

## GROUP 23Ab

# AUTOMATIC TRANSMISSION DIAGNOSIS

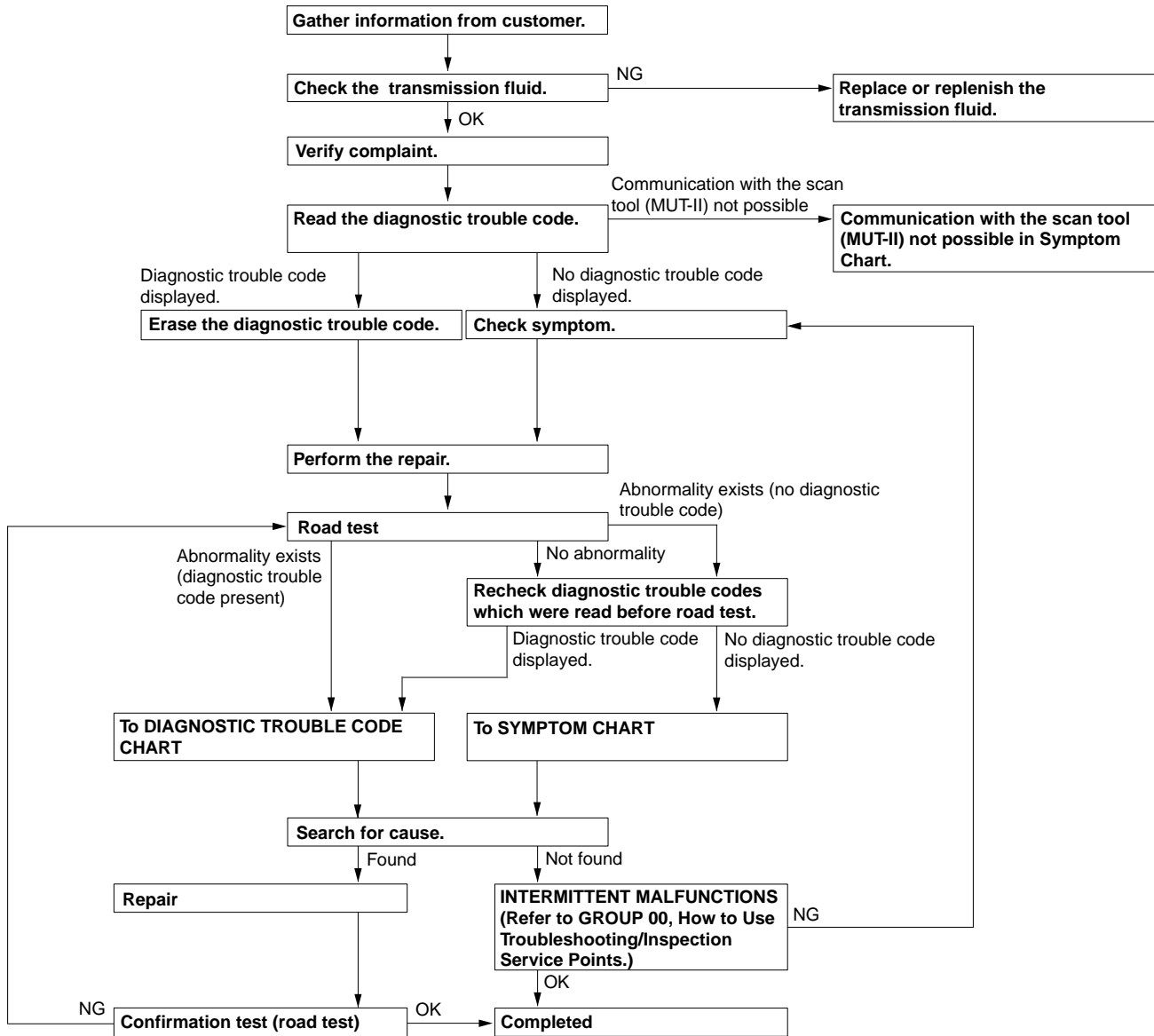
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# AUTOMATIC TRANSMISSION DIAGNOSIS

## DIAGNOSTIC TROUBLESHOOTING FLOW

M1231104000120



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### INTRODUCTION TO A/T DIAGNOSIS

The automatic transmission can exhibit any of the following symptoms: noise or vibration is generated, transmission fluid leaks, the vehicle does not move forward or backward. The causes of these symptoms could come from: Incorrect mounting, the transmission fluid may be low, or a component of the transmission may be faulty.

The following items are suspected as causes for the INVECS-II troubles: malfunction of the PCM, the sensors, the switches, the harness or connectors.

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**INTRODUCTION TO A/T KEY INTERLOCK AND SHIFT LOCK MECHANISMS**

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If the key interlock and shift lock mechanisms indicate a malfunction, the key interlock cable, the shift lock cable, or the selector lever assembly may be defective. In this case, follow troubleshooting below.

**A/T DIAGNOSITC TROUBLESHOOTING STRATEGY**

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Use these steps to plan your diagnostic strategy. If you follow them carefully, you will find most A/T malfunctions.

1. Gather as much information as possible about the complaint from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any A/T Diagnostic Trouble Codes (DTCs).
4. If you can not verify the condition and there are no DTCs, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-6](#).
5. If you can verify the condition but there are no DTCs, or the system can not communicate with scan tool MB991502, refer to Symptom Chart [P.23Ab-32](#).
6. If there is a DTC, record the number of the code, then erase the code from memory using scan tool MB991502.
7. Reconfirm the symptom with a Road Test.
8. If a DTC is set again, go to the Inspection Chart for Diagnostic Trouble Codes.
9. If a DTC is not set again, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-6](#).
10. After repairs are completed, conduct a Road Test duplicating the complaint conditions to confirm the malfunction has been eliminated.

**A/T KEY INTERLOCK AND SHIFT LOCK MECHANISM DIAGNOSTIC TROUBLESHOOTING STRATEGY**

M1232001700193

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find automatic transmission key interlock and shift lock mechanism fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify malfunction is eliminated.

**A/T DIAGNOSITC TROUBLE CODE DIAGNOSIS**

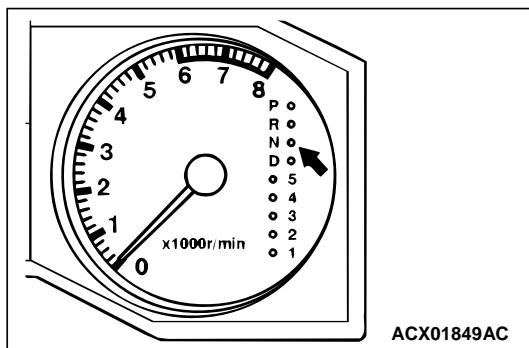
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**CHECK "N" RANGE LIGHT**

The "N" range light flashes once per second if there is an abnormality in any of the items in the table below which are related to the A/T system. Check for diagnostic trouble codes if the "N" range light is flashing once per second.

**"N" range light flashing items**

Input shaft speed sensor
Output shaft speed sensor
Each solenoid valve
Gear incorrect ratio
A/T control relay system



**⚠ CAUTION**

If the "A/T TEMP" indicator light is illuminated, it means that the transmission fluid temperature is too high. Stop the vehicle in a safe place and wait until the "A/T TEMP" indicator light extinguishes.

**ON-BOARD DIAGNOSTICS**

The powertrain control module (PCM) monitors its input/output signals (some signals all the time and others under specified conditions). When an irregular signal is initially monitored, the PCM decides that a malfunction has occurred and records the occurrence as a diagnostic trouble code. There are 26 diagnostic items. The diagnostic results can be read with a scan tool. Diagnostic trouble codes are kept in memory by direct battery feed. The codes are retained in memory even if the ignition switch is in

the "LOCK" (OFF) position. Diagnostic trouble codes will, however, be erased when a battery terminal or the PCM connector is disconnected. In addition, the diagnostic trouble code can also be erased by scan tool MUT-II (MB991502).

*NOTE: If a sensor is disconnected when the ignition switch is in the "ON" position, a diagnostic trouble code is stored in memory. In this case, erase the DTC using scan tool MB991502.*

The 26 diagnostic items are displayed in numeric order.

**HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES****Required Special Tool:**

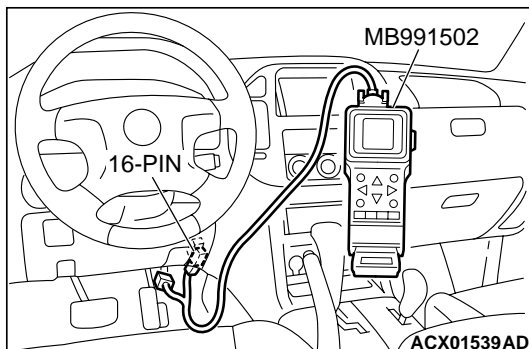
- MB991502: Scan Tool (MUT-II)

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

*NOTE: If the battery positive voltage is low, diagnostic trouble codes will not be output. Check the battery if scan tool MB991502 does not display.*

*NOTE: If the battery is disconnected or if the powertrain control module connector is disconnected, the diagnostic trouble codes will be erased. Do not disconnect the battery or powertrain control module before the diagnostic trouble codes have been read.*



1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Record the diagnostic trouble codes for (DTCs) A/T.
4. Refer to P.23Ab-31, Diagnostic Trouble Code Chart.
5. Turn the ignition switch to the "LOCK" (OFF) and then back to the "ON" again.
6. Erase the diagnostic trouble code by selecting DTC erase from SPECIAL MENU screen, using scan tool MB991502.
7. Check for diagnostic trouble codes. Confirm scan tool MB991502 displays "normal."
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect scan tool MB991502.

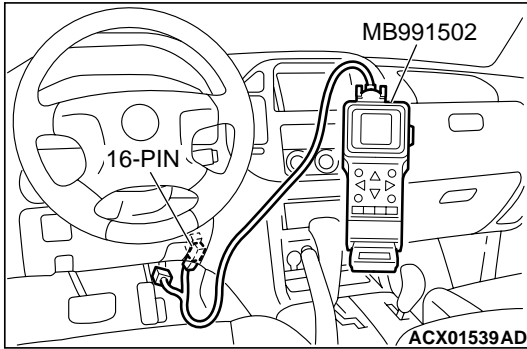
## INSPECTION USING SCAN TOOL MB991502, ROAD TEST AND DATA LIST

**Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**⚠ CAUTION**

**To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**



1. Connect scan tool MB991502 to data link connector.
2. Turn the ignition switch to the "ON" position.
3. Carry out the inspection by means of the Road Test and the Data List function. If there is an abnormality, check and repair the chassis harnesses and components. Refer to [P.23Ab-7](#), Road Test. Refer to [P.23Ab-33](#), Data List Reference Table.
4. Re-check using scan tool MB991502 and confirm that the abnormal input and output have returned to normal because as a result of the repairs.
5. Check for and inspect any diagnostic trouble codes (DTCs) that may have surfaced from testing. Erase the diagnostic trouble codes after checking.
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.
8. Start the engine again and do a test drive to confirm that the problem is eliminated.

### FAIL-SAFE/BACKUP FUNCTION

When a malfunction of a main sensor or actuator is detected by the PCM, the transmission is controlled by pre-set control logic to maintain safe conditions for driving.

The following table shows how the fail-safe/backup function affects vehicle driveability and operation.

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<b>MALFUNCTIONING ITEM</b>	<b>JUDGMENT CONDITION</b>	<b>CONTROL DEFAULT DURING MALFUNCTION</b>
Input shaft speed sensor	If no output pulse from the input shaft speed sensor is detected for one second or more when the vehicle speed is 30 km/h (19 mph) or greater.	The diagnostic trouble code is recorded when the malfunction occurs once during 4 monitoring periods in one drive cycle. When the judgment condition is met, the transmission holds 3rd gear or 2nd gear, depending on speed and "N" range light flashes as a fail-safe.
Output shaft speed sensor	Output from the output shaft speed sensor is continuously 50 % or less of the output from the vehicle speed sensor one second or more when the vehicle speed is 30 km/h (19 mph) or more.	The diagnostic trouble code is recorded when the malfunction occurs once during 4 monitoring periods in one drive cycle. When the judgment condition is met, the transmission holds 3rd gear or 2nd gear, depending on speed and "N" range light flashes as a fail-safe.

<b>MALFUNCTIONING ITEM</b>		<b>JUDGMENT CONDITION</b>	<b>CONTROL DEFAULT DURING MALFUNCTION</b>
Low-reverse solenoid valve		Solenoid valve resistance is below 2.7 ohms for 0.32 seconds.	The diagnostic trouble code is recorded when the malfunction occurs during 4 monitoring periods in one drive cycle. When the judgment condition is met, the A/T control relay is turned off and "N" range light flashes.
Underdrive solenoid valve			
Second solenoid valve			
Overdrive solenoid valve			
Reduction solenoid valve			
Torque converter clutch solenoid valve			
Incomplete shifting	1st	The gear ratio value from the output shaft speed sensor is not the same as the output from the input shaft speed sensor for one second after has been completed.	The diagnostic trouble code is recorded when the malfunction occurs during 4 monitoring periods in one drive cycle. When the judgment condition is met, the A/T control relay is turned off and "N" range light flashes.
	2nd		
	3rd		
	4th		
	5th		
	Reverse		
A/T control relay		A/T control relay voltage is less than seven volts for 0.1 second after the ignition switch is turned "ON."	The A/T control relay is switched off. The transmission will only operate in 3rd and Reverse gears until the system is repaired.
Malfunction in the PCM		Malfunction has occurred in the PCM.	The A/T control relay is switched off. The transmission will only operate in 3rd and Reverse gears until the system is repaired.

**ROAD TEST**

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Check using the following procedures

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
1	Ignition switch: OFF	Ignition switch (1) ON	Data list No. 54 (1) Control Relay Voltage [V]	A/T Control relay output voltage	54	A/T Control relay system (P.23Ac-237)
2	Ignition switch: ON Engine: Stopped Transmission range: P	Transmission range (1) P, (2) R, (3) N, (4) D	Data list No. 61 (1) P, (2) R, (3) N, (4) D	Transmission range switch	27, 28	Transmission range switch system (P.23Ac-93 , P.23Ac-123)
		Transmission range (1) D (1st gear) (2) Select the sport mode (1st gear) (3) Upshift and hold the selector lever in that position (2nd gear) (4) Downshift and hold the selector lever in that position (1st gear)	Data list No. 67 (1) OFF, (2) ON, (3) ON, (4) ON Data list No. 68 (1) OFF, (2) OFF, (3) ON, (4) OFF Data list No. 69 (1) OFF, (2) OFF, (3) OFF, (4) ON	Select switch Shift switch	-	Shift switch assembly system (P.23Ad-48)
			Shift indicator light (1) "D" and "1" illuminates (2) Only "1" illuminates (3) Only "2" illuminates (4) Only "1" illuminates			
		Accelerator pedal (1) Fully closed (2) Depressed (3) Fully open	Data list No. 11 (1) 200 – 800 mV (2) Gradually rises from (1) (3) 3,800 – 4,900 mV	Throttle position sensor	-	-
		Brake pedal (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stoplight switch	26	Stoplight switch system (P.23Ac-83)
		Transfer position (1) Other than 4LLc (2) 4LLc	Data list No. 26 (1) OFF (2) ON	4LLc detection switch	-	4LLc detection switch system (P.23Ad-67)
3	Ignition switch: ST Engine: Stopped	Cranking test with lever in P or N range	Cranking should be possible	Cranking	-	Engine does not start (P.23Ad-2)

# 23Ab-8

## AUTOMATIC TRANSMISSION DIAGNOSIS AUTOMATIC TRANSMISSION DIAGNOSIS

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
4	Engine warmed	Drive for 15 minutes or more so that the transmission fluid temperature becomes 70 – 80°C. (158 – 176°F)	Data list No. 15 Gradually rises to 70 – 80°C (158 – 176°F)	Transmission fluid temperature sensor	15, 16	Transmission fluid temperature sensor system (P.23Ac-2, P.23Ac-18)



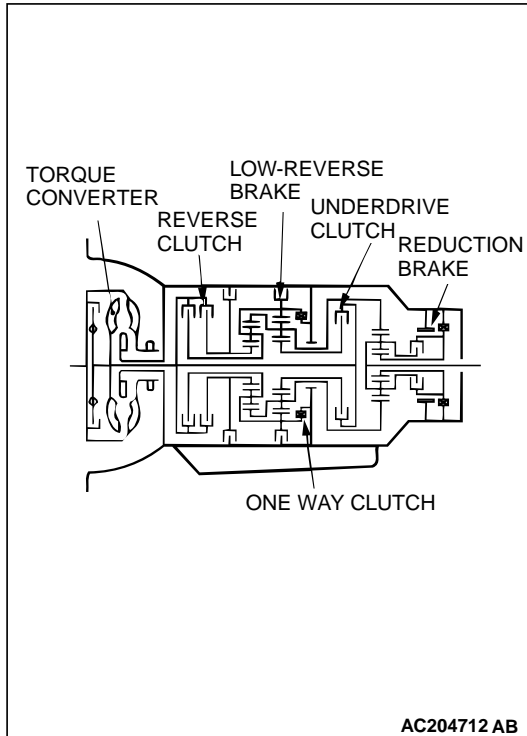
STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE	
5	Engine: Idling Transmission range: N	Brake pedal (Retest) (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stoplight switch	26	Stoplight switch system (P.23Ac-83)	
		A/C switch (1) ON (2) OFF	Data list No. 65 (1) ON (2) OFF	Dual pressure switch	–	Vehicle shifts differently with A/C engaged (P.23Ad-33)	
	Engine: Idling Transmission range: N	Accelerator pedal (1) Fully closed (2) Depressed	Data list No. 21 (1) Engine tachometer and the MUT-II show the same engine speed (2) Gradually rises from (1)	Crankshaft position sensor	21	Crankshaft position sensor system (P.23Ac-27)	
					–	Engine stalls when moving selector lever from N to D or N to R (P.23Ad-9)	
		–	Shift shock when shifting from N to D and long delay (P.23Ad-11)				
				–			Shift shock when shifting from N to R and long delay (P.23Ad-14)
		Does not move	–	Does not move forward (P.23Ad-4)			
			–	Does not move backward (P.23Ad-6)			
			–	Does not move (forward or backward) (P.23Ad-8)			

