GROUP 23A

AUTOMATIC TRANSMISSION

CONTENTS

Continued on next page

GENERAL DESCRIPTION

M1231100100125

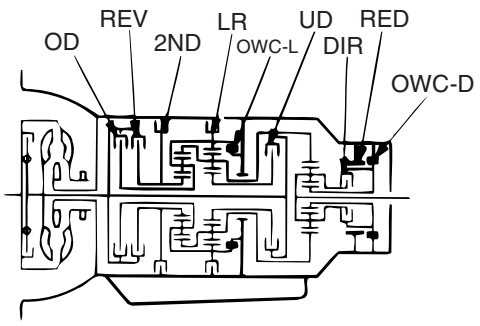
The automatic transmission comes in one model V5A51.

ITEM		SPECIFICATION
Model		V5A51
Engine		6G75 (3.8L Engine)
Torque converter type		With torque converter clutch
Transmission type		Electronically controlled 5-speed full automatic
Control elements	Clutch	Multiple disc type 4 sets
	Brake	Multiple disc type 2 sets, band type 1 set
	One-way clutch	Sprag type 2 set
Gear ratio	1st gear	3.789
	2nd gear	2.057
	3rd gear	1.421
	4th gear	1.000
	5th gear	0.731
	Reverse gear	3.865
Oil pump type		Gear type
Oil cooling system		Water-cooled type
Transfer type		Active Track 4WD II
Shift ratio	High	1.000
	Low	1.900
Transmission fluid	Specified lubricants	DIAMOND ATF SP III
	Quantity dm^3 (qt)	9.7 (10.2)
Transfer oil	Specified lubricants	Gear oil API classification GL-4 SAE 75W-85W or 75W-90
	Quantity dm^3 (qt)	2.8 (3.0)

TRANSMISSION

The transmission is made up of the torque converter and gear train. A 3-element, 1-step, 2-phase torque converter with built-in torque converter clutch is used. The gear train of the V5A51 transmission made up of four sets of multiple disc clutches, two sets of multiple disc brakes, one set of band brake, two set of one-way clutch and three sets of planetary carriers.

TRANSMISSION CONFIGURATION DRAWING



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COMPONENTS AND FUNCTIONS

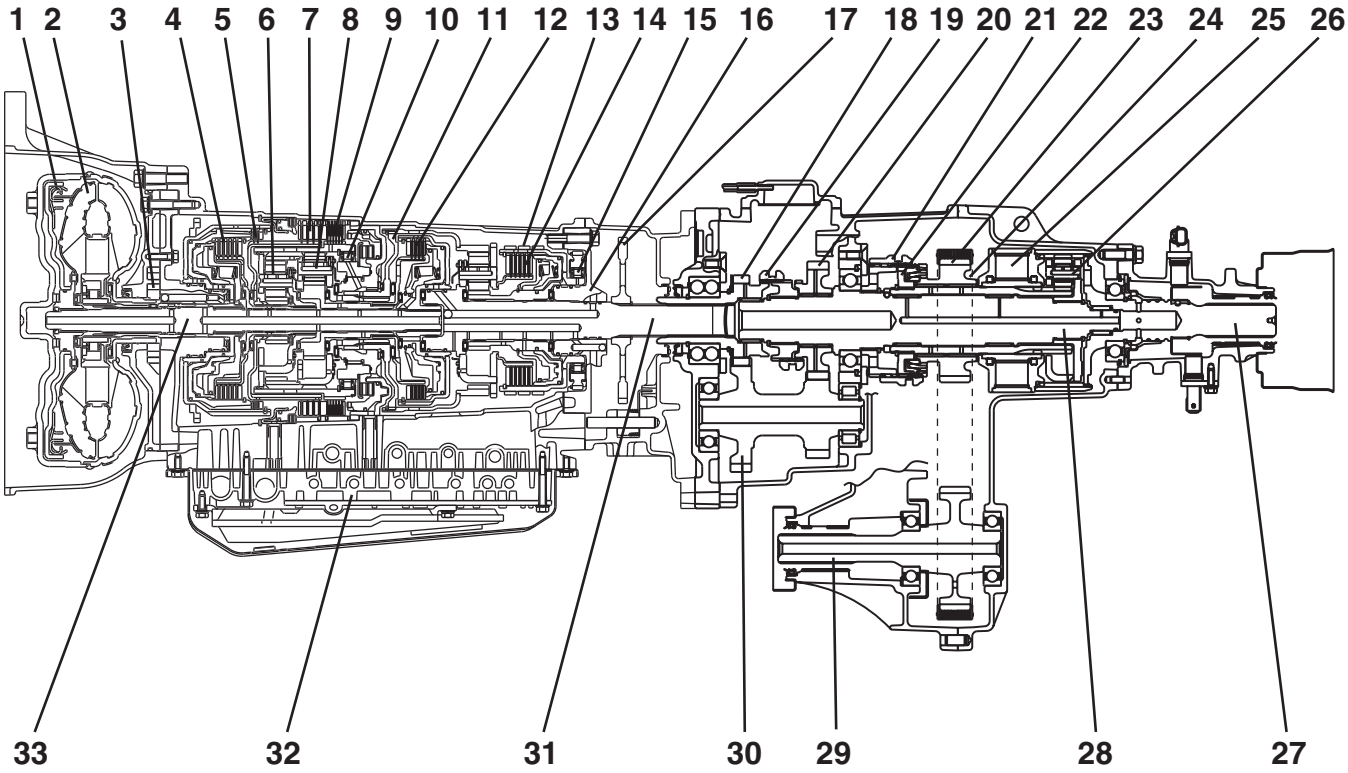
COMPONENT		FUNCTION
Underdrive clutch	UD	connects the input shaft to the underdrive sun gear.
Reverse clutch	REV	connects the input shaft to the reverse sun gear.
Overdrive clutch	OD	connects the input shaft to the overdrive planetary carrier.
Direct clutch	DIR	connects the direct sun gear to the direct planetary carrier
Low-reverse brake	LR	holds the low-reverse annulus gear and the overdrive planetary carrier.
Second brake	2ND	holds the reverse sun gear.
Reduction brake	RED	holds the direct sun gear.
One-way clutch (Low-reverse brake)	OWC-L	controls rotation direction of the low-reverse annulus gear.
One-way clutch (Direct clutch)	OWC-D	controls rotation direction of the direct sun gear.

FUNCTION ELEMENT TABLE

OPERATING ELEMENT / TRANSMISSION RANGE		ENGINE START	PARKING MECHA-NISM	UNDER-DRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	DIRECT CLUTCH (DIR)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)	REDUC-TION BRAKE (RED)	ONE-WAY CLUTCH (OWC-L)	ONE-WAY CLUTCH (OWC-D)
P	Parking	OK	X	-	-	-	-	X	-	X	-	-
R	Reverse	-	-	-	X	-	-	X	-	X	-	-
N	Neutral	OK	-	-	-	-	-	X	-	X	-	-
D	1st	-	-	X	-	-	-	X*	-	X	X	X
	2nd	-	-	X	-	-	-	-	X	X	-	X
	3rd	-	-	X	-	X	-	-	-	X	-	X
	4th	-	-	X	-	X	X	-	-	-	-	-
	5th	-	-	-	-	X	X	-	X	-	-	-
SPORT MODE	1st	-	-	X	-	-	-	X	-	X	X	X
	2nd	-	-	X	-	-	-	-	X	X	-	X
	3rd	-	-	X	-	X	-	-	-	X	-	X
	4th	-	-	X	-	X	X	-	-	-	-	-
	5th	-	-	-	-	X	X	-	X	-	-	-

- × : Function element
- Item marked with an * operate only when stopped [approximately 10 km/h (6.2mph) or less].

SECTIONAL VIEW



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1. TORQUE CONVERTER CLUTCH
2. TORQUE CONVERTER
3. OIL PUMP
4. OVERDRIVE CLUTCH
5. REVERSE CLUTCH
6. OVERDRIVE PLANETARY CARRIER
7. SECOND BRAKE
8. OUTPUT PLANETARY CARRIER
9. LOW-REVERSE BRAKE
10. ONE-WAY CLUTCH
11. CENTER SUPPORT
12. UNDERDRIVE CLUTCH
13. DIRECT CLUTCH
14. REDUCTION BRAKE BAND
15. ONE-WAY CLUTCH
16. OUTPUT SHAFT SUPPORT
17. PARKING GEAR
18. TRANSFER INPUT GEAR
19. H-L CLUTCH
20. LOW SPEED GEAR
21. DIFFERENTIAL LOCK HUB
22. 2-4WD SYNCHRONIZER SLEEVE
23. DRIVE SPROCKET
24. CHAIN
25. VISCOUS COUPLING
26. CENTER DIFFERENTIAL
27. REAR OUTPUT SHAFT
28. TRANSFER DRIVE SHAFT
29. FRONT OUTPUT SHAFT
30. TRANSFER COUNTER GEAR
31. OUTPUT SHAFT
32. VALVE BODY
33. INPUT SHAFT

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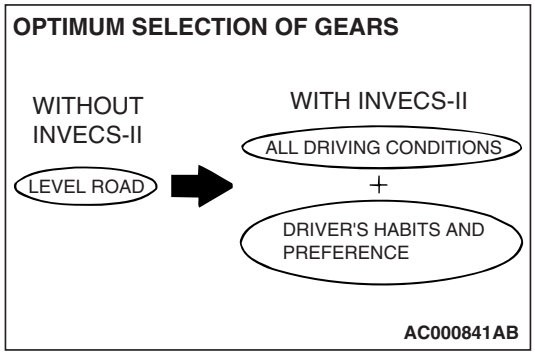
ELECTRONICALLY-CONTROLLED SYSTEM

INVECS-II

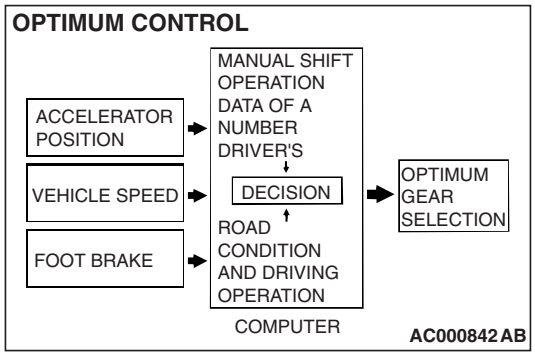
- When in drive ("D" range), the new automatic transmission employs an innovative shift schedule to provide a high level of comfort and "easy driving style" that matches all driving conditions as well as the driver's driving style.
- INVECS-II features "Optimum Shift Control," which provides shift timing the average driver perceives to be the optimum timing under any road conditions "Adaptive Shift Control" adjusts shift timing to match the driving habits and preferences of individual drivers.



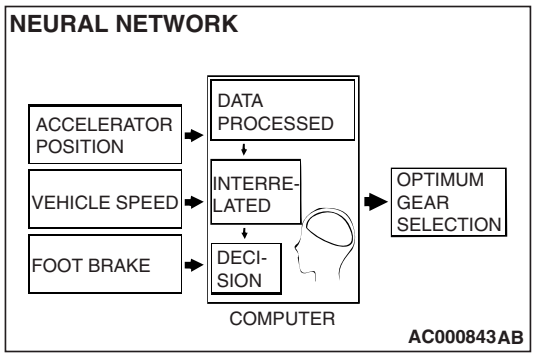
FEATURES

OPTIMUM SHIFT CONTROL

1. The shift patterns found satisfying by the typical driver for all ranges of driving are stored in the computer's memory. The computer uses this data to analyze road conditions and the driver's style of operation, and then outputs the optimal shift patterns stored in its memory to best match the conditions.



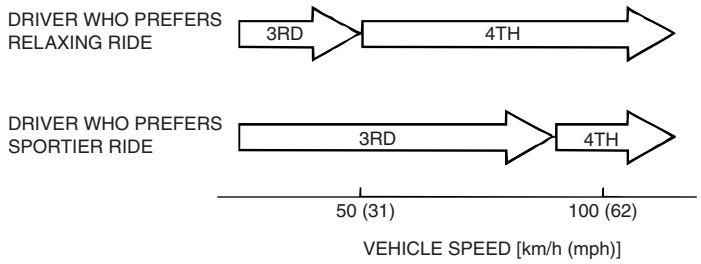
2. We introduce the latest control technologies with an innovative new algorithm called the "neural network" that works to imitate the decision-making processes of the human brain. The neural network links a wide variety of input data regarding road and operating conditions, and instantly makes accurate shift control decisions.



ADAPTIVE SHIFT CONTROL

1. The computer learns the driving habits and preferences of each individual driver by processing driving data on engine output, tire load, foot brake operation, etc. It then uses this data to adjust shift timing to best suit the driver's style.
2. If the computer determines from the driving patterns that the driver is one who enjoys a relaxed, unhurried style, it adjusts timing to execute upshifts at a lower engine speed to provide a smooth, quiet ride. On the other hand, if the computer determines the driver to prefer a sporty ride, it adjusts timing to shift up at a higher engine speed to provide more powerful response.

ADAPTIVE SHIFT CONTROL DURING ACCELERATION



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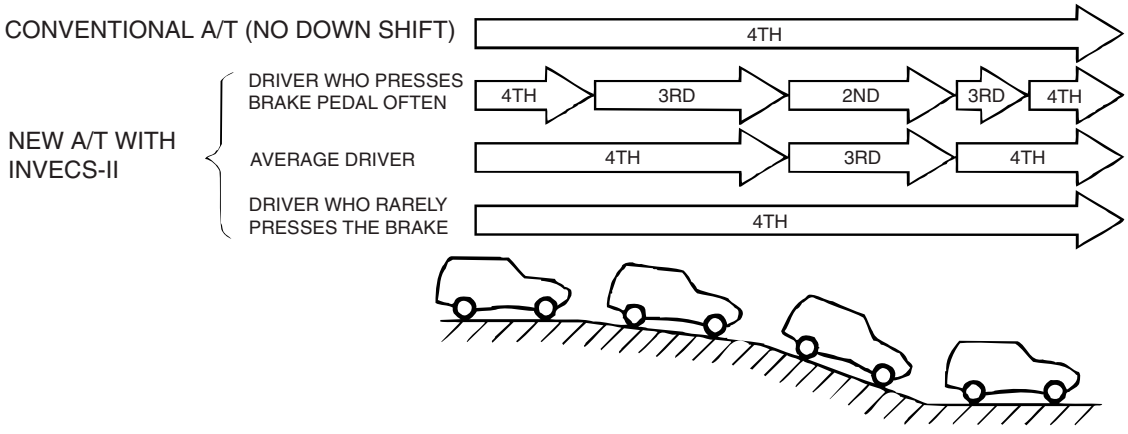
3. If the computer determines that the driver tends to apply the brakes often on a descending roadway, it adjusts timing to down shift sooner so that engine braking is more effectively applied. Conversely, if the computer determines that the driver does not brake much while driving downhill, it delays downshifting to minimize the effect of engine braking.

ADAPTIVE SHIFT CONTROL ON DOWNGRADES



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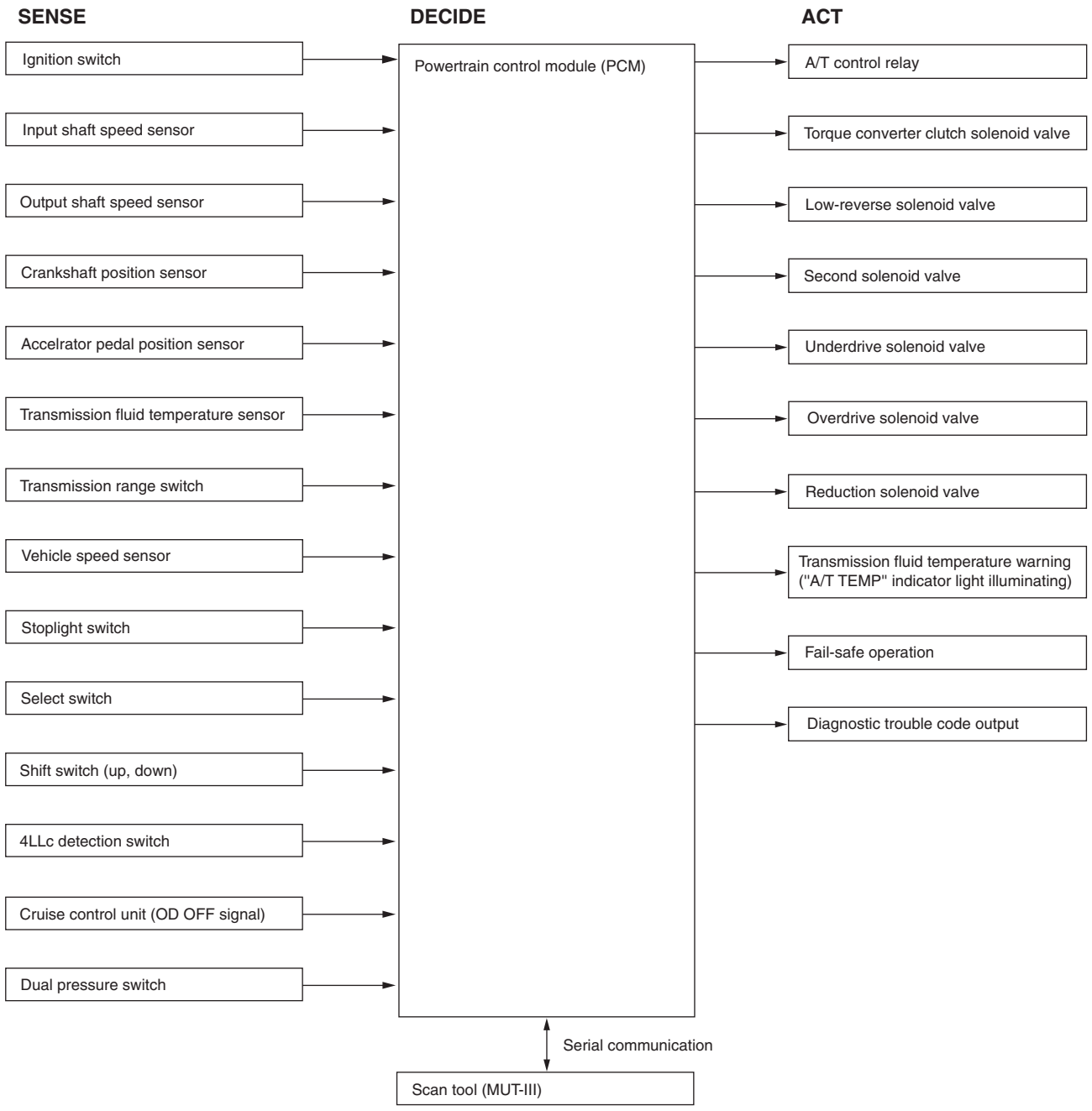
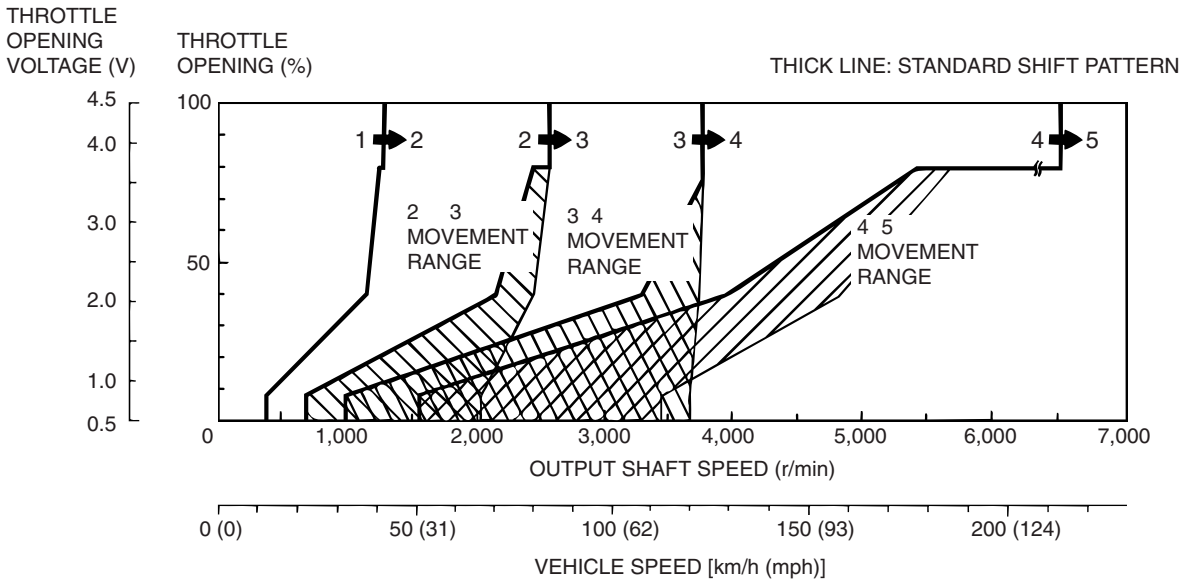
SYSTEM CONSTRUCTION DIAGRAM



SHIFT PATTERN CONTROL

UPSHIFT PATTERN



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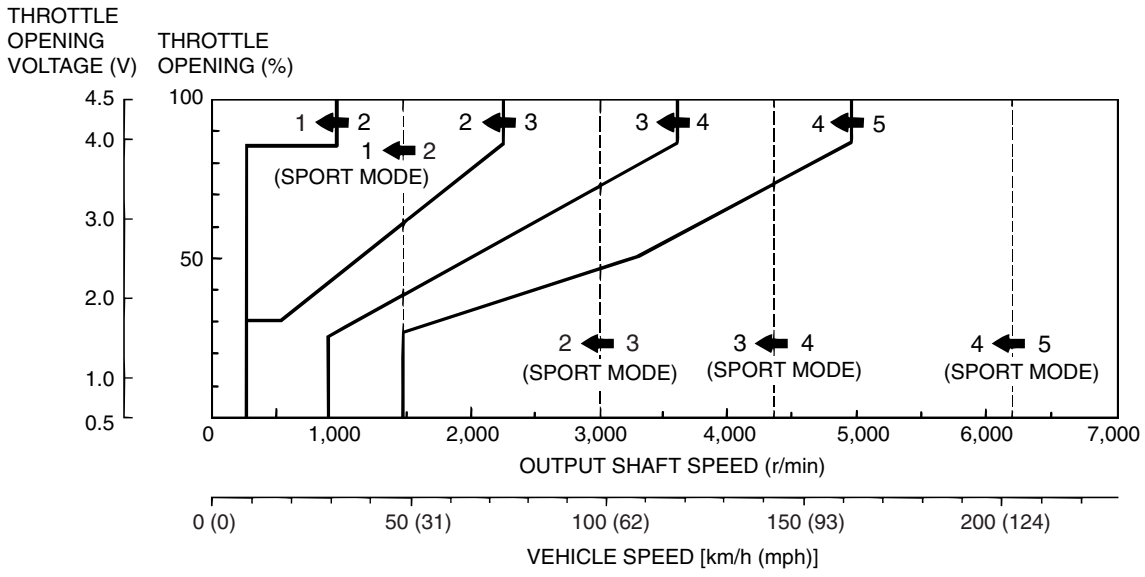
NOTE: Within 2 -to- 3 and 3 -to- 4 movement ranges, the PCM adjusts shift points according to the driving conditions by memorizing the accelerator pedal stroke and braking timing.

DOWNSHIFT PATTERN



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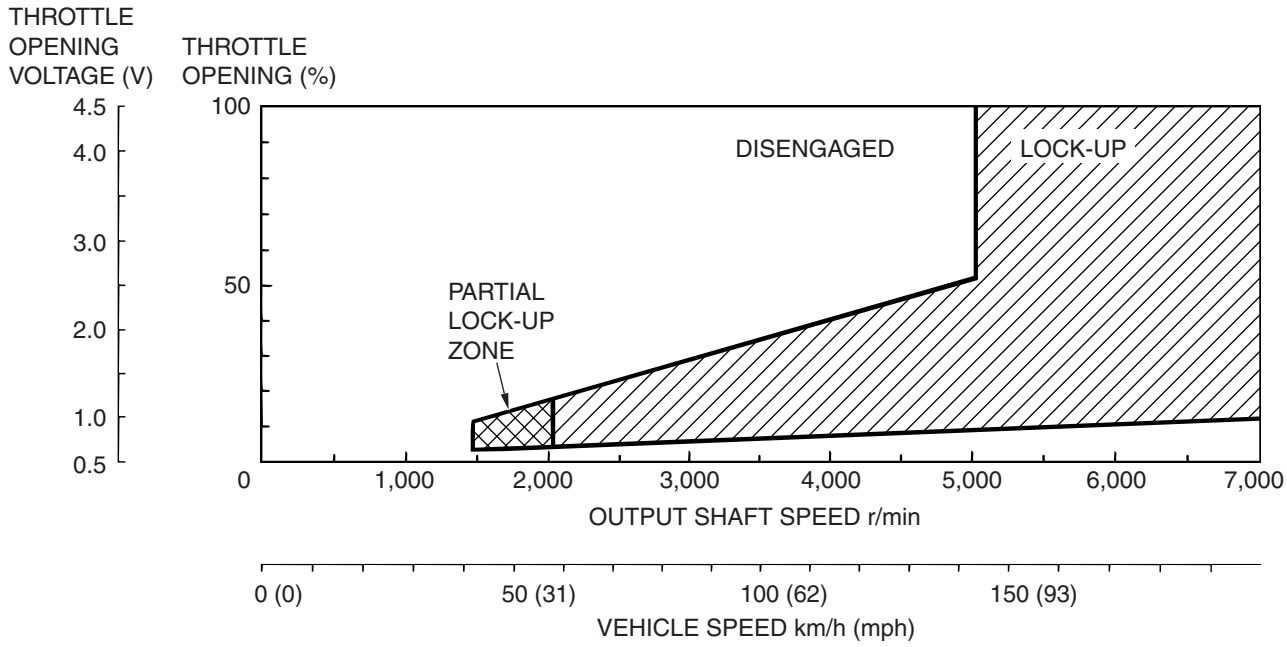
TORQE CONVERTER CLUTCH CONTROL

5TH GEAR RANGE



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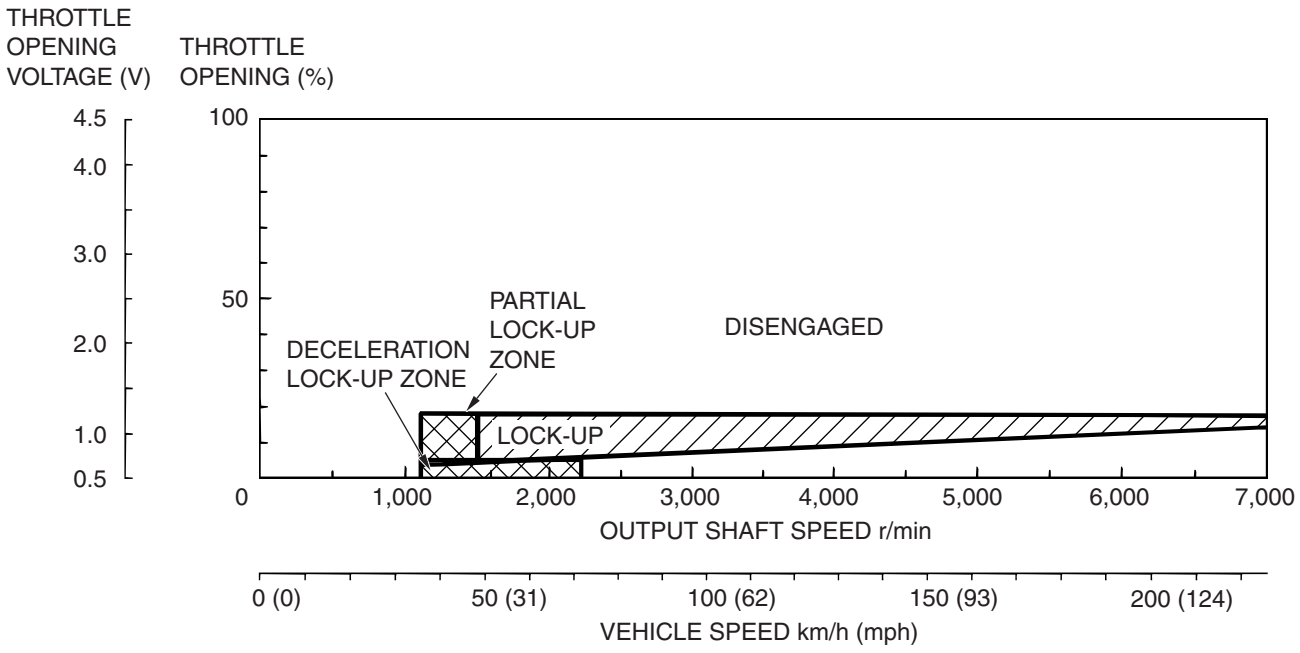
4TH GEAR RANGE



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AUTOMATIC TRANSMISSION DIAGNOSIS

DIAGNOSTIC TROUBLESHOOTING FLOW

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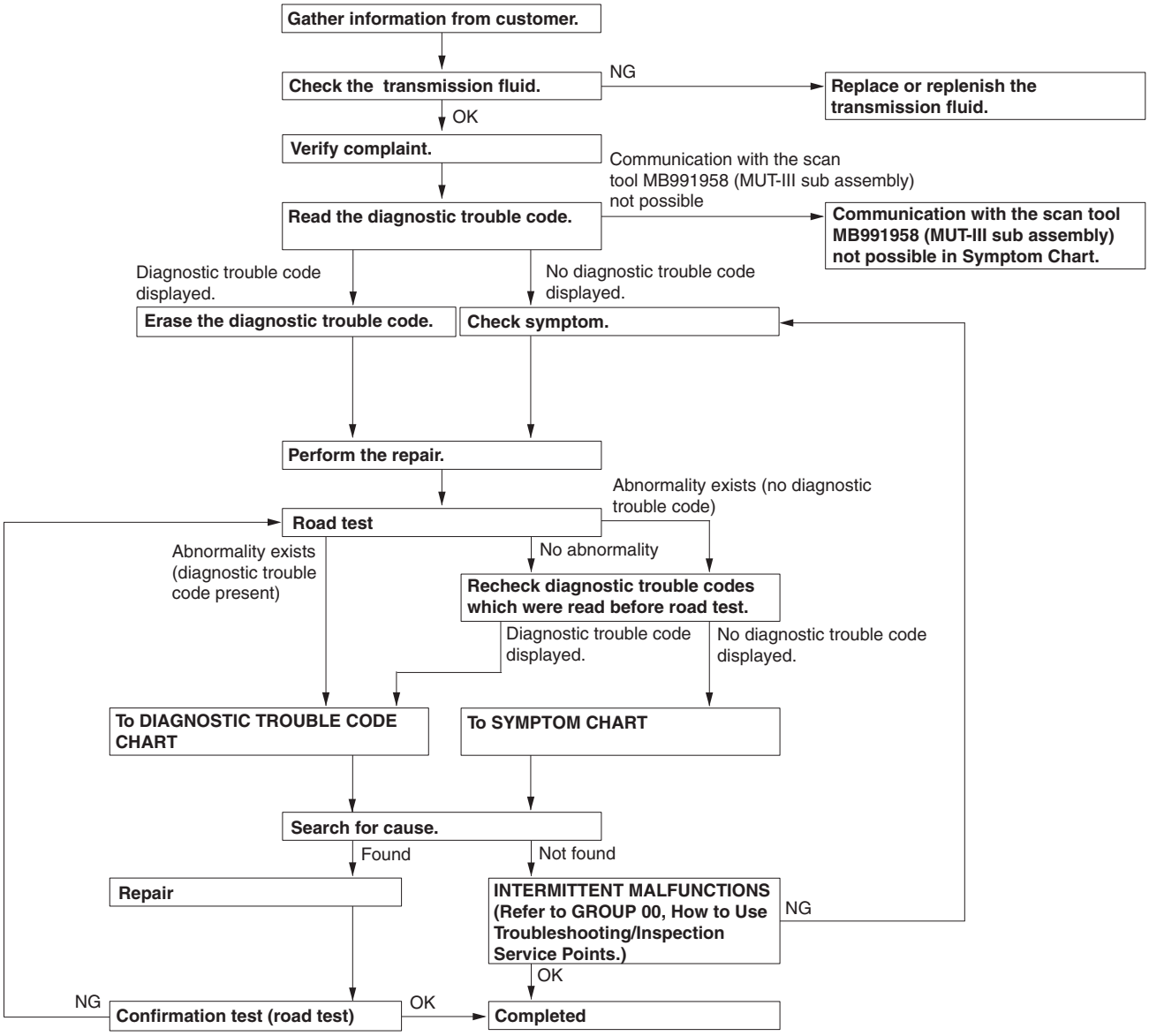

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INTRODUCTION TO A/T DIAGNOSIS

M1231108400119

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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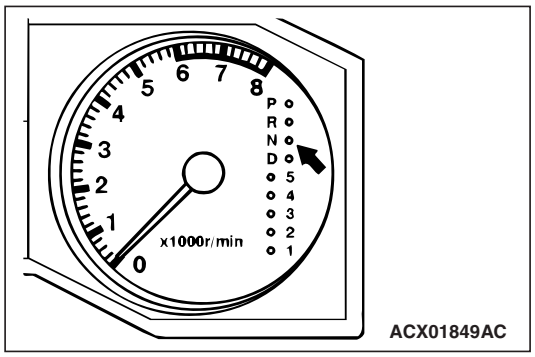
A/T DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1231108500138

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.00-13.
5. If you can verify the condition but there are no DTCs, or the system can not communicate with scan tool MB991958 (MUT-III sub assembly), refer to the Symptom Chart P.23A-44.
6. If there is a DTC, record the number of the code, then erase the code from memory using scan tool MB991958 (MUT-III sub assembly).
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.00-13.
10. After repairs are completed, conduct a Road Test duplicating the complaint conditions to confirm the malfunction has been eliminated.



DIAGNOSTIC FUNCTION

M1231103300010

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.

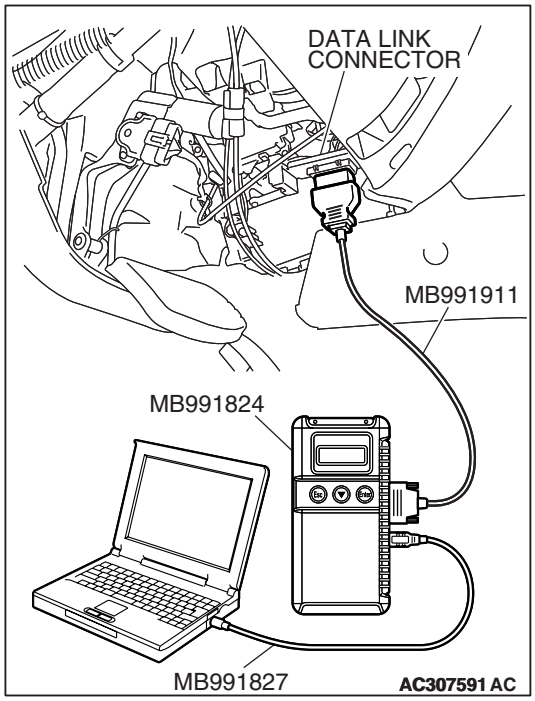
ON-BOARD DIAGNOSTICS

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 has 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 MB991958 (MUT-III sub assembly).

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 MB991958 (MUT-III sub assembly).

The 26 diagnostic items are displayed in numeric order.

HOW TO CONNECT THE SCAN TOOL (MUT-III)



Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Ensure that the ignition switch is at the "LOCK" (OFF) position.
2. Start up the personal computer.
3. Connect special tool MB991827 to special tool MB991824 and the personal computer.
4. Connect special tool MB991911 to special tool MB991824.
5. Connect special tool MB991911 to the data link connector.
6. Turn the power switch of special tool MB991824 to the "ON" position.

   NOTE: When special tool MB991824 is energized, special tool MB991824 indicator light will be illuminated in a green color.
7. Start the MUT-III system on the personal computer.

NOTE: Disconnecting scan tool MB991958 is the reverse of the connecting sequence, making sure that the ignition switch is at the "LOCK" (OFF) position.

HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES

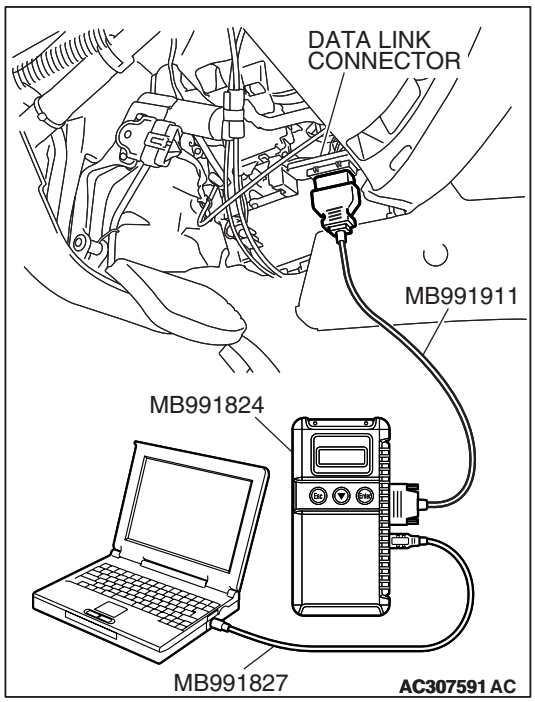
Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

NOTE: If the battery voltage is low, diagnostic trouble codes will not be set. Check the battery if scan tool MB991958 does not display.



1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "ELC-A/T" from the "POWER TRAIN" tab.
6. Select "MITSUBISHI."
7. Select "Diagnostic Trouble Code."
8. If a DTC is set, it is shown.
9. Choose "Erase DTCs" to erase the DTC.

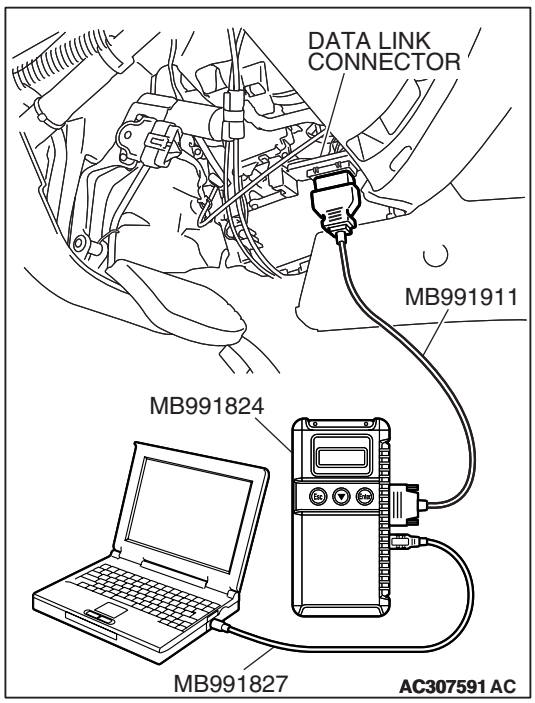
HOW TO READ DATA LIST

Required Special Tools:

- MB991958 : Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "ELC-A/T" from the "POWER TRAIN" tab.
6. Select "MITSUBISHI."
7. Select "Data List."
8. Choose an appropriate item and select the "OK" button.

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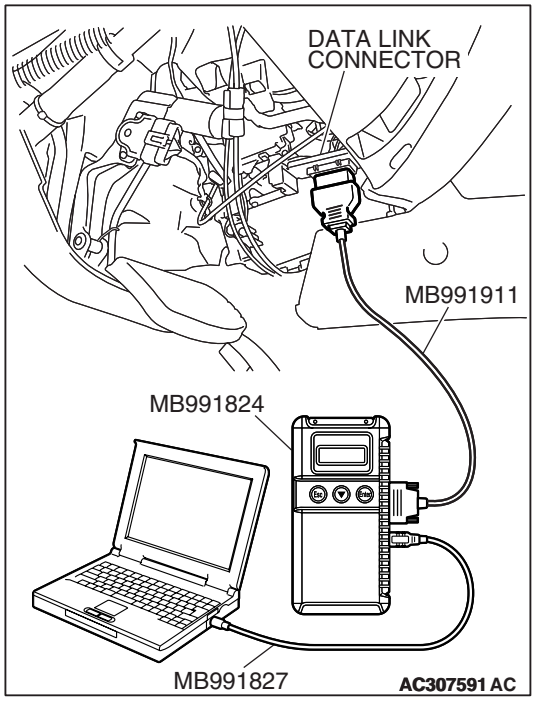
HOW TO PERFORM ACTUATOR TEST

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "ELC-A/T" from the "POWER TRAIN" tab.
6. Select "MITSUBISHI."
7. Select "Actuator Test."
8. Choose an appropriate item and select the "OK" button.

HOW TO INITIALIZE A/T LEARNED VALUE

M1231104300013

AIM

A/T learned value must be reset whenever the automatic transaxle, engine assembly, A/T valve body, or A/T solenoid valve is replaced. It cannot be reset by disconnecting the battery. Use the MUT-III as follows:

INITIALIZATION PROCEDURE

1. Shift the selector lever to P and turn the ignition switch to the "LOCK" (OFF) position.
2. Connect the MUT-III to the vehicle's data link connector.
3. In the ELC-A/T menu screen, select "Special Function," then select "Memory Reset."
4. Select "OK" to reset the A/T learned memory.
5. After this initialization, make the system learn the idling in accordance with "Learning procedure for idling in MFI engine" (Refer to GROUP 00 – Precautions before Service P.00-24).

NOTE: This reset procedure will also automatically initialize the INVECS-II Learned Value. A/T DTCs and A/T freeze-frame data will be erased. (Engine DTCs, engine-related freeze-frame data, and Readiness status will remain even after A/T Learned Value is reset.)

FAIL-SAFE/BACKUP FUNCTION

M1231101100117

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.

MALFUNCTIONING ITEM		JUDGMENT CONDITION	CONTROL DEFAULT DURING MALFUNCTION
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.
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. The transmission will only operate in 3rd and reverse gears until the system is repaired.
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 shifting 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. The transmission will only operate in 3rd and reverse gears until the system is repaired.
	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.

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ROAD TEST

M1231100800146

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.23A-283)
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.23A-122 , P.23A-151)
		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.23A-361)
			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	–	Group 13A, Diagnostic Trouble Code Procedures – DTCs P0122, 0123: Throttle Position Sensor System (P.13A-196, P.13A-204).
		Brake pedal (1) Depressed (2) Released	Data list No.26 (1) ON (2) OFF	Stoplight switch	26	Stoplight switch system (P.23A-112)
		Transfer position (1) Other than 4LLc (2) 4LLc	Data list No.75 (1) OFF (2) ON	4LLc detection switch	–	4LLc detection switch system (P.23A-380)
3	Ignition switch: ST Engine: Stopped	Cranking test with lever in P or N range	Cranking should be possible	Cranking	–	Engine does not crank (P.23A-309)

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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.23A-45, P.23A-62)
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.23A-112)
		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.23A-345)
5	Engine: Idling Transmission range: N	Accelerator pedal (1) Fully closed (2) Depressed	Data list No.21 (1) Engine tachometer and the scan tool MB991958 (MUT-III sub assembly) show the same engine speed (2) Gradually rises from (1)	Crankshaft position sensor	21	Group 13A, Diagnostic Trouble Code Procedures – DTC P0335: Crank shaft Position Sensor System (P.13A-483).
		Transmission range (1) N → D (2) N → R	Should be no abnormal shift shocks Time delay when engaging should be within 2 seconds	Malfunction when starting	–	Engine stalls when moving selector lever from N to D or N to R (P.23A-318)
					–	Shift shock when shifting from N to D and long delay (P.23A-320)
					–	Shift shock when shifting from N to R and long delay (P.23A-323)

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
					–	Shift shock when shifting from N to D, N to R and long delay (P.23A-327)
				Does not move	–	Does not move forward (P.23A-312)
					–	Does not move backward (P.23A-314)
					–	Does not move (forward or backward) (P.23A-317)
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 (44 mph) in 5th gear	Data list No.63 (2) 1st, (3) 2nd, (4) 3rd, (5) 4th, (6) 5th	Shift position	–	–

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
			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.23A-178)
			Data list No.32 (2) 0%, (3) 0%, (4) 0%, (5) 0%, (6) 100%	Underdrive solenoid valve duty %	32	Underdrive solenoid valve system (P.23A-193)
			Data list No.33 (2) 100%, (3) 0%, (4) 100%, (5) 100%, (6) 0%	Second solenoid valve duty %	33	Second solenoid valve system (P.23A-206)
			Data list No.34 (2) 100%, (3) 100%, (4) 0%, (5) 0%, (5) 0%	Overdrive solenoid valve duty %	34	Overdrive solenoid valve system (P.23A-219)
			Data list No.35 (2) 0%, (3) 0%, (4) 0%, (5) 100%, (6) 100%	Reduction solenoid valve duty %	35	Reduction solenoid valve system (P.23A-232)
			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.23A-170)
			Data list No.22 (5) 1,400 – 1,700 r/min	Input shaft speed sensor	22	Input shaft speed sensor system (P.23A-72)
			Data list No.23 (5) 1,400 – 1,700 r/min	Output shaft speed sensor	23	Output shaft speed sensor system (P.23A-92)
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 – 99.6% (3) 70 – 99.6% → 0%	Torque converter clutch solenoid valve duty %	36, 52, 53	Torque converter clutch solenoid system (P.23A-245, P.23A-274, P.23A-279)

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STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
			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 MB991958 (MUT-III sub assembly) 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 1.5 V (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.23A-328)
				Does not shift according to instructions	–	Early or late shifting in all gears (P.23A-331)
					–	Early or late shifting in all gears (P.23A-334)
				Does not shift	–	No diagnostic trouble code (P.23A-336)
8	Use scan tool MB991958 (MUT-III sub assembly) 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 1.5 V (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.	Does not shift	22	Input shaft speed sensor system (P.23A-72)

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STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
					23	Output shaft speed sensor system (P.23A-92)
8	Use scan tool MB991958 (MUT-III sub assembly) 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 (25 mph) in 4th gear, down shift to 3 range. (3) While driving at 20 km/h (12 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.23A-178)
					33	Second solenoid valve system (P.23A-206)
					41	1st gear incorrect ratio (P.23A-258)

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
8	Use scan tool MB991958 (MUT-III sub assembly) 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 (25 mph) in 4th gear, down shift to 3 range. (3) While driving at 20 km/h (12 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	42	2nd gear incorrect ratio (P.23A-258)
				Does not shift from 2 to 3 or 3 to 2	33	Second solenoid valve system (P.23A-206)
					34	Overdrive solenoid valve system (P.23A-219)
					42	2nd gear incorrect ratio (P.23A-258)
					43	3rd gear incorrect ratio (P.23A-258)
				Does not shift from 3 to 4 or 4 to 3	31	Low-reverse solenoid valve system (P.23A-178)
					35	Reduction solenoid valve system (P.23A-232)
					43	3rd gear incorrect ratio (P.23A-258)

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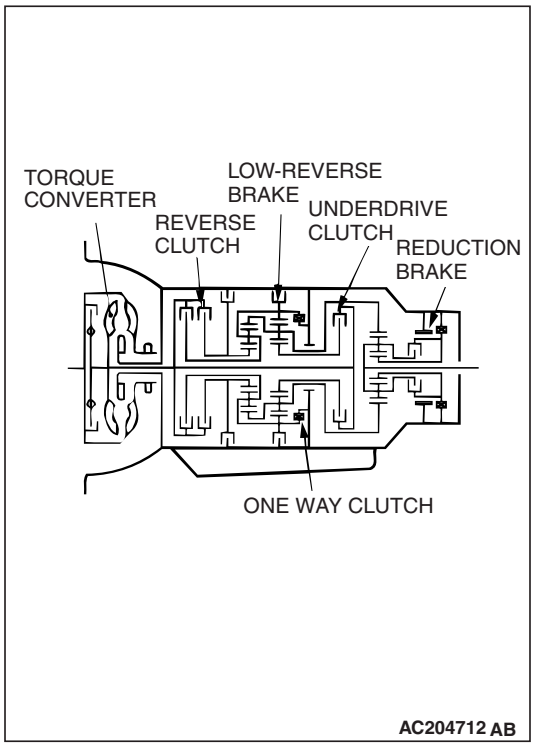
STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
					44	4th gear incorrect ratio (P.23A-258)
8	Use scan tool MB991958 (MUT-III sub assembly) to stop the INVECS-II function. Transmission range: D (on a flat and straight road)	(1) Select to the 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 (25 mph) in 4th gear, down shift to 3 range. (3) While driving at 20 km/h (12 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.23A-193)
					33	Second solenoid valve system (P.23A-206)
					44	4th gear incorrect ratio (P.23A-258)
					45	5th gear incorrect ratio (P.23A-258)

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/ OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
9	Transmission range: N (on a flat and straight road)	Monitor data list No.22 and No.23 with scan tool MB991958 (MUT-III sub assembly). (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.23A-72)
					23	Output shaft speed sensor system (P.23A-92)
					46	Reverse gear incorrect ratio (P.23A-258)



TORQUE CONVERTER STALL TEST

M1231103500111

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 MB991958 (MUT-III sub assembly).
2. Chock both front wheels.
3. Connect a tachometer.
4. Apply the parking and service brakes fully.
5. Start the engine.

