

---

Specification : Refer to " Reference data"

---

**[REFERENCE DATA]**

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		

- 4) Is resistance within specifications?

**YES**

▶ Go to "CHECK TCM(PCM)" as below.

**NO**

▶ Replace "TRANSAXLE FLUID TEMPERATURE SENSOR" as necessary and Go to "Verification Vehicle Repair" procedure.

2. CHECK TCM(PCM)

- 1) Ignition "ON" & Engine "OFF".
- 2) Connect "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
- 3) Install scantool and select a SIMU-SCAN.
- 4) Simulate voltage (0→5V) to "TRANSMISSION FLUID TEMPERATURE SENSOR" signal circuit.

1.7 SIMU-SCAN				1.7 SIMU-SCAN					
12. RED SV DUTY	0.0 %	▲ ■ ▼		12. RED SV DUTY	0.0 %	▲ ■ ▼			
13. OIL TEMPERATURE	215 °F			13. OIL TEMPERATURE	154 °F				
14. GEAR POSITION	N, P, R			14. GEAR POSITION	N, P, R				
15. SELECT LEVER POSI.	P, N			15. SELECT LEVER POSI.	P, N				
SIMULATION OF VOLTAGE				SIMULATION OF VOLTAGE					
1.02 V		2.02 V							
( CH B ONLY )		( CH B ONLY )							
METR	SIML	+	-	FIX	METR	SIML	+	-	FIX
FIG.1)				FIG.2)					

FIG.1) INPUT 1.02V → 215°F

FIG.2) INPUT 2.02V → 154°F

※ The values are subject to change according to vehicle model

ELQE016A

5) Is FLUID TEMP. SENSOR signal value changed according to simulation voltage?

**YES**

▶ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

**NO**

▶ Substitute with a known-good TCM(PCM) and check for proper operation. If the problem is corrected, replace TCM(PCM) as necessary and then go to "Verification of Vehicle Repair" procedure.

**VERIFICATION OF VEHICLE REPAIR** E49E78D6

Refer to DTC P0711.

AT -94

AUTOMATIC TRANSAXLE (F4A42)

**DTC P0713 FLUID(OIL) TEMPERATURE SENSOR CIRCUIT - HIGH**

**COMPONENT LOCATION** EC103B14

Refer to DTC P0711.

**GENERAL DESCRIPTION** E5DECAA5

Refer to DTC P0712.

**DTC DESCRIPTION** E7854692

Refer to DTC P0711.

**DTC DETECTING CONDITION** EA4CDA4D

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Check for Voltage range</li></ul>	<ul style="list-style-type: none"><li>• Sensor signal circuit is short to ground</li><li>• Faulty sensor</li><li>• Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• Always</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• Voltage <math>\geq</math> 0.49V</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• More than 1sec</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• Learning control and Intelligent shift are inhibited</li><li>• Fluid temperature is regarded as 80°C(176°F)</li></ul>	

**SPECIFICATION** EFFFDB91

Refer to DTC P0711.

**SCHEMATIC DIAGRAM** E95BDB6A

Refer to DTC P0711.

**MONITOR SCANTOOL DATA** E4C9CBCE

Refer to DTC P0711.

**TERMINAL & CONNECTOR INSPECTION** E8F1A99B

Refer to DTC P0711.

**SIGNAL CIRCUIT INSPECTION** E3CE02AE

Refer to DTC P0712.

## AUTOMATIC TRANSAXLE SYSTEM

AT -95

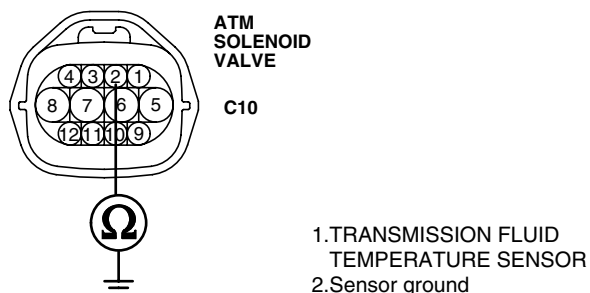
### GROUND CIRCUIT INSPECTION EBCED915

1. Ignition "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
3. Measure the resistance between terminal "2" of the "TRANSMISSION FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

---

Specification : Approx. 0  $\Omega$

---



EKRF406A

4. Is resistance within specifications?

**YES**

- ▶ Go to "Component inspection" procedure.

**NO**

- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

### COMPONENT INSPECTION EF947FF7

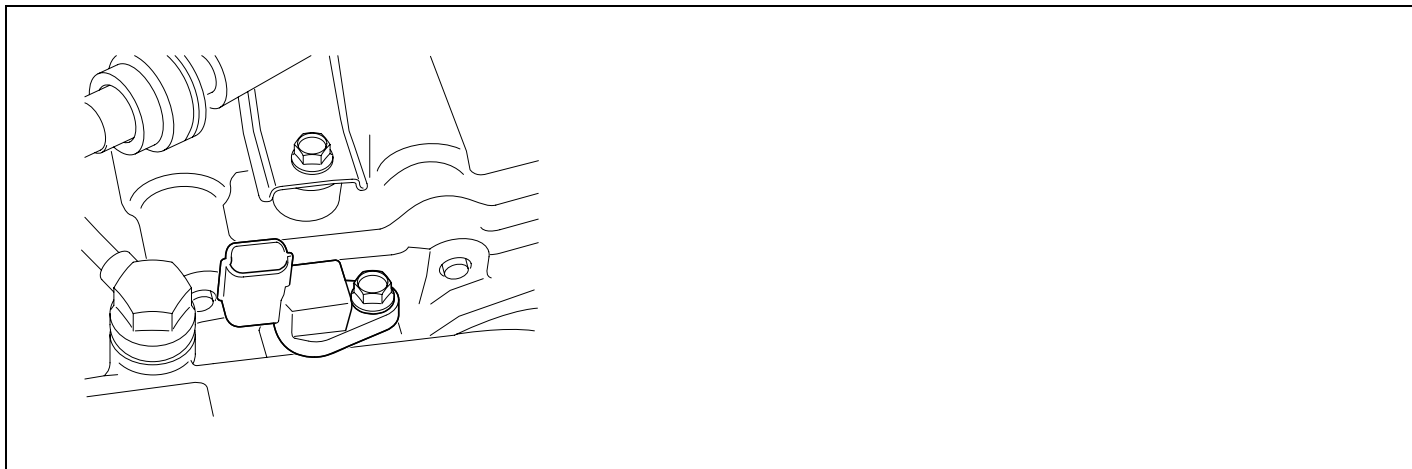
Refer to DTC P0712.

### VERIFICATION OF VEHICLE REPAIR E4D5E0B6

Refer to DTC P0711.

**DTC P0717 INPUT SPEED SENSOR CIRCUIT - NO SIGNAL**

**COMPONENT LOCATION** ED19CAB2



BKQE004A

**GENERAL DESCRIPTION** E3C7E5AF

The input(turbine) speed sensor outputs pulse-signals according to the revolutions of the input shaft of the transmission. The TCM(PCM) determines the input shaft speed by counting the frequency of the pulses. This value is mainly used to control the optimum fluid pressure during shifting.

**DTC DESCRIPTION** EAD4E37F

The TCM(PCM) sets this code if an output pulse-signal is not detected, from the input speed sensor, when the vehicle is running faster than 30 km/h. The Fail-Safe function will be set by the TCM(PCM) if this code is detected.

**DTC DETECTING CONDITION** E8CC52F1

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>Speed rationality check</li></ul>	<ul style="list-style-type: none"><li>Signal circuit is open or short</li><li>Sensor power circuit is open</li><li>Sensor ground circuit is open</li><li>Faulty INPUT SPEED SENSOR</li><li>Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>Vehicle speed is over 19 Mile/h(30 Km/h) and Engine speed <math>\geq</math> 2000rpm in D,3,2,L(A/T range switch) and SP(SPORTS MODE)</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>No signal</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>More than 1sec</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>Locked into 3rd or 2nd gear</li><li>Manual shifting is possible (2 nd <math>\rightarrow</math> 3 rd, 3 rd <math>\rightarrow</math> 2 nd)</li></ul>	

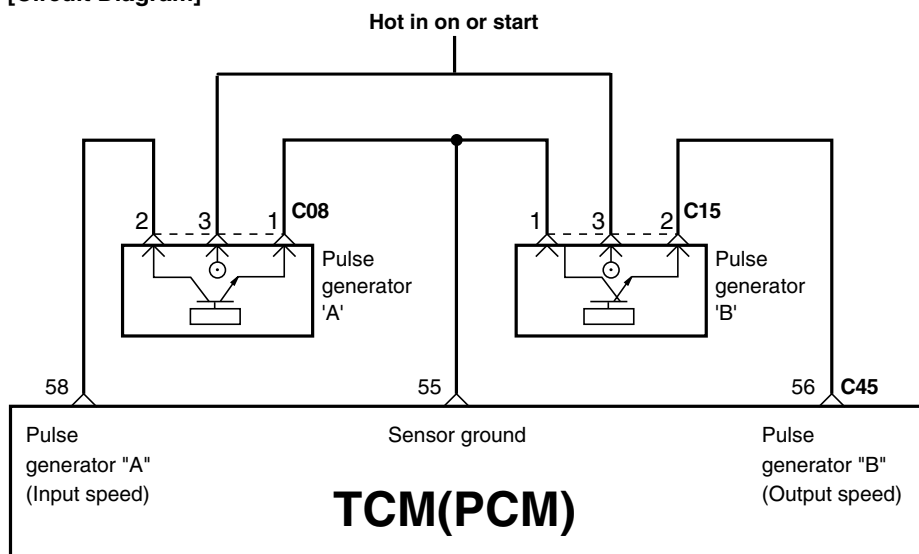
**SPECIFICATION** ED1CDFE8

Input shaft & Output shaft speed sensor

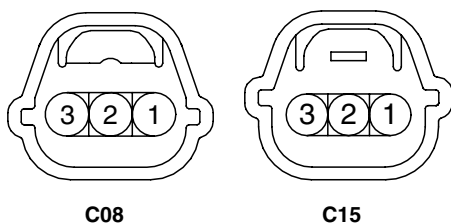
- Type : Hall sensor
- Current consumption : 22mA(MAX)
- sensor body and sensor connector have been unified as one.

**SCHEMATIC DIAGRAM** E627A2C3

[Circuit Diagram]

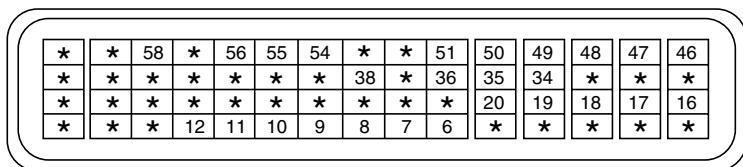


[Harness Connector]



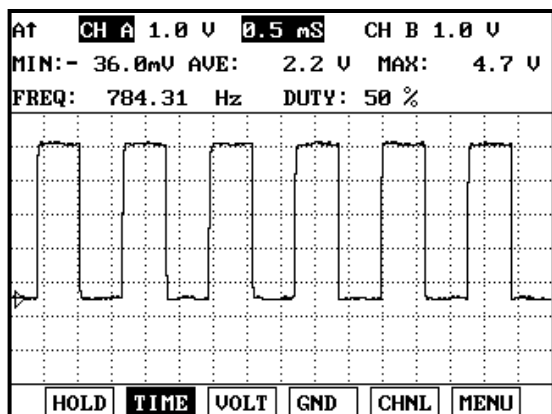
[Connection Information]

Terminal	Connection	Function
1	C45 No.55	Sensor ground
2	C45 No.58	Input speed
3	JC01 No.89	Hot at all times



**C45**

SIGNAL WAVEFORM E2F3EDA9



ELQE020A

MONITOR SCANTOOL DATA E01647A5

1. Connect scantool to data link connector(DLC).
2. Engine "ON" .
3. Monitor the "INPUT SPEED SENSOR" parameter on the scantool
4. Driving at speed of over 30 Km/h(19 mph).

Specification : Increasing Gradually

1.2 CURRENT DATA		
×	CRK POSITION SNSR	983 rpm
×	<b>INPUT SPEED SNSR</b>	<b>918 rpm</b>
×	OUTPUT SPEED SNSR	321 rpm
×	VEHICLE SPEED	8 Km/h
×	SHIFT POSITION	1
	TCC SLIP(AMOUNT)	49 rpm
	A/T RELAY VOLT	14.3 V
	TRANSAXLE RANGE SW	D

FIG.1)



1.2 CURRENT DATA		
×	CRK POSITION SNSR	2082 rpm
×	<b>INPUT SPEED SNSR</b>	<b>1957 rpm</b>
×	OUTPUT SPEED SNSR	2152 rpm
×	VEHICLE SPEED	72 Km/h
×	SHIFT POSITION	4
	TCC SLIP(AMOUNT)	105 rpm
	A/T RELAY VOLT	14.3 V
	TRANSAXLE RANGE SW	D

FIG.2)

FIG.1) Idling

FIG.2) Accelerating

ELQE018A

5. Does "input speed sensor " follow the reference data?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "Terminal & Connector Inspection" procedure.

**TERMINAL & CONNECTOR INSPECTION** EBBAD5FD

1. Many malfunctions in the electrical system may be caused from poor harness and terminals. These faults can be caused by interference from other electrical systems and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

▶ Repair as necessary and go to "Verification vehicle Repair" procedure.

**NO**

▶ Go to "Signal Supply circuit inspection" procedure.

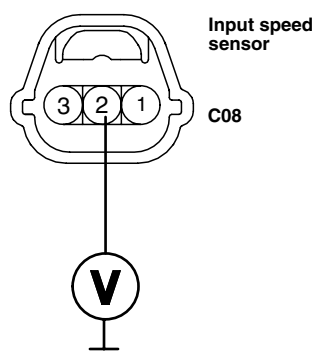
**SIGNAL CIRCUIT INSPECTION** EAAF1AC9

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "INPUT SPEED SENSOR" connector.
3. Measure voltage between terminal "2" of the INPUT SPEED SENSOR harness connector and chassis ground.

---

Specification : approx. 5V

---



1. Sensor ground
2. Input speed sensor
3. Power supply IG1

4. Is voltage within specification?

**YES**

▶ Go to "Power Supply circuit Inspection" procedure.

**NO**

▶ Check for open or short in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure  
▶ If signal circuit in harness is OK, Go to "Check TCM(PCM)" of the "Component Inspection" procedure.

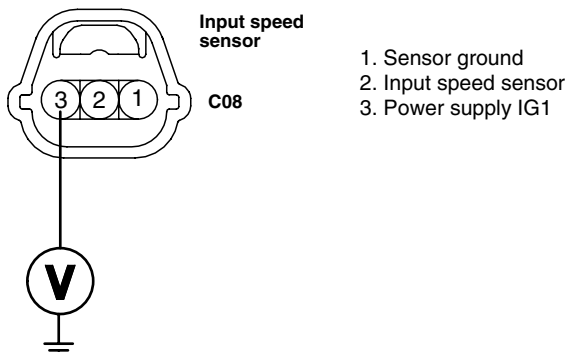
**POWER SUPPLY CIRCUIT INSPECTION** E3F0E30F

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "INPUT SPEED SENSOR" connector.
3. Measure voltage between terminal "3" of the INPUT SPEED SENSOR harness connector and chassis ground.

---

Specification : approx. B+

---



EKRF407C

4. Is voltage within specification ?

**YES**

▶ Go to "Ground circuit inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

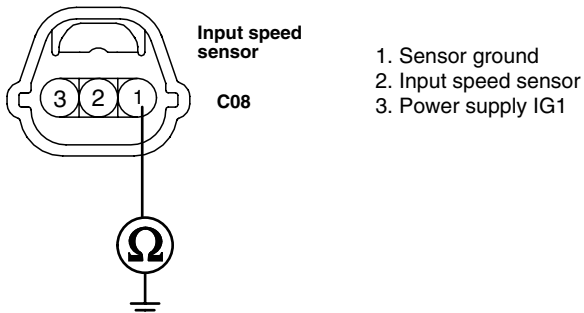
**GROUND CIRCUIT INSPECTION** E4D2D3BC

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "INPUT SPEED SENSOR" connector.
3. Measure resistance between terminal "1" of the INPUT SPEED SENSOR harness connector and chassis ground.

---

Specification : approx. 0  $\Omega$

---



EKRF407D

4. Is resistance within specification ?

**YES**

- ▶ Go to "Component Inspection" procedure.

**NO**

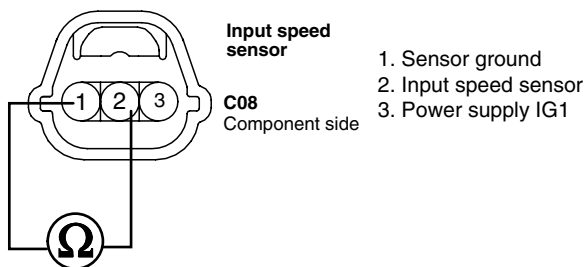
- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.
- ▶ If ground circuit in harness is OK, Go to "Check TCM(PCM)" of the "Component Inspection" procedure.

**COMPONENT INSPECTION** E9AAD8FA

1. Check "INPUT SPEED SENSOR"

- 1) Ignition "OFF".
- 2) Disconnect the "INPUT SPEED SENSOR" connector.
- 3) Measure resistance between terminal "1", "2" and "2", "3" and "1", "3" of the "INPUT SPEED SENSOR" connector.

Specification : Refer to "Reference data"



EKRF407E

- 4) Is resistance within specifications?

**[REFERENCE DATA]**

Data	Reference Data	
Current	22 mA	
Air Gap	Input sensor	1.3 mm
	Output sensor	0.85 mm
Resistance	1(red) - 2(black)	Infinite
	1(black) - 2(red)	Approx. 3.89 MΩ
	1(red) - 3(black)	Approx. 6.55 MΩ
	1(black) - 3(red)	Approx. 5.27 MΩ
	2(red) - 3(black)	Approx. 17.5 MΩ
	2(black) - 3(red)	Infinite

**YES**

- ▶ Go to "CHECK TCM(PCM)" as below.

**NO**

- ▶ Replace "INPUT SPEED SENSOR" as necessary and Go to "Verification Vehicle Repair" procedure.



**VERIFICATION OF VEHICLE REPAIR** E1EB6E7C

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Is resistance within specification ?

**YES**

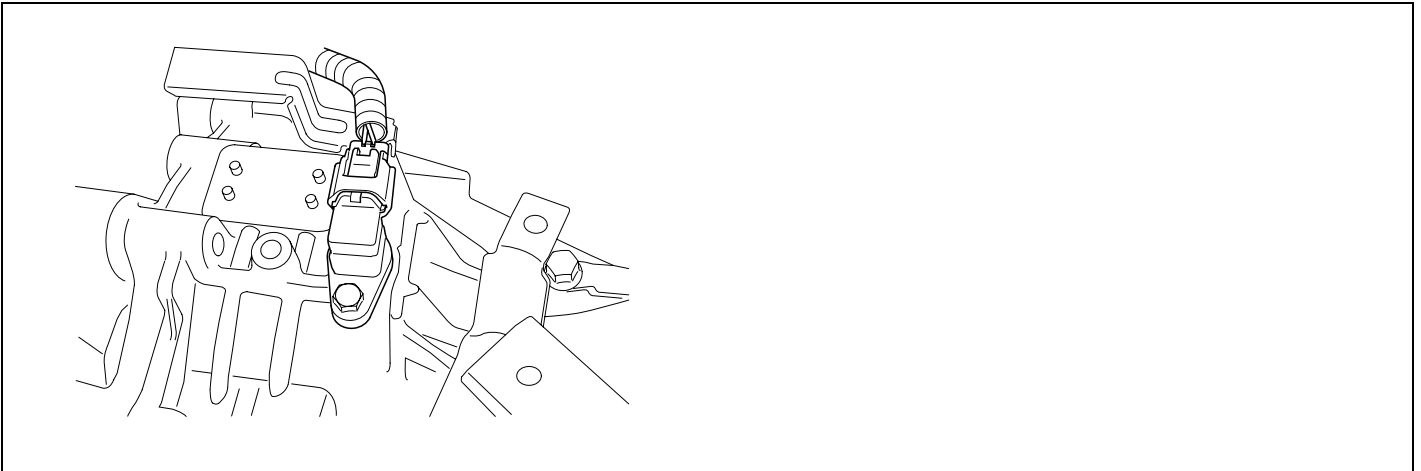
- ▶ Go to the applicable troubleshooting procedure.

**NO**

- ▶ System performing to specification at this time.

**DTC P0721 OUTPUT SPEED SENSOR CIRCUIT RANGE/PERFORMANCE**

**COMPONENT LOCATION** E2C6AF76



BKQE005A

**GENERAL DESCRIPTION** E469EF2F

The Output Speed Sensor outputs pulse-signals according to the revolutions of the output shaft of the transmission. The Output Speed Sensor is installed in front of the Transfer Drive Gear to determine the Transfer Drive Gear rpms by counting the frequency of the pulses. This value, together with the throttle position data, is mainly used to decide the optimum gear position.

**DTC DESCRIPTION** E4EED4BB

The TCM(PCM) sets this code if the calculated value of the pulse-signal is noticeably different from the value calculated, using the Vehicle Speed Sensor output, when the vehicle is running faster than 30 km/h. The TCM(PCM) will initiate the fail safe function if this code is detected.

**DTC DETECTING CONDITION** E4DA4986

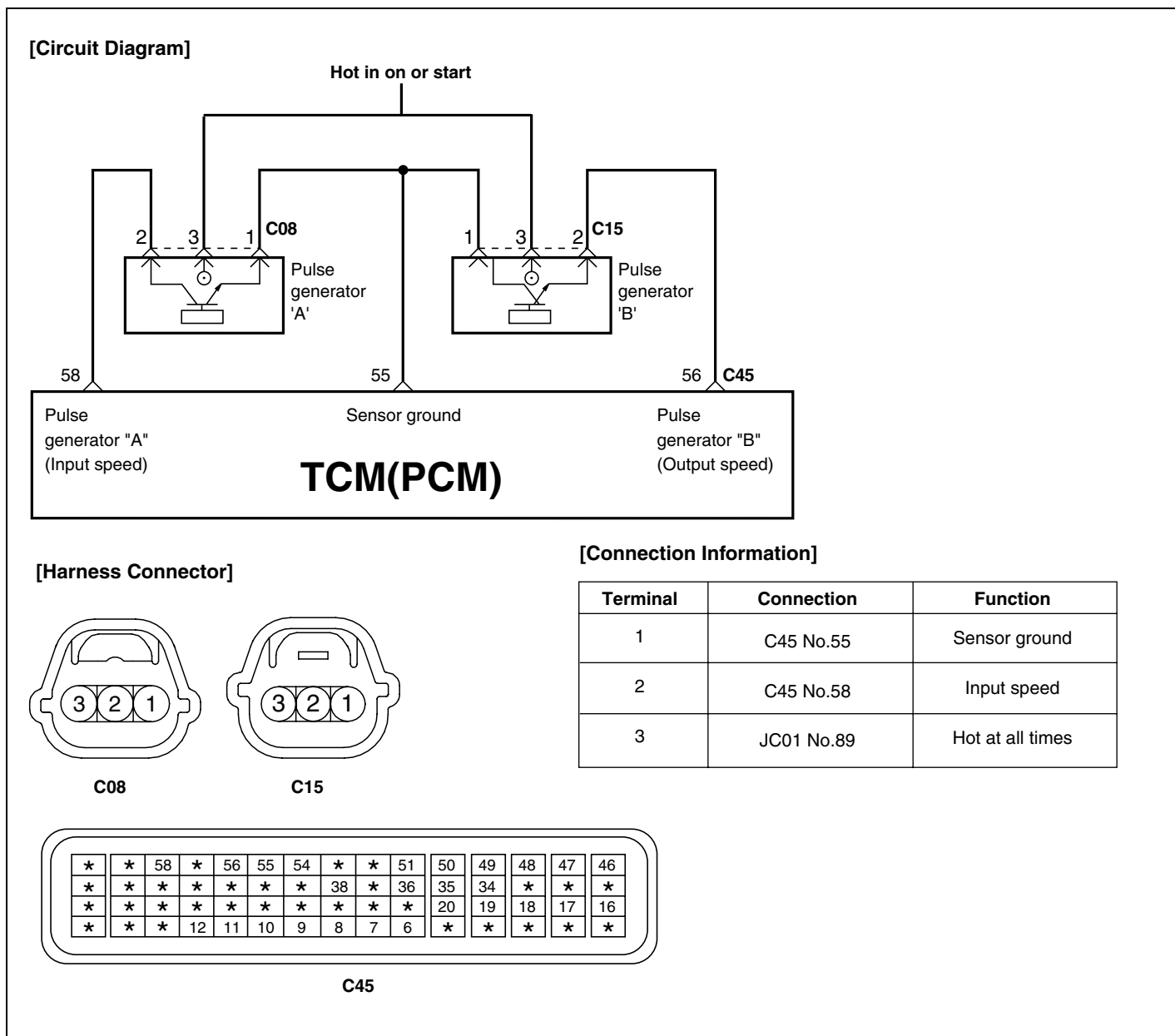
Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Speed rationality check</li></ul>	<ul style="list-style-type: none"><li>• Signal circuit is open or short</li><li>• Sensor power circuit is open</li><li>• Sensor ground circuit is open</li><li>• Faulty OUTPUT SPEED SENSOR</li><li>• Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• Vehicle speed is over 31 Mile/h(50 Km/h) in D,3,2,L(A/T range switch) and SP(SPORTS MODE)</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• If the output from the output speed sensor is continuously 50% lower or higher than the value calculated by vehicle speed sensor</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• More than 1sec</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• Locked into 3rd or 2nd gear</li><li>• Apply an electric current to Solenoide valve</li><li>• Manual shifting is possible (2 nd → 3 rd, 3 rd → 2 nd)</li></ul>	

**SPECIFICATION** E0808C43

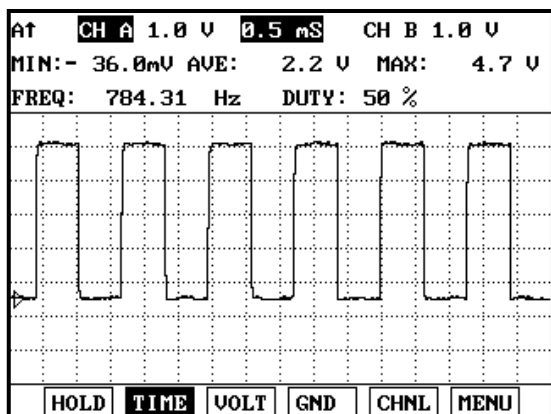
Input shaft & Output shaft speed sensor

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

**SCHEMATIC DIAGRAM** ECFA87E8



SIGNAL WAVEFORM E12434BF



ELQE020A

MONITOR SCANTOOL DATA EEFC0BD

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "OUTPUT SPEED SENSOR" parameter on the scantool.
4. Driving at speed of over 30 Km/h(19 mph).

