
AUTOMATIC TRANSMISSION

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AUTOMATIC TRANSMISSION

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GENERAL INFORMATION

Items		Specifications
Transmission model		V4A51
Torque converter	Type	3-element, 1-stage, 2-phase type
	Lock-up	Provided
	Stall torque ratio	2.04
Drive system		Part-time 4WD with synchronizing mechanism
Transmission type		4 forward speeds, 1 reverse speed, fully automatic
Transmission gear ratio	1st	2.842
	2nd	1.495
	3rd	1.000
	4th	0.731
	Reverse	2.720
Transfer type		2-speed
Transfer gear ratio	High	1.000
	Low	1.900
Speedometer gear ratio (driven/drive)		28/9
Clutch		Multi-disk type × 3 sets
Brake		Multi-disk type × 2 sets
Manual control system		P-R-N-D-3-2-L (7 positions)
Shift pattern control		Electronic control (INVECS-II)
Hydraulic control during shifting		Electronic control (Each clutch hydraulically independently controlled)
Lock-up clutch control		Electronic control

SERVICE SPECIFICATION

Items		Standard value
A/T fluid temperature sensor kΩ	at 0°C	16.5 - 20.5
	at 100°C	0.57 - 0.69
Resistance of damper clutch control solenoid valve coil (at 20°C) Ω		2.7 - 3.4
Resistance of low-reverse solenoid valve coil (at 20°C) Ω		2.7 - 3.4
Resistance of second control solenoid valve coil (at 20°C) Ω		2.7 - 3.4
Resistance of underdrive control solenoid valve coil (at 20°C) Ω		2.7 - 3.4
Resistance of overdrive control solenoid valve coil (at 20°C) Ω		2.7 - 3.4
Stall speed		2,000 - 2,600

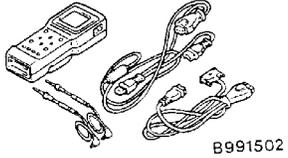
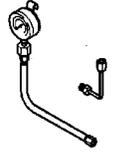
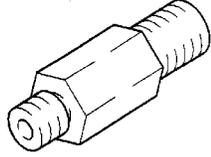
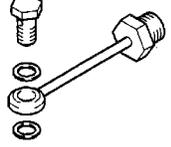
LUBRICANTS

Items	Specified lubricant	Quantity L
A/T fluid	DIA QUEEN ATF SP II M or equivalent	9.3
Transfer oil	Hypoid gear oil SAE 75W-90, 75W-85W or 80W confirming to API GL-4	2.8

SEALANTS AND ADHESIVES

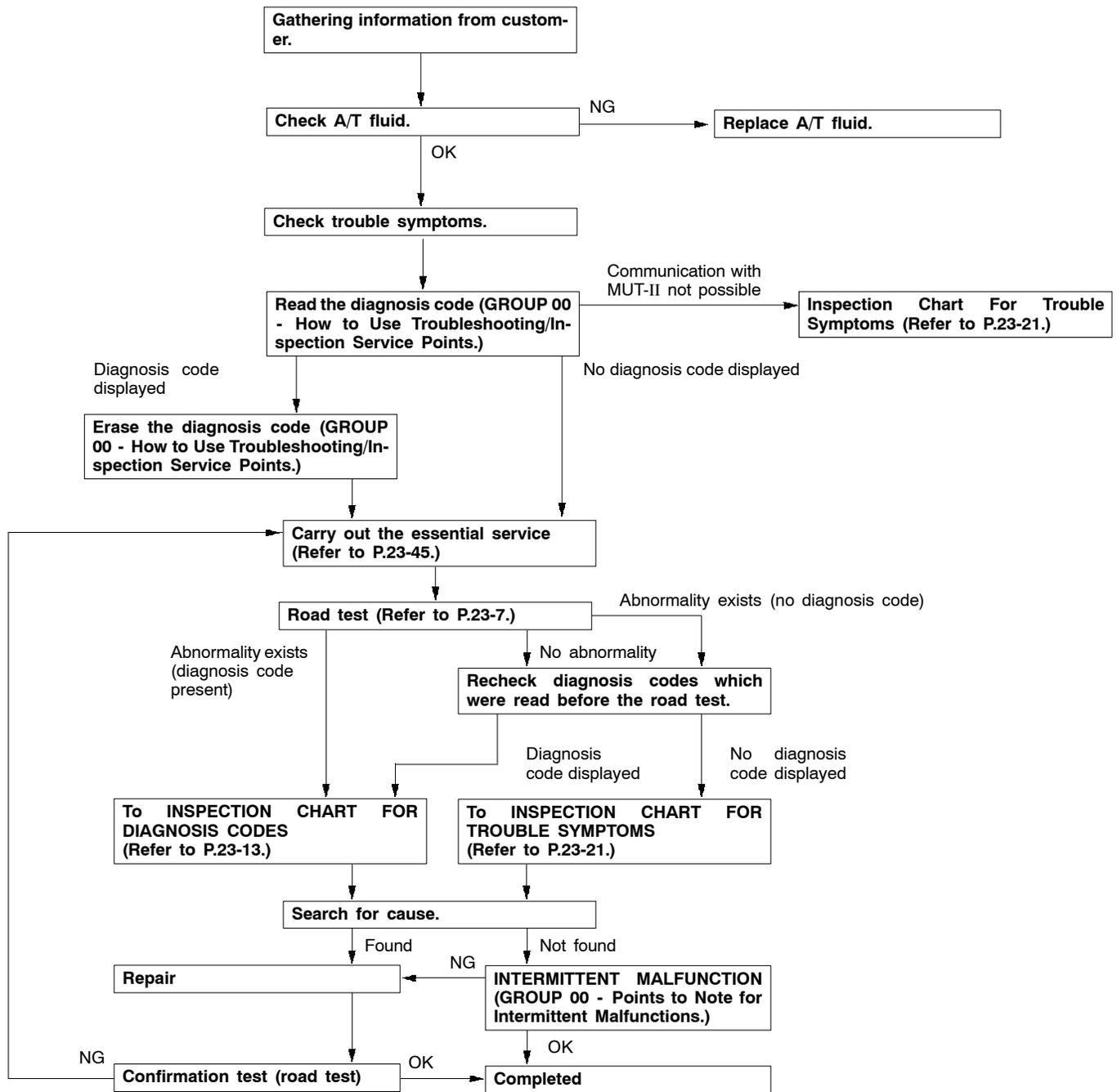
Items	Specified sealant and adhesive	Remarks
Stopper plate	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Spring cover support		
Transfer control lever		
Control lever assembly mounting bolt	3M Stud Locking No. 4710 or equivalent	Drying adhesive

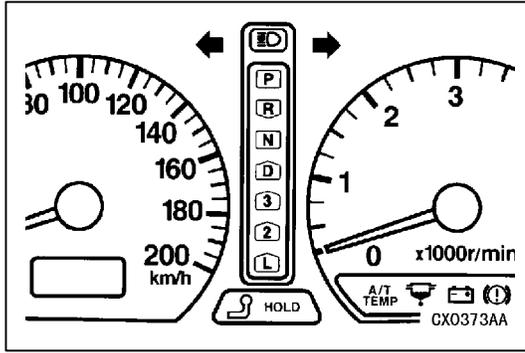
SPECIAL TOOLS

Tool	Number	Name	Use
 <p>B991502</p>	MB991502	MUT-II sub assembly	Checking of the diagnosis code
	MD998330 (including MD998331)	Oil pressure gauge (2,942 kPa)	Measurement of oil pressure
	MD998332	Adapter	
	MD998900	Adapter	

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING





DIAGNOSIS FUNCTION

1. N range lamp

The N range lamp flashes at a frequency of approximately 1 Hz if there is an abnormality in any of the items in the table below which are related to the A/T system. Check the diagnosis code output if the N range lamp is flashing at a frequency of approximately 1 Hz.

N range lamp flashing items

A/T control relay
Input shaft speed sensor
Output shaft speed sensor
Each solenoid valve
Out of phase at each shift point

2. Method of reading the diagnosis code

Use the MUT-II or the N range lamp to take a reading of the diagnosis codes. (Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points.)

ROAD TEST

Check by the following procedure.

No.	State prior to test and operation	Test and operation	Judgement value	Check item	Diagnosis code No.	Inspection procedure page if there is an abnormality
1	Ignition switch: OFF	Ignition switch (1) ON	Data list No. 54 System voltage [V]	Control relay	54	A/T Control relay system (23-20)
2	Ignition switch: ON Engine: Stopped Selector lever position: P	Selector lever position (1) P, (2) R, (3) N, (4) D, (5) 3, (6) 2, (7) L	Data list No. 61 (1) P, (2) R, (3) N, (4) D, (5) 3, (6) 2, (7) L	Inhibitor switch	-	Inhibitor switch system (23-33)
		Accelerator pedal (1) Released (2) Half depressed (3) Depressed	Data list No. 11 (1) 300 - 1,000 mV (2) Gradually rises from (1) (3) 4,500 - 5,500 mV	Throttle position sensor	11 12 14	Throttle position sensor system (23-14)
			Data list No. 25 (1) OFF (3) ON	Wide open throttle switch	25	Wide open throttle switch system (23-16)
		Brake pedal (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stop lamp switch	26	Stop lamp switch system (23-17)
		Transfer lever position (1) Other than 4L (2) 4L	Data list No. 75 (1) OFF (2) ON	Transfer low detection switch	-	Transfer low detection switch system (23-36)
		Hold switch (1) Hold (2) Normal	Data list No. 62 (1) ON (2) OFF	Hold switch	-	Hold switch system (23-35)
3	Ignition switch: ST Engine: Stopped	Starting test with lever P or N range	Starting should be possible	Starting possible or impossible	-	Starting impossible (23-24)
4	Warming up	Drive for 15 minutes or more so that the A/T fluid temperature becomes 70 - 90°C.	Data list No. 15 Gradually rises to 70 - 90°C	A/T fluid temperature sensor	15	A/T fluid temperature sensor system (23-14)

No.	State prior to test and operation	Test and operation	Judgement value	Check item	Diagnosis code No.	Inspection procedure page if there is an abnormality
5	Engine: Idling Selector lever position: N	Brake pedal (Retest) (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stop lamp switch	26	Stop lamp switch system (23-17)
		A/C switch (1) ON (2) OFF	Data list No. 65 (1) ON (2) OFF	Dual pressure switch	-	Dual pressure switch system (23-33)
		Accelerator pedal (1) Released (2) Half depressed	Data list No. 21 (1) 550 - 850 r/min Gradually rises from (1)	Crank angle sensor	21	Crank angle sensor system (23-15)
			Data list No. 57 (2) Data changes	Communication with engine-ECU	51	Abnormal communication with engine-ECU (23-20)
		Selector lever position (1) N → D (2) N → R	Should be no abnormal shifting shocks Time lag should be within 2 seconds	Malfunction when starting	-	Engine stalling when shifting (23-26)
					-	Shocks when changing from N to D and large time lag (23-27)
					-	Shocks when changing from N to R and large time lag (23-28)
					-	Shocks when changing from N to D, N to R and large time lag (23-29)
				Driving impossible	-	Does not move forward (23-24)
					-	Does not reverse (23-25)
-	Does not move (forward or reverse) (23-26)					

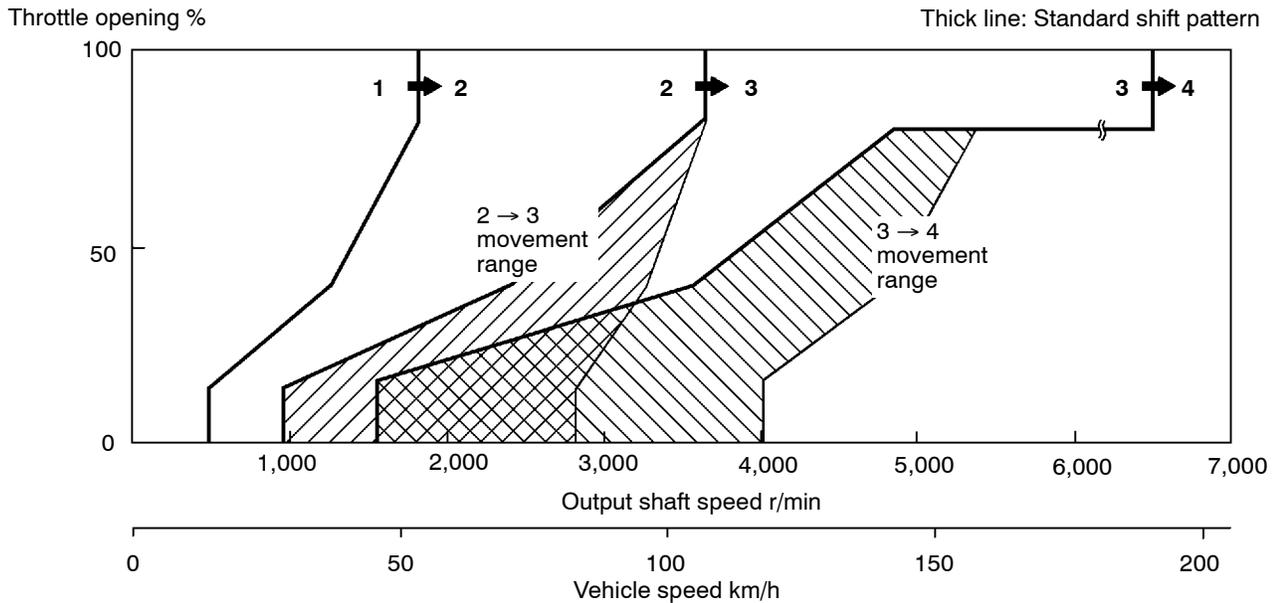
No.	State prior to test and operation	Test and operation	Judgement value	Check item	Diagnosis code No.	Inspection procedure page if there is an abnormality
6	Selector lever position: N (Carry out on a flat and straight road.)	Selector lever position and vehicle speed	Data list No. 63 (2) 1st, (4) 3rd, (3) 2nd, (5) 4th	Shift condition	-	-
		(1) Idling in L range (Vehicle stopped)	Data list No. 31 (2) 0 %, (4) 100 %, (3) 100 %, (5) 100 %	Low-reverse solenoid valve	31	Low-reverse solenoid valve system (23-18)
		(2) Driving at constant speed of 10 km/h in L position	Data list No. 32 (2) 0 %, (4) 0 %, (3) 0 %, (5) 100 %	Underdrive solenoid valve	32	Underdrive solenoid valve system (23-18)
		(3) Driving at constant speed of 30 km/h in 2 position	Data list No. 33 (2)100 %, (4) 100 %, (3) 0 %, (5) 0 %	Second solenoid valve	33	Second solenoid valve system (23-18)
		(4) Driving at constants speed of 50 km/h in 3 position	Data list No. 34 (2) 100 %, (4) 0 %, (3) 100 %, (5) 0 %	Overdrive solenoid valve	34	Overdrive solenoid valve system (23-18)
		(5) Driving at constant speed of 70 km/h in D position (Each condition should be maintained for 10 seconds or more.)	Data list No. 29 (1) 0 km/h (4) 50 km/h	Vehicle speed sensor	-	Vehicle speed sensor system (23-34)
			Data list No. 22 (4) 1,500 - 1,900 r/min	Input shaft speed sensor	22	Input shaft speed sensor system (23-15)
			Data list No. 23 (4) 1,500 - 1,900 r/min	Output shaft speed sensor	23	Output shaft speed sensor system (23-16)
7	Selector lever position: 3 (Carry out on a flat and straight road.)	Selector lever position and vehicle speed	Data list No. 36 (1) 0 % (2) Approx. 70 - 90 %	Damper clutch control solenoid valve	36 52	Damper clutch control solenoid valve system (23-18)
		(1) Release the accelerator pedal fully while driving at 50 km/h in 3rd gear.	Data list No. 52 (1) Approx. 100 - 300 r/min (2) Approx. 0 - 10 r/min			

No.	State prior to test and operation	Test and operation	Judgement value	Check item	Diagnosis code No.	Inspection procedure page if there is an abnormality
8	Use the MUT-II to stop the INVECS-II function. Selector lever position: D (Carry out on a flat and straight road.)	Monitor data list No. 11, 23 and 63 with the MUT-II. (1) Accelerate to 4th gear at a throttle position sensor output of 1.5 V (accelerator opening angle of 30 %). (2) Gently decelerate to a standstill. (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50 %). (4) While driving at 60 km/h in 4th gear, shift down to 3 range. (5) While driving at 40 km/h in 3rd gear, shift down to 2 range. (6) While driving at 20 km/h in 2nd gear, shift down to L range.	For (1), (2) and (3), the reading should be the same as the specified output shaft speed and no abnormal shocks should occur. For (4), (5) and (6), downshifting should occur immediately after the shifting operation is made.	Malfunction when shifting	-	Shocks and running up (23-29)
				Displaced shifting points	-	All points (23-30)
					-	Some points (23-31)
				Does not shift	-	No diagnosis code (23-31)
					22	Input shaft speed sensor system (23-15)
					23	Output shaft speed sensor system (23-16)
				Does not shift from 1 to 2 or 2 to 1	31	Low-reverse solenoid valve system (23-18)
					33	Second solenoid valve system (23-18)
					41	1st gear ratio is not specified (23-19)
					42	2nd gear ratio is not specified (23-19)
				Does not shift from 2 to 3 or 3 to 2	33	Second solenoid valve system (23-18)
					34	Overdrive solenoid valve system (23-18)
					42	2nd gear ratio is not specified (23-19)
					43	3rd gear ratio is not specified (23-19)
				Does not shift from 3 to 4 or 4 to 3	32	Underdrive solenoid valve system (23-18)
					33	Second solenoid valve system (23-18)
43	3rd gear ratio is not specified (23-19)					
44	4th gear ratio is not specified (23-19)					

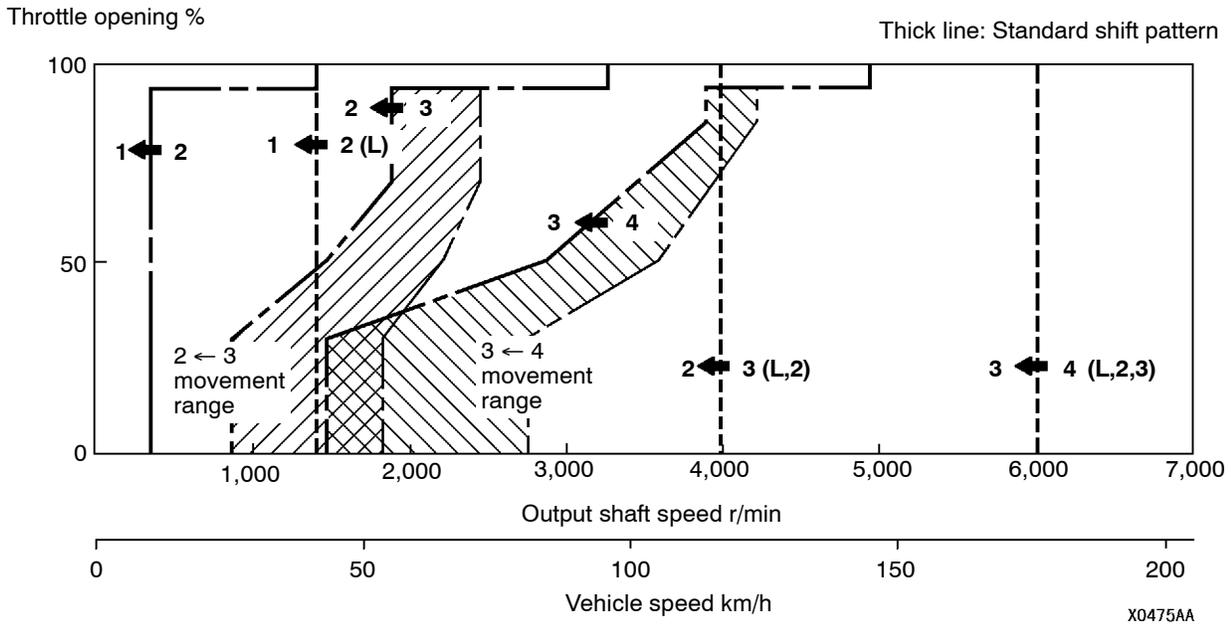
No.	State prior to test and operation	Test and operation	Judgement value	Check item	Diagnosis code No.	Inspection procedure page if there is an abnormality
9	Selector lever position: N (Carry out on a flat and straight road.)	Monitor data list No. 22 and No. 23 with the MUT-II. (1) Move selector lever to R range, drive at constant speed of 10 km/h.	The ratio between data list No. 22 and No. 23 should be the same as the gear ratio when reversing.	Does not shift	22	Input shaft speed sensor system (23-15)
					23	Output shaft speed sensor system (23-16)
					46	Reverse gear ratio is not specified (23-19)

SHIFT PATTERN

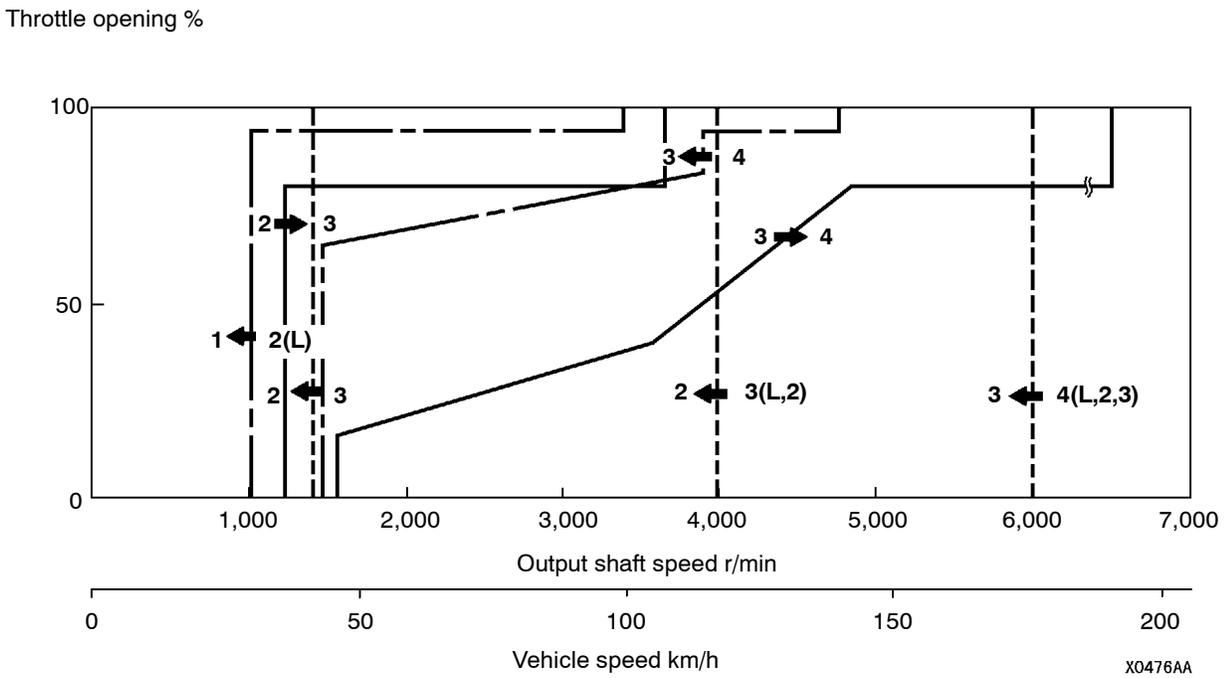
UPSHIFT PATTERN



DOWNSHIFT PATTERN



HOLD PATTERN

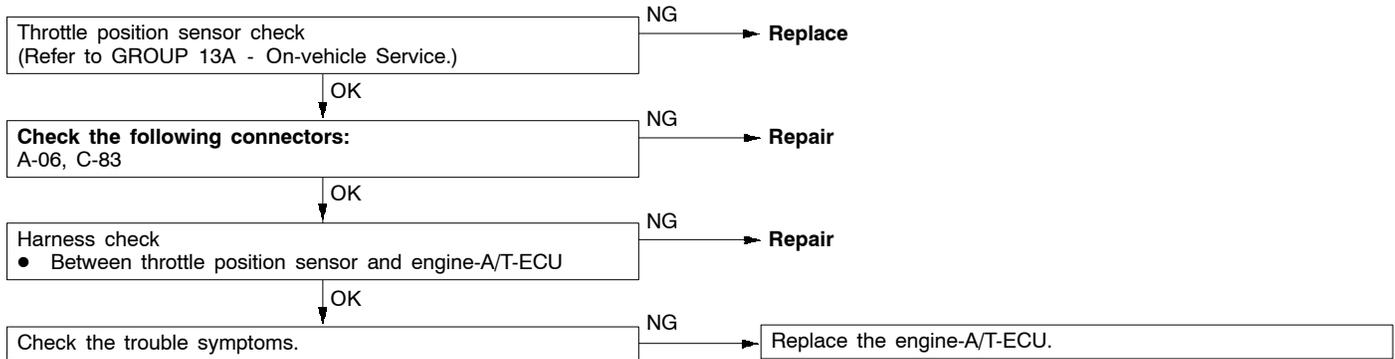


INSPECTION CHART FOR DIAGNOSIS CODES

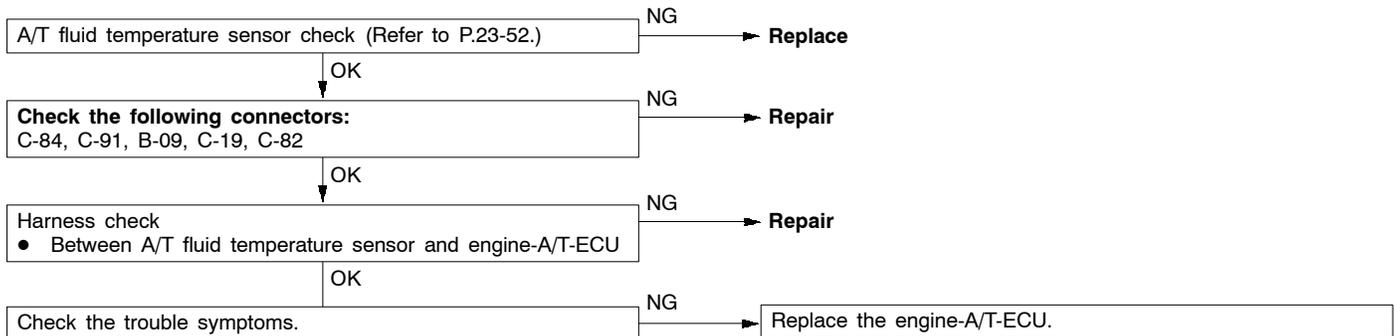
Code	Diagnosis item		Reference page
11	Throttle position sensor system	Short circuit	23-14
12		Open circuit	23-14
14		Sensor maladjustment	23-14
15	A/T fluid temperature sensor system	Open circuit	23-14
21	Crank angle sensor system	Open circuit	23-15
22	Input shaft speed sensor system	Short circuit/open circuit	23-15
23	Output shaft speed sensor system	Short circuit/open circuit	23-16
25	Wide open throttle switch	Short circuit/open circuit	23-16
26	Stop lamp switch system	Short circuit/open circuit	23-17
31	Low-reverse solenoid valve system	Short circuit/open circuit	23-18
32	Underdrive solenoid valve system	Short circuit/open circuit	23-18
33	Second solenoid valve system	Short circuit/open circuit	23-18
34	Overdrive solenoid valve system	Short circuit/open circuit	23-18
36	Damper control clutch solenoid valve system	Short circuit/open circuit	23-18
41	1st gear ratio does not meet the specification		23-19
42	2nd gear ratio does not meet the specification		23-19
43	3rd gear ratio does not meet the specification		23-19
44	4th gear ratio does not meet the specification		23-19
46	Reverse gear ratio does not meet the specification		23-19
51	Abnormal communication with engine-ECU		23-20
52	Damper control clutch solenoid valve system	Defective system	23-18
54	A/T Control relay system	Short circuit to earth/ open circuit	23-20
56	N range lamp system	Short circuit to earth	23-20

INSPECTION PROCEDURES FOR DIAGNOSIS CODES

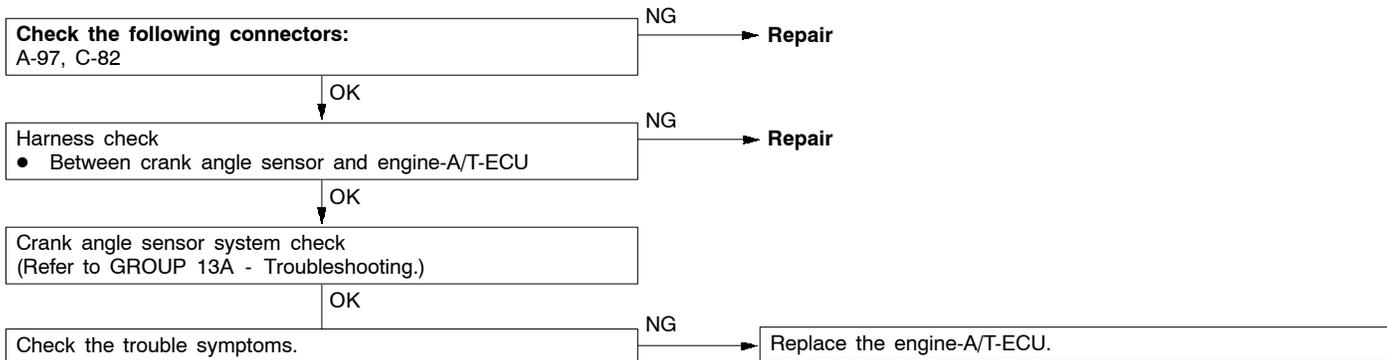
Code No. 11, 12, 14 Throttle position sensor system	Probable cause
If the TPS output voltage is 4.8 V or higher when the engine is idling, the output is judged to be too high and diagnosis code No. 11 is output. If the TPS output voltage is 0.2 V or lower at times other than when the engine is idling, the output is judged to be too low and diagnosis code No. 12 is output. If the TPS output voltage is 0.2 V or lower or if it is 1.2 V or higher when the engine is idling, the TPS adjustment is judged to be incorrect and diagnosis code No. 14 is output.	<ul style="list-style-type: none"> ● Malfunction of the throttle position sensor ● Malfunction of connector ● Malfunction of the engine-A/T-ECU



Code No. 15 A/T fluid temperature sensor system	Probable cause
If the A/T fluid temperature sensor output voltage is 2.6 V or more even after driving for 10 minutes or more (if the A/T fluid temperature does not increase), it is judged that there is an open circuit in the A/T fluid temperature sensor and diagnosis code No. 15 is output.	<ul style="list-style-type: none"> ● Malfunction of the A/T fluid temperature sensor ● Malfunction of connector ● Malfunction of the engine-A/T-ECU