⚠ 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.**

6. Move the selector lever to the "D" position. Fully depress the accelerator pedal and read the maximum engine speed.

   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

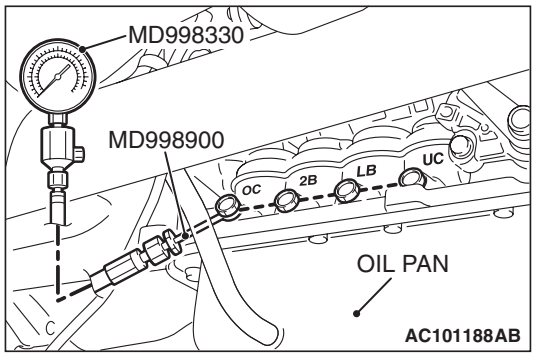
M1231103800112

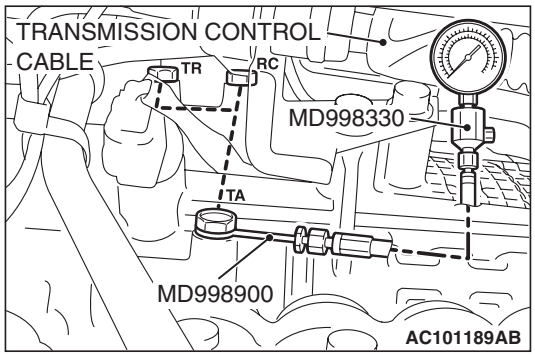
Required Special Tool:

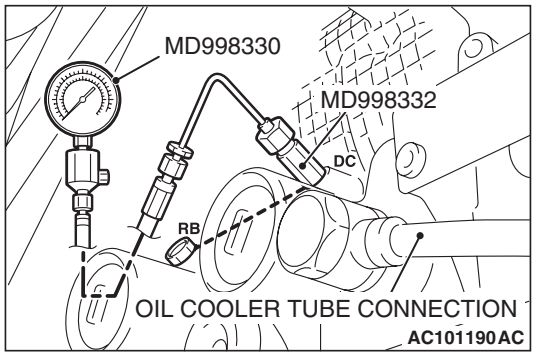
- MB998330: Oil Pressure Gauge
- MB998332: Adapter
- MB998900: Adapter

⚠ CAUTION

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







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)
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]	REDUCTION BRAKE PRESSURE [RB]	TORQUE CONVERTER CLUTCH PRESSURE [TR]
P	–	2,500	–	–	–	–	0.26 – 0.36 (38 – 52)	–	0.26 – 0.36 (38 – 52)	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)	0.50 – 0.73 (73 – 106)
N	–	2,500	–	–	–	–	0.26 – 0.36 (38 – 52)	–	0.26 – 0.36 (38 – 52)	0.22 – 0.36 (32 – 52)
Sport mode	1st gear	2,500	0.98 – 1.05 (142 – 152)	–	–	–	0.98 – 1.05 (142 – 152)	–	0.98 – 1.05 (142 – 152)	0.50 – 0.73 (73 – 106)
	2nd gear	2,500	0.98 – 1.05 (142 – 152)	–	–	–	–	0.98 – 1.05 (142 – 152)	0.98 – 1.05 (142 – 152)	0.50 – 0.73 (73 – 106)
	3rd gear	2,500	0.78 – 0.90 (113 – 131)	–	0.78 – 0.90 (113 – 131)	–	–	–	0.78 – 0.88 (113 – 128)	0.45 – 0.72 (65 – 104)
	4th gear	2,500	0.78 – 0.90 (113 – 131)	–	0.78 – 0.90 (113 – 131)	0.78 – 0.88 (113 – 128)	–	–	–	0.45 – 0.72 (65 – 104)
	5th gear	2,500	–	–	0.78 – 0.90 (113 – 131)	0.78 – 0.88 (113 – 128)	–	0.78 – 0.88 (113 – 128)	–	0.45 – 0.72 (65 – 104)

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

HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE

SYMPTOM	PROBABLE CAUSE
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

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SYMPTOM	PROBABLE CAUSE
	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
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)

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SYMPTOM	PROBABLE CAUSE
	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
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

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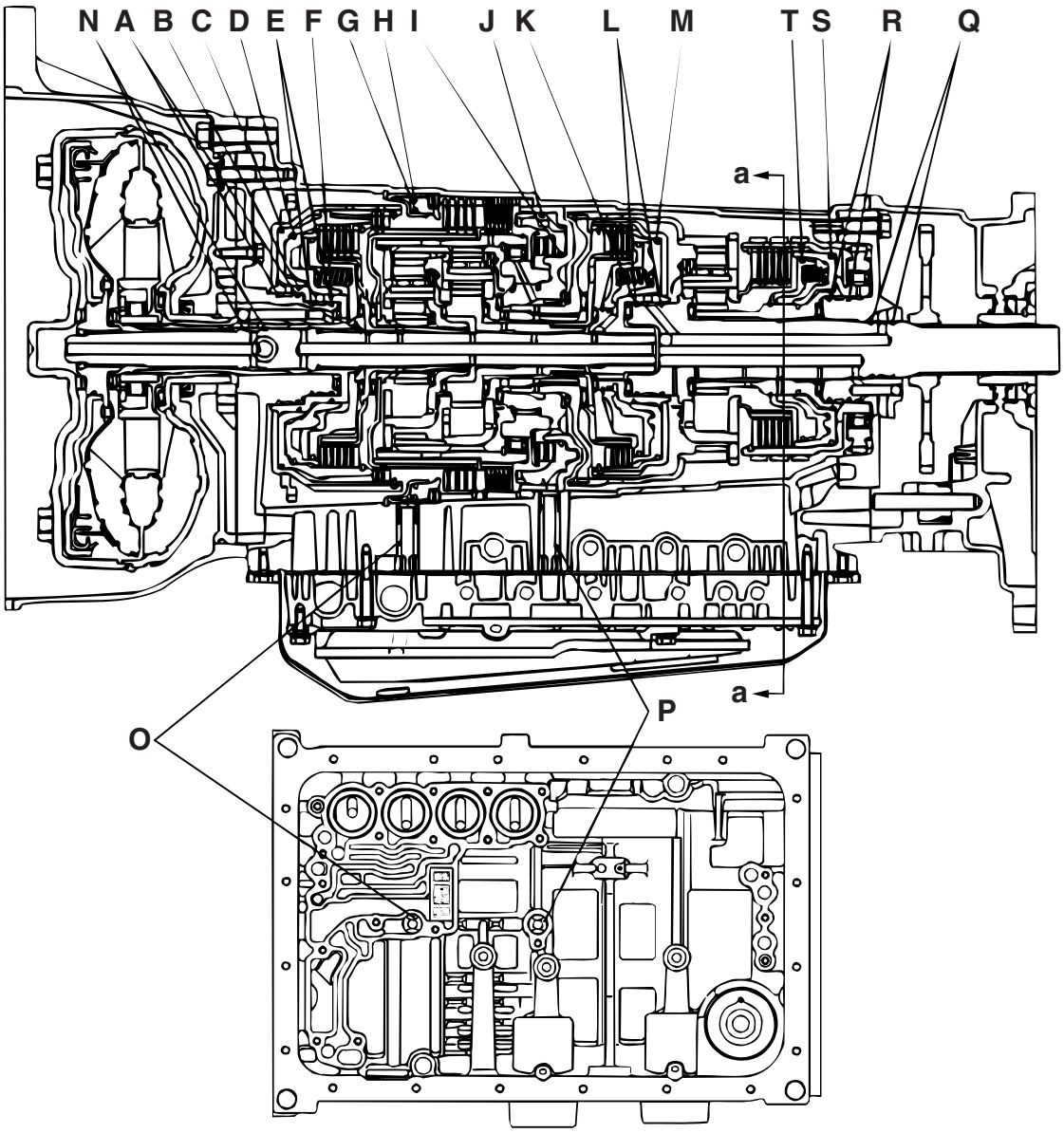
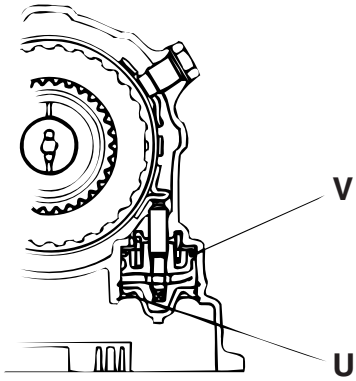
OIL SEAL LAYOUT



SECTION a - a

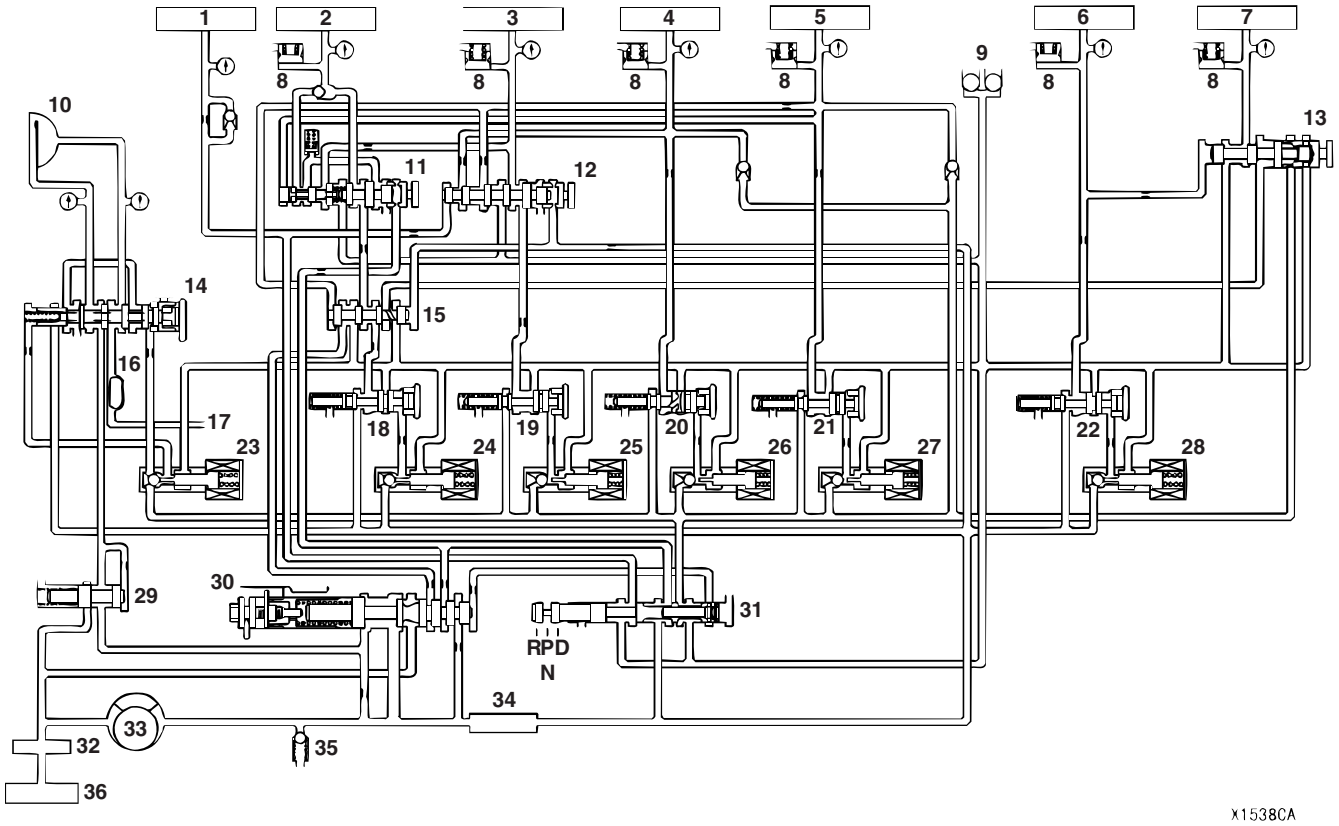


AC100422AB

HYDRAULIC CIRCUIT

M1231103900120

PARKING AND NEUTRAL



: LINE PRESSURE

: OIL PUMP SUCTION PRESSURE

: TORQUE CONVERTER CLUTCH PRESSURE

: TORQUE CONVERTER AND LUBRICATION PRESSURE

: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

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

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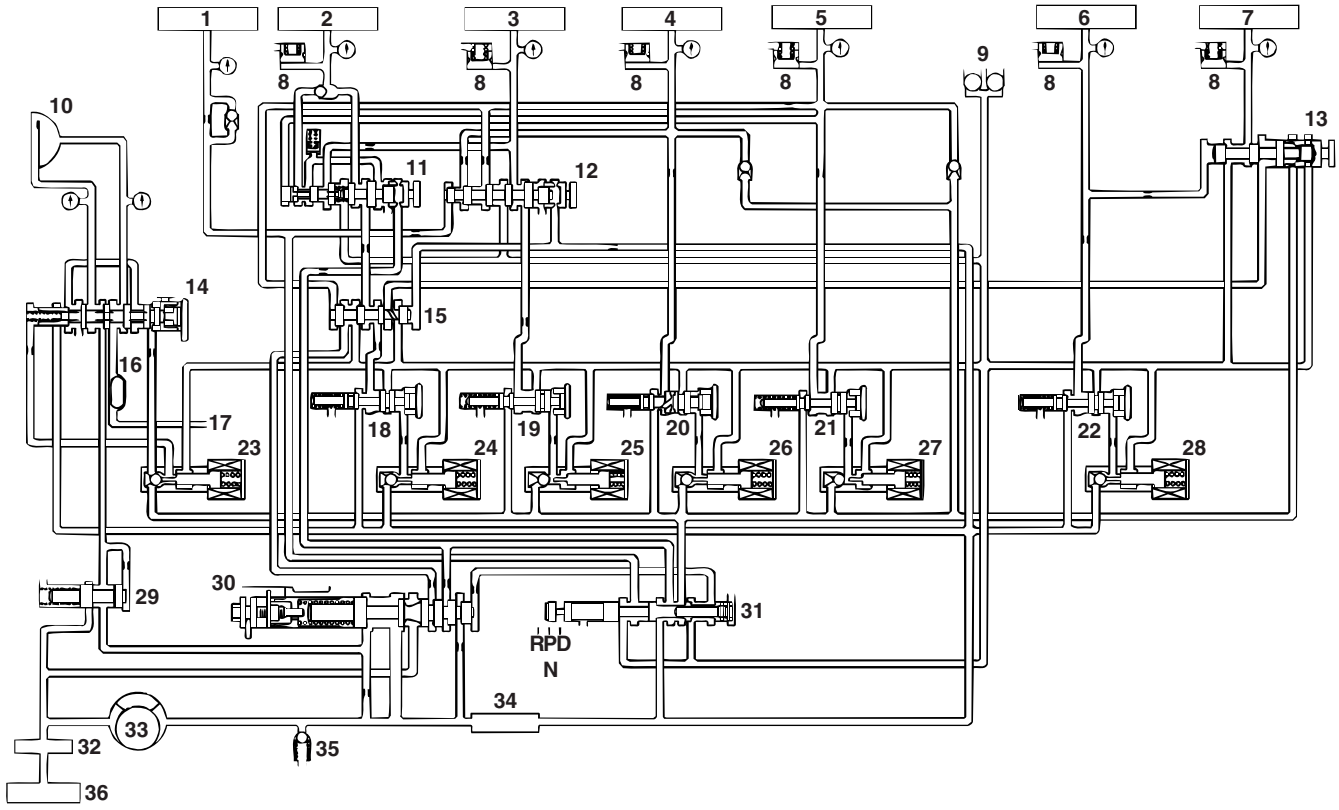
1ST GEAR



: LINE PRESSURE

: OIL PUMP SUCTION PRESSURE

: TORQUE CONVERTER CLUTCH PRESSURE

: TORQUE CONVERTER AND LUBRICATION PRESSURE

: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. REDUCTION BRAKE
7. DIRECT CLUTCH
8. ACCUMULATOR
9. CHECK BALL
10. TORQUE CONVERTER CLUTCH
11. FAIL SAFE VALVE A
12. FAIL SAFE VALVE B
13. FAIL SAFE VALVE C
14. TORQUE CONVERTER CLUTCH CONTROL VALVE
15. SWITCH VALVE
16. TRANSMISSION FLUID COOLER
17. LUBRICATION
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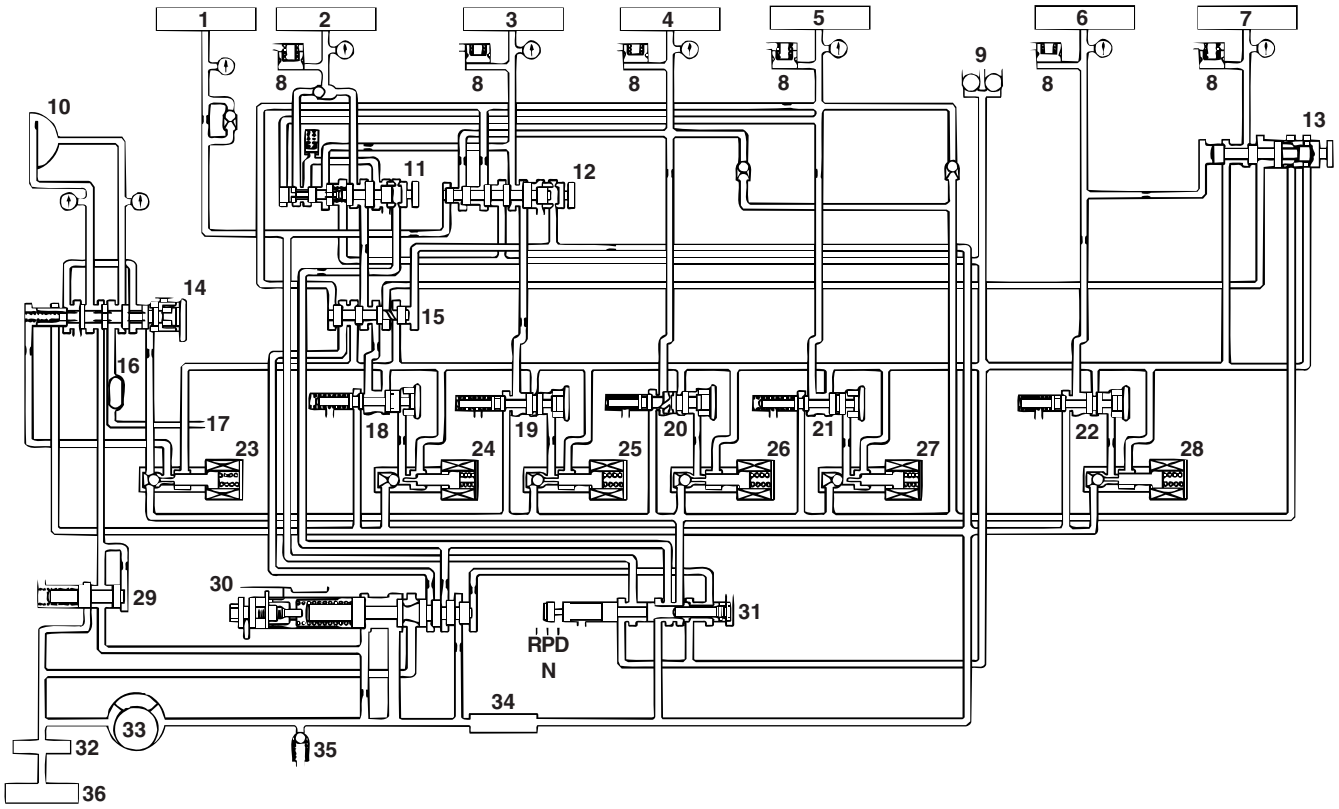
31. MANUAL VALVE
32. OIL FILTER
33. OIL PUMP
34. OIL STRAINER
35. RELIEF VALVE
36. OIL PAN

TSB Revision

2ND GEAR



: LINE PRESSURE

: OIL PUMP SUCTION PRESSURE

: TORQUE CONVERTER CLUTCH PRESSURE

: TORQUE CONVERTER AND LUBRICATION PRESSURE

: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

1. REVERSE CLUTCH
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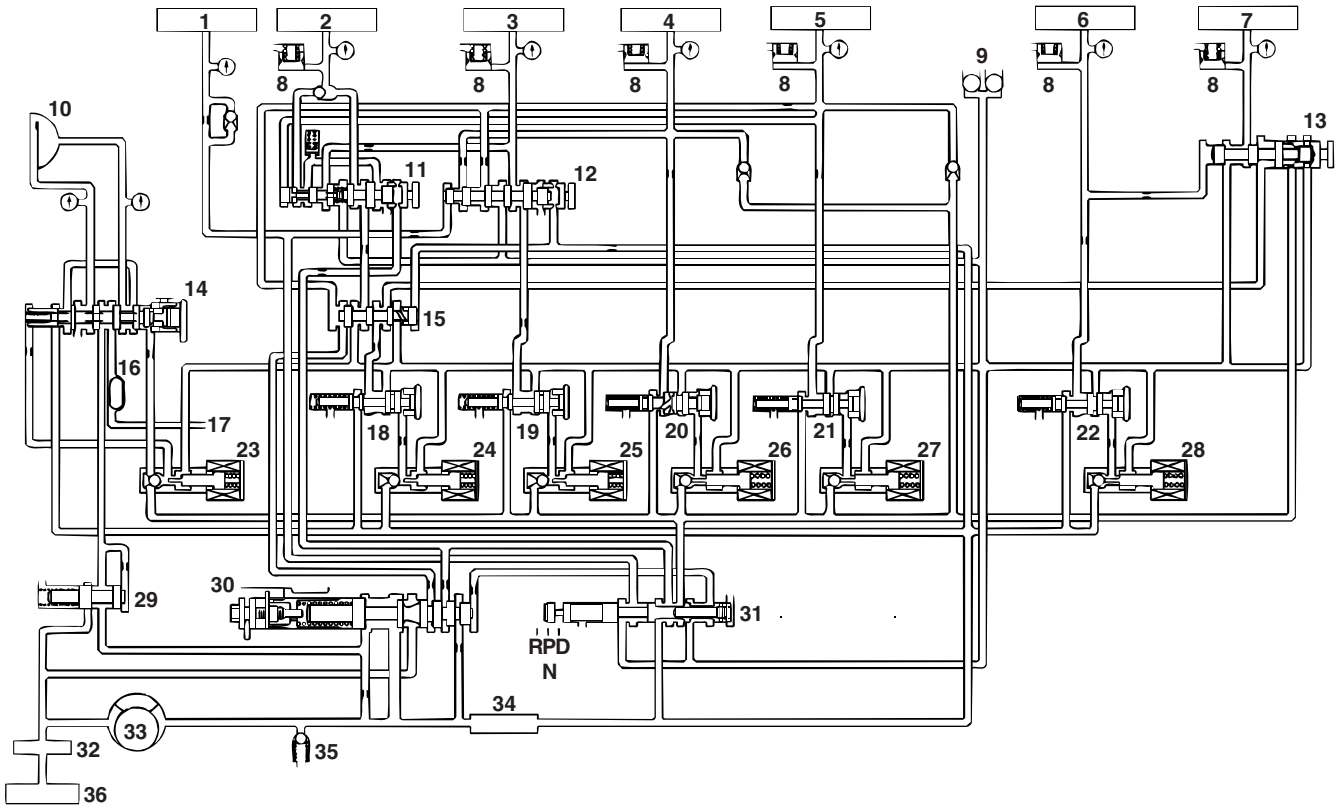
36. OIL PAN

TSB Revision

3RD GEAR



: 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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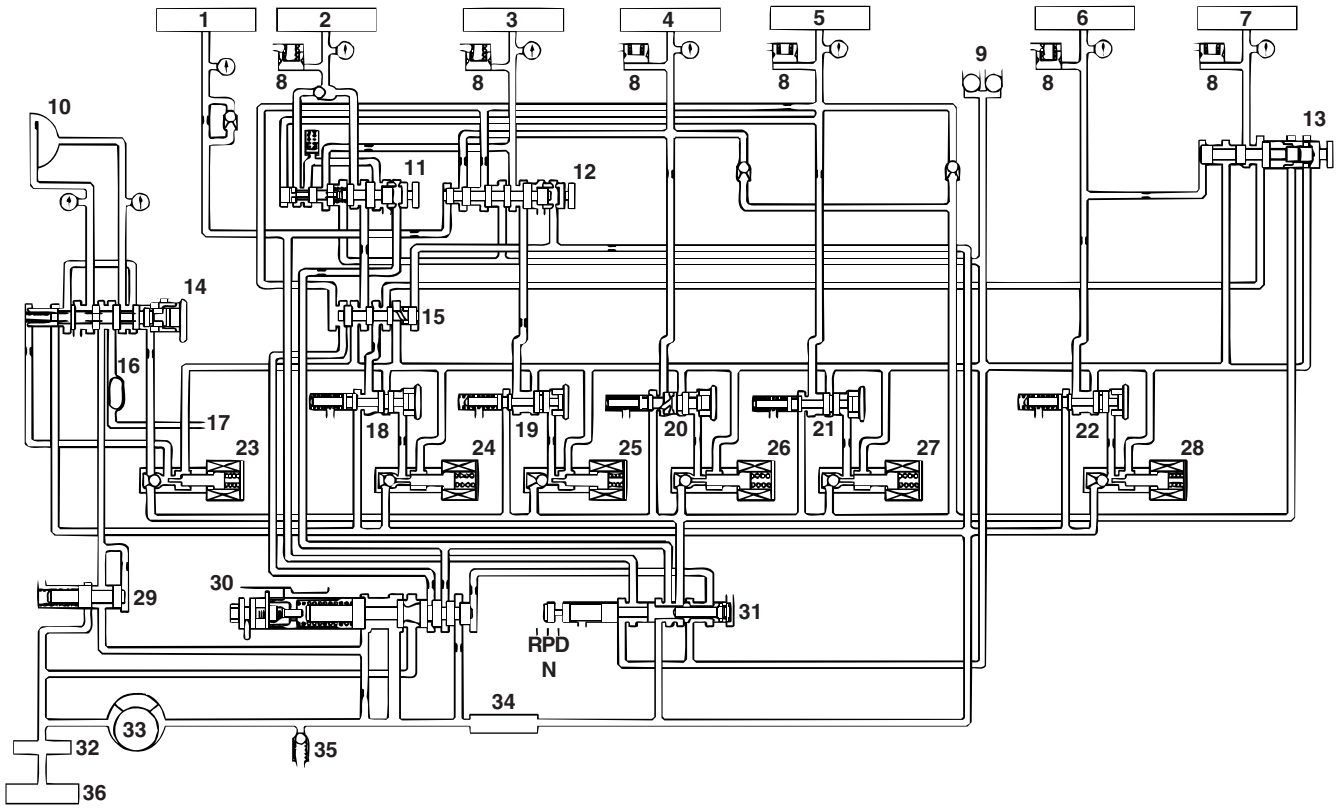
4TH GEAR



: 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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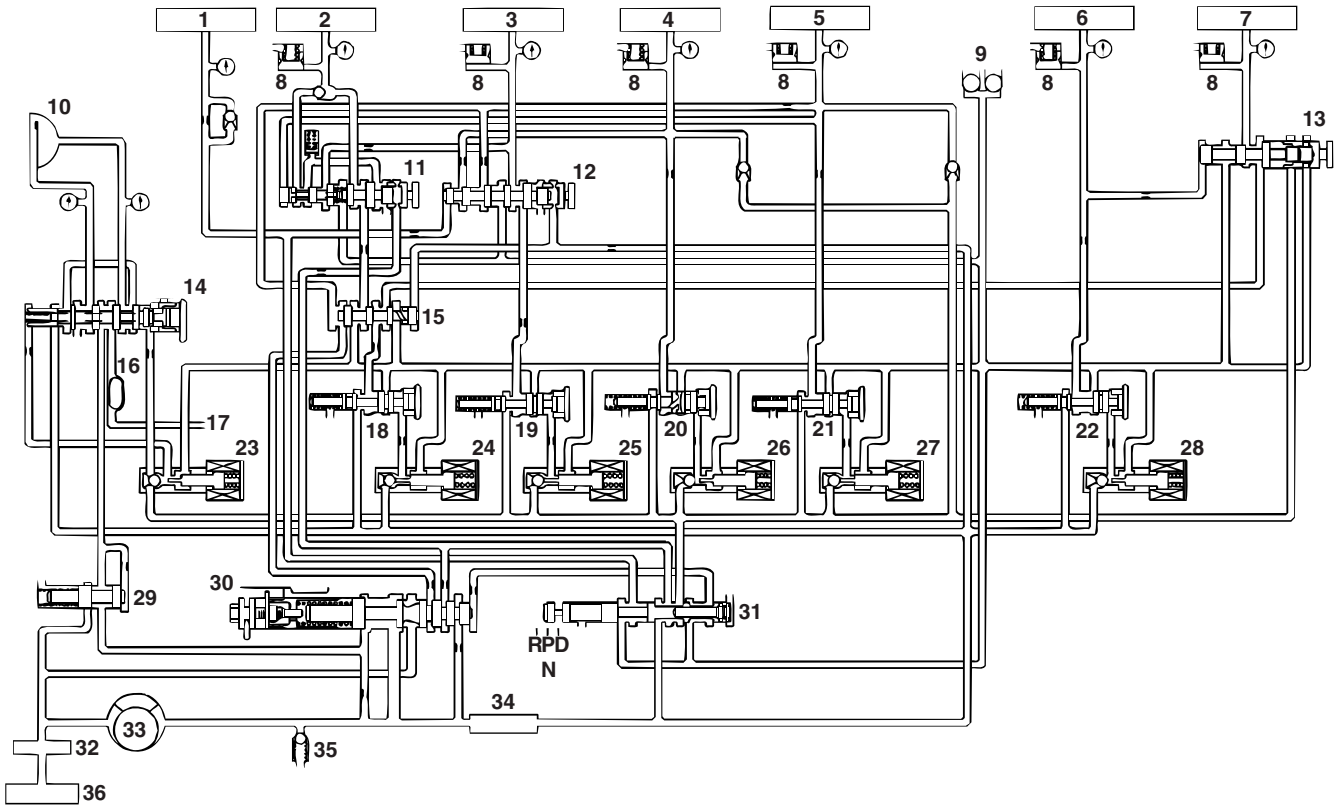
TSB Revision

5TH GEAR



: 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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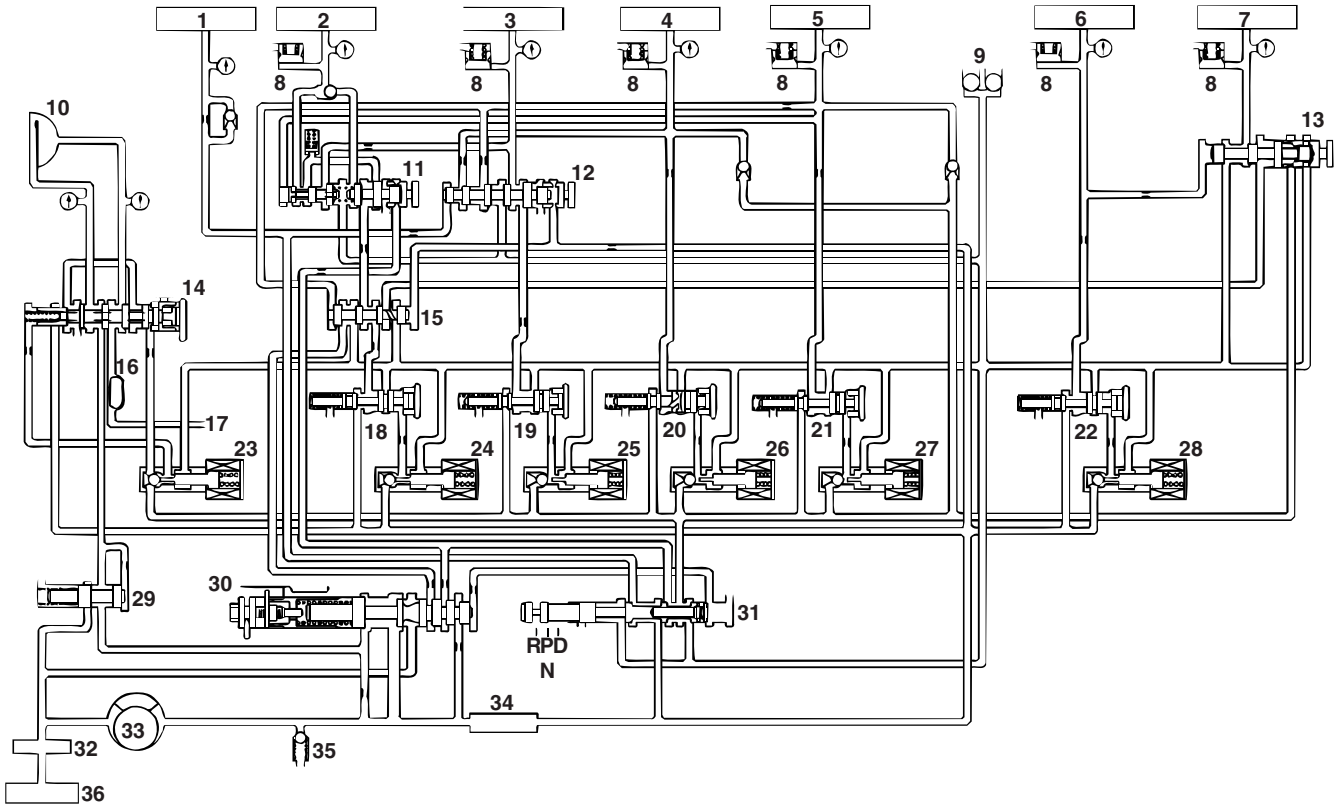
TSB Revision

REVERSE



: LINE PRESSURE
: OIL PUMP SUCTION PRESSURE
: TORQUE CONVERTER CLUTCH PRESSURE
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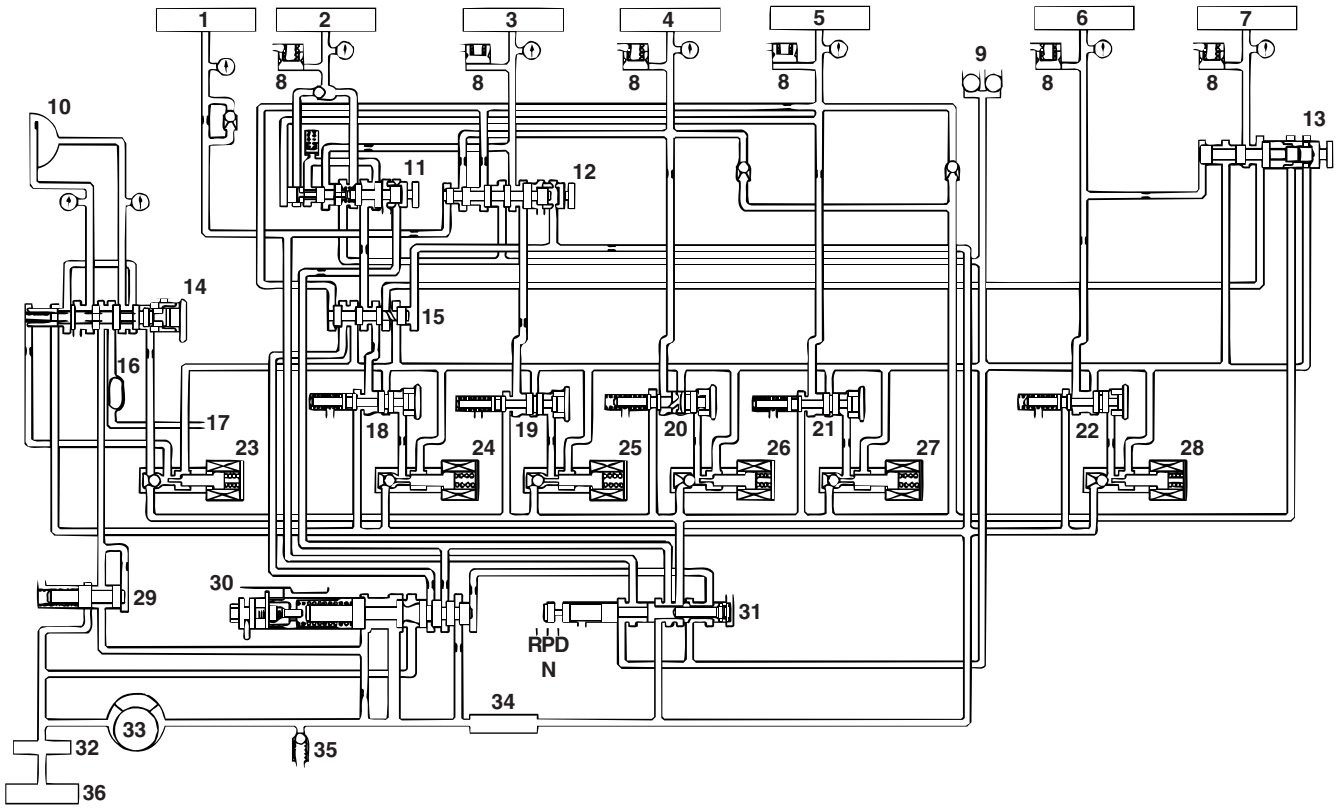
34. OIL STRAINER
35. RELIEF VALVE
36. OIL PAN

TSB Revision

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



1. REVERSE CLUTCH
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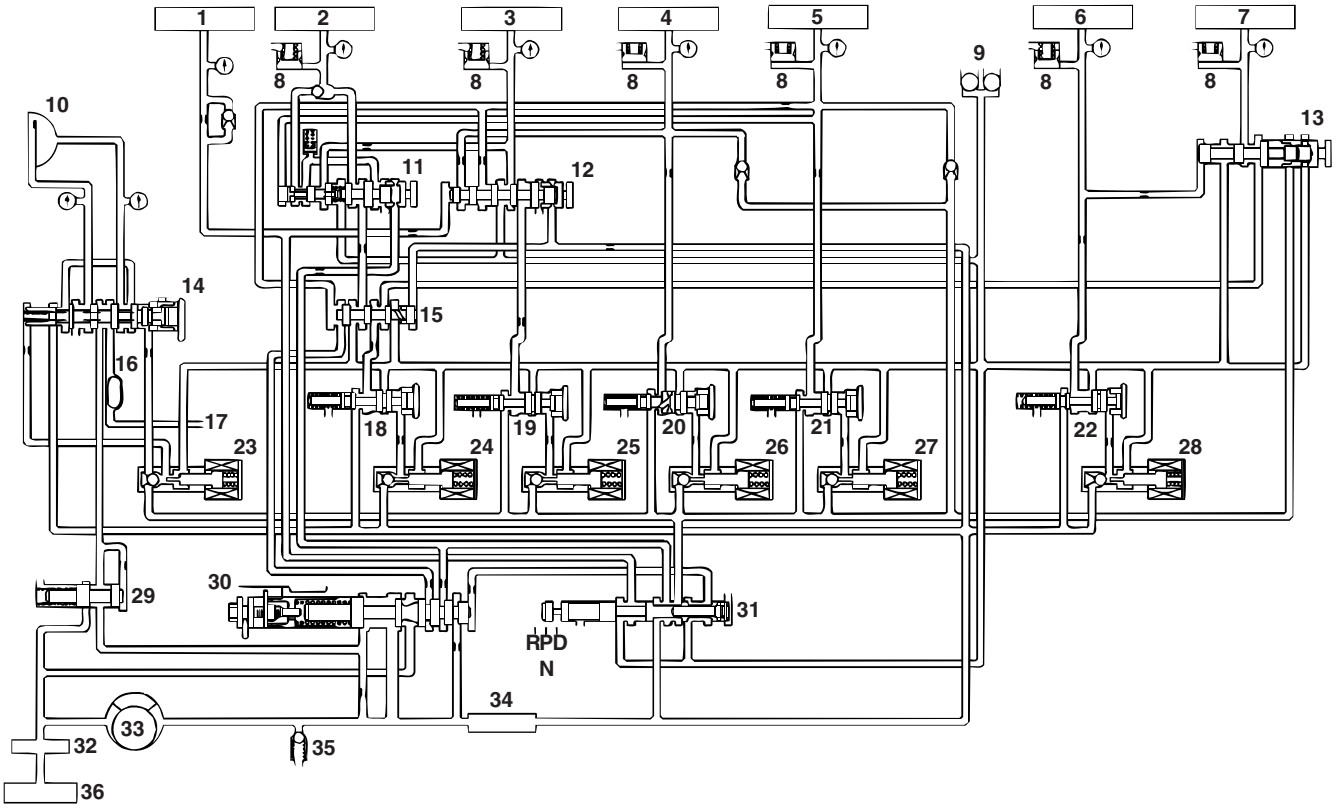
34. OIL STRAINER
35. RELIEF VALVE
36. OIL PAN

TSB Revision

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



1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
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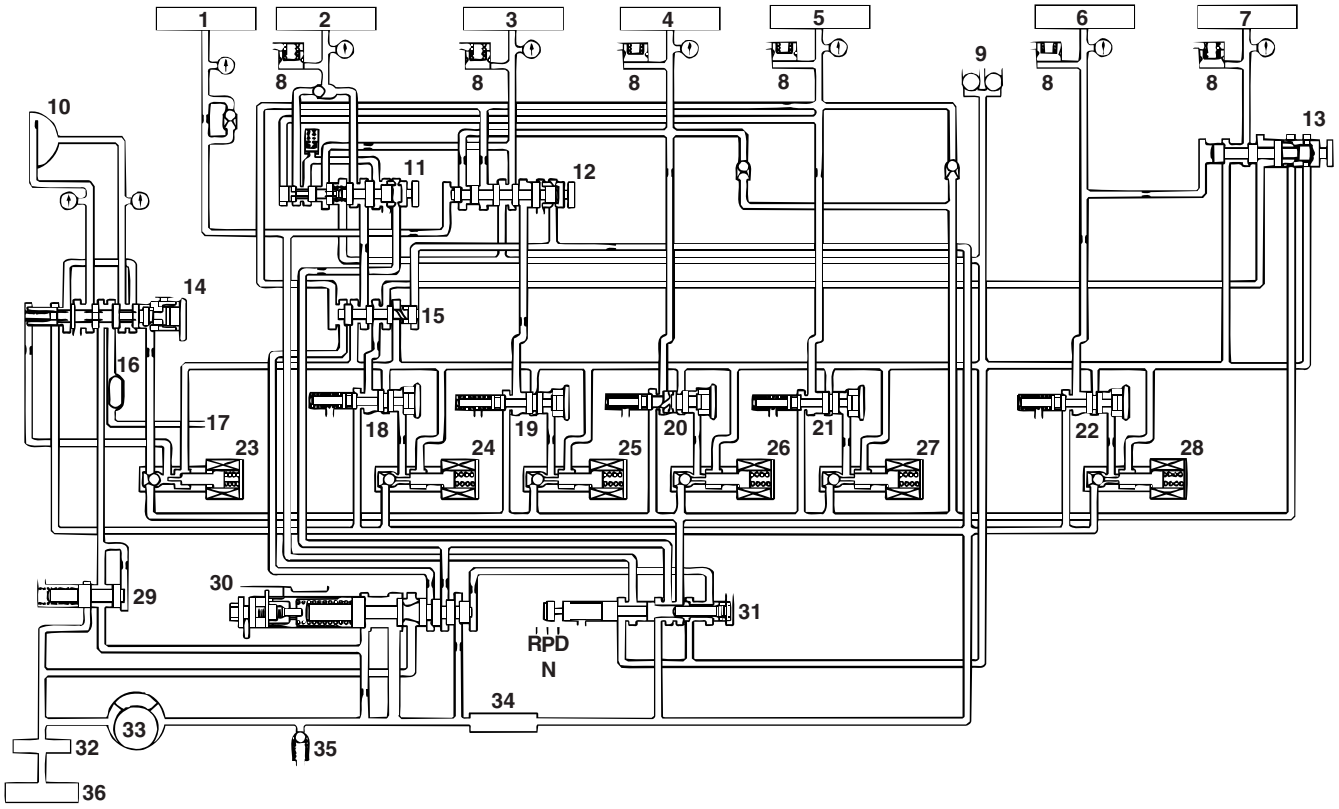
34. OIL STRAINER
35. RELIEF VALVE
36. OIL PAN

TSB Revision

FAIL-SAFE (IN CASE OF FAIL-SAFE VALVE C 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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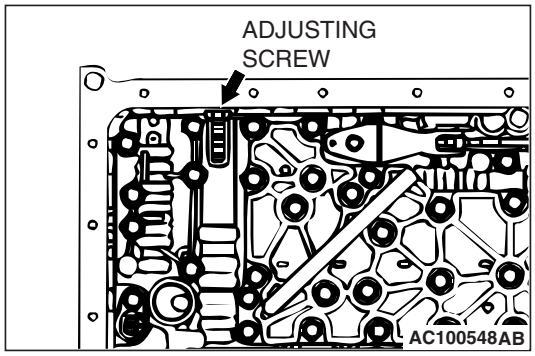
TSB Revision

LINE PRESSURE ADJUSTMENT

M1231108700109



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: 0.98 – 1.05 MPa (142 – 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.23A-27). Readjust the line pressure if necessary.

DIAGNOSTIC TROUBLE CODE CHART

M1231101200125

A/T DIAGNOSTIC TROUBLE CODE	MFI DIAGNOSTIC TROUBLE CODE	DIAGNOSTIC ITEM		REFERENCE PAGE
15	P0713	Transmission fluid temperature sensor system	Open circuit	P.23A-45
16	P0712		Short circuit	P.23A-62
21	-	Crankshaft position sensor system	Open circuit	Group 13A, Diagnostic Trouble code Procedures P.13A-483 (P0335 – Crankshaft Position Sensor Circuit)
22	P0715	Input shaft speed sensor system	Short circuit/open circuit	P.23A-72
23	P0720	Output shaft speed sensor system	Short circuit/open circuit	P.23A-92
26	-	Stoplight switch system	Short circuit	P.23A-112
27	P0705	Transmission range switch system	Open circuit	P.23A-122
28			Short circuit	P.23A-151
29	P0500	Vehicle speed sensor system	Short circuit/open circuit	P.23A-170
31	P0753	Low-reverse solenoid valve system	Short circuit/open circuit	P.23A-178
32	P0758	Underdrive solenoid valve system	Short circuit/open circuit	P.23A-193
33	P0763	Second solenoid valve system	Short circuit/open circuit	P.23A-206
34	P0768	Overdrive solenoid valve system	Short circuit/open circuit	P.23A-219
35	P0773	Reduction solenoid valve system	Short circuit/open circuit	P.23A-232

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A/T DIAGNOSTIC TROUBLE CODE	MFI DIAGNOSTIC TROUBLE CODE	DIAGNOSTIC ITEM		REFERENCE PAGE
36	P0743	Torque converter clutch solenoid system	Short circuit/open circuit	P.23A-245
41	P0731	1st gear incorrect ratio		P.23A-258
42	P0732	2nd gear incorrect ratio		P.23A-258
43	P0733	3rd gear incorrect ratio		P.23A-258
44	P0734	4th gear incorrect ratio		P.23A-258
45	P0735	5th gear incorrect ratio		P.23A-258
46	P0736	Reverse gear incorrect ratio		P.23A-258
52	P0741	Torque converter clutch solenoid system	Defective system	P.23A-274
53	P0742		Clutch stuck on	P.23A-279
54	P1751	A/T Control relay system	Short circuit to ground/ open circuit	P.23A-283
56	-	"N" range light system	Open circuit	P.23A-301

NOTE: The MFI diagnostic trouble codes are the codes which are set when item "MFI" is selected on scan tool MB991958 (MUT-III sub assembly). However, the codes above indicate failure in the automatic transmission.

SYMPTOM CHART <AUTOMATIC TRANSMISSION>

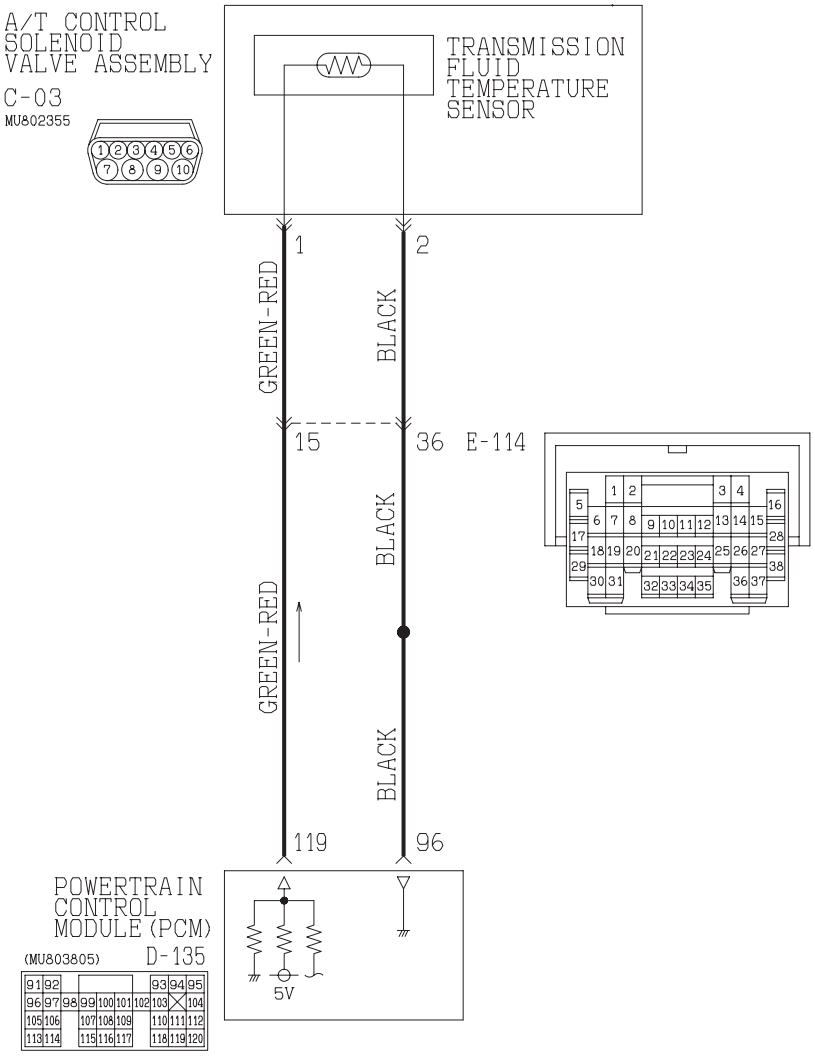
M1231108800106

SYMPTOM		INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication with scan tool MB991958 (MUT-III sub assembly) is not possible	Communication with all systems is impossible	–	Group 13A, Symptom Procedures P.13A-888
	Communication with the PCM only is impossible	–	Group 13A, Symptom Procedures P.13A-891
Driving impossible	Engine does not crank	1	P.23A-309
	Does not move forward	2	P.23A-312
	Does not move backward	3	P.23A-314
	Does not move (forward or backward)	4	P.23A-317
Malfunction when moving selector into gear	Engine stalls when moving selector lever from "N" to "D" or "N" to "R"	5	P.23A-318
	Shift shock when shifting from "N" to "D" and long delay	6	P.23A-320
	Shift shock when shifting from "N" to "R" and long delay	7	P.23A-323
	Shift shock when shifting from "N" to "D", "N" to "R" and long delay	8	P.23A-327
Malfunction when shifting	Shift shocks and slipping	9	P.23A-328
Does not shift properly	Early or late shifting in all gears	10	P.23A-331
	Early or late shifting in some gears	11	P.23A-334
Does not shift	No diagnostic trouble codes	12	P.23A-336
Malfunction while driving	Poor acceleration	13	P.23A-341
	Vibration	14	P.23A-342
Vehicle shifts differently with A/C engaged		15	P.23A-345
Transmission won't downshift under load with auto-cruise engaged		16	P.23A-359
Shift switch assembly system		17	P.23A-361
4LLc detection switch assembly system		18	P.23A-380

DIAGNOSTIC TROUBLE CODE PROCEDURES <A/T>

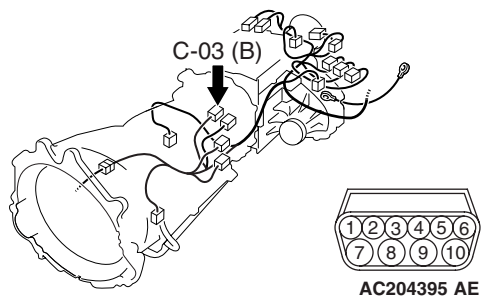
DTC 15 (P0713): Transmission Fluid Temperature Sensor System (Open Circuit)

Transmission Fluid Temperature Sensor System Circuit



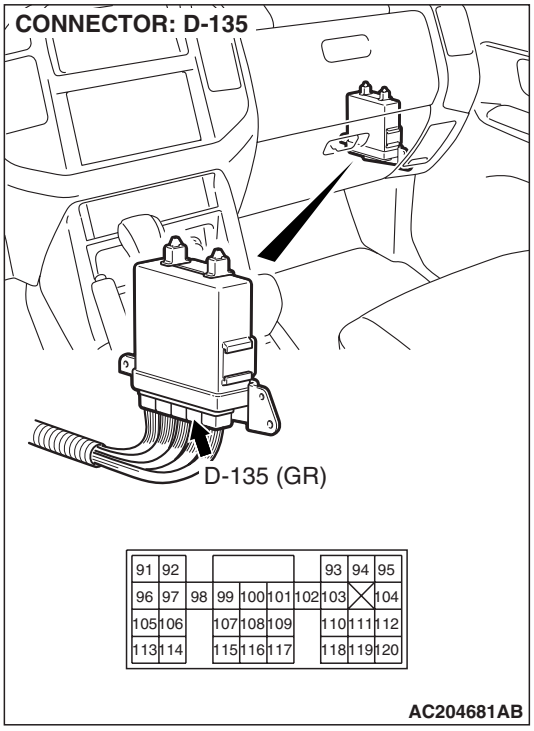
W3Q20M06AA
AC205187AC

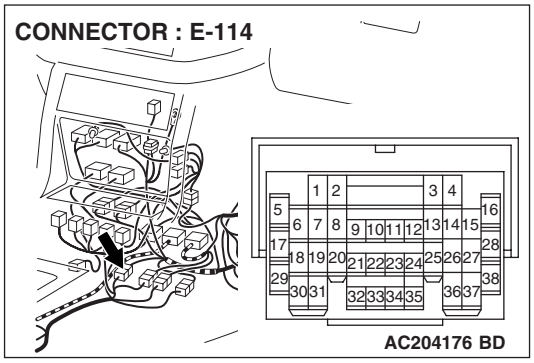
CONNECTOR : C-03



AC204395 AE

TSB Revision





CIRCUIT OPERATION

- The PCM (terminal 119) applies 5 volts to the transmission fluid temperature sensor output terminal (terminal 1).
- The transmission fluid temperature sensor circuit is grounded to the PCM (terminal 96).
- When the transmission fluid temperature is cold, the transmission fluid temperature sensor resistance is high. When the transmission fluid temperature is hot, the transmission fluid temperature sensor resistance is low.