Specification : Increasing Gradually

1.2 CURRENT DATA	
* CRK POSITION SNSR	1146 rpm
* INPUT SPEED SNSR	1143 rpm
* OUTPUT SPEED SNSR	408 rpm
* VEHICLE SPEED	11 Km/h
* SHIFT POSITION	1
TCC SLIP(AMOUNT )	49 rpm
A/T RELAY VOLT	14.2 V
TRANSAXLE RANGE SW	D

FIX SCRN FULL PART GRPH HELP

FIG.1)

FIG.1) Low-speed  
FIG.2) High-speed

1.2 CURRENT DATA	
* CRK POSITION SNSR	1684 rpm
* INPUT SPEED SNSR	1684 rpm
* OUTPUT SPEED SNSR	2247 rpm
* VEHICLE SPEED	70 Km/h
* SHIFT POSITION	4
TCC SLIP(AMOUNT )	84 rpm
A/T RELAY VOLT	14.2 V
TRANSAXLE RANGE SW	D

FIX SCRN FULL PART GRPH HELP

FIG.2)

ELQE025A

5. Does "output speed sensor" follow the reference data?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "Terminal & Connector Inspection" procedure.

### TERMINAL & CONNECTOR INSPECTION E4146EE7

1. Many malfunctions in the electrical system may be caused from poor harness and terminals. These faults can be caused by interference from other electrical systems and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

▶ Repair as necessary and go to "Verification vehicle Repair" procedure.

**NO**

▶ Go to "Signal circuit inspection" procedure.

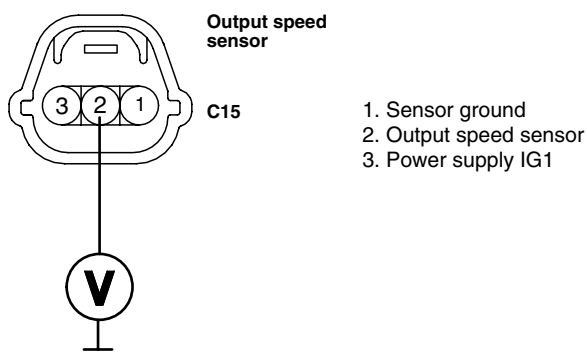
### SIGNAL CIRCUIT INSPECTION E8BF5CB9

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "OUTPUT SPEED SENSOR" connector.
3. Measure voltage between terminal "2" of the OUTPUT SPEED SENSOR harness connector and chassis ground.

---

Specification : approx. 5V

---



## AUTOMATIC TRANSAXLE SYSTEM

AT -109

4. Is voltage within specification?

**YES**

▶ Go to "Power Supply circuit Inspection" procedure.

**NO**

▶ Check for open or short in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure  
▶ If signal circuit in harness is OK, Go to "Check TCM(PCM)" of the "Component Inspection" procedure.

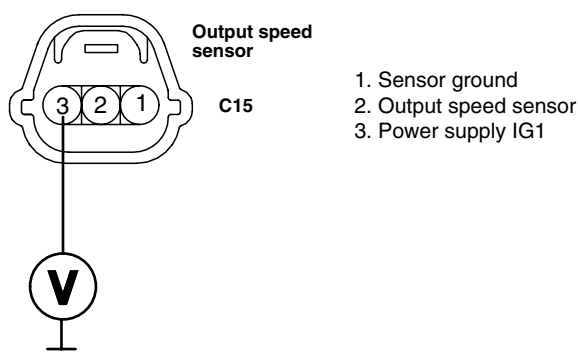
## POWER SUPPLY CIRCUIT INSPECTION EF5FDFAF

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "OUTPUT SPEED SENSOR" connector.
3. Measure voltage between terminal "3" of the OUTPUT SPEED SENSOR harness connector and chassis ground.

---

Specification : approx. B+

---



EKRF408B

4. Is voltage within specification?

**YES**

▶ Go to "Ground circuit inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

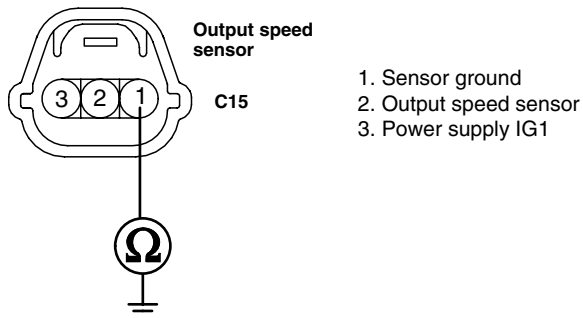
## GROUND CIRCUIT INSPECTION E898ED7B

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "OUTPUT SPEED SENSOR" connector.
3. Measure resistance between terminal "1" of the OUTPUT SPEED SENSOR harness connector and chassis ground.

---

Specification : approx. 0 Ω

---



EKRF408C

4. Is resistance within specification?

**YES**

▶ Go to "Component Inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

▶ If ground circuit in harness is OK, Go to "Check TCM(PCM)" of the "Component Inspection" procedure.

## COMPONENT INSPECTION EF5440C1

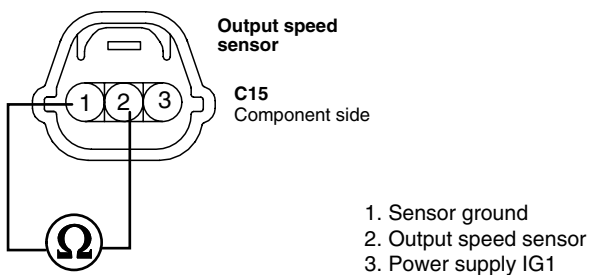
1. Check "OUTPUT SPEED SENSOR"

- 1) Ignition "OFF".
- 2) Disconnect the "OUTPUT SPEED SENSOR" connector.
- 3) Measure resistance between terminal "1","2" and "2","3" and "1","3" of the "OUTPUT SPEED SENSOR" connector.

---

Specification : Refer to "Reference data"

---



EKRF408D

4) Is resistance within specifications?

**[REFERENCE DATA]**

Data	Reference Data	
Current	22 mA	
Air Gap	Input sensor	1.3 mm
	Output sensor	0.85 mm
Resistance	1(red) - 2(black)	Infinite
	1(black) - 2(red)	Approx. 3.89 MΩ
	1(red) - 3(black)	Approx. 6.55 MΩ
	1(black) - 3(red)	Approx. 5.27 MΩ
	2(red) - 3(black)	Approx. 17.5 MΩ
	2(black) - 3(red)	Infinite

**YES**

► Go to "CHECK TCM(PCM)" as below.

**NO**

► Replace "OUTPUT SPEED SENSOR" as necessary and Go to "Verification Vehicle Repair" procedure.

**2. CHECK TCM(PCM)**

- 1) Ignition "ON" & Engine "OFF".
- 2) Connect "OUTPUT SPEED SENSOR" connector.
- 3) Install scantool and select a SIMU-SCAN.
- 4) Simulate frequency to OUTPUT SPEED SENSOR signal circuit.

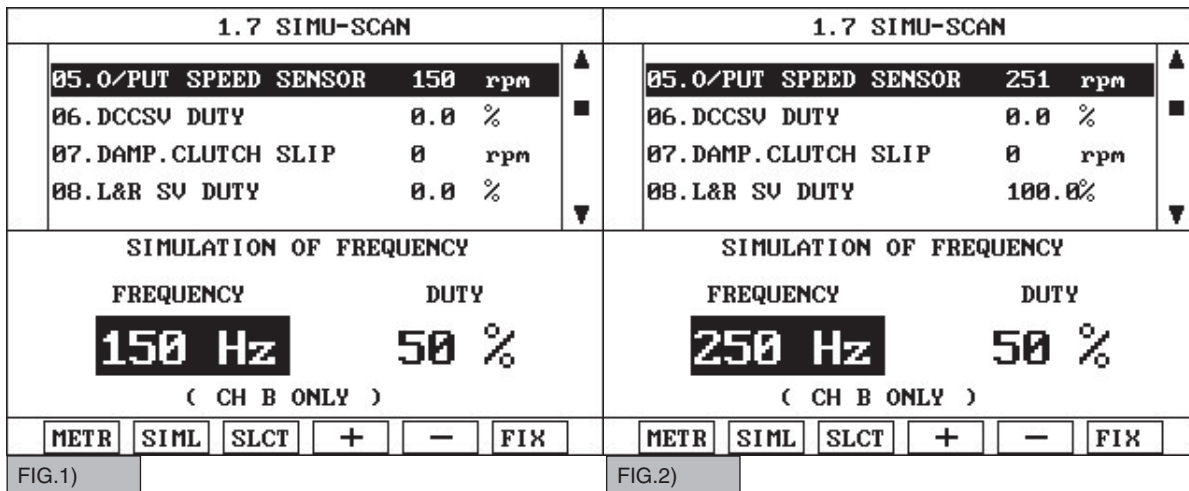


FIG.1) OUTPUT 150Hz → 150rpm

FIG.2) OUTPUT 250Hz → 250rpm

- 5) Is "OUTPUT SPEED SENSOR" signal value changed according to simulation frequency?

**YES**

▶ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

**NO**

▶ Substitute with a known-good TCM(PCM) and check for proper operation. If the problem is corrected, replace TCM(PCM) as necessary and then go to "Verification of Vehicle Repair" procedure.

**VERIFICATION OF VEHICLE REPAIR** ECF10E3D

Refer to DTC P0717.

**DTC P0722 OUTPUT SPEED SENSOR CIRCUIT - NO SIGNAL**

**COMPONENT LOCATION** E9CCDF4C

Refer to DTC P0721.

**GENERAL DESCRIPTION** EDEB5A18

Refer to DTC P0721.

**DTC DESCRIPTION** EEC8EAA7

Refer to DTC P0721.

**DTC DETECTING CONDITION** E8660FFF

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Speed rationality check</li></ul>	<ul style="list-style-type: none"><li>• Signal circuit is open or short</li><li>• Sensor power circuit is open</li><li>• Sensor ground circuit is open</li><li>• Faulty OUTPUT SPEED SENSOR</li><li>• Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• Vehicle speed is over 19 Mile/h(30 Km/h) and Engine speed<math>\geq</math> 2000rpm in D,3,2,L(A/T range swhitch) and SP(SPORTS MODE)</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• No signal</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• More than 1sec</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• Locked into 3rd or 2nd gear</li><li>• Apply an electric current to Solenoide valve</li><li>• Manual shifting is possible (2 nd <math>\rightarrow</math> 3 rd, 3 rd <math>\rightarrow</math> 2 nd)</li></ul>	

**SPECIFICATION** E8F9919F

Refer to DTC P0717.

**SCHEMATIC DIAGRAM** E55DC2AC

Refer to DTC P0717.

**SIGNAL WAVEFORM** E3214F6D

Refer to DTC P0717.

**MONITOR SCANTOOL DATA** E59483BF

Refer to DTC P0721.

**TERMINAL & CONNECTOR INSPECTION** EC46CAD6

Refer to DTC P0717.

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**AUTOMATIC TRANSAXLE (F4A42)**

---

**SIGNAL CIRCUIT INSPECTION** E23D0EE4

Refer to DTC P0721.

**POWER SUPPLY CIRCUIT INSPECTION** E43BF695

Refer to DTC P0721.

**GROUND CIRCUIT INSPECTION** ED115E9B

Refer to DTC P0721.

**COMPONENT INSPECTION** E6BFE42C

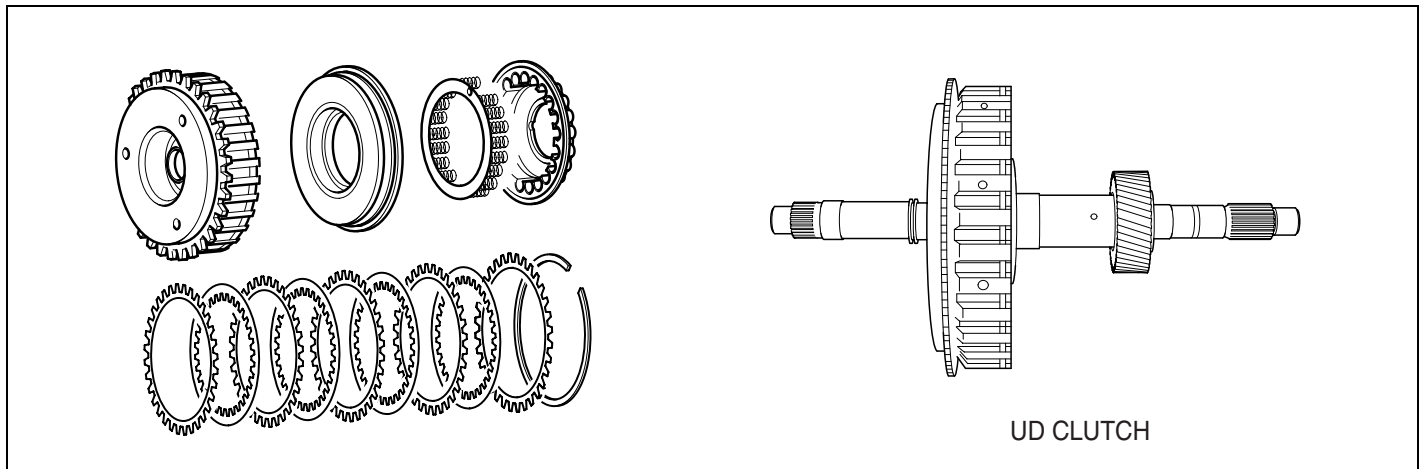
Refer to DTC P0721.

**VERIFICATION OF VEHICLE REPAIR** E192C169

Refer to DTC P0717.

**DTC P0731 GEAR 1 INCORRECT RATIO**

**COMPONENT LOCATION** EB02BCDF



BKQE006A

**GENERAL DESCRIPTION** EB6A7DD0

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 1st gear ratio, while the transaxle is engaged in the 1st gear. For example, if the output speed is 1000 rpm and the 1st gear ratio is 2.842, then the input speed is 2,842 rpm.

**DTC DESCRIPTION** E15572E9

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 1st gear ratio, while the transaxle is engaged in 1st gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

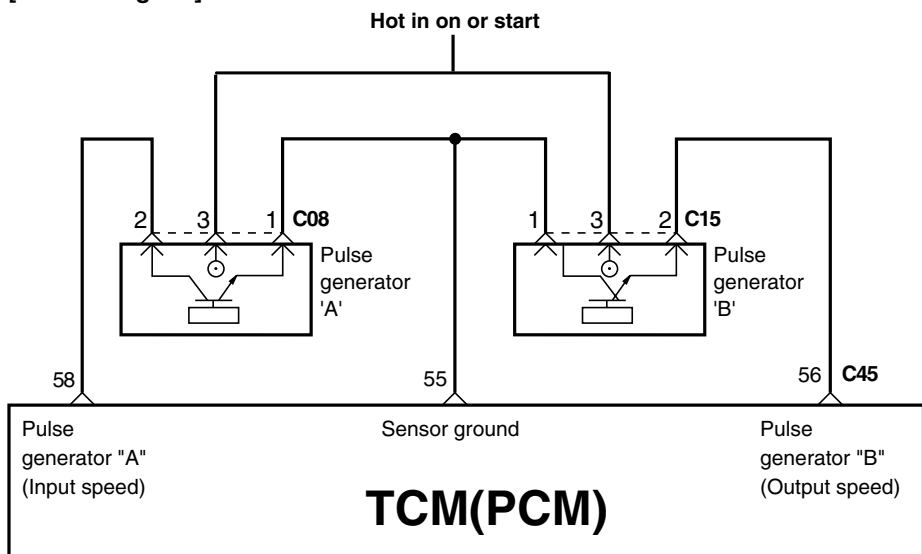
**DTC DETECTING CONDITION** EAC99B95

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"> <li>• 1st gear incorrect ratio</li> </ul>	<ul style="list-style-type: none"> <li>• Faulty Input speed sensor</li> <li>• Faulty output speed sensor</li> <li>• Faulty UD clutch or LR brake or Oneway clutch</li> </ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"> <li>• Engine speed &gt; 450rpm</li> <li>• Output speed &gt; 350rpm</li> <li>• Shift stage 1st. gear</li> <li>• Input speed &gt; 0rpm</li> <li>• A/T oil temp sensor voltage &lt; 4.5V</li> <li>• Voltage of Battery &gt; 10V</li> <li>• TRANSAXLE RANGE SWITCH is normal</li> </ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"> <li>•   Input speed/1st gear ratio - output speed  ≥ 200rpm /1st. gear ratio</li> </ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"> <li>• More than 1sec</li> </ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"> <li>• Locked into 3rd gear. (If diagnosis code P0731 is output four times, the transaxle is locked into 3rd gear)</li> </ul>	

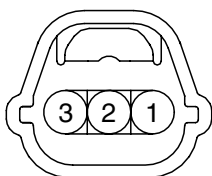
**SCHEMATIC DIAGRAM**

E9BF53E1

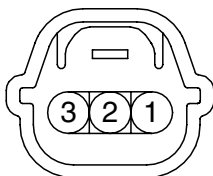
**[Circuit Diagram]**



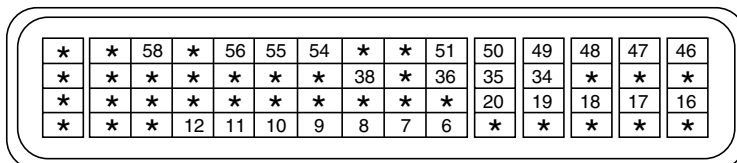
**[Harness Connector]**



C08



C15



C45

**[Input Shaft Speed Sensor]**

Terminal	Connection	Function
1	C45 No.55	Sensor ground
2	C45 No.58	Input speed
3	JC01 No.89	Hot at all times

**[Output Shaft Speed Sensor]**

Terminal	Connection	Function
1	C45 No.55	Sensor ground
2	C45 No.56	Input speed
3	JC01 No.89	Hot at all times

**SIGNAL WAVEFORM**

E70F6CCA

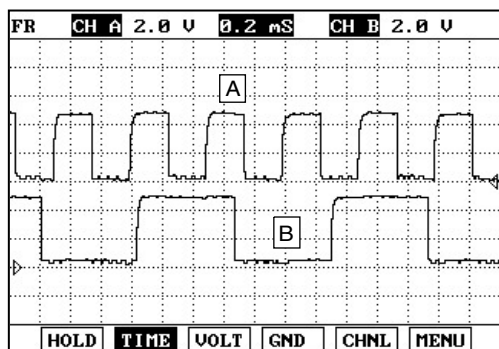


FIG.1)

A : INPUT SPEED SENSOR  
B : OUTPUT SPEED SENSOR

ELQE031A

**MONITOR SCANTOOL DATA**

EF1A16D6

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the scantool.
4. Perform the "STALL TEST" with gear position "1"

Specification : 2100~2900 engine rpm

1.2 CURRENT DATA	
* CRK POSITION SNSR	2329 rpm
* INPUT SPEED SNSR	0 rpm
* OUTPUT SPEED SNSR	0 rpm
* SHIFT POSITION	1
THROTTLE P.SENSOR	39.2 %
FLUID TEMP.SENSOR	86 °C
VEHICLE SPEED	0 Km/h
L&RSV DUTY	0.0 %

ELQE032A

OPERATING ELEMENT OF EACH SHIFTING RANGE

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

※ Low & Reverse Brake is released When the Vehicle speed over the 5 MPH(7Km/h).

**Stall test procedure in D1 and reason**

Procedure

1. Warm up the engine
2. After positioning the select lever in "D" , depress the foot brake pedal fully. After that, depress the accelerator pedal to the maximum

\* The slippage of 1st gear operating parts can be detected by stall test in D

Reason for stall test

1. If there is no mechanical defaults in A/T, every slippage occur in torque converter.
  2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
  3. If 1st gear operating part has faults, input speed revolution will be out of specification.
  4. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.
5. Is "STALL TEST " within specification?

**YES**

- ▶ Go to "Signal Circuit Inspection" procedure.

**NO**

- ▶ Go to "Component inspection" procedure.

 **CAUTION**

- Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
- Check the A/T fluid level and temperature and the engine coolant temperature.
  - Fluid level : At the hot mark on the oil level gauge.
  - Fluid temperature : 176 °F~ 212 °F (80~100 °C).
  - Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).
- Chock both rear wheel(left and right).
- Pull the parking brake lever on with the brake pedal fully depressed.
- The throttle should not be left fully open for more than eight second.
- If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.

**SIGNAL CIRCUIT INSPECTION** E61D5E21

1. Connect Scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.
4. Accelerate the Engine speed until about 2000 rpm in the 1st gear.

Specification :  $INPUT\ SPEED - (OUTPUT\ SPEED \times GEAR\ RATIO) \leq 200\ RPM$

1.2 CURRENT DATA	
* ENGINE RPM	2127 rpm
* INPUT SPEED	2056 rpm
* OUTPUT SPEED	730 rpm
* SHIFT POSITION	1 GEAR
* SELECT LEVER SW.	L
HIVEC MODE	MODE F
VEHICLE SPEED	22 MPH
THROTTLE P. SENSOR	14.1 %

FIX    SCRIN    FULL    PART    GRPH    HELP

ELQE033A

5. Are "INPUT & OUTPUT SPEED SENSOR" within specifications?

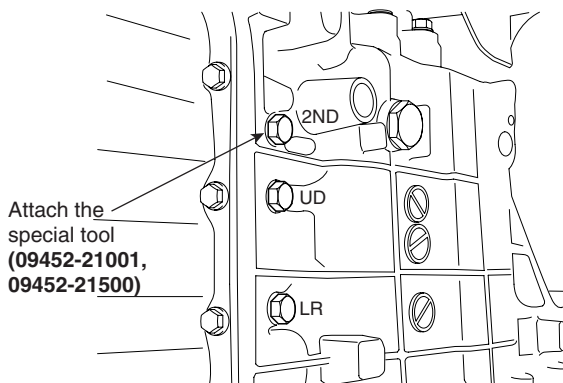
**YES**

▶ Go to "Component Inspection" procedure.

**NO**

▶ Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**COMPONENT INSPECTION** E6EEE64F



LKIF200B

**AT -120**

**AUTOMATIC TRANSAXLE (F4A42)**

1. Connect Oil pressure gauge to "UD" and "L/R" port.
2. Engine "ON".
3. Drive a car with gear position 1 in "SPORTS MODE".
4. Compare it with referance data as below.

Specification : shown below

Measurement condition			Standard hydraulic pressure kPa (psi)						
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Over-drive 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.

5. Is oil pressure value within specification?

**YES**

▶ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "Verification Vehicle Repair" procedure.

**NO**

▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification Vehicle Repair" procedure.

**VERIFICATION OF VEHICLE REPAIR** EA3F5A4F

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

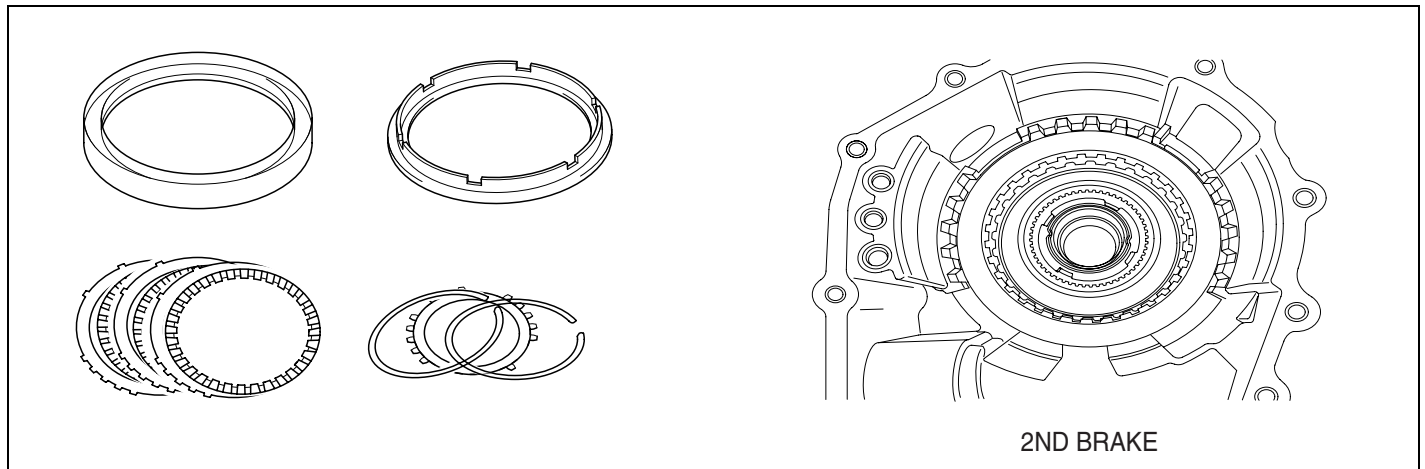
▶ Go to the applicable troubleshooting procedure.

