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دیجیتال خودرو
شرکت دیجیتال خودرو سامانه (مسئولیت محدود)
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

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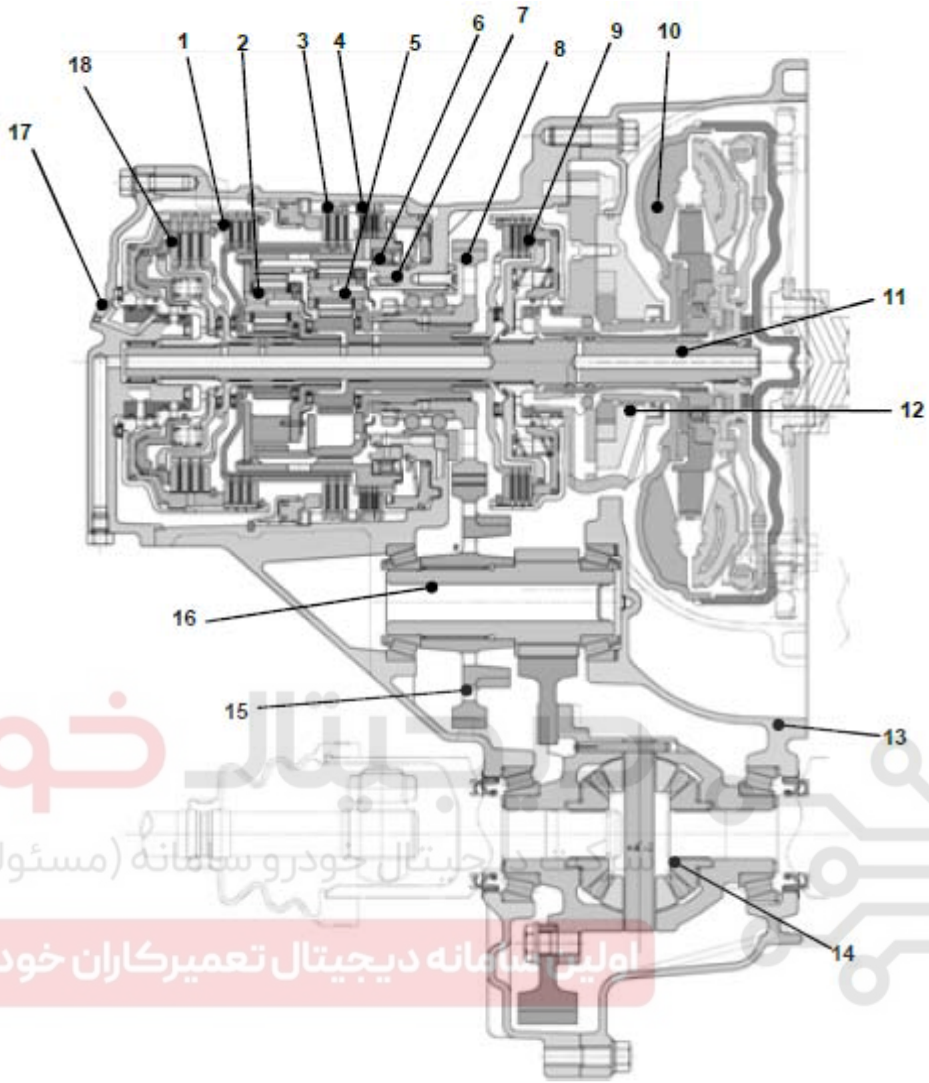
1. General



1. Backing clutch
2. Overdrive gear planetary gear set
3. Second brake
4. Low-speed gear and reversing brake
5. Output planetary gear set
6. One-way clutch
7. Inner ring of one-way clutch
8. Intermediate driving gear
9. Low-speed clutch
10. Hydraulic torque converter
11. Input shaft
12. Fuel pump
13. Shell of torque converter
14. Differential
15. Intermediate transmission gear
16. Output shaft
17. Back end cover
18. Overdrive clutch

Note: meanings of the abbreviations appearing below

LR: Low-speed gear and reversing gear
2nd&REV: second speed and reversing gear
VB: Accumulator voltage
TGS: Transmission gear selection
OD: Overdrive gear
UD: Low-speed gear
DCCV: Control value of locking clutch

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1.1 Specification of automatic transmission case

Model of transmission case		4F16
Model of engine		4A91S(1.5L)
Hydraulic torque converter		3 elements, impeller, turbine, guide wheel
Dimension of hydraulic torque converter (diameter)		236
Type of engine oil pump		PARACHOID
T/M shell		Separated
Friction element		Clutch (3EA), brake (2EA), OWC(1EA)
Planetary gear		2EA
Transmission ratio	1 / 2 speed	2.919 / 1.551
	3 / 4 speed	1.000 / 0.713
	Reversing gear	2.480
Main transmission ratio		4.121
Hydraulic compensating piston		3EA(UD, OD, REV)
Stalling rotation speed		2000～2700RPM
Pressure accumulator		4EA(UD, OD, 2nd, LR)
Solenoid valve		6EA(PWM: 5EA, VFS: 1EA)
Position of gear lever		4 gears(P, R, N, D)+ manual mode
Weight (kg)		76 kg (oil free liquid)

* PWM: Pulse width modulation *VFS: variable force solenoid
EA: piece

1.2 Tightening moment

Item	Nm	Kgf.m	lb-ft
Gear shift cable support	19 ～ 23	1.9 ～ 2.3	14 ～17
Eye bolt	30 ～45	3.0 ～ 4.5	22.1 ～33.1
Fuel supply hose	19 ～23	1.9 ～2.3	14 ～17
Input shaft revolution speed sensor	10～12	1.0 ～1.2	7 ～8
Output shaft revolution speed sensor	10～12	1.0 ～1.2	7 ～8
Manual control lever	17～21	1.7～ 2.1	13 ～15
Gear switch of transmission case	10 ～12	1.0 ～1.2	7 ～8
Drain plug	35 ～ 45	3.5 ～4.5	25 ～32

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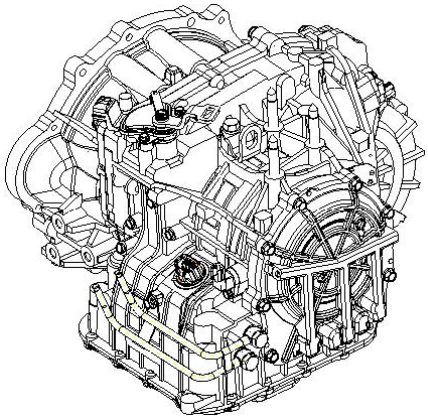
1.3 Lubricant

Item	Specification of lubricant	Quantity
Transmission case oil (liters) (US quart, BK quart)	Original DIAMOND ATF SP-III or SK ATF SP-III	7 liters

2. Automatic transmission case system



Description: the small new automatic transmission case (4F16) is used for 4A91S gasoline engine. The transmission case is improved in durability, fuel consumption, and efficiency through the following main characteristics.

1. Eccentric hydraulic fuel pressure compensating piston.
2. Variation pipe pressure control system.
3. Long-stroke locking clutch.
4. Disc return spring.
5. Super flat hydraulic torque converter.

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2.1 Function

Item	Content
Components	Variation pipe pressure control is performed in the valve to reduce fuel consumption.
	Long-stroke locking clutch acts on the hydraulic torque converter to improve the rotation speed fluctuation reduction capability of the engine and reduce fuel consumption. (18°)
	Fuel pump is changed from trochocentric to parachoid to improve manufacturing process and volumetric efficiency at low rotation speed.
	The disc return spring acts on the low-speed and reversing gear brake to improve durability and reduce its length.
	The eccentric hydraulic oil pressure compensating piston acts on interior of the clutch to improve durability and gear shift control function.
	Intermediate transmission gear adopts engagement of low-noise gear and large tooth flank to reduce noise and improve durability.
Electronic control system	The hydraulic oil pressure set by TCM is coordinated with torque of the engine so as to improve stability of gear shift.
	The reduction of engine torque controls high-efficiency operation so as to improve the gear shift sensibility and improve durability.
	Gear can be shifted from the third speed to first speed, or from the fourth speed to the second speed.

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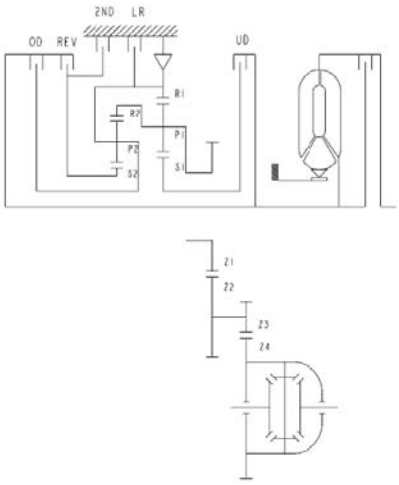
	Control the reversing clutch, instead of L/R brake, when shifting from N to R, so as to improve the gear shift sensibility from N to R.
	The range controlled by locking clutch increases, so as to reduce fuel consumption.
	the current control chip is installed inside the TCM so as to adjust the solenoid control circuit and control the hydraulic oil pressure accurately according to the changes in temperature and voltage.
	FPC (flexible printing circuit) strip wire is composed of thin and flat copper wire wrapped in the insulation film as wire.
	The speedometer uses the frequency variation signal sent from TCM to the combined instrument, instead of the signal from speed sensor.

2.2 Working components and functions of mechanical system

Working system	Symbol	Function
Low-speed gear clutch	UD	Connecting input shaft and low-speed sun gear
Reversing clutch	REV	Connecting input shaft and reversing sun gear
Overdrive clutch	OD	Connecting input shaft and overdrive planetary support
Low-speed and reversing brake	LR	Holding LR toothed ring and CD planetary support
Second brake	2ND	Holding the reversing gear sun gear
One-way clutch	OWC	Limit rotation direction of the low-speed gear and reversing toothed ring



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Elements of each gear

	UD /C	OD /C	REV /C	2-4 /B	LR /B	OWC
P						
R						
N						
D1						
D2						
D3						
D4						
L						

1) : OWC works when shifting from the first speed to second speed.
2) Release LR brake when the speed under the first speed exceeds by about 7km/h.

Lift of solenoid
The LR brake uses LR and OD solenoid valves to engage at position P and to switch the pressure to LR brake after the ON/OF solenoid valve is electrified.

Item		Solenoid valve (0%: off, 100%: on)				
Gear	Operation	PCSV-A (OD and LR)	PCSV-B (second speed and RVS)	PCSV-C (UD)	PCSV-D (DCCSV)	On/off solenoid
P, N	LR	Off	On	On	Off	On
D-first speed	UD	*Off On	On	Off	Off	*On Off
D-second speed	UD, 2ND	On	Off	Off	On	Off
D-third speed	UD, OD	Off	On	Off	On	Off
D-four speed	OD, 2ND	Off	Off	On	On	Off
R	LR, RVS	Off	Off	On	Off	On
S-first speed	UD, LR	Off	On	Off	Off	On

* When front wheel rotates, the gear will be shifted according to the vehicle speed when the gear is at the first speed of gear D. However, LR brake keeps the closed status when under the first speed of manual mode.

2.2.1 Hydraulic torque converter

As a power set transmitting the power of engine to the automatic transmission case, the hydraulic torque converter includes 3 elements, 2 impellers and one turbine cascade.

-The section of the following hydraulic torque converter is changed from circular to flat so as to reduce the length of hydraulic torque converter.

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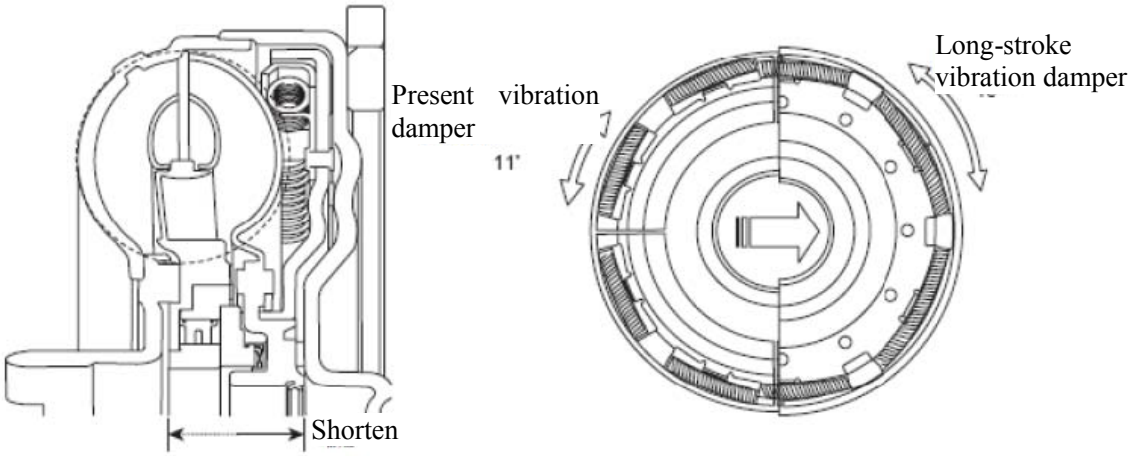
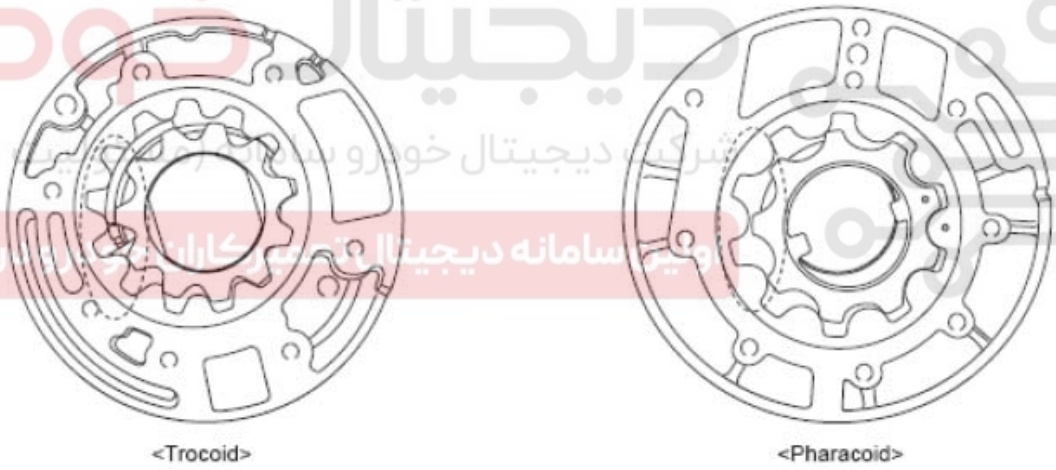
-The maximum running angle of the locking clutch installed inside the transmission case increases from 11° to 18.5° so as to improve the rotation speed fluctuation reduction capability of the engine and reduce fuel consumption.



2.2.2 Fuel pump

Function: deliver the transmission oil from the oil sump to various oil pipes. To reduce the weight, the oil pump is made of aluminum alloy (supported by the driven shaft), and in the meantime, parachoid oil pump is used to improve the manufacturing process and the volumetric efficiency at low rotation speed.



2.2.3 Brake

The automatic transmission case (4F16) uses low-speed and reversing gear brake and the second brake. The low-speed and reversing gear toothed ring and the overdrive gear planetary support is held by the low-speed and reversing gear brake at the first gear.

- The disc return spring acts on the low-speed and reversing gear brake and minimize the slippage of friction materials under the even spring action so as to improve durability and reduce its length.

The overdrive sun gear is held by the second brake to the shell of transmission case under the second gear.

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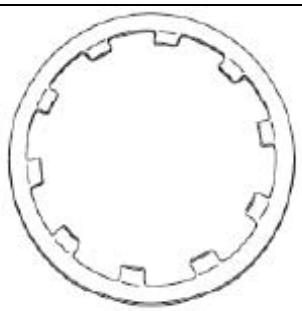
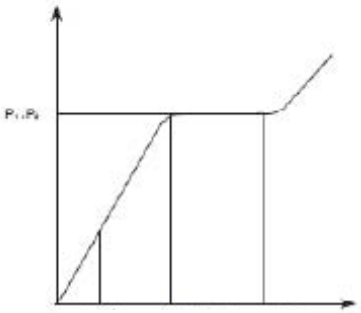
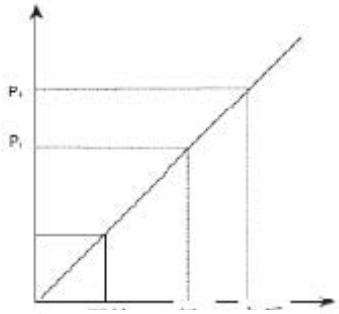




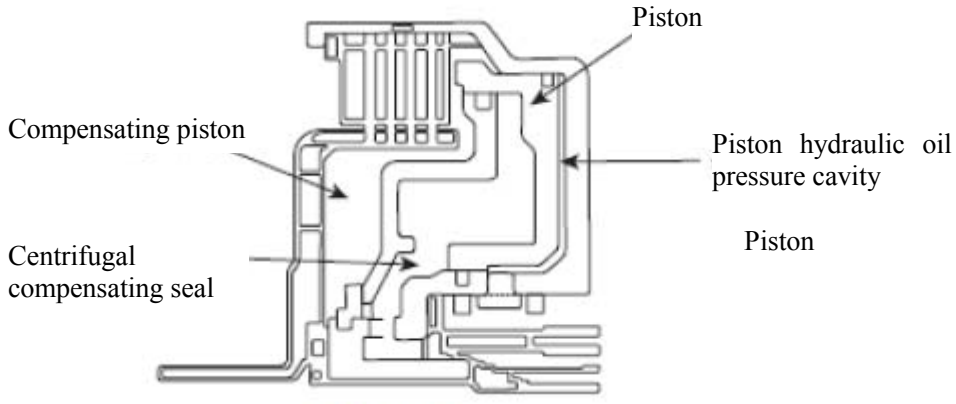
Disc return spring



Spiral return spring

2.2.4 Clutch

Multi-disc clutch and one-way clutch are used as devices of the transmission case. Every holder of the clutch is made of high-precision metal plate so as to improve productivity and reduce its weight. The eccentric hydraulic oil pressure compensating device is inside the clutch assembly. Generally, residual hydraulic oil in the piston hydraulic oil pressure cavity pushes the piston by centrifugal force. However, to prevent pushing the piston, the hydraulic oil filled between the piston and the holder of return spring holder will also generate centrifugal force. The two forces offset each other, so that the piston remains still, so as to improve durability and gear shift control performance.



Centrifugal compensating device

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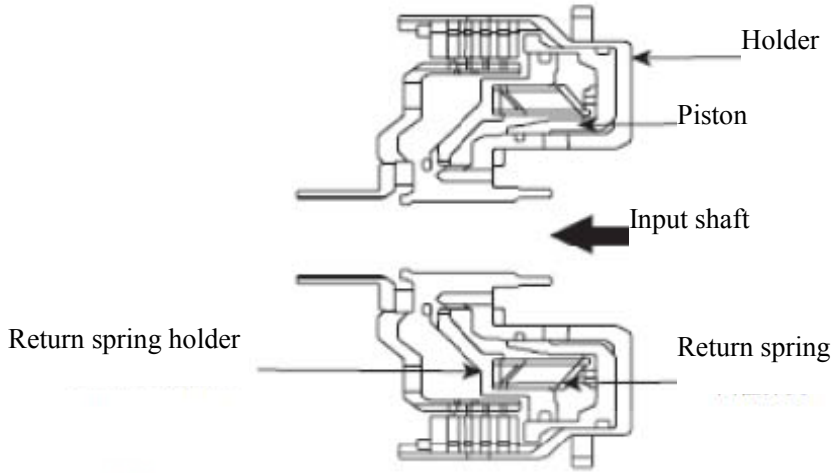
(1) Low-speed gear clutch

The low-speed gear clutch is engaged in the first speed, second speed, and third speed. The driving force of input shaft is transmitted to the low-speed sun gear. The operating oil pressure inside components of the low-speed gear clutch acts between the piston and the holder and pushes the piston the clutch disc so as to transmit the driving force from the holder to the hub.



Low-speed gear clutch

(2) Reversing clutch and overdrive gear clutch

The reversing clutch is engaged in the reversing gear and used to transmit the driving force of input shaft to the reversing sun gear. The overdrive clutch is engaged in the third and fourth gears and is used to transmit the driving force of input shaft to the overdrive gear planetary support and the low-speed and reversing gear toothed ring. Working pressure of the reversing clutch acts between the reversing clutch holder and the overdrive clutch holder to move the whole overdrive gear clutch, so as to transmit the driving force to the hub through the holder.

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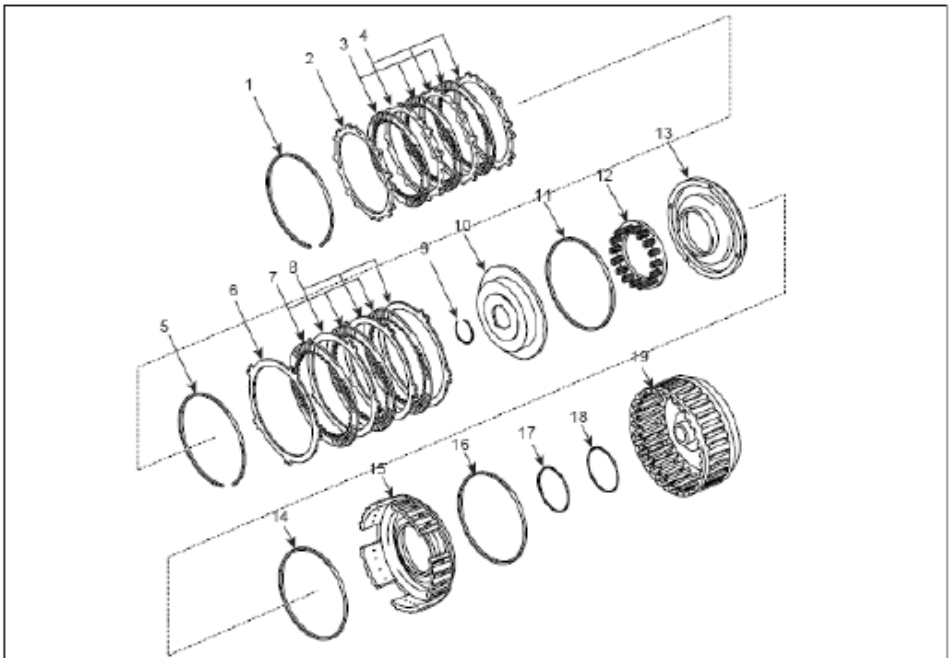
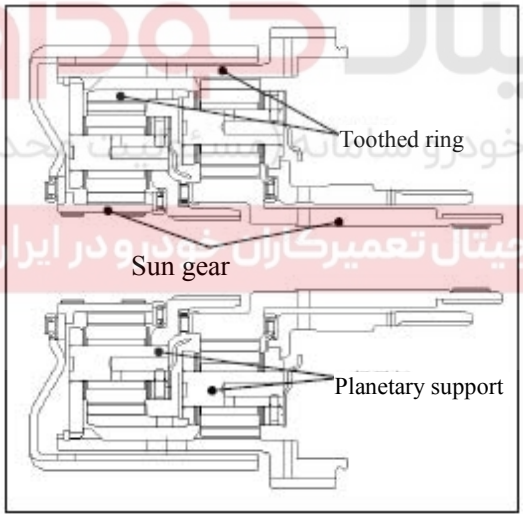
Structure of reversing and overdrive clutch



1. Snap ring
2. Clutch reaction disc
3. Clutch driven disc
4. Clutch pressure disc
5. Snap ring
6. Clutch reaction disc
7. Clutch driven disc
8. Clutch pressure disc
9. Snap ring
10. Spring holder
11. D-shaped seal ring
12. Return spring
13. Overdrive gear clutch piston
14. D-shaped seal ring
15. Reversing clutch piston
16. D-shaped seal ring
17. D-shaped seal ring
18. D-shaped seal ring
19. Reversing clutch holder

2.2.5 Drive system



Planetary gear set (overdrive planetary gear, output planetary gear)

The input shaft uses a planetary gear set composed of two planetary gear sets.

The primary transmission ratio is generated through the mechanism connection of a planetary support and another toothed ring and through the connection and fixing of the planetary support and sun gear.

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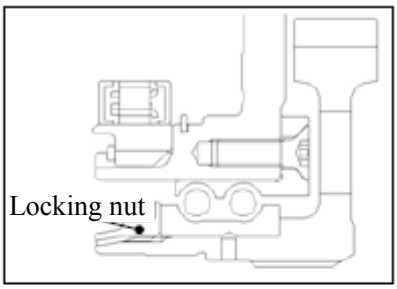
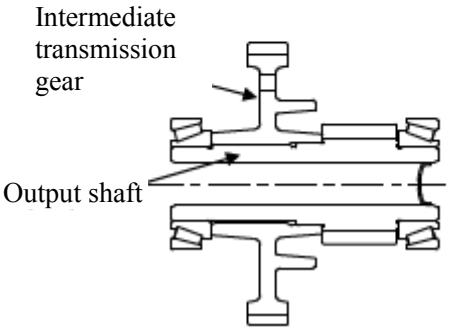


Intermediate driving gear

Long gear teeth with compact dimension and modular structure are used so as to improve engagement efficiency and reduce noise.

Besides, the bearing used to support the driving gear is pre-tightened bearing without clearance between bearings. The bearing is fixed to the shell directly with bolt, so as to improve rigidity of the gear.



Output shaft/intermediate transmission gear

As shown in the figure below, install the intermediate drive gear to the output shaft, and the output shaft is supported by the bearing.

Differential

Differential 4.2 is used.

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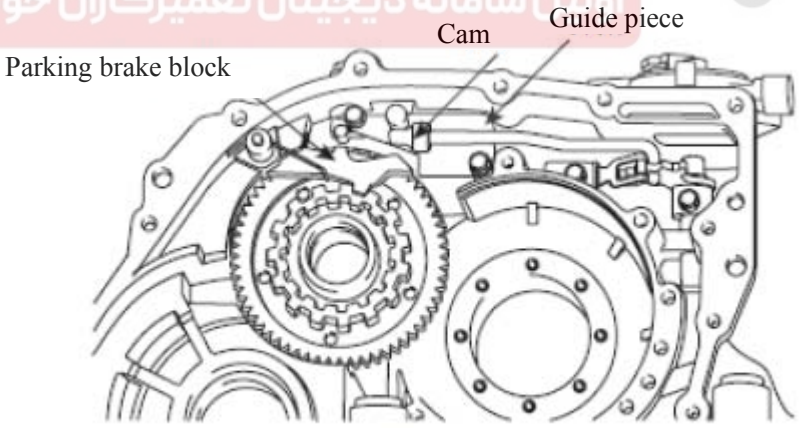
2.2.6 Parking system

The parking system of 4F16 is cam type. With the roller installed in the new AT, support is required to move the roller when operating the parking system and the structure is complex. While the cam used in 4F16 does not require support and is of simple structure. Only guide piece is required to prevent idle movement of the cam.



Parking system

2.2.7 Drive system (energy flow)

Position P
The hydraulic pressure acts on the LR brake and RED brake, so that the action is not transmitted from the input shaft to the low-speed clutch or overdrive gear clutch, the output shaft is locked by the pawl of the parking brake interlocked with the parking gear.

Position N
The hydraulic pressure acts on the LR brake (A) and RED brake, so that the action is not transmitted from the input shaft to the low-speed clutch or overdrive gear clutch.

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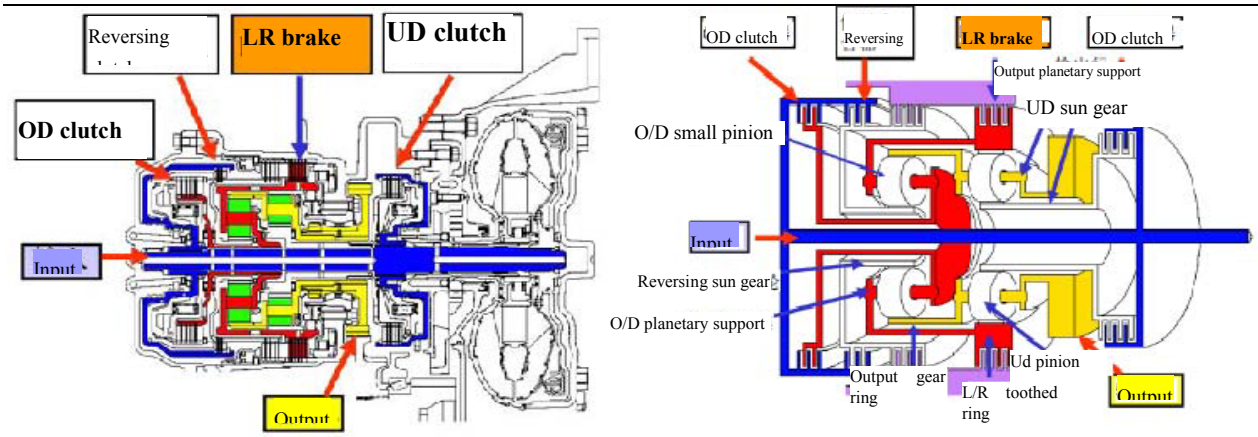
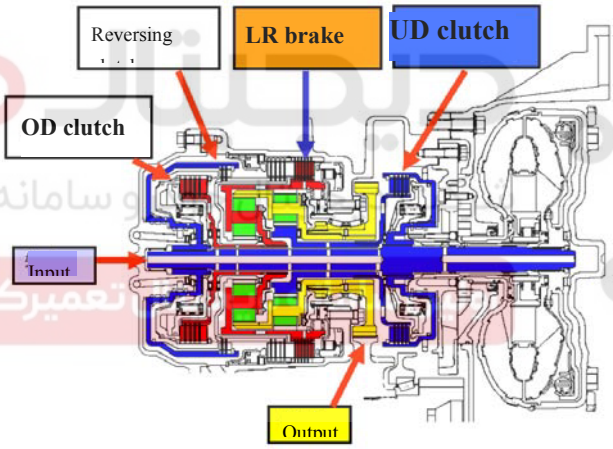


Energy flow of first speed

The hydraulic pressure acts on the UD clutch (B), LR brake (A), and one-way clutch (OWC), and then, the UD clutch transmits the driving force to the UD sun gear through the input shaft, and the LR brake keeps LR toothed ring still relative to the shell. The UD sun gear of the planetary gear drives the output pinion, LR brake locks the toothed ring, and the output pinion drives the output planetary support which drives the intermediate driving gear which drives the intermediate transmission gear of the output shaft. The action is transmitted to the differential gear through the differential driving gear.



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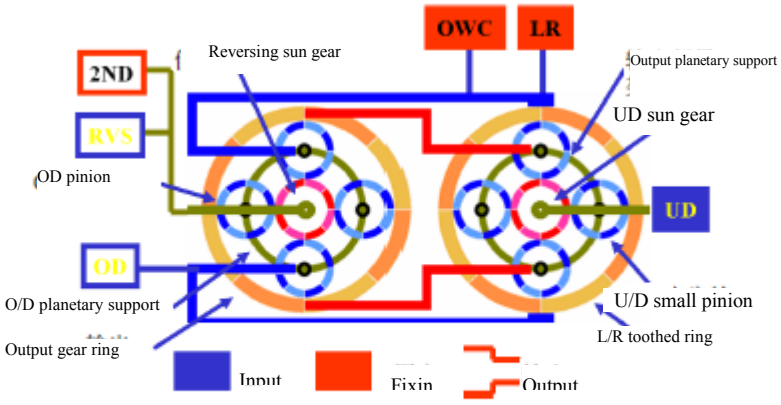
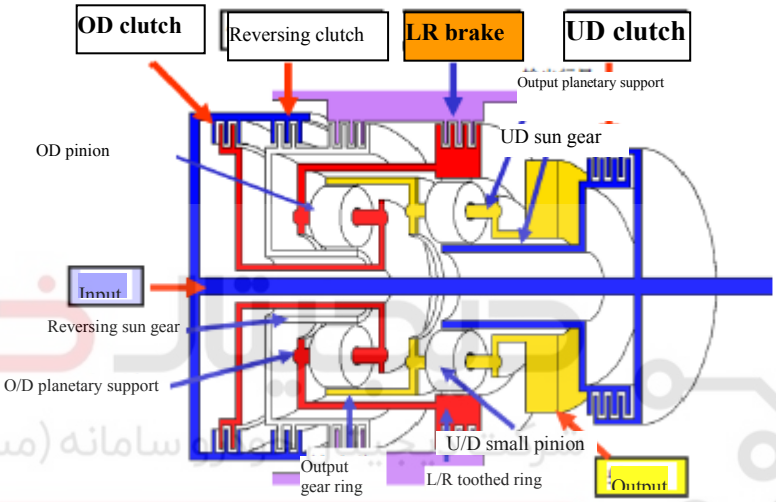
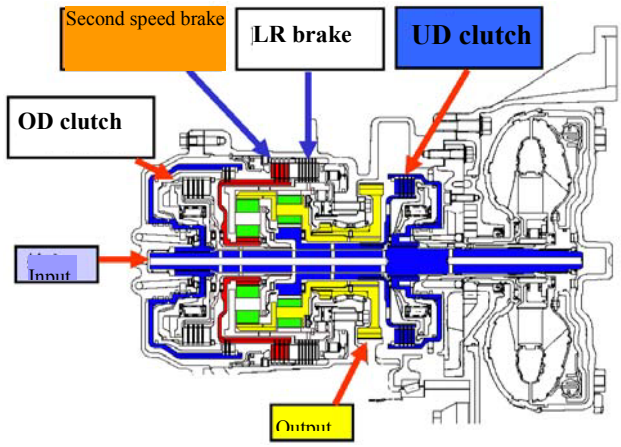




Energy flow of first speed

The hydraulic pressure acts on the UD clutch (A), second brake (B), and one-way clutch (OWC), and then, the UD clutch transmits the driving force to the UD sun gear through the input shaft, and the second brake keeps the reversing sun gear still relative to the shell. The UD sun gear of the planetary gear drives the output pinion and LR toothed ring which drives the OD planetary support which drives the OD pinion which drives the output planetary support which drives intermediate driving gear which drives the intermediate transmission gear of the output shaft. The action is transmitted to the differential gear through the differential driving gear.