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
6	Transmission range: Sport mode (on a flat and straight road.)	Transmission range and vehicle speed (Each condition should be maintained for 10 seconds or more.) (1) Idling in 1st gear (Vehicle stopped) (2) Driving at constant speed of 10 km/h (6.2 mph) in 1st gear (3) Driving at constant speed of 30 km/h (19 mph) in 2nd gear (4) Driving at constant speed of 50 km/h (31 mph) in 3rd gear (5) Driving at constant speed of 50 km/h (31 mph) in 4th gear (6) Driving at constant speed of 70 km/h (43 mph) in 5th gear	Data list No. 63 (2) 1st, (3) 2nd, (4) 3rd, (5) 4th, (6) 5th	Shift position	–	–
			Data list No. 31 (2) 0 %, (3) 100 %, (4) 100 %, (5) 0 %, (6) 0%	Low-reverse solenoid valve duty %	31	Low-reverse solenoid valve system (P.23Ac-147)
			Data list No. 32 (2) 0 %, (3) 0 %, (4) 0 %, (5) 0 %, (6) 100%	Underdrive solenoid valve duty %	32	Underdrive solenoid valve system (P.23Ac-160)
			Data list No. 33 (2) 100 %, (3) 0 %, (4) 100 %, (5) 100 %, (6) 0 %	Second solenoid valve duty %	33	Second solenoid valve system (P.23Ac-171)
			Data list No. 34 (2) 100 %, (3) 100 %, (4) 0 %, (5) 0 %, (5) 0 %	Overdrive solenoid valve duty %	34	Overdrive solenoid valve system (P.23Ac-181)
			Data list No. 35 (2) 0 %, (3) 0 %, (4) 0 %, (5) 100 %, (6) 100%	Reduction solenoid valve duty %	35	Reduction solenoid valve system (P.23Ac-193)
			Data list No. 29 (1) 0 km/h (0 mph) (5) 50 km/h (31 mph)	Vehicle speed sensor	29	Vehicle speed sensor system (P.23Ac-140)
			Data list No. 22 (5) 1,400 – 1,700 r/min	Input shaft speed sensor	22	Input shaft speed sensor system (P.23Ac-47)
			Data list No. 23 (5) 1,400 – 1,700 r/min	Output shaft speed sensor	23	Output shaft speed sensor system (P.23Ac-65)

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
7	Transmission range: Sport mode (on a flat and straight road.)	Transmission range and vehicle speed (1) Driving at speed of 80 km/h (50 mph) in 4th gear (2) Driving at constant speed of 80 km/h (50 mph) (3) Release accelerator pedal (Speed under 50 km/h (31 mph))	Data list No. 36 (2) 70 – 90 % (3) 70 – 90 % → 0 %	Torque converter clutch solenoid valve duty %	36, 52, 53	Torque converter clutch solenoid system (P.23Ac-204, P.23Ac-228, P.23Ac-232)
			Data list No. 52 (2) –10 to 10 r/min (3) The value changes from (2)	Torque converter clutch amount of slippage		
8	Use scan tool MB991502 to stop the INVECS-II function. Transmission range: D (on a flat and straight road.)	(1) Accelerate to 5th gear at a throttle opening voltage of 1.5V (accelerator opening angle of 30 %). (2) Slowly decelerate to a stop. (3) Accelerate to 5th gear at a throttle opening voltage of 2.5 V (accelerator opening angle of 50%).	Data list No.11, 23 The shifting points correspond with the scan tool display and the throttle opening voltage (opening angle) and output shaft speed, which are shown in the standard shift pattern.	Malfunction when shifting	–	Shift shock and slipping (P.23Ad-18)
				Does not shift according to instructions	–	Early or late shifting in all gears (P.23Ad-21)
					–	Early or late shifting in all gears (P.23Ad-23)
				Does not shift	–	No diagnostic trouble code (P.23Ad-25)
					22	Input shaft speed sensor system (P.23Ac-47)
					23	Output shaft speed sensor system (P.23Ac-65)

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
8	Use scan tool MB991502 to stop the INVECS-II function. Transmission range: D (on a flat and straight road.)	(1) Select to the sport mode while driving at 60 km/h (37 mph) in 5th gear, shift down to 4th gear. (2) While driving at 40 km/h (37 mph) in 4th gear, down shift to 3 range. (3) While driving at 20 km/h (25 mph) in 3rd gear, down shift to 2nd gear. (4) While driving at 20 km/h (12 mph) in 2nd gear, down shift to 1st gear.	Data list No.63 (1) 5th → 4th (2) 4th → 3rd (3) 3rd → 2nd (4) 2nd → 1st	Does not shift from 1 to 2 or 2 to 1	31	Low-reverse solenoid valve system (P.23Ac-147)
					33	Second solenoid valve system (P.23Ac-171)
					41	1st gear incorrect ratio (P.23Ac-215)
					42	2nd gear incorrect ratio (P.23Ac-215)
				Does not shift from 2 to 3 or 3 to 2	33	Second solenoid valve system (P.23Ac-171)
					34	Overdrive solenoid valve system (P.23Ac-181)
					42	2nd gear incorrect ratio (P.23Ac-215)
					43	3rd gear incorrect ratio (P.23Ac-215)
					Does not shift from 3 to 4 or 4 to 3	31
				35		Reduction solenoid valve system (P.23Ac-193)
				43		3rd gear incorrect ratio (P.23Ac-215)
				44		4th gear incorrect ratio (P.23Ac-215)

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
8	Use scan tool MB991502 to stop the INVECS-II function. Transmission range: D (on a flat and straight road.)	(1) Select to the sport mode while driving at 60 km/h (37 mph) in 5th gear, shift down to 4th gear. (2) While driving at 40 km/h (37 mph) in 4th gear, down shift to 3 range. (3) While driving at 20 km/h (25 mph) in 3rd gear, down shift to 2nd gear. (4) While driving at 20 km/h (12 mph) in 2nd gear, down shift to 1st gear.	Data list No.63 (1) 5th → 4th (2) 4th → 3rd (3) 3rd → 2nd (4) 2nd → 1st	Does not shift from 4 to 5 or 5 to 4	32	Underdrive solenoid valve system (P.23Ac-160)
					33	Second solenoid valve system (P.23Ac-171)
					44	4th gear incorrect ratio (P.23Ac-215)
					45	5th gear incorrect ratio (P.23Ac-215)
9	Transmission range: N (on a flat and straight road.)	Monitor data list No. 22 and No. 23 with scan tool MB991502. (1) Move selector lever to R range, drive at constant speed of 10 km/h (6.2 mph).	The ratio between data list No. 22 and No. 23 should be the same as the gear ratio when reversing.	Does not match	22	Input shaft speed sensor system (P.23Ac-47)
					23	Output shaft speed sensor system (P.23Ac-65)
					46	Reverse gear incorrect ratio (P.23Ac-215)



## TORQUE CONVERTER STALL TEST

M1231103500100

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

### **⚠ WARNING**

**Do not let anyone stand in front of or behind the vehicle while this test is performed.**

1. Check the transmission fluid level and temperature. Check the engine coolant temperature.
  - Transmission fluid level: At the "HOT" mark on the dipstick
  - Transmission fluid temperature: 70 – 80 °C (158 – 176 °F)
  - Engine coolant temperature: 80 – 100 °C (176 – 212 °F)

*NOTE: Measures transmission fluid temperature with scan tool MB991502 (MUT-II).*
2. Chock both front wheels.
3. Connect a tachometer.
4. Apply the parking and service brakes fully.
5. Start the engine.
6. Move the selector lever to the "D" position. Fully depress the accelerator pedal and read the maximum engine speed.

### **⚠ CAUTION**

- The throttle should not be fully open for any more than five seconds.
  - If you repeat the stall test when the transmission fluid temperature is greater than 80°C (176°F) move the selector lever to the "N" position and let the engine run at approximately 1,000 r/min for at least one minute. Wait until the transmission fluid temperature returns to 80°C (176°F) or less.
- Standard value: Stall speed: 2,200 – 2,700 r/min**
7. Move the selector lever to the "R" position. Fully depress the accelerator pedal and read the maximum engine speed.
- Standard value: Stall speed: 2,200 – 2,700 r/min**

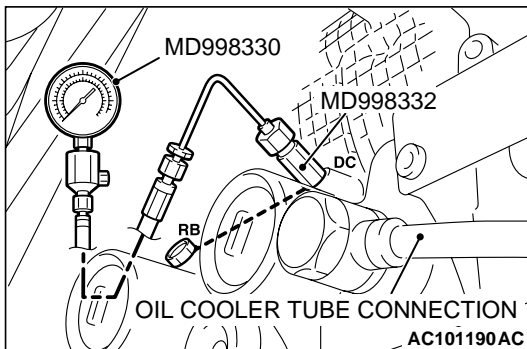
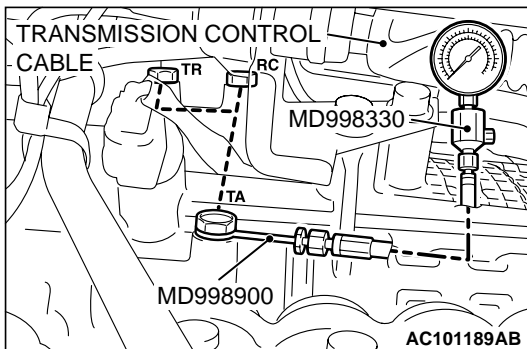
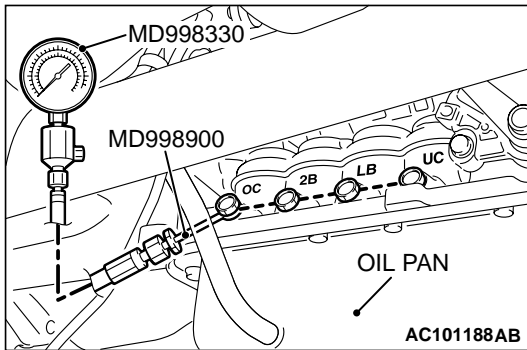
## TORQUE CONVERTER STALL TEST JUDGMENT RESULTS

1. Stall speed is too high in both "D" and "R" ranges
  - Malfunction of the torque converter (Slippage on the splines of the torque converter and the input shaft)
  - Low line pressure
  - Low-reverse brake slippage and malfunction of the 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
  - Low-reverse brake slippage
  - Reduction brake slippage

4. Stall speed is too low in both "D" and "R" ranges
  - Malfunction of the torque converter (Slippage of the one-way clutch)
  - Insufficient engine output

## HYDRAULIC PRESSURE TESTS

M1231103800101



1. Check the transmission fluid level and temperature. Check engine coolant temperature.
  - Transmission fluid level: "HOT" mark on the dipstick
  - Transmission fluid temperature: 70 – 80°C (158 – 176°F)
  - Engine coolant temperature: 80 – 100°C (176 – 212°F)

### ⚠ CAUTION

The transmission fluid temperature should be between 70 – 80 °C (158 – 176°F) during the test.

2. Raise the vehicle so that the wheels are free to turn.
3. Connect the special tools (3.0 MPa (427 psi) oil pressure gauge [MD998330] and adapters [MD998332, MD998900]) to each pressure discharge port.

### NOTE:

- UC: Underdrive clutch pressure port
  - RC: Reverse clutch pressure port
  - OC: Overdrive clutch pressure port
  - DC: Direct clutch pressure port
  - LB: Low-reverse brake pressure port
  - 2B: Second brake pressure port
  - RB: Reduction brake pressure port
  - TA: Torque converter apply pressure port
  - TR: Torque converter release pressure port
4. Restart the engine.
  5. Check that there are no leaks around the special tool port adaptors.
  6. 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.
  7. If the pressure is not within the standard value, stop the engine and refer to the hydraulic pressure test diagnosis table.
  8. Remove the O-ring from the port plug and replace it.
  9. Remove the special tool, and install the plugs to the hydraulic pressure ports.
  10. Start the engine and check that there are no leaks around the plugs.

## STANDARD HYDRAULIC PRESSURE TEST

MEASUREMENT CONDITION			STANDARD HYDRAULIC PRESSURE MPa (psi)							
TRANS-MISSION RANGE	SHIFT POSITION	ENGINE SPEED (r/min)	UNDERDRIVE CLUTCH PRESSURE [UC]	REVERSE CLUTCH PRESSURE [RC]	OVERDRIVE CLUTCH PRESSURE [OC]	DIRECT CLUTCH PRESSURE [DC]	LOW-REVERSE BRAKE PRESSURE [LB]	SECOND BRAKE PRESSURE [2B]	REDUC-TION BRAKE PRESSURE [RB]	TORQUE CONVER-TER CLUTCH PRESSURE [TR]
P	–	2,500	–	–	–	–	0.26 – 0.34 (38 – 49)	–	1.01 – 1.05 (147 – 152)	0.22 – 0.36 (32 – 52)
R	Reverse	2,500	–	1.27 – 1.77 (185 – 256)	–	–	1.27 – 1.77 (185 – 256)	–	1.27 – 1.77 (185 – 256)	0.65 – 0.85 (94 – 123)
N	–	2,500	–	–	–	–	0.26 – 0.34 (38 – 49)	–	0.26 – 0.34 (38 – 49)	0.22 – 0.36 (32 – 52)
Sport mode	1st gear	2,500	1.01 – 1.05 (147 – 152)	–	–	–	1.01 – 1.05 (147 – 152)	–	1.01 – 1.05 (147 – 152)	0.65 – 0.85 (94 – 123)
	2nd gear	2,500	1.01 – 1.05 (147 – 152)	–	–	–	–	1.01 – 1.05 (147 – 152)	1.01 – 1.05 (147 – 152)	0.65 – 0.85 (94 – 123)
	3rd gear	2,500	0.78 – 0.88 (113 – 28)	–	0.78 – 0.88 (113 – 128)	–	–	–	0.78 – 0.88 (113 – 128)	0.65 – 0.85 (94 – 123)
	4th gear	2,500	0.78 – 0.88 (113 – 28)	–	0.78 – 0.88 (113 – 128)	0.78 – 0.88 (113 – 128)	–	–	–	–
	5th gear	2,500	–	–	0.78 – 0.88 (113 – 128)	0.78 – 0.88 (113 – 128)	–	0.78 – 0.88 (113 – 128)	–	–

NOTE: If the torque converter clutch pressure is measured, the engine speed should be 1,500 r/min or less.



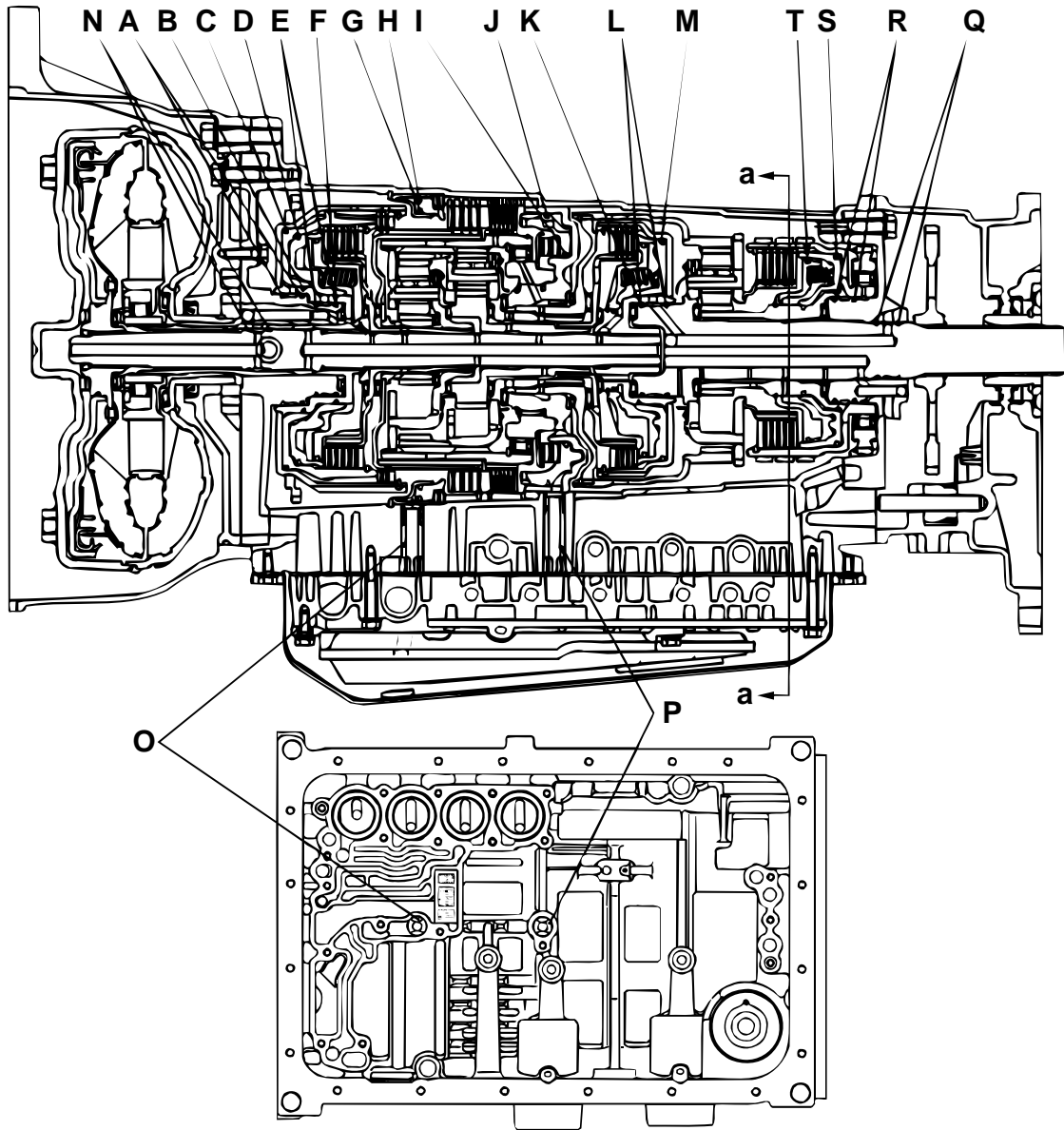
**HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE**

<b>SYMPTOM</b>	<b>PROBABLE CAUSE</b>
All hydraulic pressures are high.	Malfunction of the regulator valve
All hydraulic pressures are low.	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
	Improperly installed solenoid valves
	Damaged solenoid valve O-rings
Hydraulic pressure is abnormal in reverse gear only.	Malfunction of the regulator valve
	Clogged orifice
	Incorrect valve body installation
Hydraulic pressure is abnormal in 3rd or 4th gear 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 clutch hydraulic pressure is abnormal.	Malfunction of the oil seal K
	Malfunction of the oil seal L
	Malfunction of the oil seal M
	Malfunction of the oil seal Q
	Malfunction of the underdrive solenoid valve
	Malfunction of the underdrive pressure control valve
	Malfunction of the check ball
	Clogged orifice
	Incorrect valve body installation
Only reverse clutch hydraulic pressure is abnormal.	Malfunction of the oil seal A
	Malfunction of the oil seal B
	Malfunction of the oil seal C
	Clogged orifice
	Incorrect valve body installation