DESCRIPTIONS OF MONITOR METHODS

If transmission fluid temperature is below specified value even after driving test for more than specified period, PCM judges that transmission fluid temperature sensor has a failure.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

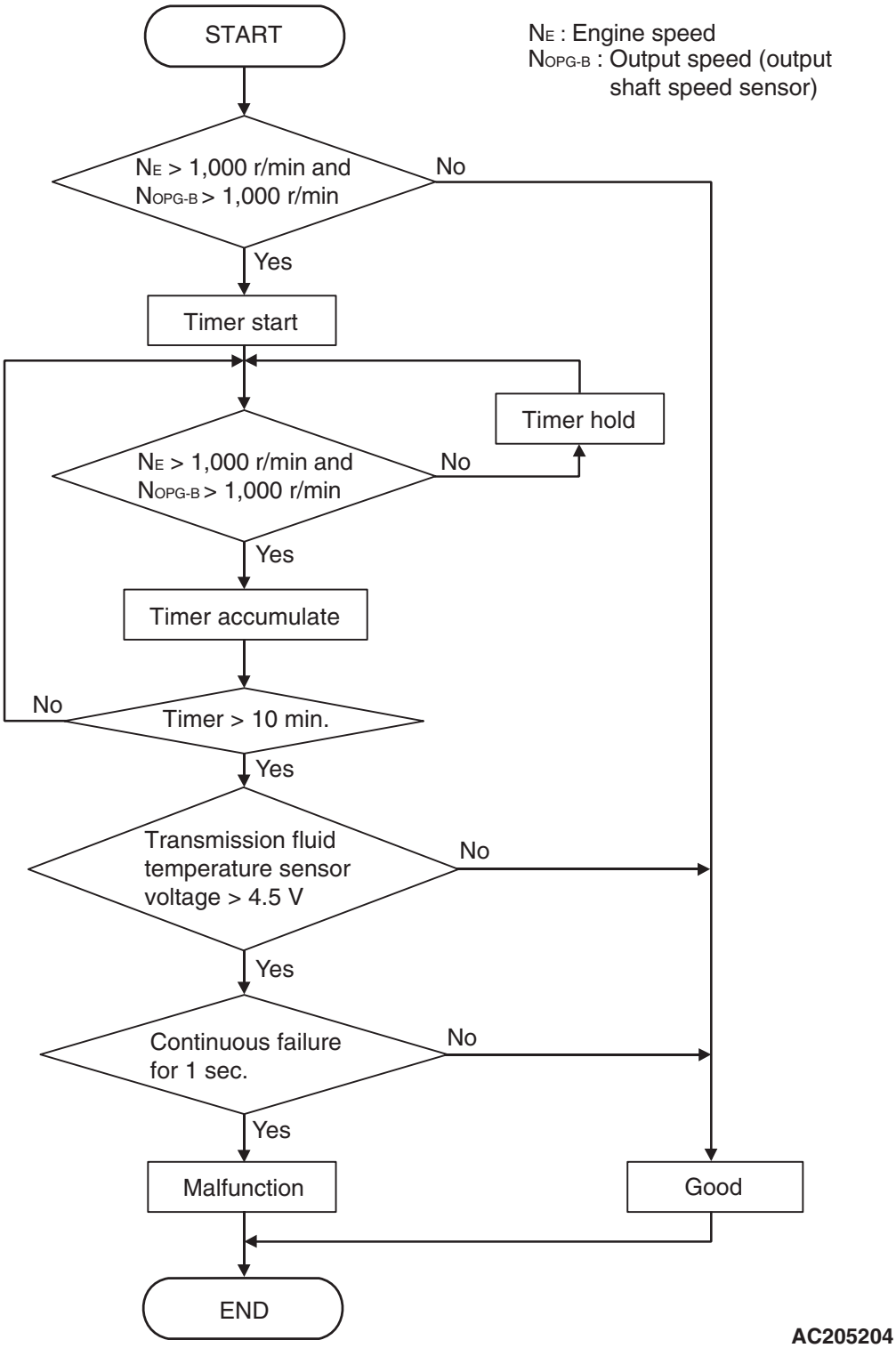
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- DTC 23 (P0720): Output shaft speed sensor malfunction

Sensor (The sensor below is determined to be normal)

- Output shaft speed sensor

LOGIC FLOW CHARTS (Monitor Sequence)



AC205204

DTC SET CONDITIONS

Check Conditions

- Engine speed: 1,000 r/min or more.
- Output speed: 1,000 r/min or more.
- Accumulated time in above condition: 10 minutes.

Judgement Criteria

- Transmission fluid temperature sensor voltage: 4.5 volts or more. (1 second)

OBD-II DRIVE CYCLE PATTERN

Start the engine, drive at 60 km/h (37 mph) or more for 15 minutes in total.

TSB Revision

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the transmission fluid temperature sensor circuit
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

STEP 1. Using scan tool MB991958, check data list item 15: Transmission Fluid Temperature Sensor.

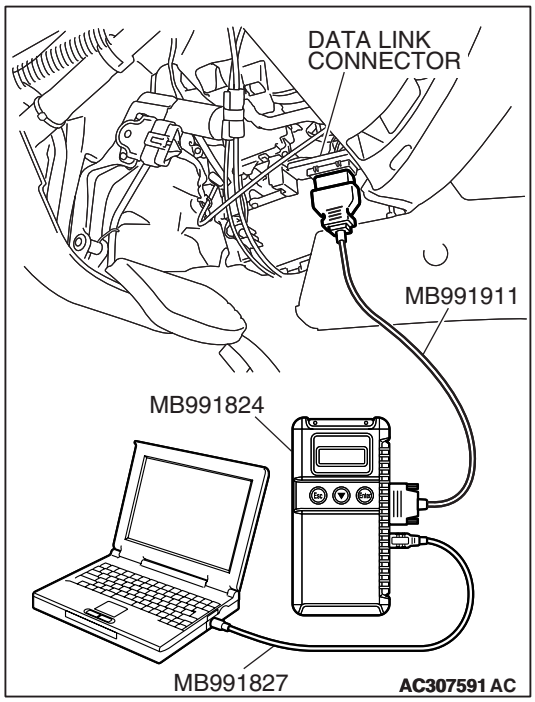
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode.
- Item 15: Transmission Fluid Temperature Sensor.
  - When the engine is cool: Almost equal to the ambient temperature (atmospheric temperature)

    NOTE: Set scan tool MB991958 to the data reading mode for item number 13, Intake Air Temperature (IAT) Sensor and note the temperature measurement. When the engine is cool, the temperature should be almost equal to the ambient temperature (atmospheric temperature), and the IAT sensor measurement should be approximately the same as the Transmission Fluid Temperature Sensor.
  - When the engine is warm: 70 to 80°C (158 to 176°F).

(4) Turn the ignition switch to the "LOCK" (OFF) position.



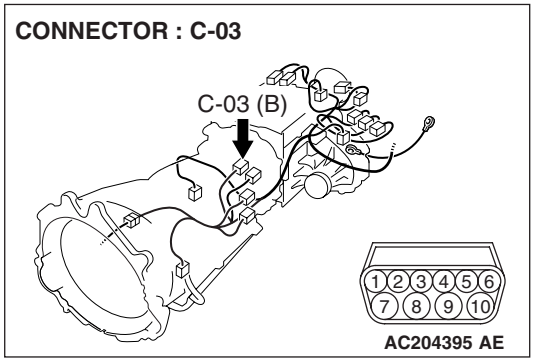
Q: Is the sensor operating properly?

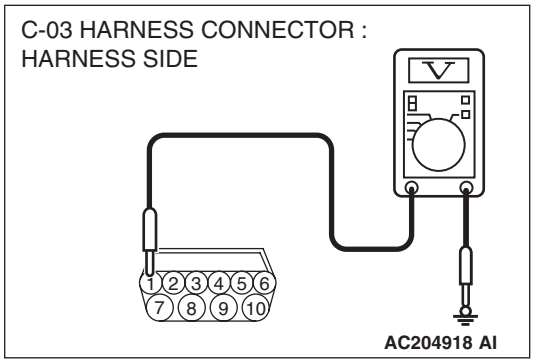
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at the A/T control solenoid valve assembly connector C-03 by backprobing.

(1) Do not disconnect connector C-03.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 1 and ground by backprobing.
- When transmission fluid temperature is 20°C (68°F), voltage should measure between 3.8 and 4.0 volts.
- When transmission fluid temperature is 40°C (104°F), voltage should measure between 3.2 and 3.4 volts.
- When transmission fluid temperature is 80°C (176°F), voltage should measure between 1.7 and 1.9 volts.

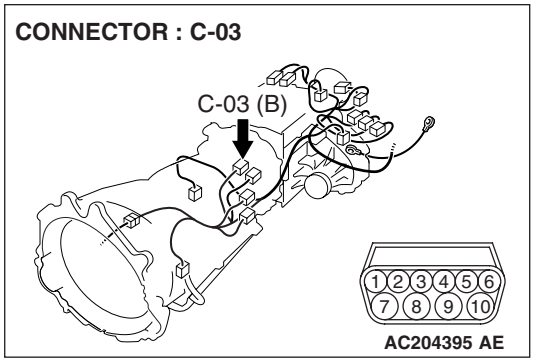
(4) Turn the ignition switch to the "LOCK" (OFF) position.

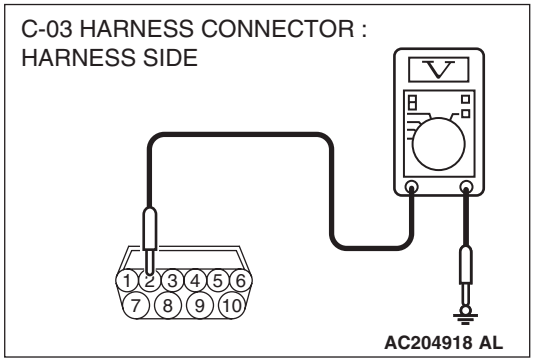
Q: Is the measured voltage within the specified range?

YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Measure the ground voltage at the A/T control solenoid valve assembly connector C-03 by backprobing.

(1) Do not disconnect connector C-03.
(2) Turn the ignition switch to the "ON" position.



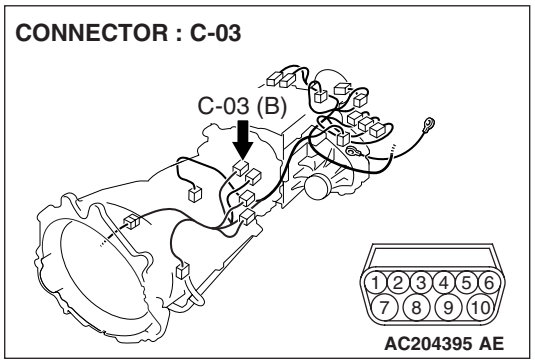


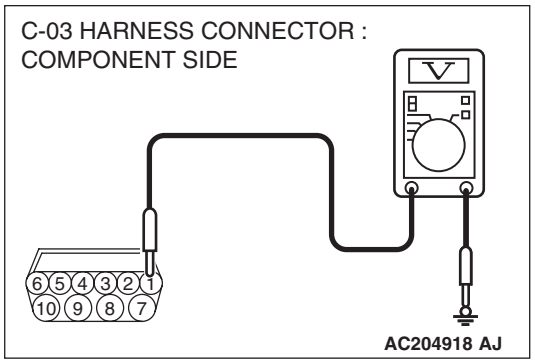
(3) Measure the voltage between terminal 2 and ground by backprobing.
- The voltage should measure 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 4.
NO : Go to Step 7.





STEP 4. Check the sensor output voltage at A/T control solenoid valve assembly connector C-03.

(1) Disconnect connector C-03 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.
- The voltage should measure between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

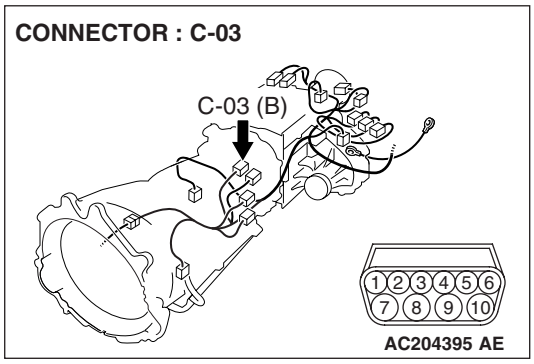
Q: Is the measured voltage between 4.5 and 4.9 volts?

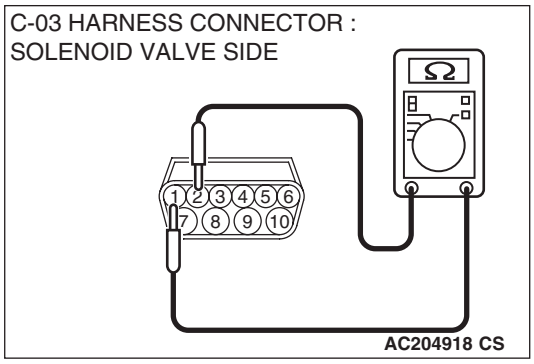
YES : Go to Step 5.

NO : Go to Step 9.

STEP 5. Check the transmission fluid temperature sensor at A/T control solenoid valve assembly connector C-03.

(1) Disconnect connector C-03 and measure at the sensor side.



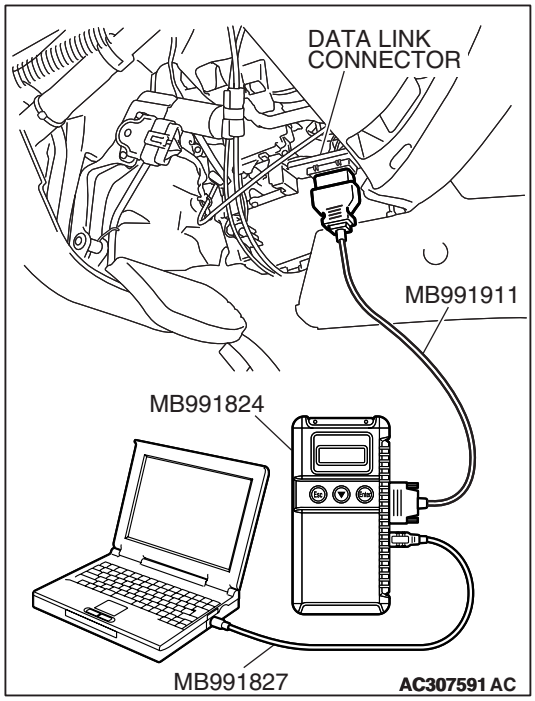


(2) Measure the resistance between terminal 1 and 2.
- When transmission fluid temperature is 0°C (32°F), resistance should be between 16.7 and 20.5 kΩ.
- When transmission fluid temperature is 20°C (68°F), resistance should be between 7.3 and 8.9 kΩ.
- When transmission fluid temperature is 40°C (104°F), resistance should be between 3.4 and 4.2 kΩ.
- When transmission fluid temperature is 60°C (140°F), resistance should be between 1.9 and 2.2 kΩ.
- When transmission fluid temperature is 80°C (176°F), resistance should be between 1.0 and 1.2 kΩ.
- When transmission fluid temperature is 100°C (212°F), resistance should be between 0.57 and 0.69 kΩ.

Q: Is the measured resistance within the specified range?

YES : Go to Step 6.

NO : Replace the transmission fluid temperature sensor. Refer to GROUP 23B, Transmission P.23B-14.



STEP 6. Using scan tool MB991958, check data list item 15: Transmission Fluid Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode.
- Item 15: Transmission Fluid Temperature Sensor.
  - When the engine is cool: Almost equal to the ambient temperature (atmospheric temperature)

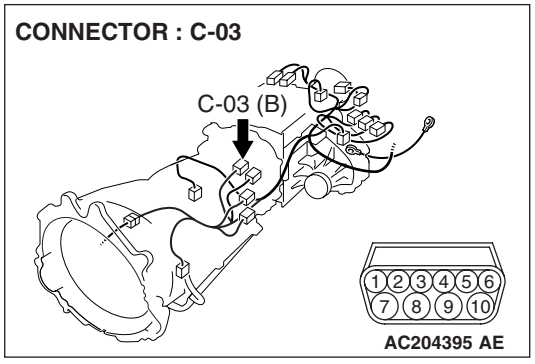
    NOTE: Set scan tool MB991958 to the data reading mode for item number 13, Intake Air Temperature (IAT) Sensor and note the temperature measurement. When the engine is cool, the temperature should be almost equal to the ambient temperature (atmospheric temperature), and the IAT sensor measurement should be approximately the same as the Transmission Fluid Temperature Sensor.
  - When the engine is warm: 70 to 80°C (158 to 176°F).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Replace the PCM.



STEP 7. Check A/T control solenoid valve assembly connector C-03 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

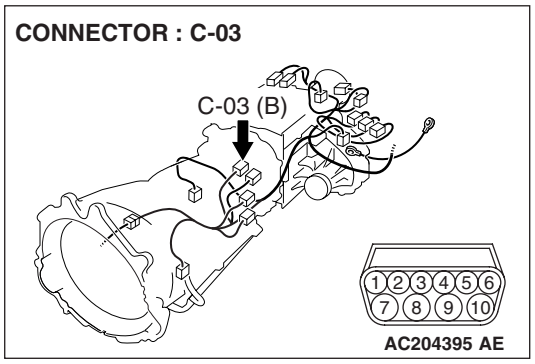
Q: Are the connector and terminals in good condition?

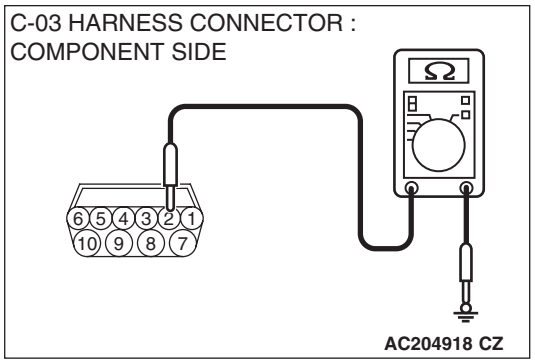
YES : Go to Step 8.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 8. Measure the resistance of the ground circuit at A/T control solenoid valve assembly connector C-03.

(1) Disconnect connector C-03 and measure at the harness side.





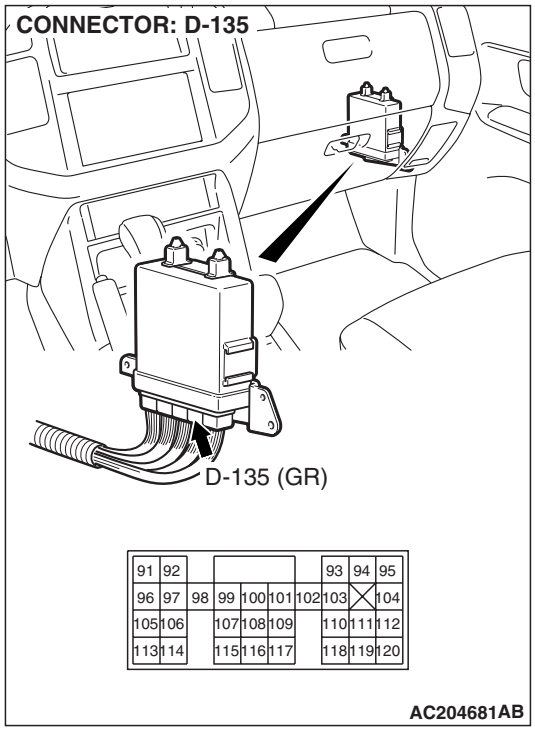
(2) Measure the resistance between terminal 2 and ground.
- The resistance should measure less than 2 ohms.

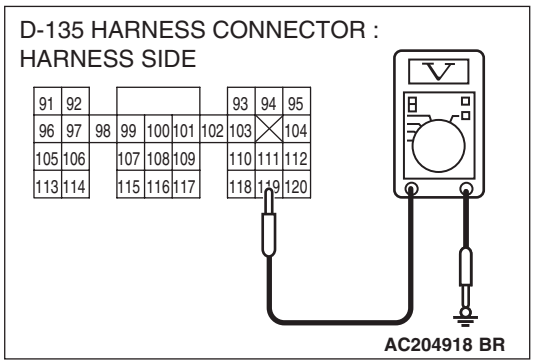
Q: Is the resistance less than 2 ohms?

YES : Go to Step 5.
NO : Go to Step 14.

STEP 9. Measure the sensor output voltage at PCM connector D-135 by backprobing.

(1) Do not disconnect connector D-135.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 119 and ground by backprobing.
- When transmission fluid temperature is 20°C (68°F), voltage should measure between 3.8 and 4.0 volts.
- When transmission fluid temperature is 40°C (104°F), voltage should measure between 3.2 and 3.4 volts.
- When transmission fluid temperature is 80°C (176°F), voltage should measure between 1.7 and 1.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

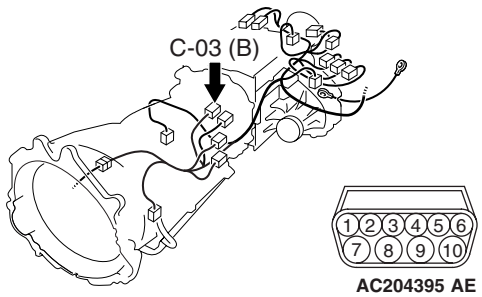
YES : Go to Step 12.
NO : Go to Step 10.

STEP 10. Check A/T control solenoid valve assembly connector C-03, PCM connector D-135 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Are the connectors and terminals in good condition?

YES : Go to Step 11.

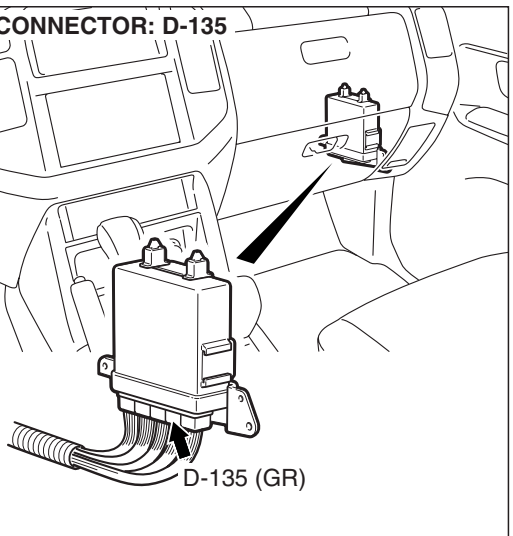
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR : C-03



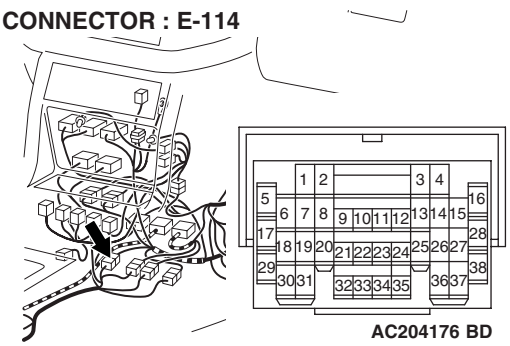
AC204395 AE

CONNECTOR: D-135



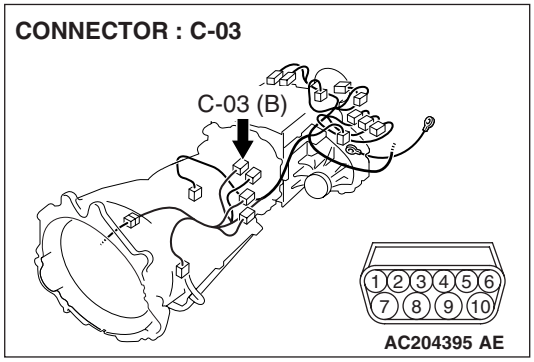
AC204681AB

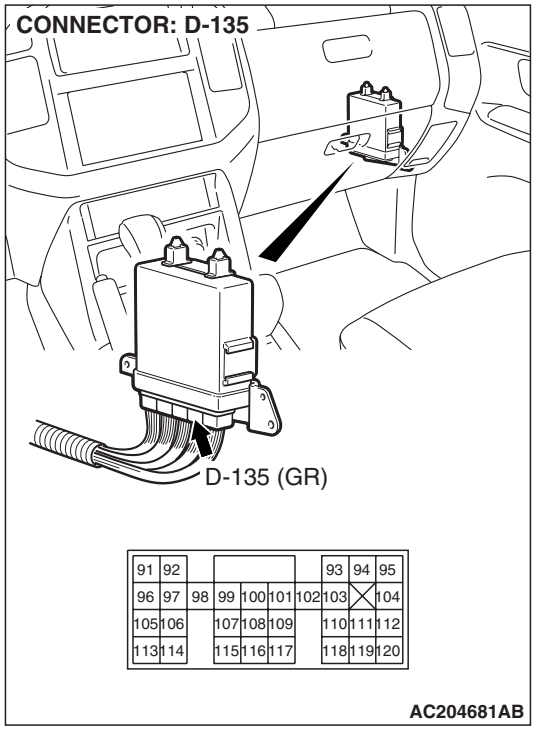
CONNECTOR : E-114



AC204176 BD

TSB Revision





STEP 11. Check the harness for short circuit to ground between A/T control solenoid valve connector C-03 terminal 1 and PCM connector D-135 terminal 119.

Q: Is the harness wire in good condition?

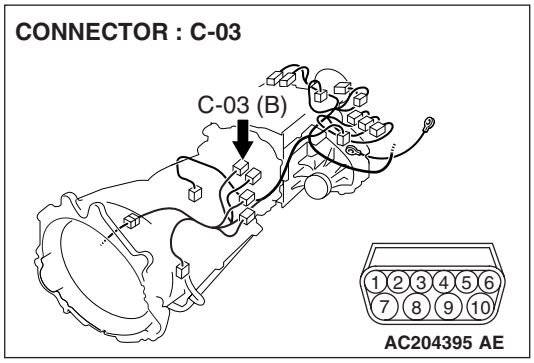
YES : Go to Step 6.

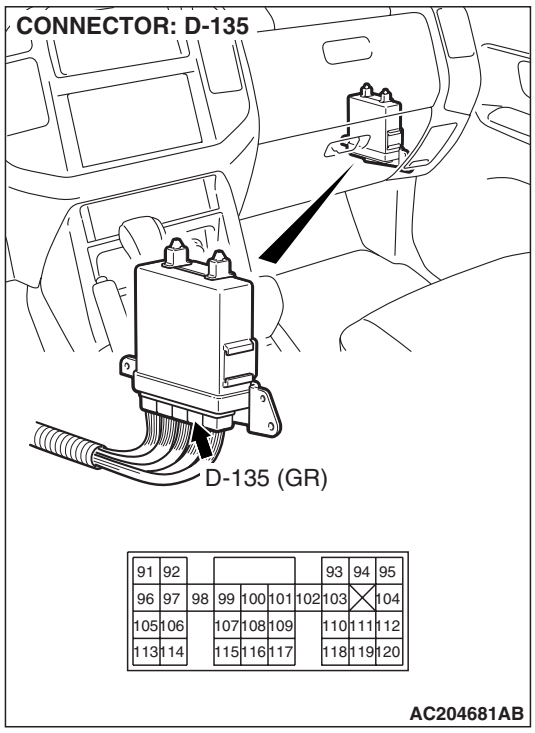
NO : Repair or replace the harness wire.

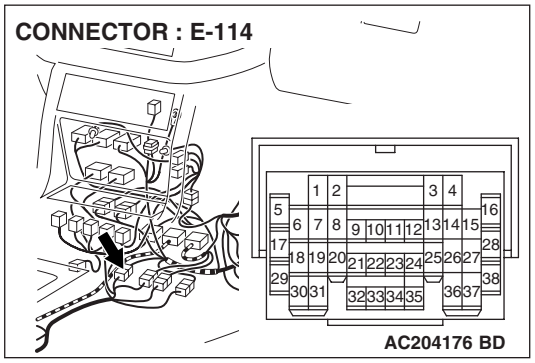
STEP 12. Check A/T control solenoid valve assembly connector C-03, PCM connector D-135 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Are the connectors and terminals in good condition?

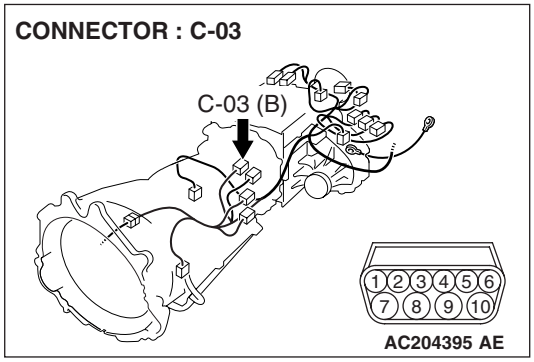
YES : Go to Step 13.

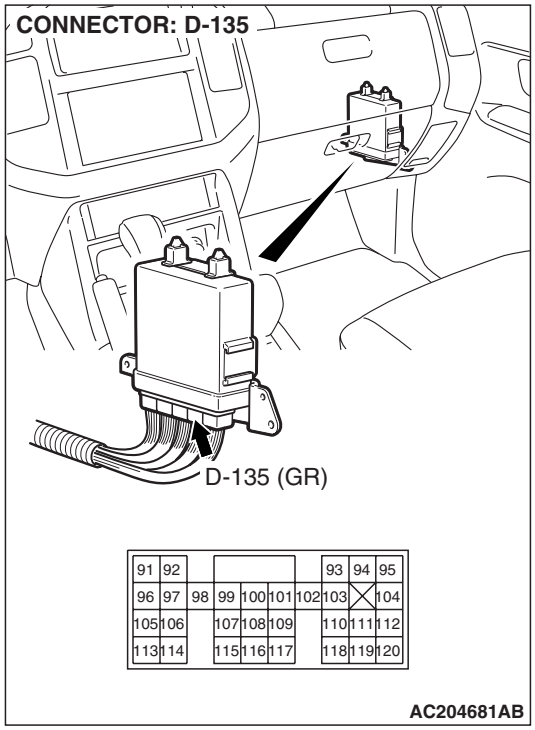
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.











STEP 13. Check the harness for open circuit between A/T control solenoid valve connector C-03 terminal 1 and PCM connector D-135 terminal 119.

Q: Is the harness wire in good condition?

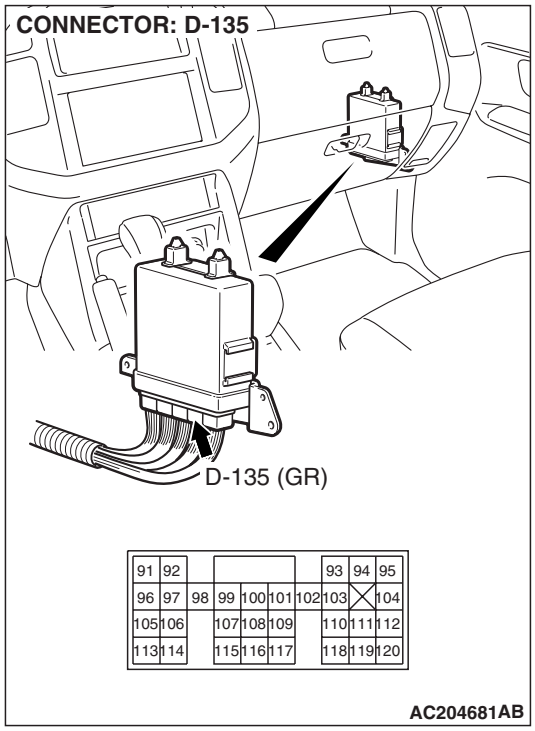
YES : Go to Step 6.

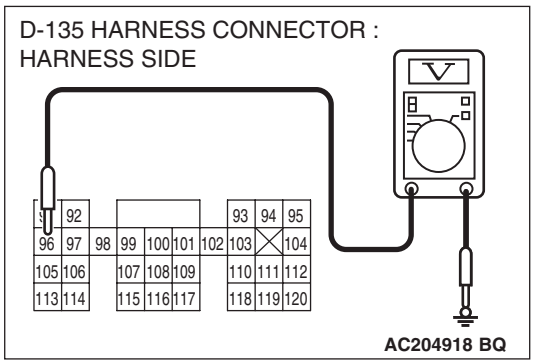
NO : Repair or replace the harness wire.

STEP 14. Measure the ground voltage at PCM connector D-135 by backprobing.

(1) Do not disconnect connector D-135.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 96 and ground by backprobing.
- Voltage should measure 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

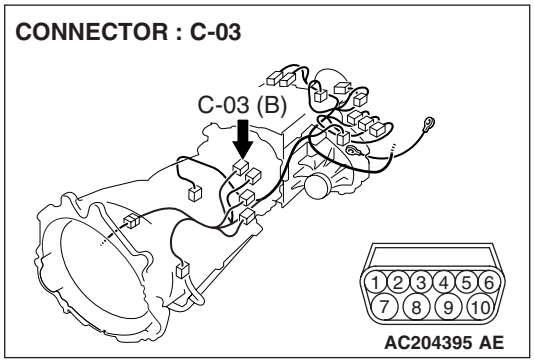
YES : Go to Step 15.

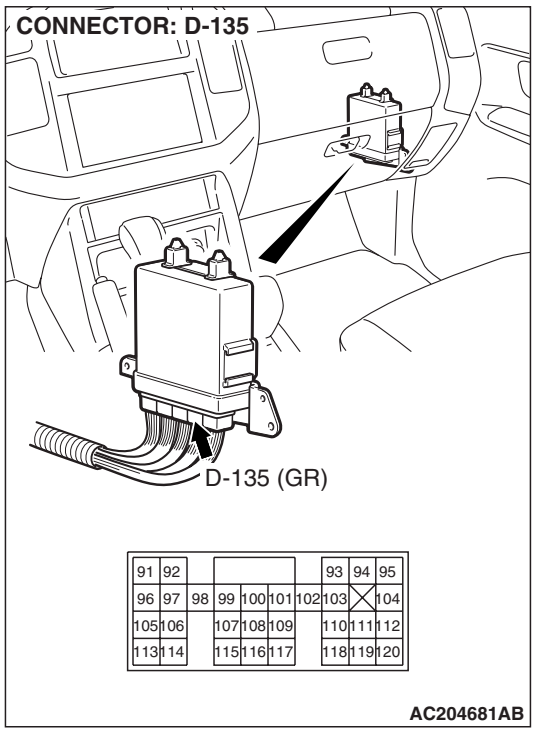
NO : Go to Step 17.

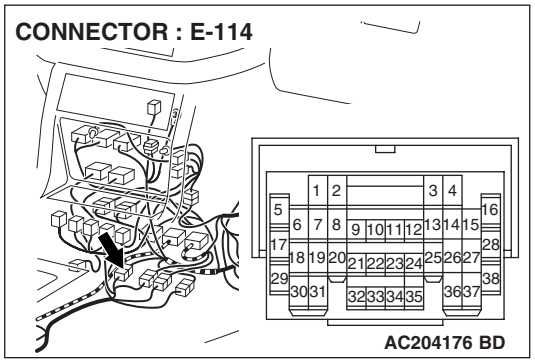
STEP 15. Check A/T control solenoid valve assembly connector C-03, PCM connector D-135 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Are the connectors and terminals in good condition?

YES : Go to Step 16.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

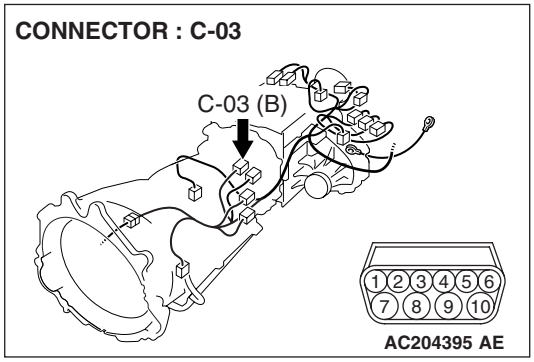


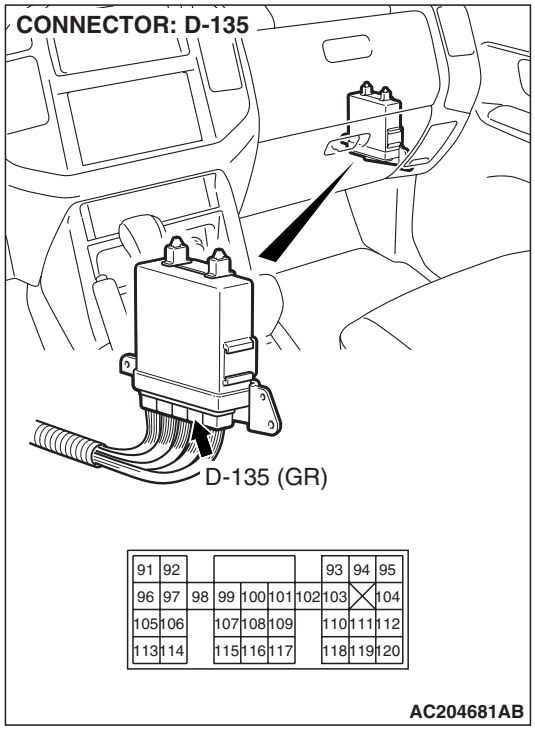


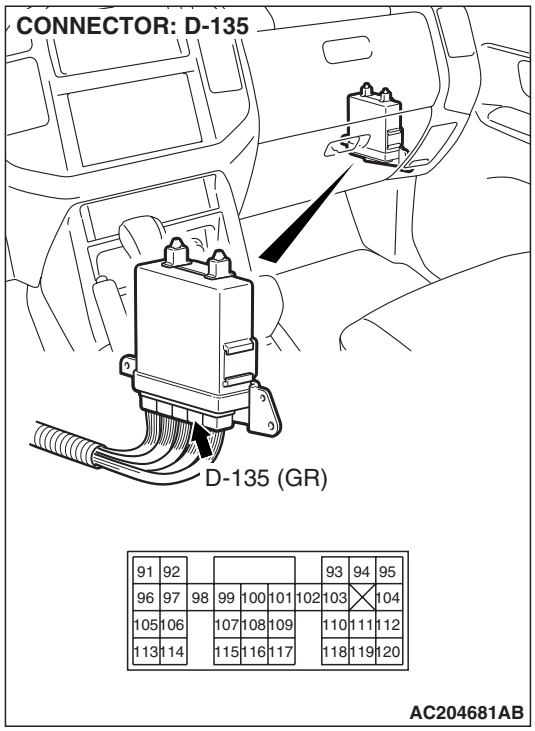


STEP 16. Check the harness for open circuit or damage between A/T control solenoid valve connector C-03 terminal 2 and PCM connector D-135 terminal 96.
Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair or replace the harness wire.







STEP 17. Check PCM connector D-135 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 6.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

DTC 16 (P0712): Transmission Fluid Temperature Sensor System (Short Circuit)

TRANSMISSION FLUID TEMPERATURE SENSOR SYSTEM CIRCUIT

Refer to P.23A-45.

CIRCUIT OPERATION

Refer to P.23A-45.

DESCRIPTIONS OF MONITOR METHODS

If transmission fluid temperature equals or exceeds specified value, PCM judges that transmission fluid temperature sensor has a failure.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

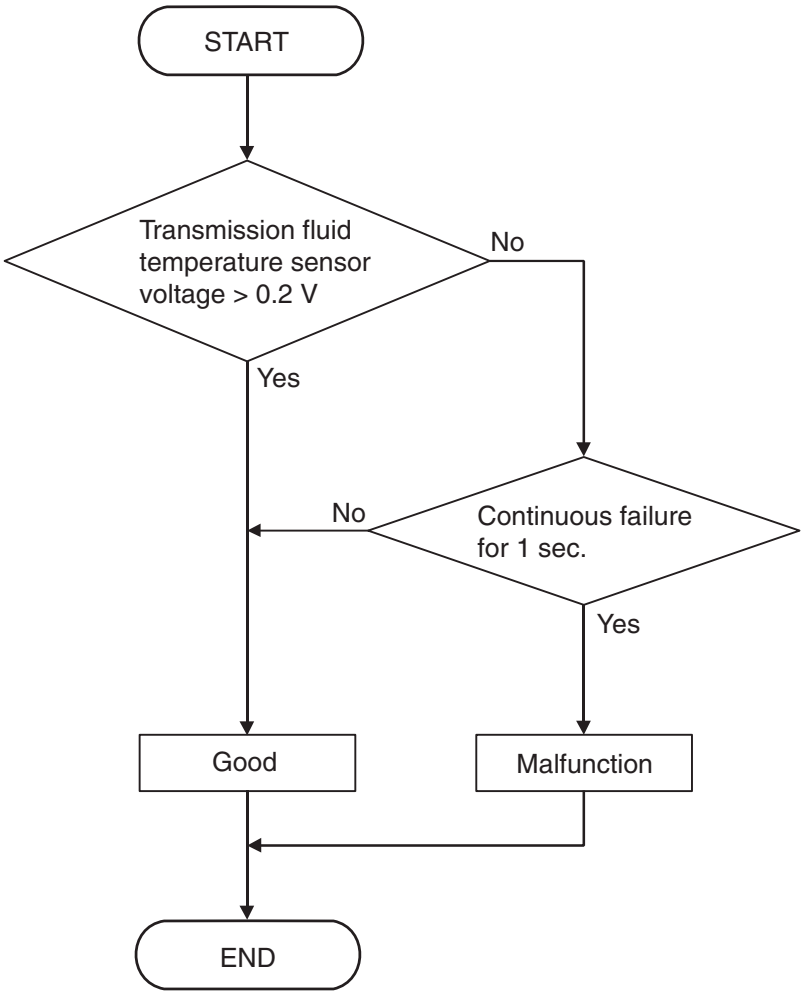
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

LOGIC FLOW CHARTS (Monitor Sequence)



DTC SET CONDITIONS

Check Conditions, Judgement Criteria

- Transmission fluid temperature sensor voltage: 0.2 volt or less. (1 second)

OBD-II DRIVE CYCLE PATTERN

Start the engine, keep the vehicle stopped in P range for 5 seconds.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the transmission fluid temperature sensor circuit
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

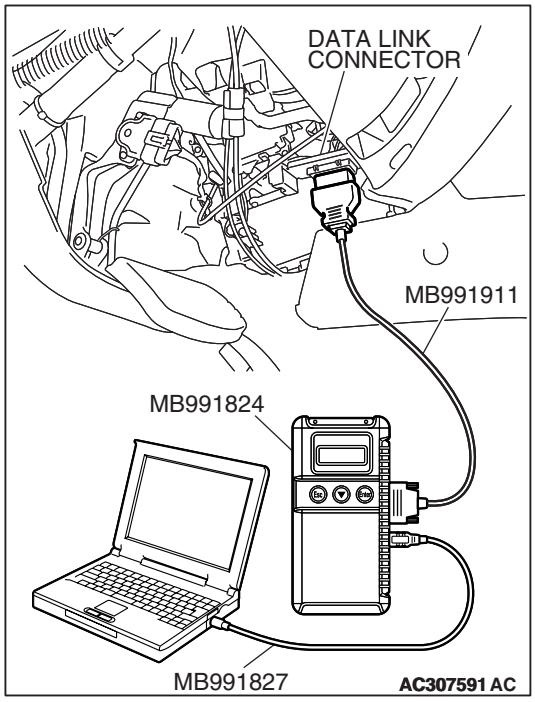
Required Special Tool:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

STEP 1. Using scan tool MB991958, check data list item 15: Transmission Fluid Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode.
- Item 15: Transmission Fluid Temperature Sensor.
  - When the engine is cool: Almost equal to the ambient temperature (atmospheric temperature)

    NOTE: Set scan tool MB991958 to the data reading mode for item number 13, Intake Air Temperature (IAT) Sensor and note the temperature measurement. When the engine is cool, the temperature should be almost equal to the ambient temperature (atmospheric temperature), and the IAT sensor measurement should be approximately the same as the Transmission Fluid Temperature Sensor.
  - When the engine is warm: 70 to 80°C (158 to 176°F)

(4) Turn the ignition switch to the "LOCK" (OFF) position.

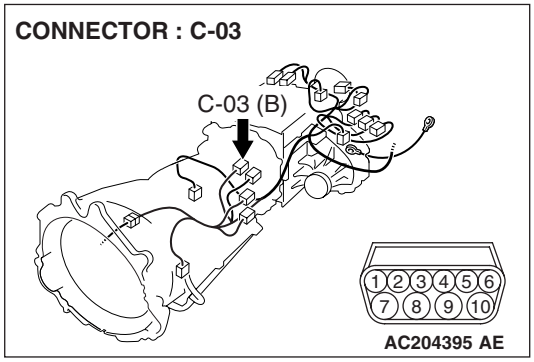
Q: Is the sensor operating properly?

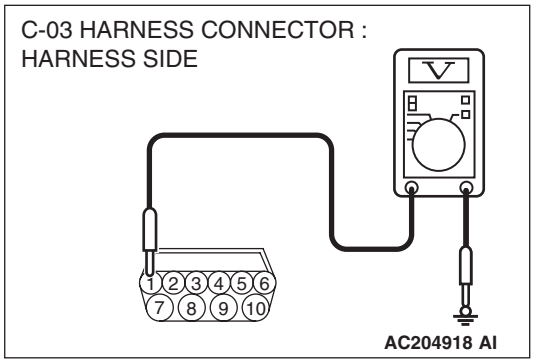
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at the A/T control solenoid valve assembly connector C-03 by backprobing.

(1) Do not disconnect connector C-03.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 1 and ground by backprobing.
- When transmission fluid temperature is 20°C (68°F), voltage should measure between 3.8 and 4.0 volts.
- When transmission fluid temperature is 40°C (104°F), voltage should measure between 3.2 and 3.4 volts.
- When transmission fluid temperature is 80°C (176°F), voltage should measure between 1.7 and 1.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

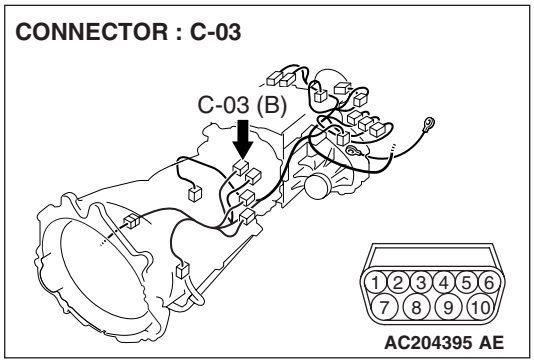
Q: Is the measured voltage within the specified range?

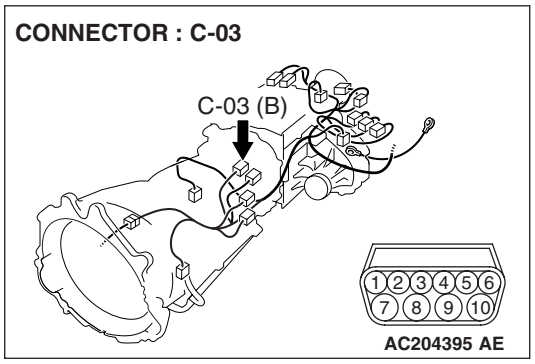
YES : Go to Step 6.
NO : Go to Step 3.

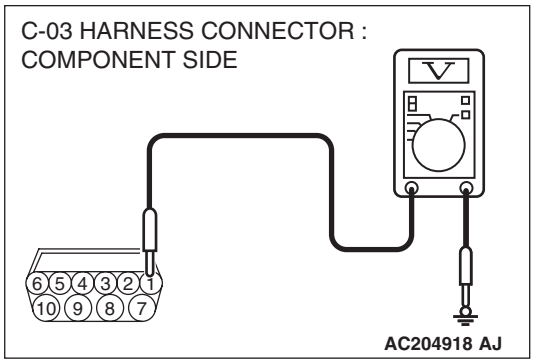
STEP 3. Check A/T control solenoid valve assembly connector C-03 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 4.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







STEP 4. Check the sensor output voltage at A/T control solenoid valve assembly connector C-03.

(1) Disconnect connector C-03 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground.
- The voltage should measure between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

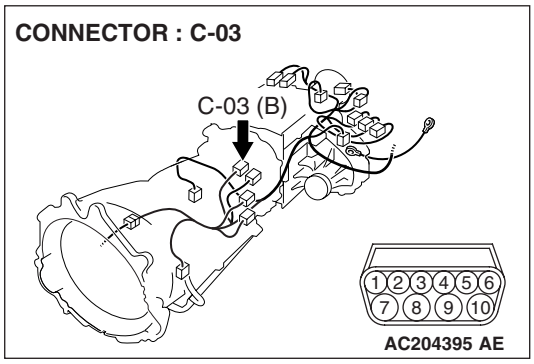
Q: Is the measured voltage between 4.5 and 4.9 volts?

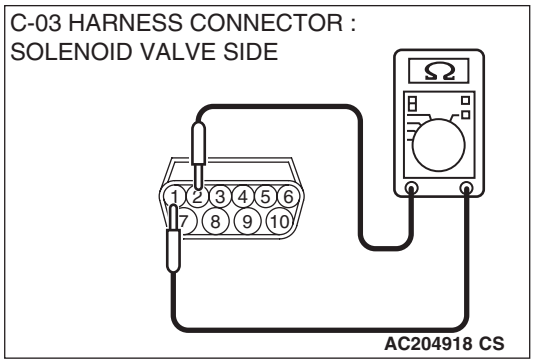
YES : Go to Step 5.

NO : Go to Step 7.

STEP 5. Check the transmission fluid temperature sensor at A/T control solenoid valve assembly connector C-03.

(1) Disconnect connector C-03 and measure at the sensor side.



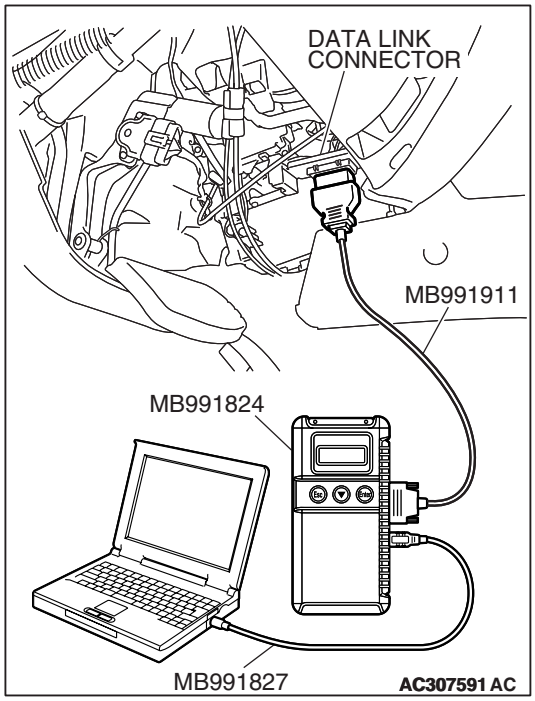


(2) Measure the resistance between terminal 1 and 2.
- When transmission fluid temperature is 0°C (32°F), resistance should be between 16.7 and 20.5 kΩ.
- When transmission fluid temperature is 20°C (68°F), resistance should be between 7.3 and 8.9 kΩ.
- When transmission fluid temperature is 40°C (104°F), resistance should be between 3.4 and 4.2 kΩ.
- When transmission fluid temperature is 60°C (140°F), resistance should be between 1.9 and 2.2 kΩ.
- When transmission fluid temperature is 80°C (176°F), resistance should be between 1.0 and 1.2 kΩ.
- When transmission fluid temperature is 100°C (212°F), resistance should be between 0.57 and 0.69 kΩ.