**NO**

▶ System performing to specification at this time.

**DTC P0732 GEAR 2 INCORRECT RATIO**

**COMPONENT LOCATION** E9DCC73B



BKQE007A

**GENERAL DESCRIPTION** EA8BD05C

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 2nd gear ratio, while the transaxle is engaged in the 2nd gear. For example, if the output speed is 1000 rpm and the 2nd gear ratio is 1.529, then the input speed is 1,529 rpm.

**DTC DESCRIPTION** E86D0CAC

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 2nd gear ratio, while the transaxle is engaged in 2nd gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

**DTC DETECTING CONDITION** E7EF2DFF

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"> <li>• 2nd gear incorrect ratio</li> </ul>	<ul style="list-style-type: none"> <li>• Faulty Input speed sensor</li> <li>• Faulty output speed sensor</li> <li>• Faulty UD clutch or 2nd brake</li> </ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"> <li>• Engine speed &gt; 450rpm</li> <li>• Output speed &gt; 350rpm</li> <li>• Shift stage 2nd. gear</li> <li>• Input speed &gt; 0rpm</li> <li>• A/T oil temp sensor voltage &lt; 4.5V</li> <li>• Voltage of Battery &gt; 10V</li> <li>• TRANSAXLE RANGE SWITCH is normal</li> </ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"> <li>• <math> \text{Input speed}/2\text{nd gear ratio} - \text{output speed}  \geq 200\text{rpm} / 2\text{nd. gear ratio}</math></li> </ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"> <li>• More than 1sec</li> </ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"> <li>• Locked into 3 rd gear. (If diagnosis code P0732 is output four times, the transaxle is locked into 3rd gear)</li> </ul>	

**SCHEMATIC DIAGRAM** E3ADB198

Refer to DTC P0731.

**SIGNAL WAVEFORM** EDEFCE3A

Refer to DTC P0731.

**MONITOR SCANTOOL DATA** EC5B70F0

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the scantool.
4. Perform the "STALL TEST" with gear position "2".

Specification : 2100~2900 engine rpm

1.2 CURRENT DATA	
× CRK POSITION SNSR	2310 rpm
× INPUT SPEED SNSR	0 rpm
× OUTPUT SPEED SNSR	0 rpm
× SHIFT POSITION	2
THROTTLE P. SENSOR	36.5 %
FLUID TEMP. SENSOR	88 °C
VEHICLE SPEED	0 Km/h
L&RSV DUTY	100.0%

ELQE034A

**OPERATING ELEMENT OF EACH SHIFTING RANGE**

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

※ Low & Reverse Brake is released When the Vehicle speed over the 5 MPH(7Km/h).

### Stall test procedure in D2 and reason

#### Procedure

1. Warm up the engine
2. After positioning the select lever in "D" , depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum

\* The slippage of 1st gear operating parts can be detected by stall test in D2

#### Reason for stall test

1. If there is are mechanical defaults in A/T, all slippage occurs in the torque converter.
2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
3. If 2nd brake system(2nd gear operating part) has faults, input speed revolution will be out of specification.
4. If wheels pin occurs, the applied brake force is not adequate. Retry using more brake force.

5. Is "STALL TEST " within specification?

**YES**

- ▶ Go to "Signal Circuit Inspection" procedure.

**NO**

- ▶ Go to "Component Inspection" procedure.

#### CAUTION

- **Do not let anybody stand in front of or behind the vehicle while this test is being carried out.**
- **Check the A/T fluid level and temperature and the engine coolant temperature.**
  - **Fluid level : At the hot mark on the oil level gauge.**
  - **Fluid temperature : 176 °F~ 212 °F (80~100 °C).**
  - **Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).**
- **Chock both rear wheel(left and right).**
- **Pull the parking brake lever on with the brake pedal fully depressed.**
- **The throttle should not be left fully open for more than eight second.**
- **If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent.**

### SIGNAL CIRCUIT INSPECTION E561AABE

1. Connect Scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.

## AUTOMATIC TRANSAXLE SYSTEM

AT -125

- Accelerate the Engine speed until about 2000 rpm in the 2nd gear.

Specification :  $INPUT\ SPEED - (OUTPUT\ SPEED \times GEAR\ RATIO) \leq 200\ RPM$

1.2 CURRENT DATA	
* ENGINE RPM	2108 rpm
* INPUT SPEED	2056 rpm
* OUTPUT SPEED	1352 rpm
* SHIFT POSITION	2 GEAR
* SELECT LEVER SW.	2
HIVEC MODE	MODE D
VEHICLE SPEED	47 MPH
THROTTLE P. SENSOR	13.7 %

FIX    SCRNM    FULL    PART    GRPH    HELP

ELQE035A

- Are "INPUT & OUTPUT SPEED SENSOR" within specifications?

**YES**

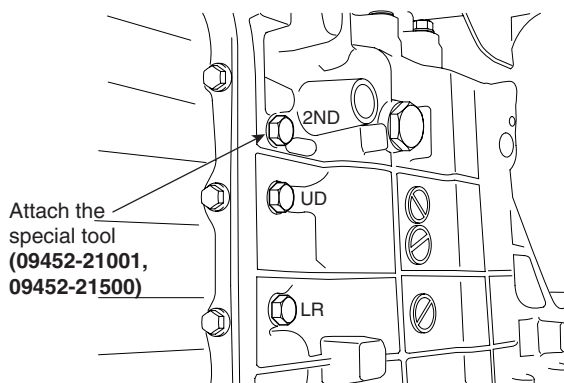
- ▶ Go to "Component Inspection" procedure.

**NO**

- ▶ Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

## COMPONENT INSPECTION

E8FA2DEE



LKIF200B

- Connect Oil pressure gauge to "UD" and "2ND" port.
- Engine "ON".
- Drive a car with gear position 2 in "SPORTS MODE".

4. Compare it with reference data as below.

Specification : shown below

Measurement condition			Standard hydraulic pressure kPa (psi)						
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Over-drive 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.

5. Is oil pressure value within specification?

**YES**

▶ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "Verification Vehicle Repair" procedure.

**NO**

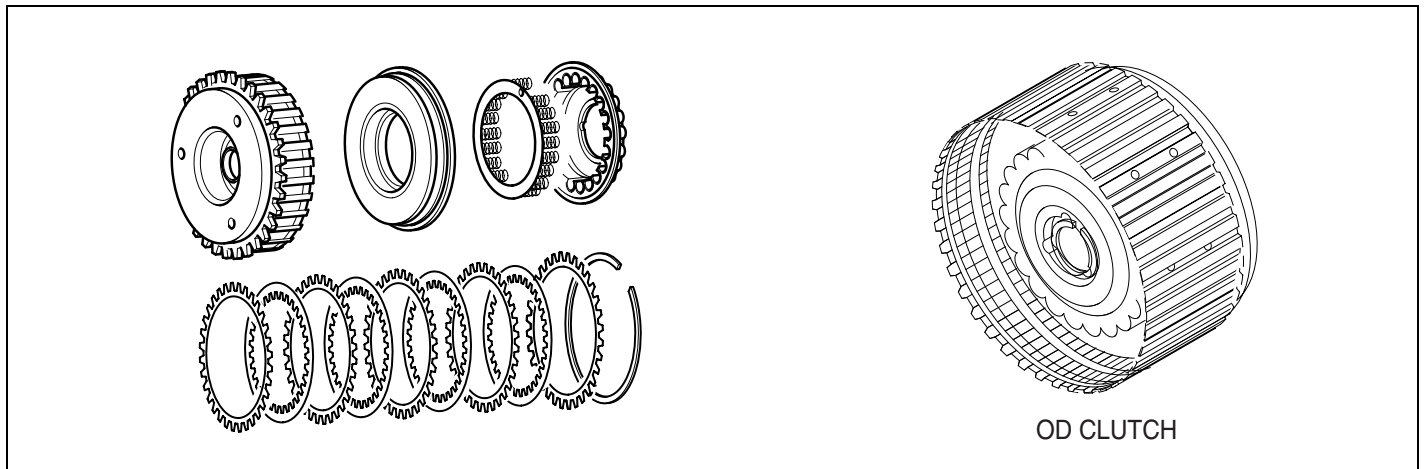
▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification Vehicle Repair " procedure.

**VERIFICATION OF VEHICLE REPAIR** EC2F1DCB

Refer to DTC P0731.

**DTC P0733 GEAR 3 INCORRECT RATIO**

**COMPONENT LOCATION** EC10D6B1



BKQE008A

**GENERAL DESCRIPTION** E14CDDEB

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 3rd gear ratio, while the transaxle is engaged in the 3rd gear. For example, if the output speed is 1,000 rpm and the 3rd gear ratio is 1.000, then the input speed is 1,000 rpm.

**DTC DESCRIPTION** E031DCB7

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 3rd gear ratio, while the transaxle is engaged in 3rd gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

**DTC DETECTING CONDITION** EFCDF3C

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"> <li>• 3rd gear incorrect ratio</li> </ul>	<ul style="list-style-type: none"> <li>• Faulty Input speed sensor</li> <li>• Faulty output speed sensor</li> <li>• Faulty UD clutch or OD clutch</li> </ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"> <li>• Engine speed &gt; 450rpm</li> <li>• Output speed &gt; 350rpm</li> <li>• Shift stage 3rd. gear</li> <li>• Input speed &gt; 0rpm</li> <li>• A/T oil temp sensor voltage &lt; 4.5V</li> <li>• Voltage of Battery &gt; 10V</li> <li>• TRANSAXLE RANGE SWITCH is normal</li> </ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"> <li>•   Input speed/3rd gear ratio - output speed  ≥ 200rpm /3rd. gear ratio</li> </ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"> <li>• More than 1sec</li> </ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"> <li>• Locked into 3rd gear. (If diagnosis code P0733 is output four times, the transaxle is locked into 3rd gear)</li> </ul>	

**SCHEMATIC DIAGRAM** E300B53C

Refer to DTC P0731.

**SIGNAL WAVEFORM** E4FCC31C

Refer to DTC P0731.

**MONITOR SCANTOOL DATA** E02CBA1F

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the scantool.
4. Disconnect the solenoid valve connector and perform the "STALL TEST".

Specification : 2100~2900 engine rpm

1.2 CURRENT DATA	
* CRK POSITION SNSR	2335 rpm
* INPUT SPEED SNSR	0 rpm
* OUTPUT SPEED SNSR	0 rpm
* SHIFT POSITION	3
THROTTLE P. SENSOR	39.6 %
FLUID TEMP. SENSOR	-40 °C
VEHICLE SPEED	0 Km/h
L&RSV DUTY	0.0 %

ELQE036A

**OPERATING ELEMENT OF EACH SHIFTING RANGE**

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

※ Low & Reverse Brake is released When the Vehicle speed over the 5 MPH(7Km/h).

**Stall test procedure in D3 and reason**

Procedure

1. Warm up the engine
2. Set 3rd gear hold by disconnecting the solenoid valve connector. Fully depress the brake pedal, then place the transaxle gear lever into "D" range. Press and hold the accelerator pedal to the floor for no more than eight seconds while observing the engine, input speed, and output speed RPM values.

\* The slippage of 3rd gear operating parts can be detected by stall test in D3

Reason for stall test

1. If there is no mechanical defaults in A/T, all slippage occurs in torque converter.
  2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
  3. If OD clutch system(3rd gear operating part) has faults, input speed revolution will be out of specification.
  4. If output speed revolution is output. It means that the foot brake force is not applied fully. Retesting using greater braking force is required.
5. Is "STALL TEST " within specification?

**YES**

- ▶ Go to "Signal Circuit Inspection" procedure.

**NO**

- ▶ Go to "Component Inspection" procedure.

 **CAUTION**

- **Do not let anybody stand in front of or behind the vehicle while this test is being carried out.**
- **Check the A/T fluid level and temperature and the engine coolant temperature.**
  - **Fluid level : At the hot mark on the oil level gauge.**
  - **Fluid temperature : 176 °F~ 212 °F (80~100 °C).**
  - **Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).**
- **Chock both rear wheel(left and right).**
- **Pull the parking brake lever on with the brake pedal fully depressed.**
- **The throttle should not be left fully open for more than eight seconds.**
- **If carrying out the stall test two or more times, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent tests.**

**SIGNAL CIRCUIT INSPECTION** ECBF636C

1. Connect Scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.

- Accelerate the Engine speed until about 2000 rpm in the 3rd gear.

Specification :  $INPUT\ SPEED - (OUTPUT\ SPEED \times GEAR\ RATIO) \leq 200\ RPM$

1.2 CURRENT DATA	
* ENGINE RPM	2110 rpm
* INPUT SPEED	2056 rpm
* OUTPUT SPEED	2054 rpm
* SHIFT POSITION	3 GEAR
* SELECT LEVER SW.	3
HIVEC MODE	MODE F
VEHICLE SPEED	67 MPH
THROTTLE P. SENSOR	14.1 %

FIX    SCRNM    FULL    PART    GRPH    HELP

ELQE037A

- Are "INPUT & OUTPUT SPEED SENSOR" within specifications?

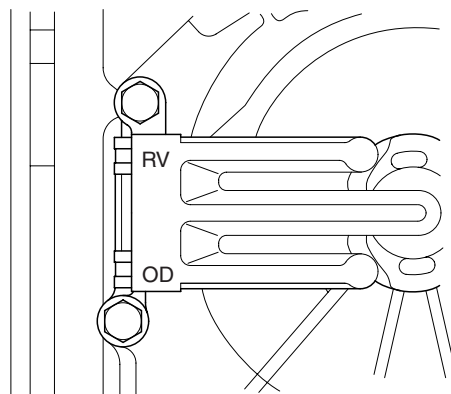
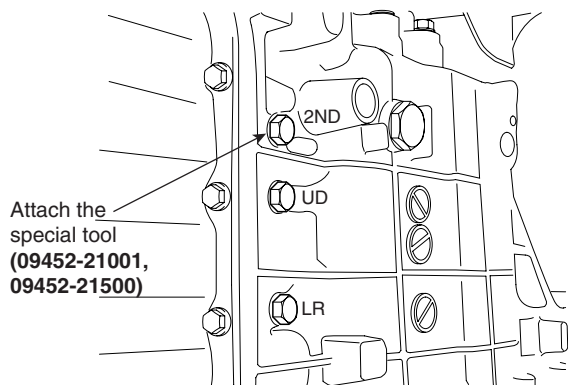
**YES**

- ▶ Go to "Component Inspection" procedure.

**NO**

- ▶ Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

### COMPONENT INSPECTION EF31AAFD



BKQE009A

- Connect Oil pressure gauge to "UD" and "OD" port.
- Engine "ON".
- Drive a car with gear position 3 in fail mode.

**AUTOMATIC TRANSAXLE SYSTEM**

4. Compare it with reference data as below.

Specification : shown below

Measurement condition			Standard hydraulic pressure kPa (psi)						
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Over-drive 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.

5. Is oil pressure value within specification?

**YES**

▶ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "Verification Vehicle Repair" procedure.

**NO**

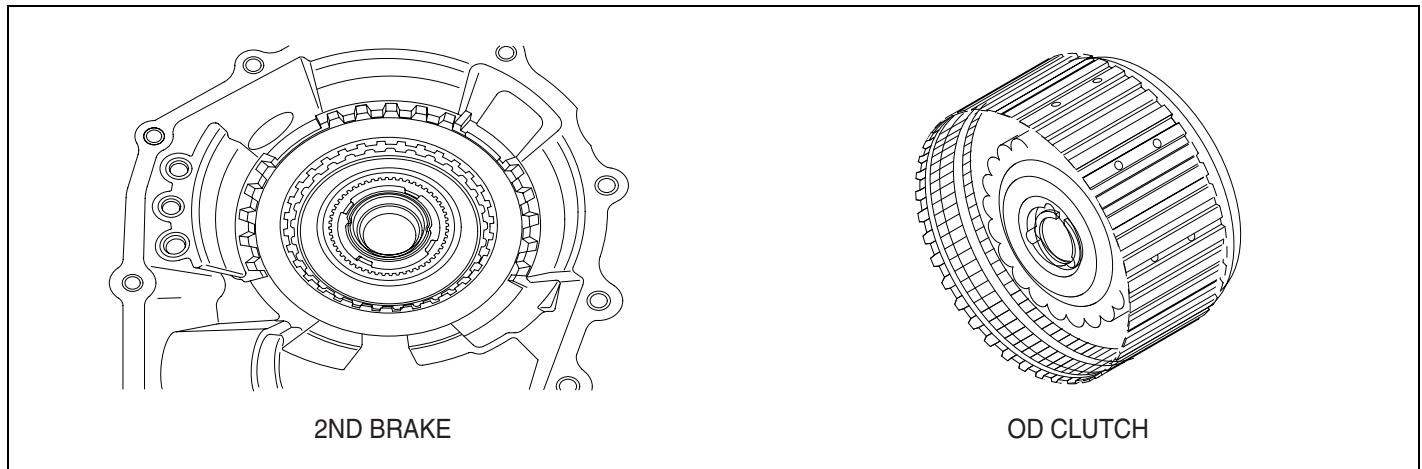
▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification Vehicle Repair" procedure.

**VERIFICATION OF VEHICLE REPAIR** E3A21EED

Refer to DTC P0731.

**DTC P0734 GEAR 4 INCORRECT RATIO**

**COMPONENT LOCATION** EB22A74C



2ND BRAKE

OD CLUTCH

BKQE010A

**GENERAL DESCRIPTION** E7D2796D

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 4th gear ratio, while the transaxle is engaged in the 4th gear. For example, if the output speed is 1,000 rpm and the 4th gear ratio is 0.712, then the input speed is 0,712 rpm.

**DTC DESCRIPTION** E68E5348

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 4th gear ratio, while the transaxle is engaged in 4th gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

**DTC DETECTING CONDITION** EEC43BE1

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"> <li>4th gear incorrect ratio</li> </ul>	<ul style="list-style-type: none"> <li>Faulty Input speed sensor</li> <li>Faulty output speed sensor</li> <li>Faulty UD clutch or 2nd brake</li> </ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"> <li>Engine speed &gt; 450rpm</li> <li>Output speed &gt; 900rpm</li> <li>Shift stage 4th. gear</li> <li>Input speed &gt; 0rpm</li> <li>A/T oil temp sensor voltage &lt; 4.5V</li> <li>Voltage of Battery &gt; 10V</li> <li>TRANSAXLE RANGE SWITCH is normal</li> </ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"> <li>  Input speed/4th gear ratio - output speed  ≥ 200rpm /4th. gear ratio</li> </ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"> <li>More than 1sec</li> </ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"> <li>Locked into 3rd gear. (If diagnosis code P0734 is output four times, the transaxle is locked into 3rd gear)</li> </ul>	

**AUTOMATIC TRANSAXLE SYSTEM**

**SCHEMATIC DIAGRAM** E15F45C2

Refer to DTC P0731.

**SIGNAL WAVEFORM** EC6FDD85

Refer to DTC P0731.

**MONITOR SCANTOOL DATA** EAB0B399

※ It is difficult to "STALL TEST" in 4th gear, therefore Go to "W/Harness Inspection" procedure.

**OPERATING ELEMENT OF EACH SHIFTING RANGE**

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

※ Low & Reverse Brake is released When the Vehicle speed over the 5 MPH(7Km/h).

**SIGNAL CIRCUIT INSPECTION** E9C7DE4D

1. Connect Scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.

4. Accelerate the Engine speed until about 2000 rpm in the 4th gear while driving the vehicle on a level road.

Specification :  $INPUT\ SPEED - (OUTPUT\ SPEED \times GEAR\ RATIO) \leq 200\ RPM$

1.2 CURRENT DATA	
* ENGINE RPM	2133 rpm
* INPUT SPEED	2056 rpm
* OUTPUT SPEED	2911 rpm
* SHIFT POSITION	4 GEAR
* SELECT LEVER SW.	D
2ND SOLENOID DUTY	0.0 %
OD SOLENOID DUTY	0.0 %
OIL TEMPERATURE	156 °F

FIX    SCRN    FULL    PART    GRPH    HELP

ELQE038A

5. Does "INPUT & OUTPUT SPEED SENSOR" within specifications?

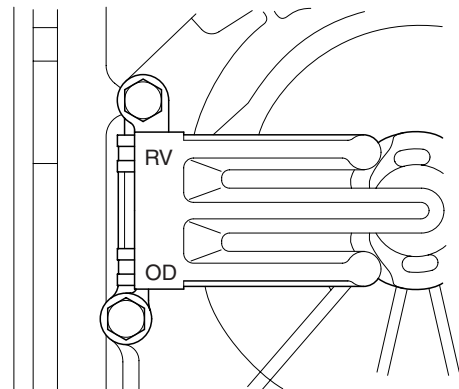
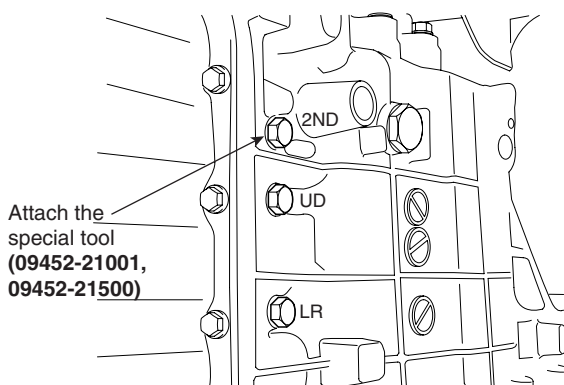
**YES**

- ▶ Go to "Component Inspection" procedure.

**NO**

- ▶ Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

### COMPONENT INSPECTION E93FA6BA



BKQE009A

1. Connect Oil pressure gauge to "OD" and "2nd" port.
2. Engine "ON".
3. Drive a car with gear position "4".

## AUTOMATIC TRANSAXLE SYSTEM

AT -135

4. Compare it with reference data as below.

Specification : shown below

Measurement condition			Standard hydraulic pressure kPa (psi)						
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Over-drive 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.

5. Is oil pressure value within specification?

**YES**

▶ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "Verification Vehicle Repair" procedure.

**NO**

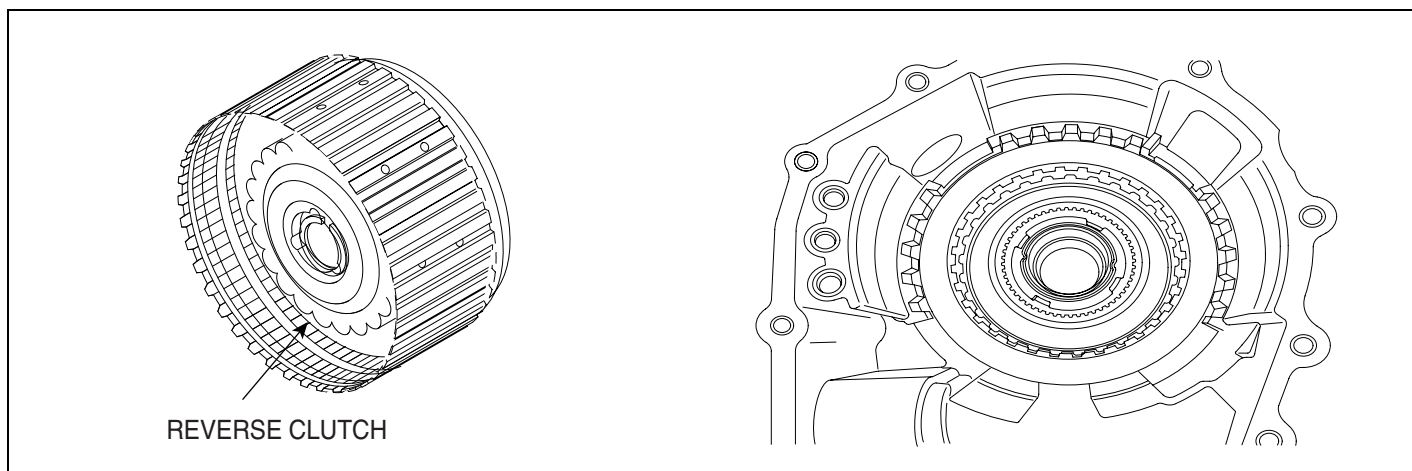
▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification Vehicle Repair" procedure.

## VERIFICATION OF VEHICLE REPAIR E1BADF87

Refer to DTC P0731.

**DTC P0736 REVERSE GEAR INCORRECT RATIO**

**COMPONENT LOCATION** EA07D663



BKQE012A

**GENERAL DESCRIPTION** EF4125CD

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the reverse gear ratio, while the transaxle is engaged in the reverse gear. For example, if the output speed is 1,000 rpm and the reverse gear ratio is 2.480, then the input speed is 2,480 rpm.

**DTC DESCRIPTION** EA3ACABB

This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the reverse gear ratio, while the transaxle is engaged in reverse gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

**DTC DETECTING CONDITION** E04CCFAE

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"> <li>Reverse gear incorrect ratio</li> </ul>	<ul style="list-style-type: none"> <li>Faulty Input speed sensor</li> <li>Faulty output speed sensor</li> <li>Faulty RVS clutch or L/R brake</li> </ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"> <li>Engine speed &gt; 450rpm</li> <li>Output speed &gt; 900rpm</li> <li>Shift stage Rev. gear</li> <li>Input speed &gt; 0rpm</li> <li>A/T oil temp sensor voltage &lt; 4.5V</li> <li>Voltage of Battery &gt; 10V</li> <li>TRANSAXLE RANGE SWITCH is normal</li> </ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"> <li>  Input speed/Rev gear ratio - output speed  ≥ 200rpm /Rev. gear ratio</li> </ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"> <li>More than 1sec</li> </ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"> <li>Locked into 3rd gear. (If diagnosis code P0736 is output four times, the transaxle is locked into 3rd gear)</li> </ul>	

**AUTOMATIC TRANSAXLE SYSTEM**

**SCHEMATIC DIAGRAM** E2C7A0D9

Refer to DTC P0731.

**SIGNAL WAVEFORM** E1319EA3

Refer to DTC P0731.