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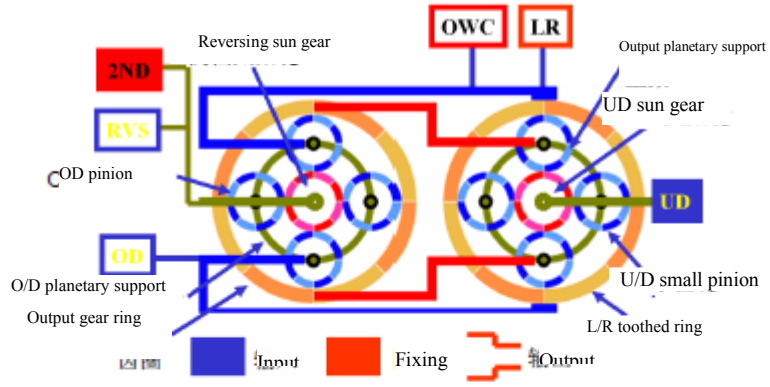
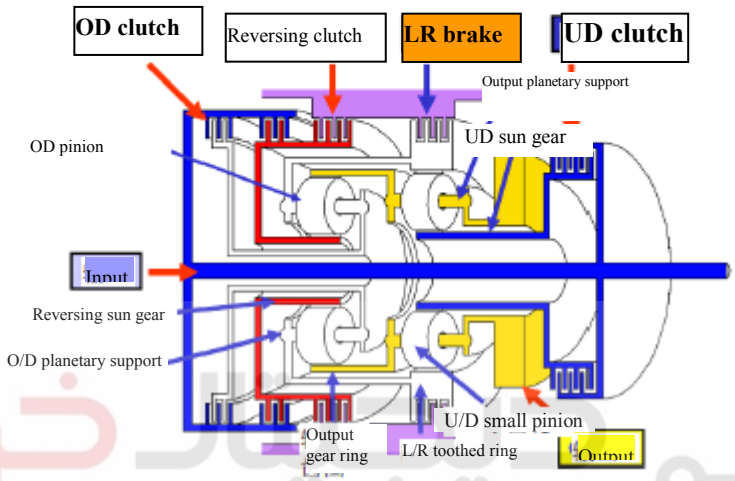
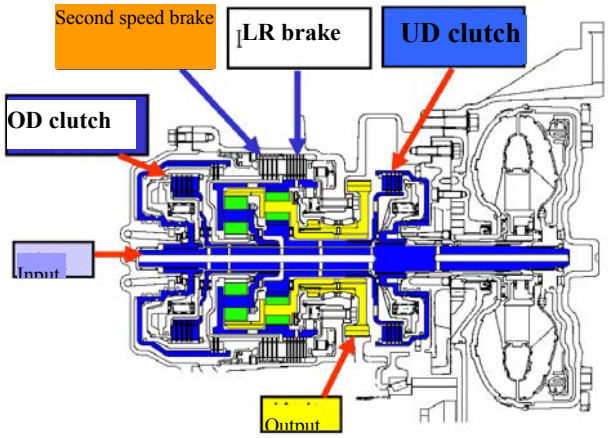




Energy flow of third speed

The hydraulic pressure acts on the UD clutch (A) and OD clutch (B), and then, the UD clutch transmits the driving force to the UD sun gear through the input shaft, and the OD clutch transmits the driving force to the overdrive planetary support and low-speed and reversing gear toothed ring through the input shaft. The UD sun gear of the planetary gear drives the output pinion and LR toothed ring which drives the OD pinion through OD planetary support, and the OD pinion drives the reversing sun gear and output planetary support. The OD clutch drives the OD planetary support which drives the OD pinion which drives the reversing sun gear and output planetary support which drives the intermediate driving gear which drives the intermediate transmission gear of the output shaft. The action is transmitted to the differential gear through the differential driving gear.



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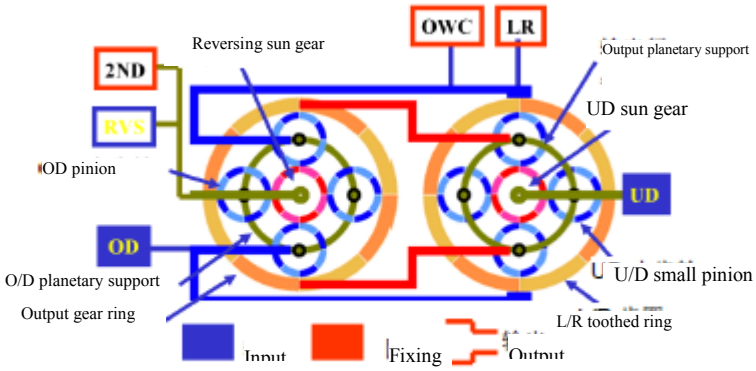
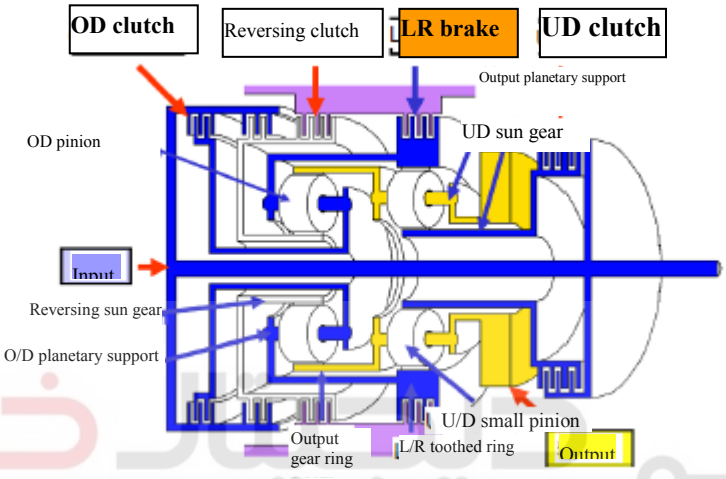
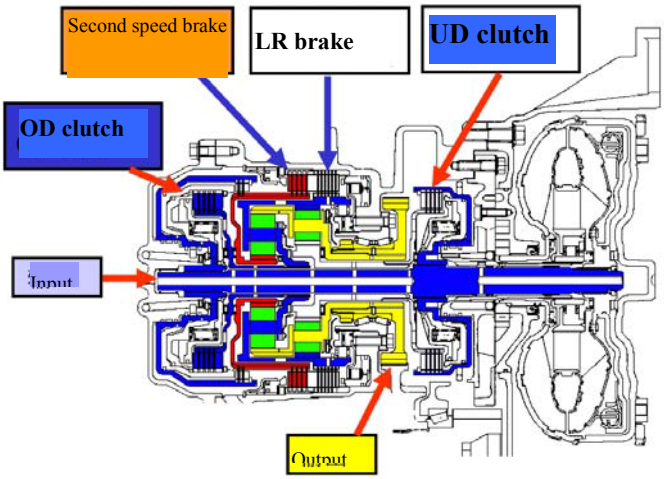




Energy flow of fourth speed

The hydraulic pressure acts on the OD clutch (A) and second brake (B), and then, the OD clutch transmits the driving force to the OD planetary support and LR toothed ring through the input shaft, and the second brake keeps the reversing sun gear still relative to the shell. The OD clutch drives the OD planetary support which drives the OD pinion and LR toothed ring, and the OD pinion drives the output planetary support which drives the intermediate driving gear which drives the intermediate transmission gear of the output shaft. The action is transmitted to the differential gear through the differential driving gear.



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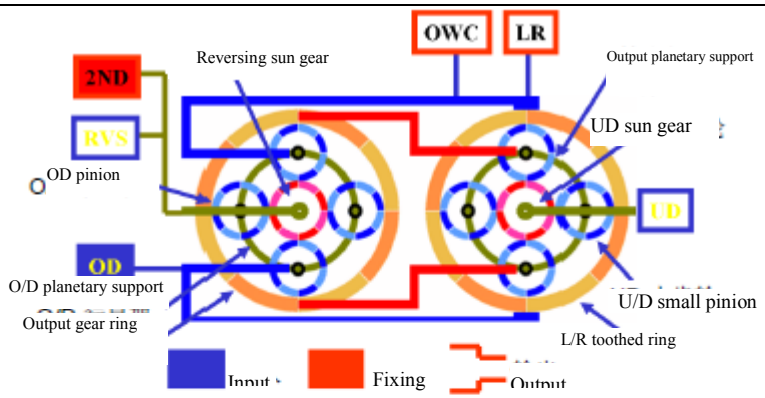
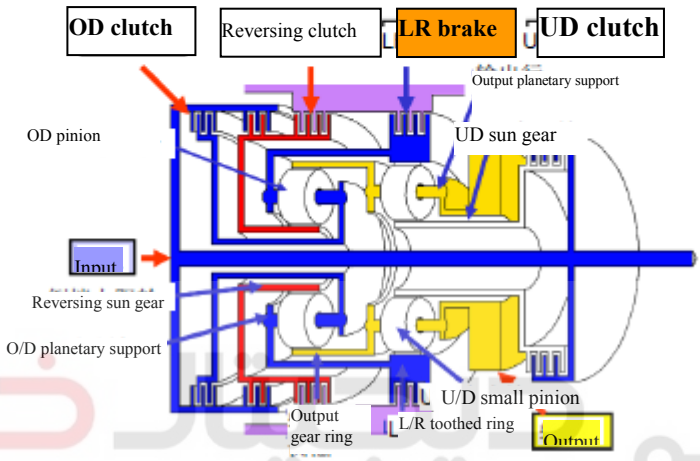
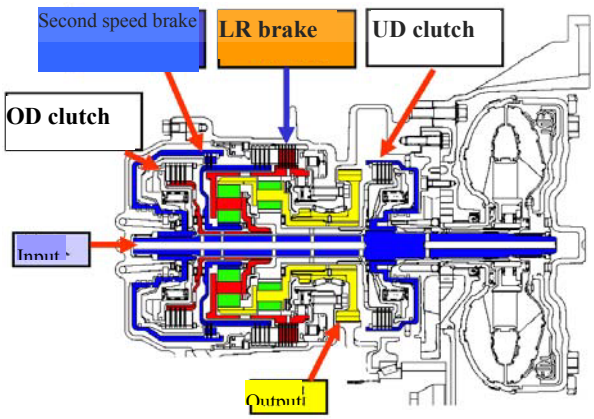




The hydraulic pressure acts on the reversing clutch (A) and LR brake (B), and then, the reversing clutch transmits the driving force to the reversing sun gear through the input shaft, and the LR brake keeps the LR toothed ring and OD planetary support still relative to the shell. The reversing clutch drives the reversing sun gear which drives the output planetary support through OD pinion, and the output planetary support drives the intermediate driving gear which drives the intermediate transmission gear of the output shaft. The action is transmitted to the differential gear through the differential driving gear.



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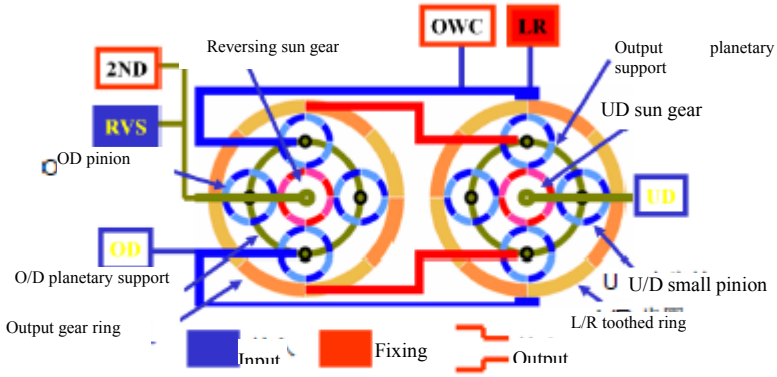

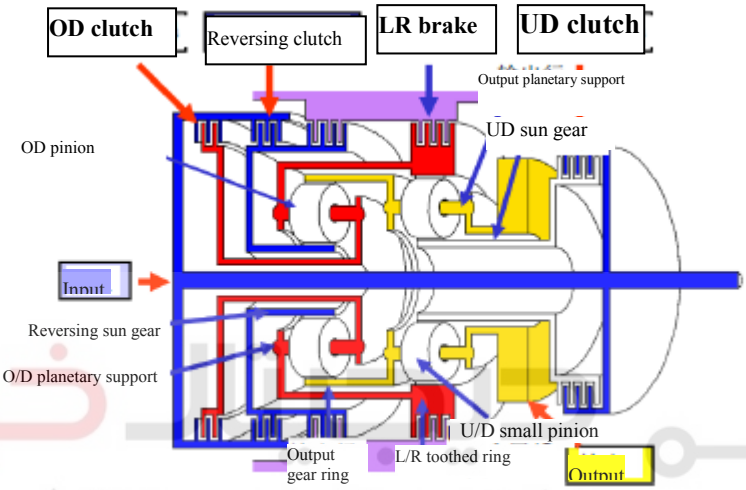

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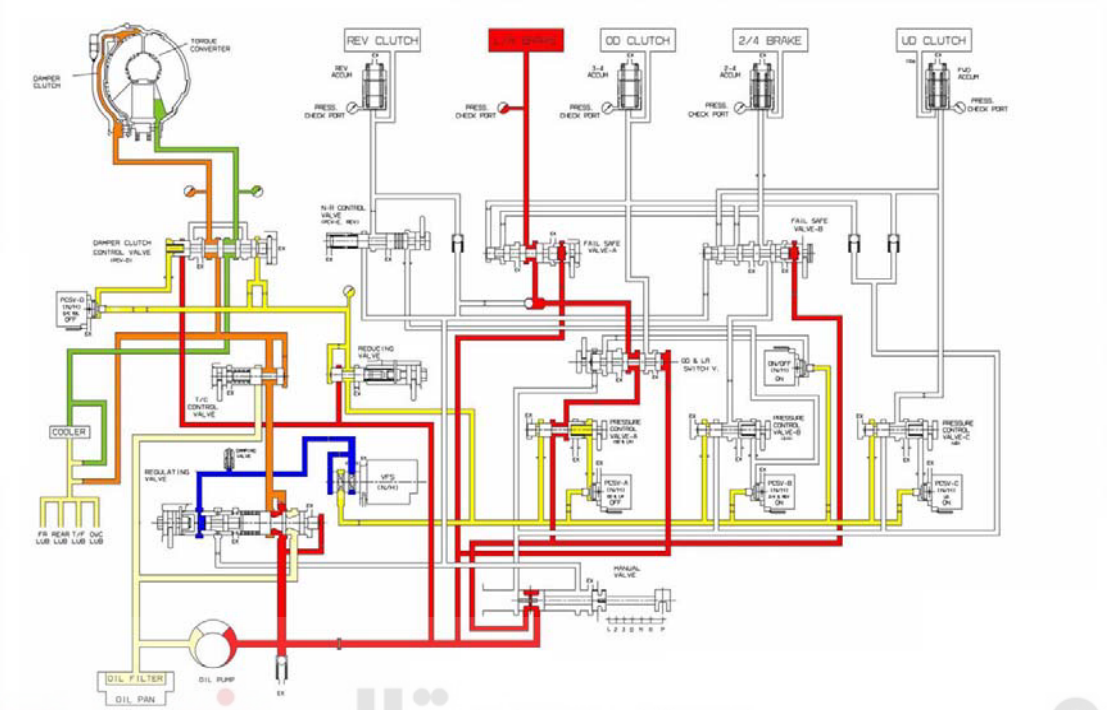
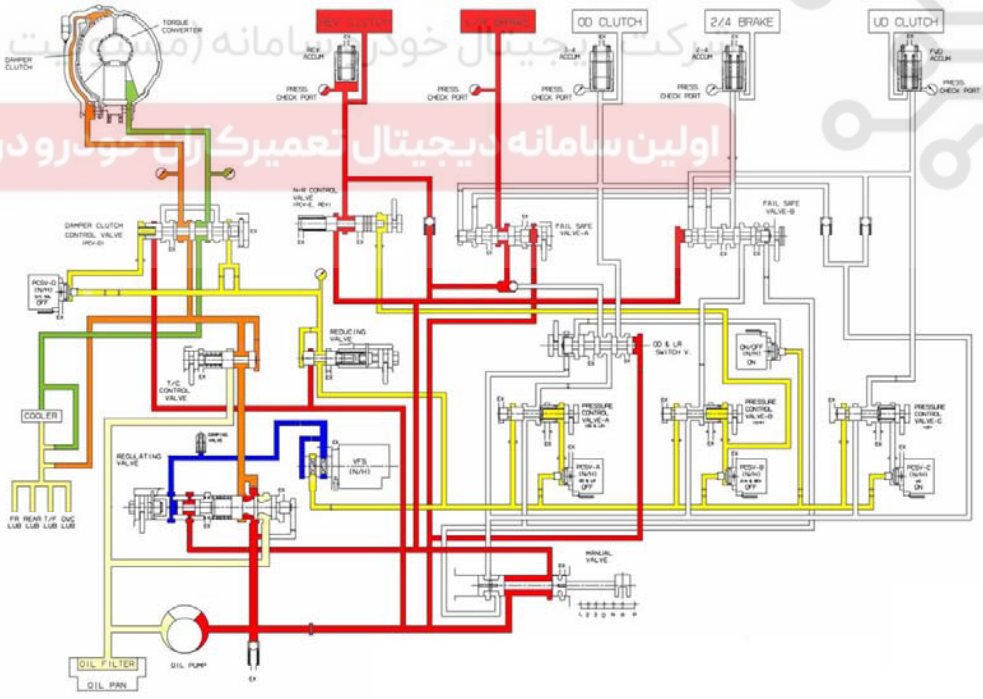
2.2.8 Circuit diagram of valve of 4F16
Gear P&N



Gear R



Gear D1

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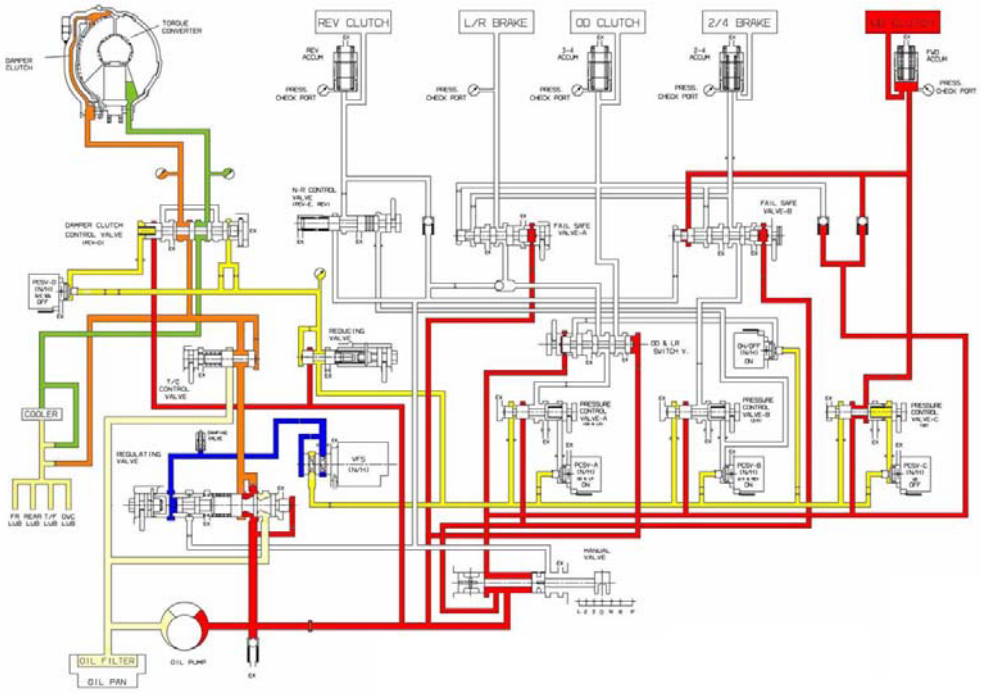
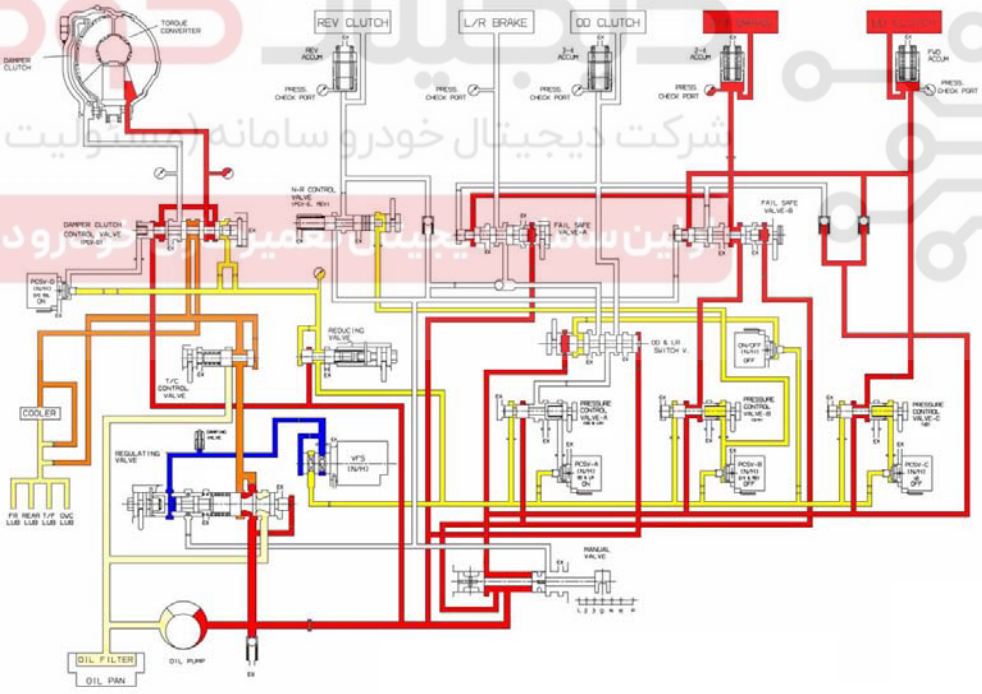
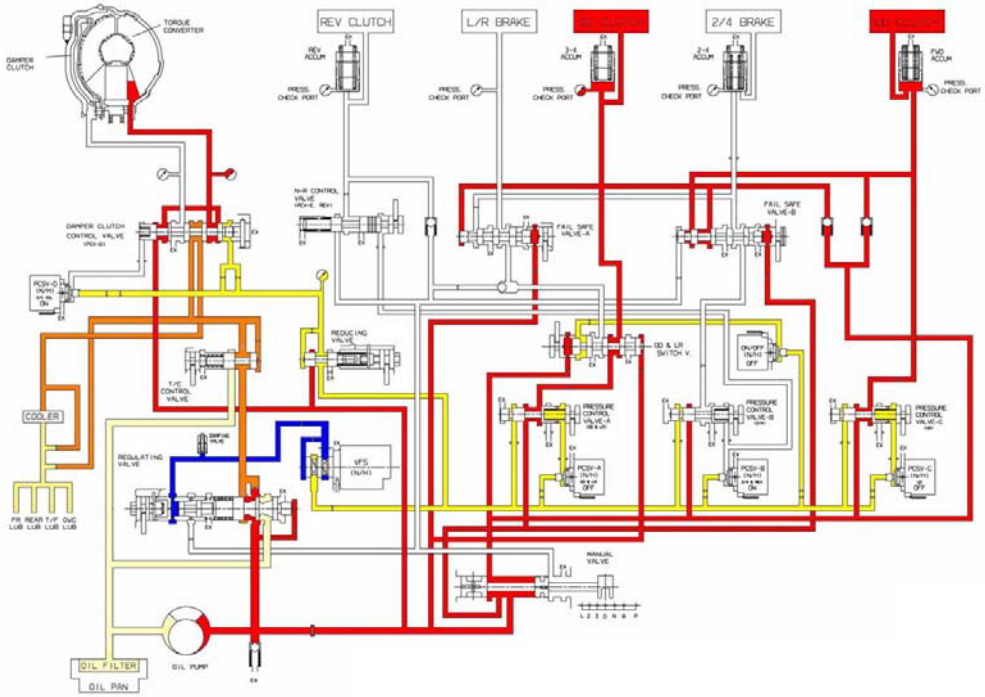


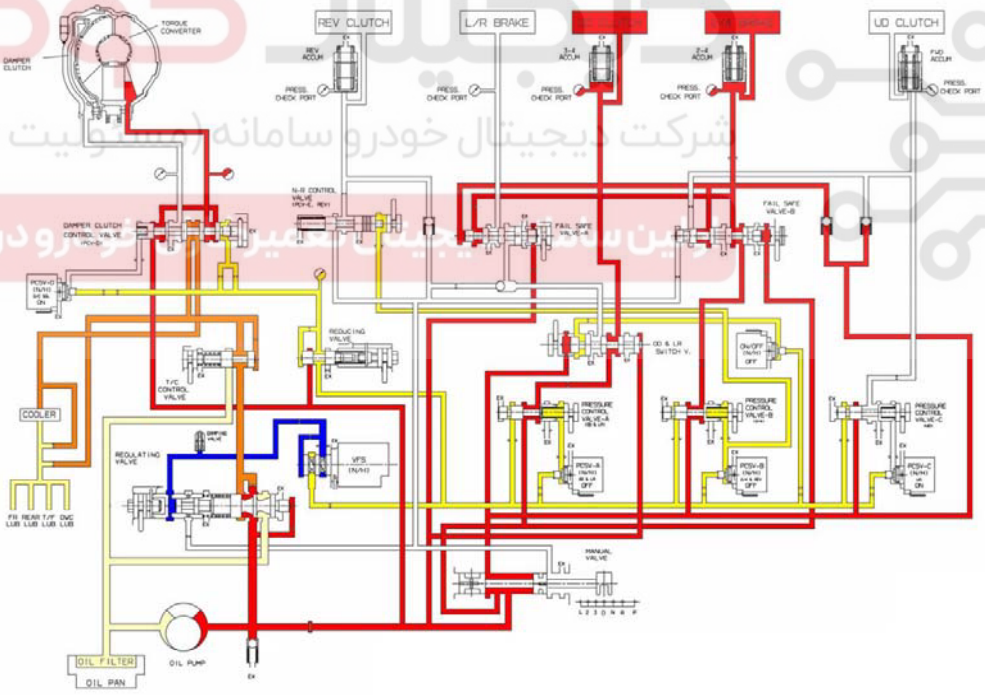
Gear D2



Gear D3



Gear D4



Low-speed gear

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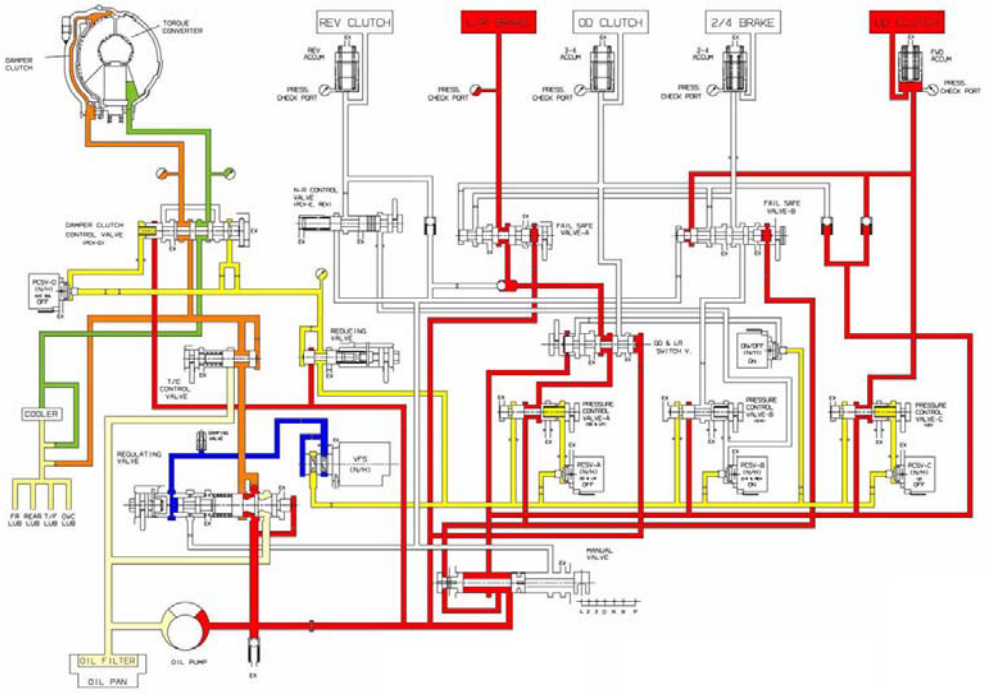

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3. Basic inspection and adjustment

3.1 Stalling test of hydraulic torque converter

This test is used to measure the maximum rotation speed of the engine when the gear selection lever is located at position “D” or “R”. The hydraulic torque converter does not work for testing the operation of hydraulic torque converter, operation of starter and one-way clutch, and maintaining performance of the clutch and brake in the transmission case.
Stalling rotation speed: 2000~2700

Note: no person is allowed to stand in front or behind the vehicle when performing this test.

(1) Check the oil level and temperature of the automatic transmission case and temperature of the cooling liquid of the engine.
Oil level: at the “HOT” mark in the oil level gauge
Temperature of cooling liquid of engine: 80~100℃
Note: it is not allowed to increase oil temperature of the automatic transmission case under still status or by the driving means of racing car.
(2) Prevent the movement of all wheels during the test.
(3) Pull up the control lever of parking brake when pedal of the brake is completely stepped.
(4) Start the engine.
(5) Turn the gear selection lever to position “D”, step the acceleration pedal completely, and then read the maximum rotation speed of the engine.

Caution
a. The time for complete opening of the choker shall not exceed 8 seconds.
b. If more than two stalling tests are to be performance, turn the gear selection lever to position “N” before proceeding subsequent test, and run the engine at the speed of 1000rpm, so as to cool down the oil of automatic transmission case.
c. Turn the gear selection lever to position “R”, and then perform the same test.
d. The third and fourth speeds are not suitable for performing stalling test.

