WORKSHOP MANUAL

TF SERIES

TRANSMISSION

JR405E MODEL

SECTION 7A

ISUZU

ISUZU
International Service & Parts
Tokyo, Japan

SECTION 7A1
CONSTRUCTION AND FUNCTION

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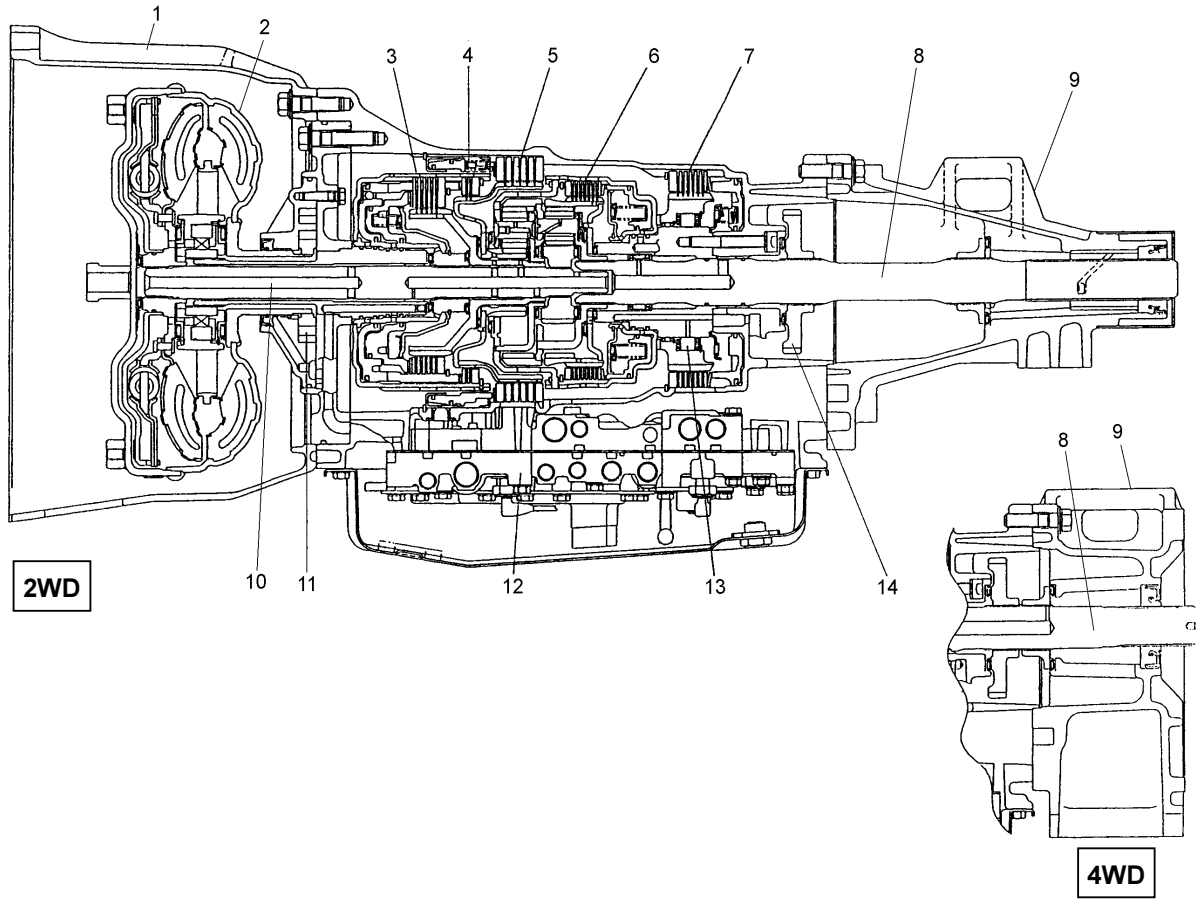
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DESCRIPTION

CONSTRUCTION



1	Converter Housing	6	Low Clutch	11	Oil Pump
2	Torque Converter	7	Low & Reverse Brake	12	Control Valve
3	High Clutch	8	Output Shaft	13	Low One-way Clutch
4	Reverse Clutch	9	Extension Housing	14	Parking Gear
5	2-4 Brake	10	Input Shaft		

Figure 1. Construction of Automatic Transmission

The JR405E automatic transmission is electrically controlled by a microcomputer transmission control module (TCM). There are four forward speeds and one reverse speed.
This JR405E automatic transmission employs a clutch pressure direct control system (Direct Electronic Shift Control: DESC) using a duty cycle type solenoid, which ensures high shift quality.
This transmission also controls learning and constantly checks the time of each clutch and brake required for the speed change to match this time with the target value for the optimum speed change.

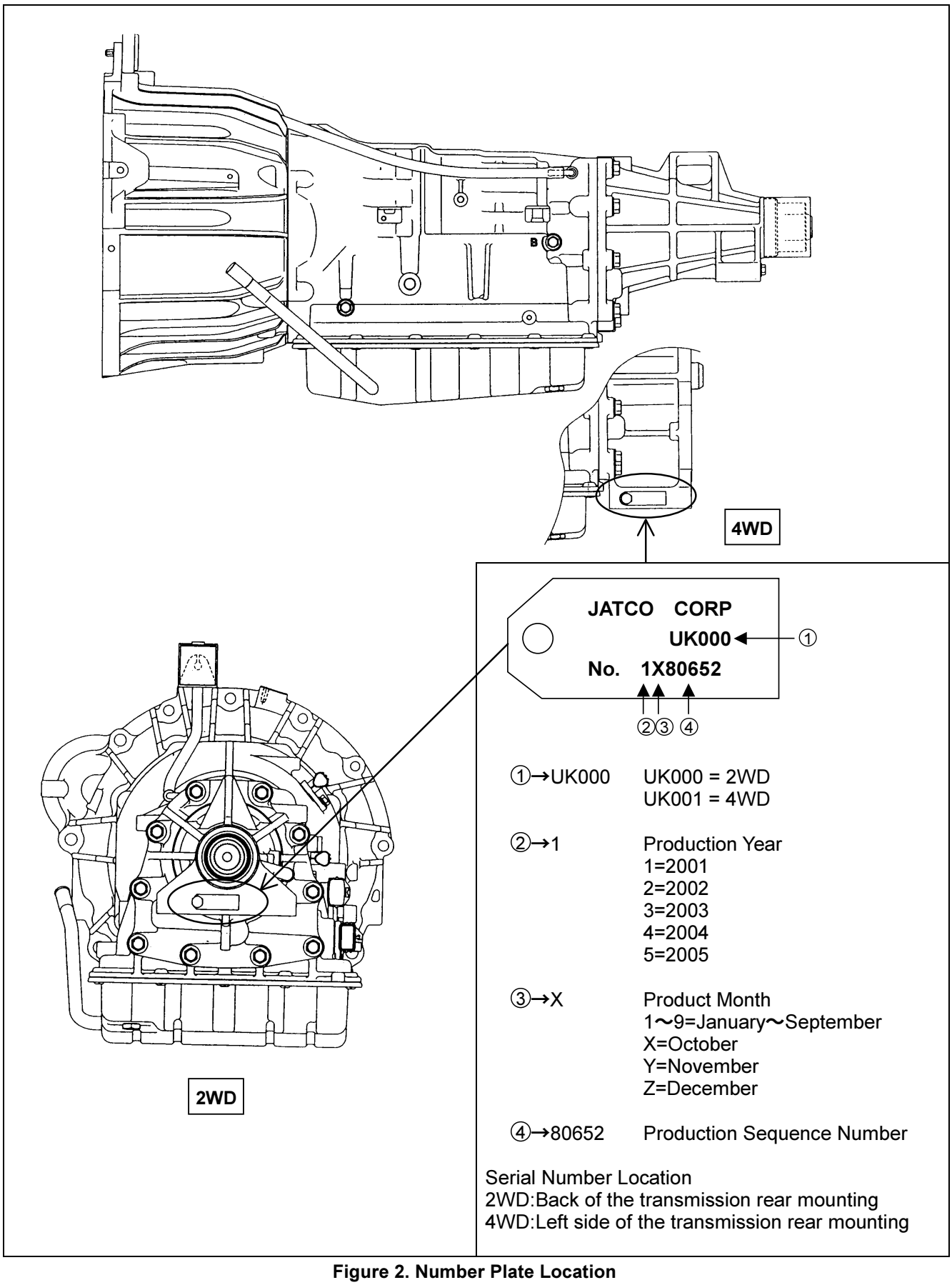
The TCM will automatically select the most appropriate shift points and lock-up points depending on the throttle opening angle, the vehicle speed and the vehicle load.
If any trouble arises in the vehicle sensor, throttle sensor, solenoid, etc., the fail-safe control function is activated to keep the running performance.
Problems with the sensors, the solenoids can be quickly detected with the self diagnosis procedure described in this manual.

The JR405E automatic transmission consists of the torque converter, the oil pump, the input shaft, the out put shaft, the planetary gears and the control valve.
The gear train consists of two planetary gear sets and three multiple plate clutches in combination with two multiple plate brakes and a one-way clutch.

MAIN DATA AND SPECIFICATION

Model			JR405E	
Torque Converter Type			Three Elements, One Stage & Two Phase Type With Lock-up Function	
Torque Converter Stall Torque Ratio			1.8	
ATF	Name		ATF DEXRON III	
	Quantity		9.2L-9.6L	
	Cooling System		Water Cooled Type (Radiator)	
Gear Ratio	1st		2.786	
	2nd		1.546	
	3rd		1.000	
	4th (Over Drive)		0.694	
	Reverse		2.273	
Clutch	Low Clutch	L/C	7	Number of Disc
	High Clutch	H/C	5	
	Reverse Clutch	R/C	2	
	Low One-way Clutch	L/O.C	1	Set
Brake	Low & Reverse Brake	L&R/B	6	Number of Disc
	2-4 Brake	2-4/B	5	
Planetary Gear Unit	Front Planetary	Sun Gear	33	Number of Teeth
		Pinion Gear	21	
		Ring Gear	75	
	Rear Planetary	Sun Gear	42	
		Pinion Gear	17	
		Ring Gear	75	

NUMBER PLATE LOCATION



①→UK000 UK000 = 2WD
UK001 = 4WD

②→1 Production Year
1=2001
2=2002
3=2003
4=2004
5=2005

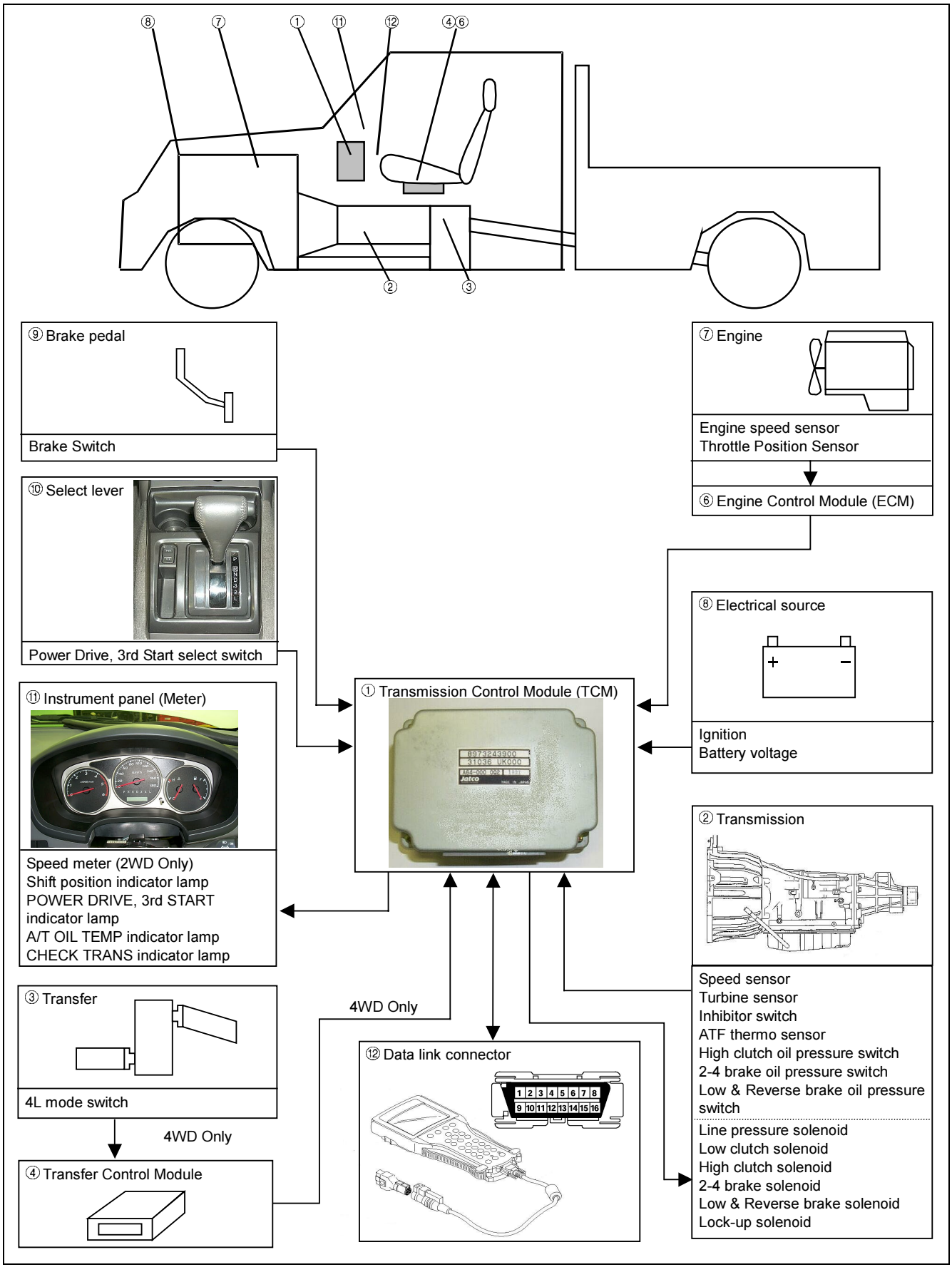
③→X Product Month
1～9=January～September
X=October
Y=November
Z=December

④→80652 Production Sequence Number

Serial Number Location
2WD:Back of the transmission rear mounting
4WD:Left side of the transmission rear mounting

Figure 2. Number Plate Location

ELECTRONIC CONTROL COMPONENTS LOCATION



TRANSMISSION CONTROL UNIT (TCM) PERIPHERAL CIRCUIT

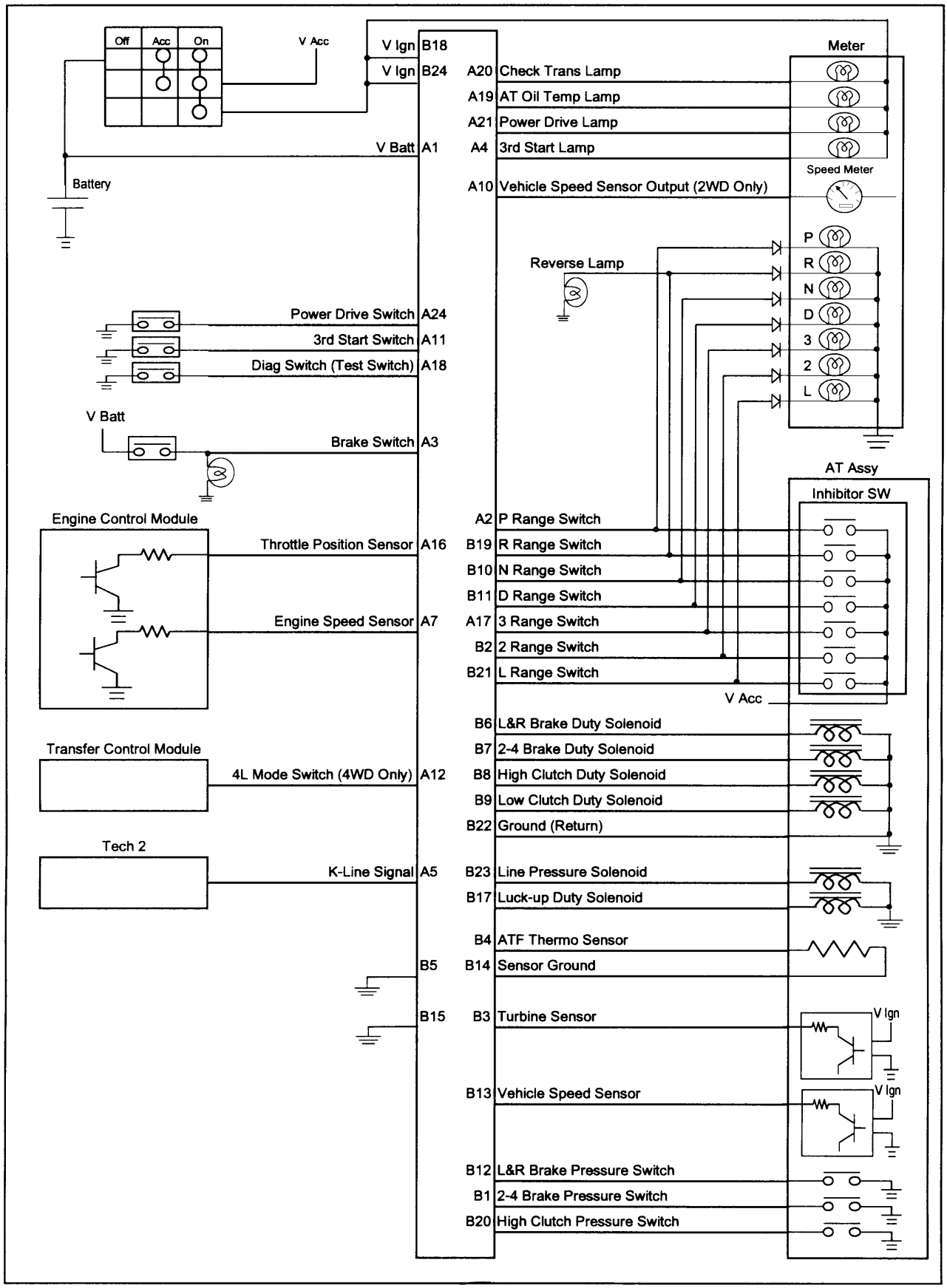


Figure 4. TCM Peripheral Circuit

STRUCTURE AND FUNCTION OF COMPONENT

TORQUE CONVERTER (WITH LOCK-UP FUNCTION)

- The torque converter is a device for transmitting the engine torque to the transmission. It transmits power by means of oil when the lock-up is disengaged and by means of a lock-up piston when it is engaged.
- The torque converter is of the symmetrical, three-element, single-stage, two-phase type.
- As shown in the drawing, the symmetrical three-elements refer to three elements (components) consisting of impeller (1), turbine (2) and stator (3) that are arranged symmetrically (figure 5).
- "Single-stage" means that there is only one turbine as an output element; "two-phase" means that the pump impeller acts as a torque converter when the turbine speed is comparatively low, and as a fluid coupling when the speed is high.

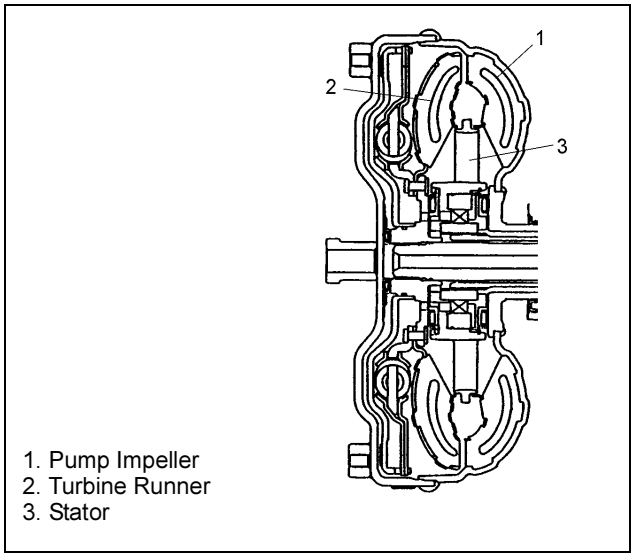


Figure 5. Torque Converter

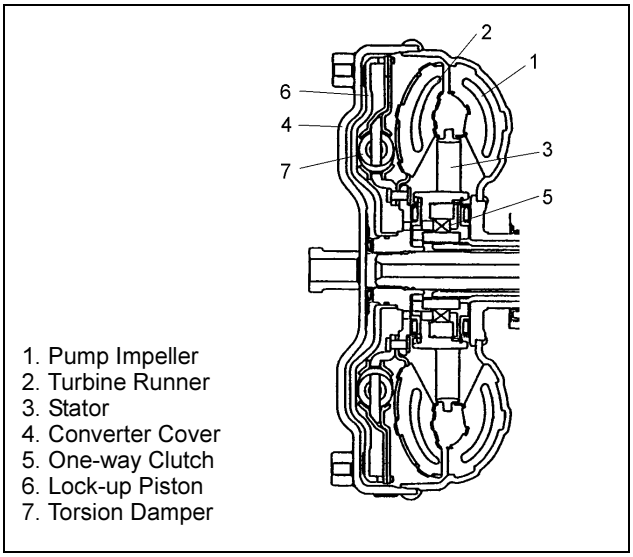


Figure 6. Construction of Torque Converter

Lock-up mechanism

- "Lock-up" refers to a fixed state of the lock-up piston inside the torque converter and thus connects the engine directly to the transmission.
- The hydraulic pressure for the lock-up control is supplied from two circuits.

When the lock-up is disengaged (Figure 7)

- When the lock-up is disengaged, the torque converter operating pressure is supplied from the oil passage (A) to between the cover and the lock-up piston, and separates the lock-up piston clutch facing and converter cover.
- As a result, the engine drive power is transmitted from the converter cover to the pump impeller, the ATF and to the turbine. The torque converter function as a fluid connector in this condition.
- The torque converter operating pressure is supplied from the oil passage (A), passes through the oil passage (B).

When the lock-up is engaged (Figure 8)

- When the lock-up is engaged, the torque converter operating pressure is supplied from oil passage (B) to the oil pump impeller, turbine, then to the stator side. The oil between the lock-up piston and converter cover is drained.
- Since the force acting on the right side of the lock-up piston is greater than force on the left side, it connects the lock-up piston clutch facing with the converter cover, thereby increasing the transmission efficiency.

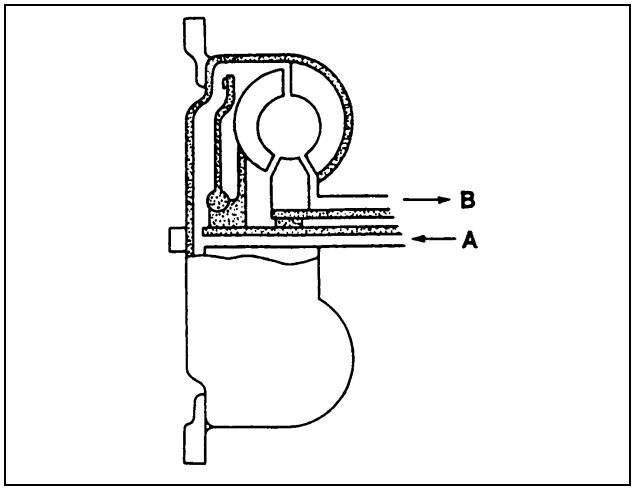


Figure 7. Lock-up Control (Disengaged)

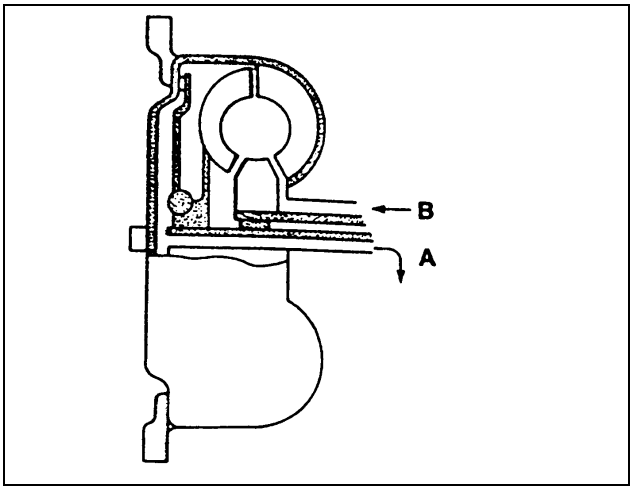


Figure 8. Lock-up Control (Engaged)

OIL PUMP

- The oil pump generating oil pressure is a small-size trochoid gear type oil pump. It feeds oil to the torque converter, lubricates the power train mechanism, and feeds the oil pressure to the oil pressure control unit under pressure.
- The oil pump is located behind the torque converter. Sine the inner rotor in the oil pump is fitted with the drive sleeve of the torque converter, it works by the power from the engine.

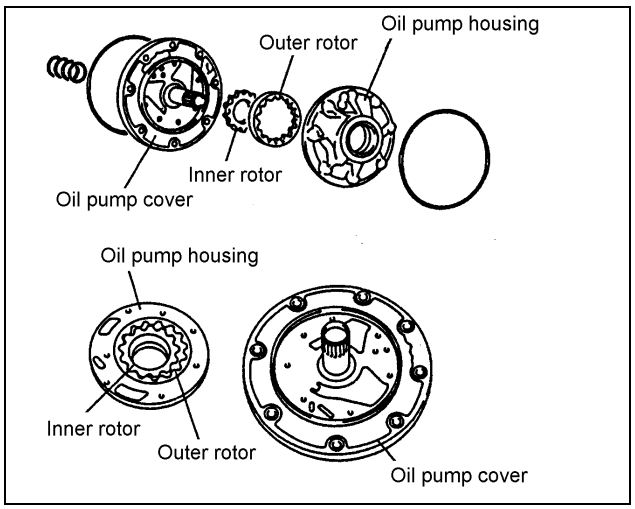


Figure 9. Construction of Oil Pump

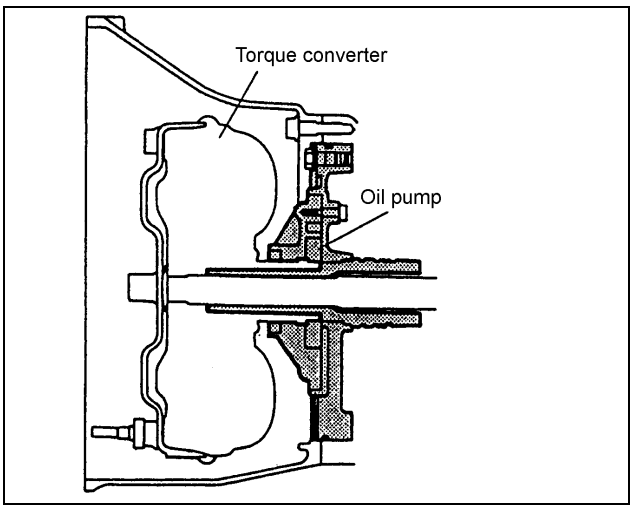


Figure 10. Location of Oil Pump

- When the inner rotor in the oil pump rotates, ATF is sucked in from the oil pan, passed between the inner rotor, outer rotor and crescent and discharged. This pressure discharged is sent to the pressure regulator valve in the control valve and adjusted as required for operating the A/T. The flow rate under pressure increases or decreases in proportion of the number of rotations.

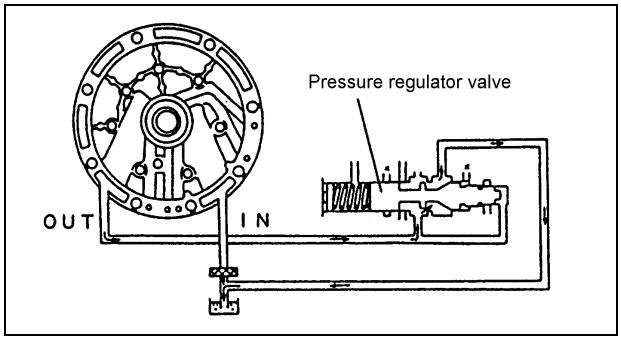


Figure 11. Operation of Oil Pump

INPUT SHAFT

- The input shaft has some oil holes, through which lubricating ATF is supplied to the torque converter, bearings, etc.
- The input shaft is fitted the turbine runner in the torque converter, reverse & high clutch drum and rear sun gear by means of the spline. Therefore, the engine driving force received by the torque converter is transmitted to the reverse & high clutch drum and rear sun gear.

OUTPUT SHAFT

- The output shaft has some oil holes, through which the lubricating ATF is supplied to the bearings, planetary gear unit, etc.
- The output shaft transmits the engine driving force from the planetary gear to the propeller shaft.
- The front internal gear is fitted with the rear carrier assembly by spline. The parking gear is also fitted by spline. By fixing this gear mechanically, the output shaft is fixed as required when parking the vehicle.

GEAR SHIFTING MECHANISM

- The JR405E consists of two sets of planetary gears, three multiple plate clutches, two multiple plate brakes and a one-way clutch. They are activated in different combinations in any of four forward and one reverse gear positions.

Principle of gear shifting (Figure 12)

- Planetary gears have the advantage of a compact configuration because of the way they are constructed with a single central shaft.
- Also, unlike the manual transmission gears that require changing of gear mesh, the gear ratio of the planetary gears can be changed more easily by locking, releasing or rotating only some of their parts.
- A planetary gear is made up of a sun gear (1) at its center and pinion gears (2) each of which rotates about its own center and also along the sun gear, as shown. They are all called in the internal gear (3).
- Also, since the pinion gears are further supported by the planetary carrier (4), they rotate as a unit in the same direction and at the same rate.
- As shown above, each planetary gears are constructed of three elements; a sun gear, pinion gears, and internal gear and a planetary carrier. Gear shifting is achieved by conditioning two of the three elements namely the sun gear, internal gear and the planetary carrier.
- The planetary gears are locked by the clutch, brake and one-way clutch according to the gear shifting.

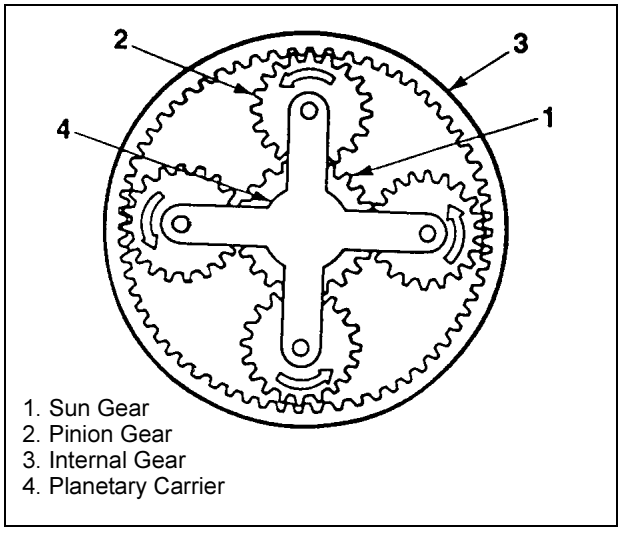


Figure 12. Planetary Gear

- The JR405E consists of two sets of planetary gears, which are called front planetary gear and rear planetary gear.
- The sun gear of front planetary gear is fixed to the drive plates of 2-4 brake and reverse clutch.
- The planetary carrier of front planetary gear is fixed to the drum of low clutch, the drive plates of low & reverse brake and the hub of high clutch.
- The internal gear of front planetary gear and the planetary carrier of rear planetary gear are connected as one, and they are fixed to output shaft.
- The sun gear of rear planetary gear is fixed to input shaft.
- The internal gear of rear planetary gear is fixed to the hub of low clutch.

Clutch and Brake

- Basic structure of the clutch and brake is shown in the figures below.
- In the figure A, the clutch plates (drive plate and driven plate) are in the fluid so that they slip against each other transmitting no power.
- Figure B shows the condition where the oil pressure is acting on the piston. The clutch plates are fitted to each other under pressure transmitting the rotations of the clutch drum to the clutch hub.
- When the oil pressure is removed from the piston, the clutch returns to the condition in the figure A by the return spring.

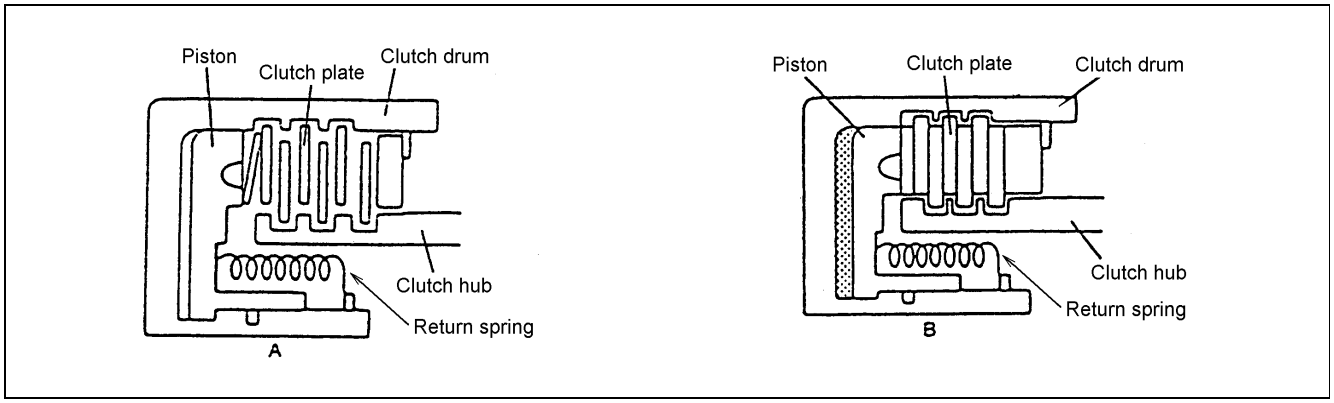


Figure 13. Basic Construction of Clutch and Brake

Low Clutch, High Clutch and Reverse Clutch (Multi-Plate Clutch)

- The multi-plate clutch is composed of drive plates and driven plates. By applying the oil pressure onto the end surface of the plates, the clutch is engaged or disengaged. The oil pressure is adjusted with the control valve according to the signal from the TCM.
- All clutches use dish plates to prevent uncontrolled operation of the clutches when engaged, causing a shock.
- For the reverse clutch, a piston check ball is used to release the oil pressure for the purpose of preventing the clutch drag due to oil pressure generated by residual ATF because of the centrifugal force while the clutch is racing (under no oil pressure).
- For the low clutch and high clutch, a centrifugal balance chamber always full of ATF is provided to offset the excessive oil pressure, for the purpose of preventing the clutch drag due to oil pressure generated by residual ATF because of the centrifugal force while the clutch is racing (under no oil pressure).
- The solenoid in the control valve is driven based on the speed change signal from TCM and moves the shift valve, thereby engaging the drive plate and driven plate through the piston of each clutch.
- Resultantly, elements of the planetary gear unit are combined.
- When the oil pressure is removed, the piston returns to the original position by the force of the return spring.

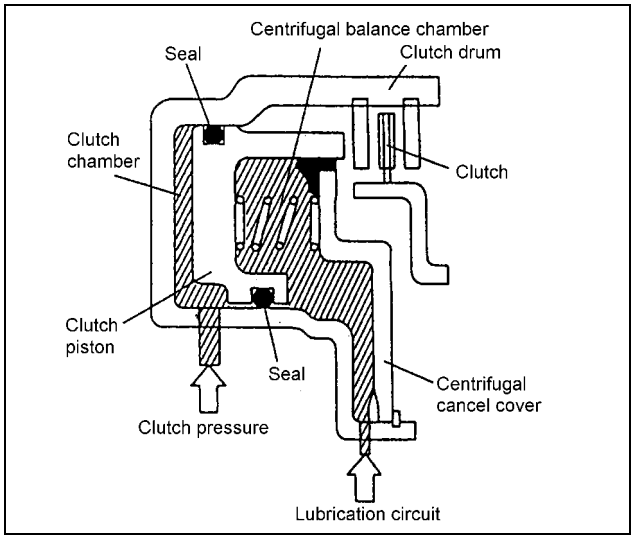


Figure 14. Basic Construction of Low Clutch and High Clutch

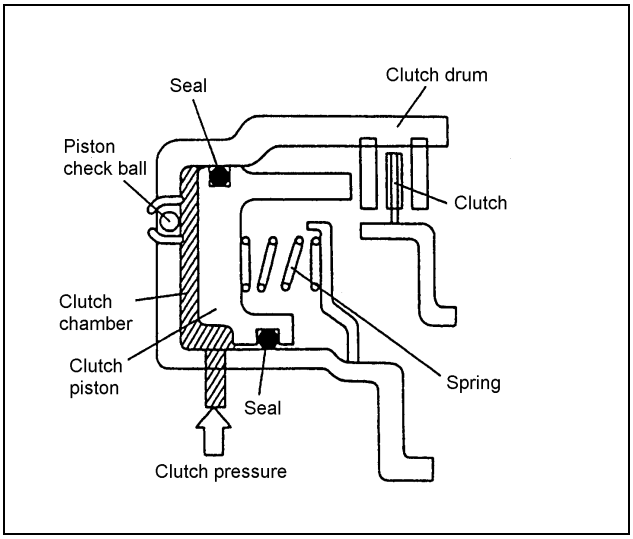


Figure 15. Basic Construction of Reverse Clutch

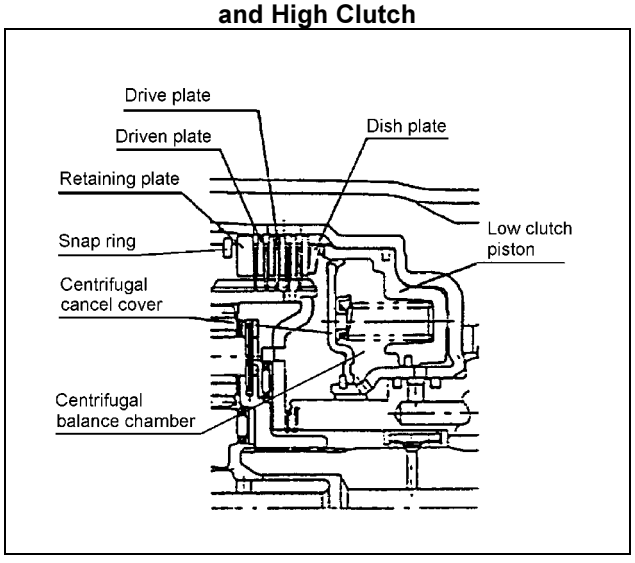


Figure 16. Construction of Low Clutch

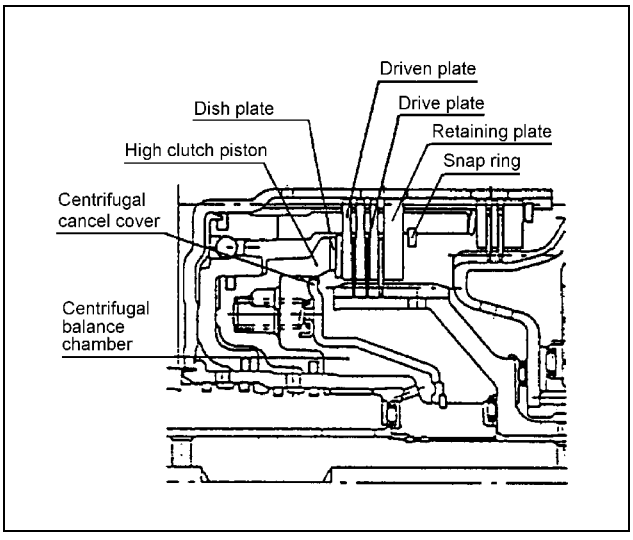


Figure 17. Construction of High Clutch

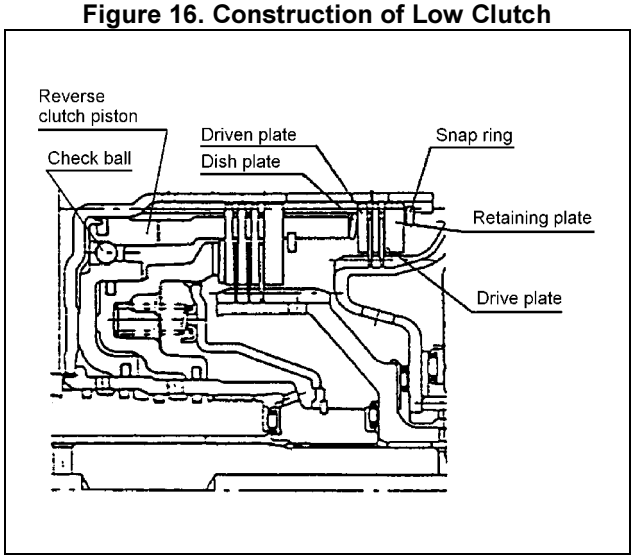


Figure 18. Construction of Reverse Clutch

2-4 Brake and Low & Reverse Brake (Multi-Plate Brake)

- The multi-plate brake is composed of drive plates and driven plates. By applying the oil pressure onto the end surface of the plates, the clutch is engaged or disengaged. The oil pressure is adjusted with the control valve according to the signal from the TCM.
- All brakes use dish plates to prevent uncontrolled operation of the clutches when engaged, causing a shock.
- The solenoid in the control valve is driven based on the speed change signal from TCM and moves the shift valve, thereby engaging the drive plate and driven plate through the piston of each clutch.
- Resultantly, rotation of each element of the planetary gear unit is fixed.
- When the oil pressure is removed, the piston returns to the original position by the force of the return spring.

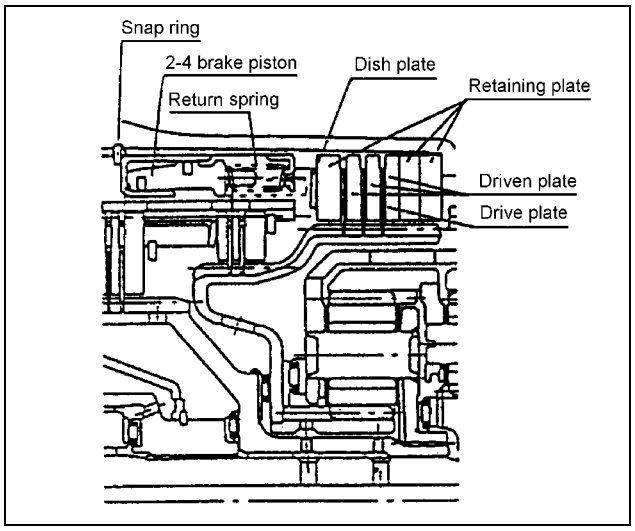


Figure 19. Construction of 2-4 Brake

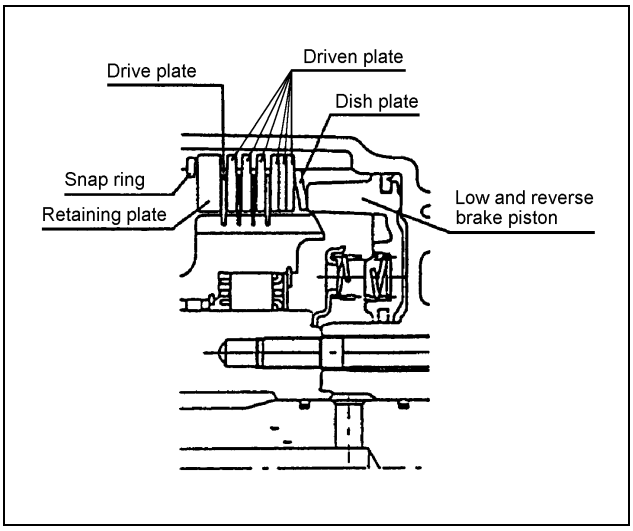


Figure 20. Construction of Low & Reverse Brake

Low One-way Clutch

- The low one-way clutch employs the sprag which locks the counterclockwise rotation of the front planetary carrier and rear internal gear.
- The one-way clutch outer race is fitted with the low clutch drum and the inner race with the transmission case.
- The outer race rotates freely clockwise but, when it attempts to rotate counterclockwise, the sprag functions to lock the outer race.
- When the vehicle is traveling in 1st gear in the D, 3 or 2range, the low one-way clutch locks the rear internal gear via the low clutch. It is left free in the 2nd, 3rd or 4th gear position.

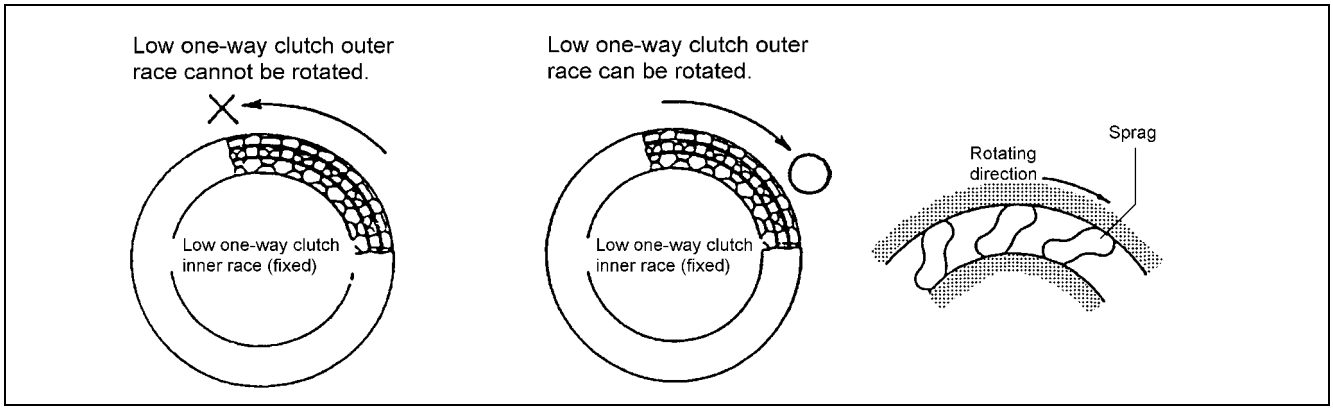


Figure 21. Construction of Low One-way Clutch

CONTROL VALVE

- Employing the direct electronic control (Direct Electronic Shift Control: DESC) for the clutch pressure has simplified the oil pressure circuit, reduced the number of functional components and made the control valve compact.
- The control valve body is divided into the upper body and lower body. All solenoids, oil pressure switch and ATF thermo sensor are installed to the lower body.
- Three-way valve type solenoids providing high responsibility are employed. Some of the solenoids are switched between ON and OFF and others repeat ON and OFF at 50Hz (duty cycle system). Functionally, some supply output pressure when power is not supplied and others drain the output pressure.
- When the solenoid is driven based on the signal from the TCM, the oil pressure is changed. The valve is operated by the difference of the oil pressure.

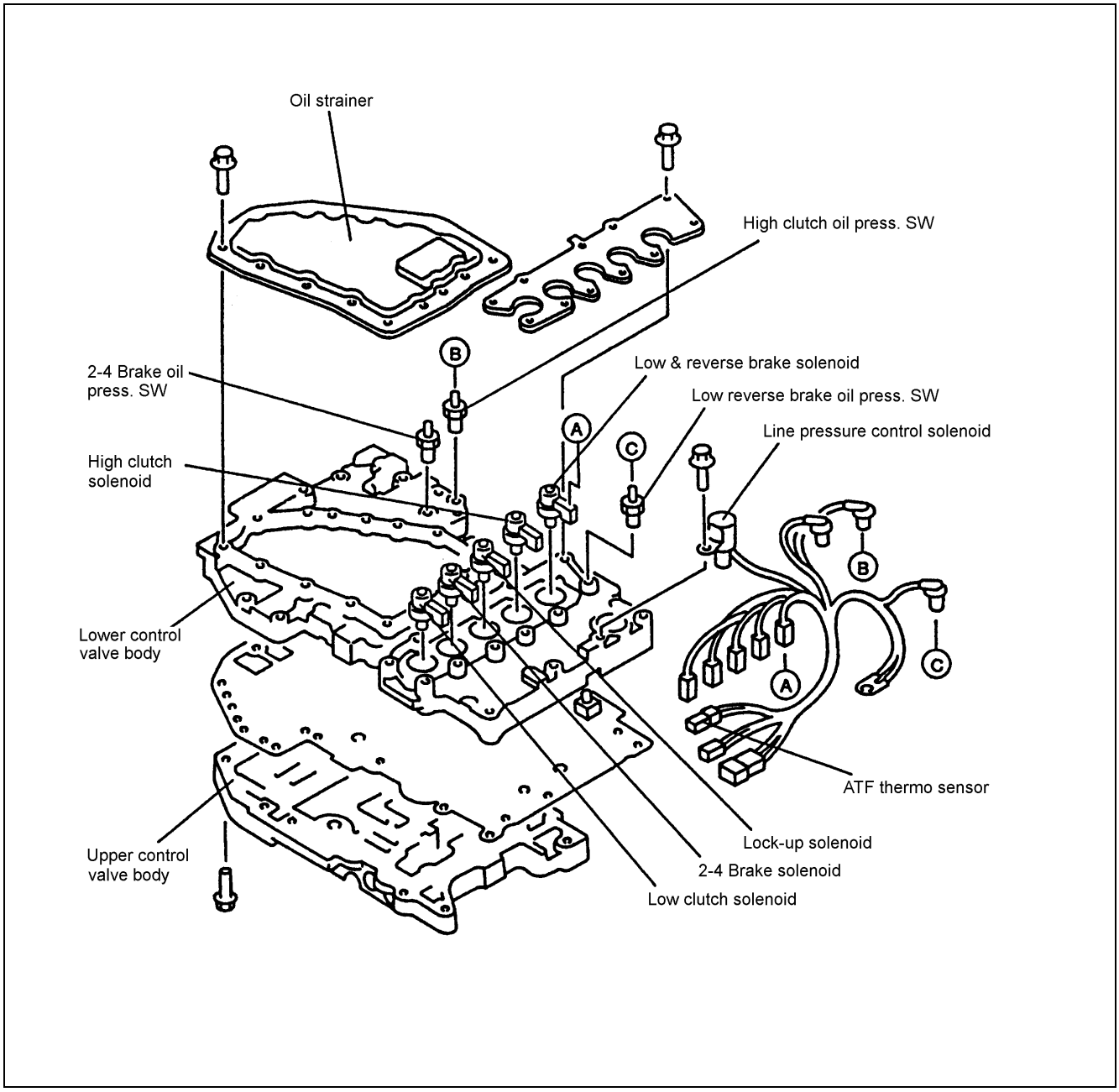


Figure 22. Construction of Valve Body

Line Pressure Solenoid

- The line pressure solenoid is turned ON or OFF according to the signal from the TCM. It switches the line pressure between high and low pressure.
- While no power is supplied, the solenoid supplies high pressure.

Shift Solenoid

- The shift solenoid is of the duty cycle type which are turned ON or OFF at 50Hz. The ratio of the ON and OFF time can be freely controlled in the range of 0 - 100%.
- While no power is supplied, the solenoid supplies output pressure.
- The low clutch solenoid adjusts the low clutch pressure, the high clutch solenoid the high clutch pressure, the 2-4 brake solenoid the 2-4 brake pressure and the low & reverse brake solenoid the low & reverse brake pressure respectively.

Lock-up Solenoid

- The lock-up solenoid is of the duty cycle type which is turned ON or OFF at 50Hz. The ratio of ON and OFF time can be freely controlled in the range of 0-100%.
- While no power is supplied, the solenoid drains the output pressure.

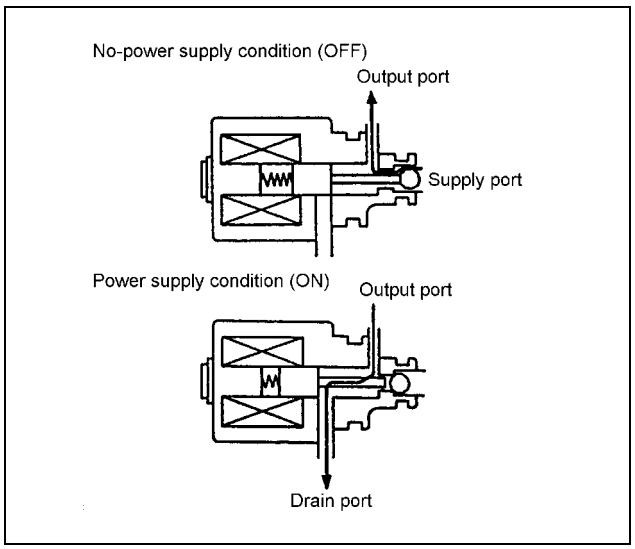


Figure 23. Shift Solenoid

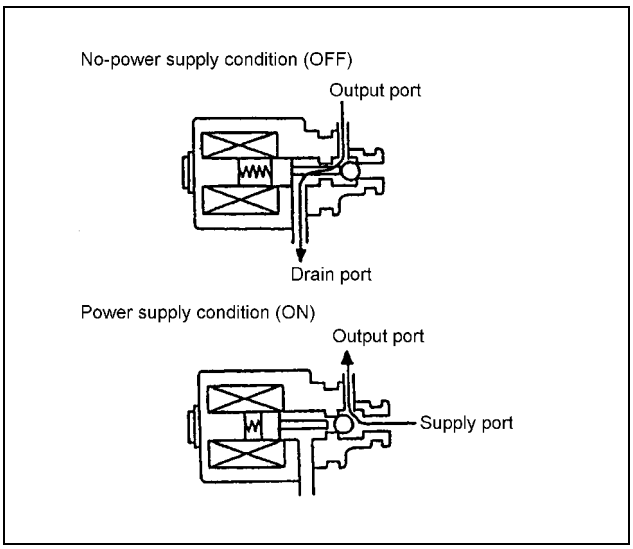


Figure 24. Lock-up Solenoid

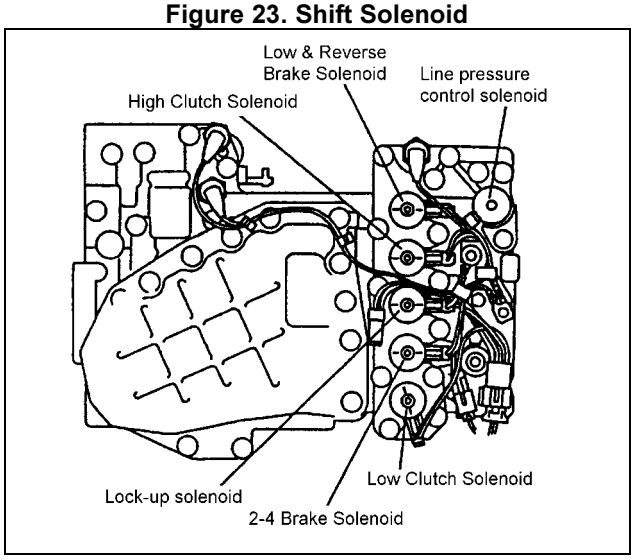


Figure 25. Location of Solenoid

Control Valve Fail-safe Function

- To prevent interlocking due to engagement of more than three clutches and brakes at the same time, the 2-4 brake fail-safe valve A and B, and the low & reverse brake fail-safe valve A and B are provided.
- When oil pressure is generated in the high clutch and the low clutch, the 2-4 brake solenoid is turned ON to drain the oil pressure applied to the 2-4 brake.
- When oil pressure is generated in the high clutch or 2-4 brake, the low & reverse brake solenoid is turned ON to drain the oil pressure applied to the low & reverse brake.

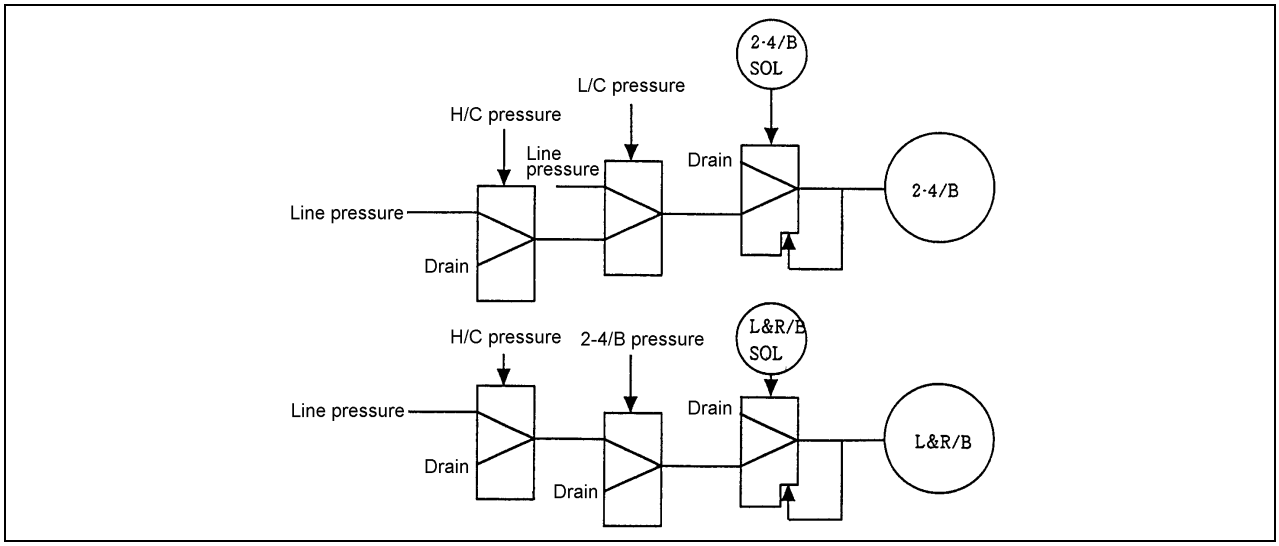


Figure 26. Fail-safe Function

Oil Pressure Switch

- The oil pressure switch detects the oil pressure supply condition to the clutch and brake and sends the detection result to the TCM.
- The oil pressure switch is turned ON when the oil pressure reaches the switch working pressure and turned OFF when the pressure decreases below the specified value.
- The high clutch oil pressure switch detects the high clutch oil pressure, 2-4 brake oil pressure switch the 2-4 brake oil pressure, and the low & reverse brake oil pressure switch the low & reverse brake oil pressure respectively.

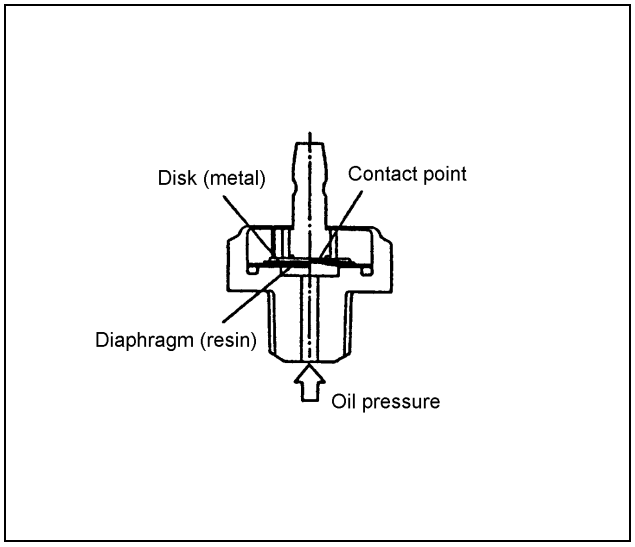


Figure 27. Oil Pressure Switch

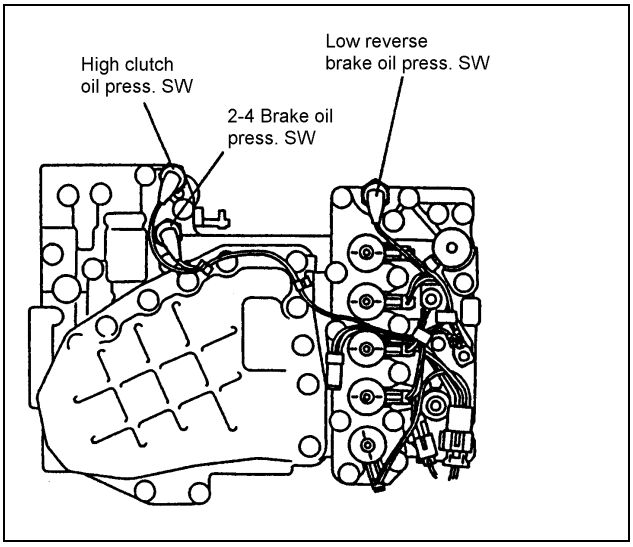


Figure 28. Location of Oil Pressure Switch

ATF Thermo Sensor

- The ATF thermo sensor detects the ATF temperature in the oil pan and sends signal to the TCM.
- The ATF thermo sensor is of the thermister type that the resistance value changes according to the ATF oil temperature.
- The lower is the ATF temperature, the larger is the resistance, and vice versa.
- When the ATF temperature exceeds 145°C, the TCM lights up the ATF temperature warning lamp in the meter. When the ATF temperature decreases below 128°C, the ATF temperature warning lamp goes out.
- The ATF thermo sensor is installed to the lower control valve body and integrated with the harness assembly.

ATF Temperature (°C)	Resistance (Approximately)
−30 °C	29,613.7 Ω
0 °C	6,028.0 Ω
10 °C	3,822.1 Ω
30 °C	1,681.7 Ω
50 °C	819.1 Ω
100 °C	117.6 Ω
128 °C	98.3 Ω
135 °C	84.6 Ω
145 °C	68.8 Ω

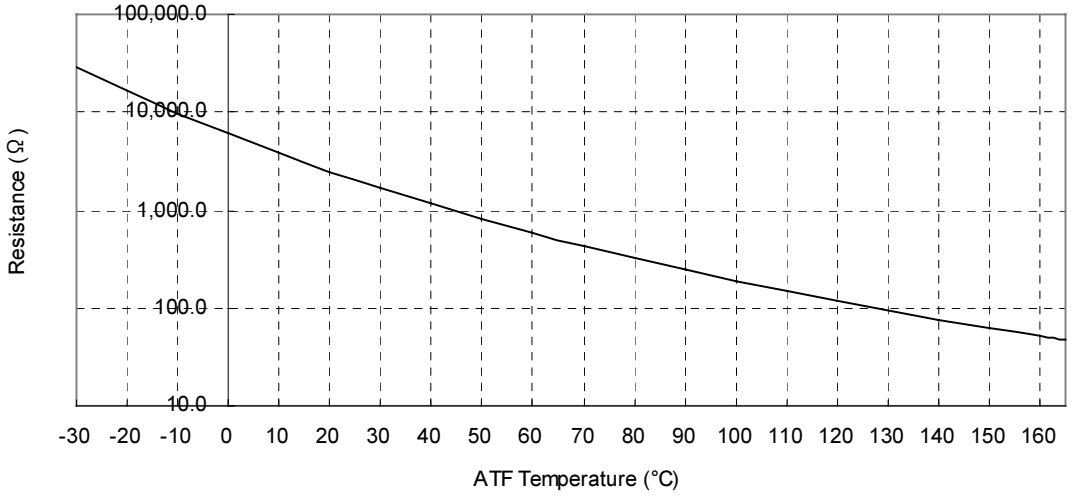


Figure 29. Characteristic of Thermo Sensor

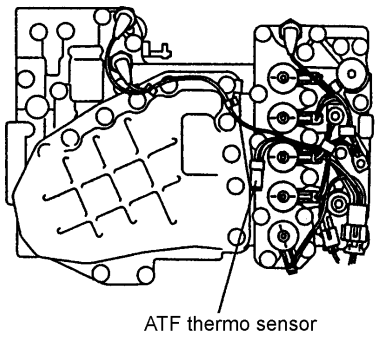


Figure 30. Location of Thermo Sensor

Terminal Assembly

Pin No.	Connected to	Connected TCMPin No.
6	Line Pressure Solenoid	B23
12	Low & Reverse Brake Oil Pressure Switch	B12
5	Low & Reverse Brake Duty Solenoid	B6
11	Ground Return	B22
4	Lock-up Duty Solenoid	B17
10	High Clutch Duty Solenoid	B8
3	Low Clutch Duty Solenoid	B9
9	2-4 Brake Duty Solenoid	B7
2	Oil Thermo Sensor	B4
8	Oil Thermo Sensor Ground	B14
1	High Clutch Oil Pressure Switch	B20
7	2-4 Brake Oil Pressure Switch	B1

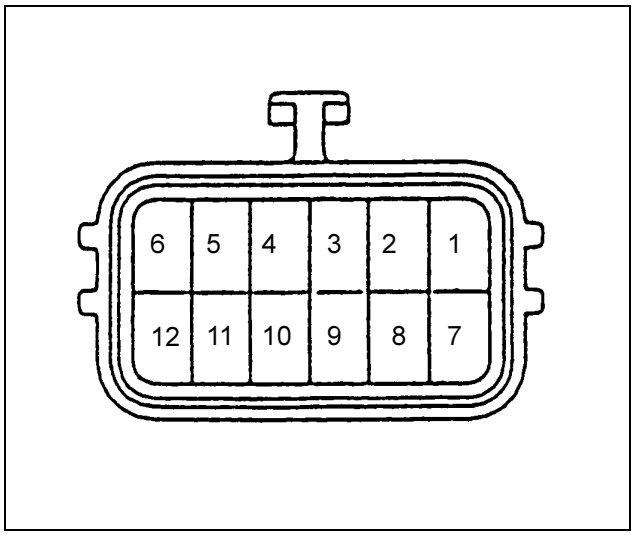


Figure 31. Pin Assignment

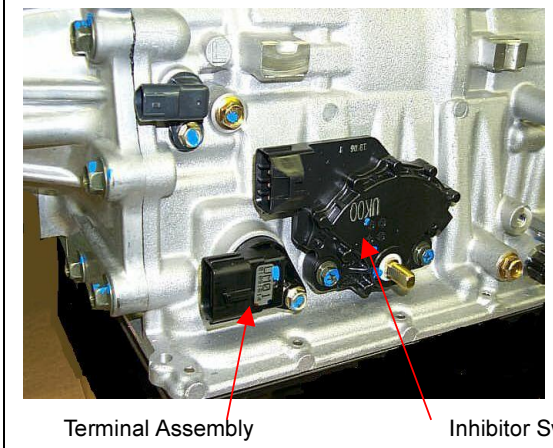


Figure 32. Location of Terminal Assembly

OIL PASSAGE

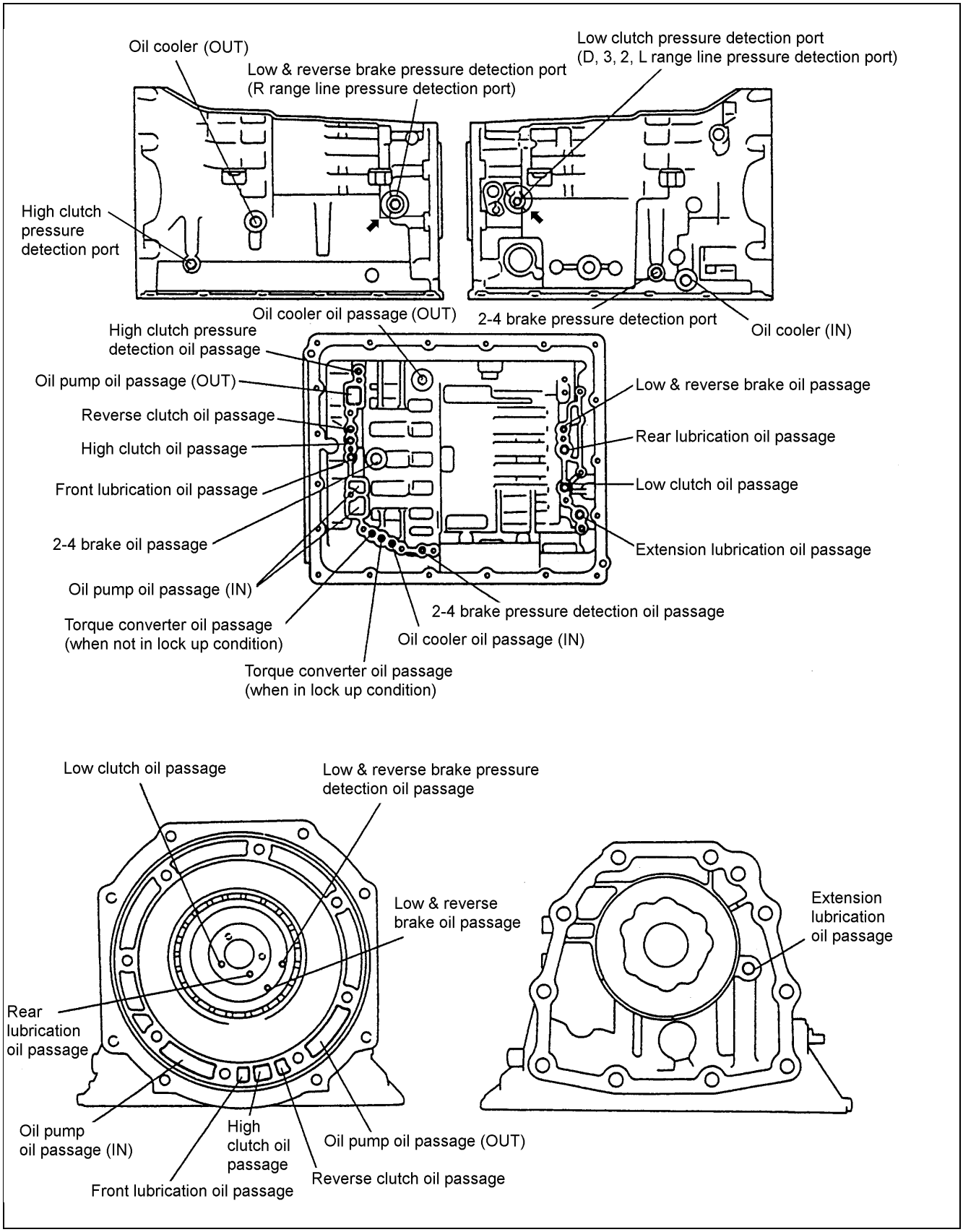


Figure 33. Oil Passage of Transmission Case

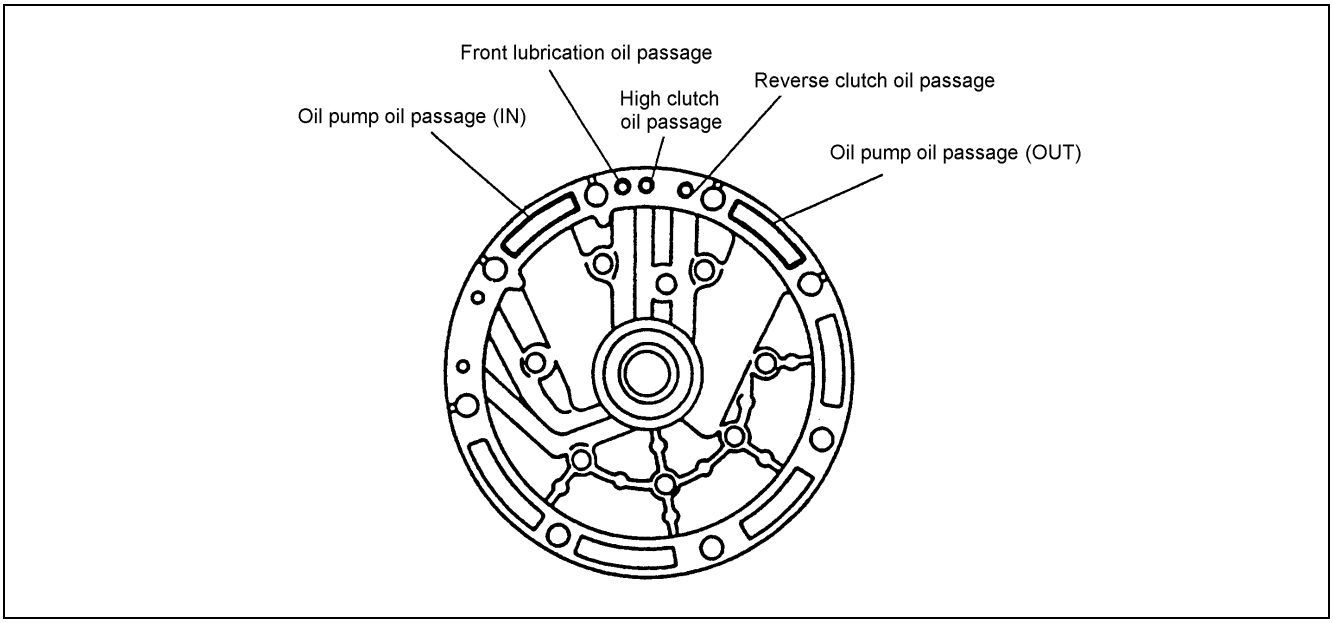


Figure 34. Oil Passage of Oil Pump

PARKING FUNCTION

- By setting the select lever to the P range, the parking pawl is engaged with the parking gear and fixes the output shaft.
- By the movement of the select lever, the manual shaft on the side surface of the AT is moved. The manual plate and parking rod in the AT are interlocked with the manual shaft. When the manual shaft moves, the parking rod end pushes up the parking pawl.
- The parking pawl is engaged with the parking gear when pushed up, and fixes the output shaft.
- When the clutch is disengaged, it returns to the original position by the force of the return spring fixed to the parking pawl.

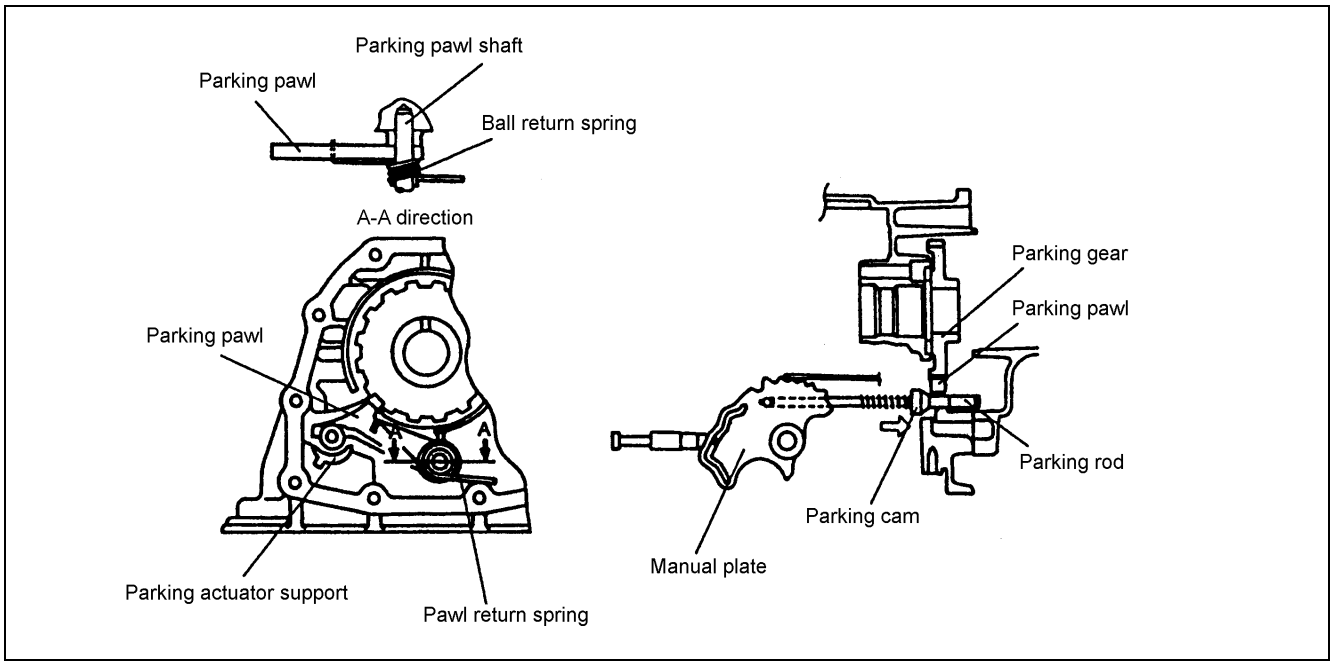


Figure 35. Parking Function

INHIBITOR SWITCH

- The inhibitor switch is installed on the right side of the transmission main unit to detect the select lever position.
- The inhibitor switch is connected with the starter SW circuit. The engine cannot be started when the select lever is at any position other than the P or N range.
- By moving the select lever, the combination of the inhibitor switch pins is changed. The current range of TCM is detected based on the combination of the pins.

	10	7	3	2	4	8	5	1	9	6
P	○	○	○	○						
R			○		○					
N	○	○	○			○				
D			○				○			
3			○					○		
2			○						○	
L			○							○

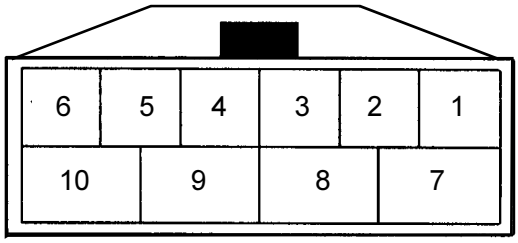


Figure 36. Pin Assignment

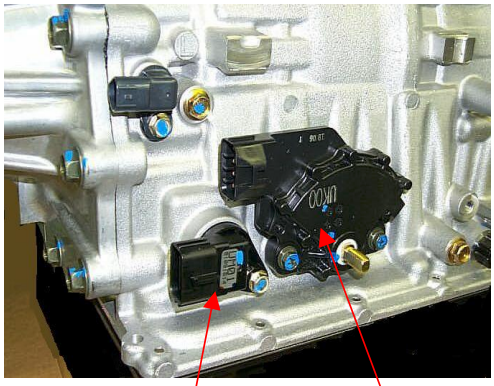


Figure 37. Location of Inhibitor Switch

TURBINE SENSOR

- The turbine sensor is a hall element. It is installed to the front of the transmission case. The turbine sensor converts the rotations of the reverse & high clutch drum fitted with the input shaft by spline to pulse signal and sends the signal to TCM.
- One turn of the reverse & high clutch drum generates 32-pulse signal, which is sent to the TCM.

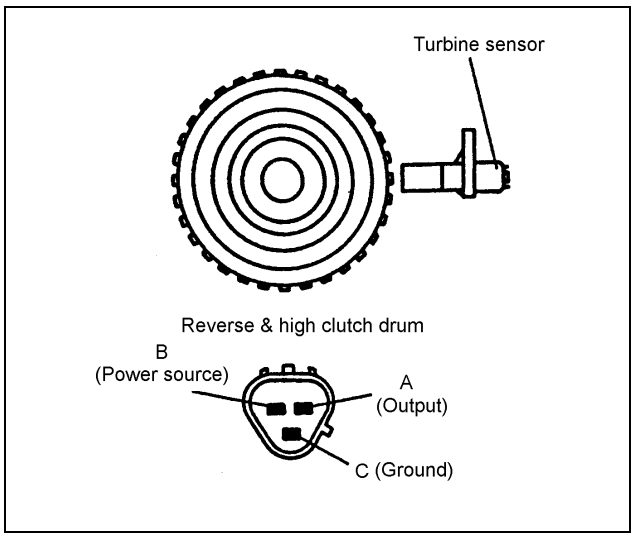


Figure 38. Turbine Sensor

SPEED SENSOR

- The speed sensor is a hall element. It is installed to the rear of the transmission case. The speed sensor converts the rotations of the parking gear fitted with the output shaft by spline to a pulse signal which is sent to the TCM.
- One turn of the parking gear generates a 16-pulse signal to be sent to the TCM.

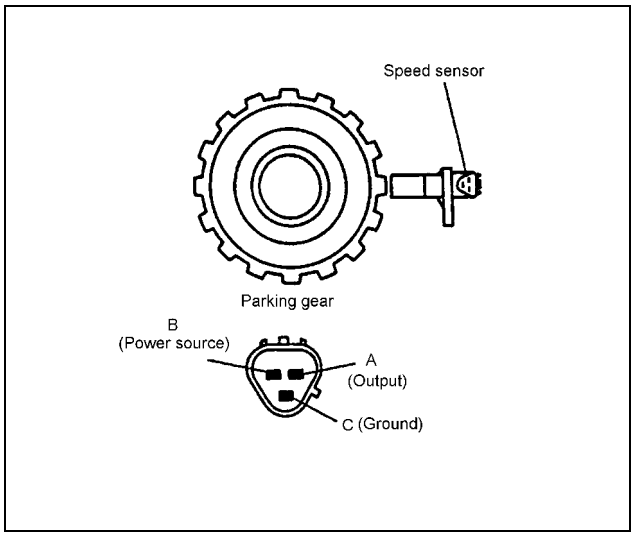


Figure 39. Speed Sensor

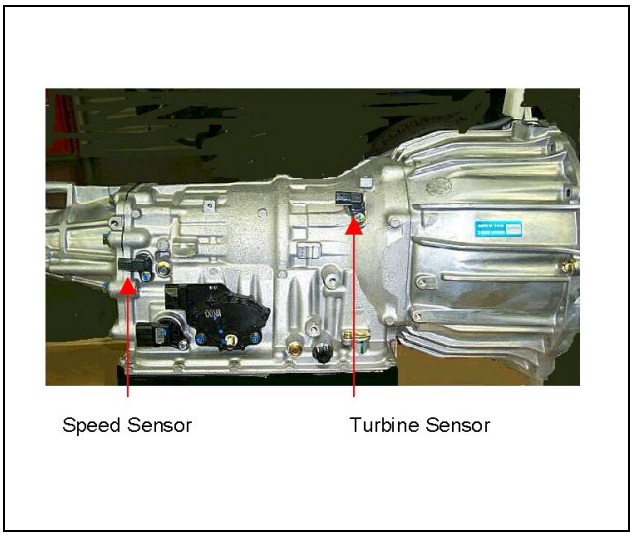


Figure 40. Location of Turbine & Speed Sensor

THROTTLE POSITION SENSOR (TPS)

- Opening of the accelerator pedal is converted to an electric signal which is transmitted from ECM to TCM.



Figure 41. Throttle Position Sensor

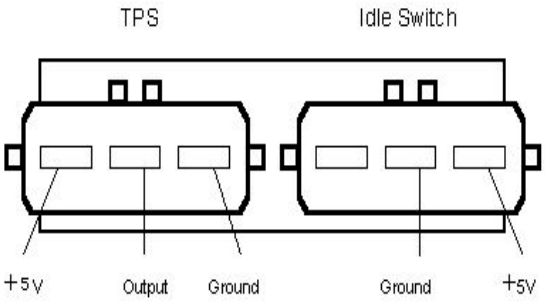


Figure 42. Pin Assignment

ENGINE SPEED SENSOR (=TDC SENSOR)

- The engine speed sensor converts the crankshaft from the TDC (Top Dead Center) sensor rotation to a pulse signal which is transmitted from ECM to TCM.



Figure 43. TDC Sensor

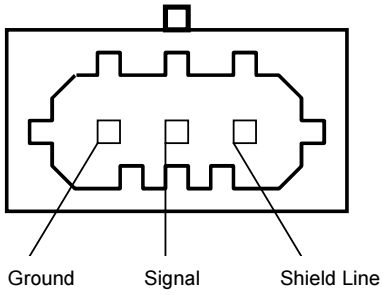


Figure 44. Pin Assignment

BRAKE SWITCH

- The brake switch is installed to the brake pedal. When the driver steps on the brake pedal, an electric signal is sent to the TCM.

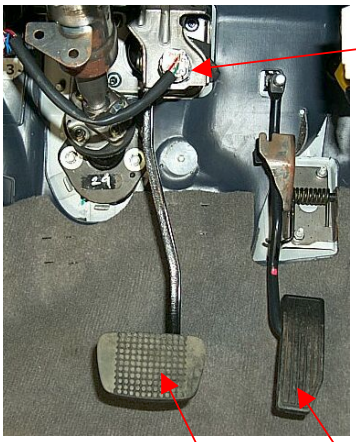


Figure 45. Brake Switch

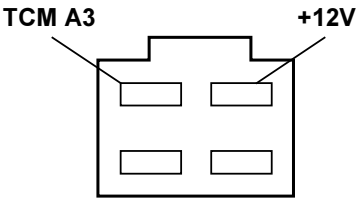


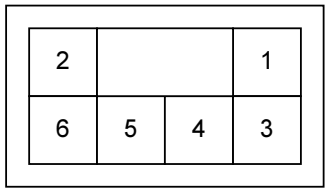
Figure 46. Pin Assignment

MODE SELECT SWITCH

- The mode select switch is installed beside the select lever. When the driver selects the PWR or 3rd, an electric signal is sent to the respectively. It turns ON the indicator lamp in the meter.
- The 3rd START mode can be used only in the D range.



Figure 47. Mode Select Switch



	Power	3rd	Illumination Lamp
1 (Illumination)			○
2 (Ground)			○
3 (TCM A24)	○		
4 (No Connection)			
5 (TCM A11)		○	
6 (Ground)	○	○	

Figure 48. Pin Assignment

TRANSMISSION CONTROL MODULE (TCM)

- The TCM is fitted side of brake pedal by means of two stud bolts.
- The TCM judges necessary line pressure, gear shifting point and lock-up operation based on electrical signals from switches and sensors and sends appropriate signals to solenoids.

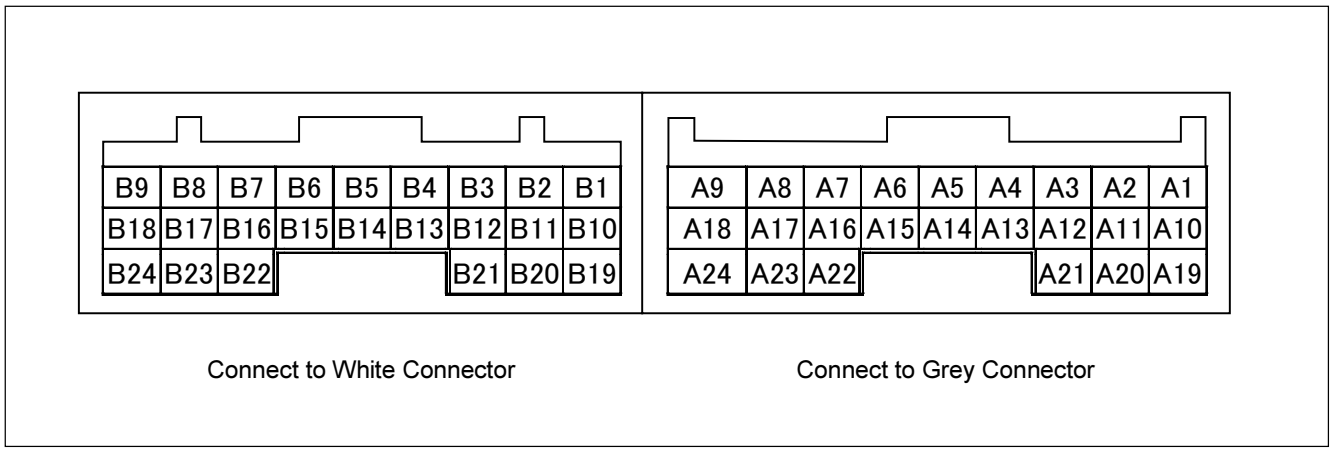


Figure 49. Pin Assignment

Pin No.	Pin Assignment	Pin No.	Pin Assignment
B1	2-4 Brake Oil Pressure Switch	A1	V BATT (Battery Back-up Power Supply)
B2	2 Range Switch	A2	P Range Switch
B3	Turbine Sensor	A3	Brake Switch
B4	ATF Thermo Sensor	A4	3rd Start Indicator Lamp
B5	Ground	A5	K-Line Signal (Tech 2 Serial Communication)
B6	Low & Reverse Brake Duty Solenoid	A6	No Connection
B7	2-4 Brake Duty Solenoid	A7	Engine Speed Sensor
B8	High Clutch Duty Solenoid	A8	No Connection
B9	Low Clutch Duty Solenoid	A9	No Connection
B10	N Range Switch	A10	Vehicle Speed Sensor Out (2WD Only)
B11	D Range Switch	A11	3rd START Select Switch
B12	Low & Reverse Brake Oil Pressure Switch	A12	4L Mode Switch (4WD Only)
B13	Vehicle Speed Sensor	A13	No Connection
B14	ATF Thermo Sensor Ground	A14	No Connection
B15	Ground	A15	No Connection
B16	No Connection	A16	Throttle Position Sensor
B17	Lock-up Duty Solenoid	A17	3 Range Switch
B18	Vign (Ignition Power Supply)	A18	DIAG Switch (Test Switch)
B19	R Range Switch	A19	A/T OIL TEMP Indicator Lamp
B20	High Clutch Oil Pressure Switch	A20	CHECK TRANS Indicator Lamp
B21	L Range Switch	A21	POWER DRIVE Indicator Lamp
B22	Ground (Shift Solenoid)	A22	No Connection
B23	Line Pressure Solenoid	A23	No Connection
B24	Vign (Ignition Power Supply)	A24	POWER DRIVE Select Switch

CONTROL MECHANISM

CONTENT OF FUNCTION AND CONTROL

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Line pressure control</td><td>TCM issues a signal according to the vehicle traveling, engine load and other conditions to TCM and the ON/OFF type line pressure solenoid is driven to switch the line pressure to high or low pressure.
The line pressure solenoid is switched to the low pressure side when the solenoid is turned ON (power supplied) and to the high pressure side when turned OFF (no power supplied).
In the forward travel range (D, 3, 2, L range), the line pressure decreases lower than that in the P, N, and R range through the oil pressure circuit for the forward travel range.</td></tr>
<tr><td>Gear shift control</td><td>The TCM issues a shift solenoid drive signal based on the traveling mode switch, inhibitor switch, vehicle speed, throttle opening and other input signal to control the optimum gear position automatically.
Speed change features have been set up to the TCM; the normal mode is suited to usual traveling and the power mode is appropriate when the vehicle is loaded or accelerates the speed.
In addition, speed change features used only for high oil temperature, hill climbing, and down have been set up to the TCM, which are automatically switched depending on the traveling conditions.
When the oil temperature is low (below 10°C), speed change from the third to the fourth speed is prohibited by the gear shift control.</td></tr>
<tr><td>Shift pattern selection control</td><td>According to a vehicle condition, the TCM selects the following shift pattern.
<table>
<tr><th>Selection Priority</th><th colspan="2">Shift Pattern</th><th>3rd Start Lamp</th><th>Power Drive Lamp</th></tr>
<tr><td rowspan="7">High ↑
↓ Low</td><td colspan="2">High Temperature</td><td>OFF</td><td>OFF</td></tr>
<tr><td colspan="2">3rd Start</td><td>ON</td><td rowspan="2">OFF</td></tr>
<tr><td colspan="2">4L</td><td rowspan="4">OFF</td></tr>
<tr><td rowspan="2">Down Slop</td><td>Power SW Off</td><td rowspan="2">ON</td></tr>
<tr><td>Power SW On</td></tr>
<tr><td colspan="2">Power</td></tr>
<tr><td colspan="2">Up Slop</td><td>OFF</td></tr>
<tr><td colspan="2">Normal</td><td colspan="2"></td></tr>
</table>
- High temperature mode -
<u>High temperature mode setting condition</u>
ATF temperature: More than 123°C
Above condition is met for more than 10 seconds.
<u>High temperature mode cancel condition</u>
ATF temperature: Less than 116°C
Above condition is met for more than 10 seconds.

- 3rd start mode -
<u>3rd start mode setting condition</u>
3rd start switch: On → Off (Pushed)
Vehicle speed: Less than 11km/h
ATF temperature: Less than 115°C
Throttle position: Less than 8%
Select lever position: D range
Above conditions are met at the same time.
<u>3rd start mode reset condition</u>
3rd start switch: On → Off again(Pushed again)
Vehicle speed: More than 34km/h
Select lever position: Other than D range
At least, one of above conditions is met.</td></tr>
</table>

Item	Description
	- 4L mode - 4L mode setting condition ,SL switch: On Vehicle speed: More than 5km/h Above conditions are met at the same time. 4L mode reset condition 4L switch: Off Vehicle speed: Less than 4km/h Above conditions are met at the same time. **- Down slope mode -** Down slope mode setting condition Brake switch: On Engine idle condition: More than 2.5 seconds Select lever position: D or 3 range Vehicle speed: More than 55km/h Vehicle speed change: +1km/h Above conditions are met at the same time. Down slope mode reset condition Engine idle condition: Not idle condition Select lever position: Other than D or 3 range At least, one of above conditions is met. **- Power Mode -** When power drive switch is On at only D range, 3 range and 2 range, the shift change is performed by 1 – 4 speed based on shift diagram set as power pattern. **- Up slope mode -** TCM compares up slope reasoning value calculated from average throttle angle with one calculated from average acceleration, regards smaller value as up slope. And up slope reasoning value is calculated from present vehicle speed. TCM compares the former with the latter judges as up slope mode, when the former is bigger than latter.
Lock-up control	The lock-up solenoid adjusts the pressure based on the signal from the TCM according to the vehicle speed, throttle opening and other input signals based on the pre-set lock-up point to control the lock-up. Smooth lock-up control engages and disengages the clutch smoothly at the time of lock-up. When the oil temperature is low (below 20°C) or high (above 128°C), lock-up is prohibited even when the vehicle is at a lock-up speed. The lock-up is disengaged also when the throttle is closed.
Direct electronic shift control (DESC)	The duty cycle type solenoid is used for each clutch and brake. The solenoid adjusts the clutch pressure to be suited to the engine load and vehicle traveling condition based on the signal from the TCM. The pressure switch provided in the control valve oil passage sends the oil pressure condition to the TCM to control the disengagement and engagement of the clutch and brake directly and finely.
Learning control	Learning is controlled to correct the oil pressure control timing to engage or disengage the clutch optimally in order to compensate changes of the engine performance and changes of the transmission with time. It is controlled to bring the speed-change time closer to the value pre-set to the TCM.

Item	Description
Fail-safe function	In case of malfunction of the vehicle speed sensor, throttle position sensor, all solenoids or inhibitor switch, TCM automatically begins fail-safe control to minimize effects on driving. The gear is fixed at the 3rd-speed position and power supply to the solenoid is shut off so that the solenoid does not work nor lock up.
Self-diagnosis function	Parts required for controlling the automatic transmission are provided with a self-diagnosis function. When any trouble occurs, the check trans indicator lamp blinks to warn the driver. The trouble code is memorized in the TCM.

CONTROL ITEM, INPUT AND OUTPUT

	Item \ Control item	Line pressure control	Gear shift control	Shift pattern selection	Lock-up control	Direct electronic shift control (DECS)	Learning control	Fail-safe function	Self-diagnosis function
Input	Speed sensor	○	○	○	○	○	○	○	○
	Turbine sensor	○	○		○	○	○	○	○
	Engine speed sensor	○	○		○	○	○	○	○
	Brake switch		○	○					
	Inhibitor switch	○	○	○				○	○
	Mode select switch		○	○					
	4L switch (4WD Only)		○	○					
	ATF thermo sensor	○	○		○	○	○	○	○
	High clutch oil pressure switch					○	○	○	○
	2-4 brake oil pressure switch					○	○	○	○
	Low & Reverse brake oil pressure switch					○	○	○	○
	Throttle position sensor	○	○	○	○	○	○	○	○
Output	Line pressure solenoid	○				○		○	○
	Low clutch solenoid		○			○	○	○	○
	High clutch solenoid		○			○	○	○	○
	2-4 brake solenoid		○			○	○	○	○
	Low & Reverse brake solenoid		○			○	○	○	○
	Lock-up solenoid				○			○	○
	Shift pattern indicator lamp		○					○	○
	ATF temperature indicator lamp							○	○
	Check trans indicator lamp							○	○

LINE PRESSURE CONTROL

- Either the throttle opening, vehicle speed, turbine rotational speed, ATF temperature or speed-change range signal appropriate under the situation is issued from the TCM. The ON/OFF type line pressure solenoid is actuated and switches the line pressure to high or low pressure.
- The line pressure generated by the oil pump acts on the point A of the pressure regulator valve. When the pressure control solenoid is turned ON by the signal from the TCM, the solenoid pressure does not act. The line pressure is adjusted to match the spring force acting on the right side of the pressure regulator valve.
- When the pressure control solenoid is turned OFF, the solenoid pressure acts so that the line pressure is adjusted to match the spring force acting on the right side of the pressure regulator valve.
- As a result, the line pressure is adjusted to be low when the pressure control solenoid is ON and to be high when the pressure control solenoid is OFF.
- In the D, 3, 2 and L range, the line pressure through the oil pressure circuit acts onto the point B of the pressure regulator valve and the pressure regulator valve moves so as to increase the pressure to be drained, so that the line pressure is adjusted to be lower than the P, N, and R range by the difference of area at the point B.

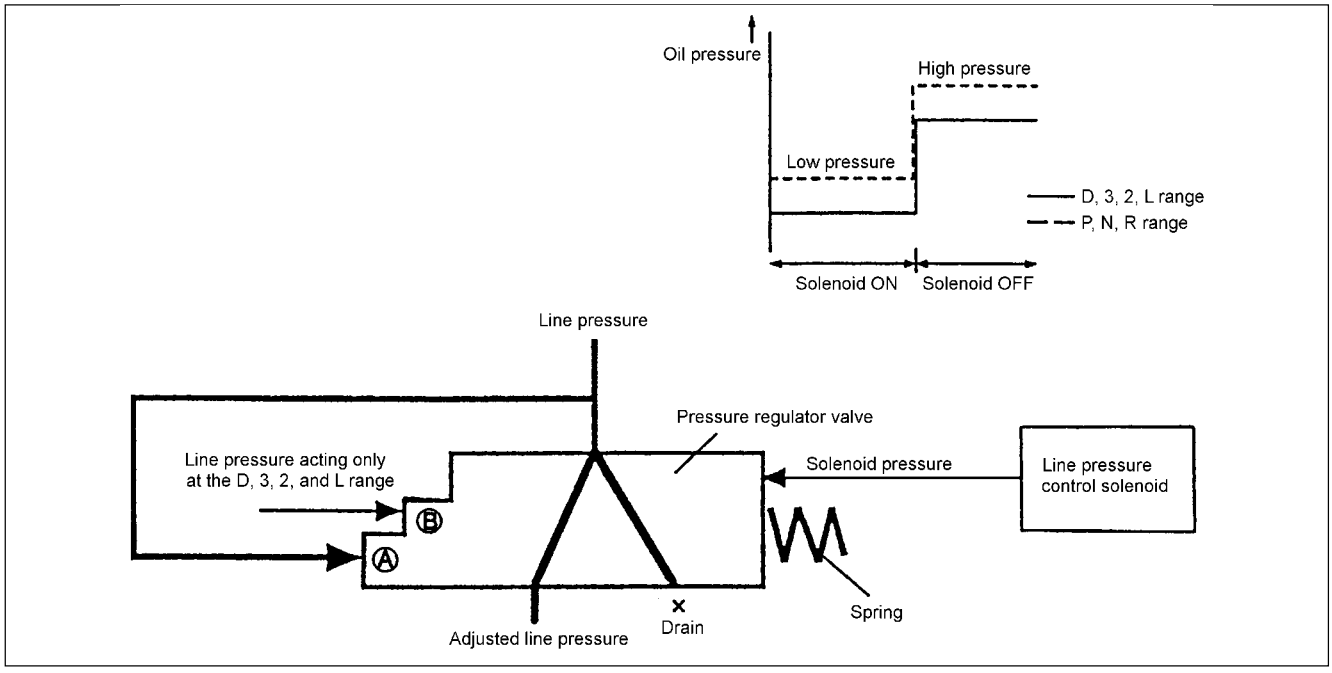


Figure 50. Line Pressure Control

LOCK-UP CONTROL

- The lock-up solenoid adjusts the pressure and controls the lock-up based on the pre-set lock-up point, according to the vehicle speed, throttle opening, engine rotations, turbine rotations and ATF temperature input signal, based on the signal from the TCM.
- Smooth lock-up control is employed to engage or disengage the clutch smoothly at the time of lock-up.
- When the oil temperature is low (below 20°C) or high (over 128°C), lock-up is disengaged even though the vehicle is at the lock-up speed.
- The lock-up is disengaged also when the throttle is closed.
- When the TCM determines the lock-up engagement, the DUTY ratio to supply power to the lock-up solenoid is gradually increased (5% to 95%) and the oil between the lock-up piston and converter cover is gradually drained.
  As a result, the lock-up piston is fitted slowly under pressure to the converter cover securing smooth lock-up engagement.

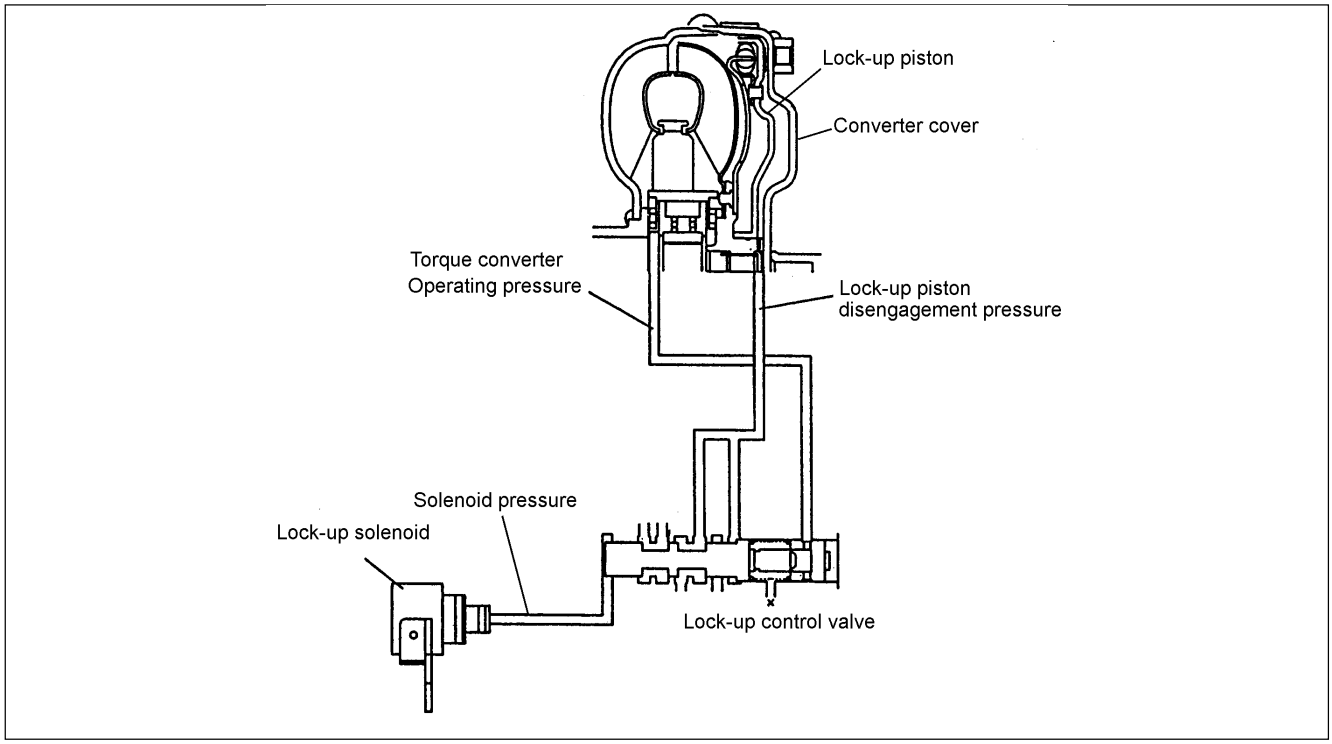


Figure 51. Lock-up Control

DIRECT ELECTRIC SHIFT CONTROL (DESC)

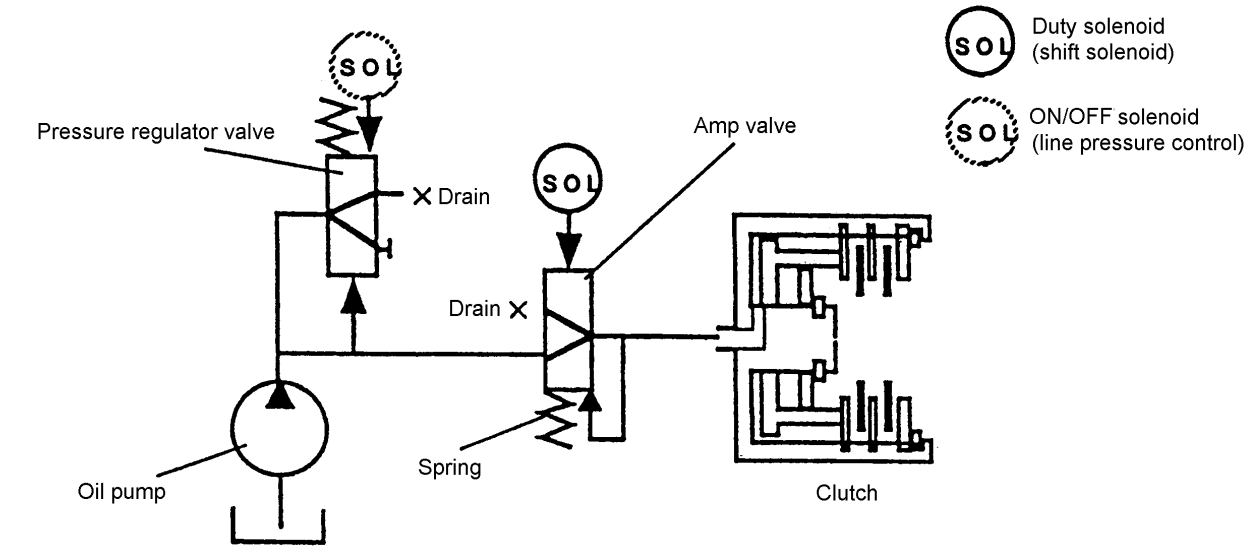
Feature

- Based on the each switch signals (low & reverse brake pressure, 2-4 brake pressure & high clutch pressure) and sensors signals (turbine sensor, speed sensor, engine speed signal & throttle position signal), duty cycle type solenoid adjusts the clutch pressure to match the engine load and vehicle traveling condition. By this result, controlling the engagement and disengagement of the clutch and brake pressure is directly and accurately controlled via TCM, which is not realized in previous accumulator type.