Q: Is the measured resistance within the specified range?

YES : Go to Step 6.

NO : Replace the transmission fluid temperature sensor. Refer to GROUP 23B, Transmission P.23B-14.



STEP 6. Using scan tool MB991958, check data list item 15: Transmission Fluid Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode.
- Item 15: Transmission Fluid Temperature Sensor.
  - When the engine is cool: Almost equal to the ambient temperature (atmospheric temperature)

    NOTE: Set scan tool MB991958 to the data reading mode for item number 13, Intake Air Temperature (IAT) Sensor and note the temperature measurement. When the engine is cool, the temperature should be almost equal to the ambient temperature (atmospheric temperature), and the IAT sensor measurement should be approximately the same as the Transmission Fluid Temperature Sensor.
  - When the engine is warm: 70 to 80°C (158 to 176°F)

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

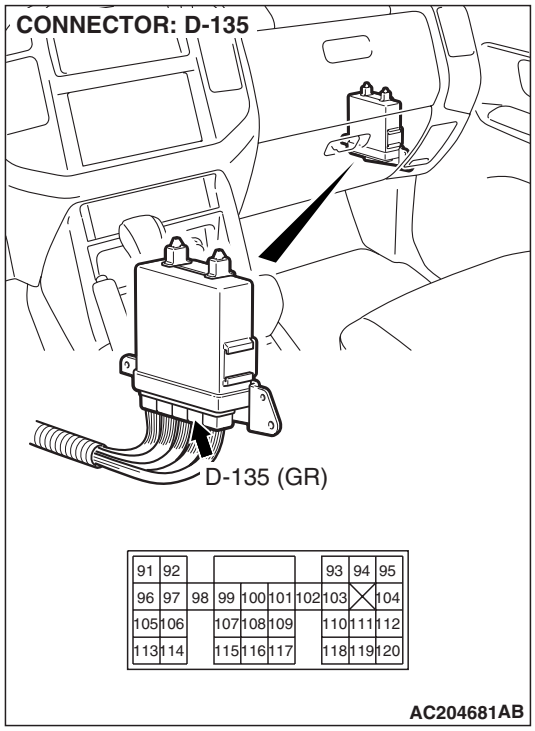
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

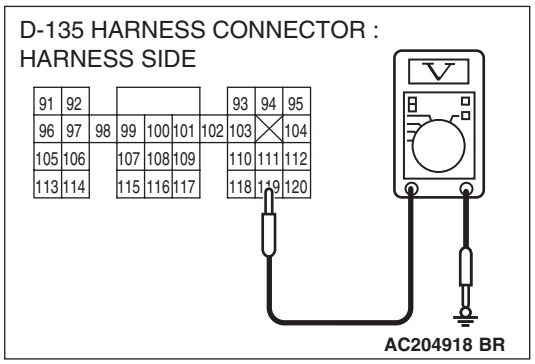
NO : Replace the PCM.

STEP 7. Measure the sensor output voltage at PCM connector D-135 by backprobing.

(1) Do not disconnect connector D-135.

(2) Turn the ignition switch to the "ON" position.





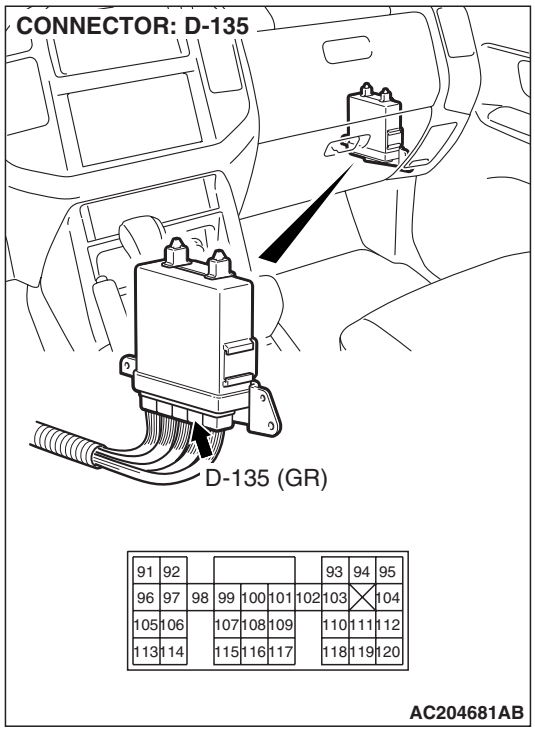
(3) Measure the voltage between terminal 119 and ground by backprobing.
- When transmission fluid temperature is 20°C (68°F), voltage should measure between 3.8 and 4.0 volts.
- When transmission fluid temperature is 40°C (104°F), voltage should measure between 3.2 and 3.4 volts.
- When transmission fluid temperature is 80°C (176°F), voltage should measure between 1.7 and 1.9 volts.

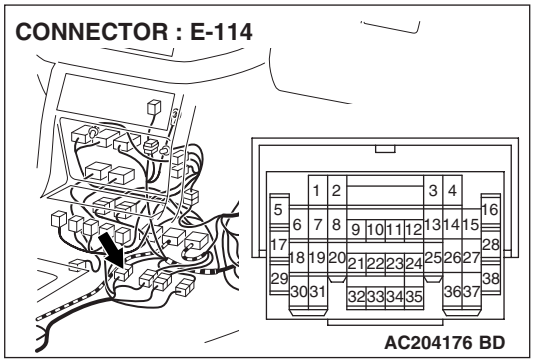
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 6.

NO : Go to Step 8.





STEP 8. Check PCM connector D-135 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Are the connectors and terminals in good condition?

YES : Go to Step 9.

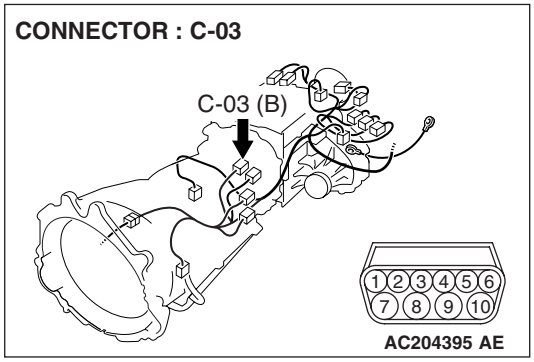
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

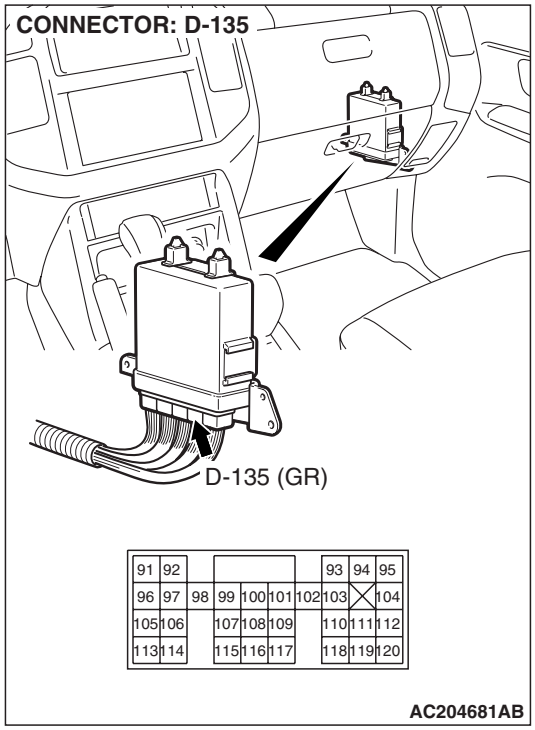
STEP 9. Check the harness for a short circuit to ground between A/T control solenoid valve connector C-03 terminal 1 and PCM connector D-135 terminal 119.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

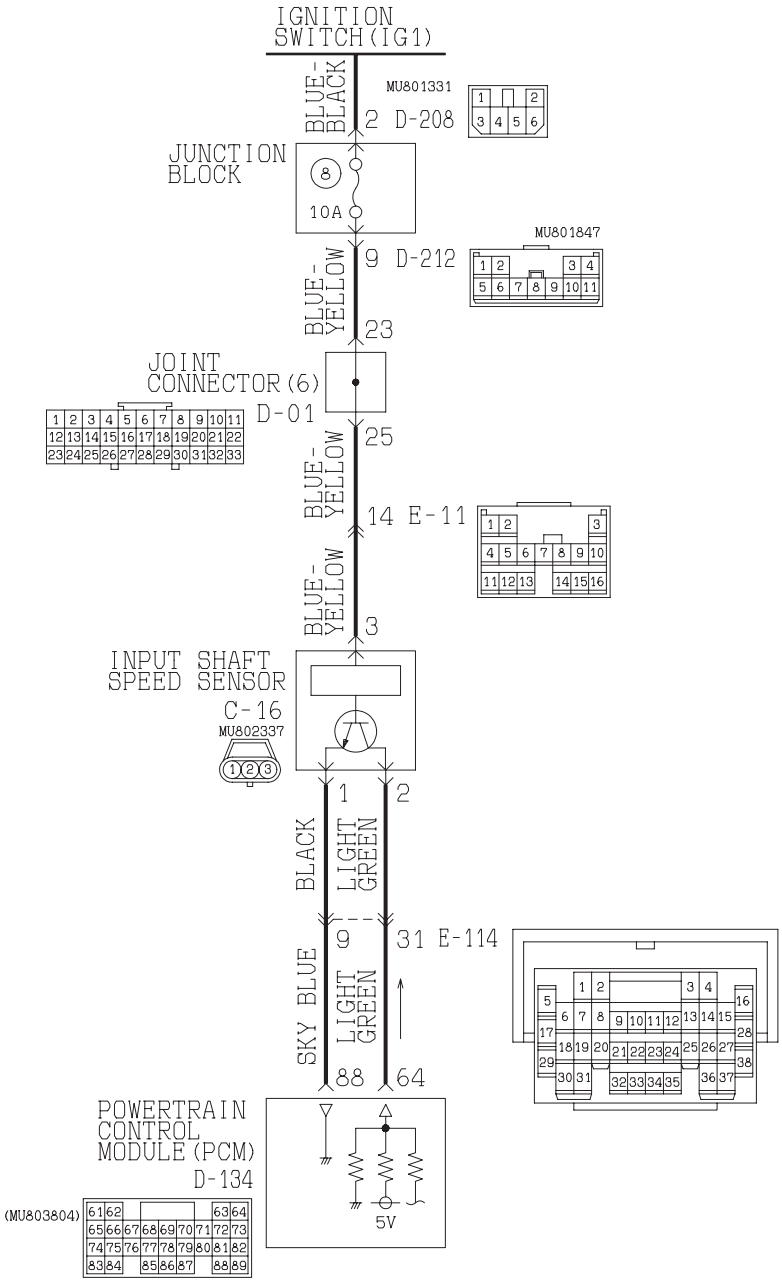
NO : Repair or replace the harness wire.





DTC 22 (P0715): Input Shaft Speed Sensor System

Input Shaft Speed Sensor System Circuit



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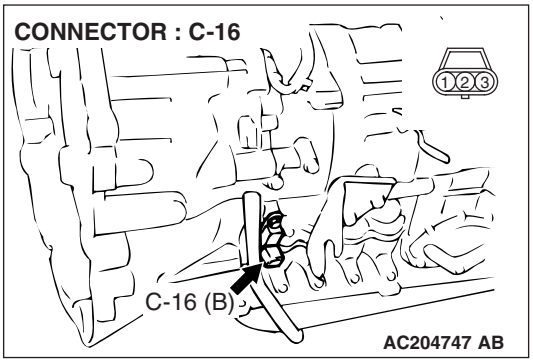
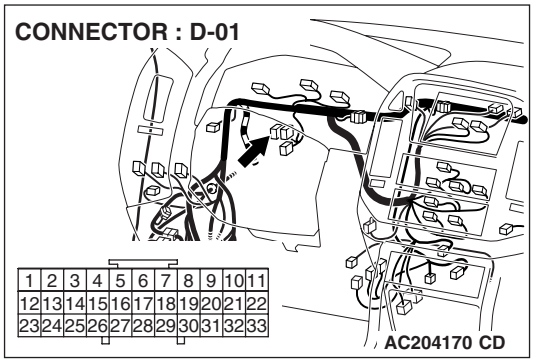
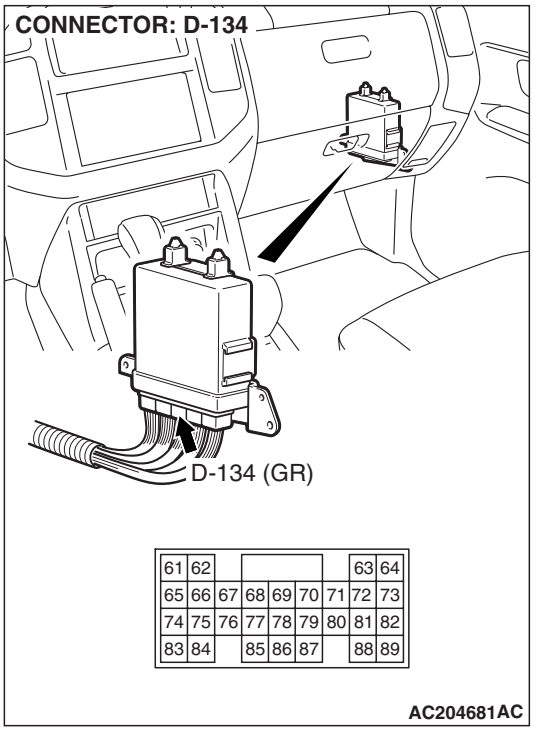
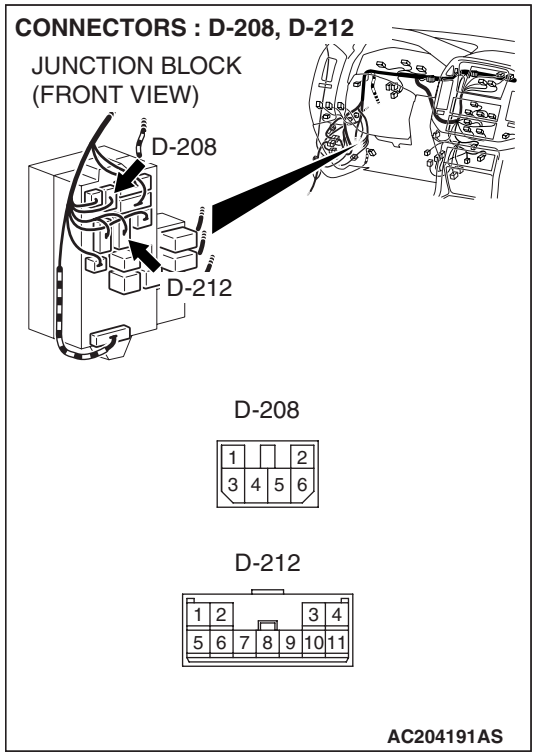
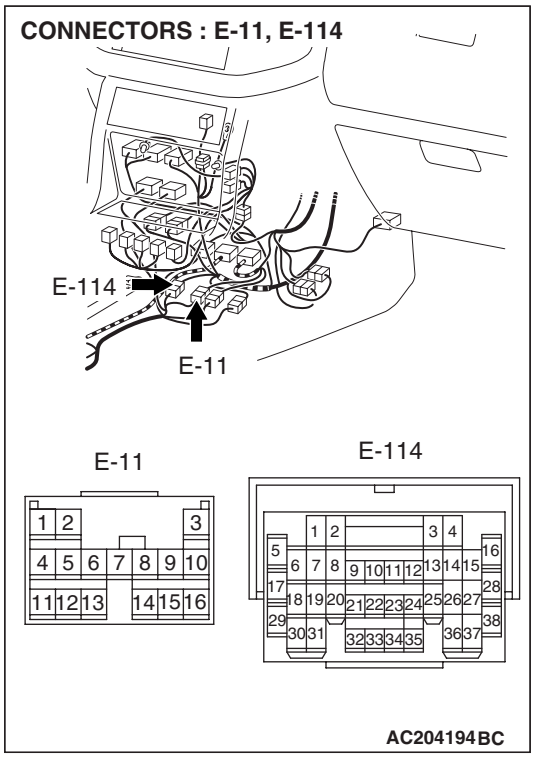








TSB Revision



CIRCUIT OPERATION

- The input shaft speed sensor generates 0 ⇔ 5 volts pulse signal when the input shaft rotates. The pulse signal frequency increases with a rise in input shaft speed.
- The input shaft speed sensor is connected to the PCM (terminals 64 and 88) via the input shaft speed sensor connector (terminals 1 and 2).
- The PCM detects the input shaft speed by the signal input to terminal 64.
- The input shaft speed sensor generates the pulse signal as the teeth of the reverse clutch retainer pass the magnetic tip of the sensor.

DESCRIPTIONS OF MONITOR METHODS

If there is no detection pulse from input shaft speed sensor (turbine rotation) even during driving test at more than specified speed, PCM judges that input shaft speed sensor has a failure.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

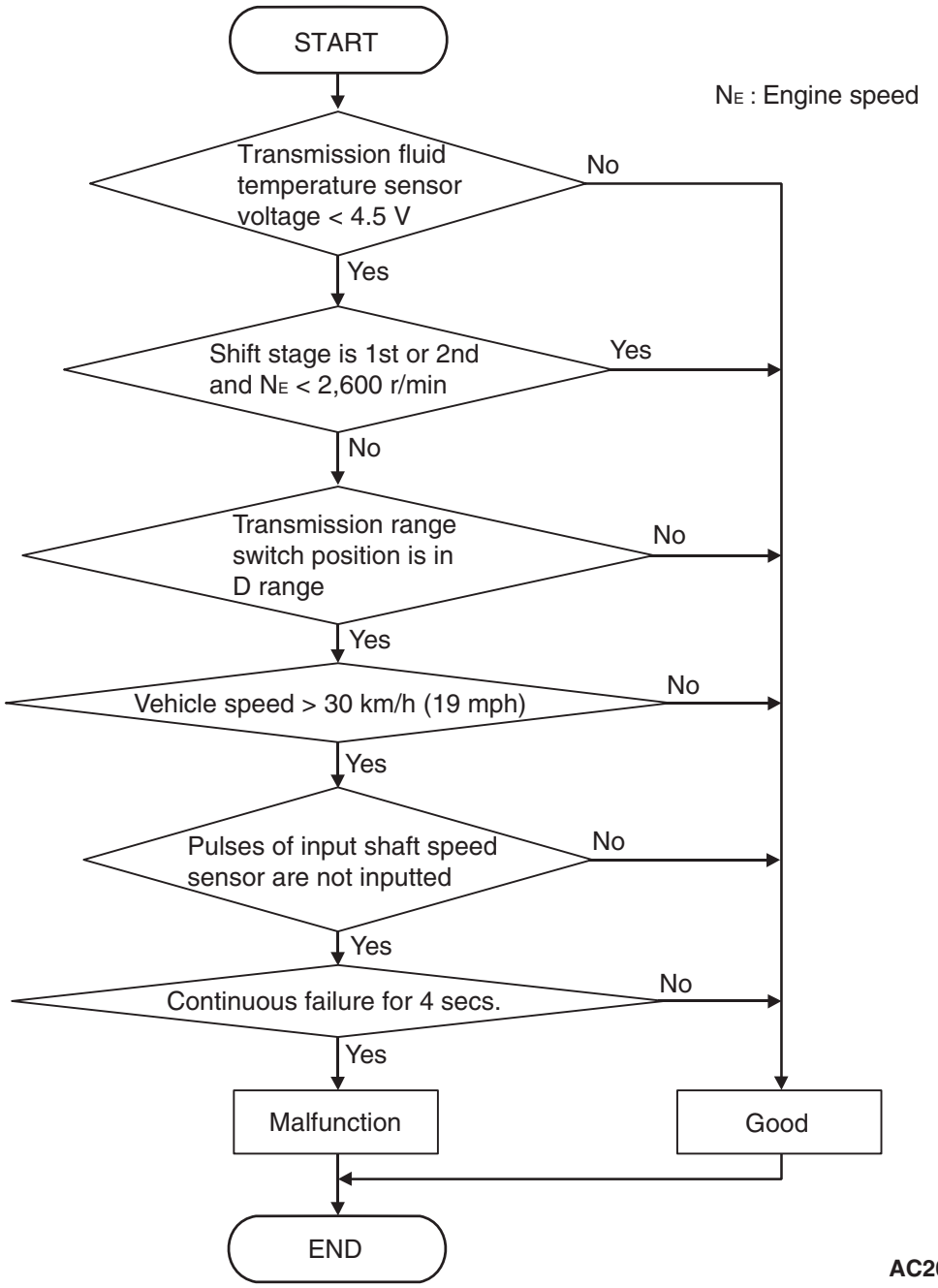
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- DTC 29 (P0500): Vehicle speed sensor malfunction

Sensor (The sensor below is determined to be normal)

- Vehicle speed sensor

LOGIC FLOW CHARTS (Monitor Sequence)



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DTC SET CONDITIONS

Check Conditions

- Transmission range switch position: D.
- Vehicle speed: 30 km/h (19 mph) or more.
- Transmission fluid temperature sensor voltage: 4.5 volts or less.

Judgement Criteria

- Input shaft speed sensor signal: no signal change. (4 seconds)
- If DTC 22 (P0715) is set consecutively four times, the transmission is locked into 3rd gear or 2nd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN

Start the engine, shift to 3rd gear or higher, and drive at 40 km/h (25 mph) or more for 10 seconds.

TSB Revision

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the input shaft speed sensor circuit
- Malfunction of the reverse clutch retainer
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

STEP 1. Using scan tool MB991958, check data list item 22: Input Shaft Speed Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

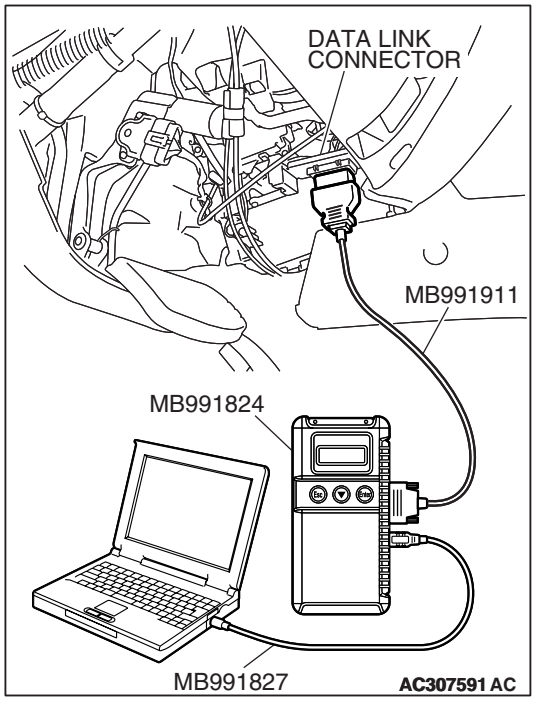
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to data reading mode.
  - Item 22: Input Shaft Speed Sensor.
    - When driving at constant speed of 50 km/h (31 mph), the display should be "1,400 – 1,700 r/min" (Gear range: 4th gear).

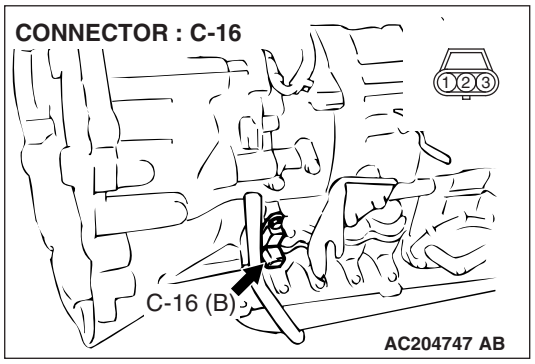
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Go to Step 2.

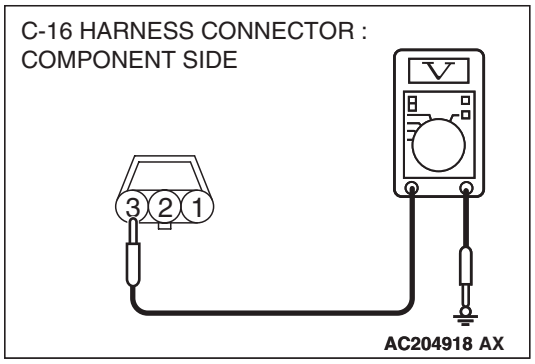




STEP 2. Measure the power supply voltage at the input shaft speed sensor connector C-16.

(1) Disconnect connector C-16 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 3 and ground.
- The voltage should measure battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage battery positive voltage?

YES : Go to Step 5.

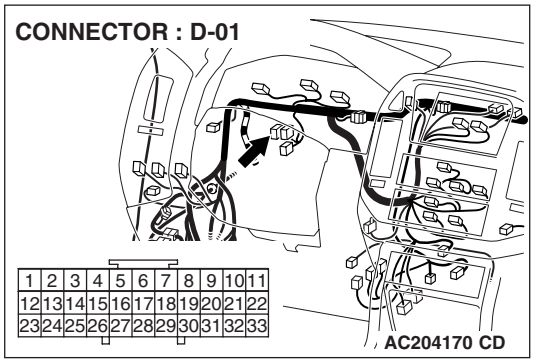
NO : Go to Step 3.

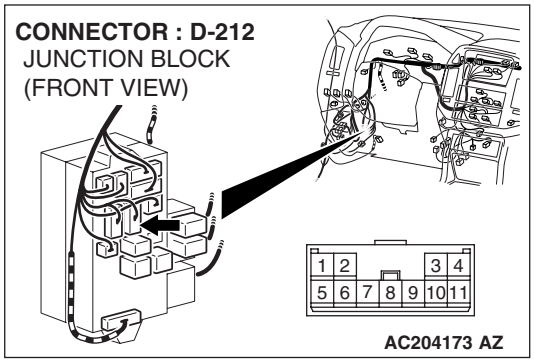
STEP 3. Check joint connector D-01, junction block connector D-212 and intermediate connector E-11 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

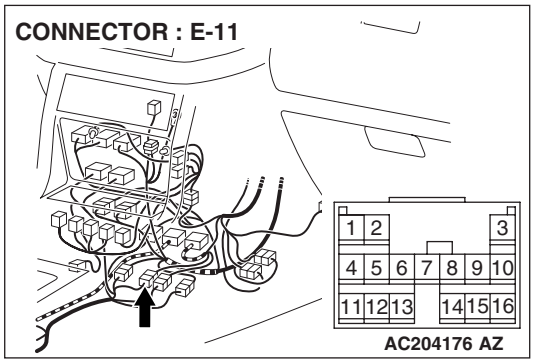
Q: Are the connectors and terminals in good condition?

YES : Go to Step 4.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





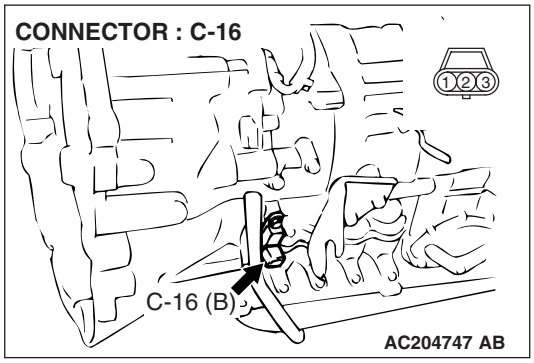


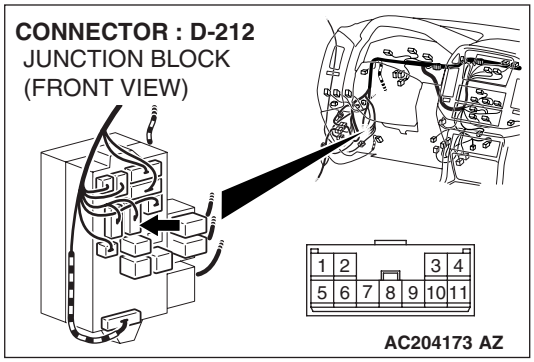
STEP 4. Check the harness for open circuit or short circuit to ground between the input shaft speed sensor connector C-16 terminal 3 and the junction block connector D-212 terminal 9.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.

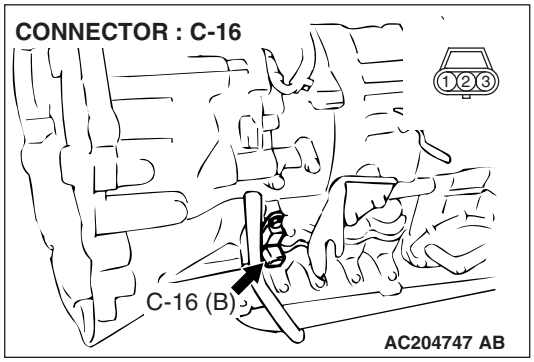


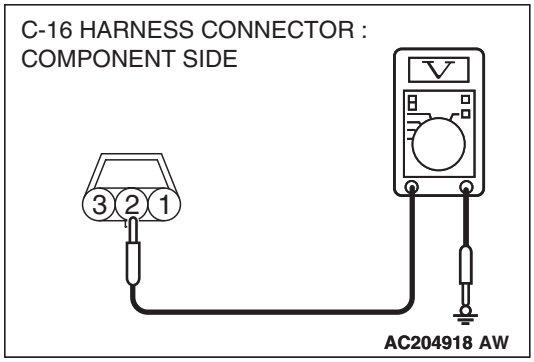


STEP 5. Measure the PCM to speed sensor output voltage at the input shaft speed sensor connector C-16.

(1) Disconnect connector C-16 from the speed sensor and measure voltage at the harness side.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 2 and ground.
- The voltage should measure between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

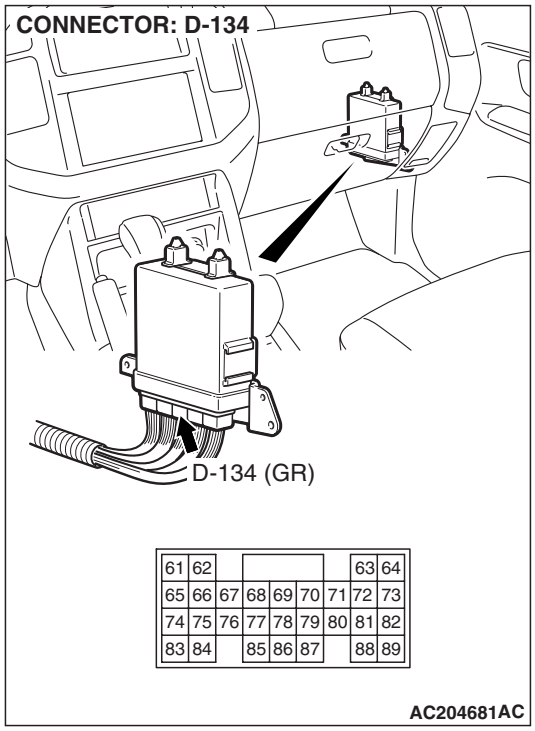
Q: Is the measured voltage between 4.5 and 4.9 volts?

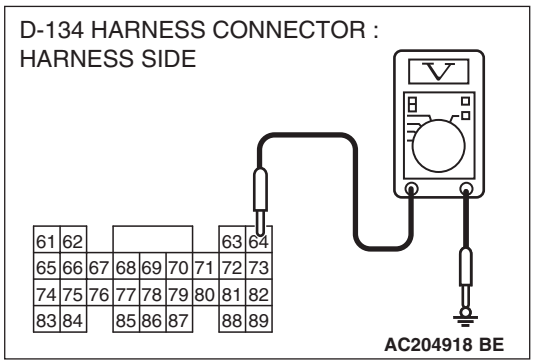
YES : Go to Step 11.

NO : Go to Step 6.

STEP 6. Measure the PCM output voltage to the speed sensor at the PCM connector D-134 by backprobing.

(1) Do not disconnect connector D-134.
(2) Disconnect connector C-16 at the input shaft speed sensor.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between PCM terminal 64 and ground by backprobing.
  - The voltage should measure between 4.5 and 4.9 volts.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

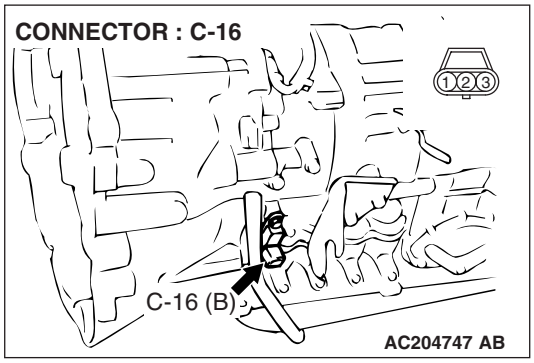
YES : Go to Step 7.
NO : Go to Step 9.

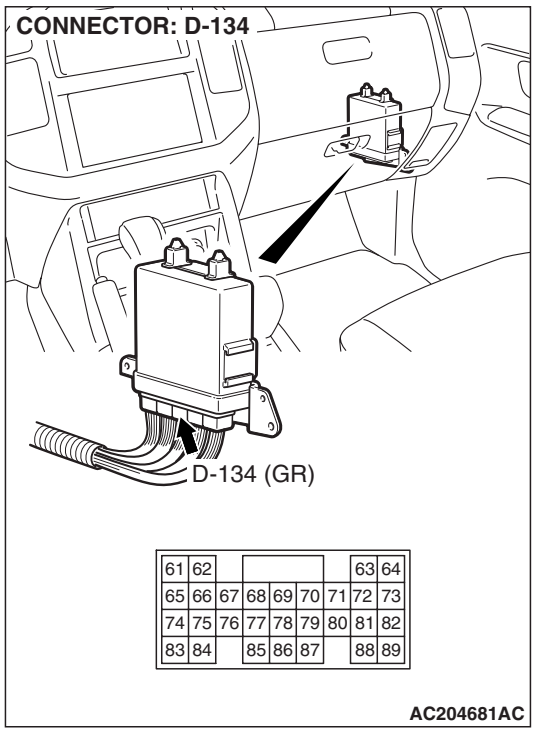
STEP 7. Check input shaft speed sensor connector C-16, PCM connector D-134 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

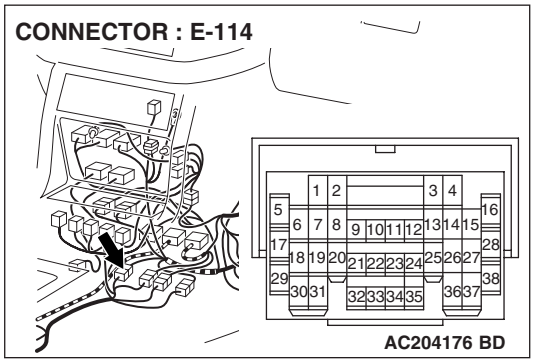
Q: Are the connectors in good condition?

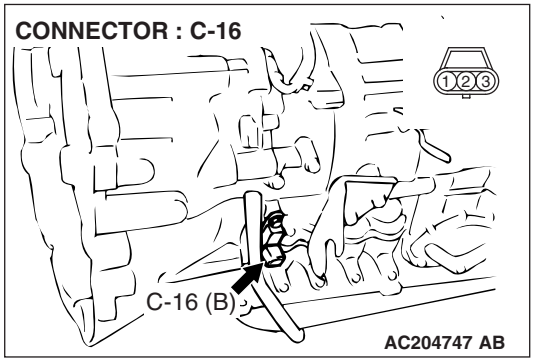
YES : Go to Step 8.

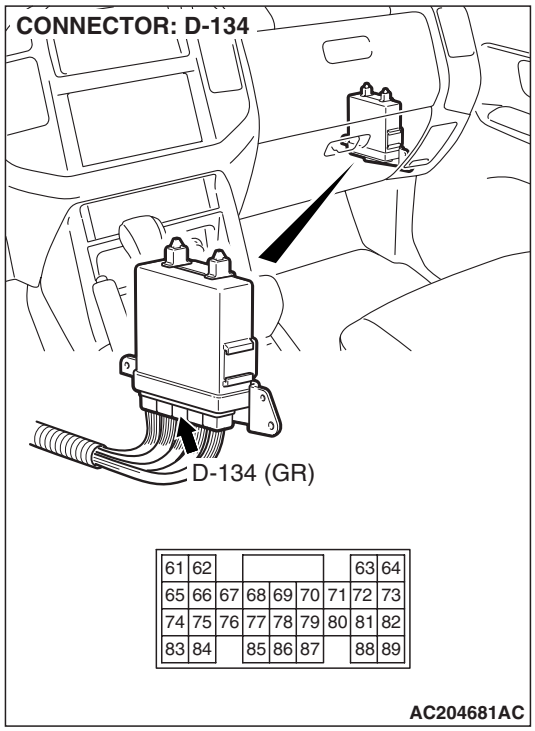
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.











STEP 8. Check the harness for open circuit or damage between input shaft speed sensor connector C-16 terminal 2 and PCM connector D-134 terminal 64.

Q: Is the harness wire in good condition?

YES : Go to Step 19.

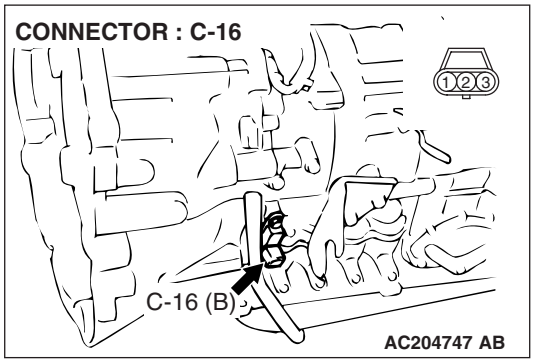
NO : Repair or replace the harness wire.

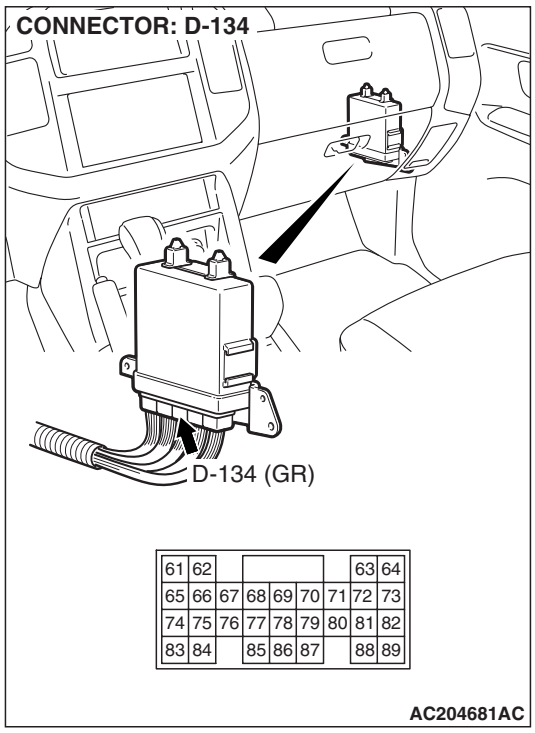
STEP 9. Check input shaft speed sensor connector C-16, PCM connector D-134 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

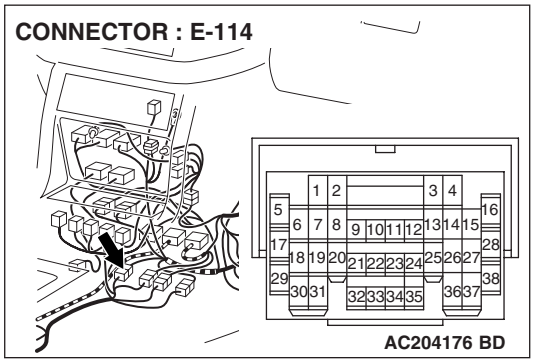
Q: Are the connectors and terminals in good condition?

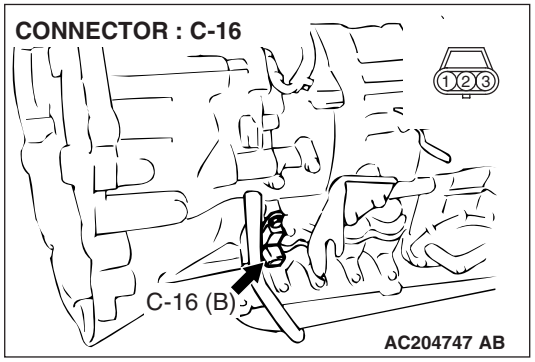
YES : Go to Step 10.

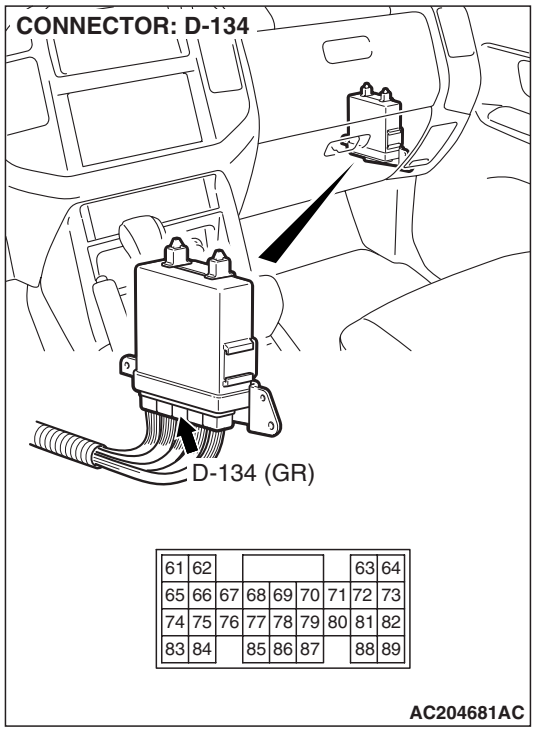
NO : Repair or replace the damages components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.











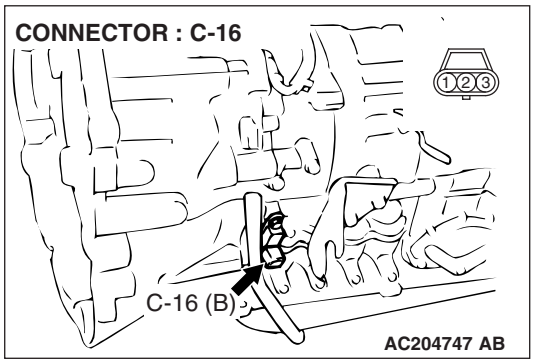
STEP 10. Check the harness for short circuit to ground between input shaft speed sensor connector C-16 terminal 2 and PCM connector D-134 terminal 64.

Q: Is the harness wire in good condition?

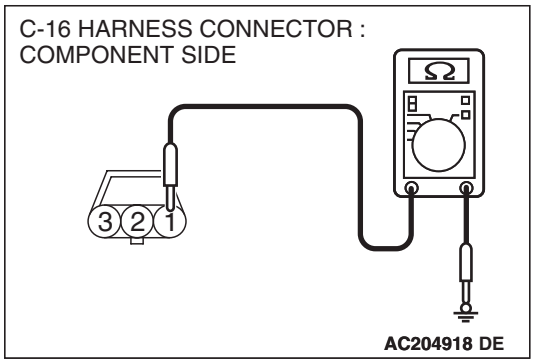
YES : Go to Step 11.

NO : Repair or replace the harness wire.

STEP 11. Measure the ground circuit for resistance at the input shaft speed sensor connector C-16.



(1) Disconnect connector C-16 from the speed sensor and measure at the harness side.



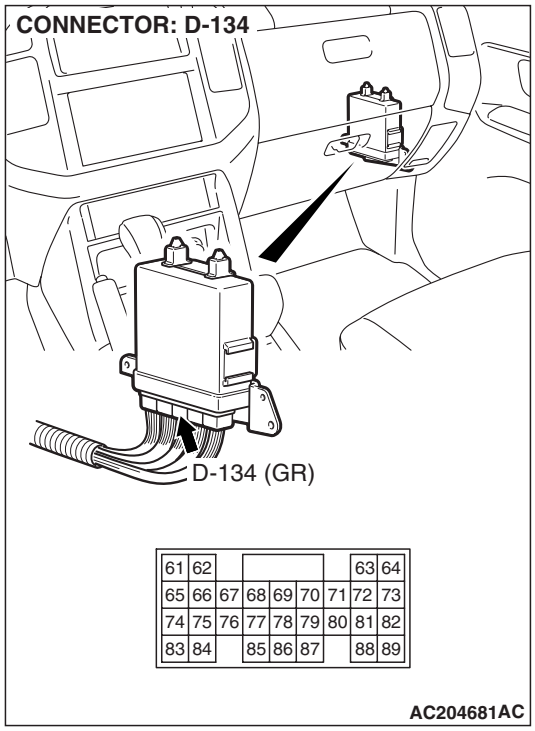
(2) Measure the resistance between terminal 1 and ground.
- The resistance should measure less than 2 ohms.

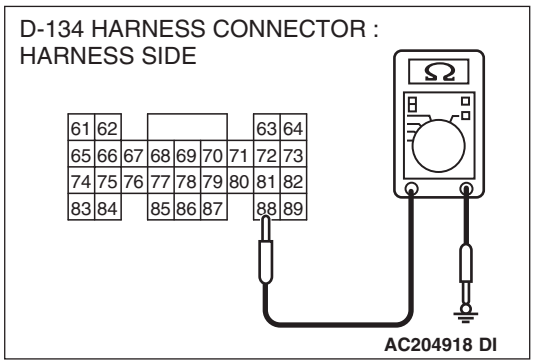
Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 16.
NO : Go to Step 12.

STEP 12. Measure the resistance at PCM connector D-134 by backprobing.

(1) Do not disconnect connector D-134.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the resistance between terminal 88 and ground by backprobing.
- The resistance should measure less than 2 ohms.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured resistance less than 2 ohms?

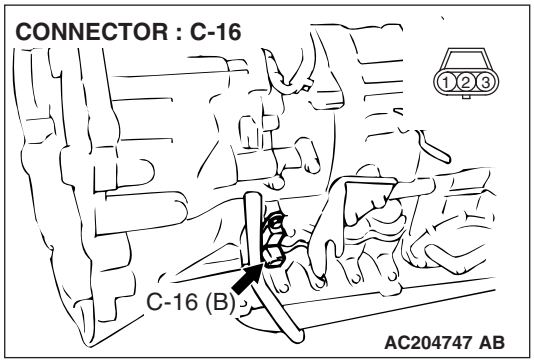
YES : Go to Step 13.
NO : Go to Step 15.

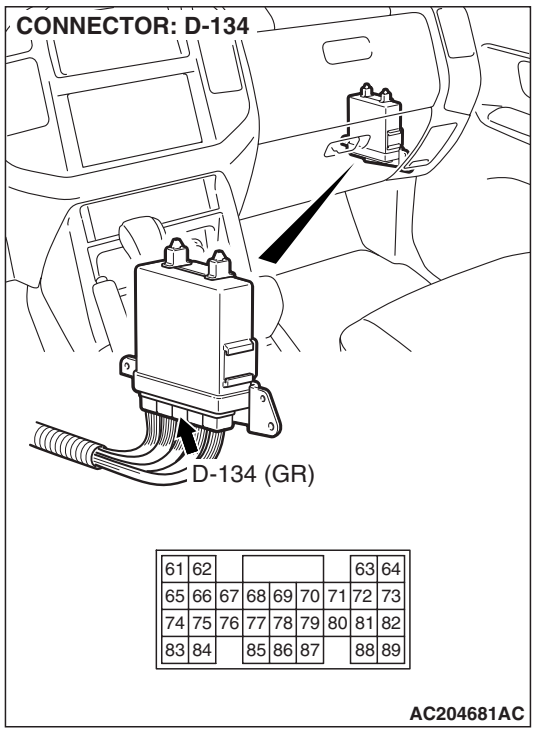
STEP 13. Check input shaft speed sensor connector C-16, PCM connector D-134 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

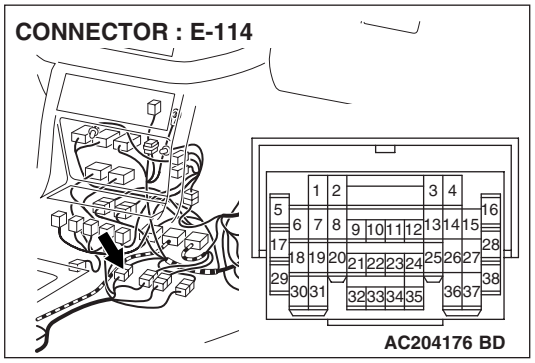
Q: Are the connectors and terminals in good condition?

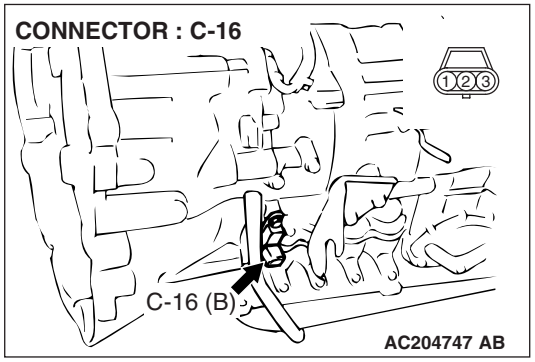
YES : Go to Step 14.

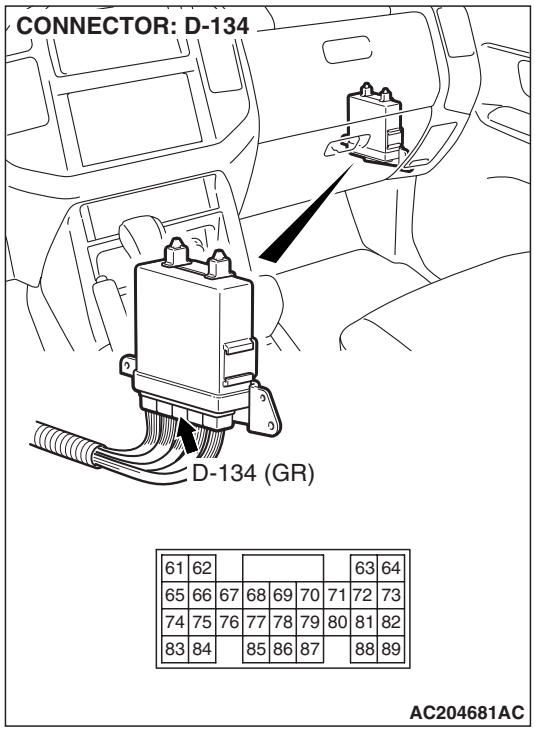
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.









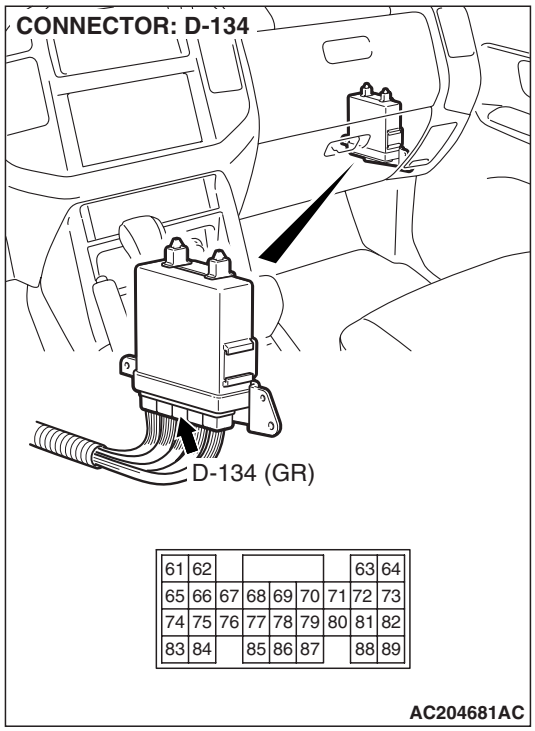


STEP 14. Check the harness for open circuit or damage between input shaft speed sensor connector C-16 terminal 1 and PCM connector D-134 terminal 88.

