GROUP 00

GENERAL

CONTENTS

GROUP 00

GENERAL

CONTENTS

HOW TO USE THIS MANUAL

M1001000100994

MAINTENANCE, REPAIR AND SERVICING EXPLANATIONS

This manual provides explanations, etc. concerning procedures for the inspection, maintenance, repair and servicing of the subject model. Unless otherwise specified, each service procedure covers all models. Procedures covering specific models are identified by the model codes, or similar designation (engine type, transaxle type, etc). A description of these designations is covered in this manual under "VEHICLE IDENTIFICATION."

ON-VEHICLE SERVICE

The "ON-VEHICLE SERVICE" section has procedures for performing inspections and adjustments of particularly important components. These procedures are done with regard to maintenance and servicing, but other inspections (looseness, play, cracking, damage, etc.) must also be performed.

SERVICE PROCEDURES

The service steps are arranged in numerical order. Attention to be paid in performing vehicle service are described in detail in SERVICE POINTS.

DEFINITION OF TERMS

STANDARD VALUE

Indicates the value used as the standard for judging whether or not a part or adjustment is correct.

LIMIT

Shows the maximum or minimum value for judging whether or not a part or adjustment is acceptable.

REFERENCE VALUE

Indicates the adjustment value prior to starting the work (presented in order to facilitate assembly and adjustment procedures, and so they can be completed in a shorter time).

DANGER, WARNING, AND CAUTION

DANGER, WARNING, and CAUTION call special attention to a necessary action or to an action that must be avoided. The differences among DANGER, WARNING, and CAUTION are as follows:

- If a DANGER is not followed, the result is severe bodily harm or even death.
- If a WARNING is not followed, the result could be bodily injury.
- If a CAUTION is not followed, the result could be damage to the vehicle, vehicle components or service equipment.

TIGHTENING TORQUE INDICATION

The tightening torque indicates a median and its tolerance by a unit of N·m (in-lb) or N·m (ft-lb). For fasteners with no assigned torque value, refer to P.00-41.

SPECIAL TOOL NOTE

Only MMC special tool part numbers are called out in the repair sections of this manual. Please refer to the special tool cross-reference chart located at the beginning of each group, for the special tool number that is available in your market.

ABBREVIATIONS

The following abbreviations are used in this manual for classification of model types:

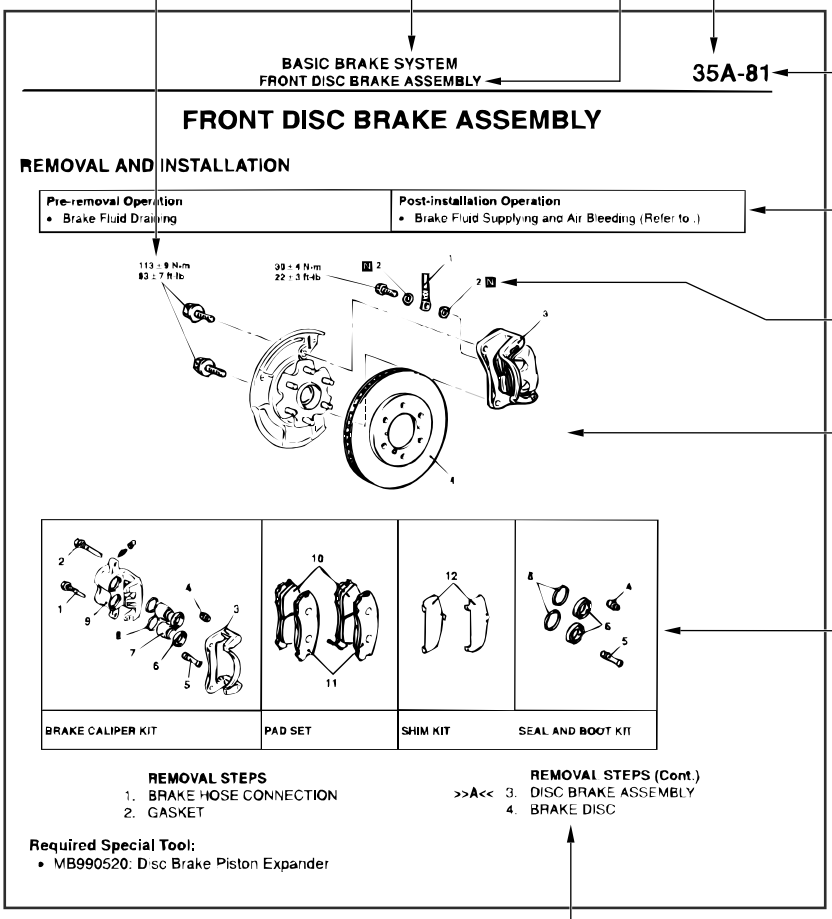
A/T:Automatic transaxle, or models equipped with automatic transaxle.
MFI: Multiport fuel injection, or engines equipped with multiport fuel injection.
2.4L engine: 2.4 liter <4G69> engine, or a model equipped with such an engine.
3.8L engine: 3.8 liter <6G75> engine, or a model equipped with such an engine.

Indicates the section title.

Denotes tightening torque. If there is no indication of tightening torque, refer to tightening torque.

Indicates the group title.

Indicates the group number.



Indicates the page number.

Indicates procedures to be performed before the work in that section is started, and procedures to be performed after the work in that section is finished.

Mark **N** denotes non-reusable part.

Component diagram
A diagram of the component parts is provided near the front of each section in order to give the reader a better understanding of the installed condition of component parts.

Repair kit or parts sets are shown.
(Only very frequently used parts are shown.)

Maintenance and servicing procedures

The numbers provided within the diagram indicate the sequence for maintenance and servicing procedures.

- Removal steps :
  The part designation number corresponds to the number in the illustration to indicate removal steps.
- Disassembly steps :
  The part designation number corresponds to the number in the illustration to indicate disassembly steps.
- Installation steps :
  Specified in case installation is impossible in reverse order of removal steps. Omitted if installation is possible in reverse order of removal steps.
- Assembly steps :
  Specified in case installation is impossible in reverse order of removal steps. Omitted if assembly is possible in reverse order of disassembly steps.

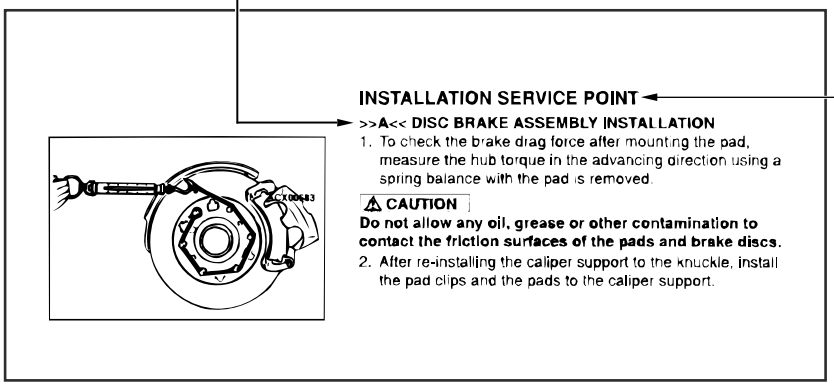
AC400266AB

TSB Revision

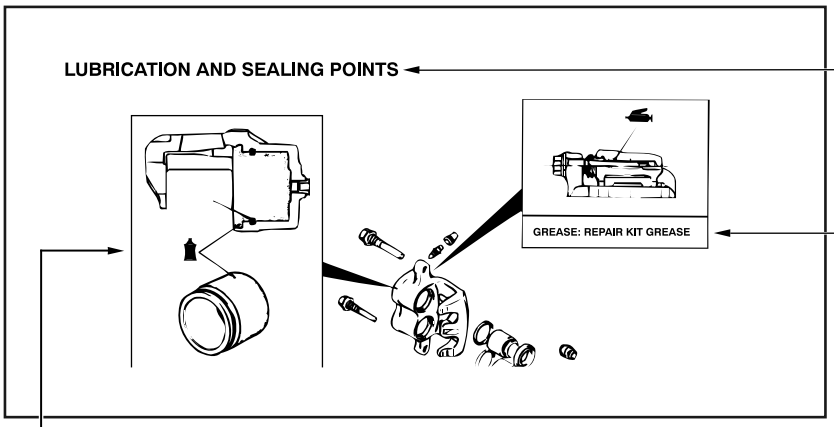
Classifications of major maintenance / service points

When there are major points relative to maintenance and servicing procedures (such as essential maintenance and service points, maintenance and service standard values, information regarding the use of special tools, etc.). These are arranged together as major maintenance and service points and explained in detail.

<<A>> : Indicates that there are essential points for removal or disassembly.
>>A<< : Indicates that there are essential points for installation or assembly.



Operating procedures, cautions, etc. on removal, installation, disassembly and assembly are described



The title of the page (following the page on which the diagram of component parts is presented) indicating the locations of lubrication and sealing procedures.

Indicates (by symbols) where lubrication is necessary.

Symbols for lubrication, sealants and adhesives

Symbols are used to show the locations for lubrication and for application of sealants and adhesives. These symbols are included in the diagram of component parts or on the page following the component parts page. The symbols do not always have accompanying text to support that symbol.

- : Grease (Multi-purpose grease unless there is a brand or type specified)
- : Sealant or adhesive
- : Brake fluid or automatic transmission fluid
- : Engine oil, gear oil or air conditioning compressor oil
- : Adhesive tape or butyl rubber tape

AC400267AB

TSB Revision

TROUBLESHOOTING GUIDELINES

M1001008800340

VERIFY THE COMPLAINT

- Make sure the customer's complaint and the service writer's work order description are understood before starting work.
- Make sure you understand the correct operation of the system. Read the service manual description to verify normal system operation.
- Operate the system to see the symptoms. Look for other symptoms that were not reported by the customer, or on the work order, that may be related to the problem.

DETERMINE POSSIBLE CAUSES

Compare the confirmed symptoms to the diagnostic symptom indexes to find the right diagnosis procedure.

If the confirmed symptoms cannot be found on any symptom index, determine other possible causes.

- Analyze the system diagrams and list all possible causes for the problem symptoms.
- Rank all these possible causes in order of probability, based on how much of the system they cover, how likely they are to be the cause, and how easy they will be to check. Be sure to take experience into account. Consider the causes of similar problems seen in the past. The list of causes should be ranked in order from general to specific, from most-likely to least-likely, and from easy-to-check to hard-to-check.

FIND THE PROBLEM

After the symptoms have been confirmed, and probable causes have been identified, the next step is to make step-by-step checks of the suspected system components, junctions, and links in logical order.

Use the diagnostic procedures in the service manual whenever possible. Follow these procedures carefully to avoid missing an important step in the diagnosis sequence. It might be the skipped step that leads to the solution of the problem.

If the service manual doesn't have step-by-step procedures to help diagnose the problem, make a series of checks based on the ranked list of probable causes. Troubleshooting checks should be made in the order that the list of causes was ranked:

- general to specific
- most-likely to least-likely
- easy-to-check to hard-to-check

REPAIR THE PROBLEM

When the step-by-step troubleshooting checks find a fault, perform the proper repairs. Make sure to fix the root cause of the problem, not just the symptom. Just fixing the symptom, without fixing the root cause, will cause the symptom to eventually return.

VERIFY THE REPAIR

After repairs are made, recheck the operation of the system to confirm that the problem is eliminated. Be sure to check the system thoroughly. Sometimes new problems are revealed after repairs have been made.

HOW TO USE TROUBLESHOOTING/INSPECTION SERVICE POINTS

TROUBLESHOOTING CONTENTS

M1001013300200

⚠ CAUTION

- **During diagnosis, a DTC code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for DTC code(s). If DTC code(s) are set, erase them all.**
- **When the M.U.T.-III detects a diagnostic trouble code, its display informs users whether a mechanical problem currently exists ("current trouble") or whether it existed before but normal operation has been restored ("past trouble"). However, if an MFI, TPMS or SRS airbag-related DTC is set, "Active DTC/Stored DTC" is not displayed. In this case, follow the diagnosis procedure for current trouble.**
- **If a trouble, detected in a CAN communication-capable system, can be reproduced, diagnose the CAN bus lines (Refer to GROUP 54C, Can Bus Line Diagnostics Chart P.54C-16).**

Troubleshooting of electronic control systems for which the scan tool can be used follows the basic outline described below. Even in systems for which the scan tool cannot be used, part of these systems still follow this outline.

1. STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

Troubleshooting strategy is shown in each group.

2. SYSTEM OPERATION AND SYMPTOM VERIFICATION TESTS

If verification of the symptom(s) is difficult, procedures for checking operation and verifying symptoms are shown.

3. DIAGNOSTIC FUNCTION

The following trouble code diagnoses are shown.

- How to read diagnostic trouble codes
- How to erase diagnostic trouble codes
- Input inspection service points

4. DIAGNOSTIC TROUBLE CODE CHART

If the scan tool displays a diagnostic trouble code, find the applicable inspection procedure according to this chart.

5. SYMPTOM CHART

If there are symptoms, even though the scan tools show that no DTCs are set, inspection procedures for each symptom will be found by using this chart.

6. DIAGNOSTIC TROUBLE CODE PROCEDURES

Indicates the inspection procedures corresponding to each diagnostic trouble code. (Refer to P.00-8).

7. SYMPTOM PROCEDURES

Indicates the inspection procedures corresponding to each symptom listed in the Symptom Chart (Refer to P.00-8).

8. SERVICE DATA REFERENCE TABLE

Inspection items and normal judgment values have been provided in this chart as reference information.

9. CHECK AT ECU TERMINALS

Terminal numbers for the ECU connectors, inspection items, and standard values have been provided in this chart as reference information.

TERMINAL VOLTAGE CHECKS

1. Connect a needle-nosed wire probe to a voltmeter probe.

⚠ CAUTION

Short-circuiting the positive (+) probe between a connector terminal and ground could damage the vehicle wiring, the sensor, the ECU, or all three. Use care to prevent this!

2. Insert the needle-nosed wire probe into each of the ECU connector terminals from the wire side, and measure the voltage while referring to the check chart.

   NOTE: Measure voltage with the ECU connectors connected.
   You may find it convenient to pull out the ECU to make it easier to reach the connector terminals. Checks don't have to be carried out in the order given in the chart.

3. If voltage readings differ from normal condition values, check related sensors, actuators, and wiring. Replace or repair as needed.

4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

TERMINAL RESISTANCE AND CONTINUITY CHECKS

1. Turn the ignition switch to the "LOCK" (OFF) position.
2. Disconnect the ECU connector.

⚠ CAUTION

If resistance and continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ECU, and/or ohmmeter may occur. Use care to prevent this!

3. Measure the resistance and check for continuity between the terminals of the ECU harness-side connector while referring to the check chart.

NOTE: Checks don't have to be carried out in the order given in the chart.

4. If the ohmmeter shows any deviation from the Normal Condition value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair has corrected the problem.

10. INSPECTION PROCEDURES USING AN OSCILLOSCOPE

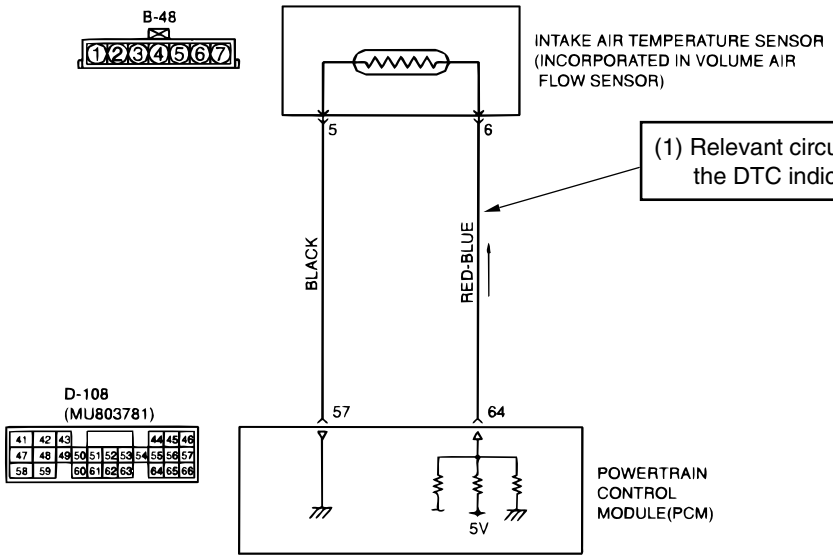
When there are inspection procedures using an oscilloscope, these are listed.

HOW TO USE THE INSPECTION PROCEDURES

M1001013500271

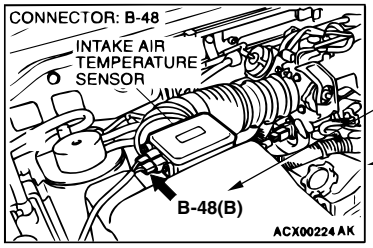
The causes of many of the problems occurring in electric circuitry are generally the connectors, components, the ECU, and the harnesses between connectors, in that order. These inspection procedures follow this order. They first try to discover a problem with a connector or a defective component.

DTC P0110: Intake Air Temperature Circuit Malfunction



(1) Relevant circuit(s) of the component which the DTC indicates are described.

(2) For connector color, refer to GROUP 80A, How to read configuration diagrams.



(3) Shows the location of the connector(s) from the circuit(s) above.

(4) Explains about the operation principle of the component or its relevant parts in that circuit.

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal 6) from the PCM (terminal 64) via the resistor in the PCM. The ground terminal (terminal 5) is grounded with or PCM (terminal 57).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

ACX00861AE

(5) Explains about technical details.

(6) Describes the conditions for that DTC being set (stored).

(7) Describes possible cause(s)for that DTC.

(8) Start of the diagnosis procedure for that DTC.

(9) Identifies the special tool(s) necessary for diagnosing that DTC.

(10) Provides the inspection procedure for that DTC step by step.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The PCM checks whether this voltage is within a specified range.

DTC SET CONDITIONS

Check Conditions

- Engine coolant temperature was 7°C (45°F) or more immediately before the engine was stopped at the last drive.

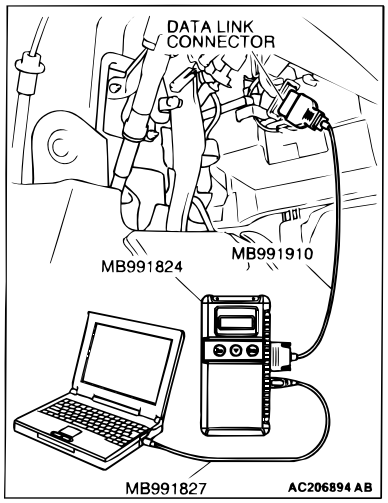
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- PCM failed.

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



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 for 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 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 .

NO : Go to Step 2.

AC210616AB

CURRENT TROUBLE

Indicates that the trouble is currently present. Carry out troubleshooting as described in the applicable inspection procedure.

PAST TROUBLE

Indicates that the status is "Stored" and the trouble is historic. Since the trouble may still be present, set the vehicle to the diagnosis code detection condition and check that the status changes to "Active". If the status does not change from "Stored", observe the applicable inspection procedure with particular emphasis on connector(s) and wiring harness.

TSB Revision

HARNESS INSPECTION

Check for an open or short circuit in the harness between the terminals which were faulty according to the connector measurements. Carry out this inspection while referring to GROUP 00E, Harness Connector Inspection P.00E-2. Here, "Check harness between power supply and terminal xx" also includes checking for blown fuse. For inspection service points when there is a blown fuse, refer to "Inspection Service Points for a Blown Fuse P.00-16."

MEASURES TO TAKE AFTER REPLACING THE PCM OR ECU

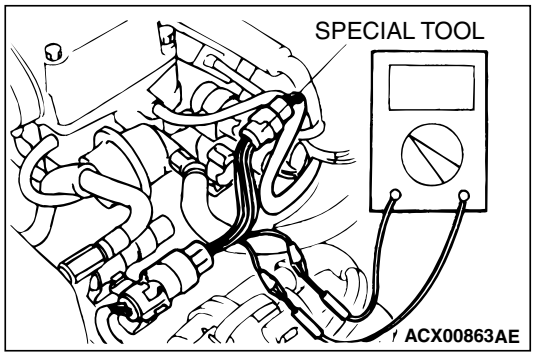
If the trouble symptoms have not disappeared even after replacing the PCM or ECU, repeat the inspection procedure from the beginning.

CONNECTOR MEASUREMENT SERVICE POINTS

M1001013600212

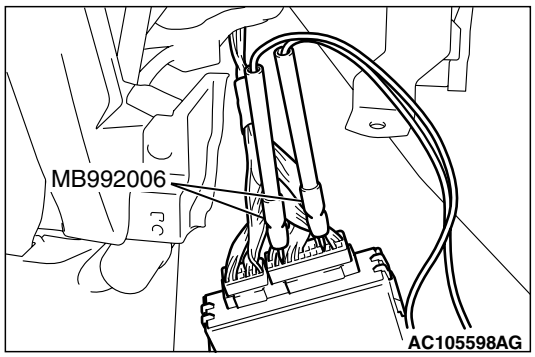
Turn the ignition switch to the "LOCK" (OFF) position when connecting and disconnecting the connectors. Turn the ignition switch to "ON" when measuring, unless there are instructions to the contrary.

IF INSPECTING WITH THE CONNECTOR CONNECTED <WATERPROOF CONNECTORS>



Be sure to use special tool. Never insert a test probe from the harness side, as this will reduce the waterproof performance and result in corrosion.

IF INSPECTING WITH THE CONNECTOR CONNECTED <ORDINARY (NON-WATERPROOF) CONNECTORS>



Required Special Tool:

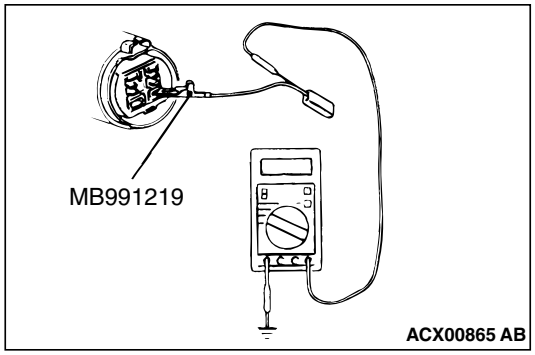
- MB992006: Extra Fine Probe

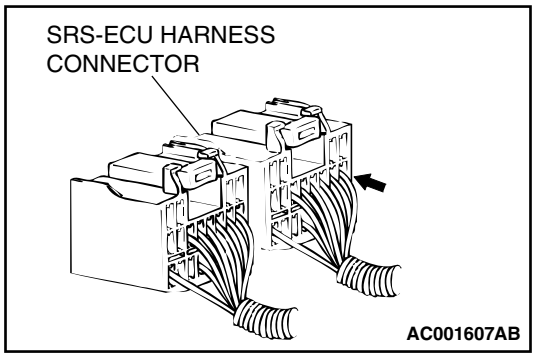
Inspect by inserting a test probe from the harness side. If the connector is too small to insert a test probe (e.g. control unit connector), do not insert it forcibly. Use special tool extra fine probe (MB992006).

IF INSPECTING WITH THE CONNECTOR DISCONNECTED <WHEN INSPECTING A FEMALE PIN>

Required Special Tool:

- MB991219: Inspection Harness (Included in MB991223, Harness Set)
- The special tool MB991219 for connector pin contact pressure should be used. The test probe should never be forcibly inserted, as it may cause a defective contact.





- From back side of the connector (SRS-ECU harness side connector)
- Since the SRS-ECU harness connector is plated to improve conductivity, observe the warning below when checking this connector.

⚠ *WARNING*

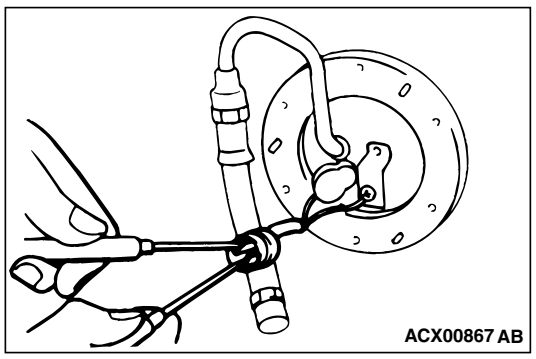
Insert the backprobing tool into the connector from the harness side, and connect the tester to the backprobing tool. If any tool other than the backprobing tool is used, it may cause damage to the harness and other components. Furthermore, measurement should not be carried out by touching the backprobing tool directly against the terminals from the front of the connector. The terminals are plated to increase their conductivity, so that if they are touched directly by the backprobing tool, the plating may break, which will decrease reliability.

IF INSPECTING WITH THE CONNECTOR DISCONNECTED <WHEN INSPECTING A MALE PIN>

⚠ CAUTION

At this time, be careful not to short the connector pins with the test probes. Doing so may damage the circuits inside the ECU.

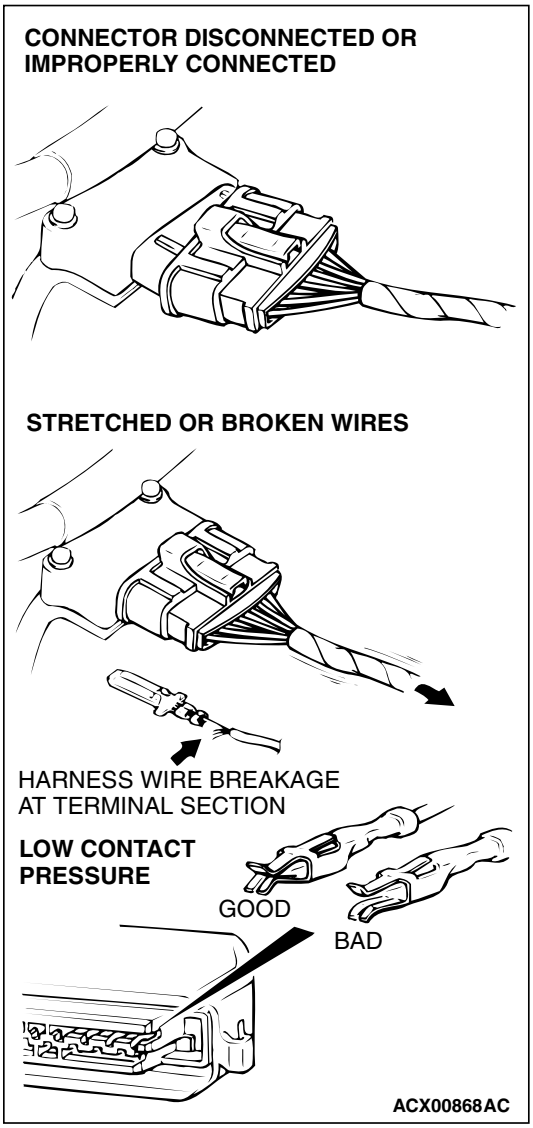
Touch the pin directly with the test probe.



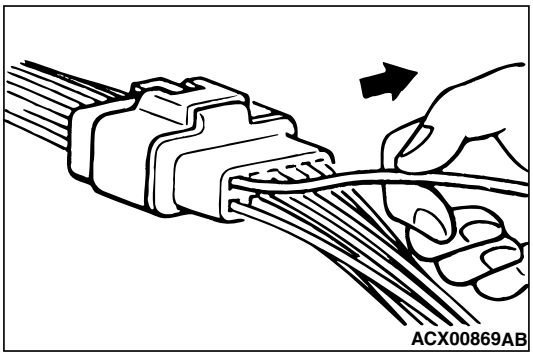
CONNECTOR INSPECTION SERVICE POINTS

M1001013700060

VISUAL INSPECTION



- Connector is disconnected or improperly connected
- Connector pins are pulled out
- Stretched an broken wires at terminal section
- Low contact pressure between male and female terminals
- Low connection pressure due to rusted terminals or foreign matter lodged in terminals



CONNECTOR PIN INSPECTION

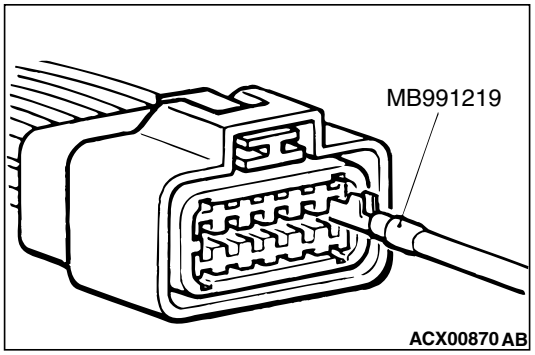
If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even when the connector body is connected, because the pins may pull out of the back side of the connector. Therefore, gently pull the wires one by one to make sure that no pins pull out of the connector.

CONNECTOR ENGAGEMENT INSPECTION

Required Special Tool:

- MB991219: Inspection Harness (contained in MB991223 Test Harness)

TSB Revision



Use special tool MB991219 to inspect the engagement of the male pins and female pins. [Pin drawing force: 1 N (0.2 pound) or more]

HOW TO COPE WITH INTERMITTENT MALFUNCTIONS

M1001013900064

Most intermittent malfunctions occur under certain conditions. If those conditions can be identified, the cause will be easier to find.

TO COPE WITH INTERMITTENT MALFUNCTION;
1. ASK THE CUSTOMER ABOUT THE MALFUNCTION
Ask what it feels like, what it sounds like, etc. Then ask about driving conditions, weather, frequency of occurrence, and so on.

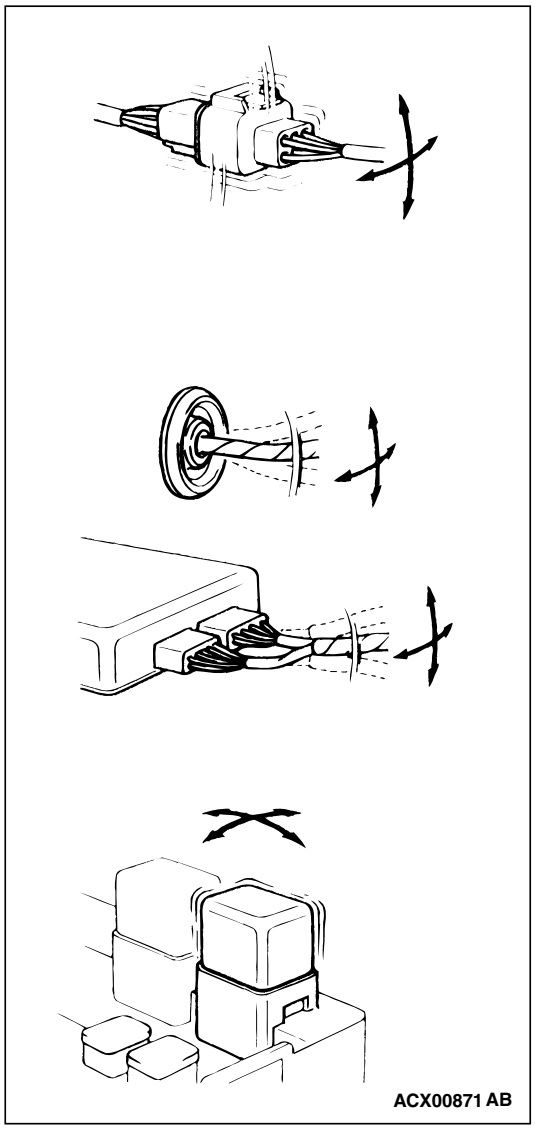
2. DETERMINE THE CONDITIONS FROM THE CUSTOMER'S RESPONSES
Typically, almost all intermittent malfunctions occur from conditions like vibration, temperature and/or moisture change, poor connections. From the customer's responses, it should be reasoned which condition is most likely.

3. USE SIMULATION TEST
Use the simulation tests below to attempt to duplicate the customer's complaint. Determine the most likely circuit(s) and perform the simulation tests on the connectors and parts of that circuit(s). Be sure to use the inspection procedures provided for diagnostic trouble codes and trouble symptoms.
For temperature and/or moisture condition related intermittent malfunctions, try to change the conditions of the suspected circuit components, then use the simulation tests below.

4. VERIFY THE INTERMITTENT MALFUNCTION IS ELIMINATED
Repair the malfunctioning part and try to duplicate the condition(s) again to verify the intermittent malfunction has been eliminated.

SIMULATION TESTS

NOTE: In case of difficulty in finding the cause of the intermittent malfunction, the data recorder function in the scan tool is effective.

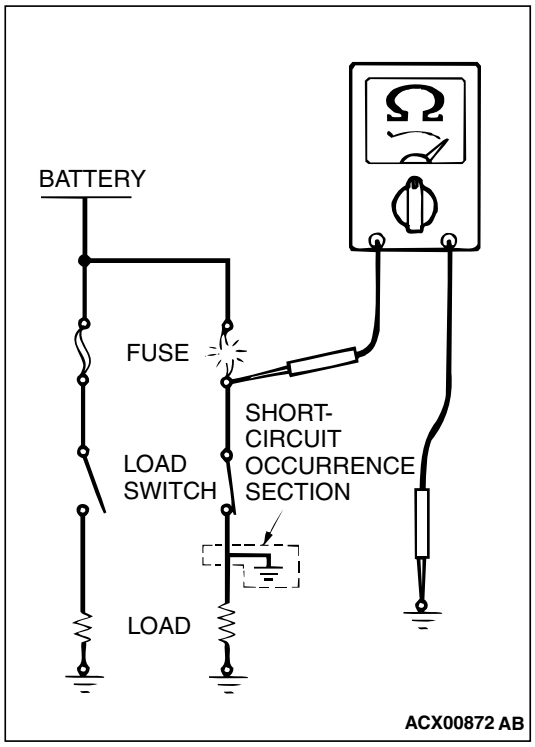


For these simulation tests, shake, then gently bend, pull, and twist the wiring of each of these examples to duplicate the intermittent malfunction.

- Shake the connector up-and-down, and right-and-left.
- Shake the wiring harness up-and-down, and right-and-left. Especially, check the splice points of wiring harnesses carefully. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.
- Shake the part or sensor.

INSPECTION SERVICE POINTS FOR A BLOWN FUSE

M1001013800067



Remove the blown fuse and measure the resistance between the load side of the blown fuse and the ground. Close the switches of all circuits which are connected to this fuse. If the resistance is almost 0 Ω at this time, there is a short somewhere between these switches and the load. If the resistance is not 0 Ω, there is no short at the present time, but a momentary short has probably caused the fuse to blow.
The main causes of a short circuit are the following.

- Harness being clamped by the vehicle body
- Damage to the outer casing of the harness due to wear or heat
- Water getting into the connector or circuitry
- Human error (mistakenly shorting a circuit, etc).

HOW TO TREAT CURRENT TROUBLE

M1001014000020

1. Make a note of the diagnostic trouble code, and erase it.
2. Check the trouble symptom again.
3. Check for diagnostic trouble codes again.
4. If a diagnostic trouble code is set, follow the applicable Diagnostic Trouble Code Chart.
5. If no diagnostic trouble code is set, refer to "How to Cope with Intermittent Malfunction P.00-14."

HOW TO TREAT PAST TROUBLE

M1001014100191

Since the trouble may still be present even the status is "Stored", set the vehicle to the diagnosis code detection condition and check that the status changes to "Active". If the status does not change from "Stored", carry out the following procedure.

1. Establish from the customer whether a fuse or connector has been replaced or disconnected.
2. If yes, erase the diagnosis code, and then check that no diagnostic code is reset. If no diagnosis code is reset, the diagnosis is complete.
3. If no, follow the applicable Diagnostic Trouble Code Chart. Then check the wiring harness and connector, and refer to "How to Cope with Intermittent Malfunction P.00-14."

INTERSYSTEM AFFILIATED DTC REFERENCE TABLE

M1001013000083

For vehicles with CAN, when DTC which influences the transmission data is set to the ECU which sends the data, DTC also could be set to the ECU which receives and controls the transmission data. The table below shows the relativity of DTC between ECUs. In addition, the alphabet shows the following DTC.

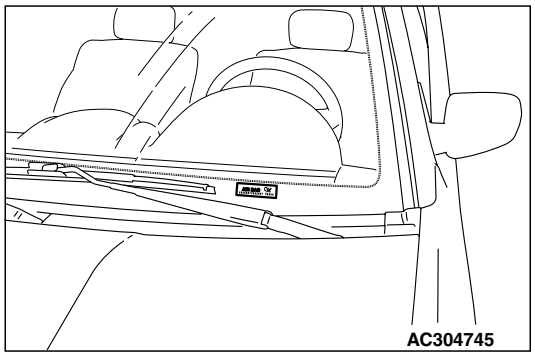
- A: TCL - DTC No. U1400 (Refer to GROUP 13D - Traction control system diagnosis P.13D-25.)
- B: TCL - DTC No. U1120 (Refer to GROUP 13D - Traction control system diagnosis P.13D-21.)
- C: TCL - DTC No. C1397 (Refer to GROUP 13D - Traction control system diagnosis P.13D-11.)
- D: Air conditioner - DTC No. U1120 (Refer to GROUP 55A - Manual A/C diagnosis P.55A-55.)
- E: Multi-center display - DTC No. 022 (Refer to GROUP 54A - Multi-center display P.54A-278.)
- F: SWS - DTC No. U1128 (Refer to GROUP 54B - SWS diagnosis P.54B-58.)

CAUSAL DTC NO.		DTC SET NO.					
SYSTEM NAME	DTC NO.	A	B	C	D	E	F
Engine (<2.4 L engine> Refer to GROUP 13A - Multiport fuel injection diagnosis P.13A-45. <3.8 L engine> Refer to GROUP 13B - Multiport fuel injection diagnosis P.13B-46.)	P0101, P0102, P0103, P0111, P0112, P0113, P0116, P0122, P0123, P0125, P0134, P0154, P0171, P0172, P0174, P0175		×				
	P0117, P0118		×		×		
	P0201, P0202, P0203, P0204, P0205, P0206, P0222, P0223		×				
	P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0325, P0335, P0340		×				
	P0506, P0507		×				
	P0638, P0657		×				
	P1601, P2108, P2127, P2128, P2135, P2227, P2228		×				
	P2138	×	×				
	P2122, P2123	×	×				
A/T (Refer to GROUP 23 - Automatic transaxle diagnosis P.23A-47.)	P0705			×			
Air conditioner (Refer to GROUP 55A - Manual A/C diagnosis P.55A-10 <low type> or P.55A-58 <middle type>.)	B1011, B1012					×	
Combination meter (Refer to GROUP 54A - Combination meter diagnosis P.54A-54.)	U1120						×

VEHICLE IDENTIFICATION

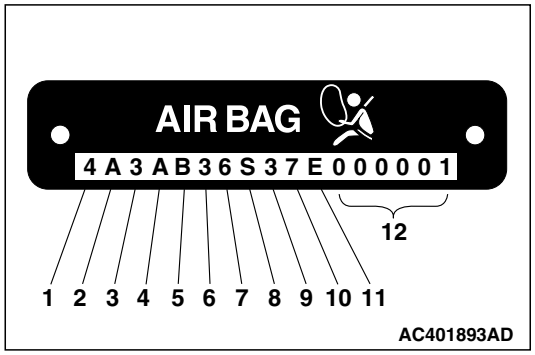
VEHICLE IDENTIFICATION NUMBER LOCATION

M1001000401783



The vehicle identification number (VIN) is located on a plate attached to the left top side of the instrument panel.

VEHICLE IDENTIFICATION CODE CHART PLATE



Vehicle identification numbers contain 17 digits. The vehicle number is a code which tells country, make, vehicle type, etc.

NO.	ITEM	CONTENT
1	Country	4: USA
2	Make	A: Mitsubishi
3	Vehicle type	3: Passenger car
4	Others	A: Driver and passenger air bags
5	Line	B: GALANT
6	Price class	2: Low
		3: Medium
		4: High
		5: Premium
		7: Ultimate
7	Body	6: 4-door sedan
8	Engine	F: 2.4L S-4 (4G69) MIVEC
		S: 3.8L S-4 (6G75)
		T: 3.8L S-4 (6G75) MIVEC
9	Check digits*	0, 1, 2, 3, ----------9, X
10	Model year	7: 2007 year
11	Plant	E: Mitsubishi Motors North America, Inc.
12	Serial number	000001 to 999999

*NOTE: *: Check digit means a single number, or letter X, used to verify the accuracy of transcription of vehicle identification number.*

VEHICLE IDENTIFICATION NUMBER LIST

EXCEPT FOR CANADA

VEHICLES FOR FEDERAL EMISSION REGULATION

VIN (EXCEPT SEQUENCE NUMBER)	BRAND	ENGINE DISPLACEMENT	MODEL CODE
4A3AB26F_7E	MITSUBISHI GALANT	2.4L	DJ1ASRJYL4M
4A3AB36F_7E			DJ1ASRHYL4M
4A3AB56F_7E			DJ1ASRXYL4M
4A3AB36F_7E			DJ1ASRFYL4M
4A3AB36S_7E		3.8L	DJ3ASYHEL4M
4A3AB56S_7E			DJ3ASYPEL4M
4A3AB56S_7E			DJ3ASYGEL4M
4A3AB76T_7E			DJ5ASYXYL4M

VEHICLES FOR CALIFORNIA EMISSION REGULATION

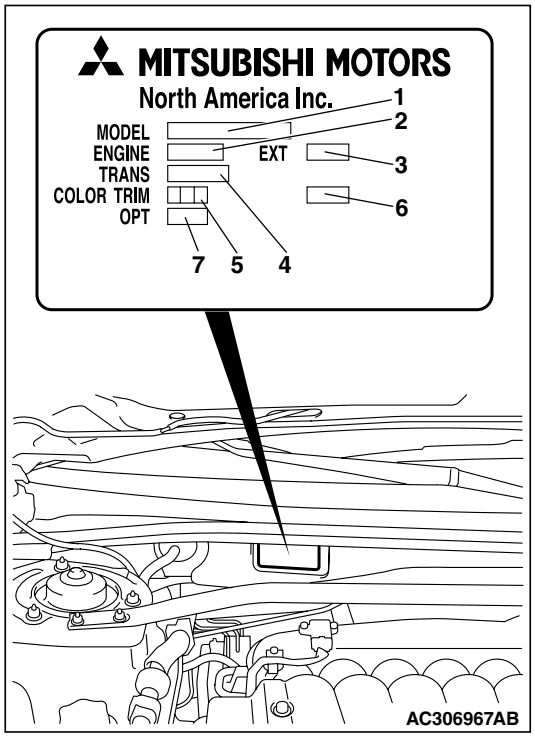
VIN (EXCEPT SEQUENCE NUMBER)	BRAND	ENGINE DISPLACEMENT	MODEL CODE
4A3AB26F_7E	MITSUBISHI GALANT	2.4L	DJ1ASRJYSL9M
4A3AB36F_7E			DJ1ASRHYSL9M
4A3AB56F_7E			DJ1ASRXYSL9M
4A3AB36F_7E			DJ1ASRFYSL9M

VEHICLES FOR CANADA

VIN (EXCEPT SEQUENCE NUMBER)	BRAND	ENGINE DISPLACEMENT	MODEL CODE
4A3AB26F_7E	MITSUBISHI GALANT	2.4L	DJ1ASRJYL5M
4A3AB36F_7E			DJ1ASRHYL5M
4A3AB46F_7E			DJ1ASRPYL5M
4A3AB36S_7E		3.8L	DJ3ASYHEL5M
4A3AB56T_7E			DJ5ASYXYL5M

VEHICLE INFORMATION CODE PLATE

M1001005401078

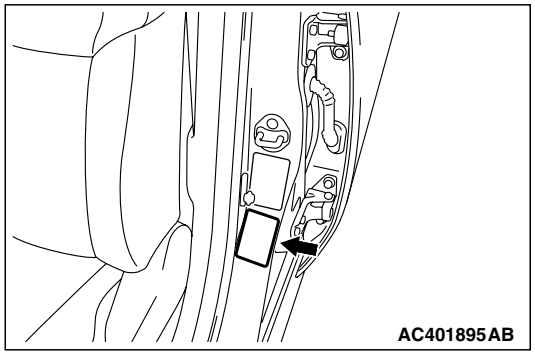


The vehicle information code plate is riveted onto the cowl top outer panel in the engine compartment.
The plate shows model code, engine model, transaxle model and body color code.

NO.	ITEM	CONTENT	
1	MODEL	DJ3ASRXEL9M	DJ3AS: Vehicle model
			RXEL9M: Model series
2	ENGINE	4G69	Engine model
		6G75	
3	EXT	W69D	Exterior code
4	TRANS	F4A4B	Transaxle model
		F5A5A	
5	COLOR	W69	Body color code
6	TRIM	08X	Interior code
7	OPT	Z12	Equipment code

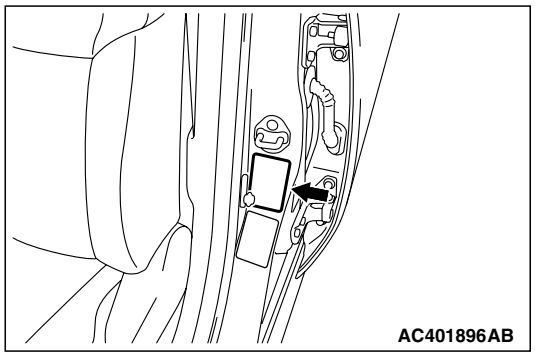
For monotone color vehicles, the body color code shall be indicated.

TIRE AND LOADING INFORMATION PLACARD



The tire and loading information placard is located on the inside sill of the driver's door.

VEHICLE SAFETY CERTIFICATION LABEL

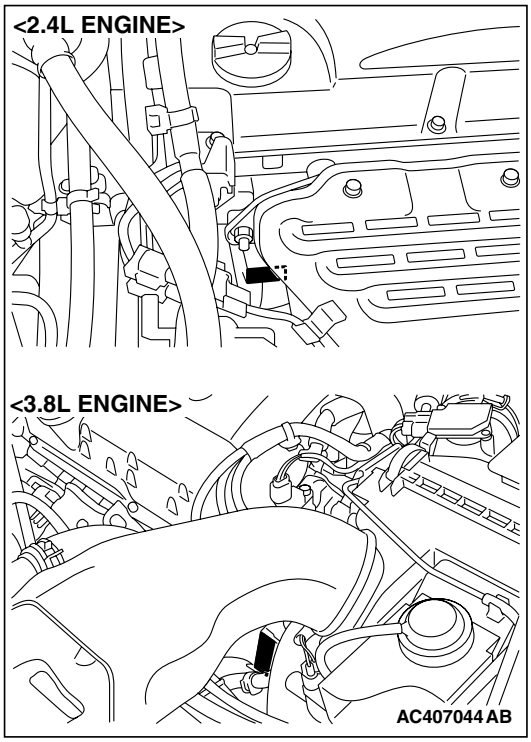


The vehicle safety certification label is attached to the face of the left door inside sill.
This label indicates the month and year of manufacture, Gross Vehicle Weight Rating (GVWR), front and rear Gross Axle Weight Rating (GAWR), and Vehicle Identification Number (VIN).

ENGINE MODEL STAMPING

<2.4L ENGINE>

<3.8L ENGINE>



The engine model is stamped on the cylinder block.
The engine model number is as shown as follow.

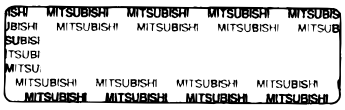
ENGINE MODEL	ENGINE DISPLACEMENT
4G69	2.4L
6G75	3.8L

The engine serial number is stamped near the engine model number.

THEFT PROTECTION

THEFT PROTECTION PLATE, LABEL OR STAMP

A: FOR ORIGINAL PARTS



B: FOR REPLACEMENT PARTS

AC101015AE

⚠ CAUTION

When replacing a part that has the theft protection plate, label or stamp on it, be sure that the part has either A or B shown in the figure. It is illegal if both A and B are attached, or neither A nor B is attached.

In order to protect against theft, a Vehicle Identification Number (VIN) is attached as a plate or label to the following major parts of the engine and transaxle, as well as main outer panels:
Engine cylinder block, Transaxle housing, Fender, Doors, Trunk lid, Rear quarter outer panel, Hood, Bumpers
In addition, a theft-protection label is attached to replacement parts for the body outer panel main components, and the same data is stamped into replacement parts for the engine and the transaxle.

⚠ CAUTION

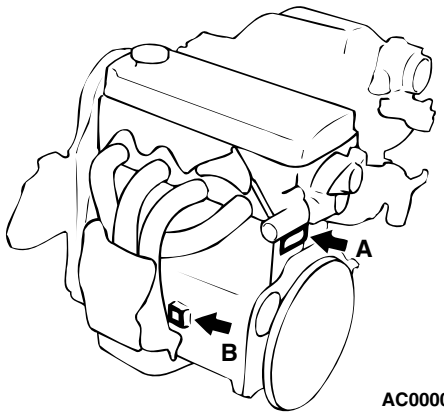
Cautions regarding panel repairs:

1. **When repainting original parts, do so after first masking the theft-protection label. After painting, be sure to peel off the masking tape.**
2. **The theft-protection label for replacement parts is covered by masking tape, so such parts can be painted as is. The masking tape should be removed after painting is finished.**
3. **The theft-protection label should not be removed from original parts or replacement parts.**

LOCATIONS

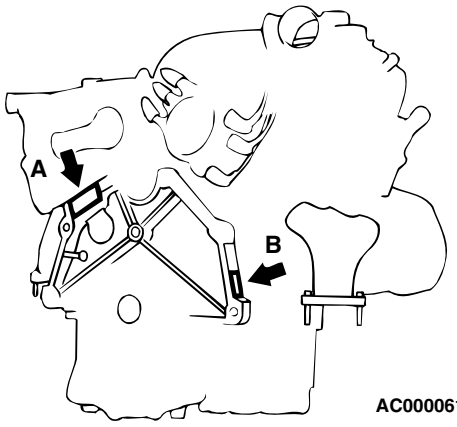
LABEL AREA (A: FOR ORIGINAL EQUIPMENT PARTS, B: FOR REPLACEMENT PARTS)

ENGINE
<2.4L ENGINE>



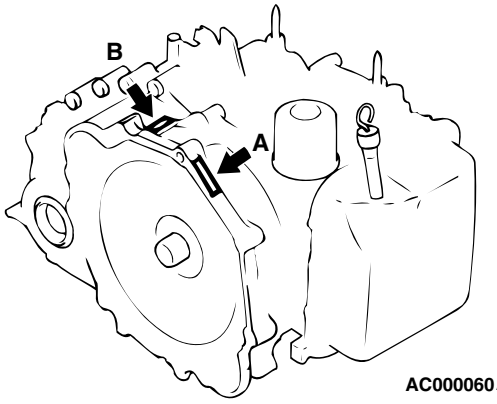
AC000058AD

ENGINE
<3.8L ENGINE>



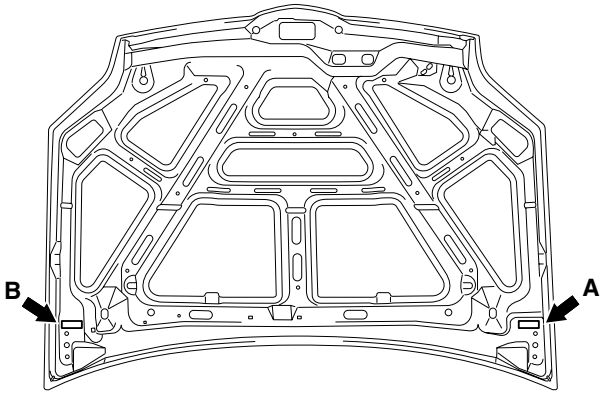
AC000061AC

AUTOMATIC TRANSAXLE



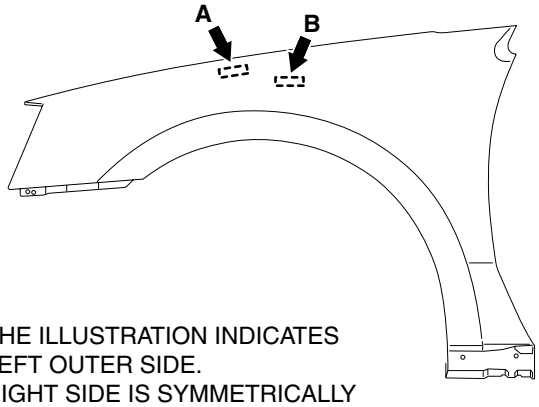
AC000060AB

HOOD



AC307026AB

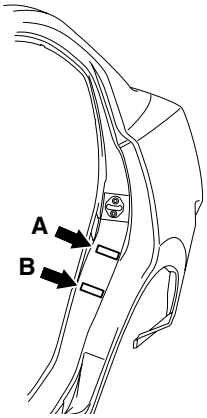
FENDER



THE ILLUSTRATION INDICATES LEFT OUTER SIDE.
RIGHT SIDE IS SYMMETRICALLY OPPOSITE.

AC307027AB

REAR QUARTER OUTER PANEL



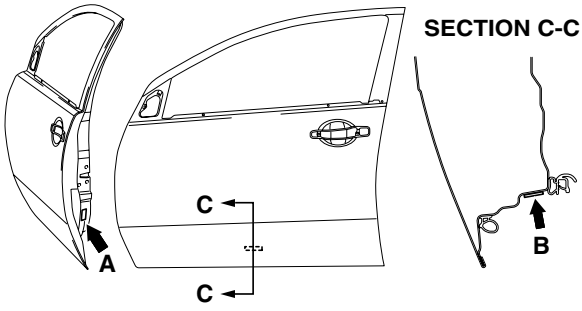
THE ILLUSTRATION INDICATES LEFT OUTER SIDE.
RIGHT SIDE IS SYMMETRICALLY OPPOSITE.

AC307028AB

TSB Revision

LABEL AREA (A: FOR ORIGINAL EQUIPMENT PARTS, B: FOR REPLACEMENT PARTS)

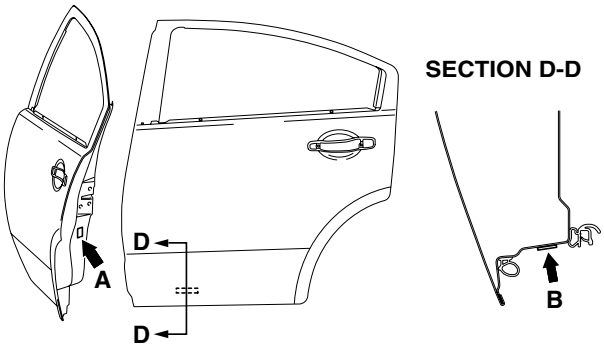
FRONT DOOR



THE ILLUSTRATION INDICATES LEFT INNER SIDE.
RIGHT SIDE IS SYMMETRICALLY OPPOSITE.

AC307042AC

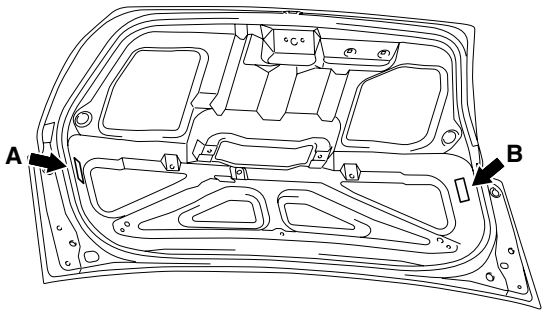
REAR DOOR



THE ILLUSTRATION INDICATES LEFT INNER SIDE.
RIGHT SIDE IS SYMMETRICALLY OPPOSITE.

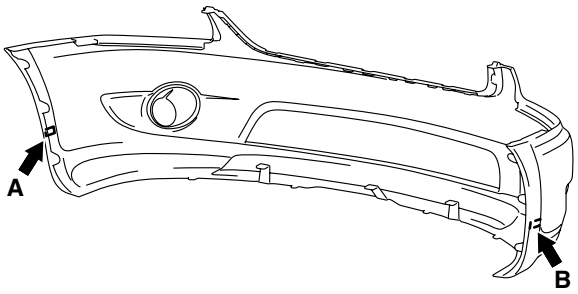
AC307044AC

TRUNK LID



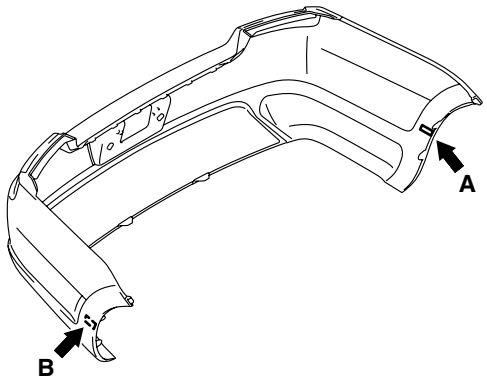
AC307046AB

FRONT BUMPER



AC601421AB

REAR BUMPER



AC601422AB

TSB Revision

PRECAUTIONS BEFORE SERVICE

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

M1001011600302

1. Items to review when servicing SRS:
   (1) Be sure to read GROUP 52B, Supplemental Restraint System (SRS). For safe operation, please follow the directions and heed all warnings.
   (2) Wait at least 60 seconds after disconnecting the battery cable before doing any further work. The SRS system is designed to retain enough voltage to deploy the air bag even after the battery has been disconnected. Serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cable is disconnected.
   (3) Warning labels must be heeded when servicing or handling SRS components. Warning labels can be found in the following locations.
   - Front impact sensor
   - Hood
   - Sun visor
   - SRS-ECU
   - Steering wheel
   - Clock spring
   - Steering joint cover
   - Air bag module (Driver's or front passenger's)
   - Side-airbag module (Driver's side or front passenger's side)
   - Side impact sensor
   - Seat belt pre-tensioner

   (4) Always use the designated special tools and test equipment.
   (5) Store components removed from the SRS in a clean and dry place. The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward.
   (6) Never attempt to disassemble or repair the SRS components (SRS-ECU, air bag module and clock spring). If there is a defect, replace the defective part.
   (7) Whenever you finish servicing the SRS, check the SRS warning light operation to make sure that the system functions properly.
   (8) Be sure to deploy the air bag before disposing of the air bag module or disposing of a vehicle equipped with an air bag (Refer to GROUP 52B, Air Bag Module Disposal Procedures P.52B-432).
2. Observe the following when carrying out operations on places where SRS components are installed, including operations not directly related to the SRS air bag.
   (1) When removing or installing parts, do not allow any impact or shock to occur to the SRS components.
   (2) If heat damage may occur during paint work, remove the SRS-ECU, the air bag module, clock spring, the front impact sensor, the side impact sensor, and the seat belt pre-tensioner.
      a. SRS-ECU, air bag module, clock spring, front impact sensor, the side impact sensor: 93°C (200°F) or more
      b. Seat belt pre-tensioner: 90°C (194°F) or more

HOW TO PERFORM VEHICLE IDENTIFICATION NUMBER (VIN) WRITING

M1001011400353

The Vehicle Identification Number (VIN) is stored in the power-train control module (PCM) by the vehicle manufacture. If the VIN to be stored in the PCM is eliminated fraudulently, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates and Diagnostic Trouble Code (DTC) No.P0630 (VIN malfunction) is shown. When the PCM is replaced, and entry of the VIN necessary due to DTC No. P0630 (VIN malfunction). Enter the VIN in accordance with the procedure as follows:

VIN CODE REGISTRATION PROCEDURE FOR POWERTRAIN CONTROL MODULE

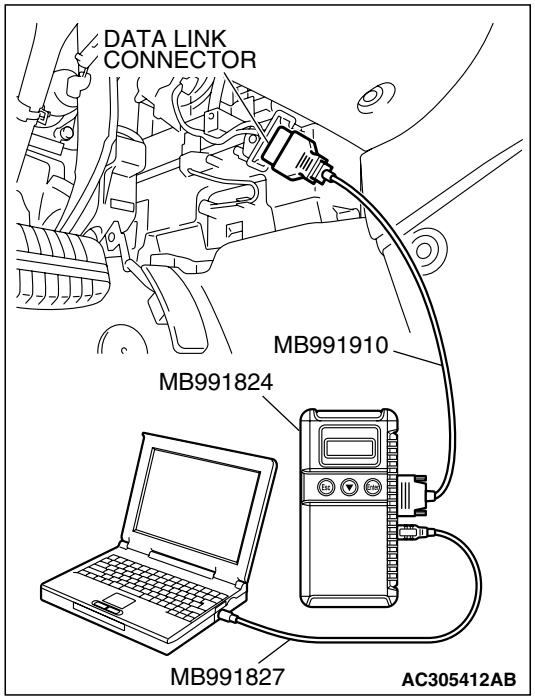
Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

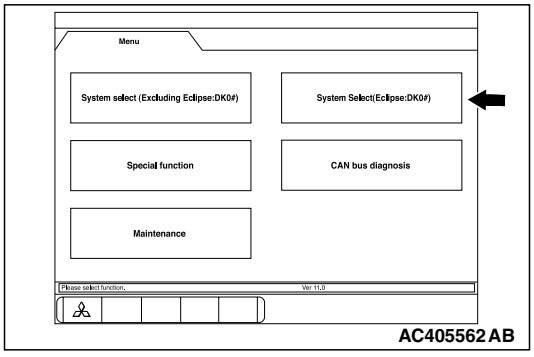
⚠ CAUTION

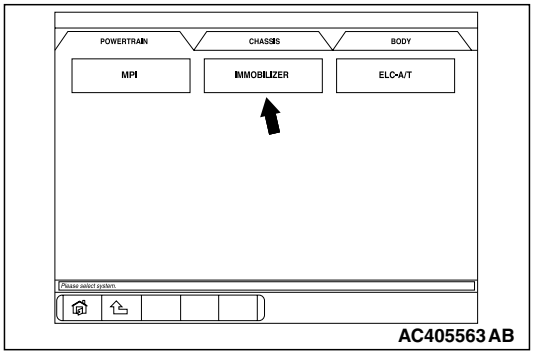
- **Check that DTC No.P0603 (EEPROM malfunction) is not set. If DTC No.P0603 (EEPROM malfunction) is set, entered VIN cannot be stored. Therefore, carry out troubleshooting and repair the malfunction when this code is set.**
- **To prevent damage to scan tool MB991958, always turn the ignition switch 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.



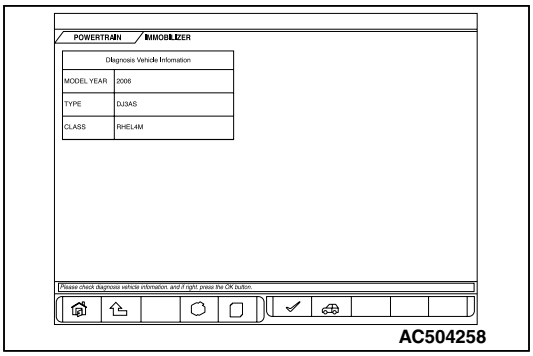
3. Select "GALANT."





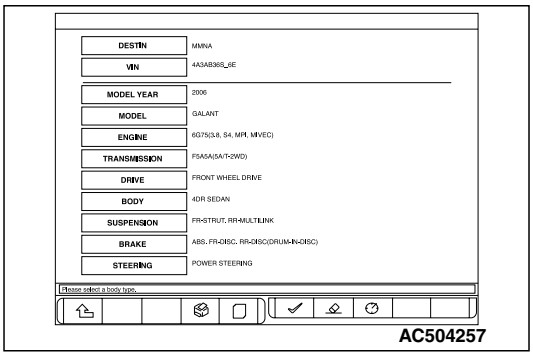
AC405563 AB

4. Choose "IMMOBILIZER" from the "POWER TRAIN" tab.

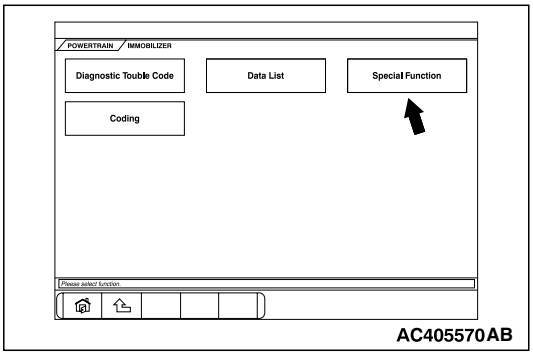


AC504258

5. Enter the VIN code of the vehicle that is being registered. Then, press "OK" button.

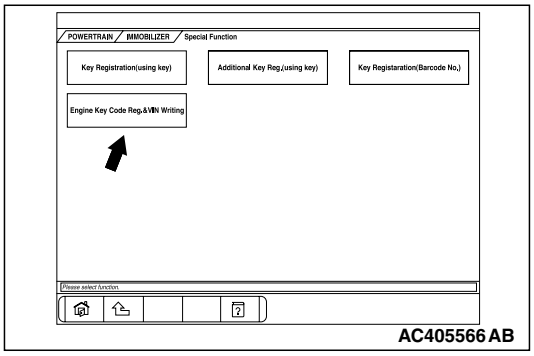


AC504257



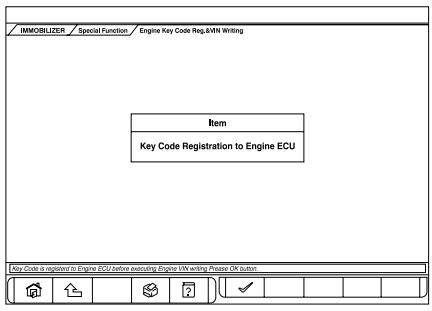
AC405570 AB

6. Select "Special Function."



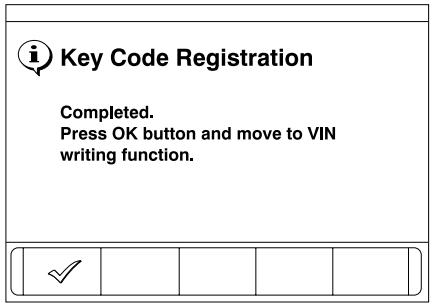
AC405566 AB

7. Select "Engine Key Code Reg.&VIN Writing."



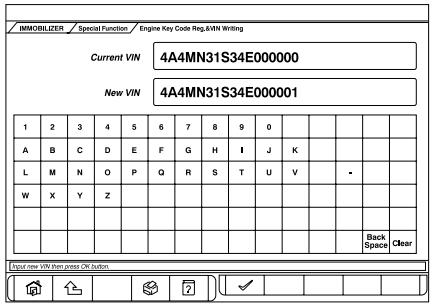
AC405567

8. Depress the OK button.



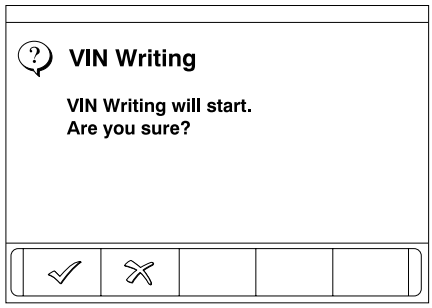
AC405575

9. When the key registration completion menu is displayed, press the OK button.



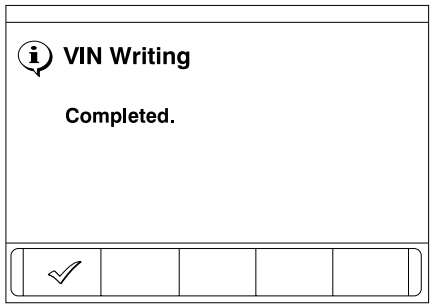
AC405568

10. Enter the VIN code of the vehicle that is being registered. Then, press "OK" button.



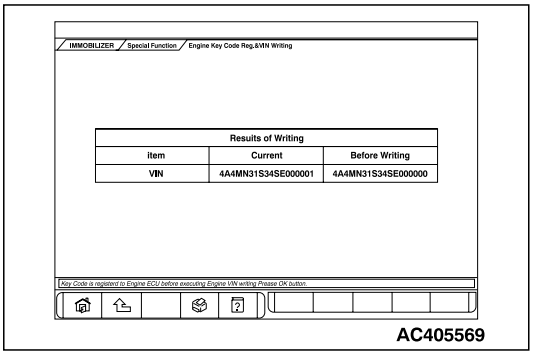
AC405576

11. When the execution confirmation menu of the VIN writing is displayed, press the OK button.



AC405577

12. When the VIN writing completion menu is displayed, press the OK button.



13. The results of VIN writing are displayed.
14. Turn off the scan tool MB991958.
15. Turn the ignition switch to the "LOCK" (OFF) position.
16. Disconnect scan tool MB991958 from the data link connector.

VIN CODE REGISTERATION PROCEDURE FOR ETACS-ECU.

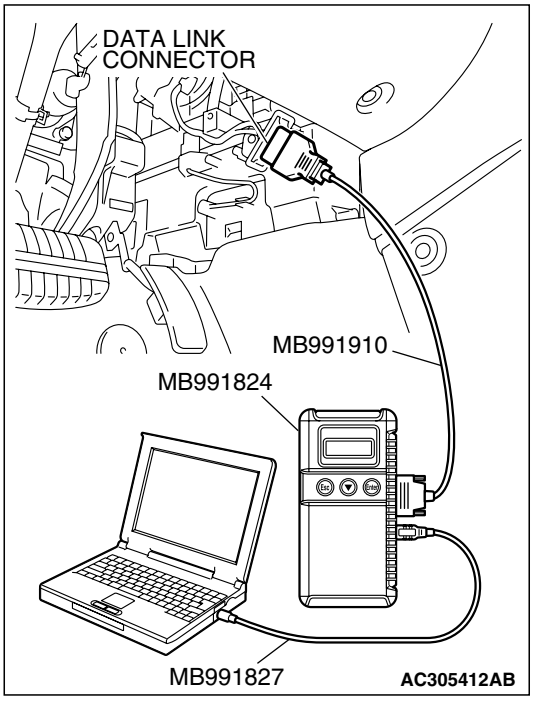
Required Special Tools:

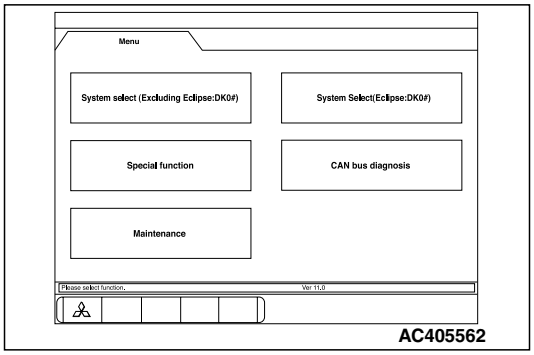
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

⚠ CAUTION

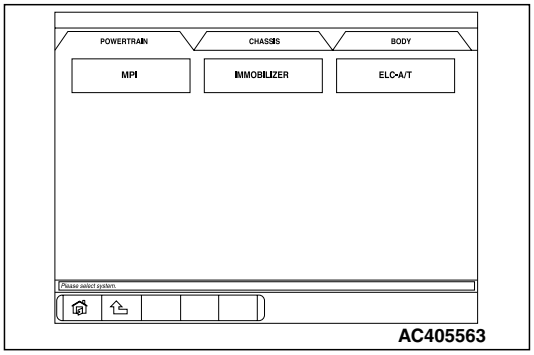
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.



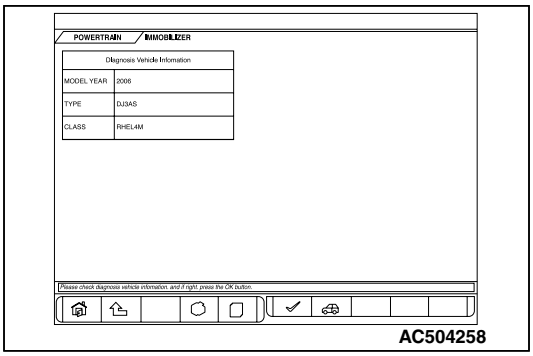


3. Select "GALANT."



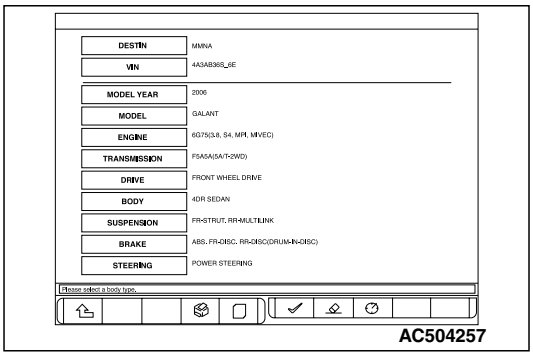
AC405563

4. Choose "IMMOBILIZER" from the "POWER TRAIN" tab.



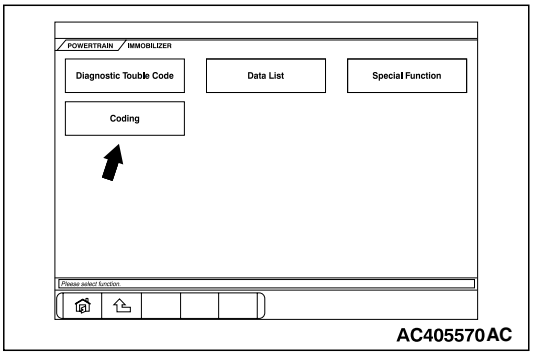
AC504258

5. Enter the VIN code of the vehicle that is being registered. Then, press "OK" button.



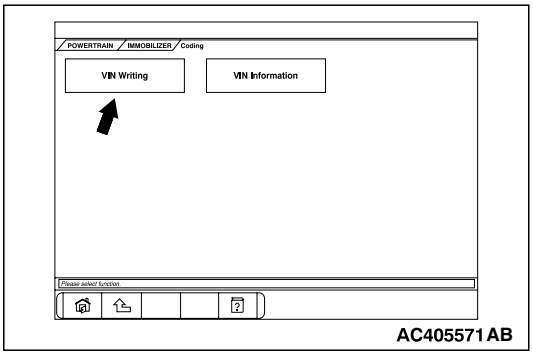
AC504257

6. Select "Coding."

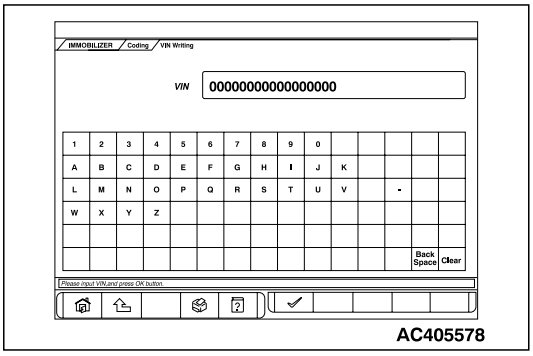


AC405570AC

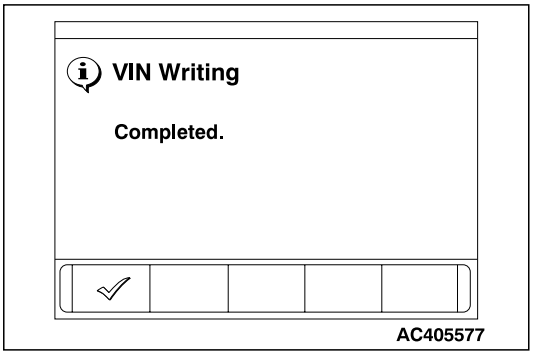
7. "VIN Writing."



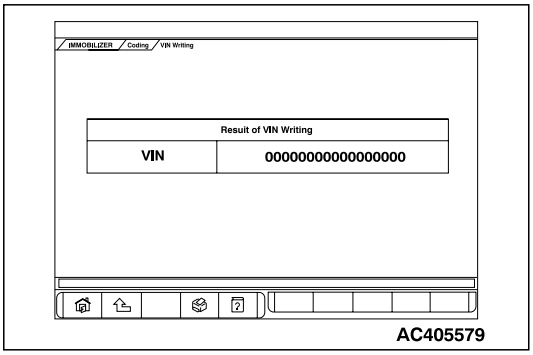
AC405571AB



8. Enter the VIN code of the vehicle that is being registered. Then, press "OK" button.
9. When the execution confirmation menu of the VIN writing is displayed, press the OK button.



10. When the VIN writing completion menu is displayed, press the OK button.



11. The results of VIN writing are displayed.
12. Register the encrypted code. (Refer to GROUP 54A, ENCRYPTED CODE REGISTRATION CRITERIA TABLE P.54A-11.)

INITIALIZATION PROCEDURE FOR LEARNING VALUE IN MFI ENGINE

M1001011700105

When the following service is performed, initialize the learning value.

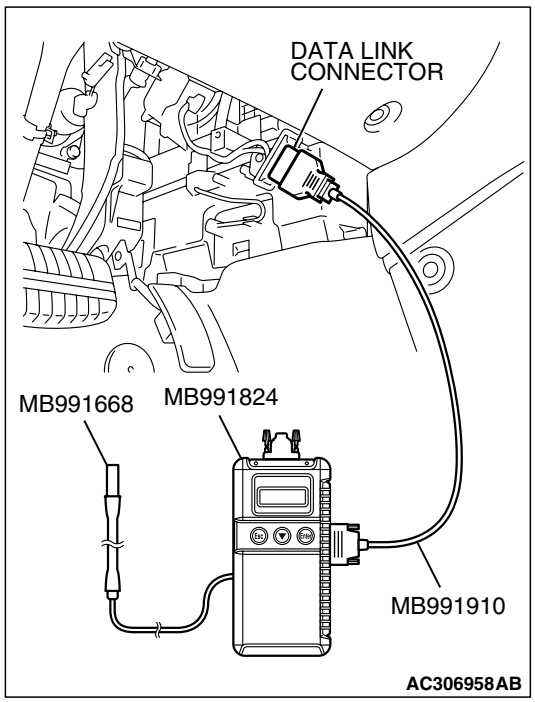
- At replacing engine assembly*
- At replacing throttle body and at cleaning
- At replacing knock sensor

*NOTE: * Initialize A/T-related learning value.*

INITIALIZATION PROCEDURE

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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 "Check Mode" form the menu screen.
4. Select "ERASE MEMORY" form the menu screen.
5. Initialize the learning value.
6. After initialization of the learning value, learn the idling in MFI engine. (Refer to LEARNING PROCEDURE FOR IDLING IN MFI ENGINE).

LEARNING PROCEDURE FOR IDLING IN MFI ENGINE

M1001011800351

PURPOSE

When the PCM is replaced, or when the learning value is initialized, the idling is not stabilized because the learning value in MFI engine is not completed. In this case, carry out the learning method for the idling through the following procedures.

LEARNING PROCEDURE

1. Start the engine and carry out the warm-up for the engine coolant temperature to reach 80°C (176°F) or more.

   NOTE: When the engine coolant temperature is 80°C (176°F) or more, the warm-up is not needed if the ignition switch is in "ON" position once.
2. Place the ignition switch in "LOCK" (OFF) position and stop the engine.
3. After 10 seconds or more, start the engine again.
4. For 10 minutes, carry out the idling under the condition shown below and then confirm the engine has the normal idling.
   - Transaxle: "P" range
   - Operation in ignition-related, fan and attachments: Not to be operated
   - Engine coolant temperature: 80°C (176°F) or more

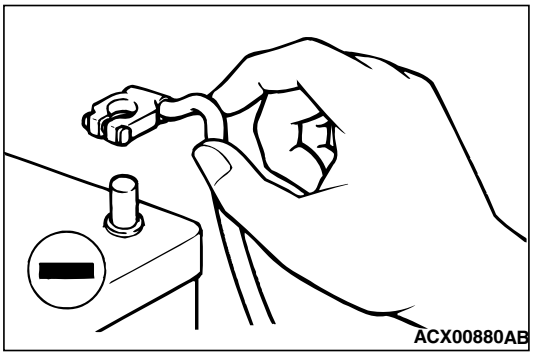
   NOTE: When the engine stalls during the idling, check the dirtiness (on the throttle valve) of the throttle body and then perform the service from Procedure 1 again.

SERVICING ELECTRICAL SYSTEM

M1001011900057

⚠ *WARNING*

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.



1. Note the following before proceeding with working on the electrical system.

   Never perform unauthorized modifications to any electrical device or wiring. Such modifications might lead to a vehicle malfunction, over-capacity or short-circuit that could result in a fire in the vehicle.

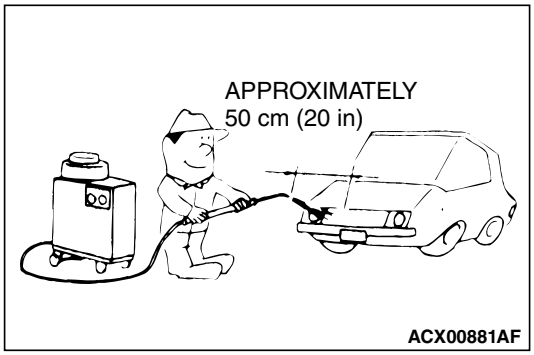
⚠ **CAUTION**

- **Before connecting or disconnecting the negative battery cable, be sure to turn the ignition switch to the "LOCK" (OFF) position and turn off the lights (If this is not done, there is the possibility of semiconductor parts being damaged).**
- **After completion of the work (and the negative battery terminals is connected), warm up the engine and allow it to idle for approximately 10 minutes under the conditions described below in order to stabilize engine control conditions, and then check to be sure that the idle is satisfactory.**
  - **Engine coolant temperature: 85 to 95°C (185 to 203°F)**
  - **Lights and all accessories: OFF**
  - **Transaxle: "N" or "P" position**
  - **Steering wheel: straight-forward position**

2. When servicing the electrical system, disconnect the negative cable terminal from the battery.

VEHICLE WASHING

M1001012000057



If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to maintain the spray nozzle at a distance of at least approximately 50 cm (20 inches) from any plastic parts and all opening parts (doors, luggage compartment, etc.).

APPLICATION OF ANTI-CORROSION AGENTS AND UNDERCOATS

M1001011000043

Do not to apply oil or grease to the heated oxygen sensor. If applied, the sensor may malfunction. Protect the heated oxygen sensor with a cover before applying anti-corrosion agent, etc.

SCAN TOOL (M.U.T.-III SUB ASSEMBLY)

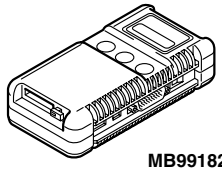
M1001012200244

⚠ CAUTION

Turn the ignition switch to the "LOCK" (OFF) position before disconnecting or connecting the scan tool.

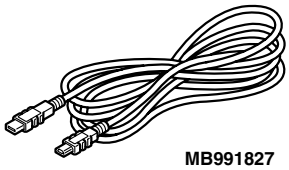
NOTE: M.U.T.-III trigger harness is not necessary when pushing V.C.I. ENTER key.

VEHICLE COMMUNICATION INTERFACE (V.C.I.)



MB991824

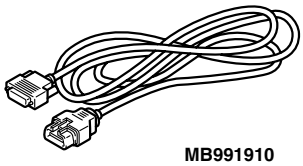
M.U.T.-III USB CABLE



MB991827

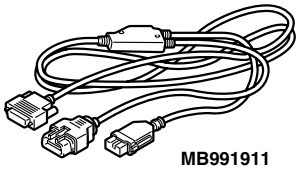
M.U.T.-III MAIN HARNESS A

DO NOT USE



MB991910

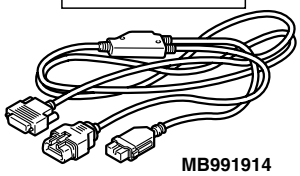
M.U.T.-III MAIN HARNESS B



MB991911

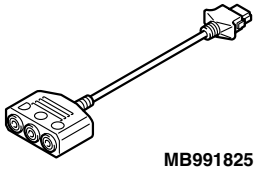
M.U.T.-III MAIN HARNESS C

DO NOT USE



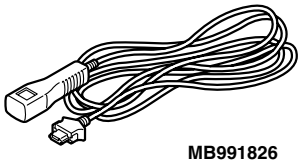
MB991914

M.U.T.-III MEASUREMENT ADAPTER



MB991825

M.U.T.-III TRIGGER HARNESS



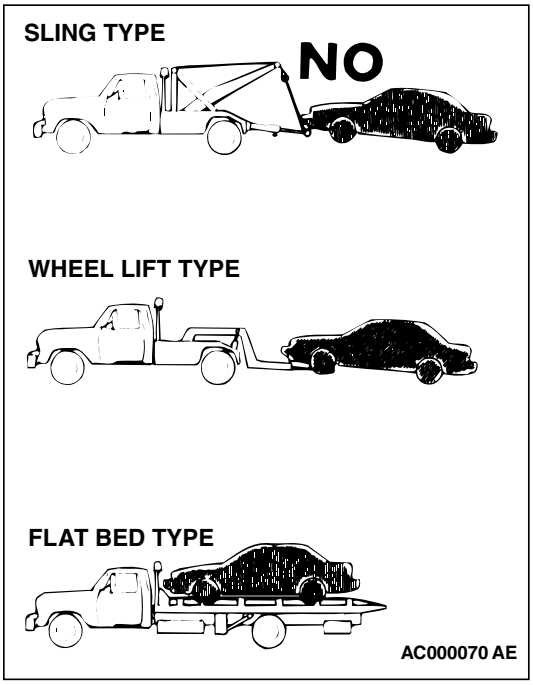
MB991826

AC500580AB

TOWING AND HOISTING

M1001000800380

WRECKER TOWING RECOMMENDATION

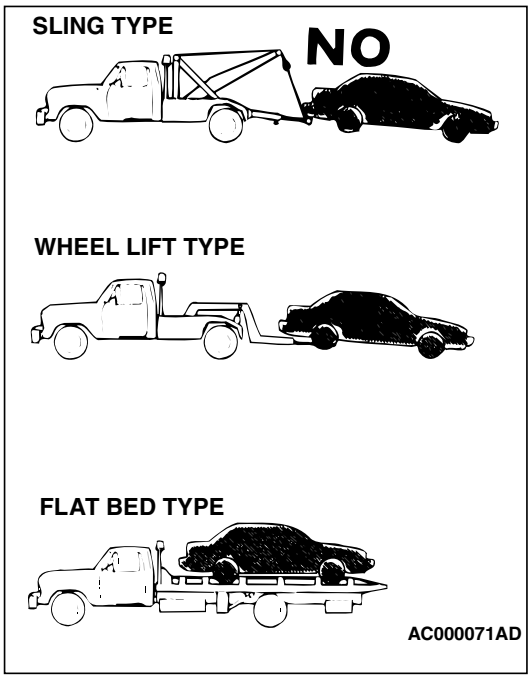


⚠ CAUTION

This vehicle cannot be towed by a wrecker using sling-type equipment; otherwise the bumper may become deformed. If this vehicle is towed, use wheel lift or flat bed equipment.

FRONT TOWING PICKUP

The vehicle may be towed on its rear wheels for extended distances provided the parking brake is released. It is recommended that vehicles be towed using the front pickup whenever possible.



REAR TOWING PICKUP

⚠ CAUTION

- **Do not use the steering column lock to secure the front wheels for towing.**
- **Make sure the transaxle is in Neutral if vehicle will have drive wheels on the ground.**
- **If these requirements cannot be met, the front wheels must be placed on a tow dolly.**

TOWING WHEN KEYS ARE NOT AVAILABLE

When a locked vehicle must be towed and keys are not available, the vehicle may be lifted and towed from the front, provided the parking brake is released. If not released, the rear wheels should be placed on a tow dolly.

SAFETY PRECAUTIONS

The following precautions should be taken when towing the vehicle:

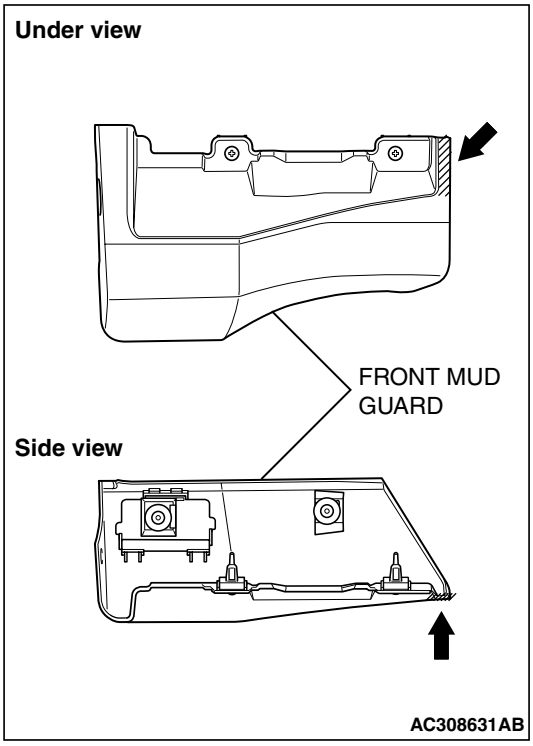
1. DO NOT LIFT OR TOW THE VEHICLE BY ATTACHING TO OR WRAPPING AROUND THE BUMPER.
2. Any loose, protruding, or damaged parts such as hoods, doors, fenders, trim, etc. should be secured or removed prior to moving the vehicle.
3. Refrain from going under a vehicle when it is lifted by the towing equipment, unless the vehicle is adequately supported by safety stands.
4. Never allow passengers to ride in a towed vehicle.
5. State and local rules and regulations must be followed when towing a vehicle.

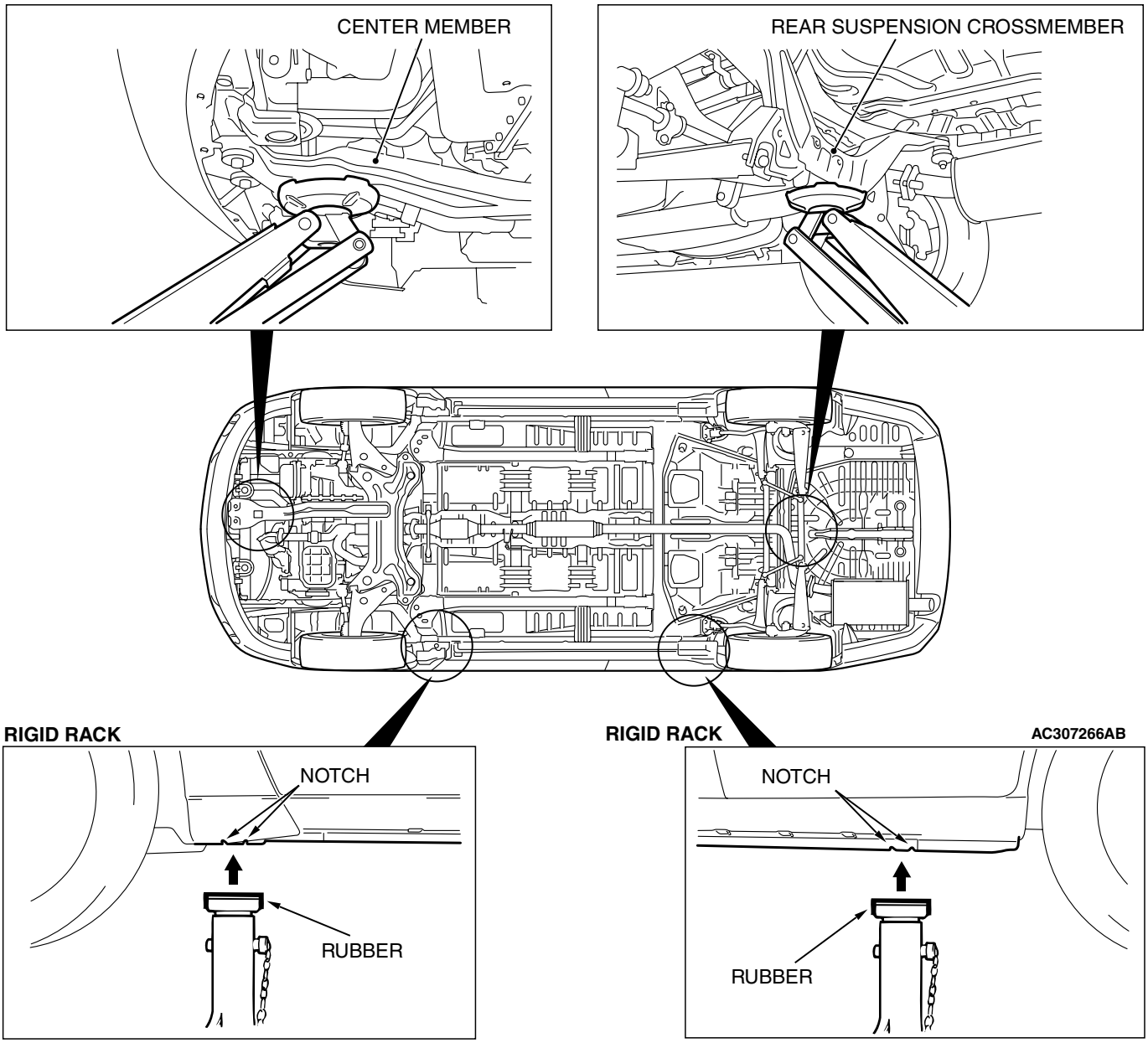
LIFTING, JACKING SUPPORT LOCATION

FLOOR JACK

⚠ CAUTION

- **Never place a support at any point other than the specified one, or that point will be deformed.**
- **Any DTCs stored in the ABS-ECU cannot be erased if there is a malfunction.**
- **For lifting, put rubber or similar material between the side sill and rigid rack, otherwise the side sill area will be damaged.**





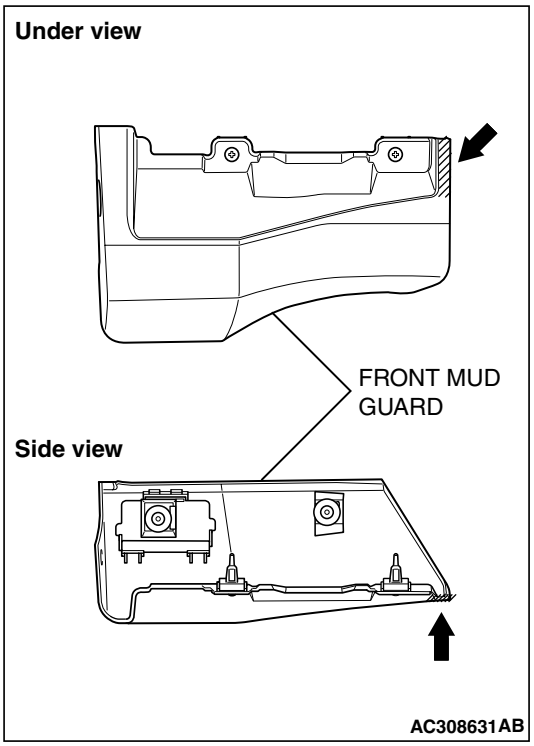
POST TYPE

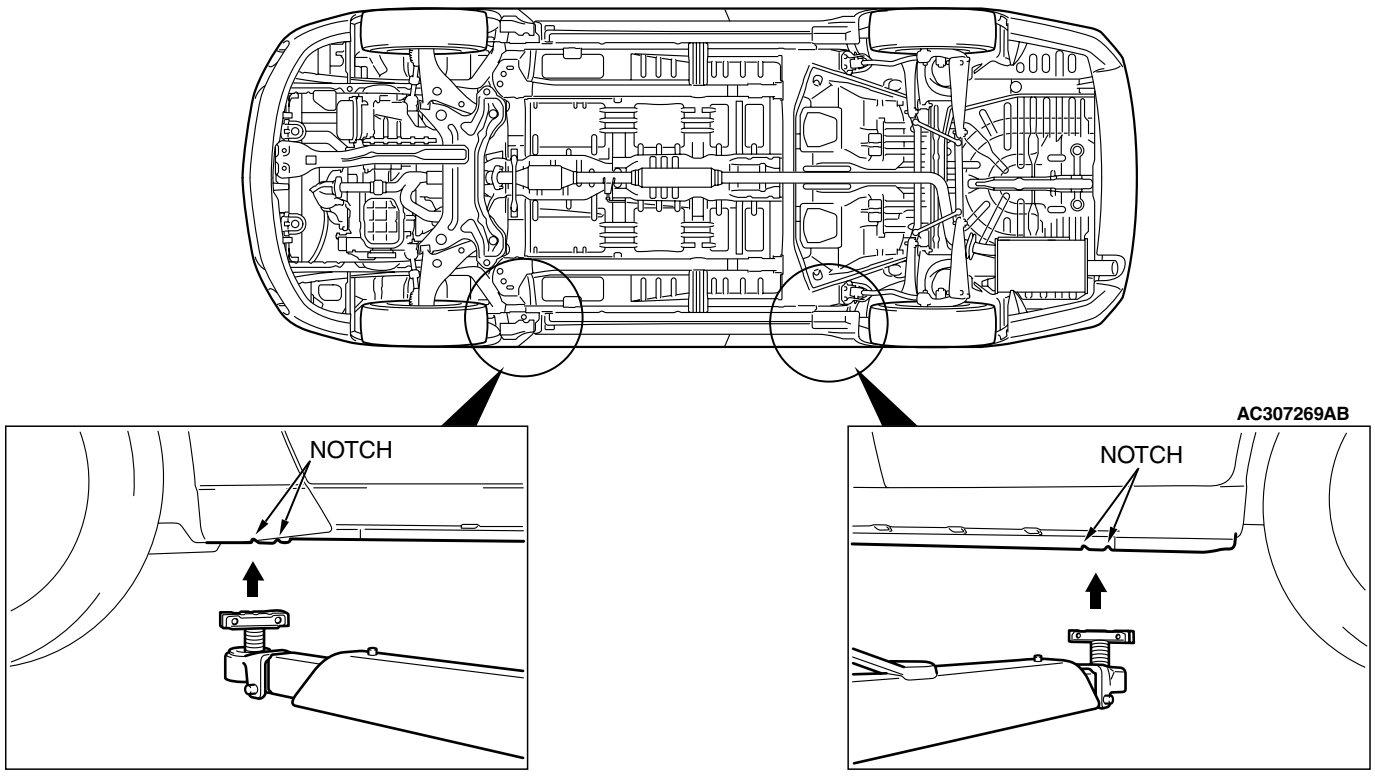
Special care should be taken when raising the vehicle on a frame contact type hoist. The hoist must be equipped with the proper adapters in order to support the vehicle at the proper locations.

TSB Revision

⚠ CAUTION

- **When service procedures require removing rear suspension, fuel tank and spare tire, place additional weight on the rear end of vehicle, or anchor vehicle to hoist to prevent tipping when the location of the center of gravity changes.**
- **If the assembling support area contacts with the front mud guard (arrow area as shown in the illustration), the front mud guard will be damaged. Slide the assembling support area to the front of the vehicle slightly to prevent the damage.**



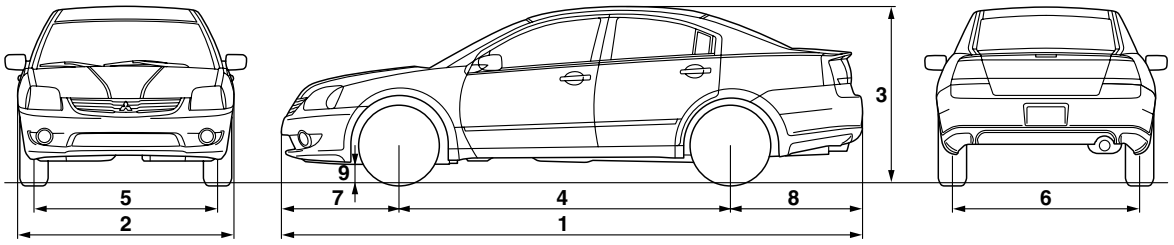


TSB Revision

GENERAL DATA AND SPECIFICATIONS

M1001000901476

GENERAL SPECIFICATIONS



AC601420AB

<2.4L ENGINE>

ITEM			DJ1ASRJYL4M/ SL9M/L5M	DJ1ASRHYL4M/ SL9M/L5M	DJ1ASRPYL5M
Vehicle dimension mm (in)	Overall length	1	4,850 (191.0)	4,850 (191.0)	4,850 (191.0)
	Overall width	2	1,840 (72.4)	1,840 (72.4)	1,840 (72.4)
	Overall height (unladen)	3	1,470 (57.9)	1,470 (57.9)	1,470 (57.9)
	Wheelbase	4	2,750 (108.3)	2,750 (108.3)	2,750 (108.3)
	Tread-front	5	1,570 (61.8)	1,570 (61.8)	1,570 (61.8)
	Tread-rear	6	1,570 (61.8)	1,570 (61.8)	1,570 (61.8)
	Overhang-front	7	985 (38.8)	985 (38.8)	985 (38.8)
	Overhang-rear	8	1,115 (43.8)	1,115 (43.8)	1,115 (43.8)
	Ground clearance	9	148 (5.8)	148 (5.8)	148 (5.8)
Vehicle weight kg (lb)	Curb weight		1,550 (3,428)	1,560 (3,439)	1,570 (3,461)
	Gross vehicle weight rating		1,980 (4,365)	1,980 (4,365)	1,980 (4,365)
	Gross axle weight rating-front		1,060 (2,337)	1,060 (2,337)	1,060 (2,337)
	Gross axle weight rating-rear		940 (2,072)	940 (2,072)	940 (2,072)
Seating capacity			5		
Engine	Model No.		4G69		
	Piston displacement		2.4L		
Transaxle	Model No.		F4A4B		
	Type		4-speed automatic		
Fuel system	Fuel supply system		Electronic controlled multiport fuel injection		

ITEM			DJ1ASRXYL4M/SL9M	DJ1ASRFYL4M/SL9M
Vehicle dimension mm (in)	Overall length	1	4,850 (191.0)	4,850 (191.0)
	Overall width	2	1,840 (72.4)	1,840 (72.4)
	Overall height (unladen)	3	1,470 (57.9)	1,470 (57.9)
	Wheelbase	4	2,750 (108.3)	2,750 (108.3)
	Tread-front	5	1,570 (61.8)	1,570 (61.8)

TSB Revision

ITEM			DJ1ASRXYL4M/SL9M	DJ1ASRFYL4M/SL9M
	Tread-rear	6	1,570 (61.8)	1,570 (61.8)
	Overhang-front	7	985 (38.8)	985 (38.8)
	Overhang-rear	8	1,115 (43.8)	1,115 (43.8)
	Ground clearance	9	148 (5.8)	148 (5.8)
Vehicle weight kg (lb)	Curb weight		1,565 (3,450)	1,580 (3,483)
	Gross vehicle weight rating		1,980 (4,365)	1,980 (4,365)
	Gross axle weight rating-front		1,060 (2,337)	1,060 (2,337)
	Gross axle weight rating-rear		940 (2,072)	940 (2,072)
Seating capacity			5	
Engine	Model No.		4G69	
	Piston displacement		2.4L	
Transaxle	Model No.		F4A4B	
	Type		4-speed automatic	
Fuel system	Fuel supply system		Electronic controlled multiport fuel injection	

<3.8L ENGINE>

ITEM			DJ3ASYHEL4M/PEL4M	DJ3ASYHEL5M	DJ3ASYGEL4M	DJ5ASYXYL4M/5M
Vehicle dimension mm (in)	Overall length	1	4,850 (191.0)	4,850 (191.0)	4,850 (191.0)	4,850 (191.0)
	Overall width	2	1,840 (72.4)	1,840 (72.4)	1,840 (72.4)	1,840 (72.4)
	Overall height (unladen)	3	1,470 (57.9)	1,470 (57.9)	1,470 (57.9)	1,473 (58.0)
	Wheelbase	4	2,750 (108.3)	2,750 (108.3)	2,750 (108.3)	2,750 (108.3)
	Tread-front	5	1,570 (61.8)	1,570 (61.8)	1,570 (61.8)	1,570 (61.8)
	Tread-rear	6	1,570 (61.8)	1,570 (61.8)	1,570 (61.8)	1,570 (61.8)
	Overhang-front	7	985 (38.8)	985 (38.8)	985 (38.8)	985 (38.8)
	Overhang-rear	8	1,115 (43.8)	1,115 (43.8)	1,115 (43.8)	1,115 (43.8)
	Ground clearance	9	148 (5.8)	148 (5.8)	148 (5.8)	155 (6.1)
Vehicle weight kg (lb)	Curb weight		1,640 (3,616)	1,635 (3,605)	1,665 (3,671)	1,700 (3,748)
	Gross vehicle weight rating		2,075 (4,574)	2,075 (4,574)	2,075 (4,574)	2,110 (4,652)
	Gross axle weight rating-front		1,150 (2,535)	1,150 (2,535)	1,150 (2,535)	1,165 (2,568)
	Gross axle weight rating-rear		945 (2,083)	945 (2,083)	945 (2,083)	965 (2,128)
Seating capacity			5			
Engine	Model No.		6G75			
	Piston displacement		3.8L			

ITEM		DJ3ASYHEL4M/PEL4M	DJ3ASYHEL5M	DJ3ASYGEL4M	DJ5ASYXYL4M/5M
Transaxle	Model No.	F5A5A			
	Type	5-speed automatic			
Fuel system	Fuel supply system	Electronic controlled multiport fuel injection			

TIGHTENING TORQUE

M1001001100555

Each torque value in the table is a standard value for tightening under the following conditions.

1. Bolts, nuts and washers are all made of steel and plated with zinc.
2. The threads and bearing surface of bolts and nuts are all in dry condition.

The values in the table are not applicable:

1. If toothed washers are inserted.
2. If plastic parts are fastened.
3. If bolts are tightened to plastic or die-cast inserted nuts.
4. If self-tapping screws or self-locking nuts are used.

STANDARD BOLT AND NUT TIGHTENING TORQUE

THREAD SIZE		STANDARD TIGHTENING TORQUE		
NOMINAL BOLT DIAMETER (mm)	PITCH (mm)	HEAD MARK "4"	HEAD MARK "7"	HEAD MARK "8"
M5	0.8	2.5 ± 0.5 N·m (23 ± 4 in-lb)	5.0 ± 1.0 N·m (44 ± 9 in-lb)	6.0 ± 1.0 N·m (53 ± 9 in-lb)
M6	1.0	5.0 ± 1.0 N·m (44 ± 9 in-lb)	8.5 ± 1.5 N·m (76 ± 13 in-lb)	10 ± 2 N·m (89 ± 17 in-lb)
M8	1.25	11 ± 2 N·m (98 ± 17 in-lb)	20 ± 4 N·m (15 ± 3 ft-lb)	24 ± 4 N·m (18 ± 3 ft-lb)
M10	1.25	23 ± 4 N·m (17 ± 3 ft-lb)	42 ± 8 N·m (31 ± 6 ft-lb)	53 ± 7 N·m (39 ± 5 ft-lb)
M12	1.25	42 ± 8 N·m (31 ± 6 ft-lb)	80 ± 10 N·m (59 ± 7 ft-lb)	93 ± 12 N·m (68 ± 9 ft-lb)
M14	1.5	70 ± 10 N·m (52 ± 7 ft-lb)	130 ± 20 N·m (96 ± 15 ft-lb)	150 ± 20 N·m (111 ± 14 ft-lb)
M16	1.5	105 ± 15 N·m (78 ± 11 ft-lb)	195 ± 25 N·m (144 ± 18 ft-lb)	230 ± 30 N·m (170 ± 22 ft-lb)
M18	1.5	150 ± 20 N·m (111 ± 14 ft-lb)	290 ± 40 N·m (214 ± 29 ft-lb)	335 ± 45 N·m (247 ± 33 ft-lb)
M20	1.5	210 ± 30 N·m (155 ± 22 ft-lb)	400 ± 60 N·m (295 ± 44 ft-lb)	465 ± 65 N·m (343 ± 48 ft-lb)
M22	1.5	290 ± 40 N·m (214 ± 29 ft-lb)	540 ± 80 N·m (398 ± 59 ft-lb)	630 ± 90 N·m (465 ± 66 ft-lb)
M24	1.5	375 ± 55 N·m (277 ± 40 ft-lb)	705 ± 105 N·m (520 ± 77 ft-lb)	820 ± 120 N·m (605 ± 88 ft-lb)

FLANGE BOLT AND NUT TIGHTENING TORQUE

THREAD SIZE		STANDARD TIGHTENING TORQUE		
NOMINAL BOLT DIAMETER (mm)	PITCH (mm)	HEAD MARK "4"	HEAD MARK "7"	HEAD MARK "8"
M6	1.0	5.0 ± 1.0 N·m (44 ± 9 in-lb)	10 ± 2 N·m (89 ± 17 in-lb)	12 ± 2 N·m (107 ± 17 in-lb)
M8	1.25	13 ± 2 N·m (111 ± 22 in-lb)	24 ± 4 N·m (18 ± 3 ft-lb)	28 ± 5 N·m (20 ± 4 ft-lb)
M10	1.25	26 ± 5 N·m (19 ± 4 ft-lb)	50 ± 5 N·m (37 ± 4 ft-lb)	58 ± 7 N·m (43 ± 5 ft-lb)
M10	1.5	25 ± 4 N·m (18 ± 3 ft-lb)	46 ± 8 N·m (34 ± 6 ft-lb)	55 ± 5 N·m (41 ± 3 ft-lb)
M12	1.25	47 ± 9 N·m (35 ± 6 ft-lb)	93 ± 12 N·m (68 ± 9 ft-lb)	105 ± 15 N·m (78 ± 11 ft-lb)
M12	1.75	43 ± 8 N·m (32 ± 6 ft-lb)	83 ± 12 N·m (61 ± 9 ft-lb)	98 ± 12 N·m (72 ± 9 ft-lb)

LUBRICATION AND MAINTENANCE

M1001001200466

Maintenance and lubrication service recommendations have been compiled to provide maximum protection for the vehicle owner's investment against all reasonable types of driving conditions. Since these conditions vary with the individual vehicle owner's driving habits, the area in which the vehicle is operated and the type of driving to which the vehicle is subjected, it is necessary to prescribe lubrication and maintenance service on a time frequency as well as mileage interval basis.
Oils, lubricants and greases are classified and graded according to standards recommended by the Society of Automotive Engineers (SAE), the American Petroleum Institute (API) and the National Lubricating Grease Institute (NLGI).

MAINTENANCE SCHEDULES

Information for service maintenance is provided in the "SCHEDULED MAINTENANCE TABLE." Three schedules are provided; one for "Required Maintenance." one for "General Maintenance" and one for "Severe Usage Service."
The item numbers in "SCHEDULED MAINTENANCE TABLE" correspond to the section numbers in "MAINTENANCE SERVICE."

SEVERE SERVICE

Vehicles operating under severe service conditions will require more frequent service.
Component service information is included for vehicles operating under one or more of the following conditions:

1. Trailer towing or police, taxi or commercial type operation.
2. Operation of Vehicle
   (1) Short-trip operation at freezing temperature (engine not thoroughly warmed up)
   (2) More than 50% operation in heavy city traffic during hot weather above 32°C (90°F)
   (3) Extensive idling
   (4) Driving in sandy areas
   (5) Driving in salty areas
   (6) Driving in dusty conditions
   (7) Driving off-road

ENGINE OIL

⚠ CAUTION

Test results submitted to EPA have shown that laboratory animals develop skin cancer after prolonged contact with used engine oil. Accordingly, the potential exists for humans to develop a number of skin disorders, including cancer, from such exposure to used engine oil. Therefore, when changing engine oil, be careful not to touch it as much as possible. Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.

Either of the following engine oils should be used:
1. Engine oil displaying ILSAC certification symbol.

2. Engine oil conforming to the API classification SL, SL/CF.

For further details, refer to "LUBRICANTS SELECTION."

LUBRICANTS AND GREASES

Semi-solid lubricants bear the NLGI designation and are further classified as grades 0, 1, 2, 3, etc.
Whenever "Chassis Lubricant" is specified, Multipurpose Grease, NLGI grade Number 2, should be used.

FUEL USAGE STATEMENT

⚠ CAUTION

Using leaded gasoline in this car will damage the catalytic converters and heated oxygen sensors, and affect the warranty coverage validity.

This vehicle must use unleaded gasoline only.
This vehicle has a fuel filler tube which is especially designed to accept only the smaller-diameter unleaded gasoline dispensing nozzle.
The 2.4L model is designed to operate on unleaded gasoline having a minimum octane rating of 87 [(MON + RON)/2], or 91 RON.
The 3.8L model is designed to operate on premium grade unleaded gasoline having a minimum octane rating of 91 [(MON + RON)/2], or 95 RON. If premium grade unleaded gasoline is not available, unleaded gasoline having an octane rating of 87 [(MON + RON)/2], or 91 RON may be reduced.

NOTE:

- *MON: Motor Octane Number*
- *RON: Research Octane Number*

GASOLINE CONTAINING ALCOHOL

Some gasoline sold at service stations contain alcohol although they may not be so identified.
Using fuels containing alcohol is not recommended unless the nature of the blend can be determined as being satisfactory.
Gasohol: A mixture of 10% ethanol (grain alcohol) and 90% unleaded gasoline may be used in your vehicle. If driveability problems are experienced as a result of using gasohol, it is recommended that the vehicle be operated on gasoline.
Methanol: **Do not use gasoline containing methanol (wood alcohol).** Using this type of alcohol can result in vehicle performance deterioration and damage critical parts in the fuel system components. Fuel system damage and performance problems resulting from the use of gasoline containing methanol may not be covered by the new vehicle warranty.

GASOLINE CONTAINING METHYL TERTIARY BUTYL ETHER (MTBE)

Unleaded gasoline containing 15% or less MTBE may be used in your vehicle. (Fuel containing MTBE over 15% in volume may cause reduced engine performance and produce vapor lock or hard starting.

MATERIALS ADDED TO FUEL

Indiscriminate use of fuel system cleaning agents should be avoided. Many materials intended for gum and varnish removal may contain highly active solvents or similar ingredients that can be harmful to gasket and diaphragm materials used in fuel system component parts.

RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE

M1001001300582

RECOMMENDED LUBRICANTS

LUBRICANT	SPECIFICATION	REMARK
Engine oil	Engine oil displaying ILSAC certification symbol ("Starburst" symbol) or conforming to the API classification SL, SL/CF or higher	For further details, refer to "LUBRICANTS SELECTION" section.
Transmission fluid	DIAMOND ATF SP III or equivalent	-
Power steering fluid	MITSUBISHI genuine Power Steering Fluid	-

LUBRICANT	SPECIFICATION	REMARK
Brakes fluid	Conforming to DOT 3 or DOT 4	-
Engine coolant	Long life antifreeze coolant or an equivalent	-
Door hinges, back door hinges	Engine oil	-

LUBRICANT CAPACITY TABLE

<2.4L ENGINE>

DESCRIPTION		SPECIFICATION
Engine oil dm^3 (qt)	Oil pan (excluding oil filter)	4.0 (4.2)
	Oil filter	0.3 (0.32)
Engine coolant dm^3 (qt)		8.0 (8.5)
Transmission fluid dm^3 (qt)		7.7 (8.1)
Power steering fluid dm^3 (qt)		1.2 (1.3)
Fuel tank dm^3 (gal)		67.0 (17.7)

<3.8L ENGINE>

DESCRIPTION		SPECIFICATION
Engine oil dm^3 (qt)	Oil pan (excluding oil filter)	4.3 (4.54)
	Oil filter	0.3 (0.32)
Engine coolant dm^3 (qt)		8.7 (9.2)
Transmission fluid dm^3 (qt)		8.4 (8.9)
Power steering fluid dm^3 (qt)		1.2 (1.3)
Fuel tank dm^3 (gal)		67.0 (17.7)

LUBRICANT SELECTION

ENGINE OIL

⚠ CAUTION

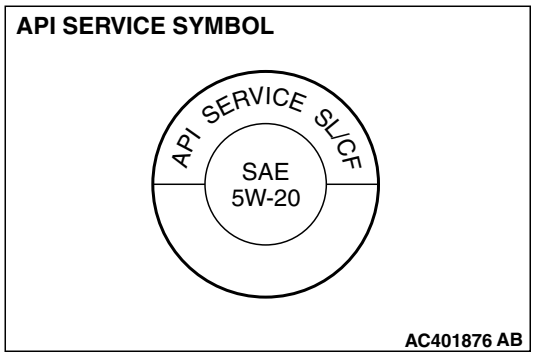
Never use nondetergent or straight mineral oil.

Oil Identification Symbol

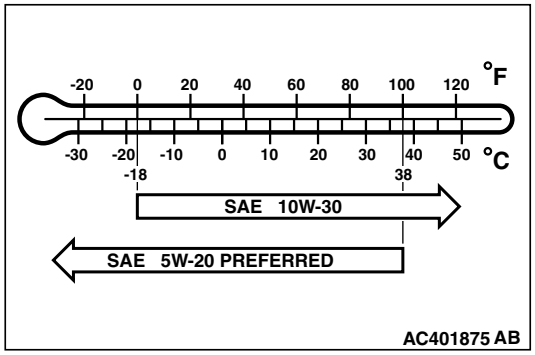
Use only engine oils displaying the ILSAC certification symbol ("Starburst" symbol) on the container.

ILSAC CERTIFICATION SYMBOL ("STARBURST" SYMBOL)

ACX00394AJ



If these oils are not available, an API classification SL or SL/CF can be used.



OIL VISCOSITY

The SAE grade number indicates the viscosity of the oil. A proper SAE grade number should be selected according to ambient temperature.

NOTE: SAE 5W-20 engine oil is strongly recommended for optimum fuel economy and cold starting. If the ambient temperature is not within the usable temperature range of SAE 5W-30 shown in the above illustration, use SAE 10W-30 engine oil.

SELECTION OF COOLANT

COOLANT

Relationship between Coolant Concentration and Specific Gravity

⚠ CAUTION

- **If the concentration of the coolant is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freeze and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.**
- **Do not use a mixture of different brands of anti-freeze.**

ENGINE COOLANT TEMPERATURE °C (°F) AND SPECIFIC GRAVITY					FREEZING TEMPERATURE	SAFE OPERATING TEMPERATURE	COOLANT CONCENTRATION (SPECIFIC VOLUME)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	°C (°F)	°C (°F)	%
1.054	1.050	1.046	1.042	1.036	–16 (3.2)	–11 (12.2)	30
1.063	1.058	1.054	1.049	1.044	–20 (–4)	–15 (5)	35
1.071	1.067	1.062	1.057	1.052	–25 (–13)	–20 (–4)	40
1.079	1.074	1.069	1.064	1.058	–30 (–22)	–25 (–13)	45
1.087	1.082	1.076	1.070	1.064	–36 (–32.8)	–31 (–23.8)	50
1.095	1.090	1.084	1.077	1.070	–42 (–44)	–37 (–35)	55
1.103	1.098	1.092	1.084	1.076	–50 (–58)	–45 (–49)	60

Example

TSB Revision

The safe operating temperature is –15°C (5° F) when the specific gravity is 1.058 at the coolant temperature of 20°C (68°F)

SCHEDULED MAINTENANCE TABLE

M1001001400749

SCHEDULED MAINTENANCE SERVICE FOR EMISSION CONTROL AND PROPER VEHICLE PERFORMANCE

Inspection and service should be performed any time if a malfunction is observed or suspected.

NO.	EMISSION CONTROL SYSTEM MAINTENANCE	SERVICE INTERVALS	KILOMETERS IN THOUSANDS	24	48	72	96	120	144	168	192
			MILEAGE IN THOUSANDS	15	30	45	60	75	90	105	120
			MONTHS	12	24	36	48	60	72	84	96
1	Fuel system (tank, pipe line and connection, and fuel tank filler tube cap)	Check for leaks					X				X
2	Fuel hoses	Check condition			X*		X		X		X
3	Air cleaner element	Replace			X		X		X		X
4	Evaporative emission control system (except evaporative emission canister)	Check for leaks and clogging					X				X
5	Spark plugs	Iridium-tipped type	Replace	Every 84 months or every 168,000 km (105,000 miles)							
6	Intake and exhaust valve clearance (4G6-MIVEC engine and 6G7-MIVEC engine <intake side> only)	Inspect and adjust If valve noise increases, adjust valve clearance			X		X		X		X
7	Timing belt	Replace		Every 168,000 km (105,000 miles)							
8	Drive belts (for the generator and power steering oil pump)	Check condition			X		X		X		X
9	Exhaust system (connection portion of muffler, muffler pipes and converter heat shields)	Check and service			X*		X		X		X

GENERAL MAINTENANCE SERVICE FOR PROPER VEHICLE PERFORMANCE

NO.	GENERAL MAINTENANCE	SERVICE INTERVALS	KILOMETERS IN THOUSANDS	24	48	72	96	120	144	168	192
			MILEAGE IN THOUSANDS	15	30	45	60	75	90	105	120
			MONTHS	12	24	36	48	60	72	84	96
10	Engine oil	Change		Every 6 months or every 12,000 km (7,500 miles)							
11	Engine oil filter	Replace		Every 6 months or every 12,000 km (7,500 miles)							
13	Engine coolant	Change					X at first		X		X
14	Coolant hoses (radiator hose, heater hose)	Inspect			X		X		X		X
15	Disc brake pads, rotors	Inspect for wear		Every 12 months or every 24,000 km (15,000 miles)							
16	Brake hoses	Check for deterioration or leaks		Every 12 months or every 24,000 km (15,000 miles)							
17	Ball joint and steering linkage seals	Inspect for grease leaks and damage			X		X		X		X
18	Drive shaft boots	Inspect for grease leaks and damage		Every 12 months or every 24,000 km (15,000 miles)							
19	Suspension system	Inspect for looseness and damage			X		X		X		X
20	Tires	Rotate		Every 12,000 km (7,500 miles)							

NOTE:

- **: This maintenance is recommended but is not required to maintain the emissions warranty.*

SCHEDULED MAINTENANCE UNDER SEVERE USAGE CONDITIONS

Maintenance should be carried out according to the following table:

NO.	MAINTENANCE ITEM	SERVICE INTERVALS	KILOMETERS IN THOUSANDS	24	48	72	96	120	144	168	192
			MILEAGE IN THOUSANDS	15	30	45	60	75	90	105	120
			MONTHS	12	24	36	48	60	72	84	96
3	Air cleaner filter	Replace		Every 12 months or 24,000 km (15,000 miles)							
10	Engine oil	Change		Every 3 months or every 6,000 km (3,750 miles)							

NO.	MAINTENANCE ITEM	SERVICE INTERVALS	KILOMETERS IN THOUSANDS	24	48	72	96	120	144	168	192
			MILEAGE IN THOUSANDS	15	30	45	60	75	90	105	120
			MONTHS	12	24	36	48	60	72	84	96
11	Engine oil filter	Replace		Every 3 months or every 6,000 km (3,750 miles)							
12	Automatic transaxle fluid	Change fluid		X check	X	X check	X	X check	X	X check	X
15	Disc brake pads, rotors	Inspect for wear		Every 6 months or every 12,000 km (7,500 miles)							

Severe usage conditions:

1. Driving on dusty, rough, muddy or salt-spread roads
2. Towing or police, taxi or commercial operation
3. Extensive idling and/or low speed operation
4. Repeated short-trip operation at freezing temperatures (engine not thoroughly warmed up)
5. Extended use of brakes while driving
6. Driving in sandy areas
7. More than 50% operation in heavy city traffic during hot weather above 32°C (90°F)

MAINTENANCE SERVICE

1. FUEL SYSTEM (TANK, PIPE LINE AND CONNECTION, AND FUEL TANK FILLER TUBE CAP) (CHECK FOR LEAKS)

M1001001600312

Check for damage or leakage in the fuel lines and connections.

2. FUEL HOSES (CHECK CONDITION)

M1001001700308

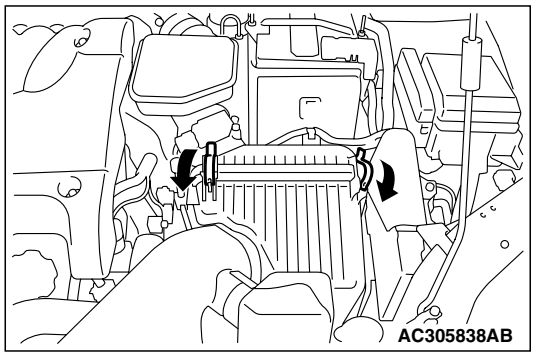
1. Inspect the surface of fuel hoses for heat and mechanical damage. Hard and brittle rubber, cracking, tears, cuts, abrasions and excessive swelling indicate deterioration of the rubber.
2. If the fabric casing of the rubber hose is exposed by cracks and abrasions in the fuel system, the hose should be replaced.

3. AIR CLEANER ELEMENT (REPLACE)

M1001001800383

The air cleaner element will become dirty during use, reducing its effectiveness. Replace it with a new one.

REPLACEMENT OF AIR CLEANER ELEMENT


AC305838AB

1. Unclamp the air cleaner housing cover.
2. Remove the air cleaner element and install a new one.
3. When clamping the air cleaner housing cover in place, be sure that the cover is completely closed.

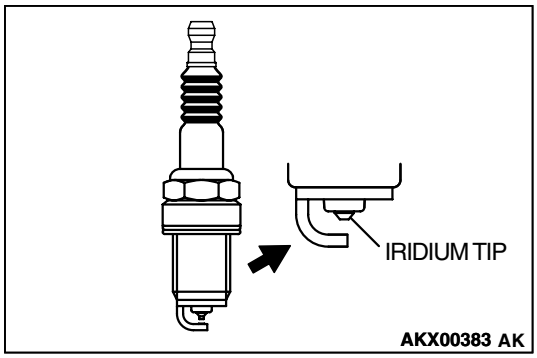
4. EVAPORATIVE EMISSION CONTROL SYSTEM (EXCEPT EVAPORATIVE EMISSION CANISTER) (CHECK FOR CLOGGING)

M1001001900368

If the fuel-vapor vent line is clogged or damaged, fuel vapor will escape into the atmosphere causing excessive emissions. Disconnect the line at both ends, and blow it clean with compressed air. Remove the fuel tank filler tube cap from the filler tube and check to see if there is evidence that the seal makes improper contact to the filler tube.

5. SPARK PLUGS (REPLACE)

M1001002000443



AKX00383 AK

⚠ CAUTION

Iridium plugs are used. Use care not to damage the iridium tips of the plugs. Do not adjust the spark plug gap.

1. Spark plugs must spark properly to assure proper engine performance and reduce exhaust emission level. Therefore, they should be replaced periodically with new ones.
   Spark plug type

MAKER	2.4L ENGINE	3.8L ENGINE <EXCEPT MIVEC>	3.8L ENGINE-MIVEC
NGK	LZFR6AI	FR6EI	IFR6B-K
DENSO	–	K20PSR-B8	–

2. The new plugs should be checked for the proper gap.
   Spark plug gap: 0.7 – 0.8 mm (0.028 – 0.031 inch)
3. Install the spark plugs and tighten to 25 ± 5 N·m (18 ± 4 ft-lb).

6. INTAKE AND EXHAUST VALVE CLEARANCE [4G6-MIVEC ENGINE AND 6G7-MIVEC ENGINE (INTAKE SIDE) ONLY] (INSPECT AND ADJUST)

M1001012900124

<2.4L ENGINE>

1. Before checks, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)

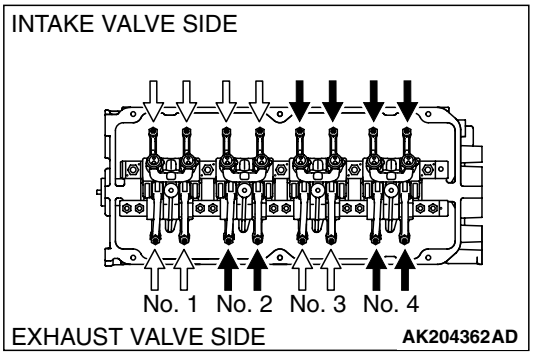
- Lights and all accessories: OFF
- Transaxle: P range

NOTE: On vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks and adjustment.

2. Remove all of the ignition coils.
3. Remove the rocker cover.
4. Turn the crankshaft clockwise until the notch on the pulley is lined up with "T" mark on the timing indicator.
5. Move the rocker arms on the No.1 and No.4 cylinders up and down by hand to determine which cylinder has its piston at the top dead center on the compression stroke.
   If both intake and exhaust valve rocker arms have a valve lash, the piston in the cylinder corresponding to these rocker arms is at the top dead center on the compression stroke.
6. Valve clearance inspection and adjustment can be performed on rocker arms indicated by white arrow mark when the No.1 cylinder piston is at the top dead center on the compression stroke, and on rocker arms indicated by black arrow mark when the No.4 cylinder piston is at the top dead center on the compression stroke.
7. Measure the valve clearance.
   If the valve clearance is not as specified, loosen the rocker arm lock nut and adjust the clearance using a thickness gauge while turning the adjusting screw.

   Standard value (hot engine):
   Intake valve: 0.20 mm (0.008 inch)
   Exhaust valve: 0.30 mm (0.012 inch)
8. While holding the adjusting screw with a screwdriver to prevent it from turning, tighten the lock nut to the specified torque.

   Tightening torque: 9 ± 1 N·m (80 ± 9 in-lb)
9. Turn the crankshaft through 360 degrees to line up the notch on the crankshaft pulley with the "T" mark on the timing indicator.
10. Repeat steps (7) and (8) on other valves for clearance adjustment.
11. Install the rocker cover.
12. Install the ignition coils.

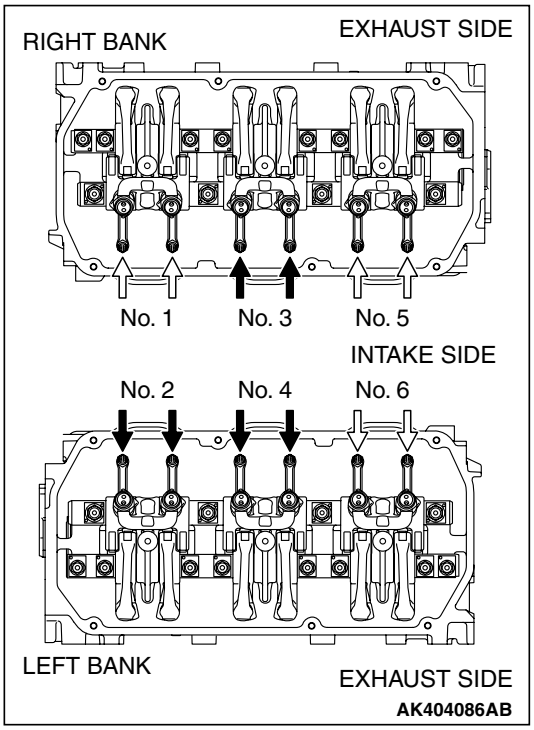


<3.8L ENGINE>

1. Before checks, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:
- Engine coolant temperature: 80 – 95°C (176 – 203°F)
- Lights and all accessories: OFF
- Transaxle: P range

NOTE: On vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks and adjustment.

2. Remove all of the ignition coils.



3. Remove the rocker cover.
4. Turn the crankshaft clockwise until the notch on the pulley is lined up with "T" mark on the timing indicator.
5. Move the rocker arms on the No.1 and No.4 cylinders up and down by hand to determine which cylinder has its piston at the top dead center on the compression stroke.
   If both intake and exhaust valve rocker arms have a valve lash, the piston in the cylinder corresponding to these rocker arms is at the top dead center on the compression stroke.
6. Valve clearance inspection and adjustment can be performed on rocker arms indicated by white arrow mark when the No.1 cylinder piston is at the top dead center on the compression stroke, and on rocker arms indicated by black arrow mark when the No.4 cylinder piston is at the top dead center on the compression stroke.
7. Measure the valve clearance for intake side.
   If the valve clearance is not as specified, loosen the rocker arm lock nut and adjust the clearance using a thickness gauge while turning the adjusting screw.
   Standard value (hot engine): 0.20 mm (0.008 inch)
   NOTE: Valve clearance check and adjustment is unnecessary for exhaust side due to auto lash adjuster installed.
8. While holding the adjusting screw with a screwdriver to prevent it from turning, tighten the lock nut to the specified torque.
   Tightening torque: 9 ± 1 N·m (80 ± 9 in-lb)
9. Turn the crankshaft through 360 degrees to line up the notch on the crankshaft pulley with the "T" mark on the timing indicator.
10. Repeat steps (7) and (8) on other valves for clearance adjustment.
11. Install the rocker cover.
12. Install the ignition coils.

7. TIMING BELT (REPLACE)

M1001002300444

Replace the belt with a new one according to the maintenance schedule P.00-46 to assure proper engine performance.

<2.4L ENGINE>

For removal and installation procedures, refer to GROUP 11A, Engine Mechanical <2.4L Engine> – Timing Belt – Removal and Installation P.11A-51.

<3.8L ENGINE (EXCEPT MIVEC)>

For removal and installation procedures, refer to GROUP 11C, Engine Mechanical <3.8L Engine (Except MIVEC)> – Timing Belt – Removal and Installation P.11C-53.

<3.8L ENGINE-MIVEC>

For removal and installation procedures, refer to GROUP 11E, Engine Mechanical <3.8L Engine-MIVEC> – Timing Belt – Removal and Installation P.11E-57.

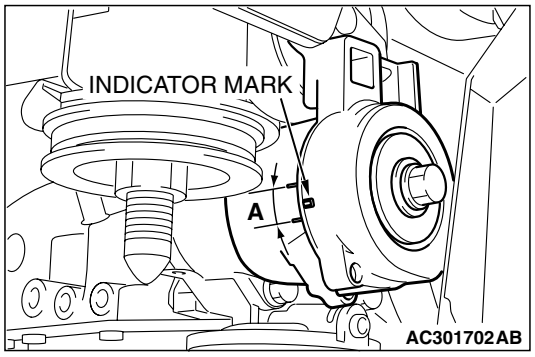
8. DRIVE BELTS (FOR THE GENERATOR AND POWER STEERING PUMP) (CHECK)

M1001008700149

DRIVE BELT TENSION CHECK <2.4L ENGINE>

⚠ CAUTION

Check the drive belt tension after turning the crankshaft clockwise one turn or more.



1. Make sure that the indicator mark is within the area marked with A in the illustration.
2. If the mark is out of the area, replace the drive belt. (Refer to P.11A-28).

   NOTE: The drive belt tension adjustment is not necessary as auto-tensioner is adopted.

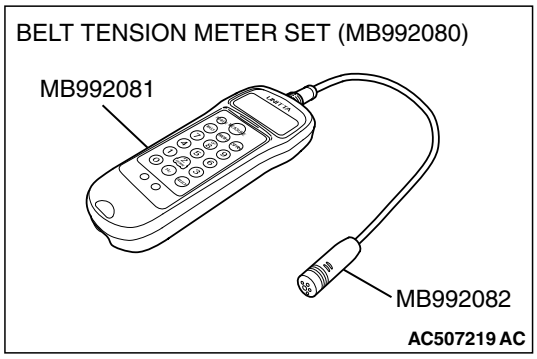
GENERATOR DRIVE BELT TENSION CHECK <3.8L ENGINE>

<WHEN USING SPECIAL TOOL MB992080: RECOMMENDATION>

Required Special Tools:

- MB992080: Belt tension meter set
  - MB992081: Belt tension meter
  - MB992082: Microphone assembly

NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.

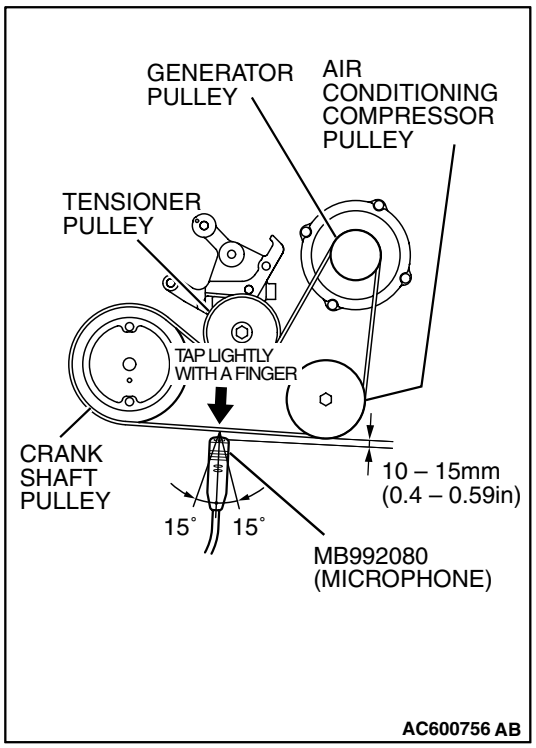


1. Connect the special tool MB992082 to the special tool MB992081 of the Special tool MB992080.
2. Press the "POWER" button to turn on the power supply.
3. Press the numeral key of "1" and check that "No.1" appears on the upper left of the display.

   NOTE: This operation is to temporarily set the preset data such as the belt specifications, because if the measurement is taken without input of the belt specifications, conversion to tension value (N) cannot be made, resulting in judgement of error.
4. Press "Hz" button twice to change the display to the frequency display (Hz).

⚠ CAUTION

- **The temperature of the surface of the belt should be as close to normal temperature as possible.**
- **Do not allow any contaminants such as water or oil to get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**



5. Hold special tool MB992080 to the middle of the drive belt between the pulleys (at the place indicated by arrow), approximately 10 – 15 mm (0.4 – 0.59 inch) away from the rear surface of the belt so that it is perpendicular to the belt (within an angle of ± 15 degree).
6. Press the "MEASURE" button.
7. Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and measure that the vibration frequency of the belt is within the standard value.

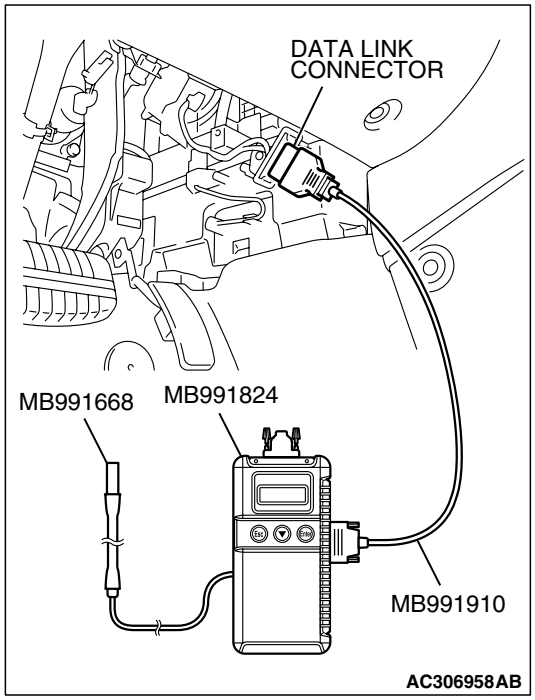
   Standard value: 143 – 169 Hz

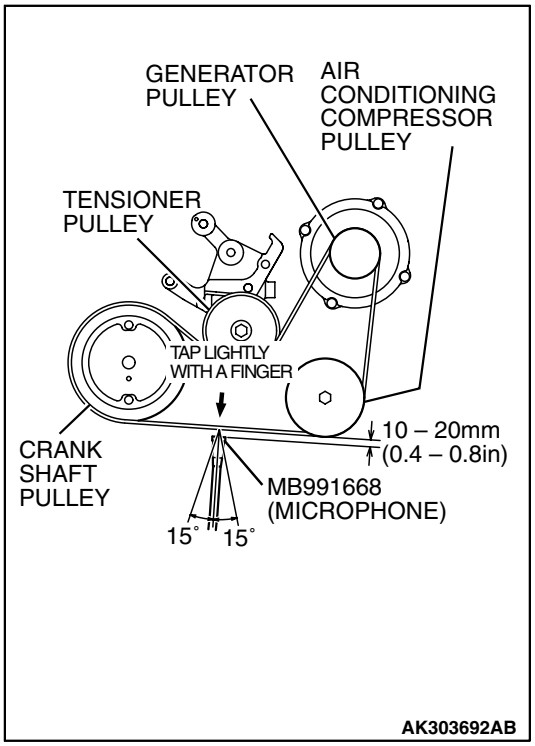
<WHEN USING SCAN TOOL MB991958: RECOMMENDATION>

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991910: M.U.T.-III Main Harness A
- MB991668: Belt Tension Meter Set

NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.





⚠ CAUTION

To prevent damage to special tool MB991824, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting special tool MB991824.

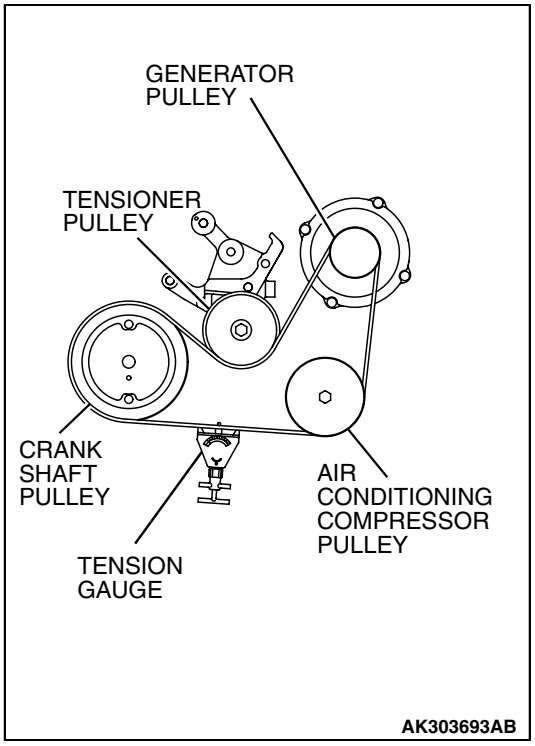
1. Connect special tool MB991668 to special tool MB991824.
2. Connect special tool MB991910 to special tool MB991824.
3. Connect scan tool MB991910 to the data link connector.
4. Turn the ignition switch to the "ON" position and select "Belt Tension" from the menu special tool MB991824 screen.

⚠ CAUTION

- **The temperature of the surface of the belt should be as close to normal temperature as possible.**
- **Do not allow any contaminants such as water or oil to get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**

5. Hold special tool MB991668 (microphone) to the middle of the drive belt between the pulleys (at the place indicated by the arrow), about 10 – 20 mm (0.4 – 0.8 inch) away from the rear surface of the belt and so that it is perpendicular to the belt (within an angle of ± 15 degree angle).
6. Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value.

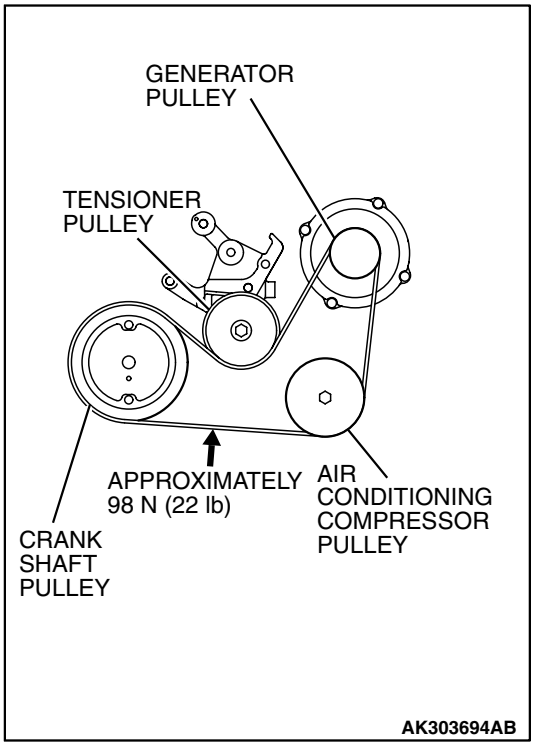
   Standard value: 143 – 169 Hz



<WHEN USING THE TENSION GAUGE>

Use a belt tension gauge to check that the belt tension is within the standard value.

Standard value: 490 – 686 N (110 – 154 lb)



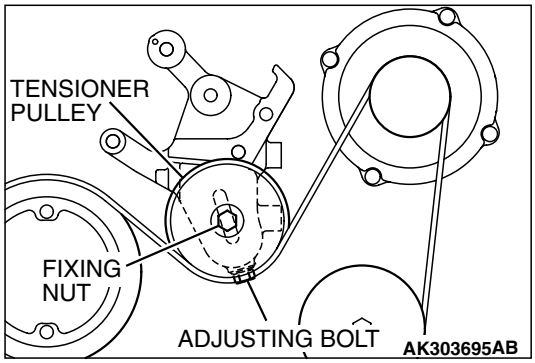
<BELT DEFLECTION CHECK>

Apply approximately 98 N (22 lb) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection in within the standard value.

Standard value: 8.4 – 10.7 mm (0.33 – 0.42 inch)

GENERATOR DRIVE BELT TENSION ADJUSTMENT <3.8L ENGINE>

If the vibration frequency, tension or deflection is outside the standard value, adjust by the following procedure.



1. Loosen the tensioner pulley fixing nut.
2. With the tensioner pulley fixing nut temporarily tightened to 15 ± 5 N·m (11 ± 4 ft-lb), set the belt tension or defection amount to the standard value using the adjusting bolt.

   Standard value:

ITEM	DURING ADJUSTMENT	DURING REPLACEMENT
Vibration frequency Hz	150 – 163	180– 202
Tension N (lb)	539 – 637 (121 – 143)	785 – 981 (176 – 221)
Deflection (Reference value) mm (inch)	8.9 – 10.1 (0.35 – 0.40)	6.2 – 7.5 (0.24 – 0.30)

3. Tighten the tension pulley fixing nut.

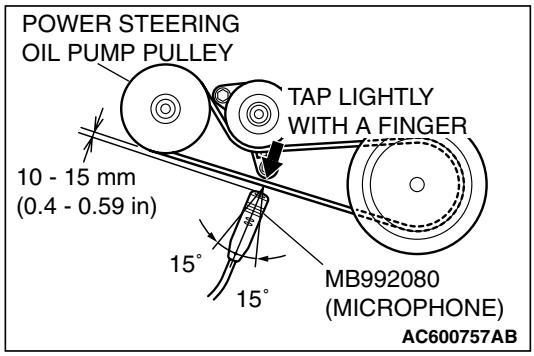
   Tightening torque: 49 ± 10 N·m (36 ± 7 ft-lb)
4. When the belt tension is adjusted by measuring the belt deflection, adjust it with a tool for vibration frequency measurement or tension measurement afterward.

POWER STEERING DRIVE BELT TENSION CHECK <3.8L ENGINE>

<WHEN USING SPECIAL TOOL MB992080: RECOMMENDATION>

Required Special Tools:
- MB992080: Belt tension meter set
  - MB992081: Belt tension meter
  - MB992082: Microphone assembly

NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.
With your finger tip lightly tap the center of the drive belt between the pulleys in the location shown by the arrow in the illustration and then measure the belt vibration frequency.



Standard value: 124 – 160 Hz

NOTE: Refer to generator drive belt tension check, for information regarding the vibration frequency measurement method using the special tool MB992080.

<WHEN USING SCAN TOOL MB991958: RECOMMENDATION>

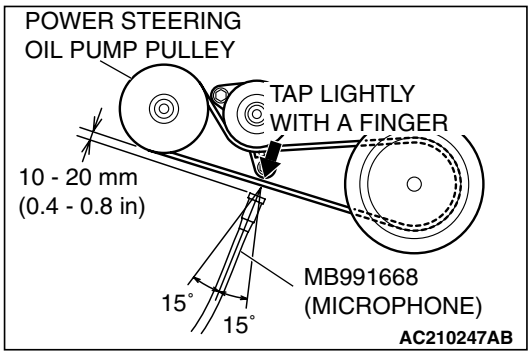
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991910: M.U.T.-III Main Harness A

- MB991668: Belt Tension Meter Set

NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.
With your finger tip lightly tap the center of the drive belt between the pulleys in the location shown by the arrow in the illustration and then measure the belt vibration frequency.

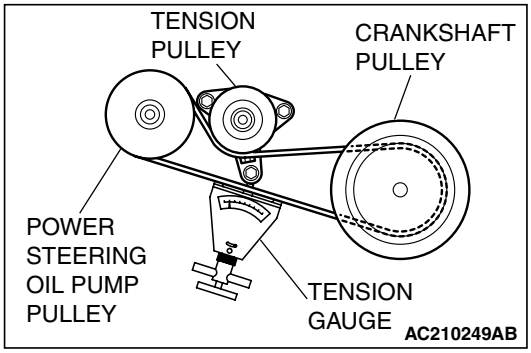
Standard value: 124 – 160 Hz

NOTE: Refer to generator drive belt tension check, for information regarding the vibration frequency measurement method using the special tool MB991958.



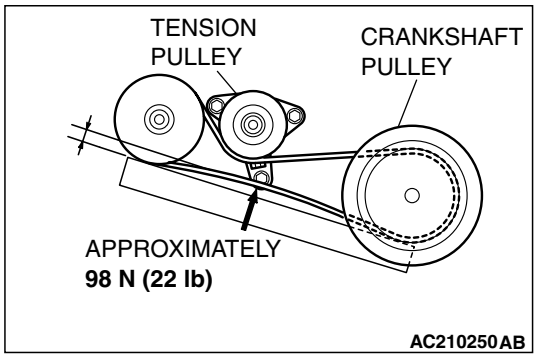
<WHEN USING A TENSION GAUGE>
Use a belt tension gauge to check that the belt tension is within the standard value.

Standard value: 294 – 490 N (66 – 110 lb)



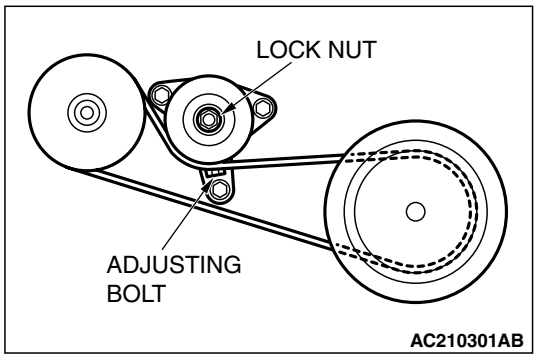
<BELT DEFLECTION CHECK>
Apply approximately 98 N (22 lb) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value.

Standard value: 12.3 – 16.2 mm (0.48 – 0.64 inch)



POWER STEERING DRIVE BELT TENSION ADJUSTMENT <3.8L ENGINE>

If the vibration frequency, tension or deflection is outside the standard value, adjust by the following procedure.



1. Loosen the tensioner pulley lock nut.
2. Adjust the belt tension to the standard value by turning the adjusting bolt. The tension will increase when turning the adjusting bolt clockwise, and decrease when turning counterclockwise.

   Standard value:

ITEM	DURING ADJUSTMENT	DURING REPLACEMENT
Vibration frequency Hz	134 – 151	160– 189
Tension N (lb)	343 – 441 (77 – 99)	490 – 686 (110 – 154)
Deflection (Reference value) mm (inch)	13.2 – 15.1 (0.52 – 0.59)	9.6 – 12.3 (0.38 – 0.48)

3. Tighten the lock nut to the specified torque.

   Tightening torque: 49 ± 9 N·m (36 ± 7 ft-lb)
4. Tighten the adjusting bolt.

   Tightening torque: 5.0 ± 1.0 N·m (44 ± 9 in-lb)

⚠ CAUTION

Check after turning the crankshaft one or more rotations clockwise.

5. Check the belt vibration frequency, tension or deflection amount, and readjust if necessary.
6. When the belt tension is adjusted by measuring the belt deflection, adjust it with a tool for vibration frequency measurement or tension measurement afterward.

9. EXHAUST SYSTEM (CONNECTION PORTION OF MUFFLER, MUFFLER PIPES AND CONVERTER HEAT SHIELDS) (CHECK AND SERVICE)

M1001005800396

1. Check for holes and exhaust gas leaks due to damage, corrosion, etc.
2. Check the joints and connections for looseness and exhaust gas leaks.
3. Check the rubber hangers and brackets for damage.

10. ENGINE OIL (CHANGE)

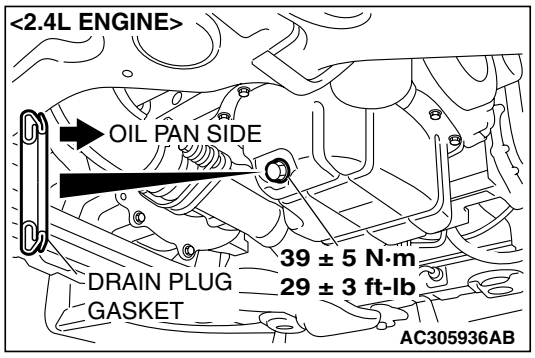
M1001002600575

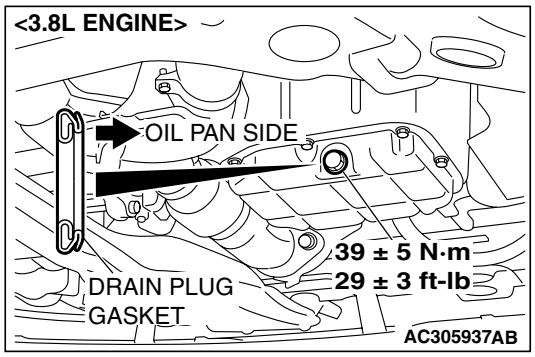
Use the specified oil. (Refer to P.00-43.)

⚠ WARNING

Use care as oil could be hot.

1. After warming up the engine, remove the oil filler cap.
2. Remove the drain plug to allow the engine oil to drain.





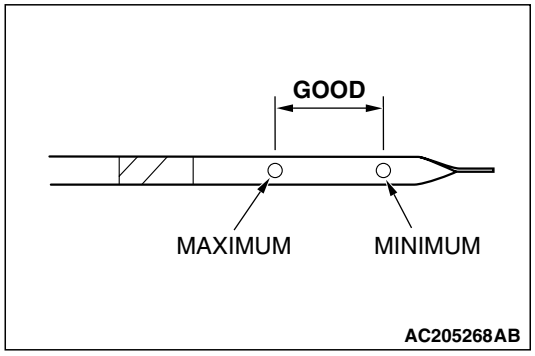
3. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.

   Tightening torque: 39 ± 5 N·m (29 ± 3 ft-lb)

4. Pour new engine oil in through the oil filler tube.

   Specified Engine Oil: Engine oils displaying ILSAC certification symbol ("Starburst" symbol) or conforming the API classification SL, SL/CF or higher.
   Total quantity:
   <2.4L Engine> 4.3 dm^3 (4.5 quarts)
   <3.8L Engine> 4.6 dm^3 (4.9 quarts)

5. Install the engine oil filler cap.
6. Start the engine and run it at idle for a few minutes.



7. Pull out the oil dipstick slowly and check that the oil level is within the marks on the oil dipstick.
8. Check that the oil is not excessively dirty, that there is no coolant or gasoline mixed in, and that it is sufficiently thick and slippery.

11. ENGINE OIL FILTER (REPLACE)

M1001002700345

The quality of replacement filters varies considerably. Only high quality filters should be used to assure most efficient service. Genuine oil filters require that the filter is capable of withstanding a pressure of 1,800 kPa (261 psi) are high quality filters and are recommended as follows:

Mitsubishi Oil Filter Part Number:
<2.4L Engine>
MD136466, MD322508 or MD356000
<3.8L Engine>
MD352627 or MD321589

Engine Oil Filter Selection

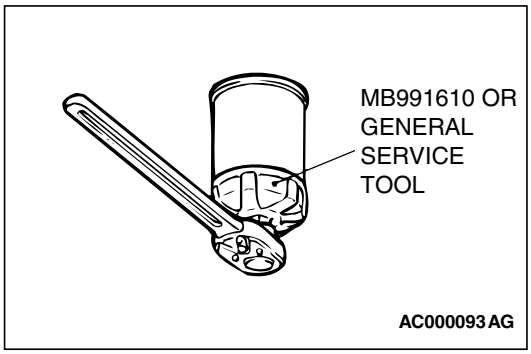
This vehicle is equipped with a full-flow, throw-away oil filter. The same type of filter is recommended as a replacement filter for this vehicle. It is possible, particularly in cold weather, that this vehicle may develop high oil pressure for a short duration. Make sure that any replacement filter used on this vehicle is a high-quality filter. The filter must withstand a pressure of 1,800 kPa (261 psi) [manufacturer's specifications] to avoid filter and

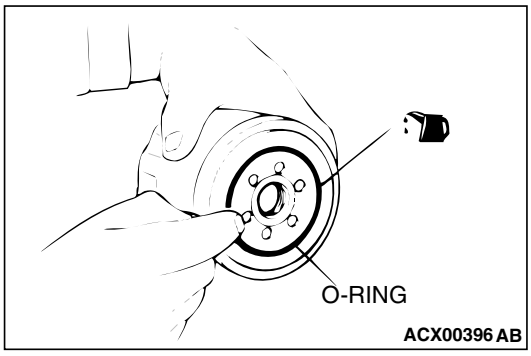
ultimately engine damage. The following is a high-quality filter and is strongly recommended for use on this vehicle: Mitsubishi Engine Oil Filter Part number MD136466, MD322508 or MD356000 <2.4L ENGINE> and MD352627 or MD321589 <3.8L ENGINE>.
Any replacement oil filter should be installed in accordance with the oil filter manufacturer's installation instructions.

Oil Filter Replacement

⚠ ***WARNING***
Use care as oil could be hot.

1. Drain the engine oil by removing the oil drain plug.
2. Use an oil filter wrench to remove the engine oil filter.
3. Clean the filter bracket side mounting surface and ensure the old O-ring has been removed.





4. Apply a small amount of engine oil to the O-ring of the new oil filter.
5. Where the oil filter O-ring touches the oil pan flange, tighten the oil filter to the specified torque using the commercially-available tool.

   Tightening torque:
   <MD356000, MD352627 or MD321589>: Approximately 3/4 turn [14 ± 2 N·m (124 ± 18 in-lb)]
   <MD136466, MD322508>: Approximately one turn [17 ± 3 N·m (13 ± 2 ft-lb)]

6. Add new engine oil through the oil filler.

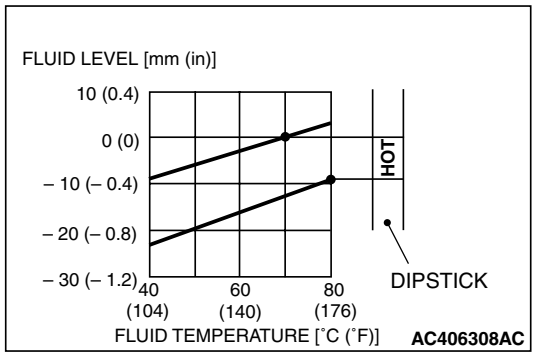
12. AUTOMATIC TRANSAXLE FLUID (CHECK FLUID LEVEL AND CONDITION)

M1001002900480

TRANSMISSION FLUID CHECK

1. Drive the vehicle until the transmission fluid temperature rises to the normal operating temperature [70 – 80°C (158 – 176°F)].

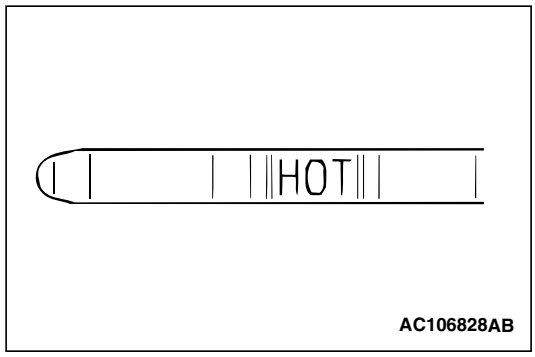
   NOTE: The transmission fluid temperature is measured with scan tool MB991958 (M.U.T.-III sub assembly).



NOTE: If it takes some amount of time until the transmission fluid reaches its normal operating temperature [70 – 80°C (158 – 176°F)], check the transmission fluid level by referring to the left diagram.

2. Park the vehicle on a level surface.
3. Move the selector lever through all positions to fill the torque converter and the hydraulic circuits with fluid, and then move the selector lever to the "N" position.
4. After wiping off any dirt around the dipstick, remove the dipstick and check the condition of the transmission fluid.

   NOTE: If the transmission fluid smells as if it is burnt, it means that the transmission fluid has been contaminated by fine particles from the bushings and friction materials. Transaxle overhaul and cooler line flushing may be necessary.



5. Check transmission fluid level is at the "HOT" mark on the dipstick. If the transmission fluid level is less than this, add DIAMOND ATF SP III until the level reaches the "HOT" mark.

   NOTE: If the transmission fluid level is too low, the oil pump will draw in air along with the transmission fluid, which will cause to form bubbles. If the transmission fluid level is too high, rotating components inside the transaxle will churn the fluid and air into a foamy liquid. Both conditions (level too low or too high) will cause the hydraulic pressure to drop, which will result in late shifting and slipping of the clutches and brakes.

   NOTE: In either case, air bubbles can interfere with normal valve, clutch, and brake operation. Also, foaming can cause transmission fluid to escape from the transaxle vent where it may be mistaken for a leak.

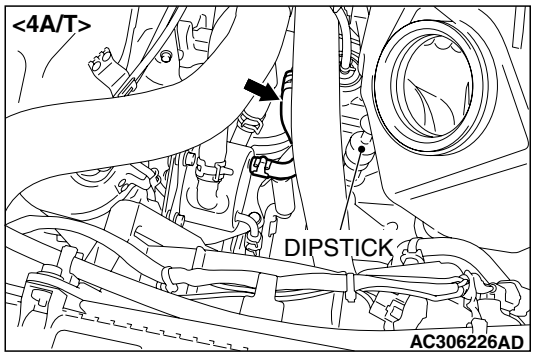
6. Securely insert the dipstick.

   NOTE: The transmission fluid should always be replaced under the following conditions:

   - *When troubleshooting the transaxle.*
   - *When overhauling the transaxle.*
   - *When the transmission fluid is noticeably dirty or burnt (driving under severe conditions).*

TRANSMISSION FLUID CHANGE

If you have an transmission fluid changer, use this changer to replace the transmission fluid. If you do not have an transmission fluid changer, replace the transmission fluid by the following procedure.



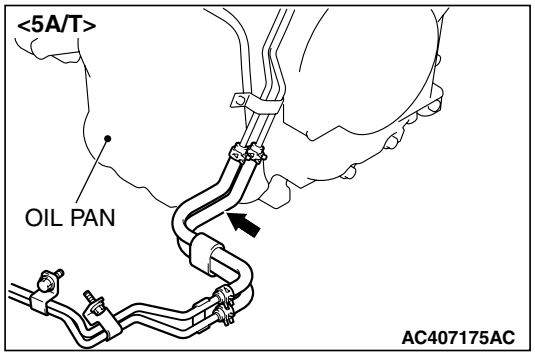
1. Disconnect the hose shown in the illustration which connects the transaxle and the oil cooler (inside the radiator). Place a container under the hose to collect the discharge.

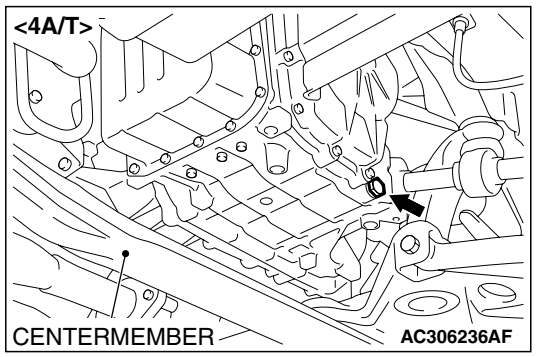
⚠ CAUTION

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

2. Start the engine and let the transmission fluid drain out. (Running conditions: "N" range with engine idling)

   Approximately 3.5 dm^3 (3.7 quarts) of transmission fluid should be removed.



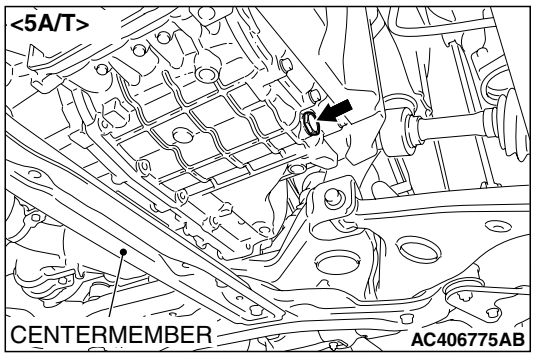


3. Remove the drain plug from the bottom of the transaxle case to drain the transmission fluid.

   Approximately 2.0 dm^3 (2.1 quarts) of transmission fluid should be removed.

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

   Tightening torque: 32 ± 2 N·m (24 ± 1 ft-lb)



⚠ CAUTION

Stop pouring if the full volume of transmission fluid can not be added.

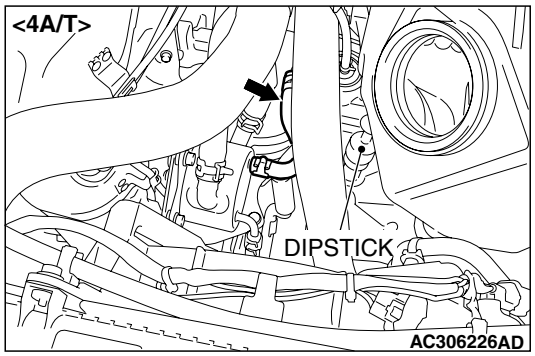
5. Add new transmission fluid (DIAMOND ATF SP III) through the oil filter tube.

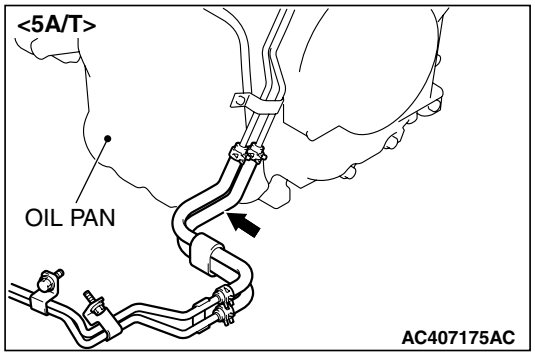
   Approximately 5.5 dm^3 (5.8 quarts) of transmission fluid should be added.

6. Repeat the procedure in Step 2. (to pump out the rest of the contaminated transmission fluid)
7. Add new transmission fluid (DIAMOND ATF SP III) through the oil filter tube.

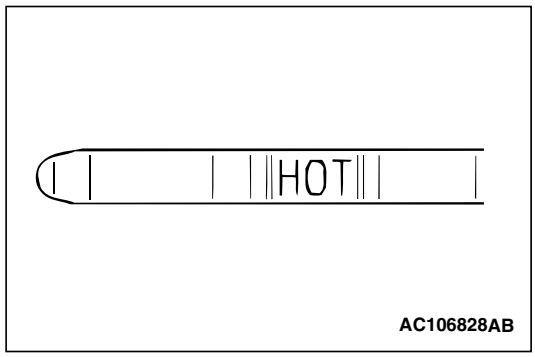
   Approximately 3.5 dm^3 (3.7 quarts) of transmission fluid should be added.

   NOTE: Check for contamination or a burnt odor. If the transmission fluid is still contaminated or burnt, repeat Steps 6 and 7 before proceeding to Step 8.





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



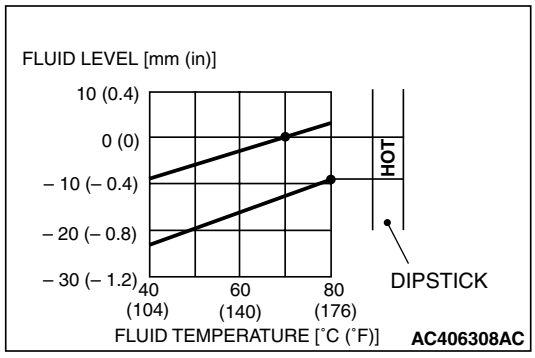
11. Check that the transmission fluid level is at the "COLD" mark on the dipstick. If the level is less than this, add transmission fluid.
12. Drive the vehicle until the transmission fluid temperature rises to the normal operating temperature [70 – 80°C (158 – 176°F)], and then check the transmission fluid level again. The transmission fluid level must be at the "HOT" mark.

    NOTE: The transmission fluid temperature is measured with scan tool MB991958 (M.U.T.-III sub assembly).

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

    NOTE: If it takes some amount of time until the transmission fluid reaches its normal operating temperature [70 – 80°C (158 – 176°F)], check the transmission fluid level by referring to the left diagram.
13. When the transmission fluid is less than the specified level, add transmission fluid.

    When the transmission fluid is greater than the specified level, drain the excess fluid through the drain plug to adjust the transmission fluid to the specified level.
14. Firmly insert the dipstick into the oil filler tube.



13. ENGINE COOLANT (CHANGE)

M1001003100528

Check the cooling system parts such as the radiator, heater and oil cooler hoses, thermostat and their connections for leakage and damage.

CHANGING COOLANT

1. Set the temperature control knob to the "HOT" position.

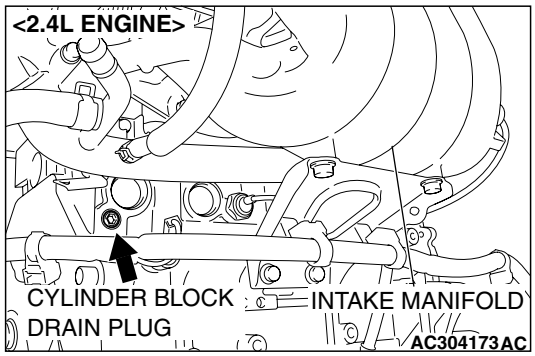
2. Run the engine until the engine coolant warms, and then stop the engine.

⚠ WARNING

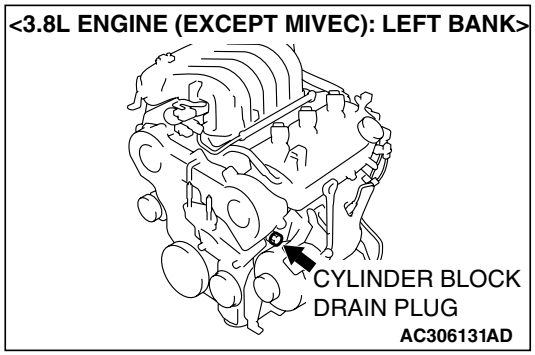
When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a shop towel over the cap and turn the cap counterclockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.

3. Drain the water from the radiator, heater core and engine after unplugging the radiator drain plug and removing the radiator cap.

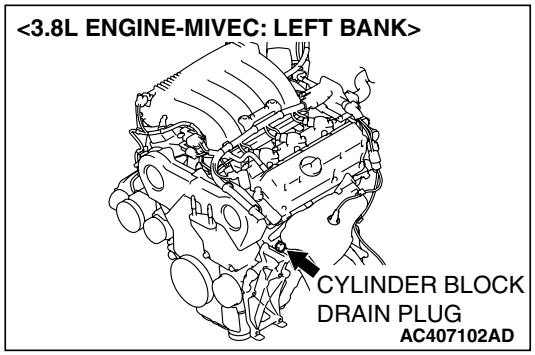
<2.4L ENGINE>



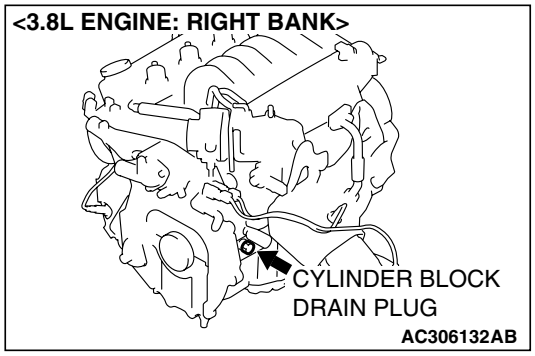
<3.8L ENGINE (EXCEPT MIVEC): LEFT BANK>



<3.8L ENGINE-MIVEC: LEFT BANK>

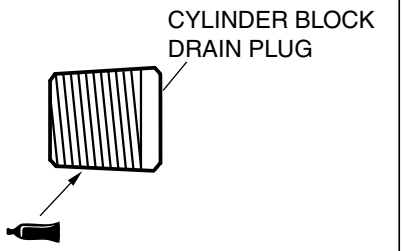


<3.8L ENGINE: RIGHT BANK>

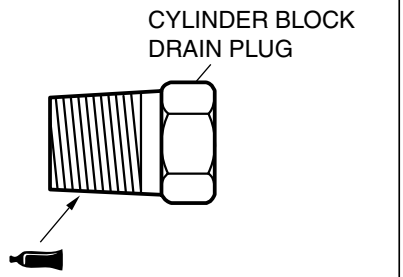


4. Drain the water in the water jacket by unplugging the drain plug of the cylinder block.
5. Remove the radiator condenser tank assembly and drain the coolant.
6. Drain the coolant then clean the path of the coolant by injecting water into the radiator from the radiator cap area.

<2.4L ENGINE, 3.8L ENGINE: RIGHT BANK>



<3.8L ENGINE: LEFT BANK>



7. Apply the designated sealant to the screw area of the cylinder block drain plug, and then tighten to the standard torque.

   Specified sealant: 3M™ AAD Part No.8731 or equivalent

   Tightening torque:

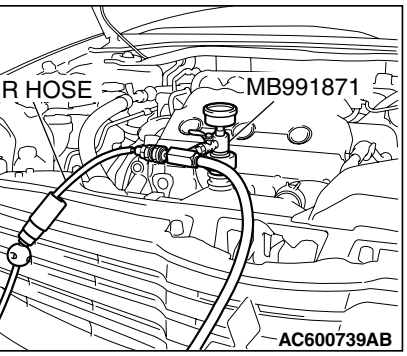
   <2.4L Engine> 44 ± 5 N·m (33 ± 3 ft-lb)

   <3.8L Engine> 39 ± 5 N·m (29 ± 3 ft-lb)

8. Securely tighten the radiator drain plug.
9. Assemble the radiator condenser tank assembly.

⚠ CAUTION

Do not use alcohol or methanol anti-freeze or any engine coolants mixed with alcohol or methanol anti-freeze. The use of an improper anti-freeze can cause corrosion of the aluminum components.



10. By referring to the section on coolant, select an appropriate concentration for safe operating temperature within the range of 30 to 60%. Use special tool MB991871 to refill the coolant. A convenient mixture is a 50% water and 50% antifreeze solution [freezing point: –31°C (–32.8 °F)].

    Recommended antifreeze: Long Life Antifreeze Coolant or an equivalent

    Quantity:

    <2.4L Engine> 8.0 dm^3 (8.5 quarts)

    <3.8L Engine> 8.7 dm^3 (9.2 quarts)

    NOTE: For how to use special tool MB991871, refer to its manufacturer's instructions.

11. Reinstall the radiator cap.
12. Start the engine and let it warm up until the thermostat opens.
13. After repeatedly revving the engine up to 3,000 r/min several times, stop the engine.
14. Remove the radiator cap after the engine has cooled, and pour in coolant up to the brim. Reinstall the cap.

⚠ CAUTION

Do not overfill the radiator condenser tank assembly.

15. Add coolant to the radiator condenser tank assembly between the "FULL" and "LOW" mark if necessary.

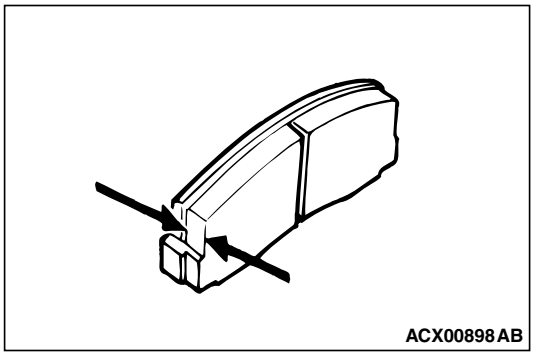
14. COOLANT HOSES (RADIATOR HOSE, HEATER HOSE) (INSPECT)

M1001009700034

Inspect the surface of radiator hoses and heater hoses for heat and mechanical damage. Hard and brittle rubber, cracking, tears, cuts, abrasions and excessive swelling indicate deterioration of the rubber.

15. DISC BRAKE PADS, ROTORS (INSPECT FOR WEAR)

M1001003200291


ACX00898AB

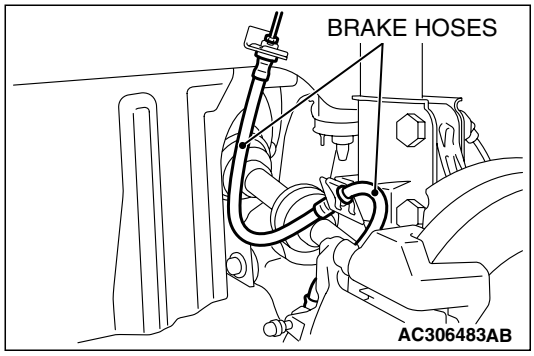
Check for fluid contamination and wear. Replace the complete set of pads if any one pad is defective.

Thickness of lining
Minimum limit: 2.0 mm (0.08 inch)

⚠ CAUTION
The pads for the right and left wheels should be replaced at the same time. Never split or intermix brake pad sets. All four pads must be replaced as a complete set.

16. BRAKE HOSES (CHECK FOR DETERIORATION OR LEAKS)

M1001003400314



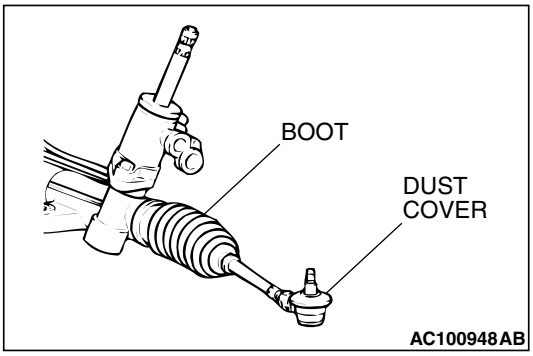
AC306483AB

Inspection of brake hoses should be included in all brake service operations.
The hoses should be checked for:

1. Incorrect length, severe surface cracking, stretching, scuffing or worn spots (If the fabric casing of the hoses is exposed by cracks or abrasion in the rubber hose cover, the hoses should be replaced. Eventual deterioration of the hose and possible bursting failure may occur).
2. Incorrect installation, twisting or interference with wheel, tire or chassis.

17. BALL JOINT AND STEERING LINKAGE SEALS (INSPECT FOR GREASE LEAKS AND DAMAGE)

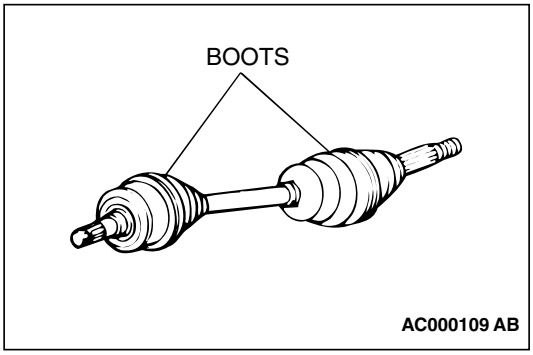
M1001003500322



1. These components, which are permanently lubricated at the factory, do not require periodic lubrication. Damaged seals and boots should be replaced to prevent leakage or grease contamination.
2. Inspect the dust cover and boots for proper sealing, leakage and damage, and replace them if defective.

18. DRIVE SHAFT BOOTS (INSPECT FOR GREASE LEAKS AND DAMAGE)

M1001003600318



1. These components, which are permanently lubricated at the factory, do not require periodic lubrication. Damaged seals and boots should be replaced to prevent leakage or grease contamination.
2. Inspect the dust cover and boots for proper sealing, leakage and damage. Replace them if defective.

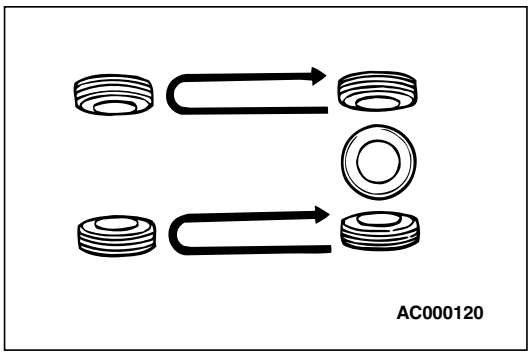
19. SUSPENSION SYSTEM (INSPECT FOR LOOSENESS AND DAMAGE)

M1001009600048

Visually inspect the front/rear suspension components for deterioration and damage. Re-tighten the front/rear suspension components retaining bolts to specified torque.

20. TIRES (ROTATE)

M1001008900411



Rotate tires regularly to equalize tire wear and help extend tire life. Recommended tire rotation is every 12,000 km (7,500 miles).
Timing for the rotation may vary according to vehicle condition, road surface conditions, and individual driver's habits.
When rotating tires, check for uneven wear, damage, and wheel alignment. Abnormal wear is usually caused by incorrect tire pressure, improper wheel alignment, out-of balance wheels, or severe braking.
The first rotation is the most important, to achieve more uniform wear for all tires on the vehicle.

MAIN SEALANT AND ADHESIVE TABLE

M1001003800334

APPLICATION		3M™ NO.	LOCTITE®/ PERMATEX®NO.
ENGINE AND DRIVETRAIN	Between rocker cover and camshaft bearing cap. Between rocker cover, semicircular packing and cylinder head. Between oil pressure switch and engine.	3M™ AAD Part No. 8672 Ultrapro High Temp. Silicone Gasket or 3M™ AAD Part No. 8679 Black/8678 Black Press-In-Place Silicone gasket strips	Permatex® Ultra Black 598, No.82180
	Between engine coolant temperature switch, engine coolant temperature sensor, thermo valve, thermo switch, joint, engine coolant temperature gauge unit (large-size) and engine	3M™ AAD Part No. 8731 Medium Strength Blue Threadlocker	Loctite®242 Blue Service Tool Removable 24200
	Between oil pan and engine block	3M™ AAD Part No. 8672, 3M™ AAD Part No. 8704 or 3M™ AAD Part No. 8679/ 8678	Permatex® Ultra Gray 599, No.82194
WEATHER-STRIPPING FOR GLASS	Between tempered glass, body flanges, and weatherstrip	3M™ AAD Part No. 8509 Auto Bedding and Glazing Compound or 3M™ AAD Part No. 8633 Windo-weld Resealant	–
WEATHER-STRIPPING FOR GLASS	Between laminated glass and weatherstrip	3M™ AAD Part No. 8633	–
INTERIORS	Adhesive of vinyl chloride cloth	3M™ AAD Part No. 8088 General Trim Adhesive or 3M™ AAD Part No. 8064 Vinyl Trim Adhesive	Permatex® Vinyl Repair Kit No.81786
	Adhesion of door weatherstrip	3M™ AAD Part No. 8001 (yellow) or 3M™ AAD Part No. 8008 (black) Super Weatherstrip Adhesive or 3M™ AAD Part No. 8011 Black Weatherstrip Adhesive	Permatex® Super Black Weatherstrip Adhesive No.82, 81850
	Sealing of various grommets and packing	3M™ AAD Part No. 8509 or 3M™ AAD Part No. 8678	–
	Adhesion of headliners and various interior decorative materials	3M™ AAD Part No. 8088 General Trim Adhesive or 3M™ AAD Part No. 8090 Super Trim Adhesive	Permatex® Spray Adhesive No.82019

APPLICATION		3M™ NO.	LOCTITE®/ PERMATEX®NO.
BODY SEALANTS	Sealing of sheet metal joints, drip rail, floor, side panels, trunk, front panel, tail gate hinge	3M™ AAD Part No. 8531 Heavy Drip-Check Sealer (gray) or 3M™ AAD Part No. 8302 Ultrapro Autobody Sealant (clear) or 3M™ AAD Part No. 8361 Urethane A/B Sealant (gray or white)	–
	Miscellaneous body sealants (originally mounted w/ adhesive tape) • Waterproof door film • Fender panel • Splash shield • Mud guard • Rear combination lamp	3M™ AAD Part No. 8633 Windo-weld Resealant	–
	Fuel Tank and Pad	3M™ AAD Part No. 8088 General Trim Adhesive or 3M™ AAD Part No. 8090 Super Trim Adhesive	Permatex® Spray Adhesive No.82019
CHASSIS SEALANT	Sealing of various flange faces and threaded parts. Packing of fuel level sensor	3M™ AAD Part No. 8730 High Strength Red Thread locker or 3M™ AAD Part No. 8731 Medium Strength Blue Threadlocker	Loctite®272 High Strength and High Temperature 27200
	Sealing of various threaded parts, dust covers. Differential carrier packing, dust covers and ball joint and linkage. Packing and shims of steering box, sealing of rack support cover and top cover of steering box housing, seal of junction face of knuckle arm flange	3M™ AAD Part No. 8672 Ultrapro High Temp. Silicone Gasket or 3M™ AAD Part No. 8679 (black) or 3M™ AAD Part No. 8678 (black) Press-In-Place Silicone gasket strips 3M™ AAD Part No. 8661 or 3M™ AAD Part No. 8663 Super Silicone sealant	Permatex® The Right Stuff No.25223
	Seal of brake shoe hold-down pin and wheel cylinder of drum brakes	3M™ AAD Part No. 8633 Windo-weld Resealant	–

APPLICATION		3M™ NO.	LOCTITE®/ PERMATEX®NO.
QUICK FIX ADHESIVE	–	3M™ AAD Part No. 8155 Quick Fix Adhesive	Loctite®Quicktite Super Glue 21309
ANAEROBIC STRONG SEALING AGENT	Fixing of various threads, bolts, screws. Fixing of differential drive gear bolt, Connecting of tilt steering bolt. Fan, pulley, gear sealing of small gaps and flange faces	3M™ AAD Part No. 8730 High Strength Threadlocker or 3M™ AAD Part No. 8731 Medium Strength Threadlocker	Loctite®271, High-Strength Threadlocker 27100 or 27200
UNDERCOATING AGENT	-	3M™ AAD Part No. 8883 Rubberized Undercoating Aerosol or 3M™ AAD Part No. 8864 Body Schutz Undercoating	Permatex® Heavy-Duty Undercoating 81833

GROUP 00E

GENERAL <ELECTRICAL>

CONTENTS

HARNESS CONNECTOR INSPECTION

M1001003900201

CONNECTOR CONTINUITY AND VOLTAGE TEST

Required Special Tools:

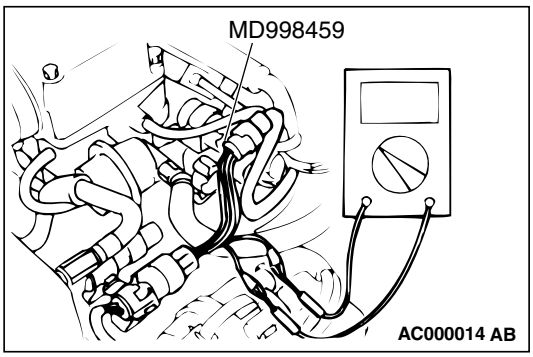
- MB991219: Test Harness Set
- MD998459: Test Harness

Follow the steps below to avoid causing poor connector contact and/or reduced waterproof performance of connectors when checking continuity and/or voltage at waterproof connectors.

⚠ CAUTION

Never backprobe a waterproof connector. Backprobing a connector may cause the terminals to corrode, deteriorating circuit performance.

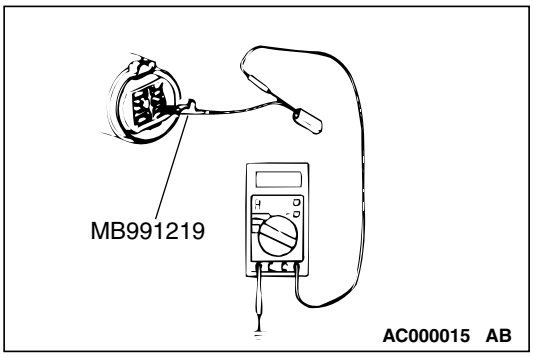
1. If the circuit to be checked is a closed state, use a special tool like MD998459.



⚠ CAUTION

Forcing the probe into the terminal may open the terminal, causing intermittent or poor contact and creating an open circuit.

2. If the connector is disconnected for checking and the facing part is the female pin side, use an appropriate male terminal for checking the contact pressure of connector pins (like MB991219).



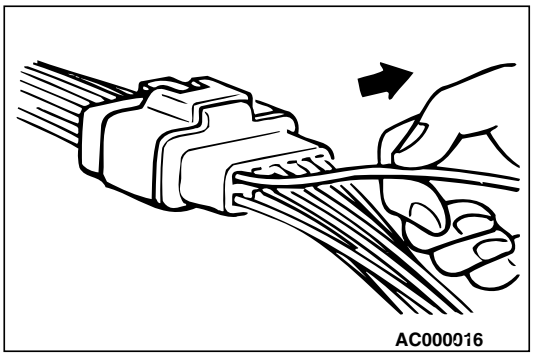
⚠ CAUTION

Do not simultaneously contact more than one terminal with the probe. Contacting two or more terminals at the same time may damage a circuit, possibly to the point of starting an electrical fire.

3. If the facing part is the male pin side, either carefully touch the probe to the pin so it does not accidently contact other pins, or use an appropriate female terminal.

IMPROPER TERMINAL ENGAGEMENT CHECK

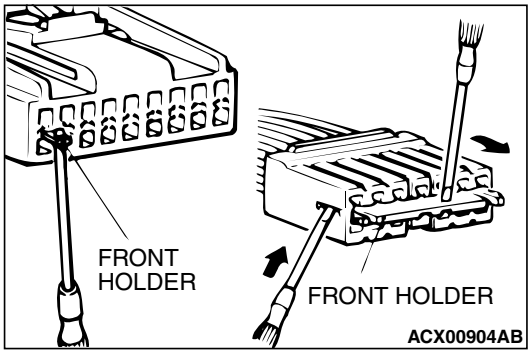
Terminals inside a connector may not engage properly even if the connectors engage. Make sure that each terminal does not come out of the connector when gently pulling each harness wire. If it does, repair or replace the terminal and/or connector.



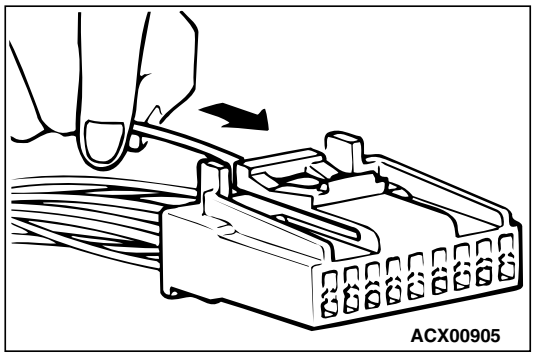
CONNECTOR TERMINAL ENGAGEMENT AND DISENGAGEMENT

Loosely engaged terminals can be repaired by removing the female terminal from the connector housing and raising its lance to establish better engagement. Removal of the connector terminal used for MFI and INVECS-II A/T control circuit can be done in the following manner.

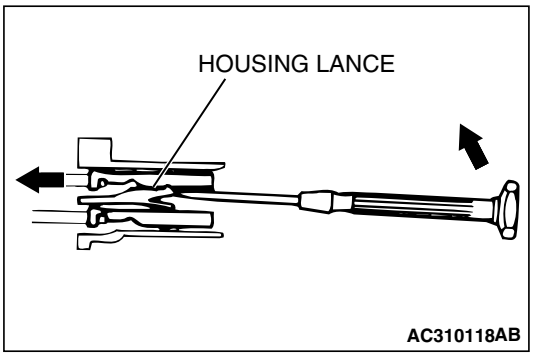
COMPUTER CONNECTOR



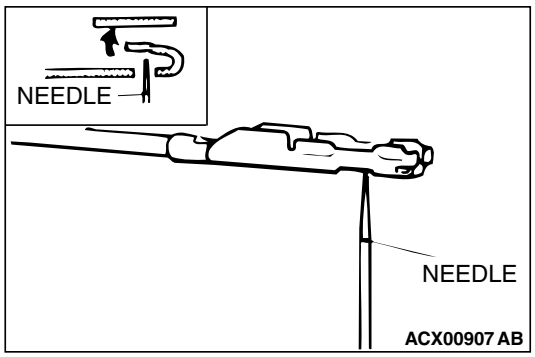
1. Insert a screwdriver [1.4 mm (0.06 inch) width] as shown in the figure, disengage the front holder, and remove it.



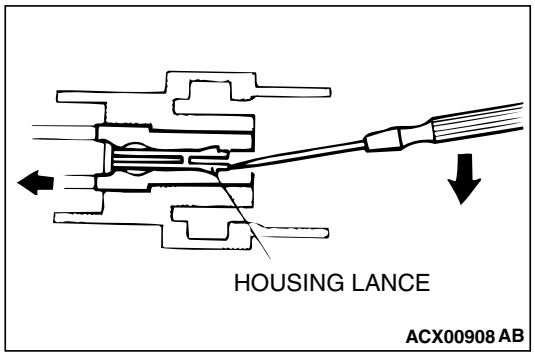
2. Push the harness wire of the terminal to be repaired deep into the connector from the harness side and hold it there.



3. Insert the tip of the screwdriver [1.4 mm (0.06 inch) width] into the connector as shown in the figure, gently push the housing lance down with the tip, and pull out the terminal.

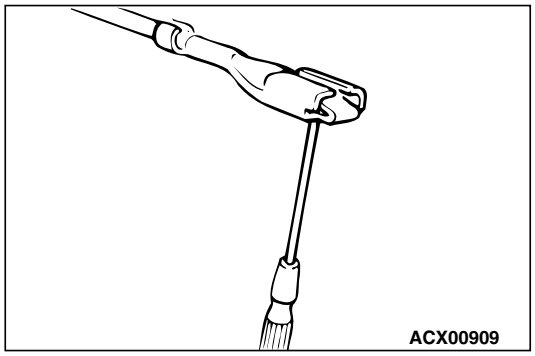


4. Insert a needle through the hole provided on the terminal and raise the contact point. Lightly squeeze the outer edge so the flats are parallel with the bottom.



ROUND WATERPROOF CONNECTOR

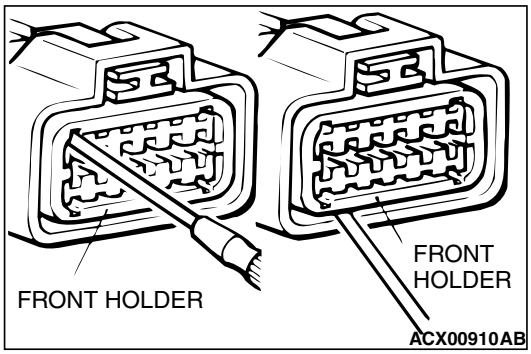
1. Remove the waterproof cap by using a screwdriver.
2. Insert the tip of the screwdriver [1.4 mm (0.06 inch) or 2.0 mm (0.08 inch) width] into the connector as shown in the figure, raise the housing lance slightly with the tip, and pull out the terminal.

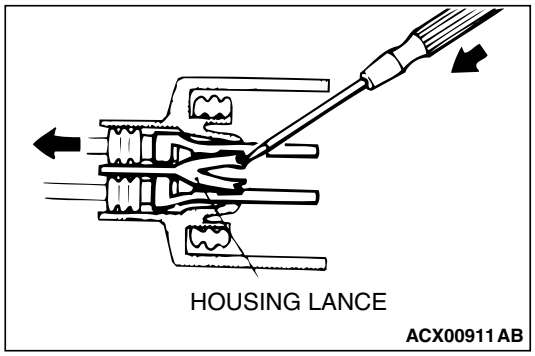


3. Insert a screwdriver through the hole provided on the terminal and raise the contact point. Lightly squeeze the outer edge so the flats are parallel with the bottom.

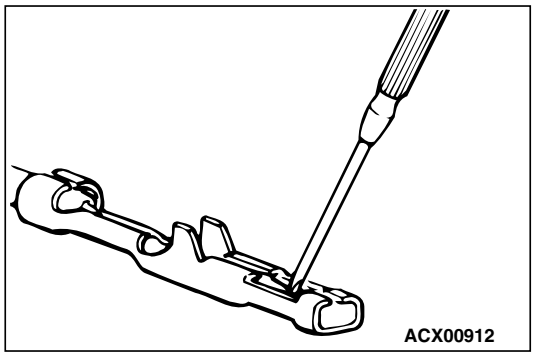
RECTANGULAR WATERPROOF CONNECTOR

1. Disengage the front holder with a screwdriver and remove it.





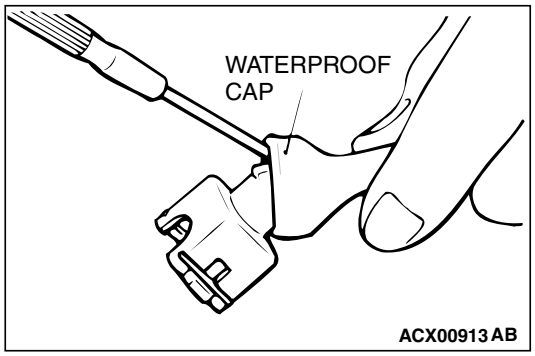
2. Insert the tip of a screwdriver [0.8 mm (0.03 inch) width] into the connector as shown in the figure, push it lightly to raise the housing lance, and pull out the terminal.

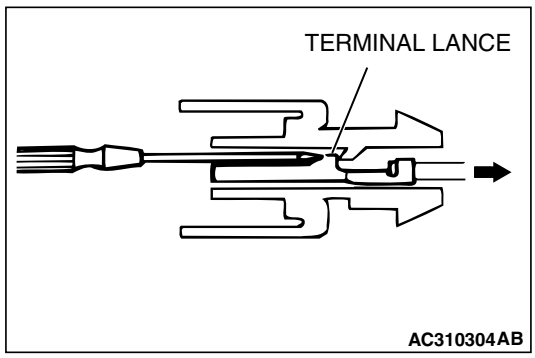


3. Press the contact point to the male terminal down by holding a screwdriver [1.4 mm (0.06 inch) width] as shown in the figure. Lightly squeeze the outer edge so the flats are parallel with the bottom.

INJECTOR CONNECTOR

1. Remove the waterproof cap.

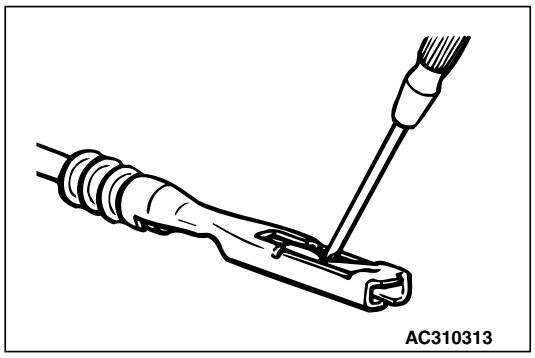




2. Insert the tip of a screwdriver [1.4 mm (0.06 inch) width] into the connector as shown in the figure, press in the terminal lance, and pull out the terminal.

⚠ CAUTION

Make sure the lance is pressed in before the terminal is inserted into the connector.



3. Press the contact point to the male terminal down by holding a screwdriver [1.4 mm (0.06 inch) width] as shown in the figure.

HOW TO DIAGNOSE

HOW TO DIAGNOSE

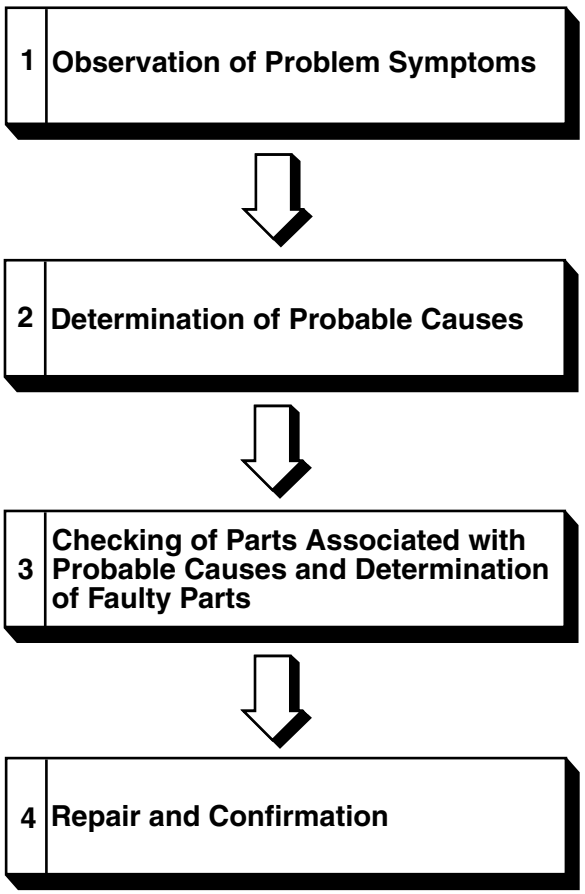
M1001004300086

The most important point in troubleshooting is to determine "Probable Cause." Once the probable causes are determined, parts to be checked can be limited to those associated with such probable causes. The determination of the probable causes must be based on a theory and be supported by facts and must not be based on intuition only.

TROUBLESHOOTING STEPS

M1001004400049

If an attempt is made to solve a problem without going through correct steps for troubleshooting, the symptoms could become more complicated, resulting in failure to determine the causes correctly and making incorrect repairs. The four steps below should be followed in troubleshooting.



Observe the symptom carefully. Check if there are also other problems.

In determining the probable causes, it is necessary to study the wiring diagram to understand the circuit as a system. Knowledge of switches, relays and other parts is necessary for accurate analysis. The causes of similar problems in the past must be taken into account.

Troubleshooting is carried out by making step-by-step checks until the cause is found.

After the problems are corrected, be sure to check that the system operates correctly. Also check that new problems have not been caused by the repair.

ACX00915AC

INFORMATION FOR DIAGNOSIS

M1001004500132

This manual contains the harness diagrams as well as the individual circuit drawings, operational explanations, and troubleshooting hints for each component. The information is presented in the following manner:

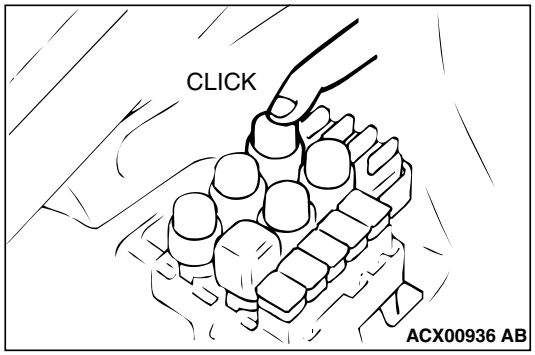
1. Connector diagrams show the connector positions, etc., on the actual vehicle as well as the harness path.
2. Circuit diagrams show the configuration of the circuit with all switches in their normal positions.
3. Operational explanations include circuit drawings of current flow when the switch is operated and how the component reacts.

4. Troubleshooting hints include numerous examples of problems which might occur, traced backward in a common-sense manner to the origin of the trouble. Problems whose origins may not be found in this manner are pursued through the various system circuits.

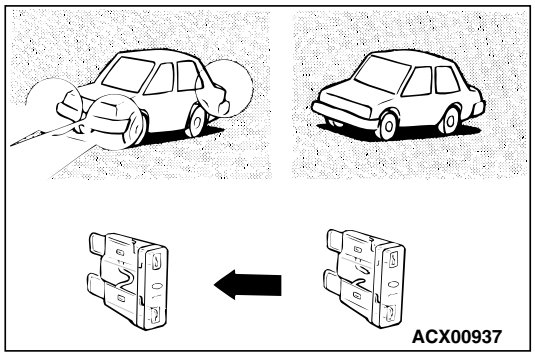
NOTE: Components of MFI, ETACS, etc. with ECU do not include 3 and 4 above. For this information, refer to a relevant group which includes details of these components.

INSPECTION

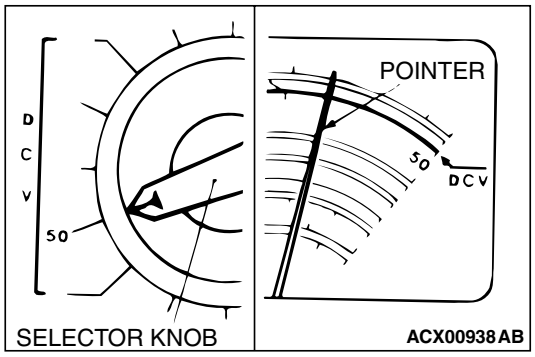
M1001004600139



1. Sight and sound checks
   Check relay operation, blower motor rotation, light illumination, etc. Listen for a "click" when some relay covers are pushed down.



2. Simple checks
   For example, if a headlight does not come on and a faulty fuse or poor grounding is suspected, replace the fuse with a new one. Or use a jumper wire to ground the light to the body. Determine which part(s) is/are responsible for the problem.

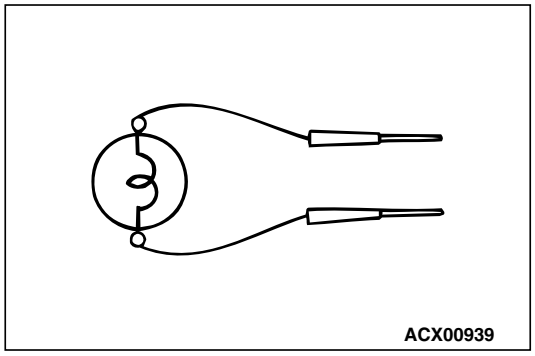


3. Checking with instruments
   Use an appropriate instrument in an adequate range and read the indication correctly.

INSPECTION INSTRUMENTS

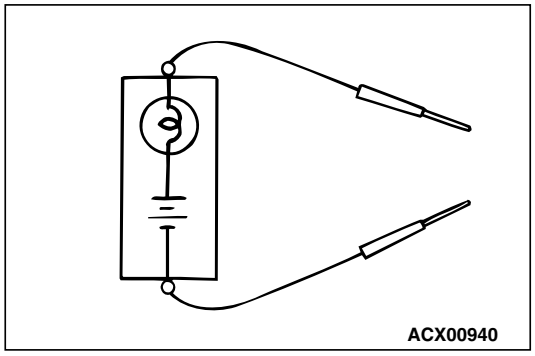
M1001004700040

For inspection, use the following instruments:

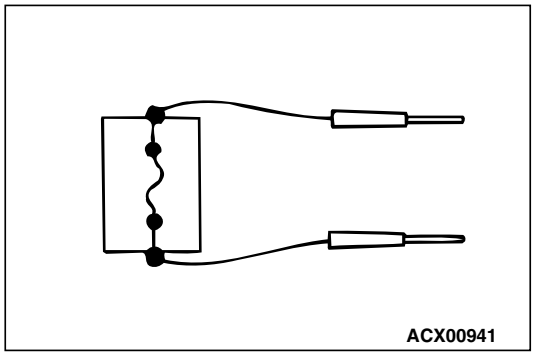

ACX00939

⚠ CAUTION
Never use a test light for checking ECU-related circuits or ECUs.

1. Test light
   A test light consists of a 12V bulb and lead wires. It is used to check voltages or short circuits.

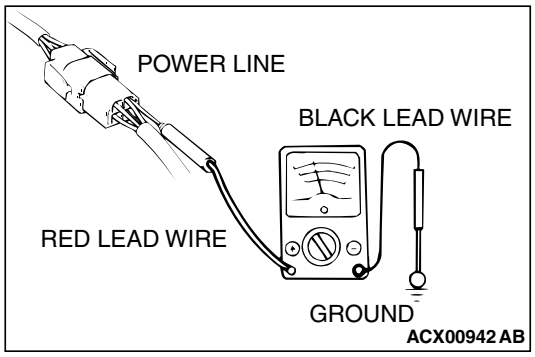

ACX00940

2. Self-powered test light
   A self-powered test light consists of a bulb, battery and lead wires connected in series. It is used to check continuity or grounding.


ACX00941

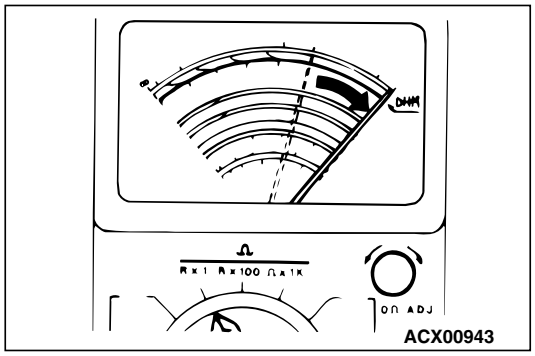
⚠ CAUTION
Never use a jumper wire to connect a power supply directly to a load.

3. Jumper wire
   A jumper wire is used to close an open circuit.



ACX00942 AB

4. Voltmeter
   A voltmeter is used to measure the circuit voltage. Normally, the positive (red lead) probe is applied to the point of voltage measurement and the negative (black lead) probe to the body ground. Use a digital voltmeter to check for voltage drop before or after a component.

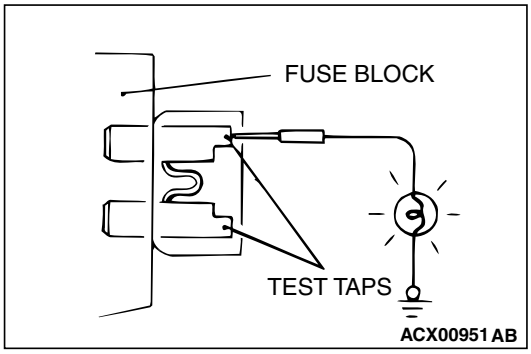


ACX00943

5. Ohmmeter
   An ohmmeter is used to check continuity or measure resistance of a switch or coil. If the measuring range has been changed, the zero point must be adjusted before measurement.