Results of the stalling test of hydraulic torque converter

Condition	Gear	Possible causes
Over high stalling rotation speed	Gear D and R	-low pipeline pressure -LR brake slip
	Gear D only	-UD clutch slip
	Gear R only	-REV clutch slip
Over low stalling rotation speed	Gear D and R	-Fault of hydraulic torque converter
R gear slip	Gear R	-REV is abnormal at gear D -LR is normal at gear D
D1 gear slip	First speed of gear D/first speed of manual mode	-LR is abnormal at the reversing gear -UD is normal at the reversing gear
D3 gear slip	3 Third gear remains engaged	-OD is slipping at the third speed (normal at the first and second speed)
Forward and reversing gear slip	Gear D, gear R	-Abnormal hydraulic torque converter, oil pump, and manual valve in the valve -Abnormal driving device

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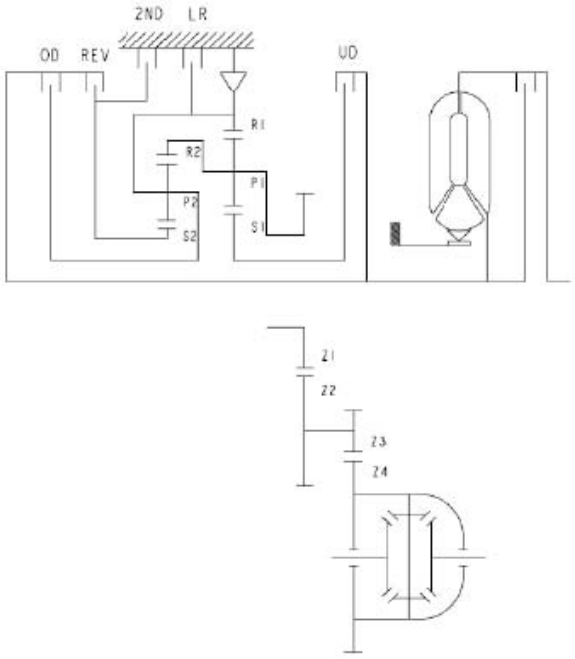


3.2 Oil level of transmission case

3.2.1 Inspection

1) Drive the car until the oil and liquid reach the normal operating temperatures. (70 ~ 80℃)

Note:

Note: it is not allowed to increase oil temperature of the automatic transmission case under still status or by the driving means of racing car.

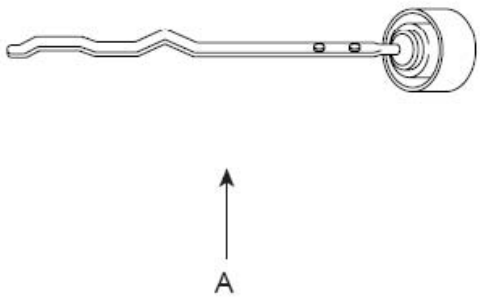
2) Place the car on flat ground (not slope).

3) Move the gear selection gear (on the vehicle side) through all the gears, so as to fill the hydraulic torque converter and hydraulic system with hydraulic oil. Turn the gear selection lever to position to “N” (neutral).

4) Clean all the dirt around the oil level gauge before disassembling the oil level gauge. And then take out the oil level gauge to check the hydraulic oil.

Note: If the hydraulic oil gives of a smell of burning, it means that particles from the shaft lining and friction material contaminate the hydraulic oil and the transmission case requires inspection.

5) Check whether the oil level is within the mark “HOT” on the oil level gauge. If the oil level is low, fill the automatic transmission case oil until the oil reaches the mark “HOT”.



Note:

Since the pump will absorb air in the meantime of absorbing hydraulic oil when at low level, various abnormalities

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may be caused. Airs in the hydraulic system become compressible bubbles, which many cause unstable pressure, delay of gear shift, and slip of clutch and brake, etc. If oil is not filled as specified, oil level may be too high. When hydraulic oil in the transmission case is too much, gears may churn up bubbles and cause the same situation as low oil level, which accelerates the deterioration of the automatic transmission case oil. In the two cases, bubbles may cause overheat and oxidation of hydraulic oil, so as to interfere normal work of the valve, clutch, and brake. Bubbles may also cause hydraulic oil to overflow through air port of the transmission case, which may be mistaken as leakage.

6) Insert the oil level gauge firmly to the hydraulic oil injection pipe.

Note:
New lubrication of automatic transmission case should be red. The purpose of adding orchil is to be convenient for the assembling workshop to identify it as transmission oil and distinguish from engine oil and antifreezing agent. The orchil is not a quality index and lubricant and will not last forever. With the use of vehicle, the transmission oil will become dark gradually. Its color will become light brown finally.

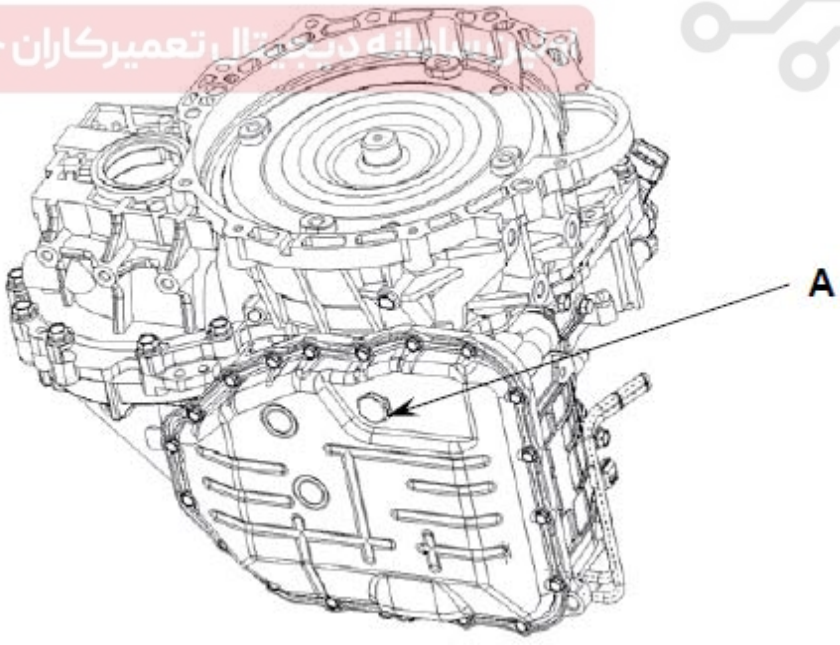
3.2.2 Replacement

If you have any hydraulic oil replacement device, please replace the hydraulic oil with such device. If you do not have one, replace the hydraulic oil by the following procedures.
1. Disconnect the hose connected with the transmission (or oil cooler (within the radiator), if any).
2. Start the engine and exhaust the hydraulic oil.

Working condition: position “N”, engine idle speed.

Note
Stop the engine within one minute after starting. If lubricant flows out completely before this, close the engine after the lubricant flows out completely.

3. Remove the drain plug (A) from bottom of the transmission shell to drain the hydraulic oil.



4. Install the drain plug and washer, and then tighten with the moment specified.

Moment: 35 ~ 45 Nm (3.5 ~ 4.5kgf.m, 25 ~ 32lb-ft)

5. Fill new hydraulic oil through the hydraulic oil injection pipe.

Note:

Stop filling after filling up.

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6. Repeat the procedures in step (2).

Note: Check whether the old hydraulic oil is contaminated. If it is, repeat steps (5) and (6).

7. Fill new hydraulic oil through the hydraulic oil injection pipe.

8. Connect the hose disconnected in step (1) and replace the oil level gauge. (the “replace” here means wipe the dirt around the oil level gauge, and then insert it into the hydraulic oil injection pipe.)

Note: wipe the dirt on surface of the oil level gauge, pleas use clean nylon cloth or paper.

9. Start the engine and run it at idle speed for 1 to 2 minutes.

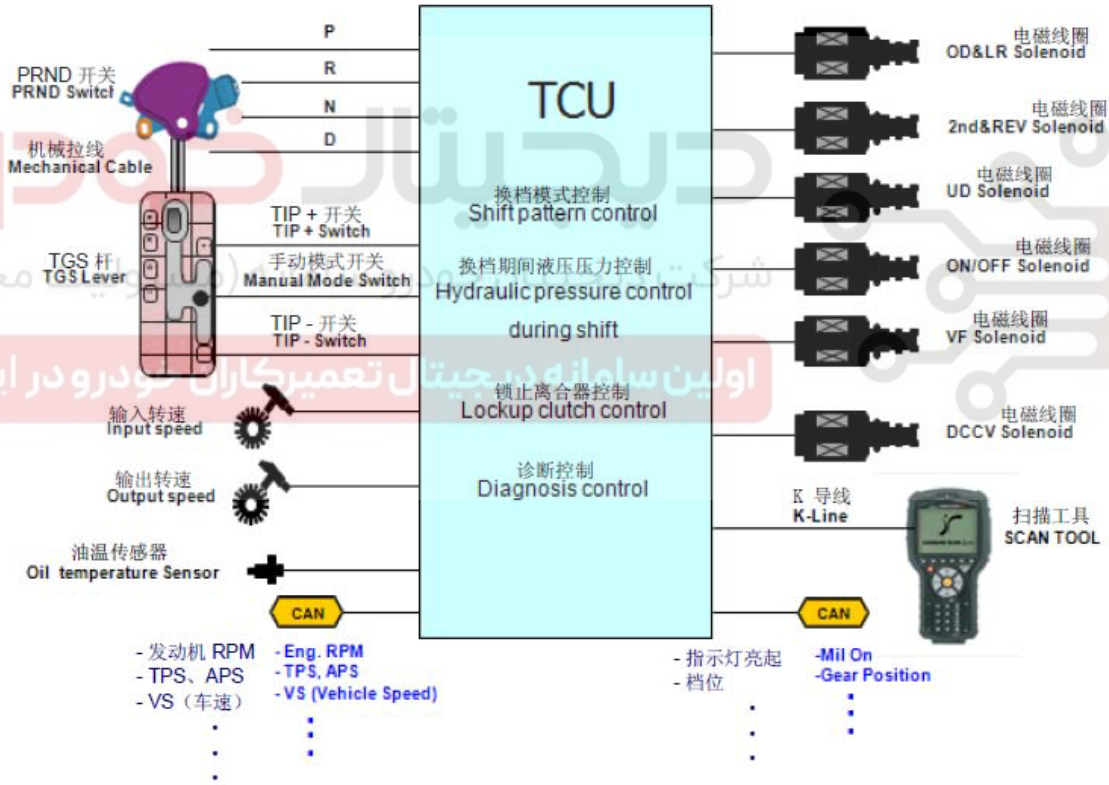
10. Turn the gear shift selection lever to all positions, and then turn to position “N” and “P”.

11. Drive the car until the oil temperature reaches the normal temperature (70 ~ 80 ℃), and then check the oil level again. The oil level must be at the mark “HOT”.

12. Insert the oil level gauge into the hydraulic oil injection pipe.

4. Electronic control

4.1 Block diagram of electronic control system



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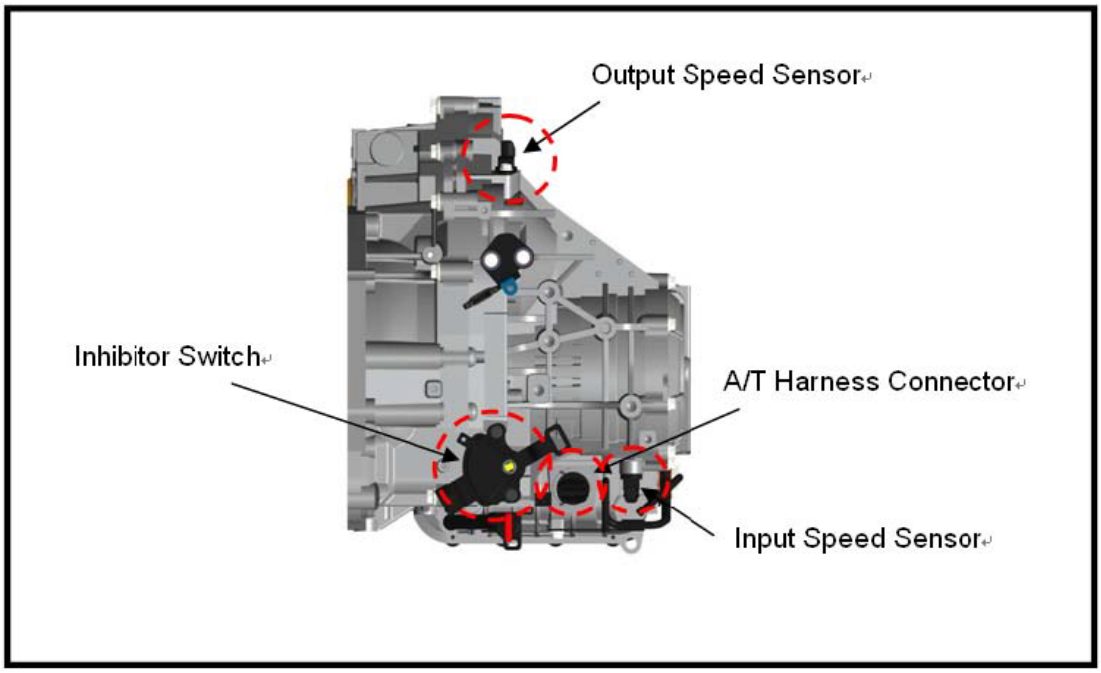
4.2 Electronic control position



4.3 Working components and functions

Sensor (switch)	Function
Input speed sensor	Detect rotation speed of input shaft
Output speed sensor	Detect rotation speed of output shaft
Start the interlocking switch	Determine the position of gear selection lever through contact switch
Manual mode switch	Choose manual mode
Upshift switch	Operate to generate upshift signal
Downshift switch	Operate to generate downshift signal

4.3.1 Sensor

Input and output speed sensor
Type: Hall sensor
Power consumption: 22mA (maximum)

Output speed sensor Input speed sensor

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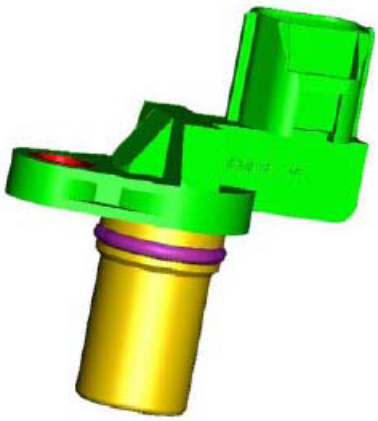
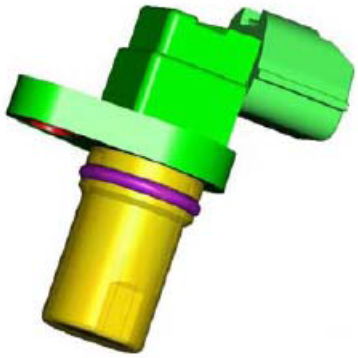
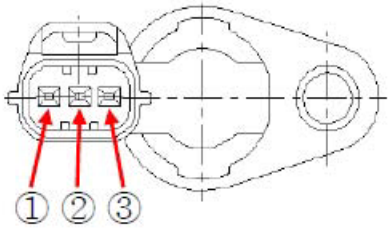
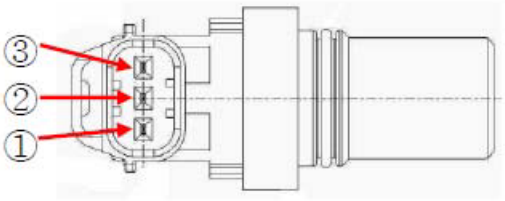






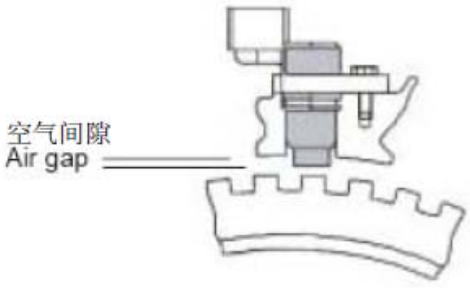


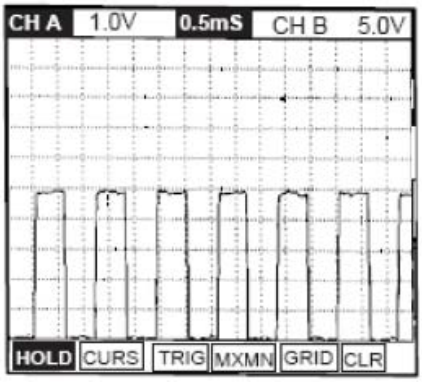
①: GND
②: Sensor signal
③: V_IG1

Specification of Hall sensor

Gap (mm)	Input speed sensor	1.3
	Output speed sensor	0.85
Solenoid resistance	Input speed sensor	Above 1MΩ
	Output speed sensor	Above 1MΩ
Peak-peak voltage	High	4.8 V
	Low	0.8 V

Arrangement and waveform of sensor





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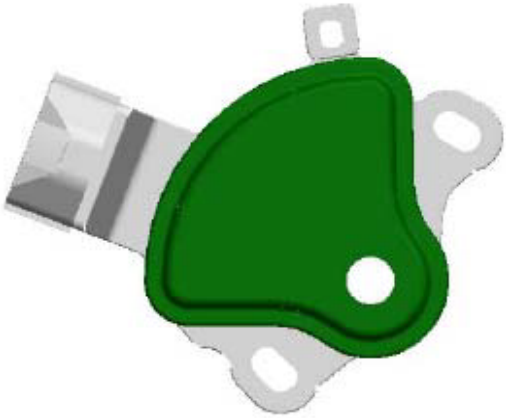
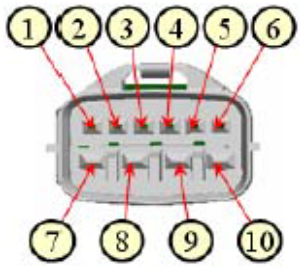
4.3.2 Inhibitor switch

Type: rotation contact type
Temperature range: -40 °C ~ 145 °C





Inhibitor switch—continuity inspection

Gear position	Terminal No.									
	①	⑥	②	⑤	③	④	⑧	⑦	⑨	⑩
P										
R										
N										
D										

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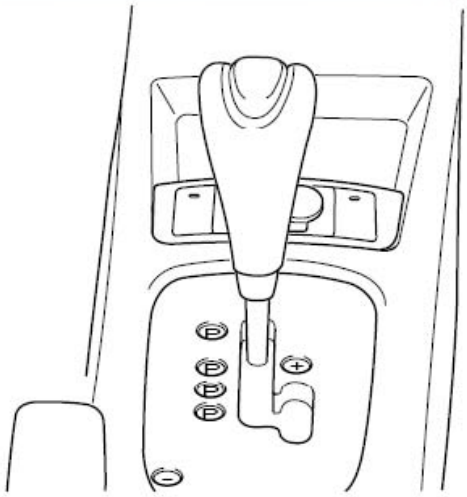
4.3.3 Manual mode



Use the manual mode for upshift and downshift manually. Under such mode, the response and gear shift is quick. Push the gear selection lever upwards or downwards once, gear will be increased or decreased by one.

Signal of manual mode switch

Item	Manual mode switch	Upshift switch	Downshift switch
D gear selection	Off	Off	Off
Manual mode selection	On	Off	Off

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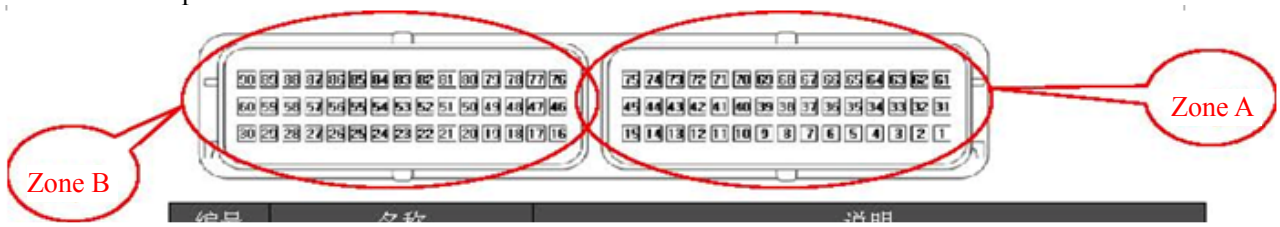
Upshift selection	On	On	Off
Downshift selection	On	Off	On

TCU PIN description



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Number	Name	Description
A2	GND1	Power output ground
A3	GND2	Power output ground
A14	ATF_GND	ATF ground
A15	ATF	Oil temperature sensor
B16	WINTER_SW	Winter switch
B18	PG_A_GND	PG_A ground
B19	PG_B_GND	PG_B ground
B20	R-SW	R inhibitor switch
B24	GND3	Power output ground
B25	GND4	Power output ground
B29	V_IGK	Accumulator voltage after IG
B30	VBD	Direct power supply of accumulator
A31	VFS	Variable force solenoid (VFS)
A35	VS_OUT	Vehicle speed output
A36	PCSV-C(UD)	UD solenoid valve
B46	PG_B	PG_B output rotation speed
B48	UP SHIFT	Inhibitor switch (upshift switch)
B49	D-SW	D inhibitor switch
B56	DIAG_DL	K wire (KWP2000)
A61	V_SOL_IN1	Accumulator voltage for HSD power supply
A62	V_SOL_IN2	Accumulator voltage for HSD power supply
A64	TRIP_COM	Trip computer
A65	PCSV-B(2nd & REV)	Second speed and REV solenoid valve
A66	PCSV-D(DCCV)	DCCV solenoid valve
A67	ON/OFF SOL	ON/OFF solenoid valve
A70	PCSV-A(OD&LR)	OD/LR solenoid valve
A72	V_SOL1	Accumulator voltage for solenoid valve power supply after HSD
A73	V-SOL2	Accumulator voltage for solenoid valve power supply after HSD
A74	V_VFS	Accumulator voltage for VFS power supply after HSD
B76	PG_A	PG_A input speed
B77	DOWN SHIFT	Inhibitor switch (downshift switch)
B78	MANUAL MODE	Inhibitor switch (manual mode switch)
B79	N-SW	N inhibitor switch
B81	P-SW	P start interlocking switch
B87	CAN_L_IN	Controller local network
B88	CAN_H_LN	Controller local network

4.4 Reset learning value

Please use the learning value of automatic transmission case rest of the diagnosis instrument

Step:
1) The ignition switch is at “ACC” and the engine is “OFF”
2) Connect the diagnosis instrument, and select “read fault code)” mode
3) Use the diagnosis instrument to clear faults (DTC)
4) Use “diagnosis instrument” to “learn” reset
5) Learn
6) IG off ⟷ IG on (repeat for twice), and then check the fault code (DOT
7) Whether the fault code (DOT) will appear again?

Yes

▶Replace with a functioning TCU, and then check for normal operation. If fault is cleared, replace TCU as required, and then execute “vehicle maintenance and inspection”

No

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▶The fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Execute the component inspection steps.

Learn reset conditions:

Perform learn reset after replacing the A/T
1) Reset conditions
a) Position the gear selection lever at position “P”
b) Vehicle speed=0 km/h
c) Ignition switch “ACC”
2) Use the diagnosis instrument to “learn” reset

4.5. Fault clearance

4.5.1 Diagnosis fault code (inspection procedures)

Check the diagnosis fault code
1) Turn off the ignition switch
2) Connect the scanning tool to DLC connector for diagnosis
3) Turn on the ignition switch
4) Check the diagnosis fault code with scanning tool
5) Read the output diagnosis fault code. Record the fault code and clear the fault
6) Clear the fault code
7) Disconnect the diagnosis instrument and the diagnosis port
1)

4.5.2 DTC list

DTC	DTC description	Remark
P0707	Inhibitor switch to ground short circuit or open circuit	
P0708	Inhibitor switch to accumulator short circuit or switch-to-switch short circuit	
P0712	Oil temperature sensor to ground short circuit	
P0713	Oil temperature sensor open circuit or to accumulator short circuit	
P0717	The turbine speed sensor has no signal	
P0722	The transmission case output speed sensor has no signal	
P0731	Rotation speed asynchronization and synchronization fault of first speed	
P0732	Rotation speed asynchronization and synchronization fault of second speed	
P0733	Rotation speed asynchronization and synchronization fault of third speed	
P0734	Rotation speed asynchronization and synchronization fault of fourth speed	
P0741	Locking clutch abnormal	
P0743	DCCV solenoid to accumulator short circuit, open circuit, or to ground short circuit	
P0748	VFS to accumulator short circuit, open circuit, or to ground short circuit	
P0750	OD and LR solenoid to accumulator short circuit, open circuit, or to ground short circuit	

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P0755	UD solenoid to accumulator short circuit, open circuit, or to ground short circuit	
P0760	Second speed and REV solenoid to accumulator short circuit, open circuit, or to ground short circuit	
P0765	ON/OFF solenoid to accumulator short circuit, open circuit, or to ground short circuit	
P0880	TCM power supply signal fault: to ground short circuit or open circuit	
U0001	CAN bus off	
U0100	No ID from ECU	

4.6 Description of diagnosis fault code

4.6.1 Inhibitor switch to ground short circuit or open circuit (P0707)

General

The inhibitor switch sends the signal of gear shift lever position to TCU through the 12V (accumulator voltage) signal. When the gear shift lever is at D (forward gear), output signal of the gear switch is 12V and voltages of all other positions are 0V. TCU identifies the position of gear shift lever by reading the signal of the gear switch.

DTC description
If the time without output signal for the inhibitor switch exceeds 30 seconds, TCU will generate this code.

DTC detection condition

Item	Inspection condition and failure protection	Possible cause
DTC policy	No signal is detected	Short circuit or open circuit Inhibitor switch fault TCU fault
Start condition	Rotation speed of engine≥400rpm Vi ≥ 10 V	
Limit	No signal is detected	
Diagnosis time	Above 30s	

Data of diagnosis instrument
1) Connect the diagnosis instrument to the diagnosis port
2) Turn the ignition switch to “ACC” and turn off the engine
3) The “inhibitor switch” parameters on the diagnosis instrument
4) Turn the TGS lever from “P” to “D”
5) Is the “inhibitor switch” in accordance with the parameters?

Yes
▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

No
▶Execute “terminal and connector inspection”

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Terminal and connector inspection
1) Many faults in the electrical system are caused by poor wire and terminal. Faults may also be caused by interference/mechanical and chemical damages of the electrical system.
2) Check the connector thoroughly for looseness, poor contact, bending, corrosion, dirt, aging, or damage.
3) Is the problem being found?

Yes
▶Repair or replace as required, and then execute “vehicle maintenance and inspection”

No
▶Execute “power circuit inspection”

Power circuit inspection
Check power supply of the inhibitor switch
1) Disconnect the “inhibitor switch” connector.
2) Turn the ignition switch to “ACC” and turn off the engine
3) Measure the voltage between the harness connector terminal “8” and the chassis ground
Technical requirements: about VB
4) Is the voltage in accordance with the technical requirements?

Yes
▶ Execute “signal circuit inspection”

No
▶ Check whether the fuse is normal
▶ Check whether the wire is open, and repair as required, and then perform “vehicle maintenance inspection”

Signal circuit inspection
1) Turn the ignition switch to “ACC”
2) Disconnect the “inhibitor switch” and “TCU” connector.
3) Measure the resistance of each terminal between the wire connector and TCU wire connector by the following means.

“Inhibitor switch” PIN number	No.1	No.2	No.6	No.7
TCU Wire PIN number	No.81	No.49	No.79	No.20
Technical requirements	0Ω	0Ω	0Ω	0Ω

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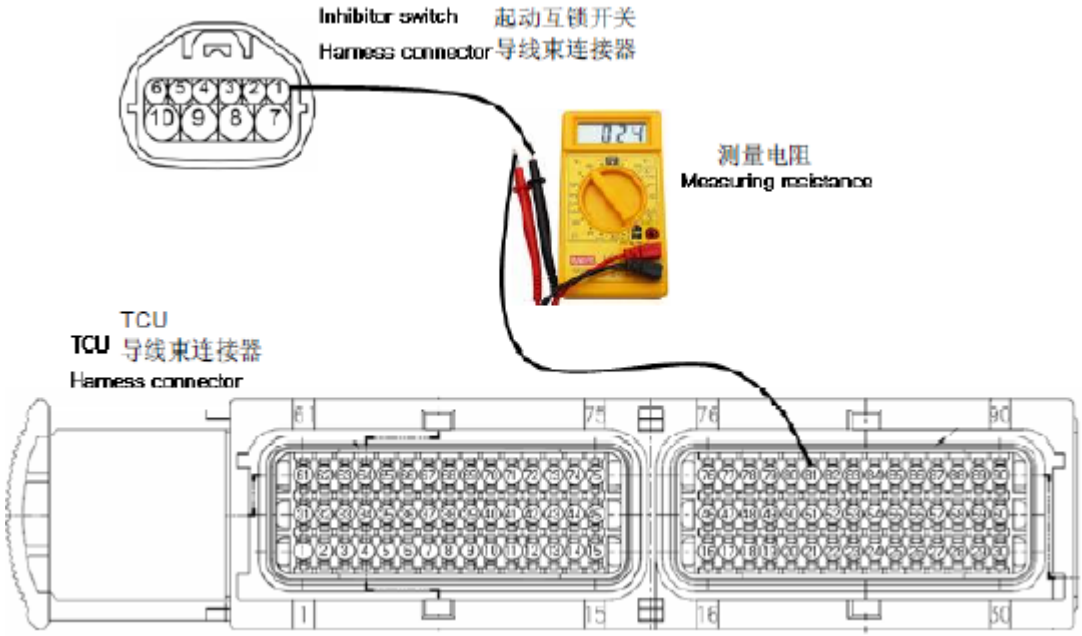


4) Is the resistance in accordance with the technical requirements?

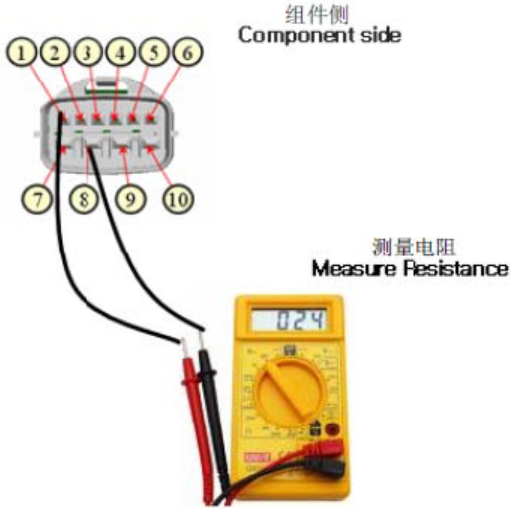
Yes

▶Execute “component inspection”

No

▶Check whether the wire is open and repair as required, and then execute “vehicle maintenance and inspection”.

1) Turn off the ignition switch
2) Remove the “inhibitor switch” connector
3) Measure the resistance between each terminal of the sensor
(Refer to 4.3.2 Inhibitor switch-continuity inspection table)
Technical requirements: 0Ω.



4) Is the resistance in accordance with the technical requirements?

Yes

▶Replace with a functioning TCU, and then check for normal operation. If fault is cleared, replace TCU as required, and then execute “vehicle maintenance and inspection”

No

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▶Replace the “inhibitor switch” as required, and then execute “vehicle maintenance and inspection”

Vehicle maintenance and inspection
Check whether the fault has been cleared after maintenance.
1) Connect the diagnosis instrument and clear DTC
2) Perform off-site commissioning according to the condition for appearance of fault code
3) Read DTC with the diagnosis instrument

Yes
▶Execute the fault clearance procedures used

No
▶The system is in accordance with current technical requirements

4.6.2 Inhibitor switch to accumulator short circuit or switch-to-switch short circuit (P0708)

General (Refer to DTC P0707)

DTC description

If the time for multiple signals of the inhibitor switch is more than 10s, TCU will generate this code.

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Detect multiple signal	Short circuit or open circuit Inhibitor switch fault TCU fault
Start condition	Vi≥ 10 V	
Limit	Detect multiple signal	
Diagnosis time	Above 10s	

Diagnosis instrument data (refer to DTC P0707)
Terminal and connector inspection (refer to DTC P0707)
Power circuit inspection (refer to DTC P007)

Signal circuit inspection
1) Turn off the ignition switch
2) Disconnect the “inhibitor switch” and “TCU” connector
3) Check for short circuit, and measure the resistance between each terminal of the wire
Technical requirements: infinite

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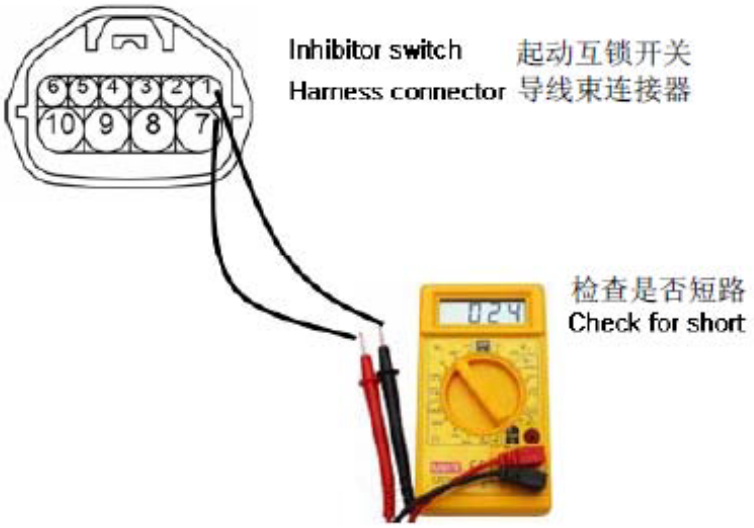

4) Is the resistance in accordance with the technical requirements?