Q: Is the harness wire in good condition?

YES : Go to Step 16.

NO : Repair or replace the harness wire.



STEP 15. Check PCM connector D-134 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

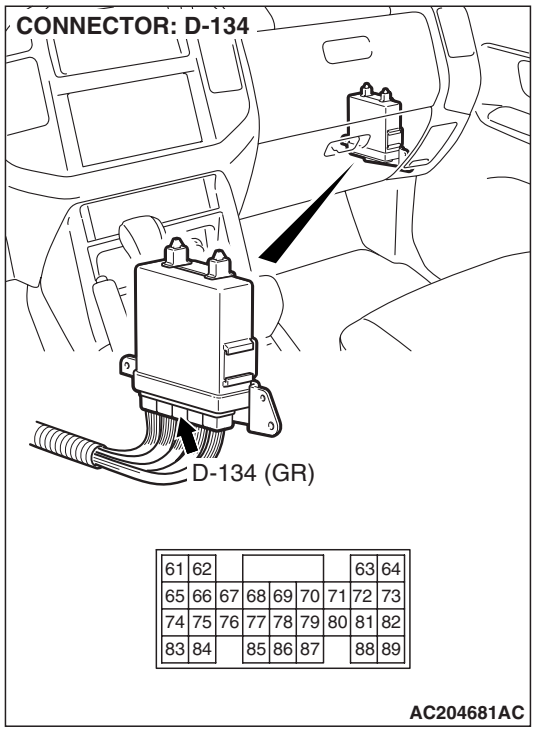
Q: Are the connector and terminals in good condition?

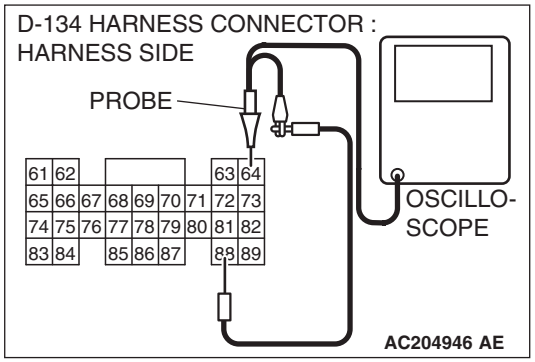
YES : Replace the PCM.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

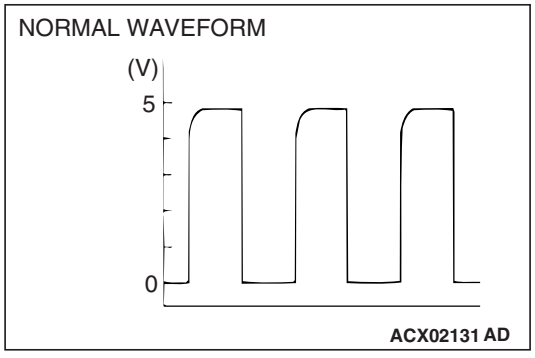
STEP 16. Using an oscilloscope, check the input shaft speed sensor waveform at PCM connector D-134 by backprobing.

(1) Do not disconnect connector D-134.





(2) Connect an oscilloscope probe to PCM connector D-134 terminal 64 and terminal 88 by backprobing.
(3) Start the engine and drive the vehicle at constant speed of 50 km/h (31 mph). (Gear range: 4th gear)

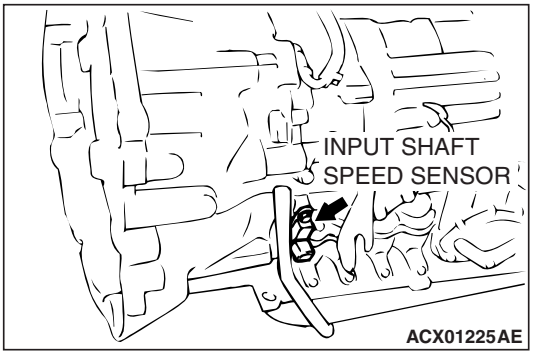


(4) Check the input shaft speed sensor waveform.
- The input shaft speed sensor waveform should show a pattern similar to the illustration. The maximum value should be 4.8 volts and more and the minimum value 0.8 volt and less. The output waveform should not contain electrical noise.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : Go to Step 19.
NO : Go to Step 17.

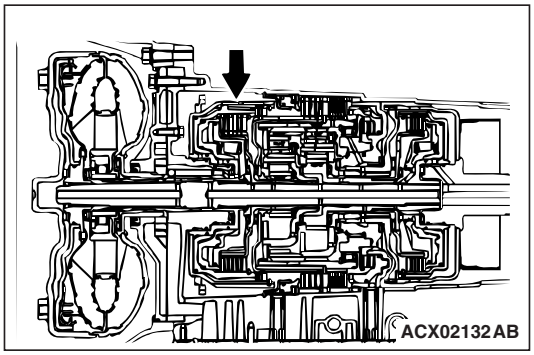


STEP 17. Replace the input shaft speed sensor.

(1) Replace the input shaft speed sensor. Refer to GROUP 23B, Transmission P.23B-14.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is A/T DTC 22 set?

YES : Go to Step 18.
NO : The procedure is complete.



STEP 18. Replace the reverse clutch retainer.

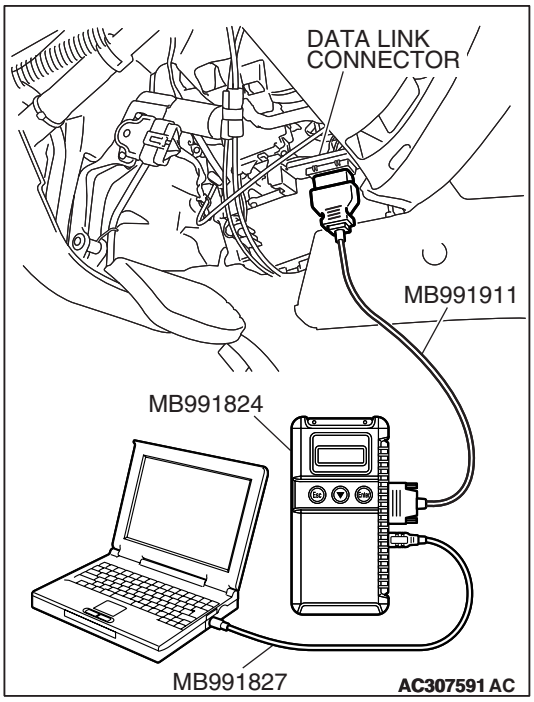
(1) Replace the reverse clutch retainer. Refer to GROUP 23B, Reverse and Overdrive Clutches P.23B-50.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is A/T DTC 22 set?

YES : An A/T DTC may have set due to external radio frequency interference (RFI) possibility caused by cellular phone activity, or aftermarket components installed on the vehicle.
NO : The procedure is complete.

STEP 19. Using scan tool MB991958, check data list item 22: Input Shaft Speed Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to data reading mode.
- Item 22: Input Shaft Speed Sensor.
  - When driving at constant speed of 50 km/h (31 mph), the display should be "1,400 – 1,700 r/min" (Gear range: 4th gear).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

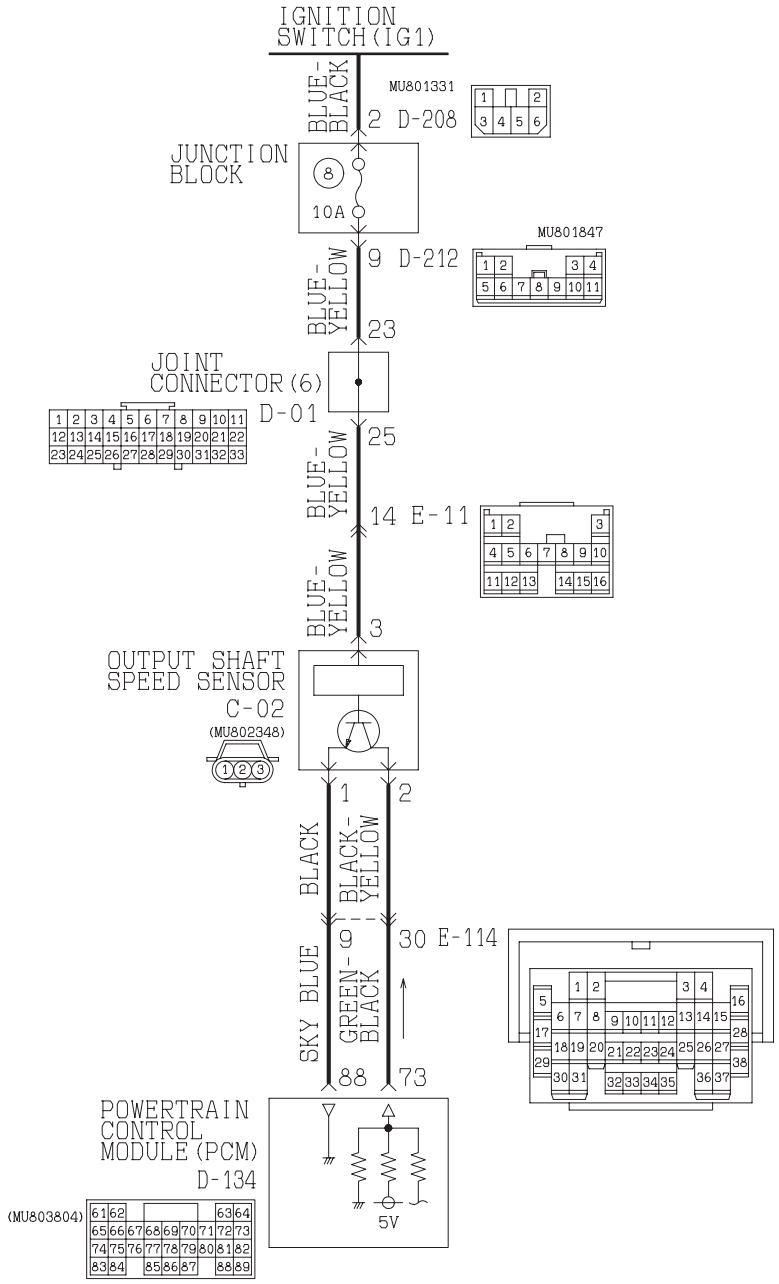
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.
NO : Replace the PCM.

TSB Revision

DTC 23 (P0720): Output Shaft Speed Sensor System

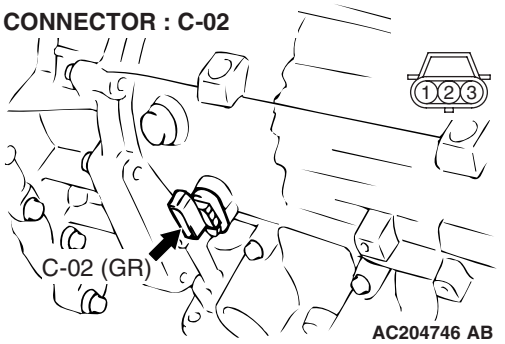
Output Shaft Speed Sensor System Circuit



W3Q20M09AA
AC205190 AC

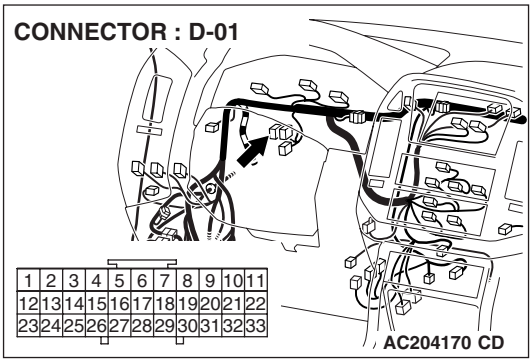
TSB Revision

CONNECTOR : C-02



AC204746 AB

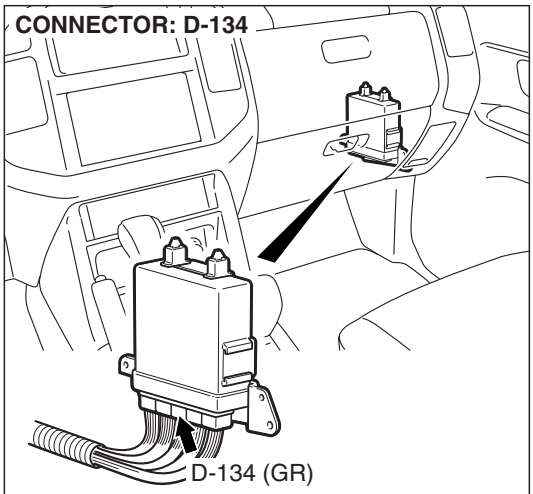
CONNECTOR : D-01



1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33

AC204170 CD

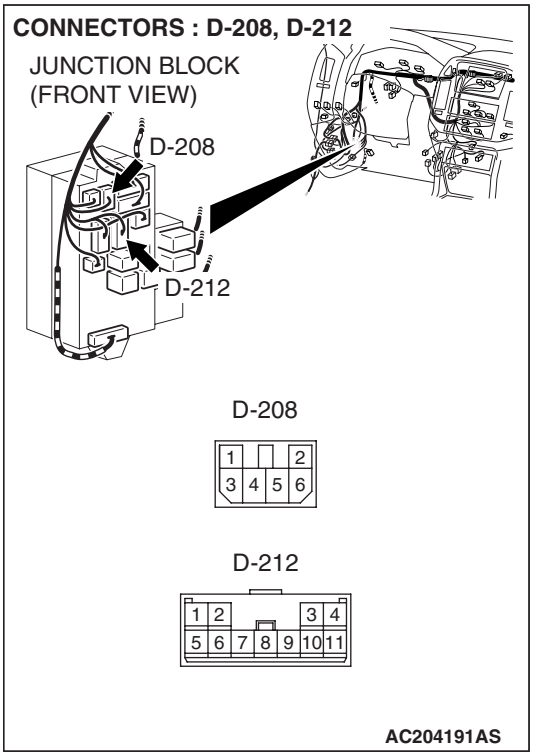
CONNECTOR: D-134



61	62						63	64
65	66	67	68	69	70	71	72	73
74	75	76	77	78	79	80	81	82
83	84		85	86	87		88	89

AC204681AC

CONNECTORS : D-208, D-212



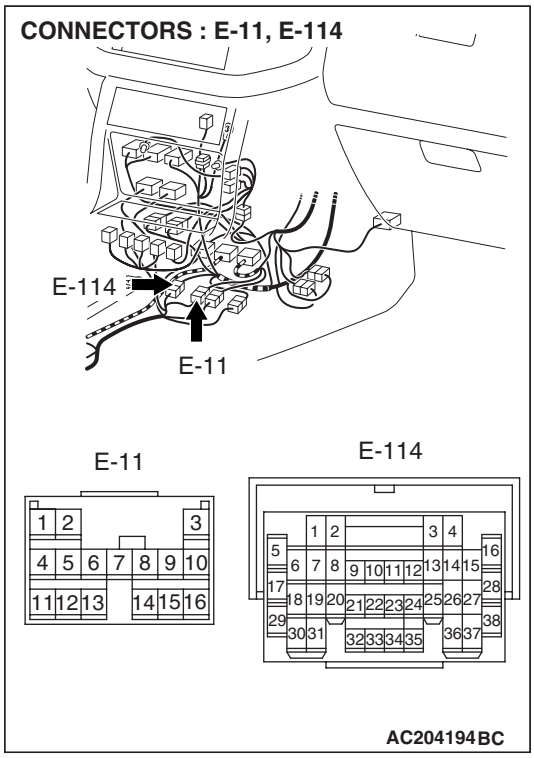
D-208

1			2
3	4	5	6

D-212

1	2						3	4
5	6	7	8	9	10	11		

AC204191AS



CIRCUIT OPERATION

- The output shaft speed sensor generates a 0 ⇔ 5 volt pulse signal when the output shaft rotates. The pulse signal frequency increases with a rise in output shaft speed.
- The output shaft speed sensor is connected to the PCM (terminals 73 and 88) via the output shaft speed sensor connector (terminals 1 and 2).
- The PCM detects the output shaft speed by the signal input to terminal 73.
- The output shaft speed sensor generates the pulse signal as the teeth of the output shaft pass the magnetic tip of the sensor.

DESCRIPTIONS OF MONITOR METHODS

During driving test at more than specified speed, if vehicle speed calculated from output revolution is below half of vehicle speed from vehicle speed sensor, PCM judges that output shaft speed sensor circuit is open.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

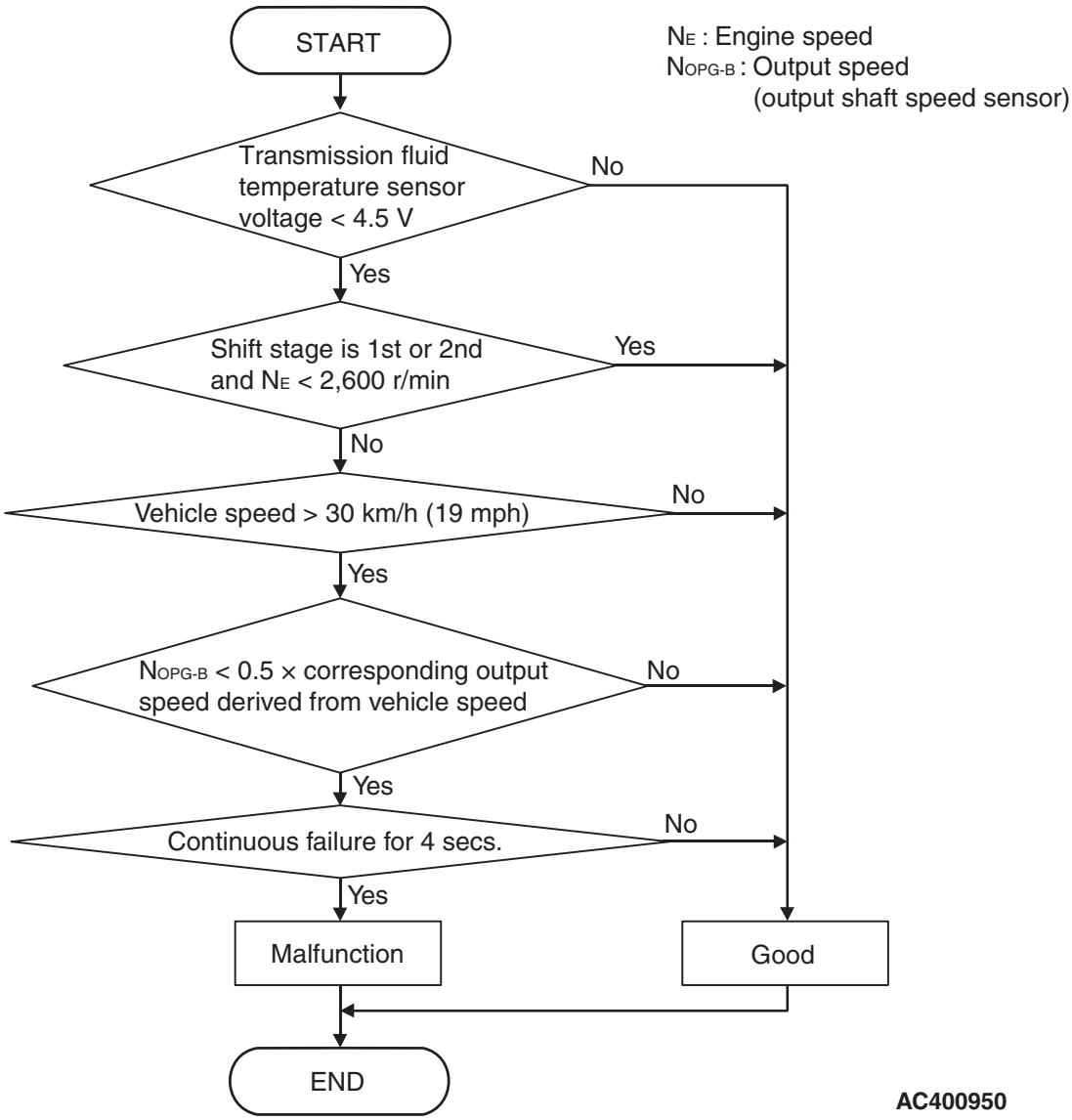
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- DTC 29 (P0500): Vehicle speed sensor malfunction

Sensor (The sensor below is determined to be normal)

- Vehicle speed sensor

LOGIC FLOW CHARTS (Monitor Sequence)



DTC SET CONDITIONS

Check Conditions

- Vehicle speed: 30 km/h (19 mph) or more.
- Transmission fluid temperature sensor voltage: 4.5 volts or less.

Judgement Criteria

- Output shaft speed sensor signal: [0.5 × calculated output speed derived from vehicle speed] or less. (4 seconds)
- If DTC 23 (P0720) is set consecutively four times, the transmission is locked into 3rd gear or 2nd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN

Start the engine, shift to 3rd gear or higher, and drive at 40 km/h (25 mph) or more for 4 seconds.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET:)

- Malfunction of the output shaft speed sensor
- Malfunction of the output shaft
- Damaged harness, connector
- Malfunction of the PCM

TSB Revision

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

STEP 1. Using scan tool MB991958, check data list item 23: Output Shaft Speed Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

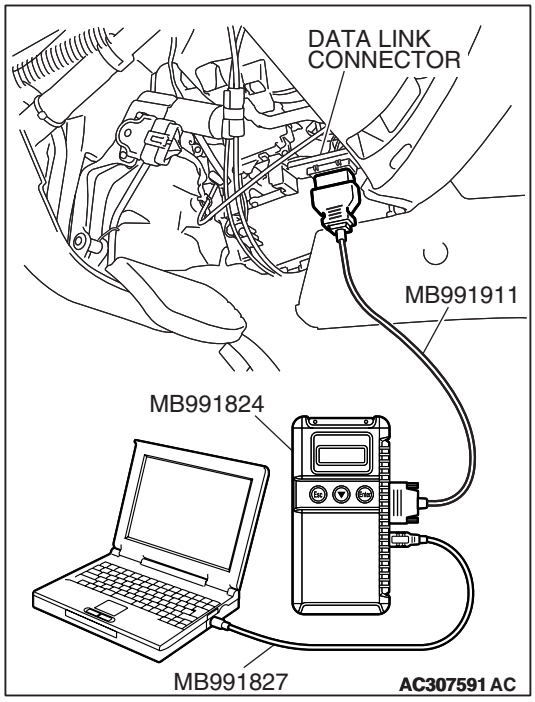
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode.
  - Item 23: Output Shaft Speed Sensor.
    - When driving at constant speed of 50 km/h (31 mph), the display should be "1,400 – 1,700 r/min" (Gear range: 4th gear).

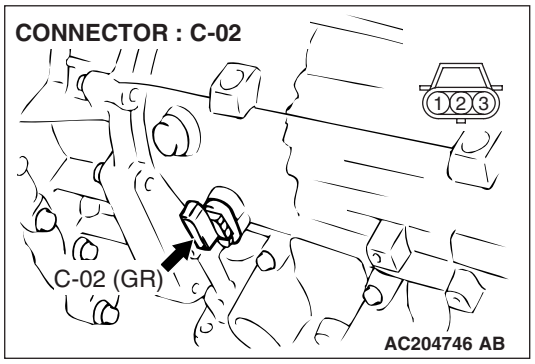
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Go to Step 2.

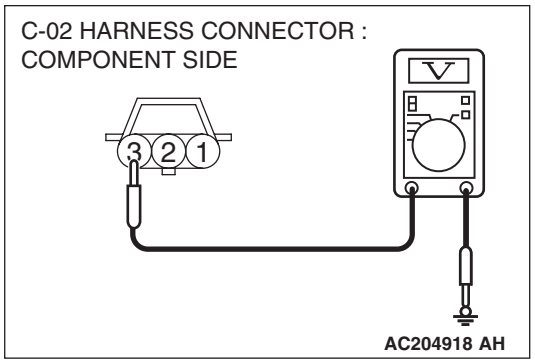




STEP 2. Measure the power supply voltage at output shaft speed sensor connector C-02.

(1) Disconnect connector C-02 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 3 and ground.
- The voltage should measure battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage battery positive voltage?

YES : Go to Step 5.

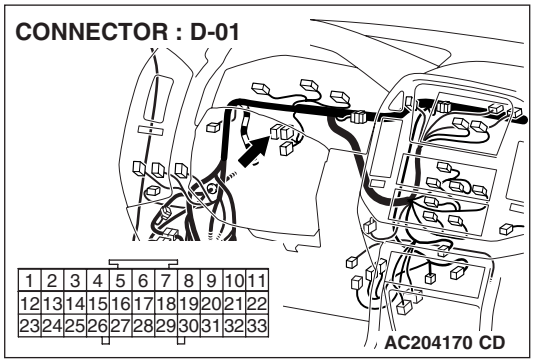
NO : Go to Step 3.

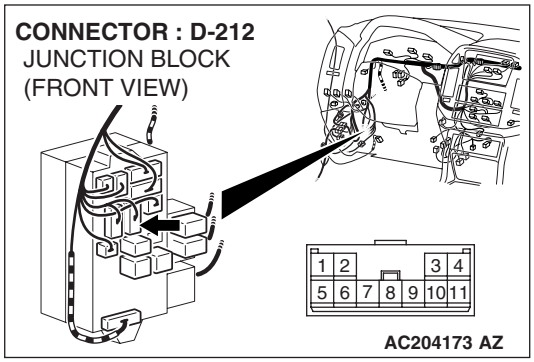
STEP 3. Check joint connector D-01, junction block connector D-212 and intermediate connector E-11 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

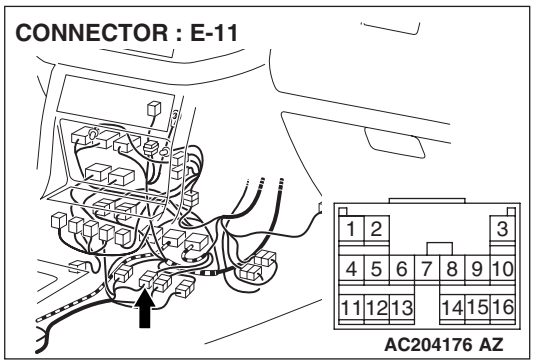
Q: Are the connectors and terminals in good condition?

YES : Go to Step 4.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





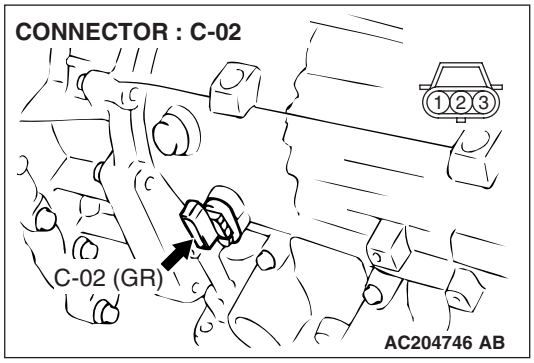


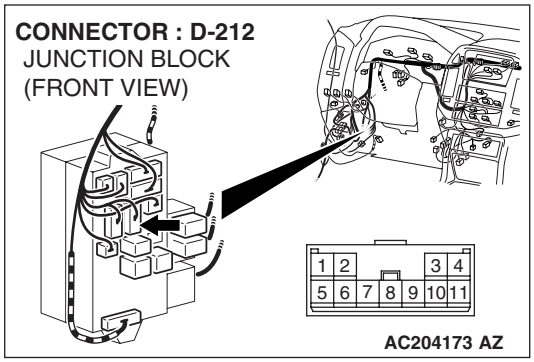
STEP 4. Check the harness for open circuit or short circuit to ground between output shaft speed sensor connector C-02 terminal 3 and the junction block connector D-212 terminal 9.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.

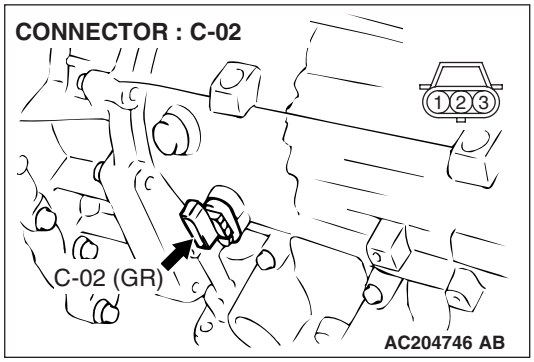


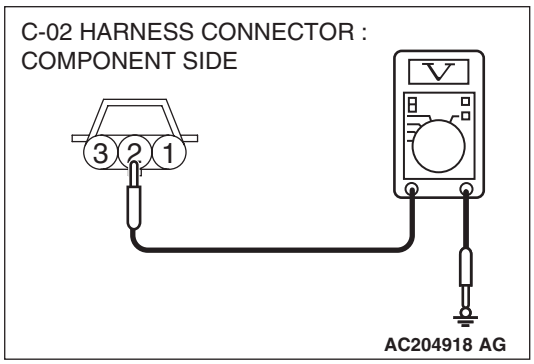


STEP 5. Measure the PCM to speed sensor output voltage at the output shaft speed sensor connector C-02.

(1) Disconnect connector C-02 from the speed sensor and measure voltage at the harness side.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal 2 and ground.
- The voltage should measure between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

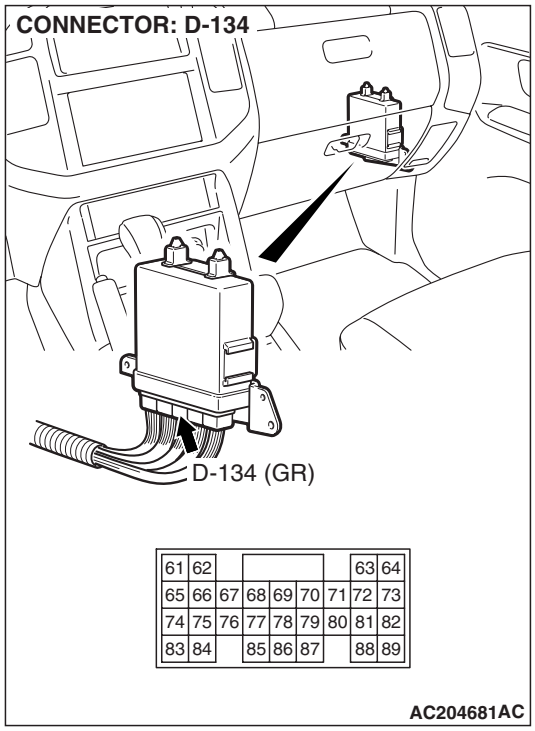
Q: Is the measured voltage between 4.5 and 4.9 volts?

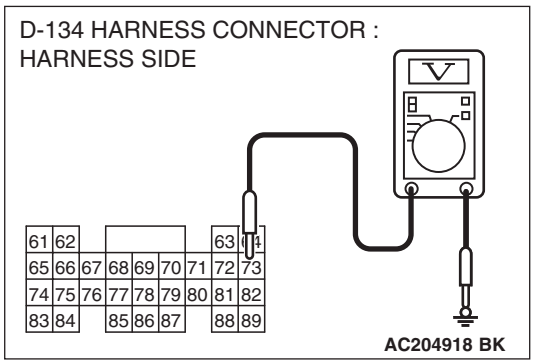
YES : Go to Step 11.

NO : Go to Step 6.

STEP 6. Measure the PCM output voltage to the speed sensor at the PCM connector D-134 by backprobing.

(1) Do not disconnect connector D-134.
(2) Disconnect connector C-02 at the output shaft speed sensor.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal 73 and ground by backprobing.
- The voltage should measure between 4.5 and 4.9 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

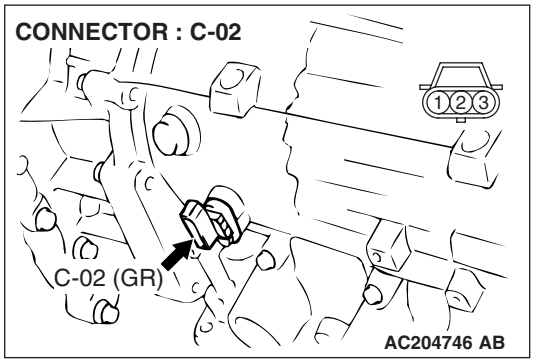
YES : Go to Step 7.
NO : Go to Step 9.

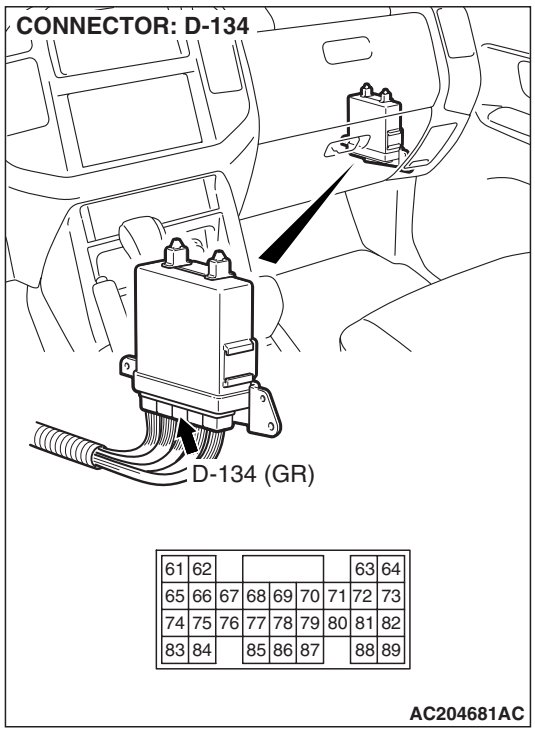
STEP 7. Check output shaft speed sensor connector C-02, PCM connector D-134 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

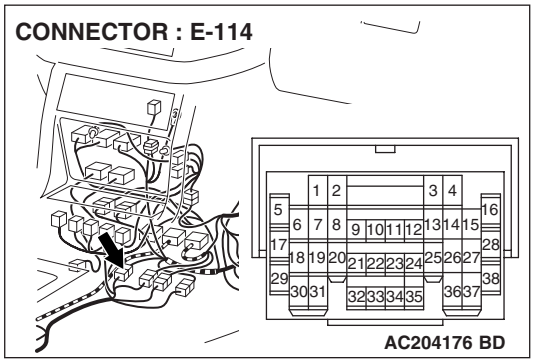
Q: Are the connectors in good condition?

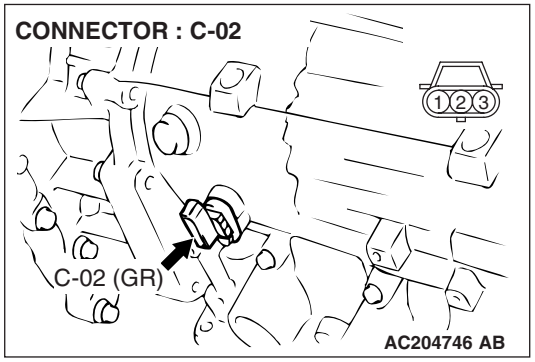
YES : Go to Step 8.

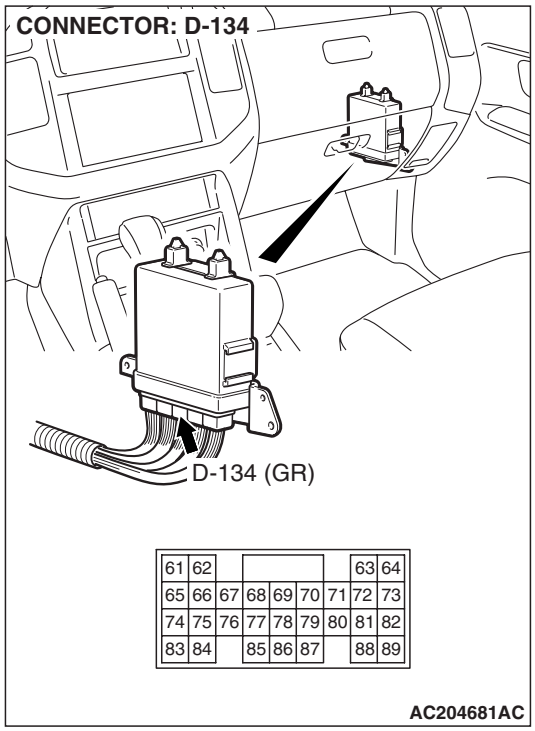
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.











STEP 8. Check the harness for open circuit or damage between output shaft speed sensor connector C-02 terminal 2 and PCM connector D-134 terminal 73.

Q: Is the harness wire in good condition?

YES : Go to Step 19.

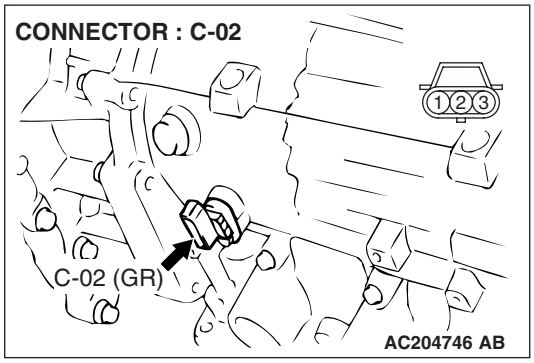
NO : Repair or replace the harness wire.

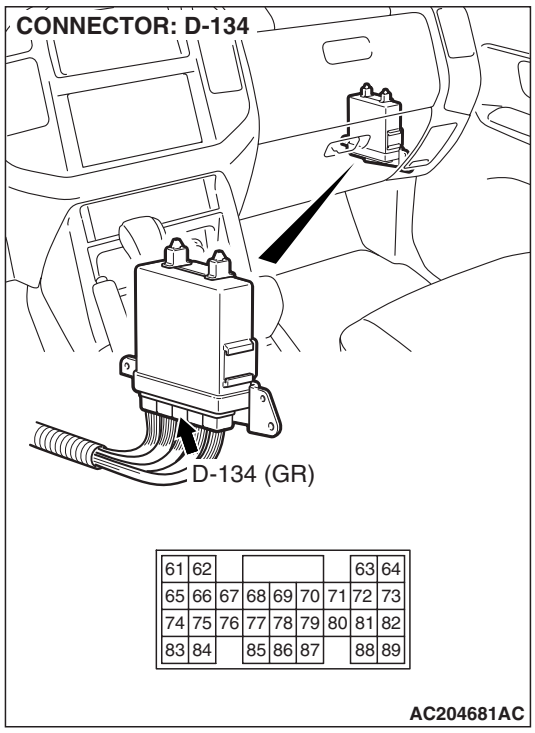
STEP 9. Check output shaft speed sensor connector C-02, PCM connector D-134 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

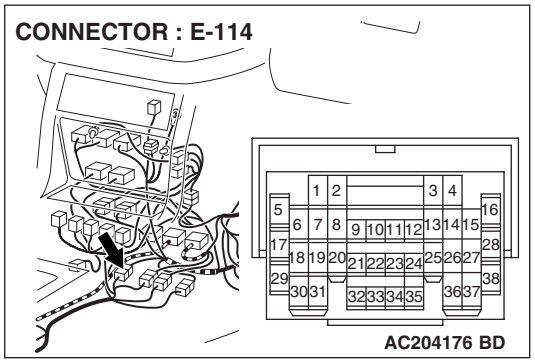
Q: Are the connectors and terminals in good condition?

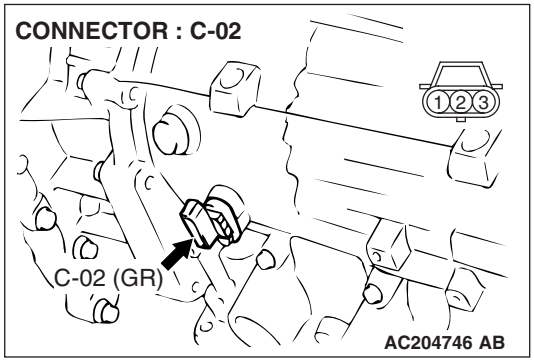
YES : Go to Step 10.

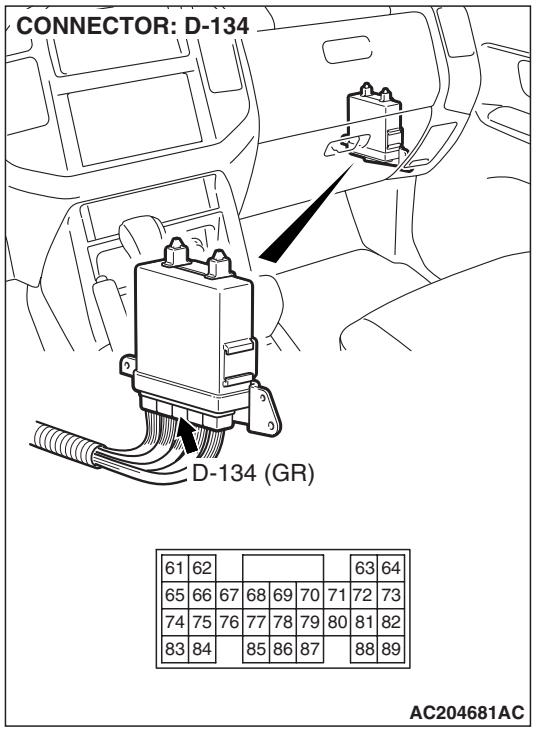
NO : Repair or replace the damages components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.









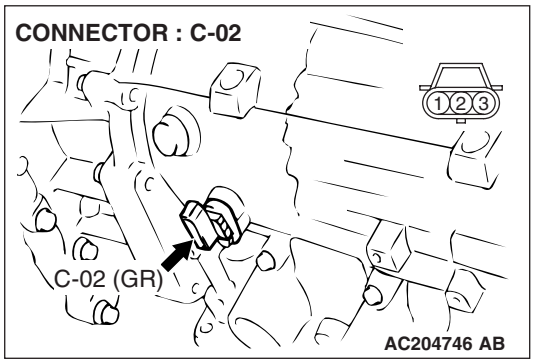


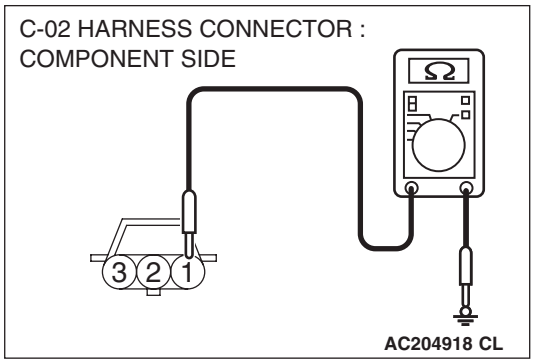
STEP 10. Check the harness for short circuit to ground between output shaft speed sensor connector C-02 terminal 2 and PCM connector D-134 terminal 73.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair or replace the harness wire.





STEP 11. Measure the ground circuit for resistance at the output shaft speed sensor connector C-02.

(1) Disconnect connector C-02 from the speed sensor and measure at the harness side.

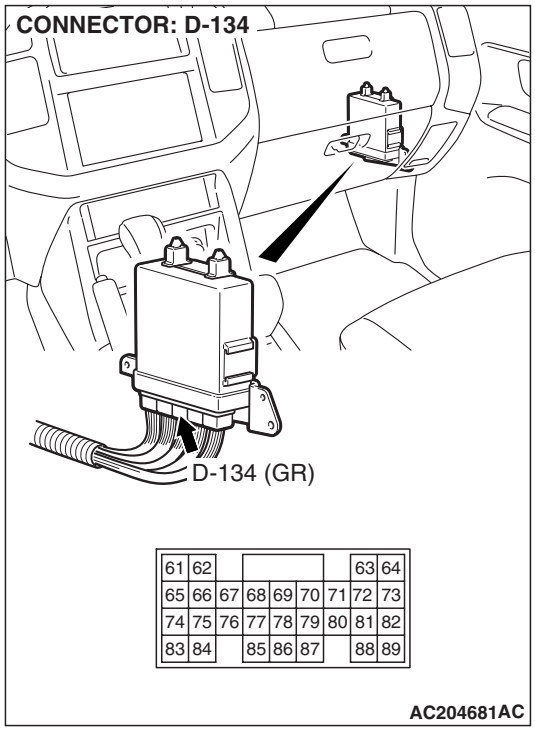
(2) Measure the resistance between terminal 1 and ground.
- The resistance should measure less than 2 ohms.

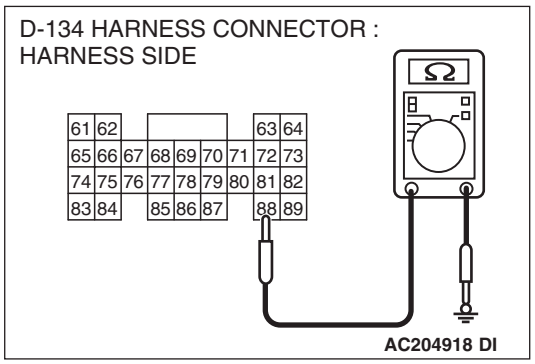
Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 16.
NO : Go to Step 12.

STEP 12. Measure the resistance at PCM connector D-134 by backprobing.

(1) Do not disconnect connector D-134.
(2) Turn the ignition switch to the "ON" position.





(3) Measure the resistance between terminal 88 and ground by backprobing.
- The resistance should measure less than 2 ohms.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured resistance less than 2 ohms?

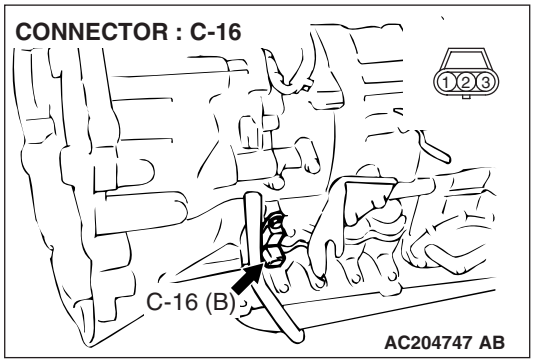
YES : Go to Step 13.
NO : Go to Step 15.

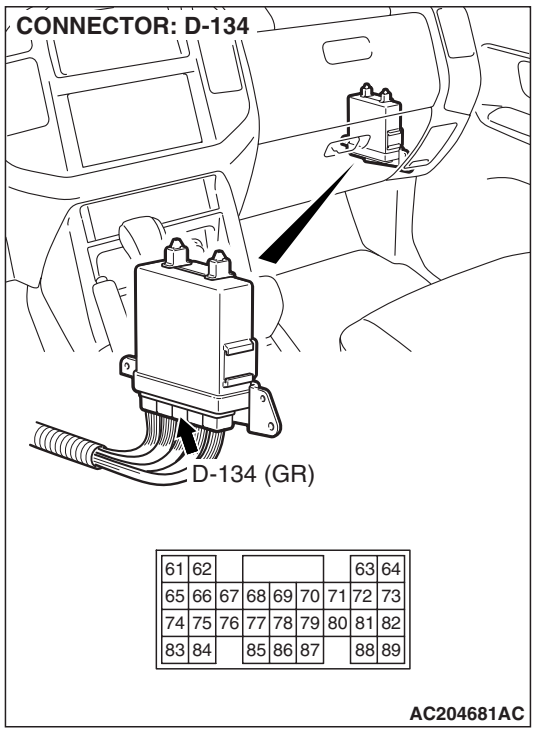
STEP 13. Check output shaft speed sensor connector C-02, PCM connector D-134 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

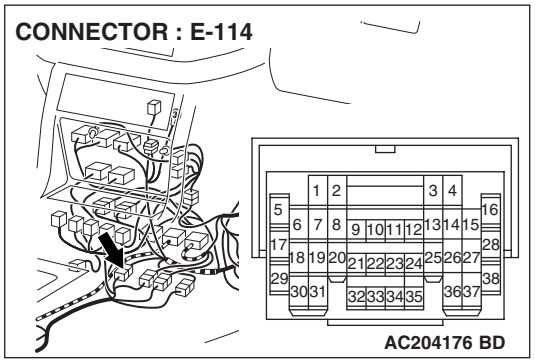
Q: Are the connectors and terminals in good condition?

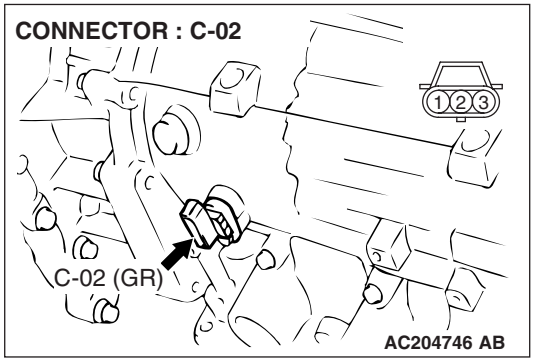
YES : Go to Step 14.

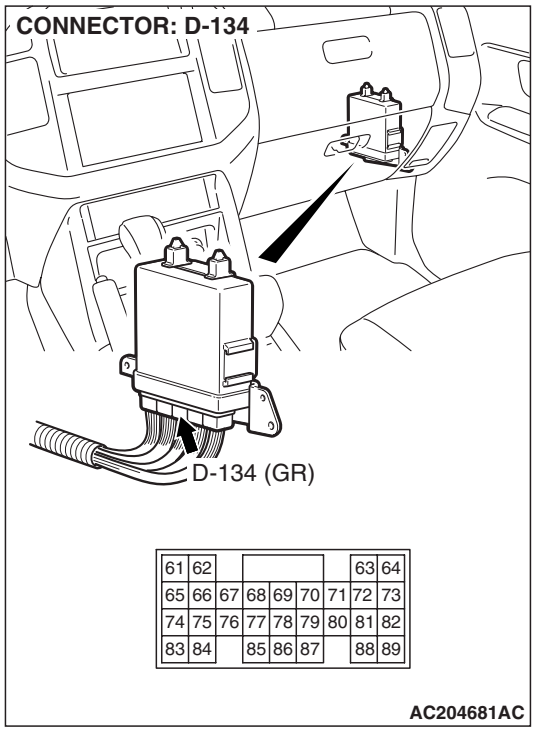
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.









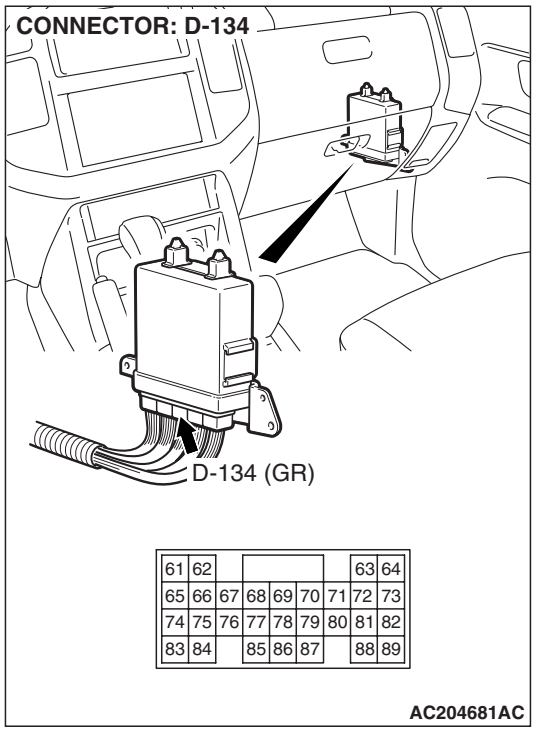


STEP 14. Check the harness for open circuit or damage between output shaft speed sensor connector C-02 terminal 1 and PCM connector D-134 terminal 88.

Q: Is the harness wire in good condition?

YES : Go to Step 16.

NO : Repair or replace the harness wire.