**MONITOR SCANTOOL DATA** ECDE71CA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the scantool.
4. Perform the "STALL TEST" with gear position "R".

Specification : 2100~2900 engine rpm

1.2 CURRENT DATA	
* CRK POSITION SNSR	2213 rpm
* INPUT SPEED SNSR	0 rpm
* OUTPUT SPEED SNSR	0 rpm
* SHIFT POSITION	N, P, R
THROTTLE P. SENSOR	36.5 %
FLUID TEMP. SENSOR	95 °C
VEHICLE SPEED	0 Km/h
L&RSV DUTY	0.0 %

ELQE039A

**OPERATING ELEMENT OF EACH SHIFTING RANGE**

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

\* Low & Reverse Brake is released When the Vehicle speed over the 5 MPH(7Km/h).

### Stall test procedure in Reverse and reason

#### Procedure

1. Warm up the engine
2. Fully depress the brake pedal, then place the transaxle gear lever into "R" range. Press and hold the accelerator pedal to the floor for no more than eight seconds while observing the engine, input speed, and output speed RPM values.

\* The slippage of REVERSE clutch and L/R brake can be detected by stall test in R range

#### Reason for stall test

1. If there is no mechanical defaults in A/T, all slippage occurs in the torque converter.
  2. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
  3. If reverse clutch and L/R brake system(reverse gear operating parts) has faults, input speed revolution will be out of specification.
  4. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.
5. Is "STALL TEST " within specification?

**YES**

- ▶ Go to "Signal Circuit Inspection" procedure.

**NO**

- ▶ Go to "Component Inspection" procedure.



#### **CAUTION**

- **Do not let anybody stand in front of or behind the vehicle while this test is being carried out.**
- **Check the A/T 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).**
- **Chock both rear wheel(left and right).**
- **Pull the parking brake lever on with the brake pedal fully depressed.**
- **The throttle should not be left fully open for more than eight seconds.**
- **If carrying out the stall test two or more time, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent tests.**

### SIGNAL CIRCUIT INSPECTION

E5AA28EE

1. Connect Scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.

4. Accelerate the Engine speed until about 2000 rpm in the "R" gear.

Specification : INPUT SPEED - (OUTPUT SPEED × GEAR RATIO) ≤ 200 RPM

1.2 CURRENT DATA	
* ENGINE RPM	2127 rpm
* INPUT SPEED	2056 rpm
* OUTPUT SPEED	828 rpm
* SHIFT POSITION	R GEAR
* SELECT LEVER SW.	L
HI/VEE MODE	MODE F
VEHICLE SPEED	22 MPH
THROTTLE P. SENSOR	14.1 %

FIX    SCRN    FULL    PART    GRPH    HELP

ELQE040A

5. Are "INPUT & OUTPUT SPEED SENSOR" within specifications?

**YES**

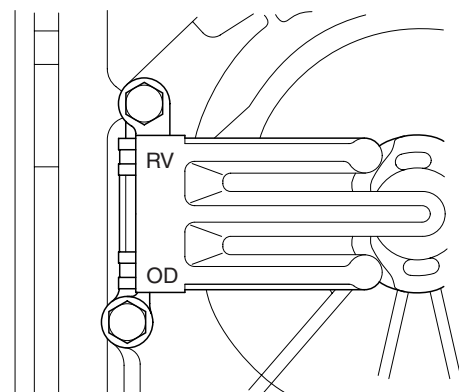
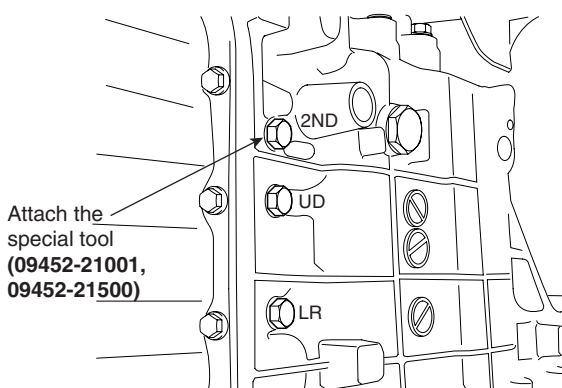
- ▶ Go to "Component Inspection" procedure.

**NO**

- ▶ Check for electrical noise of circuit in INPUT & OUTPUT SPEED SENSOR or Replace INPUT & OUTPUT SPEED SENSOR. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**COMPONENT INSPECTION**

EBCD8823



BKQE009A

1. Connect Oil pressure gauge to "RV" and "LR" port.
2. Engine "ON".
3. Drive a car with gear position R.

4. Compare it with reference data as below.

Specification : shown below

Measurement condition			Standard hydraulic pressure kPa (psi)						
Selector lever position	Shift position	Engine speed (rpm)	Under drive clutch pressure	Reverse clutch pressure	Over-drive 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.

5. Is oil pressure value within specification?

**YES**

▶ Repair AUTO TRANSAXLE(Clutch or Brake) as necessary and Go to "Verification Vehicle Repair" procedure.

**NO**

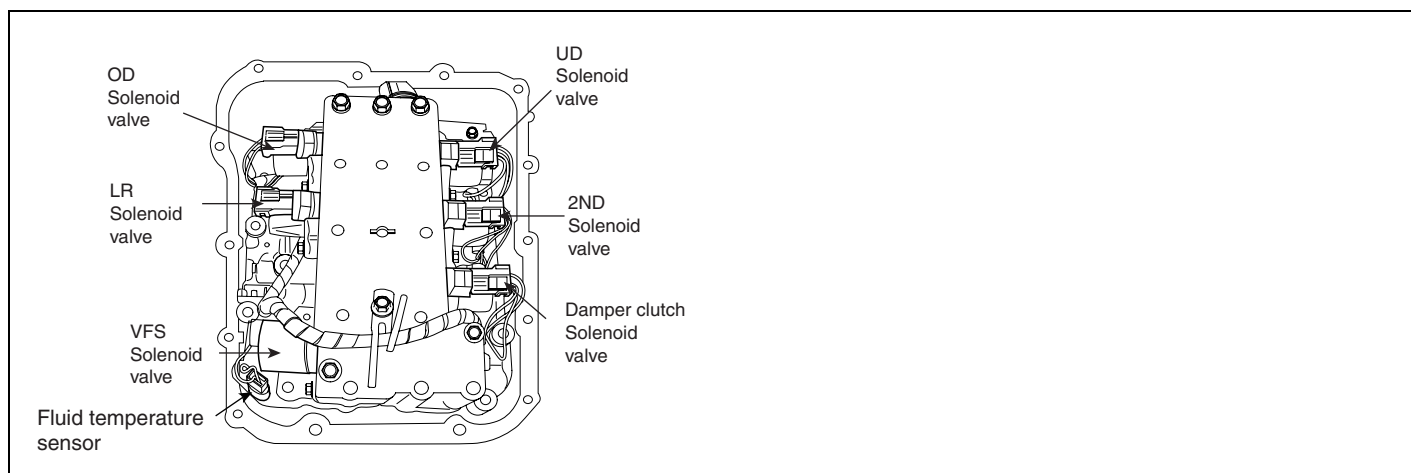
▶ Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and Go to "Verification Vehicle Repair" procedure.

**VERIFICATION OF VEHICLE REPAIR** EB90AFBB

Refer to DTC P0731.

**DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT - STUCK OFF**

**COMPONENT LOCATION** EC9FA0C8



EKRF410A

**GENERAL DESCRIPTION** EAB74AB6

The TCM(PCM) controls the locking and unlocking of the Torque Converter Clutch (or Damper Clutch), to the input shaft of the transmission, by applying hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The TCM(PCM) outputs duty pulses to control the Damper Clutch Control Solenoid Valve(DCCSV) and hydraulic pressure is applied to the DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked. The normal operating range of the Damper Clutch Control duty ratio value is from 30%(unlocked) to 85%(locked).

**DTC DESCRIPTION** E3E8D052

The TCM(PCM) increases the duty ratio to engage the Damper Clutch by monitoring slip rpms (difference value between engine speed and turbine speed). To decrease the slip of the Damper Clutch, the TCM(PCM) increases the duty ratio by applying more hydraulic pressure. When slip rpm does not drop under specification with 100% duty ratio, the TCM(PCM) determines that the Torque Converter Clutch is stuck OFF and sets this code.

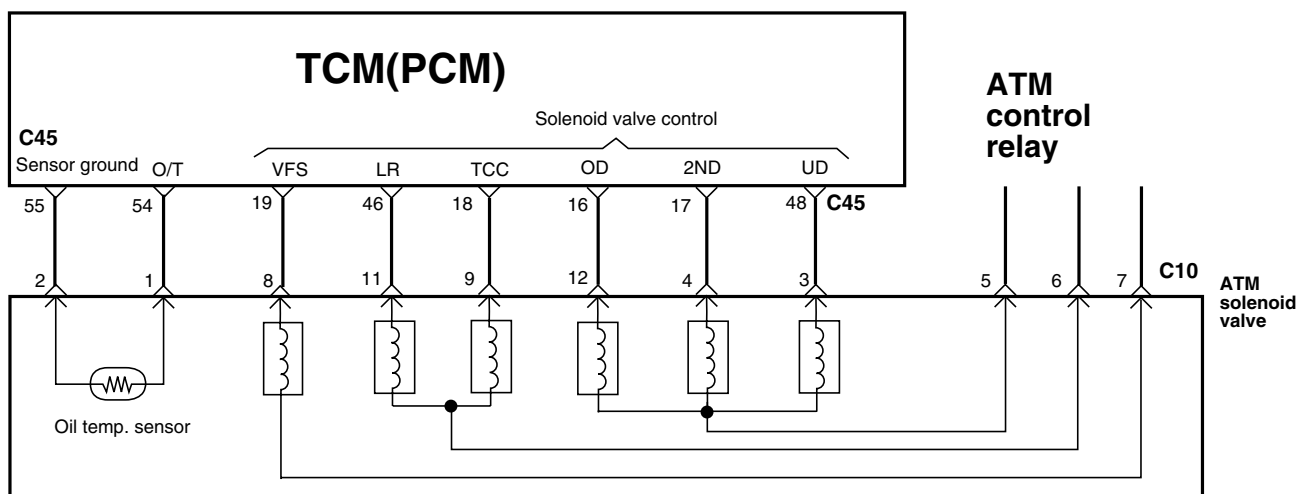
**DTC DETECTING CONDITION** EC7C600D

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"> <li>Stuck "OFF"</li> </ul>	※ TORQUE CONVERTER(DAMPER) CLUTCH : TCC <ul style="list-style-type: none"> <li>Faulty TCC or oil pressure system</li> <li>Faulty TCC solenoid valve</li> <li>Faulty body control valve</li> <li>Faulty TCM(PCM)</li> </ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"> <li>During the connect control</li> </ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"> <li>Detect 2 times the Lock-up clutch control duty=100% for 2sec</li> </ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"> <li>1 event</li> </ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"> <li>Damper clutch abnormal system (If diagnosis code P0741 is output four times, TORQUE CONVERTER(DAMPER) CLUTCH is not controlled by TCM(PCM))</li> </ul>	

**SCHEMATIC DIAGRAM**

ED5080A5

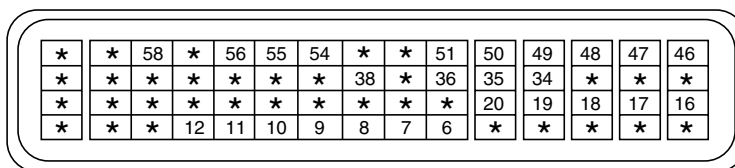
[Circuit Diagram]



[Harness Connector]



C10



C45

[Connection Information]

Terminal	Connection	Function
1	C45 No.54	Oil temp. sensor signal
2	C45 No.55	Sensor ground
3	C45 No.48	UD solenoid signal
4	C45 No.17	2ND solenoid signal
12	C45 No.16	OD solenoid signal
11	C45 No.46	LR solenoid signal
9	C45 No.18	TCC solenoid signal
5	JE01 No.38	ATM control relay
6	JE01 No.54	ATM control relay
7	JE01 No.55	ATM control relay
8	C45 No.19	VFS solenoid signal

**MONITOR SCANTOOL DATA** EBC487BA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Select "D RANGE" and drive vehicle.
4. Monitor the "TORQUE CONVERTER(DAMPER) CLUTCH" parameter on the scantool.

---

Specification : TCC SLIP < 160RPM(In condition that TCC SOL. DUTY > 80% )

---

1.2 CURRENT DATA		06/24
* 01.ENGINE SPEED	3459 rpm	▲
* 04.INPUT SPEED SENSOR	3457 rpm	■
* 05.O/PUT SPEED SENSOR	3984 rpm	
* 06.DCCSV DUTY	81.2 %	
* 07.DAMP.CLUTCH SLIP	2 rpm	
* 15.SELECT LEVER POSI.	D	
16.A/C SWITCH		
17.IDLE SWITCH		

FIG.1)

FIG.1) : Normal status

ELQE041A

5. Are "TCC SOLENOID DUTY and TCC SLIP" within specifications?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "Component Inspection" procedure.

**COMPONENT INSPECTION** ED3D7FEF

1. CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE

- 1) Connect scantool to data link connector(DLC).
- 2) Ignition "ON" & Engine "OFF".
- 3) Select A/T Solenoid valve Actuator test and Operate Actuator test.
- 4) Can you hear operating tone for using TCC SOLENOID VALVE Actuator Testing Function?

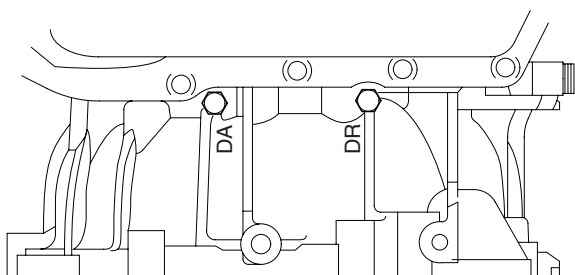
**YES**

▶ Go to "CHECK OIL PRESSURE" as below.

**NO**

▶ Replace "TCC SOLENOID VALVE" as necessary and Go to "Verification Vehicle Repair" procedure.

2. CHECK OIL PRESSURE



LKIF210B

- 1) Connect Oil pressure gauge to "DA" port.
- 2) Ignition "ON" & Engine "OFF".
- 3) After connecting Scantool and monitor the "TCC SOLENIOD VALVE DUTY" parameter on the Scantool data list.
- 4) Select 1st gear and accelerate Engine speed to 2500 rpm.
- 5) Measure oil pressure.

---

Specification : approx. 7.5kg/cm<sup>2</sup>

---

6) Is oil pressure value within specification?

**YES**

▶ Repair TORQUE CONVERTER CLUTCH(REPLACE Torque Converter ) as necessary and Go to "Verification Vehicle Repair " procedure.

**NO**

▶ Replace A/T ass'y (possible to BODY CONTROL VALVE faulty) as necessary and Go to "Verification Vehicle Repair " procedure.

**VERIFICATION OF VEHICLE REPAIR** E33A57DA

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

▶ Go to the applicable troubleshooting procedure.

**NO**

▶ System performing to specification at this time.

AT -146

AUTOMATIC TRANSAXLE (F4A42)

**DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT - ELECTRICAL**

**COMPONENT LOCATION** EEA7EC7E

Refer to DTC P0741.

**GENERAL DESCRIPTION** EE5CBC8D

Refer to DTC P0741.

**DTC DESCRIPTION** EE1D9AF3

The TCM(PCM) checks the Damper Clutch Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected) the TCM(PCM) judges that DCCSV circuit is malfunctioning and sets this code.

**DTC DETECTING CONDITION** E8FD6B5B

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Check voltage range</li></ul>	※ TORQUE CONVERTER(DAMPER) CLUTCH : TCC <ul style="list-style-type: none"><li>• Open or short in circuit</li><li>• Faulty TCC SOLENOID VALVE</li><li>• Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• 16V &gt; Voltage Battery &gt; 10V</li><li>• In gear state(no gear shifting) 500msec is passed from turn on the relay</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• Feedback voltage from DCC control solenoid &gt; Vb-2V and DCC control duty is 100%</li><li>• Feedback voltage from DCC control solenoid ≤ 5.5V and DCC control duty is 0%</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• More than 500 ms</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• Locked in 3rd gear.(Control relay off)</li></ul>	

**SPECIFICATION** E2FC2F65

Solenoid Valve for Pressure Control

- Sensor type : Normal open 3-way
- Operating temperature : -22~266°F(-30°C~130°C)
- Frequency :
  - LR, 2ND, UD, OD, RED : 61.27Hz (at the ATF temp. -20°C above)
  - DCC : 30.64Hz
  - VFS : 600 ± 20Hz
  
- Internal resistance :
  - 2.7~3.4Ω (68°F or 20°C) - LR, 2ND, UD, OD, RED, DCC
  - 4.3~4.4Ω (68°F or 20°C) - VFS
  
- Surge voltage : 56 V(except VFS)

**SCHEMATIC DIAGRAM** EB0EC8D1

Refer to DTC P0741.

**MONITOR SCANTOOL DATA** E9BE79E7

1. Connect scantool to data link connector(DLC)
2. Engine "ON".
3. Monitor the "TCC SOL. VALVE" parameter on the scantool
4. Select "D RANGE" and Operate "TCC SOLENOID DUTY" more than 85%

1.2 CURRENT DATA		06/24
× 01. ENGINE SPEED	3459 rpm	▲
× 04. INPUT SPEED SENSOR	3457 rpm	■
× 05. OUTPUT SPEED SENSOR	3984 rpm	
× 06. DCCSV DUTY	81.2 %	
× 07. DAMP. CLUTCH SLIP	2 rpm	
× 15. SELECT LEVER POSI.	D	
16. A/C SWITCH		
17. IDLE SWITCH		

FIG.1)

FIG.1) : Normal status

ELQE041A

5. Does "TCC SOLENOID DUTY " follow the reference data?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "Terminal & Connector Inspection " procedure.

**TERMINAL & CONNECTOR INSPECTION** EF6DF4CC

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

**NO**

▶ Go to "Power Supply Circuit Inspection" procedure.

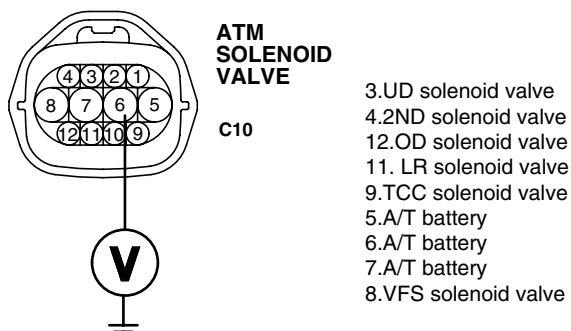
**POWER SUPPLY CIRCUIT INSPECTION** E67D4D39

1. Disconnect "A/T SOLENOID VALVE" connector.
2. Measure voltage between terminal "6" of the sensor harness connector and chassis ground.
3. Turn ignition switch OFF → ON

---

Specification: 12V is measured only for approx. 0.5sec

---



EKRF411A

4. Is voltage within specifications?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

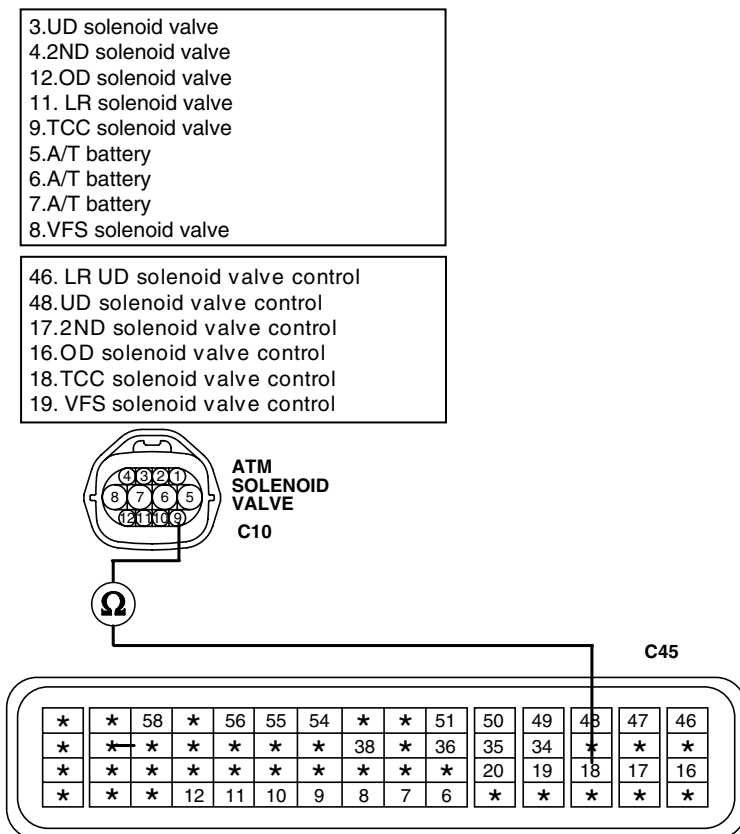
**NO**

- ▶ Check that A/T-30A Fuse in engine room junction is installed or not blown.
- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**SIGNAL CIRCUIT INSPECTION** EBDAB2CF

1. Check signal circuit open inspection.
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T SOLENOID VALVE" connector and "TCM(PCM)" connector.
  - 3) Measure resistance between terminal "9" of the ATM SOLENOID VALVE harness connector and terminal "18" of the TCM(PCM) harness connector.

Specification: approx. 0 Ω



EKRF411B

- 4) Is resistance within specifications?
 

**YES**

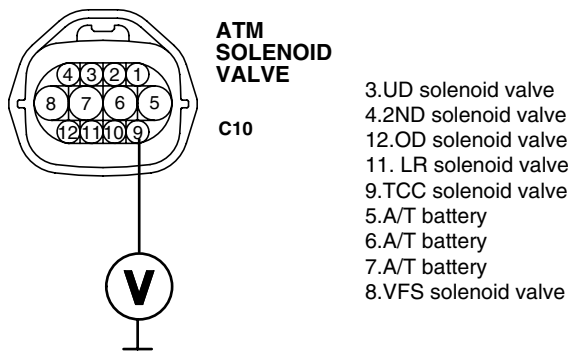
▶ Go to "Check signal circuit short Inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.
2. Check signal circuit short inspection
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T SOLENOID VALVE" connector and "TCM(PCM)" connector

- 3) Measure resistance between terminal "9" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



EKRF411C

- 4) Is resistance within specifications?

**YES**

▶ Go to "Component Inspection" procedure.

**NO**

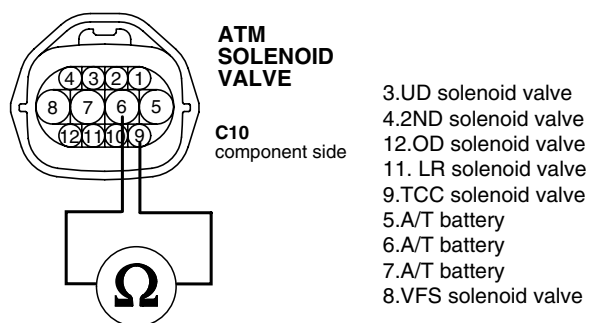
▶ Check for short to ground in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

## COMPONENT INSPECTION E28F50BA

### 1. CHECK SOLENOID VELVE

- 1) Ignition "OFF".
- 2) Disconnect "A/T SOLENOID VALVE" connector.
- 3) Measure resistance between terminal "9" and terminal "6" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7~3.4  $\Omega$  [20°C(68°F)]



EKRF411D

4) Is resistance within specification?

**YES**

▶ Go to "CHECK TCM(PCM)" as below.

**NO**

▶ Replace TCC SOLENOID VALVE as necessary and go to "Verification Vehicle Repair" procedure.

2. CHECK TCM(PCM)

1) Connect scantool to data link connector(DLC).

2) Ignition "ON" & Engine "OFF".

3) Select A/T Solenoid valve Actuator test and Operate Actuator test.

4) Can you hear operating sound for TCC SOLENOID VALVE Actuator Testing Function?

**YES**

▶ Go to "Verification Vehicle Repair" procedure.

**NO**

▶ Replace TCM(PCM) as necessary and Go to "Verification Vehicle Repair" procedure

**ACTUATOR TEST CONDITION**

1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0km/h
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

**VERIFICATION OF VEHICLE REPAIR** EEADC14F

Refer to DTC P0741.

**DTC P0748 PRESSURE CONTROL SOLENOID A - ELECTRICAL**

**COMPONENT LOCATION** E4DD52DB

Refer to DTC P0741.

**GENERAL DESCRIPTION** E69BC84D

In order to control the optimum line pressure and improve the efficiency of power transmission according to maximize the efficiency of oil pump, VFS (Variable Force Solenoid) valve has been added in the valve body hydraulic circuit.

**DTC DETECTING CONDITION** E7CDE35D

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Check oil pressure and feedback current value</li></ul>	<ul style="list-style-type: none"><li>• Open or short in circuit</li><li>• Faulty VFS SOLENOID VALVE</li><li>• Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• Voltage Battery &gt; 9V</li><li>• 10% ≤ Output duty ≤ 90% feedback current value</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• When feedback current ≤ 500mA<ul style="list-style-type: none"><li>- Duty control: 600 ± 20Hz</li></ul></li></ul> <p>Ps (Supply pressure): 660-725kpa (96-100psi) Pc (Control pressure): Shown below Pex: Exhaust pressure</p>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• More than 320 ms</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• Locked in 3rd gear.(Control relay off)</li></ul>	

**SPECIFICATION** EAFDF163

Refer to DTC P0743.

**SCHEMATIC DIAGRAM** E48EB94D

Refer to DTC P0741.

**TERMINAL & CONNECTOR INSPECTION** E8E43090

Refer to DTC P0743.