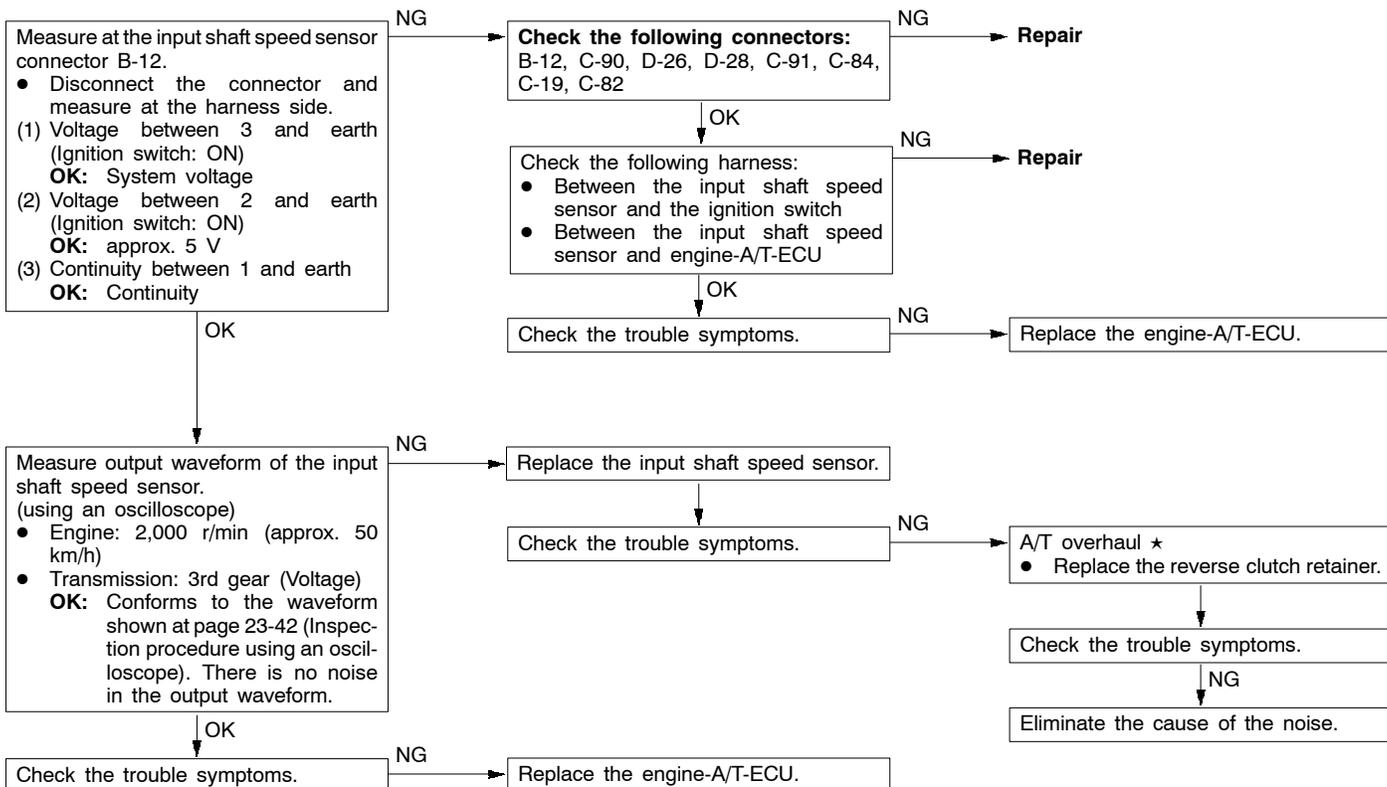


Code No. 21 Crank angle sensor system	Probable cause
If no output pulse is detected from the crank angle sensor for 5 seconds or more while driving at 25 km/h or more, it is judged that there is an open circuit in the crank angle sensor and diagnosis code No. 21 is output.	<ul style="list-style-type: none"> ● Malfunction of the crank angle sensor ● Malfunction of connector ● Malfunction of the engine-A/T-ECU



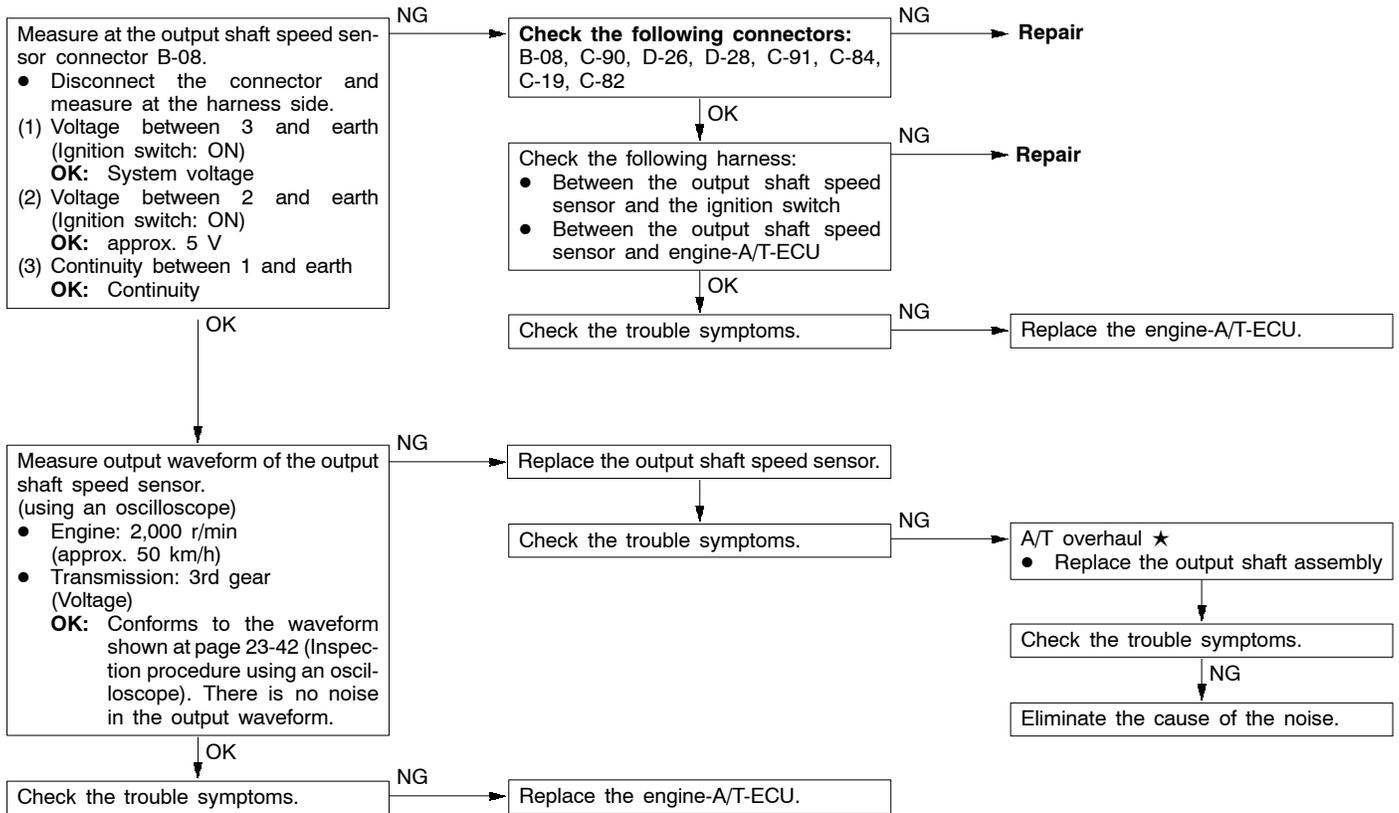
Code No. 22 Input shaft speed sensor system	Probable cause
If no output pulse is detected from the input shaft speed sensor for 1 second or more while driving in 3rd or 4th gear at a speed of 30 km/h or more, there is judged to be an open circuit or short-circuit in the input shaft speed sensor and diagnosis code No. 22 is output. If diagnosis code No. 22 is output four times, the transmission is locked into 3rd gear (D range) or 2nd gear as a fail-safe measure, and the N range lamp flashes at a frequency of 1 Hz.	<ul style="list-style-type: none"> ● Malfunction of the input shaft speed sensor ● Malfunction of the reverse clutch retainer ● Malfunction of connector ● Malfunction of engine-A/T-ECU

★: Refer to the Transmission Workshop Manual.

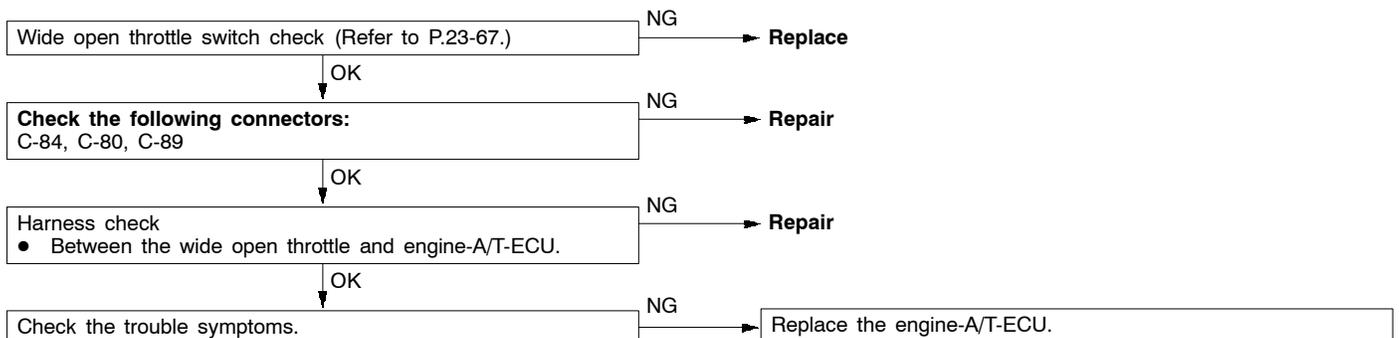


Code No. 23 Output shaft speed sensor system	Probable cause
<p>If the output from the output shaft speed sensor is continuously 50 % lower than the vehicle speed for 1 second or more while driving in 3rd or 4th gear at a speed of 30 km/h or more, there is judged to be an open circuit or short-circuit in the output shaft speed sensor and diagnosis code No. 23 is output.</p> <p>If diagnosis code No. 23 is output four times, the transmission is locked into 3rd gear (D range) or 2nd gear as a fail-safe measure, and the N range lamp flashes at a frequency of 1 Hz.</p>	<ul style="list-style-type: none"> ● Malfunction of the output shaft speed sensor ● Malfunction of the output shaft assembly ● Malfunction of connector ● Malfunction of the engine-A/T-ECU

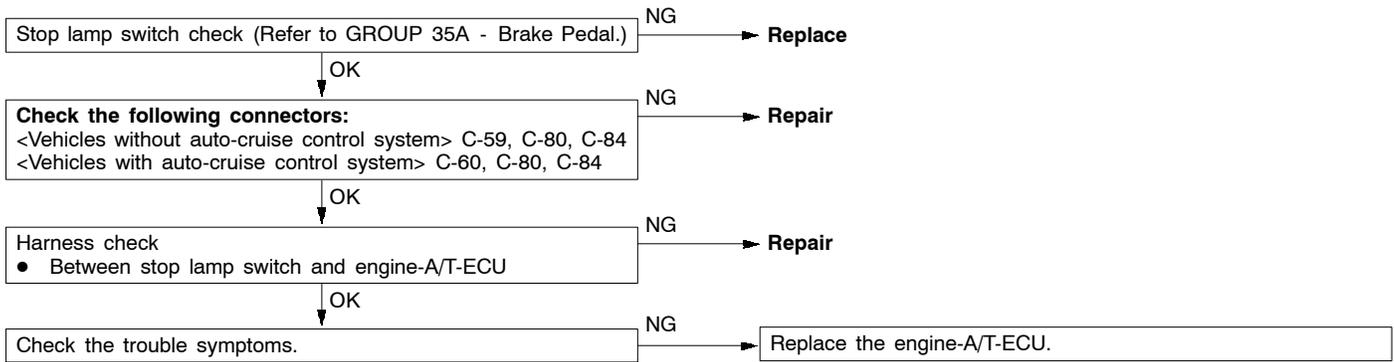
★: Refer to the Transmission Workshop Manual.



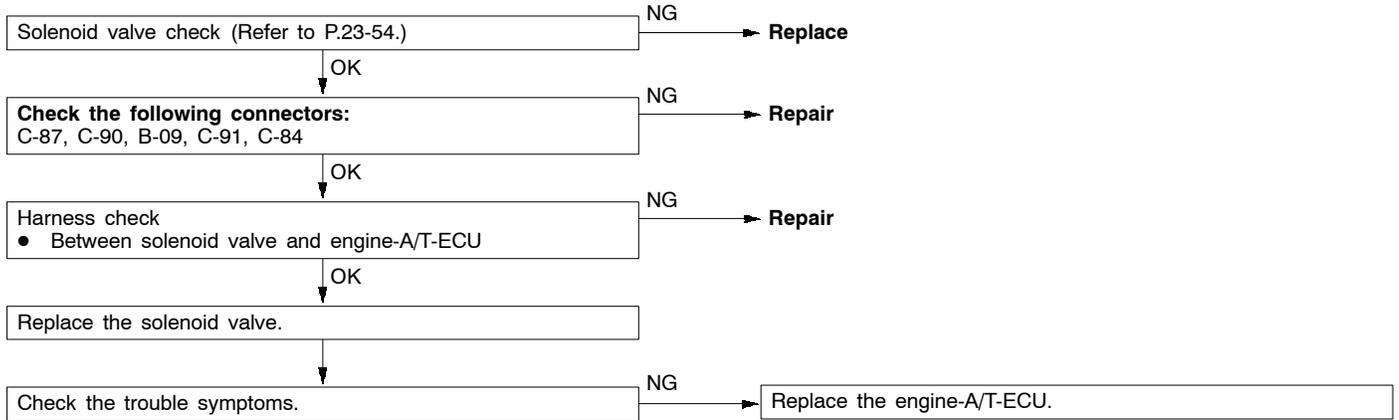
Code No. 25 Wide open throttle switch system	Probable cause
<p>If the wide open throttle switch is on for 1 second or more with the throttle valve opening angle at 70 % or less, it is judged that there is a short circuit in the wide open throttle switch and diagnosis code No. 25 is output.</p>	<ul style="list-style-type: none"> ● Malfunction of the wide open throttle switch ● Malfunction of connector ● Malfunction of the engine-A/T-ECU



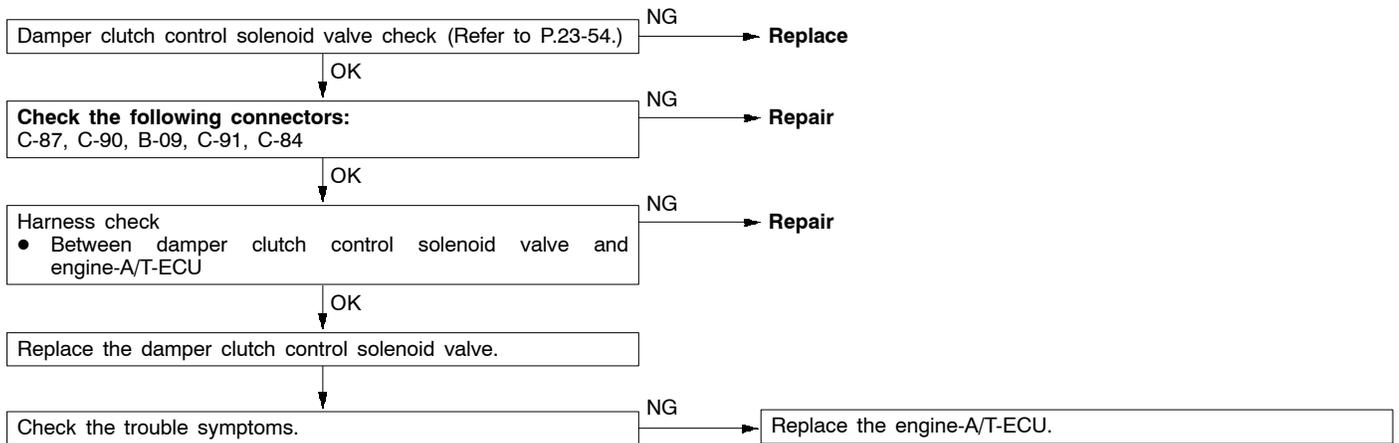
Code No. 26 Stop lamp switch system	Probable cause
If the stop lamp switch is on for 5 minutes or more while driving, it is judged that there is a short circuit in the stop lamp switch and diagnosis code No. 26 is output.	<ul style="list-style-type: none"> ● Malfunction of the stop lamp switch ● Malfunction of connector ● Malfunction of the engine-A/T-ECU



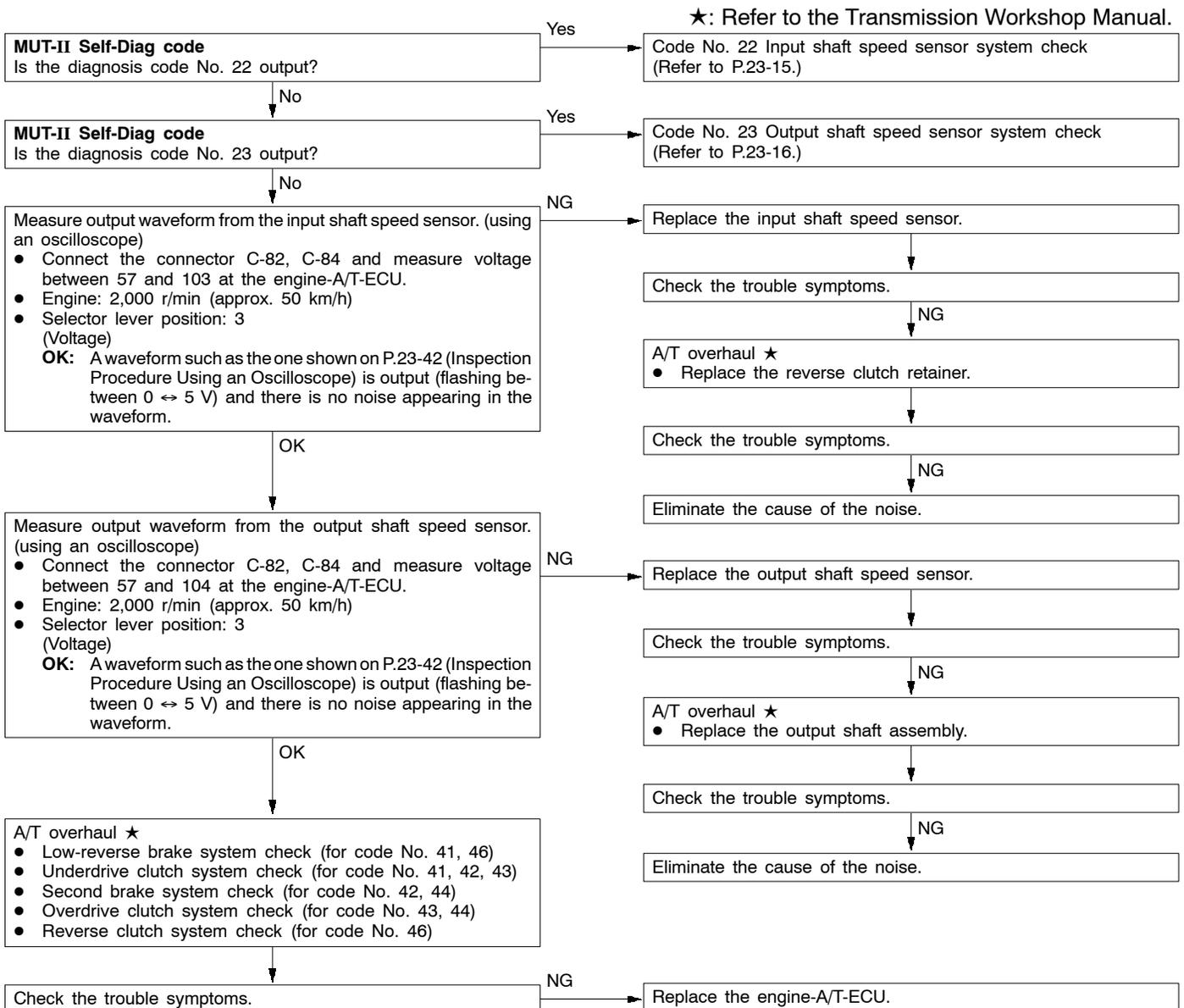
Code No. 31 Low and reverse solenoid valve system	Probable cause
Code No. 32 Underdrive solenoid valve system	
Code No. 33 Second solenoid valve system	
Code No. 34 Overdrive solenoid valve system	
<p>If the resistance value for a solenoid valve is too large or too small, it is judged that there is a short-circuit or an open circuit in the solenoid valve and the respective diagnosis code is output. The transmission is locked into 3rd gear as a fail-safe measure, and the N range lamp flashes at a frequency of 1 Hz.</p>	
<ul style="list-style-type: none"> ● Malfunction of solenoid valve ● Malfunction of connector ● Malfunction of the engine-A/T-ECU 	



Code No. 36, 52 Damper clutch control solenoid valve system	Probable cause
<p>If the resistance value for the damper clutch control solenoid valve is too large or too small, it is judged that there is a short-circuit or an open circuit in the damper clutch control solenoid valve and diagnosis code No. 36 is output. If the drive duty rate for the damper clutch control solenoid valve is 100 % for a continuous period of 4 seconds or more, it is judged that there is an abnormality in the damper clutch control system and diagnosis code No. 52 is output. When diagnosis code No. 36 is output, the transmission is locked into 3rd gear as a fail-safe measure, and the N range lamp flashes at a frequency of 1 Hz.</p>	
<ul style="list-style-type: none"> ● Malfunction of the damper clutch control solenoid valve ● Malfunction of connector ● Malfunction of the engine-A/T-ECU 	



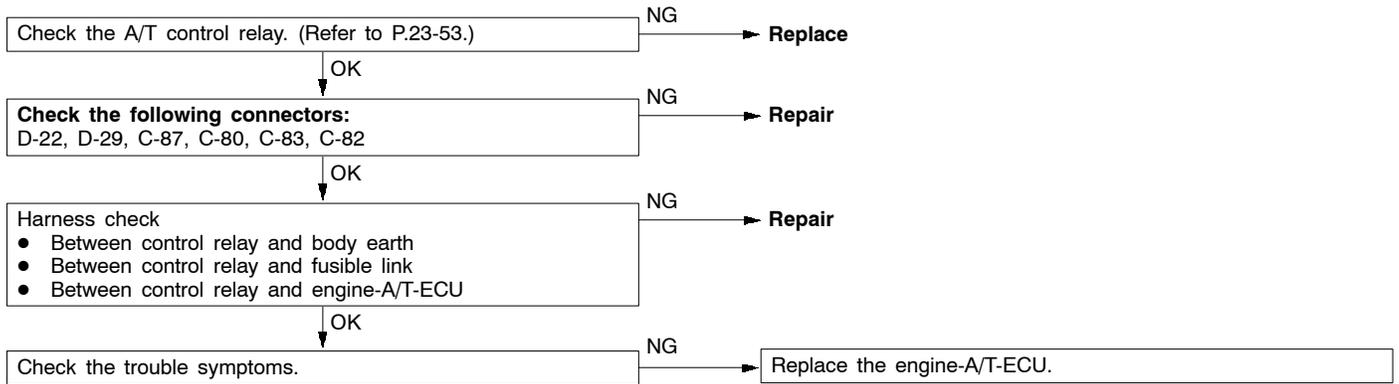
Code No. 41 1st gear ratio does not meet the specification	Probable cause
Code No. 42 2nd gear ratio does not meet the specification	
Code No. 43 3rd gear ratio does not meet the specification	
Code No. 44 4th gear ratio does not meet the specification	
Code No. 46 Reverse gear ratio does not meet the specification	
<p>If the output from the output shaft speed sensor multiplied by each gear ratio is not the same as the output from the input shaft speed sensor after shifting to each gear has been completed, each diagnosis code is output. If each diagnosis code is output four times, the transmission is locked into 3rd gear as a fail-safe measure, and the N range lamp flashes at a frequency of 1 Hz.</p>	<ul style="list-style-type: none"> ● Malfunction of the input shaft speed sensor ● Malfunction of the output shaft speed sensor ● Malfunction of the reverse clutch retainer ● Malfunction of the output shaft assembly ● Malfunction of the low-reverse brake system (for code No. 41, 46) ● Malfunction of the underdrive clutch system (for code No. 41, 42, 43) ● Malfunction of the second brake system (for code No. 42, 44) ● Malfunction of the overdrive clutch system (for code No. 43, 44) ● Malfunction of the reverse clutch system (for code No. 46) ● Malfunction of the engine-A/T-ECU ● Noise generated



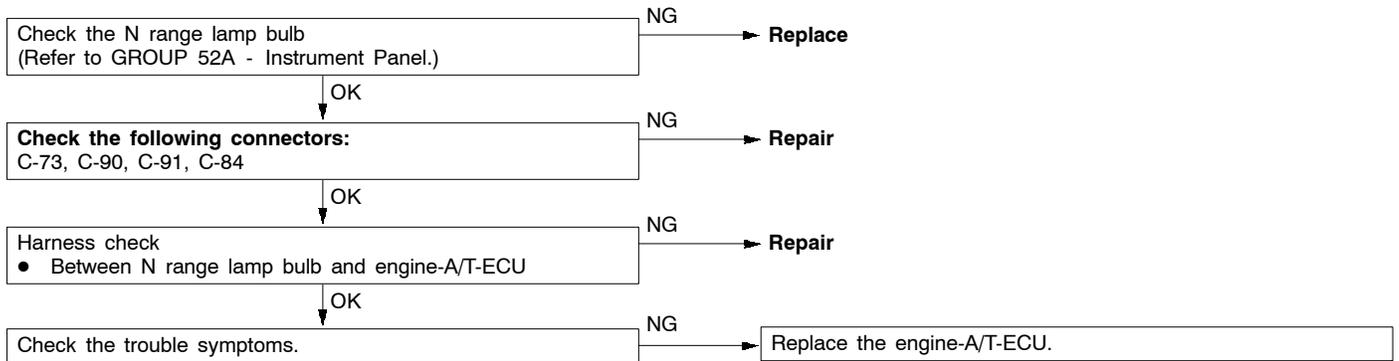
Code No. 51 Abnormal communication with engine-ECU	Probable cause
<p>If normal communication is not possible for a continuous period of 1 second or more when the ignition switch is at the ON position, the battery voltage is 10 V or more and the engine speed is 450 r/min or more, diagnosis code No. 51 is output. Diagnosis code No. 51 is also output if the data being received is abnormal for a continuous period of 4 seconds under the same conditions.</p>	<ul style="list-style-type: none"> ● Malfunction of the engine-A/T-ECU

Replace the engine-A/T-ECU.