STEP 15. Check PCM connector D-134 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

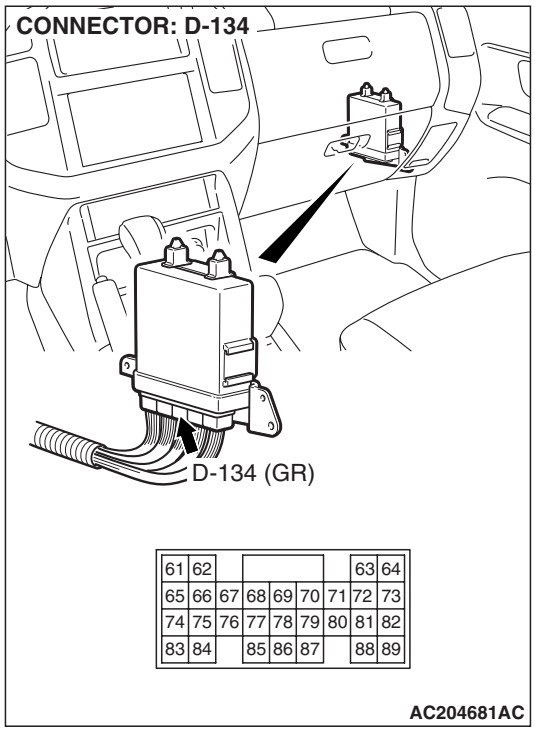
Q: Are the connector and terminals in good condition?

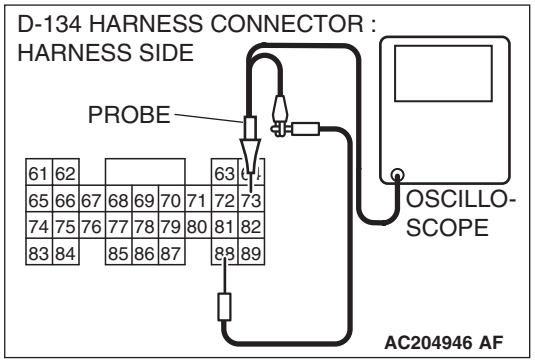
YES : Replace the PCM.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

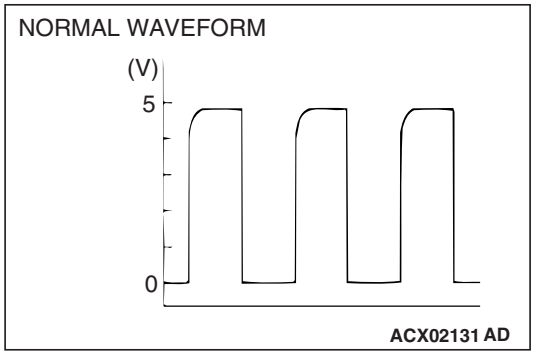
STEP 16. Using an oscilloscope, check the output shaft speed sensor waveform at PCM connector D-134 by backprobing.

(1) Do not disconnect connector D-134.





(2) Connect an oscilloscope probe to PCM connector D-134 terminal 73 and terminal 88 by backprobing.
(3) Start the engine and drive the vehicle at constant speed of 50 km/h (31 mph) (Gear range: 4th gear).

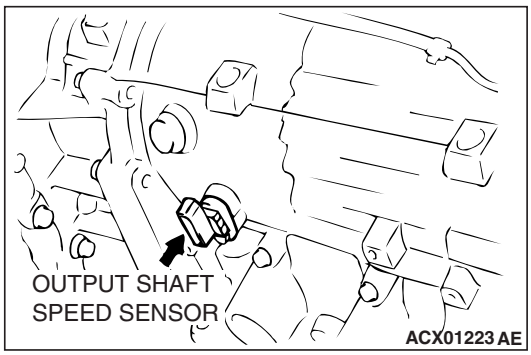


(4) Check the output shaft speed sensor waveform.
- The output shaft speed sensor waveform should show a pattern similar to the illustration. The maximum value should be 4.8 volts and more and the minimum value 0.8 volt and less. The output waveform should not contain electrical noise.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : Go to Step 19.
NO : Go to Step 17.

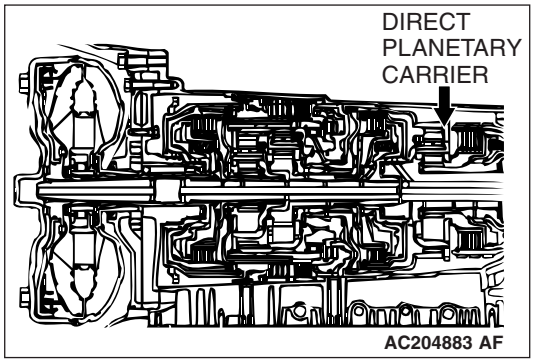


STEP 17. Replace the output shaft speed sensor.

(1) Replace the output shaft speed sensor. Refer to GROUP 23B, Transmission P.23B-14.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is A/T DTC 23 set?

YES : Go to Step 18.
NO : The procedure is complete.



STEP 18. Replace the direct planetary carrier.

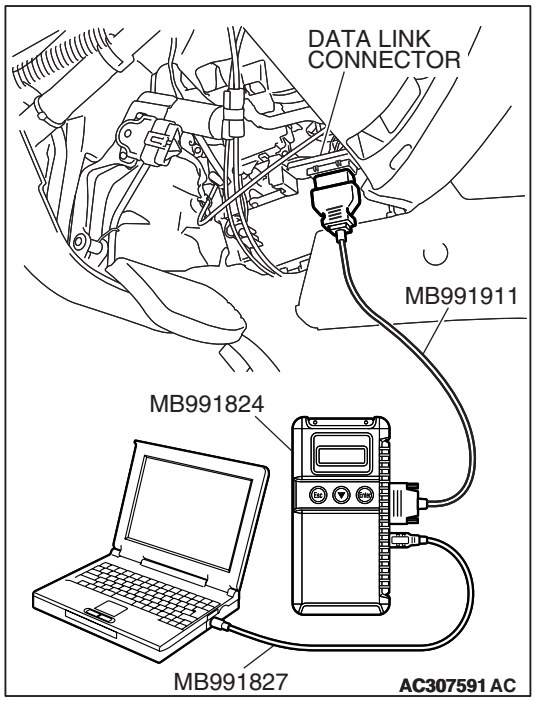
(1) Replace the direct planetary carrier. Refer to GROUP 23B, Transmission P.23B-14.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is A/T DTC 23 set?

YES : An A/T DTC may have set due to external radio frequency interference (RFI) possibility caused by cellular phone activity, or aftermarket components installed on the vehicle.
NO : The procedure is complete.

STEP 19. Using scan tool MB991958, check data list item 23: Output Shaft Speed Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to data reading mode.
- Item 23: Output Shaft Speed Sensor.
  - When driving at constant speed of 50 km/h (31 mph), the display should be "1,400 – 1,700 r/min" (Gear range: 4th gear).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

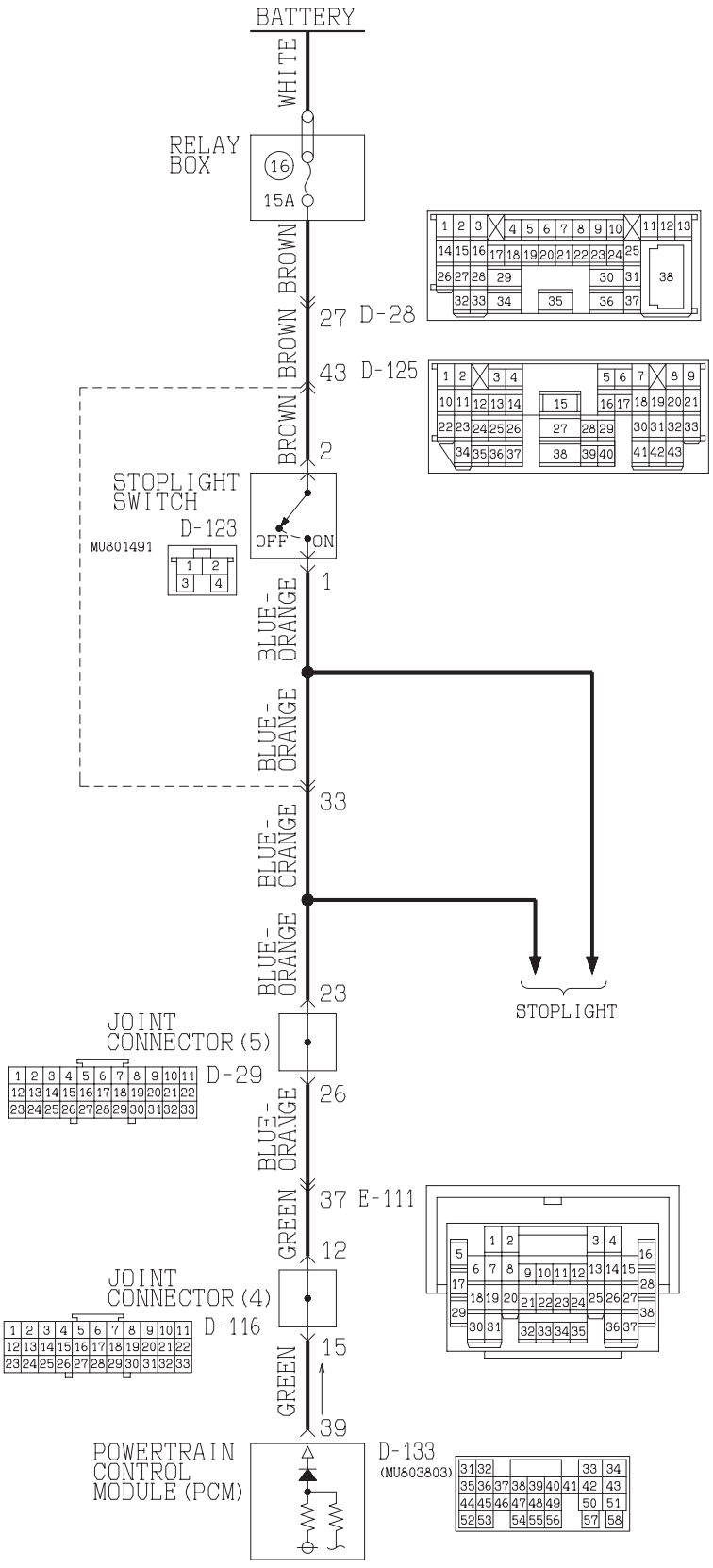
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.
NO : Replace the PCM.

TSB Revision

DTC 26: Stoplight Switch System

Stoplight Switch System Circuit



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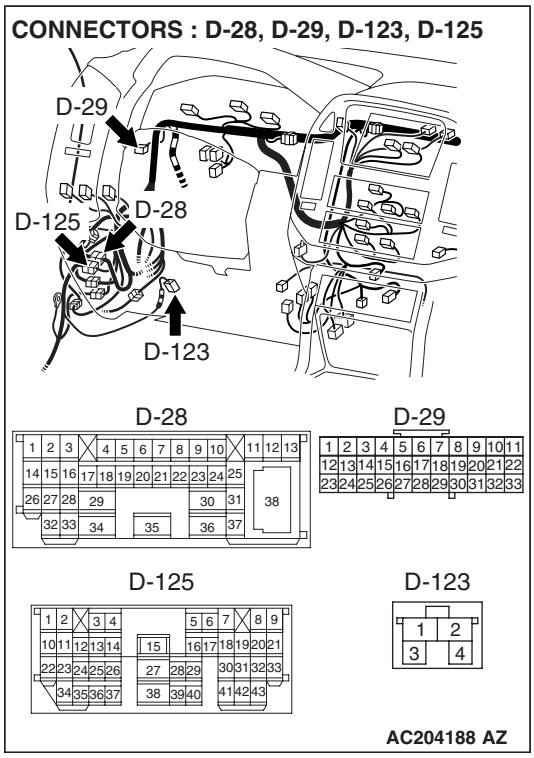
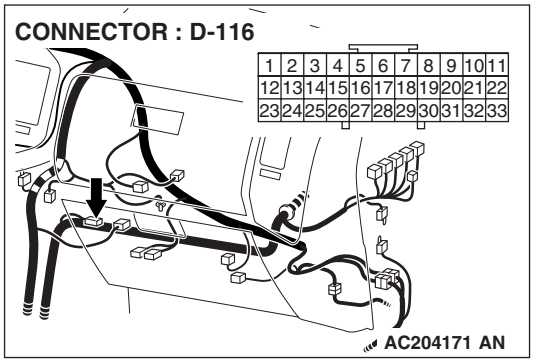
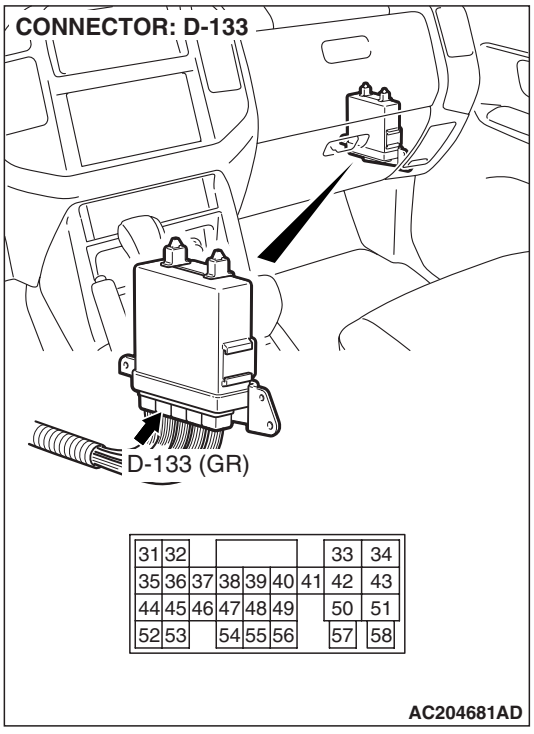
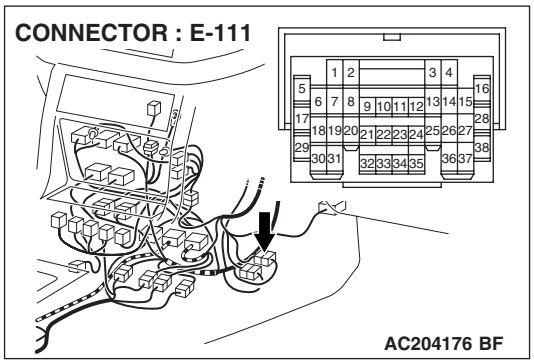
TSB Revision









CIRCUIT OPERATION

- Battery positive voltage is supplied to the stoplight switch (terminal 2).
- When the brake pedal is depressed, battery positive voltage is applied to the PCM (terminal 39).

DTC SET CONDITIONS

If the stoplight switch is on for five minutes or more while driving above 50 km/h (31 mph), or all of the stop light bulbs are blown, it is judged there is a short circuit or open circuit in the stoplight switch. This causes DTC 26 to be set.

TSB Revision

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the stoplight switch circuit
- Malfunction of stoplight bulb
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

STEP 1. Check the brake pedal height.

Refer to GROUP 35A, On-vehicle Service – Brake Pedal Check and Adjustment P.35A-116.

Q: Is the height adjusted properly?

YES : Go to Step 2.
NO : Adjust the brake pedal to the proper height.

STEP 2. Check the stoplight bulb.

Refer to GROUP 54A, Rear combination light P.54A-86.

Q: Is the stoplight bulb in good condition?

YES : Go to Step 3.
NO : Replace the stoplight switch. Refer to GROUP 35A, Brake Pedal P.35A-135.

STEP 3. Using scan tool MB991958, check data list item 26: Stoplight Switch.

⚠ CAUTION

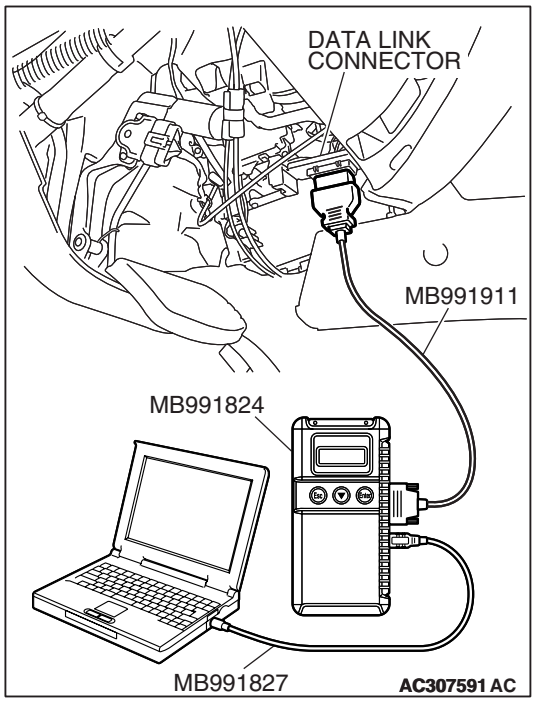
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 26: Stoplight Switch.
  - When the brake pedal is depressed, the display on scan tool MB991958 should be "ON."
  - When the brake pedal is not depressed, the display on scan tool MB991958 should be "OFF."

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

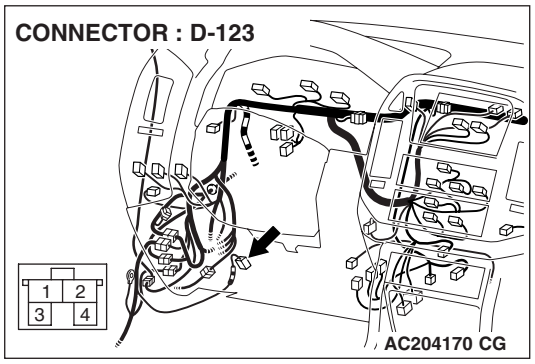
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.
NO : Go to Step 4.

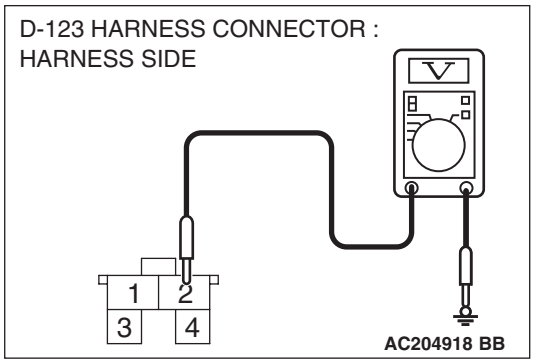


TSB Revision

STEP 4. Measure the stoplight switch power supply voltage at connector D-123 by backprobing.

(1) Remove the stoplight switch from the mounting bracket.
(2) Do not disconnect connector D-123.





(3) Measure the voltage between terminal 2 and ground by backprobing.
- The voltage should measure battery positive voltage.

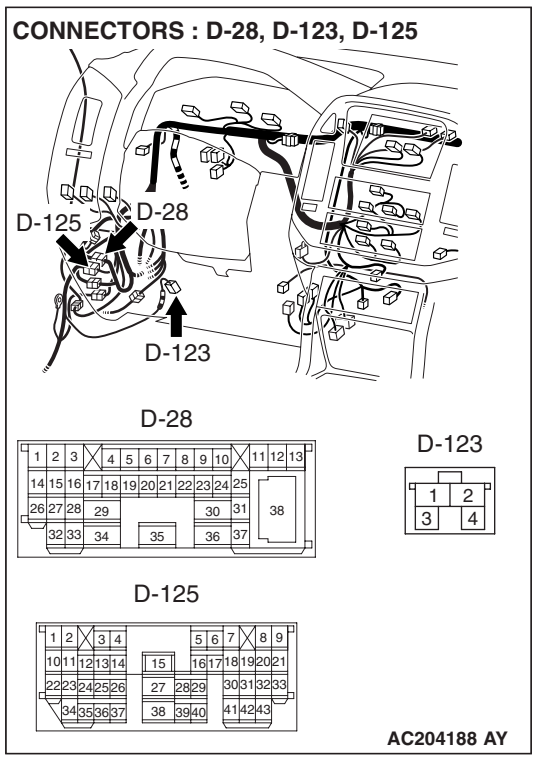
Q: Is the measured voltage battery positive voltage?

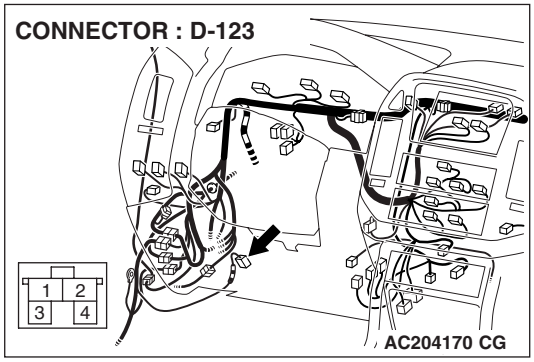
YES : Go to Step 7.
NO : Go to step 5.

STEP 5. Check stoplight switch connector D-123, intermediate connector D-28 and D-125 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 6.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



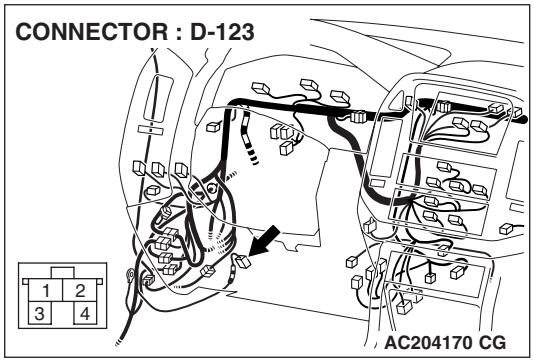


STEP 6. Check the harness for open circuit or short circuit to ground between stoplight switch connector D-123 terminal 2 and the power supply fuse.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

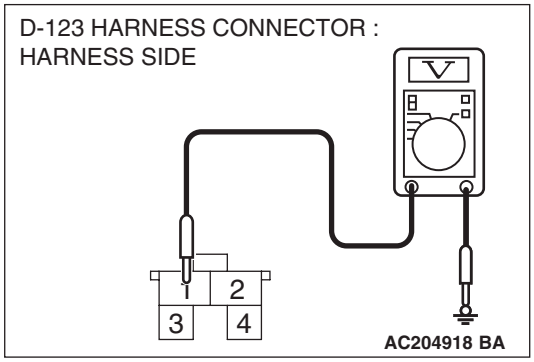
NO : Repair or replace the harness wire.



STEP 7. Measure the stoplight switch output voltage to the PCM at connector D-123 by backprobing.

(1) Remove the stoplight switch from the mounting bracket.

(2) Do not disconnect connector D-123.



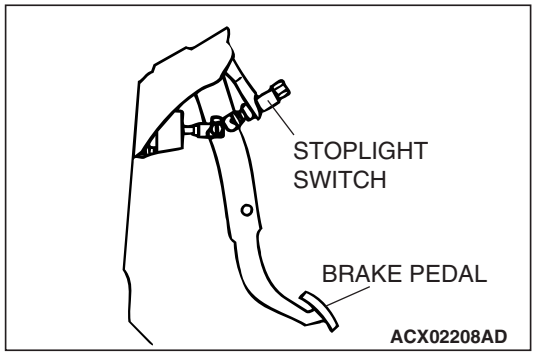
(3) Measure the voltage between stoplight switch connector D-123 terminal 1 and ground by backprobing.

- When the switch button is out (closed circuit), voltage should equal battery positive voltage.
- When the switch button is depressed (open circuit), voltage should measure less than 1.0 volt.

Q: Is the measured voltage battery positive voltage with the switch button released (closed circuit), and less than 1.0 volt with the switch button depressed (open circuit)?

YES : Go to Step 9.

NO : Go to Step 8.



STEP 8. Check the stoplight switch.

Refer to GROUP 35A, On-vehicle Service – Stoplight Switch Check P.35A-118.

Q: Does the stoplight switch pass the checks?

YES : Go to Step 9.

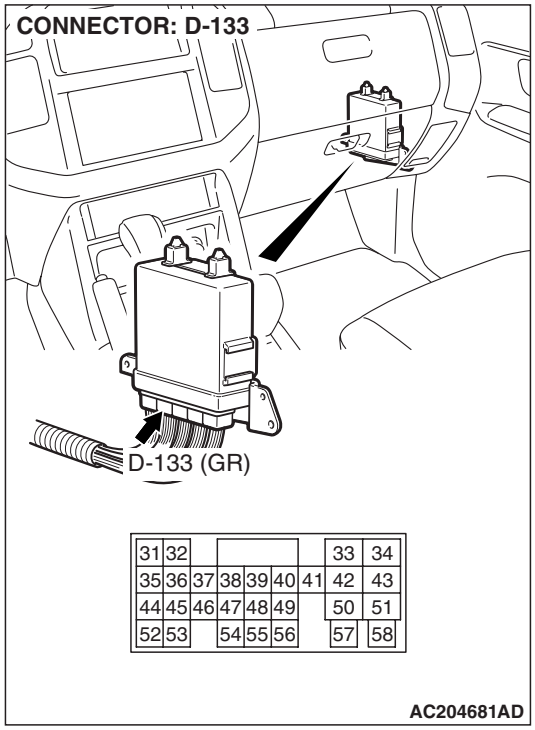
NO : Replace the stoplight switch. Refer to GROUP 35A, Brake Pedal P.35A-135.

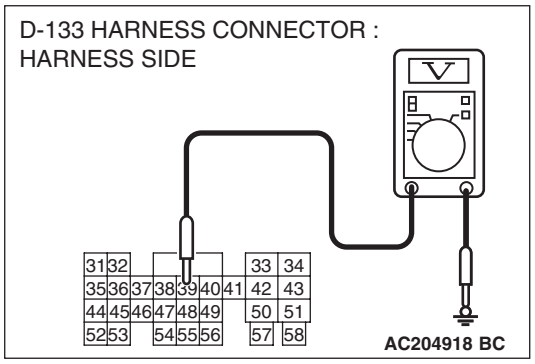
TSB Revision

STEP 9. Measure the stoplight switch output voltage at PCM connector D-133 by backprobing.

(1) Install the stoplight switch into the mounting bracket if it was removed.

(2) Do not disconnect connector D-133.





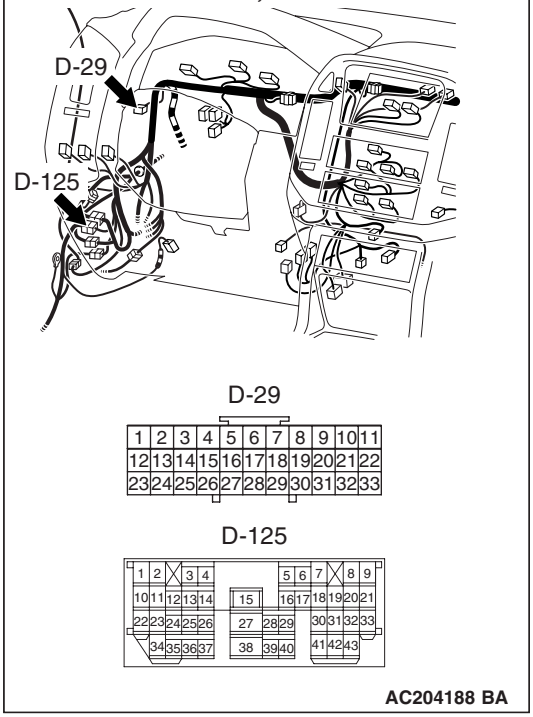
(3) Measure the voltage between terminal 39 and ground by backprobing.
- When the brake pedal is depressed, voltage should measure battery positive voltage.
- When the brake pedal is not depressed, voltage should measure less than 1.0 volt.

Q: Is the measured voltage battery positive voltage with the brake pedal depressed (closed circuit), and less than 1.0 volt with the brake pedal released (open circuit)?

YES : Go to Step 12.
NO : Go to Step 10.

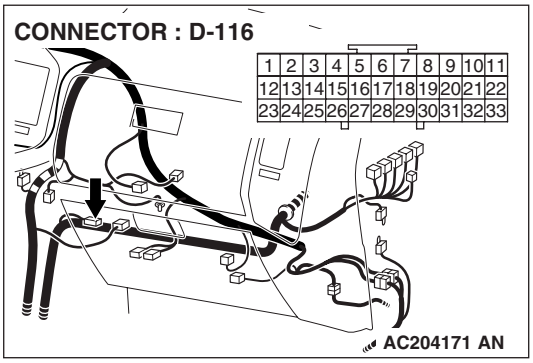
STEP 10. Check joint connector D-29, D-116, intermediate connector D-125, E-111 and PCM connector D-133 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

CONNECTORS : D-29, D-125



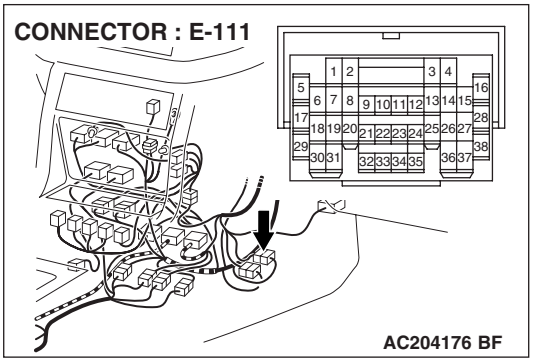
AC204188 BA

CONNECTOR : D-116

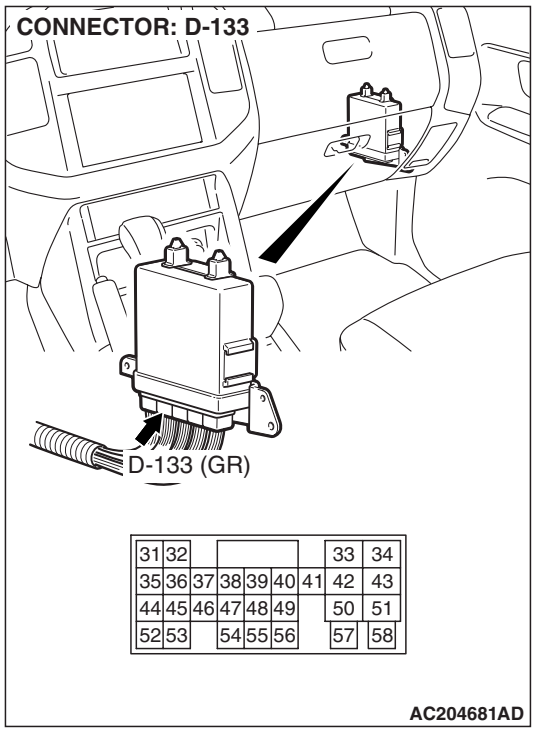


AC204171 AN

CONNECTOR : E-111



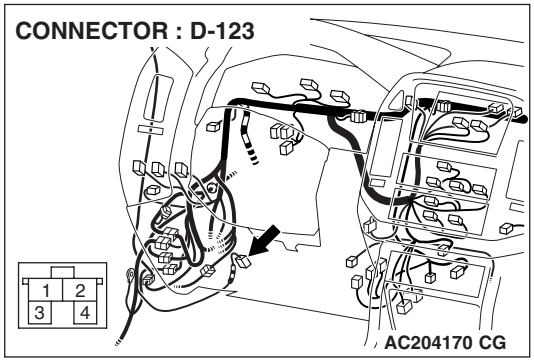
AC204176 BF

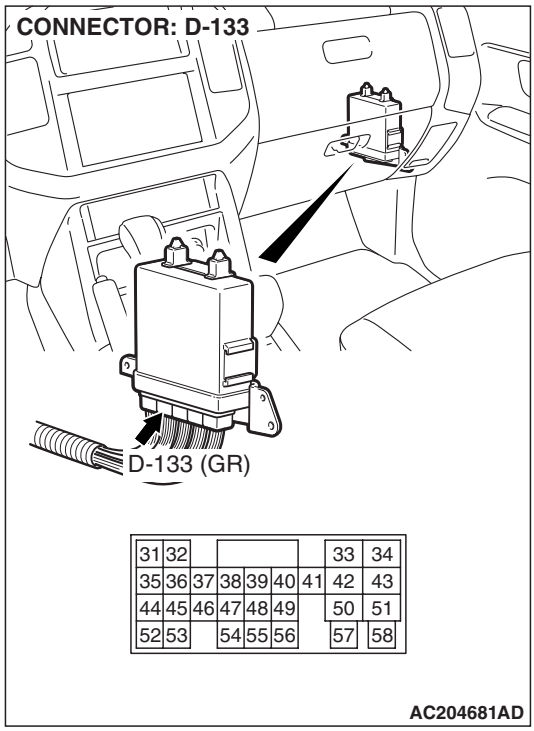


Q: Are the connectors and terminals in good condition?

YES : Go to Step 11.

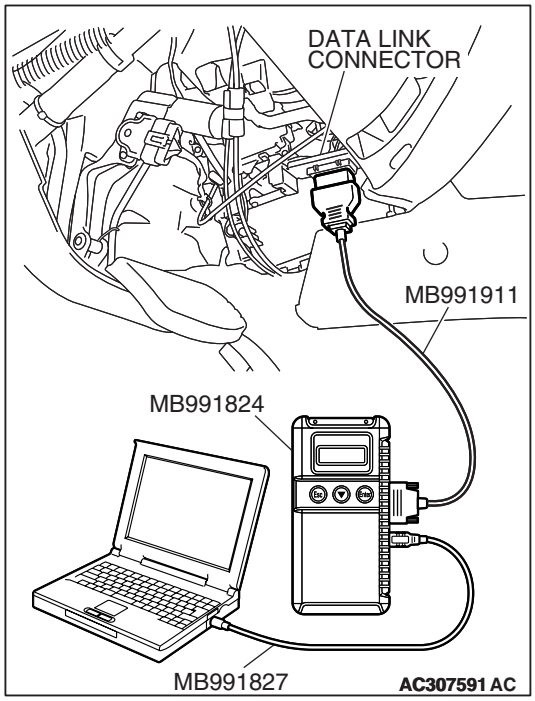
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 11. Check the harness for open circuit or short circuit to ground between stoplight switch connector D-123 terminal 1 and PCM connector D-133 terminal 39.
Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair or replace the harness wire.



STEP 12. Using scan tool MB991958, check data list item 26: Stoplight Switch.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 26: Stoplight Switch.
  - When the brake pedal is depressed, the display on scan tool MB991958 should be "ON."
  - When the brake pedal is not depressed, the display on scan tool MB991958 should be "OFF."

(4) Turn the ignition switch to the "LOCK" (OFF) position.

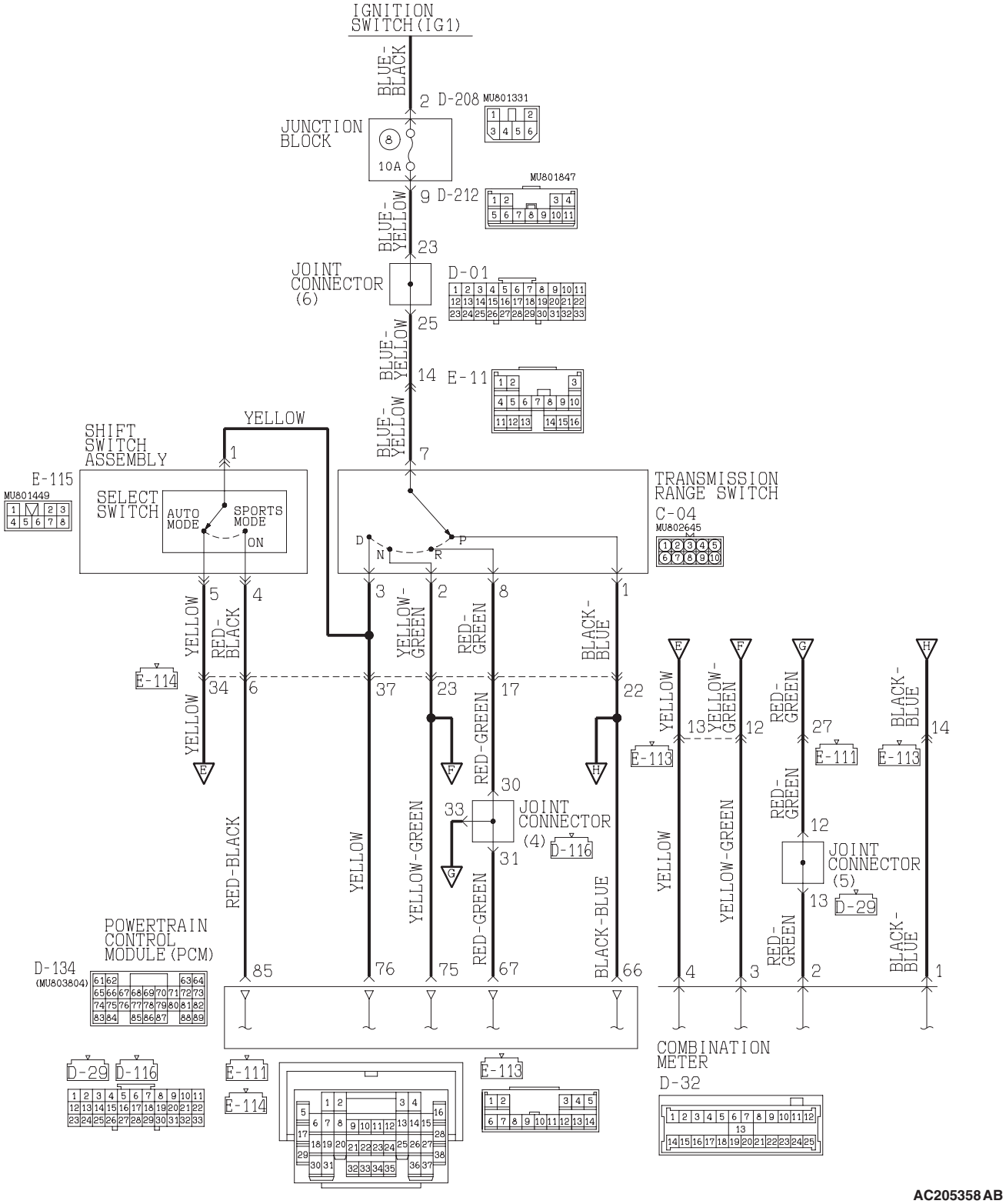
Q: Is the switch operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Replace the PCM.

DTC 27 (P0705): Transmission Range Switch System (Open Circuit)

Transmission Range Switch System Circuit



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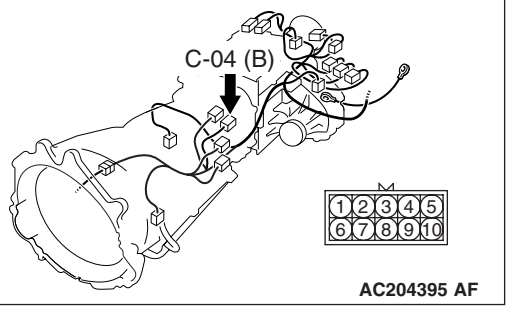
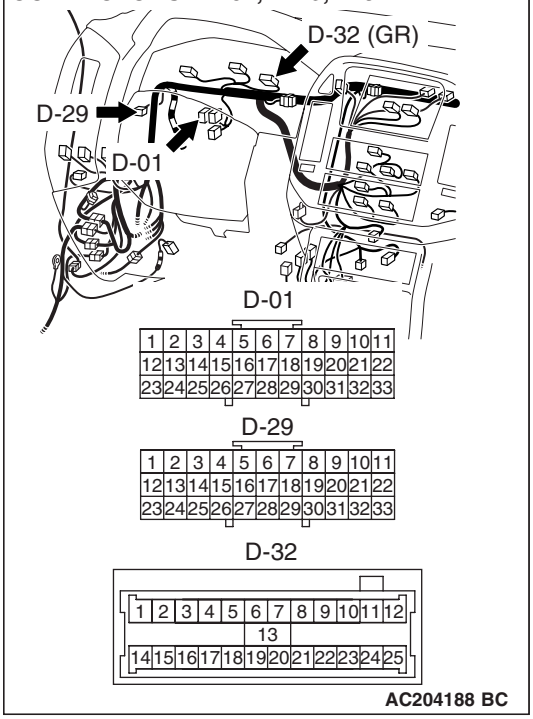
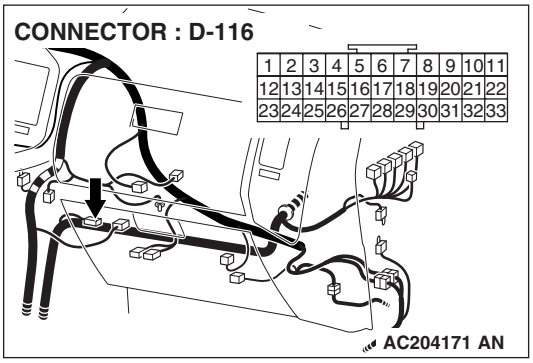
CONNECTOR : C-04



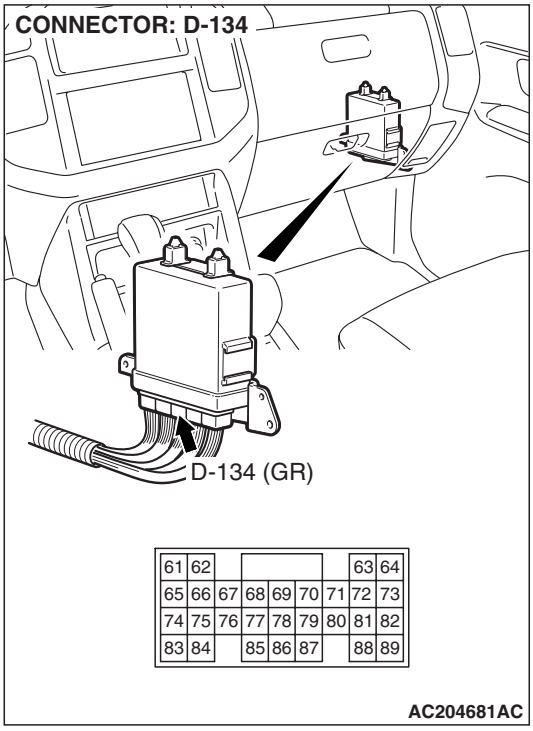
CONNECTORS : D-01, D-29, D-32



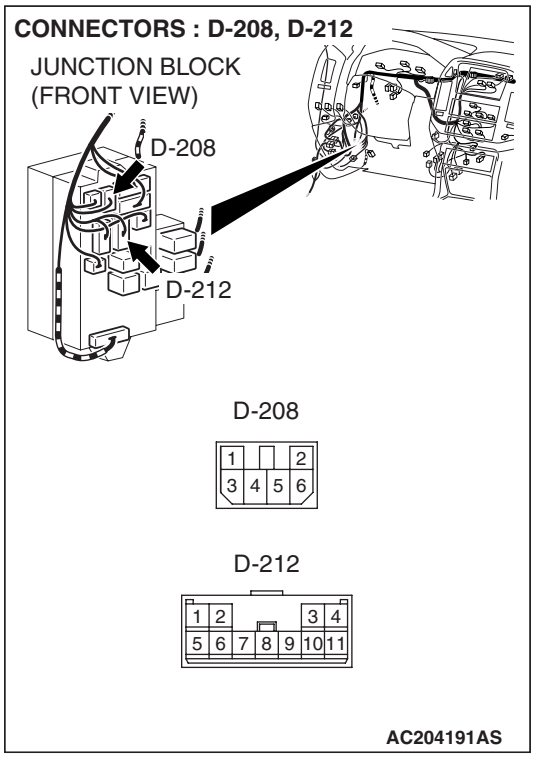
CONNECTOR : D-116

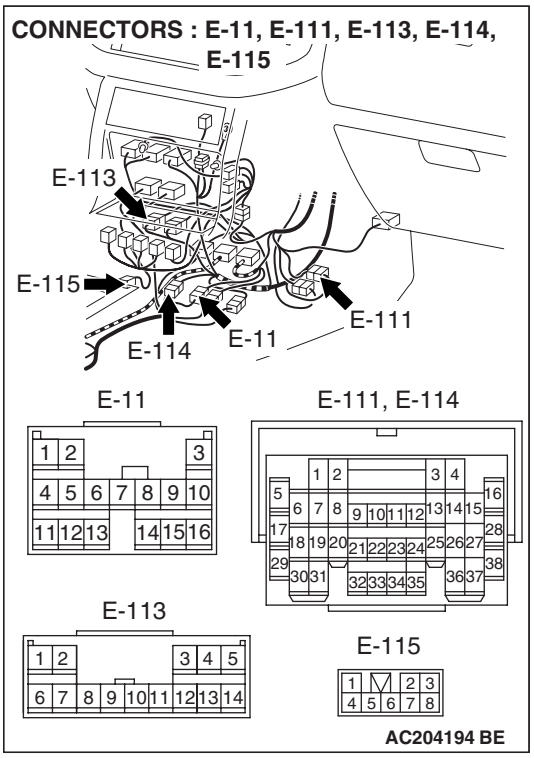


CONNECTOR: D-134



TSB Revision





CIRCUIT OPERATION

- Battery positive voltage is applied to the transmission range switch (terminal 7) when the ignition switch is turned "ON."
- Battery positive voltage is applied to the PCM (terminal 66) when the selector lever is in the "P" range. The PCM judges that the selector lever is in the "P" range when the battery positive voltage is applied.
- Battery positive voltage is applied to the PCM terminal 67 (75 or 76) when the selector lever is in the "R" range ("N" or "D" range). The PCM judges that the selector lever is in the "R" range ("N" or "D" range) when the battery positive voltage is applied.

DESCRIPTIONS OF MONITOR METHODS

If no signal is input from transmission range switch for more than 30 seconds, PCM judges that transmission range switch has a failure.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

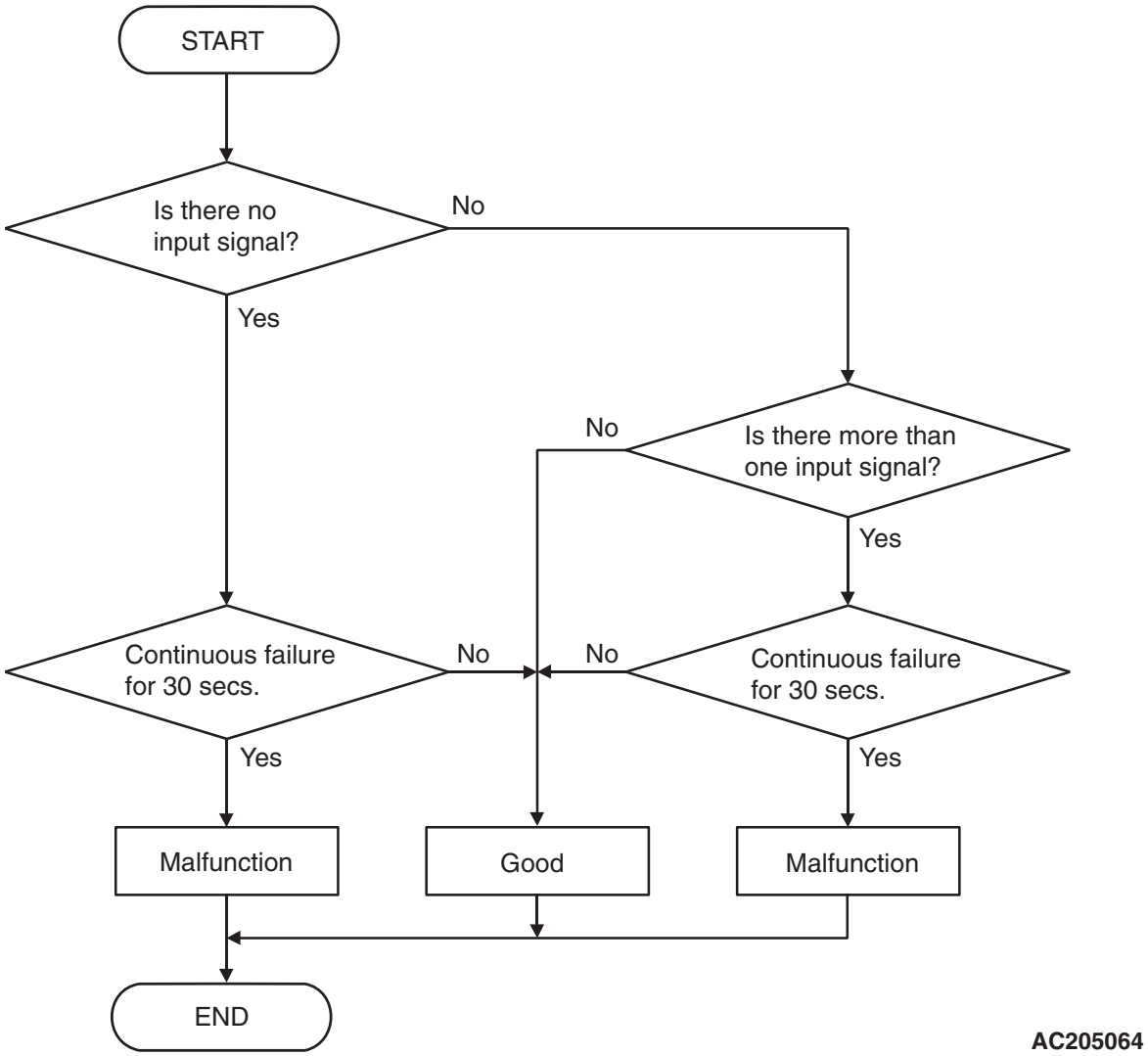
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

LOGIC FLOW CHARTS (Monitor Sequence)



DTC SET CONDITIONS

Check Conditions, Judgement Criteria

- Transmission range switch: no signal detected. (30 seconds)

OBD-II DRIVE CYCLE PATTERN

Start the engine, keep the vehicle stopped in P, R, N and D ranges respectively for more than one minute, and turn "LOCK" (OFF) the ignition switch. Then restart the engine, and stop the vehicle in P, R, N and D ranges respectively for more than one minute.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the transmission range switch
- Malfunction of the ignition switch
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

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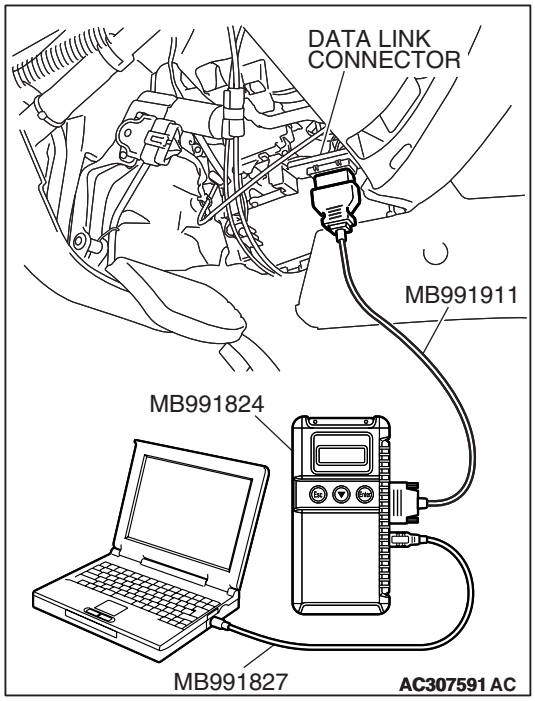


STEP 1. Using scan tool MB991958, check data list item 61: Transmission Range Switch.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 61: Transmission Range Switch.
  - Move the selector lever to "P," "R," "N," "D" and sport mode positions and confirm that the selected transmission ranges match the positions shown on scan tool MB991958 (Sport mode is indicated as "D" on scan tool MB991958).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO (no correct transmission range is displayed) : Go to Step 2.

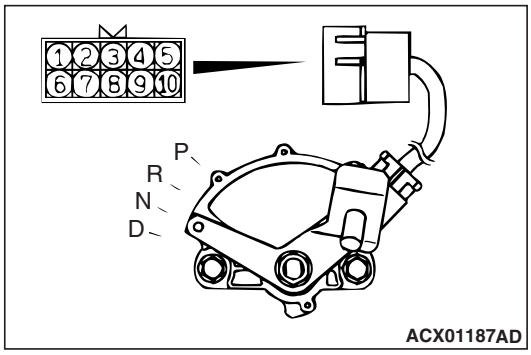
NO (Only "P" position is not displayed correctly) : Go to Step 6.