CHECKING FUSES

M1001005000141

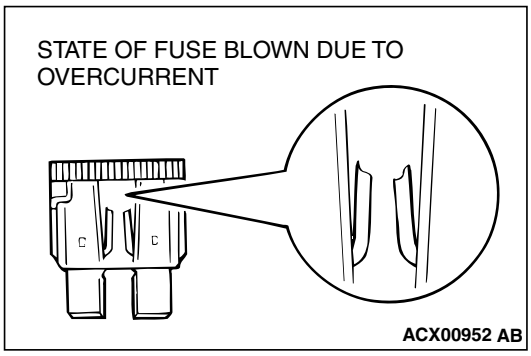


ACX00951 AB

A blade type fuse has test taps provided to allow checking of the fuse itself without removing it from the fuse block. The fuse is okay if the test light comes on when its one lead is connected to the test taps (one at a time) and the other lead is grounded. Remember to turn the ignition switch to ON to ensure all circuits are live.

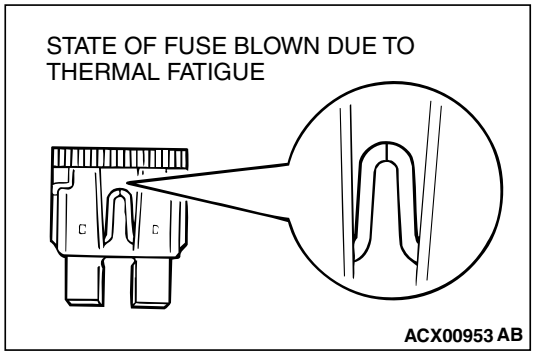
CAUTIONS IN EVENT OF BLOWN FUSE

When a fuse is blown, there are two probable causes. One is that it is blown due to flow of current exceeding its rating. The other is that it is blown due to repeated on/off current flowing through it. Which of the two causes is responsible can be easily determined by visual check as described below.



ACX00952 AB

1. Fuse blown due to current exceeding rating
   The illustration shows the state of a fuse blown due to this cause. In this case, do not replace the fuse with a new one hastily since a current heavy enough to blow the fuse has flowed through it. First, check the circuit for shorts and check for abnormal electric parts. After correcting shorts or replacing parts, use only a fuse of the same capacity as a replacement. Never use a fuse of larger capacity than the original fuse. If a larger capacity fuse is used, electric parts or wiring could be damaged, or could start a fire.



ACX00953 AB

2. Fuse blown due to repeated turning current on and off
   The illustration shows the state of a fuse blown due to repeated current on/off. Normally, this type of problem occurs after a fairly long period of use and is less frequent than above. In this case, simply replace with a new fuse of the same capacity.

CHECKING SWITCHES

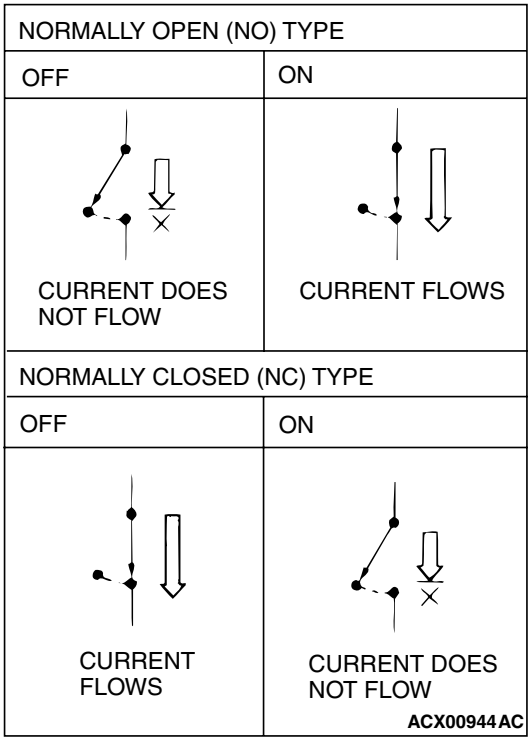
M1001004800177

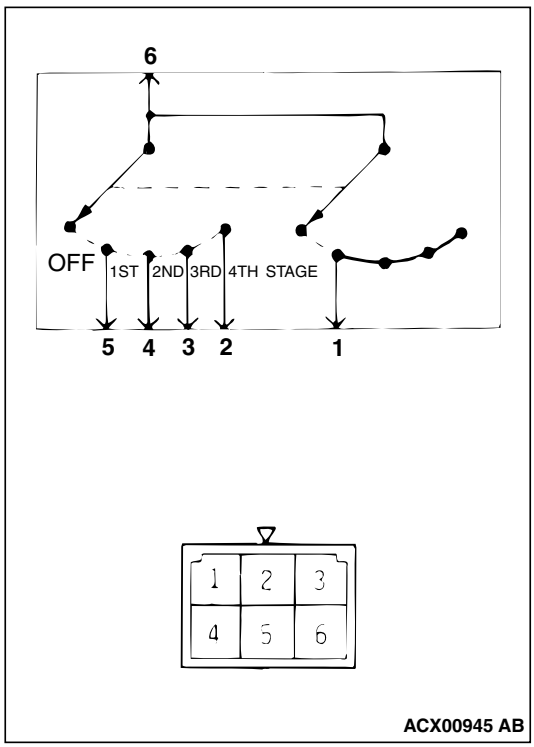
In a circuit diagram, a switch is shown in the idle state.

1. Normally open or normally closed switch

   Switches are classified into those which open the circuit and those which close the circuit when off.

   Switches are shown in their normal state unless specified otherwise.





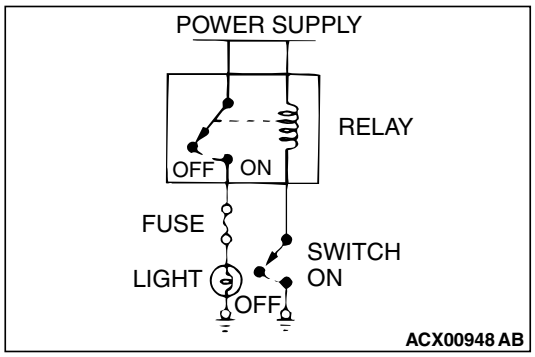
2. Switch connection

   This figure illustrates a complex switch. The continuity between terminals at each position is as indicated in the table below.

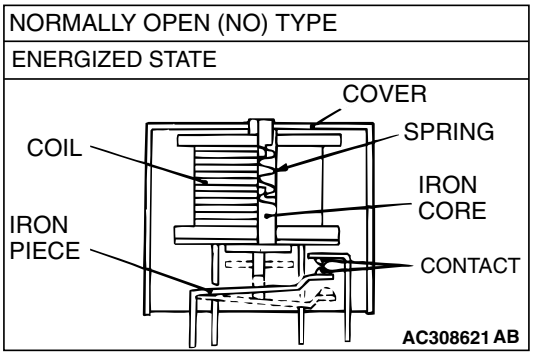
SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
OFF	–	–
1st stage	1–5–6	Continuity
2nd stage	1–4–6	Continuity
3rd stage	1–3–6	Continuity
4th stage	1–2–6	Continuity

CHECKING RELAYS

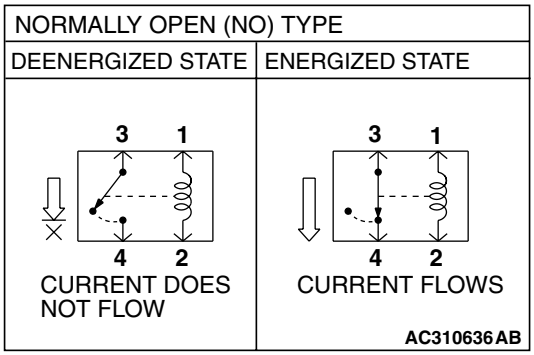
M1001004900152



1. By using a relay, a heavy current can be turned on and off by a switch using much less current. For example, in the circuit shown here, when the switch is turned on (closed), current flows to the coil of the relay. Then, its contact is turned on (closed) and the light comes on. The current flowing through the switch is much less than that for the light.



2. When current flows through the coil of a relay, its core is magnetized to attract the iron piece, closing (ON) the contact at the tip of the iron piece. When the coil current is turned off, the iron piece returns to its original position by a spring, opening the contact (OFF).



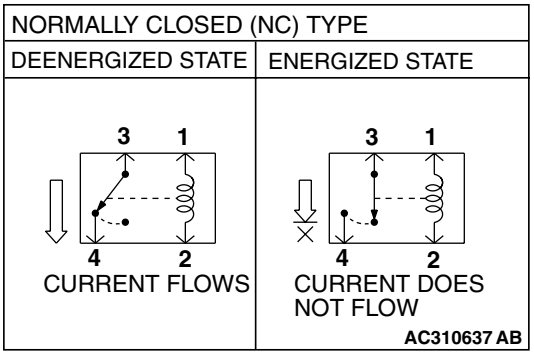
3. Relays may be classified as the normally open-type or the normally closed-type, depending on their contact construction.

   NOTE: The deenergized state means that no current is flowing through the coil. The energized state means that current is flowing through the coil.

   (1) The normally open-type

   When a normally open relay as illustrated here is checked, there should be no continuity between terminals 3 and 4 when the relay is deenergized. There should be continuity between terminals 3 and 4 when battery voltage and ground are applied to terminals 1 and 2. The relay condition is determined by this check.

   NOTE: Check the relay in both situation which is energized and is not energized.



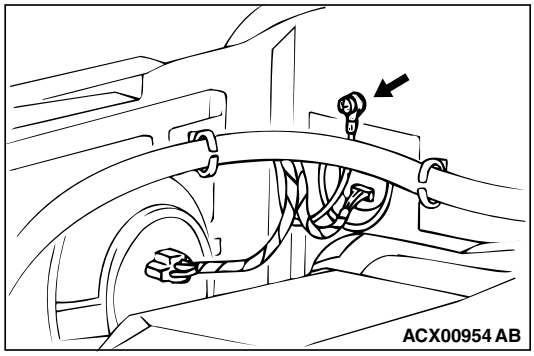
   (2) The normally closed-type

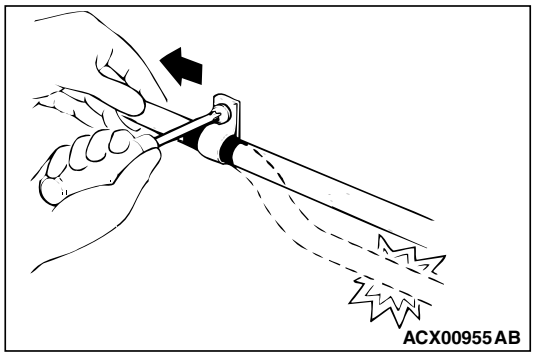
   When a normally closed relay as illustrated here is checked, there should be continuity between terminals 3 and 4 when the relay is deenergized. There should be no continuity between terminals 3 and 4 when battery voltage and ground are applied to terminals 1 and 2. The relay condition is determined by this check.

   NOTE: Check the relay in both situation which is energized and is not energized.

CABLES AND WIRES CHECK

M1001005100041

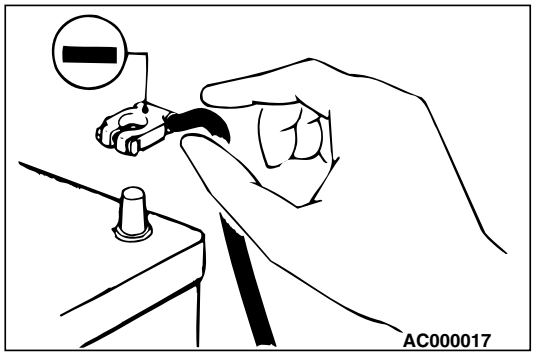

ACX00954 AB


ACX00955 AB

1. Check connections for looseness, rust, and stains.
2. Check terminals and wires for corrosion.
3. Check terminals and wires for open circuit or impending open circuit.
4. Check wire insulation and coating for damage, cracks, and wear.
5. Check conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
6. Check grounding parts to verify that there is complete continuity between attaching bolt(s) and vehicle body.
7. Check for incorrect wiring.
8. Check that harnesses are secured to prevent contact with sharp edges and corners or hot parts (exhaust manifold, pipe, etc.).
9. Check that harnesses are secured firmly to provide enough clearance from the fan pulley, fan belt, and other rotating or moving parts.
10. Check that the harnesses between fixed parts (such as the vehicle body) and vibrating parts (such as the engine) are long enough to allow for vibration and movement.

BATTERY HANDLING

M1001005200048


AC000017

⚠ WARNING

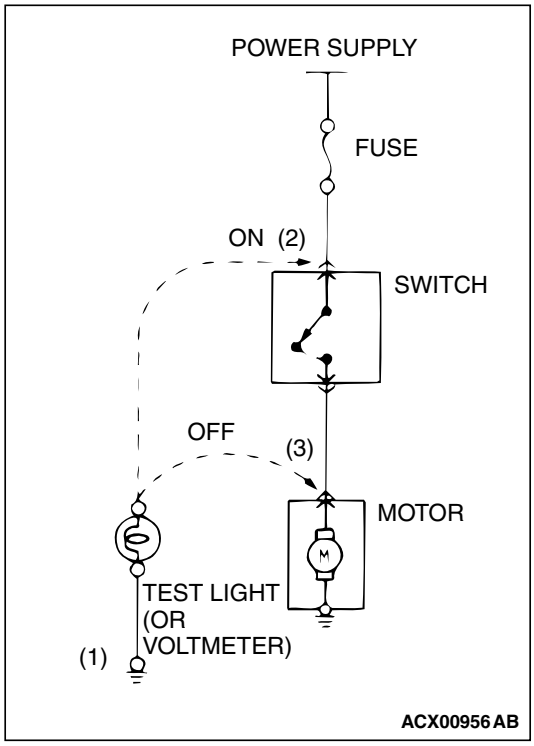
Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

When checking or servicing does not require power from the vehicle battery, be sure to disconnect the cable from the battery (–) terminal. This will prevent problems that could be caused by a short circuit. Disconnect the (–) battery terminal first and reconnect it last.

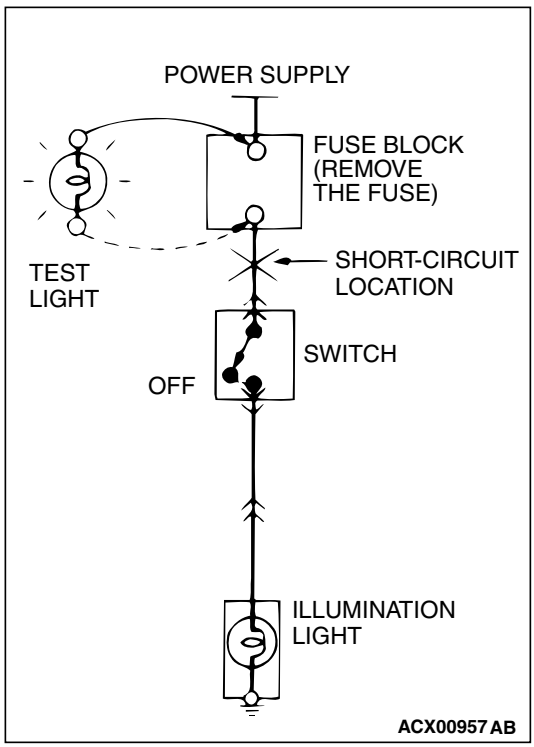
GENERAL ELECTRICAL SYSTEM CHECK

M1001005300045

A circuit consists of the power supply, switch, relay, load, ground, etc. There are various methods to check a circuit including an overall check, voltage check, short-circuit check, and continuity check. Each of the methods briefly described below applies only to circuits similar to the illustration.

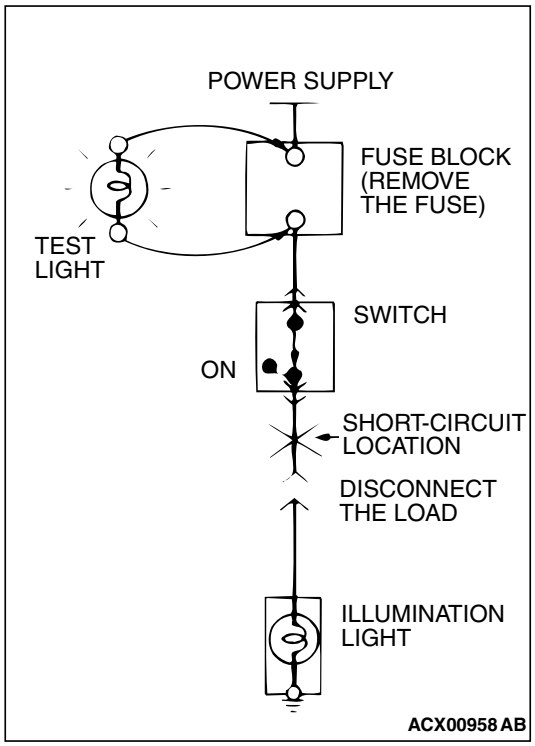


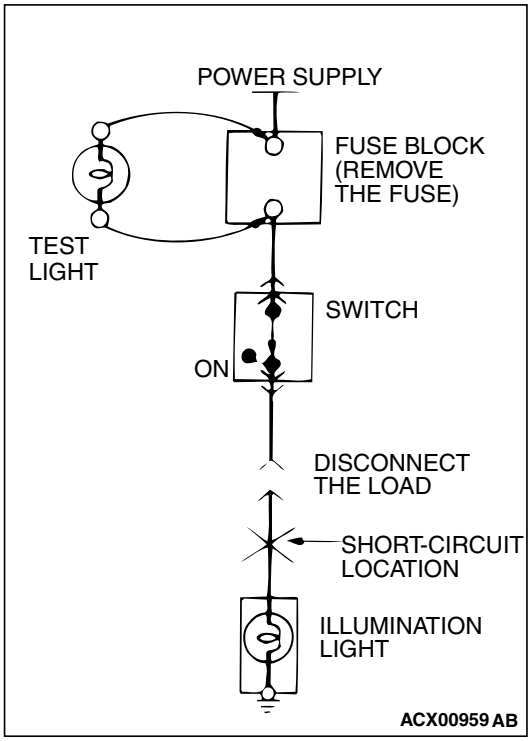
1. VOLTAGE CHECK
   (1) Ground one lead wire of the test light. If a voltmeter is used instead of the test light, ground the grounding side lead wire.
   (2) Connect the other lead wire of the test light to the power side terminal of the switch connector. The test light should come on or the voltmeter should indicate a voltage.
   (3) Then, connect the test light or voltmeter to the motor connector. The test light should not come on, or the voltmeter should indicate no voltage. When the switch is turned ON in this state, the test light should come on, or the voltmeter should indicate a voltage, with the motor starting to run.
   (4) The circuit illustrated here is normal. If there is any problem, such as the motor failing to run, check voltages beginning at the connector nearest to the motor until the faulty part is identified.
2. SHORT-CIRCUIT CHECK
   Because the fuse has blown, it is probable that there is a short circuit. Follow the procedures below to narrow down the short-circuit location.



STEP 1. Remove the blown fuse and connect the test light across the fuse terminals (Circuit switch: OFF).
Q: Does the test light illuminate?

YES : Short-circuit exists between the fuse block and the switch. Repair the harness between the fuse block and the switch.
NO : Go to Step 2.



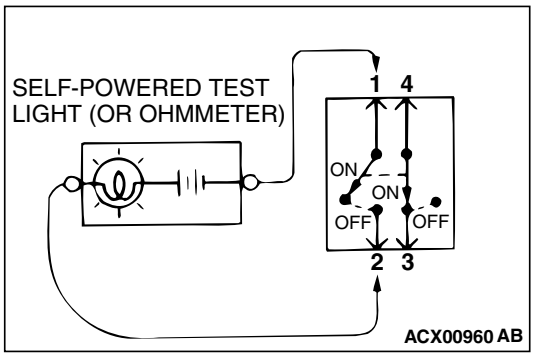


STEP 2. Turn the switch ON and disconnect the illumination light connector.

Q: Does the test light illuminate?

YES : Short-circuit exists between the switch and the connector. Repair the harness between the switch and the connector.

NO : Short-circuit exists between the connector and the illumination light. Repair the harness between the connector and the illumination light.



3. CONTINUITY CHECK
   (1) When the switch is in the "OFF" position and the contact points of terminals 1 and 2 are connected, the self-powered test light should illuminate or the ohmmeter should read 0 ohm.
   (2) When the switch is the "ON" position and the contact points of terminals 3 and 4 are connected, the self-powered test light should come on or the ohmmeter should read 0 ohm.

GROUP 11

ENGINE

CONTENTS

GROUP 11A

ENGINE MECHANICAL <2.4L ENGINE>

CONTENTS

GENERAL DESCRIPTION

M1111000100754

The 4G69 (2.4L) engine is an in-line four cylinder engine. The cylinder numbers are assigned as 1 – 2 – 3 – 4 from the front of the engine (timing belt side). This engine is fired in the order of the 1, 3, 4 and 2 cylinders.

ITEM			SPECIFICATION
Type			In-line SOHC
Number of cylinders			4
Bore mm (in)			87 (3.43)
Stroke mm (in)			100.0 (3.94)
Total displacement cm^3 (cu in)			2,378 (145.1)
Compression ratio			9.5
Firing order			1 – 3 – 4 – 2
Counterbalance shaft			Equipped
Valve timing	Intake valve	Opens (BTDC)	4° <Low speed cam A>
			6° <Low speed cam B>
			24° <High speed cam>
		Closes (ABDC)	42° <Low speed cam A>
			44° <Low speed cam B>
			70° <High speed cam>
	Exhaust valve	Opens (BBDC)	58°
		Closes (ATDC)	17°
Lubrication system			Pressure feed, full-flow filtration
Oil pump type			Involute gear type

ENGINE DIAGNOSIS

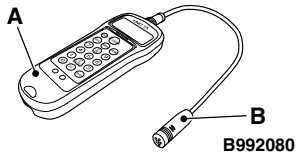
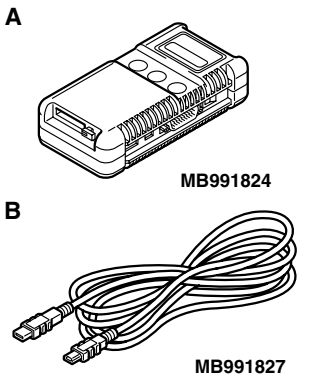
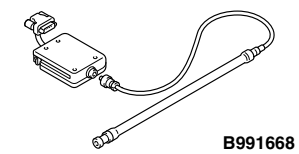
M1111000700262

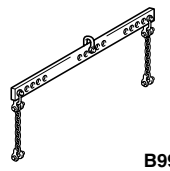
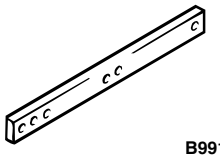
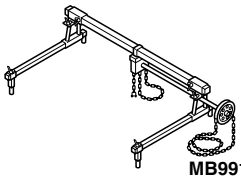
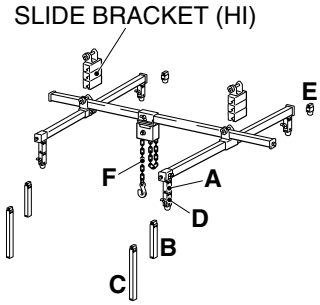
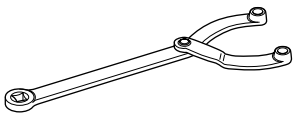
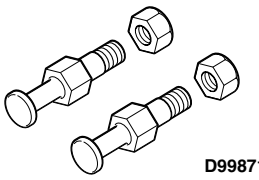
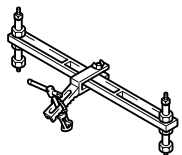
SYMPTOM	PROBABLE CAUSE	REMEDY
Compression is too low	Blown cylinder head gasket	Replace the gasket
	Worn or damaged piston rings	Replace the rings
	Worn piston or cylinder	Repair or replace the piston and/or the cylinder block
	Worn or damaged valve seat	Repair or replace the valve and/or the seat ring

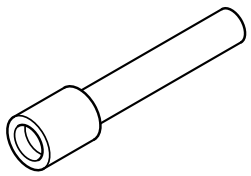
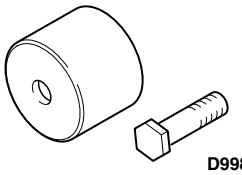
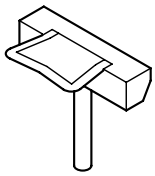
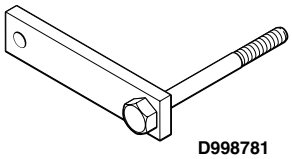
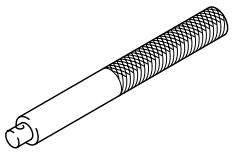
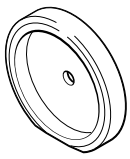
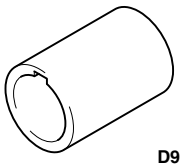
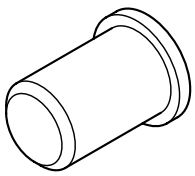
SYMPTOM	PROBABLE CAUSE	REMEDY
Drop in engine oil pressure	Engine oil level is too low	Check the engine oil level
	Malfunction of engine oil pressure switch	Replace the engine oil pressure switch
	Clogged oil filter	Install a new filter
	Worn oil pump gears or cover	Replace the gears and/or the cover
	Thin or diluted engine oil	Change the engine oil to correct viscosity
	Stuck (opened) oil relief valve	Repair the relief valve
	Excessive bearing clearance	Replace the bearings
Engine oil pressure too high	Stuck (closed) oil relief valve	Repair the relief valve
Noisy valves	Incorrect valve clearance	Adjust valve clearance
	Thin or diluted engine oil (low engine oil pressure)	Change the engine oil
	Worn or damaged valve stem or valve guide	Replace the valve and/or the guide
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check the engine oil level
	Low engine oil pressure	Refer to engine oil pressure drop symptoms above
	Thin or diluted engine oil	Change the engine oil
	Excessive bearing clearance	Replace the bearings

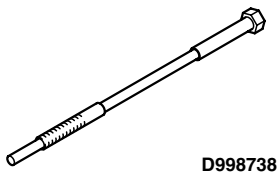
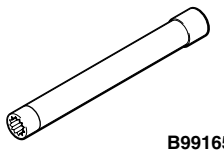
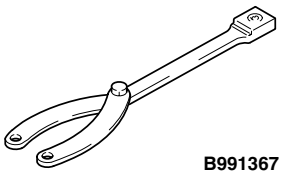
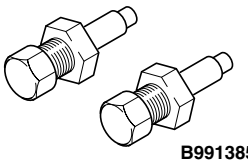
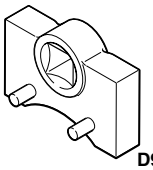
SPECIAL TOOLS

M1111000601439

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB992080 Belt tension meter set A: MB9912081 Belt tension meter B: MB992082 Mic assembly	Tool not available	Drive belt tension check
	MB991958 Scan tool (M.U.T.-III sub assembly) A: MB991824 Vehicle communication interface (V.C.I.) B: MB991827 M.U.T.-III USB cable C: MB991910 M.U.T.-III main harness A (Vehicles with CAN communication system) D: MB991911 M.U.T.-III main harness B (Vehicles without CAN communication system) E: MB991914 M.U.T.-III main harness C (for Daimler Chrysler models only) F: MB991825 M.U.T.-III measurement adapter G: MB991826 M.U.T.-III trigger harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.*	• Drive belt tension check • Ignition timing check • Curb idle speed check • Idle mixture check **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**
	MB991668 Belt tension meter set	Tool not available	Drive belt tension check [used together with scan tool (M.U.T.-III sub assembly)]

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991454	MB991454 Engine hanger balancer	MZ203827-01	When the engine hanger is used: Supporting the engine assembly during removal and installation of the transaxle assembly *NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.*
 B991527	MB991527 Hanger	Tool not available	
 MB991895	MB991895 Engine hanger	Tool not available	
 B991928	MB991928 Engine hanger A: MB991929 Joint (50) × 2 B: MB991930 Joint (90) × 2 C: MB991931 Joint (140) × 2 D: MB991932 Foot (standard) × 4 E: MB991933 Foot (short) × 2 F: MB991934 Chain and hook assembly	Tool not available	
 B990767	MB990767 Front hub and flange yoke holder	MB990767-01	Holding the camshaft sprocket
 D998719	MD998719 Pin	MIT308239	
 MD998772	MD998772 Valve spring compressor	General service tool	Compressing valve spring

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB991999 Valve stem seal installer	–	Valve stem seal installation
 D998713	MD998713 Camshaft oil seal installer	MD998713-01	Camshaft oil seal installation
 D998727	MD998727 Oil pan FIPG cutter	MD998727-01	Oil pan removal
 D998781	MD998781 Flywheel stopper	General service tool	Supporting the A/T drive plate
	MB990938 Installer bar	MB990938-01	Crankshaft rear oil seal installation
 D998776	MD998776 Crankshaft rear oil seal installer	MD998776-01	
 D998285	MD998285 Crankshaft front oil seal guide	MD998285-01	Crankshaft front oil seal installation
	MD998375 Crankshaft front oil seal installer	MD998375-01	

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 D998738	MD998738 Adjusting bolt	MD998738-01	Supporting the timing belt tensioner arm and timing belt tensioner adjuster
 B991654	MB991654 Cylinder head bolt wrench (12)	General service tool	Removal and installation of cylinder head bolt
 B991367	MB991367 Special spanner	MB991367-01	Holding the crankshaft camshaft drive sprocket
 B991385	MB991385 Pin	MIT217213	
 D998767	MD998767 Tensioner wrench	MD998752-01	Valve timing belt tension adjustment

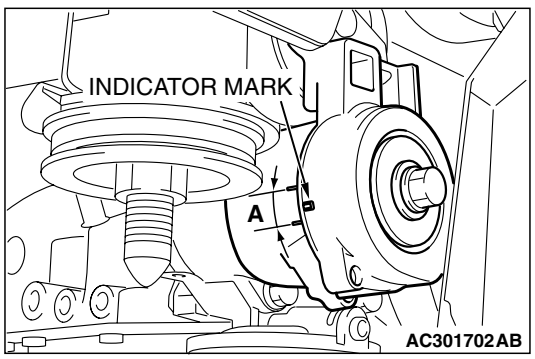
ON-VEHICLE SERVICE

DRIVE BELT TENSION CHECK

M1111003100485

⚠ CAUTION

Check the drive belt tension after turning the crankshaft clockwise one turn or more.



1. Make sure that the indicator mark is within the area marked with A in the illustration.
2. If the mark is out of the area, replace the drive belt. (Refer to P.11A-28).

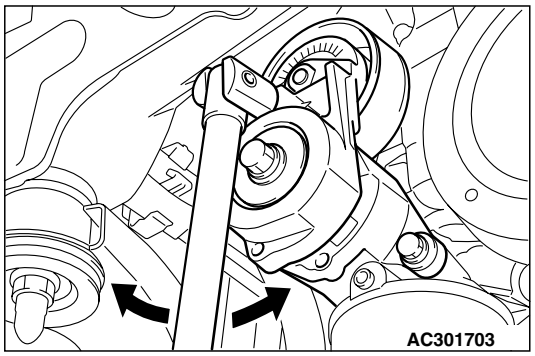
   NOTE: The drive belt tension adjustment is not necessary as auto-tensioner is adopted.

TSB Revision

AUTO-TENSIONER CHECK

M1111003000790

OPERATION CHECK



1. Turn OFF the engine from the idle state then check to see that the drive belt is not protruding from the pulley width of the auto-tensioner.
2. Remove the drive belt. (Refer to P.11A-28).
3. Securely insert the spindle handle or ratchet handle with a 12.7 mm (1/2-inch) insertion angle into the jig hole of the auto tensioner. Turn the auto-tensioner to the left and right to check and see that there is no threading.
4. If there are any problems in the procedure 1 or 3, replace the auto-tensioner. (Refer to P.11A-51).
5. Install the drive belt. (Refer to P.11A-28).

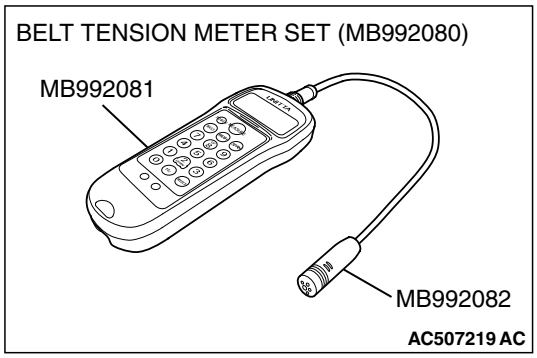
FUNCTION CHECK

You can verify if the auto-tensioner is defective or not by checking the drive belt tension.

<When using special tool MB992080: Recommendation>

Required Special Tools:

- MB992080: Belt Tension Meter Set
  - MB992081: Belt Tension Meter
  - MB992082: Mic Assembly



1. Check the drive belt tension. (Refer to P.11A-8).
2. Measure the drive belt tension vibration frequency by the following procedures:
   (1) Connect special tool MB992082 to special tool MB992081 of special tool MB992080.
   (2) Press the "POWER" button to turn on the power supply.
   (3) Press the numeral key of "1" and check that "No. 1" appears on the upper left of the display.

   NOTE: This operation is to temporarily set the preset data such as the belt specifications, because if the measurement is taken without input of the belt specifications, conversion to tension value (N) cannot be made, resulting in judgement of error.
   (4) Press "Hz" button twice to change the display to the frequency display (Hz).

⚠ CAUTION
- **The temperature of the surface of the belt should be as close to normal temperature as possible.**
- **Do not allow any contaminants such as water or oil to get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**

(5) Hold special tool MB992080 to the middle of the drive belt between the pulleys (at the place indicated by arrow), approximately 10 – 15 mm (0.4 – 0.59 inch) away from the rear surface of the belt so that it is perpendicular to the belt (within an angle of ± 15 degree).

(6) Press the "MEASURE" button.

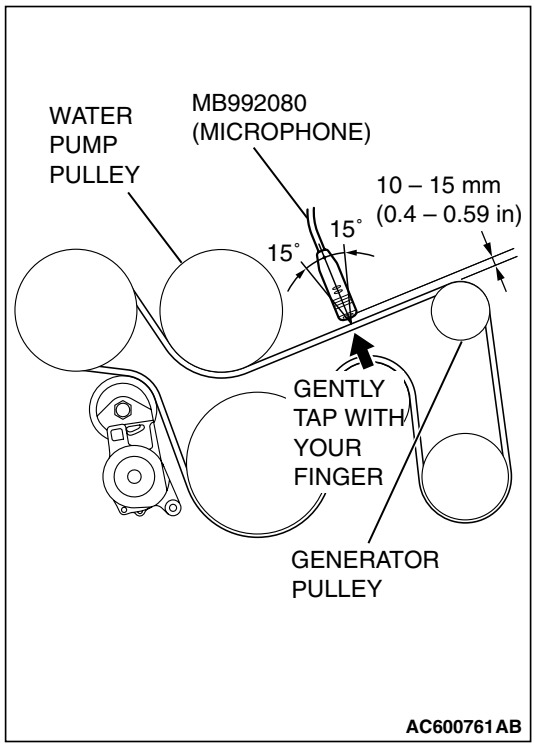
(7) Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and measure that the vibration frequency of the belt is within the standard value.

Standard value: 120 – 154 Hz

NOTE: To take the measurement repeatedly, fillip the belt again.

(8) Press and hold the "POWER" button to turn off the power supply.

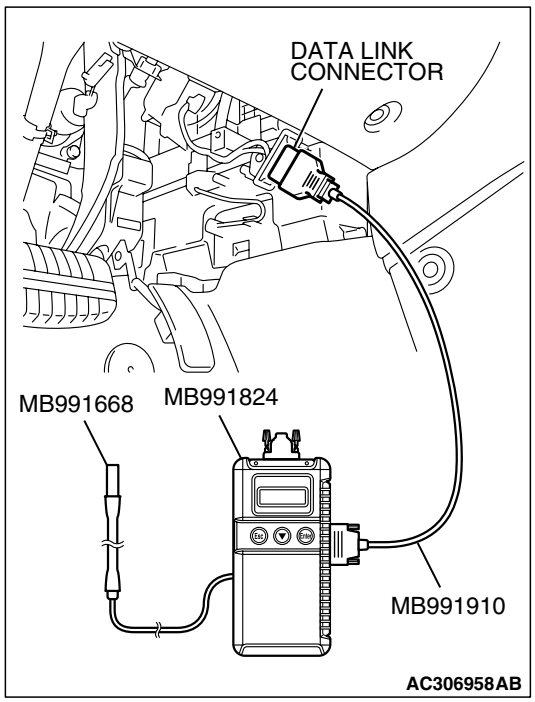
3. If not within the standard value, replace the auto-tensioner. (Refer to P.11A-51).



<When using scan tool MB991958: Recommendation>

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991910: M.U.T.-III Main Harness A
- MB991668: Belt Tension Meter Set

1. Check the drive belt tension. (Refer to P.11A-8).
2. Measure the drive belt tension vibration frequency by the following procedures:



⚠ CAUTION

To prevent damage to special tool MB991824, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting special tool MB991824.

(1) Connect special tool MB991668 to special tool MB991824.

(2) Connect special tool MB991910 to special tool MB991824.

(3) Connect special tool MB991910 to the data link connector.

(4) Turn the ignition switch to the "ON" position and select "Belt Tension" from the menu special tool MB991824 screen.

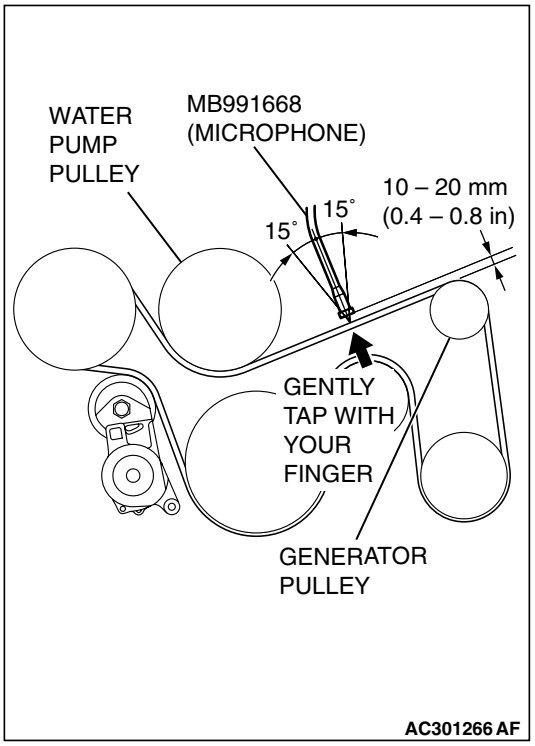
⚠ CAUTION

- **The temperature of the surface of the belt should be as close to normal temperature as possible.**
- **Do not allow any contaminants such as water or oil to get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**

(5) Hold special tool MB991668 to the middle of the drive belt between the pulleys (at the place indicated by arrow), approximately 10 – 20 mm (0.4 – 0.8 inch) away from the rear surface of the belt so that it is perpendicular to the belt (within an angle of ± 15 degree).

(6) Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and measure that the vibration frequency of the belt is within the standard value.

Standard value: 120 – 154 Hz

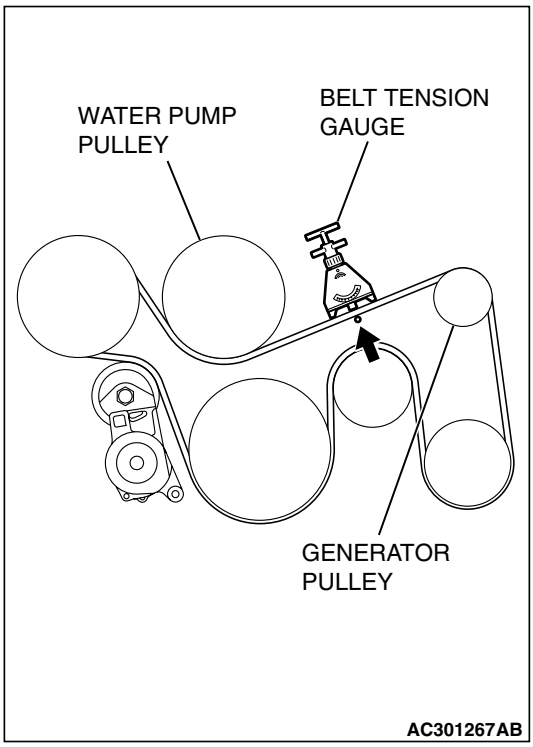


3. If not within the standard value, replace the auto-tensioner. (Refer to P.11A-51).

<When using a tension gauge>

1. Check the drive belt tension. (Refer to P.11A-8).

TSB Revision



2. Use a belt tension gauge in the middle of the belt between the pulleys (at the place indicated by the arrow) to measure that the belt tension is within the standard value.

   Standard value: 340 – 562 N (76 – 126 lb)

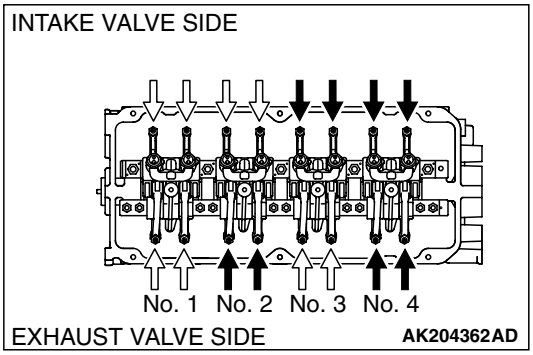
3. If not within the standard value, replace the auto-tensioner. (Refer to P.11A-51).

VALVE CLEARANCE CHECK AND ADJUSTMENT

M1111001500283

1. Before checks, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: P range

   NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks and adjustment.
2. Remove all of the ignition coils.
3. Remove the rocker cover.
4. Turn the crankshaft clockwise until the notch on the pulley is lined up with "T" mark on the timing indicator.



5. Move the rocker arms on the No.1 and No.4 cylinders up and down by hand to determine which cylinder has its piston at the top dead center on the compression stroke.

   If both intake and exhaust valve rocker arms have a valve lash, the piston in the cylinder corresponding to these rocker arms is at the top dead center on the compression stroke.
6. Valve clearance inspection and adjustment can be performed on rocker arms indicated by white arrow mark when the No.1 cylinder piston is at the top dead center on the compression stroke, and on rocker arms indicated by black arrow mark when the No.4 cylinder piston is at the top dead center on the compression stroke.
7. Measure the valve clearance.

   If the valve clearance is not as specified, loosen the rocker arm lock nut and adjust the clearance using a thickness gauge while turning the adjusting screw.

TSB Revision

Standard value (hot engine):

<VEHICLES EXCEPT FOR CALIFORNIA EMISSION REGULATION >
Intake side: 0.20 mm (0.008 inch)
Exhaust side: 0.30 mm (0.012 inch)

<VEHICLES FOR CALIFORNIA EMISSION REGULATION>
Intake side: 0.20 mm (0.008 inch)
Exhaust side: 0.30 mm (0.012 inch)

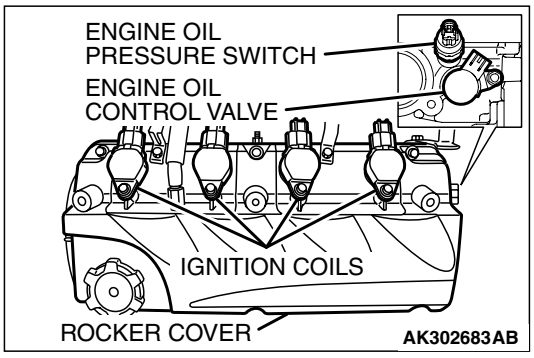
8. While holding the adjusting screw with a screwdriver to prevent it from turning, tighten the lock nut to the specified torque.

   Tightening torque: 9 ± 1 N·m (80 ± 9 in-lb)

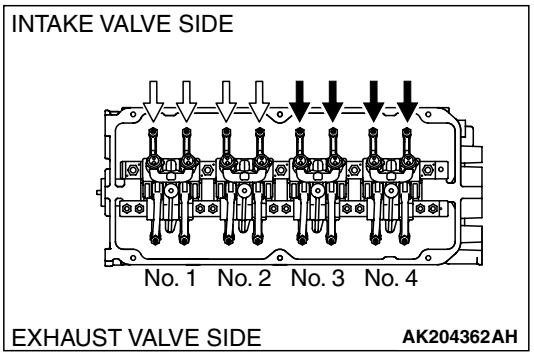
9. Turn the crankshaft through 360 degree angle to line up the notch on the crankshaft pulley with the "T" mark on the timing indicator.
10. Repeat steps (7) and (8) on other valves for clearance adjustment.
11. Install the rocker cover.
12. Install the ignition coils.

ROCKER ARM PISTON OPERATION CHECK

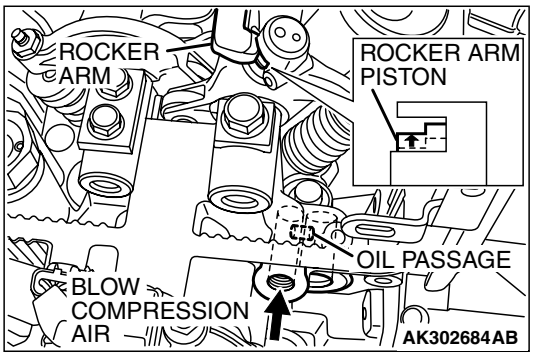
M1111051000142



1. Remove all of the ignition coils.
2. Remove the rocker cover.
3. Remove the engine oil control valve.
4. Remove the engine oil pressure switch.
5. Turn the crankshaft clockwise until the notch on the crankshaft pulley is lined up with "T" mark on the lower cover of timing belt.
6. Move the rocker arms on the No.1 and No.4 cylinders up and down by hand to determine which cylinder has its piston at the top dead center on the compression stroke.



NOTE: The rocker arm piston operation check can be performed on rocker arms indicated by white arrow mark when the No.1 cylinder piston is at the top dead center on the compression stroke, and on rocker arms indicated by black arrow mark when the No.4 cylinder piston is at the top dead center on the compression stroke.



7. While shutting up the oil passage hole at the depth of the engine oil control valve's installation hole by finger not to leak air, blow compression air into the engine oil pressure switch's installation hole by air blowgun. At this time, confirm that the rocker arm piston can operate.

NOTE: To fully confirm the check, prevent the compression air from leaking as much as possible by installing the O-ring to the end of air blowgun.

8. Turn the crankshaft clockwise until the notch on the crankshaft pulley is lined up with "T" mark on the lower cover of timing belt.
9. Confirm the rest of the rocker arm pistons under the procedure 7.
10. When the rocker arm piston does not operate, replace the rocker arm assy.
11. Install the engine oil pressure switch and the engine oil control valve. (Refer to Camshaft and Valve Stem Seal – Removal and Installation P.11A-30.)
12. Install the rocker cover.
13. Install all of the ignition coils.

IGNITION TIMING CHECK

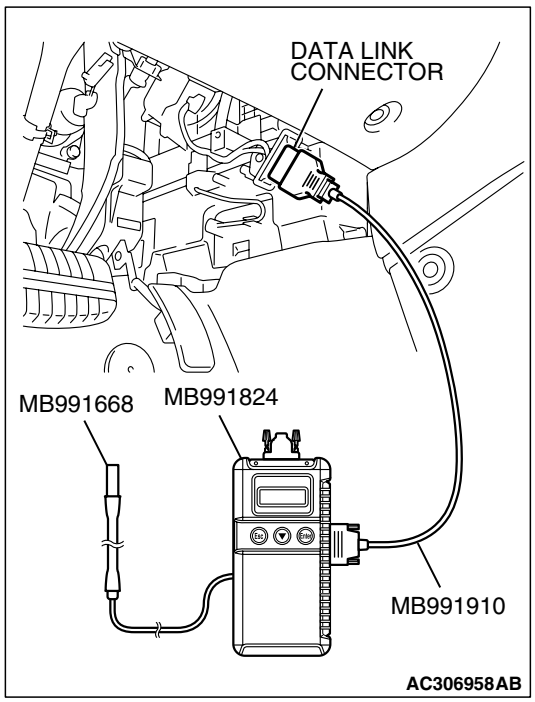
M1111001701064

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, set the vehicle in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: P range

   NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.



⚠ 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.

2. Connect scan tool MB991958 to the data link connector.
3. Set the timing light to the power supply line (terminal No. 1) of the ignition coil No. 1.

   NOTE: The power supply line is looped and also longer than the other ones.
4. Start the engine and run it at idle.
5. Check that the idle speed is approximately 700 r/min.
6. Select scan tool MB991958 actuator test "item number 17".
7. Check that basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°
8. If the basic ignition timing is not within the standard value, check the following items:
   - Diagnostic output
   - Timing belt cover and crankshaft position sensor installation conditions
   - Crankshaft sensing blade condition

⚠ CAUTION

If the actuator test is not canceled, the forced drive will continue for 27 minutes. Driving in this state could lead to engine failure.

9. Press the clear key on scan tool MB991958 (select forced drive stop mode), and cancel the actuator test.
10. Check that the actual ignition timing is at the standard value.

    Standard value: Approximately 10° BTDC

    NOTE: Ignition timing fluctuates about ± 7° Before Top Dead Center, even under normal operating condition.

    NOTE: It is automatically further advanced by about 5° to 10° Before Top Dead Center at higher altitudes.

CURB IDLE SPEED CHECK

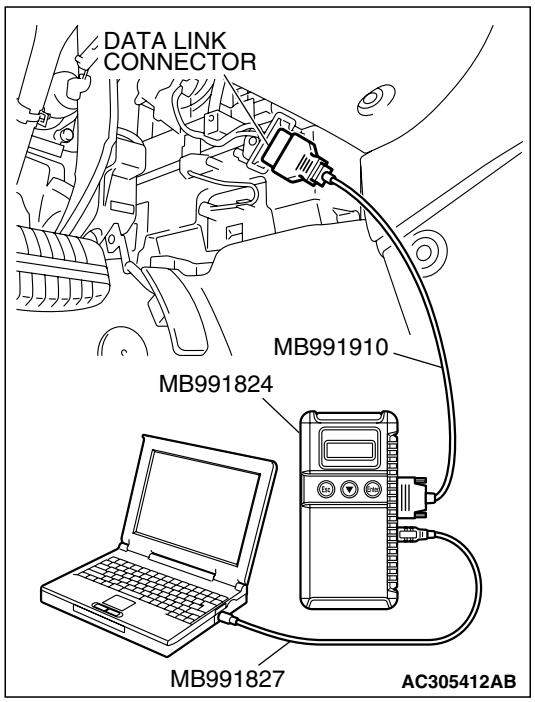
M1111003501408

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, set the vehicle in the following condition.
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: P range

   NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.



⚠ 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.

2. Connect scan tool MB991958 to the data link connector.
3. Check the basic ignition timing.

   Standard value: 5° BTDC ± 3°
4. Start the engine.
5. Run the engine at idle for 2 minutes.
6. Check the idle speed. Select item number 22 and take a reading of the idle speed.

   Curb idle speed: 700 ± 100 r/min

   NOTE: The idle speed is controlled automatically by the idle air control system.
7. If the idle speed is outside the standard value, refer to GROUP 13A, Multiport Fuel Injection (MFI) <2.4L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Symptom Chart P.13A-50.

IDLE MIXTURE CHECK

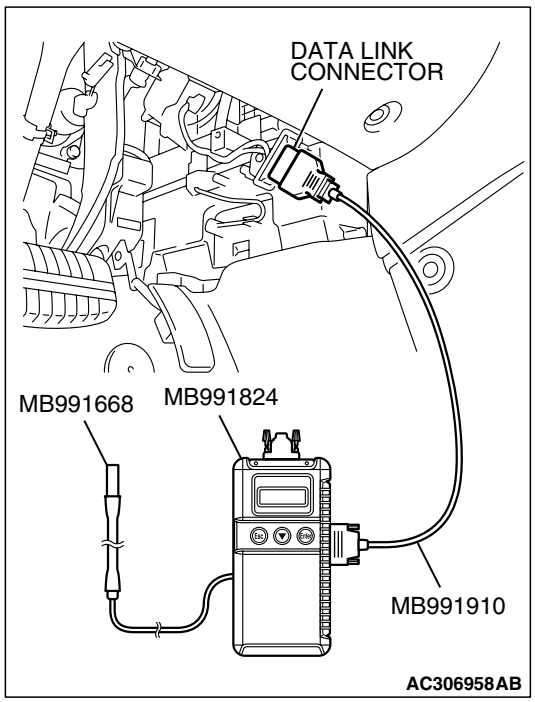
M1111002100749

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, set the vehicle in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: P range

   NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.



⚠ 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.

2. Connect scan tool MB991958 to the data link connector.
3. Check that the basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°
4. Start the engine and increase the engine speed to 2,500 r/min for 2 minutes.
5. Set the CO, HC tester.
6. Check the CO contents and the HC contents at idle.

   Standard value:
   CO contents: 0.5 % or less
   HC contents: 100 ppm or less
7. If the CO and HC contents do not remain inside the standard value, check the following items:

   NOTE: Replace the catalytic converter when the CO and HC contents do not remain inside the standard value, even though the result of the inspection is normal for all items.
- Diagnostic output
- Closed-loop control (When the closed-loop control is carried out normally, the output signal of the heated oxygen sensor changes between 0 – 400 mV and 600 – 1,000 mV at idle.)
- Fuel pressures
- Injector
- Ignition coil, spark plug
- EGR system
- Evaporative emission system
- Compression pressure

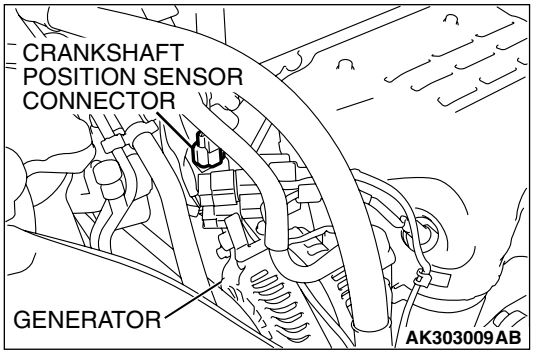
COMPRESSION PRESSURE CHECK

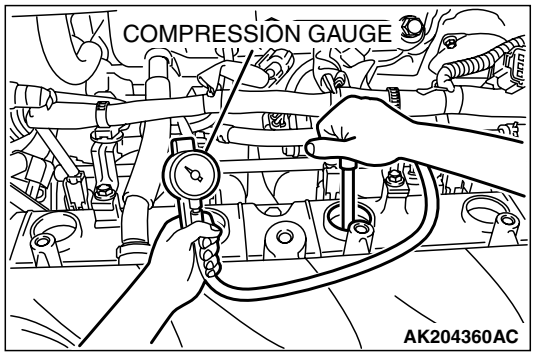
M1111002601101

Required Special Tool:
MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:
- Engine coolant temperature: 80 – 95°C (176 – 203°F)
- Lights and all accessories: OFF
- Transaxle: P range

   NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.
2. Remove all of the ignition coils and spark plugs.





3. Disconnect the crankshaft position sensor connector.

   NOTE: Doing this will prevent the engine control module from carrying out ignition and fuel injection.

⚠ WARNING

Keep your distance from the spark plug hole when cranking. Oil, fuel, etc., may spray out from the spark plug hole and may cause serious injury.

4. Cover the spark plug hole with a shop towel etc., during cranking. After the engine has been cranked, check for foreign material adhering to the shop towel.
5. Set a compression gauge to one of the spark plug holes.
6. Crank the engine with the throttle valve fully open and measure the compression pressure.

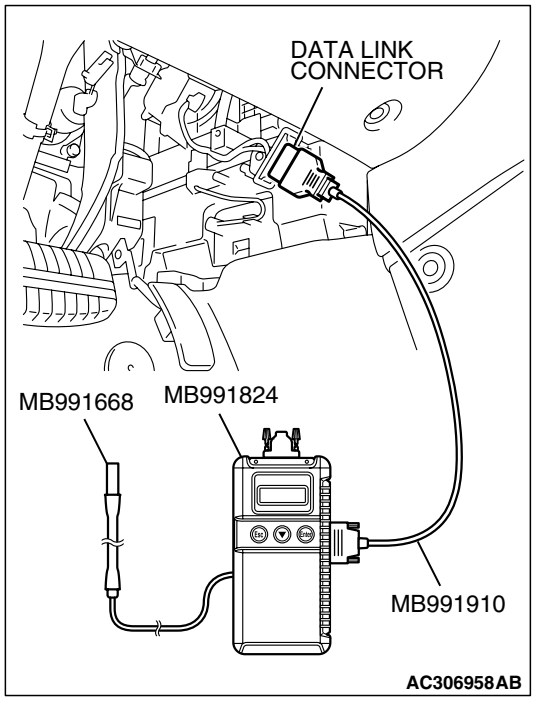
   Standard value (at engine speed of 200 r/min): 1,560 kPa (226 psi)

   Minimum limit (at engine speed of 200 r/min): 1,130 kPa (164 psi)

7. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

   Limit: 98 kPa (14 psi)

8. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 6 to 8.
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
   (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
9. Connect the crankshaft position sensor connector.
10. Install the spark plugs and ignition coils.



11. Use the scan tool MB991958 to erase the diagnostic trouble codes.

    NOTE: This will erase the diagnostic trouble code resulting from the crankshaft position sensor connector being disconnected.

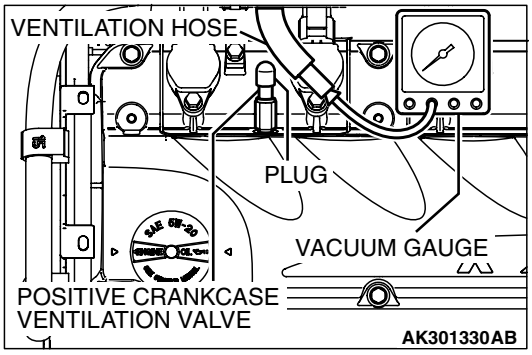
MANIFOLD VACUUM CHECK

M1111002700837

1. Start the engine and allow it to warm up until the temperature of the engine coolant reaches 80 – 95°C (176 – 203°F).
2. Connect an engine tachometer.
3. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve , and connect a vacuum gauge to the ventilation hose.
4. Plug the PCV valve.
5. Start the engine and check that idle speed is within specification. Then check the vacuum gauge reading.

   Idle speed: 700 ± 100 r/min

   Minimum limit: 60 kPa (18 in Hg)



ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

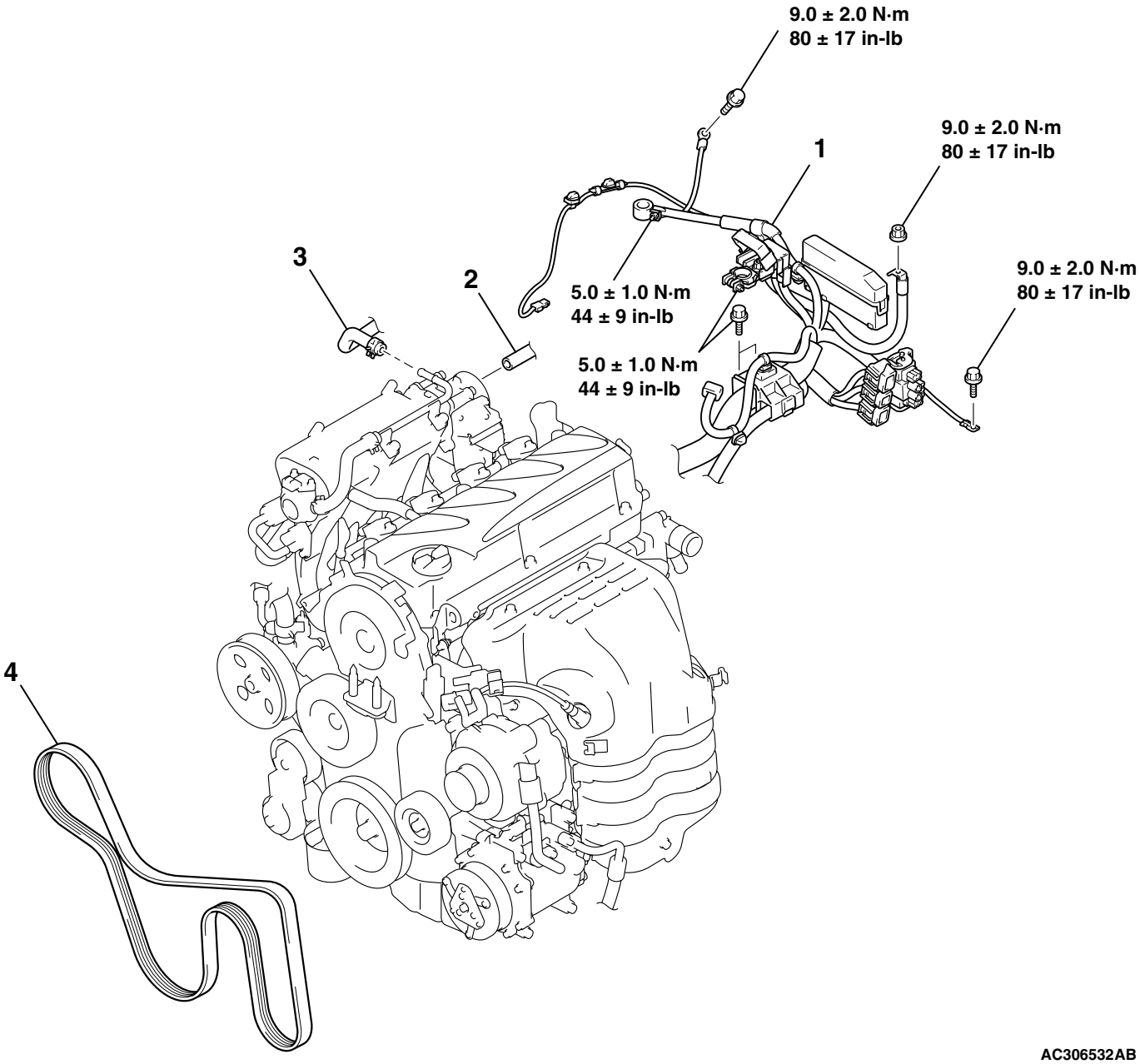
M1112001002823

⚠ CAUTION

- **When the engine assembly replacement is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Initialization Procedure for Learning Value in MFI Engine P.00-31).**
- ***: indicates parts which should be temporarily tightened, and then fully tightened with the engine weight applied on the vehicle body.**

Pre-removal Operation	Post-installation Operation
• Side Under Cover Removal (Refer to GROUP 51, Under Cover P.51-12). • Fuel Line Pressure Reduction [Refer to GROUP 13A, On-vehicle Service – Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) P.13A-1166]. • Engine Oil Draining (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3). • Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7). • Transmission Fluid Draining (Refer to GROUP 23A, On-vehicle Service – Transmission Fluid Change P.23A-367). • Hood Removal (Refer to GROUP 42, Hood P.42-7). • Powertrain Control Module (PCM) Removal (Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180). • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-4). • Battery and Battery Tray Removal • Radiator Assembly Removal (Refer to GROUP 14, Radiator P.14-12). • Front No.1 Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32). • Front No.2 Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32).	• Front No.2 Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32). • Front No.1 Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32). • Radiator Assembly Installation (Refer to GROUP 14, Radiator P.14-12). • Battery and Battery Tray Installation • Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-4). • Powertrain Control Module (PCM) Installation (Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180). • Hood Installation (Refer to GROUP 42, Hood P.42-7). • Transmission Fluid Refilling (Refer to GROUP 23A, On-vehicle Service – Transmission Fluid Change P.23A-367). • Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7). • Engine Oil Refilling (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3). • Fuel Leak Check • Drive Belt Tension Check (Refer to P.11A-8). • Side Under Cover Installation (Refer to GROUP 51, Under Cover P.51-12). • Front Wheel Alignment Check and Adjustment (Refer to GROUP 33, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33-6).

TSB Revision



AC306532AB

REMOVAL STEPS

1. CONTROL WIRING HARNESS CONNECTION
2. EVAPORATIVE EMISSION VACUUM HOSE CONNECTION

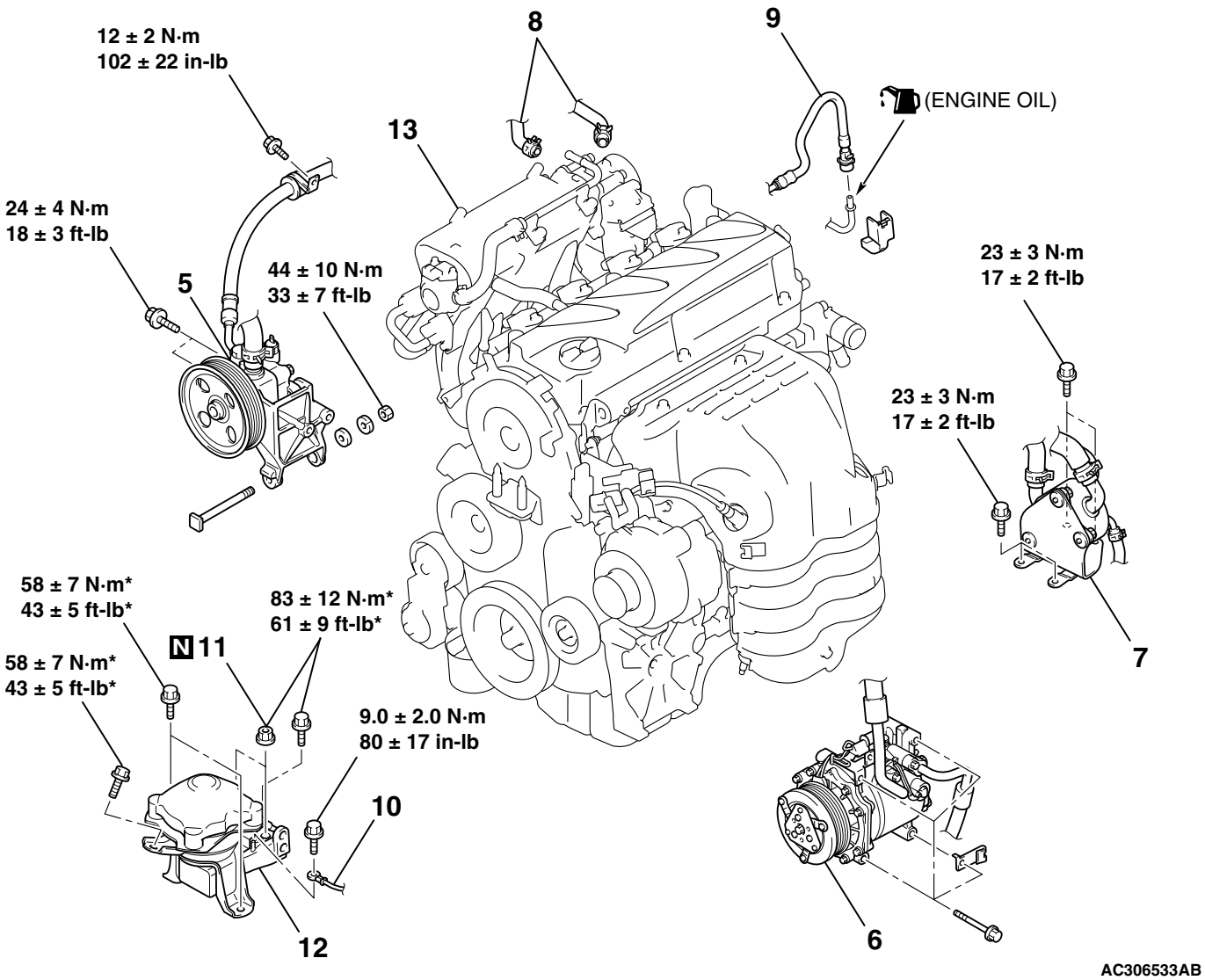
<<**A**>>

>>**E**<<

REMOVAL STEPS (Continued)

3. BRAKE BOOSTER VACUUM HOSE CONNECTION
4. DRIVE BELT

TSB Revision



REMOVAL STEPS

<<B>> 5. POWER STEERING OIL PUMP AND BRACKET ASSEMBLY
<<C>> 6. A/C COMPRESSOR AND CLUTCH ASSEMBLY
<<D>> 7. ATF WARMER (TRANSMISSION FLUID COOLER) AND BRACKET ASSEMBLY
8. HEATER WATER HOSES CONNECTION
<<E>> >>D<< 9. FUEL HIGH-PRESSURE HOSE CONNECTION

REMOVAL STEPS (Continued)

<<F>> >>C<< • TRANSAXLE ASSEMBLY
10. GROUNDING CABLE CONNECTION
<<G>> • POWER STEERING OIL RESERVOIR
11. JAM NUTS
<<H>> >>B<< 12. ENGINE FRONT MOUNTING BRACKET
<<I>> >>A<< 13. ENGINE ASSEMBLY

Required Special Tools:

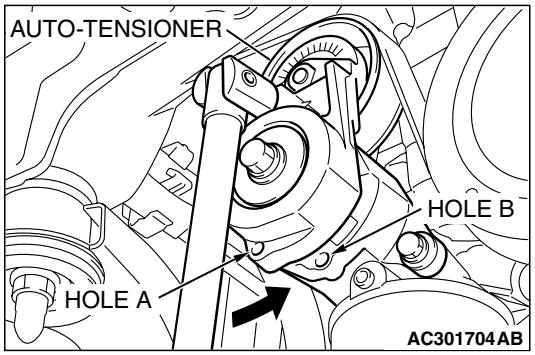
- MB991454: Engine Hanger Balancer
- MB991527: Hanger
- MB991895: Engine Hanger
- MB991928: Engine Hanger

TSB Revision

REMOVAL SERVICE POINTS

<<A>> DRIVE BELT REMOVAL

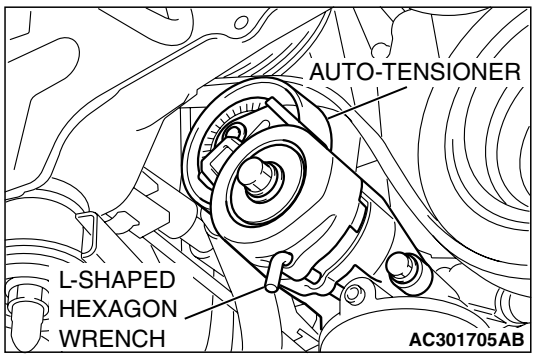
The following operations will be needed due to the introduction of the serpentine drive system with the drive belt auto-tensioner.



1. Securely insert the spindle handle or ratchet handle with a 12.7 mm (1/2-inch) insertion angle into the jig hole of the auto-tensioner.
2. Rotate the auto-tensioner counterclockwise and align hole A with hole B.

⚠ CAUTION

To reuse the drive belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk, etc.



3. Insert an L-shaped hexagon wrench, etc. into the hole to fix and then remove the drive belt.

<<B>> POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

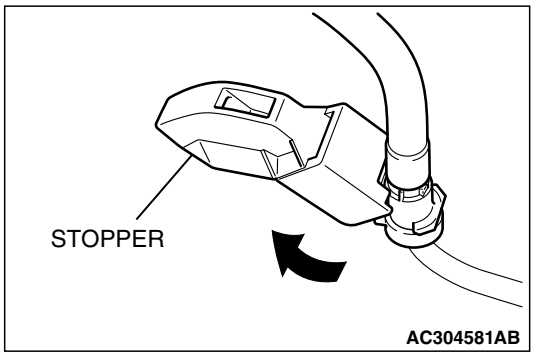
1. With the hose installed, remove the power steering oil pump and bracket assembly from the engine assembly.
2. After removing the power steering oil pump and bracket assembly, secure it with a cord in the location where the removal and installation of the engine assembly cannot be hindered.

<<C>> A/C COMPRESSOR AND CLUTCH ASSEMBLY REMOVAL

1. With the hose installed, remove the A/C compressor and clutch assembly from the bracket.
2. After removing the A/C compressor and clutch assembly, secure it with a cord in the location where the removal and installation of the engine assembly cannot be hindered.

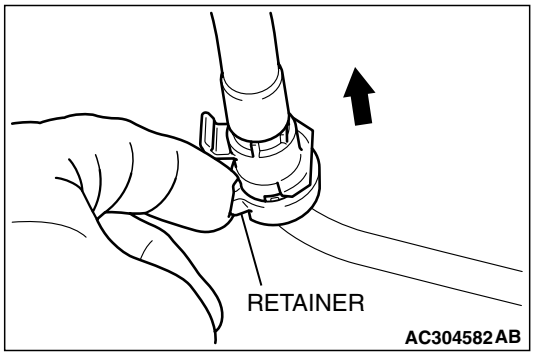
<<D>> ATF WARMER (TRANSMISSION FLUID COOLER) AND BRACKET ASSEMBLY REMOVAL

With the hose installed, remove the ATF warmer (transmission fluid cooler) &bracket assembly from the transmission case front roll stopper bracket.



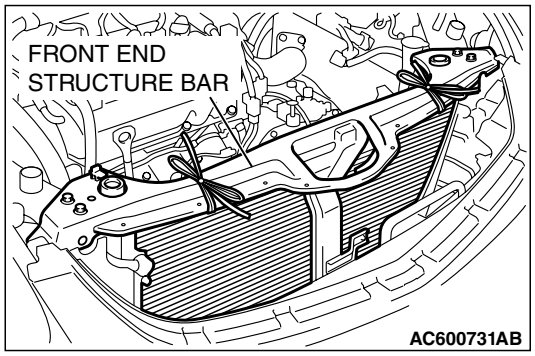
<<E>> FUEL HIGH-PRESSURE HOSE REMOVAL

1. Remove the fuel high-pressure hose stopper.



2. Remove the fuel high-pressure hose in the direction shown in the figure while the retainer is pulled up.

   NOTE: If the retainer is released, install it after removing the fuel high-pressure hose.



<<F>> TRANSAXLE ASSEMBLY REMOVAL

1. Frame front end structure bar provisorily.

   NOTE: Secure A/C condenser and front end structure bar with a cord in the location where the removal and installation of the engine assembly cannot be hindered.

2. Remove the transaxle assembly. (Refer to GROUP 23A, Transaxle Assembly P.23A-388).

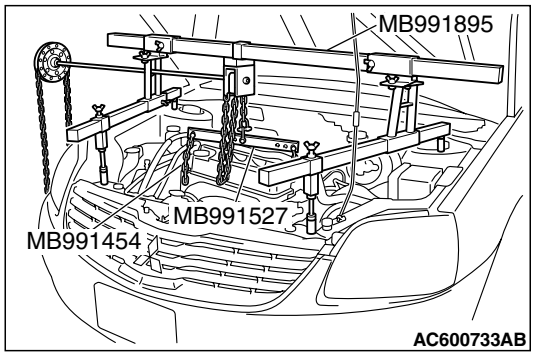
<<G>> POWER STEERING OIL RESERVOIR REMOVAL

With the hose installed, remove the power steering oil reservoir from the vehicle. (Refer to GROUP 37, Power Steering Hoses P.37-54).

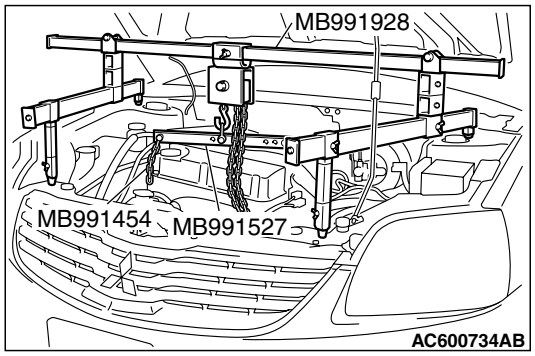
NOTE: After removing the power steering oil reservoir, secure it with a cord in the location where the removal and installation of the engine front mounting bracket cannot be hindered.

<<H>> ENGINE FRONT MOUNTING BRACKET REMOVAL

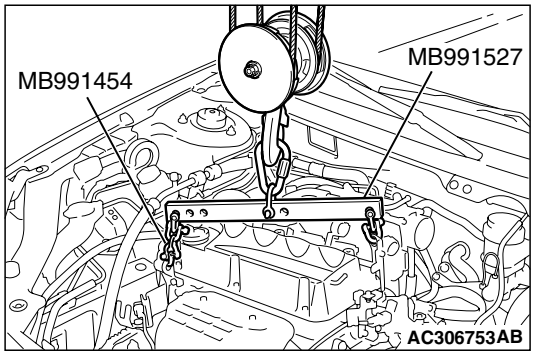
1. Support the engine with a garage jack.
2. Remove the following special tool.



(1) <Special tool MB991895 is used>
Remove special tool MB991895.



(2) <Special tool MB991928 is used>
Remove special tool MB991928.

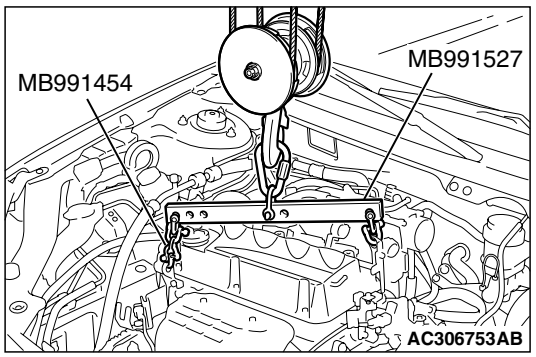


3. Hold the engine assembly with a chain block, etc.
4. Place a garage jack against the engine oil pan with a piece of wood in between so that the weight of the engine assembly is no longer being applied to the engine front mounting bracket.
5. Loosen the engine front mounting bracket mounting nuts and bolts, and remove the engine front mounting bracket.

<<I>> ENGINE ASSEMBLY REMOVAL
After checking that all cables, hoses and wiring harness connectors and so on are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

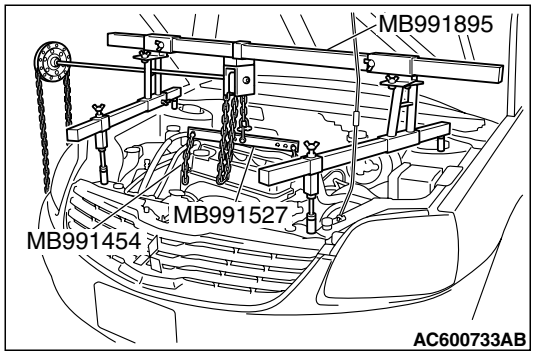
INSTALLATION SERVICE POINTS

>>A<< ENGINE ASSEMBLY INSTALLATION
Install the engine assembly, being careful not to pinch the cables, hoses or wiring harness connectors.

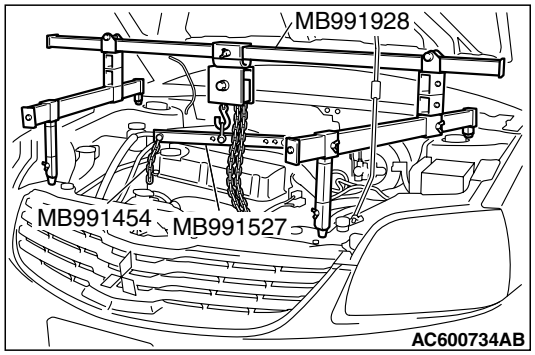


>>B<< ENGINE FRONT MOUNTING BRACKET INSTALLATION

1. Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine front mounting bracket while adjusting the position of the engine.
2. Support the engine assembly with a garage jack.
3. Remove the chain block.
4. Use the following special tool as during removal to support the engine.



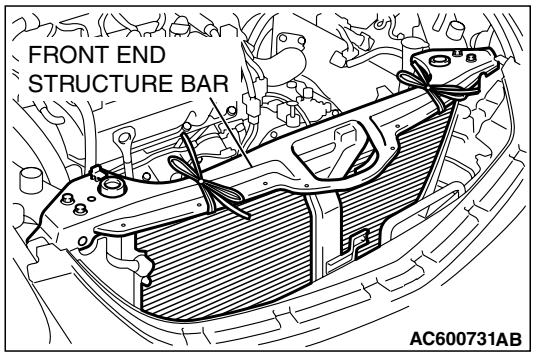
(1) <Special tool MB991895 is used>
Set special tool MB991895. (Refer to GROUP 23A, Transaxle Assembly P.23A-388).

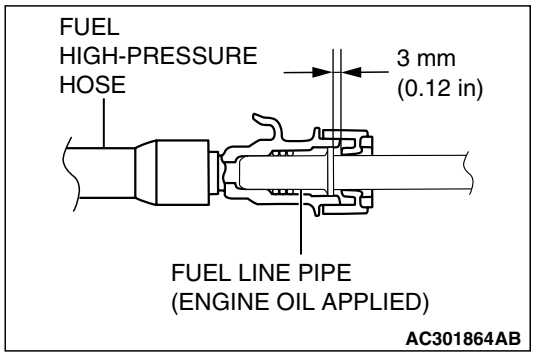


(2) <Special tool MB991928 is used>
Set special tool MB991928. (Refer to GROUP 23A, Transaxle Assembly P.23A-388).

>>C<<TRANSAXLE ASSEMBLY INSTALLATION

1. Install the transaxle assembly. (Refer to GROUP 23A, Transaxle Assembly P.23A-388).
2. Remove the front end structure bar.



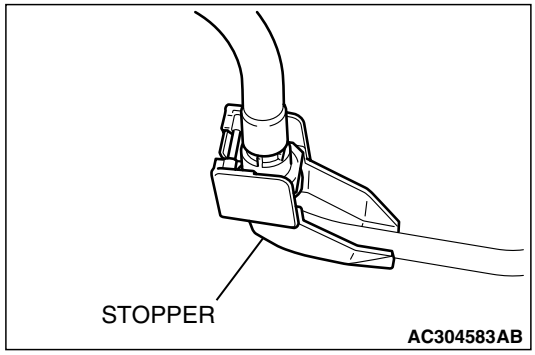


>>D<< FUEL HIGH-PRESSURE HOSE INSTALLATION

⚠ CAUTION

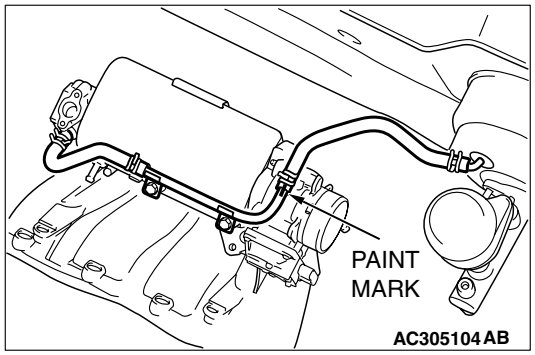
After connecting the fuel high-pressure hose, slightly pull it to ensure that it is installed securely. Also confirm that there is a play approximately 3 mm (0.12 inch). Then install the stopper securely.

Apply a small amount of engine oil to the fuel line pipe and then install the fuel high-pressure hose.



>>E<< BRAKE BOOSTER VACUUM HOSE CONNECTION

Insert vacuum hose with its paint mark facing upward.

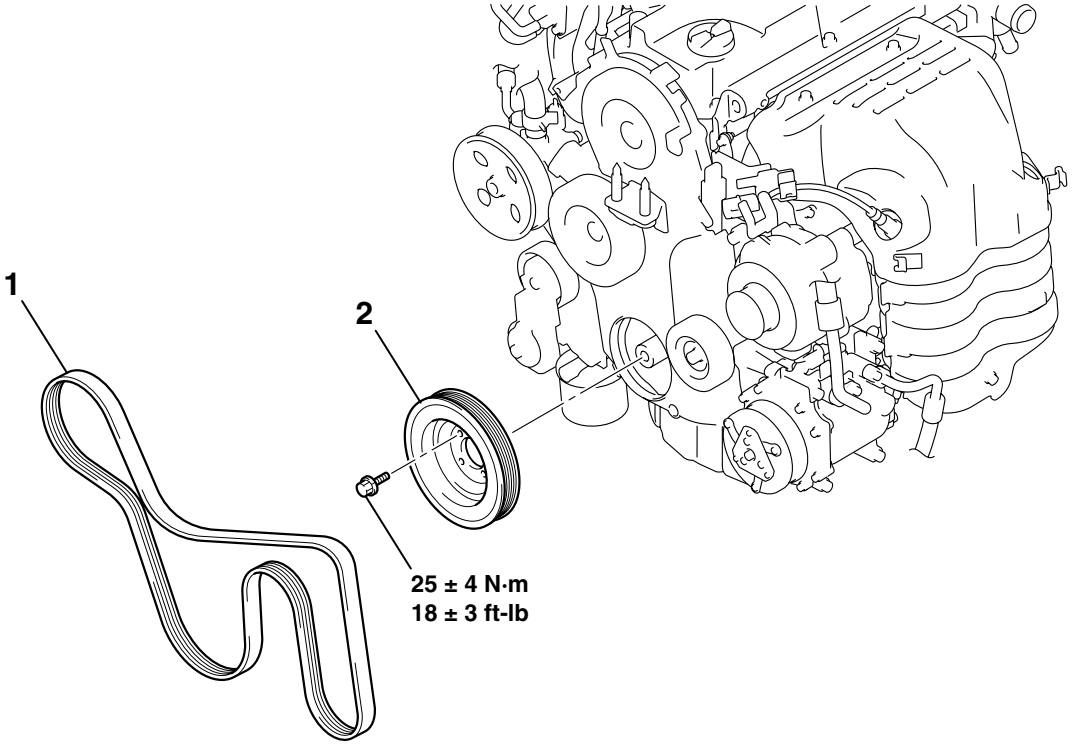


CRANKSHAFT PULLEY

REMOVAL AND INSTALLATION

M1112001600487

Pre-removal Operation	Post-installation Operation
• Side Under Cover Removal (Refer to GROUP 51, Under Cover P.51-12).	• Drive Belt Tension Check (Refer to P.11A-8). • Side Under Cover Installation (Refer to GROUP 51, Under Cover P.51-12).



AC306534AB

REMOVAL STEPS

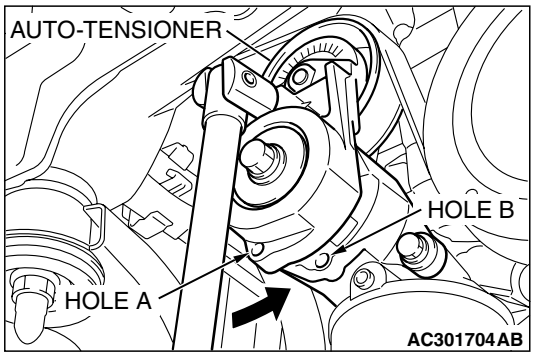
<<**A**>> 1. DRIVE BELT
2. CRANKSHAFT DAMPER PULLEY

REMOVAL SERVICE POINT

<<A>> DRIVE BELT REMOVAL

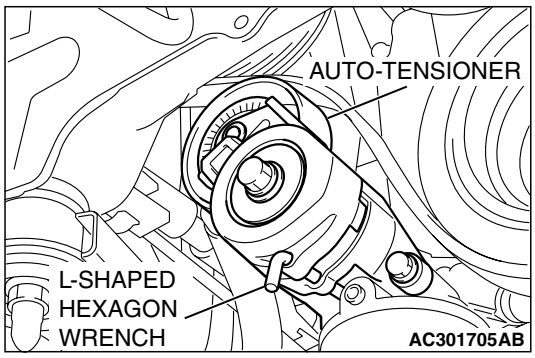
The following operations will be needed due to the introduction of the serpentine drive system with the drive belt auto-tensioner.

1. Securely insert the spindle handle or ratchet handle with a 12.7 mm (1/2-inch) insertion angle into the jig hole of the auto-tensioner.
2. Rotate the auto-tensioner counterclockwise and align hole A with hole B.



AC301704AB

TSB Revision



⚠ CAUTION

To reuse the drive belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk, etc.

3. Insert an L-shaped hexagon wrench, etc. into the hole to fix and then remove the drive belt.

CAMSHAFT AND VALVE STEM SEAL

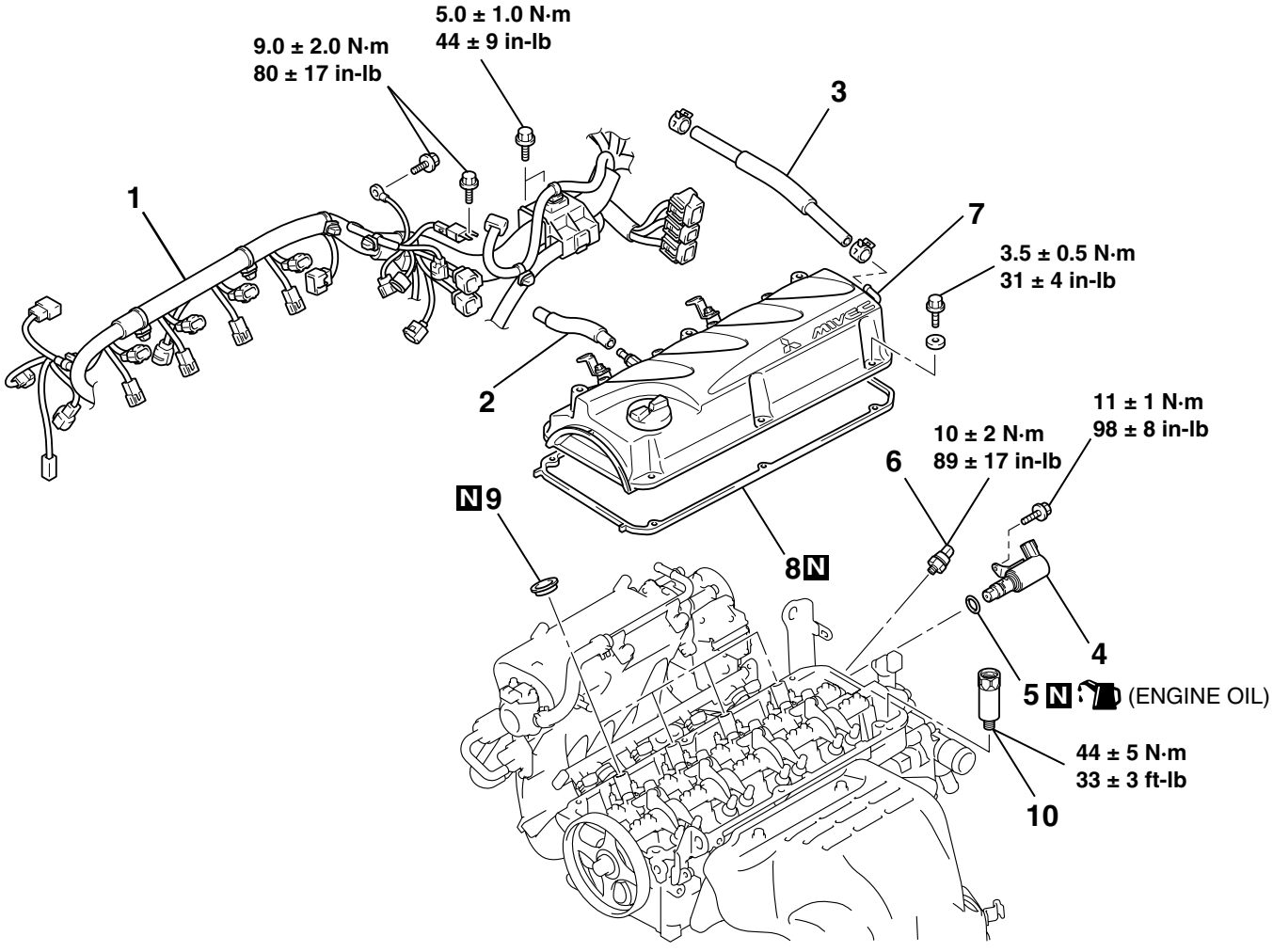
REMOVAL AND INSTALLATION

M1112006600835

⚠ CAUTION

*** Remove and assemble the marked parts in each cylinder unit.**

Pre-removal Operation	Post-installation Operation
• Powertrain Control Module (PCM) Removal (Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180). • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-4). • Battery and Battery Tray Removal • Ignition Coils Removal (Refer to GROUP 16, Ignition System – Ignition Coil P.16-41). • Timing Belt Upper Cover Removal (Refer to P.11A-51).	• Timing Belt Upper Cover Installation (Refer to P.11A-51). • Ignition Coils Installation (Refer to GROUP 16, Ignition System – Ignition Coil P.16-41). • Battery and Battery Tray Installation • Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-4). • Powertrain Control Module (PCM) Installation (Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180). • Drive Belt Tension Check (Refer to P.11A-8). • Valve Clearance Check and Adjustment (Refer to P.11A-12).



AC500443AB

CAMSHAFT REMOVAL STEPS

1. CONTROL WIRING HARNESS CONNECTION
2. ROCKER COVER PCV HOSE
3. ROCKER COVER BREATHER HOSE

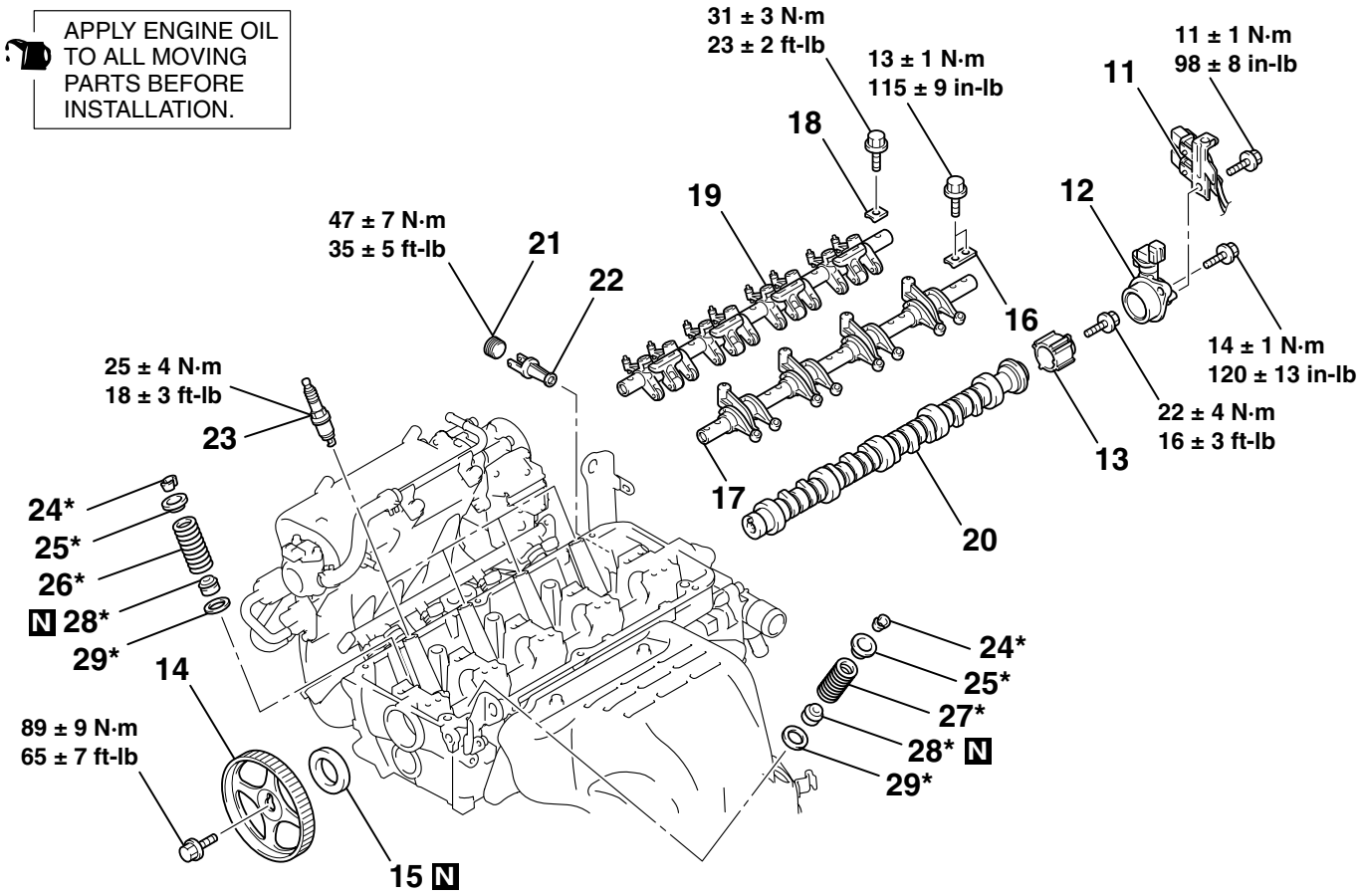
CAMSHAFT REMOVAL STEPS

>>K<< 4. ENGINE OIL CONTROL VALVE
>>K<< 5. O-RING
>>J<< 6. ENGINE OIL PRESSURE SWITCH
7. ROCKER COVER ASSEMBLY
8. ROCKER COVER GASKET

TSB Revision

CAMSHAFT REMOVAL STEPS

9. SPARK PLUG GUIDE OIL SEALS
10. ACCUMULATOR ASSEMBLY
- VALVE TIMING BELT (REFER TO P.11A-51).



AC306536AB

CAMSHAFT REMOVAL STEPS

11. CONNECTOR BRACKET
>>I<< 12. CAMSHAFT POSITION SENSOR SUPPORT
13. CAMSHAFT POSITION SENSING CYLINDER
<<A>> >>H<< 14. CAMSHAFT SPROCKET
>>G<< 15. CAMSHAFT OIL SEAL
>>F<< 16. EXHAUST ROCKER ARM SHAFT CAPS
<<B>> >>F<< 17. EXHAUST ROCKER ARM AND SHAFT ASSEMBLY
>>E<< 18. INTAKE ROCKER ARM SHAFT CAPS
<<B>> >>E<< 19. INTAKE ROCKER ARM AND SHAFT ASSEMBLY
<<C>> >>D<< 20. CAMSHAFT
- WATER INLET FITTING AND THERMOSTAT CASE ASSEMBLY (REFER TO GROUP 14, WATER HOSE AND WATER PIPE P.14-26).

CAMSHAFT REMOVAL STEPS

21. CYLINDER HEAD PLUG
22. ENGINE OIL CONTROL VALVE FILTER

VALVE STEM SEAL REMOVAL STEPS

1. CONTROL WIRING HARNESS CONNECTION
2. ROCKER COVER PCV HOSE
3. ROCKER COVER BREATHER HOSE
7. ROCKER COVER ASSEMBLY
8. ROCKER COVER GASKET
9. SPARK PLUG GUIDE OIL SEALS
>>F<< 16. EXHAUST ROCKER ARM SHAFT CAPS
<<B>> >>F<< 17. EXHAUST ROCKER ARM AND SHAFT ASSEMBLY
>>E<< 18. INTAKE ROCKER ARM SHAFT CAPS
<<B>> >>E<< 19. INTAKE ROCKER ARM AND SHAFT ASSEMBLY
23. SPARK PLUGS

TSB Revision

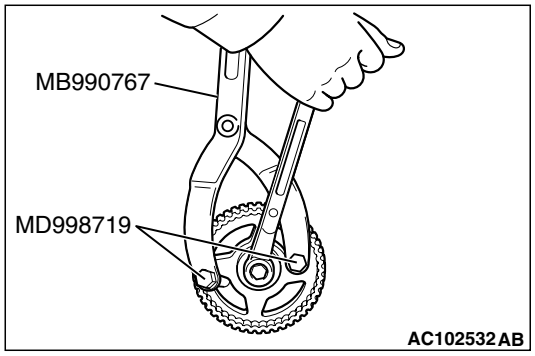
VALVE STEM SEAL REMOVAL STEPS (Continued)

<<**D**>> >>**C**<< 24. VALVE SPRING RETAINER LOCKS
25. VALVE SPRING RETAINERS
>>**B**<< 26. INTAKE VALVE SPRINGS
>>**B**<< 27. EXHAUST VALVE SPRINGS
>>**A**<< 28. VALVE STEM SEALS
29. VALVE SPRING SEATS

Required Special Tools:

- MB990767: Front Hub and Flange Yoke Holder
- MD998713: Camshaft Oil Seal Installer
- MD998719: Pin
- MD998772: Valve Spring Compressor
- MB991999: Valve Stem Seal Installer

REMOVAL SERVICE POINTS



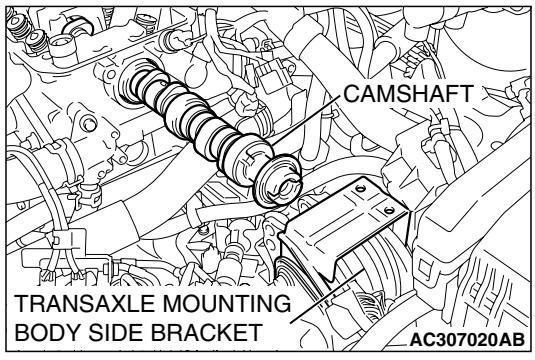
<<A>> CAMSHAFT SPROCKET REMOVAL

1. Hold the camshaft sprocket with special tools MB990767 and MD998719.
2. Loosen the camshaft sprocket mounting bolt and remove the camshaft sprocket.

<<B>> EXHAUST ROCKER ARM AND SHAFT ASSEMBLY/ INTAKE ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

⚠ CAUTION

Never disassemble the exhaust rocker arm and shaft assembly, and intake rocker arm and shaft assembly.



<<C>> CAMSHAFT REMOVAL

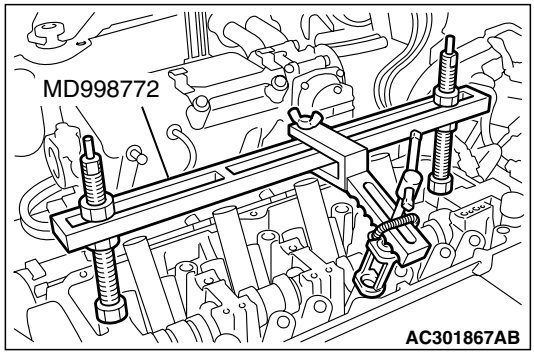
1. Raise the transaxle assembly to a position in which the camshaft and transaxle mounting body side bracket do not touch it.
2. Remove the camshaft.

<<D>> VALVE SPRING RETAINER LOCKS REMOVAL

⚠ CAUTION

When removing valve spring retainer locks, leave the piston of each cylinder in the TDC (Top Dead Center) position. The valve may fall into the cylinder if the piston is not properly in the TDC position.

Use special tool MD998772 to compress the valve spring and then remove the valve spring retainer locks.



INSTALLATION SERVICE POINTS

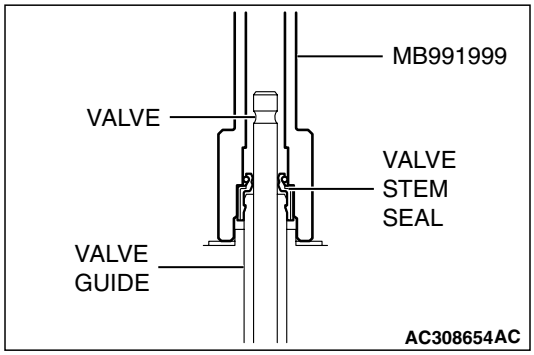
>>A<< VALVE STEM SEALS INSTALLATION

1. Apply a small amount of engine oil to the valve stem seals.

⚠ CAUTION

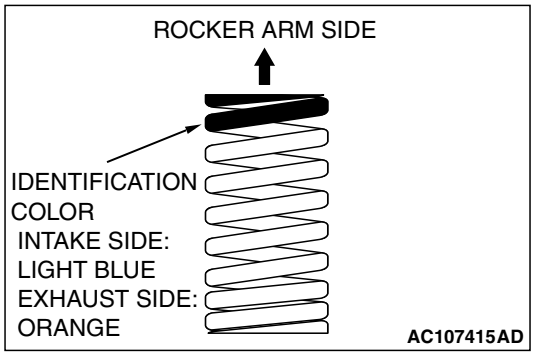
- **Do not re-use the valve stem seal.**
- **The special tool MB991999 must be used to install the valve stem seal. Improper installation could result in oil leaking past the valve guide.**

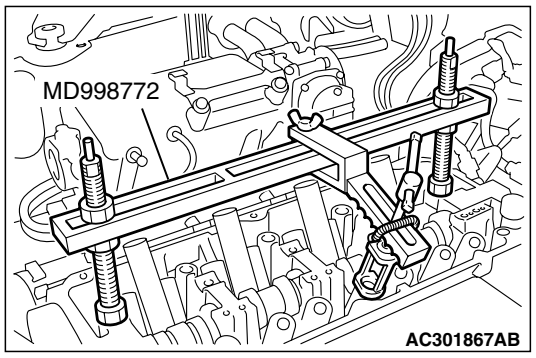
2. Use special tool MB991999 to fill a new valve stem seal in the valve guide using the valve stem area as a guide.



>>B<< EXHAUST VALVE SPRINGS/INTAKE VALVE SPRINGS INSTALLATION

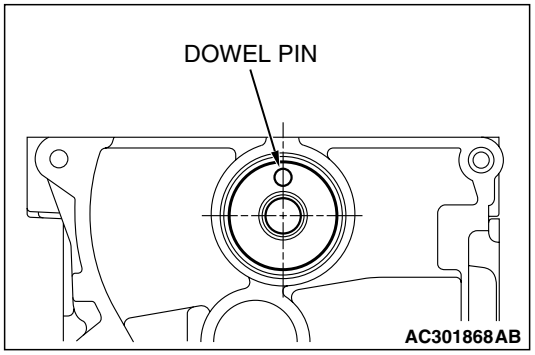
Install the valve springs with its identification color painted end facing the rocker arm.





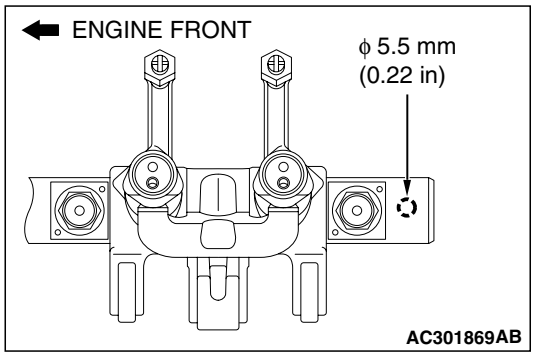
>>C<< VALVE SPRING RETAINER LOCKS INSTALLATION

Use special tool MD998772 to compress the valve spring and then install the valve spring retainer lock in the same manner as removal.



>>D<< CAMSHAFT INSTALLATION

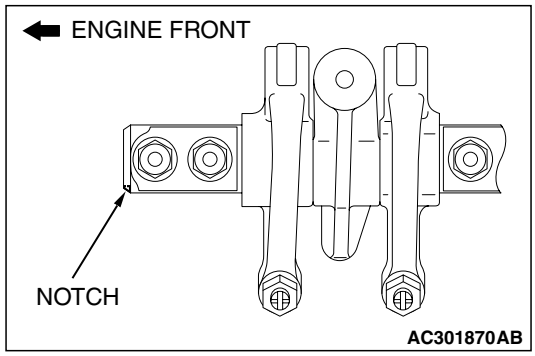
Set the dowel pin of the camshaft in the position shown in the figure.



>>E<< INTAKE ROCKER ARM AND SHAFT ASSEMBLY/ INTAKE ROCKER ARM SHAFT CAPS INSTALLATION

1. Place the intake rocker shaft so that its 5.5 mm (0.22 inch) hole faces toward the cylinder head.
2. Install the intake rocker arm shaft caps.
3. Tighten the intake rocker shaft mounting bolts to the specified torque.

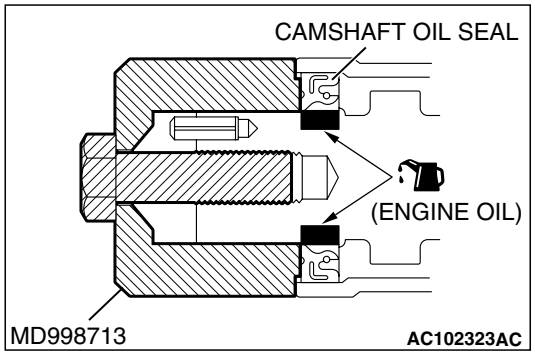
   Tightening torque: 31 ± 3 N·m (23 ± 2 ft-lb)



>>F<< EXHAUST ROCKER ARM AND SHAFT ASSEMBLY/ EXHAUST ROCKER ARM SHAFT CAPS INSTALLATION

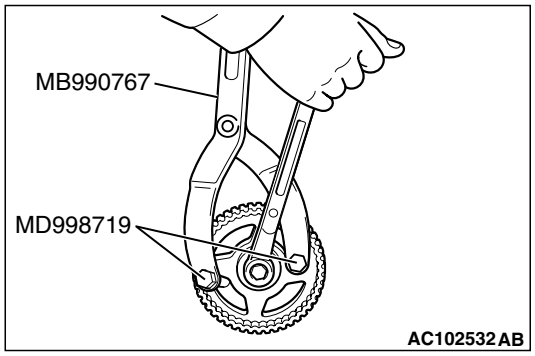
1. Install the exhaust rocker shaft so that its notch is positioned as shown.
2. Install the exhaust rocker arm shaft caps.
3. Tighten the exhaust rocker shaft mounting bolts to the specified torque.

   Tightening torque: 13 ± 1 N·m (115 ± 9 in-lb)



>>G<< CAMSHAFT OIL SEAL INSTALLATION

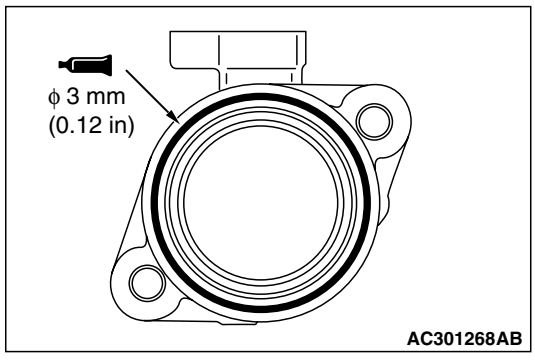
1. Apply engine oil to the entire inner diameter of the oil seal lip.
2. Use special tool MD998713 to press-fit the oil seal as shown.



>>H<< CAMSHAFT SPROCKET INSTALLATION

1. Hold the camshaft sprocket with special tools MB990767 and MD998719 in the same manner as removal.
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

   Tightening torque: 89 ± 9 N·m (65 ± 7 ft-lb)



>>I<< CAMSHAFT POSITION SENSOR SUPPORT INSTALLATION

1. Remove sealant from the camshaft position sensor support and cylinder head surfaces.
2. Apply the sealant to the camshaft position sensor support flange in a continuous bead as shown in the illustration.

   Specified sealant: 3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent

   NOTE: Install the camshaft position sensor support within 15 minutes after applying the sealant.
3. Install the camshaft position sensor support to the cylinder head.

⚠ CAUTION

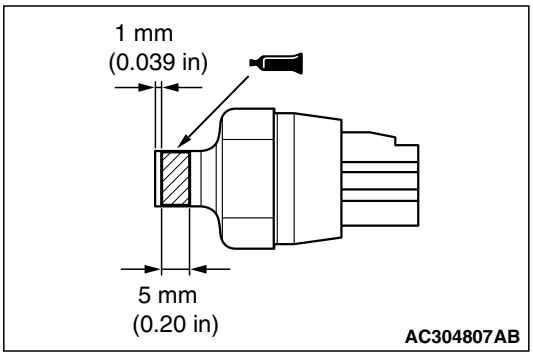
Wait at least one hour. Never start the engine or let engine oil or coolant touch the adhesion surface during that time.

4. Tighten the camshaft position sensor support mounting bolts to the specified torque.

   Tightening torque: 14 ± 1 N·m (120 ± 13 in-lb)

>>J<< ENGINE OIL PRESSURE SWITCH INSTALLATION

1. Remove sealant from the engine oil pressure switch and cylinder head surfaces.



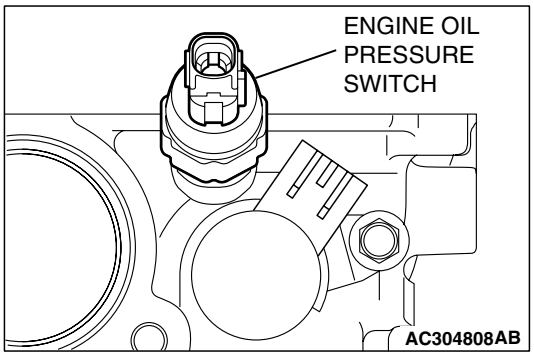
2. Apply sealant to the thread of the engine oil pressure switch as shown.

   Specified sealant: 3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent

   NOTE: Install the engine oil pressure switch within 15 minutes after applying the sealant.

⚠ CAUTION

Wait at least one hour. Never start the engine or let engine oil or coolant touch the adhesion surface during that time.



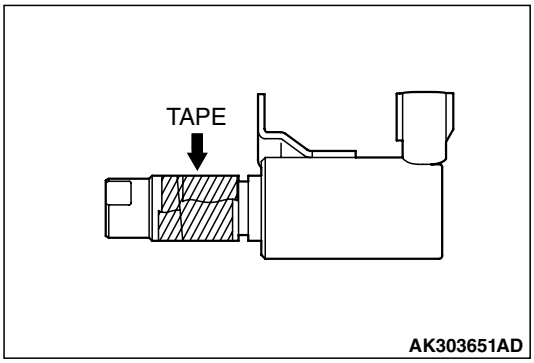
3. Tighten the engine oil pressure switch to the specified torque as shown.

   Tightening torque: 10 ± 2 N·m (89 ± 17 in-lb)

>>K<< O-RING/ENGINE OIL CONTROL VALVE INSTALLATION

⚠ CAUTION

- **Never re-use the O-ring.**
- **Before installing O-ring, wind the tape with the soft adhesion (sealing tape) around the oil passages cut-out area of engine oil control valve to prevent the damage. If the O-ring is damaged, it can be the cause of oil leak.**



1. Apply a small amount of engine oil to the O-ring and then install it to the engine oil control valve.
2. Assemble the engine oil control valve to the cylinder head.
3. Tighten the engine oil control valve mounting bolt to the specified torque.

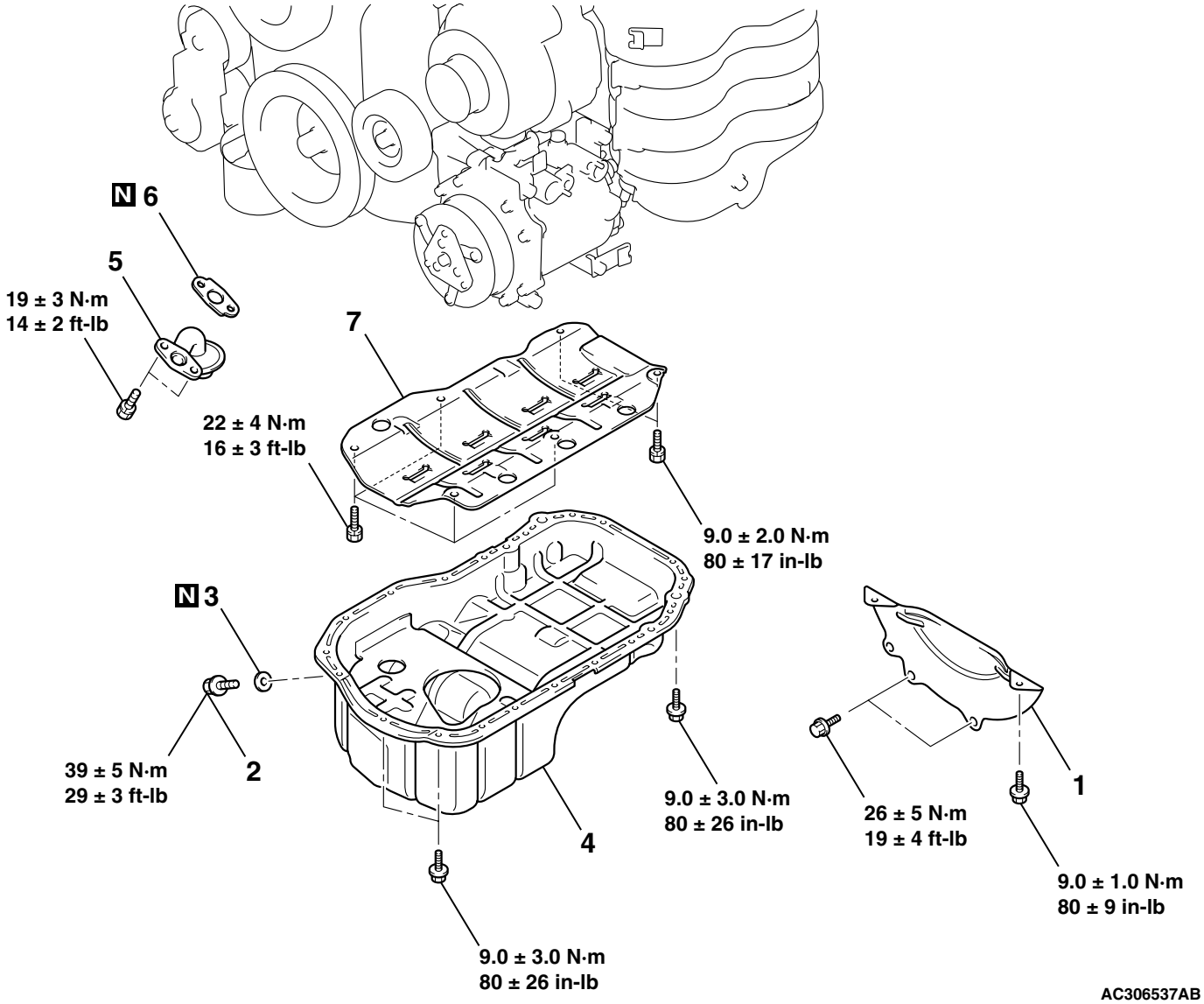
   Tightening torque: 11 ± 1 N·m (98 ± 8 in-lb)

OIL PAN

REMOVAL AND INSTALLATION

M1112002800718

Pre-removal Operation	Post-installation Operation
• Side Under Cover Removal (Refer to GROUP 51, Under Cover P.51-12). • Engine Oil Draining (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3). • Front No.1 Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32). • Front No.2 Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32).	• Front No.2 Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32). • Front No.1 Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32). • Engine Oil Refilling (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3). • Side Under Cover Installation (Refer to GROUP 51, Under Cover P.51-12).



AC306537AB

REMOVAL STEPS

1. TORQUE CONVERTER HOUSING FRONT LOWER COVER
2. ENGINE OIL PAN DRAIN PLUG
>>B<< 3. ENGINE OIL PAN DRAIN PLUG GASKET
<<A>> >>A<< 4. ENGINE OIL PAN

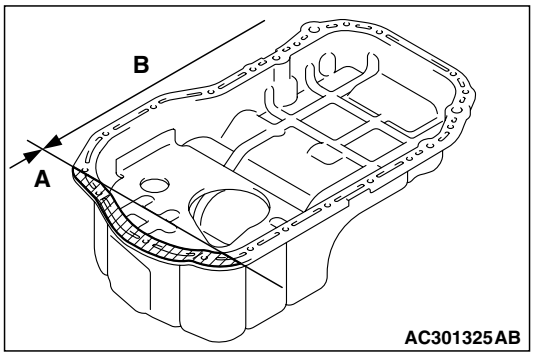
REMOVAL STEPS (Continued)

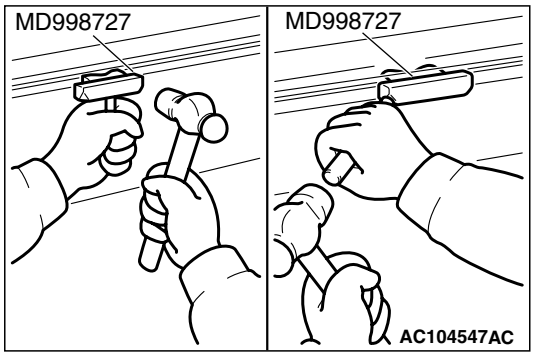
5. ENGINE OIL PAN STRAINER
6. ENGINE OIL PAN STRAINER GASKET
7. BAFFLE PLATE

TSB Revision

Required Special Tool:

- MD998727: Oil Pan FIPG cutter





REMOVAL SERVICE POINT

<<A>> ENGINE OIL PAN REMOVAL

1. Remove the engine oil pan mounting bolts.

⚠ CAUTION

Do not use special tool MD998727 in area A of the engine oil pan. Using the special tool in area A may cause deformation of the front case because the front case is made of aluminum.

2. Tap special tool MD998727 into the range (B) between the cylinder block and the engine oil pan, and then slide the tool sideways.

   NOTE: If any sounding parts interfere with the removal, there is no need to use special tool MD998727.

3. Remove the engine oil pan.

INSTALLATION SERVICE POINTS

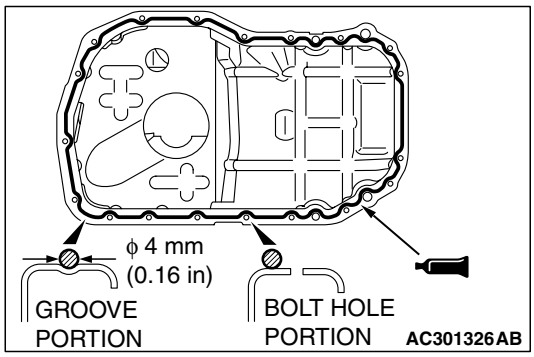
>>A<< ENGINE OIL PAN INSTALLATION

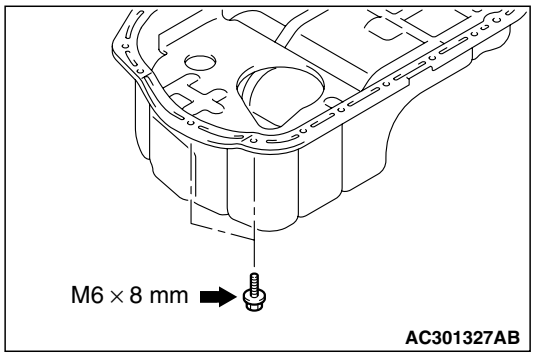
1. Remove sealant from the engine oil pan, front case and cylinder block surfaces.
2. Apply a bead of the sealant to the cylinder block mating surface of the engine oil pan as shown.

   Specified sealant: 3M™ AAD Part No.8672, 8704, 3M™ AAD Part No.8679/8678 or equivalent

   NOTE: Install the engine oil pan within 15 minutes after applying sealant.

3. Assemble the engine oil pan to the cylinder block.



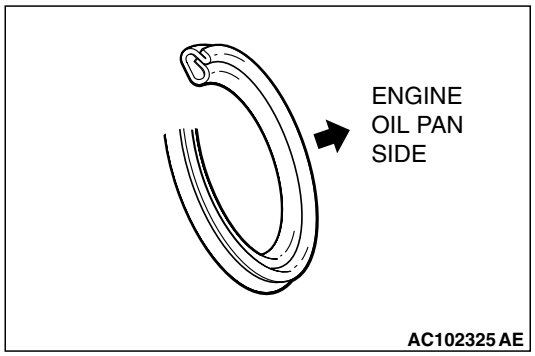


⚠ CAUTION

Wait at least one hour. Never start the engine or let engine oil or coolant touch the sealant surface during that time.

4. Tighten the engine oil pan mounting bolts to the specified torque. Be careful when installing, as the bolts indicated in the illustration have different lengths from the other bolts.

   Tightening torque: 9.0 ± 3.0 N·m (80 ± 26 in-lb)



>>B<< ENGINE OIL PAN DRAIN PLUG GASKET INSTALLATION

Replace the gasket with a new gasket. Install the new gasket in the direction shown in the illustration.

INSPECTION

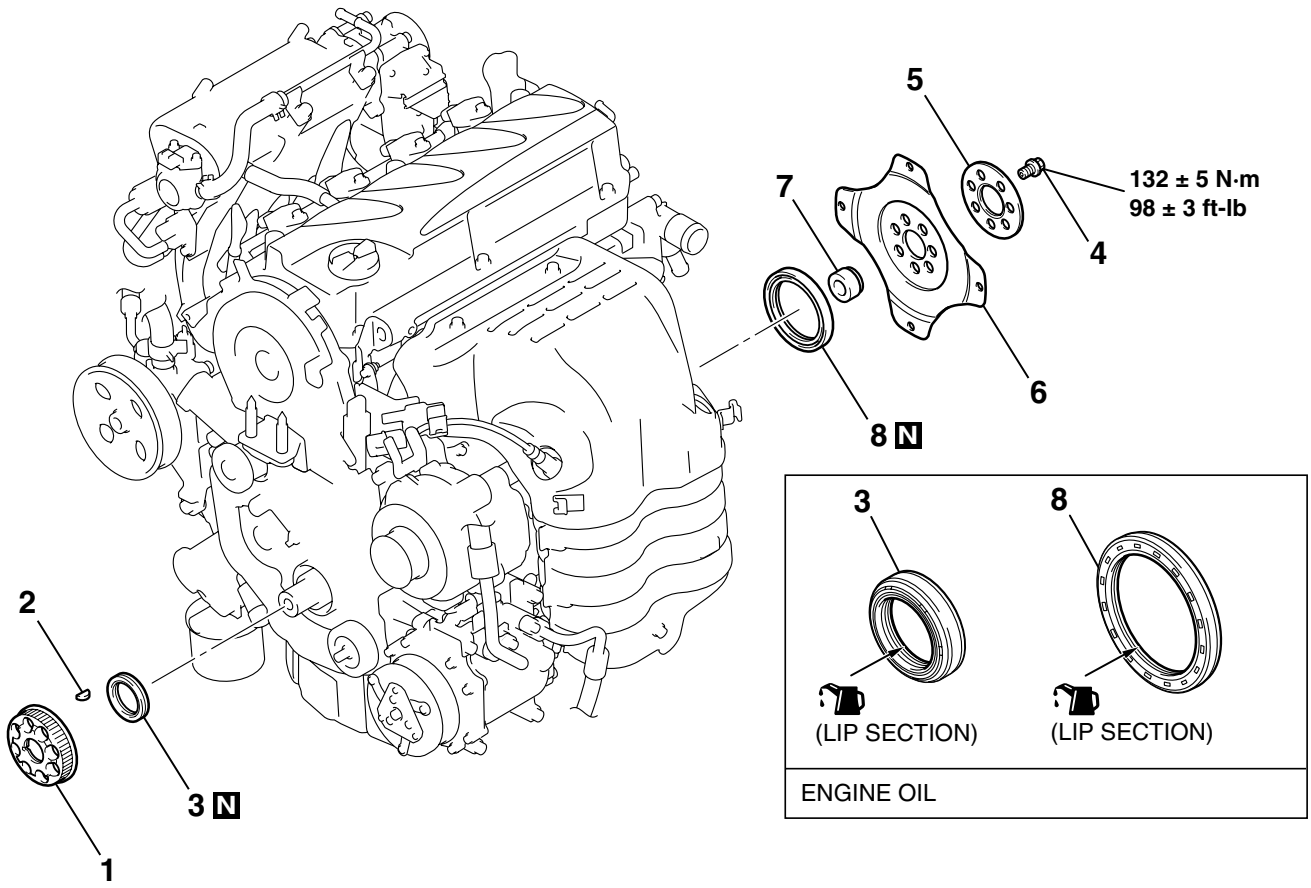
M1112002900146

- Check the oil pan for cracks.
- Check the oil pan sealant-coated surface for damage and deformation.

CRANKSHAFT OIL SEAL

REMOVAL AND INSTALLATION

M1112003100369



AC306538AB

CRANKSHAFT FRONT OIL SEAL REMOVAL STEPS

- VALVE TIMING BELT AND BALANCER TIMING BELT (REFER TO P.11A-51).

>>D<< 1. CRANKSHAFT BALANCER SHAFT DRIVE SPROCKET
2. CRANKSHAFT KEY
>>C<< 3. CRANKSHAFT FRONT OIL SEAL

CRANKSHAFT REAR OIL SEAL REMOVAL STEPS

- TRANSAXLE ASSEMBLY (REFER TO GROUP 23A, TRANSAXLE ASSEMBLY P.23A-388).

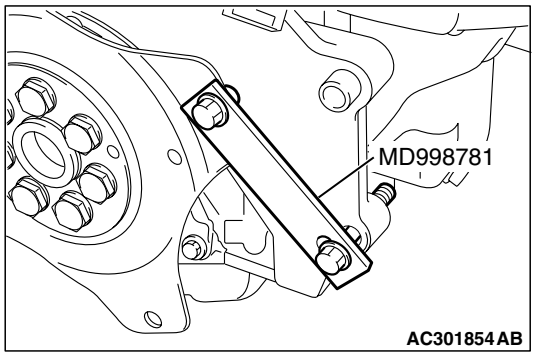
<<A>> >>B<< 4. A/T DRIVE PLATE BOLTS
5. A/T DRIVE PLATE ADAPTER PLATE
6. A/T DRIVE PLATE
7. CRANKSHAFT BUSH
>>A<< 8. CRANKSHAFT REAR OIL SEAL

Required Special Tools:

- MB990938: Installer Bar
- MD998285: Crankshaft Front Oil Seal Guide
- MD998375: Crankshaft Front Oil Seal Installer
- MD998776: Crankshaft Rear Oil Seal Installer
- MD998781: Flywheel Stopper

TSB Revision

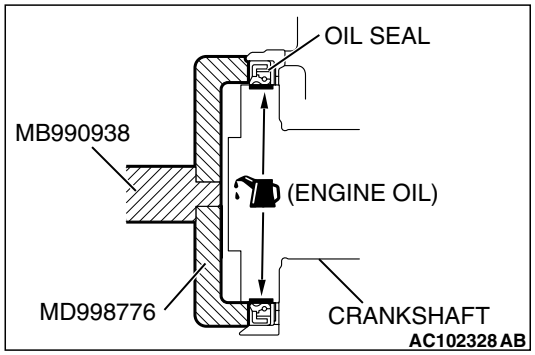
REMOVAL SERVICE POINT



<<A>> A/T DRIVE PLATE BOLTS REMOVAL

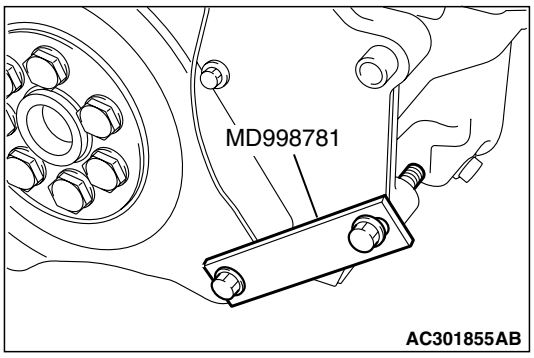
1. Use special tool MD998781 to secure the A/T drive plate.
2. Remove the A/T drive plate bolts.

INSTALLATION SERVICE POINTS



>>A<< CRANKSHAFT REAR OIL SEAL INSTALLATION

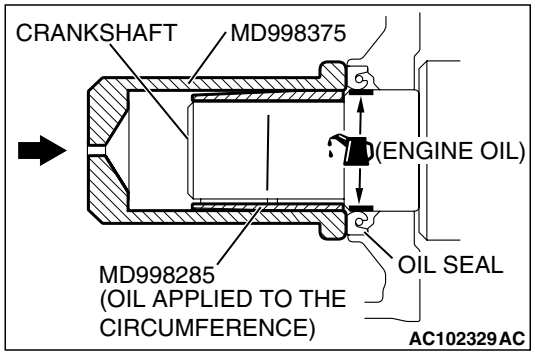
1. Apply a small amount of engine oil to the entire inner diameter of the oil seal lip.
2. Use special tools MB990938 and MD998776 to press-fit the oil seal.



>>B<< A/T DRIVE PLATE BOLTS INSTALLATION

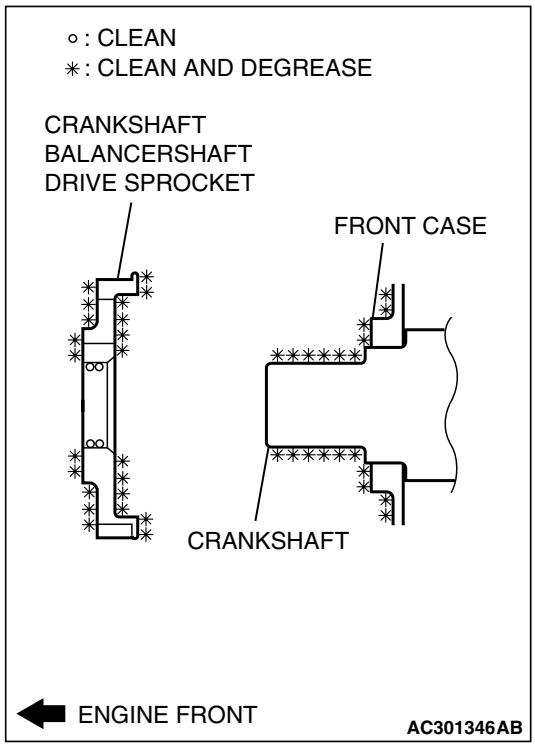
1. Use special tool MD998781 to secure the A/T drive plate in the same manner as removal.
2. Tighten the A/T drive plate bolts to the specified torque.

   Tightening torque: 132 ± 5 N·m (98 ± 3 ft-lb)



>>C<< CRANKSHAFT FRONT OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the outer diameter of special tool MD998285 and install it to the crankshaft.
2. Apply a small amount of engine oil to the entire inner diameter of the oil seal lip.
3. Use special tool MD998375 to press-fit the oil seal.



>>D<< CRANKSHAFT BALANCER SHAFT DRIVE SPROCKET INSTALLATION

1. Clean or degrease the front case, the crankshaft and the crankshaft balancer shaft drive sprocket as shown.

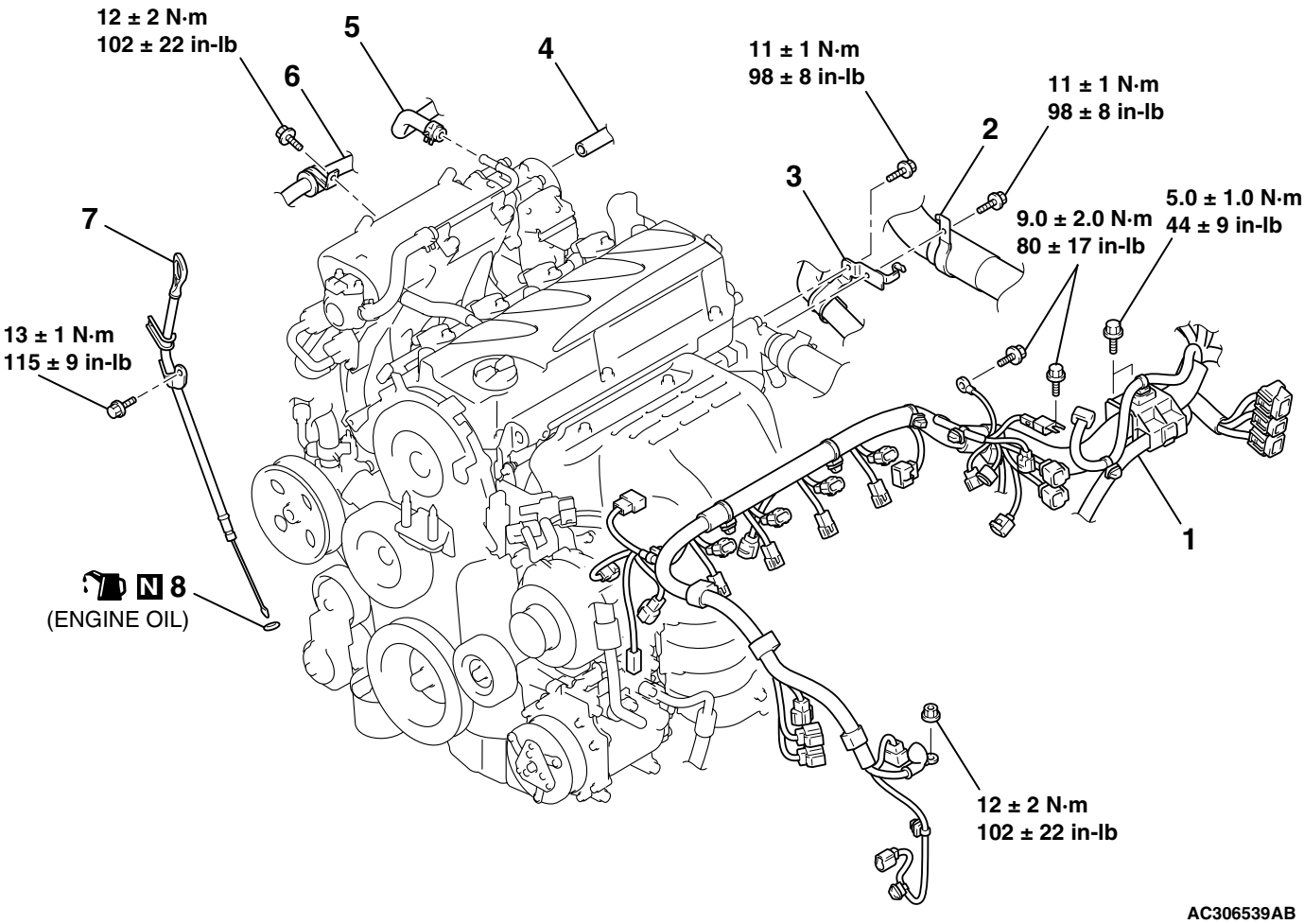
   NOTE: Also clean the degreased surfaces.
2. Install the crankshaft balancer shaft drive sprocket in the direction shown in the illustration.

CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

M1112004001603

Pre-removal Operation	Post-installation Operation
• Fuel Line Pressure Reduction [Refer to GROUP 13A, On-vehicle Service – Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) P.13A-1166]. • Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7). • Powertrain Control Module (PCM) Removal (Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180). • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-4). • Battery and Battery Tray Removal	• Battery and Battery Tray Installation • Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-4). • Powertrain Control Module (PCM) Installation (Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180). • Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7). • Fuel Leak Check



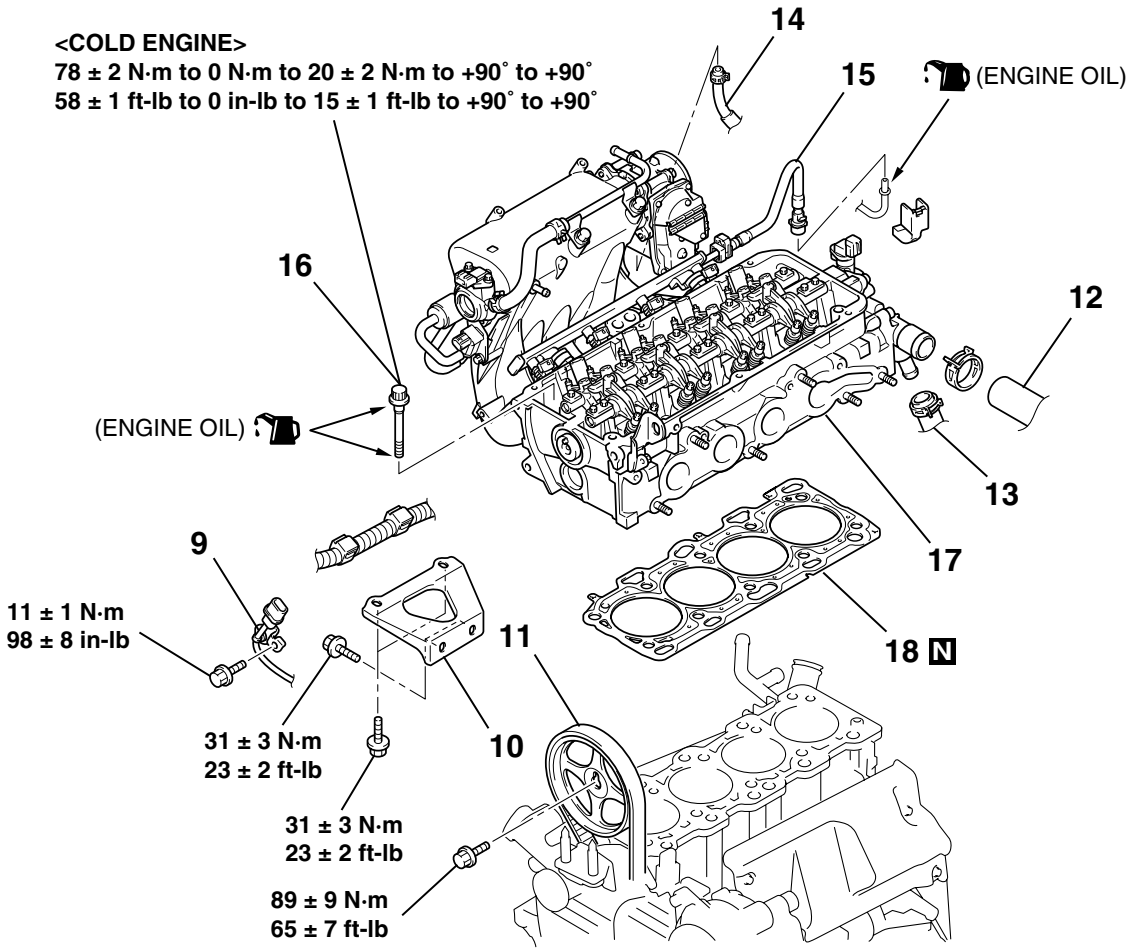
AC306539AB

REMOVAL STEPS
1. CONTROL WIRING HARNESS CONNECTION
2. RADIATOR LOWER HOSE CLAMP
3. WATER HOSE CLAMP
4. EVAPORATIVE EMISSION VACUUM HOSE CONNECTION

REMOVAL STEPS (Continued)

>>F<< 5. BRAKE BOOSTER VACUUM HOSE CONNECTION
6. PRESSURE HOSE CLAMP
7. ENGINE OIL DIPSTICK AND DIPSTICK GUIDE
8. O-RING

TSB Revision



AC500454AB

REMOVAL STEPS

9. KNOCK SENSOR CONNECTOR CONNECTION
10. INTAKE MANIFOLD STAY
- EXHAUST MANIFOLD (REFER TO GROUP 15, EXHAUST MANIFOLD P.15-22).
- TIMING BELT UPPER COVER (REFER TO P.11A-51).
- ENGINE FRONT MOUNTING BRACKET (REFER TO GROUP 32, ENGINE MOUNT P.32-4).

<<A>> >>E<< 11. CAMSHAFT SPROCKET
<<B>> >>D<< 12. RADIATOR UPPER HOSE CONNECTION

REMOVAL STEPS (Continued)

13. WATER COOLER HOSE CONNECTION
14. WATER HOSE CONNECTION
- WATER INLET FITTING AND THERMOSTAT CASE ASSEMBLY (REFER TO GROUP 14, WATER HOSE AND WATER PIPE P.14-26).

<<C>> >>C<< 15. FUEL HIGH-PRESSURE HOSE CONNECTION
- ROCKER COVER ASSEMBLY (REFER TO P.11A-30).

<<D>> >>B<< 16. CYLINDER HEAD BOLTS
17. CYLINDER HEAD ASSEMBLY
>>A<< 18. CYLINDER HEAD GASKET

Required Special Tools:

- MB990767: Front Hub and Flange Yoke Holder
- MB991654: Cylinder Head Bolt Wrench (12)
- MD998719: Pin
- MD998738: Adjusting Bolt

TSB Revision

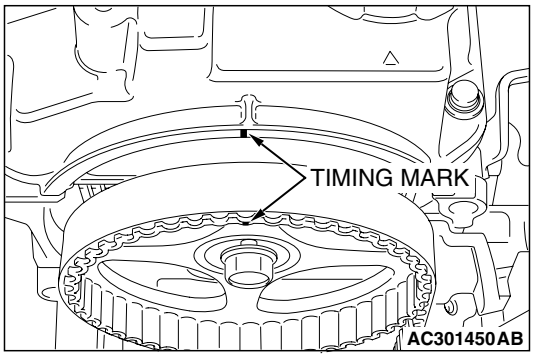
REMOVAL SERVICE POINTS

<<A>> CAMSHAFT SPROCKET REMOVAL

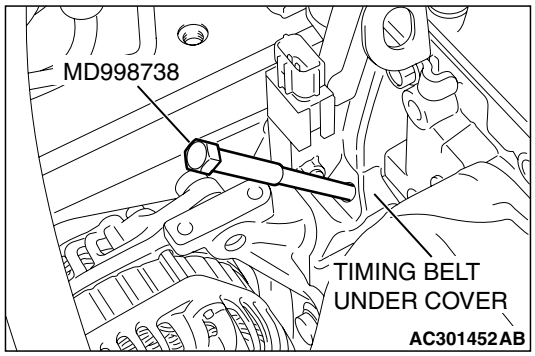
⚠ CAUTION

Never turn the crankshaft counterclockwise.

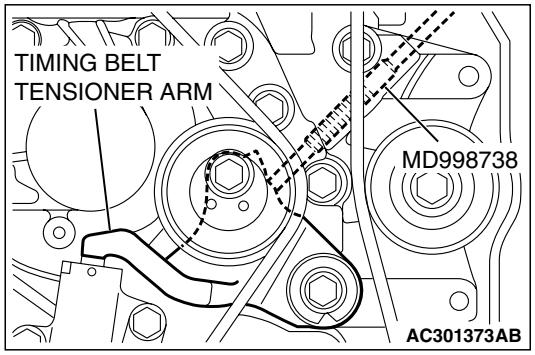
1. Turn the crankshaft clockwise, align the timing marks on the camshaft sprocket to set number 1 cylinder to TDC of its compression stroke.



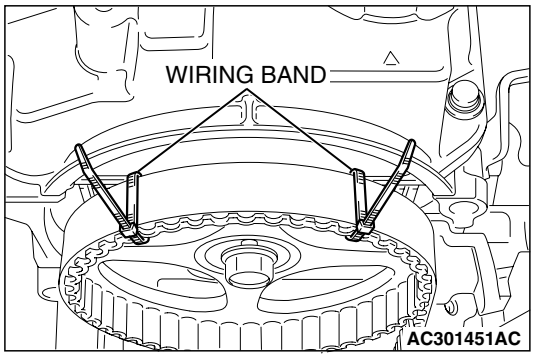
2. Remove the timing belt under cover rubber plug and then set special tool MD998738.

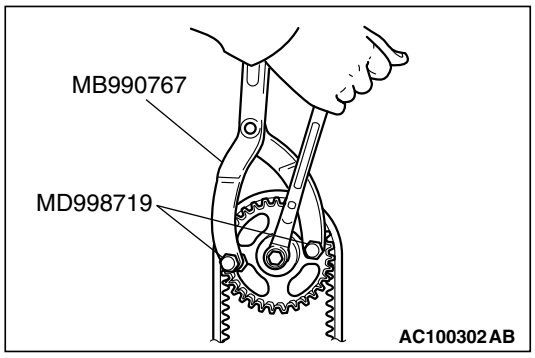


3. Screw in special tool MD998738 until it contacts the timing belt tensioner arm.



4. Secure the camshaft sprocket and valve timing belt with wiring bands and so on to prevent slippage between the camshaft sprocket and valve timing belt.

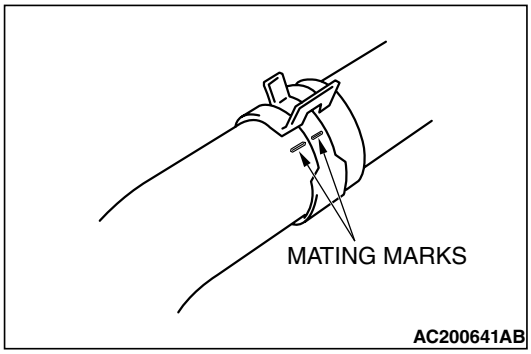




5. Hold the camshaft sprocket with special tools MB990767 and MD998719.

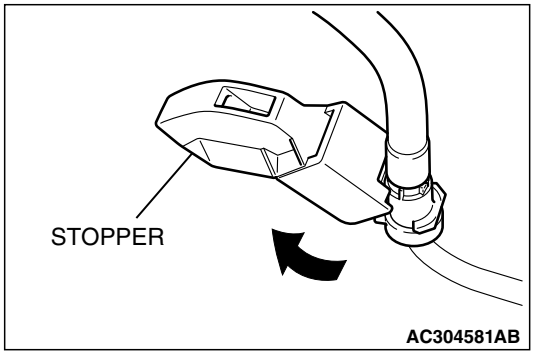
⚠ CAUTION
Do not rotate the crankshaft after camshaft sprocket removal.

6. Remove the camshaft sprocket with the valve timing belt and place it on the timing belt lower cover.



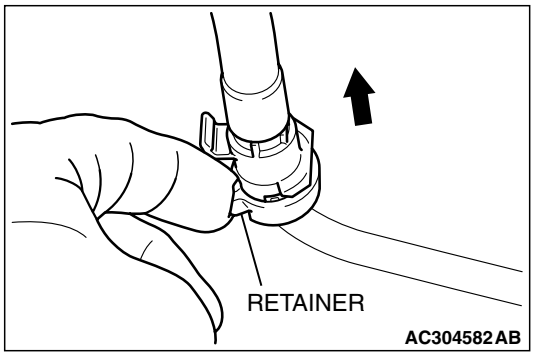
<<B>> RADIATOR UPPER HOSE DISCONNECTION

Make mating marks on the radiator upper hose and the hose clamp. Disconnect the radiator upper hose.



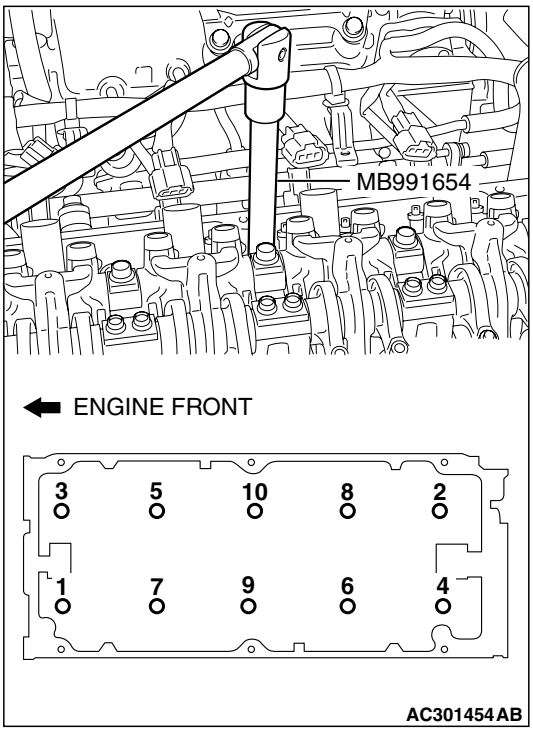
<<C>> FUEL HIGH-PRESSURE HOSE REMOVAL

1. Remove the fuel high-pressure hose stopper.



2. Remove the fuel high-pressure hose in the direction shown in the figure while the retainer is pulled up.

NOTE: If the retainer is released, install it after removing the fuel high-pressure hose.



<<D>> CYLINDER HEAD BOLTS REMOVAL

Use special tool MB991654 to loosen the cylinder head bolts in two or three steps in the order of the numbers shown in the illustration. If the cylinder head bolts cannot be pulled out due to the washer being trapped in the valve spring, raise the bolt slightly, then remove it while holding it by using a magnet.

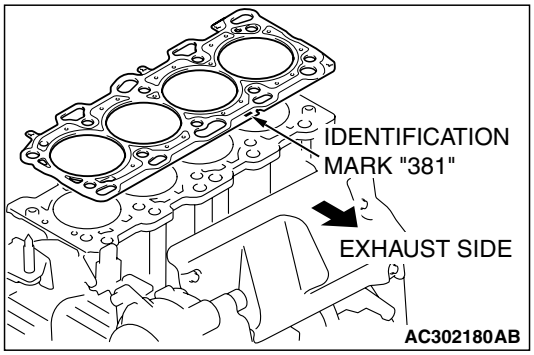
INSTALLATION SERVICE POINTS

>>A<< CYLINDER HEAD GASKET INSTALLATION

⚠ CAUTION

Do not allow any foreign materials get into the coolant passages, oil passages and cylinder.

1. Degrease the cylinder head gasket mounting surface.
2. Assemble to the cylinder block so the cylinder head gasket identification mark of "381" is at the top surface and on the exhaust side.

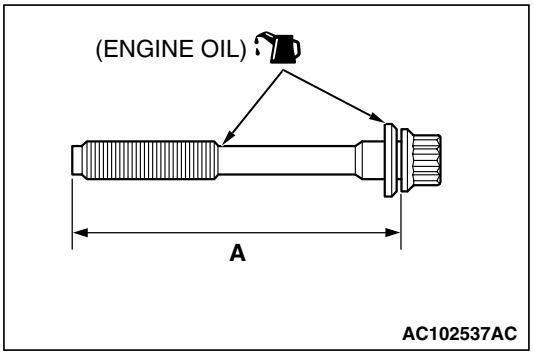


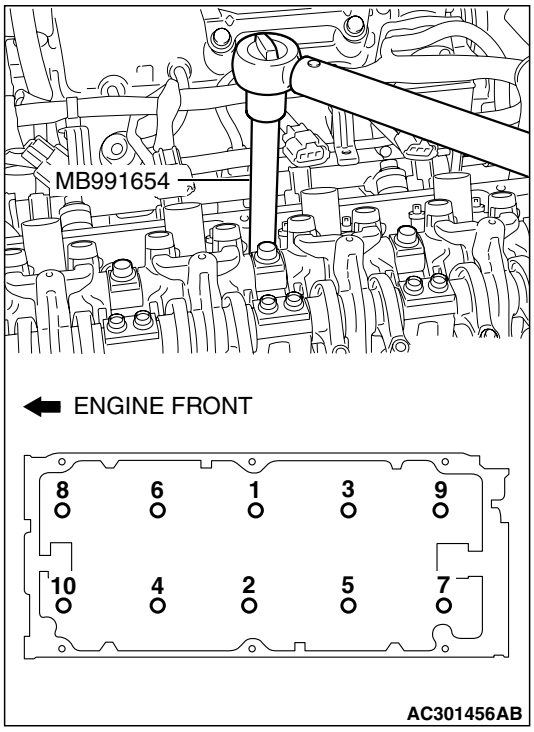
>>B<< CYLINDER HEAD BOLTS INSTALLATION

1. Check that the nominal length of each cylinder head bolt meets the limit. If it exceeds the limit, replace the bolts with a new one.

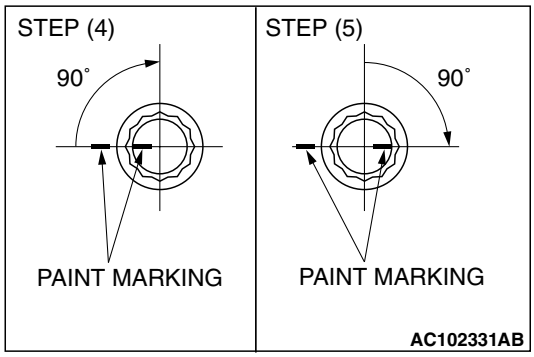
   Limit (A): 99.4 mm (3.91 inches)

2. Apply a small amount of engine oil to the thread of the bolts and to the washers.





3. Use special tool MB991654 to tighten the cylinder head bolts in the following procedures.
   (1) Tighten the bolts to 78 ± 2 N·m (58 ± 1 ft-lb) in the order shown.
   (2) Loosen the bolts fully in the reverse sequence to that shown.
   (3) Tighten the bolts to 20 ± 2 N·m (15 ± 1 ft-lb) in the order shown.

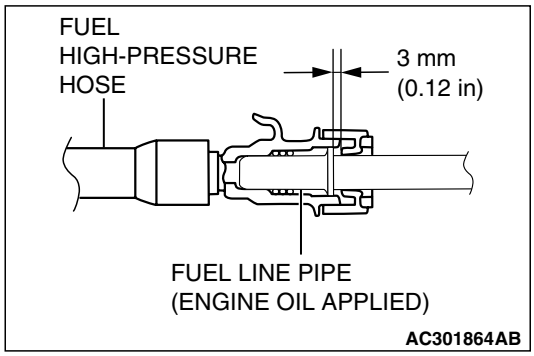


   (4) Apply a paint mark to the heads of the cylinder head bolts and cylinder head, then tighten 90 degree angle as shown.

⚠ CAUTION

- **The bolt is not tightening sufficiently if the tightening angle is less than a 90 degree angle.**
- **If the tightening angle exceeds the standard specification, remove the bolt and start over from step 1.**

   (5) Tighten in a 90 degree angle as shown in the instructions of the figure, then check to see that the paint mark on the head of the cylinder head bolts and the paint mark on the cylinder head is on a linear line.

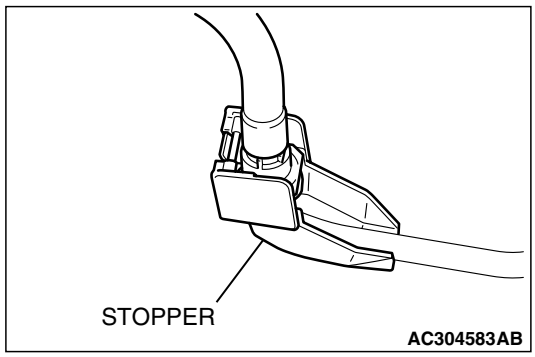


>>C<< FUEL HIGH-PRESSURE HOSE INSTALLATION

⚠ CAUTION

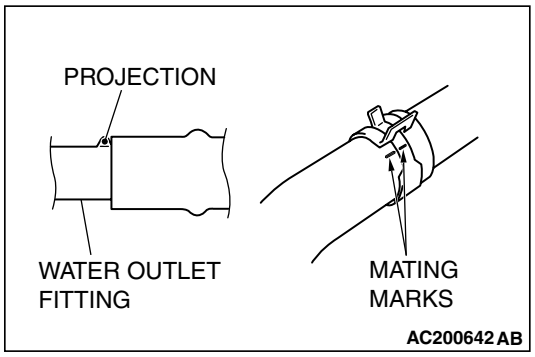
After connecting the fuel high-pressure hose, slightly pull it to ensure that it is installed securely. Also confirm that there is a play approximately 3 mm (0.12 inch). Then install the stopper securely.

Apply a small amount of engine oil to the fuel line pipe and then install the fuel high-pressure hose.



>>D<< RADIATOR UPPER HOSE CONNECTION

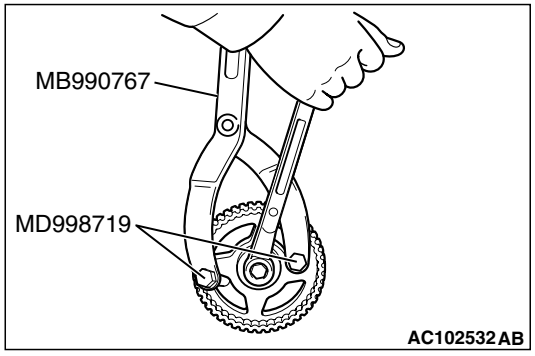
1. Insert radiator upper hose until it contacts the projection on the water outlet fitting.
2. Align the mating marks on the radiator upper hose and hose clamp, and then secure the radiator upper hose.

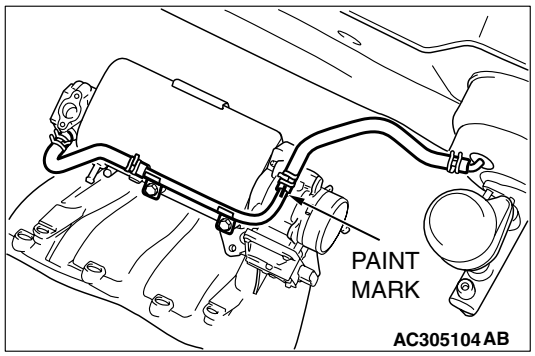


>>E<< CAMSHAFT SPROCKET INSTALLATION

1. Hold the camshaft sprocket with special tools MB990767 and MD998719 in the same manner as removal.
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

Tightening torque: 89 ± 9 N·m (65 ± 7 ft-lb)





>>F<< BRAKE BOOSTER VACUUM HOSE CONNECTION

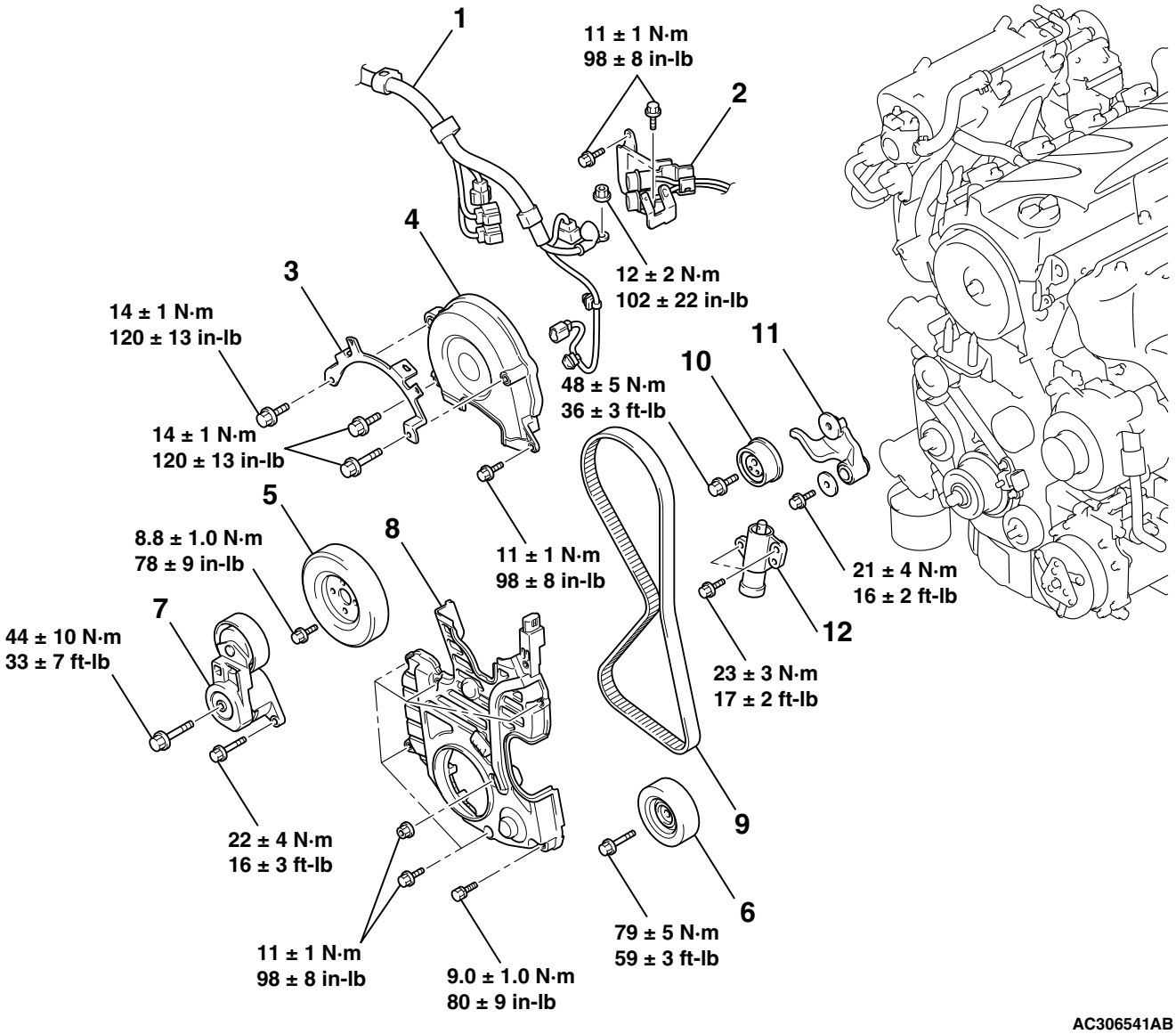
Insert vacuum hose with its paint mark facing upward.

TIMING BELT

REMOVAL AND INSTALLATION

M1112004300764

Pre-removal Operation	Post-installation Operation
• Side Under Cover Removal (Refer to GROUP 51, Under Cover P.51-12). • Crankshaft Shaft Damper Pulley Removal (Refer to P.11A-28).	• Crankshaft Shaft Damper Pulley Installation (Refer to P.11A-28). • Drive Belt Tension Check (Refer to P.11A-8). • Side Under Cover Installation (Refer to GROUP 51, Under Cover P.51-12).



AC306541AB

REMOVAL STEPS

1. CONTROL WIRING HARNESS CONNECTION
2. CONNECTOR BRACKET
3. HARNESS BRACKET
4. TIMING BELT UPPER COVER
   - ENGINE FRONT MOUNTING BRACKET (REFER TO GROUP 32, ENGINE MOUNT P.32-4).
5. WATER PUMP PULLEY
6. IDLER PULLEY

<<A>>

>>G<<

>>F<<

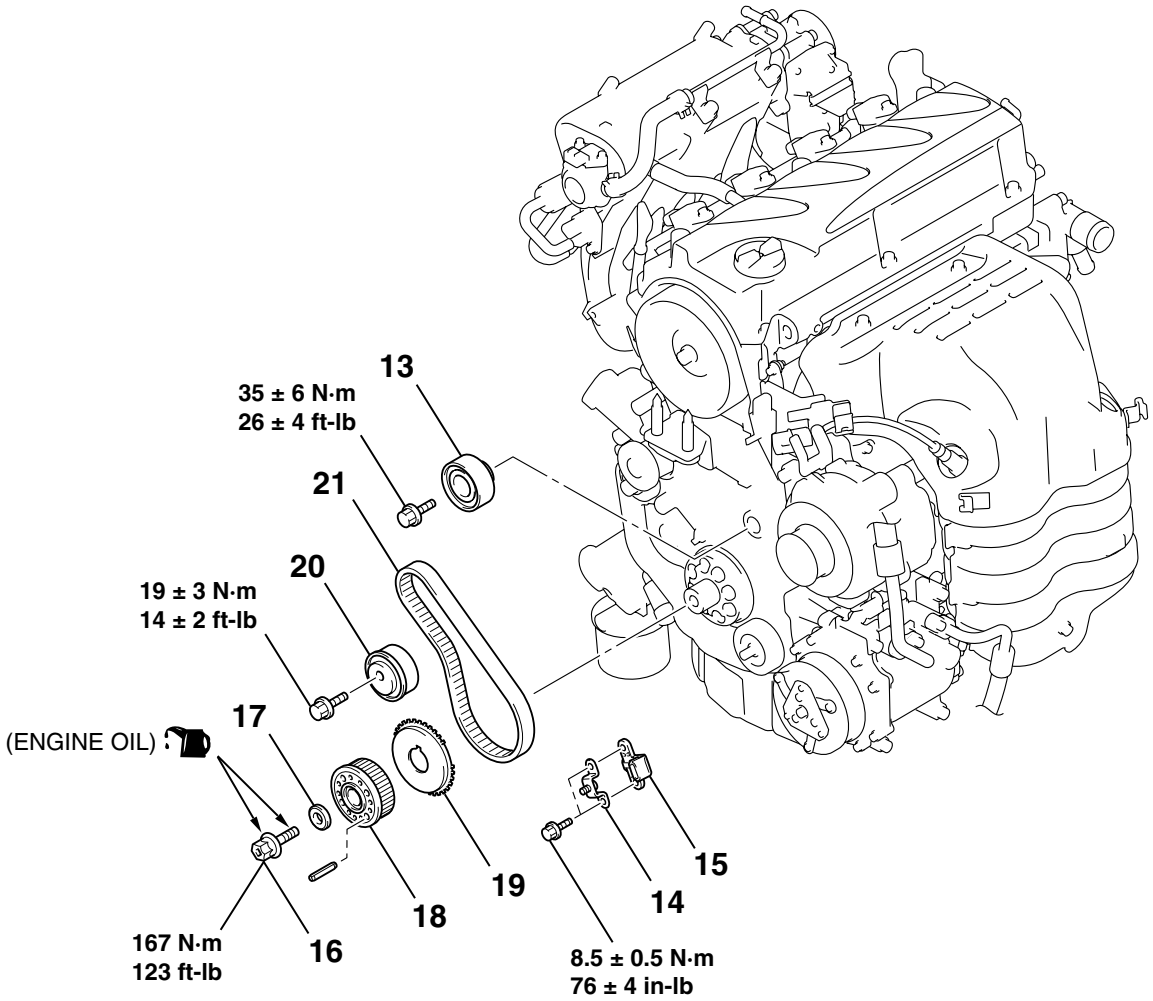
>>E<<

>>D<<

REMOVAL STEPS (Continued)

7. AUTO-TENSIONER
8. TIMING BELT LOWER COVER
   - VALVE TIMING BELT TENSION ADJUSTMENT (INSTALLATION ONLY)
9. VALVE TIMING BELT
10. TIMING BELT TENSIONER PULLEY
11. TIMING BELT TENSIONER ARM
12. TIMING BELT TENSIONER ADJUSTER

TSB Revision



REMOVAL STEPS

13. TIMING BELT IDLER PULLEY
14. TIMING BELT LOWER COVER BRACKET
15. CRANKSHAFT POSITION SENSOR
<<**B**>> >>**C**<< 16. CRANKSHAFT PULLEY CENTER BOLT
<<**B**>> >>**C**<< 17. CRANKSHAFT PULLEY WASHER
<<**B**>> >>**C**<< 18. CRANKSHAFT CAMSHAFT DRIVE SPROCKET

REMOVAL STEPS (Continued)

>>**C**<< 19. CRANKSHAFT ANGLE SENSING BLADE
>>**B**<< • BALANCER TIMING BELT TENSION ADJUSTMENT (INSTALLATION ONLY)
>>**A**<< 20. BALANCER TIMING BELT TENSIONER
<<**C**>> >>**A**<< 21. BALANCER TIMING BELT

Required Special Tools:

- MB991367: Special Spanner
- MB991385: Pin
- MD998738: Adjusting Bolt
- MD998767: Tensioner Wrench

TSB Revision

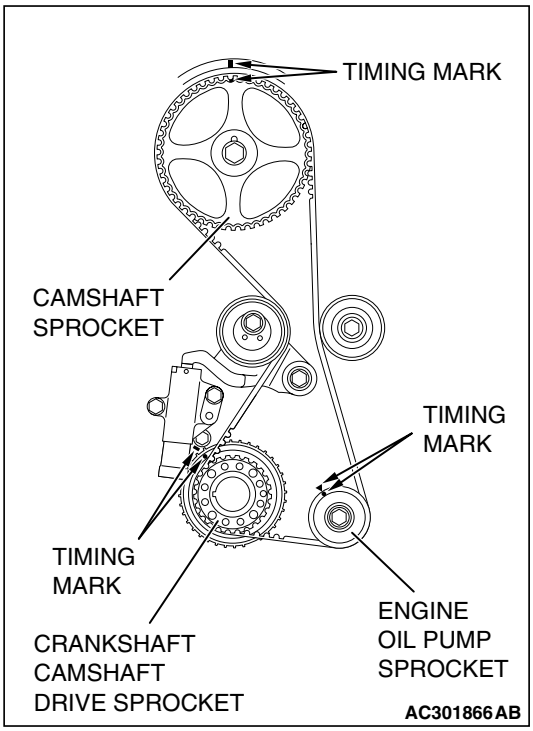
REMOVAL SERVICE POINTS

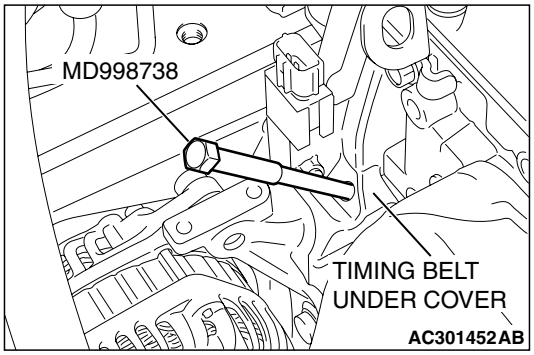
<<A>> VALVE TIMING BELT REMOVAL

⚠ CAUTION

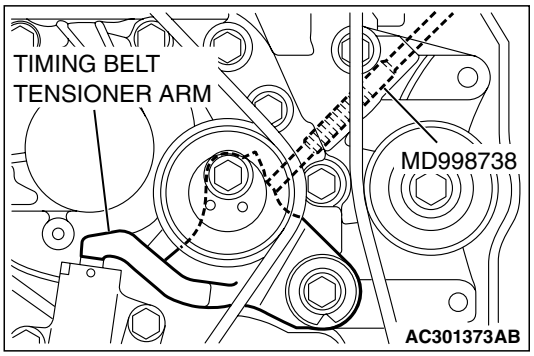
Never turn the crankshaft counterclockwise.

1. Turn the crankshaft clockwise, align each timing mark to set number 1 cylinder to TDC of its compression stroke.





2. Remove the timing belt under cover rubber plug and then set special tool MD998738.

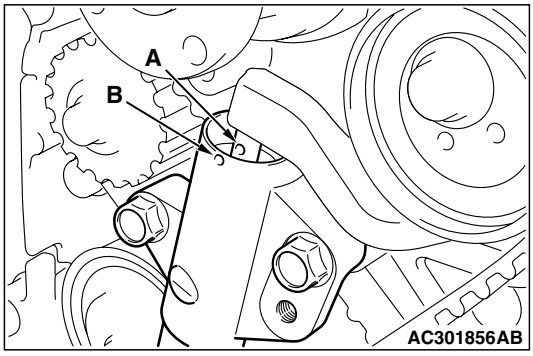


3. Screw in special tool MD998738 with hands until it contacts the timing belt tensioner arm.

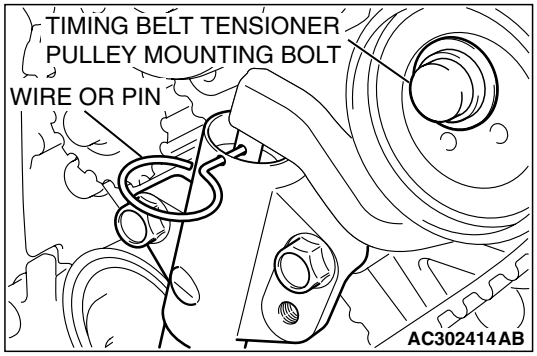
⚠ CAUTION

Special tool MD998738 can be gradually installed at a rate of a 30 degree turn per second. If it is screwed in all at once, the timing belt tensioner adjuster rod will not easily retract and special tool MD998738 may bend.

4. Gradually screw in special tool MD998738 and then align the timing belt tensioner adjuster rod set hole A with the timing belt tensioner adjuster cylinder set hole B.



5. Insert a wire or pin in the set hole aligned.



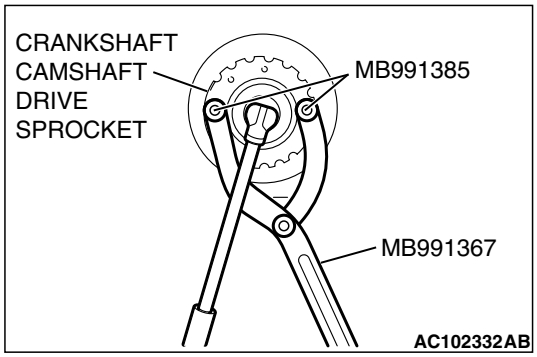
⚠ CAUTION

To reuse the valve timing belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk, etc.

6. After removal of special tool MD998738, loosen the timing belt tensioner pulley mounting bolts and remove the valve timing belt.

<<B>> CRANKSHAFT PULLEY CENTER BOLT/ CRANKSHAFT PULLEY WASHER/CRANKSHAFT CAMSHAFT DRIVE SPROCKET REMOVAL

1. Hold the crankshaft camshaft drive sprocket with special tools MB991367 and MB991385.
2. Loosen the crankshaft pulley center bolt and remove the crankshaft pulley washer and crankshaft camshaft drive sprocket.



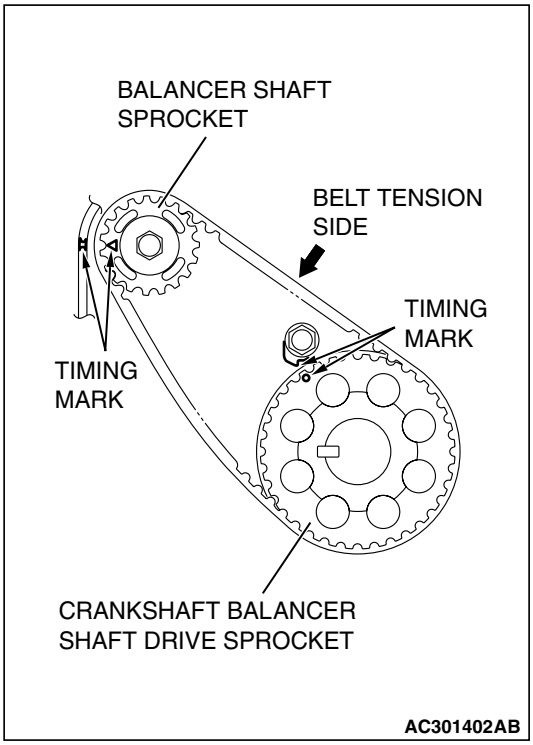
<<C>> BALANCER TIMING BELT REMOVAL

⚠ CAUTION

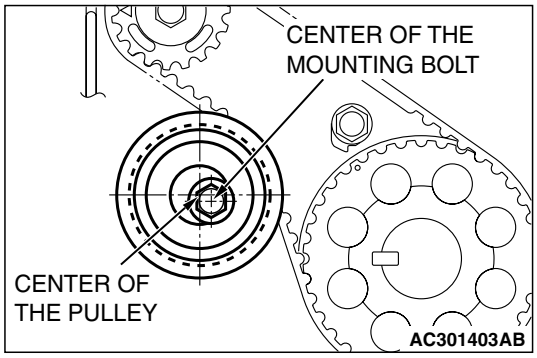
To reuse the balancer timing belt, draw an arrow indicating the rotating direction on the back of the belt using chalk, etc.

INSTALLATION SERVICE POINTS

>>A<< BALANCER TIMING BELT/BALANCER TIMING BELT TENSIONER INSTALLATION



1. Ensure that the crankshaft balancer shaft drive sprocket timing marks and balancer shaft sprocket timing marks are aligned.
2. Install the balancer timing belt on the crankshaft balancer shaft drive sprocket and balancer shaft sprocket. There should be no slack on the tension side.

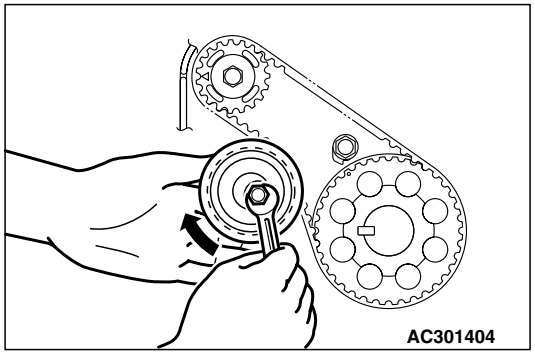


3. Assemble and temporarily fix the center of the pulley of the balancer timing belt tensioner so that it is at the top left from the center of the assembling bolt, and the pulley flange is at the front-side of the engine.
4. Adjust the balancer timing belt tension.

>>B<< BALANCER TIMING BELT TENSION ADJUSTMENT

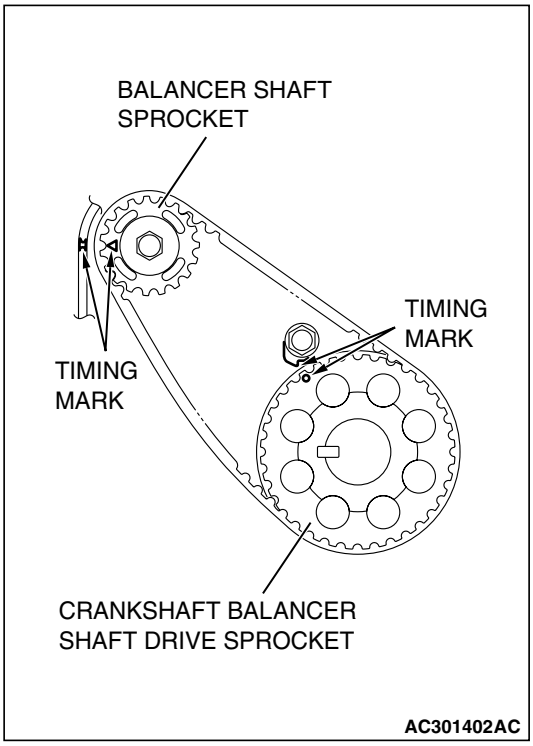
⚠ CAUTION

When tightening the mounting bolts, ensure that the tensioner does not rotate with the bolts. Allowing it to rotate with the bolts can cause excessive tension of the belt.

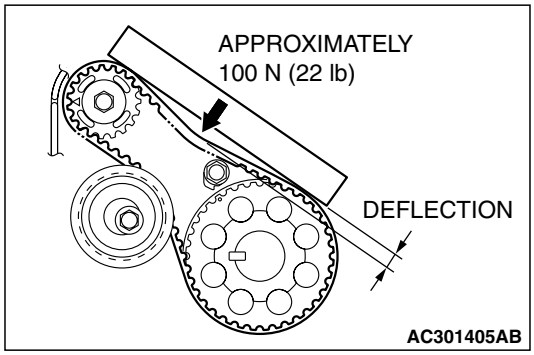


1. Lift with your fingers the balancer timing belt tensioner in the direction of the arrow. Apply a tensile torque of [3.0 ± 0.4 N·m (26 ± 4 in-lb)] to the balancer timing belt so the belt is tense without any looseness. Tighten the assembling bolt to the specified torque in this state. Then, fix the balancer timing belt tensioner.

   Tightening torque: 19 ± 3 N·m (14 ± 2 ft-lb)



2. Turn the crankshaft clockwise two turns to set number 1 cylinder to TDC of its compression stroke and check that sprocket timing marks are aligned.

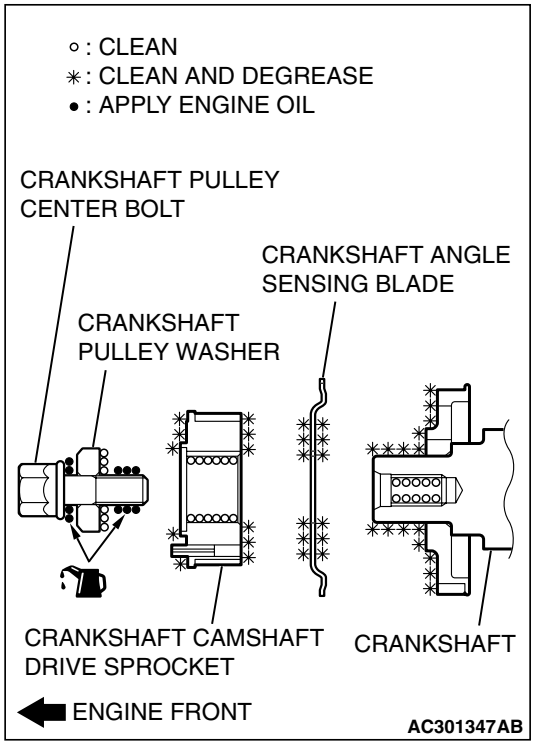


3. Apply a pressure of approximately 100 N (22 pounds) at the center (arrow area) between the sprocket as shown in the figure, then inspect whether the belt deflection is within the standard value.

   Standard value:
   <When adjusting> 5 – 7 mm (0.20 – 0.27 inch)
   <When replacing> 5 – 7 mm (0.20 – 0.27 inch)

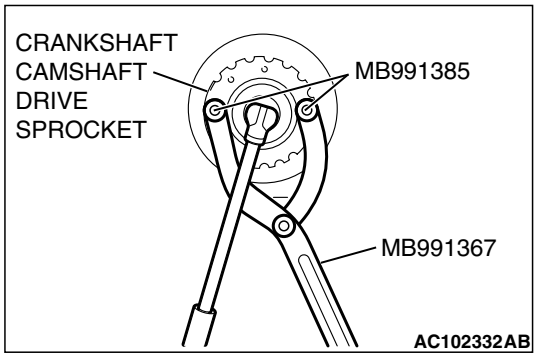
4. If not within the standard value, adjust the belt tension again.

>>C<< CRANKSHAFT ANGLE SENSING BLADE/ CRANKSHAFT CAMSHAFT DRIVE SPROCKET/ CRANKSHAFT PULLEY WASHER/CRANKSHAFT PULLEY CENTER BOLT INSTALLATION



1. Clean or degrease the crankshaft, the crankshaft angle sensing blade, the crankshaft camshaft drive sprocket and crankshaft pulley washer as shown.

   NOTE: Also clean the degreased surfaces.
2. Install the crankshaft angle sensing blade and crankshaft camshaft drive sprocket in the direction shown.
3. Place the larger chamfer side of the crank shaft pulley washer in the direction shown in the Figure and then assemble on the crank shaft pulley center bolt.
4. Apply a small of engine oil to the crank shaft pulley center bolt bearing surface and screw.

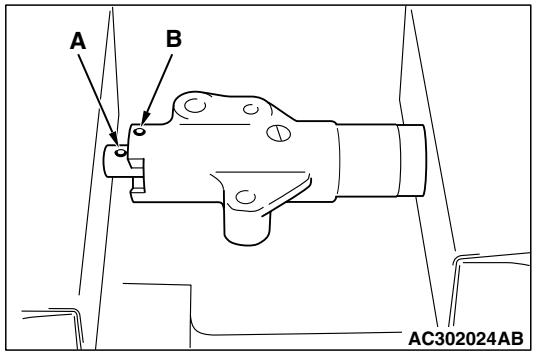


5. Hold the crankshaft camshaft drive sprocket with special tools MB991367 and MB991385 in the same manner as removal.
6. Tighten the crankshaft pulley center bolts to the specified torque.

   Tightening torque: 167 N·m (123 ft-lb)

>>D<< TIMING BELT TENSIONER ADJUSTER INSTALLATION

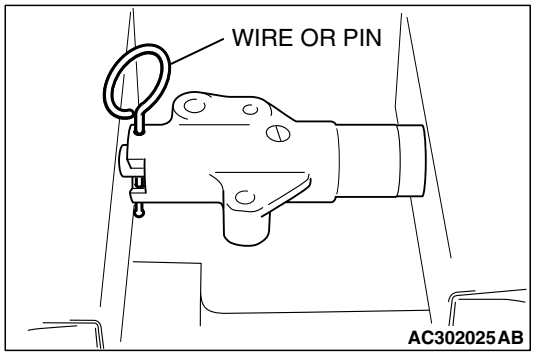
1. Set according to the following procedures when the timing belt tensioner adjuster rod is fully extended.



⚠ CAUTION

If the compression is too fast the procedure may damage the rod. Make a point to slowly and thoroughly compress.

(1) Slowly compress the timing belt tensioner adjuster rod using a press or vice, then align the set hole A of the rod with set hole B of the timing belt tensioner adjuster cylinder.

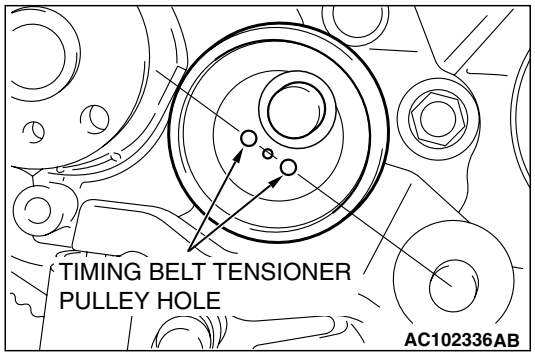


(2) Insert a wire or pin in the set hole aligned.

NOTE: When replacing the timing belt tensioner adjuster with new parts, the timing belt tensioner adjuster is set with a pin.

2. Install the timing belt tensioner adjuster to the engine and then tighten the mounting bolt to the specified torque. Do not remove the wire or pin until the tension of the valve timing belt is adjusted.

Tightening torque: 23 ± 3 N·m (17 ± 2 ft-lb)

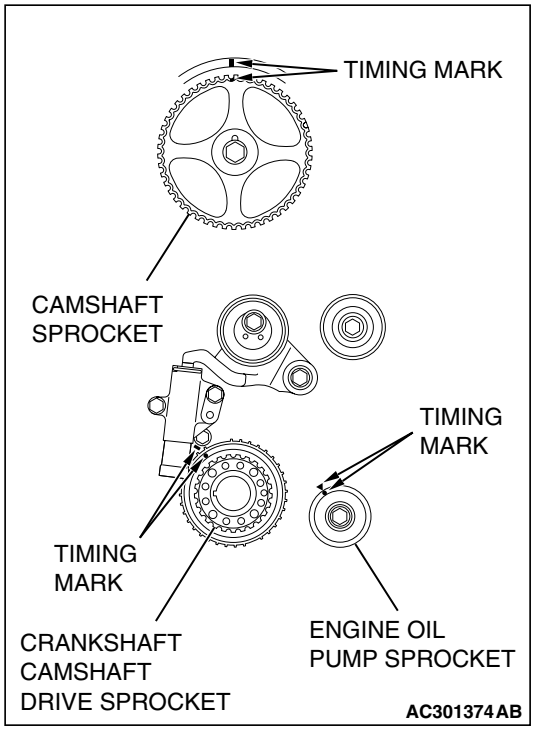


>>E<< TIMING BELT TENSIONER PULLEY INSTALLATION

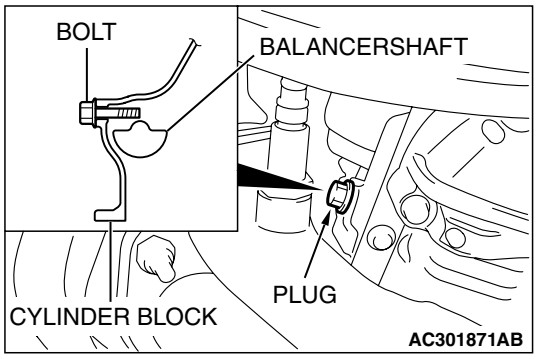
Temporarily tighten the timing belt tensioner pulley as shown.

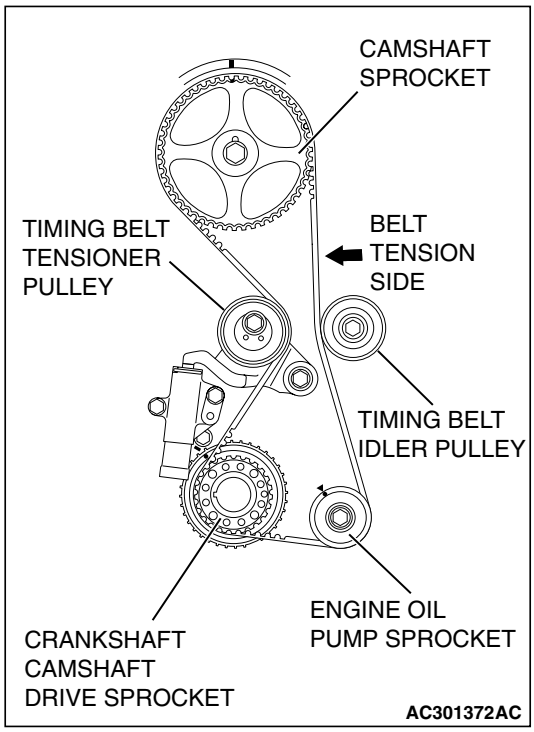
>>F<< VALVE TIMING BELT INSTALLATION

1. Align the timing marks on the camshaft sprocket, crankshaft camshaft drive sprocket and engine oil pump sprocket.



2. Adjust the timing mark of the engine oil pump sprocket. Unplug the cylinder block plug. Insert a bolt (M6, section width 10 mm, nominal length 45 mm) from the plug hole. If the bolt comes in contact with the balancer shaft, turn the engine oil sprocket one rotation. Re-adjust the timing mark and then check to see that the bolt fits. Do not remove the bolt until the valve timing belt is assembled.



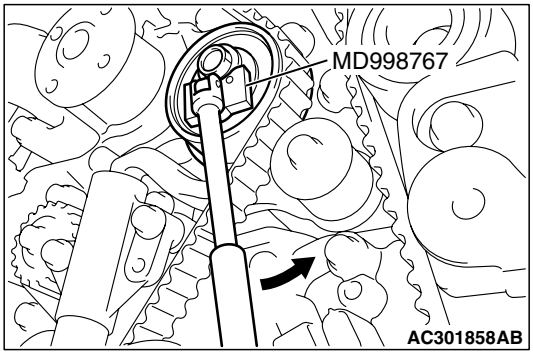


3. Incorporate the valve timing belt in the following manner so that the tensile force of the belt is not lax.
   (1) Place the valve timing belt on the timing belt tensioner pulley and crankshaft camshaft driver sprocket and then support it with your left hand so it does not slide.
   (2) Place the valve timing belt on the engine oil pump sprocket while pulling it with the right hand.
   (3) Place the valve timing belt on the timing belt idler pulley.

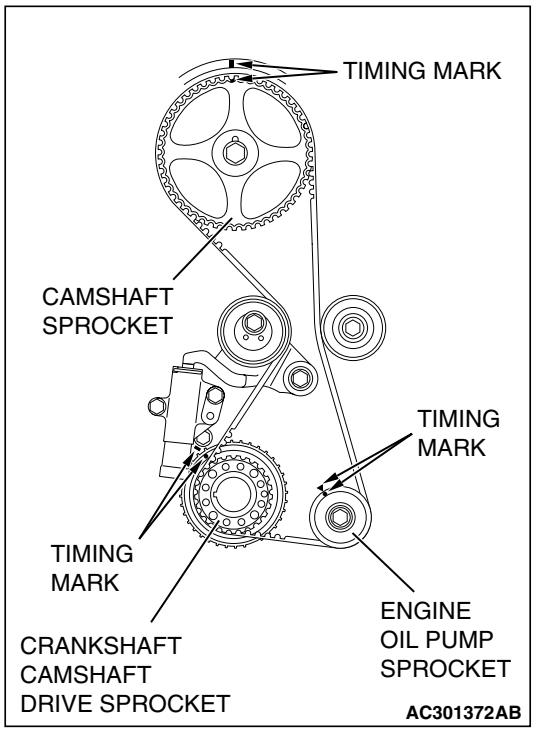
⚠ CAUTION

Incorporate the valve timing belt. Then apply reverse rotation (counterclockwise rotation) pressure to the cam shaft sprocket. Re-check to see that each timing mark is aligned while the tension side of the belt is right.

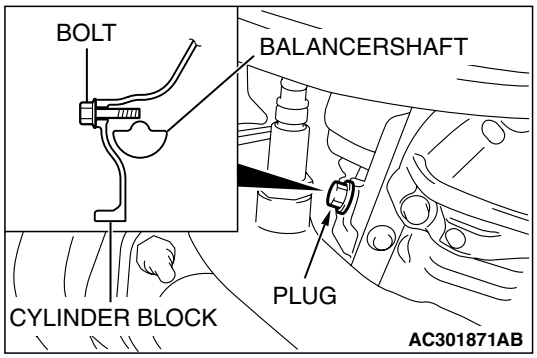
   (4) Place the valve timing belt on the camshaft sprocket.



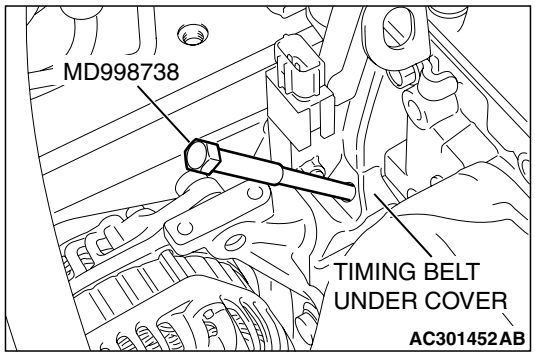
4. Turn the timing belt tensioner pulley in the direction shown in the figure using special tool MD998767 to apply tension to the valve timing belt. Then temporarily tighten and fix the timing belt tensioner pulley mounting bolt.



5. Check that the timing marks are aligned.



6. Remove the bolt inserted in Step 2 above, then assemble the cylinder block plug.
7. Tighten the cylinder block plug to the specified torque.
   Tightening torque: 30 ± 3 N·m (23 ± 2 ft-lb)
8. Adjust the valve timing belt tension.



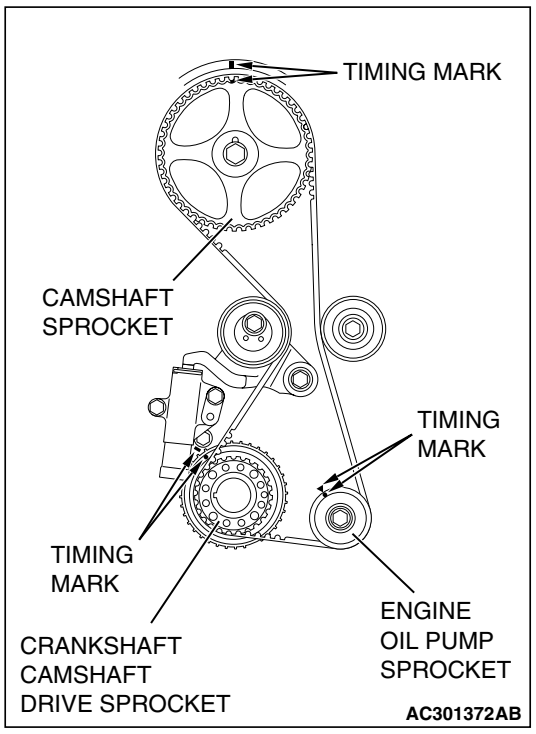
>>G<< VALVE TIMING BELT TENSION ADJUSTMENT

1. Set special tool MD998738 used when removing the valve timing belt.

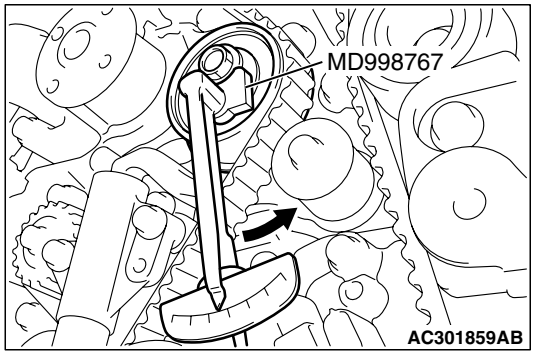
⚠ CAUTION

Always screw in special tool MD998738 in with your hands, since use of a spanner or other tools may damage the wire or pin inserted in the timing belt tensioner adjuster.

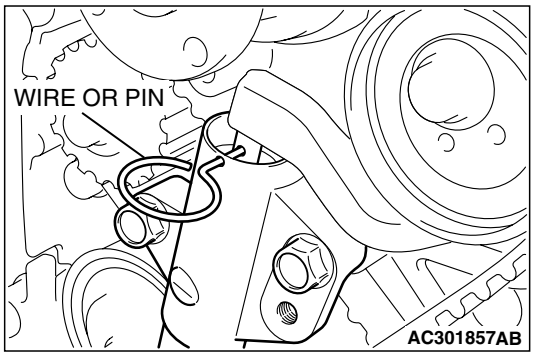
2. Gradually screw in special tool MD998738 to a position in which the wire or pin inserted in the timing belt tensioner adjuster lightly moves.
3. Turn the crankshaft 1/4 of a revolution in the counterclockwise direction.
4. Turn the crankshaft in the clockwise direction, align each timing mark to set number 1 cylinder to TDC of its compression stroke.
5. Loosen the timing belt tensioner pulley mounting bolt.



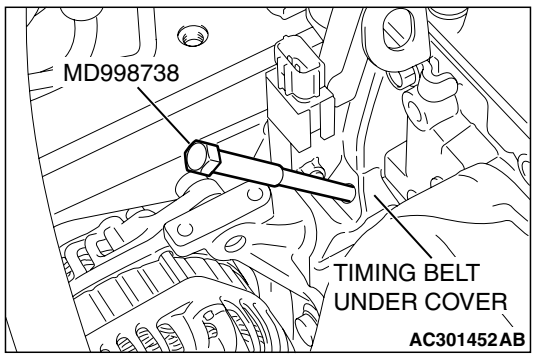
⚠ CAUTION
When tightening the mounting bolt, ensure that the timing belt tensioner pulley does not rotate with the bolt. Allowing it to rotate with the bolt can cause deficient tension of the belt.



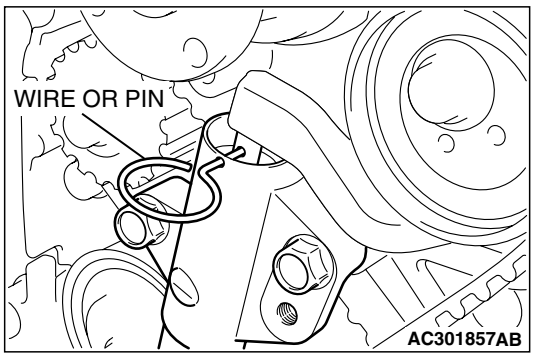
6. With special tool MD998767 and torque wrench, apply tension torque [3.5 N·m (31 in-lb)] to the valve timing belt, and tighten the timing belt tensioner pulley mounting bolt to the specified torque.
   Tightening torque: 48 ± 5 N·m (36 ± 3 ft-lb)



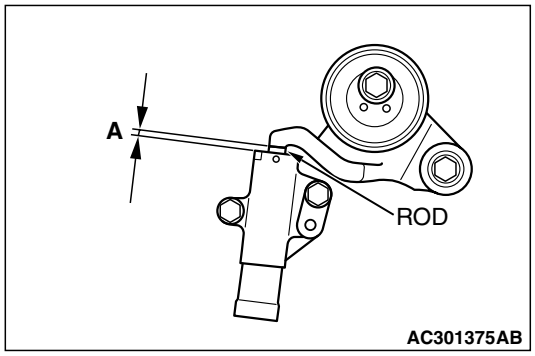
7. Remove wire or pin inserted to timing belt tensioner adjuster.



8. Remove special tool MD998738, and install the rubber plug to the timing belt under cover.
9. Rotate crankshaft clockwise two turns, and leave it for about 15 minutes.



10. Insert wire or pin removed in Step 7 again, and ensure that it can be pulled out with a light load. When wire or pin can be lightly removed, appropriate tension is applied on timing belt. In this case, remove wire or pin.



Also the projection of timing belt tensioner adjuster rod (A) is within the standard value, appropriate tension is applied.

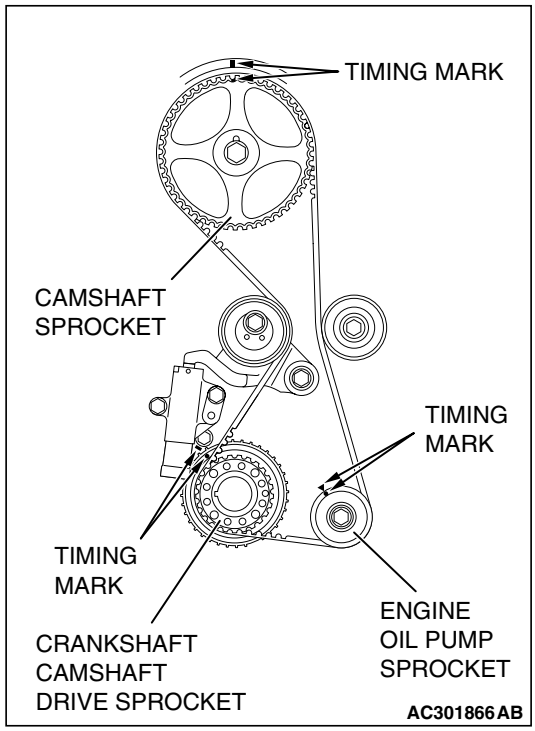
Standard value (A): 3.8 – 4.5 mm (0.15 – 0.17 inch)

11. If wire or pin cannot be easily pulled out, repeat Step 1 through Step 9 to reach proper valve timing belt tension.

⚠ CAUTION

Always check the tightening torque of the crank shaft pulley center bolt when turning the crank shaft pulley center bolt counterclockwise. Re-tighten if it is loose.

12. Check again that the timing marks on sprockets are aligned.



INSPECTION

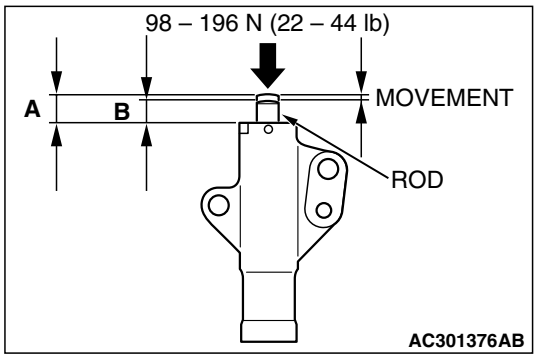
M1112004400426

TIMING BELT TENSIONER ADJUSTER CHECK

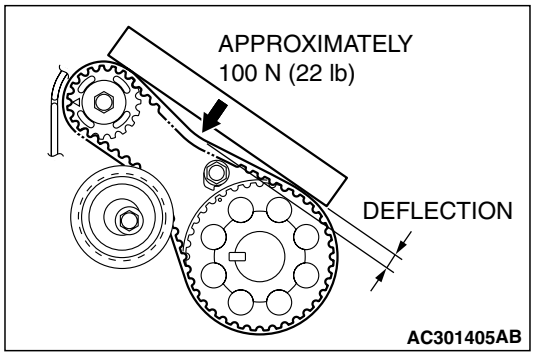
1. Check for oil leak from seal, and replace it if leak is detected.
2. Check for wear or damage at the top of the rod. Replace it, if required.
3. Hold the timing belt tensioner adjuster by hand, and press top end of the rod onto the metal (e.g. cylinder block) under a pressure of 98 – 196 N (22 – 44 pounds) to measure the movement of the rod.

   Standard value: Within 1 mm (0.039 inch)
   A: Length when it is free (not pressed)
   B: Length when it is pressed
   A – B: Movement

4. If the measured value is out of the standard value, replace the timing belt tensioner adjuster.



BALANCER TIMING BELT TENSION CHECK



Check the balancer timing belt tension in the following procedures.

1. Apply a pressure of approximately 100 N (22 pounds) at the center (arrow area) between the sprocket as shown in the figure, then inspect whether the flexure is within the standard value.