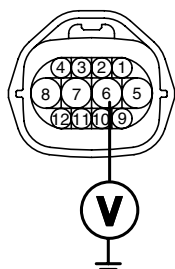
**POWER SUPPLY CIRCUIT INSPECTION** E6E7F0FF

1. Disconnect "A/T SOLENOID VALVE" connector.
2. Measure voltage between terminal "6" of the sensor harness connector and chassis ground.
3. Turn ignition switch OFF → ON.

---

Specification: 12V is measured only for approx. 0.5sec

---



**ATM  
SOLENOID  
VALVE**

C10

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
- 11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF412A

4. Is voltage within specifications?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Check that A/T-20A Fuse in engine room junction is installed or not blown.
- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**SIGNAL CIRCUIT INSPECTION**

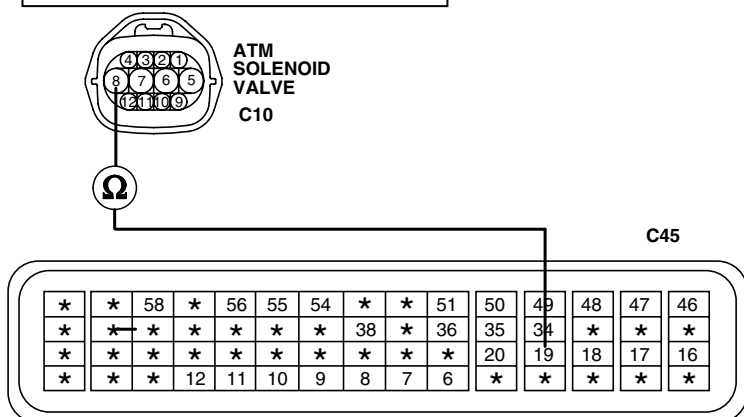
E4F61462

1. Check signal circuit open inspection
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
  - 3) Measure resistance between terminal "8" of the ATM SOLENOID VALVE harness connector and terminal "19" of the TCM(PCM) harness connector

Specification: approx. 0 Ω

3.UD solenoid valve  
4.2ND solenoid valve  
12.OD solenoid valve  
11. LR solenoid valve  
9.TCC solenoid valve  
5.A/T battery  
6.A/T battery  
7.A/T battery  
8.VFS solenoid valve

46. LR UD solenoid valve control  
48.UD solenoid valve control  
17.2ND solenoid valve control  
16.OD solenoid valve control  
18.TCC solenoid valve control  
19. VFS solenoid valve control



EKRF412B

- 4) Is resistance within specifications?

**YES**

▶ Go to "Check signal circuit short Inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

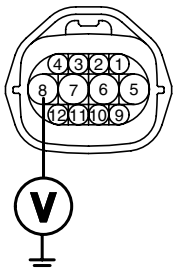
## AUTOMATIC TRANSAXLE SYSTEM

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### 2. Check signal circuit short inspection

- 1) Ignition "OFF".
- 2) Disconnect "A/T SOLENOID VALVE" connector and "TCM(PCM)" connector.
- 3) Measure resistance between terminal "8" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



ATM SOLENOID VALVE

C10

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
- 11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF412C

### 4) Is resistance within specifications?

**YES**

- ▶ Go to "Component Inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

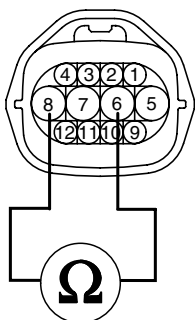
## COMPONENT INSPECTION

EC9166D9

### 1. CHECK SOLENOID VELVE

- 1) Ignition "OFF".
- 2) Disconnect "A/T SOLENOID VALVE" connector.
- 3) Measure resistance between terminal "8" and terminal "6" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7~3.4  $\Omega$  [20°C(68°F)]



ATM SOLENOID VALVE

C10  
component side

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
- 11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF412D

- 4) Is resistance within specification?

**YES**

▶ Go to "CHECK TCM(PCM)" as below.

**NO**

▶ Replace VFS SOLENOID VALVE as necessary and go to "Verification Vehicle Repair" procedure.

2. CHECK TCM(PCM)

- 1) Connect scantool to data link connector(DLC).
- 2) Ignition "ON" & Engine "OFF".
- 3) Select A/T Solenoid valve Actuator test and Operate Actuator test.
- 4) Can you hear operating sound for VFS SOLENOID VALVE Actuator Testing Function?

**YES**

▶ Go to "Verification Vehicle Repair" procedure.

**NO**

▶ Replace TCM(PCM) as necessary and Go to "Verification Vehicle Repair" procedure.

**ACTUATOR TEST CONDITION**

1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0km/h
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

**VERIFICATION OF VEHICLE REPAIR** E0AE3E21

Refer to DTC P0741.

**DTC P0750 SHIFT CONTROL SOLENOID VALVE A CIRCUIT MALFUNCTION**

**COMPONENT LOCATION** EDA3ED70

Refer to DTC P0741.

**GENERAL DESCRIPTION** EED50ABA

The Automatic Transmission changes the gear position of the transmission by utilizing a combination of Clutches and Brakes, which are controlled by solenoid valves. The HIVEC Automatic Transmission consists of a: LR ( Low and Reverse Brake ), 2ND ( 2nd Brake ), UD ( Under Drive Clutch ), OD ( Over Drive Clutch ), REV ( Reverse Clutch ), and a RED ( Reduction Brake, only for 5 speed transmissions). The LR Brake is engaged in the 1st gear and reverse gear positions.

**DTC DESCRIPTION** E834BACE

The TCM(PCM) checks the Low and Reverse Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected), the TCM(PCM) judges that the Low and Reverse control solenoid circuit is malfunctioning and sets this code.

**DTC DETECTING CONDITION** E3DCBA98

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Check voltage range</li></ul>	<ul style="list-style-type: none"><li>• Open or short in circuit</li><li>• Faulty LR SOLENOID VALVE</li><li>• Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• 16V &gt; Voltage Battery &gt; 10V</li><li>• In gear state(no gear shifting) 500msec is passed from turn on the relay</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• Feedback voltage from LR control solenoide &gt; Vb-2V and LR control duty is 0%</li><li>• Feedback voltage from LR control solenoide ≤ 5.5V and LR control duty is 100%</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• More than 320 ms</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• Locked in 3rd gear.(Control relay off)</li></ul>	

**SPECIFICATION** EE7A4461

Refer to DTC P0743.

**SCHEMATIC DIAGRAM** EA538651

Refer to DTC P0741.

**MONITOR SCANTOOL DATA** E9B7DCA4

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "LR SOL. VALVE" parameter on the scantool.
4. Shift gear position 1st to 2nd.

Specification: 1st → 0%, 2nd → 100%

1.2 CURRENT DATA	
* L&RSV DUTY	0.0 %
* UDSV DUTY	0.0 %
* ZNDSV DUTY	100.0%
* ODSV DUTY	100.0%
* TRANSAXLE RANGE SW	D
THROTTLE P.SENSOR	12.9 %
FLUID TEMP.SENSOR	66 °C
CRK POSITION SNSR	807 rpm

FIG.1)

1.2 CURRENT DATA	
* L&RSV DUTY	100.0%
* UDSV DUTY	0.0 %
* ZNDSV DUTY	0.0 %
* ODSV DUTY	100.0%
* SHIFT POSITION	2
THROTTLE P.SENSOR	12.9 %
FLUID TEMP.SENSOR	71 °C
CRK POSITION SNSR	835 rpm

FIG.2)

FIG. 1) 1st gear

FIG. 2) 2nd gear

ELQE045A

5. Does "LR SOLENOID DUTY " follow the reference data?

**YES**

► Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

► Go to "Terminal & Connector Inspection " procedure.

**TERMINAL & CONNECTOR INSPECTION** E79F1EDD

Refer to DTC P0743.

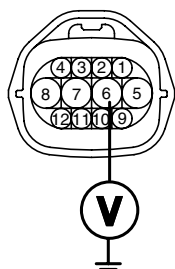
**POWER SUPPLY CIRCUIT INSPECTION** EA4BB6FF

1. Disconnect "A/T SOLENOID VALVE" connector.
2. Measure voltage between terminal "6" of the sensor harness connector and chassis ground.
3. Turn ignition switch OFF → ON.

---

Specification: 12V is measured only for approx. 0.5sec

---



**ATM  
SOLENOID  
VALVE**

C10

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
- 11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF412A

4. Is voltage within specifications?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Check that A/T-20A Fuse in engine room junction is installed or not blown.
- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**SIGNAL CIRCUIT INSPECTION**

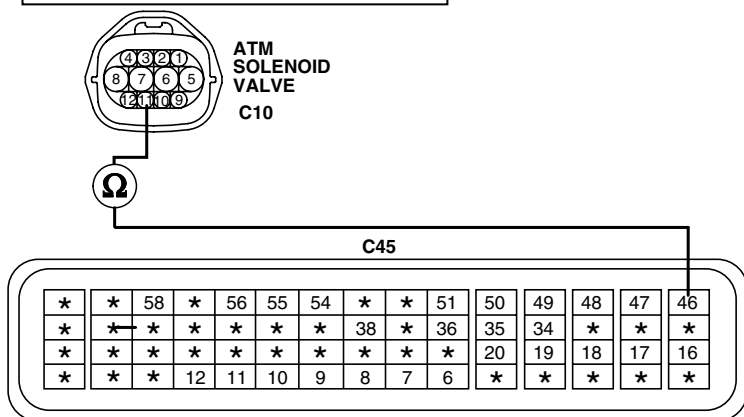
EB0D2C5E

1. Check signal circuit open inspection
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T SOLENOID VALVE" connector and "PCM/TCM" connector.
  - 3) Measure resistance between terminal "11" of the ATM SOLENOID VALVE harness connector and terminal "46" of the TCM(PCM) harness connector

Specification: approx. 0 Ω

3.UD solenoid valve  
4.2ND solenoid valve  
12.OD solenoid valve  
11. LR solenoid valve  
9.TCC solenoid valve  
5.A/T battery  
6.A/T battery  
7.A/T battery  
8.VFS solenoid valve

46. LR UD solenoid valve control  
48.UD solenoid valve control  
17.2ND solenoid valve control  
16.OD solenoid valve control  
18.TCC solenoid valve control  
19. VFS solenoid valve control



EKRF413B

- 4) Is resistance within specifications?

**YES**

▶ Go to "Check signal circuit short Inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

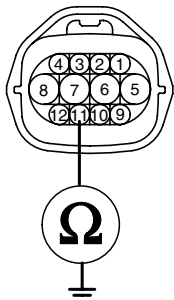
## AUTOMATIC TRANSAXLE SYSTEM

AT -161

### 2. Check signal circuit short inspection

- 1) Ignition "OFF".
- 2) Disconnect "A/T SOLENOID VALVE" connector and "TCM(PCM)" connector.
- 3) Measure resistance between terminal "11" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



ATM SOLENOID VALVE

C10

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF413C

### 4) Is resistance within specifications?

**YES**

- ▶ Go to "Component Inspection" procedure.

**NO**

- ▶ Check for short to ground in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

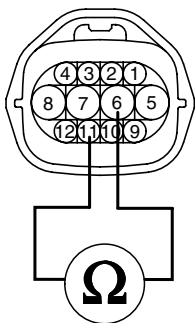
## COMPONENT INSPECTION

EA7672B5

### 1. CHECK SOLENOID VELVE

- 1) Ignition "OFF".
- 2) Disconnect "A/T SOLENOID VALVE" connector.
- 3) Measure resistance between terminal "11" and terminal "6" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



ATM SOLENOID VALVE

C10  
component side

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF413D

- 4) Is resistance within specification?

**YES**

▶ Go to "CHECK TCM(PCM)" as below.

**NO**

▶ Replace LR SOLENOID VALVE as necessary and go to "Verification Vehicle Repair" procedure.

2. CHECK TCM(PCM)

- 1) Connect scantool to data link connector(DLC).
- 2) Ignition "ON" & Engine "OFF".
- 3) Select A/T Solenoid valve Actuator test and Operate Actuator test.
- 4) Can you hear operating sound for LR SOLENOID VALVE Actuator Testing Function?

**YES**

▶ Go to "Verification Vehicle Repair" procedure.

**NO**

▶ Replace TCM(PCM) as necessary and Go to "Verification Vehicle Repair" procedure.

**ACTUATOR TEST CONDITION**

1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0km/h
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

**VERIFICATION OF VEHICLE REPAIR** E4B9DFBC

Refer to DTC P0741.

**DTC P0755 SHIFT CONTROL SOLENOID VALVE B CIRCUIT MALFUNCTION**

**COMPONENT LOCATION** ECEC2EA2

Refer to DTC P0741.

**GENERAL DESCRIPTION** EFDD839C

Refer to DTC P0750.

**DTC DESCRIPTION** EB8CBA19

Refer to DTC P0750.

**DTC DETECTING CONDITION** E2B87ECB

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Check voltage range</li></ul>	<ul style="list-style-type: none"><li>• Open or short in circuit</li><li>• Faulty UD SOLENOID VALVE</li><li>• Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• 16V &gt; Voltage Battery &gt; 10V</li><li>• In gear state(no gear shifting) 500msec is passed from turn on the relay</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• Feedback voltage from UD control solenoide &gt; Vb-2V and UD control duty is 0%</li><li>• Feedback voltage from UD control solenoide ≤ 5.5V and UD control duty is 100%</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• more than 320 ms</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• Locked in 3rd gear.(Control relay off)</li></ul>	

**SPECIFICATION** EBC191B0

Refer to DTC P0743.

**SCHEMATIC DIAGRAM** E9E360AC

Refer to DTC P0741.

**MONITOR SCANTOOL DATA** E1DCBBC8

1. Connect scantool to data link connector(DLC)
2. Engine "ON".
3. Monitor the "UD SOL. VALVE" parameter on the scantool.
4. Shift gear position "N" to "D".

Specification: P/N → 100%, D → 0.0%

1.2 CURRENT DATA	
* TCC SOLENOID DUTY	0.0 %
* LR SOLENOID DUTY	0.0 %
* UD SOLENOID DUTY	100.0%
* 2ND SOLENOID DUTY	100.0%
* OD SOLENOID DUTY	100.0%
* SHIFT POSITION	-
* SELECT LEVER SW.	P, N
ENGINE TORQUE	14.9 %

FIX SCRN FULL PART GRPH HELP

FIG.1)

1.2 CURRENT DATA	
* L&RSV DUTY	0.0 %
* UDSV DUTY	0.0 %
* 2NDSV DUTY	100.0%
* ODSV DUTY	100.0%
* TRANSAXLE RANGE SW	D
THROTTLE P. SENSOR	12.9 %
FLUID TEMP. SENSOR	66 °C
CRK POSITION SNSR	807 rpm

FIX SCRN FULL PART GRPH HELP

FIG.2)

FIG. 1) P/N Range

FIG. 2) D Range

ELQE046A

5. Does "UD SOLENOID DUTY " follow the reference data?

**YES**

► Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

► Go to "Terminal & Connector Inspection " procedure.

**TERMINAL & CONNECTOR INSPECTION** EB1BA5F2

Refer to DTC P0743.

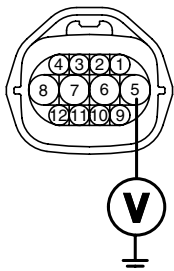
**POWER SUPPLY CIRCUIT INSPECTION** EF373AB4

1. Disconnect "A/T SOLENOID VALVE" connector.
2. Measure voltage between terminal "5" of the sensor harness connector and chassis ground.
3. Turn ignition switch OFF → ON.

---

Specification: 12V is measured only for approx. 0.5sec

---



**ATM  
SOLENOID  
VALVE**

C10

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
- 11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF414A

4. Is voltage within specifications?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

**NO**

- ▶ Check that A/T-30A Fuse in engine room junction is installed or not blown.
- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**SIGNAL CIRCUIT INSPECTION**

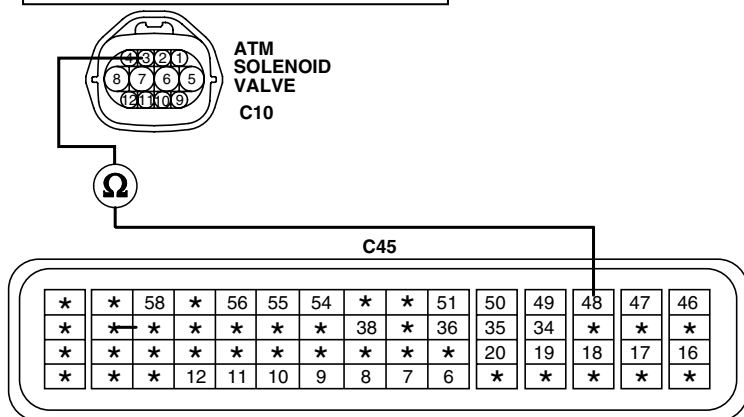
E5FED6B0

1. Check signal circuit open inspection
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T SOLENOID VALVE" connector and "TCM(PCM)" connector
  - 3) Measure resistance between terminal "3" of the ATM SOLENOID VALVE harness connector and terminal "48" of the TCM(PCM) harness connector

Specification: approx. 0 Ω

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
- 11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

- 46. LR UD solenoid valve control
- 48.UD solenoid valve control
- 17.2ND solenoid valve control
- 16.OD solenoid valve control
- 18.TCC solenoid valve control
- 19. VFS solenoid valve control



EKRF414B

- 4) Is resistance within specifications?

**YES**

- ▶ Go to "Check signal circuit short Inspection" procedure.

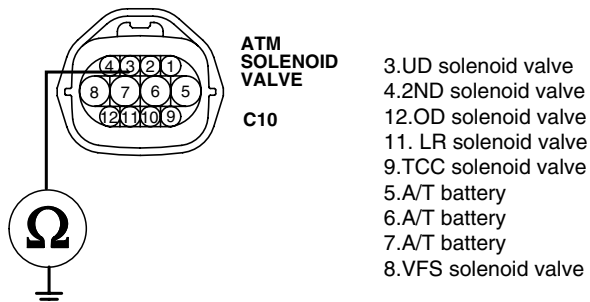
**NO**

- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

2. Check signal circuit short inspection

- 1) Ignition "OFF".
- 2) Disconnect "A/T SOLENOID VALVE" connector and "TCM(PCM)" connector.
- 3) Measure resistance between terminal "3" of the ATM SOLENOID VALVE harness and chassis ground.

Specification: Infinite



EKRF414C

4) Is resistance within specifications?

**YES**

▶ Go to "Component Inspection" procedure.

**NO**

▶ Check for short to ground in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

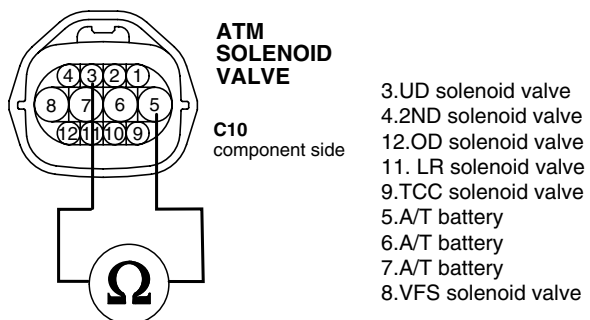
**COMPONENT INSPECTION**

E8CD5A6F

1. CHECK SOLENOID VELVE

- 1) Ignition "OFF".
- 2) Disconnect "A/T SOLENOID VALVE" connector.
- 3) Measure resistance between terminal "3" and terminal "5" of the ATM SOLENOID VALVE harness connector.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



EKRF414D

- 4) Is resistance within specification?

**YES**

▶ Go to "CHECK TCM(PCM)" as below.

**NO**

▶ Replace UD SOLENOID VALVE as necessary and go to "Verification Vehicle Repair" procedure.

2. CHECK TCM(PCM)

- 1) Connect scantool to data link connector(DLC)
- 2) Ignition "ON" & Engine "OFF".
- 3) Select A/T Solenoid valve Actuator test and Operate Actuator test.
- 4) Can you hear operating sound for UD SOLENOID VALVE Actuator Testing Function?

**YES**

▶ Go to "Verification Vehicle Repair" procedure.

**NO**

▶ Replace TCM(PCM) as necessary and Go to "Verification Vehicle Repair" procedure.

**ACTUATOR TEST CONDITION**

1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0km/h
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

**VERIFICATION OF VEHICLE REPAIR** E2C8F070

Refer to DTC P0741.

**DTC P0760 SHIFT CONTROL SOLENOID VALVE C CIRCUIT MALFUNCTION**

**COMPONENT LOCATION** E58ECDCC

Refer to DTC P0741.

**GENERAL DESCRIPTION** EDCDC688

Refer to DTC P0750.

**DTC DESCRIPTION** E3AA6DFC

Refer to DTC P0750.

**DTC DETECTING CONDITION** EB60C1C6

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Check voltage range</li></ul>	<ul style="list-style-type: none"><li>• Open or short in circuit</li><li>• Faulty 2nd SOLENOID VALVE</li><li>• Faulty TCM(PCM)</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• 16V &gt; Voltage Battery &gt; 10V</li><li>• In gear state(no gear shifting) 500msec is passed from turn on the relay</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• Feedback voltage from 2nd control solenoide &gt; Vb-2V and 2nd control duty is 0%</li><li>• Feedback voltage from 2nd control solenoide ≤ 5.5V and 2nd control duty is 100%</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• more than 320 ms</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• Locked in 3rd gear.(Control relay off)</li></ul>	

**SPECIFICATION** EE91ADDF

Refer to DTC P0743.

**SCHEMATIC DIAGRAM** EE3A5A8A

Refer to DTC P0741.

**MONITOR SCANTOOL DATA** E715BD75

1. Connect scantool to data link connector(DLC)
2. Engine "ON".
3. Monitor the "2nd SOL. VALVE" parameter on the scantool.
4. Shift gear position 1st to 2nd.

---

Specification: 1st gear → 100%, 2nd gear → 0.0%

---

1.2 CURRENT DATA	
* L&RSV DUTY	0.0 %
* UDSV DUTY	0.0 %
* ZNDSV DUTY	100.0%
* ODSV DUTY	100.0%
* TRANSAXLE RANGE SW	D
THROTTLE P. SENSOR	12.9 %
FLUID TEMP. SENSOR	66 °C
CRK POSITION SNSR	807 rpm

FIG.1)

1.2 CURRENT DATA	
* L&RSV DUTY	100.0%
* UDSV DUTY	0.0 %
* ZNDSV DUTY	0.0 %
* ODSV DUTY	100.0%
* SHIFT POSITION	2
THROTTLE P. SENSOR	12.9 %
FLUID TEMP. SENSOR	71 °C
CRK POSITION SNSR	835 rpm

FIG.2)

FIG. 1) 1st gear  
FIG. 2) 2nd gear

ELQE047A

5. Does "2nd SOLENOID DUTY " follow the reference data?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "Terminal & Connector Inspection " procedure.

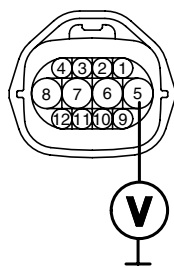
**TERMINAL & CONNECTOR INSPECTION** E3DAA14E

Refer to DTC P0743.

**POWER SUPPLY CIRCUIT INSPECTION** EF295A57

1. Disconnect "A/T SOLENOID VALVE" connector.
2. Measure voltage between terminal "5" of the sensor harness connector and chassis ground.
3. Turn ignition switch OFF → ON

Specification : 12V is measured only for approx. 0.5sec



ATM SOLENOID VALVE  
C10

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
- 11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF414A

4. Is voltage within specifications?

**YES**

▶ Go to "Signal circuit inspection" procedure.

**NO**

▶ Check that A/T-30A Fuse in engine room junction is installed or not blown.

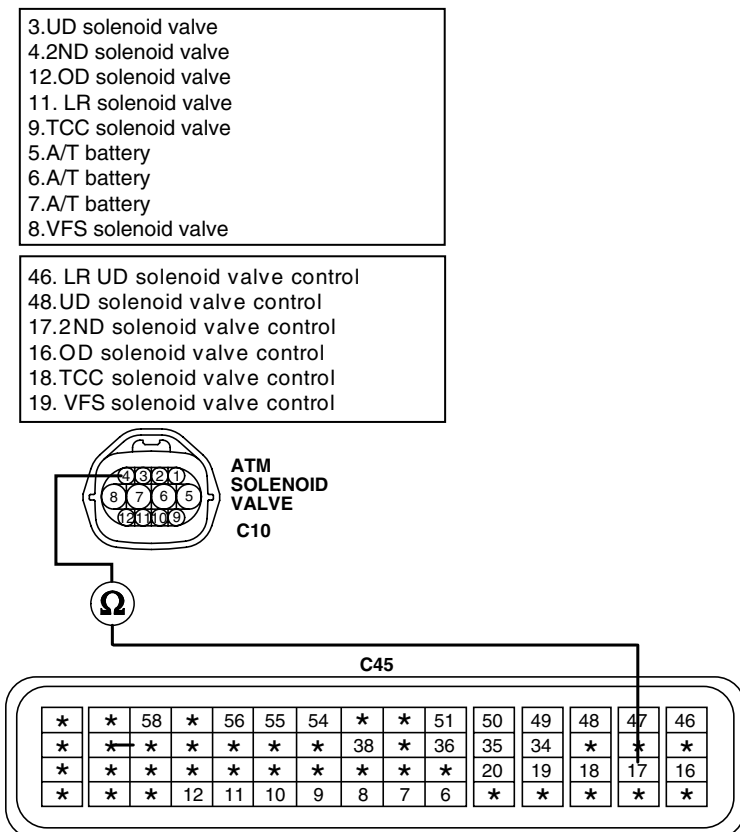
▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**SIGNAL CIRCUIT INSPECTION** E4DBD60D

1. Check signal circuit open inspection

- 1) Ignition "OFF".
- 2) Disconnect "A/T SOLENOID VALVE" connector and "TCM(PCM)" connector
- 3) Measure resistance between terminal "4" of the ATM SOLENOID VALVE harness connector and terminal "17" of the TCM(PCM) harness connector

Specification: approx. 0 Ω



4) Is resistance within specifications?