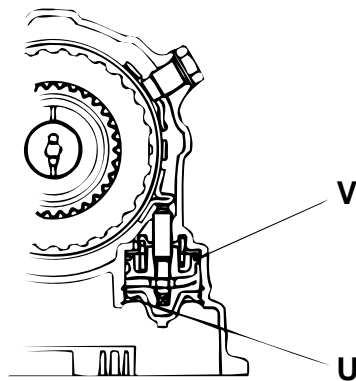
SYMPTOM	PROBABLE CAUSE
Only overdrive clutch hydraulic pressure is abnormal.	Malfunction of the oil seal D
	Malfunction of the oil seal E
	Malfunction of the oil seal F
	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of the check ball
	Clogged orifice
	Incorrect valve body installation
Only direct clutch hydraulic pressure is abnormal.	Malfunction of the oil seal R
	Malfunction of the oil seal S
	Malfunction of the oil seal T
	Malfunction of the low-reverse solenoid valve (Shared with direct clutch)
	Malfunction of the low-reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve C
	Clogged orifice
Incorrect valve body installation	
Only low-reverse brake hydraulic pressure is abnormal.	Malfunction of the oil seal I
	Malfunction of the oil seal J
	Malfunction of the oil seal 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 all the check ball
	Clogged orifice
	Incorrect valve body installation
Only second brake hydraulic pressure is abnormal.	Malfunction of the oil seal G
	Malfunction of the oil seal H
	Malfunction of the oil seal O
	Malfunction of the second solenoid valve
	Malfunction of the second pressure control valve
	Malfunction of the fail safe valve B
	Clogged orifice
	Incorrect valve body installation

<b>SYMPTOM</b>	<b>PROBABLE CAUSE</b>
Only reduction brake hydraulic pressure is abnormal.	Malfunction of the oil seal U
	Malfunction of the oil seal V
	Malfunction of the reduction solenoid valve
	Malfunction of the reduction pressure control valve
	Clogged orifice
	Incorrect valve body installation
Only torque converter clutch pressure is abnormal.	Clogged oil cooler
	Malfunction of the oil seal N
	Malfunction of the torque converter clutch solenoid valve
	Malfunction of the torque converter clutch pressure control valve
	Clogged orifice
	Incorrect valve body installation
Pressure applied to element which should not receive pressure.	Incorrect transmission control cable adjustment
	Malfunction of the manual valve
	Malfunction of the check ball
	Incorrect valve body installation

OIL SEAL LAYOUT



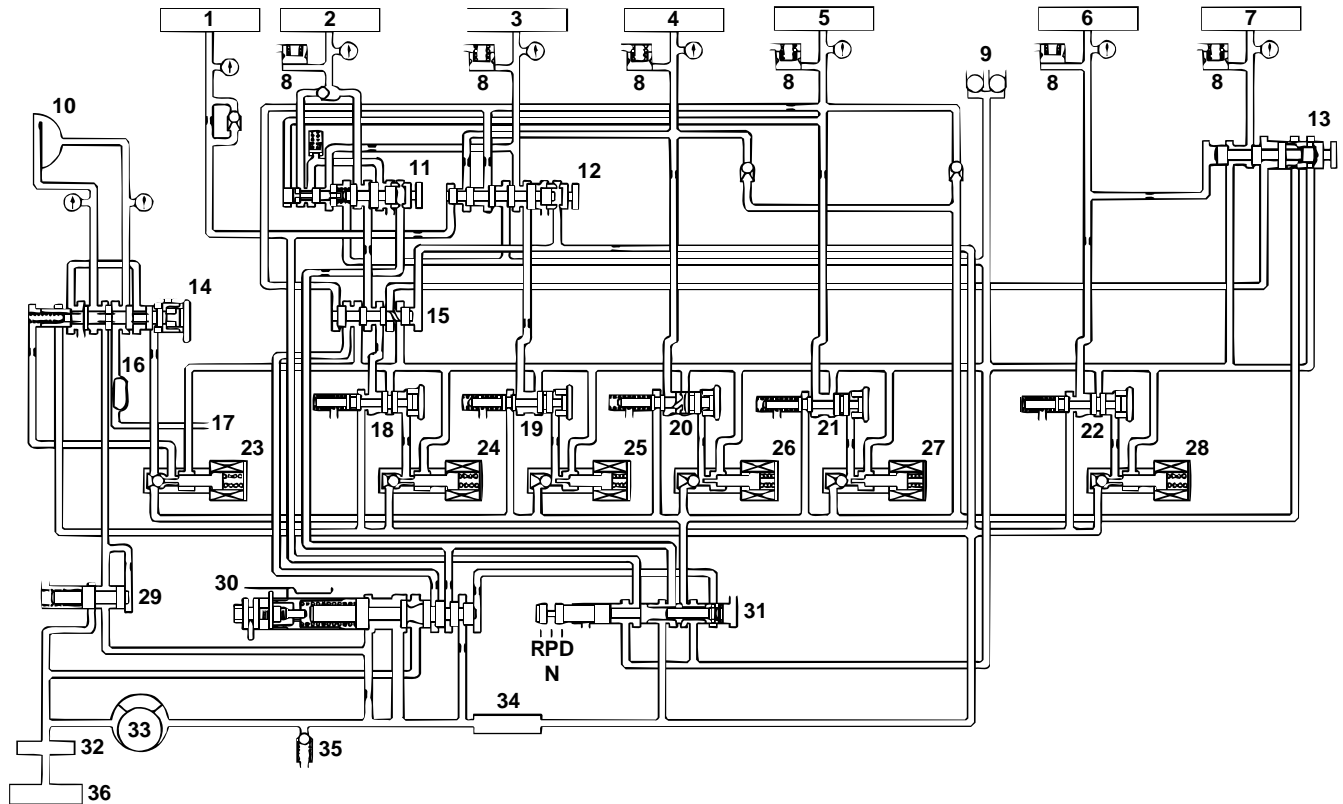
SECTION a - a








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**HYDRAULIC CIRCUIT**

**PARKING AND NEUTRAL**

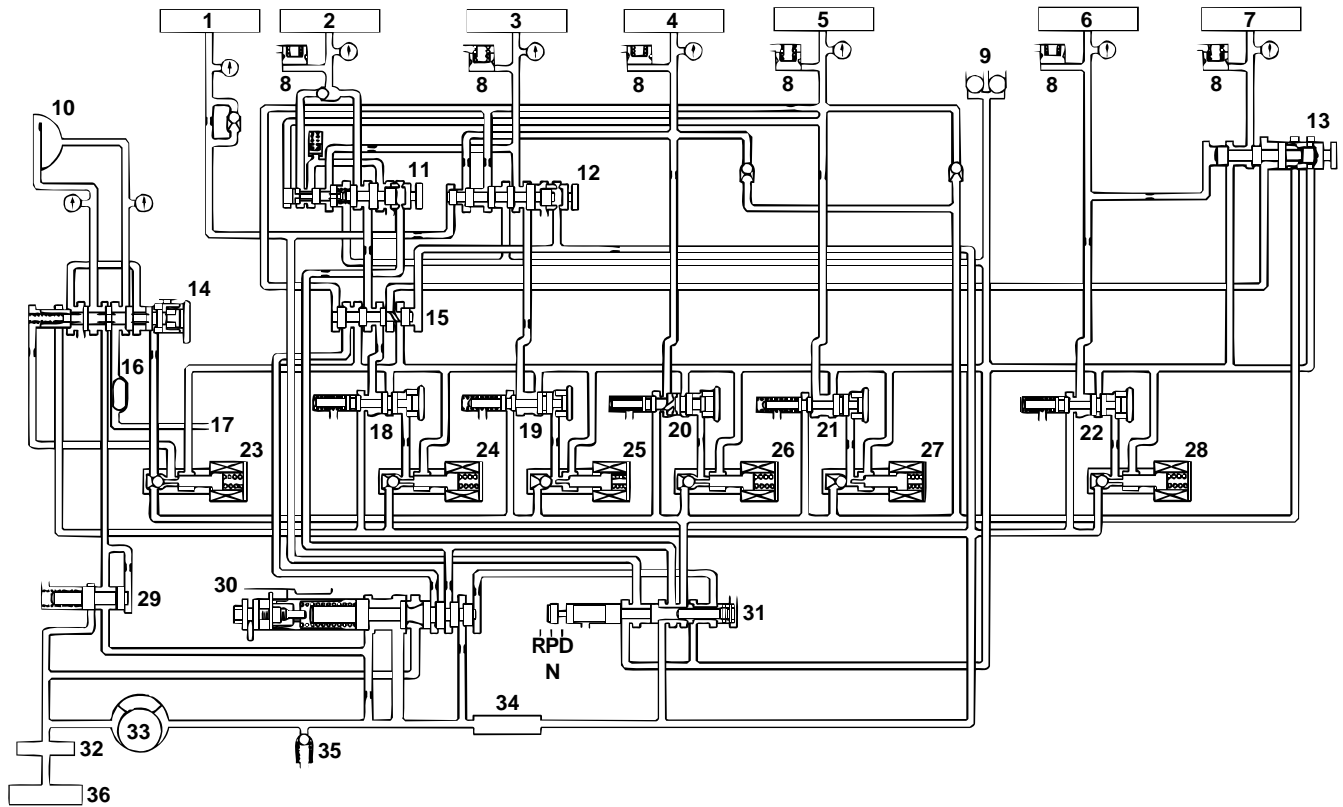


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



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|  : OIL PUMP SUCTION PRESSURE        |  : TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE |
|  : TORQUE CONVERTER CLUTCH PRESSURE |   |

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|---|--|
| 1. REVERSE CLUTCH                         | 20. UNDERDRIVE PRESSURE CONTROL VALVE              |
| 2. LOW-REVERSE BRAKE                      | 21. OVERDRIVE PRESSURE CONTROL VALVE               |
| 3. SECOND BRAKE                           | 22. REDUCTION PRESSURE CONTROL VALVE               |
| 4. UNDERDRIVE CLUTCH                      | 23. TORQUE CONVERTER CLUTCH SOLENOID VALVE         |
| 5. OVERDRIVE CLUTCH                       | 24. LOW-REVERSE SOLENOID VALVE                     |
| 6. REDUCTION BRAKE                        | 25. SECOND SOLENOID VALVE                          |
| 7. DIRECT CLUTCH                          | 26. UNDERDRIVE SOLENOID VALVE                      |
| 8. ACCUMULATOR                            | 27. OVERDRIVE SOLENOID VALVE                       |
| 9. CHECK BALL                             | 28. REDUCTION SOLENOID VALVE                       |
| 10. TORQUE CONVERTER CLUTCH               | 29. TORQUE CONVERTER CLUTCH PRESSURE CONTROL VALVE |
| 11. FAIL SAFE VALVE A                     | 30. REGULATOR VALVE                                |
| 12. FAIL SAFE VALVE B                     | 31. MANUAL VALVE                                   |
| 13. FAIL SAFE VALVE C                     | 32. OIL FILTER                                     |
| 14. TORQUE CONVERTER CLUTCH CONTROL VALVE | 33. OIL PUMP                                       |
| 15. SWITCH VALVE                          | 34. OIL STRAINER                                   |
| 16. TRANSMISSION FLUID COOLER             | 35. RELIEF VALVE                                   |
| 17. LUBRICATION                           | 36. OIL PAN  |
| 18. LOW-REVERSE PRESSURE CONTROL VALVE    |  |
| 19. SECOND PRESSURE CONTROL VALVE         |  |

1ST GEAR

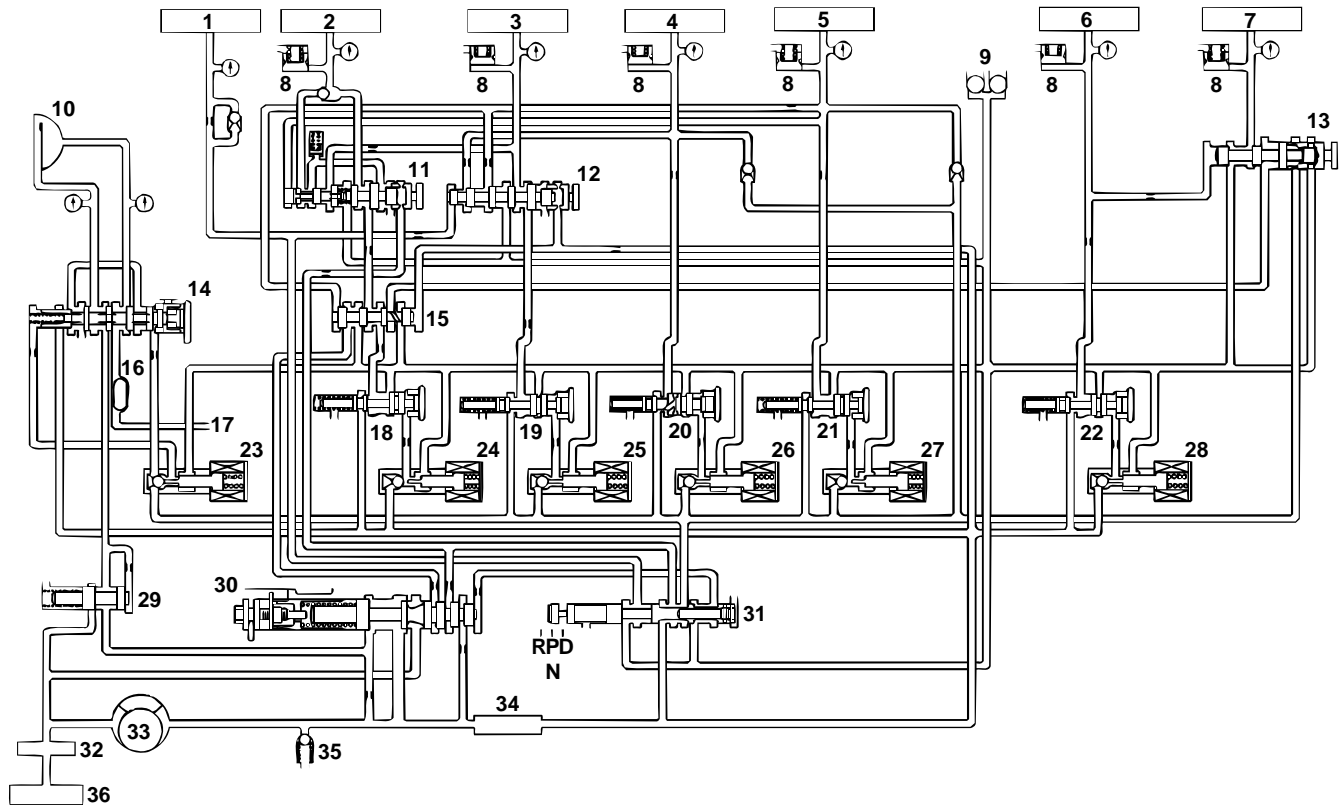


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|  : TORQUE CONVERTER CLUTCH PRESSURE |   |

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|---|--|
| 1. REVERSE CLUTCH                         | 20. UNDERDRIVE PRESSURE CONTROL VALVE              |
| 2. LOW-REVERSE BRAKE                      | 21. OVERDRIVE PRESSURE CONTROL VALVE               |
| 3. SECOND BRAKE                           | 22. REDUCTION PRESSURE CONTROL VALVE               |
| 4. UNDERDRIVE CLUTCH                      | 23. TORQUE CONVERTER CLUTCH SOLENOID VALVE         |
| 5. OVERDRIVE CLUTCH                       | 24. LOW-REVERSE SOLENOID VALVE                     |
| 6. REDUCTION BRAKE                        | 25. SECOND SOLENOID VALVE                          |
| 7. DIRECT CLUTCH                          | 26. UNDERDRIVE SOLENOID VALVE                      |
| 8. ACCUMULATOR                            | 27. OVERDRIVE SOLENOID VALVE                       |
| 9. CHECK BALL                             | 28. REDUCTION SOLENOID VALVE                       |
| 10. TORQUE CONVERTER CLUTCH               | 29. TORQUE CONVERTER CLUTCH PRESSURE CONTROL VALVE |
| 11. FAIL SAFE VALVE A                     | 30. REGULATOR VALVE                                |
| 12. FAIL SAFE VALVE B                     | 31. MANUAL VALVE                                   |
| 13. FAIL SAFE VALVE C                     | 32. OIL FILTER                                     |
| 14. TORQUE CONVERTER CLUTCH CONTROL VALVE | 33. OIL PUMP                                       |
| 15. SWITCH VALVE                          | 34. OIL STRAINER                                   |
| 16. TRANSMISSION FLUID COOLER             | 35. RELIEF VALVE                                   |
| 17. LUBRICATION                           | 36. OIL PAN  |
| 18. LOW-REVERSE PRESSURE CONTROL VALVE    |  |
| 19. SECOND PRESSURE CONTROL VALVE         |  |