   Standard value: 5 – 10 mm (0.20 – 0.39 inch)

2. If not within the standard value, adjust the belt tension. (Refer to P.11A-51).

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1111003800569

ITEM	SPECIFICATION
Camshaft and valve stem seal	
Accumulator assembly	44 ± 5 N·m (33 ± 3 ft-lb)
Camshaft position sensing cylinder bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Camshaft position sensor support bolt	14 ± 1 N·m (120 ± 13 in-lb)
Camshaft sprocket bolt	89 ± 9 N·m (65 ± 7 ft-lb)
Connector bracket bolt	11 ± 1 N·m (98 ± 8 in-lb)
Control wiring harness bolt	9.0 ± 2.0 N·m (80 ± 17 in-lb)
Control wiring harness protector bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Cylinder head plug	47 ± 7 N·m (35 ± 5 ft-lb)
Engine oil control valve bolt	11 ± 1 N·m (98 ± 8 in-lb)
Engine oil pressure switch	10 ± 2 N·m (89 ± 17 in-lb)
Exhaust rocker arm shaft bolt	13 ± 1 N·m (115 ± 9 in-lb)
Intake rocker arm shaft bolt	31 ± 3 N·m (23 ± 2 ft-lb)
Rocker cover assembly bolt	3.5 ± 0.5 N·m (31 ± 4 in-lb)
Spark plug	25 ± 4 N·m (18 ± 3 ft-lb)
Crankshaft oil seal	
A/T drive plate bolt	132 ± 5 N·m (98 ± 3 ft-lb)
Crankshaft pulley	
Crankshaft damper pulley bolt	25 ± 4 N·m (18 ± 3 ft-lb)
Cylinder head gasket	
Camshaft sprocket bolt	89 ± 9 N·m (65 ± 7 ft-lb)
Control wiring harness bolt	9.0 ± 2.0 N·m (80 ± 17 in-lb)
Control wiring harness protector bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)

TSB Revision

ITEM		SPECIFICATION
Cylinder head bolt <Cold engine>		78 ± 2 N·m to 0 N·m to 20 ± 2 N·m to +90° to +90° (58 ± 1 ft-lb to 0 in-lb to 15 ± 1 ft-lb to +90° to +90°)
Engine oil dipstick guide bolt		13 ± 1 N·m (115 ± 9 in-lb)
Generator terminal nut		12 ± 2 N·m (102 ± 22 in-lb)
Intake manifold stay bolt		31 ± 3 N·m (23 ± 2 ft-lb)
Knock sensor connector bracket bolt		11 ± 1 N·m (98 ± 8 in-lb)
Pressure hose clamp bolt		12 ± 2 N·m (102 ± 22 in-lb)
Radiator lower hose clamp bolt		11 ± 1 N·m (98 ± 8 in-lb)
Water hose clamp bolt		11 ± 1 N·m (98 ± 8 in-lb)
Engine assembly		
ATF warmer (transmission fluid cooler) bracket bolt		23 ± 3 N·m (17 ± 2 ft-lb)
Battery terminal nut		5.0 ± 1.0 N·m (44 ± 9 in-lb)
Control wiring harness bolt and nut		9.0 ± 2.0 N·m (80 ± 17 in-lb)
Control wiring harness protector bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)
Engine front mounting bracket bolt	M10	58 ± 7 N·m (43 ± 5 ft-lb)
Engine front mounting bracket bolt and nut	M12	83 ± 12 N·m (61 ± 9 ft-lb)
Grounding cable bolt		9.0 ± 2.0 N·m (80 ± 17 in-lb)
Power steering oil pump bracket bolt		24 ± 4 N·m (18 ± 3 ft-lb)
Power steering oil pump bracket nut		44 ± 10 N·m (33 ± 7 ft-lb)
Pressure hose clamp bolt		12 ± 2 N·m (102 ± 22 in-lb)
Oil pan		
Baffle plate bolt (bolt, washer assembled)	M6	9.0 ± 2.0 N·m (80 ± 17 in-lb)
	M8	22 ± 4 N·m (16 ± 3 ft-lb)
Engine oil pan bolt		9.0 ± 3.0 N·m (80 ± 26 in-lb)
Engine oil pan drain plug		39 ± 5 N·m (29 ± 3 ft-lb)
Engine oil pan strainer bolt		19 ± 3 N·m (14 ± 2 ft-lb)
Torque converter housing front lower cover bolt (bolt, flange)	M10	26 ± 5 N·m (19 ± 4 ft-lb)
Torque converter housing front lower cover bolt (bolt, washer assembled)	M6	9.0 ± 1.0 N·m (80 ± 9 in-lb)
Timing belt		
Auto-tensioner bolt (bolt, washer assembled)	M8	22 ± 4 N·m (16 ± 3 ft-lb)
	M10	44 ± 10 N·m (33 ± 7 ft-lb)
Balancer timing belt tensioner bolt		19 ± 3 N·m (14 ± 2 ft-lb)
Connector bracket bolt		11 ± 1 N·m (98 ± 8 in-lb)
Crankshaft pulley center bolt		167 N·m (123 ft-lb)
Cylinder block plug		30 ± 3 N·m (23 ± 2 ft-lb)
Generator terminal nut		12 ± 2 N·m (102 ± 22 in-lb)
Idler pulley bolt		79 ± 5 N·m (59 ± 3 ft-lb)
Timing belt idler pulley bolt		35 ± 6 N·m (26 ± 4 ft-lb)
Timing belt lower cover bolt (bolt, flange)	M6	11 ± 1 N·m (98 ± 8 in-lb)

ITEM		SPECIFICATION
Timing belt lower cover bolt (bolt, washer assembled)	M6	9.0 ± 1.0 N·m (80 ± 9 in-lb)
Timing belt lower cover bracket bolt		8.5 ± 0.5 N·m (76 ± 4 in-lb)
Timing belt lower cover nut		11 ± 1 N·m (98 ± 8 in-lb)
Timing belt tensioner adjuster bolt		23 ± 3 N·m (17 ± 2 ft-lb)
Timing belt tensioner arm bolt		21 ± 4 N·m (16 ± 2 ft-lb)
Timing belt tensioner pulley bolt		48 ± 5 N·m (36 ± 3 ft-lb)
Timing belt upper cover bolt (bolt, flange)	M6	11 ± 1 N·m (98 ± 8 in-lb)
	M8	14 ± 1 N·m (120 ± 13 in-lb)
Water pump pulley bolt		8.8 ± 1.0 N·m (78 ± 9 in-lb)

SERVICE SPECIFICATIONS

M1111000300907

ITEM		STANDARD VALUE	LIMIT
Drive belt tension (Reference)	Vibration frequency Hz	120 – 154	–
	Tension N (lb)	340 – 562 (76 – 126)	–
Valve clearance (at hot) mm (in) <Vehicles Except For California Emission Regulation>	Intake valve	0.20 (0.008)	–
	Exhaust valve	0.30 (0.012)	–
Valve clearance (at hot) mm (in) <Vehicles For California Emission Regulation>	Intake valve	0.20 (0.008)	–
	Exhaust valve	0.30 (0.012)	–
Actual ignition timing at idle		Approximately 10° BTDC	–
Basic ignition timing at idle		5°BTDC ± 3°	–
CO content%		0.5 or less	–
HC contents ppm		100 or less	–
Curb idle speed r/min		700 ± 100	–
Compression pressure (250 – 400 r/min) kPa (psi)		1,560 (226)	Minimum 1,130 (164)
Intake manifold vacuum at curb idle kPa (in Hg)		–	Minimum 60 (18)
Cylinder head bolt nominal length mm (in)		–	99.4 (3.91)
Balancer timing belt tension (When adjusted)	Deflection mm (in)	5 – 7 (0.20 – 0.27)	–
Balancer timing belt tension (When replaced)	Deflection mm (in)	5 – 7 (0.20 – 0.27)	–
Balancer timing belt tension (When checked)	Deflection mm (in)	5 – 10 (0.20 – 0.39)	–
Timing belt tensioner adjuster rod protrusion amount mm (in)		3.8 – 4.5 (0.15 – 0.17)	–
Timing belt tensioner adjuster rod movement mm (in)		Within 1 (0.039)	–

SEALANTS

M1111000500354

ITEM	SPECIFIED SEALANT
Camshaft position sensor support	3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent
Engine oil pressure switch	
Engine oil pan	3M™ AAD Part No.8672, 8704, 3M™ AAD Part No.8679/8678 or equivalent

GROUP 11C

ENGINE MECHANICAL <3.8L ENGINE>

CONTENTS

GENERAL DESCRIPTION

M1111000100419

The 6G75 (3.8 L) engine is a six-cylinder engine. The cylinder numbers are assigned as 1-3-5 for the right bank and 2-4-6 for the left bank from the front of the engine (timing belt side). This engine is fired in the order of 1-2-3-4-5-6 cylinders.

ITEMS			SPECIFICATIONS
Type			V type, overhead camshaft
Number of cylinders			6
Bore mm (in)			95.0 (3.74)
Stroke mm (in)			90.0 (3.54)
Total displacement cm^3 (cu. in)			3,828 (233.6)
Compression ratio			10.0
Firing order			1-2-3-4-5-6
Valve timing	Intake valve	Opens (BTDC)	7°
		Closes (ABDC)	61°
	Exhaust valve	Opens (BBDC)	61°
		Closes (ATDC)	15°
Lubrication system			Pressure feed, full-flow filtration
Oil pump type			Trochoid type

ENGINE DIAGNOSIS

M1111000700273

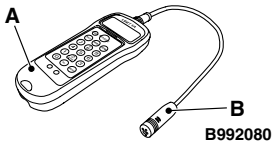
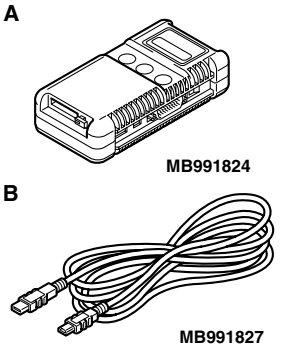
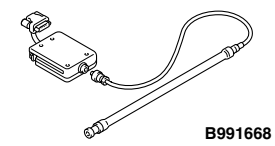
SYMPTOMS	PROBABLE CAUSE	REMEDY
Compression is too low	Blown cylinder head gasket	Replace the gasket.
	Worn or damaged piston rings	Replace the rings.
	Worn piston or cylinder	Repair or replace the piston and/or the cylinder block.
	Worn or damaged valve seat	Repair or replace the valve and/or the seat ring
Drop in engine oil pressure	Engine oil level is too low	Check the engine oil level.
	Malfunction of engine oil pressure switch	Replace the engine oil pressure switch.
	Clogged oil filter	Install a new filter.
	Worn oil pump gears or cover	Replace the gears and/or the cover.
	Thin or diluted engine oil	Change the engine oil to the correct viscosity.
	Stuck (opened) oil relief valve	Repair the relief valve.
	Excessive bearing clearance	Replace the bearings.
Engine oil pressure too high	Stuck (closed) oil relief valve	Repair the relief valve.

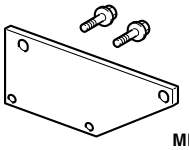
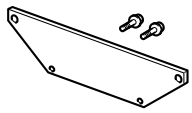
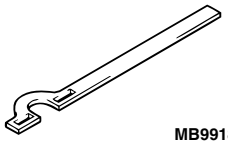
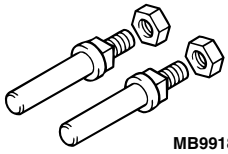
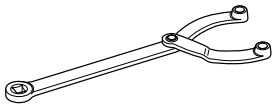
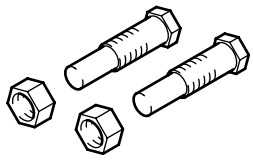
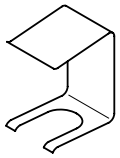
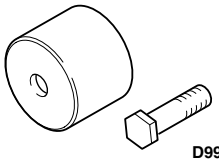
TSB Revision

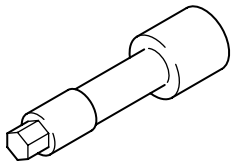
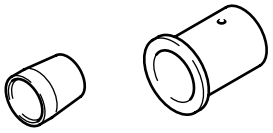
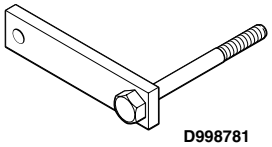
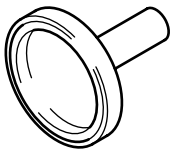
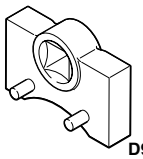
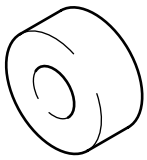
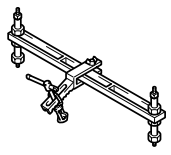
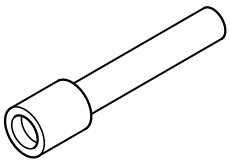
SYMPTOMS	PROBABLE CAUSE	REMEDY
Noisy valves	Malfunction of lash adjuster (including entry of air into high pressure chamber)	Check the lash adjuster.
	Thin or diluted engine oil (low engine oil pressure)	Change the engine oil.
	Worn or damaged valve stem or valve guide	Replace the valve and/or the guide.
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check the engine oil level.
	Thin or diluted engine oil	Change the engine oil.
	Excessive bearing clearance	Replace the bearings.

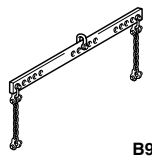
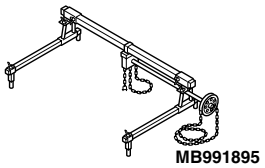
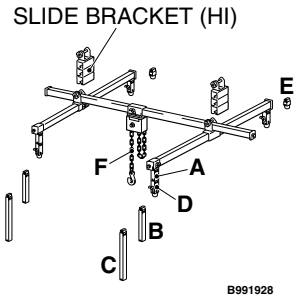
SPECIAL TOOLS

M1111000601440

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB992080 Belt tension meter set A: MB9912081 Belt tension meter B: MB992082 Mic assembly	Tool not available	Drive belt tension check
	MB991958 Scan tool (M.U.T.-III sub assembly) A: MB991824 Vehicle communication interface (V.C.I.) B: MB991827 M.U.T.-III USB cable C: MB991910 M.U.T.-III main harness A (Vehicles with CAN communication system) D: MB991911 M.U.T.-III main harness B (Vehicles without CAN communication system) E: MB991914 M.U.T.-III main harness C (for Daimler Chrysler models only) F: MB991825 M.U.T.-III measurement adapter G: MB991826 M.U.T.-III trigger harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.*	• Drive belt tension check • Ignition timing check • Curb idle speed check • Idle mixture check • Erasing the diagnostic trouble code **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**
	MB991668 Belt tension meter set	Tool not available	Drive belt tension check [used together with scan tool (M.U.T.-III sub assembly)]

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB992012	MB992012 Engine hanger plate A	General service tool	Supporting the engine assembly
 MB992013	MB992013 Engine hanger plate B	General service tool	
 MB991800	MB991800 Pulley holder	MB991800-01	Holding the crankshaft pulley
 MB991802	MB991802 Pin B	MB991802-01	Holding the crankshaft pulley
 B990767	MB990767 Front hub and flange yoke holder	MB990767-01	Holding the camshaft sprocket
	MD998715 Crankshaft pulley holder pin	MIT308239	Holding the camshaft sprocket
 D998443	MD998443 Auto-lash adjuster holder	MD998443-01	Holding the auto-lash adjuster
 D998713	MD998713 Camshaft oil seal installer	MD998713-01	Press-in of the camshaft oil seal
 B991559	MB991559 Camshaft oil seal adapter installer	MB991559-01	Press-fitting the camshaft oil seal (left bank side)

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998051 Cylinder head bolt wrench	MD998051-01 or General service tool	Cylinder head bolt removal and installation
	MD998717 Crankshaft front oil seal installer	MD998717-01	Press-in of the crankshaft front oil seal
 D998781	MD998781 Flywheel stopper	General service tool	Securing the drive plate
	MD998718 Crankshaft rear oil seal installer	MD998718-01	Press-fitting the crankshaft rear oil seal
 D998767	MD998767 Tension pulley socket wrench	MD998752-01	Timing belt tension adjustment
	MD998769 Crankshaft pulley spacer	General service tool	Rotating the crankshaft when installing the timing belt
 AC204024	MD998772 Valve spring compressor	General service tool	Compressing valve spring
	MB991999 Valve stem seal installer	-	Valve stem seal installer

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991454	MB991454 Engine hanger balancer	MZ203827-01	When the engine hanger is used: Supporting the engine assembly during removal and installation of the transaxle assembly *NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.*
 MB991895	MB991895 Engine hanger	Tool not available	
 B991928	MB991928 Engine hanger A: MB991929 Joint (50) ×2 B: MB991930 Joint (90) ×2 C: MB991931 Joint (140) ×2 D: MB991932 Foot (standard) ×4 E: MB991933 Foot (short) ×2 F: MB991934 Chain and hook assembly	Tool not available	

ON-VEHICLE SERVICE

DRIVE BELT (FOR GENERATOR, POWER STEERING OIL PUMP AND AIR CONDITIONING) TENSION CHECK AND ADJUSTMENT

M1111003101358

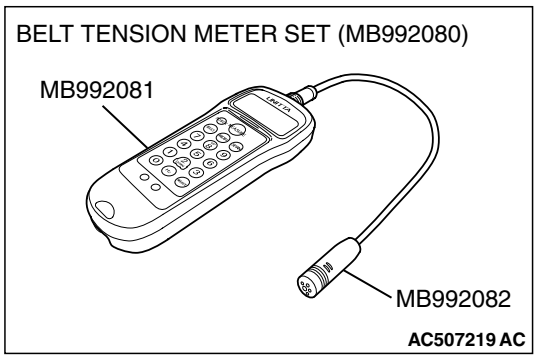
GENERATOR DRIVE BELT TENSION CHECK

<WHEN USING SPECIAL TOOL MB992080: RECOMMENDATION>

Required Special Tools:

- MB992080: Belt tension meter set
  - MB992081: Belt tension meter
  - MB992082: Microphone assembly

NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.

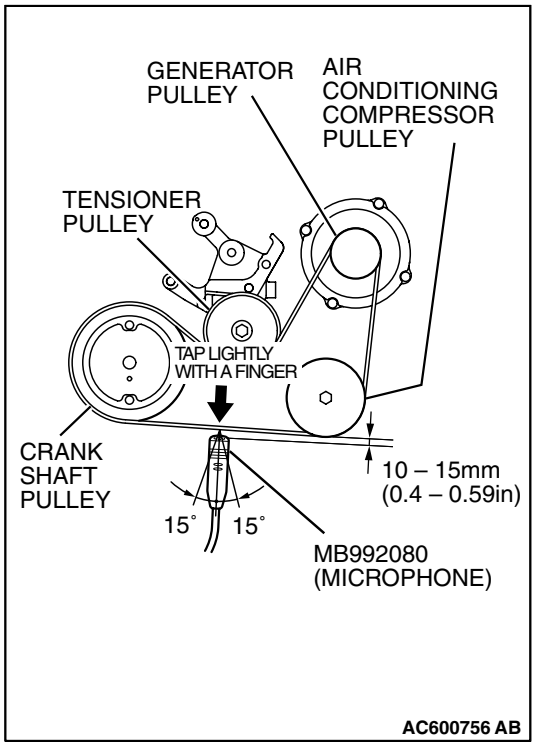


1. Connect the special tool MB992082 to the special tool MB992081 of the Special tool MB992080.
2. Press the "POWER" button to turn on the power supply.
3. Press the numeral key of "1" and check that "No.1" appears on the upper left of the display.

   NOTE: This operation is to temporarily set the preset data such as the belt specifications, because if the measurement is taken without input of the belt specifications, conversion to tension value (N) cannot be made, resulting in judgement of error.
4. Press "Hz" button twice to change the display to the frequency display (Hz).

⚠ CAUTION

- **The temperature of the surface of the belt should be as close to normal temperature as possible.**
- **Do not allow any contaminants such as water or oil to get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**



5. Hold special tool MB992080 to the middle of the drive belt between the pulleys (at the place indicated by arrow), approximately 10 – 15 mm (0.4 – 0.59 inch) away from the rear surface of the belt so that it is perpendicular to the belt (within an angle of ± 15 degree).
6. Press the "MEASURE" button.
7. Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and measure that the vibration frequency of the belt is within the standard value.

   Standard value: 143 – 169 Hz

<WHEN USING SCAN TOOL MB991958: RECOMMENDATION>

Required Special Tools:

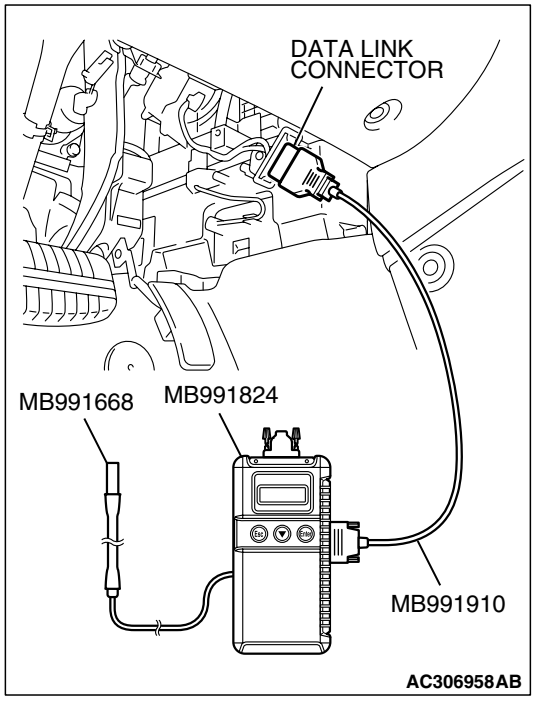
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991910: M.U.T.-III Main Harness A
- MB991668: Belt Tension Meter Set

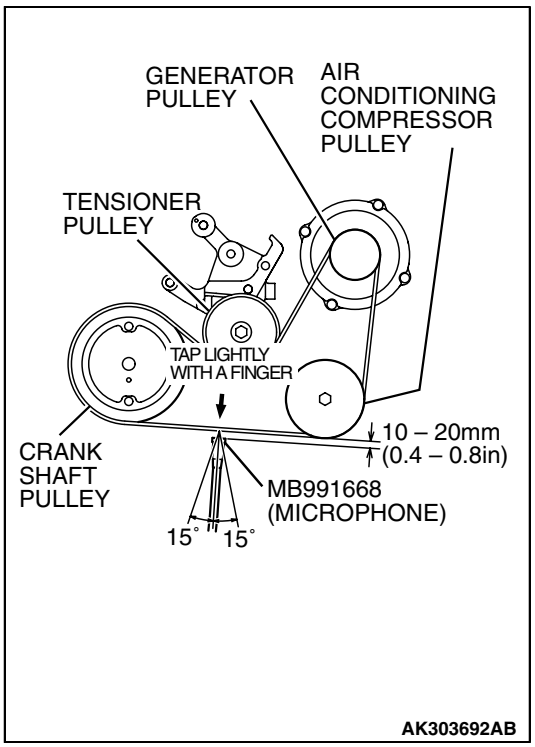
NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.

⚠ CAUTION

To prevent damage to special tool MB991824, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting special tool MB991824.

1. Connect special tool MB991668 to special tool MB991824.
2. Connect special tool MB991910 to special tool MB991824.
3. Connect scan tool MB991910 to the data link connector.
4. Turn the ignition switch to the "ON" position and select "Belt Tension" from the menu special tool MB991824 screen.



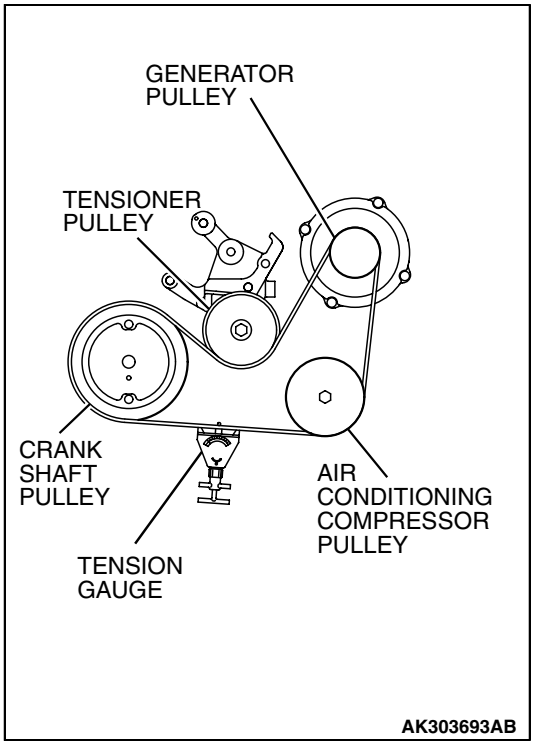


⚠ CAUTION

- **The temperature of the surface of the belt should be as close to normal temperature as possible.**
- **Do not allow any contaminants such as water or oil to get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**

5. Hold special tool MB991668 (microphone) to the middle of the drive belt between the pulleys (at the place indicated by the arrow), about 10 – 20 mm (0.4 – 0.8 inch) away from the rear surface of the belt and so that it is perpendicular to the belt (within an angle of ± 15 degree angle).
6. Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value.

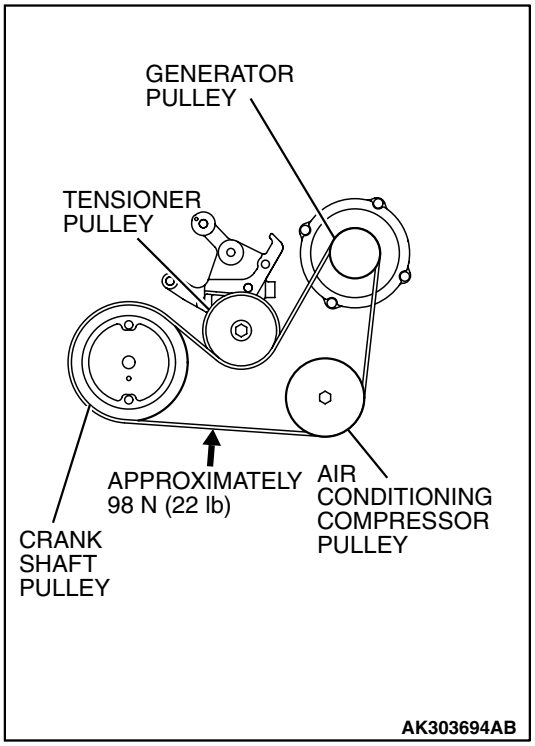
   Standard value: 143 – 169 Hz



<WHEN USING THE TENSION GAUGE>

Use a belt tension gauge to check that the belt tension is within the standard value.

Standard value: 490 – 686 N (110 – 154 lb)



<BELT DEFLECTION CHECK>

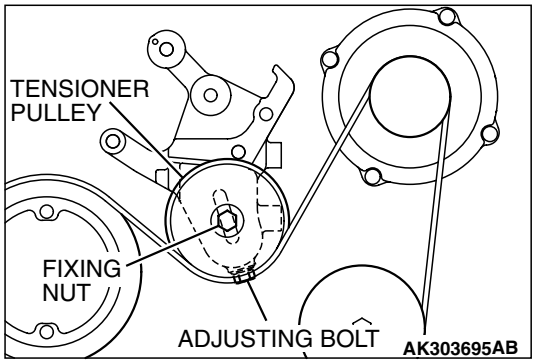
Apply approximately 98 N (22 lb) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection in within the standard value.

Standard value: 8.4 – 10.7 mm (0.33 – 0.42 in)

GENERATOR DRIVE BELT TENSION ADJUSTMENT

If the vibration frequency, tension or deflection is outside the standard value, adjust by the following procedure.

TSB Revision



1. Loosen the tensioner pulley fixing nut.
2. With the tensioner pulley fixing nut temporarily tightened to 15 ± 5 N·m (11 ± 4 ft-lb), set the belt tension or defection amount to the standard value using the adjusting bolt.

   Standard value:

ITEM	DURING ADJUSTMENT	DURING REPLACEMENT
Vibration frequency Hz	150 – 163	180– 202
Tension N (lb)	539 – 637 (121 – 143)	785 – 981 (176 – 221)
Deflection (Reference value) mm (in)	8.9 – 10.1 (0.35 – 0.40)	6.2 – 7.5 (0.24 – 0.30)

3. Tighten the tension pulley fixing nut.

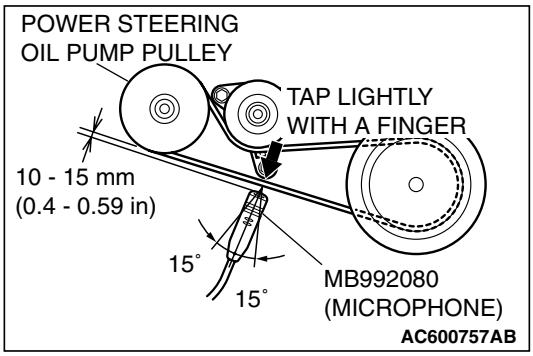
   Tightening torque: 49 ± 10 N·m (36 ± 7 ft-lb)
4. When the belt tension is adjusted by measuring the belt deflection, adjust it with a tool for vibration frequency measurement or tension measurement afterward.

POWER STEERING DRIVE BELT TENSION CHECK

<WHEN USING SPECIAL TOOL MB992080: RECOMMENDATION>

Required Special Tools:
- MB992080: Belt tension meter set
  - MB992081: Belt tension meter
  - MB992082: Microphone assembly

NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.
With your finger tip lightly tap the center of the drive belt between the pulleys in the location shown by the arrow in the illustration and then measure the belt vibration frequency.



Standard value: 124 – 160 Hz

NOTE: Refer to generator drive belt tension check, for information regarding the vibration frequency measurement method using the special tool MB992080.

<WHEN USING SCAN TOOL MB991958: RECOMMENDATION>

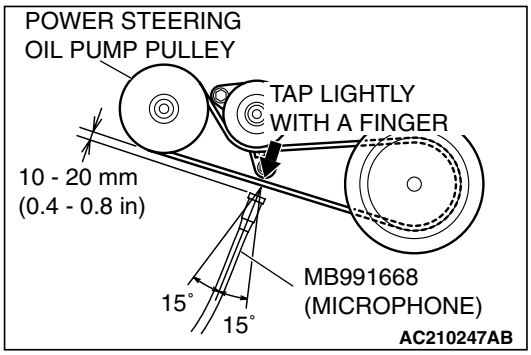
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991910: M.U.T.-III Main Harness A

- MB991668: Belt Tension Meter Set

NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.
With your finger tip lightly tap the center of the drive belt between the pulleys in the location shown by the arrow in the illustration and then measure the belt vibration frequency.

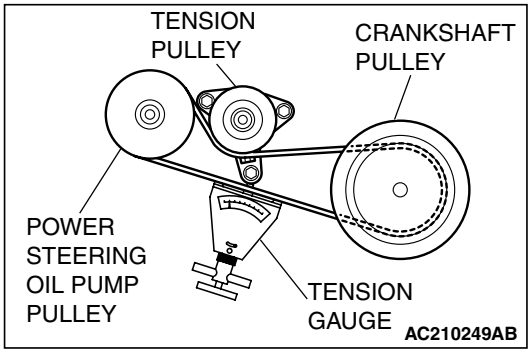
Standard value: 124 – 160 Hz

NOTE: Refer to generator drive belt tension check, for information regarding the vibration frequency measurement method using the special tool MB991958.



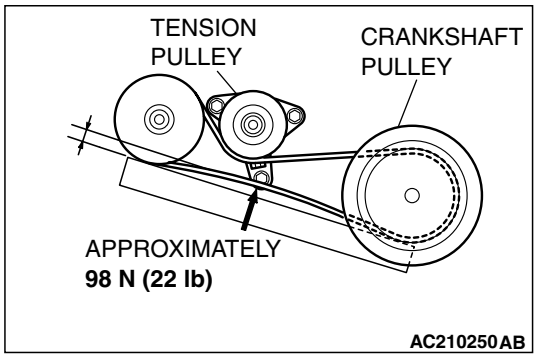
<WHEN USING A TENSION GAUGE>
Use a belt tension gauge to check that the belt tension is within the standard value.

Standard value: 294 – 490 N (66 – 110 lb)



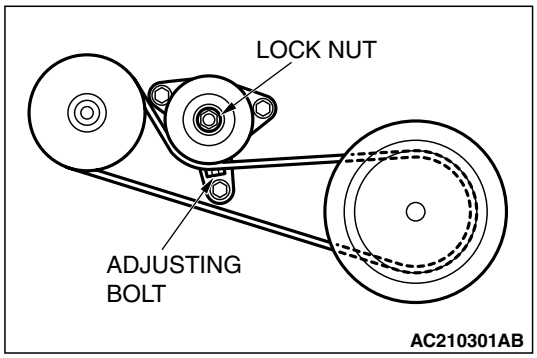
<BELT DEFLECTION CHECK>
Apply approximately 98 N (22 lb) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value.

Standard value: 12.3 – 16.2 mm (0.48 – 0.64 in)



POWER STEERING DRIVE BELT TENSION ADJUSTMENT

If the vibration frequency, tension or deflection is outside the standard value, adjust by the following procedure.



1. Loosen the tensioner pulley lock nut.
2. Adjust the belt tension to the standard value by turning the adjusting bolt. The tension will increase when turning the adjusting bolt clockwise, and decrease when turning counterclockwise.

   Standard value:

ITEM	DURING ADJUSTMENT	DURING REPLACEMENT
Vibration frequency Hz	134 – 151	160– 189
Tension N (lb)	343 – 441 (77 – 99)	490 – 686 (110 – 154)
Deflection (Reference value) mm (in)	13.2 – 15.1 (0.52 – 0.59)	9.6 – 12.3 (0.38 – 0.48)

3. Tighten the lock nut to the specified torque.

   Tightening torque: 49 ± 9 N·m (36 ± 7 ft-lb)
4. Tighten the adjusting bolt.

   Tightening torque: 5.0 ± 1.0 N·m (44 ± 9 in-lb)

⚠ CAUTION

Check after turning the crankshaft one or more rotations clockwise.

5. Check the belt vibration frequency, tension or deflection amount, and readjust if necessary.
6. When the belt tension is adjusted by measuring the belt deflection, adjust it with a tool for vibration frequency measurement or tension measurement afterward.

IGNITION TIMING CHECK

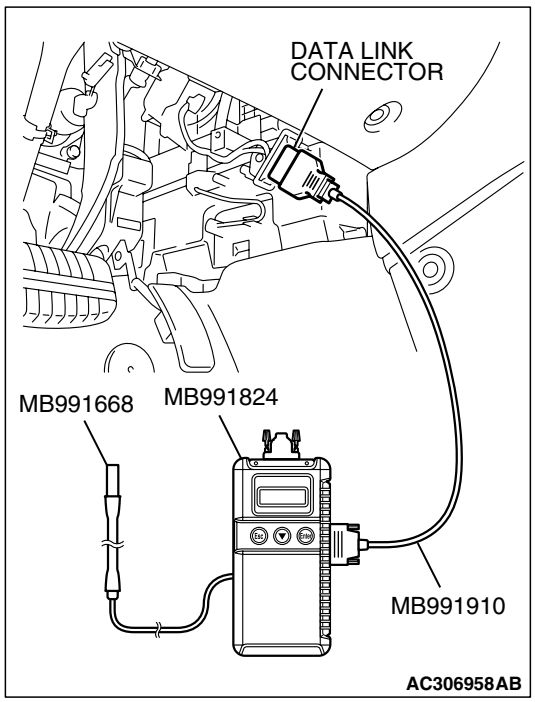
M1111001701075

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, set the vehicle in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transaxle: P range

   NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.



⚠ 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.

2. Connect scan tool MB991958 to the data link connector.
3. Set the timing light to the power supply line (terminal No. 1) of the ignition coil No. 1.

   NOTE: The power supply line is looped and also longer than the other ones.
4. Start the engine and run it at idle.
5. Check that the idle speed is approximately 680 r/min.
6. Select scan tool MB991958 actuator test "item number 17".
7. Check that basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°
8. If the basic ignition timing is not within the standard value, check the following items:
   - Diagnostic output
   - Timing belt cover and crankshaft position sensor installation conditions
   - Crankshaft sensing blade condition

⚠ CAUTION

If the actuator test is not canceled, the forced drive will continue for 27 minutes. Driving in this state could lead to engine failure.

9. Press the clear key on scan tool MB991958 (select forced drive stop mode), and cancel the actuator test.
10. Check that the actual ignition timing is at the standard value.

    Standard value: Approximately 10° BTDC

    NOTE: Ignition timing fluctuates about ± 7° Before Top Dead Center, even under normal operating condition.

    NOTE: It is automatically further advanced by about 5° to 10° Before Top Dead Center at higher altitudes.

CURB IDLE SPEED CHECK

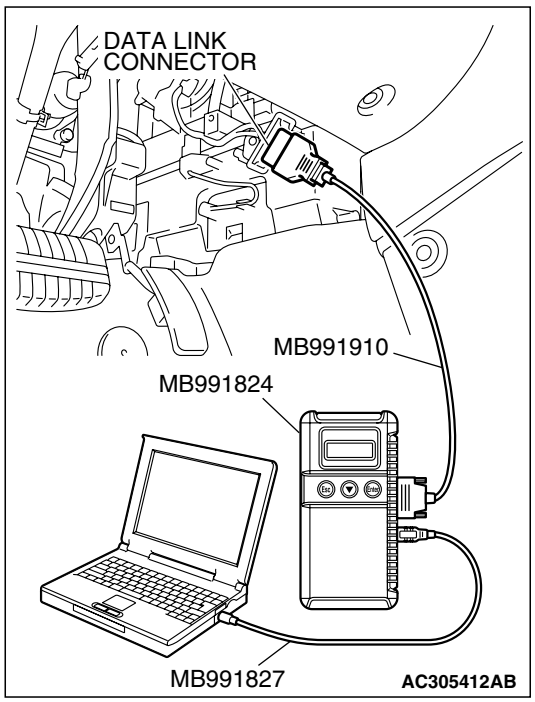
M1111003501390

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, set the vehicle in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transmission: P range

   NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.



⚠ 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.

2. Connect scan tool MB991958 to the data link connector.
3. Check the basic ignition timing.

   Standard value: 5° BTDC ± 3°
4. Start the engine.
5. Run the engine at idle for 2 minutes.
6. Check the idle speed. Select item number 22 and take a reading of the idle speed.

   Curb idle speed: 680 ± 100 r/min

   NOTE: The idle speed is controlled automatically by the idle air control system.
7. If the idle speed is outside the standard value, refer to GROUP 13B, Multiport Fuel Injection (MFI) <3.8L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Symptom Chart P.13B-52.

IDLE MIXTURE CHECK

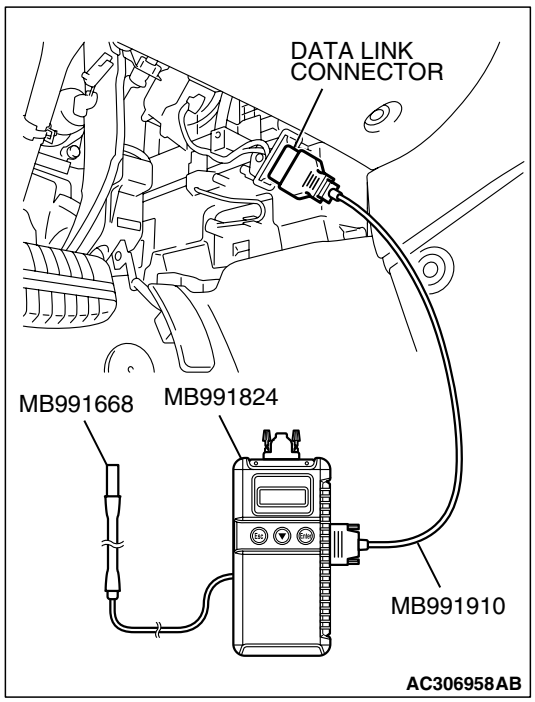
M1111002100750

Required Special Tool:

MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, set the vehicle in the following condition:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights and all accessories: OFF
   - Transmission: P range

   NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.



⚠ 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.

2. Connect scan tool MB991958 to the data link connector.
3. Check that the basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°
4. Start the engine and increase the engine speed to 2,500 r/min for 2 minutes.
5. Set the CO, HC tester.
6. Check the CO contents and the HC contents at idle.

   Standard value:
   CO contents: 0.5% or less
   HC contents: 100 ppm or less
7. If the CO and HC contents do not remain inside the standard value, check the following items:

   NOTE: Replace the catalytic converter when the CO and HC contents do not remain inside the standard value, even though the result of the inspection is normal for all items.
- Diagnostic output
- Closed-loop control (When the closed-loop control is carried out normally, the output signal of the heated oxygen sensor changes between 0 – 400 mV and 600 – 1,000 mV at idle.)
- Fuel pressures
- Injector
- Ignition coil, spark plug
- EGR system and EGR valve leak
- Evaporative emission system
- Compression pressure

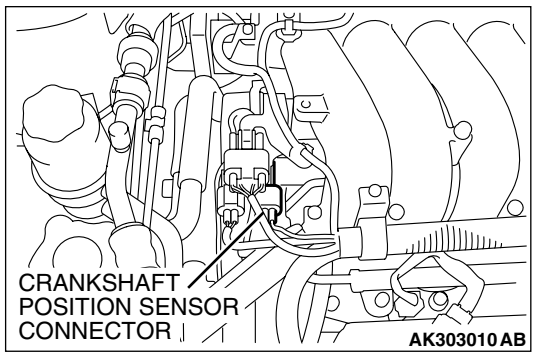
COMPRESSION PRESSURE CHECK

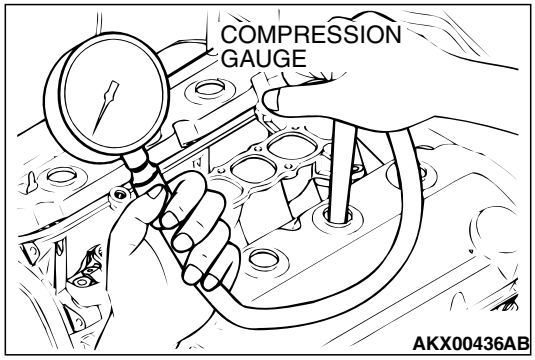
M1111002601112

Required Special Tool:
MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition:
- Engine coolant temperature: 80 – 95°C (176 – 203°F)
- Lights and all accessories: OFF
- Transmission: P range

   NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.
2. Remove all of the ignition coils and spark plugs.





3. Disconnect the crankshaft position sensor connector.

   NOTE: Doing this will prevent the engine control module from carrying out ignition and fuel injection.

⚠ WARNING

Keep your distance from the spark plug hole when cranking. Oil, fuel, etc., may spray out from the spark plug hole and may cause serious injury.

4. Cover the spark plug hole with a shop towel etc., during cranking. After the engine has been cranked, check for foreign material adhering to the shop towel.
5. Set compression gauge to one of the spark plug holes.
6. Crank the engine with the throttle valve fully open and measure the compression pressure.

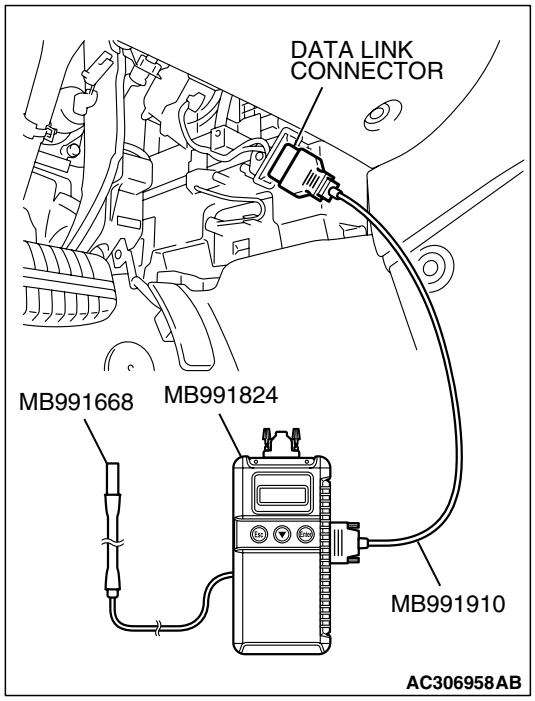
   Standard value (at engine speed of 200 r/min): 1,550 kPa (225 psi)

   Minimum limit (at engine speed of 200 r/min): 1,110 kPa (161 psi)

7. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

   Limit: 98 kPa (14 psi)

8. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 6 to 8.
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
   (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
9. Connect the crankshaft position sensor connector.
10. Install the spark plugs and ignition coils.



11. Use the scan tool MB991958 to erase the diagnostic trouble codes.

NOTE: This will erase the diagnostic trouble code resulting from the crankshaft position sensor connector being disconnected.

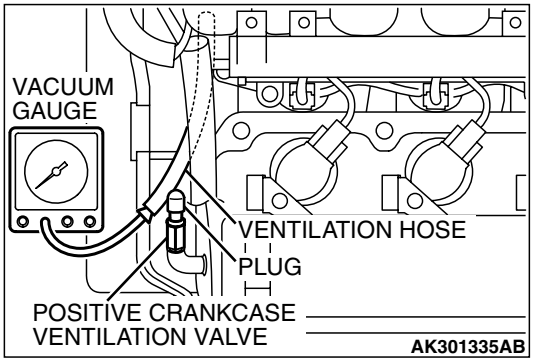
MANIFOLD VACUUM CHECK

M1111002700848

1. Start the engine and allow it to warm up until the temperature of the engine coolant reaches 80 – 95°C (176 – 203°F).
2. Connect an engine tachometer.
3. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve, and connect a vacuum gauge to the ventilation hose.
4. Plug the PCV valve.
5. Start the engine and check that idle speed is within specification. Then check the vacuum gauge reading.

Idle speed: 680 ± 100 r/min

Minimum limit: 60 kPa (18 in Hg)



LASH ADJUSTER CHECK

M1111002900400

If an abnormal noise (chattering noise) suspected to be caused by malfunction of the lash adjuster is produced immediately after starting the engine and does not disappear, perform the following check.

NOTE: An abnormal noise due to malfunction of the lash adjuster is produced immediately after starting the engine and changes with the engine speed, irrespective of the engine load. If, the abnormal noise is not produced immediately after starting the engine or does not change with the engine speed, or it changes with the engine load, the lash adjuster is not the cause for the abnormal noise.

NOTE: When the lash adjuster is malfunctioning, the abnormal noise is rarely eliminated by continuing the warming-up of the engine at idle speed.
However, the abnormal noise may disappear only when seizure is caused by oil sludge in the engine whose oil is not maintained properly.

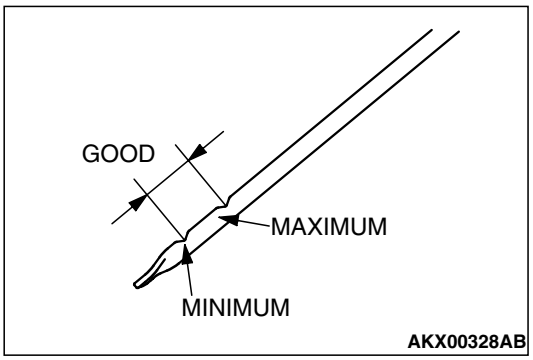
1. Start the engine.
2. Check if the abnormal noise produced immediately after starting the engine, changes with the change in the engine speed.
   If the abnormal noise is not produced immediately after starting the engine or it does not change with the engine speed, the lash adjuster is not the cause for the noise. Therefore, investigate other causes. The abnormal noise is probably caused by some other parts than the engine proper if it does not change with the engine speed. (In this case, the lash adjuster is in good condition.)
3. With the engine idling, change the engine load (shift from N to D range, for example) to make sure that there is no change in the level of abnormal noise.
   If there is a change in the level of abnormal noise, suspect a tapping noise due to worn crankshaft bearing or connecting rod bearing (In this case, the lash adjuster is in good condition.).
4. After completion of warm-up, run the engine at idle to check for abnormal noise.
   If the noise is reduced or disappears, clean the lash adjuster (Refer to GROUP 11D, Engine Overhaul <3.8L Engine> – Rocker Arms and Camshaft – Inspection P.11D-28). As it is suspected that the noise is due to seizure of the lash adjuster. If there is no change in the level of the abnormal noise, proceed to step 5.
5. Run the engine to bleed the lash adjuster system (Refer to P.11C-20.).
6. If the abnormal noise does not disappear after air bleeding operation, clean the lash adjuster (Refer to GROUP 11D, Engine Overhaul <3.8L Engine> – Rocker Arms and Camshaft – Inspection P.11D-28).

Bleeding lash adjuster system

NOTE: Parking the vehicle on a grade for a long time may decrease oil in the lash adjuster, causing air to enter the high pressure chamber when starting the engine.

NOTE: After parking for many hours, oil may run out from the oil passage and take time before oil is supplied to the lash adjuster, causing air to enter the high pressure chamber.

NOTE: In the above cases, abnormal noise can be eliminated by bleeding the lash adjuster system.

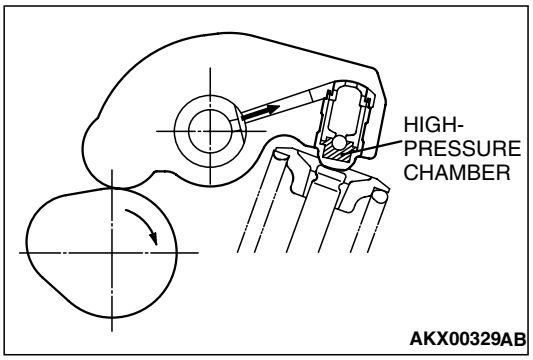


1. Check engine oil and add or change oil if required.

   NOTE: If the engine oil level is low, air is sucked from the oil screen, causing air to enter the oil passage.

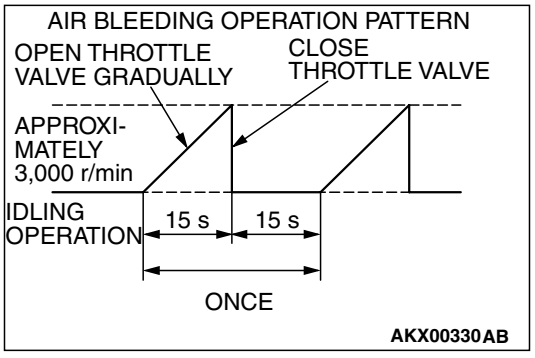
   NOTE: If the engine oil level is higher than specification, oil may be stirred by the crankshaft, causing oil to be mixed with a large quantity of air.

   NOTE: If oil is deteriorated, air is not easily separated from oil, increasing the quantity of air contained in oil.



   NOTE: If air mixed with oil enters the high pressure chamber inside the lash adjuster from the above causes, air in the high pressure chamber is compressed excessively while the valve is opened, resulting in an abnormal noise when the valve closes. This is the same phenomenon as that observed when the valve clearance has become excessive. The lash adjuster can resume normal function when air entered the lash adjuster is removed.

2. Idle the engine for one to three minutes to warm it up.
3. Repeat the operation pattern, shown in left figure, at no load to check for abnormal noise. (Usually the abnormal noise is eliminated after repetition of the operation 10 to 30 times. If, however, no change is observed in the level of abnormal noise after repeating the operation more than 30 times, suspect that the abnormal noise is due to some other factors.)
4. After elimination of abnormal noise, repeat the operation shown in left figure five more times.
5. Run the engine at idle for one to three minutes to make sure that the abnormal noise has been eliminated.



ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

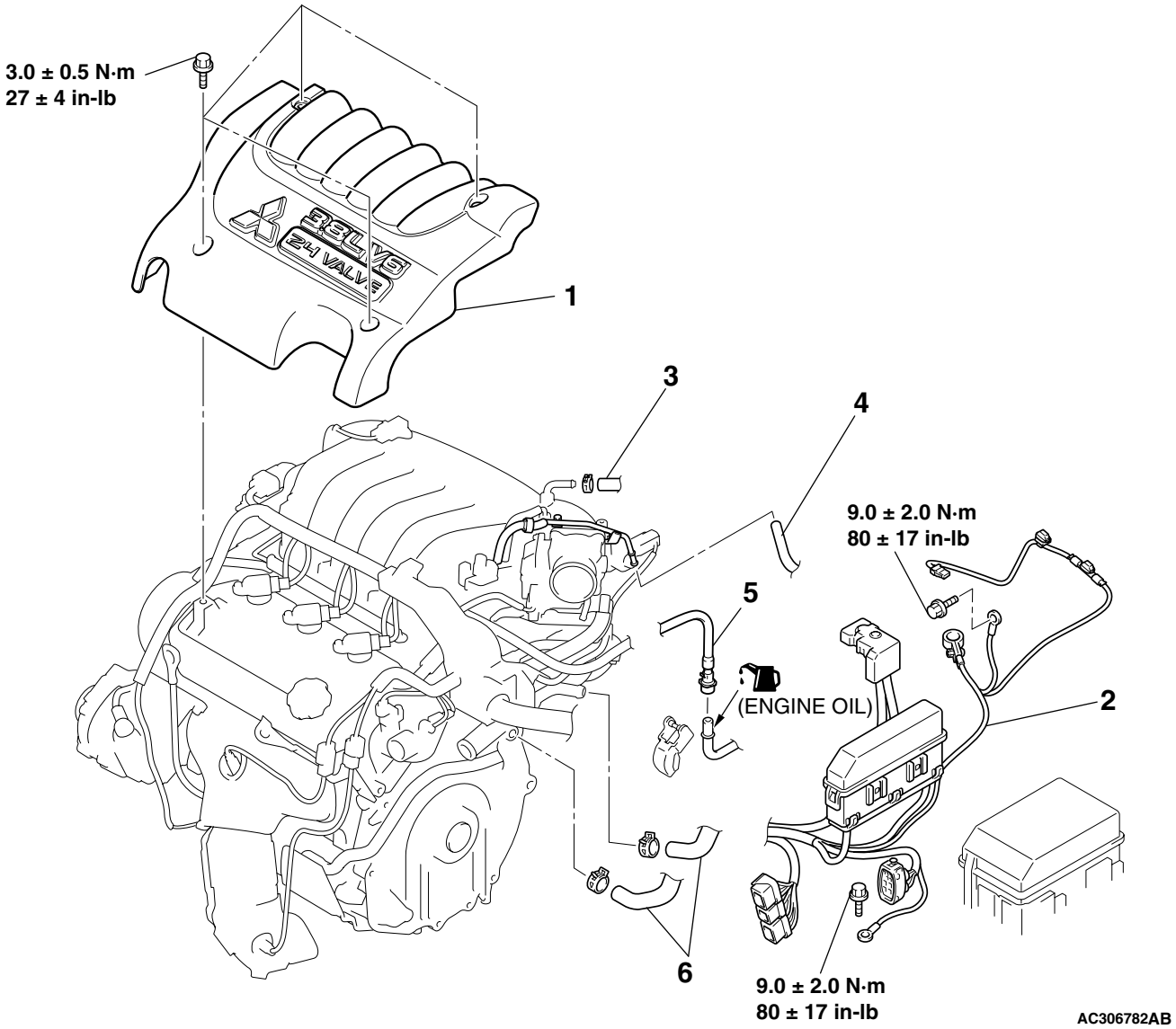
M1112001002834

⚠ CAUTION

- **When the engine assembly replacement is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Initialization Procedure for Learning Value in MFI Engine P.00-31).**
- ***: indicates parts which should be temporarily tightened, and then fully tightened with the engine weight applied on the vehicle body.**

Pre-removal Operation	Post-installation Operation
• Side Under Cover Removal (Refer to GROUP 51, Under Cover P.51-12.) • Fuel Line Pressure Reduction [Refer to GROUP 13B, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13B-1430.] • Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7.) • Engine Oil Draining (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3.) • Hood Removal (Refer to GROUP 42, Hood P.42-7.) • Powertrain Control Module (PCM) Removal (Refer to GROUP 13B, Powertrain Control Module (PCM) P.13B-1447.) • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-4.) • Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32.) • Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Battery and Battery Tray Removal • Radiator Grille Removal (Refer to GROUP 51, Radiator Grille P.51-6.)	• Right Bank Exhaust Manifold Installation (Refer to GROUP 15, Exhaust Manifold P.15-24.) • Radiator Grille Installation (Refer to GROUP 51, Radiator Grille P.51-6.) • Battery and Battery Tray Installation • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-4.) • Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32.) • Powertrain Control Module (PCM) Installation (Refer to GROUP 13B, Powertrain Control Module (PCM) P.13B-1447.) • Hood Installation (Refer to GROUP 42, Hood P.42-7.) • Drive Belt Tension Check (Refer to P.11C-7.) • Engine Oil Refilling (Refer to GROUP 12, On-vehicle Service – Engine Oil Replacement P.12-3.) • Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7.) • Fuel Leak Check • Side Under Cover Installation (Refer to GROUP 51, Under Cover P.51-12.)

TSB Revision



REMOVAL STEPS

1. ENGINE COVER
2. CONTROL WIRING HARNESS CONNECTION
3. VACUUM HOSE CONNECTION
4. PURGE HOSE CONNECTION

<<**A**>> >>**C**<< 5. FUEL HIGH-PRESSURE HOSE CONNECTION

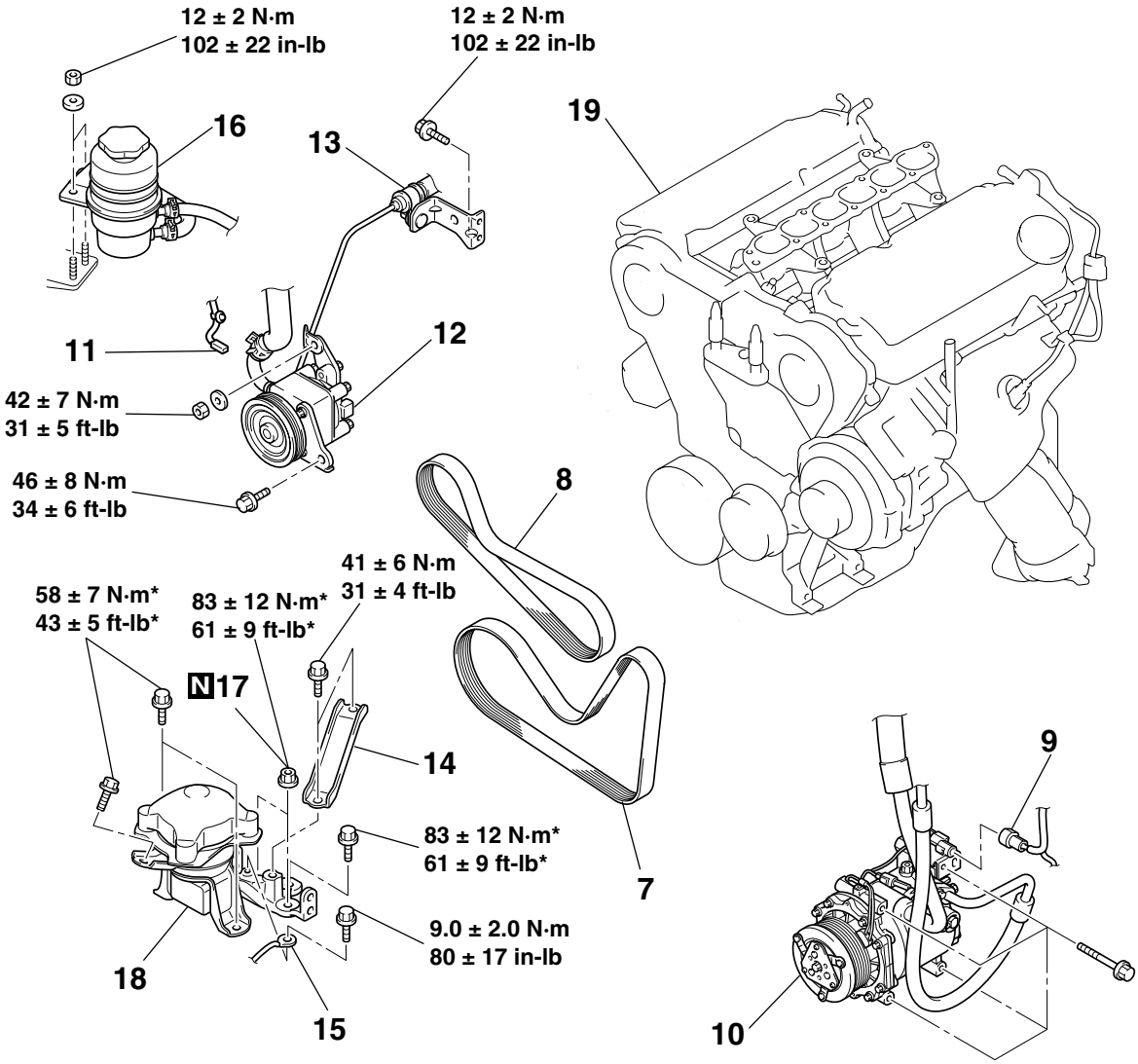
6. HEATER HOSE CONNECTION

<<**B**>>

REMOVAL STEPS (Continued)

- DRIVE SHAFT (REFER TO GROUP 26, DRIVE SHAFT ASSEMBLY P.26-13.)
- EXHAUST MANIFOLD (RH) (REFER TO GROUP 15, EXHAUST MANIFOLD P.15-24.)

TSB Revision



AC306783AE

7. GENERATOR DRIVE BELT
8. POWER STEERING OIL PUMP DRIVE BELT
9. A/C COMPRESSOR ASSEMBLY CONNECTOR

<<C>> 10. A/C COMPRESSOR ASSEMBLY

11. POWER STEERING PRESSURE SWITCH CONNECTOR

<<D>> 12. POWER STEERING OIL PUMP

13. POWER STEERING PRESSURE HOSE CLAMP BRACKET

<<E>>
- RADIATOR (REFER TO GROUP 14, RADIATOR P.14-12.)

<<F>>
- TRANSAXLE ASSEMBLY (REFER TO GROUP 23A, TRANSAXLE ASSEMBLY <5A/T>P.23A-396 .)

14. ENGINE MOUNTING STAY
15. GROUNDING CABLE CONNECTION
16. POWER STEERING OIL RESERVOIR
17. JAM NUTS

<<G>> >>B<< 18. ENGINE FRONT MOUNTING BRACKET

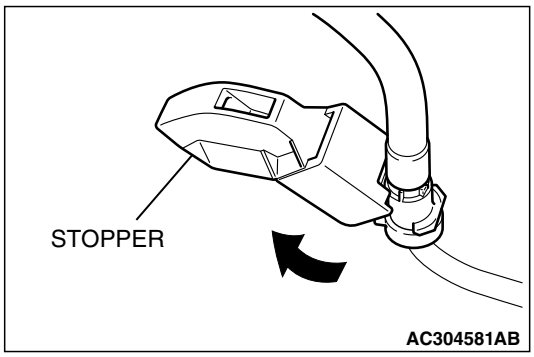
<<H>> >>A<< 19. ENGINE ASSEMBLY

Required Special Tools:

- MB991454: Engine Hanger Balancer
- MB991895: Engine Hanger
- MB991928: Engine Hanger
- MB992012: Engine Hanger Plate A
- MB992013: Engine Hanger Plate B

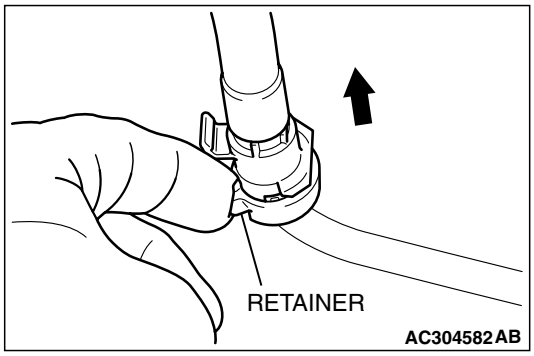
TSB Revision

REMOVAL SERVICE POINTS



<<A>> FUEL HIGH-PRESSURE HOSE REMOVAL

1. Remove the fuel high-pressure hose stopper.



2. Remove the fuel high-pressure hose in the direction shown in the figure while the retainer is pulled up.

   NOTE: If the retainer is released, install it after removing the fuel high-pressure hose.

<<B>> EXHAUST MANIFOLD (RH) REMOVAL

Do not remove the center exhaust pipe, and pull out the exhaust manifold (RH) between the crossmember and cylinder block.

<<C>> A/C COMPRESSOR ASSEMBLY REMOVAL

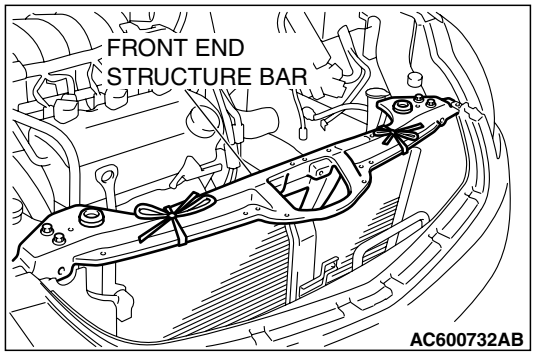
Remove the compressor from the compressor bracket with the hose still attached.

NOTE: Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and secure it with a cord or wire.

<<D>> POWER STEERING OIL PUMP REMOVAL

Remove the power steering oil pump from the engine with the hose attached.

NOTE: Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the engine assembly, and secure it with a cord or wire.



<<E>> RADIATOR REMOVAL

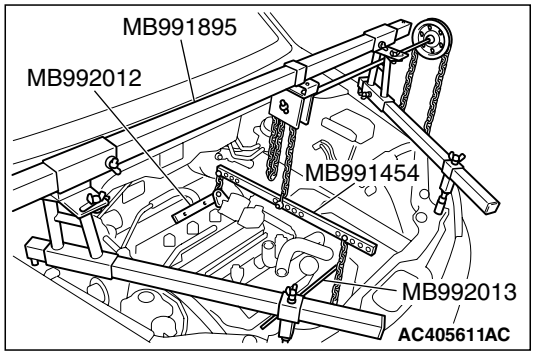
1. Assemble the front end structure bar removed temporarily and hang the condenser assembly with a cord.

<<F>> TRANSAXLE ASSEMBLY REMOVAL

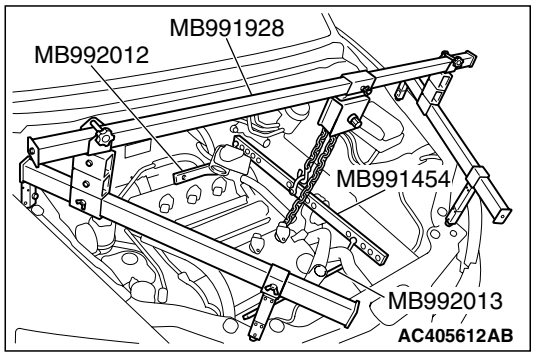
Remove the transaxle assembly. (Refer to GROUP 23A, Transaxle assembly <5A/T>P.23A-396).

<<G>> ENGINE FRONT MOUNTING BRACKET REMOVAL

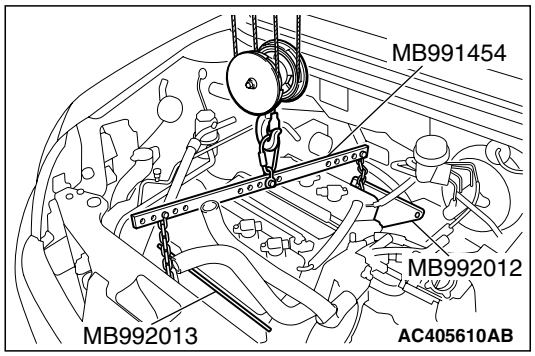
1. Support the engine with a garage jack.
2. <Engine hanger MB991895 is used>
   Remove special tool MB991895.



3. <Engine hanger MB991928 is used>
   Remove special tool MB991928.



4. Remove special tool MB991454 and hook it again as shown. Then, hole the engine assembly with the chain block, etc.
5. Place a garage jack against the engine oil pan with a piece of wood in between so that the weight of the engine is no longer being applied to the engine mount.
6. Loosen the engine mount mounting nuts and bolts, and remove the engine mount.



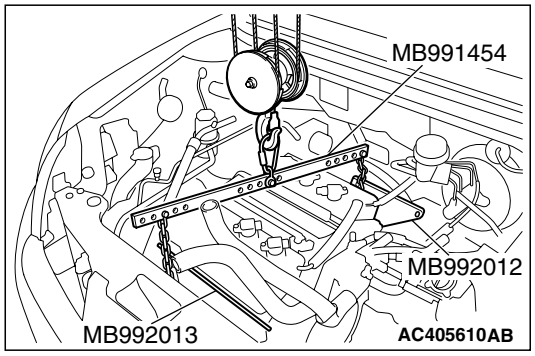
<<H>> ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and wiring harness connectors and so on are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINTS

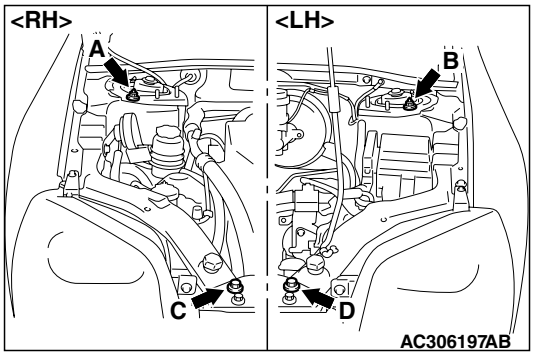
>>A<< ENGINE ASSEMBLY INSTALLATION

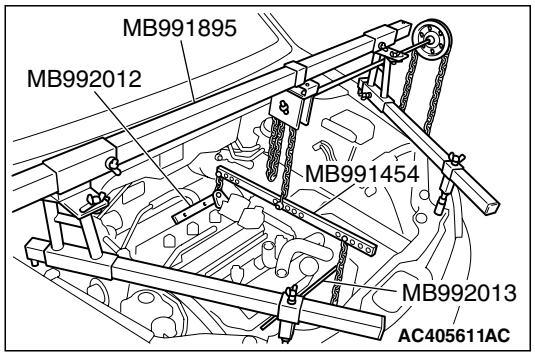
Install the engine assembly, being careful not to pinch the cables, hoses or wiring harness connectors.



>>B<< ENGINE FRONT MOUNTING BRACKET INSTALLATION

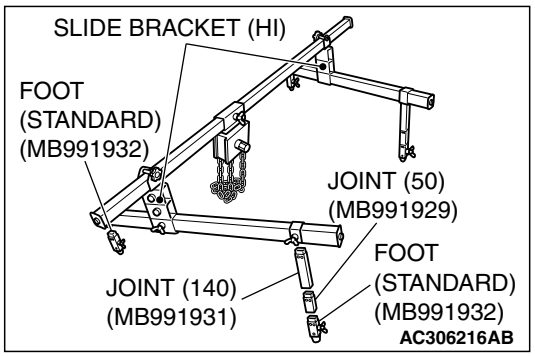
1. Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine mount while adjusting the position of the engine.
2. Support the engine assembly with a garage jack.
3. Remove the chain block.
4. <Engine hanger MB991895 is used>
   (1) Set special tool MB991895 to the front fender assembling bolts (A and B) and (C and D) as shown.





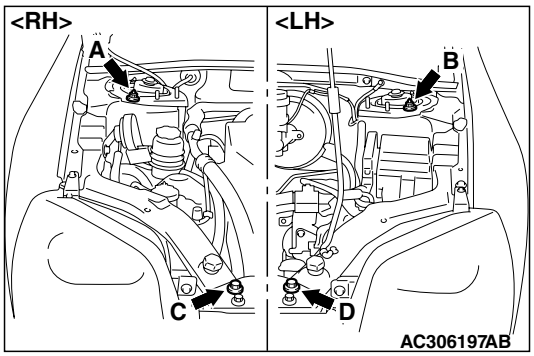
   (2) Removal special tool MB991454 and hook it again as shown. Then, set special tool MB991454 to hold the engine assembly.

5. <Engine hanger MB991928 is used>

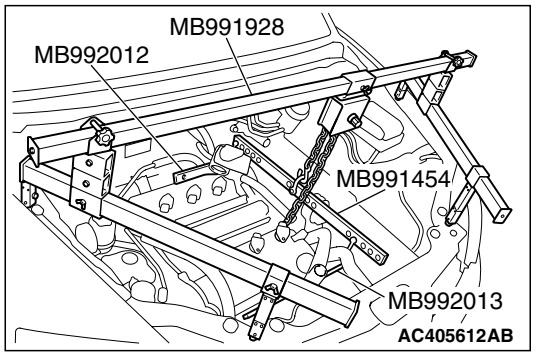


(1) Assemble special tool MB991928. (Set following parts to the base hanger.)

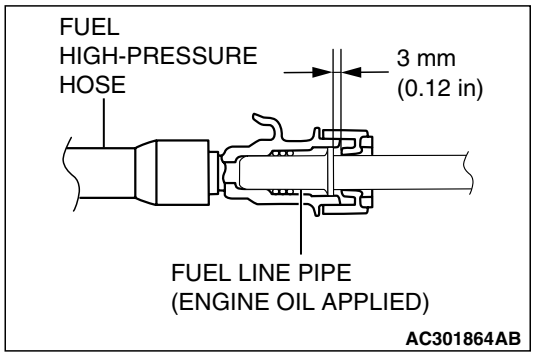
- SLIDE BRACKET (HI)
- FOOT (STANDARD) (MB991932)
- JOINT (50) (MB991929)
- JOINT (140) (MB991931)

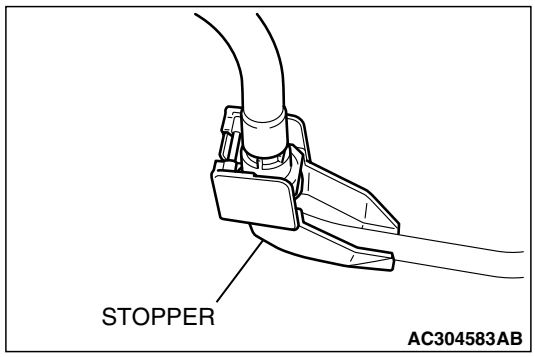


(2) Set special tool MB991928 to the front fender assembling bolts (A and B) and (C and D) as shown.



(3) Removal special tool MB991454 and hook it again as shown. Then, set special tool MB991454 to hold the engine assembly.





>>C<< FUEL HIGH-PRESSURE HOSE INSTALLATION

⚠ CAUTION

After connecting the fuel high-pressure hose, slightly pull it to ensure that it is installed securely. Also confirm that there is a play approximately 3 mm (0.12 inch). Then install the stopper securely.

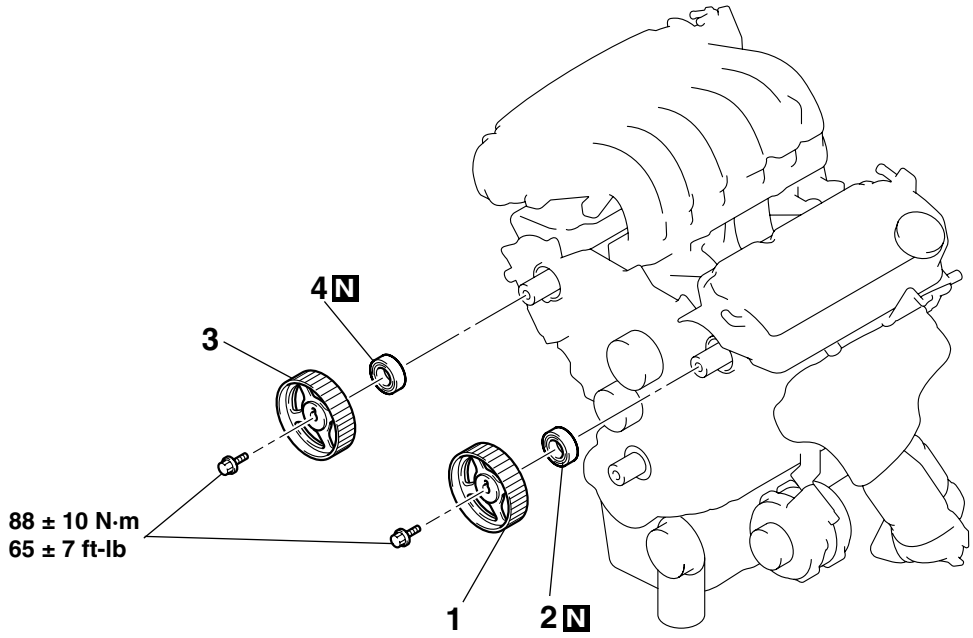
Apply a small amount of engine oil to the fuel line pipe and then install the fuel high-pressure hose.

CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

M1112002200170

Pre-removal and Post-installation Operation
Timing Belt Removal and Installation (Refer to P.11C-53.)



TSB Revision

REMOVAL STEPS

<<**A**>> >>**B**<< 1. LEFT BANK CAMSHAFT SPROCKET
<<**B**>> >>**A**<< 2. CAMSHAFT OIL SEAL

REMOVAL STEPS (Continued)

<<**A**>> >>**B**<< 3. RIGHT BANK CAMSHAFT SPROCKET
<<**B**>> >>**A**<< 4. CAMSHAFT OIL SEAL

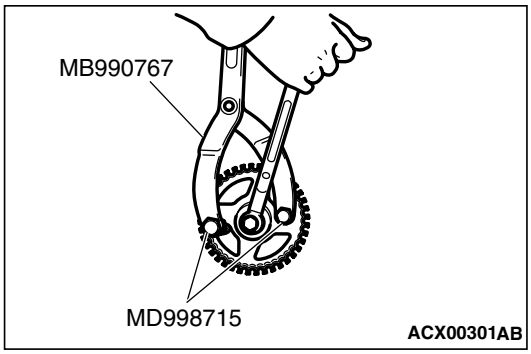
Required Special Tools:

- MB990767: End Yoke Holder
- MB991559: Camshaft Oil Seal Adapter Installer
- MD998713: Camshaft Oil Seal Installer
- MD998715: Crankshaft Pulley Holder Pin

REMOVAL SERVICE POINTS

<<A>> CAMSHAFT SPROCKET REMOVAL

Use special tools MD998715 and MB990767 to remove the camshaft sprocket.



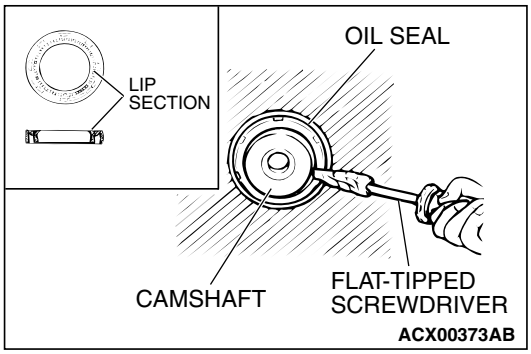
<<B>> CAMSHAFT OIL SEAL REMOVAL

1. Make a notch in the oil seal lip section with a knife, etc.

⚠ CAUTION

Be careful not to damage the camshaft and the cylinder head.

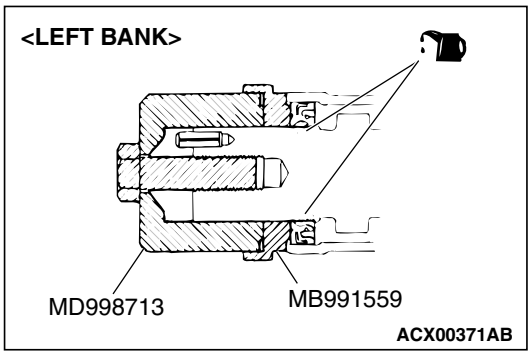
2. Cover the end of a flat-tipped screwdriver with a shop towel and insert into the notched section of the oil seal, and pry out the oil seal to remove it.



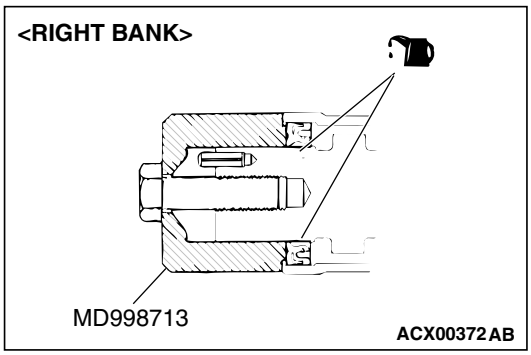
INSTALLATION SERVICE POINTS

>>A<< CAMSHAFT OIL SEAL INSTALLATION

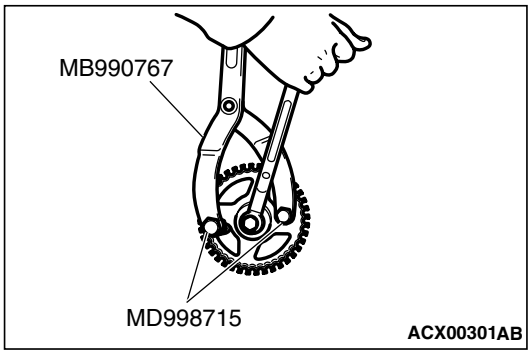
1. Apply engine oil to the camshaft oil seal lip.



2. Use special tools MD998713 and MB991559 to press-fit the camshaft oil seal.



>>B<< CAMSHAFT SPROCKET INSTALLATION



1. Use special tools MD998715 and MB990767 in the same way as during removal to install the camshaft sprocket.
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

   Tightening torque: 88 ± 10 N·m (65 ± 7 ft-lb)

CAMSHAFT AND VALVE STEM SEAL

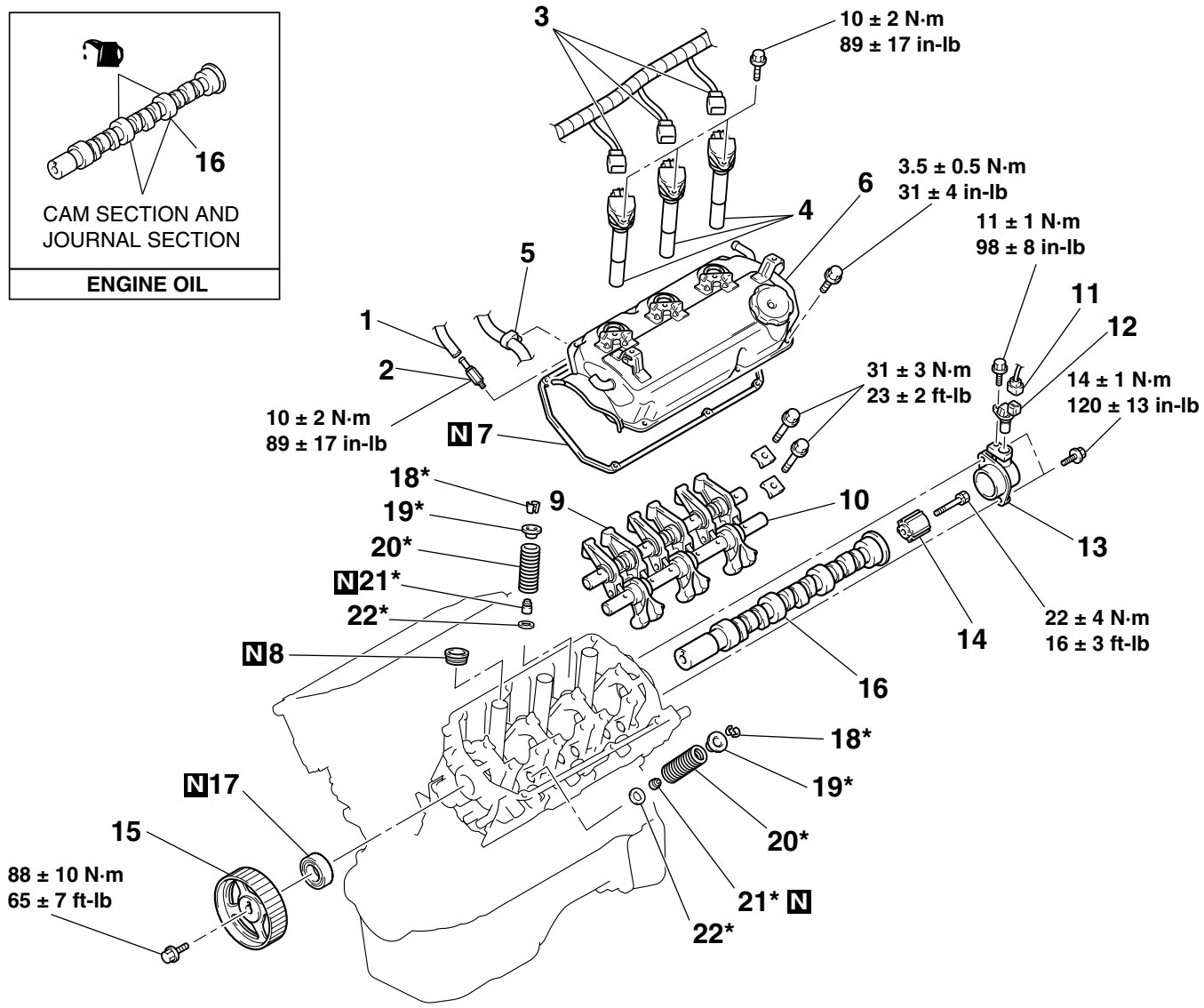
REMOVAL AND INSTALLATION

M1112006600857

⚠ CAUTION

***Remove and assemble the marked parts in each cylinder unit.**

<LEFT BANK>



AC307922AB

CAMSHAFT REMOVAL STEPS

- TIMING BELT (REFER TO P.11C-53.)
- THERMOSTAT HOUSING (REFER TO GROUP 14, WATER HOSE AND WATER PIPE P.14-28.)

<<A>> >>D<<

1. PCV HOSE CONNECTION
2. PCV VALVE
3. IGNITION COIL CONNECTOR
4. IGNITION COIL
5. ENGINE CONTROL WIRING HARNESS CLAMP
6. ROCKER COVER

CAMSHAFT REMOVAL STEPS

7. ROCKER COVER GASKET
8. SPARK PLUG GUIDE OIL SEAL
9. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (INTAKE SIDE)

<<A>> >>D<<

10. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE)
11. CAMSHAFT POSITION SENSOR CONNECTOR
12. CAMSHAFT POSITION SENSOR

TSB Revision

CAMSHAFT REMOVAL STEPS

13. CAMSHAFT POSITION SENSOR SUPPORT
14. CAMSHAFT POSITION SENSING CYLINDER

<<**B**>> >>**F**<< 15. CAMSHAFT SPROCKET
16. CAMSHAFT

<<**C**>> >>**E**<< 17. CAMSHAFT OIL SEAL

VALVE STEM SEAL REMOVAL STEPS

- ENGINE COVER (REFER TO P.11C-22.)

1. PCV HOSE CONNECTION
2. PCV VALVE
3. IGNITION COIL CONNECTOR
4. IGNITION COIL
5. ENGINE CONTROL WIRING HARNESS CLAMP
6. ROCKER COVER
7. ROCKER COVER GASKET
8. SPARK PLUG GUIDE OIL SEAL

<<**A**>> >>**D**<< 9. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (INTAKE SIDE)

<<**A**>> >>**D**<< 10. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE)

- SPARK PLUG (REFER TO GROUP 16, IGNITION COIL P.16-41.)

<<**D**>> >>**C**<< 18. VALVE SPRING RETAINER LOCK
19. VALVE SPRING RETAINER

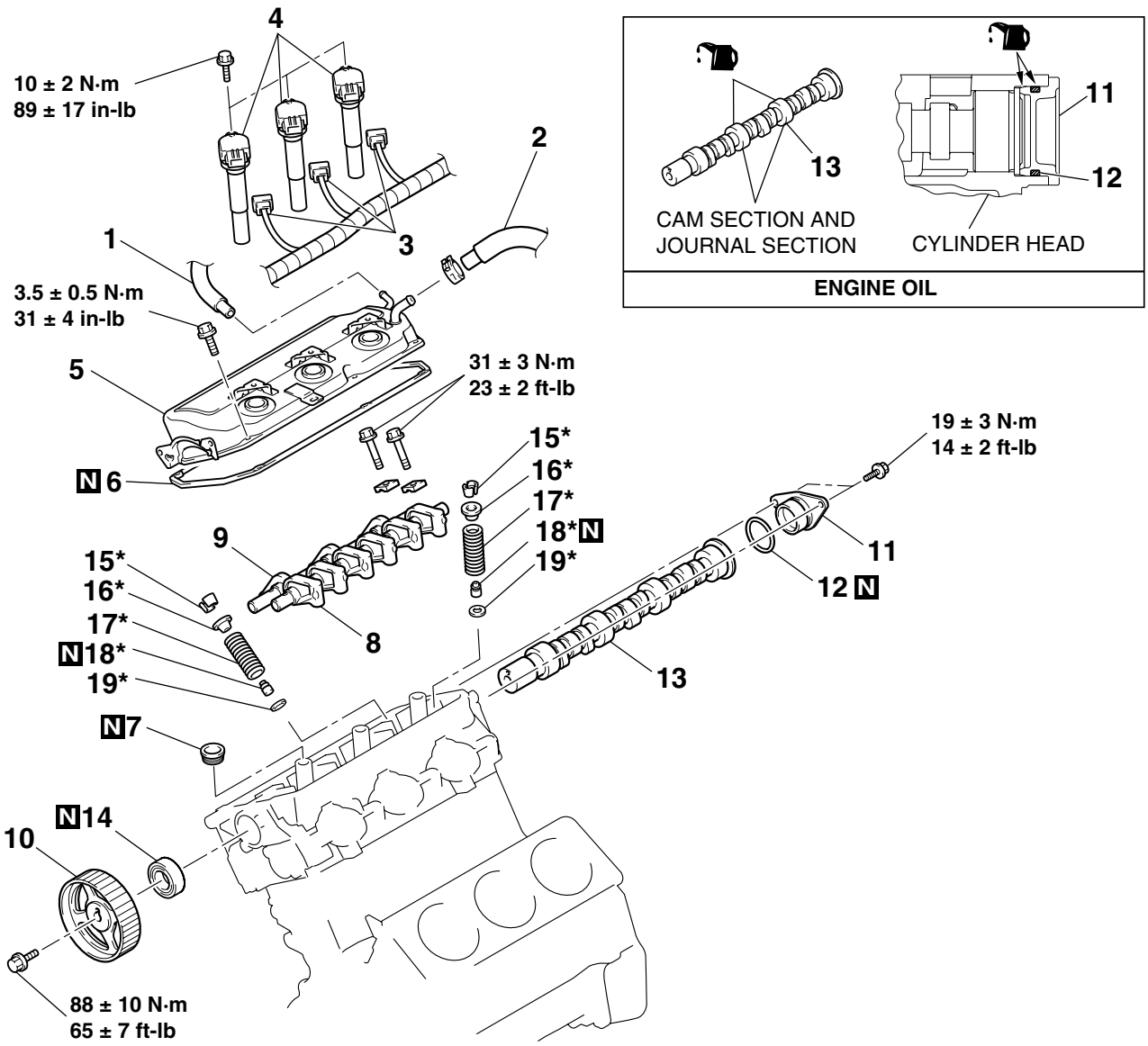
>>**B**<< 20. VALVE SPRING

>>**A**<< 21. VALVE STEM SEAL
22. VALVE SPRING SEAT

Required Special Tools:

- MB990767: End Yoke Holder
- MD998443: Auto-lash Adjuster Holder
- MB991559: Camshaft Oil Seal Adapter Installer
- MD998713: Camshaft Oil Seal Installer
- MD998715: Crankshaft Pulley Holder Pin
- MD998772: Valve Spring Compressor
- MB991999: Valve Stem Seal Installer

<RIGHT BANK>



AC307923AB

CAMSHAFT REMOVAL STEPS

- INTAKE MANIFOLD PLENUM (REFER TO GROUP 15, INTAKE MANIFOLD PLENUM P.15-8.)
- TIMING BELT (REFER TO P.11C-53.)
- BATTERY AND BATTERY TRAY
- HEATER HOSE AND WATER HOSE (REFER TO GROUP 14, WATER HOSE AND WATER PIPE P.14-28.)
- THROTTLE BODY STAY (REFER TO GROUP 13B, THROTTLE BODY ASSEMBLY P.13B-1444.)

1. BREATHER HOSE CONNECTION
2. BLOW-BY HOSE CONNECTION
3. IGNITION COIL CONNECTOR
4. IGNITION COIL

<<A>> >>D<<

<<A>> >>D<<

<<B>> >>F<<

<<C>> >>E<<

CAMSHAFT REMOVAL STEPS

5. ROCKER COVER
6. ROCKER COVER GASKET
7. SPARK PLUG GUIDE OIL SEAL
8. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (INTAKE SIDE)
9. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE)
10. CAMSHAFT SPROCKET
11. THRUST CASE
12. O-RING
13. CAMSHAFT
14. CAMSHAFT OIL SEAL

TSB Revision

VALVE STEM SEAL REMOVAL STEPS

- INTAKE MANIFOLD PLENUM (REFER TO GROUP 15, INTAKE MANIFOLD PLENUM P.15-8.)
- TIMING BELT FRONT UPPER COVER, RIGHT (REFER TO P.11C-53.)

1. BREATHER HOSE CONNECTION
2. BLOW-BY HOSE CONNECTION
3. IGNITION COIL CONNECTOR
4. IGNITION COIL
5. ROCKER COVER
6. ROCKER COVER GASKET
7. SPARK PLUG GUIDE OIL SEAL

<<**A**>> >>**D**<< 8. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (INTAKE SIDE)

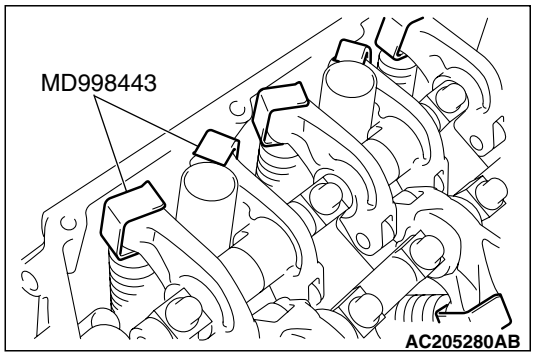
<<**A**>> >>**D**<< 9. ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY (EXHAUST SIDE)

- SPARK PLUG (REFER TO GROUP 16, IGNITION COIL P.16-41.)

<<**D**>> >>**C**<< 15. VALVE SPRING RETAINER LOCK
16. VALVE SPRING RETAINER
>>**B**<< 17. VALVE SPRING
>>**A**<< 18. VALVE STEM SEAL
19. VALVE SPRING SEAT

Required Special Tools:

- MB990767: End Yoke Holder
- MD998443: Auto-lash Adjuster Holder
- MB991559: Camshaft Oil Seal Adapter Installer
- MD998713: Camshaft Oil Seal Installer
- MD998715: Crankshaft Pulley Holder Pin
- MD998772: Valve Spring Compressor
- MB991999: Valve Stem Seal Installer



REMOVAL SERVICE POINTS

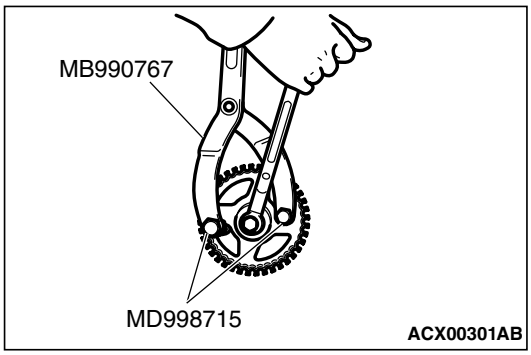
<<A>> ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY REMOVAL

1. Install special tool MD998443 as shown in the illustration so that the lash adjusters will not fall out.

⚠ CAUTION

Never disassemble the rocker arm and shaft assembly.

2. Loosen the rocker arm and shaft assembly mounting bolt, and then remove the rocker arm and shaft assembly with the bolt still attached.



<<B>> CAMSHAFT SPROCKET REMOVAL

Use special tools MD998715 and MB990767 to remove the camshaft sprocket.

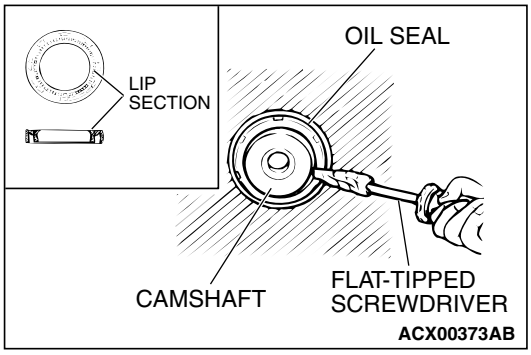
<<C>> CAMSHAFT OIL SEAL REMOVAL

1. Make a notch in the oil seal lip section with a knife, etc.

⚠ CAUTION

Be careful not to damage the camshaft and the cylinder head.

2. Cover the end of a flat-tipped screwdriver with a shop towel and insert into the notched section of the oil seal, and pry out the oil seal to remove it.

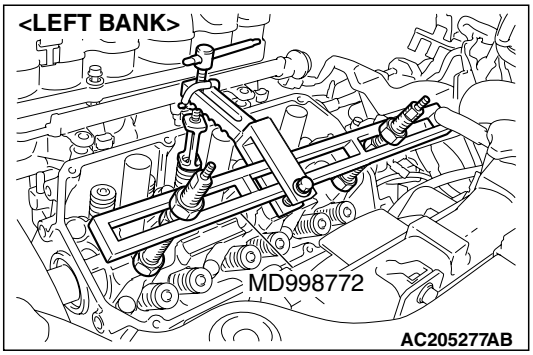


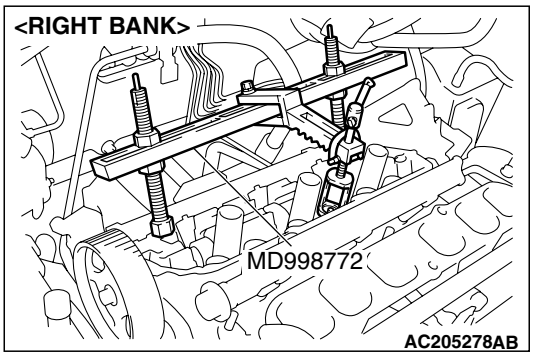
<<D>> VALVE SPRING RETAINER LOCK REMOVAL

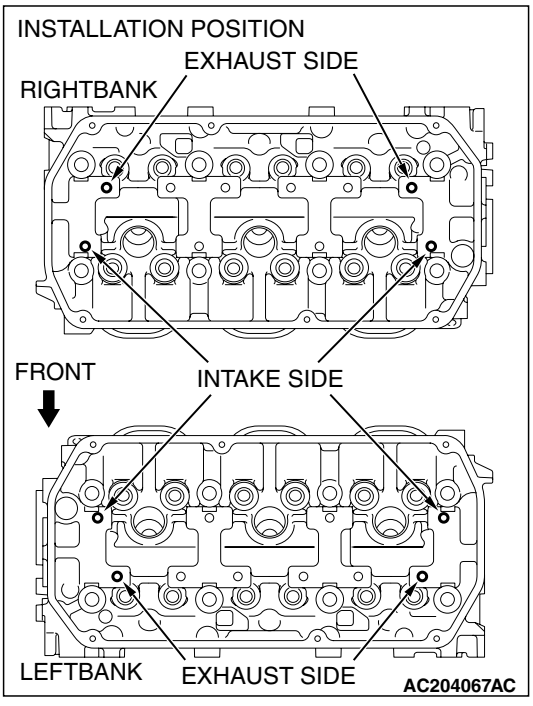
⚠ CAUTION

When removing valve spring retainer locks, leave the piston of each cylinder in the TDC (Top Dead Center) position. The valve may fall into the cylinder if the piston is not properly in the TDC position.

Use special tool MD998772 to compress the valve spring, and remove the valve spring retainer locks.







NOTE: Installation position of valve spring compressor special tool (MD998772) is different between exhaust side and intake side.

INSTALLATION SERVICE POINTS

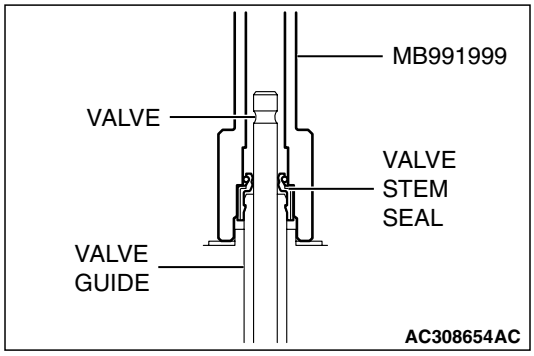
>>A<< VALVE STEM SEAL INSTALLATION

1. Apply a small amount of engine oil to the valve stem seal.

⚠ CAUTION

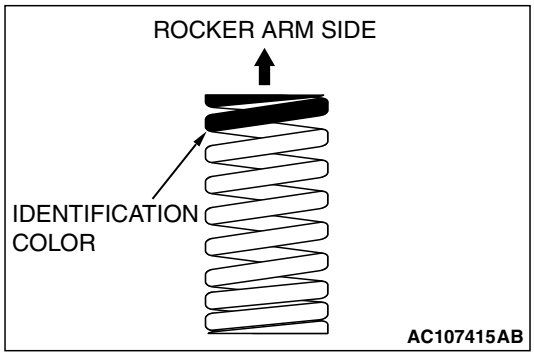
- **Valve stem seals cannot be reused.**
- **Special tool MB991999 must be used to install the valve stem seal. Improper installation could result in oil leaking past the valve guide.**

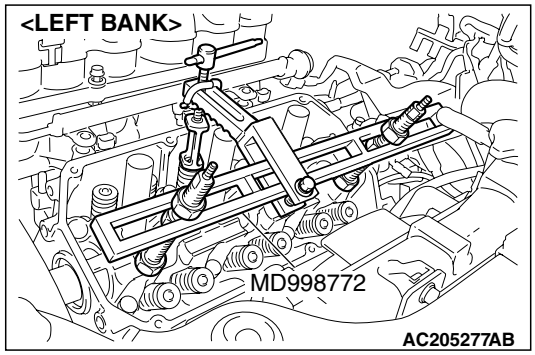
2. Use special tool MB991999 to fill a new valve stem seal in the valve guide using the valve stem area as a guide.

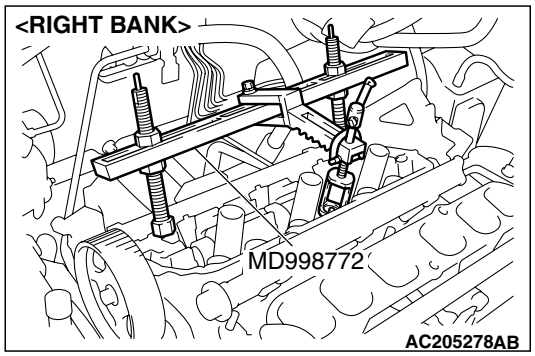


>>B<< VALVE SPRING INSTALLATION

Install the valve spring with its identification color painted end facing the locker arm.

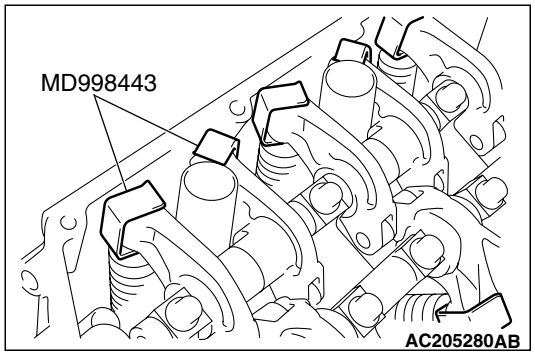






>>C<< VALVE SPRING RETAINER LOCK INSTALLATION

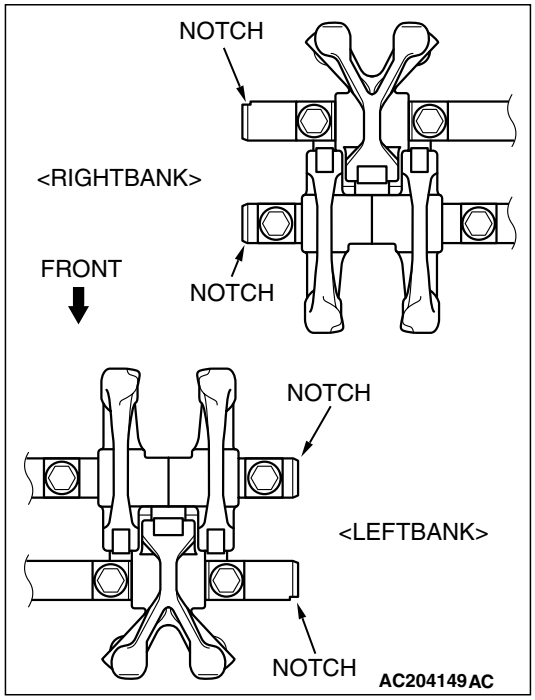
Use special tool MD998772 to compress the valve spring in the same manner as removal.



>>D<< ROCKER ARM, SHAFT AND LASH ADJUSTER ASSEMBLY INSTALLATION

1. Install the rocker arm, shaft and lash adjuster assembly.
2. Tighten the mounting bolts to the specified torque.

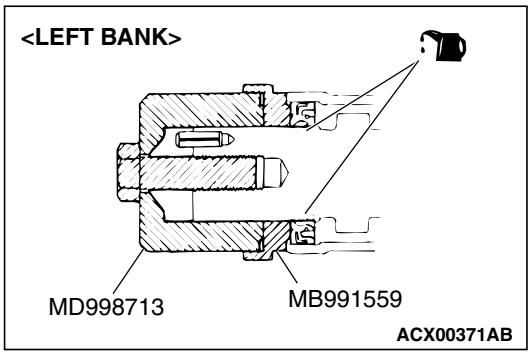
   Tightening torque: 31 ± 3 N·m (23 ± 2 ft-lb)
3. Remove special tool MD998443.

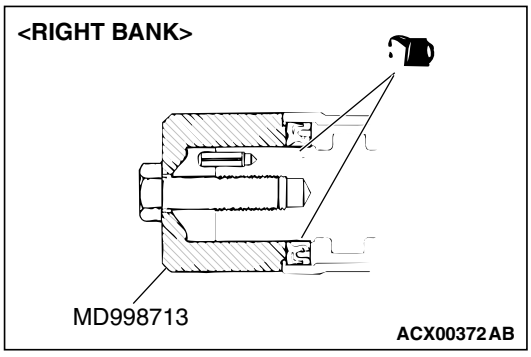


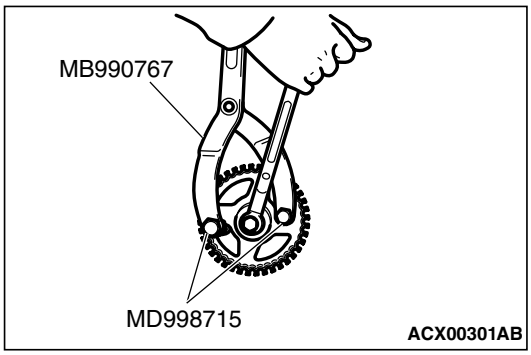
4. Check that notches in the each rocker shaft are facing the direction shown in the illustration.

>>E<< CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the camshaft oil seal lip.
2. Use special tools MD998713 and MB991559 to press-fit the camshaft oil seal.







>>F<< CAMSHAFT SPROCKET INSTALLATION

1. Use special tools MD998715 and MB990767 in the same way as during removal to install the camshaft sprocket.
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

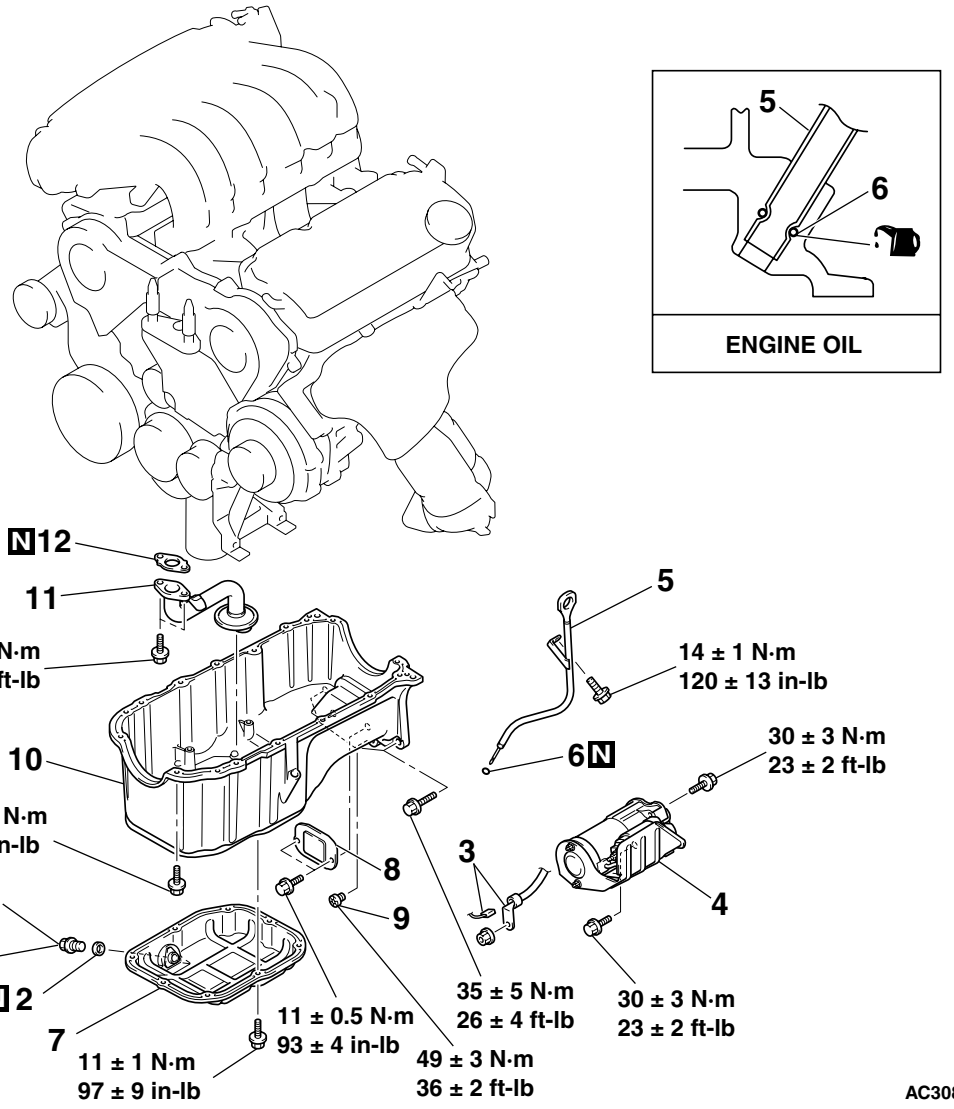
Tightening torque: 88 ± 10 N·m (65 ± 7 ft-lb)

OIL PAN AND OIL SCREEN

REMOVAL AND INSTALLATION

M1112002500193

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 51, Under Cover P.51-12.)
- Engine Oil Draining and Refilling (Refer to GROUP 12, On-vehicle Service P.12-3.)



AC308673AB

REMOVAL STEPS
1. ENGINE OIL PAN DRAIN PLUG
2. ENGINE OIL PAN DRAIN PLUG GASKET
3. STARTER CONNECTOR
4. STARTER ASSEMBLY
5. ENGINE OIL DIPSTICK ASSEMBLY
6. O-RING

<<A>> >>B<< 7. ENGINE LOWER OIL PAN

<<B>>

<<C>> >>A<<

REMOVAL STEPS (Continued)
- FRONT NO.1 EXHAUST PIPE (REFER TO GROUP 15, EXHAUST PIPE AND MAIN MUFFLER P.15-32)

8. COVER
9. TORQUE CONVERTER CONNECTING BOLT
10. ENGINE UPPER OIL PAN
11. OIL SCREEN
12. GASKET

TSB Revision

REMOVAL SERVICE POINT

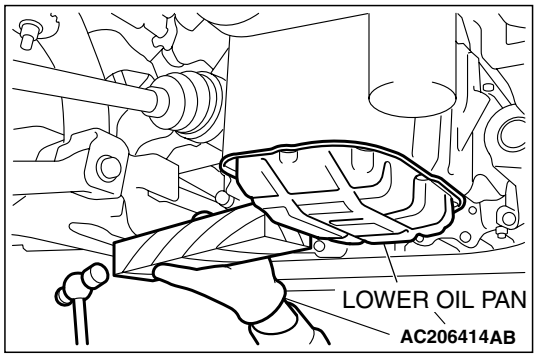
<<A>> ENGINE LOWER OIL PAN REMOVAL

1. Remove the engine lower oil pan mounting bolts.

⚠ CAUTION

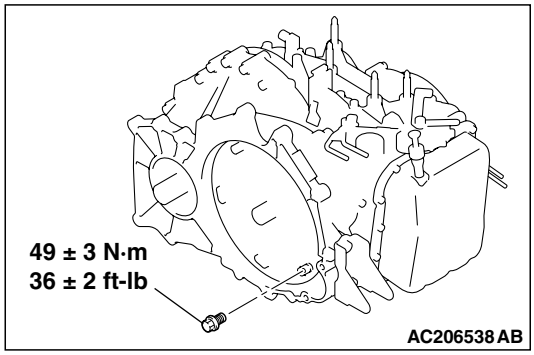
Do not use oil pan remover special tool (MD998727). The engine upper oil pan is made of aluminum and this tool will damage it.

2. Apply a piece of wood to the lower oil pan and strike it with a hammer to remove the engine lower oil pan.



<<B>> TORQUE CONVERTER CONNECTING BOLT REMOVAL

Remove the one torque converter connecting bolt as shown.



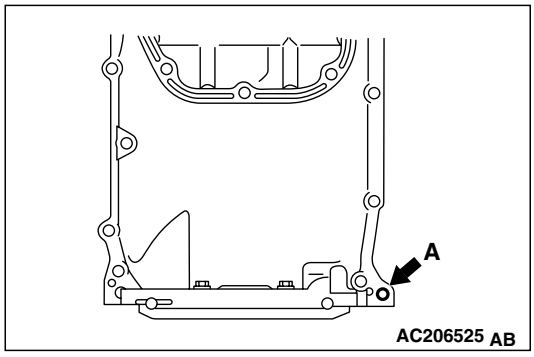
<<C>> ENGINE UPPER OIL PAN REMOVAL

1. Remove the engine upper oil pan mounting bolts.

⚠ CAUTION

Do not use oil pan remover special tool (MD998727). The engine upper oil pan is made of aluminum and this tool will damage it.

2. Screw in the bolt (M10) into bolt hole A in the location shown. Then lift the upper oil pan and remove it.



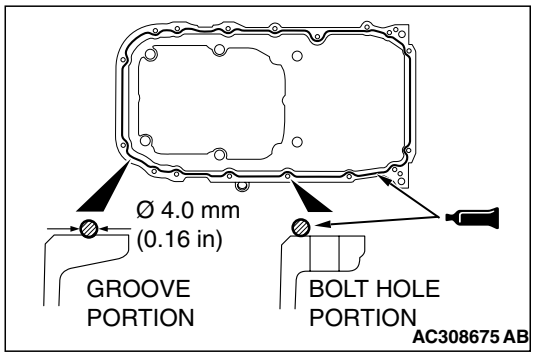
INSTALLATION SERVICE POINTS

>>A<< ENGINE UPPER OIL PAN INSTALLATION

1. Remove sealant from the oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply a bead of the sealant to the cylinder block mating surface of the engine oil pan as shown.

   Specified sealant: 3M™ AAD Part No.8672, 8704, 3M™ AAD Part No.8679/8678 or equivalent

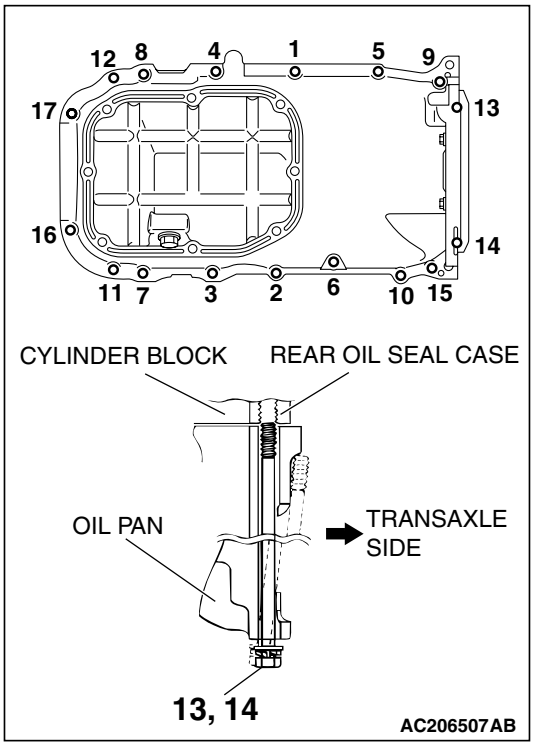
   NOTE: The sealant should be applied in a continuous bead approximately 4.0 mm (0.16 inch) in diameter.
4. Assemble the oil pan to the cylinder block within 15 minutes after applying the sealant.



⚠ CAUTION

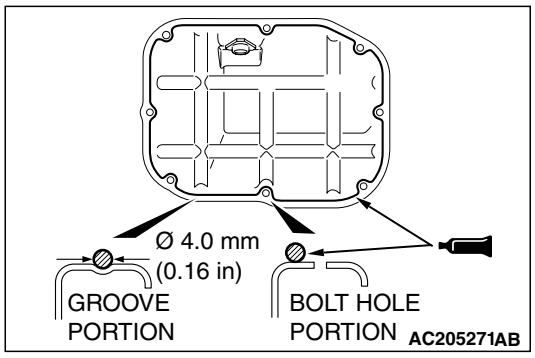
The bolt holes for bolts 13 and 14 in the illustration are cut away on the transaxle side. Be careful not to insert these bolts at an angle.

5. Tighten the bolts in order of the numbers shown in the illustration.



>>B<< ENGINE LOWER OIL PAN INSTALLATION

1. Remove sealant from the engine lower oil pan and engine upper oil pan.



2. Apply a bead of the sealant to the mating surface of the engine lower oil pan as shown.

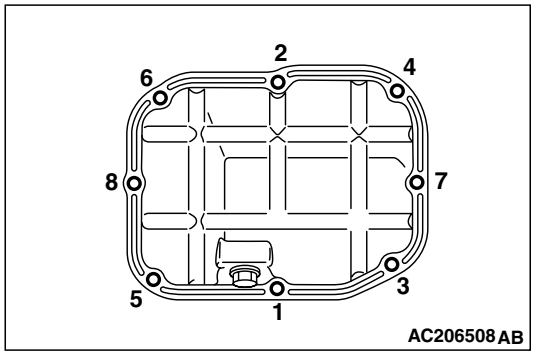
   Specified sealant: 3M™ AAD Part No.8672, 8704, 3M™ AAD Part No.8679/8678 or equivalent

   NOTE: Install the engine lower oil pan within 15 minutes after applying sealant.
3. Assemble the engine lower oil pan to the engine upper oil pan.

⚠ CAUTION

Then wait at least one hour. Never start the engine or let engine oil or coolant touch the sealant surface during that time.

4. Tighten the bolts in order of the numbers shown in the illustration.



INSPECTION

M1112002600134

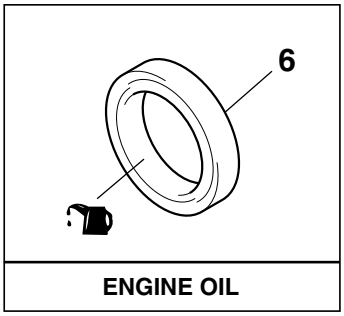
- Check the oil pan for cracks.
- Check the oil pan sealant-coated surface for damage and deformation.
- Check the oil screen for cracked, clogged or damaged wire net and pipe.

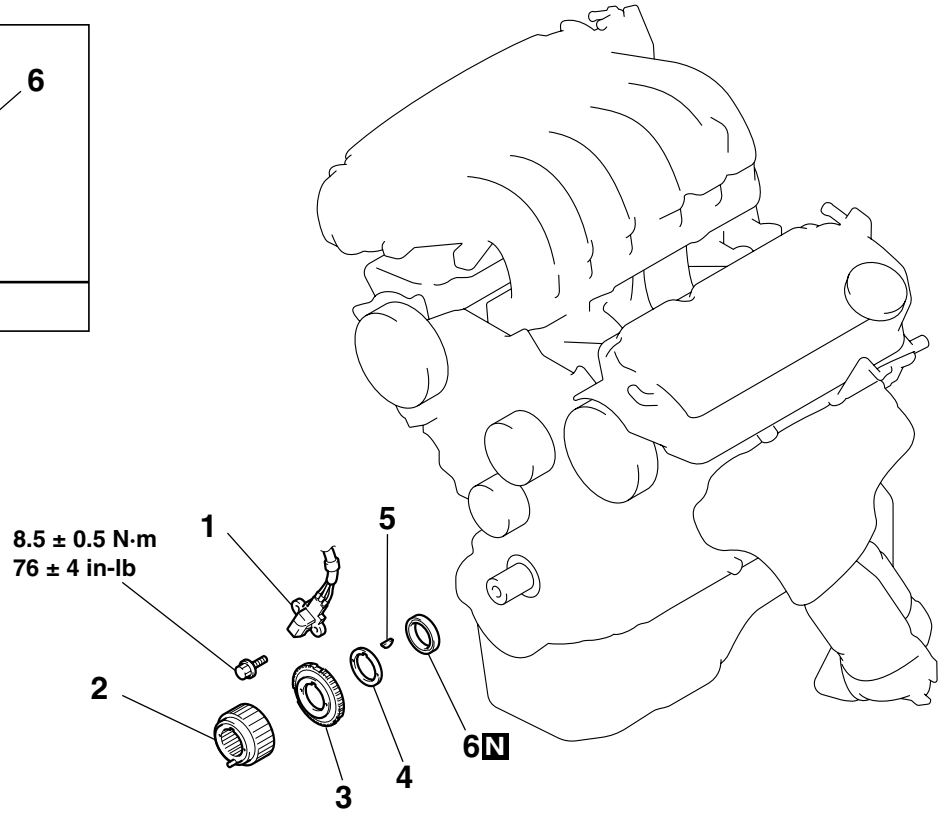
CRANKSHAFT OIL SEAL

REMOVAL AND INSTALLATION <FRONT OIL SEAL>

M1112003400478

Pre-removal and Post-installation Operation
Timing Belt Removal and Installation (Refer to P.11C-53.)





AC205520 AB

REMOVAL STEPS
1. CRANKSHAFT POSITION SENSOR
>>B<< 2. CRANKSHAFT SPROCKET
>>B<< 3. CRANKSHAFT SENSING BLADE

REMOVAL STEPS (Continued)
>>B<< 4. CRANKSHAFT SPACER
5. KEY
>>A<< 6. CRANKSHAFT FRONT OIL SEAL

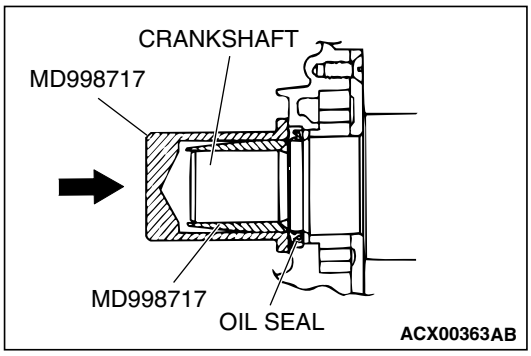
Required Special Tool:
MD998717: Crankshaft Front Oil Seal Installer

INSTALLATION SERVICE POINTS

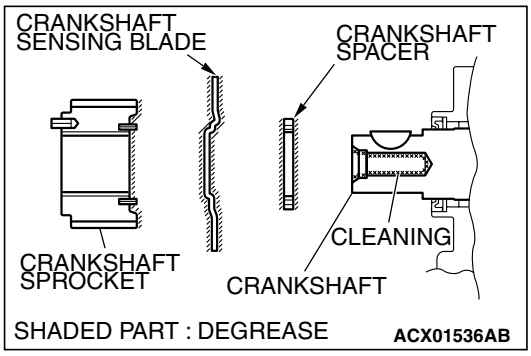
>>A<< CRANKSHAFT FRONT OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the oil seal lip and then insert.

TSB Revision



2. Using special tool MD998717, tap the oil seal into the front case.



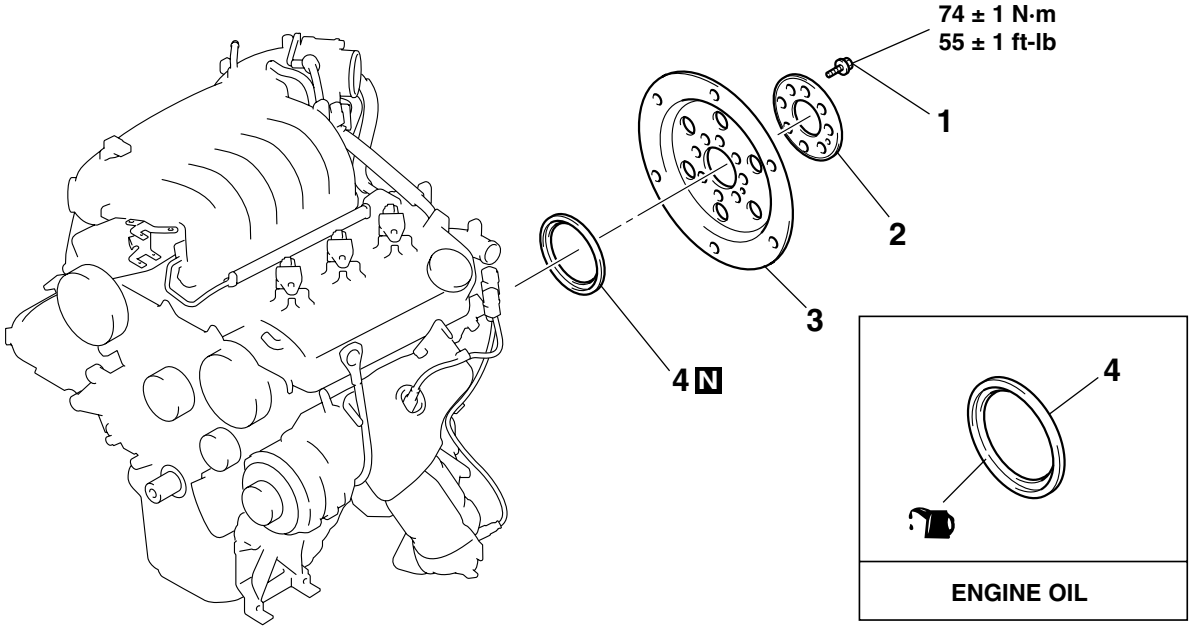
>>B<< CRANKSHAFT SPACER / CRANKSHAFT SENSING BLADE / CRANKSHAFT SPROCKET INSTALLATION

To prevent the crankshaft pulley mounting bolt from loosening, degrease or clean the crankshaft, the crankshaft spacer, the crankshaft sensing blade and the crankshaft at the shown positions.

REMOVAL AND INSTALLATION <REAR OIL SEAL>

M1112003700684

Pre-removal and Post-installation Operation
Transaxle Assembly Removal and Installation (Refer to GROUP 23A, Transaxle <F5A5A>P.23A-396 .)



REMOVAL STEPS

<<A>> >>B<< 1. DRIVE PLATE BOLTS
2. ADAPTOR PLATE

REMOVAL STEPS (Continued)

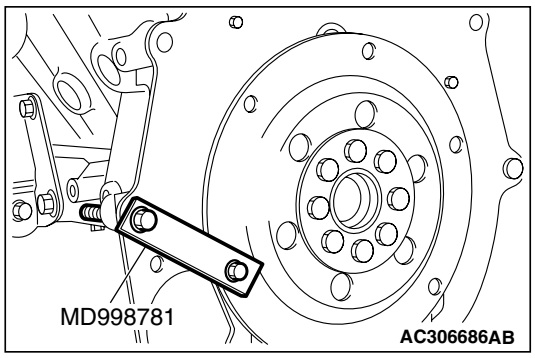
3. DRIVE PLATE
>>A<< 4. CRANKSHAFT REAR OIL SEAL

TSB Revision

Required Special Tools:

- MD998718: Crankshaft Rear Oil Seal Installer
- MD998781: Flywheel Stopper

REMOVAL SERVICE POINT



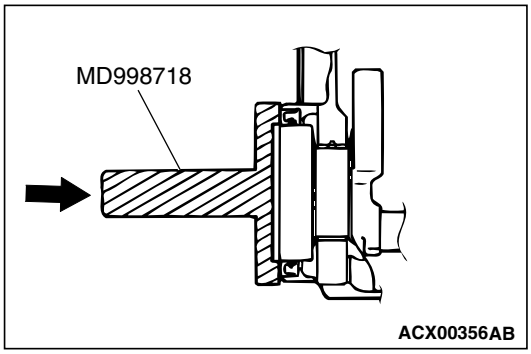
<<A>> DRIVE PLATE BOLTS REMOVAL

Use special tool MD998781 to secure the drive plate and remove the drive plate bolts.

INSTALLATION SERVICE POINTS

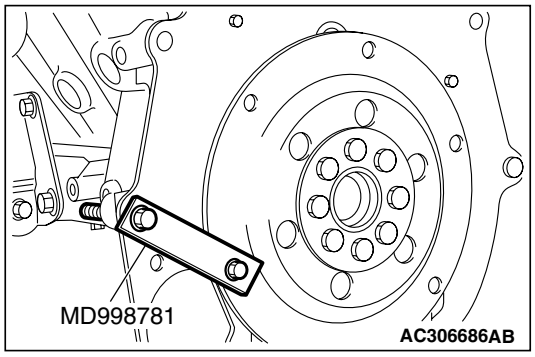
>>A<< CRANKSHAFT REAR OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the entire circumference of the oil seal lip.
2. Use special tool MD998718 to tap in the oil seal as shown in the illustration.



>>B<< DRIVE PLATE BOLTS INSTALLATION

Use special tool MD998781 in the same way as during removal to install the drive plate bolts.

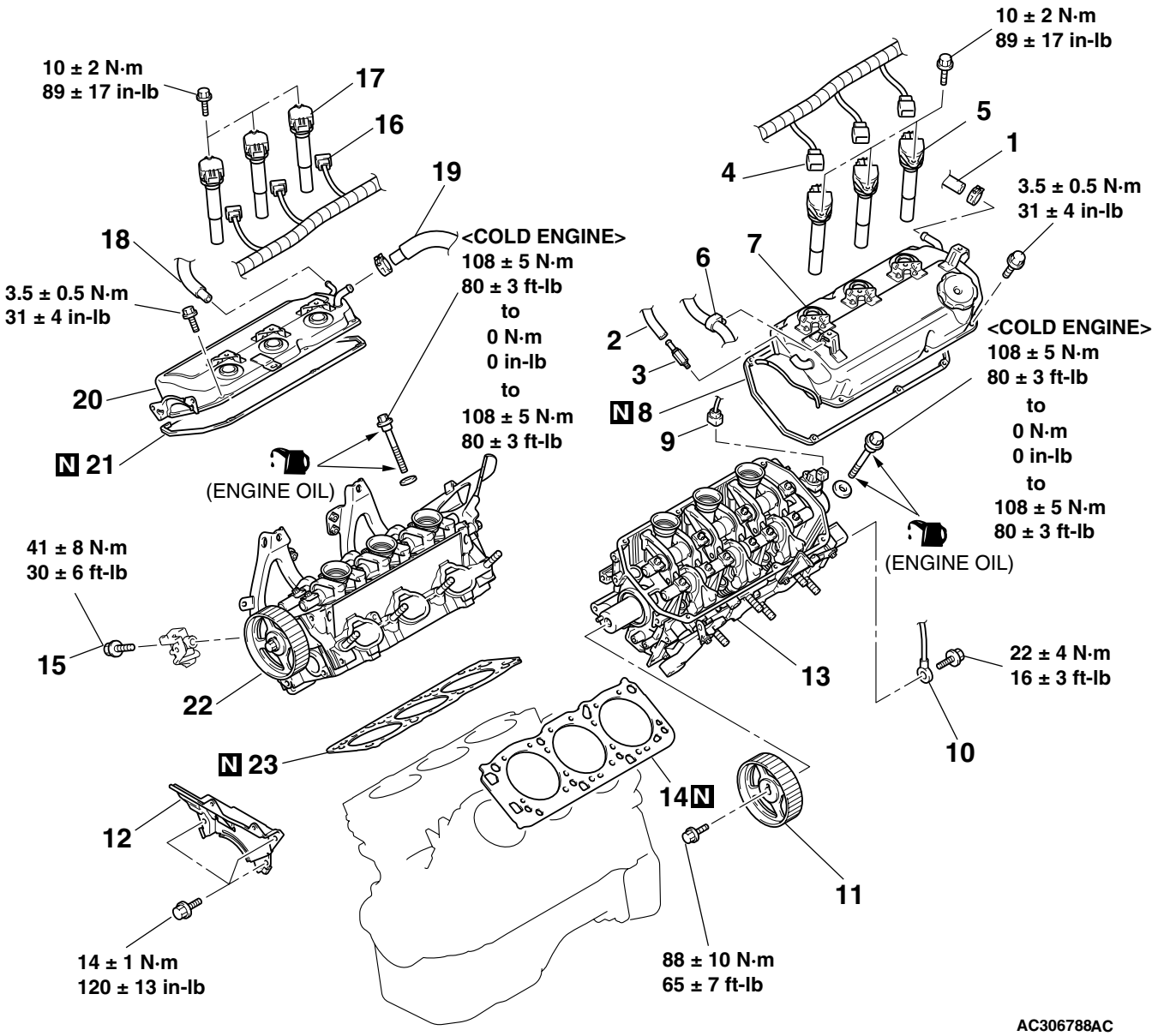


CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

M1112004001614

Pre-removal and Post-installation Operation
- Intake Manifold Removal and Installation (Refer to GROUP 15, Intake Manifold P.15-16.)
- Exhaust Manifold Removal and Installation (Refer to GROUP 15, Exhaust Manifold P.15-24.)
- Timing Belt Removal and Installation (Refer to P.11C-53.)
- Thermostat Housing Removal and Installation (Refer to GROUP 14, Water Hose and Water Pipe P.14-28.)
- Generator Removal and Installation (Refer to GROUP 16, Generator Assembly P.16-15.)



AC306788AC

REMOVAL STEPS
1. BLOW-BY HOSE CONNECTION
2. PCV HOSE CONNECTION
3. PCV VALVE
4. IGNITION COIL CONNECTOR

REMOVAL STEPS (Continued)
5. IGNITION COIL
6. ENGINE CONTROL WIRING HARNESS CLAMP
7. ROCKER COVER
8. ROCKER COVER GASKET

TSB Revision

REMOVAL STEPS (Continued)

9. CAMSHAFT POSITION SENSOR CONNECTOR
10. GROUNDING
- ENGINE OIL DIPSTICK ASSEMBLY

<<**A**>> >>**C**<< 11. CAMSHAFT SPROCKET
12. TIMING BELT REAR CENTER COVER

<<**B**>> >>**B**<< 13. LEFT BANK CYLINDER HEAD ASSEMBLY
14. CYLINDER HEAD GASKET
- POWER STEERING OIL PUMP ASSEMBLY (REFER TO GROUP 37, POWER STEERING OIL PUMP ASSEMBLY P.37-52.)

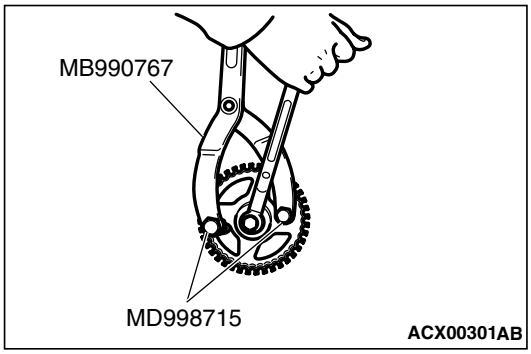
15. POWER STEERING OIL PUMP BRACKET BOLT
16. IGNITION COIL CONNECTOR
17. IGNITION COIL
18. BREATHER HOSE CONNECTION
19. BLOW-BY HOSE CONNECTION
20. ROCKER COVER
21. ROCKER COVER GASKET

<<**B**>> >>**B**<< 22. RIGHT BANK CYLINDER HEAD ASSEMBLY

>>**A**<< 23. CYLINDER HEAD GASKET

Required Special Tools:

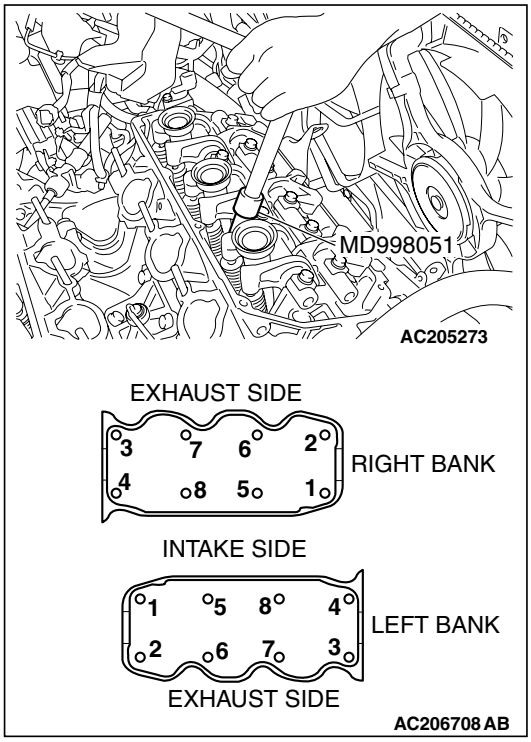
- MD998051: Cylinder Head Bolt Wrench
- MB990767: End Yoke Holder
- MD998715: Crankshaft Pulley Holder Pin



REMOVAL SERVICE POINTS

<<A>> CAMSHAFT SPROCKET REMOVAL

Use special tools MD998715 and MB990767 to remove the camshaft sprocket.



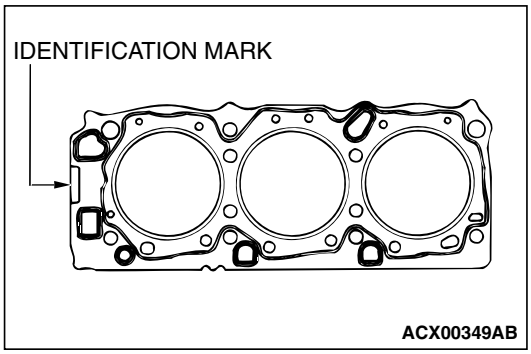
<<B>> CYLINDER HEAD ASSEMBLY REMOVAL

Use special tool MD998051 to loosen each bolt two or three steps in the order shown in the illustration.

INSTALLATION SERVICE POINTS

>>A<< CYLINDER HEAD GASKET INSTALLATION

1. Degrease the cylinder head and cylinder block gasket mounting surfaces.
2. Make sure that the gasket has the proper identification mark for the engine.
3. Lay the cylinder head gasket on the cylinder block with the identification mark at the front top.

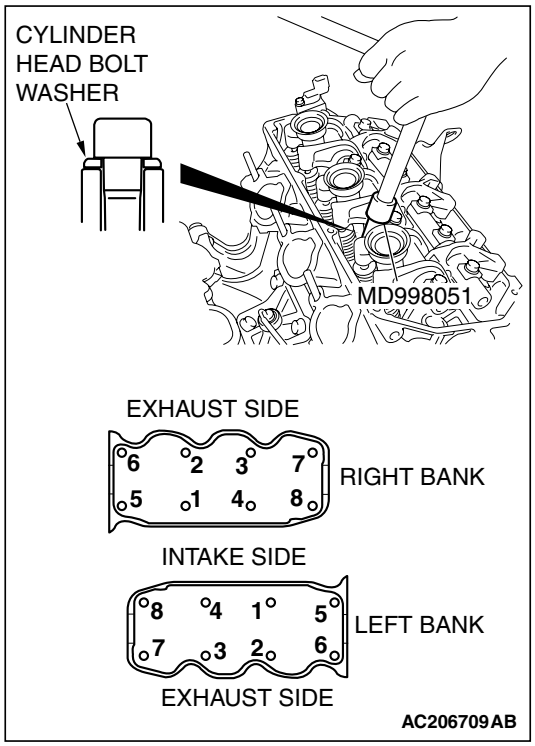


>>B<< CYLINDER HEAD ASSEMBLY INSTALLATION

⚠ CAUTION

Be careful that no foreign material gets into the cylinder, coolant passages or oil passages. Engine damage may result.

1. Use a scraper to clean the gasket surface of the cylinder head assembly.

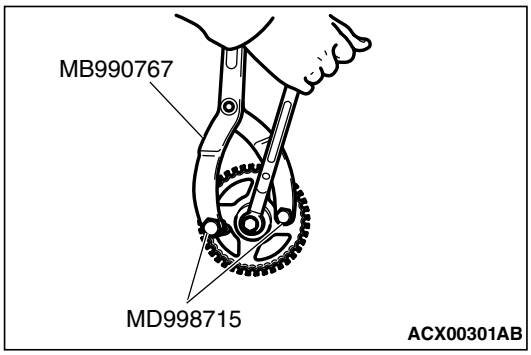


⚠ CAUTION

Install the head bolt washers with the beveled side facing upwards as shown in the illustration.

2. Using special tool MD998051 and a torque wrench, tighten the bolts to the specified torque in the order shown in the illustration. (in two or three cycles)

   Tightening torque: 108 ± 5 N·m (80 ± 3 ft-lb) to 0 N·m (0 in-lb) to 108 ± 5 N·m (80 ± 3 ft-lb)



>>C<< CAMSHAFT SPROCKET INSTALLATION

1. Use special tools MD998715 and MB990767 in the same way as during removal to install the camshaft sprocket.
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

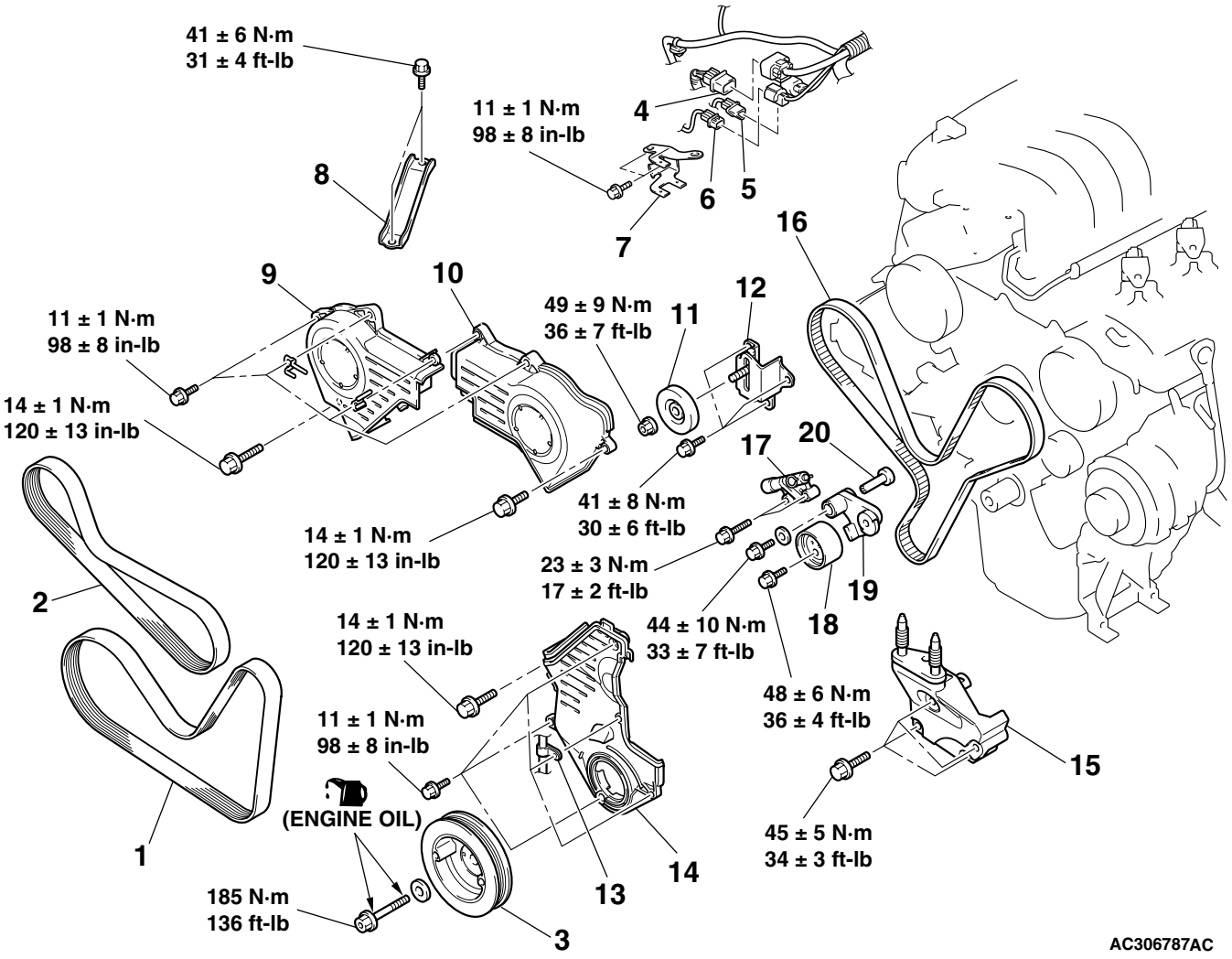
   Tightening torque: 88 ± 10 N·m (65 ± 7 ft-lb)

TIMING BELT

REMOVAL AND INSTALLATION

M1112004301369

Pre-removal and Post-installation Operation
- Engine Cover Removal and Installation (Refer to P.11C-22.)
- Under Cover Removal and Installation (Refer to GROUP 51, Under Cover P.51-12.)
- Side Under Cover Removal and Installation (Refer to GROUP 51, Under Cover P.51-12.)



AC306787AC

REMOVAL STEPS
1. GENERATOR DRIVE BELT
2. POWER STEERING OIL PUMP DRIVE BELT
<<A>> >>C<< 3. CRANKSHAFT PULLEY
4. CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION CONNECTOR
5. KNOCK SENSOR CONNECTOR
6. CRANKSHAFT POSITION SENSOR CONNECTOR
7. CONNECTOR BRACKET

REMOVAL STEPS (Continued)
8. ENGINE MOUNTING STAY
9. TIMING BELT FRONT UPPER COVER, RIGHT
10. TIMING BELT FRONT UPPER COVER, LEFT
11. TENSIONER PULLEY
12. TENSIONER BRACKET
13. CRANKSHAFT POSITION SENSOR HARNESS CLAMP
14. TIMING BELT LOWER COVER

TSB Revision

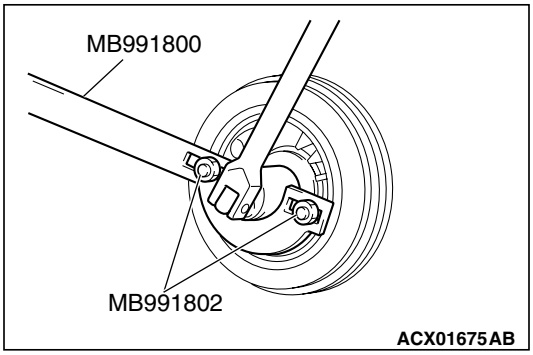
REMOVAL STEPS (Continued)

- ENGINE FRONT MOUNTING BRACKET (REFER TO GROUP 32, ENGINE MOUNTING P.32-4.)

15. ENGINE SUPPORT BRACKET
<<**B**>> >>**B**<< 16. TIMING BELT
>>**A**<< 17. AUTO-TENSIONER
18. TENSIONER PULLEY
19. TENSIONER ARM
20. SHAFT

Required Special Tools:

- MB991800: Pulley Holder
- MB991802: Pin B
- MD998767: Tension Pulley Socket Wrench
- MD998769: Crankshaft Pulley Spacer

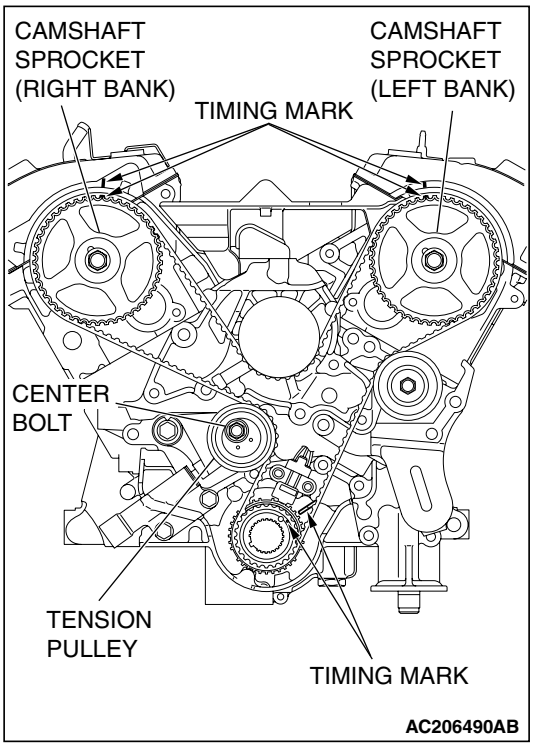


REMOVAL SERVICE POINTS

<<A>> CRANKSHAFT PULLEY REMOVAL

⚠ CAUTION
Use only the specified special tools, or a damaged pulley damper could result.

Use special tools MB991800 and MB991802 to remove the crankshaft pulley from the crankshaft.



<<B>> TIMING BELT REMOVAL

⚠ CAUTION

Never turn the crankshaft counterclockwise.

1. Turn the crankshaft clockwise to align each timing mark and to set the number 1 cylinder to compression top dead center.
2. If the timing belt is to be reused, chalk an arrow on the flat side of the belt, indicating the clockwise direction.
3. Loosen the center bolt of the tensioner pulley, then remove the timing belt.

INSTALLATION SERVICE POINTS

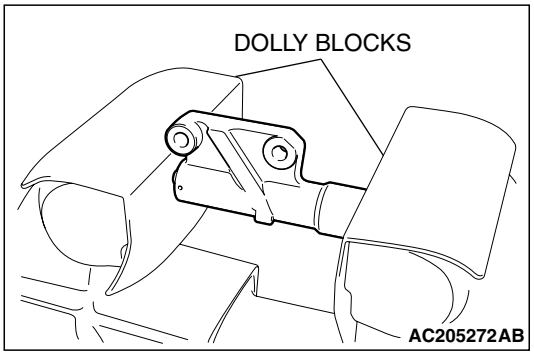
>>A<< AUTO-TENSIONER INSTALLATION

1. If the auto-tensioner rod remains fully extended, set according to the following procedure.

⚠ CAUTION

Place the auto-tensioner perpendicular to the jaws of the vice.

(1) Place two dolly blocks in a vice as shown in the illustration, and then place the auto-tensioner in the vice.



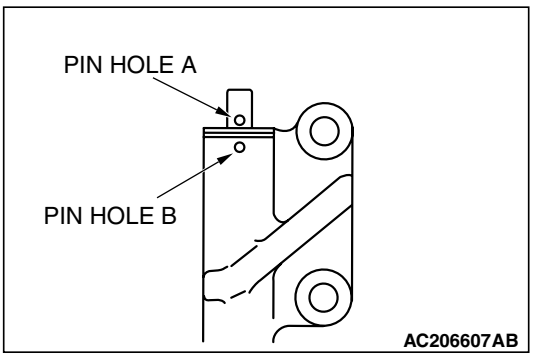
⚠ CAUTION

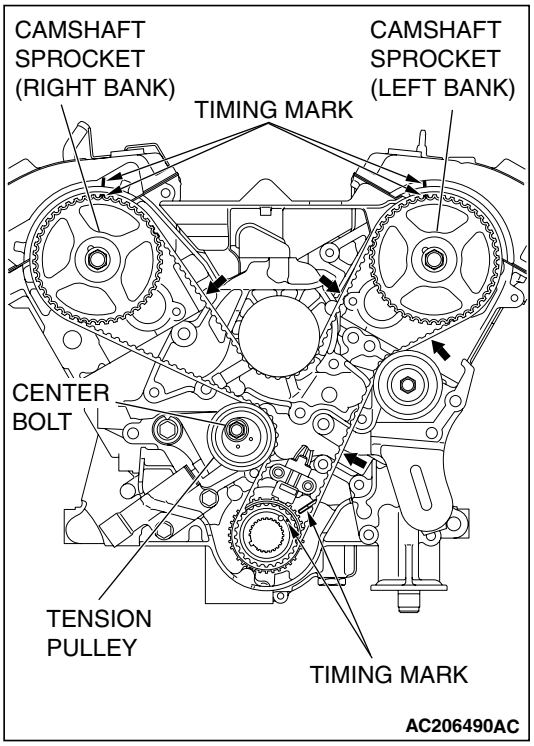
Never compress the pushrod too fast, or it may be damaged.

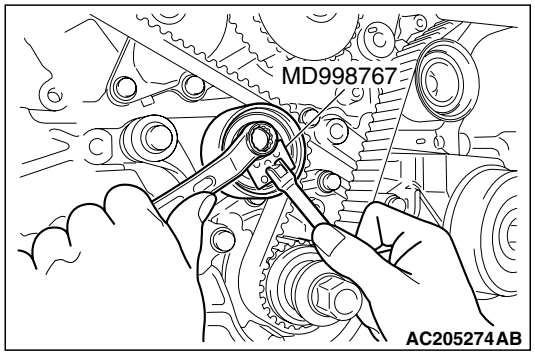
(2) Slowly compress the pushrod of the auto-tensioner until pin hole A in the pushrod is aligned with pin hole B in the cylinder.

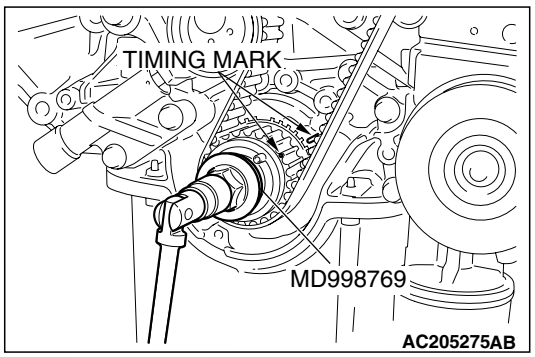
(3) Insert the setting pin into the pin holes once they are aligned.

NOTE: If replacing the auto-tensioner, the pin will already be inserted into the pin holes of the new part.









⚠ CAUTION

Do not remove the setting pin from the auto-tensioner.

(4) Install the auto-tensioner to the engine.

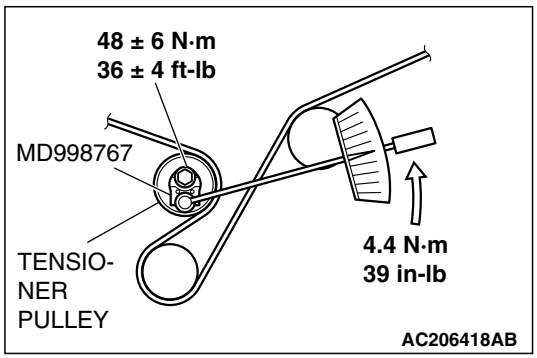
>>B<< TIMING BELT INSTALLATION

1. Align the timing marks on the camshaft sprockets with those on the rocker cover and the timing mark on the crankshaft sprocket with that on the engine block as shown in the illustration.

⚠ CAUTION

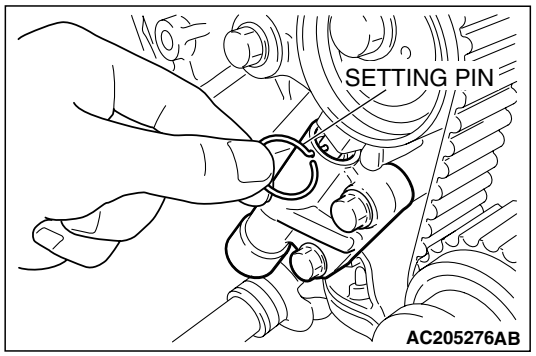
The camshaft sprocket (right bank) can turn easily due to the spring force applied, so be careful not to get your fingers caught.

2. Install the timing belt by the following procedure so that there is no deflection in the timing belt between each sprocket and pulley.
   (1) Crankshaft sprocket
   (2) Idler pulley
   (3) Camshaft sprocket (Left bank)
   (4) Water pump pulley
   (5) Camshaft sprocket (Right bank)
   (6) Tensioner pulley
3. Turn the camshaft sprocket (Right bank) counterclockwise until the tension side of the timing belt is firmly stretched. Check all the timing marks again.
4. Use special tool MD998767 to push the tensioner pulley into the timing belt, then temporarily tighten the center bolt.
5. Use special tool MD998769 to turn the crankshaft 1/4 turn counterclockwise, then turn it again clockwise until the timing marks are aligned.

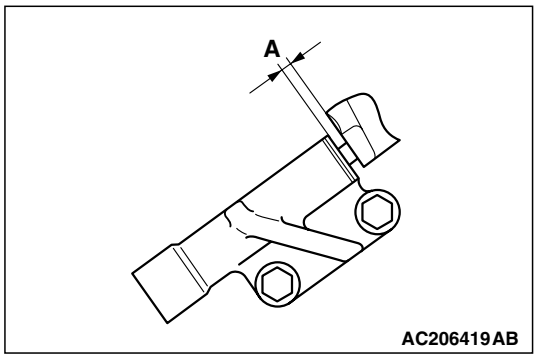


⚠ CAUTION
When tightening the center bolt, be careful that the tensioner pulley does not turn with the bolt.

6. Loosen the center bolt of the tensioner pulley. Use special tool MD998767 and a torque wrench to apply the tension torque to the timing belt as shown in the illustration. Then tighten the center bolt to the specified torque.
   Standard value: 4.4 N·m (39 in-lb) <Timing belt tension torque>
   Tightening torque: 48 ± 6 N·m (36 ± 4 ft-lb)

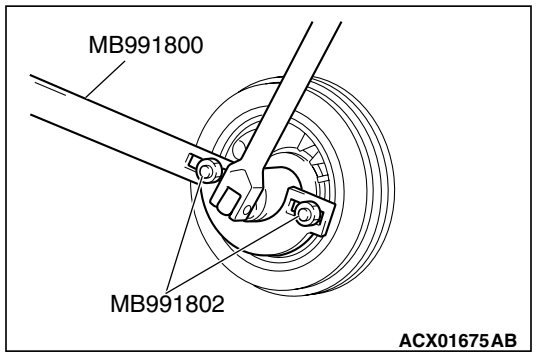


7. Remove the setting pin that has been inserted into the auto-tensioner.
8. Turn the crankshaft clockwise twice to align the timing marks.



9. Wait for at least five minutes, then check that the auto-tensioner pushrod extends within the standard value range.
   Standard value (A): 4.8 – 6.0 mm (0.19 – 0.24 inch)
10. If not, repeat the operation in steps 1 to 8 above.
11. Check again that the timing marks of the sprockets are aligned.

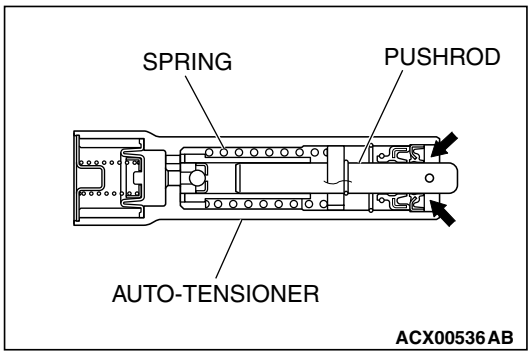
>>C<< CRANKSHAFT PULLEY INSTALLATION
Use special tools MB991800 and MB991802 to install the crankshaft pulley.



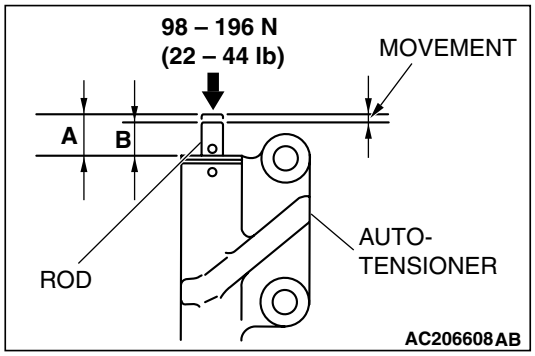
INSPECTION

M1112004400437

AUTO-TENSIONER ADJUSTER CHECK



1. Check for oil leak from seal, and replace it if leak is detected.
2. Check for wear or damage at the top of the rod. Replace it, if required.



3. While holding the auto-tensioner with your hand, press the end of the pushrod against a metal surface (such as the cylinder block) with a force of 98 – 196 N (22 – 44 pound) and measure how far the pushrod is pushed in.
   Standard value: Within 1 mm (0.04 inch)
   A: Length when no force is applied
   B: Length when force is applied
   A – B: Movement in
4. If the measured value is out of the standard value, replace the auto-tensioner adjuster.

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1111003800570

ITEM	SPECIFICATION
Camshaft and valve stem seal	
Camshaft position sensing cylinder bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Camshaft position sensor support bolt	14 ± 1 N·m (120 ± 13 in-lb)
Camshaft position sensor bolt	11 ± 1 N·m (98 ± 8 in-lb)
Camshaft sprocket bolt	88 ± 10 N·m (65 ± 7 ft-lb)
Ignition coil bolt	10 ± 2 N·m (89 ± 17 in-lb)
PCV valve	10 ± 2 N·m (89 ± 17 in-lb)
Rocker cover bolt	3.5 ± 0.5 N·m (31 ± 4 in-lb)
Rocker shaft bolt	31 ± 3 N·m (23 ± 2 ft-lb)
Thrust case bolt	19 ± 3 N·m (14 ± 2 ft-lb)
Camshaft oil seal	
Camshaft sprocket bolt	88 ± 10 N·m (65 ± 7 ft-lb)
Crankshaft oil seal	
A/T drive plate bolt	74 ± 1 N·m (55 ± 1 ft-lb)
Crankshaft position sensor bolt	8.5 ± 0.5 N·m (76 ± 4 in-lb)
Cylinder head gasket	
Camshaft sprocket bolt	88 ± 10 N·m (65 ± 7 ft-lb)

TSB Revision

ITEM		SPECIFICATION
Cylinder head bolt <Cold engine>		108 ± 5 N·m (80 ± 3 ft-lb) to 0 N·m (0 in-lb) to 108 ± 5 N·m (80 ± 3 ft-lb)
Grounding connecting bolt		22 ± 4 N·m (16 ± 3 ft-lb)
Ignition coil bolt		10 ± 2 N·m (89 ± 17 in-lb)
Power steering oil pump bracket connecting bolt		41 ± 8 N·m (30 ± 6 ft-lb)
Rocker cover bolt		3.5 ± 0.5 N·m (31 ± 4 in-lb)
Timing belt rear center cover bolt		14 ± 1 N·m (120 ± 13 in-lb)
Engine assembly		
Engine cover bolt		3.0 ± 0.5 N·m (27 ± 4 in-lb)
Engine front mounting bracket bolt	M10	58 ± 7 N·m (43 ± 5 ft-lb)
Engine front mounting bracket bolt and nut	M12	83 ± 12 N·m (61 ± 9 ft-lb)
Engine mounting stay bolt		41 ± 6 N·m (31 ± 4 ft-lb)
Grounding bolt		9.0 ± 2.0 N·m (80 ± 17 in-lb)
Grounding cable bolt		9.0 ± 2.0 N·m (80 ± 17 in-lb)
Power steering oil pump bolt		46 ± 8 N·m (34 ± 6 ft-lb)
Power steering oil pump nut		42 ± 7 N·m (31 ± 5 ft-lb)
Power steering pressure hose clamp bracket bolt		12 ± 2 N·m (102 ± 22 in-lb)
Power steering oil reservoir connecting bolt		12 ± 2 N·m (102 ± 22 in-lb)
Oil pan and oil screen		
Cover bolt		11 ± 0.5 N·m (93 ± 4 in-lb)
Engine oil dipstick bolt		14 ± 1 N·m (120 ± 13 in-lb)
Engine lower oil pan bolt		11 ± 1 N·m (97 ± 9 in-lb)
Engine oil pan drain plug		39 ± 5 N·m (29 ± 3 ft-lb)
Engine upper oil pan bolt		8.5 ± 3.5 N·m (76 ± 31 in-lb)
Engine upper oil pan to torque converter bolt		35 ± 5 N·m (26 ± 4 ft-lb)
Oil screen bolt		19 ± 3 N·m (14 ± 2 ft-lb)
Starter bolt		30 ± 3 N·m (23 ± 2 ft-lb)
Torque converter connecting bolt		49 ± 3 N·m (36 ± 2 ft-lb)
Timing belt		
Auto-tensioner bolt		23 ± 3 N·m (17 ± 2 ft-lb)
Connector bracket bolt		11 ± 1 N·m (98 ± 8 in-lb)
Crankshaft pulley center bolt		185 N·m (136 ft-lb)
Engine mounting stay bolt		41 ± 6 N·m (31 ± 4 ft-lb)
Engine support bracket bolt		45 ± 5 N·m (34 ± 3 ft-lb)
Tensioner arm bolt		44 ± 10 N·m (33 ± 7 ft-lb)
Tensioner bracket bolt		41 ± 8 N·m (30 ± 6 ft-lb)
Tensioner pulley bolt		48 ± 6 N·m (36 ± 4 ft-lb)
Tensioner pulley nut		49 ± 9 N·m (36 ± 7 ft-lb)
Timing belt lower cover bolt (bolt, flange)	M6	11 ± 1 N·m (98 ± 8 in-lb)

TSB Revision

ITEM		SPECIFICATION
Timing belt lower cover bolt (bolt, washer assembled)	M10	14 ± 1 N·m (120 ± 13 in-lb)
Timing belt front upper cover bolt (bolt, flange)	M6	11 ± 1 N·m (98 ± 8 in-lb)
	M8	14 ± 1 N·m (120 ± 13 in-lb)

SERVICE SPECIFICATIONS

M1111000301085

ITEM		STANDARD VALUE	LIMIT
Power steering drive belt tension (When checked)	Vibration frequency Hz	124 – 160	–
	Tension N (lb)	294 – 490 (66 – 110)	–
	Deflection (Reference value) mm (in)	12.3 – 16.2 (0.48 – 0.64)	–
Power steering drive belt tension (When adjusted)	Vibration frequency Hz (Reference)	134 – 151	–
	Tension N (lb)	343 – 441 (77 – 99)	–
	Deflection (Reference value) mm (in)	13.2 – 15.1 (0.52 – 0.59)	–
Power steering drive belt tension (When replaced)	Vibration frequency Hz (Reference)	160 – 189	–
	Tension N (lb)	490 – 686 (110 – 154)	–
	Deflection (Reference value) mm (in)	9.6 – 12.3 (0.38 – 0.48)	–
Generator drive belt tension (When checked)	Vibration frequency Hz	143 – 169	–
	Tension N (lb)	490 – 686 (110 – 154)	–
	Deflection (Reference value) mm (in)	8.4 – 10.7 (0.33 – 0.42)	–
Generator drive belt tension (When adjusted)	Vibration frequency Hz (Reference)	150 – 163	–
	Tension N (lb)	539 – 637 (121 – 143)	–
	Deflection (Reference value) mm (in)	8.9 – 10.1 (0.35 – 0.40)	–
Generator drive belt tension (When replaced)	Vibration frequency Hz (Reference)	180 – 202	–
	Tension N (lb)	785 – 981 (176 – 221)	–
	Deflection (Reference value) mm (in)	6.2 – 7.5 (0.24 – 0.30)	–
Basic ignition timing at idle		5°BTDC ± 3°	–
Actual ignition timing at curb idle		Approximately 10° BTDC	–
CO contents %		0.5 or less	–
HC contents ppm		100 or less	–
Curb idle speed r/min		680 ± 100	–
Compression pressure (200 r/min) kPa (psi)		1,550 (225)	Minimum 1,110 (161)

TSB Revision

ITEM	STANDARD VALUE	LIMIT
Compression pressure difference of all cylinder kPa (psi)	–	98 (14)
Intake manifold vacuum at curb idle kPa (in Hg)	–	Minimum 60 (18)
Auto-tensioner pushrod movement mm (in)	Within 1.0 (0.04)	–
Timing belt tension torque N·m (in-lb)	4.4 (39)	–
Auto tensioner rod protrusion amount mm (in)	4.8 – 6.0 (0.19 – 0.24)	–

SEALANTS

M1111000500365

ITEM	SPECIFIED SEALANT
Engine oil pan	3M™ AAD Part No.8672, 8704, 3M™ AAD Part No.8679/8678 or equivalent

GROUP 12

ENGINE LUBRICATION

CONTENTS

GENERAL DESCRIPTION

M1121000100603

The lubrication method is a fully force-fed, full-flow filtration type.

ITEM		SPECIFICATION
Oil pump type	2.4L Engine	Involute gear type
	3.8L Engine	Trochoid type
Drive method		Crankshaft

ENGINE OILS

⚠ ***WARNING***

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

Recommended Precautions

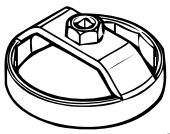
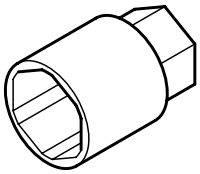
The most effective precaution is to prevent, as far as practical, the risk of skin contact with mineral oils i.e. use enclosed systems for handling used engine oil and degrease components, where practical, before handling them.

Other precautions:

- Avoid prolonged and repeated contact with oil, particularly used engine oil.
- Wear protective clothing, including impervious gloves where practical.
- Avoid contaminating clothes with oil.
- Do not put oily rags in pockets.
- Do not wear heavily soiled clothing and oil-soaked foot-wear. Overalls must be cleaned regularly and kept separate from personal clothing.
- Where there is a risk of eye contact, eye protection should be worn i.e. chemical goggles or face shields. In addition, an eye wash facility should be provided.
- Obtain first aid treatment immediately for open cuts and wounds.
- Wash regularly with soap and water to ensure all oil is removed (skin cleansers and nail brushes will help). After cleaning, apply lotion, etc., containing lanolin to replace natural skin oils is advised.
- Do not use gasoline, kerosene, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- Apply barrier creams before each work period.
- If skin disorders develop, obtain medical advice immediately.

SPECIAL TOOLS

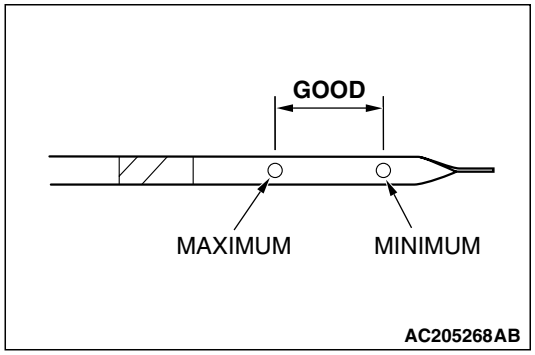
M1121000600705

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991610	MB991610 Oil filter wrench	General service tool	Removal and installation of engine oil filter (when using oil filter MD356000)
	MD998012 Engine oil pressure switch wrench	General service tool	Removal and installation of engine oil pressure switch

ON-VEHICLE SERVICE

ENGINE OIL CHECK

M1121000900397



1. Pull out the oil dipstick slowly and check that the oil level is within the marks on the oil dipstick.
2. Check that the oil is not excessively dirty, that there is no coolant or gasoline mixed in, and that it is sufficiently thick and slippery.

ENGINE OIL REPLACEMENT

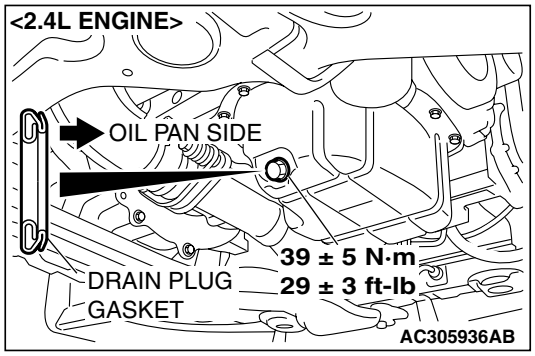
M1121001000892

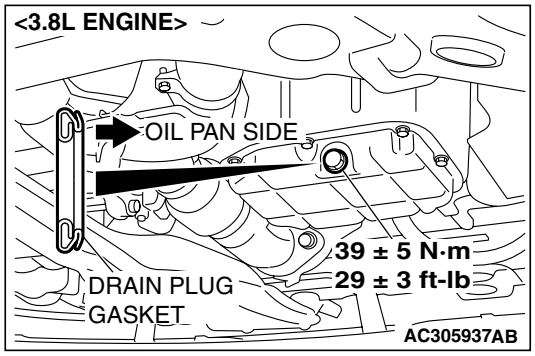
1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80 – 90°C (176 – 194°F).

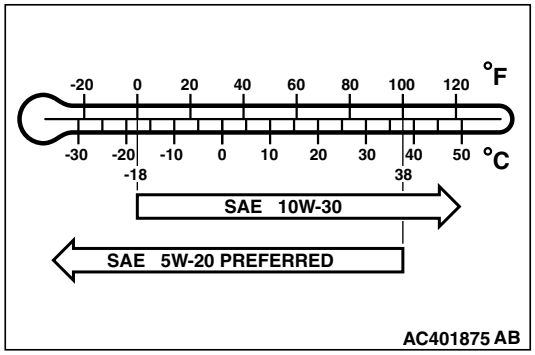
⚠ WARNING
Use care as oil could be hot.

2. Remove the engine oil filler cap.
3. Remove the drain plug to drain oil.
4. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.

   Tightening torque: 39 ± 5 N·m (29 ± 3 ft-lb)







5. Refill the specified quantity of oil.

   Specified Engine Oil: Engine oils displaying ILSAC certification symbol ("Starburst" symbol) or conforming to the API classification SL, SL/CF or higher

   Total quantity:

   <2.4L Engine> 4.3 dm^3 (4.5 quarts)

   <3.8L Engine> 4.6 dm^3 (4.9 quarts)

   NOTE: SAE 5W-20 engine oil is strongly recommended for optimum fuel economy and cold starting. If the ambient temperature is not within the usable temperature range of SAE 5W-30 shown in the above illustration, use SAE 10W-30 engine oil.
6. Install the engine oil filler cap.
7. Check oil level.

ENGINE OIL FILTER REPLACEMENT

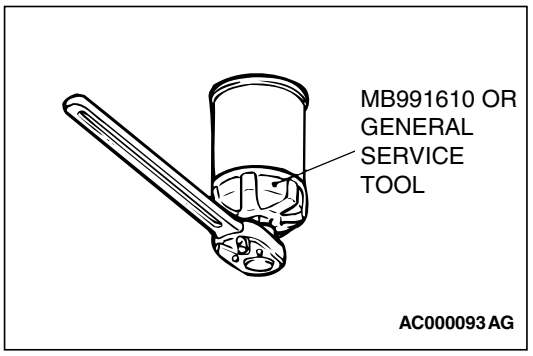
M1121001100424

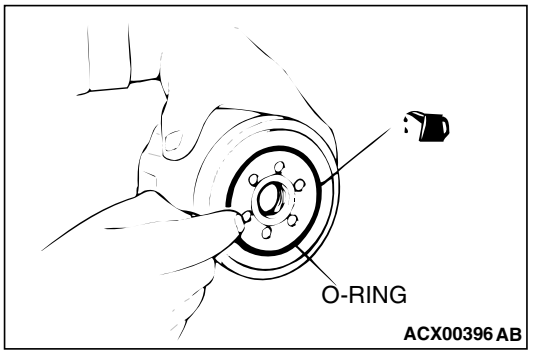
Required Special Tool:
MB991610: Oil Filter Wrench

1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80 – 90°C (176 – 194°F).

⚠ WARNING
Use care as oil could be hot.

2. Remove the engine oil filler cap.
3. Remove the drain plug to drain oil.
4. Use an oil filter wrench to remove the engine oil filter.
5. Clean the filter bracket side mounting surface and ensure the old O-ring has been removed.





6. Apply a small amount of engine oil to the O-ring of the new oil filter.
7. Screw on the oil filter by hand until it touches the surface of the flange and then tighten it with an oil filter wrench.

NUMBER	ENGINE	SPECIAL TOOL	TIGHTENING TORQUE
MD136466, MD322508	2.4L	General service tool	Approximately 3/4 turn [17 ± 3 N·m (13 ± 2 ft-lb)]
MD356000		MB991610 or equivalent	Approximately 3/4 turn [14 ± 2 N·m (124 ± 18 in-lb)]
MD352627, MD321589	3.8L	General service tool	Approximately one turn [14 ± 2 N·m (124 ± 18 in-lb)]

8. Install the drain plug and refill engine oil (Refer to Engine Oil Replacement P.12-3).
9. Rev the engine a few times, and check to be sure that no engine oil leaks at the oil filter.

ENGINE OIL PRESSURE CHECK

M1121002300863

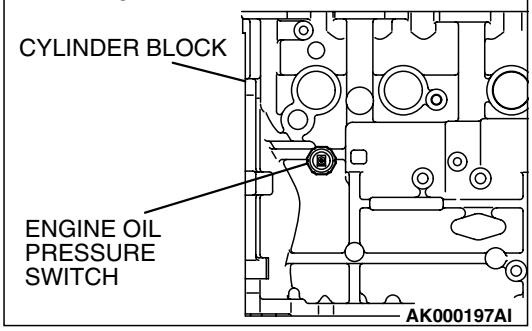
Required Special Tool:
MD998012: Engine Oil Pressure Switch Wrench

1. Check engine oil quantity.

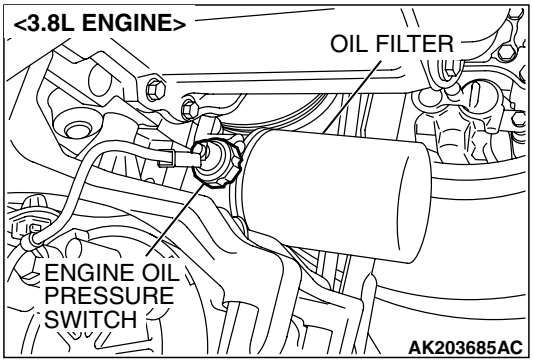
⚠ CAUTION
Since sealant is applied to the thread of the engine oil pressure switch, take care not to damage the engine oil pressure switch when removing it.

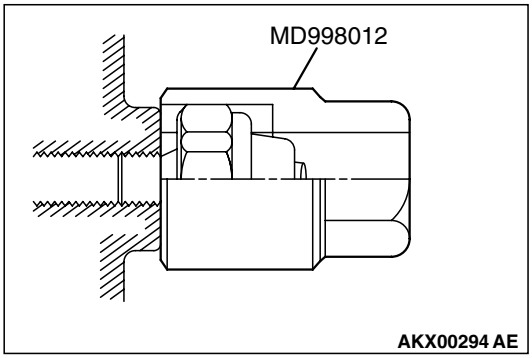
2. Use special tool MD998012 to remove the engine oil pressure switch.
   NOTE: Remove the terminal of oil pressure switch where special tool MD998012 is not fitted.
3. Install the engine oil pressure gauge.
   NOTE: Use a 1/8 pipe thread adapter.
4. Run the engine to warm it.
5. After the engine has been warmed up, check that engine oil pressure is within the standard value.
   Standard value:
   At idle: 29 kPa (4.2 psi) or more
   At 3,500 r/min: 294 – 686 kPa (43 – 100 psi)
6. Remove the engine oil pressure gauge.

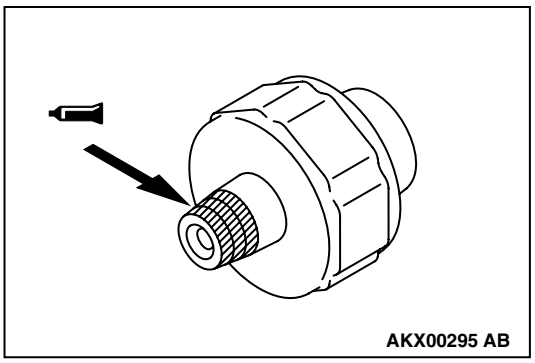
<2.4L ENGINE>



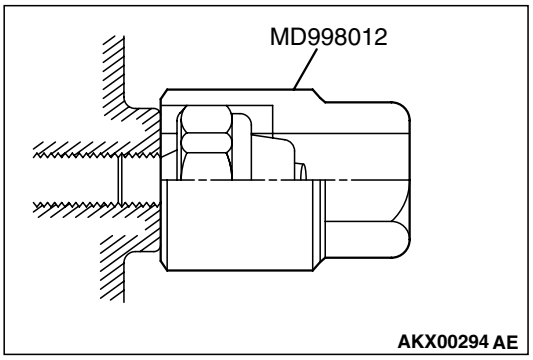
<3.8L ENGINE>






AKX00295 AB

7. Apply the specified sealant 3M™ AAD Part number 8672 or equivalent to the threads of the engine oil pressure switch.



AKX00294 AE

⚠ CAUTION
Do not start the engine within one hour after the engine engine oil pressure switch has been installed.

8. Use special tool MD998012 to tighten the engine oil pressure switch to the specified torque.

Tightening torque:
<2.4L ENGINE> 19 ± 3 N·m (14 ± 2 ft-lb)
<3.8L ENGINE> 10 ± 2 N·m (87 ± 17 in-lb)

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1121002200305

ITEM		SPECIFICATION
Engine oil filter	MD352627, MD321589, MD356000	14 ± 2 N·m (124 ± 18 in-lb)
	MD136466, MD322508	17 ± 3 N·m (13 ± 2 ft-lb)
Engine oil pan drain plug		39 ± 5 N·m (29 ± 3 ft-lb)
Engine oil pressure switch	2.4L Engine	19 ± 3 N·m (14 ± 2 ft-lb)
	3.8L Engine	10 ± 2 N·m (87 ± 17 in-lb)

SERVICE SPECIFICATIONS

M1121000300221

ITEM		STANDARD VALUE
Engine oil pressure kPa (psi)	at idle	29 (4.2) or more
	at 3,500 r/min	294 – 686 (43 – 100)

SEALANT

M1121000500225

ITEM	SPECIFIED SEALANT
Engine oil pressure switch	3M™ AAD Part No. 8672 or equivalent

LUBRICANT

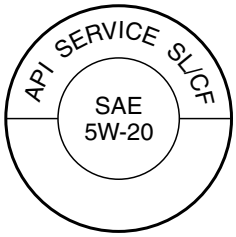
M1121000400875

ITEM		ENGINE OIL	QUANTITY dm^3 (qt)
Oil filter		Engine oils displaying ILSAC certification symbol ("Starburst" symbol) or conforming to the API classification SL, SL/CF or higher	0.3 (0.32)
Total quantity	2.4 L Engine		4.3 (4.5)
	3.8 L Engine		4.6 (4.9)

ILSAC CERTIFICATION SYMBOL ("STARBURST" SYMBOL)

ACX00394AJ

API SERVICE SYMBOL



AC401876 AB

ENGINE OIL

⚠ CAUTION

Never use nondetergent or straight mineral oil.

Use only engine oils displaying the ILSAC certification symbol ("Starburst" symbol) on the container.

If these oils are not available, an API classification SL, SL/CF or higher can be used.

GROUP 13

FUEL

CONTENTS

GROUP 13C

FUEL SUPPLY

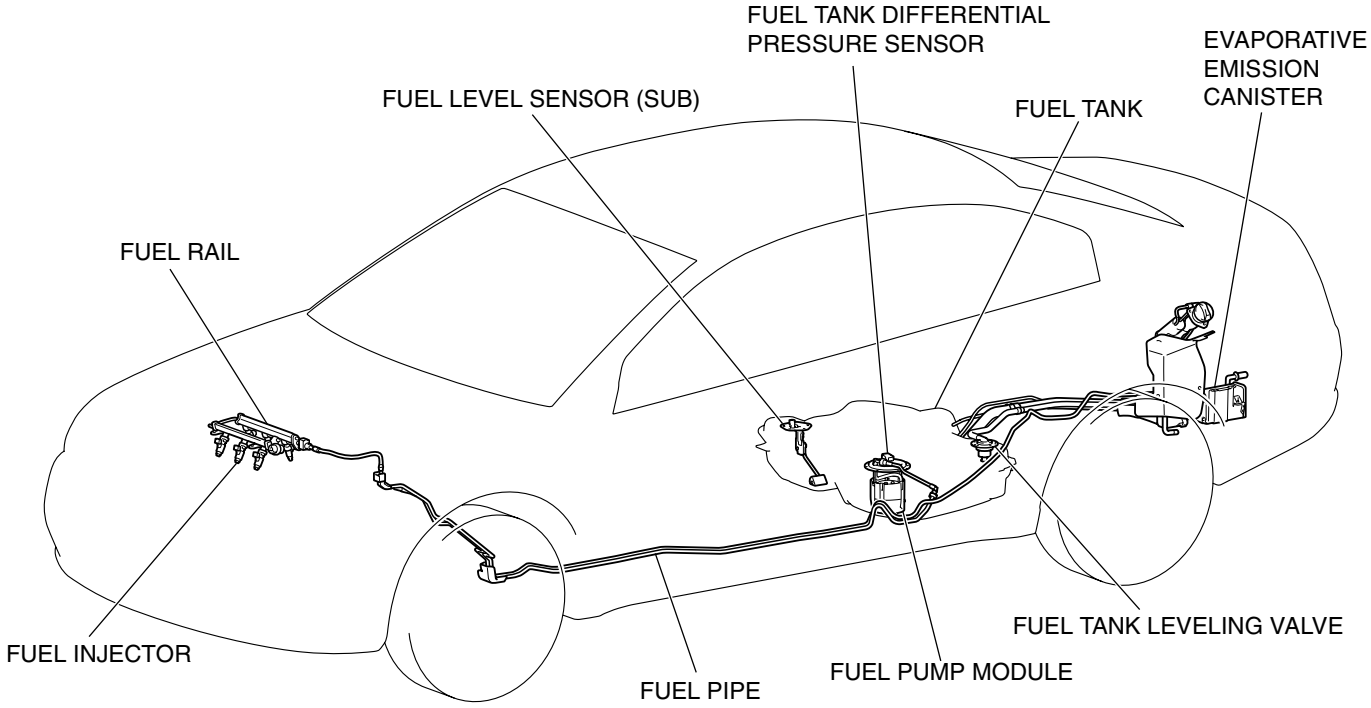
CONTENTS

GENERAL DESCRIPTION

M1135000100662

- The fuel tank is located under the floor below the rear seats.
- A fuel cut-off valve is utilized to prevent fuel from leaking out in the event of a collision.
- A fuel pump module, including fuel pump, fuel filter, reservoir and fuel level sensor, is used to lighten weight and improve serviceability.

CONSTRUCTION DIAGRAM



AC500474 AB

FUEL SUPPLY DIAGNOSIS

INTRODUCTION

M1135004000388

The fuel system is used to supply an appropriate fuel mixture to the engine. The system consists of the fuel tank, fuel filter, fuel pump and fuel pipes. An evaporative emission system is provided to prevent evaporated fuel from escaping into the atmosphere.

Engine malfunctions caused by insufficient fuel supply and evaporative emission system operation malfunctions can be caused by faults in the vapor line, fuel pipe, hose, or fuel tank pressure control valve, etc.

TROUBLESHOOTING STRATEGY

M1135004100277

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to find most of the fuel supply faults.

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

SYMPTOM PROCEDURES

M1135004800339

INSPECTION PROCEDURE 1 : Engine Malfunctions Due to Insufficient Fuel Supply

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Injector failed.
- Open or shorted injector circuit, or loose connector.
- Bent, twisted or clogged fuel pipe or hose.
- Malfunction of the fuel pump module.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

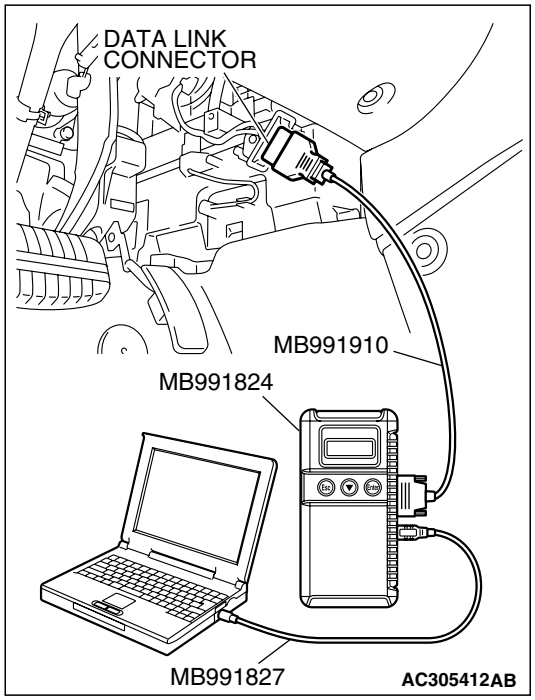
⚠ CAUTION

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 MB991910 to special tool MB991824.
(5) Connect special tool MB991910 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 M.U.T.-III system on the personal computer.
(8) Turn the ignition switch to the "ON" position.
(9) Select "Interactive Diagnosis" from the start-up screen.
(10) Select "System select."
(11) Choose "MFI" from the "POWER TRAIN" tab.
(12) Select "MITSUBISHI."
(13) Select "Diagnostic Trouble Code."
(14) If a DTC is set, it is shown.



Q: Is the DTC set?

YES : Refer to GROUP 13A - Diagnostic Trouble Code Chart <2.4L Engine>P.13A-45 , Refer to GROUP 13B - Diagnostic Trouble Code Chart <3.8L Engine>P.13B-46 .

NO : Turn the ignition switch to the "LOCK" (OFF) position, and then remove scan tool MB991958 in the reverse order of installation. Go to Step 2.

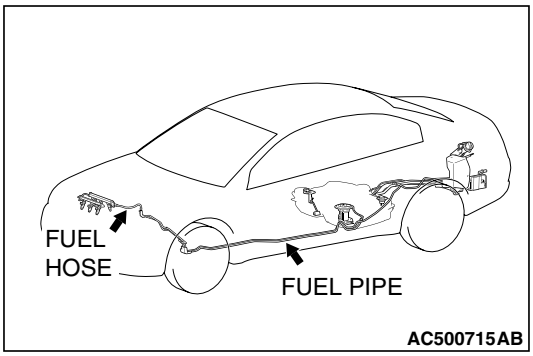
TSB Revision

STEP 2. Check the fuel pressure.
Release residual pressure from the fuel line to prevent fuel spray. Refer to GROUP 13A - Fuel Pressure Test <2.4L Engine>P.13A-1163 , Refer to GROUP 13B - Fuel Pressure Test <3.8L Engine>P.13B-1427 .

Q: Is the fuel pressure in good condition?

YES : Go to Step 5.
NO : Repair or replace. Then go to Step 3.

STEP 3. Check for bending, twisting or clogging of the fuel pipe or hose.



Q: Are the fuel pipe and hose in good condition?

YES : Go to Step 4.
NO : Repair or replace. Then go to Step 6.

STEP 4. Check the fuel pump module operation.
Refer to GROUP 13A - Fuel Pump Operation Check <2.4L Engine>P.13A-1166 , Refer to GROUP 13B - Fuel Pump Operation Check <3.8L Engine>P.13B-1431 .

Q: Is the fuel pump module operation in good condition?

YES : Then go to Step 5.
NO : Replace (Refer to P.13C-9). Then go to Step 6.

STEP 5. Check the inside of the fuel tank for contamination and rust.
(1) Drain fuel.
(2) Remove the fuel tank (Refer to P.13C-9).

Q: Is the fuel tank in good condition?

YES : Go to Step 6.
NO : Replace the fuel filter, and clean the fuel tank and fuel line. Then go to Step 6.

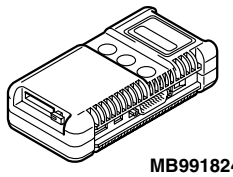
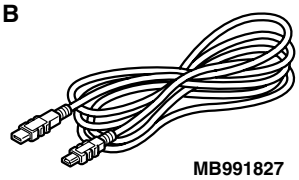
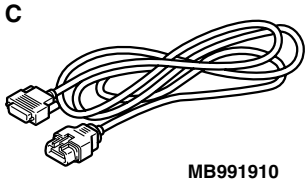
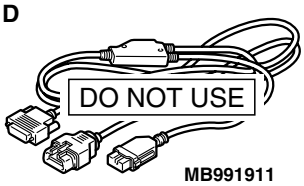
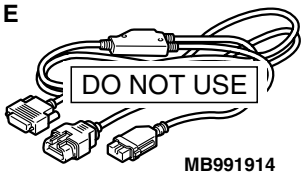
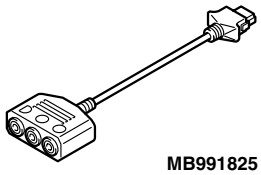
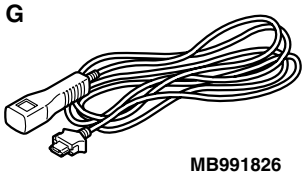
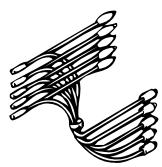
STEP 6. Retest the system.

Q: Is the engine malfunction eliminated?

YES : The procedure is complete.
NO : Return to Step 1.

SPECIAL TOOLS

M1135000600300

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III sub assembly A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III main harness C (for Daimler Chrysler models only) F: M.U.T.-III measurement adapter G: M.U.T.-III trigger harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.*	Checking diagnostic trouble codes **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**
 MB991658	MB991658 Test harness set	Tool not available	Fuel tank differential pressure sensor check

ON-VEHICLE SERVICE

FUEL LEVEL SENSOR CHECK

M1135005300069

Refer to GROUP 54A - Combination Meter, On-vehicle Service, Fuel Level Sensor Check P.54A-121.

FUEL LEVEL SENSOR REPLACEMENT

M1135005600059

Refer to P.13C-9.

FUEL PUMP OPERATION CHECK

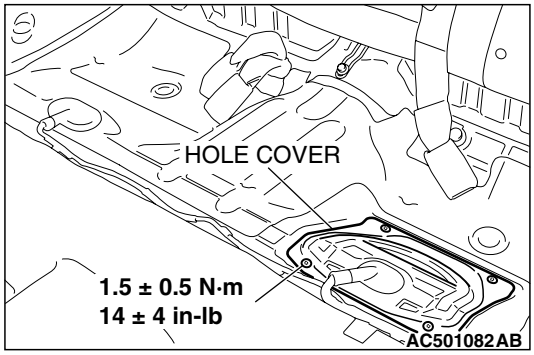
M1135001000152

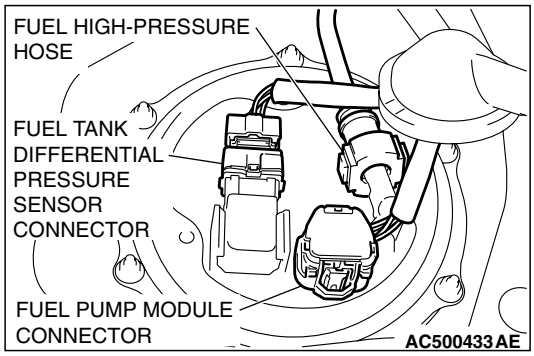
<2.4L Engine>: Refer to GROUP 13A - On-vehicle Service, Fuel Pump Operation Check P.13A-1166.
<3.8L Engine>: Refer to GROUP 13B - On-vehicle Service, Fuel Pump Operation Check P.13B-1431.

FUEL PUMP MODULE REPLACEMENT

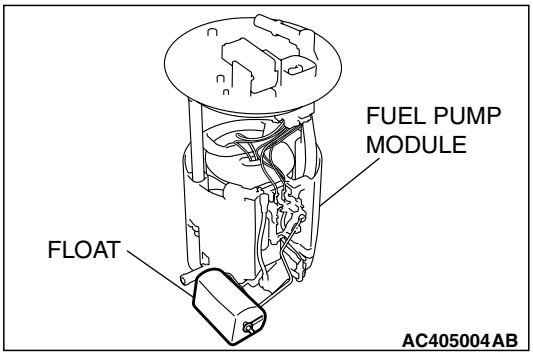
M1135004900596

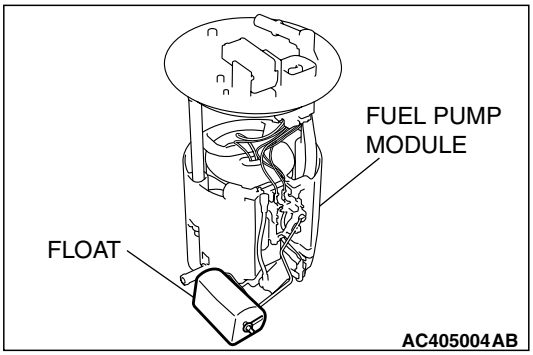
1. Remove the rear seat cushion assembly. (Refer to GROUP 52A, Rear Seat Assembly P.52A-45.)
2. Remove the hole cover.

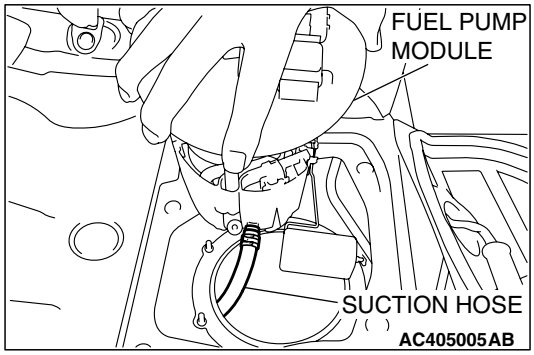


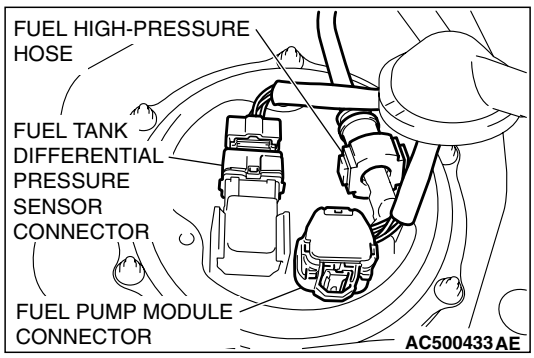


3. Disconnect the fuel pump module connector, fuel tank differential pressure sensor connector and fuel high-pressure hose.
4. Remove the mounting nuts and plate, and remove the fuel pump module from the fuel tank.









⚠ CAUTION

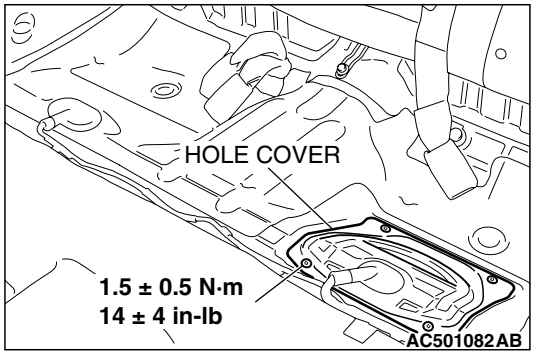
- **When removing the fuel pump module from the fuel tank, be careful not to spill the fuel remaining in the fuel pump module.**
- **When withdrawing the fuel pump module from the fuel tank, be careful not to damage the module unit and the float.**

5. Drain the fuel remaining in the fuel pump module while removing the fuel pump module from the service hole.
6. Disconnect the suction hose and remove the fuel pump module from the fuel tank.
7. Replace the packing with a new one.

⚠ CAUTION

When installing the fuel pump module into the fuel tank, be careful not to damage the module unit and the float.

8. Connect the suction hose to the fuel pump module, and install the fuel pump module to the fuel tank whilst ensuring that the suction hose is not kinked.
9. Install the plate to the fuel tank.
10. Connect the fuel pump module connector, fuel tank differential pressure sensor connector and fuel high-pressure hose connection.



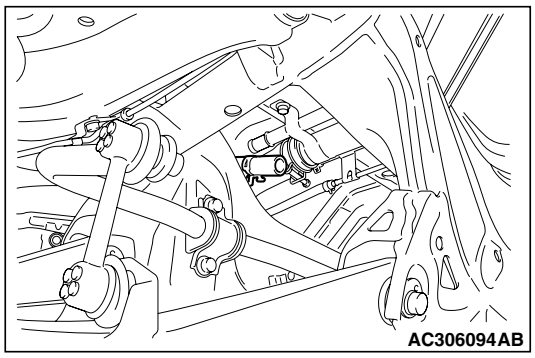
11. Install the hole cover.

    Tightening torque: 1.5 ± 0.5 N·m (14 ± 4 in-lb)

12. Install the rear seat cushion assembly. (Refer to GROUP 52A, Rear Seat Assembly P.52A-45.)

LEVELING VALVE CHECK

M1135004300129



1. Place a drain pan, and disconnect the fuel leveling hose at pipe side.

   NOTE: If fuel leaks from the fuel leveling hose at this stage, the leveling valve may be defective.

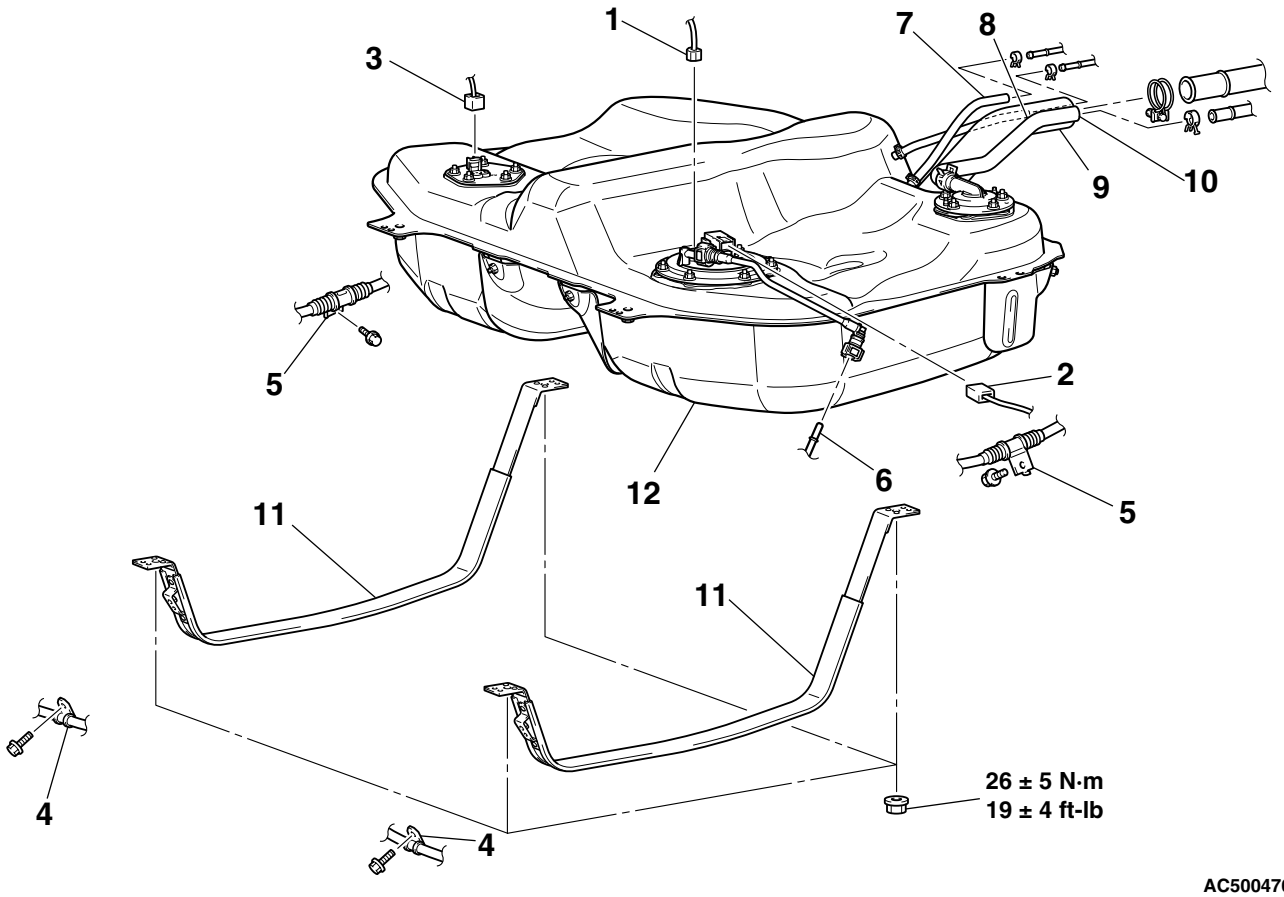
2. Open the fuel cap, and fill the fuel tank up.
3. If fuel does not leak from the fuel tank filler leveling hose with the fuel tank full, the leveling valve is normal. If not so, the leveling valve may be defective. Lower the fuel tank from the vehicle and replace the valve.
4. Reconnect the fuel leveling hose at the pipe side.