Operation

- Instead of the previous system (on/off type of shift solenoid and shift valve), the combination of duty cycle type solenoid and amplifier (Amp) valve are used to adjust the clutch pressure to match the engine load and vehicle traveling condition based on the signal from the TCM, and the pressure switch provided in the oil passage of the control valve transmits the oil pressure condition at that time to TCM, thus controlling the engagement and disengagement of the clutch and brake directly and finely.
- When the gear is shifted from the 2nd to 3rd, 3rd to 4th (O/D), 4th (O/D) to 3rd and 3rd to 2nd, the clutch pressure on the engagement side and that on the disengagement side are simultaneously controlled. As a result, engine racing or clutch drag is prevented securing smooth and quick speed change response

Direct Electric Shift Control



Previous Model

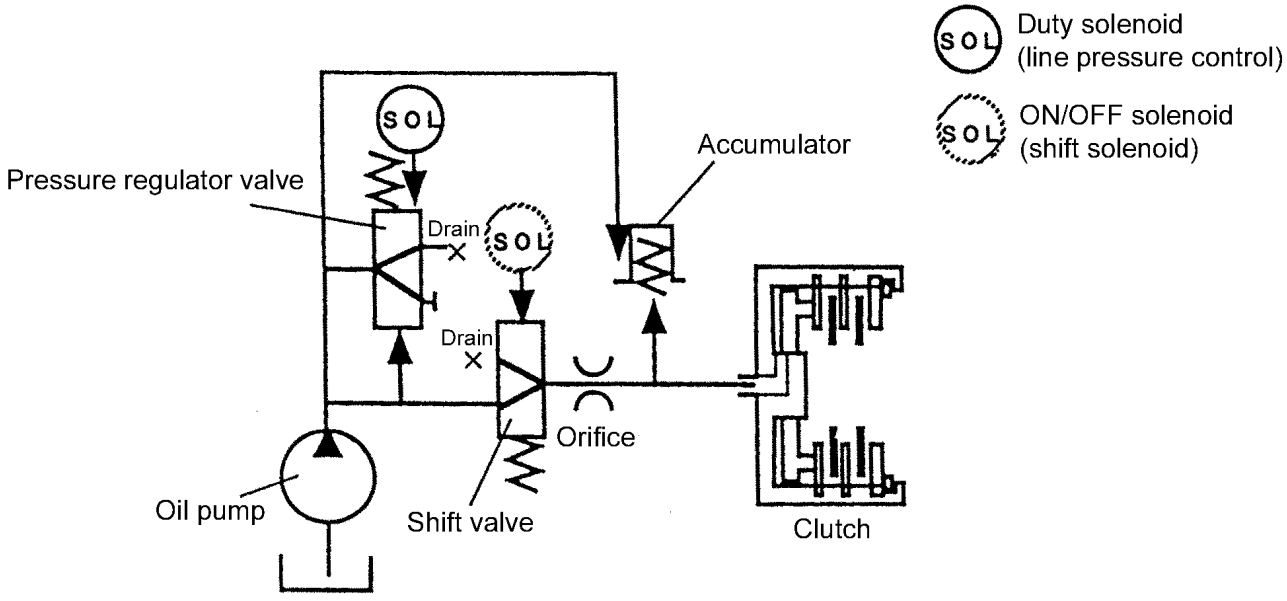


Figure 52. Direct Electric Shift Control (DESC)

LEARNING CONTROL

- Oil pressure control timing is optimally corrected at the time of clutch engagement and disengagement and controlled to bring the speed-change time to the value preset to the TCM and compensate the changes of the engine performance and changes of the transmission with time.
- When the gear is shifted, the clutch pressure ② is optimally corrected so that the speed-change time is as near as the target value ① preset to the TCM and the changes in the engine performance and the changes of the transmission with time can be compensated based on the past speed-change results.
- When the clutch is operated to shift the gear, the time of the clutch oil pressure release timing ④ on the disengagement side is optimally corrected so that the changes of the engine rpm ③ is optimum.

Note:

- When the battery terminal is disconnected, contents of learning are cleared and resultantly the speed change shock may increase. After the vehicle has traveled, learning is repeated and the shock decreases gradually.

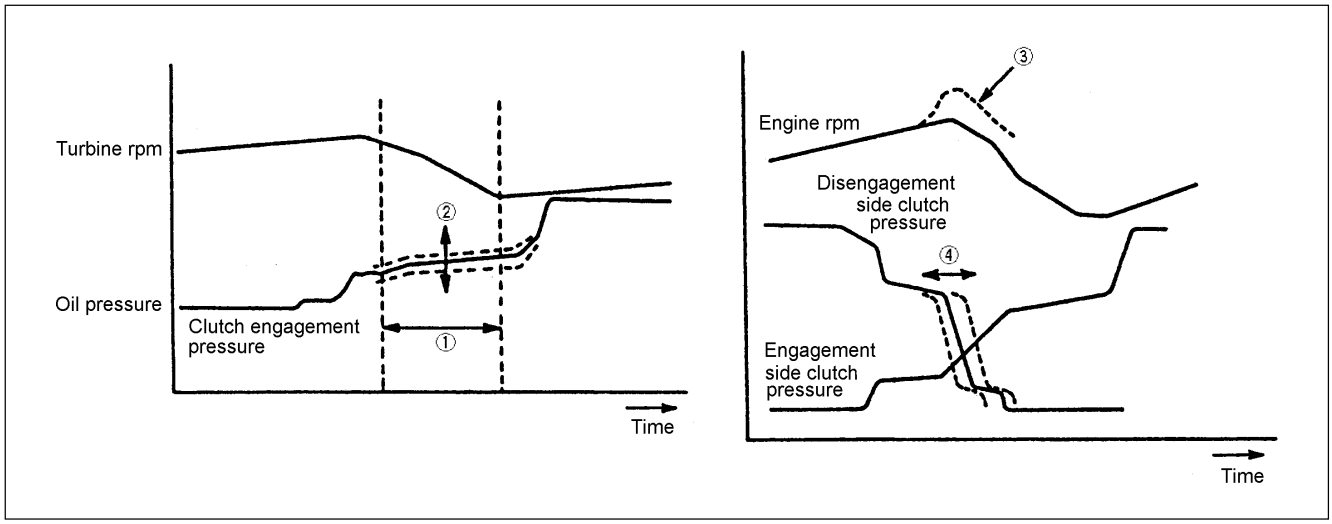


Figure 53. Learning Control

MAJOR INPUT/OUTPUT COMPONENT AND THEIR FUNCTIONS

Input	Speed sensor	Detects output shaft revolution and sends rpm signal to TCM.
	Turbine sensor	Detects input shaft revolution and sends rpm signal to TCM.
	Engine speed sensor	Inputs engine revolution from engine control computer.
	Brake switch	Detects brake pedal operated by the driver and sends signal to TCM.
	Inhibitor switch	Detects select lever position and sends signal to TCM.
	Mode select switch	Detects "Power Drive" or "3rd Start" selected by the driver and sends signal to TCM.
	4L switch (4WD Only)	Inputs 4L mode from transfer control computer.
	ATF thermo sensor	Detects ATF temperature and sends signal to TCM.
	High clutch oil pressure switch	Detects high clutch supply oil pressure and sends signal to TCM.
	2-4 brake oil pressure switch	Detects 2-4 brake supply oil pressure and sends signal to TCM.
	Low & Reverse brake oil pressure switch	Detects low & reverse brake supply oil pressure and signal to TCM.
	Throttle position sensor	Inputs throttle opening angle from engine control computer.
	TCM	Judges necessary line pressure, gear shifting point and lock-up operation based on electrical signals from switches and sensors and sends appropriate signals to solenoids.
Output	Line pressure solenoid	Regulates oil pump delivery pressure to the appropriate line pressure for current driving condition based on signal from TCM.
	Low clutch solenoid	Selects appropriate gear shifting position for current driving condition and regulates low clutch supply oil pressure based on signal from TCM.
	High clutch solenoid	Selects appropriate gear shifting position for current driving condition and regulates high clutch supply oil pressure based on signal from TCM.
	2-4 brake solenoid	Selects appropriate gear shifting position for current driving condition and regulates 2-4 brake supply oil pressure based on signal from TCM.
	Low & Reverse brake solenoid	Selects appropriate gear shifting position for current driving condition and regulates low & reverse brake supply oil pressure based on signal from TCM.
	Lock-up solenoid	Regulates lock-up pressure to appropriate level for current driving conditions based on signal from TCM.
	Mode indicator lamp	Indicates POWER DRIVE or 3rd START switch position.
	Speed meter signal (2WD Only)	Outputs vehicle speed to speed meter.
	A/T OIL TEMP indicator lamp	Indicates A/T OIL TEMP indicator lamp in case of high temperature.
	CHECK TRANS indicator lamp	Indicates CHECK TRANS indicator lamp in case of malfunction.

CONTROL CIRCUIT BLOCK DIAGRAM

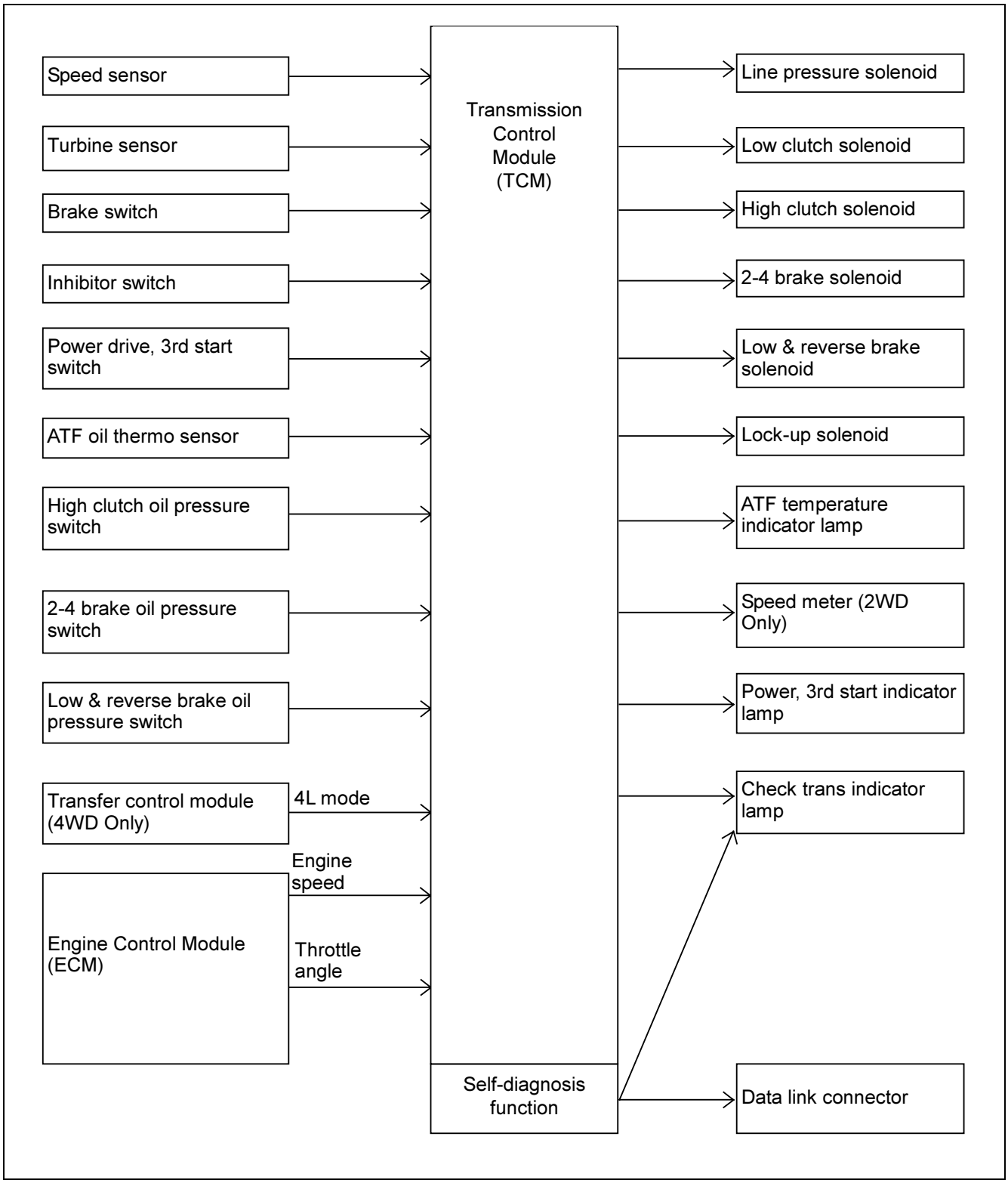
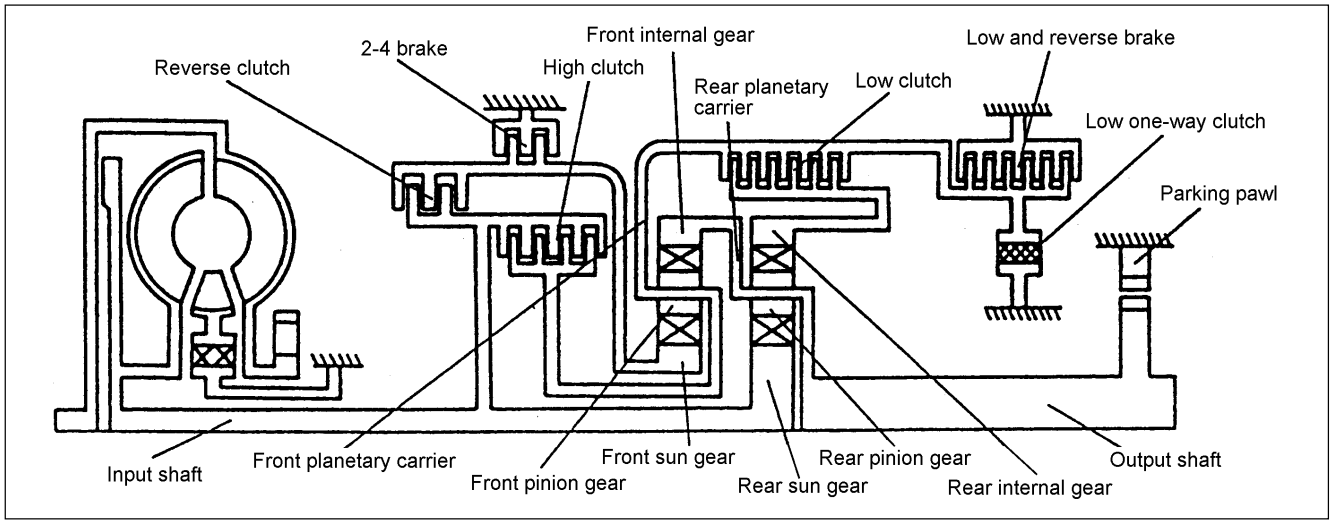


Figure 54. Control Circuit Block Diagram

GEAR TRAIN (TRANSMISSION MECHANISM) OPERATION AND HYDRAULIC CIRCUIT

CONSTRUCTION AND OPERATION

The JR405E consists of two sets of planetary gears, three multiple plate clutches, two multiple plate brakes and one one-way clutch.



COMPONENT NAME AND FUNCTION

Component Name	Symbol	Function
Low Clutch	L/C	Connects the front planetary carrier to the rear internal gear. Engaged at 1st, 2nd and 3rd gear.
High Clutch	H/C	Connects the input shaft to the front planetary carrier. Engaged at 3rd and 4th (O/D) gear.
Reverse Clutch	R/C	Connects the input shaft to the front sun gear. Engaged at Reverse gear.
Low & Reverse Brake	L&R/B	Locks the front planetary carrier. Engaged at L range and Reverse gear.
2-4 Brake	2-4/B	Locks the front sun gear. Engaged at 2nd and 4th (O/D) gear.
Low One-way Clutch	L/O.C	Allows the front planetary carrier to turn forward (clockwise) but locks to opposite direction (counterclockwise). Operative when accelerating.
Low Clutch Solenoid	L/C.S	Regulates low clutch pressure.
High Clutch Solenoid	H/C.S	Regulates high clutch pressure.
Low & Reverse Brake Solenoid	L&R/B.S	Regulates low & reverse brake pressure.
2-4 Brake Solenoid	2-4/B.S	Regulates 2-4 brake pressure.
Lock-up Solenoid	L/U.S	Regulates lock-up clutch pressure.
High Clutch Oil Pressure SW	H/C.P/SW	Detects high clutch supply oil pressure.
Low & Reverse Brake Oil Pressure SW	L&R/B.P/SW	Detects low & reverse brake supply oil pressure.
2-4 Brake Oil Pressure SW	2-4/B.P/SW	Detects 2-4 brake supply oil pressure.

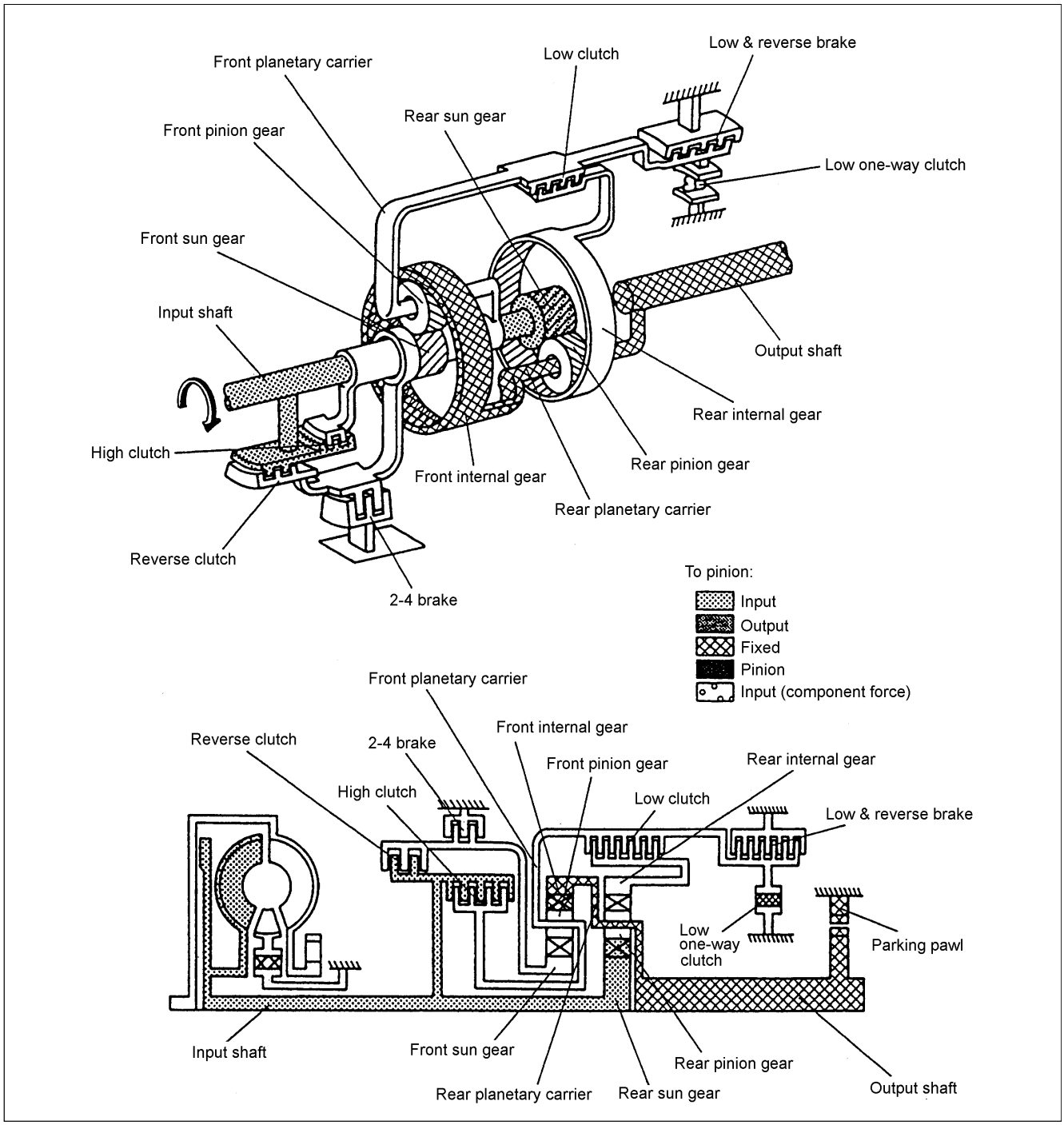
COMPONENT AND THEIR OPERATING CONDITION

				Clutch				Brake		Solenoid					Pressure Switch		
Select lever position	Gear position	Gear Shift	Lock-up	L/C	H/C	R/C	L/O.C	L&R/B	2-4/B	L/C.S	H/C.S	L&R/ B.S	2-4/ B.S	L/U.S	H/ C.P/ SW	L&R/ B.P/ SW	2-4 B.P/ SW
P	-	-									○	○	○				
R	Reverse	-				○		○			○		○			○	
N	-	-									○	○	○				
D	1st	↑		○			△				○	○	○				
	2nd	↓↑	○	○					○		○	○		○			○
	3rd	↓↑	○	○	○							○	○	○	○		
	4th	↓	○		○				○	○		○		○	○		○
3	1st	↑		○			△				○	○	○				
	2nd	↓↑	○	○					○		○	○		○			○
	3rd	↓↑	○	○	○							○	○	○	○		
	4th(*1)	↓			○				○	○		○			○		○
2	1st	↑		○			△				○	○	○				
	2nd	↓↑		○					○		○	○					○
	3rd(*1)	↑		○	○							○	○		○		
	4th(*1)	↓			○				○	○		○			○		○
L	1st	↑		○			△	○			○		○			○	
	2nd(*1)	↑		○					○		○	○					○
	3rd(*1)	↑		○	○							○	○		○		
	4th(*1)	↓			○				○	○		○			○		○

*1:Transmission is shifted at high speed to prevent engine over-run.
○ - Engaged or operated
△- Operative when accelerating

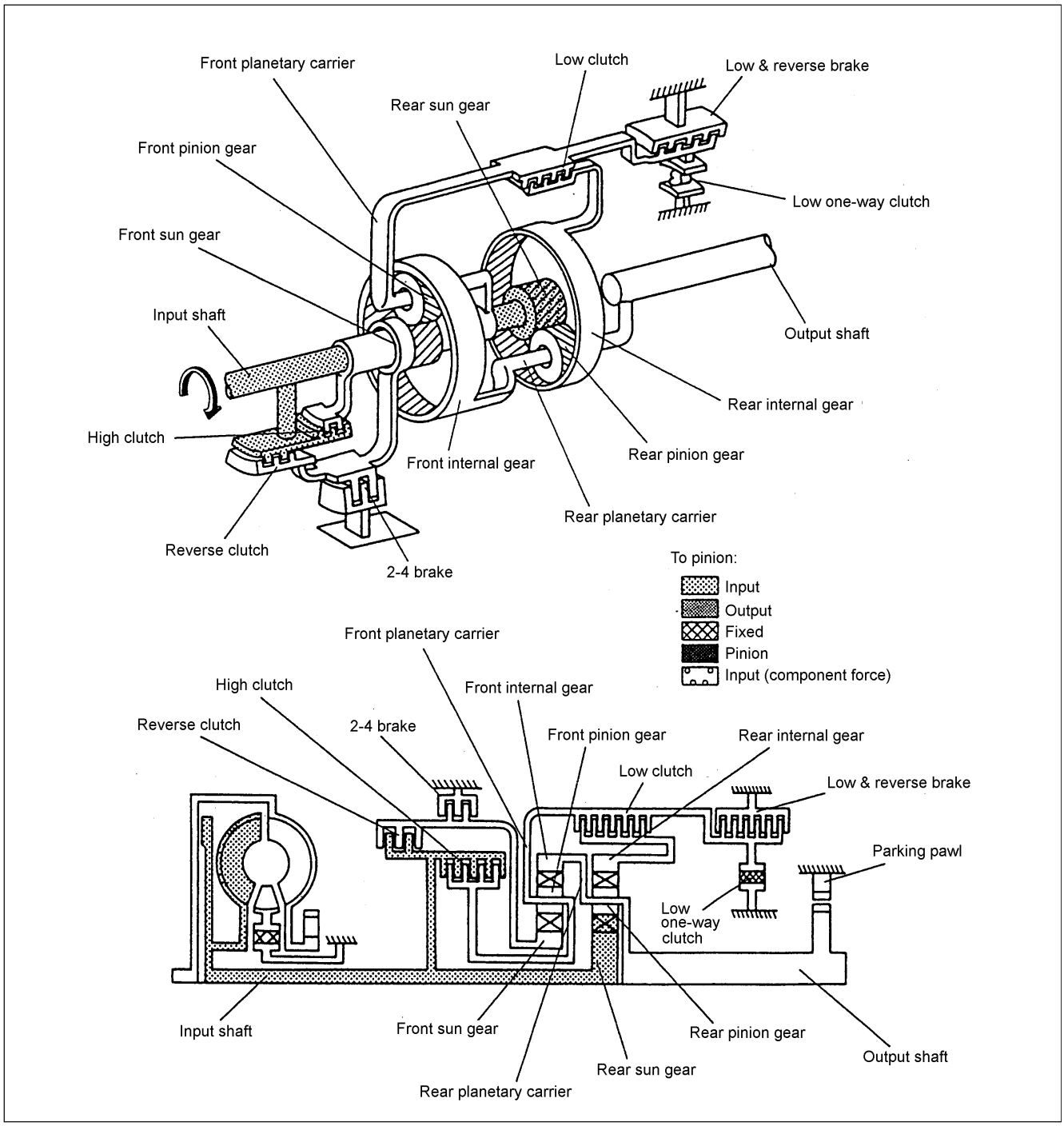
P Range

Though the driving force of the input shaft is transmitted to the rear sun gear and reverse & high clutch drum, the driving force is not transmitted to the output shaft since all of the clutches and brakes are not engaged. Therefore, the vehicle can move at this condition. However, since the output shaft is mechanically locked with the parking pawl, the rear planetary carrier and front internal gear are locked. For this reason, the vehicle does not move.



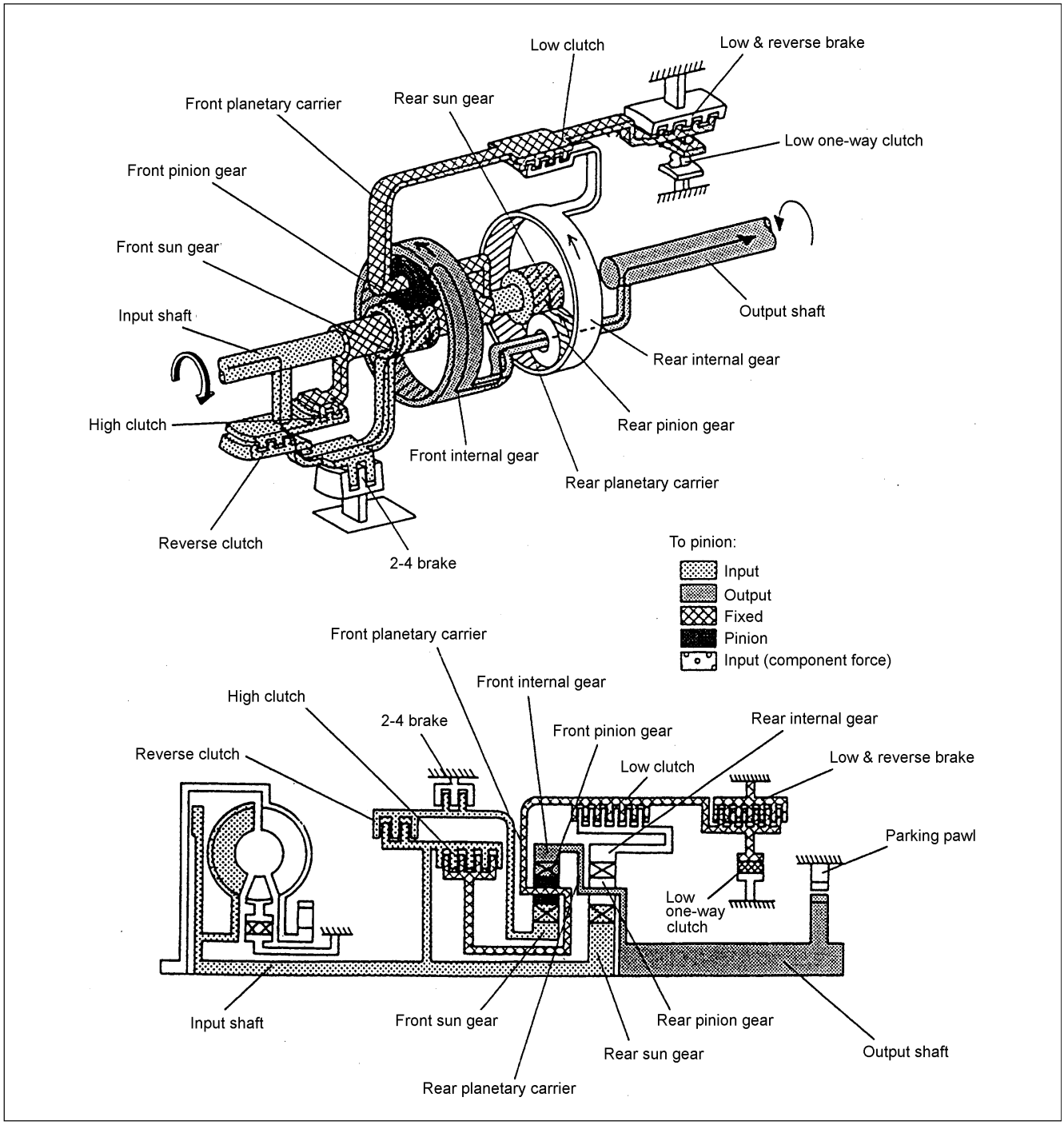
N Range

Though the driving force of the input shaft is transmitted to the rear sun gear and reverse & high clutch drum, the driving force is not transmitted to the output shaft, since all of the clutches and brakes are not engaged. Therefore, the vehicle can move at this condition.



Reverse Gear in Range

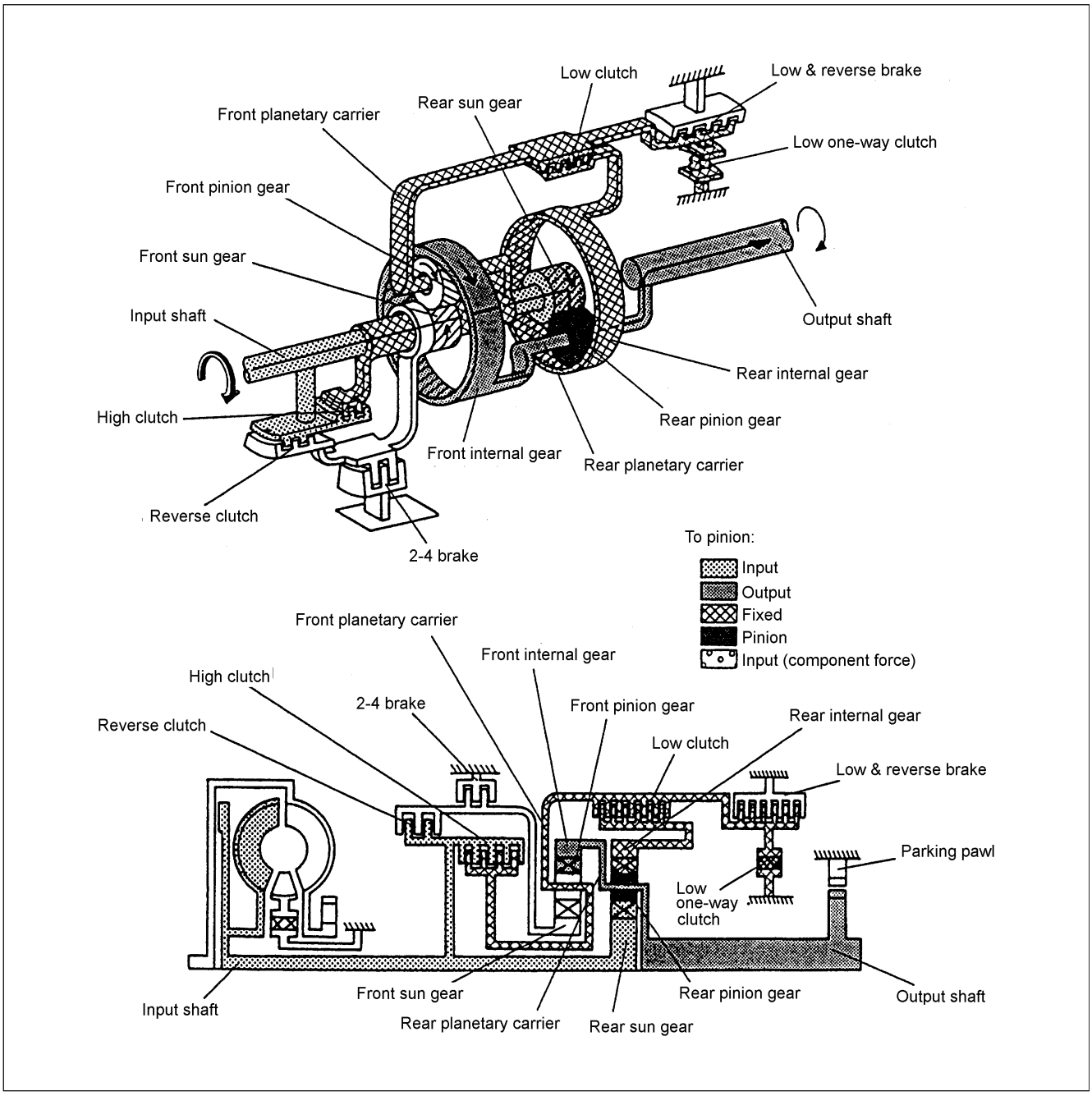
The driving force from the input shaft is transmitted to the rear sun gear and reverse & high clutch drum. In the R range, the reverse clutch is engaged and the driving force is transmitted to the front sun gear and rotates it clockwise. The low & reverse brake is also engaged and the front planetary carrier is fixed so that the front pinion gear does not rotate clockwise but can rotate counterclockwise. As a result, the output shaft rotates counterclockwise and the vehicle goes back.



1st Gear in D, 3, 2 Range

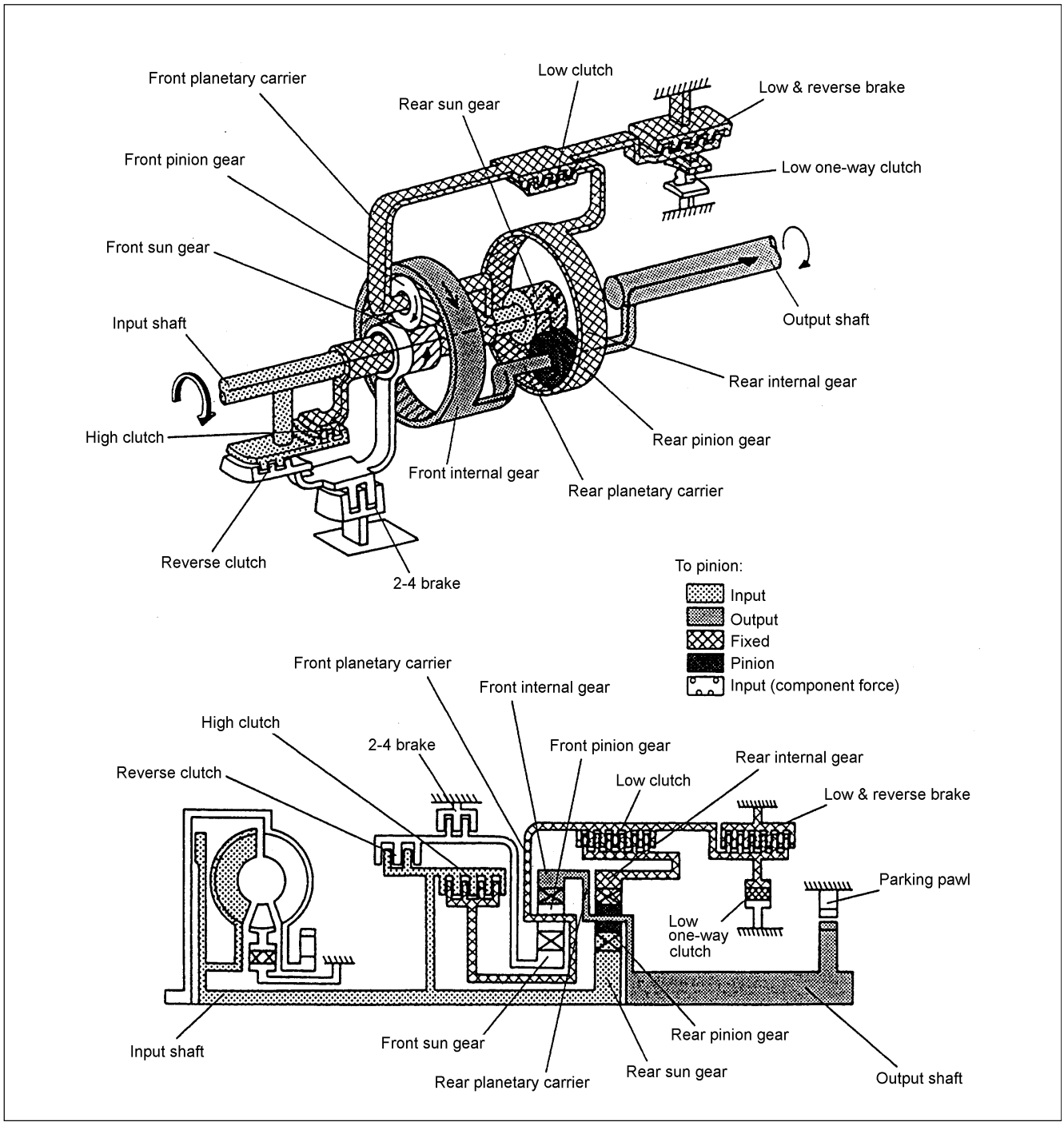
The driving force from the input shaft is transmitted to the rear sun gear and reverse & high clutch drum. Since the low clutch is engaged, the movement of the rear internal gear is restricted and, since the low one-way clutch acts at the same time, counterclockwise rotations of the rear internal gear are locked. As a result, the driving force transmitted to the rear sun gear rotates the rear planetary carrier clockwise, is decreased in speed and transmitted to the output shaft.

When decelerating, since the rotating speed of the rear planetary carrier (rear pinion gear) is higher than that of the rear sun gear and therefore, the rear internal gear attempts to rotate clockwise. At this time, the low one-way clutch does not act but races and therefore the rear internal gear rotates clockwise. That is, the reverse torque from the driving shaft is not transmitted to the engine side and therefore, the engine brake does not act.



1st Gear in L Range

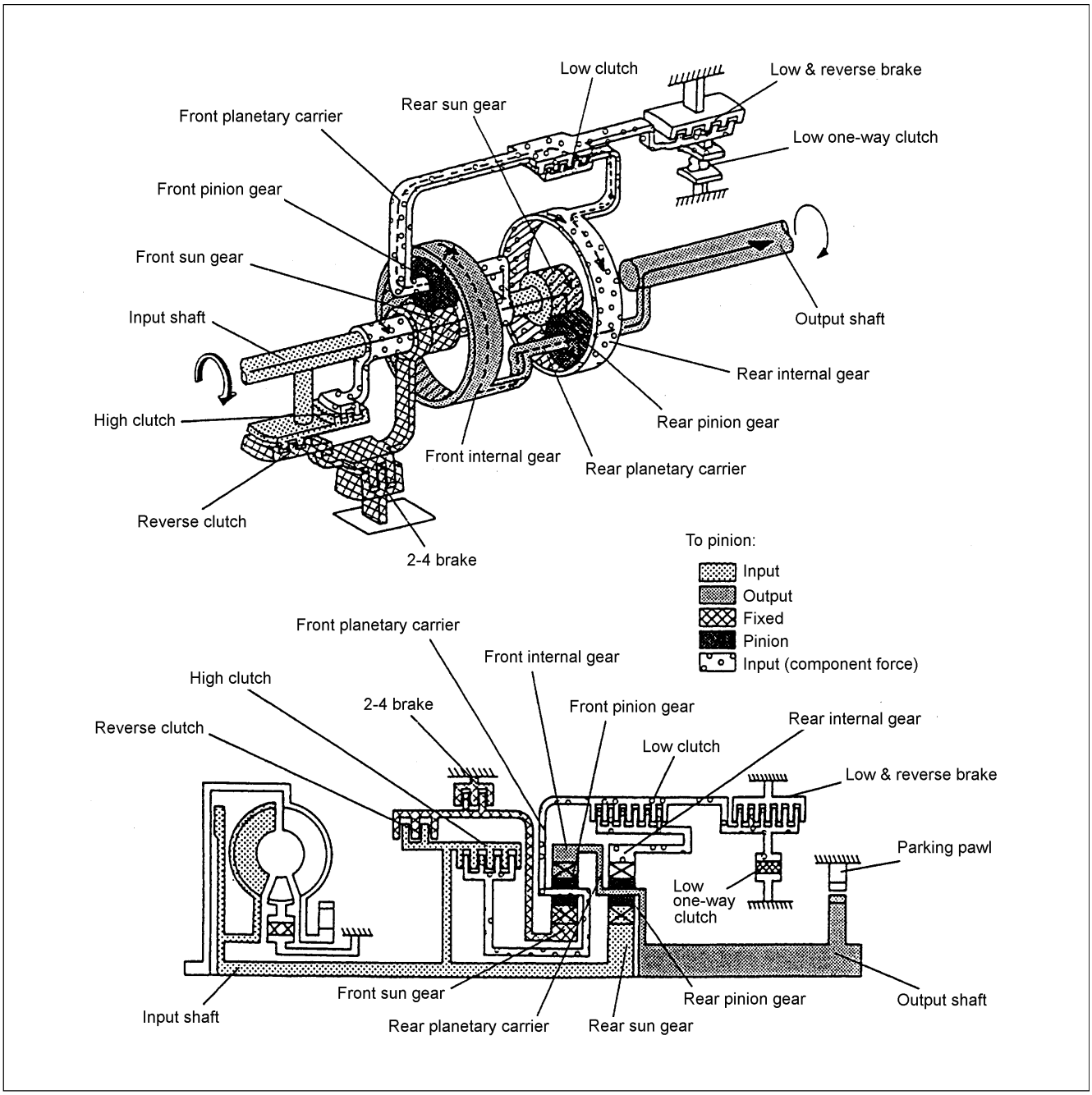
The basic mechanism is the same as in the D, 3, and 2 Range. To apply the engine brake, the low & reverse brake is engaged to restrict the movement of the low one-way clutch.
When decelerating, since the rear internal gear is fixed, reverse torque from the drive shaft is transmitted to the engine side so that the engine brake is applied.



2nd Gear in D, 3, 2 Range

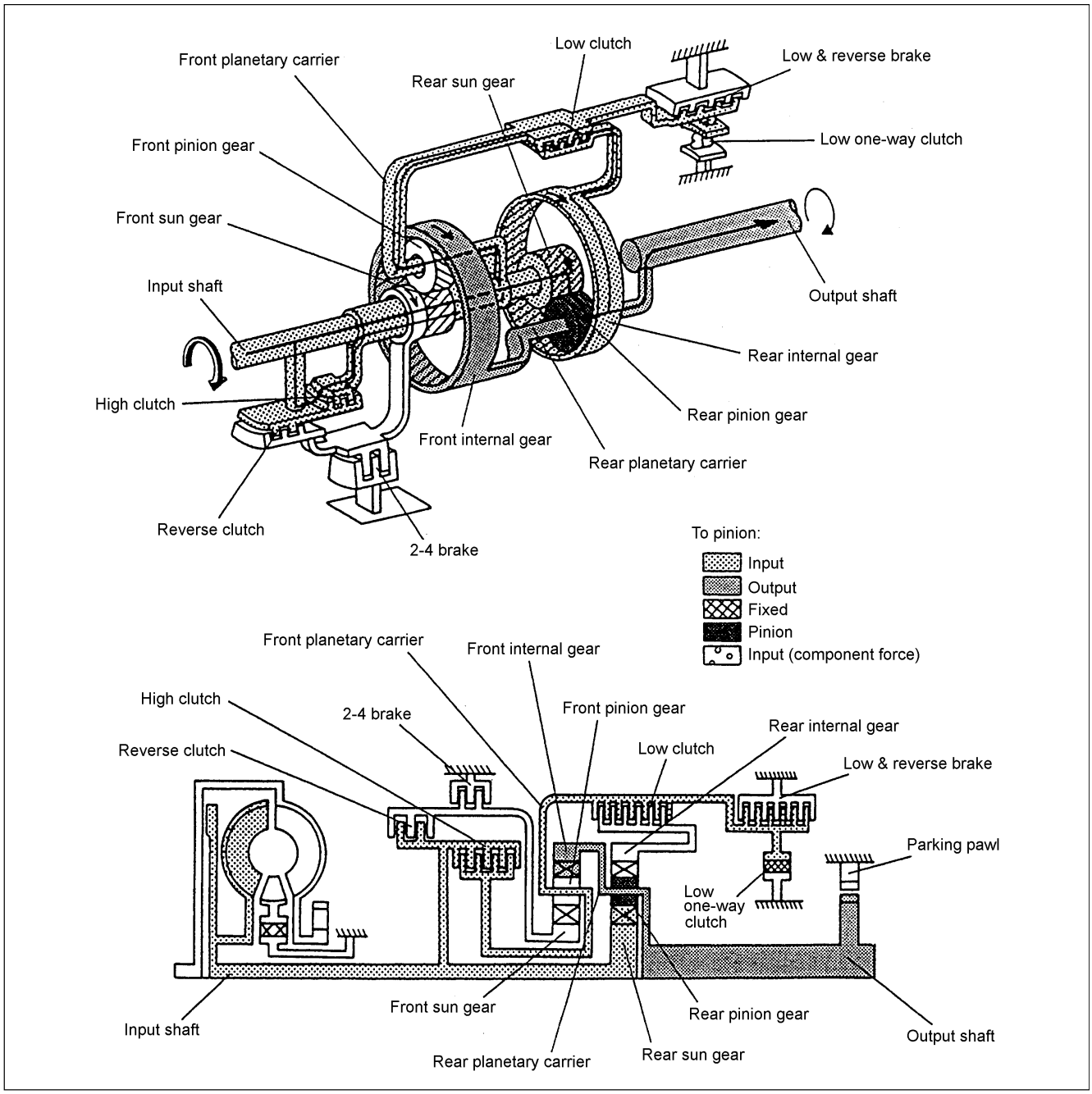
The driving force from the input shaft is transmitted to the rear sun gear and reverse & high clutch drum. As in the case of the 1st gear, since the low clutch is engaged, the movement of the rear internal gear is restricted. Since the 2-4 brake is engaged, the front sun gear is fixed. As a result, movement of the rear internal gear is restricted, and the driving force transmitted to the rear sun gear rotates the rear planetary carrier clockwise, and is decreased and output. The rotating speed of the rear planetary carrier is increased as the rear internal gear rotates.

When decelerating, the engine brake is applied.



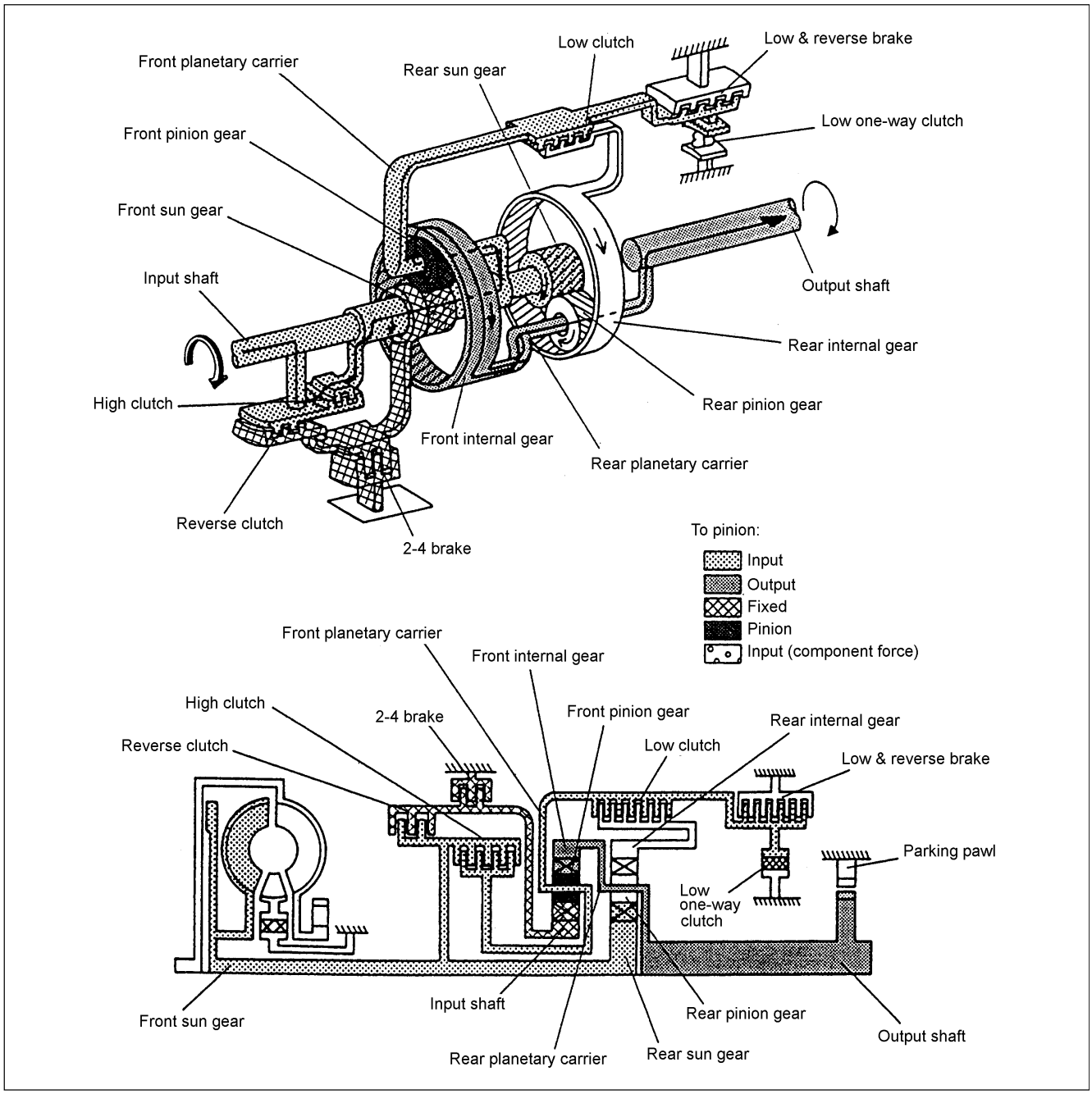
3rd Gear in D, 3 Range

The driving force from the input shaft is transmitted to the rear sun gear and reverse & high clutch drum. As in the case of the 1st gear and 2nd gear, since the low clutch is engaged, the movement of the rear internal gear is restricted. Since the high clutch is engaged, the driving force from the input shaft is directly transmitted to the rear internal gear. As a result, the rpm of the rear sun gear and the rear internal gear becomes the same as that of the input shaft so that the rear pinion gear rotates not independently but together with the rear sun gear and rear internal gear.
When decelerating, the engine brake is applied.



4th Gear (O/D) in D Range

The driving force from the input shaft is transmitted to the rear sun gear and reverse & high clutch drum. Since the 2-4 brake is engaged, the front sun gear is fixed. As a result, the front pinion gear rotates both itself and together with other gears clockwise. This rotation increases the speed of rotation of the front internal gear and is transmitted to the output shaft.



MEMO

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DIAGNOSIS

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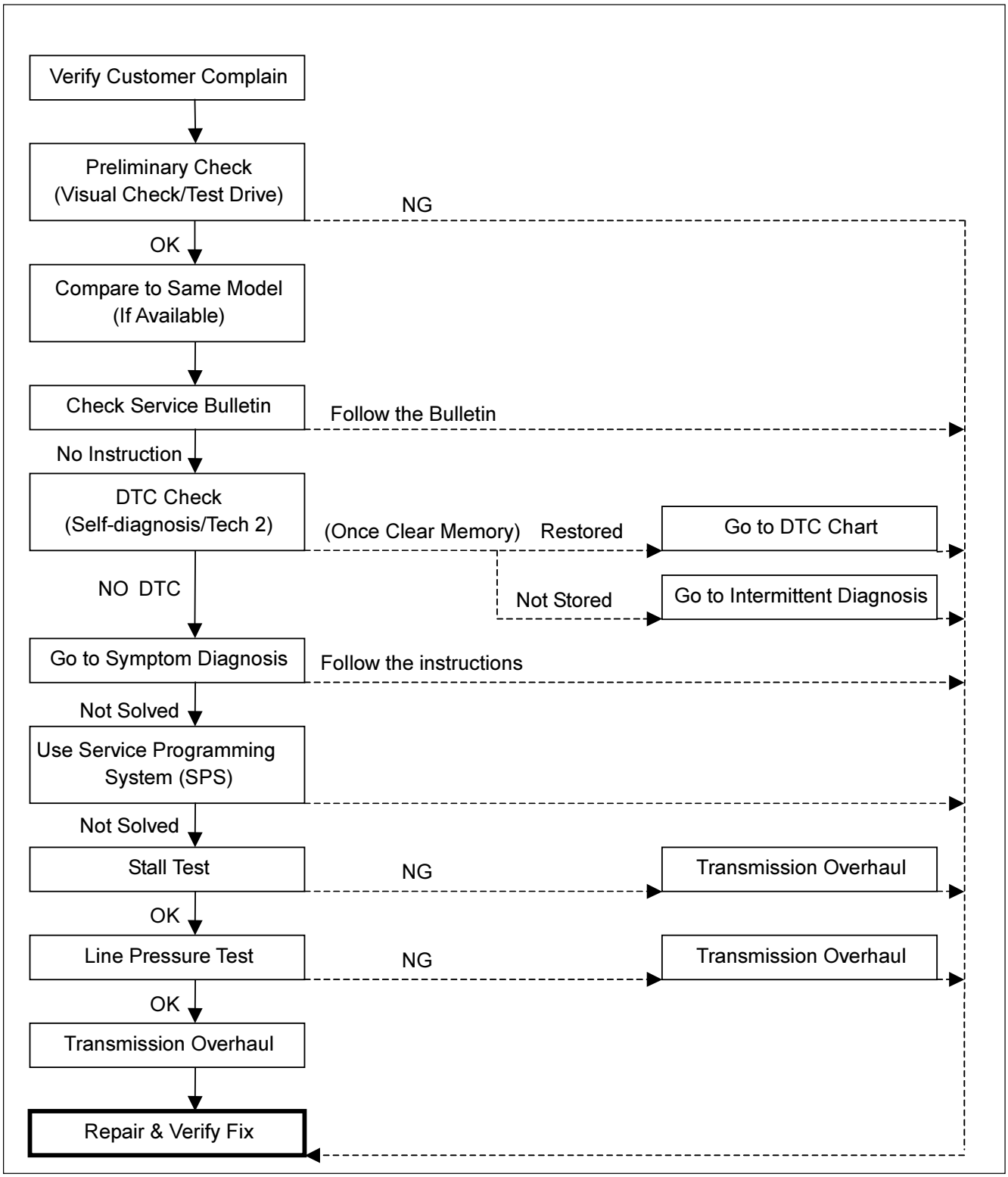
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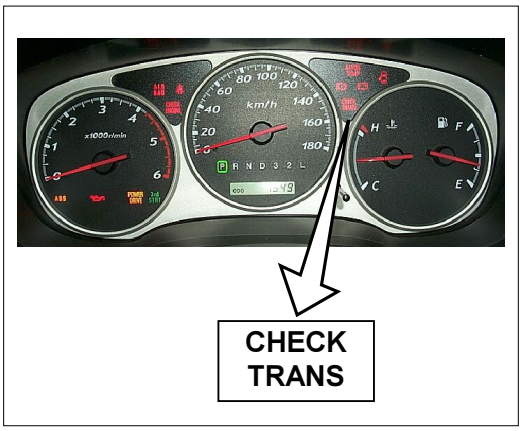
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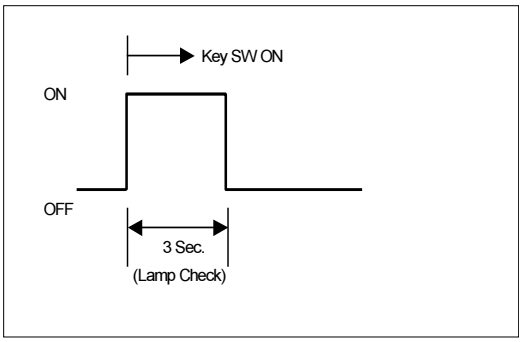
BASIC TROUBLE SHOOTING

Transmission fluid pressure together with clutch and brake friction and other important transmission functions are controlled by electrical signal from the Transmission Control Module (TCM).
Random diagnosis can produce inaccurate and misleading indications. It is important that diagnosing procedure be carried out systematically.
Carefully follow the sequence outlined below to diagnose automatic transmission assembly.

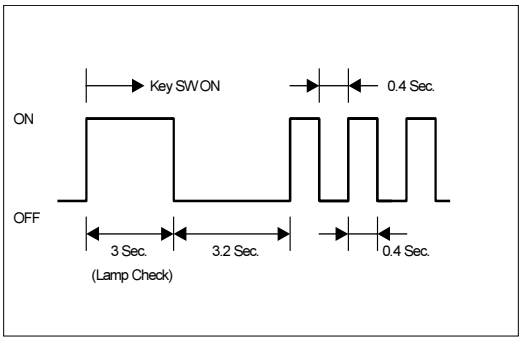


CHECK TRANS INDICATOR & SELF DIAGNOSIS





Illumination Pattern at Normal Condition



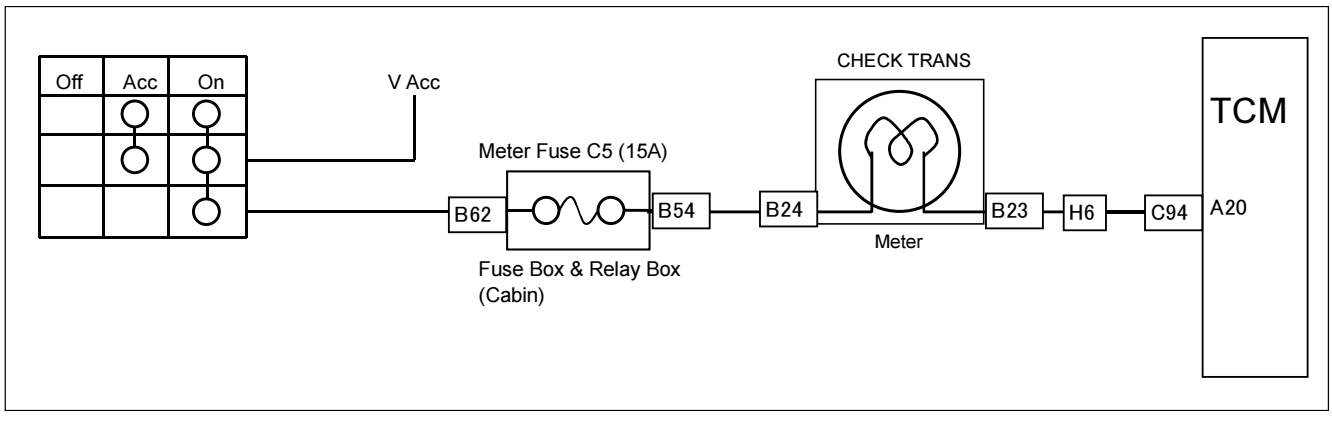
Illumination Pattern at Trouble Condition

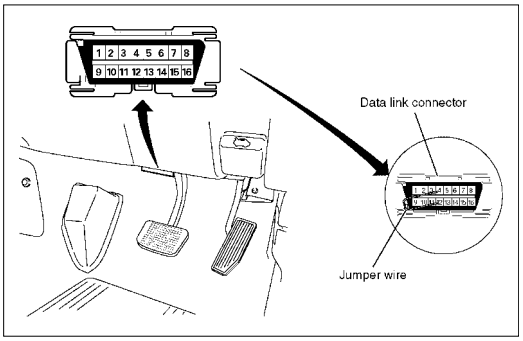
Warning to the driver

- "CHECK TRANS" is ON during 3 seconds at key switch ON position.
- When trouble has occurred to electrical components, "CHECK TRANS" lamp is blinked (1.25 Hz) even during driving to warn the driver.
- The trouble is recorded by trouble code in TCM. When temporary trouble code has been canceled, the "CHECK TRANS" lamp stops blinking. This blinking can be stopped by setting the key off. But the trouble code remains memorized in TCM.

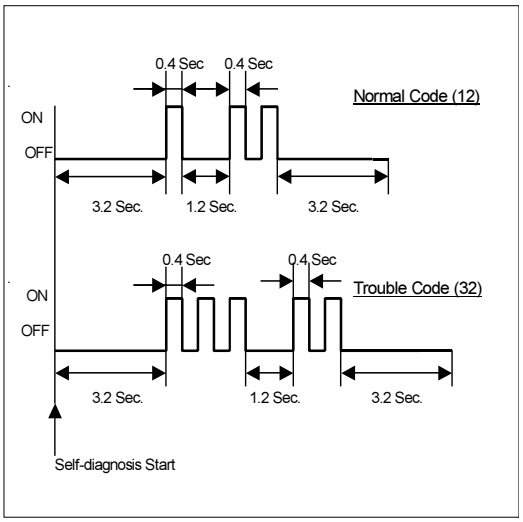
NOTE:

1. If the "CHECK TRANS" lamp is staying ON always at key switch ON position, this means that connection between the lamp and TCM is shorted to ground.
   Verify connection and wire between the TCM A20 terminal and lamp short to ground.
2. If the "CHECK TRANS" lamp is staying OFF at key switch ON position (Engine off), this means that connection between the lamp and TCM is opened or meter fuse C5 (15A) is burnt out.
   Verify connection and wire between the TCM A20 terminal and lamp open circuit and meter fuse C5 (15A).





Data Link Connector Short Circuit



Flash Code Illumination Pattern

Self-diagnosis code (Flash code) display

- The stored trouble codes can be identified by shorting the terminal No. 11 and No. 4 or 5 (ground) of data link connector with a lead wire.

Indication Method:

1. Terminal No. 11 and No. 4 or 5 (ground) of data link connector are short circuited.
2. Turn the key switch to the ON position.
3. In case no trouble code existence, normal code (12) is indicated repeatedly.
4. In case the plural trouble codes have occurred at a time, each codes are indicated three rimes in numerical order.

Trouble Code Clear Method:

If you have Tech 2:

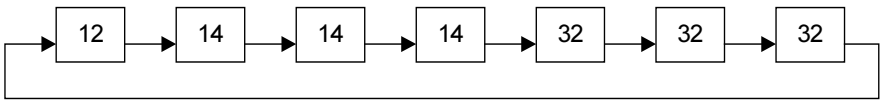
Follow the procedure **"DIAGNOSIS WITH TECH 2"** in this manual.

If you have no Tech 2:

Remove ECM(B) fuse SBF-4 (30A) for at least 10 seconds.

NOTE:
If you clear the DTC you will not be able to read any codes recorded during the last occurrence.
To use the DTC again to identify a problem, you will need to reproduce the fault or the problem. This may require a new test drive or just turning the key switch on (this depends on the nature of the fault).

In case DTC 14 & 32 are stored:



DIAGNOSIS WITH TECH 2

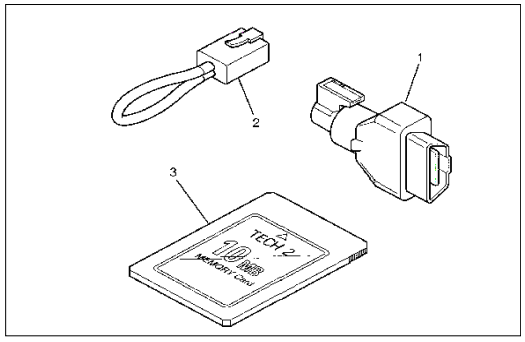
In this JR405E transmission, troubleshooting can be performed for electrical faults using the Tech 2 scan tool.
If the "CHECK TRANS" lamp blinks, or if an electrical fault in the transmission may probably exit, check trouble codes using the Tech 2 scan tool.
In the diagnostic procedures described in this manual, first repair the faulty positions indicated by trouble code in order of numbers and then perform troubleshooting for the faulty positions that are not indicated by trouble code.
For correct troubleshooting, it is necessary to first repair the trouble codes of lower order numbers, then to repair the trouble codes of higher order numbers in sequence.

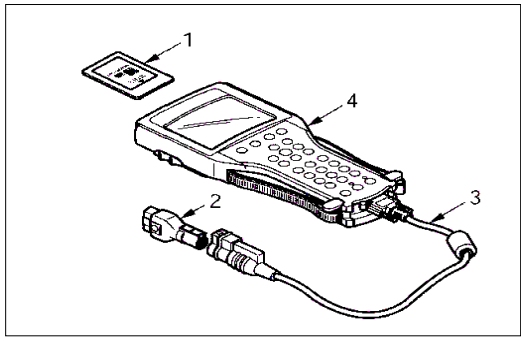
If no codes are set:

- Refer to **F1: Data Display** and identify the electrical faults that are not indicated by trouble code.
- Refer to **"SYMPTOM DIAGNOSIS"**.

If codes are set:

1. Record all trouble codes displayed by Tech 2 and check id the codes are intermittent.
2. Clear the codes.
3. Drive the vehicle for a test to reproduce the faulty status.
4. Check trouble codes again using the Tech 2.
5. If no codes is displayed by test driving, the fault is intermittent. In this case, refer to **"INTERMITTENT DIAGNOSIS"**.
6. If a code is present, refer to **DTC Chart** for diagnosis.
7. Check trouble codes again using the Tech 2.

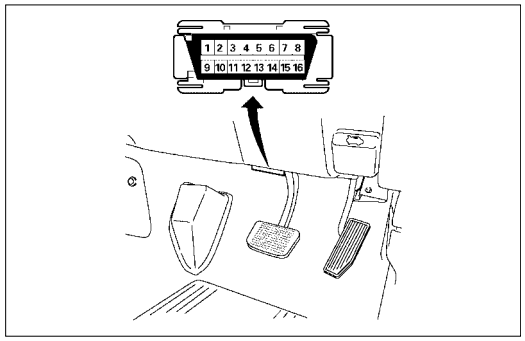




TECH 2 CONNECTION

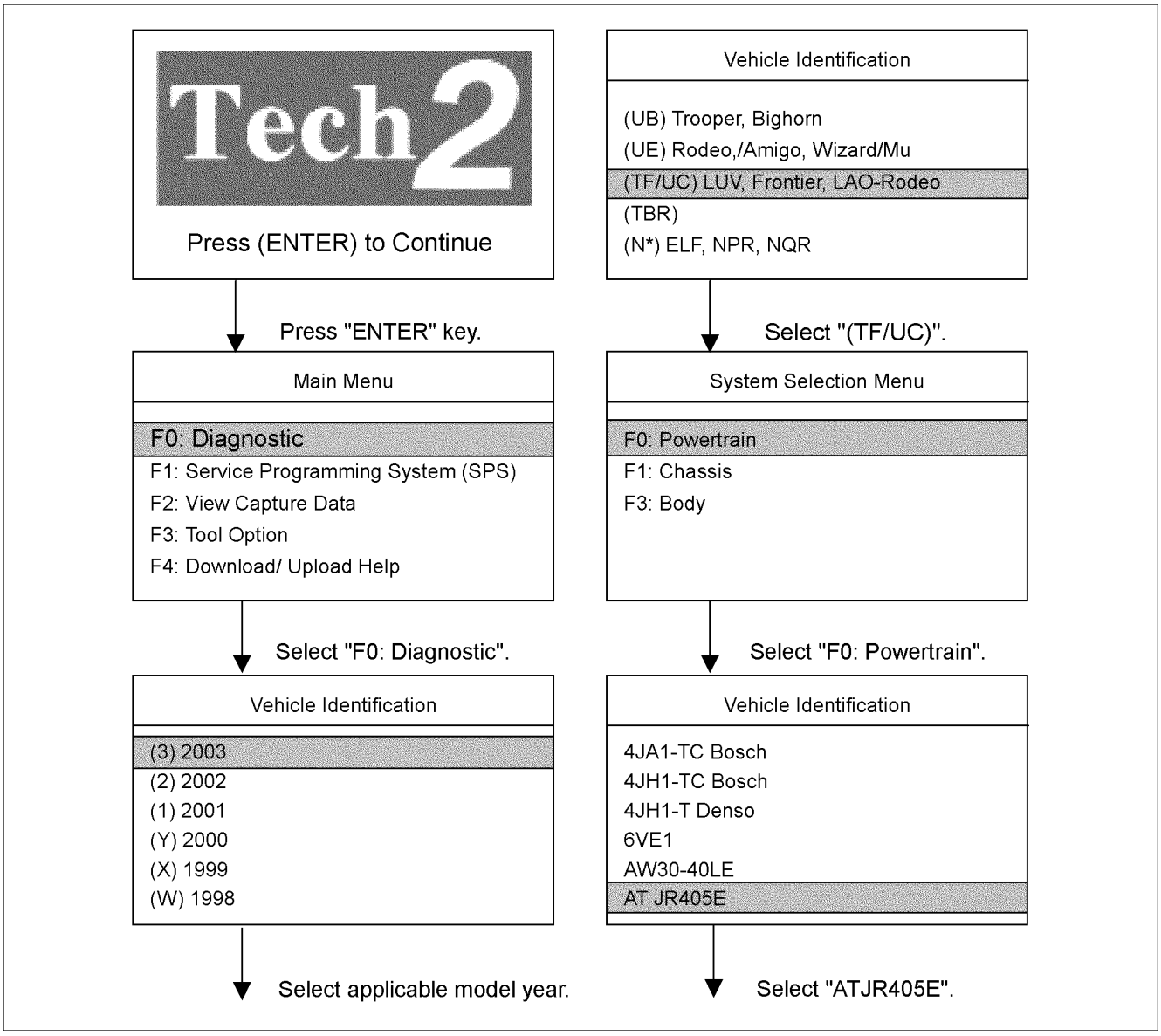
Tech 2 scan tool is used to electrically diagnose the automatic transmission system and to check the system. The Tech 2 enhances the diagnosis efficiency though all the troubleshooting can be done without the Tech 2.

1. Configuration of Tech 2
   - Tech 2 scan tool kit (No. 7000086), Tech 2 scan tool (No. 7000057) and DLC cable (No. 3000095).
   - SAE 16/19 adapter (No. 3000098) (1), RS232 loop back connector (No. 3000112) (2) and PCMCIA card (No. 3000117) (3).
2. Tech 2 Connection
   - Check the key switch is turn OFF.
   - Insert the PCMCIA card (1) into the Tech 2 (4).
   - Connect the SAE 16/19 adapter (2) to the DLC cable (3).
   - Connect the DLC cable (3) to the Tech 2 (4).
   - Connect the SAE 16/19 adapter (2) to the data link connector of the vehicle.
   - Turn the key switch of the vehicle ON and press the "PWR" key of the Tech 2.
   - Check the display of the Tech 2.



NOTE:
Be sure to check that the power is not supplied to the Tech 2 when attaching or removing the PCMCIA card.

TECH 2 OPERATING FLOW CART (START UP)



Select "AT JR405E" in Vehicle Identification menu and the following table is shown in the Tech 2 screen.

F0: Diagnostic Trouble Code
  F0: Read DTC Infor As Stored By ECU
  F1: Clear DTC Information

F1: Data Display

F2: Snapshot

F3: Miscellaneous Test
  F0: Lamp
    F0: Power Lamp Test
    F1: 3rd Start Lamp Test
    F2: AT Oil Temperature Lamp Test
    F3: Transmission Check Light Test
  F1: Solenoids
    F0: Low & Reverse Brake Solenoid
    F1: 2-4 Brake Solenoid
    F2: High Clutch Solenoid
    F3: Low Clutch Solenoid
    F4: Line Pressure Solenoid
    F5: Lock Up Duty Solenoid

F0: Diagnostic Trouble Code

The purpose of the "Diagnostic Trouble Codes" mode is to display stored trouble code in the TCM.
When "Clear DTC Information" is selected, a "Clear DTC Information", warning screen appears. This screen informs you that by cleaning DTC's "all stored DTC information in the TCM will be erased".
After clearing codes, confirm system operation by test driving the vehicle.

F1: Data Display

The purpose of the "Data Display" mode is to continuously monitor data parameters.
The current actual values of all important sensors and signals in the system are display through F1mode.
See the "Typical Scan Data" section.

F2: Snapshot

"Snapshot" allows you to focus on making the condition occur, rather than trying to view all of the data in anticipation of the fault. The snapshot will collect parameter information around a trigger point that you select.

F3: Miscellaneous Test:

The purpose of "Miscellaneous Test" mode is to check for correct operation of electronic system actuators.

Typical Scan Data

Condition : Vehicle is stopping and engine is warm-upped. (Engine coolant temperature approximately 80 deg.

	Parameter	Units	Engine Idle							Engine 2000rpm	Remark
			P Range	R Range	N Rage	D Range	3 Range	2 Range	L Range	P Range	
1	Throttle Position Sensor Signal	%	0	0	0	0	0	0	0	8 - 11	Data is changing by throttle angle.
2	Engine Speed	rpm	675-725	675 - 700	675-725	675 - 700	675 - 700	675 - 700	675 - 700	1975 - 2025	Data is changing by engine speed.
3	AT Turbine Speed	rpm	655 - 710	0	655 - 710	35 - 48	35 - 48	35 - 48	35 - 48	1955 - 2010	Data is changing by turbine speed.
4	TCC Slip RPM	rpm	34 - 48	680 - 700	34 - 48	630 - 660	630 - 660	630 - 660	630 - 660	14 - 28	Data is changing by difference of engine speed and turbine speed.
5	AT Output Speed	rpm	0	0	0	0	0	0	0	0	Data is changing by vehicle speed.
6	Vehicle Speed	km/h / mph	0	0	0	0	0	0	0	0	Data is changing by vehicle speed.
7	Current Gear	1st / 2nd / 3rd / 4th	1st	1st	1st	1st	1st	1st	1st	1st	Data is changing by shift map in TCM.
8	Gear Ratio	:1	32.77	0.00	32.77	32.77	32.77	32.77	32.77	32.77	Data is changing by current gear position.
9	Selector Position	P / R / N / D / 3 / 2 / L	P	R	N	D	3	2	L	P	Data is changing by select lever position.
10	-P- Switch	On / Off	On	Off	Off	Off	Off	Off	Off	On	Data is changing by select lever position.
11	-R- Switch	On / Off	Off	On	Off	Off	Off	Off	Off	Off	Data is changing by select lever position.
12	-N- Switch	On / Off	Off	Off	On	Off	Off	Off	Off	Off	Data is changing by select lever position.
13	-D- Switch	On / Off	Off	Off	Off	On	Off	Off	Off	Off	Data is changing by select lever position.
14	-3- Switch	On / Off	Off	Off	Off	Off	On	Off	Off	Off	Data is changing by select lever position.
15	-2- Switch	On / Off	Off	Off	Off	Off	Off	On	Off	Off	Data is changing by select lever position.
16	-L- Switch	On / Off	Off	Off	Off	Off	Off	Off	On	Off	Data is changing by select lever position.
17	Line Pressure Solenoid	On / Off	On	On	On	On	On	On	On	On	Data is changine by line pressure control signal from TCM.
18	Low & Reverse Brake Duty Solenoid	%	100	0	100	100	100	100	0	100	Data is changing by gear position.
19	Low & Reverse Brake Pressure Switch	On / Off	Off	On	Off	Off	Off	Off	On	Off	Data is changing by gear position.
20	2-4 Brake Duty Solenoid	%	100	100	100	100	100	100	100	100	Data is changing by gear position.
21	2-4 Brake Pressure Switch	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is changing by gear position.
22	High Clutch Duty Solenoid	%	100	100	100	100	100	100	100	100	Data is changing by gear position.
23	High Clutch Pressure Switch	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is changing by gear position.
24	Low Clutch Duty Solenoid	%	0	0	0	0	0	0	0	0	Data is changing by gear position.
25	Lock Up Duty Solenoid	%	5	5	5	5	5	5	5	5	Data is changing by lock-up siganl from TCM.
26	AT Oil Temperature Sensor	°C / °F	30 - 50	30 - 50	30 - 50	30 - 50	30 - 50	30 - 50	30 - 50	30 - 50	Data is changing by temperature.
27	AT Oil Temperature Light	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is On when ATF temp. exceeds 145=Ä
28	TCM Status Temp.	Low / High	Low	Low	Low	Low	Low	Low	Low	Low	Data is High when high temp. shift pattern is selected by TCM.
29	4L Switch	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is On when 4L mode is selected.
30	TCM Status Transfer	Low / High	High	High	High	High	High	High	High	High	Data is Low when 4L shift pattern is selected by TCM.
31	TCM Status Down Slope	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is On when down slope shift pattern is selected by TCM.
32	TCM Status Up Slope	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is On when up slope shift pattern is selected by TCM.
33	3rd Start Switch	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is On when 3rd start switch is pushed.
34	3rd Start Lamp	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is On when 3rd start is selected.
35	Power Switch	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is On when power drive switch is pushed.
36	Power Lamp	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is On when power drive is selected.
37	Brake Switch	On / Off	Off	On	Off	On	On	On	On	Off	Data is On when brake pedal is steped.
38	Diagnostic Switch	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is On when self-diagnosis is activated.
39	Transmission Check Light	On / Off	Off	Off	Off	Off	Off	Off	Off	Off	Data is Off when DTC is not stored.

Miscellaneous Test

The state of each circuit can be tested by using miscellaneous test menus. Especially when DTC cannot be deteced, a faulty circuit can be diagnosed by testing each circuit by means of these menus.
Even DTC has been detected, the circuit tests using these menus could help discriminate between a mecanical trouble and an electrical trouble.

Connect Tech 2 and select "Powertrain", "JR 405E" & "Miscellaneous Test".

F0: Lamps

The circuit is normal if the warning light in the meter panel comes on and goes out in accordance with Tech 2 instruction.

Lamps
F0: Power Lamp Test
F1: 3rd Start Lamp Test
F2: AT Oil Tempeature Lamp Test
F3: Transmission Check Light Test

F0: Power Lamp Test

Power Lamp Test	
Power Lamp	Off

- Press "Active" key.
  Then, "POWER DRIVE" indicator lamp is turned on in the meter panel.
- Press "Inactive" key.
  Then, "POWER DRIVE" indicator lamp is turned off in the meter panel.
- Press "Quit" Key to cancel the test.

F1: 3rd Start Lamp Test
F2: AT Oil Temperature Lamp Test
F3: Transmisstion Check Light Test

Test procedure is same as "F0: Power Lamp Test".
The circuit is normal if the warning light in the meter panel comes on and goes out in accordance with Tech 2 instruction.

F1: Solenoids

The circuit is normal if clicking sound is generated in accordance with Tech 2 instruction.

Solenoids
F0: Low & Reverse Brake Solenoid
F1: 2-4 Brake Solenoid
F2: High Clutch Solenoid
F3: Low Clutch Solenoid
F4: Line Pressure Solenoid
F5: Lock Up Duty Solenoid

F0: Low & Reverse Brake Solenoid

Low & Reverse Brake Solenoid	
Low & Reverse Brake Duty	0%

- Press "Active" key.
  Then, duty datio is indicated 100 % and "clicking sound" is generated from the transmission control valve.
- Press "Inactive" key.
  Then, duty datio is indicated 0 % and "clicking sound" is generated from the transmission control valve.
- Press "Quit" Key to cancel the test.

F0: Low & Reverse Brake Solenoid
F1: 2-4 Brake Solenoid
F2: High Clutch Brake Solenoid
F3: Low Clutch Solenoid
F4: Line Pressure Solenoid
F5: Lock Up Duty Solenoid

Test procedure is same as "F0: Low & Revese Brake Solenoid"
The circuit is normal if clicking sound is generated in accordance with Tech 2 instruction.

INTERMITTENT DIAGNOSIS

If the Tech 2 displays any codes as intermittent, or if after a test drive any codes does not reappear, the problem is most likely a faulty electrical connection or loose wiring.
Terminals should always be the prime suspect.
Intermittent rarely occur in sophisticated electronic components such as the TCM.
When an intermittent problem is encountered, check suspect circuits for:

- Poor terminal to wire connection.
- Terminals not fully seated in the connector body.
- Improperly formed or damaged terminals.
- Loose, dirty or damaged terminals.

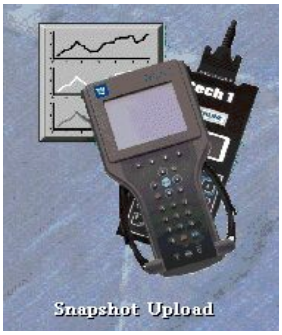
Any time you have an intermittent in more than one circuit, check whether the circuits share a common ground connection.

- Pinched or damaged wires.
- Electric interference.

Check for improperly installed electrical options, such as light, radios, etc.

Use the F2: Snapshot mode of the Tech 2 to help isolate the cause of an intermittent fault. The snapshot mode will record information before and after the problem occurs. Set the snapshot to "Trigger" on the suspected code or, if you notice the reported symptom during test drive, trigger the snapshot manually.
After the snapshot has been triggered, command the Tech 2 to play back the flow of data recorded from each of the various sensors. Sings of intermittent fault in a sensor circuit are a sudden unexplainable jump in data values out of the normal range.

SNAPSHOT DISPLAY WITH TIS2000 (For Snapshot Data Analysis)



Procedures for transferring and displaying Tech2 snapshot data by using TIS2000 [Snapshot Upload] function is described below.

Snapshot data can be displayed with [Snapshot Upload] function included in TIS2000.

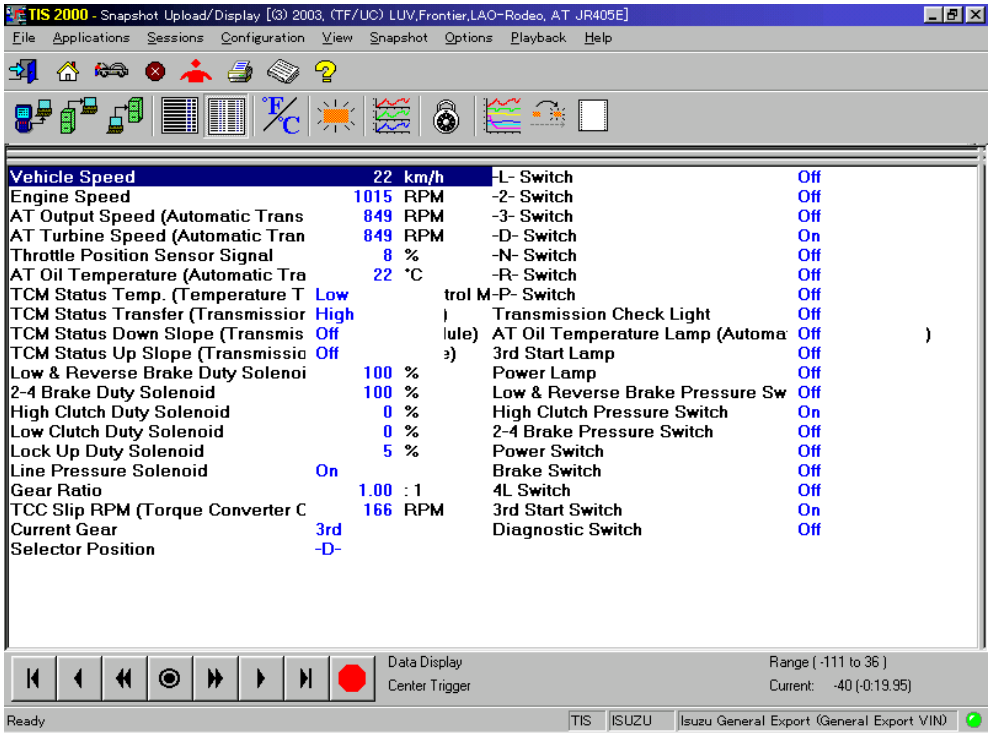
By analyzing these data in various methods, trouble conditions can be checked.

Snapshot data is displayed by executing the three steps below shown:

1. **Record the snapshot data, in Tech2.**
2. **Transfer the snapshot data to PC.**

   After recording the snapshot in Tech2, transfer the data from Tech2 to PC by the below procedures.

   1. Start TIS2000.
   2. Select [Snapshot Upload] on the TIS2000 start screen.
   3. Select [Upload from trouble diagnosis tool (transfer from diagnosis tester)] or click the corresponding icon of the tool bar.
   4. Select Tech2, and transfer the recorded snapshot information.
   5. Select the transferred snapshot.
   6. After ending transfer of the snapshot, data parameter list is displayed on the screen.



3. Snapshot data is displayed with TIS2000 [Snapshot Upload] function.

   Snapshot is stored in the PC hard disk or floppy disk, and can be displayed any time.

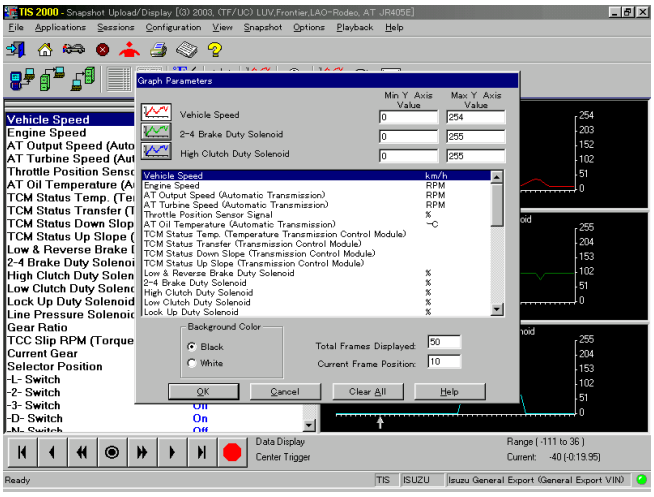
   Stored snapshot can be displayed by the below procedures.

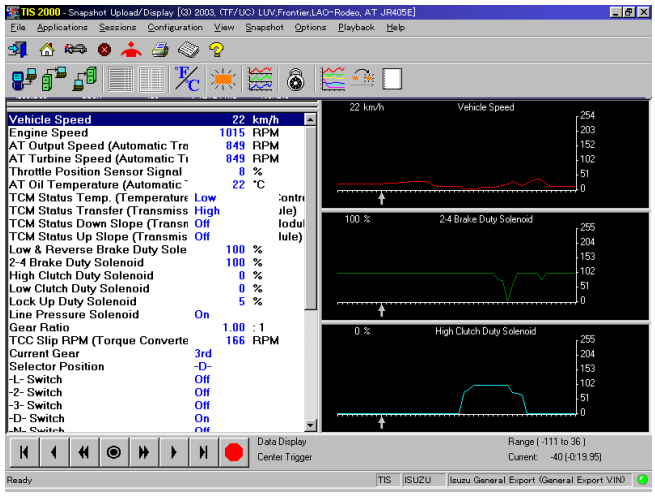
   1. Start TIS2000.
   2. Select [Snapshot Upload] on the TIS2000 start screen.
   3. Select [Open the existing files] or click the corresponding icon of the tool bar.
   4. Select the transferred snapshot.
   5. Open the snapshot, to display the data parameter list on the screen.

Graph display

Values and graphs (Max. 3 graphs):

1. Click the icon for graph display. [Graph Parameter] window opens.
2. Click the first graph icon of the window upper part, and select one parameter from the list of the window lower part. Selected parameter is displayed nest to the graph icon. Graph division can be selected in the field on the parameter right side.
3. Repeat the same procedures with the 2nd and 3rd icons.
4. After selecting all parameters to be displayed (Max. 3 parameters), click [OK] button.

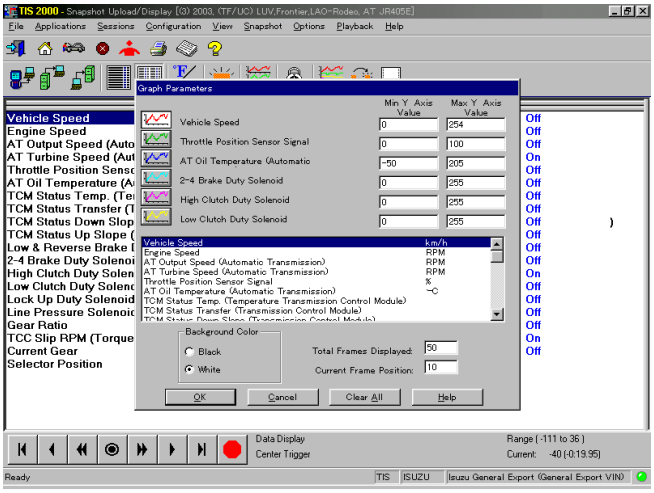


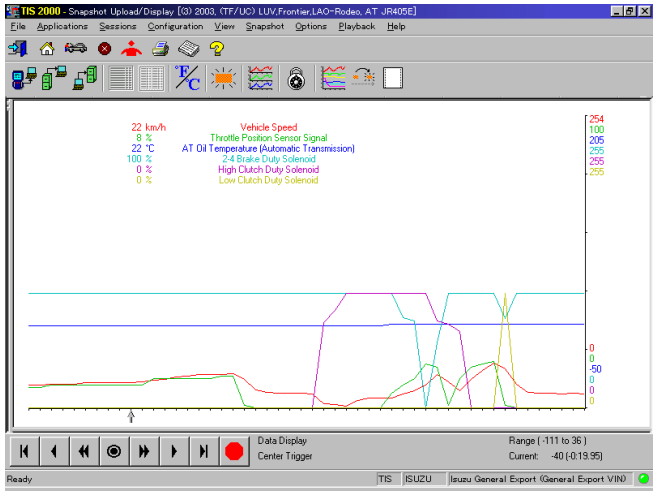


5. Parameter selected is displayed in graph form on the right of the data parameter on the screen.
6. Graph display can be moved with the navigation icon.
7. For displaying another parameter by graph, click the parameter of the list, drug the mouse to the display screen while pressing the mouse button and release the mouse button. New parameter is displayed at the position of the previous parameter. For displaying the graph display screen in full size, move the cursor upward on the screen. When the cursor is changed to the magnifying glass form, click the screen. Graph screen is displayed on the whole screen.

Display of graphs on one screen (Max. 6 graphs):

1. Click the 6 graph icon. [Graph Parameter] window opens.





2. Click the graph icon, select the parameter to be displayed from the list and change divisions according to necessity.
3. Repeat the same procedures with the graph icons, from the 2nd to 6th.
4. Click the [OK] button to display.
5. In this case, parameters are displayed only in graph form. All parameters are displayed in one graph.
6. The graph display screen can be moved with the navigation icon.

SERVICE PROGRAMMING SYSTEM (SPS)



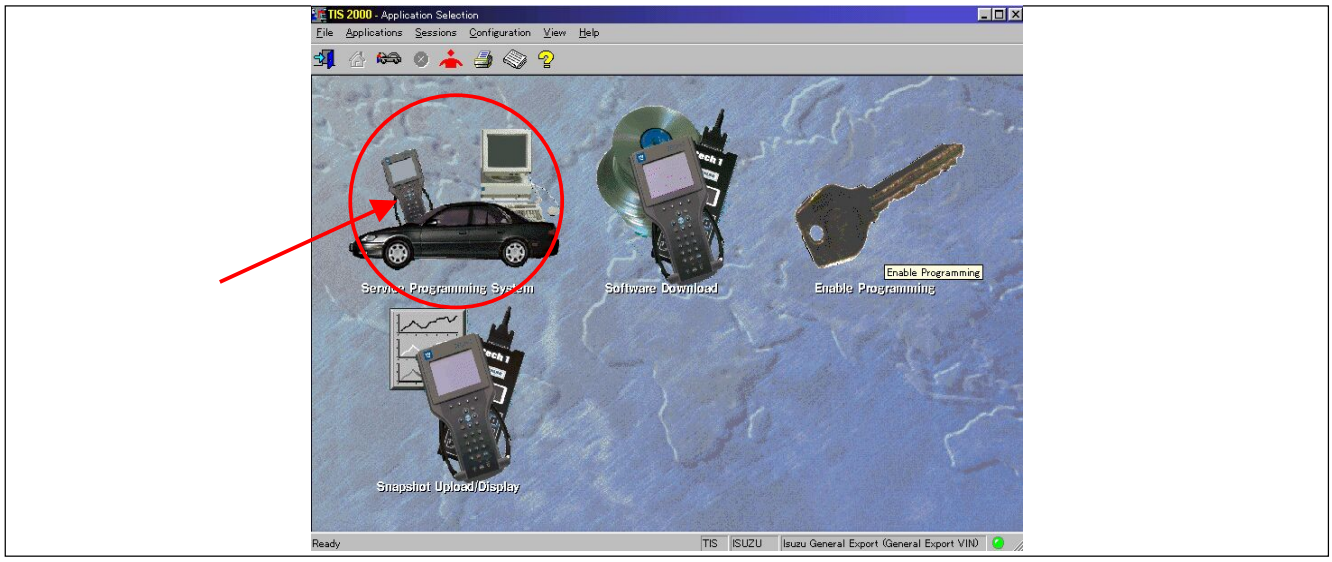
The procedure to program the control unit by using SPS software contained in TIS 2000 is explained in steps below.

Important: Please checks the following before SPS is used.

- Latest software shall be used on Tech 2 and PC.
- Batteries of the vehicle shall be fully charged.

1. Preparations of TIS 2000

1. Connect Tech 2 to P/C.
2. Check to see if Hardware Key is plugged into Port.
3. Activate TIS 2000 by P/C.
4. On the activating screen of TIS2000, choose "Service Programming System"

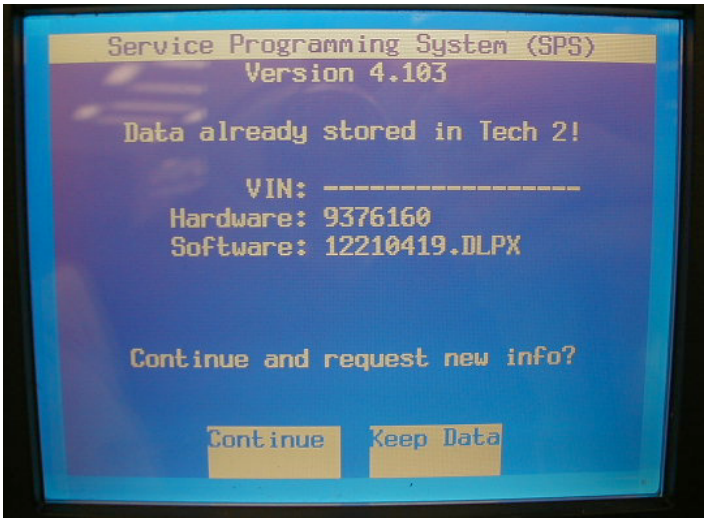


5. On the screen of "Diagnostic Tester and Processing Program Selection", choose the one that will comply with the following.
   - Diagnostic tester in use
   - New programming by the existing module or new programming by the replaced/new module.
   - Fixing position of the control unit.
6. Upon completion of the selection, push the button of "Continue".

2. Demand of Data

1. Connect Tech-2 to the vehicle. When activated by turning on the power of Tech-2, push the "Enter" switch.
2. Turn on the ignition switch (without starting the engine)
3. In the main menu of Diagnostic Tester, push "F1: Service Programming System (SPS)".
4. Push "F0: Request Info" of Tech-2.

5. Where vehicle data has been already saved in Tech 2, the existing data come on display. In this instance, as Tech-2 starts asking whether to keep the data or to continue obtaining anew data from the control unit, choose either of them.



6. If you select “continue”, you have to select “Model Year”, “Vehicle Type”, “Controller Type(Transmission)”.
7. After that. then push button and turn Ignition switch tuned on, off, on following Tech-2 display. Tech-2 will read information from controller after this procedure.
8. During obtaining information, Tech-2 is receiving information from the control unit chosen. In replacing the control unit, please be sure to undertake "Obtaining Information" from the new unit. With VIN not being programmed into the new control unit at the time of shipment, "obtaining information" is not complete (because the vehicle model, engine model and model year are specified from VIN). For the procedure get additional information on vehicles, instruction will be provided in dialog form, when TIS2000 is in operation.
9. Following instructions by Tech-2, push the "Exit" switch of Tech-2, turn off the ignition of the vehicle and turn off the power of Tech-2, thereby removing from the vehicle.

3. Data Exchange

1. Connect Tech-2 to P/C, turn on the power and click the "Next" button of P/C.
2. Check VIN of the vehicle and choose "Next".
3. When a lack of data is asked from among the following menu, enter accordingly.

* With VIN information

There is no necessary to select option menu.
The select menu is appeared automatically.
Some case, it is necessary to select “Destination code”.

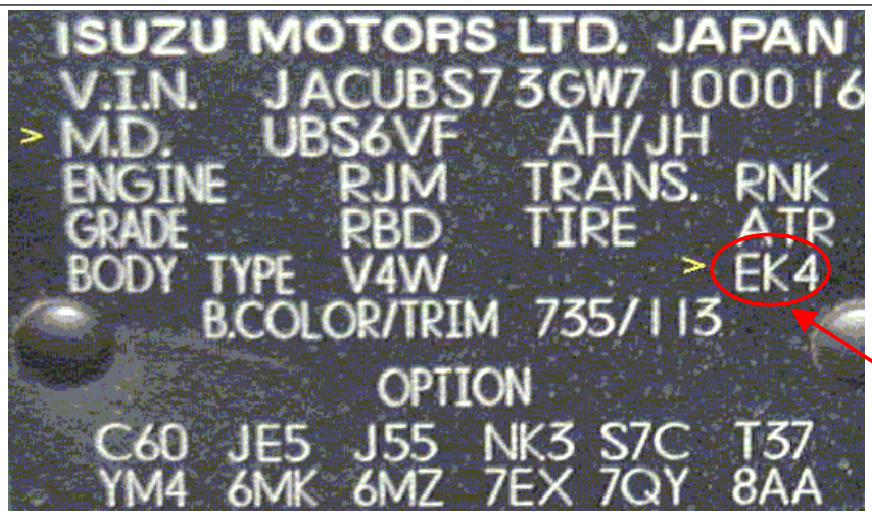
* Without VIN information

Select following Menu

- Model Year
- Model
- Engine type
- Destination code (vehicles for general export)*1

* 1: How to read the destination code

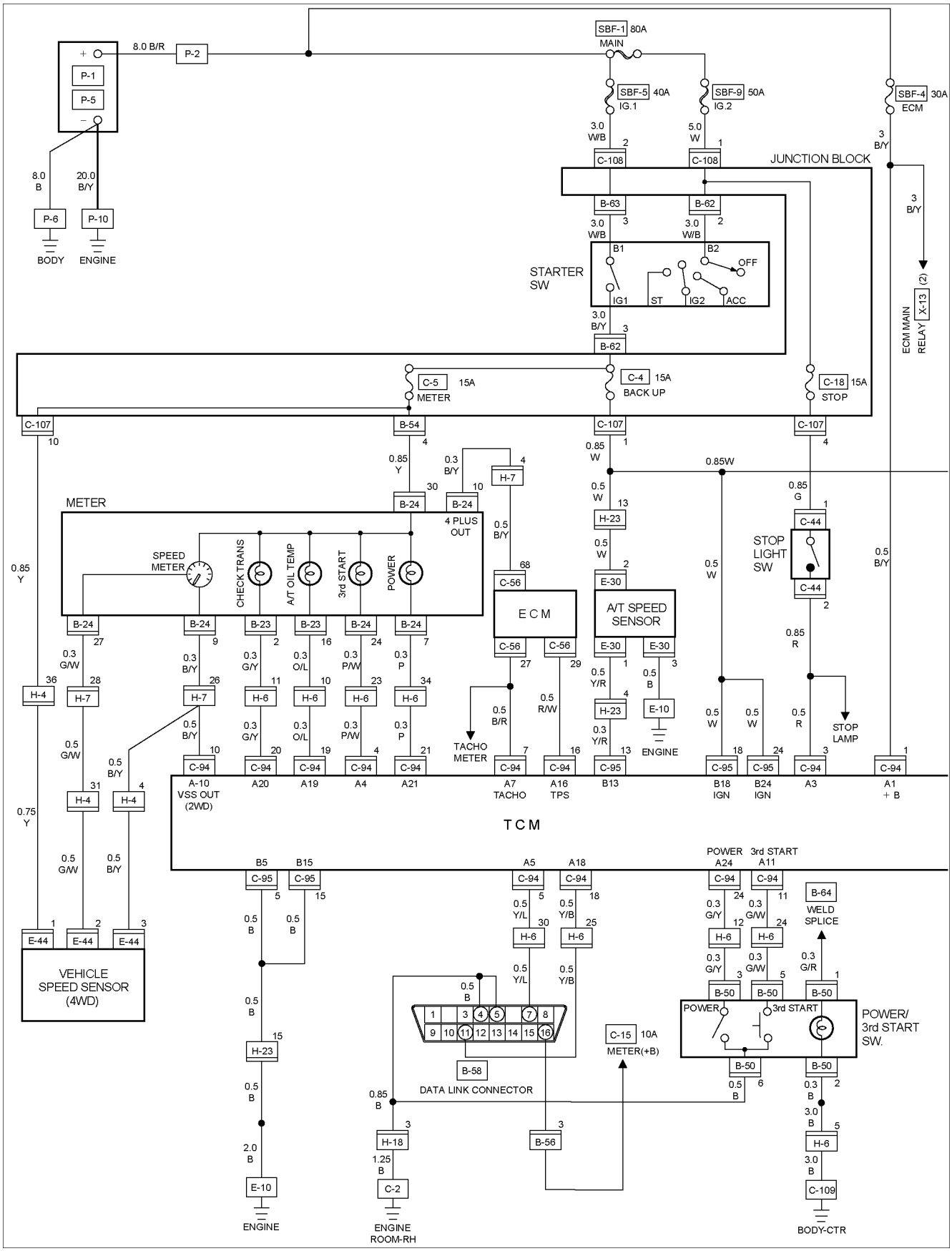
Destination code can be read from ID Plate affixed on vehicles, while on VIN plate the destination code is described at the right-hand edge of Body Type line. In Fig.-3, the destination code can be read as ""EK4"".



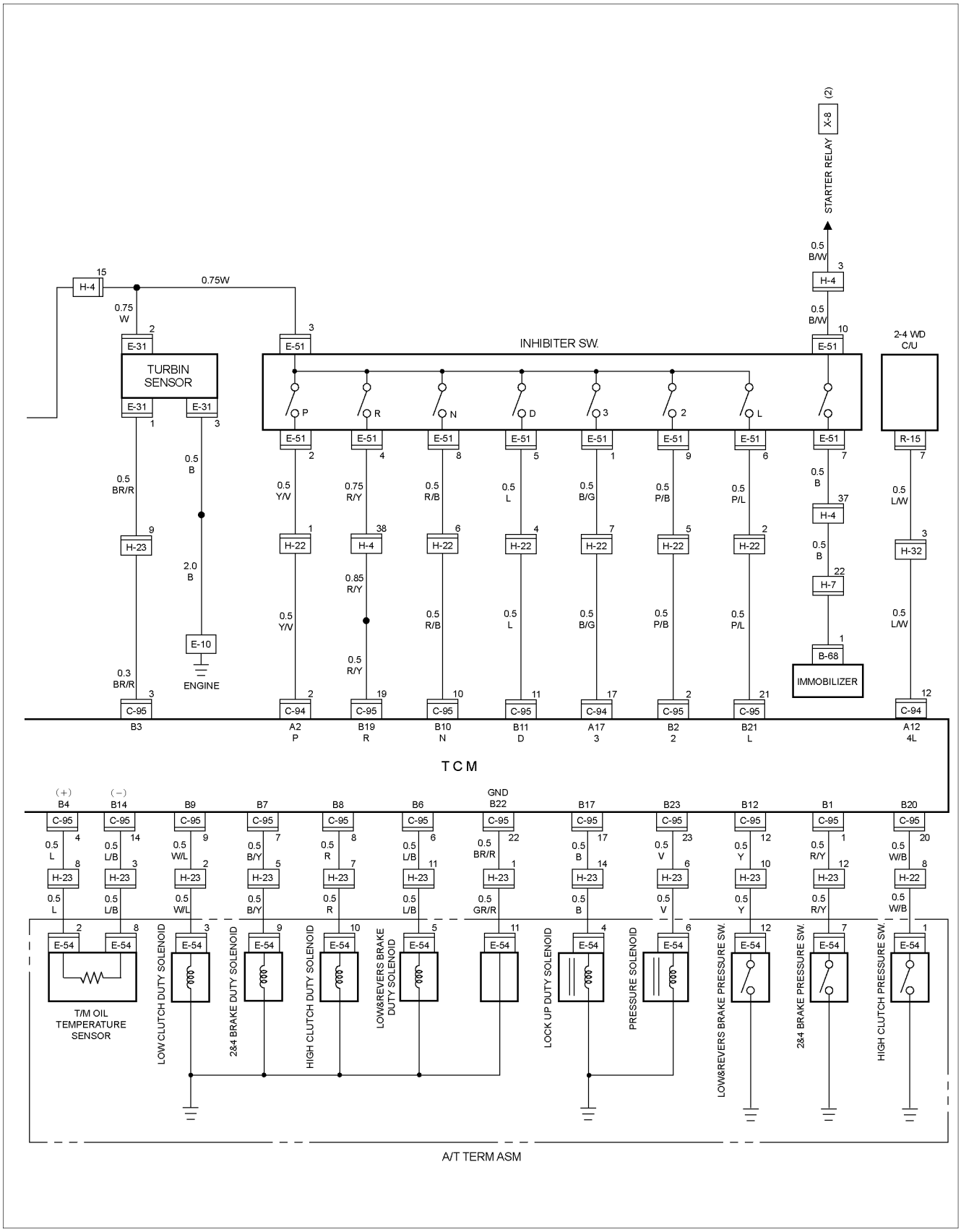
4. After choosing the data, click the "Next" button.
5. When all the necessary information is entered, the "details" of software within the database that match the entered data will appear for confirmation. Click the "Program" switch and then download the new software onto Tech-2.
6. "Data Transfer" comes on display. The progress of downloading will be displayed on the screen in the form of bar graph.
7. Upon finishing the data transfer, turn off the power of Tech-2, removing from P/C.