Yes

▶Execute “components inspection”

No

▶Check the wire for short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Component inspection (refer to DTC P0707)

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.3 Oil temperature sensor to ground short circuit (P0712)

General

The temperature sensor of automatic transmission case oil (ATF) uses a thermistor of which the resistance changes with the temperature. TCM supplies 4V reference voltage to this sensor. Output voltage of the sensor changes with changes of the temperature of ATF. The temperature of automatic transmission oil (AFT) provides an important data for TCU to control the locking clutch of the hydraulic torque converter. This temperature is also used for many other purposes.

DTC description

Within normal operating scope, if the output voltage of ATF temperature is lower than the value generated by the thermistor for more than one second, this DTC code will be generated. TCU considers ATF temperature as a fixed value, 80℃ (176℉)

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check whether there is ground short circuit	The sensor signal circuit is ground shorted Sensor failure TCU failure
Start condition	Vi≥ 10 V	
Limit	Voltage＜0.1V	
Diagnosis time	More than 1s	

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Failure protection	It is forbidden to shift the gear intelligently and learn operation Oil temperature is considered as 80℃ Stop pipe pressure control until IG is closed	

Data of diagnosis instrument
1) Connect the diagnosis instrument to the diagnosis interface
2) Turn on the engine
3) ATF sensor parameters on the diagnosis instrument
Technical parameter: increase gradually
4) Is the ATF sensor in accordance with the technical requirements?

Yes
▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

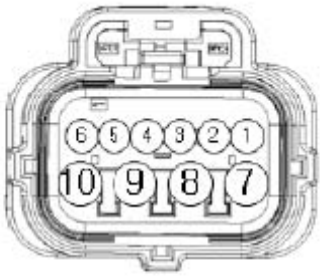
No
▶Execute “terminal and connector inspection”

Terminal and connector inspection
1) Many faults in the electrical system are caused by poor wire and terminal. Faults may also be caused by interference/mechanical and chemical damages of the electrical system.
1) Check the connector thoroughly for looseness, poor contact, bending, corrosion, dirt, aging, or damage.
2) Is the problem being found?

Yes
▶Repair or replace as required, and then execute “vehicle maintenance and inspection”

No
▶ Execute “signal circuit inspection”

Signal circuit inspection
1)The ignition switch is at “ACC” and the engine is “OFF”
2) Disconnect the “ATF sensor” connector
3) Measure the voltage between ATF (+) terminal and chassis ground
Technical requirement: 5V



4F16

Solenoid Valve 电磁阀
Harness side connector 导线束侧连接器

	T/M CIRCUIT
①	PCSV-A(OD&LR)
②	PCSV-B(2nd&REV)
③	ON/OFF SOL.
④	PCSV-D(DCCV)
⑤	OIL TEMP. SENSOR(+)
⑥	OIL TEMP. SENSOR(-)
⑦	V_SOL1, V_SOL2
⑧	PCSV-C(UD)
⑨	VFS(+)
⑩	VFS(-)

4) Is the voltage in compliance with the technical requirements?

Yes

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▶Execute “components inspection”

No

▶ Check the wire for short circuit and repair as required, and then execute “vehicle maintenance and inspection”.

Components inspection (check the ATF sensor)

1) The ignition switch is “OFF”
2) Disconnect the ATF sensor connector
3) Measure the ATF (+) and ATF(—) of the ATF sensor
   Technical requirements: refer to “parameter data”

[Parameter data]

Temperature [℃(℉)]	Resistance [kΩ]	Temperature [℃(℉)]	Resistance [kΩ]
-40(-40)	About139.5	80(176)	About1.08
-20(-4)	About47.7	100(212)	About0.63
0(32)	About18.6	120(248)	About0.38
20(68)	About8.1	140(284)	About0.25
40(104)	About3.8	160(320)	About0.16
60(140)	About1.98	—	—

4) Is the resistance in accordance with the technical requirement?

Yes

▶Check the connector thoroughly for looseness, poor contact, bending, corrosion, dirt, aging, or damage and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

No

▶Replace the “ATF sensor” as required, and then execute “vehicle maintenance and inspection”
ATF sensor is located inside the connector of main harness pin 8 (inside A/T).

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.4 Oil temperature sensor short circuit or to accumulator short circuit (P0713)

General: refer to DTC P0712

DTC description
Within normal operating scope, if the output voltage of ATF temperature is higher than the value generated by the thermistor for a certain time, this DTC code will be generated. TCU considers ATF temperature as a fixed value, 80℃ (176℉)

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check the voltage range	Open circuit sensor failure TCU failure
Start condition	Vi≥10 V	
Limit	Voltage＞4.9 V	

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Diagnosis time	More than 1s	
Failure protection	It is forbidden to shift the gear intelligently and learn operation Oil temperature is considered as 80℃ Stop pipe pressure control until IG is closed	

Diagnosis instrument data (refer to DTC P0712)
Terminal and connector inspection (refer to DTC P0712)
Signal circuit inspection (refer to DTC P0712)
Component inspection (refer to DTC P0712)
Vehicle maintenance and inspection (refer to DTC P0712)

4.6.5 Turbine rotation speed sensor has no signal (P0717)

General
The input (turbine) rotation speed sensor outputs pulse signal according to the number of rotations of the transmission case. TCU determines the rotation speed of input shaft according to the pulse frequency. This value is used to provide optimum hydraulic pressure during gear shifting.

DTC description
If no pulse signal from the input rotation speed sensor is detected when the vehicle speed is over 30Km/h, TCU will generate this code. If this code is detected, TCU will start the failure protection function.

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check the continuity of rotation speed	Signal circuit open or short Sensor power circuit open Sensor ground circuit open Turbine rotation speed sensor failure TCU failure
Start condition	Engine rotation speed of gear D ＞ 2600rpm vehicle speed≥30Km/h Vi＞ 10 V	
Limit	No signal	
Diagnosis time	Above 4s	
Failure protection	Keep at 2/3 speed Stop the pipeline pressure control unit IG is closed	

Diagnosis instrument data
1) Connect the diagnosis instrument to the diagnosis port
2) Run the engine
3) The “input (turbine) rotation speed sensor” parameters on the diagnosis instrument
4) Run at a speed above 30km/h
Technical requirements: increase gradually
5) Is the “input (turbine) rotation speed sensor” in accordance with the technical requirements?

Yes
▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

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No

▶Execute “terminal and connector inspection”

Terminal and connector inspection

1) Many faults in the electrical system are caused by poor wire and terminal. Faults may also be caused by interference/mechanical and chemical damages of the electrical system.

2) Check the connector thoroughly for looseness, poor contact, bending, corrosion, dirt, aging, or damage.

3) Is the problem being found?

Yes

▶Repair or replace as required, and then execute “vehicle maintenance and inspection”

No

▶ Execute “signal circuit inspection”

Signal circuit inspection

1)The ignition switch is at “ACC” and the engine is “OFF”

2) Disconnect the “input (turbine) rotation speed sensor” connector

3) Measure the voltage between the sensor signal terminal of the wire connector and the chassis ground

Technical requirement: 5V

1. Sensor ground
2. Input (turbine) rotation speed signal
3. Power supply

4) Is the voltage in accordance with the technical requirement?

Yes

▶Execute “power circuit inspection”

No

▶Check the wire for short circuit and repair in as required, and then execute ‘vehicle maintenance and inspection”

▶If the wire signal circuit is normal, execute the “TCU inspection” of the “component inspection”

1) The ignition switch is at “ACC” and the engine is “OFF”

2) Disconnect the “input (turbine) rotation speed sensor” connector

3) Measure the voltage between the power supply terminal of the wire connector and the chassis ground

Technical requirement: VB

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1. Sensor ground
2. Input (turbine) rotation speed signal
3. Power supply

4) Is the voltage in accordance with the technical requirement?

Yes
▶Execute “ground circuit inspection”

No
Check the wire for short circuit and repair as required, and then execute “vehicle maintenance and inspection”

Ground circuit inspection
1) The ignition switch is at “ACC” and the engine is “OFF”
2) Disconnect the “input (turbine) rotation speed sensor” connector
3) Measure the resistance between the sensor ground terminal of the sensor of wire connector and the chassis ground
Technical requirement: 0Ω

1. Sensor ground
2. Input (turbine) rotation speed signal
3. Power supply

4) Is the resistance in accordance with the technical requirement?

Yes
▶ Execute “components inspection”

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No
▶Check the wire for short circuit and repair in as required, and then execute “vehicle maintenance and inspection”
▶If the wire signal circuit is normal, execute the “TCU inspection” of the “component inspection”

Components inspection
1) Replace the sensor components. Is the work still abnormal?

Yes
▶Execute “TCU inspection” by the following means

No
▶Replace the “input (turbine) rotation speed sensor” as required, and then execute “vehicle maintenance and inspection”

2) TCU inspection
a. Connect the diagnosis instrument
b. Turn on the engine
c. Keep the manual control lever at gear N, and in the meantime, keep the engine running at idle speed.
d. Detect the “input (turbine) rotation speed” with the diagnosis instrument. The rotation speed shall be equal to or a little lower than the rotation speed of engine
e. While stepping the brake pedal to prevent movement of the vehicle, turn the manual control lever from position N to D
f. The “input (turbine) rotation speed” shall be zero
g. Is the “input rotation speed” changing as above?

Yes
▶Check the connector thoroughly for looseness, poor contact, bending, corrosion, dirt, aging, or damage and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

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No
▶Replace with a functioning TCU, and then check for normal operation. If the fault is cleared, replace the TCU as required and then execute “vehicle maintenance and inspection”.

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.6 Transmission case output speed sensor has no signal (P0722)

General
The output speed sensor outputs pulse signal according to rotation number of the output shaft of transmission case.

DTC description
If calculated pulse signal is obviously different from the actual signal when vehicle speed exceeds 30Km/h, the TCU will generate this code. If this code is detected, TCU will start failure protection function.

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check the continuity of rotation speed	Signal circuit open or short Sensor power circuit open Sensor ground circuit open Turbine rotation speed sensor failure TCU failure
Start condition	Engine rotation speed of gear D ＞ 2600rpm vehicle speed≥30Km/h Vi＞ 10 V	

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Limit	No signal	
Diagnosis time	Above 4s	
Failure protection	Keep at 2/3 speed Stop the pipeline pressure control unit IG is closed	

Diagnosis instrument data
1) Connect the diagnosis instrument to the diagnosis port
2) Run the engine
3) The “output rotation speed sensor” parameters on the diagnosis instrument
4) Run at a speed above 30km/h
Technical requirements: increase gradually
5) Is the “output rotation speed sensor” in accordance with the technical requirements?

Yes
▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

No
▶Execute “terminal and connector inspection”

Terminal and connector inspection (refer to DTC P0707)
Signal circuit inspection
1) The ignition switch is at “ACC” and the engine is “OFF”
2) Disconnect the “output rotation speed sensor” connector
3) Measure the voltage between the sensor signal terminal of the wire connector and the chassis ground
Technical requirement: 5V

1. Sensor ground
2. Input (turbine) rotation speed signal
3. Power supply

4) Is the voltage in accordance with the technical requirement?

Yes
▶ Execute “power circuit inspection”

No
▶Check the wire for short circuit and repair in as required, and then execute ‘vehicle maintenance and inspection”

Power circuit inspection
1) The ignition switch is at “ACC” and the engine is “OFF”

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2) Disconnect the “output rotation speed sensor” connector
3) Measure the voltage between the power supply terminal of the wire connector and the chassis ground
Technical requirement: VB

1. Sensor ground
2. Input (turbine) rotation speed signal
3. Power supply

4) Is the voltage in accordance with the technical requirement?

Yes
▶Execute “ground circuit inspection”
No
▶Check the wire for short circuit and repair as required, and then execute “vehicle maintenance and inspection”

Ground circuit inspection
1) The ignition switch is at “ACC” and the engine is “OFF”
2) Disconnect the “output rotation speed sensor” connector
3) Measure the resistance between the sensor ground terminal of the sensor of wire connector and the chassis ground
Technical requirement: 0Ω

1. Sensor ground
2. Input (turbine) rotation speed signal
3. Power supply

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4) Is the resistance in accordance with the technical requirement?

Yes
▶ Execute “components inspection”

No
▶Check the wire for short circuit and repair in as required, and then execute “vehicle maintenance and inspection”

Components inspection
1) Replace the sensor components. Is the work still abnormal?

Yes
▶Replace with a functioning TCU, and then check for normal operation. If the fault is cleared, replace the TCU as required and then execute “vehicle maintenance and inspection”.

No
▶Replace the “output speed sensor” as required, and then execute “vehicle maintenance and inspection”

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.7 Rotation speed asynchronization and synchronization of first speed (P0731)

General
When the transmission is engaged at the first speed, rotation speed of the input shaft shall be equal to the rotation speed of the output value multiplying the transmission ratio of the first speed.

DTC description
If the transmission is engaged at the first speed and the rotation speed of the input shaft is not equal to the rotation speed of output shaft multiplying the transmission ratio of the first speed, this code will be generated. Main cause of the fault is that the control valve is blocked or the solenoid valve is malfunctioning, instead of electrical fault.

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Transmission ratio of the first speed is incorrect	Input speed sensor failure Output speed sensor failure UD clutch, LR brake, or one-way clutch failure
Start condition	Accumulator voltage≥10V ATF temperature≥23℃ 2s after shifting to the first speed Rotation speed of engine≥450rpm T/M output rotation speed≥350rpm Turbine rotation speed=0rpm Normal inhibitor switch 2s after IG is turned on	
Limit	Nt- Nt1≥ 200rpm	
Diagnosis time	4 times for more than 1s	
Failure protection	Locked at the third speed Stop pipeline pressure control, until IG is turned off	

Nt: input (turbine) rotation speed
Nt1: transmission ratio of the first speed of output rotation speed

Diagnosis instrument data

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1) Connect the diagnosis instrument to the diagnosis port
2) Turn on the engine
3) Parameters of “engine rotation speed, input rotation speed, output speed sensor, gear position” on the diagnosis instrument
4) Execute stalling test at the first speed

Technical requirements: rotation speed of engine 2000～2700 rpm

Stalling test procedures and causes under D1
Procedures
(1) Warm the engine up
(2) Step the brake pedal completely after turning the gear selection lever to D, and then step the acceleration pedal to the most. (Detect the slip of working components of the first speed through the stalling at the gear D

Reasons for stalling test
(1) In case of no mechanism problem in A/T, slip appears in the hydraulic torque converter
(2) Therefore, there is engine rotation output, but since the wheel is locked, the input and output rotations must be zero
(3) If working components of the first speed fail, input rotation will not be transferred
(4) If there is output rotation, it means that foot braking force has not been applied completely, requiring re-measuring

Working element of each gear

	UD/C	OD/C	REV/C	2-4B	LR/B	OWC
P					●	
R			●		●	
N					●	
D1	●				●	●
D2	●			●		
D3	●	●				
D4		●		●		

5) Is the “stalling test” in accordance with the technical requirement?

Yes
▶ Execute “signal circuit inspection”

No
▶ Execute “components inspection”

Signal circuit inspection
1) Connect the diagnosis instrument
2) Turn on the engine
3) The parameter of “input and output speed sensor” on the diagnosis instrument
4) Increase rotation speed of the engine until it reaches about 2000rpm at the first speed
Technical requirements: input rotation speed—(output rotation speed*transmission ratio of the first speed)≤200 rpm
5) Is “input and output speed sensor” in accordance with technical requirements?

Yes
▶ Execute “components inspection”

No
▶ Check the electrical noise of the circuit in the input and output speed sensor or replace the input and output speed sensor, and repair as required, and then execute “vehicle maintenance and inspection”

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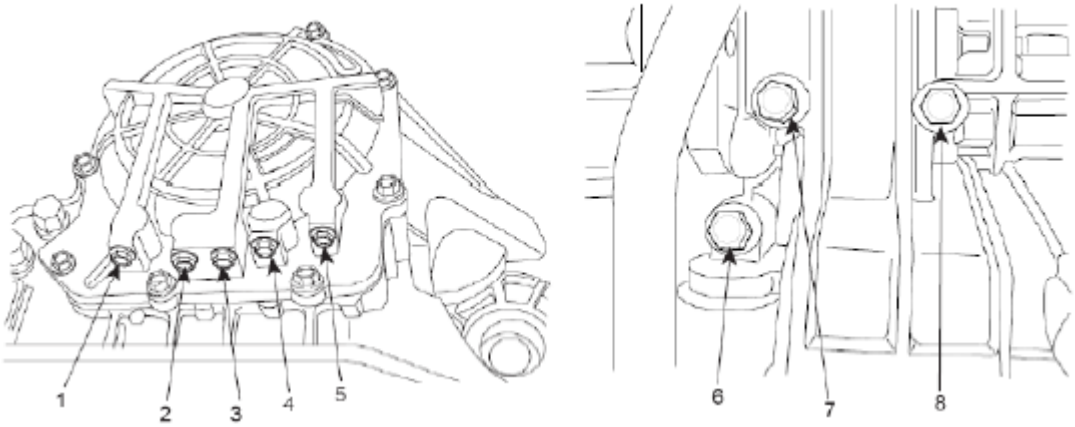
Components inspection



1. LUB pressure port
2. RED pressure port
3. OD pressure port
4. 2-4 pressure port
5. REV pressure port
6. DA pressure port
7. UD pressure port
8. LR pressure port

1) Connect the oil pressure gauge to “UD” and “L/R” port
2) Turn on the engine
3) Drive the car at first speed under manual mode
4) Compare with the following parameters

Technical requirements

Measuring conditions			Reference hydraulic pressure (Kgf/c ㎡)				
Position of gear selection lever	Gear position	Engine rotation speed (rpm)	Pressure of low-speed gear clutch	Reversing gear clutch pressure	Pressure of overdrive gear clutch	Pressure of low-speed and reversing brake	Pressure of second brake
R	Reversing gear	2500		17.1 (±0.8)		17.1 (±0.8)	
D (manual mode)	First speed	2500	10.5 (±0.2)			10.5(±0.2)	
	Second speed	2500	10.5 (±0.2)				10.5 (±0.2)
	Third speed	2500	10.5 (±0.2)		10.5 (±0.2)		
	Fourth speed	2500			10.5 (±0.2)		10.5 (±0.2)

5) Is the oil pressure in accordance with the technical requirement?

Yes

▶ Execute “vehicle maintenance and inspection”

No

▶ Replace “A/T” as required, and then execute “vehicle maintenance and inspection”

Vehicle maintenance and inspection (refer to DTC P0707)

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4.6.8 Rotation speed asynchronization and synchronization of the second speed (P0732)

Refer to DTC P0731

4.6.9 Rotation speed asynchronization and synchronization of the third speed (P0733)

Refer to DTC P0731

4.6.10 Rotation speed asynchronization and synchronization of the fourth speed (P0734)

Refer to DTC P0731

4.6.11 Abnormal locking clutch (P0741)

General:
TCU controls the locking and unlocking between locking clutch of the hydraulic torque converter and input shaft of the transmission case by applying hydraulic pressure. The main purpose of the control of T/C locking clutch is to reduce fuel consumption by reducing internal hydraulic load inside T/C.
The TCU outputs load pulse to control the solenoid control valve of the locking clutch (DCCSV, DCCV), and the hydraulic pressure is applied to DC according to the DCC load rate. Apply high pressure when the load rate is high, and lock the locking clutch.

DTC description
The TCU increases the load rate by monitoring the slip rotation speed (the difference between the engine rotation speed and the turbine rotation speed) to engage the locking clutch. To reduce the slippage rate of the locking clutch, TCU increase load rate by applying high hydraulic pressure. I the slip rotation speed under the load rate of 100% does not reduce to a certain value, TCU will determine that locking clutch of the hydraulic torque converter is blocked and cannot work and will generate this code.

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Fail to work due to blocking	Locking clutch or oil pressure system failure Solenoid valve of locking clutch failure Valve failure TCU failure
Start condition	During connection control 16V＞VB≥10V	
Limit	The control load rate of the locking clutch is twice detected to be equal to 100% for 2s	
Diagnosis time	One event	
Failure protection	Locking control is forbidden	

Diagnosis instrument data
1) Connect the diagnosis instrument to the diagnosis port
2) Turn on the engine
3) Select gear D and drive the car
4) The parameter of “locking clutch load” on the diagnosis instrument
Technical requirement: solenoid load of locking clutch＞30% (in case of slip of the locking clutch＜100rpm)
5) Is solenoid load of the locking clutch and slip of the locking clutch in accordance with the technical requirement?

Yes
▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

No
Execute “components inspection”

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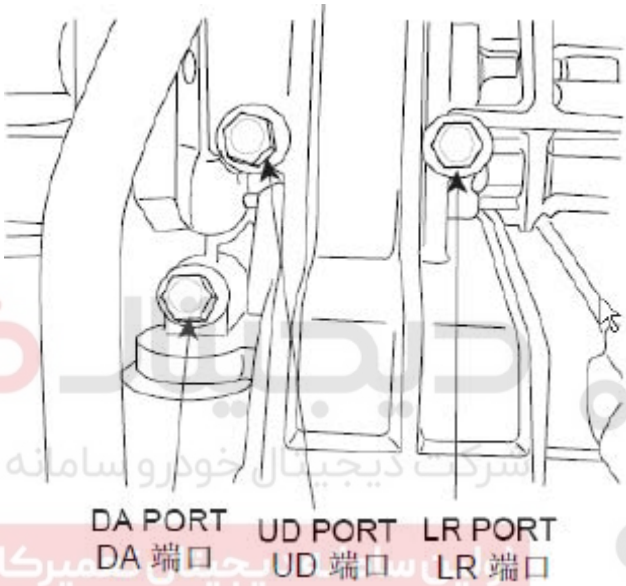
Components inspection
1) Check solenoid valve of the locking clutch
(1) Connect the diagnosis instrument to the diagnosis port
(2) The ignition switch is at “ACC” and the engine is “OFF”
(3) Choose A/T solenoid valve to execute mechanism test and execute mechanism test
(4) Is the mechanism test being executed successfully?

Yes
▶Execute “oil pressure inspection” by the following means

No
▶ Replace the “solenoid valve of locking clutch” as required, and then execute “vehicle maintenance and inspection”

2) Oil pressure inspection



(1) Connect the oil pressure gauge to “DA” port
(2) Start the engine
(3) After connecting the diagnosis instrument, the parameter of “load of solenoid of locking clutch” on the diagnosis instrument
(4) Drive the car at the third or fourth speed to make “load of solenoid of locking clutch” to exceed 35%
Technical requirements: above 2.0～4.6kg/cm^2 (196～451 Kpa, 28.4～65.4 psi) (rotation speed of the engine 2500rpm, load of the solenoid of locking clutch: 50%)
(5) Is the oil pressure in accordance with the technical requirement?

Yes
▶Replace the hydraulic torque converter as required, and then execute “vehicle maintenance and inspection”

No
▶Replace the valve as required, and then execute “vehicle maintenance and inspection”

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.12 DCCV solenoid to accumulator short circuit, open circuit, or to ground short circuit (P0743)

General (refer to DTC P0741)

DTC description
The TCU checks the control signal of locking clutch by monitoring the feedback signal from the driving circuit of solenoid valve. If unexpected signal is detected (for example, higher voltage is detected at lower voltage, or lower voltage is detected at higher voltage). TCU will judge that the solenoid valve circuit of the locking clutch is abnormal and will generate this code.

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DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check voltage range	Solenoid valve of locking clutch failure Short circuit or short TCU failure
Start condition	16V＞VB≥10V The engagement lasts for 500ms from electrification of the relay	
Limit	The feedback voltage from the control solenoid of locking clutch>VB-2V and control load of DCC is 100% (320ms) The feedback voltage from the control solenoid of locking clutch≤5.5V and control load of DCC is 0% (320ms)	
Diagnosis time	More than 320ms	
Failure protection	Lock at the third speed Stop control of the pipe pressure until IG is turned off	

Diagnosis instrument data
1) Connect the diagnosis instrument to the diagnosis port
2)Turn on the engine
3)The parameter of "solenoid valve of locking clutch" on the diagnosis instrument
4)Select "gear D" and make load of the solenoid of the locking clutch to exceed 35%
5)Is the load of solenoid of the locking clutch in accordance with the parameter?

Yes
▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute "vehicle maintenance and inspection".

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No
▶Execute "terminal and connector inspection"

Terminal and connector inspection
1) Many faults in the electrical system are caused by poor wire and terminal. Faults may also be caused by interference/mechanical and chemical damages of the electrical system.
2) Check the connector thoroughly for looseness, poor contact, bending, corrosion, dirt, aging, or damage.
3) Is the problem being found?

Yes
▶Repair or replace as required, and then execute "vehicle maintenance and inspection"

No
▶Execute "power circuit inspection"

Power circuit inspection
1) Connect the "A/T solenoid valve" connector and install the equipments to measure the waveform
2) Start the engine and operate the locking clutch
3) Measure the waveform between the terminal "4" of the sensor wire connector and the chassis ground

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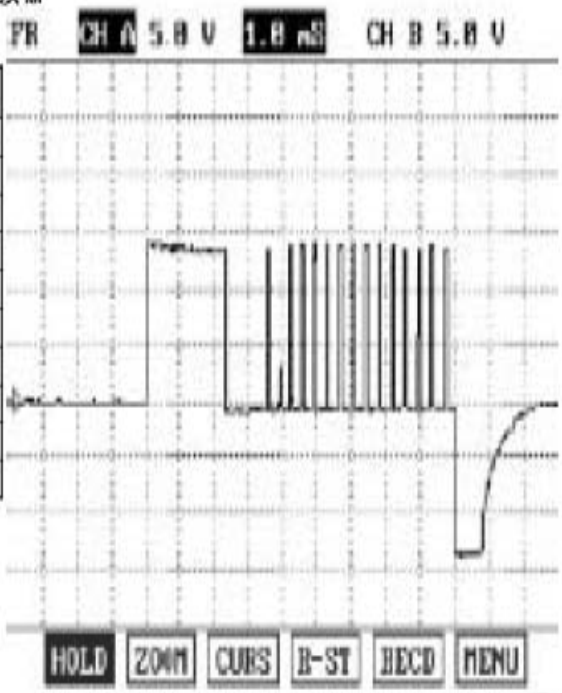
Solenoid Valve 电磁阀

导线束侧连接器

Harness side connector

	T/M CIRCUIT
①	PCSV-A(CC&LR)
②	PCSV-B(2nd&REV)
③	ON/OFF SOL.
④	PCSV-D(DCCV)
⑤	OIL TEMP. SENSOR(+)
⑥	OIL TEMP. SENSOR(-)
⑦	V_SOL1, V_SOL2
⑧	PCSV-C(UD)
⑨	VFS(+)
⑩	VFS(-)



4) Is the operation waveform being measured successfully?

Yes

▶Execute “signal circuit inspection”

No

▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Signal circuit inspection

1) Perform signal circuit open inspection

(1) Turn off the ignition switch

(2) Disconnect the “A/T solenoid valve” connector and the TCU connector

(3) Measure the resistance between terminal “4” of the wire connector of A/T solenoid valve and terminal “66” of the TCU wire connector

Technical requirement: 0Ω

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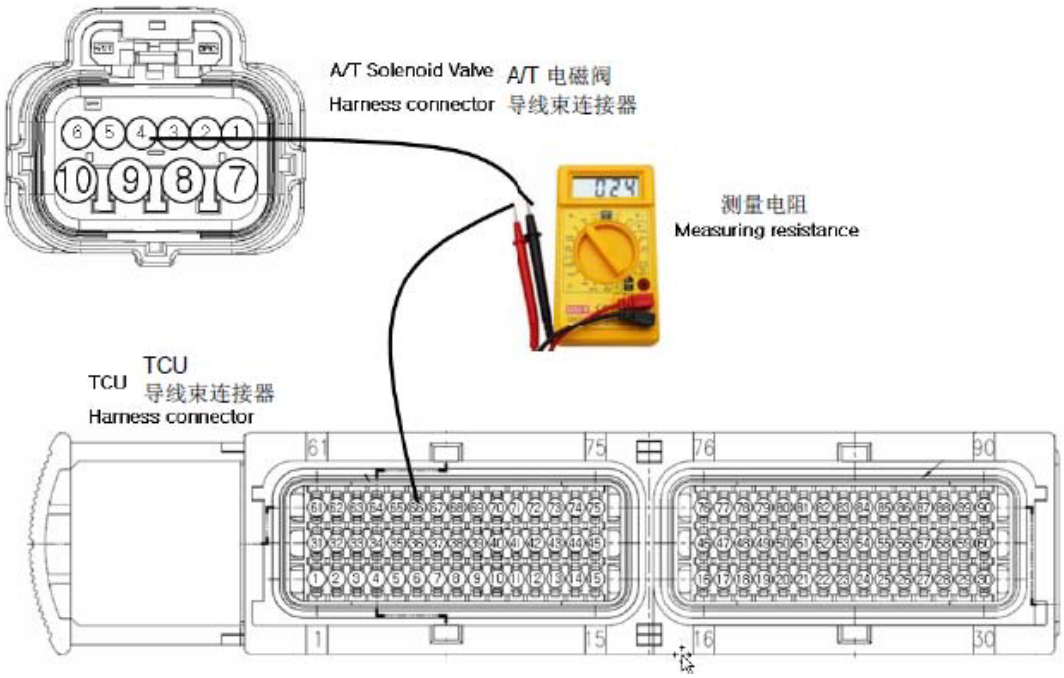


(4) Is the resistance in accordance with the technical requirement?

Yes

▶Execute “signal short circuit inspection”

No

▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

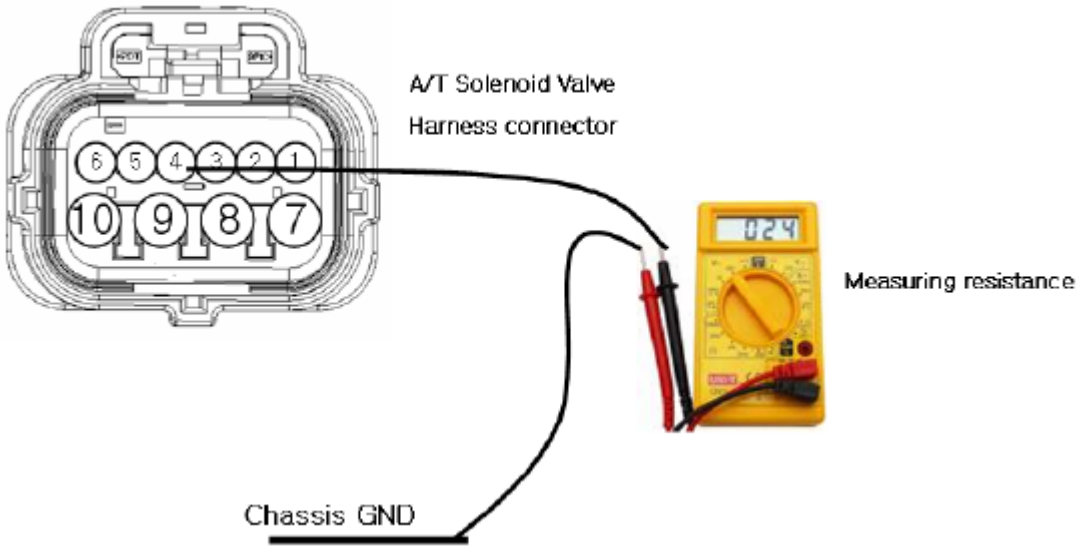
2) Perform signal circuit open inspection

(1) Turn off the ignition switch

(2) Disconnect the “A/T solenoid valve” connector and the TCU connector

(3) Measure the resistance between terminal “4” of the wire connector of A/T solenoid valve and the chassis ground

Technical requirement: infinite



(4) Is the resistance in accordance with the technical requirement?