FUEL TANK

REMOVAL AND INSTALLATION

M1135001900940

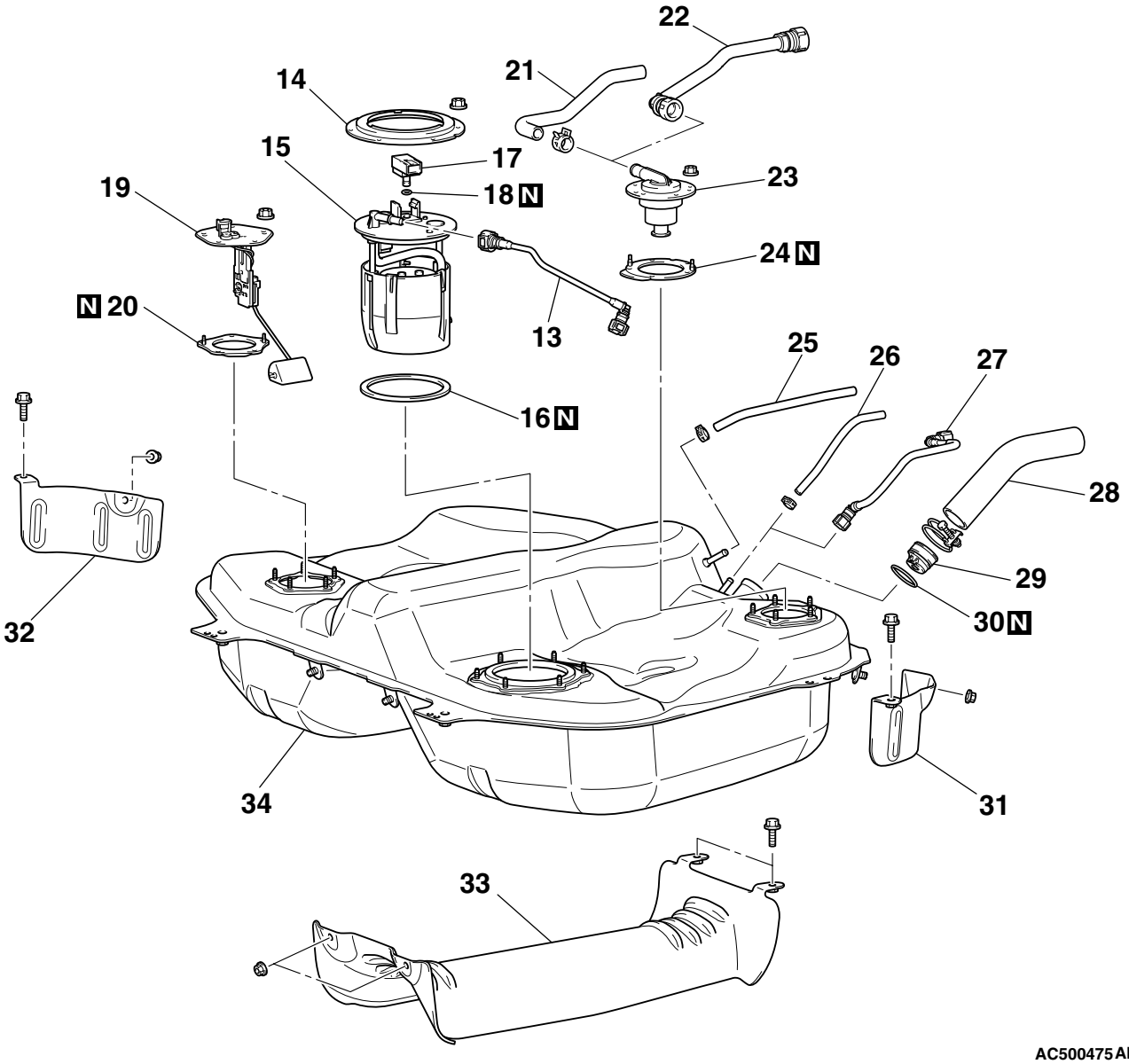
Pre-removal Operation	Pre-installation Operation
• Draining Fuel • Fuel Pump Connector Disconnection (How to Reduce Fuel Pressure) (Refer to GROUP 13A - On-vehicle Service P.13A-1166). • Center Exhaust Pipe Removal (Refer to GROUP 15 P.15-32).	• Center Exhaust Pipe Installation (Refer to GROUP 15 P.15-32). • Refilling Fuel • Checking for Fuel Leaks



AC500476AB

		FUEL TANK REMOVAL STEPS
<<A>>	1.	FUEL PUMP MODULE CONNECTOR CONNECTION
<<A>>	2.	FUEL TANK DIFFERENTIAL PRESSURE SENSOR CONNECTOR CONNECTION
<<B>>	3.	FUEL LEVEL SENSOR (SUB) CONNECTOR CONNECTION
	4.	PARKING BRAKE CABLE CLAMP CONNECTION
	5.	PARKING BRAKE CABLE CLAMP CONNECTION
<<C>> >>A<<	6.	FUEL HIGH-PRESSURE HOSE CONNECTION
	7.	FUEL TANK VAPOR HOSE C CONNECTION
	8.	FUEL TANK VAPOR HOSE B CONNECTION
	9.	FUEL FILLER HOSE CONNECTION
	10.	FUEL VAPOR HOSE A CONNECTION
<<D>> >>D<<	11.	FUEL TANK BAND
<<D>> >>D<<	12.	FUEL TANK ASSEMBLY

TSB Revision



AC500475AB

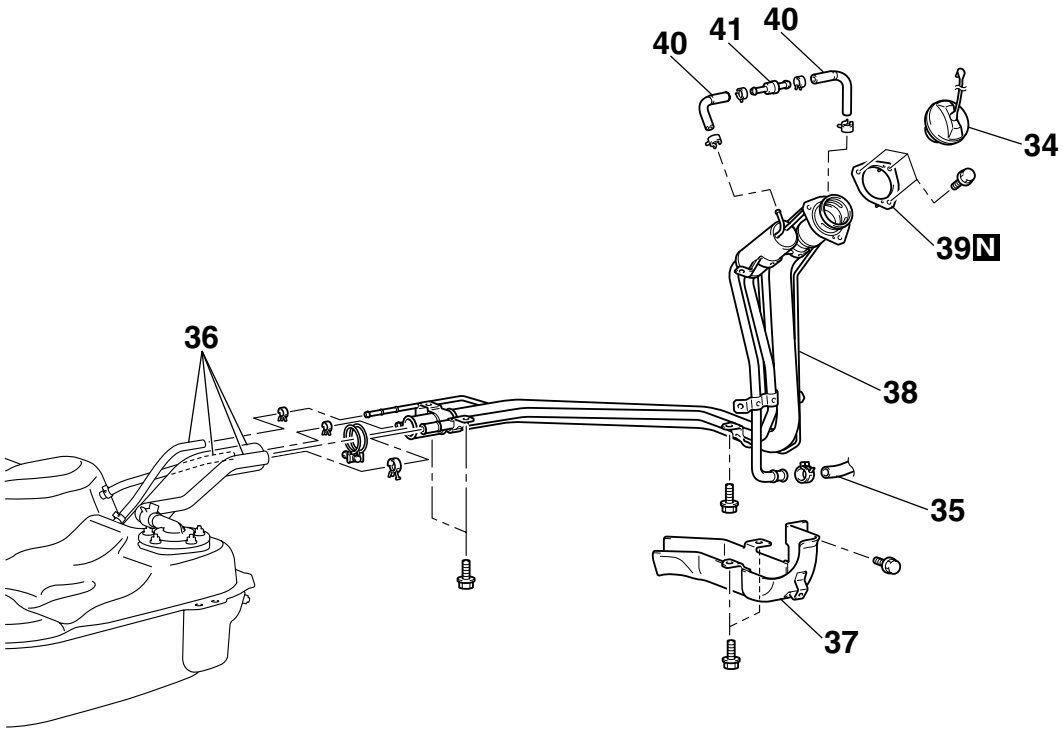
FUEL TANK REMOVAL STEPS

>>A<< 13. FUEL HIGH-PRESSURE HOSE
14. PLATE
<<E>> >>C<< 15. FUEL PUMP MODULE
16. PACKING
17. FUEL TANK DIFFERENTIAL PRESSURE SENSOR
18. O-RING
<<F>> >>B<< 19. FUEL LEVEL SENSOR (SUB)
20. PACKING
21. FUEL TANK VAPOR HOSE A <EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>
>>A<< 22. FUEL TANK VAPOR TUBE A <VEHICLES FOR CALIFORNIA EMISSION REGULATION>
23. LEVELING VALVE ASSEMBLY

FUEL TANK REMOVAL STEPS

24. PACKING
25. FUEL TANK VAPOR HOSE C
26. FUEL TANK VAPOR HOSE B <EXCEPT VEHICLES FOR CALIFORNIA EMISSION REGULATION>
>>A<< 27. FUEL TANK VAPOR TUBE B <VEHICLES FOR CALIFORNIA EMISSION REGULATION>
28. FUEL FILLER HOSE
29. FUEL SHUT-OFF VALVE
30. O-RING
31. FUEL TANK PROTECTOR (A)
32. FUEL TANK PROTECTOR (B)
33. FUEL TANK CENTER PROTECTOR
34. FUEL TANK

TSB Revision



AC306993AB

FUEL TANK FILLER TUBE REMOVAL STEPS

35. FUEL CAP
36. VAPOR HOSE CONNECTION
37. FUEL FILLER HOSE AND FUEL TANK VAPOR HOSE CONNECTION
38. FUEL TANK FILLER TUBE PROTECTOR

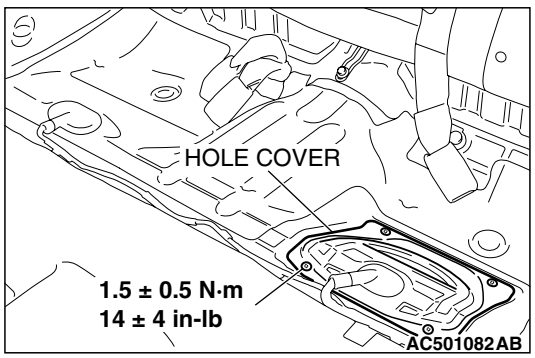
FUEL TANK FILLER TUBE REMOVAL STEPS (Continued)

39. FUEL TANK FILLER TUBE
40. FUEL TANK FILLER TUBE PACKING
41. FUEL TANK FILLER TUBE VAPOR HOSE
42. CHECK VALVE

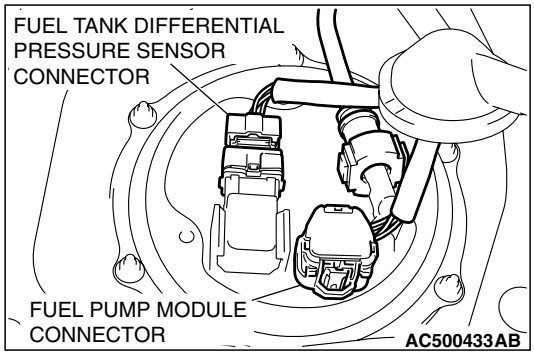
REMOVAL SERVICE POINTS

<<A>> FUEL PUMP MODULE CONNECTOR/FUEL TANK DIFFRENTIAL PRESSURE SENSOR CONNECTOR DISCONNECTION

1. Remove the rear seat cushion assembly. (Refer to GROUP 52A, Rear Seat Assembly P.52A-45.)
2. Remove the hole cover.

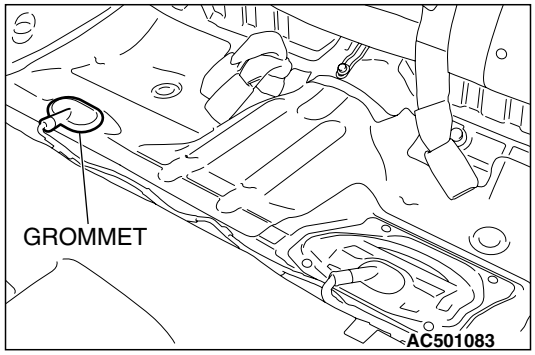


TSB Revision

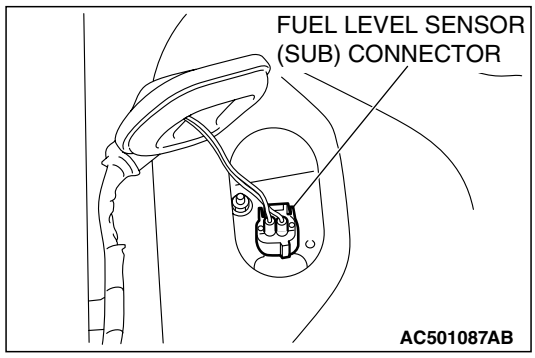


3. Disconnect the fuel pump module connector and fuel tank differential pressure sensor connector connection.

<<B>> FUEL LEVEL SENSOR (SUB) CONNECTOR DISCONNECTION



1. Remove the grommet.



2. Disconnect the fuel level sensor (sub) connector.

<<C>> FUEL HIGH-PRESSURE HOSE DISCONNECTION

⚠ CAUTION

As there will be some pressure remaining in the fuel pipe line, cover it with a shop towel to prevent fuel from spraying out.

<<D>> FUEL TANK ASSEMBLY/FUEL TANK BAND REMOVAL

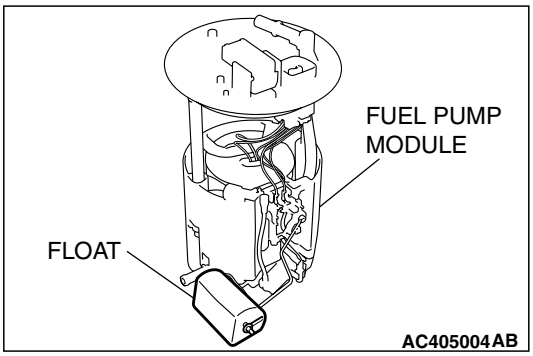
1. Support the fuel tank with a transaxle jack.
2. Remove the fuel tank band and fuel tank assembly as follows.
   (1) Remove the front securing nut of the fuel tank band.
   (2) Tilt the fuel tank assembly forward and lower it gradually to remove it.
   (3) Remove the fuel tank band.

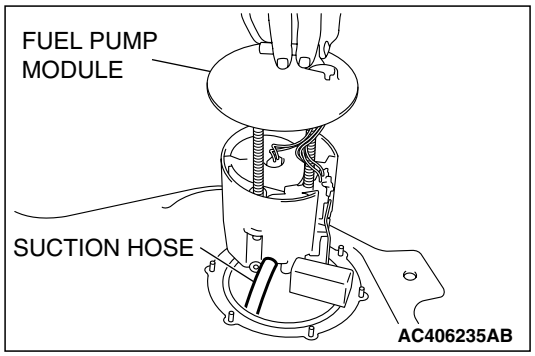
TSB Revision

<<E>> FUEL PUMP MODULE REMOVAL

⚠ CAUTION

- **When removing the fuel pump module from the fuel tank, be careful not to spill the fuel remaining in the fuel pump module.**
- **When withdrawing the fuel pump module from the fuel tank, be careful not to damage the module unit and the float.**



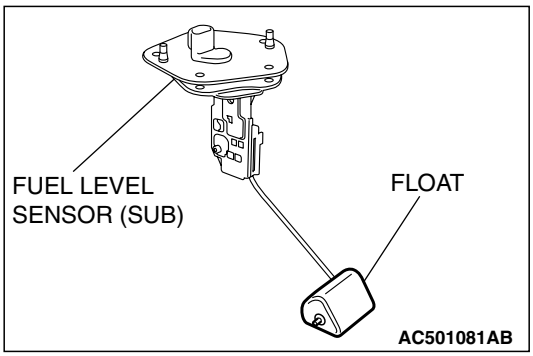


1. Drain the fuel remaining in the fuel pump module while removing the fuel pump module from the service hole.
2. Disconnect the suction hose and remove the fuel pump module from the fuel tank.

<<F>> FUEL LEVEL SENSOR (SUB) REMOVAL

⚠ CAUTION

When withdrawing the fuel level sensor (sub) from the fuel tank, be careful not to damage the sensor unit and the float.

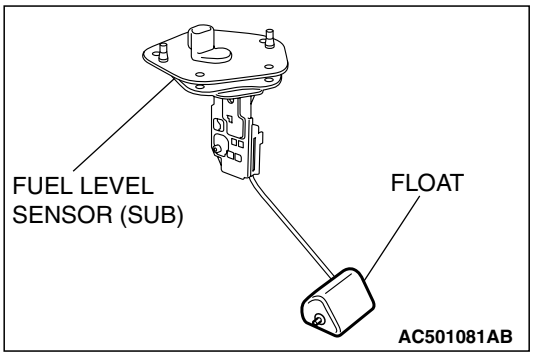


INSTALLATION SERVICE POINS

>>A<< FUEL TANK VAPOR TUBE B <VEHICLES FOR CALIFORNIA EMISSION REGULATION>/FUEL TANK VAPOR TUBE A <VEHICLES FOR CALIFORNIA EMISSION REGULATION>/FUEL HIGH-PRESSURE HOSE INSTALLATION

⚠ CAUTION

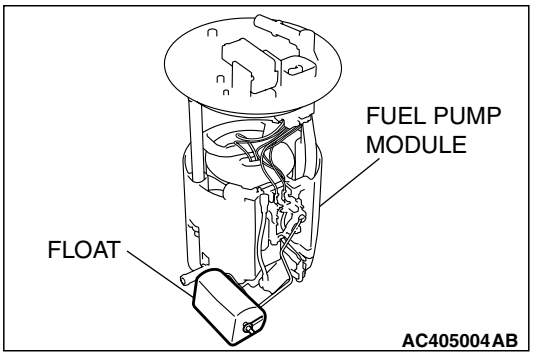
After installing, slightly pull the fuel high-pressure hose and ensure that there is no disengaged fuel high-pressure hose. Also confirm that there is approximately 3 mm (0.12 inch) play at this time.



>>B<< FUEL LEVEL SENSOR (SUB) INSTALLATION

⚠ CAUTION

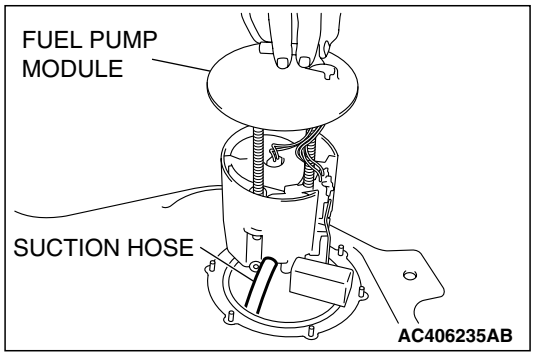
When inserting the fuel level sensor (sub) into the fuel tank, be careful not to damage the sensor unit and the float.



>>C<< FUEL PUMP MODULE INSTALLATION

⚠ CAUTION

- **When installing the fuel pump module into the fuel tank, be careful not to damage the module unit and the float.**
- **Check the fuel lever sensor moving part of the fuel pump module works smoothly and then install the fuel pump module into the fuel tank.**



1. Connect the suction hose to the fuel pump module.
2. Install the fuel pump module into the fuel tank.

>>D<< FUEL TANK BAND/FUEL TANK ASSEMBLY INSTALLATION

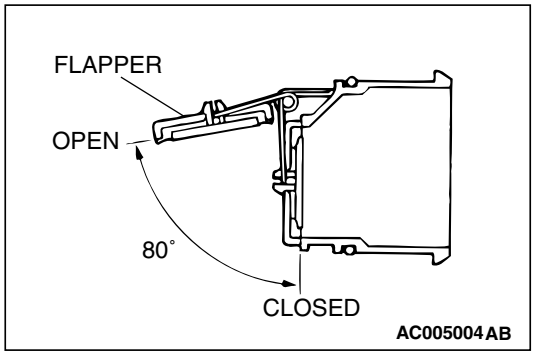
1. Raise the fuel tank assembly carefully with a transaxle jack.
2. Ensure that the fuel tank assembly does not interfere with surrounding parts. Then install the fuel tank band and tighten the mounting nuts to the specified torque.

   Tightening torque: 26 ± 5 N·m (19 ± 4 ft-lb)
3. Again, ensure that the fuel tank assembly does not interfere with surrounding components. If the fuel tank assembly interferes surrounding components, remove the fuel tank assembly and the tank band and reinstall them.

INSPECTION

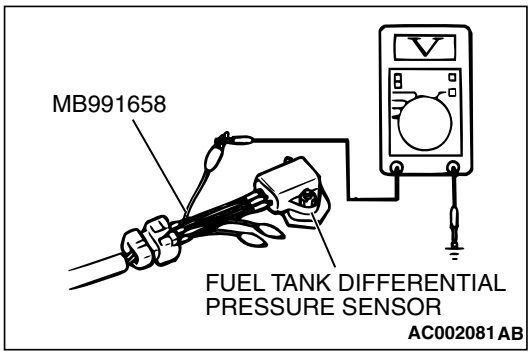
M1135002000241

TSB Revision



FUEL SHUT-OFF VALVE CHECK

Check that the flapper of the fuel shut-off valve opens and closes as shown in the illustration.



FUEL TANK DIFFERENTIAL PRESSURE SENSOR CHECK

Requird Special Tool:

- MB991658: Test Harness Set

1. Disconnect the fuel tank differential pressure sensor connector and connect special tool MB991658 between the terminals of the disconnected connector.
2. Turn the ignition switch to “ON” position and measure the voltage between terminal 1 and ground.

   Standard value: 2.0 – 3.0 V

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1135003900322

ITEM	SPECIFICATION
Fuel tank band nut	26 ± 5 N·m (19 ± 4 ft-lb)
Hole cover screw	1.5 ± 0.5 N·m (14 ± 4 in-lb)

SERVICE SPECIFICATION

M1135000300257

ITEM	STANDARD VALUE
Fuel tank differential pressure sensor output voltage V	2.0 – 3.0

GROUP 13D

TRACTION CONTROL SYSTEM (TCL)

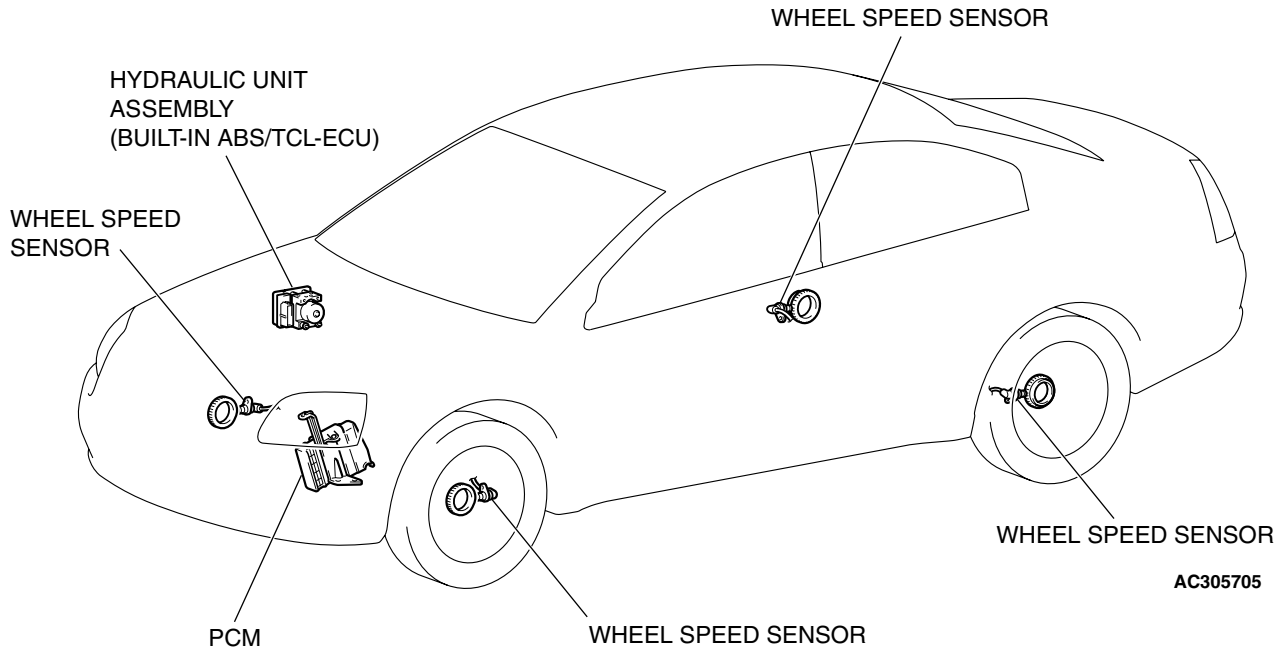
CONTENTS

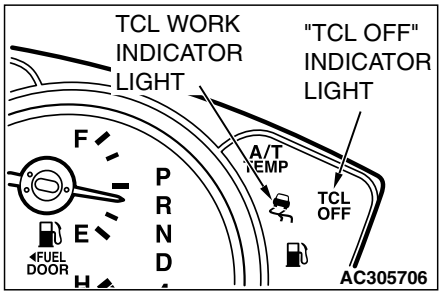
GENERAL DESCRIPTION

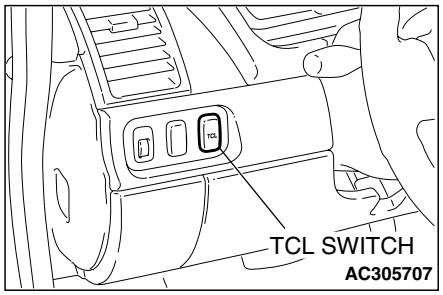
M1136000100029

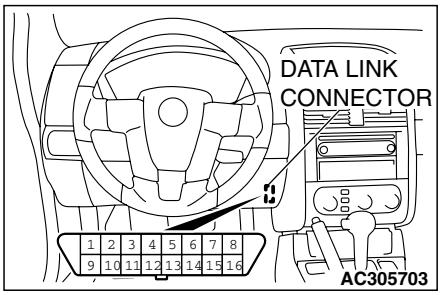
The traction control system (TCL) controls engine output to prevent the wheelspin of the drive wheels (front wheels) for improved stability.

CONSTRUCTION DIAGRAM









AC305708AB

TRACTION CONTROL SYSTEM (TCL) DIAGNOSIS

INTRODUCTION TO TRACTION CONTROL SYSTEM (TCL) DIAGNOSIS

M1136004600026

TCL Diagnostic Trouble Code Detection Conditions

TCL diagnostic trouble codes (TCL DTCs) are set under different conditions, depending on the malfunction detected. Most TCL DTCs will only be set during vehicle operation. Some TCL DTCs will also be set during the TCL self-check immediately after the engine is started. When you check if an TCL DTC will be displayed again after the DTC has been erased, you should recreate the TCL DTC set conditions. Depending on the detection timing and set conditions for the specific TCL DTC, you must either drive the vehicle or turn the engine off and restart it. To set the proper conditions for that DTC again, refer to "TCL DTC SET CONDITIONS" for each TCL DTC that you are trying to reset.

TROUBLESHOOTING STRATEGY

M1136003100062

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will check most of the possible causes of a TCL problem.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any TCL DTC. (Refer to P.13D-3, Diagnosis Function – How to Read and Erase Diagnostic Trouble Codes).
4. If you can verify the condition but no TCL DTCs are set, and the malfunction may be intermittent. (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14).
5. If you can verify the condition but there is no TCL DTCs, or the system cannot communicate with scan tool MB991958 (M.U.T.-III sub assembly), and find the fault. (Refer to P.13D-25, Symptom Chart).
6. If there is a TCL DTC, record the number of the code, then erase the code from vehicle memory using the scan tool MB991958 (M.U.T.-III sub assembly). (Refer to P.13D-3, Diagnosis Function – How to Read and Erase Diagnostic Trouble Codes).
7. Re-create the TCL DTC set conditions to see if the same TCL DTC will set again. (Refer to P.13D-3, Diagnosis Function – How to Read and Erase Diagnostic Trouble Codes).
   - If the same TCL DTC sets again, perform the diagnostic procedures for the set code. (Refer to P.13D-6, Diagnostic Trouble Code Chart).

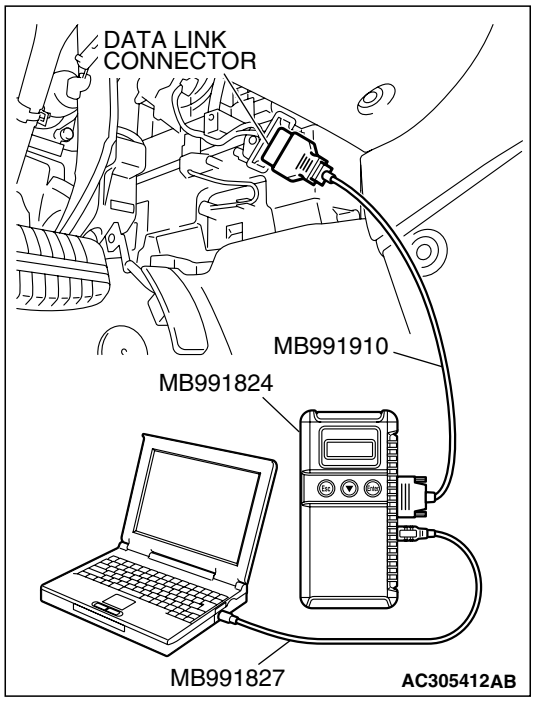
DIAGNOSIS FUNCTION

M1136003200025

HOW TO CONNECT THE SCAN TOOL (M.U.T.-III)

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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 MB991910 to special tool MB991824.
5. Connect special tool MB991910 to the data link connector.
6. Turn the power switch of special tool MB991824 to the "ON" position.

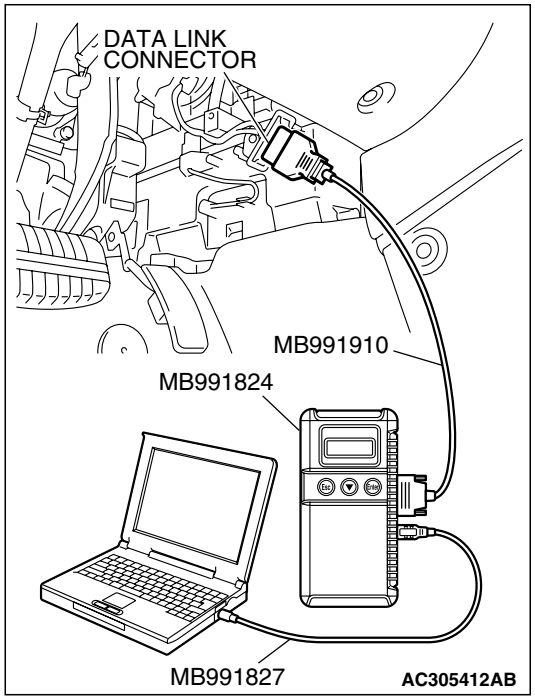
   NOTE: When special tool MB991824 is energized, special tool MB991824 indicator light will be illuminated in a green color.
7. Start the M.U.T.-III system on the personal computer.

   NOTE: Disconnect the 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 (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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.

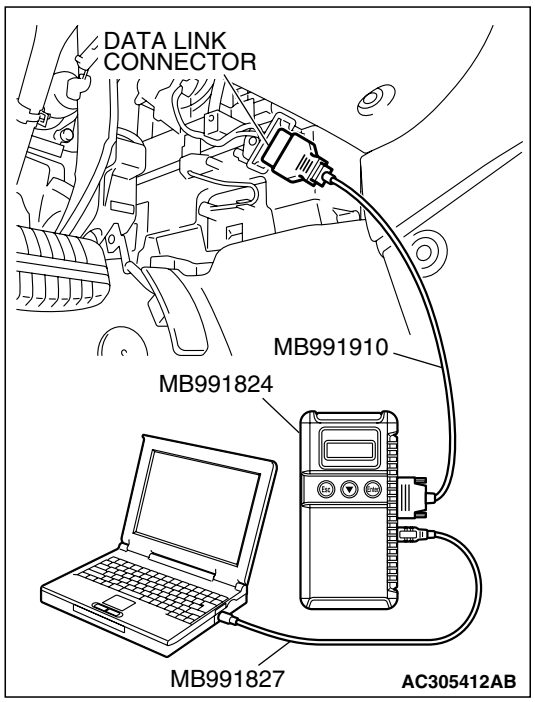
NOTE: If the battery voltage is low, diagnostic trouble codes will not be set. Check the battery if scan tool MB991958 does not display.

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 "TCL" from the "POWERTRAIN" tab.
6. Select "Diagnostic Trouble Code".
7. If a DTC is set, it is shown.
8. Choose "DTC erase" to erase the DTC.
9. Turn the ignition switch to the "LOCK" (OFF) position.
10. Disconnect scan tool MB991958.

HOW TO READ DATA LIST

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ CAUTION

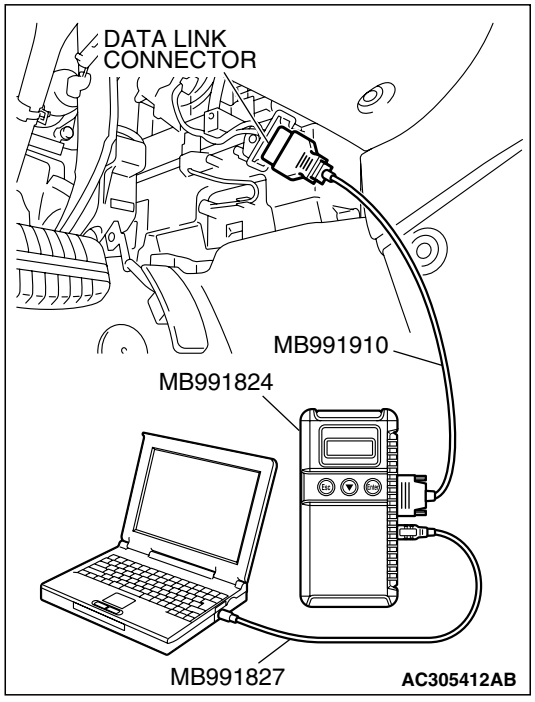
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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 "TCL" from the "POWERTRAIN" tab.
6. Select "Data List."
7. Choose an appropriate item.
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect scan tool MB991958.

HOW TO PERFORM ACTUATOR TEST

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ CAUTION

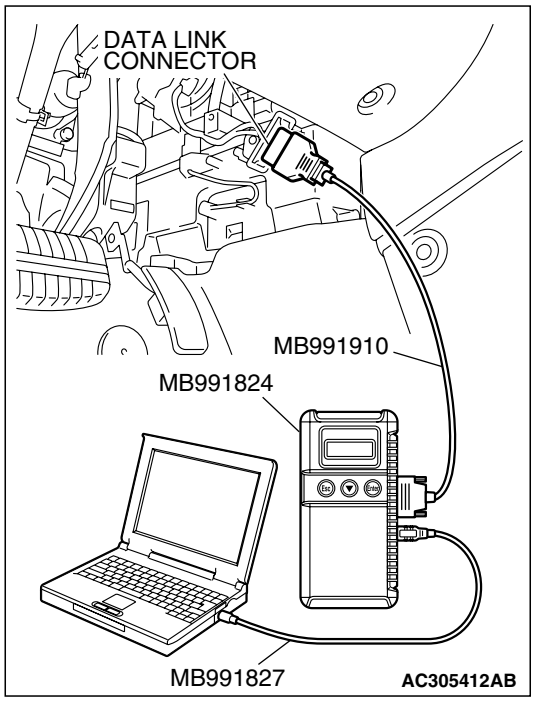
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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 "TCL" from the "POWERTRAIN" tab.
6. Choose "Actuator Test" from "TCL" screen.
7. Choose an appropriate item.
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect scan tool MB991958.

HOW TO DIAGNOSE THE CAN BUS LINE

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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 the "CAN bus diagnosis" from the start-up screen.
4. When the vehicle information is displayed, confirm that it matches the vehicle whose CAN bus lines will be diagnosed.
   - If the information is correct, go to step 8.
   - If not, go to step 5.
5. Select the "view vehicle information" button.
6. Enter the vehicle information and select the "OK" button.
7. When the vehicle information is displayed, confirm again that it matches the vehicle which is diagnosed CAN bus line.
   - If they match, go to step 8.
   - If not, go to step 5.
8. Press the "OK" button.
9. When the optional equipment screen is displayed, choose the one which the vehicle is fitted with, and then select the "OK" button.
10. Turn the ignition switch to the "LOCK" (OFF) position.
11. Disconnect scan tool MB991958.

DIAGNOSTIC TROUBLE CODE CHART

M1136003300022

⚠ CAUTION

During diagnosis, a DTC associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for DTC(s). If DTC(s) are set, erase them all.

Follow the inspection chart that is appropriate for the diagnostic trouble code.

DTC	INSPECTION ITEM	DIAGNOSTIC CONTENT	REFERENCE PAGE
C1200	Front right wheel speed sensor	Open circuit or short circuit	GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1200 P.35B-10
C1201	Front right wheel speed sensor	Abnormal output signal	GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1201 P.35B-26
C1205	Front left wheel speed sensor	Open circuit or short circuit	GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1205 P.35B-10
C1206	Front left wheel speed sensor	Abnormal output signal	GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1206 P.35B-26
C1210	Rear right wheel speed sensor	Open circuit or short circuit	GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1210 P.35B-10
C1211	Rear right wheel speed sensor	Abnormal output signal	GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1211 P.35B-26
C1215	Rear left wheel speed sensor	Open circuit or short circuit	GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1215 P.35B-10
C1216	Rear left wheel speed sensor	Abnormal output signal	GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1216 P.35B-26
C1226*	ABS front right solenoid inlet valve		-
C1231*	ABS front right solenoid outlet valve		-
C1236*	ABS front left solenoid valve inlet valve		-
C1241*	ABS front left solenoid valve outlet valve		-
C1246*	ABS rear right solenoid valve inlet valve		-
C1251*	ABS rear right solenoid valve outlet valve		-
C1256*	ABS rear left solenoid valve inlet valve		-
C1261*	ABS rear left solenoid valve outlet valve		-

TSB Revision

DTC	INSPECTION ITEM	DIAGNOSTIC CONTENT	REFERENCE PAGE
C1266*	ABS hydraulic unit motor stuck		-
C1273*	ABS hydraulic unit motor drive circuit stuck off		-
C1274*	ABS hydraulic unit motor drive circuit stuck on		-
C1278*	ABS solenoid valve power circuit stuck off		-
C1279*	ABS solenoid valve power circuit stuck on		-
C1395*	Brake fluid filling incompleted		-
C1396	Engine torque intervention refusal		P.13D-9
C1397	Transmission range switch failure		P.13D-11
C1607	ABS/TCL-ECU failure		GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1607 P.35B-62
C1860	ABS/TCL-ECU power supply	Abnormal rise in voltage	GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1860 P.35B-64
C1861	ABS/TCL-ECU power supply	Abnormal drop in voltage	GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures C1861 P.35B-64
U1073	CAN communications system bus off		GROUP 35B, ABS Diagnosis – Diagnostic Trouble Code Procedures U1073 P.35B-70
U1100	CAN communications system time out error engine related data		P.13D-13
U1101	CAN communications system time out error A/T related data		P.13D-17
U1120	CAN communications system TCL uncontrollable by engine malfunction		P.13D-21
U1400	Dynamic range error APS1		P.13D-25

*NOTE: Since the TCL is controlled with the same ABS/TCL-ECU used to control the ABS, the codes (with a *) used only for the ABS also appear.*

*The inspection contents for the codes (with a *) used only for the ABS do not described in this group.*

DIAGNOSTIC TROUBLE CODE PROCEDURES

C1396 Engine Torque Intervention Refusal

⚠ CAUTION

- **If DTC C1396 is set in the ABS/TCL-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect DTC may be set.**
- **Whenever the ABS/TCL-ECU is replaced, ensure that the communication circuit is normal.**

DTC SET CONDITIONS

This DTC is set when the refusal of torque intervention request is sent from PCM.

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

- Malfunction of the MFI system.
- Malfunction of the CAN bus line.
- Malfunction of the ABS/TCL-ECU.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code.

⚠ CAUTION

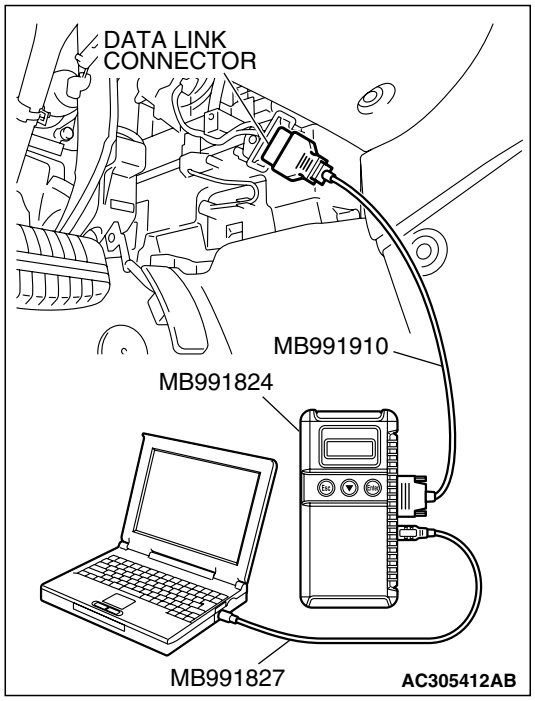
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

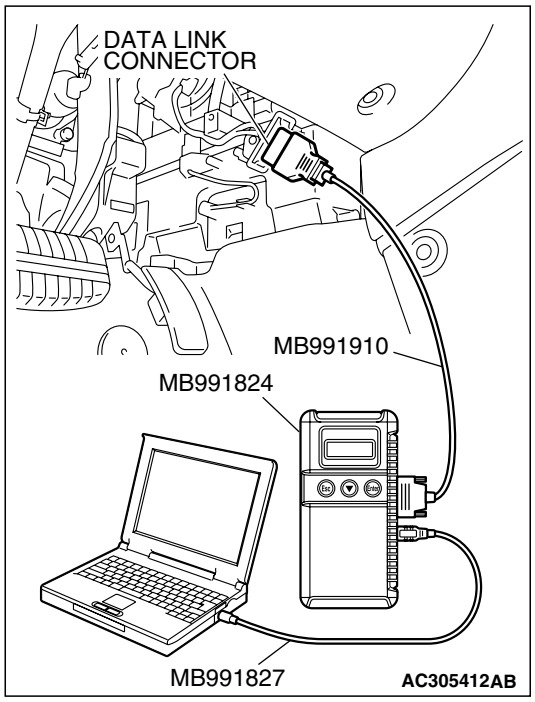
(1) Connect scan tool MB991958 to the data link connector. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Check for MFI system diagnostic trouble code. (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13B-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Repair the MFI control system. (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Trouble Code Chart P.13B-46). Then go to Step 4.

NO : Go to Step 2.





STEP 2. Using scan tool MB991958, diagnose the CAN bus line.

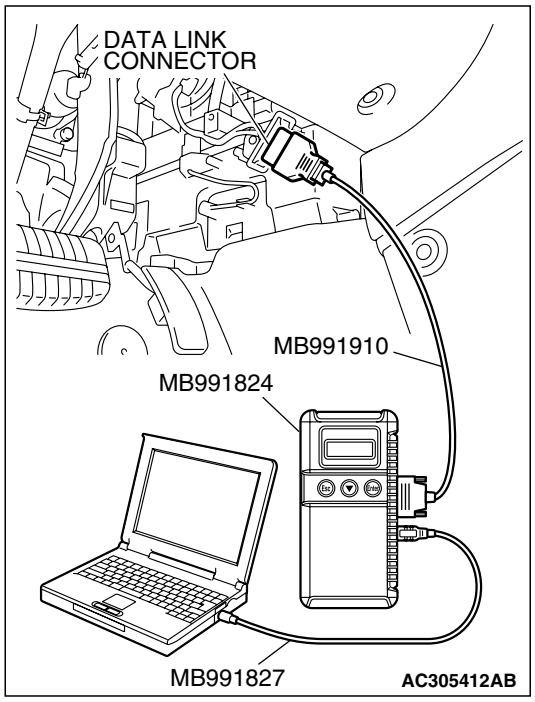
⚠ CAUTION

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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Repair the CAN bus line. (Refer to GROUP 54C, Diagnosis – Can Bus Diagnostic Chart P.54C-16). Then go to Step 4.
NO : Go to Step 3.



STEP 3. Using scan tool MB991958, read the diagnostic trouble code.

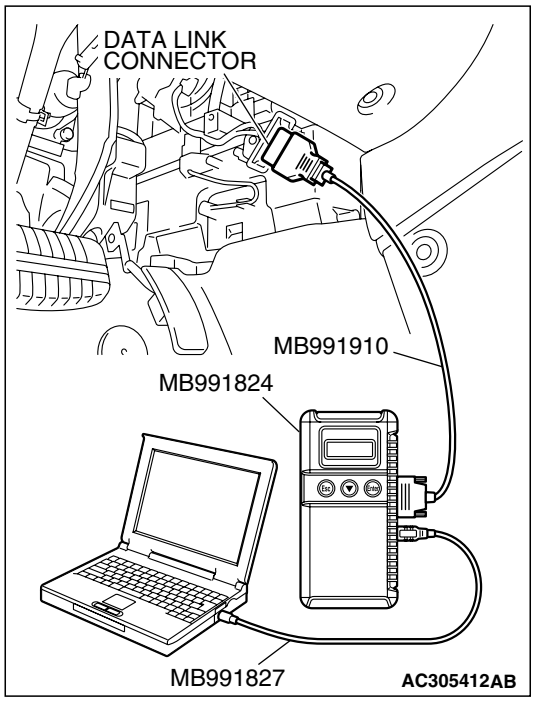
⚠ CAUTION

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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC C1396 set?

YES : Replace the hydraulic unit (integrated with ABS/TCL-ECU). (Refer to GROUP 35B – Hydraulic Unit P.35B-96). Then go to Step 4.
NO : 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.00-14).



STEP 4. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC C1396 set?

YES : Return to Step 1.
NO : The procedure is complete.

C1397 Transmission Range Switch Failure

⚠ CAUTION
- **If DTC C1397 is set in the ABS/TCL-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect DTC may be set.**
- **Whenever the ABS/TCL-ECU is replaced, ensure that the communication circuit is normal.**
- **The A/T system-related DTC may be set when DTC C1397 is set. (For details refer to GROUP 00, Intersystem Affiliated DTC Reference Table P.00-17). Diagnose the A/T system first when the A/T system-related DTC is set.**

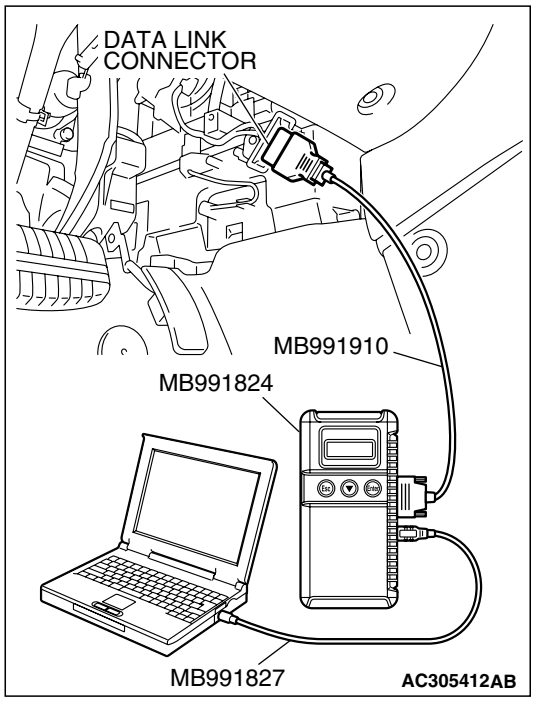
DTC SET CONDITIONS
This DTC is set when the transmission range switch fail request is sent from PCM.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)
- Malfunction of the A/T system.
- Malfunction of the ABS/TCL-ECU.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

TSB Revision



STEP 1. Using scan tool MB991958, read the diagnostic trouble code.

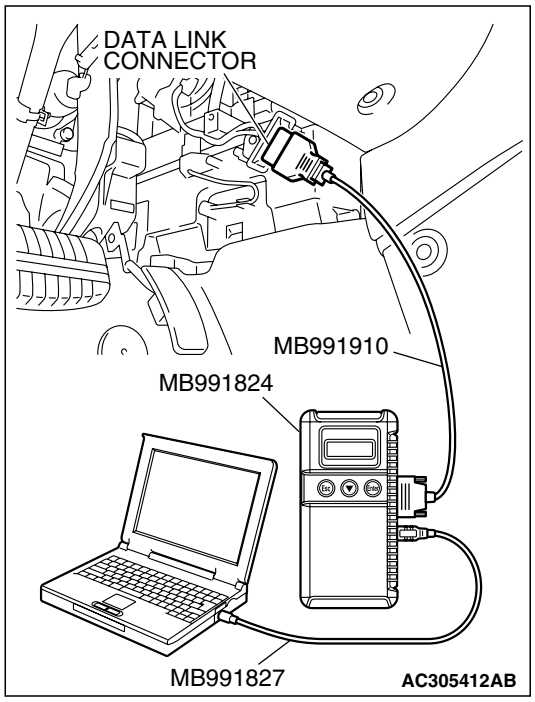
⚠ CAUTION

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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T system diagnostic trouble code. (Refer to GROUP 23A, A/T Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.23A-17).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Repair the automatic transaxle control system. (Refer to GROUP 23A, A/T Diagnosis – Diagnostic Trouble Code Chart P.23A-47). Then go to Step 3.
NO : Go to Step 2.



STEP 2. Using scan tool MB991958, read the diagnostic trouble code.

⚠ CAUTION

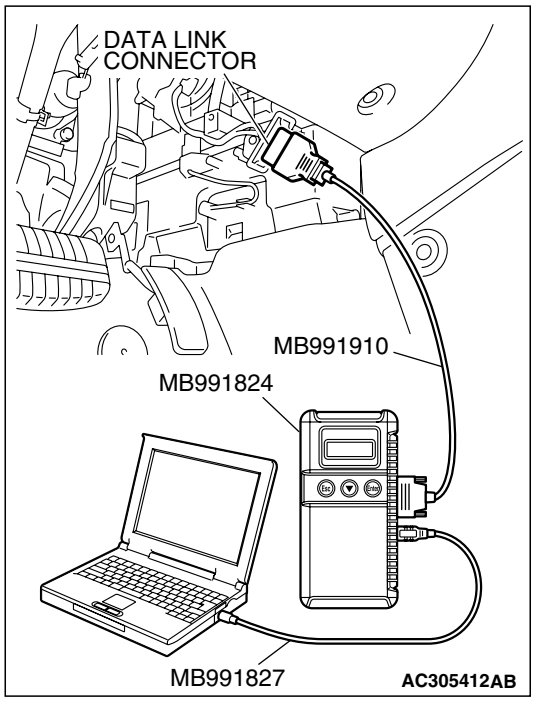
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC C1397 set?

YES : Replace the hydraulic unit (integrated with ABS/TCL-ECU). (Refer to GROUP 35B – Hydraulic Unit P.35B-96). Then go to Step 3.
NO : 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.00-14).

TSB Revision



STEP 3. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC C1397 set?

YES : Return to Step 1.
NO : The procedure is complete.

U1100 CAN Communications System Time Out Error Engine Related Data

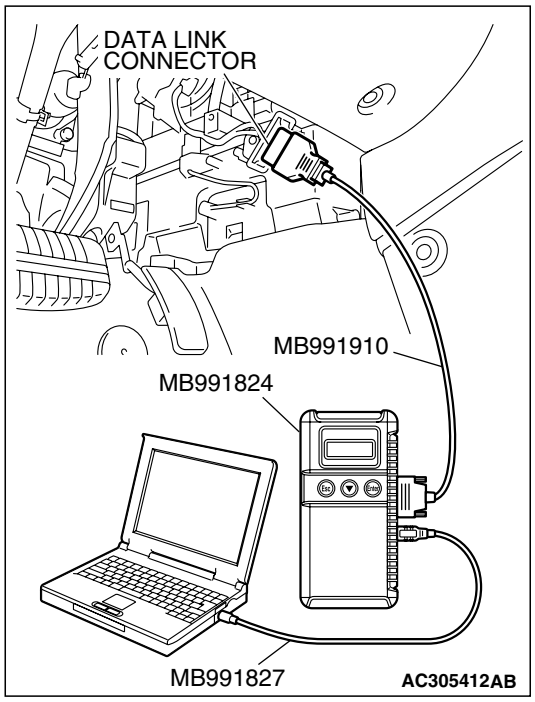
⚠ CAUTION
- **If DTC U1100 is set in the ABS/TCL-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect DTC may be set.**
- **Whenever the ABS/TCL-ECU is replaced, ensure that the communication circuit is normal.**

DTC SET CONDITION
The ABS/TCL-ECU receives engine system-related signals from the PCM via CAN bus lines.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THESE DTCS ARE TO SET ARE:)
- Damaged harness or connector.
- Malfunction of the PCM.
- Malfunction of the ABS/TCL-ECU.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

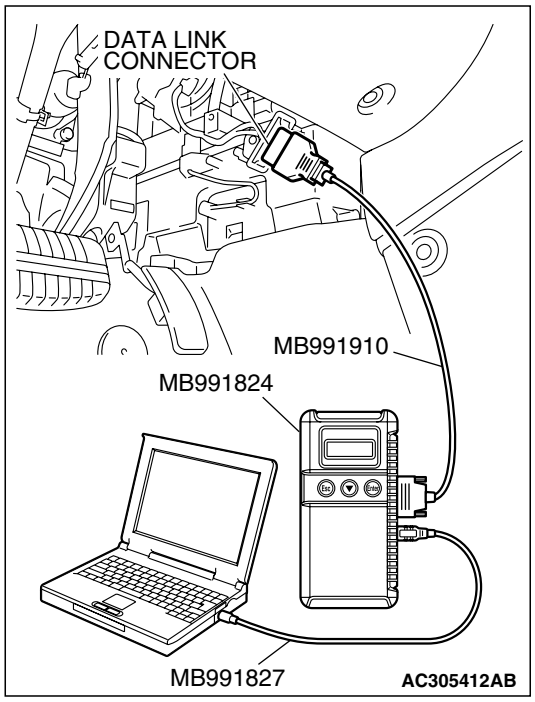
⚠ CAUTION

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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. (Refer to GROUP 54C, Diagnosis – Can Bus Diagnostic Chart P.54C-16). Then go to Step 6.



STEP 2. Using scan tool MB991958, read the diagnostic trouble code.

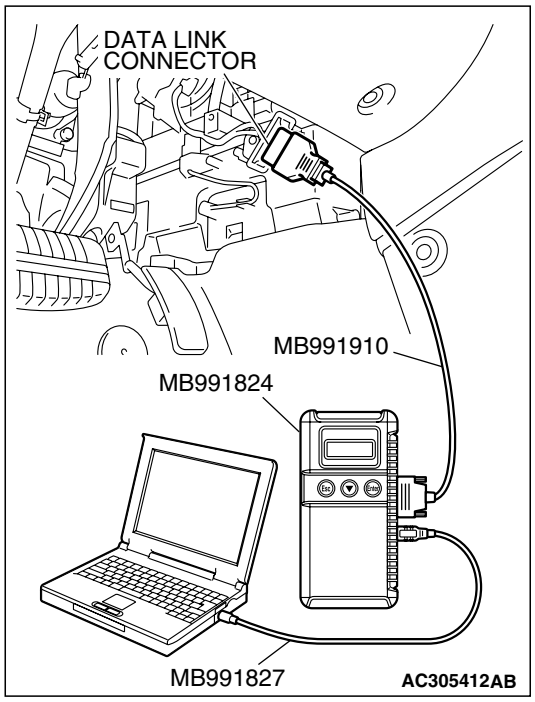
⚠ CAUTION

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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Check for MFI system diagnostic trouble code. (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13B-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Repair the MFI control system. (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Trouble Code Chart P.13B-46). Then go to Step 6.
NO : Go to Step 3.



STEP 3. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Check if a DTC, which relates to CAN communication-linked systems below, is set.
ETACS-ECU
- DTC 011: Power train control module time-out (related to engine). (Refer to GROUP 54B, SWS Diagnosis – General Description – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.54B-14).

Combination meter
- DTC 011: Power train control module time-out (related to engine). (Refer to GROUP 54A, Combination Meter Assembly Diagnosis – Diagnosis Function – How to Read and Erase Diagnostic Trouble Code P.54A-51).

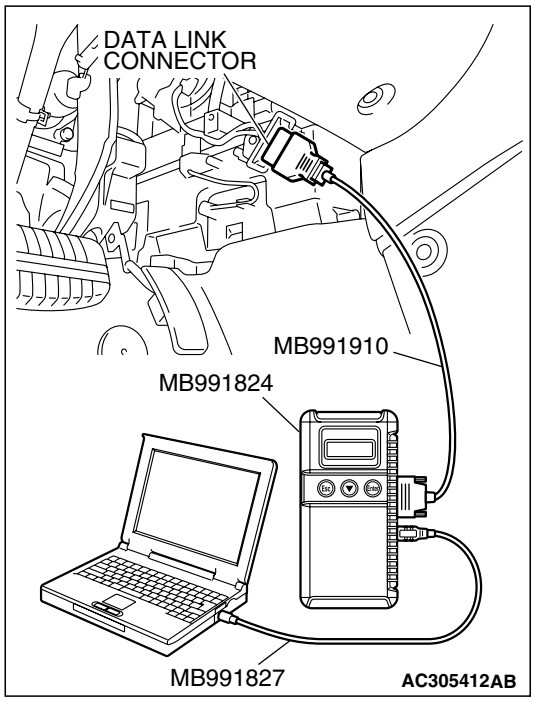
Multi-center display
- DTC 011: Power train control module time-out (related to engine). (Refer to GROUP 54A, Multi-center Display – Diagnosis Function – How to Read and Erase Diagnostic Trouble Code P.54A-251).

A/C-ECU
- DTC U1100: Power train control module time-out (related to engine). (Refer to GROUP 55A, Manual A/C Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.55A-6) <Vehicle with manual A/C> or (Refer to GROUP 55B, Auto A/C Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.55B-4) <Vehicle with auto A/C>.

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC 011 or U1100 set?

YES : Go to Step 4.
NO : Go to Step 5.



STEP 4. Using scan tool MB991958, read the diagnostic trouble code.

⚠ CAUTION

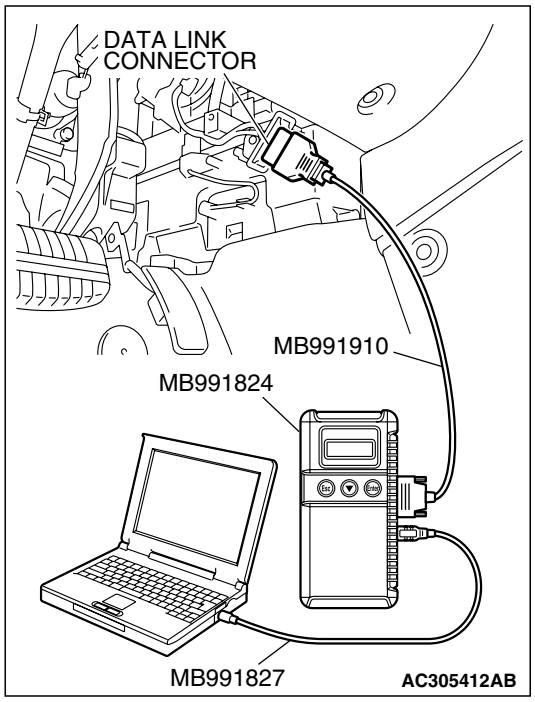
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1100 set?

YES : Replace the PCM. [Refer to GROUP 13B, Power Control Module (PCM) P.13B-1447]. Then go to Step 6.

NO : 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.00-14).



STEP 5. Using scan tool MB991958, read the diagnostic trouble code.

⚠ CAUTION

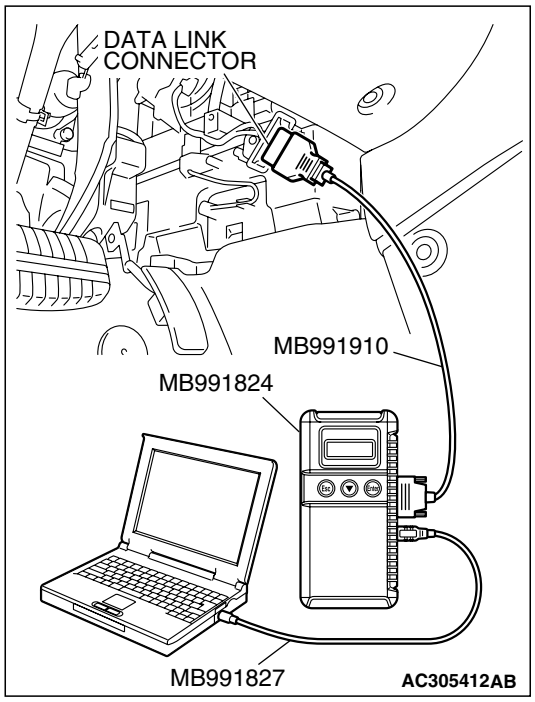
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1100 set?

YES : Replace the hydraulic unit (integrated with ABS/TCL-ECU). (Refer to GROUP 35B – Hydraulic Unit P.35B-96). Then go to Step 6.

NO : 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.00-14).



STEP 6. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1100 set?

YES : Return to Step 1.
NO : The procedure is complete.

U1101 CAN Communications System Time Out Error A/T Related Data

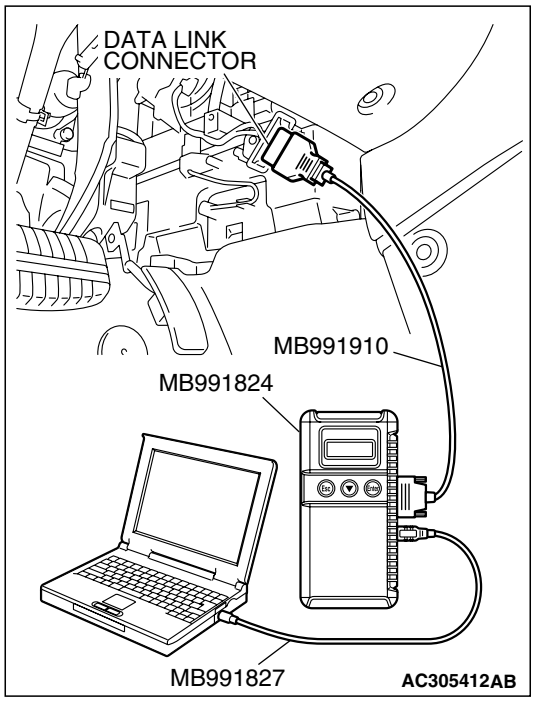
⚠ CAUTION
- **If DTC U1101 is set in the ABS/TCL-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect DTC may be set.**
- **Whenever the ABS/TCL-ECU is replaced, ensure that the communication circuit is normal.**

DTC SET CONDITION
The ABS/TCL-ECU receives A/T system-related signals from the PCM via CAN bus lines.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THESE DTCS ARE TO SET ARE:)
- Damaged harness or connector.
- Malfunction of the PCM.
- Malfunction of the ABS/TCL-ECU.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

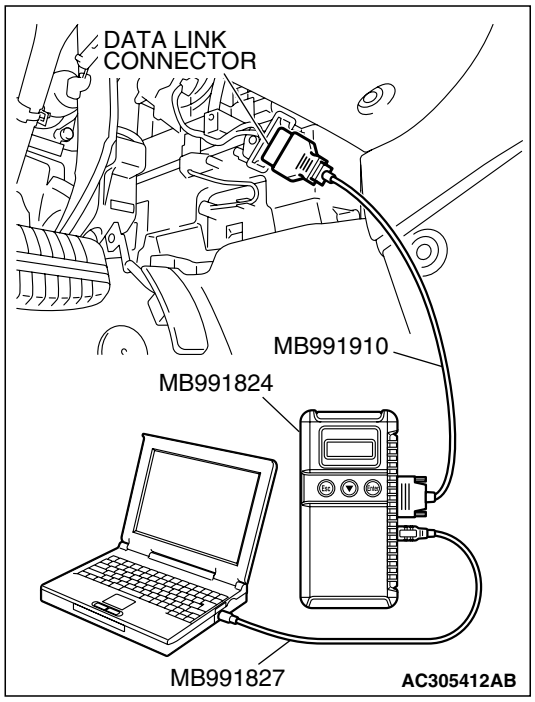
⚠ CAUTION

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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 2.
NO : Repair the CAN bus lines. (Refer to GROUP 54C, Diagnosis – Can Bus Diagnostic Chart P.54C-16). Then go to Step 6.



STEP 2. Using scan tool MB991958, read the diagnostic trouble code.

⚠ CAUTION

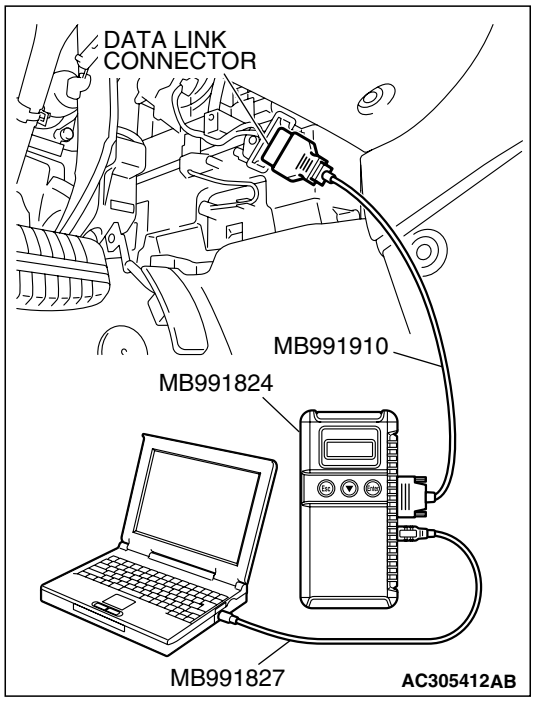
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T system diagnostic trouble code. (Refer to GROUP 23A, A/T Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.23A-17).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Repair the automatic transaxle control system. (Refer to GROUP 23A, A/T Diagnosis – Diagnostic Trouble Code Chart P.23A-47). Then go to Step 6.
NO : Go to Step 3.

TSB Revision



STEP 3. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Check if a DTC, which relates to CAN communication-linked systems below, is set.
ETACS-ECU
- DTC 012: Power train control module time-out (related to A/T). (Refer to GROUP 54B, SWS Diagnosis – General Description – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.54B-14).

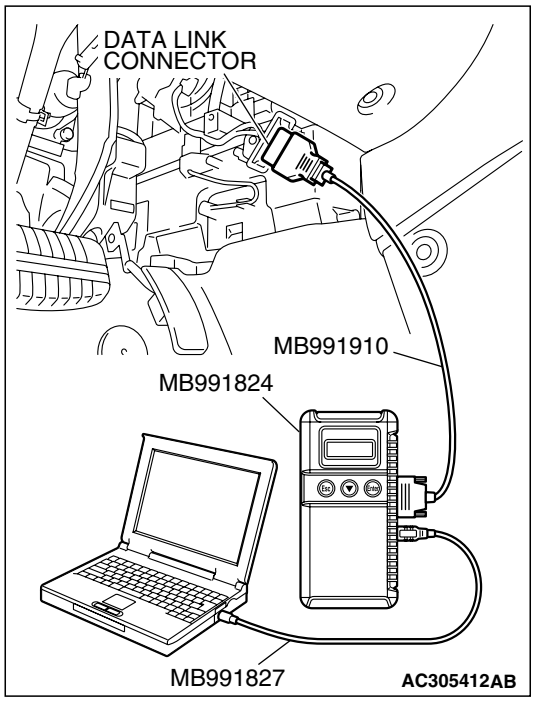
Combination meter
- DTC 012: Power train control module time-out (related to A/T). (Refer to GROUP 54A, Combination Meter Assembly Diagnosis – Diagnosis Function – How to Read and Erase Diagnostic Trouble Code P.54A-51).

Multi-center display
- DTC 012: Power train control module time-out (related to A/T). (Refer to GROUP 54A, Multi-center Display – Diagnosis Function – How to Read and Erase Diagnostic Trouble Code P.54A-251).

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC 012 set?

YES : Go to Step 4.
NO : Go to Step 5.



STEP 4. Using scan tool MB991958, read the diagnostic trouble code.

⚠ CAUTION

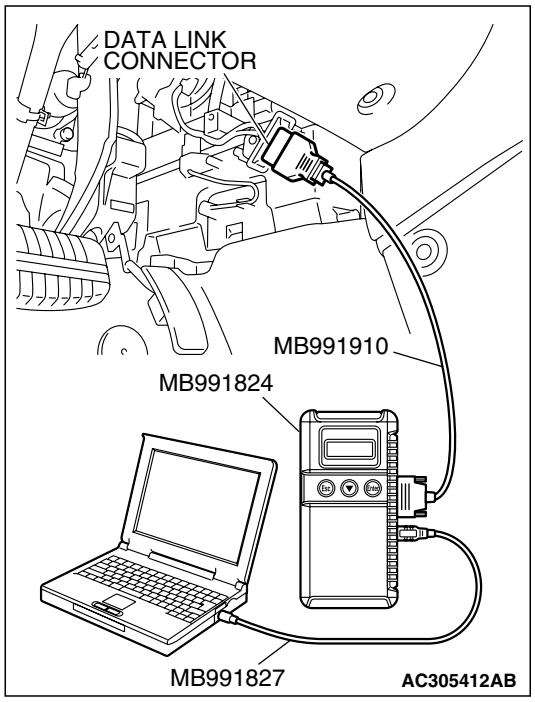
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1101 set?

YES : Replace the PCM. [Refer to GROUP 13B, Power Control Module (PCM) P.13B-1447]. Then go to Step 6.

NO : 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.00-14).



STEP 5. Using scan tool MB991958, read the diagnostic trouble code.

⚠ CAUTION

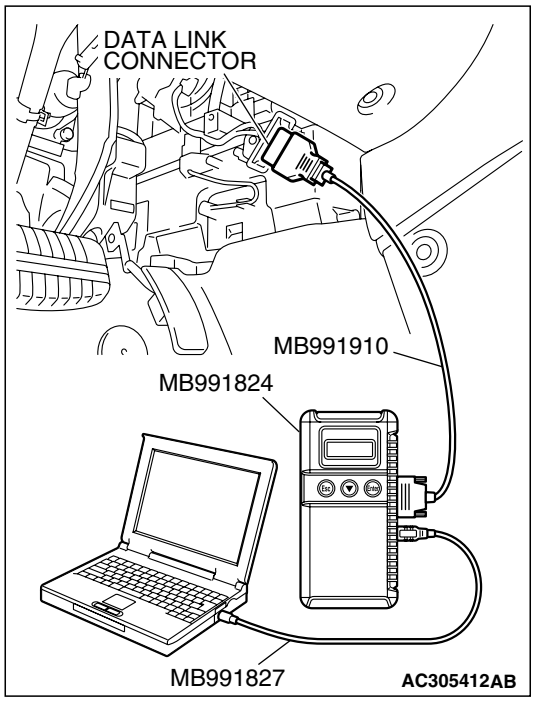
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1101 set?

YES : Replace the hydraulic unit (integrated with ABS/TCL-ECU). (Refer to GROUP 35B – Hydraulic Unit P.35B-96). Then go to Step 6.

NO : 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.00-14).



STEP 6. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1101 set?

YES : Return to Step 1.
NO : The procedure is complete.

U1120 CAN Communications System TCL Uncontrollable by Engine Malfunction

⚠ CAUTION

- **If DTC U1120 is set in the ABS/TCL-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect DTC may be set.**
- **Whenever the ABS/TCL-ECU is replaced, ensure that the communication circuit is normal.**
- **The engine control system-related DTC may be set when DTC U1120 is set. (For details refer to GROUP 00, Intersystem Affiliated DTC Reference Table P.00-17). Diagnose the engine control system first when the engine control system-related DTC is set.**

DTC SET CONDITION

The ABS/TCL-ECU receives engine system-related signals from the PCM via CAN bus lines. If a fail-safe related data is contained in the signal from the PCM, DTC U1120 will be stored.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THESE DTCS ARE TO SET ARE:)

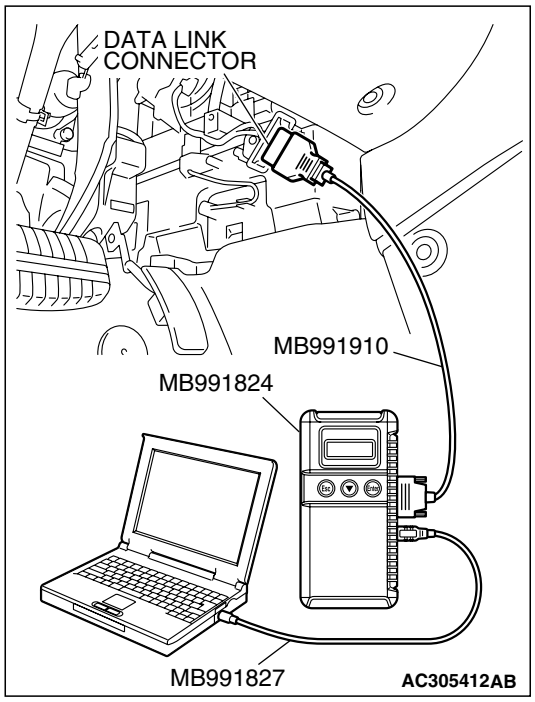
- Damaged harness or connector.
- Malfunction of the PCM.
- Malfunction of the ABS/TCL-ECU.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

TSB Revision



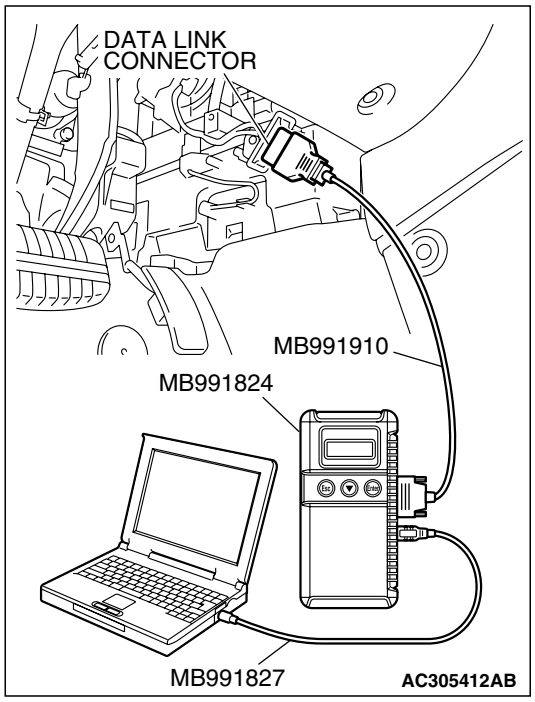
STEP 1. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Check for MFI system diagnostic trouble code. (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13B-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Repair the MFI control system. (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Trouble Code Chart P.13B-46). Then go to Step 6.
NO : Go to Step 2.



STEP 2. Using scan tool MB991958, diagnose the CAN bus line.

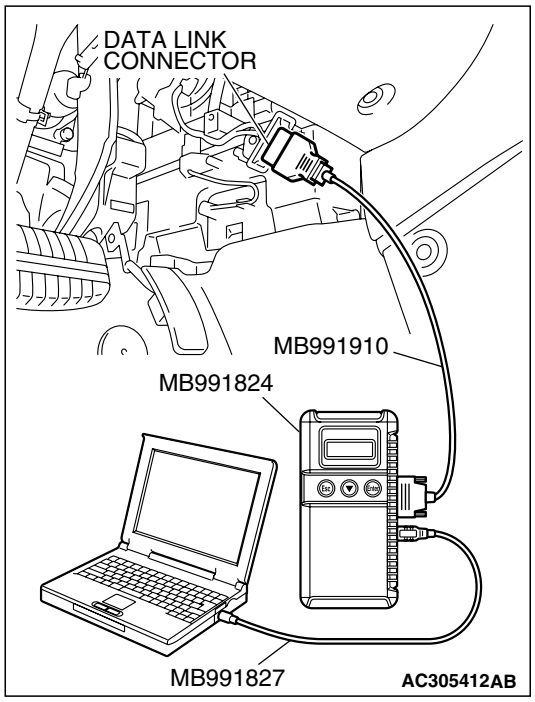
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 3.
NO : Repair the CAN bus lines. (Refer to GROUP 54C, Diagnosis – Can Bus Diagnostic Chart P.54C-16). Then go to Step 6.

TSB Revision



STEP 3. Using scan tool MB991958, read the diagnostic trouble code.

⚠ CAUTION

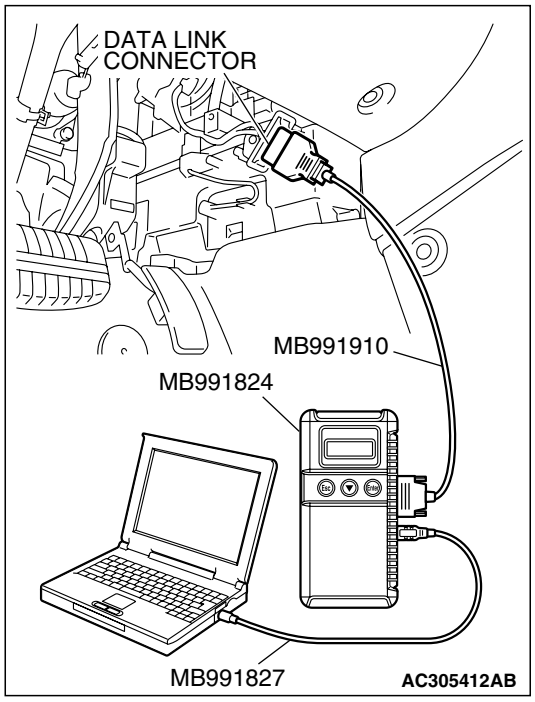
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Check if a DTC, which relates to CAN communication-linked systems below, is set.
A/C-ECU
- DTC U1120: Failure Information on Power train control module (related to engine). (Refer to GROUP 55A, Manual A/C Diagnostic – Diagnosis Function – How to Read and Erase Diagnostic Trouble Code P.55A-6) <Vehicle with manual A/C> or (Refer to GROUP 55B, Auto A/C Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.55B-4) <Vehicle with auto A/C>.

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1120 set?

YES : Go to Step 4.
NO : Go to Step 5.



STEP 4. Using scan tool MB991958, read the diagnostic trouble code.

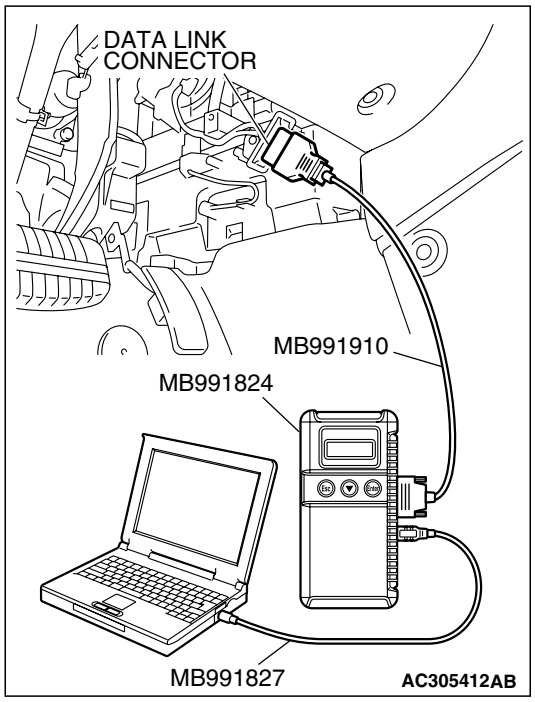
⚠ CAUTION

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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1120 set?

YES : Replace the PCM. [Refer to GROUP 13B, Power Control Module (PCM) P.13B-1447]. Then go to Step 6.
NO : 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.00-14).



STEP 5. Using scan tool MB991958, read the diagnostic trouble code.

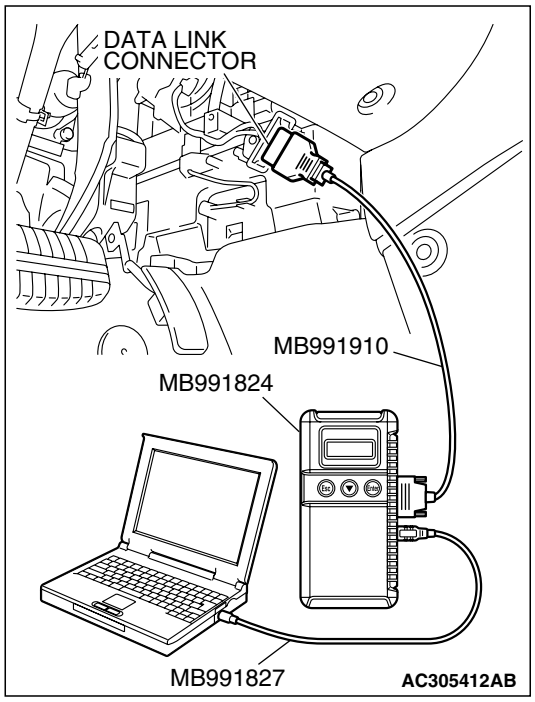
⚠ CAUTION

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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1120 set?

YES : Replace the hydraulic unit (integrated with ABS/TCL-ECU). (Refer to GROUP 35B – Hydraulic Unit P.35B-96). Then go to Step 6.
NO : 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.00-14).



STEP 6. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1120 set?

YES : Return to Step 1.
NO : The procedure is complete.

U1400 Dynamic range error APS1

DTC SET CONDITION
This code is set when the MFI system sets either of DTCs P2138, P2122 or P2123.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THESE DTCS ARE TO SET ARE:)
- Malfunction of the MFI system

DIAGNOSIS
Check whether the MFI system sets either of diagnostic trouble codes P2138, P2122 or P2123, and repair if necessary. (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13B-10).

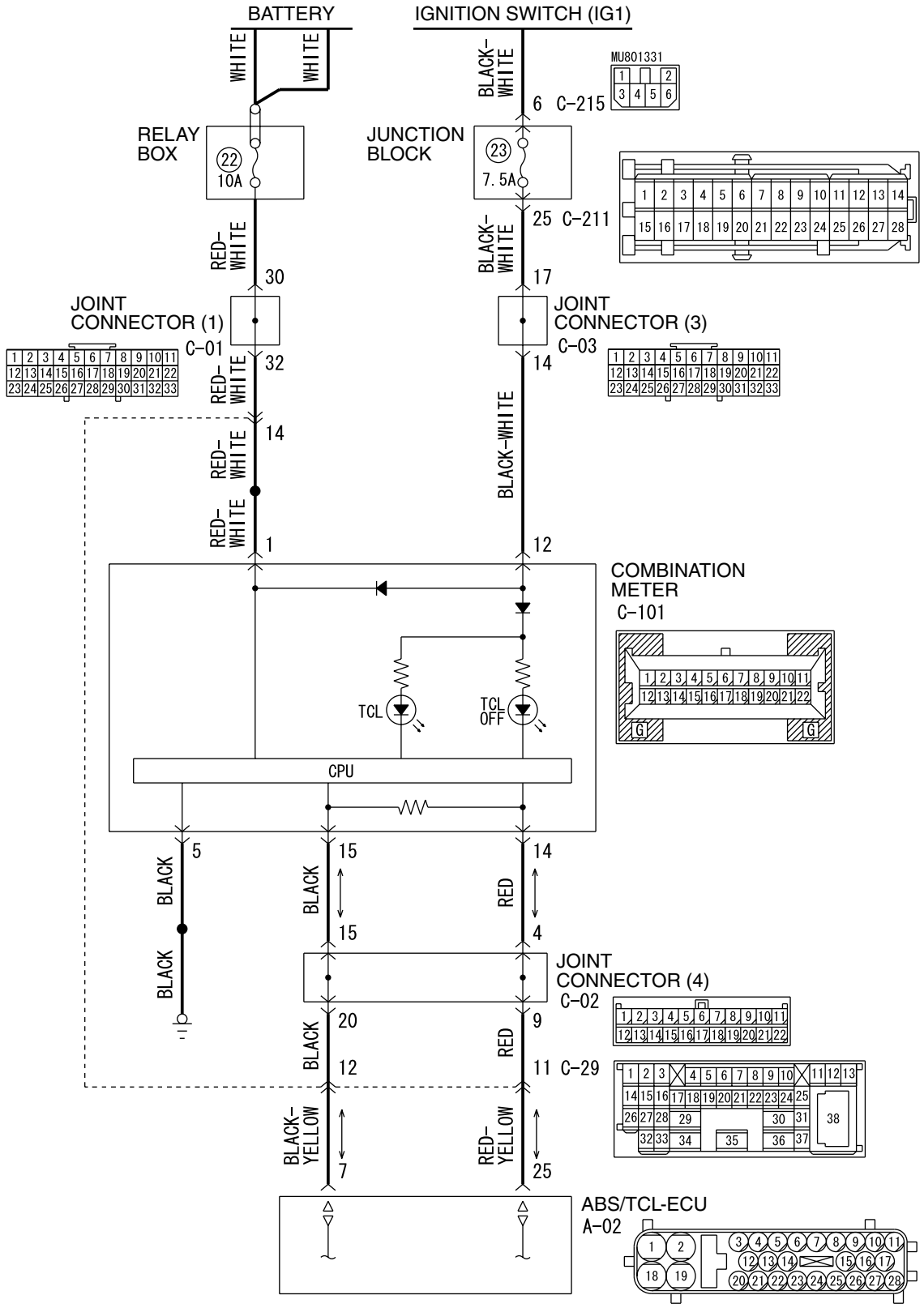
SYMPTOM CHART
M1136003400029

SYMPTOM		INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication with scan tool is not possible	Communication with all systems is impossible	-	Group 13B, MFI Diagnosis – Symptom Procedures – Inspection Procedure 1 P.13B-1251.
	Communication with the ABS/TCL-ECU only is impossible	-	Group 35B, ABS Diagnosis – Symptom Procedures – Inspection Procedure 1 P.35B-73.
When the ignition switch is turned to the "ON" position (engine stopped), the "TCL OFF" indicator light dose not illuminate.		1	P.13D-26
When the ignition switch is turned to the "ON" position (engine stopped), the TCL work indicator light dose not illuminate.		2	
The "TCL OFF" indicator light remains illuminated after the engine is started.		3	
The TCL work indicator light remains illuminated after the engine is started.		4	
When the TCL switch is push on, TCL does not be cancelled.		5	P.13D-32
TCL dose not operate.		6	P.13D-38

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: When the Ignition Switch is Turned to the "ON" Position (Engine Stopped), the "TCL OFF" Indicator Light dose not Illuminate. INSPECTION PROCEDURE 2: When the Ignition Switch is Turned to the "ON" Position (Engine Stopped), the TCL Work Indicator Light dose not Illuminate. INSPECTION PROCEDURE 3: The "TCL OFF" Indicator Light Remains Illuminated After the Engine is Started. INSPECTION PROCEDURE 4: The TCL Work Indicator Light Remains Illuminated After the Engine is Started.

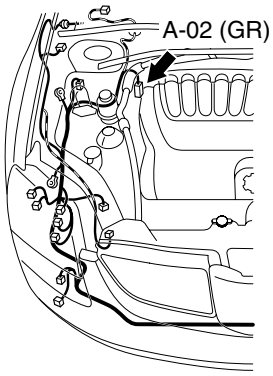
"TCL OFF" Indicator Light and TCL Work Indicator Light Drive Circuit



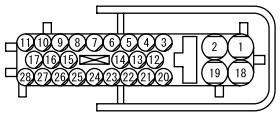
AC307013AB

TSB Revision

CONNECTOR: A-02

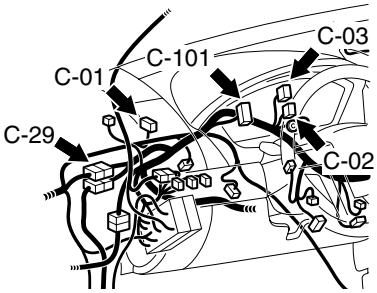


A-02 HARNESS CONNECTOR:
COMPONENT SIDE



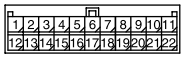
AC305209AB

CONNECTORS: C-01, C-02, C-03, C-29, C-101

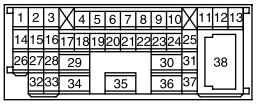


C-01 AND C-03 HARNESS CONNECTOR: COMPONENT SIDE

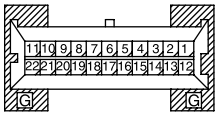
C-02 HARNESS CONNECTOR: COMPONENT SIDE



C-29 MALE SIDE CONNECTOR



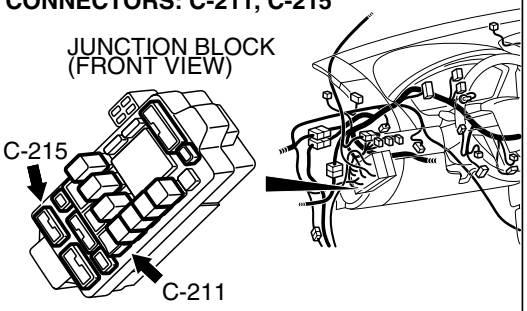
C-101 HARNESS CONNECTOR: COMPONENT SIDE



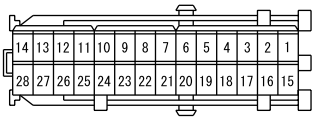
AC305232AO

CONNECTORS: C-211, C-215

JUNCTION BLOCK (FRONT VIEW)



C-211 HARNESS CONNECTOR: COMPONENT SIDE



C-215 HARNESS CONNECTOR: COMPONENT SIDE

AC305720AB

CIRCUIT OPERATION

- ABS/TCL-ECU send the illumination signal of "TCL OFF" indicator light and TCL work indicator light to the combination meter via the CAN communication.
- ABS/TCL-ECU operates the "TCL OFF" indicator light and the TCL work indicator light for three seconds after the ignition switch is turned "ON" position for bulb check.

COMMENT

This may be caused by faults in the CAN bus line, the combination meter or the ABS/TCL-ECU.

TROUBLESHOOTING HINTS

- Malfunction of the combination meter.
- Damaged harness or connector.
- Malfunction of the ABS/TCL-ECU.

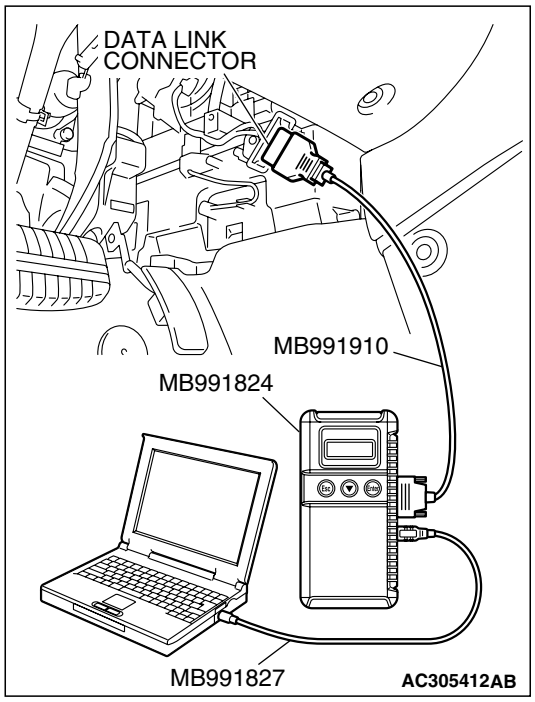
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, diagnose the CAN bus line.



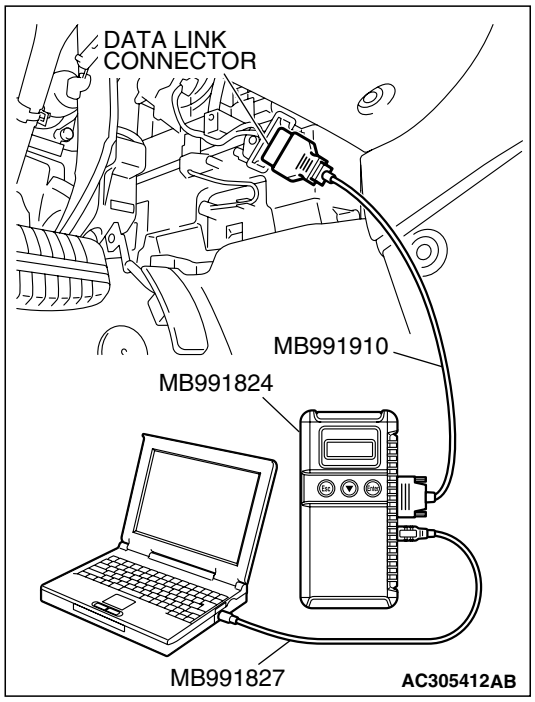
⚠ CAUTION

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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is the check result satisfactory?

YES : Go to Step 2
NO : Repair the CAN bus lines. (Refer to GROUP 54C, Diagnosis – Can Bus Diagnostic Chart P.54C-16). Then go to Step 4.



STEP 2. Using scan tool MB991958, read the diagnostic trouble code.

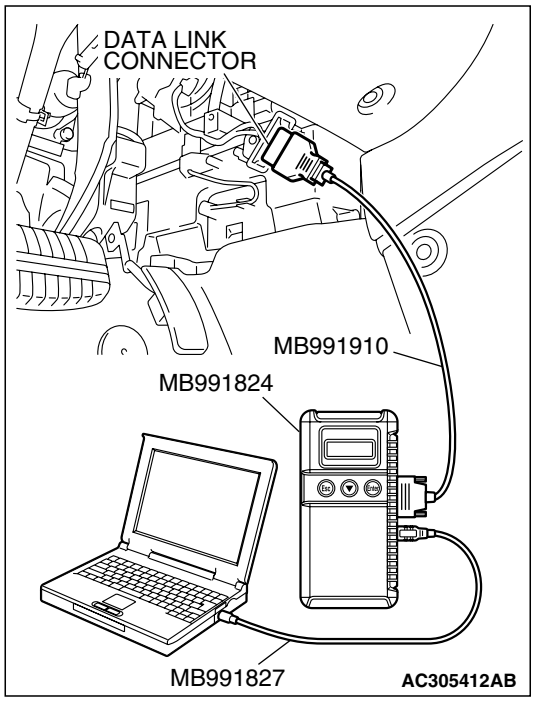
⚠ CAUTION

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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Refer to P.13D-6, Diagnostic Trouble Code Chart. Then go to Step 4.
NO : Go to Step 3.



STEP 3. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to GROUP 17 – Diagnostic Function P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Check for Combination meter system diagnostic trouble code. (Refer to GROUP 54A, Combination Meter Assembly Diagnosis – Diagnosis Function – How to Read and Erase Diagnostic Trouble Code P.54A-51).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1102 set?

YES : Replace the hydraulic unit (integrated with ABS/TCL-ECU). (Refer to GROUP 35B – Hydraulic Unit P.35B-96). Then go to Step 4.
NO : Replace the combination meter assembly. (Refer to GROUP 54A – Combination Meter Assembly P.54A-123). Then go to Step 4.

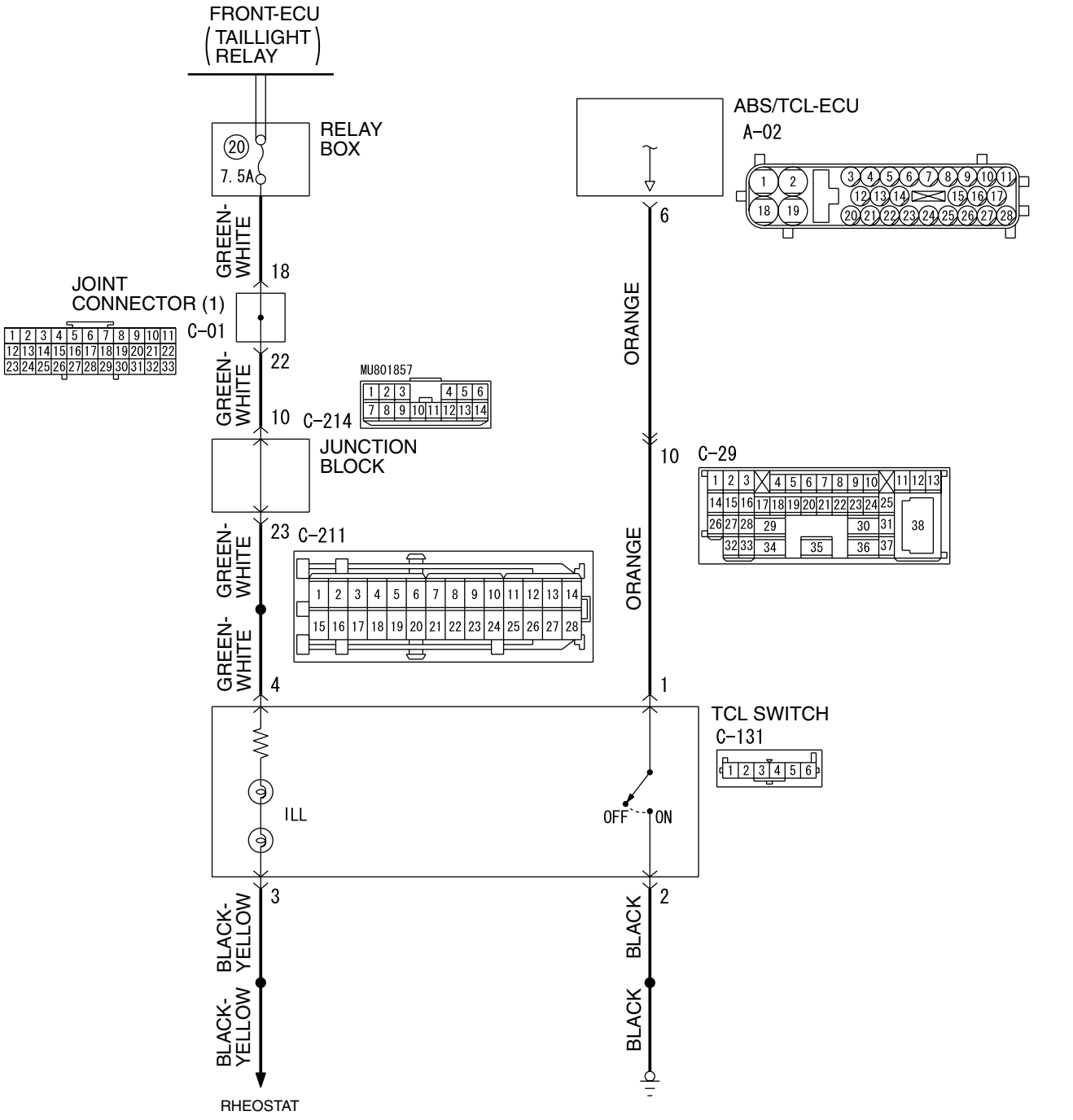
STEP 4. Retest the system

Q: Turn the ignition switch to the "ON" position. Do the "TCL OFF" indicator light and the TCL work indicator light illuminate for three seconds, and then go out after the engine starts?

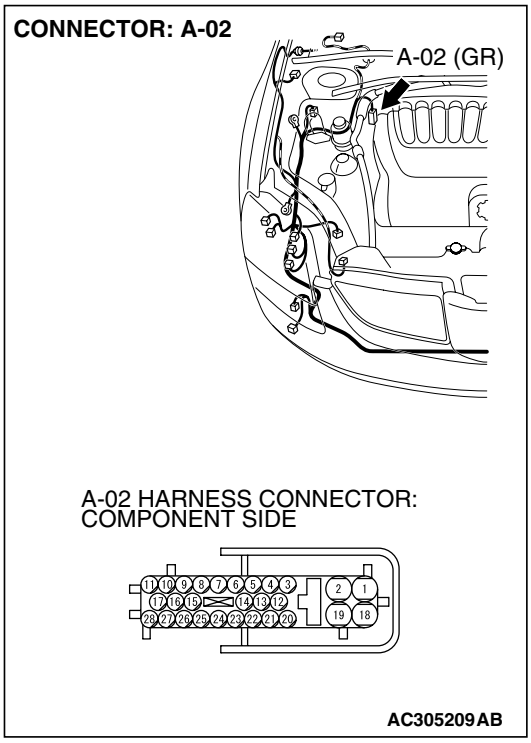
YES : The procedure is complete.
NO : Return to Step 1.

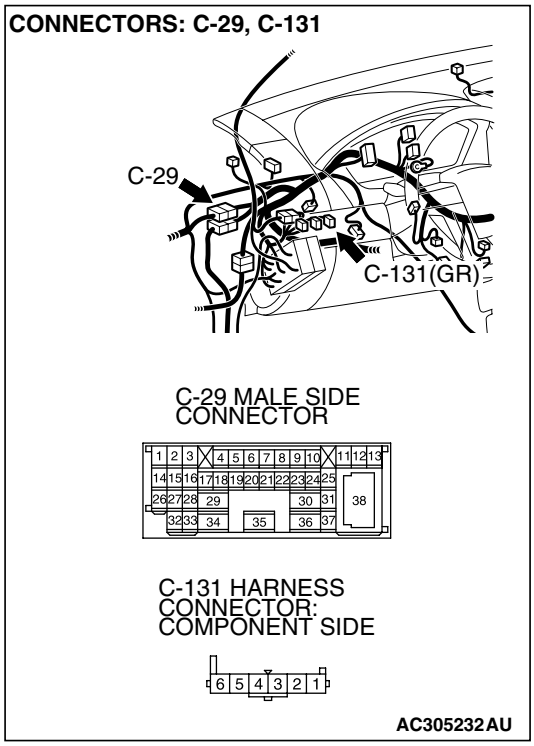
INSPECTION PROCEDURE 5: When the TCL Switch is Push On, TCL dose not Cancelled.

TCL Switch System Circuit



AC307014 AB





CIRCUIT OPERATION

ABS/TCL-ECU terminal 6 is grounded every time the TCL switch is pressed. ABS/TCL-ECU monitors this operation state and turns the TCL ON or OFF.

COMMENT

The cause is probably an open-circuit in the TCL switch circuit.

TROUBLESHOOTING HINTS

- Malfunction of the TCL switch.
- Damaged harness or connector.
- Malfunction of the ABS/TCL-ECU.

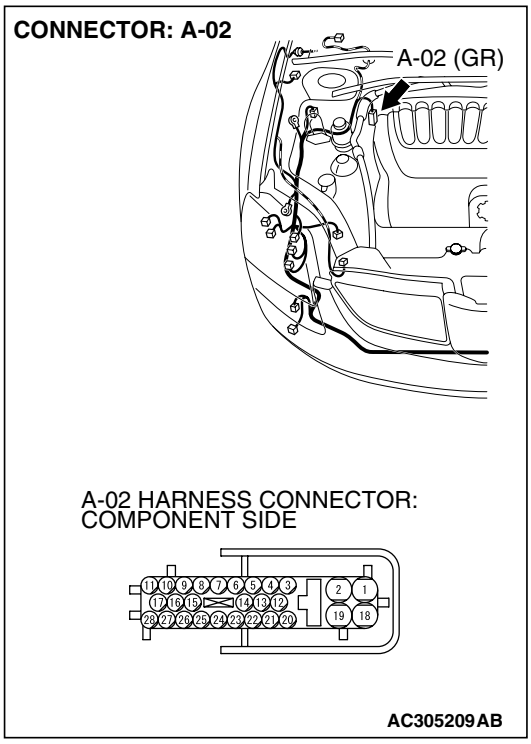
DIAGNOSIS

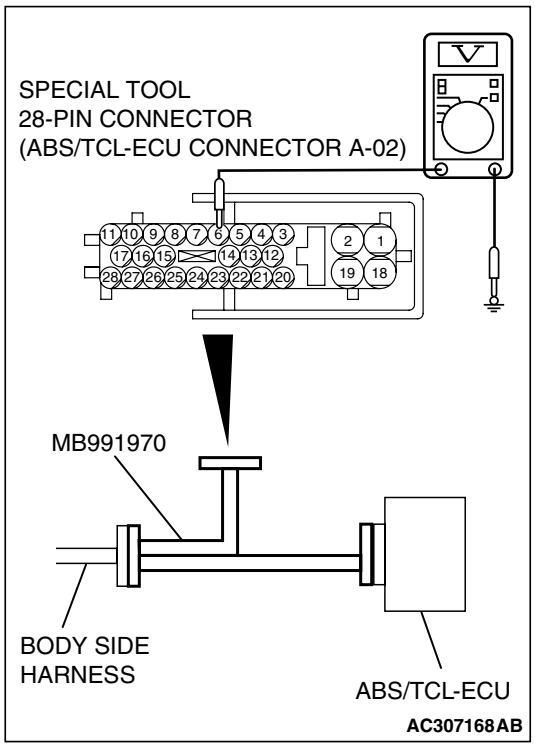
Required Special Tools:

- MB991223: Harness Set
- MB991970: ABS Check Harness

STEP 1. Measure the terminal voltage at ABS/TCL-ECU connector A-02.

(1) Disconnect the ABS/TCL-ECU connector A-02.



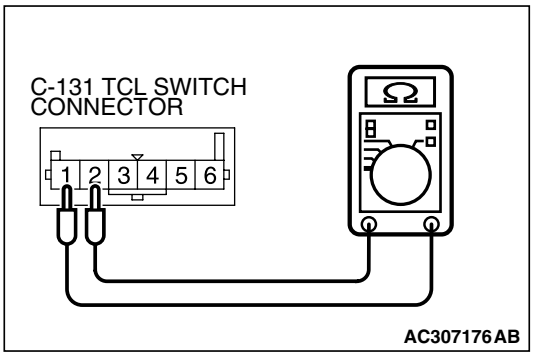


(2) Connect special tool MB991970 between the ABS/TCL-EUC and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the terminal voltage between special tool MB991970 connector terminal 6 (ABS/TCL-ECU connector A-02 terminal 6) and ground.
- When the TCL switch is not pressed, the voltage should measure battery positive voltage (approximately 12 volts).
- When the TCL switch is pressed, the voltage should measure 1 volt or less.

(5) Turn the ignition switch to the "LOCK" (OFF) position.
(6) Disconnect special tool MB991970 between the ABS/TCL-ECU and the body-side harness connector.
(7) Connect the ABS/TCL-ECU connector A-02.

Q: Is the terminal voltage battery terminal voltage when the TCL switch is not pressed, and is the terminal voltage 1 volt or less when the TCL switch is pressed?

YES : Go to Step 6.
NO : Go to Step 2.



STEP 2. Check the TCL switch.

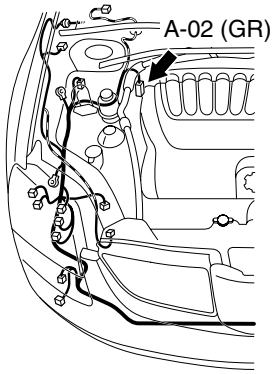
(1) Remove the TCL switch. (Refer to P.13D-50).
(2) Connect an ohmmeter to the TCL switch between terminals 1 and 2.
(3) Check for continuity between terminals 1 and 2 when the TCL switch is operated.
- There is no continuity between terminals 1 and 2 when the TCL switch is not pressed.
- There is continuity between terminals 1 and 2 when the TCL switch is pressed.

Q: Is there no continuity between terminals 1 and 2 when the TCL switch is not pressed, and is there continuity when the TCL switch is pressed?

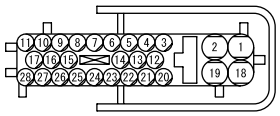
YES : Install the TCL switch. (Refer to P.13D-50). Then go to Step 6.

NO : Replace the TCL switch. (Refer to P.13D-50). Then go to Step 7.

CONNECTOR: A-02

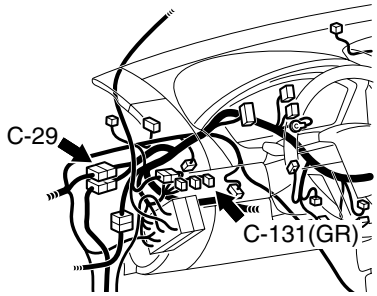


A-02 HARNESS CONNECTOR: COMPONENT SIDE

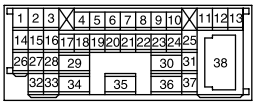


AC305209AB

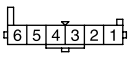
CONNECTORS: C-29, C-131



C-29 MALE SIDE CONNECTOR



C-131 HARNESS CONNECTOR: COMPONENT SIDE



AC305232AU

STEP 3. Check ABS/TCL-ECU connector A-02, intermediate connector C-29 and TCL switch connectors C-131 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are there connectors and terminals in good condition?

YES : Go to Step 4.

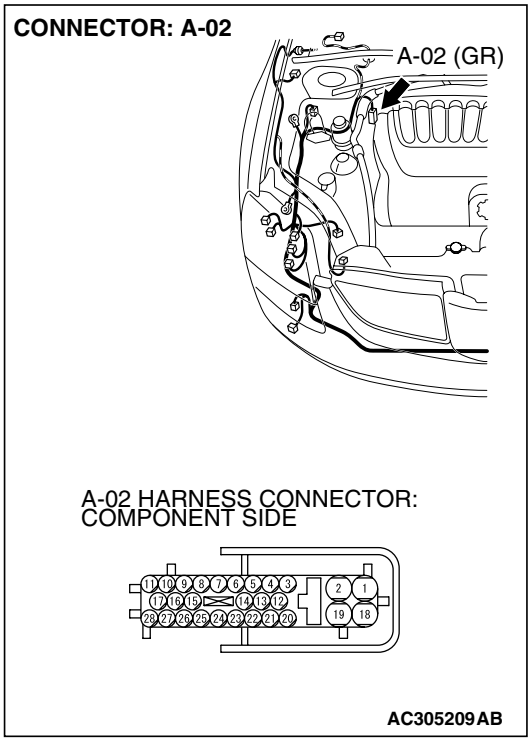
NO : Repair or replace the faulty connector. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 7.

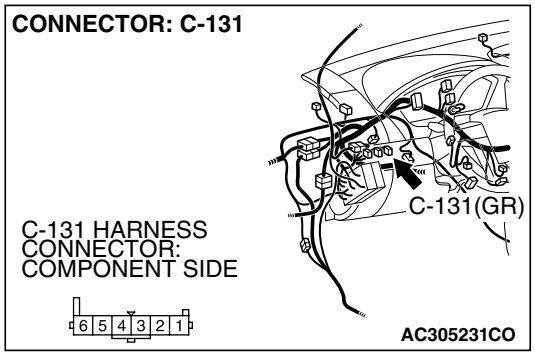
STEP 4. Check the harness wire between ABS/TCL-ECU connector A-02 terminal 6 and TCL switch connector C-131 terminal 1 for damage.

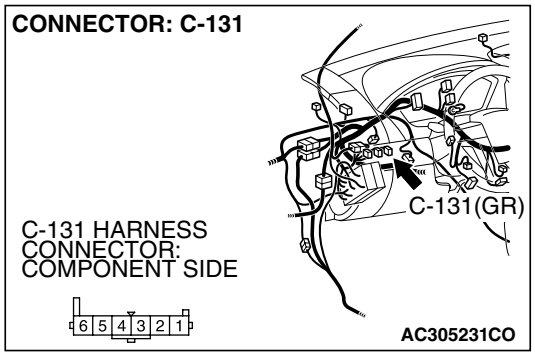
Q: Are there harness wires in good condition?

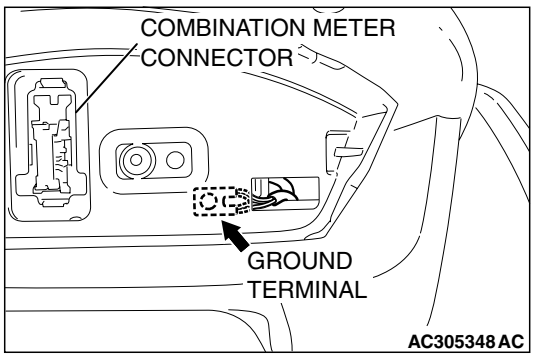
YES : Go to Step 5.

NO : Repair the damaged harness wire. Then go to Step 7.









STEP 5. Check the harness wire between TCL switch connector C-131 terminal 2 and ground for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair the damaged harness wire. Then go to Step 7.

STEP 6. Retest the system

Q: Dose TCL system cancelled, when the TCL switch is push on?

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.00-14).

NO : Replace the hydraulic unit (integrated with ABS/TCL-ECU). (Refer to GROUP 35B – Hydraulic Unit P.35B-96). Then go to Step 7.

STEP 7. Retest the system

Q: Dose TCL system cancelled, when the TCL switch is push on?

YES : The procedure is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 6: TCL does not Operate.

COMMENT

The fail-safe function is probably canceling TCL. In this case, scan tool MB991958 can be used to retest each system by checking the diagnostic trouble codes.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)

- Malfunction of the CAN bus line.
- Malfunction of the MFI system.
- Malfunction of the A/T system.
- Malfunction of the ABS/TCL-ECU.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code.

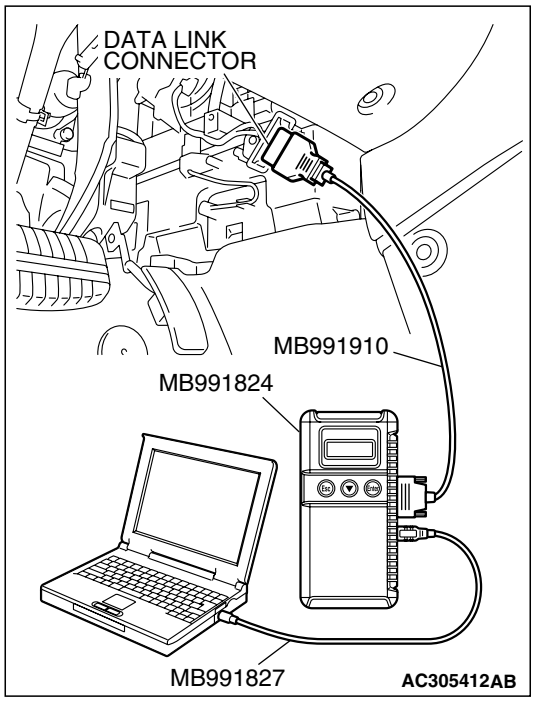
⚠ CAUTION

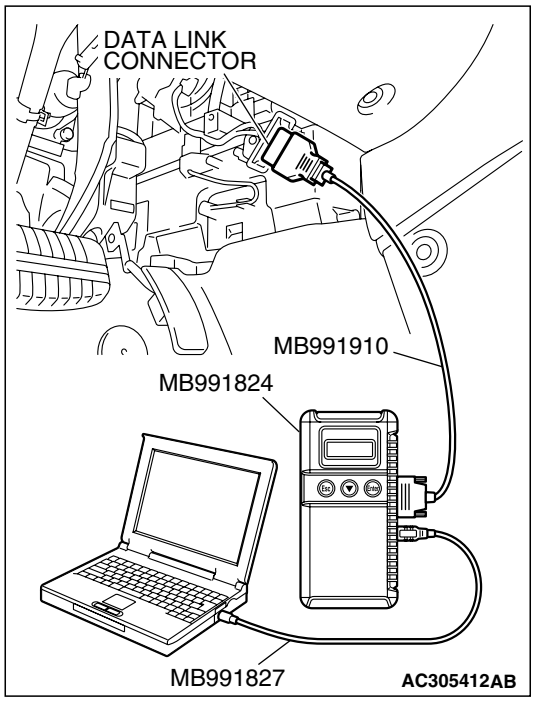
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the TCL diagnostic trouble codes. (Refer to P.13D-3).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Repair the TCL. (Refer to P.13D-6, Diagnostic Trouble Code Chart). Then go to Step 4.
NO : Go to Step 2.





STEP 2. Using scan tool MB991958, check actuator test item09: Engine TCL Drive.

⚠ 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. (Refer to P.13D-3).
(2) Turn the ignition switch to the "ON" position.

⚠ CAUTION
The engine speed increases after the actuator test because the actuator test continues for only three seconds. Therefore, release the accelerator pedal immediately.

(3) Use scan tool MB991958 to check the actuator test. (Refer to P.13D-3).
- Item 09: Engine TCL Drive.
  - When the accelerator pedal is depressed at the same time that the button for actuator test item 09 displayed on scan tool MB991958 is pressed, the system prevents the engine speed from rising for three seconds.

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Are the check results for actuator test item 09 satisfactory?

YES : Go to Step 3.
NO : Replace the hydraulic unit (integrated with ABS/TCL-ECU). (Refer to GROUP 35B – Hydraulic Unit P.35B-96). Then go to Step 4.

STEP 3. Retest the system

Q: Does the TCL work normally?

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.00-14).
NO : Replace the hydraulic unit (integrated with ABS/TCL-ECU). (Refer to GROUP 35B – Hydraulic Unit P.35B-96). Then go to Step 4.

STEP 4. Retest the system

Q: Does the TCL work normally?

YES : The procedure is complete.
NO : Return to Step 1.

DATA LIST REFERENCE TABLE

M1136003500071

The following items can be read by the scan tool from the ABS/TCL-ECU input data. (Refer to P.13D-3).

TSB Revision

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	CHECKING REQUIREMENTS	NORMAL VALUE
FR wheel speed sensor	01	Front right wheel speed sensor	Drive the vehicle	Vehicle speeds displayed on the speedometer and scan tool are identical.
FL wheel speed sensor	02	Front left wheel speed sensor		
RR wheel speed sensor	03	Rear right wheel speed sensor		
RL wheel speed sensor	04	Rear left wheel speed sensor		
Battery voltage	05	ABS/TCL-ECU power supply voltage	Ignition switch power supply voltage	Battery positive voltage
Stoplight switch*	06	Stoplight switch	Depress the brake pedal.	ON
			Release the brake pedal.	OFF
TCL mode	35	TCL operation	When the TCL outputs the operation permission signal during driving	ON
			When the TCL outputs the operation inhibition signal during driving	OFF

NOTE: Since the TCL is controlled with the same ABS/TCL-ECU used to control the ABS, the stoplight switch check item (No.6) used only for the ABS also appear.

ACTUATOR TEST REFERENCE TABLE

M1136003600067

The scan tool activates the following actuators for testing. (Refer to P.13D-3).

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	PARTS TO BE ACTIVATED
FR wheel ABS Drive*	01	Solenoid valve for front right wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
FL wheel ABS Drive*	02	Solenoid valve for front left wheel	
RR wheel ABS Drive*	03	Solenoid valve for rear right wheel	
RL wheel ABS Drive*	04	Solenoid valve for rear left wheel	
Engine TCL Drive	09	TCL operation check	Outputs the engine torque control signal (engine torque = 0) to PCM for three seconds.

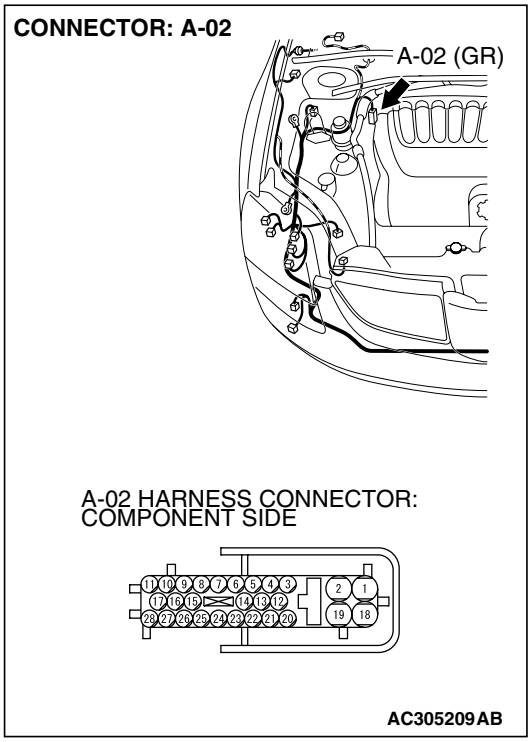
NOTE: Since the TCL is controlled with the same ABS/TCL-ECU used to control the ABS, the FR, FL, RR or RL Wheel ABS Drive testing items (No.01 to 04) used only for the ABS also appear.

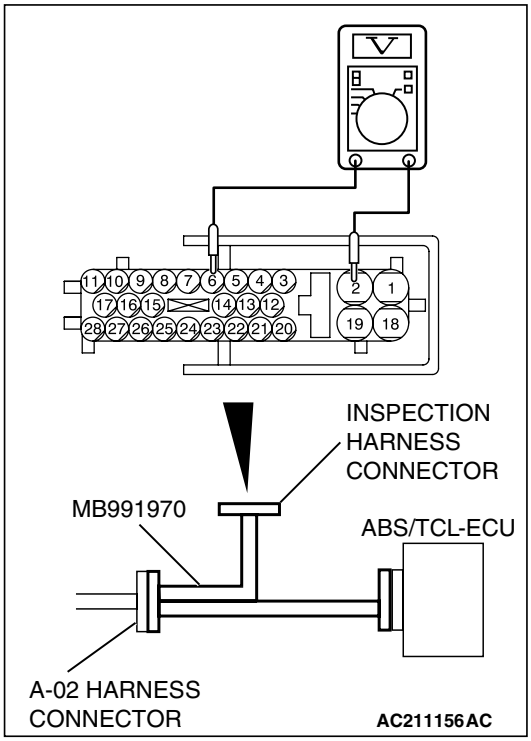
CHECK AT ABS/TCL-ECU TERMINAL VOLTAGE

M1136003800072

TERMINAL VOLTAGE CHECK CHART

Required Special Tools:
MB991970: ABS Check Harness
MB991223: Harness Set





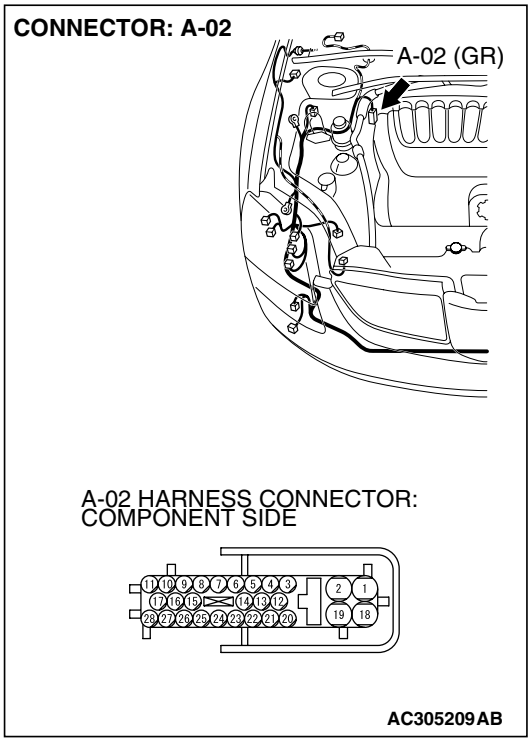
1. Disconnect the ABS/TCL-ECU connector A-02 and connect special tool MB991970 between the ABS/TCL-ECU and the body-side harness connector. Then use special tool MB991970 to measure the voltages between terminal 2 and each terminal.
2. The terminal layouts are shown in the illustrations below.

NOTE: Do not measure terminal voltage for approximately three seconds after the ignition switch is turned "ON." The ABS/TCL-ECU performs the initial check during that period.

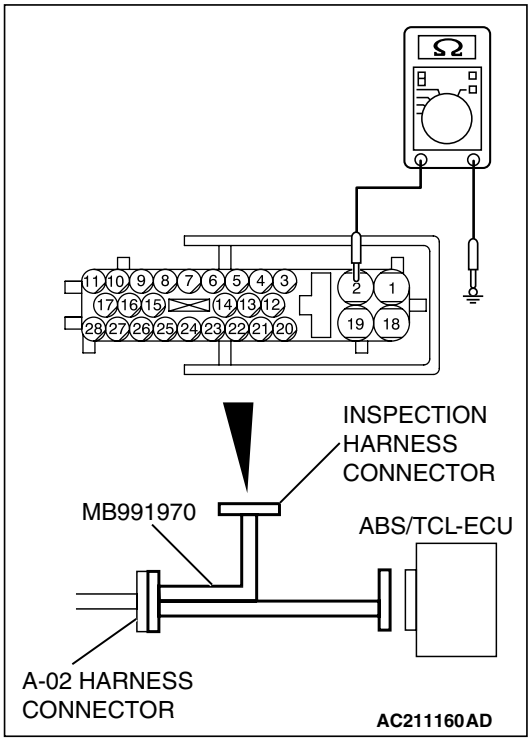
CONNECTOR TERMINAL NO	SIGNAL	CHECKING REQUIREMENT		NORMAL CONDITION
6	TCL switch	Ignition switch: "ON"	When the TCL switch is not pressed.	Battery positive voltage
			When the TCL switch is pressed.	1 V or less
20	ABS/TCL-ECU power supply	Ignition switch: "ON"		Battery positive voltage
		Ignition switch: "START"		1 V or less

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

Required Special Tools:
MB991970: ABS Check Harness
MB991223: Harness Set



1. Disconnect the ABS/TCL-ECU connector A-02 and connect special tool MB991970 to the A-02 body-side harness connector. Then turn the ignition switch to the "LOCK" (OFF) position and checking resistance and continuity.
2. Check the resistance and continuity between the terminals indicated in the table below.
3. The terminal layout is shown in the illustration.

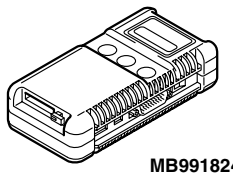
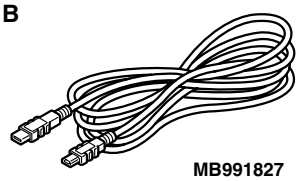
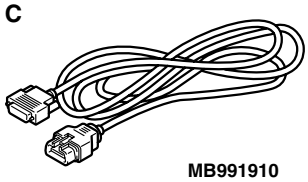
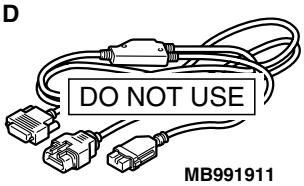
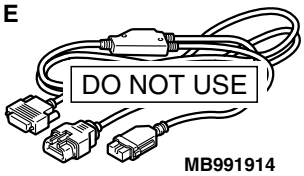
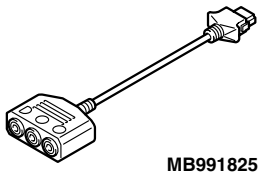
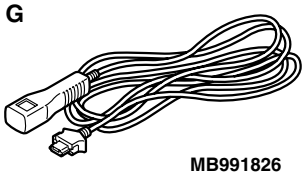
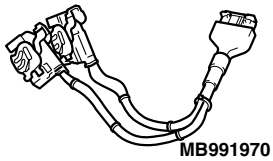


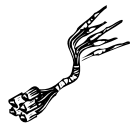
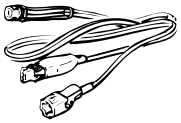
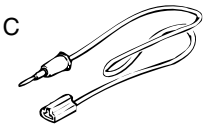
CONNECTOR TERMINAL NO.	SIGNAL	NORMAL CONDITION
2 – body ground	Ground	Less than 2 ohms
9 – 10	Front-right wheel speed sensor	1.24 – 1.64 kΩ
11 – 17	Rear-right wheel speed sensor	1.24 – 1.64 kΩ

CONNECTOR TERMINAL NO.	SIGNAL	NORMAL CONDITION
16 – 26	Front-left wheel speed sensor	1.24 – 1.64 kΩ
18 – body ground	Ground	Less than 2 ohms
27 – 28	Rear-left wheel speed sensor	1.24 – 1.64 kΩ

SPECIAL TOOLS

M1136000600024

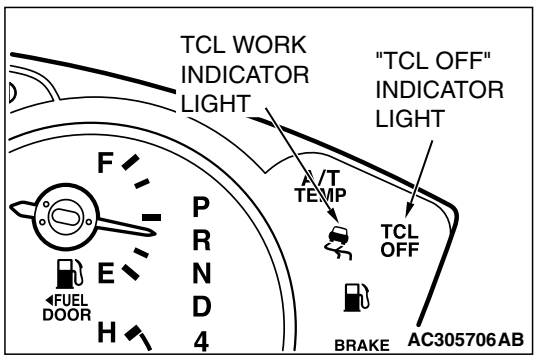
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III sub assembly A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III main harness C (for Daimler Chrysler models only) F: M.U.T.-III measurement adapter G: M.U.T.-III trigger harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III trigger harness is not necessary when pushing V.C.I. ENTER key.*	Checking diagnostic trouble codes **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**
 MB991970	MB991970 ABS check harness		ABS/TCL-ECU terminal voltage measurement

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  B  C  D  MB991223AD	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222 Harness set A: Inspection harness B: LED harness C: LED harness adapter D: Probe	General service tools	Checking the continuity and measuring the voltage at the harness connector

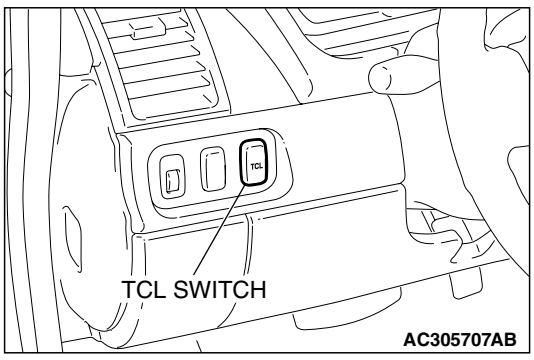
ON-VEHICLE SERVICE

TCL INDICATOR LIGHT CHECK

M1136000900058



1. Check that the "TCL OFF" indicator light and the TCL work indicator light illuminate for three seconds when the ignition switch is turned to the "ON" position.
2. Check that the "TCL OFF" indicator light illuminates and goes off in cycles each time the TCL switch is pushed after starting the engine.
3. Check that the "TCL OFF" indicator light and the TCL work indicator light do not illuminate, when driving at 30km/h (37.5 mph) for more than 2 seconds.
4. If defective, repair it. (Refer to P.13D-26, TCL diagnosis – Symptom Procedures – Inspection Procedure 1, 2, 3 and 4).



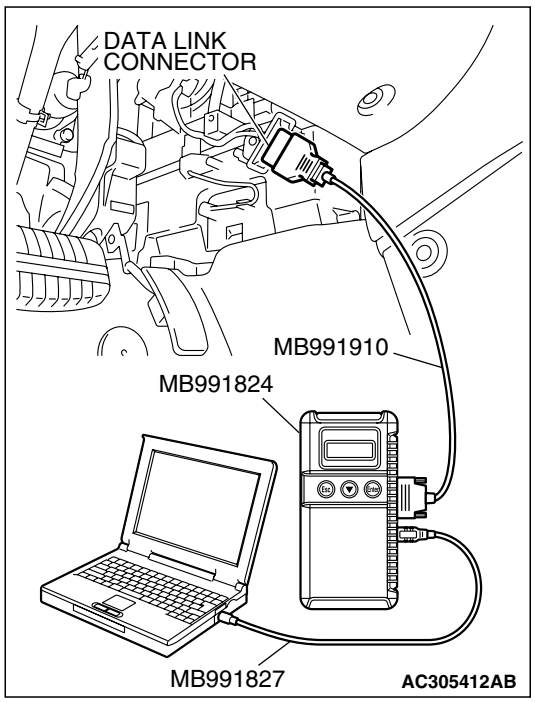
TCL OPERATION CHECK

M1136001100055

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

TSB Revision



⚠ 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. (Refer to P.13D-3).
2. Turn the ignition switch to the "ON" position.

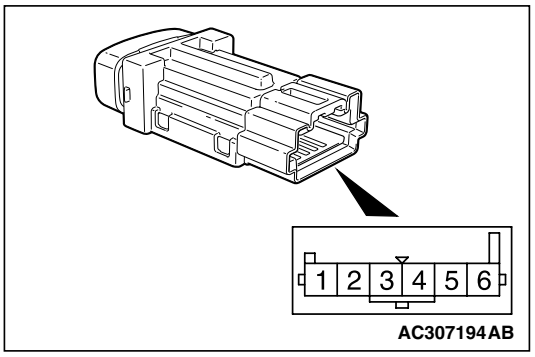
⚠ CAUTION

The engine speed increases after the actuator test because the actuator test continues for only three seconds. Therefore, release the accelerator pedal immediately.

3. Use scan tool MB991958 to check the actuator test. (Refer to P.13D-3).
   - Item 09: Engine TCL Drive.
     - When the accelerator pedal is depressed at the same time that the button for actuator test item 09 displayed on scan tool MB991958 is pressed, the system prevents the engine speed from rising for three seconds.
4. Turn the ignition switch to the "LOCK" (OFF) position.
5. Disconnect scan tool MB991958.
6. If defective, repair it. (Refer to P.13D-38, TCL diagnosis – Symptom Procedures – Inspection Procedure 6).

TCL SWITCH CHECK

M1136001700024



1. Remove the TCL switch. (Refer to P.13D-50).
2. Measure the resistance between terminal 1 and terminal 2 when the TCL switch is pressed or released. If the values measured at the time correspond to those in the table below, the resistance values are correct.

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
Pressed	1-2	Less than 2 ohms
Released	1-2	Open circuit

WHEEL SPEED SENSOR CHECK

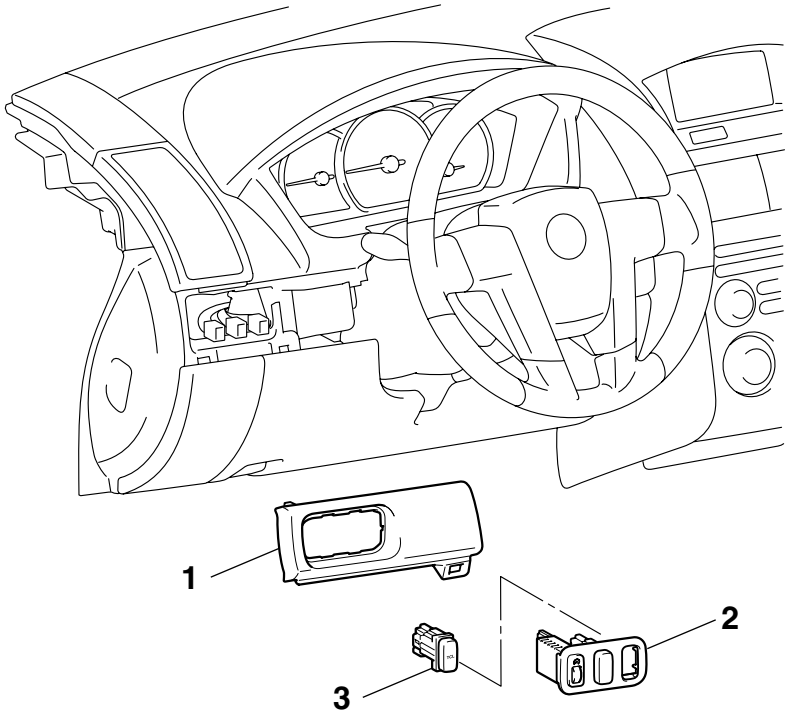
M1136001300026

Refer to GROUP 35B, On-vehicle Service P.35B-90.

TCL SWITCH

REMOVAL AND INSTALLATION

M1136001600027



AC307189AB

REMOVAL STEPS
- HOOD LOCK RELEASE HANDLE (REFER TO GROUP 42, HOOD P.42-7.)
- INSTRUMENT LOWER PANEL (REFER TO GROUP 52A, INSTRUMENT PANEL ASSEMBLY P.52A-15.)

REMOVAL STEPS (Continued)
- INSTRUMENT PANEL GARNISH (REFER TO GROUP 52A, INSTRUMENT PANEL ASSEMBLY P.52A-15.)

1. SWITCH BEZEL ASSEMBLY
2. SWITCH PANEL ASSEMBLY
3. TCL SWITCH

WHEEL SPEED SENSOR

REMOVAL AND INSTALLATION

M1136002500023

Refer to GROUP 35B, Wheel Speed Sensor P.35B-98.

ABS/TCL-ECU

REMOVAL AND INSTALLATION

M1136005300017

Replace the hydraulic unit (integrated with ABS/TCL-ECU). (Refer to GROUP 35B, Hydraulic Unit P.35B-96).

GROUP 14

ENGINE COOLING

CONTENTS

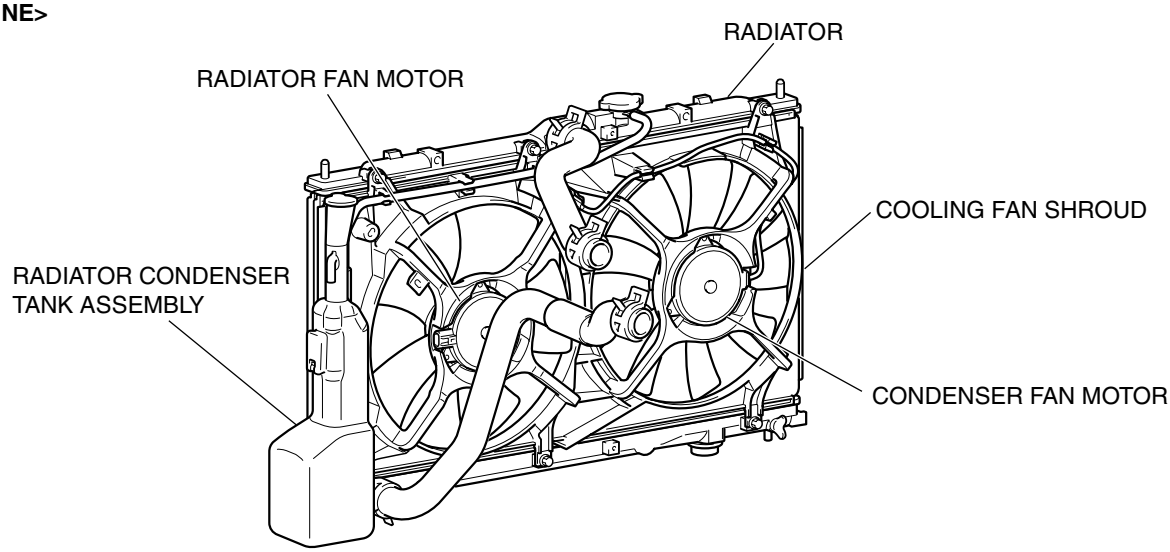
GENERAL DESCRIPTION

M1141000100401

- The cooling system is designed to keep every part of the engine at appropriate temperature in whatever condition the engine may be operated. The cooling method is of the water-cooled, pressure forced circulation type in which the water pump pressurizes coolant and circulates it throughout the engine. If the coolant temperature exceeds the prescribed temperature, the thermostat opens to circulate the coolant through the radiator as well so that the heat absorbed by the coolant may be radiated into the air. The water pump is of the centrifugal type and is driven by the drive belt from the crankshaft. The radiator is the corrugated fin, down flow type.
- PremAir® direct ozone reduction (DOR) radiator has been adopted to vehicle for California emission regulation. A catalyst which depollutes ozone (O_3) in the air has been insufflated to the radiator core. <2.4L Engine>

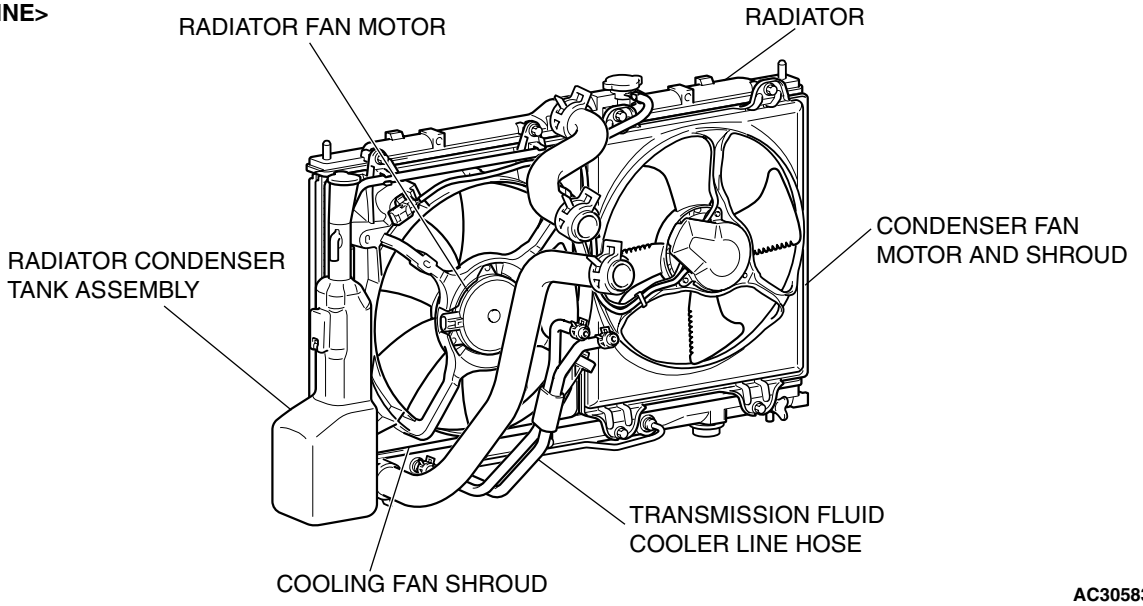
CONSTRUCTION DIAGRAM

<2.4L ENGINE>



AC305835AB

<3.8L ENGINE>

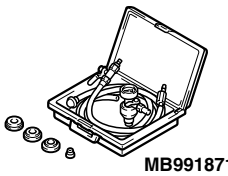


AC305836AB

TSB Revision

SPECIAL TOOL

M1141000600279

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991871	MB991871 LLC changer	General service tool	Coolant refilling

ENGINE COOLING DIAGNOSIS

INTRODUCTION

M1141005300347

The system cools the engine so that it does not overheat and maintains the engine at an optimum temperature. The system components are the radiator, water pump, thermostat, condenser fan assembly. Possible faults include low coolant, contamination, belt loosening and component damage.

TROUBLESHOOTING STRATEGY

M1141005200340

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to find most of the engine cooling faults.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find and repair the malfunction by following the SYMPTOM CHART.
4. Verify that the malfunction is eliminated.

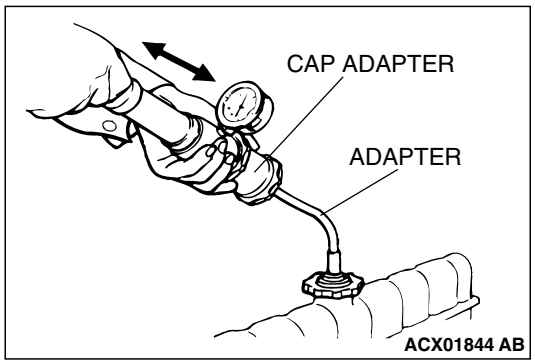
SYMPTOM CHART

M1141005600393

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Coolant Leak	1	P.14-4
Engine Overheating	2	P.14-4

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Coolant Leak



DIAGNOSIS

STEP 1. Check for coolant leaks.

⚠ ***WARNING***
When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ **CAUTION**
- **Be sure to completely clean away any moisture from the places checked.**
- **When the tester is removed, be careful not to spill any coolant.**
- **When installing and removing the tester and when testing, be careful not to deform the filler neck of the radiator.**

Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa (23 psi) pressure, and then check for leakage from the radiator hose or connections.

Q: Is leakage present from the radiator hose or connections?

YES : Repair or replace the appropriate part, then go to Step 2.
NO : There is no action to be taken.

STEP 2. Retest the system.

Q: It there still coolant leakage?

YES : Return to Step 1.
NO : The procedure is complete.

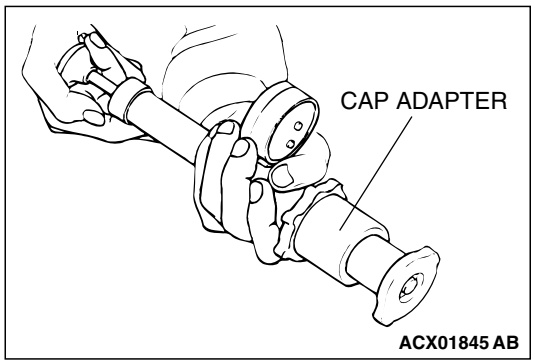
INSPECTION PROCEDURE 2: Engine Overheating

DIAGNOSIS

STEP 1. Remove the radiator cap and check for coolant contamination.

Q: Is the coolant contaminated with rust and oil?

YES : Replace it. Refer to P.14-7.
NO : There is no action to be taken. Go to Step 2.



STEP 2. Check the radiator cap valve opening pressure.

NOTE: Be sure that the cap is clean before testing. Rust or other foreign material on the cap seal will cause an improper reading.

(1) Use a cap adapter to attach the cap to the tester.
(2) Increase the pressure until the gauge indicator stops moving.

Minimum limit: 83 kPa (12 psi)
Standard value: 93 – 123 kPa (14 – 18 psi)

Q: Does the reading remain at or above the minimum limit?

YES : Go to Step 3.
NO : Replace the radiator cap. Then go to Step 5.

STEP 3. Check thermostat operation.

Refer to P.14-20.

Q: Does the thermostat operate correctly?

YES : Go to Step 4.
NO : Replace the thermostat, then go to Step 5.

STEP 4. Check the drive belt for slippage or damage.

Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition). <2.4L Engine>P.00-52 , <3.8L Engine>P.00-52 .

Q: Is the drive belt loose or damaged?

YES : Adjust or replace the drive belt, then go to Step 5.
NO : There is no action to be taken.

STEP 5. Retest the system.

Check the engine coolant temperature.

Q: Is the engine coolant temperature abnormally high?

YES : Return to Step 2.
NO : The procedure is complete.

ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

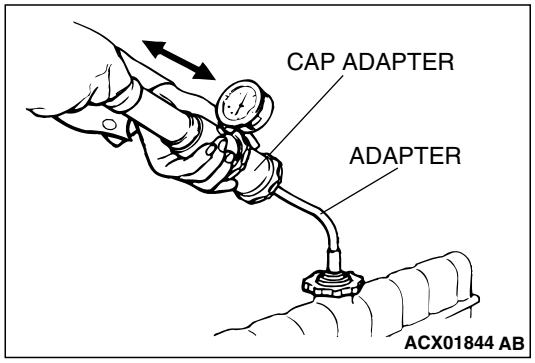
M1141001000333

⚠ *WARNING*

When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ **CAUTION**

- **Be sure to completely clean away any moisture from the places checked.**
- **When the tester is taken out, be careful not to spill any coolant.**
- **Be careful when installing and removing the tester and when testing not to deform the filler neck of the radiator.**

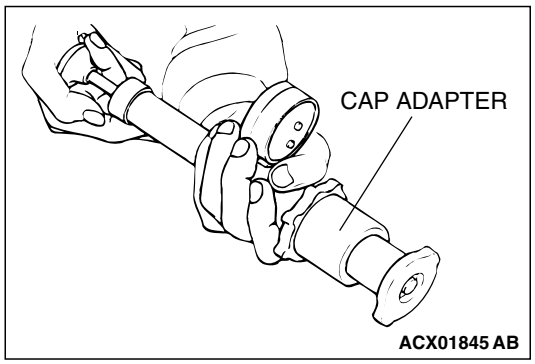


1. Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa (23 psi) pressure, and then check for leakage from the radiator hose or connections.
2. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP PRESSURE CHECK

M1141001300419

NOTE: Be sure that the cap is clean before testing. Rust or other foreign material on the cap seal will cause an improper reading.



1. Use a cap adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

   Minimum limit: 83 kPa (12 psi)
   Standard value: 93 – 123 kPa (14 – 18 psi)
3. Replace the radiator cap if the reading does not remain at or above the limit.

ENGINE COOLANT REPLACEMENT

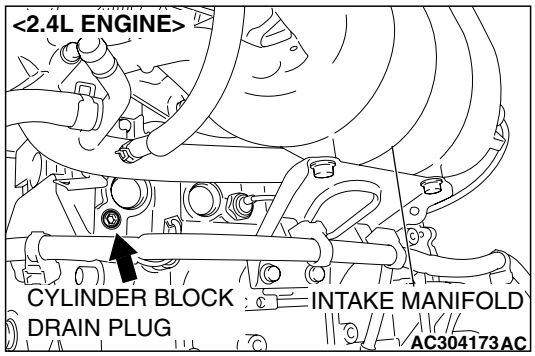
M1141001200962

⚠ ***WARNING***

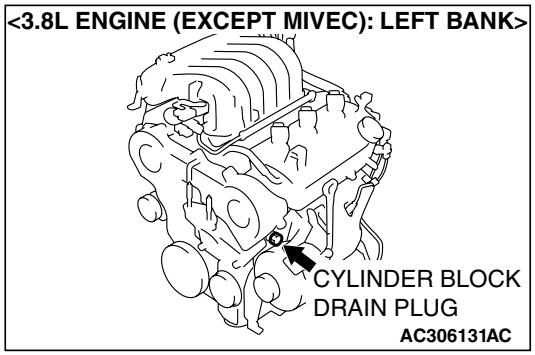
When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a shop towel over the cap and turn the cap counterclockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.

1. Drain the water from the radiator, heater core and engine after unplugging the radiator drain plug and removing the radiator cap.

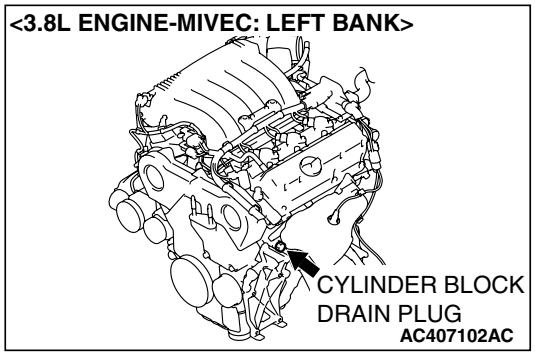
<2.4L ENGINE>



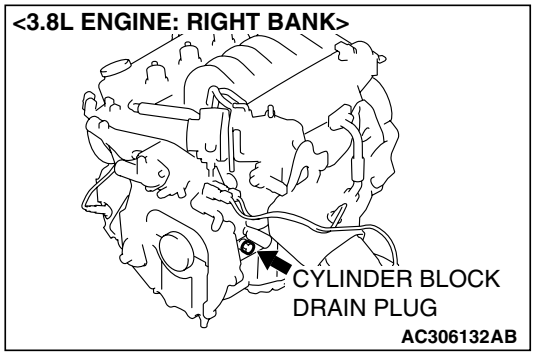
<3.8L ENGINE (EXCEPT MIVEC): LEFT BANK>



<3.8L ENGINE-MIVEC: LEFT BANK>

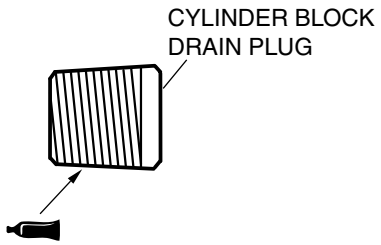


<3.8L ENGINE: RIGHT BANK>



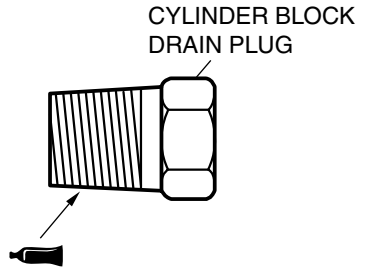
2. Drain the water in the water jacket by unplugging the drain plug of the cylinder block.
3. Remove the radiator condenser tank assembly and drain the coolant.
4. Drain the coolant then clean the path of the coolant by injecting water into the radiator from the radiator cap area.

<2.4L ENGINE, 3.8L ENGINE: RIGHT BANK>

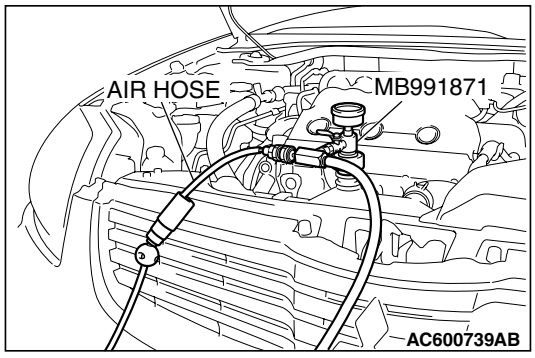


AC304677 AC

<3.8L ENGINE: LEFT BANK>



AC200625 AD



AC600739AB

5. Apply the designated sealant to the screw area of the cylinder block drain plug, and then tighten to the standard torque.

   Specified sealant: 3M™ AAD Part No.8731 or equivalent

   Tightening torque:

   <2.4L Engine> 44 ± 5 N·m (33 ± 3 ft-lb)

   <3.8L Engine> 39 ± 5 N·m (29 ± 3 ft-lb)

6. Securely tighten the radiator drain plug.
7. Assemble the radiator condenser tank assembly.

⚠ CAUTION

- **Do not use alcohol or methanol anti-freeze or any engine coolants mixed with alcohol or methanol anti-freeze. The use of an improper anti-freeze can cause corrosion of the aluminum components.**
- **If the coolant contact the PremAir® direct ozone reduction (DOR) radiator, wash it with water at once. <Vehicles for California emission regulation> (2.4L Engine)**

8. By referring to the section on coolant, select an appropriate concentration for safe operating temperature within the range of 30 to 60 %. Use special tool MB991871 to refill the coolant. A convenient mixture is a 50 % water and 50 % antifreeze solution [freezing point: –31°C (–32.8 °F)].

   Recommended antifreeze: Long Life Antifreeze Coolant or an equivalent

   Quantity:

   <2.4L Engine> 8.0 dm^3 (8.5 quarts)

   <3.8L Engine> 8.7 dm^3 (9.2 quarts)

   NOTE: For how to use special tool MB991871, refer to its manufacturer's instructions.

9. Reinstall the radiator cap.
10. Start the engine and let it warm up until the thermostat opens.
11. After repeatedly revving the engine up to 3,000 r/min several times, stop the engine.
12. Remove the radiator cap after the engine has cooled, and pour in coolant up to the brim. Reinstall the cap.

⚠ CAUTION

Do not overfill the radiator condenser tank assembly.

13. Add coolant to the radiator condenser tank assembly between the "FULL" and "LOW" mark if necessary.

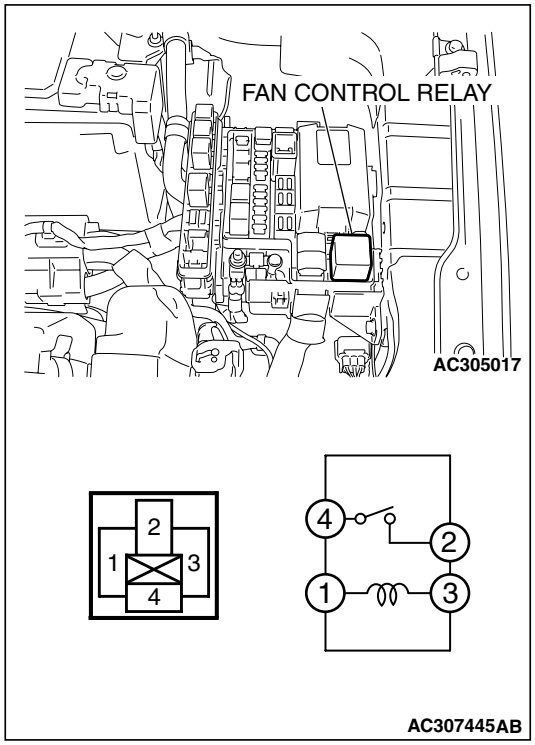
ENGINE COOLANT CONCENTRATION TEST

M1141001100396

Refer to GROUP 00, RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE P.00-43.

FAN CONTROL RELAY CONTINUITY CHECK

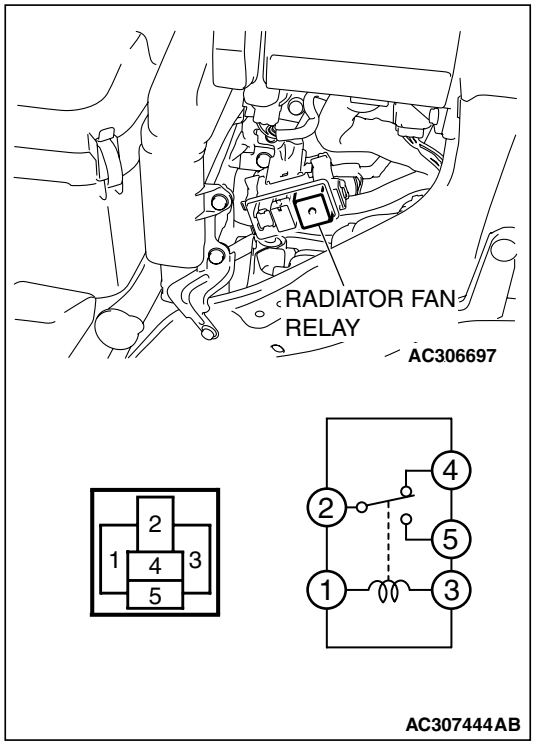
M1141006200310



BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO TESTER	CONTINUITY TEST RESULTS
Not applied	4 – 2	Open circuit
Connect terminal No.3 and battery (–) terminal. Connect terminal No.1 and battery (+) terminal.	4 – 2	Less than 2 ohms

RADIATOR FAN RELAY CHECK

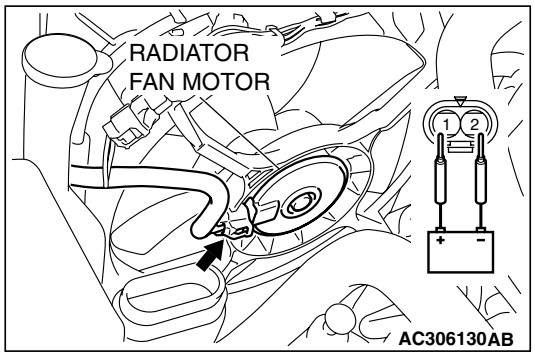
M1141004400028



BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO TESTER	CONTINUITY TEST RESULTS
Not applied	2 – 4	Less than 2 ohms
	2 – 5	Open circuit
Connect terminal No.3 and battery (–) terminal. Connect terminal No.1 and battery (+) terminal.	2 – 5	Less than 2 ohms

RADIATOR FAN MOTOR CHECK

M1141007100093



1. Remove the radiator fan motor connector.
2. Check to see that the fan motor of the radiator turns when applying battery power between the connector terminals of the radiator fan motor. Also check to see that there is no abnormal sound coming from the radiator fan motor at this time.
3. If the radiator fan motor is defective, replace it.

RADIATOR

REMOVAL AND INSTALLATION

M1141001501427

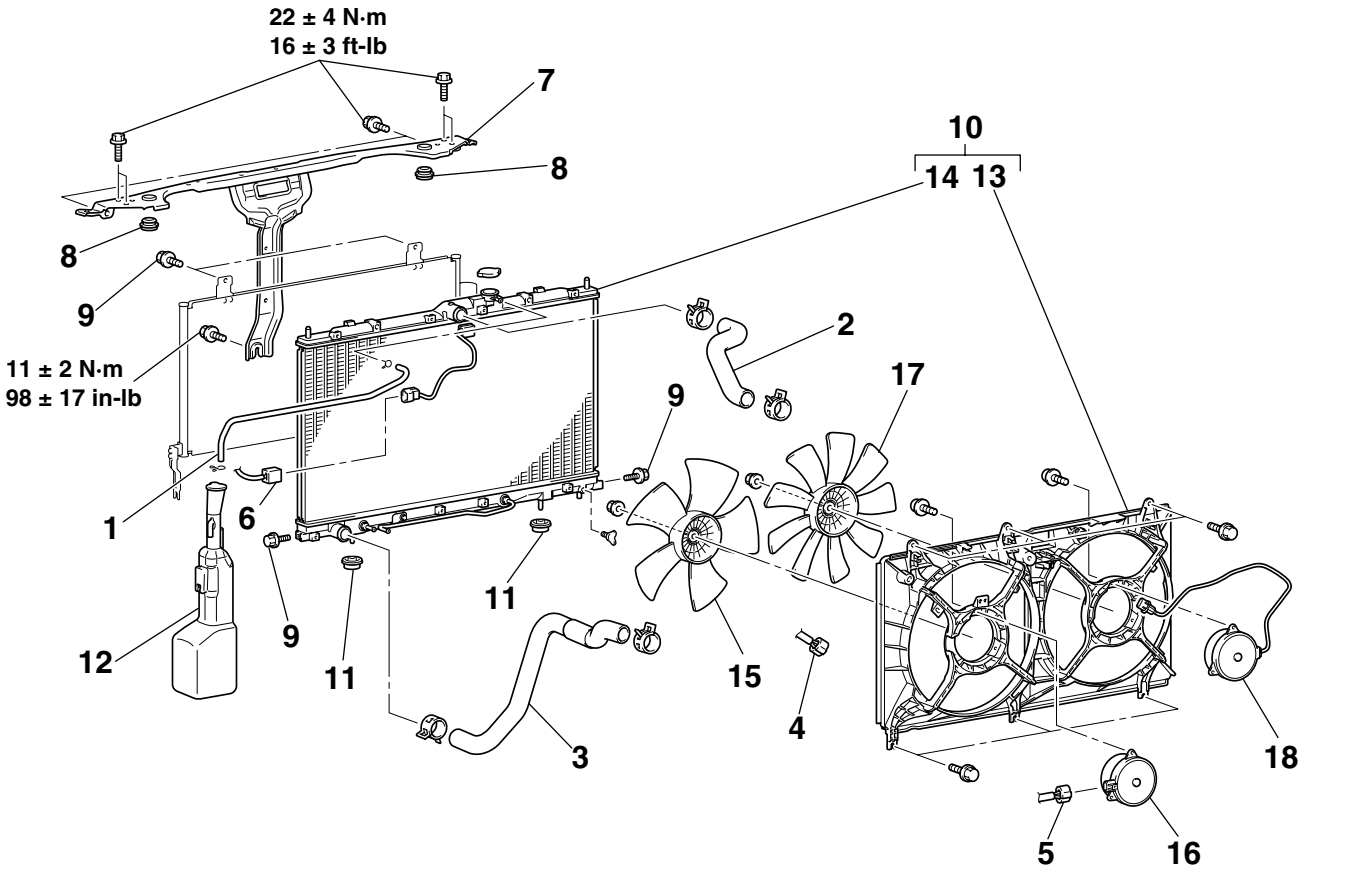
<2.4L ENGINE>

⚠ CAUTION

<Vehicles for California emission regulation>

- **Never remove the radiator sensor from the radiator because it cannot be disassembled. When replacing the radiator sensor, replace it with the radiator as a set. When the radiator sensor is removed from the radiator, the powertrain control module (PCM) detects an error and sets a diagnostic trouble code.**
- **Never replace the DOR radiator with the NON-DOR radiator.**
- **Never clean the DOR radiator with a high concentration of alkaline cleaner.**

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to P.14-7). • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-4).	• Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-4). • Engine Coolant Refilling and Level Check (Refer to P.14-7).



AC600703AB

RADIATOR REMOVAL STEPS

1. RADIATOR CONDENSER TANK HOSE
<<A>> >>A<< 2. RADIATOR UPPER HOSE
<<A>> >>A<< 3. RADIATOR LOWER HOSE
4. CONDENSER FAN MOTOR CONNECTOR
5. FAN MOTOR CONNECTOR

RADIATOR REMOVAL STEPS

6. RADIATOR SENSOR CONNECTOR <DOR RADIATOR>
• HOOD LATCH (REFER TO GROUP 42, HOOD P.42-7).
7. FRONT END STRUCTURE BAR
8. UPPER INSULATOR
9. CONDENSER BOLTS

TSB Revision

RADIATOR REMOVAL STEPS
10. RADIATOR ASSEMBLY
11. LOWER INSULATOR
12. RADIATOR CONDENSER TANK ASSEMBLY
13. SHROUD ASSEMBLY
14. RADIATOR

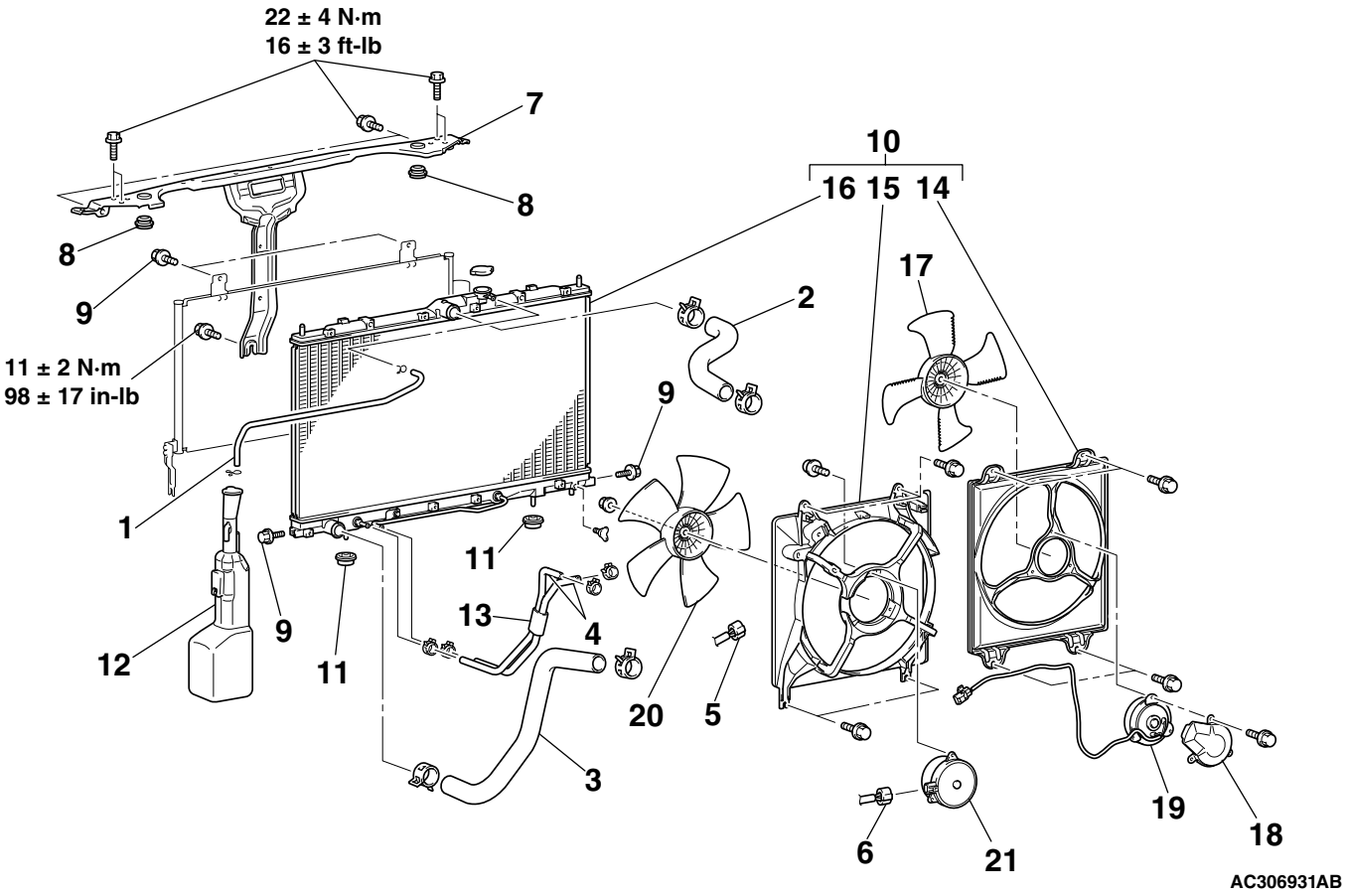
FAN MOTOR REMOVAL STEPS
1. RADIATOR CONDENSER TANK HOSE
<<**A**>> >>**A**<< 2. RADIATOR UPPER HOSE
4. CONDENSER FAN MOTOR CONNECTOR
5. FAN MOTOR CONNECTOR
6. RADIATOR SENSOR CONNECTOR <DOR RADIATOR>
12. RADIATOR CONDENSER TANK ASSEMBLY
13. SHROUD ASSEMBLY
15. RADIATOR FAN
16. RADIATOR FAN MOTOR
17. CONDENSER FAN
18. CONDENSER FAN MOTOR

RADIATOR CONDENSER TANK REMOVAL STEPS
- UNDER COVER (LH)
- AIR INTAKE DUCT (REFER TO GROUP 15, AIR CLEANER P.15-4).

1. RADIATOR CONDENSER TANK HOSE
4. CONDENSER FAN MOTOR CONNECTOR
5. FAN MOTOR CONNECTOR
6. RADIATOR SENSOR CONNECTOR <DOR RADIATOR>
12. RADIATOR CONDENSER TANK ASSEMBLY

<3.8L ENGINE>

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to P.14-7). • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-4).	• Air Cleaner Installation (Refer to GROUP 15 , Air Cleaner P.15-4). • Engine Coolant Refilling and Level Check (Refer to P.14-7). • A/T Fluid Refilling and Level Check (Refer to GROUP 00, Maintenance Service P.00-60).



RADIATOR REMOVAL STEPS

1. RADIATOR CONDENSER TANK HOSE
2. <<A>> >>A<< RADIATOR UPPER HOSE
3. <<A>> >>A<< RADIATOR LOWER HOSE
4. <<B>> A/T OIL COOLER HOSE CONNECTION
5. CONDENSER FAN MOTOR CONNECTOR
6. FAN MOTOR CONNECTOR
   - HOOD LATCH (REFER TO GROUP 42, HOOD P.42-7).
7. FRONT END STRUCTURE BAR
8. UPPER INSULATOR
9. CONDENSER BOLTS
10. RADIATOR ASSEMBLY
11. LOWER INSULATOR
12. RADIATOR CONDENSER TANK ASSEMBLY
13. <<B>> A/T OIL COOLER HOSE

RADIATOR REMOVAL STEPS

14. CONDENSER FAN SHROUD ASSEMBLY
15. COOLING FAN SHROUD ASSEMBLY
16. RADIATOR

FAN MOTOR REMOVAL STEPS

1. RADIATOR CONDENSER TANK HOSE
5. CONDENSER FAN MOTOR CONNECTOR
3. <<A>> >>A<< RADIATOR UPPER HOSE
6. FAN MOTOR CONNECTOR
12. RADIATOR CONDENSER TANK ASSEMBLY
14. CONDENSER FAN SHROUD ASSEMBLY
15. COOLING FAN SHROUD ASSEMBLY
17. CONDENSER FAN
18. HEAT PROTECTOR

TSB Revision

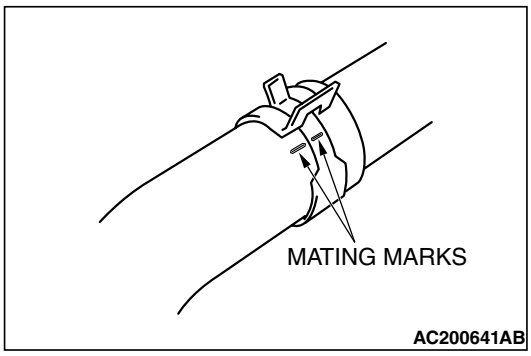
FAN MOTOR REMOVAL STEPS
19. CONDENSER FAN MOTOR
20. COOLING FAN
21. COOLING FAN MOTOR

RADIATOR CONDENSER TANK REMOVAL STEPS
- UNDER COVER (LH)
- AIR INTAKE DUCT (REFER TO GROUP 15, AIR CLEANER P.15-4).

1. RADIATOR CONDENSER TANK HOSE
5. CONDENSER FAN MOTOR CONNECTOR
6. FAN MOTOR CONNECTOR
12. RADIATOR CONDENSER TANK ASSEMBLY

REMOVAL SERVICE POINTS

<<A>> RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION



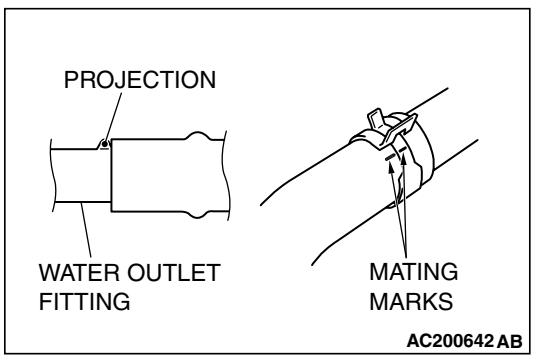
Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.

<<B>> A/T OIL COOLER HOSE REMOVAL

After removing the hose from the radiator, plug the hose and the radiator nipple to prevent dust or foreign particles from getting in.

INSTALLATION SERVICE POINT

>>A<< RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION



1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

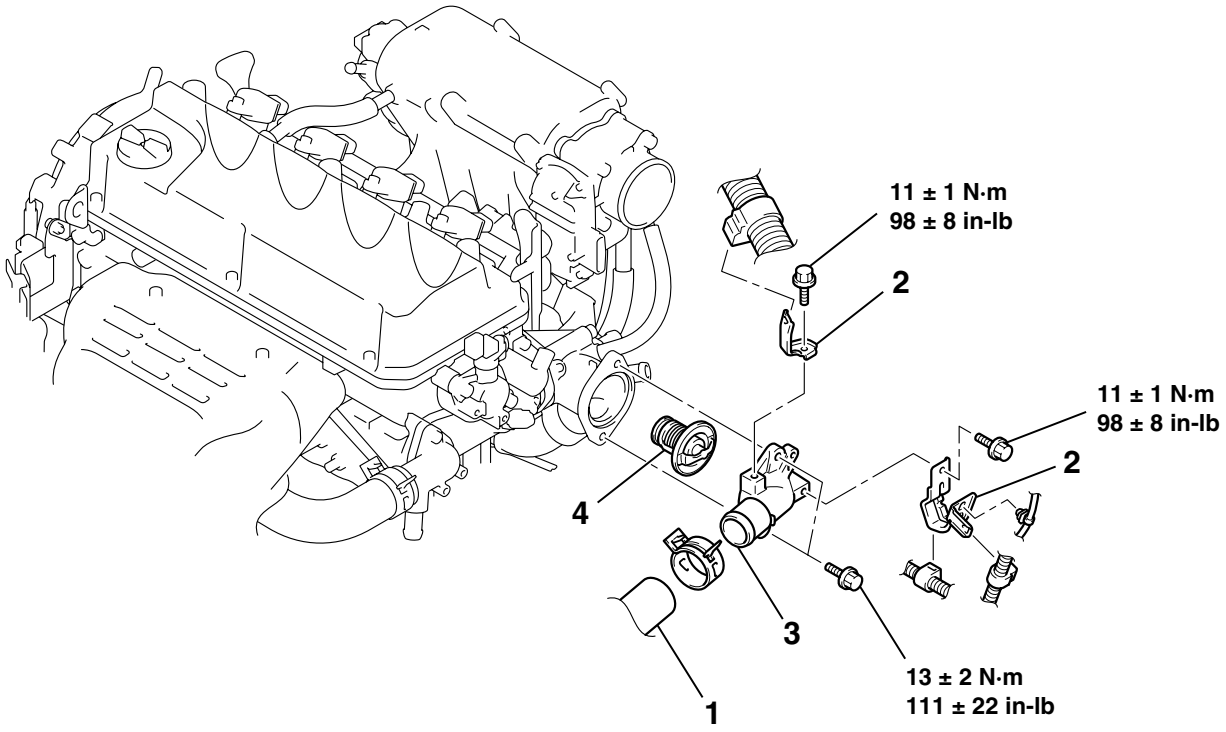
THERMOSTAT

REMOVAL AND INSTALLATION

M1141002401092

<2.4L ENGINE>

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Powertrain Control Module (PCM) Removal and Installation (Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180).
- Air Cleaner Cover and Air Intake Hose Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4).
- Battery and Battery Tray Removal and Installation.



AC306674AB

REMOVAL STEPS

<<**A**>> >>**B**<< 1. RADIATOR LOWER HOSE CONNECTION
2. HARNESS BRACKET

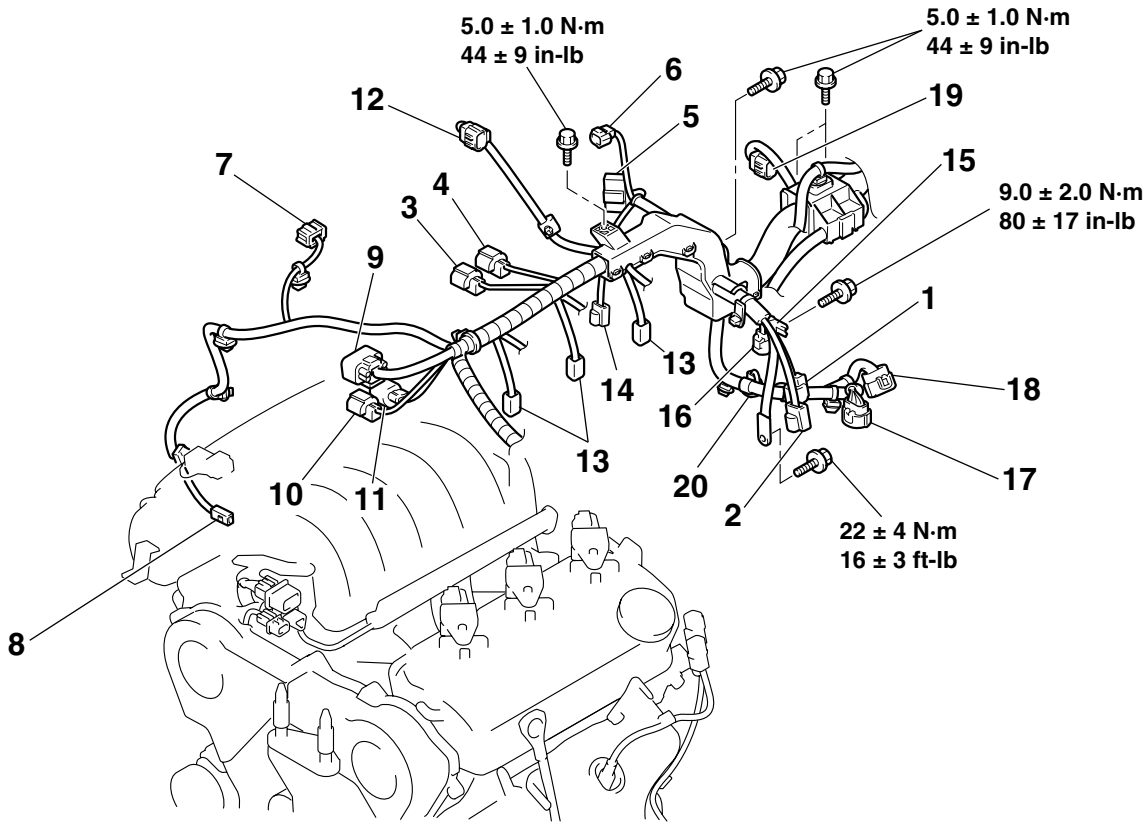
REMOVAL STEPS (Continued)

3. WATER INLET FITTING
>>**A**<< 4. THERMOSTAT

TSB Revision

<3.8L ENGINE (EXCEPT MIVEC)>

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Engine Cover Removal and Installation (Refer to GROUP 11C, Engine Assembly P.11C-22).
- Powertrain Control Module (PCM) Removal and Installation (Refer to GROUP 13B, Powertrain Control Module (PCM) P.13B-1447).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4).
- Strut Tower Bar Removal and Installation (Refer to GROUP 42, Strut Tower Bar P.42-11).
- Battery and Battery Tray Removal and Installation



AC306935AB

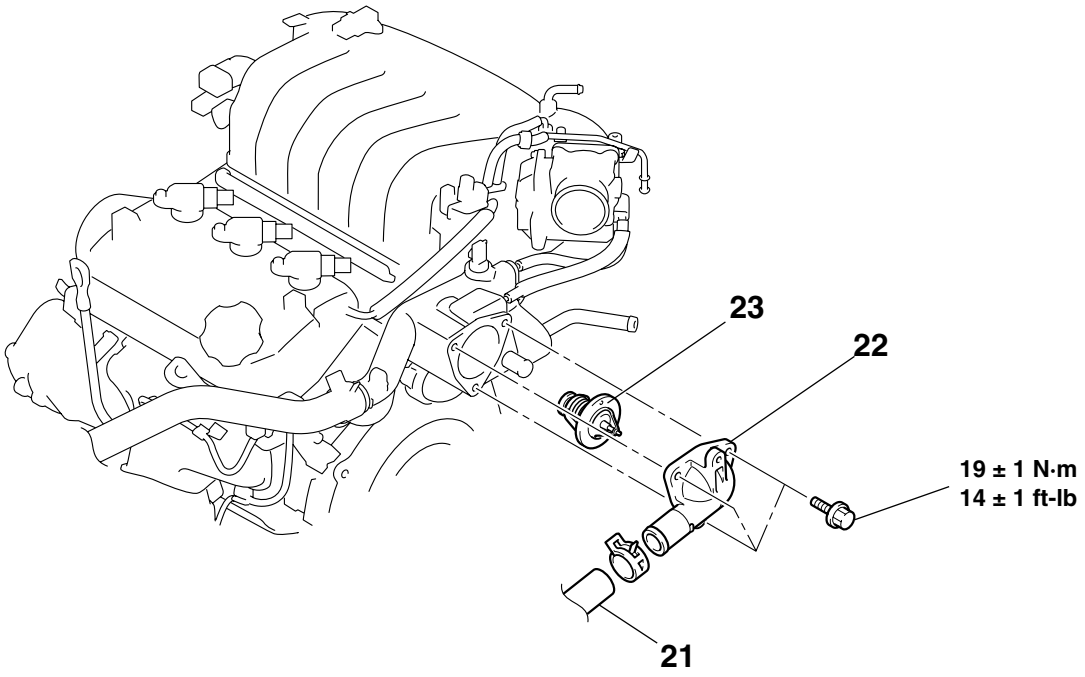
REMOVAL STEPS
1. LEFT BANK HEATED OXYGEN SENSOR (REAR) CONNECTOR
2. LEFT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR
3. RIGHT BANK HEATED OXYGEN SENSOR (REAR) CONNECTOR
4. RIGHT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR
5. THROTTLE BODY ASSEMBLY CONNECTOR
6. EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
7. MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR

REMOVAL STEPS (Continued)
8. POWER STEERING PRESSURE SWITCH CONNECTOR
9. CONTROL WIRING HARNESS AND WIRING HARNESS COMBINATION CONNECTOR
10. KNOCK SENSOR CONNECTOR
11. CRANKSHAFT POSITION SENSOR CONNECTOR
12. EXHAUST GAS RECIRCULATION VALVE CONNECTOR
13. INJECTOR CONNECTOR
14. ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR
15. CAPACITOR CONNECTOR

TSB Revision

REMOVAL STEPS (Continued)

16. CAMSHAFT POSITION SENSOR CONNECTOR
17. INHIBITOR SWITCH SENSOR CONNECTOR
18. A/T CONTROL SOLENOID VALVE ASSEMBLY CONNECTOR
19. OUTPUT SHAFT SPEED SENSOR CONNECTOR
20. INPUT SHAFT SPEED SENSOR CONNECTOR



REMOVAL STEPS

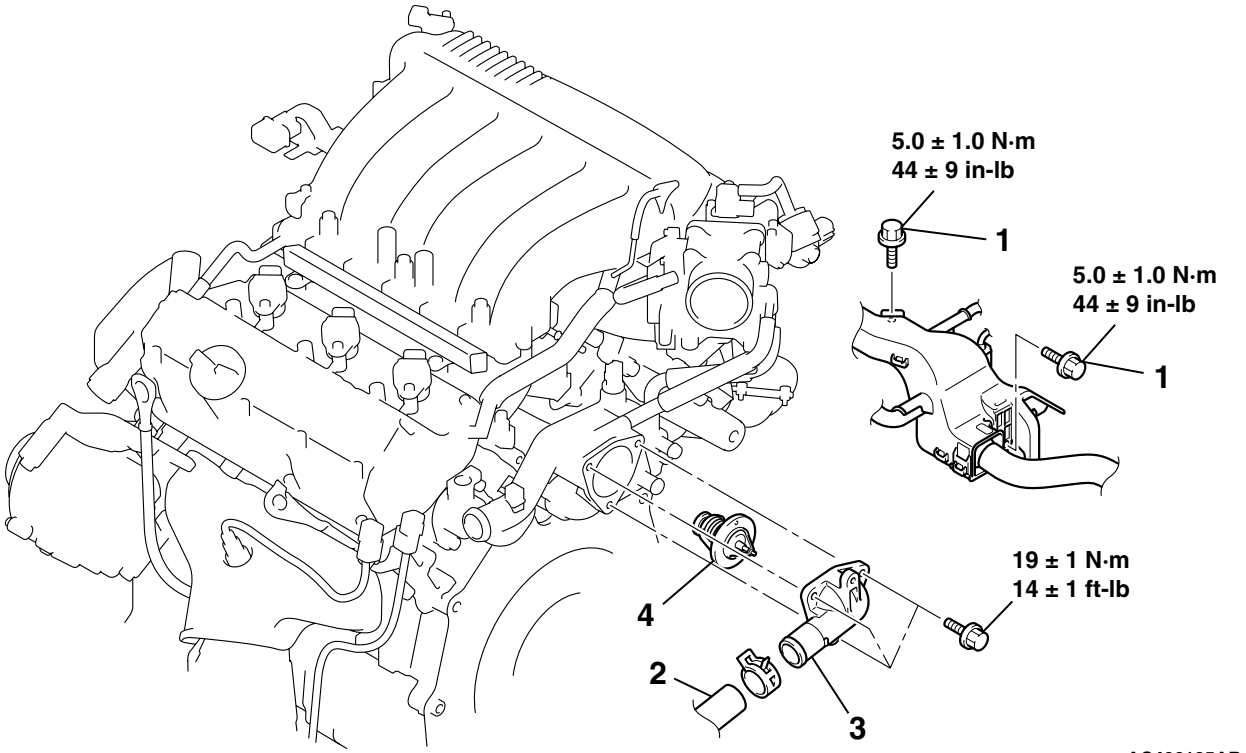
<<**A**>> >>**B**<< 21. RADIATOR LOWER HOSE CONNECTION

REMOVAL STEPS (Continued)

22. WATER INLET FITTING
>>**A**<< 23. THERMOSTAT

<3.8L ENGINE-MIVEC>

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Engine Cover Removal and Installation (Refer to GROUP 11E, Engine Assembly P.11E-25).
- Powertrain Control Module (PCM) Removal and Installation (Refer to GROUP 13B, Powertrain Control Module (PCM) P.13B-1447).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4).
- Strut Tower Bar Removal and Installation (Refer to GROUP 42, Strut Tower Bar P.42-11).
- Battery and Battery Tray Removal and Installation



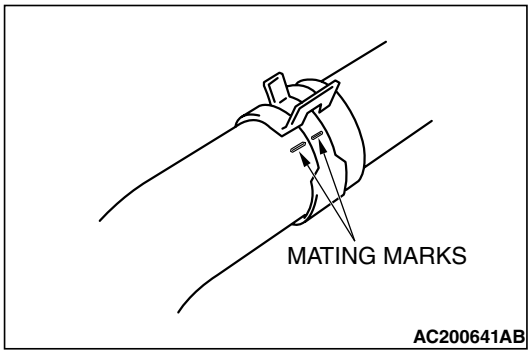
AC406185AB

REMOVAL STEPS
1. HARNESS CONNECTION BOLTS
<<**A**>> >>**B**<< 2. RADIATOR LOWER HOSE CONNECTION

REMOVAL STEPS (Continued)
3. WATER INLET FITTING
>>**A**<< 4. THERMOSTAT

TSB Revision

REMOVAL SERVICE POINT



<<A>> RADIATOR LOWER HOSE DISCONNECTION

Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.

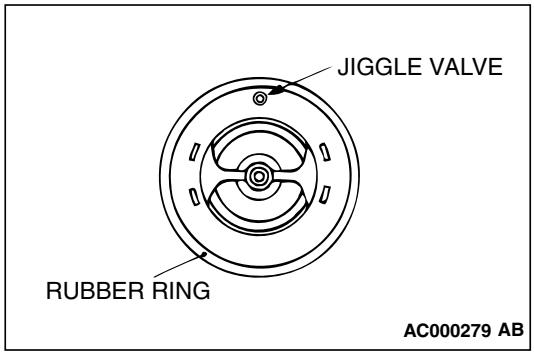
INSTALLATION SERVICE POINTS

>>A<< THERMOSTAT INSTALLATION

⚠ CAUTION

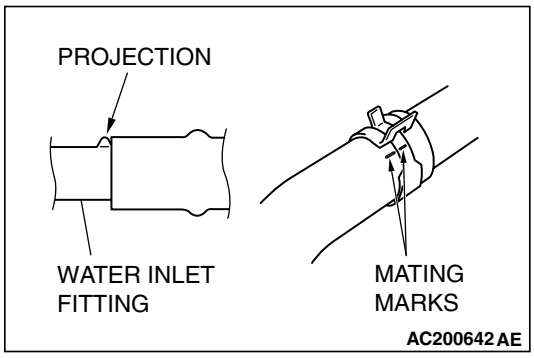
Make absolutely sure that no oil adheres to the rubber ring of the thermostat. Also do not fold or scratch the rubber ring during installation.

Install the thermostat so that the jiggle valve is facing straight up. Be careful not to fold or scratch the rubber ring.



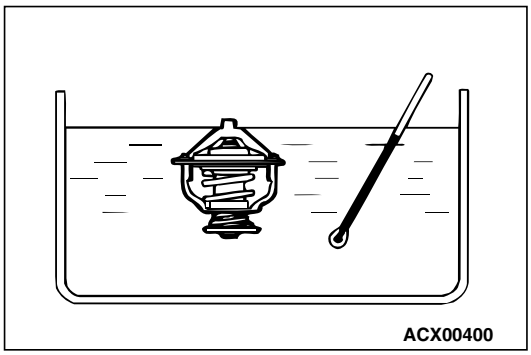
>>B<< RADIATOR LOWER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.



INSPECTION

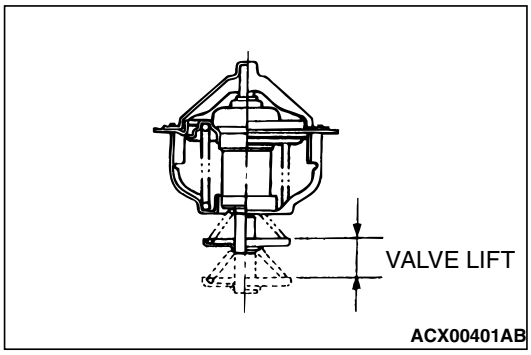
M1141002500450


ACX00400

Thermostat Check

1. Immerse the thermostat in water, and heat the water while stirring. Check the thermostat valve opening temperature.

   Standard value:
   Valve opening temperature:
   <2.4L Engine> 82 ± 1.5°C (180 ± 3°F)
   <3.8L Engine> 88 ± 1.5°C (190 ± 3°F)



ACX00401AB

2. Check that the amount of valve lift is at the standard value when the water is at the full-opening temperature.

   NOTE: Measure the valve height when the thermostat is fully closed, and use this measurement to compare the valve height when the thermostat is fully open.

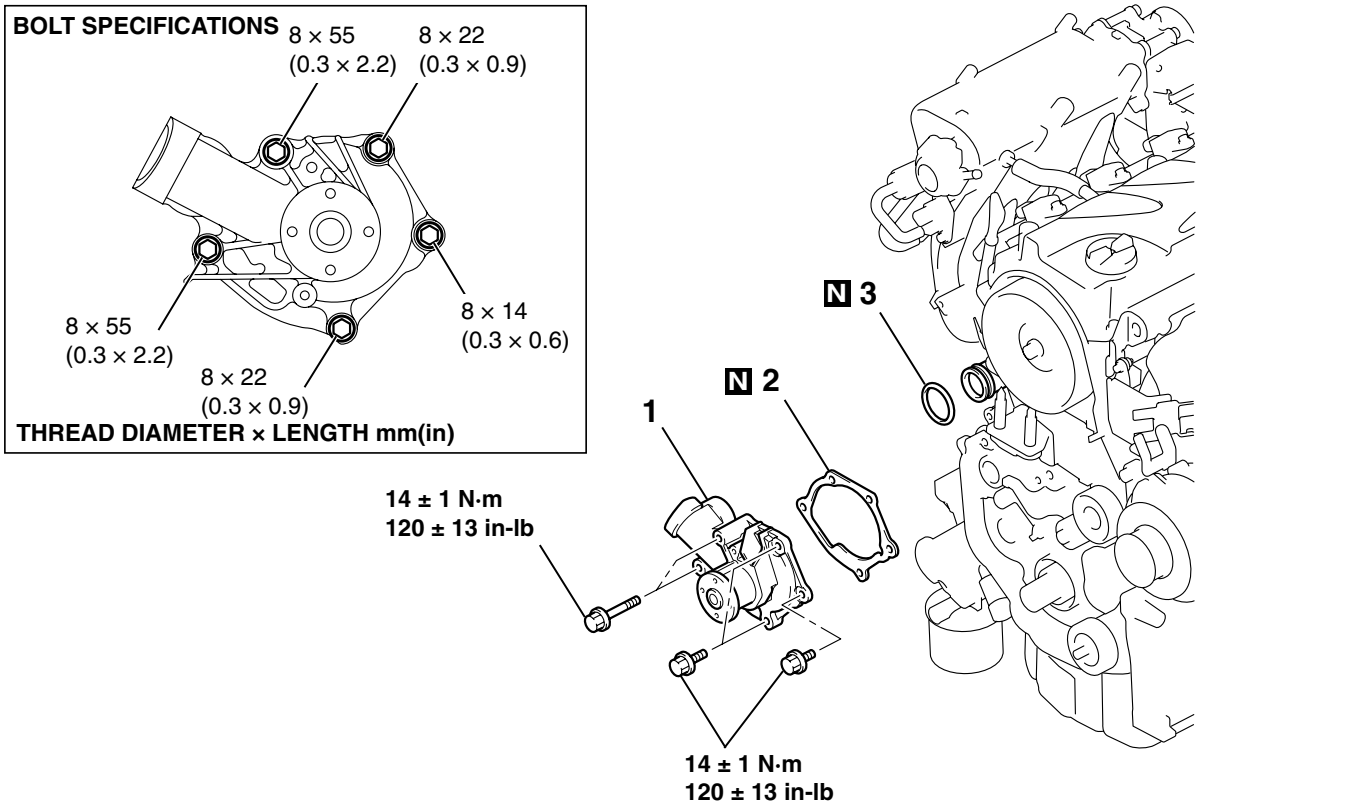
   Standard value:
   Full-opening temperature:
   <2.4L Engine> 95°C (203°F)
   <3.8L Engine> 100°C (212°F)
   Amount of valve lift:
   <2.4L Engine> 8.5 mm (0.33 inch) or more
   <3.8L Engine> 9.0 mm (0.35 inch) or more

WATER PUMP

REMOVAL AND INSTALLATION <2.4L ENGINE>

M1141002700487

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Timing Belt Removal and Installation (Refer to GROUP 11A, Timing Belt P.11A-51).



AC306675AB

REMOVAL STEPS
1. WATER PUMP

REMOVAL STEPS (Continued)
2. WATER PUMP GASKET
>>A<< 3. O-RING

TSB Revision

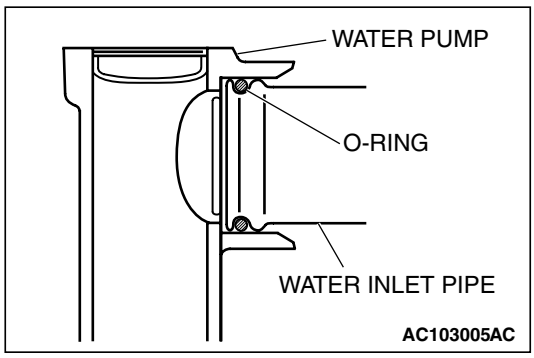
INSTALLATION SERVICE POINT

>>A<< O-RING INSTALLATION

⚠ CAUTION

Do not let the O-ring get contaminated with grease or engine oil.

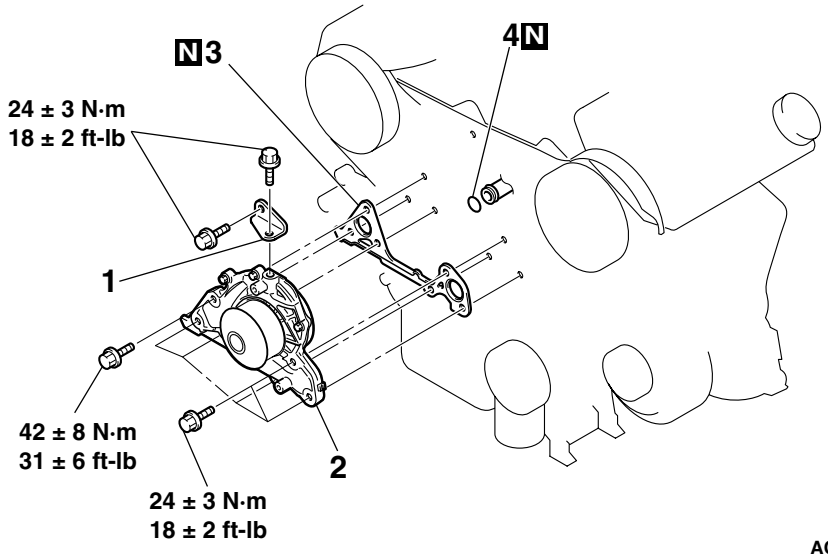
Fit an O-ring into the O-ring groove located at the end of the water inlet pipe and apply water or coolant to the O-ring or the inside of the mounting surface of the water pump for insertion.

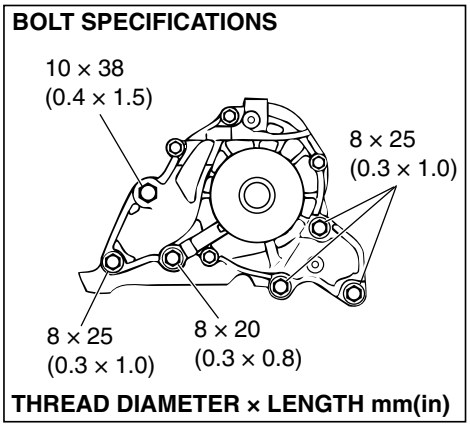


REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

M1141002701190

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Timing Belt Removal and Installation (Refer to GROUP 11C, Timing Belt P.11C-53).
- Crankshaft Position Sensor Removal and Installation (Refer to GROUP 16, Crankshaft Position Sensor P.16-45).





REMOVAL STEPS
1. WATER PUMP BRACKET
2. WATER PUMP

REMOVAL STEPS (Continued)
3. WATER PUMP GASKET
>>A<< 4. O-RING

TSB Revision

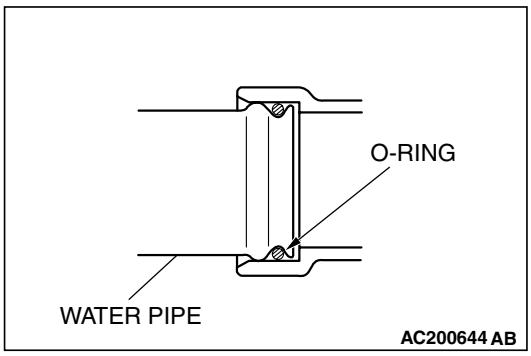
INSTALLATION SERVICE POINT

>>A<< O-RING INSTALLATION

⚠ CAUTION

Do not let the O-ring get contaminated with grease or engine oil.

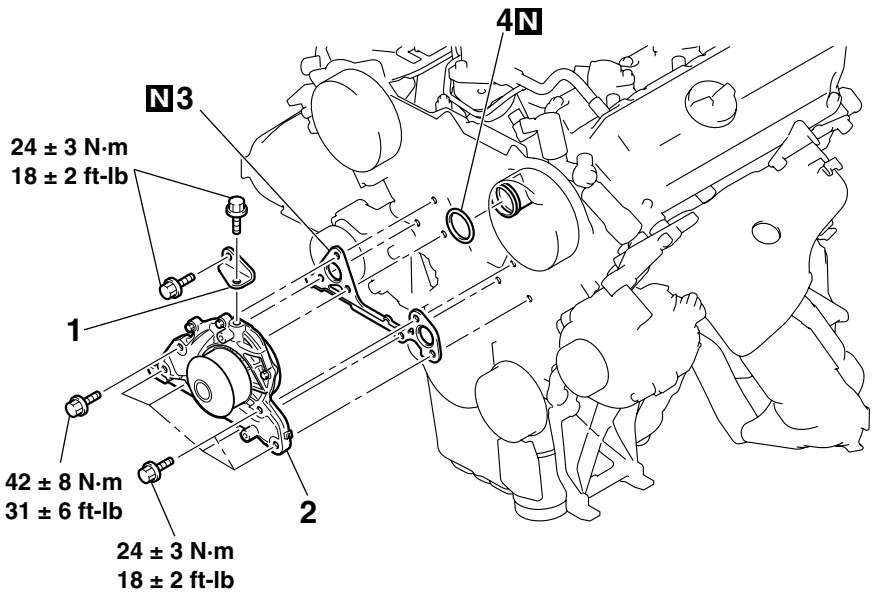
Fit the O-ring into the groove of the water pipe ends, and apply water or coolant to the circumference of the O-ring and the pipe bores to insert the pipe assembly.

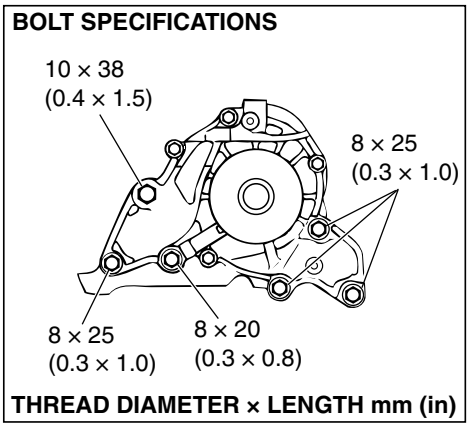


REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

M1141002701189

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Timing Belt Removal and Installation (Refer to GROUP 11E, Timing Belt P.11E-57).
- Crankshaft Position Sensor Removal and Installation (Refer to GROUP 16, Crankshaft Position Sensor P.16-46).





AC406186AB

REMOVAL STEPS
1. WATER PUMP BRACKET
2. WATER PUMP

REMOVAL STEPS (Continued)
3. WATER PUMP GASKET
>>A<< 4. O-RING

TSB Revision

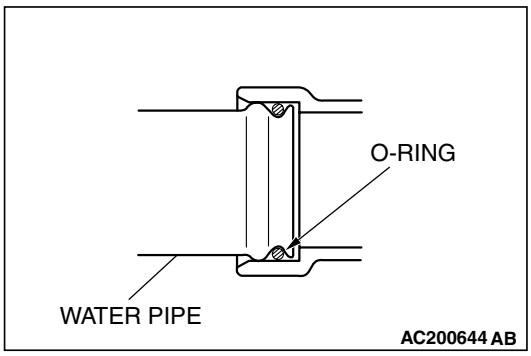
INSTALLATION SERVICE POINT

>>A<< O-RING INSTALLATION

⚠ CAUTION

Do not let the O-ring get contaminated with grease or engine oil.

Fit the O-ring into the groove of the water pipe ends, and apply water or coolant to the circumference of the O-ring and the pipe bores to insert the pipe assembly.

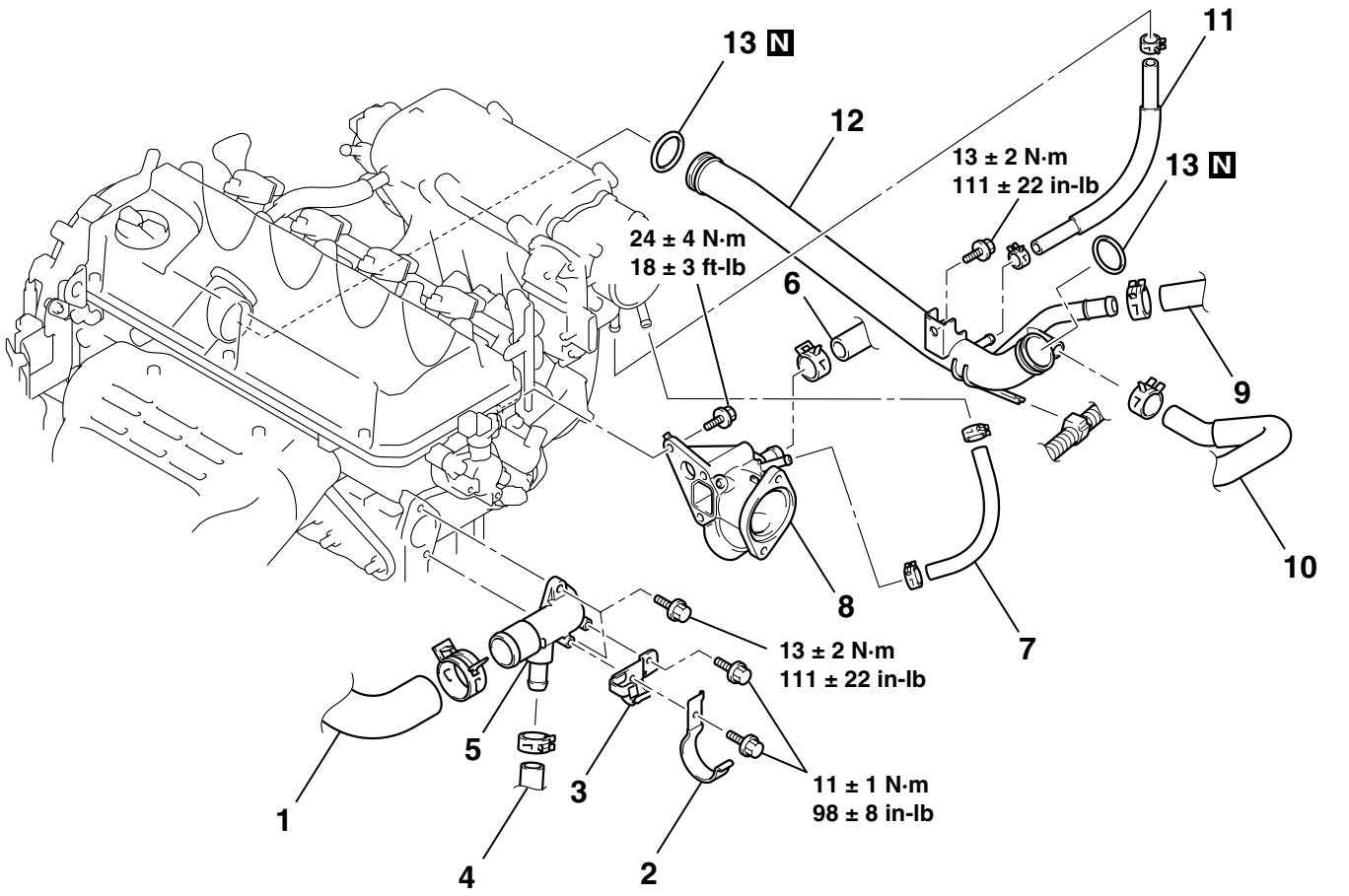


WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION <2.4L ENGINE>

M1141003300501

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Powertrain Control Module (PCM) Removal and Installation (Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4).
- Thermostat Removal and Installation (Refer to P.14-16).



AC306676AB

REMOVAL STEPS

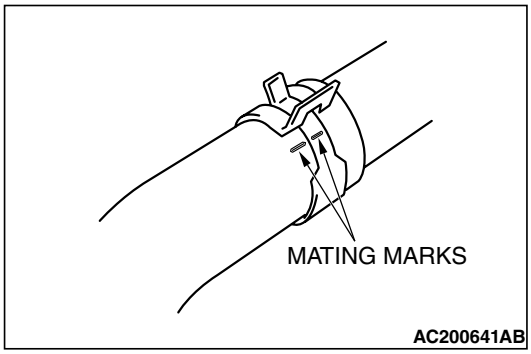
<<**A**>> >>**C**<< 1. RADIATOR UPPER HOSE CONNECTION
2. RADIATOR LOWER HOSE CLAMP
3. WATER HOSE CLAMP
4. WATER COOLER HOSE CONNECTION
>>**B**<< 5. WATER OUTLET FITTING
6. HEATER WATER HOSE CONNECTION

REMOVAL STEPS (Continued)

7. WATER HOSE
>>**B**<< 8. THERMOSTAT CASE
9. HEATER WATER HOSE CONNECTION
10. WATER COOLER HOSE CONNECTION
11. WATER HOSE
12. WATER INLET PIPE
>>**A**<< 13. O-RING

TSB Revision

REMOVAL SERVICE POINT

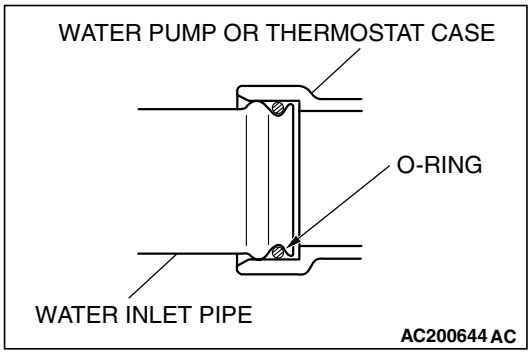


<<A>> RADIATOR UPPER HOSE DISCONNECTION
After making mating marks on the radiator hose and hose clamp, disconnect the radiator hose.

INSTALLATION SERVICE POINTS

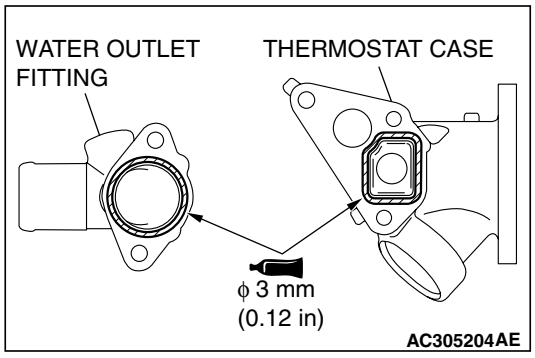
>>A<< O-RINGS INSTALLATION

⚠ CAUTION
Do not let the O-ring get contaminated with grease or engine oil.



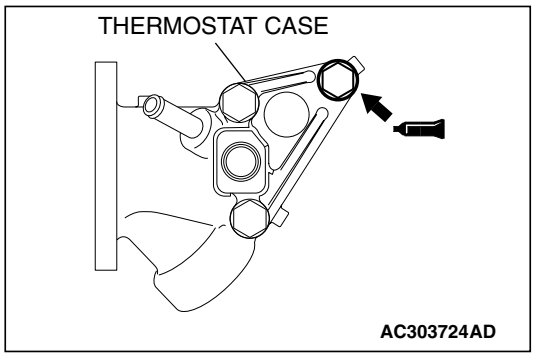
Fit an O-ring into the groove of the water inlet pipe and apply water or coolant to the circumference of the O-ring or the inside of the mounting surface of the water pump or thermostat case for insertion.

>>B<< THERMOSTAT CASE/WATER OUTLET FITTING INSTALLATION



1. Use a gasket scraper or wire brush to completely eliminate all gasket material on the gasket mounting surface.
2. Apply a bead of the sealant to the cylinder head mating surface of the thermostat case as shown.

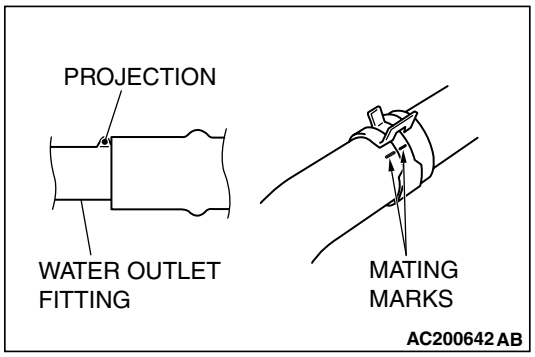
   Specified Sealant: 3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent



3. Apply sealant to the thread of the thermostat case bolts as shown.

   Specified Sealant: 3M™ AAD Part No.8730, 8731 or equivalent

4. With the sealant still wet (within 15 minutes after the sealant is applied), install the thermostat case. Do not apply the sealant in an area more than the required.