Code No. 54 A/T control relay system	Probable cause
<p>If the A/T control relay voltage is less than 7 V after the ignition switch has been turned ON, it is judged that there is an open circuit or a short-circuit in the A/T control relay circuit and diagnosis code No. 54 is output. Then the transmission is locked into 3rd gear as a fail-safe measure, and the N range lamp flashes at a frequency of 1 Hz.</p>	<ul style="list-style-type: none"> ● Malfunction of the A/T control relay ● Malfunction of connector ● Malfunction of the engine-A/T-ECU



Code No. 56 N range lamp system	Probable cause
<p>If the N range signal is off after an N range lamp illumination instruction (ON instruction) has been given, it is judged that there is a short-circuit in the N range lamp earth and diagnosis code No. 56 is output.</p>	<ul style="list-style-type: none"> ● Malfunction of the N range lamp bulb ● Malfunction of connector ● Malfunction of the engine-A/T-ECU



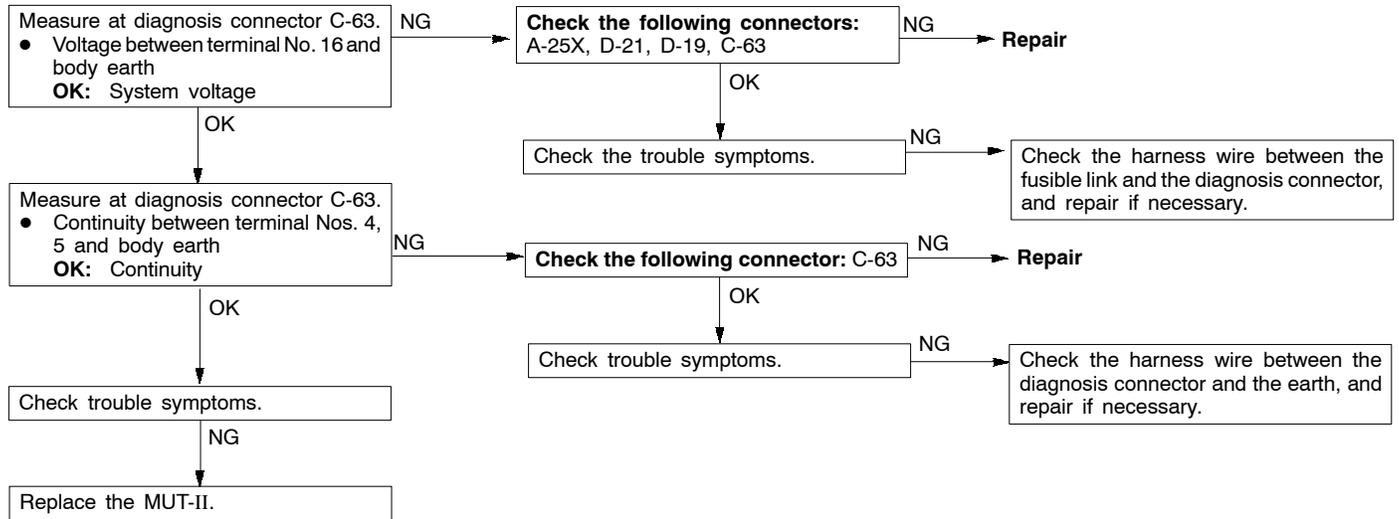
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
MUT-II can not communicate with any systems.		1	23-22
MUT-II can not communicate with the engine-A/T-ECU.		2	23-23
Driving impossible	Starting impossible	3	23-24
	Does not move forward	4	23-24
	Does not reverse	5	23-25
	Does not move (forward or reverse)	6	23-26
Malfunction when starting	Engine stalling when shifting	7	23-26
	Shocks when changing from N to D and large time lag	8	23-27
	Shocks when changing from N to R and large time lag	9	23-28
	Shocks when changing from N to D, N to R and large time lag	10	23-29
Malfunction when shifting	Shocks and running up	11	23-29
Displaced shifting points	All points	12	23-30
	Some points	13	23-31
Does not shift	No diagnosis codes	14	23-31
Malfunction while driving	Poor acceleration	15	23-32
	Vibration	16	23-32
Inhibitor switch system		17	23-33
Dual pressure switch system		18	23-33
Vehicle speed sensor system		19	23-34
Auto-cruise control-ECU signal system		20	23-35
Hold switch system		21	23-35
Transfer low detection switch system		22	23-36

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

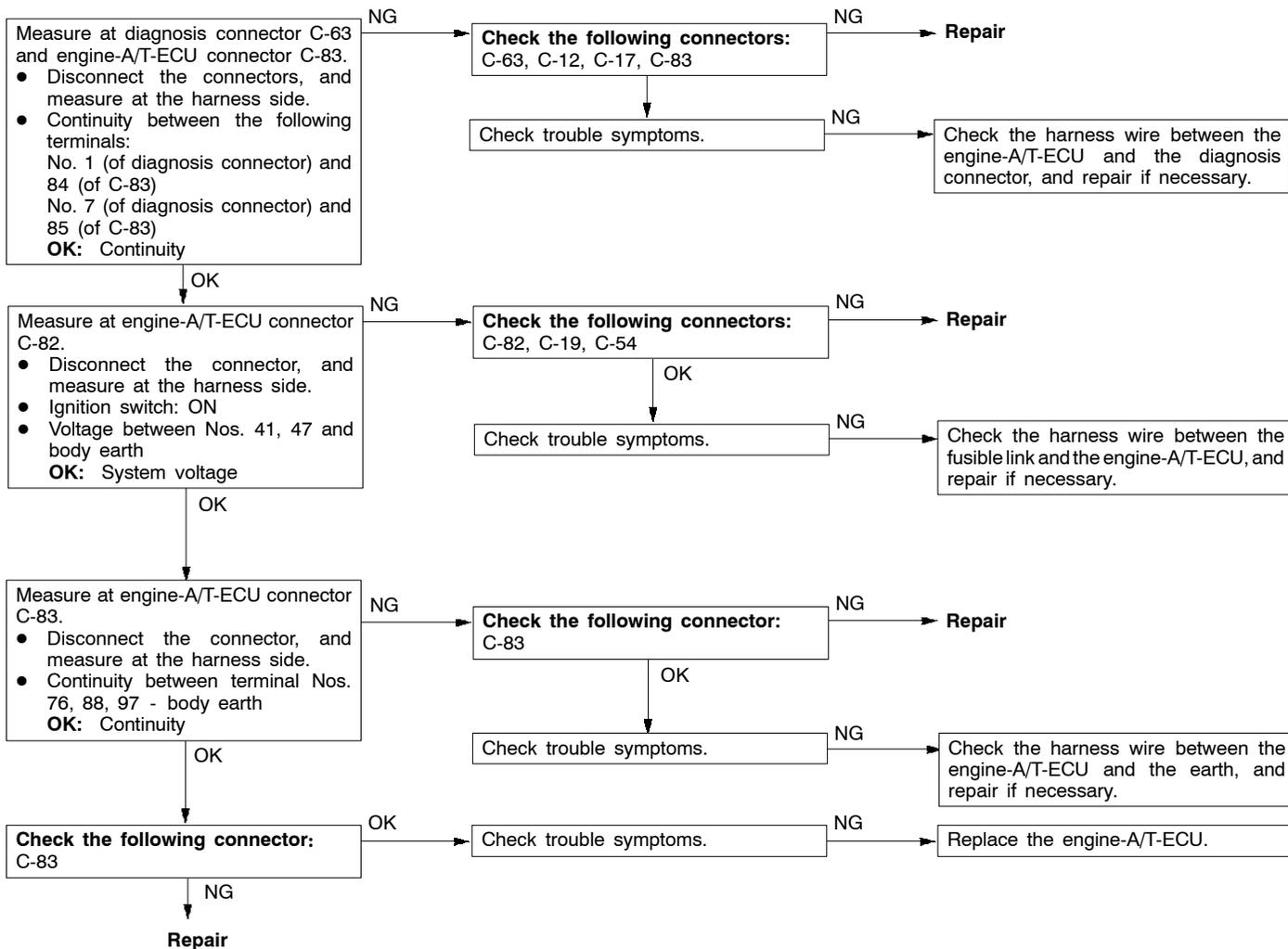
INSPECTION PROCEDURE 1

MUT-II can not communicate with any systems.	Probable cause
It is suspected that this malfunction is caused by a defective power supply and earth circuits of the diagnosis connector.	<ul style="list-style-type: none"> ● Malfunction of diagnosis connector ● Malfunction of harness or connector



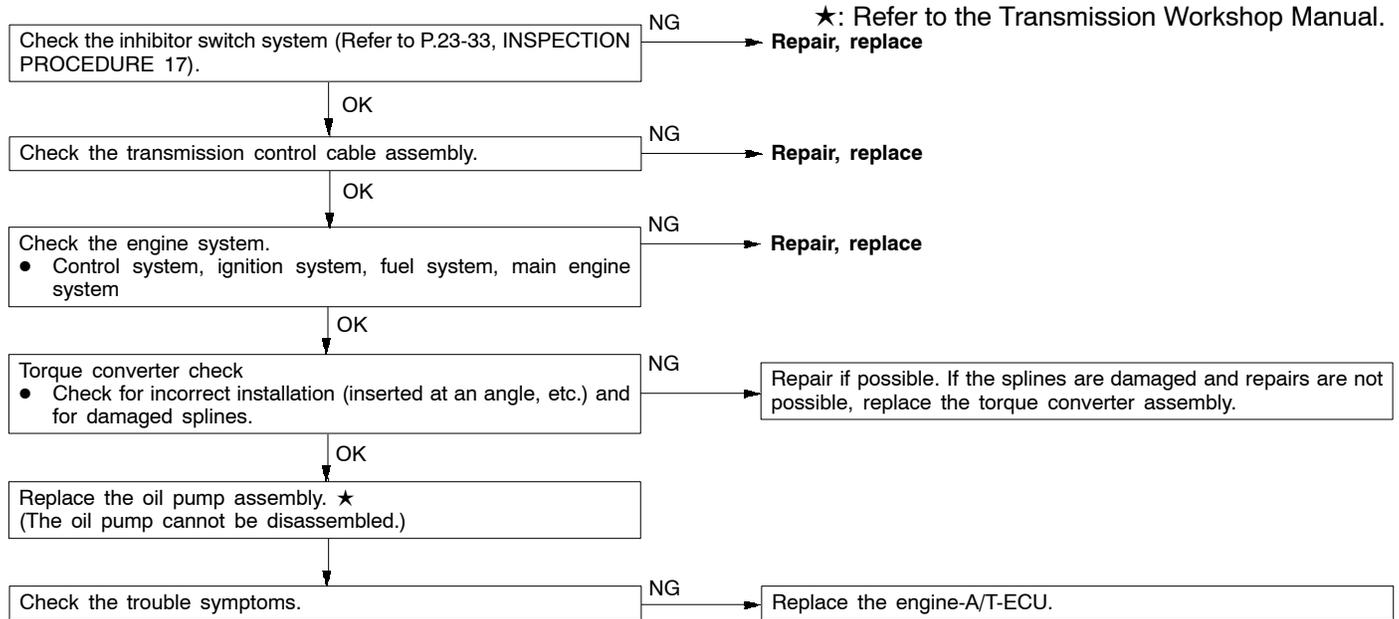
INSPECTION PROCEDURE 2

MUT-II can not communicate with the engine-A/T-ECU.	Probable cause
It is suspected that this malfunction is caused by an open circuit in engine-A/T-ECU power supply circuit or diagnosis output circuit.	<ul style="list-style-type: none"> ● Malfunction of harness or connector ● Malfunction of engine-A/T-ECU



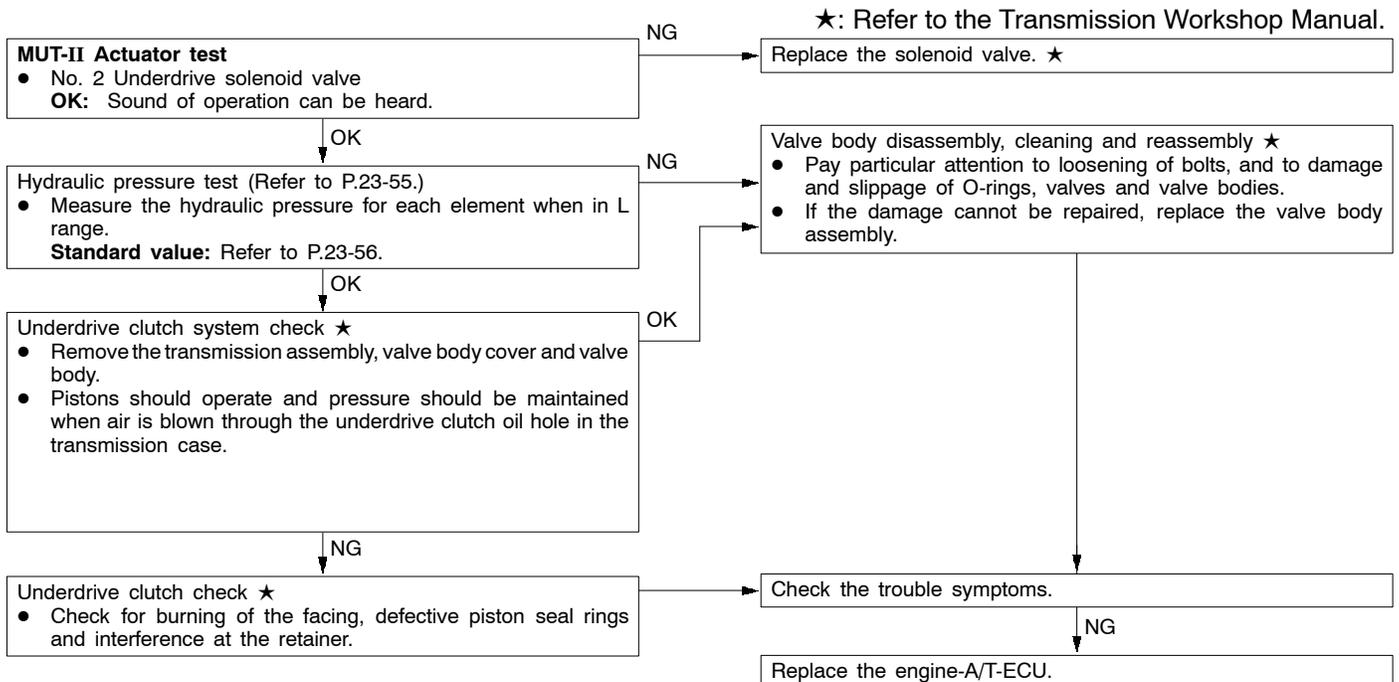
INSPECTION PROCEDURE 3

Starting impossible	Probable cause
Starting is not possible when the selector lever is in P or N range. In such cases, the cause is probably a defective inhibitor switch system, transmission control cable assembly, engine system, torque converter or oil pump.	<ul style="list-style-type: none"> ● Malfunction of the inhibitor switch system ● Malfunction of the transmission control cable assembly ● Malfunction of the engine system ● Malfunction of the torque converter ● Malfunction of the oil pump ● Malfunction of the engine-A/T-ECU



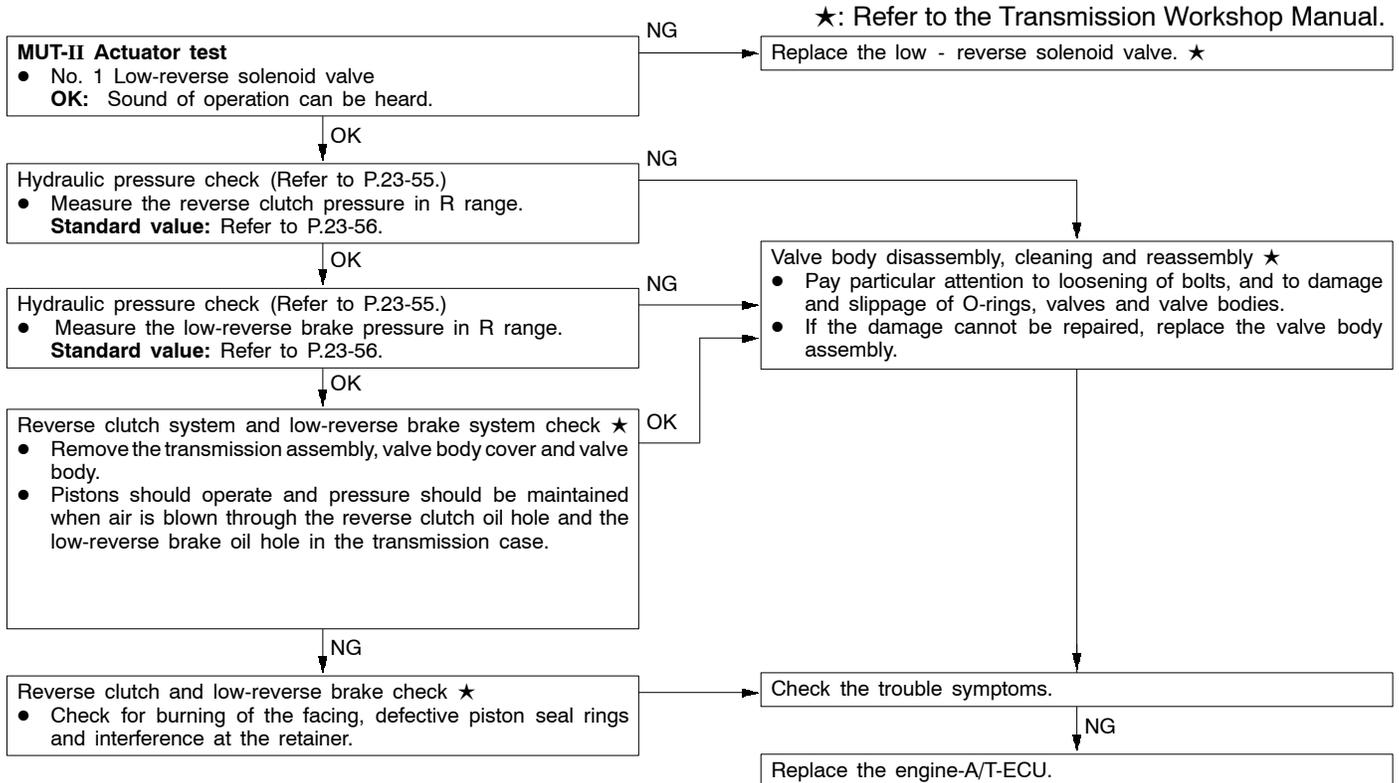
INSPECTION PROCEDURE 4

Does not move (forward)	Probable cause
If the vehicle does not move forward when the selector lever is shifted from N to D, 3, 2 or L range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the underdrive clutch or valve body.	<ul style="list-style-type: none"> ● Abnormal line pressure ● Malfunction of the underdrive solenoid valve ● Malfunction of the underdrive clutch ● Malfunction of the valve body ● Malfunction of the engine-A/T-ECU



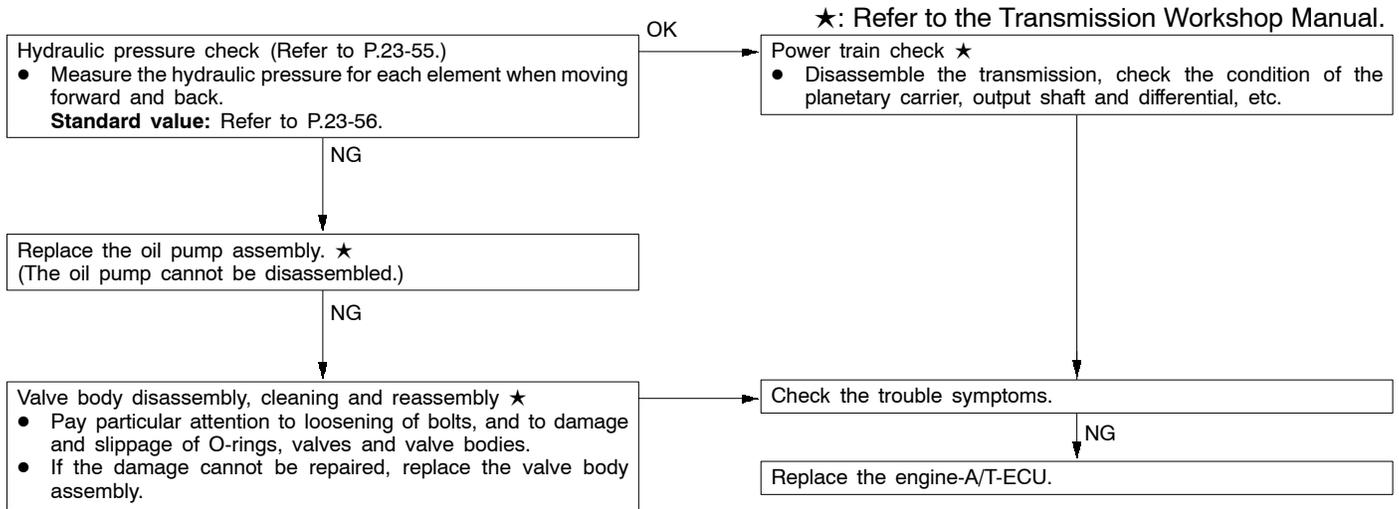
INSPECTION PROCEDURE 5

Does not reverse	Probable cause
If the vehicle does not reverse when the selector lever is shifted from N to R range while the engine is idling, the cause is probably abnormal pressure in the reverse clutch or low-reverse brake or a malfunction of the reverse clutch, low-reverse brake or valve body.	<ul style="list-style-type: none"> ● Abnormal reverse clutch pressure ● Abnormal low-reverse brake pressure ● Malfunction of the low-reverse solenoid valve ● Malfunction of the reverse clutch ● Malfunction of the low-reverse brake ● Malfunction of the valve body ● Malfunction of the engine-A/T-ECU



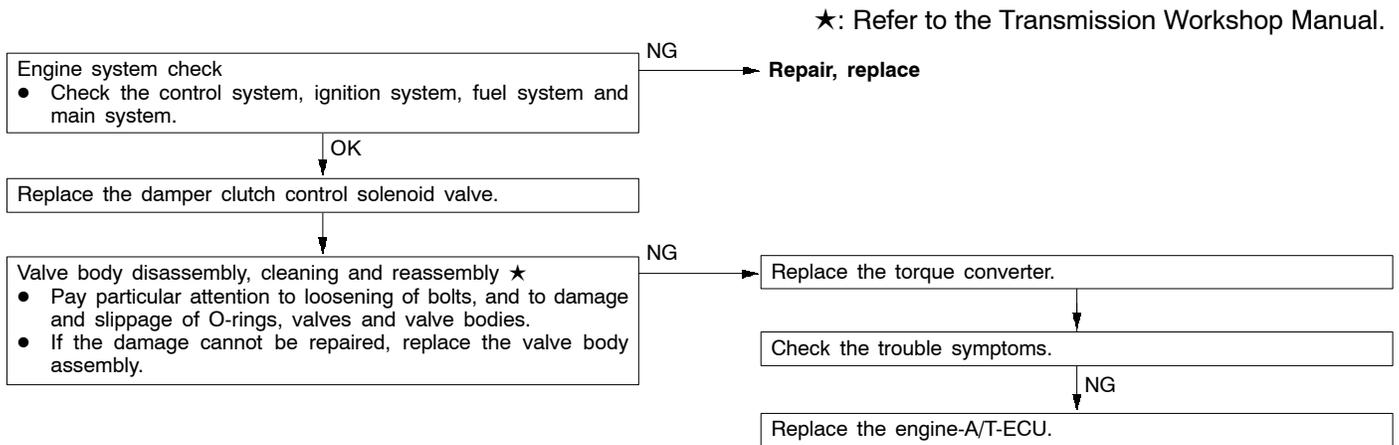
INSPECTION PROCEDURE 6

Does not move (forward or reverse)	Probable cause
If the vehicle does not move forward or reverse when the selector lever is shifted to any position while the engine is idling, the cause is probably abnormal line pressure, or a malfunction of the power train, oil pump or valve body.	<ul style="list-style-type: none"> ● Abnormal line pressure ● Malfunction of power train ● Malfunction of the oil pump ● Malfunction of the valve body ● Malfunction of the engine-A/T-ECU



INSPECTION PROCEDURE 7

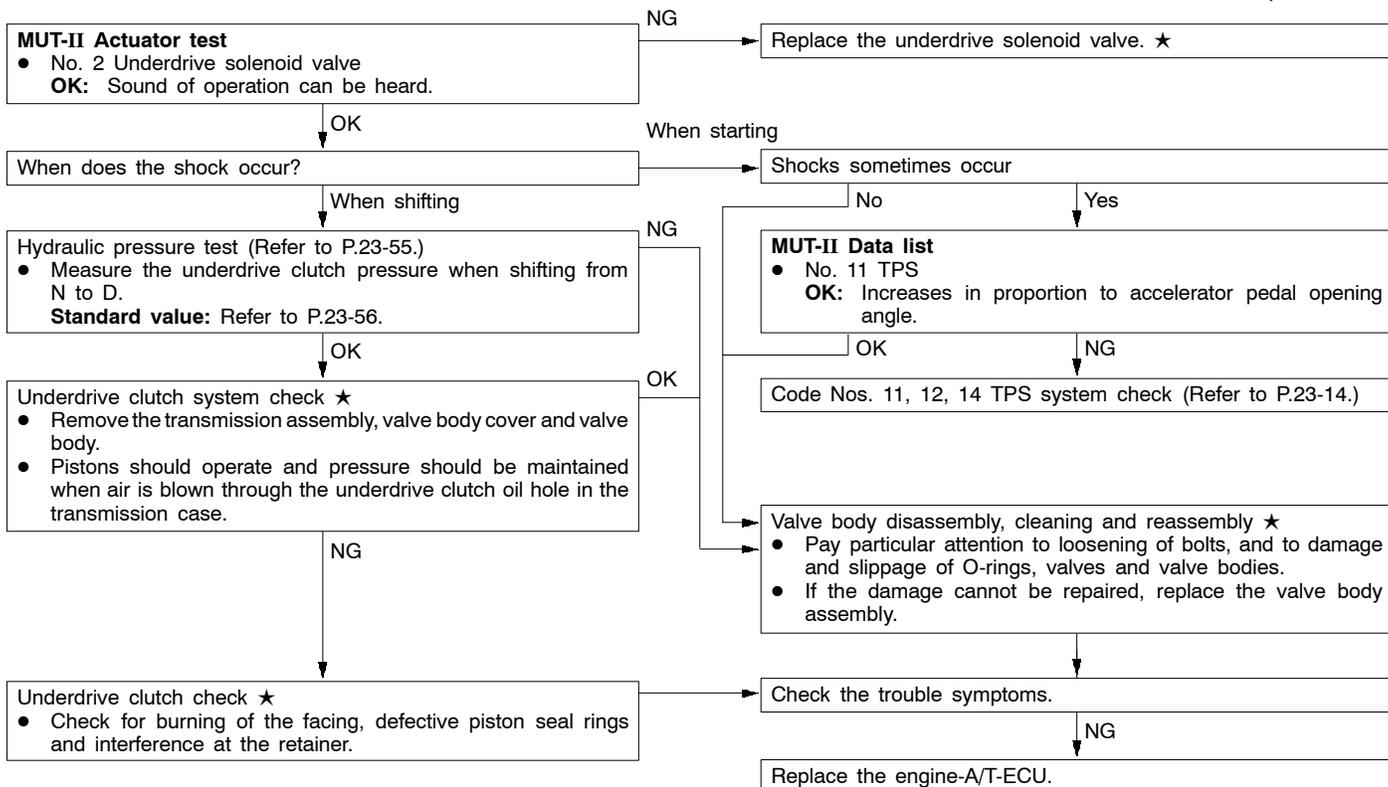
Engine stalling when shifting	Probable cause
If the engine stalls when the selector lever is shifted from N to D or R range while the engine is idling, the cause is probably a malfunction of the engine system, damper clutch solenoid valve, valve body or torque converter (damper clutch malfunction).	<ul style="list-style-type: none"> ● Malfunction of the engine system ● Malfunction of the damper clutch control solenoid valve ● Malfunction of the valve body ● Malfunction of the torque converter (Malfunction of the damper clutch) ● Malfunction of the engine-A/T-ECU



INSPECTION PROCEDURE 8

Shocks when changing from N to D and large time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range while the engine is idling, the cause is probably abnormal underdrive clutch pressure or a malfunction of the underdrive clutch, valve body, TPS.	<ul style="list-style-type: none"> ● Abnormal underdrive clutch pressure ● Malfunction of the underdrive solenoid valve ● Malfunction of the underdrive clutch ● Malfunction of the valve body ● Malfunction of the TPS ● Malfunction of the engine-A/T-ECU

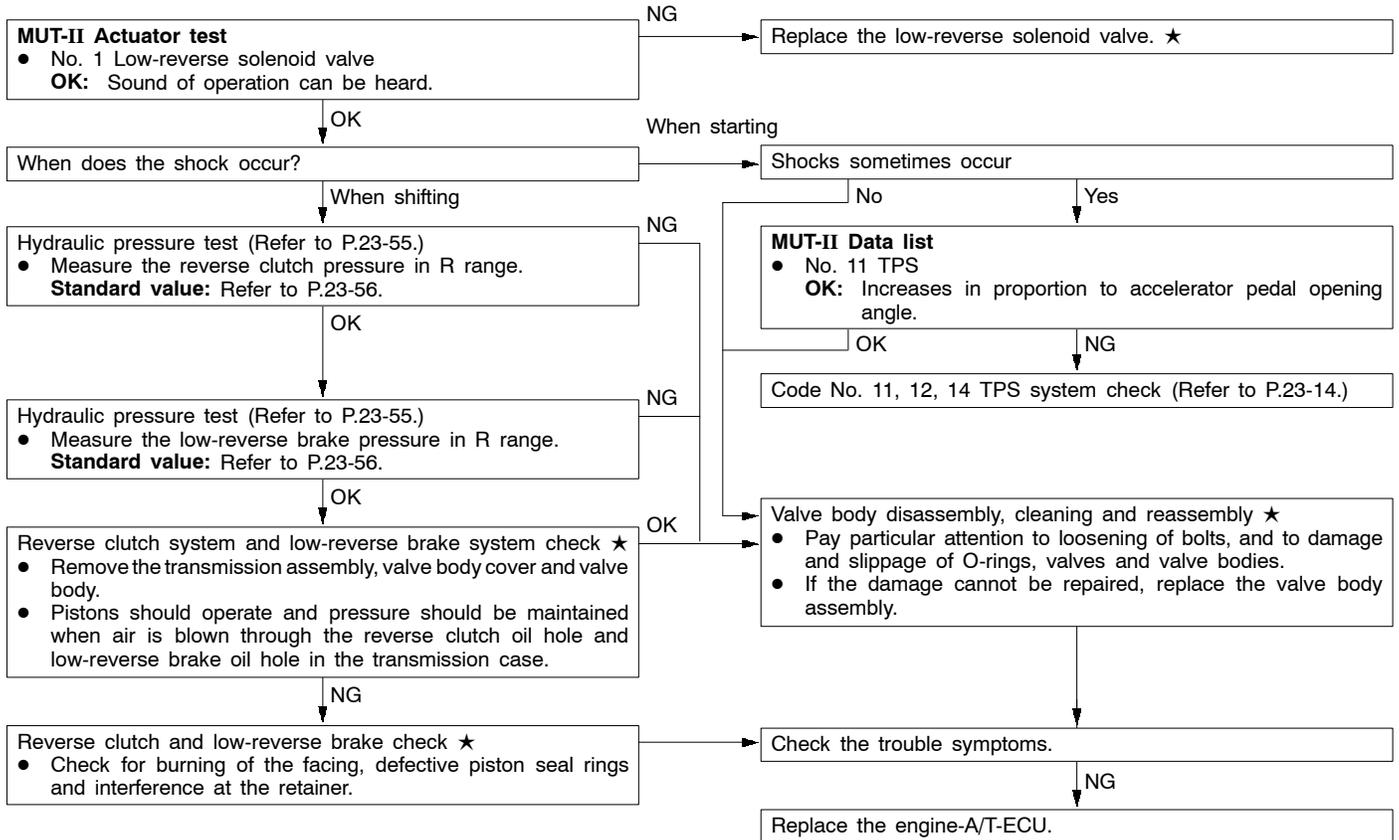
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 9

Shocks when changing from N to R and large time lag	Probable cause
<p>If abnormal shocks or a time lag of 2 seconds or more occurs when the selector lever is shifted from N to R range while the engine is idling, the cause is probably abnormal reverse clutch pressure or low-reverse brake pressure, or a malfunction of the reverse clutch, low-reverse brake, valve body, TPS.</p>	<ul style="list-style-type: none"> ● Abnormal reverse clutch pressure ● Abnormal low-reverse brake pressure ● Malfunction of the low-reverse solenoid valve ● Malfunction of the reverse clutch ● Malfunction of the low-reverse brake ● Malfunction of the valve body ● Malfunction of the TPS ● Malfunction of the engine-A/T-ECU

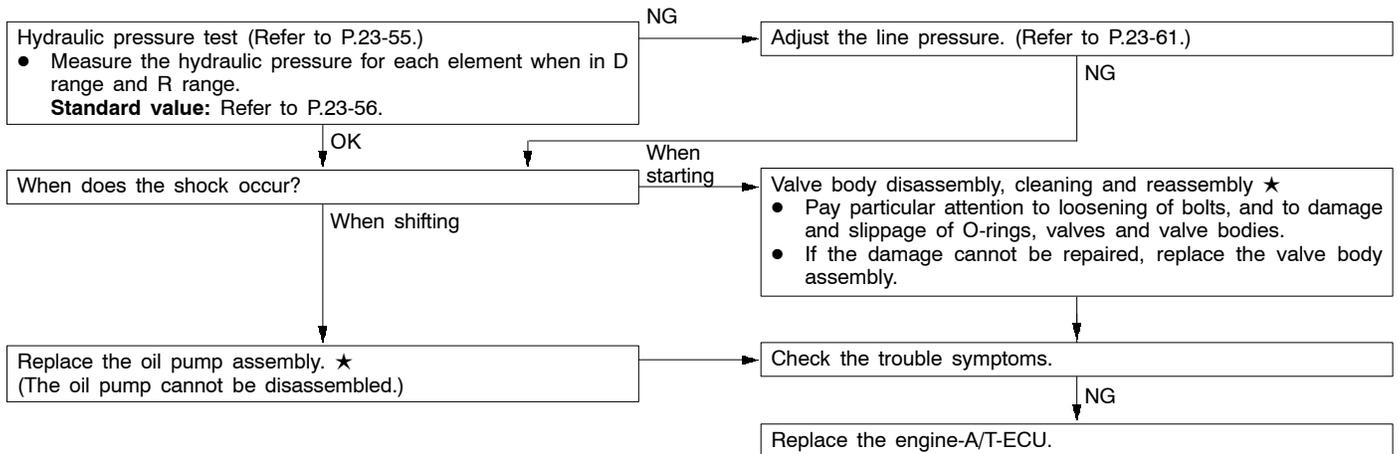
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 10