4. Programming of TCM
   1. Check to see if batteries are fully charged, while ABS connectors shall be removed from the vehicle.
   2. Connect Tech-2 to Vehicle Diagnostic Connectors.
   3. Turn on the power of Tech-2 and the title screen comes on display.
   4. Turn on the ignition (without allowing the engine to start)
   5. On the title screen of Tech-2, push the "Enter" button.
   6. Choose "F: Service Programming System" on the main screen and then choose "FI: Programming".
   7. While data is being transferred, "Downloading" will be displayed on the Tech-2 screen.
   8. Upon finishing the data transfer, Tech-2 will display "Reprogramming Successful". Push the "Exit" button to bring program to completion.
   9. Following "Procedure 2: Demand of Data", try over again "Information Obtaining" and check to confirm if the data has been correctly re-loaded.
   10. Upon finishing confirmation, turn off the ignition of the vehicle and then turn off the power of Tech-2, removing from the vehicle.

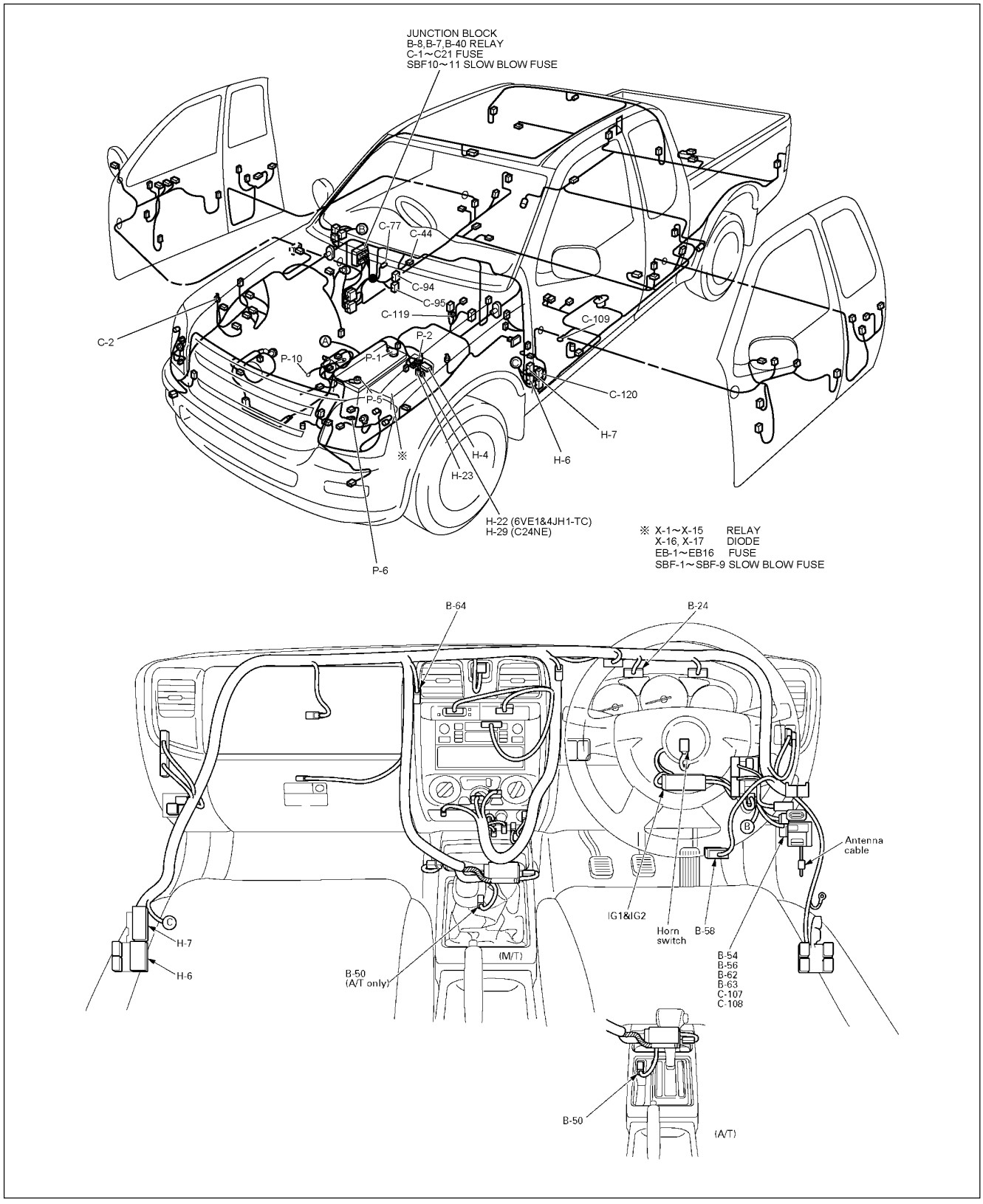
CIRCUIT DIAGRAM



RTW38DXF001001

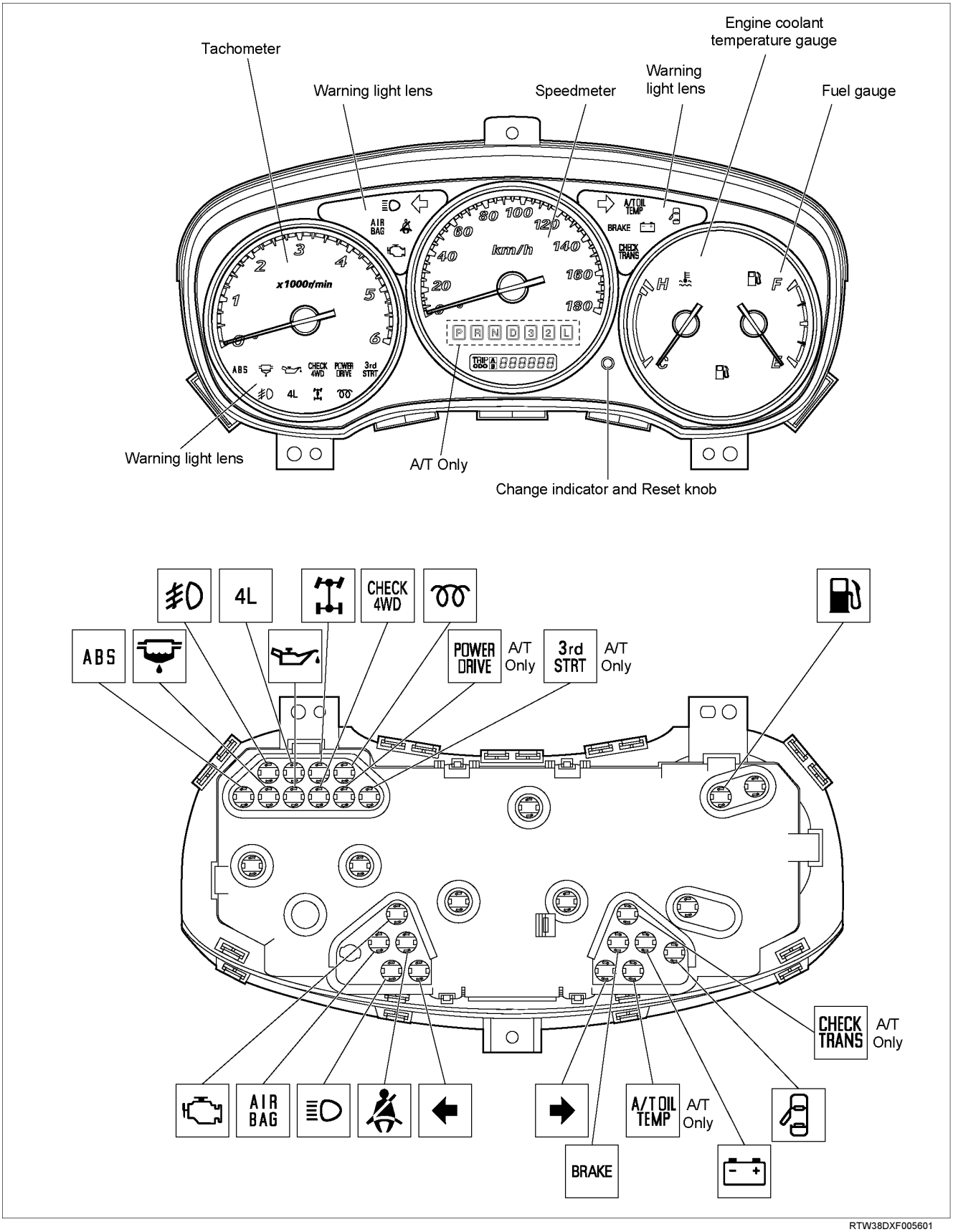

STARTER RELAY
X-8
(2)
INHIBITER SW.
TURBIN SENSOR
2-4 WD C/U
IMMOBILIZER
ENGINE
TCM
A/T TERM ASM
T/M OIL TEMPERATURE SENSOR
LOW CLUTCH DUTY SOLENOID
2&4 BRAKE DUTY SOLENOID
HIGH CLUTCH DUTY SOLENOID
LOW&REVERS BRAKE DUTY SOLENOID
LOCK UP DUTY SOLENOID
PRESSURE SOLENOID
LOW&REVERS BRAKE PRESSURE SW.
2&4 BRAKE PRESSURE SW.
HIGH CLUTCH PRESSURE SW.
RTW38DXF001101

PARTS LOCATION (1)



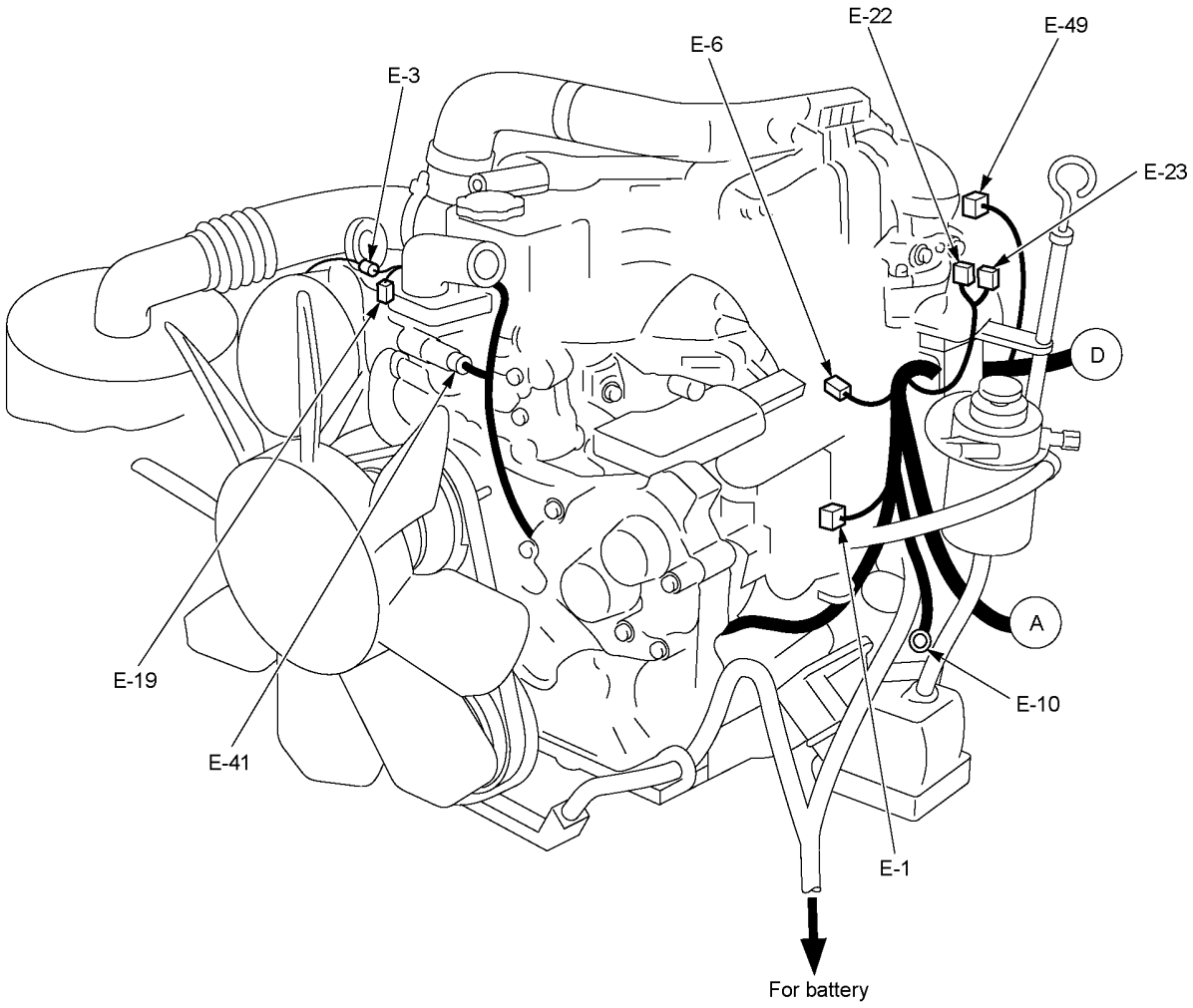
RTW38DMF001001&810R300082

PARTS LOCATION (2)



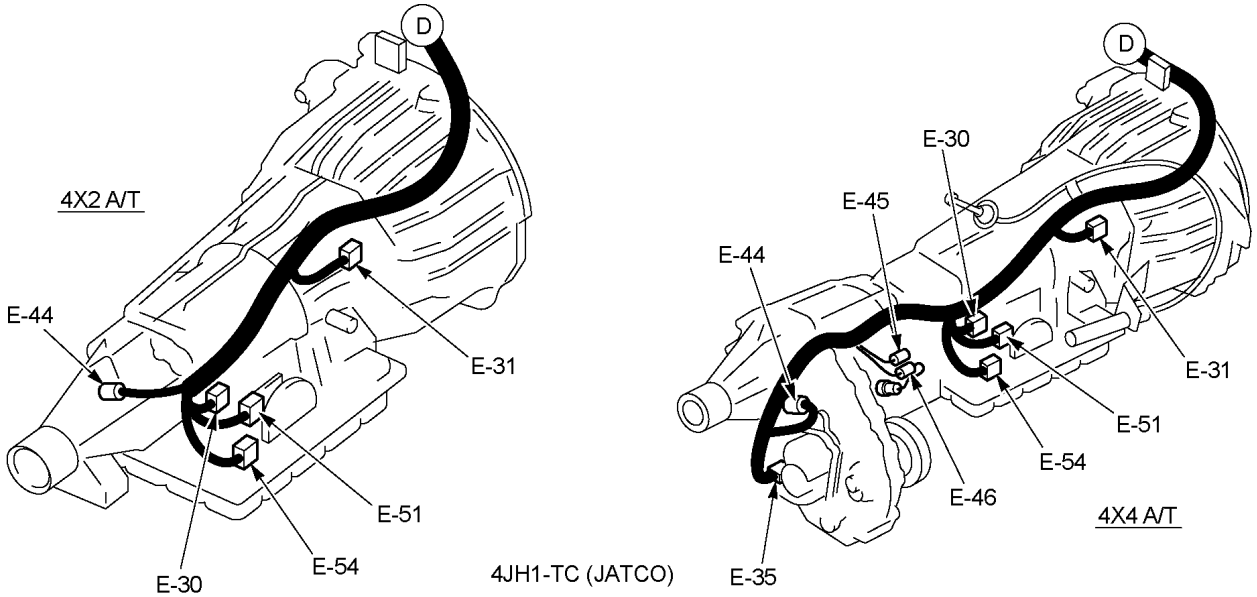
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PARTS LOCATION (3)



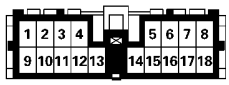
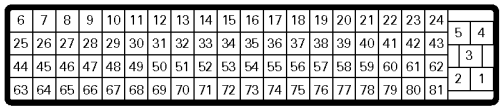
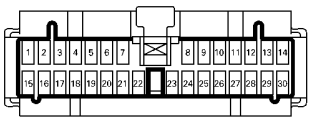
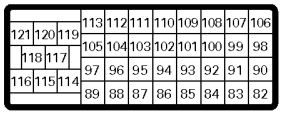
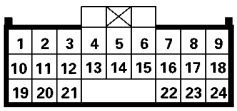
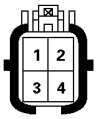
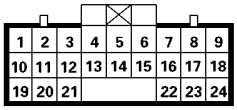
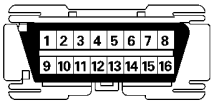
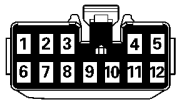
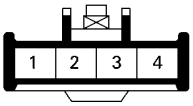
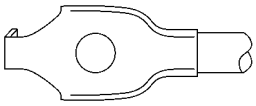
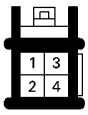
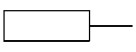
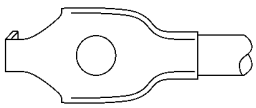
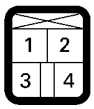
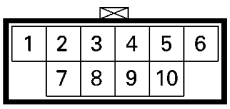
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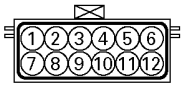
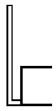
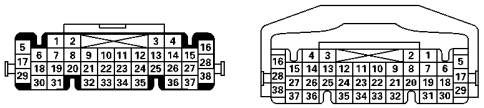
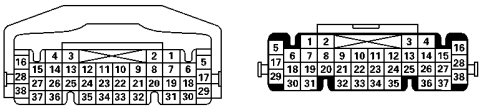
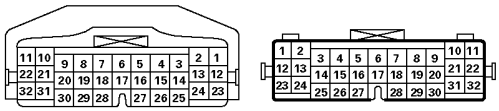
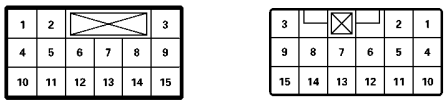
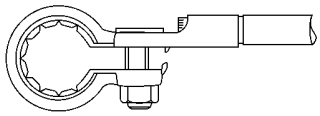
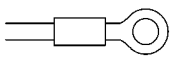
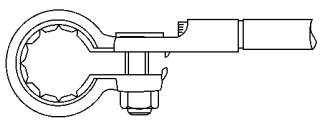
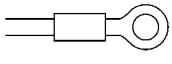
PARTS LOCATION (4)



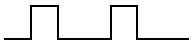
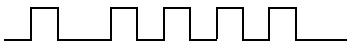
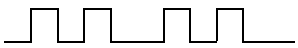
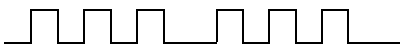
CONNECTOR LIST

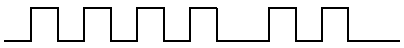
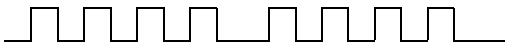
TCM

No.	Connector face	No.	Connector face
B-23 Green	 Meter-A	C-56 (4JH1-TC)	 ECM-A
B-24 Green	 Meter-B	C-57 (4JH1-TC)	 ECM-B
B-50 White	 Power/3rd start switch	C-94 (6VE1) (4JH1-TC) Gray	 TCM
B-54 White	 J/B I2	C-95 (6VE1) (4JH1-TC) White	 TCM
B-58 Black	 Check connector	C-107 White	 J/B E2
B-62 White	 Ignition switch (IGSUB : G1)	C-109 Silver	 Body-LH ; ground
B-63 White	 Ignition switch (IGSUB : G2)	E-30 (4JH1-TC) Gray	 A/T speed sensor
B-64 Silver	 Weld splice 1 (Illumination)	E-31 (4JH1-TC) Gray	 Turbine sensor
C-2 Silver	 Engine room-RH ground	E-44 Gray	 Vehicle speed sensor
C-44 White	 Stop lamp switch	E-51 (4JH1-TC) Black	 Inhibiter switch

No.	Connector face	No.	Connector face
E-54 (4JH1-TC) Black	 A/T term ASM	P-10 Silver	 Engine ground
H-4 (6VE1) (4JH1-TC) White	 Engine ~ Engine room		
H-6 White	 Engine room ~ INST		
H-7 White	 Engine room ~ INST		
H-22 (6VE1) (4JH1-TC) White	 Engine ~ Engine room C		
H-23 (6VE1) (4JH1-TC) White	 Engine ~ Engine room B		
P-1 Silver	 Battery (+)		
P-2 Silver	 Relay & Fuse box		
P-5 Silver	 Battery (-)		
P-6 Silver	 Body earth (Ground)		

DIAGNOSIS TROUBLE CODE TABLE

Flash Code (P-Code)	CHECK TRANS Flash Pattern	Description	CHECK TRANS Warning
11 (P0722)		Vehicle Speed Sensor No Signal	ON
12 (-)		Normal	-
13 (P0727)		Engine Revolution Sensor No Signal	ON
14 (P0717)		Turbine Speed Sensor No Signal	ON
15 (P0710)		ATF Temperature Sensor Failure	OFF
16 (P0560)		System Voltage Failure	ON
17 (P0705)		Inhibitor Switch Failure	ON
22 (P1120)		Throttle Signal Failure	ON
25 (P1875)		GND Return Circuit Failure	ON
26 (P1853)		Low & Reverse Brake Pressure Switch Failure	ON
27 (P1858)		2-4 Brake Pressure Switch Failure	ON
28 (P1863)		High Clutch Pressure Switch Failure	ON
31 (P0753)		Low & Reverse Brake Duty Solenoid Failure	ON
32 (P0758)		2-4BrakeDutySolenoidFailure	ON
33 (P0763)		High Clutch Duty Solenoid Failure	ON

Flash Code (P-Code)	CHECK TRANS Flash Pattern	Description	CHECK TRANS Warning
34 (P0768)		Low Clutch Duty Solenoid Failure	ON
35 (P0748)		Line Pressure Solenoid Failure	ON
36 (P1860)		Lock-up Duty Solenoid Failure	ON
41 (P0731)		1stGearRatioError	ON
42 (P0732)		2ndGearRatioError	ON
43 (P0733)		3rdGearRatioError	ON
44 (P0734)		4thGearRatioError	ON
51 (P1750)		Low & Reverse Brake Fail-safe Valve Failure	ON
52 (P1755)		2-4BrakeFail-safeValveFailure	ON
- (P0602)	No Flash Code	Programming Error	ON

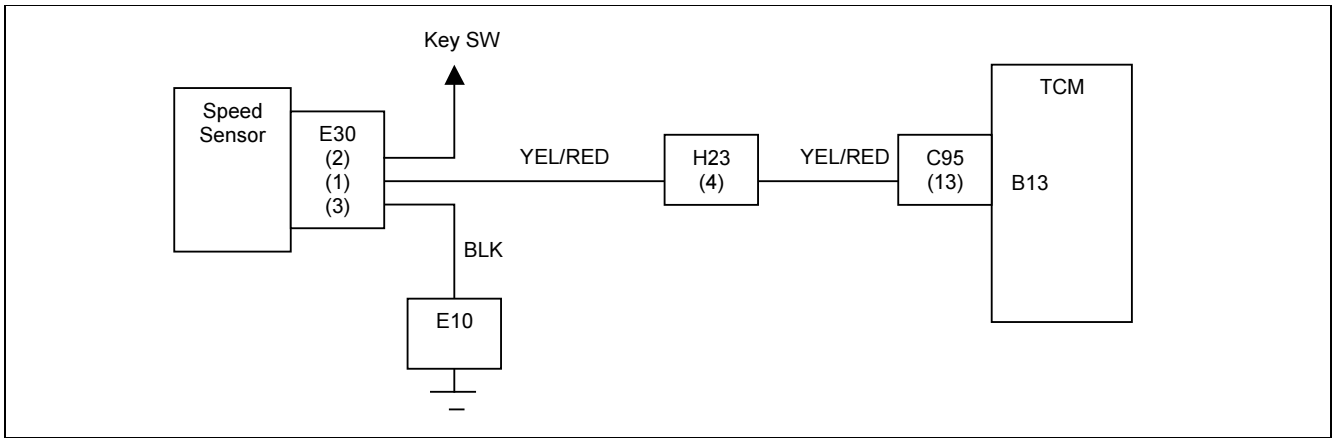
FAIL-SAFEFUNCTION

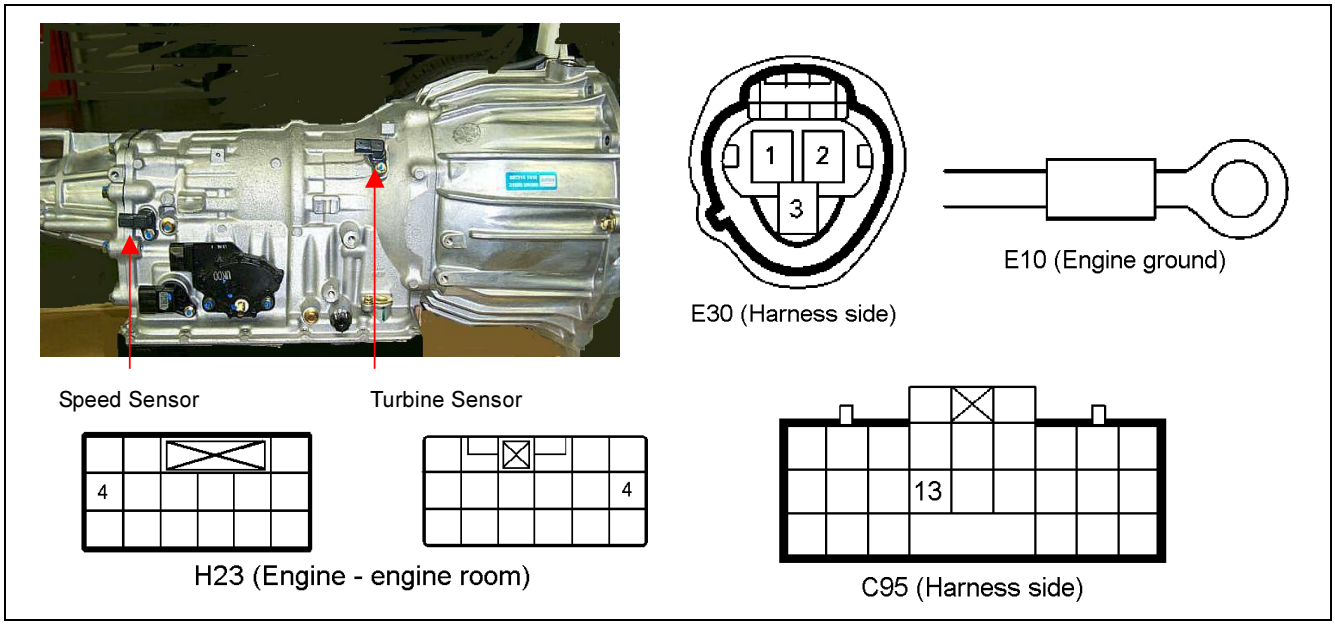
			Fail-Safe Condition				
Flash Code (P-Code)	Description	CHECK TRANS Warning	Gear	Shift Solenoid	Line Pressure Solenoid	Lock-up	Remark
11 (P0722)	Vehicle peed Sensor No Signal	ON	3rdFix	All Stop	-	Inhibited	
13 (P0727)	Engine Revolution Sensor No Signal	ON	-	-	-	Inhibited	
14 (P0717)	Turbine Speed Sensor No Signal	ON	3rdFix	All Stop	-	Inhibited	
15 (P0710)	ATF Temperature Sensor Failure	OFF	3,2,L	-	-	Inhibited	*1
16 (P0560)	System Voltage Failure	ON	3rdFix	All Stop	-	Inhibited	*2
17 (P0705)	Inhibitor Switch Failure	ON	3rdFix	All Stop	-	Inhibited	
22 (P1120)	Throttle Signal Failure	ON	3rdFix	All Stop	-	Inhibited	
25 (P1875)	GND Return Circuit Failure	ON	3rdFix	All Stop	-	Inhibited	*2
26 (P1853)	Low & Reverse Brake Pressure Switch Failure	ON	No Fail-safe Function				
27 (P1858)	2-4 Brake Pressure Switch Failure	ON	No Fail-safe Function				
28 (P1863)	High Clutch Pressure Switch Failure	ON	No Fail-safe Function				
31 (P0753)	Low & Reverse Brake Duty Solenoid Failure	ON	3rdFix	All Stop	-	Inhibited	
32 (P0758)	2-4 Brake Duty Solenoid Failure	ON	3rdFix	All Stop	-	Inhibited	
33 (P0763)	High Clutch Duty Solenoid Failure	ON	3rdFix	All Stop	-	Inhibited	
34 (P0768)	Low Clutch Duty Solenoid Failure	ON	3rdFix	All Stop	-	Inhibited	
35 (P0748)	Line Pressure Solenoid Failure	ON	-	-	Stop	-	
36 (P1860)	Lock-up Duty Solenoid Failure	ON	-	-	-	Inhibited	
41 (P0731)	1stGearRatioError	ON	No Fail-safe Function				
42 (P0732)	2ndGearRatioError	ON	No Fail-safe Function				
43 (P0733)	3rdGearRatioError	ON	No Fail-safe Function				
44 (P0734)	4thGearRatioError	ON	No Fail-safe Function				
51 (P1750)	Low & Reverse Brake Fail-safe Valve Failure	ON	3rdFix	All Stop	-	Inhibited	
52 (P1755)	2-4 Brake Fail-safe Valve Failure	ON	3rdFix	All Stop	-	Inhibited	
- (P0602)	Programming Error	ON	No Fail-safe Function				

*1: When the engine speed is more than 470 rpm for 10 minuets, the lock-up and gear shift to 4th (over-drive) are allowed.

*2: In case of fail-safe valve failure, gear shift to 4th (over-drive) is inhibited.

DTC P0722 (Flash Code 11) Vehicle Speed Sensor No Signal





Setting Condition:

- When the vehicle speed exceeds 5 km/h with the turbine speed over 1000 rpm for 5 seconds, after 25.5 seconds elapsed in D, 3, 2 or L range.

Fail Safe:

- When the vehicle is running, the gear position selected at the trouble detection is held and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd.

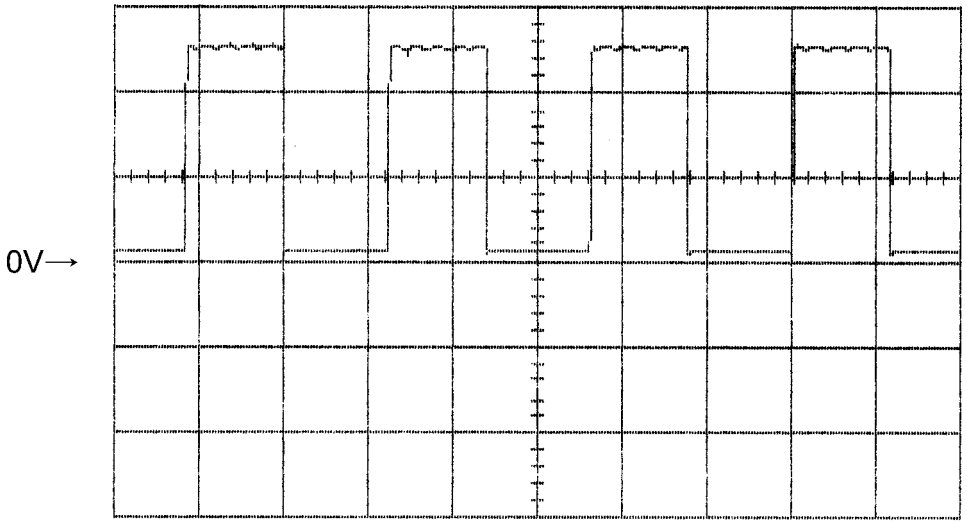
Possible Cause:

- Speed sensor malfunction.
- Sensor wheel (parking gear) malfunction.
- Large sensing gap between speed sensor and sensor wheel (parking gear).
- Sensor wire open circuit, short circuit to battery or short circuit to ground between speed sensor terminal 1 and TCM terminal B13 (C95).
- Sensor wire open circuit or short circuit to ground of the harness between speed sensor terminal 2 and power supply circuit.
- Sensor wire open circuit or short circuit to battery between speed sensor terminal 3 and ground circuit.

- Poor connection of each connector.

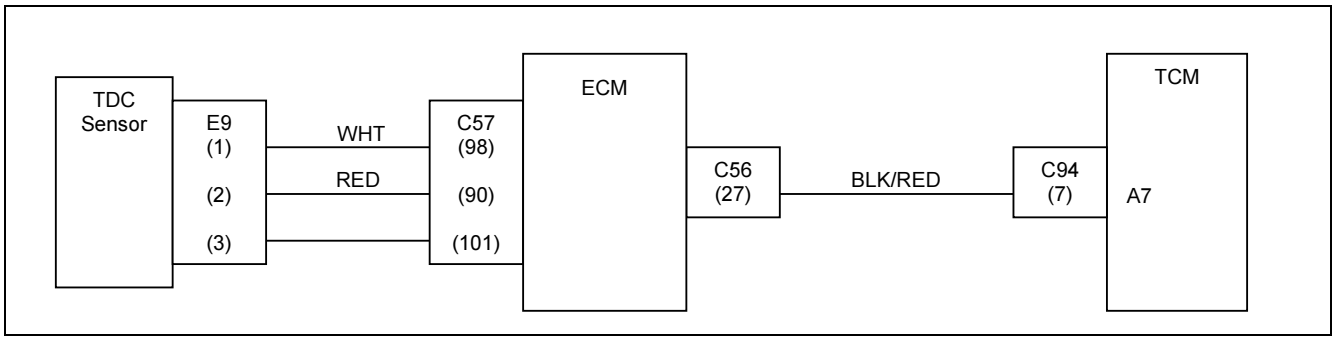
Reference:
When the vehicle speed 20km/h at L range in 1st gear, following signal is outputted.
Measurement terminal: B13 (C95) and B5 (C95)
-AC range by circuit tester: Approximately 6.2 V

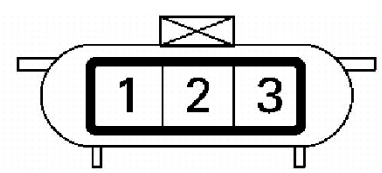
Vehicle Speed Sensor Reference Wave Form



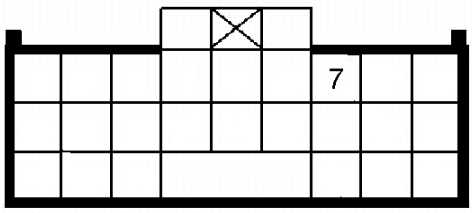
Measurement Terminal: B13 (+) B5 (-)
Measurement Scale: 5V/div 2ms/div
Measurement Condition: Vehicle speed 20km/h at L range in 1st gear

DTC P0727 (Flash Code 13) Engine Revolution Sensor No Signal

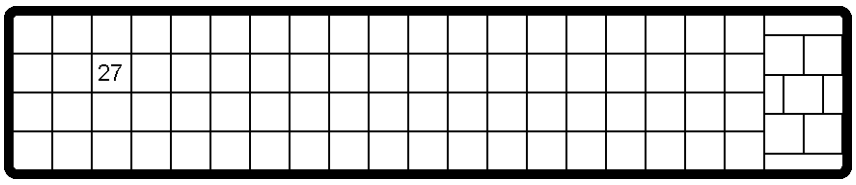




E9 (Harness side)



C94 (Harness side)



C56 (ECM-A)

Setting Condition:

- The engine speed becomes 0 rpm for 2 seconds while the vehicle is running at the over 40 km/h.

Fail Safe:

- Lock-up is inhibited.

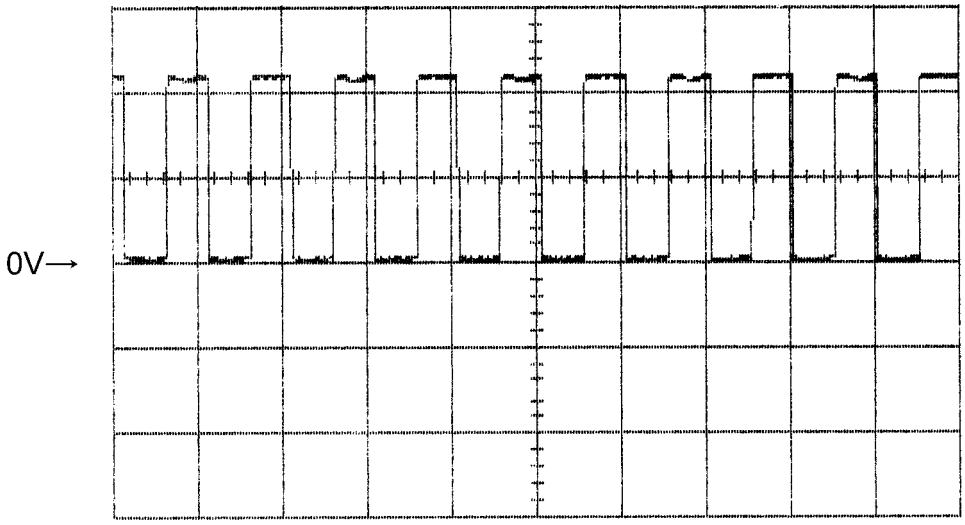
Possible Cause:

- Crank position sensor malfunction.
- Sensor wheel (flywheel) malfunction.
- Large sensing gap between speed sensor and sensor wheel (flywheel).
- Faulty input signal from crank position sensor to ECM.
- Signal wire open circuit or short circuit to battery between ECM A24 and TCM terminal A7 (C94).
- Poor connection of each connector.

Reference:

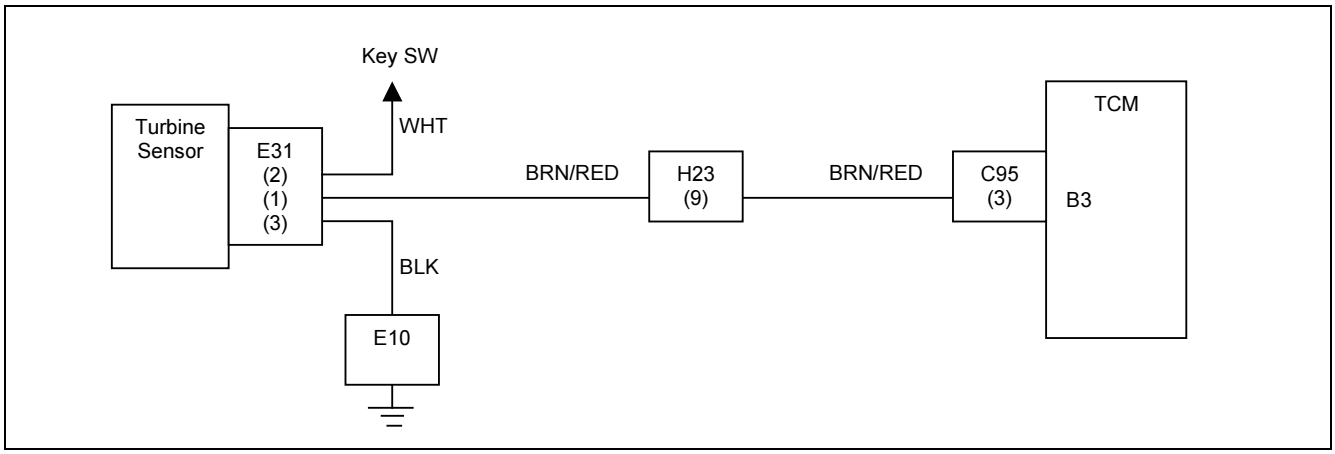
When the engine speed 1500rpm, following signal is outputted.
Measurement terminal: A7 (C94) and B5 (C95)

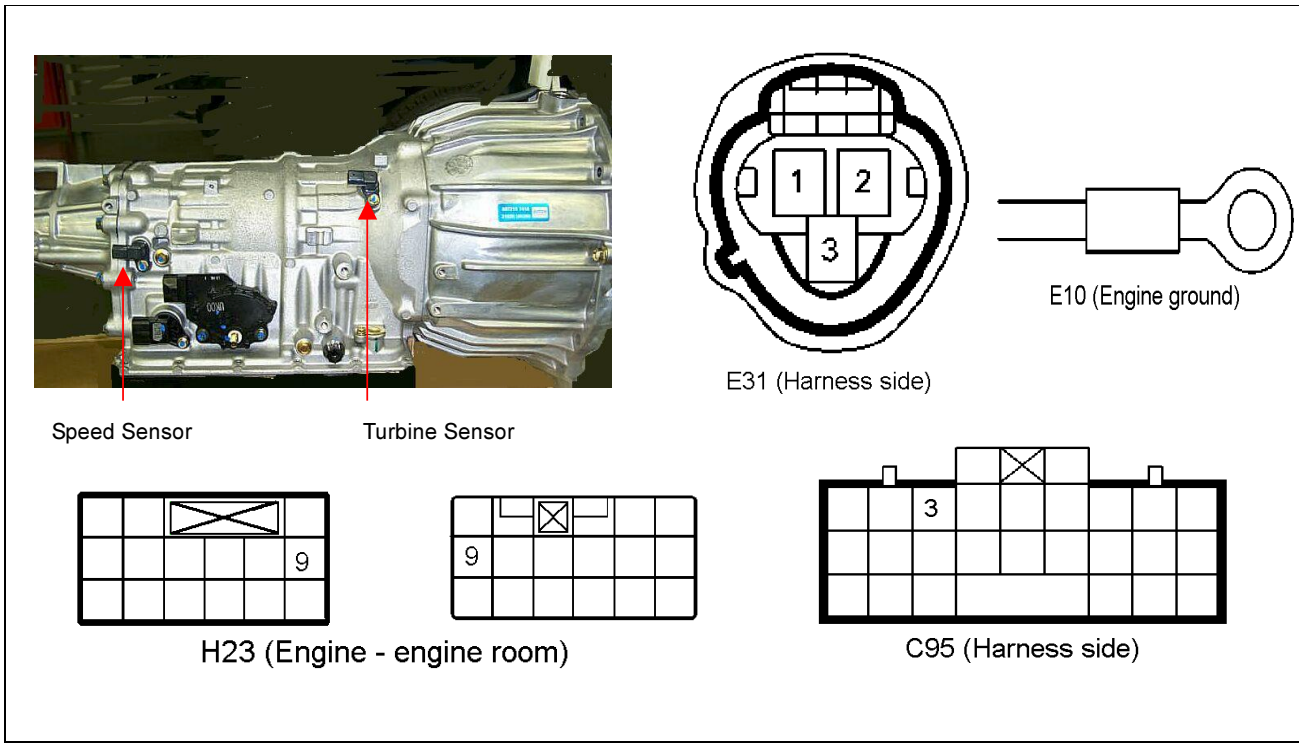
Engine Speed Sensor Reference Wave Form



Measurement Terminal: A7 (+) B5(-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: At engine speed 1500rpm

DTC P0717 (Flash Code 14) Turbine Speed Sensor No Signal





Setting Condition:

- The turbine speed below 300 rpm for 2 seconds while the vehicle is running at the speed over 40 km/h with the engine speed over 1500 rpm in the D, 3, 2, or L range.

Fail Safe:

- When the vehicle is running, the gear position selected at the trouble detection is held and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd.

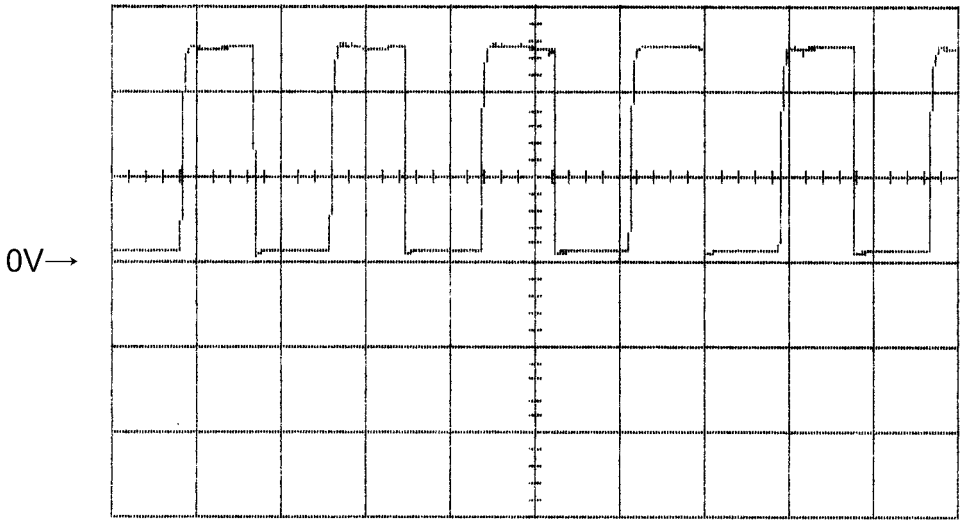
Possible Cause:

- Turbine speed sensor malfunction.
- Sensor wheel (reverse & high clutch drum) malfunction.
- Large sensing gap between speed sensor and sensor wheel (reverse & high clutch drum).
- Sensor wire open circuit, short circuit to battery or short circuit to ground between turbine speed sensor terminal 1 and TCM terminal B3 (C95).

- Sensor wire open circuit or short circuit to ground between turbine speed sensor terminal 2 and power supply circuit.
- Sensor wire open circuit or short circuit to battery between turbine speed sensor terminal 3 and ground circuit.
- Poor connection of each connector.

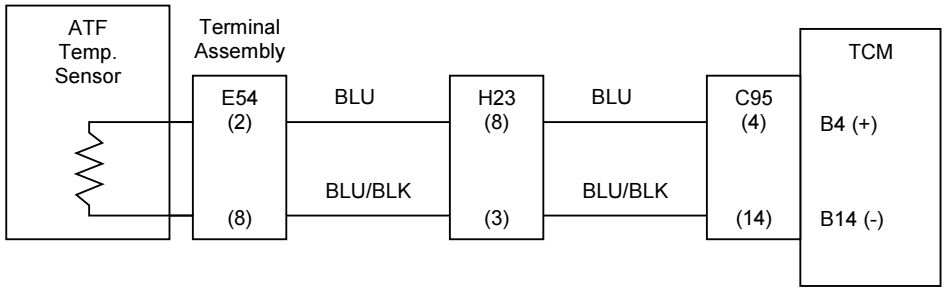
Reference:
When the vehicle speed 20km/h at L range in 1st gear, following signal is outputted.
Measurement terminal: B3 (C95) and B5 (C95)
-AC range by circuit tester: Approximately 6.2 V

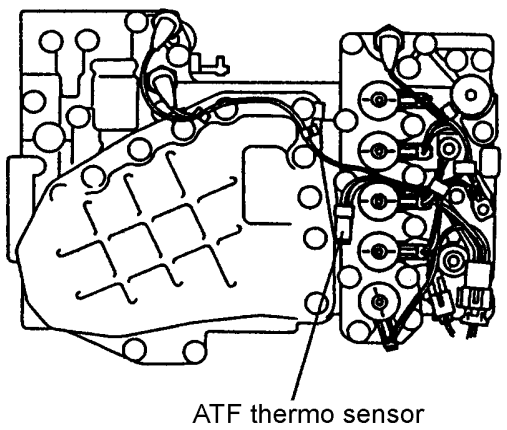
Turbine Sensor Reference Wave Form

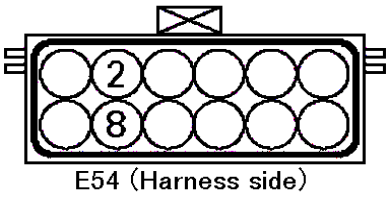


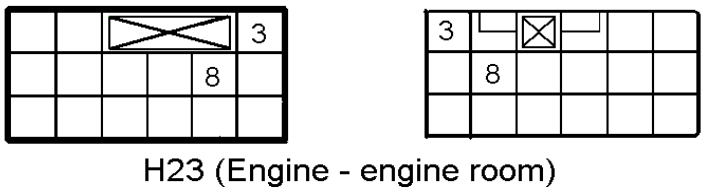
Measurement Terminal: B3 (+) B5 (-)
Measurement Scale: 5V/div 500ms/div
Measurement Condition: Vehicle speed 20km/h at L range in 1st gear

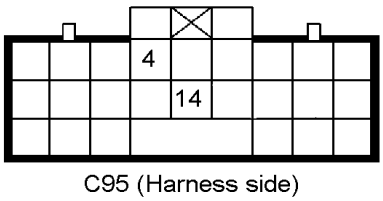
DTC P0710 (Flash Code 15) ATF Temperature Sensor Failure











Setting Condition:

- The condition in which the voltage of oil temperature sensor is below 0.1V (146°C) and ATF temperature warning lamp ON in the P or N range lasts for more than 5 minutes.
  Or
- The vehicle speed exceeds 20 km/h and the voltage of oil temperature sensor exceeds 2.43V (-40°C) for more than 10 seconds.

Fail Safe:

- The lock-up is inhibited, and TCM is controlled ATF temperature 80°C condition as substitute.
- When the engine speed is more than 470 rpm for 10 minuets, the lock-up and gear shift to 4th (over-drive) are allowed.

Possible Cause:

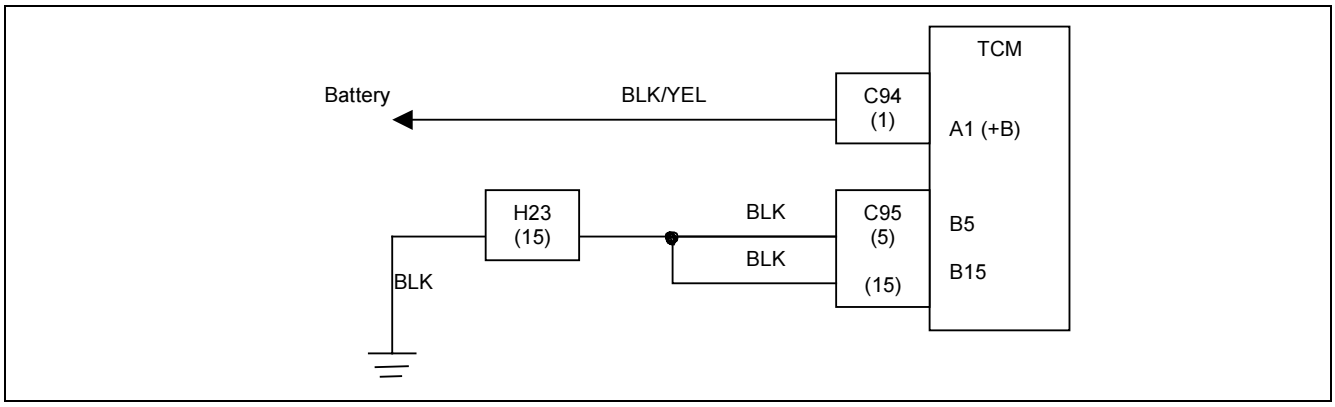
- Oil temperature sensor wire open circuit or short circuit.
- Oil temperature sensor malfunction.
- Power supply wire open circuit, short circuit to battery or short circuit to ground between oil temperature sensor and TCM terminal B4 (C95).
- Ground wire open circuit or short circuit to battery between oil temperature sensor terminal and TCM terminal B14 (C95).

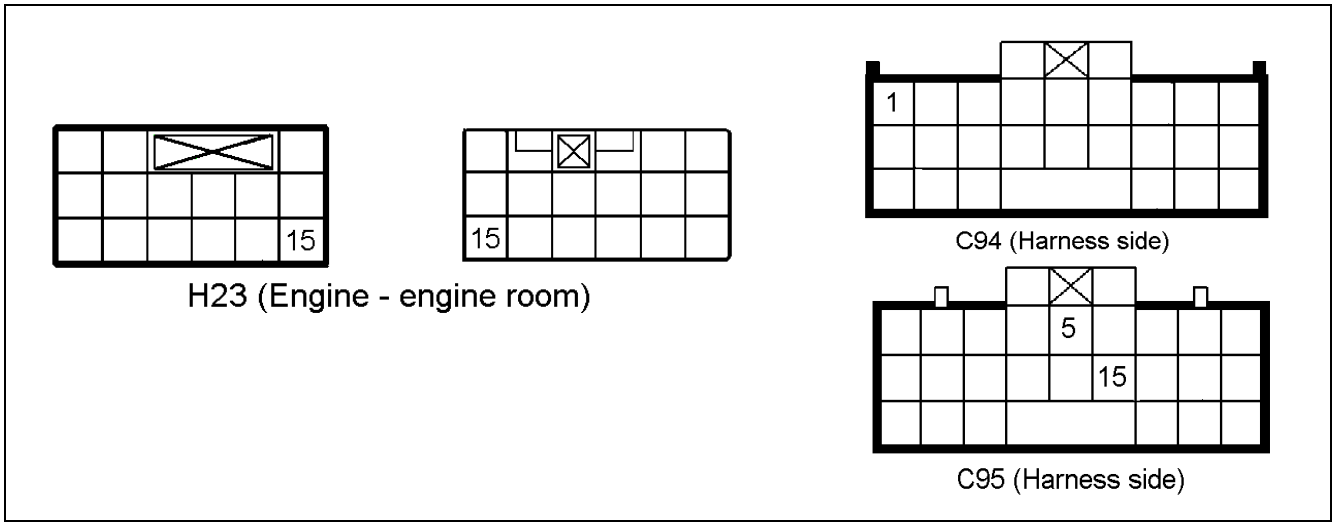
- Poor connection of each connector.

Reference:
Following output voltage and resistance can be measured by circuit tester.
Measurement terminal: B4 (C95) and B14 (C95)

Temperature	Output Voltage (V)	Resistance
20 °C	1.55	2,500Ω
40 °C	1.08	1,160Ω
60 °C	0.7	590Ω

DTC P0560 (Flash Code 16) System Voltage Failure





Setting Condition:

- The supply voltage is below 10V and the engine speed exceeds 1000 rpm for more than 1 second.

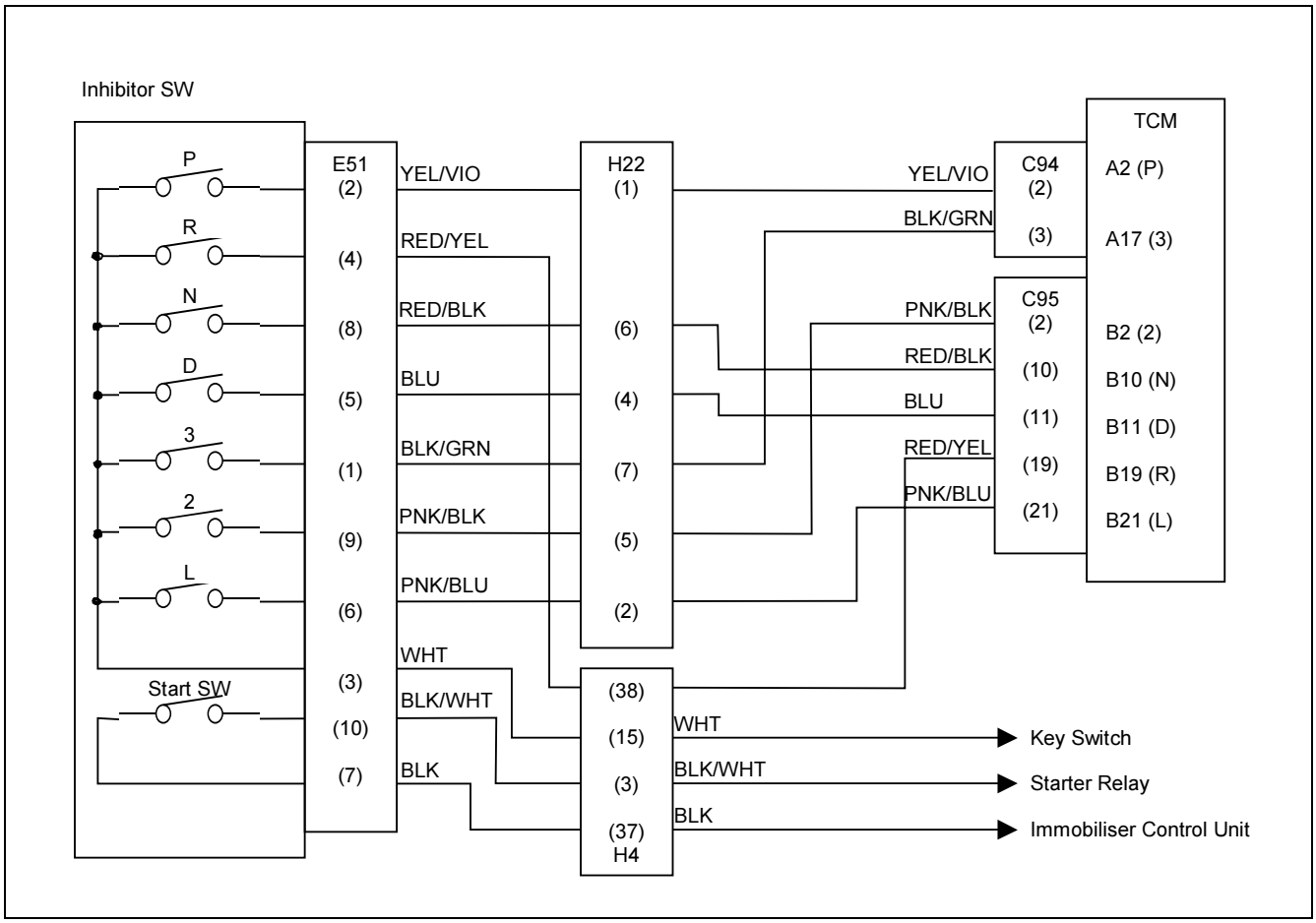
Fail Safe:

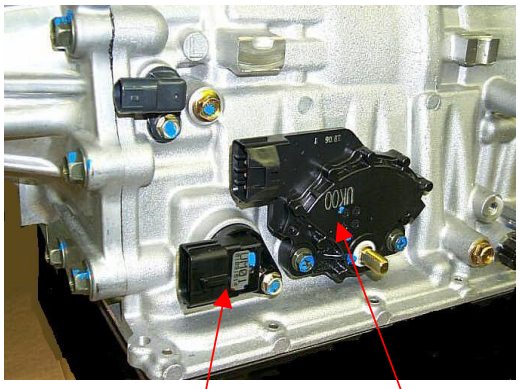
- When the vehicle is running, the gear position selected at the trouble detection is held and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd. (In case of fail-safe valve failure, gear shift to 4th (over-drive) is inhibited.)

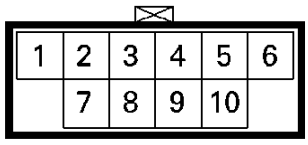
Possible Cause:

- Alternator or battery malfunction.
- Power supply wire open circuit or short circuit to ground between power supply and TCM terminal A1 (C94).
- Ground wire open circuit or short circuit to battery between ground location and TCM terminal B5 (C95) or B15 (C95).
- Poor connection of each connector.

DTC P0705 (Flash Code 17) Inhibitor Switch Failure



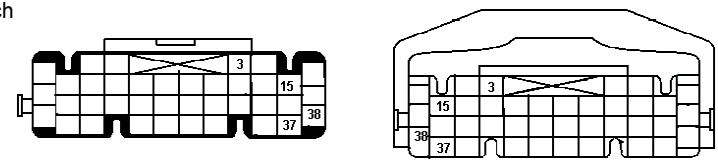




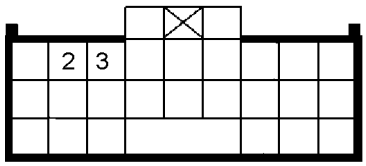
E51 (Harness side)



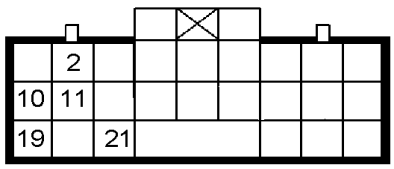
H22 (Engine - engine room)



H4 (Engine - engine room)



C94 (Harness side)



C95 (Harness side)

Setting Condition:

- No range signal is entered from the inhibitor switch with the engine speed over 500 rpm for 2 seconds.
  Or
- Multiple signals are entered from the inhibitor switch for 1 second.

Fail Safe:

- When the vehicle is running, the gear position selected at the trouble detection is held and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd.

Possible Cause:

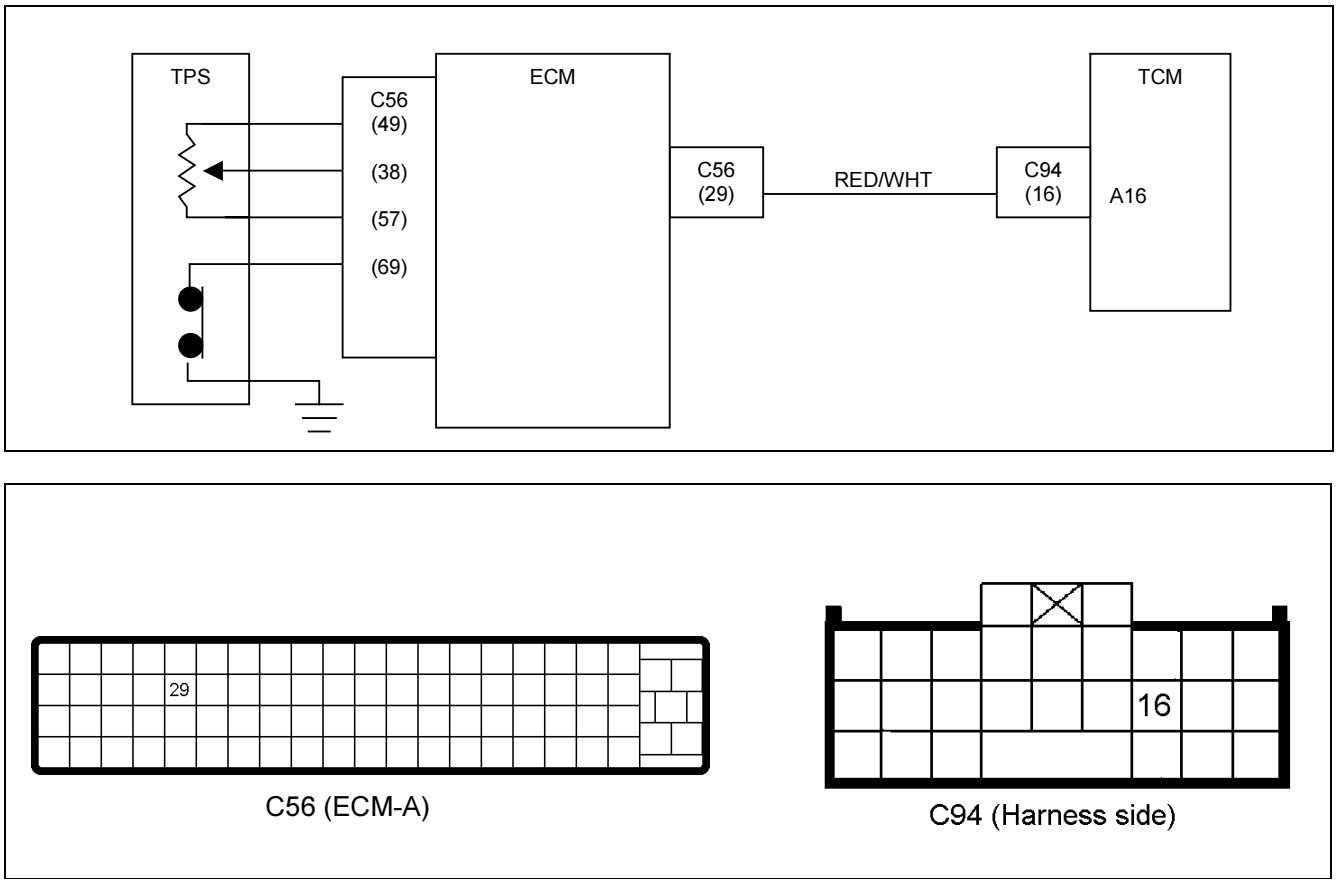
- Inhibitor switch incorrect adjustment.
- Inhibitor switch malfunction.
- Open circuit or short circuit to battery between inhibitor switch terminal 2 and TCM terminal A2 (C94), terminal 4 and TCM terminal B19 (C95), terminal 8 and TCM terminal B10 (C95), terminal 5 and TCM terminal B11 (C95), terminal 1 and TCM terminal A17 (C94), terminal 9 and TCM terminal B2 (B95), or terminal 6 and TCM terminal B21 (C95), or short between respective harness.
- Power supply wire open circuit or short circuit to ground between inhibitor switch terminal 3 and power supply circuit.
- Poor connection of each connector.

Reference:

Following continuity can be measured by circuit tester.

	10	7	3	2	4	8	5	1	9	6
P	○	○	○	○						
R			○		○					
N	○	○	○			○				
D			○				○			
3			○					○		
2			○						○	
L			○							○

DTC P1120 (Flash Code 22) Throttle Signal Failure



Setting Condition:

- No throttle signal is sent from the ECM for 0.4 seconds.

Fail Safe:

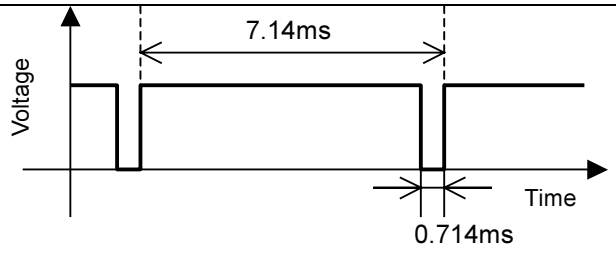
- When the vehicle is running, the gear position selected at the trouble detection is held and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd.

Possible Cause:

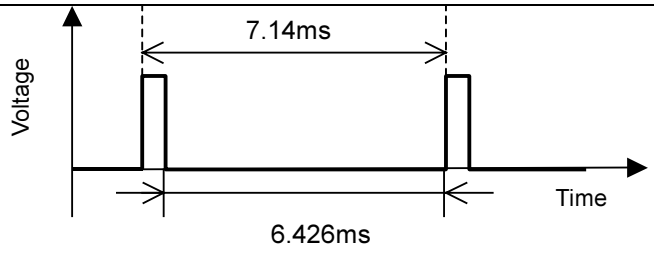
- Throttle position sensor malfunction.
- Signal wire open circuit or short circuit to battery of the harness between ECM A26 (C56) and TCM terminal A16 (C94).
- Poor connection of each connector.

Reference:

- At throttle position 0%, OFF duty signal 10% is sent from ECM terminal A26 (C56) to TCM terminal A16 (C94).
- At throttle position 100% (WOT), OFF duty signal 90% is sent from ECM terminal A26 (C56) to TCM terminal A16 (C94).

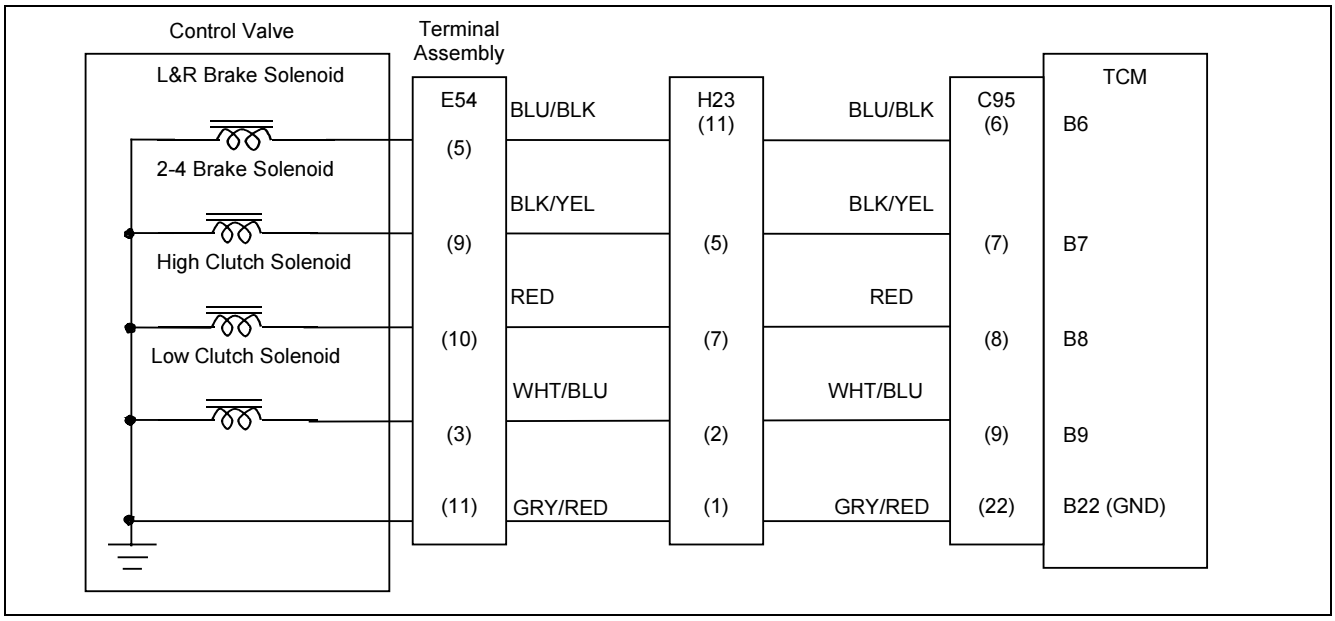


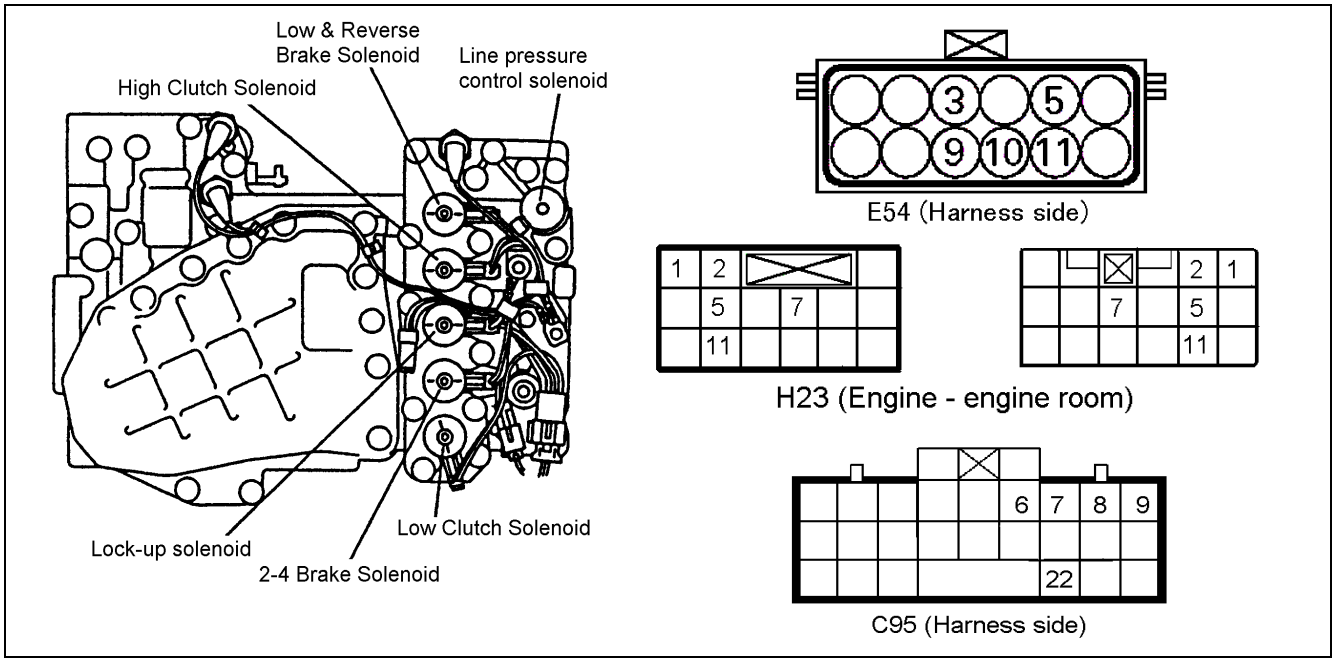
Off duty 10% =Throttle Position 0%



Off duty 90% =Throttle Position 100%

DTC P1875 (Flash Code 25) GND Return Circuit Failure





Setting Condition:

- Ground return circuit is failed 7 times continuously after the low & reverse brake duty solenoid output signal turn on.

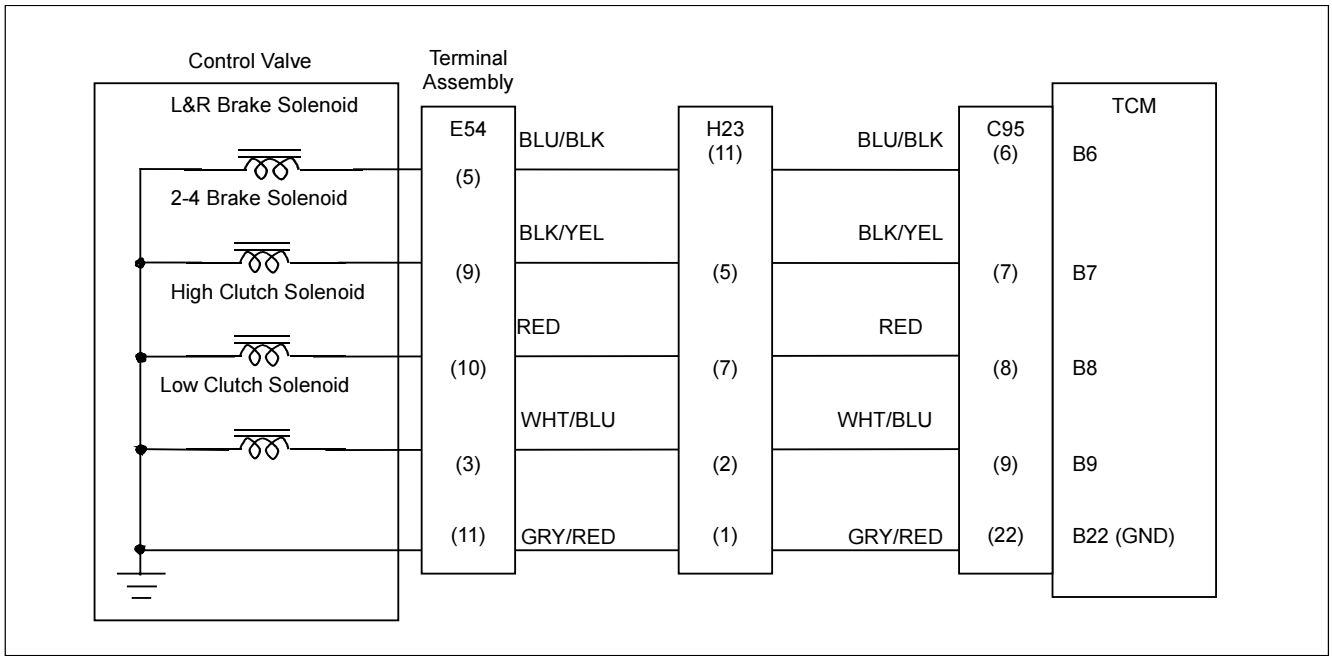
Fail Safe:

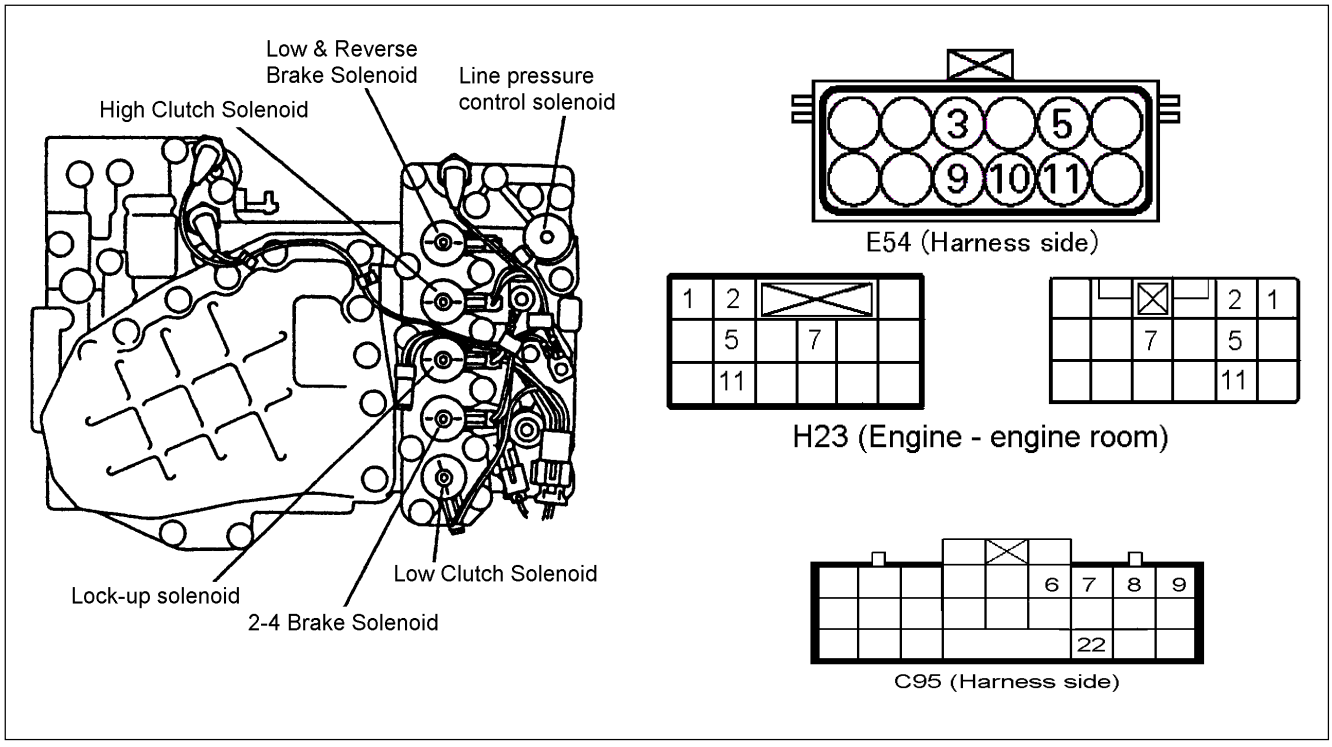
- All solenoid operations are stopped (OFF), the gear is fixed to the 3rd, and the lock-up is inhibited. (In case of fail-safe valve failure, gear shift to 4th (over-drive) and lock-up are inhibited.)

Possible Cause:

- Ground return wire open circuit between terminal assembly terminal 11 and TCM terminal B22 (C95).
- Poor connection of each connector.

DTC P0753 (Flash Code 31) Low & Reverse Brake Duty Solenoid Failure





Gear Position & Shift Solenoid Operation

Range	TCM terminal / Gear	B8 (High clutch solenoid)	B9 (Low clutch solenoid)	B7 (2-4 brake solenoid)	B6 (Low & reverse brake solenoid)
P	—	○	×	○	○
R	Reverse	○	×	○	×
N	—	○	×	○	○
D, 3, 2	1st	○	×	○	○
	2nd	○	×	×	○
	3rd	×	×	○	○
	4th	×	○	×	○
L	1st	○	×	○	×
	2nd	○	×	×	○
	3rd	×	×	○	○
	4th	×	○	×	○

○ : On (Operated)

× : Off (Not operated)

Setting Condition:

- The low & reverse brake duty solenoid signal is open circuit or short circuit.
  (The voltage different from the output ON/OFF signals was detected while the TCM monitors the solenoid output voltage.)

Fail Safe:

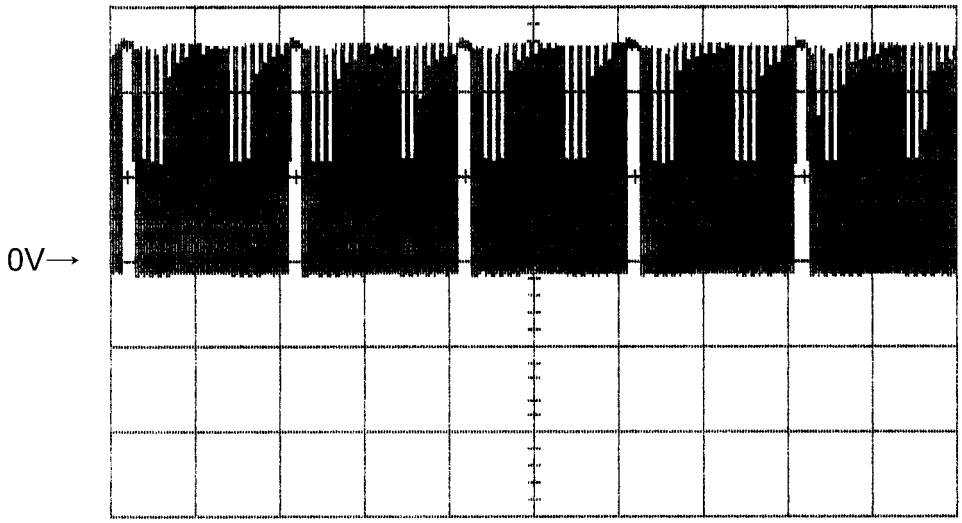
- When the vehicle is running, the operation of the low & reverse brake duty solenoid and the lock-up solenoid is stopped (OFF), the gear position selected at the trouble detection is held, and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd.

Possible Cause:

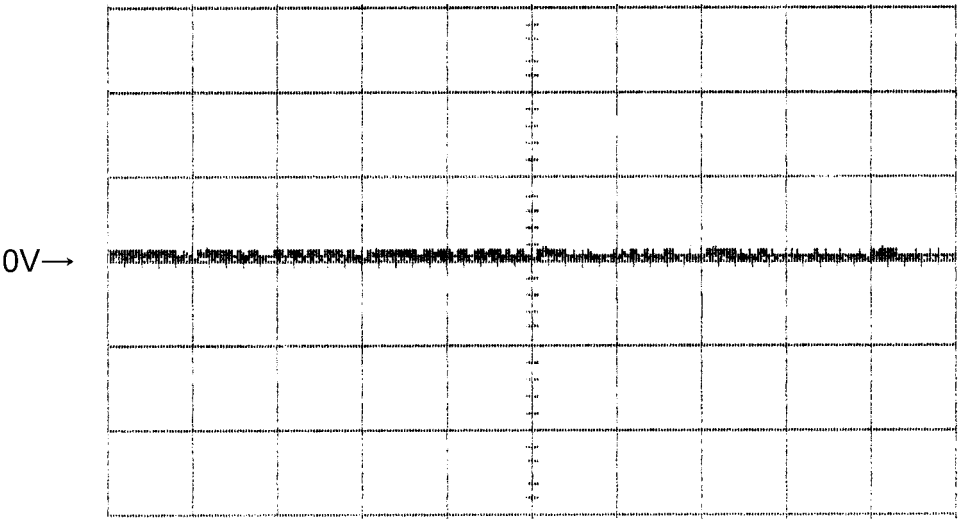
- Low & reverse brake duty solenoid malfunction.
- Open (Off) circuit or short (On) circuit harness of the low & reverse brake duty solenoid.
- Open circuit, short circuit to battery or short circuit to ground between low & reverse brake duty solenoid terminal 5 and TCM terminal B6 (C96).
- Insufficient ground condition of the low & reverse brake duty solenoid.
- Poor connection of each connector.

Reference:
When the low & reverse brake solenoid is operated, following signal is outputted.
Measurement terminal: B6 (C95) and B22 (C95)
-AC range by circuit tester: Approximately 6.8V

Low & Reverse Brake Duty Solenoid Reference Wave Form

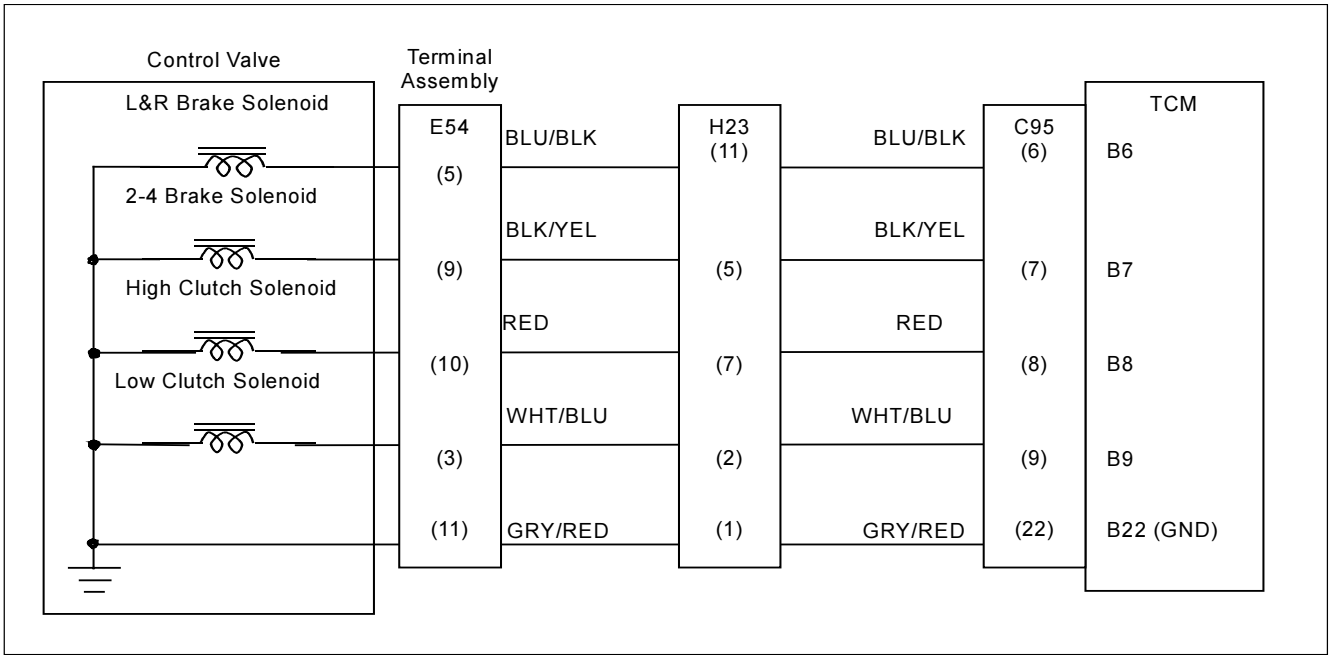


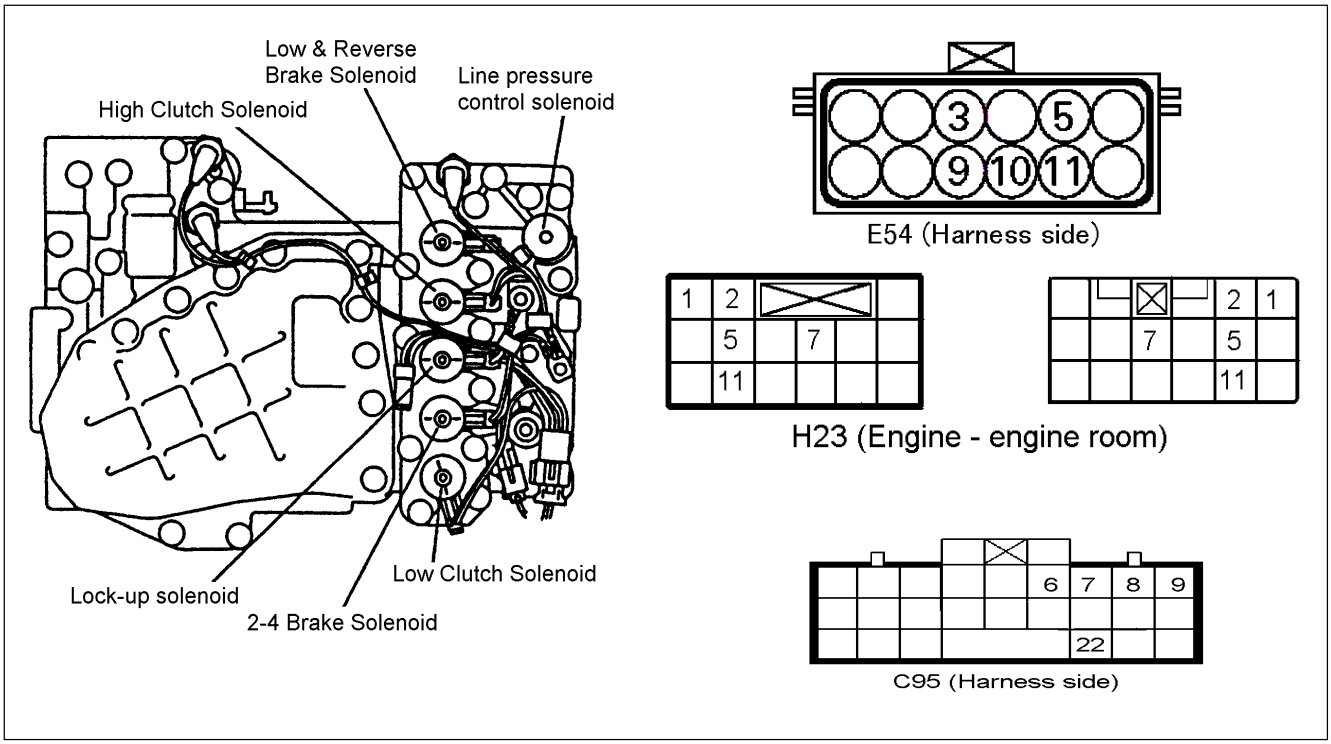
Measurement Terminal: B6 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: P, N range in idle



Measurement Terminal: B6 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: R range in idle

DTC P0758 (Flash Code 32) 2-4 Brake Duty Solenoid Failure





Gear Position & Shift Solenoid Operation

Range	TCM terminal / Gear	B8 (High clutch solenoid)	B9 (Low clutch solenoid)	B7 (2-4 brake solenoid)	B6 (Low & reverse brake solenoid)
P	—	○	×	○	○
R	Reverse	○	×	○	×
N	—	○	×	○	○
D, 3, 2	1st	○	×	○	○
	2nd	○	×	×	○
	3rd	×	×	○	○
	4th	×	○	×	○
L	1st	○	×	○	×
	2nd	○	×	×	○
	3rd	×	×	○	○
	4th	×	○	×	○

○ : On (Operated)

× : Off (Not operated)

Setting Condition:

- The 2-4 brake duty solenoid signal is open circuit or short circuit.
  (The voltage different from the output ON/OFF signals was detected while the TCM monitors the solenoid output voltage.)

Fail Safe:

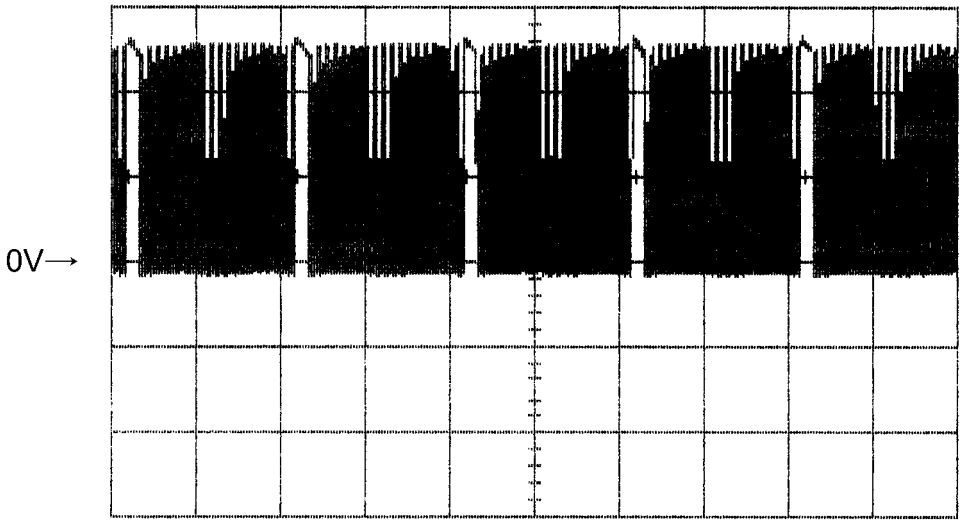
- When the vehicle is running, the operation of the 2-4 brake duty solenoid and the lock-up solenoid is stopped (OFF), the gear position selected at the trouble detection is held, and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd.

Possible Cause:

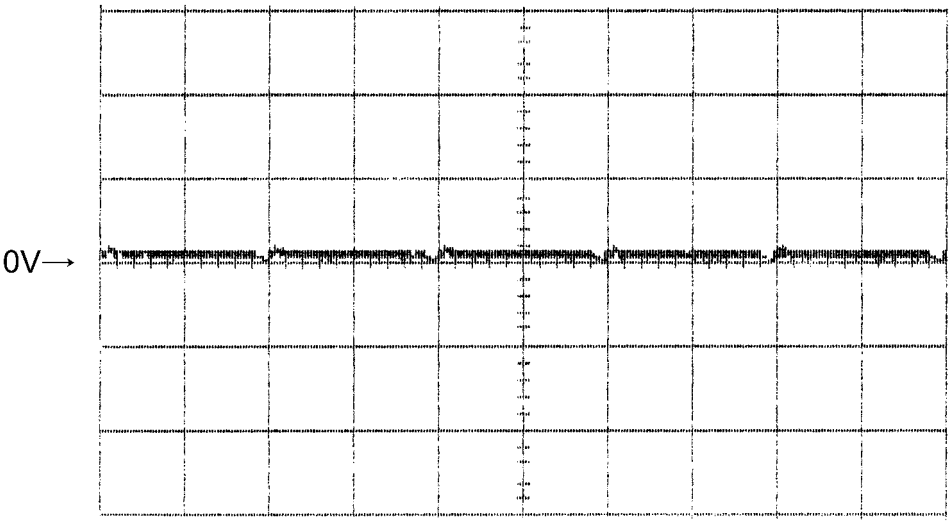
- 2-4 brake duty solenoid malfunction.
- Open (Off) circuit or short (On) circuit of the 2-4 brake duty solenoid.
- Open circuit, short circuit to battery or short circuit to ground of the harness between 2-4 brake duty solenoid terminal 9 and TCM terminal B7 (C95).
- Insufficient ground condition of the 2-4 brake duty solenoid.
- Poor connection of each connector.

Reference:
When the 2-4 brake duty solenoid is operated, following signal is outputted.
Measurement terminal: B7 (C95) and B22 (C95)
-AC range by circuit tester: Approximately 6.8V

2-4 Brake Duty Solenoid Reference Wave Form

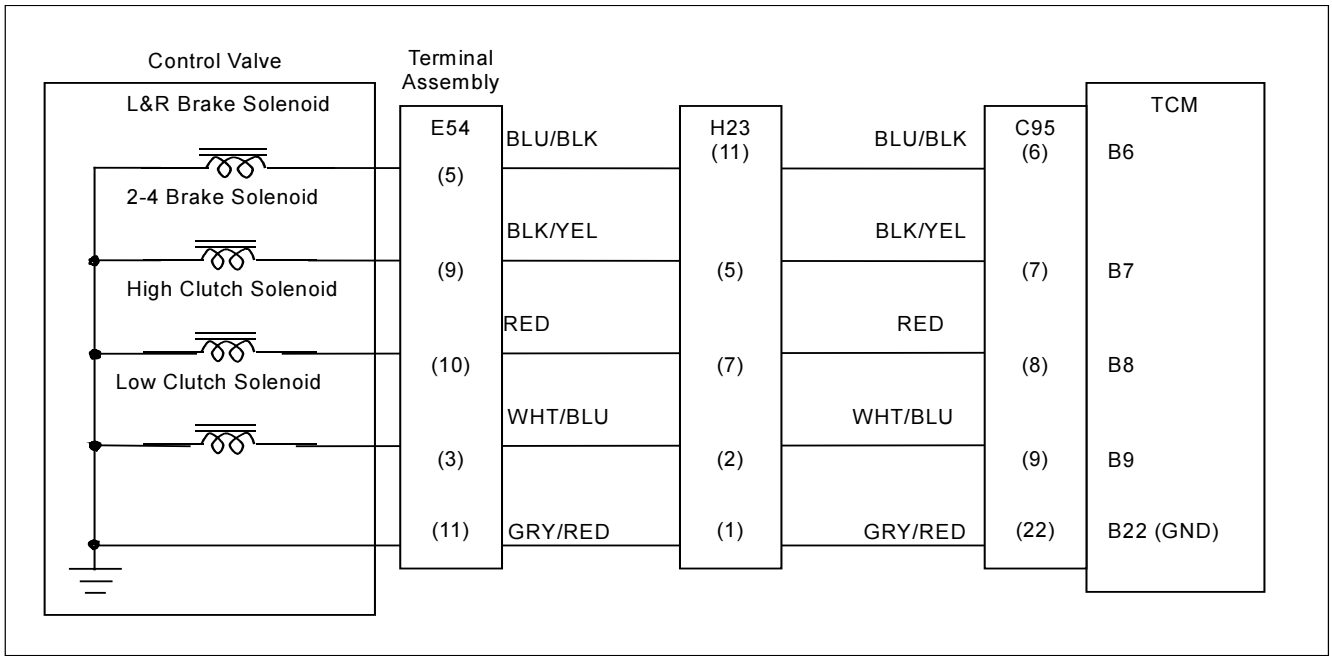


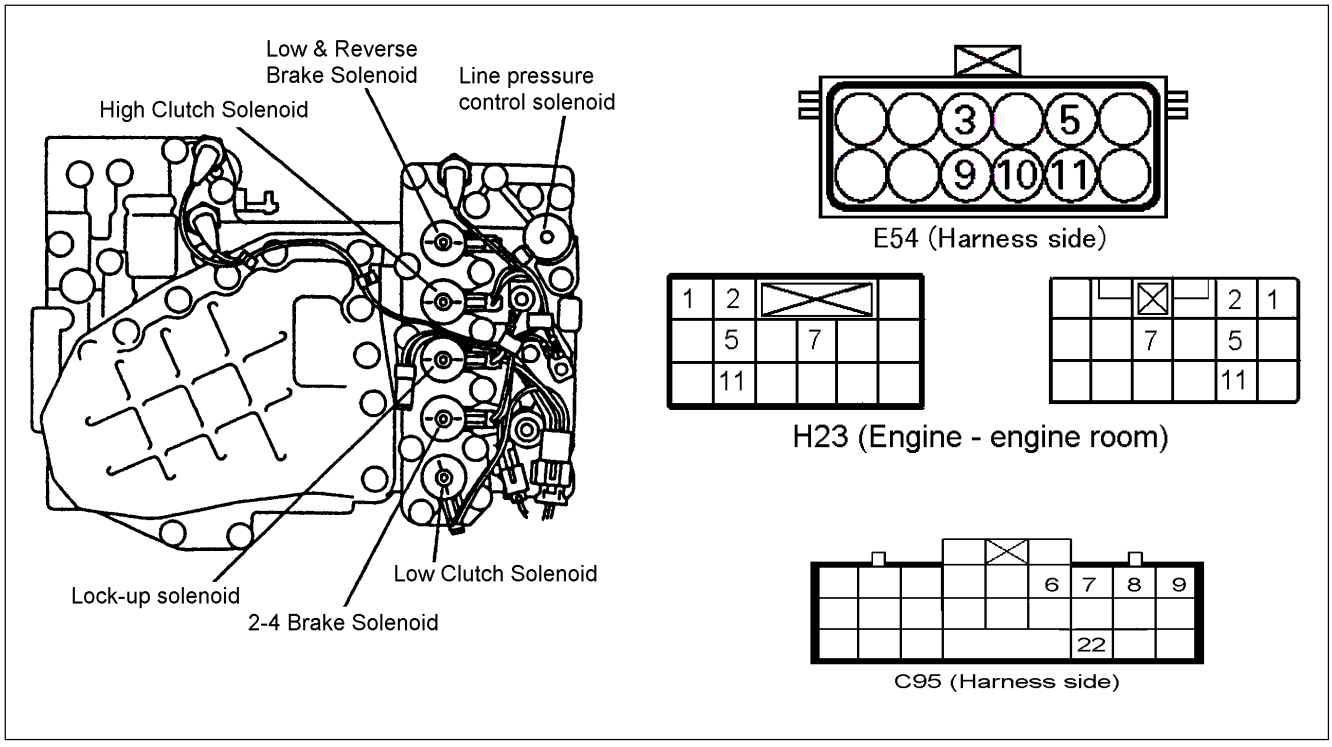
Measurement Terminal: B7 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: P, N range in idle



Measurement Terminal: B7 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: D range 4th gear

DTC P0763 (Flash Code 33) High Clutch Duty Solenoid Failure





Gear Position & Shift Solenoid Operation

Range	TCM terminal / Gear	B8 (High clutch solenoid)	B9 (Low clutch solenoid)	B7 (2-4 brake solenoid)	B6 (Low & reverse brake solenoid)
P	—	○	×	○	○
R	Reverse	○	×	○	×
N	—	○	×	○	○
D, 3, 2	1st	○	×	○	○
	2nd	○	×	×	○
	3rd	×	×	○	○
	4th	×	○	×	○
L	1st	○	×	○	×
	2nd	○	×	×	○
	3rd	×	×	○	○
	4th	×	○	×	○

○ : On (Operated)

× : Off (Not operated)

Setting Condition:

- The high clutch duty solenoid signal is open circuit or short circuit.
  (The voltage different from the output ON/OFF signals was detected while the TCM monitors the solenoid output voltage.)

Fail Safe:

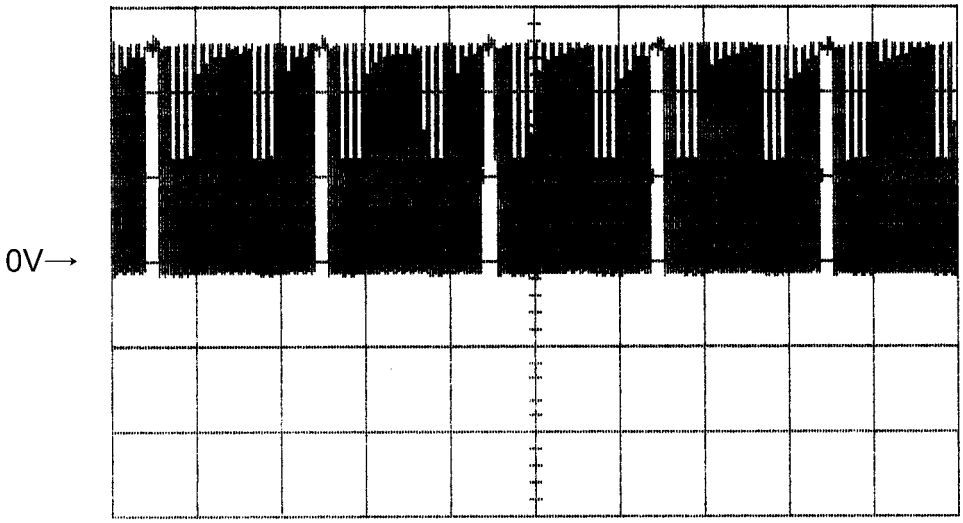
- When the vehicle is running, the operation of the high clutch duty solenoid and the lock-up solenoid is stopped (OFF), the gear position selected at the trouble detection is held, and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd.

Possible Cause:

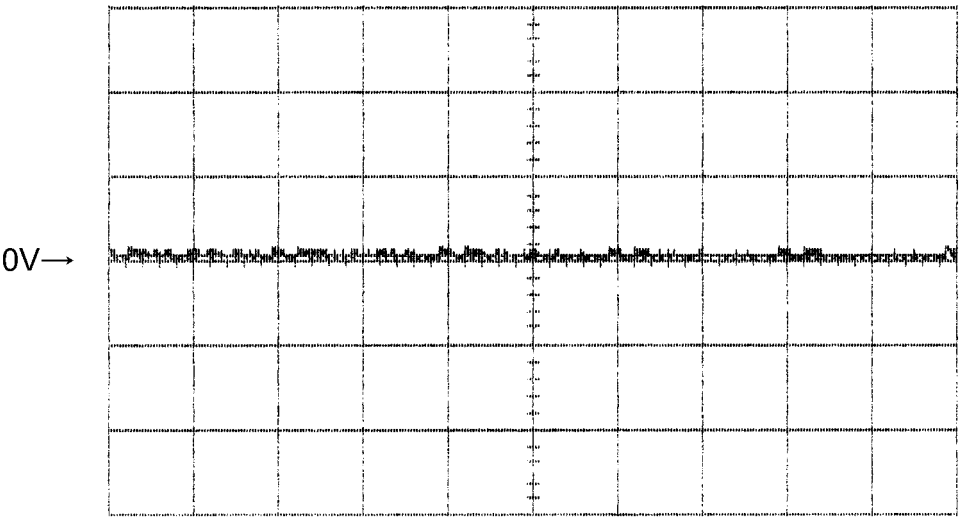
- High clutch duty solenoid malfunction.
- Open (Off) circuit or short (On) circuit of the high clutch duty solenoid.
- Open circuit, short circuit to battery or short circuit to ground between high clutch duty solenoid terminal 10 and TCM terminal B8 (C95).
- Insufficient ground condition of the high clutch duty solenoid.
- Poor connection of each connector.