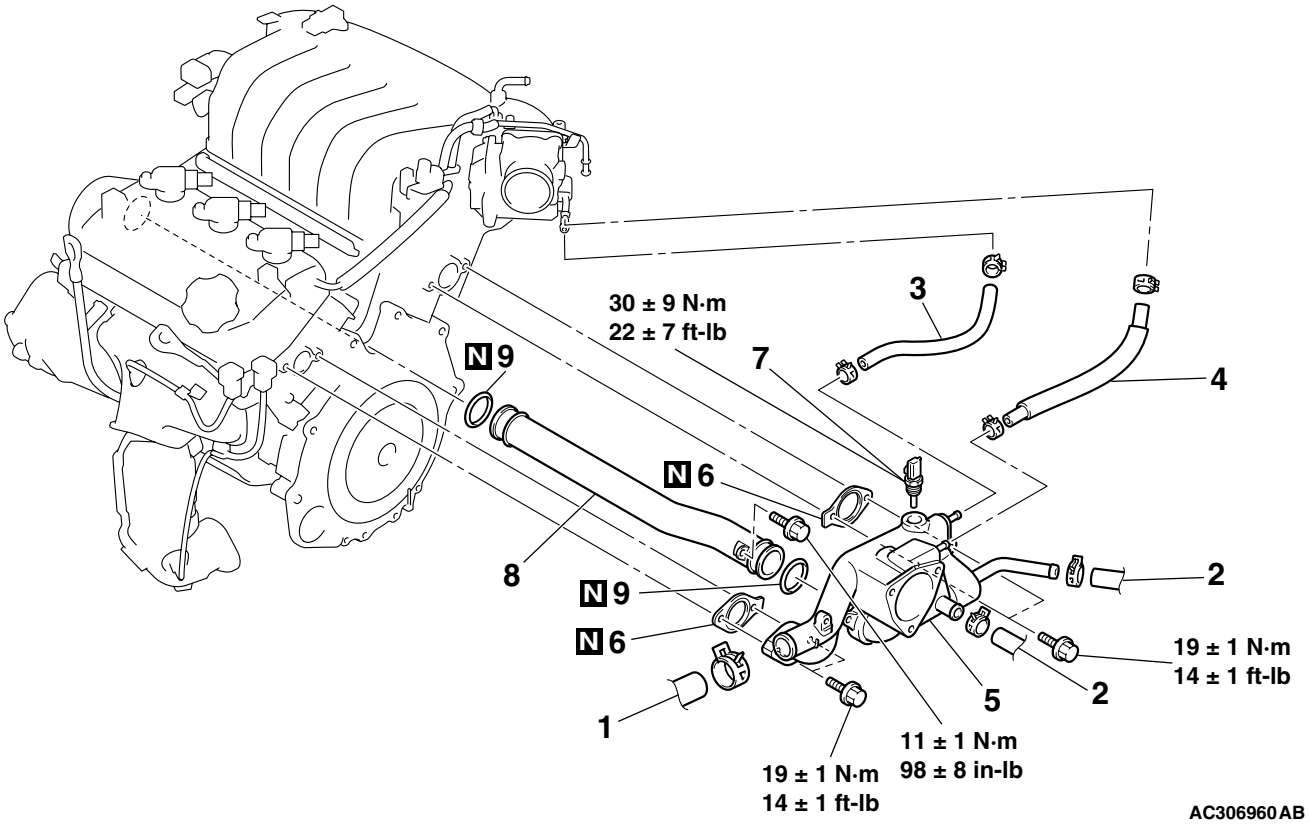
>>C<< RADIATOR UPPER HOSE CONNECTION

1. Insert each hose as far as the projection of the water outlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

M1141003301292

Pre-removal and Post-installation Operation
Thermostat Removal and Installation (Refer to P.14-16).



TSB Revision

REMOVAL STEPS

<<**A**>> >>**C**<< 1. RADIATOR UPPER HOSE CONNECTION
2. HEATER HOSE CONNECTION
3. THROTTLE BODY WATER FEED HOSE
4. THROTTLE BODY WATER RETURN HOSE

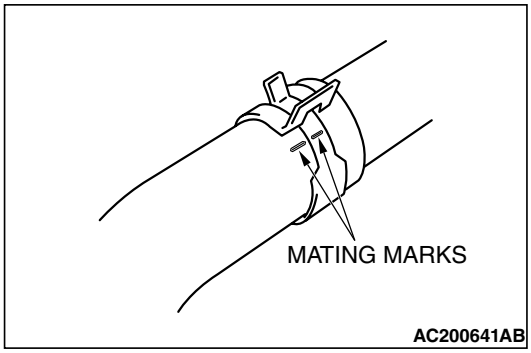
REMOVAL STEPS (Continued)

5. THERMOSTAT HOUSING
6. GASKET
>>**B**<< 7. ENGINE COOLANT TEMPERATURE SENSOR
8. WATER PUMP INLET PIPE
>>**A**<< 9. O-RING

REMOVAL SERVICE POINT

<<A>> RADIATOR UPPER HOSE DISCONNECTION

After making mating marks on the radiator hose and hose clamp, disconnect the radiator hose.



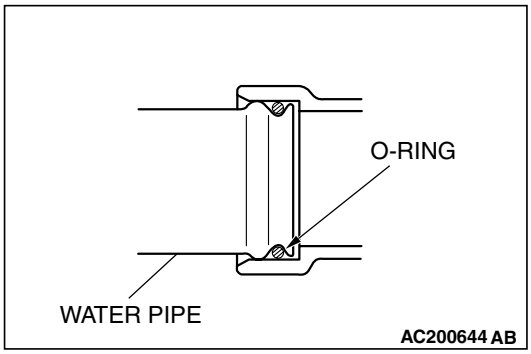
INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION

⚠ CAUTION

Do not allow engine oil or other grease to adhere to the O-ring

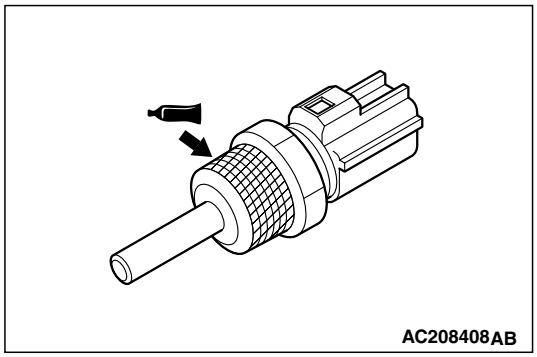
Insert the O-ring to the water pipe, and coat the outer portion of the O-ring with water or engine coolant.



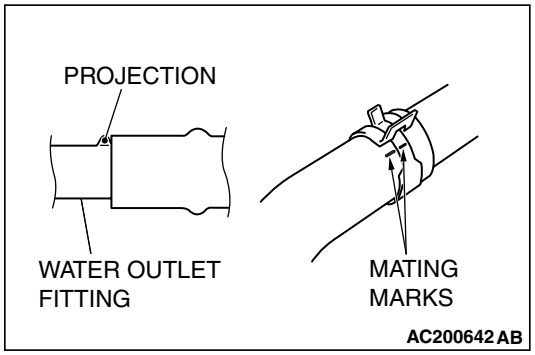
>>B<< ENGINE COOLANT TEMPERATURE SENSOR INSTALLATION

Apply the specified sealant to the thread of the engine coolant temperature sensor, and then tighten it to the specified torque.

Specified Sealant: 3M™ AAD Part No. 8731 or equivalent



TSB Revision



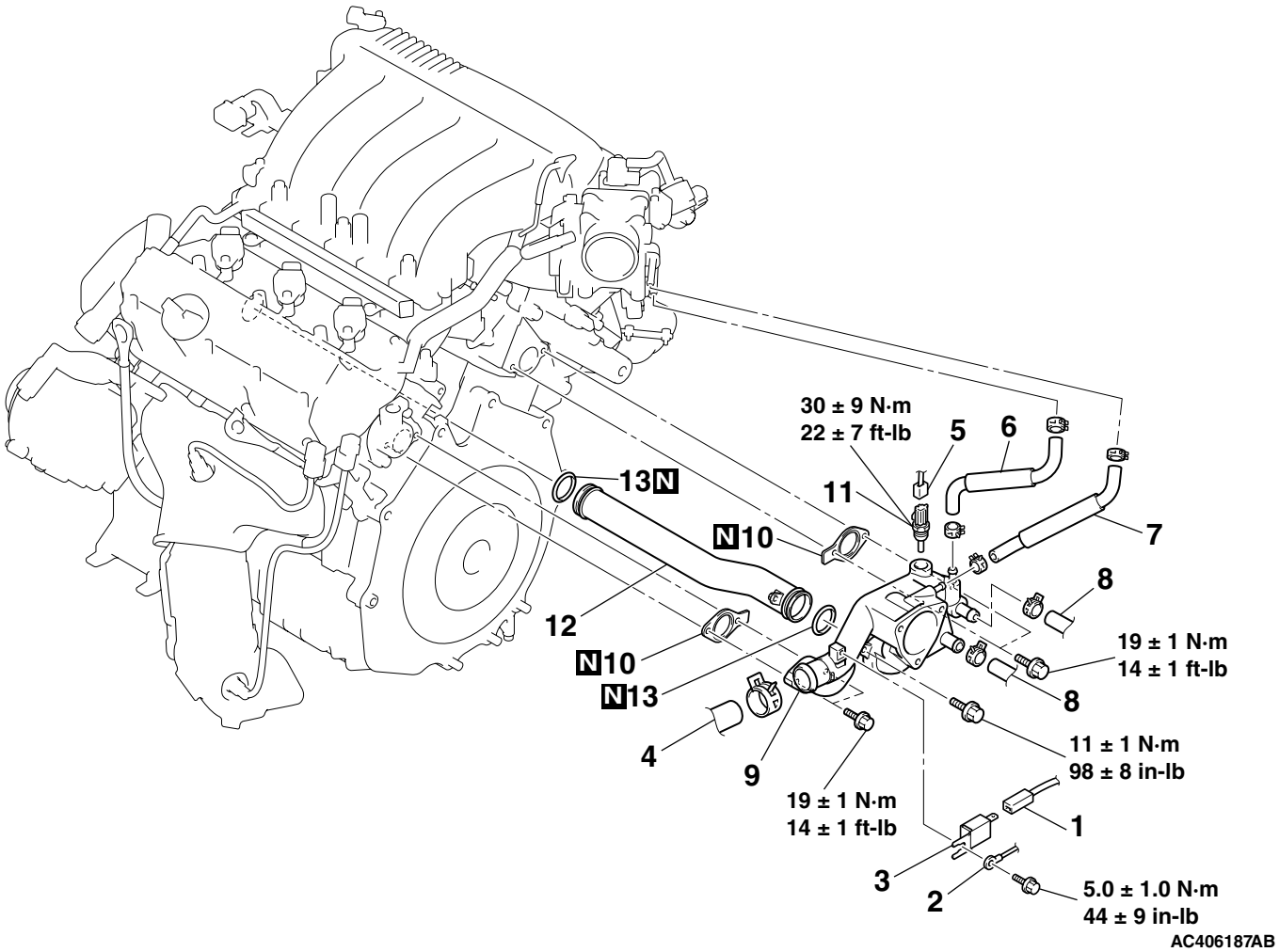
>>C<< RADIATOR UPPER HOSE CONNECTION

1. Insert each hose as far as the projection of the water outlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

M1141003301281

Pre-removal and Post-installation Operation
Thermostat Removal and Installation (Refer to P.14-16).



REMOVAL STEPS

1. CAPACITOR CONNECTOR
2. GROUNDING CONNECTION
3. CAPACITOR

<<**A**>> >>**C**<< 4. RADIATOR UPPER HOSE CONNECTION

REMOVAL STEPS (Continued)

5. ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR
6. HEATER HOSE CONNECTION
7. THROTTLE BODY WATER FEED HOSE

TSB Revision

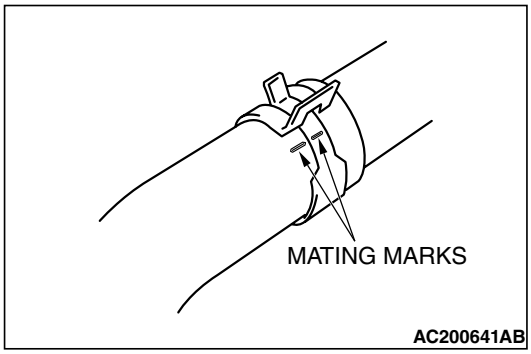
REMOVAL STEPS (Continued)

8. THROTTLE BODY WATER RETURN HOSE
9. THERMOSTAT HOUSING
10. GASKET
>>**B**<< 11. ENGINE COOLANT TEMPERATURE SENSOR
12. WATER INLET PIPE
>>**A**<< 13. O-RING

REMOVAL SERVICE POINT

<<A>> RADIATOR UPPER HOSE DISCONNECTION

After making mating marks on the radiator hose and hose clamp, disconnect the radiator hose.



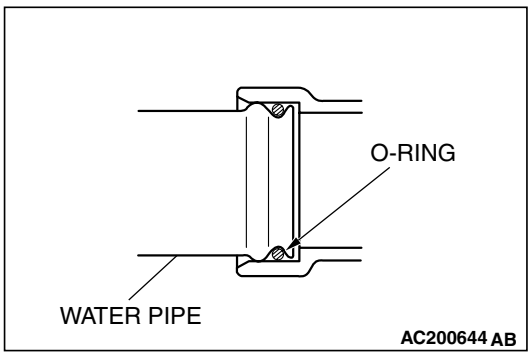
INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION

⚠ CAUTION

Do not allow engine oil or other grease to adhere to the O-ring

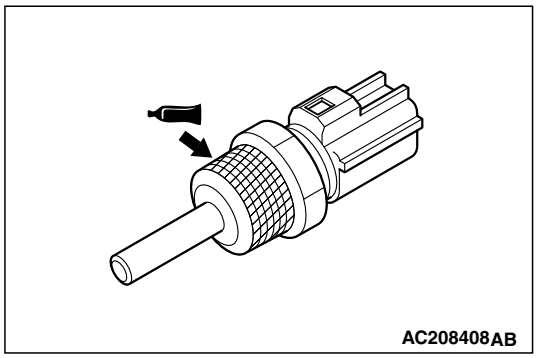
Insert the O-ring to the water pipe, and coat the outer portion of the O-ring with water or engine coolant.

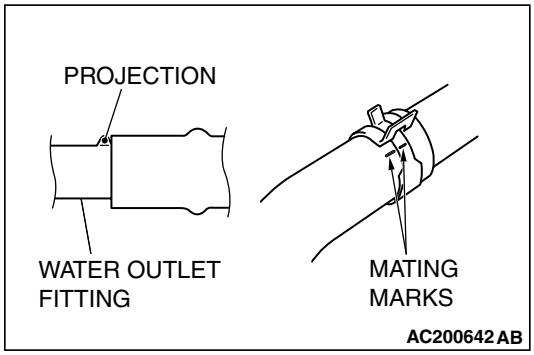


>>B<< ENGINE COOLANT TEMPERATURE SENSOR INSTALLATION

Apply the specified sealant to the thread of the engine coolant temperature sensor, and then tighten it to the specified torque.

Specified Sealant: 3M™ AAD Part No. 8731 or equivalent





>>C<< RADIATOR UPPER HOSE CONNECTION

1. Insert each hose as far as the projection of the water outlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

INSPECTION

M1141003400337

Water Pipe and Hose Check

Check the water pipe and hose for cracks, damage and clogs. Replace them if necessary.

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1141005000410

ITEM		SPECIFICATION
Cylinder block drain plug <2.4L Engine>		44 ± 5 N·m (33 ± 3 ft-lb)
Cylinder block drain plug <3.8L Engine>		39 ± 5 N·m (29 ± 3 ft-lb)
Radiator		
Front end structure bar bolt	M8 × 10	11 ± 2 N·m (98 ± 17 in-lb)
	M8 × 20	22 ± 4 N·m (16 ± 3 ft-lb)
Thermostat <2.4L ENGINE>		
Harness bracket bolt		11 ± 1 N·m (98 ± 8 in-lb)
Water inlet fitting bolt		13 ± 2 N·m (111 ± 22 in-lb)
Thermostat <3.8L ENGINE>		
Control harness bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)
Grounding bolt	M6	9.0 ± 2.0 N·m (80 ± 17 in-lb)
	M8	22 ± 4 N·m (16 ± 3 ft-lb)
Water inlet fitting bolt		19 ± 1 N·m (14 ± 1 ft-lb)
Water hose and water pipe <2.4L ENGINE>		
Radiator lower hose clamp bolt		11 ± 1 N·m (98 ± 8 in-lb)
Thermostat case bolt		24 ± 4 N·m (18 ± 3 ft-lb)
Water hose clamp bolt		11 ± 1 N·m (98 ± 8 in-lb)
Water inlet pipe bolt		13 ± 2 N·m (111 ± 22 in-lb)
Water outlet fitting bolt		13 ± 2 N·m (111 ± 22 in-lb)
Water hose and water pipe <3.8L ENGINE>		
Capacitor bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)

TSB Revision

ITEM		SPECIFICATION
Engine coolant temperature sensor		30 ± 9 N·m (22 ± 7 ft-lb)
Thermostat housing bolt		19 ± 1 N·m (14 ± 1 ft-lb)
Water pump inlet pipe		11 ± 1 N·m (98 ± 8 ft-lb)
Water pump <2.4L ENGINE>		
Water pump bolt		14 ± 1 N·m (120 ± 13 in-lb)
Water pump <3.8L ENGINE>		
Water pump bolt	M10	24 ± 3 N·m (18 ± 2 ft-lb)
	M8	42 ± 8 N·m (31 ± 6 ft-lb)
Water pump bracket bolt		24 ± 3 N·m (18 ± 2 ft-lb)

SERVICE SPECIFICATION

M1141000300449

ITEM			STANDARD VALUE	LIMIT
High-pressure valve opening pressure of radiator cap kPa (psi)			93 – 123 (14 – 18)	Minimum 83 (12)
Thermostat	Valve opening temperature of thermostat °C (°F)	2.4L Engine	82 ± 1.5 (180 ± 3)	-
		3.8L Engine	88 ± 1.5 (190 ± 3)	-
	Full-opening temperature of thermostat °C (°F)	2.4L Engine	95 (203)	-
		3.8L Engine	100 (212)	-
	Valve lift mm (in)	2.4L Engine	8.5 (0.33) or more	-
		3.8L Engine	9.0 (0.35) or more	-

CAPACITIES

M1141005100161

ITEM		QUANTITY dm^3 (qt)
Long life antifreeze coolant or an equivalent	2.4L Engine	8.0 (8.5)
	3.8L Engine	8.7 (9.2)

SEALANTS

M1141000500368

<2.4L ENGINE>

ITEM	SPECIFIED SEALANT
Cylinder block drain plug	3M™ AAD Part No.8731 or equivalent
Thermostat case	3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent
Water outlet fitting	
Thermostat case bolt	3M™ AAD Part No. 8730, 8731 or equivalent

<3.8L ENGINE>

ITEM	SPECIFIED SEALANT
Cylinder block drain plug	3M™ AAD Part No.8731 or equivalent
Engine coolant temperature sensor	

GROUP 15

INTAKE AND EXHAUST

CONTENTS

GENERAL DESCRIPTION

M1151000100446

The exhaust pipe is divided into four parts.

INTAKE AND EXHAUST DIAGNOSIS

INTRODUCTION

M1151006900321

Intake leaks usually create driveability issues that are not obviously related to the intake system. Exhaust leaks or abnormal noise is caused by cracks, gaskets and fittings, or by exhaust pipe or muffler damage due to impacts during travel. The exhaust leaks from these sections and causes the exhaust noise to increase. There may be cases when the system contacts the body and vibration noise is generated.

TROUBLESHOOTING STRATEGY

M1151007000321

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an intake or exhaust system fault.

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

SYMPTOM CHART

M1151007100328

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Exhaust Leakage	1	P.15-2
Abnormal Noise	2	P.15-3

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Exhaust Leakage

DIAGNOSIS

STEP 1. Start the engine. Have an assistant stay in the driver's seat. Raise the vehicle on a hoist. Have the assistant rev the engine while searching for exhaust leaks.

Q: Is the exhaust leaking?
YES : Go to Step 2.
NO : The procedure is complete.

STEP 2. Check the gasket for cracks, damage.

Q: Is the gasket damaged?
YES : Replace the gasket, then go to Step 1.
NO : Go to Step 3.

STEP 3. Check for loosening in each coupling section.

Q: Is there any loosening in any section?
YES : Tighten, then go to Step 1.
NO : There is no action to be taken.

INSPECTION PROCEDURE 2: Abnormal Noise

DIAGNOSIS

STEP 1. Start the engine. Have an assistant stay in the drivers seat. Raise the vehicle on a hoist. Have the assistant rev the engine while searching for exhaust leaks.

Q: Is any abnormal noise generated?
YES : Go to Step 2.
NO : The procedure is complete.

STEP 2. Check for missing parts in the muffler. Tap the muffler lightly to check for loose baffles, etc.

Q: Are there any missing parts in the muffler?
YES : Replace, then go to Step 1.
NO : Go to Step 3.

STEP 3. Check the hanger for cracks.

Q: Is the hanger cracked?
YES : Replace, then go to Step 1.
NO : Go to Step 4.

STEP 4. Check for interference of the pipes and muffler with the body.

Q: Are the pipes and muffler interfering with the body?
YES : Repair, then go to Step 1.
NO : Go to Step 5.

STEP 5. Check the heat protectors.

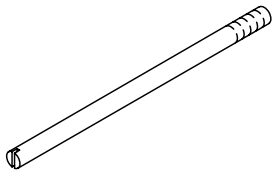
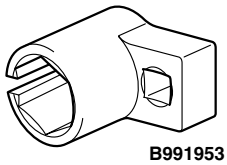
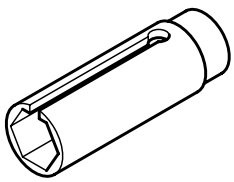
Q: Are any heat protectors loose or damaged?
YES : Tighten or replace, then go to Step 1.
NO : Go to Step 6.

STEP 6. Check the pipes and muffler for damage.

Q: Are the pipes and muffler damaged?
YES : Replace, then go to Step 1.
NO : There is no action to be taken.

SPECIAL TOOLS

M1151000600429

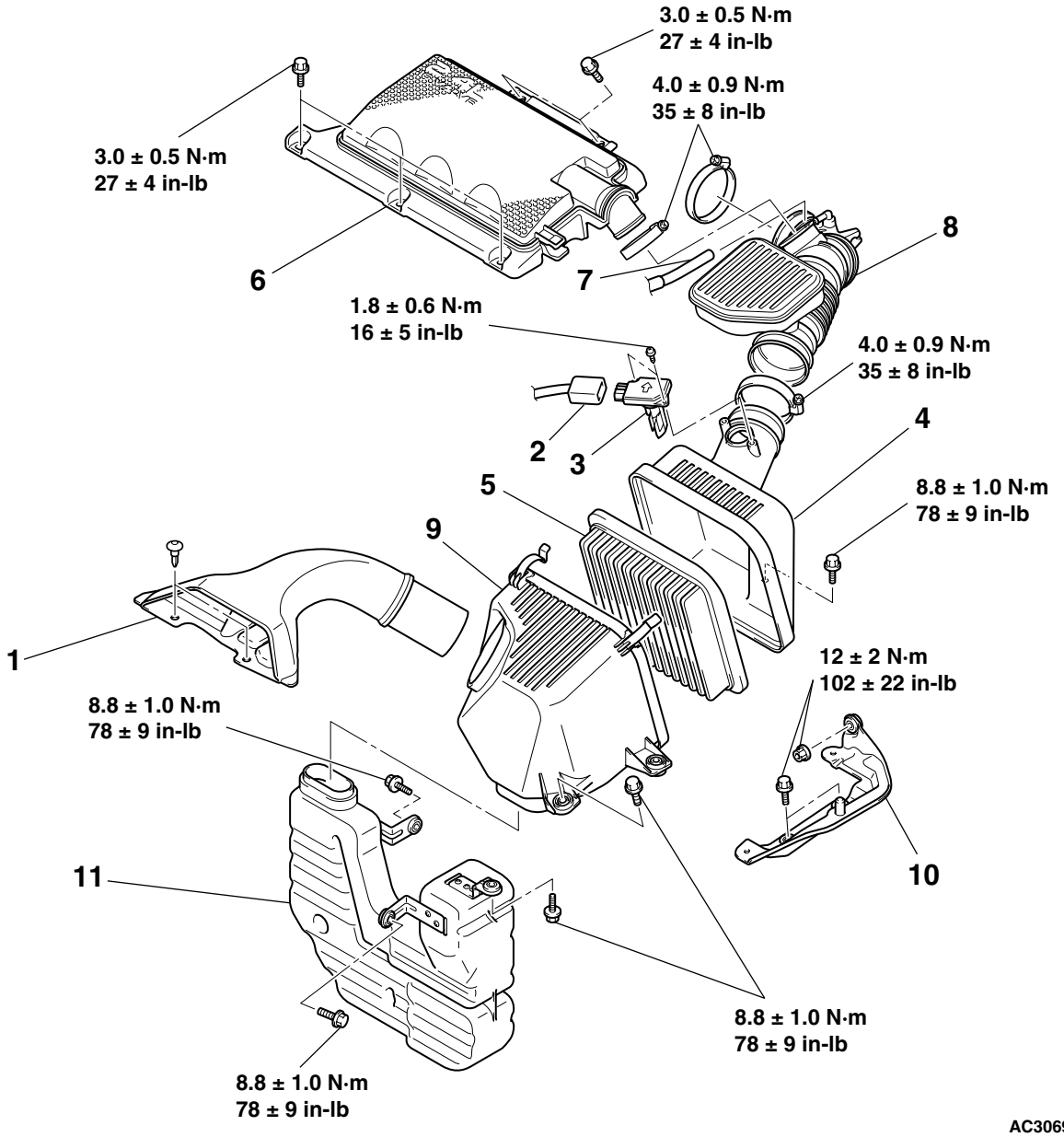
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998412 Guide	MD998412	Installation of intake manifold plenum
 B991953	MB991953 Oxygen sensor wrench	-	Removal and installation of heated oxygen sensor
	MD998770 Oxygen sensor wrench	MD998770-01 or General service tool	Removal and installation of heated oxygen sensor

AIR CLEANER

REMOVAL AND INSTALLATION

M1151002101274

<2.4L ENGINE>



AC306972AB

REMOVAL STEPS

1. AIR DUCT
2. MASS AIRFLOW SENSOR CONNECTOR
3. MASS AIRFLOW SENSOR
4. AIR CLEANER COVER
5. AIR CLEANER ELEMENT
6. AIR CLEANER RESONATOR
7. BREATHER HOSE CONNECTION
8. AIR INTAKE HOSE

REMOVAL STEPS (Continued)

- POWERTRAIN CONTROL MODULE (PCM) (REFER TO GROUP 13A, POWERTRAIN CONTROL MODULE (PCM) P.13A-1180).

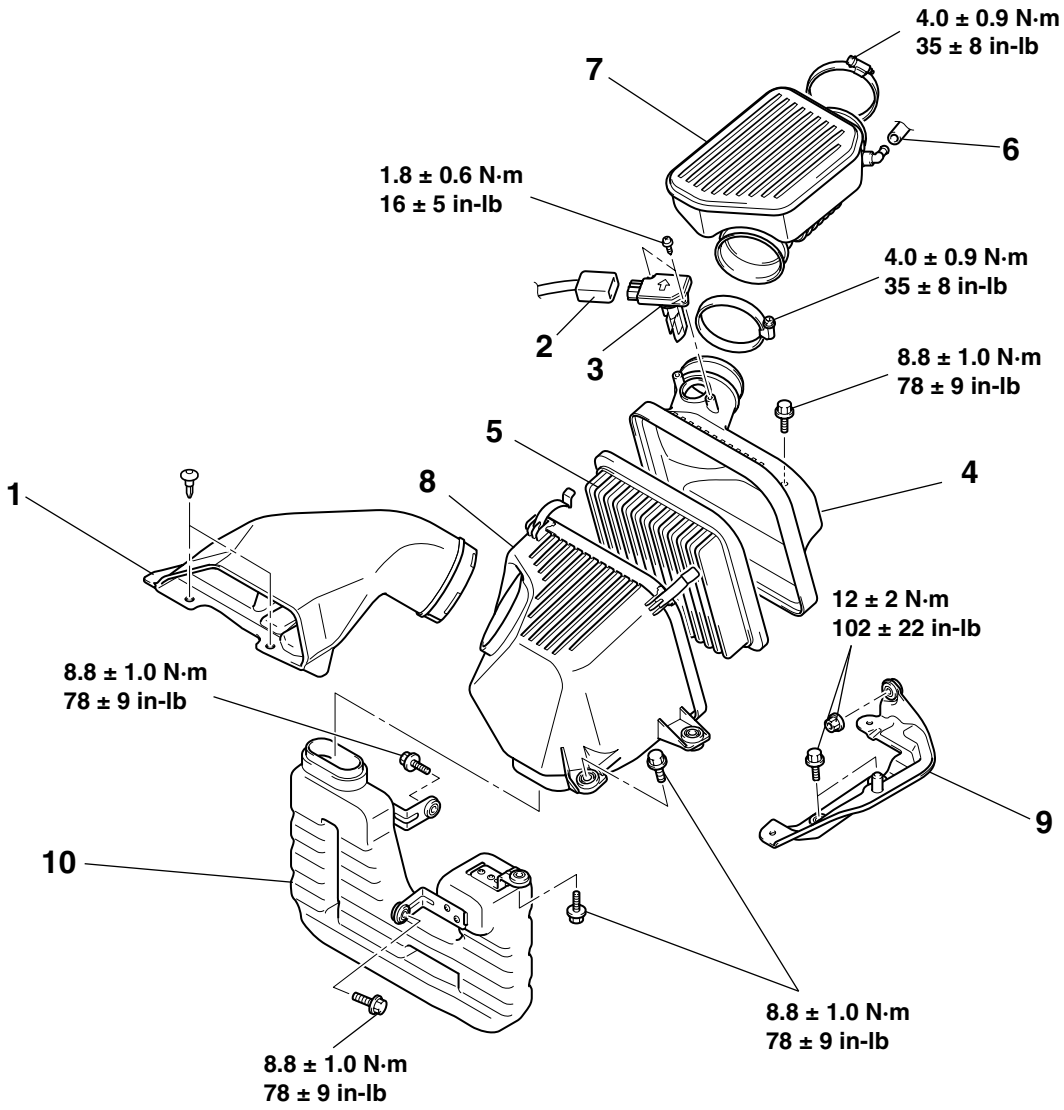
9. AIR CLEANER BODY
10. AIR CLEANER BRACKET

- UNDER COVER (LH)

11. AIR CLEANER RESONATOR

TSB Revision

<3.8L ENGINE (EXCEPT MIVEC)>



AC306973 AB

REMOVAL STEPS

1. AIR DUCT
2. MASS AIRFLOW SENSOR CONNECTOR
3. MASS AIRFLOW SENSOR
4. AIR CLEANER COVER
5. AIR CLEANER ELEMENT
6. BREATHER HOSE CONNECTION
7. AIR INTAKE HOSE

REMOVAL STEPS (Continued)

- POWERTRAIN CONTROL MODULE (PCM) (REFER TO GROUP 13B, POWERTRAIN CONTROL MODULE (PCM) P.13B-1447).

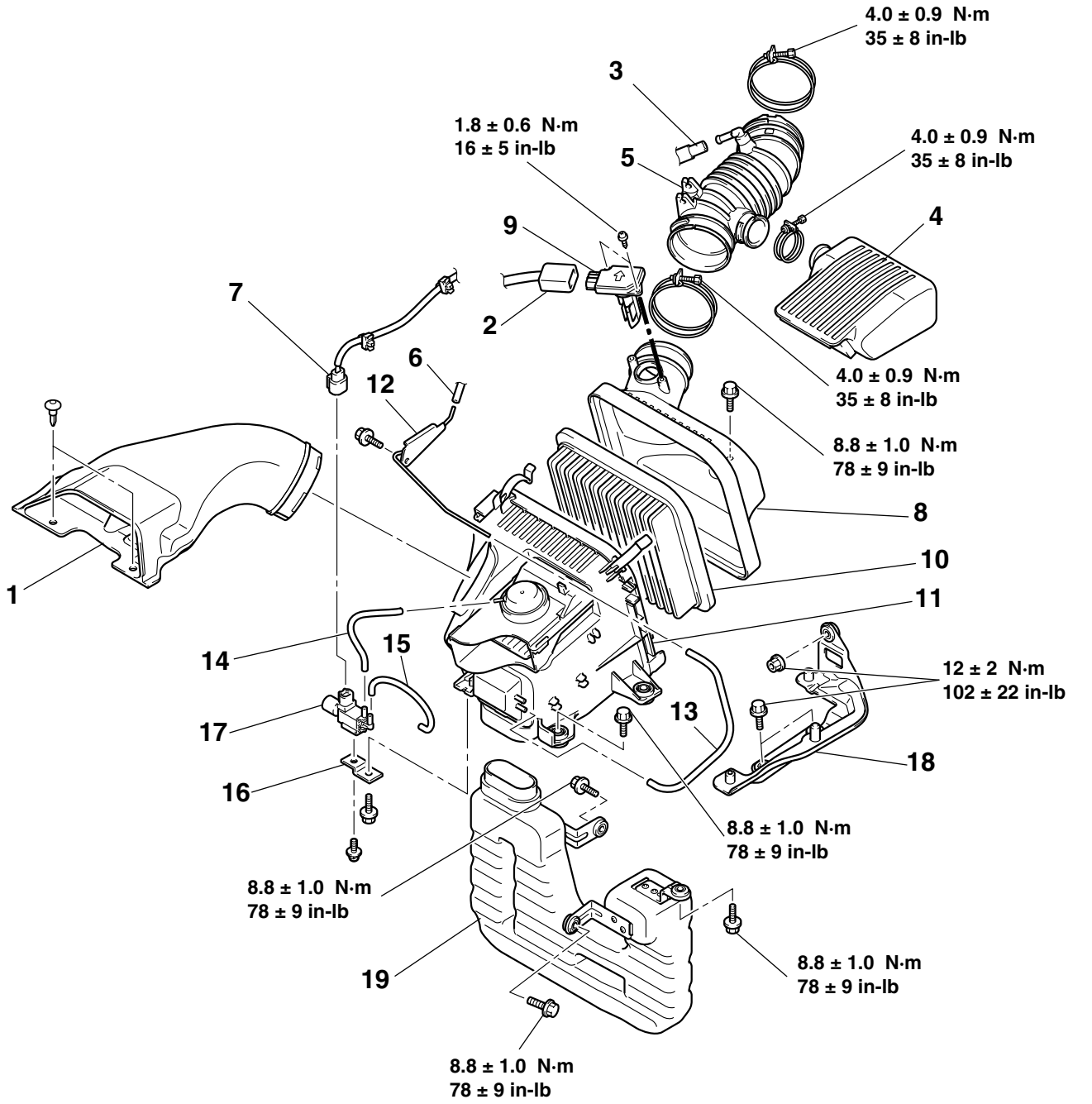
8. AIR CLEANER BODY
9. AIR CLEANER BRACKET

- UNDER COVER (LH)

10. AIR CLEANER RESONATOR

TSB Revision

<3.8L ENGINE-MIVEC>



AC404946AB

REMOVAL STEPS

1. AIR CLEANER INTAKE DUCT
2. MASS AIRFLOW SENSOR CONNECTOR
3. BREATHER HOSE CONNECTION
4. AIR CLEANER RESONATOR
5. AIR CLEANER TO THROTTLE BODY DUCT
6. VACUUM HOSE CONNECTION
7. VARIABLE INTAKE AIR CONTROL SOLENOID VALVE CONNECTOR

REMOVAL STEPS (Continued)

- POWERTRAIN CONTROL MODULE (PCM) (REFER TO GROUP 13B, POWERTRAIN CONTROL MODULE (PCM) P.13B-1447).

8. AIR CLEANER COVER
9. MASS AIRFLOW SENSOR
10. AIR CLEANER ELEMENT
11. AIR CLEANER BODY
12. VACUUM PIPE
13. VACUUM HOSE

TSB Revision

REMOVAL STEPS (Continued)

14. VACUUM HOSE
15. VACUUM HOSE
16. SOLENOID VALVE STAY
17. VARIABLE AIR INTAKE SOLENOID
18. AIR CLEANER BRACKET

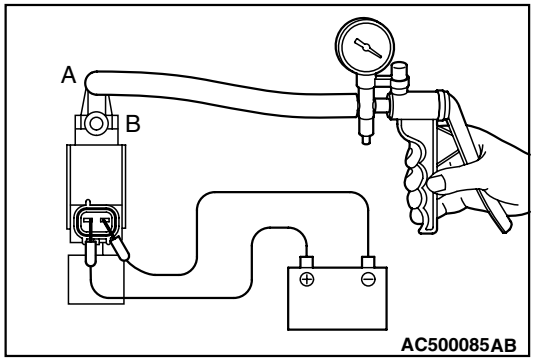
- UNDER COVER (LH)
- TRANSMISSION FLUID COOLER LINE TUBE ASSEMBLY AND TRANSMISSION FLUID COOLER LINE HOSE ASSEMBLY B CONNECTION (REFER TO GROUP 23A, TRANSMISSION FLUID COOLER P.23A-405).

19. AIR CLEANER RESONATOR

INSPECTION

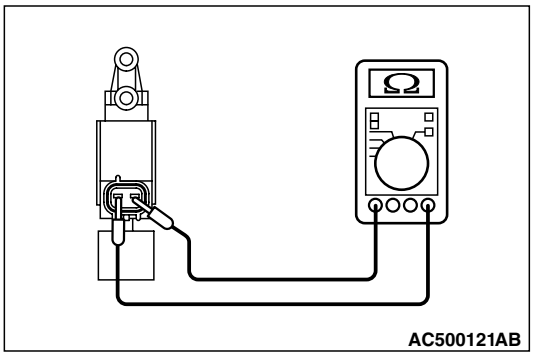
M1151002200030

VARIABLE AIR INTAKE SOLENOID CHECK



1. Connect a hand vacuum pump to nipple (A) of the solenoid.
2. Check air tightness by applying a vacuum with voltage applied directly from the battery to the variable air intake solenoid and without applying voltage.

BATTERY VOLTAGE	NORMAL CONDITION
Applied	Vacuum maintained
Not applied	Vacuum leaks



3. Measure the resistance between the terminals of the solenoid.

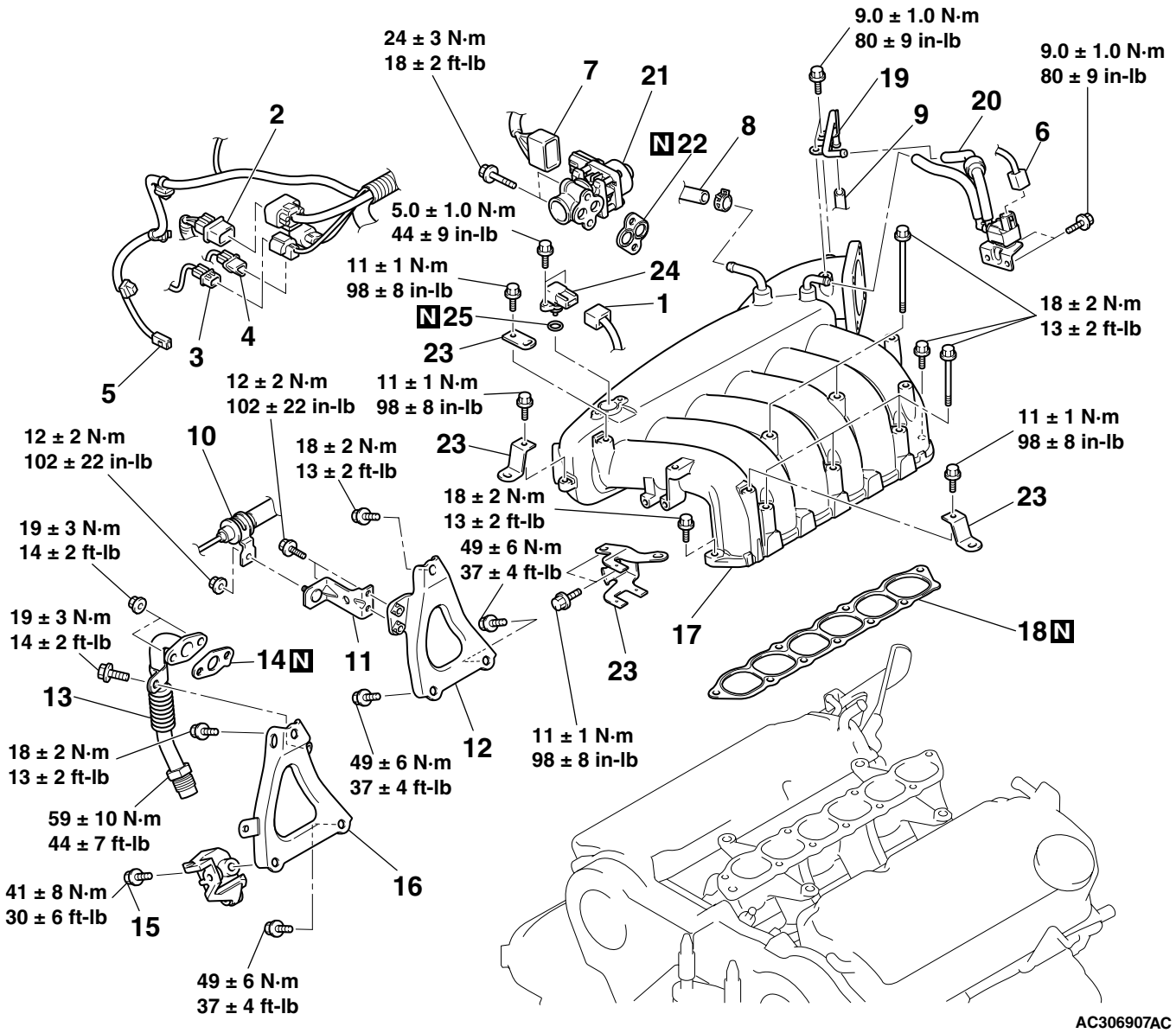
Standard value: 29 – 35 Ω [at 20°C (68°F)]

INTAKE MANIFOLD PLENUM

REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

M1151002700240

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service P.14-7). • Engine Cover Removal (Refer to GROUP 11C, Engine Assembly P.11C-22). • Air Cleaner Cover and Air Intake Hose Removal (Refer to P.15-4). • Throttle Body Removal (Refer to GROUP 13B, Throttle Body P.13B-1444).	• Throttle Body Installation (Refer to GROUP 13B, Throttle Body P.13B-1444). • Air Cleaner Cover and Air Intake Hose Installation (Refer to P.15-4). • Engine Cover Installation (Refer to GROUP 11C, Engine Assembly P.11C-22). • Engine Coolant Supplying (Refer to GROUP 14, On-vehicle Service P.14-7).



AC306907AC

TSB Revision

REMOVAL STEPS

1. MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR
2. CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION CONNECTOR
3. CRANKSHAFT POSITION SENSOR CONNECTOR
4. KNOCK SENSOR CONNECTOR
5. POWER STEERING PRESSURE SWITCH CONNECTOR
6. EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
7. EXHAUST GAS RECIRCULATION VALVE CONNECTOR
8. VACUUM HOSE CONNECTION
9. PURGE HOSE CONNECTION
10. POWER STEERING PRESSURE HOSE CLAMP
11. POWER STEERING PRESSURE HOSE CLAMP BRACKET
12. INTAKE MANIFOLD PLENUM STAY, REAR

REMOVAL STEPS (Continued)

- POWER STEERING GEAR AND LINKAGE PROTECTOR (REFER TO 37, POWER STEERING GEAR BOX AND LINKAGE P.37-31)

13. EGR PIPE
14. EGR PIPE GASKET

- POWER STEERING OIL PUMP (REFER TO 37, POWER STEERING OIL PUMP ASSEMBLY P.37-52)

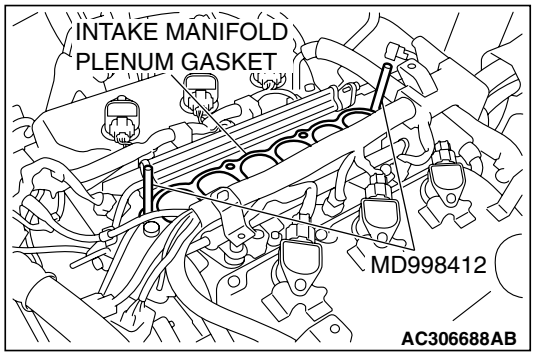
15. POWER STEERING OIL PUMP BRACKET CONNECTING BOLT
16. INTAKE MANIFOLD PLENUM STAY, FRONT

>>**A**<< 17. INTAKE MANIFOLD PLENUM

18. INTAKE MANIFOLD PLENUM GASKET
19. VACUUM PIPE
20. EVAPORATIVE EMISSION PURGE SOLENOID
21. EXHAUST GAS RECIRCULATION VALVE
22. GASKET
23. HARNESS BRACKET
24. MANIFOLD ABSOLUTE PRESSURE SENSOR
25. O-RING

Required Special Tool:

- MD998412: Guide



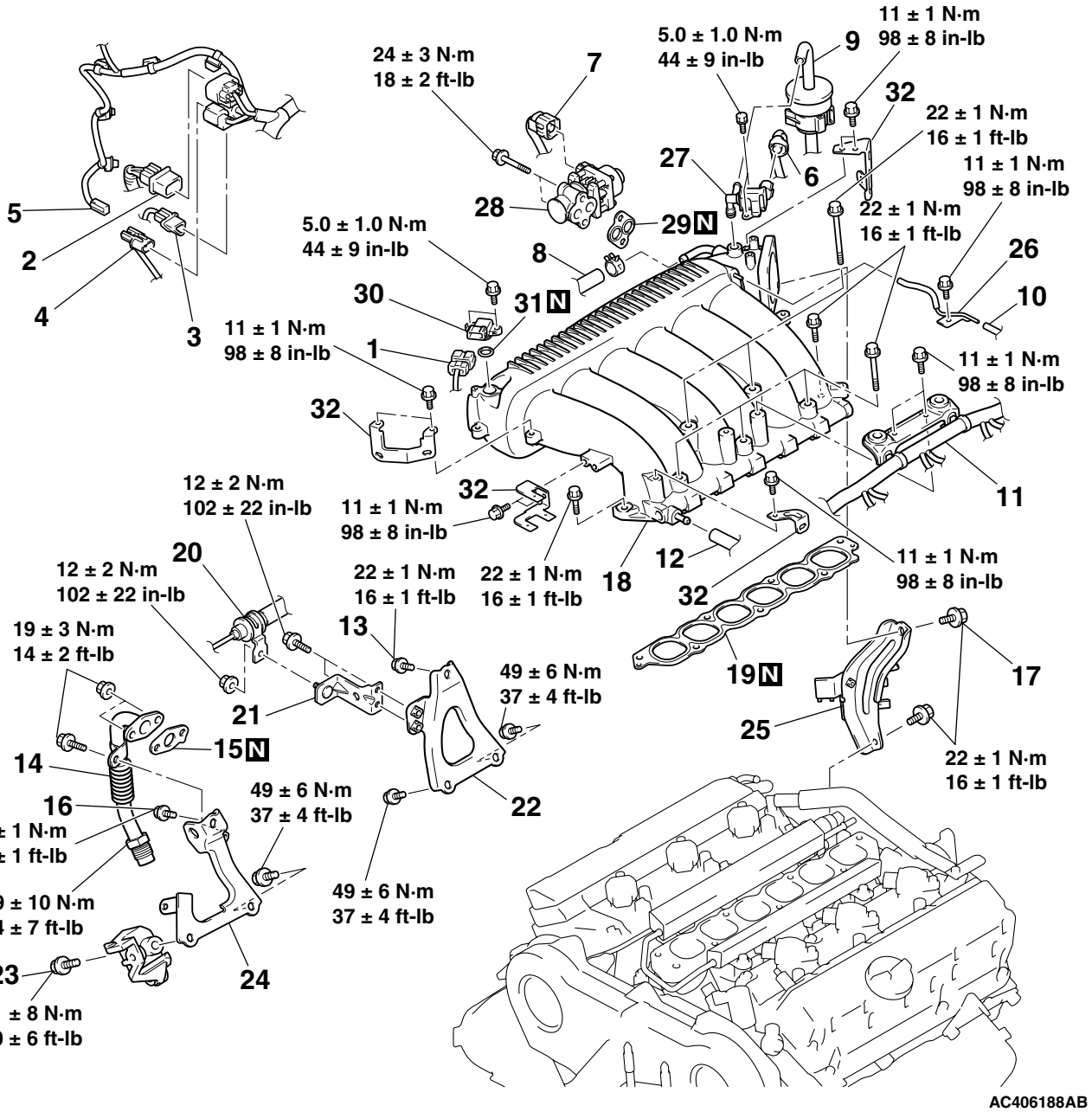
INSTALLATION SERVICE POINT

>>A<< INTAKE MANIFOLD PLENUM INSTALLATION

Use special tool MD998412 to install the intake manifold plenum.

REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7). • Engine Cover Removal (Refer to GROUP 11E, Engine Assembly P.11E-25). • Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-11). • Air Cleaner Cover and Air Cleaner to Throttle Body Duct Removal (Refer to P.15-4). • Throttle Body Removal (Refer to GROUP 13B, Throttle Body P.13B-1444).	• Throttle Body Installation (Refer to GROUP 13B, Throttle Body P.13B-1444). • Air Cleaner Cover and Air Cleaner to Throttle Body Duct Installation (Refer to P.15-4). • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11). • Engine Cover Installation (Refer to GROUP 11E, Engine Assembly P.11E-25). • Engine Coolant Supplying (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7).



AC406188AB

TSB Revision

REMOVAL STEPS

1. MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR
2. CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION CONNECTOR
3. CRANKSHAFT POSITION SENSOR CONNECTOR
4. KNOCK SENSOR CONNECTOR
5. POWER STEERING PRESSURE SWITCH CONNECTOR
6. EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
7. EXHAUST GAS RECIRCULATION VALVE CONNECTOR
8. BRAKE BOOSTER VACUUM HOSE CONNECTION
9. EVAPORATIVE EMISSION PURGE HOSE CONNECTION
10. VACUUM HOSE CONNECTION
11. CONTROL WIRING HARNESS AND ENGINE COVER BRACKET ASSEMBLY
12. PCV HOSE CONNECTION
13. INTAKE MANIFOLD PLENUM STAY (REAR) CONNECTING BOLT
14. EGR PIPE
15. EGR PIPE GASKET
16. INTAKE MANIFOLD PLENUM STAY (FRONT) CONNECTING BOLT
17. THROTTLE BODY STAY CONNECTING BOLT

REMOVAL STEPS (Continued)

>>B<< 18. INTAKE MANIFOLD PLENUM
19. INTAKE MANIFOLD PLENUM GASKET
20. POWER STEERING PRESSURE HOSE CLAMP
21. POWER STEERING PRESSURE HOSE CLAMP BRACKET
22. INTAKE MANIFOLD PLENUM STAY (REAR)
- STEERING GEAR AND LINKAGE PROTECTOR (REFER TO GROUP 37, STEERING GEAR BOX AND LINKAGE P.37-31).
- POWER STEERING OIL PUMP (REFER TO GROUP 37, POWER STEERING OIL PUMP ASSEMBLY P.37-52).

23. POWER STEERING OIL PUMP BRACKET CONNECTING BOLT
24. INTAKE MANIFOLD PLENUM STAY (FRONT)
25. THROTTLE BODY STAY
26. VACUUM PIPE AND HOSE ASSEMBLY
27. EVAPORATIVE EMISSION PURGE SOLENOID
28. EXHAUST GAS RECIRCULATION VALVE

>>A<< 29. EXHAUST GAS RECIRCULATION VALVE GASKET
30. MANIFOLD ABSOLUTE PRESSURE SENSOR
31. O-RING
32. HARNESS BRACKET

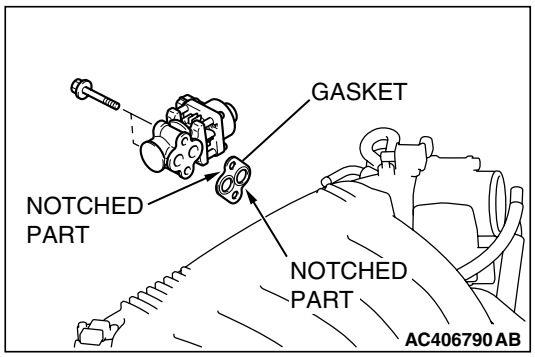
Required Special Tool:

- MD998412: Guide

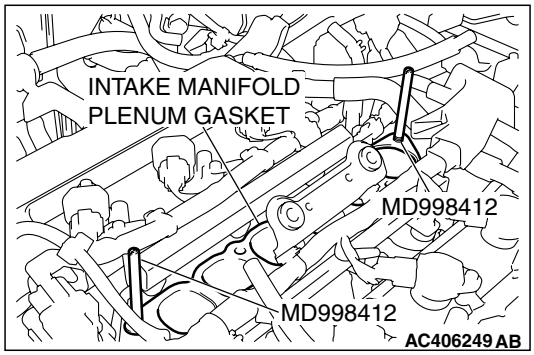
INSTALLATION SERVICE POINTS

>>A<< EXHAUST GAS RECIRCULATION VALVE GASKET INSTALLATION

Install the exhaust gas recirculation valve gasket as shown in the illustration.



TSB Revision



>>B<< INTAKE MANIFOLD PLENUM INSTALLATION

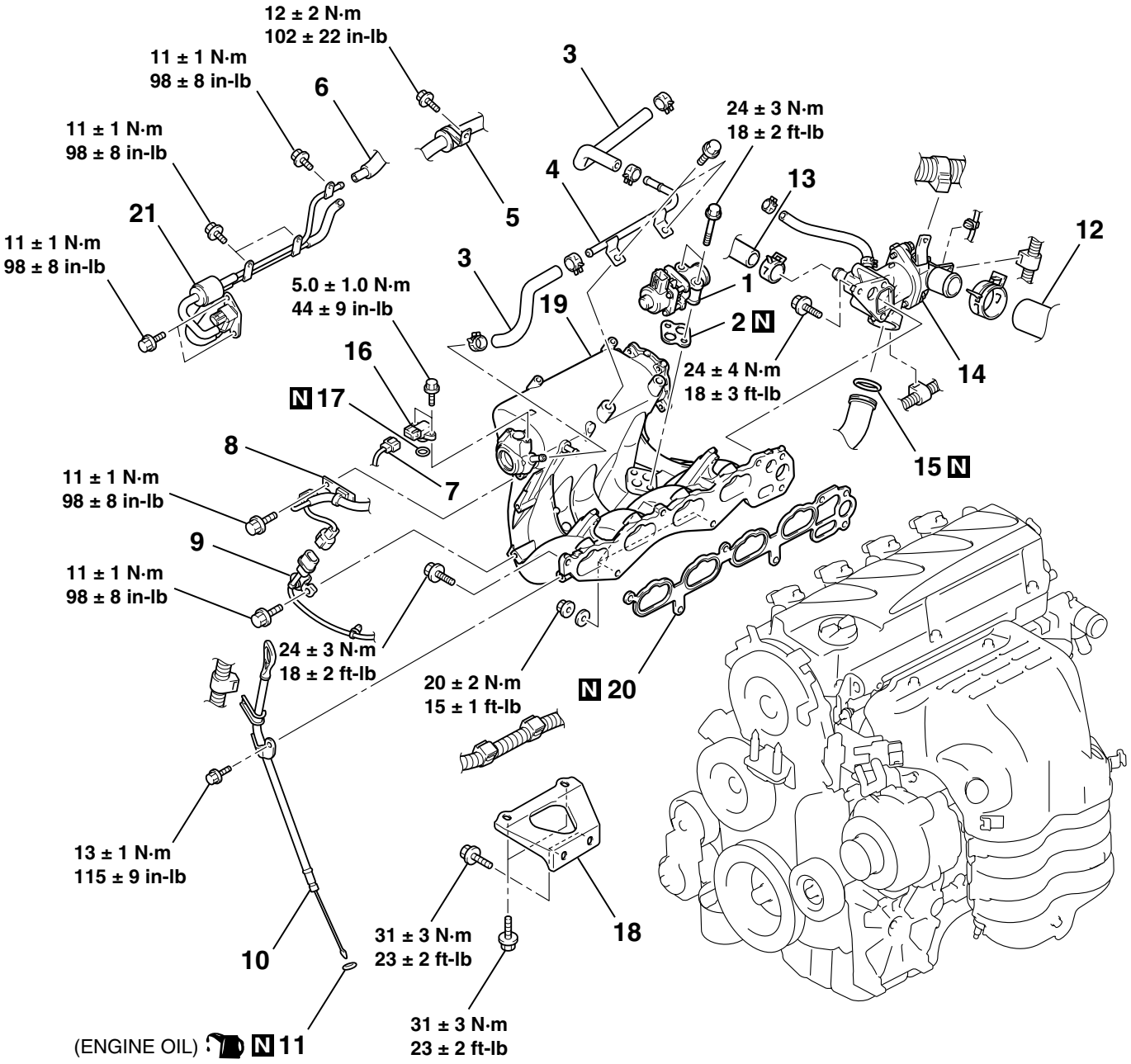
Use special tool MD998412 to install the intake manifold plenum.

INTAKE MANIFOLD

REMOVAL AND INSTALLATION <2.4L ENGINE>

M1151003000813

Pre-removal Operation	Post-installation Operation
• Fuel Line Pressure Reduction [Refer to GROUP 13A, On-vehicle Service – Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) P.13A-1166]. • Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7). • Air Cleaner Cover and Air Intake Hose Removal (Refer to P.15-4). • Throttle Body Removal (Refer to GROUP 13A, Throttle Body P.13A-1178). • Delivery Pipe and Injector Assembly Removal (Refer to GROUP 13A, Injector P.13A-1175).	• Delivery Pipe and Injector Assembly Installation (Refer to GROUP 13A, Injector P.13A-1175). • Throttle Body Installation (Refer to GROUP 13A, Throttle Body P.13A-1178). • Air Cleaner Cover and Air Intake Hose Installation (Refer to P.15-4). • Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7).



AC306677AB

TSB Revision

REMOVAL STEPS

1. EXHAUST GAS RECIRCULATION VALVE
>>**D**<< 2. EXHAUST GAS RECIRCULATION VALVE GASKET
>>**C**<< 3. BRAKE BOOSTER VACUUM HOSE
4. BRAKE BOOSTER VACUUM PIPE
5. PRESSURE HOSE CLAMP
6. EVAPORATIVE EMISSION VACUUM HOSE CONNECTION
7. MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR
8. HARNESS CRAMP
9. KNOCK SENSOR CONNECTOR BRACKET
10. ENGINE OIL DIPSTICK AND DIPSTICK GUIDE
11. O-RING

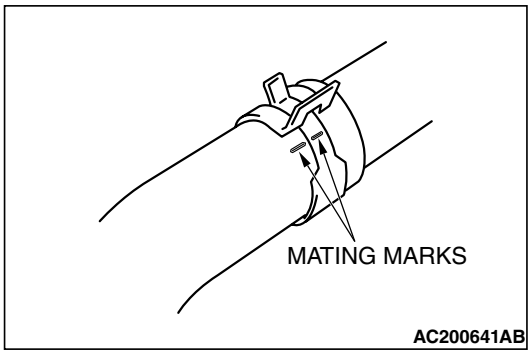
REMOVAL STEPS (Continued)

<<**A**>> >>**B**<< 12. RADIATOR LOWER HOSE CONNECTION
13. HEATER WATER HOSE CONNECTION
>>**A**<< 14. THERMOSTAT CASE ASSEMBLY
15. O-RING
16. MANIFOLD ABSOLUTE PRESSURE SENSOR
17. O-RING
18. INTAKE MANIFOLD STAY
19. INTAKE MANIFOLD
20. INTAKE MANIFOLD GASKET
21. EVAPORATIVE EMISSION PURGE SOLENOID VALVE, EVAPORATIVE EMISSION VACUUM HOSE AND PIPE ASSEMBLY

REMOVAL SERVICE POINT

<<A>> RADIATOR LOWER HOSE DISCONNECTION

Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.

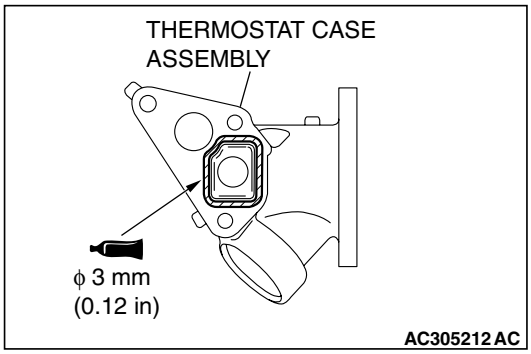


INSTALLATION SERVICE POINTS

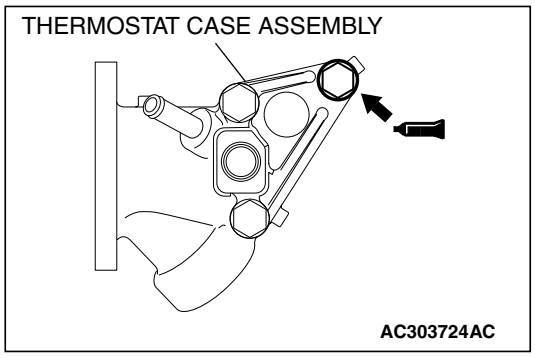
>>A<< THERMOSTAT CASE ASSEMBLY INSTALLATION

1. Use a gasket scraper or wire brush to completely eliminate all gasket material on the gasket mounting surface.
2. Apply a bead of the sealant to the cylinder head mating surface of the thermostat case assembly as shown.

   Specified Sealant: 3M™ AAD Part No.8672, 3M™ AAD part No.8679/8678 or equivalent



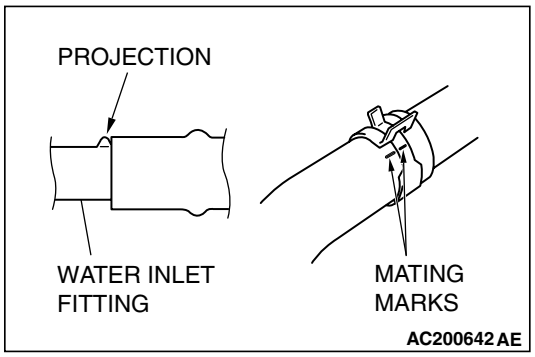
TSB Revision



3. Apply sealant to the thread of the thermostat case assembly bolts as shown.

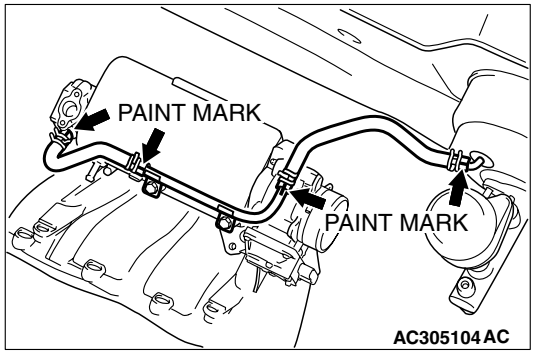
   Specified Sealant: 3M™ AAD Part No.8730, 8731 or equivalent

4. With the sealant still wet (within 15 minutes after the sealant is applied), install the thermostat case assembly. Do not apply the sealant in an area more than the required.



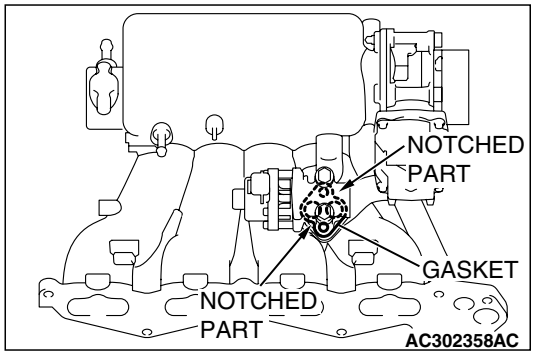
>>B<< RADIATOR LOWER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.



>>C<< BRAKE BOOSTER VACUUM HOSE CONNECTION

Insert vacuum hose with its paint mark facing upward.



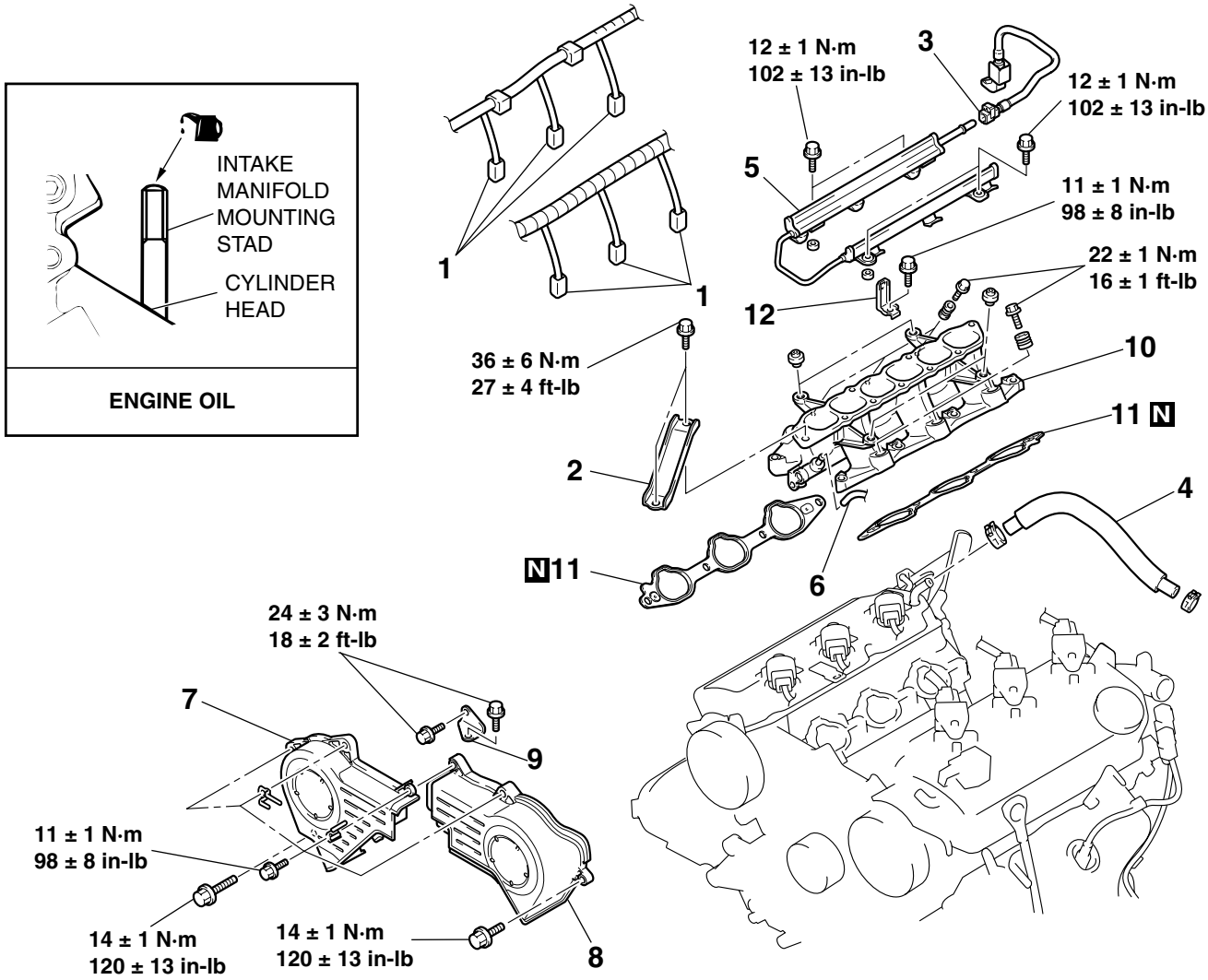
>>D<< EXHAUST GAS RECIRCULATION VALVE GASKET INSTALLATION

Install the exhaust gas recirculation valve gasket as shown in the illustration.

REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

M1151003001764

Pre-removal Operation	Post-installation Operation
• Fuel Discharge Prevention [Refer to GROUP 13B, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13B-1430.] • Intake Manifold Plenum Removal (Refer to P.15-8.)	• Intake Manifold Plenum Installation (Refer to P.15-8.) • Fuel Leakage Inspection



AC500605AB

REMOVAL STEPS

1. INJECTOR CONNECTOR
2. ENGINE MOUNTING STAY

<<A>> >>C<< 3. FUEL HIGH-PRESSURE HOSE CONNECTION (FUEL RAIL SIDE)

4. BLOW-BY HOSE

<<B>> 5. FUEL RAIL AND FUEL INJECTOR ASSEMBLY

6. PCV HOSE CONNECTION

REMOVAL STEPS (Continued)

7. TIMING BELT FRONT UPPER COVER, RIGHT
8. TIMING BELT FRONT UPPER COVER, LEFT
9. WATER PUMP BRACKET

>>B<< 10. INTAKE MANIFOLD

>>A<< 11. INTAKE MANIFOLD GASKET

12. CONTROL HARNESS CLAMP

TSB Revision

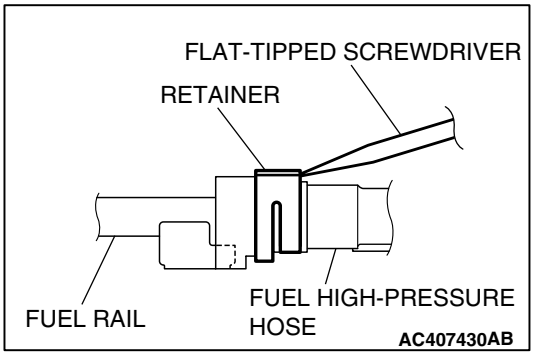
REMOVAL SERVICE POINTS

<<A>> FUEL HIGH-PRESSURE HOSE DISCONNECTION

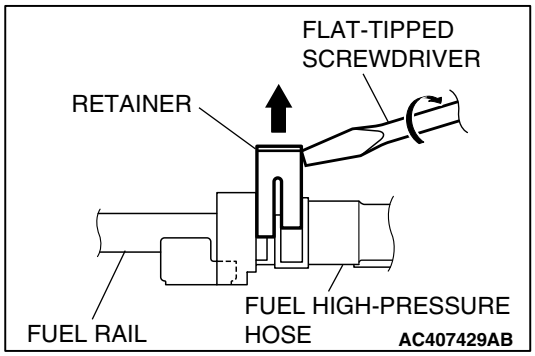
⚠ CAUTION

Do not kink the fuel high-pressure hose as it is made of plastics.

1. Insert a flat-tipped screwdriver [width 6 mm (0.24 inch), thickness 1 mm (0.04 inch)] to the retainer.



2. Turn the flat-tipped screwdriver approximately 90° to the arrowed direction, and lift the retainer to unlock and disconnect the fuel high-pressure hose.



<<B>> FUEL RAIL AND INJECTOR ASSEMBLY REMOVAL

⚠ CAUTION

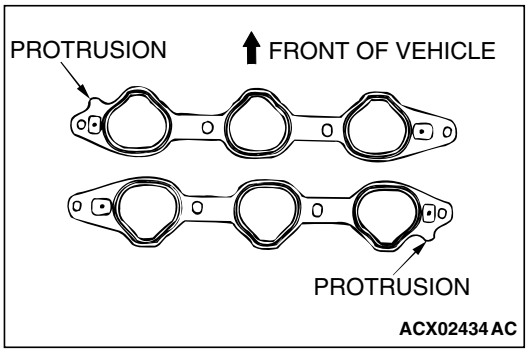
Care must be taken when removing the fuel rail not to drop the injector.

Remove the fuel rail with the injectors attached to it.

INSTALLATION SERVICE POINTS

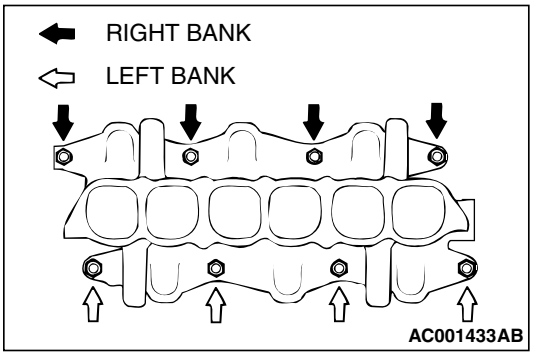
>>A<< INTAKE MANIFOLD GASKET INSTALLATION

Install the gasket with the protrusions in the position illustrated.



>>B<< INTAKE MANIFOLD INSTALLATION

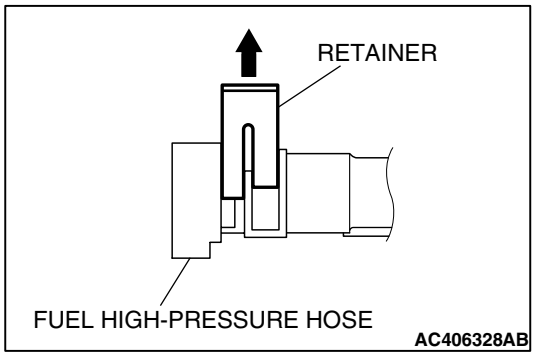
1. Coat the intake manifold mounting studs with engine oil.



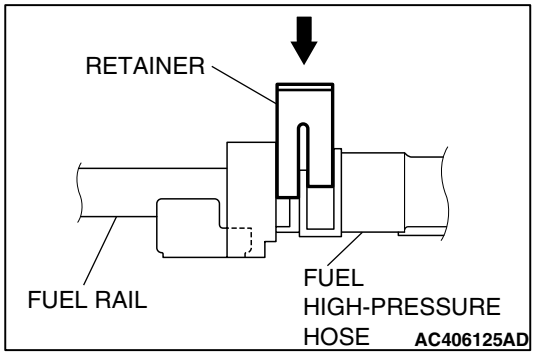
2. Tighten the intake manifold mounting nuts by the following procedure.

ORDER	MOUNTING NUTS	TIGHTENING TORQUE
1st	Right-bank nuts	6.5 ± 1.5 N·m (58 ± 13 in-lb)
2nd	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
3rd	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
4th	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
5th	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)

>>C<< FUEL HIGH-PRESSURE HOSE CONNECTION



1. Pull up the lock of fuel high-pressure hose to unlock before installing.

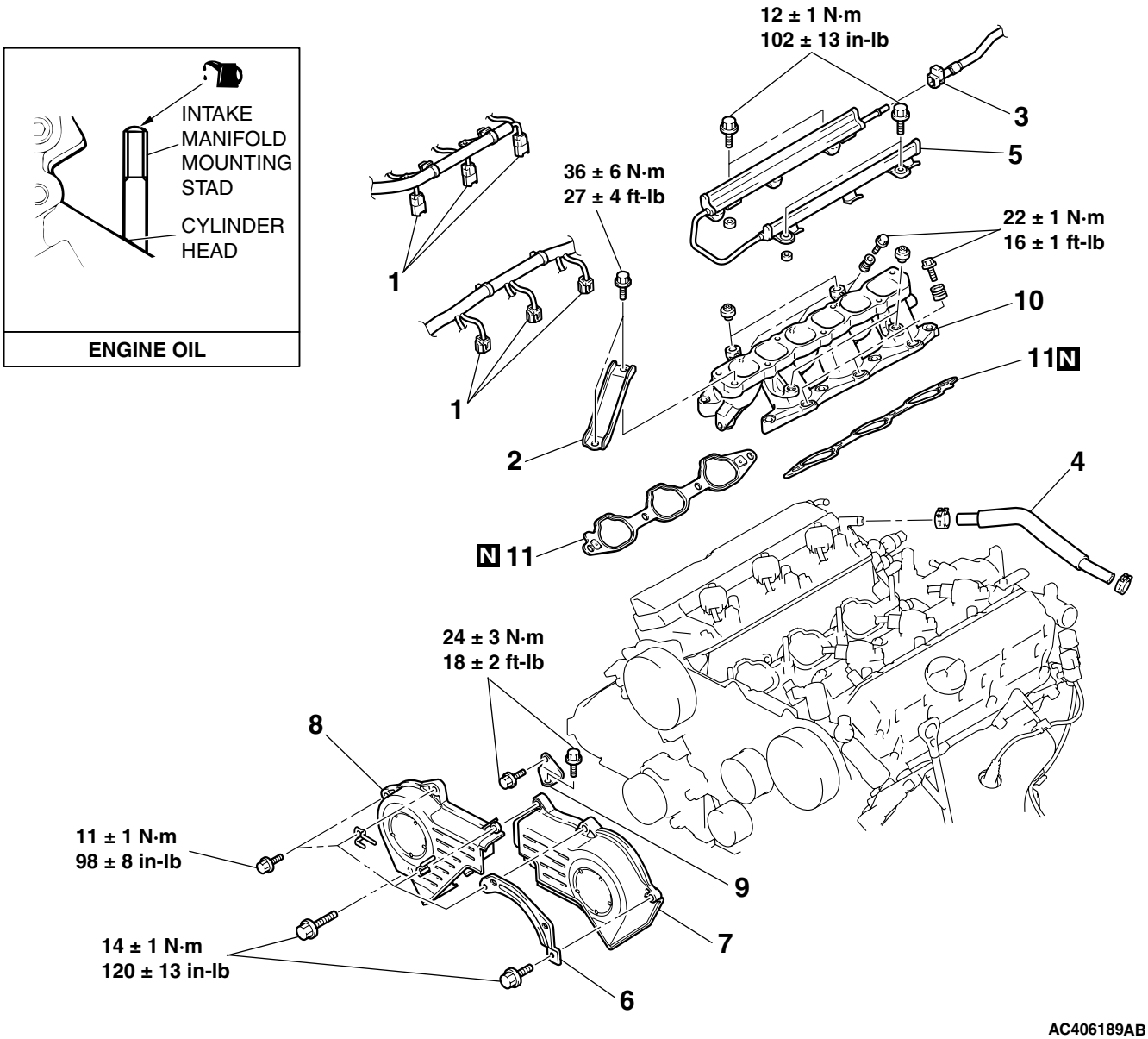


2. Install the fuel high-pressure hose to the fuel rail securely and push the lock of fuel high-pressure hose downward and lock thoroughly.
3. After installing, slightly pull the fuel high-pressure hose and ensure that there is no disengaged fuel high-pressure hose. Also confirm that there is approximately 1 mm (0.04 inch) play at this time.

REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

M1151003001753

Pre-removal Operation	Post-installation Operation
• Fuel Discharge Prevention [Refer to GROUP 13B, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13B-1430]. • Intake Manifold Plenum Removal (Refer to P.15-8).	• Intake Manifold Plenum Installation (Refer to P.15-8). • Fuel Leakage Inspection



AC406189AB

REMOVAL STEPS

1. INJECTOR CONNECTOR
2. ENGINE MOUNTING STAY
<<A>> >>C<< 3. FUEL HIGH-PRESSURE HOSE CONNECTION
4. PCV HOSE CONNECTION
<<B>> 5. FUEL RAIL AND INJECTOR
6. HARNESS BRACKET

REMOVAL STEPS (Continued)

7. TIMING BELT FRONT UPPER COVER, LEFT
8. TIMING BELT FRONT UPPER COVER, RIGHT
9. WATER PUMP BRACKET
>>B<< 10. INTAKE MANIFOLD
>>A<< 11. INTAKE MANIFOLD GASKET

TSB Revision

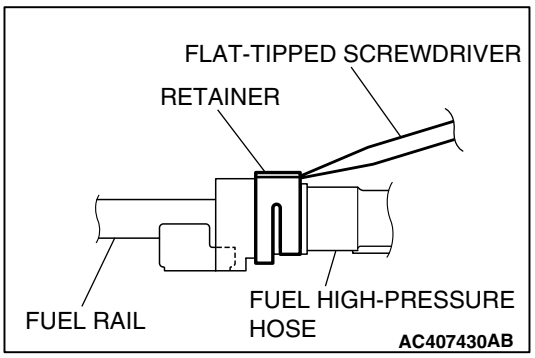
REMOVAL SERVICE POINTS

<<A>> FUEL HIGH-PRESSURE HOSE DISCONNECTION

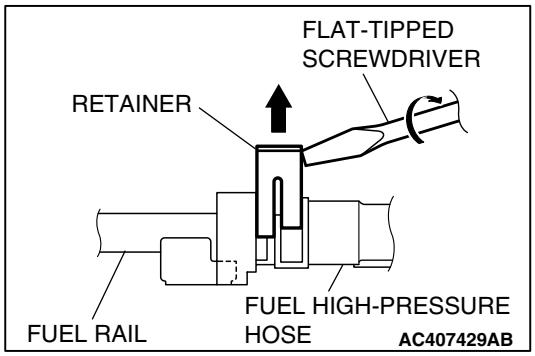
⚠ CAUTION

Do not kink the fuel high-pressure hose as it is made of plastic and will become damage.

1. Insert a flat-tipped screwdriver [width 6 mm (0.24 inch), thickness 1 mm (0.04 inch)] to the retainer.



2. Turn the flat-tipped screwdriver approximately 90° to the arrowed direction, and lift the retainer to unlock and disconnect the fuel high-pressure hose.



<<B>> FUEL RAIL AND INJECTOR REMOVAL

⚠ CAUTION

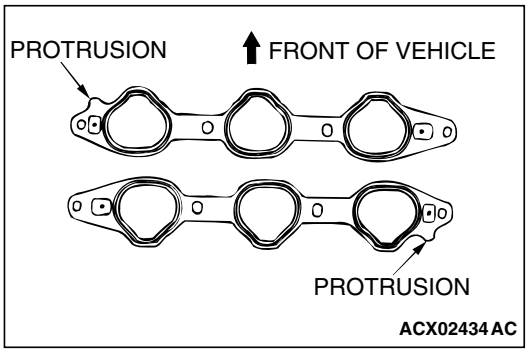
Care must be taken when removing the fuel rail not to drop the injector.

Remove the fuel rail with the injectors attached to it.

INSTALLATION SERVICE POINTS

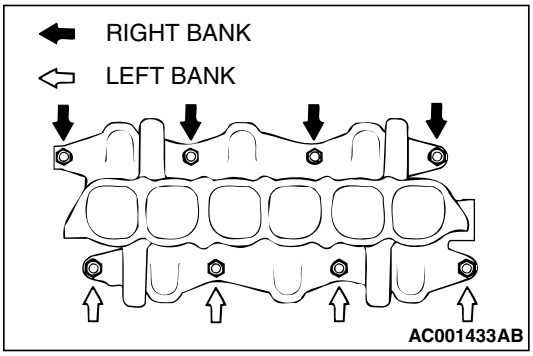
>>A<< INTAKE MANIFOLD GASKET INSTALLATION

Install the gasket with the protrusions in the position illustrated.



>>B<< INTAKE MANIFOLD INSTALLATION

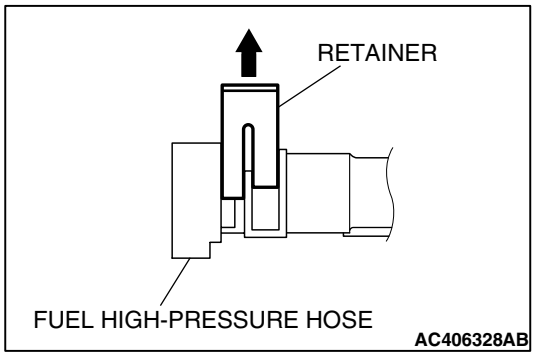
1. Coat the intake manifold mounting studs with engine oil.



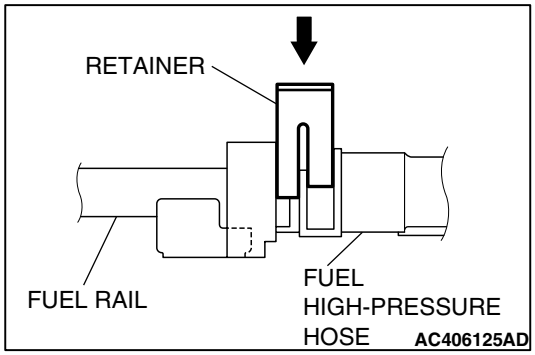
2. Tighten the intake manifold mounting nuts by the following procedure.

ORDER	MOUNTING NUTS	TIGHTENING TORQUE
1st	Right-bank nuts	6.5 ± 1.5 N·m (58 ± 13 in-lb)
2nd	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
3rd	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
4th	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
5th	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)

>>C<< FUEL HIGH-PRESSURE HOSE CONNECTION



1. Pull up the lock of fuel high-pressure hose to unlock before installing.



2. Install the fuel high-pressure hose to the fuel rail securely and push the lock of fuel high-pressure hose downward and lock thoroughly.
3. After installing, slightly pull the fuel high-pressure hose and ensure that there is no disengaged fuel high-pressure hose. Also confirm that there is approximately 1 mm (0.04 inch) play at this time.

INSPECTION

M1151003100672

Check the following points; replace the part if a problem is found.

Intake Manifold Check

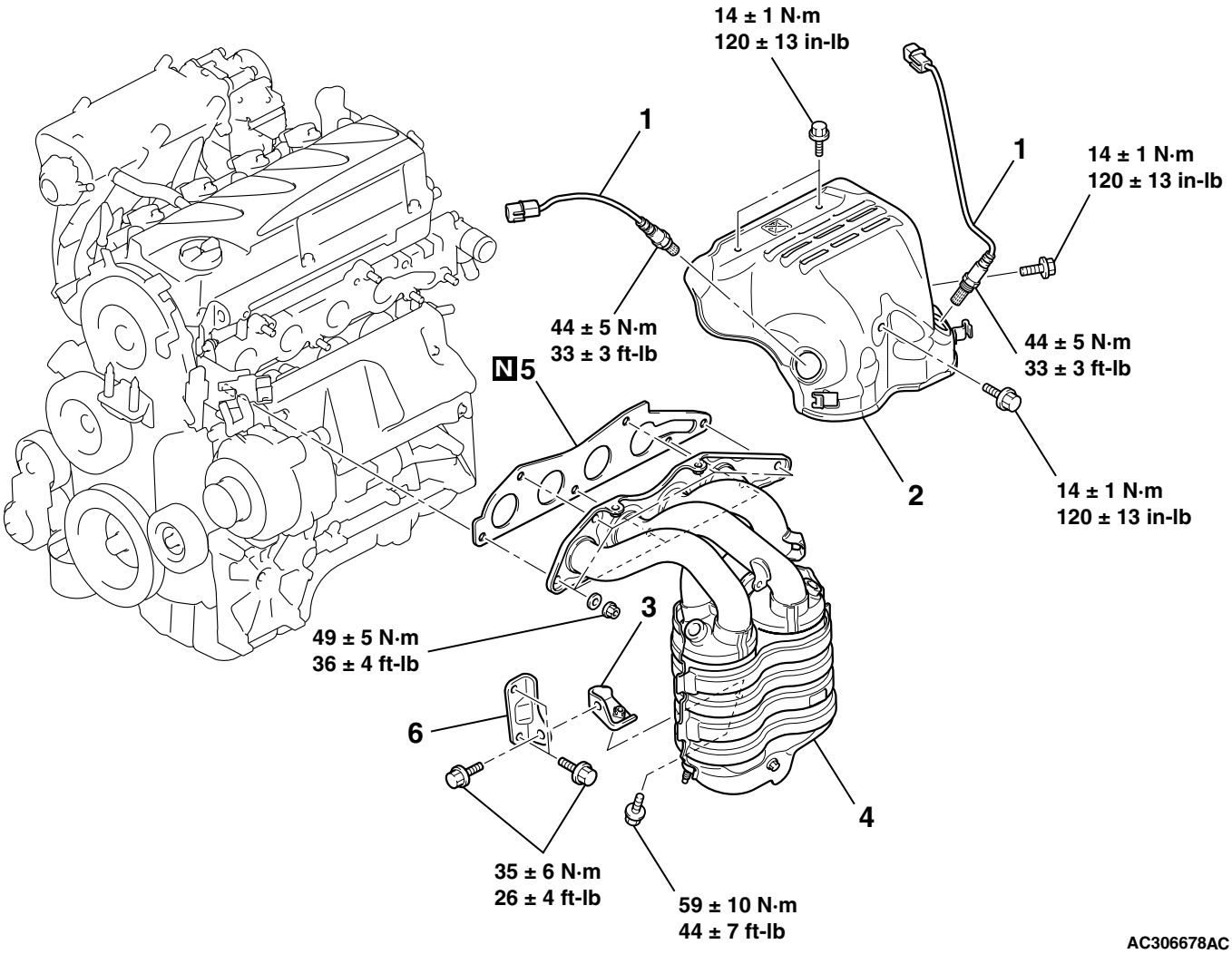
1. Check for damage or cracking of any part.
2. Clogging of the negative pressure (vacuum) outlet port, or clogging of the exhaust gas recirculation passages.
3. Using a straight edge and feeler gauge, check for distortion of the cylinder head installation surface.

   Standard value: 0.15 mm (0.006 inch) or less
   Limit: 0.20 mm (0.008 inch)

EXHAUST MANIFOLD

REMOVAL AND INSTALLATION <2.4L ENGINE>

M1151003301237



AC306678AC

REMOVAL STEPS

<<**A**>> >>**A**<< 1. HEATED OXYGEN SENSOR
2. EXHAUST MANIFOLD COVER
   - FRONT NO.1 EXHAUST PIPE (REFER TO P.15-32).
3. EXHAUST MANIFOLD BRACKET B

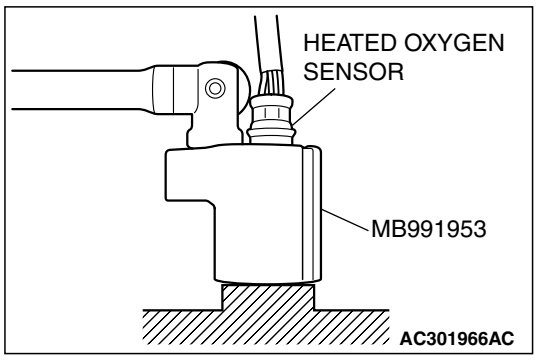
REMOVAL STEPS (Continued)

4. EXHAUST MANIFOLD
5. EXHAUST MANIFOLD GASKET
6. EXHAUST MANIFOLD BRACKET A

Required Special Tool:

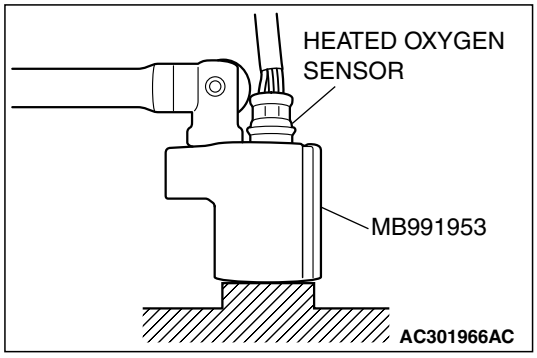
- MB991953: Oxygen Sensor Wrench

REMOVAL SERVICE POINT



<<A>> HEATED OXYGEN SENSOR REMOVAL
Use special tool MB991953 to remove the heated oxygen sensor.

INSTALLATION SERVICE POINT



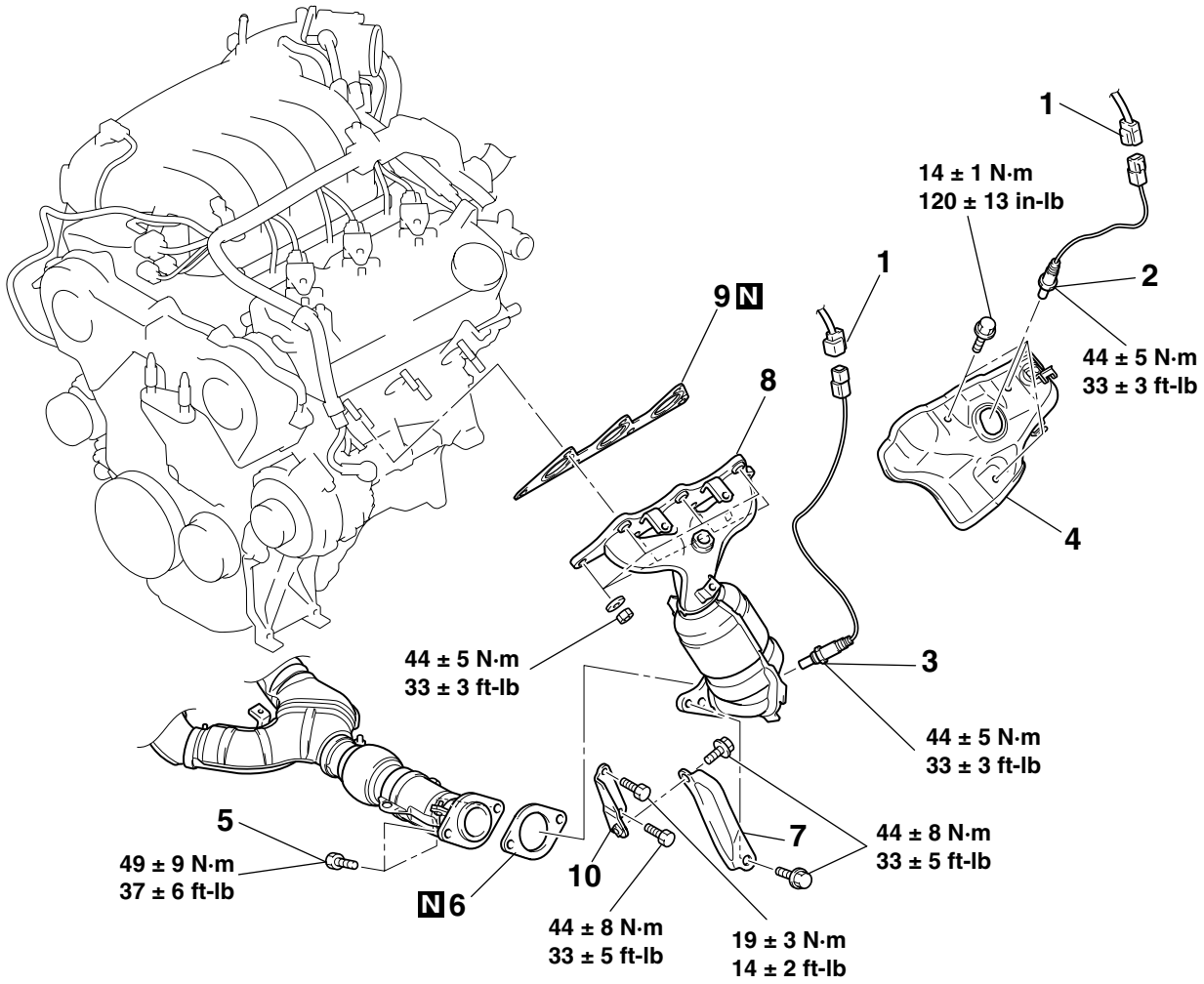
>>A<< HEATED OXYGEN SENSOR INSTALLATION
Use special tool MB991953 to install the heated oxygen sensor.

REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

M1151003301431

<LEFT BANK>

Pre-removal Operation	Post-installation Operation
• Front Bumper Under Cover Removal (Refer to GROUP 51, Front Bumper P.51-2). • Air Cleaner Intake Duct Removal (Refer to P.15-4).	• Air Cleaner Intake Duct Installation (Refer to P.15-4). • Front Bumper Under Cover Installation (Refer to GROUP 51, Front Bumper P.51-2).



AC500457AB

REMOVAL STEPS

1. LEFT HEATED OXYGEN SENSOR CONNECTOR
<<A>> >>A<< 2. LEFT BANK HEATED OXYGEN SENSOR (FRONT)
<<B>> >>B<< 3. LEFT BANK HEATED OXYGEN SENSOR (REAR)
4. HEAT PROTECTOR
5. FRONT EXHAUST PIPE CONNECTING BOLTS

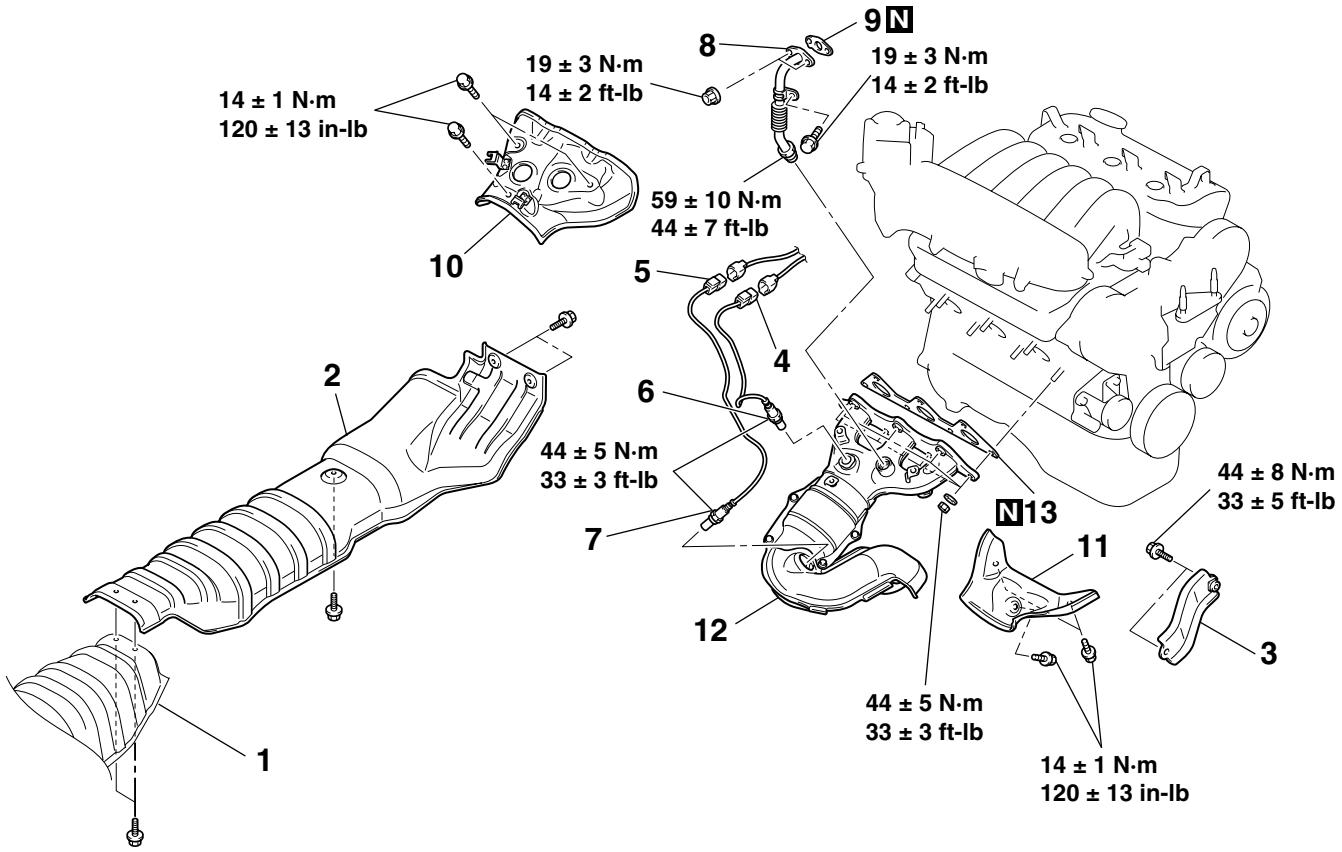
REMOVAL STEPS (Continued)

6. FRONT EXHAUST PIPE GASKET
7. EXHAUST MANIFOLD STAY, LEFT B
8. EXHAUST MANIFOLD
9. EXHAUST MANIFOLD GASKET
10. EXHAUST MANIFOLD STAY, LEFT A

TSB Revision

<RIGHT BANK>

Pre-removal Operation	Post-installation Operation
• Air Cleaner Cover and Air Cleaner Air Intake Duct Removal (Refer to P.15-4). • Battery Removal • Front Exhaust Pipe, Center Exhaust Pipe Removal (Refer to P.15-32). • Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7).	• Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7). • Front Exhaust Pipe, Center Exhaust Pipe Installation (Refer to P.15-32). • Battery Installation • Air Cleaner Cover and Air Cleaner Air Intake Duct Installation (Refer to P.15-4).



AC308063AB

REMOVAL STEPS

1. CENTER UNDER FLOOR HEAT PROTECTOR
- STEERING GEAR AND LINKAGE PROTECTOR (REFER TO GROUP 37, POWER STEERING GEAR BOX AND LINKAGE P.37-31)
2. FRONT UNDER FLOOR HEAT PROTECTOR
3. EXHAUST MANIFOLD STAY, RIGHT B
4. RIGHT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR

<<A>> >>A<<

<<A>> >>A<<

REMOVAL STEPS (Continued)

5. RIGHT BANK HEATED OXYGEN SENSOR (REAR) CONNECTOR
6. RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
7. RIGHT BANK HEATED OXYGEN SENSOR (REAR)
8. EGR PIPE
9. EGR PIPE GASKET
10. UPPER HEAT PROTECTOR
11. LOWER HEAT PROTECTOR
12. EXHAUST MANIFOLD
13. EXHAUST MANIFOLD GASKET

Required Special Tools:

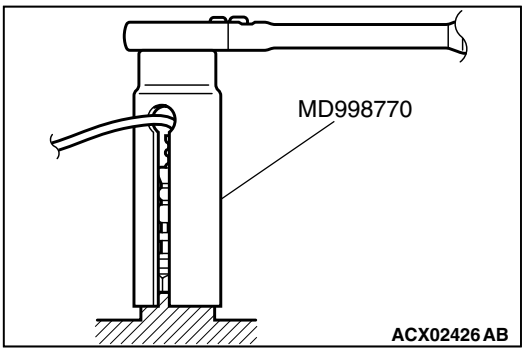
- MB991953: Oxygen Sensor Wrench
- MD998770: Oxygen Sensor Wrench

TSB Revision

REMOVAL SERVICE POINTS

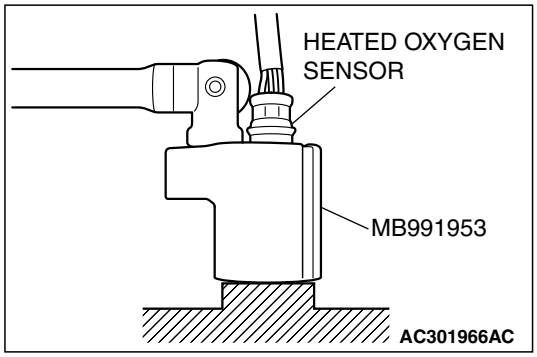
<<A>> LEFT BANK HEATED OXYGEN SENSOR (FRONT)/ RIGHT BANK HEATED OXYGEN SENSOR (FRONT)/RIGHT BANK HEATED OXYGEN SENSOR (REAR) REMOVAL

Use special tool MD998770 to remove the heated oxygen sensor.



<<B>> LEFT BANK HEATED OXYGEN SENSOR (REAR) REMOVAL

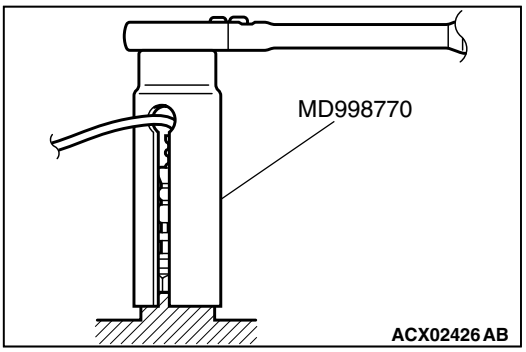
Use special tool MB991953 to remove the heated oxygen sensor.

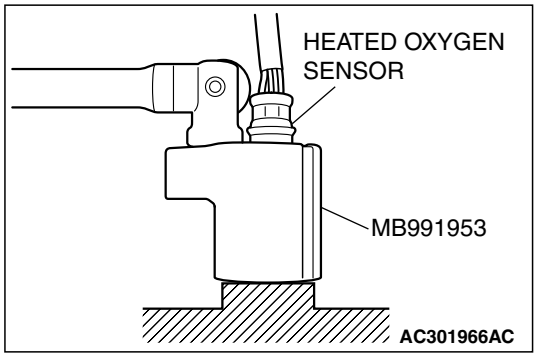


INSTALLATION SERVICE POINTS

>>A<< RIGHT BANK HEATED OXYGEN SENSOR (REAR)/ RIGHT BANK HEATED OXYGEN SENSOR (FRONT)/LEFT BANK HEATED OXYGEN SENSOR (FRONT) INSTALLATION

Use special tool MD998770 to install the heated oxygen sensor.





>>B<< LEFT BANK HEATED OXYGEN SENSOR (REAR) INSTALLATION

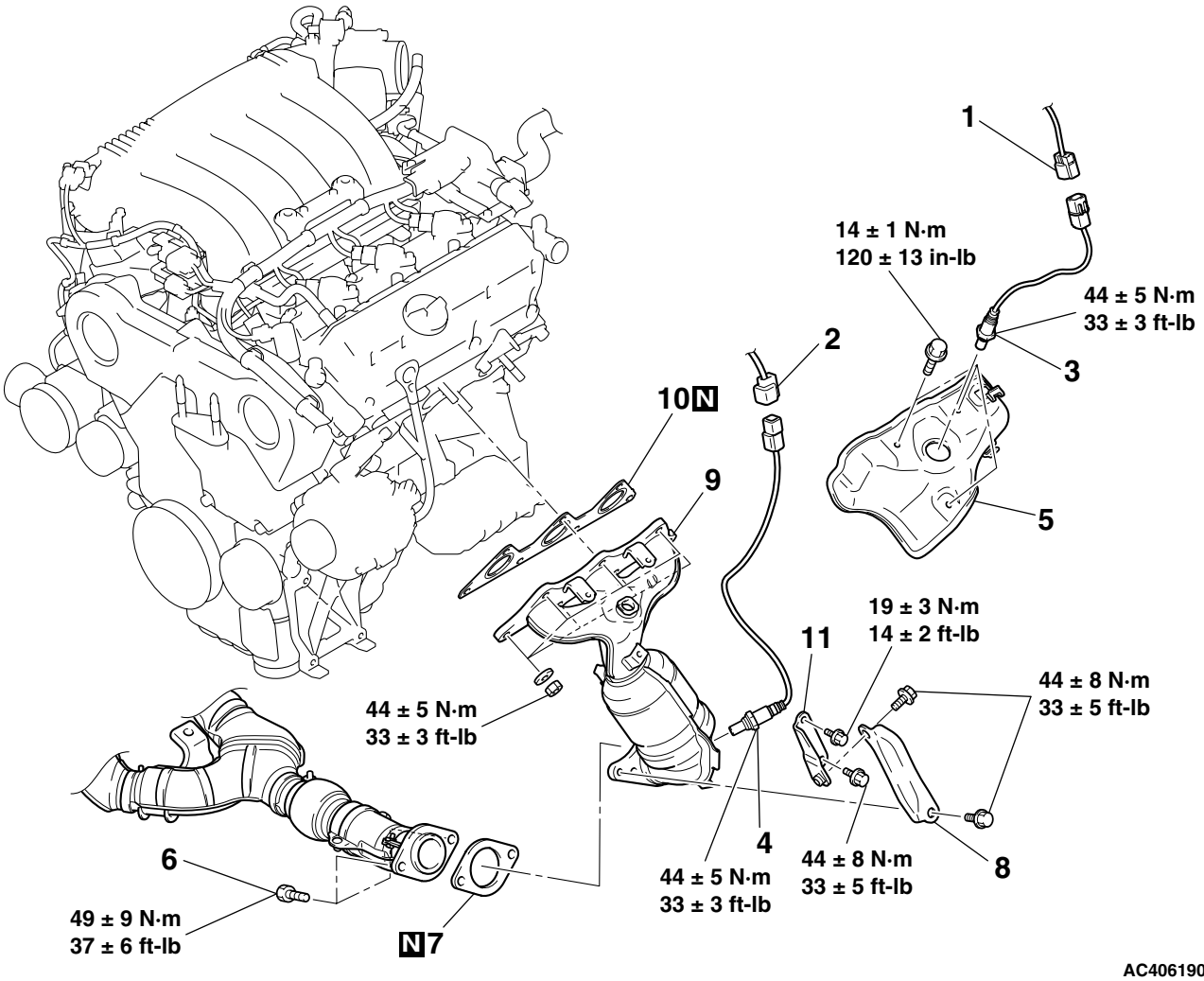
Use special tool MB991953 to install the heated oxygen sensor.

REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

M1151003301420

<LEFT BANK>

Pre-removal Operation	Post-installation Operation
• Front Bumper Under Cover Removal (Refer to GROUP 51, Front Bumper P.51-2). • Air Cleaner Intake Duct Removal (Refer to P.15-4).	• Air Cleaner Intake Duct Installation (Refer to P.15-4). • Front Bumper Under Cover Installation (Refer to GROUP 51, Front Bumper P.51-2).



TSB Revision

REMOVAL STEPS

1. LEFT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR
2. LEFT BANK HEATED OXYGEN SENSOR (REAR) CONNECTOR
3. <<**A**>> >>**B**<< LEFT BANK HEATED OXYGEN SENSOR (FRONT)
4. <<**B**>> >>**A**<< LEFT BANK HEATED OXYGEN SENSOR (REAR)
5. HEAT PROTECTOR

REMOVAL STEPS (Continued)

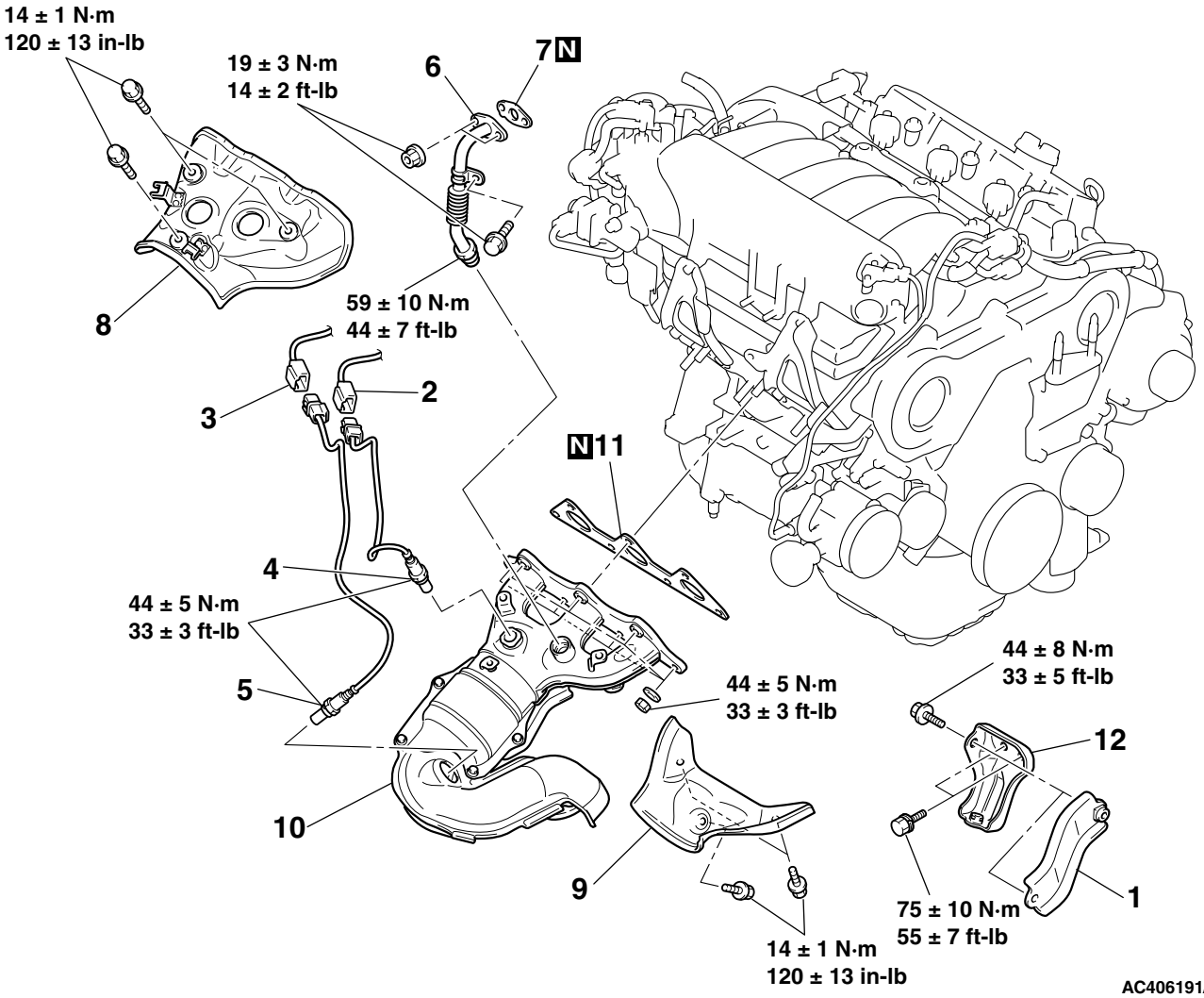
6. FRONT EXHAUST PIPE CONNECTING BOLTS
7. FRONT EXHAUST PIPE GASKET
8. EXHAUST MANIFOLD STAY, LEFT B
9. EXHAUST MANIFOLD
10. EXHAUST MANIFOLD GASKET
11. EXHAUST MANIFOLD STAY, LEFT A

Required Special Tools:

- MB991953: Oxygen Sensor Wrench
- MD998770: Oxygen Sensor Wrench

<RIGHT BANK>

Pre-removal Operation	Post-installation Operation
• Air Cleaner Cover and Air Cleaner Air Intake Duct Removal (Refer to P.15-4). • Battery Removal • Front Exhaust Pipe, Center Exhaust Pipe Removal (Refer to P.15-32). • Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-11). • Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7).	• Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7). • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11). • Front Exhaust Pipe, Center Exhaust Pipe Installation (Refer to P.15-32). • Battery Installation • Air Cleaner Cover and Air Cleaner Air Intake Duct Installation (Refer to P.15-4).



AC406191AB

REMOVAL STEPS

- STEERING GEAR AND LINKAGE PROTECTOR (REFER TO GROUP 37, POWER STEERING GEAR BOX AND LINKAGE P.37-31).
- CENTER UNDER FLOOR HEAT PROTECTOR (REFER TO P.15-32).
- FRONT UNDER FLOOR HEAT PROTECTOR (REFER TO P.15-32).

<<A>> >>B<<

<<B>> >>A<<

REMOVAL STEPS (Continued)

1. EXHAUST MANIFOLD STAY, RIGHT B
2. RIGHT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR
3. RIGHT BANK HEATED OXYGEN SENSOR (REAR) CONNECTOR
4. RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
5. RIGHT BANK HEATED OXYGEN SENSOR (REAR)
6. EGR PIPE
7. EGR PIPE GASKET

TSB Revision

REMOVAL STEPS (Continued)

8. UPPER HEAT PROTECTOR
9. LOWER HEAT PROTECTOR
10. EXHAUST MANIFOLD
11. EXHAUST MANIFOLD GASKET
12. EXHAUST MANIFOLD STAY, RIGHT A

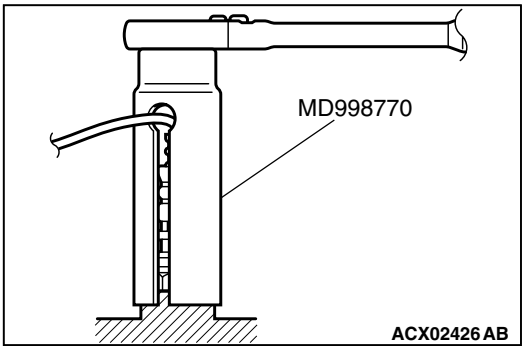
Required Special Tools:

- MB991953: Oxygen Sensor Wrench
- MD998770: Oxygen Sensor Wrench

REMOVAL SERVICE POINTS

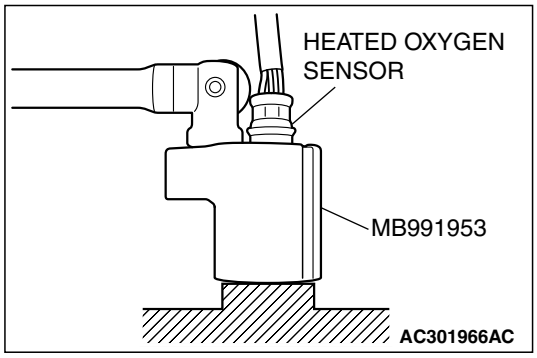
<<A>> LEFT BANK HEATED OXYGEN SENSOR (FRONT)/ RIGHT BANK HEATED OXYGEN SENSOR (FRONT) REMOVAL

Use special tool MD998770 to remove the heated oxygen sensor.



<<B>> LEFT BANK HEATED OXYGEN SENSOR (REAR)/ RIGHT BANK HEATED OXYGEN SENSOR (REAR) REMOVAL

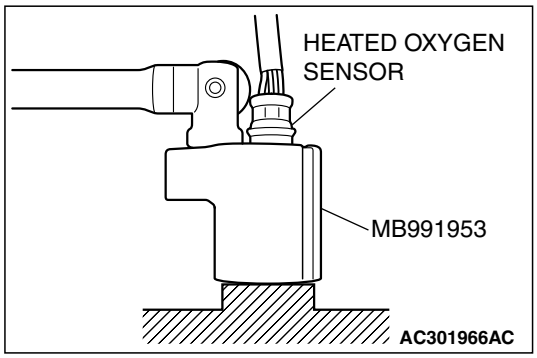
Use special tool MB991953 to remove the heated oxygen sensor.



INSTALLATION SERVICE POINTS

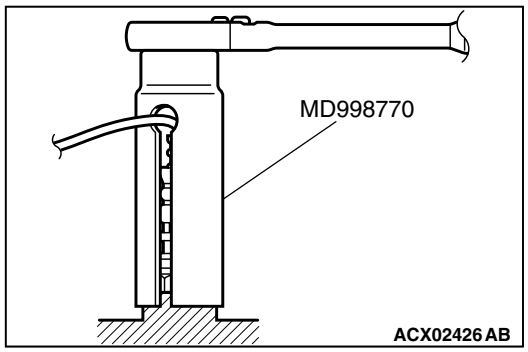
>>A<< RIGHT BANK HEATED OXYGEN SENSOR (REAR)/ LEFT BANK HEATED OXYGEN SENSOR (REAR) INSTALLATION

Use special tool MB991953 to install the heated oxygen sensor.



>>B<< RIGHT BANK HEATED OXYGEN SENSOR (FRONT)/ LEFT BANK HEATED OXYGEN SENSOR (FRONT) INSTALLATION

Use special tool MD998770 to install the heated oxygen sensor.



INSPECTION

M1151003400587

Check the following points; replace the part if a problem is found.

Exhaust Manifold Check

1. Check for damage or cracking of any part.
2. Using a straight edge and a feeler gauge, check for distortion of the cylinder head installation surface.

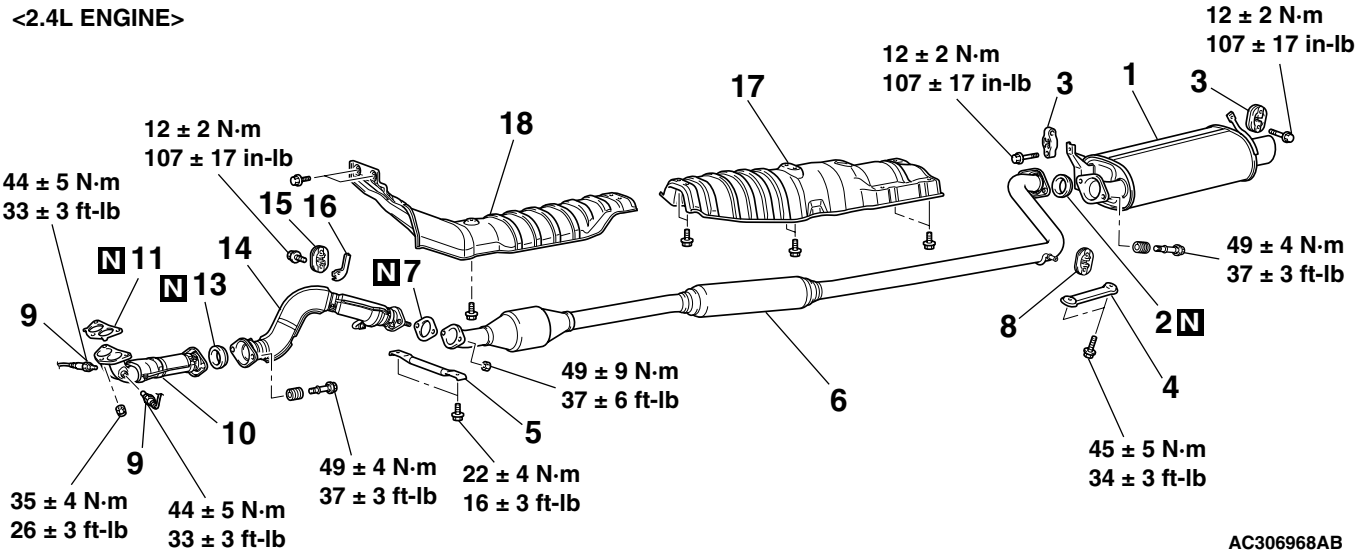
   Standard value: 0.15 mm (0.006 inch) or less
   Limit: 0.20 mm (0.008 inch)

EXHAUST PIPE AND MAIN MUFFLER

REMOVAL AND INSTALLATION

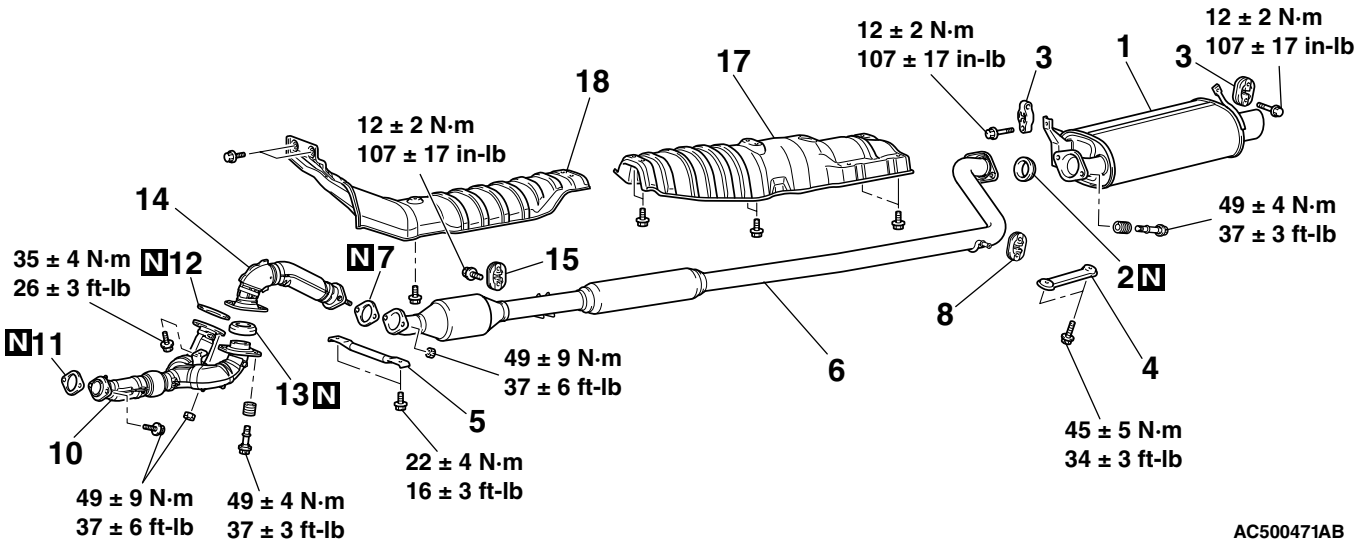
M1151008700851

<2.4L ENGINE>



AC306968AB

<3.8L ENGINE>



AC500471AB

MAIN MUFFLER REMOVAL STEPS

1. MAIN MUFFLER
2. SEAL RING
3. HANGER

CENTER EXHAUST PIPE REMOVAL STEPS

4. CROSSMEMBER STAY
5. FRONT FLOOR BACKBONE BRACE
6. CENTER EXHAUST PIPE
2. SEAL RING
7. GASKET
8. HANGER

<<A>> >>A<<

FRONT EXHAUST PIPE REMOVAL STEPS

9. HEATED OXYGEN SENSOR <2.4L ENGINE>
10. FRONT NO.1 EXHAUST PIPE
11. GASKET
12. GASKET <3.8L ENGINE>
13. SEAL RING
14. FRONT NO.2 EXHAUST PIPE
7. GASKET
15. HANGER
16. PROTECTOR <2.4L ENGINE>
17. CENTER UNDER FLOOR HEAT PROTECTOR
18. FRONT UNDER FLOOR HEAT PROTECTOR

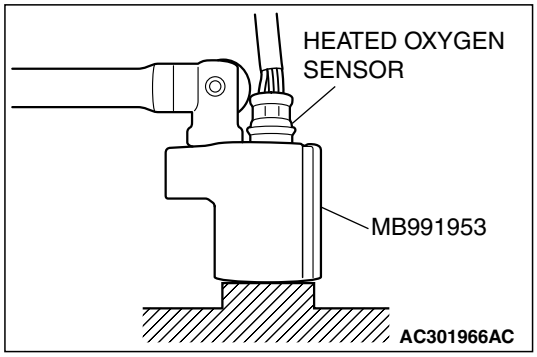
Required Special Tool:

- MB991953: Oxygen Sensor Wrench

TSB Revision

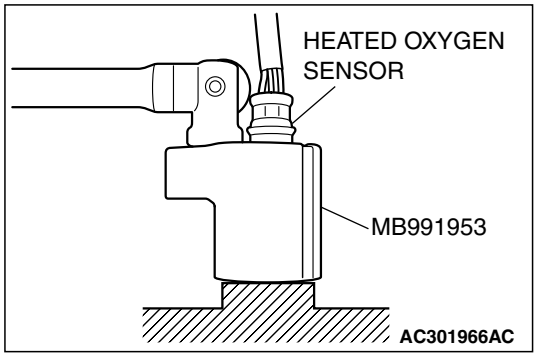
REMOVAL SERVICE POINT

<<A>> HEATED OXYGEN SENSOR REMOVAL
Use special tool MB991953 to remove the heated oxygen sensor.



INSTALLATION SERVICE POINT

>>A<< HEATED OXYGEN SENSOR INSTALLATION
Use special tool MB991953 to install the heated oxygen sensor.



SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1151006800614

ITEM	SPECIFICATION
Air cleaner	
Air cleaner bolt	8.8 ± 1.0 N·m (78 ± 9 in-lb)
Air cleaner bracket bolt and nut	12 ± 2 N·m (102 ± 22 in-lb)
Air cleaner resonator bolt <2.4L ENGINE>	3.0 ± 0.5 N·m (27 ± 4 in-lb)
Air cleaner resonator bolt	8.8 ± 1.0 N·m (78 ± 9 in-lb)
Air intake hose clamp bolt	4.0 ± 0.9 N·m (35 ± 8 in-lb)
Mass airflow sensor bolt	1.8 ± 0.6 N·m (16 ± 5 in-lb)
Exhaust manifold <2.4L ENGINE>	
Exhaust manifold bracket A bolt	35 ± 6 N·m (26 ± 4 ft-lb)
Exhaust manifold bracket B bolt	59 ± 10 N·m (44 ± 7 ft-lb)
Exhaust manifold cover bolt	14 ± 1 N·m (120 ± 13 in-lb)
Exhaust manifold nut	49 ± 5 N·m (36 ± 4 ft-lb)
Heated oxygen sensor	44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust manifold <Left bank> <3.8L ENGINE>	

TSB Revision

ITEM		SPECIFICATION
Exhaust manifold nut		44 ± 5 N·m (33 ± 3 ft-lb)
Front exhaust pipe bolt		49 ± 9 N·m (37 ± 6 ft-lb)
Exhaust manifold stay, left A bolt	M8	19 ± 3 N·m (14 ± 2 ft-lb)
	M10	44 ± 8 N·m (33 ± 5 ft-lb)
Heat protector bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heated oxygen sensor		44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust manifold <Right bank> <3.8L ENGINE>		
EGR pipe		59 ± 10 N·m (44 ± 7 ft-lb)
EGR pipe clamp bolt		19 ± 3 N·m (14 ± 2 ft-lb)
EGR pipe connecting nut		19 ± 3 N·m (14 ± 2 ft-lb)
Exhaust manifold nut		44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust manifold stay, right A bolt		75 ± 10 N·m (55 ± 7 ft-lb)
Exhaust manifold stay, right B bolt		44 ± 8 N·m (33 ± 5 ft-lb)
Heat protector bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heated oxygen sensor		44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust pipe and main muffler		
Crossmember stay bolt		45 ± 5 N·m (34 ± 3 ft-lb)
Center exhaust pipe nut		49 ± 9 N·m (37 ± 6 ft-lb)
Front floor backbone brace bolt		22 ± 4 N·m (16 ± 3 ft-lb)
Front no.1 exhaust pipe nut <2.4L ENGINE>		35 ± 4 N·m (26 ± 3 ft-lb)
Front no.2 exhaust pipe bolt <2.4L ENGINE>		49 ± 4 N·m (37 ± 3 ft-lb)
Front no.1 exhaust pipe bolt <3.8L ENGINE>		35 ± 4 N·m (26 ± 3 ft-lb)
Front no.1 exhaust pipe to front no.2 exhaust pipe bolt <3.8L ENGINE>		49 ± 4 N·m (37 ± 3 ft-lb)
Front no.1 exhaust pipe to right bank exhaust manifold nut <3.8L ENGINE>		49 ± 9 N·m (37 ± 6 ft-lb)
Front no.1 exhaust pipe to left bank exhaust manifold bolt <3.8L ENGINE>		49 ± 9 N·m (37 ± 6 ft-lb)
Hanger bolt		12 ± 2 N·m (107 ± 17 in-lb)
Heated oxygen sensor <2.4L ENGINE>		44 ± 5 N·m (33 ± 3 ft-lb)
Main muffler bolt		49 ± 4 N·m (37 ± 3 ft-lb)
Intake manifold <2.4L ENGINE>		
Engine oil dipstick guide bolt		13 ± 1 N·m (115 ± 9 in-lb)
Evaporative emission purge solenoid valve bolt		11 ± 1 N·m (98 ± 8 in-lb)
Evaporative emission vacuum pipe bolt		11 ± 1 N·m (98 ± 8 in-lb)
Exhaust gas recirculation valve bolt		24 ± 3 N·m (18 ± 2 ft-lb)
Harness clamp bolt		11 ± 1 N·m (98 ± 8 in-lb)
Intake manifold bolt		24 ± 3 N·m (18 ± 2 ft-lb)
Intake manifold nut		20 ± 2 N·m (15 ± 1 ft-lb)
Intake manifold stay bolt		31 ± 3 N·m (23 ± 2 ft-lb)
Knock sensor connector bracket bolt		11 ± 1 N·m (98 ± 8 in-lb)
Manifold absolute pressure sensor bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)
Pressure hose clamp bolt		12 ± 2 N·m (102 ± 22 in-lb)

TSB Revision

ITEM		SPECIFICATION
Thermostat case assembly bolt		24 ± 4 N·m (18 ± 3 ft-lb)
Intake manifold <3.8L ENGINE>		
Control harness clamp bolt		11 ± 1 N·m (98 ± 8 in-lb)
Engine mounting stay bolt		36 ± 6 N·m (27 ± 4 ft-lb)
Fuel rail and injector bolt		12 ± 1 N·m (102 ± 13 in-lb)
Intake manifold bolt		22 ± 1 N·m (16 ± 1 ft-lb)
Timing belt front upper cover bolt	M6	11 ± 1 N·m (98 ± 8 in-lb)
	M8	14 ± 1 N·m (120 ± 13 in-lb)
Water pump bracket bolt		24 ± 3 N·m (18 ± 2 ft-lb)
Intake manifold plenum		
Exhaust gas recirculation valve bolt		24 ± 3 N·m (18 ± 2 ft-lb)
EGR pipe		59 ± 10 N·m (44 ± 7 ft-lb)
EGR pipe clamp bolt		19 ± 3 N·m (14 ± 2 ft-lb)
EGR pipe connection nut		19 ± 3 N·m (14 ± 2 ft-lb)
Evaporative emission purge solenoid bolt		9.0 ± 1.0 N·m (80 ± 9 in-lb)
Harness bracket bolt		11 ± 1 N·m (98 ± 8 in-lb)
Intake manifold plenum bolt <3.8L Engine (Except MIVEC)>		18 ± 2 N·m (13 ± 2 ft-lb)
Intake manifold plenum bolt <3.8L Engine-MIVEC>		22 ± 1 N·m (16 ± 1 ft-lb)
Intake manifold plenum stay bolt <3.8L Engine (Except MIVEC)>	M8	18 ± 2 N·m (13 ± 2 ft-lb)
	M10	49 ± 6 N·m (37 ± 4 ft-lb)
Intake manifold plenum stay bolt <3.8L Engine-MIVEC>	M8	22 ± 1 N·m (16 ± 1 ft-lb)
	M10	49 ± 6 N·m (37 ± 4 ft-lb)
Manifold absolute pressure sensor bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)
Power steering pressure hose clamp nut		12 ± 2 N·m (102 ± 22 in-lb)
Power steering pressure hose clamp bracket bolt		12 ± 2 N·m (102 ± 22 in-lb)
Power steering oil pump bracket connecting bolt		41 ± 8 N·m (30 ± 6 ft-lb)
Vacuum pipe bolt <3.8L Engine (Except MIVEC)>		9.0 ± 1.0 N·m (80 ± 9 in-lb)
Vacuum pipe bolt <3.8L Engine-MIVEC>		11 ± 1 N·m (98 ± 8 in-lb)

SERVICE SPECIFICATION

M1151000300462

ITEM	STANDARD VALUE	LIMIT
Manifold distortion of the installation surface mm (in)	0.15 (0.006) or less	0.20 (0.008)

SEALANTS

M1151000500187

ITEM	SPECIFIED SEALANT
Thermostat case assembly	3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent
Thermostat case assembly bolt	3M™ AAD Part No. 8730, 8731 or equivalent

GROUP 17

ENGINE AND EMISSION CONTROL

CONTENTS

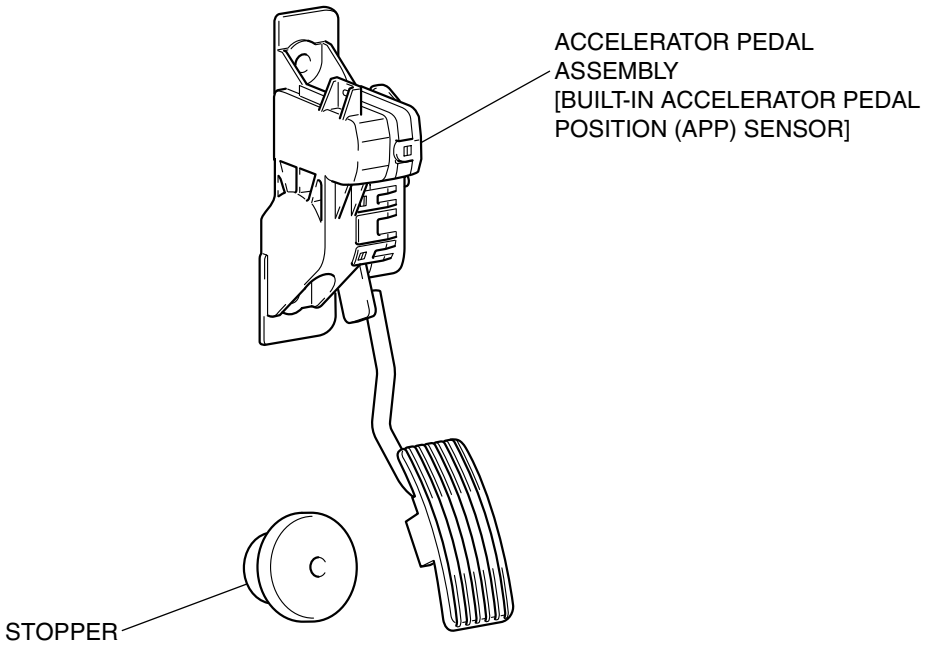
ENGINE CONTROL

GENERAL DESCRIPTION

M1171000100437

For the accelerator system, an electronic throttle actuator control system is utilized, eliminating the accelerator cable.

CONSTRUCTION DIAGRAM



AC305917AC

ENGINE CONTROL SYSTEM DIAGNOSIS

INTRODUCTION

M1171002000254

If there is a malfunction in the engine control system, the accelerator pedal or throttle body may be faulty.

TROUBLESHOOTING STRATEGY

M1171002100284

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an engine control system fault.

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

SYMPTOM CHART

M1171002200292

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Throttle Valve Will Not Fully Open or Close	1	P.17-4
Accelerator Pedal Operation Not Smooth (Over Acceleration)	2	P.17-5

SYMPTOM PROCEDURES

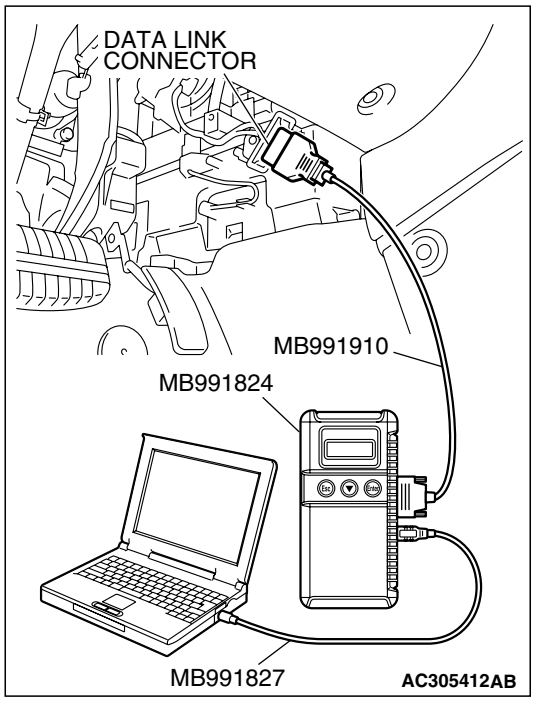
INSPECTION PROCEDURE 1: Throttle Valve will not Fully Open or Close

COMMENT
The throttle body or accelerator pedal position (APP) sensor is suspected.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)
- Malfunction of the throttle body.
- Malfunction of the accelerator pedal position (APP) sensor.
- Malfunction of the PCM.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ 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 MB991910 to special tool MB991824.
(5) Connect special tool MB991910 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 M.U.T.-III system on the personal computer.
(8) Turn the ignition switch to the "ON" position.
(9) Check for MFI system diagnostic trouble code. (Refer to GROUP 13A, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13A-9) <2.4L engine> or (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13B-10) <3.8L engine>.
(10) Turn the ignition switch to the "LOCK" (OFF) position, and then remove scan tool MB991958 in the reverse order of installation.

Q: Is any DTC set?

YES : Repair MFI system. (Refer to GROUP 13A, MFI Diagnosis – Diagnostic Trouble Code Chart P.13A-45) <2.4L engine> or (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Trouble Code Chart P.13B-46) <3.8L engine>. Then go to Step 2.
NO : Go to Step 2.

STEP 2. Retest the system.

Q: Does the throttle valve fully open and close?

YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Accelerator Pedal Operation not Smooth (Over Acceleration)

COMMENT
The accelerator pedal, its installation condition or the accelerator pedal position (APP) sensor is suspected.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)
- Malfunction of the accelerator pedal.
- Incorrectly installed accelerator pedal.
- Malfunction of the accelerator pedal position (APP) sensor.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Check if the accelerator pedal is installed correctly.

Q: Is the accelerator pedal installed correctly?

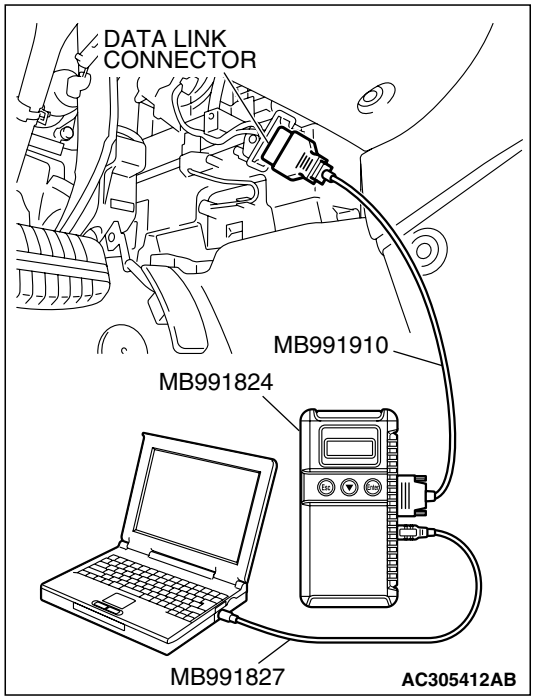
YES : Go to Step 2.

NO : Replace and reinstall the accelerator pedal. (Refer to P.17-8). Go to Step 3.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ 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 MB991910 to special tool MB991824.
(5) Connect special tool MB991910 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 M.U.T.-III system on the personal computer.
(8) Turn the ignition switch to the "ON" position.
(9) Check for MFI system diagnostic trouble code. (Refer to GROUP 13A, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13A-9) <2.4L engine> or (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13B-10) <3.8L engine>.
(10) Turn the ignition switch to the "LOCK" (OFF) position, and then remove scan tool MB991958 in the reverse order of installation.

Q: Is any DTC set?

YES : Repair MFI system. (Refer to GROUP 13A, MFI Diagnosis – Diagnostic Trouble Code Chart P.13A-45) <2.4L engine> or (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Trouble Code Chart P.13B-46) <3.8L engine>. Then go to Step 3.

NO : Go to Step 3.

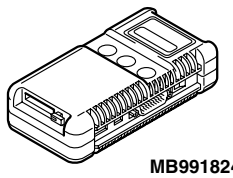
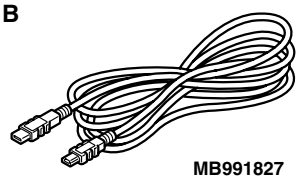
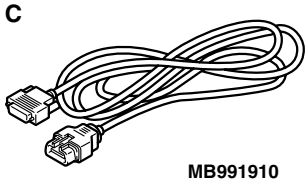
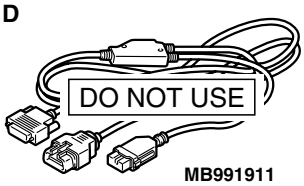
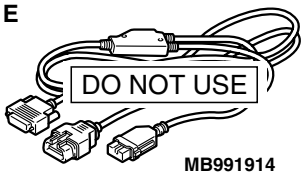
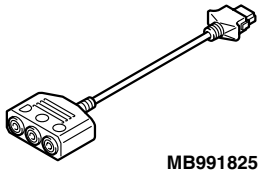
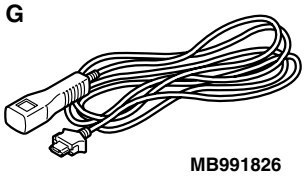
STEP 3. Retest the system.

Q: Does the accelerator pedal work normally?

YES : The procedure is complete.
NO : Return to Step 1.

SPECIAL TOOL

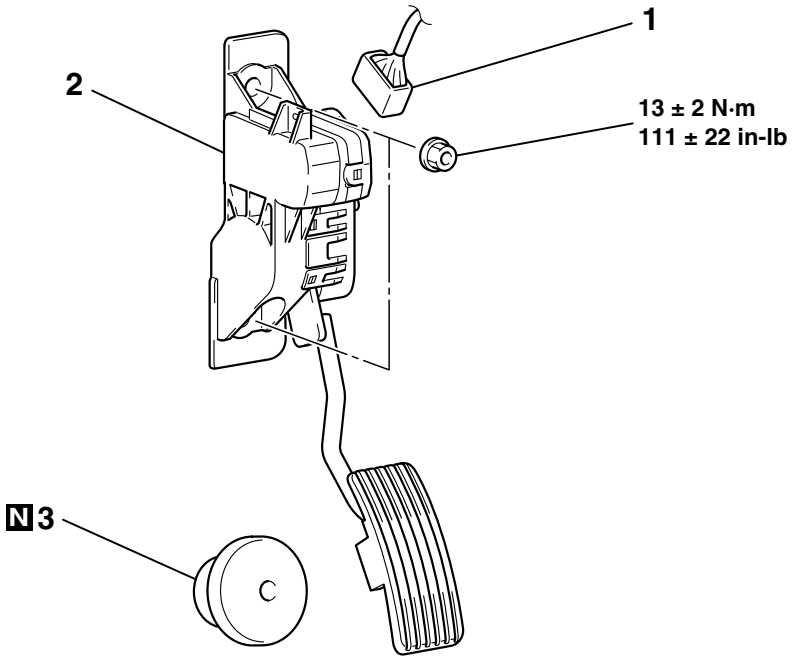
M1171000600045

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III sub assembly A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III main harness C (for Daimler Chrysler models only) F: M.U.T.-III measurement adapter G: M.U.T.-III trigger harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III trigger harness is not necessary when pushing V.C.I. ENTER key.*	Checking diagnostic trouble codes **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**

ACCELERATOR PEDAL

REMOVAL AND INSTALLATION

M1171003000310



AC307006AC

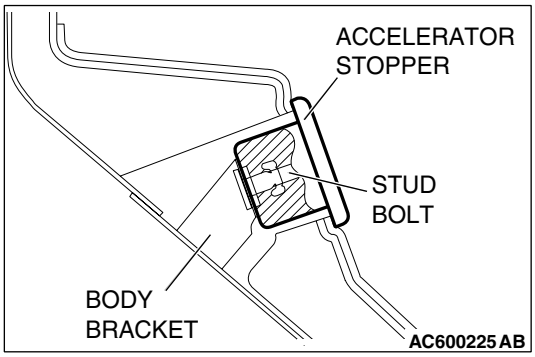
REMOVAL STEPS
1. ACCELERATOR PEDAL POSITION (APP) SENSOR CONNECTOR

REMOVAL STEPS (Continued)
2. ACCELERATOR PEDAL ASSEMBLY
>>**A**<< 3. ACCELERATOR STOPPER

INSTALLATION SERVICE POINT

>>A<< ACCELERATOR STOPPER INSTALLATION

1. Insert the accelerator stopper straight into the stud bolt of the floor.
2. Install the accelerator stopper securely by turning it clockwise until its underside contacts with the body bracket as shown in the figure.
3. After the installation, slightly pull the accelerator stopper by hand to check that it cannot be removed easily (appropriate holding power: 100N or more).



AC600225AB

TSB Revision

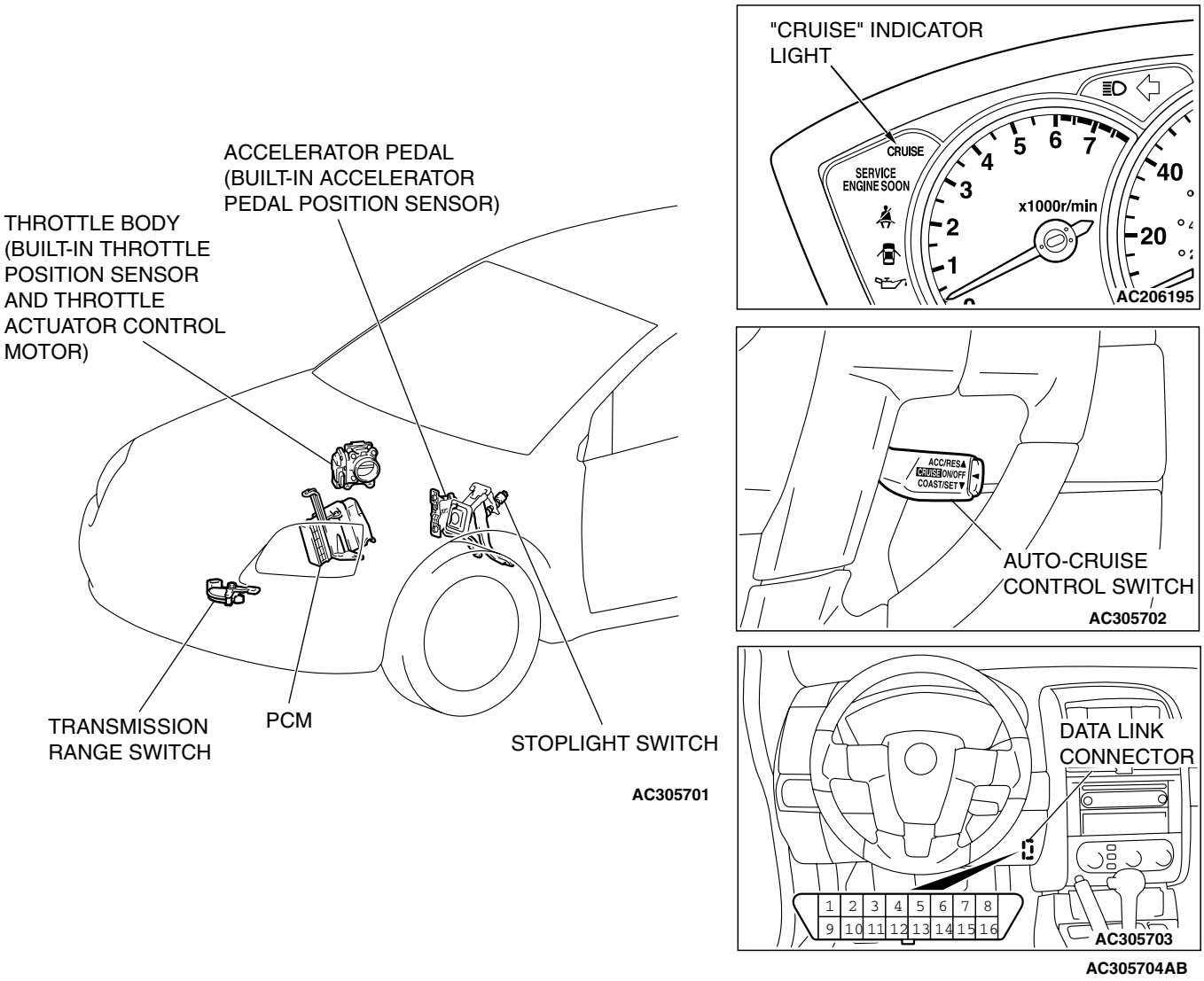
AUTO-CRUISE CONTROL

GENERAL DESCRIPTION

M1172000100281

By using the auto-cruise control system, the driver can select and maintain a desired cruising speed [between 40 km/h (25 mph) and 200 km/h (124 mph)] without depressing the accelerator pedal.

CONSTRUCTION DIAGRAM



AUTO-CRUISE CONTROL SYSTEM DIAGNOSIS

INTRODUCTION TO AUTO-CRUISE CONTROL SYSTEM DIAGNOSIS

M1172003300251

The auto-cruise control system allows driving without stepping on the accelerator pedal by setting a random speed between 40 km/h (25 mph) and 200 km/h (124 mph). Problems in this system can be investigated by the following methods.

Auto-cruise control system diagnostic trouble codes

The auto-cruise control system consists of the powertrain control module (PCM), control switches and sensors. The control switches and sensors monitor the state of the vehicle. The PCM controls the throttle valve opening angle in the throttle body in accordance with the input signals from the switches and

sensors. If the PCM detects a problem on any of those components, the PCM estimates where the problem may be occurring, and will set a diagnostic trouble code. Diagnostic trouble codes cover the auto-cruise control switch, stoplight switch and PCM.

DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1172002000484

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will check most of the possible causes of an auto-cruise control system problem.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any auto-cruise control system DTC. (Refer to P.17-10, Diagnostic Function – How to Read and Erase Diagnostic Trouble Codes).
4. If you can verify the condition but no auto-cruise control system DTCs are set, the malfunction may be intermittent. (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14).
5. If you can verify the condition but there are no auto-cruise control system DTCs, or the system cannot communicate with scan tool MB991958 (M.U.T.-III sub assembly), and find the fault. (Refer to P.17-52, Symptom Chart).
6. If there is an auto-cruise control system DTC, record the number of the code, then erase the code from PCM memory using the scan tool MB991958 (M.U.T.-III sub assembly). (Refer to P.17-10, Diagnostic Function – How to Read and Erase Diagnostic Trouble Codes).
7. Re-create the auto-cruise control system DTC set conditions to see if the same Auto-cruise Control System DTC will set again. (Refer to P.17-10, Diagnostic Function – How to Read and Erase Diagnostic Trouble Codes).
   - If the same Auto-cruise Control System DTC sets again, perform the diagnostic procedures for the set code. (Refer to P.17-13, Diagnostic Trouble Code Chart).

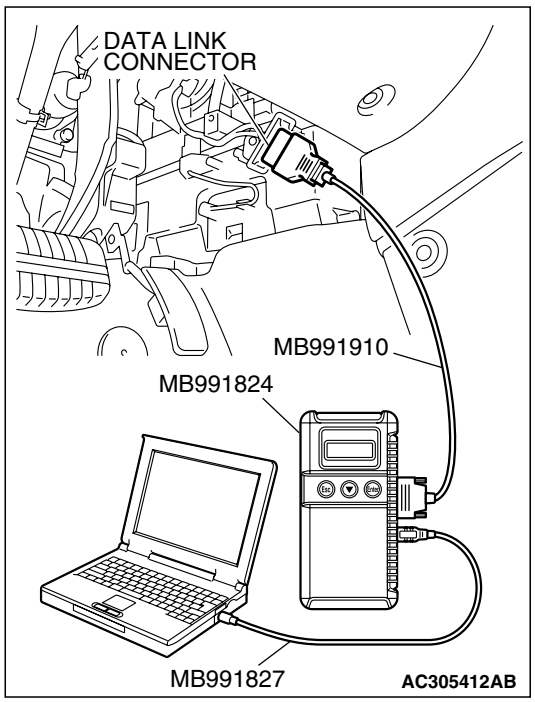
DIAGNOSTIC FUNCTION

M1172004900171

HOW TO CONNECT THE SCAN TOOL (M.U.T.-III).

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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 MB991910 to special tool MB991824.
5. Connect special tool MB991910 to the data link connector.
6. Turn the power switch of special tool MB991824 to the "ON" position.

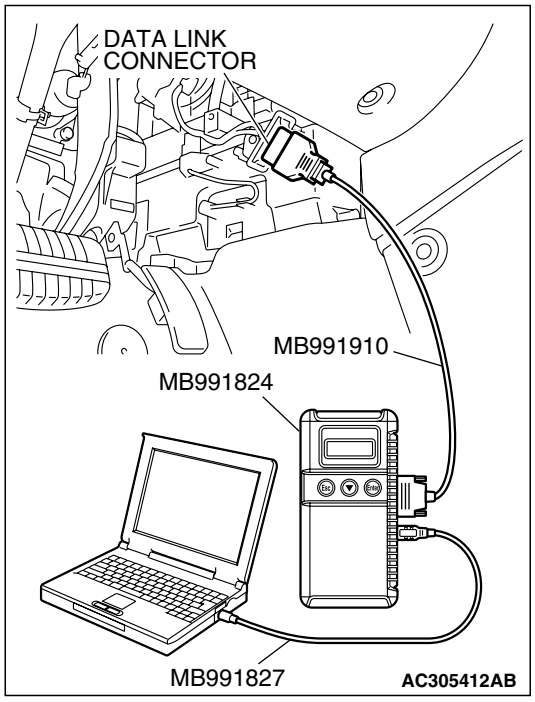
   NOTE: When special tool MB991824 is energized, special tool MB991824 indicator light will be illuminated in green color.
7. Start the M.U.T.-III system on the personal computer.

   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 (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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.

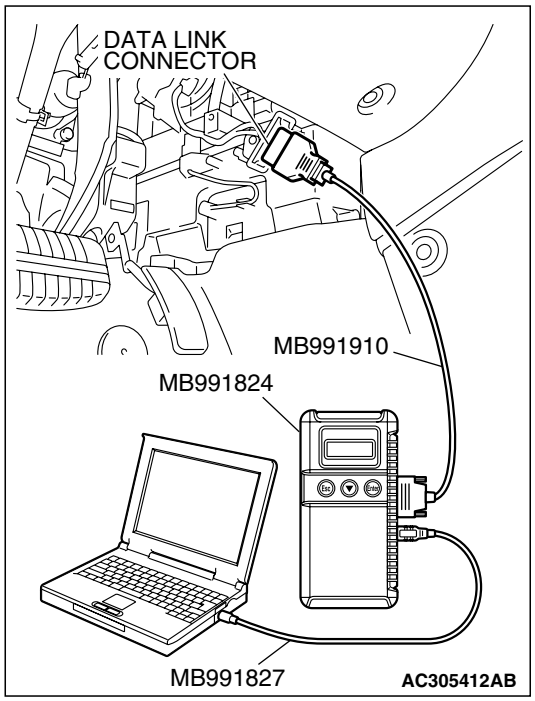
NOTE: If the battery voltage is low, diagnostic trouble codes will not be set. Check the battery if scan tool MB991958 does not display.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Depress the "CRUISE" (MAIN) switch to illuminate the "CRUISE" indicator light in the combination meter.
4. Select the "Interactive Diagnosis" from the start-up screen.
5. Select the "System Select."
6. Choose the "Auto-cruise Control System" from the "POWERTRAIN" tab.
7. Select the "Diagnostic Trouble Code."
8. If a DTC is set, it is shown.
9. Choose the "DTC erase" to erase the DTC.
10. Turn the ignition switch to the "LOCK" (OFF) position.
11. Disconnect scan tool MB991958.

HOW TO READ DATA LIST

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ CAUTION

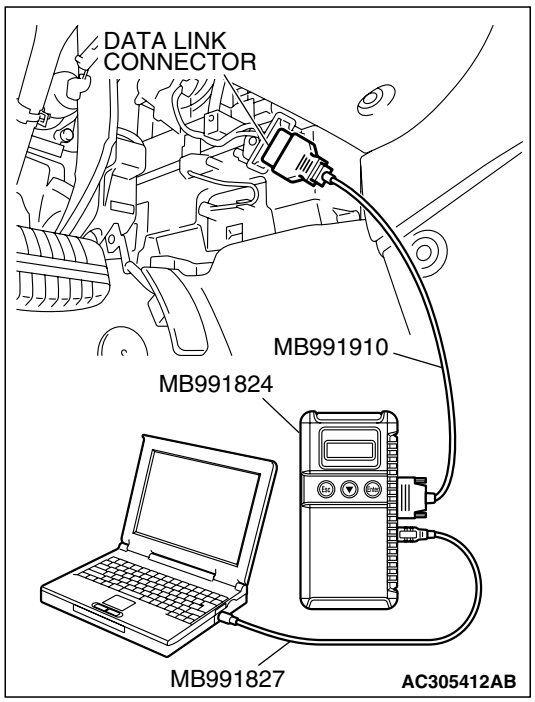
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select the "Interactive Diagnosis" from the start-up screen.
4. Select the "System Select."
5. Choose the "Auto-cruise Control System" from the "POWERTRAIN" tab.
6. Select the "Data List."
7. Choose an appropriate item.
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect scan tool MB991958.

HOW TO DIAGNOSE THE CAN BUS LINE

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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 the "CAN bus diagnosis" from the start-up screen.
4. When the vehicle information is displayed, confirm that it matches the vehicle whose CAN bus lines will be diagnosed.
   - If the information is correct, go to step 8.
   - If not, go to step 5.
5. Select the "view vehicle information" button.
6. Enter the vehicle information and select the "OK" button.
7. When the vehicle information is displayed, confirm again that it matches the vehicle which is diagnosed CAN bus line.
   - If they match, go to step 8.
   - If not, go to step 5.
8. Press the "OK" button.
9. When the optional equipment screen is displayed, choose the one which the vehicle is fitted with, and then select the "OK" button.
10. Turn the ignition switch to the "LOCK" (OFF) position.
11. Disconnect scan tool MB991958.

DIAGNOSTIC TROUBLE CODE CHART

M1172002200455

Check according to the inspection chart that is appropriate for the diagnostic trouble code.

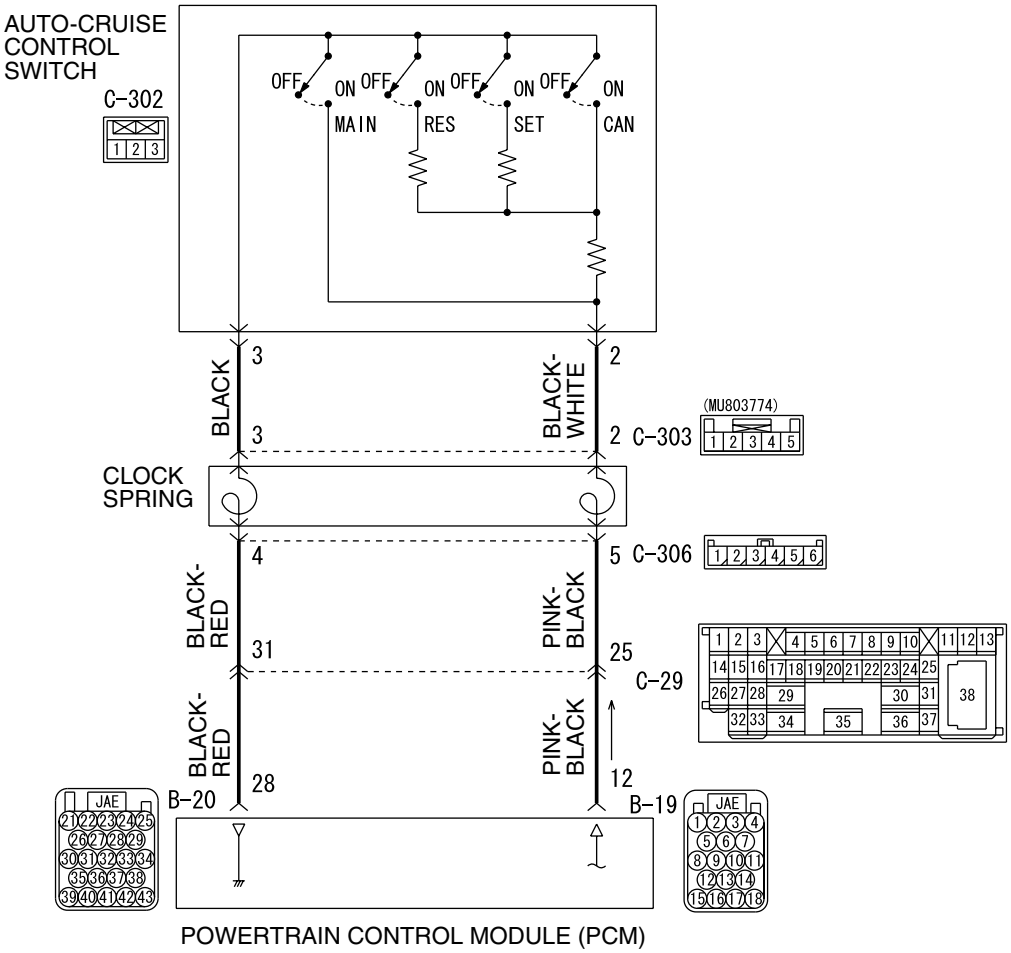
NOTE: Auto-cruise control system is controlled by PCM as well as MFI system. Therefore, the diagnostic trouble codes of MFI system is also set when checking the diagnostic trouble codes of auto-cruise control system. Other than the following dedicated codes of auto-cruise control system shows the diagnostic trouble codes of MFI system. (Refer to GROUP 13A, MFI Diagnosis – Diagnostic Trouble Code Chart P.13A-45) <2.4L engine> or (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Trouble Code Chart P.13B-46) <3.8L engine>.

DIAGNOSTIC TROUBLE CODE NO.	INSPECTION ITEM	REFERENCE PAGE
P1564	Auto-cruise control switch system	P.17-14
P1571	Stoplight switch system	P.17-31
P1574	PCM and its related components	P.17-49
P1575	Cancel latch system	P.17-51

DIAGNOSTIC TROUBLE CODE PROCEDURES

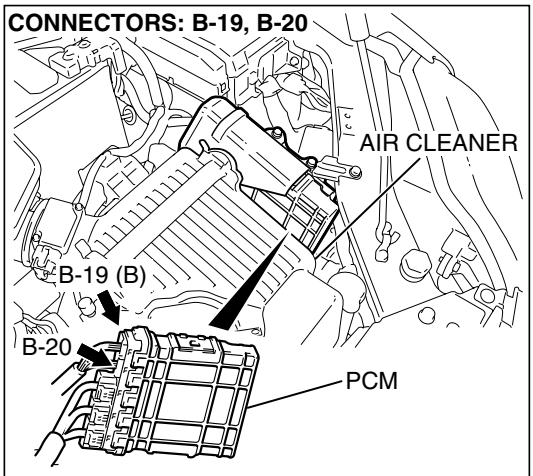
DTC P1564: Auto-cruise Control Switch System

Auto-cruise Control Switch System Circuit

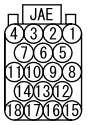


AC305709AB

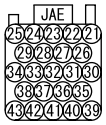
CONNECTORS: B-19, B-20



B-19 HARNESS CONNECTOR: COMPONENT SIDE

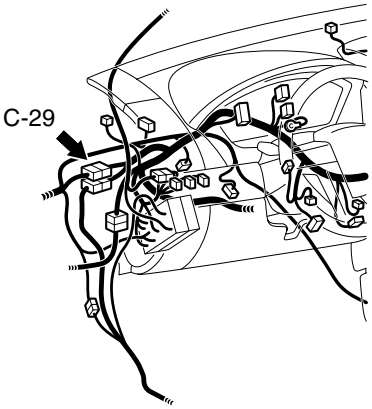


B-20 HARNESS CONNECTOR: COMPONENT SIDE

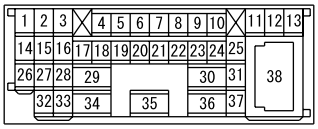


AC305710AB

CONNECTOR: C-29

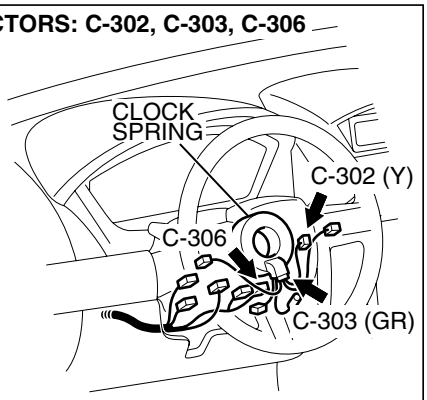


C-29 MALE SIDE CONNECTOR



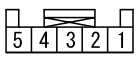
AC305232AC

CONNECTORS: C-302, C-303, C-306

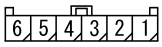


C-302 HARNESS CONNECTOR: COMPONENT SIDE

C-303 HARNESS CONNECTOR: COMPONENT SIDE



C-306 HARNESS CONNECTOR: COMPONENT SIDE



AC305236AB

CIRCUIT OPERATION

This circuit judges the signals of each switch ("COAST/SET", "ACC/RES" and "CANCEL") of the auto-cruise control switch. The PCM detects the state of the auto-cruise control switch by sensing the voltages shown below.

- When all switches are OFF: 4.7 – 5.0 volts
- When the "CRUISE" (MAIN) switch is "ON": 0 – 0.3 volt
- When the "COAST/SET" switch is ON: 2.0 – 2.8 volts
- When the "ACC/RES" switch is ON: 3.3 – 4.1 volts
- When the "CANCEL" switch is ON: 0.8 – 1.5 volts

TSB Revision

DTC SET CONDITIONS

Check Condition

- The "CRUISE" indicator light illuminates.

Judgement Criteria

- If the auto-cruise control switch is operated, this DTC will be set when the PCM terminal voltage is different from the standard value.

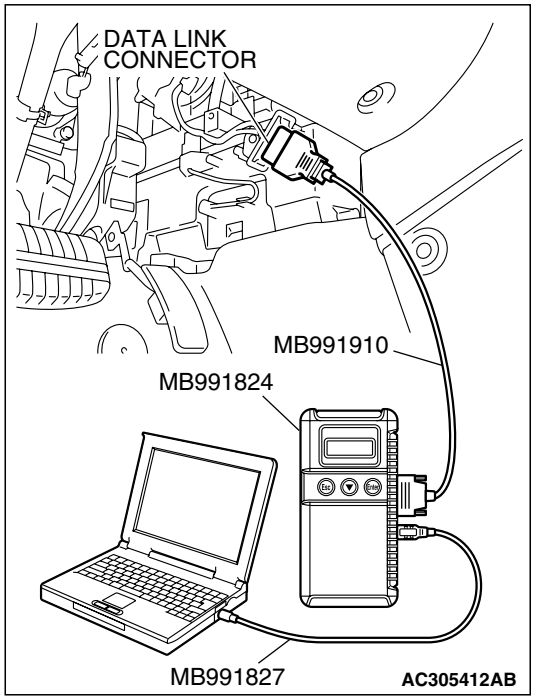
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)

- Malfunction of the auto-cruise control switch.
- Malfunction of the clock spring.
- Damaged harness or connector.
- Malfunction of the PCM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991223: Harness Set
- MB991923: Power Plant ECU Check Harness
- MB992006: Extra Fine Probe



STEP 1. Using scan tool MB991958, check data list item 86: Main Switch, list item 92: Set Switch, item 91: Resume Switch and list item 57: Cancel Switch.

⚠ CAUTION

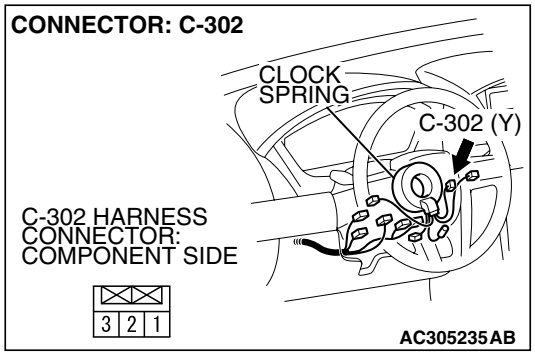
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to data reading mode for auto-cruise control system. (Refer to P.17-10).
- Item 86: Main Switch.
  - When "CRUISE" (MAIN) switch is at the "ON" position, the display on scan tool MB991958 should be "ON".
  - When ""CRUISE" (MAIN) switch is at the "OFF" position, the display on scan tool MB991958 should be "OFF".
- Item 92: Set Switch.
  - When "COAST/SET" switch is at the "ON" position, the display on scan tool MB991958 should be "ON".
  - When "COAST/SET" switch is at the "OFF" position, the display on scan tool MB991958 should be "OFF".
- Item 91: Resume Switch.
  - When "ACC/RES" switch is at the "ON" position, the display on scan tool MB991958 should be "ON".
  - When "ACC/RES" switch is at the "OFF" position, the display on scan tool MB991958 should be "OFF".
- Item 57: Cancel Switch.
  - When "CANCEL" switch is at the "ON" position, the display on scan tool MB991958 should be "ON".
  - When "ACC/RES" switch is at the "OFF" position, the display on scan tool MB991958 should be "OFF".

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

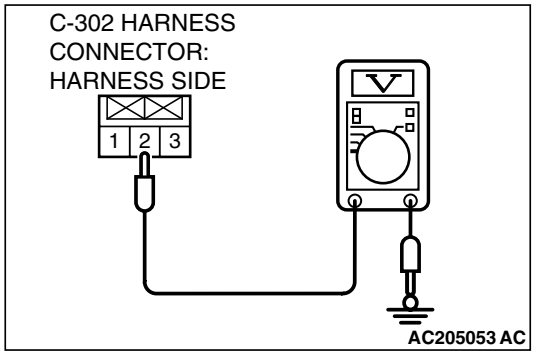
Q: Is the switch operating properly?

YES : Go to Step 17.
NO : Go to Step 2.



STEP 2. Measure the power supply voltage at auto-cruise control switch connector C-302 by backprobing.

(1) Remove the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408).
(2) Connect the negative (–) battery cable.
(3) Do not disconnect auto-cruise control switch connector C-302.
(4) Turn the ignition switch to the "ON" position.
(5) The "CRUISE" (MAIN) switch to the "OFF" position.



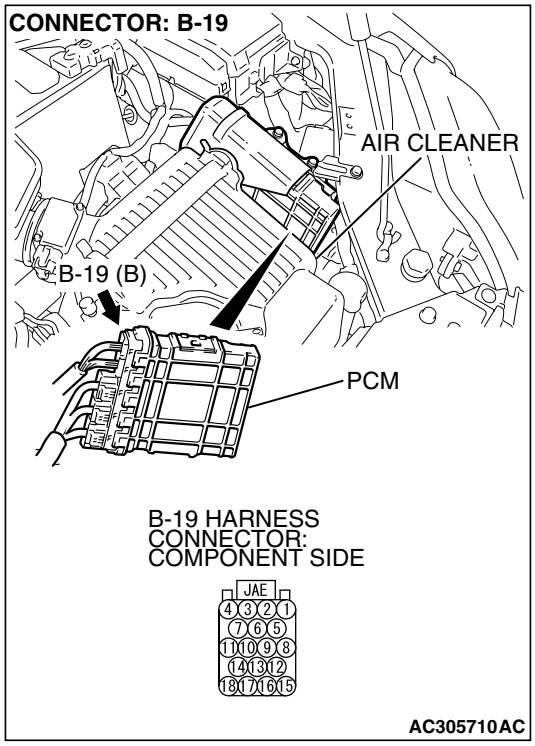
(6) Measure the power supply voltage between auto-cruise control switch connector C-302 terminal 2 and ground by backprobing.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

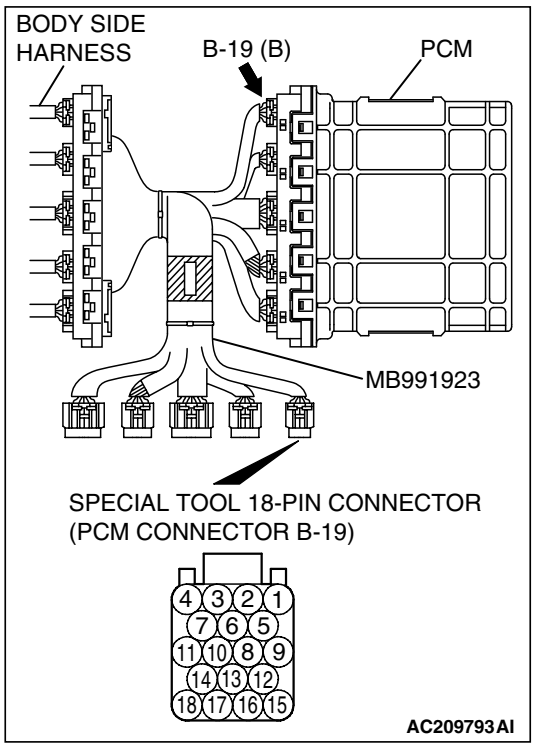
Q: Is the measured voltage between 4.7 and 5.0 volts?

YES : Go to Step 9.
NO : Go to Step 3.

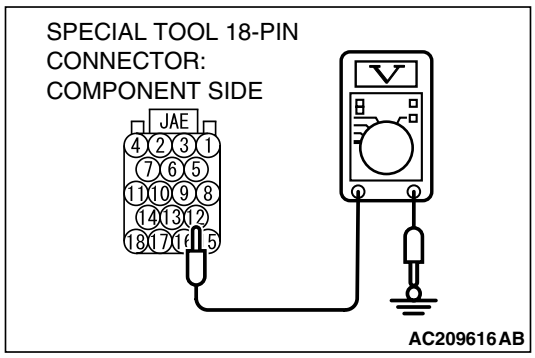
STEP 3. Measure the power supply voltage at PCM connector B-19.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) The "CRUISE" (MAIN) switch to the "OFF" position.



(5) Measure the power supply voltage between special tool 18-pin connector terminal 12 (PCM connector B-19 terminal 12) and ground.
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect special tool MB991923 between the PCM and the body-side harness connector.
(8) Reconnect all the connectors to the PCM.

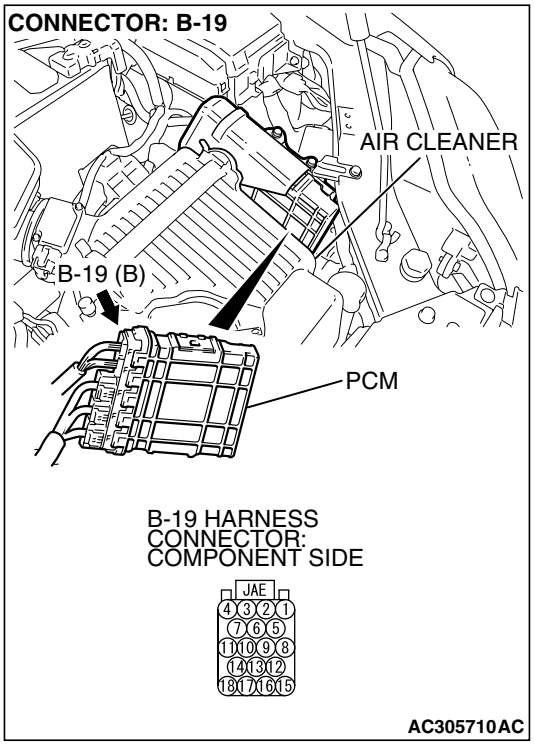
Q: Is the measured voltage between 4.7 and 5.0 volts?

YES : Go to Step 6.
NO : Go to Step 4.

STEP 4. Check PCM connector B-19 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

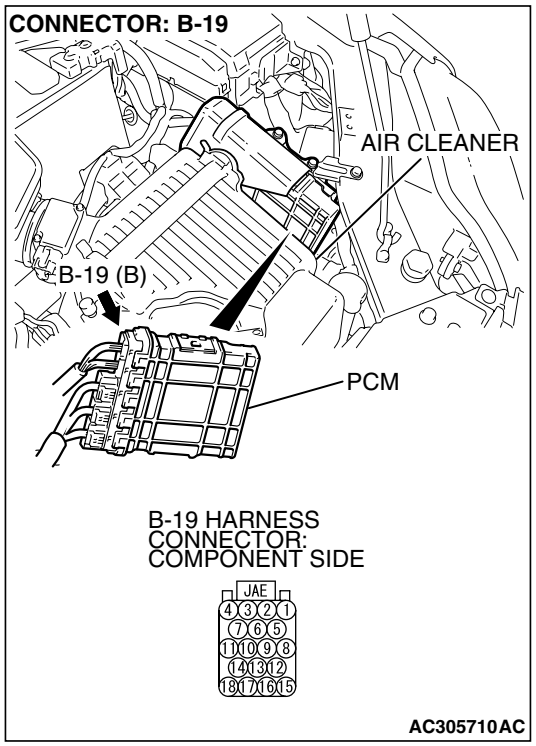
Q: Are the connector and terminals in good condition?

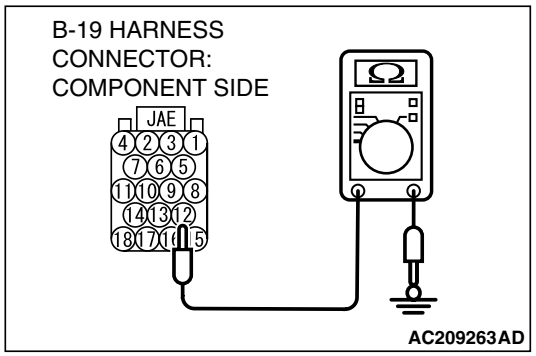
YES : Go to Step 5.
NO : Repair or replace the faulty connector. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.



STEP 5. Check the harness for short circuit to ground between the PCM connector B-19 terminal 12 and the auto-cruise control switch connector C-302 terminal 2.

(1) Disconnect PCM connector B-19 and measure at the harness connector side.
(2) Turn the ignition switch to the "LOCK" (OFF) position.





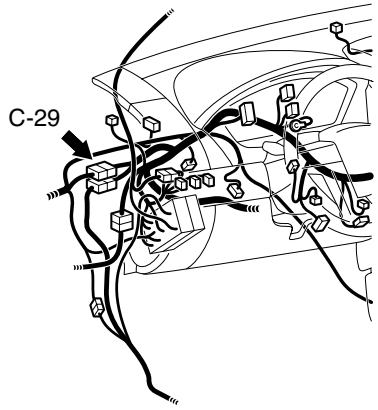
(3) Measure the continuity between PCM connector B-19 terminal 12 and ground.
(4) Reconnect PCM connector B-19.

Q: Is the measured continuity open circuit?

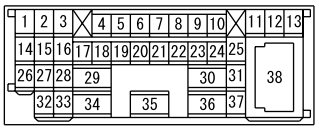
YES : Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 17.

NO : Go to Step 6.

CONNECTOR: C-29

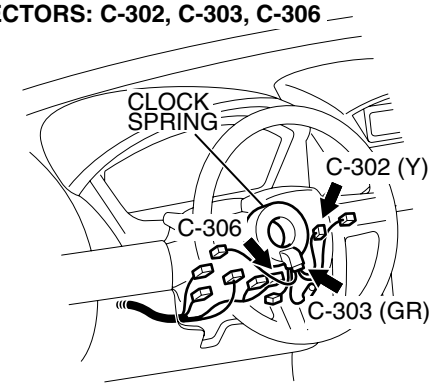


C-29 MALE SIDE CONNECTOR



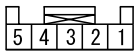
AC305232AC

CONNECTORS: C-302, C-303, C-306

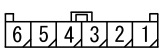


C-302 HARNESS CONNECTOR: COMPONENT SIDE

C-303 HARNESS CONNECTOR: COMPONENT SIDE



C-306 HARNESS CONNECTOR: COMPONENT SIDE



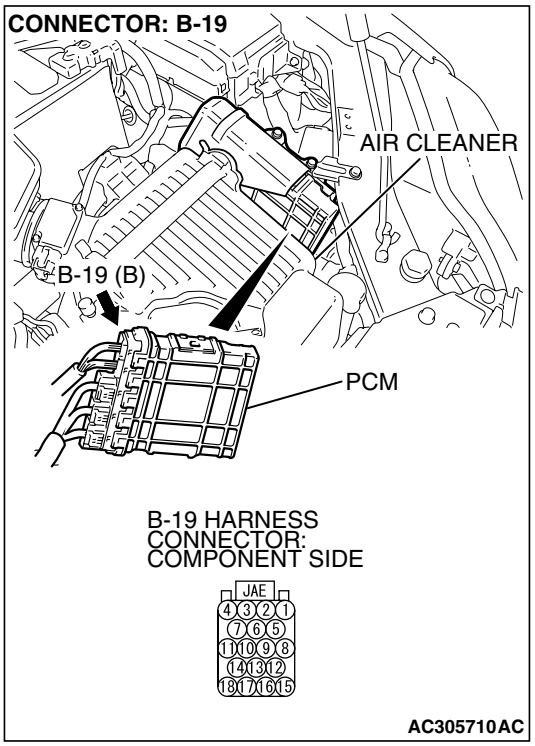
AC305236AB

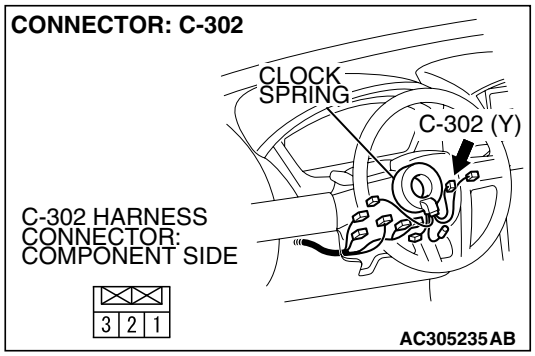
STEP 6. Check intermediate connector C-29, auto-cruise control switch connector C-302 and clock spring connectors C-303 and C-306 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

NO : Repair or replace the faulty connector. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.





STEP 7. Check the harness wire between PCM connector B-19 terminal 12 and auto-cruise control switch connector C-302 terminal 2 for damage.

Q: Are the harness wires in good condition?

YES : Go to Step 8.

NO : Repair the damaged harness wire and install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.

STEP 8. Check the clock spring.

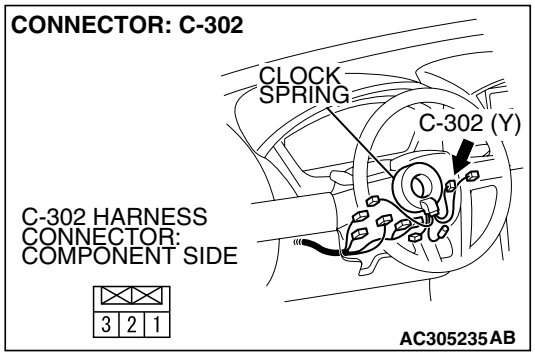
Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-414.

Q: Is the clock spring in good condition?

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.00-14). Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.

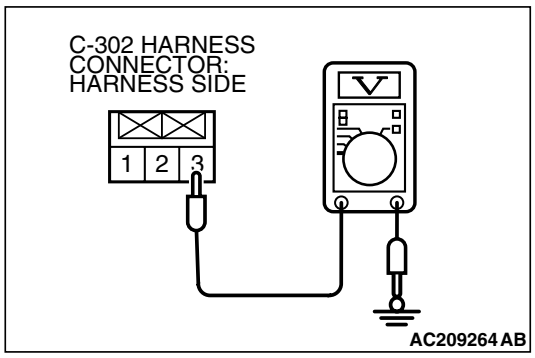
NO : Replace the clock spring and install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.

TSB Revision



STEP 9. Measure the ground voltage at auto-cruise control switch connector C-302 by backprobing.

(1) Do not disconnect auto-cruise control switch connector C-302.
(2) Turn the ignition switch to the "ON" position.
(3) Turn the "CRUISE" (MAIN) switch to the "ON" position.



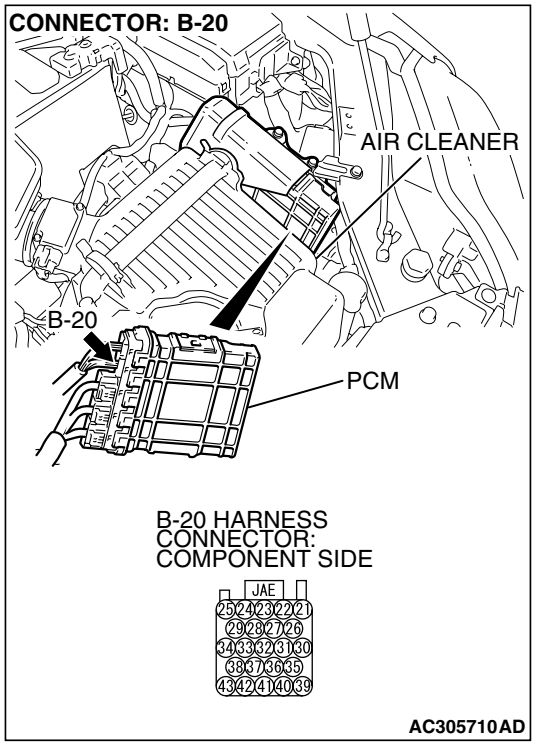
(4) Measure the ground voltage between auto-cruise control switch connector C-302 terminal 3 and ground by backprobing.
(5) Turn the "CRUISE" (MAIN) switch to the "OFF" position.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

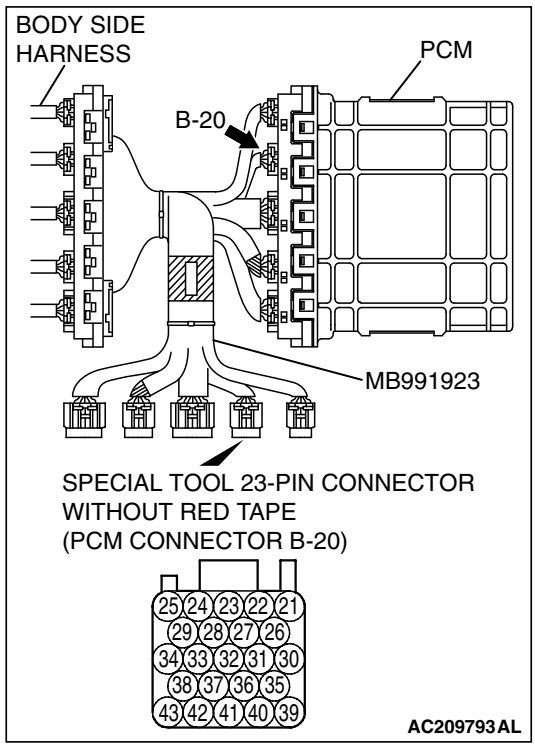
Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 15.
NO : Go to Step 10.

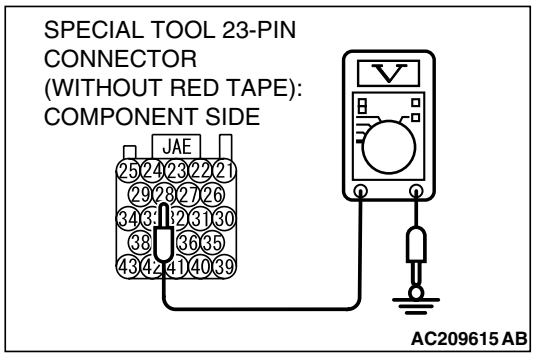
STEP 10. Measure the ground voltage at PCM connector B-20.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Turn the "CRUISE" (MAIN) switch to the "ON" position.



(5) Measure the ground voltage between special tool 23-pin connector (without red tape) terminal 28 (PCM connector B-20 terminal 28) and ground.
(6) Turn the "CRUISE" (MAIN) switch to the "OFF" position.
(7) Turn the ignition switch to the "LOCK" (OFF) position.
(8) Disconnect special tool MB991923 between the PCM and the body-side harness connector.
(9) Reconnect all the connectors to the PCM.

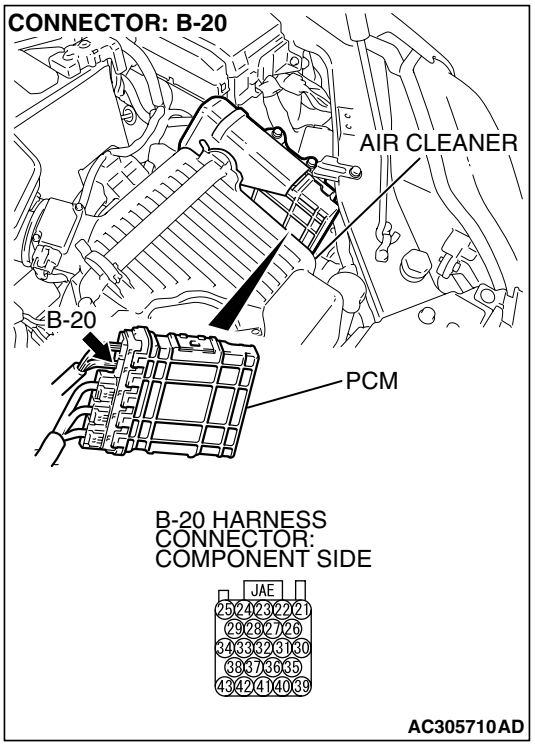
Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 12.
NO : Go to Step 11.

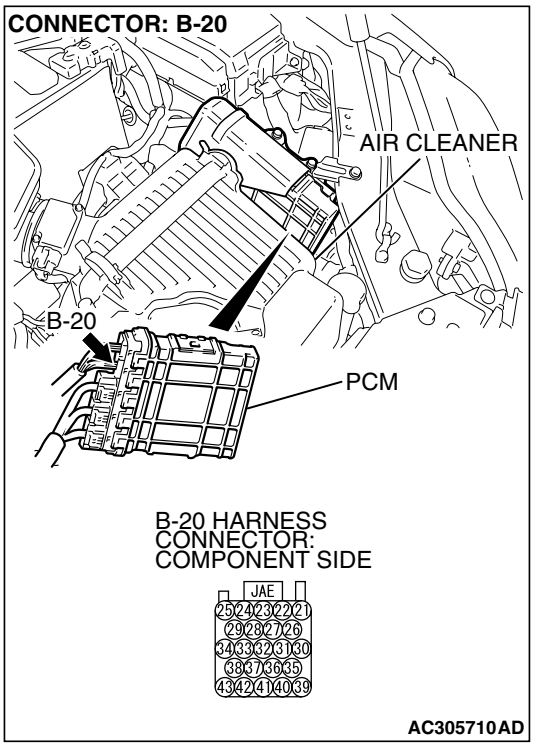
STEP 11. Check PCM connector B-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

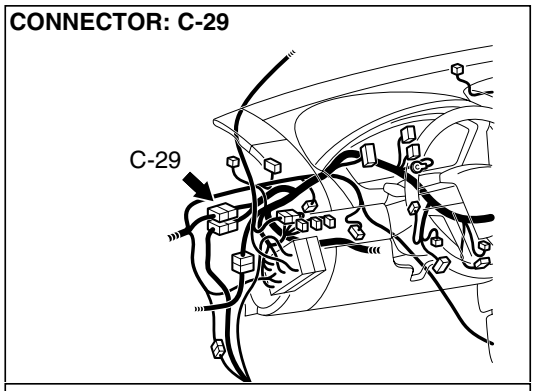
Q: Are the connector and terminals in good condition?

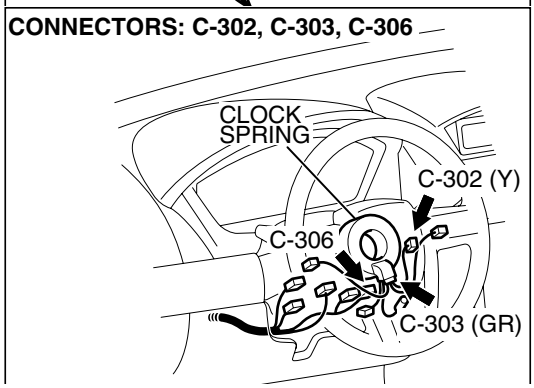
YES : Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 17.
NO : Repair or replace the faulty connector. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.



STEP 12. Check PCM connector B-20, intermediate connector C-29, auto-cruise control switch connector C-302 and clock spring connectors C-303 and C-306 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



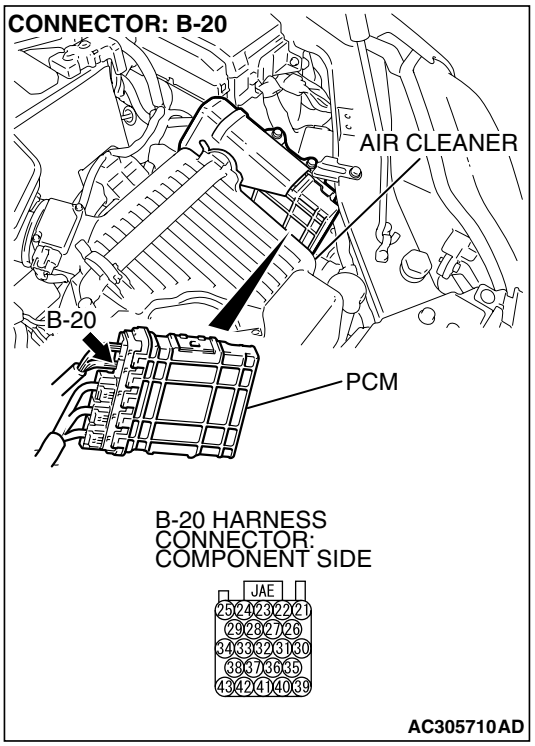


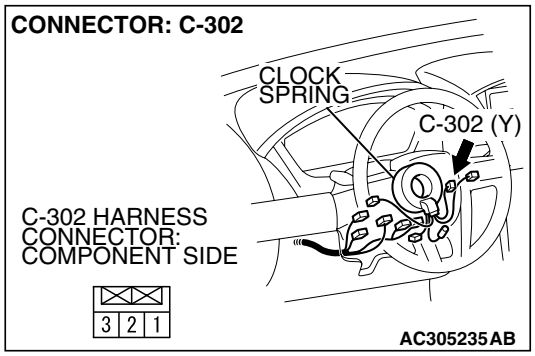


Q: Are the connectors and terminals in good condition?

YES : Go to Step 13.

NO : Repair or replace the faulty connector. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.





STEP 13. Check the harness wire between PCM connector B-20 terminal 28 and auto-cruise control switch connector C-302 terminal 3 for damage.

Q: Are the harness wires in good condition?

YES : Go to Step 14.

NO : Repair the damaged harness wire and install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.

STEP 14. Check the clock spring.

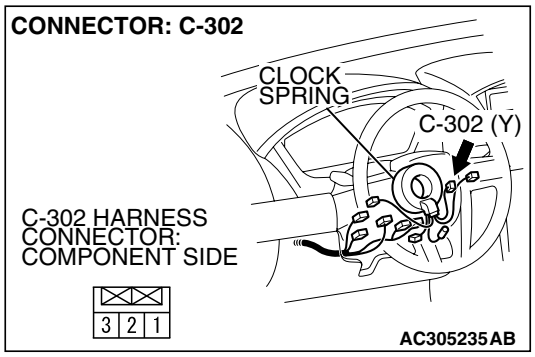
Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-414.

Q: Is the clock spring in good condition?

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.00-14). Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.

NO : Replace the clock spring and install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.

TSB Revision

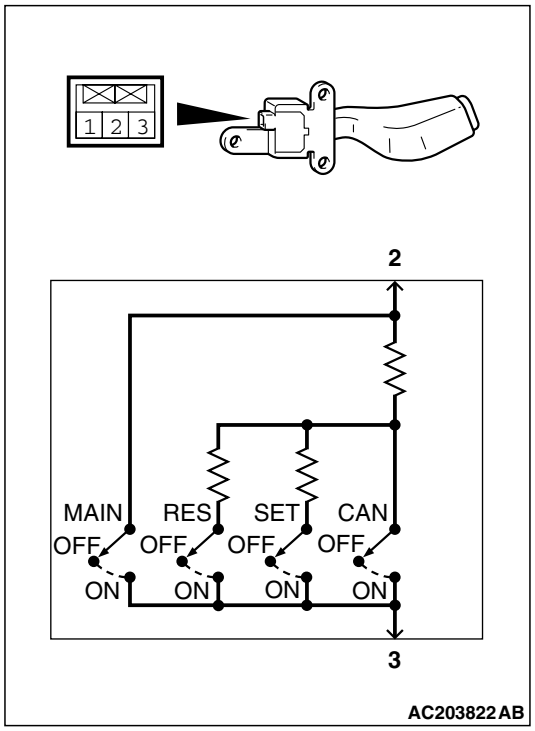


STEP 15. Check auto-cruise control switch connector C-302 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 16.

NO : Repair or replace the faulty connector. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.



STEP 16. Check the auto-cruise control switch.

(1) Remove auto-cruise control switch. (Refer to P.17-78).

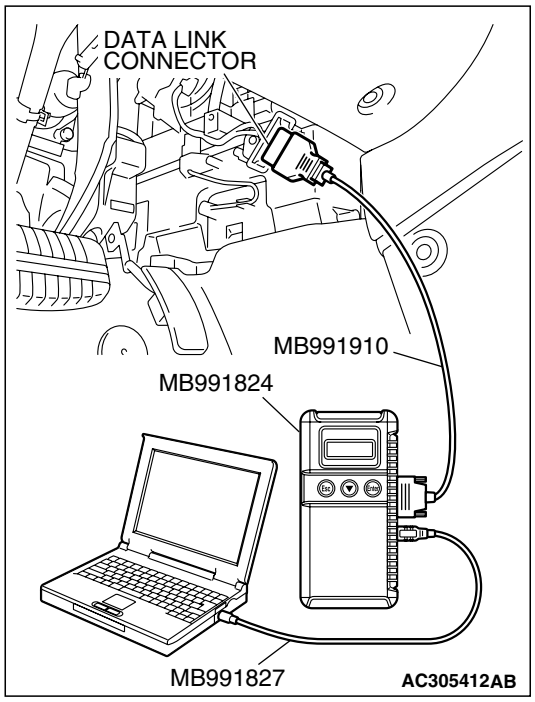
(2) Measure the resistance between terminal 2 and terminal 3 when each of the "CRUISE" (MAIN), "COAST/SET", "ACC/RES" and "CANCEL" switch is pressed.

SWITCH POSITION	SPECIFIED CONDITION
"CRUISE" (MAIN) switch "OFF"	Open circuit
"CRUISE" (MAIN) switch "ON"	Less than 2 ohms
"CANCEL" switch ON	Approximately 100 Ω
"ACC/RES" switch ON	Approximately 887 Ω
"COAST/SET" switch ON	Approximately 300 Ω

Q: Is the resistance within specifications?

YES : Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 17.

NO : Replace the auto-cruise control switch. (Refer to P.17-78). Install the air bag module (driver's side). (Refer to GROUP 52B, Air Bag Modules and Clock Spring P.52B-408). Then go to Step 18.



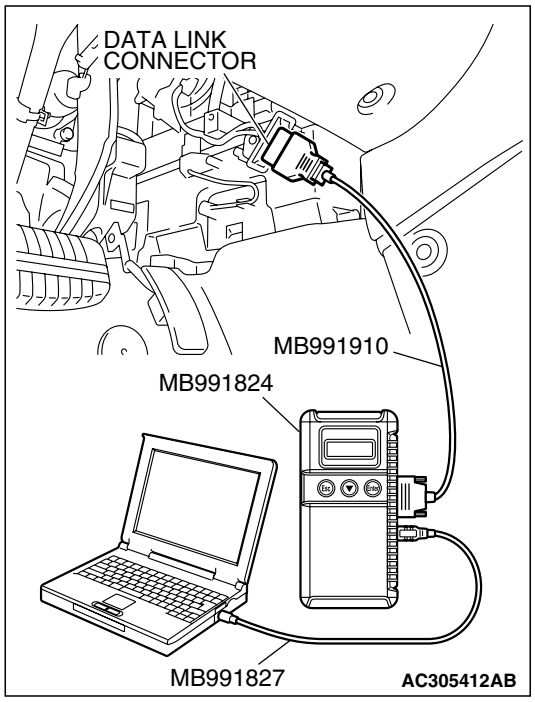
STEP 17. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to read the diagnostic trouble codes. (Refer to P.17-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC P1564 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 18.
NO : 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.00-14).



STEP 18. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to read the diagnostic trouble codes. (Refer to P.17-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

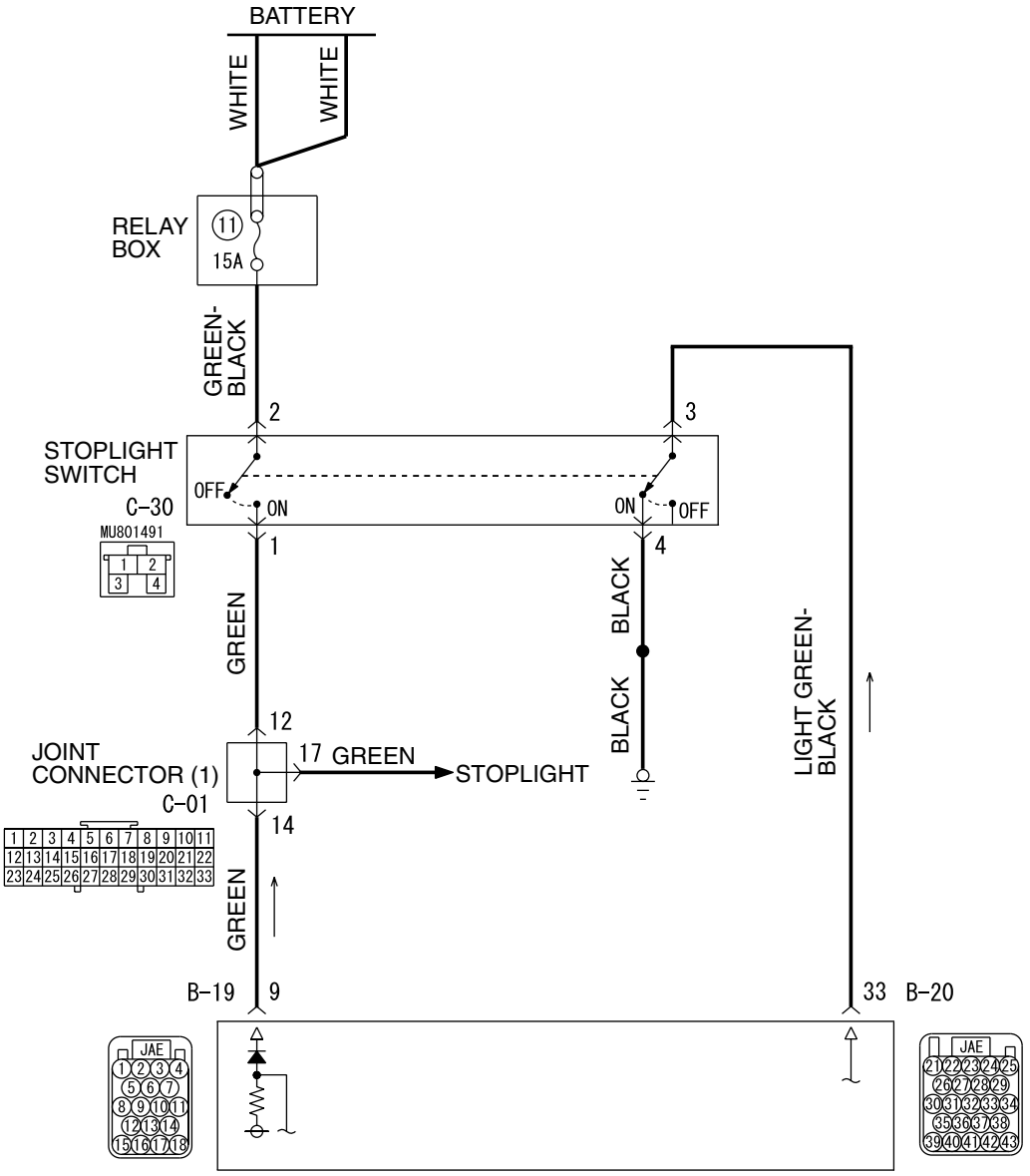
Q: Is DTC P1564 set?

YES : Return to Step 1.
NO : The procedure is complete.

DTC P1571: Stoplight Switch System

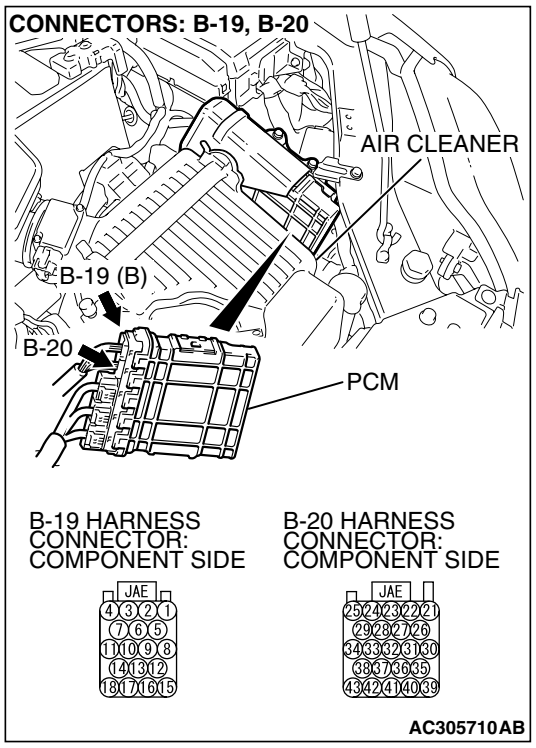
M1172006200048

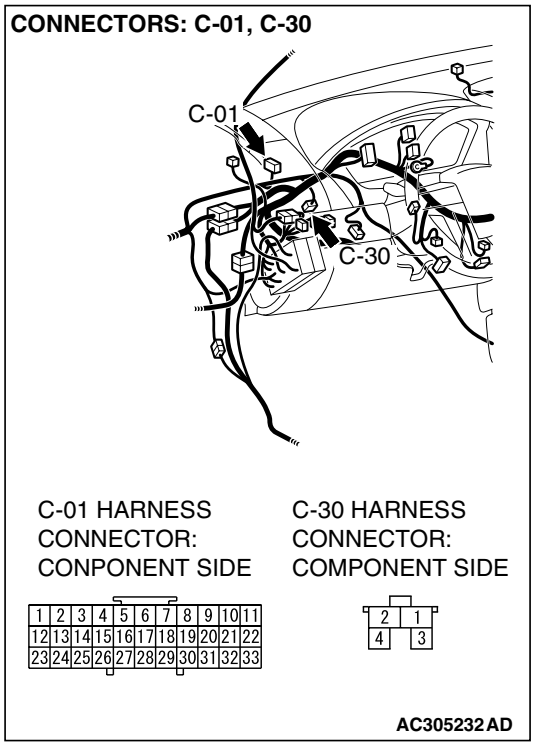
Stoplight Switch System Circuit



AC305711AB

TSB Revision





CIRCUIT OPERATION

- Battery positive voltage is supplied to the stop-light switch (terminal 2 and 3).
- When the brake pedal is depressed, battery positive voltage is applied to the PCM (terminal 9 and 33).

DTC SET CONDITIONS

Check Condition

- The "CRUISE" indicator light illuminates.

Judgement Criteria

- Short in stop light switch circuit.
- Open circuit in the brake switch circuit (between PCM terminal 33 and ground).