Shocks when changing from N to D, N to R and large time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range and from N to R range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the oil pump or valve body.	<ul style="list-style-type: none"> ● Abnormal line pressure ● Malfunction of the oil pump ● Malfunction of the valve body ● Malfunction of the engine-A/T-ECU

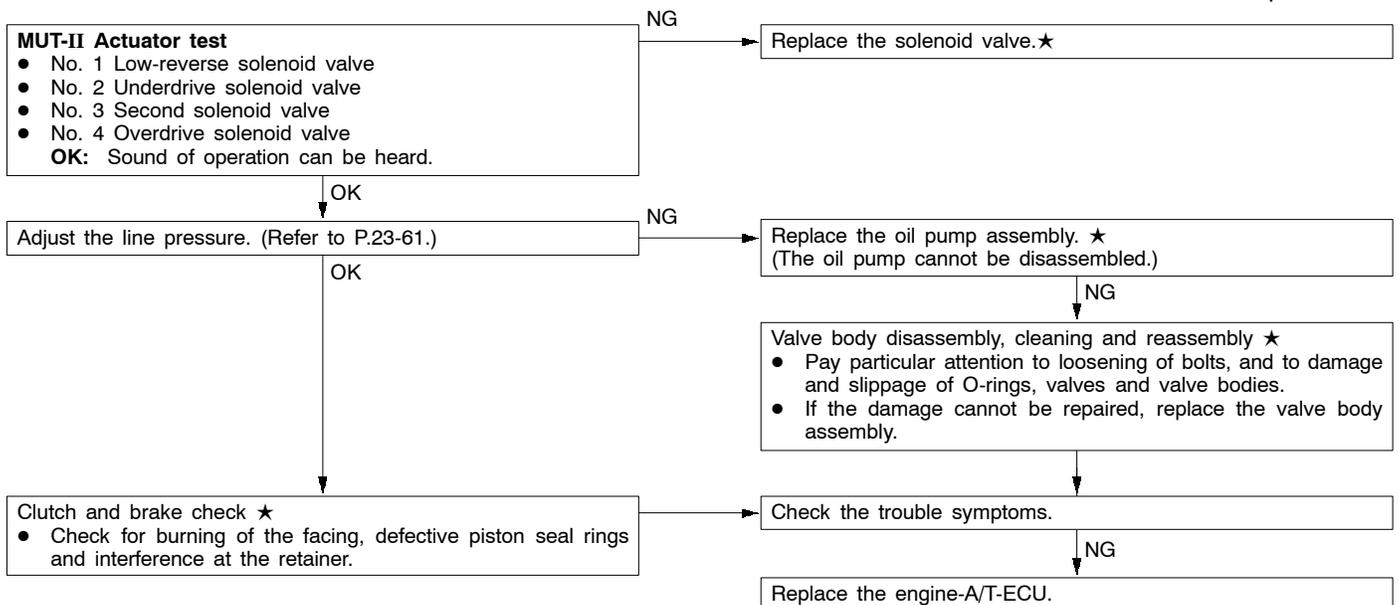
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 11

Shocks and running up	Probable cause
If shocks occur when driving due to upshifting or downshifting and the transmission speed becomes higher than the engine speed, the cause is probably abnormal line pressure or a malfunction of a solenoid valve, oil pump, valve body or of a brake or clutch.	<ul style="list-style-type: none"> ● Abnormal line pressure ● Malfunction of each solenoid valve ● Malfunction of the oil pump ● Malfunction of the valve body ● Malfunction of each brake or each clutch ● Malfunction of the engine-A/T-ECU

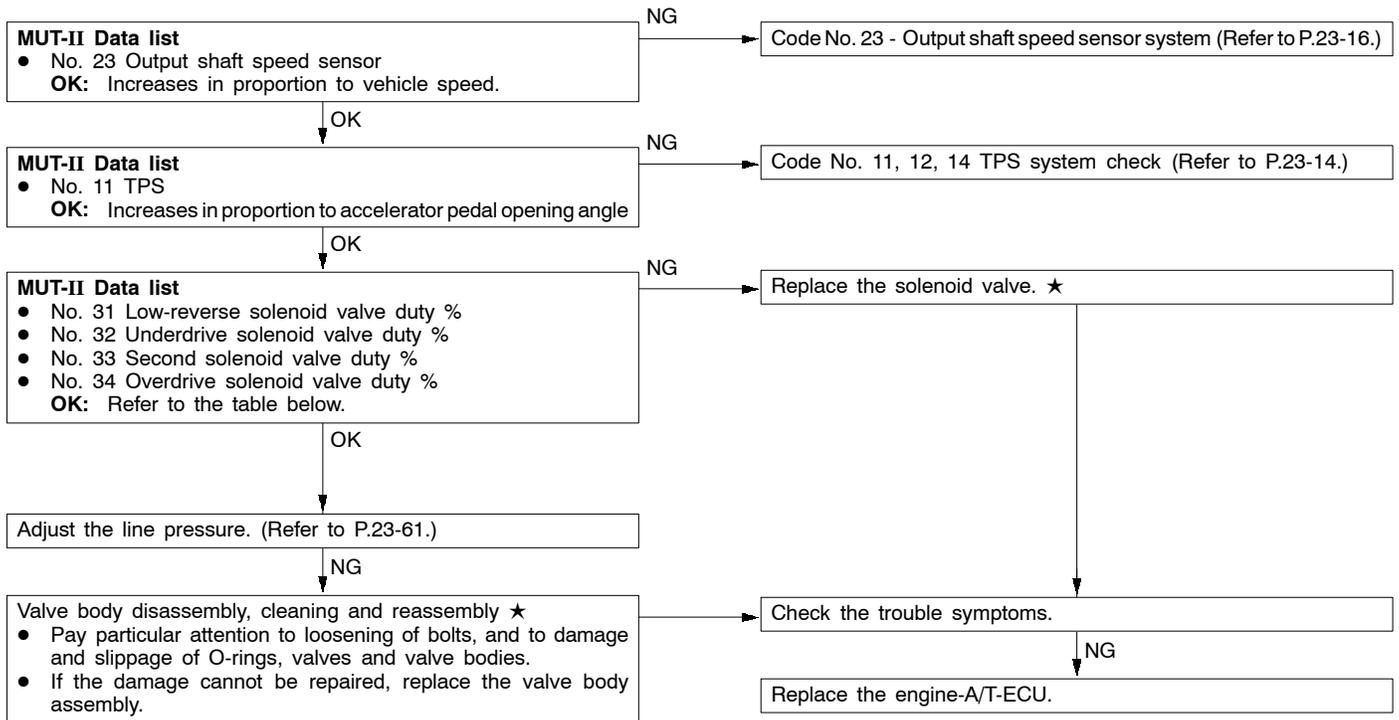
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 12

All points (Displaced shifting points)	Probable cause
If all shift points are displaced while driving, the cause is probably a malfunction of the output shaft speed sensor, TPS or of a solenoid valve.	<ul style="list-style-type: none"> ● Malfunction of the output shaft speed sensor ● Malfunction of the TPS ● Malfunction of each solenoid valve ● Abnormal line pressure ● Malfunction of the valve body ● Malfunction of the engine-A/T-ECU

★: Refer to the Transmission Workshop Manual.

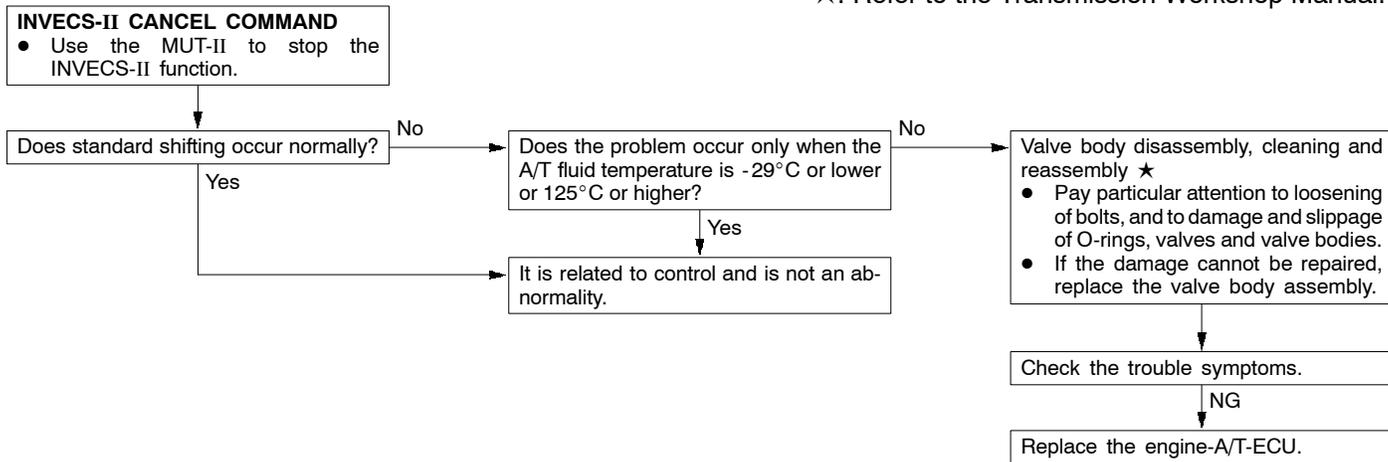


	No. 31	No. 32	No. 33	No. 34
Driving at constant speed in 1st gear	0 %	0 %	100 %	100 %
Driving at constant speed in 2nd gear	100 %	0 %	0 %	100 %
Driving at constant speed in 3rd gear	100 %	0 %	100 %	0 %
Driving at constant speed in 4th gear	100 %	100 %	0 %	0 %

INSPECTION PROCEDURE 13

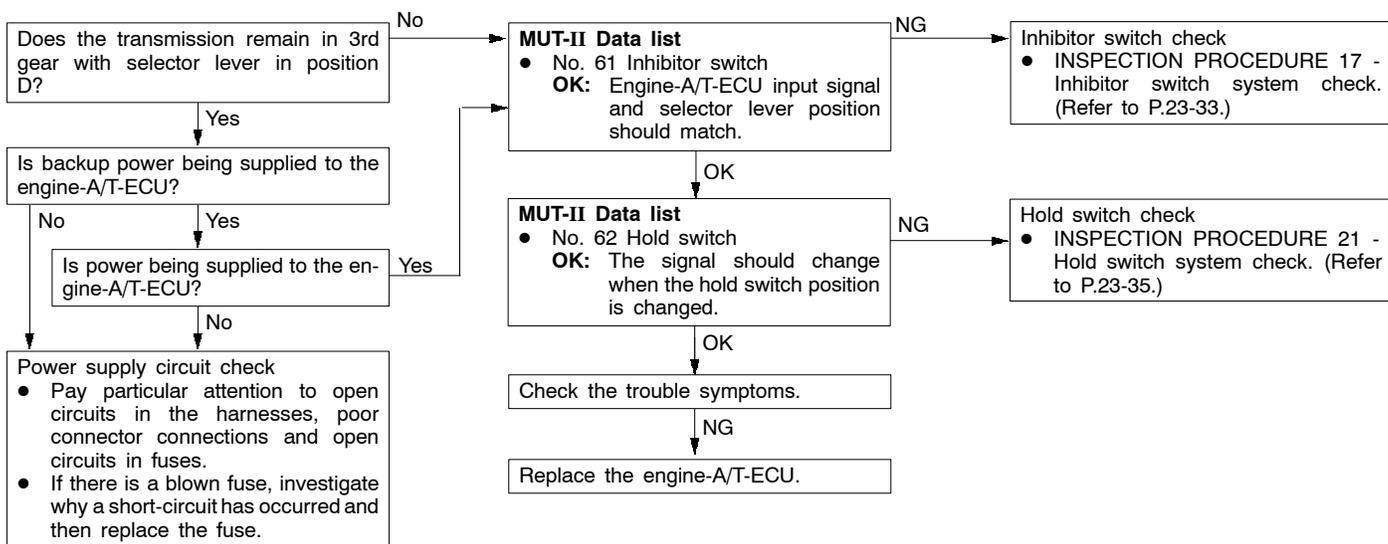
Some points (Displaced shifting points)	Probable cause
If some of the shift points are displaced while driving, the cause is probably a malfunction of the valve body, or it is related to control and is not an abnormality.	<ul style="list-style-type: none"> • Malfunction of the valve body • Malfunction of the engine-A/T-ECU

★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 14

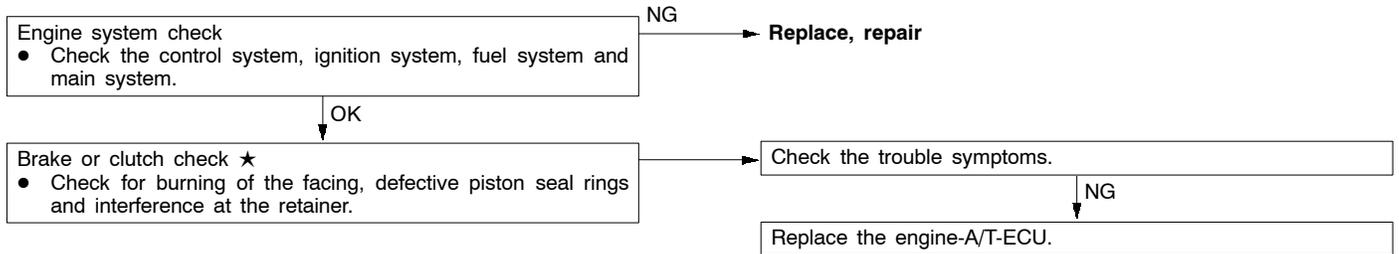
No diagnosis codes (Does not shift)	Probable cause
If shifting does not occur while driving and no diagnosis codes are output, the cause is probably a malfunction of the inhibitor switch, engine-A/T-ECU.	<ul style="list-style-type: none"> • Malfunction of the inhibitor switch • Malfunction of the engine-A/T-ECU



INSPECTION PROCEDURE 15

Poor acceleration	Probable cause
If acceleration is poor even if downshifting occurs while driving, the cause is probably a malfunction of the engine system or of a brake or clutch.	<ul style="list-style-type: none"> ● Malfunction of the engine system ● Malfunction of the brake or clutch ● Malfunction of the engine-A/T-ECU

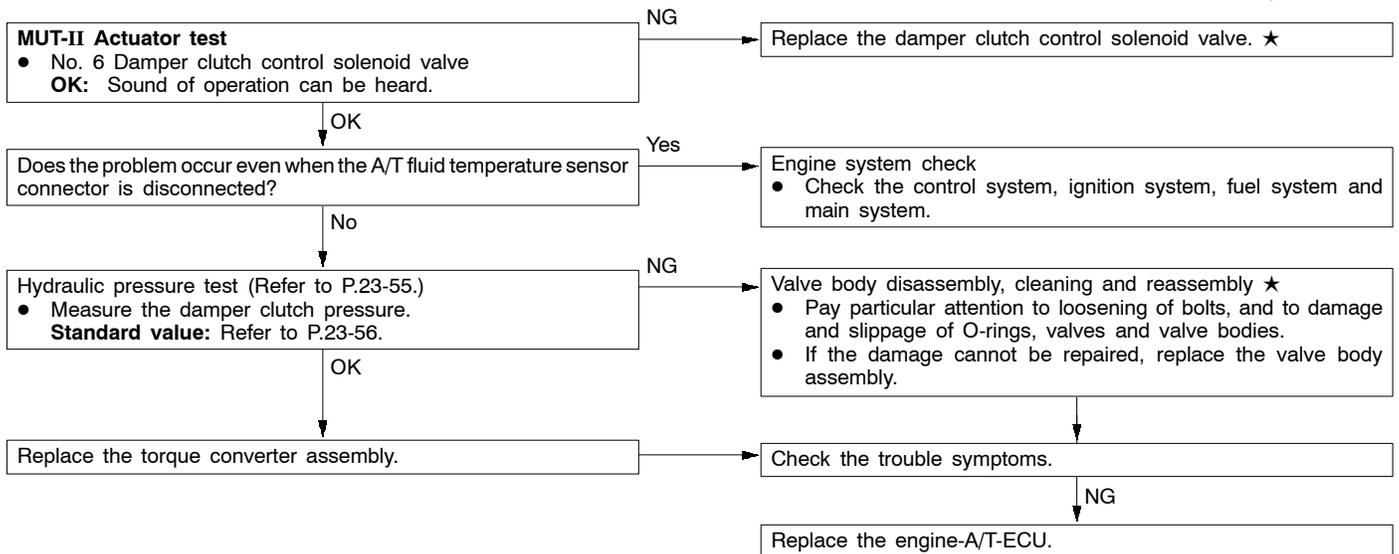
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 16

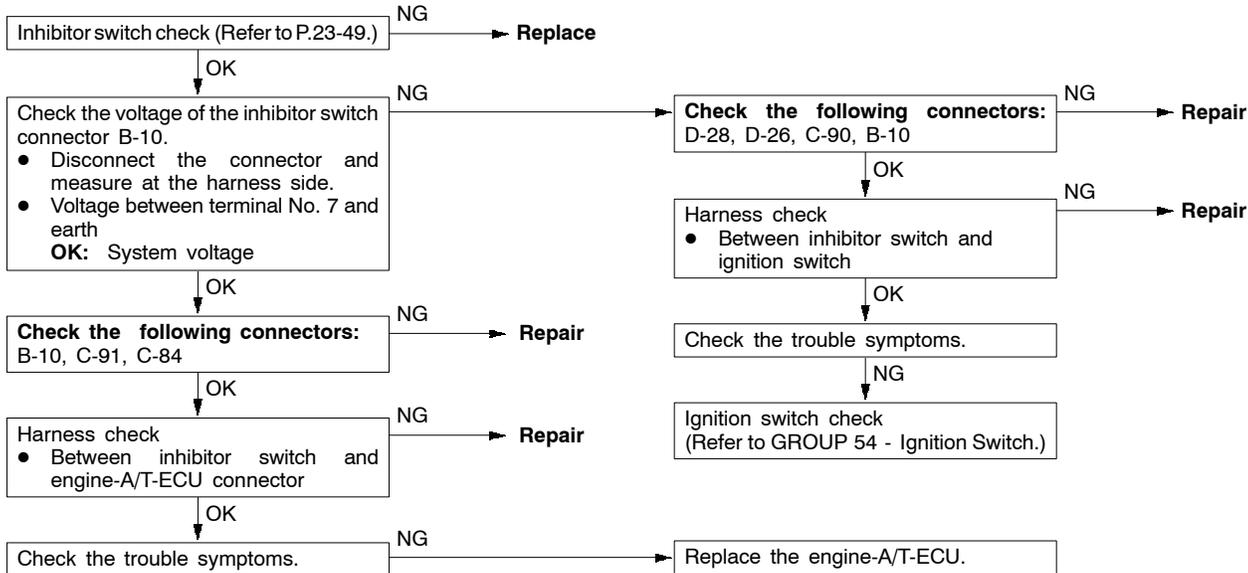
Vibration	Probable cause
If vibration occurs when driving at constant speed or when accelerating and deceleration in top range, the cause is probably abnormal damper clutch pressure or a malfunction of the engine system, damper clutch control solenoid valve, torque converter or valve body.	<ul style="list-style-type: none"> ● Abnormal damper clutch pressure ● Malfunction of the engine system ● Malfunction of the damper clutch control solenoid valve ● Malfunction of the torque converter ● Malfunction of the valve body ● Malfunction of the engine-A/T-ECU

★: Refer to the Transmission Workshop Manual.



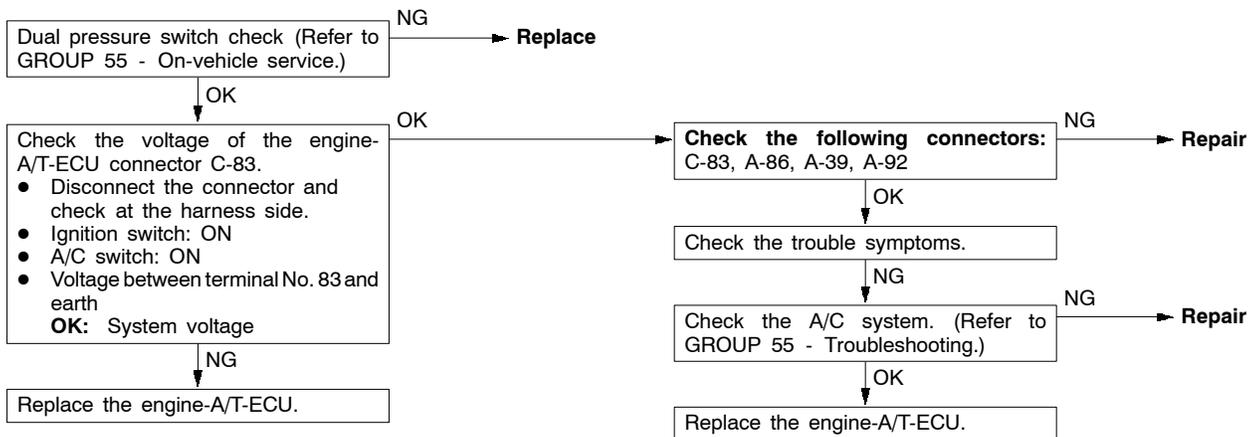
INSPECTION PROCEDURE 17

Inhibitor switch system	Probable cause
The cause is probably a malfunction of the inhibitor switch circuit, ignition switch circuit or a defective engine-A/T-ECU.	<ul style="list-style-type: none"> ● Malfunction of the inhibitor switch ● Malfunction of the ignition switch ● Malfunction of connector ● Malfunction of the engine-A/T-ECU



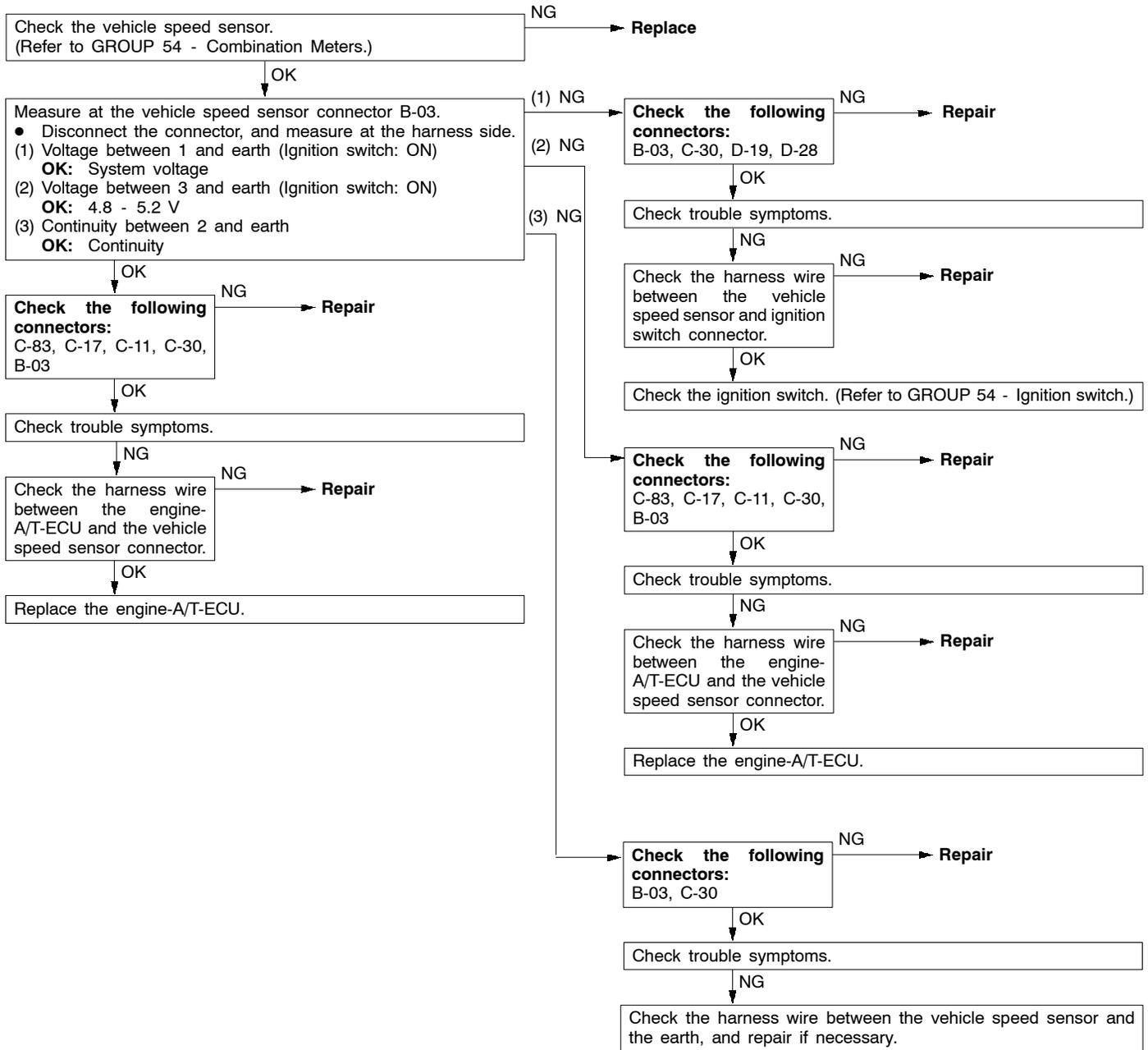
INSPECTION PROCEDURE 18

Dual pressure switch system	Probable cause
The cause is probably a defective dual pressure switch circuit or a defective engine-A/T-ECU.	<ul style="list-style-type: none"> ● Malfunction of the dual pressure switch ● Malfunction of connector ● Malfunction of A/C system ● Malfunction of the engine-A/T-ECU



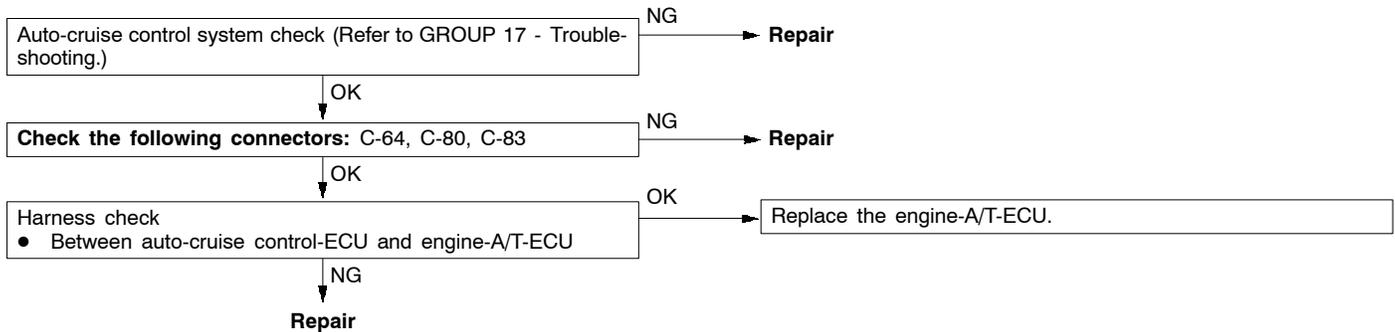
INSPECTION PROCEDURE 19

Vehicle speed sensor system	Probable cause
The cause is probably a defective vehicle speed sensor circuit or a defective engine-A/T-ECU.	<ul style="list-style-type: none"> ● Malfunction of the vehicle speed sensor ● Malfunction of connector ● Malfunction of the engine-A/T-ECU



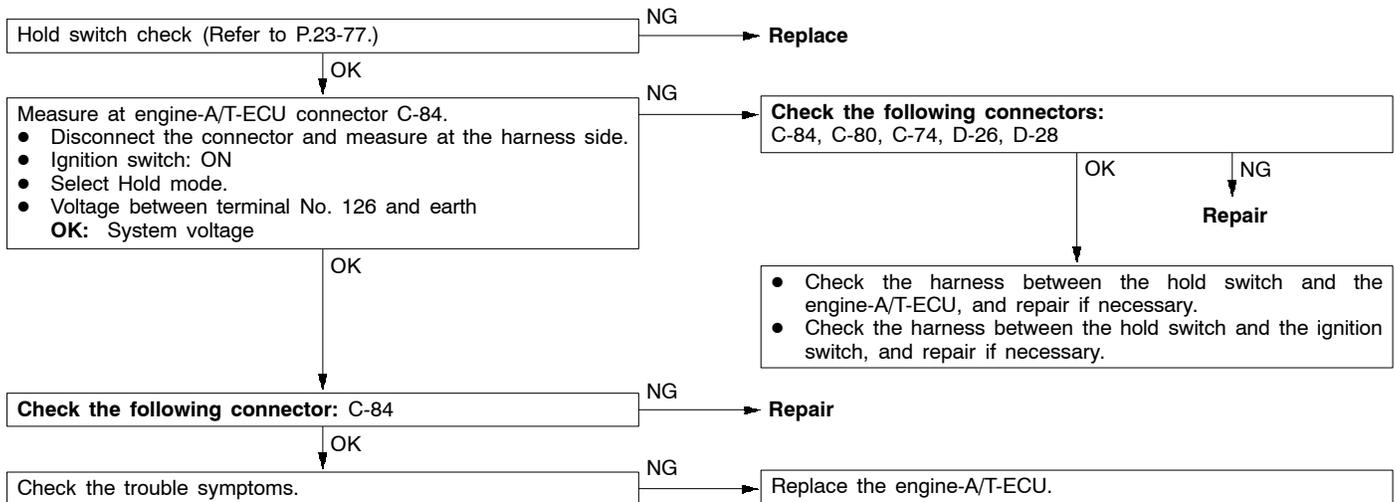
INSPECTION PROCEDURE 20

Auto-cruise control-ECU signal system	Probable cause
The cause is probably a defective auto-cruise signal line circuit or a defective engine-A/T-ECU.	<ul style="list-style-type: none"> ● Malfunction of connector ● Malfunction of the engine-A/T-ECU ● Malfunction of the auto-cruise control-ECU