**YES**

▶ Go to "Check signal circuit short Inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

2. Check signal circuit short inspection

1) Ignition "OFF".

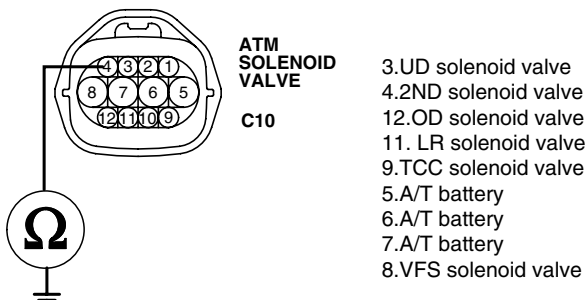
2) Disconnect "A/T SOLENOID VALVE" connector and "TCM(PCM)" connector.

3) Measure resistance between terminal "4" of the ATM SOLENOID VALVE harness and chassis ground.

---

Specification: Infinite

---



EKRF415B

4) Is resistance within specifications?

**YES**

▶ Go to "Component Inspection" procedure.

**NO**

▶ Check for short to ground in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

## COMPONENT INSPECTION EB06AE6

1. CHECK SOLENOID VELVE

1) Ignition "OFF".

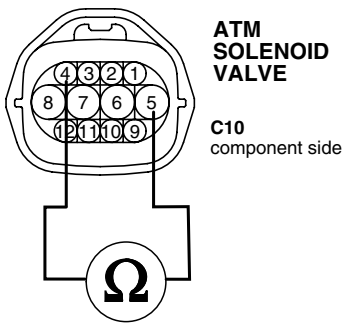
2) Disconnect "A/T SOLENOID VALVE" connector.

3) Measure resistance between terminal "4" and terminal "5" of the ATM SOLENOID VALVE harness connector.

---

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]

---



- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
- 11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF415C

4) Is resistance within specification?

**YES**

▶ Go to "CHECK TCM(PCM)" as below.

**NO**

▶ Replace 2nd SOLENOID VALVE as necessary and go to "Verification Vehicle Repair" procedure.

**2. CHECK TCM(PCM)**

- 1) Connect scantool to data link connector(DLC)
- 2) Ignition "ON" & Engine "OFF".
- 3) Select A/T Solenoid valve Actuator test and Operate Actuator test.
- 4) Can you hear operating sound for 2ND SOLENOID VALVE Actuator Testing Function?

**YES**

▶ Go to "Verification Vehicle Repair" procedure.

**NO**

▶ Replace TCM(PCM) and Go to "Verification Vehicle Repair" procedure.

**ACTUATOR TEST CONDITION**

1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0km/h
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

**VERIFICATION OF VEHICLE REPAIR** E59C90A4

Refer to DTC P0741.

AT -174

AUTOMATIC TRANSAXLE (F4A42)

**DTC P0765 SHIFT CONTROL SOLENOID VALVE D CIRCUIT MALFUNCTION**

**COMPONENT LOCATION** EB67B270

Refer to DTC P0741.

**GENERAL DESCRIPTION** E055EBFA

Refer to DTC P0750.

**DTC DESCRIPTION** E7FE2ED8

Refer to DTC P0750.

**DTC DETECTING CONDITION** E21CDFE7

Item		Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>		<ul style="list-style-type: none"> <li>Check voltage range</li> </ul>	<ul style="list-style-type: none"> <li>Open or short in circuit</li> <li>Faulty OD SOLENOID VALVE</li> <li>Faulty TCM(PCM)</li> </ul>
<b>Enable Conditions</b>	<b>Case1</b>	<ul style="list-style-type: none"> <li>16V &gt; Voltage Battery &gt; 10V</li> </ul>	
	<b>Case2</b>	<ul style="list-style-type: none"> <li>Voltage Battery &gt; 10V</li> <li>OIL TEMP. <math>\geq -23.5^{\circ}\text{C}(-10.3^{\circ}\text{F})</math></li> <li>2nd gear and not under the down shifting</li> <li>Engine speed <math>\geq 450\text{rpm}</math></li> <li>Output speed &gt; 100rpm</li> <li>Input speed &gt; 0rpm</li> <li>Inhibitor switch is normal and after 2sec is passed from IG ON</li> </ul>	
<b>Threshold value</b>	<b>Case1</b>	<ul style="list-style-type: none"> <li>Feedback voltage from 2nd control solenoide &gt; Vb-2V and 2nd control duty is 0%</li> <li>Feedback voltage from 2nd control solenoide <math>\leq 5.5\text{V}</math> and 2nd control duty is 100%</li> </ul>	
	<b>Case2</b>	<ul style="list-style-type: none"> <li><math> \text{Input speed}/3\text{rd gear ratio} - \text{output speed}  \leq 50\text{rpm}</math></li> </ul>	
<b>Diagnostic Time</b>		<ul style="list-style-type: none"> <li>More than 320 ms</li> </ul>	
<b>Fail Safe</b>		<ul style="list-style-type: none"> <li>Locked in 3 rd gear.(Control relay off)</li> </ul>	

**SPECIFICATION** E0DDB07C

Refer to DTC P0743.

**SCHEMATIC DIAGRAM** EC0D3D4F

Refer to DTC P0741.

**MONITOR SCANTOOL DATA** E8BB7AB0

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "OD SOL. VALVE" parameter on the scantool.
4. Shift gear position 2nd to 3rd.

---

Specification: 2nd gear → 100%, 3rd gear → 0.0%

---

ELQE048A

Does "OD SOLENOID DUTY " follow the reference data?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "Terminal & Connector Inspection " procedure.

**TERMINAL & CONNECTOR INSPECTION** EDF14FED

Refer to DTC P0743.

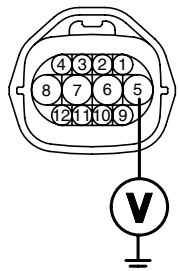
**POWER SUPPLY CIRCUIT INSPECTION** E9B8D3CE

1. Disconnect "A/T SOLENOID VALVE" connector.
2. Measure voltage between terminal "5" of the sensor harness connector and chassis ground.
3. Turn ignition switch OFF → ON.

---

Specification : 12V is measured only for approx. 0.5sec

---



**ATM  
SOLENOID  
VALVE**

C10

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
- 11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF414A

Is voltage within specifications?

**YES**

- ▶ Go to "Signal circuit inspection" procedure.

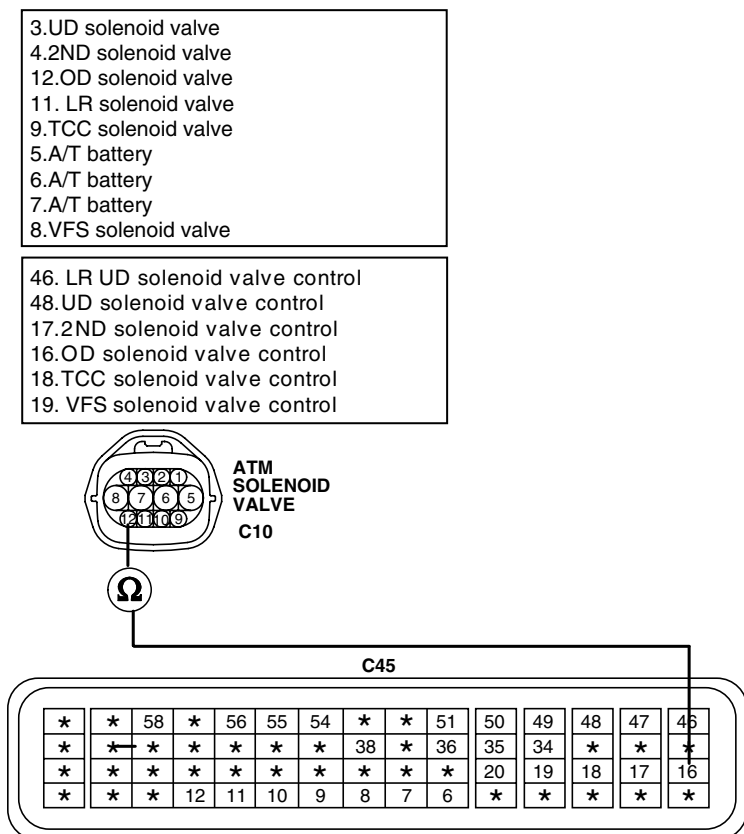
**NO**

- ▶ Check that A/T-30A Fuse in engine room junction is installed or not blown.
- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**SIGNAL CIRCUIT INSPECTION** EC8233FD

1. Check signal circuit open inspection
  - 1) Ignition "OFF".
  - 2) Disconnect "A/T SOLENOID VALVE" connector and "TCM(PCM)" connector.
  - 3) Measure resistance between terminal "12" of the ATM SOLENOID VALVE harness connector and terminal "16" of the TCM(PCM) harness connector

Specification: approx. 0 Ω



EKRF416A

Is resistance within specifications?

**YES**

▶ Go to "Check signal circuit short Inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

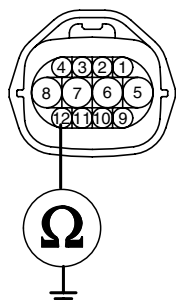
2. Check signal circuit short inspection

- 1) Ignition "OFF" & Engine "OFF".
- 2) Disconnect "A/T SOLENOID VALVE" connector and "TCM(PCM)" connector.
- 3) Measure resistance between terminal "12" of the ATM SOLENOID VALVE harness and chassis ground.

---

Specification: Infinite

---



ATM SOLENOID VALVE

C10

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF416B

4) Is resistance within specifications?

**YES**

▶ Go to "Component Inspection" procedure.

**NO**

▶ Check for short to ground in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**COMPONENT INSPECTION** E61015DE

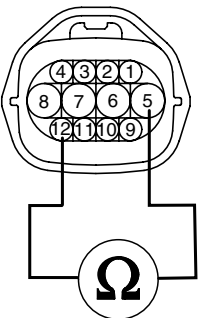
1. CHECK SOLENOID VALVE

- 1) Ignition "OFF".
- 2) Disconnect "A/T SOLENOID VALVE" connector.
- 3) Measure resistance between terminal "12" and terminal "5" of the ATM SOLENOID VALVE harness connector.

---

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]

---



ATM SOLENOID VALVE

C10 component side

- 3.UD solenoid valve
- 4.2ND solenoid valve
- 12.OD solenoid valve
11. LR solenoid valve
- 9.TCC solenoid valve
- 5.A/T battery
- 6.A/T battery
- 7.A/T battery
- 8.VFS solenoid valve

EKRF416C

- 4) Is resistance within specification?

**YES**

▶ Go to "CHECK TCM(PCM)" as below.

**NO**

▶ Replace OD SOLENOID VALVE as necessary and go to "Verification Vehicle Repair" procedure.

**2. CHECK TCM(PCM)**

- 1) Connect scantool to data link connector(DLC).
- 2) Ignition "ON" & Engine "OFF".
- 3) Select A/T Solenoid valve Actuator test and Operate Actuator test.
- 4) Can you hear operating sound for OD SOLENOID VALVE Actuator Testing Function?

**YES**

▶ Go to "Verification Vehicle Repair" procedure.

**NO**

▶ Replace TCM(PCM) and Go to "Verification Vehicle Repair" procedure.

**ACTUATOR TEST CONDITION**

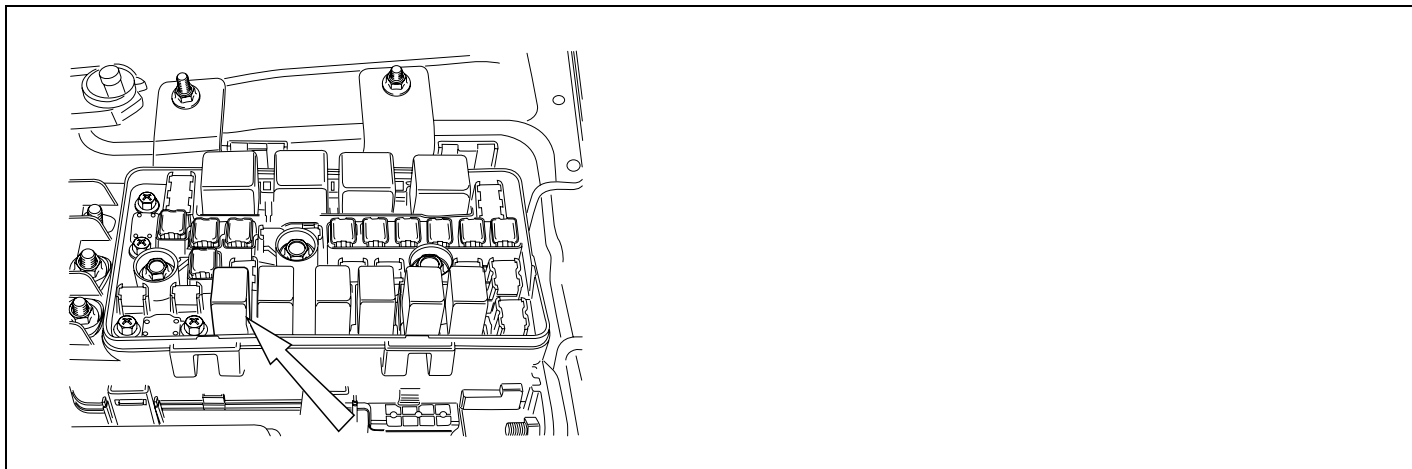
1. IG SWITCH ON
2. TRANSAXLE RANGE SWITCH is normal
3. P RANGE
4. Vehicle Speed 0km/h
5. Throttle position sensor < 1V
6. IDLE SWITCH ON
7. ENGINE RPM 0

**VERIFICATION OF VEHICLE REPAIR** EDECD504

Refer to DTC P0741.

**DTC P0885 A/T RELAY CIRCUIT MALFUNCTION**

**COMPONENT LOCATION** E2CDEADF



EKRF417A

**GENERAL DESCRIPTION** EF0105DF

The HIVEC Automatic Transmission supplies the power to the solenoid valves by way of a control relay. When the TCM(PCM) sets the relay to ON, the relay operates and the battery power is supplied to all the solenoid valves. When the TCM(PCM) sets the relay to OFF, all solenoid valve power is shut off and the transmission is held in the 3rd gear position. (Fail Safe Mode)

**DTC DESCRIPTION** E0271881

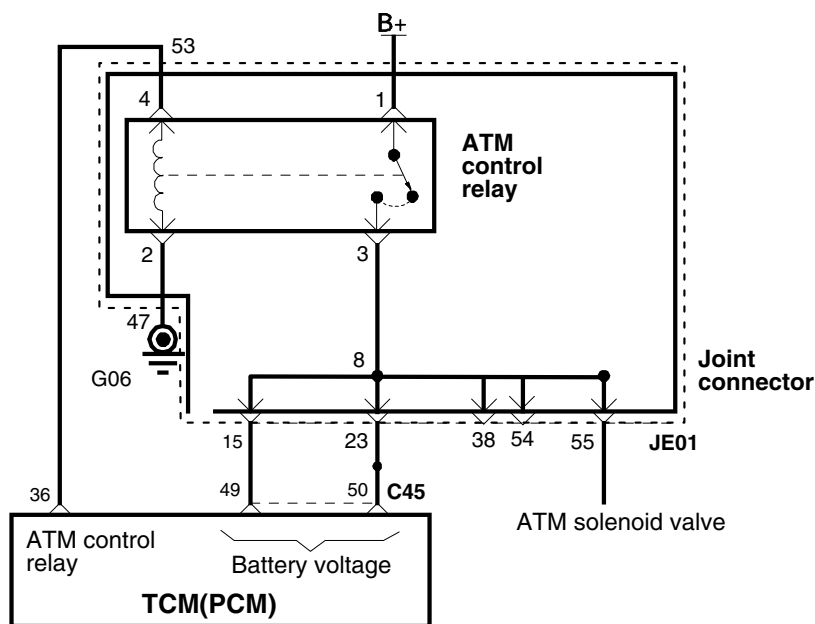
The TCM(PCM) checks the A/T control relay signal by monitoring the control signal. If, after the ignition key is turned on, an unexpected voltage value, which is quite a bit lower than battery voltage is detected, the TCM(PCM) sets this code.

**DTC DETECTING CONDITION** EC6BFEDB

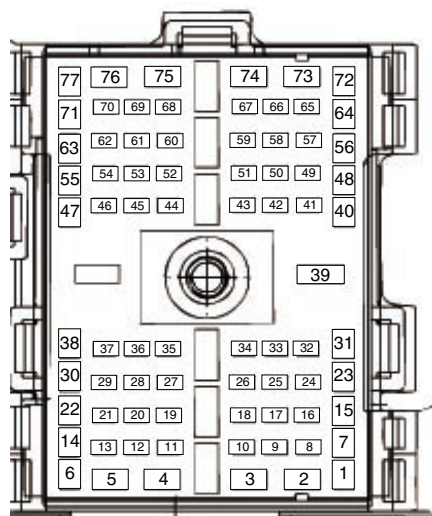
Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	<ul style="list-style-type: none"><li>• Check voltage range</li></ul>	<ul style="list-style-type: none"><li>• Open or short in circuit</li><li>• Faulty A/T control relay</li><li>• Faulty TCM(PCM)</li></ul>
Enable Conditions	<ul style="list-style-type: none"><li>• 22V &gt; Voltage Battery &gt; 9V</li><li>• Time after TCM(PCM) turns on &gt; 0.5sec</li></ul>	
Threshold value	<ul style="list-style-type: none"><li>• Voltage &lt; 7V or Voltage &gt; 24.5V</li></ul>	
Diagnostic Time	<ul style="list-style-type: none"><li>• 0.1sec</li></ul>	
Fail Safe	<ul style="list-style-type: none"><li>• Locked in 3rd gear.(Control relay off)</li></ul>	

**SCHEMATIC DIAGRAM** EE24CDFE

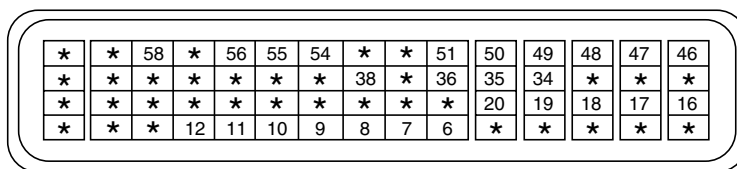
[Circuit Diagram]



[Harness Connector]



**JE01**



**C45**

[Connection Information]

Terminal	Connection	Function
1	-	Hot at all times
2	G06	Ground
3	C46 No. 49	Joint connector
4	C46 No. 53	ATM control relay signal

**MONITOR SCANTOOL DATA** EC9A0F99

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "A/T CON. RELAY VOLT" parameter on the scantool.

Specification : Approx. B+

1.2 CURRENT DATA	
* A/T RELAY VOLT	14.3 V
TRANSAXLE RANGE SW	P, N
SHIFT POSITION	N, P, R
BOOST PRESS. SNSR	3 kPa
HOLD/STD SWITCH	STD
A/C SWITCH	OFF
CLOSED TP SWITCH	ON
STOP LIGHT SWITCH	OFF

FIX    SCRNM    FULL    PART    GRPH    HELP

ELQE049A

4. Is A/T RELAY VOLT within specifications?

**YES**

▶ Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification Vehicle Repair" procedure.

**NO**

▶ Go to "Terminal & Connector Inspection" procedure.

**TERMINAL & CONNECTOR INSPECTION** E6B7AA2A

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

**YES**

▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

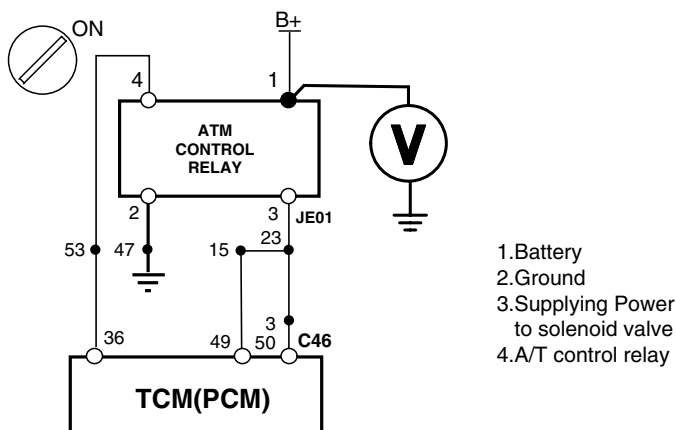
**NO**

▶ Go to "Power Supply circuit inspection" procedure.

**POWER SUPPLY CIRCUIT INSPECTION** E0639F47

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "A/T CONTROL RELAY" connector.
3. Measure the voltage between terminal "1" of the "A/T CONTROL RELAY" harness connector and chassis ground.

Specification : Approx. B+



EKRF417C

4. Is voltage within specifications?

**YES**

▶ Go to "Signal circuit inspection" procedure.

**NO**

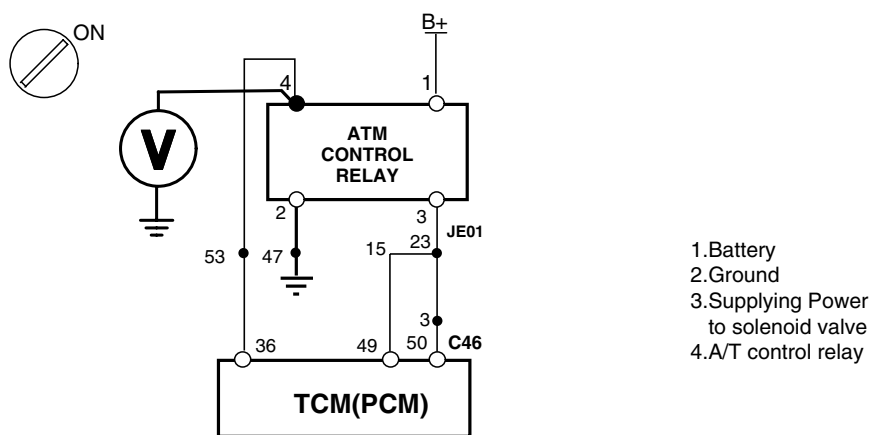
- ▶ Check that A/T-30A Fuse in engine room junction is installed or not blown.
- ▶ Check for Open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**SIGNAL CIRCUIT INSPECTION**

EF082BDD

1. CHECK A/T control relay harness
  - 1) Ignition "OFF".
  - 2) Disconnect the "A/T CONTROL RELAY" connector.
  - 3) Measure the voltage between terminal "4" of the "A/T CONTROL RELAY" harness connector and chassis ground.
  - 4) Turn ignition switch OFF → ON.

Specification: 12V is measured only for approx. 0.5sec



EKRF417D

- 5) Is voltage within specifications?

**YES**

- ▶ Go to "Check Supplying Power to solenoid valve" procedure.

**NO**

- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure
- ▶ If signal circuit is OK, Substitute with a known-good TCM(PCM) and check for proper operation. If the problem is corrected, replace TCM(PCM) and then go to "Verification of Vehicle Repair" procedure.

## AUTOMATIC TRANSAXLE SYSTEM

AT -185

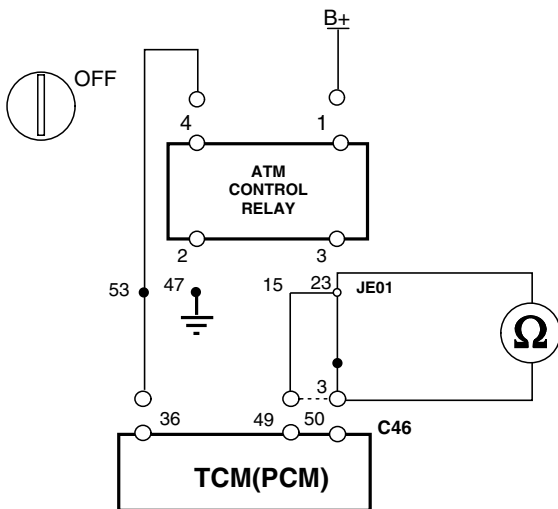
### 2. CHECK Supplying Power to solenoid valve harness

- 1) Ignition "OFF".
- 2) Disconnect the "A/T CONTROL RELAY" and TCM(PCM) connector.
- 3) Measure the resistance between terminal "3" of the "A/T CONTROL RELAY" harness connector and terminal "49/50" of the TCM(PCM) harness connector

---

Specification : Approx. 0  $\Omega$

---



1. Battery
2. Ground
3. Supplying Power to solenoid valve
4. A/T control relay

EKRF417E

### 4) Is resistance within specifications?

**YES**

- ▶ Go to "Ground circuit inspection" procedure.

**NO**

- ▶ Check for Open in JE01 joint connector.
- ▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

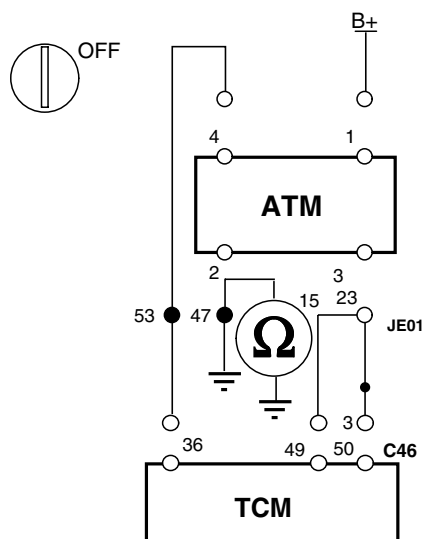
## GROUND CIRCUIT INSPECTION EB06AFE3

1. Ignition "OFF".
2. Connect the "A/T CONTROL RELAY" connector.
3. Measure the resistance between terminal "2" of the "A/T CONTROL RELAY" harness connector and chassis ground.

---

Specification : Approx. 0  $\Omega$

---



- 1. Battery
- 2. Ground
- 3. Supplying Power to solenoid valve
- 4. A/T control relay

EKRF417F

4. Is resistance within specifications?

**YES**

▶ Go to "Component inspection" procedure.