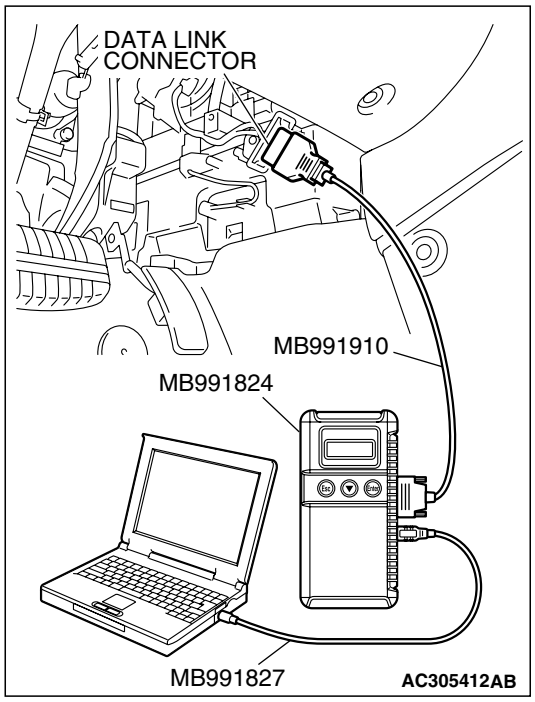
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)

- Malfunction of the stoplight switch.
- Damaged harness or connector.
- Malfunction of the PCM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991223: Harness Set
- MB991923: Power Plant ECU Check Harness
- MB992006: Extra Fine Probe



STEP 1. Using scan tool MB991958, check data list item 74: Brakelight 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to data reading mode for auto-cruise control system. (Refer to P.17-10).
- Item 74, Brakelight Switch.
  - When the brake pedal is depressed, the display on scan tool MB991958 should be "ON".
  - When the brake pedal is released, the display on scan tool MB991958 should be "OFF".

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is the switch operating properly?

YES : Go to Step 14.
NO : Go to Step 2.

STEP 2. Check the stoplight operation.

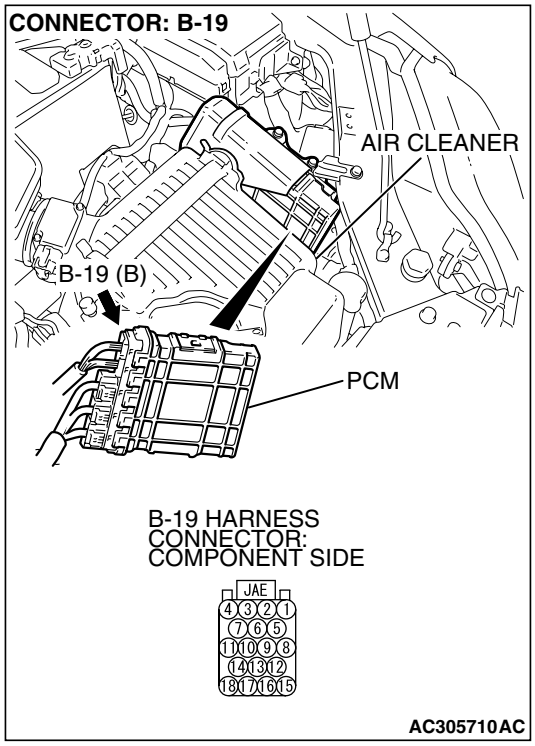
Check the stoplight operation.
- When the brake pedal is depressed, the stoplight will illuminate.
- When the brake pedal is released, the stoplight does not illuminate.

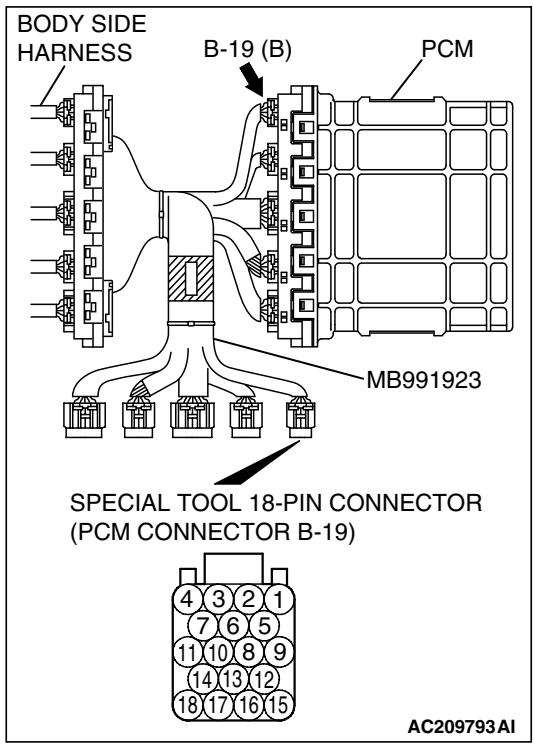
Q: Is the stoplight will illuminate (when the brake pedal is depressed) and the stoplight does not illuminate (when the brake pedal is released)?

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

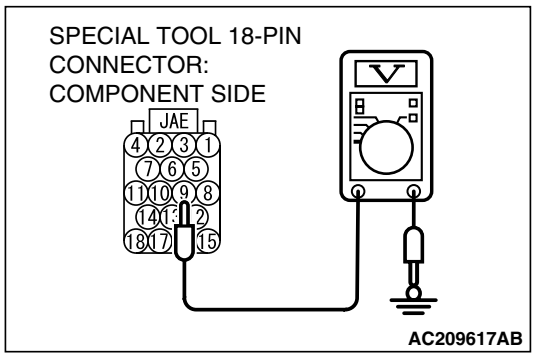
STEP 3. Measure the terminal voltage at PCM connector B-19.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.

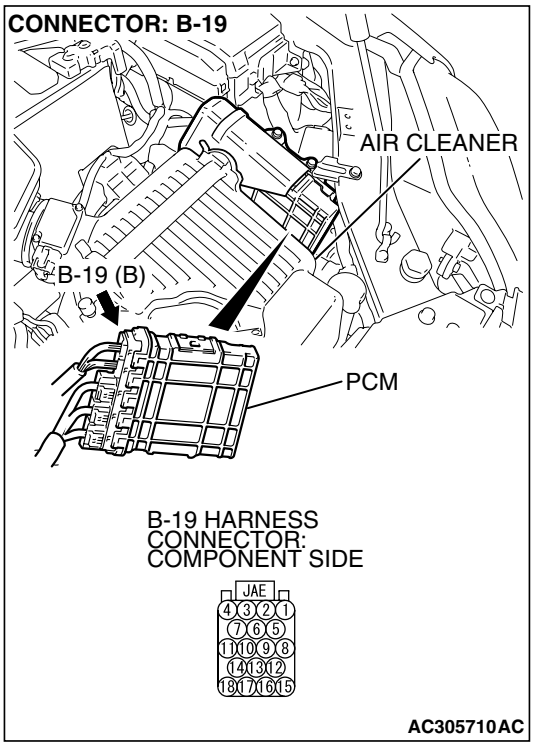


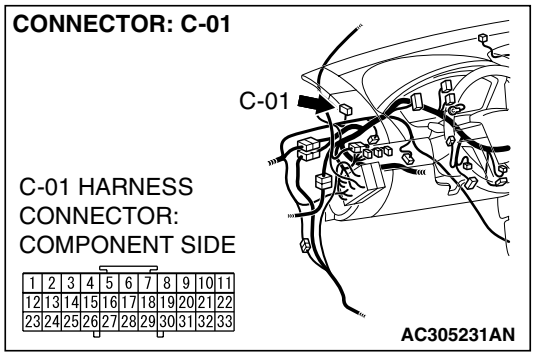
(4) Measure the terminal voltage between special tool 18-pin connector terminal 9 (PCM connector B-19 terminal 9) and ground.
- When the brake pedal is depressed, the voltage should measure battery positive voltage (approximately 12 volts).
- When the brake pedal is released, the voltage should measure 1 volt or less.

(5) Turn the ignition switch to the "LOCK" (OFF) position.
(6) Disconnect special tool MB991923 between the PCM and the body-side harness connector.
(7) Reconnect all the connectors to the PCM.

Q: Is the measured voltage battery positive voltage (approximately 12 volts) when the brake pedal is depressed and 1 volt or less when the brake pedal is released?

YES : Go to Step 13.
NO : Go to Step 4.



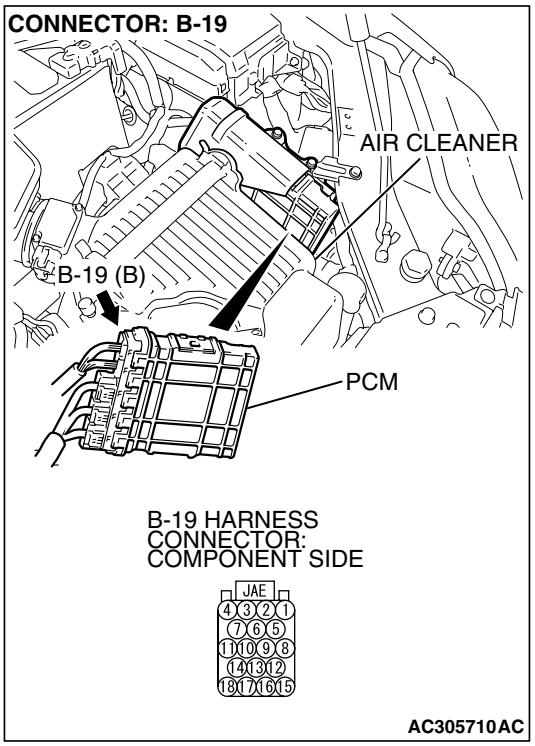


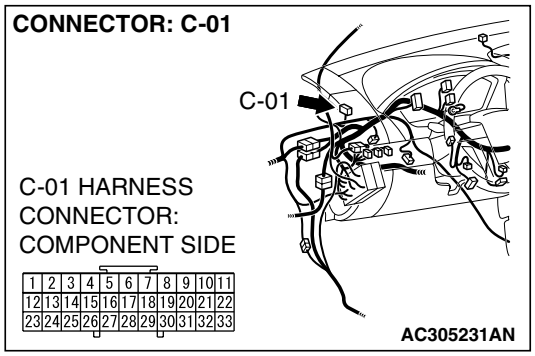
STEP 4. Check PCM connector B-19 and joint connector (1) C-01 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 5.

NO : Repair or replace the damaged components. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 22.





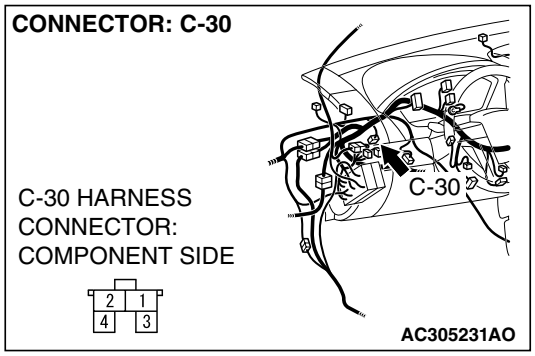
STEP 5. Check the harness wire between PCM connector B-19 terminal 9 and joint connector (1) C-01 terminal 14 for damage.

Q: Is the harness wire in good condition?

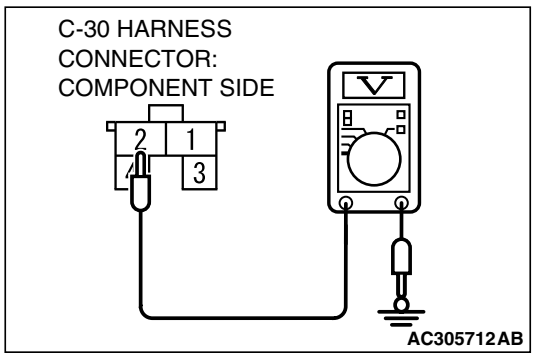
YES : Go to Step 13.

NO : Repair the damaged harness wire. Then go to Step 22.

STEP 6. Measure the power supply voltage at stoplight switch connector C-30 by backprobing.



(1) Disconnect stoplight switch connector C-30.

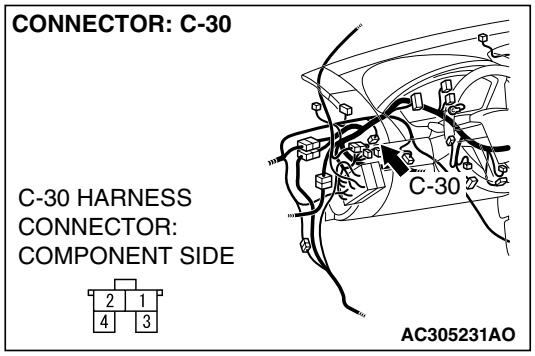


(2) Measure the power supply voltage between stoplight switch connector C-30 terminal 2 and ground.
(3) Reconnect stoplight switch connector C-30.

Q: Is the measured voltage battery positive voltage (approximately 12 volts)?

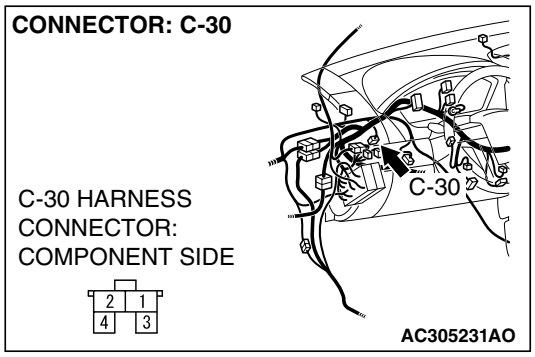
YES : Go to Step 10.
NO : Go to Step 7.

STEP 7. Check stoplight switch connector C-30 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). Then go to Step 22.

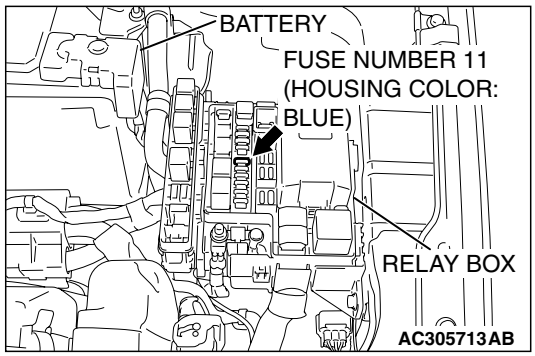


STEP 8. Check the harness wire between stoplight switch connector C-30 terminal 2 and fuse number 11 at the relay box at engine compartment for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair the damaged harness wire. Then go to Step 22.

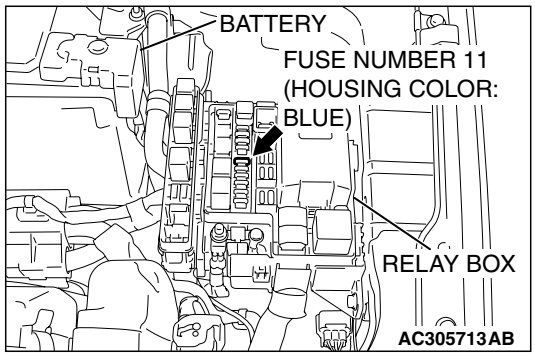


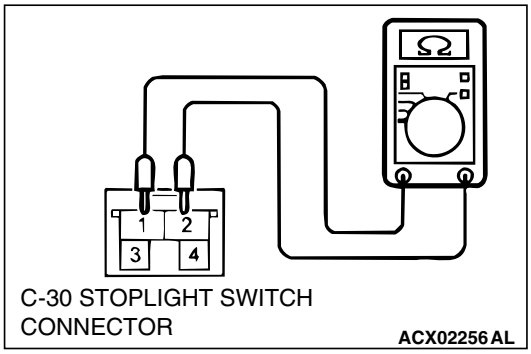
STEP 9. Check the fuse number 11 at the relay box at engine compartment.

Q: Is the fuse in good condition?

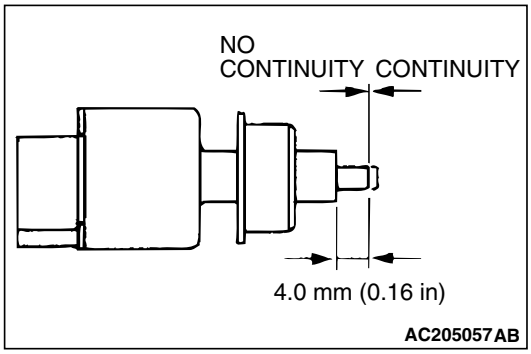
YES : Go to Step 10.

NO : Check the stoplight system harness and replace the fuse. Then go to Step 22.





C-30 STOPLIGHT SWITCH CONNECTOR
ACX02256AL



AC205057AB

STEP 10. Check the stoplight switch.

(1) Remove the stoplight switch. (Refer to GROUP 35A, Brake Pedal P.35A-24).
(2) Connect an ohmmeter to the stoplight switch between terminals 1 and 2.
(3) Check for continuity between the terminals when the plunger of the stoplight switch is pushed in and when it is released.
(4) The stoplight switch is operating properly if the circuit is open between terminals 1 and 2 when the plunger is pushed in to a depth of within 4.0 mm (0.16 inch) from the outer case edge surface, and if the resistance value is less than 2 ohms between terminals 1 and 2 when it is released.

Q: Is the stoplight switch operating properly?

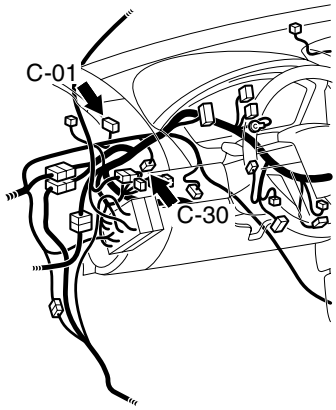
YES : Install the stoplight switch. (Refer to GROUP 35A, Brake Pedal P.35A-24). Then go to Step 11.
NO : Replace the stoplight switch. (Refer to GROUP 35A, Brake Pedal P.35A-24). Then go to Step 22.

STEP 11. Check stoplight switch connector C-30 and joint connector (1) C-01 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

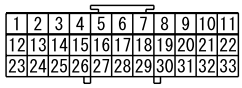
Q: Are the connectors and terminals in good condition?

YES : Go to Step 12.
NO : Repair or replace the damaged components. (Refer to GROUP 00E, Harness Connector Inspection P.00E-2). Then go to Step 22.

CONNECTORS: C-01, C-30



C-01 HARNESS CONNECTOR: CONPONENT SIDE



C-30 HARNESS CONNECTOR: COMPONENT SIDE

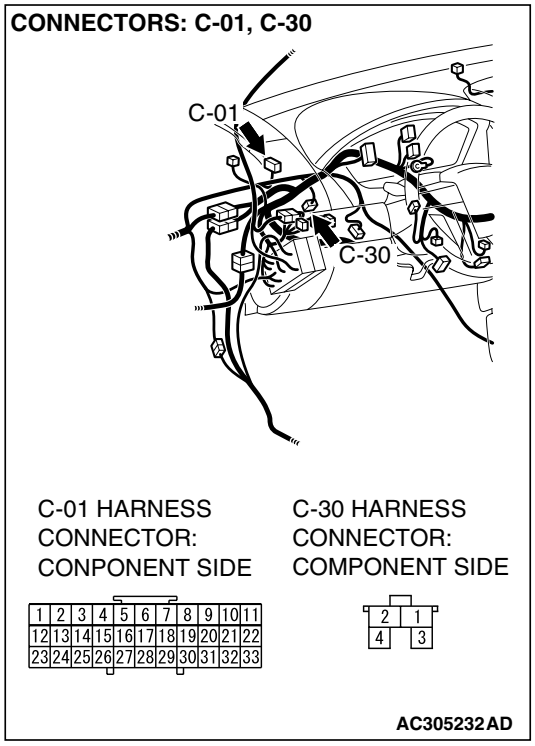
AC305232AD

STEP 12. Check the harness wire between stoplight switch connector C-30 terminal 1 and joint connector (1) C-01 terminal 12 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair the damaged harness wire. Then go to Step 22.



STEP 13. Using scan tool MB991958, check data list item 74: Brakelight 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. (Refer to P.17-10).

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

(3) Set scan tool MB991958 to data reading mode for auto-cruise control system. (Refer to P.17-10).

- Item 74, Brakelight Switch.
  - When the brake pedal is depressed, the display on scan tool MB991958 should be "ON".
  - When the brake pedal is released, the display on scan tool MB991958 should be "OFF".

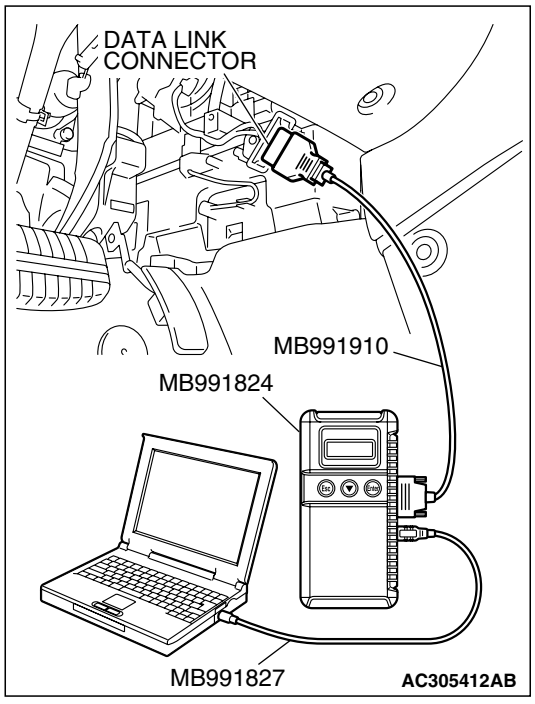
(4) Turn the ignition switch to the "LOCK" (OFF) position.

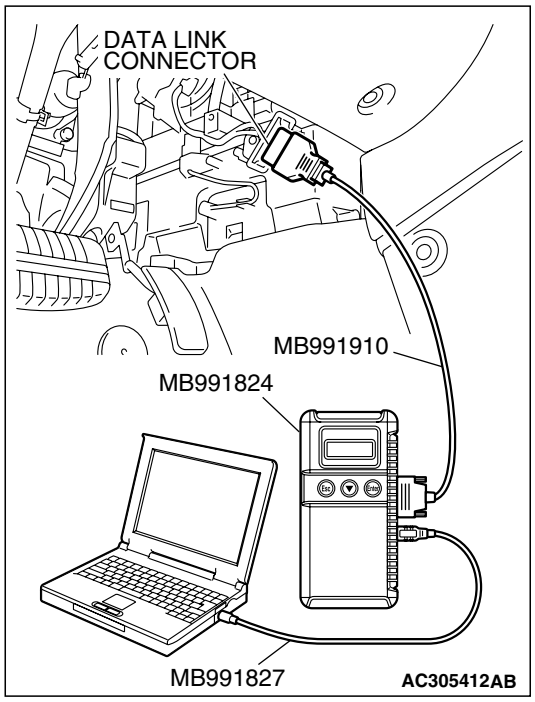
(5) Disconnect scan tool MB991958.

Q: Is the switch operating properly?

YES : Go to Step 21.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 22.





STEP 14. Using scan tool MB991958, check data list item 89: Normally Closed Brake 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to data reading mode for auto-cruise control system. (Refer to P.17-10).
- Item 89, Normally Closed Brake Switch.
  - When the brake pedal is depressed, the display on scan tool MB991958 should be "ON".
  - When the brake pedal is released, the display on scan tool MB991958 should be "OFF".

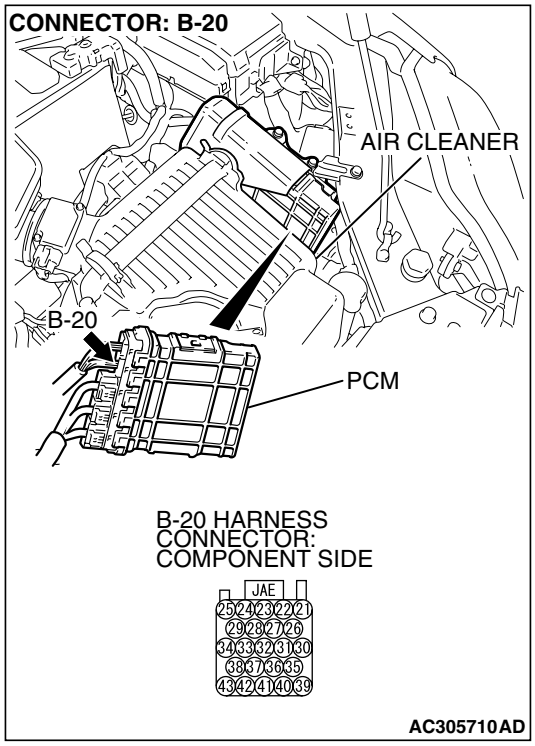
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

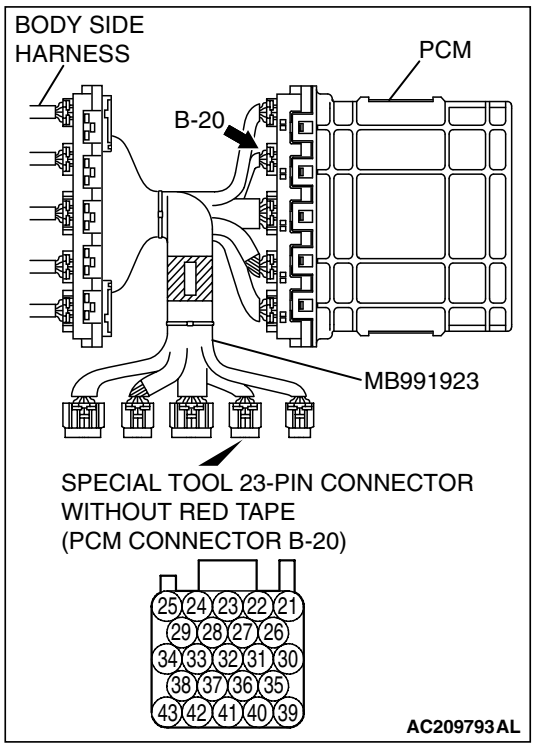
Q: Is the switch operating properly?

YES : Go to Step 21.
NO : Go to Step 15.

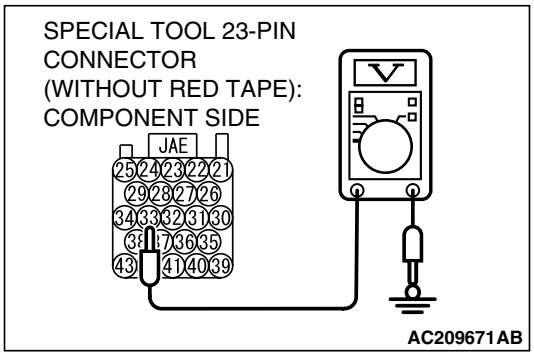
STEP 15. Measure the terminal voltage at PCM connector B-20.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.



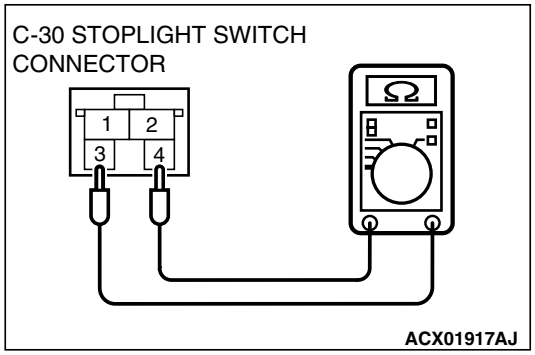
(4) Measure the terminal voltage between special tool 23-pin connector (without red tape) terminal 33 (PCM connector B-20 terminal 33) and ground.
- When the brake pedal is depressed, the voltage should measure battery positive voltage (approximately 12 volts).
- When the brake pedal is released, the voltage should measure 1 volt or less.

(5) Turn the ignition switch to the "LOCK" (OFF) position.
(6) Disconnect special tool MB991923 between the PCM and the body-side harness connector.
(7) Reconnect all the connectors to the PCM.

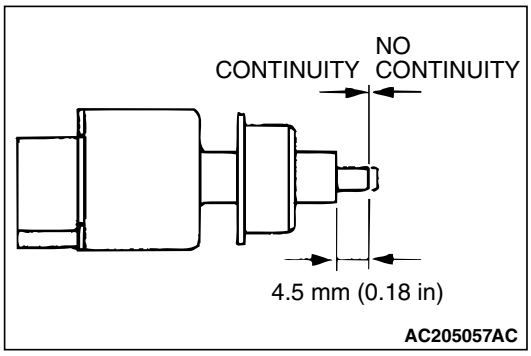
Q: Is the measured voltage battery positive voltage (approximately 12 volts) when the brake pedal is depressed and 1 volt or less when the brake pedal is released?

YES : Go to Step 20.
NO : Go to Step 16.

STEP 16. Check the stoplight switch.

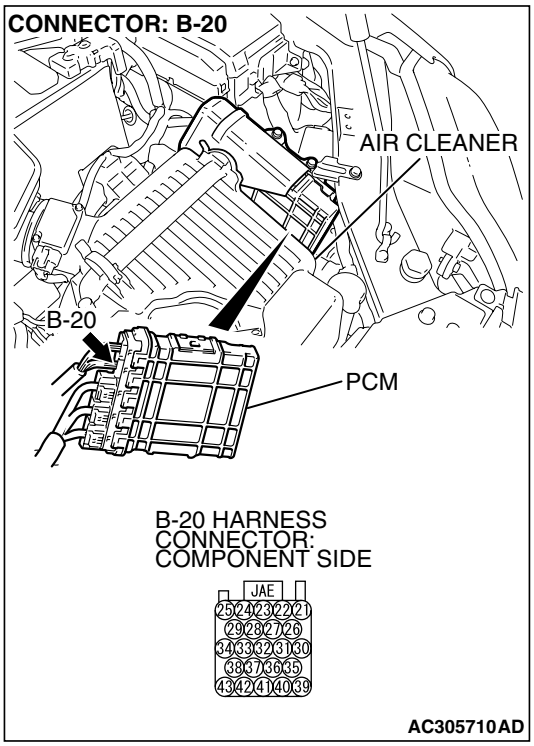


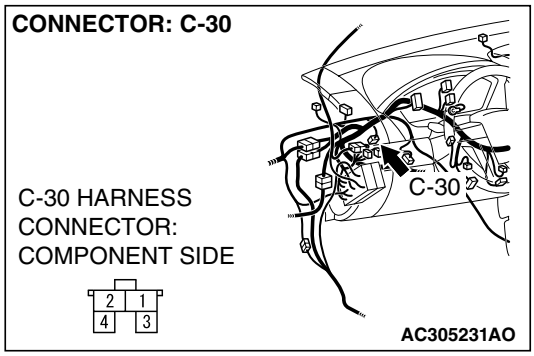
(1) Remove the stoplight switch. (Refer to GROUP 35A, Brake Pedal P.35A-24).
(2) Connect an ohmmeter to the stoplight switch between terminals 3 and 4.
(3) Check for continuity between the terminals when the plunger of the stoplight switch is pushed in and when it is released.
(4) The stoplight switch is operating properly if the circuit is open between terminals 3 and 4 when the plunger is released, and if resistance value is less than 2 ohms between terminals 3 and 4 when the plunger is pushed in to a depth of within 4.5 mm (0.18 inch) from the outer case edge surface.



Q: Is the stoplight switch operating properly?

YES : Install the stoplight switch. (Refer to GROUP 35A, Brake Pedal P.35A-24). Then go to Step 17.
NO : Replace the stoplight switch. (Refer to GROUP 35A, Brake Pedal P.35A-24). Then go to Step 22.



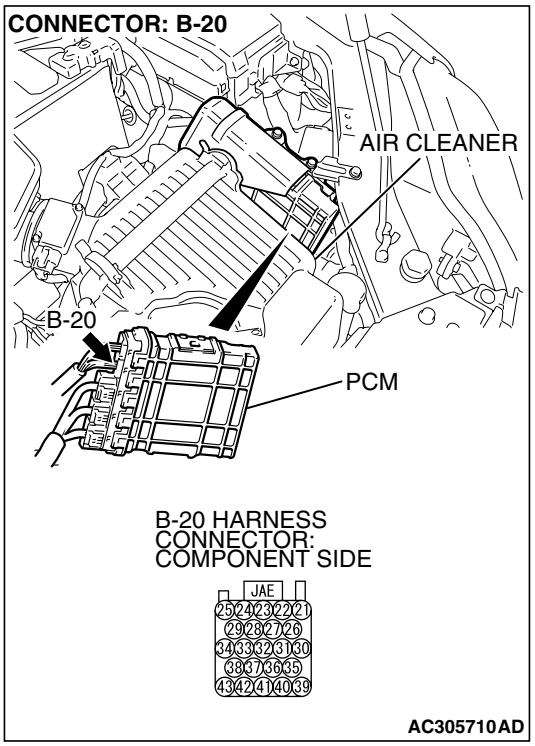


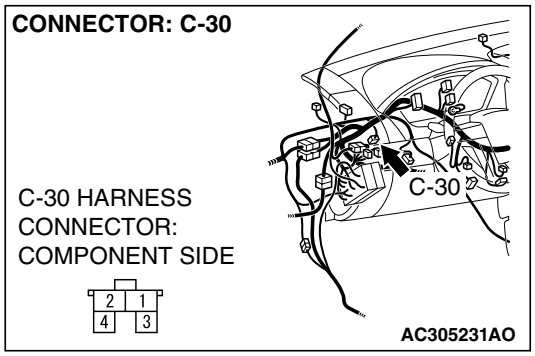
STEP 17. Check PCM connector B-20 and stoplight switch connector C-30 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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). Then go to Step 22.



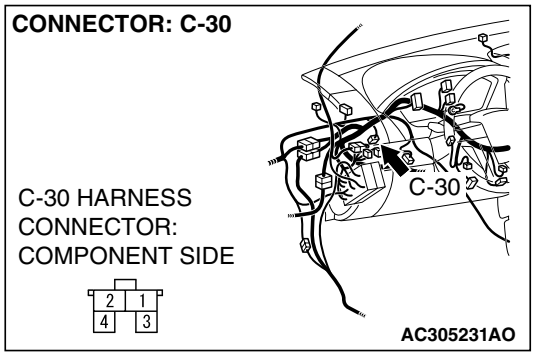


STEP 18. Check the harness wire between PCM connector B-20 terminal 33 and stoplight switch connector C-30 terminal 3 for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair the damaged harness wire. Then go to Step 22.

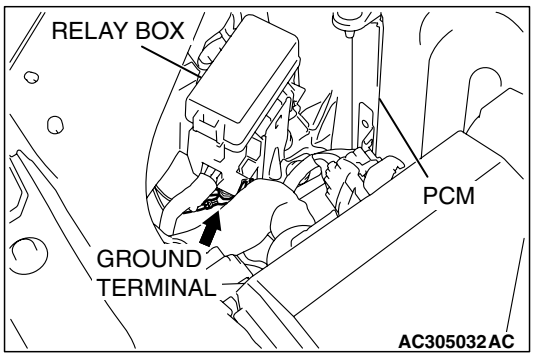


STEP 19. Check the harness wire between stoplight switch connector C-30 terminal 4 and ground for damage.

Q: Is the harness wire in good condition?

YES : Go to Step 20.

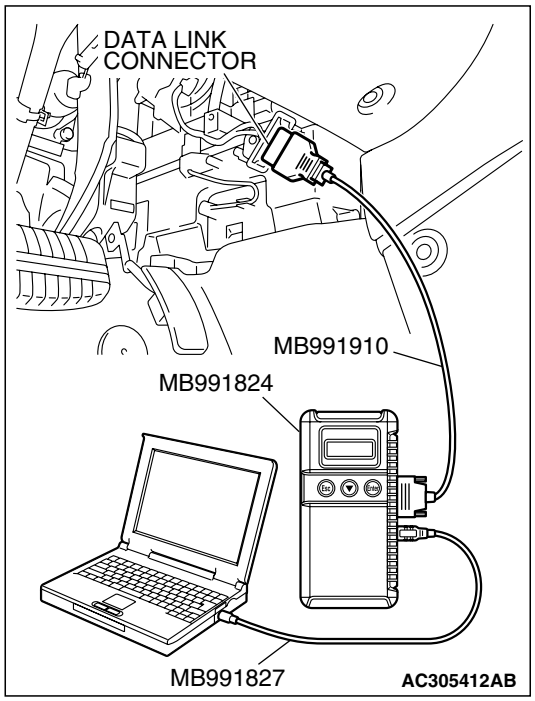
NO : Repair the damaged harness wire. Then go to Step 22.



STEP 20. Using scan tool MB991958, check data list item 89: Normally Closed Brake 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. (Refer to P.17-10).

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

(3) Set scan tool MB991958 to data reading mode for auto-cruise control system. (Refer to P.17-10).

- Item 89, Normally Closed Brake Switch.
  - When the brake pedal is depressed, the display on scan tool MB991958 should be "ON".
  - When the brake pedal is released, the display on scan tool MB991958 should be "OFF".

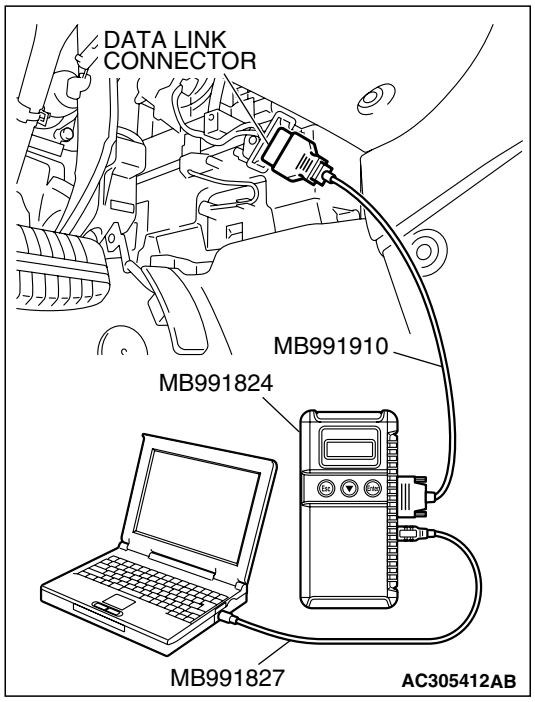
(4) Turn the ignition switch to the "LOCK" (OFF) position.

(5) Disconnect scan tool MB991958.

Q: Is the switch operating properly?

YES : Go to Step 21.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 22.



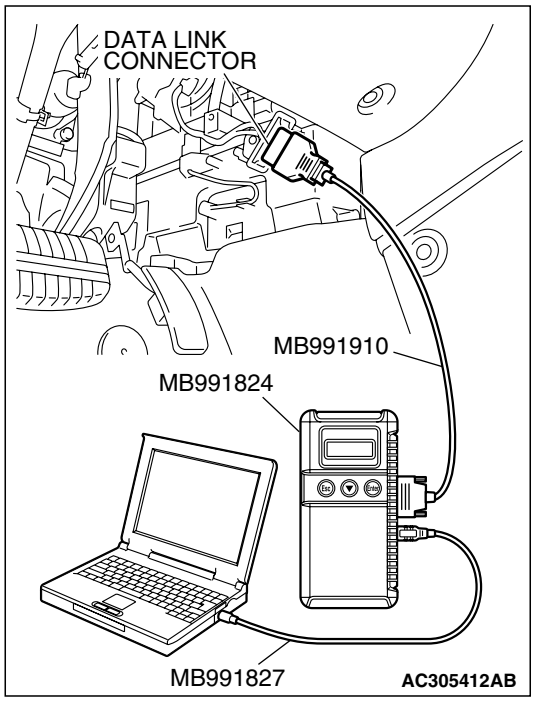
STEP 21. Using scan tool MB991958, read the diagnostic trouble codes.

⚠ 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to read the diagnostic trouble codes. (Refer to P.17-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC P1571 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 22.
NO : 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.00-14).



STEP 22. Using scan tool MB991958, read the diagnostic trouble codes.

⚠ 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to read the diagnostic trouble codes. (Refer to P.17-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC P1571 set?

YES : Return to Step 1.
NO : The procedure is complete.

DTC P1574: PCM and Its Related Component

DTC SET CONDITIONS
This DTC is set when there is an failure in the PCM and its related components.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)
- Malfunction of the MFI system.
- Malfunction of the A/T system.
- Malfunction of the PCM.

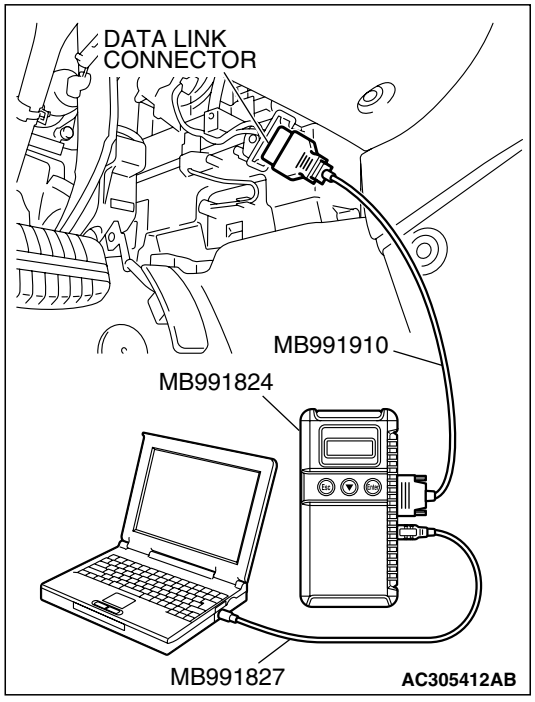
DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, read the MFI system diagnostic trouble code.

⚠ 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.

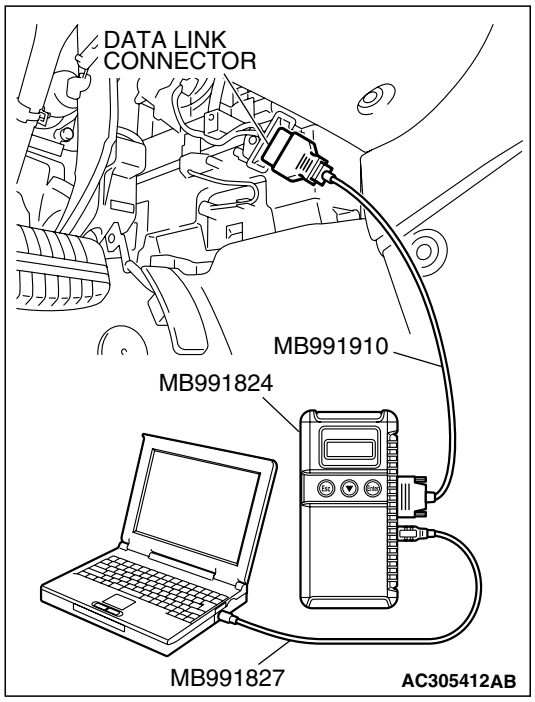
(1) Connect scan tool MB991958 to the data link connector. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Check for MFI system diagnostic trouble code. (Refer to GROUP 13A, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13A-9) <2.4L engine> or (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13B-10) <3.8L engine>.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.



Q: Is any DTC set?

YES : Diagnose the MFI system. (Refer to GROUP 13A, MFI Diagnosis – Diagnostic Trouble Code Chart P.13A-45) <2.4L engine> or (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Trouble Code Chart P.13B-46) <3.8L engine>. Then go to Step 4.

NO : Go to Step 2.



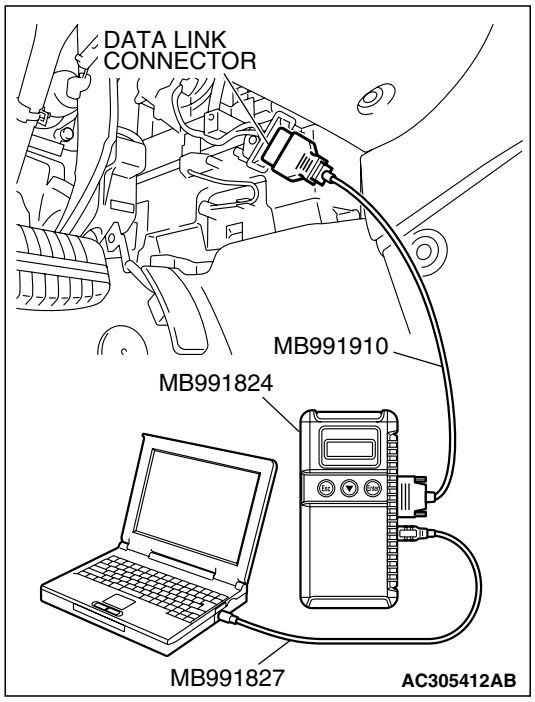
STEP 2. Using scan tool MB991958, read the A/T system diagnostic trouble code.

⚠ 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T system diagnostic trouble code. (Refer to GROUP 23A, A/T Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.23A-17).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Diagnose the A/T system. (Refer to GROUP 23A, A/T Diagnosis – Diagnostic Trouble Code Chart P.23A-47). Then go to Step 4.
NO : Go to Step 3.



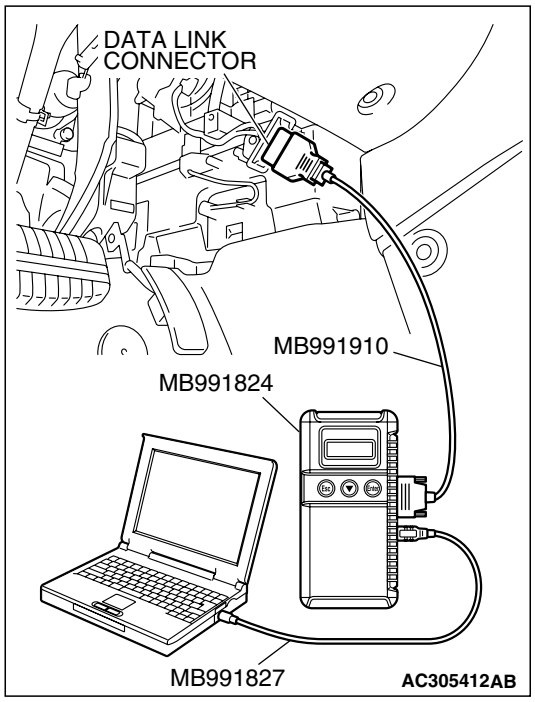
STEP 3. Using scan tool MB991958, read the auto-cruise control system diagnostic trouble code.

⚠ 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the auto-cruise control system diagnostic trouble codes. (Refer to P.17-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC P1574 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 4.
NO : 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.00-14).



STEP 4. Using scan tool MB991958, read the auto-cruise control system diagnostic trouble code.

⚠ 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Use scan tool MB991958 to read the auto-cruise control system diagnostic trouble codes. (Refer to P.17-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC P1574 set?

YES : Return to Step 1.
NO : The procedure is complete.

DTC P1575: Cancel Latch System

DTC SET CONDITIONS
The PCM communicates cancellation retention information between the two microprocessors. This DTC is set when cancellation retention information contains inconsistency.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)
Malfunction of the PCM.

DIAGNOSIS

Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then check that diagnostic trouble code P1575 is not set.

SYMPTOM CHART

M1172002300366

SYMPTOM		INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication with scan tool is not possible	Communication with all systems is impossible	-	Group 13A, MFI Diagnosis – Symptom Procedures – Inspection Procedure 1 P.13A-1000 <2.4L engine>. Group 13B, MFI Diagnosis – Symptom Procedures – Inspection Procedure 1 P.13B-1251 <3.8L engine>.
	Communication with the PCM only is impossible	-	Group 13A, MFI Diagnosis – Symptom Procedures – Inspection Procedure 2 P.13A-1003 <2.4L engine>. Group 13B, MFI Diagnosis – Symptom Procedures – Inspection Procedure 2 P.13B-1254 <3.8L engine>.
Auto-cruise control system is not cancelled.	When brake pedal is depressed	1	P.17-53
	When selector lever is moved to "N" range	2	P.17-54
	When "CANCEL" switch is turned ON	3	P.17-57
Auto-cruise control system cannot be set.		4	P.17-58
Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.		5	P.17-60
When "CRUISE" (MAIN) switch is turned "ON", "CRUISE" indicator light inside combination meter does not illuminate. (However, auto-cruise control system is normal).		6	P.17-63

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: When the Brake Pedal is Depressed, Auto-cruise Control System is not Cancelled.

COMMENT
The stoplight switch circuit is suspected.

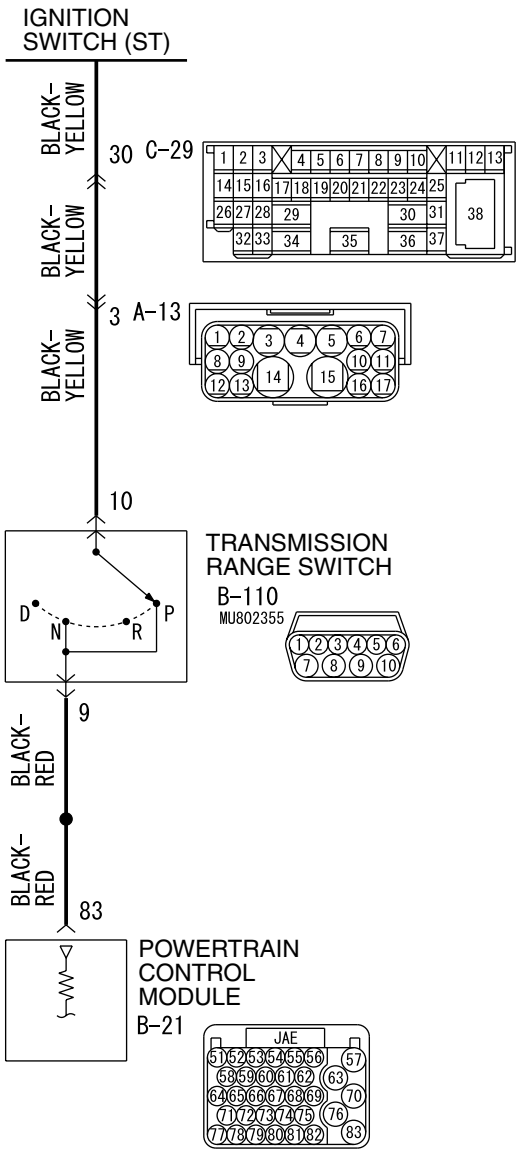
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)
- Malfunction of the stoplight switch.
- Damaged harness or connector.
- Malfunction of the PCM.

DIAGNOSIS

Refer to P.17-31, Diagnostic Trouble Code Procedures – DTC P1571: Stoplight Switch System.

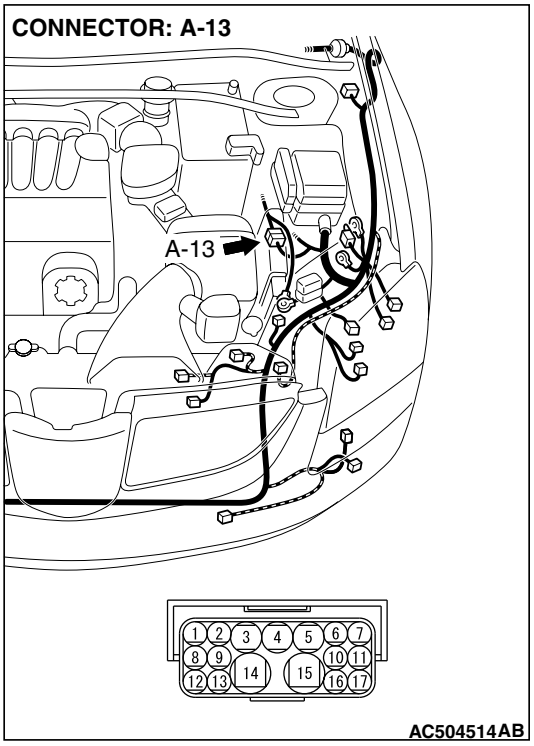
INSPECTION PROCEDURE 2: When the Selector Lever is Moved to "N" Position, Auto-cruise Control System is not Cancelled .

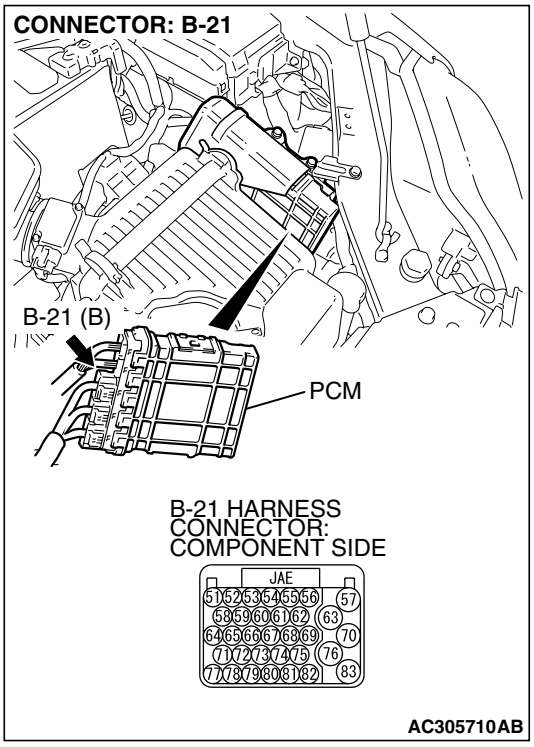
Transmission Range Switch Circuit

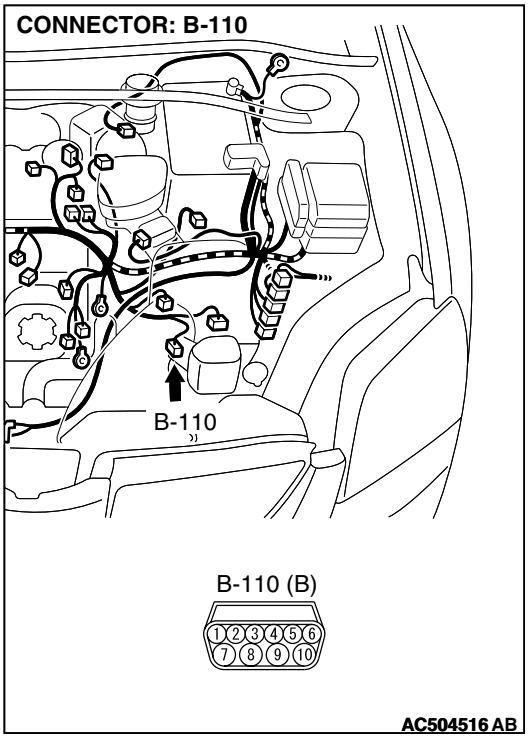


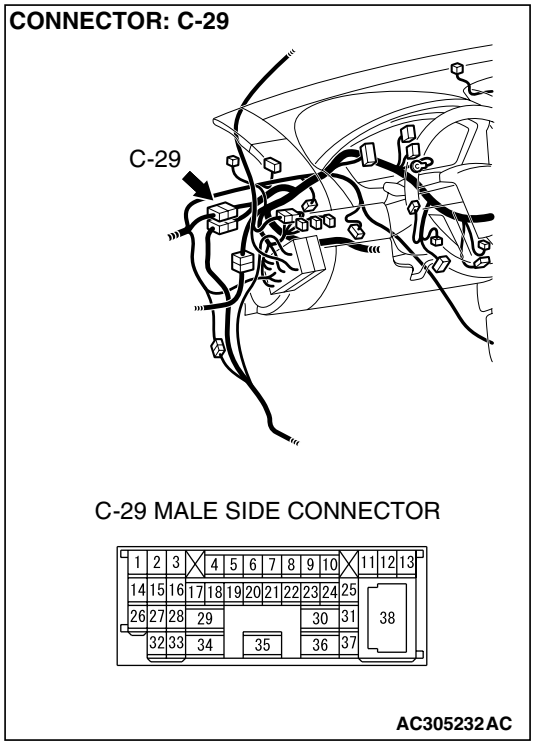
AC600740AB
W7P17M002A

TSB Revision









CIRCUIT OPERATION

- Battery positive voltage is applied to the transmission range switch (terminal 10) when the ignition switch is turned "ST."
- Battery positive voltage is applied to the PCM terminal 83 when the selector lever is in the "N" range. The PCM judges that the selector lever is in the "N" range when the battery positive voltage is applied.

COMMENT

The transmission range switch circuit is suspected.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)

- Malfunction of the transmission range switch.
- Damaged harness or connector.
- Malfunction of the PCM.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, check data list item 88: Neutral switch.

⚠ CAUTION

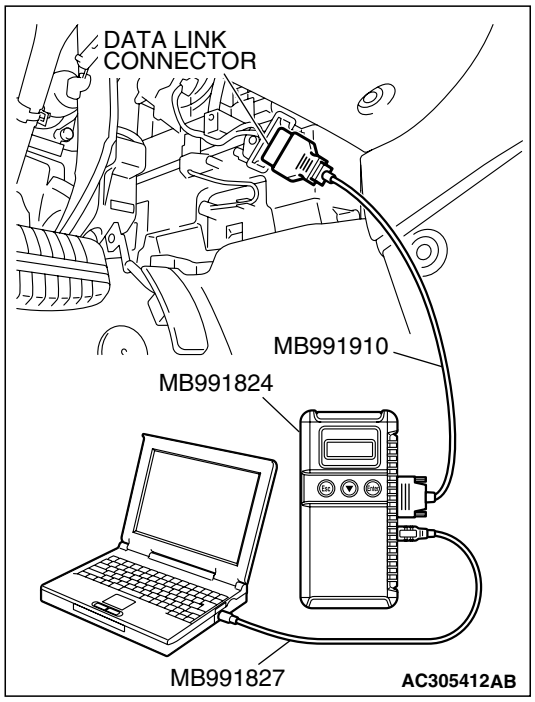
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

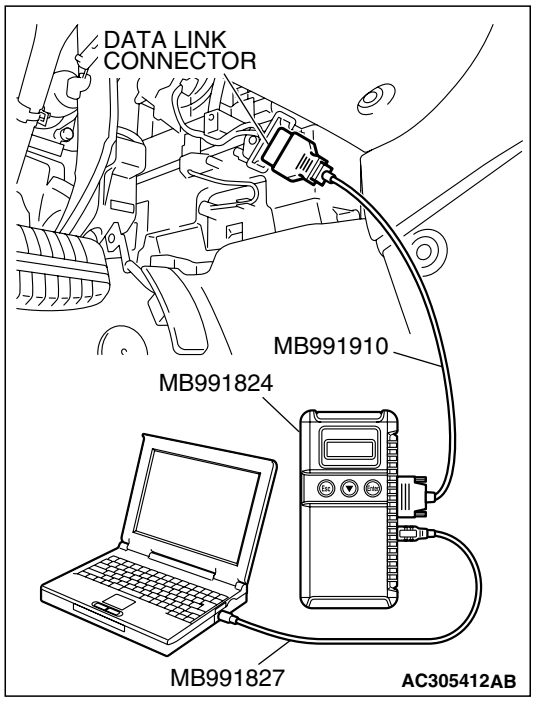
(1) Connect scan tool MB991958 to the data link connector. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to data reading mode for auto-cruise control system. (Refer to P.17-10).
- Item 88, Neutral switch.
  - When selector lever is at the "N" position, the display on scan tool MB991958 should be "ON".
  - When selector lever is other than "N" position, the display on scan tool MB991958 should be "OFF".

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is the switch operating properly?

YES : Go to Step 3.
NO : Go to Step 2.





STEP 2. Using scan tool MB991958, read the A/T system diagnostic trouble code.

⚠ 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T system diagnostic trouble code. (Refer to GROUP 23A, A/T Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.23A-17).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC P1770 or P1771 set?

YES : Refer to GROUP 23A, A/T Diagnosis – Diagnostic Trouble Code Procedures – DTC P1770: Transmission Range Switch System (Open Circuit) P.23A-125, DTC P1771: Transmission Range Switch System (Short Circuit) P.23A-157. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Check the symptoms.

Q: When the selector lever is moved to "N" position, auto-cruise control system is cancelled?

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.00-14).
NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 4.

STEP 4. Check the symptoms.

Q: When the selector lever is moved to "N" position, auto-cruise control system is cancelled?

YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: When the Auto-cruise Control "CANCEL" Switch is Set to ON, Auto-cruise Control System is not Cancelled.

COMMENT
The cause is probably an open-circuit in the output in the circuit inside the "CANCEL" switch.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)
- Malfunction of the auto-cruise control switch.

TSB Revision

DIAGNOSIS

Replace the auto-cruise control switch. (Refer to P.17-78, Auto-cruise Control).

INSPECTION PROCEDURE 4: Auto-cruise Control System cannot be Set.

COMMENT

The fail-safe function is probably canceling auto-cruise control system. In this case, scan tool MB991958 can be used to retest each system by checking the diagnostic trouble codes. The scan tool can also be used to check if the circuits of each input switch are normal or not by checking the input switch codes.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)

- Malfunction of the auto-cruise control switch.
- Malfunction of the stoplight switch.
- Malfunction of the transmission range switch.
- Malfunction of the PCM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code.

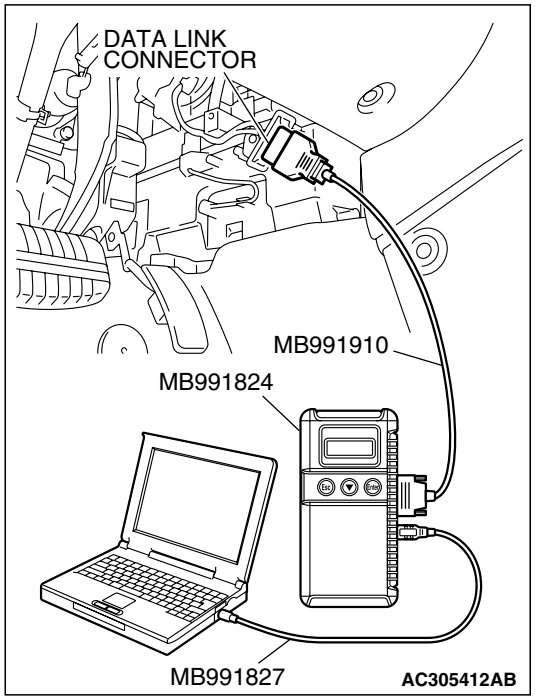
⚠ CAUTION

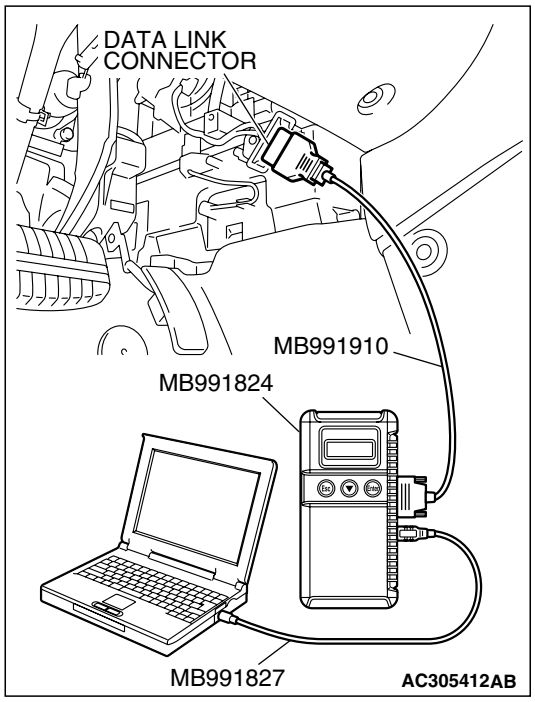
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Check for auto-cruise control system diagnostic trouble code. (Refer to P.17-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC set?

YES : Diagnose the auto-cruise control system. (Refer to P.17-13, Diagnostic Trouble Code Chart). Then go to Step 6.
NO : Go to Step 2.





STEP 2. Using scan tool MB991958, check data list item 75: Cancel Switch.

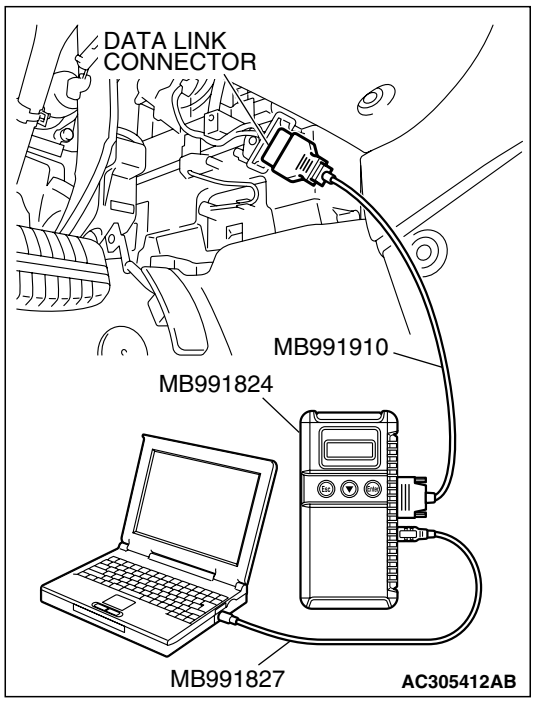
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to data reading mode for auto-cruise control system. (Refer to P.17-10).
- Item 75, Cancel Switch.
  - When "CANCEL" switch is at the ON position, the display on scan tool MB991958 should be "ON".
  - When "CANCEL" switch is at the OFF position, the display on scan tool MB991958 should be "OFF".

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is the switch operating properly?

YES : Go to Step 3.
NO : Refer to P.17-57, Symptom Procedures – Inspection Procedure 3. Then go to Step 6.



STEP 3. Using scan tool MB991958, check data list item 74: Brakelight Switch and data list item 89: Normally Closed Brake 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.

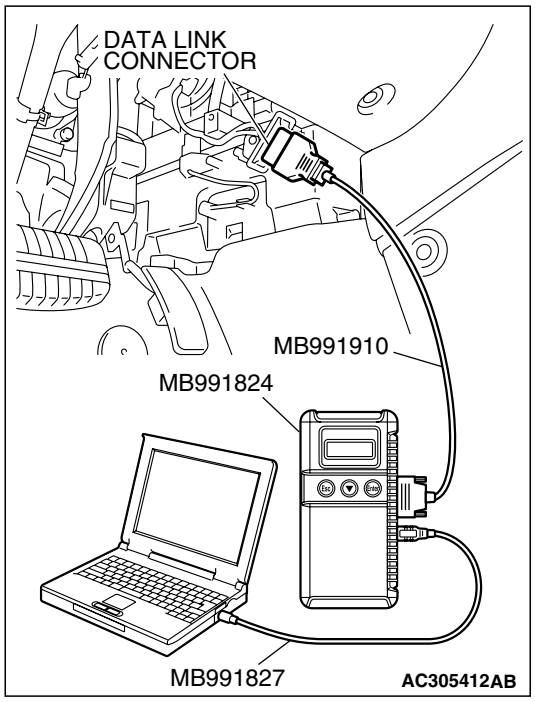
(1) Connect scan tool MB991958 to the data link connector. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to data reading mode for auto-cruise control system. (Refer to P.17-10).
- Item 74, Brakelight Switch.
  - When brake pedal is depressed, the display on scan tool MB991958 should be "ON".
  - When brake pedal is released, the display on scan tool MB991958 should be "OFF".
- Item 89, Normally Closed Brake Switch.
  - When brake pedal is depressed, the display on scan tool MB991958 should be "ON".
  - When brake pedal is released, the display on scan tool MB991958 should be "OFF".

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is the switch operating properly?

YES : Go to Step 4.
NO : Refer to P.17-53, Symptom Procedures – Inspection Procedure 1. Then go to Step 6.

TSB Revision



STEP 4. Using scan tool MB991958, check data list item 88: Neutral 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to data reading mode for auto-cruise control system. (Refer to P.17-10).
- item 88, Neutral Switch.
  - When selector lever is at the "N" position, the display on scan tool MB991958 should be "ON".
  - When selector lever is other then "N" position, the display on scan tool MB991958 should be "OFF".

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is the switch operating properly?

YES : Go to Step 5.
NO : Refer to P.17-54, Symptom Procedures – Inspection Procedure 2. Then go to Step 6.

STEP 5. Check the symptoms.

Q: Can auto-cruise control be set?

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.00-14).
NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 6.

STEP 6. Check the symptoms.

Q: Can auto-cruise control be set?

YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 5: Hunting (Repeated Acceleration and Deceleration) Occurs at the Set Vehicle Speed.

COMMENT
The output shaft speed sensor signal or the throttle body is suspected.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)
- Malfunction of the output shaft speed sensor.
- Malfunction of the throttle body.
- Malfunction of the PCM.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code.

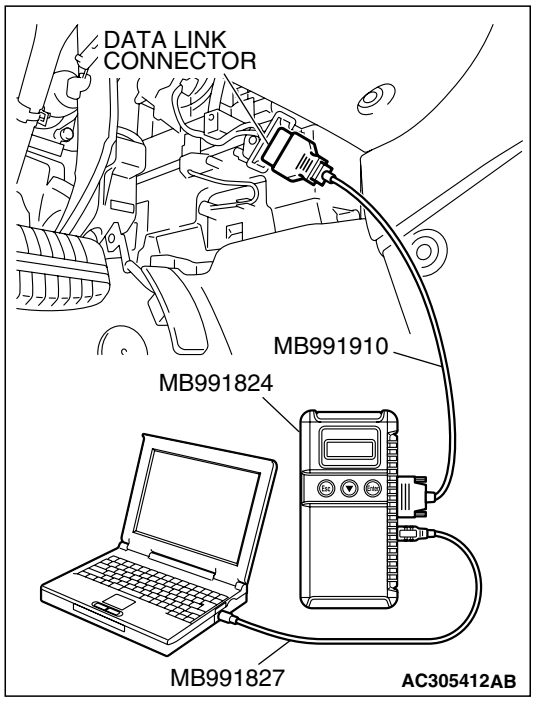
⚠ CAUTION

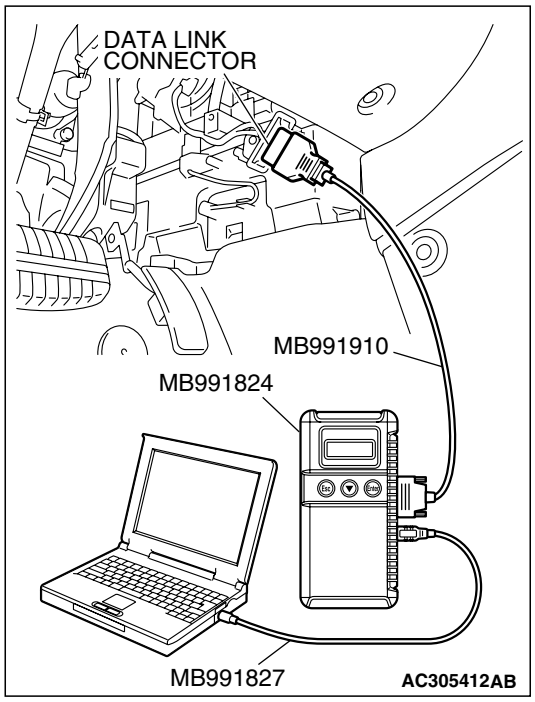
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T system diagnostic trouble code. (Refer to GROUP 23A, A/T Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.23A-17).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Diagnose the A/T system. (Refer to GROUP 23A, A/T Diagnosis – Diagnostic Trouble Code Chart P.23A-47). Then go to Step 4.
NO : Go to Step 2.





STEP 2. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Check for MFI system diagnostic trouble code (Refer to GROUP 13A, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13A-9) <2.4L engine> or (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13B-10) <3.8L engine>.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is any DTC set?

YES : Diagnose the MFI system. (Refer to GROUP 13A, MFI Diagnosis – Diagnostic Trouble Code Chart P.13A-45) <2.4L engine> or (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Trouble Code Chart P.13B-46) <3.8L engine>. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Retest the system

Q: Does hunting occur?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 4.
NO : 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.00-14).

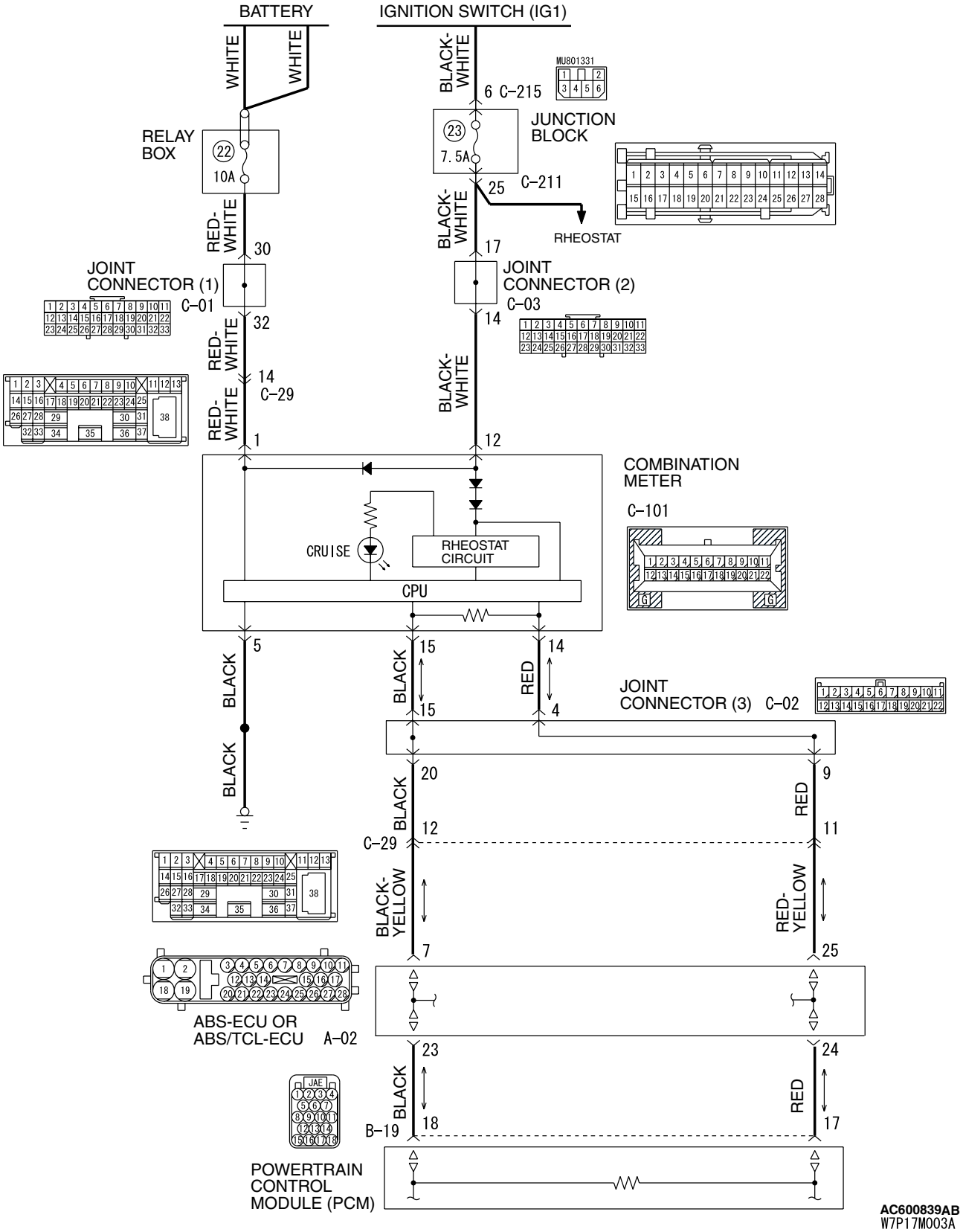
STEP 4. Retest the system

Q: Does hunting occur?

YES : Return to Step 1.
NO : The procedure is complete.

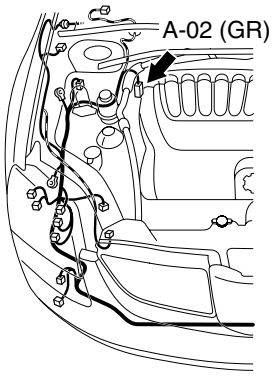
INSPECTION PROCEDURE 6: When "CRUISE" (MAIN) Switch is Turned "ON", "CRUISE" Indicator Light Inside Combination Meter does not Illuminate. (However, Auto-cruise Control System is Normal).

Auto-cruise Control Indicator Light Drive Circuit

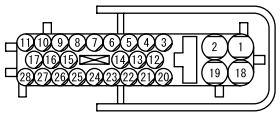


TSB Revision

CONNECTOR: A-02

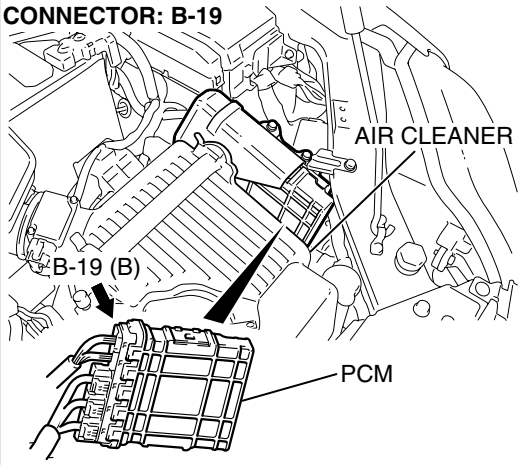


A-02 HARNESS CONNECTOR: COMPONENT SIDE

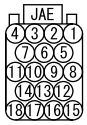


AC305209AB

CONNECTOR: B-19

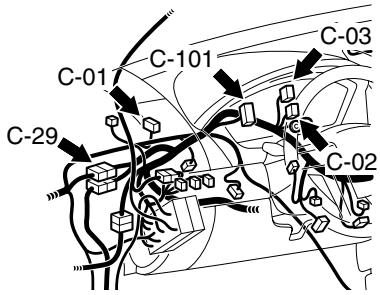


B-19 HARNESS CONNECTOR: COMPONENT SIDE



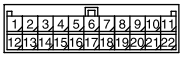
AC305710AC

CONNECTORS: C-01, C-02, C-03, C-29, C-101

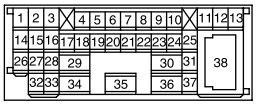


C-01 AND C-03 HARNESS CONNECTOR: COMPONENT SIDE

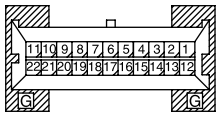
C-02 HARNESS CONNECTOR: COMPONENT SIDE



C-29 MALE SIDE CONNECTOR



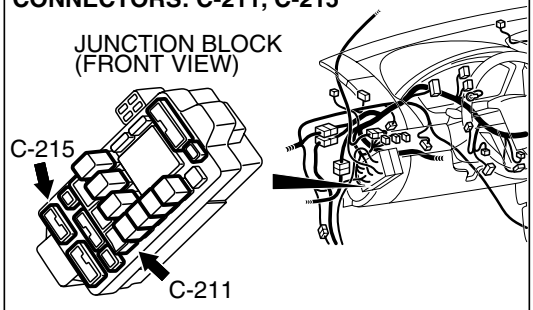
C-101 HARNESS CONNECTOR: COMPONENT SIDE



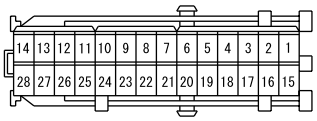
AC305232AO

CONNECTORS: C-211, C-215

JUNCTION BLOCK (FRONT VIEW)



C-211 HARNESS CONNECTOR: COMPONENT SIDE



C-215 HARNESS CONNECTOR: COMPONENT SIDE

AC305720AB

CIRCUIT OPERATION

The PCM detects "CRUISE" (MAIN) switch "ON" signal to illuminate the "CRUISE" indicator light on the combination meter.

COMMENT

Connector(s), wiring harness in the CAN bus line between the PCM and the combination meter, power supply to the PCM, the combination meter, the PCM may be defective.

TROUBLESHOOTING HINTS

- Malfunction of the combination meter.
- Damaged harness or connector.

TSB Revision

- Malfunction of the PCM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

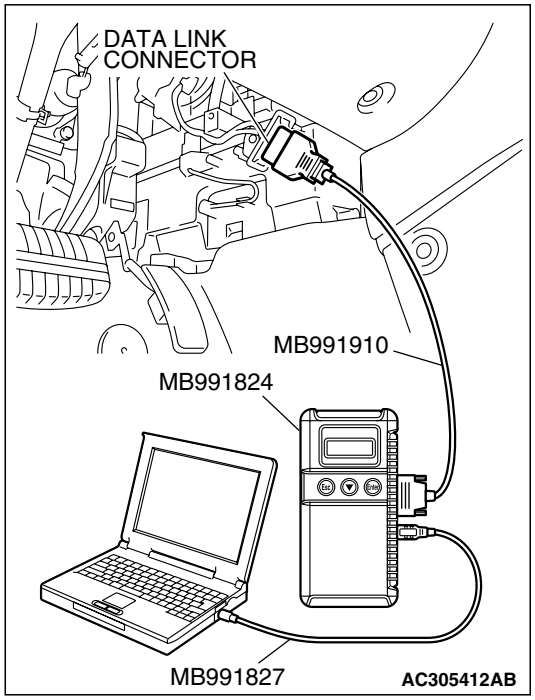
⚠ CAUTION

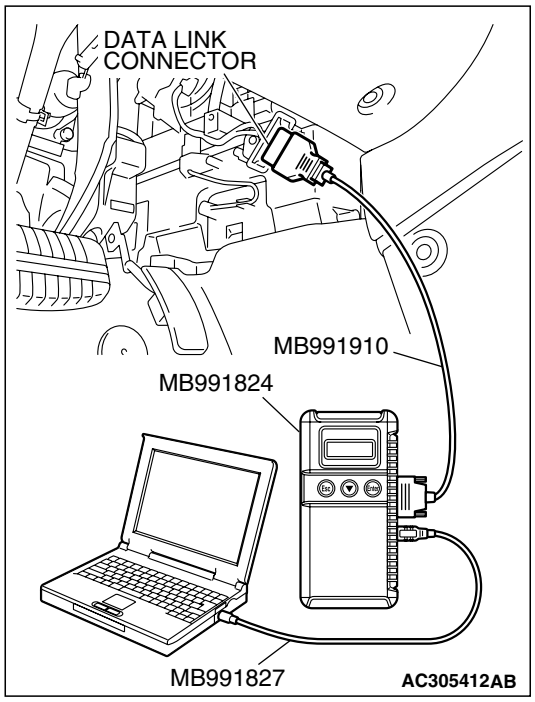
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line. (Refer to P.17-10).
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is the check result satisfactory?

YES : Go to Step 2
NO : Repair the CAN bus lines. (Refer to GROUP 54C, Diagnosis – Can Bus Diagnostic Chart P.54C-16). Then go to Step 4.





STEP 2. Using scan tool MB991958, read the MFI diagnostic trouble code.

⚠ 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. (Refer to P.17-10).
(2) Turn the ignition switch to the "ON" position.
(3) Check for MFI system diagnostic trouble code (Refer to GROUP 13A, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13A-9) <2.4L engine> or (Refer to GROUP 13B, MFI Diagnosis – Diagnostic Function – How to Read and Erase Diagnostic Trouble Code P.13B-10) <3.8L engine>.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect scan tool MB991958.

Q: Is DTC U1108 set?

YES : Refer to GROUP 13A, MFI Diagnosis – Diagnostic Trouble Code Procedures – DTC U1108: Combination Meter-ECU CAN Communication Time Out P.13A-984 <2.4L engine> or Refer to GROUP 13B, MFI Diagnosis – Diagnostic Trouble Code Procedures – DTC U1108: Combination Meter-ECU CAN Communication Time Out P.13B-1235 <3.8L engine>. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Retest the system.

Q: Does the "CRUISE" indicator light illuminate when the "CRUISE" (MAIN) switch is turned "ON"?

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.00-14).
NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Ignition Switch – Encrypted Code Registration Criteria Table P.54A-11. Then go to Step 4.

STEP 4. Retest the system.

Q: Does the "CRUISE" indicator light illuminate when the "CRUISE" (MAIN) switch is turned "ON"?

YES : The procedure is complete.
NO : Return to Step 1.

DATA LIST REFERENCE TABLE

M1172002400556

⚠ CAUTION

- **When shifting the selector lever to "D" range, apply the brakes should be applied so that the vehicle does not move forward.**
- **Driving tests always need two persons: one driver and one observer.**

*NOTE: *:After the inspection is completed, disconnect the throttle position sensor connector, and then delete the diagnostic trouble code using use of scan tool MB991958. (Refer to P.17-10).*

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM		INSPECTION REQUIREMENT		NORMAL CONDITION
APS (main)	11	Accelerator pedal position sensor (main)		Ignition switch: "ON"	Accelerator pedal: Released	735 – 1,335 mV
					Accelerator pedal: Gradually depressed	Increases in response to the pedal depression stroke
					Accelerator pedal: Fully depressed	4,000 mV or more
Brake light switch	74	Stoplight switch		Brake pedal: Depressed		ON
				Brake pedal: Released		OFF
Cancel code	57	Cancel code		Ignition switch: "ON"		The cancel code, which set when the auto-cruise control system was cancelled at the last time.
Cancel switch	75	Auto-cruise control switch	CANCEL	"CANCEL" switch: ON		ON
				"CANCEL" switch: OFF		OFF
Cruise switch	81	Auto-cruise control system operation		Auto-cruise control system: active		ON
				Auto-cruise control system: Inactive		OFF
Main switch	86	Auto-cruise control switch	CRUISE (MAIN)	"CRUISE" (MAIN) switch: "ON"		ON
				"CRUISE" (MAIN) switch: "OFF"		OFF
Neutral switch	88	Transmission range switch		Transmission range switch: "N" position		ON
				Transmission range switch: Other than above		OFF
Normally closed brake switch	89	Stoplight switch (brake switch)		Brake pedal: Depressed		ON
				Brake pedal: Released		OFF
Resume switch	91	Auto-cruise control switch	ACC/RES	"ACC/RES" switch: ON		ON
				"ACC/RES" switch: OFF		OFF
Set switch	92	Auto-cruise control switch	COAST/ SET	"COAST/SET" switch: ON		ON
				"COAST/SET" switch: OFF		OFF

TSB Revision

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
TPS (main)	13	Throttle position sensor (main)*	• Remove the intake air hose at the throttle body. • Disconnect the throttle position sensor connector, and then connect terminals 3, 4, 5 and 6 with the use of the special tool: MB991658 (Test harness). • Ignition switch: "ON"	Fully close the throttle valve with your finger	300 – 700 mV
				Fully open the throttle valve with your finger	4,000 mV or more
			No load		520 – 620 mV
			A/C switch: "OFF" to "ON"		Voltage rises
			Selector lever: "N" to "D"		Voltage rises
Vehicle speed sensor	4	Vehicle speed signal	Road test the vehicle		The speedometer and scan tool MB991958 display the same value.

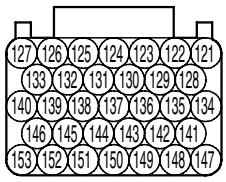
PCM TERMINAL VOLTAGE REFERENCE CHART FOR AUTO-CRUISE CONTROL SYSTEM OPERATION

M1172004800055

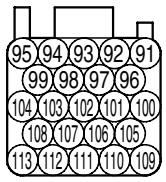
1. Disconnect the PCM connectors, and connect special tool MB991923 (Power plant ECU check harness) in between.
2. Measure the voltages between the check connector terminals of special tool MB991923 and ground terminals 63 or 76.

SPECIAL TOOL-POWER PLANT ECU CHECK HARNESS (MB991923) CONNECTOR: COMPONENT SIDE

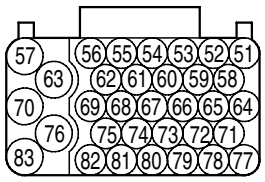
33-PIN CONNECTOR (PCM CONNECTOR B-23)



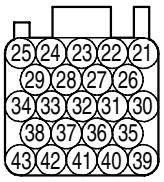
23-PIN CONNECTOR WITH RED TAPE (PCM CONNECTOR B-22)



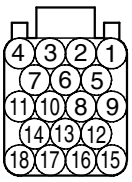
33-PIN CONNECTOR (PCM CONNECTOR B-21)



23-PIN CONNECTOR WITHOUT RED TAPE (PCM CONNECTOR B-20)



18-PIN CONNECTOR (PCM CONNECTOR B-19)



AC209259AE

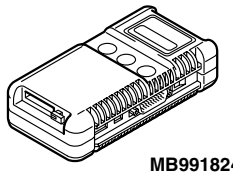
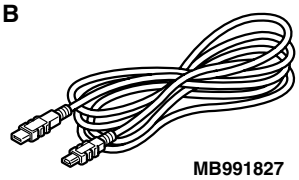
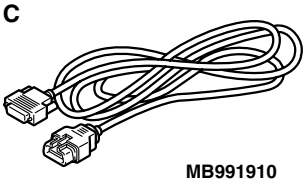
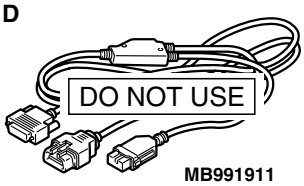
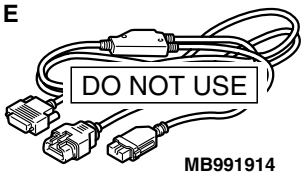
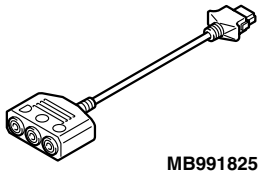
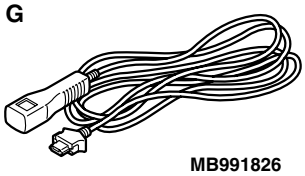
TERMINAL NO.	CHECK ITEM	CHECK CONDITION		NORMAL CONDITION
9	Stoplight switch	Ignition switch: "ON"	Depress the brake pedal.	Battery positive voltage
			Release the brake pedal.	1V or less

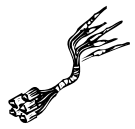
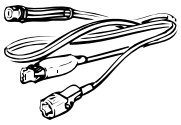
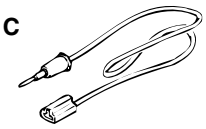
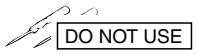
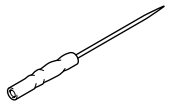
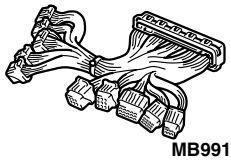
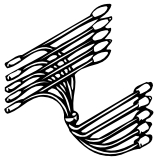
TERMINAL NO.	CHECK ITEM	CHECK CONDITION			NORMAL CONDITION
12	Auto-cruise control switch power supply	Ignition switch: "ON"	All switches: OFF		4.7 – 5.0 V
			"CRUISE" (MAIN) switch: "ON"		0 – 0.3 V
			"COAST/SET" switch: ON		2.0 – 2.8 V
			"ACC/RES" switch: ON		3.3 – 4.1 V
			"CANCEL" switch: ON		0.8 – 1.5 V
21	Accelerator pedal position sensor (sub) power supply	Ignition switch: "ON"			4.9 – 5.1 V
26	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal		0.7 – 1.3 V <2.4L engine> 0.735 – 1.335 V <3.8L engine>
			Depress the accelerator pedal.		4.0 V or more
27	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal		0.4 – 1.0 V <2.4L engine> 0.435 – 1.035 V <3.8L engine>
			Depress the accelerator pedal.		3.7 V or more
30	Accelerator pedal position sensor (main) power supply	Ignition switch: "ON"			4.9 – 5.1 V
33	Brake switch	Ignition switch: "ON"	Depress the brake pedal.		Battery positive voltage
			Release the brake pedal.		1V or less
83	Transmission range switch: "P" and "N"	Ignition switch: "ON"	Transmission range switch: "P" or "N"		Battery positive voltage
			Transmission range switch: Other than above		1V or less
94	Throttle position sensor power supply	Ignition switch: "ON"			4.9 – 5.1 V
98	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor, and then connect terminals 3, 4, 5 and 6 with the use of the special tool: MB991658 (Test harness). • Ignition switch: "ON"		Fully close the throttle valve with your finger	2.2 – 2.8 V
				Fully open the throttle valve with your finger	4.0 V or more

TERMINAL NO.	CHECK ITEM	CHECK CONDITION		NORMAL CONDITION
99	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor, and then connect terminals 3, 4, 5 and 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	0.3 – 0.7 V
			Fully open the throttle valve with your finger	4.0 V or more
141	Throttle actuator control motor (–)	• Ignition switch: "ON" • Accelerator pedal: fully closed to fully opened		Decreases slightly (approx. 2 V) from battery voltage.
147	Throttle actuator control motor (+)	• Ignition switch: "ON" • Accelerator pedal: fully opened to fully closed		Decreases slightly (approx. 2 V) from battery voltage.

SPECIAL TOOLS

M1172000600598

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III sub assembly A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III main harness C (for Daimler Chrysler models only) F: M.U.T.-III measurement adapter G: M.U.T.-III trigger harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III trigger harness is not necessary when pushing V.C.I. ENTER key.*	Checking diagnostic trouble codes **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B or C instead, the CAN communication does not function correctly.**

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  B  C  D  DO NOT USE MB991223AZ	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222 Harness set A: Inspection harness B: LED harness C: LED harness adapter D: Probe	General service tools	Checking the continuity and measuring the voltage at the harness connector
 MB992006	MB992006 Extra fine probe	General service tool	Continuity check and voltage measurement at harness wire or connector for loose, corroded or damaged terminals, or terminals pushed back in the connector.
 MB991923	MB991923 Power plant ECU check harness	–	Measuring the terminal voltage at the PCM
 MB991658	MB991658 Test harness	Tool not available	Checking throttle position sensor

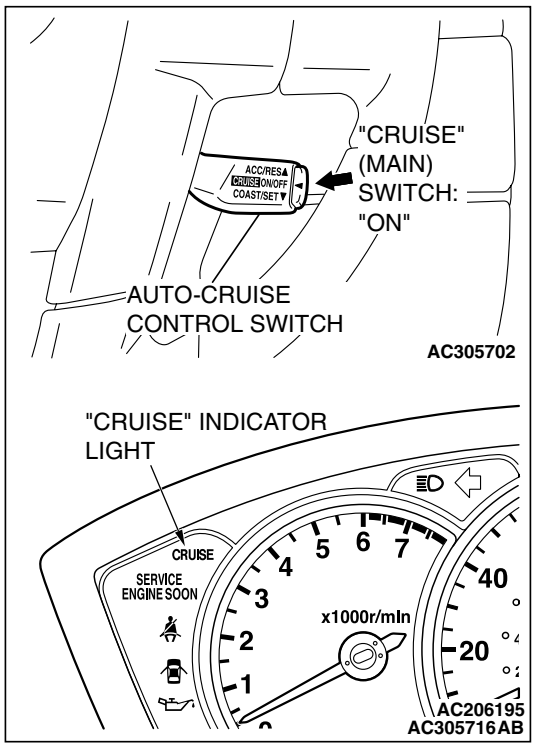
ON-VEHICLE SERVICE

AUTO-CRUISE CONTROL SWITCH CHECK

M1172001200054

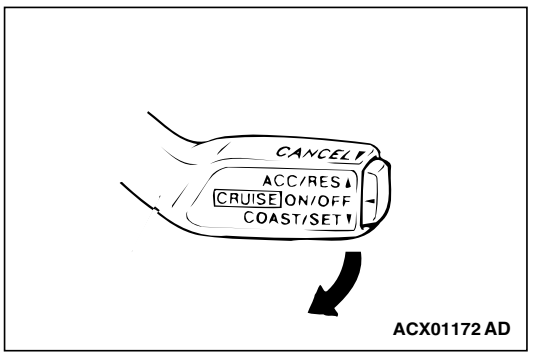
AUTO-CRUISE CONTROL MAIN SWITCH CHECK

1. Turn the ignition switch to the "ON" position.



2. Check that the "CRUISE" indicator light within the combination meter illuminates when the "CRUISE" (MAIN) switch is switched "ON".

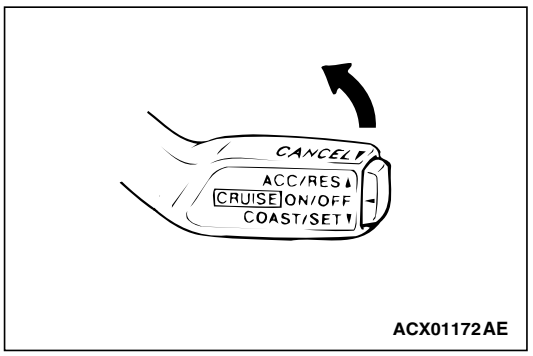
AUTO-CRUISE CONTROL SETTING



1. Switch "ON" the "CRUISE" (MAIN) switch.
2. Drive at the desired speed, above approximately 40 km/h (25 mph).
3. Push the auto-cruise control switch in the direction of the arrow.
4. Check to be sure that when the switch is released the speed is the desired constant speed.

   NOTE: If the vehicle speed decreases to approximately 15 km/h (9 mph) below the set speed because of climbing a hill for example, it is normal for the auto-cruise control to be cancelled.

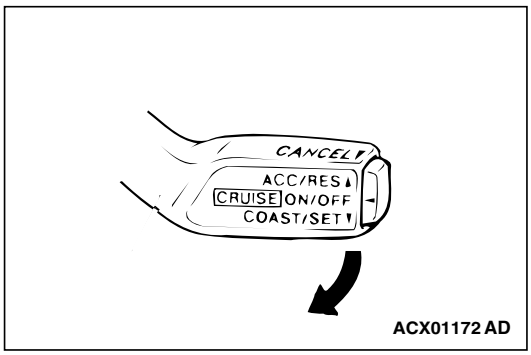
SPEED-INCREASE SETTING



1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of the arrow.
3. Check to be sure that acceleration continues while the switch is held, and that after it is released the constant speed at the time when it was released becomes the driving speed.

   NOTE: Acceleration can be continued even if the vehicle speed has passed the high-speed limit [approximately 170 km/h (106 mph)]. But the speed when the auto-cruise control switch is released will be recorded as the high-speed limit.

SPEED-REDUCTION SETTING

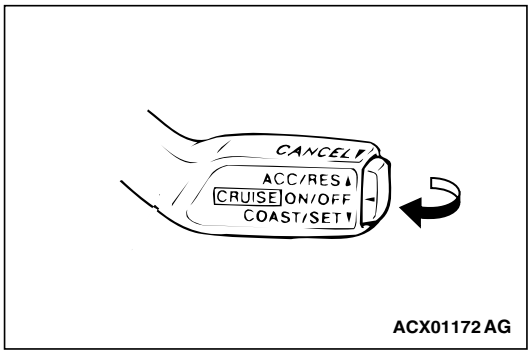


ACX01172 AD

1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of the arrow.
3. Check to be sure that deceleration continues while the switch is pressed, and that after it is released the constant speed at the time when it was released becomes the driving speed.

   NOTE: When the vehicle speed reaches the low limit [approximately 40 km/h (25 mph)] during deceleration, the auto-cruise control will be cancelled.

RETURN TO THE SET SPEED BEFORE CANCELLATION AND AUTO-CRUISE CONTROL CANCELLATION



ACX01172 AG

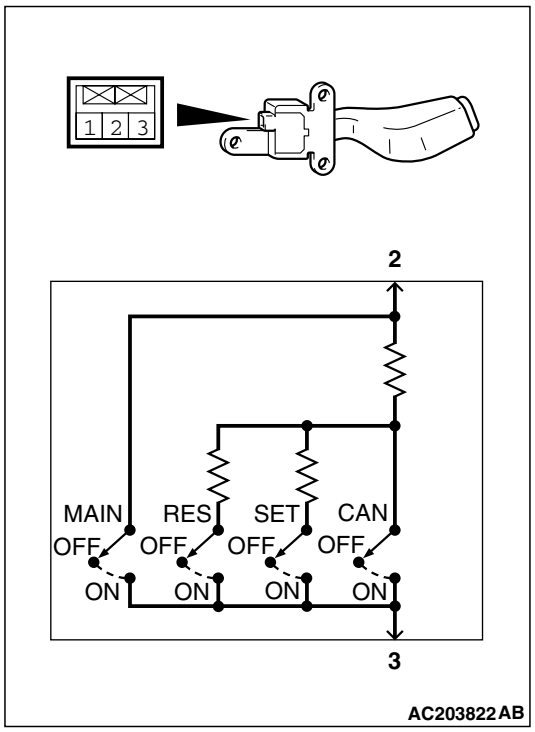
1. Set the auto-cruise speed control.
2. When any of the following operations are performed while at constant speed during auto-cruise control, check if normal driving is resumed and deceleration occurs.
   (1) The auto-cruise control switch is pulled in the direction of the arrow.
   (2) The brake pedal is depressed.
   (3) The selector lever is moved to the "N" range.
3. At a vehicle speed of 40 km/h (25 mph) or higher, check if when the "ACC/RES" switch is switched ON, the vehicle speed returns to the speed before auto-cruise control driving was cancelled, and constant speed driving occurs.
4. When the "CRUISE" (MAIN) switch is turned to the "OFF" while driving at constant speed, check if normal driving is resumed and deceleration occurs.

AUTO-CRUISE CONTROL SYSTEM COMPONENT CHECK

M1172001700316

AUTO-CRUISE CONTROL SWITCH CHECK

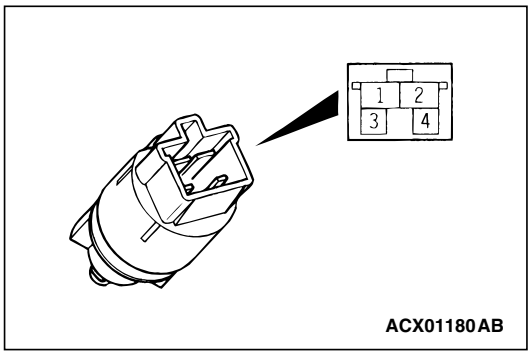
1. Remove the auto-cruise control switch. (Refer to P.17-78).



2. Measure the resistance between terminal 2 and terminal 3 when each of the "COAST/SET", "ACC/RES", "CANCEL" and "CRUISE" (MAIN) switches is pressed. If measure values measured at the time correspond to those in the table below, the resistance values are correct.

SWITCH POSITION	SPECIFIED CONDITION
"CRUISE" (MAIN) switch "OFF"	Open circuit
"CRUISE" (MAIN) switch "ON"	Less than 2 ohms
"CANCEL" switch ON	Approximately 100 Ω
"ACC/RES" switch ON	Approximately 887 Ω
"COAST/SET" switch ON	Approximately 300 Ω

STOPLIGHT SWITCH



1. Disconnect the connector.
2. Check for continuity between the terminals of the switch.

MEASUREMENT CONDITION	TERMINAL CONNECTOR OF TESTER	SPECIFIED CONDITION
When brake pedal is depressed.	1 – 2 (for stoplight circuit)	Less than 2 ohms
	3 – 4 (for auto-cruise control circuit)	Open circuit
When brake pedal is not depressed.	1 – 2 (for stoplight circuit)	Open circuit
	3 – 4 (for auto-cruise control circuit)	Less than 2 ohms

THROTTLE POSITION SENSOR

Refer to GROUP 13A, On-vehicle Service – Throttle Actuator Control Motor Check P.13A-1173 (2.4L engine).
Refer to GROUP 13B, On-vehicle Service – Throttle Actuator Control Motor Check P.13B-1436 (3.8L engine).

TRANSMISSION RANGE SWITCH ("N" POSITIN)

Refer to GROUP 23A, On-vehicle Service – Essential Service P.23A-372.

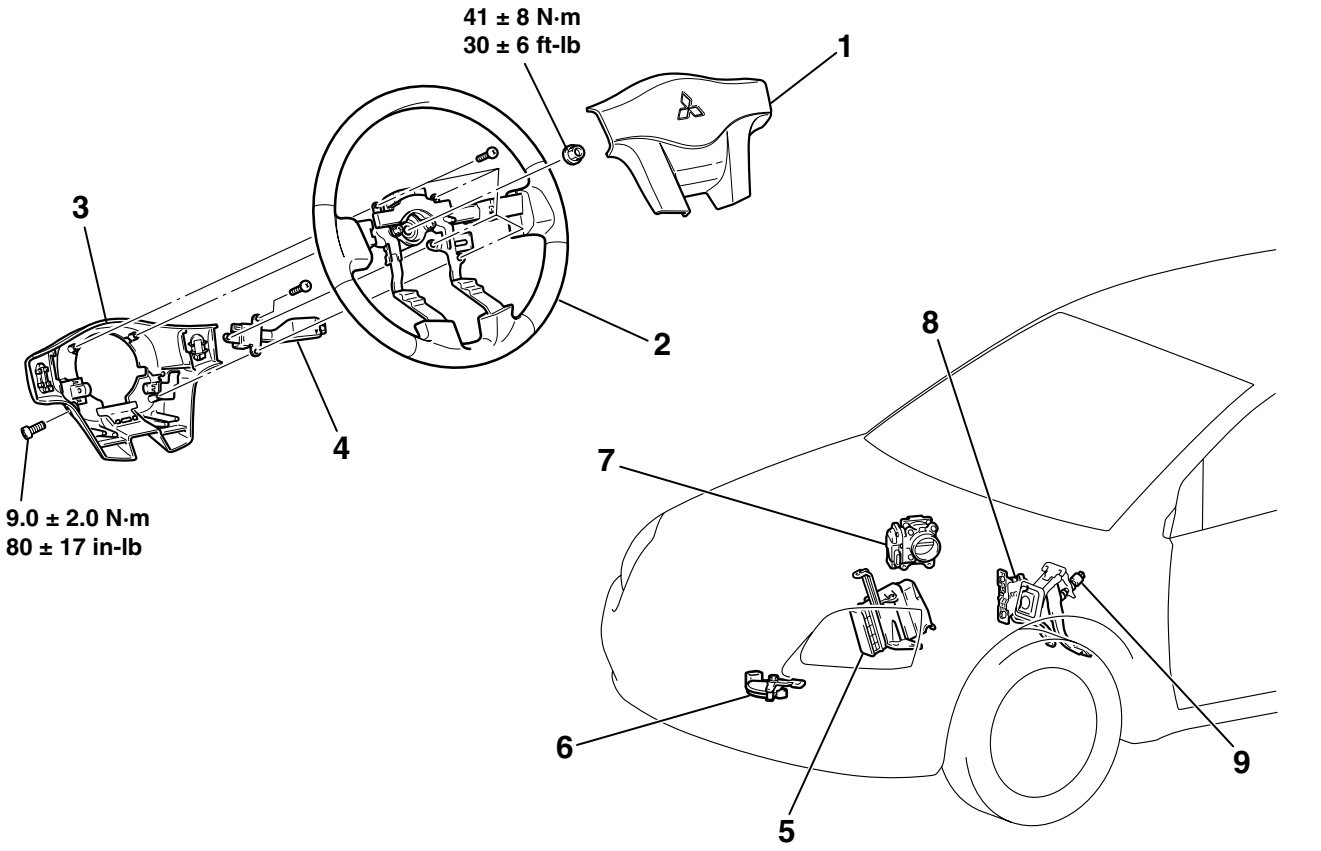
AUTO-CRUISE CONTROL

REMOVAL AND INSTALLATION

M1172001400605

⚠ WARNING

Before removal of the air bag module, refer to GROUP 52B, SRS Service Precautions P.52B-29 and GROUP 52B, Air Bag Module and Clock Spring P.52B-408.



AC600840AB

CONTROL SWITCH REMOVAL STEPS

1. AIR BAG MODULE <DRIVER'S SIDE> (REFER TO GROUP 52B, AIR BAG MODULES AND CLOCK SPRING P.52B-408)
2. STEERING WHEEL ASSEMBLY (REFER TO GROUP 37, STEERING WHEEL P.37-24)
3. LOWER COVER CAP
4. AUTO-CRUISE CONTROL SWITCH

CONTROL UNIT REMOVAL

5. POWERTRAIN CONTROL MODULE (PCM) [REFER TO GROUP 13A, POWERTRAIN CONTROL MODULE (PCM) P.13A-1180] <2.4L ENGINE> or [REFER TO GROUP 13B, POWERTRAIN CONTROL MODULE (PCM) P.13B-1447] <3.8L ENGINE>

SENSOR REMOVAL STEPS

6. TRANSMISSION RANGE SWITCH (REFER TO GROUP 23B, TRANSAXLEP.23B-8)
7. THROTTLE BODY (BUILT-IN THROTTLE POSITION SENSOR AND THROTTLE ACTUATOR CONTROL MOTOR) (REFER TO GROUP 13A, THROTTLE BODY P.13A-1178) <2.4L ENGINE> or (REFER TO GROUP 13B, THROTTLE BODY P.13B-1444) <3.8L ENGINE>
8. ACCELERATOR PEDAL (BUILT-IN ACCELERATOR PEDAL POSITION SENSOR) (REFER TO GROUP 17, ACCELERATOR PEDAL P.17-8)
9. STOPLIGHT SWITCH (REFER TO GROUP 35A, BRAKE PEDAL P.35A-24)

TSB Revision

EMISSION CONTROL

GENERAL DESCRIPTION

M1173000100314

The emission control system consists of the following subsystems:

- Positive crankcase ventilation system
- Evaporative emission system
- Exhaust emission control system

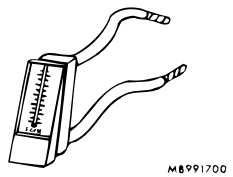
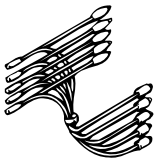
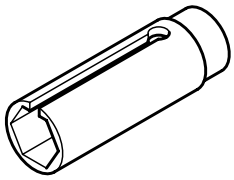
DIAGNOSIS

M1173000700112

SYMPTOM	PROBABLE CAUSE	REMEDY
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	The EGR valve (Stepper Motor) is not closed.	Repair or replace
	Malfunction of the evaporative emission purge solenoid	Repair or replace
Rough idle or engine stalls	The EGR valve (Stepper Motor) is not closed.	Repair or replace
	Vacuum hose disconnected or damaged.	Repair or replace
	Malfunction of the positive crankcase ventilation valve	Replace
	Malfunction of the purge control system	Check the system; If there is a problem, check its component parts.
Engine hesitates or poor acceleration	Malfunction of the exhaust gas recirculation system	Check the system; If there is a problem, check its component parts.
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system
Poor fuel mileage	Malfunction of the exhaust gas recirculation system	Check the system; If there is a problem, check its component parts.

SPECIAL TOOLS

M1173000600193

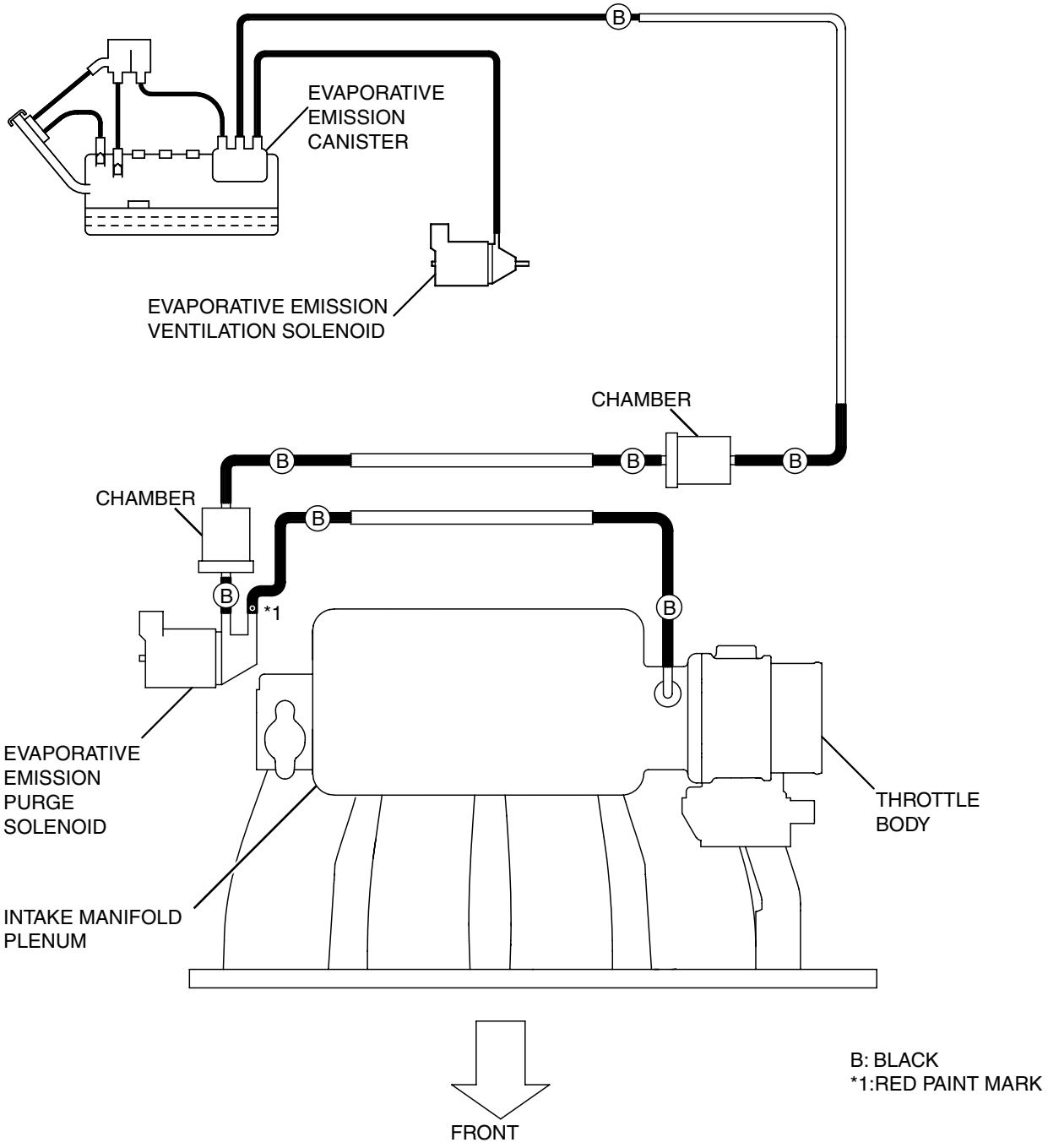
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991700	MB995061 Purge flow indicator	MLR6890A Part of MIT280220	Inspection of purge control system
 MB991658	MB991658 Test harness set	Tool not available	Inspection of EGR valve (Stepper Motor)
	MD998770 Oxygen sensor wrench	MD998770-01 or General service tool	Removal/installation of heated oxygen sensor

VACUUM HOSES

VACUUM HOSE ROUTING

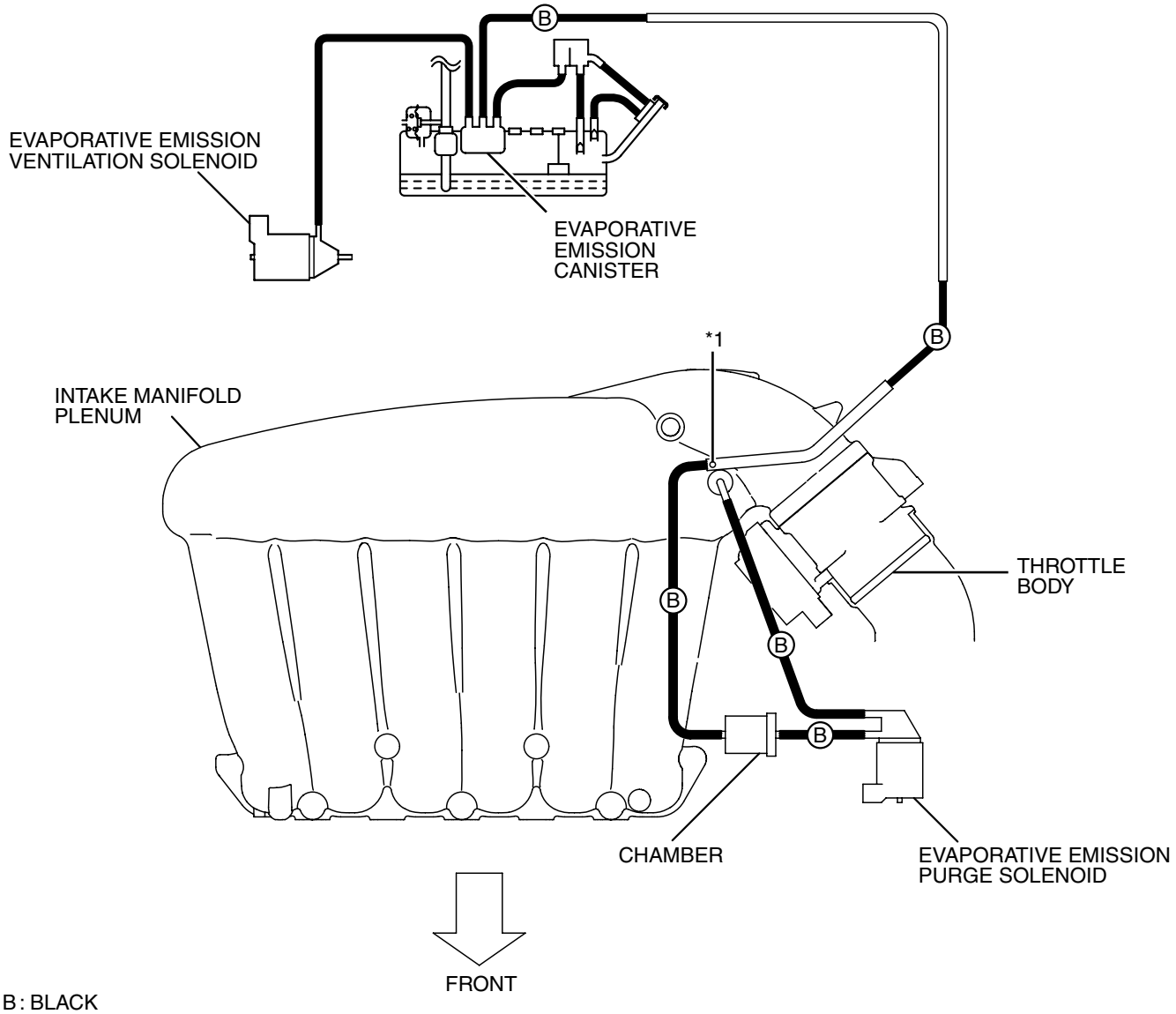
M1173000900945

<2.4L ENGINE>



AK301809AB

<3.8L ENGINE (EXCEPT MIVEC) >

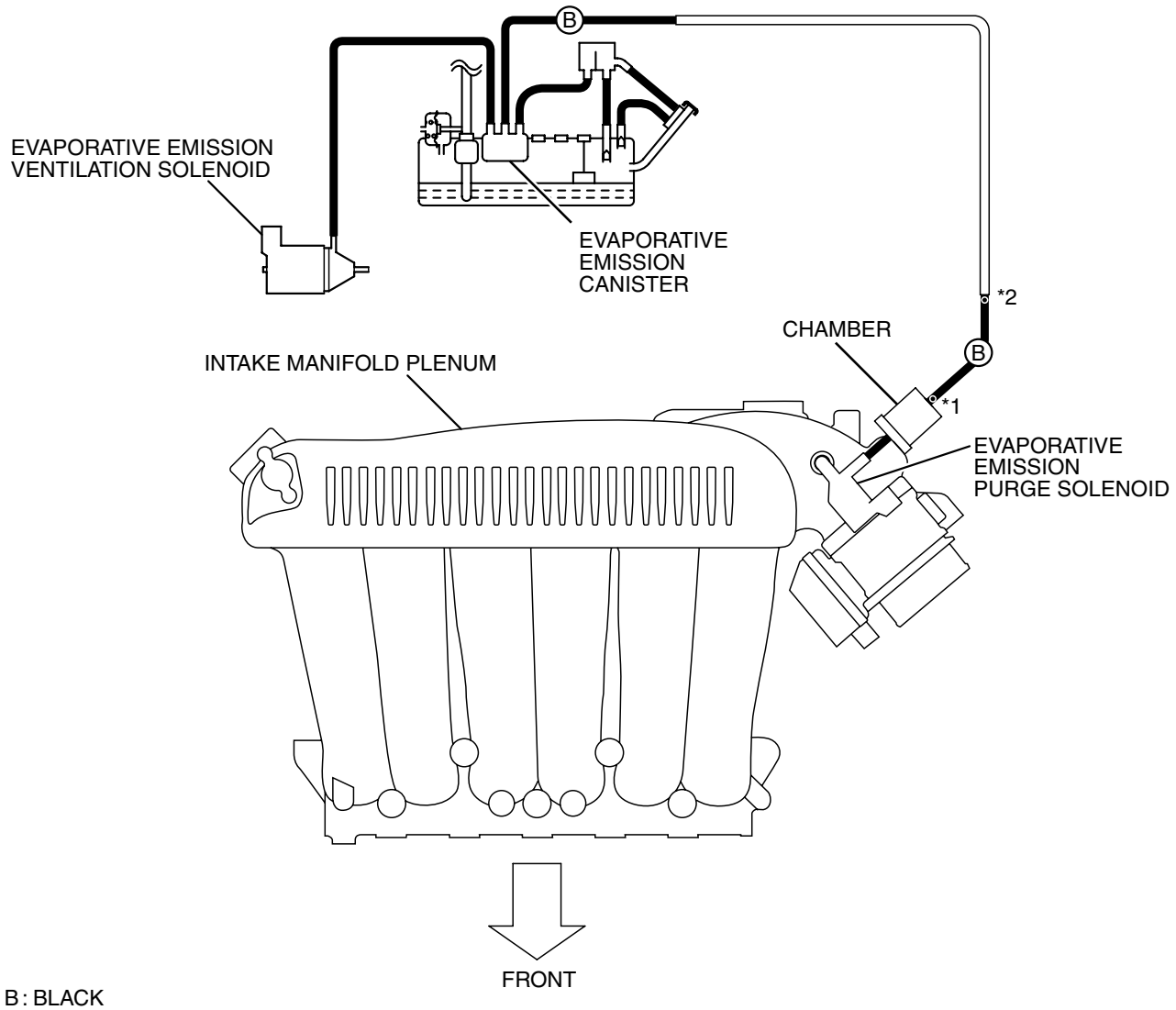


B : BLACK
*1:WHITE PAINT MARK

AK301810AB

TSB Revision

<3.8L ENGINE (MIVEC) >



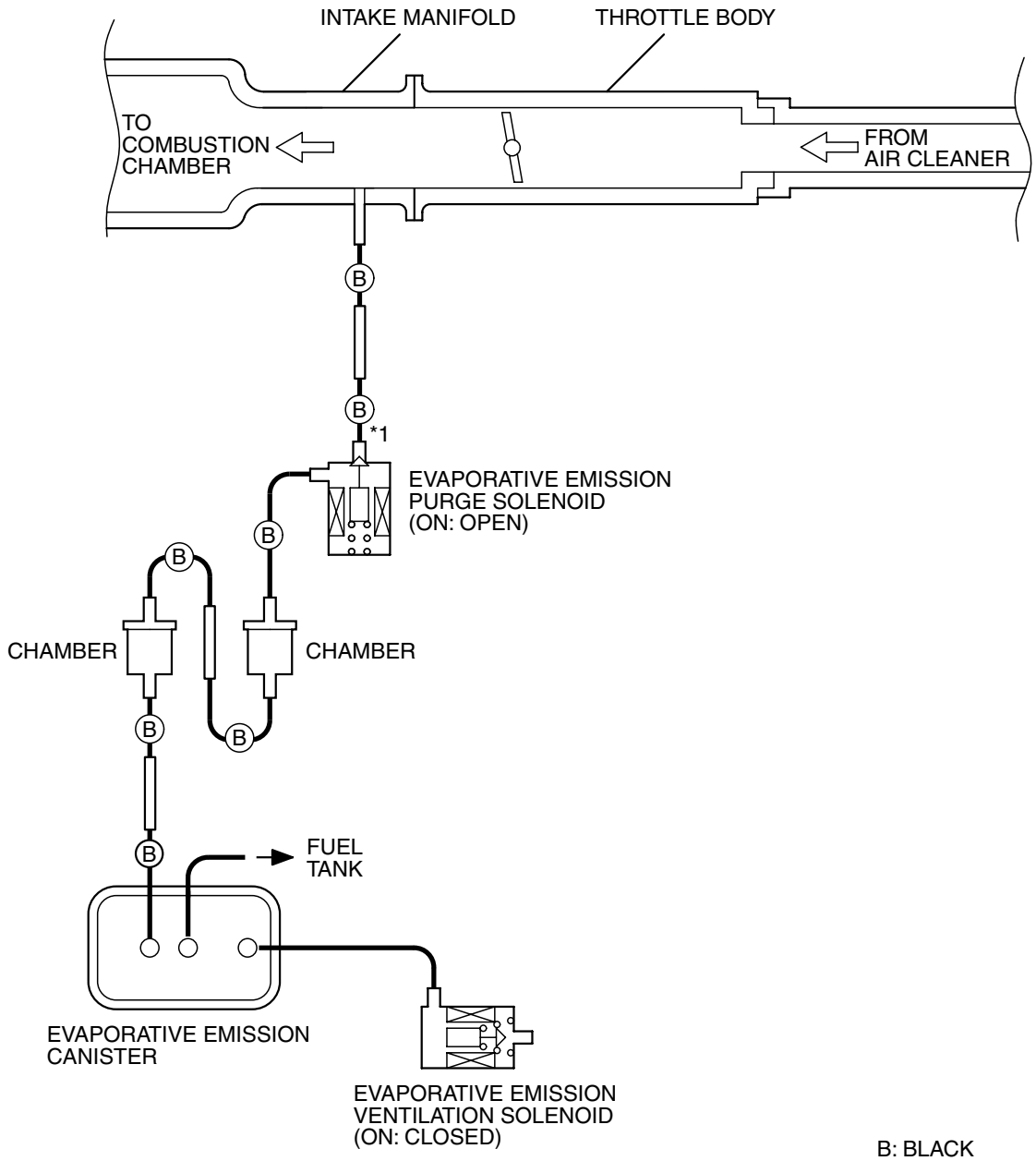
B : BLACK
*1:WHITE PAINT MARK
*2:YELLOW PAINT MARK

AK404091AB

VACUUM CIRCUIT DIAGRAM

M1173007100694

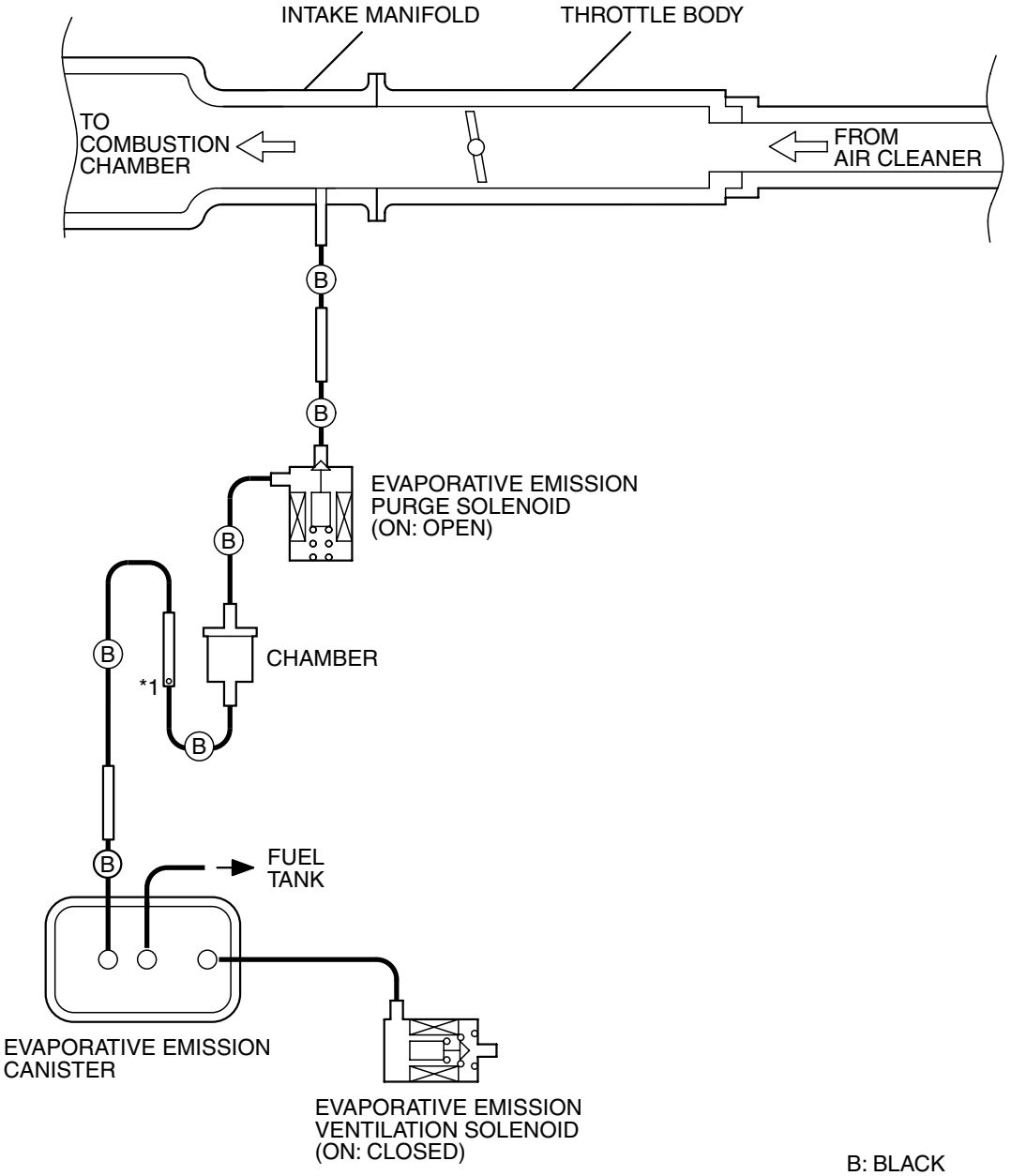
<2.4L ENGINE>



B: BLACK
*1:RED PAINT MARK

AK301813 AB

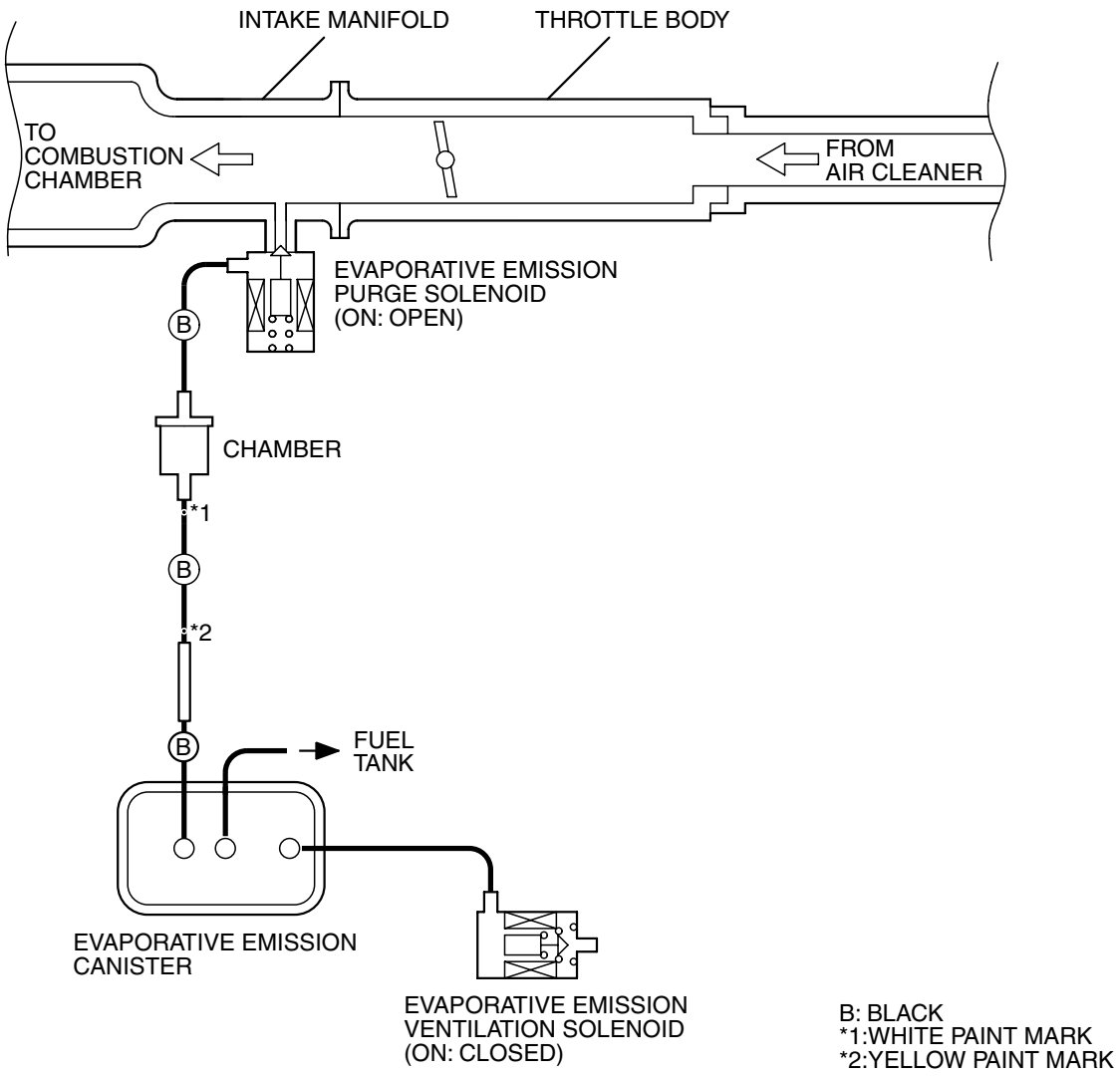
<3.8L ENGINE (EXCEPT MIVEC) >



B: BLACK
*1:WHITE PAINT MARK

AK301814 AB

<3.8L ENGINE (MIVEC) >



AK404093 AB

VACUUM HOSE INSTALLATION

M1173007200129

1. When connecting the vacuum hoses, they should be securely inserted onto the nipples.
2. Connect the hoses correctly, using the VACUUM HOSE ROUTING diagram as a guide.

VACUUM HOSE CHECK

M1173007300171

1. Using the VACUUM HOSE ROUTING diagram as a guide, check that the vacuum hoses are correctly connected.
2. Check the connection of the vacuum hoses, (removed, loose, etc.) and confirm that there are no sharp bends or damage.

TSB Revision

POSITIVE CRANKCASE VENTILATION SYSTEM

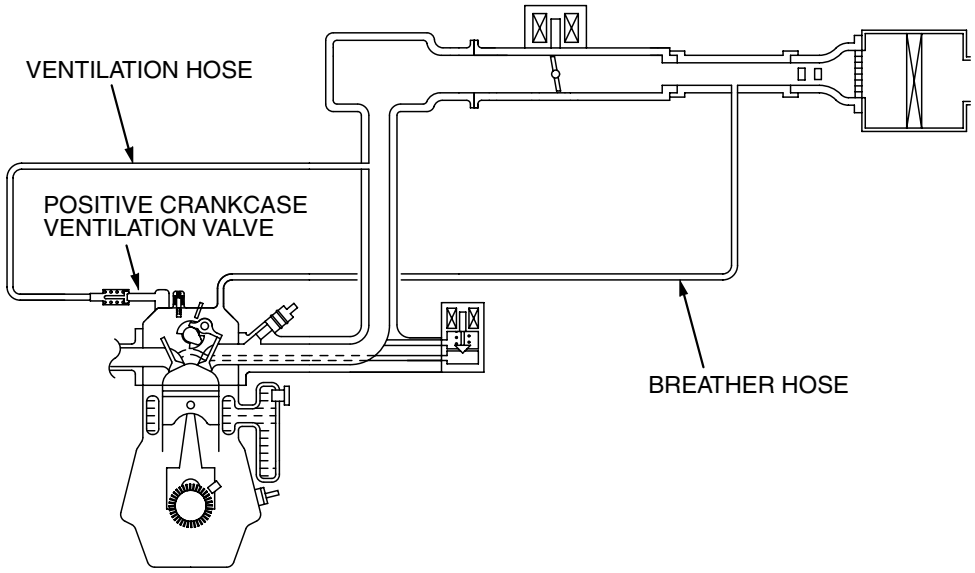
GENERAL DESCRIPTION (POSITIVE CRANKCASE VENTILATION SYSTEM)

M1173005000293

The positive crankcase ventilation (PCV) system prevents the escape of blow-by gases from inside the crankcase into the atmosphere.
Fresh air is sent from the air cleaner into the crankcase through the breather hose to be mixed with the blow-by gas inside the crankcase.
The blow-by gas inside the crankcase is drawn into the intake manifold through the PCV valve.
The PCV valve is designed to lift the plunger according to the intake manifold vacuum so as to regulate the flow of blow-by gas properly.
In other words, the blow-by gas flow is regulated during low load engine operation to maintain engine stability, while the flow is increased during high load operation to improve the ventilation performance.

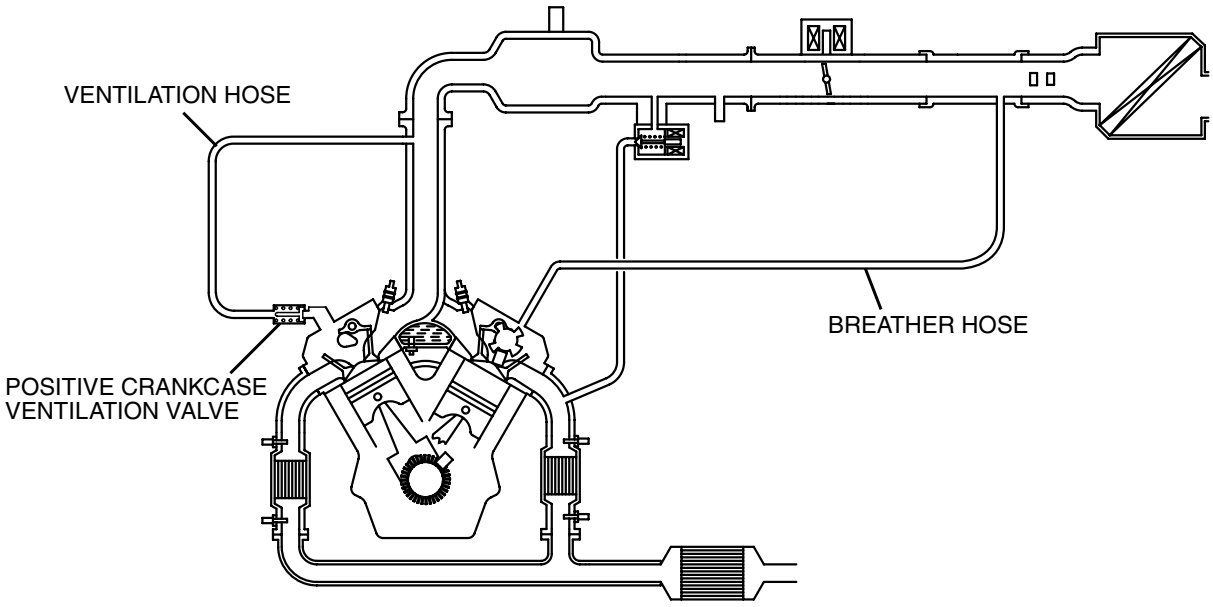
SYSTEM DIAGRAM

<2.4L ENGINE>



AK300553 AB

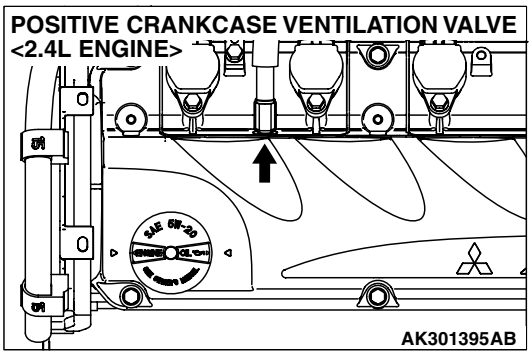
<3.8L ENGINE>

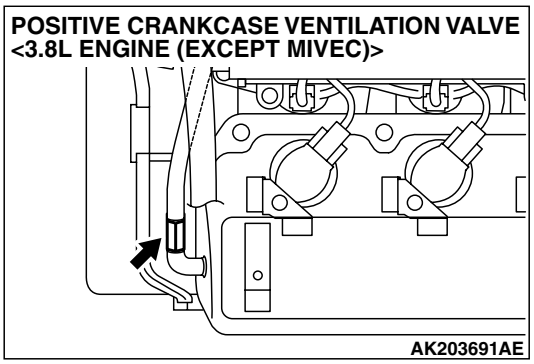


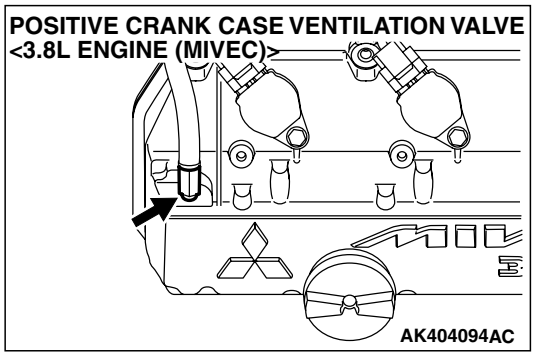
AK303639 AB

COMPONENT LOCATION

M1173007400521





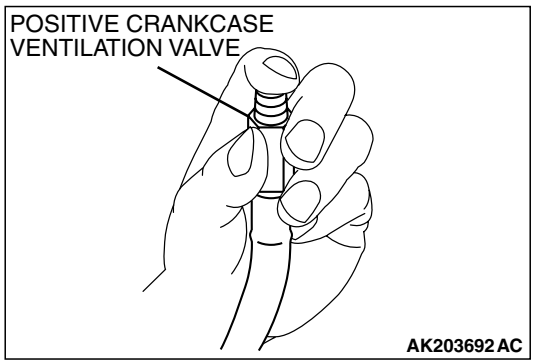


POSITIVE CRANKCASE VENTILATION SYSTEM CHECK

M1173001100232

1. Remove the positive crankcase ventilation (PCV) valve from the rocker cover, then reconnect the PCV valve to the vacuum supply hose.

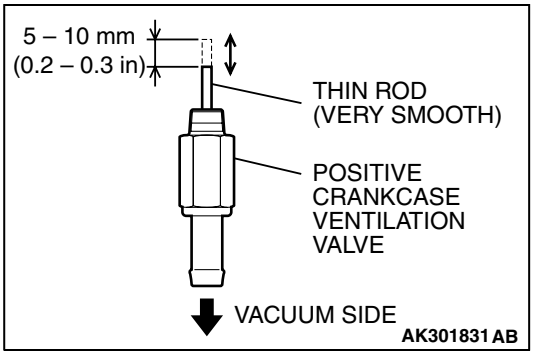
TSB Revision



2. With the engine idling, put your finger on the open end of the PCV valve, and check for negative pressure (vacuum).
   NOTE: At this time, the plunger in the PCV valve should move back and forth as the open end is covered and uncovered.
3. If negative pressure is not felt, clean or replace the PCV valve. Inspect the vacuum supply hose and vacuum supply hose port for restriction or plugged condition.

POSITIVE CRANKCASE VENTILATION VALVE CHECK

M1173001200228



1. Hold the positive crankcase ventilation (PCV) valve with the vacuum side down. Insert a thin rod, and using light pressure, depress the end of the PCV valve spring by 5 – 10 mm (0.2 – 0.3 inch). Release pressure on the rod to see if the PCV valve spring will lift the rod to its original position.
2. If the rod returns quickly to its original position, the PCV valve is OK. If the stick does not return quickly, clean or replace the PCV valve.

EVAPORATIVE EMISSION CONTROL SYSTEM

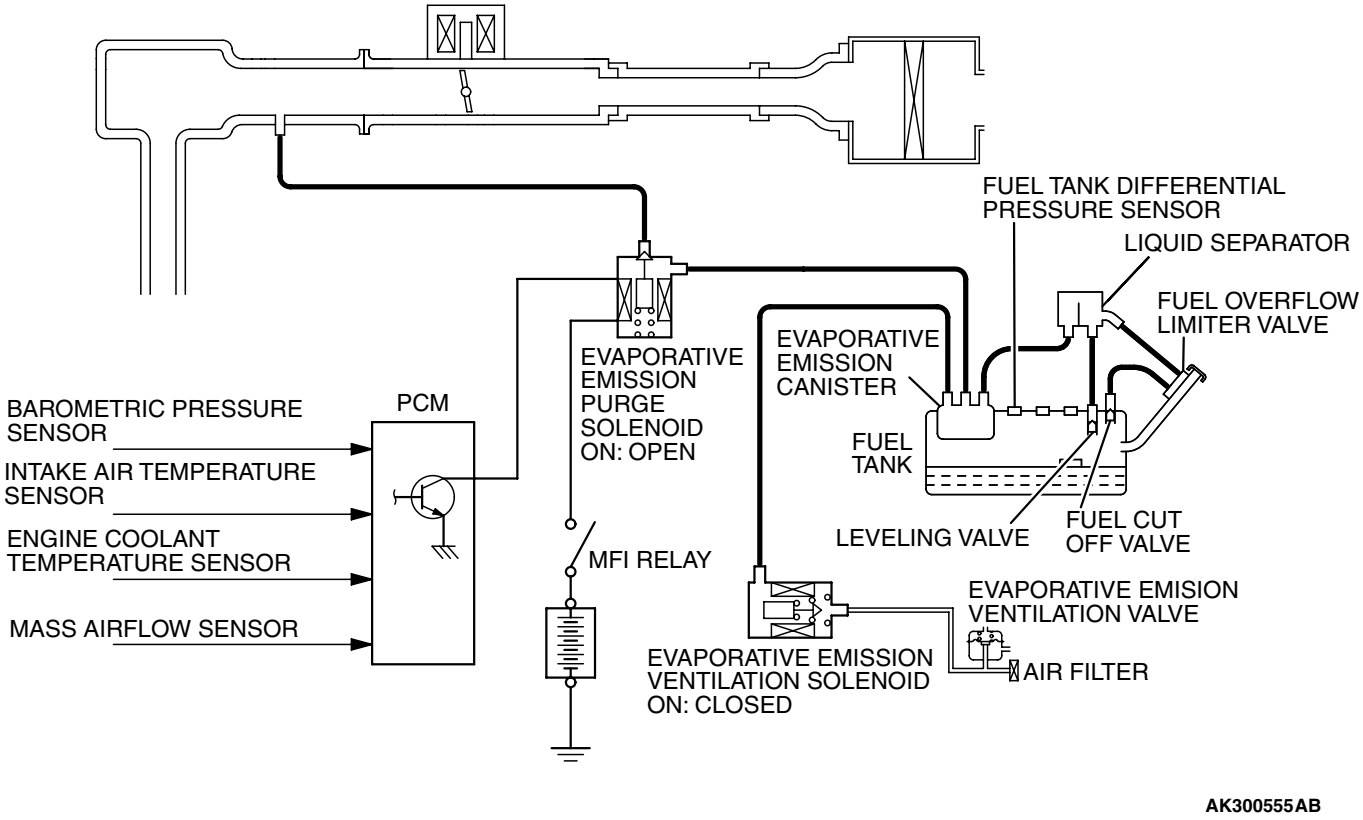
GENERAL DESCRIPTION (EVAPORATIVE EMISSION SYSTEM)

M1173005100706

The evaporative emission (EVAP) system prevents fuel vapors generated in the fuel tank from escaping into the atmosphere.
Fuel vapors from the fuel tank flow through the vapor pipe/hose to be stored temporarily in the EVAP canister.
When the vehicle is in operation, fuel vapors stored in the EVAP canister flow through the EVAP purge solenoid, purge port and intake manifold plenum to the combustion chamber.
When the engine coolant temperature is low or when the intake air quantity is small (when the engine is at idle, for example), the powertrain control module (PCM) brings the EVAP purge solenoid into the OFF state to shut off the fuel vapor flow to the intake manifold plenum. This ensures driveability when the engine is cold or running under low load and also stabilizes the emission level.
An EVAP ventilation solenoid is provided between the EVAP canister and atmosphere to monitor for OBD-II EVAP leaks. This solenoid is normally OFF. However, it turns ON when monitoring the OBD-II EVAP leaks and shuts off the atmosphere flow to the EVAP canister. Then the fuel tank differential pressure sensor monitors the fuel vapor pressure to detect OBD-II EVAP leaks. The fuel overflow limiter valve and the leveling valve prevent fuel from being overfilled. The fuel overflow limiter valve and the leveling valve prevents fuel leaks if the vehicle is rolled over in an accident.
The EVAP ventilation valve releases the air from the fuel tank through the EVAP canister into the atmosphere when the fuel tank pressure increases due to refueling, etc. The EVAP ventilation valve and the air filter supply the atmospheric air to the EVAP canister when the fuel tank pressure decreases.

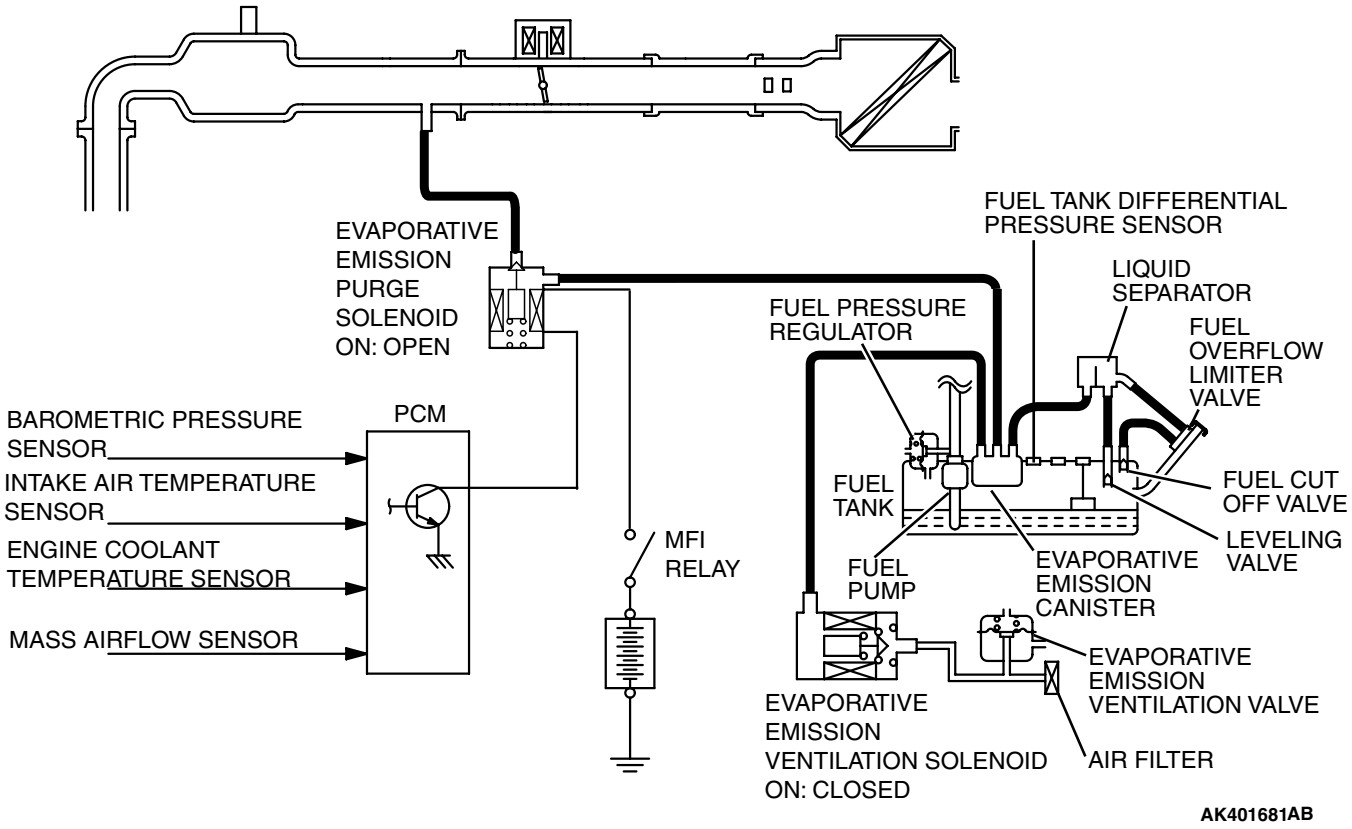
SYSTEM DIAGRAM

<2.4L ENGINE>



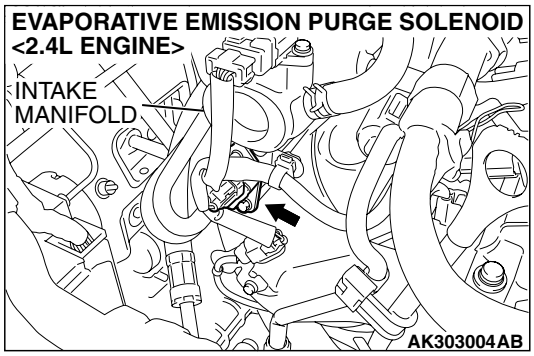
AK300555AB

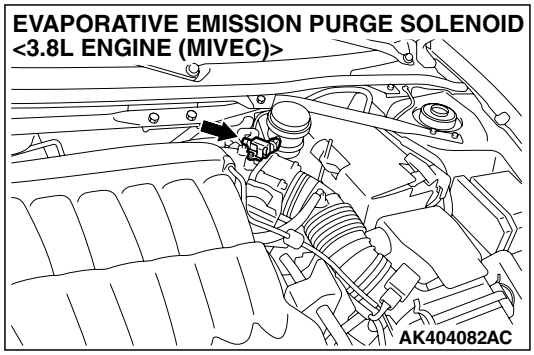
<3.8L ENGINE>

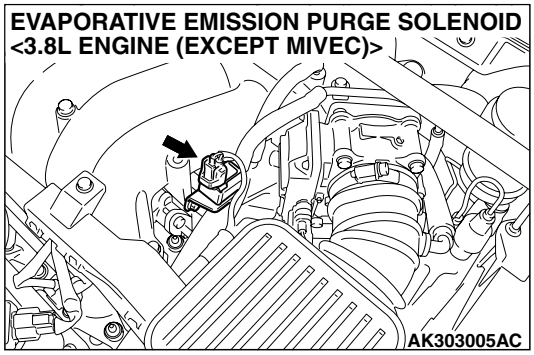


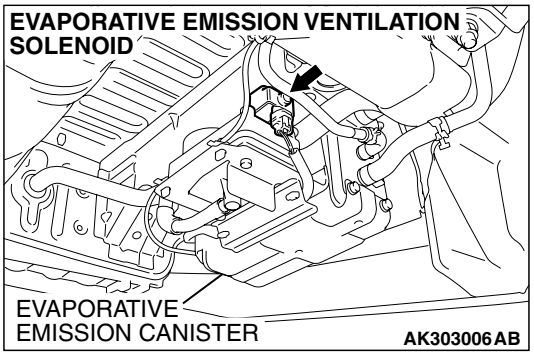
COMPONENT LOCATION

M1173007500528





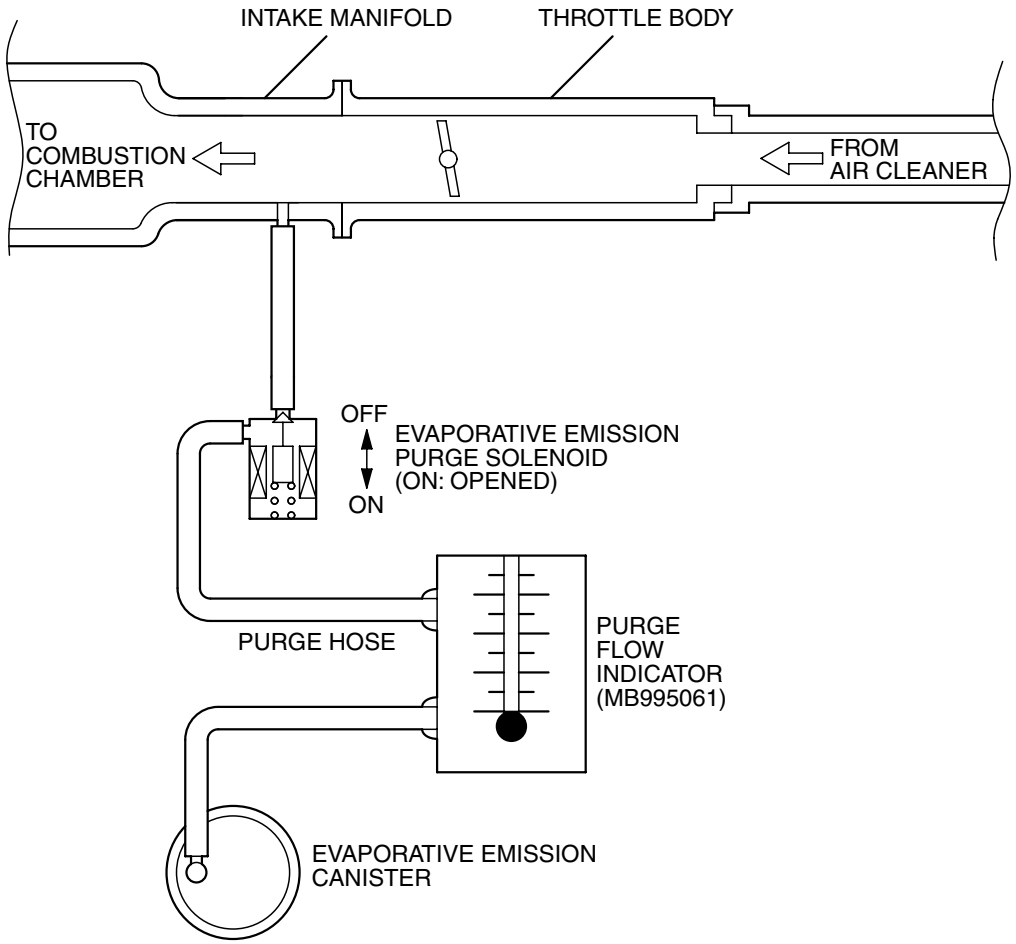




TSB Revision

PURGE CONTROL SYSTEM CHECK (PURGE FLOW CHECK)

M1173001400620



AK300556 AB

Required Special Tool:
MB995061: Purge Flow Indicator

1. Disconnect the purge hose from the evaporative emission (EVAP) purge solenoid, and connect special tool MB995061 between the EVAP purge solenoid and the purge hose.
2. Before inspection, set the vehicle in the following conditions:
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights, electric cooling fan and accessories: OFF
   - Transaxle: P range

   NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.
3. Run the engine at idle for more than four minutes.
4. Check the purge flow volume when engine is revved suddenly several times.

   Standard value: Momentarily 20 cm^3/s (2.5 SCFH) or more.

TSB Revision

5. If the purge flow volume is less than the standard value, check it again with the vacuum hose disconnected from the EVAP canister. If the purge flow volume is less than the standard value, check the vacuum port and the vacuum hose for clogging. Also check the EVAP purge solenoid. If the purge flow volume is at the standard value, replace the EVAP canister.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

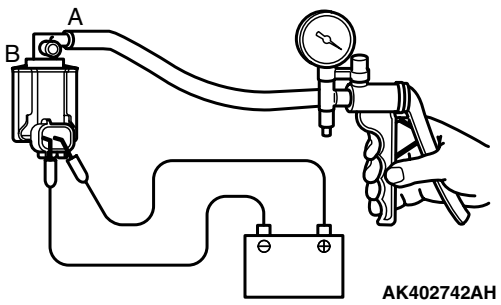
M1173001700557

1. Disconnect the vacuum hose (black, black with red paint mark) from the evaporative emission (EVAP) purge solenoid.

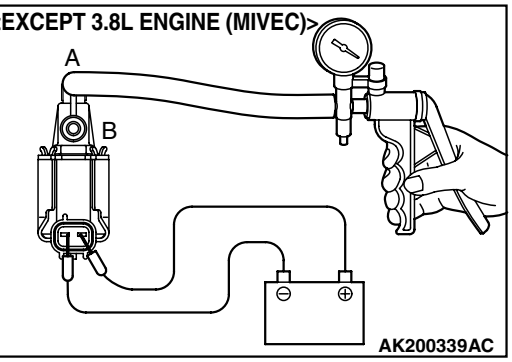
   NOTE: When disconnecting the vacuum hose, always place an identification mark so that it can be reconnected at its original position.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to nipple (A) of the EVAP purge solenoid (refer to the illustration at left).
4. As described in the chart below, check airtightness by applying a vacuum with voltage applied directly from the battery to the EVAP purge solenoid valve and without applying voltage.

BATTERY POSITIVE VOLTAGE	NORMAL CONDITION
Applied	Vacuum leaks
Not applied	Vacuum maintained

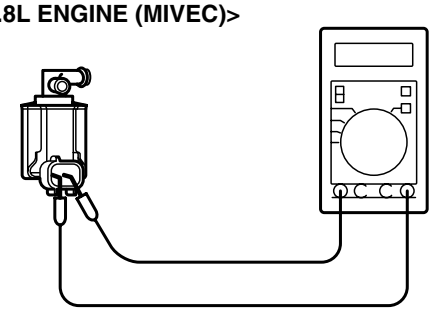
<3.8L ENGINE (MIVEC)>



<EXCEPT 3.8L ENGINE (MIVEC)>

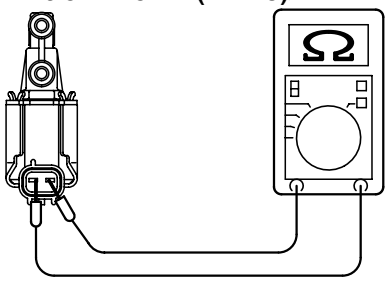


<3.8L ENGINE (MIVEC)>



AK402743AF

<EXCEPT 3.8L ENGINE (MIVEC)>



AK600586AB

5. Measure the resistance between the terminals of the EVAP purge solenoid.
   Standard value: 22 – 26 Ω [at 20°C (68°F)]
6. Replace the solenoid if resistance is out of specification.

MASS AIRFLOW SENSOR CHECK

M1173050400053

<2.4L ENGINE>

To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) <2.4L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-45.

<3.8L ENGINE>

To inspect these parts, refer to GROUP 13B, Multiport Fuel Injection (MFI) <3.8L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-46.

BAROMETRIC PRESSURE SENSOR CHECK

M1173008000269

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A, Multiport Fuel Injection (MFI) <2.4L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-45.

<3.8L ENGINE>

To inspect the sensor, refer to GROUP 13B, Multiport Fuel Injection (MFI) <3.8L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-46.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1173008100523

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A, Multiport Fuel Injection (MFI) <2.4L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-45.

<3.8L ENGINE>

To inspect the sensor, refer to GROUP 13B, Multiport Fuel Injection (MFI) <3.8L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-46.

INTAKE AIR TEMPERATURE SENSOR CHECK

M1173008200263

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A, Multiport Fuel Injection (MFI) <2.4L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-45.

<3.8L ENGINE>

To inspect the sensor, refer to GROUP 13B, Multiport Fuel Injection (MFI) <3.8L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-46.

FUEL TANK DIFFERENTIAL PRESSURE SENSOR CHECK

M1173007700221

To inspect the sensor, refer to GROUP 13C, Fuel Supply – Fuel Tank – Fuel Tank Inspection – Fuel Tank Differential Pressure Sensor Check P.13C-14.

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

M1173007800206

Refer to Emission Control – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve – Inspection – Evaporative Emission Ventilation Solenoid Check P.17-103.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL DESCRIPTION (EXHAUST GAS RECIRCULATION SYSTEM)

M1173005200554

The exhaust gas recirculation system (EGR) lowers the nitrogen oxides (NOx) emission level. When the air/fuel mixture combustion temperature is high, a large quantity of NOx is generated in the combustion chamber. Therefore, this system recirculates part of exhaust gas from the exhaust port of the cylinder head to the combustion chamber through the intake manifold to decrease the air/fuel mixture combustion temperature, resulting in reduction of NOx. The EGR flow rate is controlled by the EGR valve (Stepper Motor) for driveability quality.

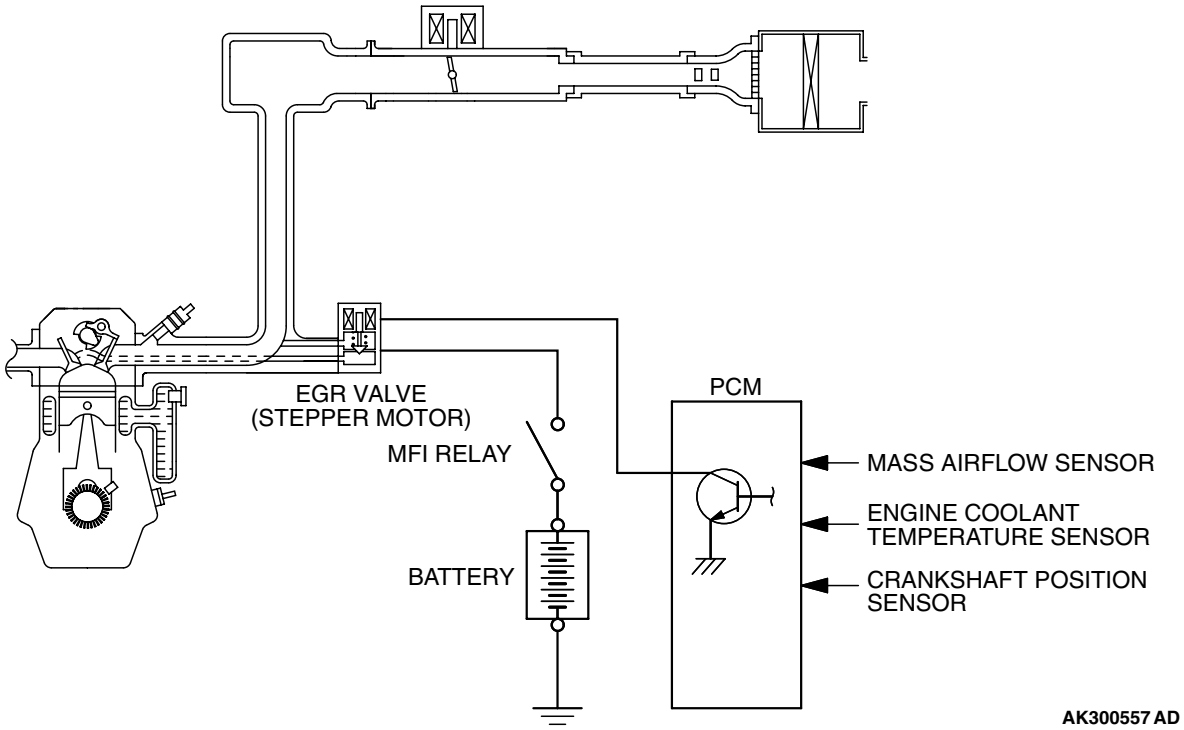
OPERATION

When the engine coolant temperature is low, when the engine is at idle or when a wide open throttle operation is performed, the EGR valve (Stepper Motor) is kept closed, achieving no EGR. After warming up of the engine, the EGR valve (Stepper Motor) can be opened by the powertrain control module (PCM).

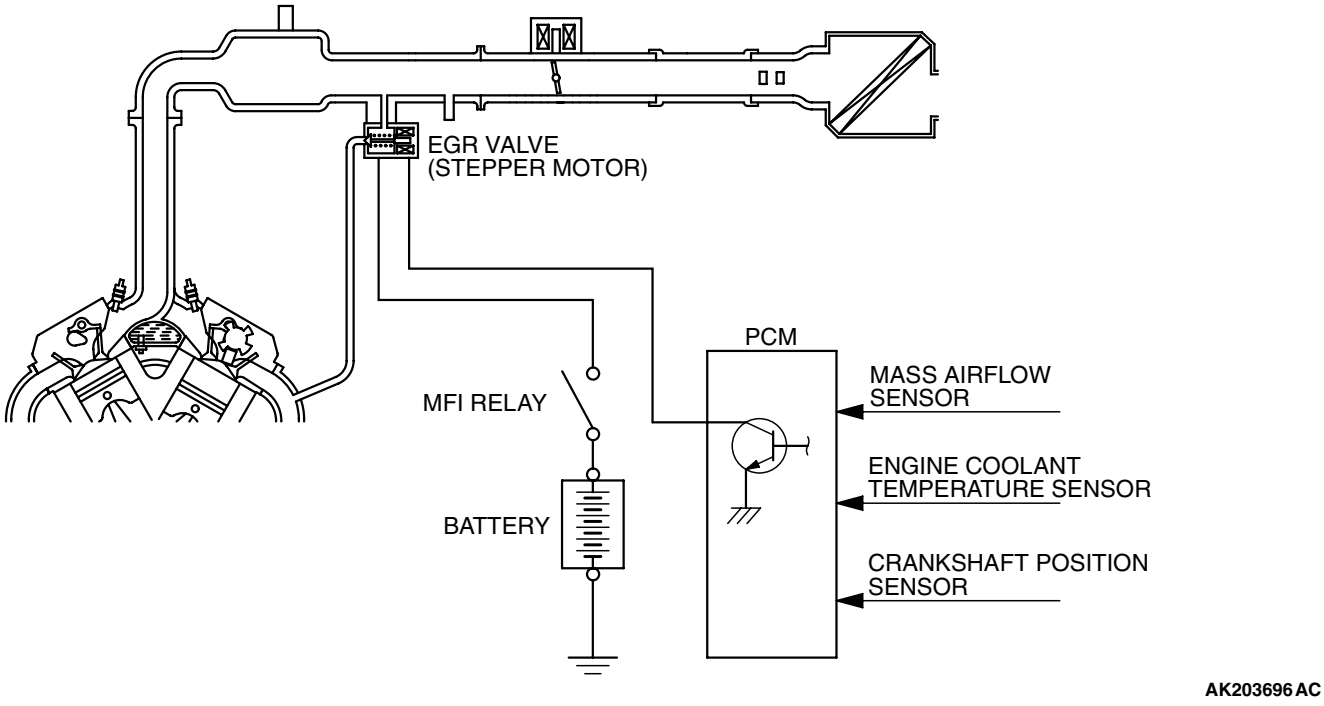
The PCM monitors the EGR system and illuminates the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) to indicate that there is a malfunction.

SYSTEM DIAGRAM

<2.4L ENGINE>

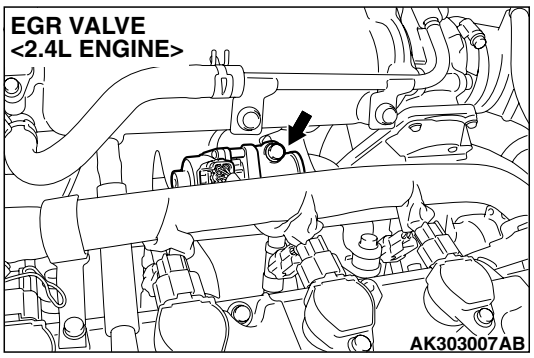


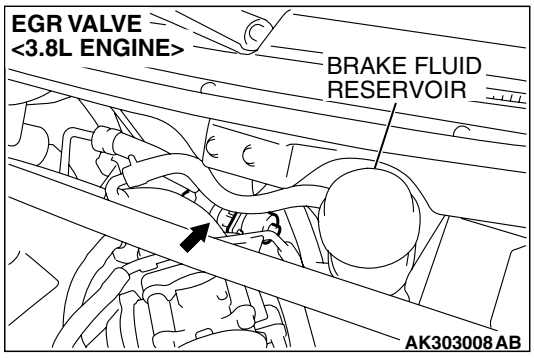
<3.8L ENGINE>



COMPONENT LOCATION

M1173007600213





EGR VALVE (STEPPER MOTOR) CHECK

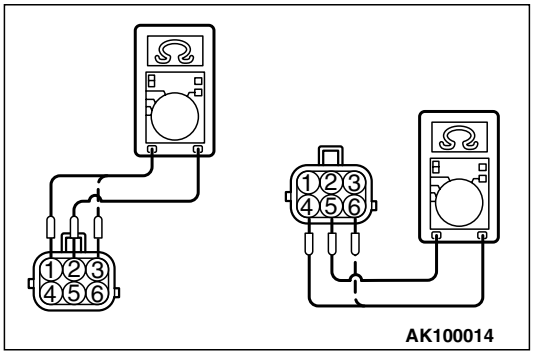
M1173050200123

Required Special Tool:
MB991658: Test Harness Set

Checking the Operation Sound

1. Check that the operation sound of the stepper motor can be heard from the EGR valve when the ignition switch is turned ON (without starting the engine).
2. If the operation sound cannot be heard, inspect the drive circuit of the stepper motor.

NOTE: If the operation sound is not heard, and the circuit is normal, either the stepper motor or the PCM may have failed.



Checking the Coil Resistance

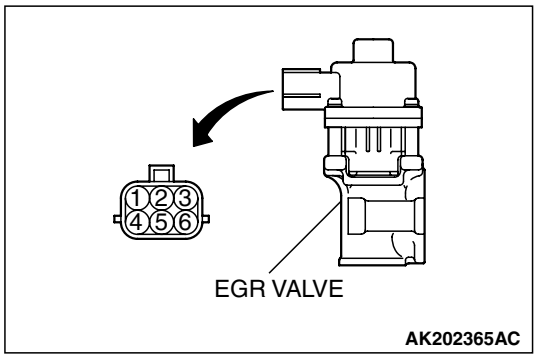
1. Remove the EGR valve.
2. Measure the resistance between terminal No. 2 and either terminal No. 1 or terminal No. 3 of the connector at the EGR valve.

   Standard value: 20 – 24 Ω [at 20°C (68°F)]
3. If the resistance is not within the standard, replace the EGR valve.
4. Measure the resistance between terminal No. 5 and either terminal No. 6 or terminal No. 4 of the connector at the EGR valve.

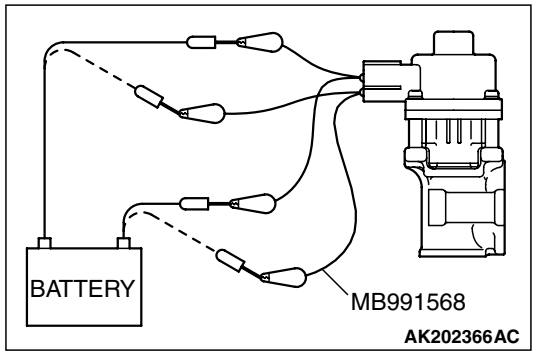
   Standard value: 20 – 24 Ω [at 20°C (68°F)]
5. If the resistance is not within the standard, replace the EGR valve.

Operation Check

1. Remove the EGR valve.



2. Connect special tool MB991658 to the EGR valve.



3. Connect the positive (+) terminal the battery to terminal No. 2.

⚠ CAUTION
Connecting battery voltage to the EGR valve for a long term could damage the coil.

4. Connect terminals 1 and 3 to the negative (-) terminal of the battery, in order to test whether the stepper motor vibrates (with a slight shudder), indicating that the stepper motor is operating.
5. Connect the positive (+) terminal the battery to terminal No. 5.

⚠ CAUTION
Connecting battery voltage to the EGR valve for a long term could damage the coil.

6. Connect terminals 4 and 6 to the negative (-) terminal of the battery, in order to test whether the stepper motor vibrates (with a slight shudder), indicating that the stepper motor is operating.
7. If vibrations can be felt as a result of the test, the stepper motor is determined to be normal.

EGR VALVE (STEPPER MOTOR) CLEANING

M1173050300012

NOTE: DO not use solvents or other cleaning agents, which will enter the motor and cause a malfunction.
Remove the EGR valve and make sure that it is not stuck and does not have any carbon deposits. If there are any carbon deposits, use a wire brush to clean it.

MASS AIRFLOW SENSOR CHECK

M1173050400064

<2.4L ENGINE>

To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) <2.4L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-45.

<3.8L ENGINE>

To inspect these parts, refer to GROUP 13B, Multiport Fuel Injection (MFI) <3.8L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-46.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1173008100534

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A, Multiport Fuel Injection (MFI) <2.4L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-45.

<3.8L ENGINE>

To inspect the sensor, refer to GROUP 13B, Multiport Fuel Injection (MFI) <3.8L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-46.

CRANKSHAFT POSITION SENSOR CHECK

M1173008300271

<2.4L ENGINE>

To inspect the sensor, refer to GROUP 13A, Multiport Fuel Injection (MFI) <2.4L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13A-45.

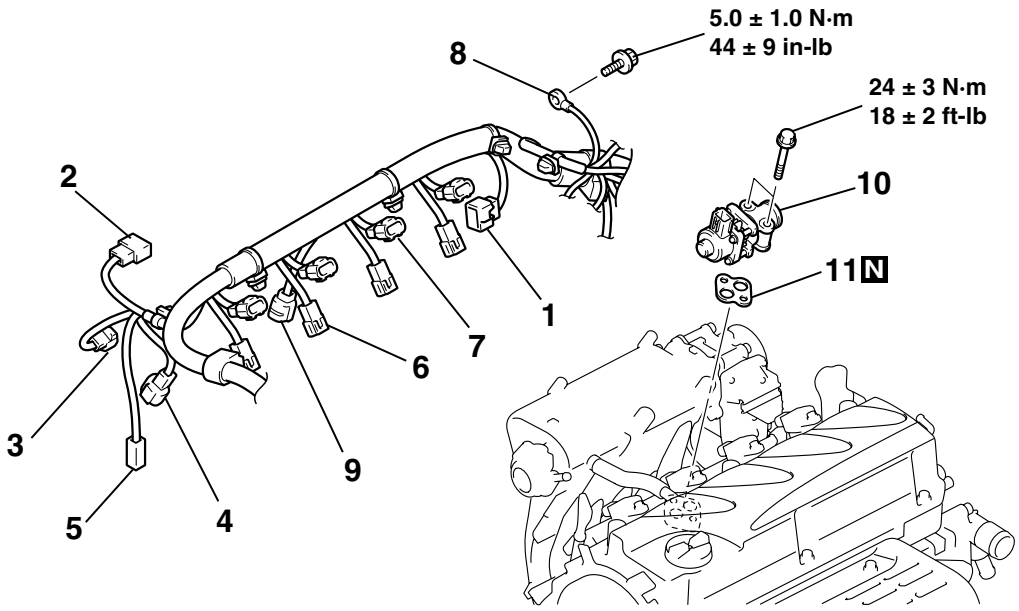
<3.8L ENGINE>

To inspect the sensor, refer to GROUP 13B, Multiport Fuel Injection (MFI) <3.8L Engine> – Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13B-46.

REMOVAL AND INSTALLATION <2.4L ENGINE>

M1173010500216

Pre-removal and Post-installation Operation
Air Cleaner Cover, Air Intake Hose and Resonator Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4).



AC307977AB

TSB Revision

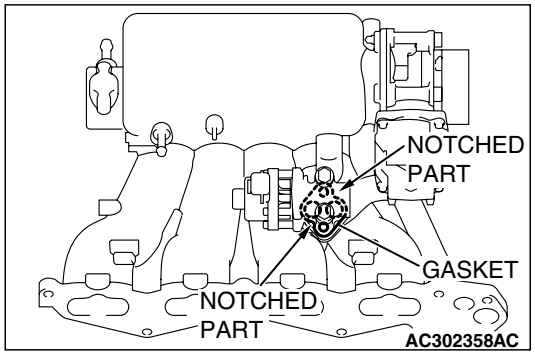
REMOVAL STEPS
1. THROTTLE BODY ASSEMBLY CONNECTOR
2. MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR
3. EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
4. KNOCK SENSOR CONNECTOR

REMOVAL STEPS (Continued)
5. POWER STEERING PRESSURE SWITCH CONNECTOR
6. INJECTOR CONNECTOR
7. IGNITION COIL CONNECTOR
8. GROUNDING
9. EGR VALVE CONNECTOR
10. EGR VALVE

>>**A**<< 11. EGR VALVE GASKET

INSTAIIATION SERVICE POINT

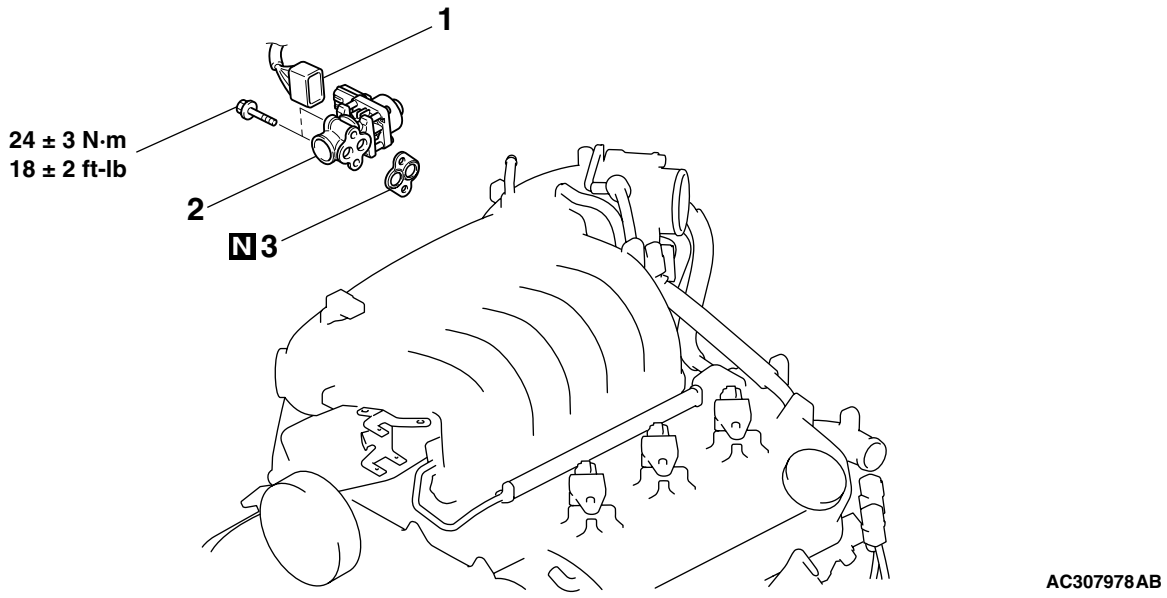
>>A<< EGR VALVE GASKET INSTALLATION
Install the EGR valve gasket as shown in the illustration.



REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

M1173010500669

Pre-removal and Post-installation Operation
Strut Tower Bar Removal and Installation (Refer to GROUP 42, Strut Tower Bar P.42-11.)



REMOVAL STEPS
1. EGR VALVE CONNECTOR

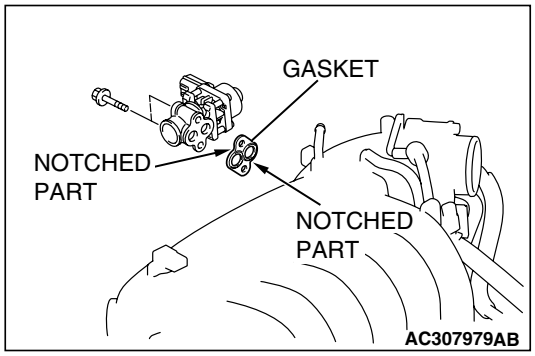
REMOVAL STEPS (Continued)
2. EGR VALVE

>>**A**<< 3. EGR VALVE GASKET

TSB Revision

INSTAIIATION SERVICE POINT

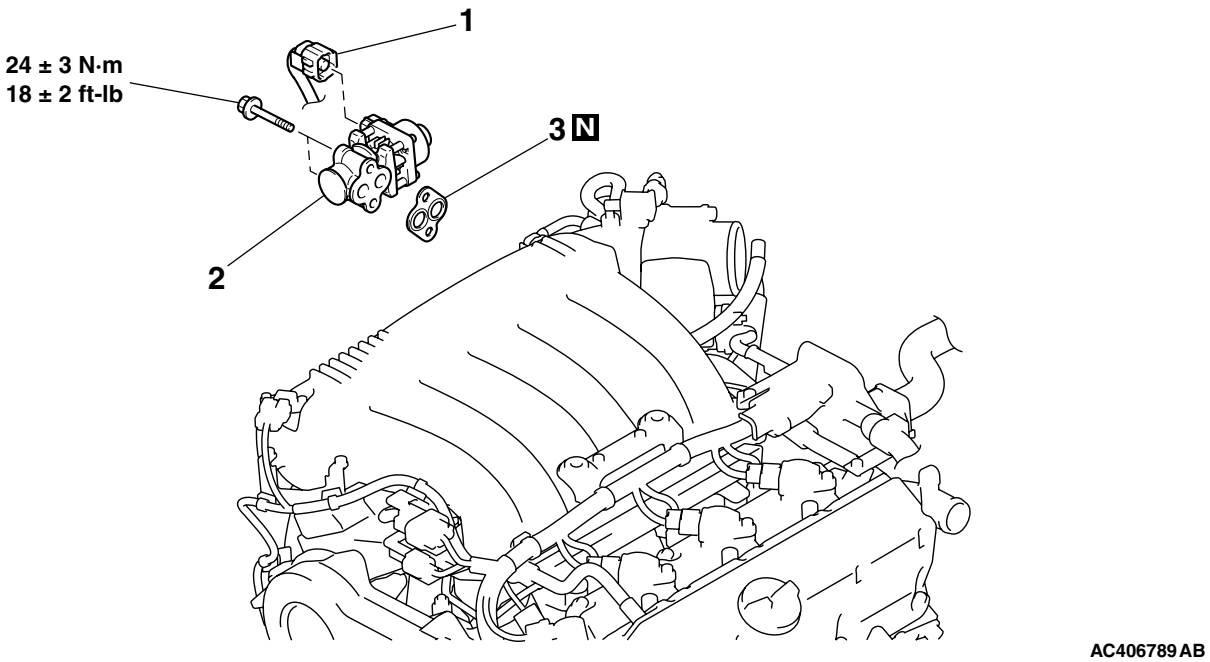
>>A<< EGR VALVE GASKET INSTALLATION
Install the EGR valve gasket as shown in the illustration.



REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

M1173010500670

Pre-removal and Post-installation Operation
Strut Tower Bar Removal and Installation (Refer to GROUP 42, Strut Tower Bar P.42-11).

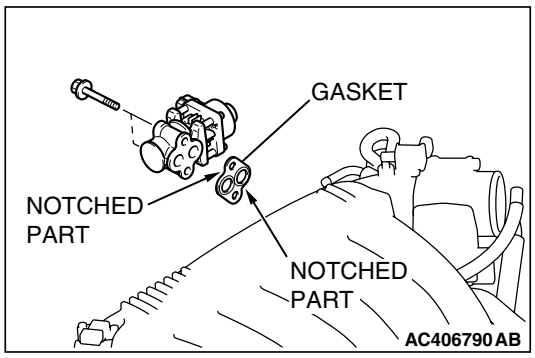


REMOVAL STEPS
1. EGR VALVE CONNECTOR

REMOVAL STEPS (Continued)
2. EGR VALVE
>>A<< 3. EGR VALVE GASKET

INSTALLATION SERVICE POINT

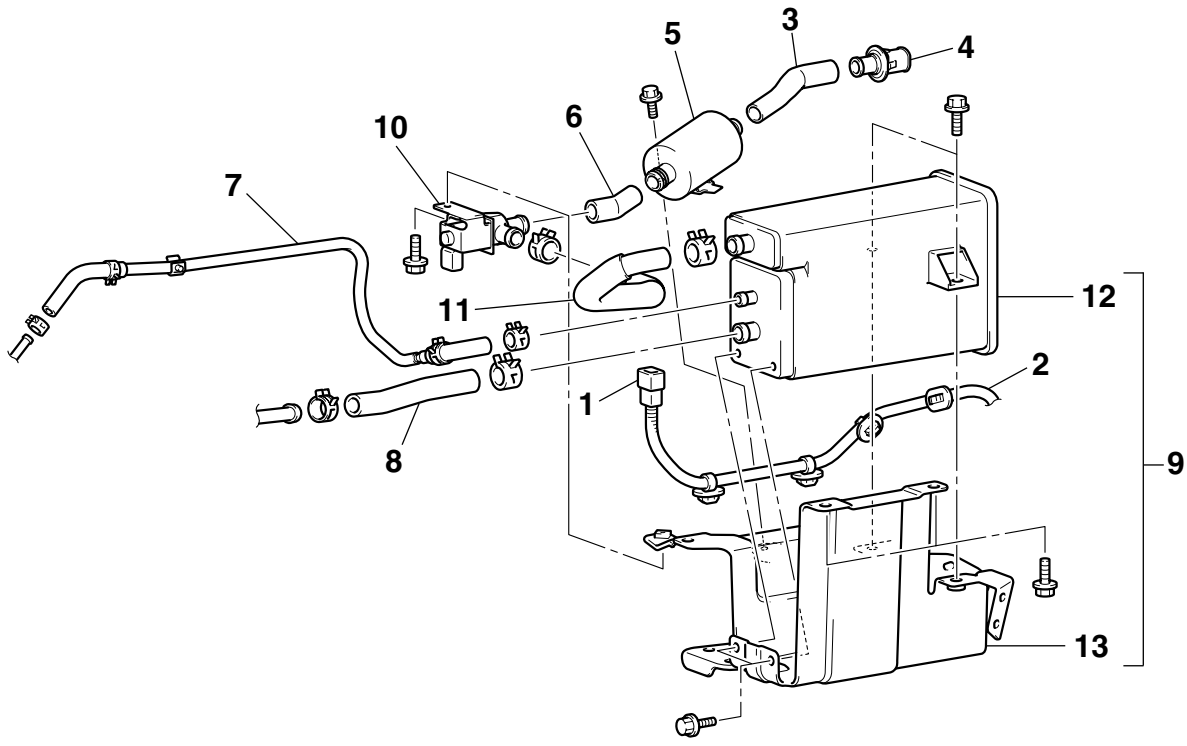
>>A<< EGR VALVE GASKET INSTALLATION
Install the EGR valve gasket as shown in the illustration.



EVAPORATIVE EMISSION CANISTER AND FUEL TANK PRESSURE RELIEF VALVE

REMOVAL AND INSTALLATION

M1173004800445



REMOVAL STEPS
1. EVAPORATIVE EMISSION VENTILATION SOLENOID CONNECTOR
2. WIRING HARNESS CLAMP CONNECTION
3. VENT HOSE D
4. VENT PIPE
5. AIR FILTER
6. VENT HOSE C
7. PURGE HOSE ASSEMBLY
8. VAPOR HOSE

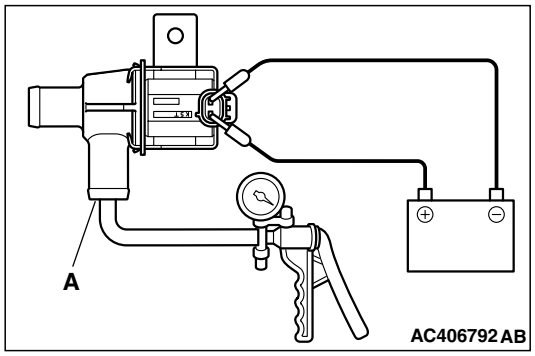
REMOVAL STEPS (Continued)
9. EVAPORATIVE EMISSION VENTILATION SOLENOID AND EVAPORATIVE EMISSION CANISTER ASSEMBLY
10. EVAPORATIVE EMISSION VENTILATION SOLENOID
11. VENT HOSE A
12. EVAPORATIVE EMISSION CANISTER
13. EVAPORATIVE EMISSION CANISTER BRACKET

TSB Revision

INSPECTION

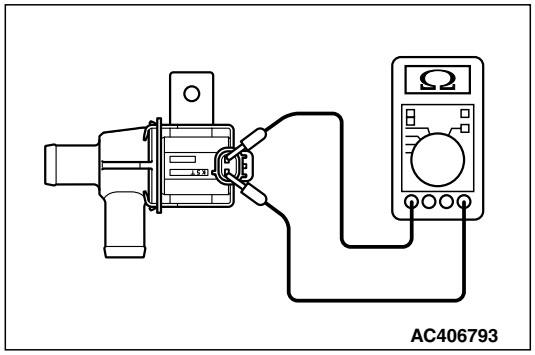
M1173004900204

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK



1. Connect a hand vacuum pump to nipple (A) of the solenoid.
2. Check air tightness by applying a vacuum with voltage applied directly from the battery to the evaporative emission ventilation solenoid and without applying voltage.

BATTERY VOLTAGE	NORMAL CONDITION
Applied	Vacuum maintained
Not applied	Vacuum leaks



3. Measure the resistance between the terminals of the solenoid.

   Standard value: 17 – 21 Ω [at 20°C (68°F)]

CATALYTIC CONVERTER

GENERAL DESCRIPTION (CATALYTIC CONVERTER)

M1173005300131

The three way catalytic converter, together with the closed loop air-fuel ratio control based on the oxygen sensor signal, oxidizes carbon monoxides (CO) and hydrocarbons (HC), also reduces nitrogen oxides (NOx).

When the mixture is controlled at stoichiometric air-fuel ratio, the three way catalytic converter provides the highest purification against the three constituents, namely, CO, HC and NOx.

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1173006400324

ITEM	SPECIFICATION
Auto-cruise control system	
Lower cover cap bolt	9.0 ± 2.0 N·m (80 ± 17 in-lb)
Steering wheel assembly nut	41 ± 8 N·m (30 ± 6 ft-lb)
Emission control system	
EGR valve bolt	24 ± 3 N·m (18 ± 2 ft-lb)
Grounding bolt <2.4L Engine>	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Engine control system	
Accelerator pedal assembly nut	13 ± 2 N·m (111 ± 22 in-lb)

SERVICE SPECIFICATIONS

M1173000300545

ITEMS	STANDARD VALUE
Emission control system	
Purge flow cm^3/s (SCFH) [at 80 – 95°C (176 – 205°F) with sudden revving]	20 (2.5)
Evaporative emission purge solenoid coil resistance [at 20°C (68°F)] Ω	22 – 26
EGR valve (Stepper Motor) connector resistance [at 20°C (68°F)] Ω	20 – 24
Evaporative emission ventilation solenoid coil resistance [at 20°C (68°F)] Ω	17 – 21

GROUP 23

AUTOMATIC TRANSAXLE(TRANSMISSION)

CONTENTS

GROUP 23A

AUTOMATIC TRANSAXLE

CONTENTS

GENERAL DESCRIPTION

M1231000100593

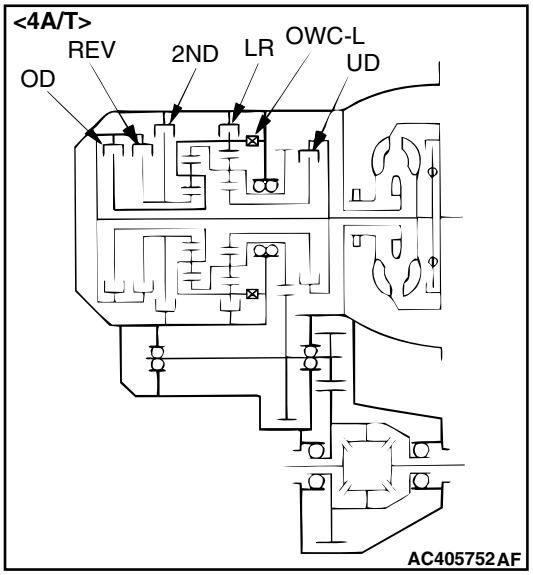
F4A4B and F5A5A models have been established.

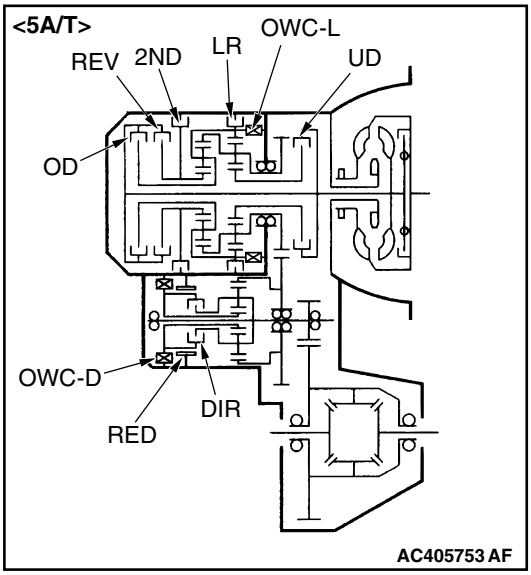
ITEM		SPECIFICATION		
Transaxle model		F4A4B-4-L1Z	F5A5A-4-C4Z	F5A5A-4-C3Z
Engine model		4G69-MPI-MIVEC	6G75-MPI	6G75-MPI-MIVEC
Torque converter	Type	3-element, 1-stage, 2-phase type		
	Lock-up	Provided		
	Stall torque ratio	2.0	1.7	
Transaxle type		4 forward speeds, 1 reverse speed, fully automatic	5 forward speeds, 1 reverse speed, fully automatic	
Transaxle gear ratio	1st	2.842	3.789	
	2nd	1.573	2.162	
	3rd	1.000	1.421	
	4th	0.688	1.000	
	5th	–	0.686	
	Reverse	2.214	3.117	
Final reduction ratio (Differential gear ratio)		4.212	3.325	
Clutch		Multi-disc type 3 sets	Multi-disc type 4 sets	
Brake		Multi-disc type 2 sets	Multi-disc type 2 sets, band type 1 set	
Manual control system		P-R-N-D (4 position) + Sport mode (up, down)		
Shift pattern control		Electronic control (INVECS - II)		
Hydraulic control during shifting		Electronic control (Each clutch hydraulically independently controlled)		
Torque converter clutch control		Electronic control		
Transmission fluid	Specified lubricants	DIAMOND ATF SP III		
	Quantity dm^3 (qt)	7.7 (8.1)	8.4 (8.9)	

TRANSAXLE

The transaxle is made up of the torque converter and gear train. A 3-element, 1-stage, 2-phase torque converter with built-in torque converter clutch is used. The gear train is made up of four sets of multi-disc clutches, two sets of multi-plate brakes, one set of one-way clutches and two sets of planetary gears. The planetary gears are made up of sun gears, carriers, pinion gears and annulus gears.

TRANSAXLE CONFIGURATION DRAWING





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.
Direct clutch <5A/T>	DIR	connects the direct sun gear to the direct planetary carrier.
Overdrive clutch	OD	connects the input shaft to the overdrive 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 <5A/T>	RED	holds the direct sun gear.
One-way clutch-L	OWC-L	restricts the rotation direction of the low-reverse annulus gear.
One-way clutch-D <5A/T>	OWC-D	controls rotation direction of the direct sun gear.

FUNCTION ELEMENT TABLE <4A/T>

OPERATING ELEMENT / TRANSMISSION RANGE		ENGINE START	PARKING MECHANISM	UNDER DRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)	ONE-WAY CLUTCH
P	Parking	OK	×	–	–	–	×	–	–
R	Reverse	–	–	–	×	–	×	–	–
N	Neutral	OK	–	–	–	–	×	–	–

TSB Revision

OPERATING ELEMENT / TRANSMISSION RANGE			ENGINE START	PARKING MECHANISM	UNDER DRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)	ONE-WAY CLUTCH
D	Sport mode	1st	–	–	×	–	–	×*	–	×
		2nd	–	–	×	–	–	–	×	–
		3rd	–	–	×	–	×	–	–	–
		4th	–	–	–	–	×	–	×	–

×: Function element –: Not applicable

*NOTE: * operates only when the vehicle is stationary [at approximately 10 km/h (6.2 mph) or less].*

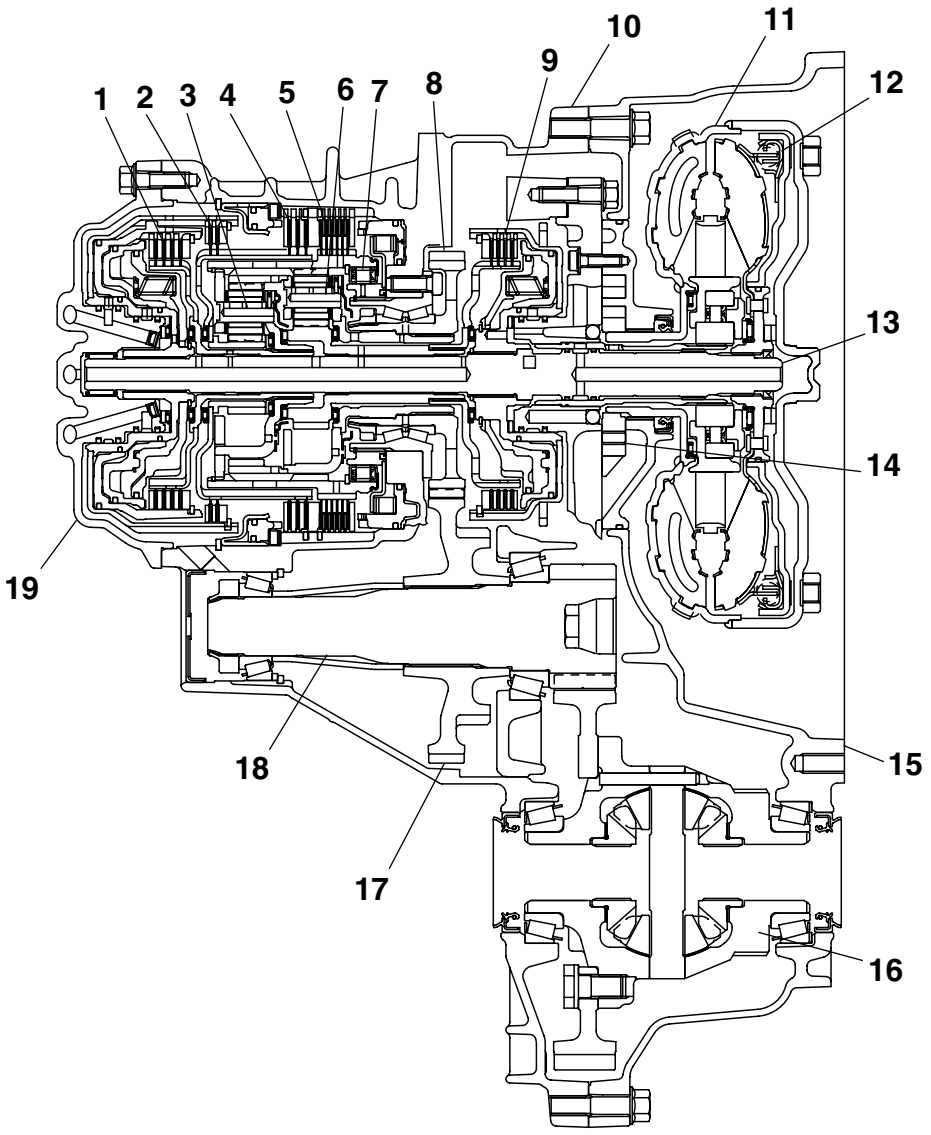
FUNCTION ELEMENT TABLE <5A/T>

OPERATING ELEMENT / SELECTOR LEVER POSITION			ENGINE START	PARKING MECHANISM	UNDERDRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	DIRECT CLUTCH (DIR)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)	REDUCTION BRAKE (RED)	ONE-WAY CLUTCH (OWC-L)	ONE-WAY CLUTCH (OWC-D)
P		Parking	OK	×	–	–	–	–	×	–	×	–	–
R		Reverse	–	–	–	×	–	–	×	–	×	–	–
N		Neutral	OK	–	–	–	–	–	×	–	×	–	–
D	Sport mode	1st	–	–	×	–	–	–	×*	–	×	×	×
		2nd	–	–	×	–	–	–	–	×	×	–	×
		3rd	–	–	×	–	×	–	–	–	×	–	×
		4th	–	–	×	–	×	×	–	–	–	–	–
		5th	–	–	–	–	×	×	–	×	–	–	–

×: Function element –: Not applicable

*NOTE: * operates only when the vehicle is stationary [at approximately 10 km/h (6.2 mph) or less].*

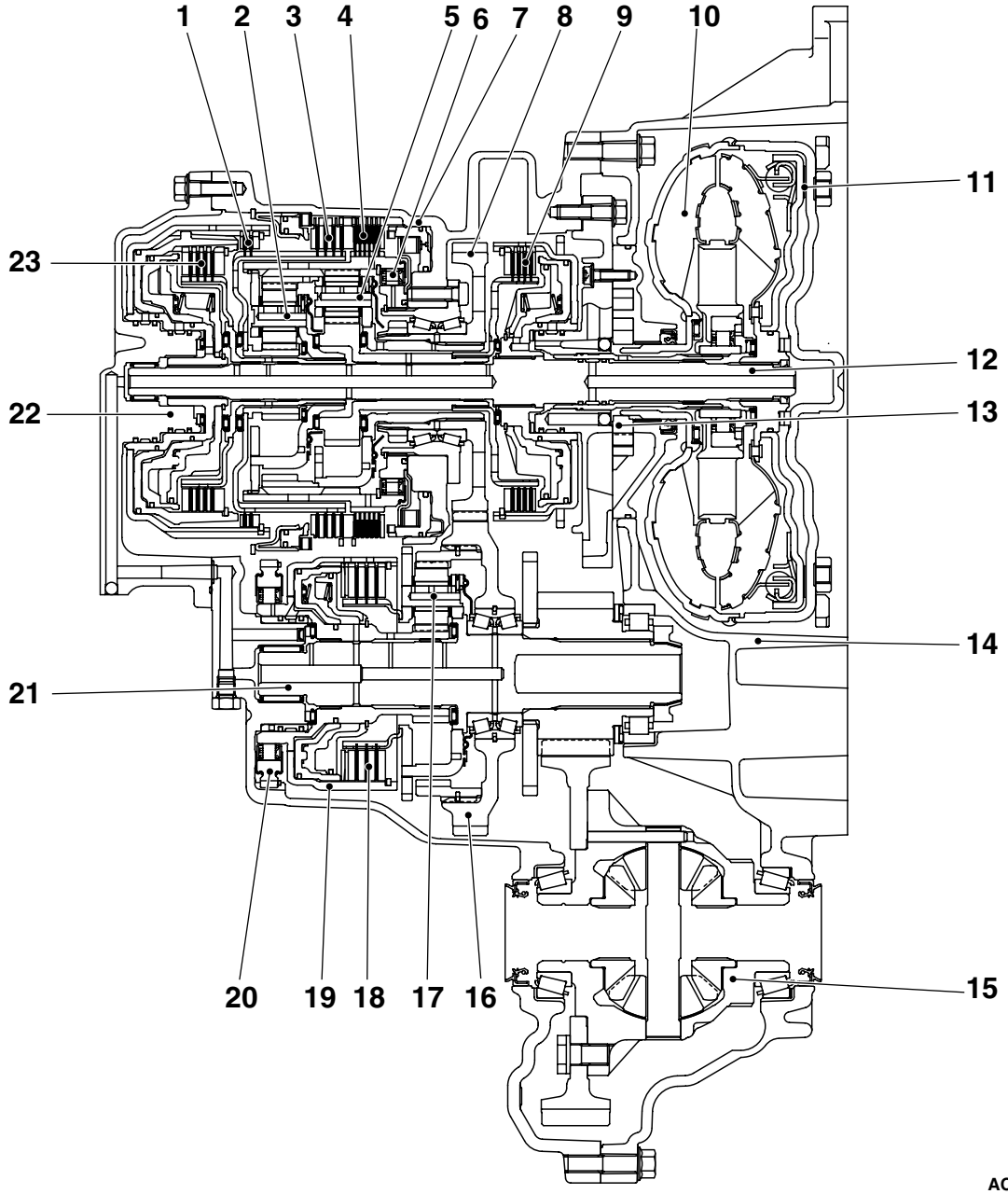
SECTIONAL VIEW <4A/T>



AC305544AC

1. OVERDRIVE CLUTCH
2. REVERSE CLUTCH
3. OVERDRIVE PLANETARY CARRIER
4. SECOND BRAKE
5. LOW-REVERSE BRAKE
6. OUTPUT PLANETARY CARRIER
7. ONE-WAY CLUTCH-L
8. TRANSFER DRIVE GEAR
9. UNDERDRIVE CLUTCH
10. TRANSAXLE CASE
11. TORQUE CONVERTER
12. TORQUE CONVERTER CLUTCH
13. INPUT SHAFT
14. OIL PUMP
15. TORQUE CONVERTER HOUSING
16. DIFFERENTIAL
17. TRANSFER DRIVEN GEAR
18. OUTPUT SHAFT
19. REAR COVER

SECTIONAL VIEW <5A/T>



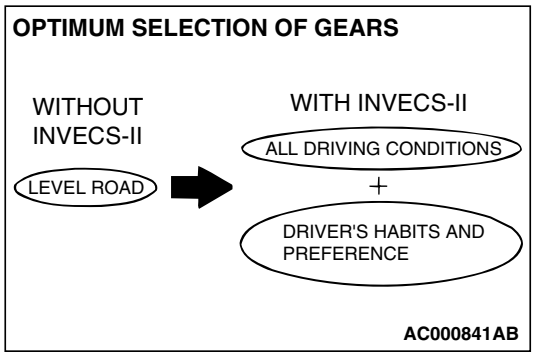
1. REVERSE CLUTCH
2. OVERDRIVE PLANETARY CARRIER
3. SECOND BRAKE
4. LOW-REVERSE BRAKE
5. OUTPUT PLANETARY CARRIER
6. ONE-WAY CLUTCH-L
7. TRANSAXLE CASE
8. TRANSFER DRIVE GEAR
9. UNDERDRIVE CLUTCH
10. TORQUE CONVERTER
11. TORQUE CONVERTER CLUTCH
12. INPUT SHAFT
13. OIL PUMP
14. TORQUE CONVERTER HOUSING
15. DIFFERENTIAL
16. TRANSFER DRIVEN GEAR
17. DIRECT PLANETARY GEAR SET
18. DIRECT CLUTCH
19. REDUCTION BRAKE
20. ONE-WAY CLUTCH-D
21. OUTPUT SHAFT
22. REAR COVER
23. OVERDRIVE CLUTCH

TSB Revision

ELECTRONICALLY-CONTROLLED SYSTEM

INVECS-II

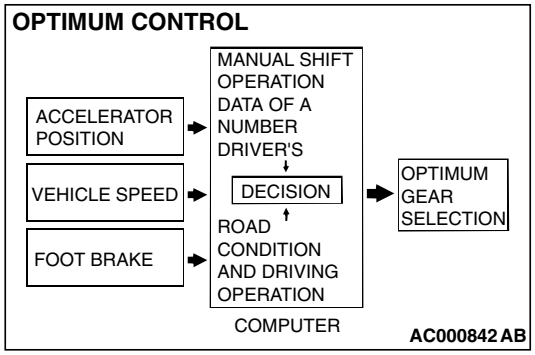
- When in drive ("D" range), the new automatic transaxle employs an innovative shift schedule to provide a high level of comfort and "easy driving style" that matches all driving conditions as well as the driver's driving style.
- INVECS-II features "Optimum Shift Control," which provides shift timing 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.