**2ND GEAR**

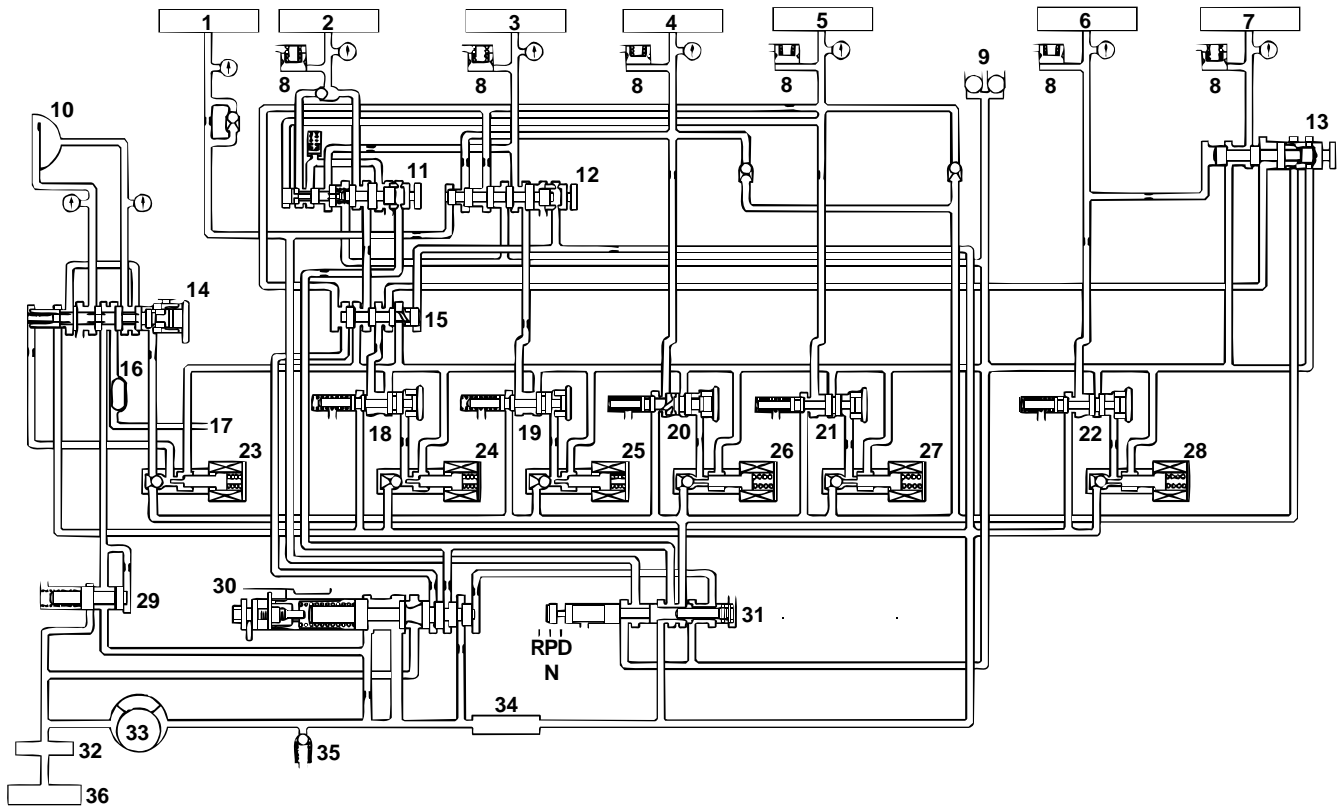


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| : OIL PUMP SUCTION PRESSURE        | : TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE |
| : TORQUE CONVERTER CLUTCH PRESSURE |   |

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| <ul style="list-style-type: none"> <li>1. REVERSE CLUTCH</li> <li>2. LOW-REVERSE BRAKE</li> <li>3. SECOND BRAKE</li> <li>4. UNDERDRIVE CLUTCH</li> <li>5. OVERDRIVE CLUTCH</li> <li>6. REDUCTION BRAKE</li> <li>7. DIRECT CLUTCH</li> <li>8. ACCUMULATOR</li> <li>9. CHECK BALL</li> <li>10. TORQUE CONVERTER CLUTCH</li> <li>11. FAIL SAFE VALVE A</li> <li>12. FAIL SAFE VALVE B</li> <li>13. FAIL SAFE VALVE C</li> <li>14. TORQUE CONVERTER CLUTCH CONTROL VALVE</li> <li>15. SWITCH VALVE</li> <li>16. TRANSMISSION FLUID COOLER</li> <li>17. LUBRICATION</li> <li>18. LOW-REVERSE PRESSURE CONTROL VALVE</li> <li>19. SECOND PRESSURE CONTROL VALVE</li> </ul> | <ul style="list-style-type: none"> <li>20. UNDERDRIVE PRESSURE CONTROL VALVE</li> <li>21. OVERDRIVE PRESSURE CONTROL VALVE</li> <li>22. REDUCTION PRESSURE CONTROL VALVE</li> <li>23. TORQUE CONVERTER CLUTCH SOLENOID VALVE</li> <li>24. LOW-REVERSE SOLENOID VALVE</li> <li>25. SECOND SOLENOID VALVE</li> <li>26. UNDERDRIVE SOLENOID VALVE</li> <li>27. OVERDRIVE SOLENOID VALVE</li> <li>28. REDUCTION SOLENOID VALVE</li> <li>29. TORQUE CONVERTER CLUTCH PRESSURE CONTROL VALVE</li> <li>30. REGULATOR VALVE</li> <li>31. MANUAL VALVE</li> <li>32. OIL FILTER</li> <li>33. OIL PUMP</li> <li>34. OIL STRAINER</li> <li>35. RELIEF VALVE</li> <li>36. OIL PAN</li> </ul> |
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3RD GEAR



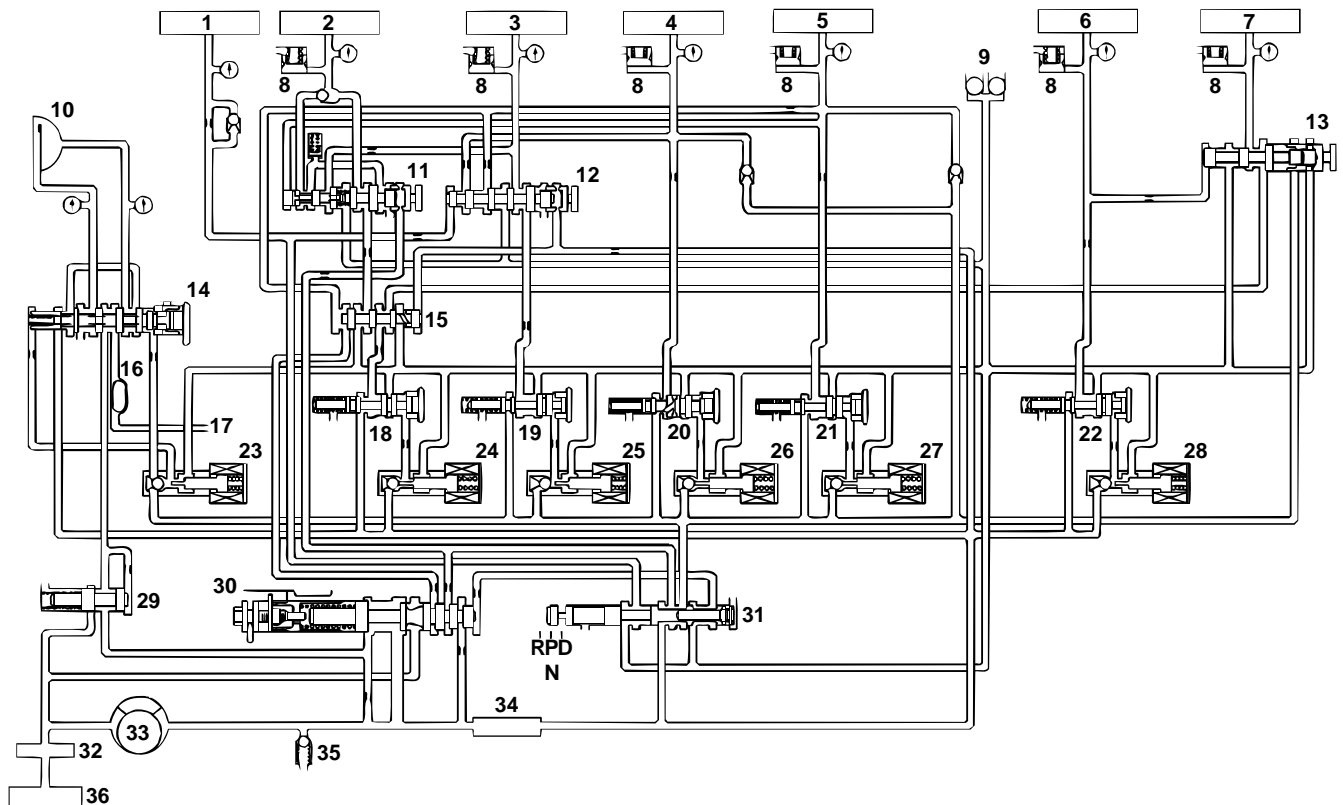
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




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|---|--|
| 1. REVERSE CLUTCH                         | 20. UNDERDRIVE PRESSURE CONTROL VALVE              |
| 2. LOW-REVERSE BRAKE                      | 21. OVERDRIVE PRESSURE CONTROL VALVE               |
| 3. SECOND BRAKE                           | 22. REDUCTION PRESSURE CONTROL VALVE               |
| 4. UNDERDRIVE CLUTCH                      | 23. TORQUE CONVERTER CLUTCH SOLENOID VALVE         |
| 5. OVERDRIVE CLUTCH                       | 24. LOW-REVERSE SOLENOID VALVE                     |
| 6. REDUCTION BRAKE                        | 25. SECOND SOLENOID VALVE                          |
| 7. DIRECT CLUTCH                          | 26. UNDERDRIVE SOLENOID VALVE                      |
| 8. ACCUMULATOR                            | 27. OVERDRIVE SOLENOID VALVE                       |
| 9. CHECK BALL                             | 28. REDUCTION SOLENOID VALVE                       |
| 10. TORQUE CONVERTER CLUTCH               | 29. TORQUE CONVERTER CLUTCH PRESSURE CONTROL VALVE |
| 11. FAIL SAFE VALVE A                     | 30. REGULATOR VALVE                                |
| 12. FAIL SAFE VALVE B                     | 31. MANUAL VALVE                                   |
| 13. FAIL SAFE VALVE C                     | 32. OIL FILTER                                     |
| 14. TORQUE CONVERTER CLUTCH CONTROL VALVE | 33. OIL PUMP                                       |
| 15. SWITCH VALVE                          | 34. OIL STRAINER                                   |
| 16. TRANSMISSION FLUID COOLER             | 35. RELIEF VALVE                                   |
| 17. LUBRICATION                           | 36. OIL PAN  |
| 18. LOW-REVERSE PRESSURE CONTROL VALVE    |  |
| 19. SECOND PRESSURE CONTROL VALVE         |  |



**4TH GEAR**

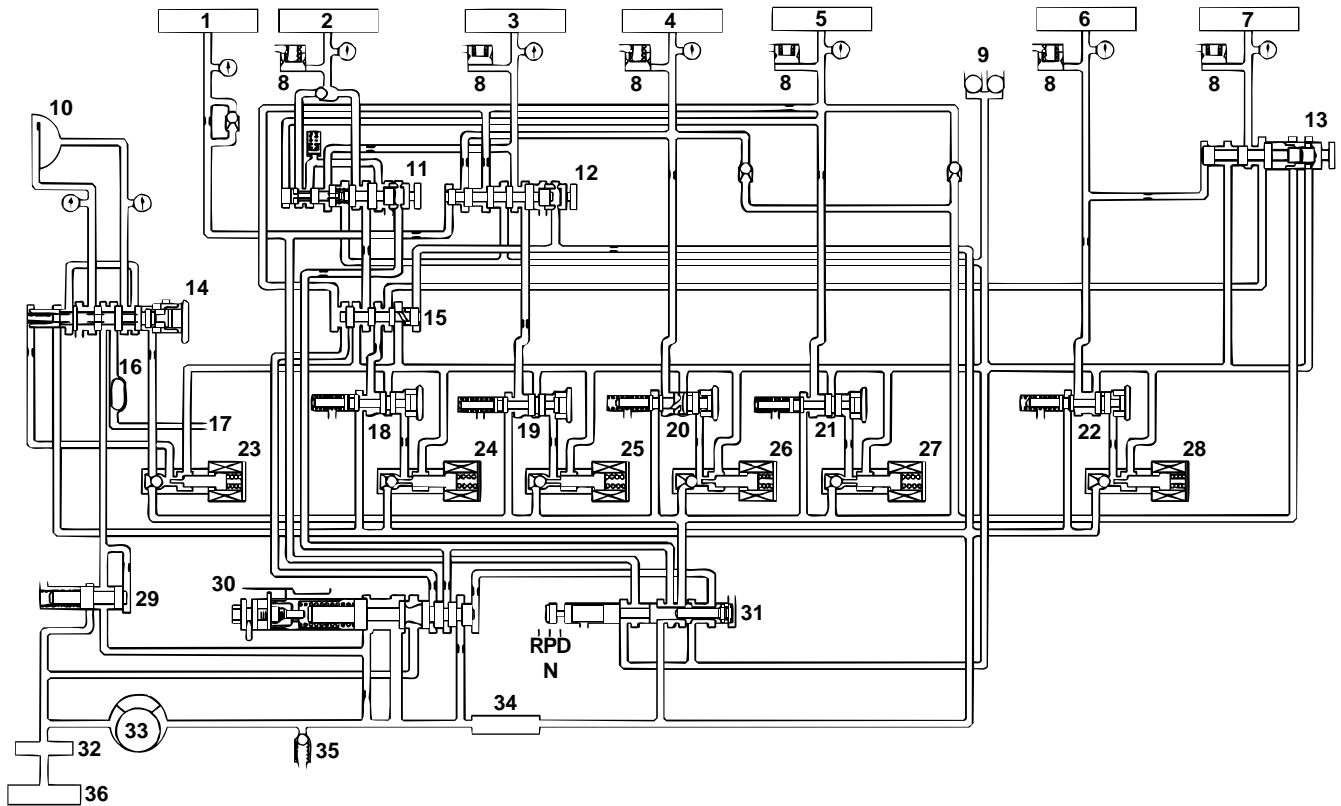


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|  : TORQUE CONVERTER CLUTCH PRESSURE |   |

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|---|--|
| 1. REVERSE CLUTCH                         | 20. UNDERDRIVE PRESSURE CONTROL VALVE              |
| 2. LOW-REVERSE BRAKE                      | 21. OVERDRIVE PRESSURE CONTROL VALVE               |
| 3. SECOND BRAKE                           | 22. REDUCTION PRESSURE CONTROL VALVE               |
| 4. UNDERDRIVE CLUTCH                      | 23. TORQUE CONVERTER CLUTCH SOLENOID VALVE         |
| 5. OVERDRIVE CLUTCH                       | 24. LOW-REVERSE SOLENOID VALVE                     |
| 6. REDUCTION BRAKE                        | 25. SECOND SOLENOID VALVE                          |
| 7. DIRECT CLUTCH                          | 26. UNDERDRIVE SOLENOID VALVE                      |
| 8. ACCUMULATOR                            | 27. OVERDRIVE SOLENOID VALVE                       |
| 9. CHECK BALL                             | 28. REDUCTION SOLENOID VALVE                       |
| 10. TORQUE CONVERTER CLUTCH               | 29. TORQUE CONVERTER CLUTCH PRESSURE CONTROL VALVE |
| 11. FAIL SAFE VALVE A                     | 30. REGULATOR VALVE                                |
| 12. FAIL SAFE VALVE B                     | 31. MANUAL VALVE                                   |
| 13. FAIL SAFE VALVE C                     | 32. OIL FILTER                                     |
| 14. TORQUE CONVERTER CLUTCH CONTROL VALVE | 33. OIL PUMP                                       |
| 15. SWITCH VALVE                          | 34. OIL STRAINER                                   |
| 16. TRANSMISSION FLUID COOLER             | 35. RELIEF VALVE                                   |
| 17. LUBRICATION                           | 36. OIL PAN  |
| 18. LOW-REVERSE PRESSURE CONTROL VALVE    |  |
| 19. SECOND PRESSURE CONTROL VALVE         |  |

5TH GEAR



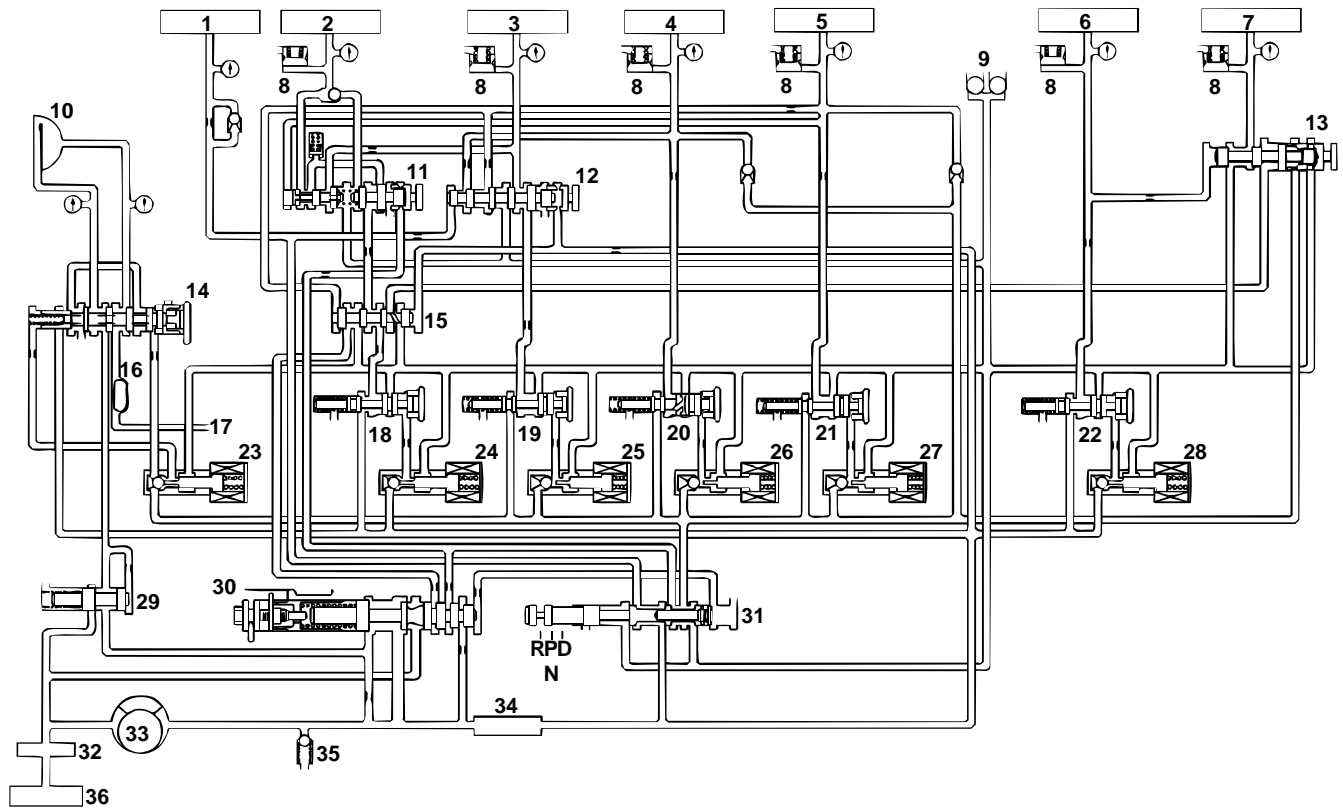
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: LINE PRESSURE  
 : OIL PUMP SUCTION PRESSURE  
 : TORQUE CONVERTER CLUTCH PRESSURE