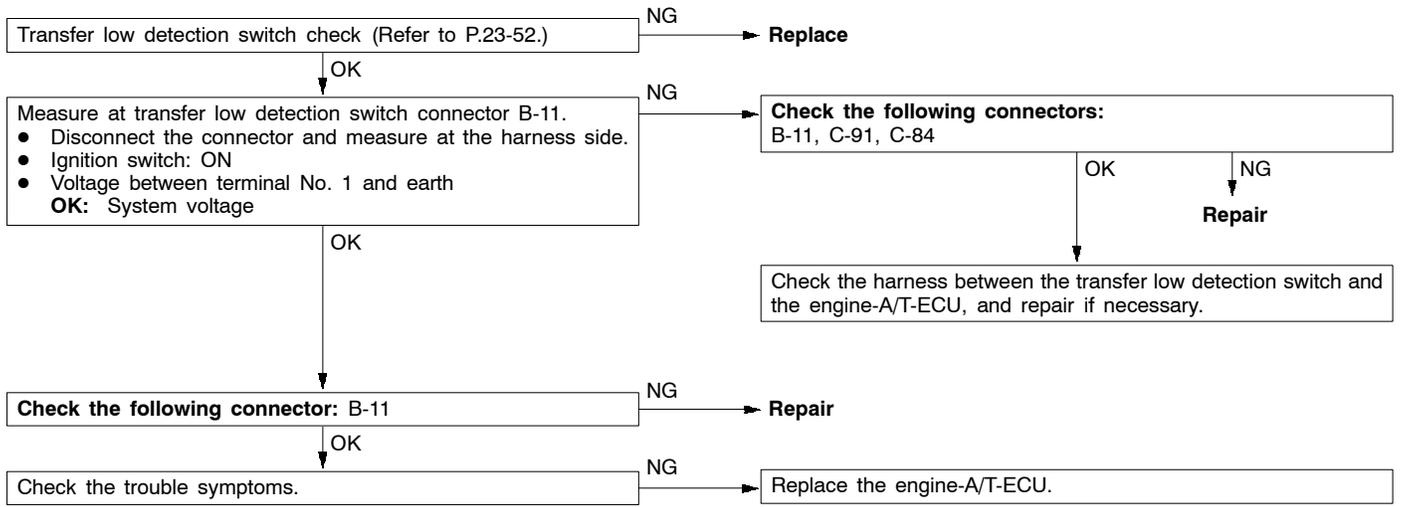
INSPECTION PROCEDURE 21

Hold switch system	Probable cause
The cause is probably a malfunction of the hold switch circuit, engine-A/T-ECU.	<ul style="list-style-type: none"> ● Malfunction of hold switch ● Malfunction of connector ● Malfunction of the engine-A/T-ECU



INSPECTION PROCEDURE 22

Transfer low detection switch system	Probable cause
The cause is probably a malfunction of the transfer low detection switch circuit, engine-A/T-ECU.	<ul style="list-style-type: none"> ● Malfunction of transfer low detection switch ● Malfunction of connector ● Malfunction of the engine-A/T-ECU



DATA LIST REFERENCE TABLE

Item No.	Check item	Check requirement		Normal value
11	Throttle position sensor	Engine: Stopped Selector lever position: P	Accelerator pedal: Released	300 - 1,000 mV
			Accelerator pedal: Half depressed	Gradually rises from the above value
			Accelerator pedal: Depressed	4,500 - 5,500 mV
15	A/T fluid temperature sensor	Warming up	Drive for 15 minutes or more so that the A/T fluid temperature becomes 70 - 90 °C.	Gradually rises to 70 - 90 °C
21	Crank angle sensor	Engine: Idling Selector lever position: P	Accelerator pedal: Released	550 - 850 r/min
			Accelerator pedal: Half depressed	Gradually rises from the above value
22	Input shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h in 3rd gear	1,500 - 1,900 r/min
23	Output shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h in 3rd gear	1,500 - 1,900 r/min
25	Wide open throttle switch	Accelerator pedal position	Released	OFF
			Depressed	ON
26	Stop lamp switch	Ignition switch: ON Engine: Stopped	Brake pedal: Depressed	ON
			Brake pedal: Released	OFF
29	Vehicle speed sensor	Selector lever position: 3	Idling with 1st gear (Vehicle stopped)	0 km/h
			Driving at constant speed of 50 km/h in 3rd gear	50 km/h
31	Low-reverse solenoid valve duty %	Selector lever position: L, 2, 3, D	10 km/h in 1st gear	No. 31: 0 %, No. 32: 0 %, No. 33: 100 %, No. 34: 100%
32	Underdrive solenoid valve duty %		30 km/h in 2nd gear	No. 31: 100 %, No. 32: 0 %, No. 33: 0 %, No. 34: 100%
33	Second solenoid valve duty %		50 km/h in 3rd gear	No. 31: 100 %, No. 32: 0 %, No. 33: 100 %, No. 34: 0%
34	Overdrive solenoid valve duty %		70 km/h in 4th gear	No. 31: 100 %, No. 32: 100 %, No. 33: 0 %, No. 34: 0%
36	Damper clutch control solenoid valve duty %	Selector lever position: 3	Driving at 50 km/h in 3rd gear with accelerator released	0 %
			Driving at constant speed of 70 km/h in 3rd gear	Approx. 70 - 90 %

Item No.	Check item	Check requirement		Normal value
52	Amount of damper clutch slippage	Selector lever position: 3	Driving at 50 km/h in 3rd gear with accelerator fully closed	Approx. 100 - 300 r/min
			Driving at constant speed of 70 km/h in 3rd gear	Approx. 0 - 10 r/min
54	Control relay output voltage	Ignition switch: OFF	Ignition switch: ON → OFF	System voltage (V) → 0 V
57	Engine volumetric efficiency	Selector lever position: N	N range with accelerator pedal released → depressed.	Data changes
61	Inhibitor switch	Ignition switch: ON Engine: Stopped	Selector lever position: P	P
			Selector lever position: R	R
			Selector lever position: N	N
			Selector lever position: D	D
			Selector lever position: 3	3
			Selector lever position: 2	2
			Selector lever position: L	L
62	Hold switch	Ignition switch: ON Engine: Stopped	Hold	ON
			Normal	OFF
63	Shift position	Selector lever position: L, 2, 3, D	Driving at constant speed of 10 km/h in 1st gear	1st
			Driving at constant speed of 30 km/h in 2nd gear	2nd
			Driving at constant speed of 50 km/h in 3rd gear	3rd
			Driving at constant speed of 70 km/h in 4th gear	4th
65	Dual pressure switch	Engine: Idling Selector lever position: N	A/C switch: ON	ON
			A/C switch: OFF	OFF
66	Auto-cruise control-ECU signal <Vehicles with Auto-cruise control system>	While auto-cruise control operating	Plain road	OFF
			Sloping road	ON
75	Transfer low detection switch	Ignition switch: ON Engine: Stopped	Transfer lever position: Other than 4L	OFF
			Transfer lever position: 4L	ON

ACTUATOR TEST JUDGEMENT VALUE

Item No.	Check item	Test content	Check requirement	Normal value
1	Low-reverse solenoid valve	Drive the solenoid valve specified by the MUT-II at 50 % duty for 5 seconds. No other solenoid valve should be energized.	Ignition switch: ON Selector lever position: P Engine: 0 r/min Vehicle speed: 0 km/h (Vehicle stopped) Throttle (Accelerator) opening voltage: Less than 0 V	The operation sound should be audible when the solenoid valve is driven.
2	Underdrive solenoid valve			
3	Second solenoid valve			
4	Overdrive solenoid valve			
6	Damper clutch control solenoid valve			
12	A/T control relay	Control relay is OFF for 3 seconds.		Data list No. 54 (1) During test: 0 V (2) Normal: System voltage [V]

INVECS-II CANCEL COMMAND

Item No.	Item	Content	Remarks
14	INVECS-II	Stop the INVECS-II control and change gears according to the standard shift pattern.	Use this function when carrying out procedure 8 in the road tests. If the ignition switch is turned from OFF to ON this function restores the INVECS-II control.

CHECK AT ENGINE-A/T-ECU TERMINALS

1	2	3	4		5	6	7	8	41	42	43		44	45	46	71	72	73	74		75	76	77	101	102	103	104		105	106	107																			
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	47	48	49	50	51	52	53	54	55	56	57	78	79	80	81	82	83	84	85	86	87	88	89	108	109	110	111	112	113	114	115	116	117	118	119	120
24	25	26	27	28	29	30	31	32	33	34	35	58	59	60	61	62	63	64	65	66	90	91	92	93	94	95	96	97	98	121	122	123	124	125	126	127	128	129	130											

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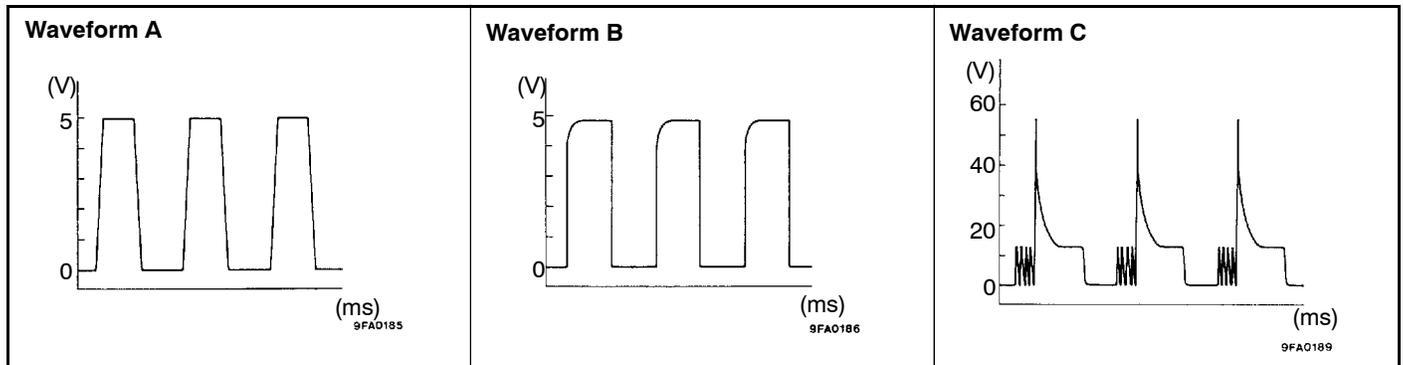
Terminal No.	Check item	Check requirement	Standard value
50	A/T control relay	Ignition switch: OFF	0 V
		Ignition switch: ON	System voltage
57	Sensor earth	Always	0 V
75	Auto-cruise OD-OFF command <Vehicles with auto-cruise control system>	No OD-OFF request (Auto-cruise control operating: Plane road)	System voltage
		OD-OFF request (Auto-cruise control operating: Sloping road)	0 V
76	Earth	Always	0 V
77	Solenoid valve power supply	Ignition switch: OFF	0 V
		Ignition switch: ON	System voltage
88	Earth	Always	0 V
89	Solenoid valve power supply	Ignition switch: OFF	0 V
		Ignition switch: ON	System voltage
97	Earth	Always	0 V
101	Inhibitor switch P	Selector lever position: P	System voltage
		Selector lever position: Other than above	0 V
102	Inhibitor switch D	Selector lever position: D	System voltage
		Selector lever position: Other than above	0 V
103	Input shaft speed sensor	Measure between terminal No. 57 and No. 103 by an oscilloscope. Engine: 2,000 r/min Selector lever position: 3 (3rd gear)	Refer to P.23-42, Oscilloscope inspection procedure.
104	Output shaft speed sensor	Measure between terminal No. 57 and No. 104 by an oscilloscope. Engine: 2,000 r/min Selector lever position: 3 (3rd gear)	Refer to P.23-42, Oscilloscope inspection procedure.
106	Second solenoid valve	Selector lever position: 2 (2nd gear)	System voltage
		Selector lever position: P	Approx. 7 - 9 V

Terminal No.	Check item	Check requirement	Standard value
107	Damper clutch control solenoid valve	Selector lever position: L (1st gear)	System voltage
		Selector lever position: 3 (50 km/h in 3rd gear)	Other than system voltage
108	Inhibitor switch R	Selector lever position: R	System voltage
		Selector lever position: Other than above	0 V
109	Inhibitor switch 3	Selector lever position: 3	System voltage
		Selector lever position: Other than above	0 V
110	Inhibitor switch L	Selector lever position: L	System voltage
		Selector lever position: Other than above	0 V
115	Wide open throttle switch	Accelerator pedal: Released	4.5 - 5.5 V
		Accelerator pedal: Depressed	Less than 0.4 V
120	Underdrive solenoid valve	Selector lever position: L (1st gear)	System voltage
		Selector lever position: P	Approx. 7 - 9 V
121	Inhibitor switch N	Selector lever position: N	System voltage
		Selector lever position: Other than above	0 V
122	Inhibitor switch 2	Selector lever position: 2	System voltage
		Selector lever position: Other than above	0 V
123	Stop lamp switch	Brake pedal: Depressed	System voltage
		Brake pedal: Released	0 V
124	A/T fluid temperature sensor	A/T fluid temperature: 25 °C	3.8 - 4.0 V
		A/T fluid temperature: 80 °C	2.3 - 2.5 V
125	Transfer low detection switch	Transfer lever position: Other than 4L	4 - 5 V
		Transfer lever position: 4L	0 V
126	Hold switch	Hold	System voltage
		Normal	0 V
129	Low-reverse solenoid valve	Selector lever position: P	System voltage
		Selector lever position: 2 (2nd gear)	Approx. 7 - 9 V
130	Overdrive solenoid valve	Selector lever position: 3 (3rd gear)	System voltage
		Selector lever position: P	Approx. 7 - 9 V

OSCILLOSCOPE INSPECTION PROCEDURE

Check item	Check requirement		Normal condition (Waveform sample)
Crank angle sensor	Selector lever position: N	Idling (Vehicle stopped)	Waveform A
Input shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h in 3rd gear (Engine: 1,800 - 2,100 r/min)	Waveform B
Output shaft speed sensor			
Vehicle speed sensor			
Low-reverse solenoid valve	Ignition switch: ON Selector lever position: P Engine: 0 r/min Vehicle speed: 0 km/h (Vehicle stopped) Throttle (Accelerator) opening angle: Less than 1 V	Force drive each solenoid valve (Actuator test)	Waveform C
Underdrive solenoid valve			
Second solenoid valve			
Overdrive solenoid valve			
Damper clutch control solenoid valve			

Waveform sample



TROUBLESHOOTING <A/T KEY INTERLOCK AND SHIFT LOCK MECHANISMS>

INSPECTION CHART FOR TROUBLE SYMPTOMS

Problem	Inspection Procedure No.	Reference page
Selector lever can be moved from P to R without depressing brake pedal when ignition key is at positions other than LOCK (OFF).	1	23-43
Selector lever cannot be moved from P to R with brake pedal depressed when ignition key is at positions other than LOCK (OFF).	2	23-43
Selector lever can be moved from P to R with brake pedal depressed when ignition key is at LOCK (OFF) position.	3	23-44
Selector lever cannot be moved from P to R smoothly.	4	23-44
Selector lever cannot be moved from R to P.	5	23-44
Ignition key cannot be turned to LOCK (OFF) position when selector lever is at P position.	6	23-44
Ignition key can be turned to LOCK (OFF) position when selector lever is at positions other than P.	7	23-44

INSPECTION CHART FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

Selector lever can be moved from P to R without depressing brake pedal when ignition key is at positions other than LOCK (OFF).	Probable cause
Lock cam or shift lock cable may be defective.	<ul style="list-style-type: none"> ● Malfunction of lock cam ● Malfunction of shift lock cable

Check items described in the column "Probable cause".

INSPECTION PROCEDURE 2

Selector lever cannot be moved from P to R with brake pedal depressed when ignition key is at positions other than LOCK (OFF).	Probable cause
Selector lever assembly, shift lock cable, key interlock cable, transmission control cable or lock cam may be defective.	<ul style="list-style-type: none"> ● Malfunction of selector lever assembly ● Malfunction of shift lock cable ● Malfunction of key interlock cable ● Malfunction of transmission control cable ● Malfunction of lock cam

Check items described in the column "Probable cause".

INSPECTION PROCEDURE 3

Selector lever can be moved from P to R with brake pedal depressed when ignition key is at LOCK (OFF) position.	Probable cause
Lock cam or key interlock cable may be defective.	<ul style="list-style-type: none"> ● Malfunction of lock cam ● Malfunction of key interlock cable

Check items described in the column "Probable cause".

INSPECTION PROCEDURE 4

Selector lever cannot be moved from P to R smoothly.	Probable cause
Key interlock cable, shift lock cable, lock cam, or selector lever assembly may be defective.	<ul style="list-style-type: none"> ● Malfunction of key interlock cable ● Malfunction of shift lock cable ● Malfunction of lock cam ● Malfunction of selector lever assembly

Check items described in the column "Probable cause".

INSPECTION PROCEDURE 5

Selector lever cannot be moved from R to P.	Probable cause
Selector lever assembly or transmission control cable may be defective.	<ul style="list-style-type: none"> ● Malfunction of selector lever assembly ● Malfunction of transmission control cable

Check items described in the column "Probable cause".

INSPECTION PROCEDURE 6

Ignition key cannot be turned to LOCK (OFF) position when selector lever is at P position.	Probable cause
Lock cam, key interlock cable or key cylinder slider may be defective.	<ul style="list-style-type: none"> ● Malfunction of lock cam ● Malfunction of key interlock cable ● Malfunction of key cylinder slider

Check items described in the column "Probable cause".

INSPECTION PROCEDURE 7

Ignition key can be turned to LOCK (OFF) position when selector lever is at positions other than P.	Probable cause
Lock cam, key cylinder cover or key interlock cable may be defective.	<ul style="list-style-type: none"> ● Malfunction of lock cam ● Malfunction of key cylinder cover ● Malfunction of key interlock cable

Check items described in the column "Probable cause".

ON-VEHICLE SERVICE

ESSENTIAL SERVICE

A/T FLUID CHECK

Caution

When the transmission has been replaced or overhauled, or driving has been carried out under the severe condition, the A/T fluid cooler line flushing should always be carried out and also, the A/T fluid should always be replaced.

1. Drive the vehicle until the A/T fluid temperature rises to the normal temperature (70 - 90°C).
2. Park the vehicle on a level surface.
3. Move the selector lever through all positions to fill the torque converter and the hydraulic circuits with A/T fluid, and then move the selector lever to the N position.
4. After wiping off any dirt around the oil level gauge, remove the oil level gauge and check the condition of the A/T fluid.

NOTE

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

5. Check that the A/T fluid level is at the HOT mark on the oil level gauge. If the A/T fluid level is lower than this, pour in more A/T fluid until the level reaches the HOT mark.

A/T fluid: Dia Queen ATF SP II M or equivalent

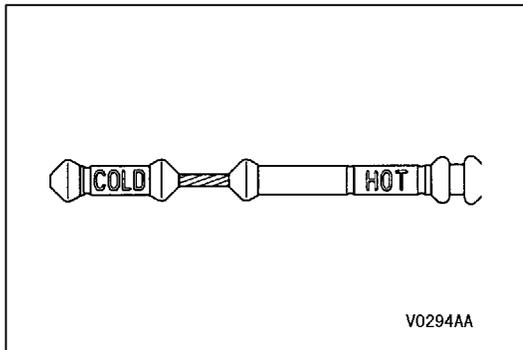
NOTE

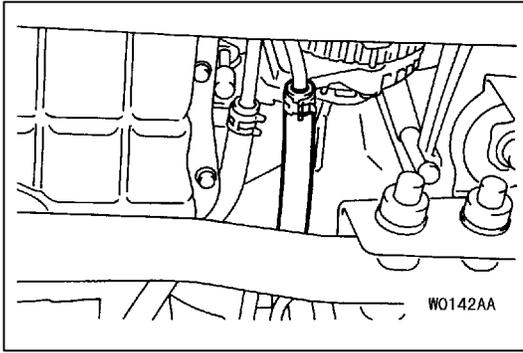
If the A/T fluid level is low, the oil pump will draw in air along with the A/T fluid, which will cause bubbles to form inside the hydraulic circuit. This will in turn cause the hydraulic pressure to drop, which will result in late shifting and slipping of the clutches and brakes.

If there is too much A/T fluid, the gears can churn it up into foam and cause the same conditions that can occur with low A/T fluid levels.

In either case, air bubbles can cause overheating and oxidation of the A/T fluid which can interfere with normal valve, clutch, and brake operation. Foaming can also result in A/T fluid escaping from the transmission vent, in which case it may be mistaken for a leak.

6. Securely insert the oil level gauge.





A/T FLUID REPLACEMENT

Caution

When the transmission has been replaced or overhauled, the A/T fluid cooler line flushing should always be carried out before installing the A/T fluid cooler hose.

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

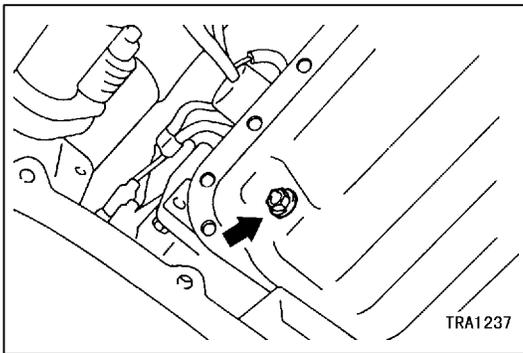
1. Disconnect the hose shown in the illustration which connects the transmission and the oil cooler (inside the radiator).
2. Start the engine and let the A/T fluid drain out.

Running conditions: N range with engine idling

Caution

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

Discharge volume: Approx. 4.0 L



3. Remove the drain plug from the bottom of the transmission case to drain the A/T fluid.

Discharge volume: Approx. 2.0 L

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

Tightening torque: 32 Nm

5. Pour the new A/T fluid in through the oil filler tube.

Adding volume: Approx. 6.0 L

Caution

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

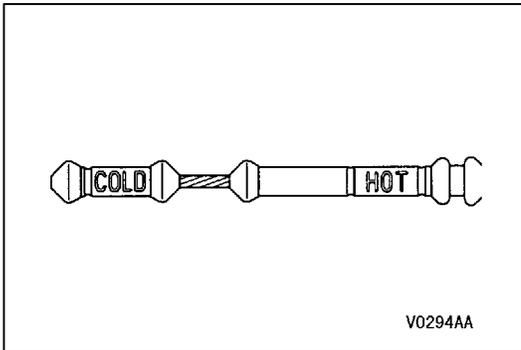
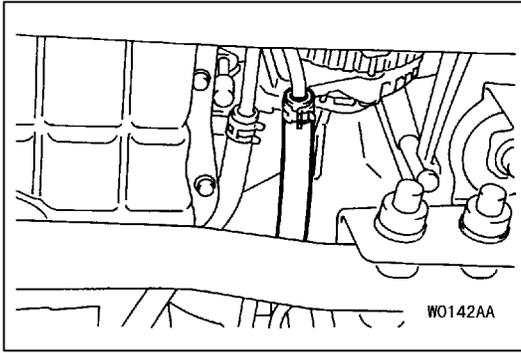
6. Repeat the procedure in step 2.

NOTE

Drain the A/T fluid from the cooler hose 8.0 L, at least. Then drain the A/T fluid a little and check the A/T fluid for dirt. If it has been contaminated, repeat the steps 6 and 7.

7. Pour the new A/T fluid in through the oil filler tube.

Adding volume: Approx. 4.0 L



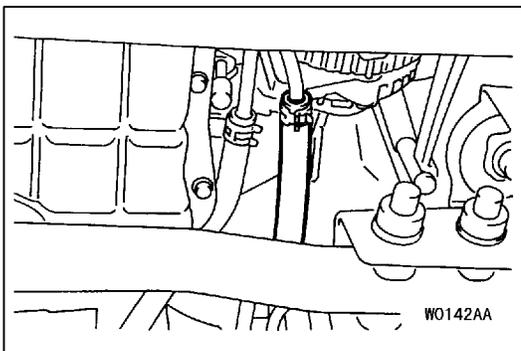
8. Reconnect the hose which was disconnected in step 1 above, and firmly replace the oil level gauge.
9. Start the engine and run it at idle for 1 - 2 minutes.
10. Move the selector lever through all positions, and then move it to the N position.

11. Check that the A/T fluid level is at the COLD mark on the oil level gauge. If the level is lower than this, pour in more A/T fluid.
12. Drive the vehicle until the A/T fluid temperature rises to the normal temperature (70 - 90°C), and then check the A/T fluid level again.
The A/T fluid level must be at the HOT mark.

NOTE

The COLD level is for reference only; the HOT level should be regarded as the standard level.

13. Firmly insert the oil level gauge into the oil filler tube.

**A/T FLUID COOLER LINE FLUSHING****Caution**

When the transmission has been replaced or overhauled, or A/T fluid is contaminated, the A/T fluid cooler line flushing should always be carried out.

1. Disconnect the hose shown in the illustration which connects the transmission and the oil cooler (inside the radiator).
2. Start the engine and let the A/T fluid drain out.

Caution

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

Discharge volume: Approx. 4.0 L

3. Pour the new A/T fluid in through the oil filler tube.

Adding volume: Approx. 4.0 L

Caution

Stop pouring if the 4.0 L of fluid cannot be poured in.

4. Repeat the procedure in step 2.

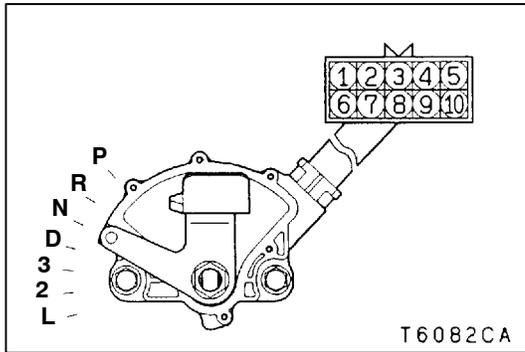
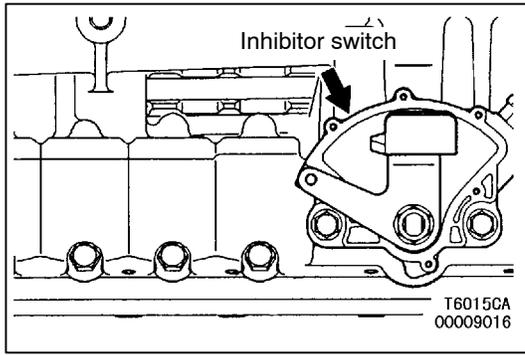
NOTE

Drain the A/T fluid from the cooler hose 8.0 L, at least in step 2. Then drain the A/T fluid a little and check the A/T fluid for dirt. If it has been contaminated, repeat steps 3 and 4.

5. Follow the A/T fluid replacement procedure from step 3.

THROTTLE POSITION SENSOR ADJUSTMENT

Refer to GROUP 13A - On-vehicle Service.

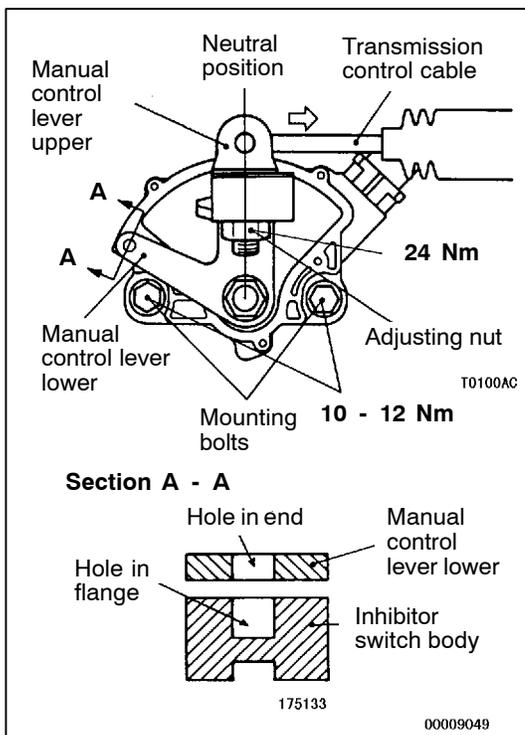


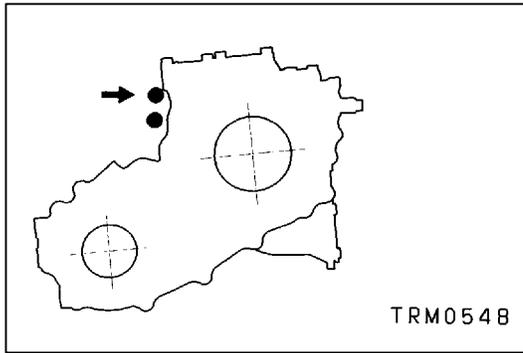
INHIBITOR SWITCH CONTINUITY CHECK

Items	Terminal No.									
	1	2	3	4	5	6	7	8	9	10
P	○						○		○	○
R							○	○		
N		○					○		○	○
D			○				○			
3				○			○			
2					○		○			
L						○	○			

INHIBITOR SWITCH AND CONTROL CABLE ADJUSTMENT

1. Set the selector lever to the “N” position.
2. Loosen the control cable to manual control upper and lower lever adjusting nut to free the cable and lever.
3. Set the manual control lower lever to the neutral position.
4. Loosen the inhibitor switch body mounting bolts and the turn the inhibitor switch body so the hole in the end of the manual control lower lever and the hole (cross section A - A in the figure on the left) in the flange of the inhibitor switch body flange are aligned.
5. Tighten the inhibitor switch body mounting bolts to the specified torque. Be careful at this time that the position of the switch body is not changed.
6. Gently pull the transmission control cable in the direction of the arrow, and then tighten the adjusting nut.
7. Check that the selector lever is in the “N” position.
8. Check that each range on the transmission side operates and functions correctly for each position of the selector lever.

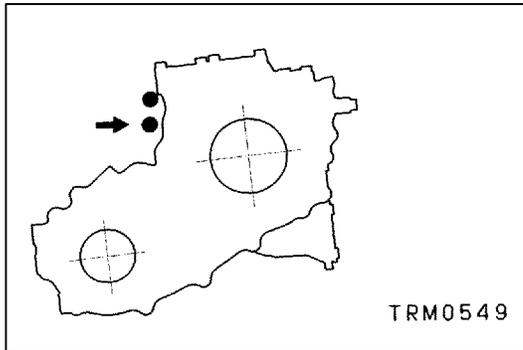




4WD DETECTION SWITCH CONTINUITY CHECK

Check the continuity between terminals of the black connector indicated in the illustration.

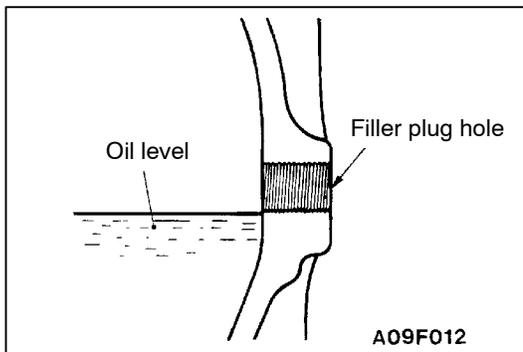
Transfer lever position	Terminal No.	
	1	2
2H		
4H	○	○



HIGH/LOW DETECTION SWITCH CONTINUITY CHECK

Check the continuity between terminals of the gray connector indicated in the illustration.