Yes

▶Execute “components inspection”

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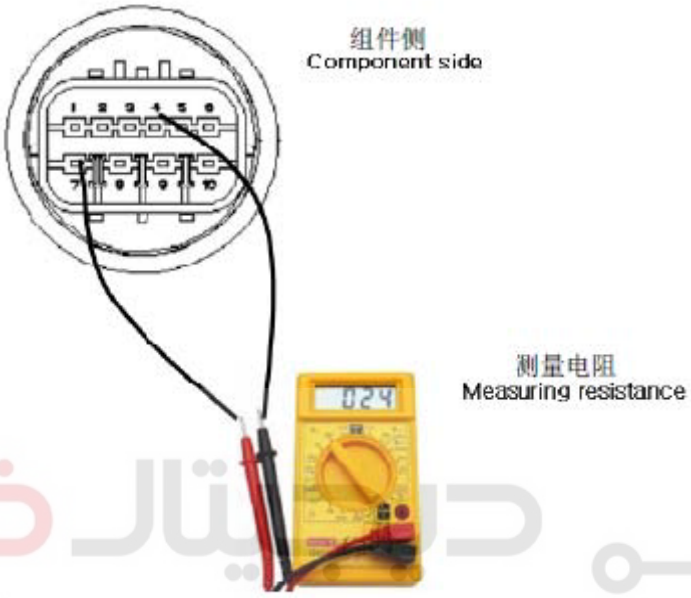
No
▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Components inspection
1) Perform signal circuit open inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector
(3) Measure the resistance between terminal “4” and terminal “7” of the wire connector of A/T solenoid valve
Technical requirement: about 3.5±02Ω[25°C]



(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “TCU inspection” by the following means

No
▶Replace the solenoid valve of locking clutch as required, and then execute “vehicle maintenance and inspection”
2) TCU inspection
(1) Connect the diagnosis instrument to the diagnosis port
(2) The ignition switch is at “ACC” and the engine is “OFF”
(3) Select A/T solenoid to execute mechanism test and execute mechanism test
(4) Is the mechanism test being performed successfully?

Yes
▶Execute “vehicle maintenance and inspection”

No
▶Replace the TCU as required, and then execute “vehicle maintenance and inspection”

Conditions for mechanism test
(1) Ignition switch is at “ACC”
(2) Normal inhibitor switch
(3) Position P
(4) Choker 0%
(5) Vehicle speed 0Km/h
(6) Engine rotation speed 0rpm

Vehicle maintenance and inspection (refer to DTC P0707)

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4.6.13 VFS to accumulator short circuit, open circuit or to ground short circuit (P0748)

General
Variable force solenoid (linear solenoid): since load control of higher frequency (600Hz) is used to replace the current PWN control with lower frequency (60Hz),the slide valve can be controlled accurately
When PWN control is used, the flow of hydraulic oil is determined by the duration of "ON" signal of the repeating ON/OFF signal.
When VFS is used, the flow is determined by the opening extent of slide valve.

DTC description
The TCU checks the control signal of VFS by monitoring the feedback signal from the driving circuit of solenoid valve. If unexpected signal is detected (for example, higher voltage is detected at lower voltage, or lower voltage is detected at higher voltage). TCU will judge that control circuit of the low-speed and reversing solenoid is abnormal and will generate this code.

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check the feedback cycle	Variable force solenoid valve failure Circuit open or short TCU failure
Start condition	VB≥9V 10%<output load≤90%	
Limit	Circuit open or short	
Diagnosis time	More than 320 ms	
Failure protection	Stop the control of pipe pressure until IG is closed	

Diagnosis instrument data
1)Connect the diagnosis instrument to the diagnosis port
2)Turn on the engine
3)The parameter of "VFS valve" on the diagnosis instrument
4)Is the "VFS solenoid load" in accordance with the parameter?

Yes
▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute "vehicle maintenance and inspection".

No
▶Execute "terminal and connector inspection"

Terminal and connector inspection (refer to DTC P0743)

Power circuit inspection
1) Connect the A/T solenoid valve connector and install the equipment to measure the waveform
2) Start the engine and operate VFS valve
3) Measure the waveform between terminal "9" of the wire connector of sensor and the chassis ground

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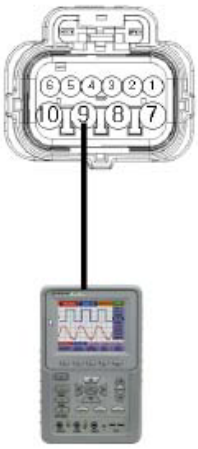
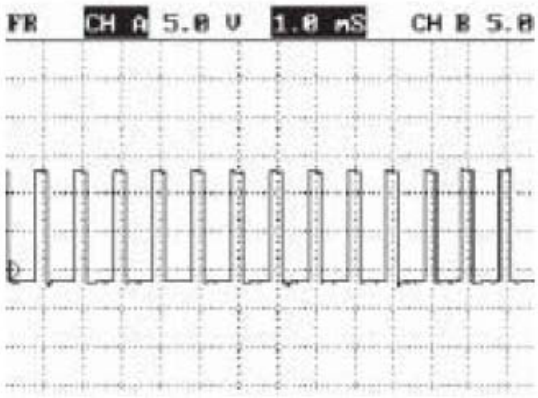


Solenoid Valve 电磁阀
导线束侧连接器
Harness side connector

	T/M CIRCUIT
①	PCSV-A(CO&LR)
②	PCSV-B(2nd&REV)
③	ON/OFF SOL.
④	PCSV-D(DCCV)
⑤	OIL TEMP. SENSOR(+)
⑥	OIL TEMP. SENSOR(-)
⑦	V_SOL1, V_SOL2
⑧	PCSV-C(UD)
⑨	VFS(+)
⑩	VFS(-)



4) Is the operation waveform being measured successfully?

Yes
▶Execute “signal short circuit inspection”

No
▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Signal circuit inspection
1) Perform signal circuit open inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector and the TCU connector
(3) Measure the resistance between terminal “4” of the wire connector of A/T solenoid valve and terminal “74” of the TCU wire connector
Technical requirement: 0Ω

(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “signal short circuit inspection”

No
▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

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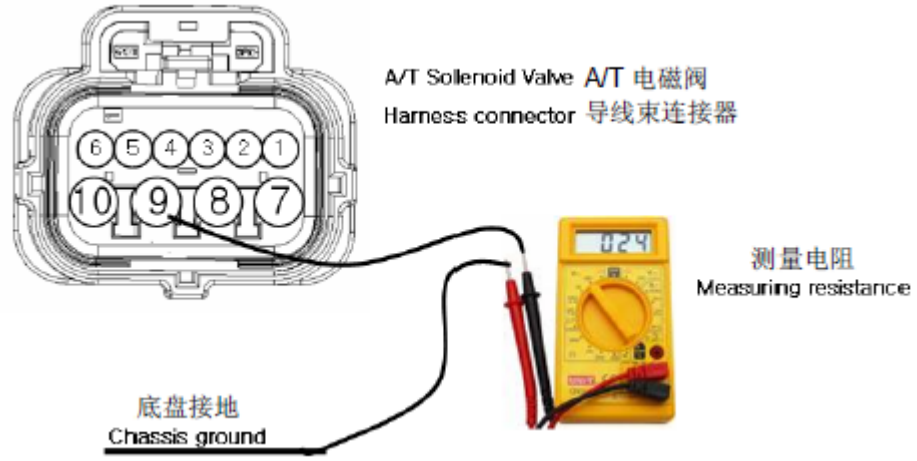
2) Perform signal short circuit inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector and the TCU connector
(3) Measure the resistance between terminal “9” of the wire connector of A/T solenoid valve and the chassis ground
Technical requirement: infinite

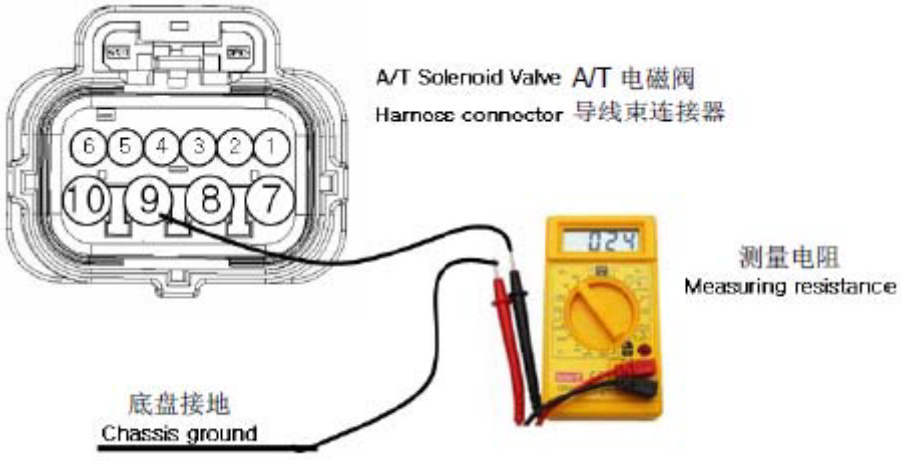


(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “signal circuit inspection”

No
▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

3) Perform signal circuit ground inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector and the TCU connector
(3) Measure the resistance between terminal “10” of the wire connector of A/T solenoid valve and the chassis ground
Technical requirement: 0Ω



(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “components inspection”

No
▶Check the wire for ground short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

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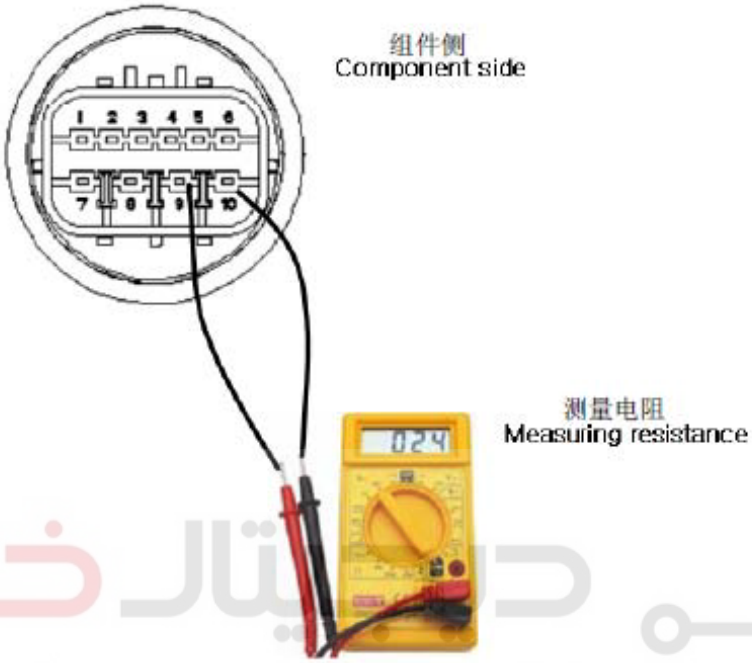
Components inspection
1) Solenoid valve inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector
(3) Measure the resistance between terminal “9” and terminal “10” of the wire connector of A/T solenoid valve
Technical requirement: about 3.5±0.2Ω[25°C]



(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “TCU inspection” by the following means

No
▶Replace the VFS as required, and then execute “vehicle maintenance and inspection”

2) TCU inspection
(1) Connect the diagnosis instrument to the diagnosis port
(2) The ignition switch is at “ACC” and the engine is “OFF”
(3) Select A/T solenoid to execute mechanism test and execute mechanism test
(4) Is the operation noise being heard when executing mechanism test function with the VFS valve?

Yes
▶Execute “vehicle maintenance and inspection”

No
▶Replace the TCU as required, and then execute “vehicle maintenance and inspection”

Conditions for mechanism test
(1) Ignition switch is at “ACC”
(2) Normal inhibitor switch
(3) Position P
(4) Choker 0%
(5) Vehicle speed 0Km/h
(6) Engine rotation speed 0rpm

Vehicle maintenance and inspection (refer to DTC P0707)

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4.6.14 OD and LR solenoid to accumulator short circuit, short circuit or to ground short circuit (P0750)

General

The automatic transmission case uses the clutch and brake (controlled by solenoid valve) to shift gears of the transmission case. 4F16 A/T includes: OD and LR, 2 gears, and REV, UD, and ON/OFF solenoid.

DTC description

The TCU checks the overdrive gear and low-speed and reversing gear control by monitoring the feedback signal from the driving circuit of solenoid valve. If unexpected signal is detected (for example, higher voltage is detected at lower voltage, or lower voltage is detected at higher voltage). TCU will judge that control circuit of the overdrive gear and low-speed and reversing gear solenoid is abnormal and will generate this code.

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check the feedback cycle	OD and LR solenoid valves failure Circuit open or short TCU failure
Start condition	16V＞VB≥10V The engagement lasts for 500ms from electrification of the relay	
Limit	The feedback voltage from the OD and LR control solenoids>VB-2V and control load of OD and LR is 0% (320ms) The feedback voltage from the OD and LR control solenoids≤5.5V and control load of OD and LR is 100%	
Diagnosis time	More than 320ms	
Failure protection	Lock at the third speed Stop control of the pipe pressure until IG is turned off	

Diagnosis instrument data

1)Connect the diagnosis instrument to the diagnosis port

2)Turn on the engine

3)The parameter of “OD and LR solenoid valve” on the diagnosis instrument

4) Shift to each gear

Technical requirements: the second speed 100%, the third speed 0%

5)Is the “load of OD and LR solenoid” in accordance with the parameter?

Yes

▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

No

▶Execute “terminal and components inspection”

Terminal and connector inspection (refer to DTC P0743)

Power circuit inspection

1) Connect the “A/T solenoid valve” connector and install the equipments to measure the waveform

2) Start the engine and operate the OD and LR solenoid valve

3) Measure the waveform between the terminal “1” of the sensor wire connector and the chassis ground

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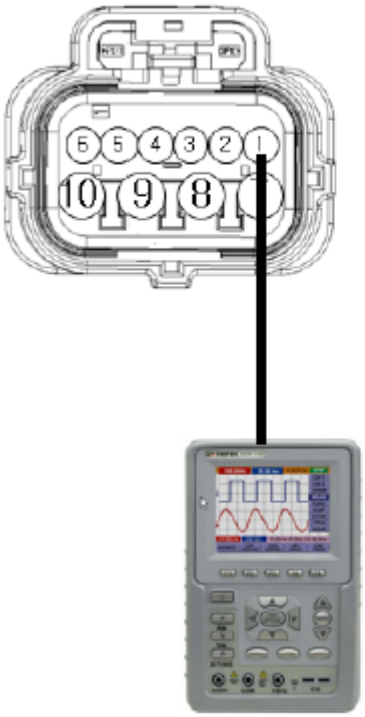
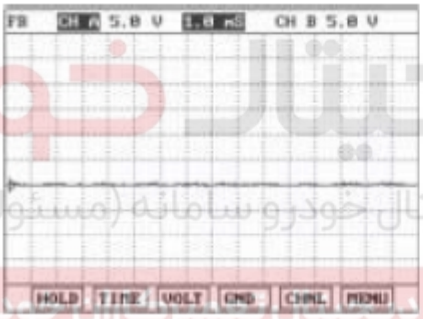


Solenoid Valve 电磁阀

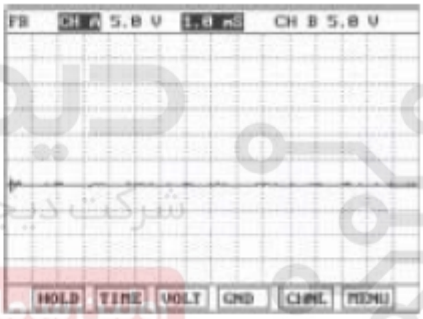
导线束侧连接器

Harness side connector

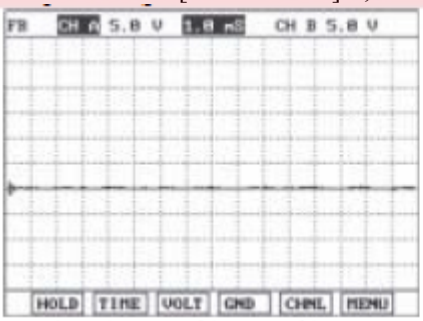
	T/M CIRCUIT
①	PCSV-A(OD&LR)
②	PCSV-B(2nd&REV)
③	ON/OFF SOL.
④	PCSV-D(DCCV)
⑤	OIL TEMP. SENSOR(+)
⑥	OIL TEMP. SENSOR(-)
⑦	V_SOL1, V_SOL2
⑧	PCSV-C(UD)
⑨	VFS(+)
⑩	VFS(-)



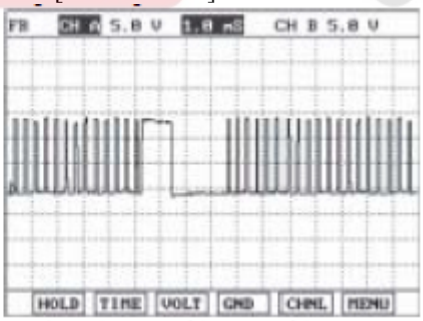
[Illustration 1] P, N



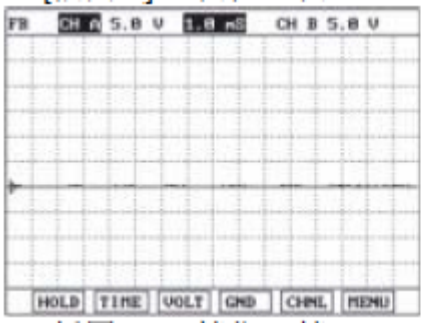
[Illustration 2] R



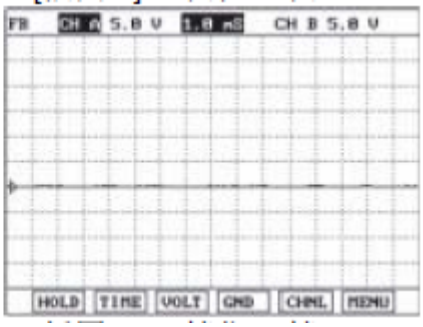
[Illustration 3] first speed of gear D



[Illustration 4] second speed of gear D



[Illustration 5] third speed of gear D



[Illustration 6] fourth speed of gear D

4) Is the operation waveform being measured successfully?

Yes

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▶Execute “signal circuit inspection”

No

▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Signal circuit inspection

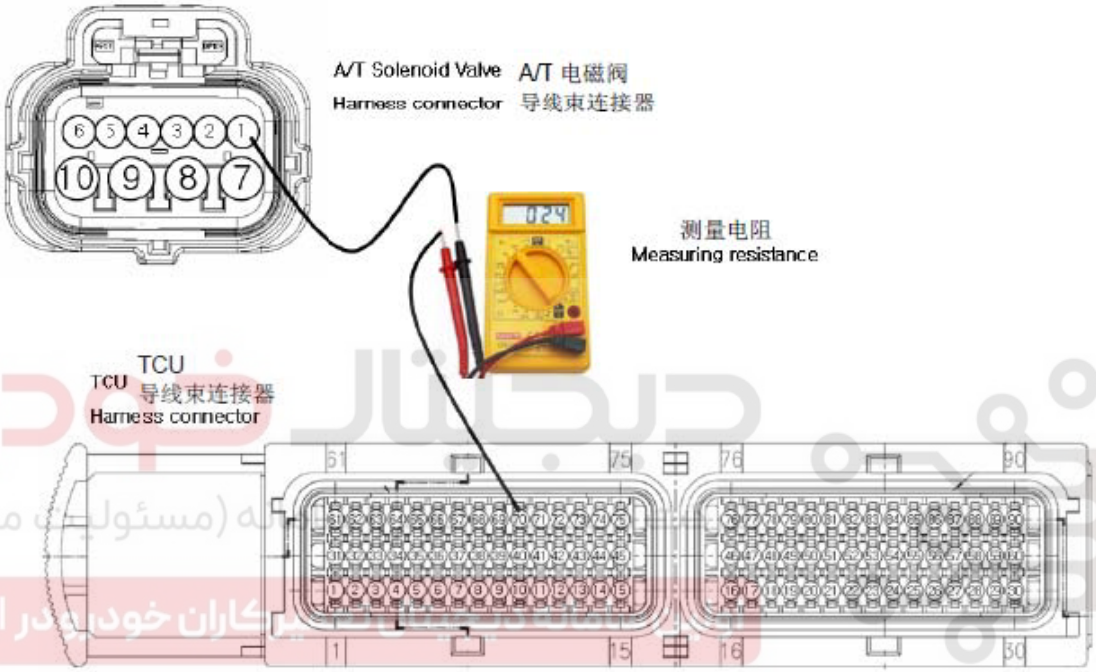
1) Perform signal circuit open inspection

(1) Turn off the ignition switch

(2) Disconnect the “A/T solenoid valve” connector and the TCU connector

(3) Measure the resistance between terminal “1” of the wire connector of A/T solenoid valve and terminal “70” of the TCU wire connector

Technical requirement: 0Ω



(4) Is the resistance in accordance with the technical requirement?

Yes

▶Execute “signal short circuit inspection”

No

▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

2) Perform signal short circuit inspection

(1) Turn off the ignition switch

(2) Disconnect the “A/T solenoid valve” connector and the TCU connector

(3) Measure the resistance between terminal “1” of the wire connector of A/T solenoid valve and the chassis ground

Technical requirement: infinite

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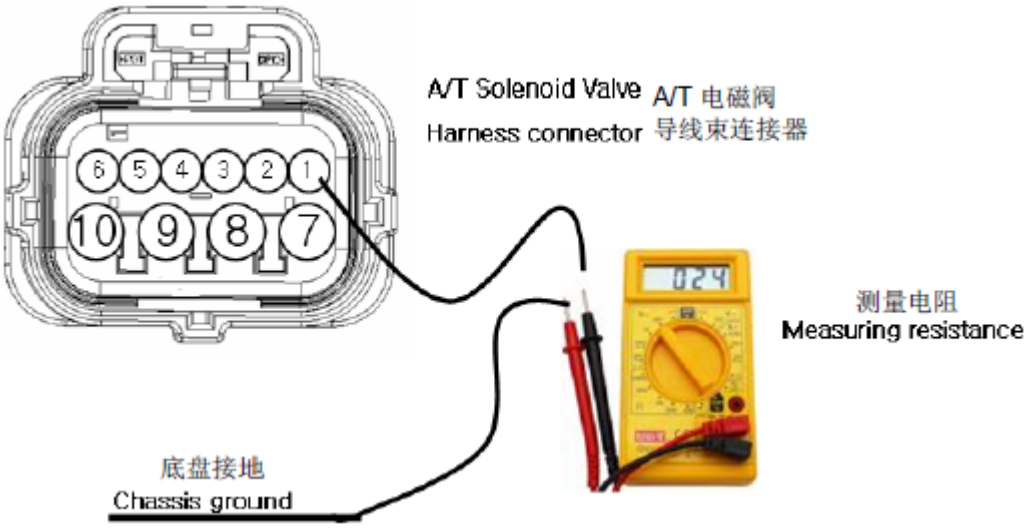
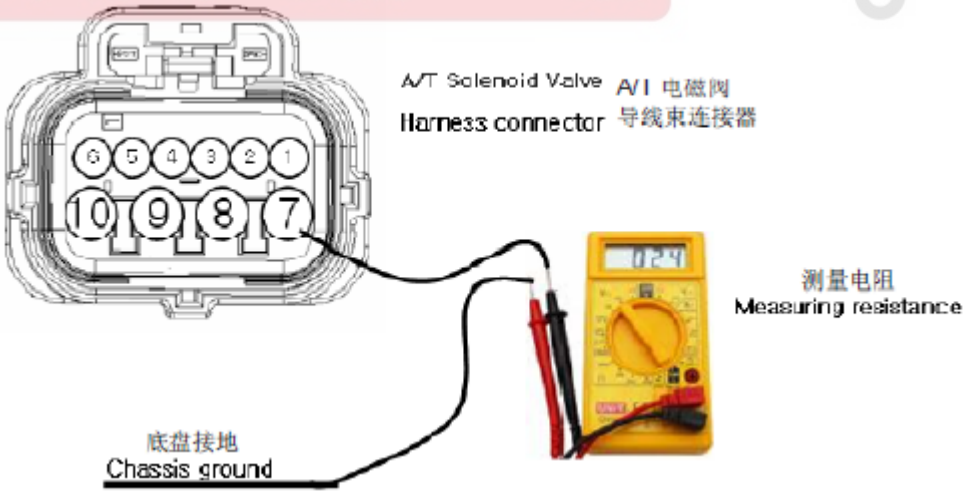


(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “signal circuit inspection”

No
▶Check the wire for ground short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

3) Perform signal circuit ground inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector and the TCU connector
(3) Measure the resistance between terminal “7” of the wire connector of A/T solenoid valve and the chassis ground
Technical requirement: 0Ω



(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “components inspection”

No
▶Check the wire for ground short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Components inspection
1) Solenoid valve inspection

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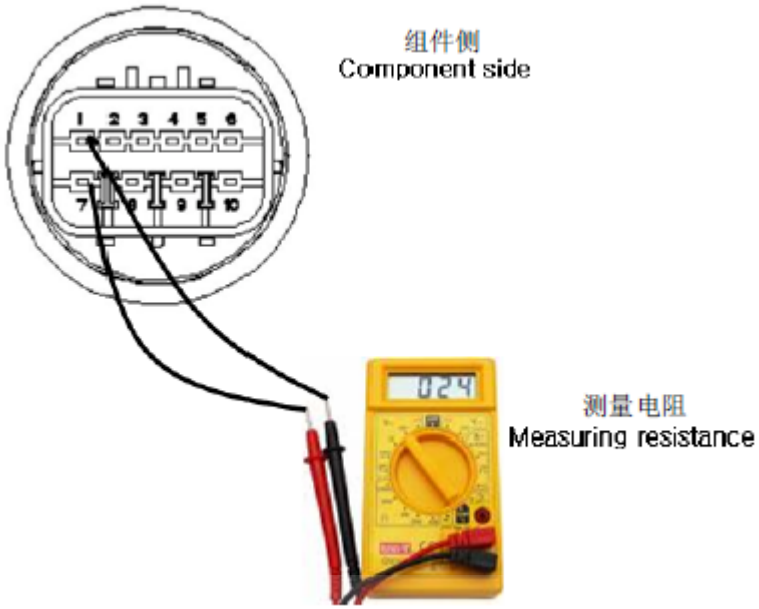
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector
(3) Measure the resistance between terminal “1” and terminal “7” of the wire connector of A/T solenoid valve
Technical requirement: about 3.5±02Ω[25°C]



(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “TCU inspection” by the following means

No
▶Replace the OD and LR solenoid valves, and then execute “vehicle maintenance and inspection”
2) TCU inspection
(1) Connect the diagnosis instrument to the diagnosis port
(2) The ignition switch is at “ACC” and the engine is “OFF”
(3) Select A/T solenoid to execute mechanism test and execute mechanism test
(4) Is the mechanism test being performed successfully?

Yes
▶Execute “vehicle maintenance and inspection”

No
▶Replace the TCU as required, and then execute “vehicle maintenance and inspection”

Conditions for mechanism test
(1) Ignition switch is at “ACC”
(2) Normal inhibitor switch
(3) Position P
(4) Choker 0%
(5) Vehicle speed 0Km/h
(6) Engine rotation speed 0rpm

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.15 UD solenoid to accumulator short circuit, open circuit, or to ground short circuit (P0755)

General (DTC P0750)

DTC description
The TCU checks the low-speed gear clutch control signal by monitoring the feedback signal from the driving circuit of solenoid valve. If unexpected signal is detected (for example, higher voltage is detected at lower voltage,

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or lower voltage is detected at higher voltage). TCU will judge that circuit of driving control solenoid circuit of the low-speed gear clutch is abnormal and will generate this code.

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check the voltage range	UD solenoid valve failure Circuit open or short TCU failure
Start condition	16V＞VB≥10V The engagement lasts for 500ms from electrification of the relay	
Limit	The feedback voltage from the UD control solenoid>VB-2V and control load of UD is 0% (320ms) The feedback voltage from the UD control solenoids≤5.5V and control load of UD is 100%	
Diagnosis time	More than 320ms	
Failure protection	Lock at the third speed Stop control of the pipe pressure until IG is turned off	

Diagnosis instrument data
1)Connect the diagnosis instrument to the diagnosis port
2)Turn on the engine
3)The parameter of “UD solenoid valve” on the diagnosis instrument
4) Shift to each gear
Technical requirements: the third speed 0%, the fourth speed 100%
5)Is the “load of UD solenoid” in accordance with the parameter?

Yes

▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

No

▶Execute “terminal and connector inspection”

Terminal and connector inspection (refer to DTC P0743)

Power circuit inspection
1) Connect the “A/T solenoid valve” connector and install the equipments to measure the waveform
2) Start the engine and operate the UD solenoid valve
3) Measure the waveform between the terminal “8” of the sensor wire connector and the chassis ground

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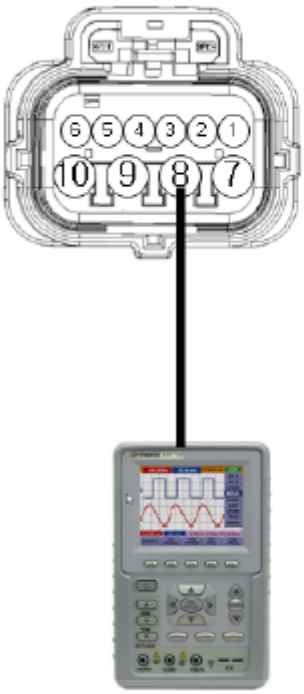
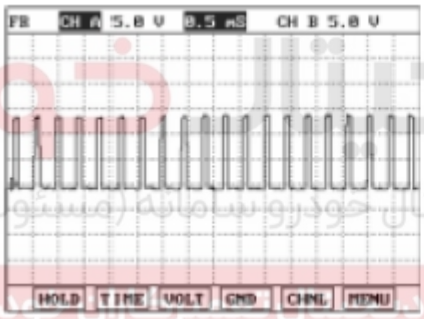
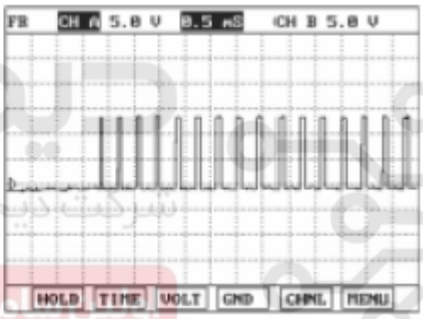


Solenoid Valve 电磁阀
导线束侧连接器
Harness side connector

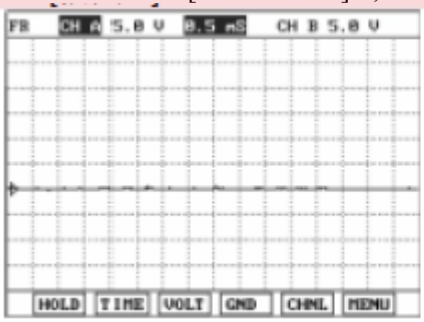
	T/M CIRCUIT
①	PCSV-A(CD&LR)
②	PCSV-B(2nd&REV)
③	ON/OFF SOL.
④	PCSV-D(DCCV)
⑤	OIL TEMP. SENSOR(+)
⑥	OIL TEMP. SENSOR(-)
⑦	V_SOL1, V_SOL2
⑧	PCSV-C(UD)
⑨	VFS(+)
⑩	VFS(-)



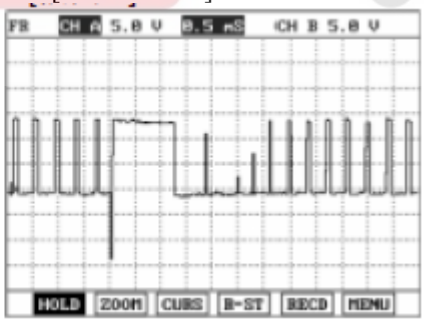
[Illustration 1] P, N



[Illustration 2] R



[Illustration 3] first to third speed of gear D



[Illustration 4] fourth speed of gear D

4) Is the operation waveform being measured successfully?