: TORQUE CONVERTER AND LUBRICATION PRESSURE  
 : TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

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**REVERSE**

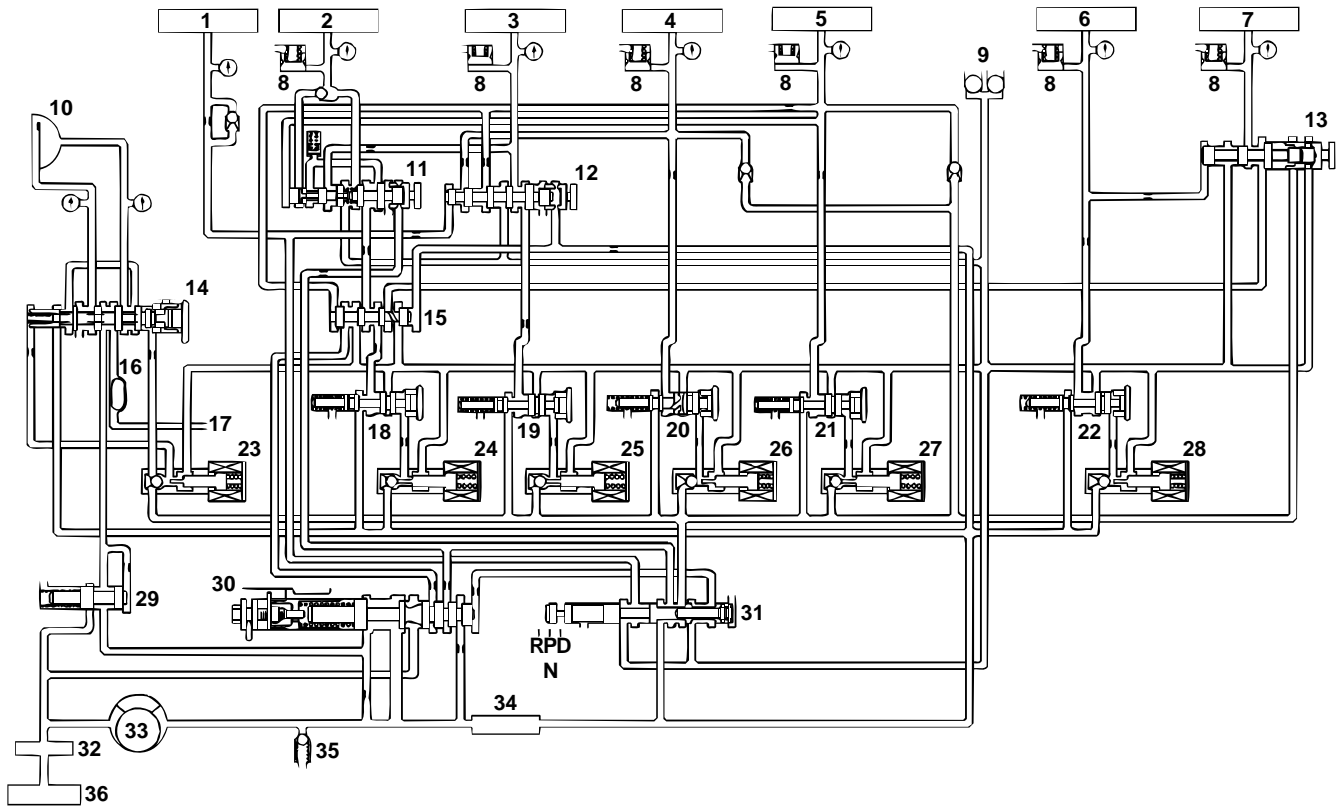


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|  : OIL PUMP SUCTION PRESSURE        |  : TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE |
|  : TORQUE CONVERTER CLUTCH PRESSURE |   |

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|---|--|
| 1. REVERSE CLUTCH                         | 20. UNDERDRIVE PRESSURE CONTROL VALVE              |
| 2. LOW-REVERSE BRAKE                      | 21. OVERDRIVE PRESSURE CONTROL VALVE               |
| 3. SECOND BRAKE                           | 22. REDUCTION PRESSURE CONTROL VALVE               |
| 4. UNDERDRIVE CLUTCH                      | 23. TORQUE CONVERTER CLUTCH SOLENOID VALVE         |
| 5. OVERDRIVE CLUTCH                       | 24. LOW-REVERSE SOLENOID VALVE                     |
| 6. REDUCTION BRAKE                        | 25. SECOND SOLENOID VALVE                          |
| 7. DIRECT CLUTCH                          | 26. UNDERDRIVE SOLENOID VALVE                      |
| 8. ACCUMULATOR                            | 27. OVERDRIVE SOLENOID VALVE                       |
| 9. CHECK BALL                             | 28. REDUCTION SOLENOID VALVE                       |
| 10. TORQUE CONVERTER CLUTCH               | 29. TORQUE CONVERTER CLUTCH PRESSURE CONTROL VALVE |
| 11. FAIL SAFE VALVE A                     | 30. REGULATOR VALVE                                |
| 12. FAIL SAFE VALVE B                     | 31. MANUAL VALVE                                   |
| 13. FAIL SAFE VALVE C                     | 32. OIL FILTER                                     |
| 14. TORQUE CONVERTER CLUTCH CONTROL VALVE | 33. OIL PUMP                                       |
| 15. SWITCH VALVE                          | 34. OIL STRAINER                                   |
| 16. TRANSMISSION FLUID COOLER             | 35. RELIEF VALVE                                   |
| 17. LUBRICATION                           | 36. OIL PAN  |
| 18. LOW-REVERSE PRESSURE CONTROL VALVE    |  |
| 19. SECOND PRESSURE CONTROL VALVE         |  |

FAIL-SAFE (IN CASE OF FAIL-SAFE VALE A OPERATION)



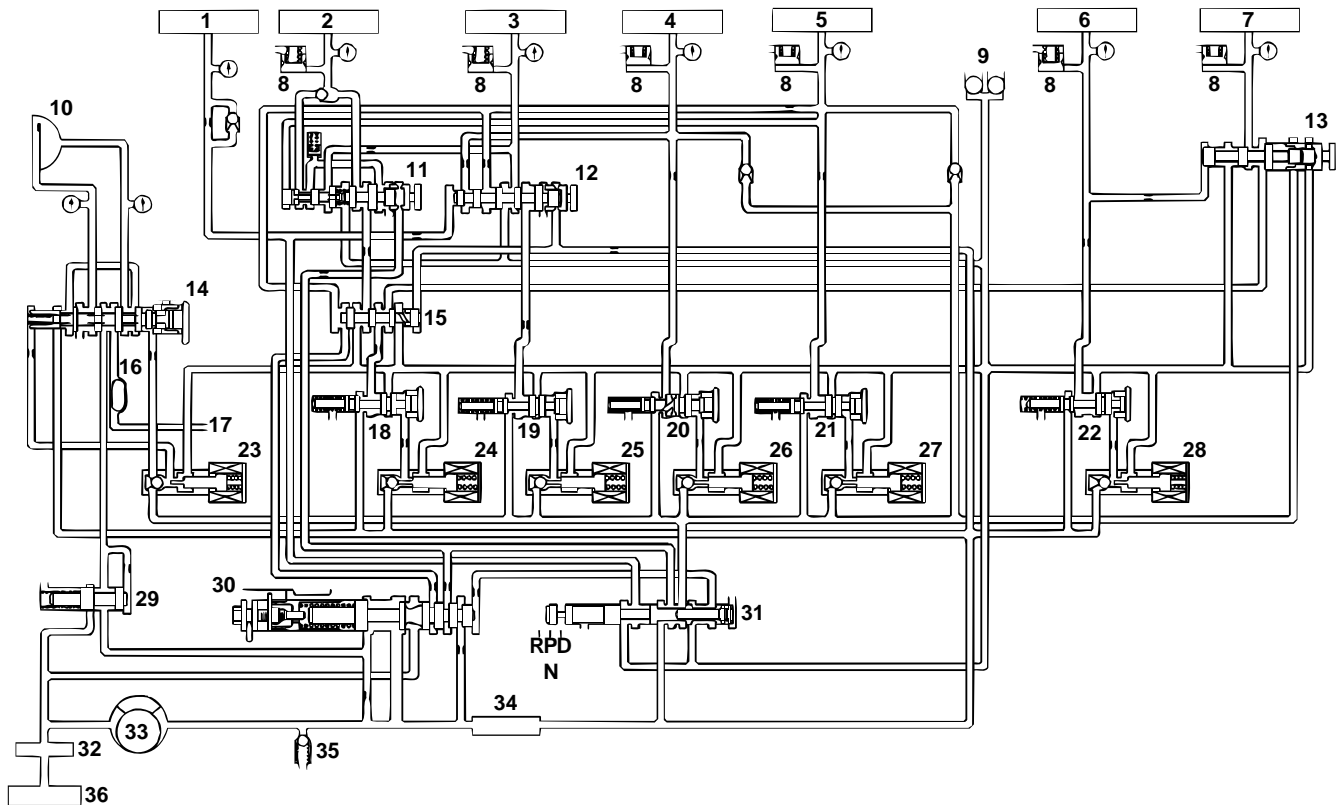
: LINE PRESSURE  
 : OIL PUMP SUCTION PRESSURE  
 : TORQUE CONVERTER CLUTCH PRESSURE

: TORQUE CONVERTER AND LUBRICATION PRESSURE  
 : TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE






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|--|---|
| <ul style="list-style-type: none"> <li>1. REVERSE CLUTCH</li> <li>2. LOW-REVERSE BRAKE</li> <li>3. SECOND BRAKE</li> <li>4. UNDERDRIVE CLUTCH</li> <li>5. OVERDRIVE CLUTCH</li> <li>6. REDUCTION BRAKE</li> <li>7. DIRECT CLUTCH</li> <li>8. ACCUMULATOR</li> <li>9. CHECK BALL</li> <li>10. TORQUE CONVERTER CLUTCH</li> <li>11. FAIL SAFE VALVE A</li> <li>12. FAIL SAFE VALVE B</li> <li>13. FAIL SAFE VALVE C</li> <li>14. TORQUE CONVERTER CLUTCH CONTROL VALVE</li> <li>15. SWITCH VALVE</li> <li>16. TRANSMISSION FLUID COOLER</li> <li>17. LUBRICATION</li> <li>18. LOW-REVERSE PRESSURE CONTROL VALVE</li> <li>19. SECOND PRESSURE CONTROL VALVE</li> </ul> | <ul style="list-style-type: none"> <li>20. UNDERDRIVE PRESSURE CONTROL VALVE</li> <li>21. OVERDRIVE PRESSURE CONTROL VALVE</li> <li>22. REDUCTION PRESSURE CONTROL VALVE</li> <li>23. TORQUE CONVERTER CLUTCH SOLENOID VALVE</li> <li>24. LOW-REVERSE SOLENOID VALVE</li> <li>25. SECOND SOLENOID VALVE</li> <li>26. UNDERDRIVE SOLENOID VALVE</li> <li>27. OVERDRIVE SOLENOID VALVE</li> <li>28. REDUCTION SOLENOID VALVE</li> <li>29. TORQUE CONVERTER CLUTCH PRESSURE CONTROL VALVE</li> <li>30. REGULATOR VALVE</li> <li>31. MANUAL VALVE</li> <li>32. OIL FILTER</li> <li>33. OIL PUMP</li> <li>34. OIL STRAINER</li> <li>35. RELIEF VALVE</li> <li>36. OIL PAN</li> </ul> |
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**FAIL-SAFE (IN CASE OF FAIL-SAFE VALVE B OPERATION)**

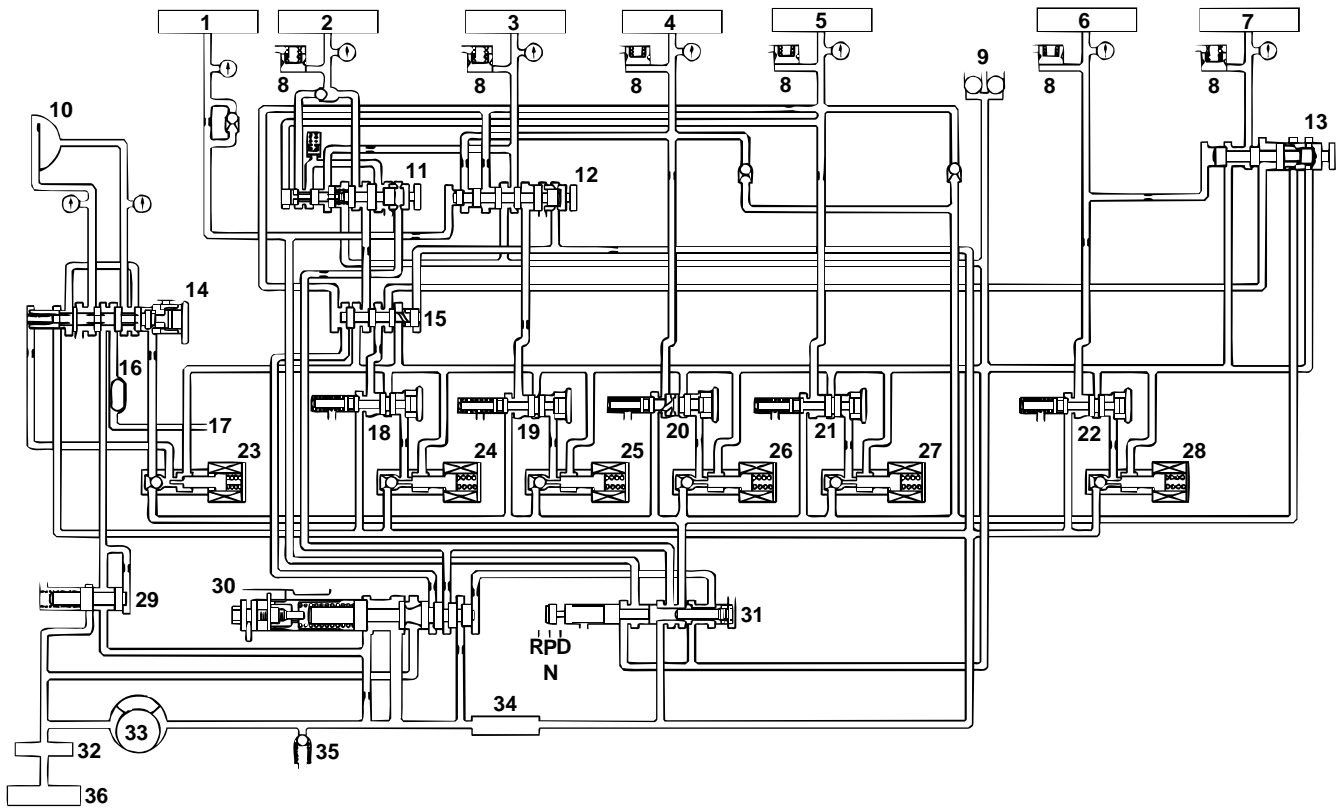


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




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|--|---|
|  : LINE PRESSURE                    |  : TORQUE CONVERTER AND LUBRICATION PRESSURE       |
|  : OIL PUMP SUCTION PRESSURE        |  : TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE |
|  : TORQUE CONVERTER CLUTCH PRESSURE |   |

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|---|--|
| 1. REVERSE CLUTCH                         | 20. UNDERDRIVE PRESSURE CONTROL VALVE              |
| 2. LOW-REVERSE BRAKE                      | 21. OVERDRIVE PRESSURE CONTROL VALVE               |
| 3. SECOND BRAKE                           | 22. REDUCTION PRESSURE CONTROL VALVE               |
| 4. UNDERDRIVE CLUTCH                      | 23. TORQUE CONVERTER CLUTCH SOLENOID VALVE         |
| 5. OVERDRIVE CLUTCH                       | 24. LOW-REVERSE SOLENOID VALVE                     |
| 6. REDUCTION BRAKE                        | 25. SECOND SOLENOID VALVE                          |
| 7. DIRECT CLUTCH                          | 26. UNDERDRIVE SOLENOID VALVE                      |
| 8. ACCUMULATOR                            | 27. OVERDRIVE SOLENOID VALVE                       |
| 9. CHECK BALL                             | 28. REDUCTION SOLENOID VALVE                       |
| 10. TORQUE CONVERTER CLUTCH               | 29. TORQUE CONVERTER CLUTCH PRESSURE CONTROL VALVE |
| 11. FAIL SAFE VALVE A                     | 30. REGULATOR VALVE                                |
| 12. FAIL SAFE VALVE B                     | 31. MANUAL VALVE                                   |
| 13. FAIL SAFE VALVE C                     | 32. OIL FILTER                                     |
| 14. TORQUE CONVERTER CLUTCH CONTROL VALVE | 33. OIL PUMP                                       |
| 15. SWITCH VALVE                          | 34. OIL STRAINER                                   |
| 16. TRANSMISSION FLUID COOLER             | 35. RELIEF VALVE                                   |
| 17. LUBRICATION                           | 36. OIL PAN  |
| 18. LOW-REVERSE PRESSURE CONTROL VALVE    |  |
| 19. SECOND PRESSURE CONTROL VALVE         |  |

FAIL-SAFE (IN CASE OF FAIL-SAFE VALVE C OPERATION)



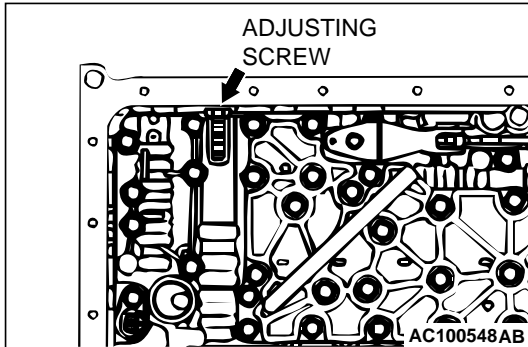
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|--|---|
|  : LINE PRESSURE                    |  : TORQUE CONVERTER AND LUBRICATION PRESSURE       |
|  : OIL PUMP SUCTION PRESSURE        |  : TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE |
|  : TORQUE CONVERTER CLUTCH PRESSURE |   |

- |   |  |
|---|--|
| 1. REVERSE CLUTCH                         | 20. UNDERDRIVE PRESSURE CONTROL VALVE              |
| 2. LOW-REVERSE BRAKE                      | 21. OVERDRIVE PRESSURE CONTROL VALVE               |
| 3. SECOND BRAKE                           | 22. REDUCTION PRESSURE CONTROL VALVE               |
| 4. UNDERDRIVE CLUTCH                      | 23. TORQUE CONVERTER CLUTCH SOLENOID VALVE         |
| 5. OVERDRIVE CLUTCH                       | 24. LOW-REVERSE SOLENOID VALVE                     |
| 6. REDUCTION BRAKE                        | 25. SECOND SOLENOID VALVE                          |
| 7. DIRECT CLUTCH                          | 26. UNDERDRIVE SOLENOID VALVE                      |
| 8. ACCUMULATOR                            | 27. OVERDRIVE SOLENOID VALVE                       |
| 9. CHECK BALL                             | 28. REDUCTION SOLENOID VALVE                       |
| 10. TORQUE CONVERTER CLUTCH               | 29. TORQUE CONVERTER CLUTCH PRESSURE CONTROL VALVE |
| 11. FAIL SAFE VALVE A                     | 30. REGULATOR VALVE                                |
| 12. FAIL SAFE VALVE B                     | 31. MANUAL VALVE                                   |
| 13. FAIL SAFE VALVE C                     | 32. OIL FILTER                                     |
| 14. TORQUE CONVERTER CLUTCH CONTROL VALVE | 33. OIL PUMP                                       |
| 15. SWITCH VALVE                          | 34. OIL STRAINER                                   |
| 16. TRANSMISSION FLUID COOLER             | 35. RELIEF VALVE                                   |
| 17. LUBRICATION                           | 36. OIL PAN  |
| 18. LOW-REVERSE PRESSURE CONTROL VALVE    |  |
| 19. SECOND PRESSURE CONTROL VALVE         |  |

**LINE PRESSURE ADJUSTMENT**

M1231108700091



1. Drain the transmission fluid.  
*NOTE: The hydraulic pressure test must be performed before attempting any adjustments.*
2. Remove the valve body cover.
3. Turn the adjusting screw shown in the illustration to adjust the line pressure to the standard value. The pressure increases when the screw is turned counterclockwise.  
*NOTE: Adjust to the middle of the standard range when the transmission is at the 1st or 2nd gear.*  
**Standard value: 1.01 – 1.05 MPa (147 – 152 psi)**  
*NOTE: Each complete turn of the adjusting screw changes pressure: 0.035 MPa (5.1 psi)*
4. Install the valve body cover. Pour in one quart Transmission fluid.
5. Repeat the hydraulic pressure test. (Refer to [P.23Ab-15.](#)) Readjust the line pressure if necessary.