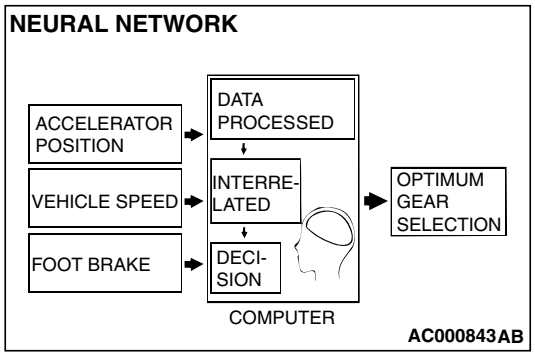
FEATURES

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.



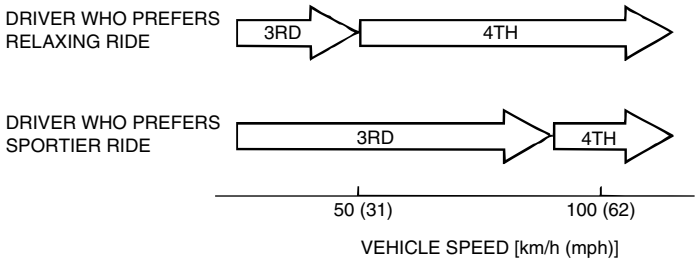
2. We introduce the latest control technologies with an innovative new algorithm called the "neural network" that works to imitate the decision-making processes of the human brain. The neural network links a wide variety of input data regarding road and operating conditions, and instantly makes accurate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

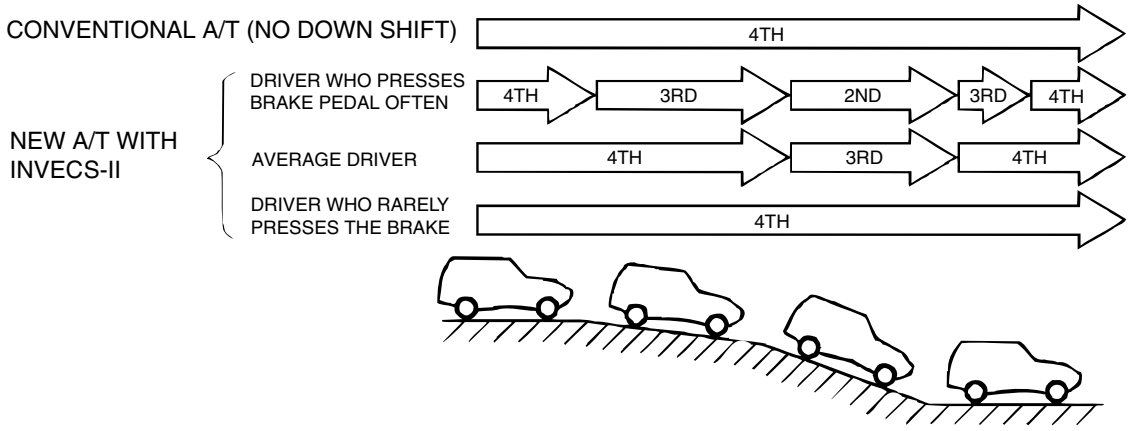
ADAPTIVE SHIFT CONTROL DURING ACCELERATION



AC000844 AB

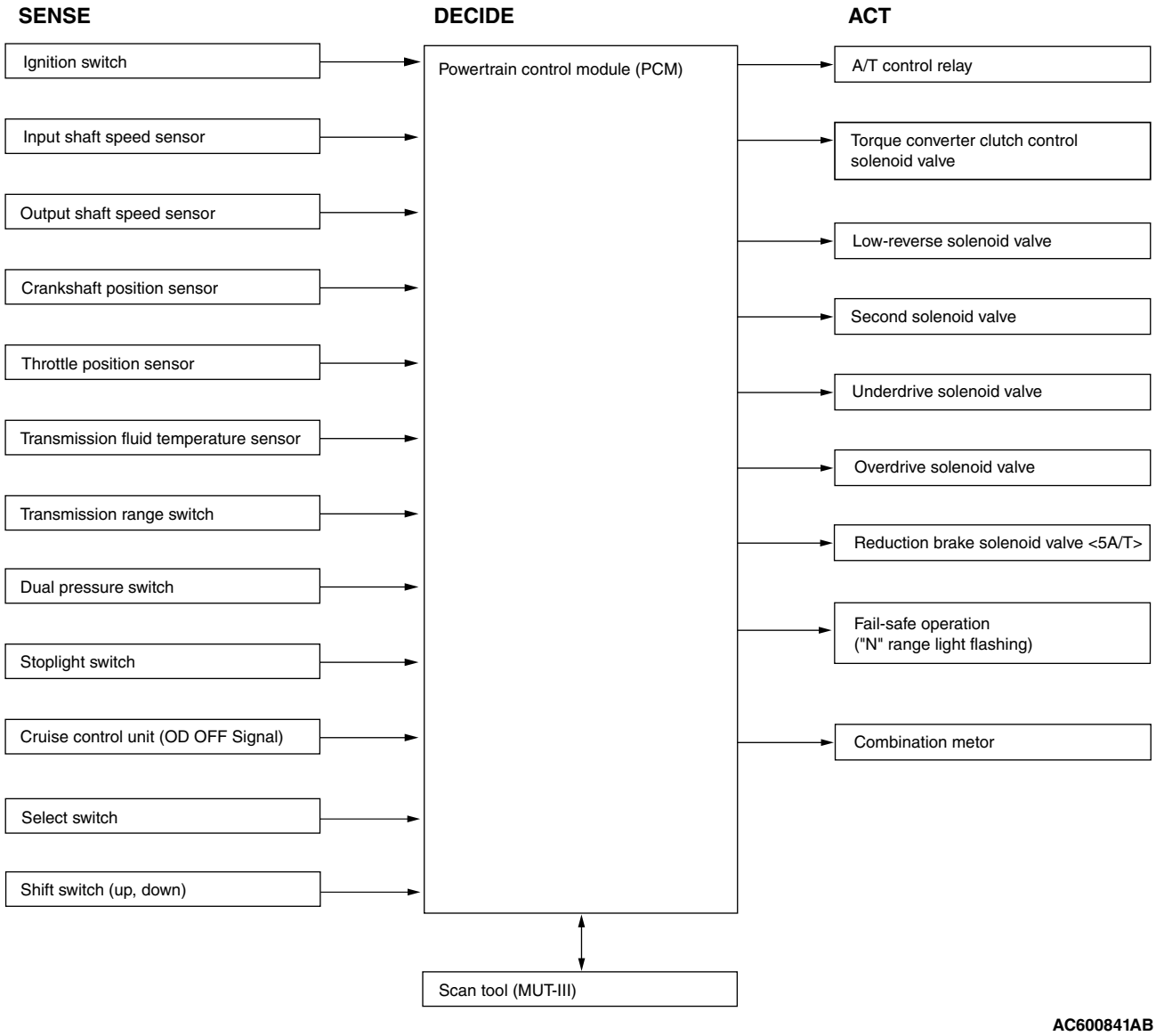
3. If the computer determines that the driver tends to apply the brakes often on a descending roadway, it adjusts timing to down shift sooner so that engine braking is more effectively applied. Conversely, if the computer determines that the driver does not brake much while driving downhill, it delays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

ADAPTIVE SHIFT CONTROL ON DOWNGRADES



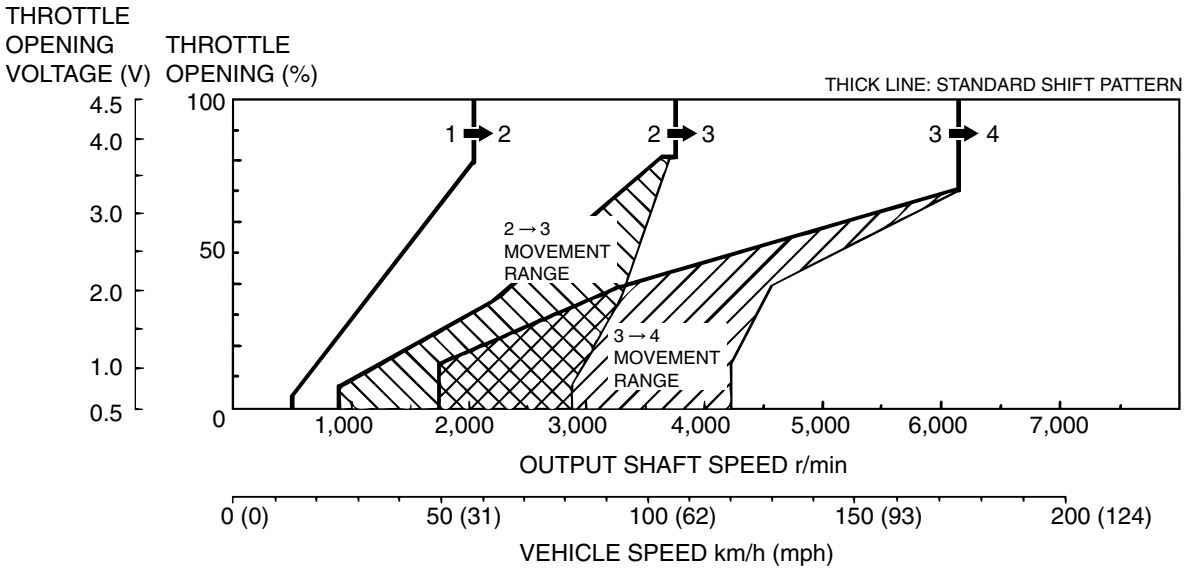
AC000845AB

SYSTEM CONSTRUCTION DIAGRAM



SHIFT PATTERN CONTROL

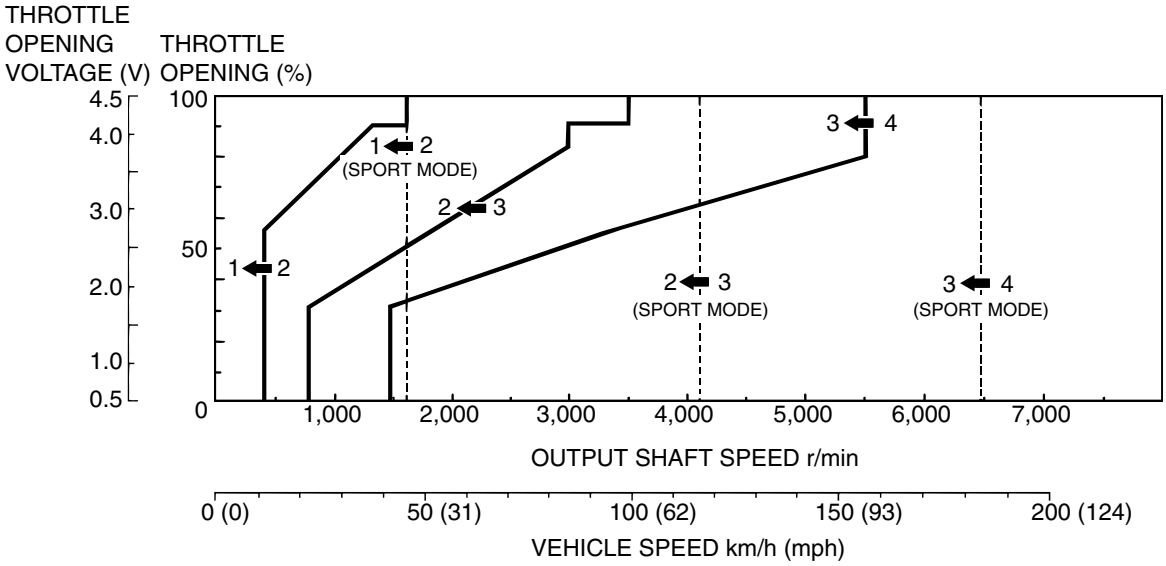
UPSHIFT PATTERN <4A/T>



AC500232AB

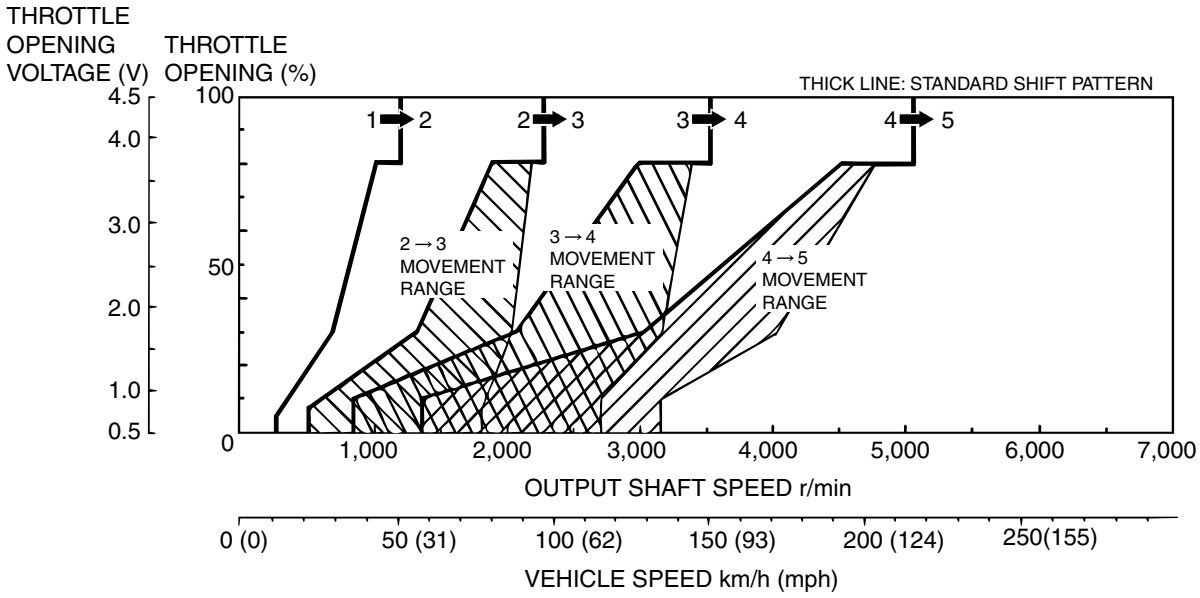
NOTE: Within 2 -to- 3 and 3 -to- 4 movement ranges, the PCM adjusts shift points according to the driving conditions by memorizing the accelerator pedal stroke and braking timing.

DOWNSHIFT PATTERN <4A/T>



AC500233AB

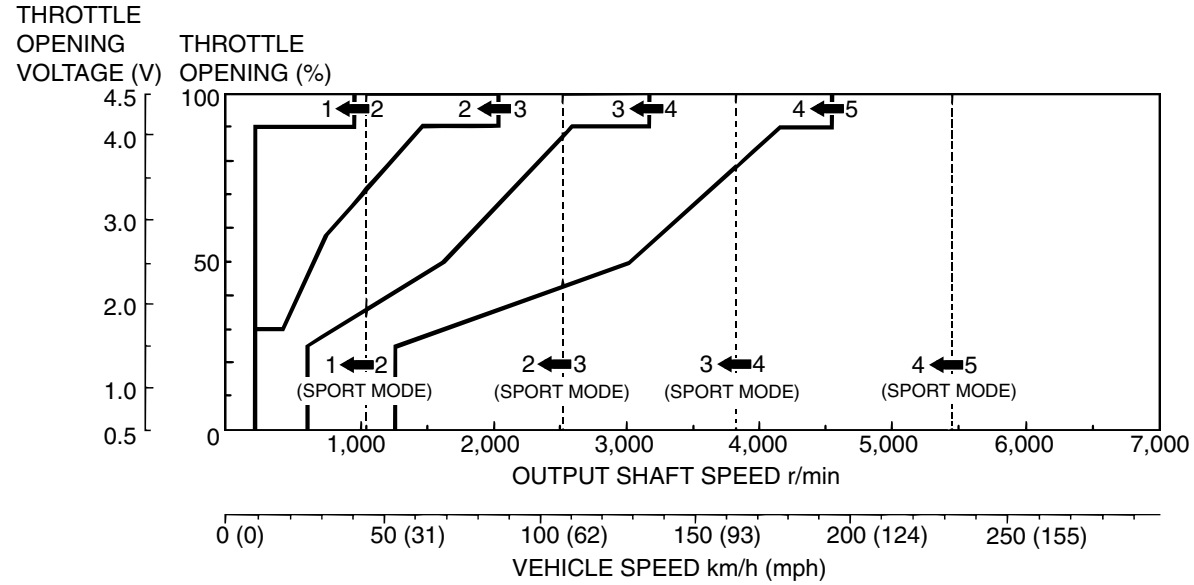
UPSHIFT PATTERN <5A/T>



AC500234 AB

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.

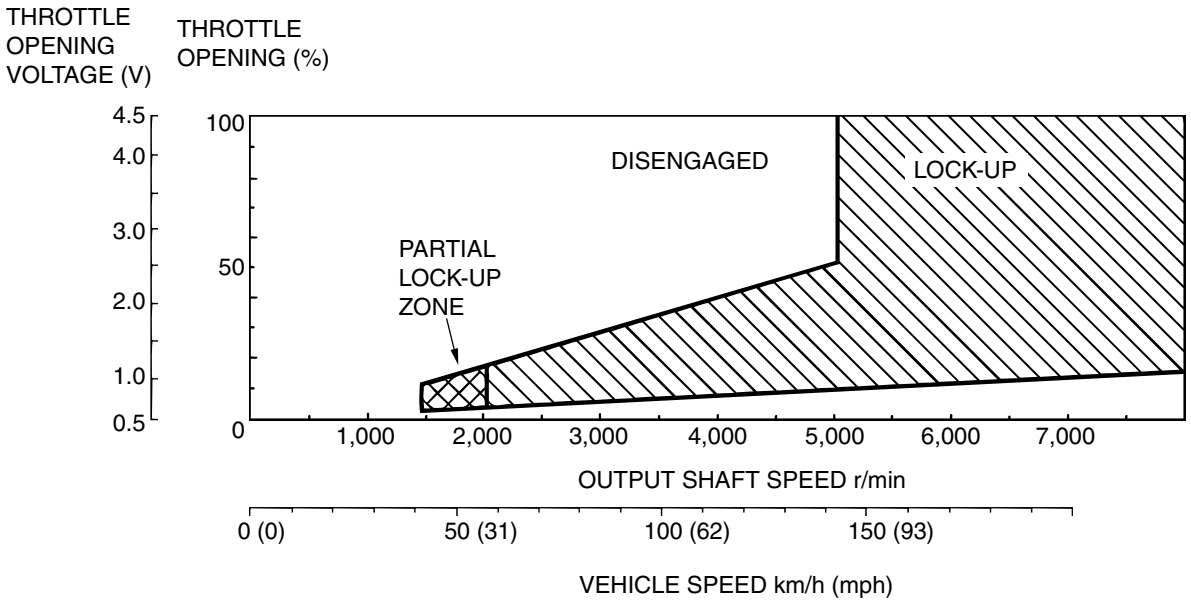
DOWNSHIFT PATTERN <5A/T>



AC500235 AB

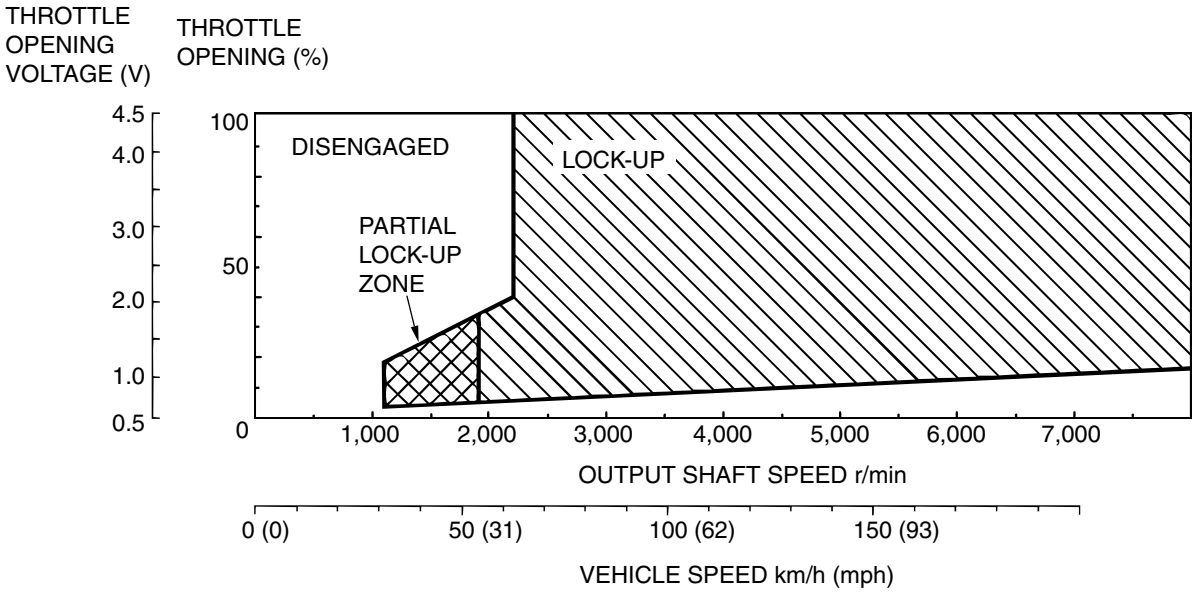
TORQE CONVERTER CLUTCH CONTROL

4TH GEAR RANGE <4A/T>



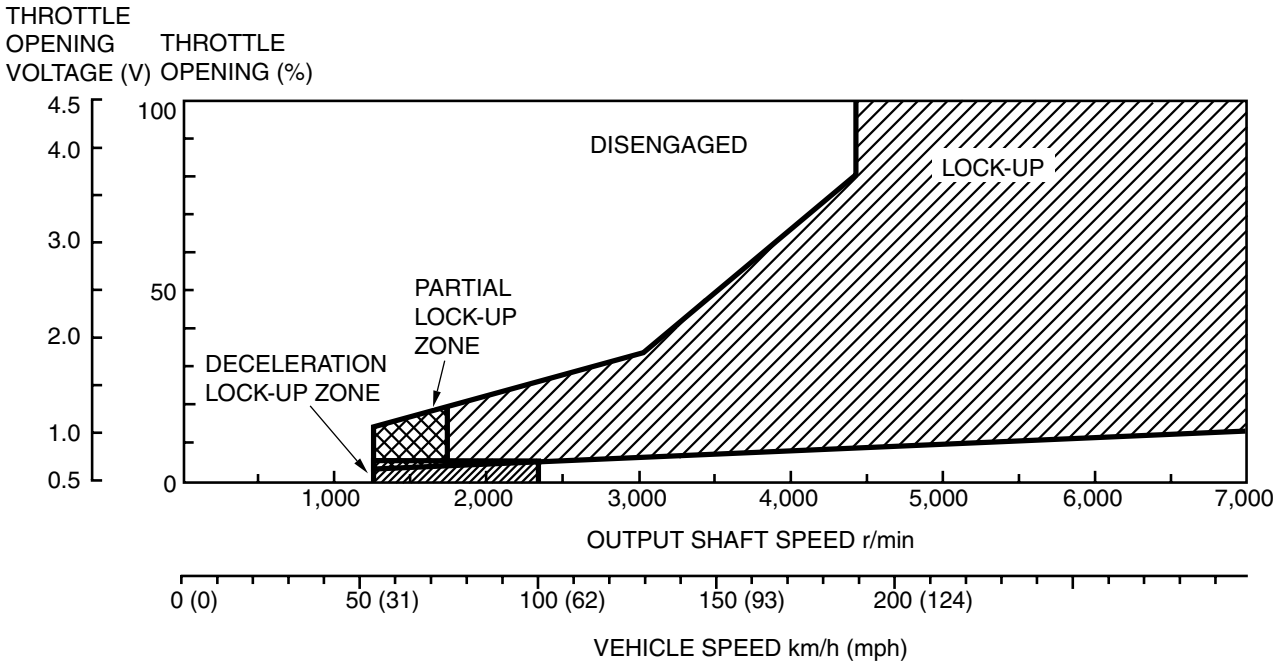
AC407208 AB

3RD GEAR RANGE <4A/T>



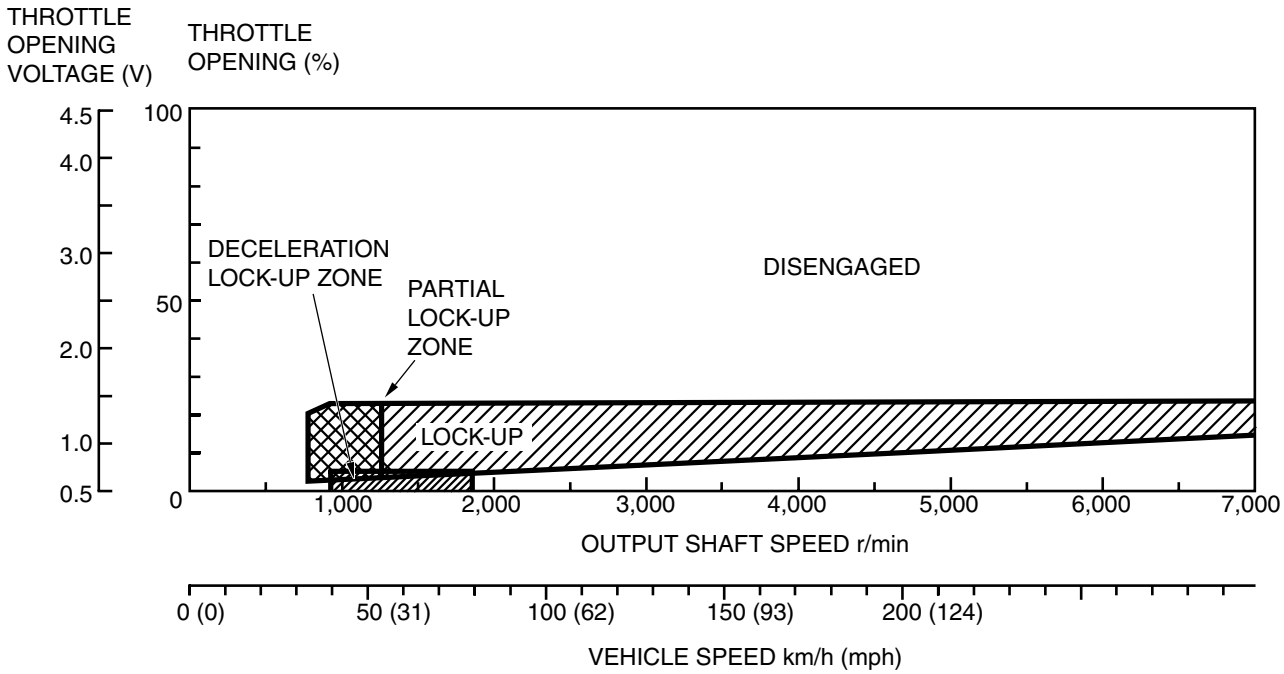
AC407207 AB

5TH GEAR RANGE <5A/T>



AC406257AB

4RD GEAR RANGE <5A/T>

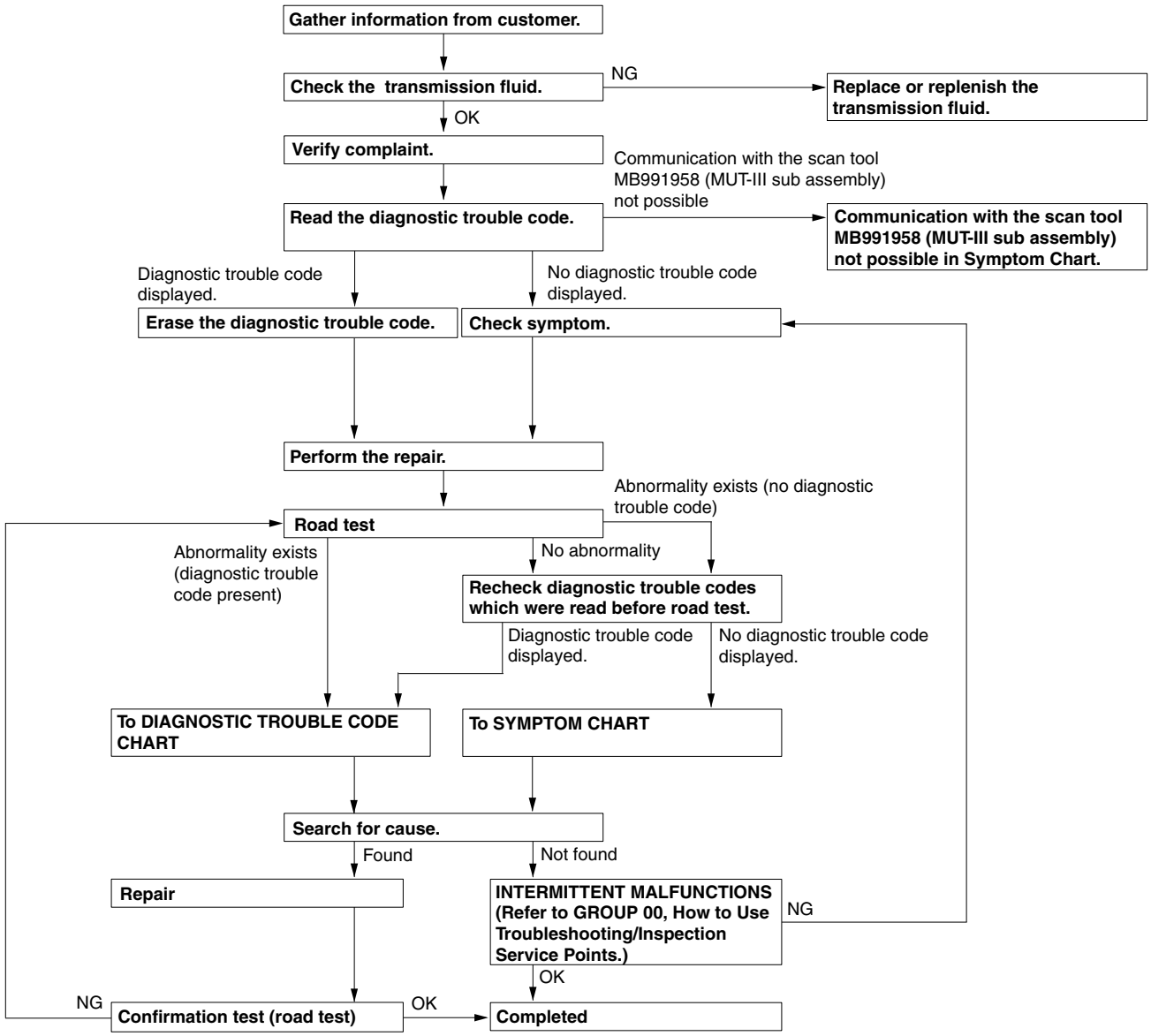


AC406256 AB

AUTOMATIC TRANSAXLE DIAGNOSIS

DIAGNOSTIC TROUBLESHOOTING FLOW

M1231013500353



AC210189AB

INTRODUCTION TO A/T DIAGNOSIS

M1231012300226

The automatic transaxle 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 transaxle 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.

TSB Revision

A/T DIAGNOSTIC TROUBLESHOOTING STRATEGY

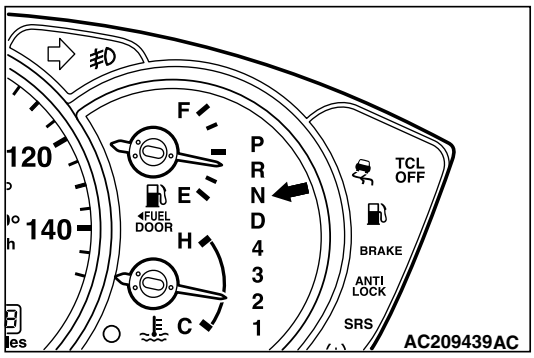
M1231007600339

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.00-14.
5. If you can verify the condition but there are no DTCs, or the system can not communicate with scan tool, refer to the Symptom Chart P.23A-48.
6. If there is a DTC, record the number of the code, then erase the code from memory using scan tool.
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.00-14.
10. After repairs are completed, conduct a Road Test duplicating the complaint conditions to confirm the malfunction has been eliminated.

DIAGNOSTIC FUNCTION

M1231022500135



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 "N" range light is flashing, the transmission fluid temperature is high. (It flushes when the fluid is approximately 125°C or more and goes off when the fluid is approximately 115°C or less)

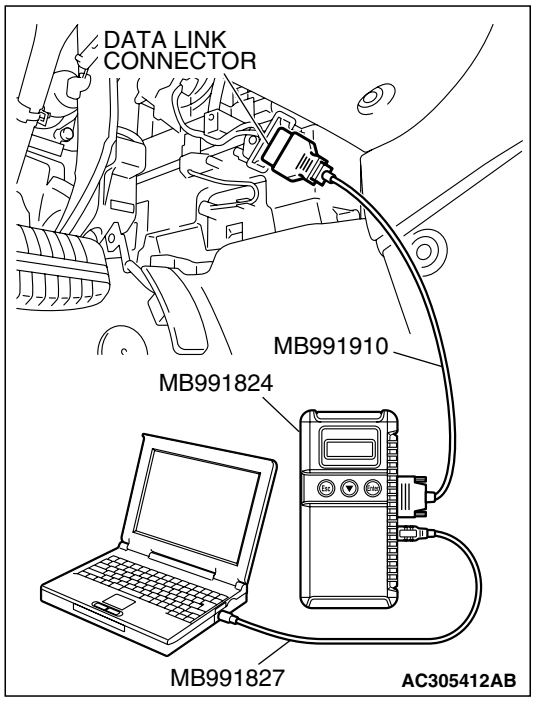
ON-BOARD DIAGNOSTICS

The powertrain control module (PCM) monitors its input/output signals (some signals all the time and others under specified conditions). When an irregular signal is initially monitored, the PCM decides that a malfunction has occurred and records the occurrence as a diagnostic trouble code. There are 21 diagnostic items. The diagnostic results can be read with 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. DTCs are not erased even after the battery terminals and the PCM connector are disconnected. In addition, the diagnostic trouble code can also be erased by scan tool.

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.

The 21 diagnostic items are displayed in numeric order.

HOW TO CONNECT THE SCAN TOOL (M.U.T.-III)



Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

⚠ 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 MB991910 to special tool MB991824.
5. Connect special tool MB991910 to the data link connector.
6. Turn the power switch of special tool MB991824 to the "ON" position.

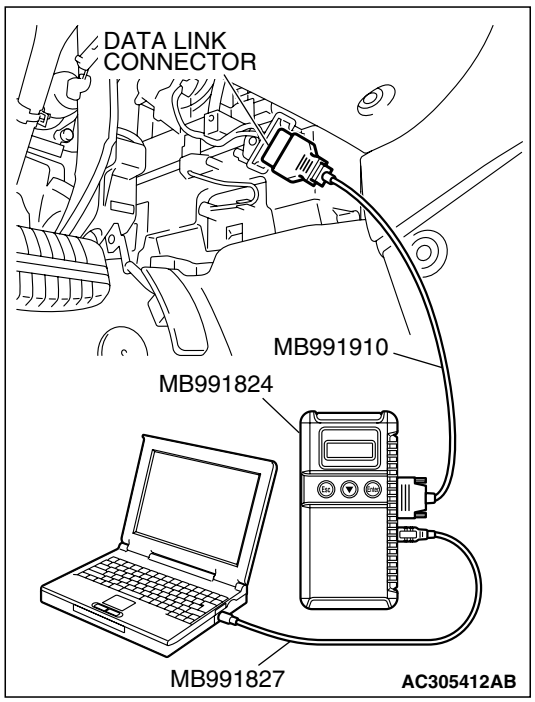
   NOTE: When special tool MB991824 is energized, special tool MB991824 indicator light will be illuminated in a green color.
7. Start the M.U.T.-III system on the personal computer.

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 (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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.

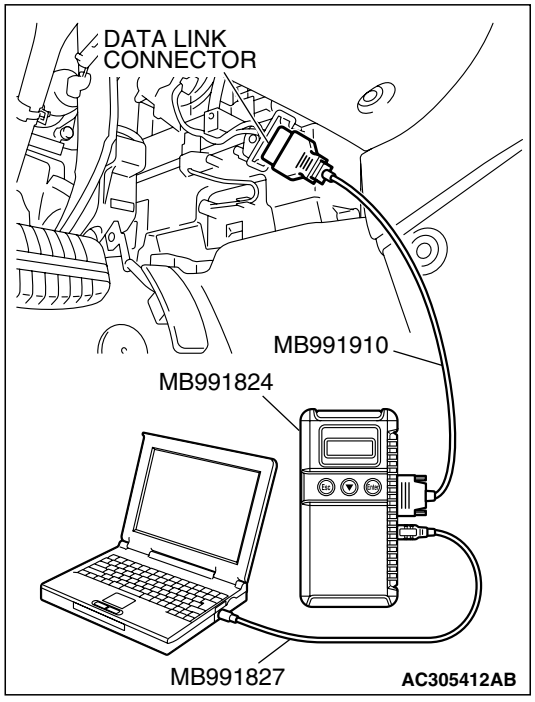
NOTE: If the battery voltage is low, diagnostic trouble codes will not be set. Check the battery if scan tool MB991958 does not display.

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 (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ CAUTION

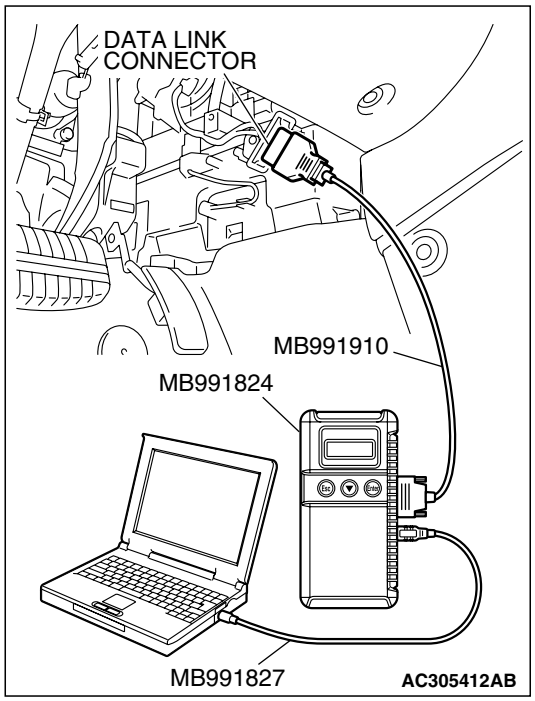
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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.

HOW TO PERFORM ACTUATOR TEST

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ CAUTION

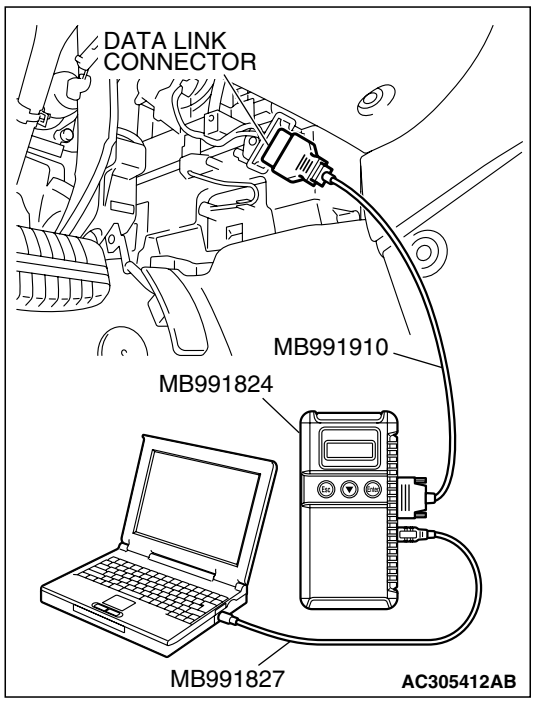
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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 DIAGNOSE THE CAN BUS LINES

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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 "CAN bus diagnosis" from the start-up screen.
4. When the vehicle information is displayed, confirm that it matches the vehicle whose CAN bus lines will be diagnosed.
   - If they matches, go to step 8.
   - If not, go to step 5.
5. Select the "view vehicle information" button.
6. Enter the vehicle information and select the "OK" button.
7. When the vehicle information is displayed, confirm again that it matches the vehicle whose CAN bus lines will be diagnosed.
   - If they matches, go to step 8.
   - If not, go to step 5.
8. Select the "OK" button.
9. When the optional equipment screen is displayed, choose the one which the vehicle is fitted with, and then select the "OK" button.

HOW TO INITIALIZE A/T LEARNED VALUE

M1231022600121

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 M.U.T.-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 M.U.T.-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.00-32).

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

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

M1231008300319

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

MALFUNCTIONING ITEM		JUDGEMENT 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 during 4 monitoring periods in one drive cycle. When the judgment condition is met, the transaxle holds 3rd gear or 2nd gear, depending on speed, as a fail-safe.
Output shaft speed sensor		The output signal from the output shaft speed sensor is not present for one second or more while the vehicle is driven.	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 transaxle holds 3rd gear or 2nd gear, depending on speed, 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. The transaxle 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 <5A/T>			
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. The transaxle will only operate in 3rd and reverse gears until the system is repaired.
	2nd		
	3rd		
	4th		
	5th <5A/T>		
	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 transaxle 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 transaxle will only operate in 3rd and reverse gears until the system is repaired.

ROAD TEST

M1231007800753

Check using the following procedures.

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
1	Ignition switch: (LOCK) OFF	Ignition switch (1) ON	Data list No.8 (1) Control Relay Voltage [V]	A/T Control relay output voltage	P1788	A/T Control relay system (P.23A-265).
2	Ignition switch: ON Engine: Stopped Transmission range: P	Transmission range (1) P, (2) R, (3) N, (4) D	Data list No.34 (1) P, (2) R, (3) N, (4) D	Transmission range switch	P1770, P1771	Transmission range switch system (P.23A-125, P.23A-157).
		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.27 (1) OFF, (2) ON, (3) ON, (4) ON Data list No.28 (1) OFF, (2) OFF, (3) ON, (4) OFF Data list No.29 (1) OFF, (2) OFF, (3) OFF, (4) ON	Select switch and Shift switch	-	Shift switch assembly system (P.23A-316).
			Shift indicator light (1) "D" and "1" illuminates (2) Only "1" illuminates (3) Only "2" illuminates (4) Only "1" illuminates			

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
		Accelerator pedal (1) Fully closed (2) Depressed (3) Fully open	Data list No.2 (1) 300 – 700 mV (2) Gradually rises from (1) (3) 4,000 mV or more	TP sensor	–	Group 13A <2.4L Engine>, Diagnostic Trouble Code Procedures – DTCs P0122, 0123: Throttle Position Sensor System (P.13A-244, P.13A-255). Group 13B <3.8L Engine>, Diagnostic Trouble Code Procedures – DTCs P0122, 0123: Throttle Position Sensor System (P.13B-262, P.13B-275).
		Brake pedal (1) Depressed (2) Released	Data list No.19 (1) ON (2) OFF	Stoplight switch	P1769	Stoplight switch system (P.23A-117).
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-280).
4	Engine warming up	Drive for 15 minutes or more so that the transmission fluid temperature becomes 70 – 80°C (158 – 176°F)	Data list No.7 Gradually rises to 70 – 80°C (158 – 176°F)	Transmission fluid temperature sensor	P1763, P1764	Transmission fluid temperature sensor system (P.23A-51, P.23A-65).
5	Engine: Idling Transmission range: N	Brake pedal (Retest) (1) Depressed (2) Released	Data list No.19 (1) ON (2) OFF	Stoplight switch	P1769	Stoplight switch system (P.23A-117).

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
		Accelerator pedal (1) Fully closed (2) Depressed	Data list No.1 (1) Engine tachometer and the scan tool MB991958 (M.U.T.-III sub assembly) shows the same engine speed (2) Gradually rises from (1)	Crankshaft position sensor	-	Group 13A <2.4L Engine>, Diagnostic Trouble Code Procedures – DTC P0335: Crank shaft Position Sensor System (P.13A-553). Group 13B <3.8L Engine>, Diagnostic Trouble Code Procedures – DTC P0335: Crank shaft Position Sensor System (P.13B-632).
		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-289).
					-	Shift shock when shifting from N to D and long delay (P.23A-291).
					-	Shift shock when shifting from N to R and long delay (P.23A-293).
					-	Shift shock when shifting from N to D, N to R and long delay (P.23A-297).
				Does not move	-	Does not move forward (P.23A-283).
					-	Does not move backward (P.23A-285).

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
					-	Does not move (forward or backward) (P.23A-288).
6 <4A/T>	Transmission range: Sport mode (on a flat and straight road)	Gear 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 60 km/h (37 mph) in 4th gear	Data list No.11 (2) 1st, (3) 2nd, (4) 3rd, (5) 4th	Shift position	-	-
			Data list No.17 (2) 0%, (3) 100%, (4) 100%, (5) 100%	Low-reverse solenoid valve duty %	P1773	Low-reverse solenoid valve system (P.23A-172).
			Data list No.12 (2) 0%, (3) 0%, (4) 0%, (5) 100%	Underdrive solenoid valve duty %	P1774	Underdrive solenoid valve system (P.23A-185).

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
6 <4A/T>	Transmission range: Sport mode (on a flat and straight road)	Gear 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 60 km/h (37 mph) in 4th gear	Data list No.14 (2)100%, (3) 0%, (4) 100%, (5) 0%	Second solenoid valve duty %	P1775	Second solenoid valve system (P.23A-196).
			Data list No.15 (2) 100%, (3) 100%, (4) 0%, (5) 0%	Overdrive solenoid valve duty %	P1776	Overdrive solenoid valve system (P.23A-207).
			Data list No.5 (4) 1,500 – 1,800 r/min	Input shaft speed sensor	P1766	Input shaft speed sensor system (P.23A-75).
			Data list No.6 (4) 1,500 – 1,800 r/min	Output shaft speed sensor	P1767	Output shaft speed sensor system (P.23A-96).

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
6 <5A/T>	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 60 km/h (37 mph) in 4th gear (6) Driving at constant speed of 70 km/h (43 mph) in 5th gear	Data list No.11 (2) 1st, (3) 2nd, (4) 3rd, (5) 4th, (6) 5th	Shift position	-	-
			Data list No.12 (2) 0%, (3) 100%, (4) 100%, (5) 0%, (6) 0%	Low-reverse solenoid valve duty %	P1773	Low-reverse solenoid valve system (P.23A-172).
			Data list No.13 (2) 0%, (3) 0%, (4) 0%, (5) 0%, (6) 100%	Underdrive solenoid valve duty %	P1774	Underdrive solenoid valve system (P.23A-185).
			Data list No.14 (2)100%, (3) 0%, (4) 100%, (5) 100%, (6) 0%	Second solenoid valve duty %	P1775	Second solenoid valve system (P.23A-196).
			Data list No.15 (2) 100%, (3) 100%, (4) 0%, (5) 0%, (6) 0%	Overdrive solenoid valve duty %	P1776	Overdrive solenoid valve system (P.23A-207).

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
6 <5A/T>	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 60 km/h (37 mph) in 4th gear (6) Driving at constant speed of 70 km/h (43 mph) in 5th gear	Data list No.16 (2) 0%, (3) 0%, (4) 0%, (5)100%, (6)100%	Reduction solenoid valve duty%	P1777	Reduction solenoid valve system (P.23A-218).
			Data list No.5 (5) 1,400 – 1,700 r/min	Input shaft speed sensor	P1766	Input shaft speed sensor system (P.23A-75).
			Data list No.6 (5) 1,400 – 1,700 r/min	Output shaft speed sensor	P1767	Output shaft speed sensor system (P.23A-96).
7 <4A/T>	Transmission range: Sport mode (on a flat and straight road)	Transmission range and vehicle speed (1) Driving at speed of 60 km/h (37 mph) in 3rd gear (2) Driving at constant speed of 60 km/h (37 mph) (3) Release accelerator pedal (Speed under 50 km/h (31 mph)	Data list No.17 (2) 70 – 99.6% (3) 70 – 99.6% to 0%	Torque converter clutch solenoid valve duty %	P1778, P1786, P1787	Torque converter clutch solenoid system (P.23A-229, P.23A-256, P.23A-261).
			Data list No.10 (2) –10 to 10 r/min (3) The value changes from (2)	Torque converter clutch amount of slippage		

TSB Revision

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
7 <5A/T>	Transmission range: Sport mode (on a flat and straight road)	Transmission range and vehicle speed (1) Driving at speed of 50 km/h (31 mph) in 4th gear (2) Driving at constant speed of 50 km/h (31 mph) (3) Release accelerator pedal (Speed under 50 km/h (31 mph)	Data list No.17 (2) 70 – 99.6% (3) 70 – 99.6% to 0%	Torque converter clutch solenoid valve duty %	P1778, P1786, P1787	Torque converter clutch solenoid system (P.23A-229, P.23A-256, P.23A-261).
			Data list No.10 (2) –10 to 10 r/min (3) The value changes from (2)	Torque converter clutch amount of slippage		
8 <4A/T>	Use the scan tool MB991958 (M.U.T.-III sub assembly) to stop the INVECS-II function Transmission range: D (on a flat and straight road)	(1)Accelerate to 4th gear at a throttle position sensor output of 1.5 V (accelerator opening angle of 25%) (2)Slowly decelerate to a stop (3)Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%)	Data list No.2, 6 The shifting points correspond with the scan tool display and the TP sensor voltage (opening angle) and output shaft speed, which are shown in the standard shift pattern	Malfunction when shifting	-	Shift shock and slipping (P.23A-298).
				Does not shift according to instructions	-	Early or late shifting in all gears (P.23A-301).
					-	Early or late shifting in some gears (P.23A-304).
				Does not shift	-	No diagnostic trouble code (P.23A-306).
					P1766	Input shaft speed sensor system (P.23A-75).
					P1767	Output shaft speed sensor system (P.23A-96).

TSB Revision

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
8 <4A/T>	Use the scan tool MB991958 (M.U.T.-III sub assembly) to stop the INVECS-II function Transmission range: D (on a flat and straight road)	(1) Accelerate from 1st gear to 4th gear. (2) While driving at 60 km/h (37 mph) in 4th gear, downshift to 3rd gear (3) While driving at 40 km/h (25 mph) in 3rd gear, downshift to 2nd gear (4) While driving at 20 km/h (12 mph) in 2nd gear, downshift to 1st gear	Data list No.11 (1) 1st → 2nd → 3rd → 4th (2) 4th → 3rd (3) 3rd → 2nd (4) 2nd → 1st	Does not shift from 1 to 2 or 2 to 1	P1773	Low-reverse solenoid valve system (P.23A-172).
					P1775	Second solenoid valve system (P.23A-196).
					P1779	1st gear incorrect ratio (P.23A-240).
					P1780	2nd gear incorrect ratio (P.23A-240).
				Does not shift from 2 to 3 or 3 to 2	P1775	Second solenoid valve system (P.23A-196).
					P1776	Overdrive solenoid valve system (P.23A-207).
					P1780	2nd gear incorrect ratio (P.23A-240).
					P1781	3rd gear incorrect ratio (P.23A-240).

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
8 <4A/T>	Use the scan tool MB991958 (M.U.T.-III sub assembly) to stop the INVECS-II function Transmission range: D (on a flat and straight road)	(1) Accelerate from 1st gear to 4th gear. (2) While driving at 60 km/h (37 mph) in 4th gear, downshift to 3rd gear (3) While driving at 40 km/h (25 mph) in 3rd gear, downshift to 2nd gear (4) While driving at 20 km/h (12 mph) in 2nd gear, downshift to 1st gear	Data list No.11 (1) 1st → 2nd → 3rd → 4th (2) 4th → 3rd (3) 3rd → 2nd (4) 2nd → 1st	Does not shift from 3 to 4 or 4 to 3	P1774	Underdrive solenoid valve system (P.23A-185).
					P1775	Second solenoid valve system (P.23A-196).
					P1781	3rd gear incorrect ratio (P.23A-240).
					P1782	4th gear incorrect ratio (P.23A-240).
8 <5A/T>	Use the scan tool MB991958 (M.U.T.-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 position sensor output of 1.5 V (accelerator opening angle of 25%) (2)Slowly decelerate to a stop (3)Accelerate to 5th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%)	Data list No.2, 6 The shifting points correspond with the scan tool display and the TP sensor voltage (opening angle) and output shaft speed, which are shown in the standard shift pattern	Malfunction when shifting	-	Shift shock and slipping (P.23A-298).
				Does not shift according to instructions	-	Early or late shifting in all gears (P.23A-301).
					-	Early or late shifting in some gears (P.23A-304).

TSB Revision

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
8 <5A/T>	Use the scan tool MB991958 (M.U.T.-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 position sensor output of 1.5 V (accelerator opening angle of 25%) (2)Slowly decelerate to a stop (3)Accelerate to 5th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%)	Data list No.2, 6 The shifting points correspond with the scan tool display and the TP sensor voltage (opening angle) and output shaft speed, which are shown in the standard shift pattern	Does not shift	-	No diagnostic trouble code (P.23A-306).
					P1766	Input shaft speed sensor system (P.23A-75).
					P1767	Output shaft speed sensor system (P.23A-96).
8 <5A/T>	Use the scan tool MB991958 (M.U.T.-III sub assembly) to stop the INVECS-II function Transmission range: D (on a flat and straight road)	(1) Accelerate from 1st gear to 5th gear. (2) While driving at 70 km/h (43 mph) in 5th gear, downshift to 4th gear (3) While driving at 60 km/h (37 mph) in 4th gear, downshift to 3rd gear (4) While driving at 40 km/h (25 mph) in 3rd gear, downshift to 2nd gear (5) While driving at 20 km/h (12 mph) in 2nd gear, downshift to 1st gear	Data list No.11 (1) 1st → 2nd → 3rd → 4th → 5th (2) 5th → 4th (3) 4th → 3rd (4) 3rd → 2nd (5) 2nd → 1st	Does not shift from 1 to 2 or 2 to 1	P1773	Low-reverse solenoid valve system (P.23A-172).
					P1775	Second solenoid valve system (P.23A-196).
					P1779	1st gear incorrect ratio (P.23A-240).

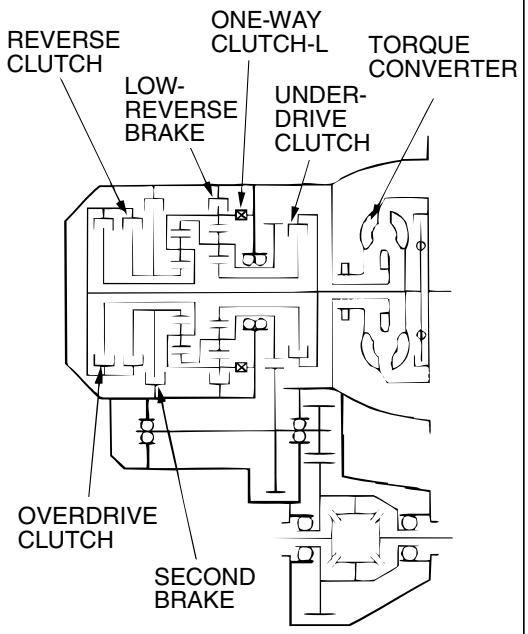
STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
					P1780	2nd gear incorrect ratio (P.23A-240).
				Does not shift from 2 to 3 or 3 to 2	P1775	Second solenoid valve system (P.23A-196).
					P1776	Overdrive solenoid valve system (P.23A-207).
					P1780	2nd gear incorrect ratio (P.23A-240).
					P1781	3rd gear incorrect ratio (P.23A-240).
8 <5A/T>	Use the scan tool MB991958 (M.U.T.-III sub assembly) to stop the INVECS-II function Transmission range: D (on a flat and straight road)	(1) Accelerate from 1st gear to 5th gear. (2) While driving at 70 km/h (43 mph) in 5th gear, downshift to 4th gear (3) While driving at 60 km/h (37 mph) in 4th gear, downshift to 3rd gear (4) While driving at 40 km/h (25 mph) in 3rd gear, downshift to 2nd gear (5) While driving at 20 km/h (12 mph) in 2nd gear, downshift to 1st gear	Data list No.11 (1) 1st → 2nd → 3rd → 4th → 5th (2) 5th → 4th (3) 4th → 3rd (4) 3rd → 2nd (5) 2nd → 1st	Does not shift from 3 to 4 or 4 to 3	P1774	Low-reverse solenoid valve system (P.23A-172).
					P1777	Reduction solenoid valve system (P.23A-218).
					P1781	3rd gear incorrect ratio (P.23A-240).
					P1782	4th gear incorrect ratio (P.23A-240).

STEP	CONDITION BEFORE TEST/ OPERATION	TEST/OPERATION	STANDARD	INSPECTION ITEM	DTC	INSPECTION PROCEDURE PAGE
				Does not shift from 4 to 5 or 5 to 4	P1774	Underdrive solenoid valve system (P.23A-185).
					P1775	Second solenoid valve system (P.23A-196).
					P1782	4th gear incorrect ratio (P.23A-240).
					P1783	5th gear incorrect ratio (P.23A-240).
9	Transmission range: N (on a flat and straight road)	Monitor data list No.5 and No.6 with the scan tool MB991958 (M.U.T.-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.5 and No.6 should be the same as the gear ratio when reversing.	Does not match	P1766	Input shaft speed sensor system (P.23A-75).
					P1767	Output shaft speed sensor system (P.23A-96).
					P1784	Reverse gear incorrect ratio (P.23A-240).

TORQUE CONVERTER STALL TEST

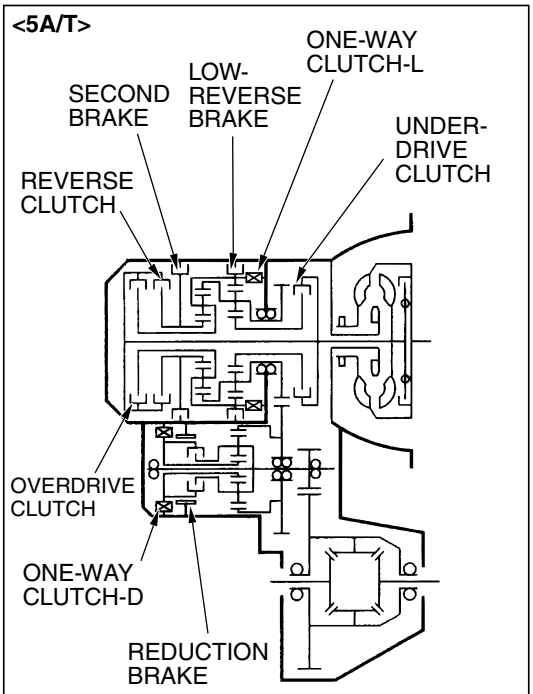
M1231005400544

<4A/T>



AC001824AG

<5A/T>



AC407211AB

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 transaxle.

⚠ *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: Measure transmission fluid temperature with scan tool MB991958 (M.U.T.-III sub assembly).
2. Chock both rear 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 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" range
   - Malfunction of the torque converter (Slippage on the splines of the torque converter and the input shaft)
   - Low line pressure

TSB Revision

- 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
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

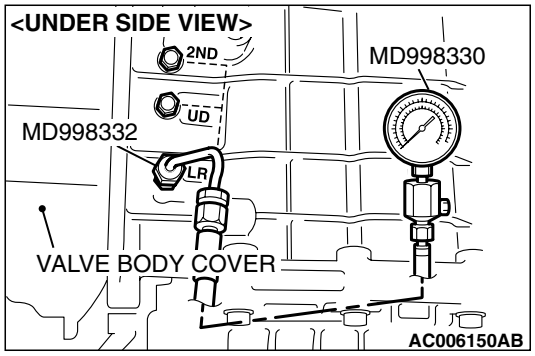
HYDRAULIC PRESSURE TESTS

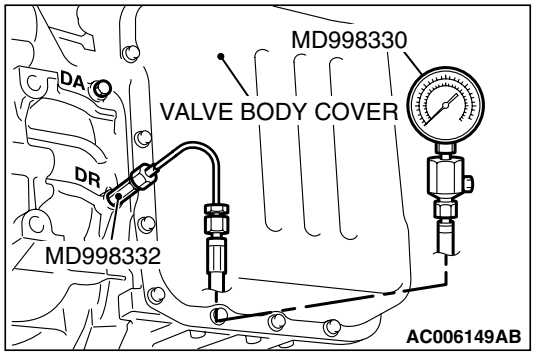
M1231005500585

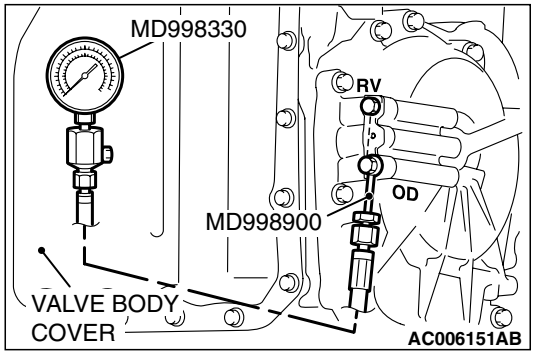
⚠ CAUTION

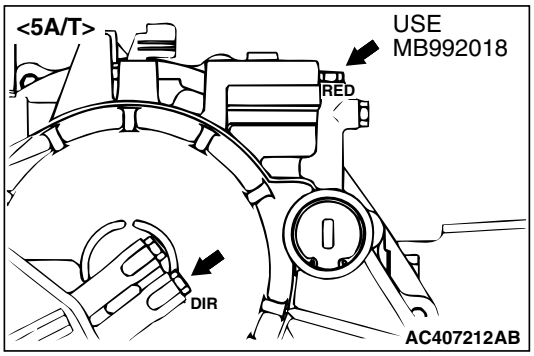
The transmission fluid temperature should be between 70 – 80°C (158 – 176°F) during the test.

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, MB992018 <5A/T>]) to each pressure discharge port.

   NOTE:
   - *2ND: Second brake pressure port*
   - *UD: Underdrive clutch pressure port*
   - *LR: Low-reverse brake pressure port*
   - *DR: Torque converter release pressure port*
   - *DA: Torque converter apply pressure port*
   - *RV: Reverse clutch pressure port*
   - *OD: Overdrive clutch pressure port*
   - *DIR: Direct clutch pressure port <5A/T>*
   - *RED: Reduction brake pressure port <5A/T>*
4. Restart the engine.
5. Check that there are no leaks around the special tool port adapters.
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 TABLE

<4A/T>

MEASUREMENT CONDITION			STANDARD HYDRAULIC PRESSURE MPa (psi)					
TRANSMISSION RANGE	SHIFT POSITION	ENGINE SPEED (r/min)	UNDERDRIVE CLUTCH PRESSURE [UD]	REVERSE CLUTCH PRESSURE [RV]	OVERDRIVE CLUTCH PRESSURE [OD]	LOW-REVERSE BRAKE PRESSURE [LR]	SECOND BRAKE PRESSURE [2ND]	TORQUE CONVERTER PRESSURE [DR]
P	–	2,500	–	–	–	0.31 – 0.39 (44 – 56)	–	0.22 – 0.36 (32 – 52)
R	Reverse	2,500	–	1.27 – 1.77 (185 – 256)	–	1.27 – 1.77 (185 – 256)	–	0.50 – 0.73 (73 – 106)
N	–	2,500	–	–	–	0.31 – 0.39 (44 – 56)	–	0.22 – 0.36 (32 – 52)
Sport mode	1st gear	2,500	0.95 – 1.06 (137 – 153)	–	–	0.95 – 1.06 (137 – 153)	–	0.50 – 0.73 (73 – 106)
	2nd gear	2,500	0.95 – 1.06 (137 – 153)	–	–	–	0.95 – 1.06 (137 – 153)	0.50 – 0.73 (73 –106)
	3rd gear	2,500	0.78 – 0.90 (113 – 131)	–	0.78 – 0.90 (113 – 131)	–	–	-
	4th gear	2,500	–	–	0.78 – 0.90 (113 – 131)	–	0.78 – 0.88 (113 – 128)	-

<5A/T>

MEASUREMENT CONDITION			STANDARD HYDRAULIC PRESSURE MPa (psi)							
TRANSMISSION RANGE	SHIFT POSITION	ENGINE SPEED (r/min)	UNDERDRIVE CLUTCH PRESSURE [UD]	REVERSE CLUTCH PRESSURE [RV]	OVERDRIVE CLUTCH PRESSURE [OD]	DIRECT CLUTCH PRESSURE [DIR]	LOW-REVERSE BRAKE PRESSURE [LR]	SECOND BRAKE PRESSURE [2ND]	REDUCTION BRAKE PRESSURE [RED]	TORQUE CONVERTER CLUTCH PRESSURE [DR]
P	–	2,500	–	–	–	–	0.31 – 0.39 (44 – 56)	–	0.31 – 0.39 (44 – 56)	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	–	–	–	–	0.31 – 0.39 (44 – 56)	–	0.31 – 0.39 (44 – 56)	0.22 – 0.36 (32 – 52)

MEASUREMENT CONDITION			STANDARD HYDRAULIC PRESSURE MPa (psi)							
TRANSMISSION RANGE	SHIFT POSITION	ENGINE SPEED (r/min)	UNDERDRIVE CLUTCH PRESSURE [UD]	REVERSE CLUTCH PRESSURE [RV]	OVERDRIVE CLUTCH PRESSURE [OD]	DIRECT CLUTCH PRESSURE [DIR]	LOW-REVERSE BRAKE PRESSURE [LR]	SECOND BRAKE PRESSURE [2ND]	REDUCTION BRAKE PRESSURE [RED]	TORQUE CONVERTER CLUTCH PRESSURE [DR]
Sport mode	1st gear	2,500	0.95 – 1.06 (137 – 153)	–	–	–	0.95 – 1.06 (137 – 153)	–	0.95 – 1.06 (137 – 153)	0.50 – 0.73 (73 – 106)
	2nd gear	2,500	0.95 – 1.06 (137 – 153)	–	–	–	–	0.95 – 1.06 (137 – 153)	0.95 – 1.06 (137 – 153)	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)	–	–	–	–
	5th gear	2,500	–	–	0.78 – 0.90 (113 – 131)	0.78 – 0.88 (113 – 128)	–	0.78 – 0.88 (113 – 128)	–	–

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

HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE

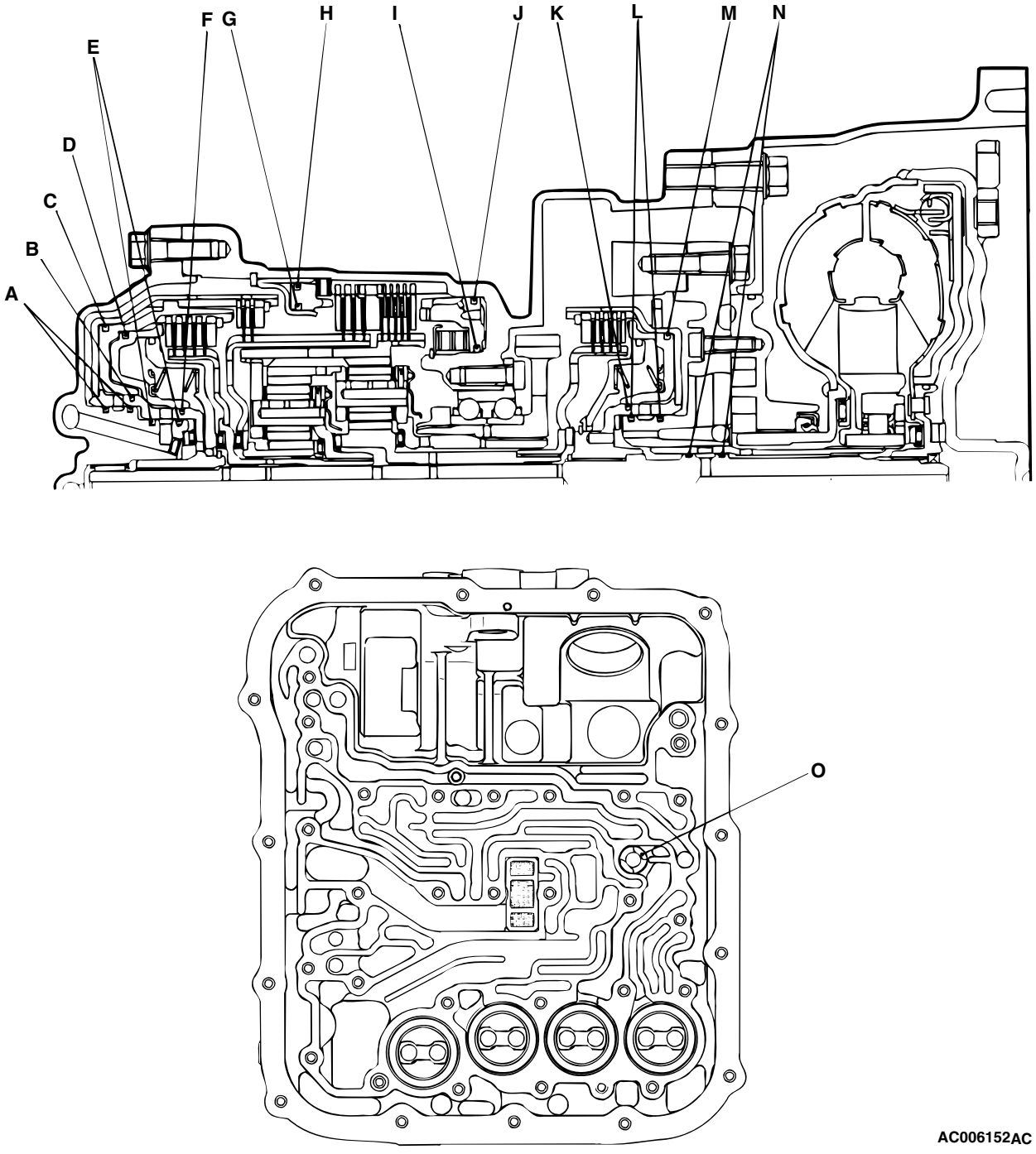
SYMPTOM	PROBABLE CAUSE
All hydraulic pressures are high.	Malfunction of the regulator valve
All hydraulic pressures are low.	Malfunction of the oil pump
	Clogged internal oil filter
	Clogged oil cooler
	Malfunction of the regulator valve
	Malfunction of the relief valve
	Incorrect valve body installation
	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

SYMPTOM	PROBABLE CAUSE
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 underdrive solenoid valve
	Malfunction of the underdrive pressure control valve
	Malfunction of the check ball
	Clogged orifice
	Incorrect valve body installation
	Malfunction of the accumulator for underdrive clutch
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
	Malfunction of the accumulator for overdrive clutch
Only direct clutch hydraulic pressure is abnormal <5A/T>.	Malfunction of the oil seal R
	Malfunction of the oil seal S
	Malfunction of the oil seal T
	Malfunction of the low-reverse solenoid valve (Shared with direct clutch)
	Malfunction of the low-reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve C
	Clogged orifice
	Incorrect valve body installation

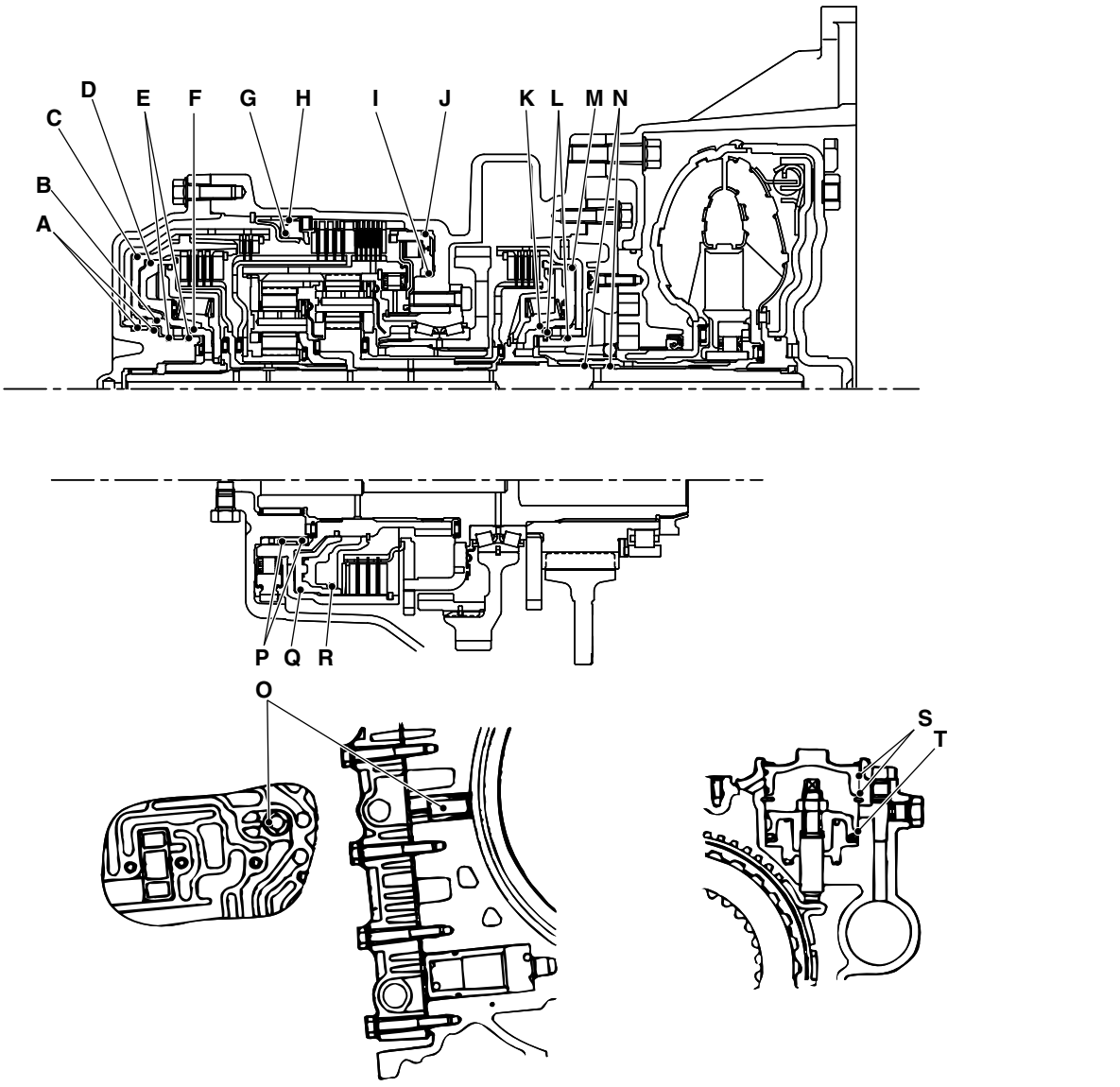
SYMPTOM	PROBABLE CAUSE
Only low-reverse brake hydraulic pressure is abnormal.	Malfunction of the oil seal I
	Malfunction of the oil seal J
	Malfunction of the low-reverse solenoid valve
	Malfunction of the low-reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve A
	Malfunction of all the check balls
	Clogged orifice
	Incorrect valve body installation
	Malfunction of the accumulator for low-reverse brake
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
	Malfunction of the accumulator for second brake
Only reduction brake hydraulic pressure is abnormal <5A/T>.	Malfunction of the oil seal P
	Malfunction of the oil seal Q
	Malfunction of the reduction solenoid valve
	Malfunction of the reduction pressure control valve
	Clogged orifice
	Incorrect valve body installation
Only torque converter pressure is abnormal.	Clogged oil cooler
	Malfunction of the oil seal N
	Malfunction of the torque converter clutch solenoid
	Malfunction of the torque converter pressure control valve
	Clogged orifice
	Incorrect valve body installation
Pressure applied to element which should not receive pressure.	Incorrect transaxle control cable adjustment
	Malfunction of the manual valve
	Malfunction of the check ball
	Incorrect valve body installation

OIL SEAL LAYOUT

<4A/T>



<5A/T>

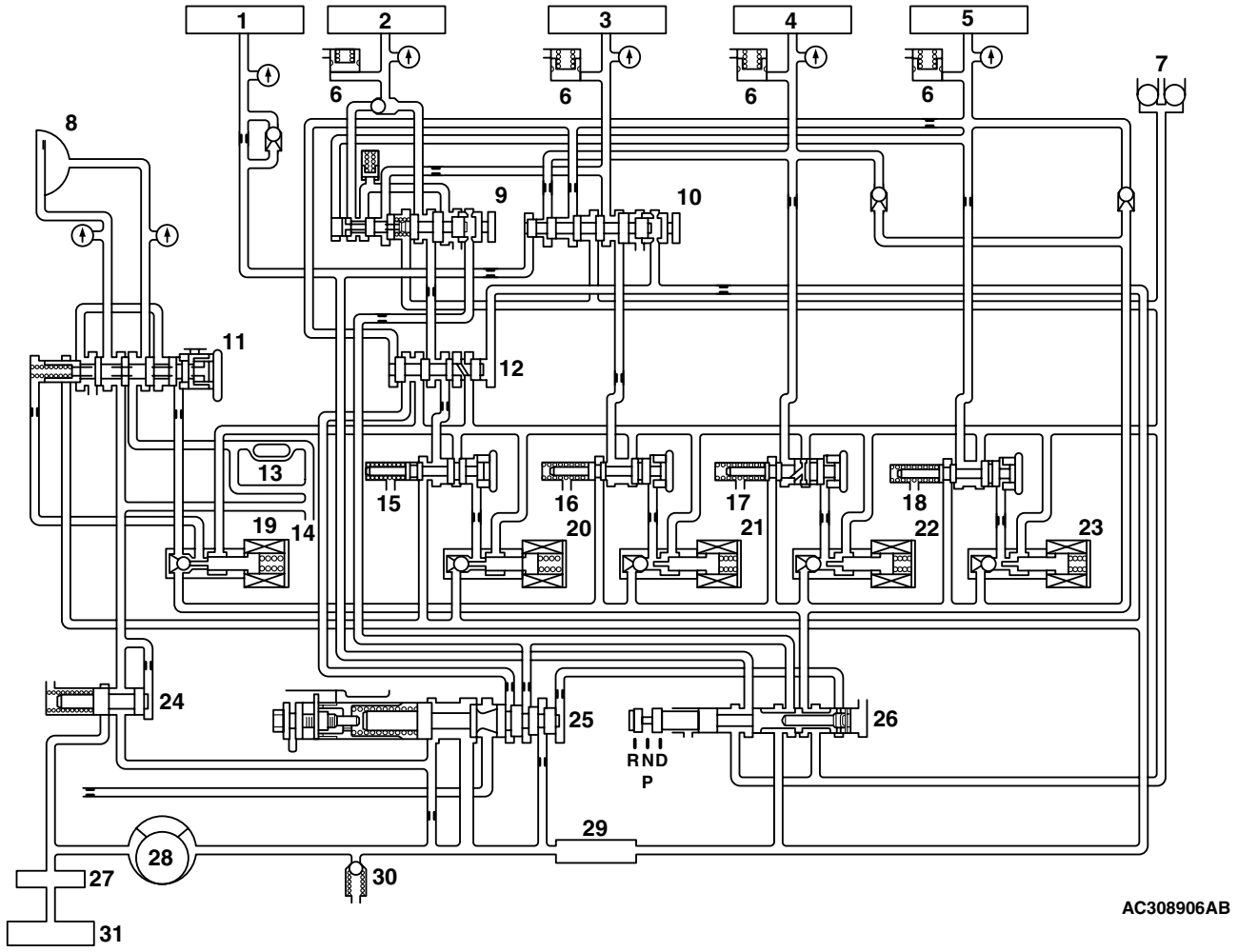


AC407213 AB

HYDRAULIC CIRCUIT

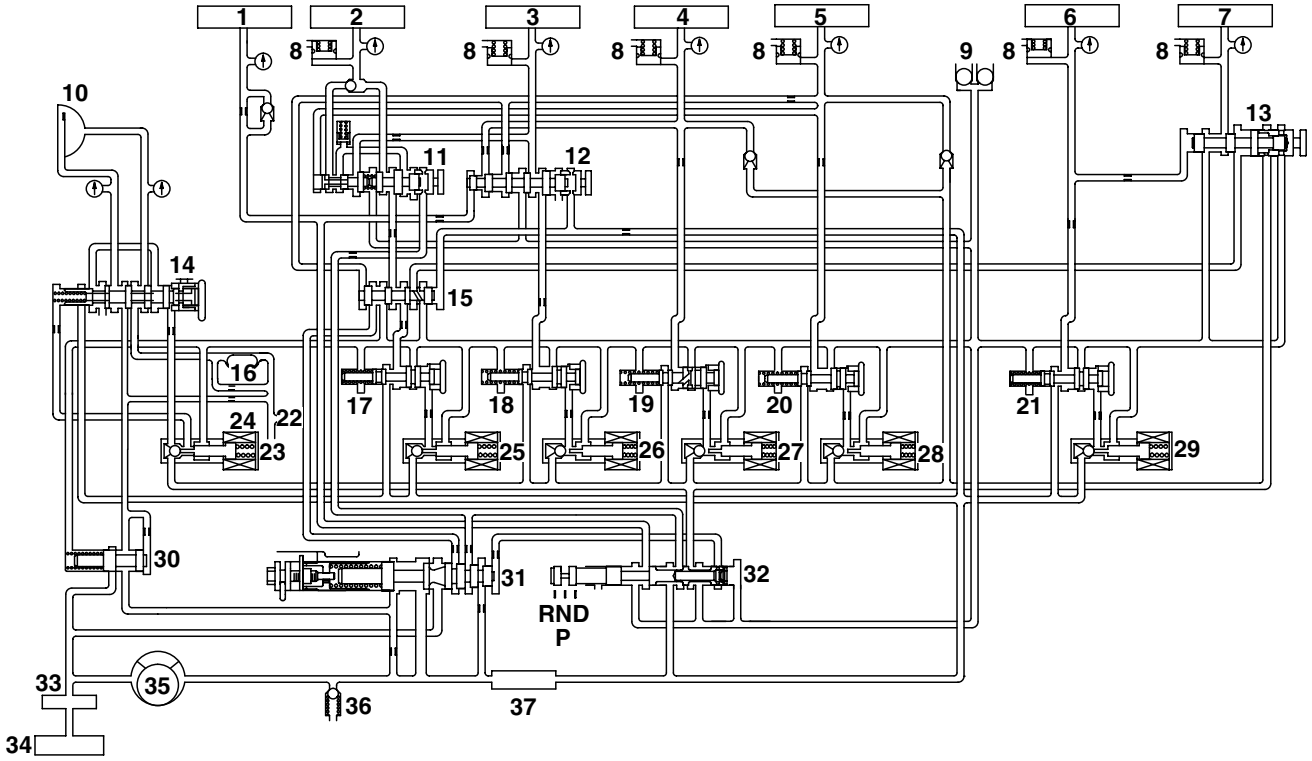
M1231008800507

PARKING AND NEUTRAL <4A/T>



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

PARKING AND NEUTRAL <5A/T>

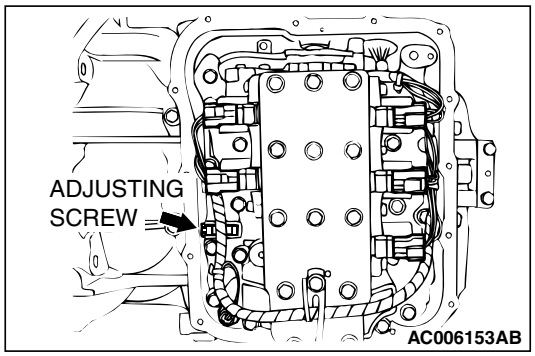


AC406938 AB

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. LOW-REVERSE PRESSURE CONTROL VALVE
18. SECOND PRESSURE CONTROL VALVE
19 UNDERDRIVE PRESSURE CONTROL VALVE
20. OVERDRIVE PRESSURE CONTROL VALVE
21. REDUCTION PRESSURE CONTROL VALVE
22. LUBRICATION
23. LUBRICATION
24. TORQUE CONVERTER CLUTCH SOLENOID VALVE
25. LOW-REVERSE SOLENOID VALVE
26. SECOND SOLENOID VALVE
27. UNDERDRIVE SOLENOID VALVE
28. OVERDRIVE SOLENOID VALVE
29. REDUCTION SOLENOID VALVE
30 TORQUE CONVERTER PRESSURE CONTROL VALVE
31. REGULATOR VALVE
32. MANUAL VALVE
33. OIL FILTER
34. OIL PUMP
35. OIL STRAINER
36. RELIEF VALVE
37. OIL PAN

LINE PRESSURE ADJUSTMENT

M1231001700361



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: When adjusting the line pressure, adjust to the middle of the standard value range.
   Standard value: 0.98 – 1.05 MPa (142 – 152 psi)
4. Install the valve body cover. Pour in one quart transmission fluid.
5. Repeat the hydraulic pressure test. (Refer to P.23A-37). Readjust the line pressure if necessary.

DIAGNOSTIC TROUBLE CODE CHART

M1231007900716

⚠ CAUTION
During diagnosis, a DTC code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for DTC code(s). If DTC code(s) are set, erase them all.

A/T DTC NO.	MFI DTC NO.	DIAGNOSIS ITEM		REFERENCE PAGE
P1606	–	EEPROM malfunction		P.23A-49
P1763	P0713	Transmission fluid temperature sensor system	Open circuit	P.23A-51
P1764	P0712		Short circuit	P.23A-65
P1766	P0715	Input shaft speed sensor system	Short circuit/open circuit	P.23A-75
P1767	P0720	Output shaft speed sensor system	Short circuit/open circuit	P.23A-96
P1769	–	Stoplight switch system	Short circuit	P.23A-117
P1770	P0705	Transmission range switch system	Open circuit	P.23A-125
P1771			Short circuit	P.23A-157
P1773	P0753	Low-reverse solenoid valve system	Short circuit/open circuit	P.23A-172
P1774	P0758	Underdrive solenoid valve system	Short circuit/open circuit	P.23A-185
P1775	P0763	Second solenoid valve system	Short circuit/open circuit	P.23A-196
P1776	P0768	Overdrive solenoid valve system	Short circuit/open circuit	P.23A-207
P1777	P0773	Reduction solenoid valve system <5A/T>	Short circuit/open circuit	P.23A-218
P1778	P0743	Torque converter clutch solenoid valve system	Short circuit/open circuit	P.23A-229
P1779	P0731	1st gear incorrect ratio		P.23A-240
P1780	P0732	2nd gear incorrect ratio		P.23A-240
P1781	P0733	3rd gear incorrect ratio		P.23A-240

TSB Revision

A/T DTC NO.	MFI DTC NO.	DIAGNOSIS ITEM		REFERENCE PAGE
P1782	P0734	4th gear incorrect ratio		P.23A-240
P1783	P0735	5th gear incorrect ratio <5A/T>		P.23A-240
P1784	P0736	Reverse gear incorrect ratio		P.23A-240
P1786	P0741	Torque converter clutch system	Defective system	P.23A-256
P1787	P0742		Clutch stuck on	P.23A-261
P1788	P1751	A/T control relay system	Short circuit to ground/ open circuit	P.23A-265

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

SYMPTOM CHART

M1231008000534

⚠ CAUTION
During diagnosis, a DTC code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for DTC code(s). If DTC code(s) are set, erase them all.

SYMPTOM		INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication with scan tool is not possible	Communication with all systems is impossible	-	Group 13A <2.4L Engine>, Symptom Procedures P.13A-1000. Group 13B <3.8L Engine>, Symptom Procedures P.13B-1251.
	Communication with the PCM only is impossible	-	Group 13A <2.4L Engine>, Symptom Procedures P.13A-1003. Group 13B <3.8L Engine>, Symptom Procedures P.13B-1254.
Driving impossible	Engine does not start	1	P.23A-280
	Does not move forward	2	P.23A-283
	Does not move backward	3	P.23A-285
	Does not move (forward and backward)	4	P.23A-288

SYMPTOM		INSPECTION PROCEDURE NO.	REFERENCE PAGE
Malfunction when moving selector into gear	Engine stalls when moving selector lever from "N" to "D" or "N" to "R"	5	P.23A-289
	Shift shock when shifting from "N" to "D" and long delay	6	P.23A-291
	Shift shock when shifting from "N" to "R" and long delay	7	P.23A-293
	Shift shock when shifting from "N" to "D" and "N" to "R" and long delay	8	P.23A-297
Malfunction when shifting	Shift shock and slipping	9	P.23A-298
Does not shift properly	Early or late shifting in all gears	10	P.23A-301
	Early or late shifting in some gears	11	P.23A-304
Does not shift	No diagnostic trouble codes	12	P.23A-306
Malfunction while driving	Poor acceleration	13	P.23A-311
	Vibration	14	P.23A-313
Shift switch assembly system		15	P.23A-316
Shift position indicator light system		16	P.23A-339

DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC P1606: EEPROM Malfunction

DTC SET CONDITIONS

DTC P1606 will be set when abnormal conditions are encountered in the A/T side area of EEPROM.

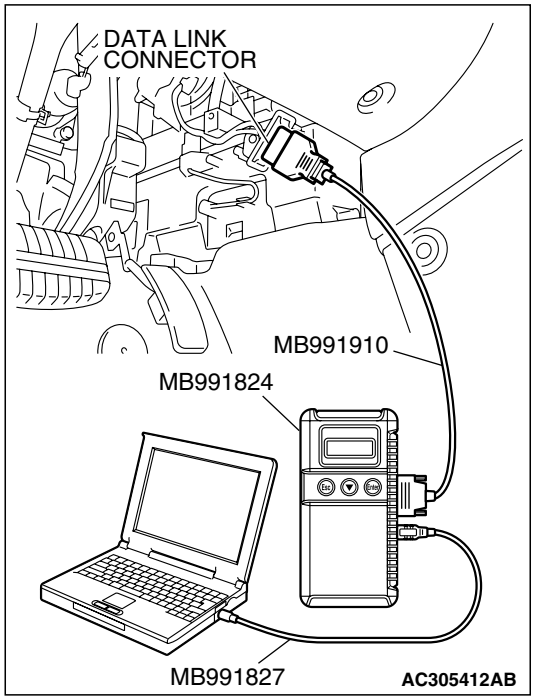
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the PCM

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC)

⚠ 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) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

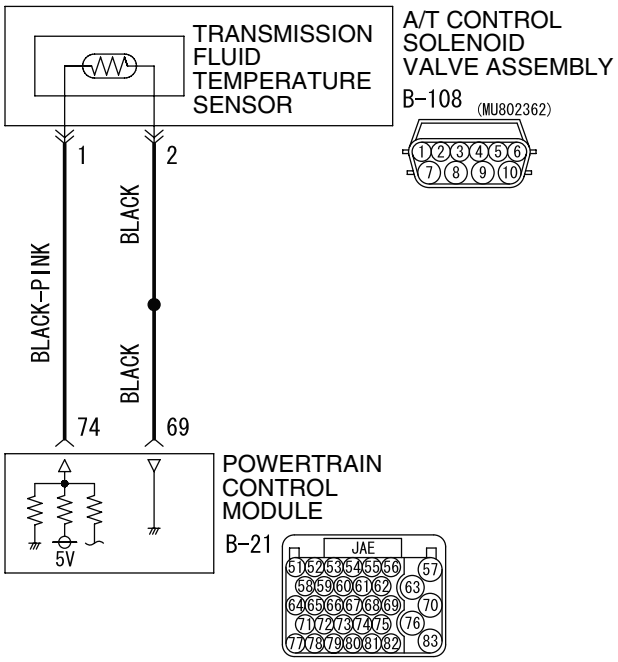
Q: Is DTC P1606 set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

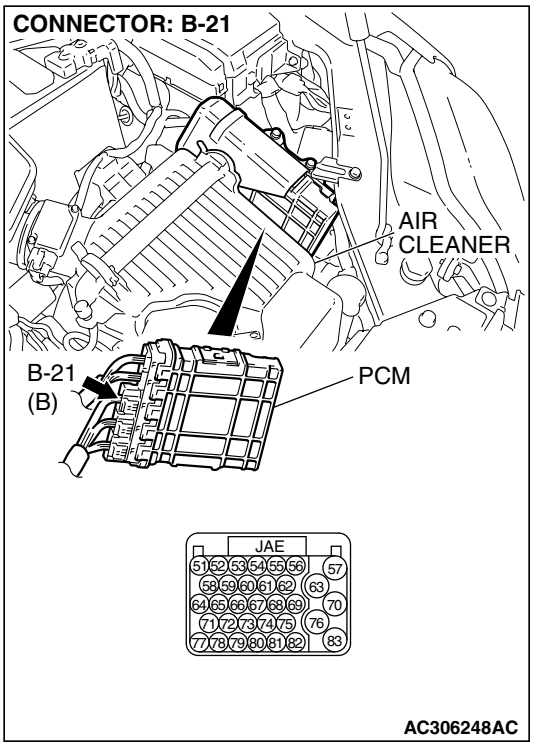
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

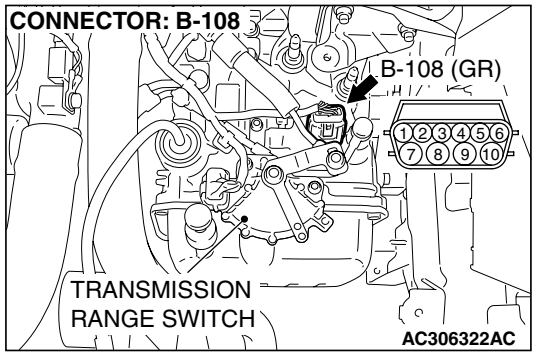
DTC P1763 (P0713): Transmission Fluid Temperature Sensor System (Open Circuit)

Transmission Fluid Temperature Sensor System Circuit



W4P06M00AA
AC209753AC





CIRCUIT OPERATION

- The PCM (terminal 74) applies 5 volts to the transmission fluid temperature sensor output terminal (terminal 1).

TSB Revision

- The transmission fluid temperature sensor circuit is grounded to the PCM (terminal 69).
- 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)

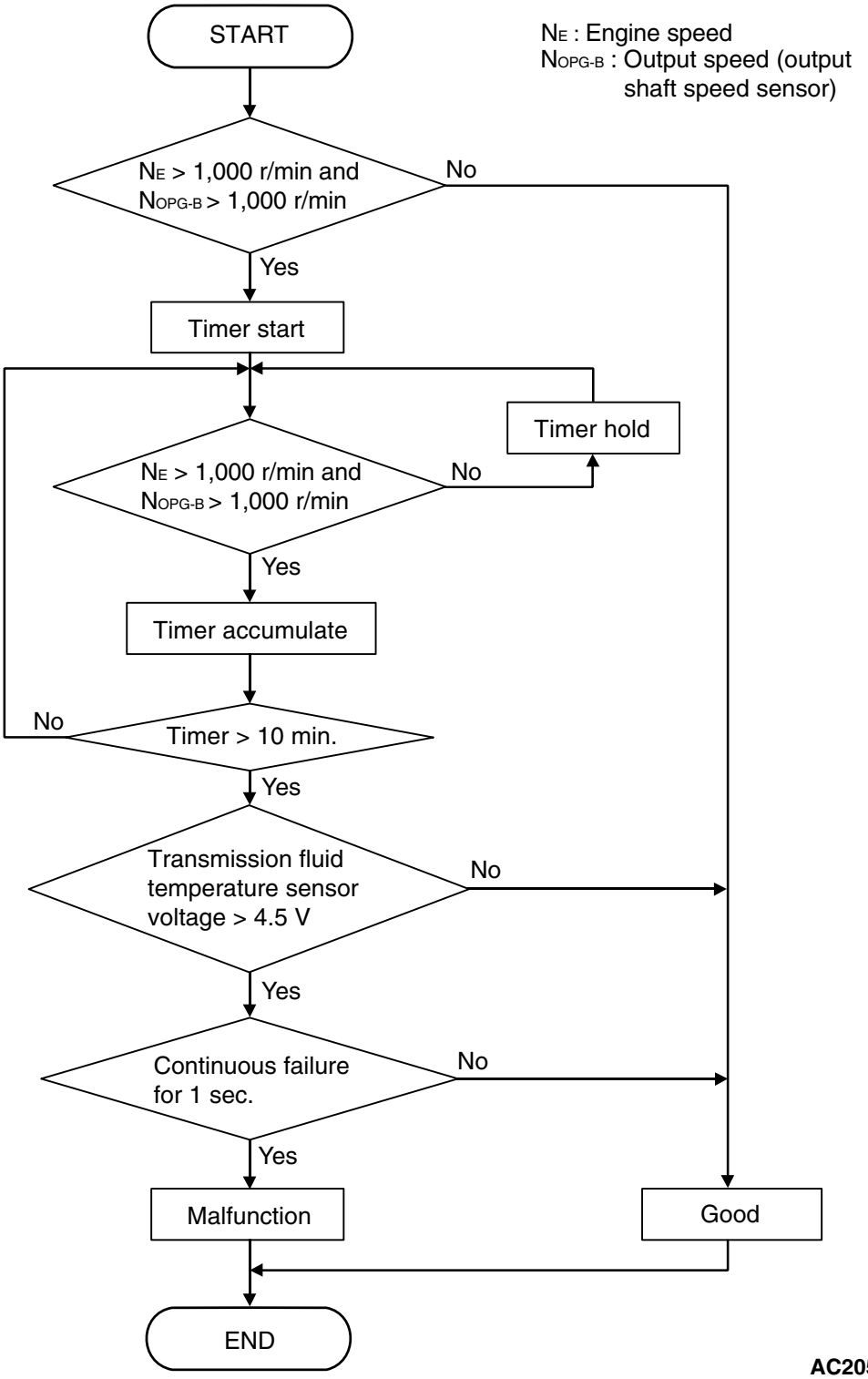
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- DTC P1767 (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

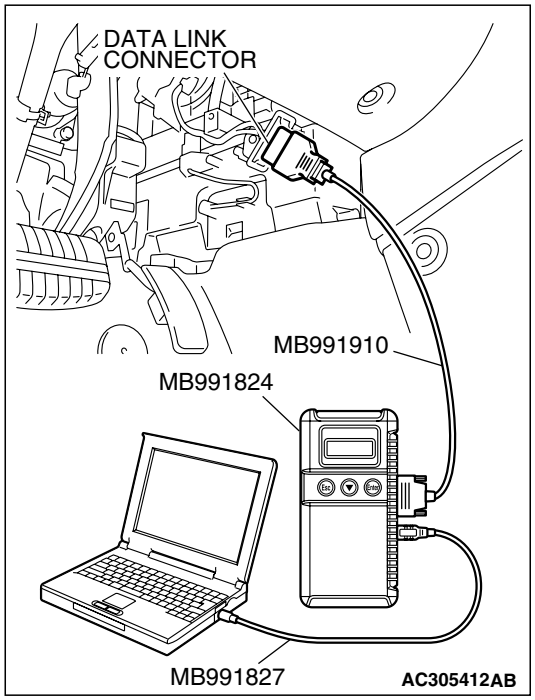
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

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

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check data list item 7: 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 7: 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 5, 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 – 80°C (158 – 176°F).

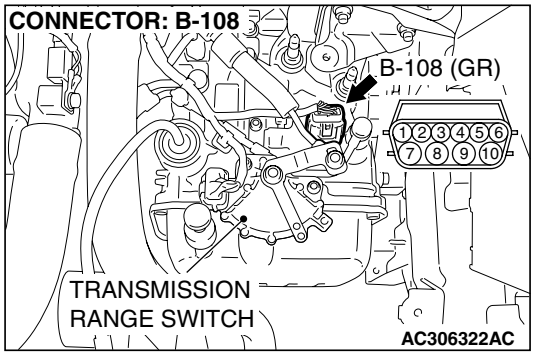
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

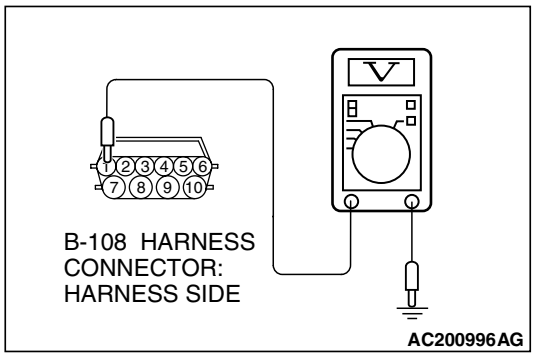
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-14.

NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at the A/T control solenoid valve assembly connector B-108 by backprobing.



(1) Do not disconnect connector B-108.
(2) Turn the ignition switch to the "ON" position.



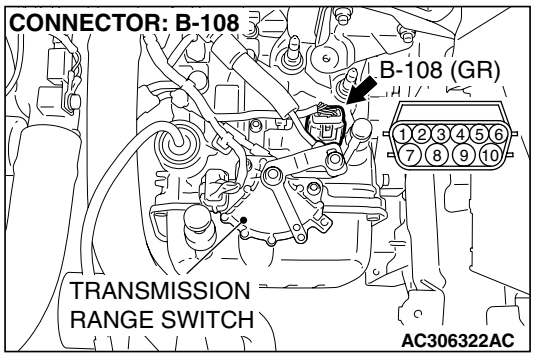
(3) Measure the voltage between terminal 1 and ground by backprobing.
- When transmission fluid temperature is 20°C (68°F), voltage should measure between 3.8 and 4.0 volts.
- When transmission fluid temperature is 40°C (104°F), voltage should measure between 3.2 and 3.4 volts.
- When transmission fluid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

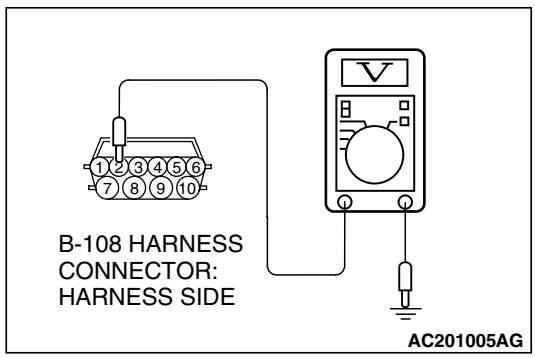
Q: Is the measured voltage within the specified range?

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 B-108 by backprobing.



(1) Do not disconnect connector B-108.
(2) Turn the ignition switch to the "ON" position.

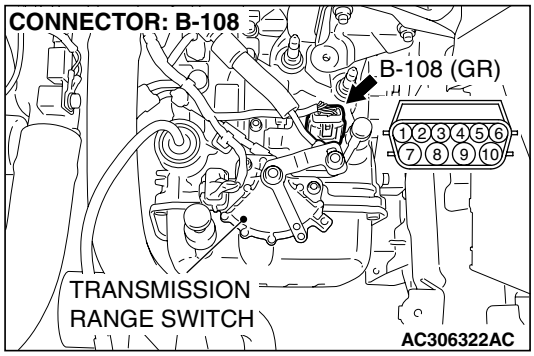


(3) Measure the voltage between terminal 2 and ground by backprobing.
- The voltage should measure 0.5 volt or less.

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

Q: Is the measured voltage 0.5 volt or less?

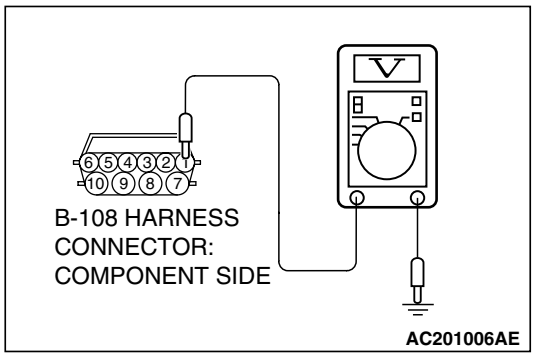
YES : Go to Step 4.
NO : Go to Step 7.



STEP 4. Check the sensor output voltage at A/T control solenoid valve assembly connector B-108.

(1) Disconnect connector B-108 and measure at the harness side.

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



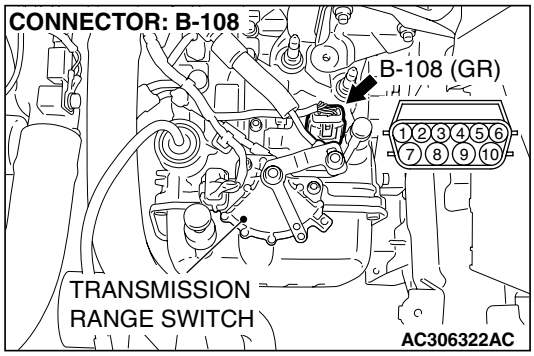
(3) Measure the voltage between terminal 1 and ground.
- The voltage should measure between 4.5 and 4.9 volts.

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

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

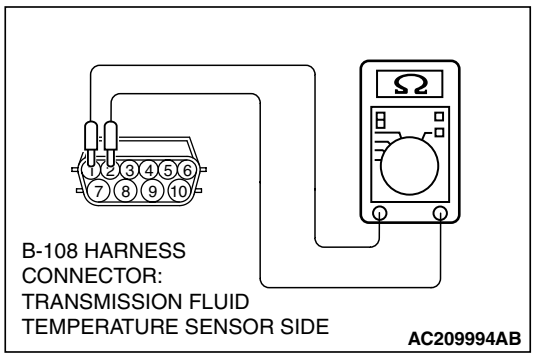
YES : Go to Step 5.

NO : Go to Step 9.



STEP 5. Check the transmission fluid temperature sensor at A/T control solenoid valve assembly connector B-108.

(1) Disconnect connector B-108 and measure at the sensor side.

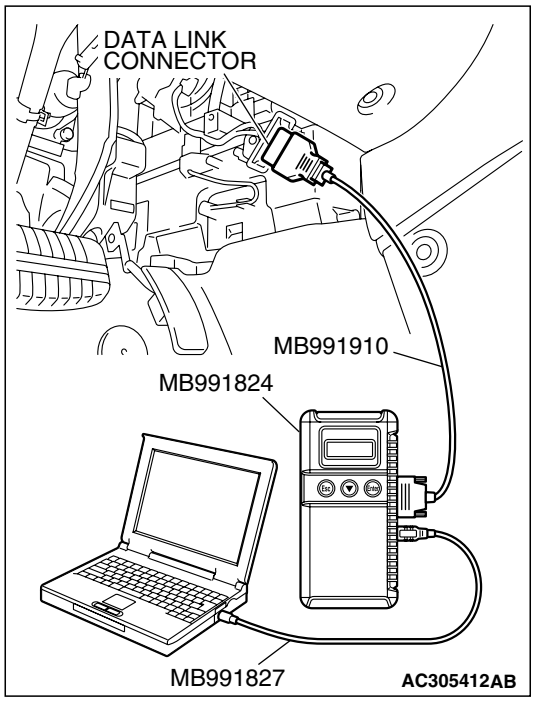


(2) Measure the resistance between terminal 1 and 2.
- When transmission fluid temperature is 0°C (32°F), resistance should be between 16.7 and 20.5 kΩ.
- When transmission fluid temperature is 20°C (68°F), resistance should be between 7.3 and 8.9 kΩ.
- When transmission fluid temperature is 40°C (104°F), 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, Transaxle <4A/T> P.23B-8 or Refer to GROUP 23C, Transaxle <5A/T> P.23C-8.



STEP 6. Using scan tool MB991958, check data list item 7: 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 7: Transmission Fluid Temperature Sensor.
  - When the engine is cool: Almost equal to the ambient temperature (atmospheric temperature)

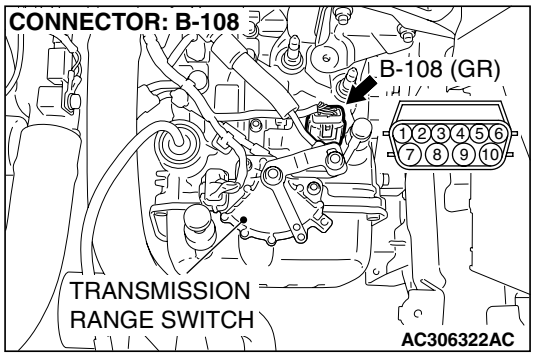
    NOTE: Set scan tool MB991958 to data reading mode for item number 5, Intake Air Temperature (IAT) Sensor and note the temperature measurement. When the engine is cool, the temperature should be almost equal to the ambient temperature (atmospheric temperature), and the IAT sensor measurement should be approximately the same as the Transmission Fluid Temperature Sensor.
  - When the engine is warm: 70 – 80°C (158 – 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.00-14.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

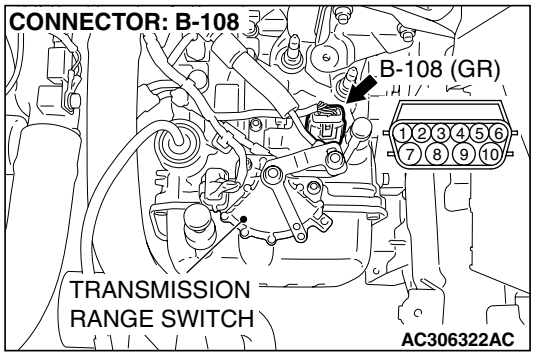


STEP 7. Check A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

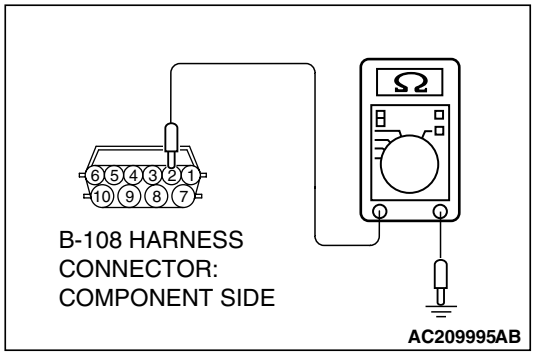
YES : Go to Step 8.

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 B-108.

(1) Disconnect connector B-108 and measure at the harness side.



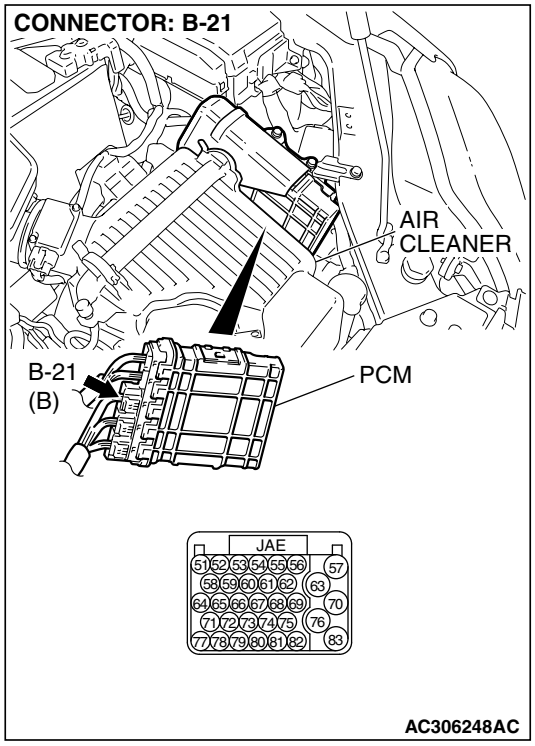
(2) Measure the resistance between terminal 2 and ground.
- The resistance should measure less than 2 ohms.

Q: Is the resistance less than 2 ohms?

YES : Go to Step 5.
NO : Go to Step 12.

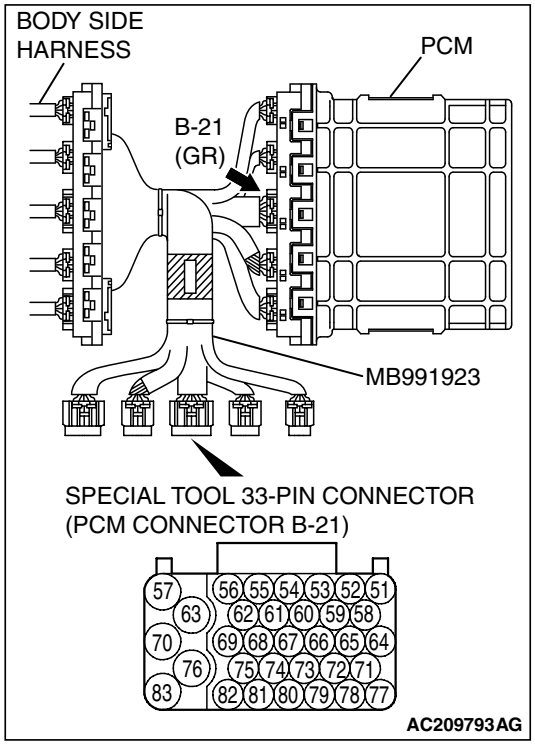
STEP 9. Measure the sensor output voltage at PCM connector B-21 by using check harness special tool MB991923 .

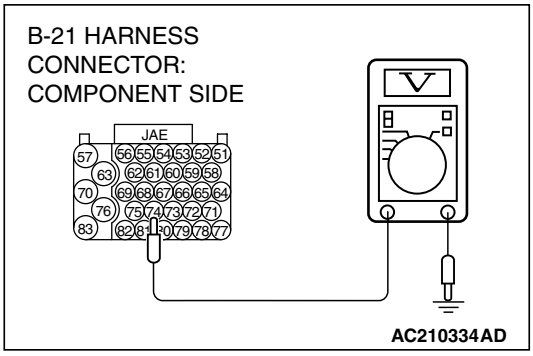
(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.

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





(4) Measure the voltage between terminal 74 and ground.
- 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.

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

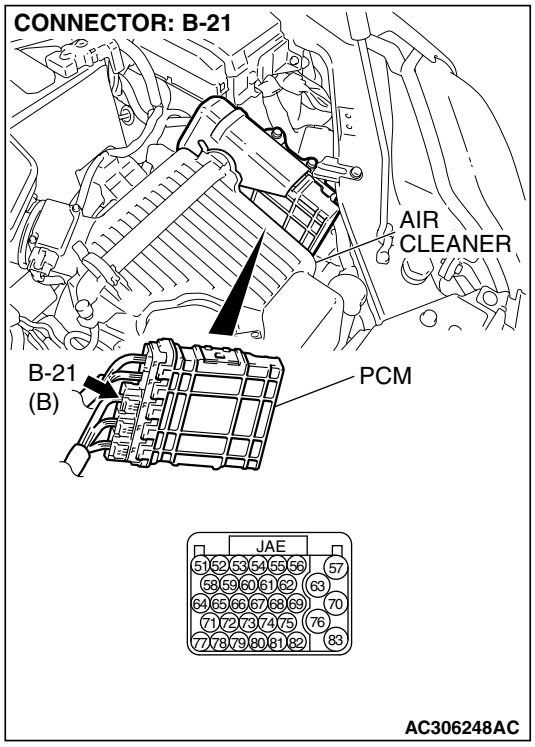
Q: Is the measured voltage within the specified range?

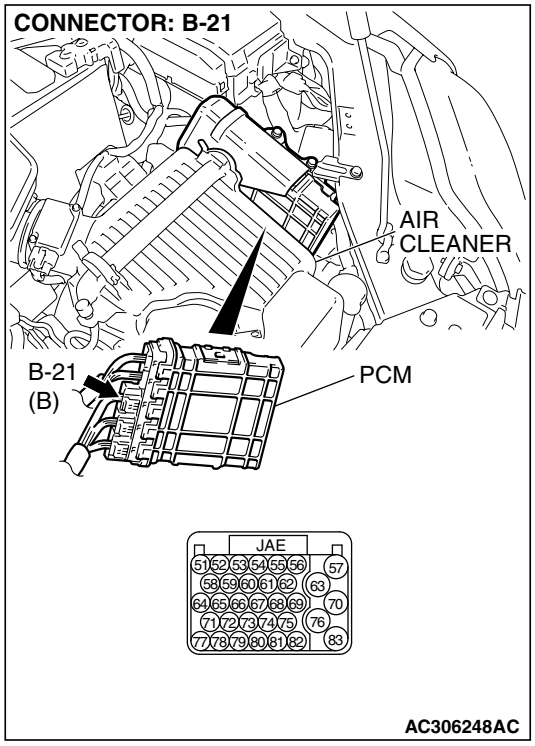
YES : Go to Step 6.
NO : Go to Step 10.

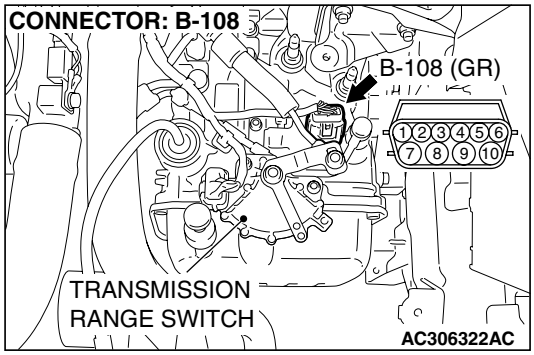
STEP 10. Check PCM connector B-21 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 11.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





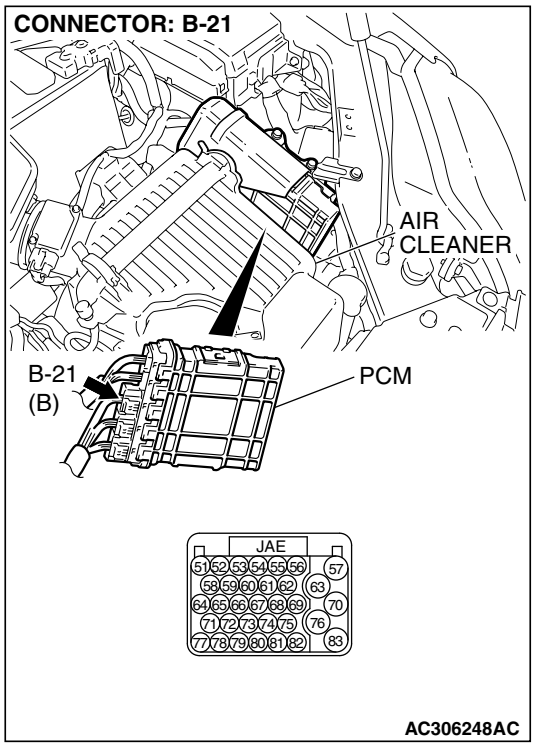


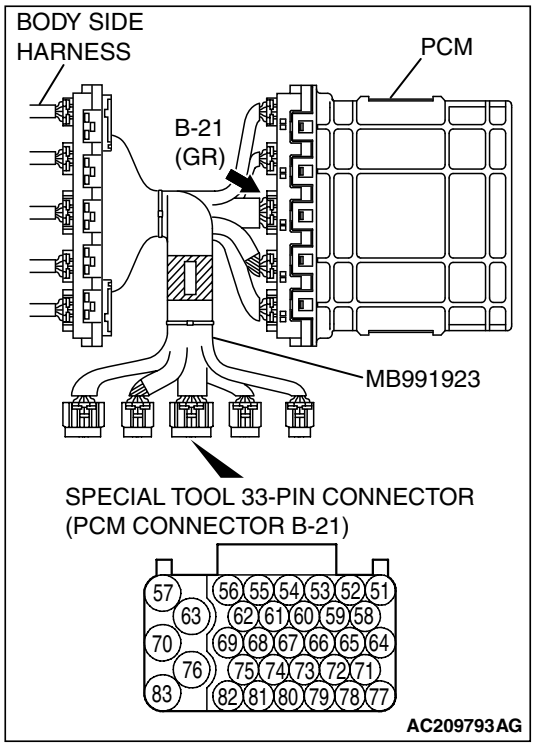
STEP 11. Check the harness for open circuit or short circuit to ground between PCM connector B-21 terminal 74 and A/T control solenoid valve connector B-108 terminal 1.
Q: Is the harness wire in good condition?

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

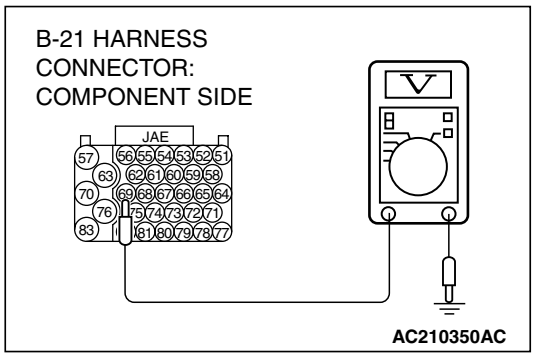
STEP 12. Measure the ground voltage at PCM connector B-21 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.



(4) Measure the voltage between terminal 69 and ground.
- Voltage should measure 0.5 volt or less.

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

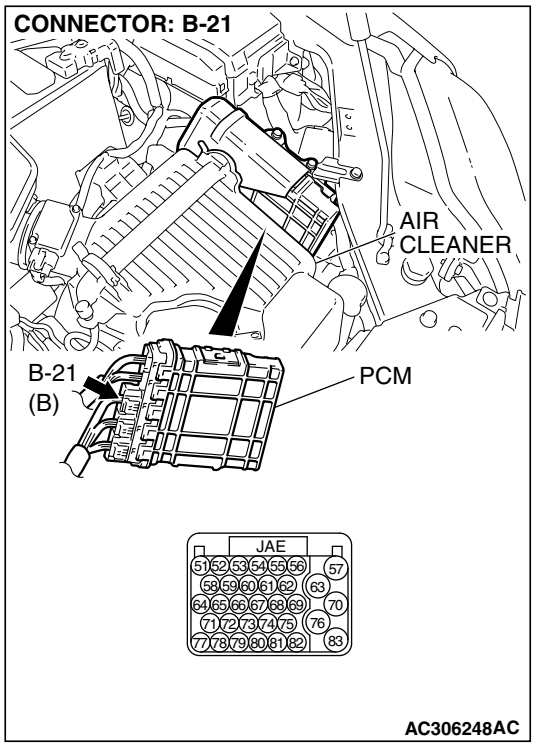
Q: Is the measured voltage within the specified range?

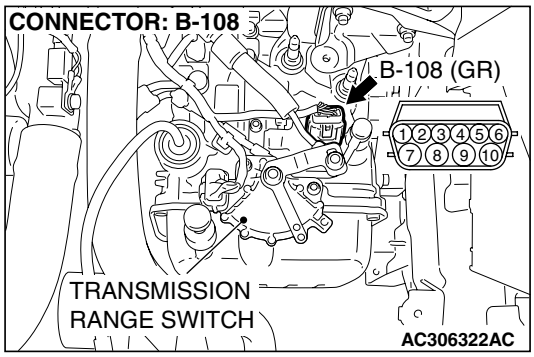
YES : Go to Step 13.
NO : Go to Step 14.

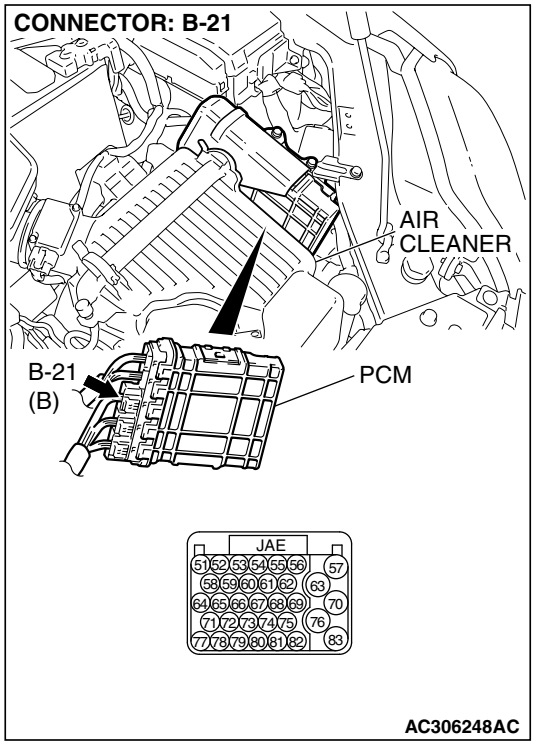
STEP 13. Check the harness for open circuit or damage between PCM connector B-21 terminal 69 and A/T control solenoid valve connector B-108 terminal 2.

Q: Is the harness wire in good condition?

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







STEP 14. Check PCM connector B-21 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 P1764 (P0712): Transmission Fluid Temperature Sensor System (Short Circuit)

TRANSMISSION FLUID TEMPERATURE SENSOR SYSTEM CIRCUIT

Refer to P.23A-51.

CIRCUIT OPERATION

Refer to P.23A-51.

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)

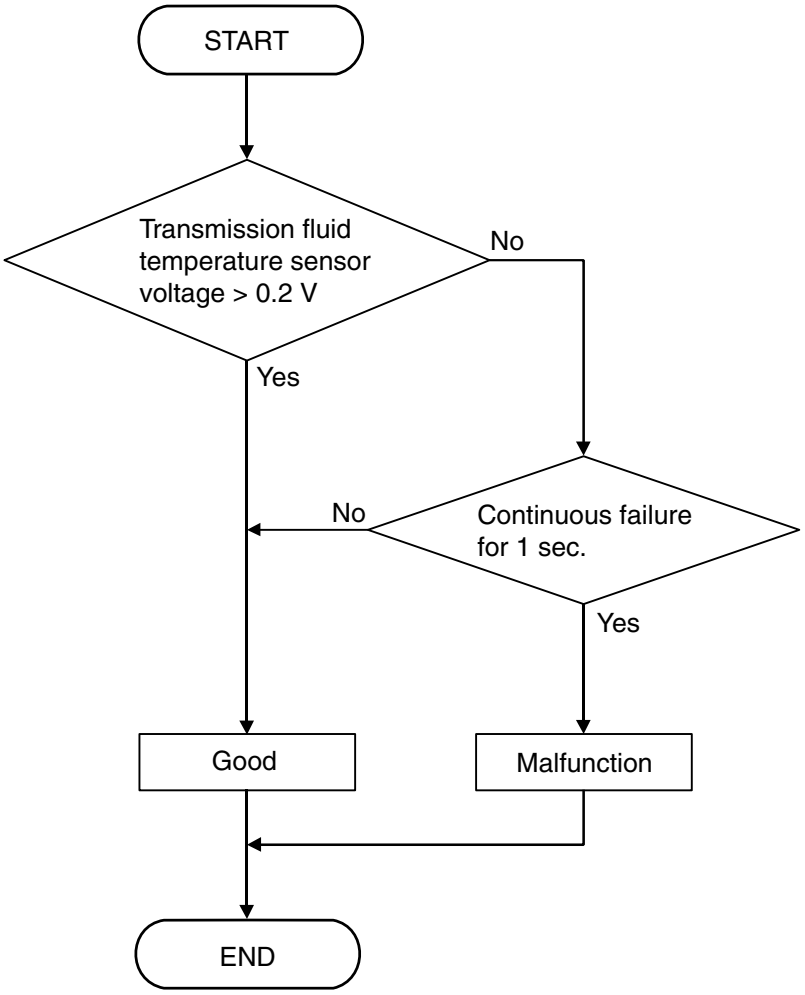
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

LOGIC FLOW CHARTS (Monitor Sequence)



AC205182

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:)

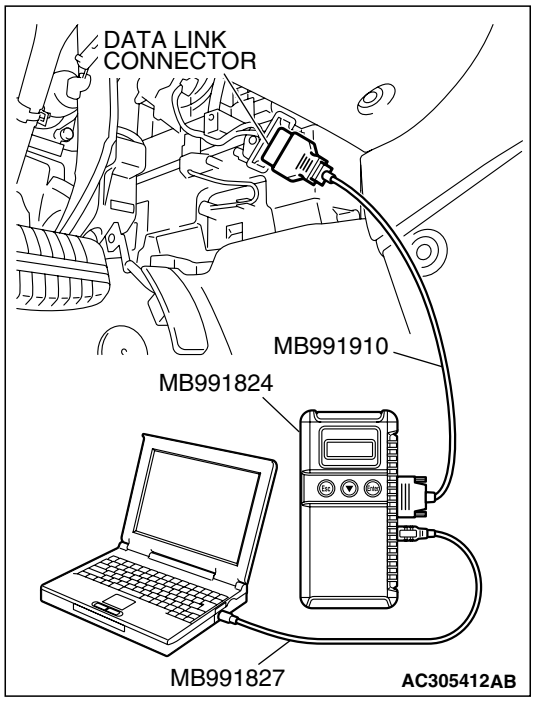
- Malfunction of the transmission fluid temperature sensor circuit
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

TSB Revision



STEP 1. Using scan tool MB991958, check data list item 7: 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 7: Transmission Fluid Temperature Sensor.
  - When the engine is cool: Almost equal to the ambient temperature (atmospheric temperature)

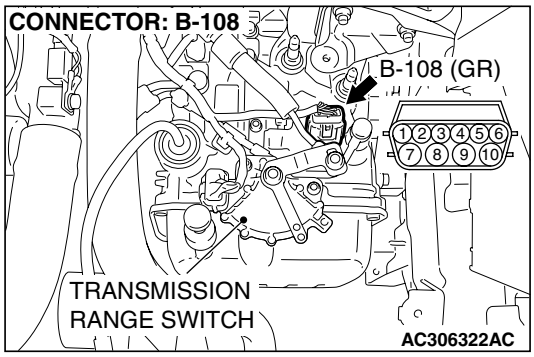
    NOTE: Set scan tool MB991958 to the data reading mode for item number 5, Intake Air Temperature (IAT) Sensor and note the temperature measurement. When the engine is cool, the temperature should be almost equal to the ambient temperature (atmospheric temperature), and the IAT sensor measurement should be approximately the same as the Transmission Fluid Temperature Sensor.
  - When the engine is warm: 70 – 80°C (158 – 176°F).

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

Q: Is the sensor operating properly?

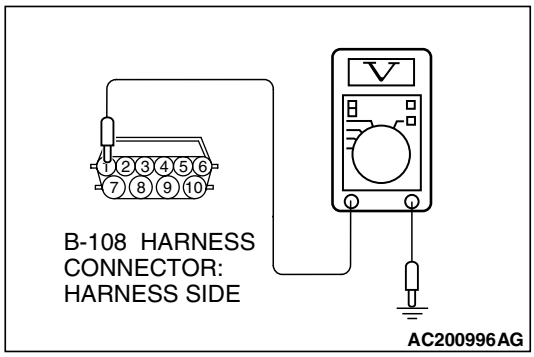
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-14.

NO : Go to Step 2.



STEP 2. Measure the sensor output voltage at the A/T control solenoid valve assembly connector B-108 by backprobing.

(1) Do not disconnect connector B-108.
(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.

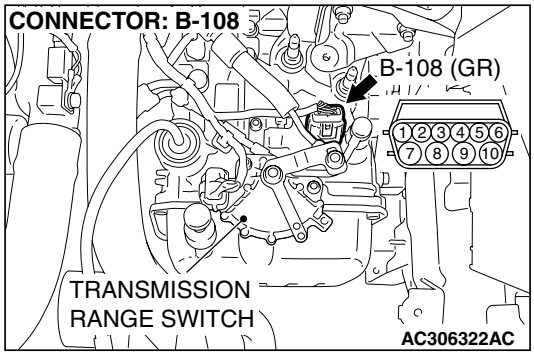
Q: Is the measured voltage within the specified range?

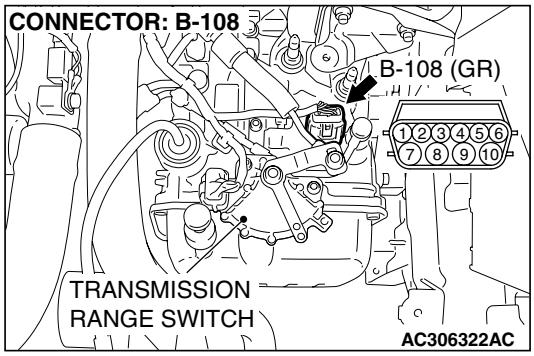
YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Check A/T control solenoid valve assembly connector B-108 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.

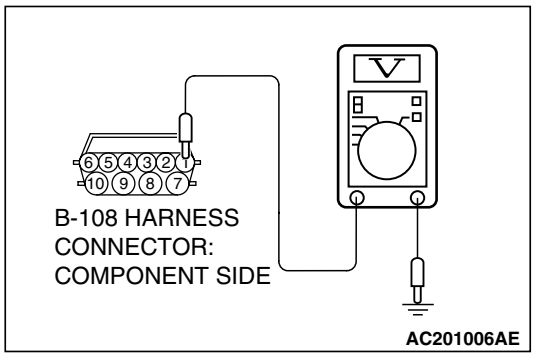




STEP 4. Check the sensor output voltage at A/T control solenoid valve assembly connector B-108.

(1) Disconnect connector B-108 and measure at the harness side.

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



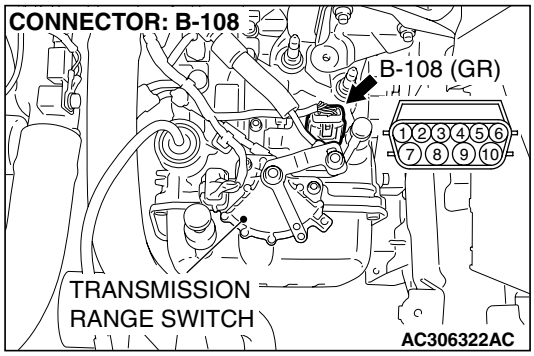
(3) Measure the voltage between terminal 1 and ground.
- The voltage should measure between 4.5 and 4.9 volts.

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

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

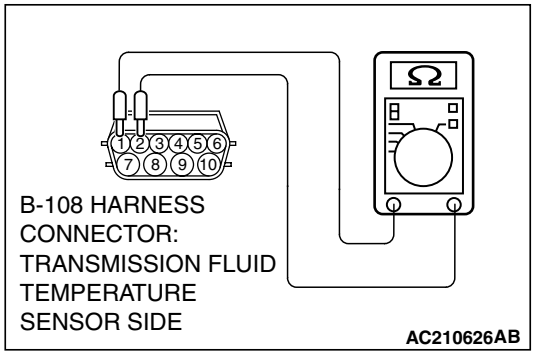
YES : Go to Step 5.

NO : Go to Step 7.



STEP 5. Check the transmission fluid temperature sensor at A/T control solenoid valve assembly connector B-108.

(1) Disconnect connector B-108 and measure at the sensor side.

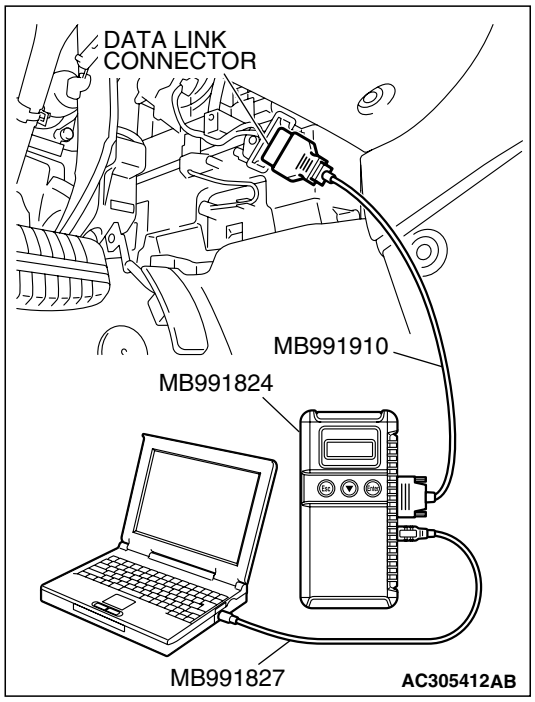


(2) Measure the resistance between terminal 1 and 2.
- When transmission fluid temperature is 0°C (32°F), resistance should be between 16.7 and 20.5 kΩ.
- When transmission fluid temperature is 20°C (68°F), resistance should be between 7.3 and 8.9 kΩ.
- When transmission fluid temperature is 40°C (104°F), 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, Transaxle <4A/T> P.23B-8 or Refer to GROUP 23C, Transaxle <5A/T>P.23C-8.



STEP 6. Using scan tool MB991958, check data list item 7: 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 7: 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 – 80°C (158 – 176°F).

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

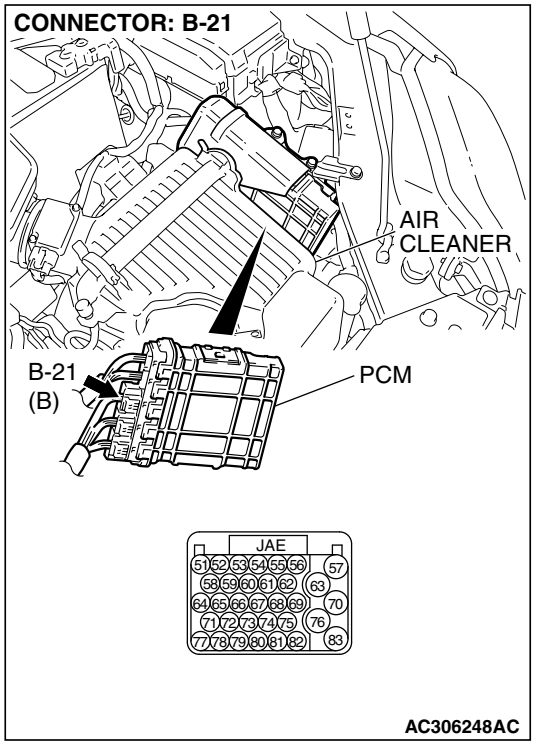
Q: Is the sensor operating properly?

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.00-14.

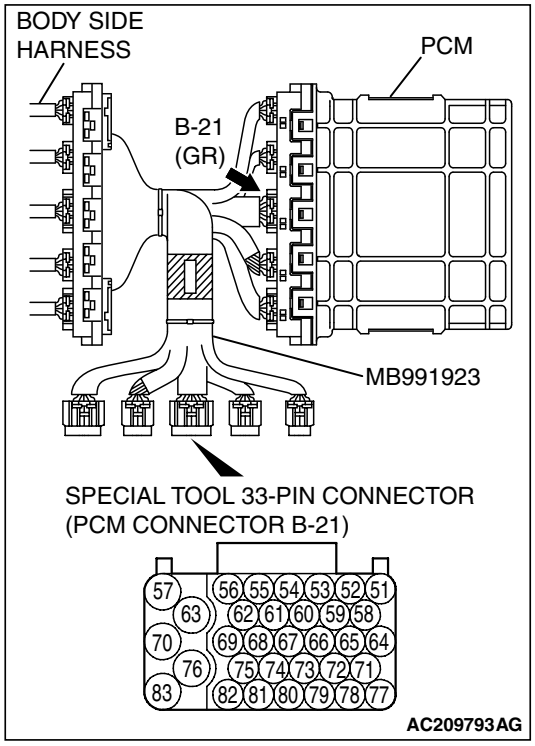
NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

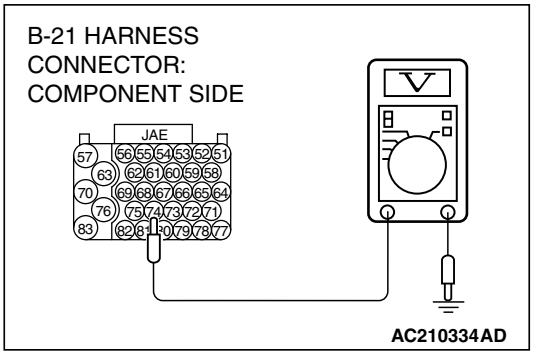
STEP 7. Measure the sensor output voltage at PCM connector B-21 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal 74 and ground.
- 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.

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

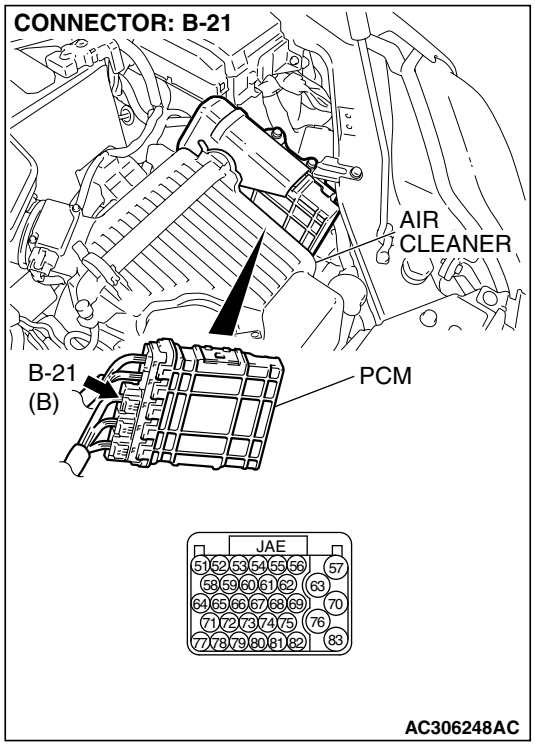
Q: Is the measured voltage within the specified range?

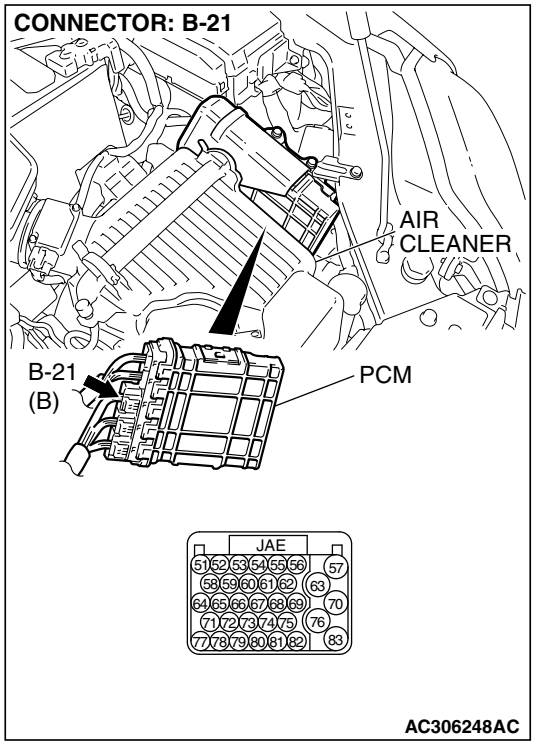
YES : Go to Step 6.
NO : Go to Step 8.

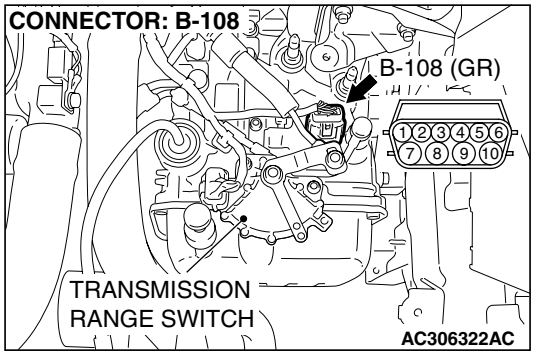
STEP 8. Check PCM connector B-21 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 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 PCM connector B-21 terminal 74 and A/T control solenoid valve connector B-108 terminal 1.

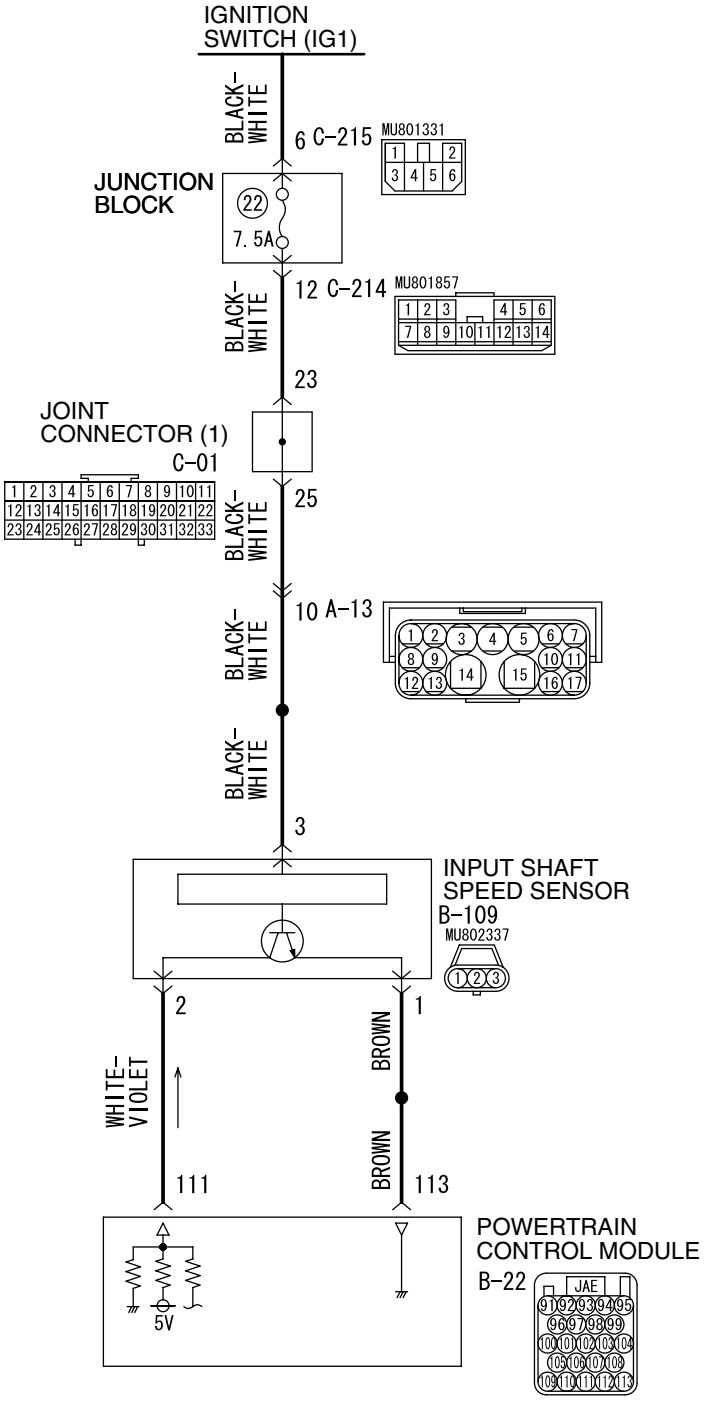
Q: Is the harness wire in good condition?

YES : Go to Step 6.

NO : Repair or replace the harness wire.

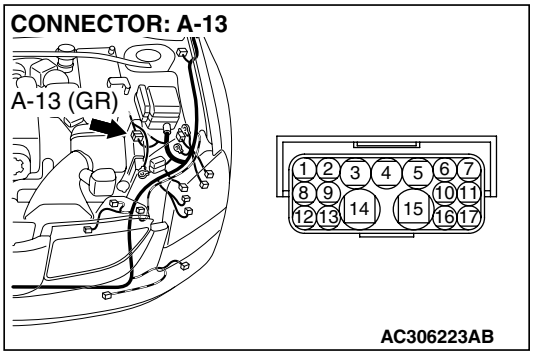
DTC P1766 (P0715): Input Shaft Speed Sensor System

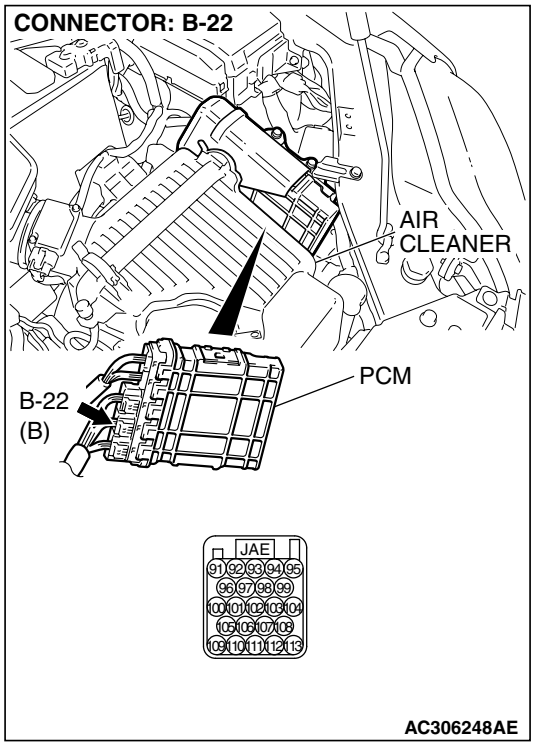
Input Shaft Speed Sensor System Circuit

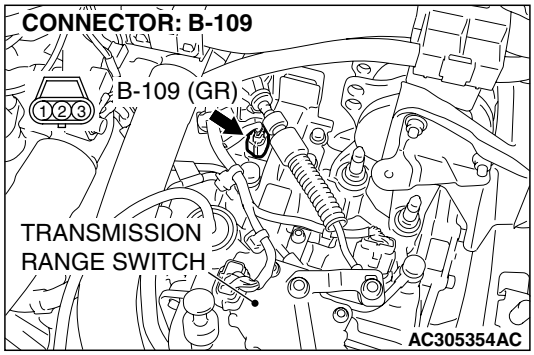


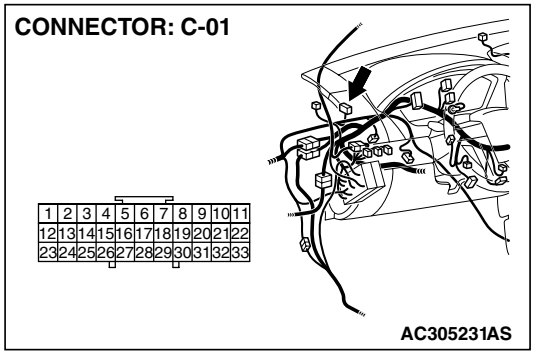
W4P06M02AA
AC209755AC

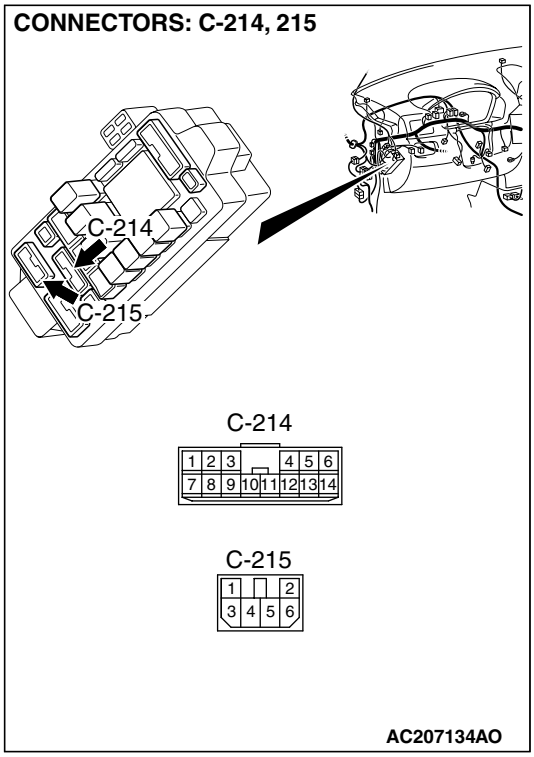
TSB Revision


CONNECTOR: A-13
A-13 (GR)
1 2 3 4 5 6 7
8 9 14 15 10 11
12 13 16 17
AC306223AB


CONNECTOR: B-22
AIR CLEANER
PCM
B-22 (B)
JAE
91 92 93 94 95
96 97 98 99
100 101 102 103 104
105 106 107 108
109 110 111 112 113
AC306248AE


CONNECTOR: B-109
B-109 (GR)
1 2 3
TRANSMISSION RANGE SWITCH
AC305354AC


CONNECTOR: C-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
AC305231AS



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 111 and 113) via the input shaft speed sensor connector (terminals 1 and 2).
- The PCM detects the input shaft speed by the signal input to terminal 111.
- The input shaft speed sensor generates the pulse signal as the teeth of the underdrive 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)

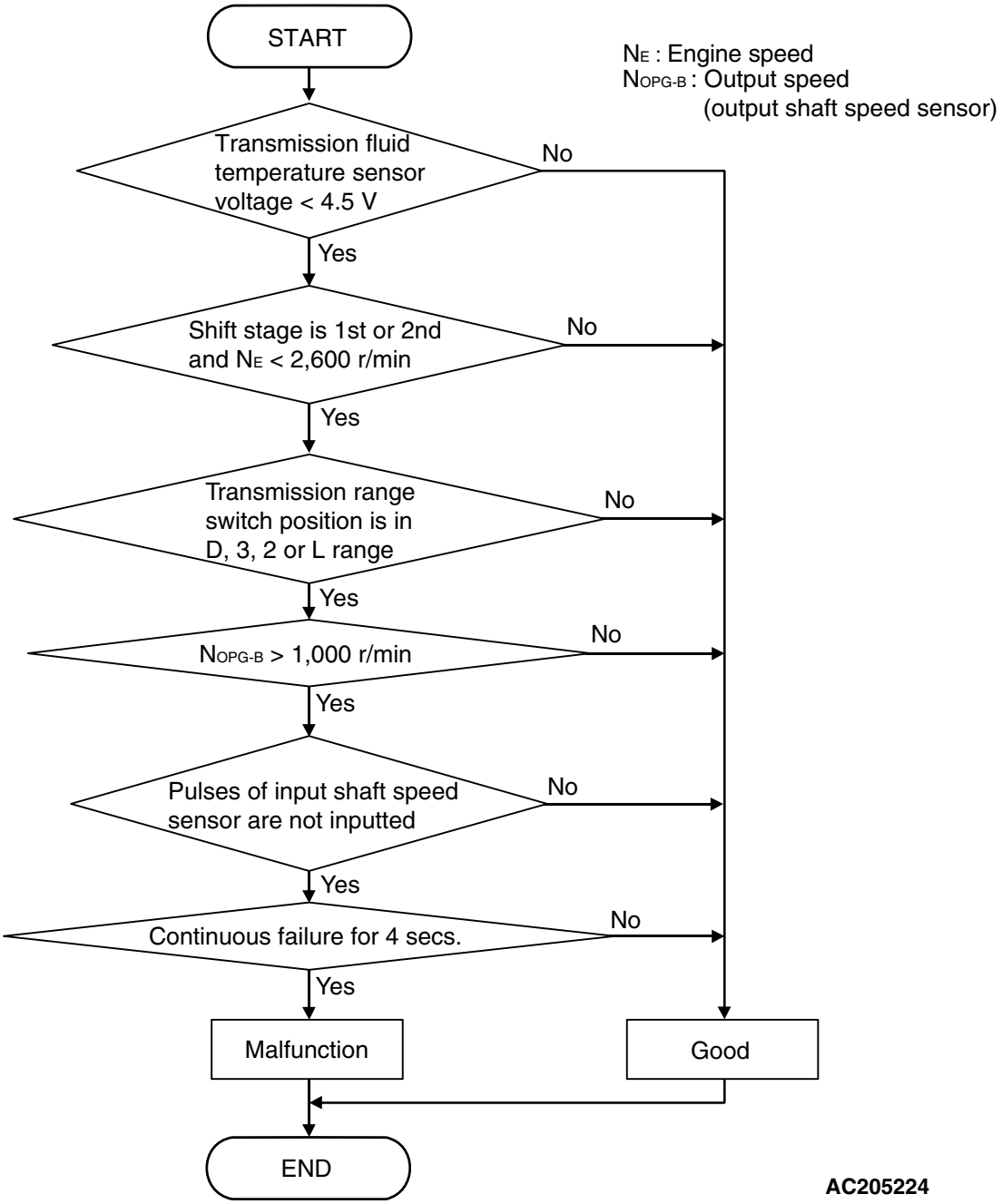
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- DTC P1767 (P0720): Output shaft speed sensor malfunction

Sensor (The sensor below is determined to be normal)

- Output shaft speed sensor

LOGIC FLOW CHARTS (Monitor Sequence)



DTC SET CONDITIONS

Check Conditions

- Transmission range switch position: D, 3, 2 or L.
- Output speed: 1,000 r/min or more. <4A/T>
- Vehicle speed: 30 km/h (19 mph). <5A/T>
- Transmission fluid temperature sensor voltage: 4.5 volts or less.

Judgement Criteria

- Input shaft speed sensor signal: no signal change. (4 seconds)
- If DTC P1766 (P0715) is set consecutively four times, the transaxle 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.

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

- Malfunction of the input shaft speed sensor
- Malfunction of the underdrive clutch retainer

TSB Revision

- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, check data list item 5: Input Shaft Speed Sensor.

⚠ CAUTION

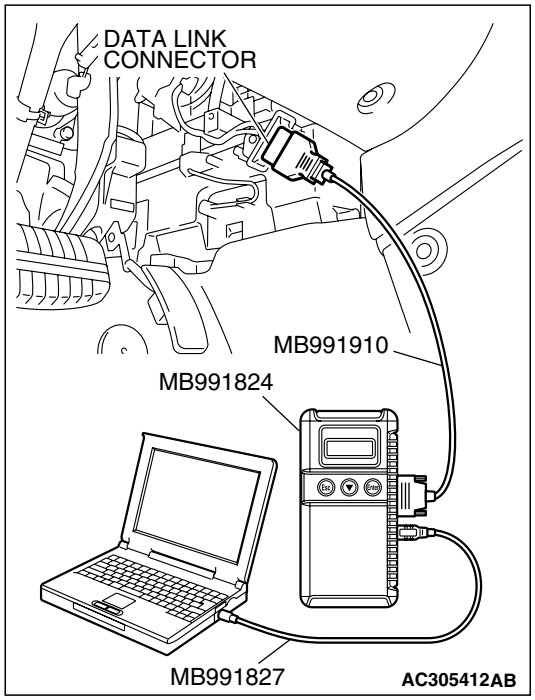
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

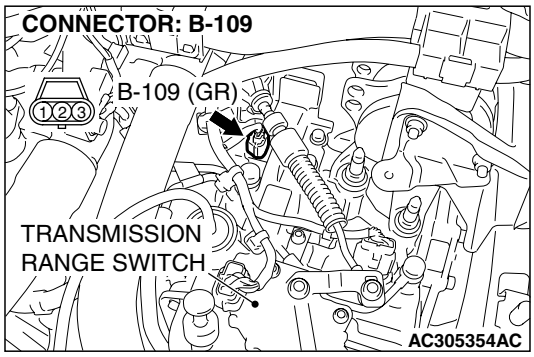
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to data reading mode.
  - Item 5: Input Shaft Speed Sensor.
    - When driving at constant speed of 50 km/h (31 mph), the display should be "1,400 – 1,700 r/min" (Gear range: 3rd gear). <4A/T>
    - When driving at constant speed of 60 km/h (37 mph), the display should be "1,400 – 1,700 r/min" (Gear range: 4th gear). <5A/T>
(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.00-14.

NO : Go to Step 2.

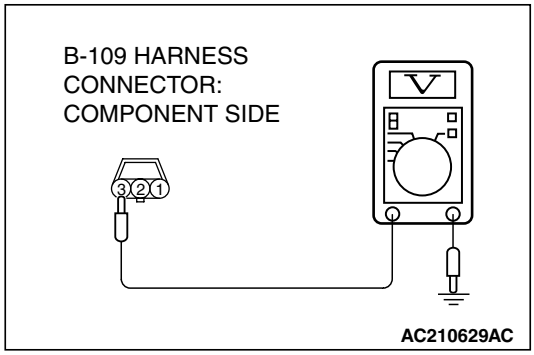




STEP 2. Measure the power supply voltage at the input shaft speed sensor connector B-109.

(1) Disconnect connector B-109 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.

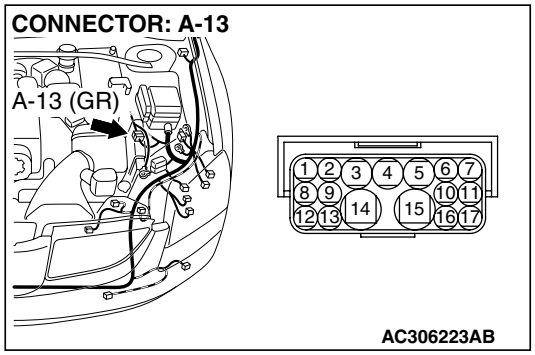
NO : Go to Step 3.

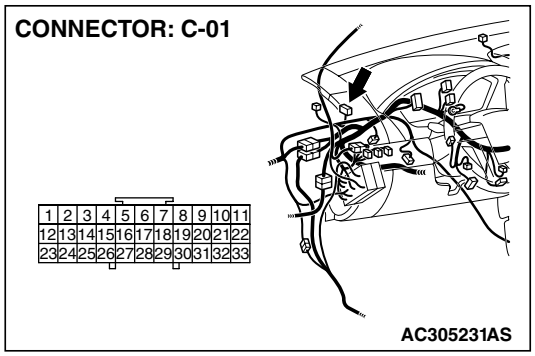
STEP 3. Check intermediate connector A-13, joint connector (1) C-01 and junction block connector C-214 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

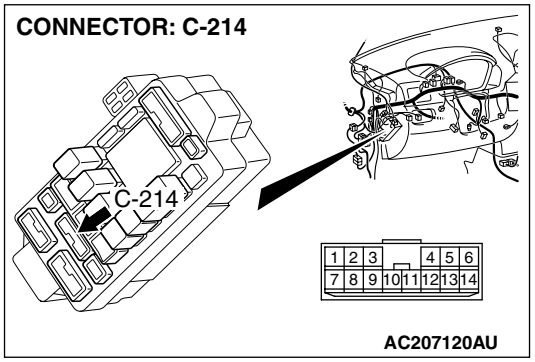
Q: Are the connectors and terminals in good condition?

YES : Go to Step 4.

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





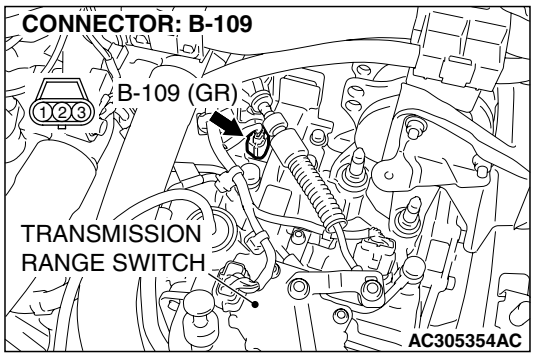


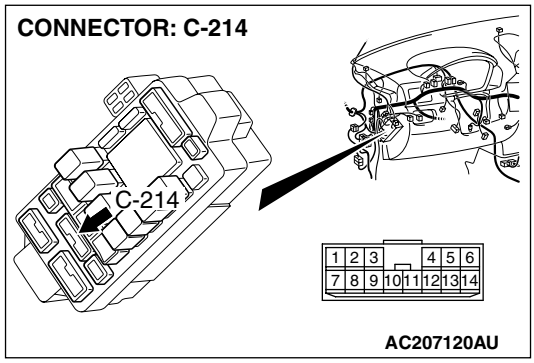
STEP 4. Check the harness for open circuit or short circuit to ground between the input shaft speed sensor connector B-109 terminal 3 and the junction block connector C-214 terminal 12.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.

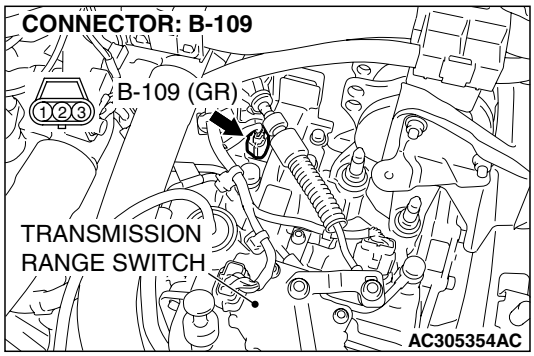


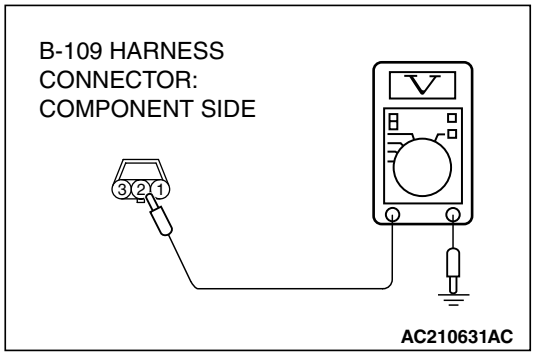


STEP 5. Measure the PCM to speed sensor output voltage at the input shaft speed sensor connector B-109.

(1) Disconnect connector B-109 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.

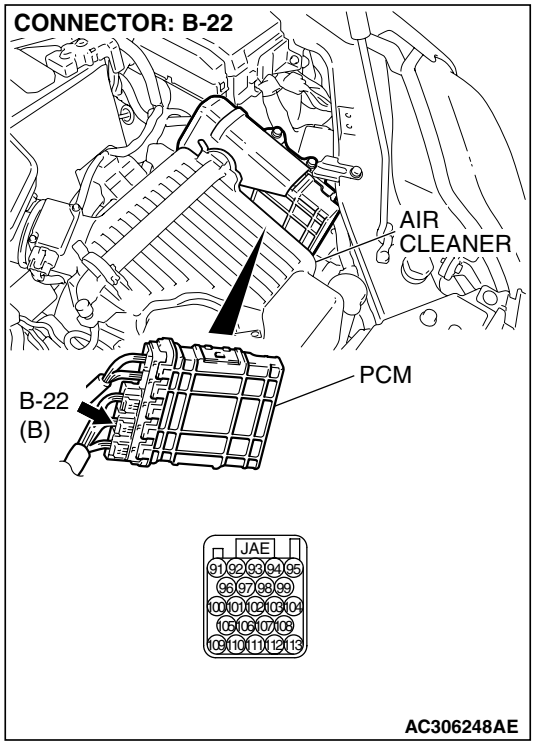
Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 11.

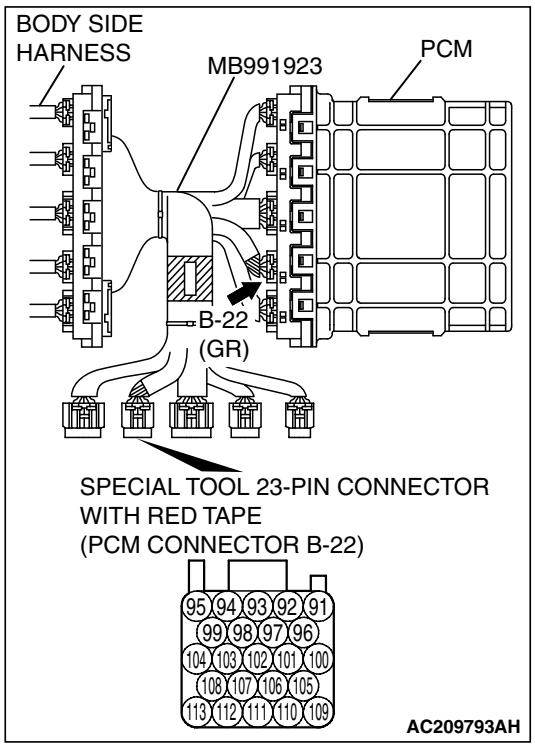
NO : Go to Step 6.

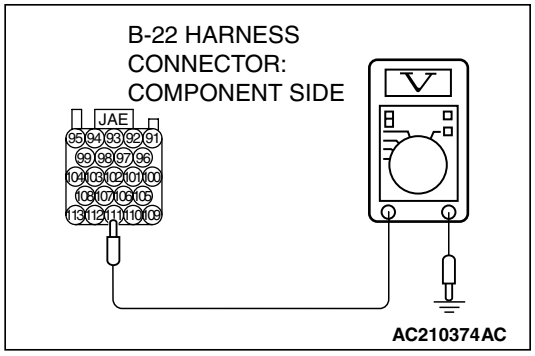
STEP 6. Measure the PCM output voltage to the speed sensor at the PCM connector B-22 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between PCM terminal 111 and ground.
- The voltage should measure between 4.5 and 4.9 volts.

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

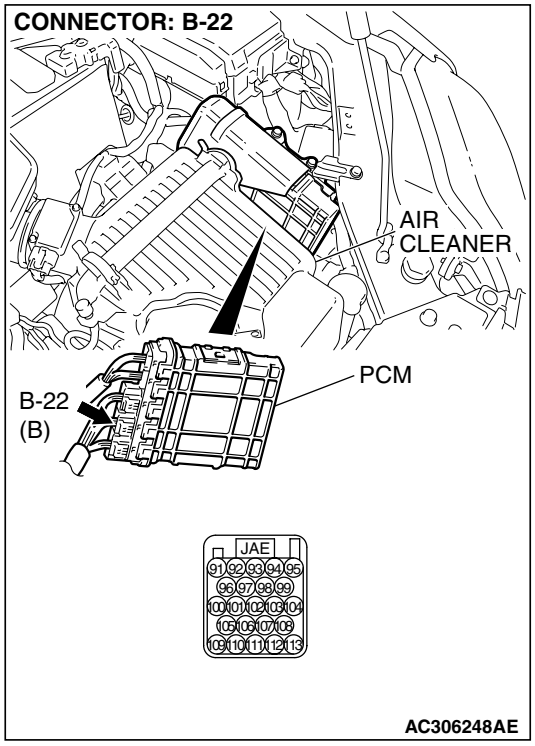
Q: Is the measured voltage between 4.5 and 4.9 volts?

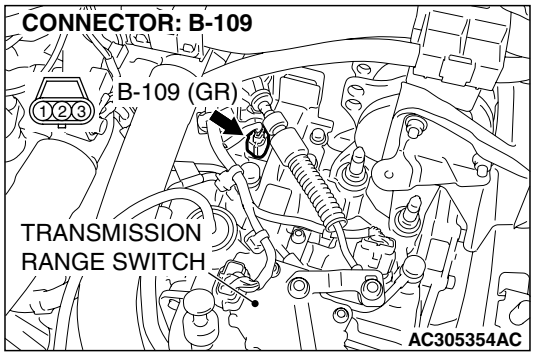
YES : Go to Step 7.
NO : Go to Step 9.

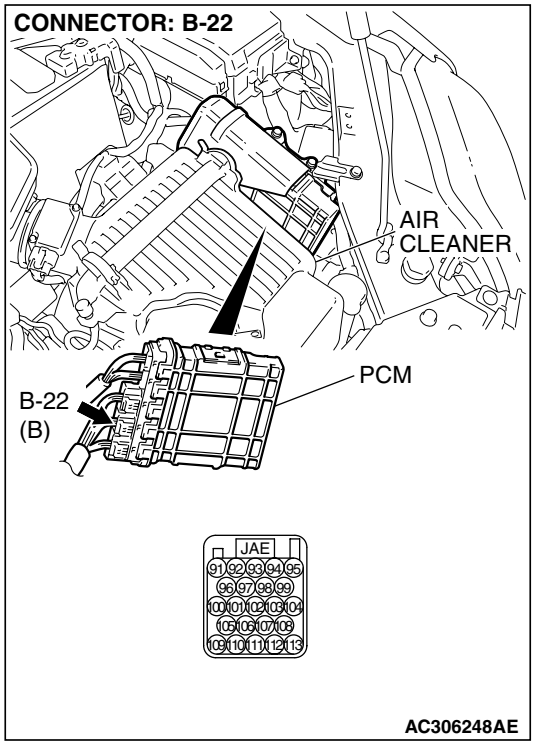
STEP 7. Check PCM connector B-22 and input shaft speed sensor connector B-109 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

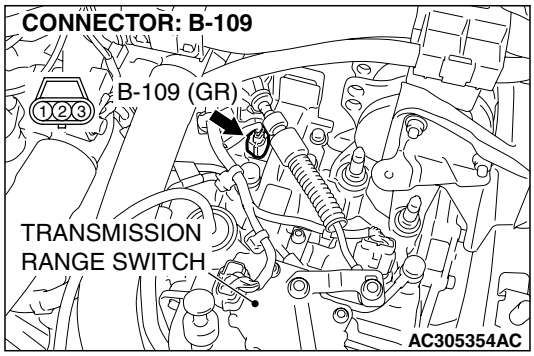
Q: Are the connectors in good condition?

YES : Go to Step 8.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







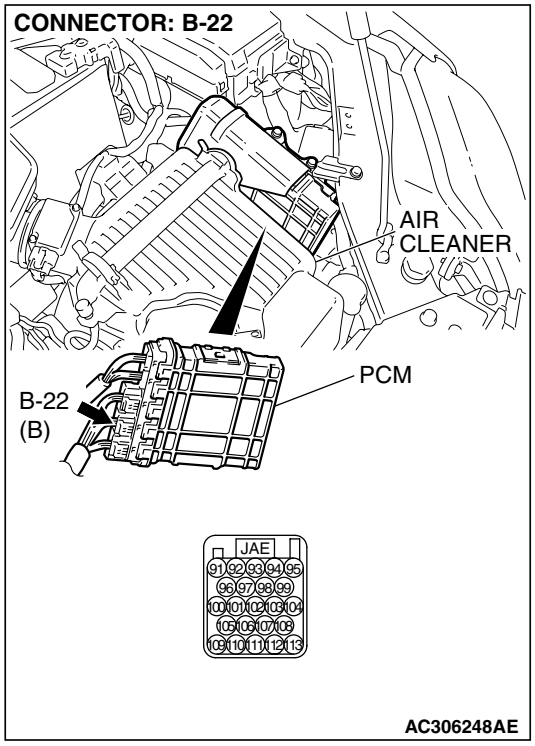


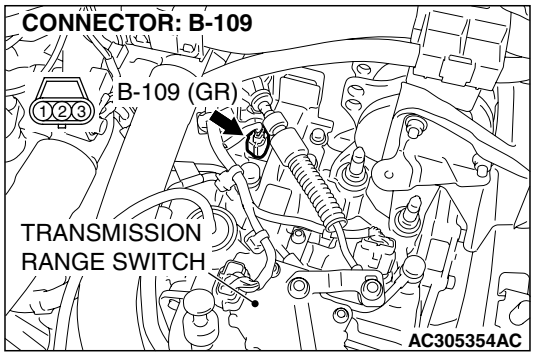
STEP 8. Check the harness for open circuit or damage between PCM connector B-22 terminal 111 and input shaft speed sensor connector B-109 terminal 2.

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair or replace the harness wire.



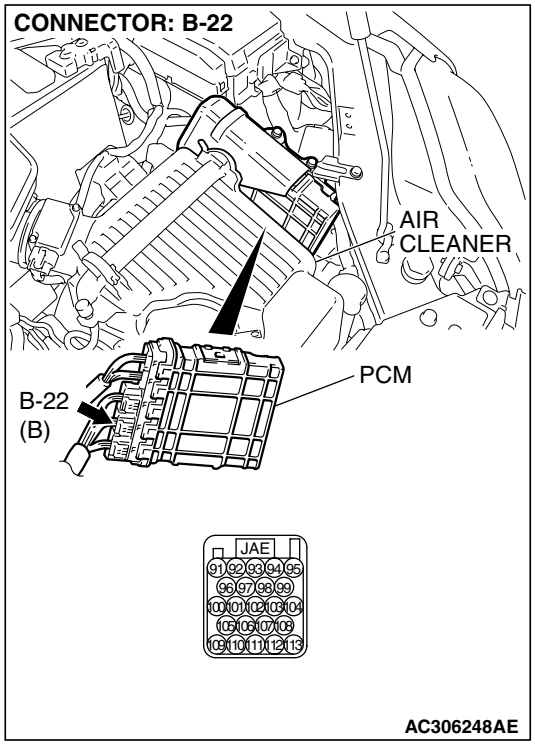


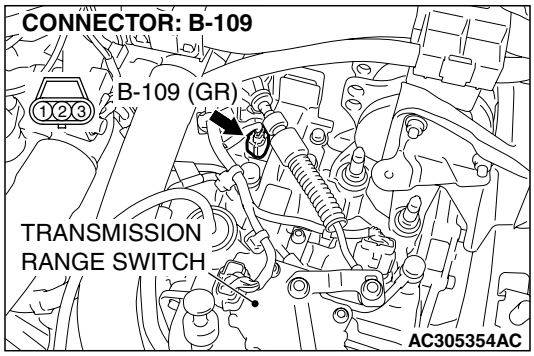
STEP 9. Check PCM connector B-22 and input shaft speed sensor connector B-109 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.



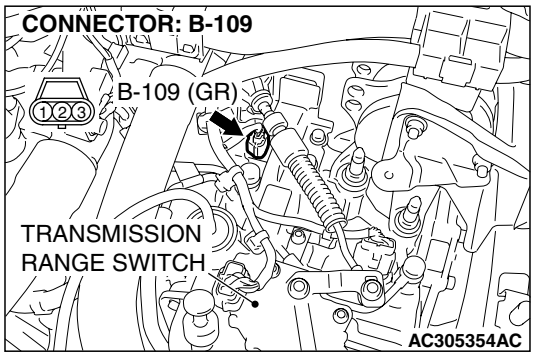


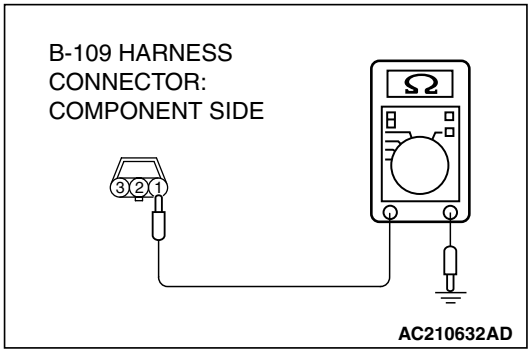
STEP 10. Check the harness for short circuit to ground between PCM connector B-22 terminal 111 and input shaft speed sensor connector B-109 terminal 2.

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 B-109.

(1) Disconnect connector B-109 from the speed sensor and measure at the harness side.

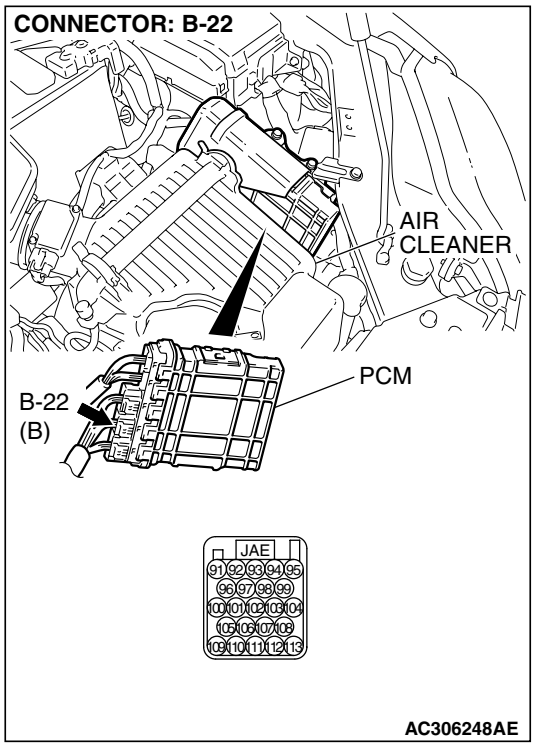
(2) Measure the resistance between terminal 1 and ground.
- The resistance should measure less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

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

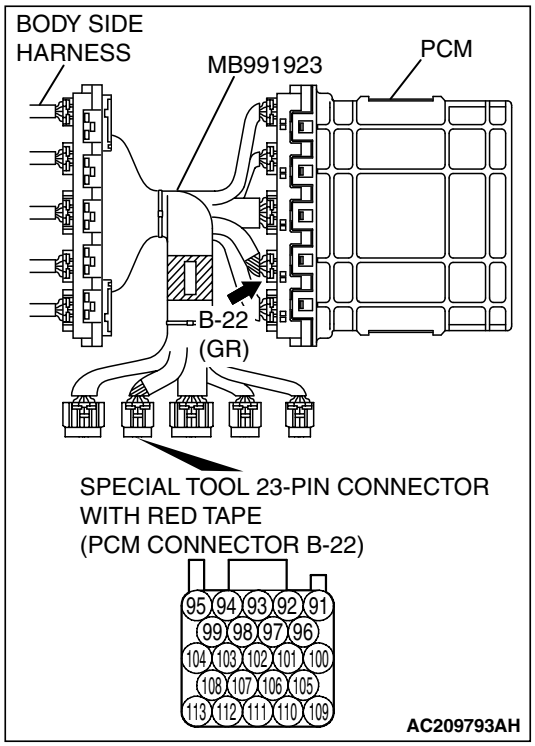
STEP 12. Measure the resistance at the PCM connector B-22 by using check harness special tool.

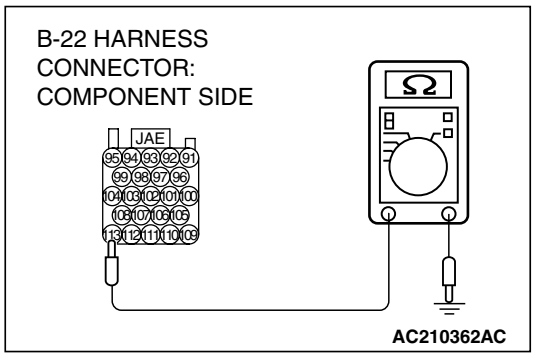
(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.

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





(4) Measure the resistance between terminal 113 and ground.
- The resistance should measure less than 2 ohms.

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

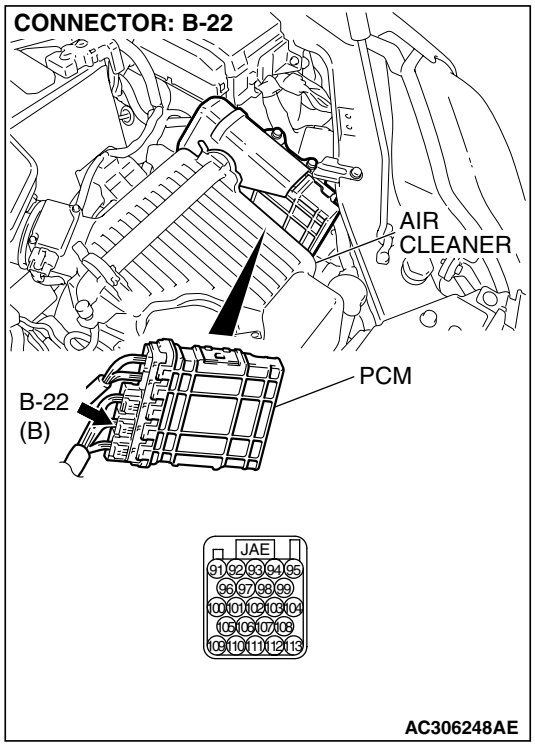
Q: Is the measured resistance less than 2 ohms?

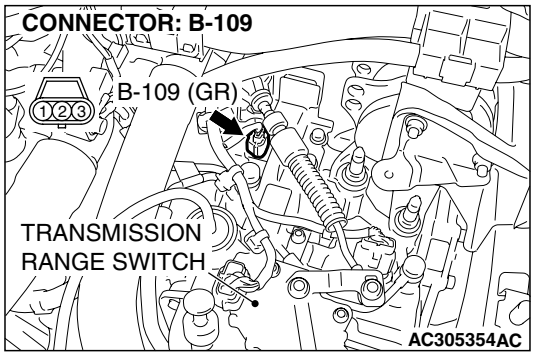
YES : Go to Step 13.
NO : Go to Step 15.

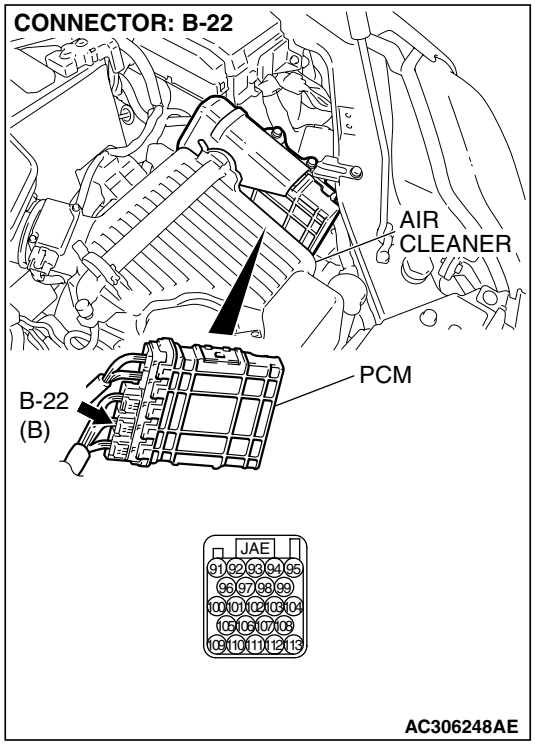
STEP 13. Check PCM connector B-22 and input shaft speed sensor connector B-109 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

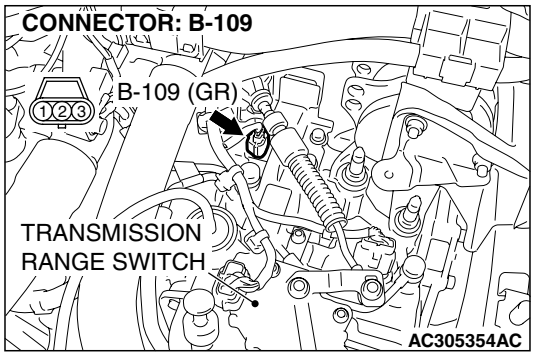
Q: Are the connectors and terminals in good condition?

YES : Go to Step 14.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







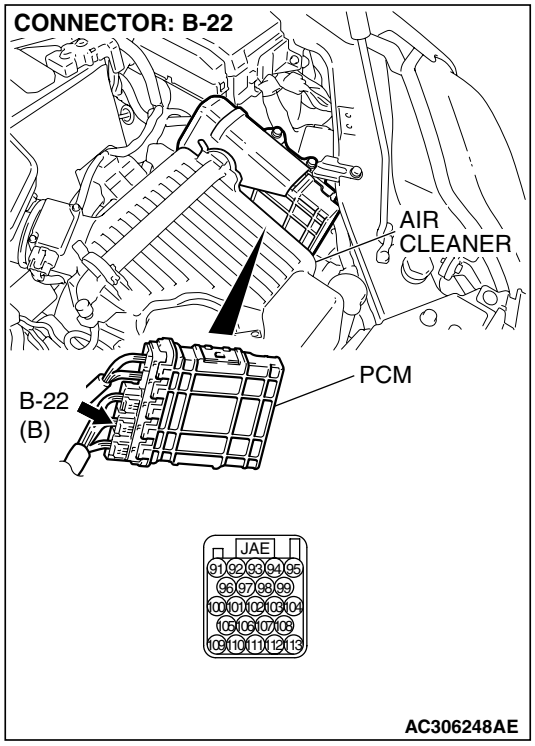


STEP 14. Check the harness for open circuit or damage between PCM connector B-22 terminal 113 and input shaft speed sensor connector B-109 terminal 1.

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 B-22 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

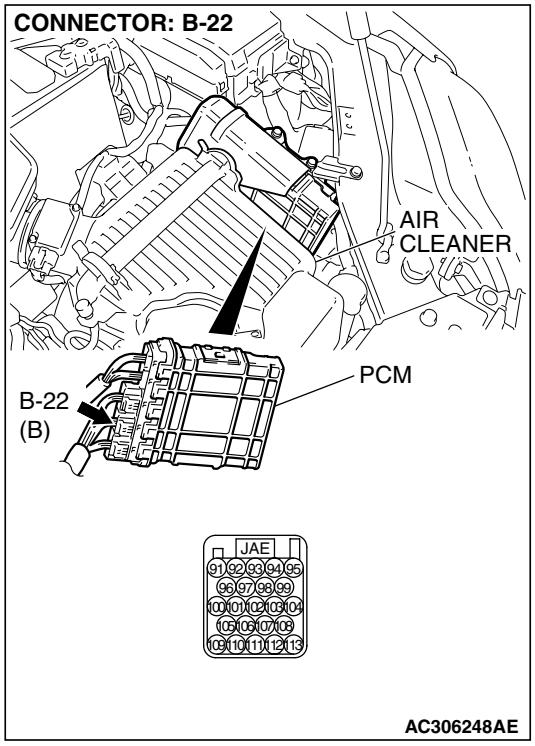
Q: Are the connector and terminals in good condition?

YES : Replace the PCM.

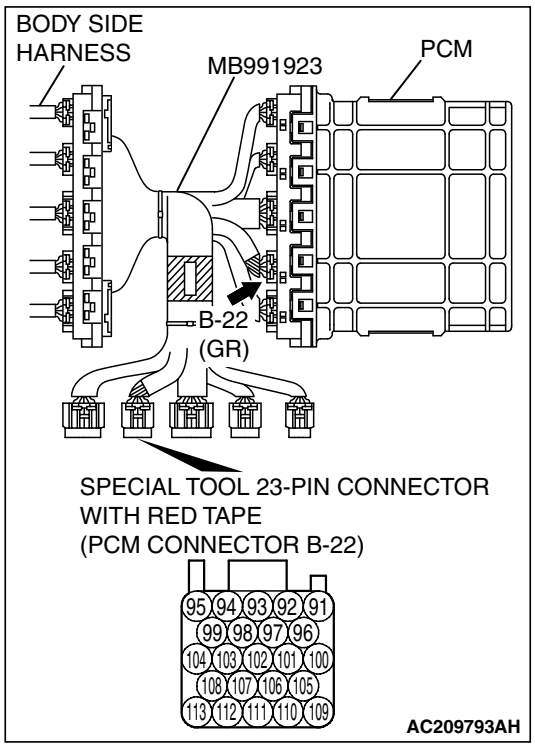
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

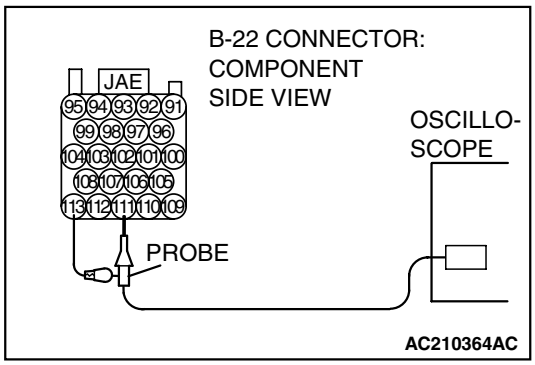
STEP 16. Using the oscilloscope, check the input shaft speed sensor waveform at PCM connectors B-22 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.

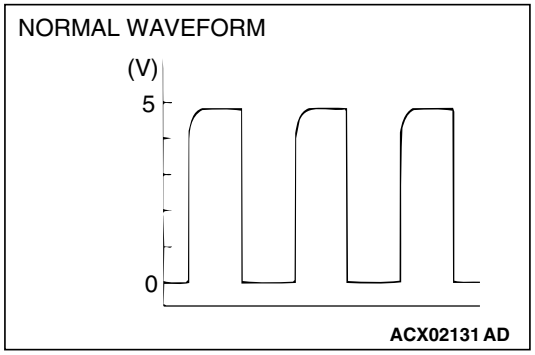


(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.





(3) Connect an oscilloscope probe to PCM connector B-22 terminal 111 and to 113.
(4) Start the engine and drive the vehicle at constant speed of 50 km/h (31 mph) (Gear range: 3rd gear) <4A/T> or 60 km/h (37 mph) (Gear range: 4th gear) <5A/T>.



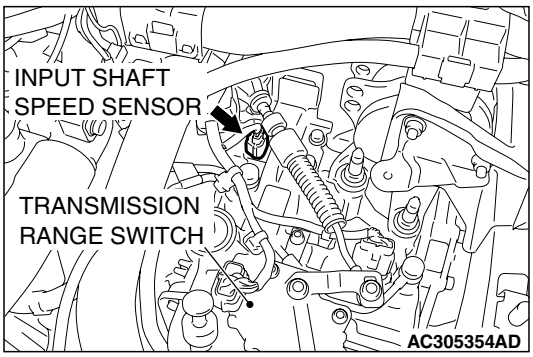
(5) Check the input shaft speed sensor waveform.
- The input shaft speed sensor waveform should show a pattern similar to the illustration. The maximum value should be 4.8 volts or more and the minimum value 0.8 volt or less. The output waveform should not contain electrical noise.

(6) 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.

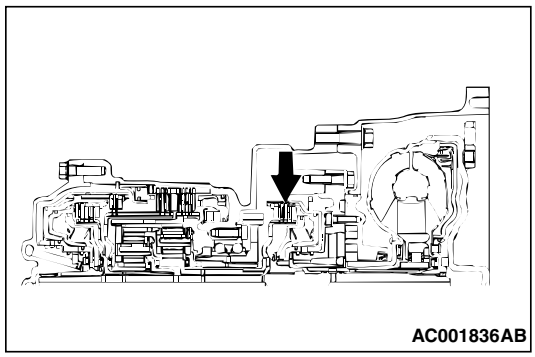


(1) Replace the input shaft speed sensor. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is A/T DTC P1766 set?

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

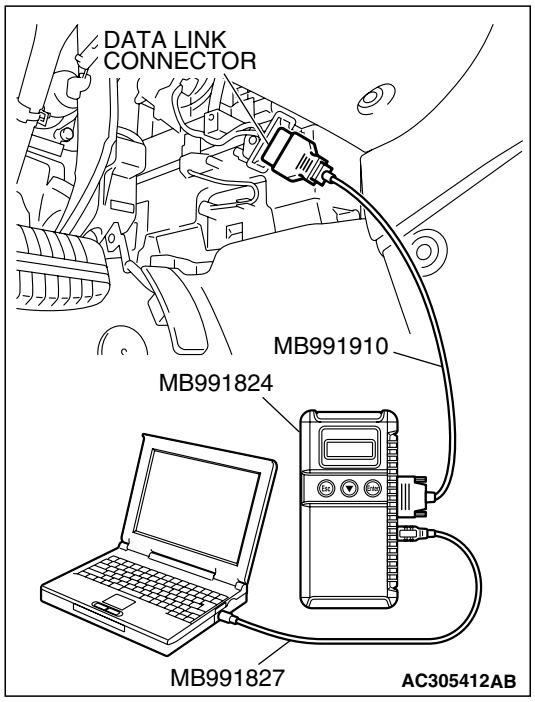
STEP 18. Replace the underdrive clutch retainer.



(1) Replace the underdrive clutch retainer. Refer to GROUP 23B, P.23B-51 Underdrive Clutch and Input Shaft <4A/T> or Refer to GROUP 23C, P.23C-56 Underdrive Clutch and Input Shaft <5A/T>.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is A/T DTC P1766 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 5: 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 5: 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: 3rd gear). <4A/T>
  - When driving at constant speed of 60 km/h (37 mph), the display should be "1,400 – 1,700 r/min" (Gear range: 4th gear). <5A/T>

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

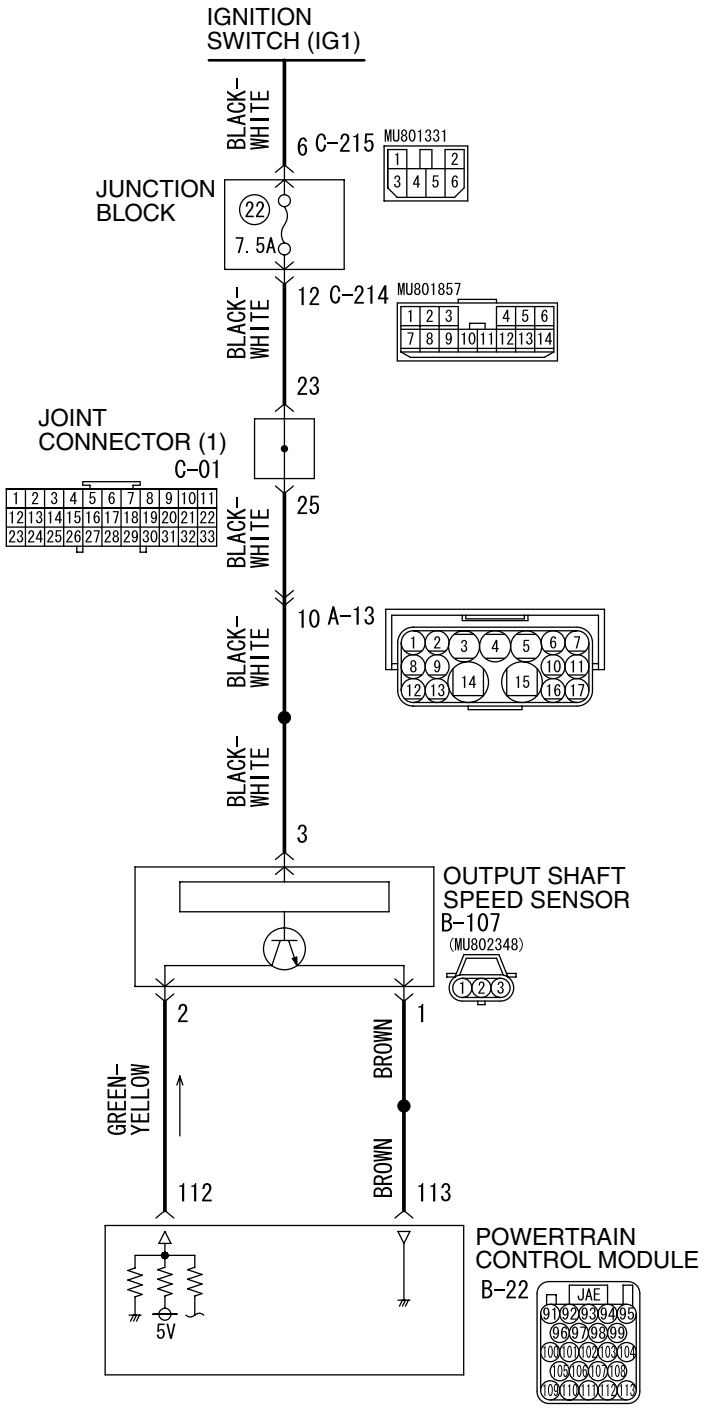
Q: Is the sensor operating properly?

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.00-14.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

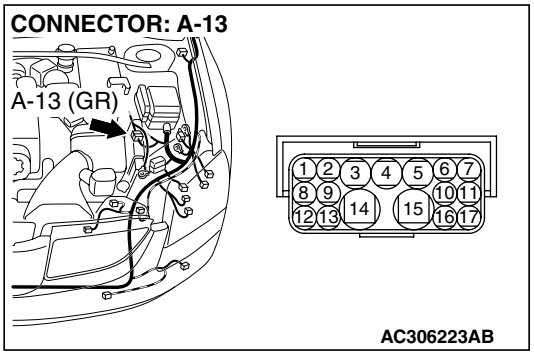
DTC P1767 (P0720): Output Shaft Speed Sensor System

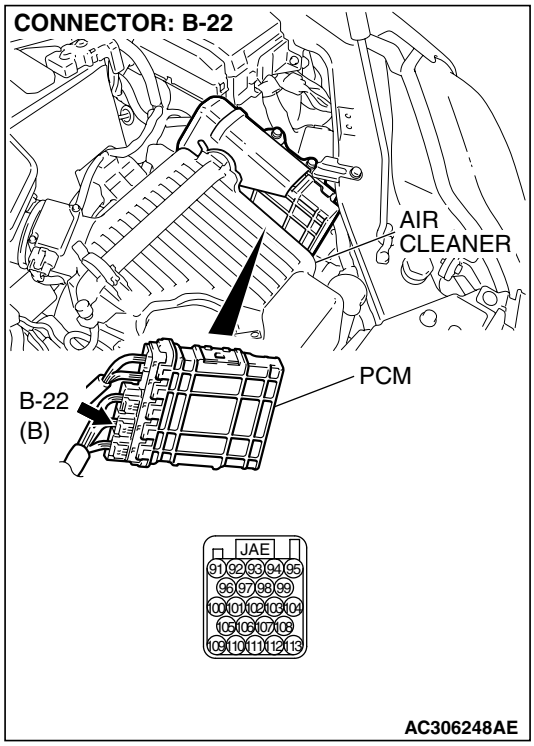
Output Shaft Speed Sensor System Circuit

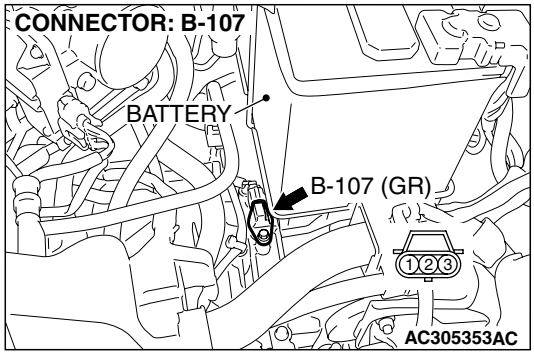


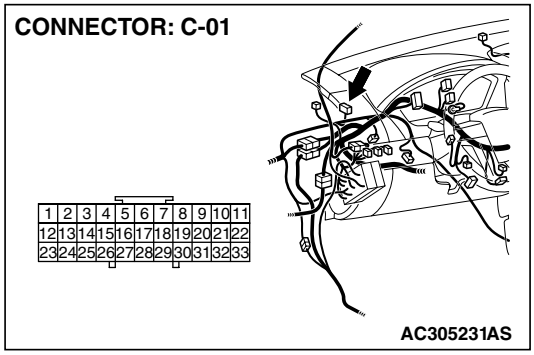
W4P06M03AA
AC209756AC

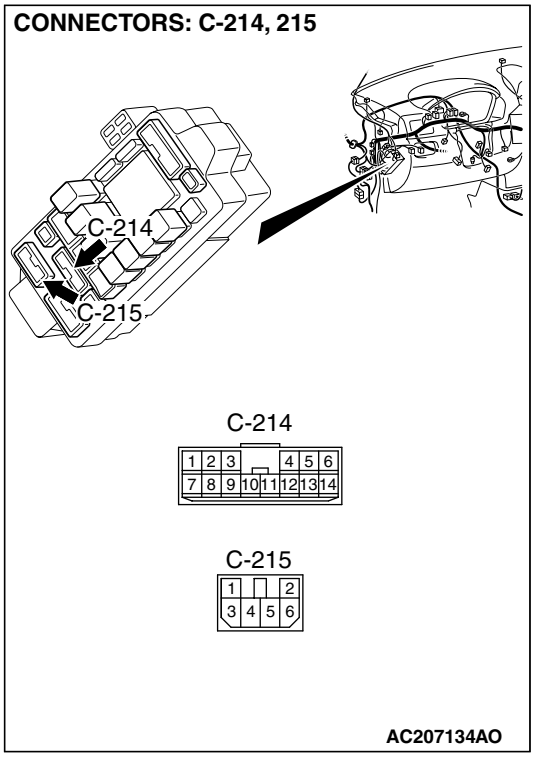
TSB Revision


CONNECTOR: A-13
A-13 (GR)
1 2 3 4 5 6 7
8 9 14 15 10 11
12 13 16 17
AC306223AB


CONNECTOR: B-22
AIR CLEANER
PCM
B-22 (B)
JAE
91 92 93 94 95
96 97 98 99
100 101 102 103 104
105 106 107 108
109 110 111 112 113
AC306248AE


CONNECTOR: B-107
BATTERY
B-107 (GR)
1 2 3
AC305353AC


CONNECTOR: C-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
AC305231AS



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 output shaft speed.
- The output shaft speed sensor is connected to the PCM (terminals 112 and 113) via the output shaft speed sensor connector (terminals 1 and 2).
- The PCM detects the output shaft speed by the signal input to terminal 112.
- The output shaft speed sensor generates the pulse signal as the teeth of the transfer drive gear pass the magnetic tip of the sensor.

DESCRIPTIONS OF MONITOR METHODS

- <If open circuit occurs during driving test> If abruptly reduced output revolution is detected during driving test, and a difference between turbine revolution and that value calculated from output revolution equals or exceeds specified value, PCM judges that output shaft speed sensor has a failure.
- <If open circuit occurs with vehicle stopped, and driving test is started> If there is no detection pulse from output shaft speed sensor (output rotation) even when engine revolution and turbine revolution both equal or exceed specified value, PCM judges that output 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)

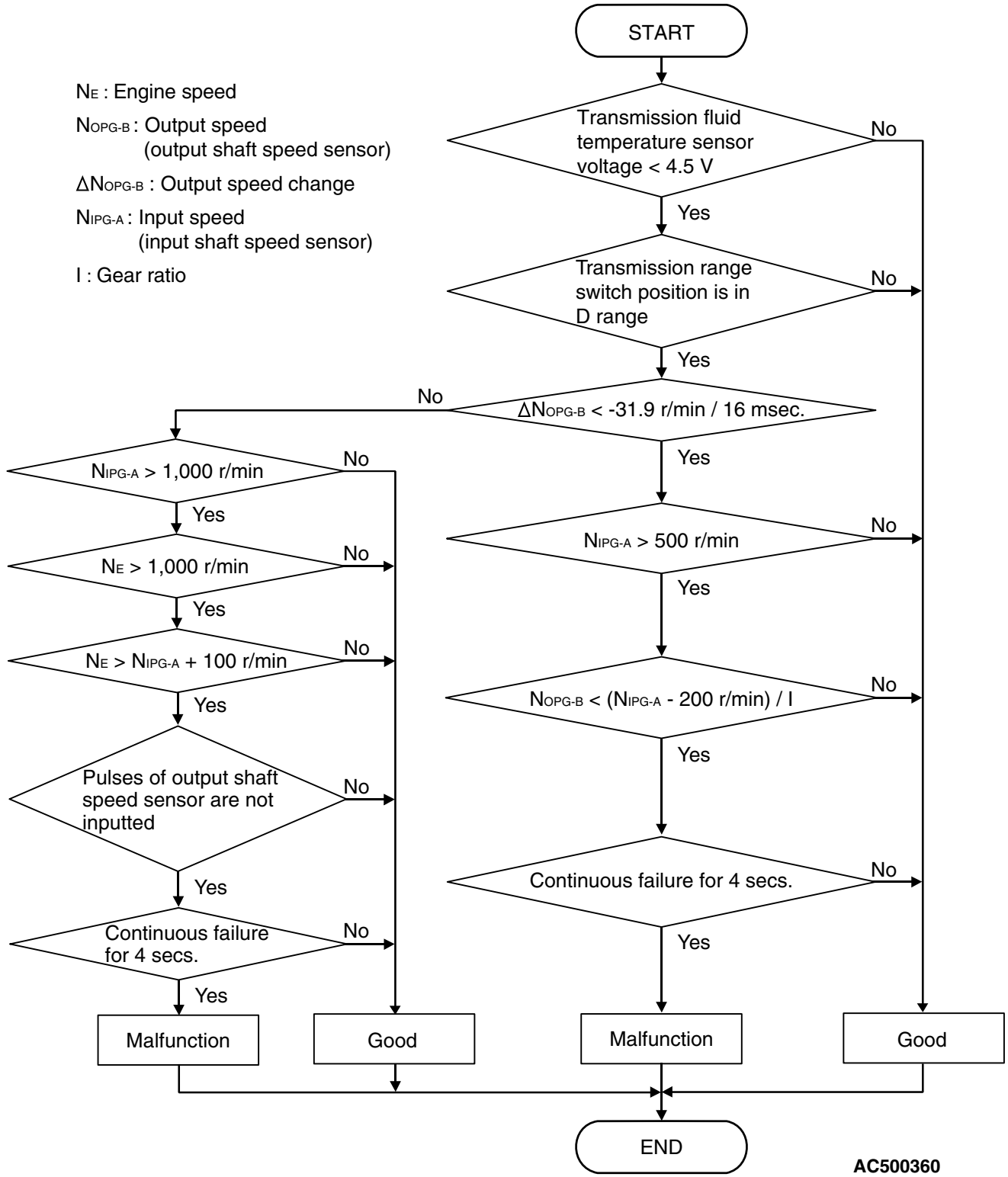
- DTC P1766 (P0715): Input shaft speed sensor malfunction
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low and reverse solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)

- Input shaft speed sensor
- Torque converter clutch solenoid
- Low and reverse solenoid
- Underdrive solenoid
- Second solenoid

- Overdrive solenoid
- Reduction solenoid <5A/T>
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence)



DTC SET CONDITIONS

Check Conditions

- Transmission range switch position: D.
- Input speed: 1,000 r/min or more.
- Engine speed: 1,000 r/min or more.
- Transmission fluid temperature sensor voltage: 4.5 volts or less.