**NO**

▶ Check for open in harness. Repair as necessary and Go to "Verification Vehicle Repair" procedure.

**COMPONENT INSPECTION** EC898F3B

1. Ignition "OFF".
2. Remove "A/T CONTROL RELAY"
3. Measure the resistance between each terminal of the sensor.

Specification: Shown below

Item	Terminal No	
Resistance	1(red) - 3(pink)	INFINITE
	2(black) - 4(pink)	
supply(B+) to number 4 and supply (B-) to number 2.	1(red) - 3(pink)	0 Ω

4. Is resistance with in specification?

**YES**

▶ Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

**NO**

▶ Replace ATM CONTROL RELAY and then go to "Verification of Vehicle Repair" procedure.

**VERIFICATION OF VEHICLE REPAIR** EB4CCA4B

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

**YES**

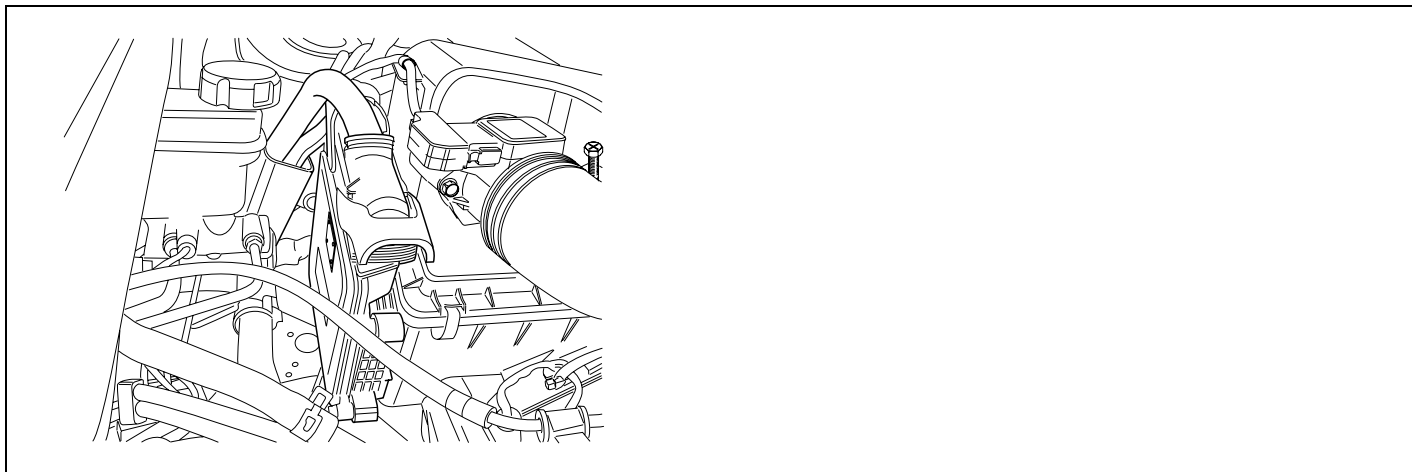
- ▶ Go to the applicable troubleshooting procedure.

**NO**

- ▶ System performing to specification at this time.

**DTC U0001 CAN COMMUNICATION BUS OFF**

**COMPONENT LOCATION** E6B41D43



KKRE008Y

**GENERAL DESCRIPTION** EC40BD0C

The TCM can either receive data from the Engine Control Module or ABS control module, or it can send data to the ECM and ABSCM by using CAN communication. The CAN communication is one of the vehicle communication methods, which is now widely used to transfer the vehicle data.

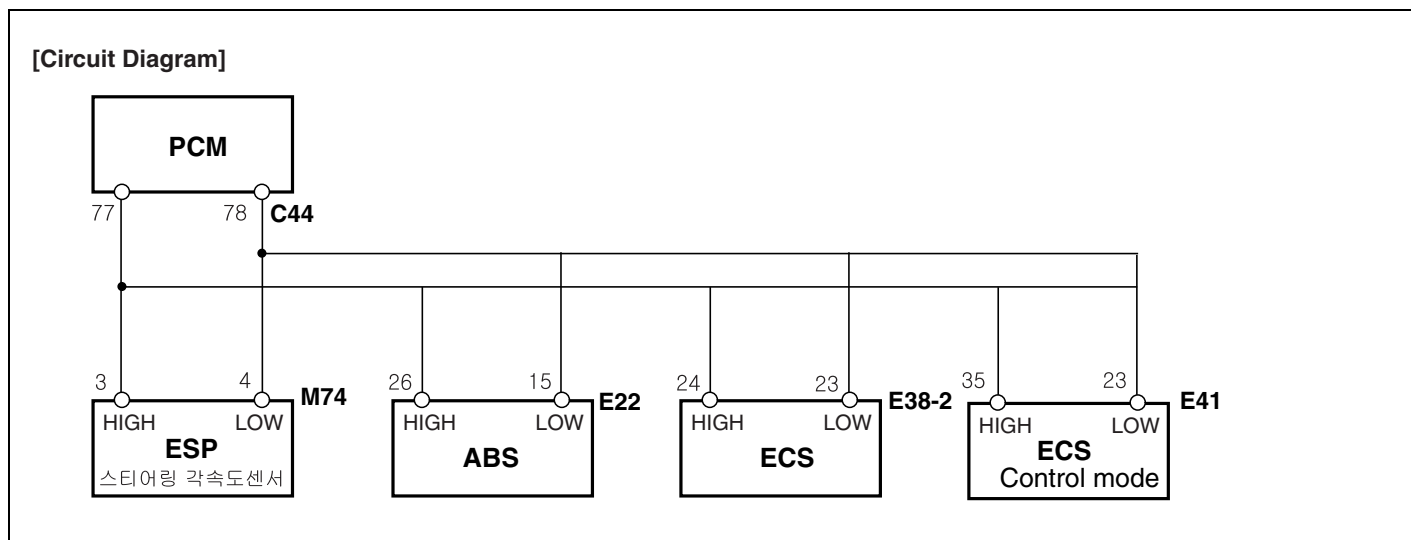
**DTC DESCRIPTION** E8FEB5BE

When the TCM cannot read the data from the ECM through the CAN-BUS line, the TCM sets this code. CAN-BUS circuit malfunctioning or ECM can be a possible cause of this DTC.

**DTC DETECTING CONDITION** EA9D2255

Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Check communication</li></ul>	<ul style="list-style-type: none"><li>• Open or Short in CAN communication harness</li><li>• Faulty ECM</li><li>• Faulty TCM</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• Input speed <math>\geq</math> 1000rpm and 5000msec passed from IG "on"</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• CAN message transfer error</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• 0.5 sec</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• INTELLIGENT SHIFT is inhibited</li><li>• Learning for oil pressure control is inhibited</li><li>• Torque Retard requirement is inhibited</li><li>• Direct connection control of TCC is inhibited</li></ul>	

**SCHEMATIC DIAGRAM** E1DB3F9B



EKRF418A

**REFER TO DTC P0600 (FL Gr).**

EKRF418B

AT -190

AUTOMATIC TRANSAXLE (F4A42)

**DTC U0100 CAN-TIME OUT ECU**

**COMPONENT LOCATION** EA0FD314

Refer to DTC U0001.

**GENERAL DESCRIPTION** E379E6BC

Refer to DTC U0001.

**DTC DESCRIPTION** E7001A57

Refer to DTC U0001.

**DTC DETECTING CONDITION** E14C6CD8

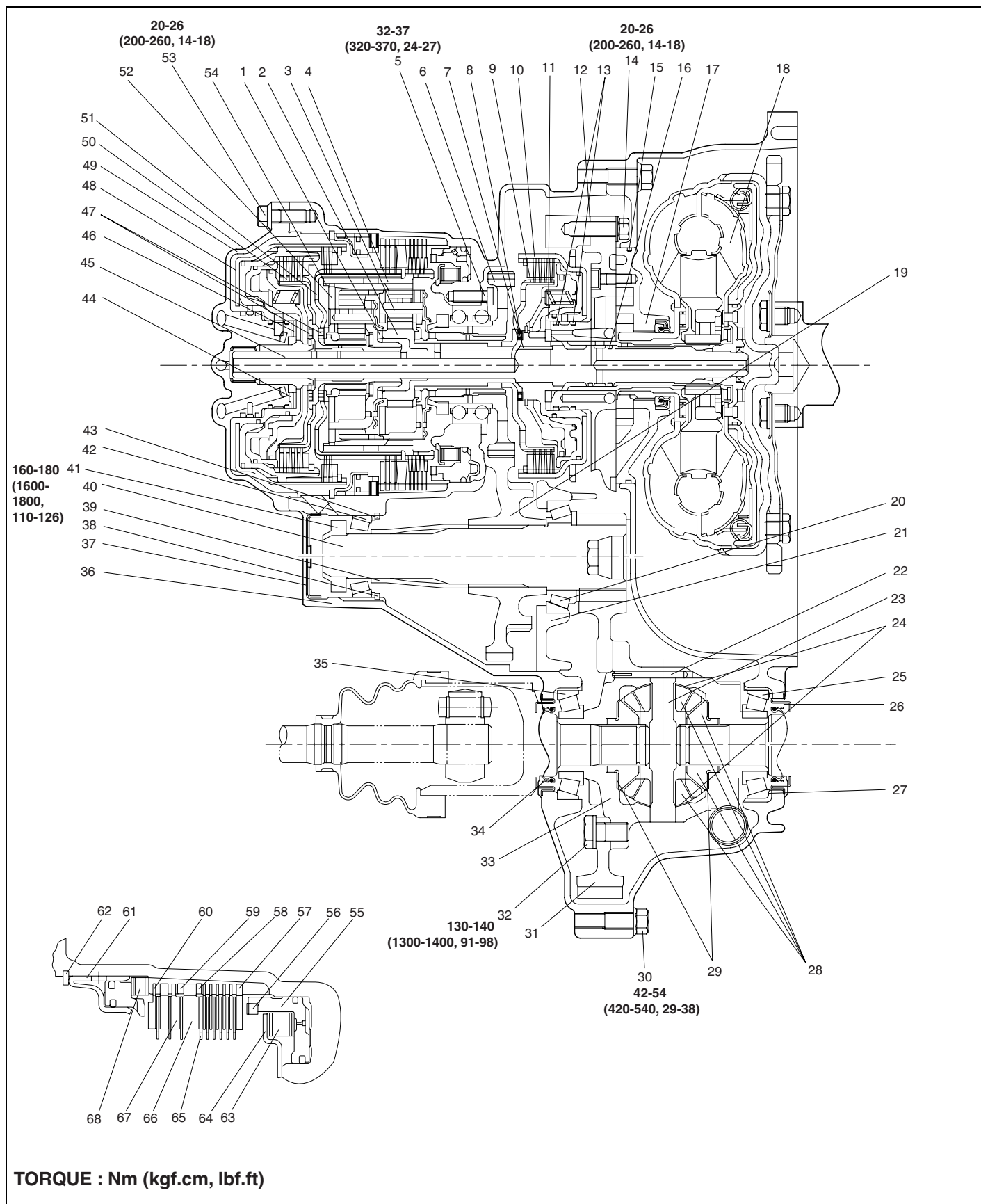
Item	Detecting Condition & Fail Safe	Possible cause
<b>DTC Strategy</b>	<ul style="list-style-type: none"><li>• Check communication</li></ul>	<ul style="list-style-type: none"><li>• Open or Short in CAN communication harness</li><li>• Faulty ECM</li><li>• Faulty TCM</li></ul>
<b>Enable Conditions</b>	<ul style="list-style-type: none"><li>• Input speed <math>\geq</math> 1000rpm and 5000msec passed from IG "on"</li></ul>	
<b>Threshold value</b>	<ul style="list-style-type: none"><li>• No message from ems</li></ul>	
<b>Diagnostic Time</b>	<ul style="list-style-type: none"><li>• 1.5 sec</li></ul>	
<b>Fail Safe</b>	<ul style="list-style-type: none"><li>• INTELLIGENT SHIFT is inhibited</li><li>• Learning for oil pressure control is inhibited</li><li>• Torque Retard requirement is inhibited</li><li>• Direct connection control of TCC is inhibited</li></ul>	

**SCHEMATIC DIAGRAM** E65A303C

Refer to DTC U0001.

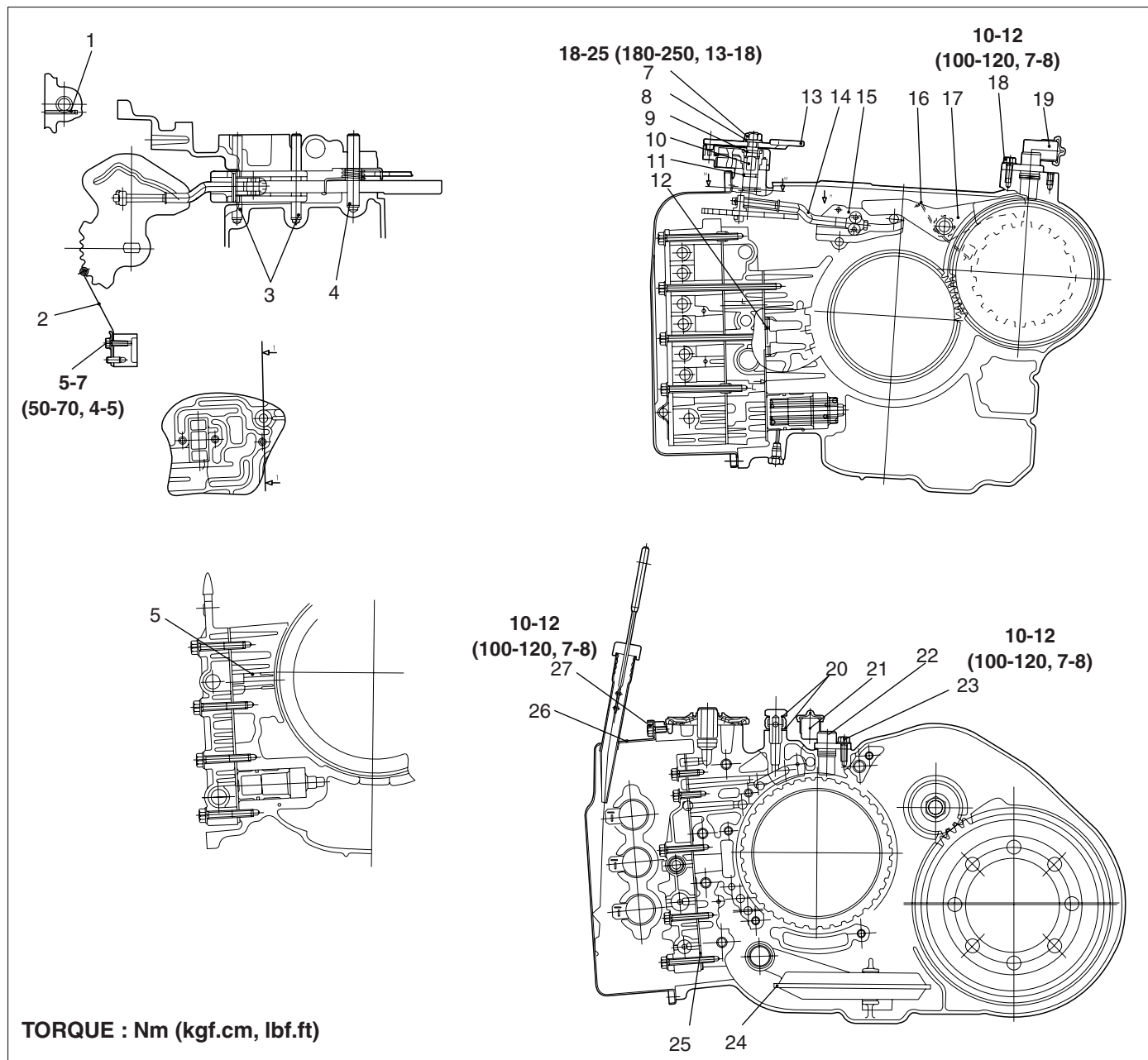
**AUTOMATIC TRANSAXLE**

**COMPONENTS (1)** EB4B15EA



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

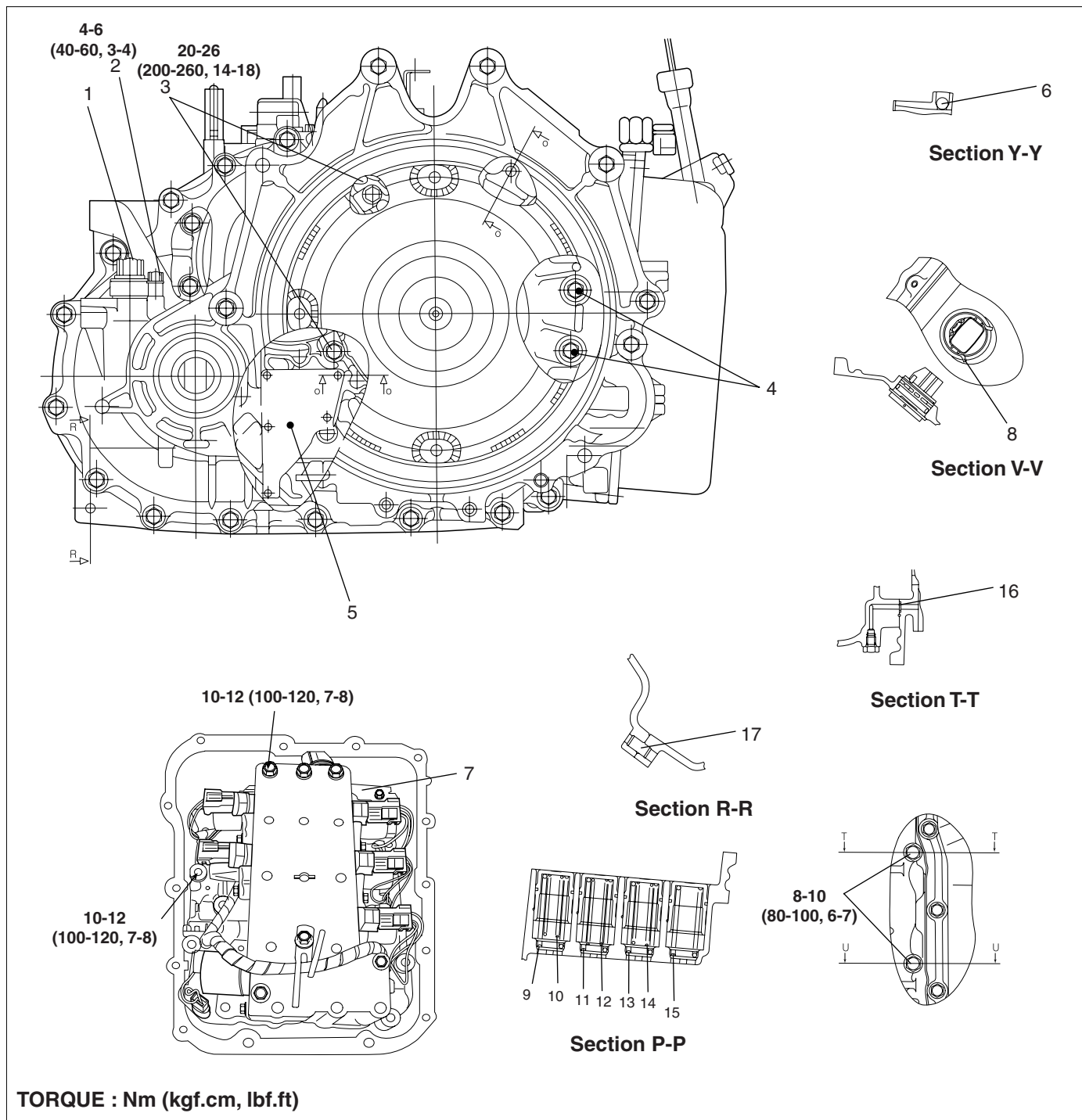
**COMPONENTS (2)**



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

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

COMPONENTS (3)

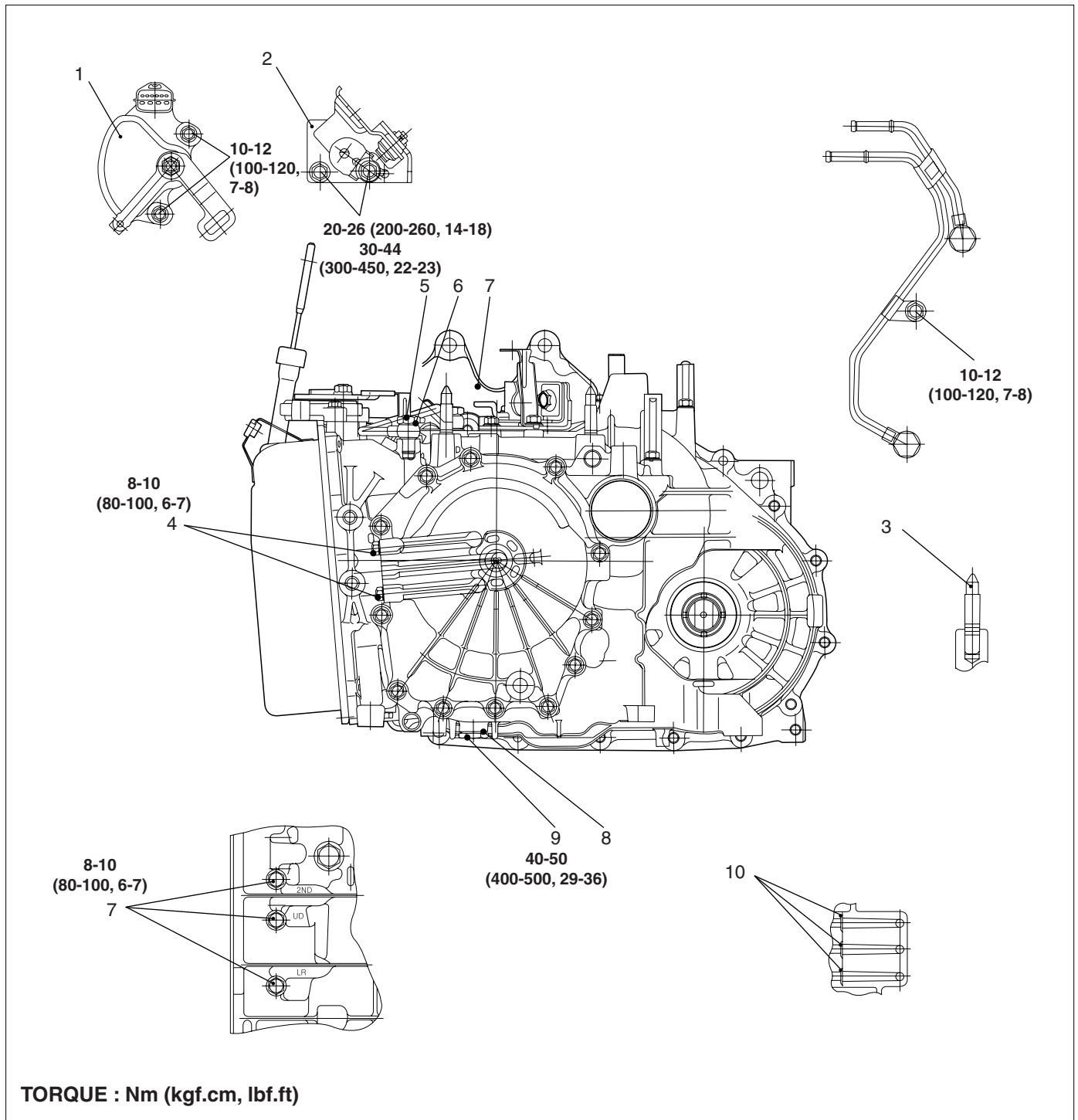


- 1. Vehicle speed sensor
- 2. Washer
- 3. Seal bolt
- 4. Flange bolt
- 5. Oil guide
- 6. Steel ball

- 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

**COMPONENTS (4)**



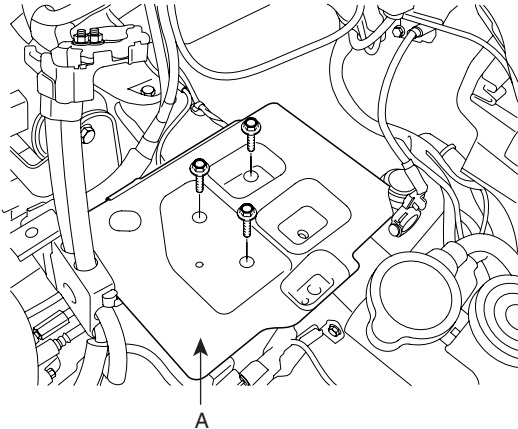
- |                          |                        |
|--------------------------|------------------------|
| 1. Inhibitor switch      | 6. Gasket              |
| 2. Control cable bracket | 7. Converter housing   |
| 3. Stud                  | 8. Gasket              |
| 4. Pressure check plug   |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