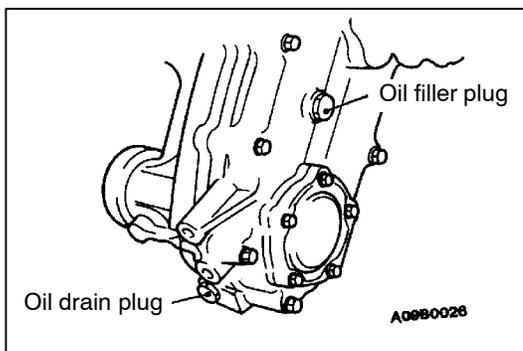
Transfer lever position	Terminal No.	
	1	2
4H	○	○
4L	○	○
4H - 4L		



TRANSFER OIL LEVEL CHECK

Inspect each component for evidence of leakage, and check the oil level by removing the filler plug. If the oil is contaminated, it is necessary to replace it with new oil.

1. Oil level should be at the lower portion of the filler plug hole.
2. Check that the transmission oil is not noticeably dirty, and that it has a suitable viscosity.



TRANSFER OIL REPLACEMENT

1. Remove the oil filler plug and oil drain plug.
2. Drain oil.
3. Tighten the oil drain plug to the specified torque.

Tightening torque: 33 Nm

4. Fill with specified oil till the level comes to the lower portion of the oil filler plug hole.

Specified transmission oil:

Hypoid gear oil SAE 75W-90, 75W-85W or 80W conforming to API GL-4

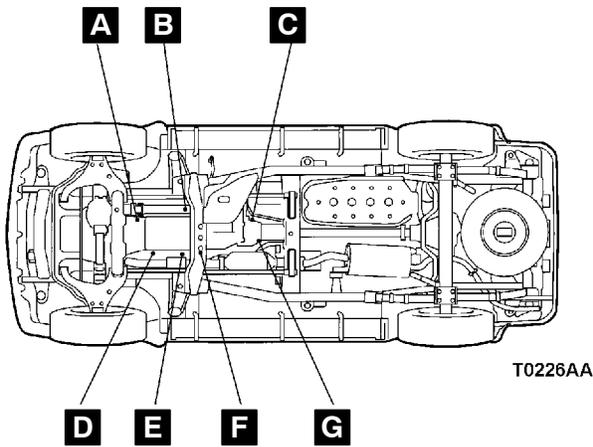
Quantity: 2.8 L

5. Tighten the oil filler plug to the specified torque.

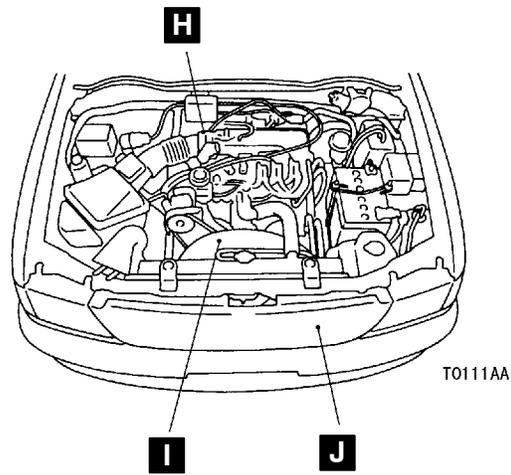
Tightening torque: 33 Nm

A/T CONTROL COMPONENT LOCATION

Name	Symbol	Name	Symbol
A/T control relay	L	Input shaft speed sensor	A
A/T fluid temperature sensor	D	Output shaft speed sensor	F
Crank angle sensor	I	Solenoid valves	E
Diagnosis connector	M	Stop lamp switch	N
Dual pressure switch	J	Throttle position sensor	H
Engine-A/T-ECU	P	Transfer low detection switch	G
Hold switch	K	Vehicle speed sensor	C
Inhibitor switch	B	Wide open throttle switch	O



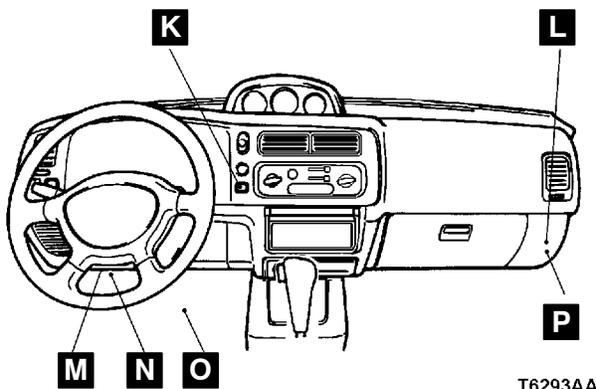
T0226AA



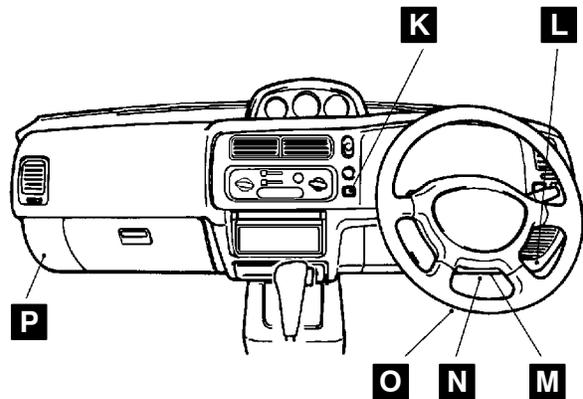
T0111AA

<L.H. drive vehicles>

<R.H. drive vehicles>



T6293AA



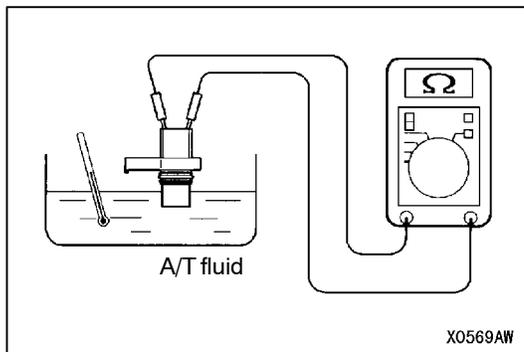
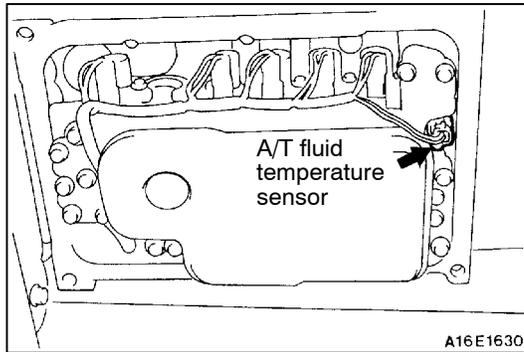
X0447AA

A/T CONTROL COMPONENT CHECK**CRANK ANGLE SENSOR CHECK**

Refer to GROUP 13A - Troubleshooting.

THROTTLE POSITION SENSOR CHECK

Refer to GROUP 13A - On-vehicle Service.

**A/T FLUID TEMPERATURE SENSOR CHECK**

1. Remove the A/T fluid temperature sensor.

2. Measure the resistance between terminals No. 1 and No. 2 of the A/T fluid temperature sensor connector.

Standard value:

A/T fluid temperature (°C)	Resistance (kΩ)
0	16.7 - 20.5
100	0.57 - 0.69

INHIBITOR SWITCH CHECK

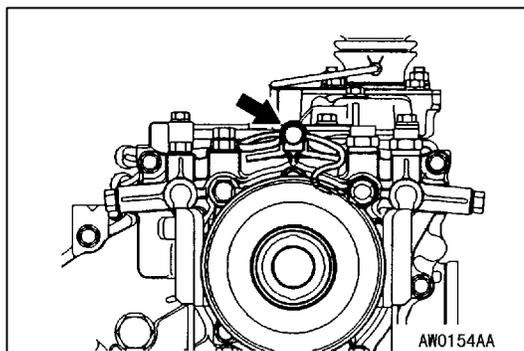
Refer to P.23-49.

STOP LAMP SWITCH CHECK

Refer to GROUP 35A - Brake Pedal.

VEHICLE SPEED SENSOR CHECK

Refer to GROUP 54 - On-vehicle Service.

**TRANSFER LOW DETECTION SWITCH CHECK**

Check the continuity between terminals of the connector indicated in the illustration.

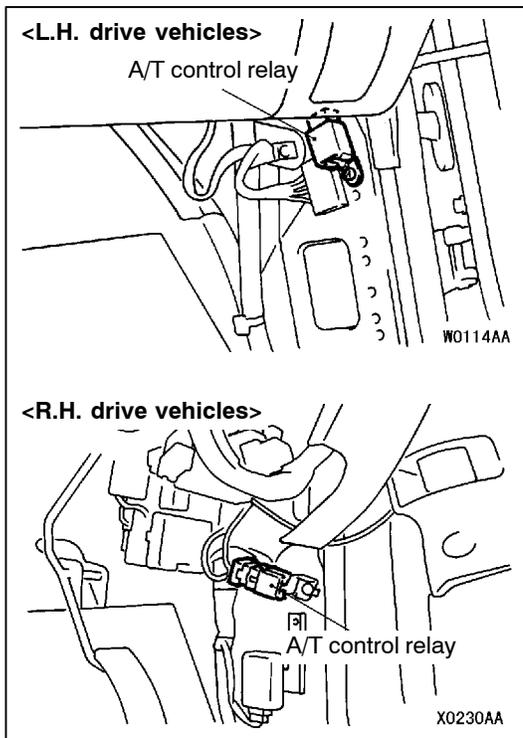
Transfer lever position	Continuity
4H	No continuity
4L	Continuity

DUAL PRESSURE SWITCH CHECK

Refer to GROUP 55 - On-vehicle Service.

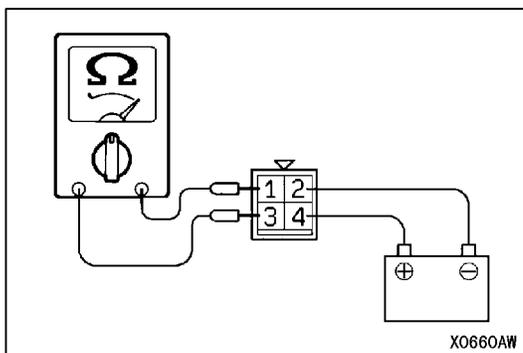
HOLD SWITCH CHECK

Refer to P.23-77.



A/T CONTROL RELAY CHECK

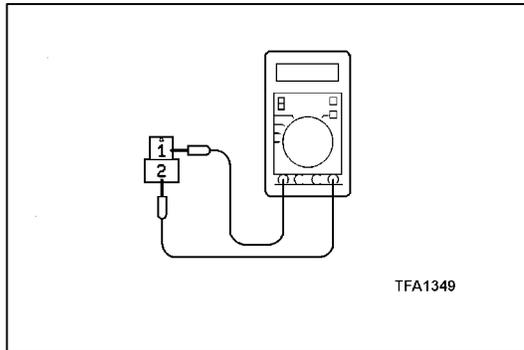
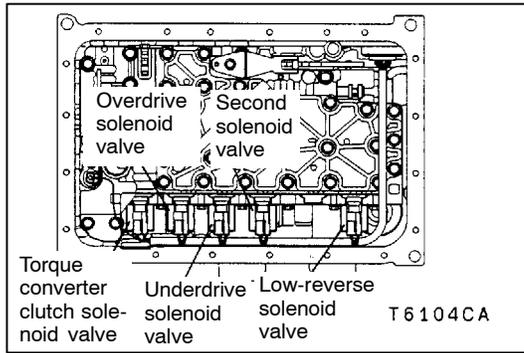
1. Remove the A/T control relay.



2. Use jumper wires to connect A/T control relay terminal 2 to the battery (-) terminal and terminal 4 to the battery (+) terminal.
3. Check the continuity between terminal 1 and terminal 3 of the A/T control relay when the jumper wires are connected to and disconnected from the battery.

Jumper wire	Continuity between terminals No. 1 and No. 3
Connected	Continuity
Disconnected	No continuity

4. If there is a problem, replace the A/T control relay.



SOLENOID VALVE CHECK

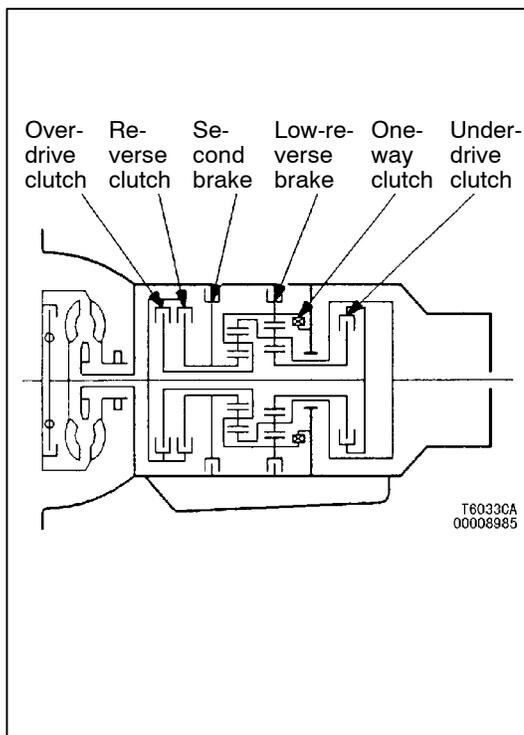
1. Remove the valve body cover.
2. Disconnect the connectors of each solenoid valve.

3. Measure the resistance between terminals 1 and 2 of each solenoid valve.

Standard value:

Name	Resistance
Damper clutch solenoid valve	2.7 - 3.4 Ω (at 20°C)
Low-reverse solenoid valve	
Second solenoid valve	
Underdrive solenoid valve	
Overdrive solenoid valve	

4. If the resistance is outside the standard value, replace the solenoid valve.



TORQUE CONVERTER STALL TEST

This test measures the maximum engine speed when the selector lever is at the D or R position and the torque converter stalls to test the operation of the torque converter (stator and one-way clutch operation) and the holding performance of the clutches and brakes in the transmission.

Caution

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

1. Check the A/T fluid level and temperature and the engine coolant temperature.
 - A/T fluid level: At the HOT mark on the oil level gauge
 - A/T fluid temperature: 70 - 90°C
 - Engine coolant temperature: 80 - 100°C

2. Chock both front wheels (left and right).
3. Pull the parking brake lever on, with the brake pedal fully depressed.
4. Start the engine.
5. Move the selector lever to the D position, fully depress the accelerator pedal and take a reading of the maximum engine speed at this time.

Caution

- (1) The throttle should not be left fully open for any more than eight seconds.
- (2) If carrying out the stall test two or more times, move the selector lever to the N position and run the engine at 1,000 r/min to let the automatic A/T fluid cool down before carrying out subsequent tests.

Standard value

Stall speed: 2,000 - 2,600 r/min

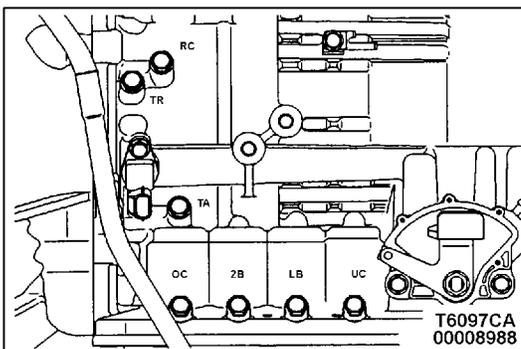
6. Move the selector lever to the R position and carry out the same test again.

Standard value

Stall speed: 2,000 - 2,600 r/min

TORQUE CONVERTER STALL TEST JUDGEMENT RESULTS

1. Stall speed is too high in both D and R ranges
 - Low line pressure
 - Low-reverse brake slippage and malfunction of one-way clutch
2. Stall speed is too high in D range only
 - Underdrive clutch slippage
3. Stall speed is too high in R range only
 - Reverse clutch slippage
4. Stall speed too low in both D and R ranges
 - Malfunction of torque converter
 - Insufficient engine output

**HYDRAULIC PRESSURE TEST**

1. Warm up the engine until the automatic transmission fluid temperature is 70 - 90°C.
2. Jack up the vehicle so that the wheels are free to turn.
3. Connect the special tools (2,942 kPa oil pressure gauge [MD998330] and joints [MD998332, MD998900]) to each pressure discharge port.

4. Measure the hydraulic pressure at each port under the conditions given in the standard hydraulic pressure table, and check that the measured values are within the standard value ranges.

NOTE

RC:Reverse clutch pressure port

TR:Torque converter pressure port

TA: Damper clutch application pressure port

OC:Overdrive clutch pressure port

2B: Second brake pressure port

LB: Low-reverse brake pressure port

UC:Underdrive clutch pressure port

5. If a value is outside the standard range, correct the problem while referring to the hydraulic pressure test diagnosis table.

STANDARD HYDRAULIC PRESSURE TEST

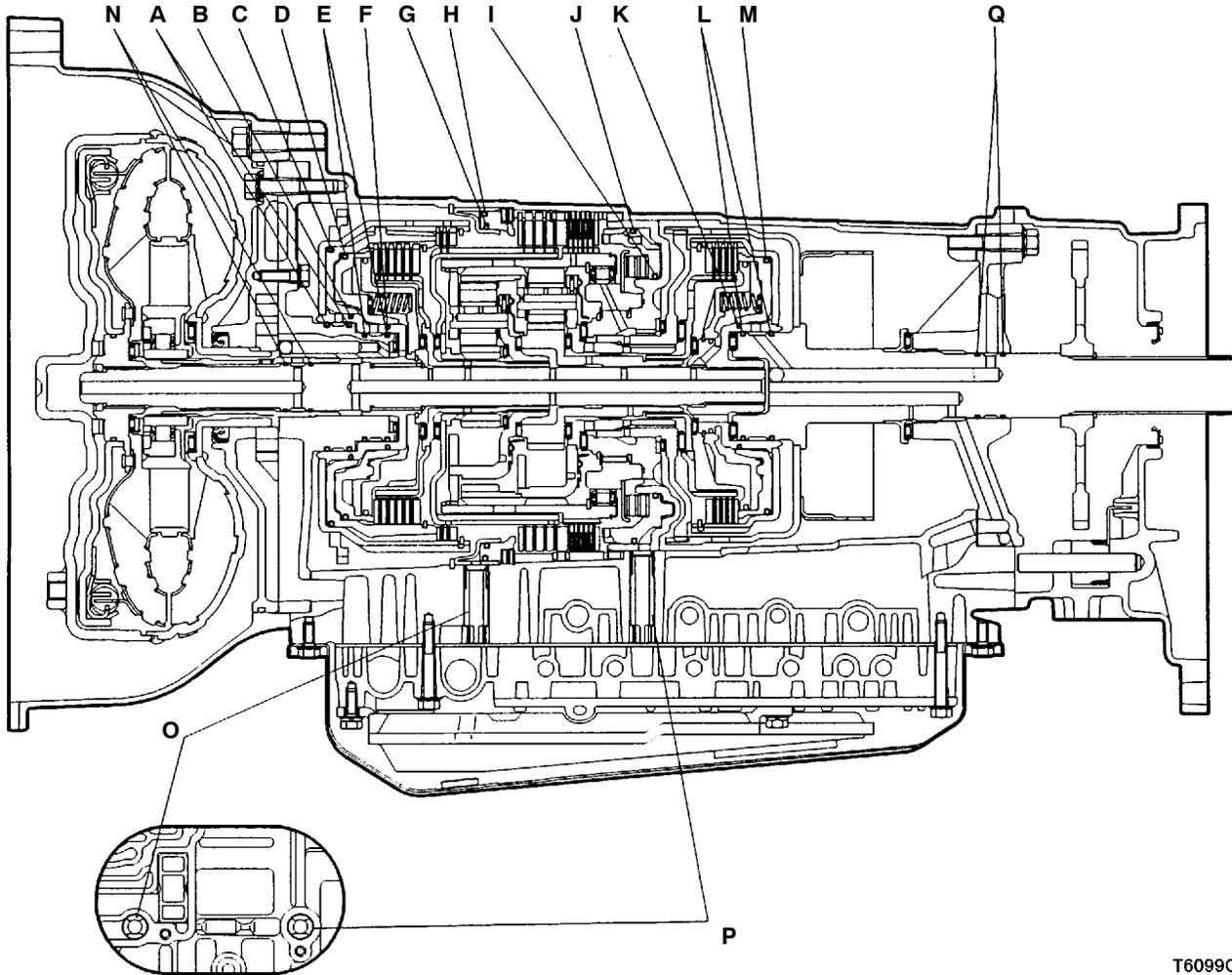
Measurement condition			Standard hydraulic pressure kPa					
Selector lever position	Shift position	Engine speed (r/min)	Under-drive clutch pressure	Reverse clutch pressure	Overdrive clutch pressure	Low and reverse brake pressure	Second brake pressure	Torque converter pressure
P	-	2,500	-	-	-	260 - 340	-	500 - 700
R	Reverse	2,500	-	1,270 - 1,770	-	1,270 - 1,770	-	500 - 700
N	-	2,500	-	-	-	260 - 340	-	500 - 700
L	1st gear	2,500	1,010 - 1,050	-	-	1,010 - 1,050	-	500 - 700
2	2nd gear	2,500	1,010 - 1,050	-	-	-	1,010 - 1,050	500 - 700
3	3rd gear	2,500	780 - 880	-	780 - 880	-	-	-
D	4th gear	2,500	-	-	780 - 880	-	780 - 880	-

HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE

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

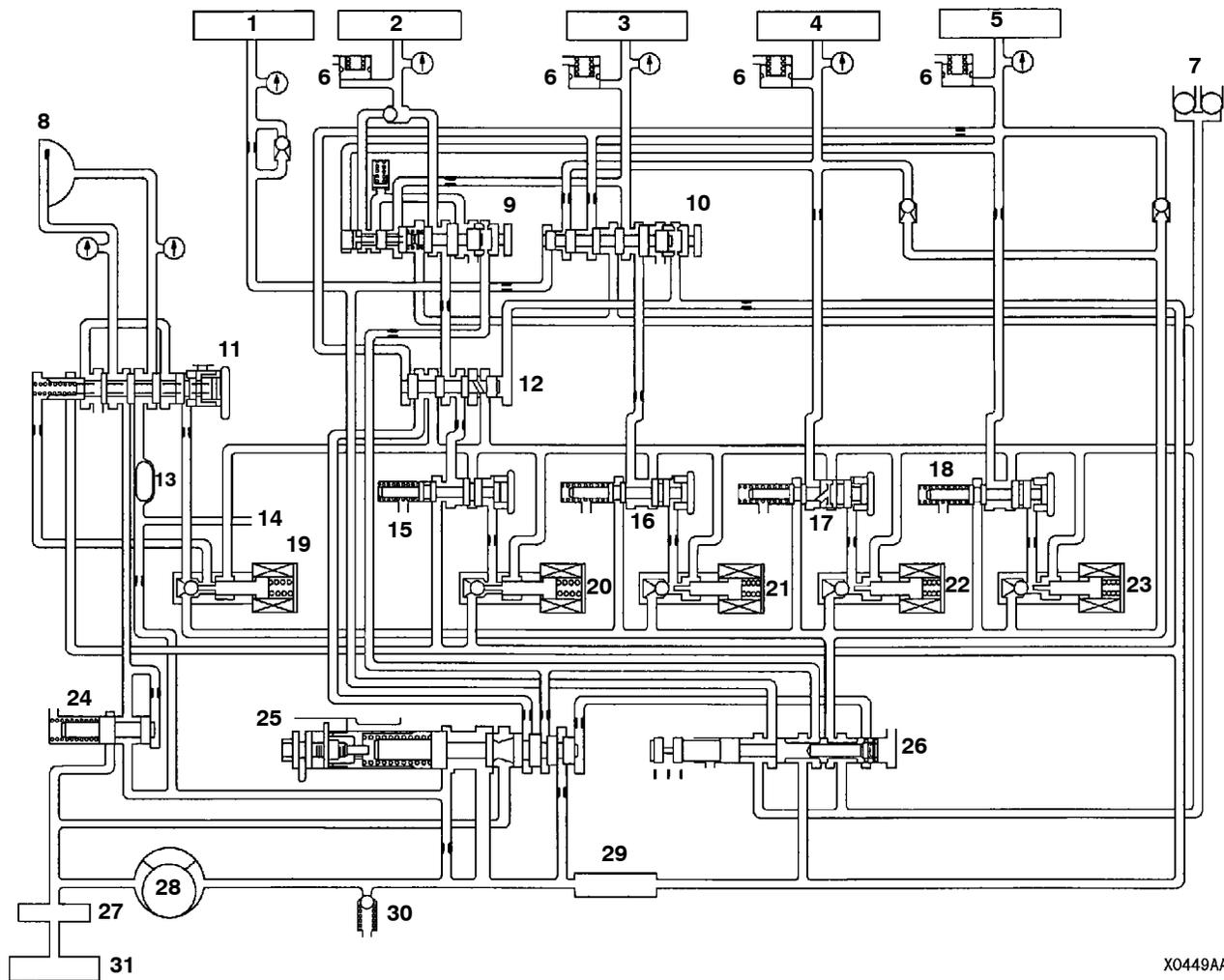
Trouble symptom	Probable cause
Only low and reverse hydraulic pressure is abnormal.	Malfunction of the oil seal I, J, P
	Malfunction of the low-reverse solenoid valve
	Malfunction of the low-reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve A
	Malfunction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

OIL SEAL LAYOUT



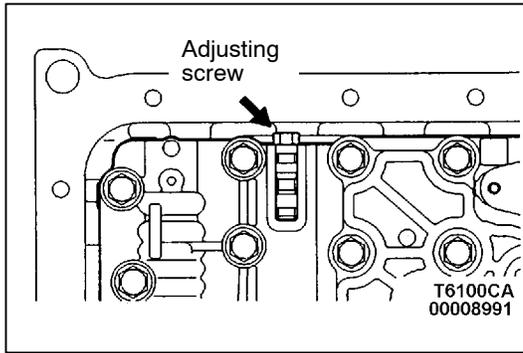
T6099CA
0008989

HYDRAULIC CIRCUIT PARKING AND NEUTRAL



X0449AA

- | | |
|-------------------------------------------|---------------------------------------------|
| 1. Reverse clutch | 17. Underdrive pressure control valve |
| 2. Low-reverse brake | 18. Overdrive pressure control valve |
| 3. Second brake | 19. Torque converter clutch solenoid |
| 4. Underdrive clutch | 20. Low-reverse solenoid valve |
| 5. Overdrive clutch | 21. Second solenoid valve |
| 6. Accumulator | 22. Underdrive solenoid valve |
| 7. Check ball | 23. Overdrive solenoid valve |
| 8. Torque converter clutch | 24. Torque converter pressure control valve |
| 9. Fail safe valve A | 25. Regulator valve |
| 10. Fail safe valve B | 26. Manual valve |
| 11. Torque converter clutch control valve | 27. Oil filter |
| 12. Switch valve | 28. Oil pump |
| 13. A/T fluid cooler | 29. Oil strainer |
| 14. Lubrication | 30. Relief valve |
| 15. Low-reverse pressure control valve | 31. Oil pan |
| 16. Second pressure control valve | |



LINE PRESSURE ADJUSTMENT

1. Discharge the A/T fluid, and then remove the valve body cover.
2. Turn the adjusting screw shown in the illustration at left to adjust the underdrive pressure to the standard value. The pressure increases when the screw is turned to the left.

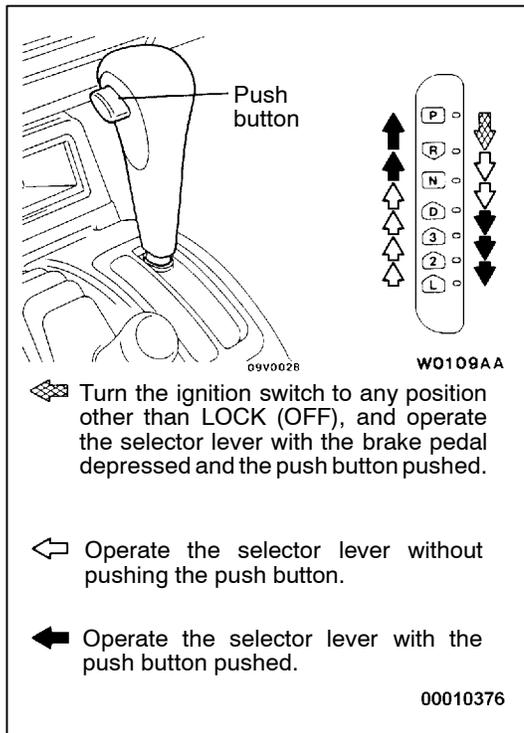
NOTE

Adjust to the middle of the standard range when the transmission is at the 1st or 2nd gear.

Standard value: 1,010 - 1,050 kPa

Change in pressure for each turn of the adjusting screw:
35 kPa

3. Install the valve body cover, and pour in the standard volume of A/T fluid.
4. Carry out a hydraulic pressure test. (Refer to P.23-55.)
Readjust the line pressure if necessary.



SELECTOR LEVER OPERATION CHECK

1. Apply the parking brake lever.
2. Move the selector lever from N position to each of D, 2 and L positions to check that the selector lever moves smoothly.
3. Check that the engine starts when the selector lever is in each of N and P positions, and that the engine does not start when the selector lever is in positions other than N and P.
4. Start the engine and release the parking brake. Check that the vehicle moves forward when the selector lever is moved from N position to each of D, 2 and L positions, and moves backward when the selector lever is moved to R position.
5. Stop the engine.
6. Turn the ignition switch to ON position. Check that the backup lamp illuminates and the buzzer sounds when the selector lever is moved from P position to R position.

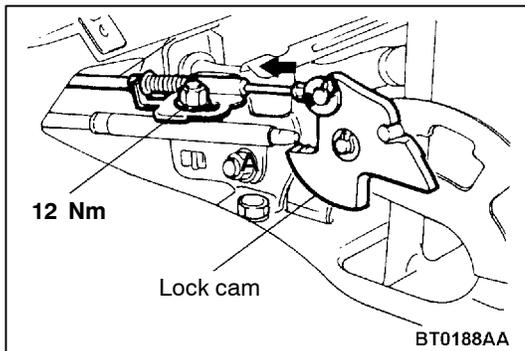
NOTE

Because of the inclusion of an A/T mis-operation prevention device, the selector lever cannot be moved from the P position to an other position unless you turn the ignition key to a position other than LOCK (OFF) and depress the brake pedal first.