Yes
▶Execute “signal circuit inspection”

No
▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Signal circuit inspection
1) Perform signal circuit open inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector and the TCU connector
(3) Measure the resistance between terminal “8” of the wire connector of A/T solenoid valve and terminal “86” of the TCU wire connector

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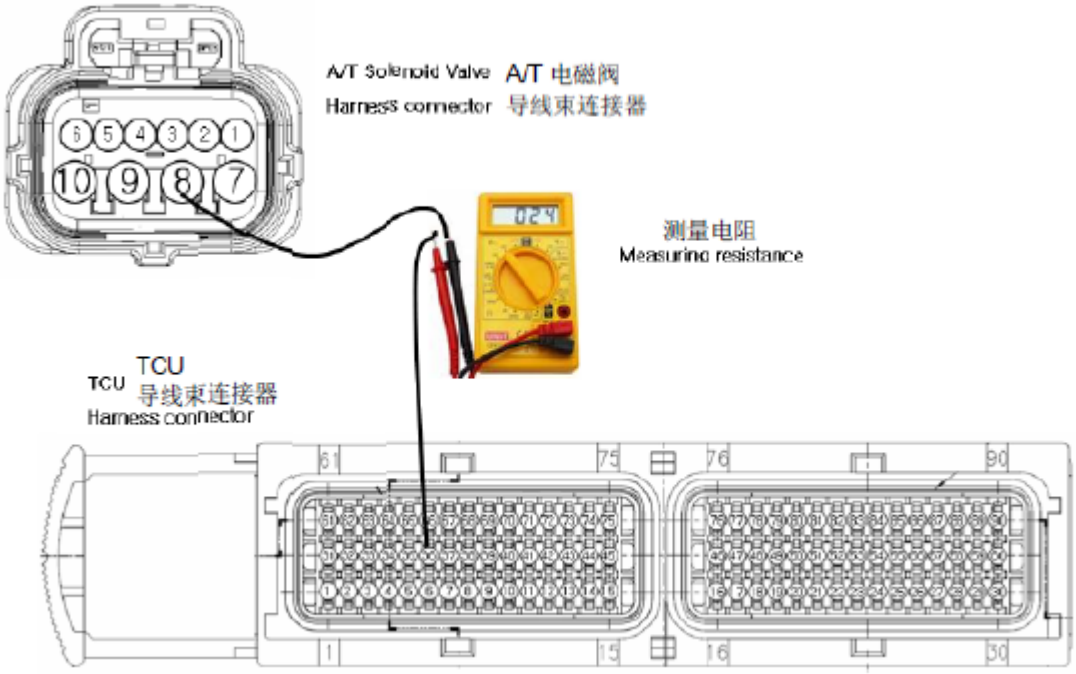
Technical requirement: 0Ω



(4) Is the resistance in accordance with the technical requirement?

Yes

▶Execute “signal short circuit inspection”

No

▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

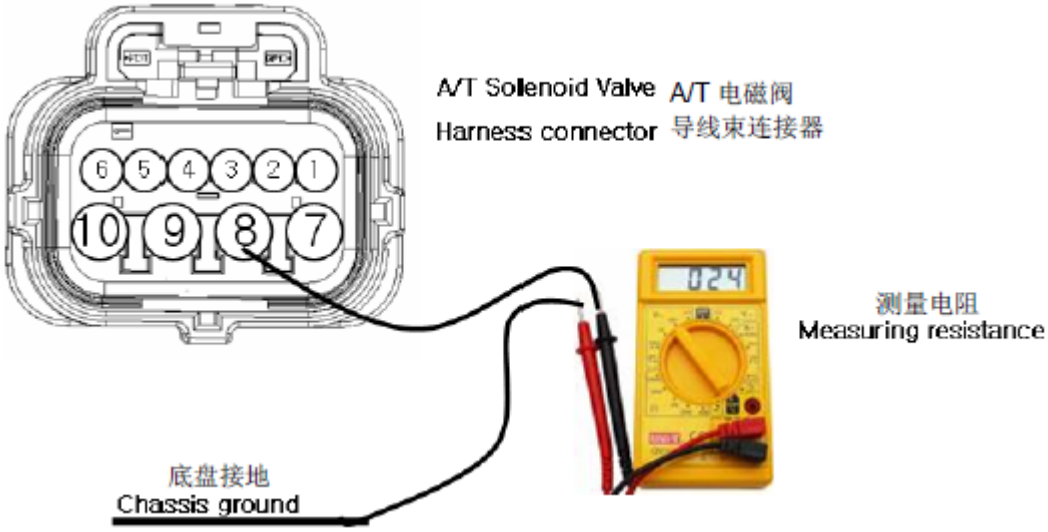
2) Perform signal short circuit inspection

(1) Turn off the ignition switch

(2) Disconnect the “A/T solenoid valve” connector and the TCU connector

(3) Measure the resistance between terminal “8” of the wire connector of A/T solenoid valve and the chassis ground

Technical requirement: infinite



(4) Is the resistance in accordance with the technical requirement?

Yes

▶Execute “signal circuit inspection”

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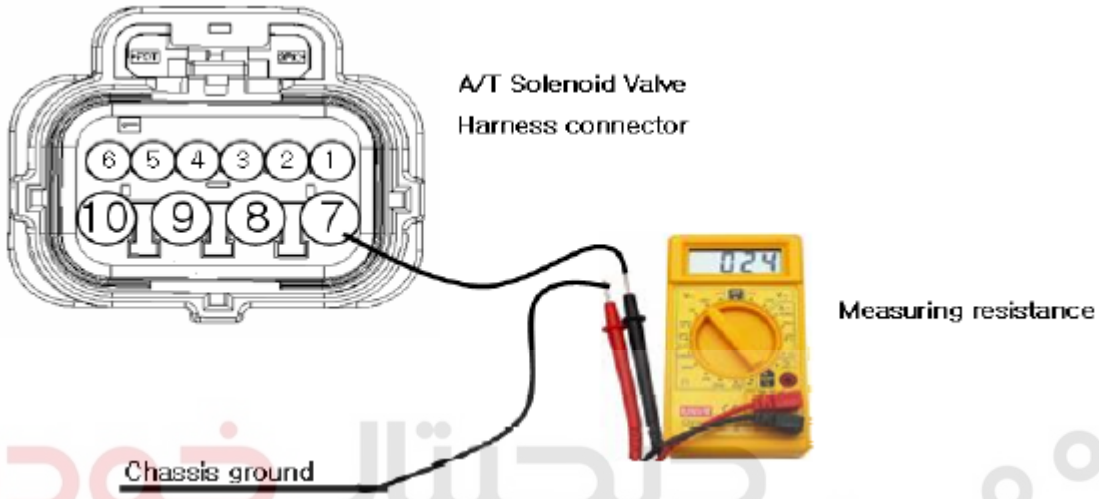
No
▶Check the wire for ground short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

3) Perform signal circuit ground inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector and the TCU connector
(3) Measure the resistance between terminal “7” of the wire connector of A/T solenoid valve and the chassis ground
Technical requirement: 0Ω



(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “components inspection”

No
▶Check the wire for ground short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Components inspection
1) Solenoid valve inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector
(3) Measure the resistance between terminal “7” and terminal “8” of the wire connector of A/T solenoid valve
Technical requirement: about 3.5±02Ω[25°C]

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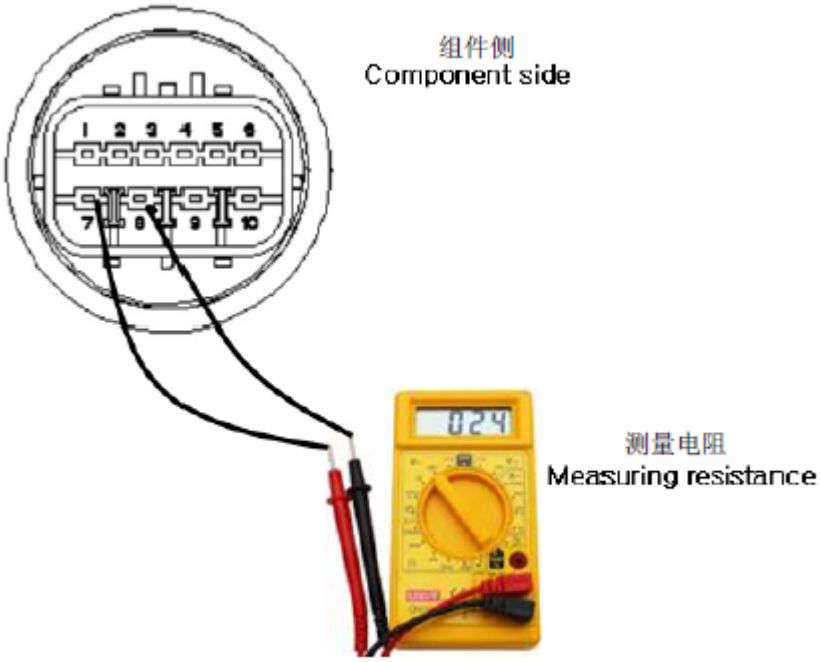

(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “TCU inspection” by the following means

No
▶Replace the UD solenoid valve as required, and then execute “vehicle maintenance and inspection”
2) TCU inspection
(1) Connect the diagnosis instrument to the diagnosis port
(2) The ignition switch is at “ACC” and the engine is “OFF”
(3) Select A/T solenoid to execute mechanism test and execute mechanism test
(4) Is the mechanism test being performed successfully?

Yes
▶Execute “vehicle maintenance and inspection”

No
▶Replace the TCU as required, and then execute “vehicle maintenance and inspection”

Conditions for mechanism test
(1) Ignition switch is at “ACC”
(2) Normal inhibitor switch
(3) Position P
(4) Choker 0%
(5) Vehicle speed 0Km/h
(6) Engine rotation speed 0rpm

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.16 Second speed and REV solenoid to accumulator short circuit, open circuit, or to ground short circuit (P0760)

General (refer to DTC P0750)

DTC description
The TCU checks the driving control signal of the second speed brake and reversing clutch by monitoring the feedback signal from the driving circuit of solenoid valve. If unexpected signal is detected (for example, higher voltage is detected at lower voltage, or lower voltage is detected at higher voltage). TCU will judge that circuit of

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driving control solenoid circuit of the second speed brake and reversing clutch is abnormal and will generate this code.

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check the voltage range	Second speed and REV solenoid valve failure Circuit open or short TCU failure
Start condition	16V＞VB≥10V The engagement lasts for 500ms from electrification of the relay	
Limit	The feedback voltage from the second speed control solenoid>VB-2V and control load of the second speed is 0% The feedback voltage from the second speed control solenoid≤5.5V and control load of the second speed is 100%	
Diagnosis time	More than 320ms	
Failure protection	Lock at the third speed Stop control of the pipe pressure until IG is turned off	

Diagnosis instrument data
1)Connect the diagnosis instrument to the diagnosis port
2)Turn on the engine
3)The parameter of “second speed and REV solenoid valve” on the diagnosis instrument
4) Shift to each gear
Technical requirements: the first speed 100%, the second speed 0%

5)Is the “load of the second speed and REV solenoid” in accordance with the parameter?

Yes

▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

No

▶Execute “terminal and connector inspection”

Terminal and connector inspection (refer to DTC P0743)

Power circuit inspection
1) Connect the “A/T solenoid valve” connector and install the equipments to measure the waveform.
2) Start the engine and operate the second speed and REV solenoid valves.
3) Measure the waveform between the terminal “2” of the sensor wire connector and the chassis ground.

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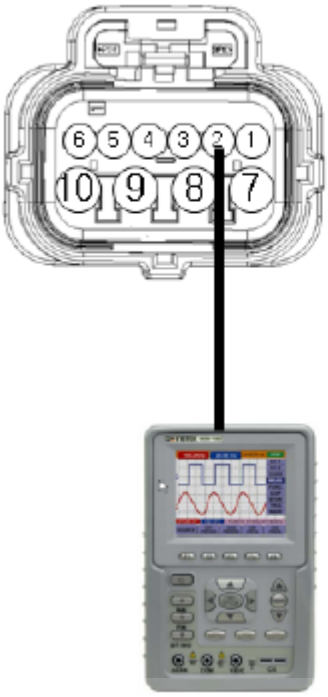
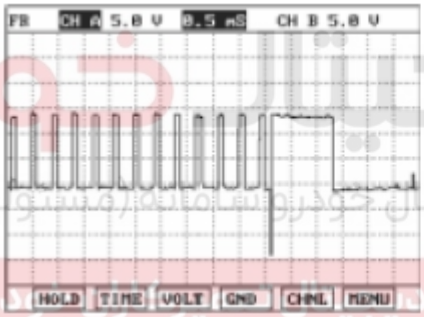
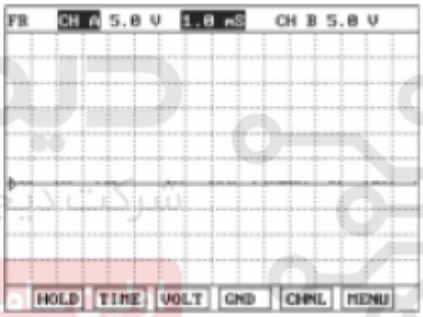


Solenoid Valve 电磁阀
导线束侧连接器
Harness side connector

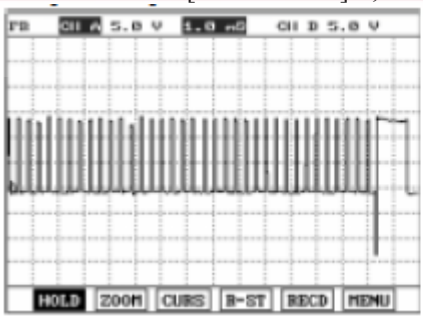
	T/M CIRCUIT
①	PCSV-A(OD&LR)
②	PCSV-B(2nd&REV)
③	ON/OFF SOL.
④	PCSV-D(DCCV)
⑤	OIL TEMP. SENSOR(+)
⑥	OIL TEMP. SENSOR(-)
⑦	V_SOL1, V_SOL2
⑧	PCSV-C(UD)
⑨	VFS(+)
⑩	VFS(-)



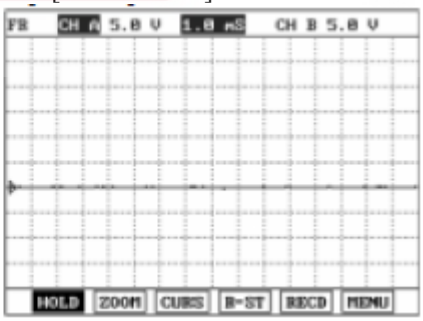
[Illustration 1] P, N



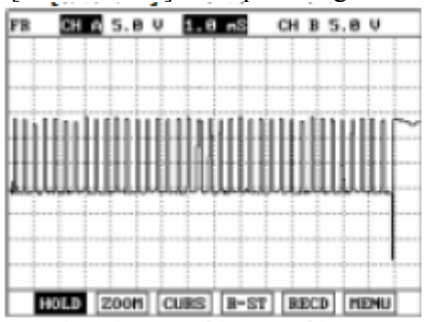
[Illustration 2] R



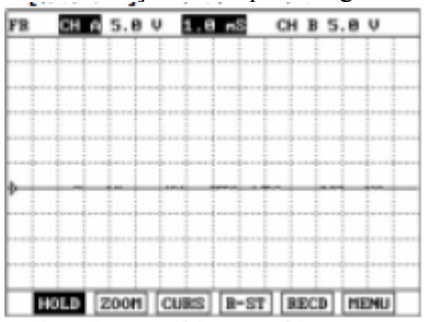
[Illustration 3] first speed of gear D



[Illustration 4] second speed of gear D



[Illustration 5] third speed of gear D



[Illustration 6] fourth speed of gear D

4) Is the operation waveform being measured successfully?

Yes

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▶Execute “signal circuit inspection”

No

▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Signal circuit inspection

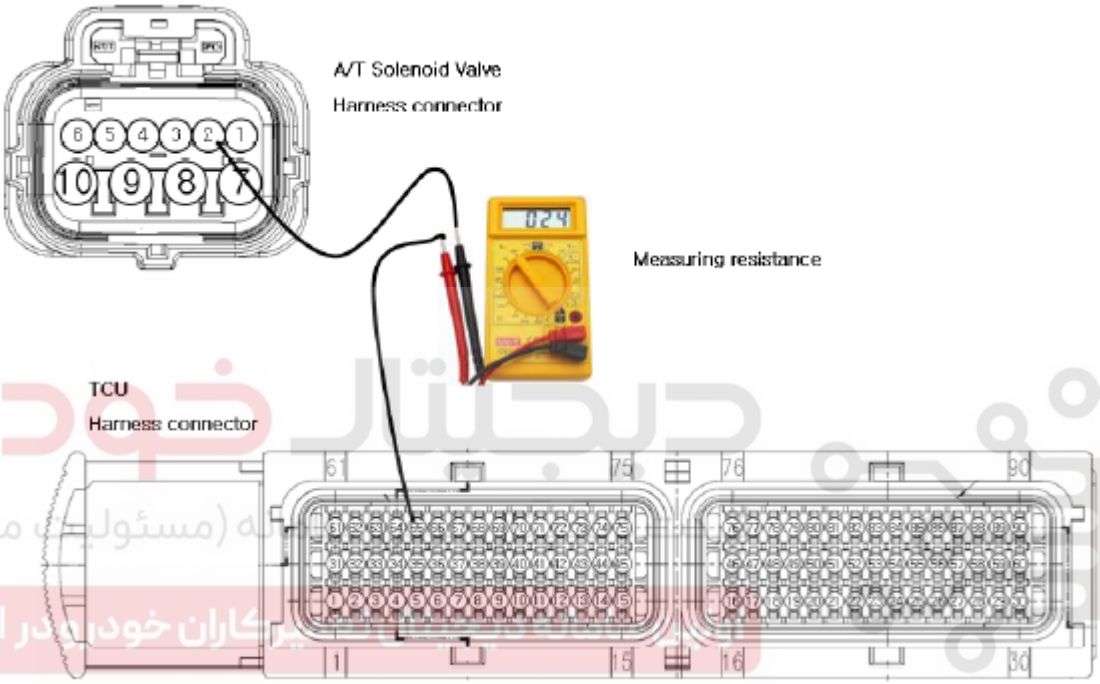
1) Perform signal circuit open inspection

(1) Turn off the ignition switch

(2) Disconnect the “A/T solenoid valve” connector and the TCU connector

(3) Measure the resistance between terminal “2” of the wire connector of A/T solenoid valve and terminal “65” of the TCU wire connector

Technical requirement: 0Ω



(4) Is the resistance in accordance with the technical requirement?

Yes

▶Execute “signal short circuit inspection”

No

▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

2) Perform signal short circuit inspection

(1) Turn off the ignition switch

(2) Disconnect the “A/T solenoid valve” connector and the TCU connector

(3) Measure the resistance between terminal “2” of the wire connector of A/T solenoid valve and the chassis ground

Technical requirement: infinite

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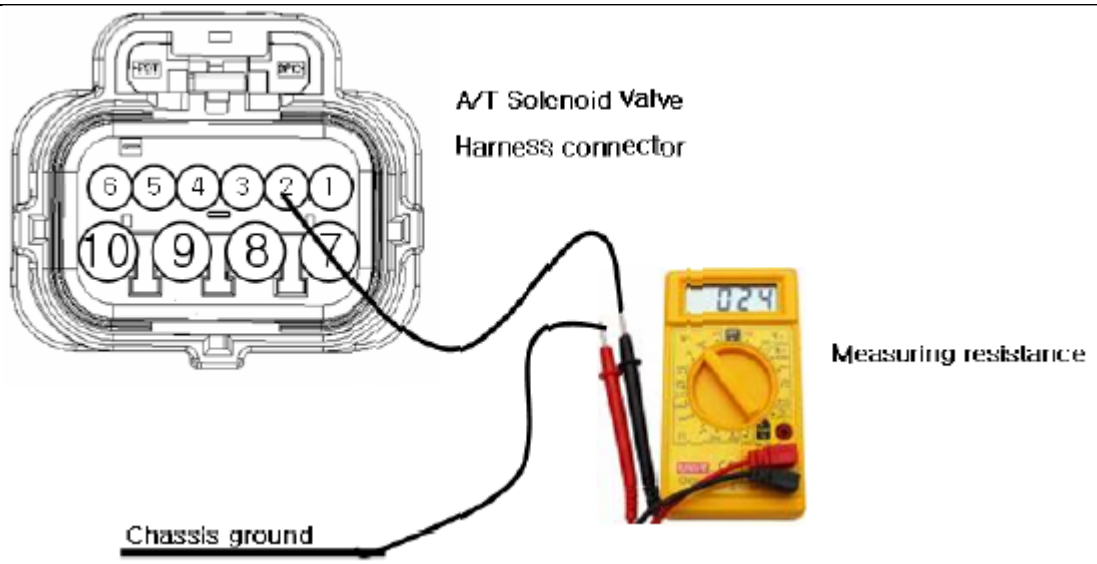


(4) Is the resistance in accordance with the technical requirement?

Yes

▶Execute “signal circuit inspection”

No

▶Check the wire for ground short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

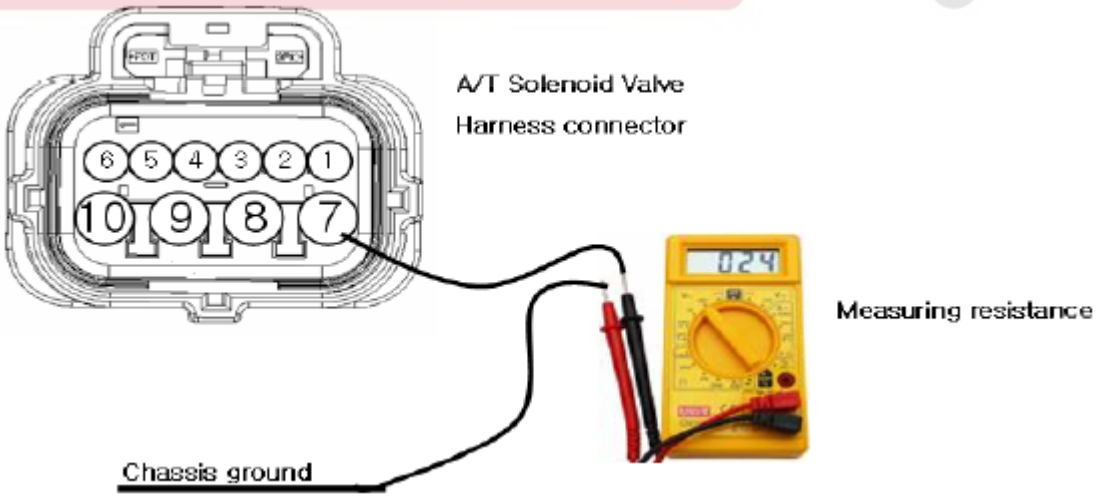
3) Perform signal circuit ground inspection

(1) Turn off the ignition switch

(2) Disconnect the “A/T solenoid valve” connector and the TCU connector

(3) Measure the resistance between terminal “7” of the wire connector of A/T solenoid valve and the chassis ground

Technical requirement: 0Ω



(4) Is the resistance in accordance with the technical requirement?

Yes

▶Execute “components inspection”

No

▶Check the wire for ground short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Components inspection

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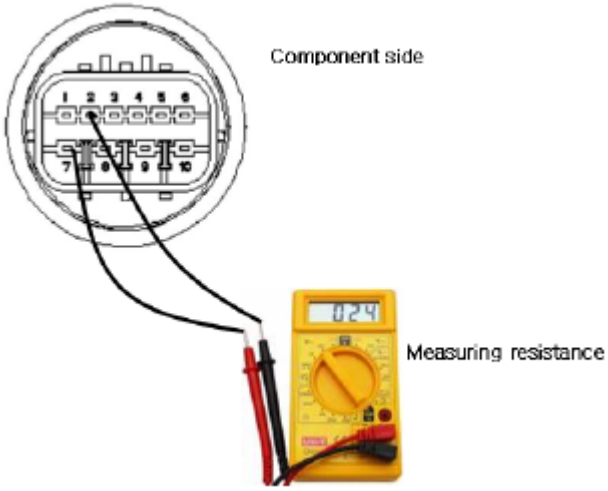
1) Solenoid valve inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector
(3) Measure the resistance between terminal “2” and terminal “7” of the wire connector of A/T solenoid valve
Technical requirement: about 3.5±02Ω[25°C]



(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “TCU inspection” by the following means

No
▶Replace the second speed solenoid valve as required, and then execute “vehicle maintenance and inspection”
2) TCU inspection
(1) Connect the diagnosis instrument to the diagnosis port
(2) The ignition switch is at “ACC” and the engine is “OFF”
(3) Select A/T solenoid
(4) Is the mechanism test being performed successfully?

Yes
▶Execute “vehicle maintenance and inspection”

No
▶Replace the TCU as required, and then execute “vehicle maintenance and inspection”

Conditions for mechanism test
(1) Ignition switch is at “ACC”
(2) Normal inhibitor switch
(3) Position P
(4) Choker 0%
(5) Vehicle speed 0Km/h
(6) Engine rotation speed 0rpm

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.17 On/off solenoid to accumulator short circuit, open circuit, or to ground short circuit (P0765)

General (refer to DTC P0750)

DTC description
The TCU checks the ON/OFF control signal by monitoring the feedback signal from the driving circuit of solenoid valve. If unexpected signal is detected (for example, higher voltage is detected at lower voltage, or lower voltage is detected at higher voltage). TCU will judge that control circuit of the ON/OFF solenoid is abnormal and will generate this code.

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DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check the voltage range	ON/OFF solenoid failure Circuit open or short TCU failure
Start condition	16V＞VB≥10V The engagement lasts for 500ms from electrification of the relay	
Limit	The feedback voltage from the ON/OFF control solenoid>VB-2V and ON/OFF control load is 0% The feedback voltage from the ON/OFF control solenoid≤5.5V and ON/OFF control load is 100%	
Diagnosis time	More than 320ms	
Failure protection	Lock at the third speed Stop control of the pipe pressure until IG is turned off	

Diagnosis instrument data
1)Connect the diagnosis instrument to the diagnosis port
2)Turn on the engine
3)The parameter of “ON/OFF solenoid valve” on the diagnosis instrument
4) Shift to each gear
Technical requirements: the first speed 100%, the second speed 0%

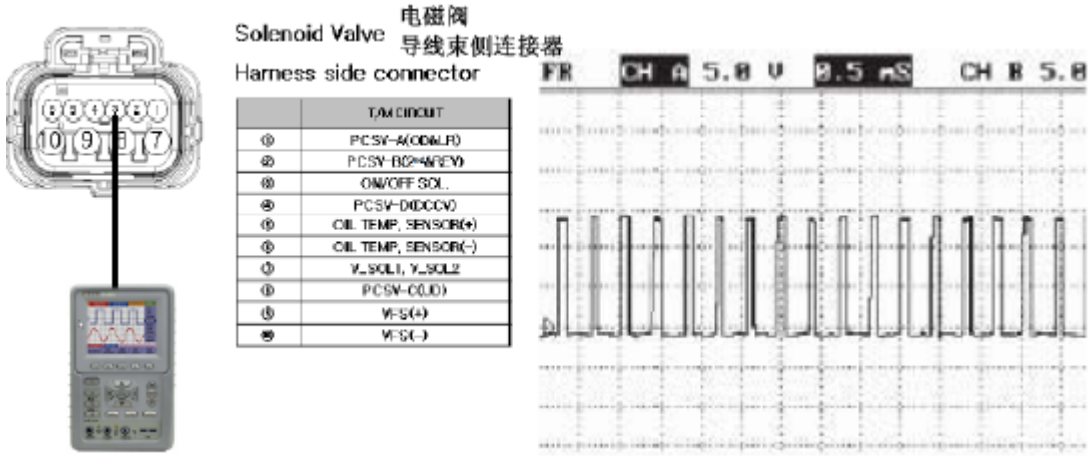
5)Is the “load of ON/OFF solenoid” in accordance with the parameter?

Yes
▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

No
▶Execute “terminal and connector inspection”

Terminal and connector inspection (refer to DTC P0743)

Power circuit inspection
1) Connect the A/T solenoid valve connector and install the equipments to measure the waveform.
2) Start the engine and operate the ON/OFF solenoid valves.
3) Measure the waveform between the terminal “3” of the sensor wire connector and the chassis ground.



4) Is the operation waveform being measured successfully?

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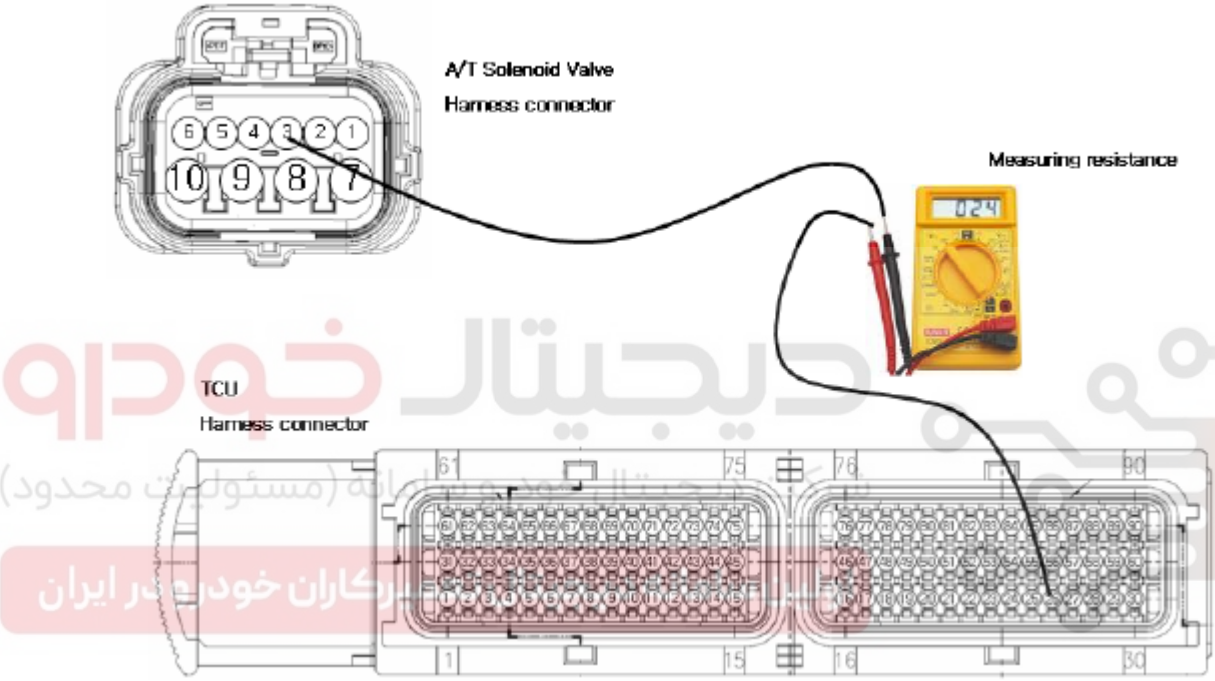
Yes
▶Execute “signal circuit inspection”

No
▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Signal circuit inspection
1) Perform signal circuit open inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector and the TCU connector
(3) Measure the resistance between terminal “3” of the wire connector of A/T solenoid valve and terminal “26” of the TCU wire connector
Technical requirement: 0Ω

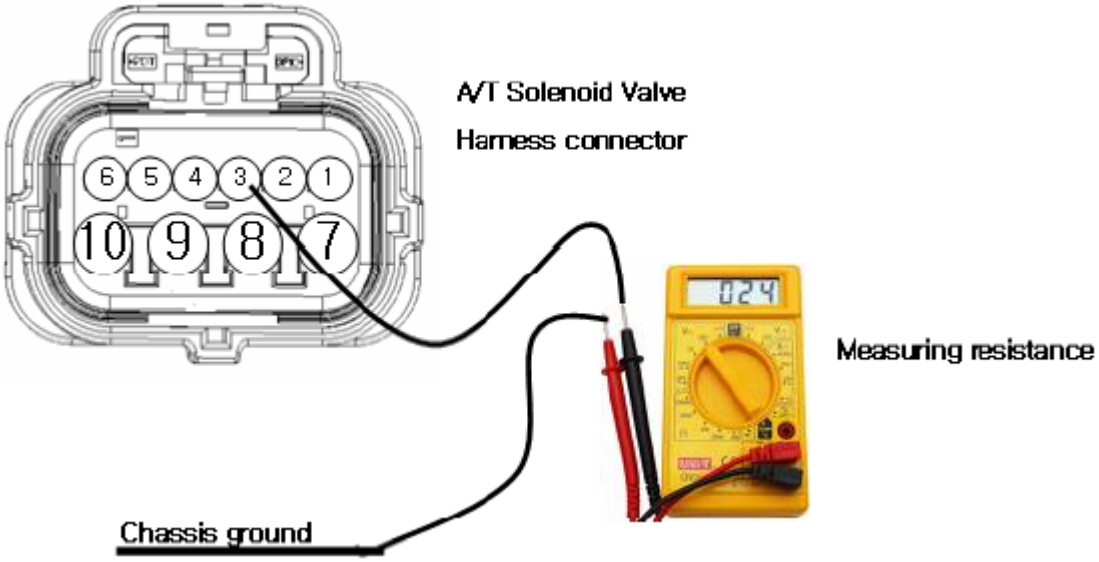


(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “signal short circuit inspection”

No
▶Check the wire for open circuit and repair it as required, and then execute “vehicle maintenance and inspection”

2) Perform signal short circuit inspection
(1) Turn off the ignition switch
(2) Disconnect the “A/T solenoid valve” connector and the TCU connector
(3) Measure the resistance between terminal “3” of the wire connector of A/T solenoid valve and the chassis ground
Technical requirement: infinite



(4) Is the resistance in accordance with the technical requirement?