**DIAGNOSTIC TROUBLE CODE CHART**

M1231101200114

<b>A/T DTC</b>	<b>MFI DTC</b>	<b>DIAGNOSTIC ITEM</b>	<b>REFERENCE PAGE</b>	
15	P0712	Transmission fluid temperature sensor system	Open circuit	<a href="#">P.23Ac-2</a>
16	P0713		Short circuit	<a href="#">P.23Ac-18</a>
21	-	Crankshaft position sensor system	Open circuit	<a href="#">P.23Ac-27</a>
22	P0715	Input shaft speed sensor system	Short circuit/open circuit	<a href="#">P.23Ac-47</a>
23	P0720	Output shaft speed sensor system	Short circuit/open circuit	<a href="#">P.23Ac-65</a>
26	-	Stoplight switch system	Short circuit	<a href="#">P.23Ac-83</a>
27	P0705	Transmission range switch system	Open circuit	<a href="#">P.23Ac-93</a>
28			Short circuit	<a href="#">P.23Ac-123</a>
29	P0500	Vehicle speed sensor system	Short circuit/open circuit	<a href="#">P.23Ac-140</a>
31	P0753	Low-reverse solenoid valve system	Short circuit/open circuit	<a href="#">P.23Ac-147</a>
32	P0758	Underdrive solenoid valve system	Short circuit/open circuit	<a href="#">P.23Ac-160</a>
33	P0763	Second solenoid valve system	Short circuit/open circuit	<a href="#">P.23Ac-171</a>
34	P0768	Overdrive solenoid valve system	Short circuit/open circuit	<a href="#">P.23Ac-181</a>
35	P0773	Reduction solenoid valve system	Short circuit/open circuit	<a href="#">P.23Ac-193</a>
36	P0743	Torque converter clutch solenoid system	Short circuit/open circuit	<a href="#">P.23Ac-204</a>
41	P0731	1st gear incorrect ratio		<a href="#">P.23Ac-215</a>
42	P0732	2nd gear incorrect ratio		<a href="#">P.23Ac-215</a>
43	P0733	3rd gear incorrect ratio		<a href="#">P.23Ac-215</a>
44	P0734	4th gear incorrect ratio		<a href="#">P.23Ac-215</a>
45	P0735	5th gear incorrect ratio		<a href="#">P.23Ac-215</a>
46	P0736	Reverse gear incorrect ratio		<a href="#">P.23Ac-215</a>

A/T DTC	MFI DTC	DIAGNOSTIC ITEM		REFERENCE PAGE
52	P0741	Torque converter clutch solenoid system	Defective system	<a href="#">P.23Ac-228</a>
53	P0742		Clutch stuck on	<a href="#">P.23Ac-232</a>
54	P1751	A/T Control relay system	Short circuit to ground/ open circuit	<a href="#">P.23Ac-237</a>
56	-	"N" range light system	Open circuit	<a href="#">P.23Ac-253</a>

*NOTE: The MFI diagnostic trouble codes are the codes which are set when item "MFI" is selected on scan tool MB991502. However, the codes above indicate failure in the automatic transmission.*

### SYMPTOM CHART <AUTOMATIC TRANSMISSION>

M1231108800098

SYMPTOM		INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication with scan tool (MUT-II) is not possible	Communication with all systems is impossible	–	Group 13A, Symptom Procedures <a href="#">P.13Ad-2</a>
	Communication with the PCM only is impossible	–	Group 13A, Symptom Procedures <a href="#">P.13Ad-5</a>
Driving impossible	Engine does not crank	1	<a href="#">P.23Ad-2</a>
	Does not move forward	2	<a href="#">P.23Ad-4</a>
	Does not move backward	3	<a href="#">P.23Ad-6</a>
	Does not move (forward or backward)	4	<a href="#">P.23Ad-8</a>
Malfunction when moving selector into gear	Engine stalls when moving selector lever from "N" to "D" or "N" to "R"	5	<a href="#">P.23Ad-9</a>
	Shift shock when shifting from "N" to "D" and long delay	6	<a href="#">P.23Ad-11</a>
	Shift shock when shifting from "N" to "R" and long delay	7	<a href="#">P.23Ad-14</a>
	Shift shock when shifting from "N" to "D", "N" to "R" and long delay	8	<a href="#">P.23Ad-17</a>
Malfunction when shifting	Shift shocks and slipping	9	<a href="#">P.23Ad-18</a>
Does not shift properly	Early or late shifting in all gears	10	<a href="#">P.23Ad-21</a>
	Early or late shifting in some gears	11	<a href="#">P.23Ad-23</a>
Does not shift	No diagnostic trouble codes	12	<a href="#">P.23Ad-25</a>
Malfunction while driving	Poor acceleration	13	<a href="#">P.23Ad-29</a>
	Vibration	14	<a href="#">P.23Ad-30</a>
Vehicle shifts differently with A/C engaged		15	<a href="#">P.23Ad-33</a>
Transmission won't downshift under load with auto-cruise engaged		16	<a href="#">P.23Ad-45</a>



Shift switch assembly system	17	<a href="#">P.23Ad-48</a>
4LLc detection switch assembly system	18	<a href="#">P.23Ad-67</a>

**SYMPTOM CHART <A/T FAULTY OPERATION PREVENTION MACHANISM>**

M1232001800264

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Selector lever can be moved from "P" to "R" position without depressing brake pedal when ignition key is at any position other than "LOCK" (OFF) position.	1	<a href="#">P.23Ad-78</a>
Selector lever cannot be moved from "P" to "R" position with brake pedal depressed when ignition key is at any position other than "LOCK" (OFF) position.	2	<a href="#">P.23Ad-78</a>
Selector lever can be moved from "P" to "R" position with brake pedal depressed when ignition key is at "LOCK" (OFF) position.	3	<a href="#">P.23Ad-80</a>
Selector lever cannot be moved from "P" to "R" position smoothly.	4	<a href="#">P.23Ad-80</a>
Selector lever cannot be moved from "P" to "R" position.	5	<a href="#">P.23Ad-81</a>
Ignition key cannot be turned to "LOCK" (OFF) position when selector lever is at "P" position.	6	<a href="#">P.23Ad-82</a>
Ignition key can be turned to "LOCK" (OFF) position when selector lever is at any position other than "P" position.	7	<a href="#">P.23Ad-83</a>

**DATA LIST REFERENCE TABLE**

M1231109100100

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
2ND SOL DUTY	33	Second solenoid valve duty %	Transmission range: Sport mode	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	100 %
			Transmission range: Sport mode	Driving at constant speed of 30 km/h (19 mph) in 2nd gear	0 %
			Transmission range: Sport mode	Driving at constant speed of 50 km/h (31 mph) in 3rd gear	100 %
			Transmission range: Sport mode	Driving at constant speed of 50 km/h (31 mph) in 4th gear	100 %
			Transmission range: Sport mode	Driving at constant speed of 70 km/h (43 mph) in 5th gear	0 %
A/T CONT RLY	54	A/T control relay output voltage	Ignition switch: ON		Battery positive voltage
CKP SENSOR	21	Crankshaft position sensor	Engine: Idling (after the warming up)	Accelerator pedal: Fully closed	600 – 900 r/min
			Transmission range: P	Accelerator pedal: Depressed	Gradually rises from the above value

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
DUAL PRESS SW	65	Dual pressure switch	Engine: Idling Transmission range: P, N	A/C switch: ON (While the A/C compressor is in operation)	ON
				A/C switch: OFF	OFF
ENGINE LOAD	57	Engine load (volumetric efficiency)	Engine: Idling Transmission range: N	Accelerator pedal: fully closed → depressed	Data changes
ISS SENSOR	22	Input shaft speed sensor	Gear range: 4th gear	Driving at constant speed of 50 km/h (31 mph)	1,400 – 1,700 r/min
L/R SOL DUTY	31	Low-reverse solenoid valve duty %	Transmission range: Sport mode	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0 %
			Transmission range: Sport mode	Driving at constant speed of 30 km/h (19 mph) in 2nd gear	100 %
			Transmission range: Sport mode	Driving at constant speed of 50 km/h (31 mph) in 3rd gear	100 %
			Transmission range: Sport mode	Driving at constant speed of 50 km/h (31 mph) in 4th gear	0 %
			Transmission range: Sport mode	Driving at constant speed of 70 km/h (43 mph) in 5th gear	0 %
O/D SOL DUTY	34	Overdrive solenoid valve duty %	Transmission range: Sport mode	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	100 %
			Transmission range: Sport mode	Driving at constant speed of 30 km/h (19 mph) in 2nd gear	100 %
			Transmission range: Sport mode	Driving at constant speed of 50 km/h (31 mph) in 3rd gear	0 %
			Transmission range: Sport mode	Driving at constant speed of 50 km/h (31 mph) in 4th gear	0 %
			Transmission range: Sport mode	Driving at constant speed of 70 km/h (43 mph) in 5th gear	0 %
OD OFF SIGNAL	66	Overdrive off signal (Auto-cruise ECM signal)	While auto-cruise is engaged	Level road	OFF
				Uphill grade	ON

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
OSS SENSOR	23	Output shaft speed sensor	Gear range: 4th gear	Driving at constant speed of 50 km/h (31 mph)	1,400 – 1,700 r/min
TR SWITCH	61	Transmission range switch	Ignition switch: ON	Transmission range: P	P
				Transmission range: R	R
				Transmission range: N	N
				Transmission range: D	D
SELECT SW	67	Select switch	Ignition switch: ON	Transmission range: D	OFF
				Selector lever operation: Select sport mode	ON
				Selector lever operation: Upshift and hold the selector lever	ON
				Selector lever operation: Downshift and hold the selector lever	ON
SHIFT POS	63	Shift position	Transmission range: Sport mode	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	1st
			Transmission range: Sport mode	Driving at constant speed of 30 km/h (19 mph) in 2nd gear	2nd
			Transmission range: Sport mode	Driving at constant speed of 50 km/h (31 mph) in 3rd gear	3rd
			Transmission range: Sport mode	Driving at constant speed of 50 km/h (31 mph) in 4th gear	4th
			Transmission range: Sport mode	Driving at constant speed of 70 km/h (43 mph) in 5th gear	5th
			Transmission range: R	Driving at constant speed of 5 km/h (3.1 mph) in reverse gear	REV
			Transmission range: P or N		PN

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
SHIFT SW DOWN	69	Shift switch (Down)	Ignition switch: ON	Transmission range: D	OFF
				Selector lever operation: Select sport mode	OFF
				Selector lever operation: Upshift and hold the selector lever	OFF
				Selector lever operation: Downshift and hold the selector lever	ON
SHIFT SW UP	68	Shift switch (Up)	Ignition switch: ON	Transmission range: D	OFF
				Selector lever operation: Select sport mode	OFF
				Selector lever operation: Upshift and hold the selector lever	ON
				Selector lever operation: Downshift and hold the selector lever	OFF
STOPLIGHT SW	26	Stoplight switch	Ignition switch: ON	Brake pedal: Depressed	ON
				Brake pedal: Released	OFF
TCC SLIPPAGE	52	Torque converter clutch amount of slippage	Warmed up Transmission range: Sport mode Driving at speed of 80 km/h (50 mph) in 4th gear	Driving at constant speed of 80 km/h (50 mph)	-10 to 10 r/min
				Release accelerator pedal (at less than 50 km/h (31 mph))	The value should fluctuate when the accelerator is released
TCC SOL DUTY	36	Torque converter clutch solenoid valve duty %	Warmed up Transmission range: Sport mode Driving at speed of 80 km/h (50 mph) in 4th gear	Driving at constant speed of 80 km/h (50 mph)	70 – 90 %
				Release accelerator pedal (at less than 50 km/h (31 mph))	70 – 90 % → 0 % Decreases gradually as the vehicle speed decreases

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
TF LOW DETECT	75	4LLc detection switch	Ignition switch: ON Transmission range: N	Transfer position: 4L Lc	ON
				Transfer position: Other than above	OFF
TP SENSOR	11	Throttle position sensor	Ignition switch: ON Engine: Stopped Transmission range: P	Accelerator pedal: Fully closed	200 – 800 mV
				Accelerator pedal: Depressed	Gradually rises from the above value
				Accelerator pedal: Fully open	3,800 – 4,900 mV
TFT SENSOR	15	Transmission fluid temperature sensor	Warmed up	Drive for 15 minutes or more so that the transmission fluid temperature becomes 70 – 80°C (158 – 176°F)	Gradually rises to 70 – 80°C (158 – 176°F)
U/D SOL DUTY	32	Underdrive solenoid valve duty %	Transmission range: Sport mode	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0 %
				Driving at constant speed of 30 km/h (19 mph) in 2nd gear	0 %
				Driving at constant speed of 50 km/h (31 mph) in 3rd gear	0 %
				Driving at constant speed of 50 km/h (31 mph) in 4th gear	0 %
				Driving at constant speed of 70 km/h (43 mph) in 5th gear	100 %
VSS	29	Vehicle speed sensor	Transmission range: Sport mode	Idling with 1st gear (Vehicle stopped)	0 km/h (0 mph)
				Driving at constant speed of 50 km/h (31 mph)	50 km/h (31 mph)

## ACTUATOR TEST REFERENCE TABLE

M1231101000109

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	TEST CONTENT	INSPECTION REQUIREMENT	NORMAL CONDITION
1st SHIFT LMP	07	1st indicator light	Illuminate each indicator light for three to the signal from the MUT-II	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Transmission range: P</li> <li>Engine: stopped</li> <li>Throttle opening voltage: Less than one volt</li> </ul>	Shift indicator light illuminates.
2nd SHIFT LMP	08	2nd indicator light			
2ND SOL	03	Second solenoid valve	Drive the solenoid valve specified by the scan tool (MUT-II) at 50 % duty for five seconds. No other solenoid valve should be energized.		The solenoid should click when activated
3rd SHIFT LMP	09	3rd indicator light	Illuminate each indicator light for three to the signal from the MUT-II.		
4th SHIFT LMP	10	4th indicator light			
5th SHIFT LMP	11	5th indicator light			
A/T RELAY	12	A/T control relay	Actuator test in scope mode, data list No. 54. Control relay is OFF for three seconds.		Data list No. 54 <ul style="list-style-type: none"> <li>(1 )During test: 0 V</li> <li>(2) Normal: Battery positive voltage [12 V]</li> </ul>
L/R SOL	01	Low-reverse solenoid valve	Drive the solenoid valve specified by the scan tool (MUT-II) at 50 % duty for five seconds. No other solenoid valve should be energized.		
O/D SOL	04	Overdrive solenoid valve			
RED SOL	05	Reduction solenoid valve			
TCC SOL	06	Torque converter clutch solenoid valve			
U/D SOL	02	Underdrive solenoid valve			

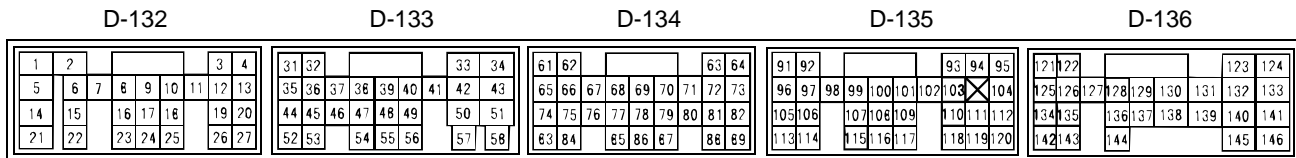
## INVECS-II CANCEL COMMAND

M1231109300096

MUT-II SCAN TOOL DISPLAY	ITEM NO.	ITEM	CONTENT	REMARKS
Std. SHIFT PATN	14	Standard shift pattern	Stops the INVECS-II control and shifts gears according to the standard shift pattern.	Use this function when performing procedure 8 in the road tests. (Refer to <a href="#">P.23Ab-7.</a> ) The INVECS-II cancel command will last until the ignition switch is turned from "ON" to "LOCK" (OFF) or vice versa.