KEY INTERLOCK MECHANISM CHECK

1. Carry out the following inspection:

Inspection procedure	Requirements	Normal condition	
1	Brake pedal: Depressed	Ignition key: LOCK (OFF) or removed	The selector lever push button can not be pushed, and the selector lever should not be moved from P position.
2		Ignition key: Other than above	If the selector lever push button is pushed, the selector lever can be moved from P position.
3	Brake pedal: Not depressed	Selector lever: Other than P	The ignition key can not be turned to LOCK (OFF) position.
4		Selector lever: P	The ignition key can be turned to LOCK (OFF) position.



2. If there is a problem on the inspection above, adjust the key interlock cable as follows:
 - (1) Remove the rear floor console. (Refer to GROUP 52A.)
 - (2) Move the selector lever to P position.
 - (3) Turn the ignition key to LOCK (OFF) position.
 - (4) Loosen the key interlock cable fixing nut.
 - (5) Tighten the key interlock cable fixing nut to the specified torque with the lock cam pushed in the direction A (shown in the illustration).

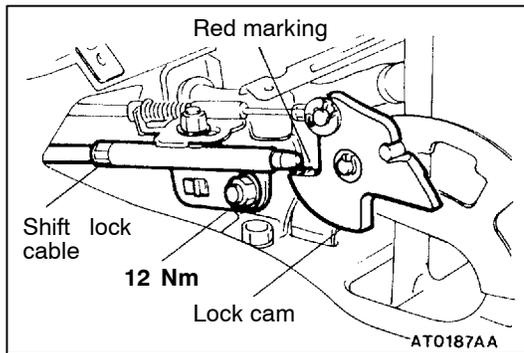
Tightening torque: 12 Nm

- (6) Install the rear floor console. (Refer to GROUP 52A.)

SHIFT LOCK MECHANISM CHECK

1. Carry out the following inspection:

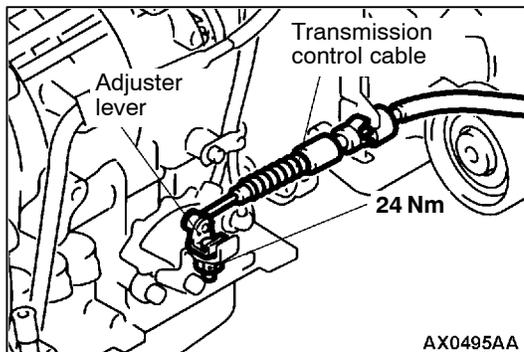
Inspection procedure	Requirements		Normal condition
1	Brake pedal: Depressed	Ignition key: ACC	If the selector lever push button is not pushed, the selector lever can not be moved from P position.
2			If the selector lever push button is pushed, the selector lever can be moved from P position.
3	Brake pedal: Not depressed		If the selector lever push button is pushed, the selector lever can be moved from R position to P position.



2. If there is a problem on the inspection above, adjust the shift lock cable as follows:
 - (1) Remove the rear floor console. (Refer to GROUP 52A.)
 - (2) Move the selector lever to P position.
 - (3) Loosen the shift lock cable fixing nut.
 - (4) Move the shift lock cable to position the shift lock cable end above the red marking painted on the lock cam, and then tighten the shift lock cable fixing nut to the specified torque.

Tightening torque: 12 Nm

- (5) Install the rear floor console. (Refer to GROUP 52A.)



TRANSMISSION CONTROL CABLE ADJUSTMENT

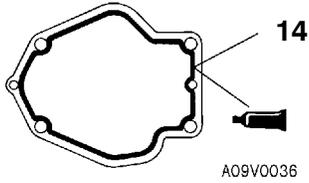
1. Move the selector lever to N position, and set the transmission lever to N position.
2. Loosen the fixing nut. Adjust the adjuster lever position so that the transmission control cable will be tight, and then tighten the fixing nut to the specified torque.

Tightening torque: 24 Nm

TRANSMISSION CONTROL

REMOVAL AND INSTALLATION

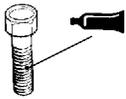
Pre-removal and Post-installation Operation
 Floor console assembly removal and installation
 (Refer to GROUP 52A - Floor Consol.)



14
 A09V0036

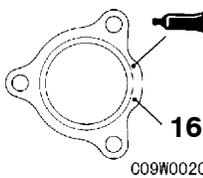
Sealant:
 3M ATD Part No. 8661 or equivalent

Control lever assembly mounting bolt



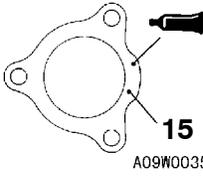
B09E0031

Adhesive:
 3M Stud Locking No. 4710 or equivalent



16
 C09W0020

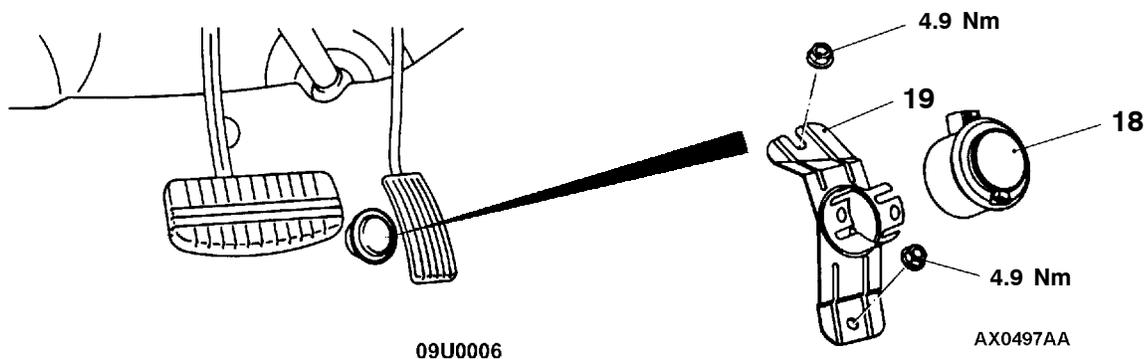
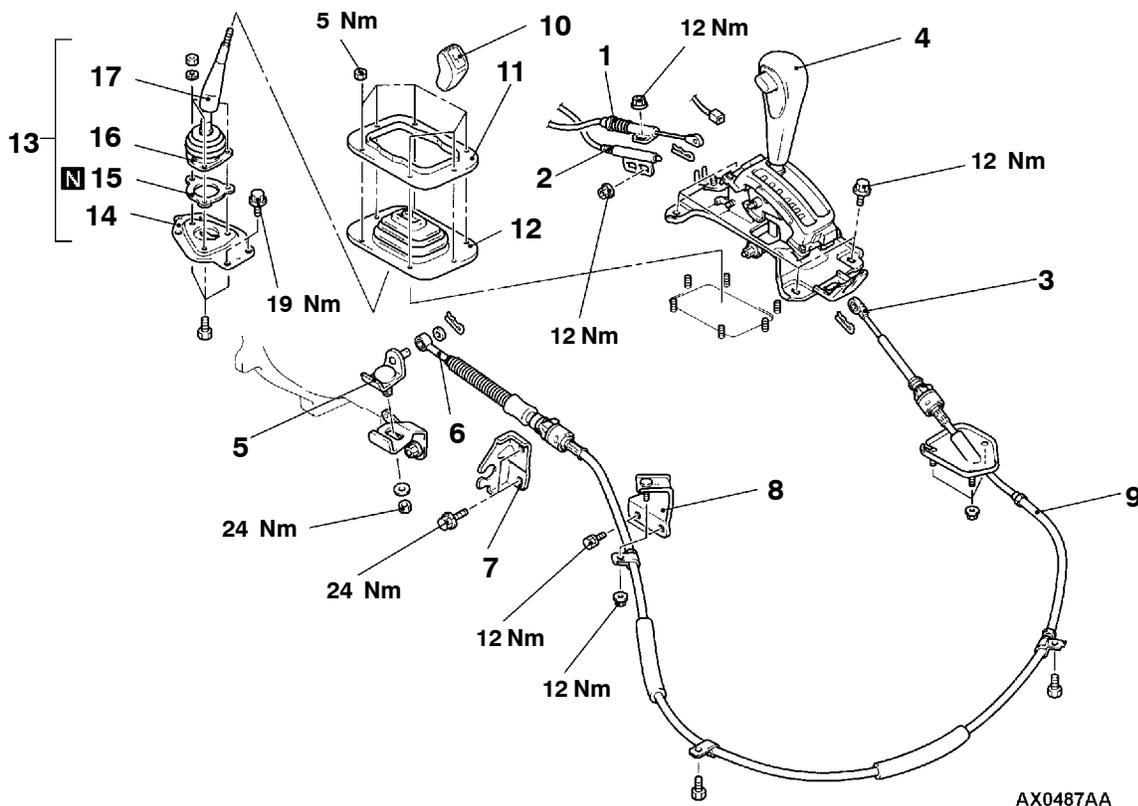
Apply sealant to contact surface with transfer control lever



15
 A09W0035

Apply sealant to both sides

Sealant:
 3M ATD Part No. 8661 or equivalent



Selector lever assembly removal steps

1. Key interlock cable connection
2. Shift lock cable connection
3. Transmission control cable connection (selector lever assembly side)
4. Selector lever assembly

Transmission control cable assembly removal steps

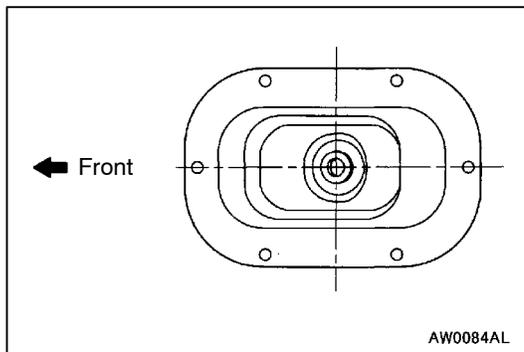
3. Transmission control cable connection (selector lever assembly side)
5. Upper lever
6. Transmission control cable connection (transmission side)
7. Cable end bracket
8. Cable bracket
9. Transmission control cable assembly

Transfer control lever assembly removal steps

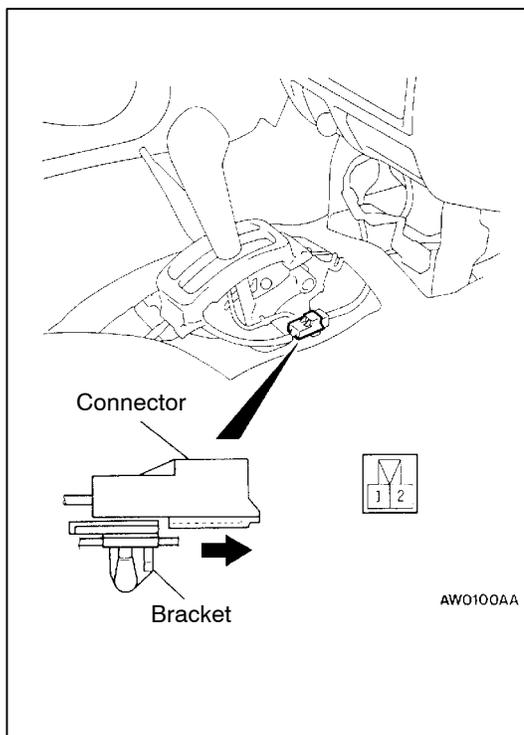
10. Shift lever knob
11. Retainer plate
- ▶A◀ 12. Dust cover
13. Transfer control lever assembly
14. Stopper plate
15. Gasket
16. Spring cover support
17. Transfer control lever

Wide open throttle switch removal steps

18. Wide open throttle switch
19. Wide open throttle switch bracket <L.H. drive vehicles>

**INSTALLATION SERVICE POINT****▶A◀ DUST COVER INSTALLATION**

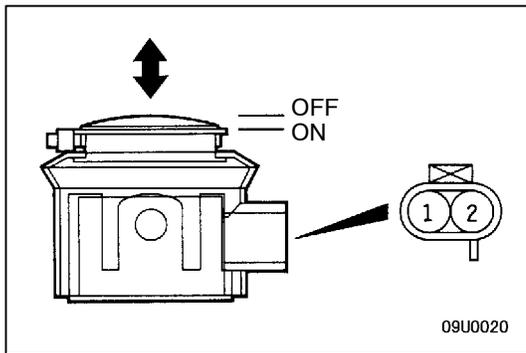
Install the dust cover as shown in the illustration.

**INSPECTION**

Move the connector in the direction of the arrow and remove it from the bracket.

POSITION INDICATOR LAMP CHECK

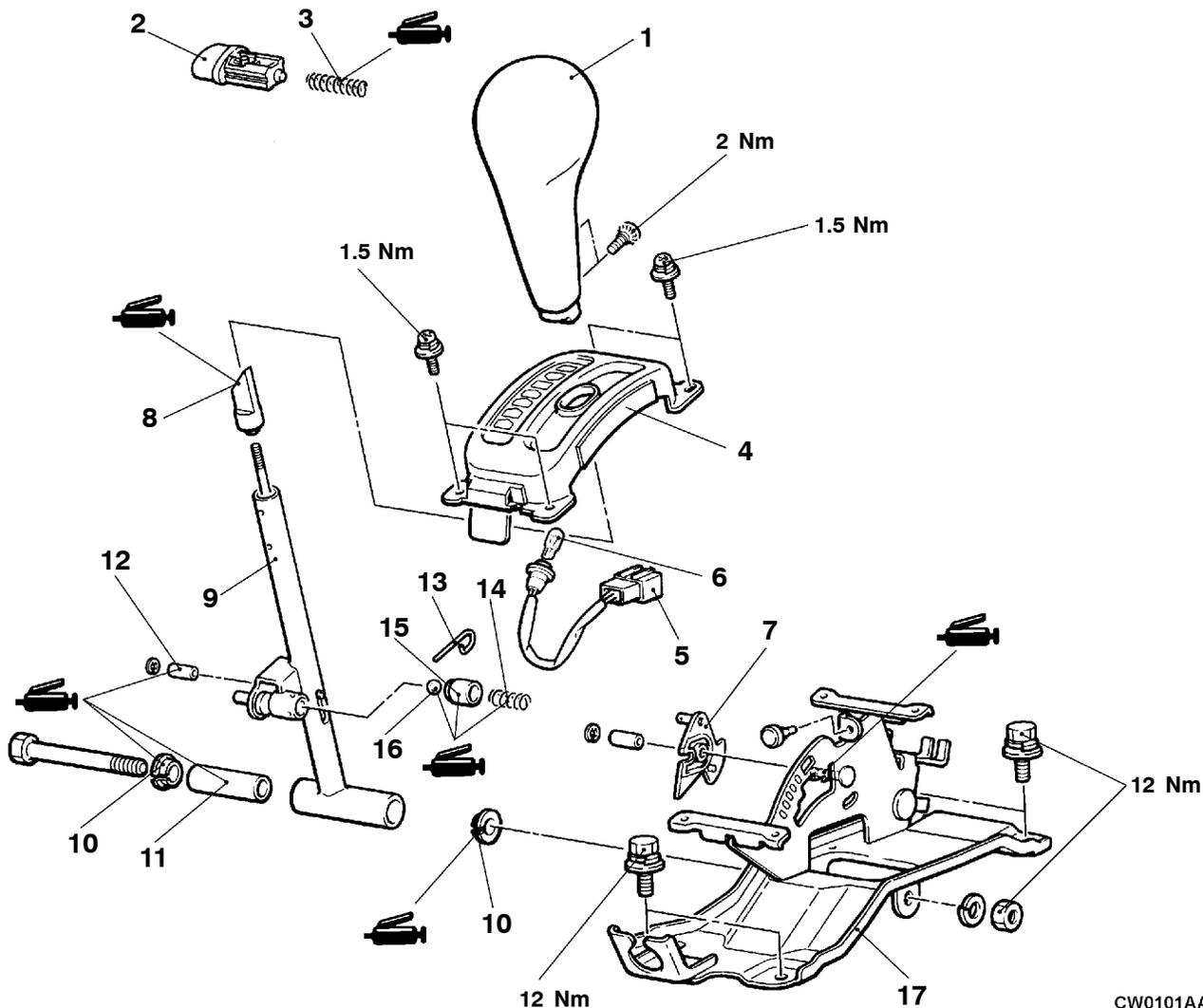
Check requirement	Terminal No.	
	1	2
Always	○	○



WIDE OPEN THROTTLE SWITCH CHECK

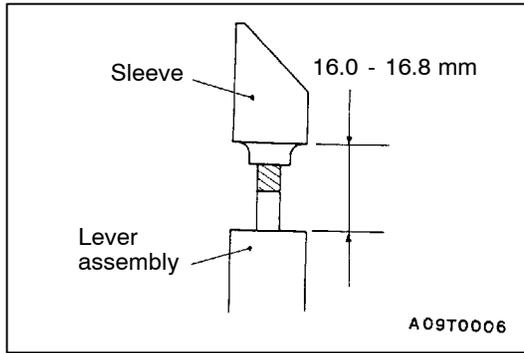
Switch position	Terminal No.	
	1	2
OFF		
ON	○	○

SELECTOR LEVER ASSEMBLY
DISASSEMBLY AND REASSEMBLY



Disassembly steps

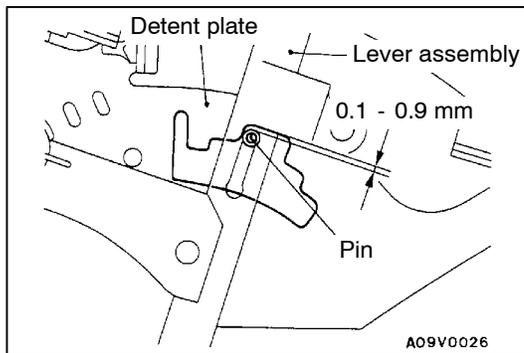
- ▶B▶ 1. Shift knob
- 2. Button
- 3. Spring
- 4. Indicator panel assembly
- 5. Position indicator socket assembly
- 6. Bulb
- 7. Lock cam
- ▶A▶ 8. Sleeve
- 9. Lever assembly
- 10. Shift bushing
- 11. Inner pipe
- 12. Collar
- 13. Pin
- 14. Ball spring
- 15. Ball support
- 16. Ball
- 17. Bracket



REASSEMBLY SERVICE POINTS

►A◄ SLEEVE INSTALLATION

Shift the selector lever to the N position, and then turn the sleeve so that the clearance between the sleeve and lever assembly end is within the dimension shown in the illustration.



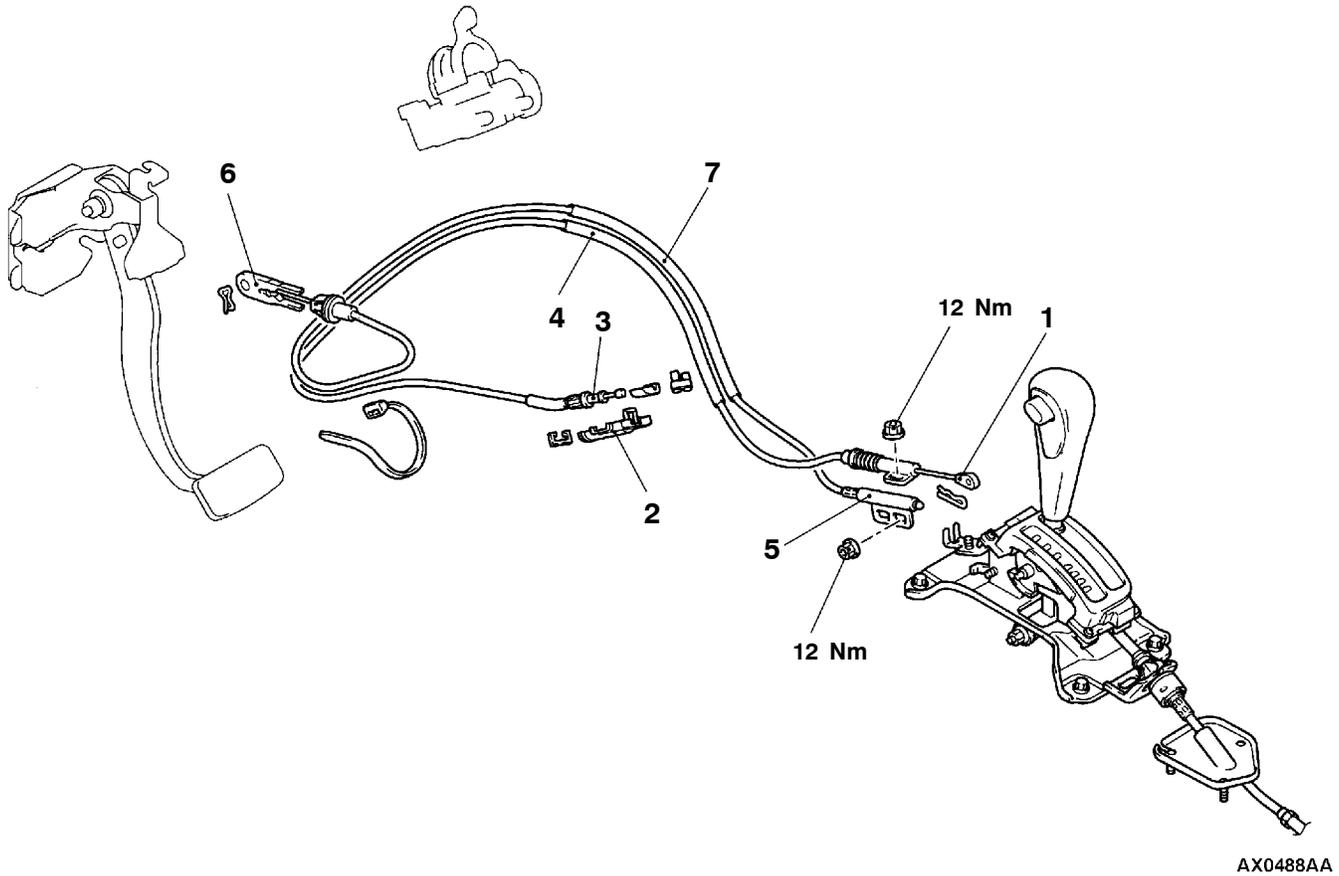
►B◄ SHIFT KNOB INSTALLATION

Shift the selector lever to the N position. Install the shift knob and then turn the sleeve so that the clearance between the detent plate and pin is within the dimension shown in the illustration.

A/T KEY INTERLOCK AND SHIFT LOCK MECHANISMS

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
 Floor console assembly removal and installation
 (Refer to GROUP 52A - Floor Console.)

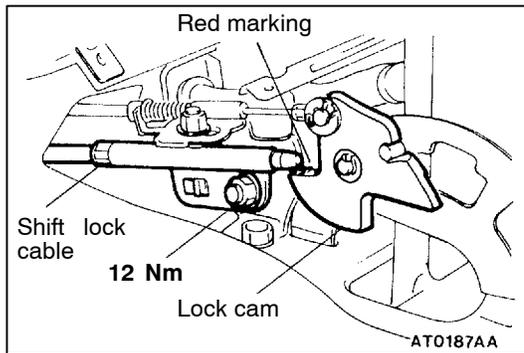


Key interlock cable removal steps

- Knee protector assembly
- Lower column cover
- ▶C◀ 1. Key interlock cable connection (selector lever side)
- 2. Cover
- ▶B◀ 3. Key interlock cable connection (steering lock cylinder side)
- 4. Key interlock cable

Shift lock cable removal steps

- ▶A◀ 5. Shift lock cable connection (selector lever side)
- 6. Shift lock cable connection (brake pedal side)
- 7. Shift lock cable



INSTALLATION SERVICE POINTS

▶A◀ SHIFT LOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

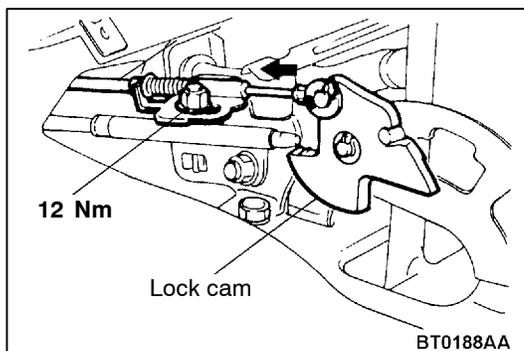
1. Move the selector lever to P position.
2. Move the shift lock cable to position the shift lock cable end above the red marking painted on the lock cam, and then tighten the shift lock cable fixing nut to the specified torque.

Tightening torque: 12 Nm

3. Check that the shift lock mechanism operates normally. (Refer to P.23-63.)

▶B◀ KEY INTERLOCK CABLE (STEERING LOCK CYLINDER SIDE) INSTALLATION

Turn the ignition key to LOCK (OFF) position, and then install the key interlock cable.



▶C◀ KEY INTERLOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

1. Move the selector lever to P position.
2. Turn the ignition key to LOCK (OFF) position.
3. Connect the key interlock cable end to the lock cam.
4. Install the key interlock cable temporarily.
5. Tighten the key interlock cable fixing nut to the specified torque with the lock cam pushed in the direction A (shown in the illustration).

Tightening torque: 12 Nm

6. Check that the key interlock mechanism operates normally. (Refer to P.23-62.)

TRANSMISSION ASSEMBLY

REMOVAL AND INSTALLATION

Caution

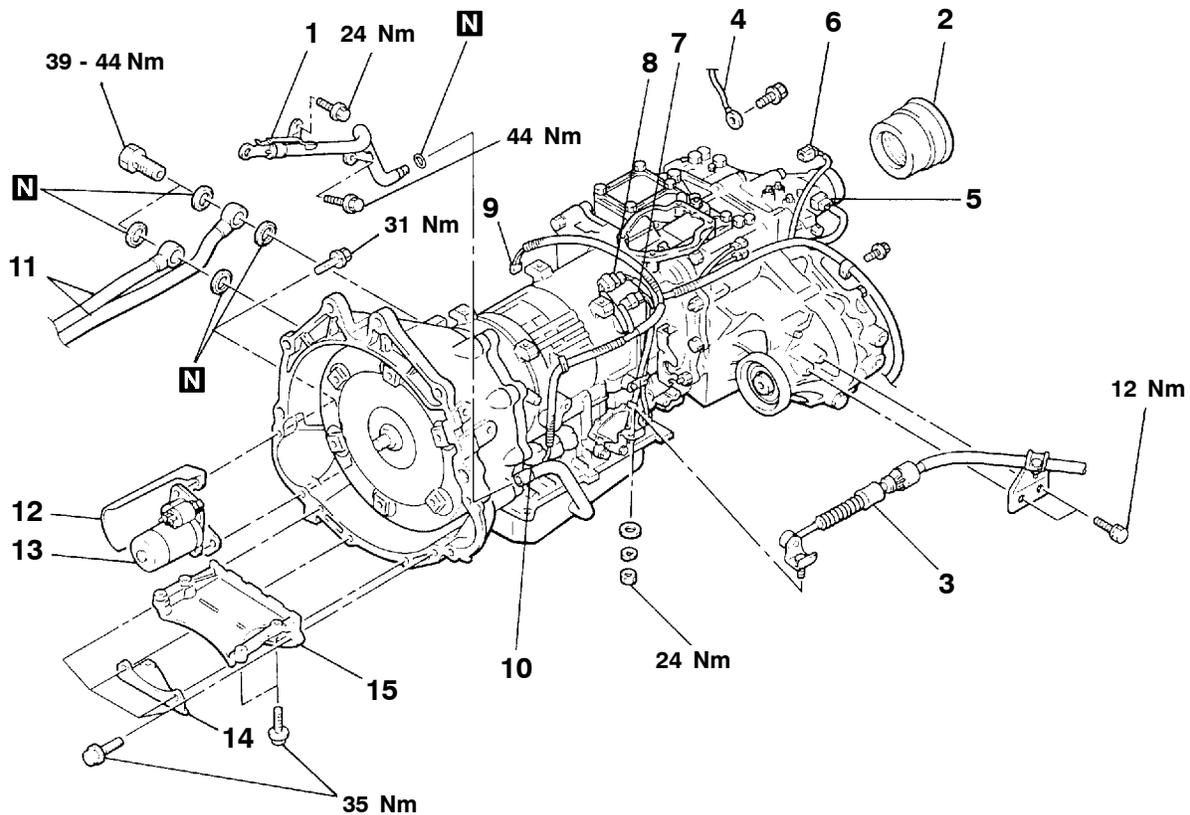
*: Indicates parts which should be initially tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.