NO (Only "R" position is not displayed correctly) : Go to Step 14.

NO (Only "N" position is not displayed correctly) : Go to Step 21.

NO (Only "D" position is not displayed correctly) : Go to Step 28.

NO [Only sport mode position is not displayed correctly ("D" is not displayed).] : Go to Step 36.



STEP 2. Check the transmission range switch.

Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	1 – 7	Less than 2 ohms.
R	7 – 8	
N	2 – 7	
D	3 – 7	

Q: Is the measured resistance less than 2 ohms for each transmission range?

YES : Go to Step 3.

NO : Replace the transmission range switch. Refer to GROUP 23B, Transmission P.23B-14.

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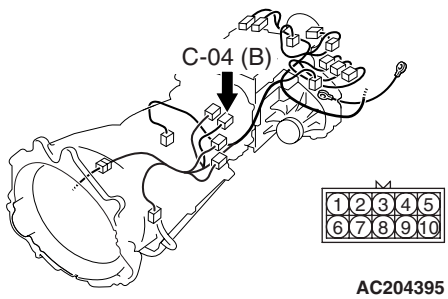
STEP 3. Check transmission range switch connector C-04, joint connector D-01, junction block connector D-212 and intermediate connector E-11 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 4.

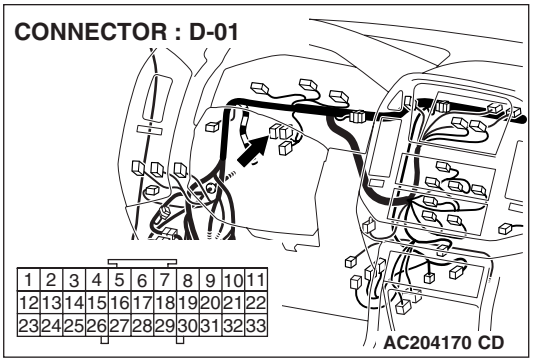
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

CONNECTOR : C-04



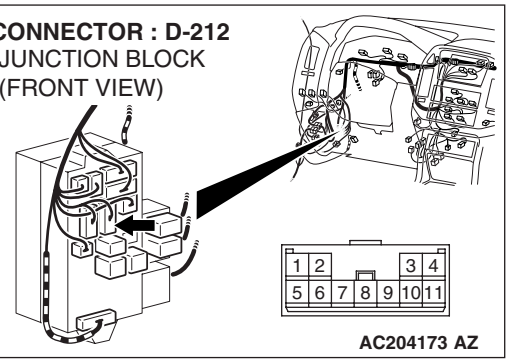
AC204395 AF

CONNECTOR : D-01



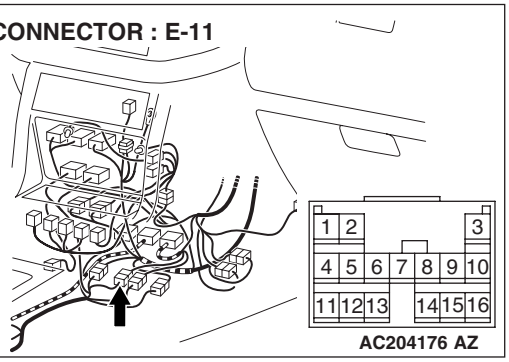
AC204170 CD

CONNECTOR : D-212
JUNCTION BLOCK
(FRONT VIEW)



AC204173 AZ

CONNECTOR : E-11



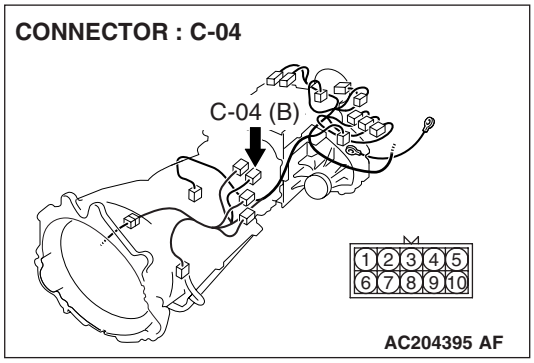
AC204176 AZ

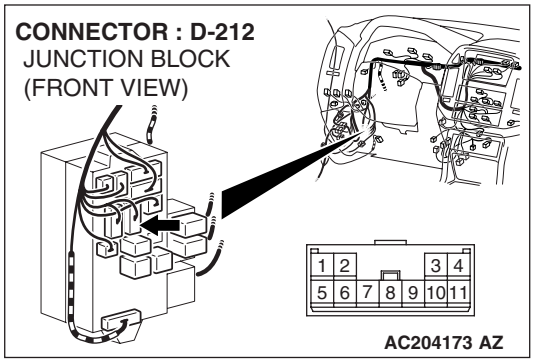
STEP 4. Check harness for open circuit or short circuit to ground between transmission range switch connector C-04 terminal 7 and junction block connector D-212 terminal 9.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.





STEP 5. Using scan tool MB991958, check data list item 61: Transmission Range Switch.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

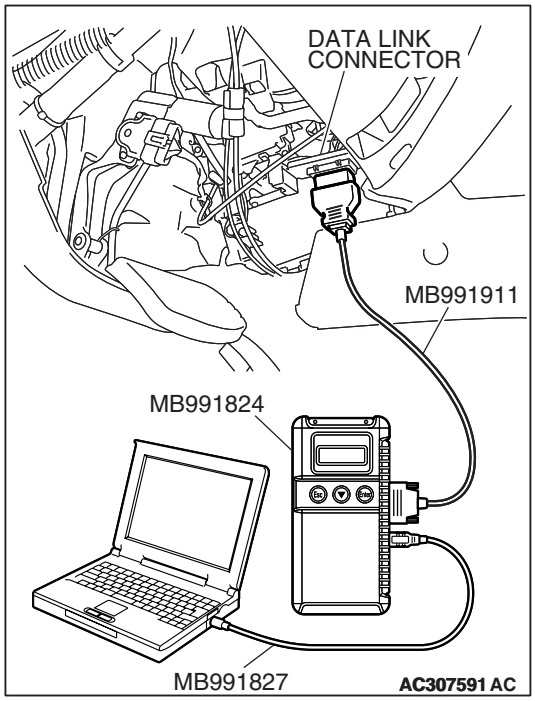
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 61: Transmission Range Switch.
  - Move the selector lever to "P," "R," "N," "D" and sport mode positions and confirm that the selected transmission ranges match the positions shown on scan tool MB991958 (Sport mode is indicated as "D" on scan tool MB991958).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Replace the PCM.



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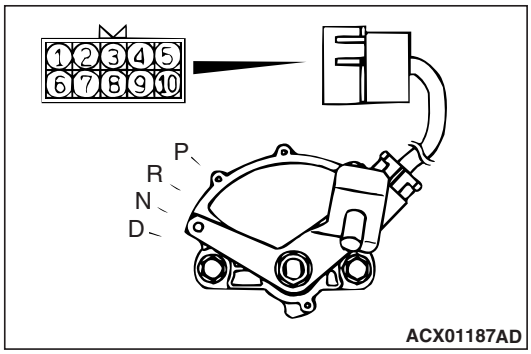


STEP 6. Check the transmission range switch.

Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	1 – 7	Less than 2 ohms.
R	7 – 8	
N	2 – 7	
D	3 – 7	

Q: Is the measured resistance less than 2 ohms for each transmission range?

YES : Go to Step 7.

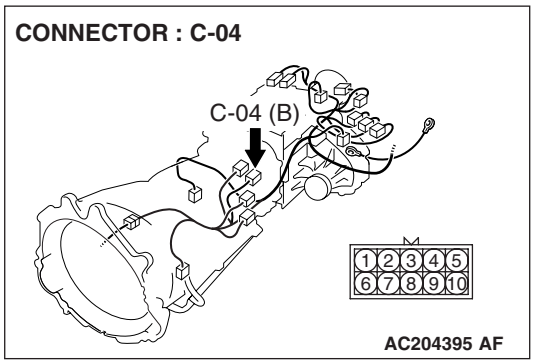
NO : Replace the transmission range switch. Refer to GROUP 23B, Transmission P.23B-14.

STEP 7. Check transmission range switch connector C-04 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

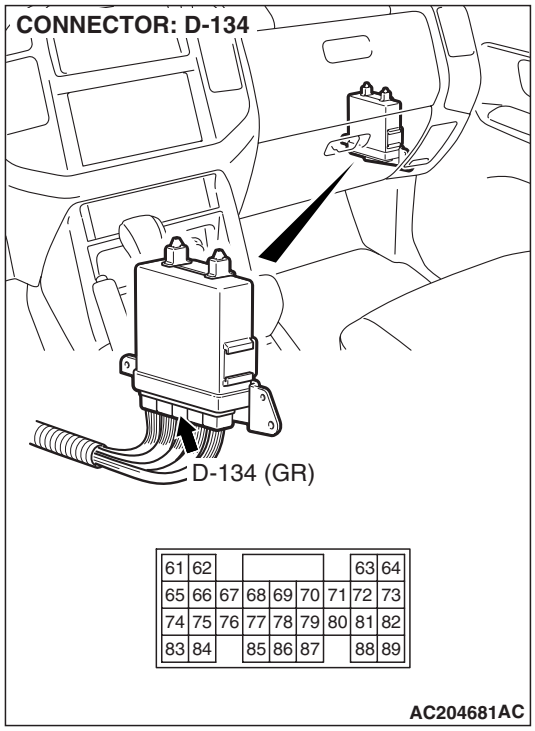
YES : Go to Step 8.

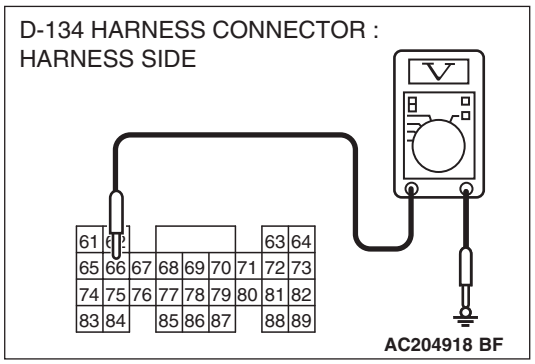
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 8. Measure the transmission range switch output voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect connector D-134.
(2) Turn the ignition switch to the "ON" position.
(3) Move the selector lever to the "P" position.



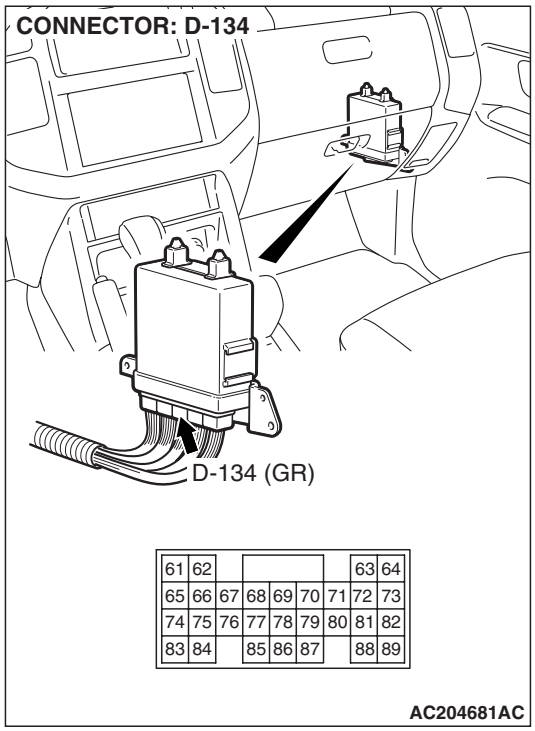


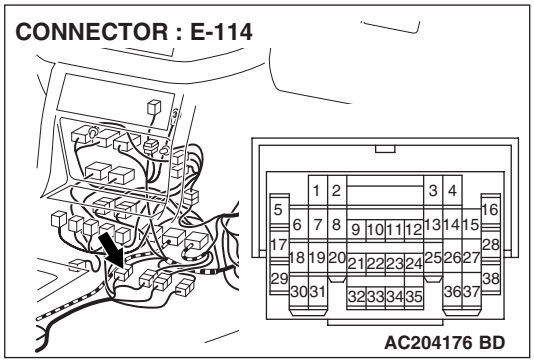
(4) Measure the voltage between terminal 66 and ground by backprobing.
- The voltage should measure battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage battery positive voltage?

YES : Go to Step 13.
NO : Go to Step 9.

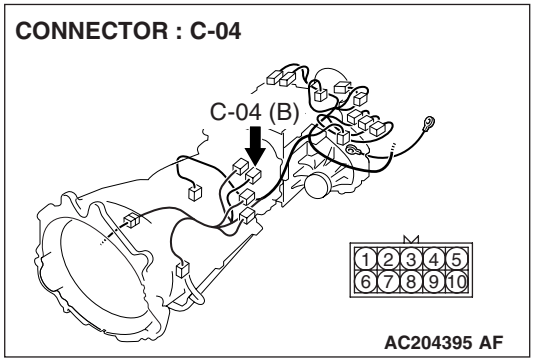


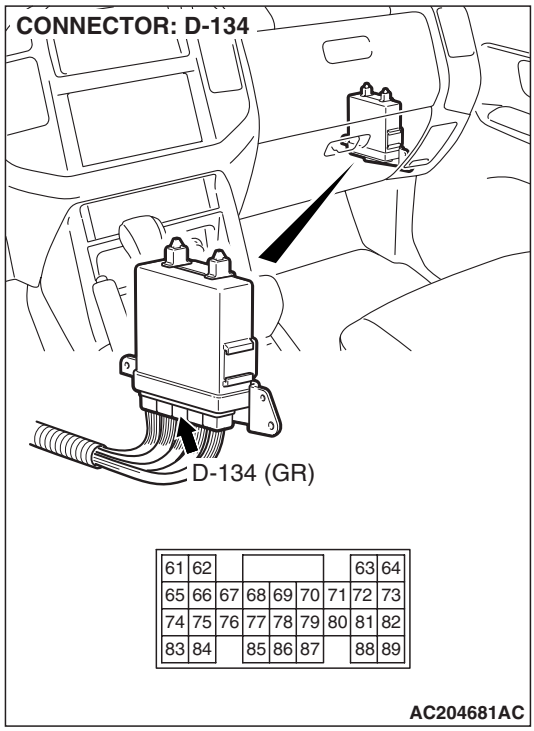


STEP 9. Check PCM connector D-134 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Are the connectors and terminals in good condition?

YES : Go to Step 10.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 10. Check harness for open circuit or short circuit to ground between transmission range switch connector C-04 terminal 1 and PCM connector D-134 terminal 66.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

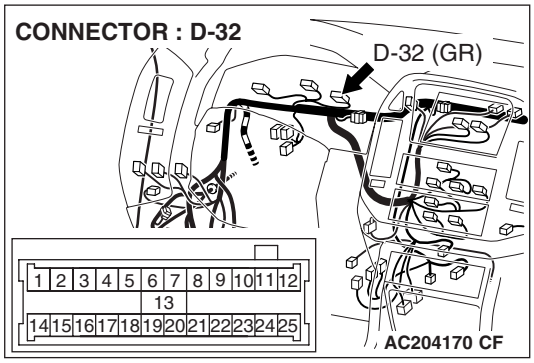
NO : Repair or replace the harness wire.

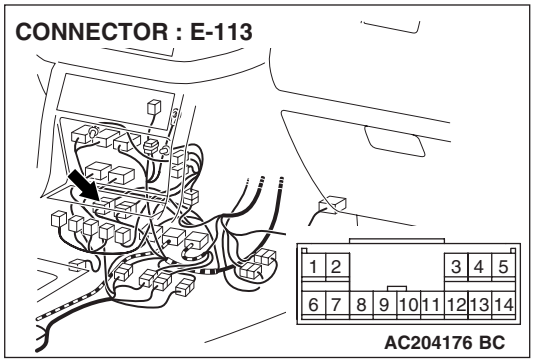
STEP 11. Check combination meter connector D-32 and intermediate connector E-113 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 12.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



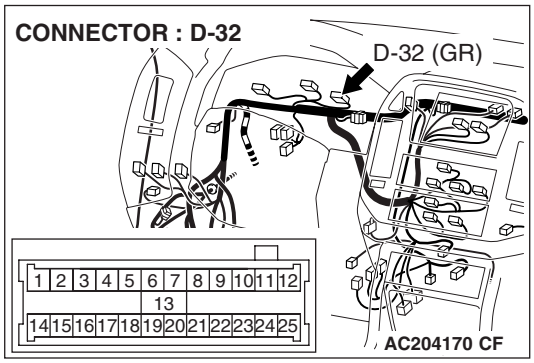


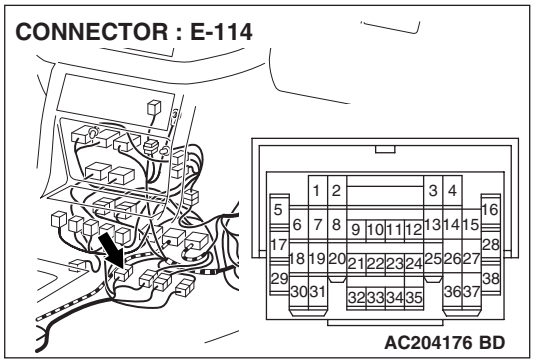
STEP 12. Check harness for short circuit to ground between combination meter connector D-32 terminal 1 and intermediate connector E-114 terminal 22.

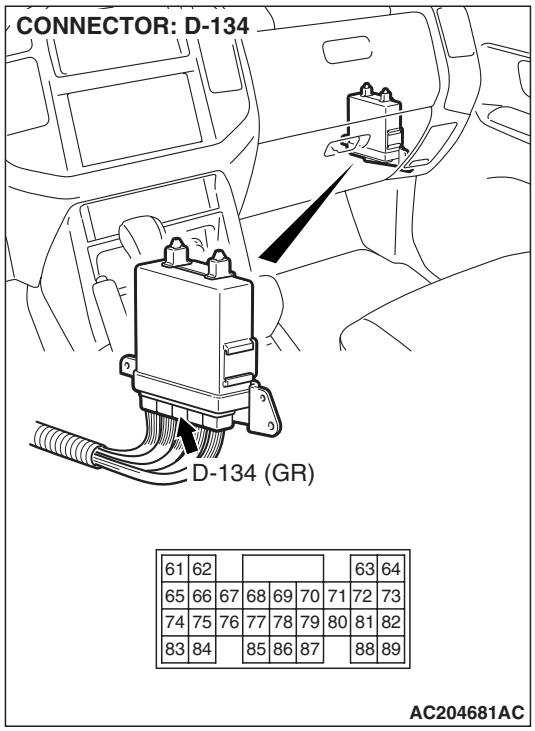
Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.





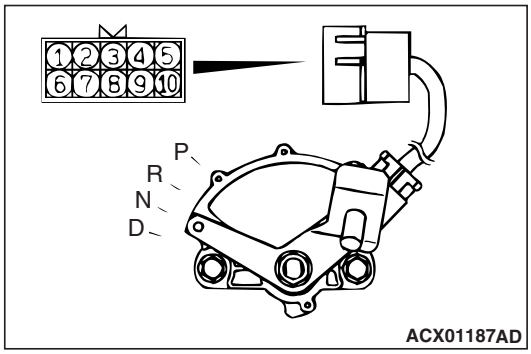


STEP 13. Check PCM connector D-134 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 5.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 14. Check the transmission range switch.

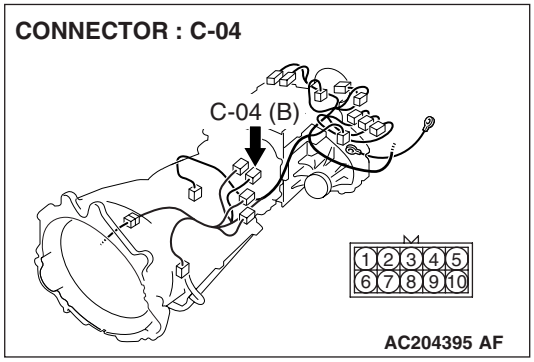
Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	1 – 7	Less than 2 ohms.
R	7 – 8	
N	2 – 7	
D	3 – 7	

Q: Is the measured resistance less than 2 ohms for each transmission range?

YES : Go to Step 15.

NO : Replace the transmission range switch. Refer to GROUP 23B, Transmission P.23B-14.

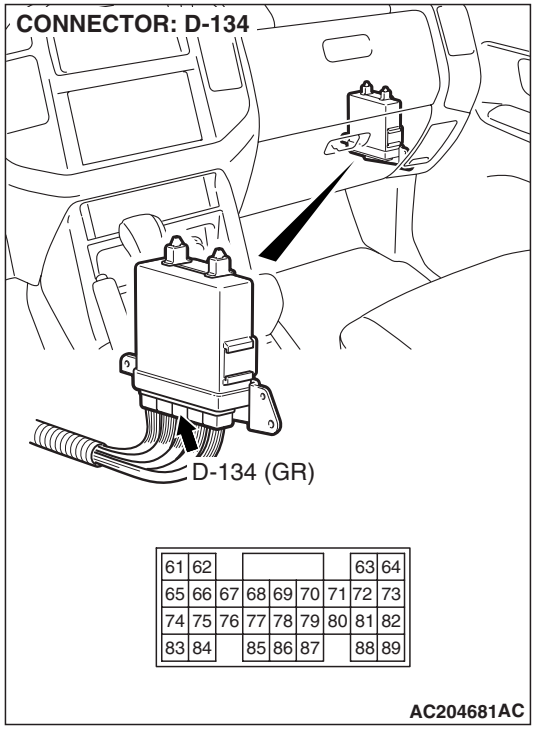


STEP 15. Check transmission range switch connector C-04 the for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

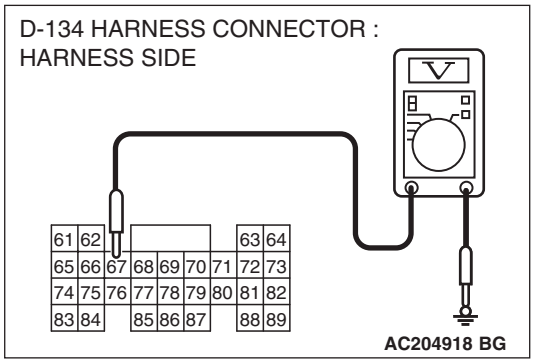
YES : Go to Step 16.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 16. Measure the transmission range switch output voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect connector D-134.
(2) Turn the ignition switch to the "ON" position.
(3) Move the selector lever to the "R" position.



(4) Measure the voltage between terminal 67 and ground by backprobing.
- The voltage should measure battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage battery positive voltage?

YES : Go to Step 13.

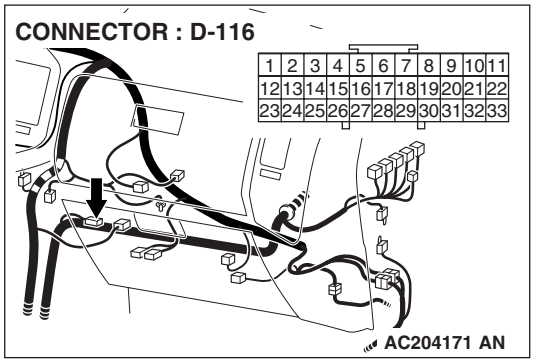
NO : Go to Step 17.

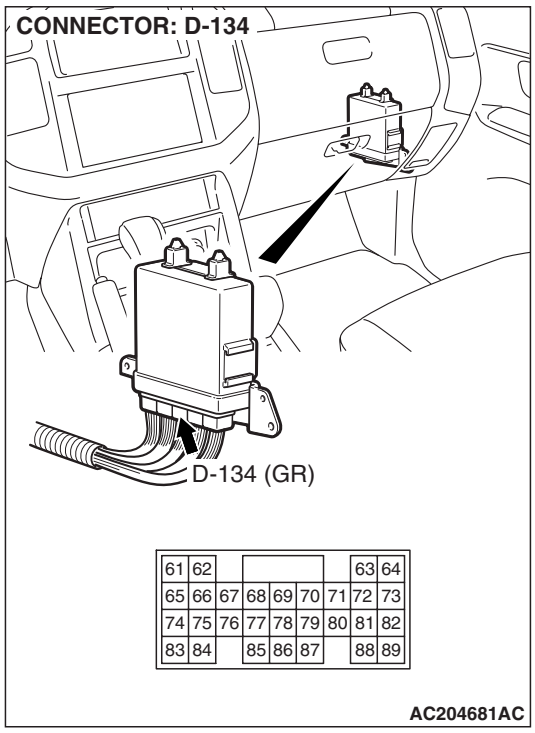
STEP 17. Check joint connector D-116, PCM connector D-134 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector

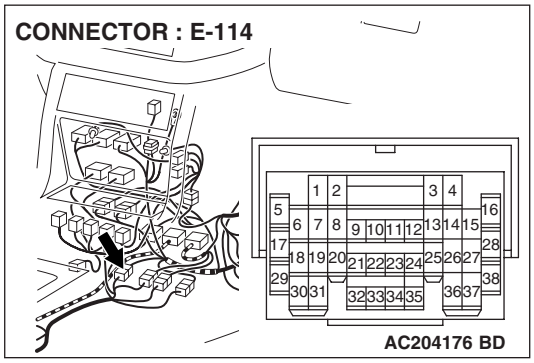
Q: Are the connectors and terminals in good condition?

YES : Go to Step 18.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

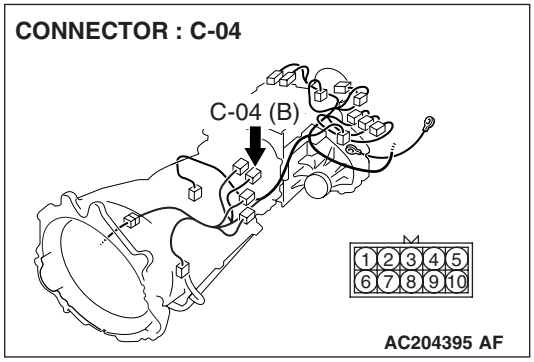


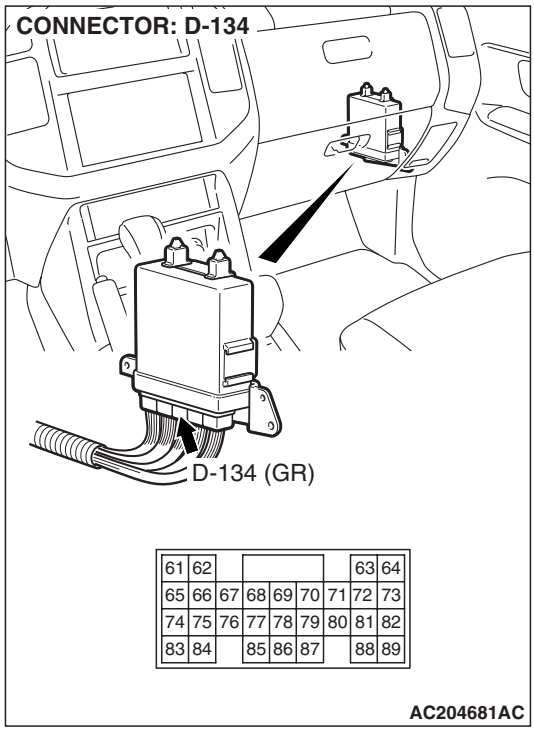




STEP 18. Check harness for open circuit or short circuit to ground between transmission range switch connector C-04 terminal 8 and PCM connector D-134 terminal 67.
Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair or replace the harness wire.



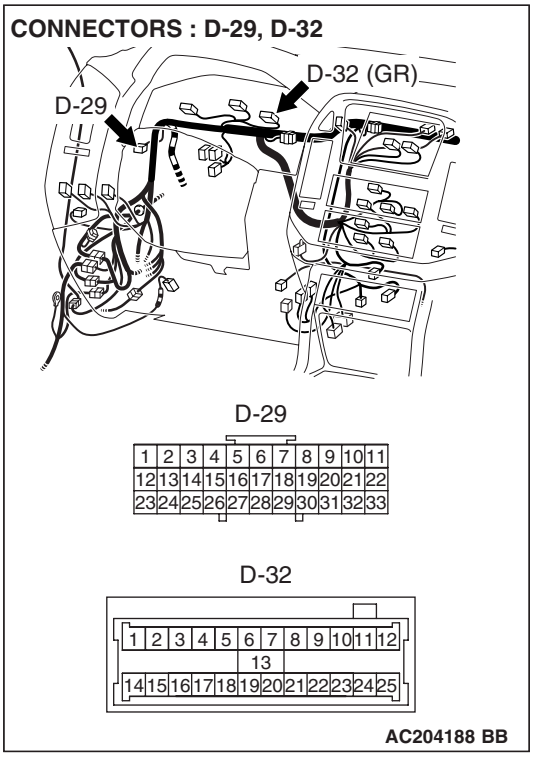


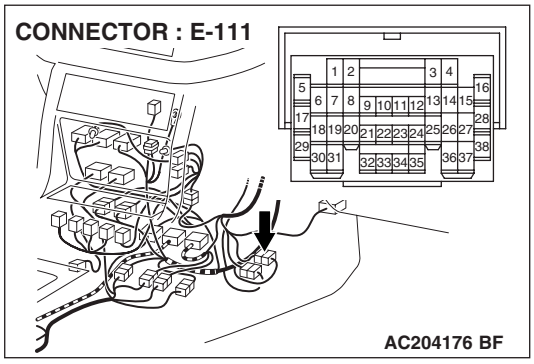
STEP 19. Check joint connector D-29, combination meter connector D-32 and intermediate connector E-111 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

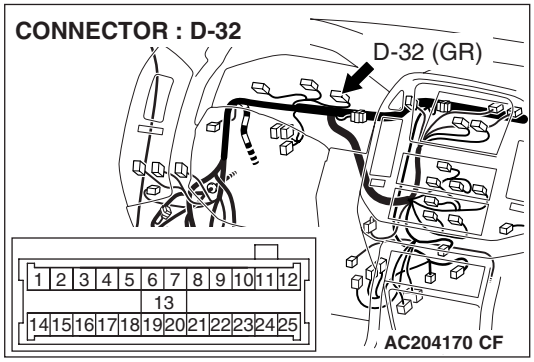
Q: Are the connectors and terminals in good condition?

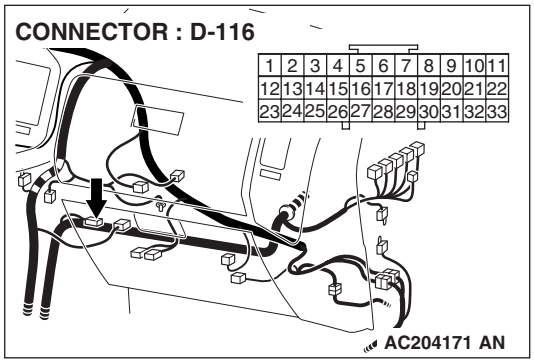
YES : Go to Step 20.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







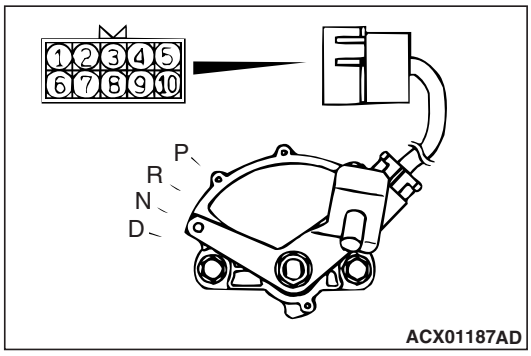


STEP 20. Check harness for short circuit to ground between combination meter connector D-32 terminal 2 and joint connector D-116 terminal 33.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.



STEP 21. Check the transmission range switch.

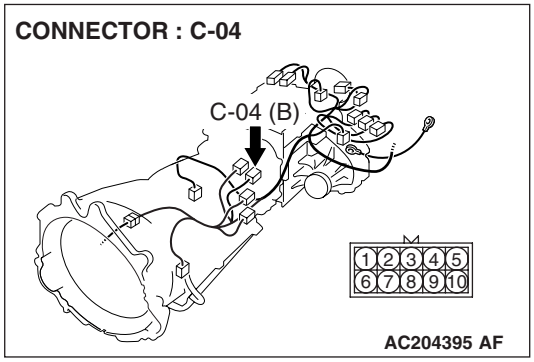
Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	1 – 7	Less than 2 ohms.
R	7 – 8	
N	2 – 7	
D	3 – 7	

Q: Is the measured resistance less than 2 ohms for each transmission range?

YES : Go to Step 22.

NO : Replace the transmission range switch. Refer to GROUP 23B, Transmission P.23B-14.

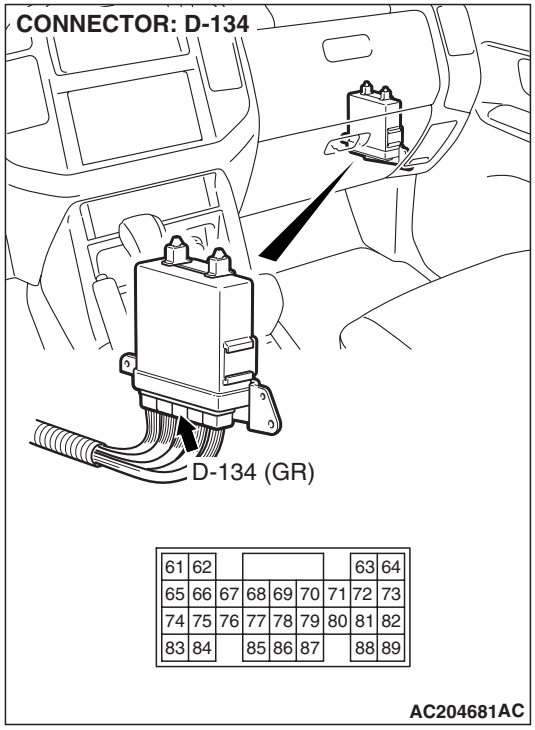


STEP 22. Check transmission range switch connector C-04 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

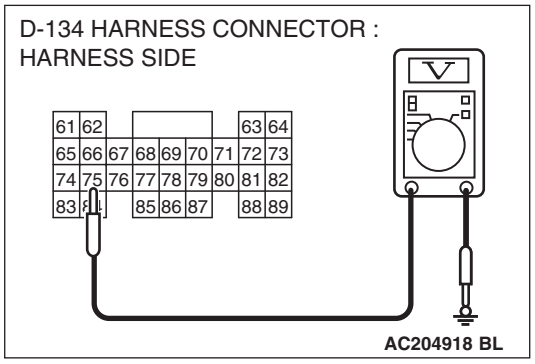
YES : Go to Step 23.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 23. Measure the transmission range switch output voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect connector D-134.
(2) Turn the ignition switch to the "ON" position.
(3) Move the selector lever to the "N" position.



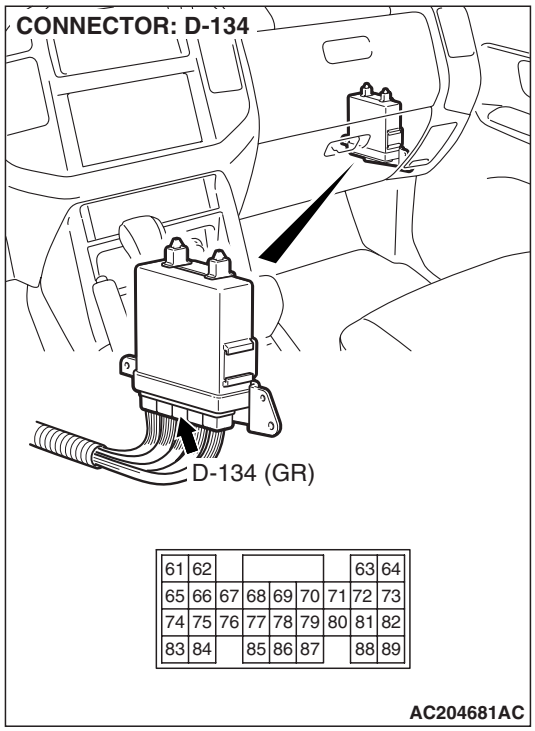
(4) Measure the voltage between terminal 75 and ground by backprobing.
- The voltage should measure battery positive voltage.

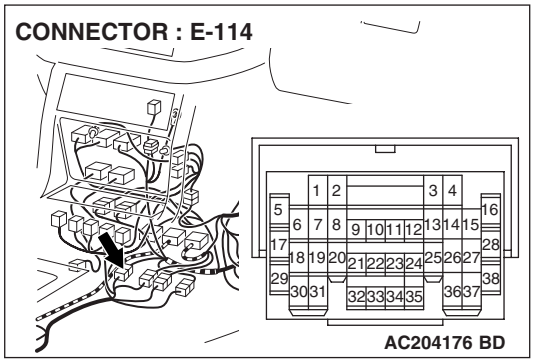
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage battery positive voltage?

YES : Go to Step 13.

NO : Go to Step 24.

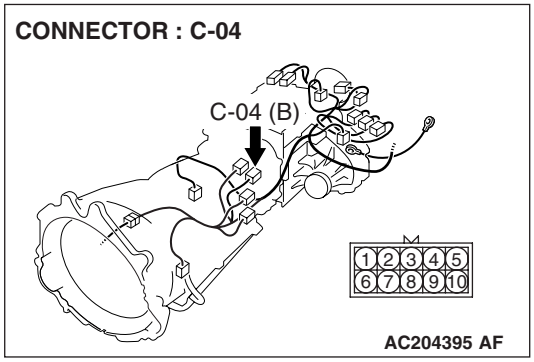


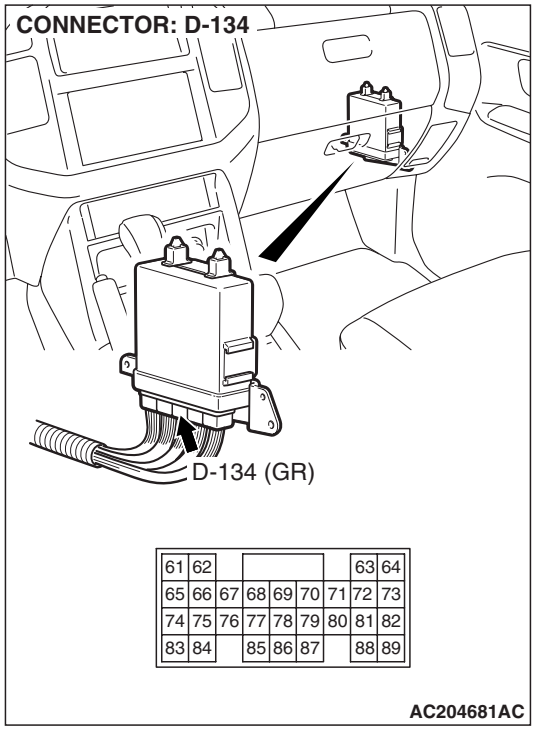


STEP 24. Check PCM connector D-134 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Are the connectors and terminals in good condition?

YES : Go to Step 25.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 25. Check harness for open circuit or short circuit to ground between transmission range switch connector C-04 terminal 2 and PCM connector D-134 terminal 75.

Q: Is the harness wire in good condition?

YES : Go to Step 26.

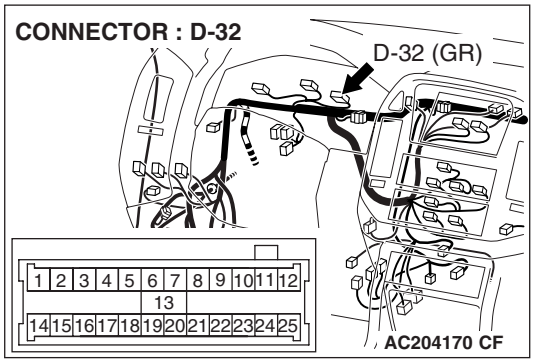
NO : Repair or replace the harness wire.

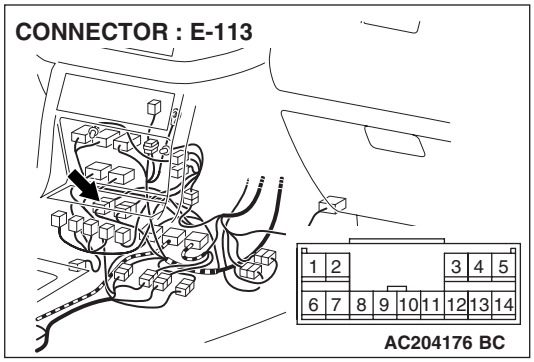
STEP 26. Check combination meter connector D-32 and intermediate connector E-113 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 27.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



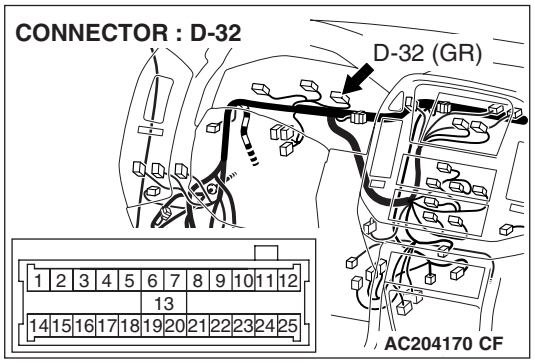


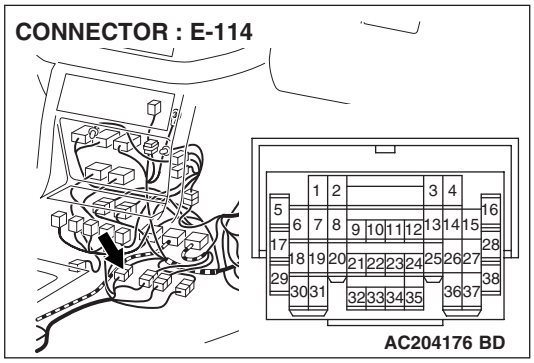
STEP 27. Check harness for short circuit to ground between combination meter connector D-32 terminal 3 and intermediate connector E-114 terminal 23.

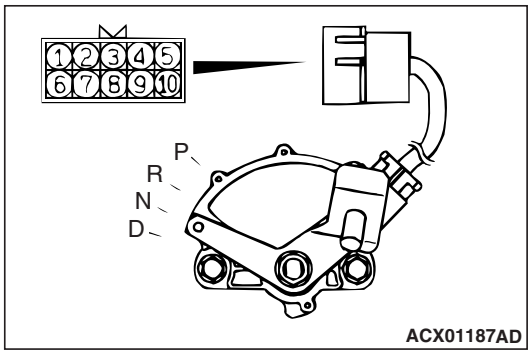
Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.







STEP 28. Check the transmission range switch.

Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	1 – 7	Less than 2 ohms.
R	7 – 8	
N	2 – 7	
D	3 – 7	

Q: Is the measured resistance less than 2 ohms for each transmission range?

YES : Go to Step 29.

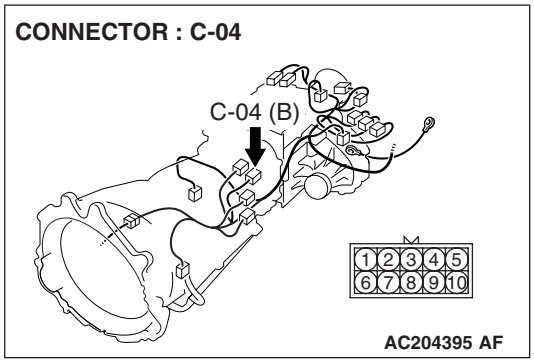
NO : Replace the transmission range switch. Refer to GROUP 23B, Transmission P.23B-14.

STEP 29. Check transmission range switch connector C-04 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is the connector in good condition?

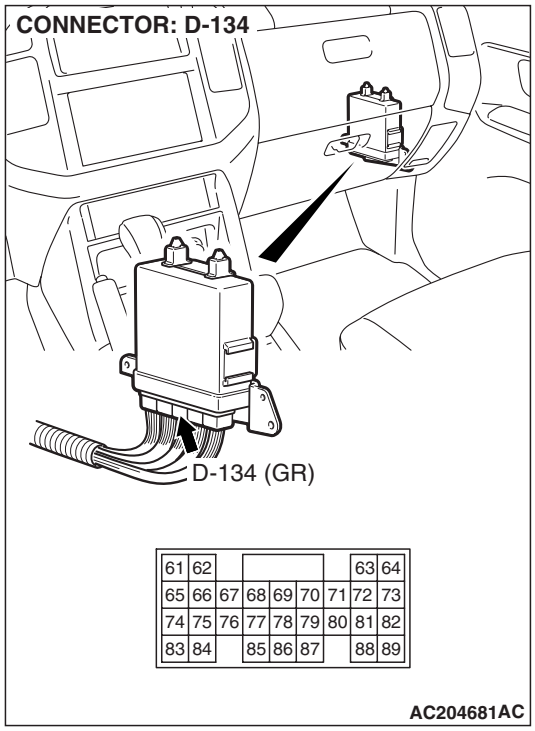
YES : Go to Step 30.

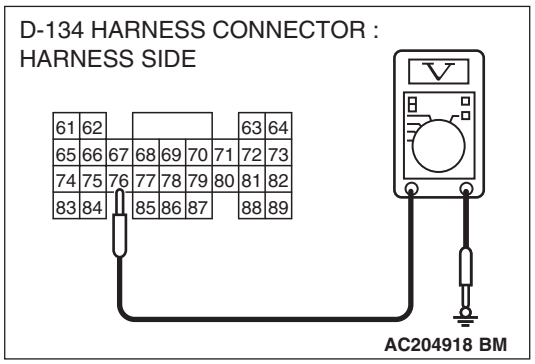
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 30. Measure the transmission range switch output voltage at PCM connector D-134 by backprobing.

(1) Do not disconnect connector D-134.
(2) Turn the ignition switch to the "ON" position.
(3) Move the selector lever to the "D" position.

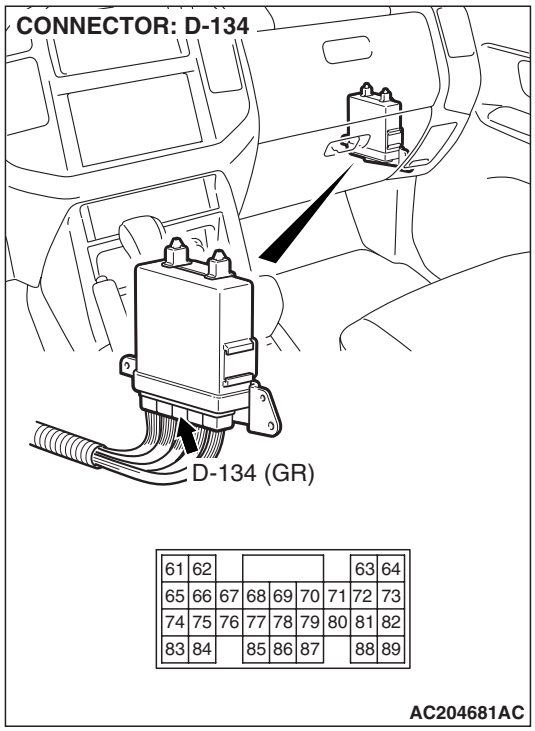


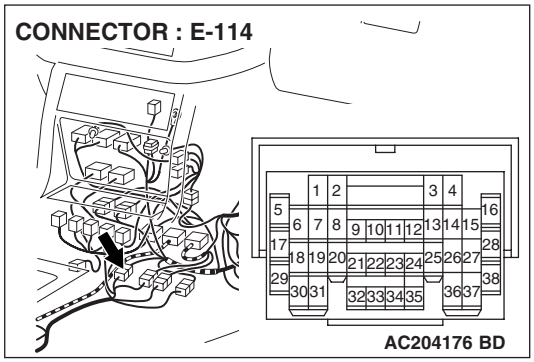


(4) Measure the voltage between terminal 76 and ground by backprobing.
  - The voltage should measure battery positive voltage.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage battery positive voltage?

YES : Go to Step 13.
NO : Go to Step 31.





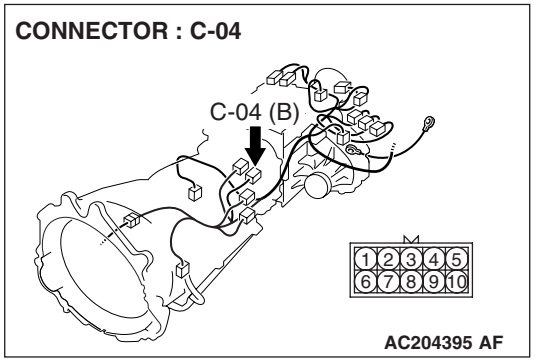
STEP 31. Check PCM connector D-134 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Are the connectors and terminals in good condition?

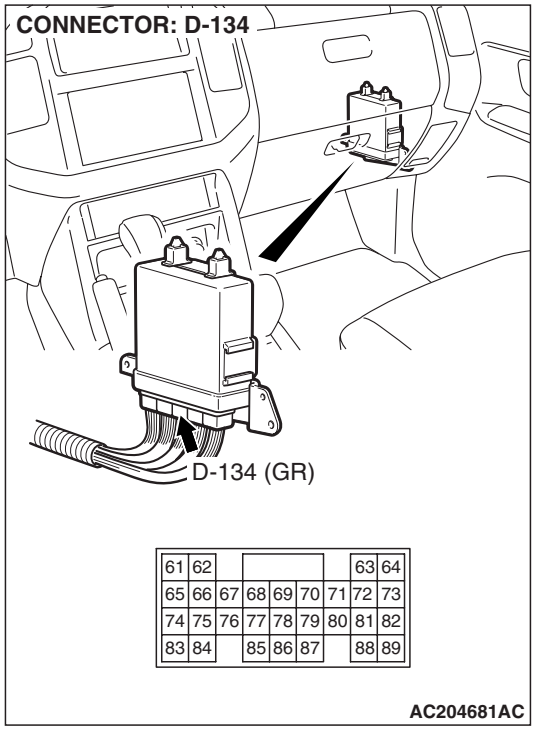
YES : Go to Step 32.

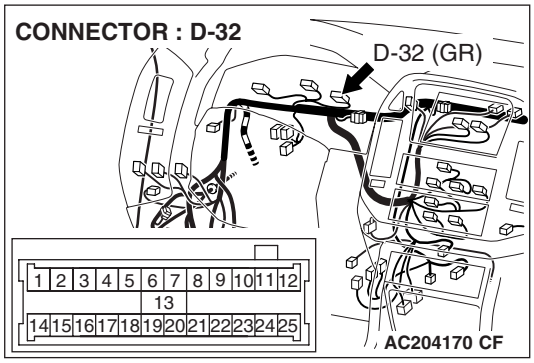
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

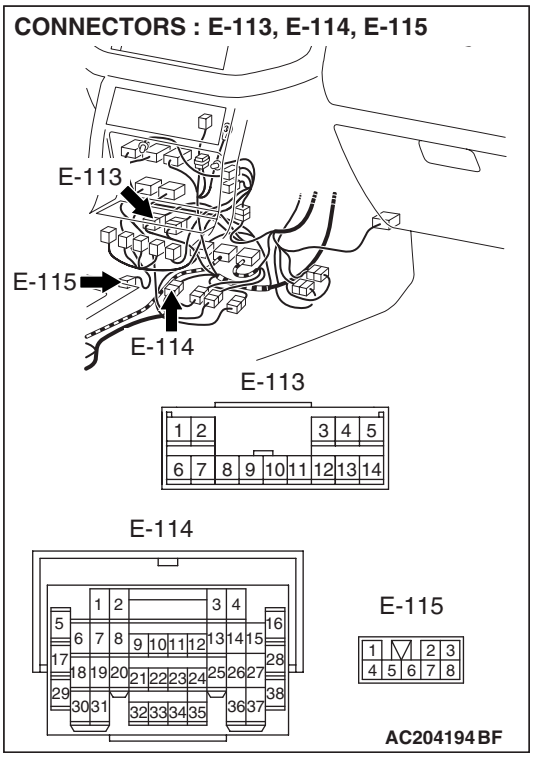
STEP 32. Check harness for open circuit or short circuit to ground between transmission range switch connector C-04 terminal 3 and PCM connector D-134 terminal 76.
Q: Is the harness wire in good condition?