Yes

▶Execute “signal circuit inspection”

No

▶Check the wire for ground short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

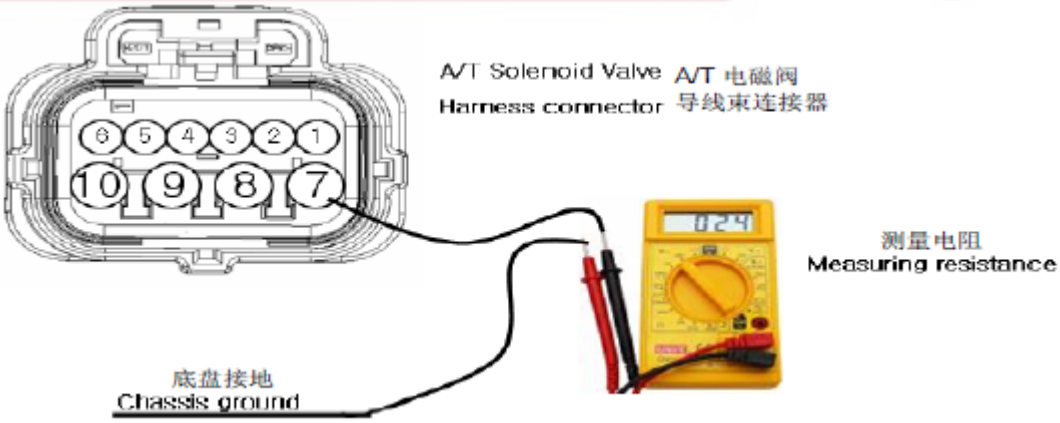
3) Perform signal circuit ground inspection

(1) Turn off the ignition switch

(2) Disconnect the “A/T solenoid valve” connector and the TCU connector

(3) Measure the resistance between terminal “7” of the wire connector of A/T solenoid valve and the chassis ground

Technical requirement: 0Ω



(4) Is the resistance in accordance with the technical requirement?

Yes

▶Execute “components inspection”

No

▶Check the wire for ground short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Components inspection

1) Solenoid valve inspection

(1) Turn off the ignition switch

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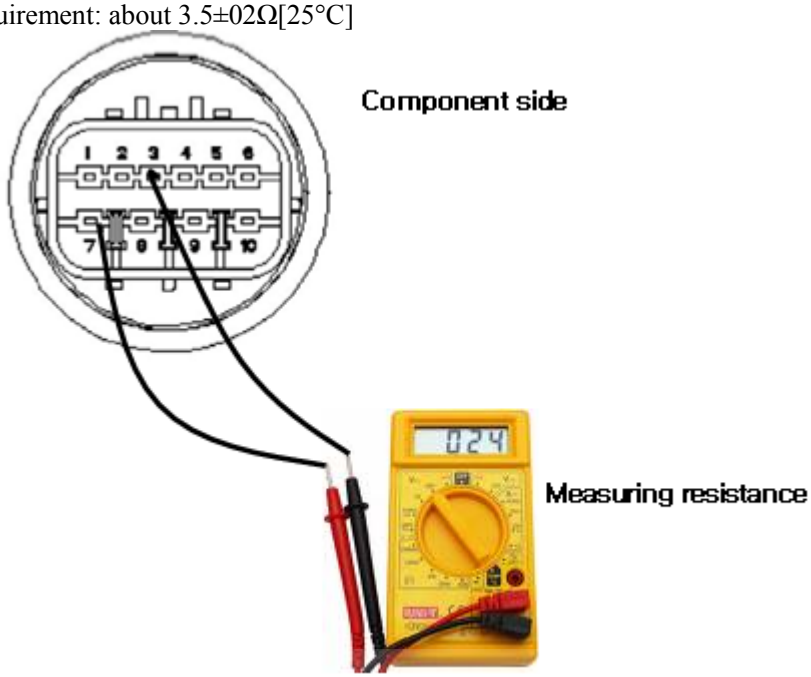
(2) Disconnect the “A/T solenoid valve” connector
(3) Measure the resistance between terminal “3” and terminal “7” of the wire connector of A/T solenoid valve
Technical requirement: about 3.5±02Ω[25°C]



(4) Is the resistance in accordance with the technical requirement?

Yes
▶Execute “TCU inspection” by the following means

No
▶Replace the ON/OFF solenoid as required, and then execute “vehicle maintenance and inspection”
2) TCU inspection
(1) Connect the diagnosis instrument to the diagnosis port
(2) The ignition switch is at “ACC” and the engine is “OFF”
(3) Select A/T solenoid valve to execute mechanism test and perform actuation mechanism test
(4) Is the actuation mechanism test being performed successfully?

Yes
▶Execute “vehicle maintenance and inspection”

No
▶Replace the TCU as required, and then execute “vehicle maintenance and inspection”

Conditions for mechanism test
(1) Ignition switch is at “ACC”
(2) Normal inhibitor switch
(3) Position P
(4) Choker 0%
(5) Vehicle speed 0Km/h
(6) Engine rotation speed 0rpm

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.18 TCU power supply signal fault: to ground short circuit or open circuit (P0880)

General
TCU checks the power supply signal of solenoid

DTC description
TCU detects the abnormality of power supply input and generate this code.

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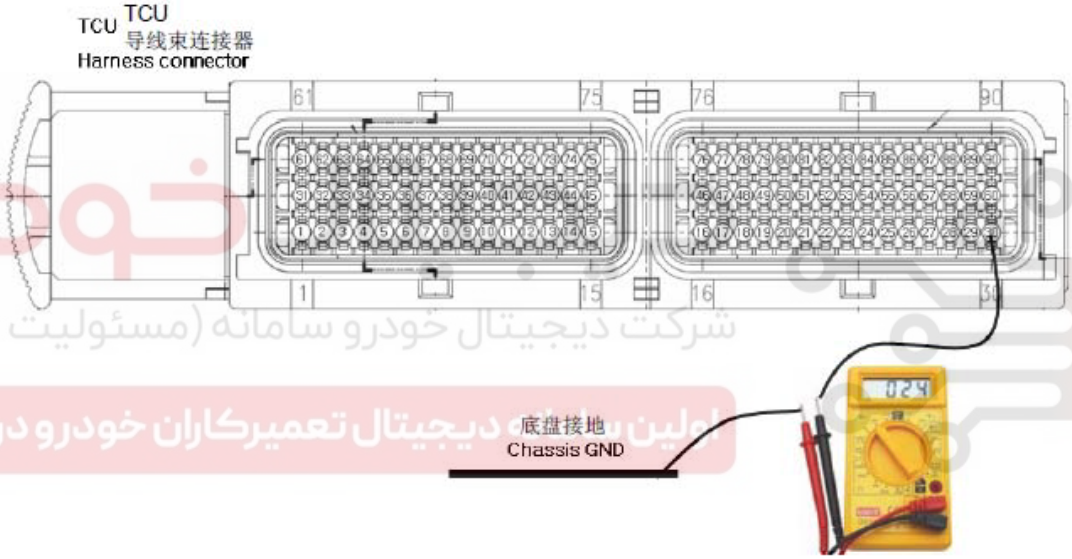
DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Check the voltage range	Circuit open or short TCU failure
Start condition	22V>VB>9V Time after TCU operation>0.5s	
Limit	VB<7V or VB>24.5V	
Diagnosis time	More than 100 ms	
Failure protection	Lock at the third speed Stop the control of pipe pressure until IG is turned off	

1)The ignition switch is at “ACC” and the engine is “OFF”
2)Disconnect the TCU connector
3)Measure the voltage between terminal “30” of the wire connector and the chassis ground
Technical requirements: VB



4) Is the voltage in accordance with the technical requirement?

Yes

▶Execute “Diagnosis instrument data”

No

▶Check the wire for ground short circuit and repair it as required, and then execute “vehicle maintenance and inspection”

Diagnosis instrument data
1)Connect the diagnosis instrument to the diagnosis port
2)Turn on the engine
3)The parameter “voltage” on the diagnosis instrument
Technical requirement: VB
4)Is the voltage in accordance with the technical requirement?

Yes

▶Fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Check whether the connector is loose, in poor contact, bent, corroded, dirty, old or damaged and repair or replace it as required, and then execute “vehicle maintenance and inspection”.

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No
▶Execute “terminal and connector inspection”

Terminal and connector inspection
1) Many faults in the electrical system are caused by poor wire and terminal. Faults may also be caused by interference/mechanical and chemical damages of the electrical system.
2) Check the connector thoroughly for looseness, poor contact, bending, corrosion, dirt, aging, or damage.
3) Is the problem being found?

Yes
▶The fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Execute the component inspection steps.

No
▶Execute “vehicle maintenance and inspection”

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.19 CAN buss off (U0001)

General
TCU may receive the data from the engine control module or ABS control module through CAN communication or send the data to ECU and ABSCU. CAN communication is one of the communications means for vehicle and is now widely used for vehicle data transmission

DTC description
If TCU fails to reach the data from ECU through the CAN bus, TCU will generate this code
Abnormal CAN bus or ECU may be one of the reasons for generating this DTC

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Communication inspection	CAN communication wire open or short TCU failure e ECU failure
Start condition	N≥ 1000rpm and IG is turned on for 500 V≥ 10V	
Limit	CAN information transmission error	
Diagnosis time	More than 1s	
Failure protection	Intelligent gear shift is forbidden Oil pressure control learning is forbidden ETR is forbidden Locking is forbidden Replace CAN input value Stop the control of pipe pressure until IG is turned off	

1)Connect the diagnosis instrument to the diagnosis interface
2)Turn on the engine
3)The parameter “CAN communication service data (engine rotation speed, vehicle speed sensor, choker position sensor)” on the diagnosis instrument
4)Compare with the parameter
5)Is the “CAN bus wire data” in accordance with the parameter?

Yes
▶The fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Execute the component inspection steps.

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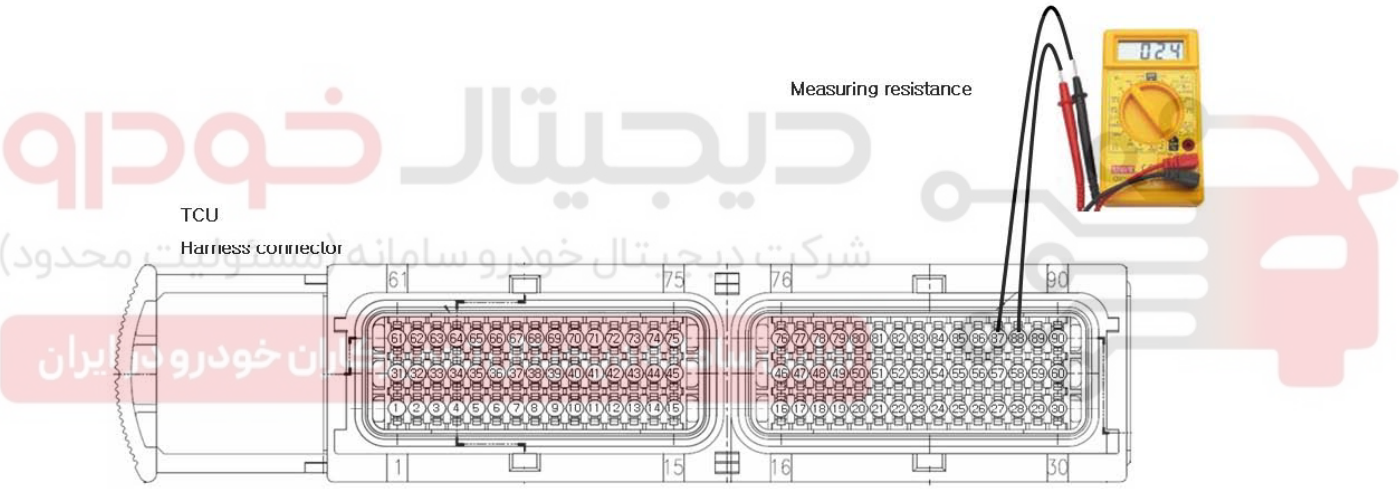
No
▶Execute “terminal and connector inspection”

Terminal and connector inspection
1) Many faults in the electrical system are caused by poor wire and terminal. Faults may also be caused by interference/mechanical and chemical damages of the electrical system.
2) Check the connector thoroughly for looseness, poor contact, bending, corrosion, dirt, aging, or damage.
3) Is the problem being found?

Yes
▶The fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Execute the component inspection steps.

No
▶Execute “signal circuit inspection”

Signal circuit inspection
1)The ignition switch is at “ACC” and the engine is “OFF”
2)Disconnect the TCU connector
3)Measure the resistance between terminal “87” and “88” of the TCU wire connector
Technical requirement: 120 Ω (If TCU has no terminal resistance, this value should be 60Ω



4)Is the resistance measured in accordance with the technical requirement?

Yes
▶Replace with a functioning TCU, and then check for normal operation. If fault is cleared, replace TCU as required, and then execute “vehicle maintenance and inspection”

No
Check the ECU for looseness, poor contact, bending, corrosion, dirt, aging, or damage, and repair or replace the resistance used for CAN communication, and then execute “vehicle maintenance and inspection”

Vehicle maintenance and inspection (refer to DTC P0707)

4.6.20 No ID from ECU (U0010)

General (refer to DTC U0001)

DTC description (refer to DTC U0001)

DTC detection condition

Item	Detection condition and failure protection	Possible cause
DTC policy	Communication inspection	CAN communication wire

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Start condition	N≥ 1000rpm and IG is turned on for 500 V≥ 10V	open or short TCU failure e ECU failure
Limit	CAN information transmission error	
Diagnosis time	More than 2s	
Failure protection	Intelligent gear shift is forbidden Oil pressure control learning is forbidden ETR is forbidden Locking is forbidden Replace CAN input value Stop the control of pipe pressure until IG is turned off	

Diagnosis instrument data
1)Connect the diagnosis instrument to the diagnosis port
2)Turn on the engine
3)The parameter “CAN communication service data (engine rotation speed, vehicle speed sensor, choker position sensor)” on the diagnosis instrument
4)Compare with the parameter
5)Is the “CAN bus wire data” in accordance with the parameter?

Yes
▶The fault may appear irregularly, because of poor connection of sensor and/or TCU connector or record in TCU memory has not been cleared after maintenance. Execute the component inspection steps.

No
▶Replace with a functioning TCU, and then check for normal operation. If fault is cleared, replace TCU as required, and then execute “vehicle maintenance and inspection”

Vehicle maintenance and inspection (refer to DTC P0707)

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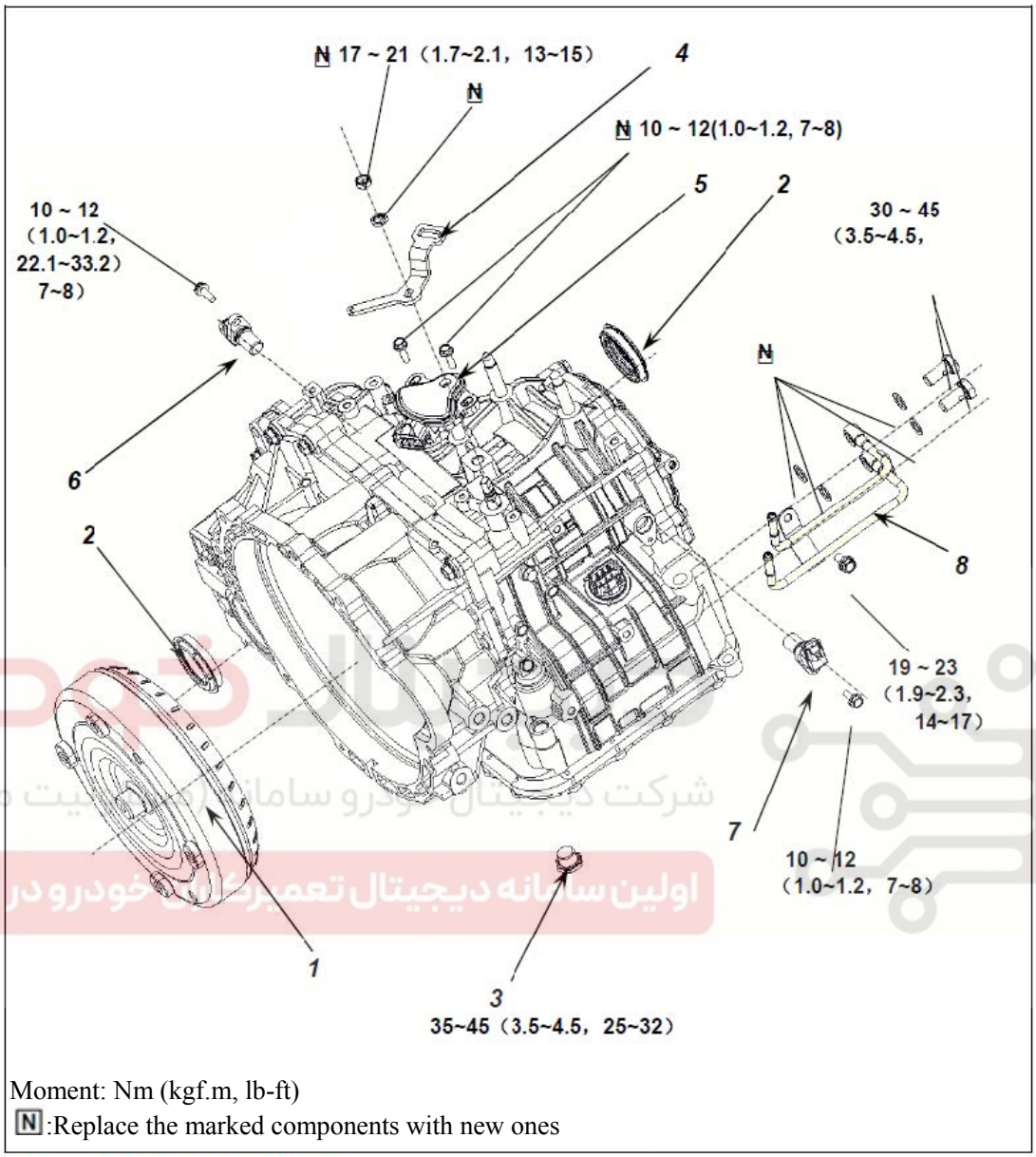
5. Disassembling and assembling of automatic transmission case

5.1 Components of automatic transmission case



Moment: Nm (kgf.m, lb-ft)
N :Replace the marked components with new ones

1. Hydraulic torque converter
3. Differential oil seal
3. Drain plug
4. Manual control lever
5. Gear switch of transmission case
6. Output speed sensor
7. Input speed sensor
8. Oil supply pipe

5.2 Disassembling of automatic transmission case

Note
Use guard to prevent damage to the paint surface.
Hold the wire connector and then pull off the connector carefully to prevent damage.
Mark on all wires and hoses to prevent wrong connection

1) Disconnect gear switch connector of the transmission case (A), solenoid valve connector (B), and input speed sensor connector (C)

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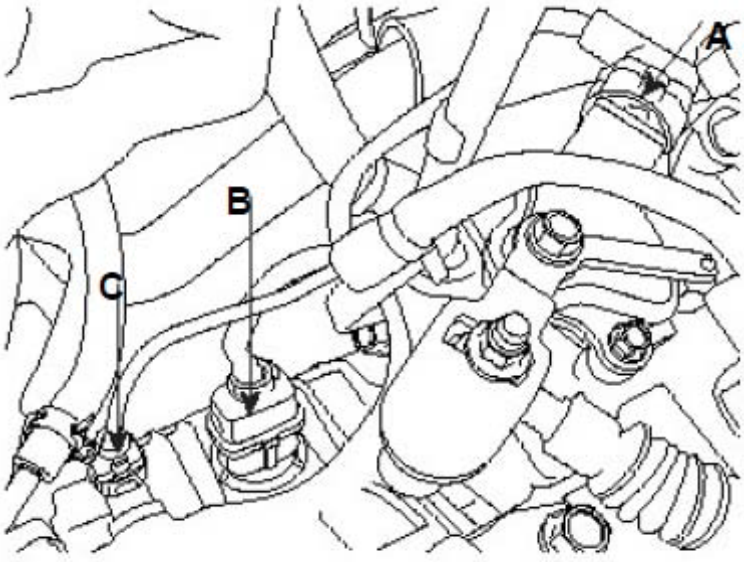
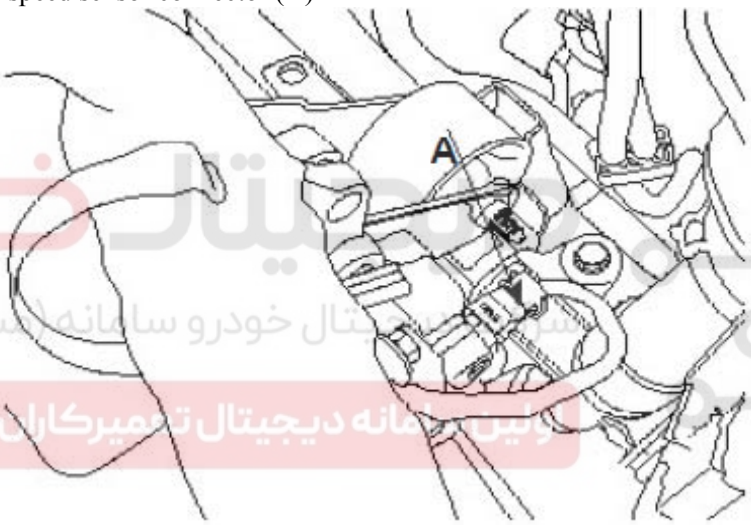
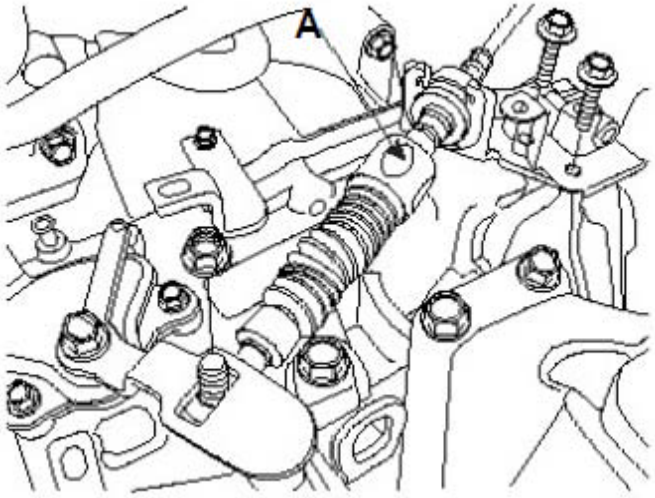


2) Disconnect the output speed sensor connector (A)



3) Remove the control cable assembly (A)



4) Remove the hydraulic oil cooler hose (A)

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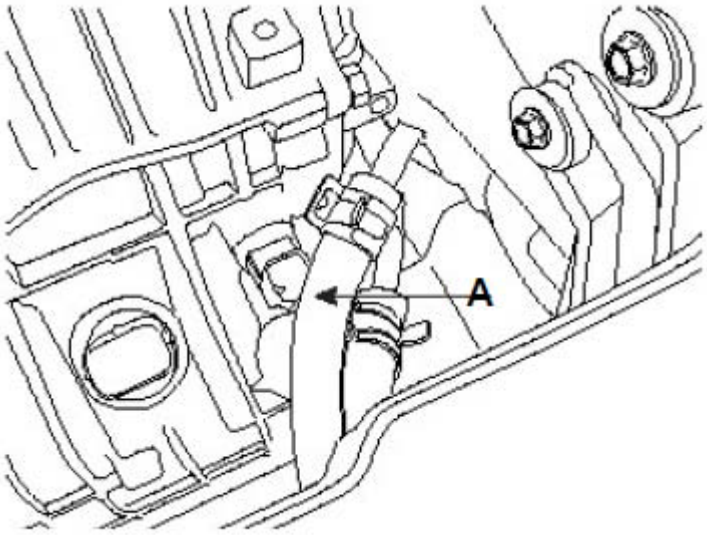
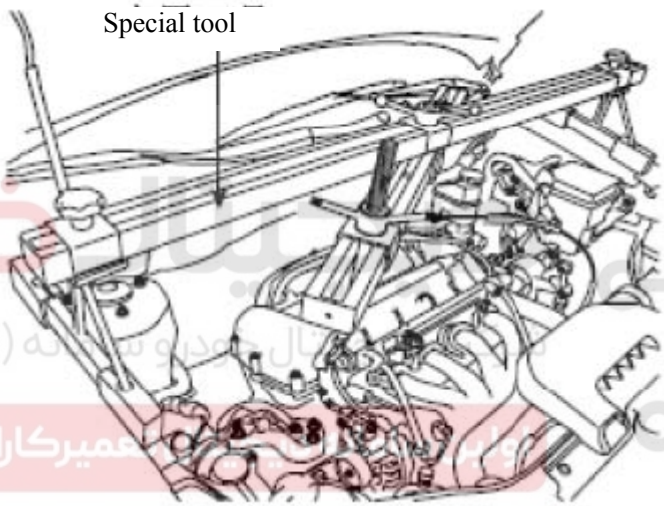
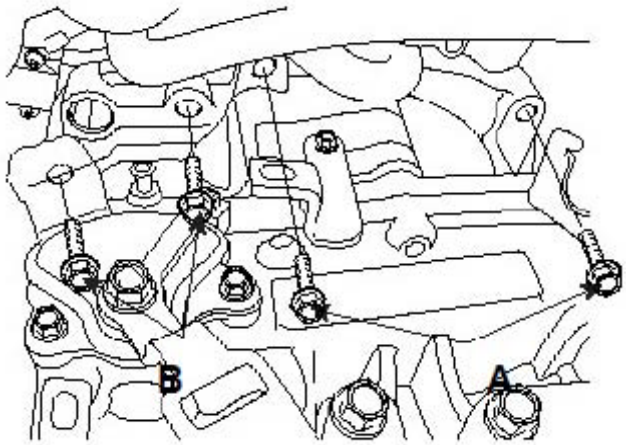


5) Install the special tool, engine support fixing device and adaptor to the engine assembly



6) Remove the assembling bolt (A) on upper part of the transmission case and the assembling bolt (B) of the starter



7) Remove the vibration damping device assembling support (A) of the transmission case after removing assembling bolts of the vibration damping device

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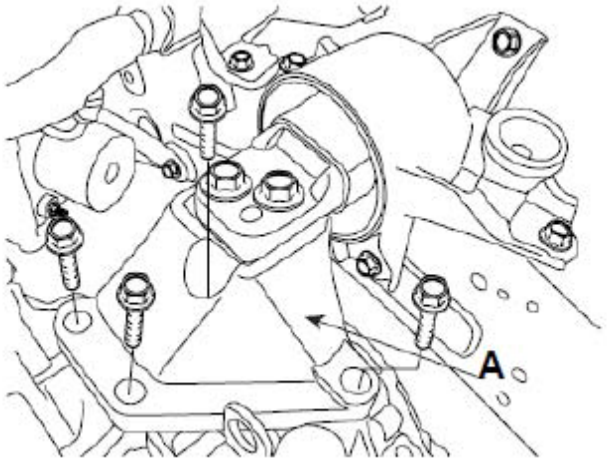
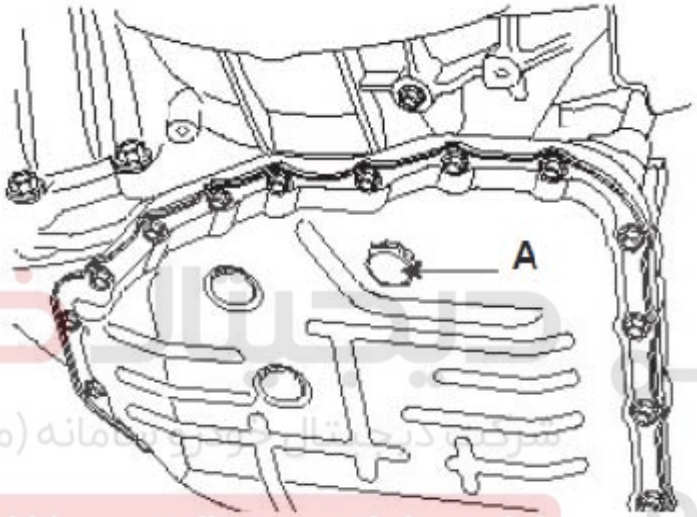


8) Remove the oil drain plug (A) to drain the transmission case oil



9) Remove assembling bolts (A, B) of the rolling stop

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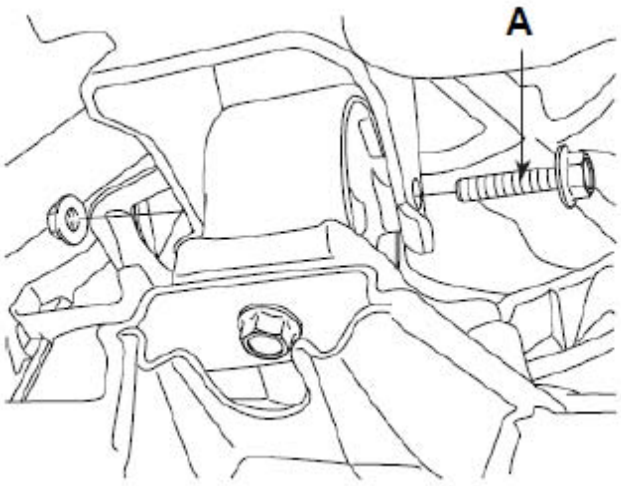
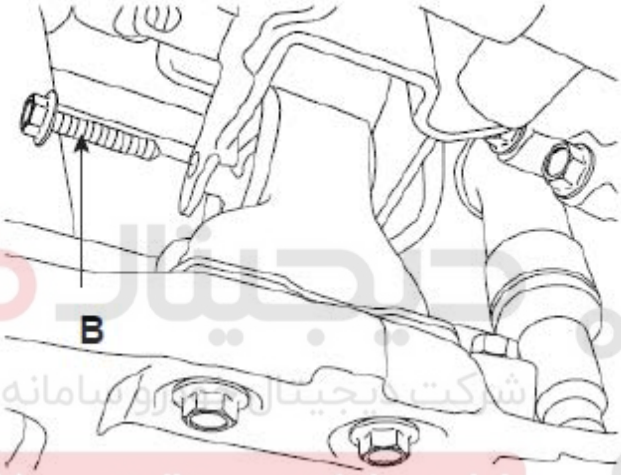
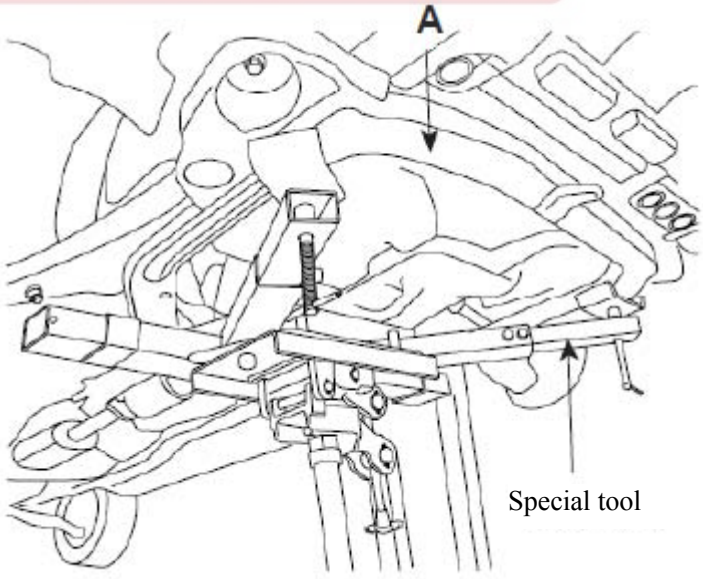




10) Support the sub frame with jack and special tools (A), and then remove the assembling bolts



11) Remove the assembling bolt of dust hood of engine (A-4EA)

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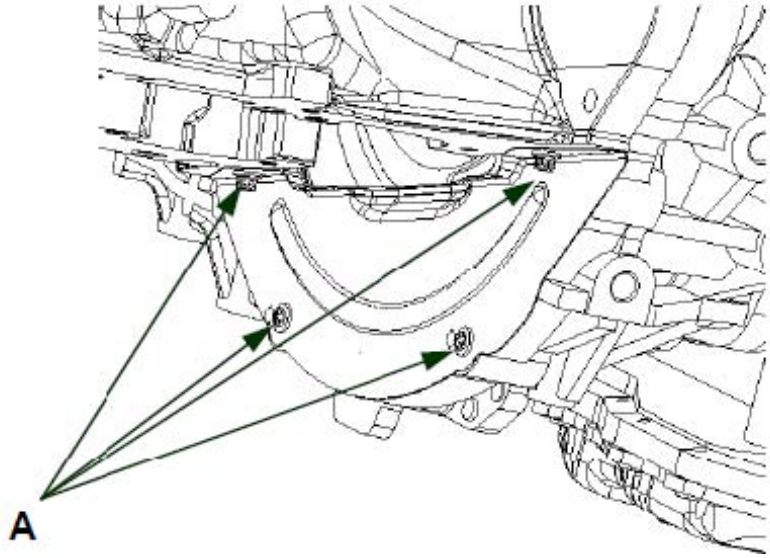
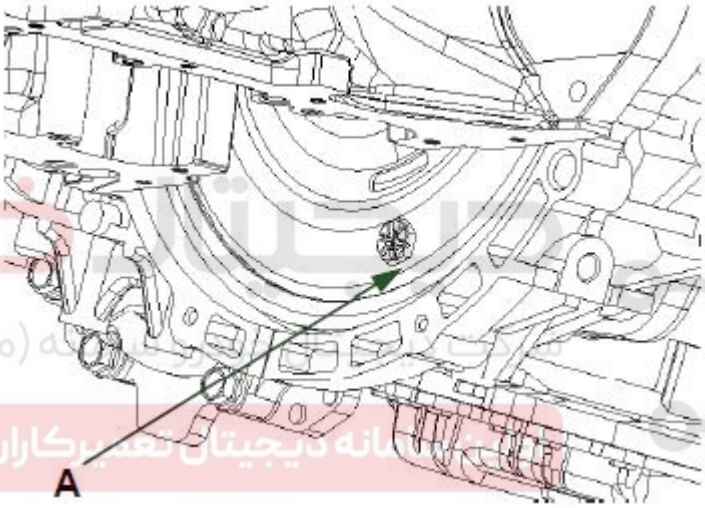
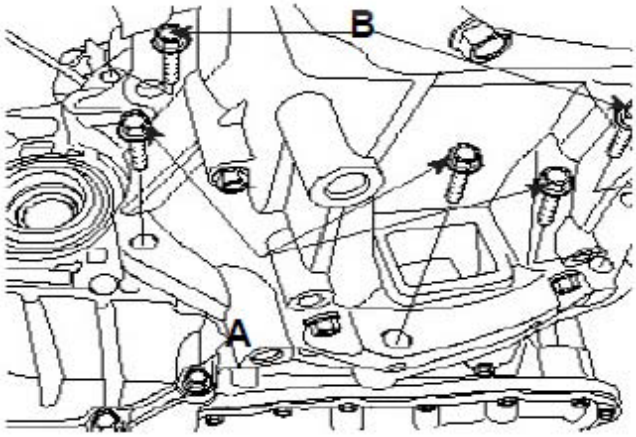


12) Remove the assembling bolt of driving disc (A-4EA)



13) Support the transmission case with a jack, and the remove assembling bolts of the transmission case



14) Lower the jack down slowly, and then remove the transmission case

Note:

Be careful when disassembling the transmission case assembly to prevent damages to surrounding components or components of the vehicle body.