**PCM TERMINAL VOLTAGE REFERENCE CHART FOR TRANSMISSION**

M1231101400129



AC204035AB

TERMINAL NO.	INSPECTION ITEMS	INSPECTION REQUIREMENT	NORMAL CONDITION
39	Stoplight switch	Ignition switch: ON Brake pedal: Depressed	Battery positive voltage
		Ignition switch: ON Brake pedal: Released	1 V or less
55	4LLc detection switch	Ignition switch: ON Selector lever operation: N Transfer position: 4LLc	1 V or less
		Ignition switch: ON Selector lever operation: N Transfer position: Other than above	Battery positive voltage
64	Input shaft speed sensor	Measure between terminals 88 and 64 with an oscilloscope. Engine: 2,000 r/min Gear range: 4th gear	Refer to <a href="#">P.23Ab-42</a> , Inspection Procedure Using an Oscilloscope.
66	Transmission range switch: P	Ignition switch: ON Transmission range: P	Battery positive voltage
		Ignition switch: ON Transmission range: Other than above	1 V or less
67	Transmission range switch: R	Ignition switch: ON Transmission range: R	Battery positive voltage
		Ignition switch: ON Transmission range: Other than above	1 V or less
68	Shift switch (Down)	Ignition switch: ON Selector lever operation: Downshift and hold the selector lever	Battery positive voltage
		Ignition switch: ON Selector lever operation: Other than above	1 V or less
70	Crankshaft position sensor	Engine: Idling	1.5– 2.5 V
73	Output shaft speed sensor	Measure between terminals 88 and 73 with an oscilloscope. Engine: 2,000 r/min Gear range: 4th gear	Refer to <a href="#">P.23Ab-42</a> , Inspection Procedure Using an Oscilloscope.
75	Transmission range switch: N	Ignition switch: ON Transmission range: N	Battery positive voltage
		Ignition switch: ON Transmission range: Other than above	1 V or less

TERMINAL NO.	INSPECTION ITEMS	INSPECTION REQUIREMENT	NORMAL CONDITION
76	Transmission range switch: D	Ignition switch: ON Transmission range: D	Battery positive voltage
		Ignition switch: ON Transmission range: Other than above	1 V or less
77	Shift switch (Up)	Ignition switch: ON Selector lever operation: Upshift and hold the selector lever	Battery positive voltage
		Ignition switch: ON Selector lever operation: Other than above	1 V or less
79	Vehicle speed sensor	Measure between terminals 131 and 79 with an oscilloscope. Engine: 2,000 r/min Gear range: 4th gear	Refer to <a href="#">P.23Ab-42</a> , Inspection Procedure Using an Oscilloscope.
85	Select switch	Ignition switch: ON Selector lever operation: Sport mode	Battery positive voltage
		Ignition switch: ON Selector lever operation: Other than above	1 V or less
119	Transmission fluid temperature sensor	Transmission fluid temperature: 20°C (68°F)	3.8 – 4.0 V
		Transmission fluid temperature: 40°C (104°F)	3.2 – 3.4 V
		Transmission fluid temperature: 80°C (176°F)	1.7 – 1.9 V
121	Shift indicator light: 1st	Engine: Idling Gear range: 1st gear	Battery positive voltage
		Engine: Idling Gear range: Other than 1st gear	1 V or less
122	Shift indicator light: 5th	Engine: Idling Gear range: 5th gear	Battery positive voltage
		Engine: Idling Gear range: Other than 5th gear	1 V or less
123	Solenoid valve power supply	Ignition switch: LOCK (OFF)	1V or less
		Ignition switch: ON	Battery positive voltage
124	Solenoid valve power supply	Ignition switch: LOCK (OFF)	1V or less
		Ignition switch: ON	Battery positive voltage
125	Shift indicator light: 2nd	Engine: Idling Gear range: 2nd gear	Battery positive voltage
		Engine: Idling Gear range: Other than 2nd gear	1 V or less
127	A/T control relay	Ignition switch: ON	Battery positive voltage



<b>TERMINAL NO.</b>	<b>INSPECTION ITEMS</b>	<b>INSPECTION REQUIREMENT</b>	<b>NORMAL CONDITION</b>
128	Low-reverse solenoid valve	Engine: Idling Transmission range: P	Battery positive voltage
		Engine: Idling Gear range: 2nd gear	6 – 9 V
129	Reduction solenoid valve	Engine: Idling Transmission range: P	Battery positive voltage
		Engine: Idling Gear range: 5th gear	6 – 9 V
130	Torque converter clutch solenoid valve	Engine: Idling Gear range: 1st gear	Battery positive voltage
131	Ground	Always	1 V or less
134	Shift indicator light: 3rd	Engine: Idling Gear range: 3rd gear	Battery positive voltage
		Engine: Idling Gear range: Other than 3rd gear	1 V or less
135	Transmission fluid temperature warning light	Ignition switch: LOCK(OFF) → ON	1 V or less → Battery positive voltage (after several seconds have elapsed)
136	Second solenoid valve	Engine: Idling Gear range: 2nd gear	Battery positive voltage
		Engine: Idling Transmission range: P	6 – 9 V
137	Under drive solenoid valve	Engine: Idling Gear range: 1st gear	Battery positive voltage
		Engine: Idling Transmission range: P	6 – 9 V
138	Overdrive solenoid valve	Engine: Idling Gear range: 3rd gear	Battery positive voltage
		Engine: Idling Transmission range: P	6 – 9 V
139	Ground	Always	1 V or less
142	Shift indicator light: 4th	Engine: Idling Gear range: 4th gear	Battery positive voltage
		Engine: Idling Gear range: Other than 4th gear	1 V or less

PCM TERMINAL RESISTANCE AND CONTINUITY INSPECTION CHART

M1231109400101

107	120	130
105	118	129
104	117	128
103	116	127
102	115	126
101	114	125
75	87	97
74	86	96
73	85	95
72	84	94
71	83	93
70	82	92
69	81	91
68	80	90
67	79	89
66	78	88
65	77	87
64	76	86
63	75	85
62	74	84
61	73	83
60	72	82
59	71	81
58	70	80
57	69	79
56	68	78
55	67	77
54	66	76
53	65	75
52	64	74
51	63	73
50	62	72
49	61	71
48	60	70
47	59	69
46	58	68
45	57	67
44	56	66
43	55	65
42	54	64
41	53	63
40	52	62
39	51	61
38	50	60
37	49	59
36	48	58
35	47	57
34	46	56
33	45	55
32	44	54
31	43	53
30	42	52
29	41	51
28	40	50
27	39	49
26	38	48
25	37	47
24	36	46
23	35	45
22	34	44
21	33	43
20	32	42
19	31	41
18	30	40
17	29	39
16	28	38
15	27	37
14	26	36
13	25	35
12	24	34
11	23	33
10	22	32
9	21	31
8	20	30
7	19	29
6	18	28
5	17	27
4	16	26
3	15	25
2	14	24
1	13	23

ACX01978AC

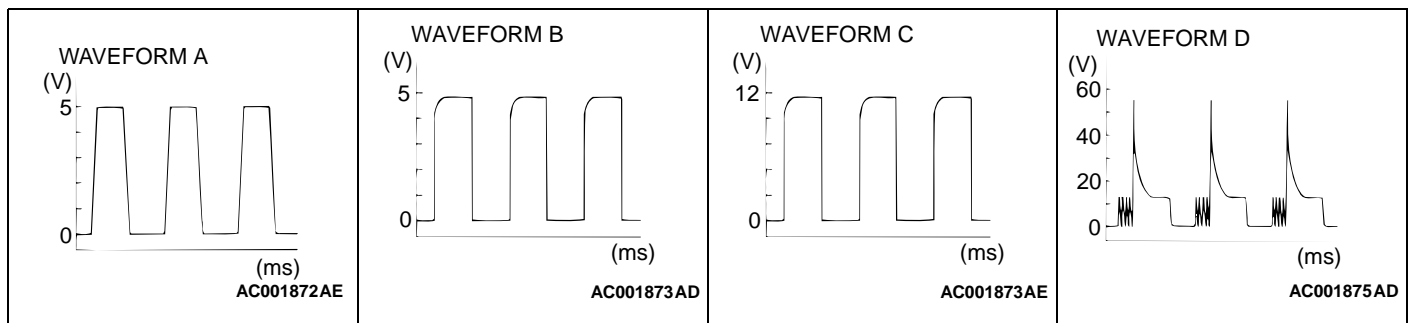
TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (CHECK CONDITION)
57 – 124	Transmission fluid temperature sensor	16.7 – 20.5 kΩ [at 0 °C (32 °F)]
		7.3 – 8.9 kΩ [at 20 °C (68 °F)]
		3.4 – 4.2 kΩ [at 40 °C (104 °F)]
		1.9 – 2.2 kΩ [at 60 °C (140 °F)]
		1.0 – 1.2 kΩ [at 80 °C (176 °F)]
		0.57 – 0.69 kΩ [at 100 °C (212 °F)]

INSPECTION PROCEDURE USING AN OSCILLOSCOPE

M1231109500090

TERMINAL NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION (WAVEFORM SAMPLE)	
70	Crankshaft position sensor	Transmission range: N	Idling (Vehicle stopped)	Waveform A
64	Input shaft speed sensor	Transmission range: Sport mode	Driving at constant speed of 50 km/h (31 mph) in 4th gear (Engine: 1,500 – 2,000 r/min)	Waveform B
73	Output shaft speed sensor			
79	Vehicle speed sensor			
128	Low-reverse solenoid valve	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Transmission range: P</li> <li>Engine: Stopped</li> <li>Throttle (Accelerator) opening angle: Less than 1 Volt</li> </ul>	Force drive each solenoid valve (Actuator test)	Waveform D
137	Underdrive solenoid valve			
136	Second solenoid valve			
138	Overdrive solenoid valve			
129	Reduction solenoid valve			
130	Torque converter clutch control solenoid valve			

Waveform sample



## TRANSFER DIAGNOSIS <ACTIVE TRAC 4WD II>

### TRANSFER (ACTIVE TRAC 4WD II) DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1231110800040

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will find most transfer malfunctions.

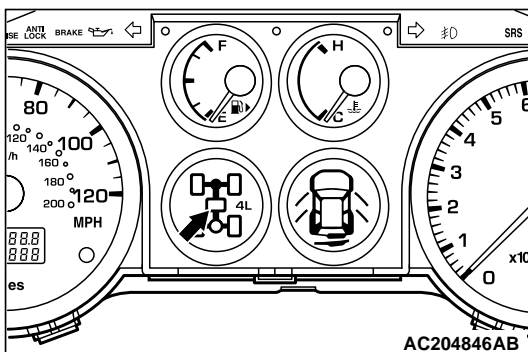
1. Gather as much information as possible about the complaint from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any transfer Diagnostic Trouble Codes (DTCs).
4. If you can not verify the condition and there are no DTCs, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-6](#).
5. If there is a DTC, record the number of the code, then erase the code from memory using scan tool MB991502.
6. If a DTC is set again, go to Inspection Chart for Diagnostic Trouble Codes.
7. If a DTC is not set again, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-6](#).
8. After repairs are completed, confirm the malfunction has been eliminated.

### TRANSFER DIAGNOSTIC TROUBLE CODE DIAGNOSIS

M1231110900047

#### CHECK CENTER DIFFERENTIAL LOCK INDICATOR LIGHT

The center differential lock indicator light flashes once per second if there is an abnormality in any of the items below which are related to the transfer system. Check for diagnostic trouble codes if the center differential lock indicator light is flashing once per second.



### ON-BOARD DIAGNOSTICS

The transfer-ECU monitors its input/output signals (some signals all the time and others under specified conditions). When an irregular signal is initially monitored, the transfer-ECU decides that a malfunction has occurred and records the occurrence as a diagnostic trouble code. There are 21 diagnostic items. The diagnostic results can be read with a scan tool. Diagnostic trouble codes are kept in memory by direct battery feed. The codes are retained in memory even if the ignition switch is in the "LOCK" (OFF)

position. Diagnostic trouble codes will, however, be erased when a battery terminal or the transfer-ECU connector is disconnected. In addition, the diagnostic trouble code can also be erased by scan tool MUT-II (MB991502).

*NOTE: If a sensor is disconnected when the ignition switch is in the "ON" position a diagnostic trouble code is stored in memory. In this case, erase the DTC using scan tool MB991502.*

The 21 diagnostic items are displayed in numeric order.

**HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES****<When using the scan tool>****Required Special Tool:**

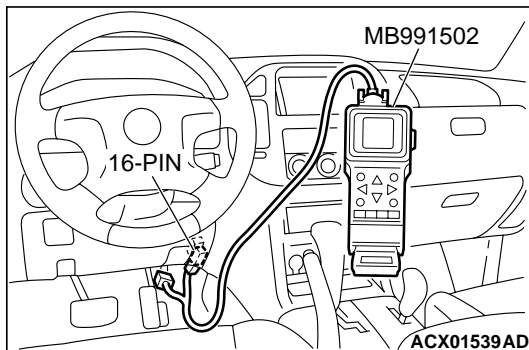
- MB991502: Scan Tool (MUT-II)

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

*NOTE: If the battery positive voltage is low, diagnostic trouble codes will not be output. Check the battery if the scan tool MB991502 can not display.*

*NOTE: If the battery is disconnected or if the transfer-ECU connector is disconnected, the diagnostic trouble codes will be erased. Do not disconnect the battery or transfer-ECU before the diagnostic trouble codes have been read.*

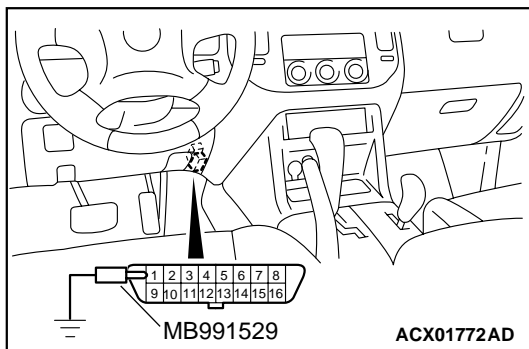


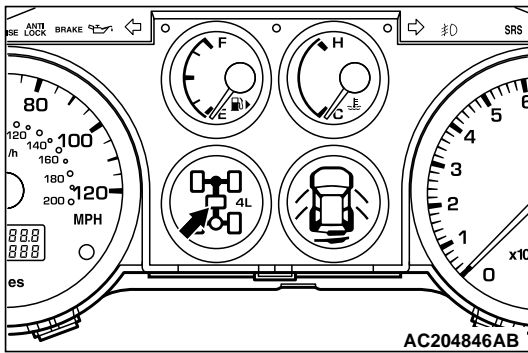
1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Record the diagnostic trouble codes (DTCs) for transfer.
4. Refer to [P.23Ab-47](#), Diagnostic Trouble Code Chart.
5. Turn the ignition switch to the "LOCK" (OFF) and then back to "ON" again.
6. Erase the diagnostic trouble code by selecting DTC erase from SPECIAL MENU screen, using scan tool MB991502.
7. Check for diagnostic trouble codes. Confirm the scan tool displays "normal."
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect scan tool MB991502.

**<When using the differential lock indicator light>****Required Special Tool:**

- MB991529: Diagnostic Trouble Code Check Harness

1. Use special tool MB991529 to ground terminal number 1 of the data link connector.
2. Turn on the ignition switch to the "ON" position.





3. Read the diagnostic trouble codes by counting center differential lock indicator light flashes.
4. Refer to P.23Ab-47, Diagnostic Trouble Codes Chart.
5. Erase the diagnostic trouble codes by the following procedure.
  - (1) Turn the ignition switch to the "LOCK" (OFF) position.
  - (2) Disconnect the negative battery cable for 10 seconds or more. Reconnect the cable.
  - (3) Turn the ignition switch to the "ON" position. Read the diagnostic trouble code output and check that no diagnostic trouble code is output.
  - (4) Start the engine and let it run until the engine has warmed up. Run it at idle for approximately 10 minutes or longer. The engine control module must build up the adaptive memory for smooth idle and good performance.

**UNDERSTANDING THE CENTER DIFFERENTIAL LOCK INDICATOR LIGHT FLASHES**

EXAMPLE OF FLASHING WHEN A DIAGNOSTIC TROUBLE CODE IS SET	FLASHING WHEN NORMAL
<p>FOR DIAGNOSTIC TROUBLE CODE No.23</p> <p style="text-align: center;">ACX01947AB</p>	<p style="text-align: center;">ACX01929AB</p>

*NOTE: Other diagnostic trouble codes also are output by the flashing of the center differential lock indicator light corresponding to the same code numbers as the scan tool displays.*

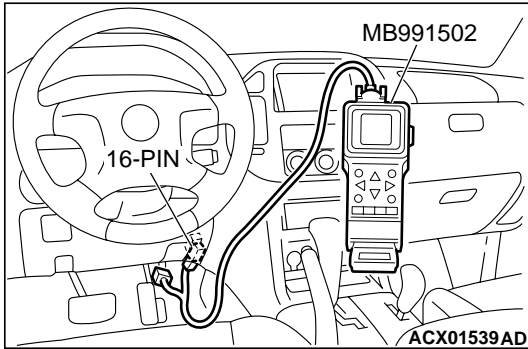
**INSPECTION USING SCAN TOOL MB991502,  
DATA LIST**

**Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.



1. Connect scan tool MB991502 to data link connector.
2. Turn the ignition switch to the "ON" position.
3. Carry out inspection by means of the Data List function. If there is an abnormality, check and repair the chassis harnesses and components. Refer to P.23Ab-49, Data List Reference Table.
4. Re-check using scan tool MB991502 and confirm that the abnormal input and output have returned to normal because as a result of the repairs.
5. Check for and inspect any diagnostic trouble codes (DTCs) that may have surfaced from testing. Erase the diagnostic trouble codes (DTCs) when finished checking.
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.
8. Start the engine again and do a test drive to confirm that the problem is eliminated.

**FAIL-SAFE/BACKUP FUNCTIONS**

When malfunctions of the main sensors or actuators are detected by the transfer-ECU, the transfer is controlled by pre-set control logic to maintain safe conditions for driving.

The following table shows how the fail-safe/backup function affects vehicle driveability and operation.