Pre-removal Operation

- Transfer Case Protector and Under Cover Removal
- A/T Fluid Draining (Refer to P.23-46.)
- Propeller Shaft Removal
- Catalytic Converter and Front Exhaust Pipe Removal (Refer to GROUP 15 - Exhaust Pipe and Main Muffler.)
- Intercooler Assembly Removal

Post-installation Operation

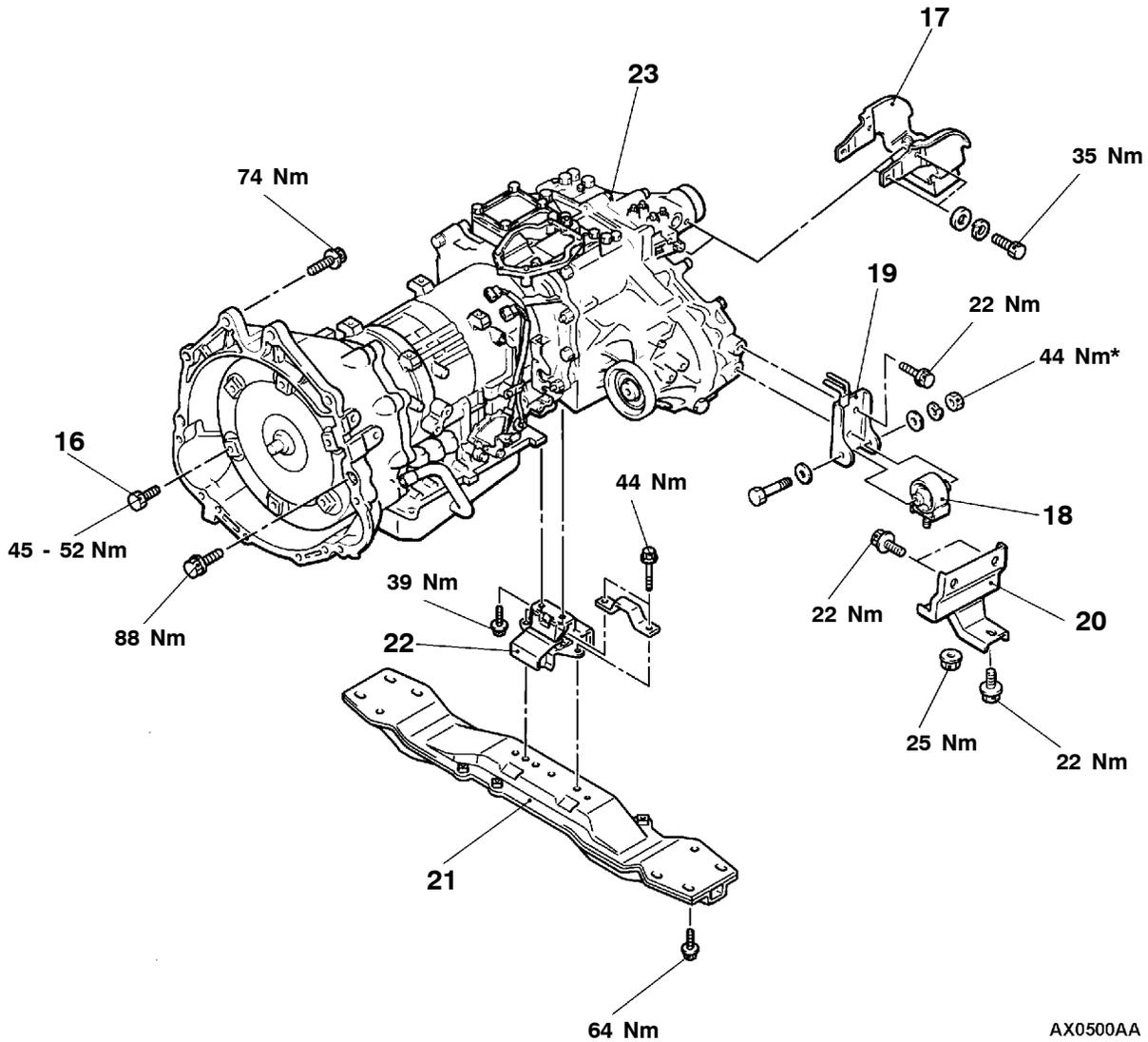
- Catalytic Converter and Front Exhaust Pipe Installation (Refer to GROUP 15 - Exhaust Pipe and Main Muffler.)
- Propeller Shaft Installation
- A/T Fluid Filling (Refer to P.23-46.)
- Transfer Case Protector and Under Cover Installation
- Selector Lever Operation (Refer to P.23-62.)
- Intercooler Assembly Installation



AX0086AA

Removal steps

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>➡ B ◀</p> <ol style="list-style-type: none"> 1. Filler tube assembly 2. Dust shield cover 3. Transmission control cable 4. Ground cable connection 5. Speed sensor connection 6. High/low detection switch connection 7. Inhibitor switch connection 8. Solenoid valve connection | <p>◀ A ▶</p> <ol style="list-style-type: none"> 9. Output shaft speed sensor connection 10. Input shaft speed sensor connection 11. Oil cooler tube 12. Starter cover 13. Starter motor 14. Exhaust pipe bracket 15. Transmission stay |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



AX0500AA



16. Torque converter and drive plate connection bolts
17. Dynamic damper assembly
- Support the transmission with A transmission jack
18. Transfer roll stopper



19. Transfer mount bracket
20. Transfer support bracket
21. No. 2 crossmember
22. Engine mounting insulator
23. Transmission assembly

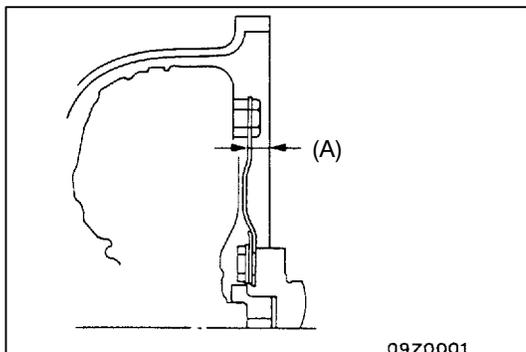
REMOVAL SERVICE POINTS

◀A▶ STARTER MOTOR REMOVAL

Remove the starter motor with the starter motor harnesses still connected, and secure it inside the engine compartment.

◀B▶ TORQUE CONVERTER AND DRIVE PLATE CONNECTION

1. Remove the 6 connection bolts while turning the crankshaft.
2. Press in the torque converter to the transmission side so that the torque converter does not remain inserted in the engine side of the drive plate.

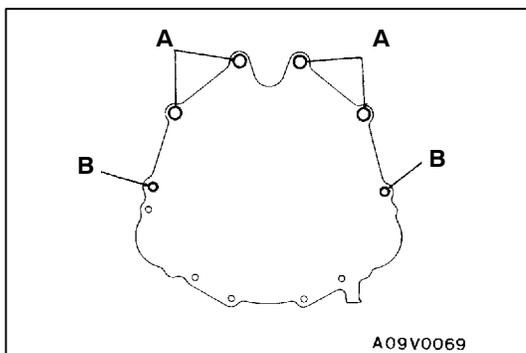


INSTALLATION SERVICE POINTS

▶A▶ TRANSMISSION ASSEMBLY INSTALLATION

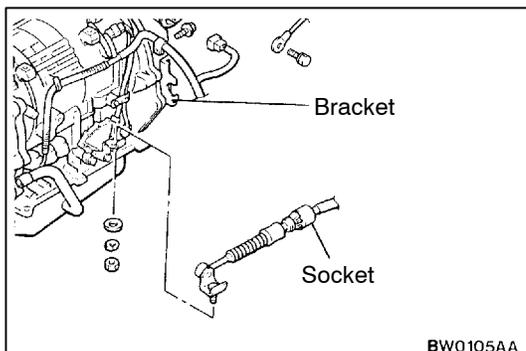
1. Press the torque converter into the transmission properly, and then assemble the transmission assembly into the engine.

Standard value (A): 20.9 mm



2. The size of the mounting bolts are different. So be sure not to confuse them.

Bolt	Diameter × Length mm
A	12 × 40
B	12 × 55



▶B▶ TRANSMISSION CONTROL CABLE INSTALLATION

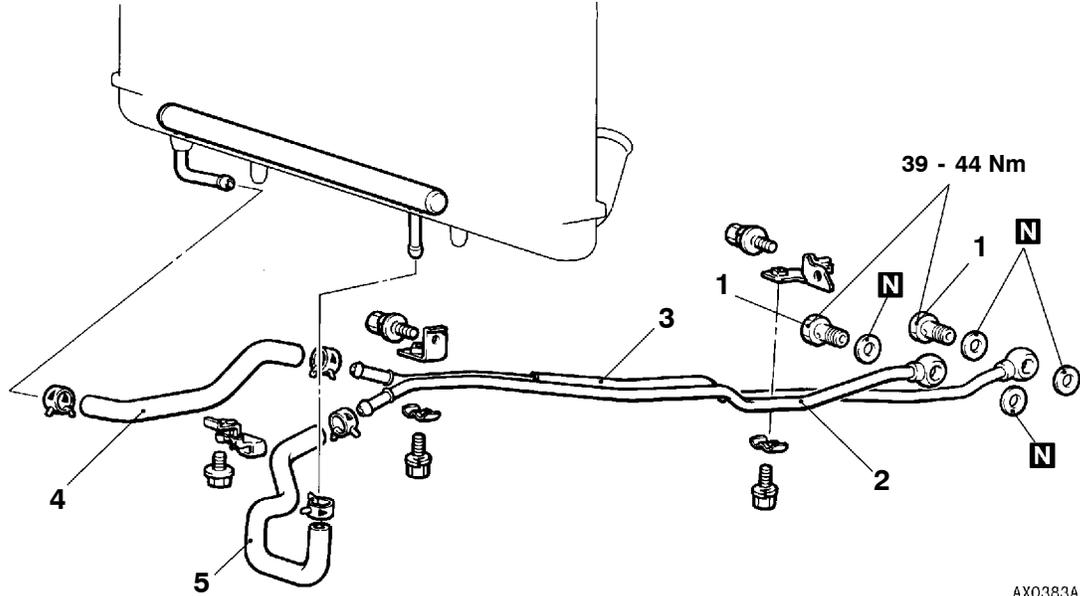
Caution
Clamp the control cable socket into the transmission bracket securely.

TRANSMISSION OIL COOLER

REMOVAL AND INSTALLATION

Pre-removal and Post-installation operation

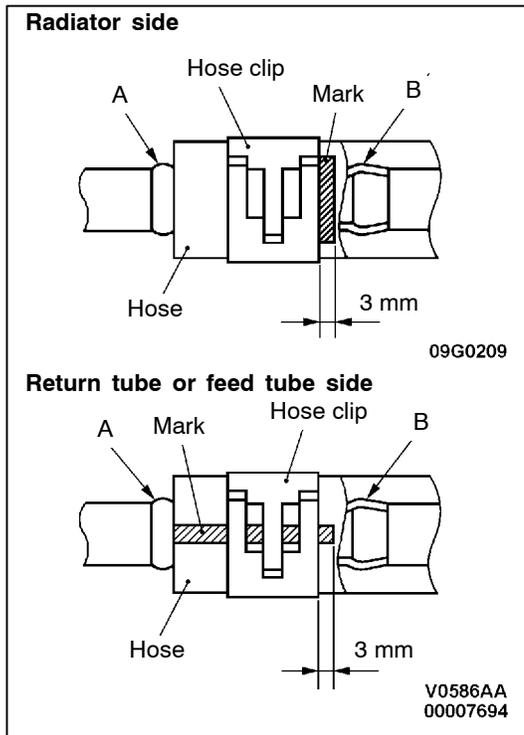
- Draining and Filling A/T Fluid (Refer to P.23-46.)
- Under Cover Removal and Installation



AX0383AA

Removal steps

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>▶A◀</p> <ol style="list-style-type: none"> 1. Eye bolt 2. Return tube 3. Feed tube 4. Feed hose | <p>▶A◀</p> <ol style="list-style-type: none"> 5. Return hose 6. Oil cooler bracket 7. Oil cooler assembly 8. Oil cooler tube assembly |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



INSTALLATION SERVICE POINT

▶A◀ RETURN HOSE/FEED HOSE INSTALLATION

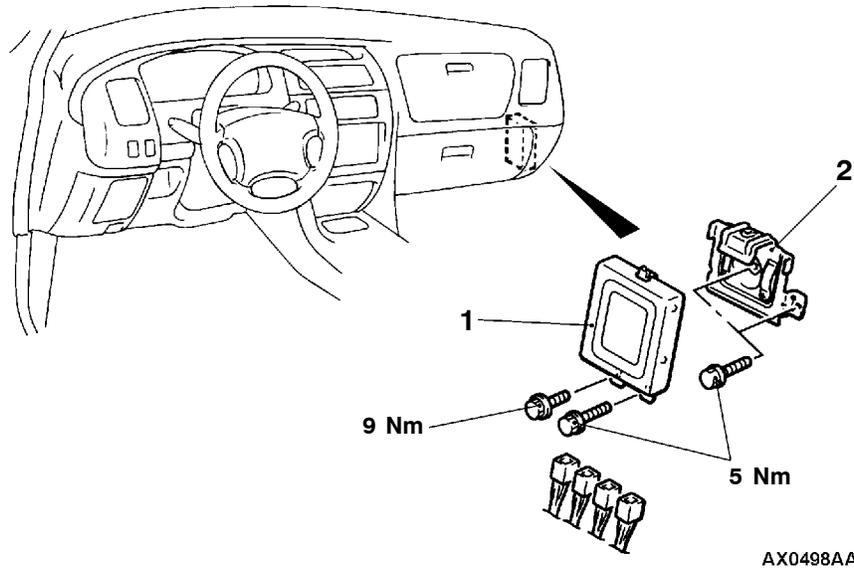
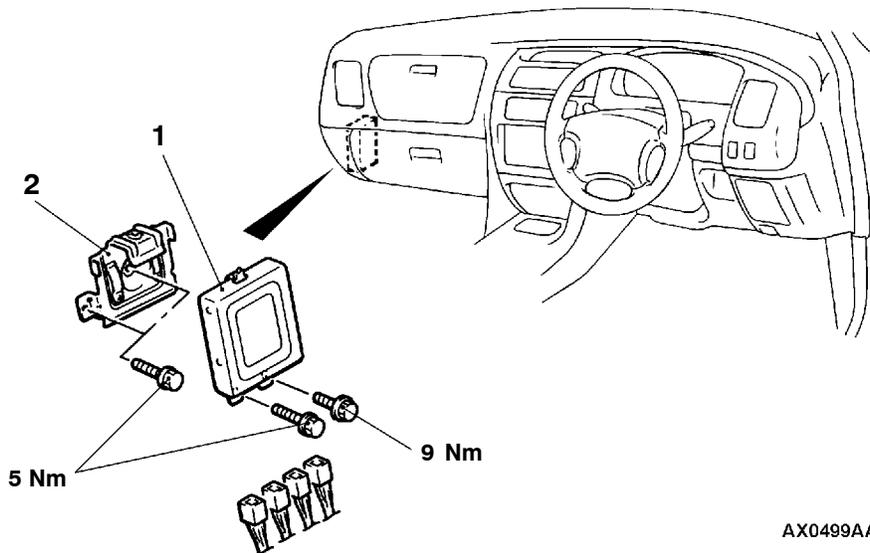
1. Insert the hoses up to bulge A in the illustration on the nipples and tubes.
2. Attach the hose clips at the positions shown in the illustration being sure that they are not on top of bulge B shown in the illustration.

ENGINE-A/T-ECU

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

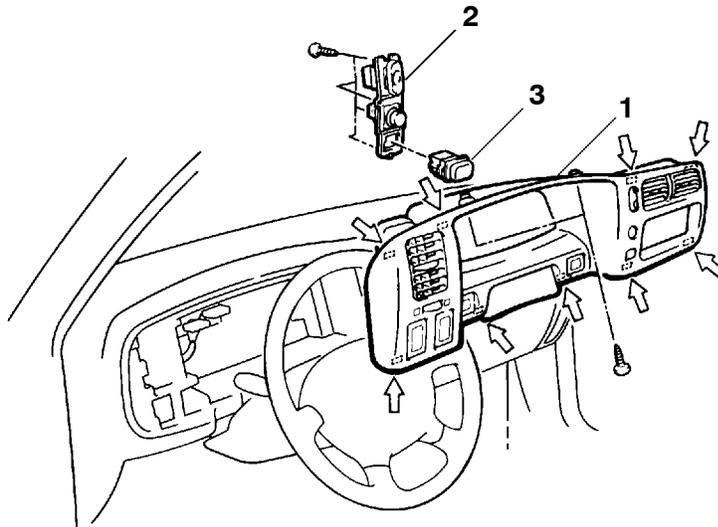
- Cowl Side Trim Removal and Installation
- Glove Box assembly Removal and Installation

<L.H. drive vehicles>**<R.H. drive vehicles>****Removal steps**

1. Engine-A/T-ECU
2. Engine-A/T-ECU bracket

HOLD SWITCH

REMOVAL AND INSTALLATION

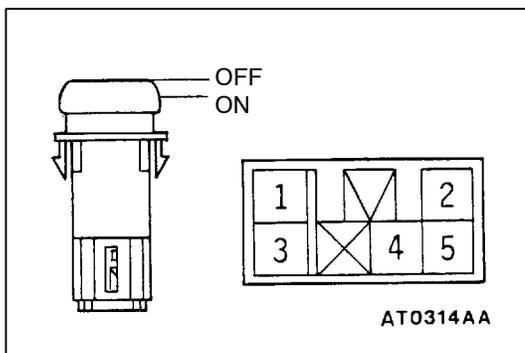


AX0452AA

↔ : Metal clip position

Removal steps

1. Meter bezel assembly
2. Switch holder
3. Hold switch



INSPECTION

HOLD SWITCH CONTINUITY CHECK

Switch position	Terminal No.					
	1	2	3	4	ILL	5
ON (Hold)	○	○	○	○	⊕	○
OFF (Normal)	○		○	○	⊕	○

GROUP 23 AUTOMATIC TRANSMISSION

GENERAL

OUTLINE OF CHANGES

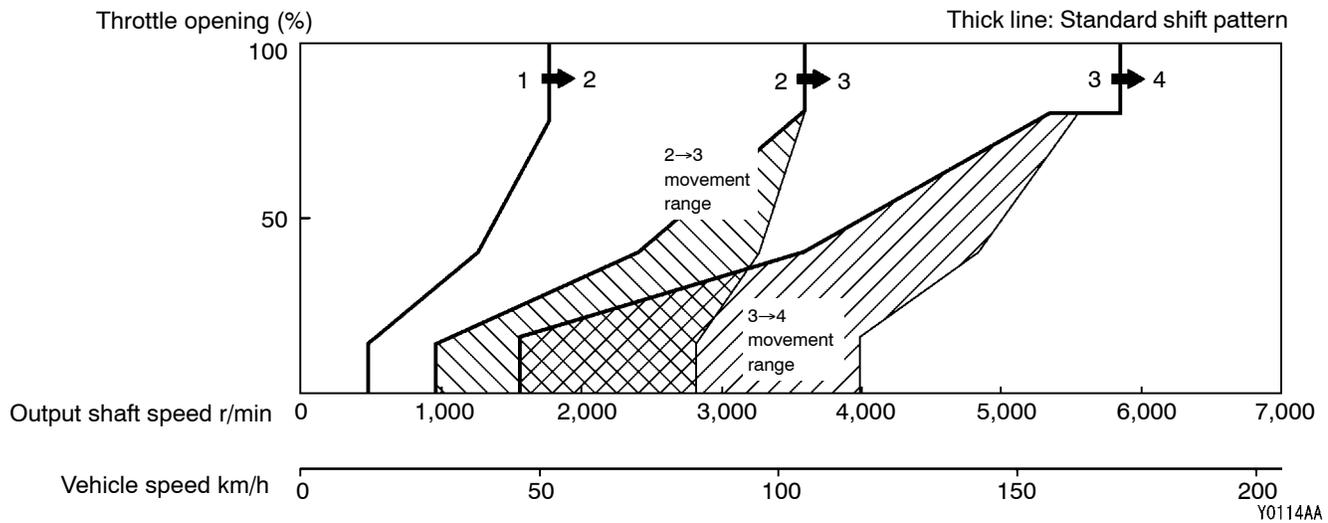
The following service procedures for items which are different from before have been established to correspond to the following changes:

- The engine-A/T-ECU has been changed.
- The shift pattern has been changed.
- The oil level gauge has been changed.

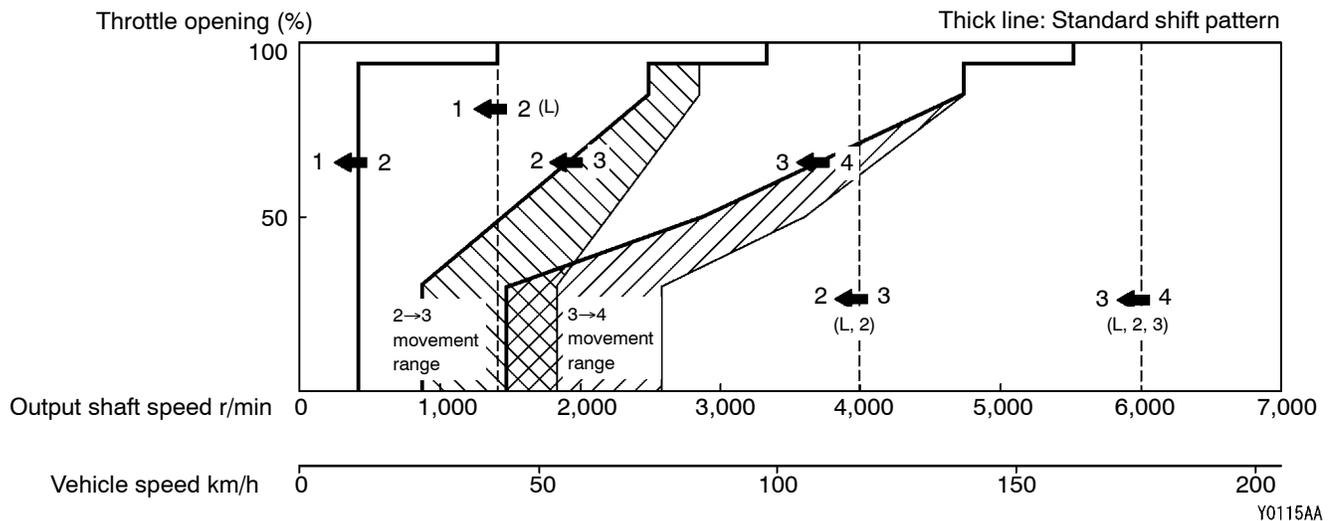
TROUBLESHOOTING

SHIFT PATTERN

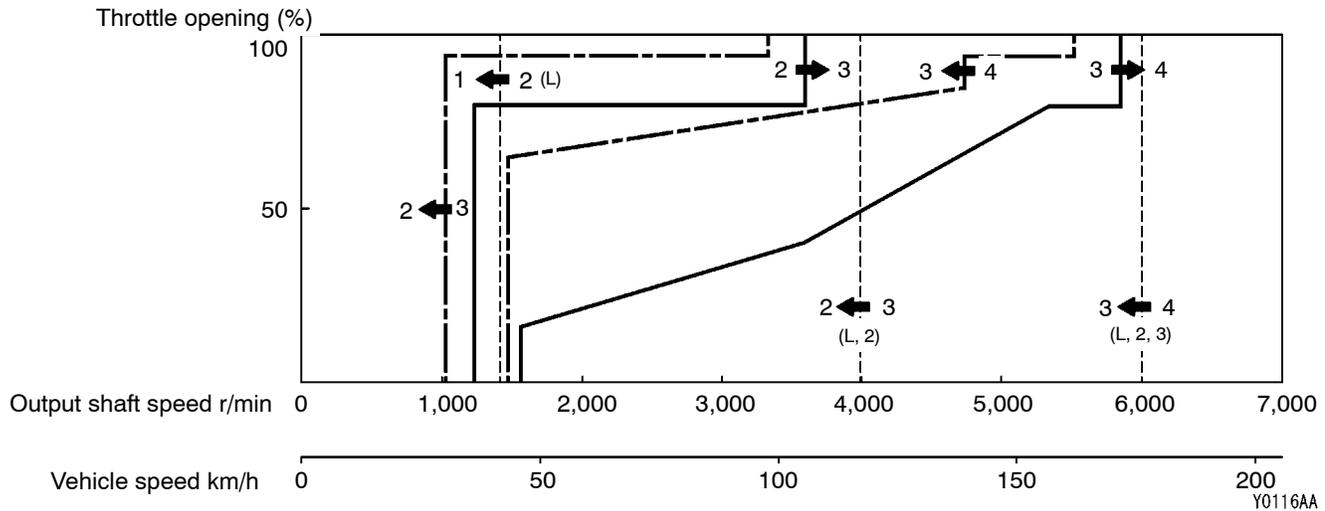
UPSHIFT PATTERN



DOWNSHIFT PATTERN



HOLD PATTERN



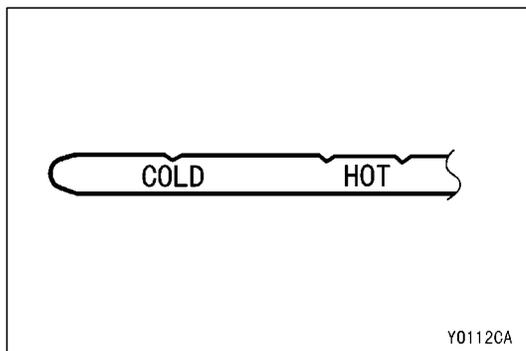
CHECK AT ENGINE-A/T-ECU TERMINALS

The A/T fluid temperature warning lamp terminal of the engine-A/T-ECU has been changed from No. 127 to No. 7, and the transfer low detection switch terminal has been changed from No. 125 to No. 112.

1	2	3	4	5	6	7	8	41	42	43	44	45	46	71	72	73	74	75	76	77	101	102	103	104	105	106	107																							
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	47	48	49	50	51	52	53	54	55	56	57	78	79	80	81	82	83	84	85	86	87	88	89	108	109	110	111	112	113	114	115	116	117	118	119	120
24	25	26	27	28	29	30	31	32	33	34	35	58	59	60	61	62	63	64	65	66	90	91	92	93	94	95	96	97	98	121	122	123	124	125	126	127	128	129	130											

9FA0253

Terminal No.	Check item	Check requirement	Standard value
7	A/T fluid temperature warning lamp	Ignition switch: LOCK (OFF) → ON	1 V or less → Battery positive voltage (after several seconds have elapsed)
112	Transfer low detection switch	Transfer lever position: Other than 4L	4 – 5 V
		Transfer lever position: 4L	0 V



ON-VEHICLE SERVICE

ESSENTIAL SERVICE

AUTOMATIC TRANSMISSION FLUID CHECK

The oil level gauge has been changed. Other service procedures are same as before.

GROUP 23

AUTOMATIC TRANSMISSION

GENERAL

OUTLINE OF CHANGE

Since the oil pan has been reshaped, the quantity of the A/T fluid has been changed.

LUBRICANT

Item	Specified lubricant	Quantity L
A/T fluid	DIA QUEEN ATF SP III	9.7

SEALANT

Item	Specified sealant	Remark
Oil pan	mitsubishi genuine sealant part No. MD166584 or equivalent	Semi-drying sealant

SPECIAL TOOL

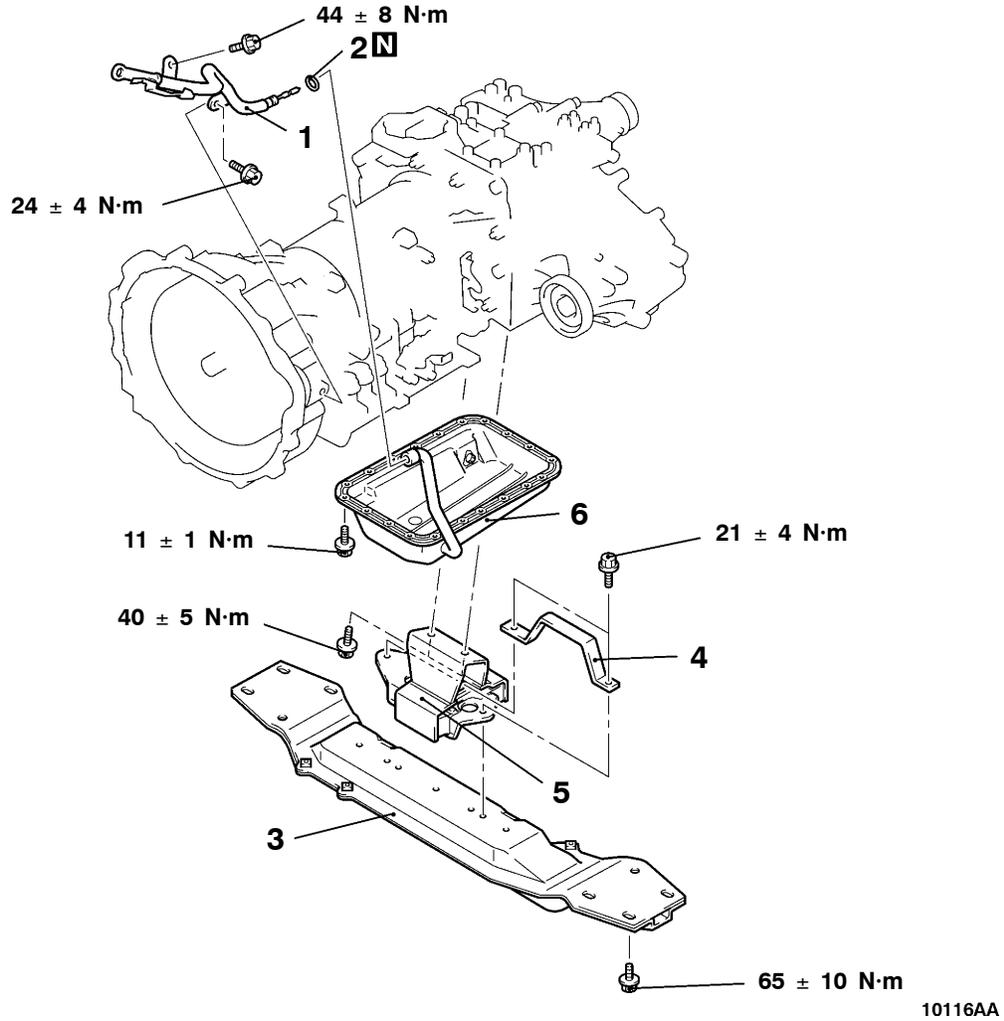
Tool	No.	Name	Application
 D998727	MD998727	Oil pan remover	Oil pan removal

OIL PAN

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations

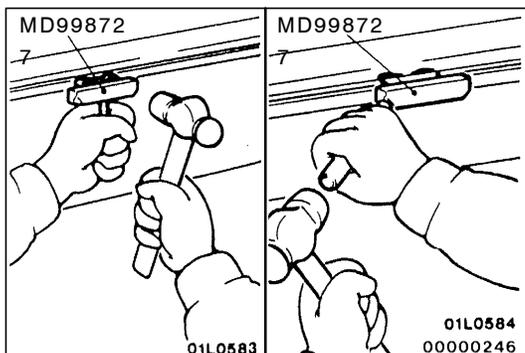
- Transmission Fluid Draining and Filling
- Under Cover Removal and Installation



Removal steps

1. Oil level gauge assembly
 - Support the transmission with a transmission jack
2. O-ring

3. No.2 crossmember
4. Stopper
5. Engine mounting insulator
6. Oil pan



REMOVAL SERVICE POINT

◀A▶ OIL PAN REMOVAL

After removing the oil pan mounting bolts, remove the oil pan with special tool MD998727 and a brass bar.

INSTALLATION SERVICE POINT**▶A◀ OIL PAN INSTALLATION**

1. Remove sealant from the oil pan and transmission case mating surfaces.
2. Degrease the sealant-coated surface and the transmission mating surface.
3. Clean the magnet and install it in the hollow of the oil pan base.

NOTE

If the oil pan is replaced, reuse the cleaned magnet.

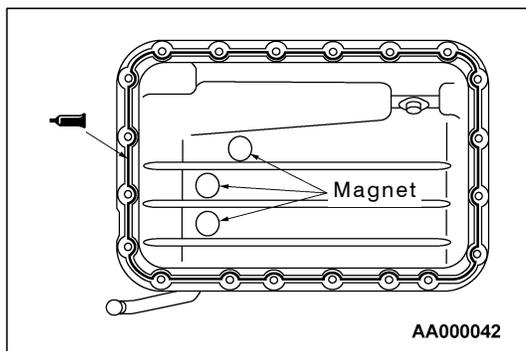
4. Apply MITSUBISHI genuine sealant part No. MD166584 or equivalent around the gasket surface of the oil pan as specified in the illustration.

NOTE

The sealant should be applied in a continuous bead approximately 3 mm in diameter.

5. Tighten the mounting bolts to the specified torque.

Tightening torque: 11 ± 1 N·m



NOTES