Reference:
When the high clutch duty solenoid is operated, following signal is outputted.
Measurement terminal: B8 (C95) and B22 (C95)
-AC range by circuit tester: Approximately 6.2V

High Clutch Duty Solenoid Reference Wave Form

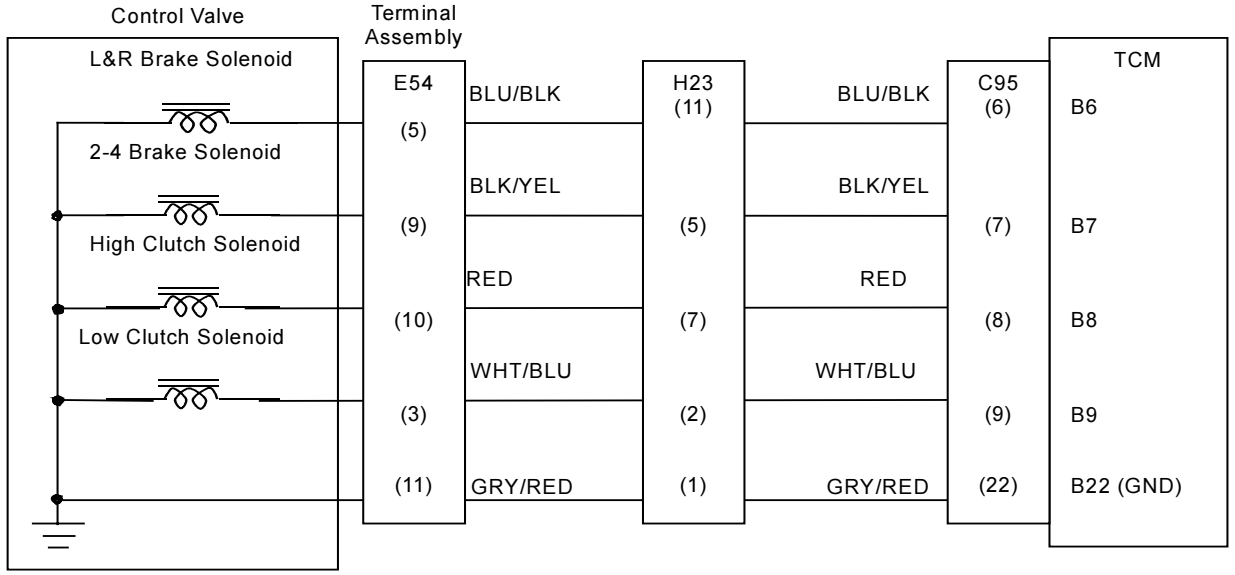


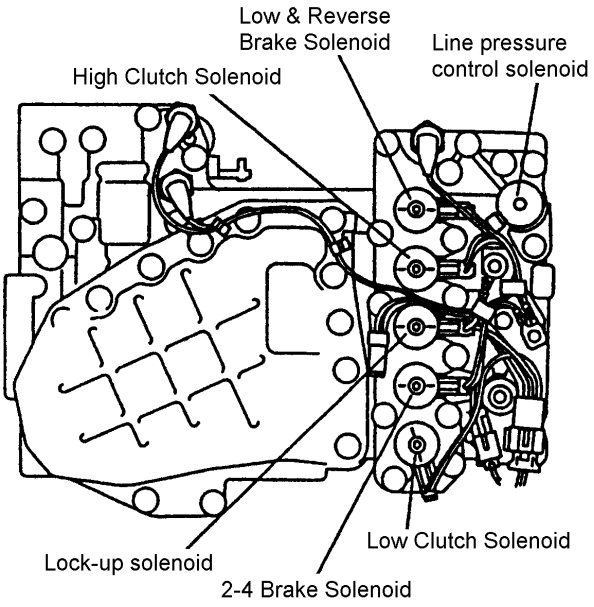
Measurement Terminal: B8 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: P, N range in idle

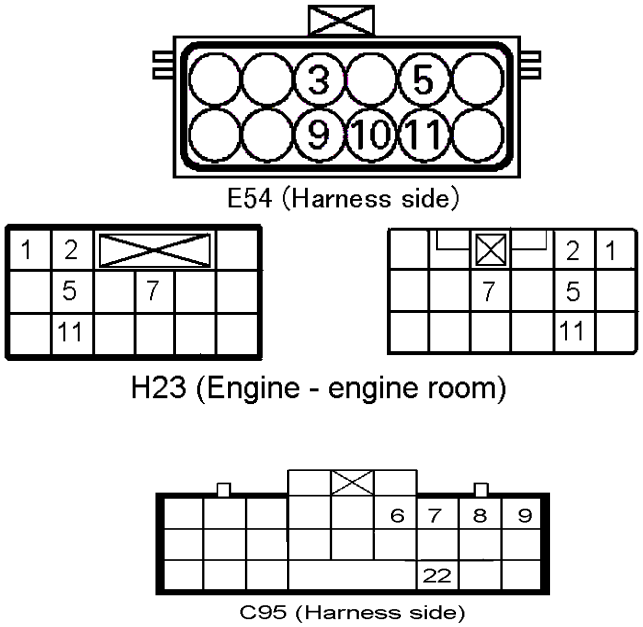


Measurement Terminal: B8 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: D range 3rd, 4th gear

DTC P0768 (Flash Code 34) Low Clutch Duty Solenoid Failure







Gear Position & Shift Solenoid Operation

Range	TCM terminal / Gear	B8 (High clutch solenoid)	B9 (Low clutch solenoid)	B7 (2-4 brake solenoid)	B6 (Low & reverse brake solenoid)
P	—	○	×	○	○
R	Reverse	○	×	○	×
N	—	○	×	○	○
D, 3, 2	1st	○	×	○	○
	2nd	○	×	×	○
	3rd	×	×	○	○
	4th	×	○	×	○
L	1st	○	×	○	×
	2nd	○	×	×	○
	3rd	×	×	○	○
	4th	×	○	×	○

○ : On (Operated)

× : Off (Not operated)

Setting Condition:

- The low clutch duty solenoid signal is open circuit or short circuit.
  (The voltage different from the output ON/OFF signals was detected while the TCM monitors the solenoid output voltage.)

Fail Safe:

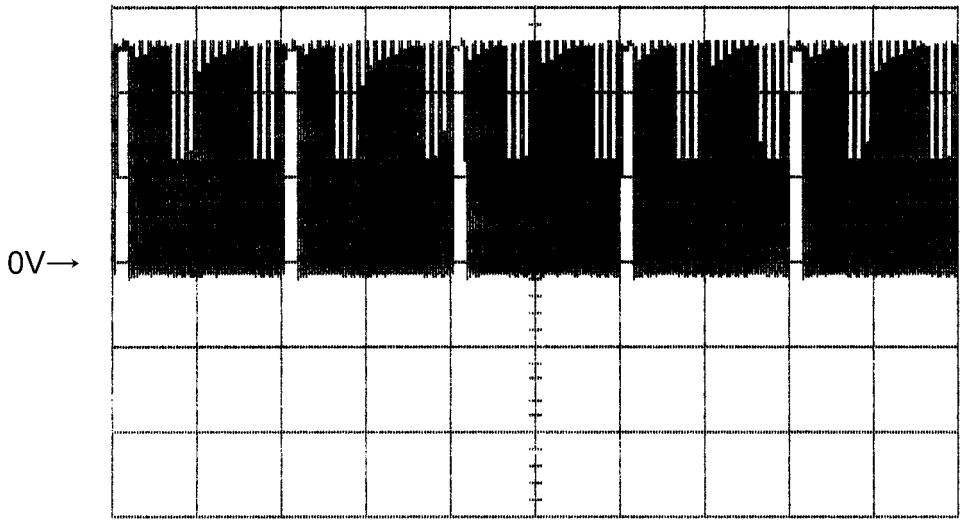
- When the vehicle is running, the operation of the low clutch duty solenoid and the lock-up solenoid is stopped (OFF), the gear position selected at the trouble detection is held, and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd.

Possible Cause:

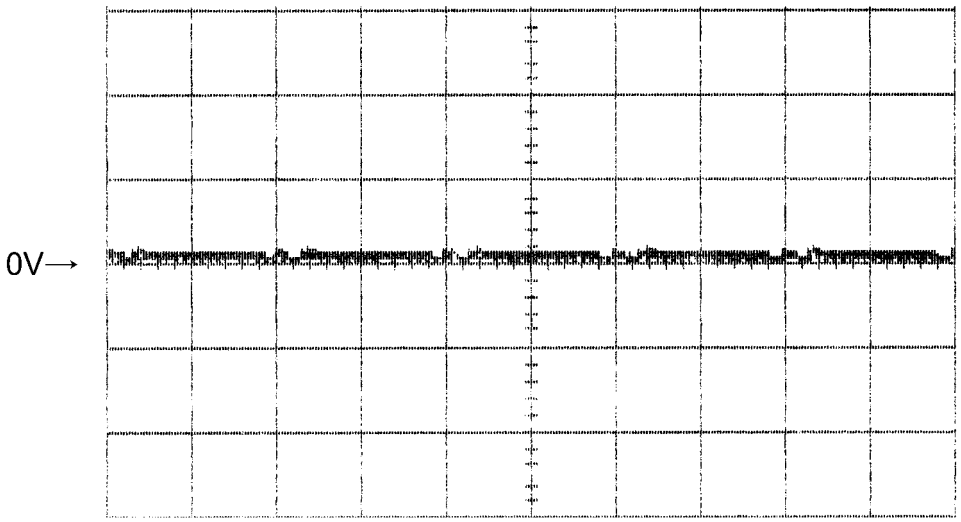
- Low clutch duty solenoid malfunction.
- Open (Off) circuit or short (On) circuit harness of the low clutch duty solenoid.
- Open circuit, short circuit to battery or short circuit to ground between low clutch duty solenoid terminal 3 and TCM terminal B9 (C95).
- Insufficient ground condition of the low clutch duty solenoid.
- Poor connection of each connector.

Reference:
When the low clutch duty solenoid is operated, following signal is outputs.
Measurement terminal: B9 (C95) and B22 (C95)
-AC range by circuit tester: Approximately 6.8V

Low Clutch Duty Solenoid Reference Wave Form

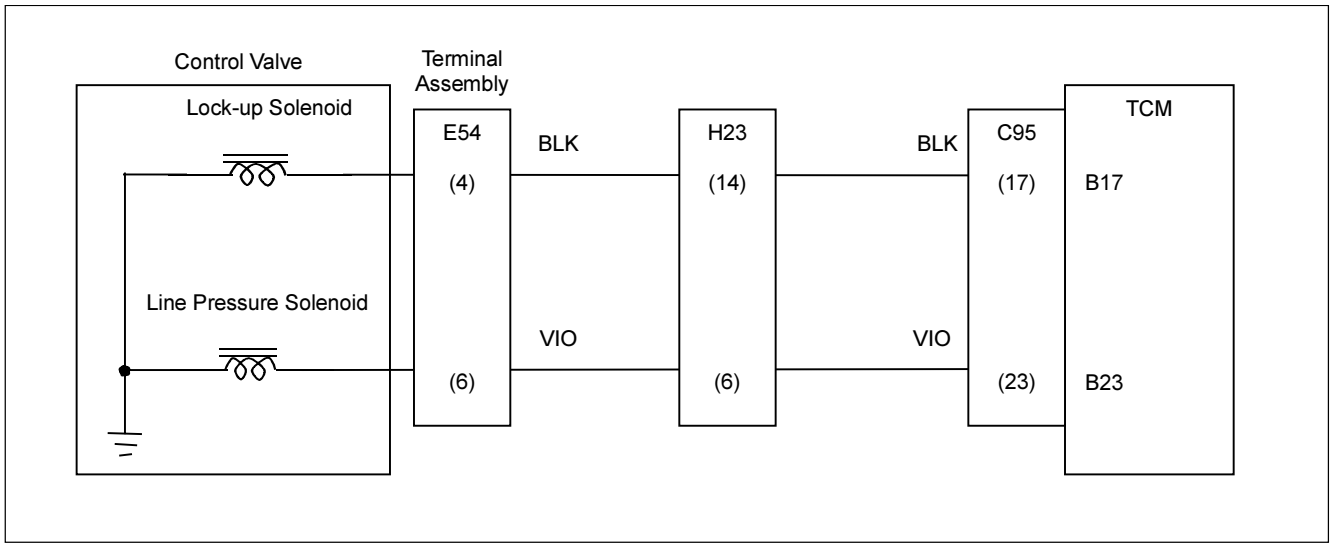


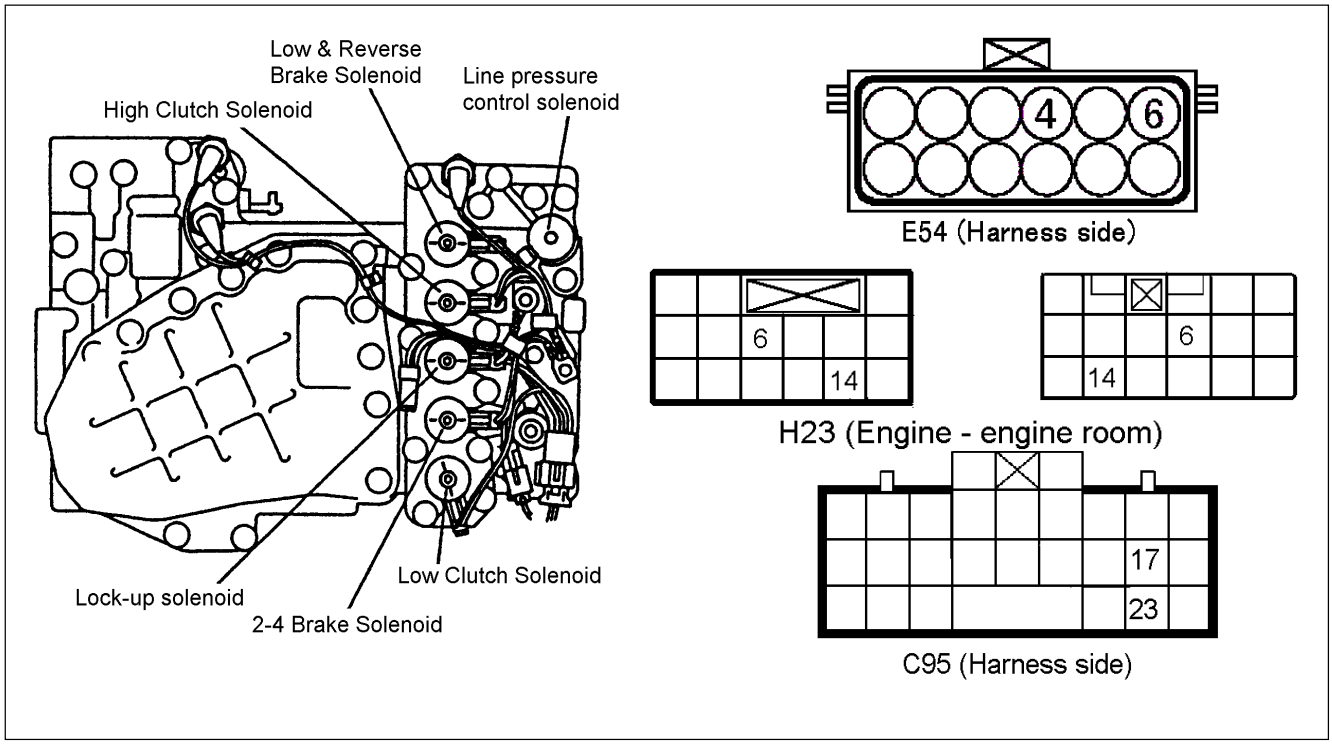
Measurement Terminal: B9 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: D range 4th gear



Measurement Terminal: B9 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: P, N range in idle

DTC P0748 (Flash Code 35) Line Pressure Solenoid Failure





Setting Condition:

- The line pressure solenoid signal is open circuit or short circuit.
  (The voltage different from the output ON/OFF signals was detected while the TCM monitors the solenoid output voltage.)

Fail Safe:

- The operation of the line pressure solenoid is stopped (OFF).

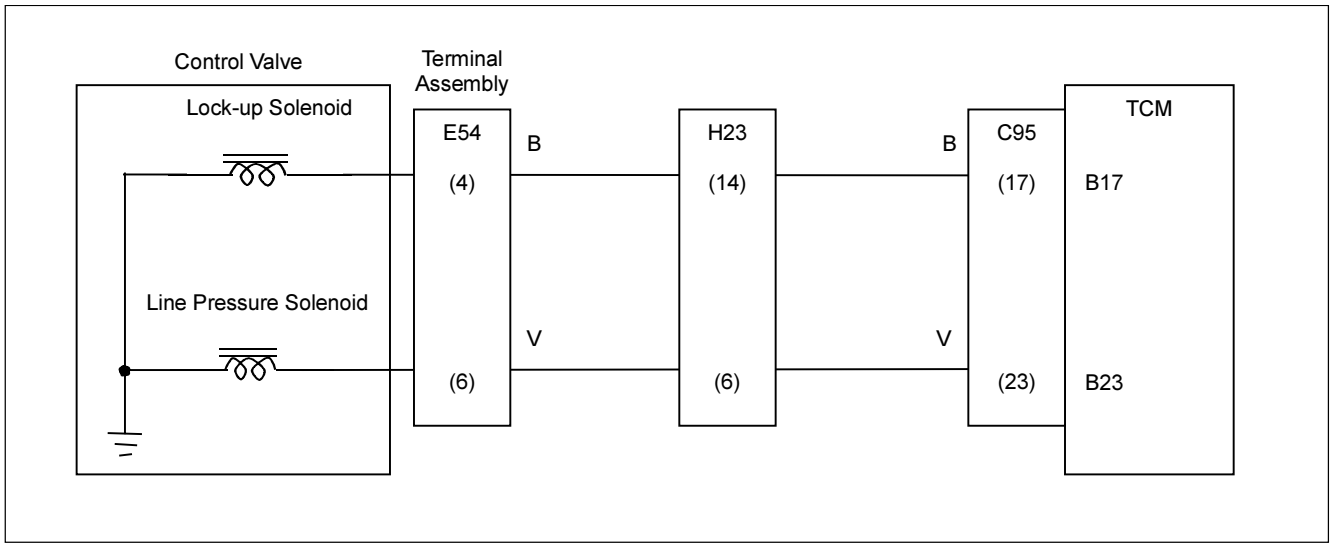
Possible Cause:

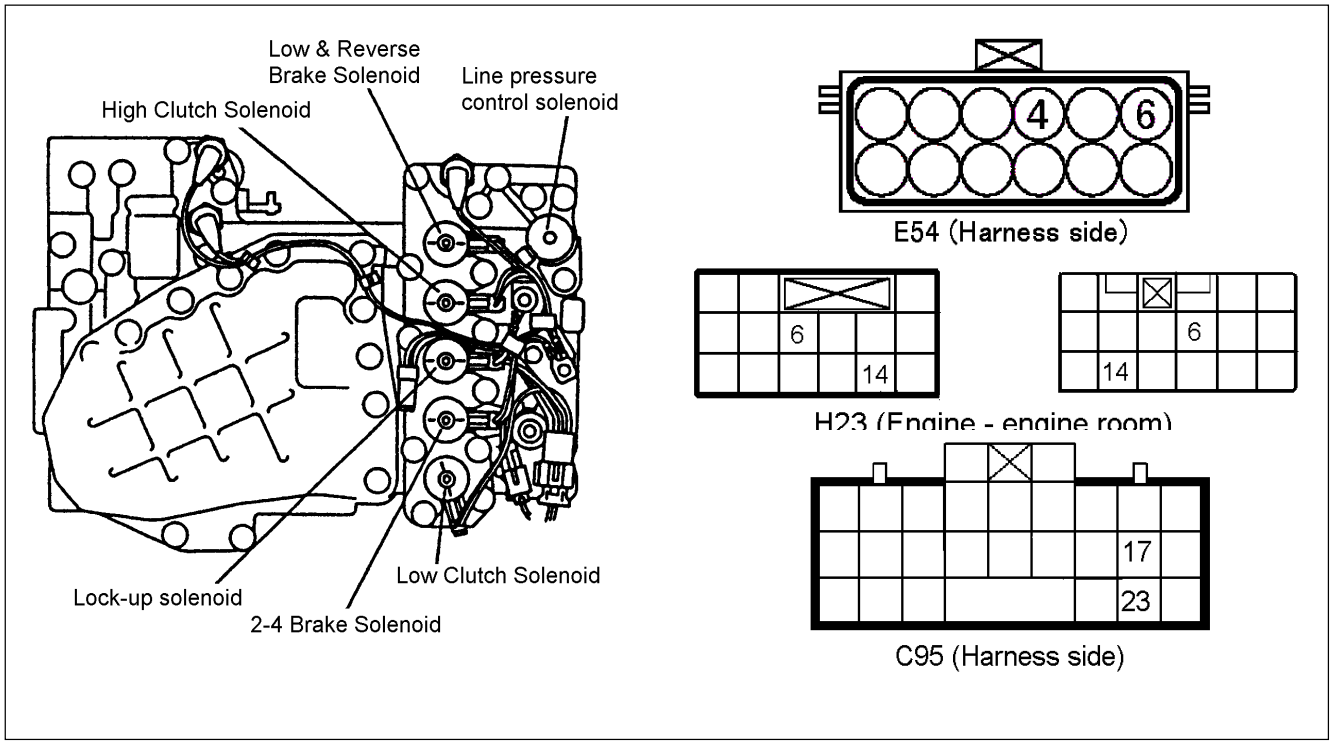
- Line pressure solenoid malfunction.
- Line pressure solenoid harness open (Off) circuit or short (On) circuit.

- Open circuit, short circuit to battery or short circuit to ground between line pressure solenoid terminal 6 and TCM terminal B23 (C95).
- Insufficient ground condition of the line pressure solenoid.
- Poor connection of each connector.

Reference:
When the line pressure solenoid is operated, following signal is outputted.
Measurement terminal: B23 (C95) and B22 (C95)
-At N rage: Battery voltage
-At D range: Less than 1V

DTC P1860 (Flash Code 36) Lock-up Duty Solenoid Failure





Setting Condition:

- The lock-up duty solenoid signal is open circuit or short circuit.
  (The voltage different from the output ON/OFF signals was detected while the TCM monitors the solenoid output voltage.)

Fail Safe:

- The lock-up is inhibited.

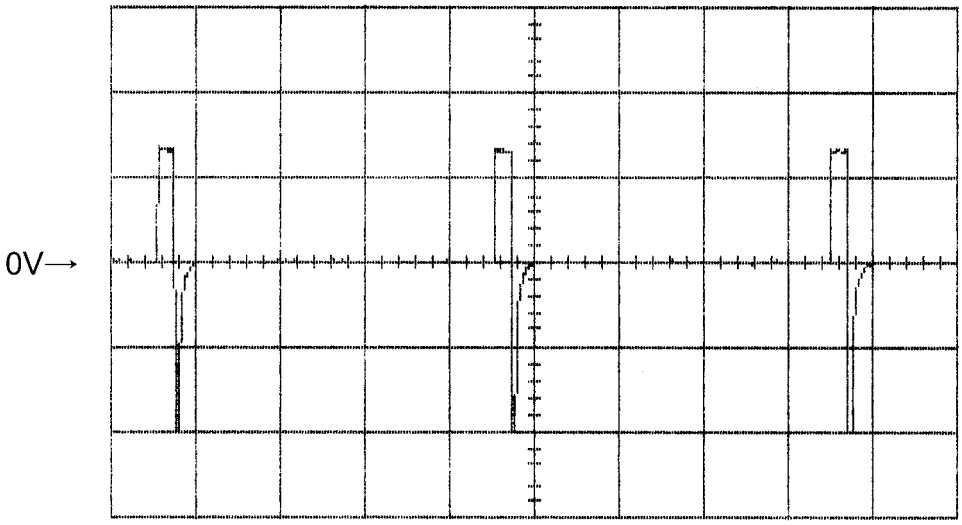
Possible Cause:

- Lock-up duty solenoid malfunction.
- Open (Off) circuit or short (On) circuit of the lock-up duty solenoid.

- Open circuit, short circuit to battery or short circuit to ground between lock-up duty solenoid terminal 4 and TCM terminal B17 (C95).
- Insufficient ground condition of the lock-up duty solenoid.
- Poor connection of each connector.

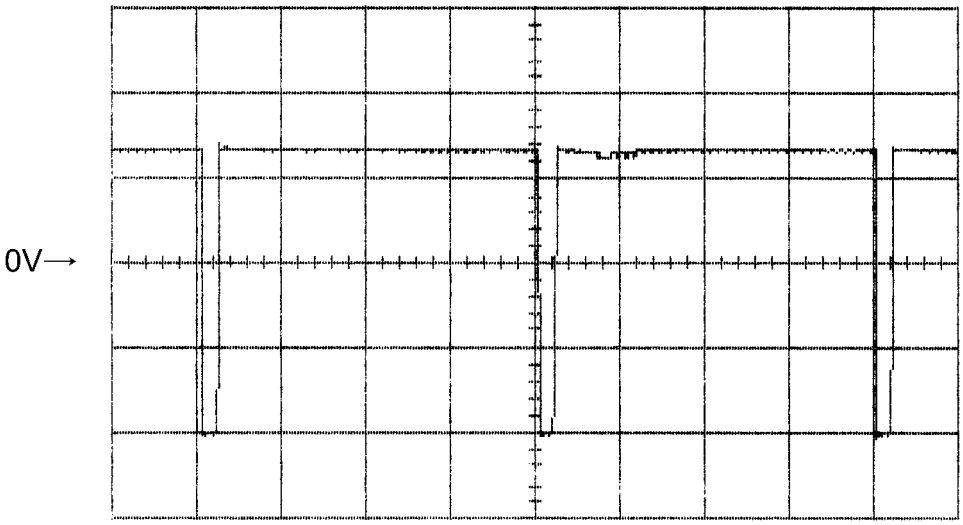
Reference:
When the lock-up duty solenoid is operated, following signal is outputted.
Measurement terminal: B17 (C95) and B5 (C95)
-AC range by circuit tester: Approximately 7.2V

Lock-up Duty Solenoid Reference Wave Form



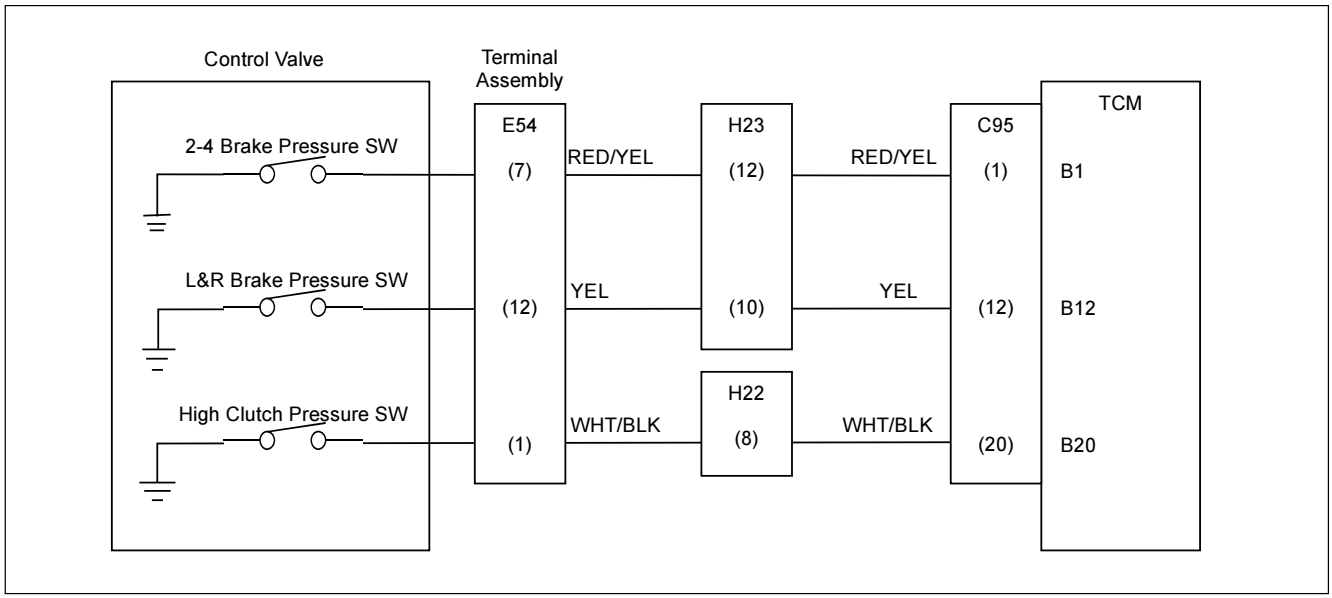
Measurement Terminal: B17 (+) B5 (-)
Measurement Scale: 10V/div 5ms/div
Measurement Condition: Unlock-up condition

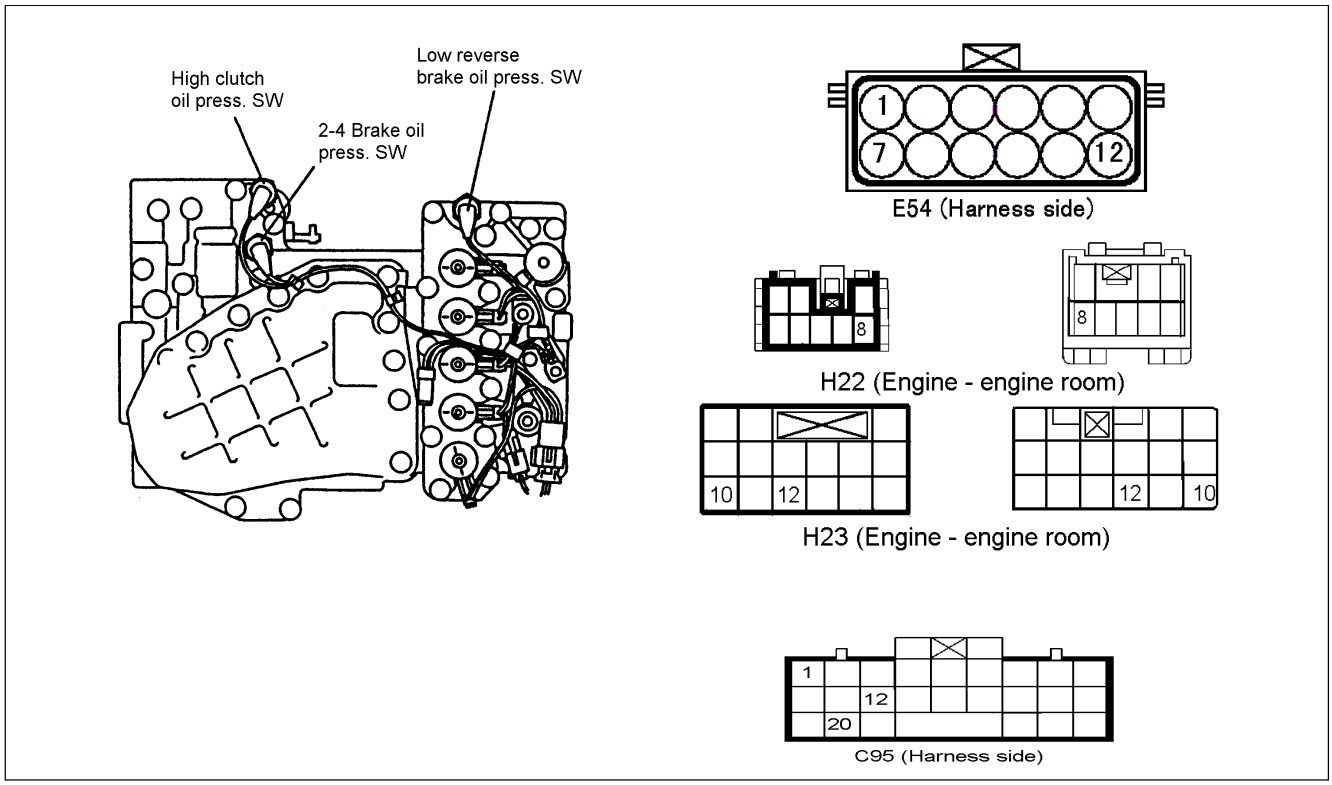
Lock-up Duty Solenoid Reference Wave Form



Measurement Terminal: B17 (+) B5 (-)
Measurement Scale: 10V/div 5ms/div
Measurement Condition: Lock-up condition

DTC P1853 (Flash Code 26) Low & Reverse Brake Pressure Switch Failure





Pre-setting Condition:

- No gear shifting.
- No Check Trans indicator lamp.
- No system voltage failure.
- No inhibitor switch failure.
- Low & reverse brake duty solenoid 0 or 100 %.
- ATF temperature more than 60°C.
- ATF input voltage more than 0.1V.
- Engine speed more than 500 rpm.

Setting Condition:

- During the running, the low & reverse brake pressure switch does not turn on though hydraulic pressure is supposed to be generated in the low & reverse brake.
  (All pre-setting conditions are met for 2.5 seconds, Low & reverse brake duty solenoid 0% and low & reverse brake pressure switch off in R range)
  Or
- During the running, the low & reverse brake switch does not turn off though no hydraulic pressure is supposed to be generated in the low & reverse brake.
  (All pre-setting conditions are met for 2.5 seconds, 4th gear, all pressure switch on and gear ratio 0.652 - 0.735 in D range.)

Fail Safe:

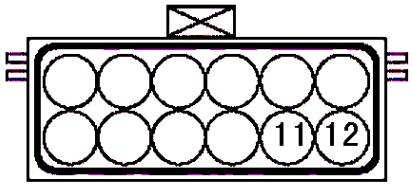
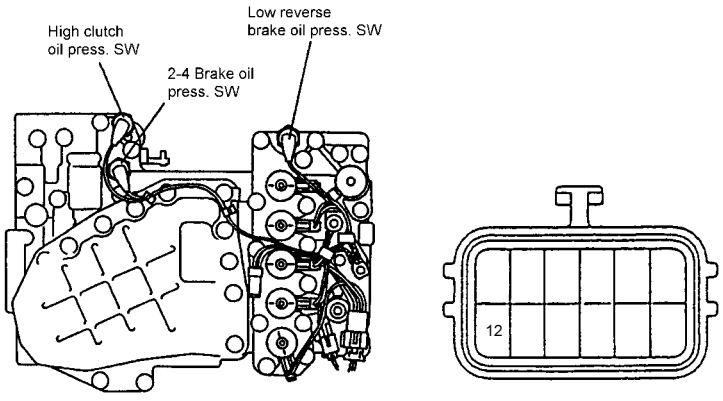
- No fail safe function

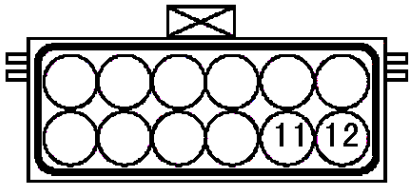
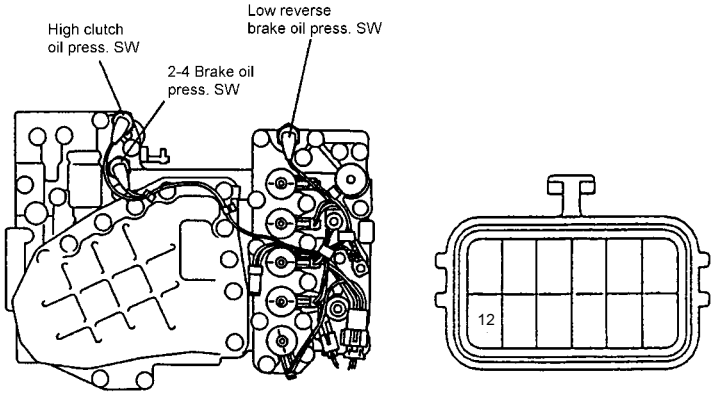
Possible Cause:

- Low & reverse brake duty solenoid malfunction.
- Low & reverse brake pressure switch wire open circuit or short circuit.
- Open circuit, short circuit to battery or short circuit to ground between low & reverse brake pressure switch terminal 12 and TCM terminal B12 (C95).
- Low & reverse brake hydraulic circuit malfunction in the control valve.
- Poor connection of each connector.

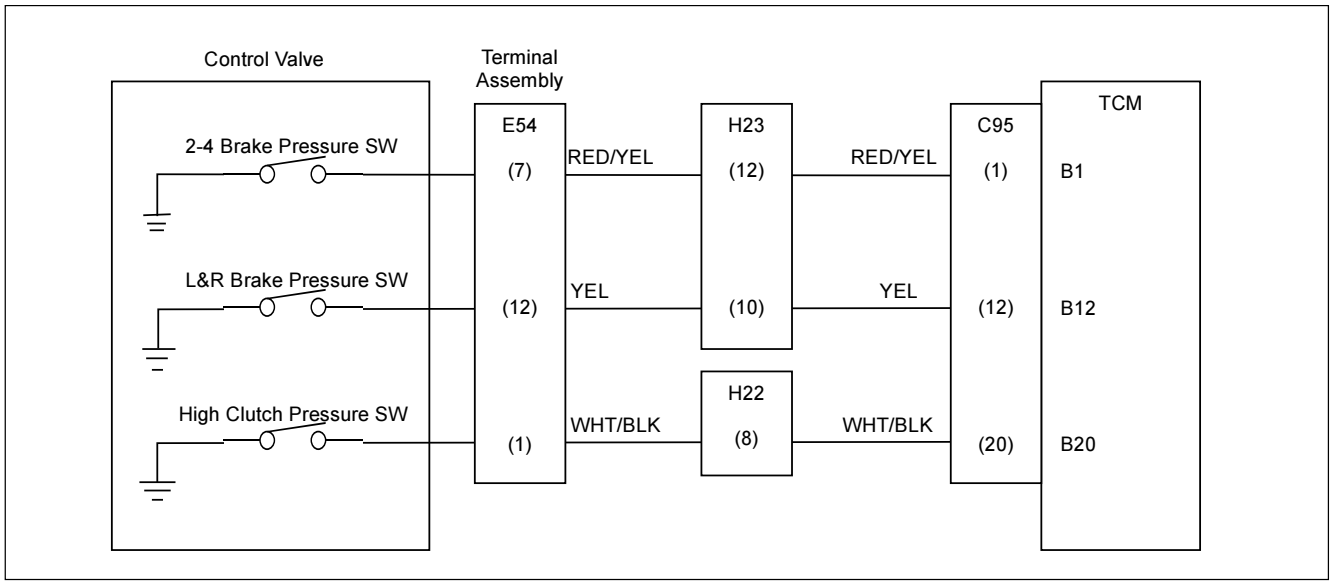
Reference:

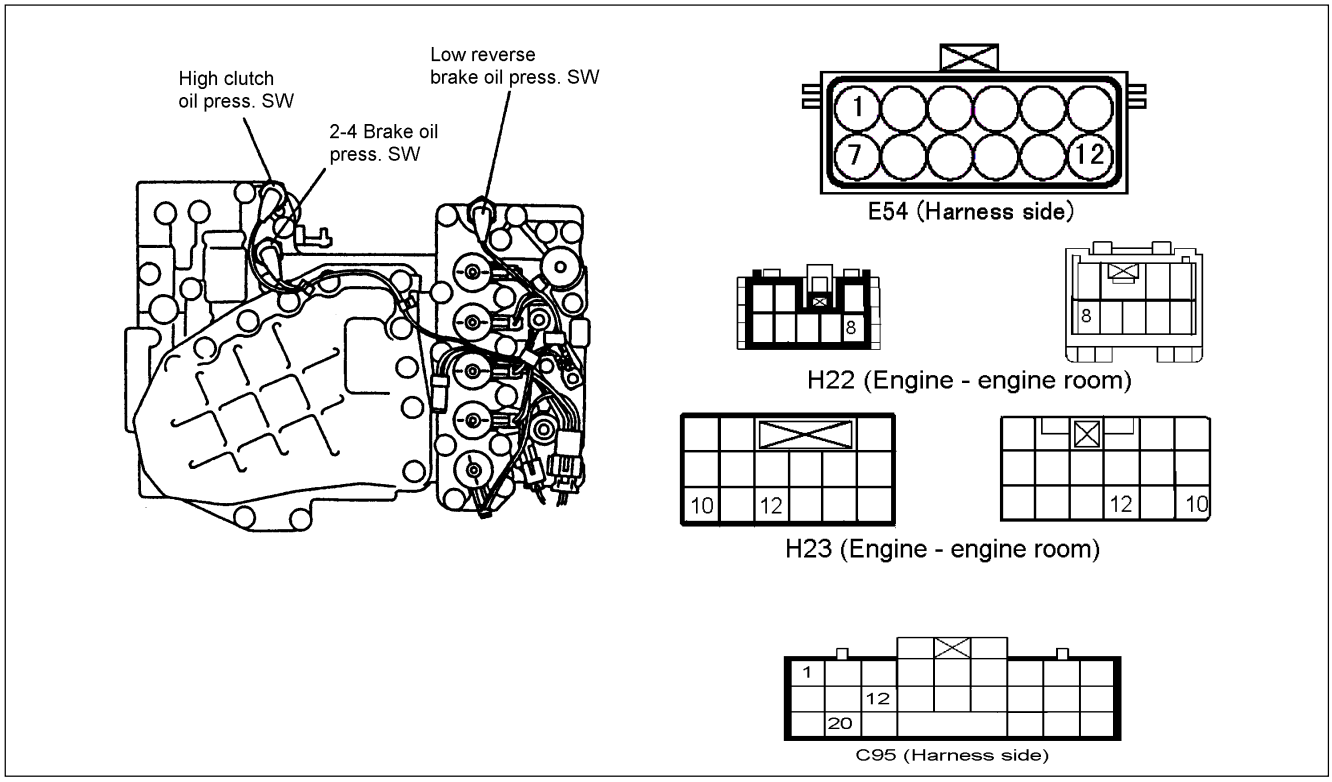
When the low & reverse brake pressure switch is operated, following signal is outputted.
Measurement terminal: B12 (C95) and B22 (C95)
-At other than R rage or L range in 1st gear: More than 10V
-At R range or L range in 1 st gear: Less than 1V

Step	Action	Yes	No
1	Clear the DTC from the memory once. Was the action complete?	Go to Step 2	Refer DTC clear method in this manual.
2	Turn the ignition switch off once, then restart the engine and shift to 4th gear in the D range. When about 10 seconds elapsed, does the CHECK TRANS lamp blink?	Go to Step 3	Go to Step 7
3	Is the DTC P0753 (31) Low & Reverse Brake Duty Solenoid Failure stored?	Go to P0753 (31) Section	Go to Step 4
4	Connect the Tech 2 and select the item for low & reverse brake pressure switch. Is the indication of low & reverse brake pressure switch turned off when the terminal assembly connector is disconnected?  E54 (Harness side)	Go to Step 5	Repair the harness or connector. Go to Step 12
5	Turn the key switch off and disconnect the terminal assembly connector. Are the pins correct?	Go to Step 6	Repair the connector or pin. Go to Step 12
6	Remove the oil pan. Is the continuity correct between terminal assembly terminal 12 and low & reverse brake pressure switch connector?  	Repair the harness or connector. Go to Step 12	Replace pressure switch. Go to Step 12
7	Start the engine and select the R range. When about 10 seconds elapsed, does the CHECK TRANS lamp blink?	Go to Step 8	Go to P0753 (31) Section

Step	Action	Yes	No
8	Connect the Tech 2, and with the key switch in OFF position, short the terminals 11 and 12 on the vehicle harness side. Does the indication of the low & reverse brake pressure switch on the Tech 2 becomes on when the key switch is turned on?  E54 (Harness side)	Go to Step 9	Repair the harness or connector. Go to Step 12
9	Check if the trouble is caused by a poor connection of terminal assembly connector. With the key switch in OFF position, is the connection condition of the connector and harness correct?	Go to Step 10	Repair the harness or connector. Go to Step 12
10	Remove the oil pan. Is the continuity correct between terminal assembly terminal 12 and low & reverse brake pressure switch connector?  	Go to Step 11	Repair the harness or connector. Go to Step 12
11	Is the result OK when the oil pan is removed and the low & reverse brake pressure switch is checked? Refer the **ON VEHICLE SERVICE SECTION** in this manual for the procedure.	Repair the control valve. Go to Step 12	Replace pressure switch. Go to Step 12
12	Clear the DTC from the memory and perform the work after repair. Is the same DTC code outputted again in the subsequent DTC check?	Replace the TCM	Go to Step 13
13	Are the other DTCs outputted?	Go to Other DTC Section	Action is completed

DTC P1858 (Flash Code 27) 2-4 Brake Pressure Switch Failure





Pre-setting Condition:

- No gear shifting.
- No Check Trans indicator lamp.
- No system voltage failure.
- No inhibitor switch failure.
- 2-4 brake duty solenoid 0 or 100 %.
- ATF temperature more than 60°C.
- ATF input voltage more than 0.1V.
- Engine speed more than 500 rpm.

Setting Condition:

- During the running, the 2-4 brake pressure switch does not turn on though hydraulic pressure is supposed to be generated in 2-4 brake.
  (All pre-setting conditions are met for 2.5 seconds, 2-4 brake pressure switch off, high clutch pressure switch on and gear ratio more than 0.65 or less than 0.74 with 4th gear in D range.)
  Or
- During the running, the 2-4 brake switch does not turn off though no hydraulic pressure is supposed to be generated in the 2-4 brake.
  (All pre-setting conditions are met for 2.5 seconds, 2-4 brake pressure switch on in D or N range.)

Fail Safe:

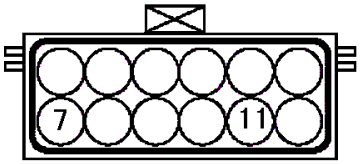
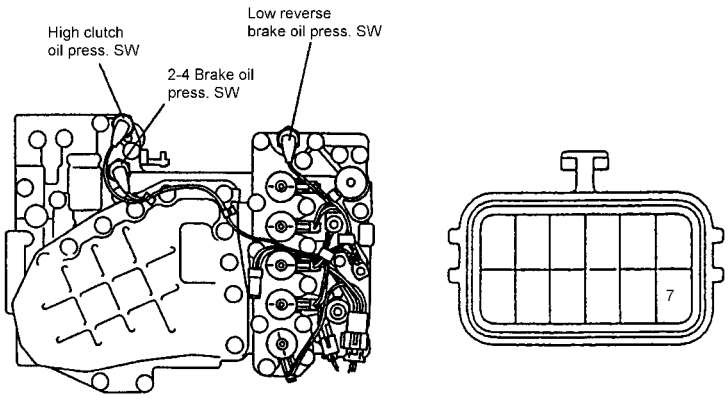
- No fail safe function

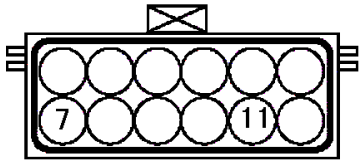
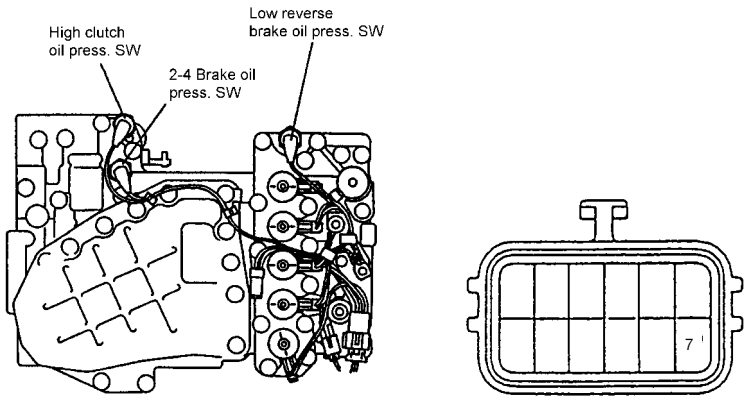
Possible Cause:

- 2-4 brake duty solenoid malfunction.
- 2-4 brake pressure switch wire open circuit or short circuit.
- Open circuit, short circuit to battery or short circuit to ground between 2-4 brake pressure switch terminal 7 and TCM terminal B1 (C95).
- 2-4 brake hydraulic circuit malfunction in the control valve.
- Poor connection of each connector.

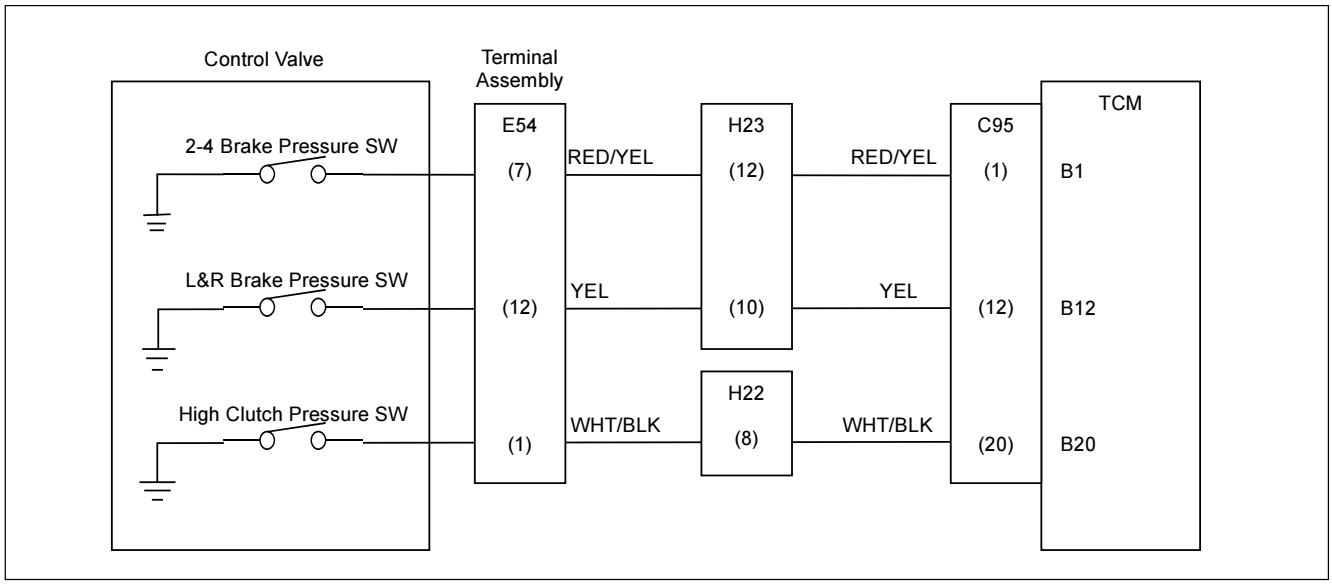
Reference:

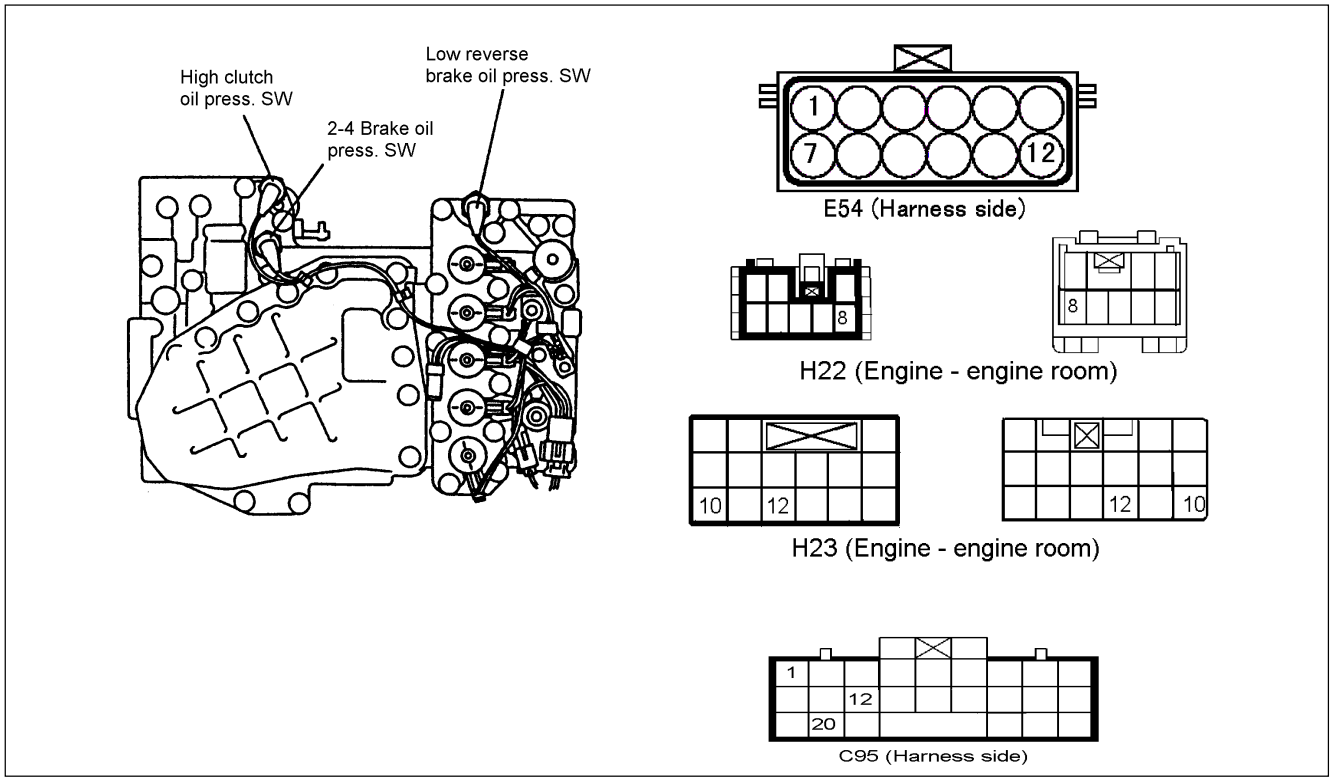
When the 2-4 brake pressure switch is operated, following signal is outputted.
Measurement terminal: B1 (C95) and B22 (C95)
-At other than 2nd or 4th gear: More than 10V
-At 2nd or 4th gear: Less than 1V

Step	Action	Yes	No
1	Clear the DTC from the memory once. Was the action complete?	Go to Step 2	Refer DTC clear method in this manual.
2	Turn the ignition switch off once, then restart the engine and in D range. When about 10 seconds elapsed, does the CHECK TRANS lamp blink?	Go to Step 3	Go to Step 7
3	Is the DTC P0758 (32) 2-4 Brake Duty Solenoid Failure stored?	Go to P0758 (32) Section	Go to Step 4
4	Connect the Tech 2 and select the item for 2-4 brake pressure switch. Is the indication of 2-4 brake pressure switch turned off when the terminal assembly connector is disconnected?  E54 (Harness side)	Go to Step 5	Repair the harness or connector. Go to Step 12
5	Turn the key switch off and disconnect the terminal assembly connector. Are the pins correct?	Go to Step 6	Repair the connector or pin. Go to Step 12
6	Remove the oil pan. Is the continuity correct between terminal assembly teminal 7 and 2-4 brake pressure switch connector?  	Repair the harness or connector. Go to Step 12	Replace pressure switch. Go to Step 12
7	Start the engine and shift to 4th gear in the D range. When about 10 seconds elapsed, does the CHECK TRANS lamp blink?	Go to Step 8	Go to P0758 (32) Section

Step	Action	Yes	No
8	Connect the Tech 2, and with the key switch in OFF position, short the terminals 11 and 7 on the vehicle harness side. Does the indication of the 2-4 brake pressure switch on the Tech 2 becomes on when the key switch is turned on?  E54 (Harness side)	Go to Step 9	Repair the harness or connector. Go to Step 12
9	Check if the trouble is caused by a poor connection of terminal assembly connector. With the key switch in OFF position, is the connection condition of the connector and harness correct?	Go to Step 10	Repair the harness or connector. Go to Step 12
10	Remove the oil pan. Is the continuity correct between terminal assembly teminal 7 and 2-4 brake pressure switch connector?  	Go to Step 11	Repair the harness or connector. Go to Step 12
11	Is the result OK when the oil pan is removed and the 2-4 brake pressure switch is checked?	Repair the control valve. Go to Step 12	Replace pressure switch. Go to Step 12
12	Clear the DTC from the memory and perform the work after repair. Is the same DTC code outputted again in the subsequent DTC check?	Replace the TCM	Go to Step 13
13	Are the other DTCs outputted?	Go to Other DTC Section	Action is completed

DTC P1863 (Flash Code 28) High Clutch Pressure Switch Failure





Pre-setting Condition:

- No gear shifting.
- No Check Trans indicator lamp.
- No system voltage failure.
- No inhibitor switch failure.
- 2-4 brake duty solenoid 0 or 100 %.
- ATF temperature more than 60°C.
- ATF input voltage more than 0.1V.
- Engine speed more than 500 rpm.

Setting Condition:

- During the running, the high clutch pressure switch does not turn on though hydraulic pressure is supposed to be generated in high clutch.
  (All pre-setting conditions are met for 2.5 seconds, high clutch pressure switch off, 2-4 brake pressure switch on and gear ratio more than 0.65 or less than 0.74 with 4th gear in D range.)
  Or
- During the running, the high clutch pressure switch does not turn off though no hydraulic pressure is supposed to be generated in the high clutch.
  (All pre-setting conditions are met for 2.5 seconds, high clutch pressure switch on in P, R or N range.)

Fail Safe:

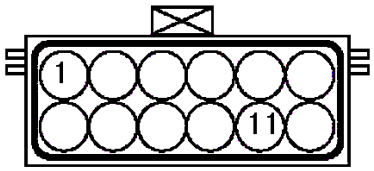
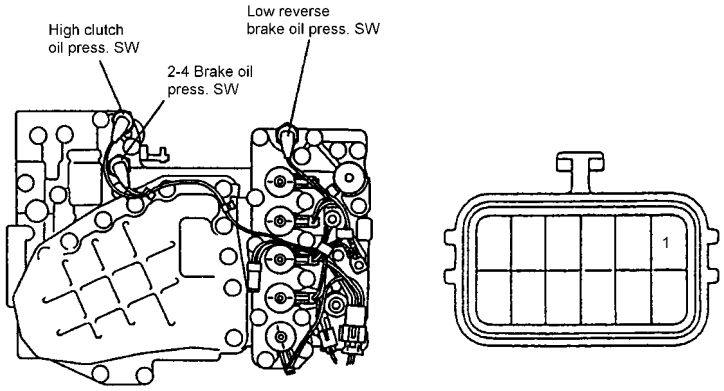
- No fail safe function

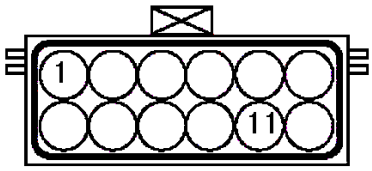
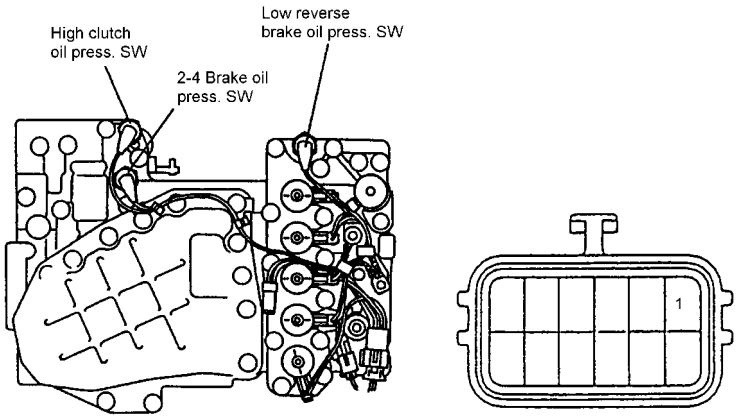
Possible Cause:

- High clutch duty solenoid malfunction.
- High clutch pressure switch open circuit or short circuit.
- Open circuit, short circuit to battery or short circuit to ground of the harness between high clutch pressure switch terminal 1 and TCM terminal B20 (C95).
- High clutch hydraulic circuit malfunction in the control valve.
- Poor connection of each connector.

Reference:

When the high clutch pressure switch is operated, following signal is outputted.
Measurement terminal: B20 (C95) and B22 (C95)
-At other than 3rd or 4th gear: More than 10V
-At 3rd or 4th gear: Less than 1V

Step	Action	Yes	No
1	Clear the DTC from the memory once. Was the action complete?	Go to Step 2	Refer DTC clear method in this manual.
2	Turn the ignition switch off once, then restart the engine and in R range. When about 10 seconds elapsed, does the CHECK TRANS lamp blink?	Go to Step 3	Go to Step 7
3	Is the DTC P0763 (33) High Clutch Duty Solenoid Failure stored?	Go to P0763 (33) Section	Go to Step 4
4	Connect the Tech 2 and select the item for high clutch pressure switch. Is the indication of high clutch pressure switch turned off when the terminal assembly connector is disconnected?  E54 (Harness side)	Go to Step 5	Repair the harness or connector. Go to Step 12
5	Turn the key switch off and disconnect the terminal assembly connector. Are the pins correct?	Go to Step 6	Repair the connector or pin. Go to Step 12
6	Remove the oil pan. Is the continuity correct between terminal assembly teminal 1 and high clutch pressure switch connector?  	Repair the harness or connector. Go to Step 12	Replace pressure switch. Go to Step 12
7	Start the engine and shift to 4th gear in the D range. When about 10 seconds elapsed, does the CHECK TRANS lamp blink?	Go to Step 8	Go to P0763 (33) Section

Step	Action	Yes	No
8	Connect the Tech 2, and with the key switch in OFF position, short the terminals 11 and 1 on the vehicle harness side. Does the indication of the high clutch pressure switch on the Tech 2 turn on when the key switch is turned on?  E54 (Harness side)	Go to Step 9	Repair the harness or connector. Go to Step 12
9	Check if the trouble is caused by a poor connection of terminal assembly connector. With the key switch in OFF position, is the connection condition of the connector and harness correct?	Go to Step 10	Repair the harness or connector. Go to Step 12
10	Remove the oil pan. Is the continuity correct between terminal assembly teminal 1 and high clutch pressure switch connector?  	Go to Step 11	Repair the harness or connector. Go to Step 12
11	Is the result OK when the oil pan is removed and the high clutch pressure switch is checked?	Repair the control valve. Go to Step 12	Replace pressure switch. Go to Step 12
12	Clear the DTC from the memory and perform the work after repair. Is the same DTC code outputted again in the subsequent DTC check?	Replace the TCM	Go to Step 13
13	Are the other DTCs outputted?	Go to Other DTC Section	Action is completed

DTC P0731 (Flash Code 41) 1st Gear Ratio Error
DTC P0732 (Flash Code 42) 2nd Gear Ratio Error
DTC P0733 (Flash Code 43) 3rd Gear Ratio Error
DTC P0734 (Flash Code 44) 4th Gear Ratio Error

Pre-setting Condition:

- No other DTCs.
- 2 seconds elapsed after D, 3, 2, or 1 range was selected.
- Vehicle is running at the vehicle speed over 10 km/h with the turbine speed over 1000 rpm.
- Except at the gear shifting.
- ATF temperature more than 60°C.
- No fail safe valve malfunction.

Setting Condition:

In the case pre-setting conditions are met, the TCM calculates the turbine speed that corresponds to the gear ratio of the outputted solenoid pattern in about 7 seconds after each gear shift has completed, and when the output shaft speed against the turbine speed exceeds 500 rpm.

Fail Safe:

- No fail safe function

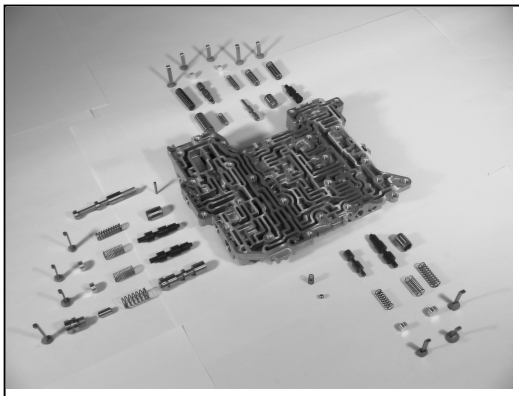
Possible Cause:

- Turbine sensor or speed sensor malfunction.
- Shift solenoid malfunction.
- Clutch slipping.

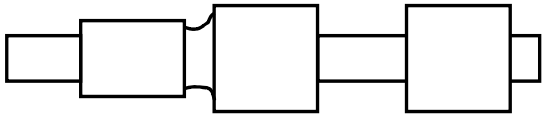
Step	Action	Yes	No
1	Turn the key switch on and check the DTC. Are the DTC other than gear ratio error outputted?	Go to Other DTC Section	Go to Step 2
2	Clear the DTC from the memory. Turn the key switch off once, and then start the engine. Does the CHECK TRANS blink when the gear shift is repeated 3 times from 1st to 4th in the D range?	Go to Other DTC Section	Go to Step 3
3	Check again the DTC. Are all codes indicating gear ratio error outputted?	Go to Step 4	Even if one of DTC indicating gear ratio error is outputted Go to step 5 DTC indicating gear ratio error are not outputted at all. Go to step 9
4	Check the turbine sensor and the speed sensor for function. Is the result OK?	Go to Step 9	Replace turbine speed sensor. Go to Step 9
5	Are the color and smell of ATF normal?	Go to Step 6	Go to Step 9

Step	Action	Yes	No
6	Is the quantity of ATF correct?	Go to Step 7	Correct the quantity of ATF. Go to Step 9
7	Connect the Tech 2 and test the solenoids of respective solenoids for low & reverse brake, 2-4 brake, high clutch and low clutch. Is operation sound heard from each solenoid?	Go to Step 8	Replace the solenoid that does not generate the operation sound. Go to Step 9
8	Check the line pressure during the idling and at the engine stall speed. Is the line pressure correct?	Go to Step 10	Either control valve, oil pump or power train parts (clutch, brake) will be faulty. Replace or overhaul the transmission unit. Go to step 10
9	Run the vehicle, and is the gear shifted from 1st to 4th correctly?	Go to Step 10	Either control valve, oil pump or power train parts (clutch, brake) will be faulty. Replace or overhaul the transmission unit. Go to step 10
10	Clear the DTC from the memory and perform the work after repair. Is the same DTC code outputted again in the subsequent DTC check?	Replace the TCM	Go to Step 11
11	Are the other DTCs outputted?	Go to Other DTC Section	Action is completed

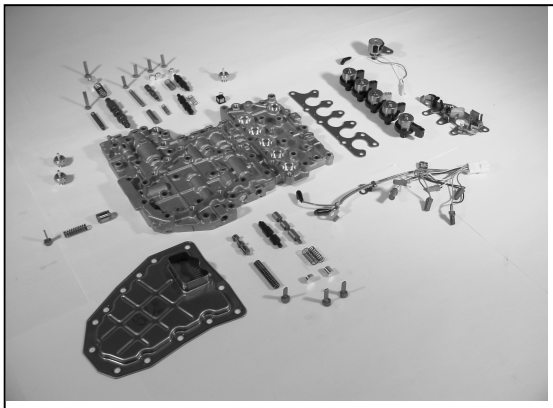
DTC P1750 (Flash Code 51) Low & Reverse Brake Fail-safe Valve Failure



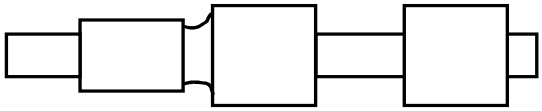
Control Valve Upper Body



Low & Reverse Brake Fail Valve (B)



Control Valve Lower Body



Low & Reverse Brake Fail Valve (A)

Setting Condition:

- When the oil pressure generated and low & reverse brake pressure switch operates off/on twice, the TCM detected an operation failure of the low & reverse brake fail-safe valve in D, 3, 2, L range.

Fail Safe:

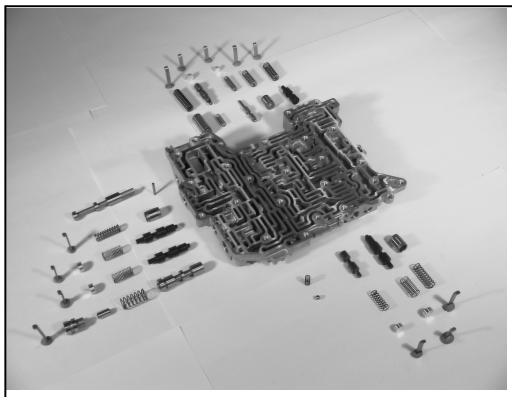
- When the vehicle is running, the gear position selected at the trouble detection is held and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd.

Possible Cause:

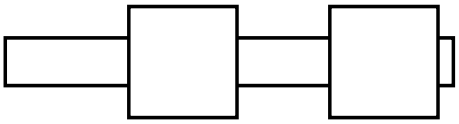
- Stick of low & reverse brake fail-safe valve.
- Low & reverse brake pressure switch does not turn on.
- Short circuit to ground of harness low & reverse brake pressure switch.
- Poor connection of each connector of harness in low & reverse brake pressure switch.

Step	Action	Yes	No
1	Turn the key switch on and check the DTC. Is only the DTC for low & reverse brake fail-safe valve failure outputted?	Go to Step 2	Go to Other DTC Section
2	Clear the DTC from the memory. Turn the key switch off once, and then start the engine. Does the CHECK TRANS blink when the D range is selected and about 10 seconds elapsed?	Go to Other DTC Section	Go to Step 3
3	Run the vehicle, shift the gear from 1st to 4th, stop the vehicle, and again shift the gear from 1st to 4th. Does the CHECK TRANS blink at this time?	Go to Step 4	The low & reverse brake fail-safe valve may be faulty temporarily. Go to step 5
4	Turn the key switch on and check the DTC. Is only the DTC for the low & reverse brake fail-safe valve failure outputted?	Repair or replace the control valve. Go to Step 5	Go to Other DTC Section
5	Clear the DTC from the memory and perform the work after repair. Is the same DTC code outputted again in the subsequent DTC check?	Replace the TCM	Go to Step 6
6	Are the other DTCs outputted?	Go to Other DTC Section	Action is completed

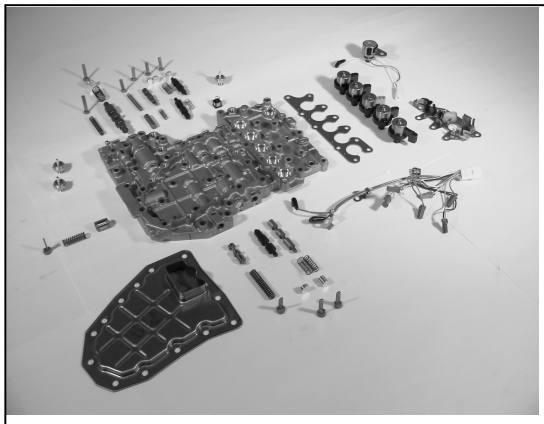
DTC P1755 (Flash Code 52) 2-4 Brake Fail-safe Valve Failure



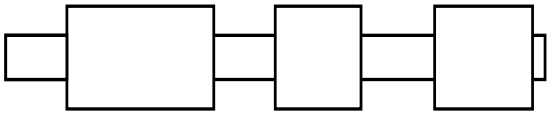
Control Valve Upper Body



2-4 Brake Fail Valve (B)



Control Valve Lower Body



2-4 Brake Fail Valve (A)

Setting Condition:

- When the oil pressure generated and 2-4 brake pressure switch operates off/on twice, the TCM detected an operation failure of the low & reverse brake fail-safe valve in D, 3, 2, L range.

Fail Safe:

- When the vehicle is running, the gear position selected at the trouble detection is held and the lock-up is inhibited.
- After the vehicle stopped, all solenoid operations stop (OFF) and the gear is fixed to the 3rd.

Possible Cause:

- Stick of 2-4 brake fail-safe valve.
- 2-4 brake pressure switch does not turn on.
- Short to ground of harness 2-4 brake pressure switch.
- Faulty fitting of each connector of harness in 2-4 brake pressure switch.

Step	Action	Yes	No
1	Turn the key switch on and check the DTC. Is only the DTC for 2-4 brake fail-safe valve failure outputted?	Go to Step 2	Go to Other DTC Section
2	Clear the DTC from the memory. Turn the key switch off once, and then start the engine. Does the CHECK TRANS blink when the D range is selected and about 10 seconds elapsed?	Go to Other DTC Section	Go to Step 3
3	Run the vehicle, shift the gear from 1st to 4th, stop the vehicle, and again shift the gear from 1st to 4th. Does the CHECK TRANS blink at this time?	Go to Step 4	The 2-4 brake fail-safe valve may be faulty temporarily. Go to step 5
4	Turn the key switch on and check the DTC. Is only the DTC for the 2-4 brake fail-safe valve failure outputted?	Repair or replace the control valve. Go to Step 5	Go to Other DTC Section
5	Clear the DTC from the memory and perform the work after repair. Is the same DTC code outputted again in the subsequent DTC check?	Replace the TCM	Go to Step 6
6	Are the other DTCs outputted?	Go to Other DTC Section	Action is completed

DTC P0602 Programming Error

Setting Condition:

- When reprogramming operation is stopped under Service Programming System (SPS).
- When non programmed TCM (blank TCM) is used without Service Programming System (SPS).

Fail Safe:

- Lock-up is inhibited.
- All solenoid operations stop (OFF) and the gear is fixed to the 3rd.

Possible Cause:

- Low battery voltage while Service Programming System (SPS) is operated.
- No programmed TCM (blank TCM) is used.

Recover DTC:

Reprogram the TCM using with Service Programming System (SPS).

SYMPTOM DIAGNOSIS

Symptom	Condition	Description	
Vehicle does not run	In D, 3, 2, L, and R ranges	Vehicle does not run though the accelerator pedal is stepped on.	A1
	In R range	Vehicle does not run in R range only. It runs normally in D, 3, 2, and L ranges.	A2
	In D, 3, 2, and L ranges	Vehicle does not run in D, 3, 2, and L ranges only. It runs normally in R range.	A3
Trouble at starting	Vehicle runs in N range	Creep appears in N range. Vehicle moves unless the brake pedal is stepped on in N range.	B1
	Poor acceptation	Starting acceleration is poor.	B2
	Engine races up during starting (slip)	The engine speeds up but vehicle speed does not increase when the accelerator pedal is stepped on at the starting.	B3
	Large shock when shift lever is changed to N to D range or N to R range	Large shock is felt when selecting D or R range from N range during the idling after warming up.	B4
	Engine stalls when selecting from N range to R, D, 3, 2, or L range	The engine stalls when selecting from N or P range to a run range during the engine idling.	B5
	Engine starter does not run in P or N range	The engine starter does not run though the P or N range is selected.	B6
	Engine starter runs except in P or N range	The engine starter runs though the R or D, 3, 2or L range is selected.	B7
	Extended time lag when shift lever is changed to N to D	The shift time lag is longer than standard value when shift lever is changed to N to D.	B8
	Extended time lag when shift lever is changed to N to R	The shift time lag is longer than standard value when shift lever is changed to N to R.	B9
	Brake is applied in R range	Brake is applied suddenly in R range.	B10
	Insufficient starting or shaking in D range	Insufficient starting or shaking in D range.	B11
	Noise or vibration	Noise or vibration is generated in the vicinity of AT at starting.	B12

SYMPTOM DIAGNOSIS TABLE

	Symptom / Possible Cause	Disordered of select lever	Line pressure out of standard value	Disordered of idle revolutions (Engine)	Lag of injection timing	Disordered of inhibitor switch	Electrical																										Hydraulic Control																						Powertrain			
							Engine speed signal	Speed sensor		Turbine sensor		Power & 3rd start mode switch		Throttle opening signal	N-D, N-R select signal	Inhibitor switch	Faulty power source or grounding	Oil temperature sensor		Line pressure solenoid circuit	Lock-up duty solenoid circuit	Low clutch duty solenoid circuit	2-4 brake duty solenoid circuit	High clutch duty solenoid circuit	L&R brake duty solenoid circuit	GND return line	High clutch hydraulic switch	2-4 brake hydraulic switch	L&R brake hydraulic switch	ATF amount	Control valve spool	Low clutch solenoid accumulator	2-4 brake solenoid accumulator	High clutch solenoid accumulator	L&R brake solenoid accumulator	2-4 brake accumulator	High clutch accumulator	Line pressure solenoid hydraulic circuit	Lock-up solenoid hydraulic circuit	Low clutch solenoid hydraulic circuit	2-4 brake solenoid hydraulic circuit	High clutch solenoid hydraulic circuit	L&R brake solenoid hydraulic circuit	Oil cooler	Clutch (brake)	Torque converter	Lock-up piston
							Open / short circuit	No signal output	Signal output error	No signal output	Signal output error	No signal output	No signal output	Signal output error	Signal output error	No signal output	Open / short circuit	Open / short circuit	No signal output	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Out of standard value	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Out of standard value	Slip	Faulty operation	Faulty operation
A1	Vehicle does not run in D, 3, 2, L, and R ranges	○	○																																																				
A2	Vehicle does not run in R range					○											○																																						
A3	Vehicle does not run in D, 3, 2, and L ranges																					○																																		
B1	Vehicle runs in N range	○																																																				
B2	Poor acceptation at starting		○		○								○																																									
B3	Engine races up during starting (slip)		○										○	○							○	○																																	
B4	Large shock when shift lever is changed to N to D range or N to R range		○		○								○	○			○				○	○																																	
B5	Engine stalls when selecting from N range to R, D, 3, 2, or L range			○	○								○	○			○																																						
B6	Engine starter does not run in P or N range		○														○																																						
B7	Engine starter runs except in P or N range		○														○																																						
B8	Extended time lag when shift lever is changed to N to D		○						○				○				○				○	○																																	
B9	Extended time lag when shift lever is changed to N to R		○						○				○				○				○																																			
B10	Brake is applied in R range	○													○																																							
B11	Insufficient starting or shaking in D range								○				○	○			○																																						
B12	Noise or vibration is generated at starting				○																																																	

SYMPTOM DIAGNOSIS

Symptom	Condition	Description	
Faulty shifting	Engine race up (slip) when gear is shifted up to 1st to 2nd	The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted up.	C1
	Engine race up (slip) when gear is shifted up to 2nd to 3rd	The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted up.	C2
	Engine race up (slip) when gear is shifted up to 3rd to 4th	The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted down or for kick-down during steady run.	C3
	Engine race up (slip) when gear is shift down or kick-down to 4th to 3rd	The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted down or for kick-down.	C4
	Engine race up (slip) when gear is shift down or kick-down to 4th to 2nd	The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted down or for kick-down.	C5
	Engine race up (slip) when gear is shift down or kick-down to3rd to 2nd	The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted down or for kick-down.	C6
	Engine race up (slip) when gear is shift down or kick-down to4th or 3rd to 1st	The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted down or for kick-down.	C7
	Engine race up (slip) others	The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted down or for kick-down during steady run.	C8
	Barking feel when gear is shifted up to 1st to 2nd	Brake feeling appears when the accelerator pedal is stepped on for acceleration and the gear is shifted up.	C9
	Barking feel when gear is shifted up to 2nd to 3rd	Brake feeling appears when the accelerator pedal is stepped on for acceleration and the gear is shifted up.	C10
	Barking feel when gear is shifted up to 3rd to 4th	Brake feeling appears when the accelerator pedal is stepped on for acceleration and the gear is shifted up.	C11
	Large shock when gear is shifted to 1st to 2nd or 2nd to 1st	Large shock is felt when the accelerator pedal is stepped on for acceleration and the gear is shifted up or down.	C12
	Large shock when gear is shifted to 2nd to 3rd or 3rd to 2nd	Large shock is felt when the accelerator pedal is stepped on for acceleration and the gear is shifted up or down.	C13

Symptom	Condition	Description	
	Large shock when gear is shifted to 3rd to 4th or 4th to 3rd	Large shock is felt when the accelerator pedal is stepped on for acceleration and the gear is shifted up or down.	C14
	Large shock when kick-down	Large shock is felt when the accelerator pedal is stepped on for kick-down.	C15
	Large shock when no acceleration	Large shock is felt when the accelerator pedal is not stepped on.	C16
	Large shock when gear is shifted down to 2nd to 1st in L range	Large shock is felt when the shift lever is selected in L range.	C17
	Large shock (other)	Large shock is felt when the accelerator pedal is stepped on for acceleration and the gear is shifted up or down.	C18
	Large shock when vehicle speed is downed by no accelerator pedal or vehicle is stopped.	Large shock is felt when the accelerator pedal is not stepped on.	C19
	Large lock-up shock	Large shock is felt at lock-up.	C20
	Shift down or engine over-run when the accelerator pedal is stepped on in 4th gear	Shift down or engine over-run above the kick-down area.	C21

SYMPTOM DIAGNOSIS TABLE

Symptom \ Possible Cause	Disordered of select lever	Line pressure out of standard value	Disordered of idle revolutions (Engine)	Lag of injection timing	Disordered of inhibitor switch	Electrical: Engine speed signal — Open / short circuit	Electrical: Speed sensor — No signal output	Electrical: Speed sensor — Signal output error	Electrical: Turbine sensor — No signal output	Electrical: Turbine sensor — Signal output error	Electrical: Power & 3rd start mode switch — No signal output	Electrical: Power & 3rd start mode switch — No signal output	Electrical: Throttle opening signal — Signal output error	Electrical: N-D, N-R select signal — Signal output error	Electrical: Inhibitor switch — No signal output	Electrical: Faulty power source or grounding — Open / short circuit	Electrical: Oil temperature sensor — Open / short circuit	Electrical: Oil temperature sensor — No signal output	Electrical: Line pressure solenoid circuit — Open / short circuit	Electrical: Lock-up duty solenoid circuit — Open / short circuit	Electrical: Low clutch duty solenoid circuit — Open / short circuit	Electrical: 2-4 brake duty solenoid circuit — Open / short circuit	Electrical: High clutch duty solenoid circuit — Open / short circuit	Electrical: L&R brake duty solenoid circuit — Open / short circuit	Electrical: GND return line — Open / short circuit	Electrical: High clutch hydraulic switch — Open / short circuit	Electrical: 2-4 brake hydraulic switch — Open / short circuit	Electrical: L&R brake hydraulic switch — Open / short circuit	Hydraulic Control: ATF amount — Out of standard value	Hydraulic Control: Control valve spool — Faulty operation	Hydraulic Control: Low clutch solenoid accumulator — Faulty operation	Hydraulic Control: 2-4 brake solenoid accumulator — Faulty operation	Hydraulic Control: High clutch solenoid accumulator — Faulty operation	Hydraulic Control: L&R brake solenoid accumulator — Faulty operation	Hydraulic Control: 2-4 brake accumulator — Faulty operation	Hydraulic Control: High clutch accumulator — Faulty operation	Hydraulic Control: Line pressure solenoid hydraulic circuit — Clogged oil passage	Hydraulic Control: Lock-up solenoid hydraulic circuit — Clogged oil passage	Hydraulic Control: Low clutch solenoid hydraulic circuit — Clogged oil passage	Hydraulic Control: 2-4 brake solenoid hydraulic circuit — Clogged oil passage	Hydraulic Control: High clutch solenoid hydraulic circuit — Clogged oil passage	Hydraulic Control: L&R brake solenoid hydraulic circuit — Clogged oil passage	Hydraulic Control: Oil cooler — Out of standard value	Powertrain: Clutch (brake) — Slip	Powertrain: Clutch (brake) — Seizure	Powertrain: Torque converter — Faulty operation	Powertrain: Lock-up piston — Separation	Powertrain: Lock-up piston — Faulty operation
C1 Engine race up (slip) when gear is shifted up to 1st to 2nd		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C2 Engine race up (slip) when gear is shifted up to 2nd to 3rd		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C3 Engine race up (slip) when gear is shifted up to 3rd to 4th		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C4 Engine race up (slip) when gear is shift down or kicked down to 4th to 3rd		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C5 Engine race up (slip) when gear is shift down or kicked down to 4th to 2nd		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C6 Engine race up (slip) when gear is shift down or kicked down to 3rd to 2nd		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C7 Engine race up (slip) when gear is shift down or kicked down to 4th or 3rd to 1st		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C8 Engine race up (slip) others		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C9 Barking feel when gear is shifted up to 1st to 2nd		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C10 Barking feel when gear is shifted up to 2nd to 3rd		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C11 Barking feel when gear is shifted up to 3rd to 4th		○				○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C12 Large shock when gear is shifted to 1st to 2nd or 2nd to 1st		○			○	○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C13 Large shock when gear is shifted to 2nd to 3rd or 3rd to 2nd		○			○	○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C14 Large shock when gear is shifted to 3rd to 4th or 4th to 3rd		○			○	○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C15 Large shock when kick-down		○			○	○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C16 Large shock when no acceleration		○			○	○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C17 Large shock when gear is shifted down to 2nd to 1st in L range		○			○	○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C18 Large shock (other)		○			○	○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C19 Large shock when vehicle speed is downed by no accelerator pedal or vehicle is stopped		○			○	○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C20 Large lock-up shock		○			○	○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
C21 Shift down or engine over-run when the accelerator pedal is stepped on in 4th gear		○			○	○		○		○			○				○														○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

SYMPTOM DIAGNOSIS

Symptom	Condition	Description	
Faulty shift point	Faulty gear shifting (different from shift pattern)	Gear is shifted, different from the specified shift pattern.	D1
	Gear is shifted frequently	Gear is shifted down immediately though the accelerator pedal is stepped on a little in D, 3, 2, or L range.	D2
	Gear shift point is low or high at all point	Gear shift point is deviated from the shift diagram. Gear is not shifted up properly though the vehicle is accelerated. Gear is not shifted immediately and enough acceleration cannot be obtained though the accelerator pedal is stepped on.	D3
	Gear shift point is low or high at limited area	Gear shift point is deviated from the shift diagram. Gear is not shifted up properly though the vehicle is accelerated. Gear is not shifted immediately and enough acceleration cannot be obtained though the accelerator pedal is stepped on.	D4
	No kick-down	Kick-down (shift down) is not performed though the accelerator pedal is fully stepped on in the kick-down speed range.	D5
No gear shift	No gear shift	Range is fixed without shifting the gear of 1st to 2nd, 2nd to 3rd, and 3rd to 4th. Gear may be shifted or may not be shifted.	E1
	Only 4th gear is not selectable	Gear is not shifted up from 3rd to 4th though the vehicle is accelerated.	E2
	Gear is shifted 2nd to 3rd in 2 range	Gear is shifted 2nd to 3rd in 2 range.	E3
	Gear is shifted 1st to 2nd in L range	Gear is shifted 1st to 2nd in L range.	E4
	Gear is shifted 3rd to 4th in 3 range	Gear is shifted 3rd to 4th in 3 range.	E5

Symptom	Condition	Description	
Faulty during the running	Low maximum speed or poor acceleration	Starting acceleration is poor. Acceleration is slow though the accelerator pedal is stepped on during the running.	F1
	Engine races up during acceleration (slip)	The engine speeds up but vehicle speed does not increase when the accelerator pedal is stepped on at the starting. Only the engine speeds up but vehicle speed does not increase when the accelerator pedal is stepped on for acceleration during the running.	F2
	Noise or vibration during the running in R, D, 3, 2, or L range	Noise or vibration is generated in the vicinity of AT during the running.	F3
	Engine brake does not in apply L range	The engine brake does not apply, allowing the vehicle to run freely when the accelerator pedal is released at low speed in L range.	F4
	Engine stalls before vehicle stops from running	The engine stalls simultaneously with the vehicle stop when the brake pedal is stepped on to stop the vehicle during the running.	F5
Faulty in the stopping	Vehicle moves in P range, or parking gear is not disengaged other than P range	Vehicle moves though it stops at a slope and P range is selected. The engine stalls and vehicle does not move though other than P range is selected and the accelerator pedal is stepped on.	G1
	Creep force is large	Vehicle accelerates in D, 3, 2, L, and R ranges though the accelerator pedal is not stepped on.	G2
	Creep force is small	Vehicle does not move though a run range is selected on a flat road during the idling.	G3
	Large noise during idling with the vehicle in stop state	The transmission is noisy during the idling speed in all ranges.	G4
Faulty lock-up	Judder occurs at the lock-up	The vehicle body judders at lock-up.	H1
	Large lock-up shock	Large shock is felt at lock-up.	H2
	Lock-up point is high or low	Lock-up point is excessive high or low.	H3
No lock-up	No lock-up	Lockup is not performed in spite of the lock-up area.	I1

SYMPTOM DIAGNOSIS TABLE

Symptom / Possible Cause			Disordered of select lever	Line pressure out of standard value	Disordered of idle revolutions (Engine)	Lag of injection timing	Disordered of inhibitor switch	Electrical																				Hydraulic Control																				Powertrain			
								Engine speed signal	Speed sensor		Turbine sensor		Power & 3rd start mode switch		Throttle opening signal	N-D, N-R select signal	Inhibitor switch	Faulty power source or grounding	Oil temperature sensor		Line pressure solenoid circuit	Lock-up duty solenoid circuit	Low clutch duty solenoid circuit	2-4 brake duty solenoid circuit	High clutch duty solenoid circuit	L&R brake duty solenoid circuit	GND return line	High clutch hydraulic switch	2-4 brake hydraulic switch	L&R brake hydraulic switch	ATF amount	Control valve spool	Low clutch solenoid accumulator	2-4 brake solenoid accumulator	High clutch solenoid accumulator	L&R brake solenoid accumulator	2-4 brake accumulator	High clutch accumulator	Line pressure solenoid hydraulic circuit	Lock-up solenoid hydraulic circuit	Low clutch solenoid hydraulic circuit	2-4 brake solenoid hydraulic circuit	High clutch solenoid hydraulic circuit	L&R brake solenoid hydraulic circuit	Oil cooler	Clutch (brake)		Torque converter	Lock-up piston	
								Open / short circuit	No signal output	Signal output error	No signal output	Signal output error	No signal output	No signal output	Signal output error	Signal output error	No signal output	Open / short circuit	Open / short circuit	No signal output	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Out of standard value	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Out of standard value	Slip	Seizure	Faulty operation	Separation	Faulty operation
D1	Faulty gear shifting (different from shift pattern)	○					○		○	○		○	○		○			○	○		○	○	○	○	○	○	○	○	○		○																	
D2	Gear is shifted frequently								○	○				○																																			
D3	Gear shift point is low or high at all point											○			○																○																	
D4	Gear shift point is low or high at limited area								○	○																																						
D5	No kick-down								○					○																																		
E1	No gear shift			○					○	○				○				○	○												○																	
E2	Only 4th gear is not selectable		○									○																																				
E3	Gear is shifted 2nd to 3rd in 2 range		○											○																																		
E4	Gear is shifted 1st to 2nd in L range		○						○																																						
E5	Gear is shifted 3rd to 4th in 3 range		○																																												
F1	Low maximum speed or poor acceleration			○					○	○		○	○	○	○			○	○		○	○	○	○	○	○	○	○	○		○																	
F2	Engine races up during acceleration (slip)			○					○	○		○			○			○	○		○	○	○	○	○	○	○	○	○		○																	
F3	Noise or vibration during the running in R, D, 3, 2, or L range			○					○	○																																						
F4	Engine brake does not in apply L range								○	○				○																																		
F5	Engine stalls before vehicle stops from running									○																																						
G1	Vehicle moves in P range, or parking gear is not disengaged other than P range	○																																												
G2	Creep force is large					○																																								
G3	Creep force is small				○																																									
G4	Large noise during idling with the vehicle in stop state					○																																								
H1	Judder occurs at the lock-up								○	○		○						○	○		○	○									○																	
H2	Large lock-up shock			○						○								○	○		○	○									○																	
H3	Lock-up point is high or low								○									○	○		○	○									○																	
I1	No lock-up								○	○																					○																	

SYMPTOM DIAGNOSIS

Symptom	Condition	Description	
Oil Leak	Breather	Oil leaks from breather.	J1
	Between engine and converter housing	Oil leaks between engine and converter housing.	J2
	Between converter housing and main case	Oil leaks between converter housing and main case.	J3
	Between main case and rear housing	Oil leaks between main case and rear housing.	J4
	Oil pan	Oil leaks from oil pan.	J5
	Manual shaft oil seal	Oil leaks from manual shaft oil seal.	J6
	Oil cooler pipe	Oil leaks from oil cooler pipe joint.	J7
Other	Transmission overheat	You smell the transmission burning. The transmission smokes.	Z1
	Mode lamp does not light up when the power mode or 3rd start mode is turned on	The mode lamp on the instrument panel does not light up though the power mode or 3rd start mode is turned on with the ignition switch in ON position.	Z2
	Mode lamp lights up when the power mode or 3rd start mode is turned off	The mode lamp on the instrument panel lights up though the power mode or 3rd start mode is turned off with the ignition switch in ON position.	Z3
	Oil temperature warning lamp lights up	Sometimes, the oil temperature warning lamp lights up.	Z4
	Select lever feeling is faulty	Select lever feeling is faulty.	Z5
	Poor fuel consumption	Poor fuel consumption.	Z6
	Pattern select switch is faulty	Shift pattern does not change though the pattern select switch is turned on.	Z7
	Oil is splashed during the running	Oil is splashed during the running.	Z8
	Abnormal smell	Abnormal smell.	Z9
	Oil quantity is low or high	Oil quantity is low or high.	Z10
	Abnormal oil pressure	Oil pressure is low or high.	Z11
	Reverse buzzer does not ring	Reverse buzzer does not ring in R range.	Z12

SYMPTOM DIAGNOSIS TABLE

	Symptom / Possible Cause	Disordered of select lever	Line pressure out of standard value	Disordered of idle revolutions (Engine)	Lag of injection timing	Disordered of inhibitor switch
J1	Oil leaks from breather					
J2	Oil leaks between engine and converter housing					
J3	Oil leaks between converter housing and main case					
J4	Oil leaks between main case and rear housing					
J5	Oil leaks from oil pan					
J6	Oil leaks from manual shaft oil seal					
J7	Oil leaks from oil cooler pipe joint					
Z1	Transmission overheat		○	○	○	
Z2	Mode lamp does not light up when the power mode or 3rd start mode is turned on					
Z3	Mode lamp lights up when the power mode or 3rd start mode is turned off					
Z4	Oil temperature warning lamp lights up		○			
Z5	Select lever feeling is faulty	○				
Z6	Poor fuel consumption		○	○	○	
Z7	Pattern select switch is faulty	○				○
Z8	Oil is splashed during the running					
Z9	Abnormal smell					
Z10	Oil quantity is low or high					
Z11	Abnormal oil pressure		○			
Z12	Reverse buzzer does not ring	○				○

		Engine speed signal	Speed sensor	Turbine sensor	Power & 3rd start mode switch	Throttle opening signal	N-D, N-R select signal	Inhibitor switch	Faulty power source or grounding	Oil temperature sensor	Line pressure solenoid circuit	Lock-up duty solenoid circuit	Low clutch duty solenoid circuit	2-4 brake duty solenoid circuit	High clutch duty solenoid circuit	L&R brake duty solenoid circuit	GND return line	High clutch hydraulic switch	2-4 brake hydraulic switch	L&R brake hydraulic switch
		Open / short circuit	No signal output	Signal output error	No signal output	Signal output error	Signal output error	No signal output	Open / short circuit	No signal output	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit
J1																				
J2																				
J3																				
J4																				
J5																				
J6																				
J7																				
Z1																				
Z2					○															
Z3					○															
Z4										○	○									
Z5																				
Z6		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Z7					○	○														
Z8																				
Z9																				
Z10																				
Z11											○									
Z12							○	○												

		AT F amount	Control valve spool	Low clutch solenoid accumulator	2-4 brake solenoid accumulator	High clutch solenoid accumulator	L&R brake solenoid accumulator	2-4 brake accumulator	High clutch accumulator	Line pressure solenoid hydraulic circuit	Lock-up solenoid hydraulic circuit	Low clutch solenoid hydraulic circuit	2-4 brake solenoid hydraulic circuit	High clutch solenoid hydraulic circuit	L&R brake solenoid hydraulic circuit	Oil cooler	Clutch (brake)	Torque converter	Lock-up piston
		Out of standard value	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Out of standard value	Slip Seizure	Faulty operation	Separation Faulty operation
J1																○			
J2																○			
J3																○			
J4																○			
J5																○			
J6																○			
J7																○			
Z1																○			
Z2																			
Z3																			
Z4			○													○			
Z5																			
Z6										○		○	○	○		○	○	○	○
Z7																			
Z8		○														○	○	○	○
Z9		○														○	○	○	○
Z10		○														○			
Z11		○									○						○	○	○
Z12																			

		Electrical																					Hydraulic Control																				Powertrain			
		Engine speed signal	Speed sensor	Turbine sensor	Power & 3rd start mode switch	Throttle opening signal	N-D, N-R select signal	Inhibitor switch	Faulty power source or grounding	Oil temperature sensor	Line pressure solenoid circuit	Lock-up duty solenoid circuit	Low clutch duty solenoid circuit	2-4 brake duty solenoid circuit	High clutch duty solenoid circuit	L&R brake duty solenoid circuit	GND return line	High clutch hydraulic switch	2-4 brake hydraulic switch	L&R brake hydraulic switch	AT F amount	Control valve spool	Low clutch solenoid accumulator	2-4 brake solenoid accumulator	High clutch solenoid accumulator	L&R brake solenoid accumulator	2-4 brake accumulator	High clutch accumulator	Line pressure solenoid hydraulic circuit	Lock-up solenoid hydraulic circuit	Low clutch solenoid hydraulic circuit	2-4 brake solenoid hydraulic circuit	High clutch solenoid hydraulic circuit	L&R brake solenoid hydraulic circuit	Oil cooler	Clutch (brake)	Torque converter	Lock-up piston	
		Open / short circuit	No signal output	Signal output error	No signal output	Signal output error	Signal output error	No signal output	Open / short circuit	No signal output	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Open / short circuit	Out of standard value	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Faulty operation	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Clogged oil passage	Out of standard value	Slip Seizure	Faulty operation	Separation Faulty operation	
J1																					○																				
J2																																										
J3																																										
J4																																										
J5																																										
J6																																										
J7																																										
Z1																					○																				
Z2					○																																					
Z3					○																																					
Z4										○	○																															
Z5																																										
Z6		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○							○	○	○	○	○	○	○	○	○	○	○	○	
Z7					○	○																																			
Z8																					○																○	○	○	○	
Z9																					○																○	○	○	○	
Z10																					○																○				
Z11																					○								○									○	○	○	
Z12							○	○																																	

No. A1: Vehicle Does Not Run in D, 3, 2, L and R Range

Description:

- Vehicle does not run though the accelerator pedal is stepped on.

Diagnosis Hints:

- Some trouble in the AT main unit is supposed (since the vehicle can run even if the TCM is defective). However, since the trouble of the main unit may be originated from the sensor system or output system, these systems should be also checked to prevent reproduce of the trouble.

Possible Cause:

- Slip of clutch (low clutch, low one-way clutch, reverse clutch, low & reverse brake).
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Shortage or faulty quality of ATF.
- Dropped line pressure.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).
- Disordered select cable (select indicator light indicates D, 3, 2, L or R but the hydraulic system is not in the D, 3, 2, L, or R range).
- Faulty torque generated.
- Trouble in the torque converter (faulty operation, sticking), insufficient engine output.
- Malfunction of parking mechanism.

Step	Action	Yes	No
1	Dislocation or disordered of select lever. Does the vehicle move when the brake is released in a position other than the P range and the vehicle is pushed?	Go to Step 2	Adjust the select cable.
2	Are any DTCs stored?	Go to DTC Chart	Go to Step 3
3	Are the quantity, contamination and smell normal?	Go to Step 4	If the ATF level is low, replenish up to the specified level. If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.
4	Is the stall revolution correct in all range? Refer the **STALL TEST** section in this manual.	Go to Step 5	Repair the defect or replace.
5	Is the line pressure correct? Refer the **LINE PRESSURE TEST** section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. A2: Vehicle Does Not Run in R Range

Description:

- Vehicle does not run in R range only.
- It runs correctly in D, 3, 2, and L ranges.

Diagnosis Hints:

- Some trouble in the AT main unit is supposed (since the vehicle can run even if the TCM is defective). However, since the trouble of the main unit may be originated from the sensor system or output system, these systems should be also checked to prevent reproduce of the trouble.

Possible Cause:

- Slip of clutch (reverse clutch, low & reverse brake).
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Shortage or faulty quality of ATF.
- Dropped line pressure.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).
- Disordered select cable (select indicator light indicates R but the hydraulic system is not in the R range).
- Faulty torque generated.
- Trouble in the torque converter (faulty operation, sticking), insufficient engine output.
- Malfunction of parking mechanism.

Step	Action	Yes	No
1	Dislocation or disordered of select lever. Does the vehicle move when the brake is released in a position other than the P range and the vehicle is pushed?	Go to Step 2	Adjust the select cable.
2	Are any DTCs stored?	Go to DTC Chart	Go to Step 3
3	Are the quantity, contamination and smell normal?	Go to Step 4	If the ATF level is low, replenish up to the specified level. If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.
4	Is the stall revolution correct in R range? Refer the **STALL TEST** section in this manual.	Go to Step 5	Repair the defect or replace.
5	Is the line pressure correct? Refer the **LINE PRESSURE TEST** section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. A3: Vehicle Does Not Run in D, 3, 2 and L Range

Description:

- Vehicle does not run in D, 3, 2 and L range only.
- It runs correctly in R ranges.

Diagnosis Hints:

- Some trouble in the AT main unit is supposed (since the vehicle can run even if the TCM is defective). However, since the trouble of the main unit may be originated from the sensor system or output system, these systems should be also checked to prevent reproduce of the trouble.

Possible Cause:

- Slip of clutch (low clutch and low one-way clutch).
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Shortage or faulty quality of ATF.
- Dropped line pressure.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).
- Disordered select cable (select indicator light indicates D, 3, 2 and L but the hydraulic system is not in the D, 3, 2 and L range).
- Faulty torque generated.
- Trouble in the torque converter (faulty operation, sticking), insufficient engine output.
- Malfunction of parking mechanism.

Step	Action	Yes	No
1	Dislocation or disordered of select lever. Does the vehicle move when the brake is released in a position other than the P range and the vehicle is pushed?	Go to Step 2	Adjust the select cable.
2	Are any DTCs stored?	Go to DTC Chart	Go to Step 3
3	Are the quantity, contamination and smell normal?	Go to Step 4	If the ATF level is low, replenish up to the specified level. If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.
4	Is the stall revolution correct in D, 3, 2 and L range? Refer the **STALL TEST** section in this manual.	Go to Step 5	Repair the defect or replace.
5	Is the line pressure correct? Refer the **LINE PRESSURE TEST** section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. B1: Vehicle Runs in N Range

Description:

- Creep appears in N range.
- Vehicle moves unless the brake pedal is stepped on in N range.

Diagnosis Hints:

- Basically a trouble in the AT main unit. However, some trouble in the sensor system or output system may have some influence on the trouble in the main unit and therefore these systems should be also checked to prevent reproduce of the trouble.

Possible Cause:

- Seized clutch (low clutch, low one-way clutch, reverse clutch, low & reverse brake).
- Trouble in the control valve (faulty operation, sticking, clogged oil passage).
- Dislocated select lever (the select indicator light indicates the N range but the hydraulic system is in the D, 3, 2 or L range).

Step	Action	Yes	No
1	Dislocation or disordered of select lever. Does the vehicle move when the brake is released in a position other than the P range and the vehicle is pushed?	Go to Step 2	Adjust the select cable.
2	Are any DTCs stored?	Go to DTC Chart	Go to Step 3
3	Are the quantity, contamination and smell normal?	Trouble in the AT assembly or control valve.	If the ATF level is low, replenish up to the specified level. If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.

No. B2: Poor Acceleration at Starting

Description:

- Starting acceleration is poor.

Diagnosis Hints:

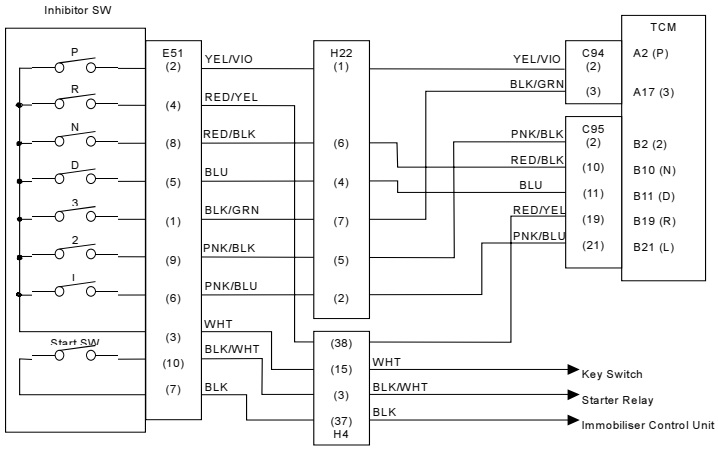
- In addition to the low engine output, faulty gear shifting of AT or fixing at the 3rd position may be possible. Therefore, in case of such a trouble that "maximum speed is low, and acceleration is poor", it should be cleared up whether the trouble is originated from the engine system of AT system by a running test, inspection of stall revolution, etc.