M1231111000047

MALFUNCTIONING ITEM	JUDGMENT CONDITION	CONTROL CONTENTS DURING MALFUNCTION
Power supply voltage	Power supply voltage is 9.5 V and less.	Control start prohibited
	Power supply voltage is 18 V and over.	Control stop
Main relay (inside of ECU)	Voltage at relay OFF is 6 V and over, or voltage at relay ON is 6 V and less.	Control stop
Accelerator pedal position sensor (APP)	APP voltage at idle condition is less than 0.2 V.	Vehicle speed limitation
Front propeller shaft speed sensor 1	Input signal from front propeller shaft speed sensor is unstable during low and medium speed driving. (When malfunction is detected during 2WD → 4WD shifting)	Control start prohibited
Front propeller shaft speed sensor 2	Input signal from front propeller shaft speed sensor is unstable at freewheel engage switch ON condition. (When malfunction is detected at 4WD condition)	Control start prohibited
Rear propeller shaft speed sensor 1	Input signal from rear propeller shaft speed sensor is unstable when APP voltage is 1.5 V and over. (When malfunction is detected at 2WD and 4WD conditions)	Control start prohibited

<b>MALFUNCTIONING ITEM</b>	<b>JUDGMENT CONDITION</b>	<b>CONTROL CONTENTS DURING MALFUNCTION</b>
Rear propeller shaft speed sensor 2	Input signal from rear propeller shaft speed sensor is unstable when freewheel engage switch is ON condition. (When malfunction is detected at 4WD condition)	Control start prohibited
Stoplight switch	Stoplight switch ON was detected for 15 minutes at vehicle speed of 15 km/h and over.	Control continued
Transfer shift lever switch	Input signal from transfer shift lever switch is unstable.	Control start prohibited
Transfer position switch 1	Shifting of transfer has not been completed during driving.	Control prohibited
Transfer position switch 2	Input signals from detection switches are unstable.	Control prohibited
Freewheel engage solenoid valve	Energizing condition to solenoid valve and ECU terminal voltage do not accord.	Control start prohibited
Freewheel engage switch	Energizing condition to solenoid valve and freewheel engage switch condition do not accord.	Control prohibited
Shift actuator abnormality	ECU terminal voltage is more than main relay voltage (90% of specified voltage) or lower than main relay voltage (10% of specified voltage).	Control stop
Shift actuator short-circuited	Actual value of actuator current is more than target value +1A.	Control stop
Shift actuator open-circuited	Main relay voltage is 6V and over or actual value of actuator current is less than 0.1 A.	Control stop
Shift actuator overload	Accumulation time to drive actuator exceeds 5 minutes.	Control stop
Dissimilar tire diameter	Speed difference between front wheel and rear wheel at 4WD condition is larger than set value.	Vehicle speed limitation
M-ASTC-ECU malfunction	Open circuit in all signal lies with the M-ASTC-ECU	Control continued
Transfer-ECU malfunction	Malfunction of ECU was detected.	Control stop

**DIAGNOSTIC TROUBLE CODE CHART**

M123111100055

<b>CODE</b>	<b>DIAGNOSIS ITEM</b>	<b>REFERENCE PAGE</b>
11	Power supply voltage system	Low voltage
12		Over voltage
13	Main relay system (inside of ECU)	Relay malfunction
21	Accelerator pedal position sensor (APP) system	Open-circuit/sensor malfunction

CODE	DIAGNOSIS ITEM		REFERENCE PAGE
22	Front propeller shaft speed sensor system	Open-circuit/short-circuit/sensor malfunction	P.23Ac-275
23			P.23Ac-275
24	Rear propeller shaft speed sensor system	Open-circuit/short-circuit/sensor malfunction	P.23Ac-287
25			P.23Ac-287
26	Stoplight switch system	Open-circuit/short-circuit/lamp failure/switch failure	P.23Ac-299
31	Transfer shift lever switch system	Open-circuit/short-circuit/switch failure	P.23Ac-307
32	Transfer position switch system	Transfer shift mechanism malfunction/actuator malfunction	P.23Ac-315
33	Transfer position switch system	Open-circuit/short-circuit/switch failure	P.23Ac-315
34	Free-wheel engage solenoid valve system	Open-circuit/short-circuit/solenoid valve malfunction	P.23Ac-326
35	Free-wheel engage switch system	Open-circuit/short-circuit/switch failure	P.23Ac-338
41	Shift actuator system (short-circuit, open-circuit)	Open-circuit/short-circuit/actuator malfunction/ECU malfunction	P.23Ac-349
42	Shift actuator system (short-circuit)	Short-circuit/actuator malfunction/ECU malfunction	P.23Ac-355
43	Shift actuator system (open-circuit)	Open-circuit/actuator malfunction/ECU malfunction	P.23Ac-355
44	Shift actuator system (Overload)	Transfer shift mechanism malfunction/actuator malfunction	P.23Ac-361
45	Dissimilar tire diameter	Incorrect tire pressure/dissimilar tire size	P.23Ac-367
51	Transfer-ECU malfunction		Replace the transfer-ECU
61	M-ASTC-ECU malfunction	Open-circuit/short-circuit/ECU malfunction	P.23Ac-368



**DATA LIST REFERENCE TABLE**

M1231111300048

<b>MUT-II SCAN TOOL DISPLAY</b>	<b>ITEM NO.</b>	<b>INSPECTION ITEM</b>	<b>INSPECTION REQUIREMENT</b>		<b>NORMAL CONDITION</b>
2/4WD DET SW	34	2WD/4WD detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H or 4H	ON
				Transfer shift lever position: 4HLc or 4LLc	OFF
2WD DET SW	33	2WD detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H	ON
				Transfer shift lever position: Other than 2H	OFF
4H DET SW	35	4H detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4H or 4HLc	ON
				Transfer shift lever position: 2H or 4LLc	OFF
4LLc DET SW	37	4LLc detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4LLc	ON
				Transfer shift lever position: Other than 4LLc	OFF
APP SENSOR	01	Accelerator pedal position sensor	Ignition switch: ON Engine: Stopped Transmission range: P	Accelerator pedal: Fully closed	905 – 1,165 mV
				Accelerator pedal: Depressed	Gradually rises from the above value
				Accelerator pedal: Fully open	4,035 mV or more
C/D LOCK SW	36	Center differential lock detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4HLc or 4LLc	ON
				Transfer shift lever position: 2H or 4H	OFF
ENGINE TYPE	28	Engine type	Ignition switch: ON Gasoline-fueled vehicle		GASOLINE
F/W ENG SOL	30	Free-wheel engage solenoid valve	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H	ON
				Transfer shift lever position: Other than 2H	OFF
F/W ENGAGE SW	38	Free-wheel engage switch	Engine: Idling Transmission range: N 4WD indicator light: Should not be flashing	Transfer shift lever position: 2H	OFF
				Transfer shift lever position: Other than 2H	ON

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	
FL M-ASTC SIG	40	M-ASTC-ECU	Active traction control system is acting on front left wheel.	ON	
			Active traction control system is not acting on front left wheel.	OFF	
FR2RR SPD DIF	04	Front to rear propeller shaft speed difference	Transfer position: 4WD	Driving at constant speed of 30 km/h (19 mph)	Within 5 km/h (3.1 mph)
FR M-ASTC SIG	39	M-ASTC-ECU	Active traction control system is acting on front right wheel.	ON	
			Active traction control system is not acting on front right wheel.	OFF	
FRT PROP SNSR	02	Front propeller shaft speed sensor	Transfer position: 4WD	Driving at constant speed of 30 km/h (19 mph)	30 km/h (19 mph)
IGNITION SW	21	Ignition switch	Ignition switch: ON		ON
IGNITION VOLT	09	Ignition switch power supply (Battery voltage)	Ignition switch: ON		Battery positive voltage
MAIN RELAY V	08	Main relay output voltage (Inside ECU)	Ignition switch: ON		Battery positive voltage
RL M-ASTC SIG	42	M-ASTC-ECU	Active traction control system is acting on rear left wheel.	ON	
			Active traction control system is not acting on rear left wheel.	OFF	
RR M-ASTC SIG	41	M-ASTC-ECU	Active traction control system is acting on rear right wheel.	ON	
			Active traction control system is not acting on rear right wheel.	OFF	

<b>MUT-II SCAN TOOL DISPLAY</b>	<b>ITEM NO.</b>	<b>INSPECTION ITEM</b>	<b>INSPECTION REQUIREMENT</b>		<b>NORMAL CONDITION</b>
RR PROP SNSR	03	Rear propeller shaft speed sensor	Transfer position: 4WD	Driving at constant speed of 30 km/h (19 mph)	30 km/h (19 mph)
SHIFT SOL AMP	10	Shift actuator amperage	Ignition switch: ON Transmission range: N	Transfer shift lever position: In operation (Actuator should be operating)	0 A → 0.2 A – 1.5 A → 0 A
SHIFT SOL TGT	11	Shift actuator target amperage	Ignition switch: ON Transmission range: N	Transfer shift lever position: In operation (Actuator should be operating)	0 A → 1.4 A – 1.6A → 0 A
SHIFT SOL V	12	Shift actuator voltage	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H → 4H or 4H → 4HLc or 4HLc → 4LLc	1/2 Battery voltage → Battery voltage → 1 V or less → 1/2 Battery voltage
				Transfer shift lever position: 4LLc → 4HLc or 4HLc → 4H or 4H → 2H	1/2 Battery voltage → 1 V or less → 1/2 Battery voltage
STOPLIGHT SW	23	Stoplight switch	Ignition switch: ON	Brake pedal: Depressed	ON
				Brake pedal: Released	OFF
T/F LEVER 2H	24	Transfer shift lever switch: 2H	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H	ON
				Transfer shift lever position: Other than 2H	OFF
T/F LEVER 4H	25	Transfer shift lever switch: 4H	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4H	ON
				Transfer shift lever position: Other than 4H	OFF
T/F LEVER POS	06	Transfer shift lever position	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H	2H
				Transfer shift lever position: 4H	4H
				Transfer shift lever position: 4HLc	4HLc
				Transfer shift lever position: 4LLc	4LLc

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
T/F LVR 4HLC	26	Transfer shift lever switch: 4HLC	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4HLC	ON
				Transfer shift lever position: Other than 4HLC	OFF
T/F LVR 4LLC	27	Transfer shift lever switch: 4LLC	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4LLC	ON
				Transfer shift lever position: Other than 4LLC	OFF
T/F MODE DET	07	Transfer mode (condition) detected	Engine: Idling Transmission range: N 4WD indicator light: Should not be flashing	Transfer shift lever position: 2H	2H
				Transfer shift lever position: 4H	4H
				Transfer shift lever position: 4HLC	4HL
				Transfer shift lever position: 4LLC	4LL
T/M TYPE	22	Transmission type	Ignition switch: ON A/T vehicle		AT
TR SW: NEUTRAL	31	Transmission range switch: N	Ignition switch: ON	Transmission range: N	ON
				Transmission range: Other than N and P	OFF
				Transmission range: P	ON ⇔ OFF (The "N" range light flashes when the MUT-II is connection)
TR SW: PARK	32	Transmission range switch: P	Ignition switch: ON	Transmission range: N	ON
				Transmission range: Other than N and P	OFF
				Transmission range: P	ON ⇔ OFF (The "N" range light flashes when the MUT-II is connection)
VEHICLE SPEED	05	Vehicle speed	Transmission range: Sport mode	Idling with 1st gear (Vehicle stopped)	0 km/h (0 mph)
				Driving at constant speed of 50 km/h (31 mph) in 3rd gear	50 km/h (31 mph)

**ACTUATOR TEST REFERENCE TABLE**

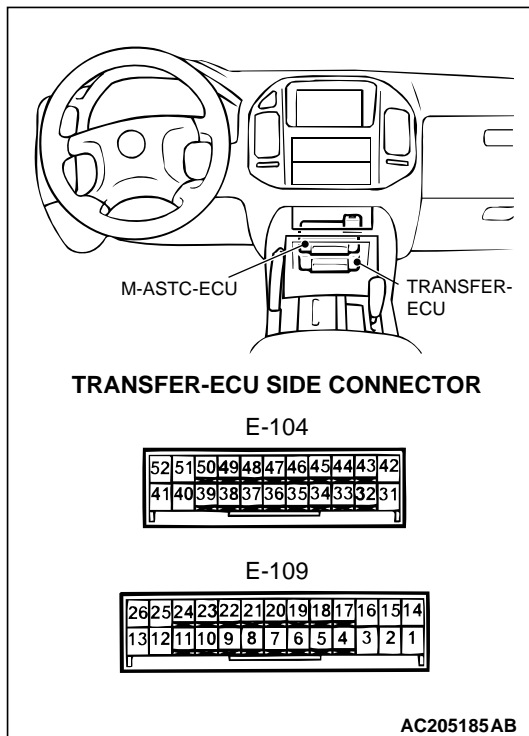
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MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	TEST CONTENT	INSPECTION REQUIREMENT	NORMAL CONDITION
F/W SOLENOID	01	Freewheel solenoid valve	Drives freewheel solenoid valve	Ignition switch: ON Transmission range: P	Freewheel engage solenoid valve is switched from ON to OFF, or from OFF to ON.
SHIFT NORMAL	02	Shift actuator	Turns shift actuator motor to normal direction	Engine: 0 r/min Vehicle speed: 0 km/h (Vehicle stop)	When the position is 2H, 4H and 4HLc, the shift returns from that position to original position after shifting in the order of 2H→4H→4HLc→4LLc. When the position is 4LLc, no shifting is performed.
SHIFT REVERSE	03		Turns shift actuator motor to reverse direction		When the position is 2H, 4HLc and 4LLc, the shift returns from that position to original position after shifting in the order of 4LLc→4HLc→4H→2H. When the position is 2H, no shifting is performed.

**TRANSFER-ECU TERMINAL VOLTAGE REFERENCE CHART FOR**

M1231111500053

*NOTE: Two ECUs of the same shape are situated up and down in a row at the inner part of the floor console. The upper side ECU is the M-ASTC-ECU. The lower side ECU is the transfer-ECU.*



TERMINAL NO.	INSPECTION ITEMS	INSPECTION REQUIREMENT		NORMAL CONDITION
1	Shift actuator voltage	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H → 4H or 4H → 4HLc or 4HLc → 4LLc	1/2 Battery voltage → Battery voltage → 1 V or less → 1/2 Battery voltage
			Transfer shift lever position: 4LLc → 4HLc or 4HLc → 4H or 4H → 2H	1/2 Battery voltage → 1 V or less → 1/2 Battery voltage
3	Shift actuator voltage	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H → 4H or 4H → 4HLc or 4HLc → 4LLc	1/2 Battery voltage → 1 V or less → 1/2 Battery voltage
			Transfer shift lever position: 4LLc → 4HLc or 4HLc → 4H or 4H → 2H	1/2 Battery voltage → Battery voltage → 1 V or less → 1/2 Battery voltage
5	Accelerator pedal position sensor	Ignition switch: ON Engine: Stopped Transmission range: P	Accelerator pedal: Fully closed	0.905 – 1.165 V
			Accelerator pedal: Fully open	4.035 V or more
6	M-ASTC-ECU signal (FR)	Ignition switch: ON		1 V or less
7	Front propeller shaft speed sensor	Measure between terminals 7 and 18 with an oscilloscope. Engine: 2,000 r/min Gear range: 3rd gear Transfer position: 4HLc		Refer to <a href="#">P.23Ab-42</a> , Inspection Procedure Using an Oscilloscope.
8	M-ASTC-ECU signal (RL)	Ignition switch: ON		1 V or less
9	Rear propeller shaft speed sensor	Measure between terminals 9 and 18 with an oscilloscope. Engine: 2,000 r/min Gear range: 3rd gear Transfer position: 4HLc		Refer to <a href="#">P.23Ab-42</a> , Inspection Procedure Using an Oscilloscope.
10	M-ASTC-ECU signal (RR)	Ignition switch: ON		1 V or less
13	ECU power supply	Ignition switch: OFF		0 V
		Ignition switch: ON		Battery positive voltage
18	Sensor ground	Always		1 V or less
19	M-ASTC-ECU signal (FL)	Ignition switch: ON		1 V or less

<b>TERMINAL NO.</b>	<b>INSPECTION ITEMS</b>	<b>INSPECTION REQUIREMENT</b>		<b>NORMAL CONDITION</b>
20	Transfer shift lever switch: 2H	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H	Battery positive voltage
			Transfer shift lever position: Other than 2H	0 V
21	Transfer shift lever switch: 4H	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4H	Battery positive voltage
			Transfer shift lever position: Other than 4H	0 V
22	Transfer shift lever switch: 4HLc	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4HLc	Battery positive voltage
			Transfer shift lever position: Other than 4HLc	0 V
23	Transfer shift lever switch: 4LLc	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4LLc	Battery positive voltage
			Transfer shift lever position: Other than 4LLc	0 V
25	Ground	Always		1 V or less
26	Ground	Always		1 V or less
31	Back-up power supply	Always		Battery positive voltage
32	Transmission range switch: N	Ignition switch: ON	Transmission range: N	Battery positive voltage
			Transmission range: Other than N	0 V
34	Stoplight switch	Ignition switch: ON	Brake pedal: Depressed	Battery positive voltage
			Brake pedal: Released	0 V
35	Ground	Always		1 V or less
37	2WD indicator light (RL)	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4HLc ↔ 4LLc	Battery positive voltage ↔ 1 V or less → battery positive voltage
			Transfer shift lever position: 2H ↔ 4H ↔ 4HLc	Battery positive voltage

TERMINAL NO.	INSPECTION ITEMS	INSPECTION REQUIREMENT		NORMAL CONDITION
38	4WD indicator light (FL)	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H	1V or less
			Transfer shift lever position: Other than 2H	1 V or less ⇔ battery positive voltage
39	Ground	Always		1 V or less
40	Center differential lock indicator light	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H, 4H	Battery positive voltage
			Transfer shift lever position: 4HLc, 4LLc	1 V or less
41	Free-wheel engage solenoid valve	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H	1 V or less
			Transfer shift lever position: Other than 2H	Battery positive voltage
42	Ground	Always		1 V or less
43	2WD detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H	1 V or less
		Ignition switch: ON Transmission range: N	Transfer shift lever position: Other than 2H	Battery positive voltage
44	2WD/4WD detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H, 4H	1 V or less
			Transfer shift lever position: 4HLc, 4LLc	Battery positive voltage
45	4H detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4H, 4HLc	1 V or less
			Transfer shift lever position: 2H, 4LLc	Battery positive voltage
46	Center differential lock detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4HLc, 4LLc	1 V or less
			Transfer shift lever position: 2H, 4H	Battery positive voltage
47	4LLc detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4LLc	1 V or less
			Transfer shift lever position: Other than 4LLc	Battery positive voltage



<b>TERMINAL NO.</b>	<b>INSPECTION ITEMS</b>	<b>INSPECTION REQUIREMENT</b>		<b>NORMAL CONDITION</b>
48	2WD indicator light (RR)	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4HLc ⇔ 4LLc	Battery positive voltage ⇔ 1 V or less → battery positive voltage
			Transfer shift lever position: 2H ⇔ 4H ⇔ 4HLc	Battery positive voltage
49	4WD indicator light (FR)	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H	1 V or less
			Transfer shift lever position: Other than 2H	1 V or less ⇔ battery positive voltage
50	Free-wheel engage switch	Engine: Idling Transmission range: N 4WD indicator light: Should not be flashing	Transfer shift lever position: 2H	Battery positive voltage
			Transfer shift lever position: Other than 2H	1 V or less
51	Buzzer	Ignition switch: ON	When buzzer not sounds	Battery positive voltage
			When buzzer sounds	0 V ⇔ battery positive voltage
52	4LLc indicator light	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4LLc	1 V or less
			Transfer shift lever position: Other than 4LLc	Battery positive voltage

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## NOTES