YES : Go to Step 33.
NO : Repair or replace the harness wire.









STEP 33. Check combination meter connector D-32, intermediate connector E-113, E-114 and shift switch assembly connector E-115 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 34.

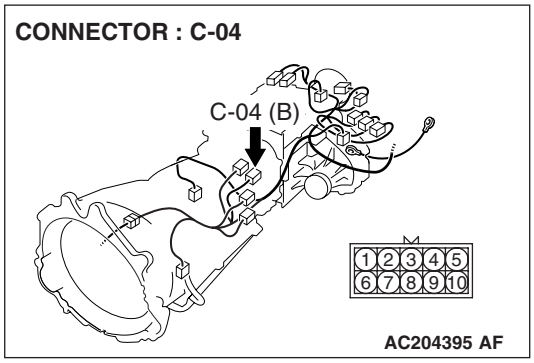
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

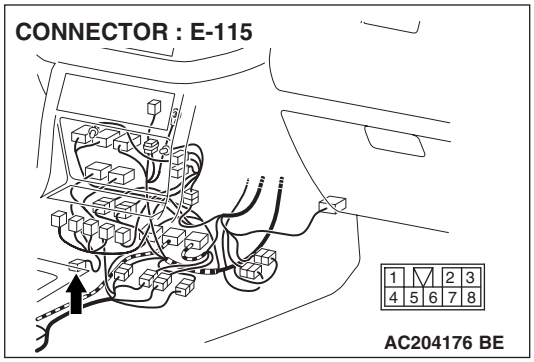
STEP 34. Check harness for short circuit to ground between transmission range switch connector C-04 terminal 3 and shift switch assembly connector E-115 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 35.

NO : Repair or replace the harness wire.



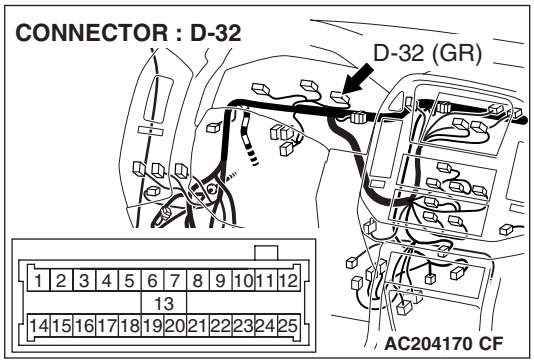


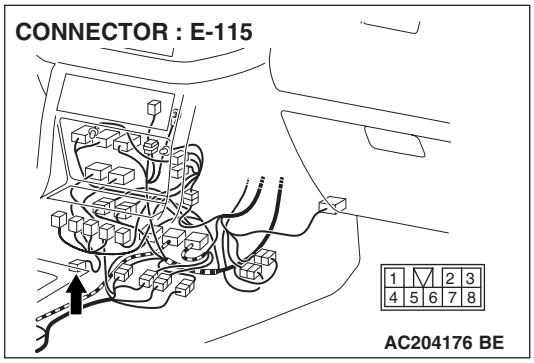
STEP 35. Check the harness for short circuit to ground between combination meter connector D-32 terminal 4 and shift switch assembly connector E-115 terminal 5.

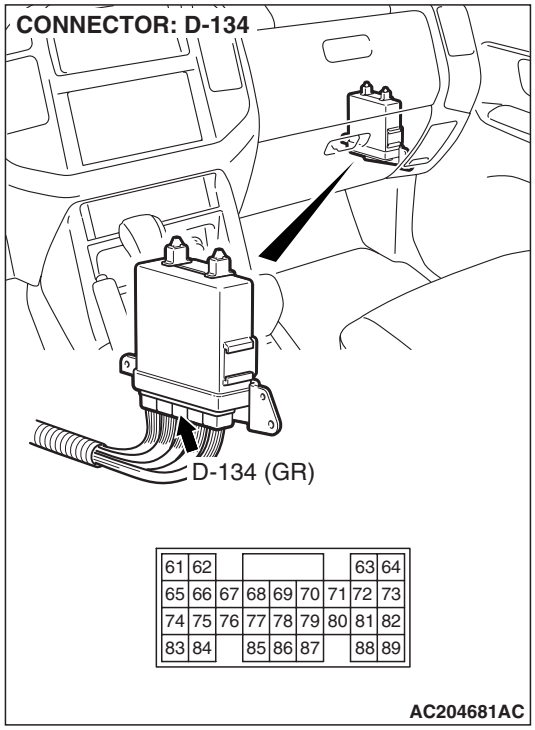
Q: Is the harness wire in good condition?

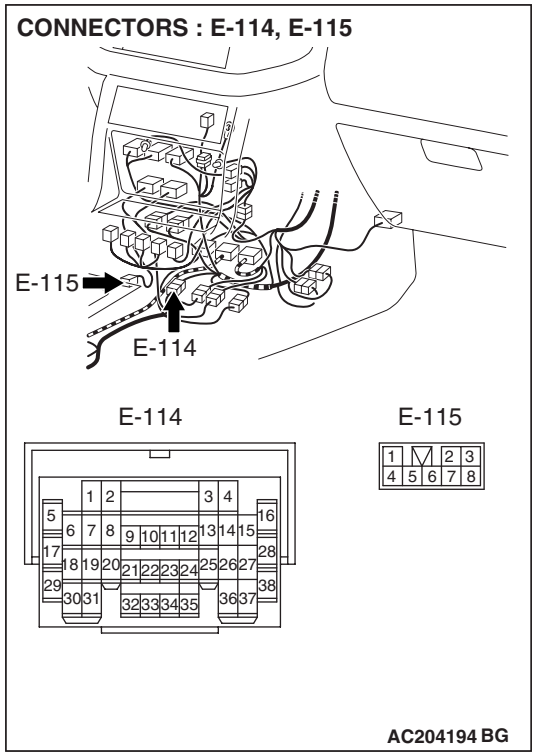
YES : Go to Step 5.

NO : Repair or replace the harness wire.









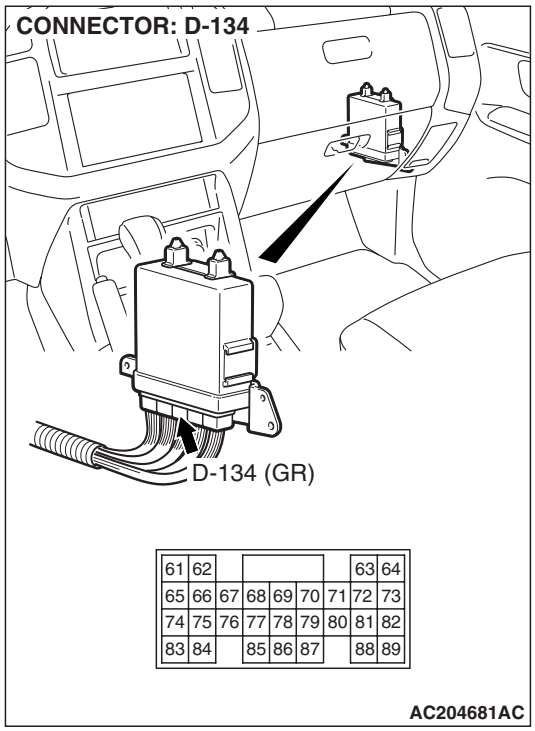
STEP 36. Check PCM connector D-134, intermediate connector E-114 and shift switch assembly connector E-115 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

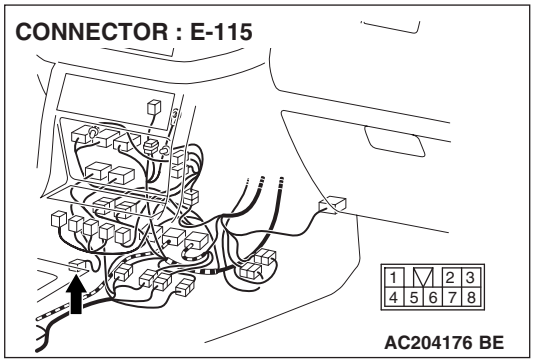
Q: Is the connector in good condition?

YES : Go to Step 37.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 37. Check the harness for short circuit to ground between PCM connector D-134 terminal 85 and shift switch assembly connector E-115 terminal 4.
Q: Is the harness wire in good condition?
YES : Go to Step 5.
NO : Repair or replace the harness wire.





DTC 28 (P0705): Transmission Range Switch System (Short Circuit)

TRANSMISSION RANGE SWITCH SYSTEM CIRCUIT
Refer to P.23A-122.

CIRCUIT OPERATION
Refer to P.23A-122.

DESCRIPTIONS OF MONITOR METHODS
If two types or more of signals are input from transmission range switch for more than 30 seconds, PCM judges that transmission range switch has a failure.

MONITOR EXECUTION
Continuous

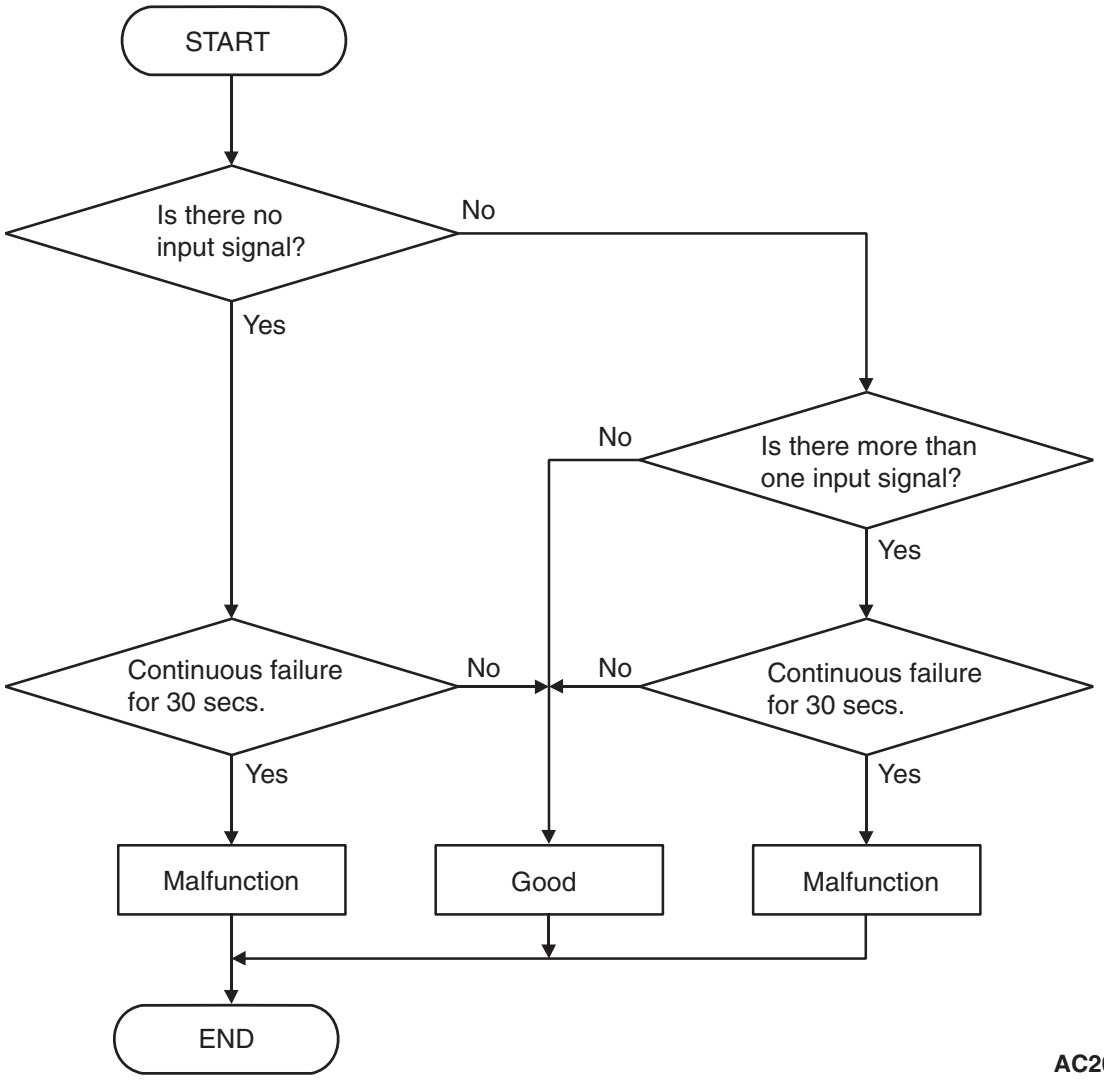
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

TSB Revision

LOGIC FLOW CHARTS (Monitor Sequence)



AC205064

DTC SET CONDITIONS

Check Conditions, Judgement Criteria

- Transmission range switch: multiple signal. (30 seconds)

OBD-II DRIVE CYCLE PATTERN

Start the engine, keep the vehicle stopped in P, R, N and D ranges respectively for more than one minute, and turn "LOCK" (OFF) the ignition switch. Then restart the engine, and stop the vehicle in P, R, N and D ranges respectively for more than one minute.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

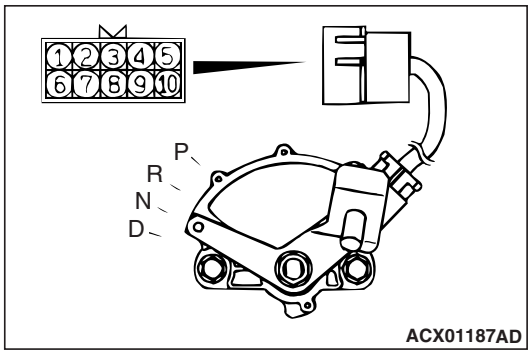
- Malfunction of the transmission range switch
- Malfunction of the ignition switch
- Damaged harness, connector
- Malfunction of the PCM

TSB Revision

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main harness B



STEP 1. Check the transmission range switch.

Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	1 – 7	Less than 2 ohms.
R	7 – 8	
N	2 – 7	
D	3 – 7	

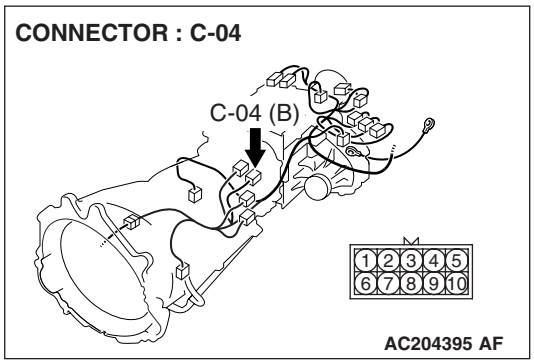
Q: Is the measured resistance less than 2 ohms for each selector position?

YES : Go to Step 2.

NO : Replace the transmission range switch. Refer to GROUP 23B, Transmission P.23B-14.

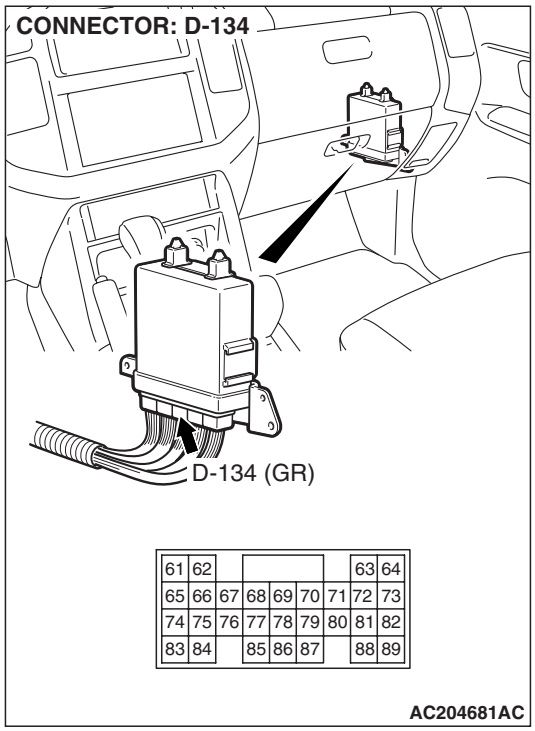
STEP 2. Check transmission range switch connector C-04 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?



YES : Go to Step 3.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 3. Check PCM connector D-134 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

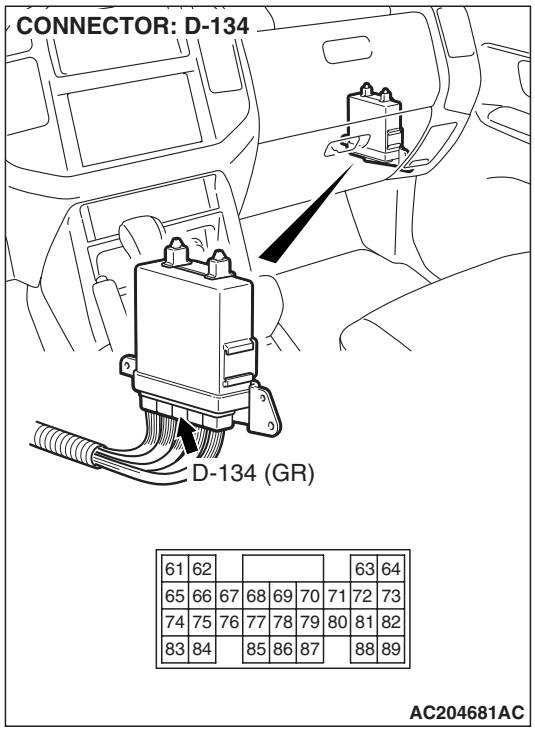
Q: Are the connector and terminals in good condition?

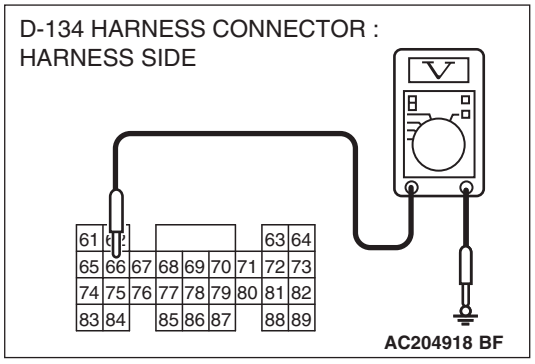
YES : Go to Step 4.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

STEP 4. Measure the transmission range switch output voltage at PCM connector D-134 by backprobing. ("P" position)

(1) Do not disconnect connector D-134.
(2) Turn the ignition switch to the "ON" position.

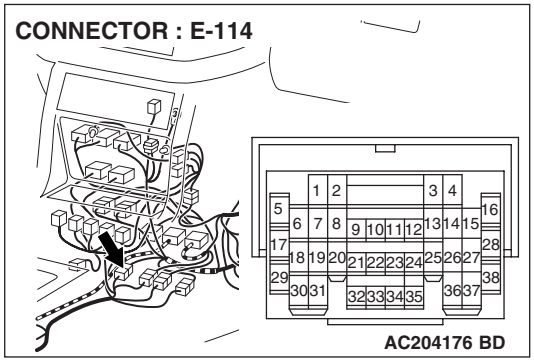




(3) Measure the voltage between terminal 66 and ground by backprobing.
- When transmission range is "P," voltage should measure battery positive voltage.
- When transmission range is "R," voltage should measure 0.5 volt or less.
- When transmission range is "N," voltage should measure 0.5 volt or less.
- When transmission range is "D," voltage should measure 0.5 volt or less.

Q: Is the measured voltage within the specified range?

YES : Go to Step 9.
NO : Turn the ignition switch to the "LOCK" (OFF) position. Go to Step 5.

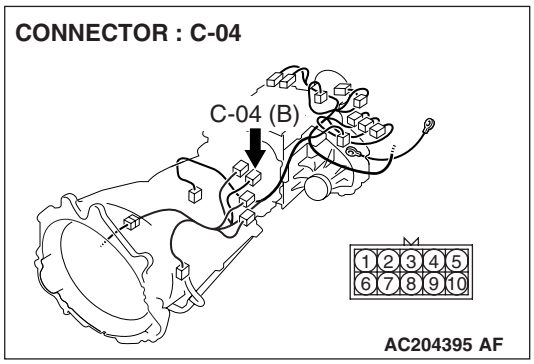


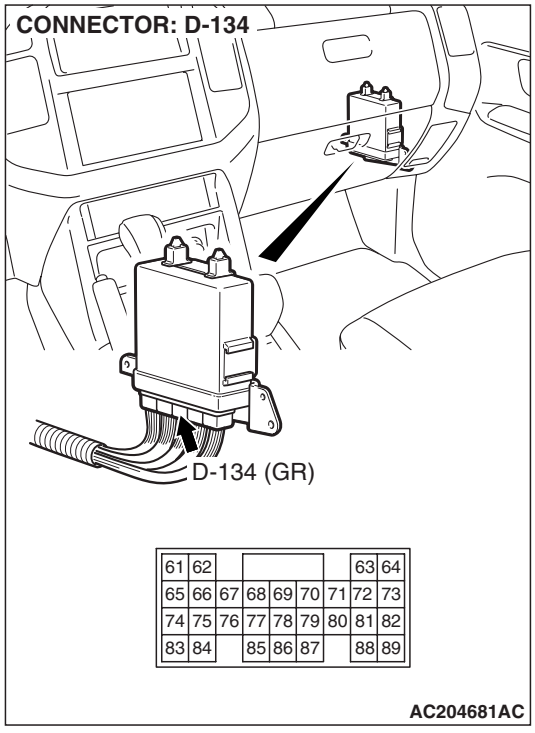
STEP 5. Check intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 6.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 6. Check harness for open circuit or short circuit to ground between transmission range switch connector C-04 terminal 1 and PCM connector D-134 terminal 66.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

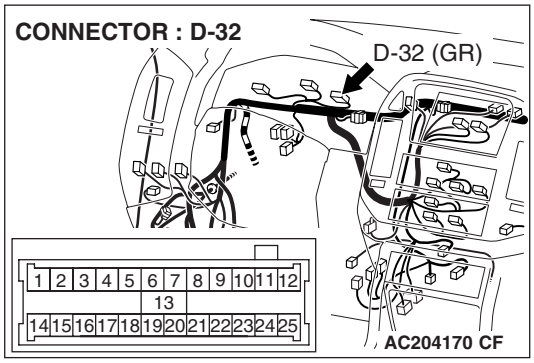
NO : Repair or replace the harness wire.

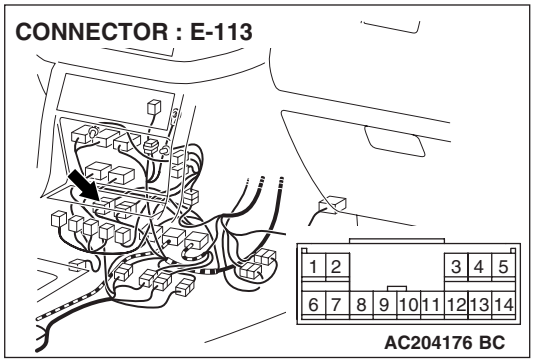
STEP 7. Check combination meter connector D-32 and intermediate connector E-113 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 8.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



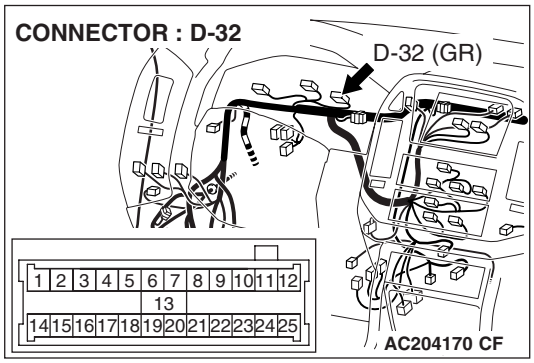


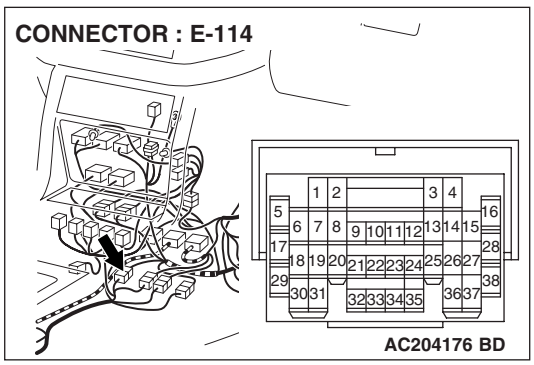
STEP 8. Check harness for damage or short circuit to ground between combination meter connector D-32 terminal 1 and intermediate connector E-114 terminal 22.

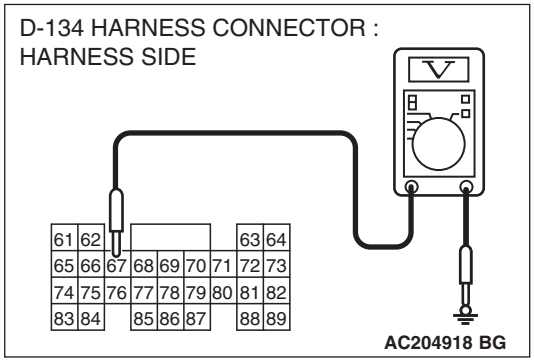
Q: Is the harness wire in good condition?

YES : Go to Step 25.

NO : Repair or replace the harness wire.







STEP 9. Measure the transmission range switch output voltage at PCM connector D-134 by backprobing. ("R" position)

Measure the voltage between terminal 67 and ground by back-probing.

- When transmission range is "P," voltage should measure 0.5 volt or less.
- When transmission range is "R," voltage should measure battery positive voltage.
- When transmission range is "N," voltage should measure 0.5 volt or less.
- When transmission range is "D," voltage should measure 0.5 volt or less.

Q: Is the measured voltage within the specified range?

YES : Go to Step 14.

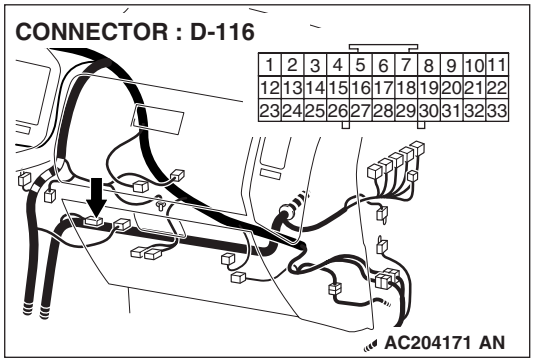
NO : Turn the ignition switch to the "LOCK" (OFF) position. Go to Step 10.

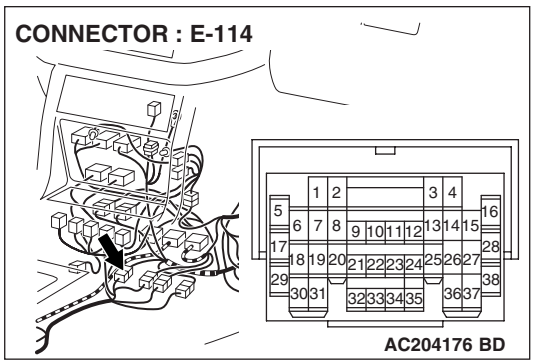
STEP 10. Check joint connector D-116 and intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector

Q: Are the connectors and terminals in good condition?

YES : Go to Step 11.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



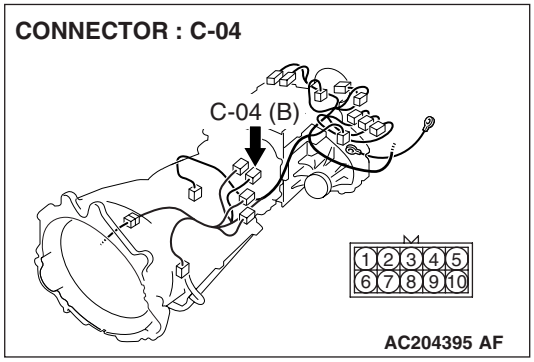


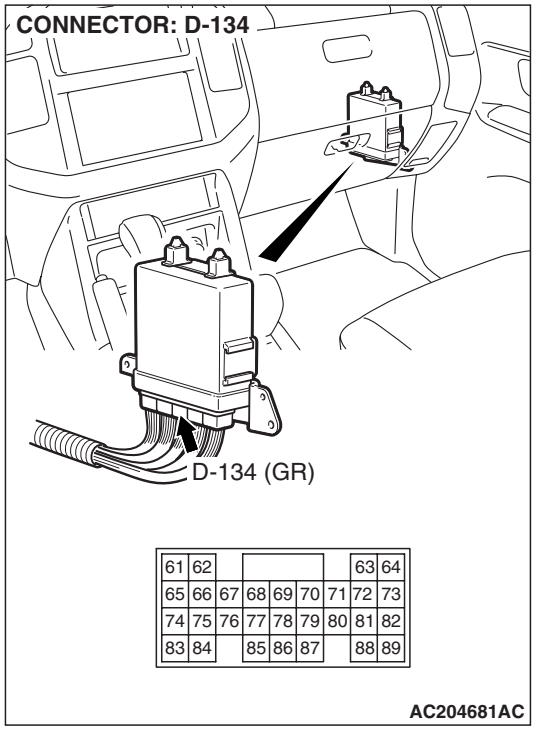
STEP 11. Check harness for open circuit or short circuit to ground between transmission range switch connector C-04 terminal 8 and PCM connector D-134 terminal 67.

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair or replace the harness wire.



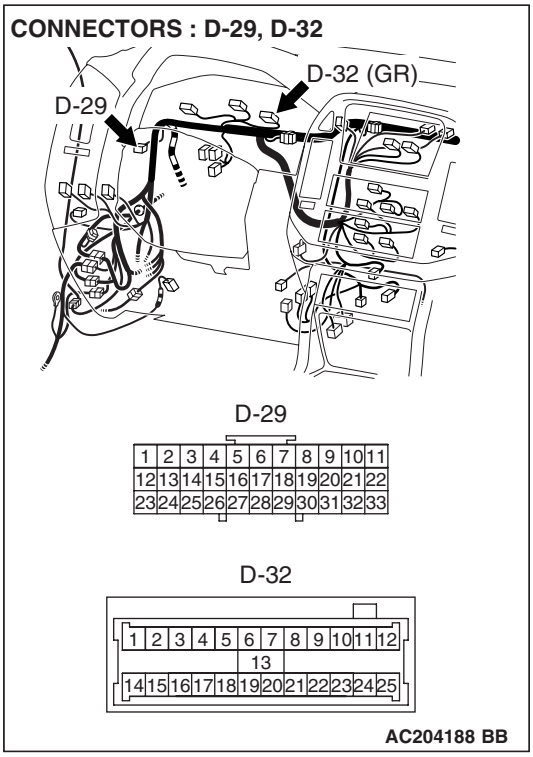


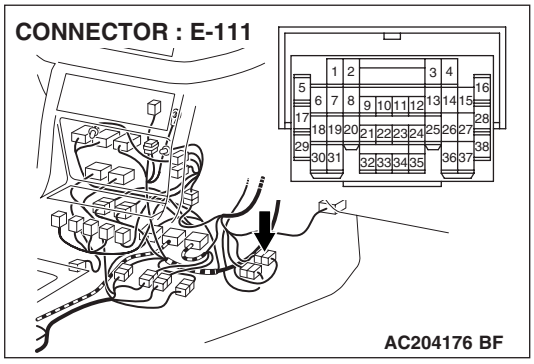
STEP 12. Check joint connector D-29, combination meter connector D-32 and intermediate connector E-111 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 13.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



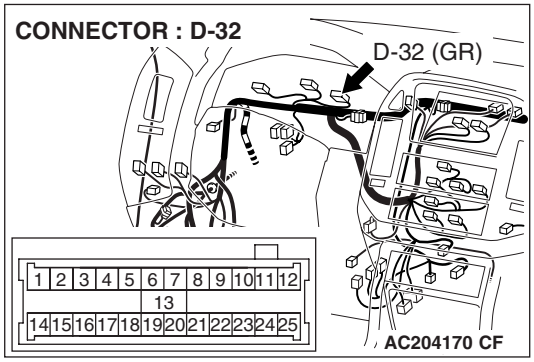


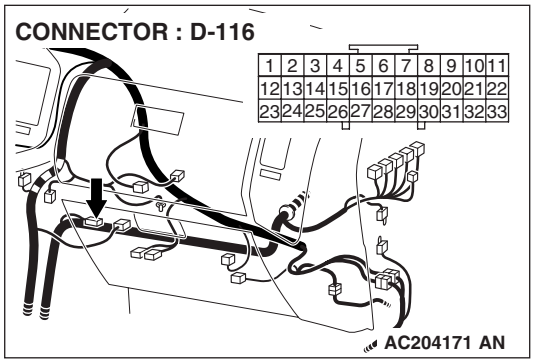
STEP 13. Check harness for damage or short circuit to ground between combination meter connector D-32 terminal 2 and joint connector D-116 terminal 33.

Q: Is the harness wire in good condition?

YES : Go to Step 25.

NO : Repair or replace the harness wire.





STEP 14. Measure the transmission range switch output voltage at PCM connector D-134 by backprobing. ("N" position)

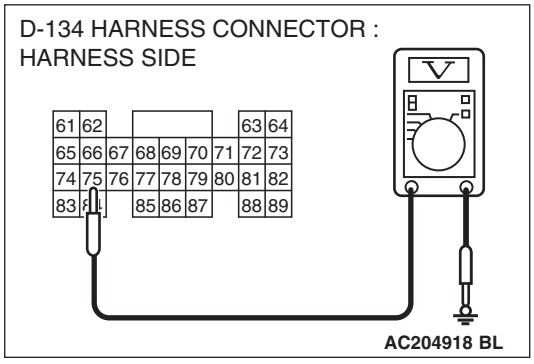
Measure the voltage between terminal 75 and ground by back-probing.

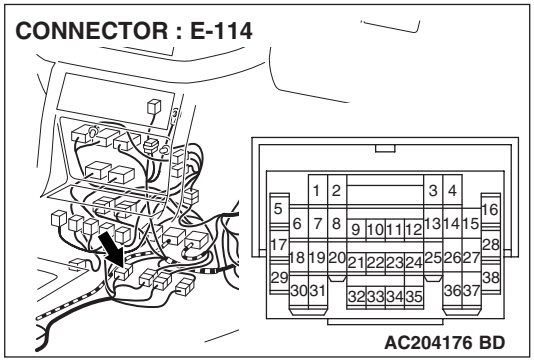
- When transmission range is "P," voltage should measure 0.5 volt or less.
- When transmission range is "R," voltage should measure 0.5 volt or less.
- When transmission range is "N," voltage should measure battery positive voltage.
- When transmission range is "D," voltage should measure 0.5 volt or less.

Q: Is the measured voltage within the specified range?

YES : Go to Step 19.

NO : Turn the ignition switch to the "LOCK" (OFF) position. Go to Step 15.



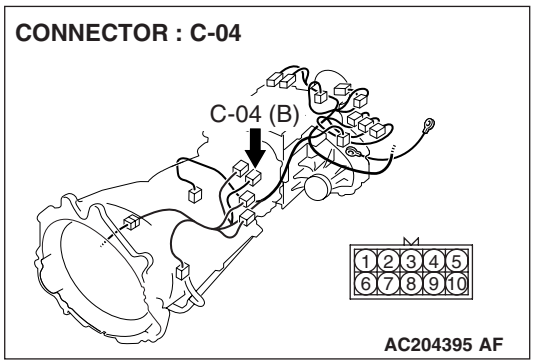


STEP 15. Check intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 16.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

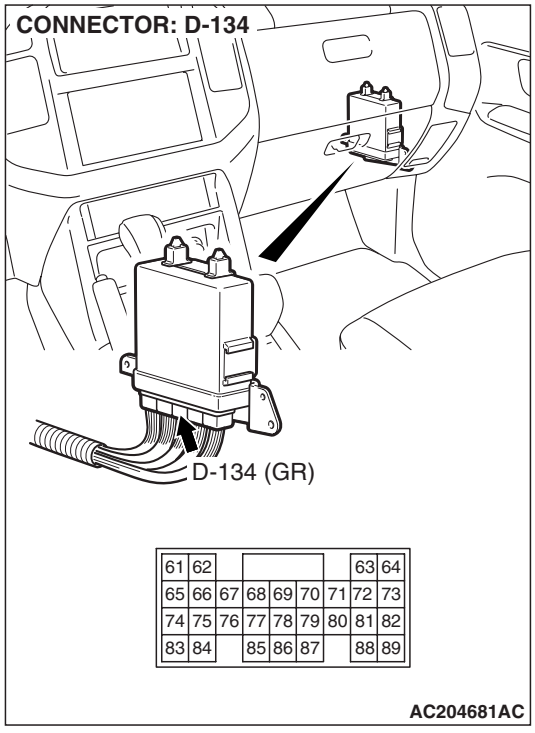


STEP 16. Check harness for open circuit or short circuit to ground between transmission range switch connector C-04 terminal 2 and PCM connector D-134 terminal 75.

Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair or replace the harness wire.

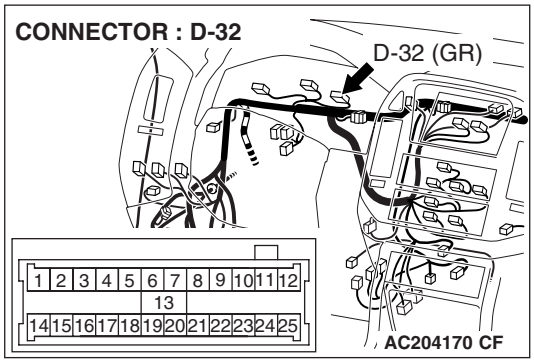


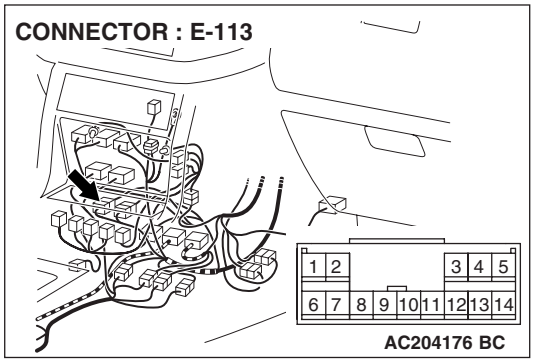
STEP 17. Check combination meter connector D-32 and intermediate connector E-113 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 18.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



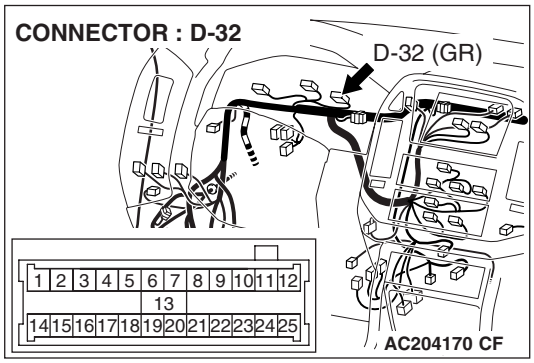


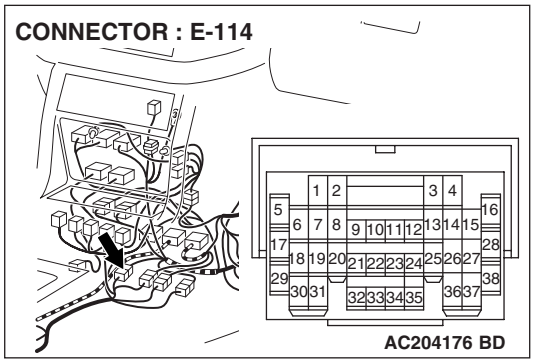
STEP 18. Check harness for damage or short circuit to ground between combination meter connector D-32 terminal 3 and intermediate connector E-114 terminal 23.

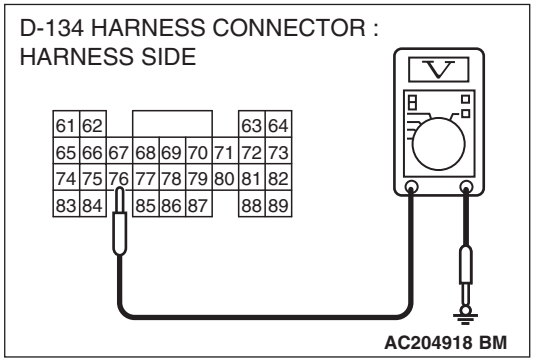
Q: Is the harness wire in good condition?

YES : Go to Step 25.

NO : Repair or replace the harness wire.







STEP 19. Measure the transmission range switch output voltage at PCM connector D-134 by backprobing. ("D" position)

Measure the voltage between terminal 76 and ground by back-probing.

- When transmission range is "P," voltage should measure 0.5 volt or less.
- When transmission range is "R," voltage should measure 0.5 volt or less.
- When transmission range is "N," voltage should measure 0.5 volt or less.
- When transmission range is "D," voltage should measure battery positive voltage.

Q: Is the measured voltage within the specified range?

YES : Go to Step 24.

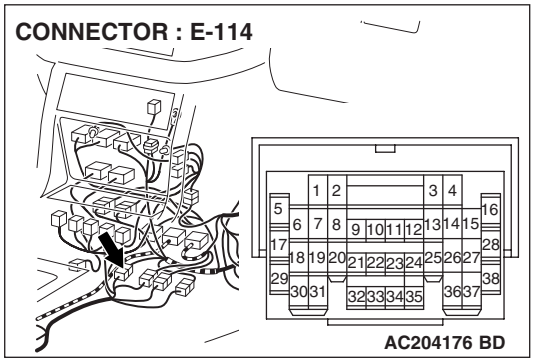
NO : Turn the ignition switch to the "LOCK" (OFF) position. Go to Step 20.

STEP 20. Check intermediate connector E-114 for loose, corroded or damaged terminals, or terminals pushed back in the connector

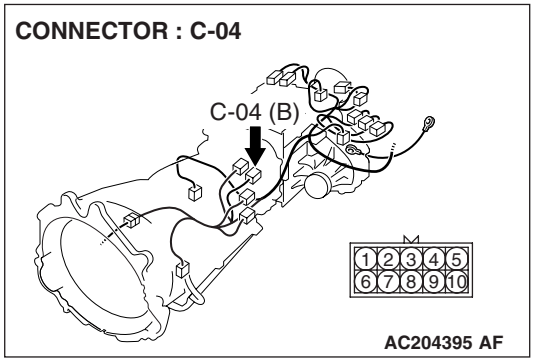
Q: Are the connector and terminals in good condition?

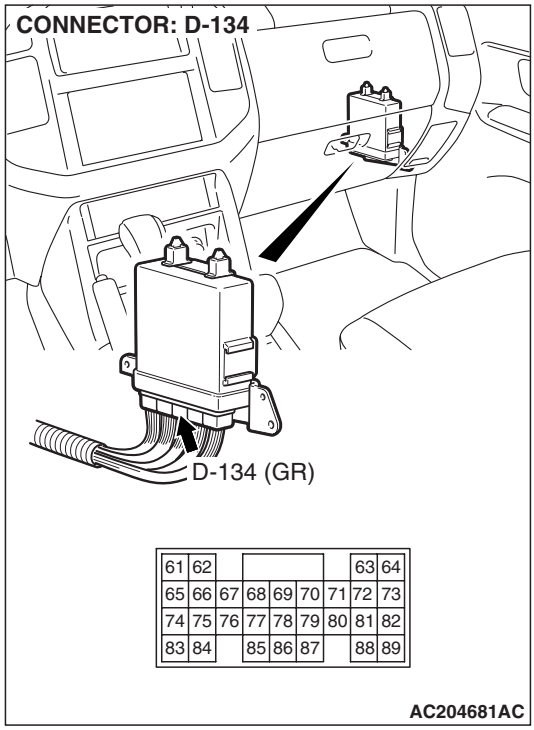
YES : Go to Step 21.

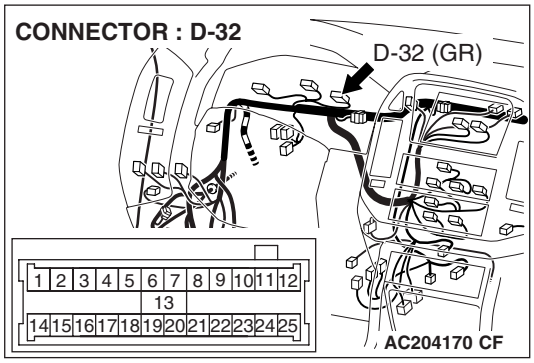
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

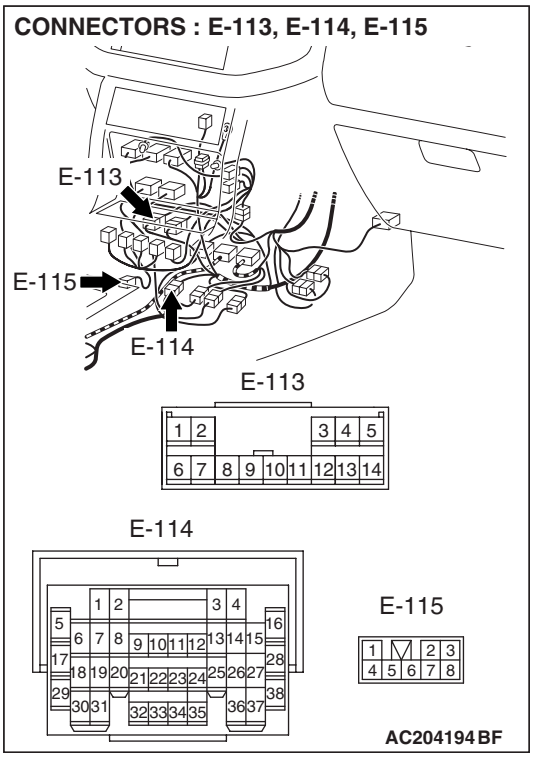


STEP 21. Check harness for open circuit or short circuit to ground between transmission range switch connector C-04 terminal 3 and PCM connector D-134 terminal 76.
Q: Is the harness wire in good condition?
YES : Go to Step 22.
NO : Repair or replace the harness wire.







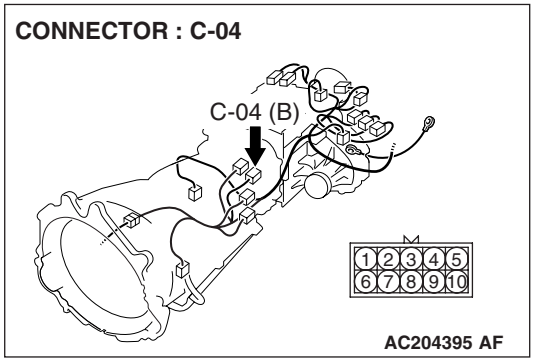


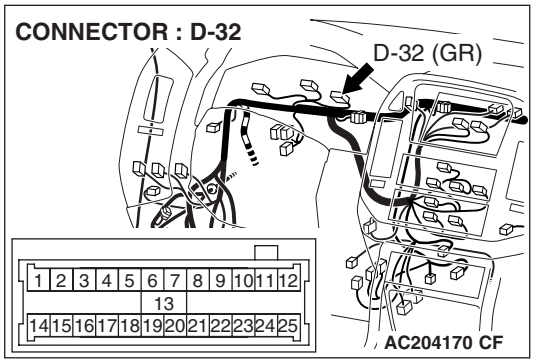
STEP 22. Check combination meter connector D-32, intermediate connector E-113, E-114 and shift switch assembly connector E-115 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 23.

NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



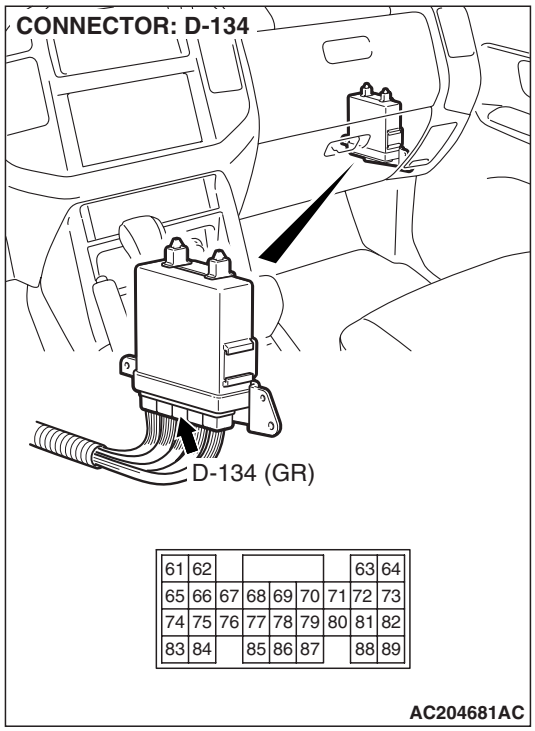


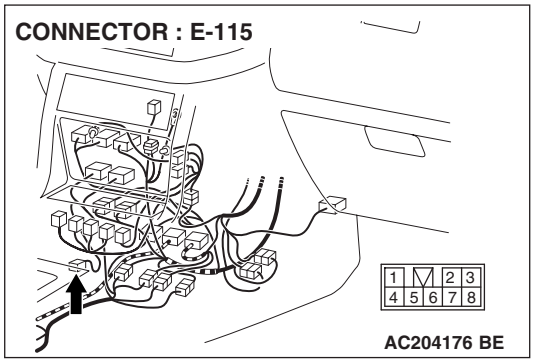
STEP 23. Check the harness for damage between transmission range switch connector C-04 terminal 3 and combination meter connector D-32 terminal 4.

Q: Is the harness wire in good condition?

YES : Go to Step 24.

NO : Repair or replace the harness wire.



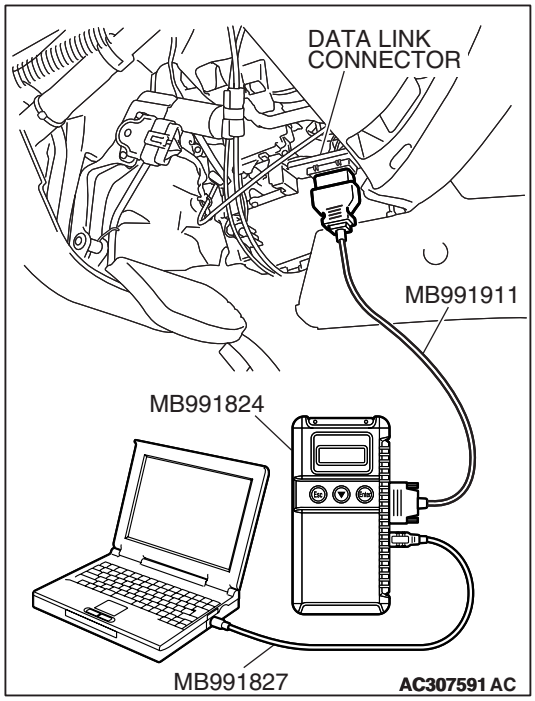


STEP 24. Check the harness for damage between PCM connector D-134 terminal 85 and shift switch assembly connector E-115 terminal 4.

Q: Is the harness wire in good condition?

YES : Go to Step 25.

NO : Repair or replace the harness wire.



STEP 25. Using scan tool MB991958, check data list item 61: Transmission Range Switch.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 61: Transmission Range Switch.
  - Move the selector lever to "P," "R," "N," "D" and sport mode positions and confirm that the selected transmission ranges match the positions (Sport mode is indicated as "D" on scan tool MB991958).

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

NO : Replace the PCM.

NEXT>>