Possible Cause:

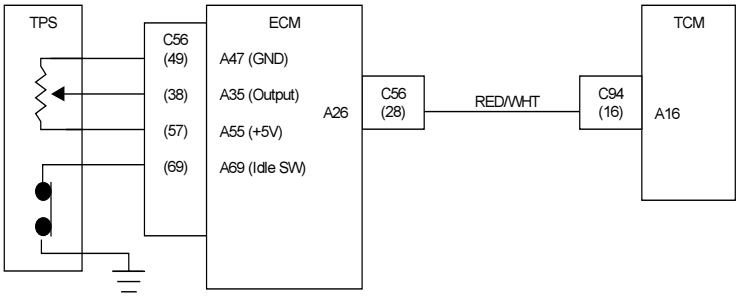
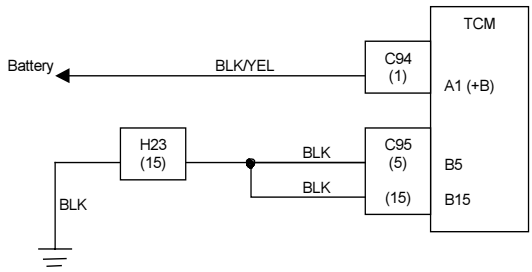
- Clogged air cleaner, out of injection timing, dropped compression pressure, etc.
- **Fixing at 3rd position (fail-safe activated).**
  Since the gear is fixed at the 3rd position because of the fail-safe function, a trouble that "Maximum speed is low, and acceleration is poor" is resulted. In this case, the DTC is memorized.
  When TCM stops operation because of faulty TCM ground, the gear is fixed at the 3rd position because of a mechanical reason. In this case, no DTC is memorized.
- Disordered inhibitor switch.
- **Incorrect properties of throttle opening signal (serial communication) of throttle position sensor.**
  Throttle opening signal (serial communication) of the throttle position sensor does not change in proportion to the throttle opening. In this case, fixing at the high or low gear results in such a trouble that "Maximum Speed is Low and Acceleration is Poor".
- Slip of clutch (low clutch, high clutch).
- If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Dropped line pressure.
- Trouble in the torque converter system (faulty operation).

Step	Action	Yes	No
1	Test Drive. Is the gear smoothly shifted in the order of 1st to 2nd, 2nd to 3rd, 3rd to 4th gear and lock up?	Clogged air cleaner, out of injection timing, dropped compression pressure, etc.	Go to Step 2
2	Gear ratio trouble diagnosis. Travel in the following sequence for about 7 seconds or more in each range: Start in the L range (1st) to 2 range (2nd) to 3 range (3rd) to D range (4th) (to detect the gear ratio trouble exactly, this process should be carried out)	Go to Step 3	Go to Step 3
3	Are any DTCs stored?	Go to DTC Chart	Go to Step 4

<table>
<tr><th>Step</th><th>Action</th><th>Yes</th><th>No</th></tr>
<tr><td>4</td><td>Are the quantity, contamination and smell normal?</td><td>Go to Step 5</td><td>If the ATF level is low, replenish up to the specified level.

If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.</td></tr>
<tr><td>5</td><td>Inspection of inhibitor switch using a Tech 2 or circuit tester.
When the select lever is operated, is the data display in the Tech 2 correct or voltage at each range correct?
 

<table>
<tr><th>TCM terminal / Range</th><th>A2</th><th>B19</th><th>B10</th><th>B11</th><th>B17</th><th>B2</th><th>B21</th></tr>
<tr><td>P</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>R</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>N</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>D</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td></tr>
<tr><td>L</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td></tr>
</table></td><td>Go to Step 6</td><td>Adjust the inhibitor switch.</td></tr>
</table>

Step	Action	Yes	No
6	Inspect the output voltage and throttle opening signal of the throttle position sensor using a Tech 2 or circuit tester. Is a voltage value in proportion to the throttle opening output? 	Go to Step 7	Repair the defect or replace.
7	Check of power supply to and earth of TCM. Are the power supply and earth proper? 	Go to Step 8	Check the power source harness and earth harness (bolt tightening to the body).
8	Is the stall revolution correct in D, 3, 2 and L range? Refer the **STALL TEST** section in this manual.	Go to Step 6	Repair the defect or replace.
9	Is the line pressure correct? Refer the **LINE PRESSURE TEST** section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. B3: Engine Race Up During Starting (Slip)

Description:

- The engine speeds up but vehicle speed does not increase when the accelerator pedal is stepped on at the starting.

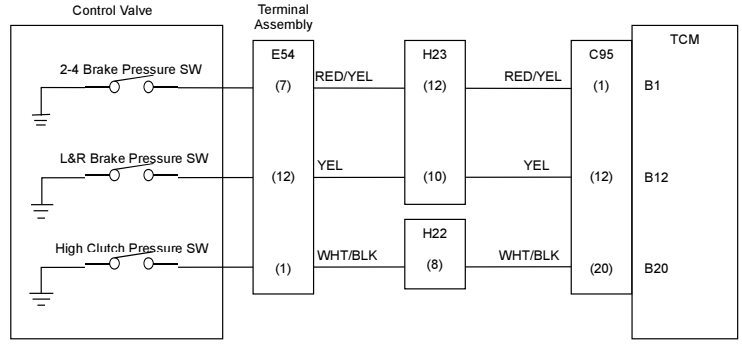
Diagnosis Hints:

- Possibility of slip of clutch is supposed. If slip of clutch has occurred, a DTC of "Gear ratio error" is stored.

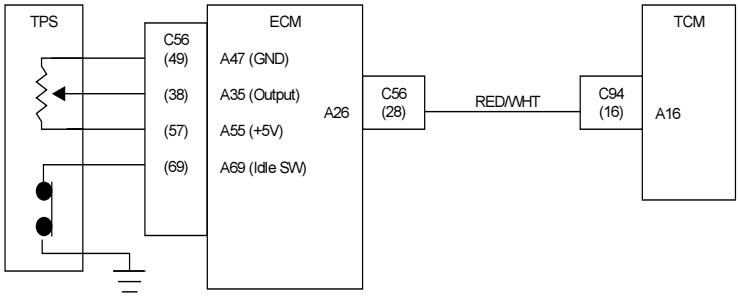
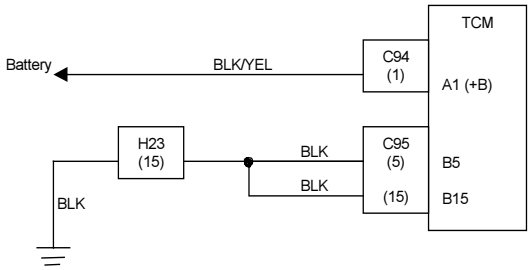
Possible Cause:

- Slip of clutch.
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Dropped line pressure.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).

<table>
<tr><th>Step</th><th>Action</th><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td>Gear ratio trouble diagnosis.
Travel in the following sequence for about 7 seconds or more in each range: Start in the L range (1st) to 2 range (2nd) to 3 range (3rd) to D range (4th) (to detect the gear ratio trouble exactly, this process should be carried out)</td><td>Go to Step 2</td><td>Go to Step 2</td></tr>
<tr><td>2</td><td>Are any DTCs stored?</td><td>Go to DTC Chart</td><td>Go to Step 3</td></tr>
<tr><td>3</td><td>Are the quantity, contamination and smell normal?</td><td>Go to Step 4</td><td>If the ATF level is low, replenish up to the specified level.

If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.</td></tr>
<tr><td>4</td><td>Are the engine speed and other engine system correct?</td><td>Go to Step 5</td><td>Repair the defect or replace.</td></tr>
<tr><td>5</td><td>Inspection of electrical or mechanical fault
Is the signal from each pressure switch changed synchronously?
 

<table>
<tr><th>Range</th><th>TCM terminal / Gear</th><th>B20 (High clutch pressure SW)</th><th>B1 (2-4 brake pressure SW)</th><th>B12 (Low & reverse brake pressure SW)</th></tr>
<tr><td>P</td><td>-</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td>R</td><td>Reverse</td><td>More than 10V</td><td>More than 10V</td><td>-</td></tr>
<tr><td>N</td><td>-</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td>D, 3, 2</td><td>1st</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td></td><td>2nd</td><td>More than 10V</td><td>-</td><td>More than 10V</td></tr>
<tr><td></td><td>3rd</td><td>-</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td></td><td>4th</td><td>-</td><td>-</td><td>More than 10V</td></tr>
<tr><td>L</td><td>1st</td><td>More than 10V</td><td>More than 10V</td><td>-</td></tr>
<tr><td></td><td>2nd</td><td>More than 10V</td><td>-</td><td>More than 10V</td></tr>
<tr><td></td><td>3rd</td><td>-</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td></td><td>4th</td><td>-</td><td>-</td><td>More than 10V</td></tr>
</table></td><td>Go to Step 6</td><td>Repair the defect or replace.</td></tr>
</table>

Step	Action	Yes	No
6	Inspect the output voltage and throttle opening signal of the throttle position sensor using a Tech 2 or circuit tester. Is a voltage value in proportion to the throttle opening output? 	Go to Step 7	Repair the defect or replace.
7	Check of power supply to and earth of TCM. Are the power supply and earth proper? 	Go to Step 8	Check the power source harness and earth harness (bolt tightening to the body).
8	Is the stall revolution correct in D, 3, 2 and L range? Refer the **STALL TEST** section in this manual.	Go to Step 9	Repair the defect or replace.
9	Is the line pressure correct? Refer the **LINE PRESSURE TEST** section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. B4: Large Shock When Shift Lever is Changed to N to D Range or N to R Range

Description:

- Large shock is felt when selecting D or R range from N range during the idling after warming up.

Diagnosis Hints:

- Check the entire condition of the vehicle for unusual other than AT including faulty engine mount, exhaust hanger, etc.
- When the fail-safe operation, select shock may grow worse. In such a case, check for the DTC. If no DTC is issued, shock due to faulty operation of the control valve or burnt clutch is considered.

Possible Cause:

- High engine idling.
- Dislocated select lever, improper inhibitor switch adjusting point.
- Faulty or insufficient tightening of engine mount, exhaust mount.
- Play of suspension.
- Burnt clutch.
- Too low or high line pressure.
- Faulty input signal system.
- Faulty control valve. (faulty operation or sticking of accumulator)

No. B5: Engine Stalls When Selecting From N Range to R, D, 3, 2 or L Range

Description:

- The engine stalls when selecting from N or P range to a run range during the engine idling.

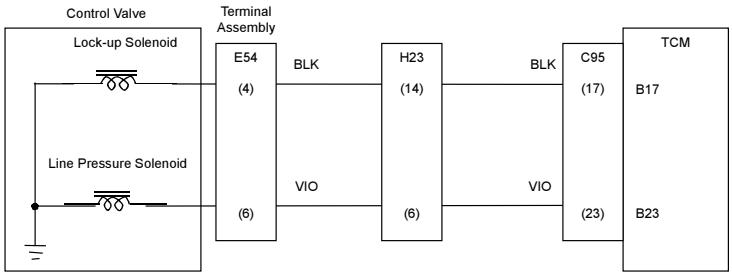
Diagnosis Hints:

- As causes attributable to the engine, faulty idle up, insufficient engine output, etc. are considered.
- As a cause of the AT system, faulty lockup piston system (lockup engine stall) is considered.
- If the oil through resistance increases remarkably due to clogged oil cooler or some other reason, or if the ATF level decreases, the lock-up piston works causing the engine stall.

Possible Cause:

- Disordered idling speed, faulty idle up, faulty engine output, shortage output.
- Insufficient ATF quantity (dropped level).
- Clogged oil cooler (foreign substance mixed in).
- Faulty lock-up piston (clogged oil passage of solenoid drive circuit, faulty operation).

Step	Action	Yes	No
1	Gear ratio trouble diagnosis. Travel in the following sequence for about 7 seconds or more in each range: Start in the L range (1st) to 2 range (2nd) to 3 range (3rd) to D range (4th) (to detect the gear ratio trouble exactly, this process should be carried out)	Go to Step 2	Go to Step 2
2	Are any DTCs stored?	Go to DTC Chart	Go to Step 3
3	Are the quantity, contamination and smell normal?	Go to Step 4	If the ATF level is low, replenish up to the specified level. If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.
4	Check of engine idle up speed Does the idle speed increase when the air conditioning or other electric load is turned on?	Go to Step 5	Repair the defect or replace.

Step	Action	Yes	No
5	Inspection of electrical or mechanical fault When the D range is selected from D at idling speed, is the signal to the lock-up solenoid turned off using the Tech 2 or circuit tester?  TCM terminal / Lock-up: B17 At lock-up: Approx. 7.2 V (AC range) At unlock-up: Approx. 4.0V (AC range)	Go to Step 6	Find a cause to turn on the lockup solenoid
6	Check of clogging of oil cooler When blowing the oil cooler outlet with air, does some foreign substance come out?	Clean or replace the oil cooler. Go to Step 7	Clogged lock-up solenoid oil passage. Faulty operation of lock-up piston. Faulty control valve.
7	Is the stall revolution correct in D, 3, 2 and L range? Refer the **STALL TEST** section in this manual.	Go to Step 8	Repair the defect or replace.
8	Is the line pressure correct? Refer the **LINE PRESSURE TEST** section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. B6: Engine Starter Does Not Run in P or N Range
No. B7: Engine Starter Runs Except in P or N Range

Description:

- The engine starter does not run though the P or N range is selected.
- The engine starter runs though the R or D, 3, 2or L range is selected.

Possible Cause:

- Disordered select cable.
- Disordered Inhibitor switch, disconnection or short-circuit of inhibitor switch.

No. B8: Extended Time Lag When Shift Lever is Changed to N to D

Description:

- The shift time lag is longer than standard value when shift lever is changed to N to D.

Possible Cause:

- Forward range line pressure is low.
- Slip of low & reverse clutch.
- Slip of low one-way clutch.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).
- Faulty low clutch duty solenoid operation.
- Shortage or faulty quality of ATF.

No. B9: Extended Time Lag When Shift Lever is Changed to N to R

Description:

- The shift time lag is longer than standard value when shift lever is changed to N to R.

Possible Cause:

- Reverse range line pressure is low.
- Slip of low & reverse brake.
- Slip of reverse clutch.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).
- Faulty low & reverse brake duty solenoid operation.
- Shortage or faulty quality of ATF.

No. B10: Brake is Applied in R Range

Description:

- Brake is applied suddenly in R range.

Diagnosis Hints:

- Basically a trouble in the AT main unit. However, some trouble in the sensor system or output system may have some influence on the trouble in the main unit and therefore these systems should be also checked to prevent reproduce of the trouble.

Possible Cause:

- Seized clutch (low clutch, high clutch, 2-4 brake).
- Shortage or faulty quality of ATF.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).
- Disordered select cable (select indicator light indicates R but the hydraulic system is not in the R range).
- Malfunction of parking mechanism.

No. B11: Insufficient Starting or Shaking in D Range

Description:

- Insufficient starting or shaking in D range.

Possible Cause:

- Slip of clutch (low clutch, low one-way clutch, reverse clutch, low & reverse brake).
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Shortage or faulty quality of ATF.
- Dropped line pressure.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).

No. B12: Noise or Vibration is Generated at Starting

Description:

- Noise or vibration is generated in the vicinity of AT at starting.

Diagnosis Hints:

- Cause other than AT can be also considered. It is effective means to reproduce a running condition using a lift up, chassis dynamo, etc. to investigate the origin (generating condition) of noise and vibration.
  Caution:
  Lifting up some unit to test it accompanies danger. Provide safety measures as far as possible and carry out the test with sufficient care.

Possible Cause:

Following sources of noise or vibration other than the AT can be considered.

- Noise from differential gears.
- Noise from propeller shaft.
- The bearing support in the middle of the propeller shaft has fatigued, and the bend angle of the propeller shaft has changed, causing vibration at the time of start.
- Unbalanced and poor uniformity of tires cause vibration.

No. C1: Engine Race Up (Slip) When Gear is Shifted Up to 1st to 2nd

No. C2: Engine Race Up (Slip) When Gear is Shifted Up to 2nd to 3rd

No. C3: Engine Race Up (slip) When Gear is Shifted Up to 3rd to 4th

No. C4: Engine Race Up (Slip) When Gear is Shift Down or Kick-down to 4th to 3rd

No. C5: Engine Race Up (Slip) When Gear is Shift Down or Kick-down to 4th to 2nd

No. C6: Engine Race Up (Slip) When Gear is Shift Down or Kick-down to 3rd to 2nd

No. C7: Engine Race Up (Slip) When Gear is Shift Down or Kick-down to 4th or 3rd to 1st

No. C8: Engine Race Up (Slip) Others

Description:

- The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted up.
- The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted down or for kick-down during steady run.
- The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted down or for kick-down during steady run.

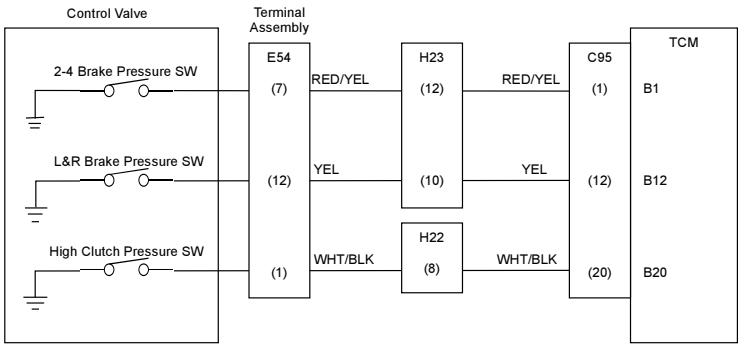
Diagnosis Hints:

- Possibility of slip of clutch is supposed. If slip of clutch has occurred, a DTC of "Gear ratio error" is stored.

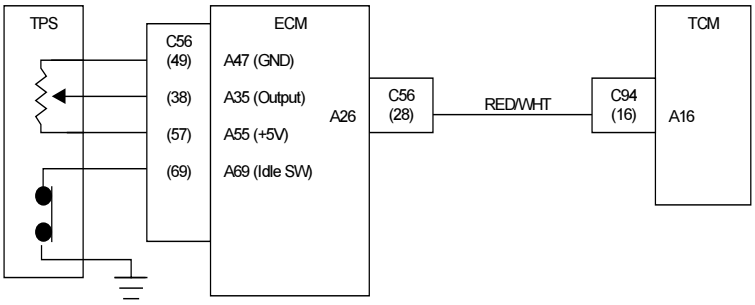
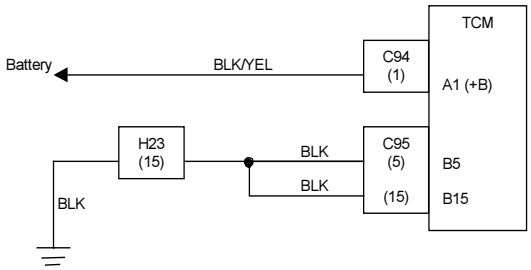
Possible Cause:

- Slip of clutch.
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Dropped line pressure.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).

<table>
<tr><th>Step</th><th>Action</th><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td>Gear ratio trouble diagnosis.
Travel in the following sequence for about 7 seconds or more in each range: Start in the L range (1st) to 2 range (2nd) to 3 range (3rd) to D range (4th) (to detect the gear ratio trouble exactly, this process should be carried out)</td><td>Go to Step 2</td><td>Go to Step 2</td></tr>
<tr><td>2</td><td>Are any DTCs stored?</td><td>Go to DTC Chart</td><td>Go to Step 3</td></tr>
<tr><td>3</td><td>Are the quantity, contamination and smell normal?</td><td>Go to Step 4</td><td>If the ATF level is low, replenish up to the specified level.

If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.</td></tr>
<tr><td>4</td><td>Are the engine speed and other engine system correct?</td><td>Go to Step 5</td><td>Repair the defect or replace.</td></tr>
<tr><td>5</td><td>Inspection of electrical or mechanical fault
Is the signal from each pressure switch changed synchronously?
 

<table>
<tr><th>Range</th><th>TCM terminal / Gear</th><th>B20 (High clutch pressure SW)</th><th>B1 (2-4 brake pressure SW)</th><th>B12 (Low & reverse brake pressure SW)</th></tr>
<tr><td>P</td><td>-</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td>R</td><td>Reverse</td><td>More than 10V</td><td>More than 10V</td><td>-</td></tr>
<tr><td>N</td><td>-</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td>D, 3, 2</td><td>1st</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td></td><td>2nd</td><td>More than 10V</td><td>-</td><td>More than 10V</td></tr>
<tr><td></td><td>3rd</td><td>-</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td></td><td>4th</td><td>-</td><td>-</td><td>More than 10V</td></tr>
<tr><td>L</td><td>1st</td><td>More than 10V</td><td>More than 10V</td><td>-</td></tr>
<tr><td></td><td>2nd</td><td>More than 10V</td><td>-</td><td>More than 10V</td></tr>
<tr><td></td><td>3rd</td><td>-</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td></td><td>4th</td><td>-</td><td>-</td><td>More than 10V</td></tr>
</table></td><td>Go to Step 6</td><td>Repair the defect or replace.</td></tr>
</table>

Step	Action	Yes	No
6	Inspect the output voltage and throttle opening signal of the throttle position sensor using a Tech 2 or circuit tester. Is a voltage value in proportion to the throttle opening output? 	Go to Step 7	Repair the defect or replace.
7	Check of power supply to and earth of TCM. Are the power supply and earth proper? 	Go to Step 8	Check the power source harness and earth harness (bolt tightening to the body).
8	Is the stall revolution correct in D, 3, 2 and L range? Refer the STALL TEST section in this manual.	Go to Step 9	Repair the defect or replace.
9	Is the line pressure correct? Refer the LINE PRESSURE TEST section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. C9: Barking Feel When Gear is Shifted Up to 1st to 2nd
No. C10: Barking Feel When Gear is Shifted Up to 2nd to 3rd
No. C11: Barking Feel When Gear is Shifted Up to 3rd to 4th

Description:

- Brake feeling appears when the accelerator pedal is stepped on for acceleration and the gear is shifted up.

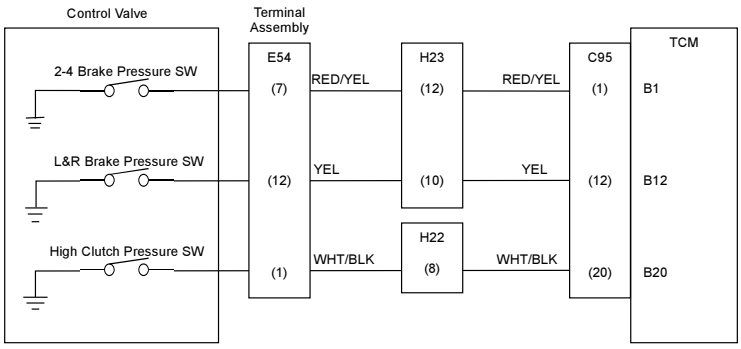
Diagnosis Hints:

- Possibility of slip of clutch is supposed. If slip of clutch has occurred, a DTC of "Gear ratio error" is stored.

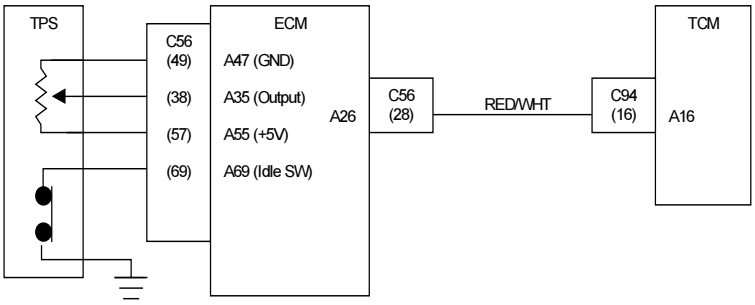
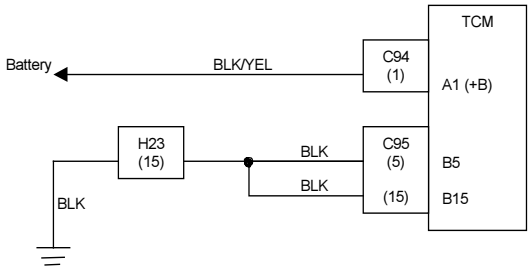
Possible Cause:

- Slip of clutch.
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Dropped line pressure.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).

<table>
<tr><th>Step</th><th>Action</th><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td>Gear ratio trouble diagnosis.
Travel in the following sequence for about 7 seconds or more in each range: Start in the L range (1st) to 2 range (2nd) to 3 range (3rd) to D range (4th) (to detect the gear ratio trouble exactly, this process should be carried out)</td><td>Go to Step 2</td><td>Go to Step 2</td></tr>
<tr><td>2</td><td>Are any DTCs stored?</td><td>Go to DTC Chart</td><td>Go to Step 3</td></tr>
<tr><td>3</td><td>Are the quantity, contamination and smell normal?</td><td>Go to Step 4</td><td>If the ATF level is low, replenish up to the specified level.

If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.</td></tr>
<tr><td>4</td><td>Are the engine speed and other engine system correct?</td><td>Go to Step 5</td><td>Repair the defect or replace.</td></tr>
<tr><td>5</td><td>Inspection of electrical or mechanical fault
Is the signal from each pressure switch changed synchronously?
 

<table>
<tr><th>Range</th><th>TCM terminal / Gear</th><th>B20 (High clutch pressure SW)</th><th>B1 (2-4 brake pressure SW)</th><th>B12 (Low & reverse brake pressure SW)</th></tr>
<tr><td>P</td><td>-</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td>R</td><td>Reverse</td><td>More than 10V</td><td>More than 10V</td><td>-</td></tr>
<tr><td>N</td><td>-</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td rowspan="4">D, 3, 2</td><td>1st</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td>2nd</td><td>More than 10V</td><td>-</td><td>More than 10V</td></tr>
<tr><td>3rd</td><td>-</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td>4th</td><td>-</td><td>-</td><td>More than 10V</td></tr>
<tr><td rowspan="4">L</td><td>1st</td><td>More than 10V</td><td>More than 10V</td><td>-</td></tr>
<tr><td>2nd</td><td>More than 10V</td><td>-</td><td>More than 10V</td></tr>
<tr><td>3rd</td><td>-</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td>4th</td><td>-</td><td>-</td><td>More than 10V</td></tr>
</table></td><td>Go to Step 6</td><td>Repair the defect or replace.</td></tr>
</table>

Step	Action	Yes	No
6	Inspect the output voltage and throttle opening signal of the throttle position sensor using a Tech 2 or circuit tester. Is a voltage value in proportion to the throttle opening output? 	Go to Step 7	Repair the defect or replace.
8	Check of power supply to and earth of TCM. Are the power supply and earth proper? 	Go to Step 9	Check the power source harness and earth harness (bolt tightening to the body).
9	Is the stall revolution correct in D, 3, 2 and L range? Refer the STALL TEST section in this manual.	Go to Step 10	Repair the defect or replace.
10	Is the line pressure correct? Refer the LINE PRESSURE TEST section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. C12: Large Shock When Gear is Shifted to 1st to 2nd or 2nd to 1st
No. C13: Large Shock When Gear is Shifted to 2nd to 3rd or 3rd to 2nd
No. C14: Large Shock When Gear is Shifted to 3rd to 4th or 4th to 3rd
No. C15: Large Shock When Kick-down
No. C16: Large Shock When No Acceleration
No. C17: Large Shock When Gear is Shifted Down to 2nd to 1st in L Range
No. C18: Large Shock (Other)
No. C19: Large Shock When Vehicle Speed is Downed by No Accelerator Pedal or Vehicle is Stopped

Description:

- Large shock is felt when the accelerator pedal is stepped on for acceleration and the gear is shifted up or down.
- Large shock is felt when the accelerator pedal is stepped on for kick-down.
- Large shock is felt when the accelerator pedal is not stepped on.
- Large shock is felt when the shift lever is selected in L range.

Diagnosis Hints:

- Basically same causes as "No. C1 - C8: Engine races up (slip)" are considered.

No. C20: Large lock-up shock

Description:

- Large shock is felt at lock-up.

Diagnosis Hints:

- Out of properties of input sensor or faulty lock-up piston pressure system are considered.
- Trouble diagnosis flow is basically the same as "No. I1: No lock-up".

No. C21: Shift Down or Engine Over-run When The Accelerator Pedal is Stepped on in 4th Gear

Description:

- Shift down or engine over-run above the kick-down area.

Diagnosis Hints:

- Basically same causes as "No. C1 - C8: Engine races up (slip)" are considered.

No. D1: Faulty Gear Shifting (Different from Shift Pattern)

Description:

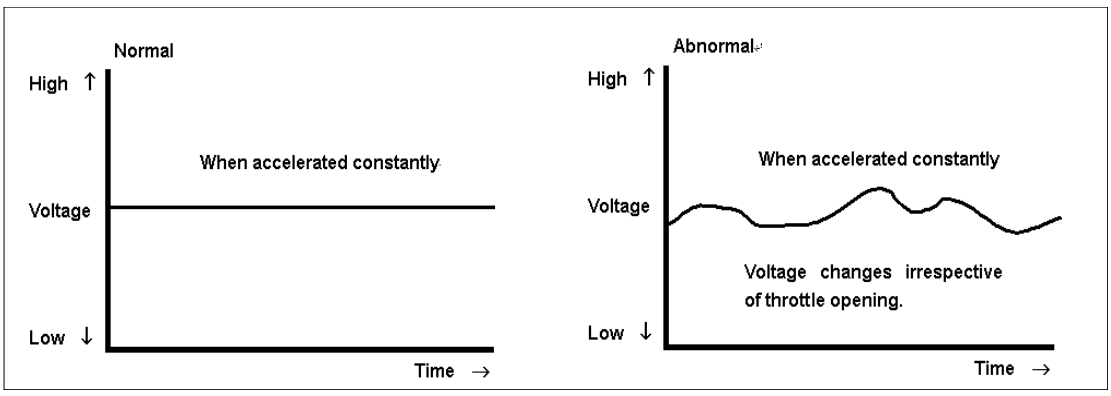
- Gear is shifted, different from the specified shift pattern.

Diagnosis Hints:

- When inspecting faulty gear shifting, it is important to distinguish between the fault of electric system and mechanical system (AT main unit).
- Fault of electric system.
  Monitor the output signal (each solenoid driving signal) using with Tech 2. If a trouble signal is sent to the solenoid synchronously with the faulty gear shifting, the fault is originated in the electric system.
  Monitor the input signal (signal from each sensor) using with Tech 2 and find an input signal by which the output signal (each solenoid driving signal) is subjected to fault.
  Fault of the electric system may be derived from temperature or vibration. For instance, though the engine is normal while it is cold, fault may occur when the engine is warmed up or vehicle is running.
- Fault of mechanical system.
  If the gear is incorrectly shifted irrespective of operating signal (ON-OFF) of each solenoid, the faulty is originated from the machine system (AT).
  If the clutch slips, ATF smells burnt, contaminated to be black or the stall speed increases.

Possible Cause:

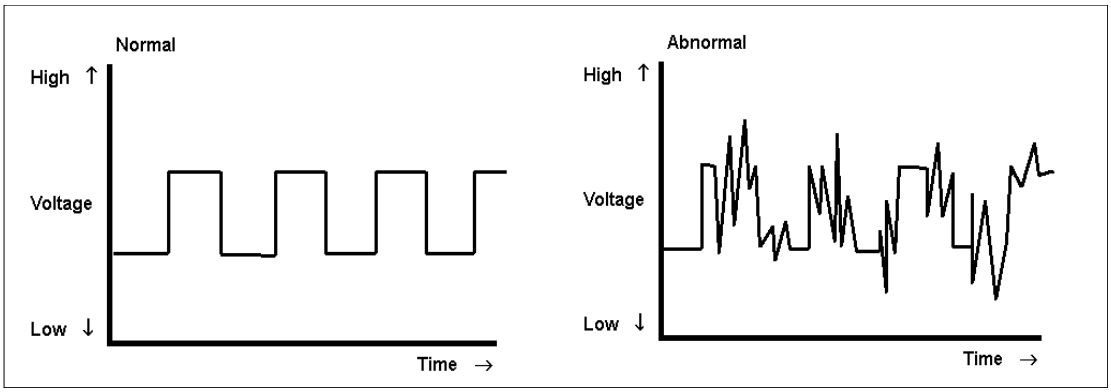
- Disordered select cable.
- Disordered inhibitor switch.
- Slip of clutch.
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- **Fixing at 3rd position (fail-safe activated)**
  Since the gear is fixed at the 3rd position because of the fail-safe function, a trouble that "Faulty gear shifting" is resulted. In this case, the DTC is memorized.
  When TCM stops operation because of faulty TCM ground, the gear is fixed at the 3rd position because of a mechanical reason. In this case, no DTC is memorized.
- **Incorrect properties of throttle opening signal (serial communication) of throttle position sensor.**
  The throttle opening signal which is sent by serial communication from ECM and TCM is an important signal for gear shifting. In case of ECM fault or when the throttle position sensor does not issue voltage signal according to the throttle opening, the gear is not shifted by stepping over the accelerator.
  If the output voltage of the throttle position sensor changes freely even though the throttle opening is constant, the gear is shifted incorrectly.



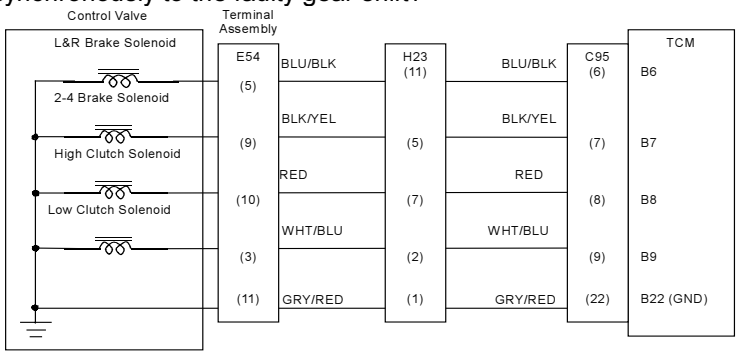
- **Faulty speed sensor.**

When signal from the speed sensor becomes out of order, it may be judged a result of changed vehicle speed and faulty gear shifting may be the causes.

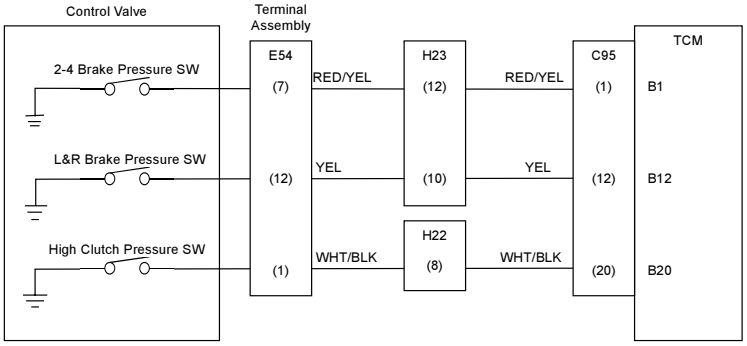
- **Trouble in control valve body (faulty operation, sticking, clogged oil passage)**



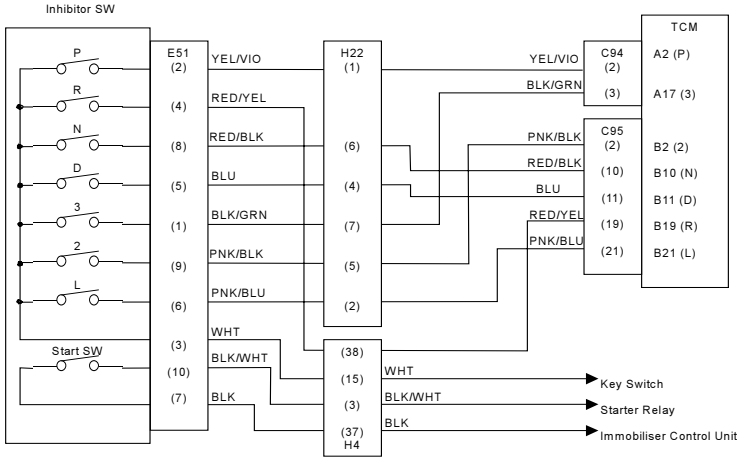
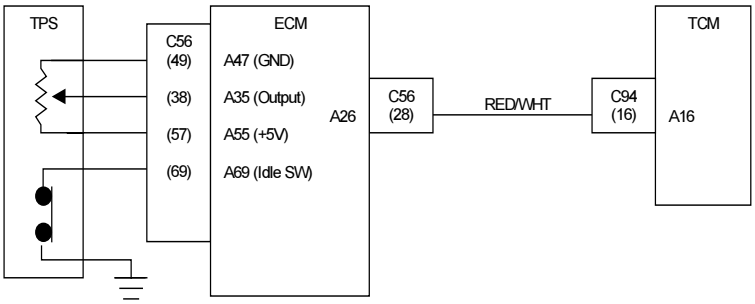
Step	Action	Yes	No
1	Dislocation or disordered of select lever. Does the vehicle move when the brake is released in a position other than the P range and the vehicle is pushed?	Go to Step 2	Adjust the select cable.
2	Gear ratio trouble diagnosis. Travel in the following sequence for about 7 seconds or more in each range: Start in the L range (1st) to 2 range (2nd) to 3 range (3rd) to D range (4th) (to detect the gear ratio trouble exactly, this process should be carried out)	Go to Step 3	Go to Step 3
3	Are any DTCs stored?	Go to DTC Chart	Go to Step 4
4	Are the quantity, contamination and smell normal?	Go to Step 5	If the ATF level is low, replenish up to the specified level. If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed.

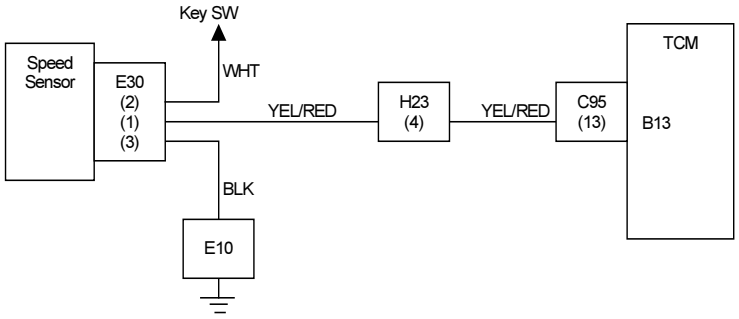
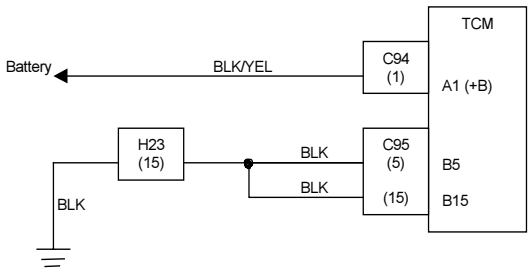
<table>
<tr><th>Step</th><th>Action</th><th>Yes</th><th>No</th></tr>
<tr>
<td>5</td>
<td>Inspection of electrical or mechanical fault
Is signal to each solenoid and pressure switch changed synchronously to the faulty gear shift?


<table>
<tr><th>Range</th><th>TCM terminal / Gear</th><th>B8 (High clutch solenoid)</th><th>B9 (Low clutch solenoid)</th><th>B7 (2-4 brake solenoid)</th><th>B6 (Low & reverse brake solenoid)</th></tr>
<tr><td>P</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>Approx. 6.2V (AC range)</td></tr>
<tr><td>R</td><td>Reverse</td><td>Approx. 6.8V (AC range)</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>-</td></tr>
<tr><td>N</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>Approx. 6.8V (AC range)</td></tr>
<tr><td>D, 3, 2</td><td>1st</td><td>Approx. 6.8V (AC range)</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>Approx. 6.8V (AC range)</td></tr>
<tr><td></td><td>2nd</td><td>Approx. 6.8V (AC range)</td><td>-</td><td>-</td><td>Approx. 6.8V (AC range)</td></tr>
<tr><td></td><td>3rd</td><td>-</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>Approx. 6.8V (AC range)</td></tr>
<tr><td></td><td>4th</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>-</td><td>Approx. 6.8V (AC range)</td></tr>
<tr><td>L</td><td>1st</td><td>Approx. 6.8V (AC range)</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>-</td></tr>
<tr><td></td><td>2nd</td><td>Approx. 6.8V (AC range)</td><td>-</td><td>-</td><td>Approx. 6.8V (AC range)</td></tr>
<tr><td></td><td>3rd</td><td>-</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>Approx. 6.8V (AC range)</td></tr>
<tr><td></td><td>4th</td><td>-</td><td>Approx. 6.8V (AC range)</td><td>-</td><td>Approx. 6.8V (AC range)</td></tr>
</table>



<table>
<tr><th>Range</th><th>TCM terminal / Gear</th><th>B20 (High clutch pressure SW)</th><th>B1 (2-4 brake pressure SW)</th><th>B12 (Low & reverse brake pressure SW)</th></tr>
<tr><td>P</td><td>-</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td>R</td><td>Reverse</td><td>More than 10V</td><td>More than 10V</td><td>-</td></tr>
<tr><td>N</td><td>-</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td>D, 3, 2</td><td>1st</td><td>More than 10V</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td></td><td>2nd</td><td>More than 10V</td><td>-</td><td>More than 10V</td></tr>
<tr><td></td><td>3rd</td><td>-</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td></td><td>4th</td><td>-</td><td>-</td><td>More than 10V</td></tr>
<tr><td>L</td><td>1st</td><td>More than 10V</td><td>More than 10V</td><td>-</td></tr>
<tr><td></td><td>2nd</td><td>More than 10V</td><td>-</td><td>More than 10V</td></tr>
<tr><td></td><td>3rd</td><td>-</td><td>More than 10V</td><td>More than 10V</td></tr>
<tr><td></td><td>4th</td><td>-</td><td>-</td><td>More than 10V</td></tr>
</table>
</td>
<td>Go to Step 6</td>
<td>In case of fault in the machine system, repair that portion or replace the unit.
Slip of clutch or fault of control valve.</td>
</tr>
</table>

Step	Action	Yes	No
6	Inspection of inhibitor switch using a Tech 2 or circuit tester. Inspect the output voltage and throttle opening signal of the throttle position sensor using a Tech 2 or circuit tester.  TCM terminal / Range A2 B19 B10 B11 B17 B2 B21 P: Battery voltage - - - - - - R: - Battery voltage - - - - - N: - - Battery voltage - - - - D: - - - Battery voltage - - - 3: - - - - Battery voltage - - 2: - - - - - Battery voltage - L: - - - - - - Battery voltage	Go to Step 7	Adjust the inhibitor switch.
7	Is a voltage value in proportion to the throttle opening output?  	Go to Step 8	Repair the defect or replace.

Step	Action	Yes	No
8	Inspect the output signal of the speed sensor using a Tech 2 or circuit tester. Is the data display in the Tech 2 correct or output voltage correct in the circuit tester?  TCM terminal / Condition: 20km/h at L range in 1st gear — B13: Approx. 6.2V (AC range)	Go to Step 9	Repair the defect or replace.
9	Check of power supply to and earth of TCM. Are the power supply and earth proper? 	Go to Step 10	Check the power source harness and earth harness (bolt tightening to the body).
10	Is the stall revolution correct in D, 3, 2 and L range? Refer the STALL TEST section in this manual.	Go to Step 11	Repair the defect or replace.
11	Is the line pressure correct? Refer the LINE PRESSURE TEST section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. D2: Gear is Shifted Frequently

Description:

- Gear is shifted down immediately though the accelerator pedal is stepped on a little in D, 3, 2, or L range.

Diagnosis Hints:

- Basically, the same cause as "No. D1: Faulty gear shifting" is considered. However, as possible cause, fault input signal of throttle position sensor or speed sensor, fault input signal of inhibitor switch, or fault of TCM power source, earth, ground return wire are considered first.
- Then, slip of the clutch, fault of the control valve are considered.

No. D3: Gear Shift Point is Low or High at All Point
No. D4: Gear Shift Point is Low or High at Limited Point

Description:

- Gear shift point is deviated from the shift diagram.
- Gear is not shifted up properly though the vehicle is accelerated.
- Gear is not shifted immediately and enough acceleration cannot be obtained though the accelerator pedal is stepped on.

Diagnosis Hints:

- If the cause is not faulty gear shift, throttle position sensor disordered or fault input of speed sensor is considered. Output signal of the throttle position sensor is changed to linear one.
  (Refer the paragraph about the faulty throttle position sensor of "No. D1: Faulty gear shifting".)

No. D5: No Kick-down

Description:

- The engine speeds up but vehicle speed does not increase when the accelerator pedal is stepped on at the starting.

Diagnosis Hints:

- When the gear shift is normal only without kick-down, possibility of fault of the throttle position sensor. Check that the throttle voltage increases linearly in proportion to the throttle opening.
  (Refer the paragraph about the faulty throttle position sensor of "No. D1: Faulty gear shifting".)

No. E1: No Gear Shift

Description:

- Range is fixed without shifting the gear of 1st to 2nd, 2nd to 3rd, and 3rd to 4th.
- Gear may be shifted or may not be shifted.

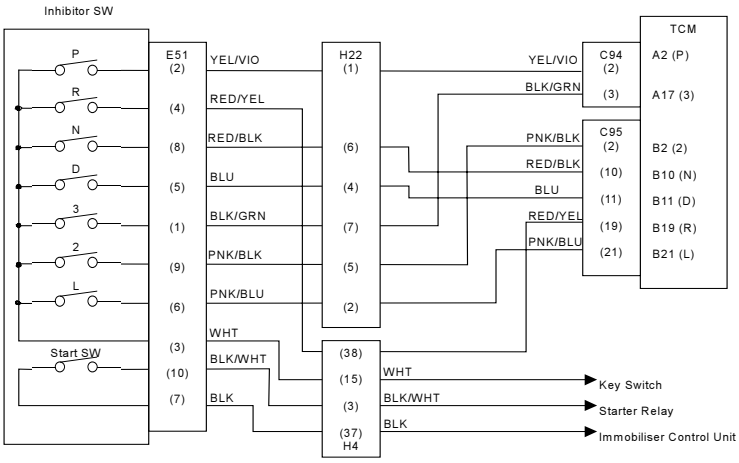
Diagnosis Hints:

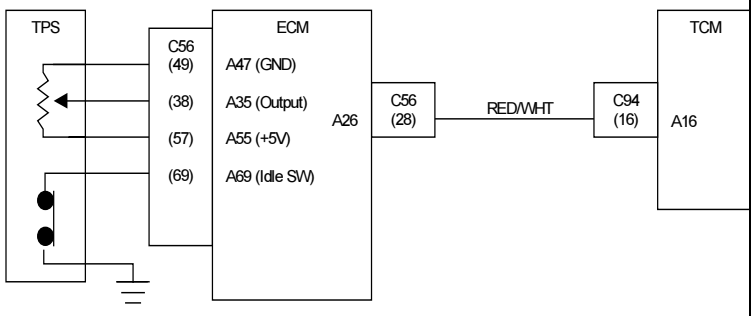
- Fixing at some gear speed, signal error from throttle position sensor or trouble in the AT main unit are supposed.

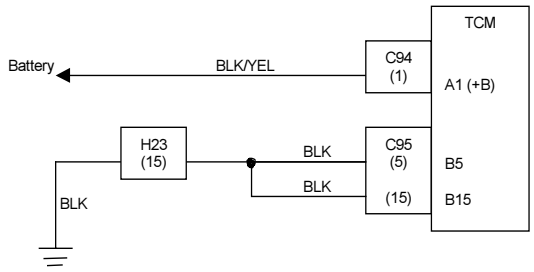
Possible Cause:

- Slip of clutch (low clutch, high clutch and 2-4 brake).
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Dropped line pressure.
- **Fixing at 3rd position (fail-safe activated).**
  Since the gear is fixed at the 3rd position because of the fail-safe function, a trouble that "No gear shift" is resulted. In this case, the DTC is memorized.
  When TCM stops operation because of faulty TCM ground, the gear is fixed at the 3rd position because of a mechanical reason. In this case, no DTC is memorized.
- **Incorrect properties of throttle opening signal (serial communication) of throttle position sensor.**
  Throttle opening signal (serial communication) of the throttle position sensor does not change in proportion to the throttle opening. In this case, fixing at the high or low gear results in such a trouble that "No Gear Shift".
- Trouble in control valve body (faulty operation, sticking, clogged oil passage)

Step	Action	Yes	No
1	Gear ratio trouble diagnosis. Travel in the following sequence for about 7 seconds or more in each range: Start in the L range (1st) to 2 range (2nd) to 3 range (3rd) to D range (4th) (to detect the gear ratio trouble exactly, this process should be carried out).	Go to Step 2	Go to Step 2
2	Are any DTCs stored?	Go to DTC Chart	Go to Step 3
3	Are the quantity, contamination and smell normal?	Go to Step 4	If the ATF level is low, replenish up to the specified level. If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.

<table>
<tr><th>Step</th><th>Action</th><th>Yes</th><th>No</th></tr>
<tr><td>4</td><td>Inspection of inhibitor switch using a Tech 2 or circuit tester.
When the select lever is operated, is the data display in the Tech 2 correct or voltage at each range correct?
 

<table>
<tr><th>TCM terminal / Range</th><th>A2</th><th>B19</th><th>B10</th><th>B11</th><th>B17</th><th>B2</th><th>B21</th></tr>
<tr><td>P</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>R</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>N</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>D</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td></tr>
<tr><td>L</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td></tr>
</table></td><td>Go to Step 5</td><td>Adjust the inhibitor switch.</td></tr>
<tr><td>5</td><td>Inspect the output voltage and throttle opening signal of the throttle position sensor using a Tech 2 or circuit tester.
Is a voltage value in proportion to the throttle opening output?
 
</td><td>Go to Step 6</td><td>Repair the defect or replace.</td></tr>
</table>

Step	Action	Yes	No
6	Check of power supply to and earth of TCM. Are the power supply and earth proper? 	Go to Step 7	Check the power source harness and earth harness (bolt tightening to the body).
7	Inspection of speed sensor and turbine sensor Have the speed sensor and turbine sensor failed at the same time? (No DTC is stored at the time of trouble)	Repair the defect or replace.	Go to Step 8
8	Is the stall revolution correct in D, 3, 2 and L range? Refer the STALL TEST section in this manual.	Go to Step 9	Repair the defect or replace.
9	Is the line pressure correct? Refer the LINE PRESSURE TEST section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. E2: Only 4th gear (O/D) is Not Selectable

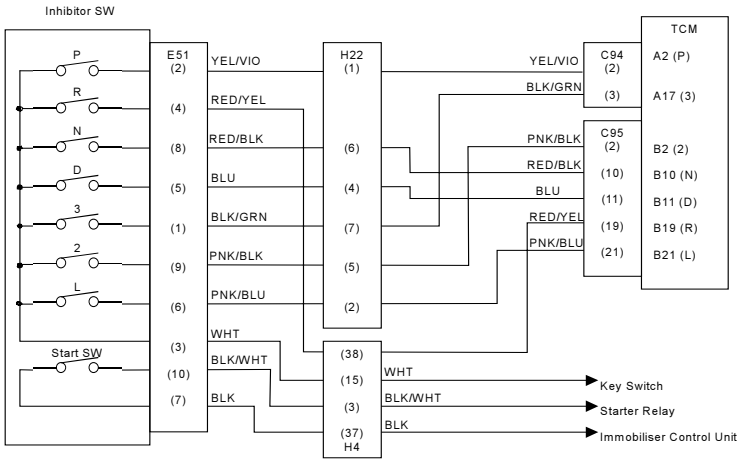
Description:

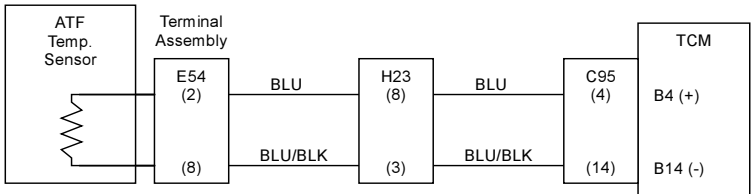
- Gear is not shifted up from 3rd to 4th though the vehicle is accelerated.

Possible Cause:

- Disordered select cable.
- Disordered inhibitor switch.
- ATF thermo sensor detects low oil temperature (4th gear is prohibited temperature less than 10°C.).
- Clogged oil passage of low clutch duty solenoid.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).

Step	Action	Yes	No
1	Dislocation or disordered of select lever. Does the vehicle move when the brake is released in a position other than the P range and the vehicle is pushed?	Go to Step 2	Adjust the select cable.
2	Gear ratio trouble diagnosis. Travel in the following sequence for about 7 seconds or more in each range: Start in the L range (1st) to 2 range (2nd) to 3 range (3rd) to D range (4th) (to detect the gear ratio trouble exactly, this process should be carried out)	Go to Step 3	Go to Step 3
3	Are any DTCs stored?	Go to DTC Chart	Go to Step 4
4	Are the quantity, contamination and smell normal?	Go to Step 5	If the ATF level is low, replenish up to the specified level. If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.

<table>
<tr><th>Step</th><th>Action</th><th>Yes</th><th>No</th></tr>
<tr><td>5</td><td>Inspection of inhibitor switch using a Tech 2 or circuit tester.
When the select lever is operated, is the data display in the Tech 2 correct or voltage at each range correct?
 

<table>
<tr><th>TCM terminal / Range</th><th>A2</th><th>B19</th><th>B10</th><th>B11</th><th>B17</th><th>B2</th><th>B21</th></tr>
<tr><td>P</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>R</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>N</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>D</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td></tr>
<tr><td>L</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td></tr>
</table></td><td>Go to Step 6</td><td>Adjust the inhibitor switch.</td></tr>
<tr><td>6</td><td>Inspection of ATF oil thermo sensor.
Is the ATF oil temperature sensor terminal voltage correct?
After running using the Tech 2 data display function, is the ATF temperature higher than 10°C?
 

<table>
<tr><th>TCM terminal / Temperature</th><th>B4 (Output voltage)</th></tr>
<tr><td>20 ℃</td><td>1.55</td></tr>
<tr><td>40 ℃</td><td>1.08</td></tr>
<tr><td>60 ℃</td><td>0.7</td></tr>
</table></td><td>Go to Step 7</td><td>Repair the defect or replace.</td></tr>
<tr><td>7</td><td>Is the stall revolution correct in D, 3, 2 and L range? Refer the STALL TEST section in this manual.</td><td>Go to Step 8</td><td>Repair the defect or replace.</td></tr>
</table>

Step	Action	Yes	No
8	Is the line pressure correct? Refer the LINE PRESSURE TEST section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. E3: Gear is Shifted 2nd to 3rd in 2 Range
No. E4: Gear is Shifted 1st to 2nd in L Range
No. E5: Gear is Shifted 3rd to 4th in 3 Range

Description:

- Gear is shifted 2nd to 3rd in 2 range
- Gear is shifted 1st to 2nd in L range
- Gear is shifted 3rd to 4th in 3 range

Possible Cause:

- Disordered select cable.
- Disordered inhibitor switch.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).

No. F1: Low Maximum Speed or Poor Acceleration

Description:

- Starting acceleration is poor.
- Acceleration is slow though the accelerator pedal is stepped on during the running.

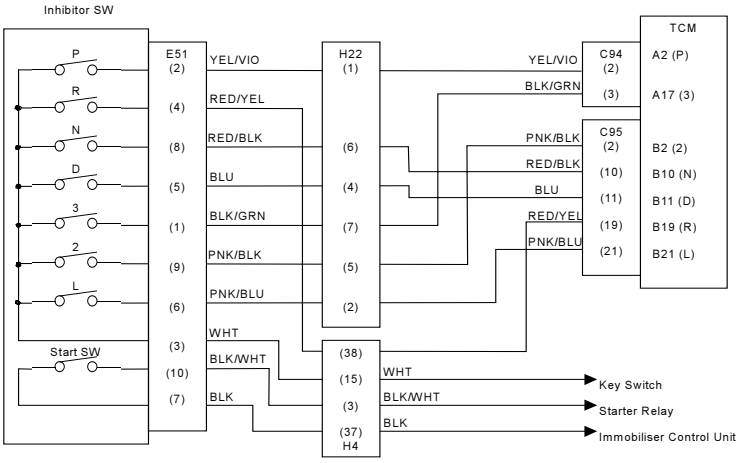
Diagnosis Hints:

- In addition to the low engine output, faulty gear shifting of AT or fixing at the 3rd position may be possible. Therefore, in case of such a trouble that "maximum speed is low, and acceleration is poor", it should be cleared up whether the trouble is originated from the engine system of AT system by a running test, inspection of stall revolution, etc.

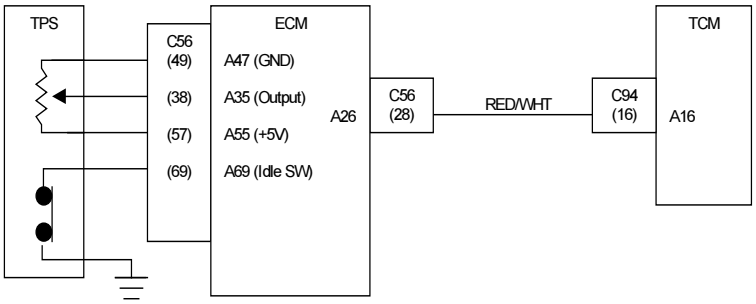
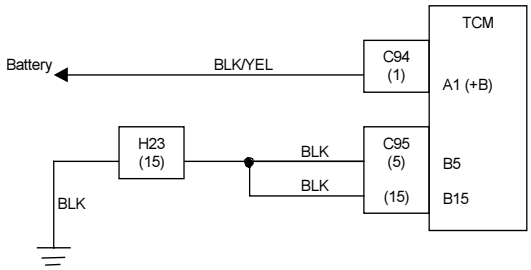
Possible Cause:

- Clogged air cleaner, out of injection timing, dropped compression pressure, etc.
- **Fixing at 3rd position (fail-safe activated).**
  Since the gear is fixed at the 3rd position because of the fail-safe function, a trouble that "Maximum speed is low, and acceleration is poor" is resulted. In this case, the DTC is memorized.
  When TCM stops operation because of faulty TCM ground, the gear is fixed at the 3rd position because of a mechanical reason. In this case, no DTC is memorized.
- Disordered inhibitor switch .
- **Incorrect properties of throttle opening signal (serial communication) of throttle position sensor.**
  Throttle opening signal (serial communication) of the throttle position sensor does not change in proportion to the throttle opening. In this case, fixing at the high or low gear results in such a trouble that "Maximum Speed is Low and Acceleration is Poor".
- Slip of clutch (low clutch, high clutch).
- If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Dropped line pressure.
- Trouble in the torque converter system (faulty operation).

Step	Action	Yes	No
1	Test Drive. Is the gear smoothly shifted in the order of 1st to 2nd, 2nd to 3rd, 3rd to 4th gear and lock up?	Clogged air cleaner, out of injection timing, dropped compression pressure, etc.	Go to Step 2
2	Gear ratio trouble diagnosis. Travel in the following sequence for about 7 seconds or more in each range: Start in the L range (1st) to 2 range (2nd) to 3 range (3rd) to D range (4th) (to detect the gear ratio trouble exactly, this process should be carried out)	Go to Step 3	Go to Step 3
3	Are any DTCs stored?	Go to DTC Chart	Go to Step 4

<table>
<tr><th>Step</th><th>Action</th><th>Yes</th><th>No</th></tr>
<tr><td>4</td><td>Are the quantity, contamination and smell normal?</td><td>Go to Step 5</td><td>If the ATF level is low, replenish up to the specified level.
If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.</td></tr>
<tr><td>5</td><td>Inspection of inhibitor switch using a Tech 2 or circuit tester.
When the select lever is operated, is the data display in the Tech 2 correct or voltage at each range correct?
 

<table>
<tr><th>TCM terminal / Range</th><th>A2</th><th>B19</th><th>B10</th><th>B11</th><th>B17</th><th>B2</th><th>B21</th></tr>
<tr><td>P</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
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<tr><td>N</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>D</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td><td>-</td></tr>
<tr><td>L</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Battery voltage</td></tr>
</table></td><td>Go to Step 6</td><td>Adjust the inhibitor switch.</td></tr>
</table>

Step	Action	Yes	No
6	Inspect the output voltage and throttle opening signal of the throttle position sensor using a Tech 2 or circuit tester. Is a voltage value in proportion to the throttle opening output? 	Go to Step 7	Repair the defect or replace.
7	Check of power supply to and earth of TCM. Are the power supply and earth proper? 	Go to Step 8	Check the power source harness and earth harness (bolt tightening to the body).
8	Is the stall revolution correct in D, 3, 2 and L range? Refer the STALL TEST section in this manual.	Go to Step 6	Repair the defect or replace.
9	Is the line pressure correct? Refer the LINE PRESSURE TEST section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. F2: Engine Races Up During Acceleration (Slip)

Description:

- The engine speed up when the accelerator pedal is stepped on for acceleration and the gear is shifted up or down.
- Only the engine speeds up but vehicle speed does not increase when the accelerator pedal is stepped on for acceleration during the running.

Diagnosis Hints:

- Basically same causes as **"No. C1 - C8: Engine races up (slip) by shift up or shift down"** are considered. When the condition of No. C1-C8 grows worse, symptom of No. F2 results.

No. F3: Noise or Vibration During the Running in R, D, 3, 2 or L Range

Description:

- Noise or vibration is generated in the vicinity of AT during the running.

Diagnosis Hints:

- Cause other than AT can be also considered. It is effective means to reproduce a running condition using a lift up, chassis dynamo, etc. to investigate the origin (generating condition) of noise and vibration.
  Caution:
  Lifting up some unit to test it accompanies danger. Provide safety measures as far as possible and carry out the test with sufficient care.

Possible Cause:

Following sources of noise or vibration other than the AT can be considered.

- Noise from differential gears.
- Noise from propeller shaft.
- The bearing support in the middle of the propeller shaft has fatigued, and the bend angle of the propeller shaft has changed, causing vibration at the time of start.
- Unbalanced and poor uniformity of tires cause vibration.

No. F4: Engine Brake Does Not Apply in L Range

Description:

- The engine brake does not apply, allowing the vehicle to run freely when the accelerator pedal is released at low speed in L range.

Possible Cause:

- Slip of clutch (low & reverse brake)
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Faulty input/output signal system.
  Low & reverse brake duty solenoid
- Faulty control valve (faulty operation, sticking).

No. F5: Engine Stalls Before Vehicle Stops from Running

Description:

- The engine stalls simultaneously with the vehicle stop when the brake pedal is stepped on to stop the vehicle during the running.

Possible Cause:

- Trouble on the engine system side (fuel injection control, engine speed control, etc.) is considered.
- Refer to **"No. B5: Engine stalls when selecting from N range to R, D, 3, 2 or L range".**

No. G1: Vehicle Moves in P Range or Parking Gear is Not Disengaged other than P Range

Description:

- Vehicle moves though it stops at a slope and P range is selected.
- The engine stalls and vehicle does not move though other than P range is selected and the accelerator pedal is stepped on.

Possible Cause:

- Trouble of the parking mechanism (noise or shock may result).
- Disordered selector cable (only when traveling in the P range).
- If the vehicle moves in the N range, follow the procedure of **"No. B1: Vehicle runs in N range".**

No. G2: Creep Force is Large

Description:

- Vehicle accelerates in D, 3, 2, L, and R ranges though the accelerator pedal is not stepped on.

Possible Cause:

- Too high engine idling speed (not attributable to AT).

No. G3: Creep Force is small

Description:

- Vehicle does not move though a run range is selected on a flat road during the idling.

Diagnosis Hints:

- When the creep force is small in all ranges, low engine output is considered. Another possible cause is slip of clutch. If the creep is normal only in the R range, operation of the fail-safe function due to a trouble in the electrical system is considered.

Possible Cause:

- Slip of clutch (low clutch).
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Low engine output (low idling speed, out of injection timing, lowered compression pressure, etc.).
- Shortage or faulty quality of ATF.
- Disconnection or short circuit of solenoid valve output.
- Clogged oil passage of solenoid valve output.
- Faulty ground return line in AT assembly.
  If the ground return line earth is faulty, clutch pressure may decrease causing slip of the clutch.
- Trouble in the torque converter system (faulty operation).

Step	Action	Yes	No
1	Gear ratio trouble diagnosis. Travel in the following sequence for about 7 seconds or more in each range: Start in the L range (1st) to 2 range (2nd) to 3 range (3rd) to D range (4th) (to detect the gear ratio trouble exactly, this process should be carried out)	Go to Step 2	Go to Step 2
2	Are any DTCs stored?	Go to DTC Chart	Go to Step 3
3	Are the quantity, contamination and smell normal?	Go to Step 4	If the ATF level is low, replenish up to the specified level. If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.
4	Are the idling speed and other engine system normal?	Go to Step 5	Repair the defect or replace.
5	Is the stall revolution normal in D, 3, 2 and L range? Refer the **STALL TEST** section in this manual.	Go to Step 6	Repair the defect or replace.
6	Is the line pressure normal? Refer the **LINE PRESSURE TEST** section in this manual.	Trouble in the AT assembly or control valve.	Repair the defect or replace.

No. G4: Large Noise During Idling with the Vehicle in Stop State

Description:

- The transmission is noisy during the idling speed in all ranges.

Diagnosis Hints:

- Causes such as solenoid operating sound or faulty oil pump are considered.
- Distinguishing to some extent is possible by stopping the solenoid operation temporarily, checking the correlation for the former case and, changing the line pressure and confirming the correlation with noise.
- As a matter of course, noise may be generated around the engine, for instance, other than the AT and should be checked carefully.

  Note:

  When the noise is generated only at the time of gear shift, it may be the sound of flowing ATF or gear noise. If the sound varies depending on the gear speed to be shifted, it may be the gear noise generated from the planetary gear and its related components. If the sound varies depending on the vehicle speed, it may be the gear noise of the output system, and if varying depending on the engine speed, it may be the gear noise of the input system or faulty torque converter.

  In either case, sound may be "noise" depending on the origin and resonance object. When the object generating the sound (resonance object) and the sound source (vibration source) are different, investigation of the cause may be difficult.

No. H1: Judder Occurs at the Lock-up

Diagnosis Hints:

・The vehicle body judders at lock-up.

Diagnosis Hints:

・Slip due to burning of the lockup piston or insufficient fastening due to dropped working pressure are considered. Trouble diagnosis flow is basically the same as **"No. I1: No lock-up"**.

Note:

When the lock-up piston has burnt, foreign material mixed in the oil cooler is considered. In such a case, inspect the oil cooler circuit for clogging of the oil cooler.

No. H2: Large Lock-up Shock
No. H3: Lock-up Point is High or Low

Description:

- Large shock is felt at lock-up.
- Lock-up point is excessive high or low.

Diagnosis Hints:

- Out of properties of input sensor or faulty lock-up piston pressure system are considered.
- Trouble diagnosis flow is basically the same as **"No. I1: No lock-up"**.

No. I1: No Lock-up

Description:

- Lockup is not performed in spite of the lock-up area.

Diagnosis:

- Lockup is not performed in spite of the lock-up area.
- Monitor the signal to the lock-up solenoid while carrying out a running test.
- When the output signal to the lock-up solenoid is correctly sent causing no lock-up, clogged lock-up solenoid oil passage or malfunction of the lock-up piston may be considered.
- Even the lock-up area, the output signal to the lock-up solenoid is not sent, fault of the ATF thermo sensor controlling the lockup is considered. (Lock-up is not operated at ATF temperature less than 11 ° C or more than 128°C.)

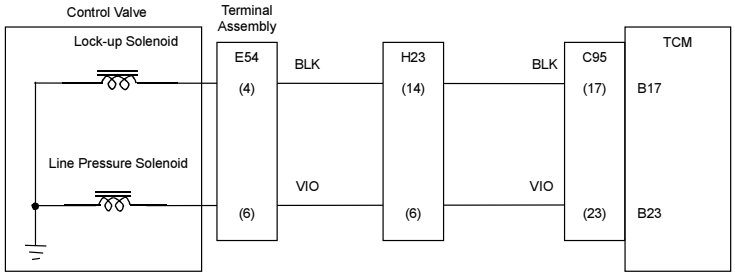
  Note:

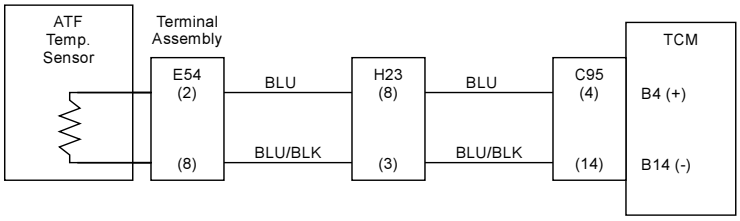
  When the lock-up piston has burnt, foreign material mixed in the oil cooler is considered. In such a case, inspect the oil cooler circuit for clogging of the oil cooler

Possible Cause:

- ATF thermo sensor detects low oil temperature (Lock-up is prohibited temperature less than 10°C.).
- Clogged oil passage of lock-up duty solenoid.
- Trouble in control valve body (faulty operation, sticking, clogged oil passage).

Step	Action	Yes	No
1	Are any DTCs stored?	Go to DTC Chart	Go to Step 2
2	Are the quantity, contamination and smell normal?	Go to Step 3	If the ATF level is low, replenish up to the specified level. If ATF is extremely black and contaminated and smells burnt, slip of the clutch is supposed. Overhaul the AT unit.

<table>
<tr><th>Step</th><th>Action</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>Inspection of electrical or mechanical fault
When the ATF oil temperature is above 20°C and the vehicle speed is 80km/h, is ON signal issued to the lock-up solenoid using the Tech 2 or circuit tester?
 

<table>
<tr><th>TCM terminal / Lock-up</th><th>B17</th></tr>
<tr><td>At lock-up</td><td>Approx. 7.2 V (AC range)</td></tr>
<tr><td>At unlock-up</td><td>Approx. 4.0 V (AC range)</td></tr>
</table></td><td>Clogged oil passage of lock-up solenoid or faulty operation of lock-up piston.</td><td>Go to Step 4</td></tr>
<tr><td>4</td><td>Inspection of ATF oil thermo sensor.
Is the ATF oil temperature sensor terminal voltage correct?
After running using the Tech 2 data display function, is the ATF temperature higher than 10°C?
 

<table>
<tr><th>TCM terminal / Temperature</th><th>B4 (Output voltage)</th></tr>
<tr><td>20 ℃</td><td>1.55</td></tr>
<tr><td>40 ℃</td><td>1.08</td></tr>
<tr><td>60 ℃</td><td>0.7</td></tr>
</table></td><td>Monitor the electric system input sensor signal and find a signal causing no lockup.</td><td>Repair the defect or replace.</td></tr>
</table>

No. J1: Oil Leaks from Breather

Description:

- Oil leaks from breather.

Possible Cause:

- ATF quantity is excessively.

No. J2: Oil Leaks Between Engine and Converter Housing
No. J3: Oil Leaks Between Main Case and Converter Housing
No. J4: Oil Leaks Between Main Case and Rear Housing
No. J5: Oil Leaks from Oil Pan
No. J6: Oil Leaks from Manual Shaft Oil Seal
No. J7: Oil Leaks from Oil Cooler Pipe Joint

Description:

- Oil leaks between engine and converter housing.
- Oil leaks between converter housing and main case.
- Oil leaks between main case and rear housing.
- Oil leaks from oil pan.
- Oil leaks from manual shaft oil seal.
- Oil leaks from oil cooler pipe joint.

Possible Cause:

- Faulty oil seal or sealing of contact surface is considered.

No. Z1: Transmission Overheat

Description:

- You smell the transmission burning.
- The transmission smokes.

Possible Cause:

- Slip of clutch.
  If slip of clutch is caused, a DTC (gear ratio error) is stored.
- Clogged oil cooler (foreign substance mixed)
- ATF stirred excessively (too much ATF).
- Faulty torque converter operating pressure.
- Faulty lock-up piston.

No. Z2: Mode Lamp (Power Drive or 3rd Start) Does Not Light Up When The Power Mode or 3rd Start Mode is Turned On

Description:

- The mode lamp on the instrument panel does not light up though the power mode or 3rd start mode is turned on with the ignition switch in ON position.

Possible Cause:

- Faulty mode select switch is considered.
- Bulb burn out.

No. Z3: Mode Lamp (Power Drive or 3rd Start) Lights Up When The Power Mode or 3rd Start Mode is Turned Off

Description:

- The mode lamp on the instrument panel lights up though the power mode or 3rd start mode is turned off with the ignition switch in ON position.

Possible Cause:

- Faulty mode select switch is considered.

No. Z4: Oil Temperature Warning Lamp Lights up

Description:

- Sometimes, the oil temperature warning lamp lights up.

Possible Cause:

- When the vehicle is stuck in the mud or continues to accelerate under overload, and ATF temperature exceeds 145 °C, the oil temperature warning lamp lights up.
- If the oil temperature warning lamp lights up under usual service condition, following causes are considered.
- ATF level has increased for some fault.
  Refer to "No. Z1: Transmission overheat".
- Lights up due to error of the ATF oil thermo sensor.

No. Z5: Select Lever Feeling is Faulty.

Description:

- Select lever feeling is faulty.

Possible Cause:

- Disordered select cable.
- Disordered select lever.
- Faulty Manual plate.

No. Z6: Poor Fuel Consumption

Description:

- Poor fuel consumption.

Diagnosis Hints:

- Basically same causes as "No. C1 - C8: Engine races up (slip) by shift up or shift down" are considered.

No. Z7: Pattern Select Switch is Faulty

Description:

- Shift pattern does not change though the pattern select switch is turned on.

Possible Cause:

- Faulty mode select switch is considered.

No. Z8: Oil is Splashed During the Running

Description:

- Oil is splashed during the running

Possible Cause:

- ATF quantity is too high.

No. Z9: Abnormal Smell

Description:

- Abnormal smell.

Diagnosis Hints:

- Basically a trouble in the AT main unit.

No. Z10: ATF Quantity is Low or High

Description:

- Oil quantity is low or high.

Possible Cause:

- In case of oil level is high.
  ATF temperature is low when ATF quantity is checked.
- In case of oil level is low.
  ATF leaks is considered. Check the AT main unit and cooler circuit.

No. Z11: Abnormal Oil Pressure

Description:

- Oil pressure is low or high.

Possible Cause:

- Basically, the same cause as **"No. C1 - C8: Engine races up (slip) by shift up or shift down"** is considered.
- In case of oil pressure is low, faulty oil pump is considered.

No. Z12: Reverse Buzzer Does Not Ring

Description:

- Reverse buzzer does not ring in R range.

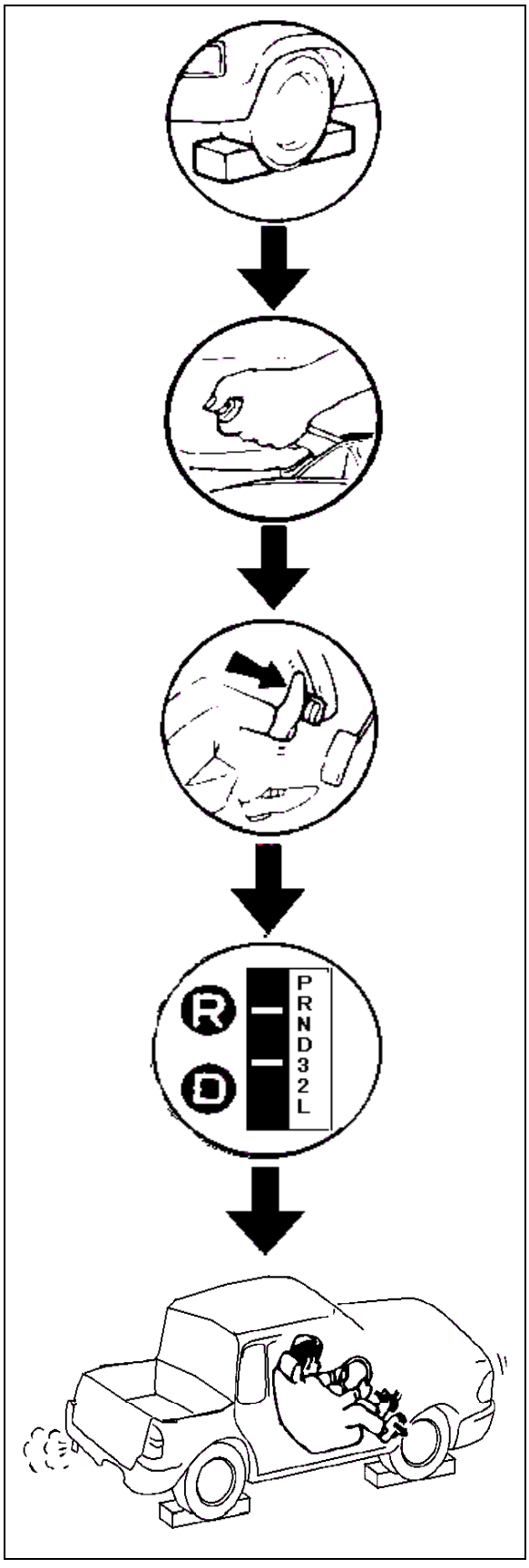
Possible Cause:

- Disordered select cable.
- Disordered select lever.
- Disordered inhibitor switch.

STALL TEST

CAUTION:

Because A/T may break down, do not perform the stall test continuously.



Procedure

1. Chock the four wheels.
2. Warm up the engine.
3. Apply the parking brake.
4. Step on the foot brake fully.
5. Set the select lever to either D, 3, 2, L or R range.
6. Step on the accelerator pedal fully.
7. When the engine speed becomes constant, record that value quickly.

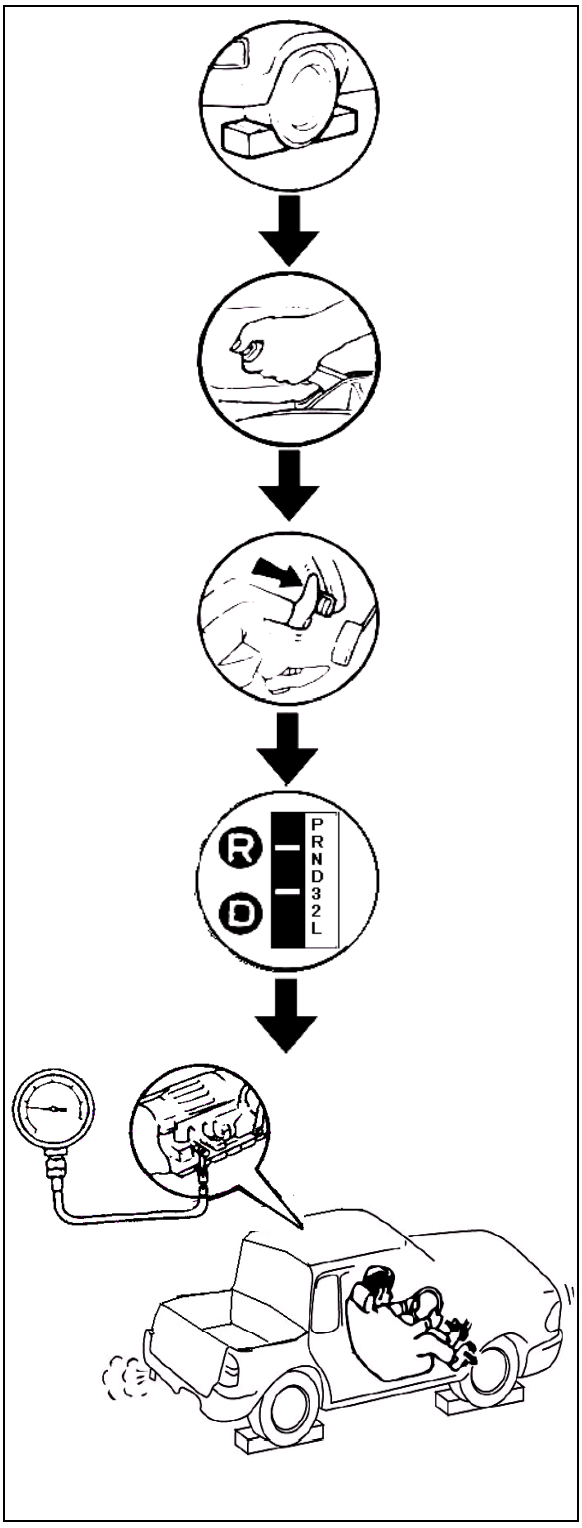
Stall Speed

Standard: 2600±150 rpm

Evaluation

1. **If the stall speed is higher than standard value in all ranges.**
   - Low line pressure.
   - Abraded oil pump.
   - Faulty operation of low clutch.
   - Adjustment error of or faulty inhibitor switch.
   - ATF leaking from oil pump, control valve, or transmission case.
   - Fixed pressure regulator valve and pilot valve.
2. **If the stall speed is higher than standard value in D, 3, 2 and L ranges.**
   - Slip of low clutch.
   - Slip of low one-way clutch.
3. **If the stall speed is higher than standard value in R range.**
   - Slip of low & reverse brake.
   - Slip of reverse clutch.
4. **If the stall speed is lower than standard value in all ranges.**
   - Slip of one-way clutch (in torque converter).
   - Faulty engine.

LINE PRESSURE TEST



Procedure

1. Chock the four wheels.
2. Remove the test plug of the transmission case and fit the oil pressure gauge.
3. Warm up the engine.
4. Apply the parking brake.
5. Step on the foot brake fully.
6. Set the select lever to either D, 3, 2, L or R range.
7. Record the oil pressure at idling.
8. When stepping over the accelerator pedal fully and the engine speed becomes constant, record the oil pressure quickly.

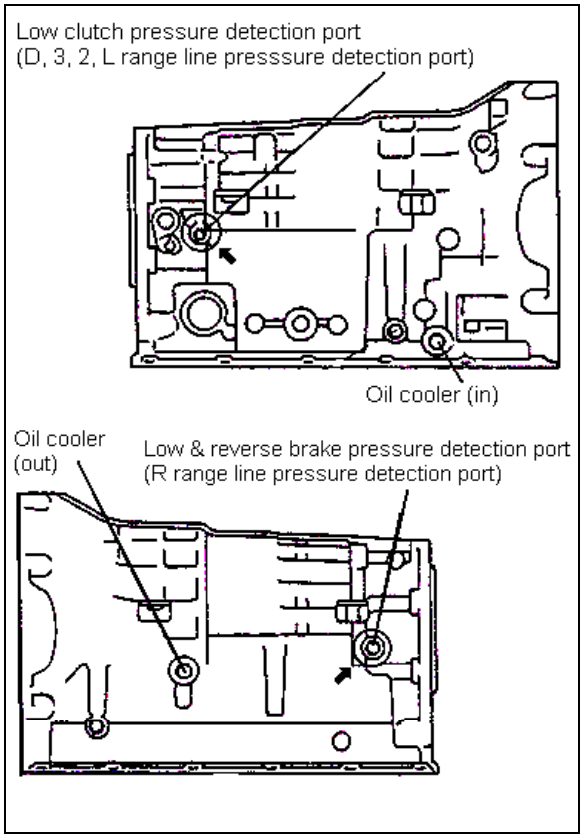
Line Pressure

Standard:

Engine Speed	Line Pressure (Kpa)	
	D, 3, 2 or L Range	R Range
Idling	350 - 480	450 - 650
Stall	1,050 - 1,250	1.400 - 1,630

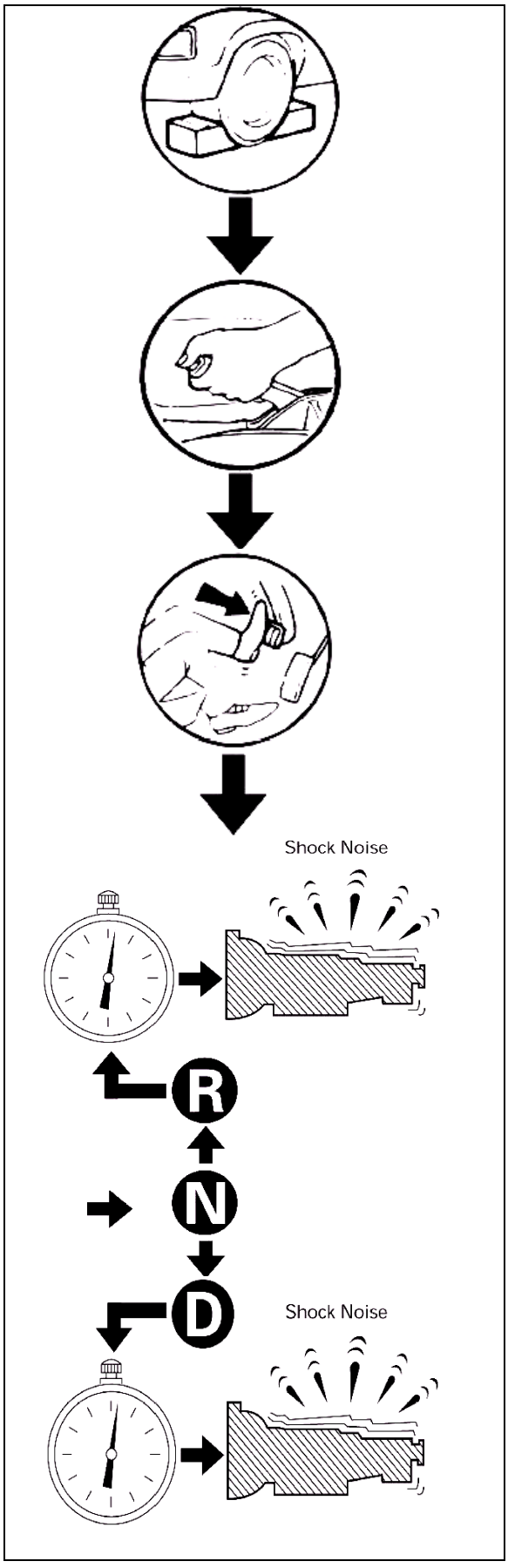
Evaluation

1. **If the line pressure is lower than standard value at idling in all ranges.**
   - Abraded oil pump.
   - Faulty operation of each solenoid.
   - Sticking of pressure regulator valve or pilot valve.
   - Fatigued pressure regulator valve or pilot valve spring.
   - ATF leaking from oil strainer, oil pump, pressure regulator valve, torque converter relief valve or pressure relief valve.
2. **If the line pressure is lower than standard value at idling in D, 3, 2 and L ranges.**
   - ATF leaking from low clutch hydraulic circuit.
3. **If the line pressure is lower than standard value at idling in R range.**
   - ATF leaking from reverse hydraulic circuit.
   - ATF leaking from low and reverse brake hydraulic circuit.



4. **If the line pressure is lower than standard value at idling in L and R ranges.**
   - ATF leaking from low and reverse brake hydraulic circuit.
5. **If the line pressure is higher than standard value at idling in all ranges.**
   - Throttle opening signal reception error.
   - Faulty oil temperature sensor.
   - Faulty operation of low clutch solenoid.
   - Sticking pilot valve.
   - Sticking pressure regulator valve or plug.
6. **If the line pressure is lower than standard value at stall speed in all ranges.**
   - Throttle opening signal reception error.
   - Faulty operation of line pressure solenoid.
   - Faulty operation of low clutch solenoid.
   - Sticking pilot valve.
   - Sticking pressure regulator valve or plug.

TIME LAG TEST



Procedure

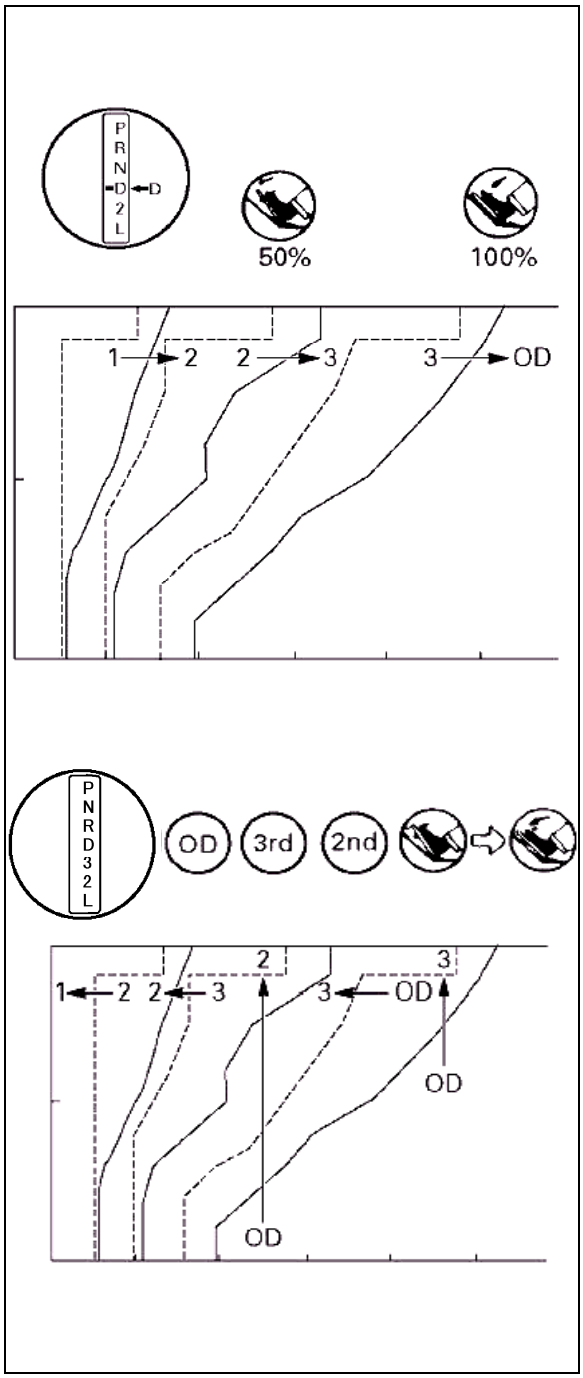
1. Chock the four wheels.
2. Warm up the engine.
3. Apply the parking brake.
4. Step on the foot brake fully.
5. Set the select lever from N to D or N to R range.
6. Record the time from when moving the select button until feeling shock.

Time Lag
Standard:
N to D Range: Below 0.7 Seconds
N to R Range: Below 1.2 Seconds

Evaluation

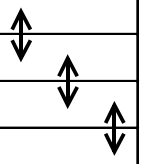
1. **If the time lag is out of standard value when shifting N to D range.**
   - Forward range line pressure is low.
   - Slip of low clutch.
   - Slip of low one-way clutch.
   - Trouble in control valve body (faulty operation, sticking, clogged oil passage).
   - Faulty low clutch duty solenoid operation.
   - Shortage or faulty quality of ATF.
2. **If the time lag is out of standard value when shifting N to R range.**
   - Reverse range line pressure is low.
   - Slip of low & reverse brake.
   - Slip of reverse clutch.
   - Trouble in control valve body (faulty operation, sticking, clogged oil passage).
   - Faulty low & reverse brake duty solenoid operation.
   - Shortage or faulty quality of ATF.

TEST DRIVE



NOTE:
Perform the test at normal operation ATF temperature 50 - 80°C.
Drive the vehicle on level ground so as not to change to up and down hill control.

1. **D range test in Normal and Power shift pattern.**
   1) Shift into the D range and hold the accelerator pedal constant at the 50% and 100% throttle angle.
   2) 1-2, 2-3, 3-4 and lock-up, up-shift should take place, and shift points should confirm to those shown in the diagram.
   3) Also check to see that downshift is made from 4-3, 3-2 and 2-1 down-shift point is within the limits shown in the diagram.
2. **3 range test in Normal and Power shift pattern.**
   1) Shift into the 3 range and hold the accelerator pedal constant at the 50% and 100% throttle angle.
   2) 1-2, 2-3 and lock-up, up-shift should take place, and shift points should confirm to those shown in the diagram.
   3) While running in the 3 rages, does not up-shift 3-4.
   4) Also check to see that down-shift is made from 4-3, 3-2 and 2-1 down-shift point is within the limits shown in the diagram.
3. **2 range test in Normal shift pattern.**
   1) Shift into the 2 range and hold the accelerator pedal constant at the 50% and 100% throttle angle.
   2) 1-2 and up-shift should take place, and shift points should confirm to those shown in the diagram.
   3) While running in the 2 rages, does not up-shift 2-3 or 3-4, and lock-up does not operate.
   4) Also check to see that down-shift is made from 4-3, 3-2 and 2-1 down-shift point is within the limits shown in the diagram.
4. **L range test in Normal shift pattern.**
   1) While running in the L rages, does not up-shift 1-2, 2-3 or 3-4, and lock-up does not operate.
   2) Also check to see that down-shift is made from 4-3, 3-2 and 2-1 down-shift point is within the limits shown in the diagram.

Select Lever Position	Gear Position	Gear Shift
P	—	—
R	Reverse	—
N	—	—
D	1st	
	2nd	
	3rd	
	4th	
3	1st	
	2nd	
	3rd	
	4th(*1)	
2	1st	
	2nd	
	3rd(*1)	
	4th(*1)	
L	1st	
	2nd(*1)	
	3rd(*1)	
	4th(*1)	

*1: Transmission is shifted at high speed to prevent engine over-run.

5. R range test.

1) Shift into the R range and while starting at full throttle, check for slipping.

6.P range test.

1) Stop the vehicle on a grade and after shifting into the P range, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

Evaluation

1. If there is no 1 to 2 up-shift.
   - 2-4 brake malfunction.
   - 2-4 brake hydraulic circuit failed.
   - 2-4 brake duty solenoid stick.

   Refer to symptom diagnosis **"No. D1: Faulty Gear Shifting"** or DTC section **"Gear Ratio Error".**

2. If there is no 2 to 3 up-shift.
   - High clutch malfunction.
   - High clutch hydraulic circuit failed.
   - High clutch duty solenoid stick.

   Refer to symptom diagnosis **"No. D1: Faulty Gear Shifting"** or DTC section **"Gear Ratio Error".**

3. If there is no 2 to 4 (O/D) up-shift.
   - 2-4 brake malfunction.
   - 2-4 brake hydraulic circuit failed.
   - 2-4 brake duty solenoid stick.

   Refer to symptom diagnosis **"No. D1: Faulty Gear Shifting"** or DTC section **"Gear Ratio Error".**

4. If there is no lock-up in 2, 3 and 4.
   - Lock-up piston malfunction.
   - Lock-up hydraulic circuit failed.
   - Lock-up duty solenoid stick.

   Refer to symptom diagnosis **"No. I1: No Lock-up"** or DTC section **"Lock-up Duty Solenoid Failure".**

5. If there is no reverse.
   - Reverse clutch malfunction.
   - Reverse clutch hydraulic circuit failed.
   - Low & reverse brake hydraulic circuit failed.
   - Low & reverse brake duty solenoid stick.

   Refer to symptom diagnosis **"No. A2: Vehicle Dose Not Run in R Range"** or DTC section **"Low & Reverse Brake Duty Solenoid Failure"**.
6. If there is no parking.
   - Parking pawl malfunction.

   Refer to symptom diagnosis **"No. G1: Vehicle Moves in P Range or Parking Gear in Not Disengaged other than P Range".**

NOTE:

The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in propeller shaft, differential, the torque converter, etc. Or insufficient bending, rigidity, etc. in the powertran.