**AT -196**

**AUTOMATIC TRANSAXLE (F4A42)**

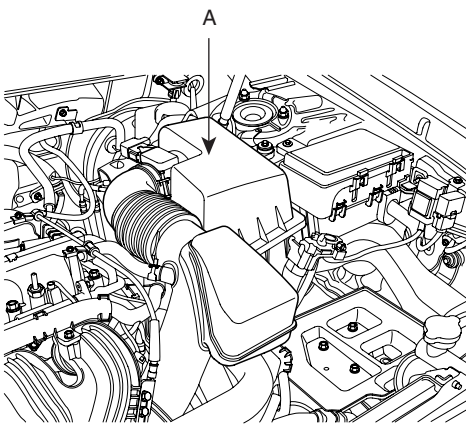
**REMOVAL** E87B0F4B

1. Remove the air duct.
2. Remove the battery.
3. Remove the battery tray.



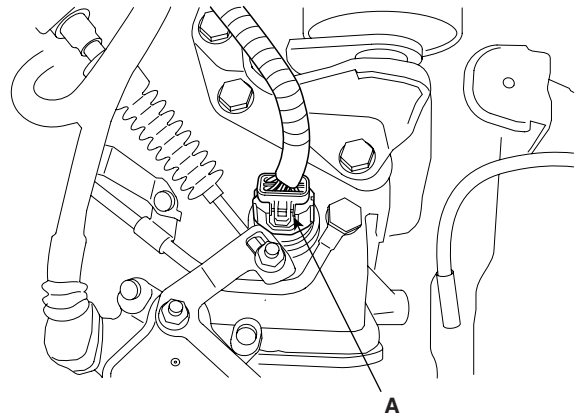
EKRF060A

4. Remove the air cleaner assembly(A)and PCM.  
(See EM group)



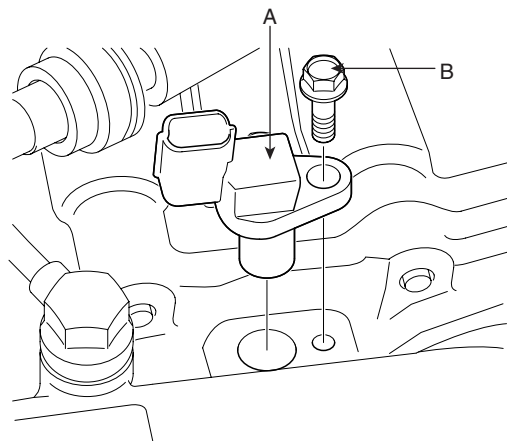
EKRF061A

5. Disconnect the transaxle range connector(A).



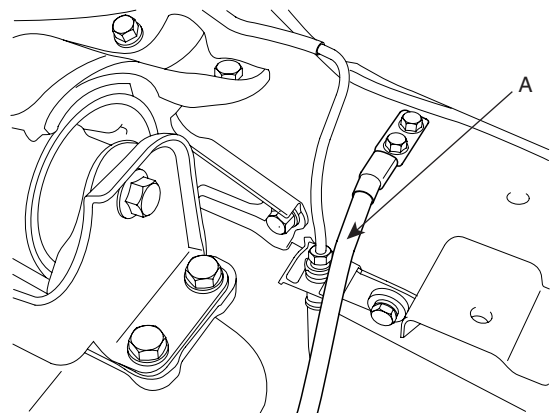
EKRF013B

6. Disconnect the input speed sensor, output speed sensor and vehicle speed sensor.



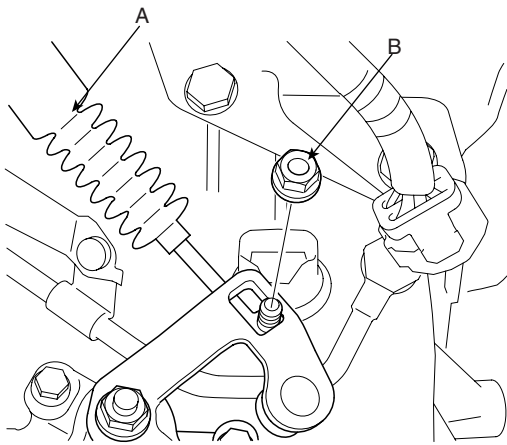
EKRF013C

7. Disconnect the ground earth wire(A).



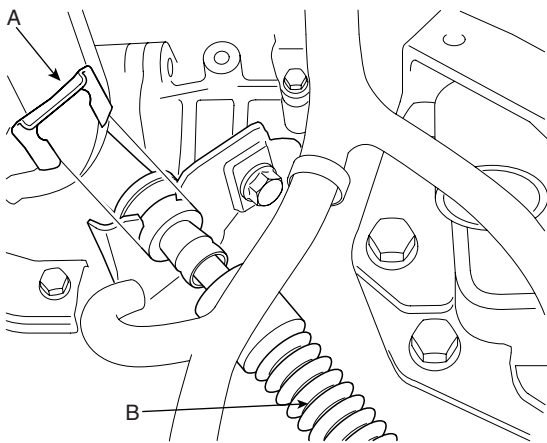
EKRF062A

8. Remove the bolt(B) which mounts the clutch release cylinder(A) to the inhibitor switch.



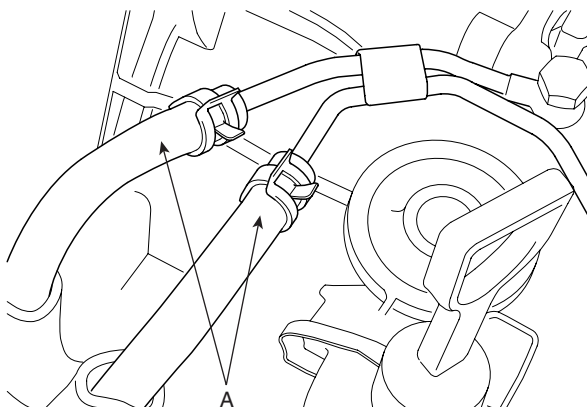
EKRF013D

9. Detach the clutch release cylinder(B) clip(A).



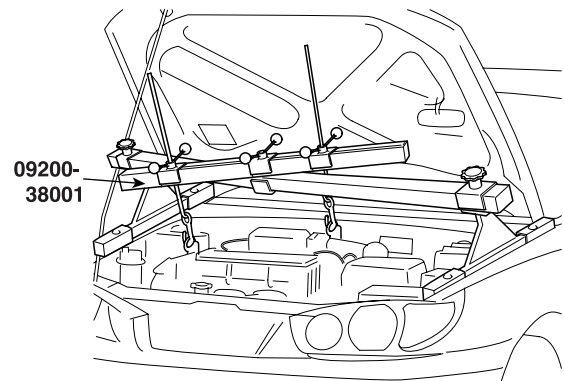
EKRF013E

10. Detach the hoses(A), loosening the oil cooler hose clamps.



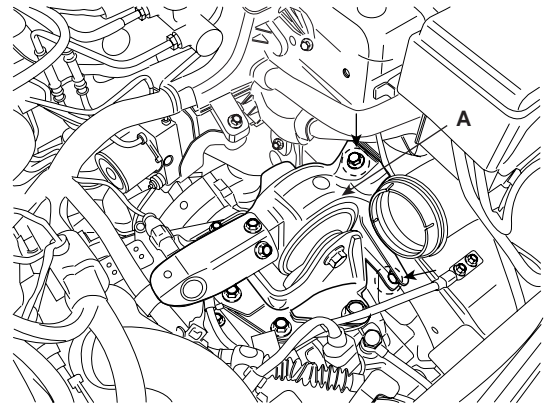
EKRF013F

11. Using SST(09200-38001), support the engine.

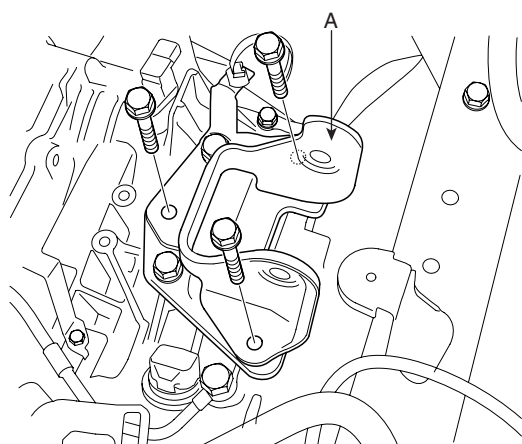


EKRF013G

12. Remove the trasaxle mounting bracket(A) bolts.

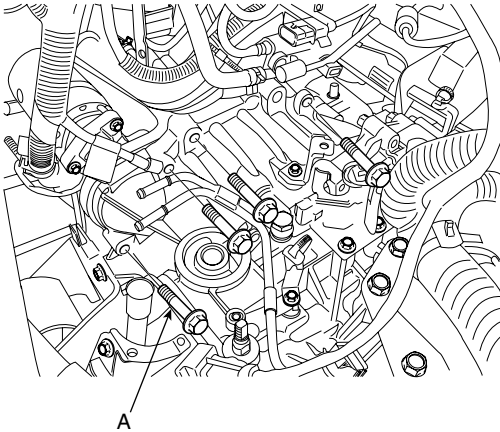


EKRF013H



EKRF013I

13. Remove the transaxle upper mounting bolts(A).

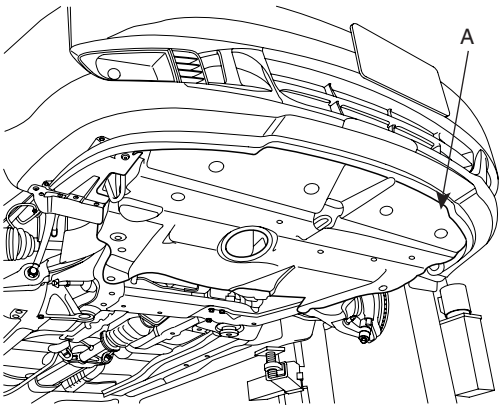


EKRF013J

14. Remove the bolts which mount the transaxle to the front sub frame.

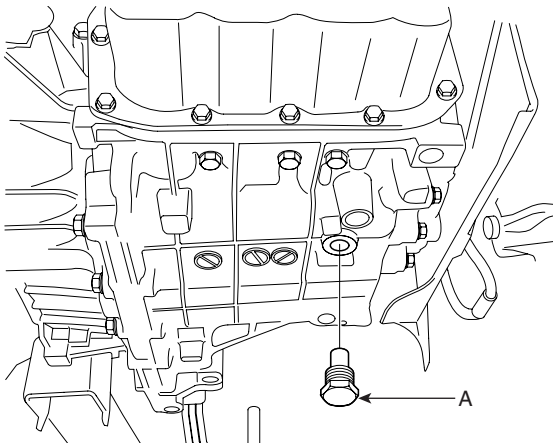
15. Lift up the vehicle.

16. Remove the under cover.



EKRF063A

17. After removing the oil drain plug(A), Drain the fluid.



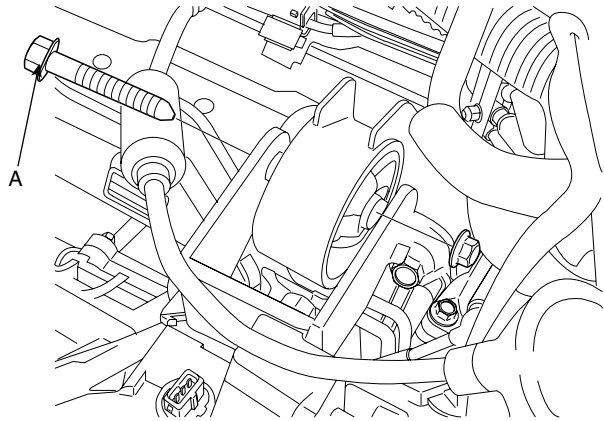
EKRF013K

18. Support the transaxle with a jack.

19. Remove the steering column bolt(See 'ST' group).

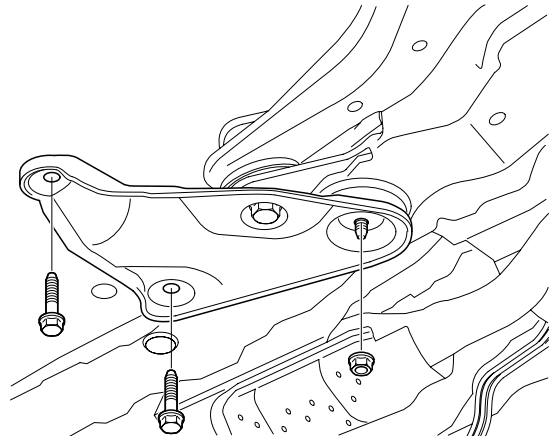
20. Remove the driveshafts (See 'DS' group-'DRIVE-SHAFT').

21. Remove the bolt(A) which mounts the transaxle to the rear sub-frame.

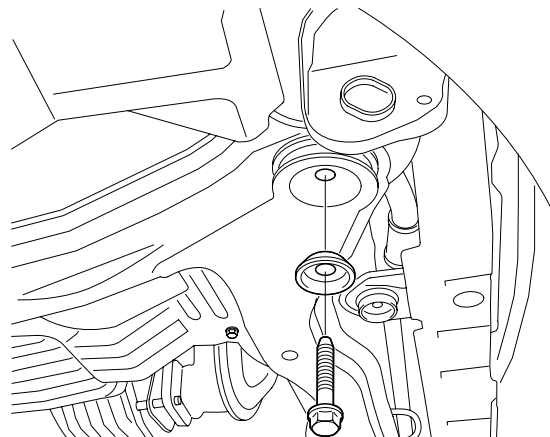


EKRF013L

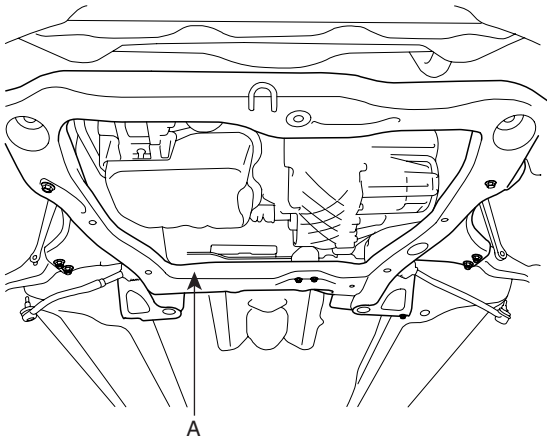
22. Remove the subframe.



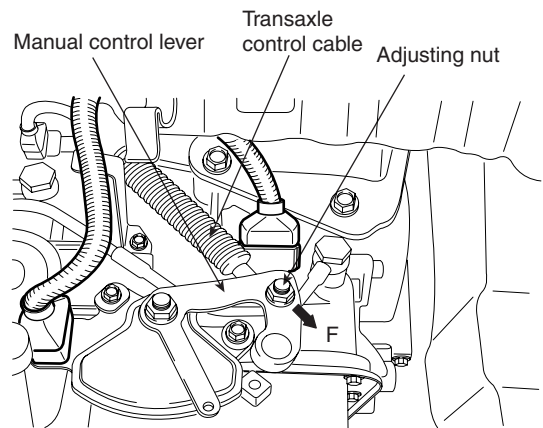
EKRF013M



EKRF013N



EKRF064A



EKRF014A

23. Remove the transaxle lower mounting bolts from engine.
24. Remove the transaxle assembly.

3. Installation is the reverse of removal.

**INSTALLATION** EE8B341F

1. Attach the torque converter on the transaxle side and mount the transaxle assembly onto the engine.

**CAUTION**

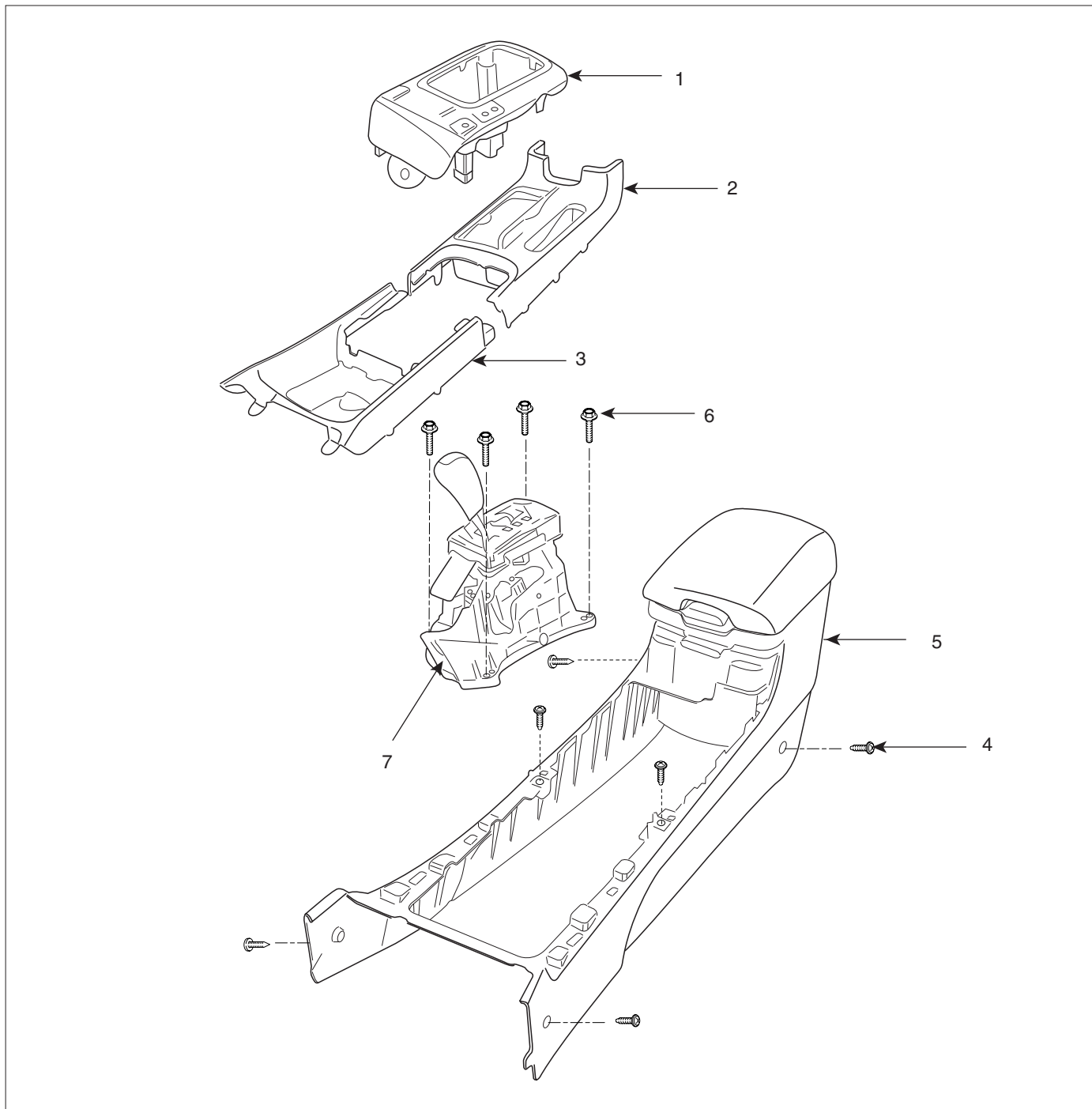
***If the torque converter is mounted first on the engine, the oil seal on the transaxle may be damaged. Therefore, be sure to first assemble the torque converter to the transaxle.***

2. Install the transaxle control cable and adjust as follows.
  - 1) Move the shift lever and the transaxle range switch to the "N" position, and install the control cable.
  - 2) When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts the control cable.
  - 3) Remove any free-play in the control cable by adjusting nut and then check to see that the selector lever moves smoothly.
  - 4) Check to see that the control cable has been adjusted correctly.

# AUTOMATIC TRANSAXLE CONTROL SYSTEM

## SHIFT LEVER

### COMPONENTS EC65DE7B



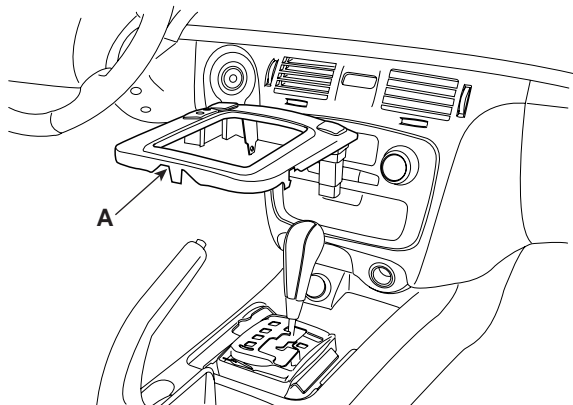
1. Center console cover  
2. Rear center console upper cover

3. Front center console upper cover  
4. Screw

5. Center console  
6. Bolt  
7. Shift lever assembly

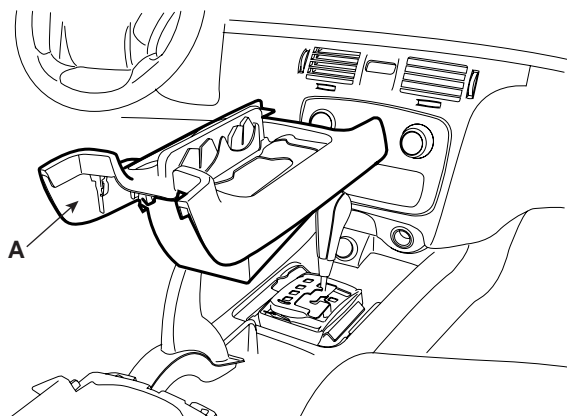
**REMOVAL** EC64B881

1. Remove the center console cover(A) after disconnecting the connectors (3EA).



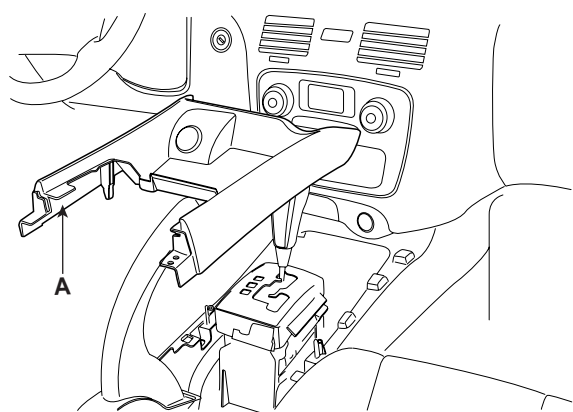
EKRF017A

2. Remove the rear center console upper cover(A).



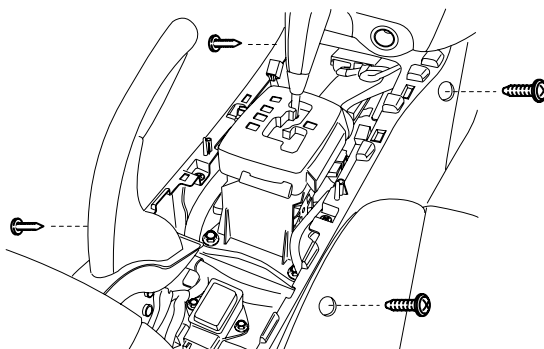
EKRF017B

3. Remove the front center console upper cover(A).



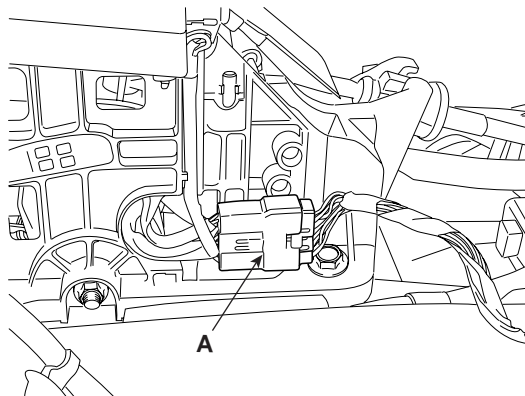
EKRF017C

4. Remove the center console.(Screw : 6EA)



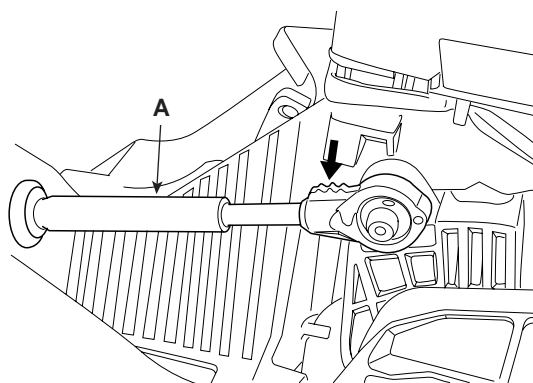
EKRF017D

5. Disconnect the sports mode connector(A).



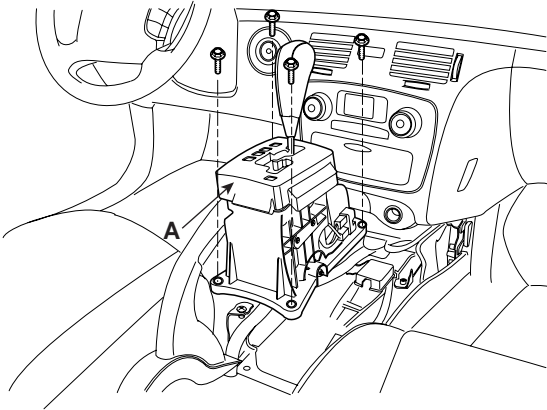
EKRF017E

6. Disconnect the control cable(A).



EKRF017F

7. Remove the shift lever assembly(A) (Bolt : 4EA)



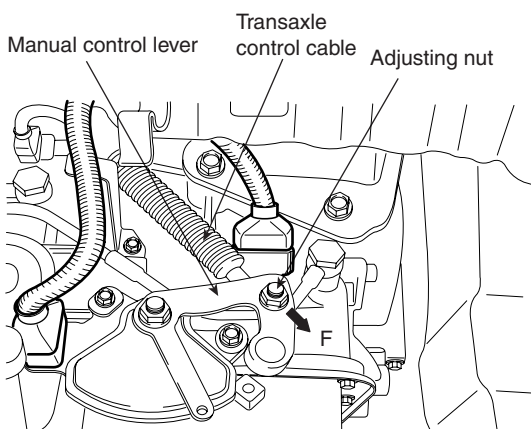
EKRF017G

## INSTALLATION E04AF33A

1. Installation is the reverse of removal.

## INSPECTION EF2EE7DC

1. Adjusting method for T/M control cable
  - 1) Set room side lever and T/M side lever to "N" position.
  - 2) Connect room side lever and shift cable.
  - 3) Connect T/M side lever to cable in a following orders.
    - a. Push cable lightly to "F" direction shown to eliminate FREE PLAY of cable.
    - b. Tighten adjusting nut.



EKRF016A

- 4) After adjusting according to (2)-(4). Check to be sure that this part operates surely at each range of T/M side corresponding to each position of room lever.