15) Remove the oil seal (transmission shell and body case), replace it when necessary .

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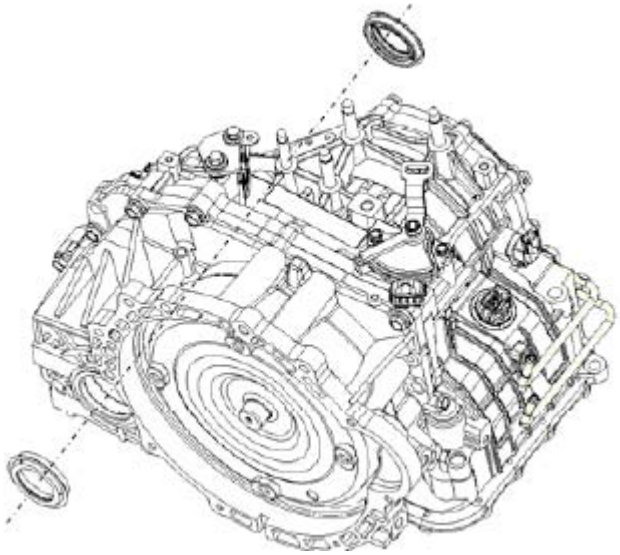
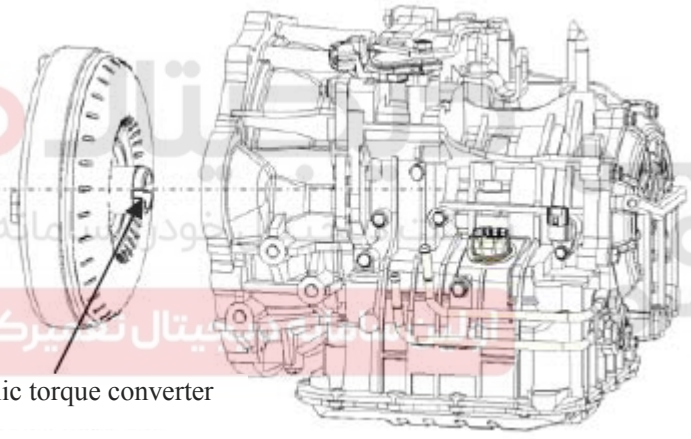


Note:

The automatic transmission case is made of high-precision components, and be careful during disassembling to prevent these components from being starched or damaged.

16) Remove the hydraulic torque converter, and replace it when necessary. (Please pay attention to the hydraulic torque converter stalling test and the specified procedures)

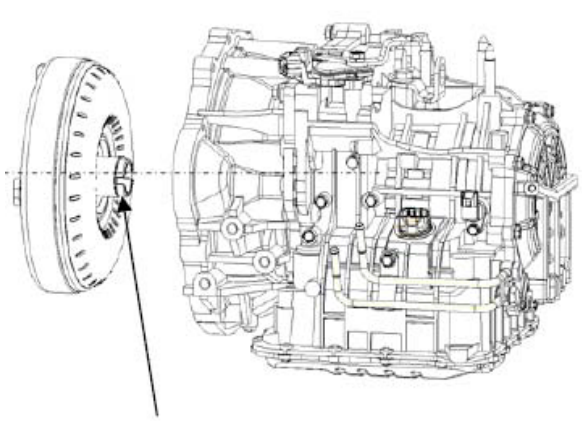


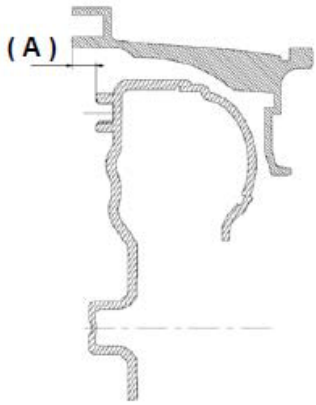
Hub of hydraulic torque converter

Note: do not damage to the lip seal of the oil pump due to the hydraulic torque converter when disassembling the hydraulic torque converter. Disassemble the hydraulic torque converter stably.

5.3 Assembling of automatic transmission case

1) Assemble the hydraulic torque converter. Ensure installation dimension of the hydraulic torque converter A





Hub of hydraulic torque converter

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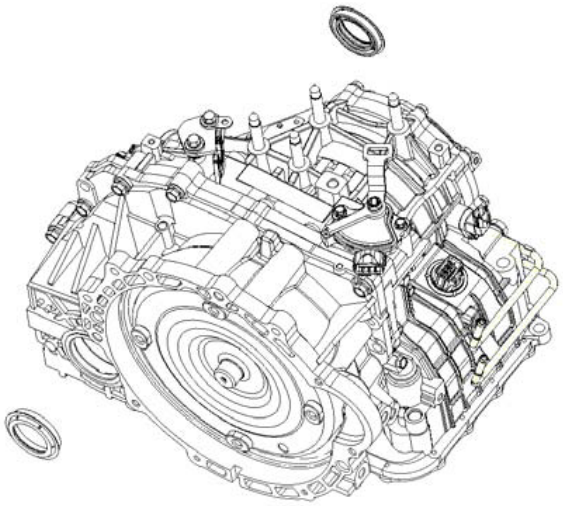
Reference value of (A) : about 12.4mm(0.488 in)

Note: apply A.T.F to the driving hub of the oil pump before assembling the hydraulic torque converter. Be careful! Do not damage the seal of oil pump.

Do not damage to the lip seal of the oil pump due to the hydraulic torque converter when disassembling the hydraulic torque converter. Assemble the hydraulic torque converter stably, and then adjust the axle of the hydraulic torque converter with respect to the oil pump shaft. (Central axle of the transmission case)

2) Install the oil seal (transmission case shell and body case)



Note:

·The automatic transmission case is made of high-precision components, and be careful during disassembling to prevent these components from being starched or damaged.

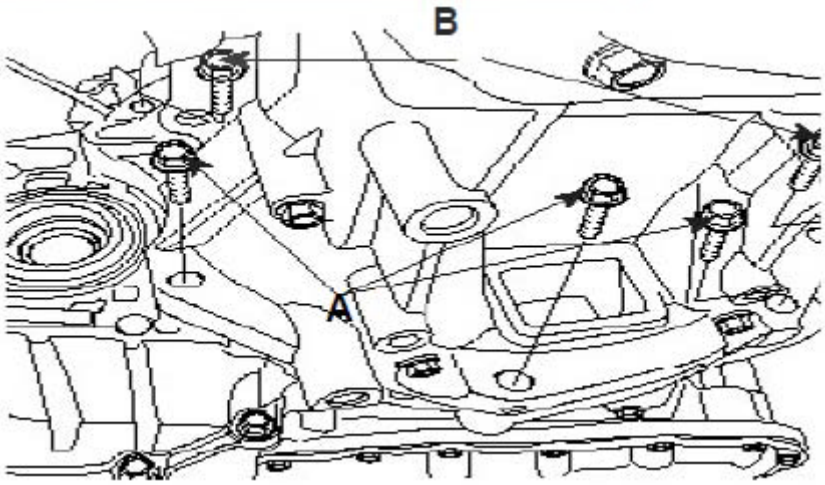
·Do not use the old oil seal again. Replace the oil seal every time of disassembling.

·Do not damage the steel dust hood of the oil seal during the assembling.

·Do not apply sealant or adhesive to the oil seal.

·Do not clean the seal lip of the oil seal with any textile gloves or cloth.

3) Install the assembling bolts of the transmission case after fixing the transmission case assembly to the engine assembly



Moment: refer to 1.2 Tightening moment table

4) Install assembling bolt of the driving disc (A-4EA)

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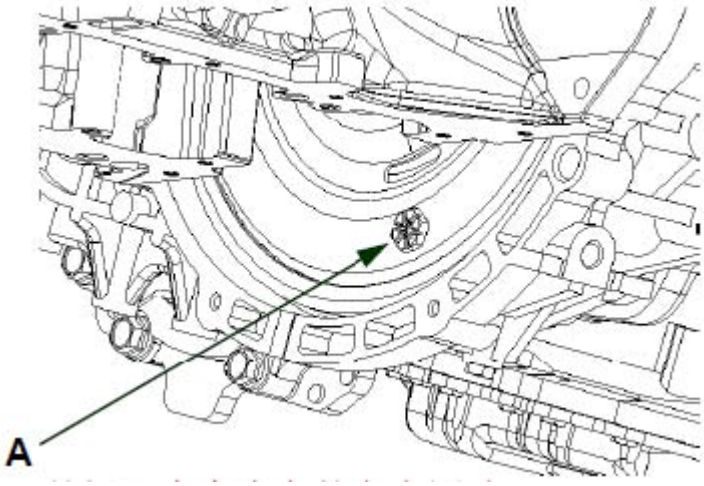
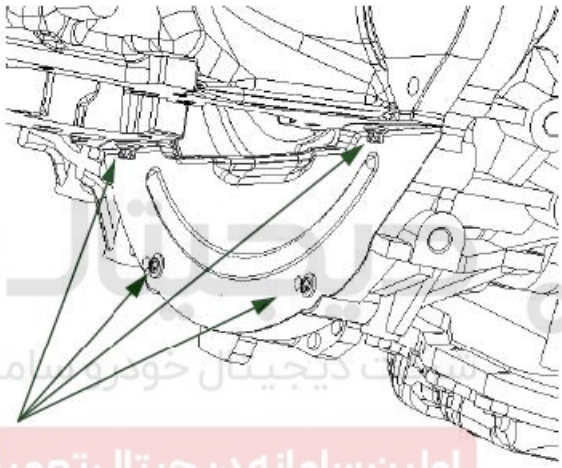
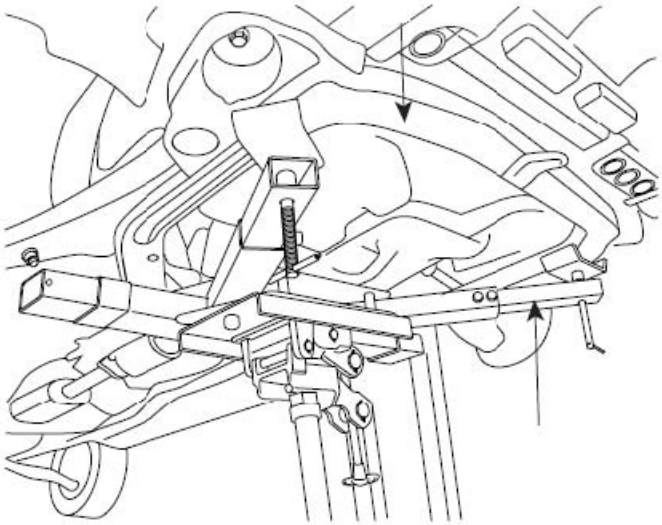


Moment: refer to 1.2 Tightening moment table

5) Install assembling bolt of the dust hood of engine (A-4EA)



6) Support the sub frame with jack and special tools (A), and then install the assembling bolts



Moment: refer to 1.2 Tightening moment table

7) Install assembling bolts (A, B) of the rolling stop

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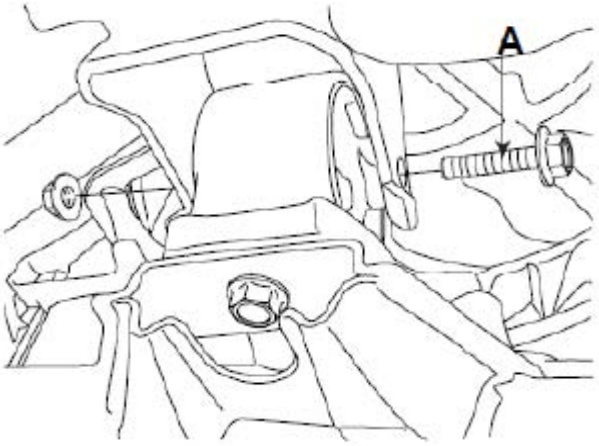
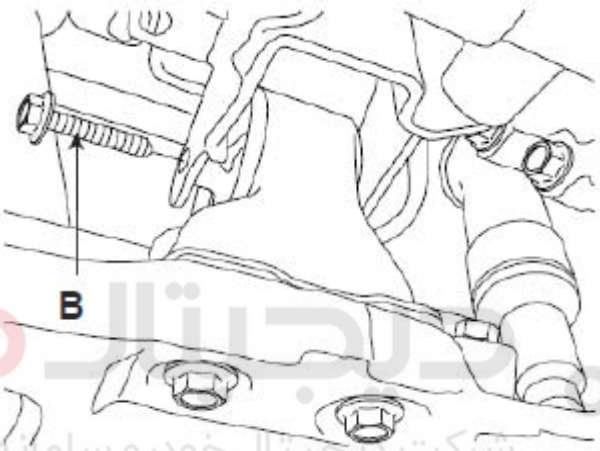
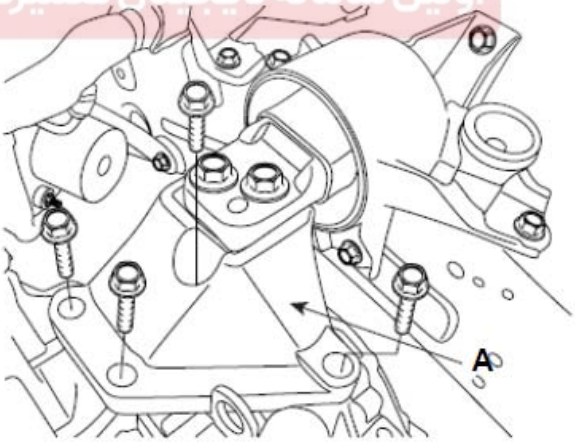




Moment: refer to 1.2 Tightening moment table

8) Install the vibration damping device assembling support (A) of the transmission case



Moment: refer to 1.2 Tightening moment table

9) Install the assembling bolt (A) on upper part of the transmission case and the assembling bolt (B) of the starter

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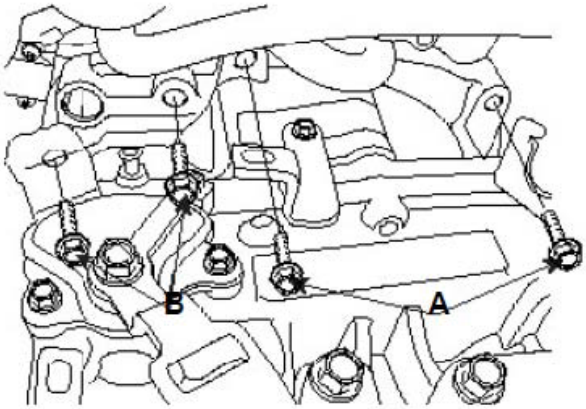
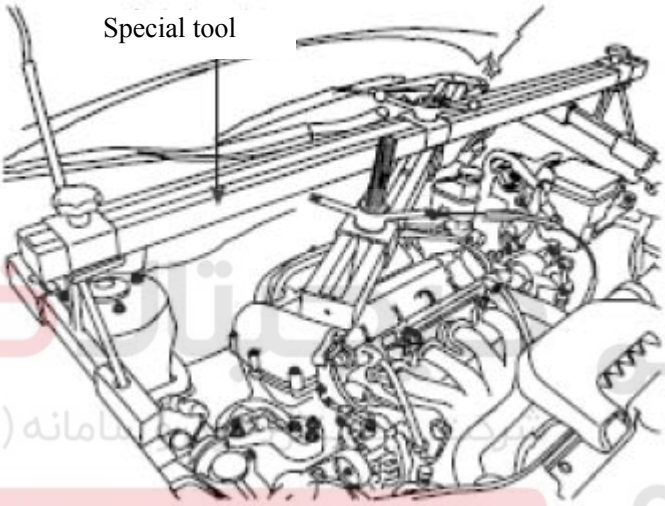


Moment: refer to 1.2 Tightening moment table

10. Remove the special tool

Special tool



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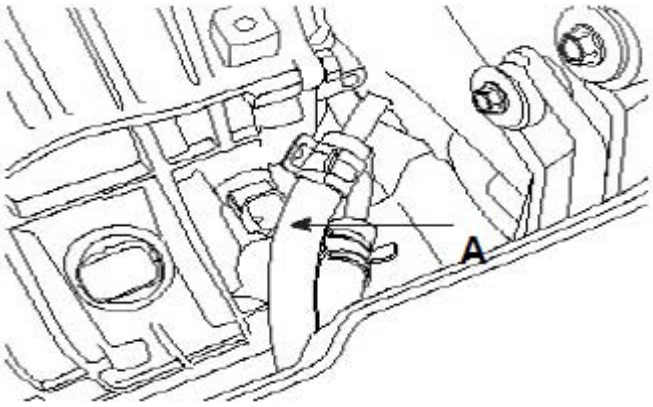
11) Connect the cooler hose of the transmission case (A) to the sleeve with a tightening clamp



12) install the control cable assembly (A)

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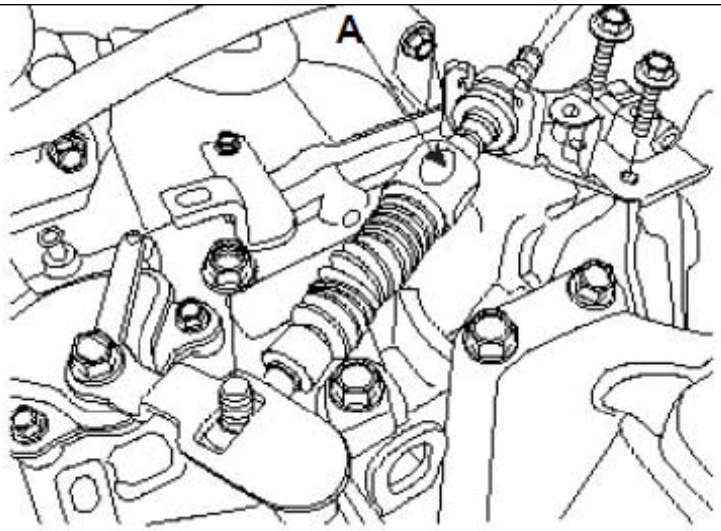
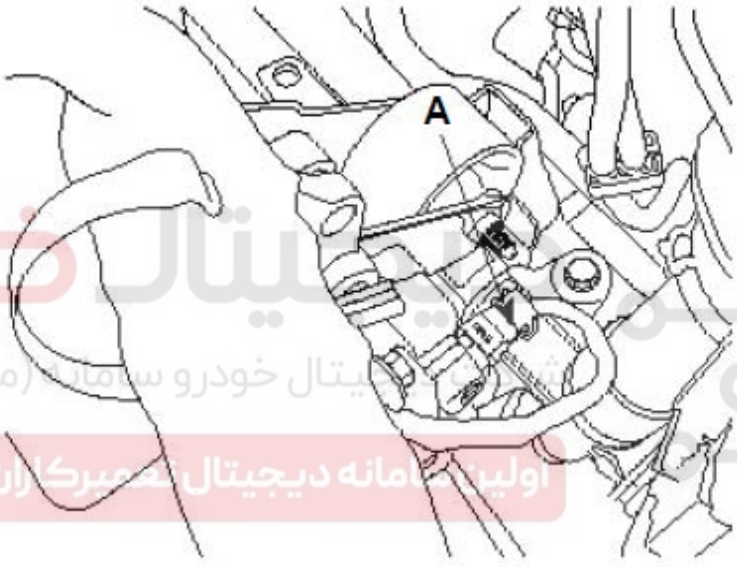
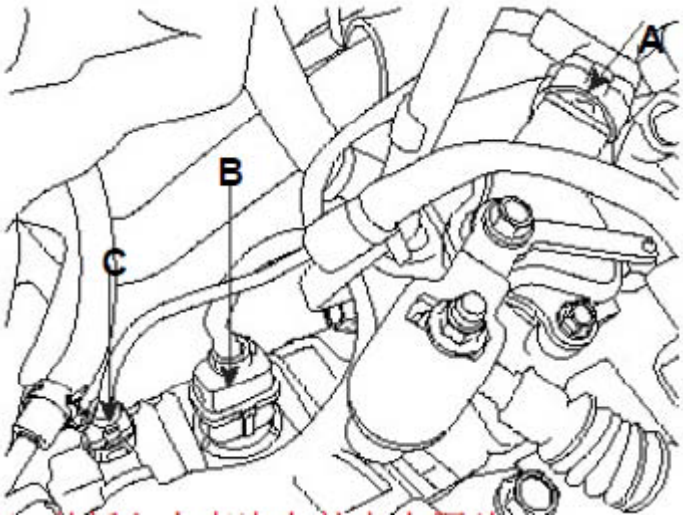


13. Assemble the output speed sensor connector (A)



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



15) Install the drain plug (A)

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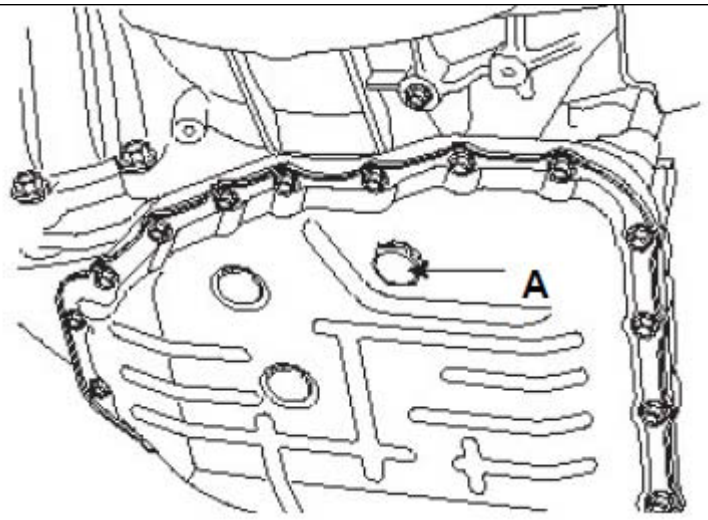

Moment: 35 ~ 45 Nm (3.5 ~ 4.5kgf.m, 25 ~ 32lb-ft)

16) Execute the followings after assembling:
Adjust the gear cable.
Fill with automatic transmission case oil.
Clean the accumulator terminal and cable end with abrasive paper, and then apply with grease to prevent corrosion before assembling.

5.4 Disassembling of gear switch of transmission case

1) Remove the accumulator terminal
2) Remove the accumulator and accumulator tray
3) Remove the air inlet pipe
4) Remove the air filter assembly. (Please refer to the disassembling of automatic transmission case)
5) Disconnect the inhibitor switch connector (A)

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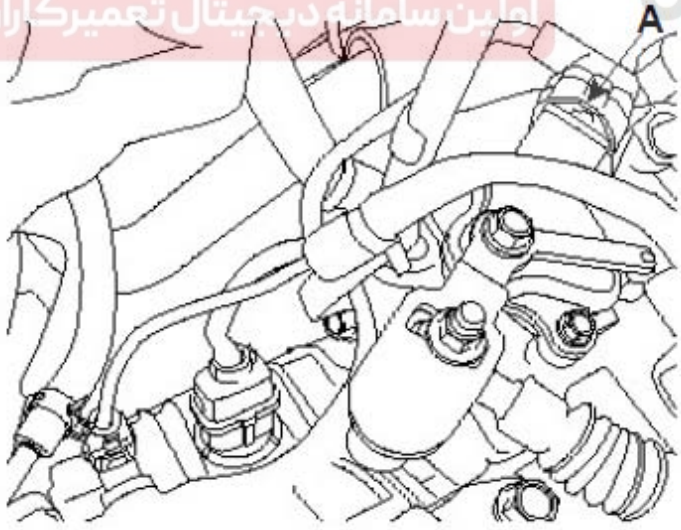

6) Remove the control cable from the manual control lever (A)

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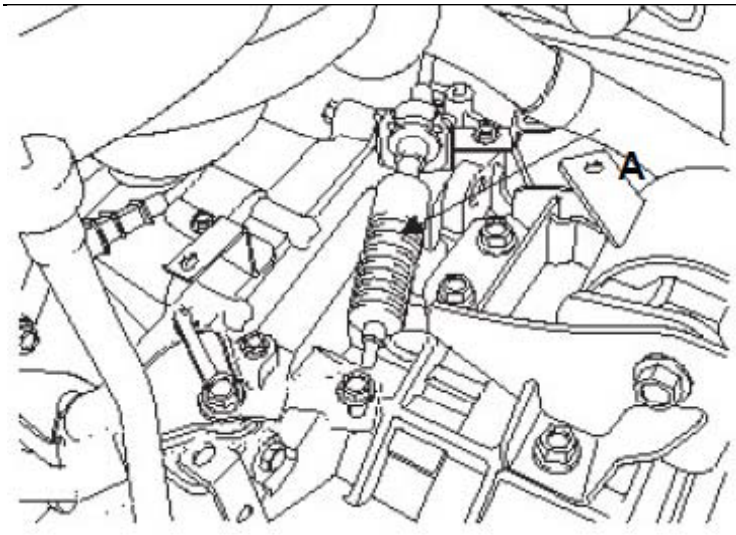


7) Remove the gear switch and manual control lever of the transmission case 拆

5.5 Assembling of gear switch of the transmission case

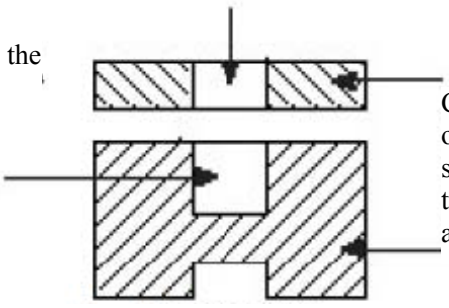
1) Turn the gear switch of the transmission case to position “N”
2)Turn the control shaft of gear switch of the transmission case to position “N”
3)Assemble the gear switch and manual control lever of the transmission case
Moment:
Shaft nut: 17 ~ 21 Nm(1.7 ~ 2.1 kgf.m, 13 ~ 15 lb-ft)
Bolt(2EA): 10 ~ 12 Nm(1.0 ~ 1.2 kgf.m, 7 ~ 8 lb-ft)
Note:
Do not use the old spring washer, nut, and bolt.

4) Unscrew the assembling bolts of components of the gear switch of transmission case, and then turn the components of the gear switch of the transmission case to make the hole on the end of manual control lever to align with the hole of the flange of the components of the gear switch of the transmission case (D-D profile in the illustration)

Hole on the end (inserting direction of the guide pin)

Manual control lever

Hole on the flange



Components of the gear switch of transmission axle

D-D profile

Note:
Align the gear switch of the transmission case with the manual control lever with the guide pin.

5) Tighten the assembling bolt of components of the gear switch of the transmission case with specified moment, and ensure that positions of the switch components are kept the same.

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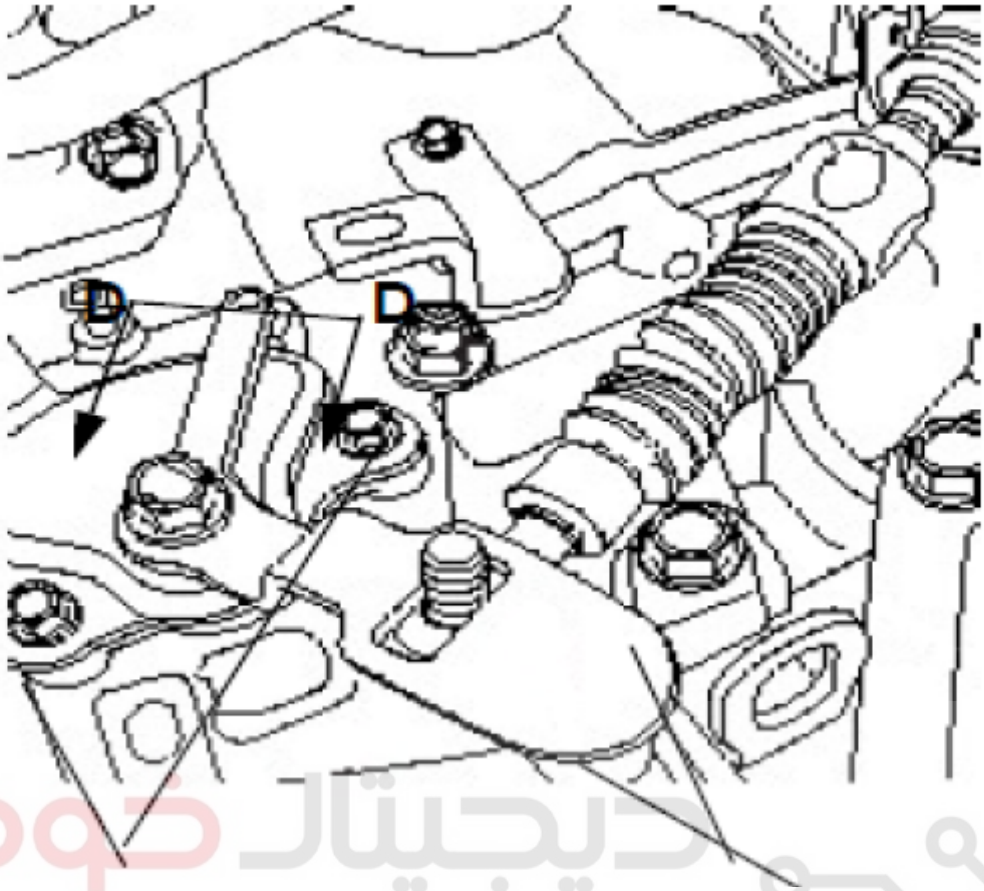

Assembling bolt of gear switch of transmission axle Manual control lever

Moment: bolt (2EA): 10 ~ 12 Nm (1.0 ~ 1.2 kgf.m, 7 ~ 8 lb-ft)

6) Connect the gear switch connector of the transmission case
7) Assembling sequence is reverse to disassembling sequence.
8) Turn on the ignition switch after assembling.

Turn the gear shift lever (vehicle side) from “P” to “L”, and make sure that the A/T gear indication is consistent with the gear switch of transmission case.

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