SHIFT POINT CHART

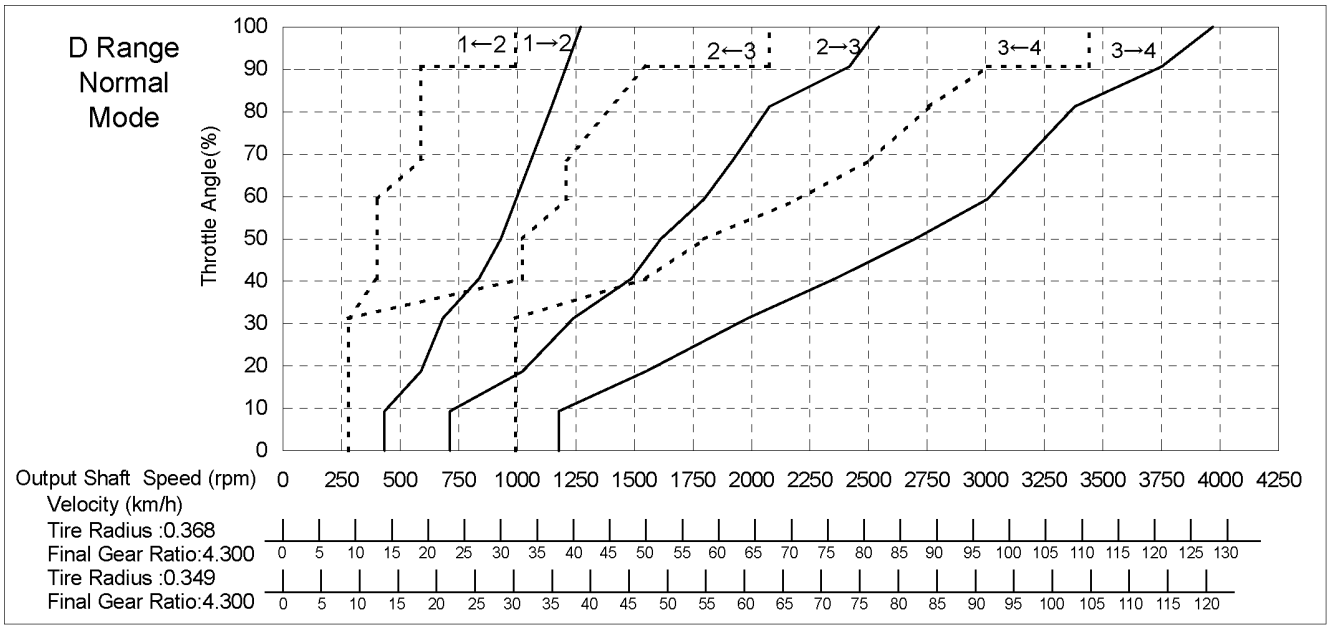
D Range											
		Normal Mode			Power Mode			4L Mode			
Gear	Throttle Position	Velocity (km/h)		Output Shaft Speed (rpm)	Velocity (km/h)		Output Shaft Speed (rpm)	Velocity (km/h)		Output Shaft Speed (rpm)	
1→2	50%	25 - 31	27 - 33	930	29 - 35	31 - 37	1054	28 - 34	30 - 36	1023	
	100%	36 - 42	37 - 43	1271	36 - 42	38 - 44	1271	32 - 38	34 - 40	1147	
2→3	50%	46 - 52	49 - 55	1612	55 - 61	58 - 64	1891	52 - 58	55 - 61	1798	
	100%	75 - 81	79 - 85	2542	75 - 81	79 - 85	2542	67 - 73	71 - 77	2294	
3→4	50%	80 - 86	84 - 90	2697	83 - 89	88 - 94	2821	80 - 86	84 - 90	2697	
	100%	118 - 124	125 - 131	3967	118 - 124	125 - 131	3967	107 - 113	113 - 119	3595	
4→3	0%	27 - 33	29 - 35	992	27 - 33	29 - 35	992	27 - 33	29 - 35	992	
	50%	52 - 58	55 - 61	1798	70 - 76	74 - 80	2387	67 - 73	71 - 77	2294	
	100%	102 - 108	108 - 114	3440	102 - 108	108 - 114	3440	93 - 99	98 - 104	3130	
3→2	0%	6 - 12	6 - 12	279	6 - 12	6 - 12	279	6 - 12	6 - 12	279	
	50%	28 - 34	30 - 36	1023	44 - 50	47 - 53	1550	43 - 49	46 - 52	1488	
	100%	61 - 67	64 - 70	2077	61 - 67	64 - 70	2077	56 - 62	59 - 65	1922	
2→1	0%	6 - 12	6 - 12	279	6 - 12	6 - 12	279	6 - 12	6 - 12	279	
	50%	9 - 15	10 - 16	403	18 - 24	19 - 25	682	17 - 23	18 - 24	651	
	100%	27 - 33	29 - 35	992	27 - 33	29 - 35	992	25 - 31	27 - 36	930	
Axle Gear Ratio		4.300	4.300		4.300	4.300		4.300	4.300		
Tire Radius		0.349	0.368		0.349	0.368		0.349	0.368		

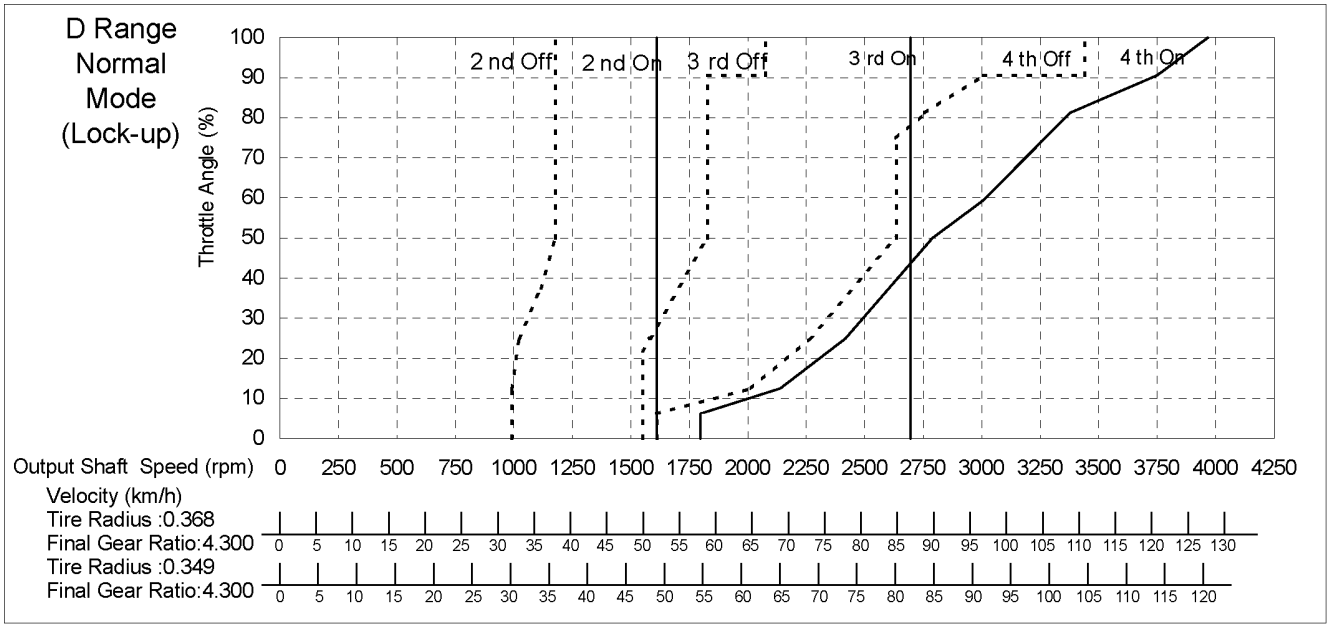
3 Range											
		Normal Mode			Power Mode			4L Mode			
Gear	Throttle Position	Velocity (km/h)		Output Shaft Speed (rpm)	Velocity (km/h)		Output Shaft Speed (rpm)	Velocity (km/h)		Output Shaft Speed (rpm)	
1→2	50%	25 - 31	27 - 33	930	29 - 35	31 - 37	1054	28 - 34	30 - 36	1023	
	100%	36 - 42	38 - 44	1271	36 - 42	38 - 44	1271	32 - 38	34 - 40	1147	
2→3	50%	46 - 52	49 - 55	1612	55 - 61	58 - 64	1891	52 - 58	55 - 61	1798	
	100%	75 - 81	79 - 85	2542	75 - 81	79 - 85	2542	67 - 73	71 - 77	2294	
4→3	0%	118 - 124	125 - 131	3967	118 - 124	125 - 131	3967	107 - 113	113 - 119	3595	
	50%	118 - 124	125 - 131	3967	118 - 124	125 - 131	3967	107 - 113	113 - 119	3595	
	100%	118 - 124	125 - 131	3967	118 - 124	125 - 131	3967	107 - 113	113 - 119	3595	
3→2	0%	6 - 12	6 - 12	279	6 - 12	6 - 12	279	6 - 12	6 - 12	279	
	50%	28 - 34	30 - 36	1023	44 - 50	47 - 53	1550	43 - 49	45 - 51	1488	
	100%	61 - 67	64 - 70	2077	61 - 67	64 - 70	2077	57 - 63	59 - 65	1922	
2→1	0%	6 - 12	6 - 12	279	6 - 12	6 - 12	279	6 - 12	6 - 12	279	
	50%	9 - 15	10 - 16	403	18 - 24	19 - 25	682	17 - 23	18 - 24	651	
	100%	27 - 33	29 - 35	992	27 - 33	29 - 35	992	25 - 31	27 - 33	930	
Axle Gear Ratio		4.300	4.300		4.300	4.300		4.300	4.300		
Tire Radius		0.349	0.368		0.349	0.368		0.349	0.368		

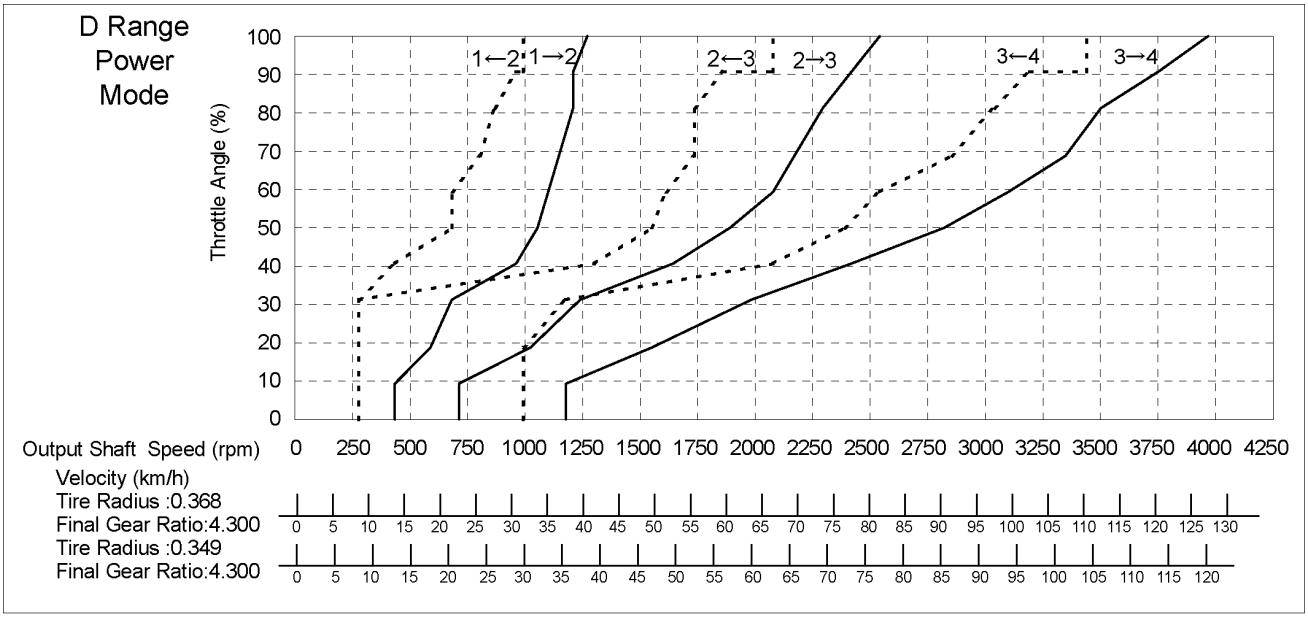
2 Range							
		Normal Mode			4L Mode		
Gear	Throttle Position	Velocity (km/h)		Output Shaft Speed (rpm)	Velocity (km/h)		Output Shaft Speed (rpm)
1→2	50%	25 - 31	27 - 33	930	28 - 34	30 - 36	1023
	100%	36 - 42	38 - 44	1271	32 - 38	34 - 40	1147
4→3	0%	119 - 125	125 - 131	3967	107 - 113	113 - 119	3595
	50%	119 - 125	125 - 131	3967	107 - 113	113 - 119	3595
	100%	119 - 125	125 - 131	3967	107 - 113	113 - 119	3595
3→2	0%	75 - 81	79 - 85	2542	67 - 73	71 - 77	2294
	50%	75 - 81	79 - 85	2542	67 - 73	71 - 77	2294
	100%	75 - 81	79 - 85	2542	67 - 73	71 - 77	2294
2→1	0%	6 - 12	6 - 12	279	6 - 12	6 - 12	279
	50%	9 - 15	10 - 16	403	17 - 23	18 - 24	651
	100%	27 - 33	29 - 35	992	25 - 31	27 - 33	930
Axle Gear Ratio		4.300	4.300		4.300	4.300	
Tire Radius		0.349	0.368		0.349	0.368	

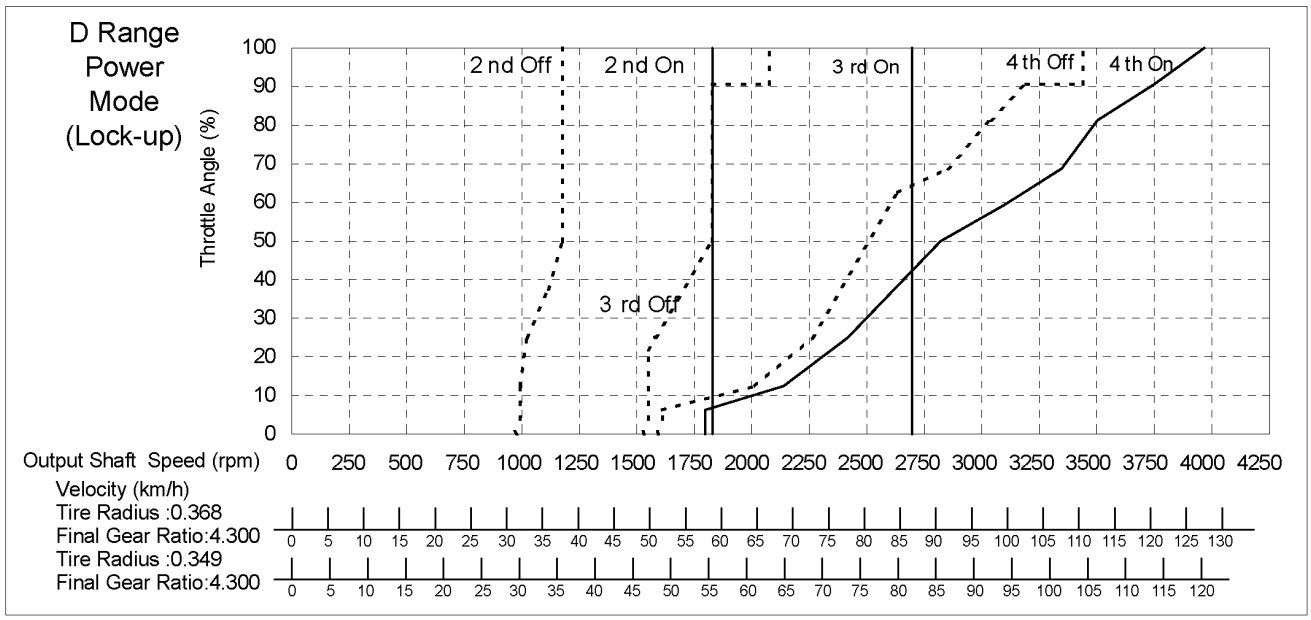
L Range							
		Normal Mode			4L Mode		
Gear	Throttle Position	Velocity (km/h)		Output Shaft Speed (rpm)	Velocity (km/h)		Output Shaft Speed (rpm)
4→3	0%	118 - 124	125 - 131	3967	107 - 113	113 - 119	3595
	50%	118 - 124	125 - 131	3967	107 - 113	113 - 119	3595
	100%	118 - 124	125 - 131	3967	107 - 113	113 - 119	3595
3→2	0%	75 - 81	79 - 85	2542	67 - 73	71 - 77	2294
	50%	75 - 81	79 - 85	2542	67 - 73	71 - 77	2294
	100%	75 - 81	79 - 85	2542	67 - 73	71 - 77	2294
2→1	0%	36 - 42	38 - 44	1271	32 - 38	34 - 40	1147
	50%	36 - 42	38 - 44	1271	32 - 38	34 - 40	1147
	100%	36 - 42	38 - 44	1271	32 - 38	34 - 40	1147
Axle Gear Ratio		4.300	4.300		4.300	4.300	
Tire Radius		0.349	0.368		0.349	0.368	

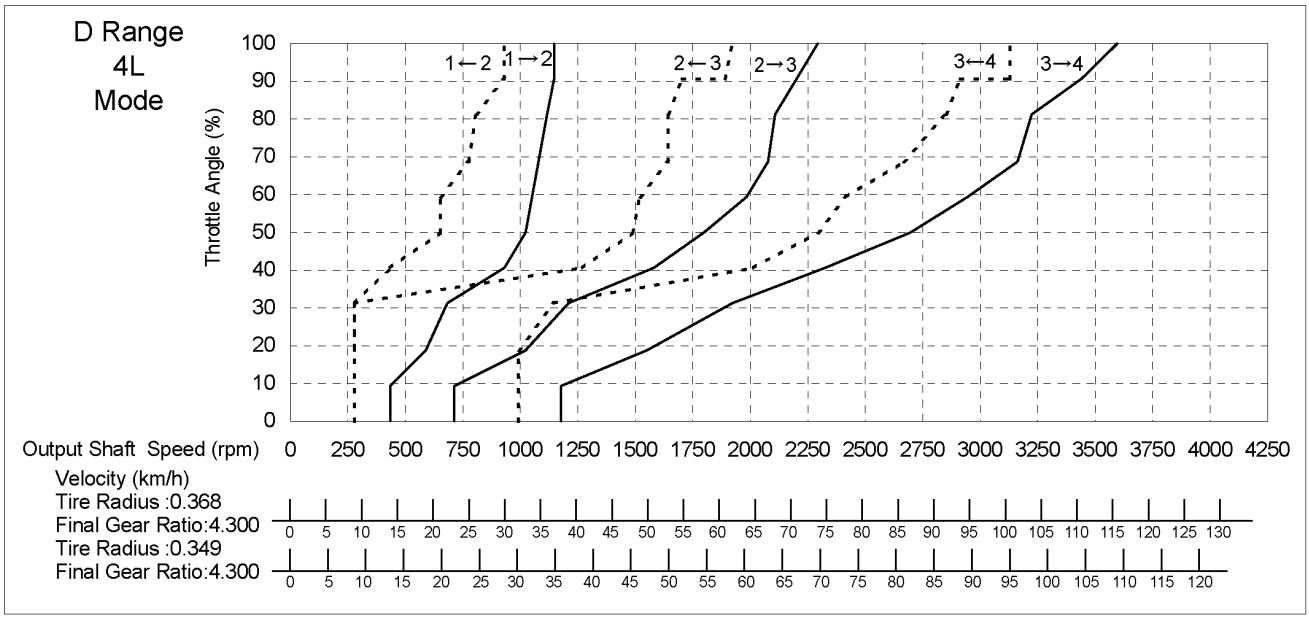
SHIFT POINT DIAGRAM

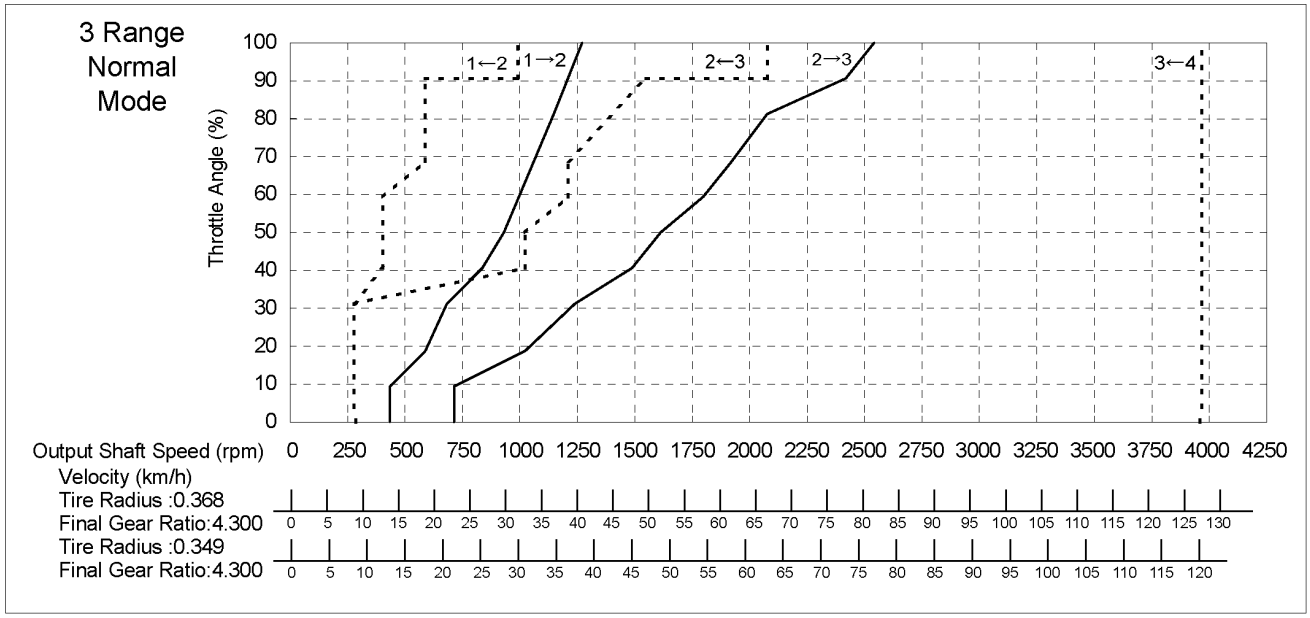


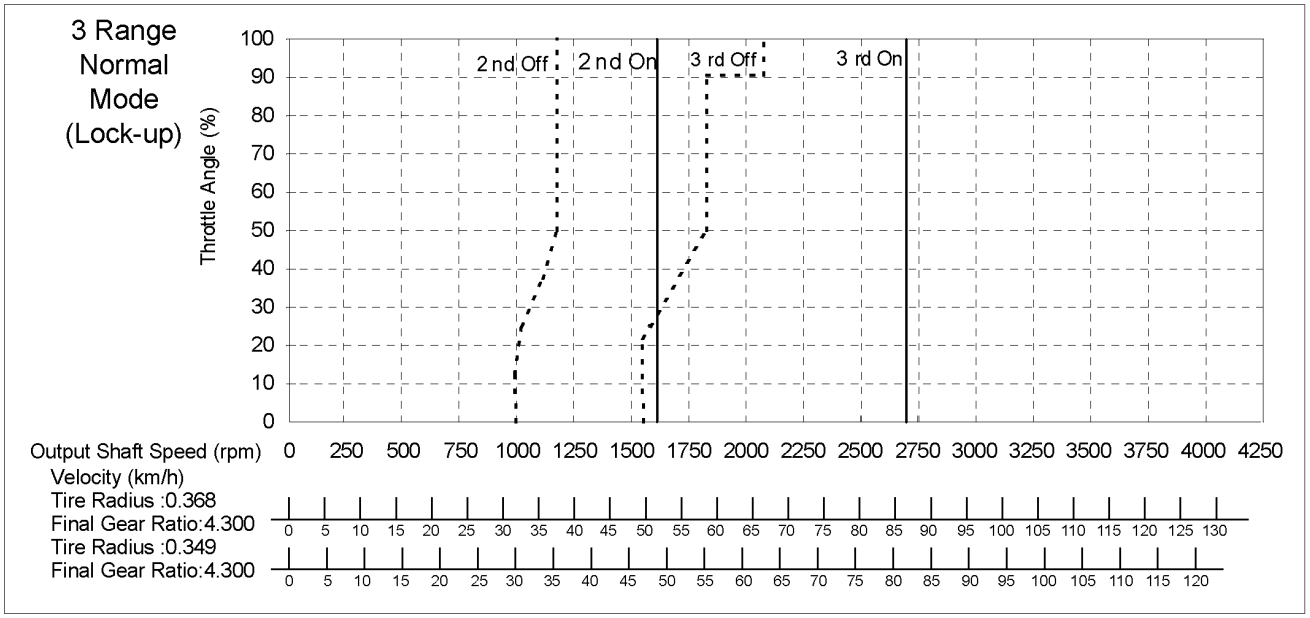


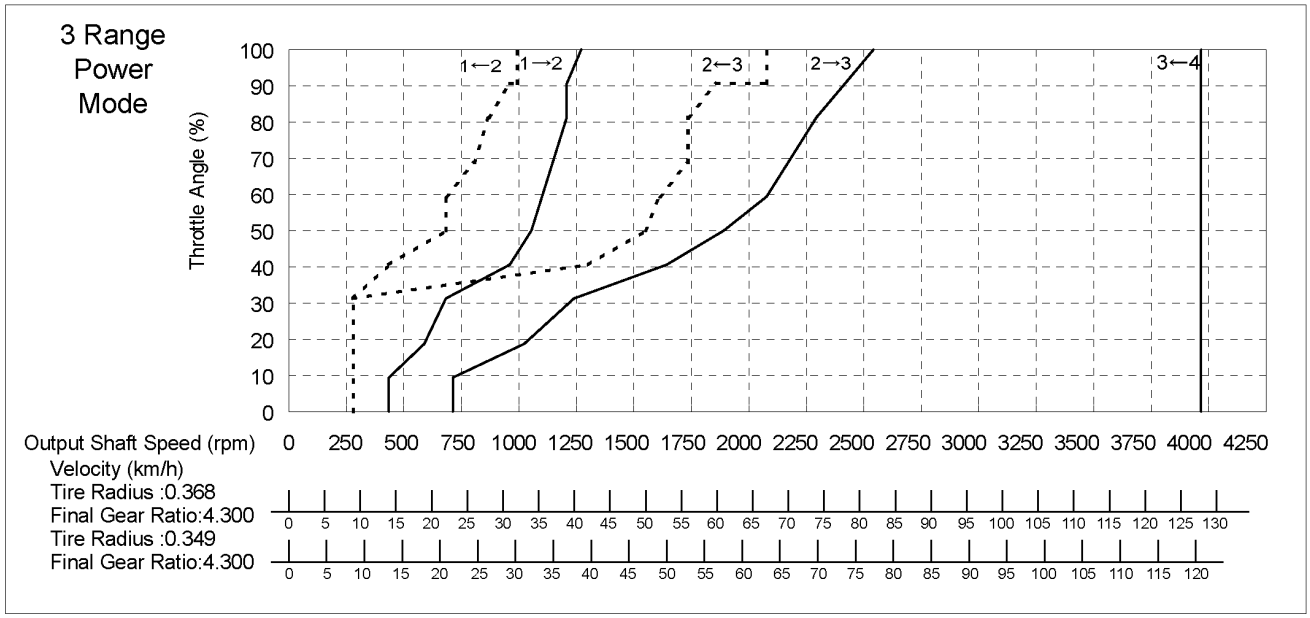

D Range
Power
Mode
Throttle Angle (%)
1←2
1→2
2←3
2→3
3←4
3→4
Output Shaft Speed (rpm)
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
Tire Radius :0.349
Final Gear Ratio:4.300

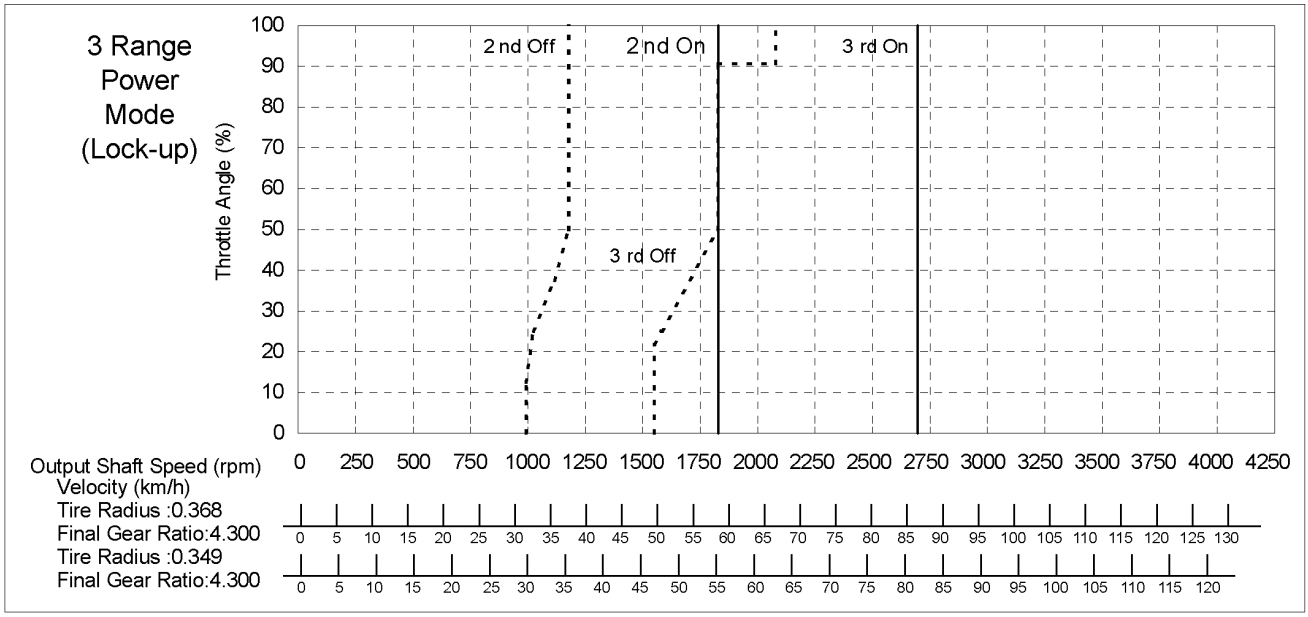

D Range
Power
Mode
(Lock-up)
Throttle Angle (%)
2 nd Off
2 nd On
3 rd On
4 th Off
4 th On
3 rd Off
Output Shaft Speed (rpm)
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
Tire Radius :0.349
Final Gear Ratio:4.300

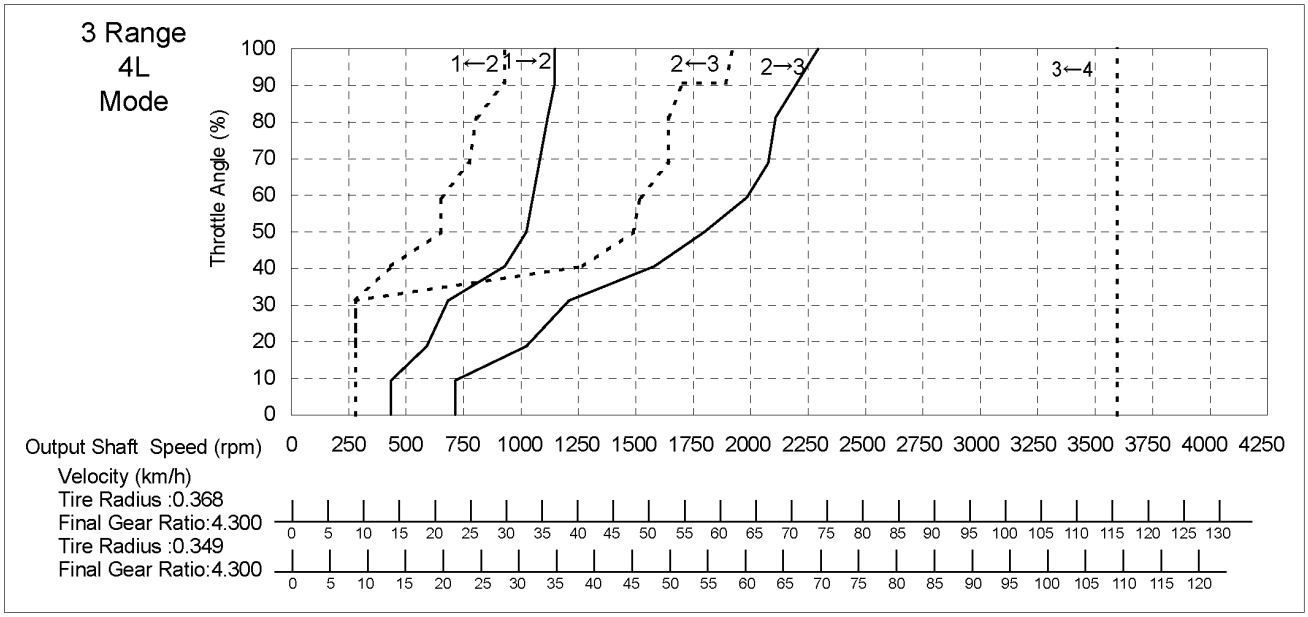

D Range
4L
Mode
Throttle Angle (%)
1←2
1→2
2←3
2→3
3←4
3→4
Output Shaft Speed (rpm)
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
Tire Radius :0.349
Final Gear Ratio:4.300

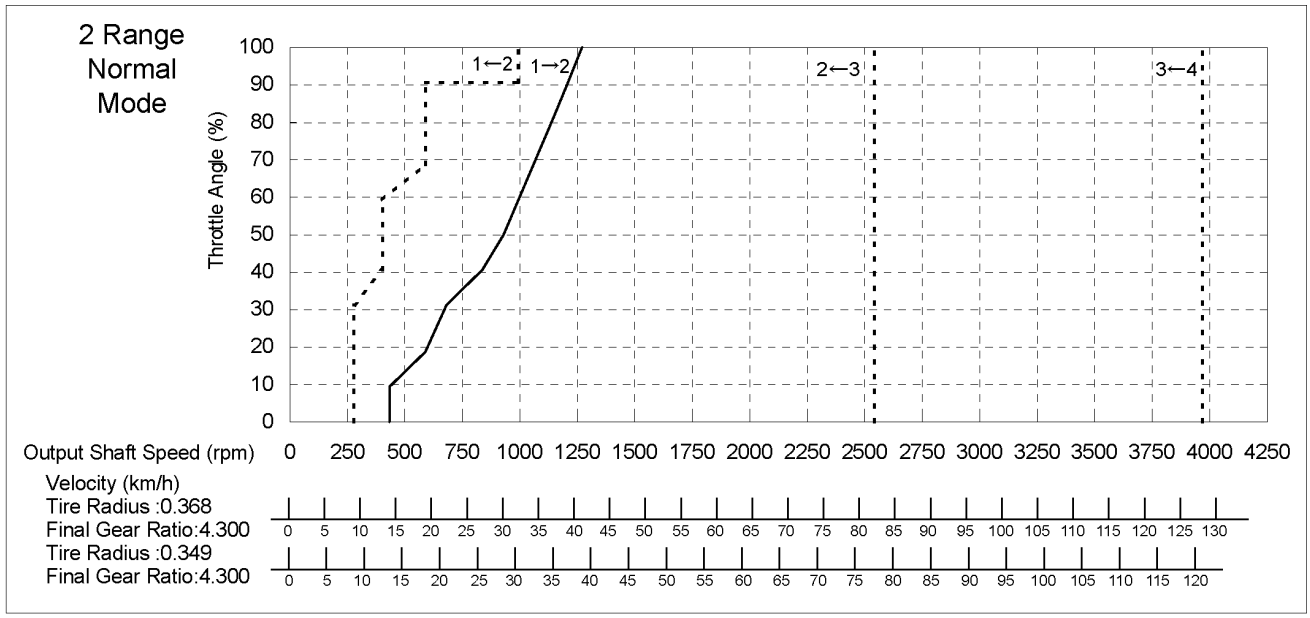

3 Range
Normal
Mode
Throttle Angle (%)
1←2
1→2
2←3
2→3
3←4
Output Shaft Speed (rpm)
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
Tire Radius :0.349
Final Gear Ratio:4.300

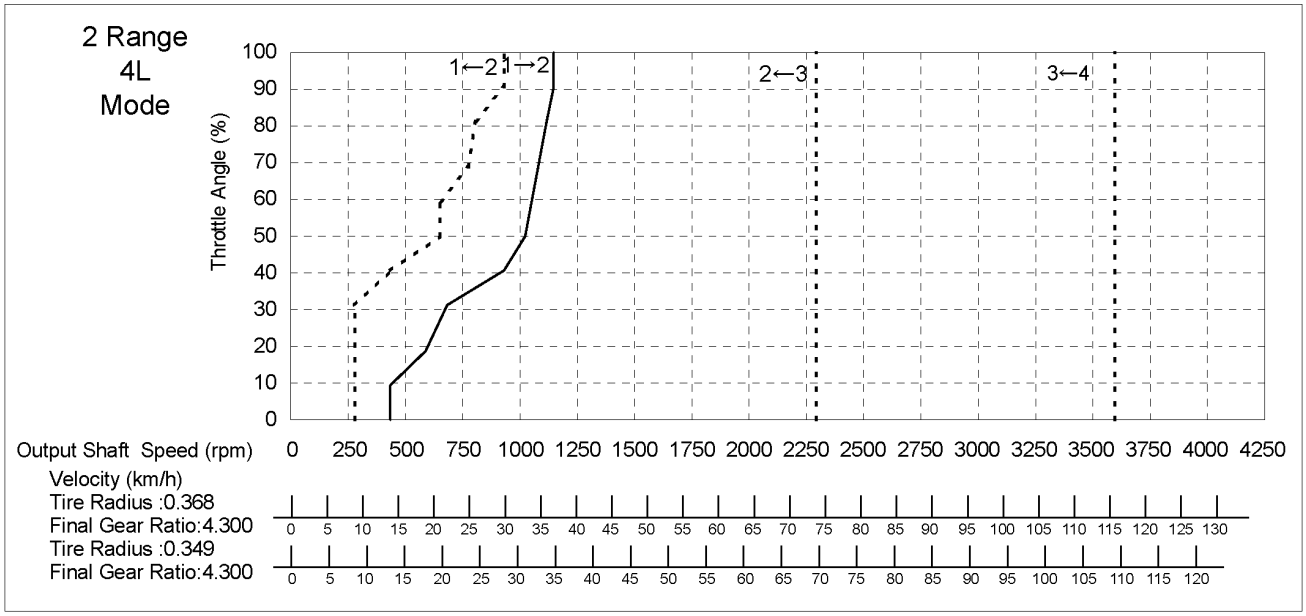

3 Range
Normal
Mode
(Lock-up)
Throttle Angle (%)
2 nd Off
2 nd On
3 rd Off
3 rd On
Output Shaft Speed (rpm)
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
Tire Radius :0.349
Final Gear Ratio:4.300

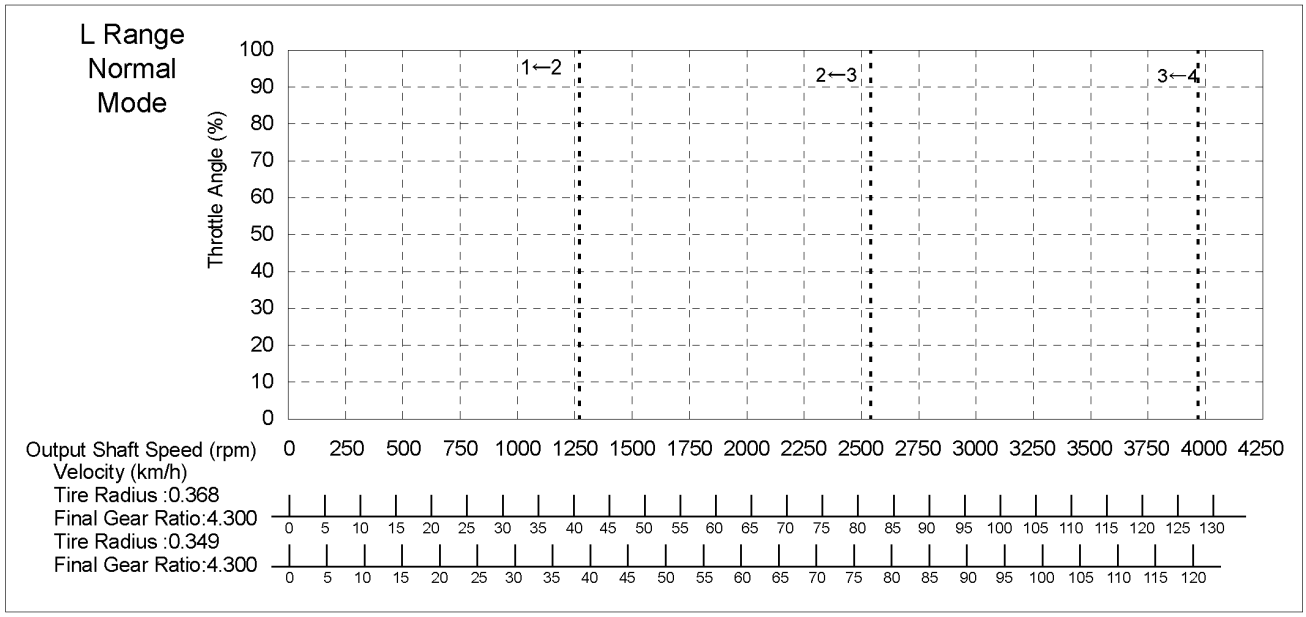

3 Range
Power
Mode
Throttle Angle (%)
1←2
1→2
2←3
2→3
3←4
Output Shaft Speed (rpm)
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
Tire Radius :0.349
Final Gear Ratio:4.300

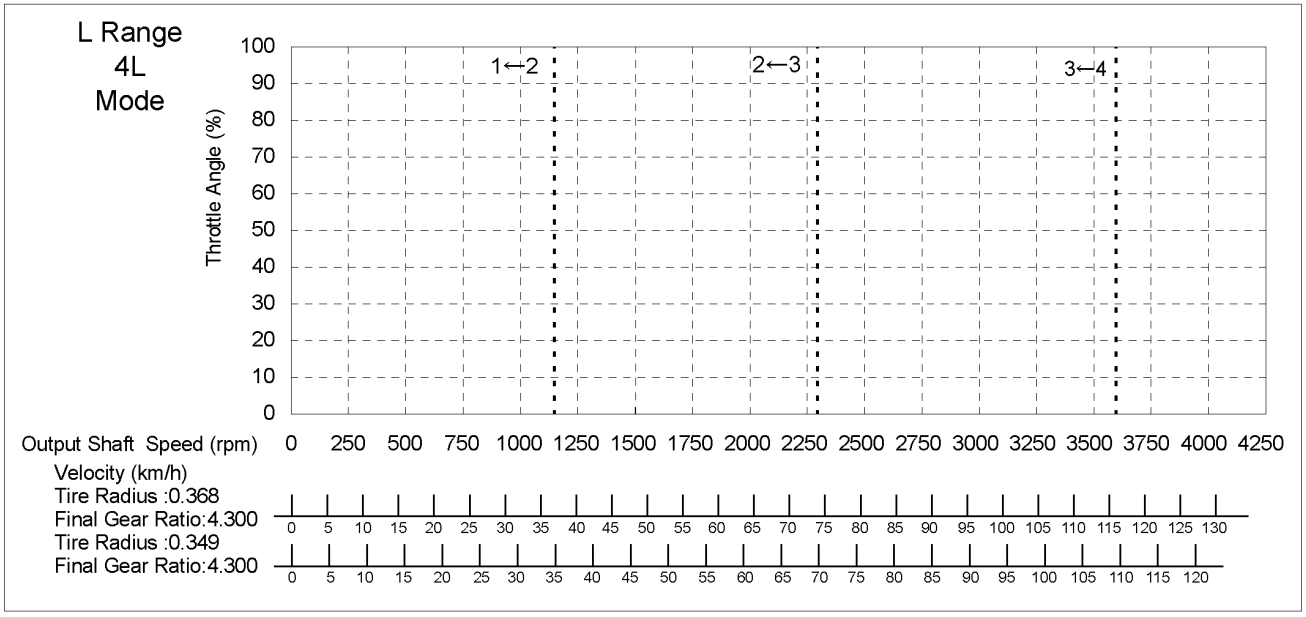

3 Range
Power
Mode
(Lock-up)
Throttle Angle (%)
2 nd Off
2 nd On
3 rd On
3 rd Off
Output Shaft Speed (rpm)
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
Tire Radius :0.349
Final Gear Ratio:4.300


3 Range
4L
Mode
Throttle Angle (%)
1←2
1→2
2←3
2→3
3←4
Output Shaft Speed (rpm)
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
Tire Radius :0.349
Final Gear Ratio:4.300

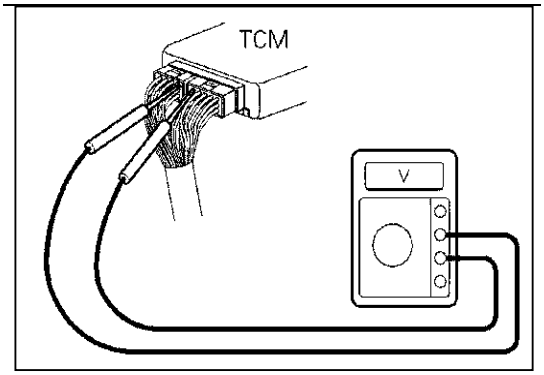

2 Range
Normal
Mode
Throttle Angle (%)
1←2
1→2
2←3
3←4
Output Shaft Speed (rpm)
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
Tire Radius :0.349
Final Gear Ratio:4.300


2 Range
4L
Mode
Throttle Angle (%)
100
90
80
70
60
50
40
30
20
10
0
1←2
1→2
2←3
3←4
Output Shaft Speed (rpm)
0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000 3250 3500 3750 4000 4250
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130
Tire Radius :0.349
Final Gear Ratio:4.300
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120


L Range
Normal
Mode
Throttle Angle (%)
100
90
80
70
60
50
40
30
20
10
0
1←2
2←3
3←4
Output Shaft Speed (rpm)
0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000 3250 3500 3750 4000 4250
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130
Tire Radius :0.349
Final Gear Ratio:4.300
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120


L Range
4L
Mode
Throttle Angle (%)
100
90
80
70
60
50
40
30
20
10
0
1←2
2←3
3←4
Output Shaft Speed (rpm)
0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000 3250 3500 3750 4000 4250
Velocity (km/h)
Tire Radius :0.368
Final Gear Ratio:4.300
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130
Tire Radius :0.349
Final Gear Ratio:4.300
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120

TCM VOLTAGE CHECK



TCM voltage check is done to check for transmission and TCM problems which cannot be detected by self-diagnosis.

Additionally, it severs as a back-up check for self-diagnosis.

Measure the voltage drop and make a continuity test for each of sensors, solenoids and switches.

If the voltage is within the specified range and continuity exists, that particular area of the TCM and transmission assembly is normal.

If voltage deviation or lack of continuity is discovered, disconnect the applicable parts and check of them individually.

Inspection Tool

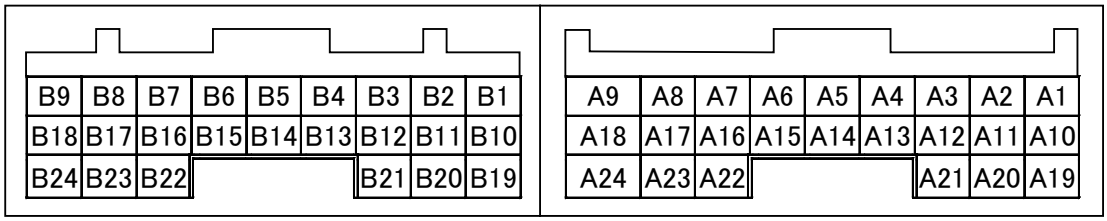
Use a circuit tester and an oscilloscope to measure voltage and circuit continuity.

Insert the test probes from the connector wiring side. TCM terminals are extremely small.

Wrap a piece of thin wire around the probe of tester.

This will make measurement easier.

TCM Pin Assignment



Connect to White Connector

Connect to Grey Connector

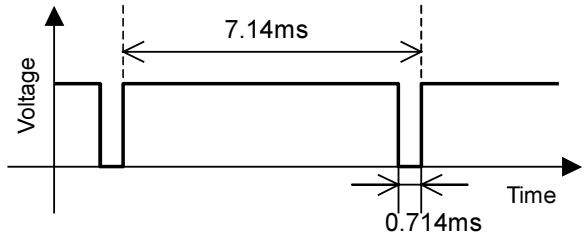
No.	Wire Color	Pin Name	Input / Output	Connected to	Measurement Item	Measurement Condition	Standard	Inspection Point at Trouble
A1	RED	V BATT (Battery Back-up Power Supply)	Input	Battery	Voltage	-	Battery voltage	Related harness
A2	YEL/ VIO	P Range Switch	Input	Inhibitor switch	Voltage	At P range	Battery voltage	Related harness
						At other than P range	Less than 2V	Inhibitor switch
A3	RED	Brake Switch	Input	Brake switch	Voltage	At brake stepped	Battery voltage	Related harness
						At brake no stepped	Less than 2V	Brake switch
A4	PNK/ WHT	3rd Start Indicator Lamp	Output	3rd start lamp	Voltage	At lamp OFF	Battery voltage	Related harness
						At lamp ON	Less than 2V	Lamp
A5	GRN	K-line signal (Tech 2 serial communication)	Input/ Output	Tech 2	-	-	-	Related harness
A6	-	-	-	-	-	-	-	-

No.	Wire Color	Pin Name	Input / Output	Connected to	Measurement Item	Measurement Condition	Standard	Inspection Point at Trouble
A7	BLK/ RED	Engine Speed Sensor	Input	ECM	Voltage (Wave form)	At 1500rpm. Circuit tester (+) to A7 pin, (-) to B5 pin.	Pulse generated (At AC range approx. 5.5 V)	Related harness Engine Speed Sensor ECM
A8	-	-	-	-	-	-	-	-
A9	-	-	-	-	-	-	-	-
A10	BLK/ YEL	Vehicle Speed Sensor Out (2WD Only)	Output	Speed meter	Voltage (Wave form)	At run in L range in 1st gear 20 km/h. Circuit tester (+) to A10 pin, (-) to B5 pin.	Pulse generated (At AC range approx. 6.5 V)	Related harness Speed sensor Speed meter TCM
A11	GRN/ WHT	3rd Start Select Switch	Input	3rd start switch	Voltage	At switch pushed	Less than 2V	Related harness
						At switch off	Battery voltage	3rd start switch
A12	BLU/ WHT	4L Mode Switch (4WD Only)	Input	Transfer control unit	Voltage	At 4L	Less than 2V	Related harness
						At other than 4L	Battery voltage	4L switch
A13	-	-	-	-	-	-	-	-
A14	-	-	-	-	-	-	-	-
A15	-	-	-	-	-	-	-	-
A16	RED/ WHT	Throttle Position Sensor	Input	ECM	Wave form (140Hz Duty signal) *1	At fully close	Off duty 10%	Related harness
						At fully open	Off duty 90%	ECM Throttle position sensor
A17	BLK/ GRN	3 Range Switch	Input	Inhibitor switch	Voltage	At 3 range	Battery voltage	Related harness
						At other than 3 range	Less than 2V	Inhibitor switch
A18	YEL/ BLK	DIAG Switch	Input	Data link connector	Voltage	At key switch ON	Battery voltage	Related harness
						At short circuit of DIAG switch	Less than 2V	
A19	ORG/ BLU	A/T OIL TEMP Indicator Lamp	Output	AT OIL TEMP indicator lamp	Voltage	At lamp OFF	Battery voltage	Related harness
						At lamp ON	Less than 2V	Lamp
A20	GRN/ YEL	CHECK TRANS Indicator Lamp	Output	CHECK TRANS indicator Lamp	Voltage	At lamp OFF	Battery voltage	Related harness
						At lamp ON	Less than 2V	Lamp
A21	PNK	POWER DRIVE Indicator Lamp	Output	POWER DRIVE indicator lamp	Voltage	At lamp OFF	Battery voltage	Related harness
						At lamp ON	Less than 2V	Lamp
A22	-	-	-	-	-	-	-	-
A23	-	-	-	-	-	-	-	-

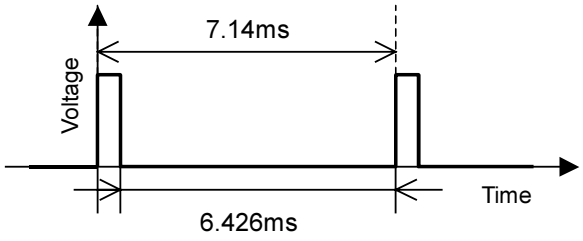
No.	Wire Color	Pin Name	Input / Output	Connected to	Measurement Item	Measurement Condition	Standard	Inspection Point at Trouble
A24	GRN/ YEL	Power Drive Select Switch	Input	Power drive switch	Voltage	At lamp OFF	Battery voltage	Related harness
						At lamp ON	Less than 2V	Lamp
B1	RED/ YEL	2-4 Brake Pressure Switch	Input	2-4 brake pressure switch	Voltage	At other than 2nd or 4th gear	More than 10 V	Related harness
						At 2nd or 4th gear	Less than 2V	Pressure switch
B2	PNK/ BLK	2 Range Switch	Input	Inhibitor switch	Voltage	At 2 range	Battery voltage	Related harness
						At other than 2 range	Less than 2V	Inhibitor switch
B3	BRN/ RED	Turbine Sensor	Input	Turbine sensor	Voltage (Wave form)	At run in L range in 1st gear 20 km/h. Circuit tester (+) to B3 pin, (-) to B5 pin.	Pulse generated (At AC range approx. 6.2 V)	Related harness
								Turbine sensor
B4	BLU	ATF Thermo Sensor	Input	ATF thermo sensor	Voltage	ATF temp. 20°C	Approx. 1.55 V	Related harness
						ATF temp. 60°C	Approx. 0,7V	Thermo sensor
B5	BLK	Ground	-	Ground	Voltage	Normally	Less than 2V	Related harness
B6	BLU/ BLK	Low & Reverse Brake Duty Solenoid	Output	Low & reverse brake duty solenoid	Voltage (Wave form)	P, N range. Circuit tester (+) to B6 pin, (-) to B22 pin.	Pulse generated (At AC range approx. 6.8V)	Related harness
								Duty solenoid
B7	BLK/ YEL	2-4 Brake Duty Solenoid	Output	2-4 brake duty solenoid	Voltage (Wave form)	P, N range. Circuit tester (+) to B7 pin, (-) to B22 pin.	Pulse generated (At AC range approx. 6.8V)	Related harness
								Duty solenoid
B8	RED	High Clutch Duty Solenoid	Output	High clutch duty solenoid	Voltage (Wave form)	P, N range. Circuit tester (+) to B8 pin, (-) to B22 pin.	Pulse generated (At AC range approx. 6.8V)	Related harness
								Duty solenoid
B9	WHT/ RED	Low Clutch Duty Solenoid	Output	Low clutch duty solenoid	Voltage (Wave form)	4th gear in D range. Circuit tester (+) to B9 pin, (-) to B22 pin.	Pulse generated (At AC range approx. 6.8V)	Related harness
								Duty solenoid
B10	RED/ BLK	N Range Switch	Input	Inhibitor switch	Voltage	At N range	Battery voltage	Related harness
						At other than N range	Less than 2V	Inhibitor switch
B11	BLU	D Range Switch	Input	Inhibitor switch	Voltage	At D range	Battery voltage	Related harness
						At other than D range	Less than 2V	Inhibitor switch

No.	Wire Color	Pin Name	Input / Output	Connected to	Measurement Item	Measurement Condition	Standard	Inspection Point at Trouble
B12	YEL	Low & Reverse Brake Pressure Switch	Input	Low & reverse brake pressure switch	Voltage	At other than R range, L range 1st gear	More than 10 V	Related harness
						At R range, L range 1st gear	Less than 2V	Pressure switch
B13	YEL/ RED	Vehicle Speed Sensor	Input	Vehicle speed sensor	Voltage (Wave form)	At run in L range in 1 st gear 20 km/h. Circuit tester (+) to B13 pin, (-) to B5 pin.	Pulse generated (At AC range approx. 6.2 V)	Related harness
								Vehicle speed sensor
B14	BLU/ BLK	ATF Thermo Sensor Ground	-	ATF thermo sensor	Continuity	Normally	Continuity	Related harness
B15	BLK	Ground	-	Ground	Voltage	Normally	Less than 2V	Related harness
B16	-	-	-	-	-	-	-	-
B17	BLK	Lock-up Duty Solenoid	Output	Lock-up duty solenoid	Voltage (Wave form)	At lock-up. Circuit tester (+) to B17 pin, (-) to B5 pin.	Pulse generated (At AC range approx. 7.2 V)	Related harness
						At unlock-up. Circuit tester (+) to B17 pin, (-) to B5 pin.	Pulse generated (At AC range approx. 4.0 V)	Duty solenoid
B18	WHT	V ign (Ignition Power Supply)	Input	Key switch	Voltage	At key switch ON	Battery voltage	Related harness
						At key switch OFF	Less than 2V	Fuse
B19	RED/ YEL	R Range Switch	Input	Inhibitor switch	Voltage	At R range	Battery voltage	Related harness
						At other than R range	Less than 2V	Inhibitor switch
B20	WHT/ BLK	High Clutch Oil Pressure Switch	Input	High clutch pressure switch	Voltage	At other than 3rd or 4th gear	More than 10 V	Related harness
						At 3rd or 4th gear	Less than 2V	Pressure switch
B21	PNK/ BLK	L Range Switch	Input	Inhibitor switch	Voltage	At L range	Battery voltage	Related harness
						At other than L range	Less than 2V	Inhibitor switch
B22	GRY/ RED	Ground Return	Output	Shift solenoid	Continuity	Normally	Continuity	Related harness
B23	VIO	Line Pressure Solenoid	Output	Line pressure solenoid	Voltage	At N range	Battery voltage	Related harness
						At D range stall	Less than 2V	Solenoid

No.	Wire Color	Pin Name	Input / Output	Connected to	Measurement Item	Measurement Condition	Standard	Inspection Point at Trouble
B24	WHT	V ign (Ignition Power Supply)	Input	Key switch	Voltage	At key switch ON	Battery voltage	Related harness
						At Key switch OFF	Less than 2V	Fuse

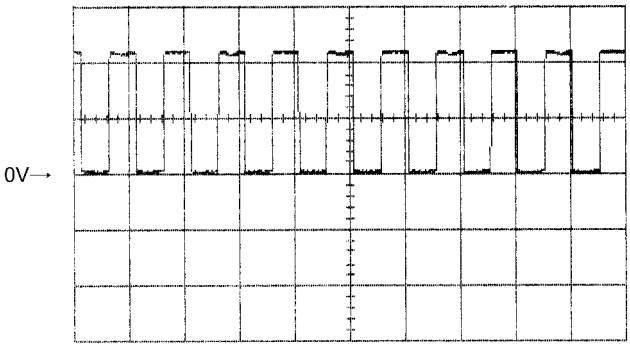


Off duty 10% =Throttle Position 0%



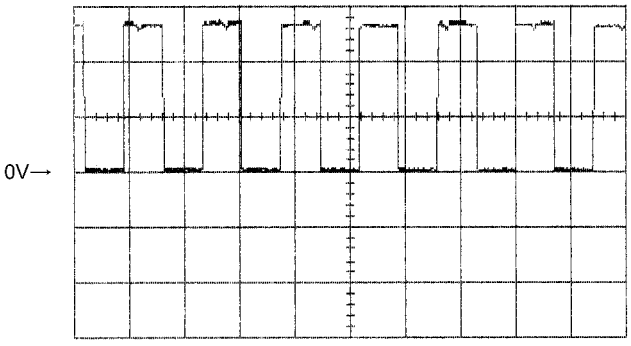
Off duty 90% =Throttle Position 100%

Engine Speed Sensor Reference Wave Form



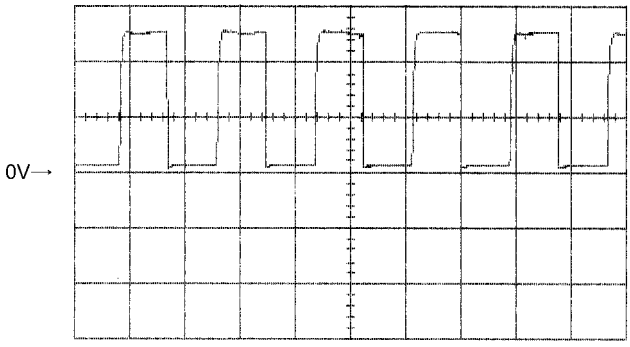
Measurement Terminal: A7 (+) B5 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: At engine speed 1500rpm

Vehicle Speed Sensor Out Reference Wave Form



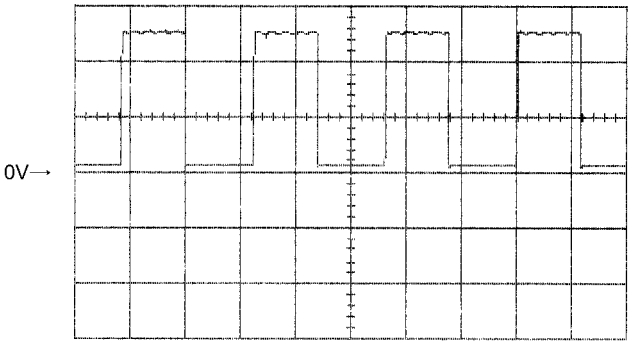
Measurement Terminal: A10 (+) B5 (-)
Measurement Scale: 5V/div 50ms/div
Measurement Condition: Vehicle speed 20km/h at L range in 1st gear

Turbine Sensor Reference Wave Form



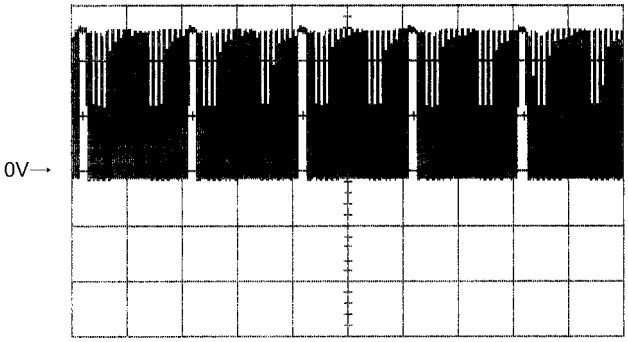
Measurement Terminal: B3 (+) B5 (-)
Measurement Scale: 5V/div 500ms/div
Measurement Condition: Vehicle speed 20km/h at L range in 1st gear

Vehicle Speed Sensor Reference Wave Form



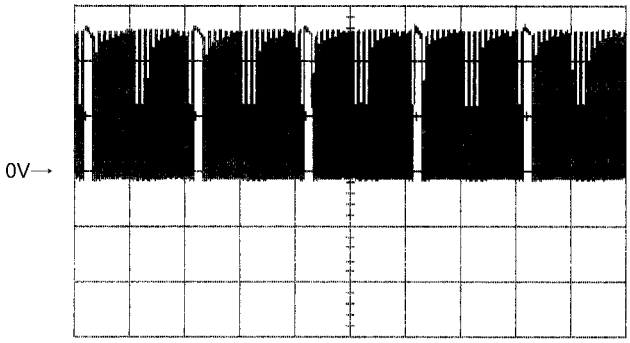
Measurement Terminal: B13 (+) B5 (-)
Measurement Scale: 5V/div 2ms/div
Measurement Condition: Vehicle speed 20km/h at L range in 1st gear

Low & Reverse Brake Duty Solenoid Reference Wave Form



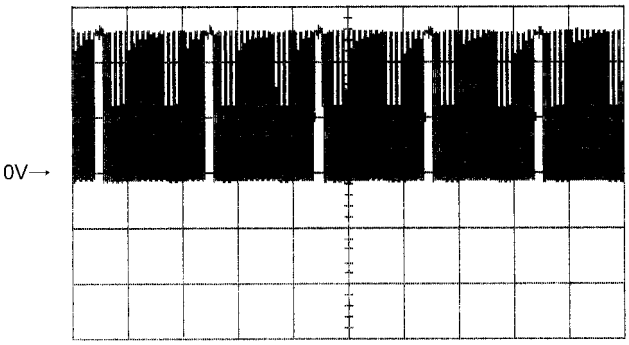
Measurement Terminal: B6 (+) B22 (-)
Measurement Scale: 5V/div 10ms/div
Measurement Condition: P, N range in idle

2-4 Brake Duty Solenoid Reference Wave Form



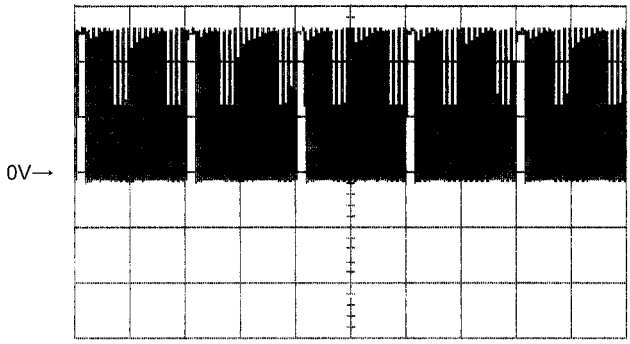
Measurement Terminal: B7 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: P, N range in idle

High Clutch Duty Solenoid Reference Wave Form



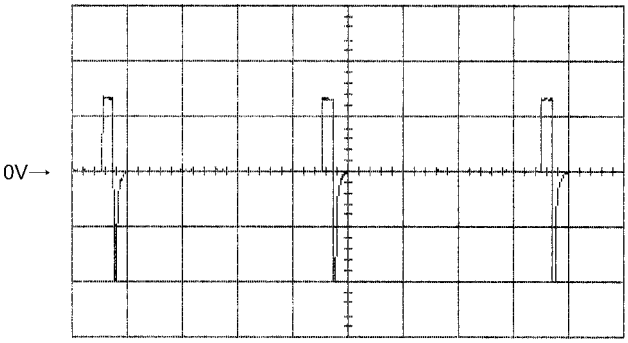
Measurement Terminal: B8 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: P, N range in idle

Low Clutch Duty Solenoid Reference Wave Form



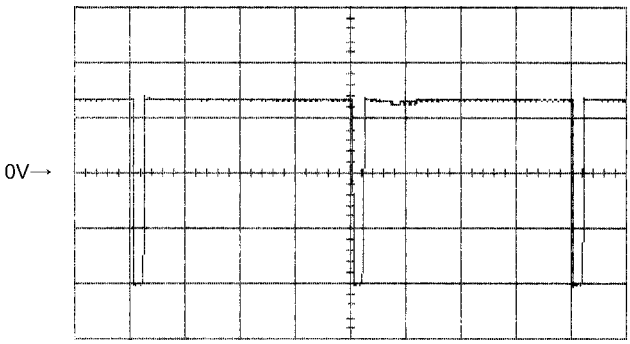
Measurement Terminal: B9 (+) B22 (-)
Measurement Scale: 5V/div 20ms/div
Measurement Condition: D range 4th gear

Lock-up Duty Solenoid Reference Wave Form



Measurement Terminal: B17 (+) B5 (-)
Measurement Scale: 10V/div 5ms/div
Measurement Condition: Unlock-up condition

Lock-up Duty Solenoid Reference Wave Form



Measurement Terminal: B17 (+) B5 (-)
Measurement Scale: 10V/div 5ms/div
Measurement Condition: Lock-up condition

MEMO

SECTION 7A3
ON-VEHICLE SERVICE (JR405E)
TABLE OF CONTENTS

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Throttle Position Sensor	7A3 – 5
Inhibitor Switch	7A3 – 6
Speed Sensor	7A3 – 8
Turbine Sensor	7A3 – 8
Power and 3rd Start Switch	7A3 – 9
Select Lever	7A3 –10
Shift Cable	7A3 –13
Solenoids, Oil Pressure Switch and Oil Temperature Sensor	7A3 –16
Control Valve Assembly	7A3 –18
Flushing the Transmission Fluid Cooler and Line	7A3 –19
Transmission Assembly	7A3 –20

DESCRIPTION

Before performing on-vehicle service on the automatic transmission, check that the engine idling speed and general engine condition are normal.

AUTOMATIC TRANSMISSION FLUID (ATF)

Inspect

Remove the transmission dipstick to check the condition of the ATF.

Clean the dipstick and look for gum or varnish.

Gum or varnish indicate scorching of the clutch band and other parts.

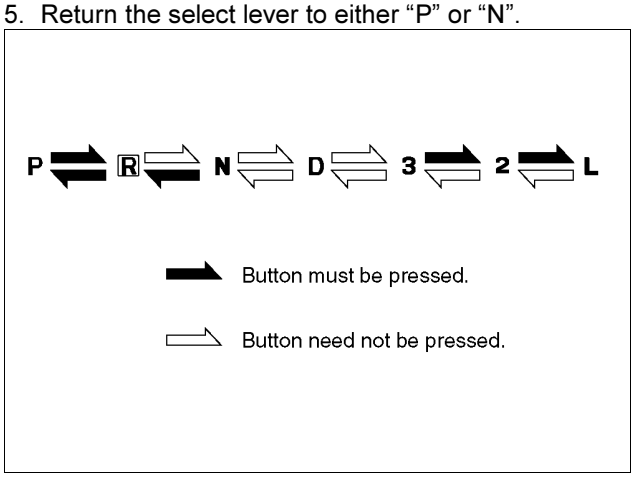
The transmission control module, the transmission unit, and the vehicle must be carefully checked if gum or varnish is present.

ATF LEVEL

Inspect

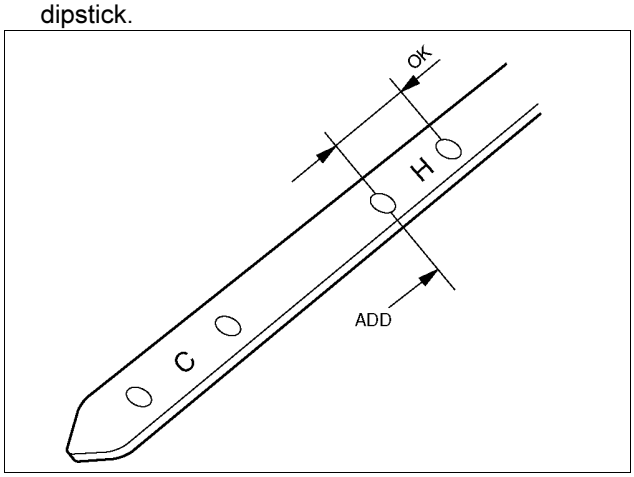
Hot Level

1. Warm up the engine and the transmission by driving the vehicle on the road so that the temperature reaches around 80°C (176°F).
   Do not turn the engine off.
2. Park the vehicle on a level surface.
3. Apply the parking brake firmly.
4. Let the engine run at idle.
   Move the select lever slowly through all the gear ranges.
   Stop in each gear range just long enough for the transmission to engage.
5. Return the select lever to either “P” or “N”.



C07RW009

6. Remove the ATF level dipstick.
7. Wipe the dipstick clean with a paper towel.
8. Reinsert the dipstick and wait several seconds.
9. Remove the dipstick.
   The ATF level should be inside the “H” range on the dipstick.



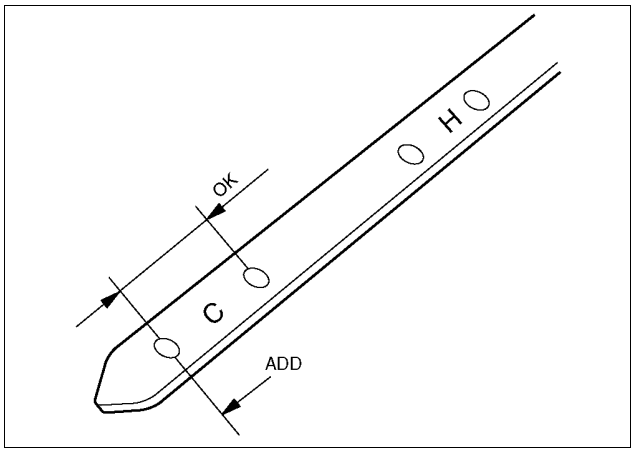
242R300001

If the ATF level is below the “H” range, ATF must be added.

Cold Level

The vehicle must not have been driven so that the temperature reaches around 20°C (68°F) before the cold level check is made.

1. Park the vehicle on a level surface.
2. Apply the parking brake firmly.
3. Start the engine and allow it to warm up.
   The engine coolant temperature gauge needle should be midway between the “C” mark and “H” mark.
4. Let the engine run at idle.
   Move the select lever slowly through all the gear ranges.
   Stop in each range just long enough for the transmission to engage.
5. Return the select lever either “P” or “N”.
6. Remove the ATF level dipstick.
7. Wipe the dipstick clean with a paper towel.
8. Reinsert the dipstick and wait several seconds.
9. Remove the dipstick.
   The ATF level should be inside the “C” range on the dipstick.
   If the ATF level is below the “C” range, ATF must be added.



242R300002

ATF CHANGE

1. Start the engine and allow it to idle until the ATF reaches a temperature of 40-50°C
2. Park the vehicle on level ground and block the wheels.
3. Stop the engine.
4. Raise vehicle and support with suitable safety stands.
5. Remove the drain plug from the oil pan and drain the ATF (approximately 6 liters).
6. Remove the oil pan.
7. Inspect the oil pan (details written below).
8. Install the oil pan.

Note:

Use new gasket. Clean the oil pan and magnet.

Oil pan bolt torque : 8 N·m (69 lb·in)

9. Replace the gasket and install the drain plug.
   Drain plug torque : 35 N·m (26 lb·ft)

Note:

Do not reuse old washer (gasket).

Clean the drain plug (especially the threaded section).

10. Pour about 5 liters of new ATF. Then, add more ATF carefully as necessary using the dipstick.
    Refer to “ATF LEVEL” previously in this section.

Note:

Keep the engine idle (do not stop it) during the oil level adjustment.

11. Remove the safety stands and wheel blocks.

Inspect

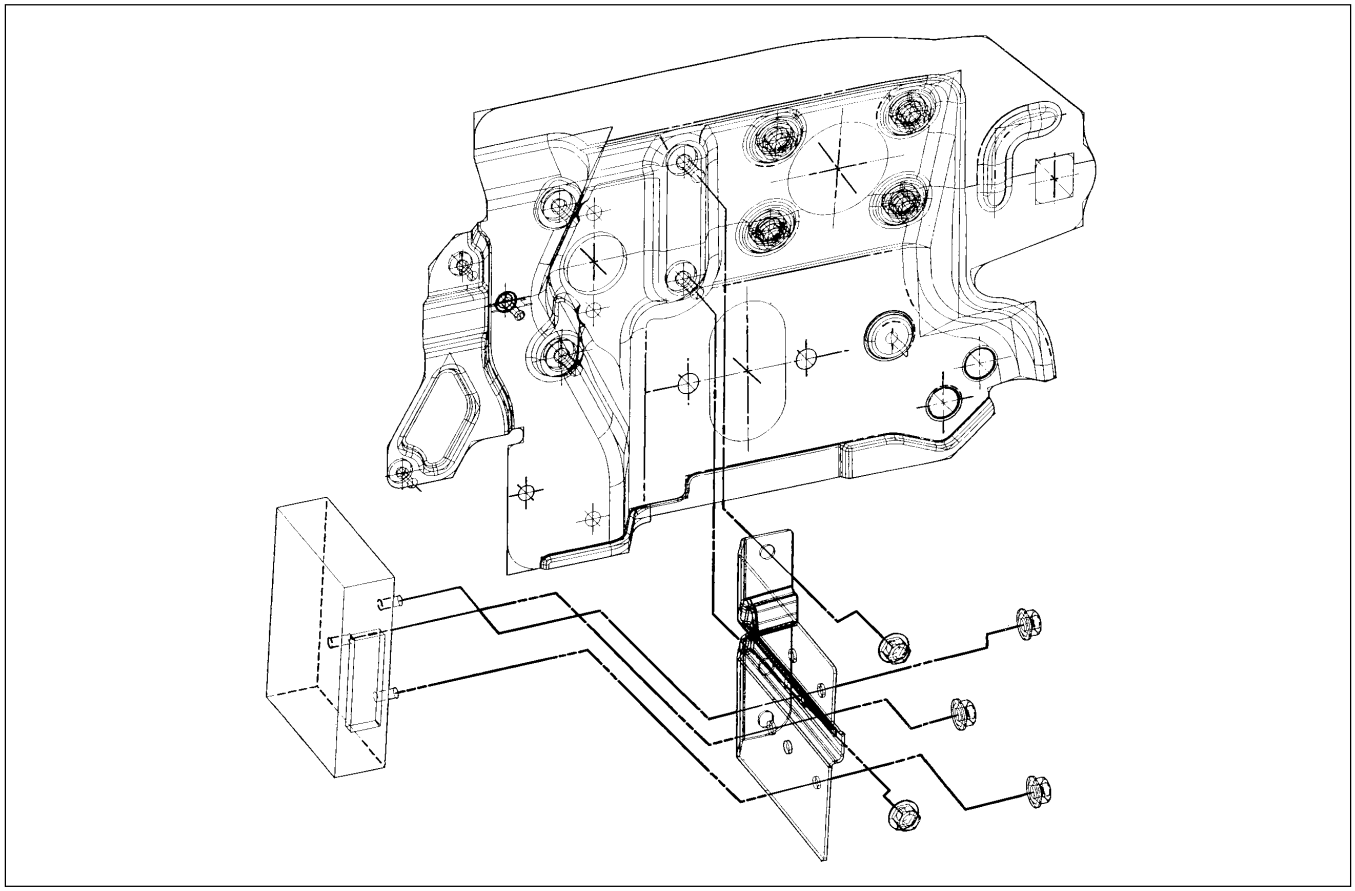
1. Check the drain plug tip for adhesion of foreign substances.
2. Check the drained ATF for color, smell and inclusion of foreign substances.
3. Check the oil pan bottom and magnet for adhesion of foreign substances.
   If a problem is discovered during those checks, the Automatic transmission must be overhauled.

Note:

The torque converter and the oil strainer need replaced with new ones if the drained ATF contains large amounts of metallic or facing flakes.

In addition, flush the ATF cooler circuit

TRANSMISSION CONTROL MODULE (TCM)



RTW37ALF001901

Remove and Disconnect

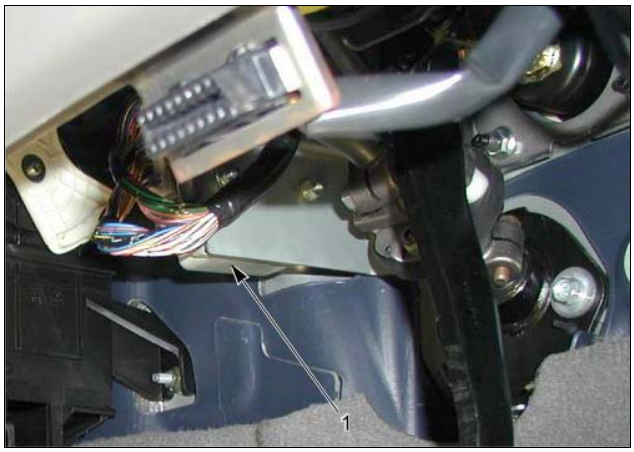
1. Disconnect the negative battery cable.
2. Remove the connectors.
3. Remove the fixing nuts and remove the TCM (1) from the bracket.

Note:

The TCM is fitted under instrument panel of the driver's compartment by means of three stud bolts.

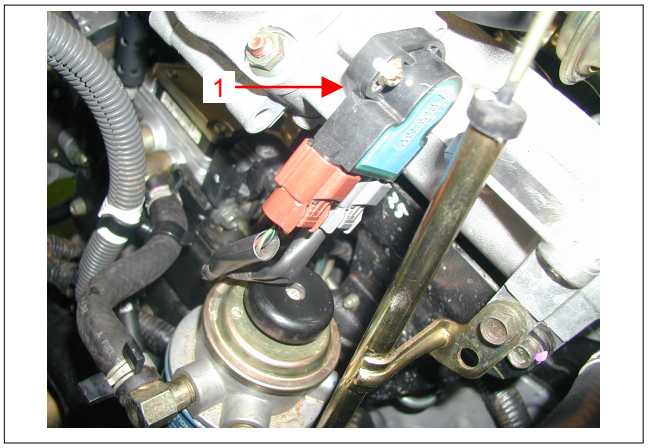
Install or Connect

Follow the removal steps in the reverse order. Be absolutely sure that the connectors are securely fastened.



AT CONT

THROTTLE POSITION SENSOR



P1010052

The throttle position sensor (1) is fitted on the throttle valve body.

Adjust

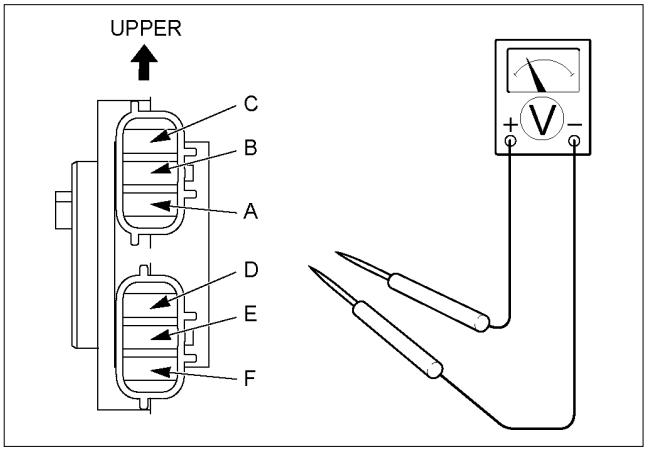
1. Turn the starter switch to the “ON” position.
2. Measure the voltage between TPS connector terminals (B) (output) and (A) (ground).

Note:

- Do not remove the sensor connector.
- Make sure that power source (5.0 ± 0.01 V) is measured between TPS connector terminals (C) and (A) before measurement at step 2.

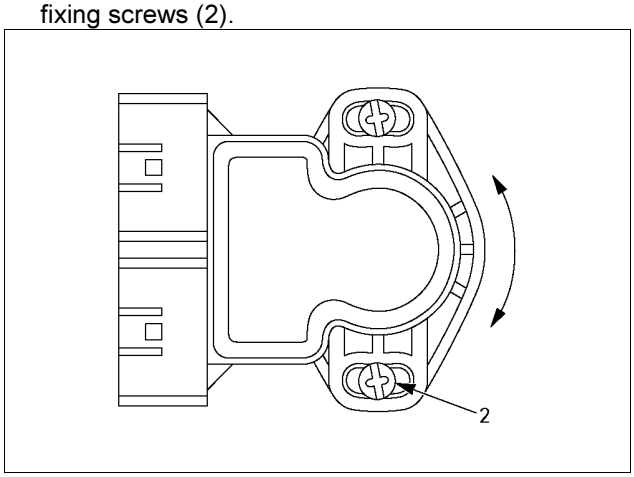
Standard voltage :

Throttle Angle	TPS
Idling (0%)	0.2 - 0.3 V
WOT (100%)	3.4 – 4.1 V



RTW37ASH0013

3. If the reading is beyond the specified value, loosen the throttle position sensor fixing bolts, and turn it right or left, so that the specified output voltage be obtained.
   After adjusting, tighten the throttle position sensor fixing screws (2).



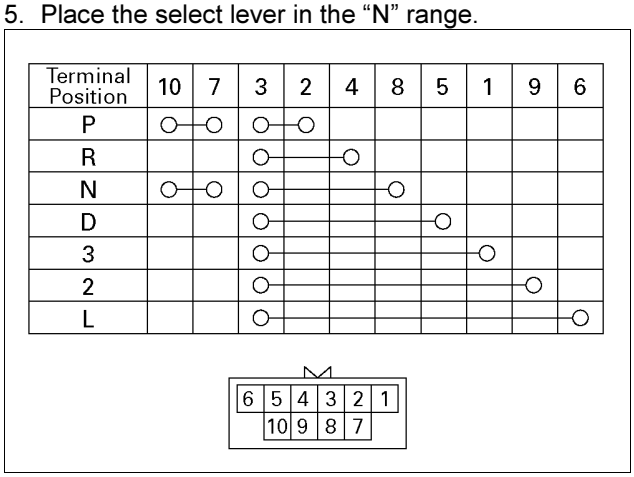
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INHIBITOR SWITCH

The inhibitor switch is attached to the right side of the transmission.

Inspect

1. Block the wheels.
2. Disconnect the negative battery cable.
3. Disconnect the harness connectors.
4. Use a ohmmeter to check the inhibitor switch continuity between the following terminals as shown in figure.
5. Place the select lever in the “N” range.



249R300001

6. Move the select lever to either side.
   Check the inhibitor switch continuity between the terminals shown in Step (4).
   The continuity readings should remain fairly steady as the select lever is moved.
   If there is no continuity or the continuity is intermittent, the inhibitor switch must be adjusted.

Adjust

1. Disconnect the shift calbe from the lever.
2. Loosen the inhibitor switch bolts.
3. Use the inhibitor switch set plate to align the neutral holes (manual shaft and inhibitor switch).
   Turn the inhibitor switch to adjust it.
   Inibitor switch set plate: 5-8840-2763-0

Note:

Inhibitor switch adjustment is very important.

If the inibitor switch is not correctly adjusted, the automatic transmission will not function normally.

4. Tighten the 2 inhibitor switch bolts to the specified touque.
   Torque: 5.5 N·m (48 lb·in)

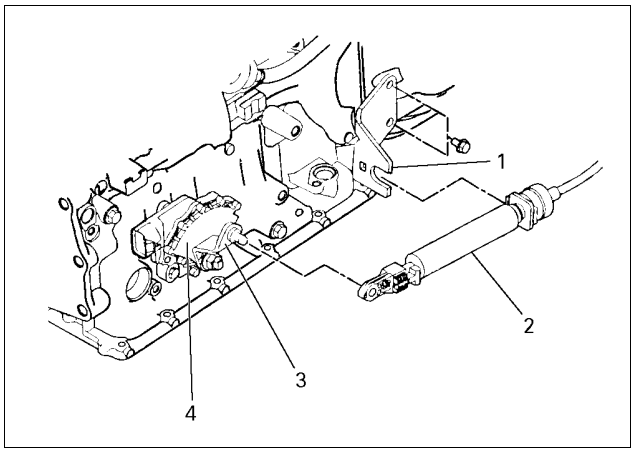


47INH-SW01

5. Connect the shift cable to the lever.
6. Connect the harness connector.

Remove or Disconnect

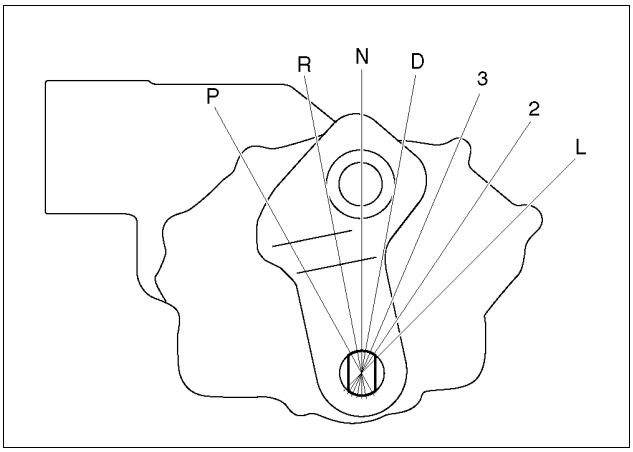
1. Remove the cable bracket (1) from the transmission.
2. Disconnect the shift cable (2) from the lever (3).
3. Disconnect the harness connectors.
4. Remove the inhibitor switch bolts.
5. Remove the inhibitor switch (4) from the transmission.



238R300001

Install or Connect

1. Install the inhibitor switch (4) to the transmission.
   Temporarily tighten the inhibitor switch bolts.
2. Move the manual shaft select lever to the “N” range.



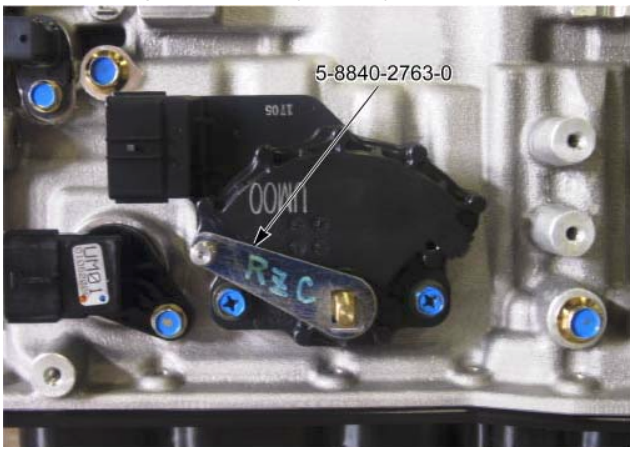
249R300002

3. Use the inhibitor switch set plate to align the neutral holes (manual shaft and inhibitor switch).
   Turn the inhibitor switch to adjust it.
   Inhibitor switch set plate: 5-8840-2763-0

Note:

Inhibitor switch adjustment is very important.
If the inhibitor switch is not correctly adjusted, the automatic transmission will not function normally.

4. Tighten the 2 inhibitor switch bolts to the specified torque.
   Torque: 5.5 N·m (48 lb·in)

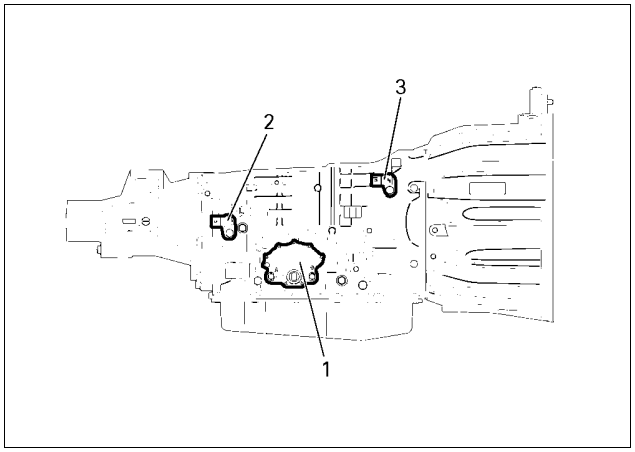


47INH-SW01

5. Install the cable bracket (1) to the transmission.
6. Connect the shift cable (2) to the lever (3).
7. Connect the harness connector.
8. Connect the negative battery cable.
9. Remove the wheel blocks.

SPEED SENSOR

The speed sensor is attached to the right side of the transmission.



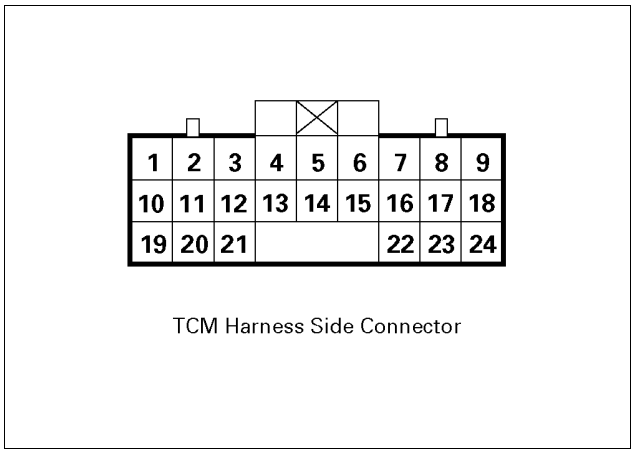
240L300001

Legend

1. Inhibitor switch
2. Speed sensor
3. Turbine sensor

Inspect

1. During the driving at speed of 20km/h (12mph) with “L” range in low gear, measure the voltage between the TCM connector terminals (B13) and (B5) with a digital voltmeter.
   Standard voltage : approx. 7V (AC range)



826R300014

2. If the voltage is out of the standard value, check the speed sensor pole piece for presence of foreign meterials and the speeed sensor cable for short or open circuit.
   Result of the inspection is normal, replace the speed sensor.
   Torque: 6 N·m (52 lb·in)

TURBINE SENSOR

The turbine sensor is attached to the right side of the transmission.

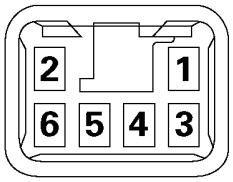
Inspect

1. During the driving at speed of 20km/h (12mph) with “L” range in low gear, measure the voltage between the TCM connector terminals (B3) and (B5) with a digital voltmeter.
   Standard voltage : approx. 7V (AC range)
2. If the voltage is out of the standard value, check the turbine sensor pole piece for presence of foreign materials and the turbine sensor cable for short or open circuit.
   Result of the inspection is normal, replace the turbine sensor.
   Torque: 6 N·m (52 lb·in)

POWER AND 3RD START SWITCH

Inspect

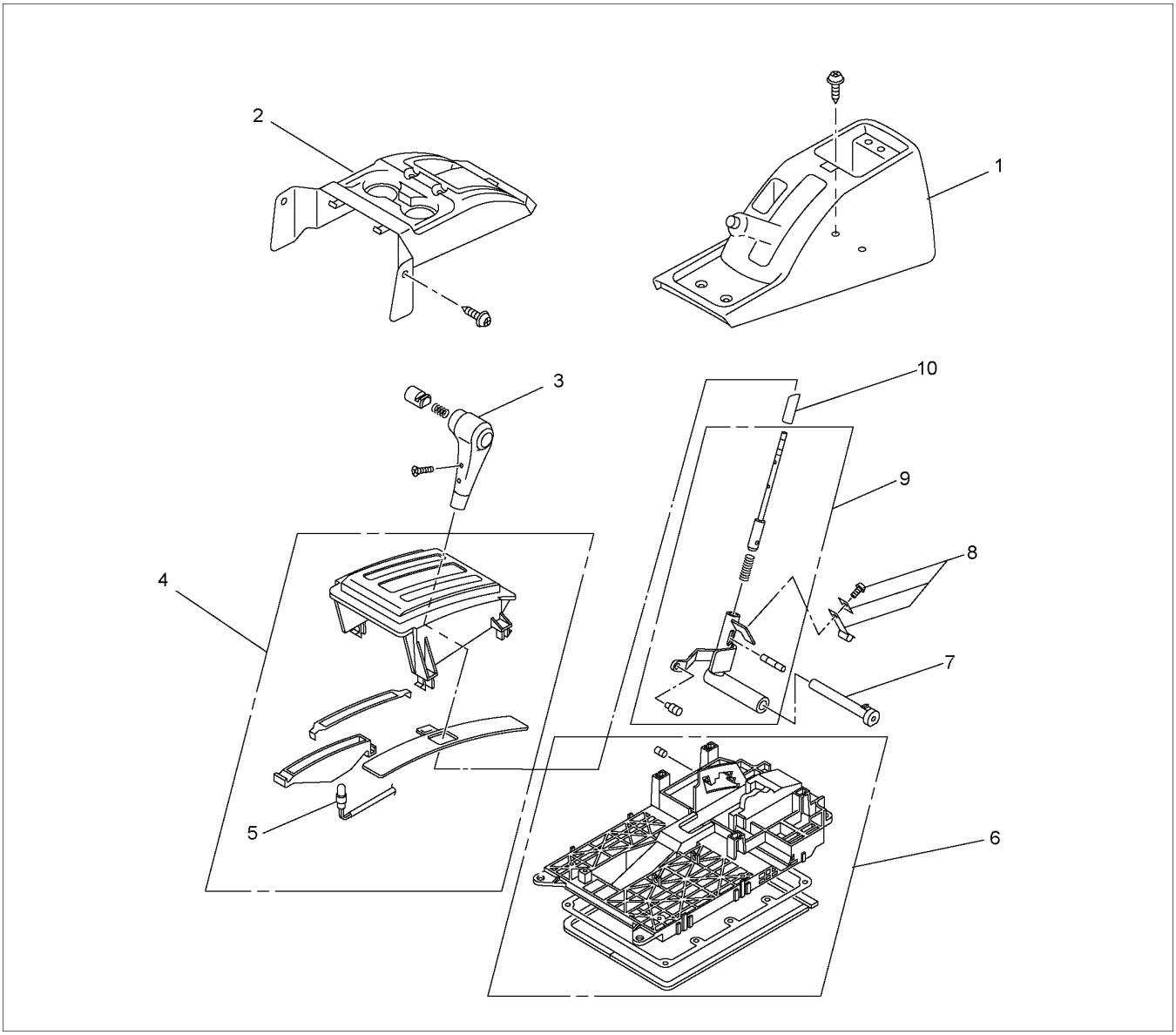
1. Block the wheels.
2. Disconnect the negative battery cable.
3. Pry out the switch from the floor console.
4. Disconnect the harness connector.
5. Check continuity between terminal (5) and (6) at third (3rd) position.
6. Check continuity between terminals (3) and (6) at power (PWR) position.
7. Replace the power and 3rd start switch when the result of inspection is found abnormal.
8. Connect the harness connector.
9. Connect the negative battery cable.
10. Remove the wheel blocks.



Switch Position	Terminal		
	3	6	5
PWR	○	○	
3rd		○	○

238R300003

SELECT LEVER



RTW37ALF001101

Legend

1. Rear console
2. Front console
3. Select lever knob
4. Upper housing
5. Lamp assembly
6. Base plate
7. Grooved pin
8. Spring plate
9. Lever assembly
10. Sleeve

Remove or Disconnect

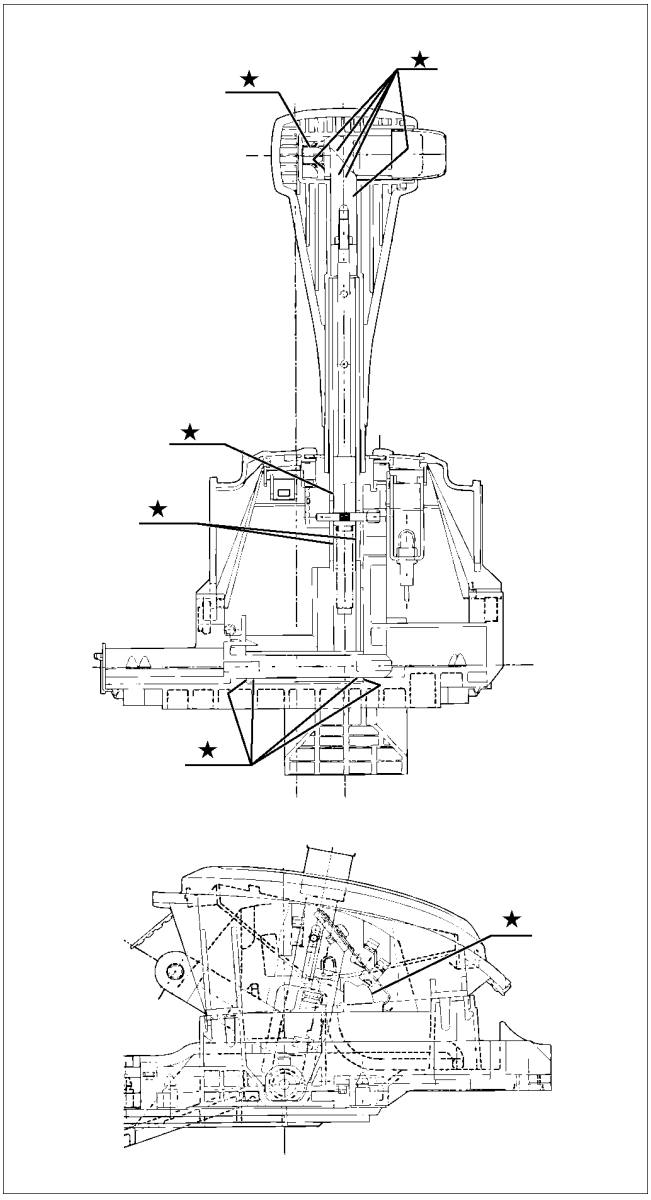
1. Block the wheels.
2. Disconnect the negative battery cable.
3. Remove the rear console and the front console.
4. Remove the 2 screws fixing the select lever knob.
5. Remove the knob together with the knob button and spring from the lever.
6. Turn the sleeve counterclockwise to remove it. Make a note of the number of turns required to free the sleeve.
7. Remove the harness connectors from the base plate.
8. Remove the upper housing (held in place by 4 latched fasteners).
9. Remove the spring plate.

10. Remove the grooved pin.
11. Remove the lever assembly by pressing the rod down (lever in N position).
12. If lamp replacement is required, remove the lamp assembly from the lamp socket (align the socket grooved portion and the lamp assembly protruding portion).

Install or Connect

NOTE

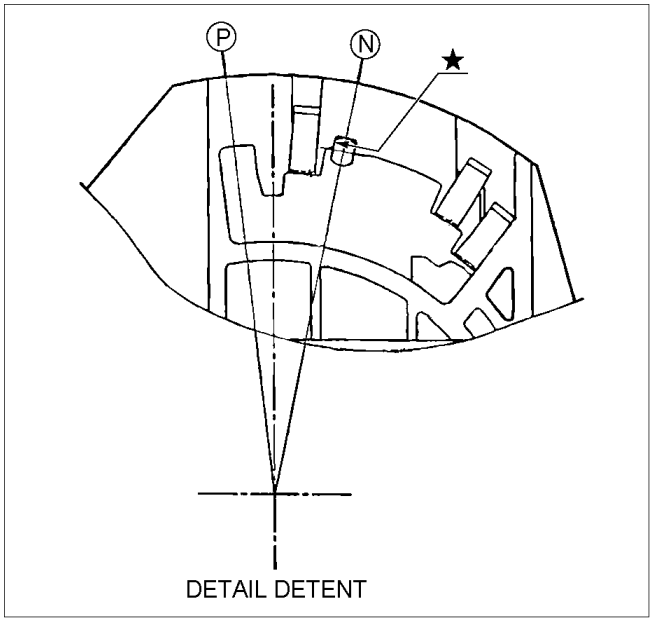
Apply MULTEMP No. 2 grease (or equivalent) to the select lever. Refer to the illustration.



RTW37ALH000201

1. Install the lever assembly to the base plate.
   a. Insert and secure shaft.
   b. Insert pawled end of shaft into base plate hole.
   c. Insert grooved pin of shaft into detente aperture (lever assembly in N position).

2. Install the spring plate.
   a. Insert the grooved pin into the base plate detente groove until it touches the front wall (lever assembly in N position).



DETAIL DETENT

RTW37ASH001001

   b. Stack the short spring plate tighten the screws to the specified torque.

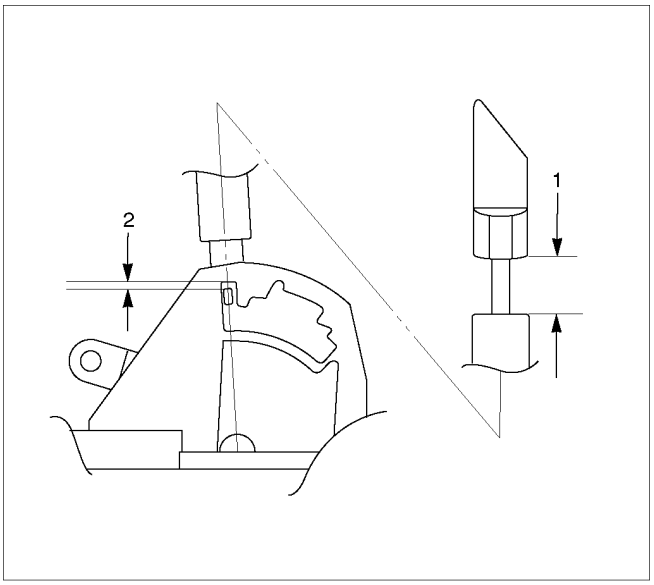
Screw torque	2 N·m (0.2kg·m/17 lb ft)

   c. Check that the grooved pin moves smoothly in the detente groove (shift knob temporarily installed).

3. Temporarily install the sleeve.
4. Install the lamp assembly to the lamp socket (if removed at disassembly).
   a. Align the recessed portion of the lamp socket with the protruding portion of the lamp assembly.
   b. Insert the lamp assembly into the lamp socket and rotate it 90 degrees clockwise.
5. Attach the harness connectors to the base plate.
6. Move the lever to the “P” position.
7. Install the sleeve (rotate the sleeve clockwise the same number of turns it was rotated counterclockwise at disassembly).
8. Install the knob, the knob button, and the knob spring.

9. Adjust the clearance (2) between the detente plate and the pin by moving the select lever knob sleeve (1).

Detente plate and pin clearance	mm(in)
0.2 - 1.0 (0.01 - 0.04)	



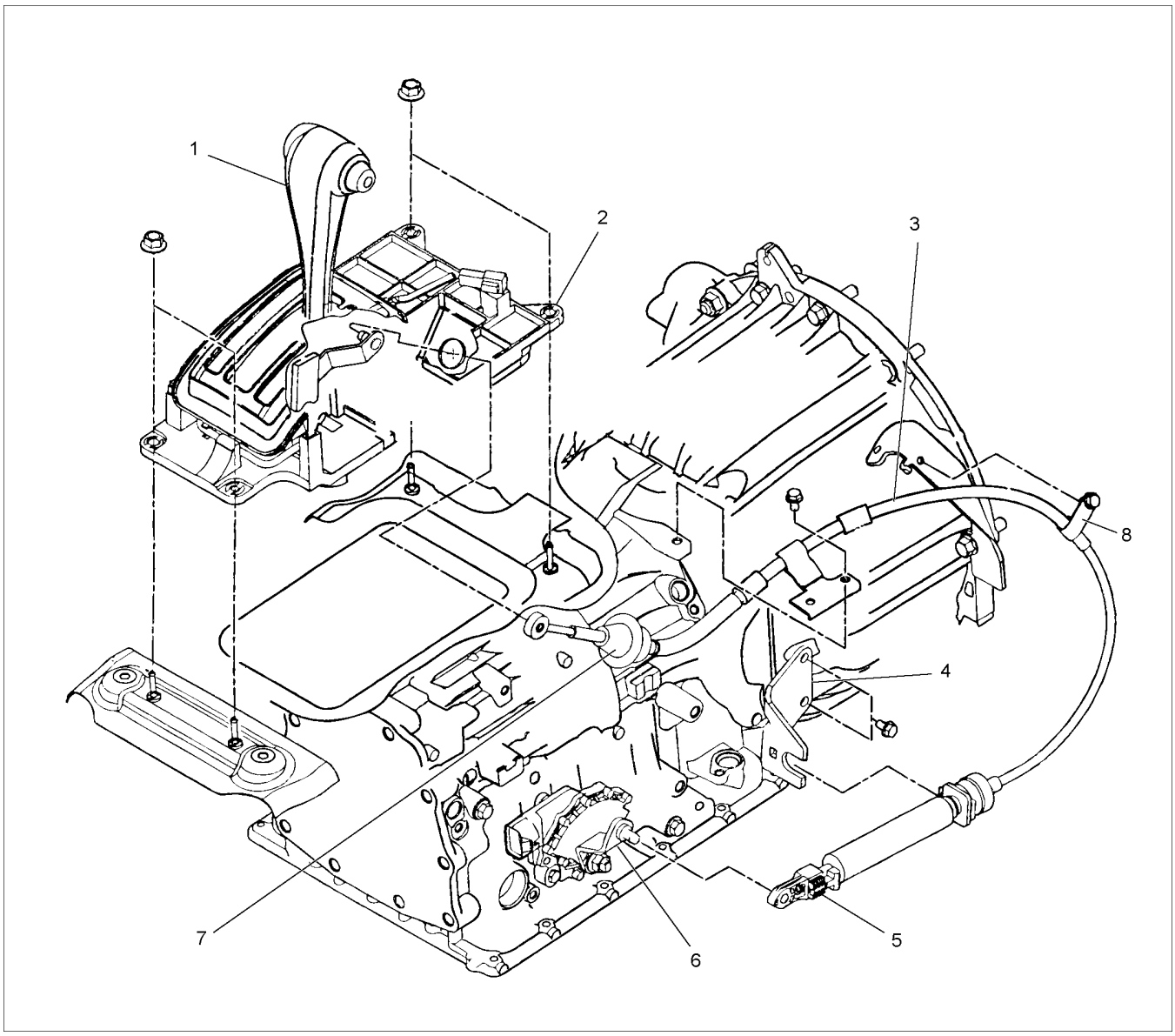
255R300002

10. Install the 2 screws securing the knob and tighten them to the specified torque.

    Screw torque: 2 N·m (0.2kg·m/17 lb in)

11. Install the upper housing. Make sure that the 4 latched fasteners are securely closed.

SHIFT CABLE



RTW37ALF001201

Legend

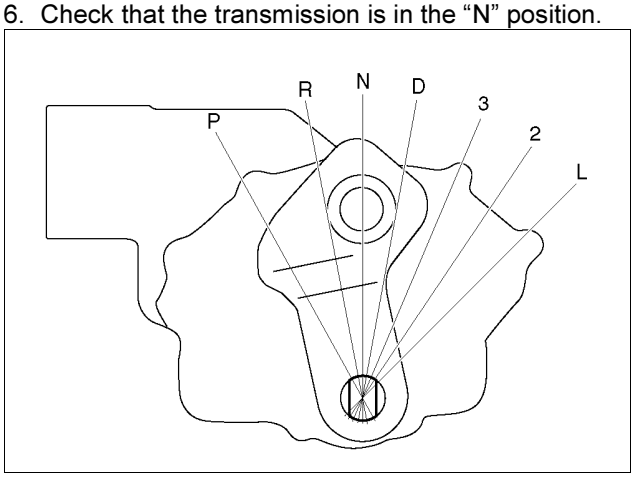
1. Select lever
2. Select lever base
3. Shift cable
4. Bracket
5. Adjuster
6. Manual shaft select lever
7. Shift cable retaining pawl
8. Clip

Remove or Disconnect

1. Block the wheels.
2. Disconnect the negative battery cable.
3. Move the select lever to the “N” position.
4. Remove the rear console and front console.
5. Disconnect the shift cable from the select lever.
6. Press on the shift cable retaining pawl to remove the cable from the select lever base.
7. Disconnect the shift cable from the transmission side.
8. Remove the shift cable from the bracket.
9. Pull the shift cable free from the bottom of the vehicle.

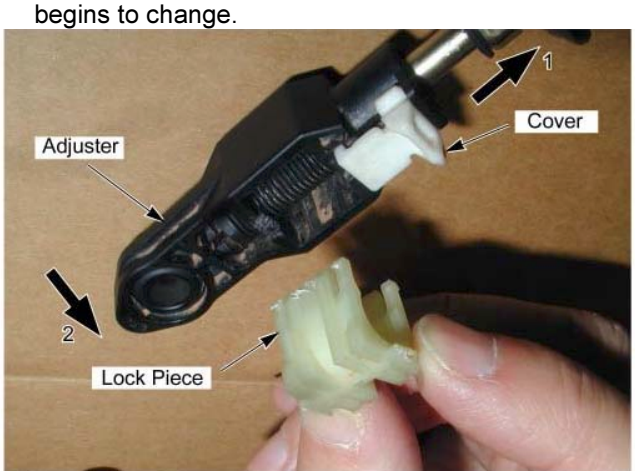
Install or Connect

1. Install the shift cable toward the inside of the cabin from the bottom of the vehicle.
2. Push the shift cable into the select lever base.
3. Connect the shift cable to the select lever.
4. Fix the shift cable to the bracket.
   Install the clip on the marking of shift cable.
5. Check that the select lever is in the “N” position.
6. Check that the transmission is in the “N” position.



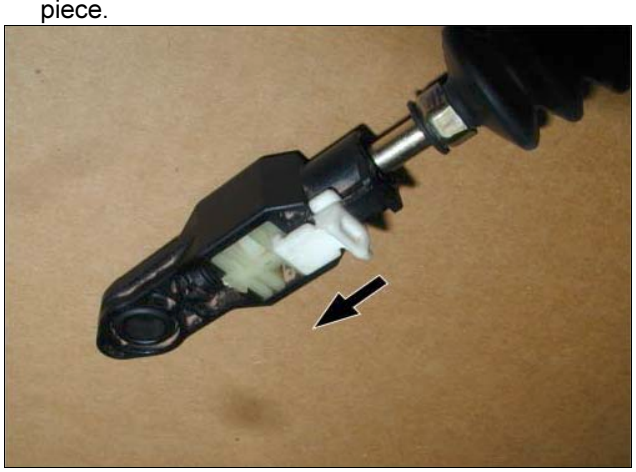
249R300002

7. Slide the cover in the direction shown by the arrow (1).
8. Use an ordinary screwdriver to move the lock piece from the position indicated by the arrow (2). Continue to move the lock piece until the adjuster position begins to change.



P1010012

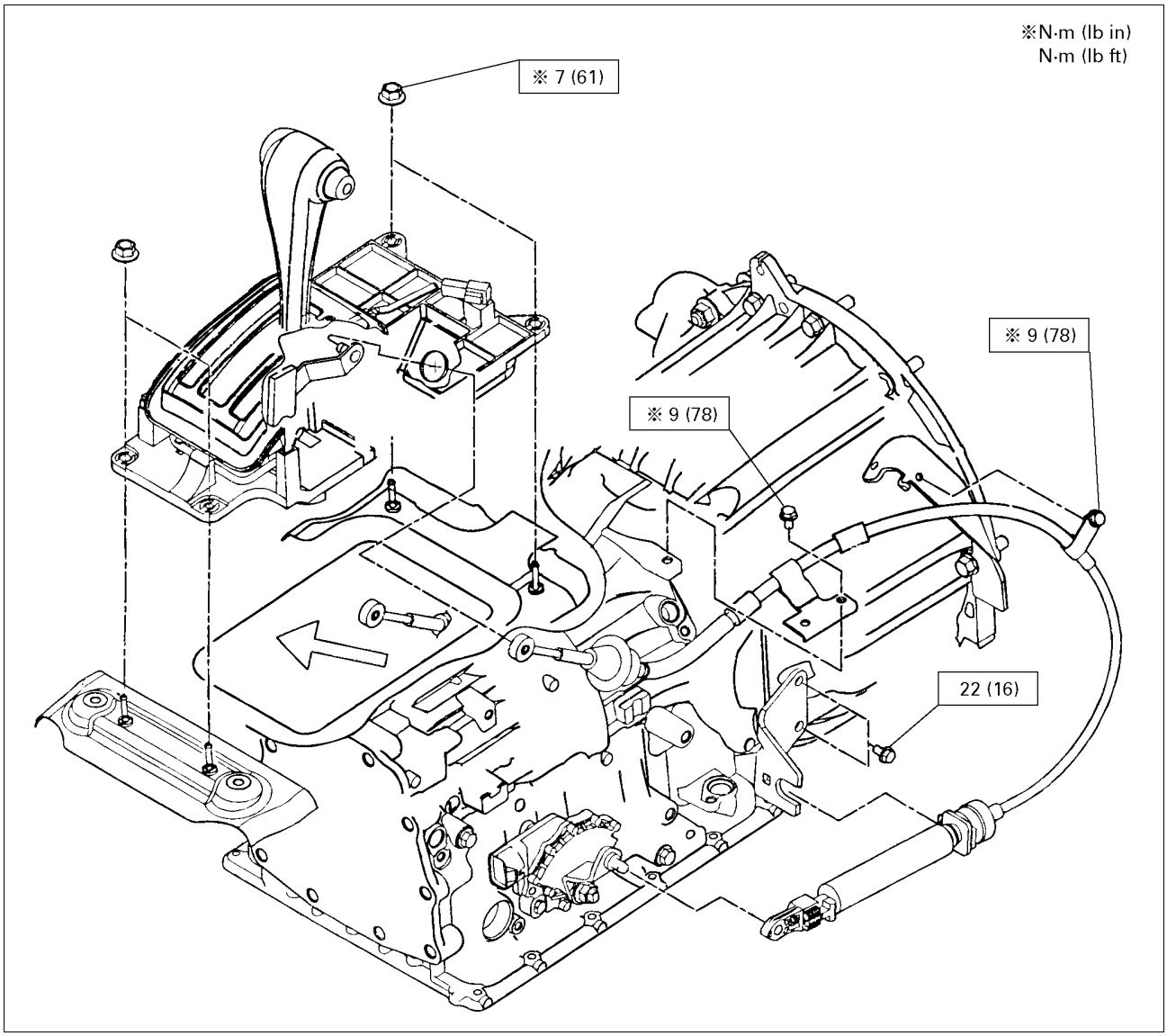
9. Connect the shift cable to the manual shaft select lever at the transmission side.
10. Insert the lock piece to the adjuster (cable length adjustment).
11. Slide the cover on the adjuster and secure lock piece.



P1010016-2

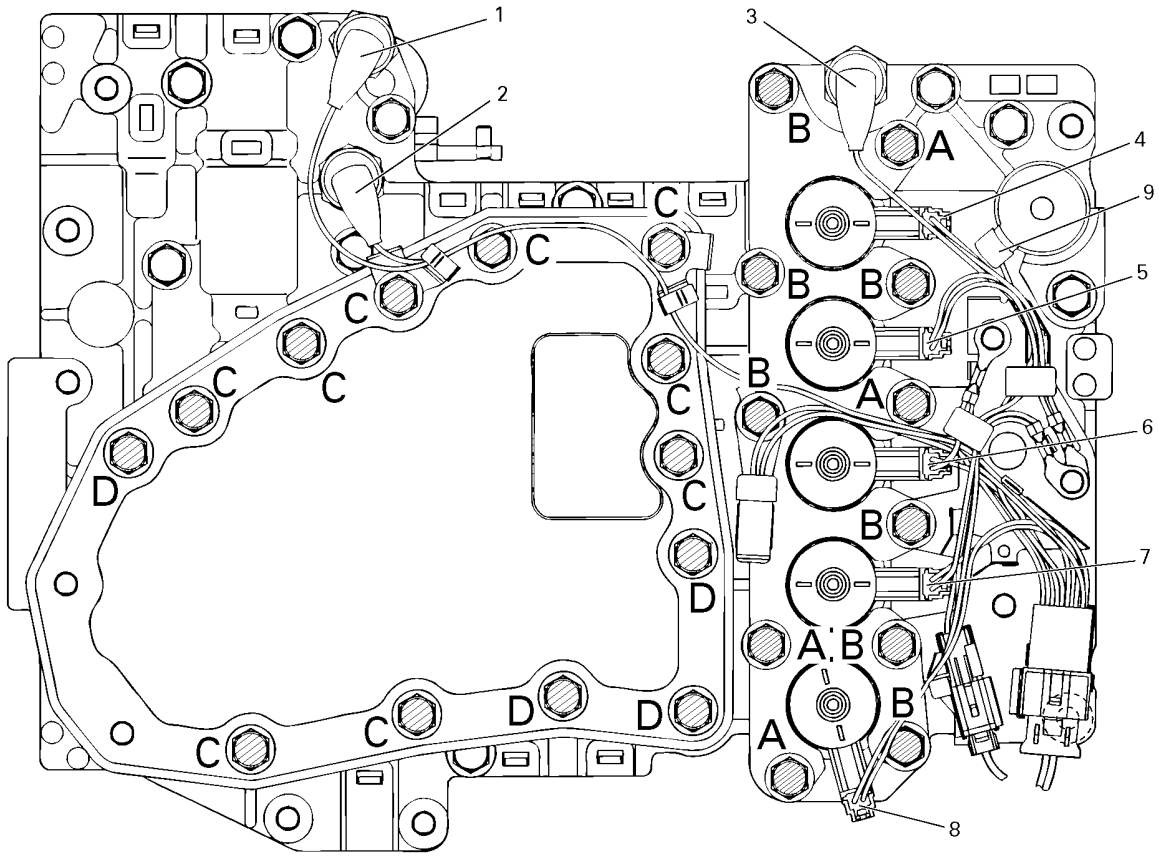
11. Press the select lever knob button 5 times.
    Then check that the select lever moves smoothly to each of its positions.
13. Check that the shift position indicated by the select lever and the actual shift position are the same.
14. Install the front console and rear console.
15. Connect the negative battery cable.
16. Remove the wheel blocks.

Torque Specifications



E07R300015

SOLENOIDS, OIL PRESSURE SWITCH AND OIL TEMPERATURE SENSOR



244L300003

Legend

1. High clutch oil pressure switch connector (wire color: Gray)
2. 2-4 brake oil pressure switch connector (wire color: Brown)
3. Low and reverse brake oil pressure switch connector (wire color: White)
4. Low and reverse brake duty solenoid connector (wire color: Pink and White)
5. High clutch duty solenoid connector (wire color: Green and Gray)
6. Lock-up duty solenoid connector (wire color: Yellow and Black)
7. 2-4 brake duty solenoid connector (wire color: Blue and Brown)
8. Low clutch duty solenoid connector (wire color: Orange and Black)
9. Line pressure solenoid connector (wire color: Pink)

Remove or Disconnect

1. Block the wheels.
2. Disconnect the negative battery cable.
3. Drain the fluid.
   Refer to “ATF CHANGE” in this section.
4. Remove the 19 bolts and oil pan.
5. Inspect the bottom of the oil pan and strainer netting for foreign material (clutch facing and metal shavings).
   If there is an excessive accumulation of foreign material, the oil strainer must be replaced.
   Further inspection is required to determine the source of the foreign material.
6. Remove the harness assembly (including oil temperature sensor).
7. Remove the 11 bolts and the solenoid fixing plate.
8. Remove the 6 solenoids and 3 oil pressure switchs.

Inspect

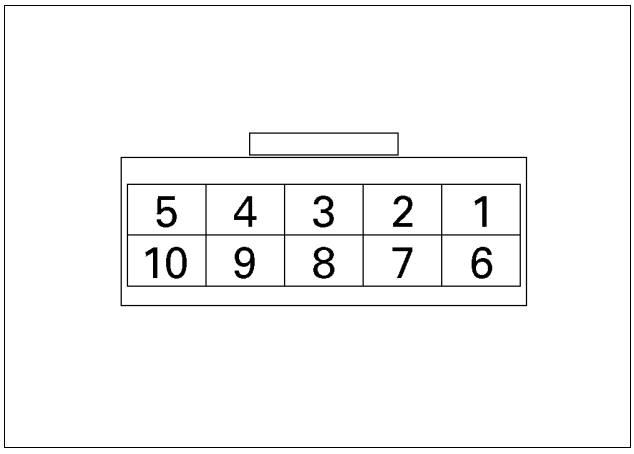
Oil pressure switch

Apply compressed air (392 kPa/4.0 kg/cm^2) to the oil pressure switch to check the oil pressure switch continuity between the connector and screw.

Oil temperature sensor (harness assembly)

Check the oil temperature sensor resistance between harness terminals 7 and 6 (ground).

Oil temperature sensor resistance:
2,400~2,600 ohms (20°C)



244L300011

Solenoid

Measure the resistance of each solenoid.

Resistance:
Brown connector – 3.0~3.4 ohms (20°C)
Gray connector – 12.0~13.2 ohms (20°C)
White connector – 12.2~13.4 ohms (20°C)

Install or connect

1. Install the O-rings to each of the solenoids.
2. Install the 6 solenoids and 3 oil pressure switchs.
   Line pressure solenoid bolt torque:
   8 N·m (69 lb·in)
   Oil pressure switch bolt torque:
   4.4 N·m (39 lb·in)
3. Install the solenoid fixing plate together with the harness brackets.

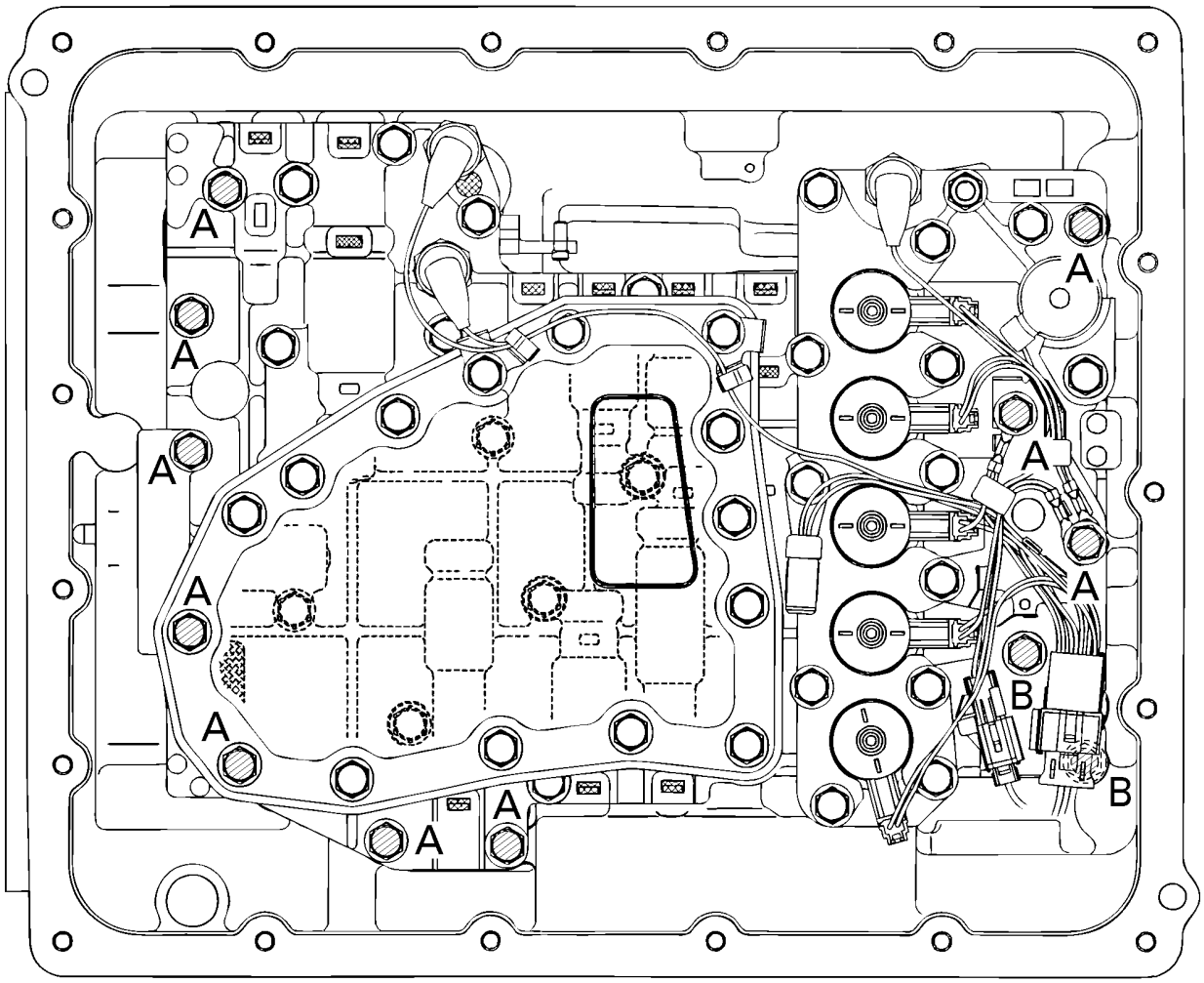
	Number	Length (Color)
Solenoid fixing plate bolt		
(A)	4	16 mm (0.63 in) (Gold)
(B)	7	45 mm (1.77 in) (Silver)

   Bolt torque : 8 N·m (69 lb·in)
4. Install the harness assembly.
5. If removed, install the oil strainer.

	Number	Length (Color)
Oil strainer bolt		
(C)	9	13 mm (0.51 in) (Silver)
(D)	4	45 mm (1.77 in) (Silver)

   Bolt torque : 8 N·m (69 lb·in)
6. Install the new gasket and oil pan.
   Bolt torque : 8 N·m (69 lb·in)
7. Fill the fluid.
   Refer to “ATF CHANGE” in this section.
8. Connect the negative battery cable.
9. Remove the wheel blocks.

CONTROL VALVE ASSEMBLY



244L300001

Remove or Disconnect

1. Block the wheels.
2. Disconnect the negative battery cable.
3. Drain the fluid.
   Refer to “ATF CHANGE” in this section.
4. Remove the 19 bolts and oil pan.
5. Inspect the bottom of the oil pan and strainer netting for foreign material (clutch facing and metal shavings).
   If there is an excessive accumulation of foreign material, the oil strainer must be replaced.
   Further inspection is required to determine the source of the foreign material.
6. Disconnect the 2 harness connectors leading to the control valve.
7. Remove the 12 bolts and the control valve assembly.

Number of bolts	Length
10 (A)	40 mm (1.57 in)
2 (B)	30 mm (1.18 in)

Note:

Take care not to disturb the manual valve (inside the control valve assembly).

Do not allow the pin to fall free (the pin prevents the valve from turning).

Install or Connect

1. Align the manual valve and the manual plate of the transmission case.



43ASSY119

2. Install the control valve assembly and tighten the 12 fixing bolts to the specified torque.

Number of bolts	Length	Color
10 (A)	40 mm (1.57 in)	Gold
2 (B)	30 mm (1.18 in)	Gold

Bolt torque : 8 N·m (69 lb·in)

3. Connect the 2 harness connectors.
4. If removed, install the oil strainer.
   Refer to “Solenoids, Oil Pressure Switch and Oil Temperature Sensor” previously in this section.
5. Install the new gasket and oil pan.
   Bolt torque : 8 N·m (69 lb·in)
6. Fill the fluid.
   Refer to “ATF CHANGE” in this section.
7. Connect the negative battery cable.
8. Remove the wheel blocks.

FLUSHING THE TRANSMISSION FLUID COOLER AND LINE

The fluid cooler and lines may be flushed under the following condition. This will help prevent more trouble after the transmission is repaired.

1. When the abnormal amount of debris are found.
2. When the abnormal wear or chips on gears and shafts are found while overhauling.
3. When the abnormal clutch facing wear and oil contamination are found.

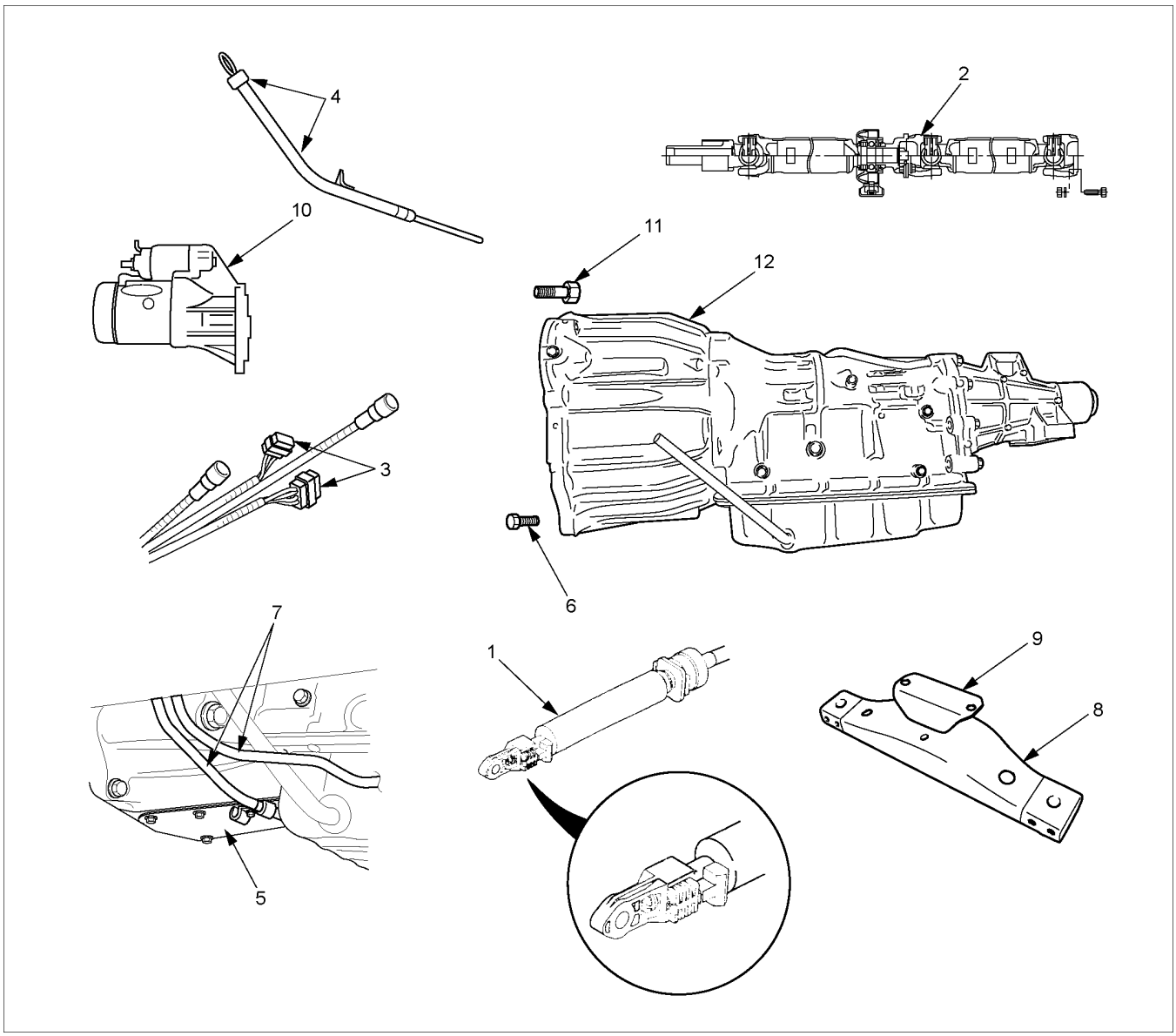
Procedures

1. Block the wheels.
2. Disconnect negative battery cable.
3. Raise vehicle and support with suitable safety stands.
4. Disconnect fluid cooler lines at transmission case and fluid cooler.
5. Flush and back-flush the fluid cooler and lines using solvent and compressed air.

Note:
DO NOT exceed 197 kPa (29 psi) air pressure or damage may result to oil cooler.

6. Remove all remaining solvent from the system with compressed air.
7. Flush the cooling system again with Automatic Transmission Fluid (ATF).
   After the final flush, connect all lines.
   Cooler line joint connector torque :
   44 N·m (33 lb·ft)
8. Replenish ATF
9. Start engine to test the system for the free flow of fluid. If the flow is restricted, the cooler assembly or lines must be replaced.
   Repeated cleaning and flushing may not remove all debris from the fluid cooler circuit.
   Move the select lever through the various ranges and return to neutral.
   Check for fluid level.
   If the fluid level is below the specified range, ATF must be added.
10. Connect negative battery cable.
11. Remove safety stands.
12. Remove wheel blocks.

TRANSMISSION ASSEMBLY



RTW37ALF001401

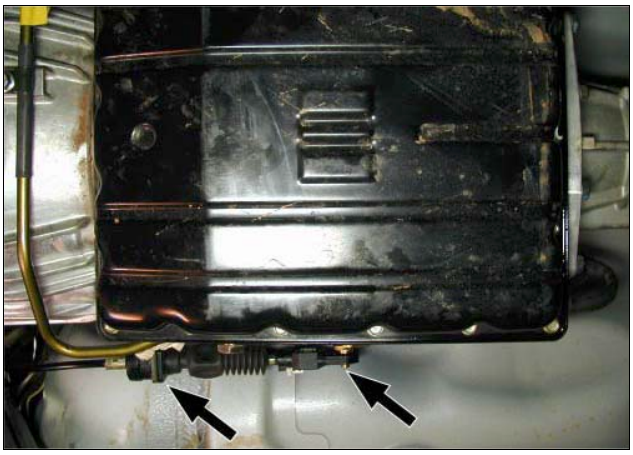
Legend

1. Shift Cable
2. Propeller Shaft
3. Engine Harness
4. ATF Level Dipstick
5. Under Cover
6. Bolt
7. ATF Pipe
8. Crossmember
9. Bracket
10. Starter Motor
11. Bolt
12. Automatic Transmission

Remove or Disconnect

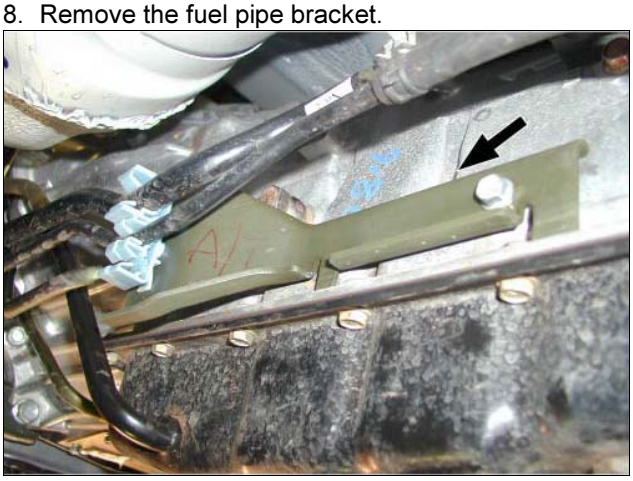
1. Block the wheels.
2. Disconnect the negative battery cable.
3. Raise the vehicle and support with the suitable safety stands.

4. Remove the shift cable from the transmission.

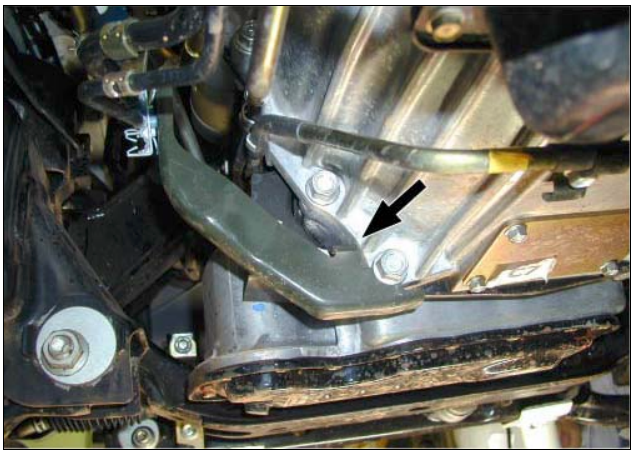


P1010068

5. Remove the rear propeller shaft assembly.
6. Loosen (do not remove) the nuts securing the exhaust manifold and the exhaust pipe.
7. Disconnect the harness connectors from the transmission.
8. Remove the fuel pipe bracket.



P1010013



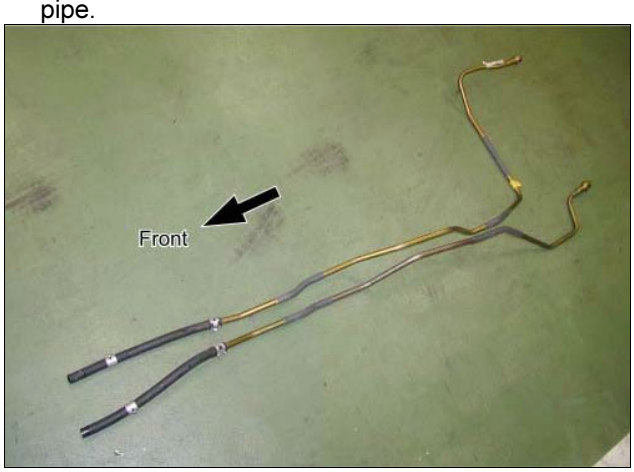
P1010014

9. Remove the ATF level dipstick and tube.
10. Remove the undercover.
11. Rotate the ring gear and remove the 6 torque converter bolts.



P1010016

12. Remove the automatic transmission fluid cooling pipe.



P1010060

13. Place a jack beneath the engine to support it.
14. Remove the 3rd crossmember.
15. Remove the transmission mount.
16. Lower the jack beneath the engine slightly to tilt the engine and transmission. Do not allow the radiator and air conditioner hoses to stretch.
17. Remove the bolts attaching the transmission to the engine.
18. Lower the transmission from beneath the vehicle. Take care not to damage the breathers.

Install or Connect

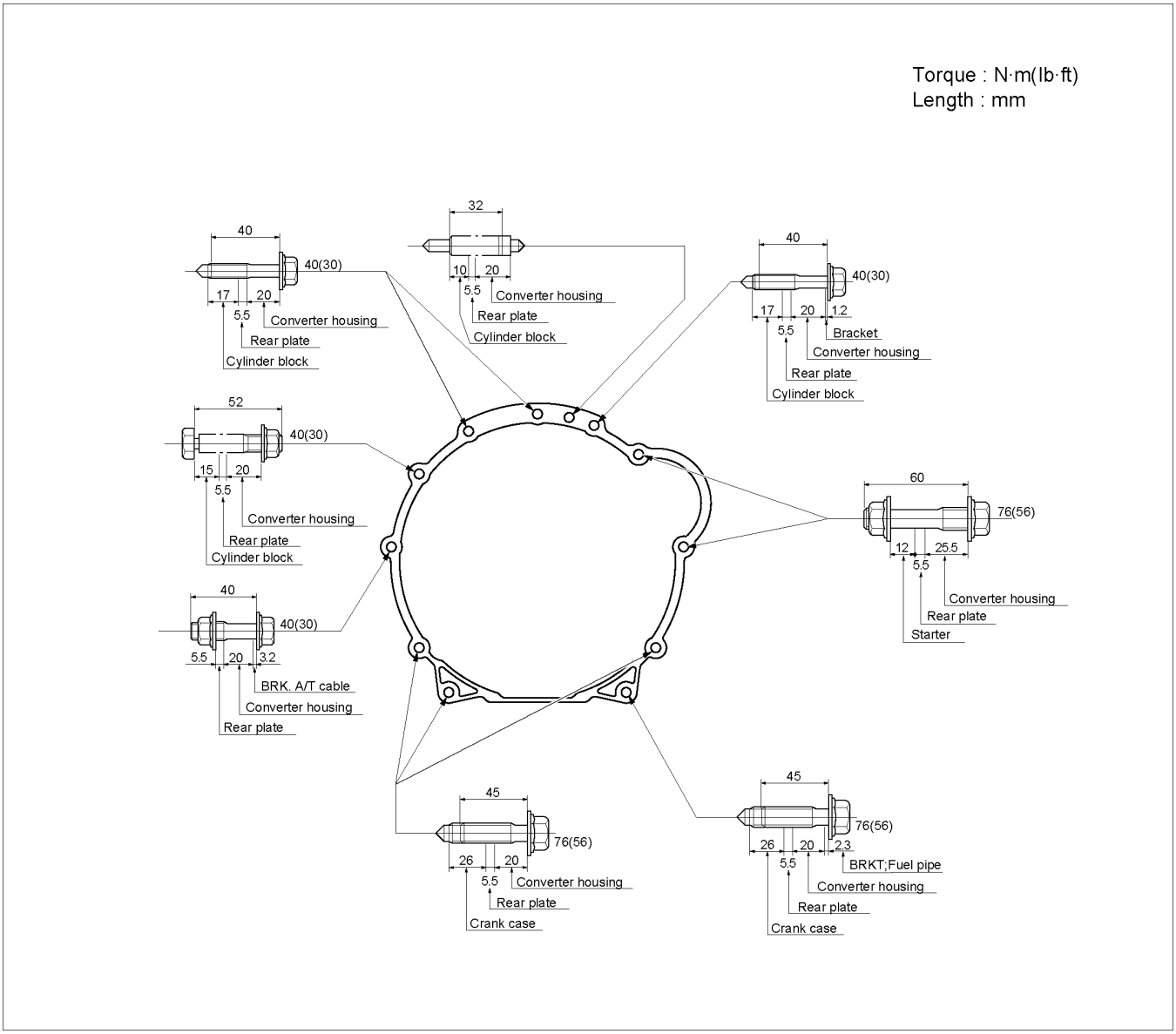
1. Install the transmission to the engine and tighten the bolts.

   Bolt torque : M10 40 N·m (30 lb·ft)
   M12 76 N·m (56 lb·ft)

2. Install the cable bracket to the transmission.
3. Connect the engine harness connectors.

4. Install the 3rd crossmember.
   Bolt and Nut torque : 67 N·m (49 lb·ft)
   Bolt torque : 50 N·m (37 lb·ft)
5. Install the automatic transmission fluid cooling pipe.
6. Install the torque converter bolts.
   Bolt torque : 29 N·m (22 lb·ft)
7. Install the undercover.
   Bolt torque : 9 N·m (78 lb·in)
8. Install the ATF level dipstick and tube.
9. Install the fuel hose bracket.
   Bolt torque : 6 N·m (52 lb·in)
10. Tighten the nuts securing the exhaust manifold and the exhaust pipe.
    Bolt torque : 43 N·m (32 lb·ft)
11. Install the rear propeller shaft assembly.
    Flange bolt torque : 63 N·m (46 lb·ft)
    Center bearing bracket bolt torque :
    69 N·m (51 lb·ft)
12. Install the shift cable.
13. Connect the negative battery cable.
14. Remove the safety stands.
15. Remove the wheels blocks.

Torque Specifications



RTW37ALF001501

SECTION 7A4
UNIT REPAIR (JR405E)
TABLE OF CONTENTS

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Control Valve Assembly	7A4 - 11
Control Valve Upper Body	7A4 - 18
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AUTOMATIC TRANSMISSION DISASSEMBLY

Cleaning the automatic transmission

1. Use compressed steam and /or cleaning oil to thoroughly clean the outside of the transmission before disassembly.

CAUTION:
Steam under high pressure may cause dirt particles adhering to the transmission to fly through the air at great speed. These particles can cause serious eye injury. Wear protective goggles when steam-cleaning the outside of the transmission.

2. During disassembly, clean the removed parts with cleaning oil. Dry the parts with compressed air.
   Use Compressed air to clean the transmission oil holes and oil passages.

Automatic transmission disassembly cautions

- Perform the disassembly procedure in a dust-free environment to prevent the entry of foreign material into the transmission.
- Inspect each transmission part as you remove it.
- Carefully check the oil pan and the magnet for foreign material. This is a good way to estimate transmission condition.
- Use your bare hands or vinyl gloves to disassemble the transmission. Do not use ordinary work gloves (loose threads from the gloves may fall into the transmission and cause problems).
- Use a plastic hammer to loosen the transmission case and other aluminum parts during disassembly. Strike around the parts lightly with the hammer. Do not pry aluminum parts away from each other with a screwdriver or similar object.
- Arrange the disassembled parts neatly in the order they were removed. Cover the parts with a plastic sheet or similar object to protect them from dust.

Disassembly steps

1. Torque converter

- Pull the torque converter free.

NOTE:
Place a pan beneath the torque converter to catch automatic transmission fluid (ATF) spillage.

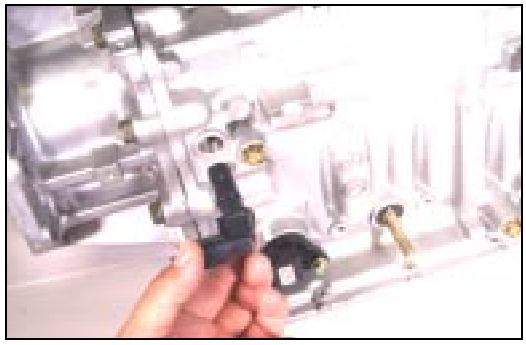
- Draining the ATF from the torque converter.



01ASSY101

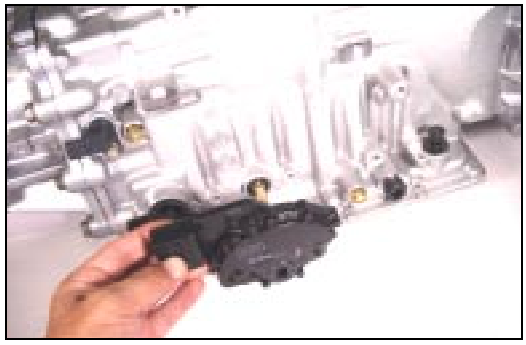
2. Turbine sensor and speed sensor

- Remove the turbine sensor from the transmission case.



02ASSY103

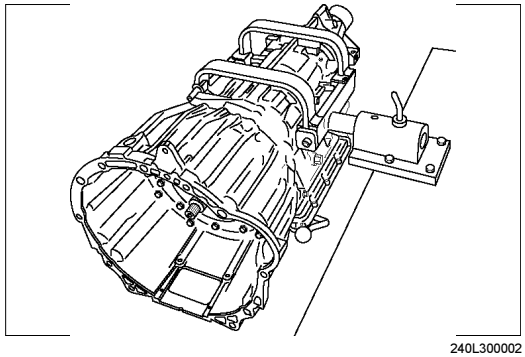
- Remove the speed sensor from the transmission case.



03ASSY106

3. Inhibitor switch

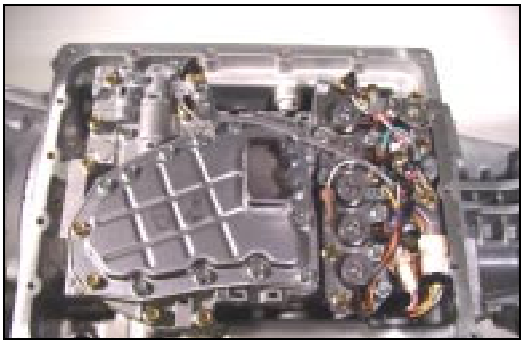
Remove the 2 bolts and the inhibitor switch from the transmission case.



240L300002

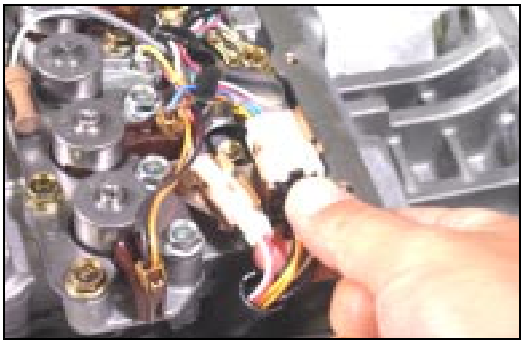
4. Oil pan

- Lift and support the transmission with the holding fixture and holding fixture base.
  Holding fixture: 5-8841-0841-0
  Holding fixture base: 5-8840-0003-0
- Remove the drain plug from the oil pan and drain the ATF from the oil pan.
- Rotate the automatic transmission so that the converter housing is facing up and drain the ATF.
- Rotate the automatic transmission so that the oil pan is facing up.
- Remove the 19 bolts and the oil pan.



04CV37

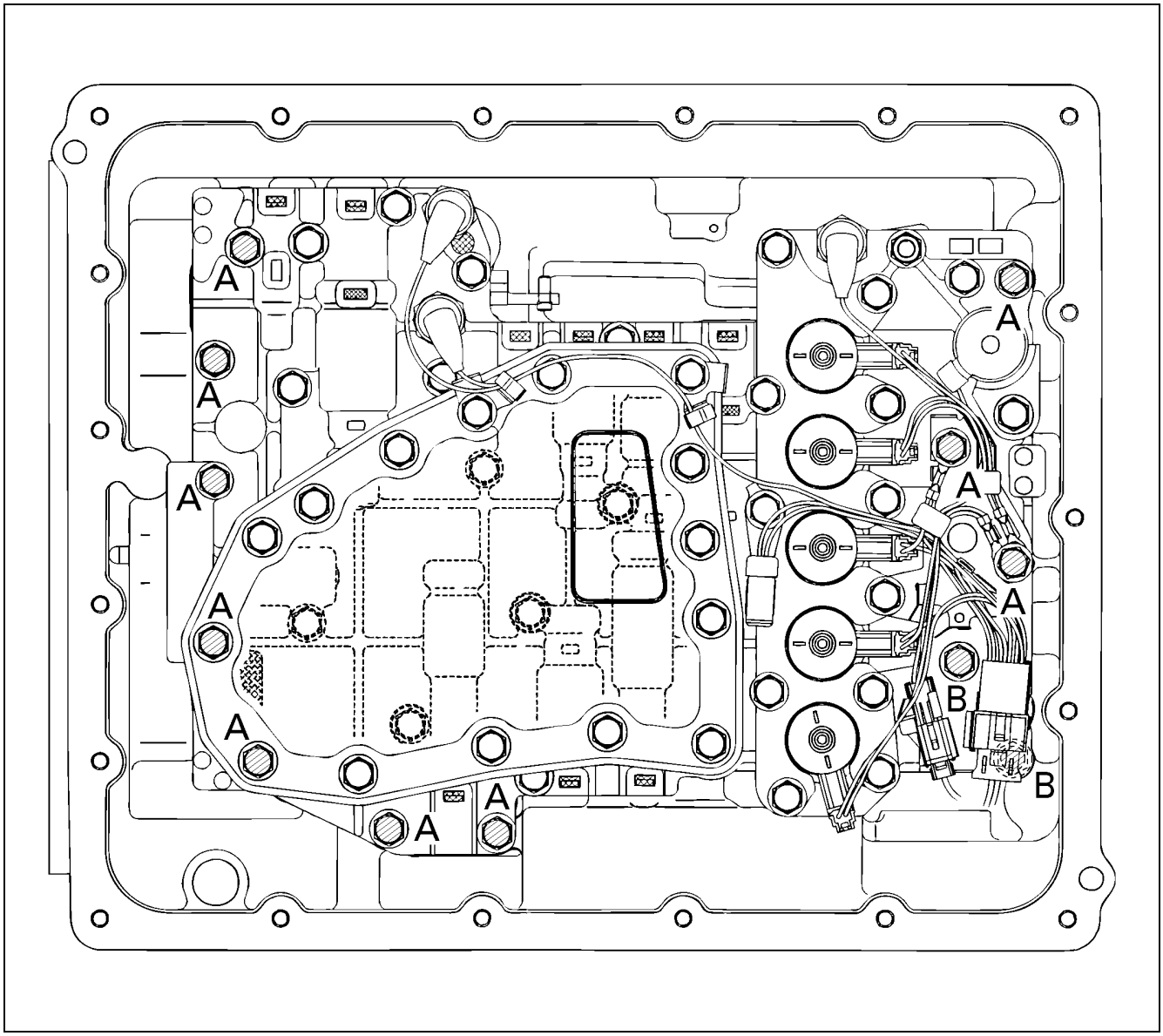
- Inspect the bottom of the oil pan and strainer netting for foreign material (clutch facing and metal shavings).
  If there is an excessive accumulation of foreign material, the oil strainer must be replaced.
  Further inspection is required to determine the source of the foreign material.



45CV29

5. Control valve assembly

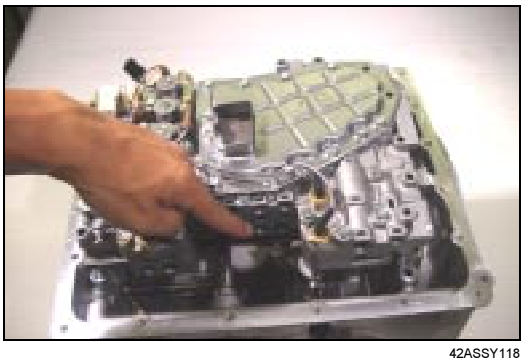
- Disconnect the 2 harness connectors leading to the control valve.



244L300001

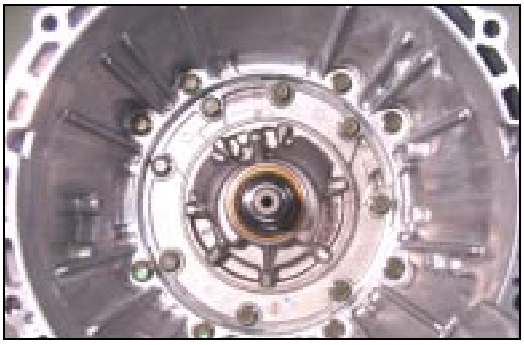
- Remove the 12 bolts and the control valve assembly.

Number of bolts	Length
10 (A)	40 mm (1.57 in)
2 (B)	30 mm (1.18 in)



42ASSY118

NOTE:
Take care not to disturb the manual valve (inside the control valve assembly).
Do not allow the pin to fall free (the pin prevents the valve from turning).


10ASSY116

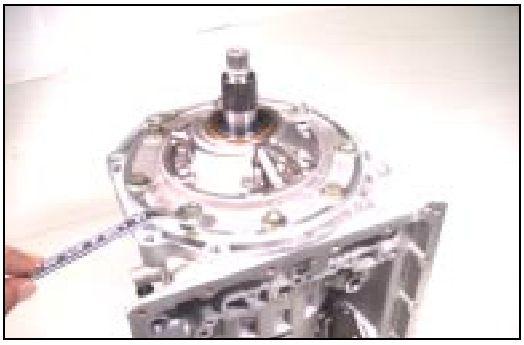
6. Converter housing

- Position the automatic transmission so that the converter housing is facing up.
- Remove the 8 bolts and the converter housing.


11ASSY068

7. O-ring

Remove the O-ring from the input shaft.

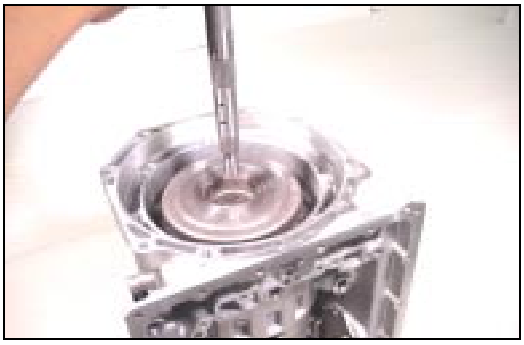

12ASSY067

8. Oil pump assembly and bearing race

- Remove the 8 bolts.
- Use a slide hammer to remove the oil pump assembly from the transmission case.

NOTE:
To prevent damage to the oil pump bolt hole threads, hand-tighten the slide hammer as far as possible.

- Remove the bearing race from the oil pump assembly.
- Inspect the bearing race surfaces for damage.


14ASSY057

9. Input shaft

Pull the input shaft free.


15ASSY049

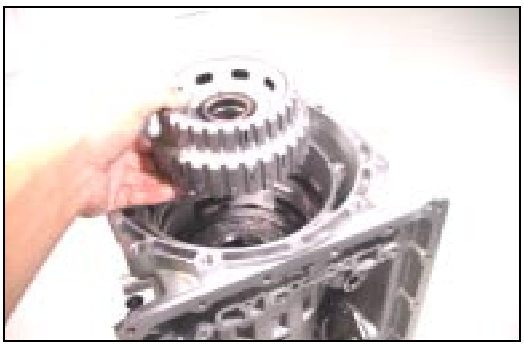
10. Clutch pack (Reverse and high clutch assembly) and bearing

- Pull the clutch pack free.
- Remove the bearing from the clutch pack.


16ASSY047

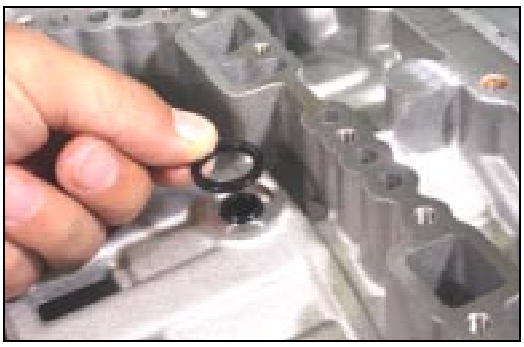
11.High clutch hub, bearing, and bearing race

- Remove the clutch hub, bearing (with bearing race), and the bearing race.
- Remove the bearing (with bearing race) and the bearing race from the high clutch hub.
- Inspect the bearing race surfaces for damage.


17ASSY040

12.Front sun gear, bearing, and bearing race

- Remove the bearing, the front sun gear, and the bearing race.
- Remove the bearing and the bearing race from the front sun gear.
- Inspect the bearing race surfaces for damage.


19ASSY113

13.2-4 brake retainer

- Remove the brake seal ring and the sleeve.


23ASSY030

- Attach the spring compressor to the transmission case.
  Spring compressor: 5-8840-2764-0


24ASSY029

- Force out the 2-4 brake retainer and remove the snap ring.

NOTE:
Overturning the spring compressor will damage the 2-4 brake retainer.

- Remove the spring compressor.



25ASSY019

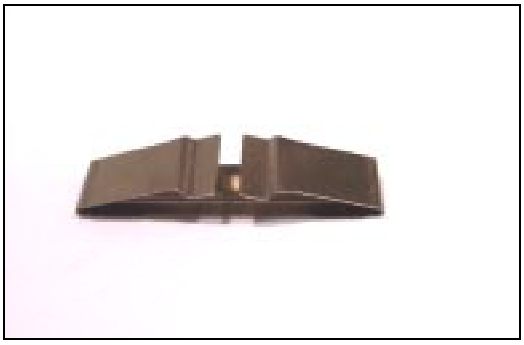
- Remove the 2-4 brake retainer and return spring.



26ASSY026

14.Carrier assembly (Carrier and low clutch assembly), bearing, bearing race, and 2 – 4 brake assembly

- Pull the carrier assembly, the bearing, the bearing race and the 2-4 brake assembly (Dish plate, retaining plate, drive plate, and driven plate) from the transmission case at the same time.
- Remove the bearing, the bearing race, and the 2-4 brake assembly from the carrier assembly.



27U-SPG02

- Remove the 3 brake springs from the transmission case.



28L&R06

15.Low and reverse brake

- Remove the snap ring.
- Pull the low and reverse brake free.

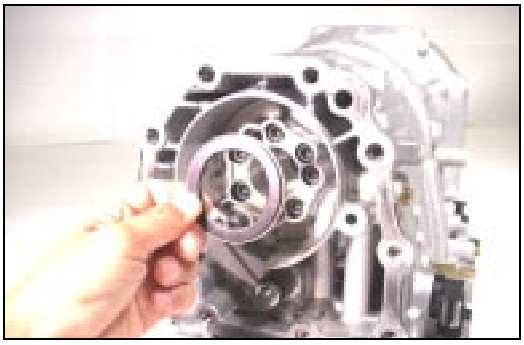
16.Rear extension (2WD) or Adapter case (4WD)

- Rotate the transmission case so that the oil pan opening is facing up.
- Remove the 10 bolts and the rear extension (2WD) or the adapter case (4WD).


29ASSY091

17.Output shaft

- Pull the output shaft from the transmission case.


30ASSY089

- Remove the bearing (with bearing race) from the transmission case.


31ASSY124

18.Parking pawl, shaft, spring, and spacer

Remove the parking pawl, shaft, spring and spacer from the transmission case.


36ASSY075

19.Actuator support

Remove the actuator support from the transmission case.


37ASSY074

20.Low one-way clutch inner race and bearing

- Loosen the 7 bolts securing the low one-way clutch inner race.

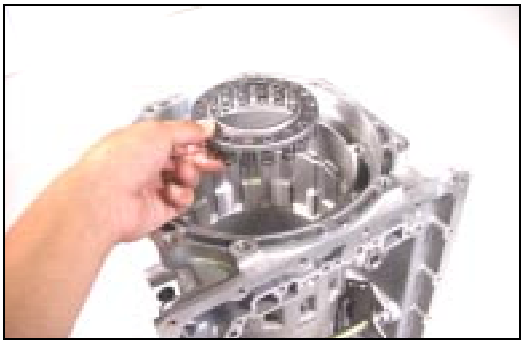
NOTE:
Loosen the bolts a little at a time as uniformly as possible to prevent the inner race from tilting and becoming jammed.

- Remove the 6 bolts. Support the low one-way clutch inner race with your hand and remove the final bolt.



39ASSY006

- Remove the bearing and the low one-way clutch inner race from the transmission case.
- Remove the bearing from the low one-way clutch inner race.



40ASSY005

21.Low and reverse brake return spring

Remove the low and reverse brake return spring from the transmission case.



41L&R02

22.Low and reverse brake piston

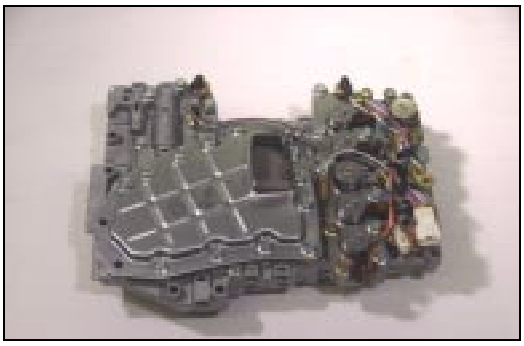
- Force compressed air (329kPa/4.0kg/cm^2) through the transmission case oil passages.



42ASSY004

- Remove the low and reverse brake piston from the transmission case.

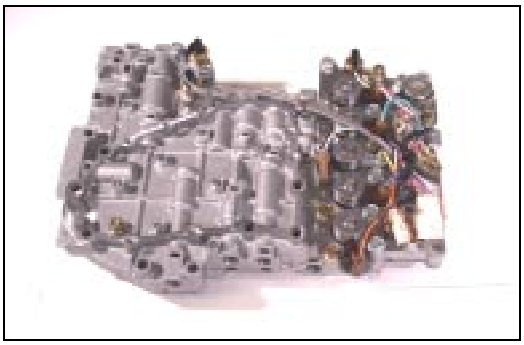
CONTROL VALVE ASSEMBLY



01CV40

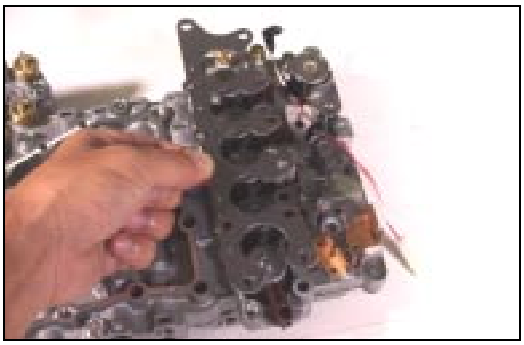
Disassembly steps

1. **Oil strainer**
   Remove the 13 bolts and the oil strainer from the control valve assembly.



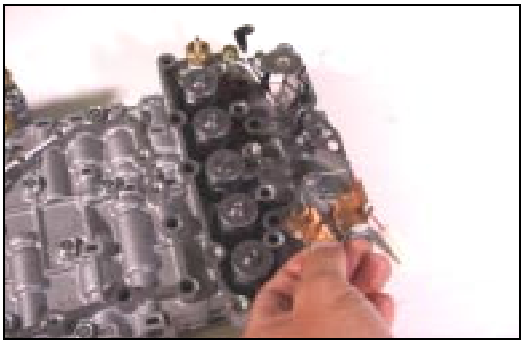
02CV26

2. **Harness assembly**
   Remove the harness assembly.

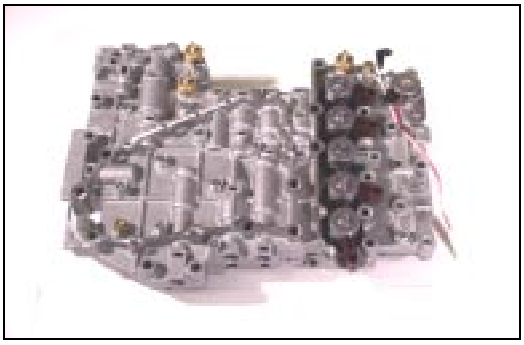


04CV21

3. **Solenoid fixing plate**
4. **Harness bracket**
   - Remove the 11 bolts and the solenoid fixing plate together with the harness bracket.

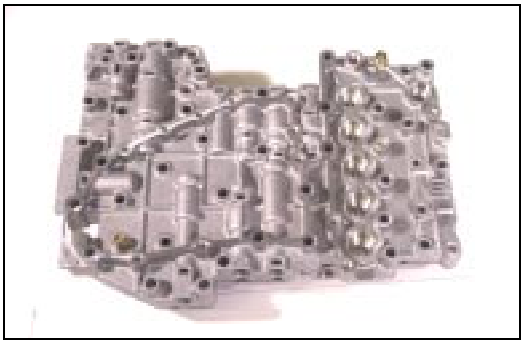


05CV20



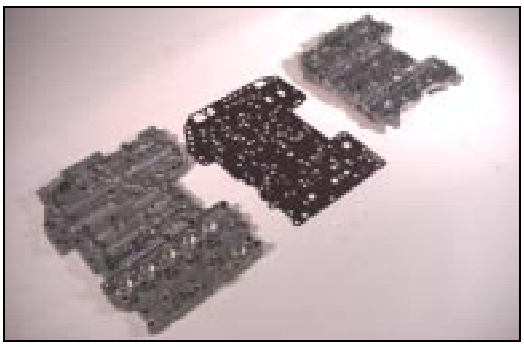
06CV19

5. **Solenoid**
6. **Oil pressure switch**
   Remove the 6 solenoids together and the 3 oil pressure switchs.



07CV17

7. **Control valve upper body**
8. **Control valve lower body**
9. **Separation plate**
   - Remove the 17 bolts securing the control valve upper body, the control valve lower body, and the separation plate.



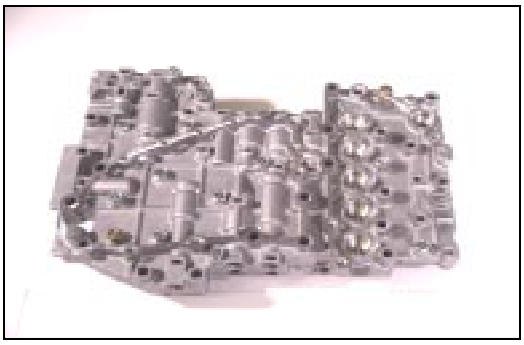
08CV16

- Separate the upper body, the lower body, and the separation plate.

NOTE:
Take care not to drop or lose the parts at the inside of the control valve.

Inspection

- Inspect the separation plate for wear and other damage.



11CV18

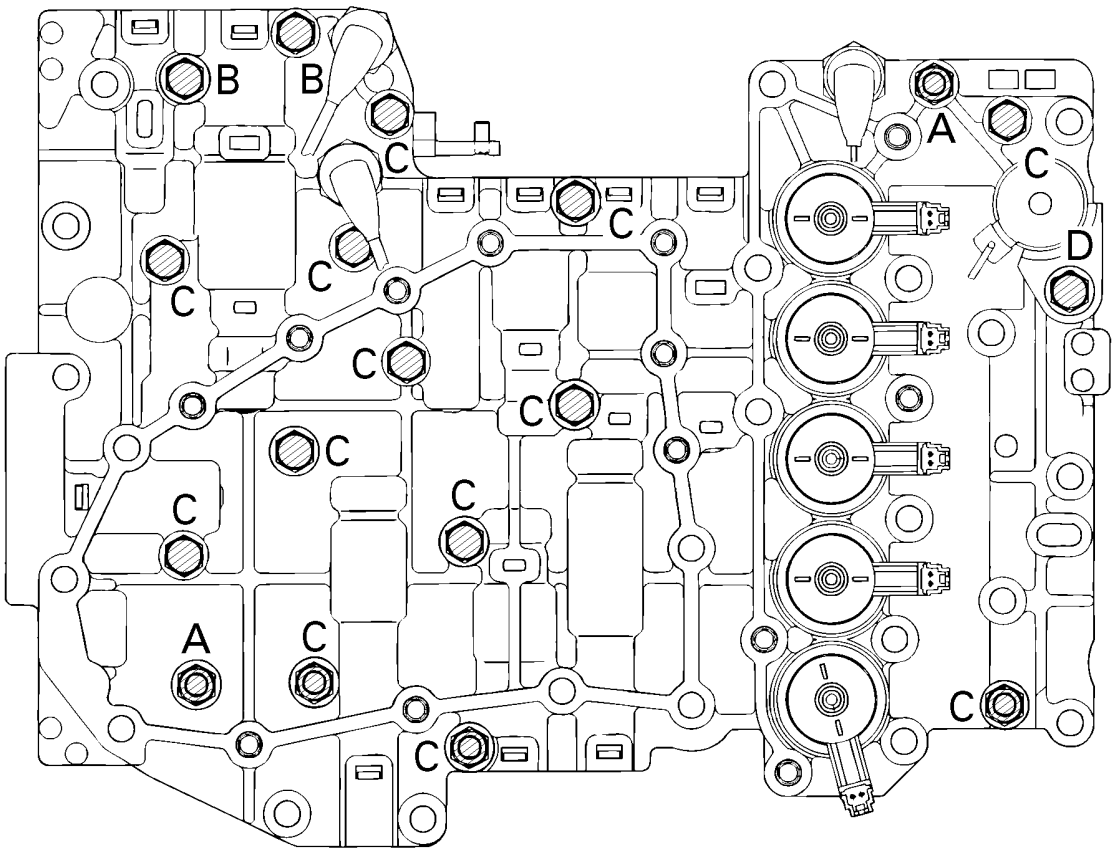
Reassembly steps

Coat the parts with ATF before installing them.

1. **Control valve upper body**
2. **Control valve lower body**
3. **Separation plate**

   Assembly the control valve upper body, the lower body, and the separation plate.

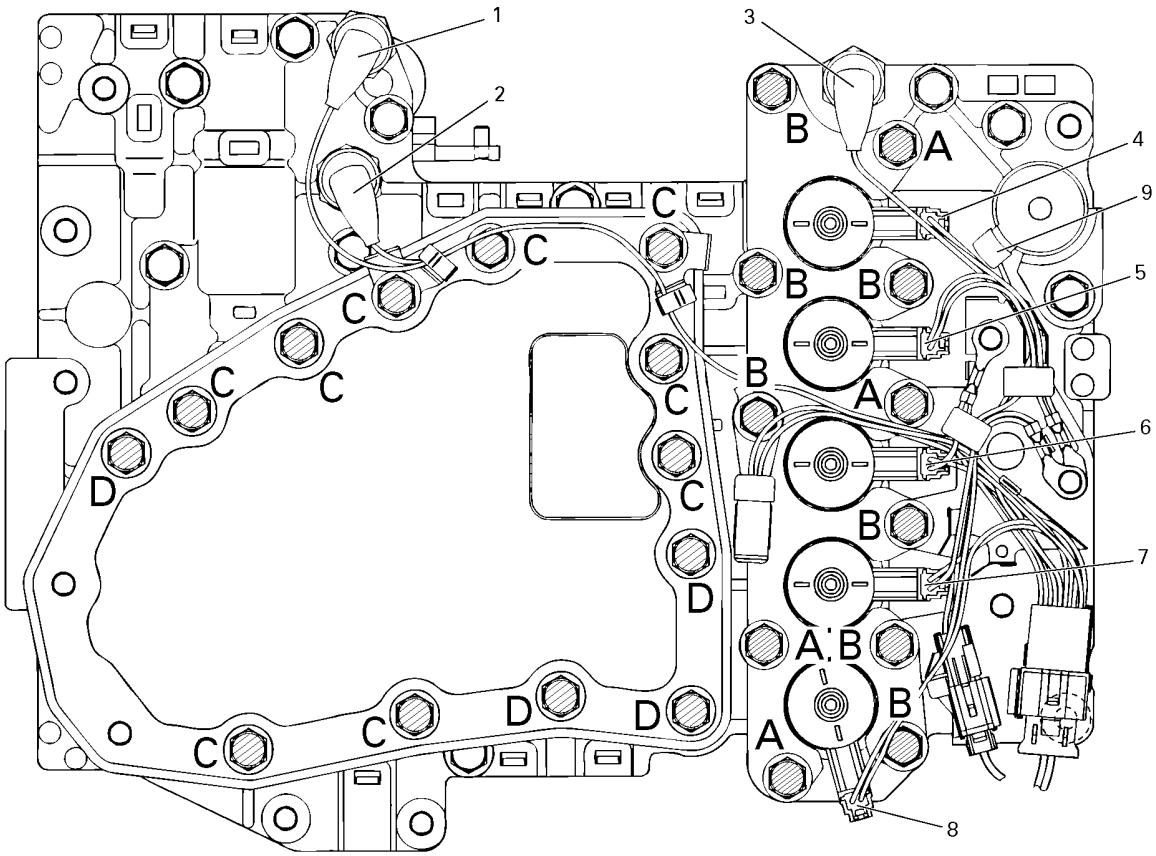
   Tighten the bolts to the specified torque.



244L300002

	Number	Length (Color)
Control valve rocket bolts and nuts (A)	2 (Plus 2 nuts)	50 mm (1.97 in) (Gold)
Upper body and lower body fixing bolts		
(B)	2	45 mm (1.77 in) (Silver)
(C)	13	35 mm (1.38 in) (Silver)
Line pressure solenoid fixing bolt (D)	1	16 mm (0.63 in) (Gold)

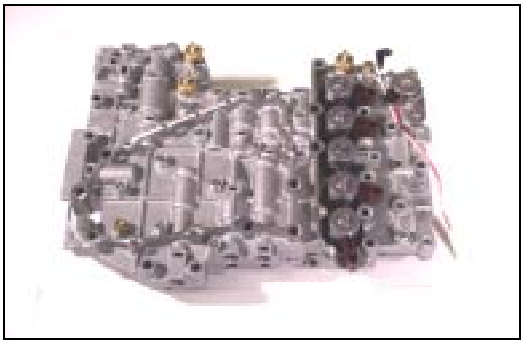
Torque: 8 N·m (69 lb·in)



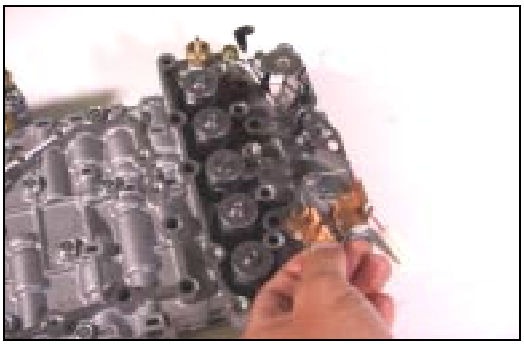
244L300003

Legend

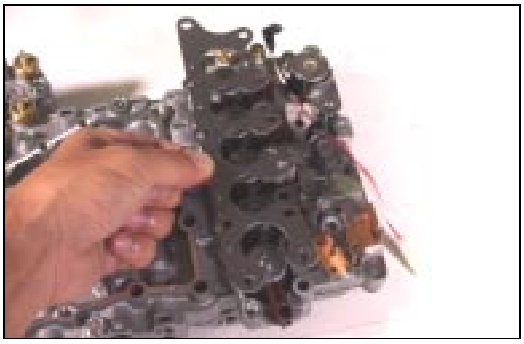
1. High clutch oil pressure switch connector (wire color: Gray)
2. 2-4 brake oil pressure switch connector (wire color: Brown)
3. Low and reverse brake oil pressure switch connector (wire color: White)
4. Low and reverse brake duty solenoid connector (wire color: Pink and White)
5. High clutch duty solenoid connector (wire color: Green and Gray)
6. Lock-up duty solenoid connector (wire color: Yellow and Black)
7. 2-4 brake duty solenoid connector (wire color: Blue and Brown)
8. Low clutch duty solenoid connector (wire color: Orange and Black)
9. Line pressure solenoid connector (wire color: Pink)



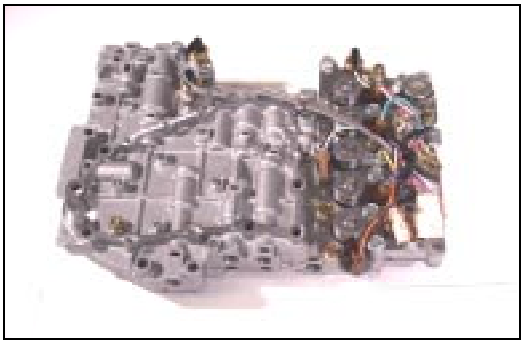
12CV19



13CV20



14CV21



15CV26

4. Solenoid

5. Oil pressure switch

- Install the O-rings to each of the solenoids.
- Install the 6 solenoids together and the 3 oil pressure switchs.

NOTE:
Be sure the high clutch oil pressure switch is marked.

- Tighten the bolts to the specified torque.

Torque:
Oil pressure switch bolts – 4.4 N·m (39 lb·in)
Line pressure solenoid bolt (Single gold-colored bolt 16 mm) – 8 N·m (69 lb·in)

6. Solenoid fixing plate

7. Harness bracket

Install the solenoid fixing plate together with the harness bracket.

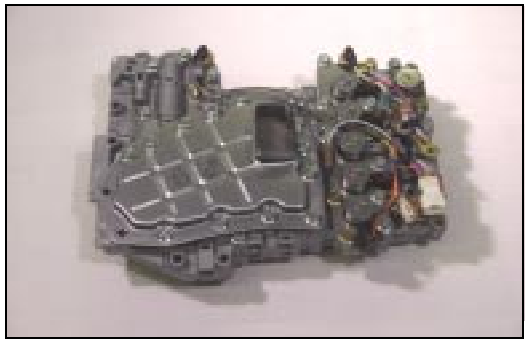
Tighten the bolts to the specified torque.

	Number	Length (Color)
Solenoid fixing plate bolt		
(A)	4	16 mm (0.63 in) (Gold)
(B)	7	45 mm (1.77 in) (Silver)

Torque: 8 N·m (69 lb·in)

8. Harness assembly

Install the harness assembly.



16CV40

9. Oil strainer

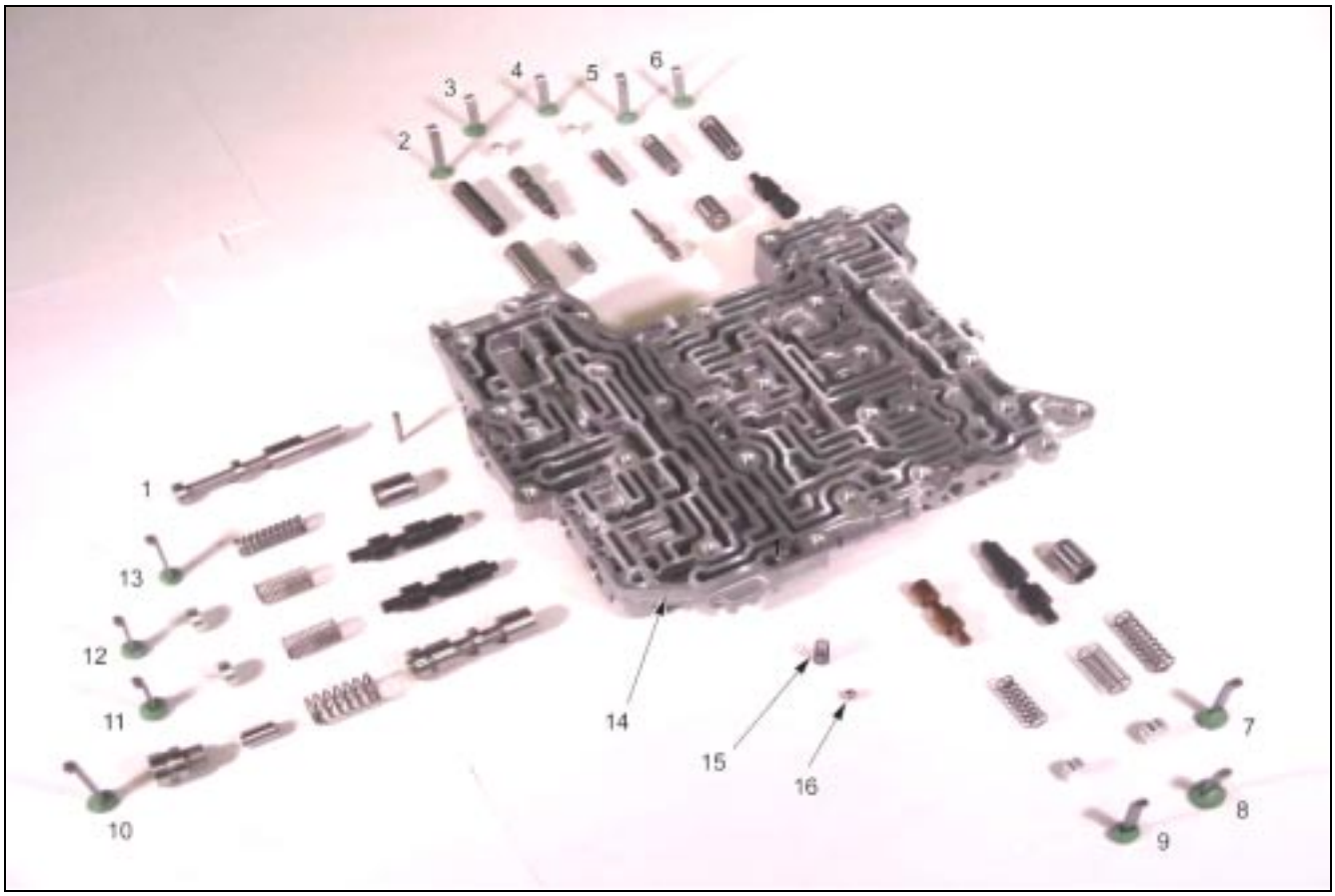
Install the oil strainer.

Tighten the bolts to the specified torque.

	Number	Length (Color)
Oil strainer bolt		
(C)	9	13 mm (0.51 in) (Silver)
(D)	4	45 mm (1.77 in) (Silver)

Torque: 8 N·m (69 lb·in)

CONTROL VALVE UPPER BODY



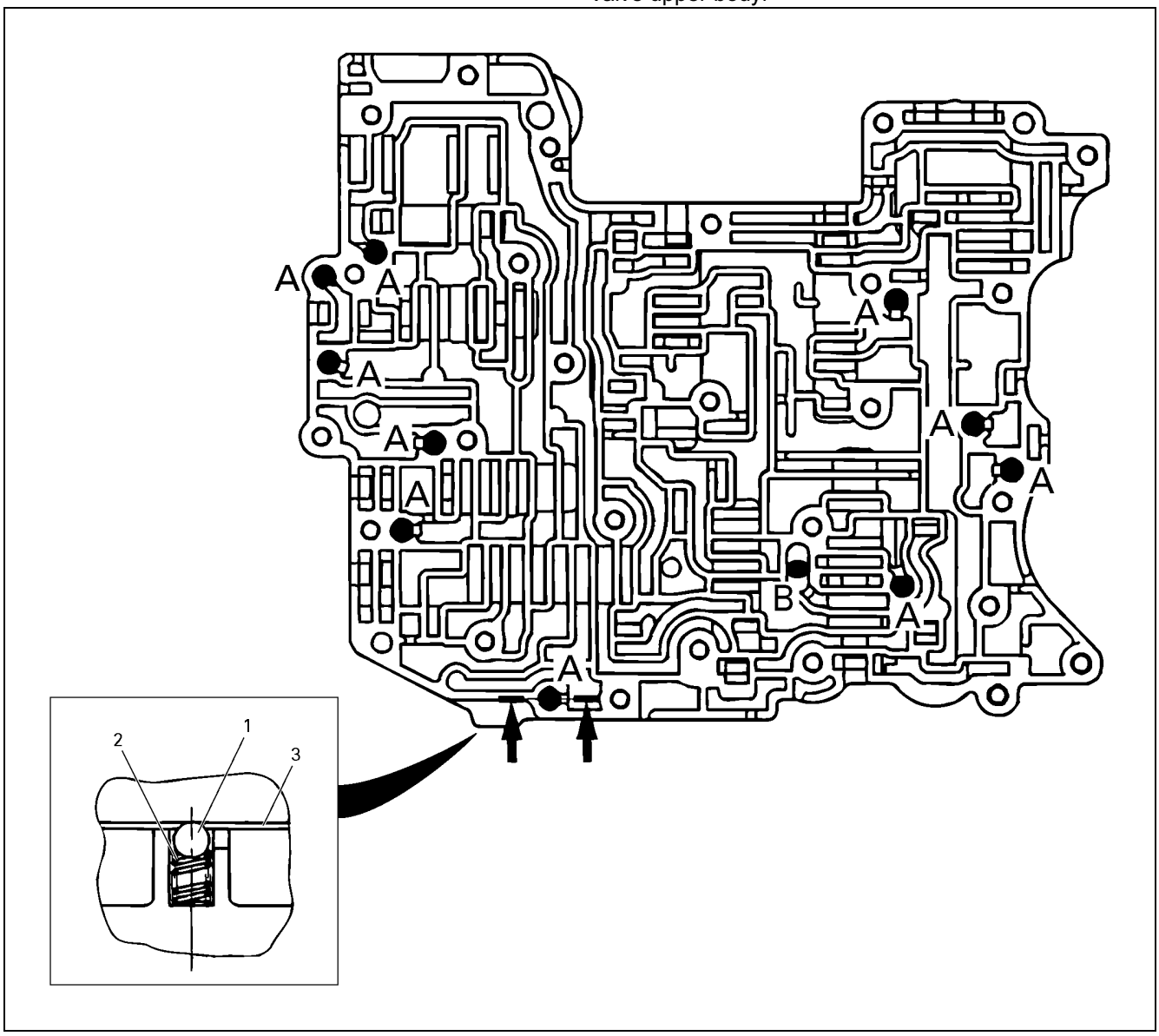
09CV02

Legend

1. Manual valve, and pin
2. Retainer plate, spring, and 2-4 brake accumulator
3. Retainer plate, plug, and low and reverse brake fail valve B
4. Retainer plate, plug, spring, and reverse stall valve
5. Retainer plate, spring, and low and reverse brake solenoid accumulator
6. Retainer plate, spring, and pilot valve
7. Retainer plate, spring, and low clutch solenoid accumulator
8. Retainer plate, plug, spring, and low clutch amp valve A
9. Retainer plate, plug, spring, and 2-4 brake fail valve B
10. Retainer plate, sleeve, plug, spring, and lock-up control valve
11. Retainer plate, plug, spring, and 2-4 brake amp valve
12. Retainer plate, plug, spring, and high clutch amp valve
13. Retainer plate, spring, and high clutch solenoid accumulator
14. Control valve upper body
15. Spring
16. Steel ball

Disassembly steps

- Remove the 11 steel balls and spring from the control valve upper body.



244L300005

Legend

1. Steel ball: A – 10 (Silver)
   B – 1 (Black)
2. Spring
3. Separation plate

- Remove the control valves from the control valve upper body.

NOTE:
Place the control valve where it will not get mixed up with the other parts.

Inspection

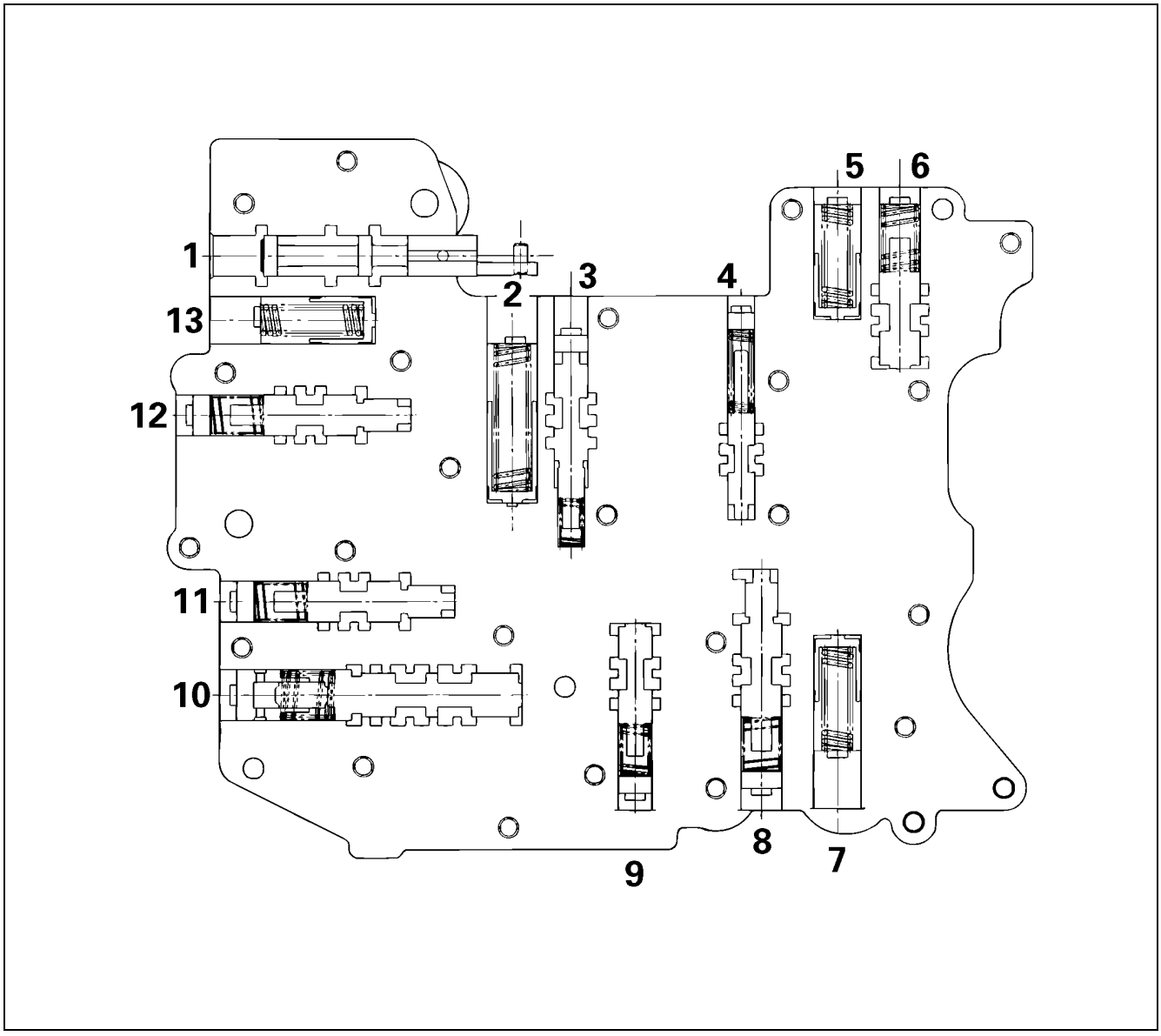
Valve

Inspect each of the valves for denting and other damage.

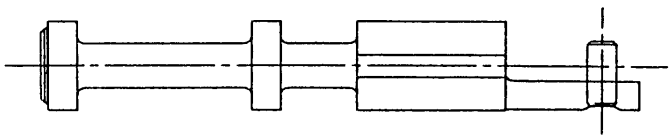
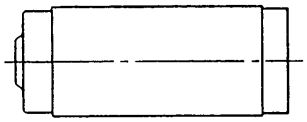
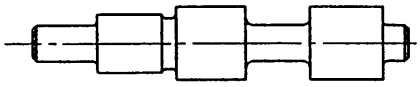
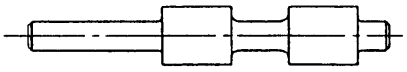
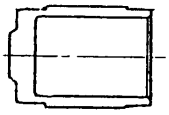
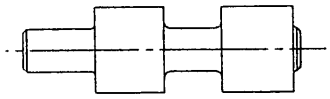
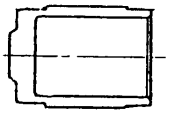
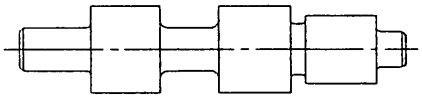
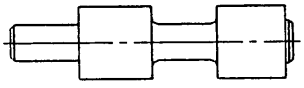
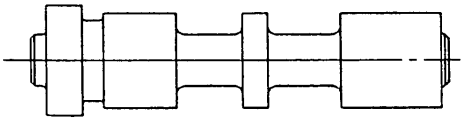
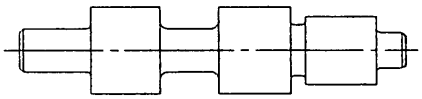
Spring

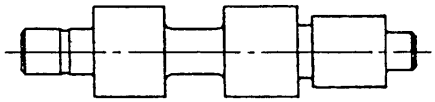
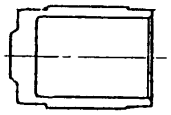
Inspect each of the springs for wear and fatigue.

Valve specifications



244L300006

No.	Valve nomenclature	Diameter (mm / in)	Length (mm / in)	Configuration
1	Manual	12.0 / 0.472	82.0 / 3.228	
2	2 – 4 brake accumulator	15.0 / 0.591	37.5 / 1.476	
3	Low and reverse brake fail (B)	10.0 / 0.394	52.0 / 2.047	
4	Reverse stall	8.0 / 0.315	50.0 / 1.969	
5	Low and reverse brake solenoid accumulator	14.0 / 0.551	19.5 / 0.768	
6	Pilot	12.0 / 0.472	38.5 / 1.516	
7	Low clutch solenoid accumulator	14.0 / 0.551	19.5 / 0.768	
8	Low clutch amp (A)	12.0 / 0.472	53.5 / 2.106	
9	2 – 4 brake fail (B)	10.0 / 0.394	39.0 / 1.535	
10	Lock-up control	12.9 / 0.508	57.5 / 2.264	
11	2 – 4 brake amp	12.0 / 0.472	53.5 / 2.106	

12	High clutch amp	12.0 / 0.472	53.5 / 2.106	
13	High clutch solenoid accumulator	14.0 / 0.551	19.5 / 0.768	

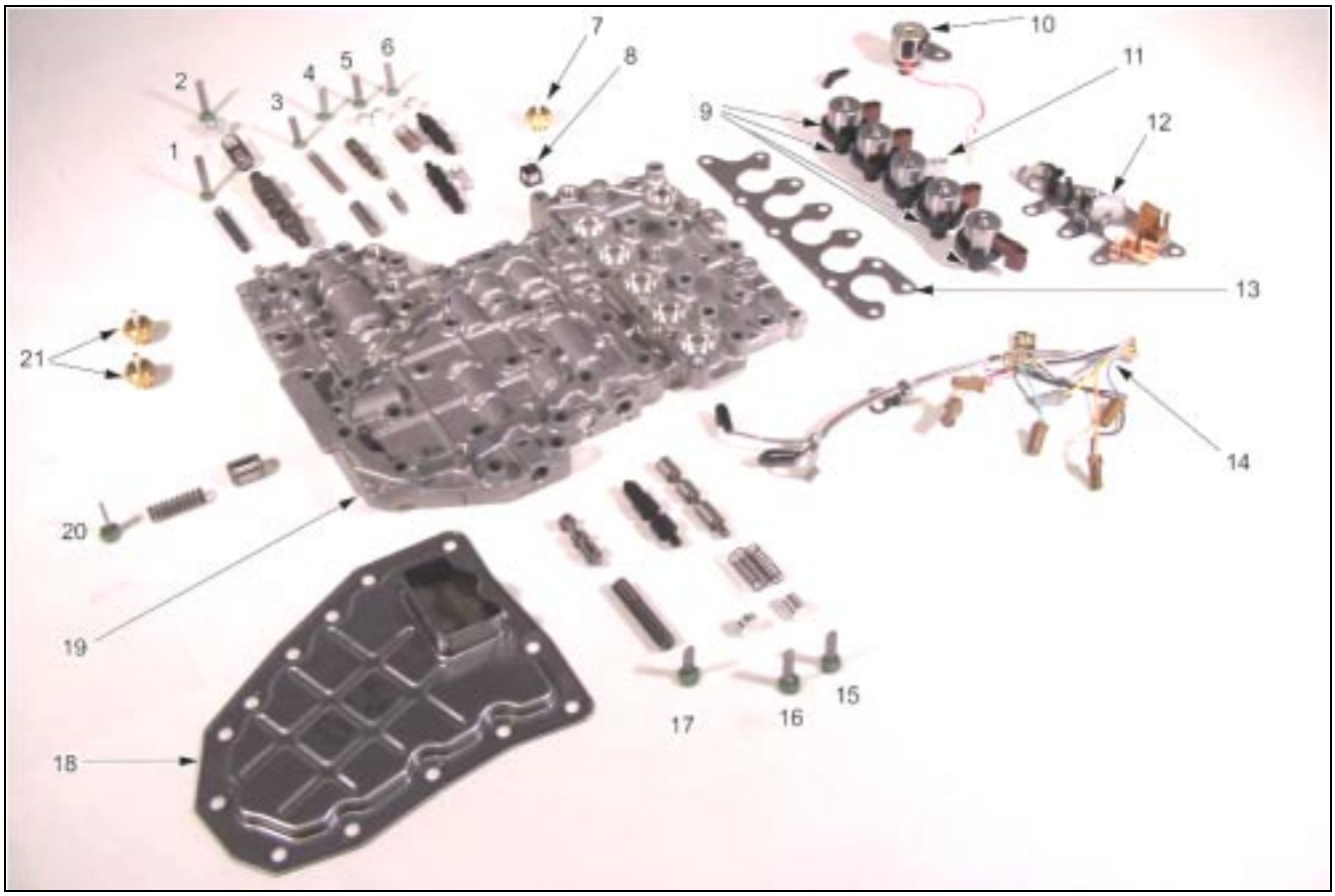
Spring specifications

No.	Valve nomenclature	Free length (mm / in)	Outside diameter (mm / in)	Linear diameter (mm / in)	Number of coils
1	Manual	----	----	----	----
2	2 – 4 brake accumulator	43.9 / 1.728	11.0 / 0.433	2.0 / 0.079	13.1
3	Low and reverse brake fail (B)	22.0 / 0.866	7.0 / 0.276	0.6 / 0.024	10.0
4	Reverse stall	31.5 / 1.240	7.0 / 0.276	1.0 / 0.039	12.8
5	Low and reverse solenoid brake accumulator	31.4 / 1.236	9.8 / 0.386	1.3 / 0.051	9.3
6	Pilot	32.0 / 1.260	11.0 / 0.433	1.3 / 0.051	9.2
7	Low clutch solenoid accumulator	31.4 / 1.236	9.8 / 0.386	1.3 / 0.051	9.3
8	Low clutch amp (A)	23.0 / 0.906	11.0 / 0.433	0.5 / 0.020	13.2
9	2 – 4 brake fail (B)	24.8 / 0.976	8.5 / 0.335	0.9 / 0.035	7.8
10	Lock-up control	27.0 / 1.063	14.0 / 0.551	1.1 / 0.043	5.7
11	2 – 4 brake amp	23.0 / 0.906	11.0 / 0.433	0.5 / 0.020	13.2
12	High clutch amp	23.0 / 0.906	11.0 / 0.433	0.5 / 0.020	13.2
13	High clutch solenoid accumulator	31.4 / 1.236	9.8 / 0.386	1.3 / 0.051	9.3

Reassembly steps

- Coat the parts with ATF before installing them.
- Install the control valve to the upper body.
- Install the 11 steel balls and spring to the upper body.

CONTROL VALVE LOWER BODY



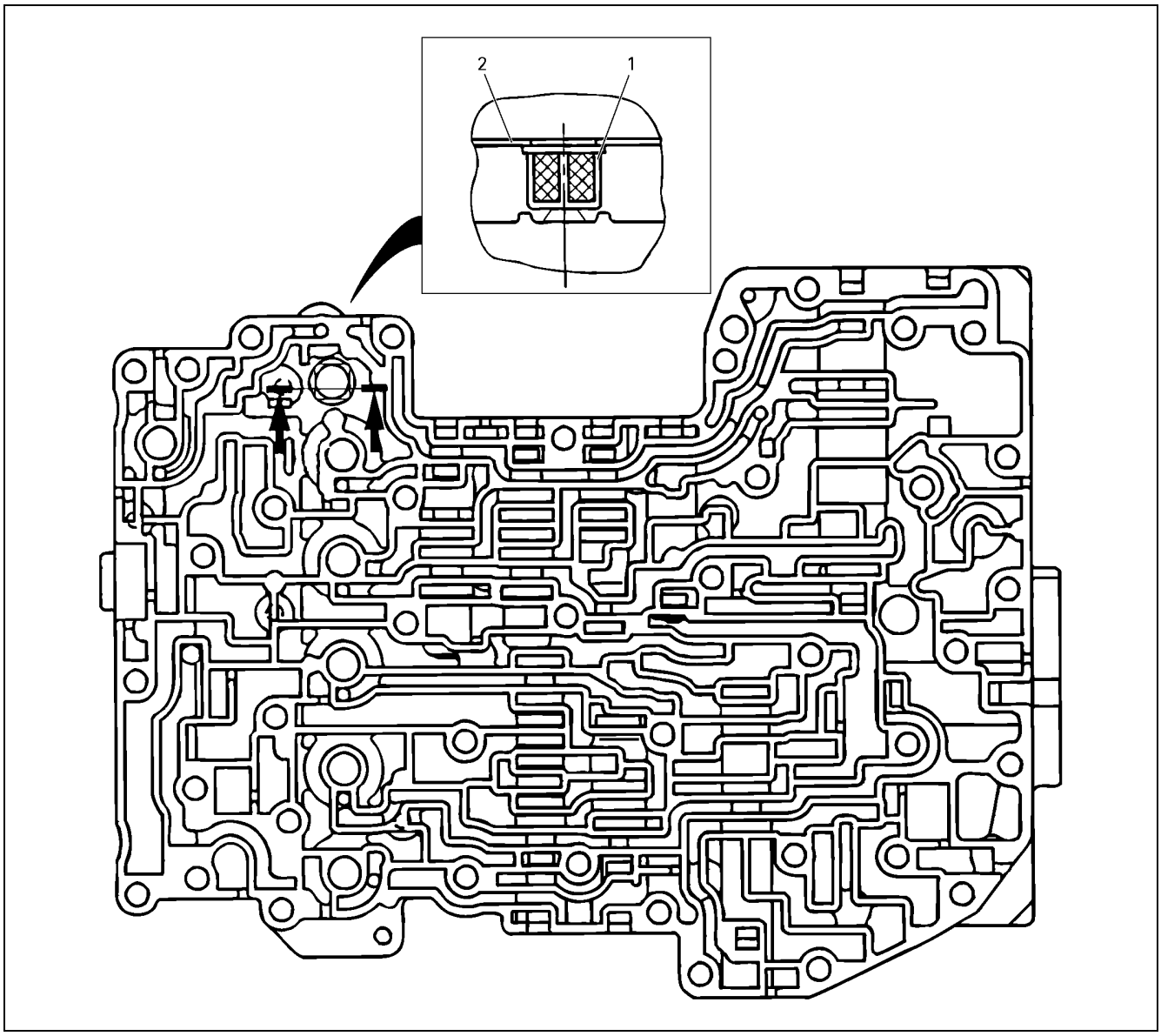
10CV11

Legend

1. Retainer plate, spring, and steel ball
2. Retainer plate, plug, spring, and pressure regulator valve
3. Retainer plate, spring, and high clutch accumulator
4. Retainer plate, plug, low and reverse brake fail valve A, and spring
5. Retainer plate, plug, spring, and fail valve
6. Retainer plate, plug, low and reverse brake amp valve, and spring
7. Oil pressure switch
8. Oil filter
9. Solenoid
10. Line pressure solenoid
11. Lock-up solenoid
12. Harness bracket
13. Solenoid fixing plate
14. Harness assembly
15. Retainer plate, plug, spring, and 2-4 brake fail valve A
16. Retainer plate, plug, spring, and low clutch amp valve B
17. Retainer plate, spring, and torque converter relief valve
18. Oil strainer
19. Control valve lower body
20. Retainer plate, spring, and 2-4 brake solenoid accumulator
21. Oil pressure switch

Disassembly steps

- Remove the oil filter from the control valve lower body.



244L300009

Legend

1. Oil filter
2. Separation plate

- Remove the control valve from the control valve lower body.

NOTE:
Place the control valve where it will not get mixed up with the other parts.

Inspection

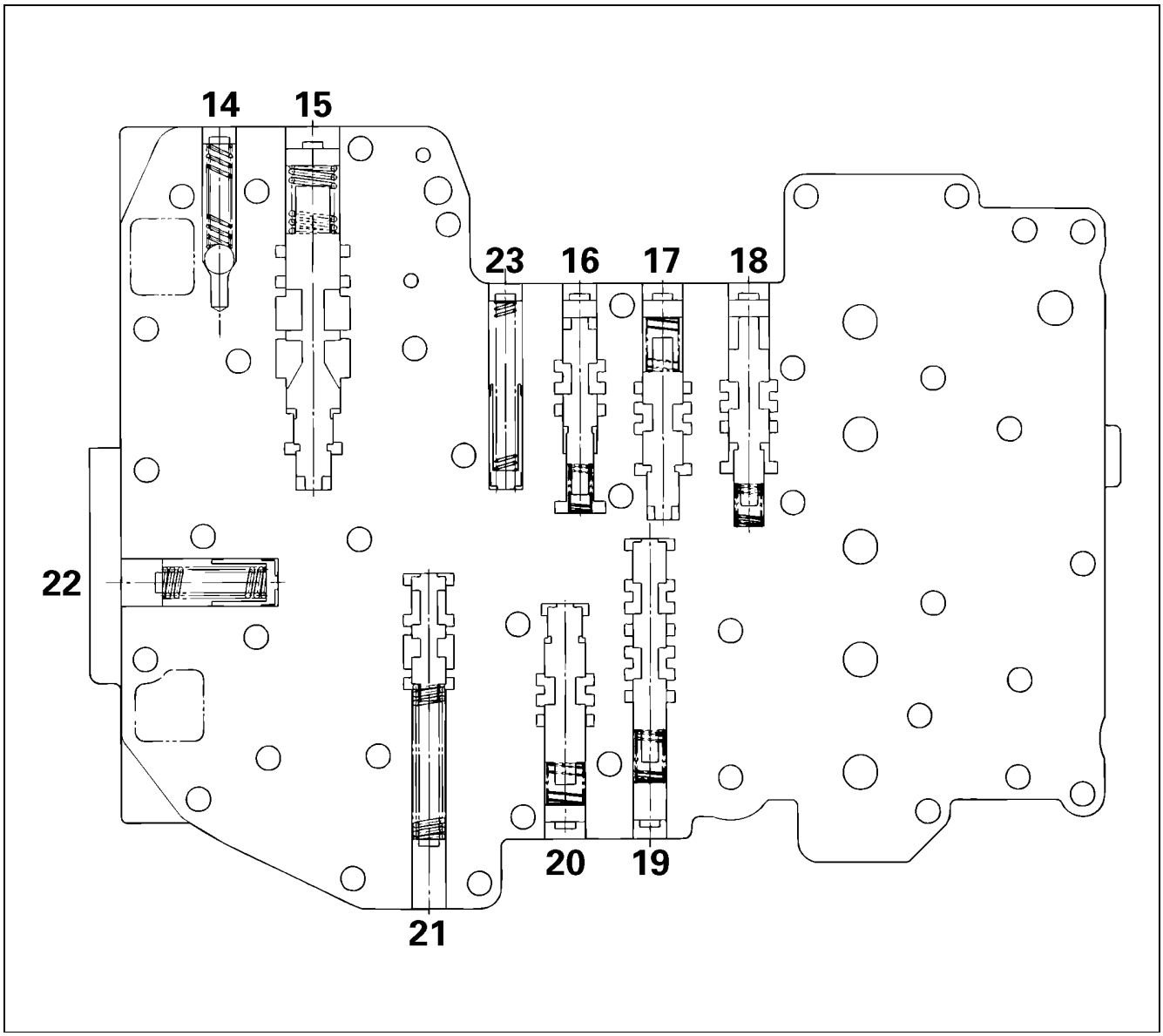
Valve

Inspect each of the valves for denting and other damage.

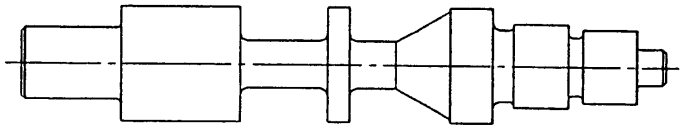
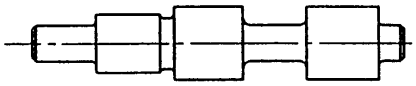
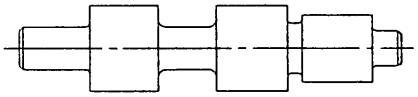
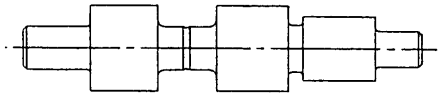
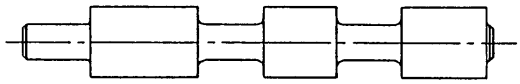
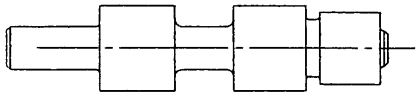
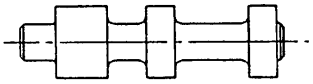
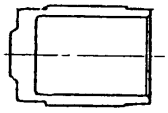
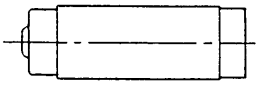
Spring

Inspect each of the springs for wear and fatigue.

Valve specifications



244L300008

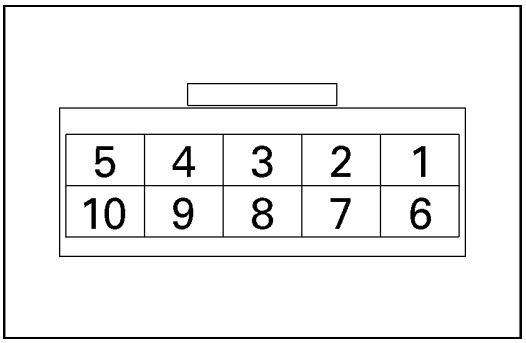
No.	Valve nomenclature	Diameter (mm / in)	Length (mm / in)	Configuration
14	Pressure relief	----	----	
15	Pressure regulator	16.0 / 0.630	89.5 / 3.524	
16	Low and reverse brake fail (A)	10.0 / 0.394	52.0 / 2.047	
17	Fail	12.0 / 0.472	53.5 / 2.106	
18	Low and reverse brake amp	12.0 / 0.472	55.5 / 2.185	
19	2 – 4 brake fail (A)	10.0 / 0.394	65.5 / 2.579	
20	Low clutch amp (B)	12.0 / 0.472	53.0 / 2.087	
21	Torque converter relief	10.0 / 0.394	37.4 / 1.472	
22	2 – 4 brake solenoid accumulator	14.0 / 0.551	19.5 / 0.768	
23	High clutch accumulator	10.0 / 0.394	31.0 / 1.220	

Spring specifications

No.	Valve nomenclature	Free length (mm / in)	Outside diameter (mm / in)	Linear diameter (mm / in)	Number of coils
14	Pressure relief	49.0 / 1.929	7.6 / 0.299	1.1 / 0.043	17.3
15	Pressure regulator	30.5 / 1.201	14.0 / 0.551	1.4 / 0.055	5.7
16	Low and reverse brake fail (A)	22.0 / 0.866	7.0 / 0.276	0.6 / 0.024	10.0
17	Fail	23.0 / 0.906	11.0 / 0.433	0.5 / 0.020	13.2
18	Low and reverse brake amp	19.5 / 0.768	7.9 / 0.311	0.5 / 0.020	6.9
19	2 – 4 brake fail (A)	24.8 / 0.976	8.5 / 0.335	0.9 / 0.035	7.8
20	Low clutch amp (B)	26.0 / 1.024	11.0 / 0.433	0.5 / 0.020	6.9
21	Torque converter relief	More than 47.2 / 1.858	9.2 / 0.362	1.6 / 0.063	20.2
22	2 – 4 brake solenoid accumulator	31.4 / 1.236	9.8 / 0.386	1.3 / 0.051	9.3
23	High clutch accumulator	51.0 / 2.008	6.5 / 0.256	0.8 / 0.031	23.5

Oil pressure switch

Apply compressed air (392 kPa/4.0 kg/cm^2) to the oil pressure switch to check the oil pressure switch continuity between the connector and screw.



244L300011

Oil temperature sensor (harness assembly)

Check the oil temperature sensor resistance between harness terminals 7 and 6 (ground).

Oil temperature sensor resistance: 2,400～2,600 ohms (20℃)

Solenoid

Measure the resistance of each solenoid.

Resistance:
Brown connector – 3.0~3.4 ohms (20°C)
Gray connector – 12.0~13.2 ohms (20°C)
White connector – 12.2~13.4 ohms (20°C)

Reassembly steps

- Coat the parts with ATF before installing them.
- Install the control valve to the control valve lower body.
- Install the oil filter to the control valve lower body.

OIL PUMP ASSEMBLY



01PUMP32

Legend

1. Oil seal
2. O-ring (small)
3. Oil pump housing
4. Inner rotor
5. Outer rotor
6. Oil pump cover
7. O-ring (large)
8. Seal ring (large)
9. Seal ring (small)
10. Bearing race



02PUMP07

Disassembly steps

1. **Oil pump cover**
2. **Oil pump housing**
   - Loosen the 8 bolts evenly a little at a time.



04PUMP10

- Separate the oil pump cover from the oil pump housing by tapping on each of the bolts with a plastic hammer.



06PUMP13

3. Inner rotor

Remove the inner rotor from the oil pump housing.



07PUMP14

4. Outer rotor

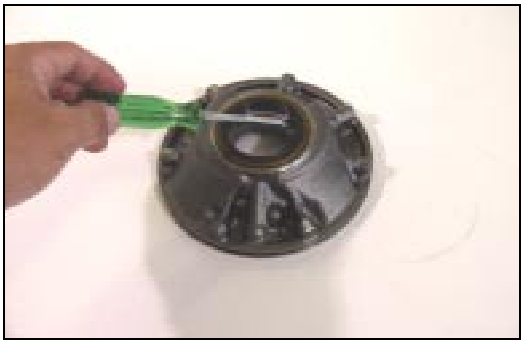
Remove the outer rotor form the oil pump housing.



15PUMP18

5. O-ring (small)

Remove the O-ring (small) from the oil pump housing.



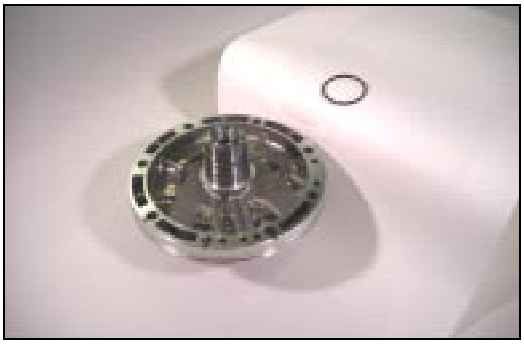
10PUMP19

6. Oil seal

Remove the oil seal from the oil pump housing.


08PUMP09

7. O-ring (large)
Remove the O-ring (large) from the oil pump cover.


09PUMP05

8. Seal ring
Remove the 4 seal rings from the oil pump cover.

Inspection

Oil pump cover

- Install new seal rings to the oil pump cover.

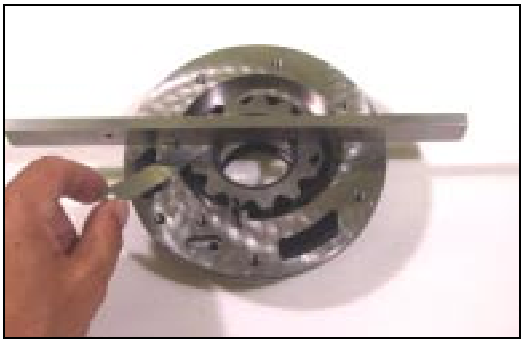
NOTE:
The seal ring with the large inside diameter fits into the primary mating surface of the cover.

- Measure the gap between the seal ring and the seal ring groove.
  If the measured gap is outside the specified range, the oil pump cover must be replaced.
  Seal ring and seal ring groove gap: 0.10~0.25 mm (0.0039~0.0098 in)


11PUMP43

Inner rotor

- Install the inner rotor to the oil pump housing.
- Use a straight edge to measure the side clearance between the oil pump housing and the inner rotor.
  If the measured clearance is outside the specified range, the inner rotor must be replaced.
  Oil pump housing and inner rotor side clearance: 0.02~0.04 mm (0.0008~0.0016 in)


12PUMP45


13PUMP46

Outer rotor

- Install the outer rotor to the oil pump housing.
- Measure the gap between the outer rotor and the crescent.
  If the measured gap is outside the specified range, the outer rotor must be replaced.
  Outer rotor and crescent gap:
  0.02~0.15 mm (0.0008~0.0059 in)


14PUMP28

Reassembly steps

Coat the parts with ATF before installing them.

1. **Oil seal**
   - Use the oil seal installer to install new oil seal to the oil pump housing.
     Oil seal installer: 5-8840-2761-0


15PUMP18

2. **O-ring (small)**
   Install new O-ring (small) to the oil pump housing.


16PUMP29

3. **Outer rotor**
4. **Inner rotor**
   Install the outer rotor and the inner rotor to the oil pump housing.


17PUMP42

NOTE:
The identification mark on the inner rotor must be facing the inside of the oil pump housing.

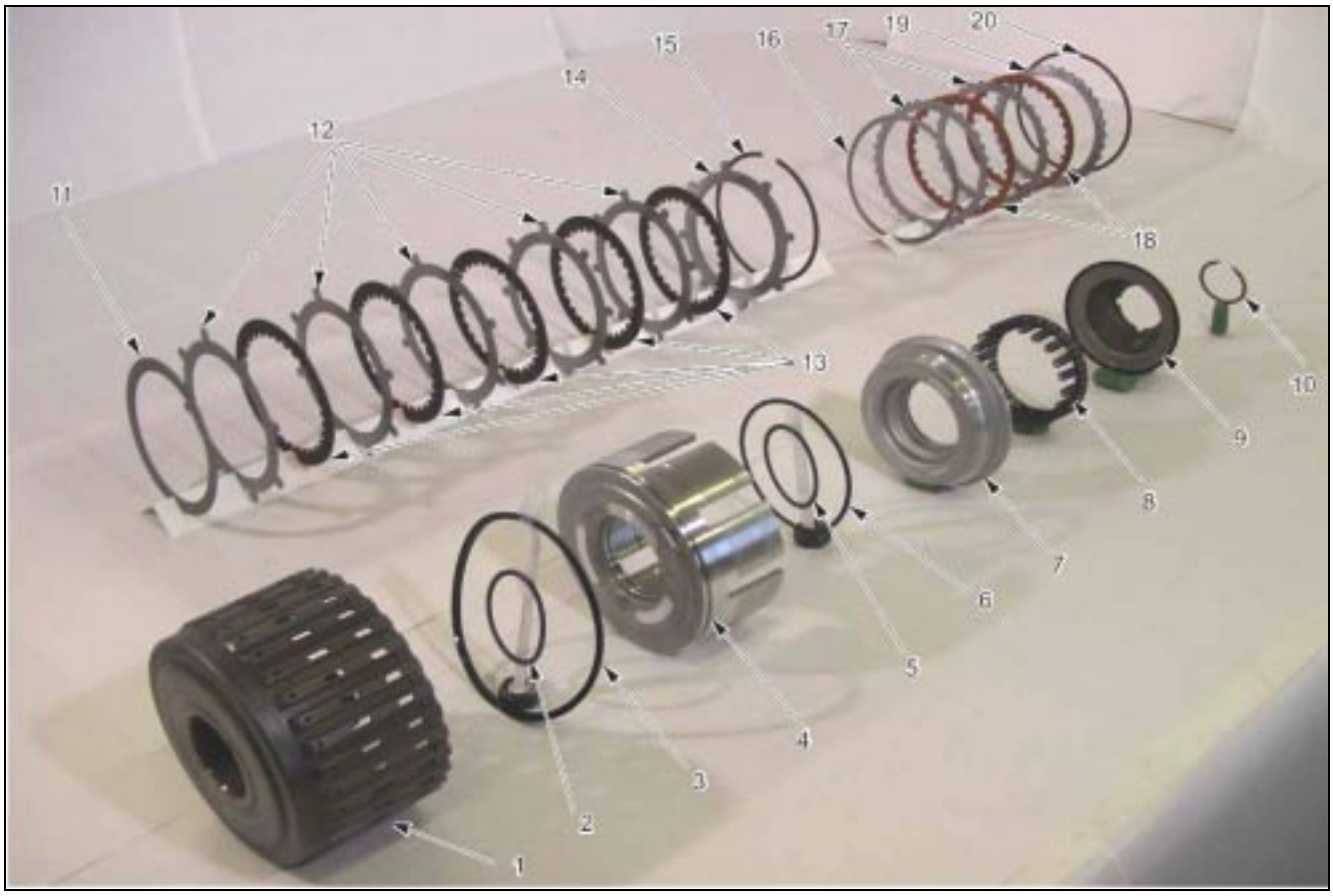


18PUMP07

5. **Oil pump cover**
6. **Oil pump housing**
   Install the oil pump cover to the oil pump housing.
   Tighten the 8 bolts to the specified torque.
   Torque: 9 N·m (78 lb·in)

7. **O-ring (large)**
   Install the O-ring (large) to the oil pump cover.
8. **Seal ring**
   Install the 4 seal rings to the oil pump cover.

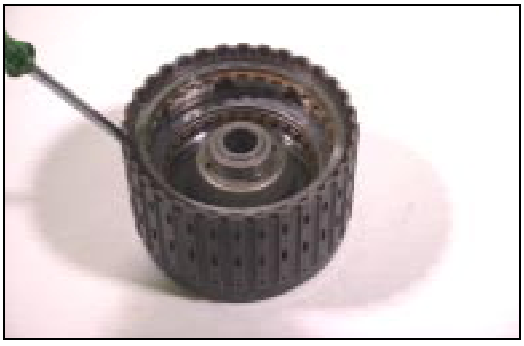
CLUTCH PACK (REVERSE AND HIGH CLUTCH ASSEMBLY)



01R&H17

Legend

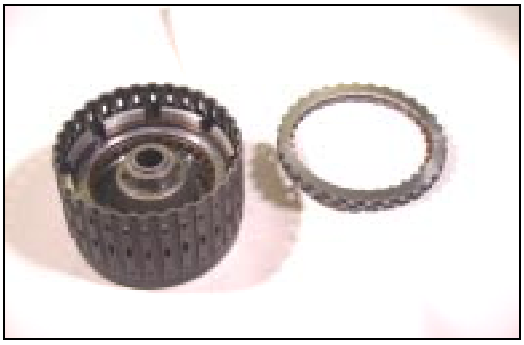
1. Reverse and high clutch drum
2. Seal ring (reverse clutch)
3. Lip seal (reverse clutch)
4. Reverse clutch piston
5. Seal ring (small, high clutch)
6. Seal ring (large, high clutch)
7. High clutch piston
8. Return spring
9. High clutch cover
10. Snap ring
11. Dish plate (high clutch)
12. Driven plates (5, high clutch)
13. Drive plates (5, high clutch)
14. Retaining plate (high clutch)
15. Snap ring (high clutch)
16. Dish plate (reverse clutch)
17. Driven plates (2, reverse clutch)
18. Drive plates (2, reverse clutch)
19. Retaining plate (reverse clutch)
20. Snap ring (reverse clutch)



02R&H18

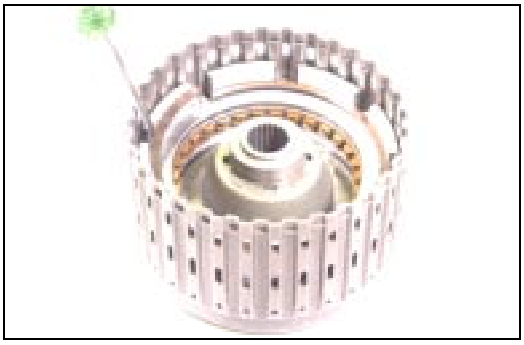
Disassembly steps

1. **Snap ring**
   Remove the reverse clutch snap ring.



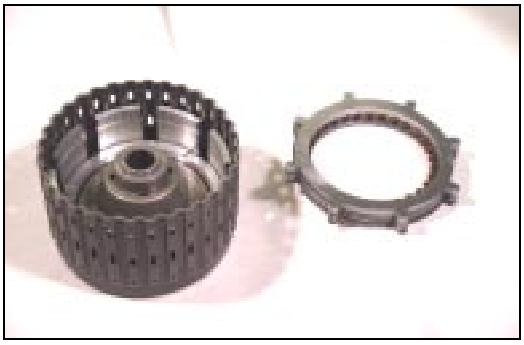
03R&H21

2. **Retaining plate, drive plate, driven plate and dish plate**
   Remove the reverse clutch retaining plate, the 2 drive plates, the 2 driven plates, and the dish plate.



04R&H22

3. **Snap ring**
   Remove the high clutch snap ring.



05R&H25

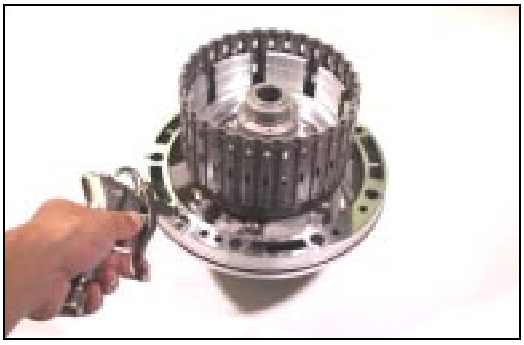
4. **Retaining plate, drive plate, driven plate and dish plate**
   Remove the high clutch retaining plate, the 5 drive plates, the 5 driven plates, and the dish plate.



07R&H28

5. **Snap ring**
6. **High clutch cover**
7. **Return spring**
   - Install the spring compressor to the reverse and high clutch drum.
     Spring compressor: 5-8840-2767-0
   - Carefully press the high clutch cover down .
     Take care not to damage the return spring.
   - Remove the snap ring.
   - Remove the high clutch cover and the return spring.

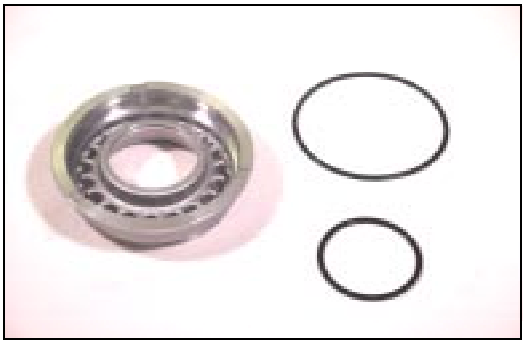

08R&H36


09R&H37

8. High clutch piston

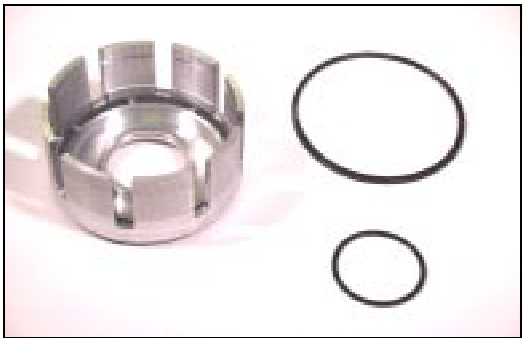
9. Reverse clutch piston

- Install the reverse and high clutch drum to the oil pump.
- Force compressed air into the oil pump oil channels.
- Remove the high clutch piston and the reverse clutch piston.


12R&H39

10.Seal ring (high clutch)

Remove the 2 seal rings from the high clutch piston.


13R&H38

11.Seal ring (reverse clutch)

Remove the 2 seal rings from the reverse clutch piston.

Inspection

Drive plate

- Measure the drive plate facing thickness at 3 points.
- Calculate the average value.
  If the average value is less than the specified limit, the drive plate must be replaced.
  Drive plate facing thickness:
  Standard – 2.0 mm (0.079 in)
  Limit – 1.8 mm (0.071 in)

Return spring

- Check the number of effective return spring coils.
  If the number is less than the specified minimum, the return spring must be replaced.
  Effective return spring coils (standard): 10.2
- Measure the return spring outside diameter, free length, and linear diameter.
  If any of the measured values exceed the specified limit, the return spring must be replaced.
  Return spring measurements (standard):
  Outside diameter – 8.0 mm (0.315 in)
  Free length – 27.1 mm (1.067 in)
  Linear diameter – 1.1 mm (0.043 in)



10R&H40

Reverse clutch piston

- Apply compressed air (392 kPa/4.0 kg/cm^2) to the reverse clutch piston from the outside to the inside.
  The flow of air should be blocked.



11R&H44

- Apply compressed air (392 kPa/4.0 kg/cm^2) to the reverse clutch piston from inside to the outside.
  The flow of air should be unrestricted.

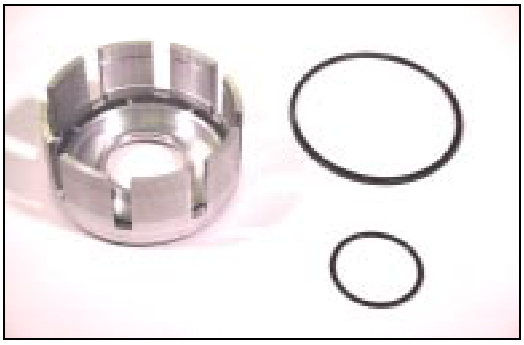


12R&H39

Reassembly steps

Coat the parts with ATF before installing them.

1. **Seal ring (high clutch)**
   Install new seal rings to the high clutch piston.


13R&H38

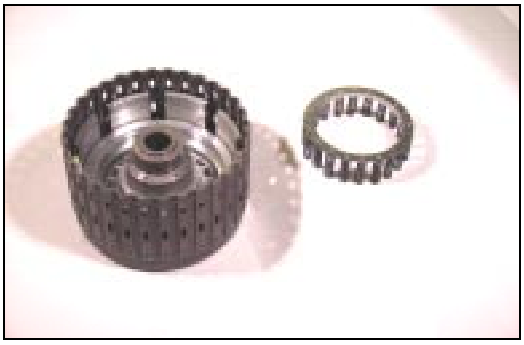
2. Seal ring (reverse clutch)
Install new seal rings to the reverse clutch piston.


14R&H32

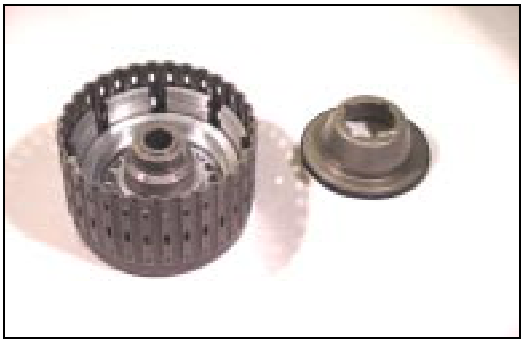
3. Reverse clutch piston
Install the reverse clutch piston to the reverse and high clutch drum.


15R&H31

4. High clutch piston
Install the high clutch piston to the reverse clutch piston.


16R&H33

5. Return spring
Install the return spring to the high clutch piston.


17R&H30

6. High clutch cover
- Carefully center the high clutch cover and install it.

NOTE:
If the clutch cover is not centered, the cover outside seal gum will be forced into the piston area where it will be damaged.



18R&H27



19R&H28

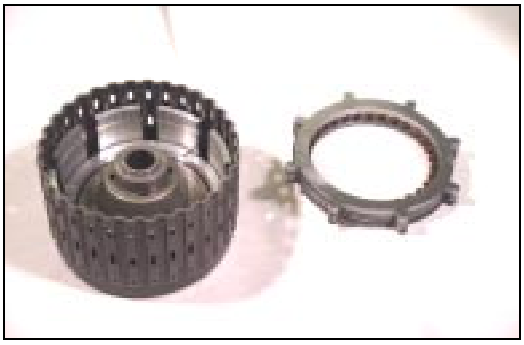
7. Snap ring

- Install the spring compressor to the reverse and high clutch drum.
- Use the spring compressor to carefully force the high clutch cover down.

  Spring compressor: 5-8840-2767-0

NOTE:
To avoid damage to return springs, use only as much force as is required to press the high clutch cover into place.

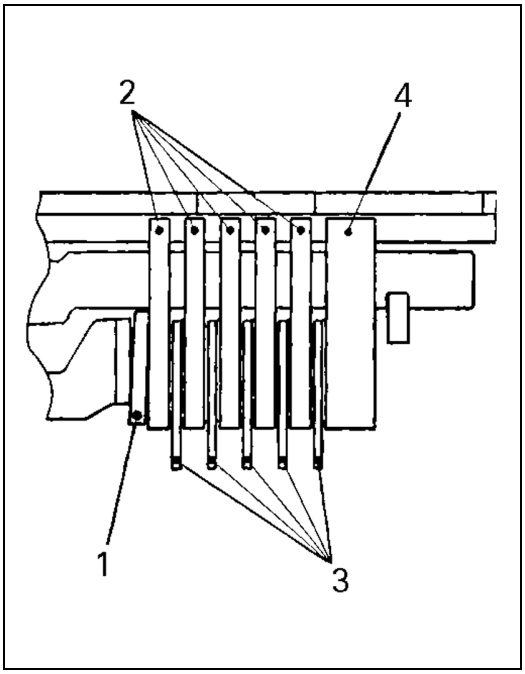
- Install the new snap ring to the reverse and high clutch drum.



20R&H25

8. Dish plate, drive plates, driven plates, and retaining plate

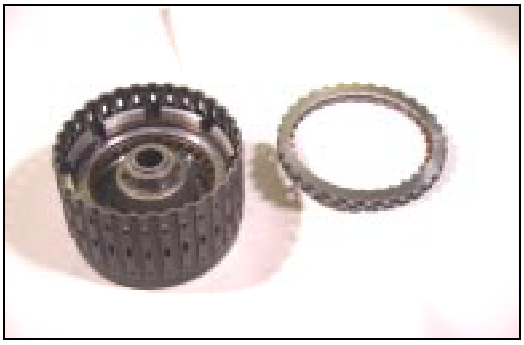
Install the high clutch dish plate (1), the 5 driven plates (2), the 5 drive plates (3), and retaining plate (4).



248L300002

9. Snap ring

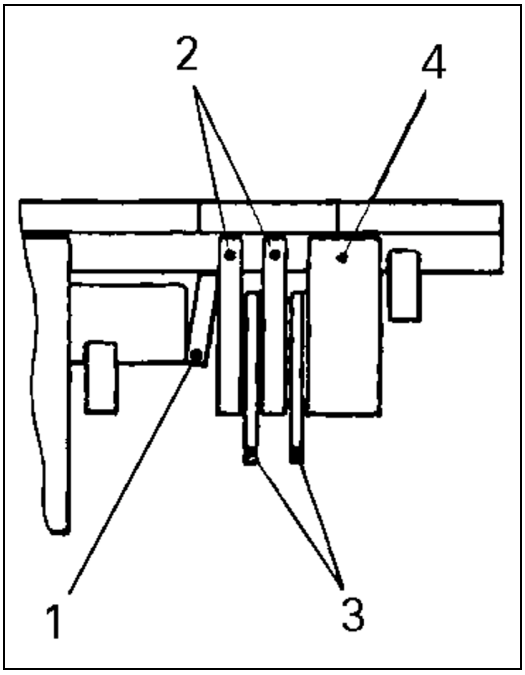
Install the snap ring.



21R&H21

10.Dish plate, drive plates, driven plates, and retaining plate

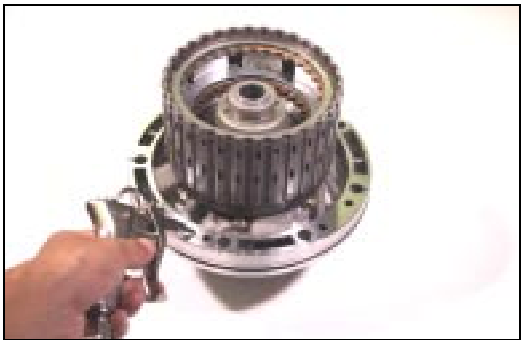
Install the reverse clutch dish plate (1) the 2 driven plates (2), the 2 drive plates (3), and retaining plate (4).



248L300003

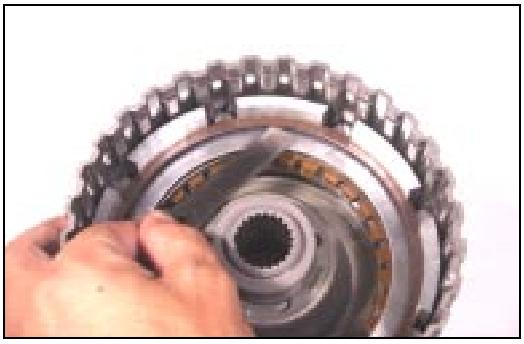
11.Snap ring

Install the snap ring.



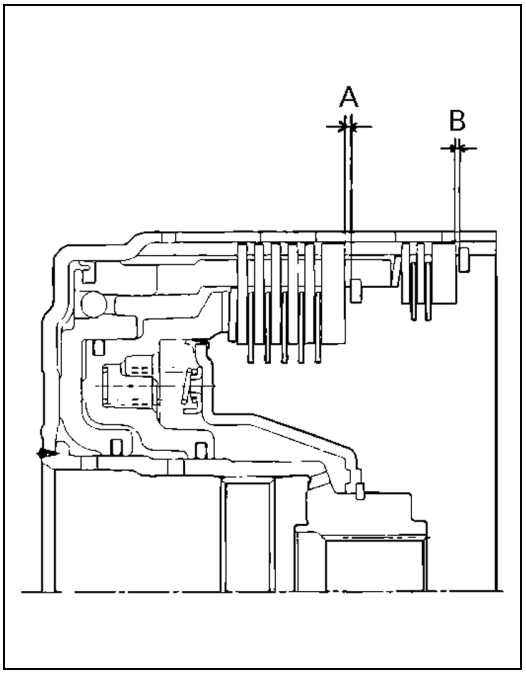
22R&H35

- Install the reverse and high clutch drum to the oil pump assembly.
- Force compressed air (392 kPa/4.0 kg/cm^2) through the oil pump oil passages to check high clutch operation.
  If the clutch does not operate, the seal ring may be damaged or the parts may have been installed in the wrong order.



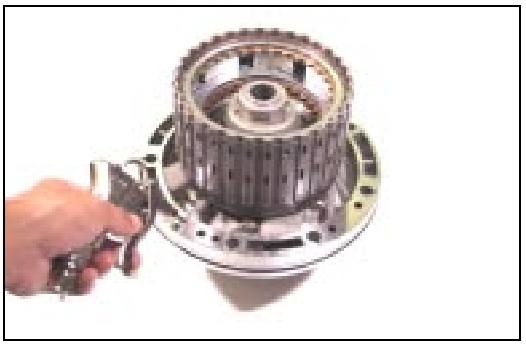
23CLEAR02

- Measure the clearance between the high clutch retaining plate and the snap ring.
  If the clearance is outside the specified range, replace the existing retaining plate with a new plate of the proper size (thickness).
  High clutch retaining plate and snap ring clearance (A): 1.2~1.6 mm (0.047~0.063 in)
  Available high clutch retaining plate thicknesses
  4.6 mm (0.181 in)
  4.8 mm (0.189 in)



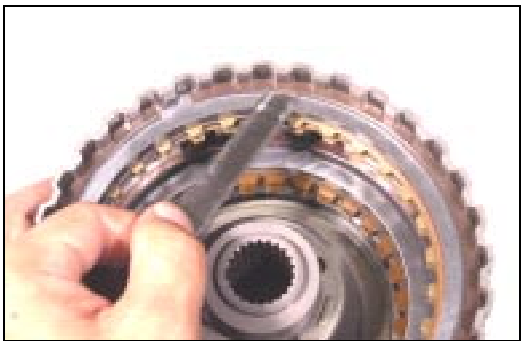
248L300004

5.0 mm (0.197 in)
5.2 mm (0.205 in)
5.4 mm (0.213 in)



24R&H34

- Force compressed air (392 kPa/4.0 kg/cm^2) through the oil pump oil passages to check reverse clutch operation. If the clutch does not operate, the seal ring may be damaged or the parts may have been installed in the wrong order.



25CLEAR04

- Measure the clearance between the reverse clutch retaining plate and the snap ring.
  If the clearance is outside the specified range, replace the existing retaining plate with a new plate of the proper size (thickness).
  Reverse clutch retaining plate and snap ring clearance (B):
  0.6~0.9 mm (0.024~0.035 in)
  Available reverse clutch retaining plate thicknesses
  4.8 mm (0.189 in)
  5.0 mm (0.197 in)
  5.2 mm (0.205 in)
  5.4 mm (0.213 in)

CARRIER AND LOW CLUTCH ASSEMBLY



01C&L12

Legend

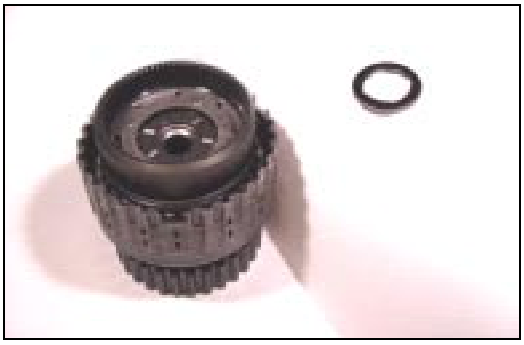
1. Snap ring
2. Front carrier
3. Bearing (with bearing race)
4. Rear sun gear
5. Bearing
6. Rear carrier
7. Bearing race
8. Bearing
9. Rear internal gear
10. Bearing race
11. Snap ring
12. Retaining plate
13. Drive plates (7, low clutch)
14. Driven plates (6, low clutch)
15. Driven plate (1, 2 mm thick, low clutch)
16. Dish plate
17. Snap ring
18. Cancel cover
19. Return spring
20. Low clutch piston
21. Seal ring (small)
22. Seal ring (large)
23. Low clutch drum
24. Bearing
25. Snap ring
26. Low one-way clutch
27. Side plate
28. Snap ring



02C&L-SUB03



03C&L-SUB05



04C&L-SUB06



05C&L-SUB07

Disassembly steps

1. **Snap ring**
   Remove the snap ring from the low clutch drum.

2. **Front carrier**
   Remove the front carrier from the low clutch assembly.

3. **Bearing (with bearing race)**
4. **Rear sun gear**
5. **Bearing**
6. **Rear carrier**
7. **Bearing race**
8. **Bearing**
9. **Rear internal gear**
10. **Bearing race**
    Remove the bearing (with bearing race), the rear sun gear, the bearing, the rear carrier, the bearing race, the bearing, and rear internal gear.



06C&L-SUB08



07C&L-SUB09



08C&L-SUB10



09C&L-SUB11



10C&L-SUB12

- Remove the bearing race from the rear internal gear.



11C&L-SUB13

11.Snap ring

Remove the low clutch snap ring.



12C&L-SUB15

12.Retaining plate, drive plate, driven plate, and dish plate

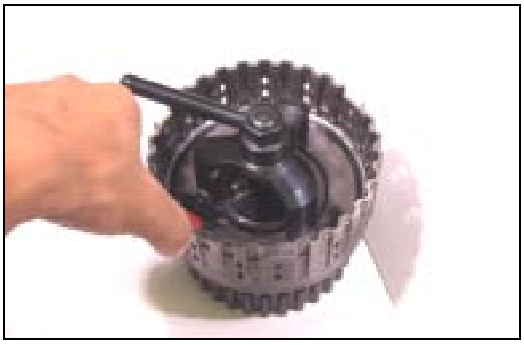
Remove the low clutch retaining plate, the 7 drive plates, the 7 driven plates, and the dish plate.



13C&L-SUB18

13.Snap ring

- Install the spring compressor to the low clutch drum.
  Spring compressor: 5-8840-2759-0
- Carefully press the cancel cover down.
  Take care not to damage the return spring.



14C&L-SUB19

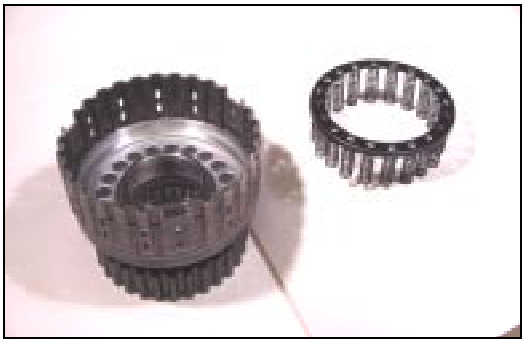
- Remove the snap ring.



31C&L-SUB20

14.Cancel cover

Remove the cancel cover.



30C&L-SUB21

15.Return spring

Remove the return spring.



15C&L-SUB38

16.Low clutch piston

- Insert the low one-way clutch inner race to the low clutch drum.
- Force compressed air through the oil passages of the low one-way clutch inner race to remove the low clutch piston.



29C&L-SUB22



16C&L-SUB25

17.Snap ring

- Raise the low one-way clutch side.
- Remove the low one-way clutch snap ring.



17C&L-SUB27

18.Side plate

Remove the side plate.


18C&L-SUB28

19.Low one-way clutch

Remove the low one-way clutch.


19C&L-SUB29

20.Snap ring

Remove the snap ring from the low clutch drum.


20C&L-SUB31

21.Bearing

Remove the bearing.

Inspection

Drive plate

- Measure the drive plate facing thickness at 3 points.
- Calculate the average value.
  If the average value is less than the specified limit, the drive plate must be replaced.
  Drive plate facing thickness:
  Standard – 2.0 mm (0.079 in)
  Limit – 1.8 mm (0.071 in)

Return spring

- Check the number of effective return spring coils.
  If the number is less than the specified minimum, the return spring must be replaced.
  Effective return spring coils (standard): 9.9
- Measure the return spring outside diameter, free length, and linear diameter.
  If any of the measured values exceed the specified limit, the return spring must be replaced.
  Return spring measurements (standard):
  Outside diameter – 9.7 mm (0.382 in)

Free length – 36.4 mm (1.433 in)
Linear diameter – 1.2 mm (0.047 in)


21C&L-SUB31

Reassembly steps

Coat the parts with ATF before installing them.

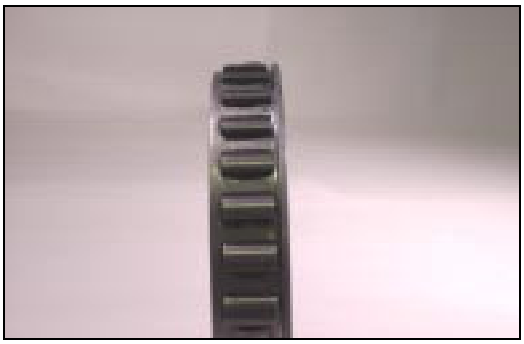
1. **Bearing**
   Install the bearing into the low clutch drum.


22C&L-SUB30

2. **Snap ring**
   Install the snap ring to the low clutch drum.


23C&L-SUB28

3. **Low one-way clutch**
   Install the low one-way clutch to the low clutch drum.


24C&L-SUB33

NOTE:
The flanged side of the low one-way clutch must face the outside.



25C&L-SUB27

4. Side plate

Install the side plate.



26C&L-SUB26

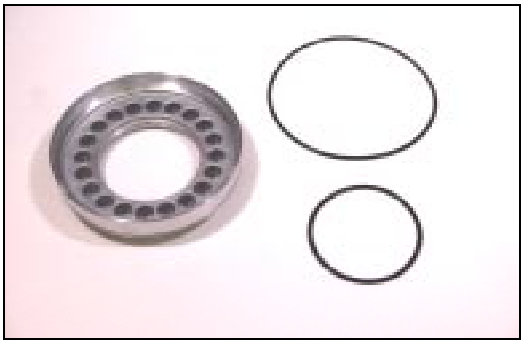
5. Snap ring

Install the snap ring to the low clutch drum.



27C&L-SUB58

- Attach the low one-way clutch inner race to the low clutch drum in the opposite direction of normal position.
- Rotate the one-way clutch inner race clockwise. It should turn smoothly with little resistance.
- Rotate the low one-way clutch inner race counterclockwise.
  It should immediately lock (rotation is impossible).
  If it does not, check the low one-way clutch installation direction.
  Inspect and replace the low one-way clutch if required.
- Remove the low one-way clutch inner race.
- Reverse the low clutch drum.



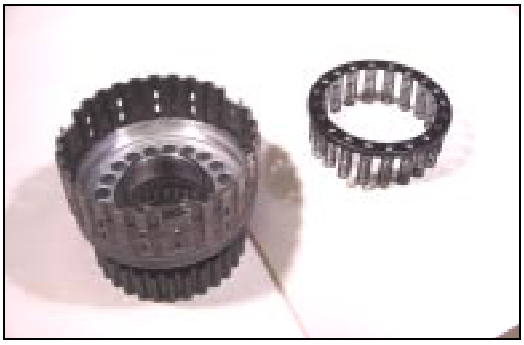
28C&L-SUB32

6. Low clutch piston

- Install new seal rings to the low clutch piston.


29C&L-SUB22

- Install the low clutch piston to the low clutch drum.


30C&L-SUB21

7. Return spring

Install the return spring to the low clutch piston.


31C&L-SUB20

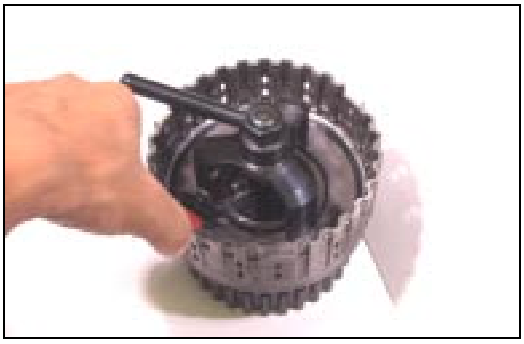
8. Cancel cover

- Carefully center the cancel cover and install it.

NOTE:
If the cancel cover is not centered, the cover outside seal ring gum will be forced into the low clutch piston area where it will be damaged.


32C&L-SUB18

- Install the spring compressor to the low clutch.
  Spring compressor: 5-8840-2759-0


33C&L-SUB19

9. Snap ring

- Use the spring compressor to carefully force the cancel cover down.

NOTE:
To avoid damage to the return spring, use only as much force as is required to press the cancel cover into place.

- Install new snap ring to the low clutch drum.



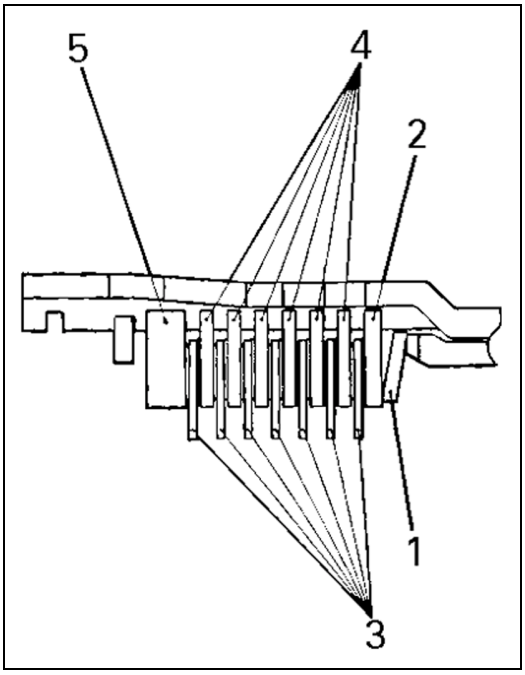
34C&L-SUB15

10.Dish plate, drive plate, driven plate, and retaining plate

Install the low clutch dish plate (1), the 2 mm thick driven plate (2), the 7 drive plate (3), the other 6 driven plates (4), and the retaining plate (5).

NOTE:

Dish plate side with the identification mark must face the driven plate.



248L300006

11.Snap ring

Install the snap ring to the low clutch drum.



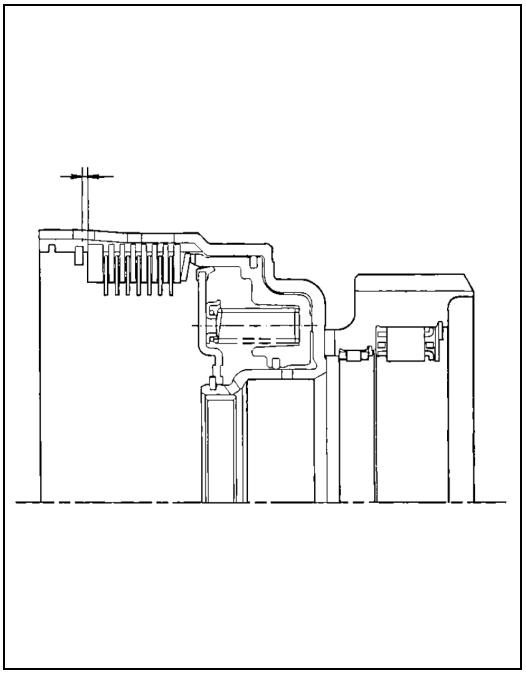
35C&L-SUB38

Inspection

- Insert the low one-way clutch inner race to the low clutch drum.
- Force compressed air (392 kPa/4.0 kg/cm^2) through the oil passages of the low one-way clutch inner race to check low clutch operation.
  If the low clutch does not operate, the seal rings may be damaged or the parts may have been installed in the wrong order.
- Measure the clearance between the low clutch retaining plate and the snap ring.
  If the clearance is outside the specified range, replace the existing plate with a new plate of the proper size (thickness).
  Low clutch retaining plate and snap ring clearance:
  0.9~1.3 mm (0.035~0.051 in)
  Available low clutch retaining plate thicknesses
  3.8 mm (0.150 in)
  4.0 mm (0.157 in)



36CLEAR06



248L300007

4.2 mm (0.165 in)
4.4 mm (0.173 in)
4.6 mm (0.181 in)
4.8 mm (0.189 in)



37C&L-SUB40

12.Bearing race

13.Rear internal gear

14.Bearing

Install the bearing race and the bearing to the rear internal gear.

NOTE:

Apply Vaseline to the fitting surfaces of the rear internal gear to prevent the bearing race and the bearing from falling during the installation process.



38C&L-SUB43



39C&L-SUB60

- Install the rear internal gear to the low clutch drum.


40C&L-SUB46

15.Bearing race

16.Rear carrier

17.Bearing

Install the bearing race and the bearing to the rear carrier.

NOTE:

Apply Vaseline to the fitting surfaces of the rear carrier to prevent the bearing race and the bearing from falling during the installation process.


41C&L-SUB49

- Install the rear carrier to the low clutch drum.


42C&L-SUB61

18.Rear sun gear

Install the rear sun gear to the low clutch drum.


43C&L-SUB07

19.Bearing (with bearing race)

20.Front carrier

Install the bearing (with bearing race) to the front carrier.

NOTE:

Apply Vaseline to the fitting surfaces of the front carrier to prevent the bearing from falling during the installation process.


44C&L-SUB52

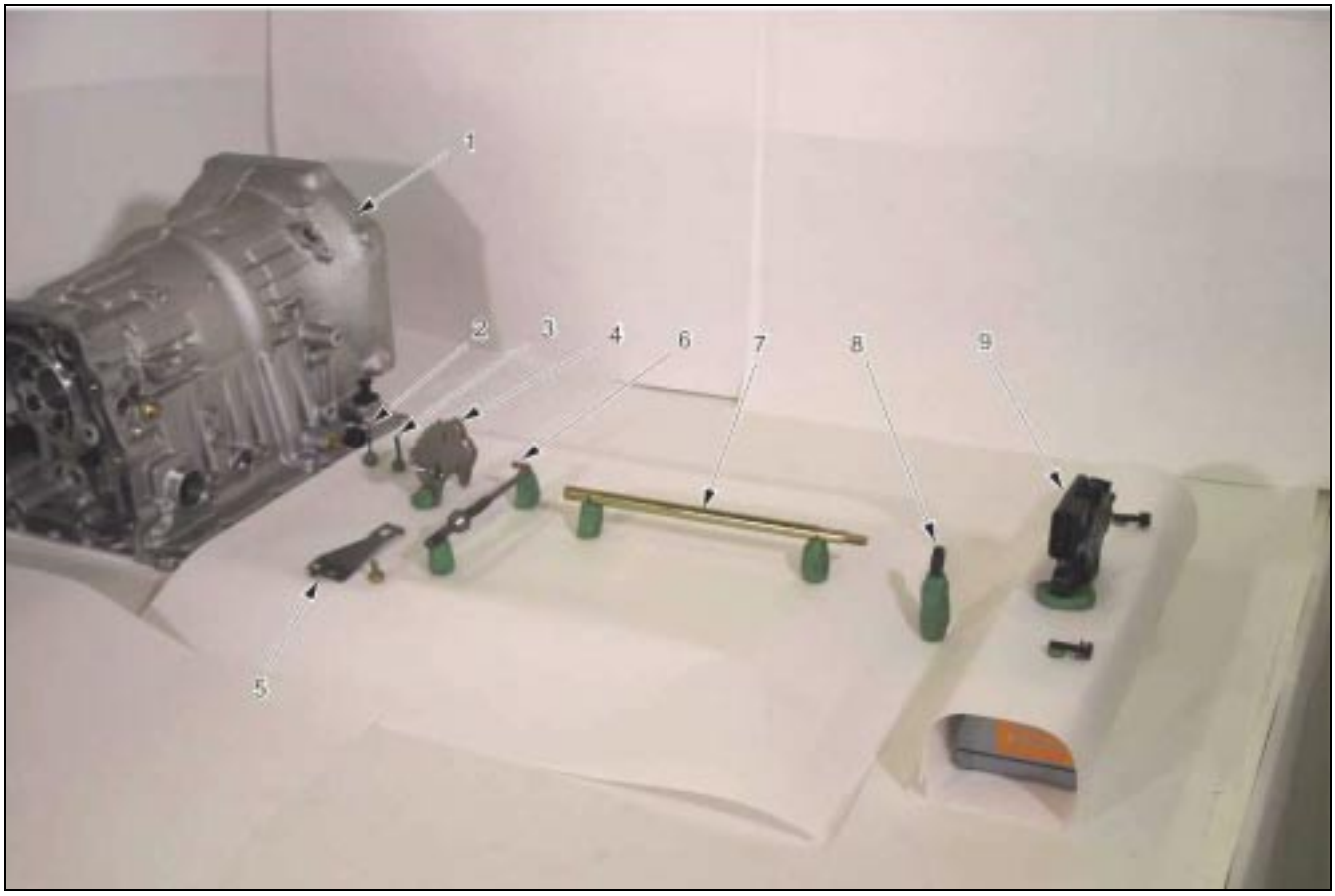


45C&L-SUB04

21.Snap ring

- Install the front carrier to the low clutch drum.
- Install the snap ring to the low clutch drum.

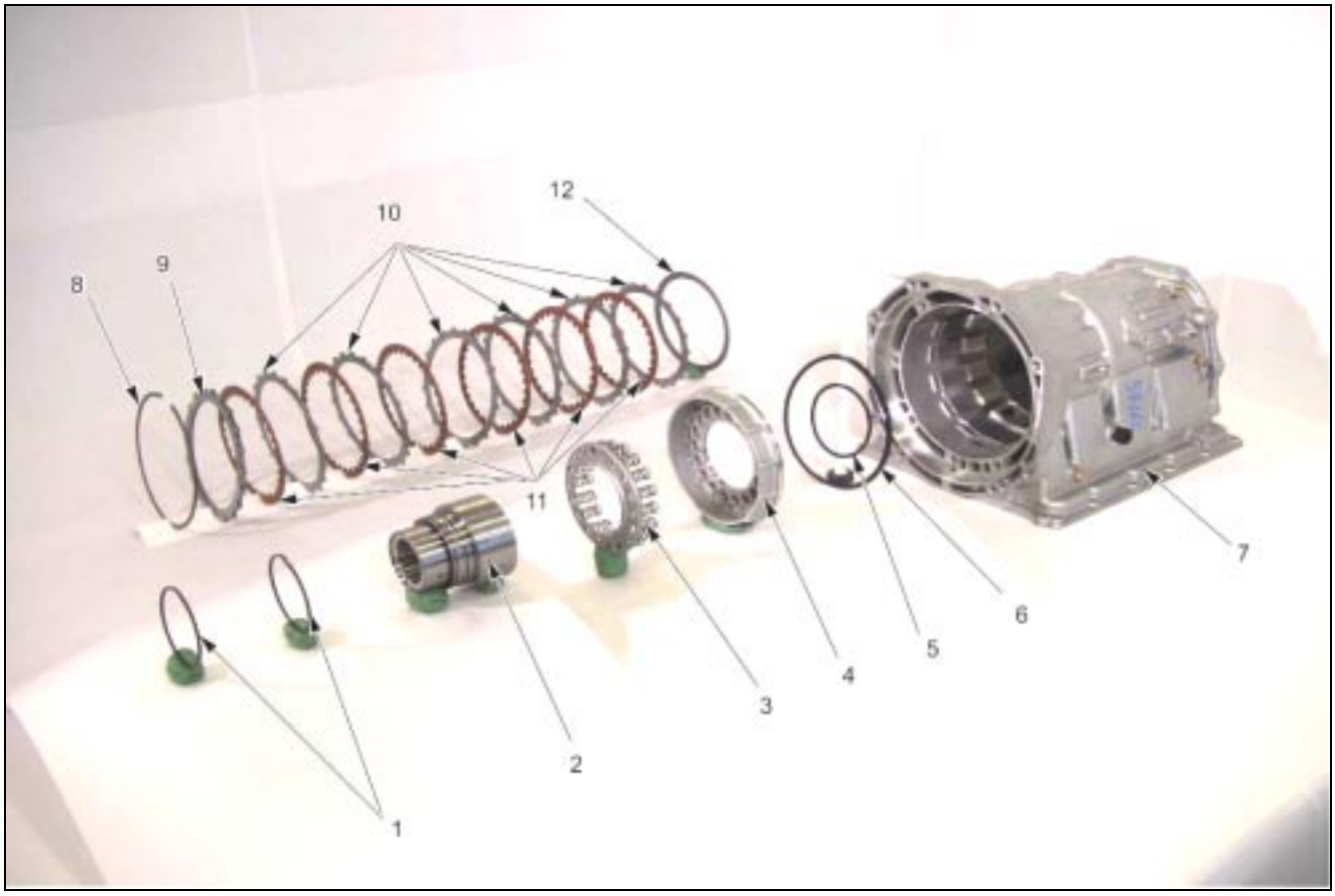
TRANSMISSION CASE



02CASE-BK06

Legend

1. Transmission case
2. Spring pin (slender)
3. Spring pin (fat)
4. Manual plate
5. Detent spring
6. Parking rod
7. Manual shaft
8. Oil seal
9. Inhibitor switch



01L&R-CS05

Legend

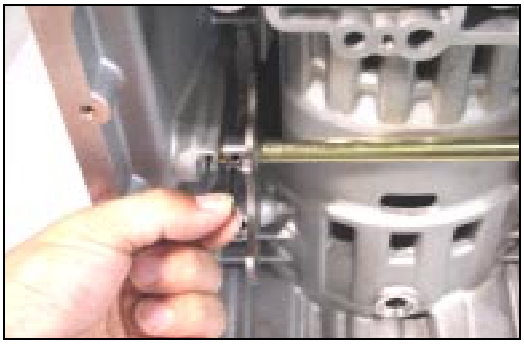
1. Seal ring
2. Low one-way clutch inner race
3. Return spring
4. Low and reverse brake piston
5. Seal ring
6. Lip seal
7. Transmission case
8. Snap ring
9. Retaining plate
10. Driven plate
11. Drive plate
12. Dish plate



04CASE-AY52

Disassembly steps

1. **Harness assembly**
   Remove the fixing bolt and the harness assembly.

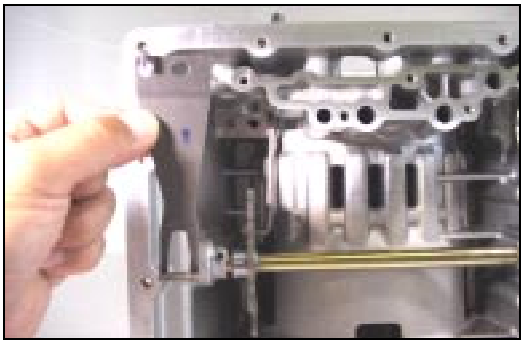

05CASE-AY30

2. Parking rod

- Use a pin punch to force out the parking rod spring pin.


06CASE-AY37

- Rotate the manual plate as you pull the parking rod free.


08CASE-AY45

3. Detent spring

Remove the fixing bolt and the detent spring.


09CASE-AY28

4. Manual shaft and manual plate

- Remove the manual shaft spring pin.


10CASE-AY21

- Remove the manual shaft together with the manual plate.


11CASE-AY01

5. Oil seal

Using a screwdriver, remove the oil seal from the transmission case.

Inspection

2 – 4 brake drive plate

Measure the 2-4 brake drive plate facing thickness at 3 points and calculate the average value.

If the average value is less than the specified limit, the 2-4 brake drive plate must be replaced.

2 – 4 brake drive plate facing thickness:
Standard = 2.0 mm (0.079 in)
Limit = 1.8 mm (0.071 in)

Low and reverse brake drive plate

Measure the low and reverse brake drive plate facing thickness at 3 points and calculate the average value.

If the average value is less than the specified limit, the low and reverse drive plate must be replaced.

Low and reverse brake drive plate facing thickness:
Standard = 2.0 mm (0.079 in)
Limit = 1.8 mm (0.071 in)

2 – 4 brake return spring

- Check the number of effective 2-4 brake return spring coils.
  Effective return spring coils (Standard): 10.2
- Measure the 2-4 brake return spring outside diameter, free length, and linear diameter.
  If any of the measured values exceed the specified limit, the 2-4 brake return spring must be replaced.
  2 – 4 brake return spring measurements (Standard):
  Outside diameter = 6.9 mm (0.272 in)
  Free length = 22.5 mm (0.886 in)
  Linear diameter = 1.1 mm (0.043 in)

Low and reverse brake return spring

- Check the number of effective low and reverse brake return spring coils.
  Effective return spring coils (standard): 4.8
- Measure the low and reverse brake return spring outside diameter, free length, and linear diameter.
  If any of the measured values exceed the specified limit, the low and reverse return spring must be replaced.
  Low and reverse brake return spring measurements (Standard):
  Outside diameter = 11.2 mm (0.441 in)

Free length = 22.3 mm (0.878 in)
Linear diameter = 1.1 mm (0.043 in)


12CASE-AY06

Reassembly steps

1. **Oil seal, manual shaft, and manual plate**
   - Use the oil seal installer to force the manual plate oil seal into place.
     Oil seal installer: 5-8840-2758-0


14CASE-AY21

   - Install the manual shaft together with the manual plate.


15CASE-AY26

   - Drive the spring pin into the transmission case.

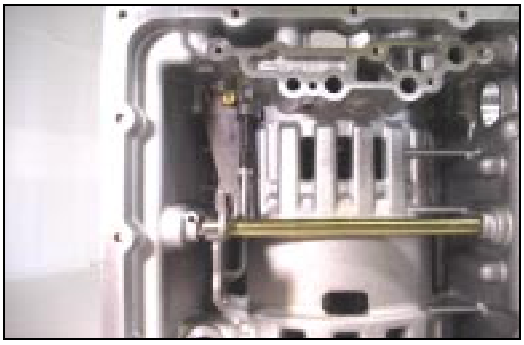
2. **Parking rod**
   - Rotate the manual plate while installing the parking rod.


16CASE-AY37



18CASE-AY43

- Use a pin punch to drive the manual plate spring pin into place.



21CASE-AY48

3. Detent spring

- Install the detent spring and tighten the fixing bolt to the specified torque.
  Torque: 7 N·m (61 lb·in)



23CASE-AY53

4. Harness assembly

- Apply automatic transmission fluid to the new O-ring and install them to the harness assembly.
- Install the harness assembly to the transmission case. Tighten the fixing bolt to the specified torque.
  Torque: 6 N·m (52 lb·in)



24ASSY003

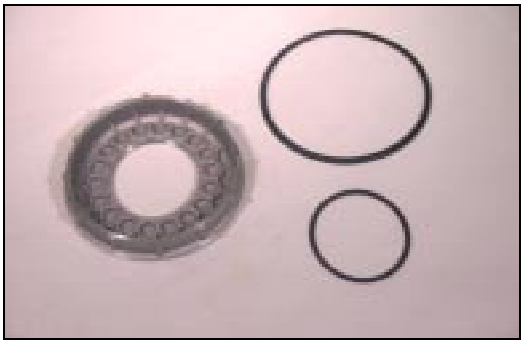
5. Low one-way clutch inner race

- Install new seal rings to the low one-way clutch inner race.



25ASSY126

- Measure the gap between the seal ring and the ring groove.
  If the measured valve is outside the specified range the low one-way clutch inner race must be replaced.
  Sealing ring and ring groove gap:
  0.10~0.25 mm (0.0004~0.001 in)


26L&R01

6. Low and reverse brake piston

- Install new seal rings to the low and reverse piston.


27ASSY004

- Install the low and reverse brake piston to the transmission case.


28ASSY005

7. Return spring

- Install the return spring to the low and reverse brake piston.


29ASSY006

8. Low one-way clutch inner race

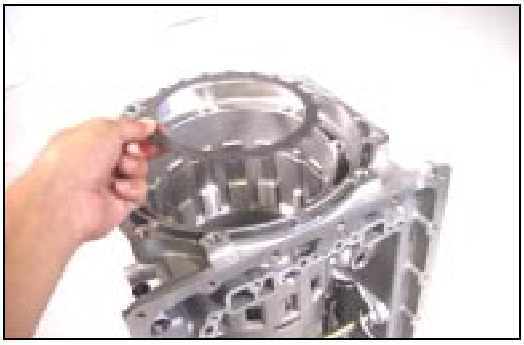
- Install the low one-way clutch inner race to the transmission case.
- Temporarity tighten the 7 fixing bolts.


31ASSY074

- Tighten each of the bolts a little at a time to the specified torque.
  Be sure that the return spring and the low one-way clutch inner race installation position does not change as you tighten the bolts.
  Torque: 24 N·m (17 lb·ft)



32ASSY007



33ASSY008



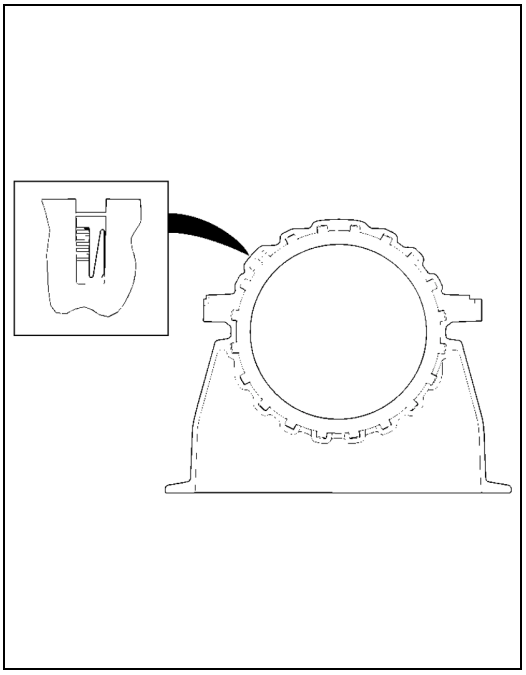
34ASSY009



35N-SPG02

9. **Dish plate, driven plate, drive plate, and retaining plate (low and reverse brake)**
   - Install the dish plate (1) followed by the 6 driven plates (2) and drive plates (3) sets.

   - Install the N-type spring.



249L300004



36ASSY10

- Install the retaining plate (4).



37ASSY011

- Install the snap ring.

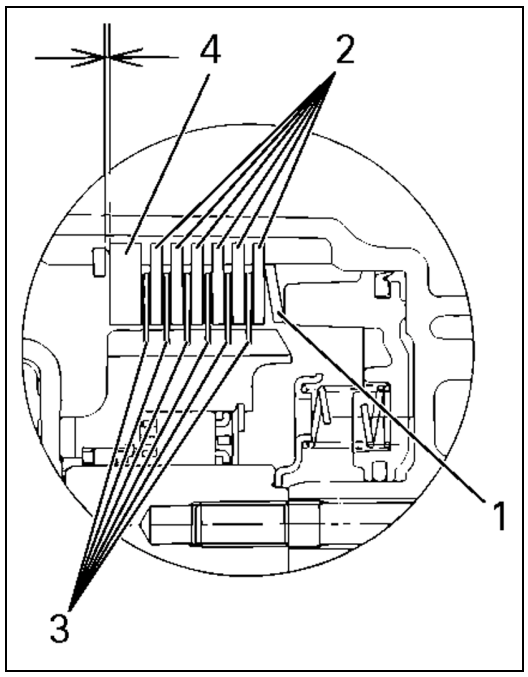


38L&R03

- Force compressed air (392 kPa/4.0 kg/cm^2) through the oil passages of the transmission case to check low and reverse brake operation.
  If the low and reverse brake does not operate, check the seal rings for damage and replace if necessary. Also check that no parts have been installed out of place.



39L&R04



249L300003

- Measure the clearance between the low and reverse retaining plate and the snap ring.
  If the clearance is out side the specified range, replace the existing retaining plate with a new plate of the proper size (thickness).
  Low and reverse retaining and snap ring clearance:
  0.7~1.1 mm (0.028~0.043 in)
  Available low and reverse brake retaining plate thickensses
  5.2 mm (0.205 in)
  5.4 mm (0.213 in)
  5.6 mm (0.220 in)
  5.8 mm (0.228 in)
  6.0 mm (0.236 in)

10.Dish plate, drive plate, driven plate, and retaining plate (2-4 brake)

NOTE:
If 2-4 brake clearance measurement is required, it must be done now.
Brake clearance cannot be measured after the carrier assembly has been installed.

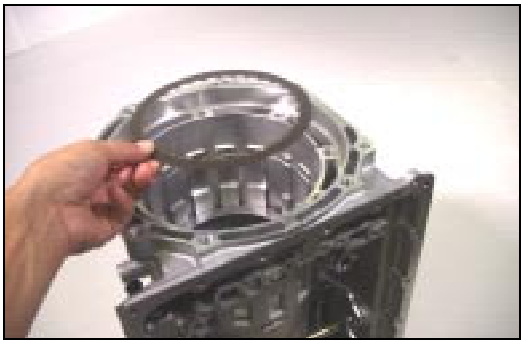


402-4B08

- Install the 2-4 brake dish plate to the transmission case (plate contact surface).



412-4B09



422-4B10



432-4B11



442-4B12



452-4B15

- Install the drive plate, driven plate, and the retaining plate.

11.2 – 4 brake piston and 2 – 4 brake retainer

- Install new seal ring to the 2-4 brake piston.
- Install the 2-4 brake piston to the 2-4 brake retainer.

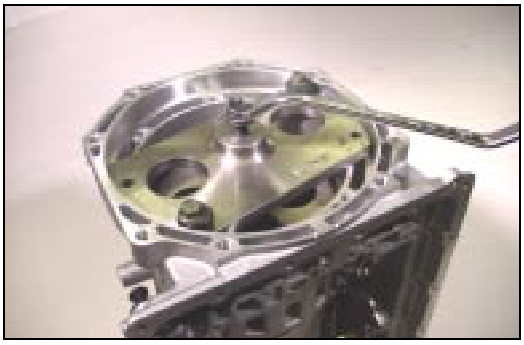
- Install the 2-4 brake piston and the 2-4 brake retainer to the transmission case.
  Pay close attention to the retainer projection from the case groove.


472-4B17

- Install the spring compressor to the transmission case.
  Spring compressor: 5-8840-2764-0

NOTE:
Be sure that the spring compressor is perfectly centered (an off-center special tool will damage the return spring).

- Use the spring compressor to force the 2-4 brake retainer.


482-4B18

NOTE:
To avoid damaging the return spring, apply as little force as possible to the 2-4 brake retainer.

- Install the snap ring.

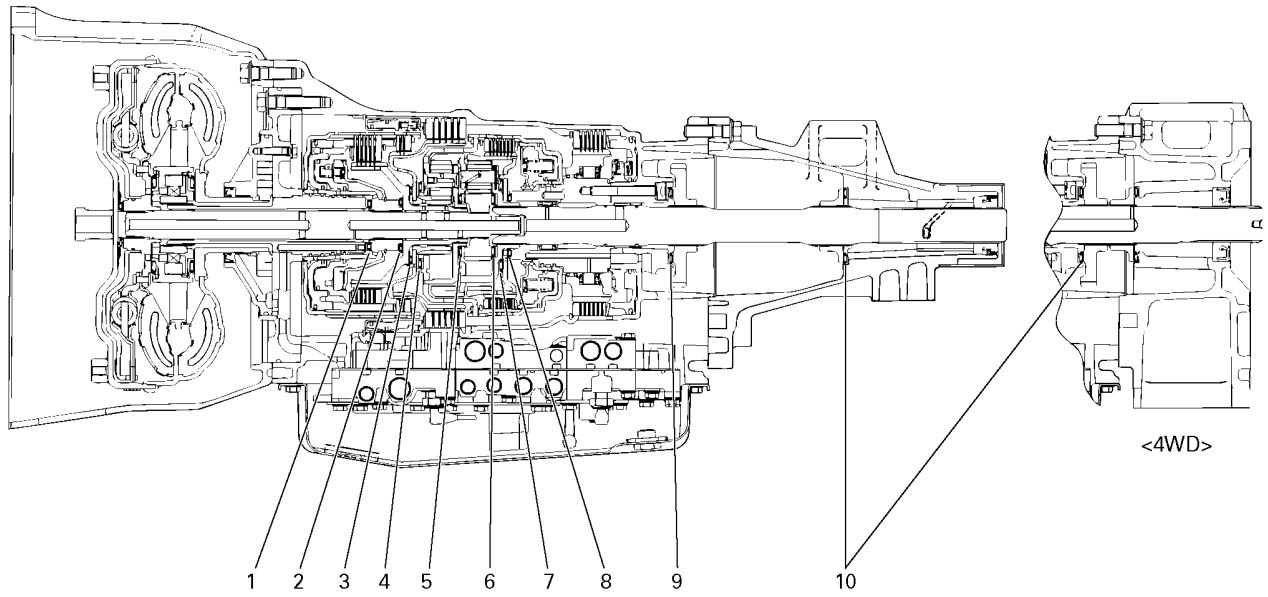

492-4B22

- Force compressed air (392 kPa/4.0 kg/cm^2) through the oil passages of the transmission case to operate and break-in the 2-4 brake.


502-4B19

- Measure the clearance between the 2-4 brake retainer and the retaining plate.
  If the clearance is outside the specified range, replace the existing brake retainer with a new one of the proper size (thickness).
  2 – 4 brake retainer and retaining plate clearance:
  1.0~1.4 mm (0.039~0.055 in)
  Available 2-4 brake retaining plate thicknesses
  5.4 mm (0.213 in)
  5.6 mm (0.220 in)
  5.8 mm (0.228 in)
  6.0 mm (0.236 in)
  6.2 mm (0.244 in)
  6.4 mm (0.252 in)
- Use the spring compressor to release the 2-4 brake.

BEARING AND BEARING RACE INSTALLATION POSITION



A07L300001

1. Bearing and bearing race

		Outside diameter
Bearing	–	46 mm (1.811 in)
Bearing race	–	45 mm (1.772 in)


01BRG16

1. Bearing and bearing race


01BRG16

2. Bearing (with bearing race) Outside diameter

Outside diameter

Bearing – 46 mm (1.811 in)

Bearing race (black color) installation direction – Facing the front of the transmission.


01BRG16

3. Bearing and bearing race Bearing – 46 mm (1.811 in)

Outside diameter

Bearing – 65 mm (2.559 in)

Bearing race – 64 mm (2.520 in)


01BRG16

4. Bearing and bearing race Bearing race – 45 mm (1.772 in)

Outside diameter

Bearing – 73 mm (2.874 in)

Bearing race – 72 mm (2.835 in)


01BRG16

5. Bearing (with bearing race)

Outside diameter

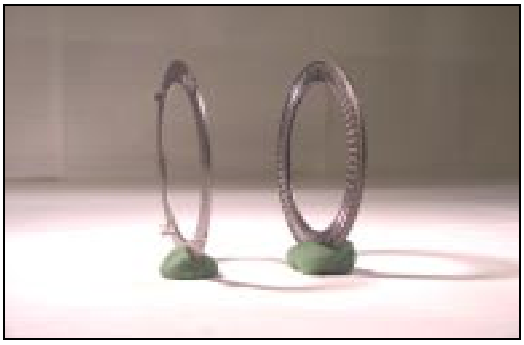
Bearing – 53 mm (2.087 in)

Bearing race (black color) installation direction – Facing the front of the transmission.


06BRG07

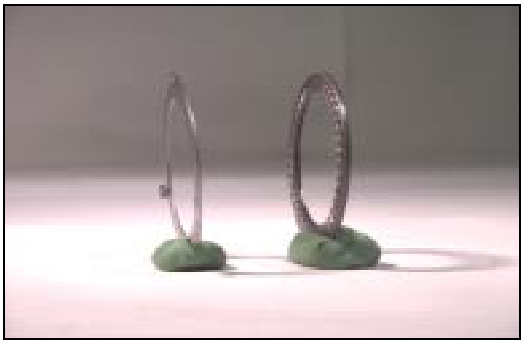
6. Bearing

		Outside diameter
Bearing	–	53 mm (2.087 in)


07BRG08

7. Bearing and bearing race

		Outside diameter
Bearing	–	78 mm (3.071 in)
Bearing race	–	76 mm (2.992 in)


08BRG09

8. Bearing and bearing race

		Outside diameter
Bearing	–	53.4 mm (2.102 in)
Bearing race	–	51 mm (2.008 in)


09BRG18

9. Bearing (with bearing race)

		Outside diameter
Bearing	–	64 mm (2.520 in)

Bearing race (black color) installation direction – Facing the rear of the transmission.


10BRG17

10. Bearing (with bearing race)

		Outside diameter
Bearing	–	64 mm (2.520 in)

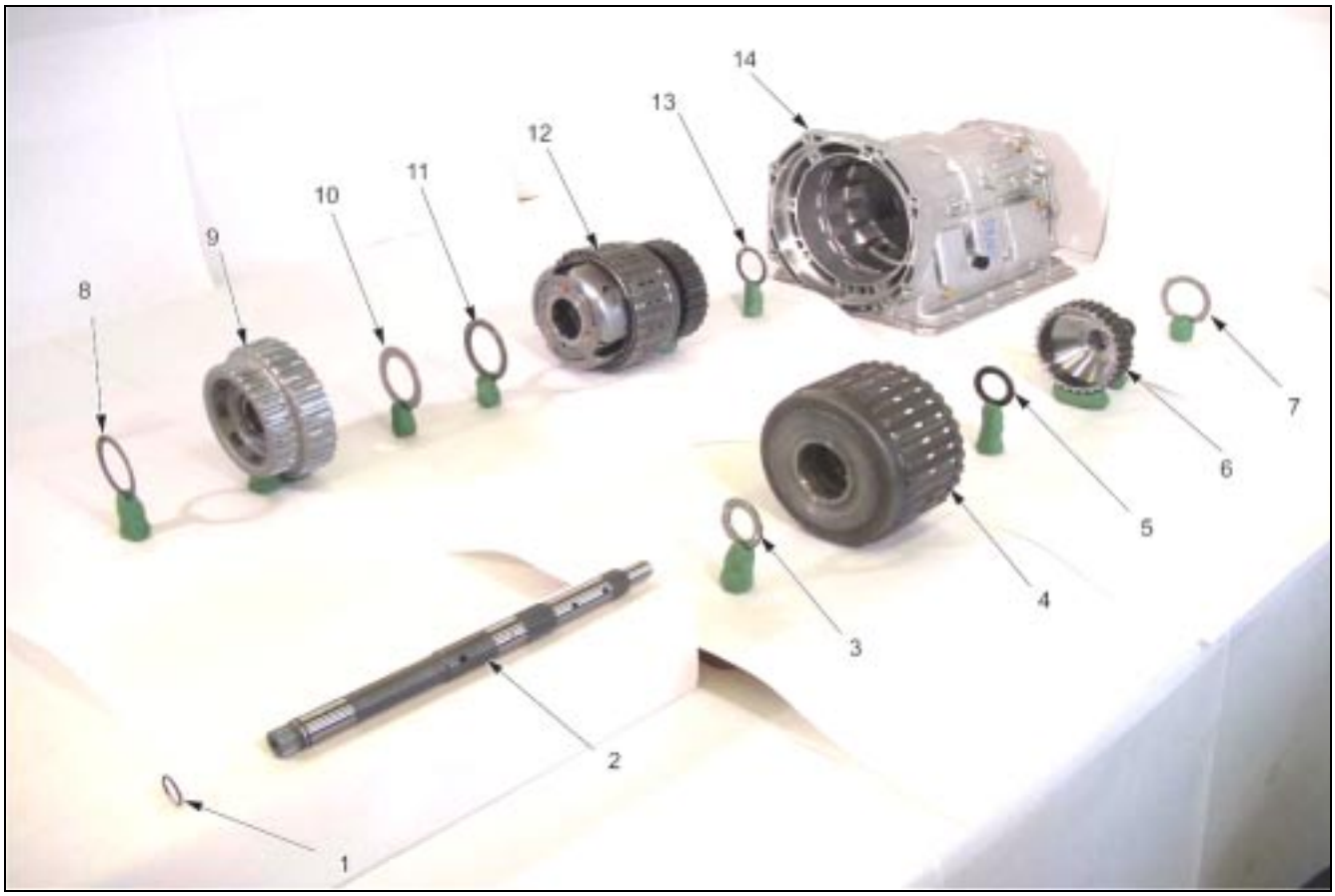
Bearing race (black color) installation direction – Facing the front of the transmission.

AUTOMATIC TRANSMISSION REASSEMBLY

Assembly cautions

- Use your bare hands or vinyl gloves to reassemble the transmission. Do not use ordinary work gloves (loosen threads from the gloves may fall into the transmission and cause problems).
- Before installing the drive plates, immerse them in the recommended automatic transmission fluid (BESCO ATF II or ATF III). If the drive plate is new, it must be immersed for at least two hours to ensure oil penetration and saturation of the facing.
- Apply ATF to all sliding and contact surfaces before assembly. Also apply ATF to seal rings and O-rings. Assemble the parts carefully to avoid damaging them.
- Replace any snap ring that appears worn, bent out of shape, or otherwise damaged.
- If any part contacting the transmission case is damaged, it must be replaced with a new part.
- Be careful not to damage the plates during reassembly (oil leakage from the plate will result).
- If you are reusing a seal, remove the old adhesive agent and clean the surface with cleaning oil before applying the new adhesive agent.
- Wait at least two hours after installing the oil seals before installing the plates.
- Do not replace O-rings, snap rings, bearings, and/or bearing races with inferior substitutes.

Power train



01HUB-H04

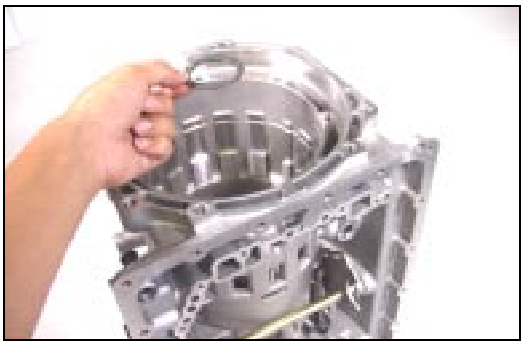
Legend

1. O-ring
2. Input shaft
3. Bearing
4. Reverse and high clutch assembly
5. Bearing
6. High clutch hub
7. Bearing race
8. Bearing
9. Front sun gear
10. Bearing race
11. Bearing
12. Carrier and low clutch assembly
13. Bearing
14. Transmission case

Reassembly steps

1. **Transmission case**
   Rotate the transmission case so that the converter housing installation surfaces are facing up.
2. **Bearing**
   Install the bearing to the low and one-way clutch inner race. Refer to the item “Transmission Case” for more detailed information.

NOTE:
Apply Vaseline to the bearing to prevent them from failing during the installation procedure.



02ASSY012



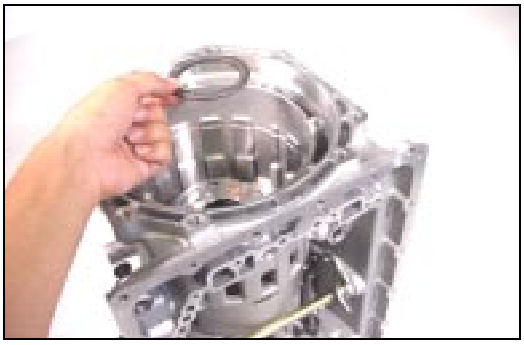
03ASSY013

3. Carrier and low clutch assembly

Install the carrier and low clutch assembly to the transmission case.

NOTE:

Do not allow the low clutch drum end to protrude beyond the 2-4 brake plate contact surface (transmission case).



04ASSY014

4. Bearing

Install the bearing to the carrier and low clutch assembly.



05ASSY015

5. Driven plate, drive plate, retaining plate, and dish plate (2 – 4 brake)

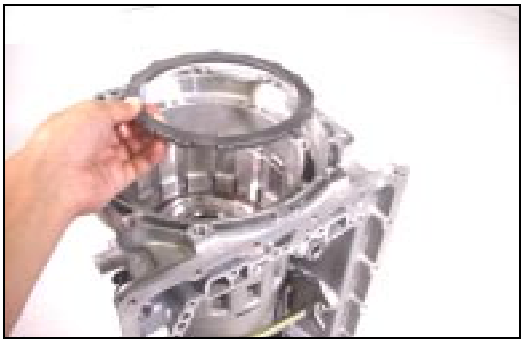
Install the 2-4 brake 5 driven plate (1), 5 drive plates (2), retaining plate (3), and dish plate (4) in that order.

NOTE:

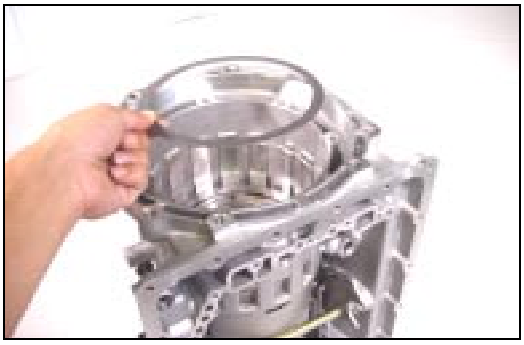
- **The thickest driven plate (5.6 mm) must be installed at the bottom (transmission case plate surface).**
- **Dish plate side with the identification mark must face the retaining plate.**



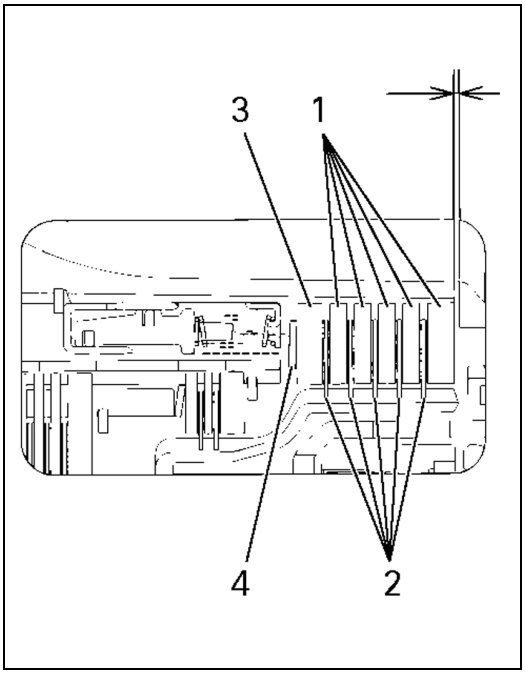
06ASSY016



07ASSY017



08ASSY018



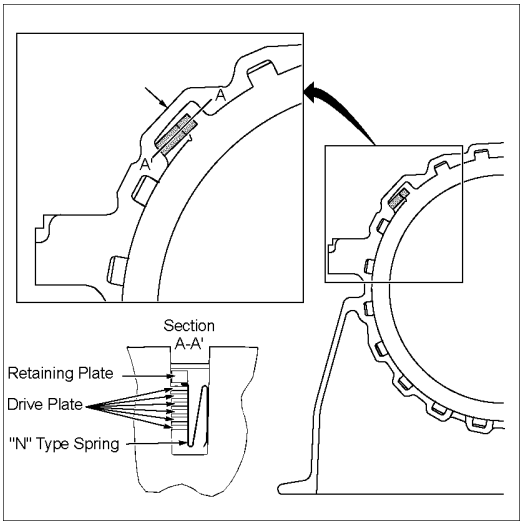
248L300008



09U-SPG2

6. 2 – 4 brake spring

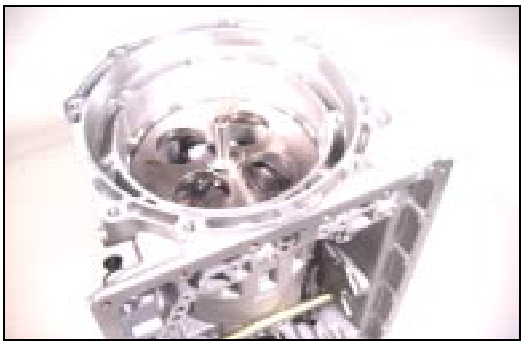
Install the 2-4 brake springs (3) to the transmission case.



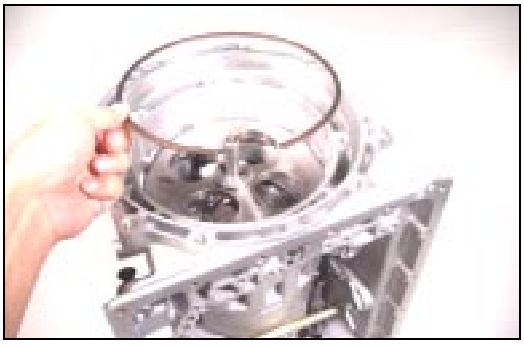
RTW37AMF0001-X



10ASSY019



11ASSY028



12ASSY029

7. Return spring and 2 – 4 brake retainer

- Align the transmission case groove and the 2-4 brake retainer projection.
- Install the return spring and the 2-4 brake retainer.

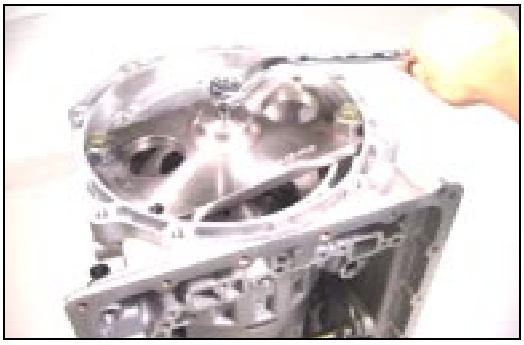
- Install the spring compressor to the transmission case.
  Spring compressor: 5-8840-2764-0

NOTE:
Carefully center the spring compressor to prevent damage to the return spring.

- Push the 2-4 brake retainer into place.

NOTE:
Do not push the brake retainer too far.
Damage to the return spring will result.

- Install the snap ring.



14ASSY031



17ASSY113

8. Sleeve and seal ring

- Install the new sleeve and seal ring to the transmission case.



192-4B22

- Force compressed air (392 kPa/4.0 kg/cm^2) through the transmission case oil passage to 2-4 brake operation.
  If the 2-4 brake does not operate, the seal ring may be damaged or the parts may have been installed in the wrong order.

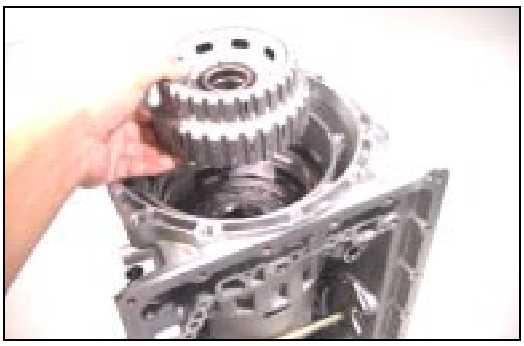


20ASSY037

9. Bearing race, front sun gear, and bearing

- Install the bearing race to the front sun gear.

NOTE:
Apply Vaseline to the bearing race and bearing to prevent them from falling during the installation procedure.



21ASSY040

- Install the front sun gear to the transmission case.


22ASSY042

- Install the bearing to the front sun gear.


23ASSY045

10.High clutch hub and bearing race

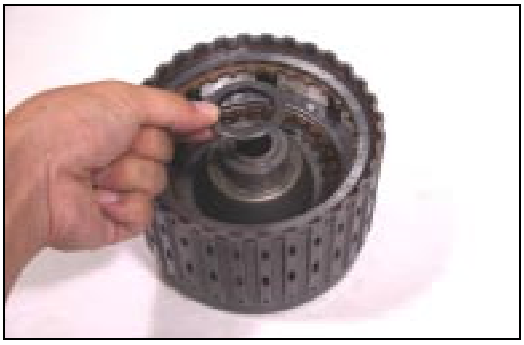
Install the bearing race to the high clutch hub.

NOTE:

Apply Vaseline to the bearing race.


24ASSY047

- Install the high clutch hub and the bearing race to the transmission case.

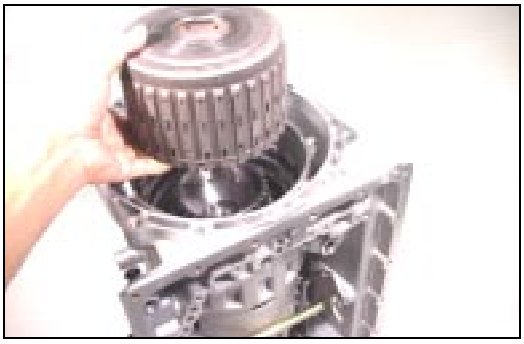

25R&H42

11.Clutch pack (reverse and high clutch assembly)

- Install the bearing (with bearing race) to the clutch pack.

NOTE:

- **The black side (bearing race) of the bearing must contact the clutch pack.**
- **Apply Vaseline to the bearing.**


26ASSY049

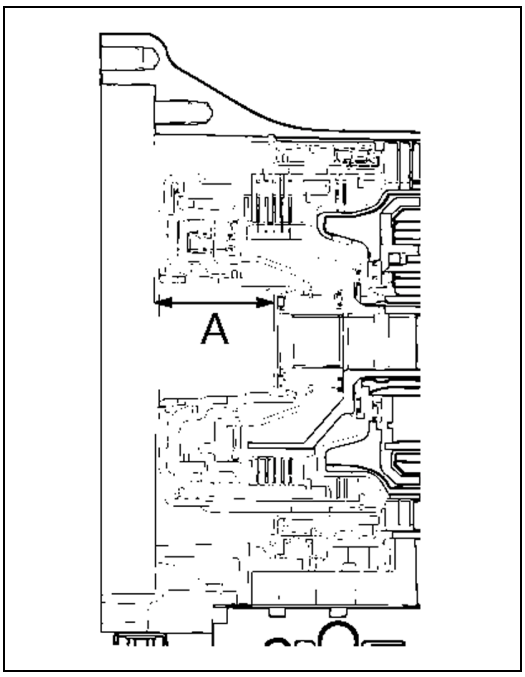
- Install the clutch pack and bearing to the transmission case.



27ASSY051

- Install the bearing to the clutch pack.

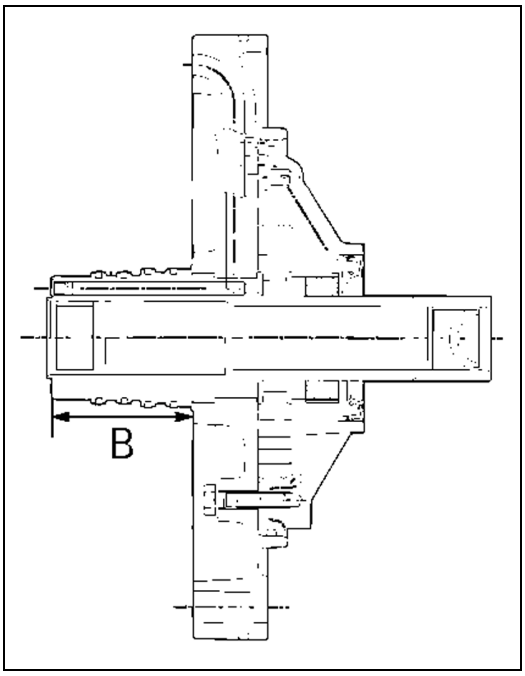
NOTE:
Apply Vaseline to the bearing.



A07L300002

Total end play measurement

- Install the bearing race (oil pump) to the clutch pack.
- Measure the distance (A) between the oil pump installation surface and the bearing race.



241L300003

- Measure the distance (B) between the bearing race installation surface and the machined surface.
- Calculate the total end play using the following formula.
  Total end play = distance (A) – distance (B)
  If the measured and calculated end play is outside the specified range, replace the existing bearing race with a bearing race of the proper size (thickness).
  Total end play = 0.25~0.55 mm (0.0098~0.0217 in)
  Available oil pump bearing race thicknesses
  1.4 mm (0.055 in)
  1.6 mm (0.063 in)
  1.8 mm (0.071 in)
  2.0 mm (0.079 in)
  2.2 mm (0.087 in)
  2.4 mm (0.094 in)


28ASSY058

12.Input shaft

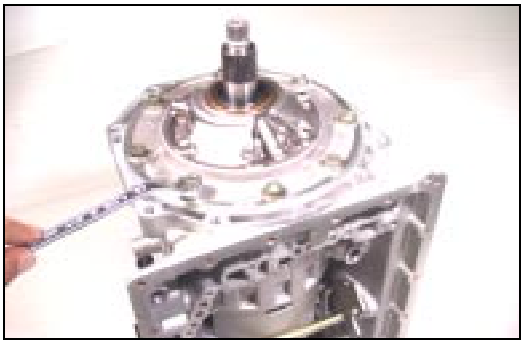
Install the input shaft.


29PUMP02

13.Oil pump assembly

- Install a new O-ring to the outside of the oil pump.
- Install the bearing race to the oil pump.

NOTE:
Apply Vaseline to the bearing race.

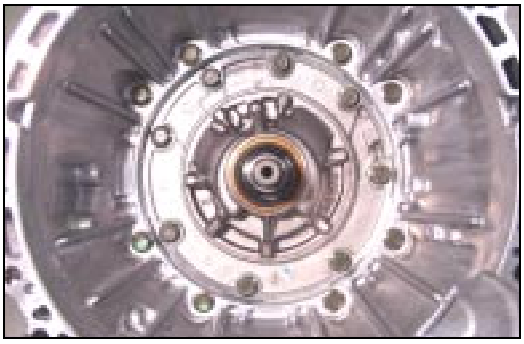

30ASSY067

- Apply ATF to the O-ring at the outside of the oil pump.
- Install the oil pump assembly to the transmission case.
- Apply sealing agent (TB1215) to the threaded surfaces of the 8 fixing bolts and tighten to the specified torque.
  Torque: 58 N·m (43 lb·ft)


31ASSY068

14.O-ring

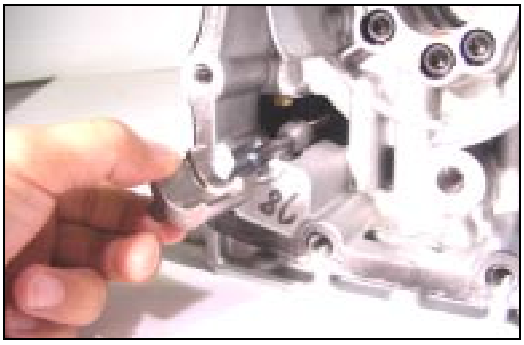
Install a new O-ring to the input shaft.


32ASSY116

15.Converter housing

Install the converter housing and tighten the bolts to the specified torque.

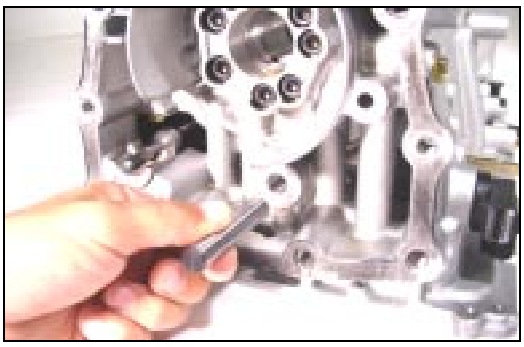
Torque: 53 N·m (39 lb·ft)



33ASSY075

16.Actuator support

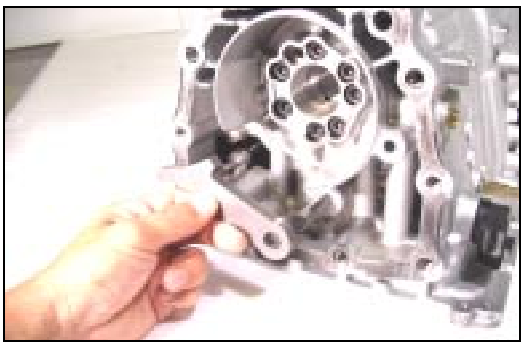
Install the actuator support.



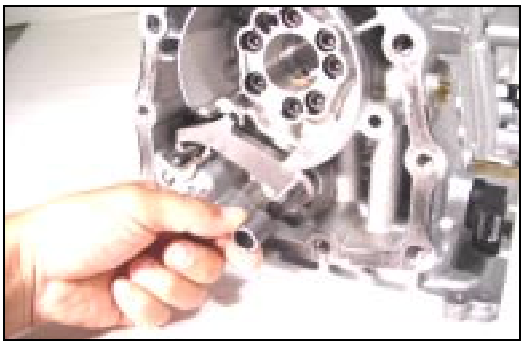
34ASSY077

17.Parking pawl, shaft, spring, and spacer

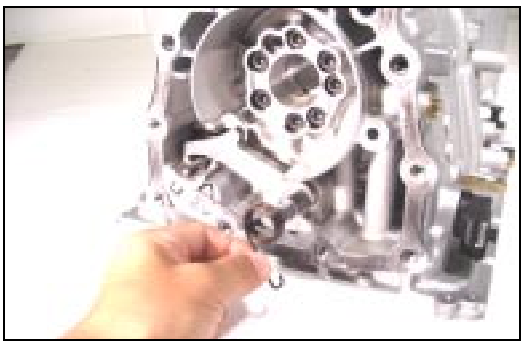
Install the parking pawl, the shaft, the spring, and the spacer.



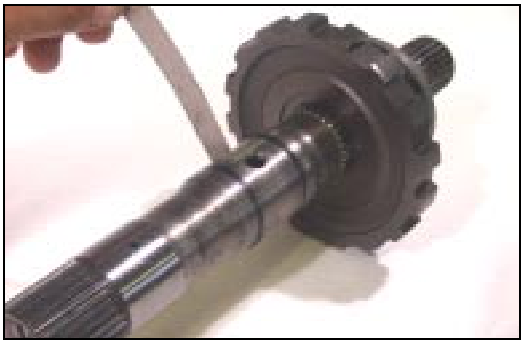
35ASSY082



36ASSY084



37ASSY086

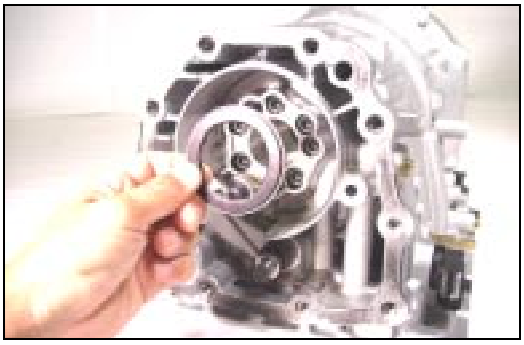

38OUTPUT25

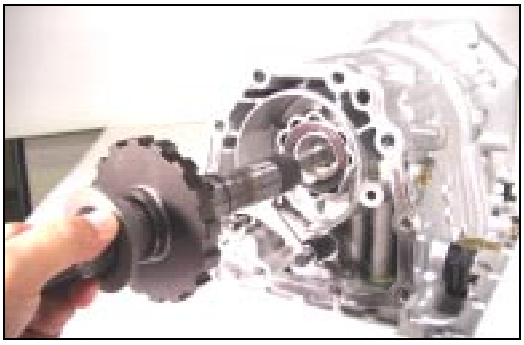
18.Output shaft

- Install a new seal ring to the output shaft assembly.
- Measure the gap between the seal ring and the ring groove.
  If the gap is outside the specified range, the output shaft must be replaced.
  Seal ring and ring groove gap:
  0.10~0.25 mm (0.0039~0.0098 in)
- Install the bearing to the case.

NOTE:

- **Apply Vaseline to the bearing (with bearing race).**
- **The black side (bearing race) of the bearing must be visible.**


29ASSY089


40ASSY091

- Push the output shaft into place.

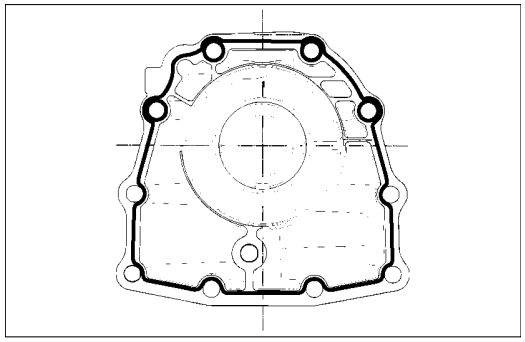
19.Rear extension (2WD) or adapter case (4WD)

- Use the oil seal installer to install the oil seal to the rear extension (2WD) or adapter case (4WD).
  Oil seal installer:
  5-8840-2769-0 (2WD)
  5-8840-2770-0 (4WD)
- Install the bearing (with bearing race) to the rear extension (2WD) or adapter case (4WD).

NOTE:

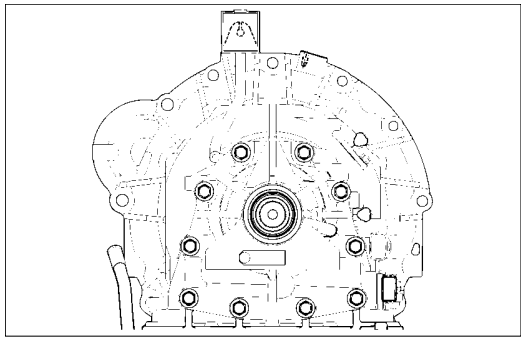
- **The black side (bearing race) of the bearing must be visible.**
- **Apply Vaseline to the bearing.**


41ASSY096



249L300005

- Apply sealing agent (TB1216B) to the rear extension (2WD) or adapter case (4WD) contact surfaces.



249L300006

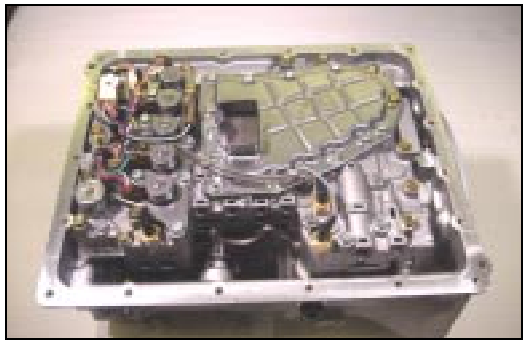
- Install the rear extension (2WD) or adapter case (4WD) to the transmission case and tighten the 10 bolts to the specified torque.
  Torque: 53 N·m (39 lb·ft)



43ASSY119

20.Control valve assembly

- Align the manual valve and the manual plate of the transmission case.

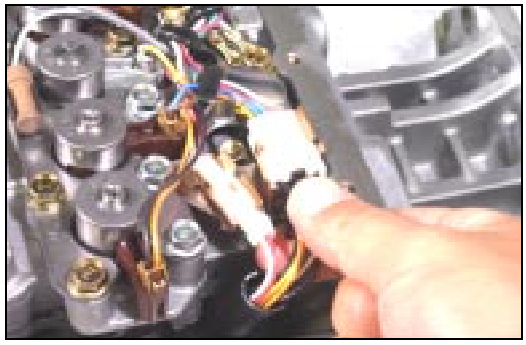


44ASSY121

- Install the control valve assembly and tighten the 12 fixing bolts to the specified torque.

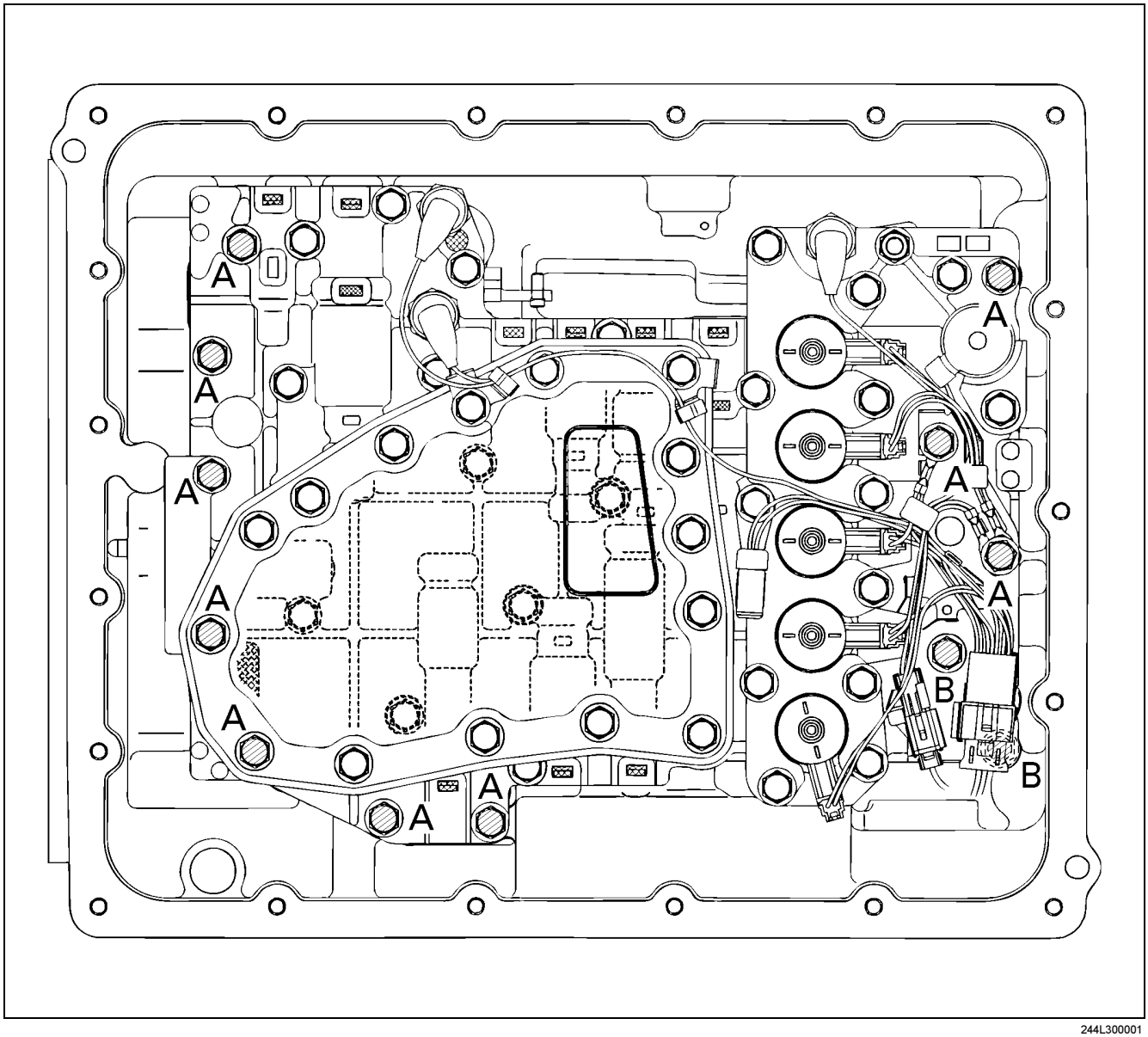
Number of bolts	Length	Color
10 (A)	40 mm (1.57 in)	Gold
2 (B)	30 mm (1.18 in)	Gold

Torque: 8 N·m (69 lb·in)



45CV29

- Connect the harness assembly and control valve assembly connectors.



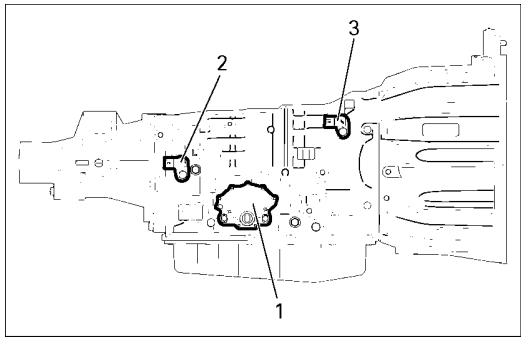
244L300001

21.Oil pan

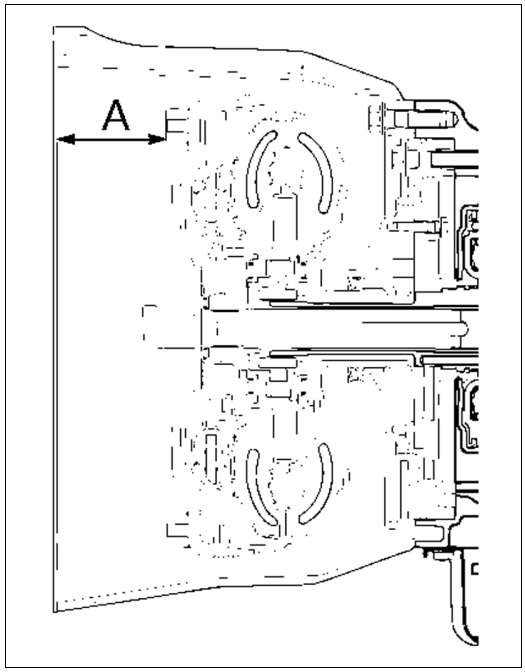
- Install a new gasket and the oil pan.
- Tighten the bolts to the specified torque.
  Torque: 8 N·m (69 lb·in)



47INH-SW01



240L300001



A07L300003

22.Inhibitor switch

- Secure the inhibitor switch (1) by hand-tightening the 2 bolts.
- Use the inhibitor switch set plate to align the neutral holes (manual shaft and inhibitor switch).
  Turn the inhibitor switch to adjust it.
  Inhibitor switch set plate: 5-8840-2763-0

NOTE:
Inhibitor switch adjustment is very important.
If the inhibitor switch is not correctly adjusted, the automatic transmission will not function normally.

- Tighten the 2 inhibitor switch bolts to the specified torque.
  Torque: 5.5 N·m (48 lb·in)
- Remove the holding fixture from the transmission case.

23.Speed sensor and turbine sensor

- Apply ATF to the new O-rings and install them the speed sensor (2) and the turbine sensor (3).
- Install the speed sensor and the turbine sensor. Tighten the bolt to the specified torque.
  Torque: 6 N·m (52 lb·in)

24.Torque converter

- Pour the new ATF into the torque converter.
- Shake the torque converter to thoroughly clean the inside.
- Drain the ATF from the torque converter.
- Pour the new ATF into the torque converter.

NOTE:
If significant amounts of foreign material (clutch facing, metallic fragments, etc.) are found in the automatic transmission at time of disassembly, the existing torque converter must be replaced with a new one.

- Install the torque converter.
- Measure the torque converter end play (A).
  If the measured value is greater than the specified minimum, the torque converter is correctly installed.
  Torque converter end pay (Minimum): 67 mm (2.64 in)

SERVICE STANDARD

ATF	Name			ATF DEXRON Ⅲ	
	Quantity		L	9.2 – 9.6	
Oil pump	Seal ring clearance		mm (in)	0.10 – 0.25	(0.0039 – 0.0098)
	Housing and inner rotor side clearance		mm (in)	0.02 – 0.04	(0.0008 – 0.0016)
	Outer rotor and crescent clearance		mm (in)	0.02 – 0.15	(0.0008 – 0.0059)
Low clutch	Number of drive plate / driven plate			7/7	
	Drive plate facing thickness	Standard	mm (in)	2.0	(0.079)
		Limit	mm (in)	1.8	(0.071)
	Retaining plate and snap ring clearance		mm (in)	0.9 – 1.3	(0.035 – 0.051)
	Available low clutch retaining plate thickness		mm (in)	3.8	(0.150)
				4.0	(0.157)
				4.2	(0.165)
				4.4	(0.173)
				4.6	(0.181)
				4.8	(0.189)
	Return spring	Number of coil		9.9	
		Outside diameter	mm (in)	9.7	(0.382)
		Free length	mm (in)	36.4	(1.433)
		Linear diameter	mm (in)	1.2	(0.047)
High clutch	Number of drive plate / driven plate			5/5	
	Drive plate facing thickness	Standard	mm (in)	2.0	(0.079)
		Limit	mm (in)	1.8	(0.071)
	Retaining plate and snap ring clearance		mm (in)	1.2 – 1.6	(0.047 – 0.063)
	Available high clutch retaining plate thickness		mm (in)	4.6	(0.181)
				4.8	(0.189)
				5.0	(0.197)
				5.2	(0.205)
				5.4	(0.213)
	Return spring	Number of coil		10.2	
		Outside diameter	mm (in)	8.0	(0.315)
		Free length	mm (in)	27.1	(1.067)
		Linear diameter	mm (in)	1.1	(0.043)
Reverse clutch	Number of drive plate / driven plate			2/2	
	Drive plate facing thickness	Standard	mm (in)	2.0	(0.079)
		Limit	mm (in)	1.8	(0.071)
	Retaining plate and snap ring clearance		mm (in)	0.6 – 0.9	(0.0236 – 0.035)
	Available reverse clutch retaining plate thickness		mm (in)	4.8	(0.189)
				5.0	(0.197)
				5.2	(0.205)
				5.4	(0.213)
Low one-way clutch	Seal ring clearance		mm (in)	0.10 – 0.25	(0.0039 – 0.0098)
Low & reverse brake	Number of drive plate / driven plate			6/6	
	Drive plate facing thickness	Standard	mm (in)	2.0	(0.079)
		Limit	mm (in)	1.8	(0.071)
	Retaining plate and snap ring clearance		mm (in)	0.7 – 1.1	(0.028 – 0.043)
	Available low & reverse brake retaining plate thickness		mm (in)	5.2	(0.205)
				5.4	(0.213)
				5.6	(0.220)
				5.8	(0.228)
				6.0	(0.236)

SERVICE STANDARD (Cont'd)

	Return spring	Number of coil		4.8	
		Outside diameter	mm (in)	11.2	(0.441)
		Free length	mm (in)	22.3	(0.878)
		Linear diameter	mm (in)	1.1	(0.043)
2-4 brake	Number of drive / driven plate			5/5	
	Drive plate facing thickness	Standard	mm (in)	2.0	(0.079)
		Limit	mm (in)	1.8	(0.071)
	Retaining plate and retaining plate clearance		mm (in)	1.0 – 1.4	(0.039 – 0.055)
	Available 2-4 brake retaining plate thickness		mm (in)	5.4	(0.213)
				5.6	(0.220)
				5.8	(0.228)
				6.0	(0.236)
				6.2	(0.244)
				6.4	(0.252)
	Return spring	Number of coil		10.2	
		Outside diameter	mm (in)	6.9	(0.272)
		Free length	mm (in)	22.5	(0.886)
		Linear diameter	mm (in)	1.1	(0.043)
Output shaft	Seal ring clearance		mm (in)	0.10 – 0.25	(0.0039 – 0.0098)
Total end play	Total end play		mm (in)	0.25 – 0.55	(0.0098 – 0.0217)
	Available oil pump bearing race thickness		mm (in)	1.4	(0.055)
				1.6	(0.063)
				1.8	(0.071)
				2.0	(0.079)
				2.2	(0.087)
				2.4	(0.094)
Torque converter end play			mm (in)	67.0	(2.638)

SPECIAL SERVICE TOOL

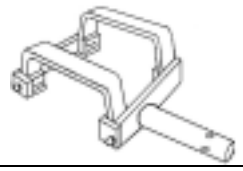
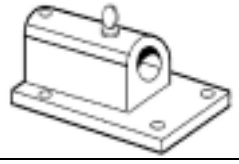
ILLUSTRATION	PART NO.	PART NAME
	5-8841-0841-0	Holding Fixture
	5-8840-0003-0	Holding Fixture Base
	5-8840-2764-0	2-4 Brake Spring Compressor
	5-8840-2767-0	High Clutch Spring Compressor
	5-8840-2759-0	Low Clutch Spring Compressor
	5-8840-2761-0	Oil Pump Oil Seal Installer
	5-8840-2769-0	Rear Extension Oil Seal Installer
	5-8840-2770-0	Rear Adapter Oil Seal Installer
	5-8840-2758-0	Manual Shaft Oil Seal Installer

ILLUSTRATION	PART NO.	PART NAME
	5-8840-2763-0	Inhibitor Switch Set Plate