TSB Revision

- Calculated slip (engine speed - input speed): 100 r/min or more.

Judgement Criteria

- Output speed: no signal change. (4 seconds)
- If DTC P1767 (P0720) is set consecutively four times, the transaxle is locked into 3rd gear or 2nd gear as a fail-safe measure, and the "N" range light flashes once per second.

Check Conditions

- Transmission range switch position: D.
- Input speed: 500 r/min or more.
- Transmission fluid temperature sensor voltage: 4.5 volts or less.
- Rapid output speed change: -31.9 r/min / 0.016 second or less.

Judgement Criteria

- Output speed: [(input speed - 200 r/min) / gear ratio] or less. (4 seconds)
- If DTC P1767 (P0720) is set consecutively four times, the transaxle 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, and drive for 5 seconds, with 1st gear fixed (1st gear in sport mode), at 20 km/h (12 mph) or more with 50% or more of throttle valve opening. Then stop the vehicle, and drive again for 5 seconds, with 1st gear fixed (1st gear in sport mode), at 20 km/h (12 mph) or more with 50% or more of throttle valve opening.

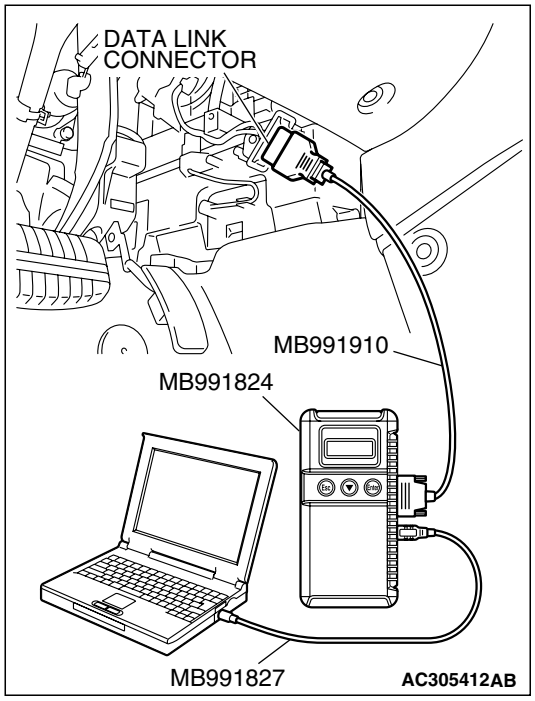
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the output shaft speed sensor
- Malfunction of the transfer drive gear or driven gear <4A/T>
- Malfunction of the direct planetary carrier <5A/T>
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check data list item 6: 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.

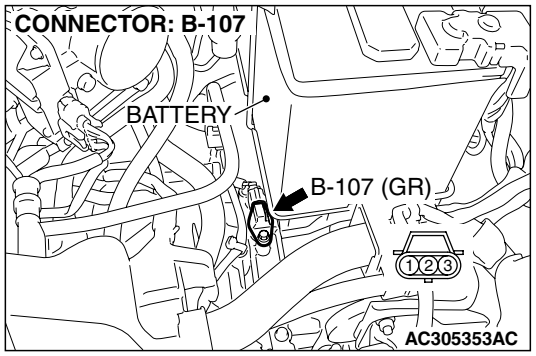
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode.
  - Item 6: Output Shaft Speed Sensor.
    - When driving at a constant speed of 50km/h (31mph), the display should be "1,400 – 1,700 r/min" (Gear range: 3rd gear). <4A/T>
    - When driving at a constant speed of 60km/h (37mph), the display should be "1,400 – 1,700 r/min" (Gear range: 4th gear). <5A/T>
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor within the specified range?

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.00-14.

NO : Go to Step 2.

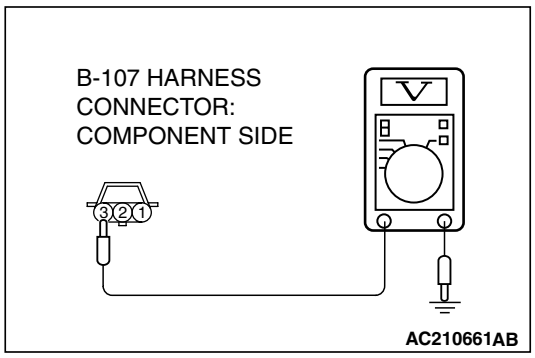
TSB Revision



STEP 2. Measure the power supply voltage at the output shaft speed sensor connector B-107.

(1) Disconnect connector B-107 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.

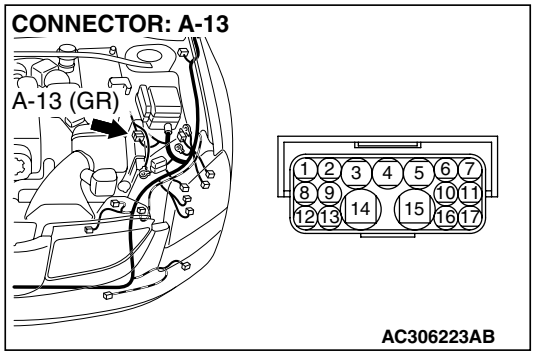
NO : Go to Step 3.

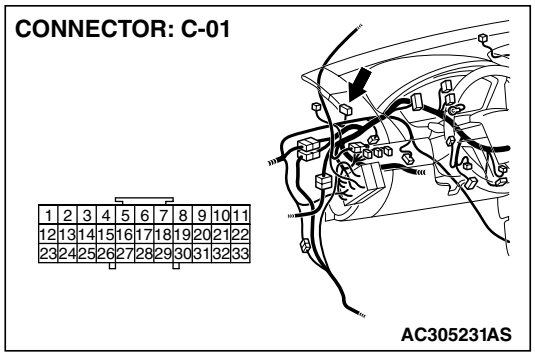
STEP 3. Check intermediate connector A-13, joint connector (1) C-01 and junction block connector C-214 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

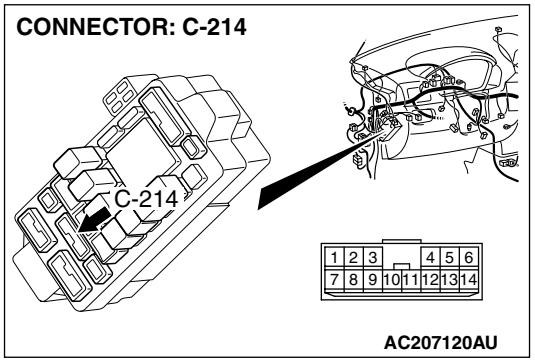
Q: Are the connectors and terminals in good condition?

YES : Go to Step 4.

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





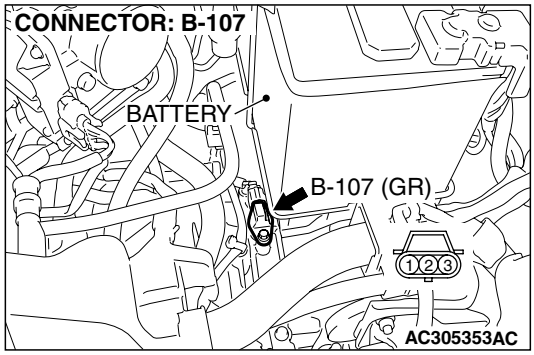


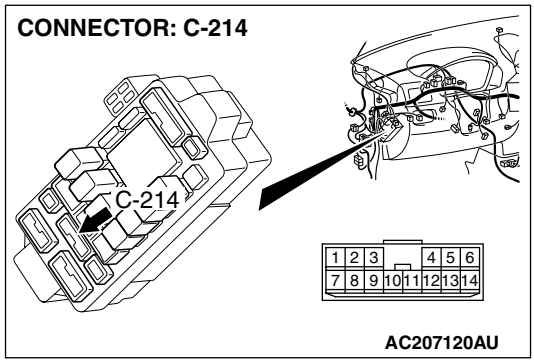
STEP 4. Check the harness for open circuit or short circuit to ground between the output shaft speed sensor connector B-107 terminal 3 and the junction block connector C-214 terminal 12.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.

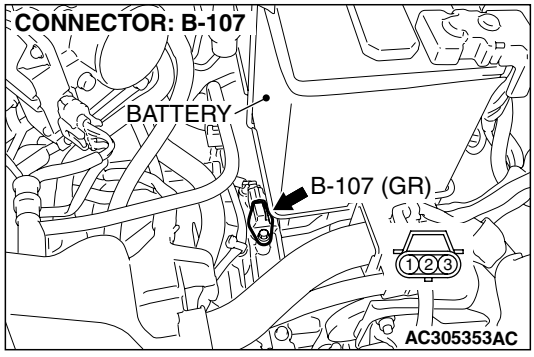


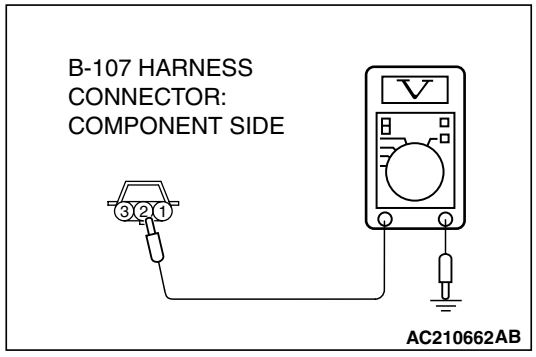


STEP 5. Measure the PCM to speed sensor output voltage at the output shaft speed sensor connector B-107.

(1) Disconnect connector B-107 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.

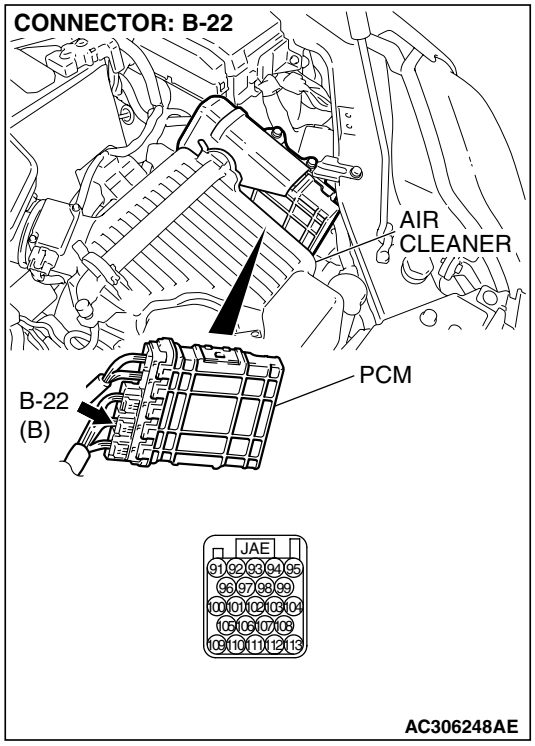
Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 11.

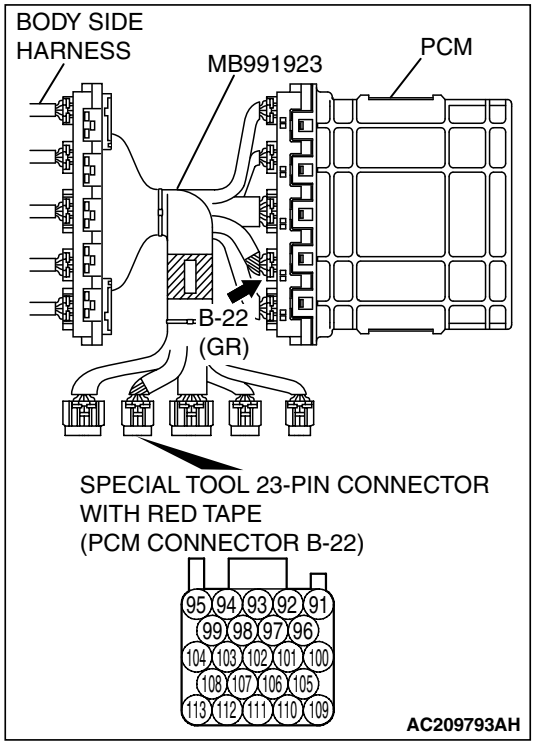
NO : Go to Step 6.

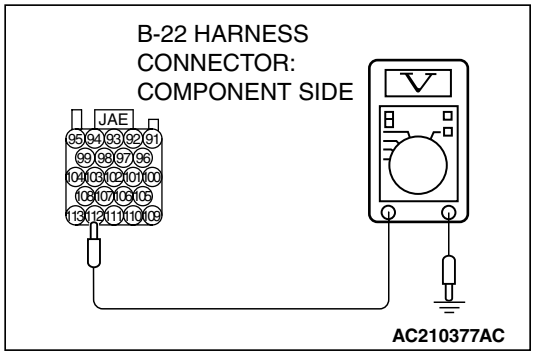
STEP 6. Measure the PCM output voltage to the speed sensor at the PCM connector B-22 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal 112 and ground.
- The voltage should measure between 4.5 and 4.9 volts.

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

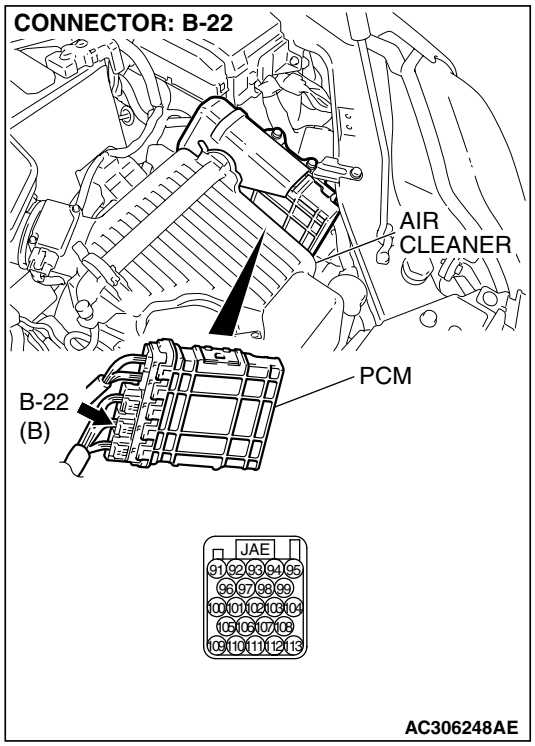
Q: Is the measured voltage between 4.5 and 4.9 volts?

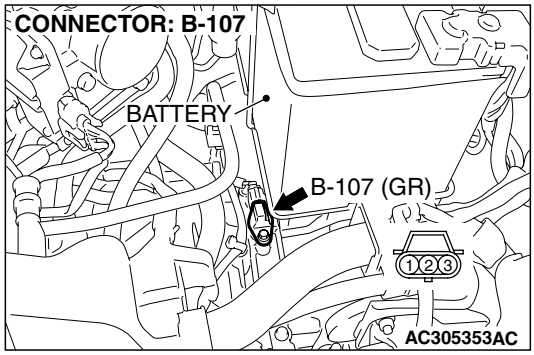
YES : Go to Step 7.
NO : Go to Step 9.

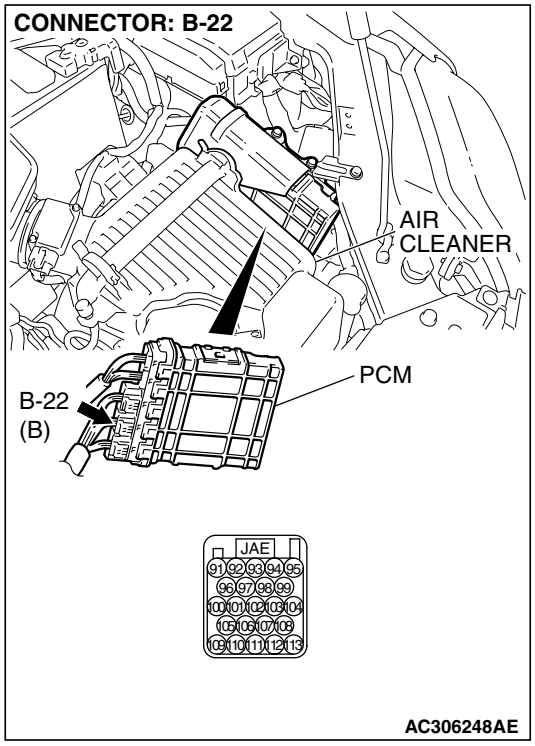
STEP 7. Check PCM connector B-22 and output shaft speed sensor connector B-107 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

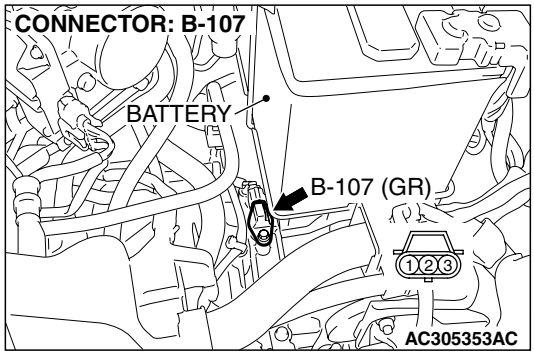
Q: Are the connectors in good condition?

YES : Go to Step 8.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







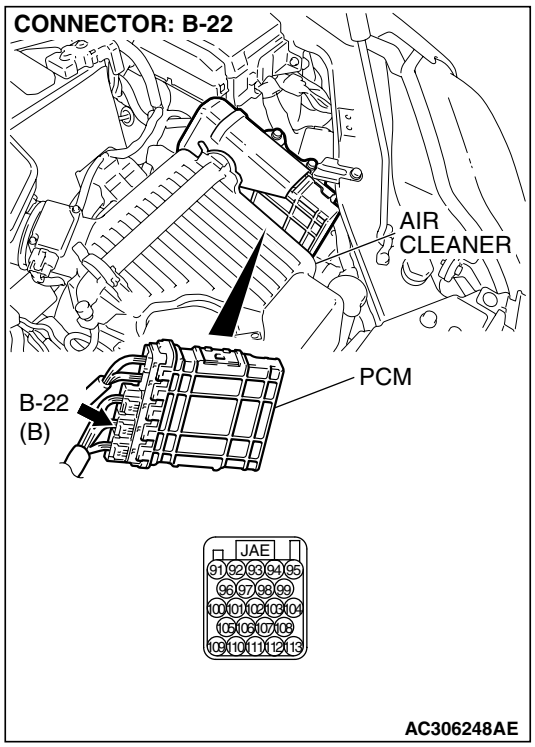


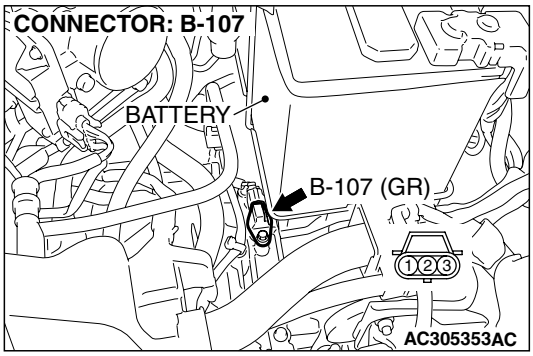
STEP 8. Check the harness for open circuit or damage between PCM connector B-22 terminal 112 and output shaft speed sensor connector B-107 terminal 2.

Q: Is the harness wire in good condition?

YES : Go to Step 19.

NO : Repair or replace the harness wire.



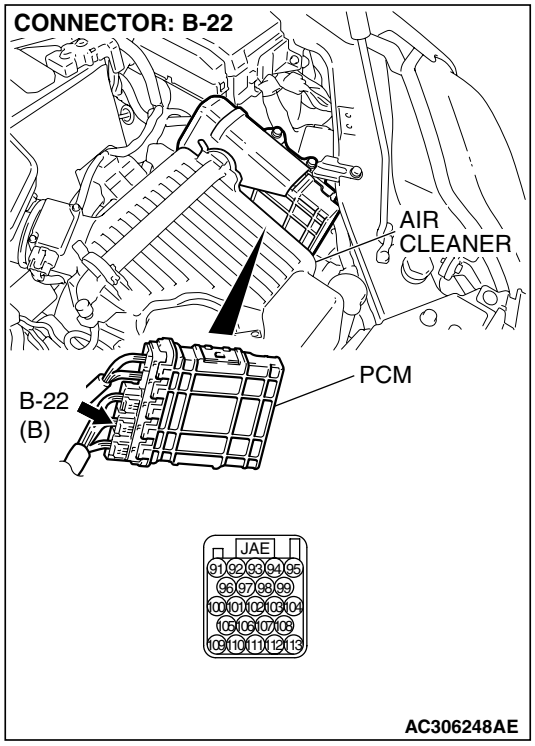


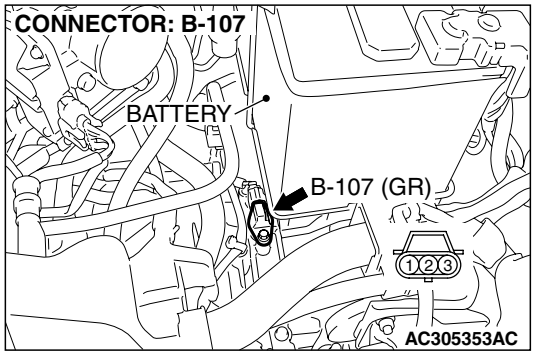
STEP 9. Check PCM connector B-22 and output shaft speed sensor connector B-107 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.



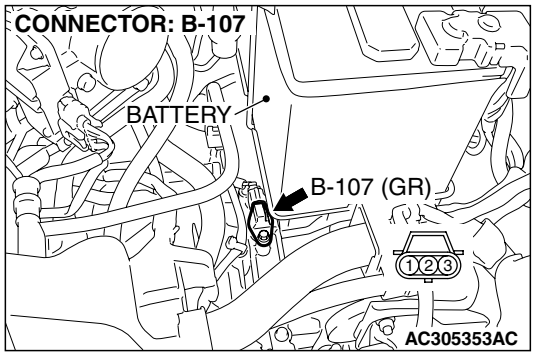


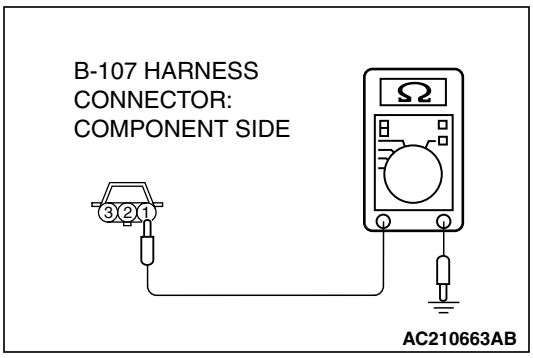
STEP 10. Check the harness for short circuit to ground between PCM connector B-22 terminal 112 and output shaft speed sensor connector B-107 terminal 2.

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 B-107.

(1) Disconnect connector B-107 from the speed sensor and measure at the harness side.

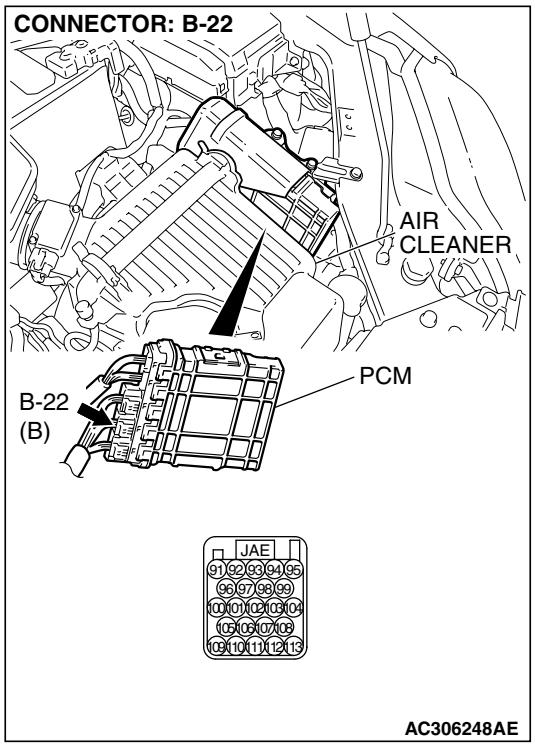
(2) Measure the resistance between terminal 1 and ground.
- The resistance should measure less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

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

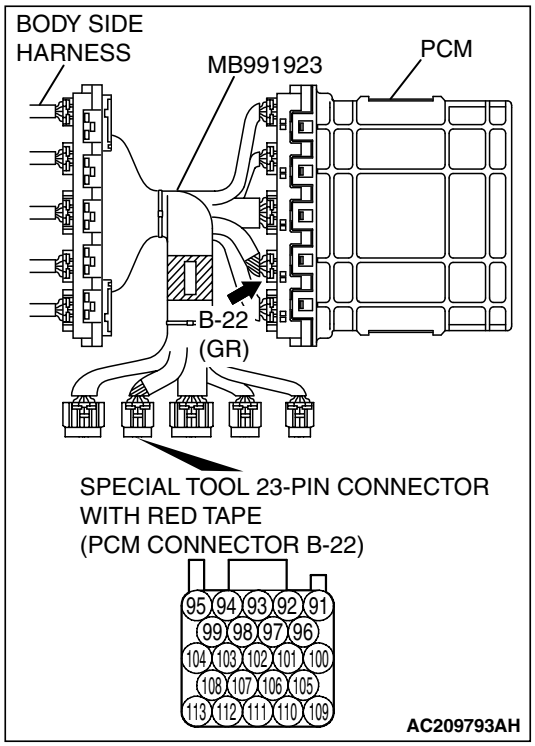
STEP 12. Measure the resistance at the PCM connector B-22 by using check harness special tool MB991923.

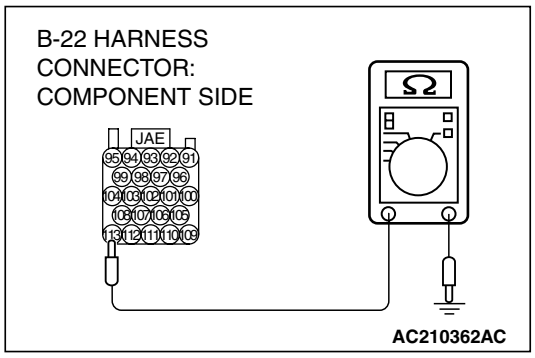
(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.

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





(4) Measure the resistance between terminal 113 and ground.
- The resistance should measure less than 2 ohms.

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

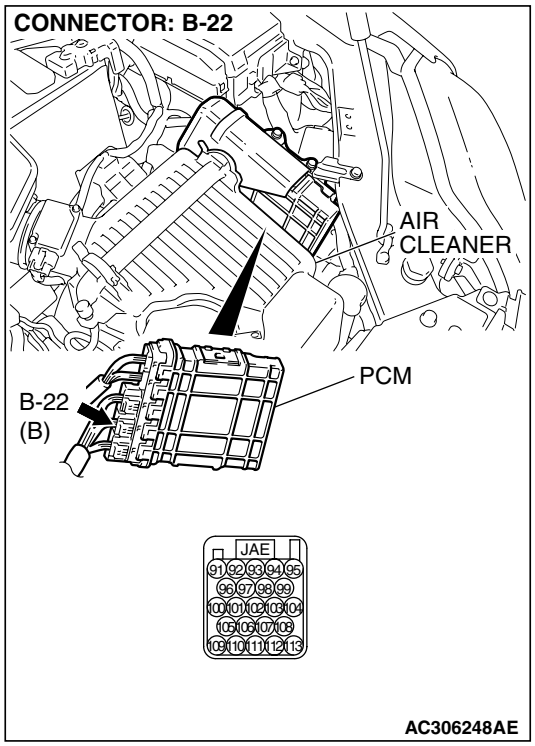
Q: Is the measured resistance less than 2 ohms?

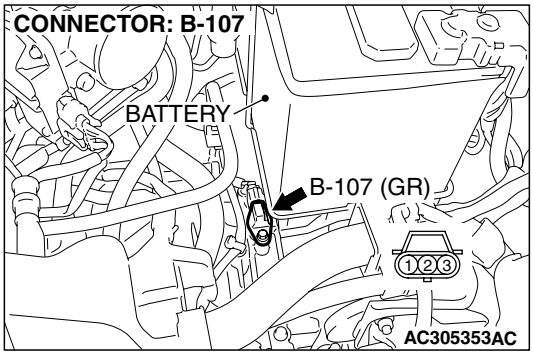
YES : Go to Step 13.
NO : Go to Step 15.

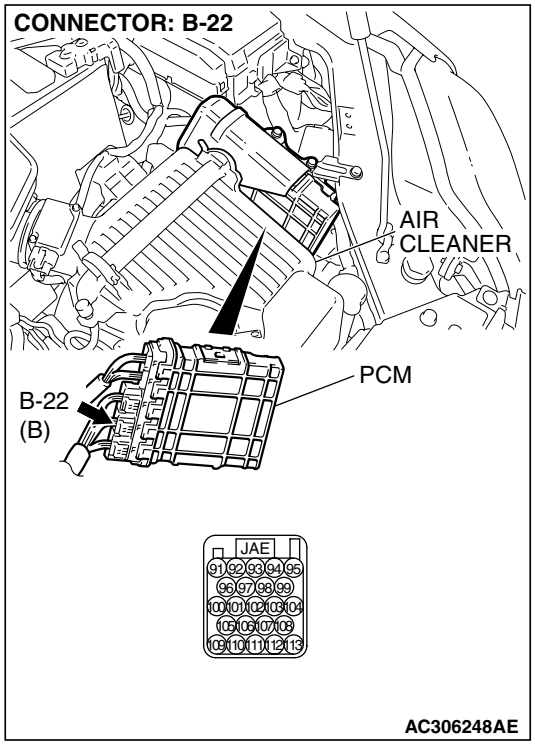
STEP 13. Check PCM connector B-22 and output shaft speed sensor connector B-107 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

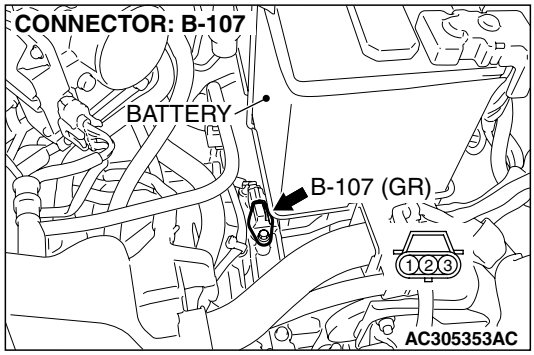
Q: Are the connectors and terminals in good condition?

YES : Go to Step 14.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







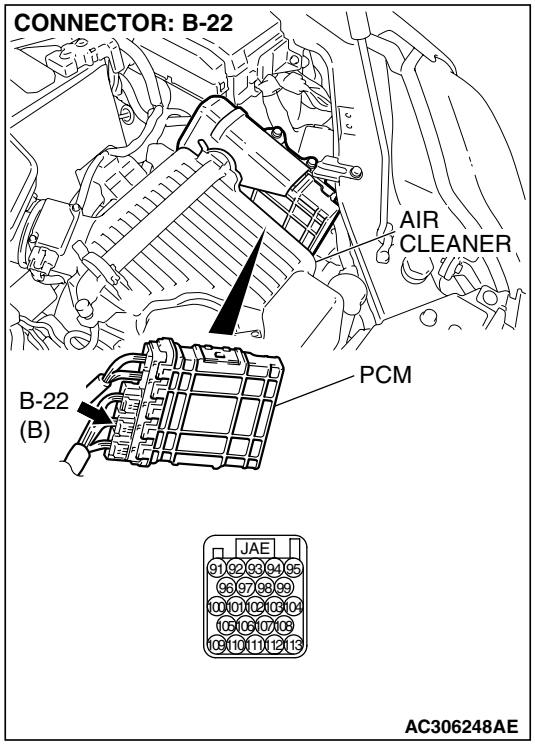


STEP 14. Check the harness for open circuit or damage between PCM connector B-22 terminal 113 and output shaft speed sensor connector B-107 terminal 1.

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 B-22 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

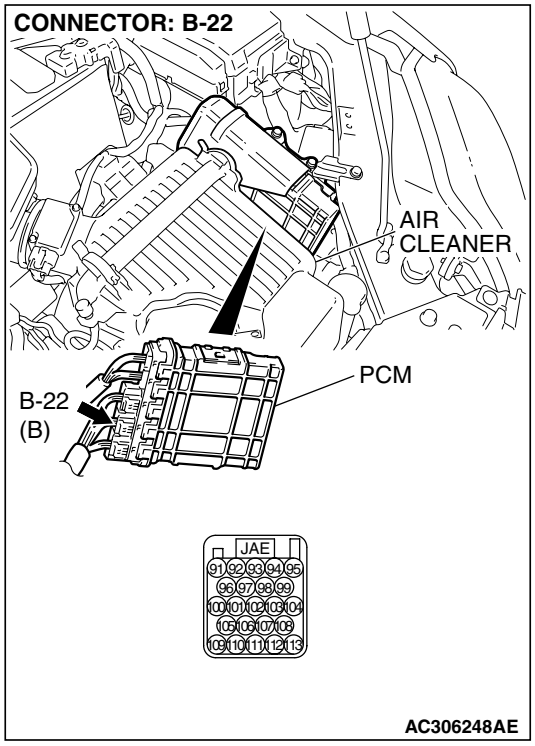
Q: Are the connector and terminals in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

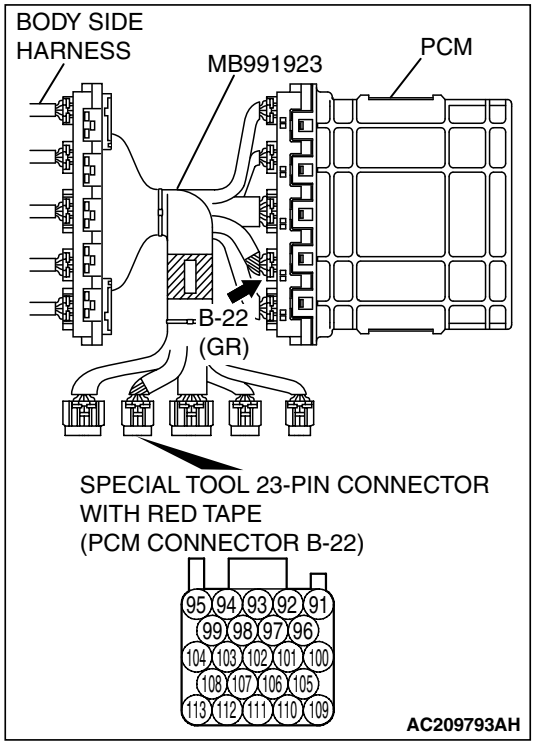
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

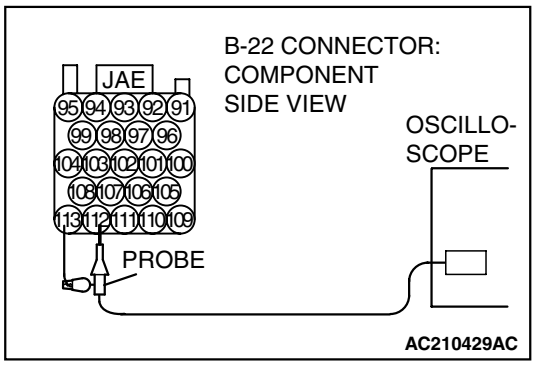
STEP 16. Using the oscilloscope, check the output shaft speed sensor waveform at PCM connectors B-22 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.

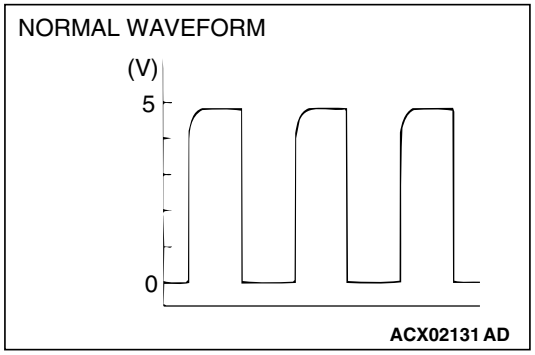


(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.





(3) Connect an oscilloscope probe to PCM connector B-22 terminal 112 and 113.
(4) Start the engine and drive the vehicle at constant speed of 50 km/h (31 mph) (Gear range: 3rd gear) <4A/T> or 60 km/h (37 mph) (Gear range: 4th gear) <5A/T>.



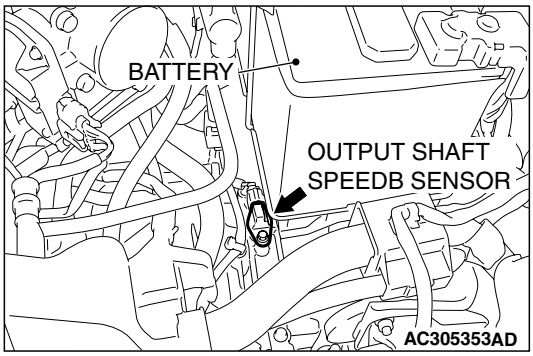
(5) Check the output shaft speed sensor waveform.
- The output shaft speed sensor waveform should show a pattern similar to the illustration. The maximum value should be 4.8 volts or more and the minimum value 0.8 volt or less. The output waveform should not contain electrical noise.

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

Q: Is the waveform normal?

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

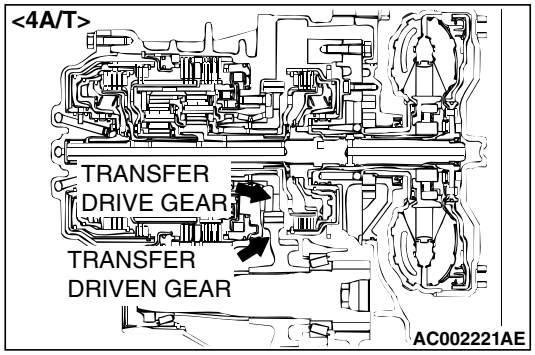
STEP 17. Replace the output shaft speed sensor.

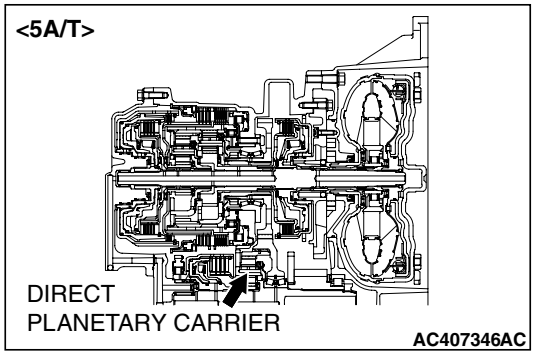


(1) Replace the output shaft speed sensor. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is A/T DTC P1767 set?

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



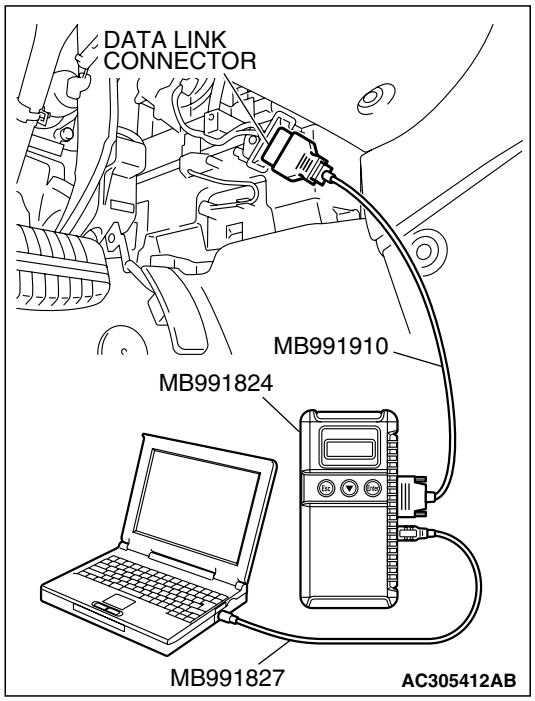


STEP 18. Replace the transfer drive gear, driven gear <4A/T> or direct planetary carrier <5A/T>.

(1) Replace the transfer drive gear or driven gear. Refer to GROUP 23B, Transaxle P.23B-8, Output Shaft P.23B-62 <4A/T> or Refer to GROUP 23C, Direct Planetary carrierP.23C-70 <5A/T>.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is A/T DTC P1767 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 6: 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 6: Output Shaft Speed Sensor.
  - When driving at a constant speed of 50km/h (31mph), the display should be "1,400 – 1,700 r/min" (Gear range: 3rd gear). <4A/T>
  - When driving at a constant speed of 60km/h (37mph), the display should be "1,400 – 1,700 r/min" (Gear range: 4th gear). <5A/T>

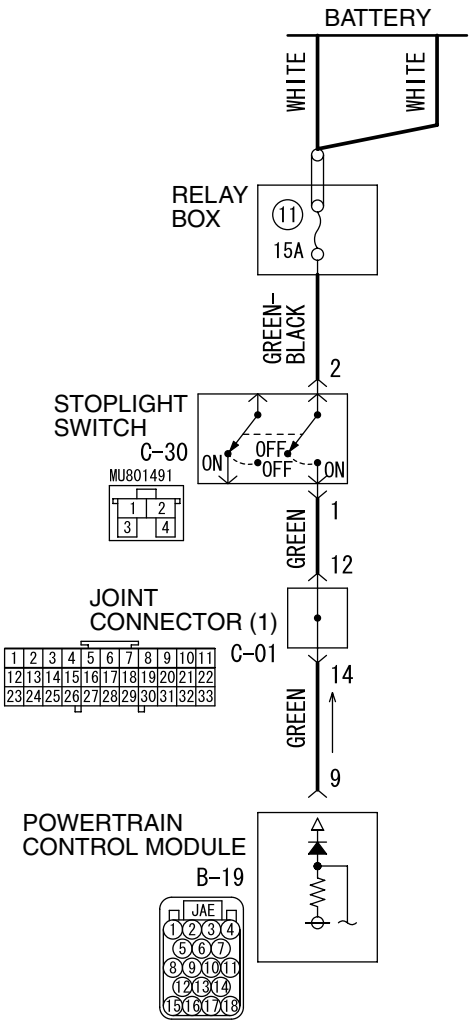
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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.00-14.
NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

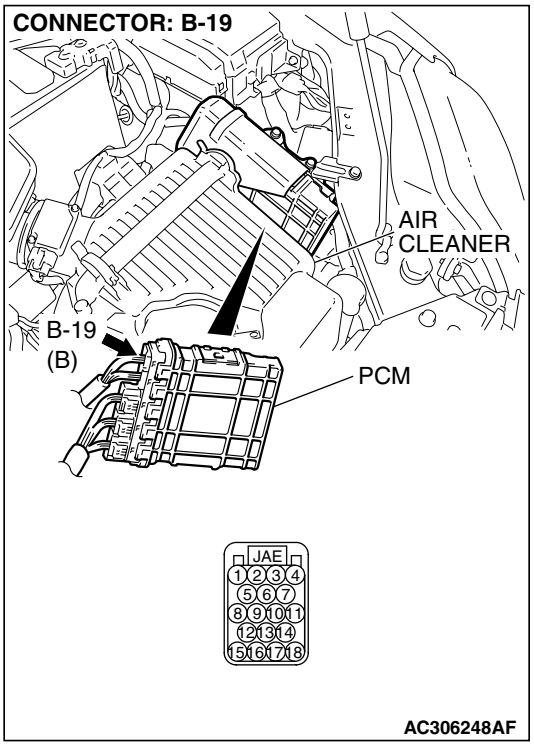
DTC P1769: Stoplight Switch System

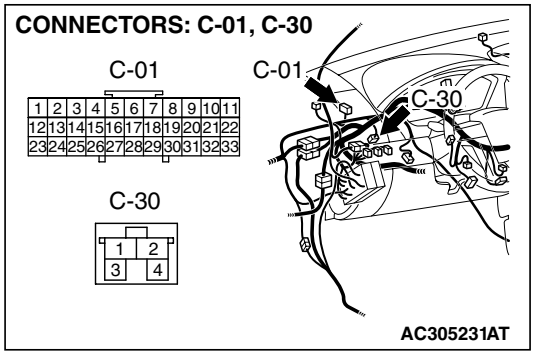
Stoplight Switch System Circuit



W4P06M04AA
AC209757AC

TSB Revision





CIRCUIT OPERATION

- Battery positive voltage is supplied to the stop-light switch (terminal 2).
- When the brake pedal is depressed, battery positive voltage is applied to the PCM (terminal 9).

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 P1769 to be set.

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

- Malfunction of the stoplight switch
- Malfunction of stoplight valve
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Check the brake pedal height.

Refer to GROUP 35A, On-vehicle Service – Brake Pedal Check and Adjustment P.35A-12.

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 valve.
Refer to GROUP 54A, Rear combination light P.54A-135.

Q: Is the stoplight valve in good condition?

YES : Go to Step 3.
NO : Replace the stoplight switch. Refer to GROUP 35A, Brake Pedal P.35A-24.

STEP 3. Using scan tool MB991958, check data list item 19: Stoplight Switch.

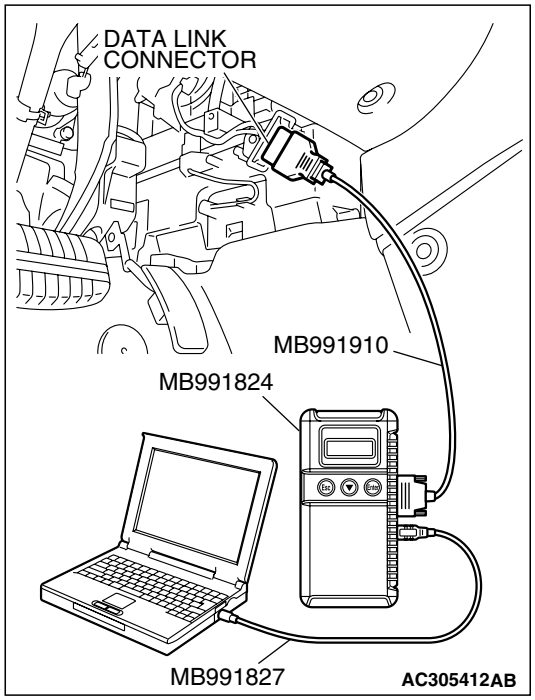
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

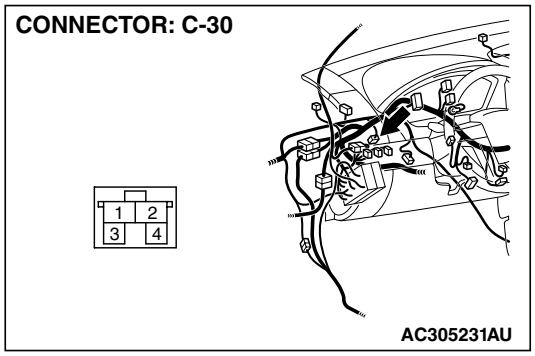
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 19: Stoplight Switch.
  - When the brake pedal is depressed, the display on scan tool MB991958 should be "ON."
  - When the brake pedal 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?

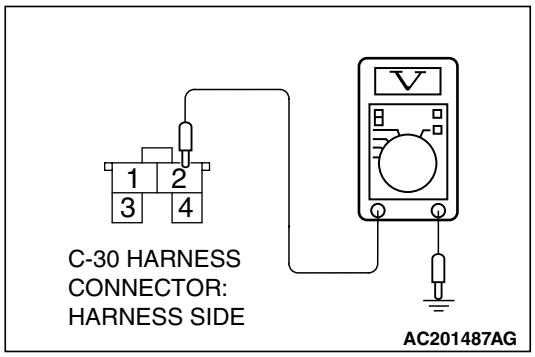
YES : It can be assumed that this malfunction may be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-14.
NO : Go to Step 4.





STEP 4. Measure the stoplight switch power supply voltage at connector C-30 by backprobing.

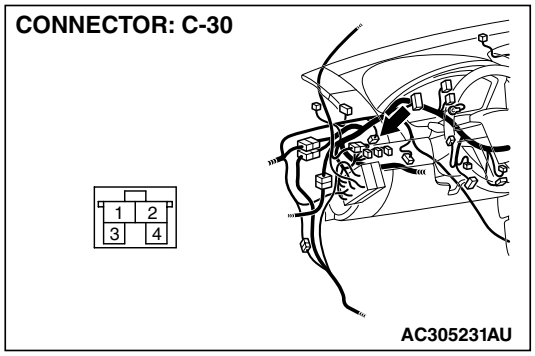
(1) Remove the stoplight switch from the mounting bracket.
(2) Do not disconnect connector C-30.



(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?

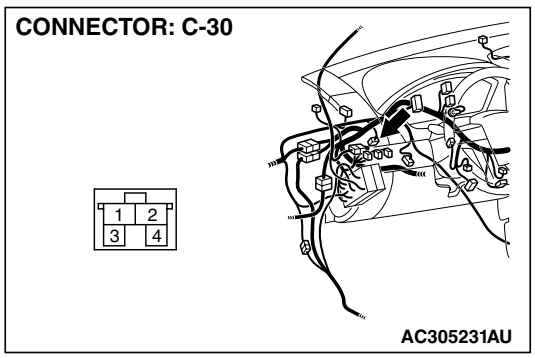
YES : Go to Step 7.
NO : Go to step 5.



STEP 5. Check stoplight switch connector C-30 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

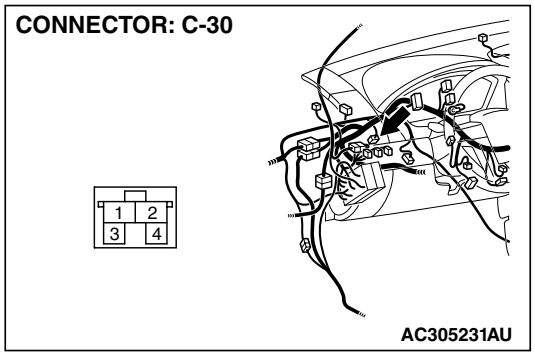
YES : Go to Step 6.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 6. Check the harness for damage between stoplight switch connector C-30 terminal 2 and the power supply fuse.

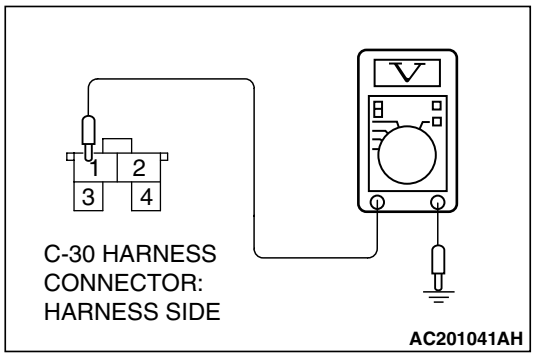
Q: Is the harness wire in good condition?

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 C-30 by backprobing.

(1) Remove the stoplight switch from the mounting bracket.
(2) Do not disconnect connector C-30.



(3) Measure the voltage between 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)?

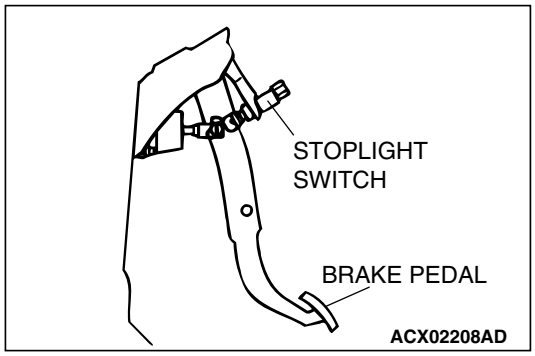
YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check the stoplight switch.

Refer to GROUP 35A, On-vehicle Service – Stoplight Switch Check P.35A-24.

Q: Does the stoplight switch pass the checks?

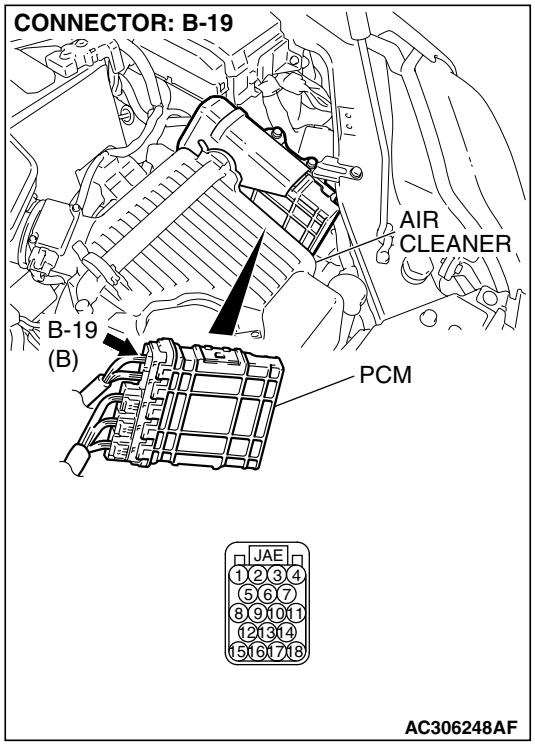
YES : Go to Step 9.
NO : Replace the stoplight switch. Refer to GROUP 35A, Brake Pedal P.35A-24.



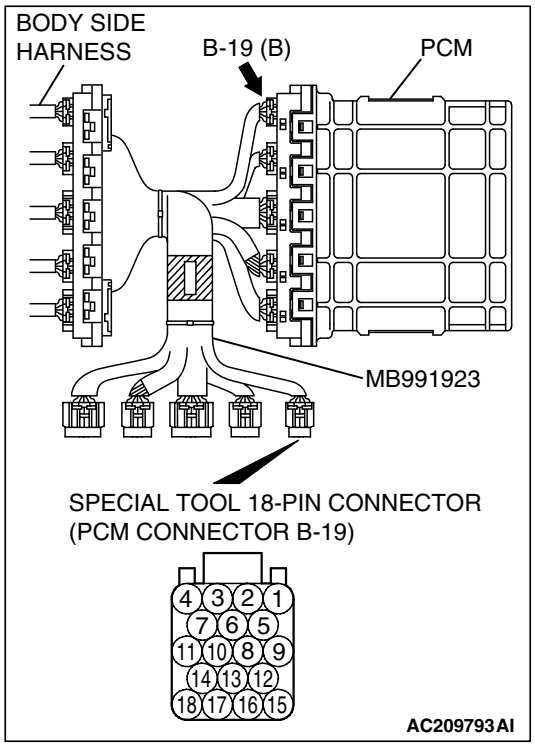
STEP 9. Measure the stoplight switch output voltage at the PCM connector B-19 by using check harness special tool MB991923.

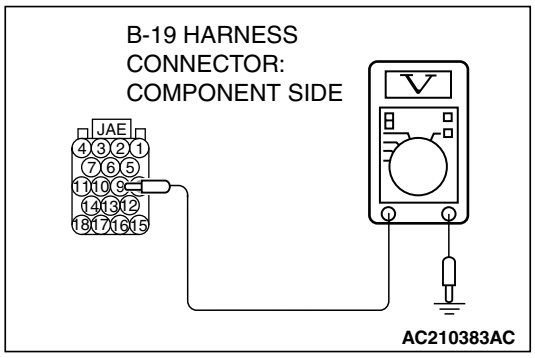
(1) Install the stoplight switch into the mounting bracket if it was removed.

(2) Disconnect all the connectors from the PCM.



(3) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.





(4) Measure the voltage between terminal 9 and ground.
- 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.

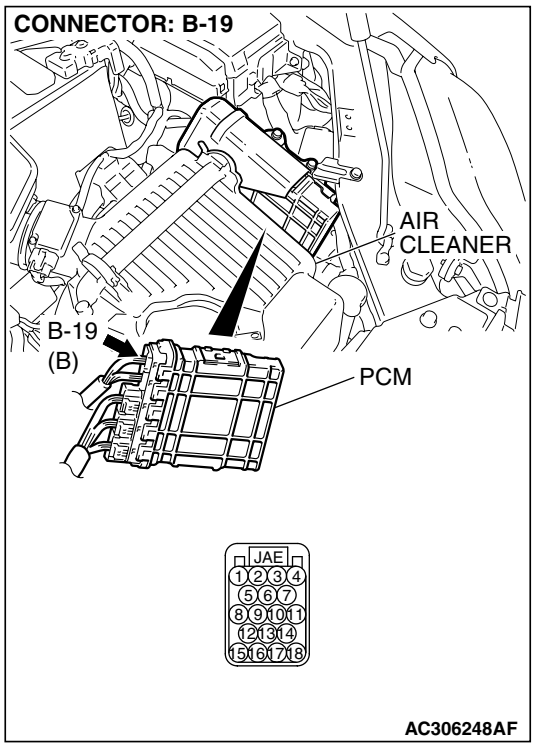
Q: Is the measured voltage battery positive voltage with the brake pedal depressed (closed circuit), and less than 1.0 volt with the brake pedal released (open circuit)?

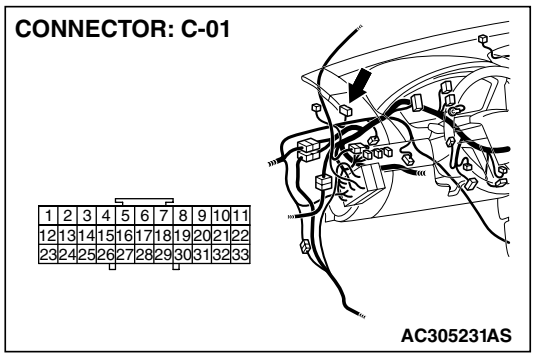
YES : Go to Step 12.
NO : Go to Step 10.

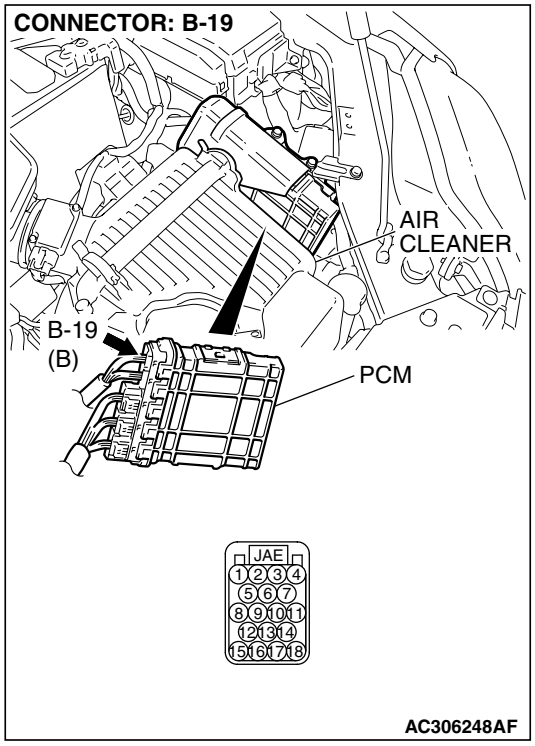
STEP10. Check PCM connector B-19 and joint connector (1) C-01 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

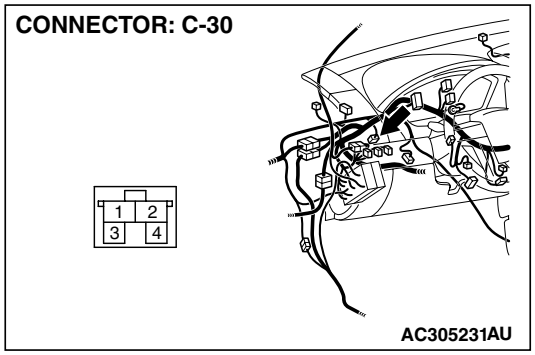
Q: Are the connectors and terminals in good condition?

YES : Go to Step 11.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







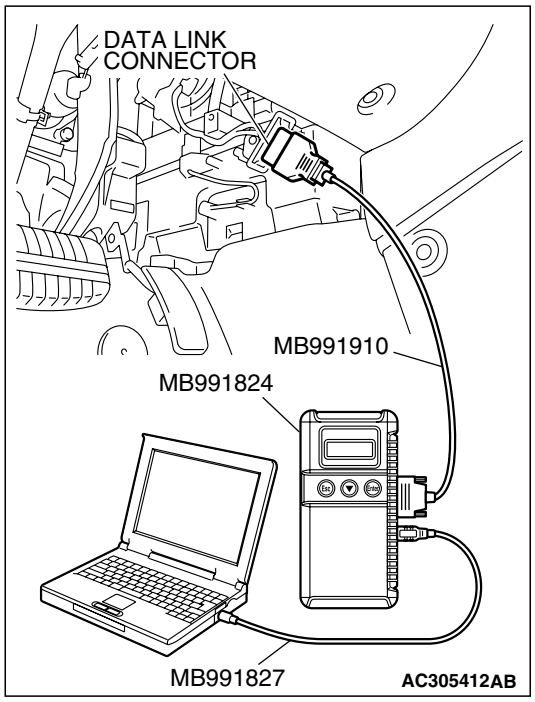


STEP 11. Check the harness for damage between PCM connector B-19 terminal 9 and stoplight switch connector C-30 terminal 1.

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 19: 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 19: 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?

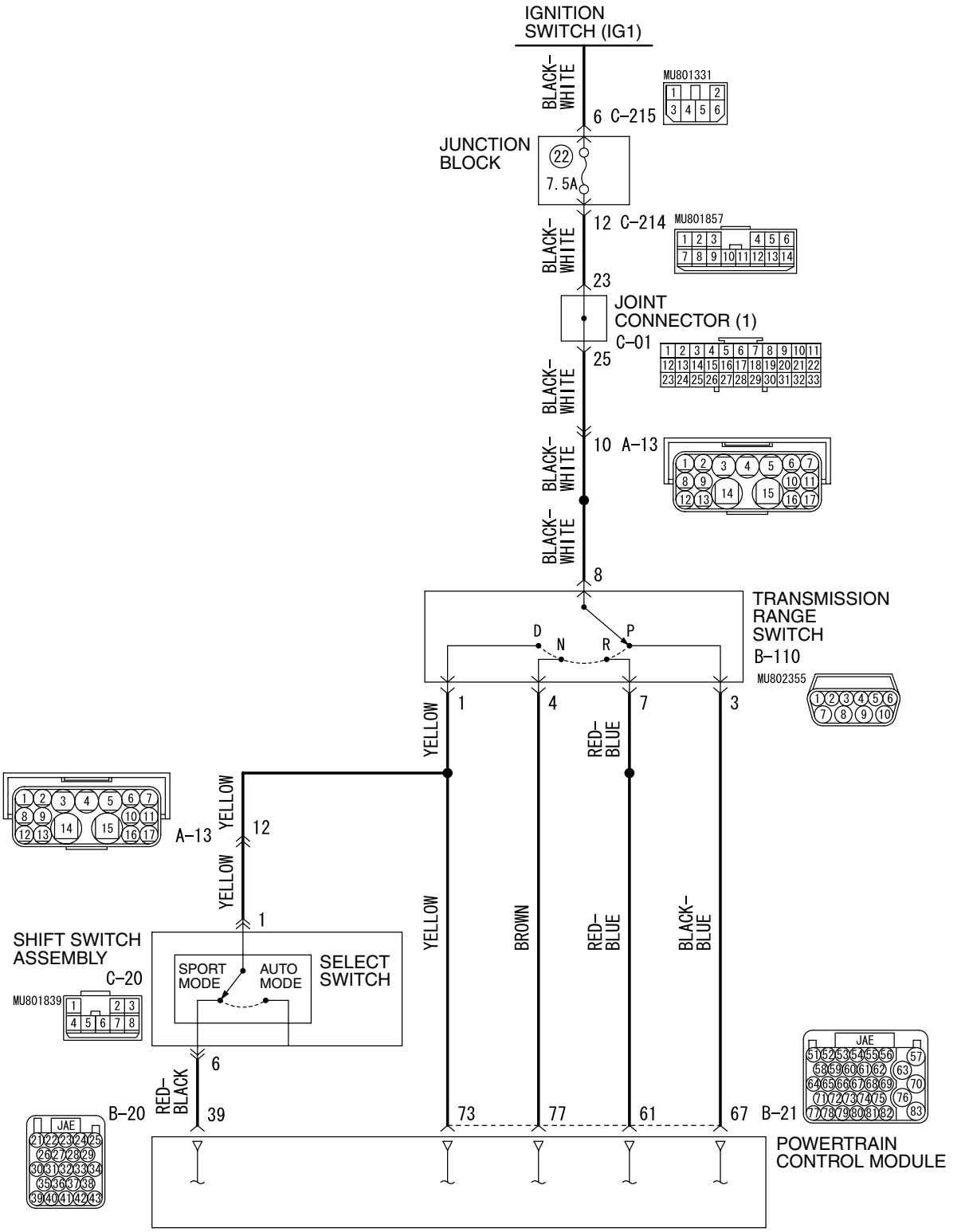
YES : It can be assumed that this malfunction may be intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-14.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

DTC P1770 (P0705): Transmission Range Switch System (Open Circuit)

⚠ CAUTION
If DTC P1770 (P0705) has been set, TCL related DTC C1397 is also set. After DTC P1770 (P0705) has been diagnosed, don't forget to erase DTC C1397.

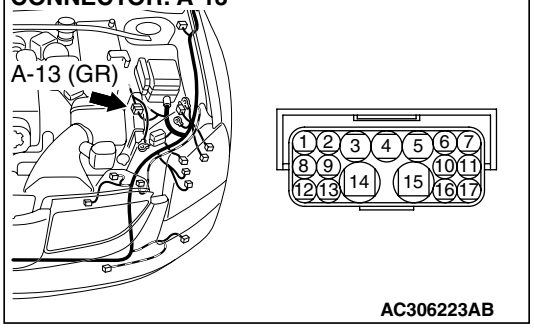
Transmission Range Switch System Circuit



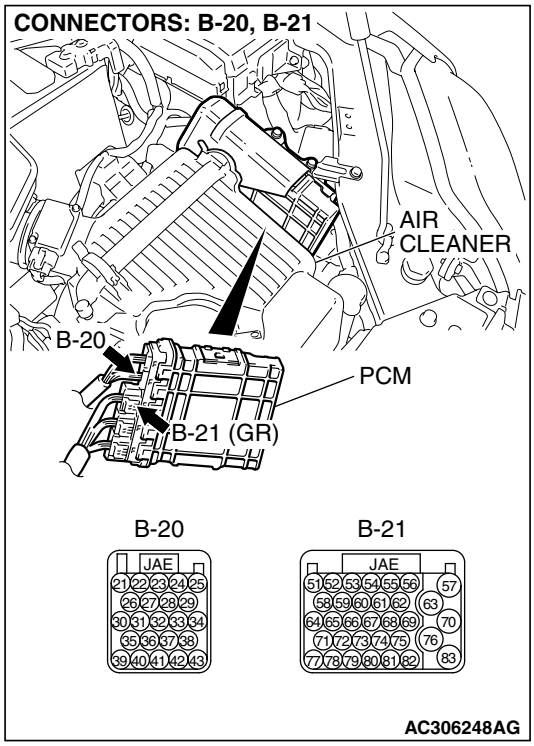
W7P23M010A
AC600842AB

TSB Revision

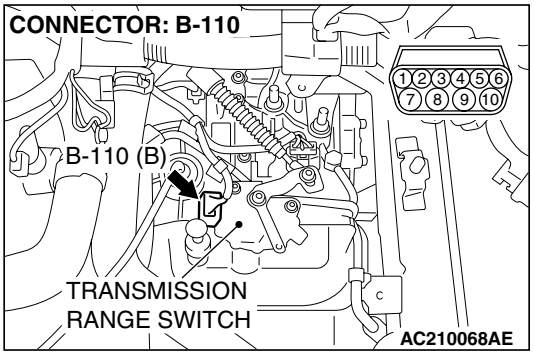
CONNECTOR: A-13



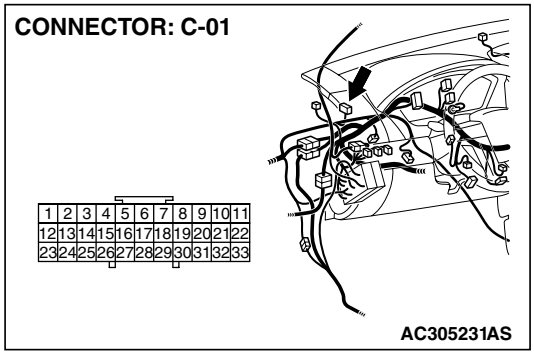
CONNECTORS: B-20, B-21



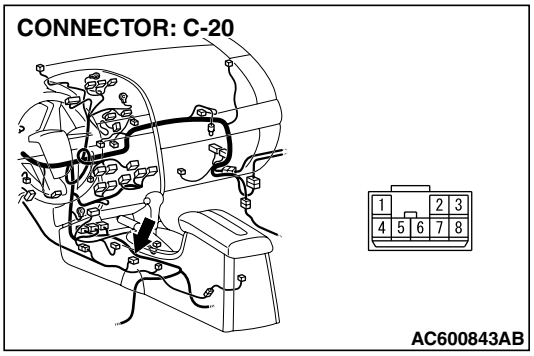
CONNECTOR: B-110



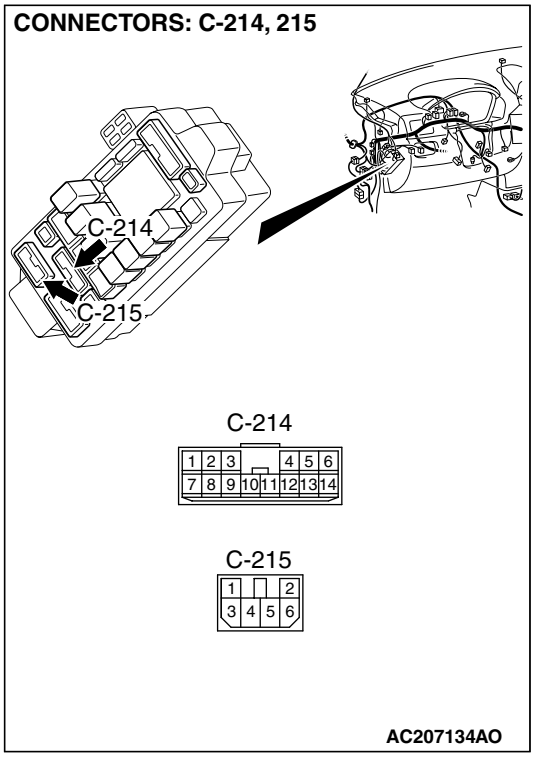
CONNECTOR: C-01



CONNECTOR: C-20



TSB Revision



CIRCUIT OPERATION

- Battery positive voltage is applied to the transmission range switch (terminal 8) when the ignition switch is turned "ON."
- Battery positive voltage is applied to the PCM (terminal 67) when the transmission range is in the "P" range. The PCM judges that the transmission range is in the "P" range when the battery positive voltage is applied.
- Battery positive voltage is applied to the PCM terminal 61 (77, 73) when the selector lever is in the "R" range ("N," "D" range). The PCM judges that the selector lever is in the "R" range ("N," "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)

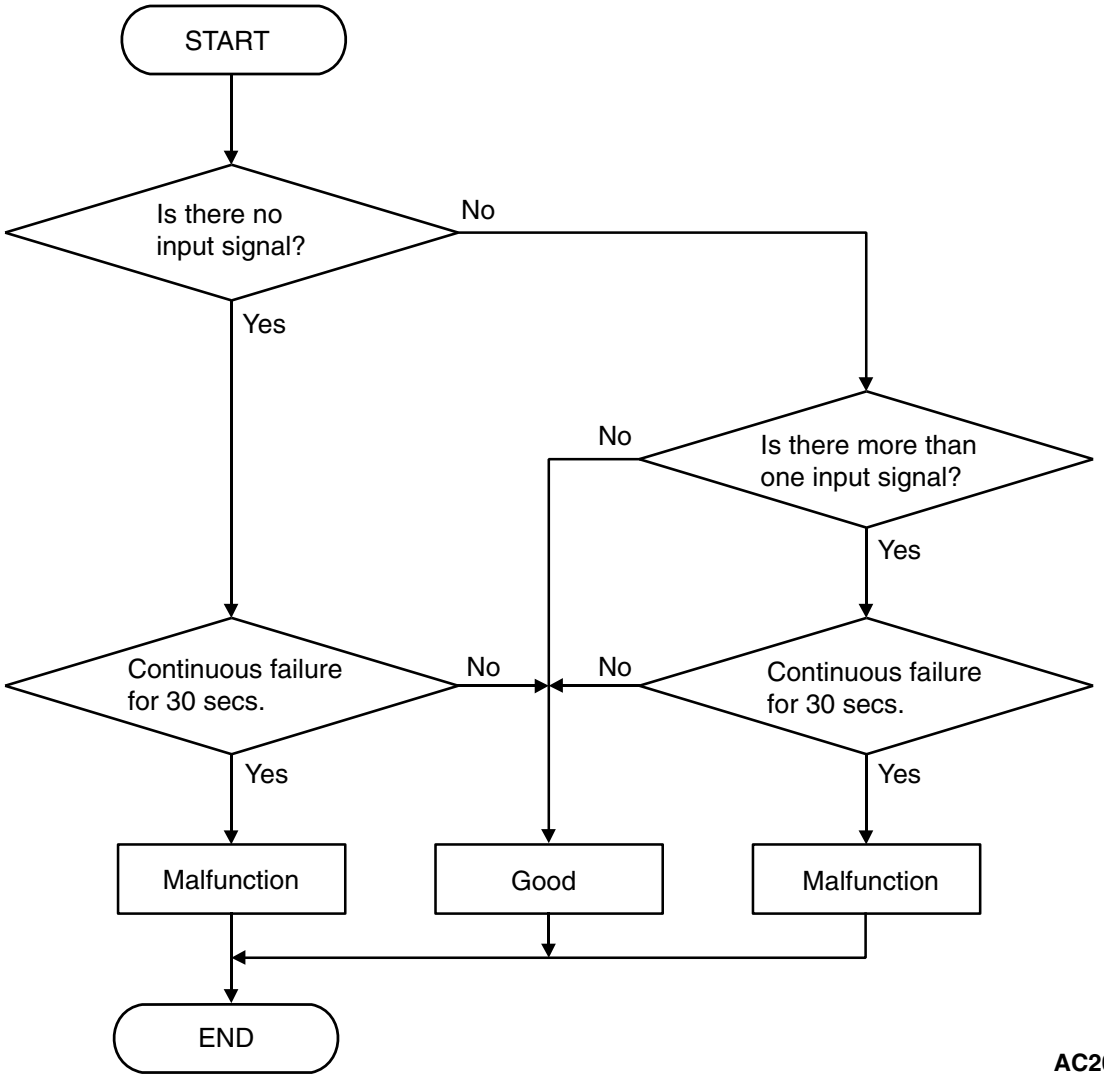
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- 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," "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," "D" ranges respectively for more than one minute.

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

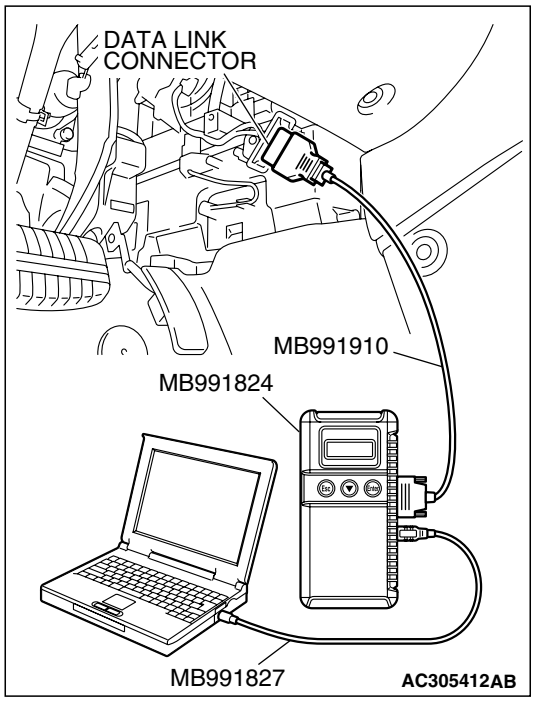
- Malfunction of the transmission range switch
- Malfunction of the ignition switch
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

TSB Revision



STEP 1. Using scan tool MB991958, check data list item 34: 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 "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 34: Transmission Range Switch.
  - Move the selector lever to "P," "R," "N," "D" and sport mode positions and confirm that the selected transmission range match the positions shown on scan tool MB991958. (The scan tool displays "D" range when the selector lever is shifted to the sport mode).

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

Q: Does the scan tool indication correspond to the actual transmission range?

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.00-14.

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

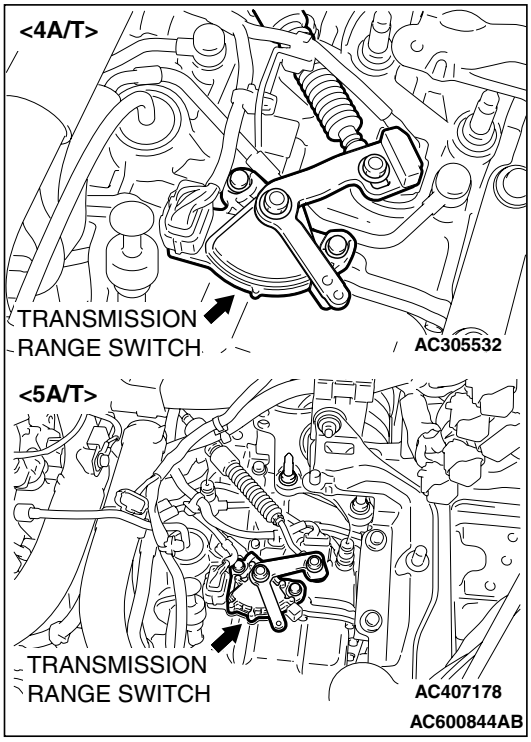
NO (Only "P" position is not displayed correctly) : Go to Step 6.

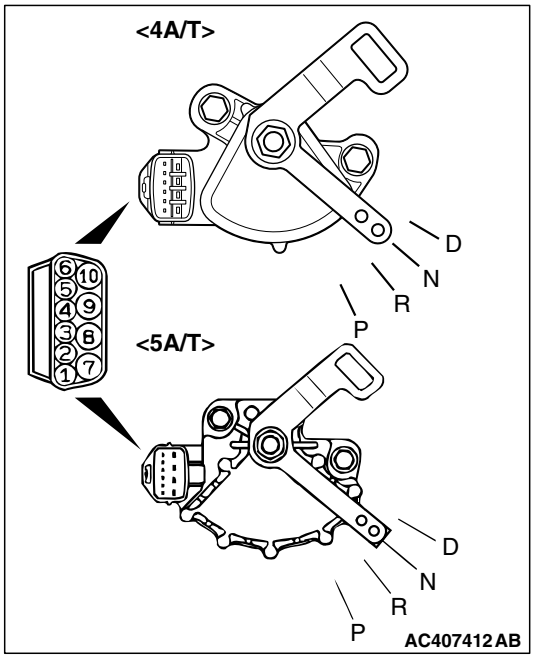
NO (Only "R" position is not displayed correctly) : Go to Step 12.

NO (Only "N" position is not displayed correctly) : Go to Step 17.

NO (Only "D" position is not displayed correctly) : Go to Step 22.

NO [Only sport mode position is not displayed correctly ("D" is not displayed.)] : Go to Step 29.





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	3 – 8, 9 – 10	Less than 2 ohms.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	

Q: Does the resistance measure less than 2 ohms for each transmission range?

YES : Go to Step 3.

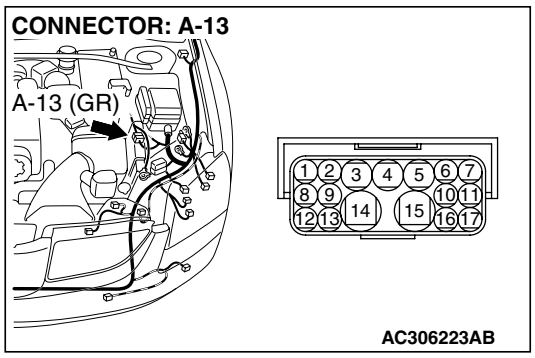
NO : Replace the transmission range switch. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.

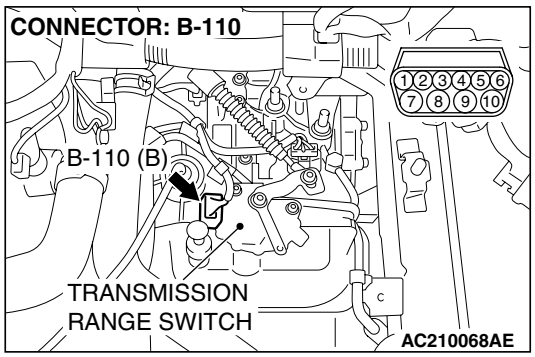
STEP 3. Check intermediate connector A-13, transmission range switch connector B-110, joint connector (1) C-01 and junction block connector C-214 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

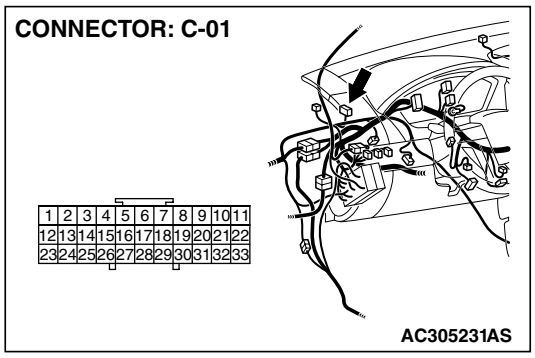
Q: Are the connectors and terminals in good condition?

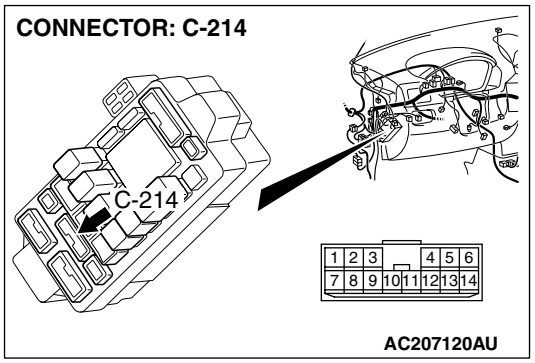
YES : Go to Step 4.

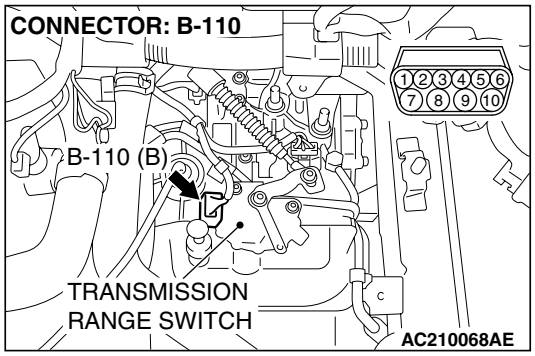
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

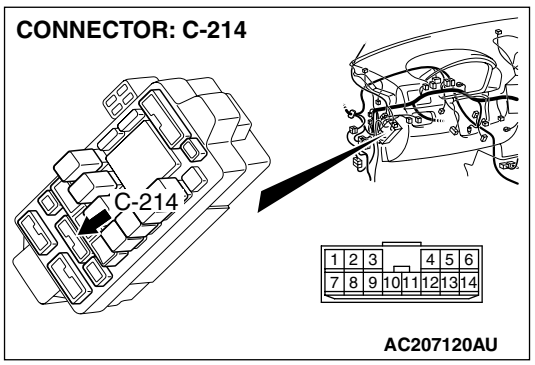










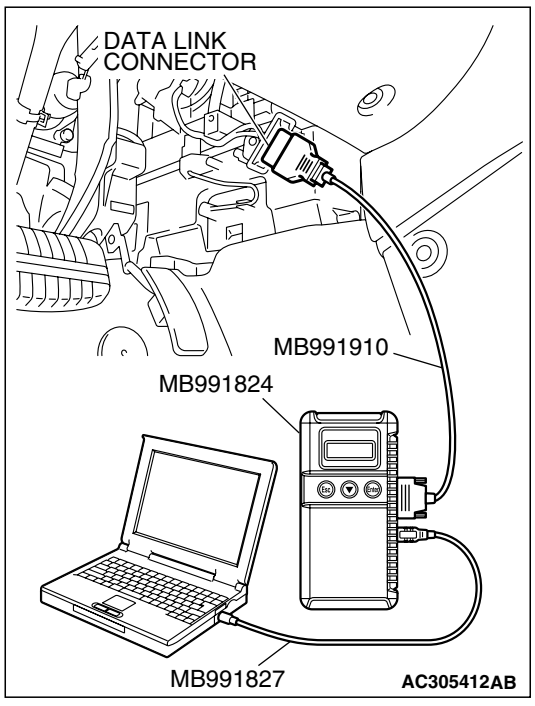


STEP 4. Check harness for open or short circuit to ground between transmission range switch connector B-110 terminal 8 and junction block connector C-214 terminal 12.

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 34: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.

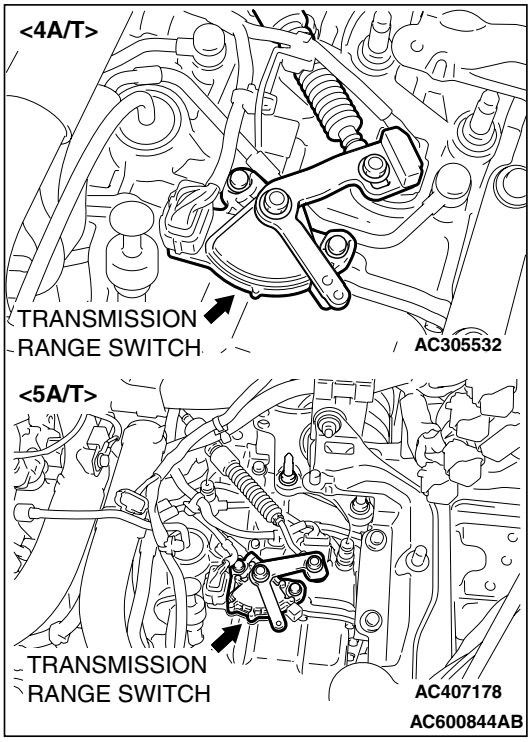
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 34: Transmission Range Switch.
  - Move the selector lever to "P," "R," "N," "D" and sport mode positions and confirm that the selected transmission range match the positions shown on scan tool MB991958. (The scan tool displays "D" range when the selector lever is shifted to the sport mode).

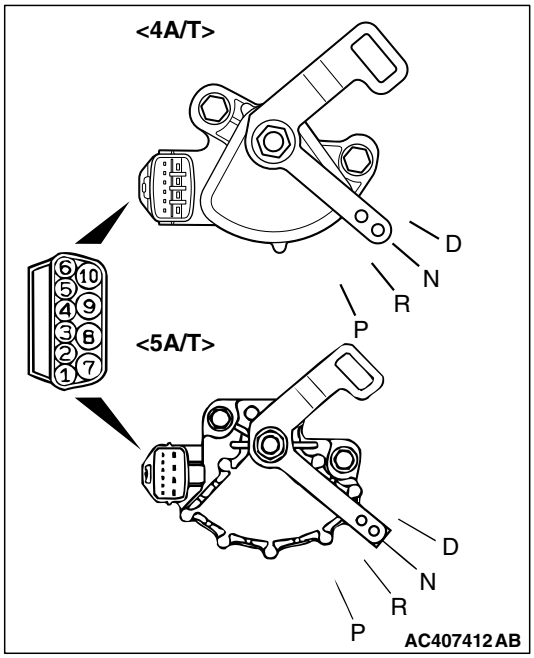
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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.00-14.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.





STEP 6. Check the transmission range switch.

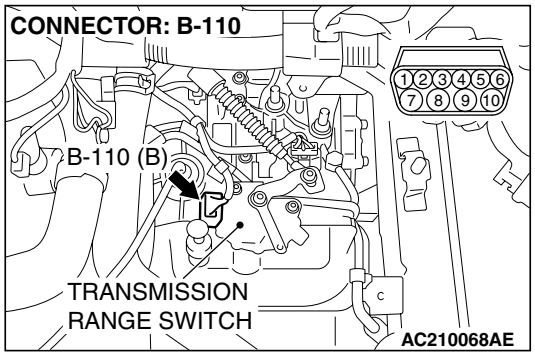
Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohms.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	

Q: Does the resistance measure less than 2 ohms for each transmission range?

YES : Go to Step 7.

NO : Replace the transmission range switch. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.



STEP 7. Check transmission range switch connector B-110 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

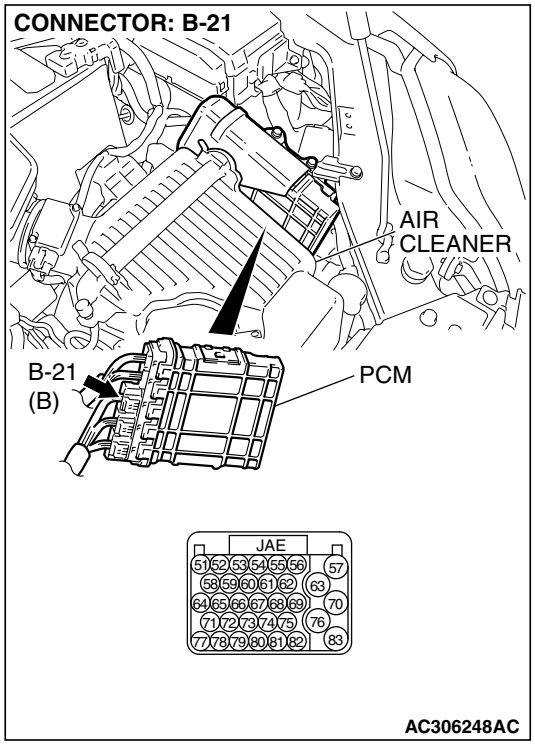
Q: Are the connector and terminals in good condition?

YES : Go to Step 8.

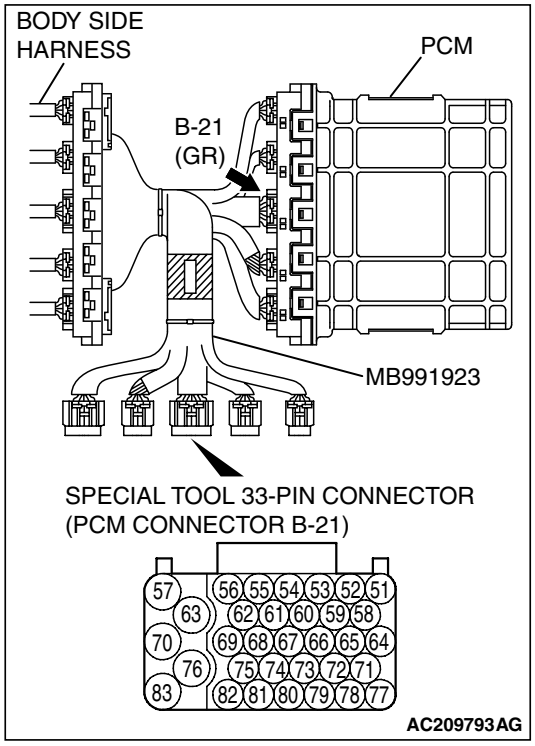
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

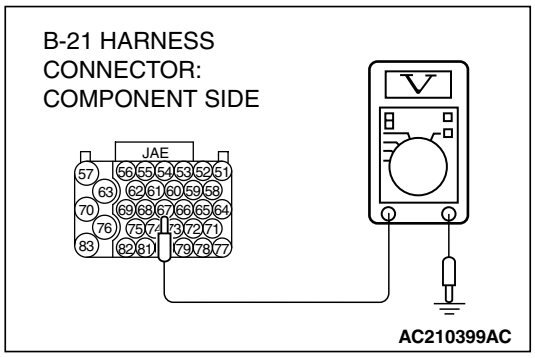
STEP 8. Measure the transmission range switch output voltage at PCM connector B-21 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Move the selector lever to the "P" position.





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

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

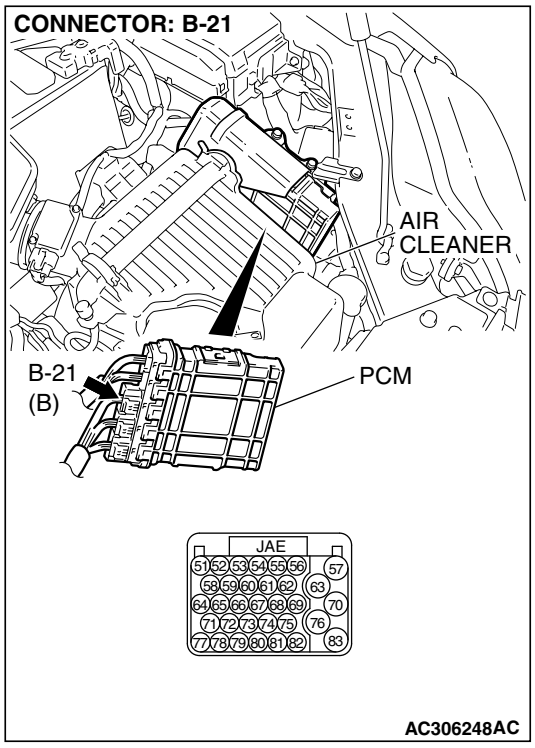
Q: Is the measured voltage battery positive voltage?

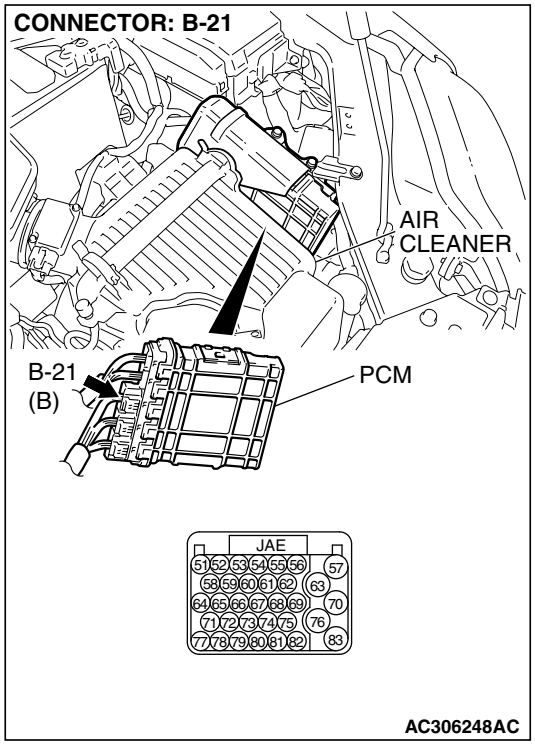
YES : Go to Step 11.
NO : Go to Step 9.

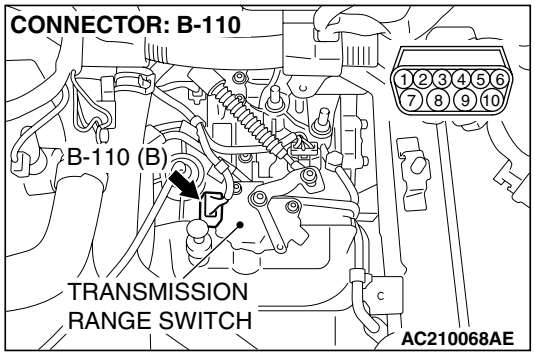
STEP 9. Check PCM connector B-21 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 10.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





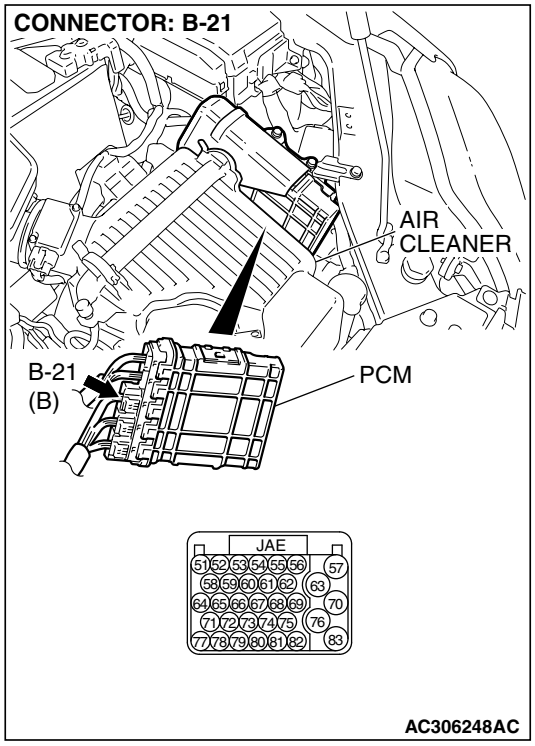


STEP 10. Check harness for open circuit or short circuit to ground between PCM connector B-21 terminal 67 and transmission range switch connector B-110 terminal 3.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.

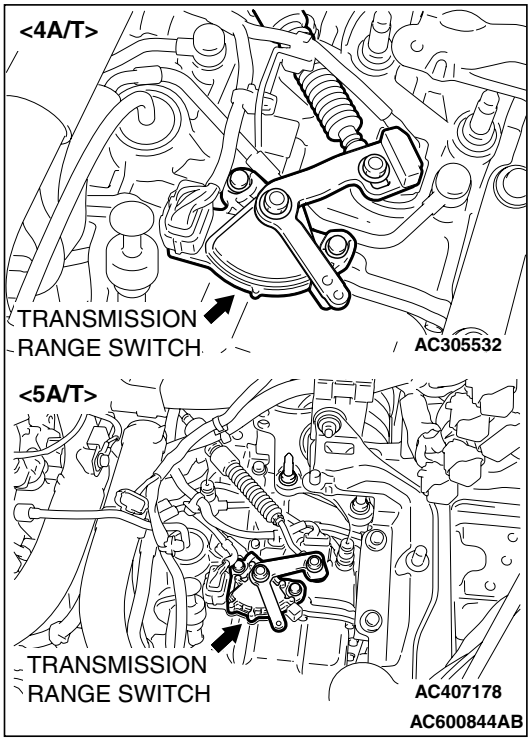


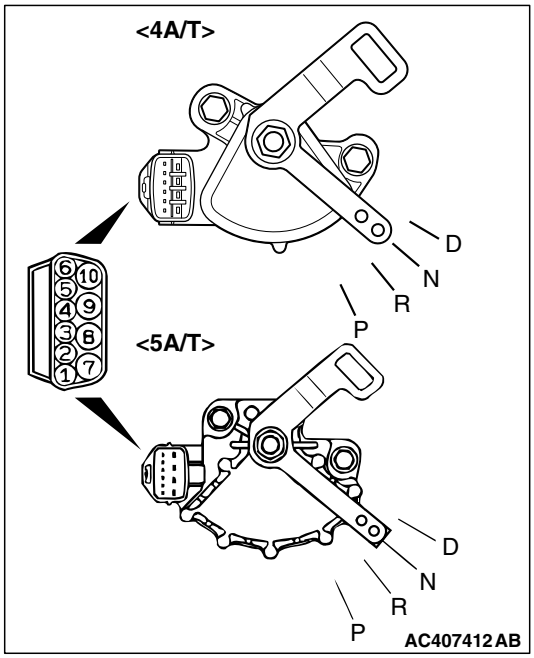
STEP 11. Check PCM connector B-21 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.





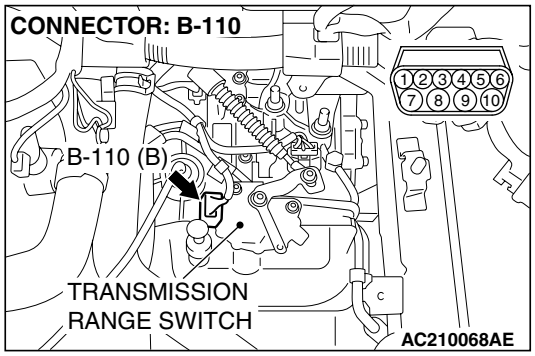
STEP 12. Check the transmission range switch.
Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohms.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	

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

YES : Go to Step 13.

NO : Replace the transmission range switch. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.



STEP 13. Check transmission range switch connector B-110 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

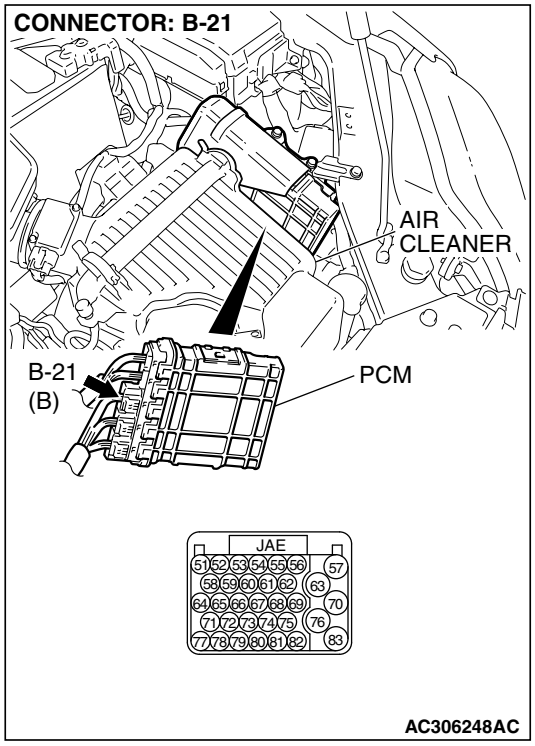
Q: Are the connector and terminals in good condition?

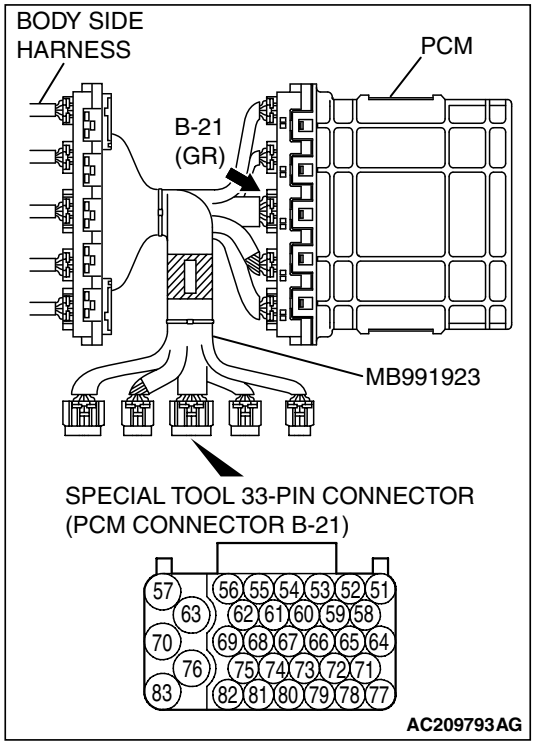
YES : Go to Step 14.

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

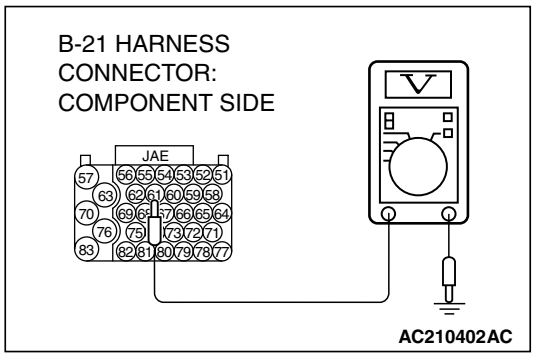
STEP 14. Measure the transmission range switch output voltage at PCM connector B-21 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Move the selector lever to the "R" position.



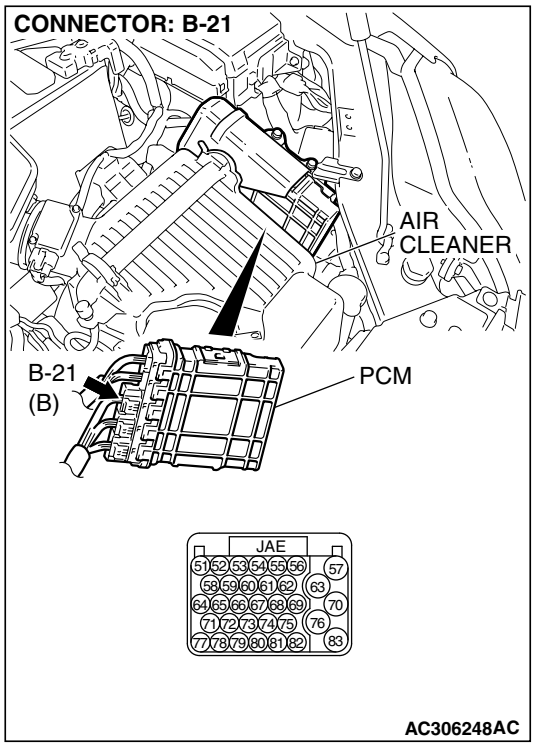
(5) Measure the voltage between terminal 61 and ground.
- The voltage should measure below battery positive voltage.

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

Q: Is the measured voltage battery positive voltage?

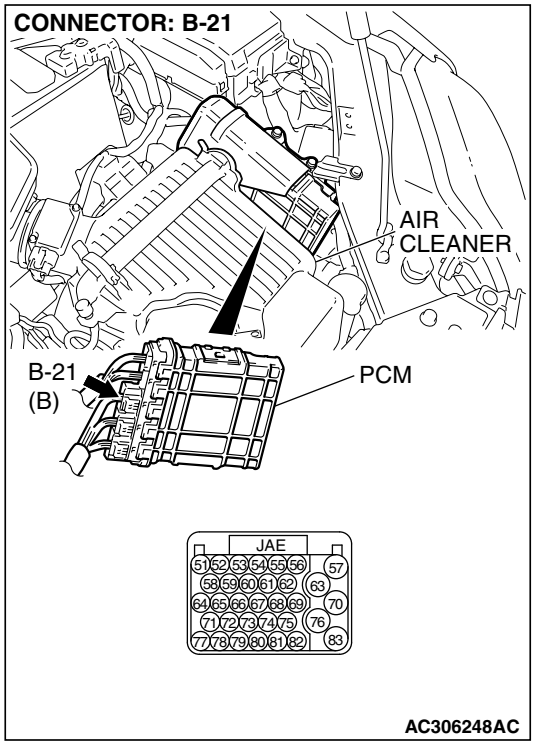
YES : Go to Step 11.
NO : Go to Step 15.

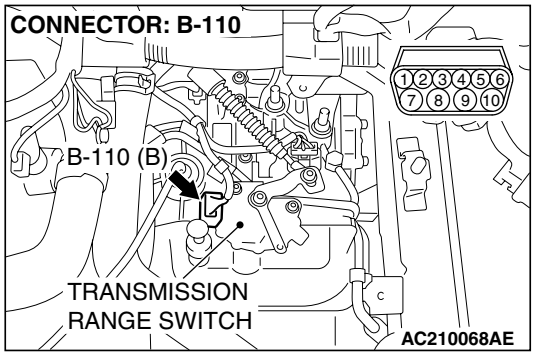
STEP 15. Check PCM connector B-21 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



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.



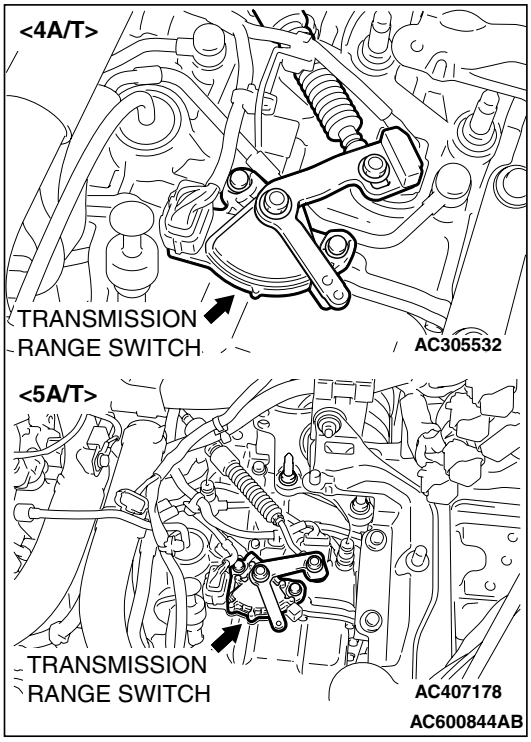


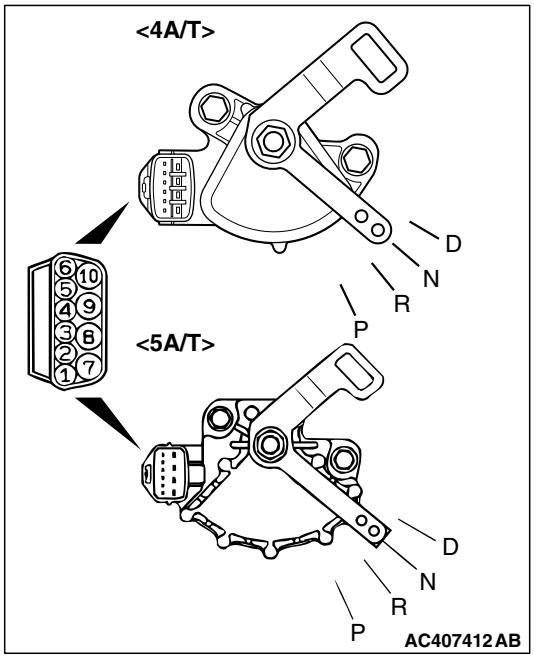
STEP 16. Check harness for open circuit or short circuit to ground between PCM connector B-21 terminal 61 and transmission range switch connector B-110 terminal 7.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.





STEP 17. Check the transmission range switch.

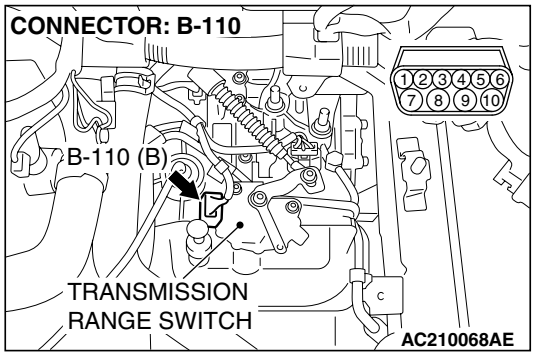
Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohms.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	

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

YES : Go to Step 18.

NO : Replace the transmission range switch. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.



STEP 18. Check transmission range switch connector B-110 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

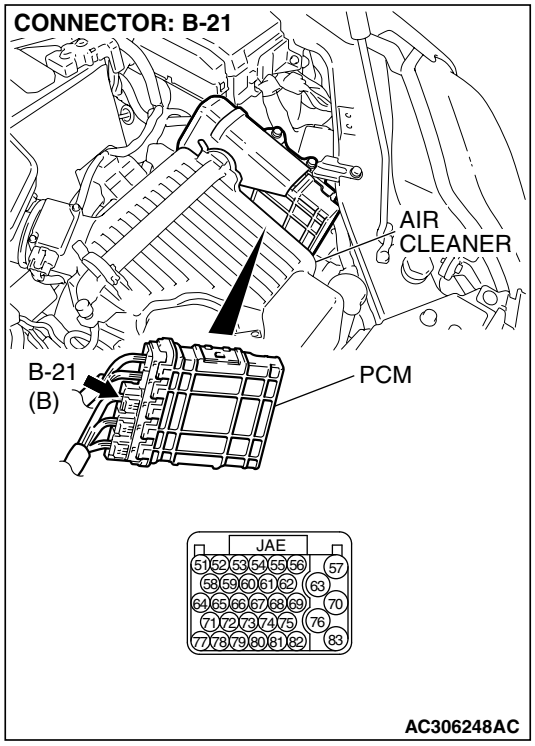
Q: Are the connector and terminals in good condition?

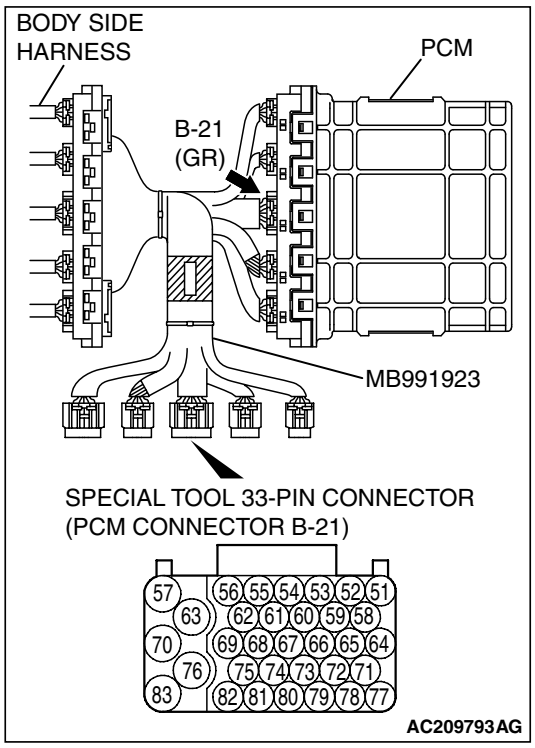
YES : Go to Step 19.

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

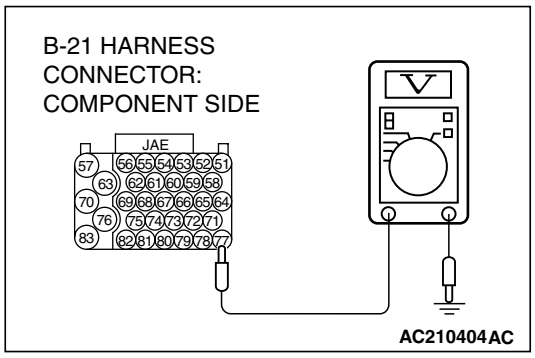
STEP 19. Measure the transmission range switch output voltage at PCM connector B-21 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Move the selector lever to the "N" position.



(5) Measure the voltage between terminal 77 and ground.
- The voltage should measure battery positive voltage.

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

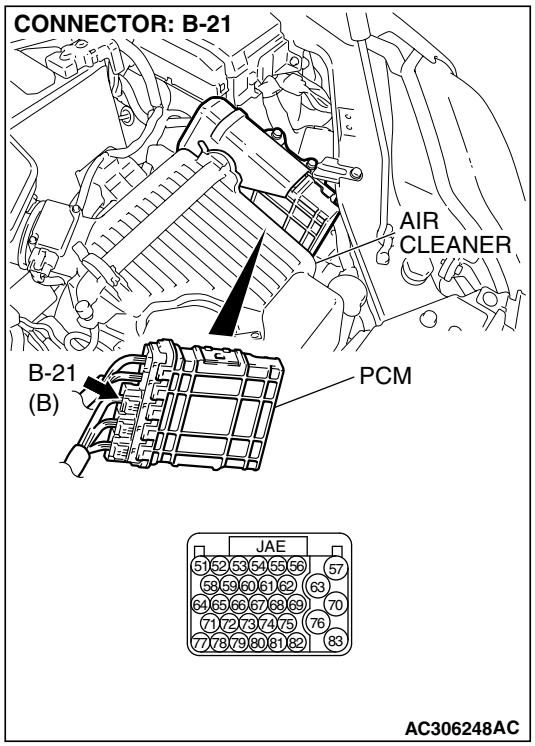
Q: Is the measured voltage battery positive voltage?

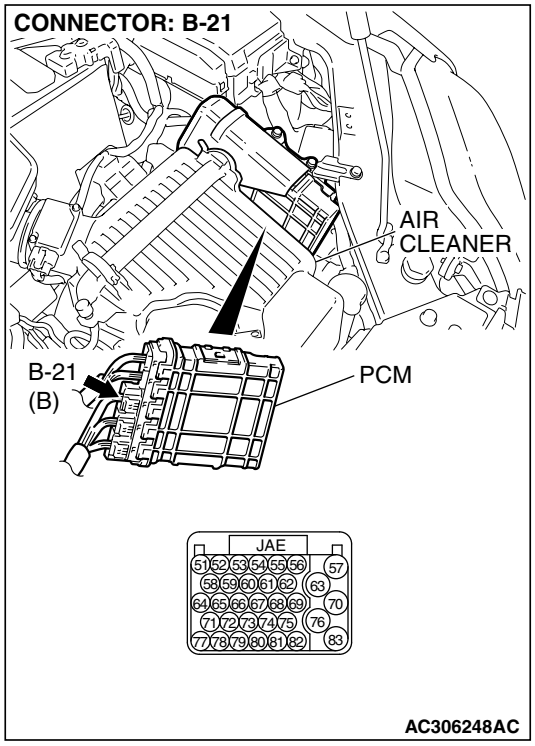
YES : Go to Step 11.
NO : Go to Step 20.

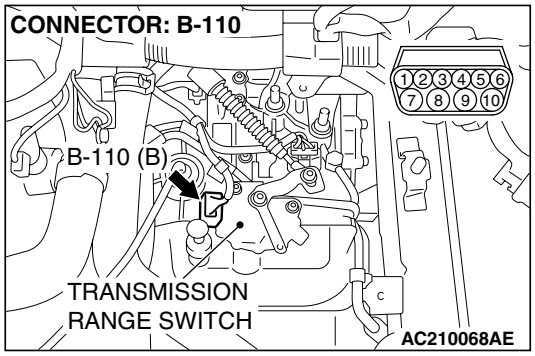
STEP 20. Check PCM connector B-21 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.





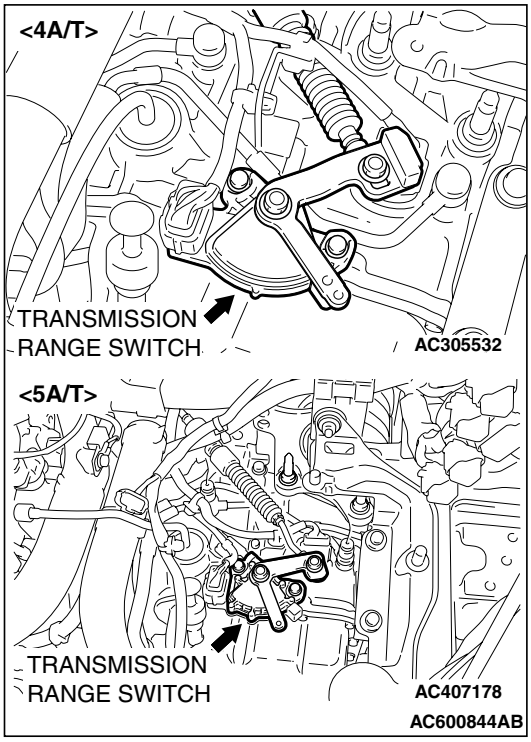


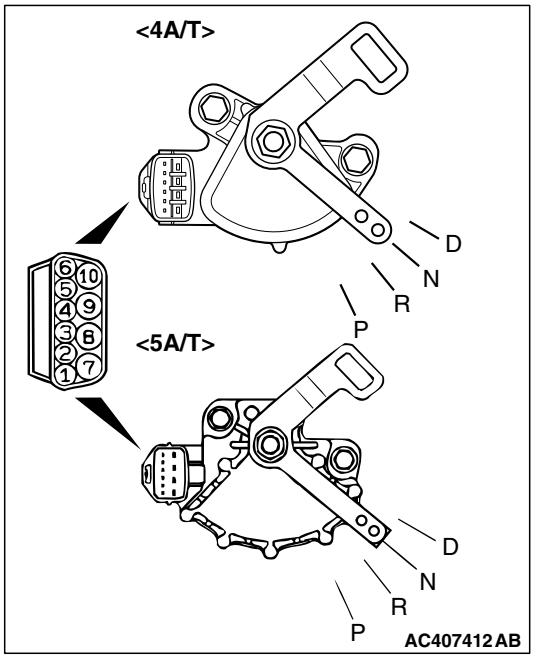
STEP 21. Check harness for open circuit or short circuit to ground between PCM connector B-21 terminal 77 and transmission range switch connector B-110 terminal 4.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.





STEP 22. Check the transmission range switch.

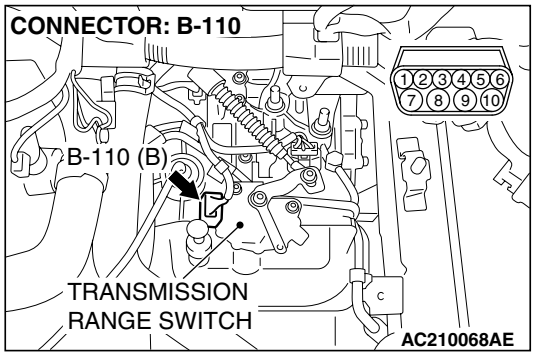
Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohms.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	

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

YES : Go to Step 23.

NO : Replace the transmission range switch. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.



STEP 23. Check transmission range switch connector B-110 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

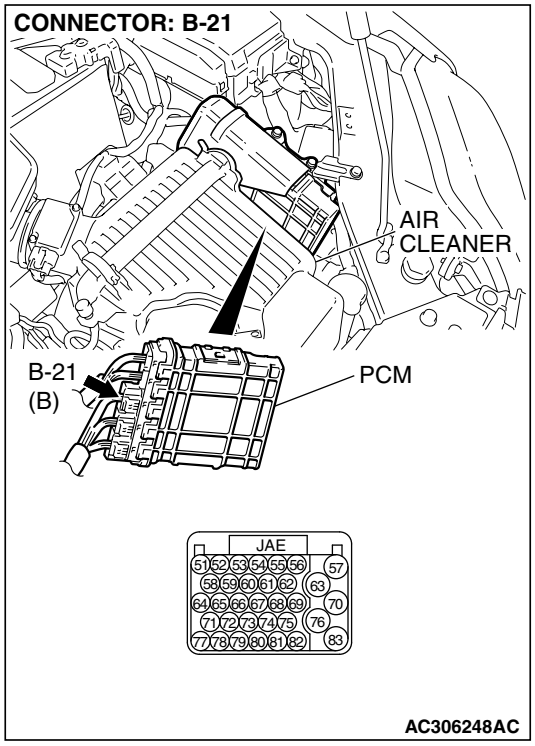
Q: Are the connector and terminals in good condition?

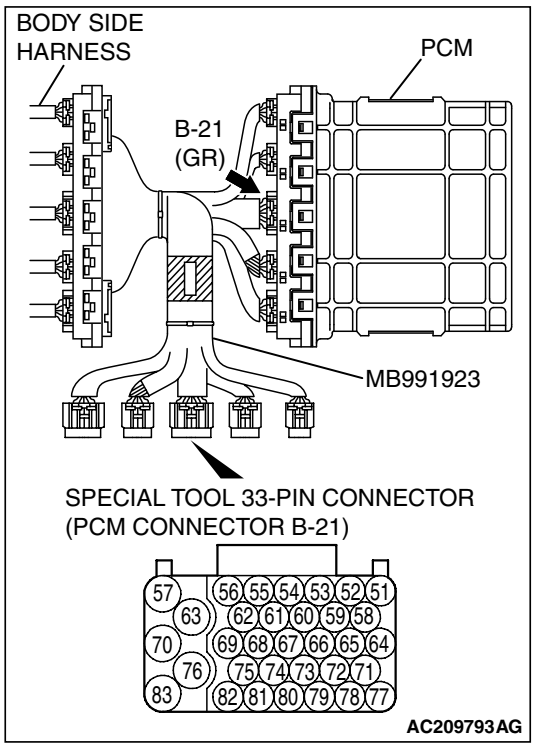
YES : Go to Step 24.

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

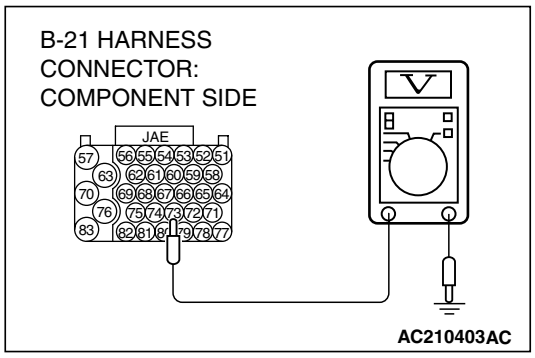
STEP 24. Measure the transmission range switch output voltage at PCM connector B-21 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.





(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Move the selector lever to the "D" position.



(5) Measure the voltage between terminal 73 and ground.
- The voltage should equal battery voltage (approximately12 volts).

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

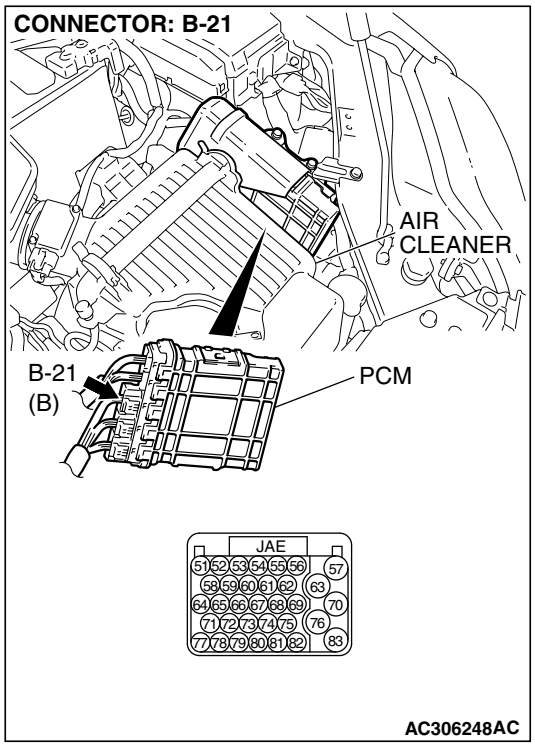
Q: Does the voltage measure battery positive voltage?

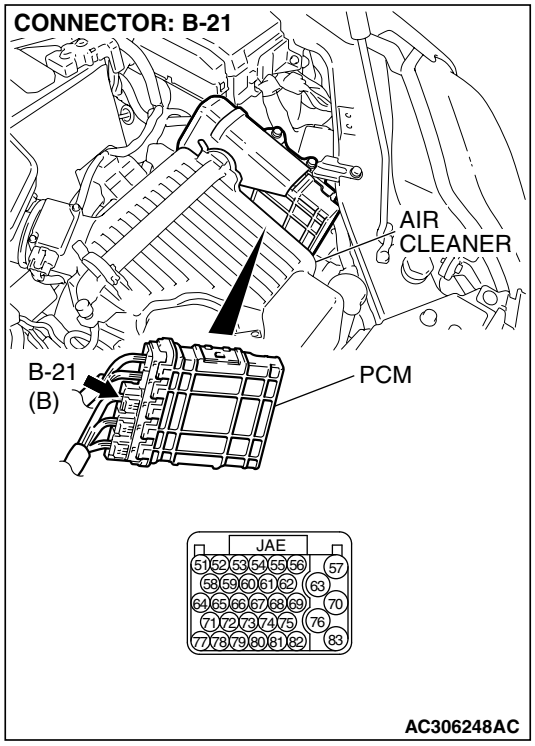
YES : Go to Step 11.
NO : Go to Step 25.

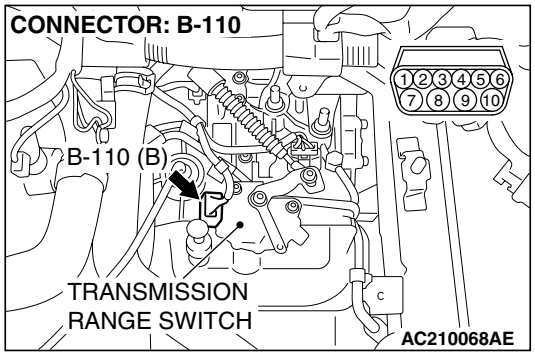
STEP 25. Check PCM connector B-21 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 26.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







STEP 26. Check harness for open circuit or short circuit to ground between PCM connector B-21 terminal 73 and transmission range switch connector B-110 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 27.

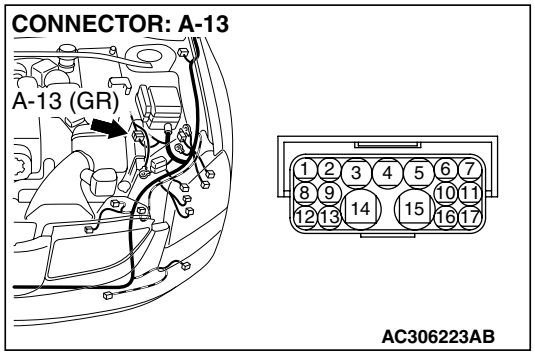
NO : Repair or replace the harness wire.

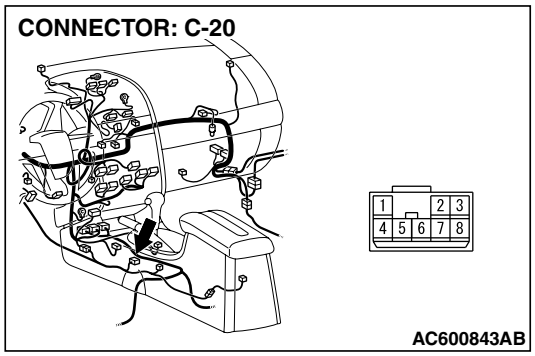
STEP 27. Check intermediate connector A-13 and shift switch assembly connector C-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 28.

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



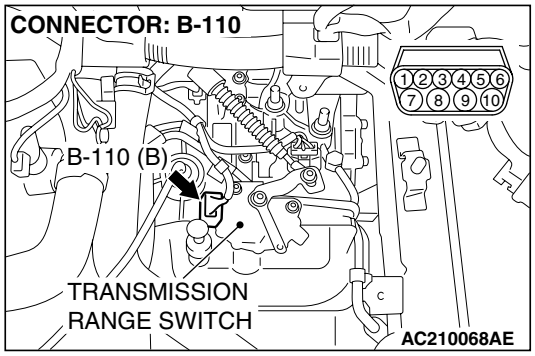


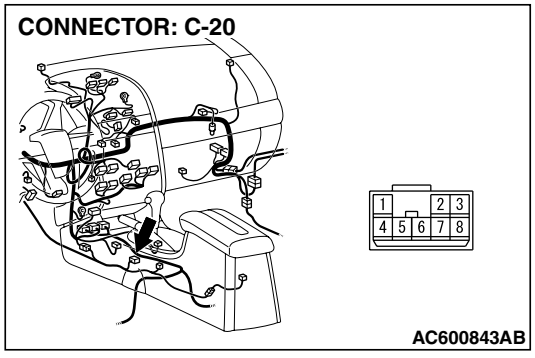
STEP 28. Check harness for short circuit to ground between transmission range switch connector B-110 terminal 1 and shift switch assembly connector C-20 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.





STEP 29. Check the shift switch assembly. Refer to P.23A-380, Transaxle Control.

Q: Is the switch operating properly?

YES : Go to Step 30 .

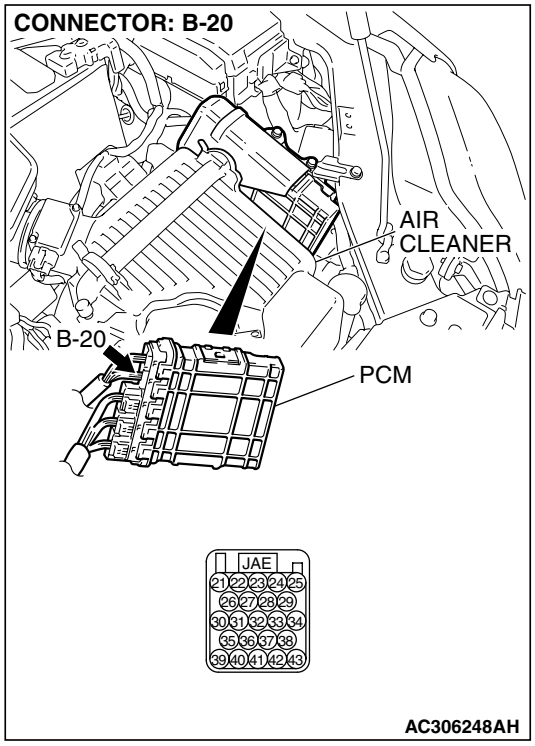
NO : Replace the shift switch assembly. Refer to P.23A-380, Transaxle Control.

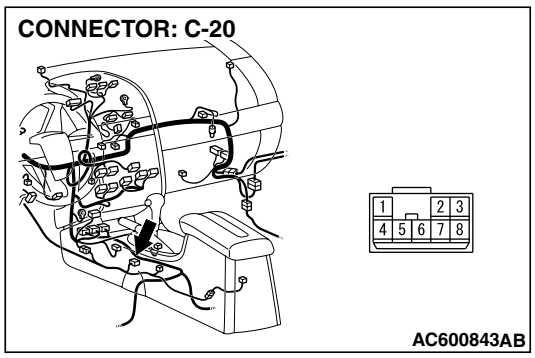
STEP 30. Check PCM connector B-20 and shift switch assembly connector C-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

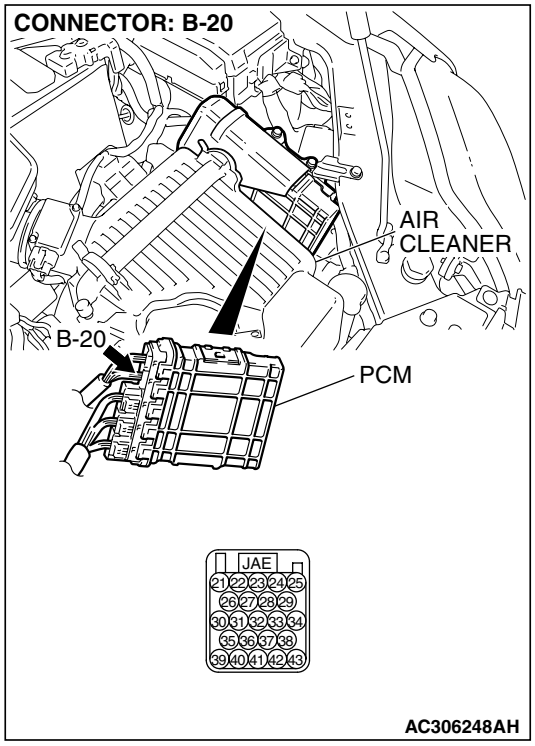
Q: Are the connector and terminals in good condition?

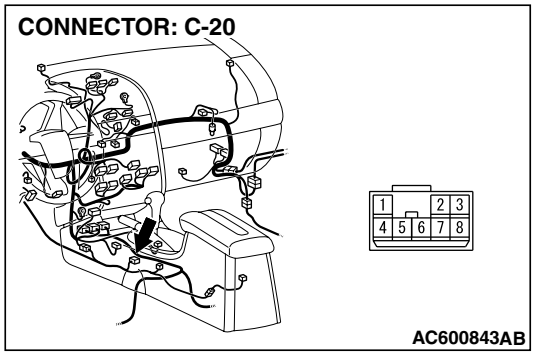
YES : Go to Step 31.

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









STEP 31 . Check harness for short circuit to ground between PCM connector B-20 terminal 39 and shift switch assembly connector C-20 terminal 6.

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair or replace the harness wire.

DTC P1771 (P0705): Transmission Range Switch System (Short Circuit)

⚠ CAUTION

If DTC P1771 (P0705) has been set, TCL related DTC C1397 is also set. After DTC P1771 (P0705) has been diagnosed, don't forget to erase DTC C1397.

TRANSMISSION RANGE SWITCH SYSTEM CIRCUIT

Refer to P.23A-125.

CIRCUIT OPERATION

Refer to P.23A-125.

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

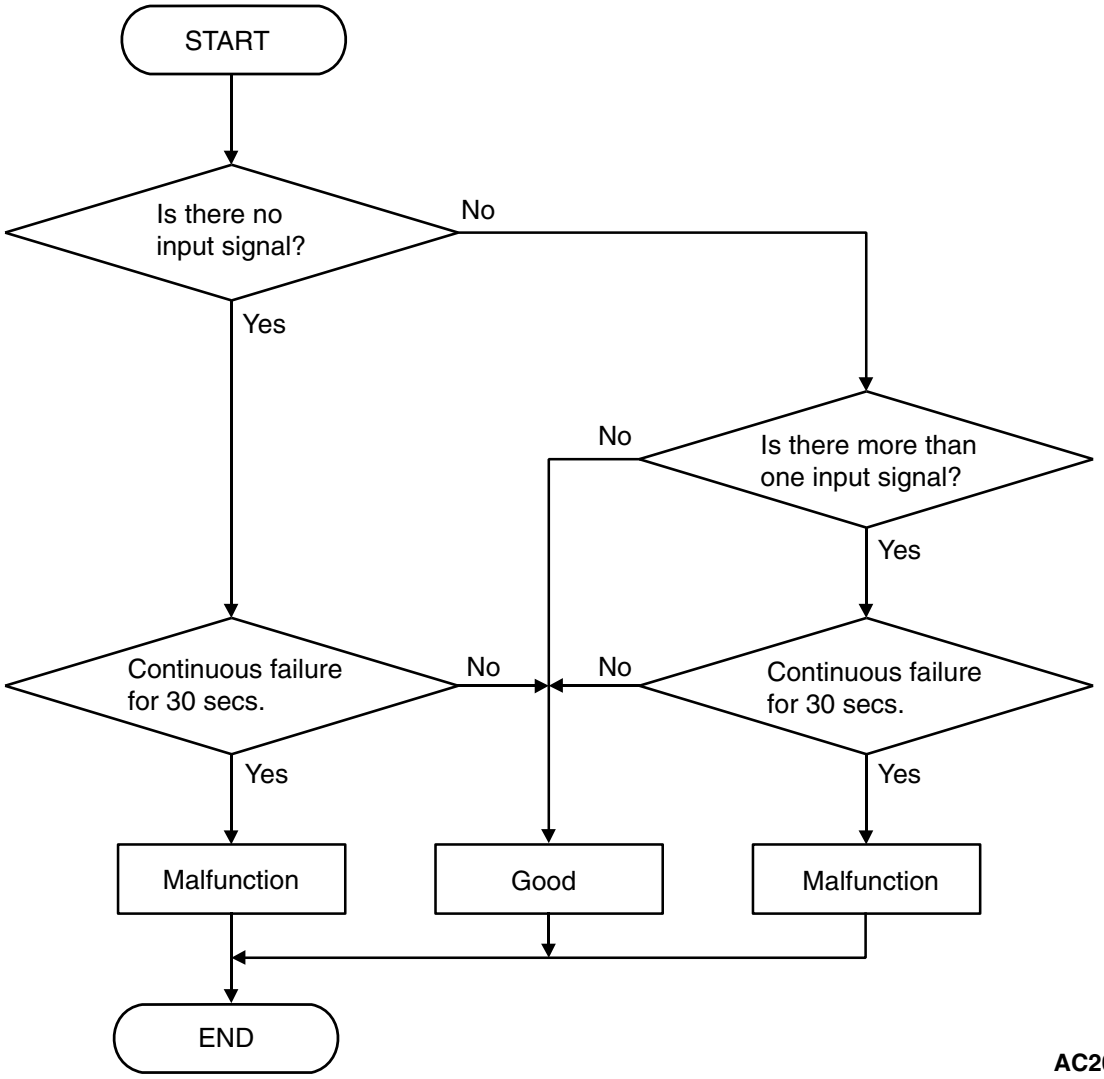
TSB Revision

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)



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.

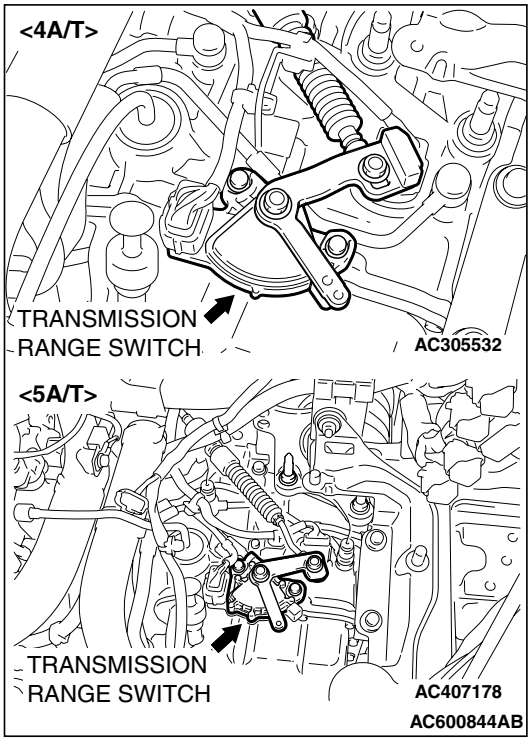
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)
- Malfunction of the transmission range switch circuit
- Damaged harness or connector
- Malfunction of the PCM

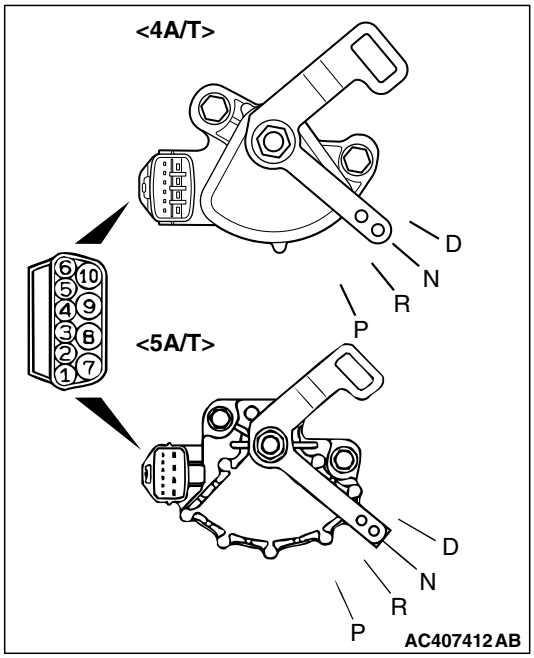
TSB Revision

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main harness A





STEP 1. Check the transmission range switch.

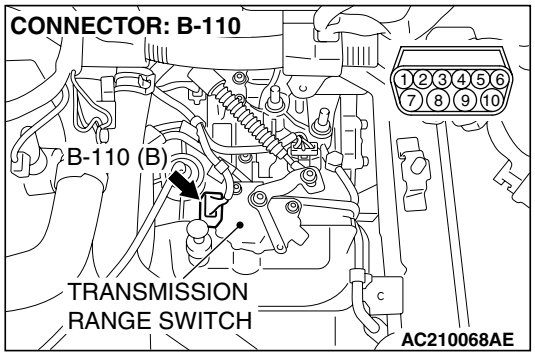
Measure the resistance between the terminals for each transmission range as indicated in the table below.

TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohms.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	

Q: Does the resistance measure less than 2 ohms for each selector position?

YES : Go to Step 2.

NO : Replace the transmission range switch. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.

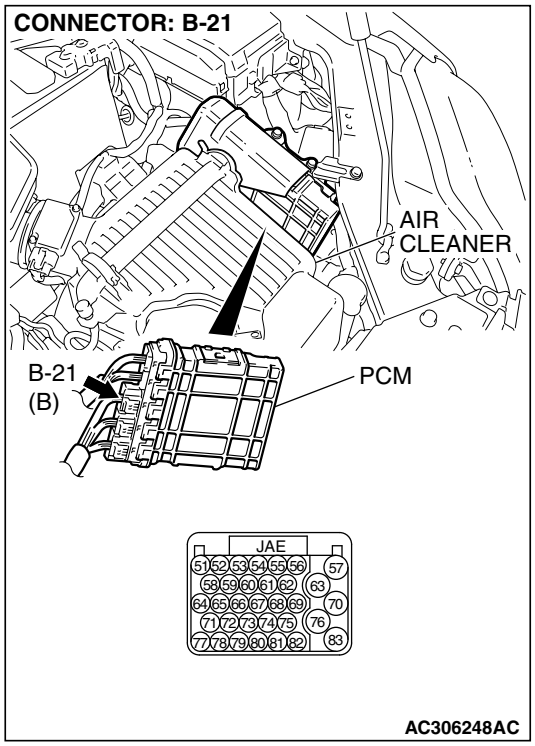


STEP 2. Check transmission range switch connector B-110 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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 B-21 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

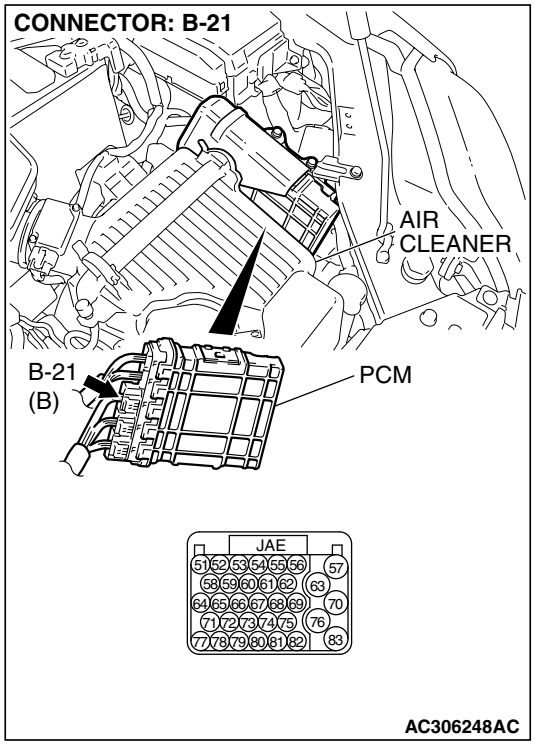
Q: Are the connector and terminals in good condition?

YES : Go to Step 4.

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

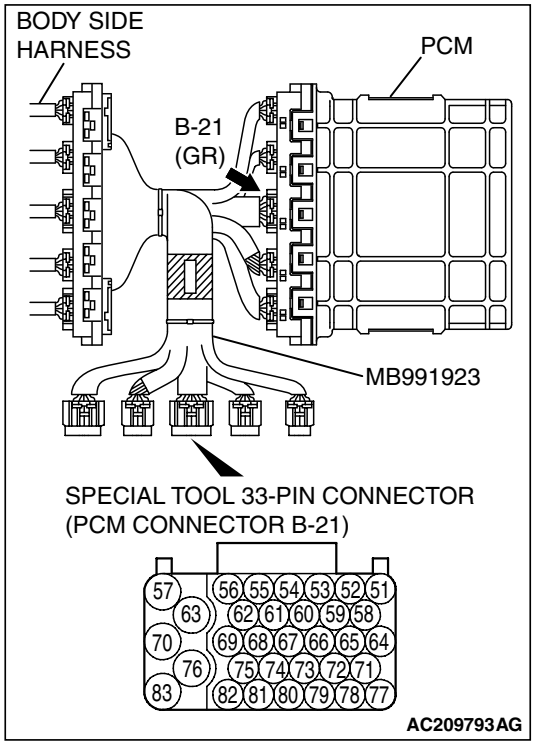
STEP 4. Measure the transmission range switch output voltage at PCM connector B-21 by using check harness special tool MB991923. ("P" position)

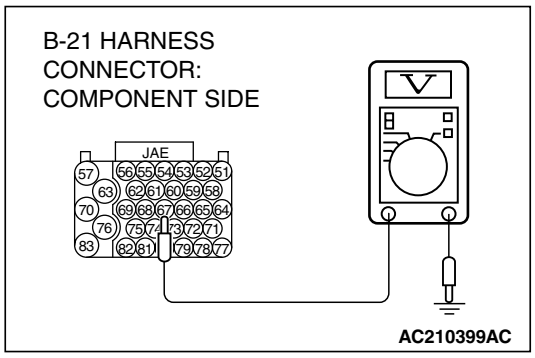
(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.

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





(4) Measure the voltage between terminal 67 and ground.
- When transmission range is "P," voltage should equal 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.
- When transmission range is sport mode, voltage should measure 0.5 volt or less.

Q: Is the measured voltage within the specified range?

YES : Go to Step 6.

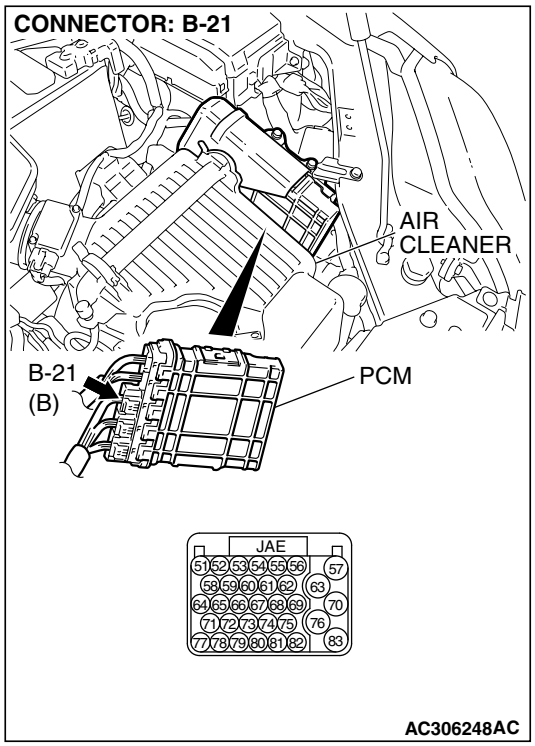
NO : Turn the ignition switch to the "LOCK" (OFF) position. Go to Step 5.

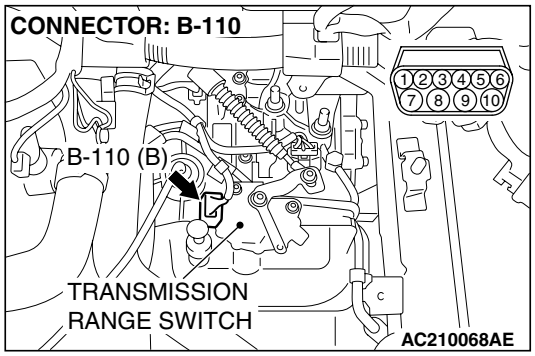
STEP 5. Check harness for damage between PCM connector B-21 terminal 67 and transmission range switch connector B-110 terminal 3.

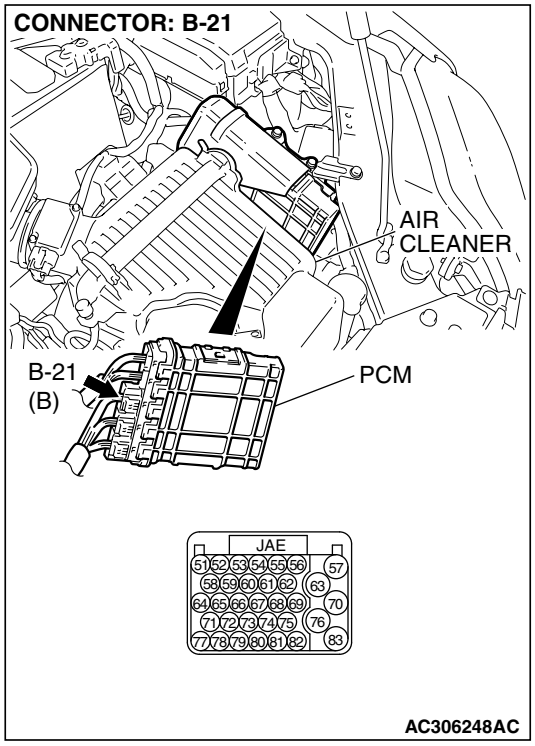
Q: Is the harness wire in good condition?

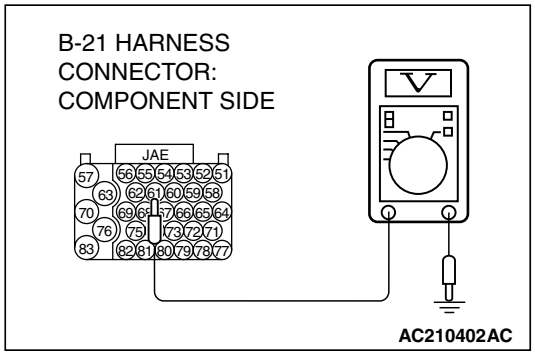
YES : Go to Step 14.

NO : Repair or replace the harness wire.









STEP 6. Measure the transmission range switch output voltage at PCM connector B-21 by using check harness special tool MB991923. ("R" position)

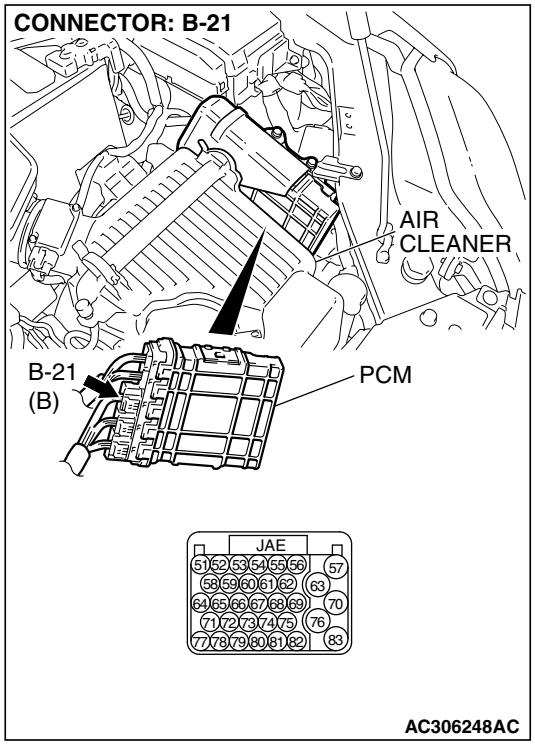
Measure the voltage between terminal 61 and ground.

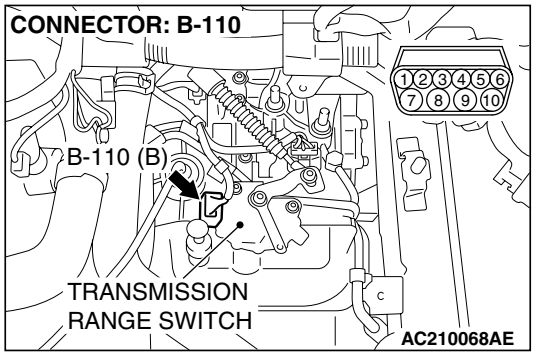
- When transmission range is "P," voltage should measure 0.5 volt or less.
- When transmission range is "R," voltage should equal battery positive voltage.
- When transmission range is "N," voltage should measure 0.5 volt or less.
- When transmission range is "D," voltage should measure 0.5 volt or less.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

Q: Is the measured voltage within the specified range?

YES : Go to Step 8.

NO : Turn the ignition switch to the "LOCK" (OFF) position. Go to Step 7.



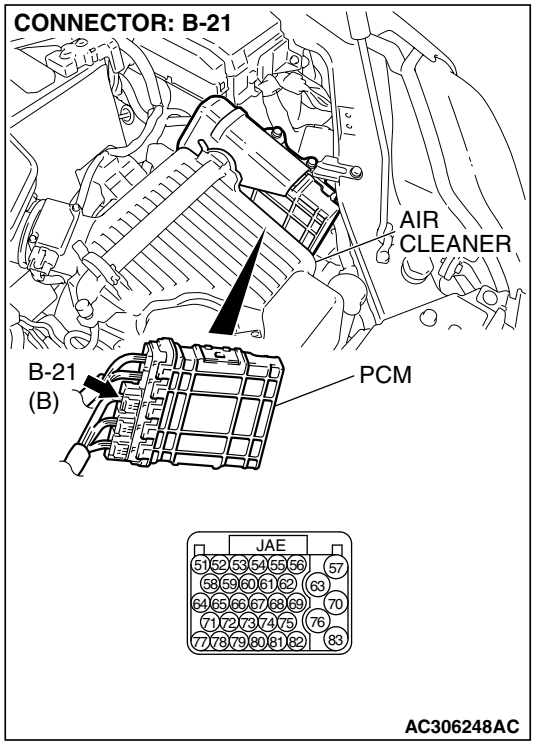


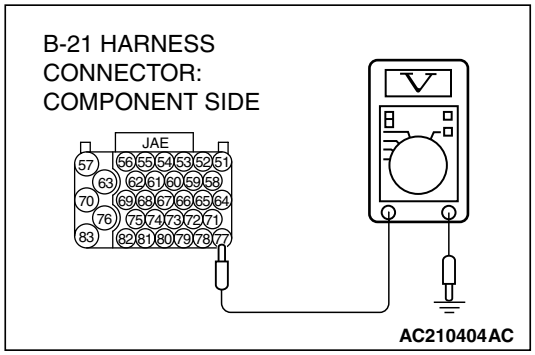
STEP 7. Check the harness for damage between PCM connector B-21 terminal 61 and transmission range switch connector B-110 terminal 7.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair or replace the harness wire.





STEP 8. Measure the transmission range switch output voltage at PCM connector B-21 by using check harness special tool MB991923. ("N" position)

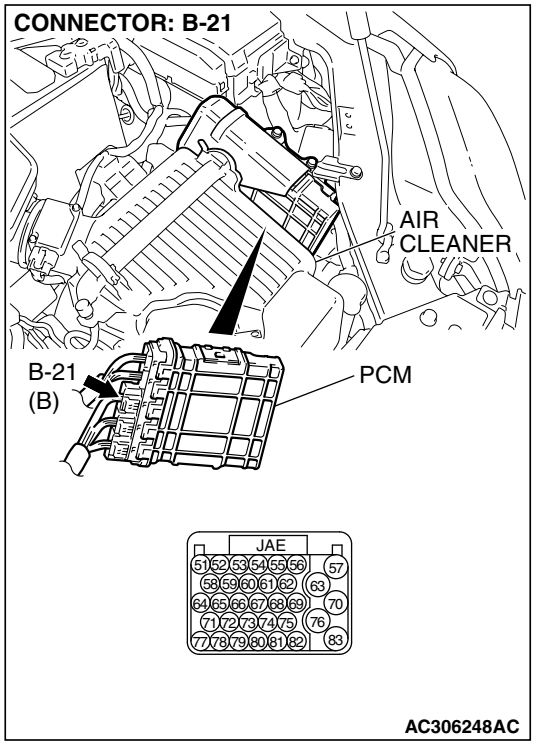
Measure the voltage between terminal 77 and ground.

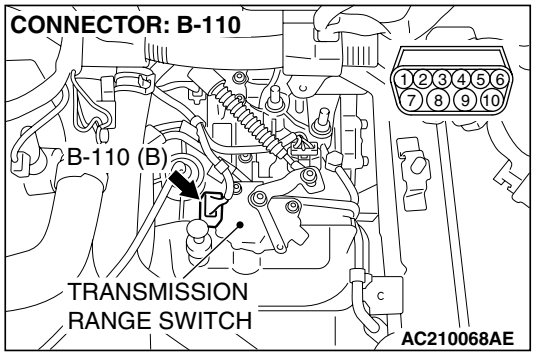
- When transmission range is "P," voltage should measure 0.5 volt or less.
- When transmission range is "R," voltage should measure 0.5 volt or less.
- When transmission range is "N," voltage should equal battery positive voltage.
- When transmission range is "D," voltage should measure 0.5 volt or less.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

Q: Is the measured voltage within the specified range?

YES : Go to Step 10.

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



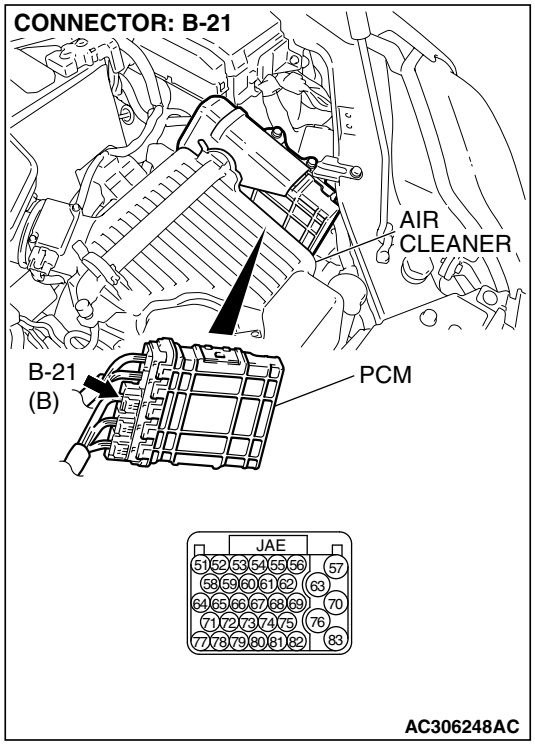


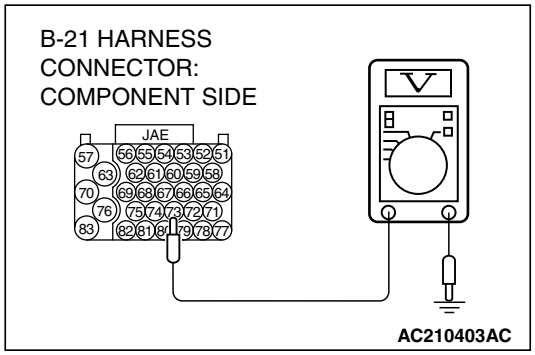
STEP 9. Check the harness for damage between PCM connector B-21 terminal 77 and transmission range switch connector B-110 terminal 4.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair or replace the harness wire.





STEP 10. Measure the transmission range switch output voltage at PCM connector B-21 by using check harness special tool MB991923. ("D" position)

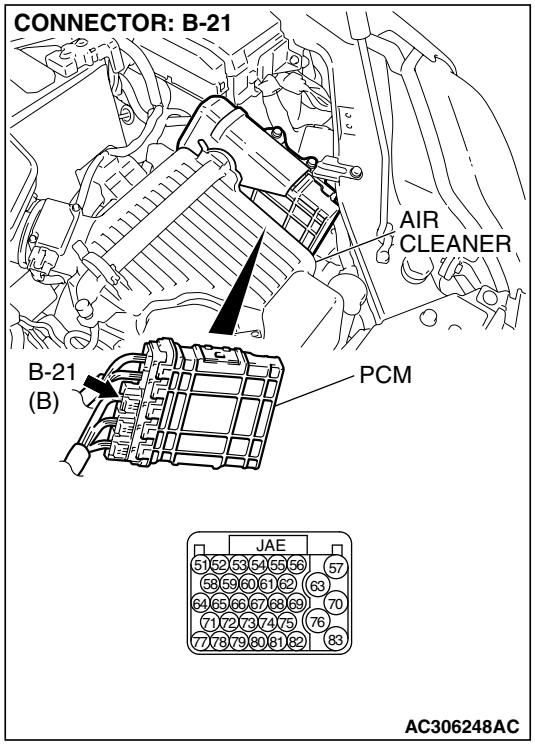
Measure the voltage between terminal 73 and ground.

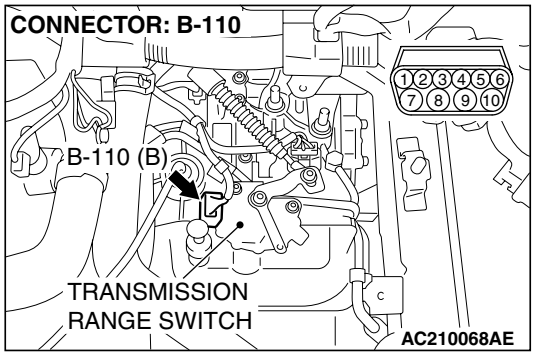
- When transmission range is "P," voltage should measure 0.5 volt or less.
- When transmission range is "R," voltage should measure 0.5 volt or less.
- When transmission range is "N," voltage should measure 0.5 volt or less.
- When transmission range is "D," voltage should equal battery positive voltage.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

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 11.





STEP 11. Check the harness for damage between PCM connector B-21 terminal 73 and transmission range switch connector B-110 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 12.

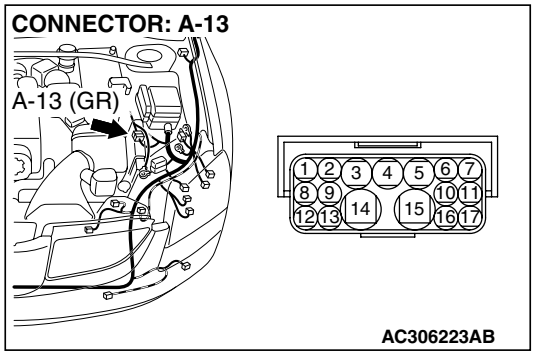
NO : Repair or replace the harness wire.

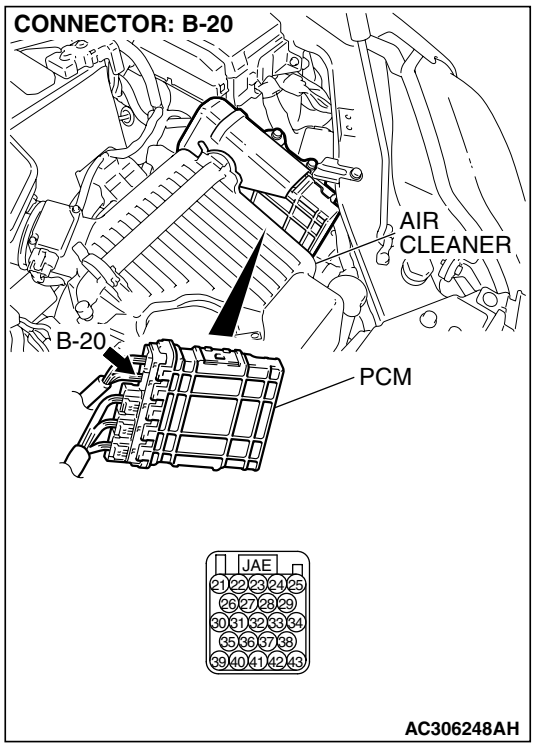
STEP 12. Check intermediate connector A-13, PCM connector B-20 and shift switch assembly connector C-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

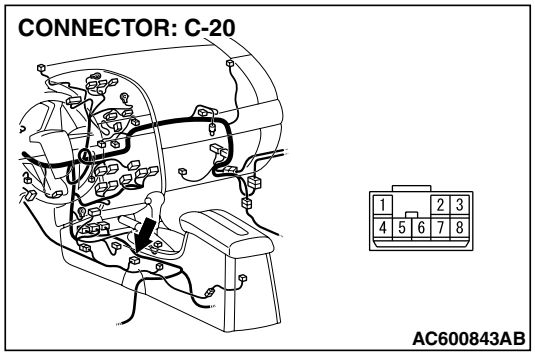
Q: Are the connectors and terminals in good condition?

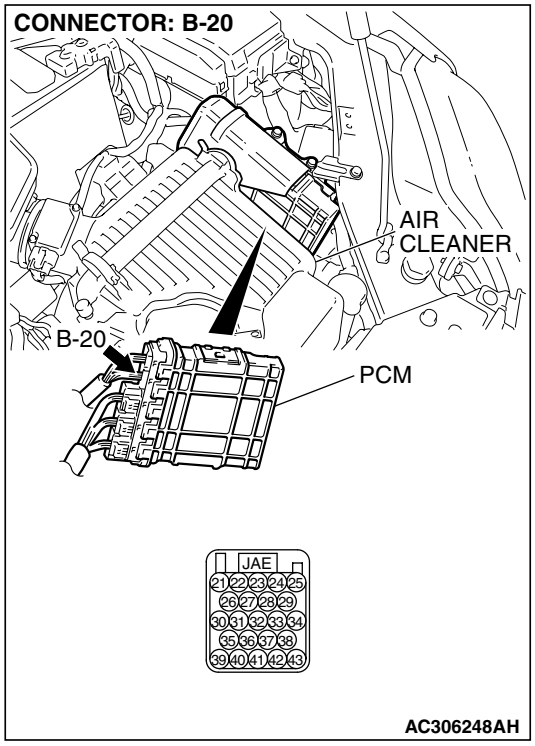
YES : Go to Step 13.

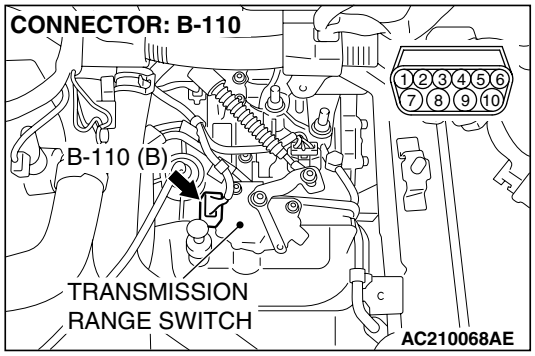
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.









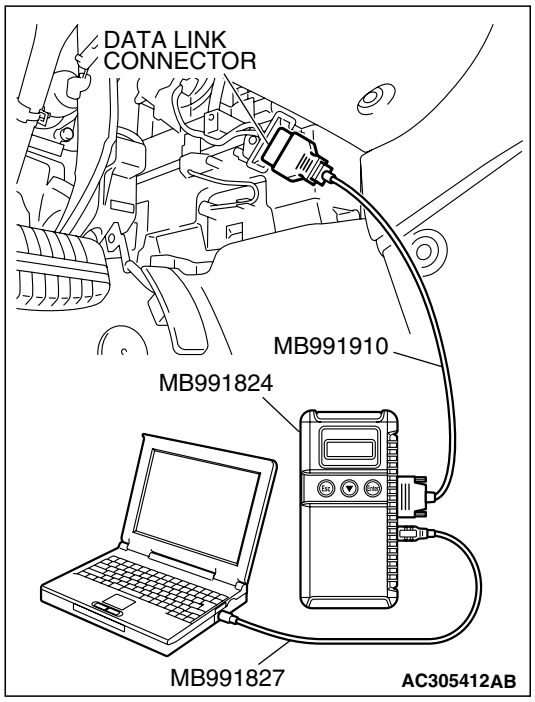


STEP 13. Check the harness for damage between PCM connector B-20 terminal 39 and transmission range switch connector B-110 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 14.

NO : Repair or replace the harness wire.



STEP 14. Using scan tool MB991958, check data list item 34: 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 data reading mode.
- Item 34: 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. (The scan tool displays "D" range when the selector lever is shifted to the sport mode).

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

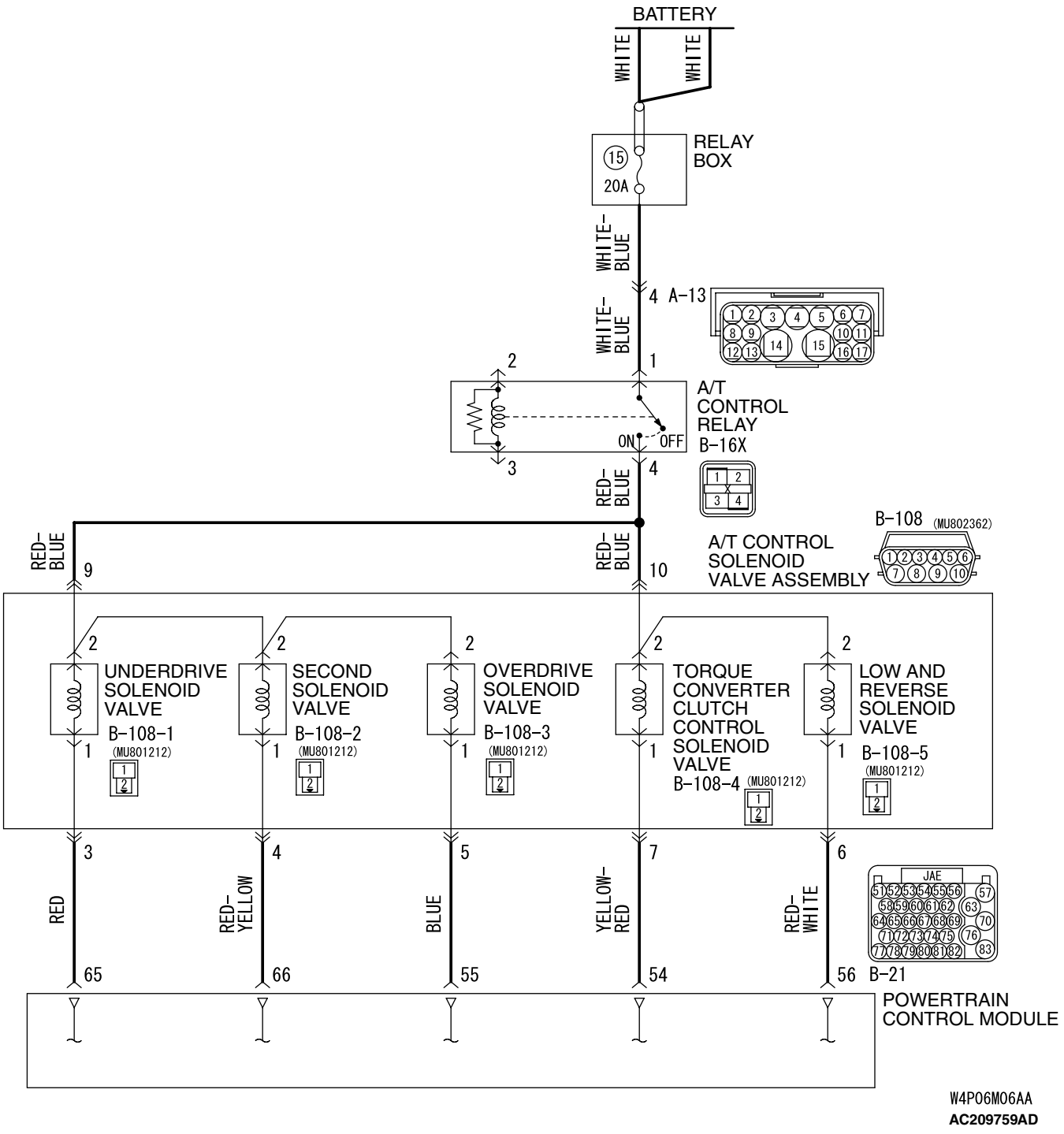
Q: Is the switch operating properly?

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.00-14.

NO : Replace the PCM.

DTC P1773 (P0753): Low-Reverse Solenoid Valve System

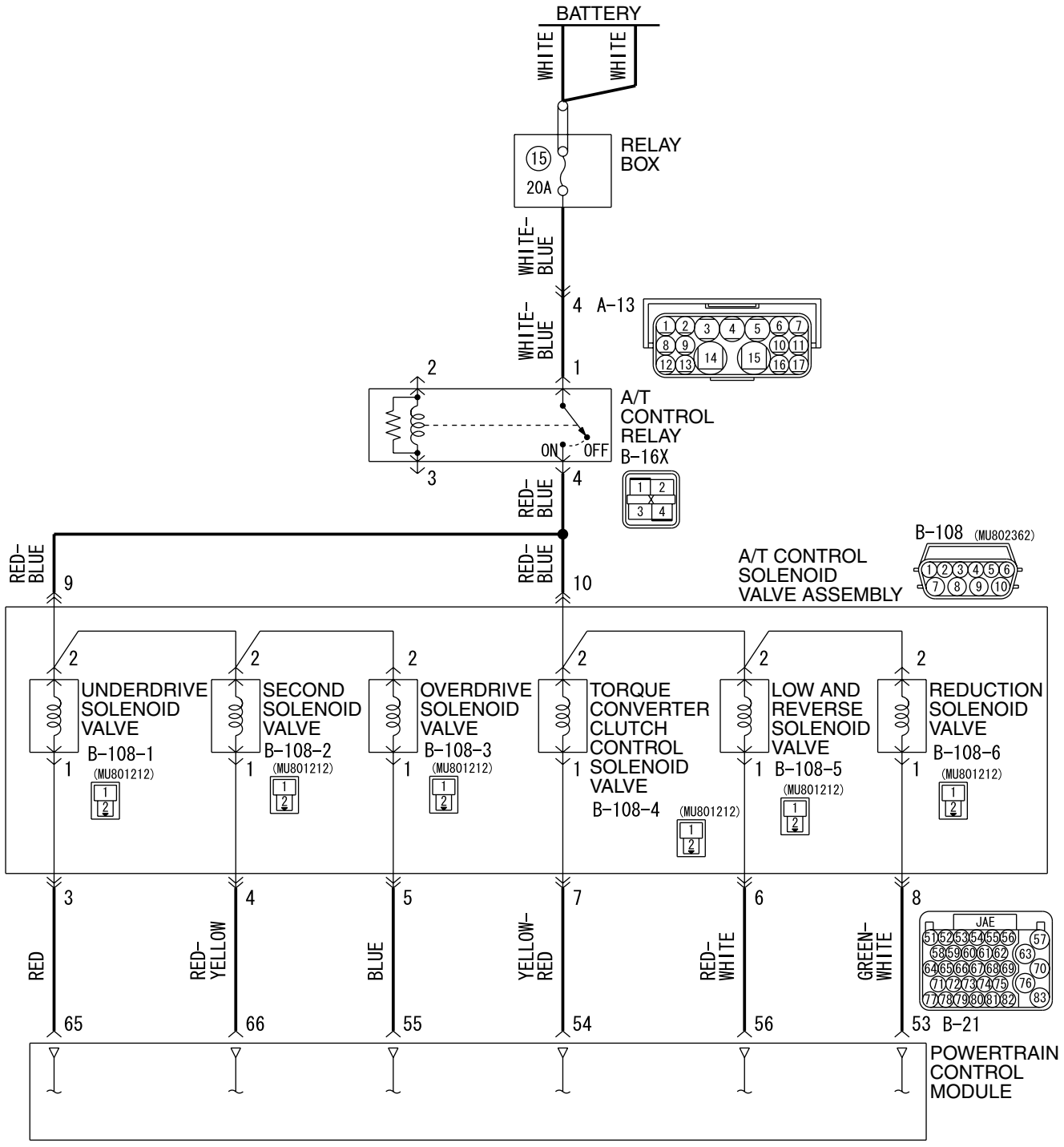
Solenoid Valve System Circuit <4A/T>



W4P06M06AA
AC209759AD

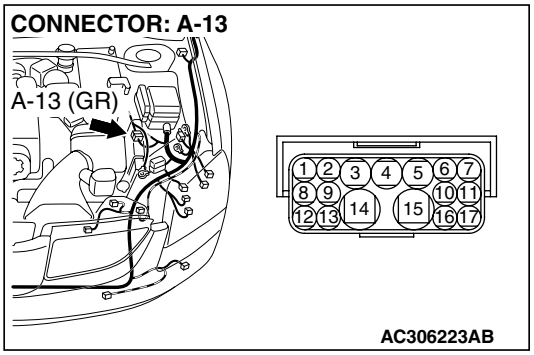
TSB Revision

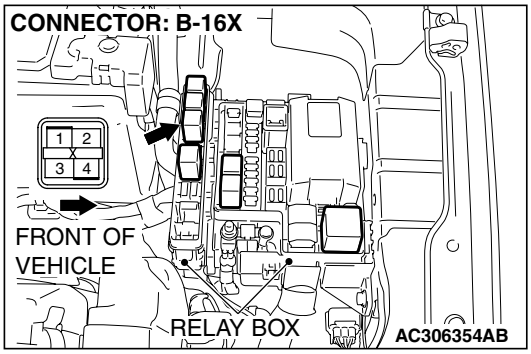
Solenoid Valve System Circuit <5A/T>

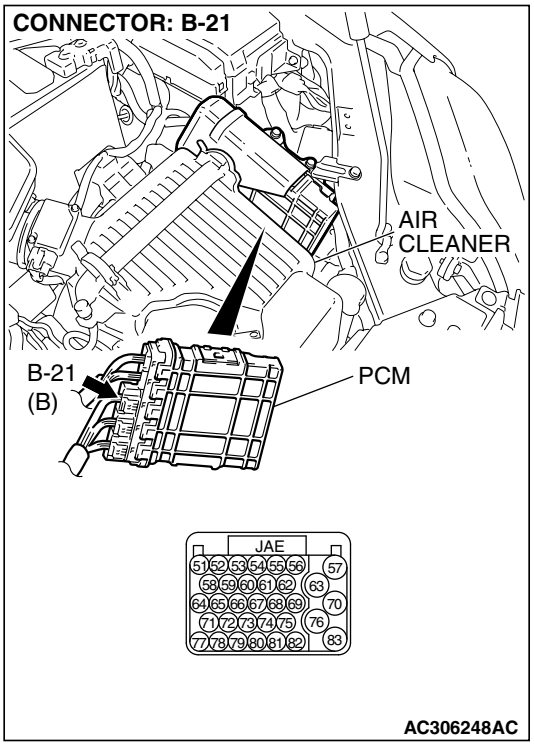


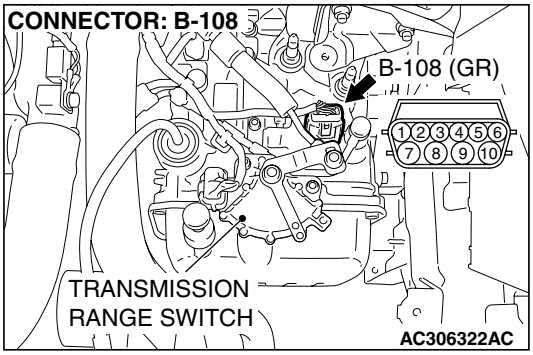
W7P23M011A
AC600845AB

TSB Revision









CIRCUIT OPERATION

- The A/T control relay supplies battery positive voltage to the solenoid valve assembly (terminals 9 and 10).
- The solenoid valve closes when energized (on), and opens when not energized (off). The PCM energizes the solenoid valve based on input data from sensors such as the Throttle Position Sensor, Transmission Range Switch, Stoplight Switch, Input Shaft Speed Sensor, Output Shaft Speed Sensor, and Transmission Fluid Temperature Sensor.
- The PCM provides the ground to energize the solenoid. The amount of time that the circuit is grounded is displayed on scan tool MB991958 in percent.
- When the solenoid is energized or de-energized, fluid passes through the valve body and transaxle passages to apply and release components.

DESCRIPTIONS OF MONITOR METHODS

- If solenoid terminal voltage is below specified value when shift control is not in progress, PCM judges that low-reverse solenoid valve 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 P1779 (P0731): 1st gear incorrect ratio
- DTC P1780 (P0732): 2nd gear incorrect ratio
- DTC P1781 (P0733): 3rd gear incorrect ratio
- DTC P1782 (P0734): 4th gear incorrect ratio
- DTC P1783 (P0735): 5th gear incorrect ratio <5A/T>
- DTC P1784 (P0736): Reverse gear incorrect ratio

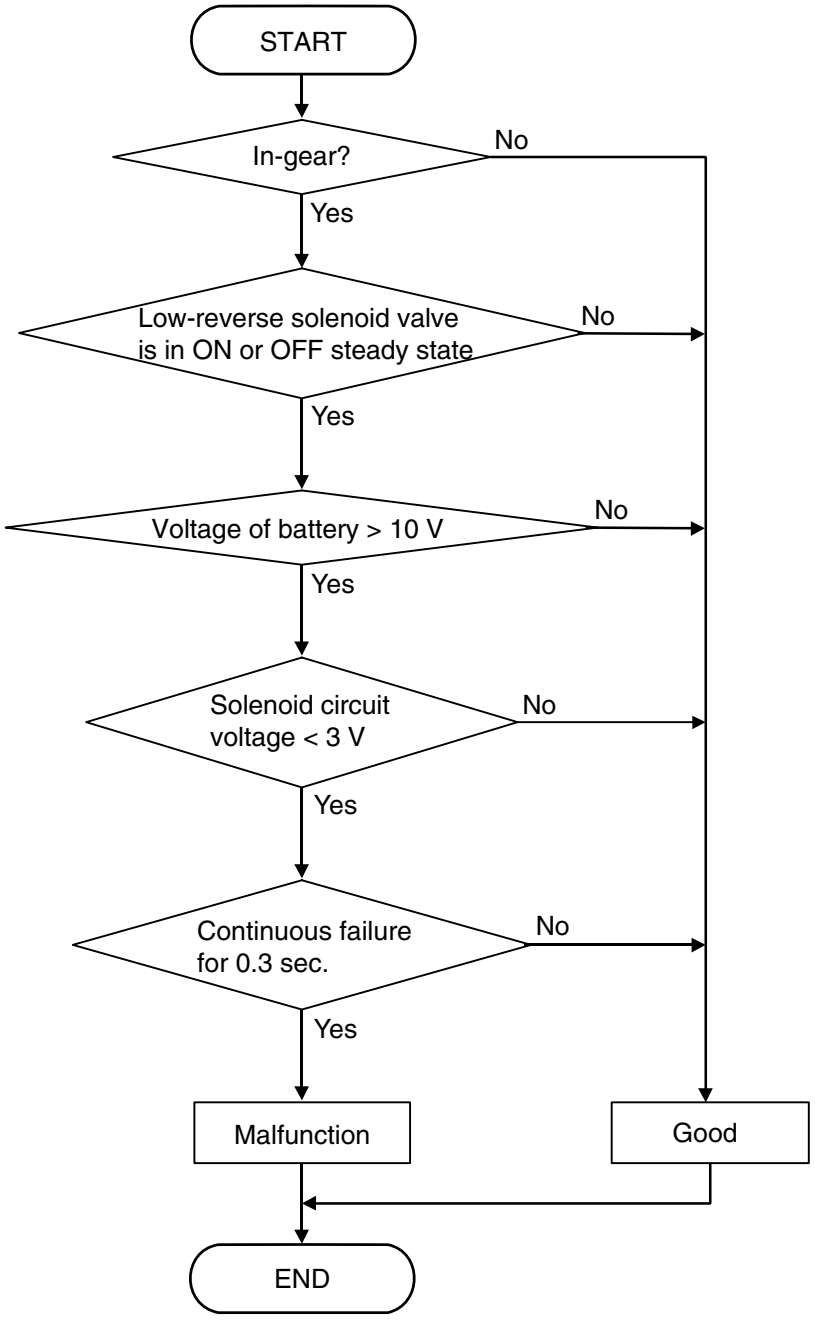
TSB Revision

- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)

- Torque converter clutch solenoid
- Underdrive solenoid
- Second solenoid
- Overdrive solenoid
- Reduction solenoid <5A/T>
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence)



AC205281AB

TSB Revision

DTC SET CONDITIONS

Check Conditions

- Solenoid status: either solid ON or OFF.
- Shift status: in-gear.
- Voltage of battery: 10 volts or more.

Judgement Criteria

- Solenoid voltage: 3 volts or less. (0.3 second)
- If DTC P1773 (P0753) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN

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

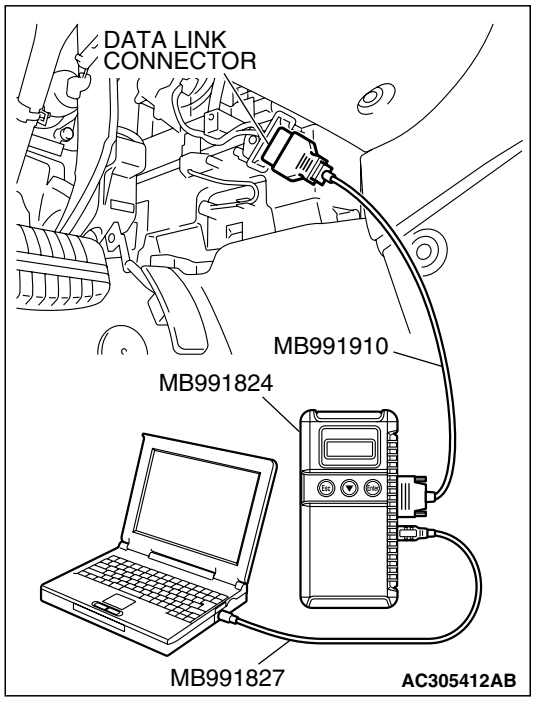
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the low-reverse solenoid valve
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check actuator test item 1: Low-Reverse Solenoid Valve.

⚠ 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.

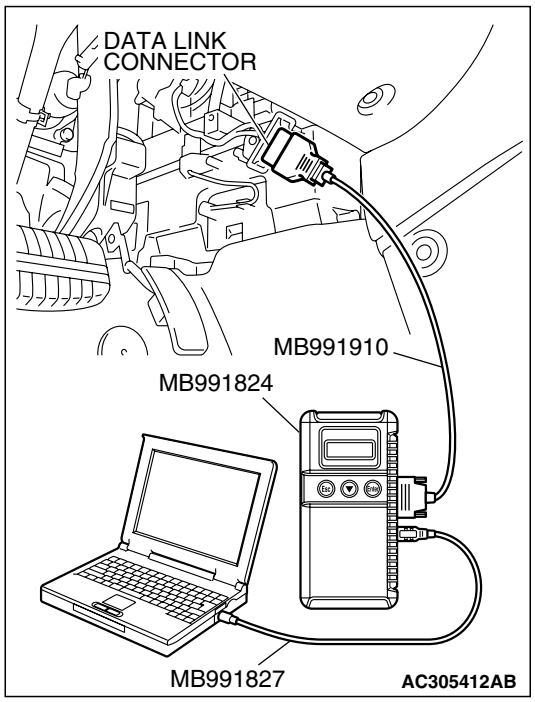
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode.
  - Item 1: Low-Reverse Solenoid Valve.
    - An audible clicking or buzzing should be heard when the low-reverse solenoid valve is energized.

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

Q: Is the solenoid valve 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 Malfunctions P.00-14.

NO : Go to Step 2.

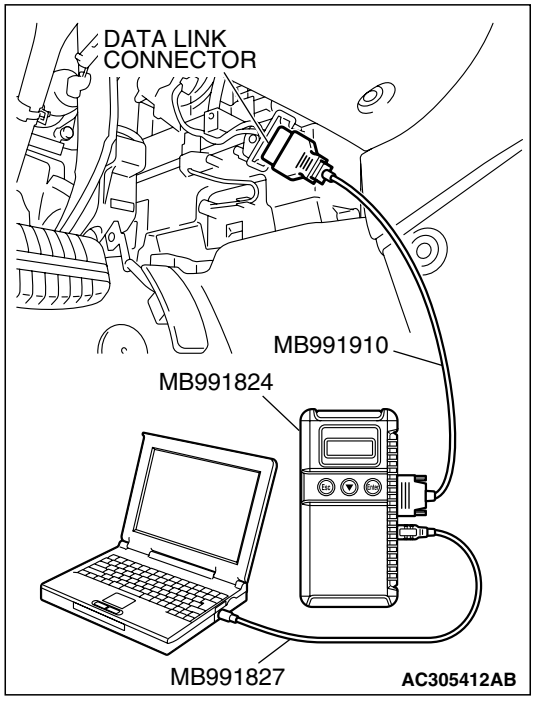


STEP 2. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1788 (P1751) set? (DTC P1788 (P1751) may be set along with multiple DTCs).

YES : Refer to P.23A-265 DTC P1778 (P1751): A/T Control Relay System.
NO : Go to Step 3.



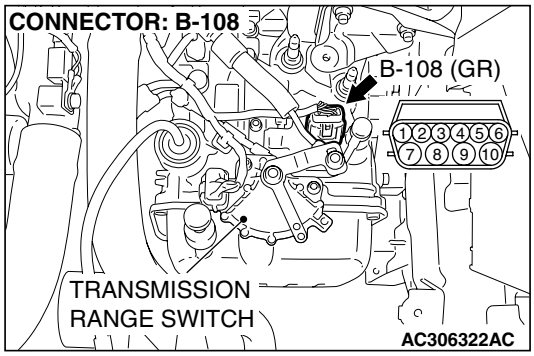
STEP 3. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

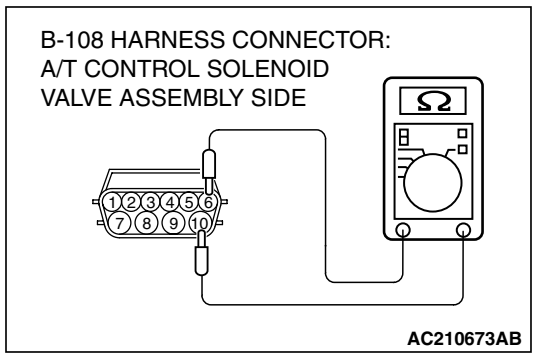
Q: Is DTC P1778 (P0743) set?

YES : Go to Step 8.
NO : Go to Step 4.

STEP 4. Measure the low-reverse solenoid valve resistance at A/T control solenoid valve assembly connector B-108.



(1) Disconnect connector B-108 and measure at the solenoid valve side.



(2) Measure the resistance between solenoid valve assembly connector B-108 terminals 6 and 10.

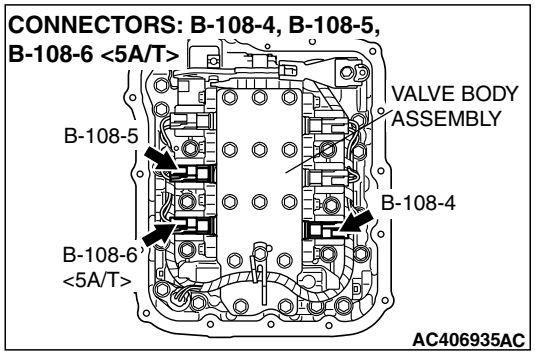
Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)]?

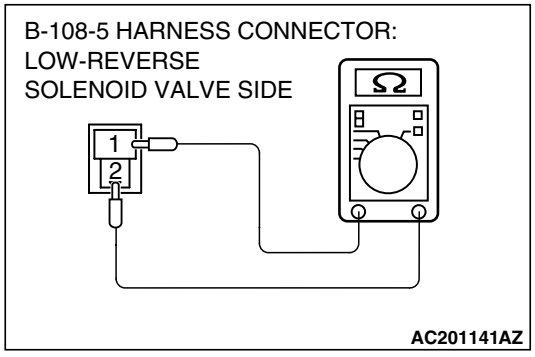
YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Measure the solenoid valve resistance at the low-reverse solenoid valve assembly inside the transaxle.



(1) Disconnect connector B-108-5 and measure at the solenoid valve side.



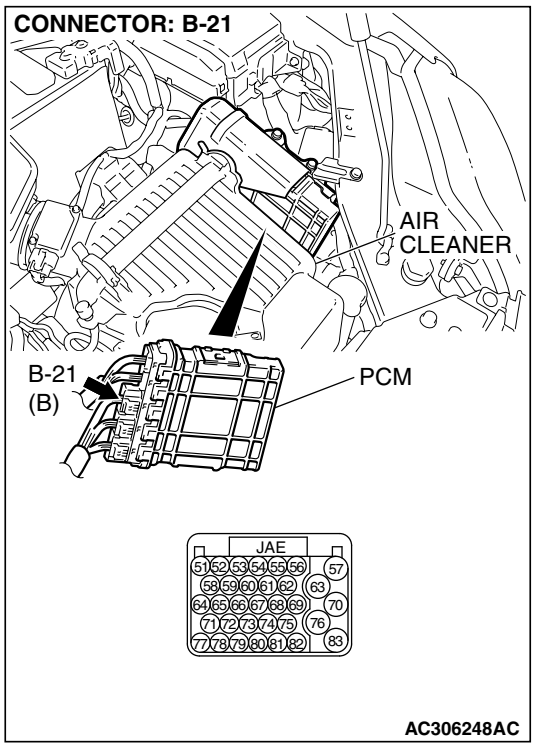
(2) Measure the resistance between low-reverse solenoid valve terminals 1 and 2.

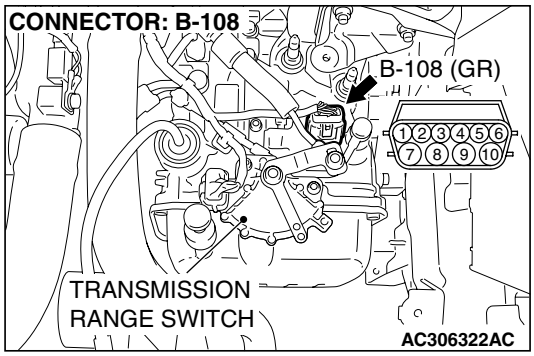
Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)?

YES : Replace the harness wire between A/T control solenoid valve assembly connector B-108 and the solenoid valves.

NO : Replace the low-reverse solenoid valve. Refer to GROUP 23B, P.23B-67 Valve Body <4A/T> or Refer to GROUP 23C, P.23C-77 Valve Body <5A/T>.



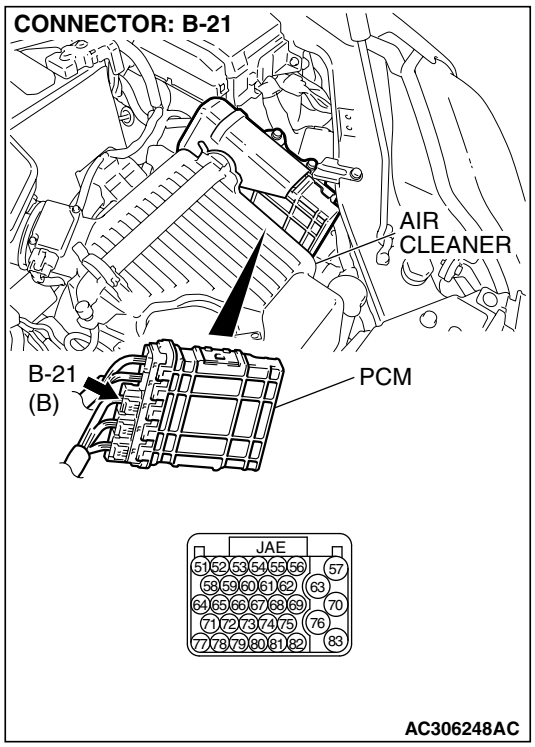


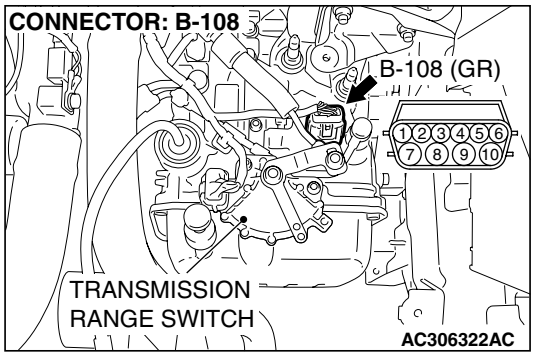
STEP 6. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

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



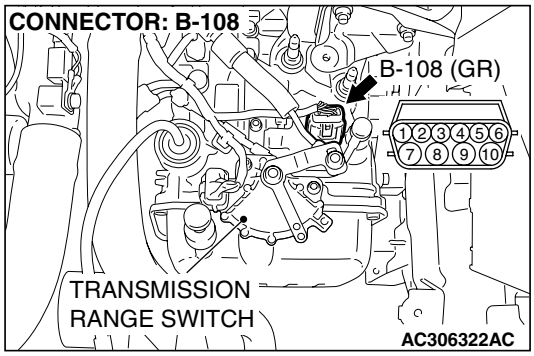


STEP 7. Check the harness for an open or short circuit to ground between PCM connector B-21 terminal 56 and A/T control solenoid valve assembly connector B-108 terminal 6.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

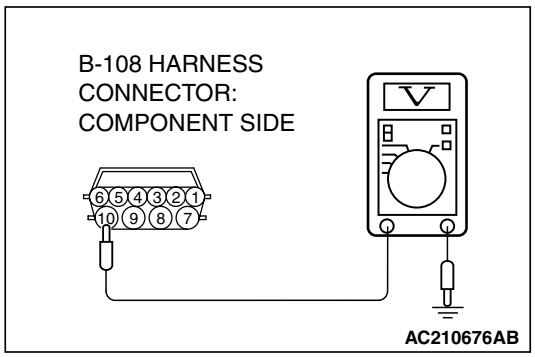
NO : Repair or replace the harness wire.



STEP 8. Measure the supply voltage at A/T control solenoid valve assembly connector B-108.

(1) Disconnect solenoid valve assembly harness connector B-108.

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



(3) Measure the voltage between harness connector B-108 terminal 10 and ground.

- The voltage should equal 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 11.

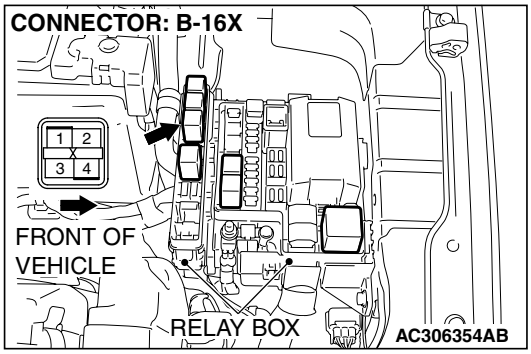
NO : Go to Step 9.

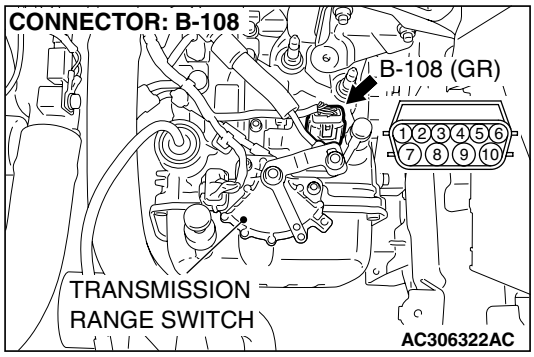
STEP 9. Check A/T control relay connector B-16X in the engine component relay box and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

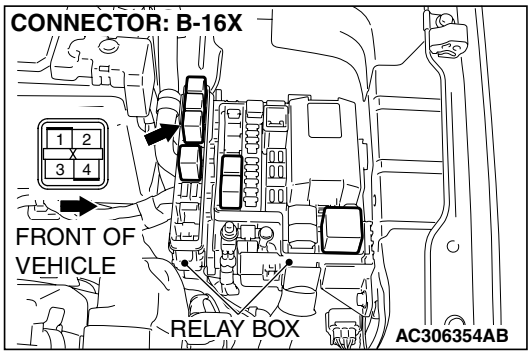
Q: Are the connectors and terminals in good condition?

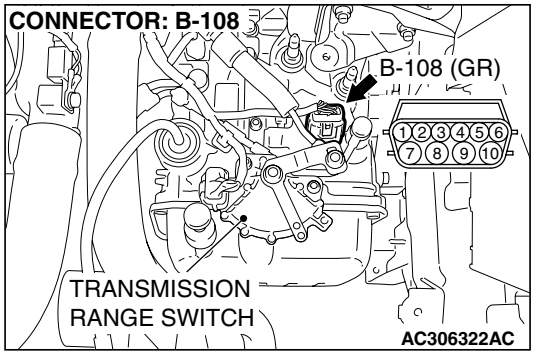
YES : Go to Step 10.

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







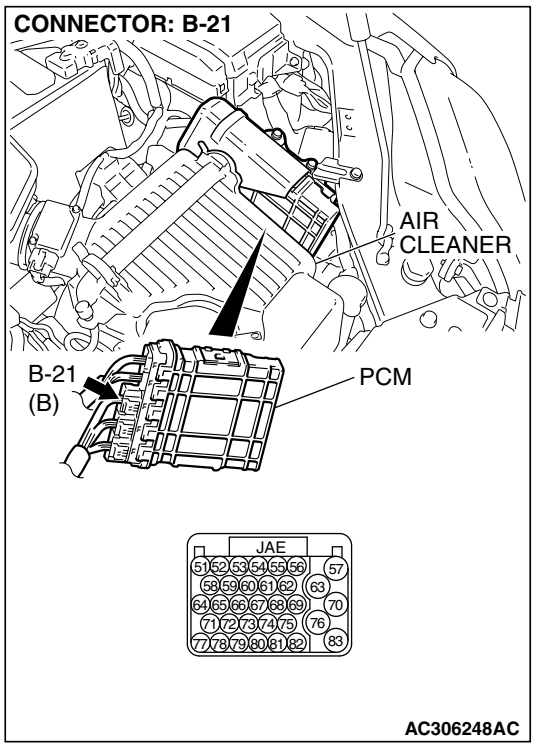


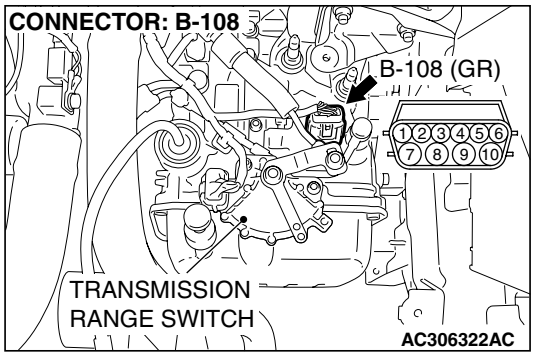
STEP 10. Check the harness for an open circuit or short circuit to ground between A/T control relay connector B-16X terminal 4 in the engine component relay box and A/T control solenoid valve assembly connector B-108 terminal 10.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair or replace the harness wire.



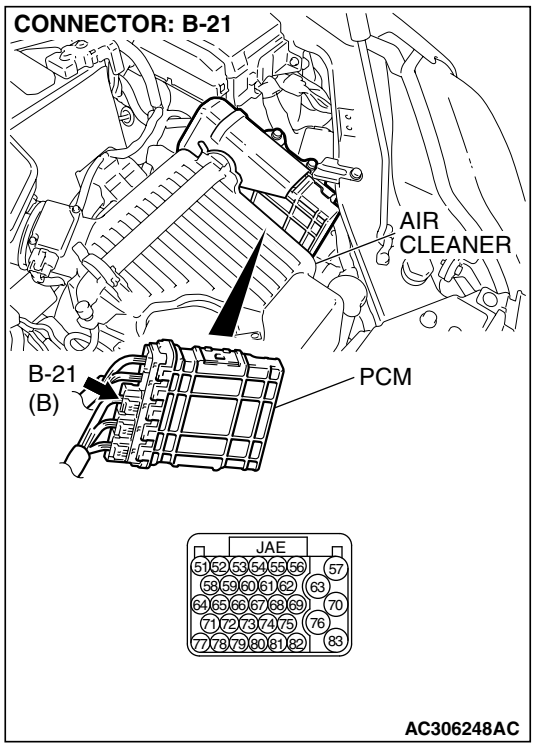


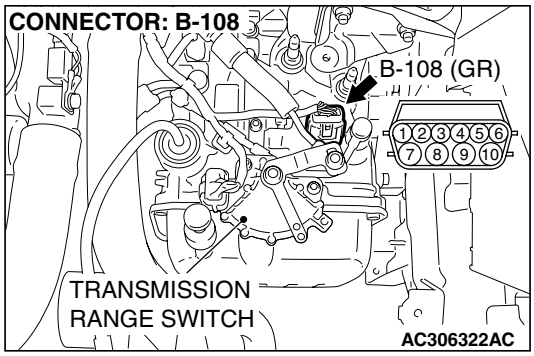
STEP 11. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.



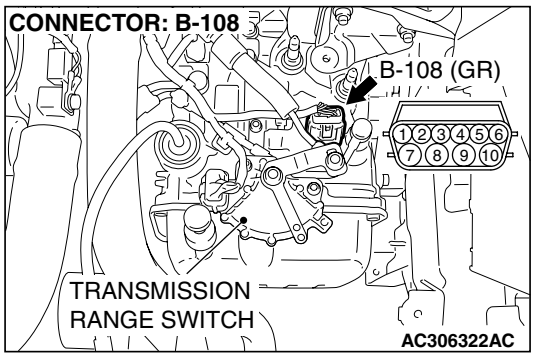


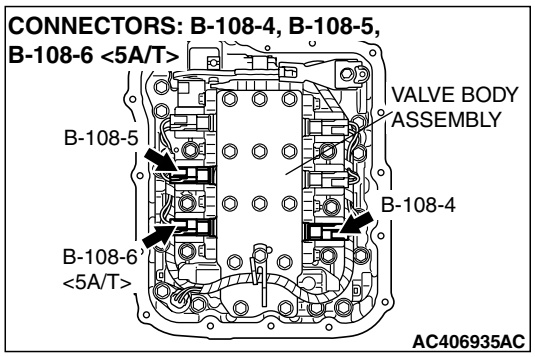
STEP 12. Check the harness for an open or short circuit to ground between PCM connector B-21 (terminals 54, 56 and 53 <5A/T>) and A/T control solenoid valve assembly connector B-108 (terminals 6, 7 and 8 <5A/T>).

Q: Are the harness wires in good condition?

YES : Go to Step 13.

NO : Repair or replace the harness wire.





STEP 13. Check the harness for an open or short circuit to ground between A/T control solenoid valve assembly connector B-108 (terminals 6, 7, 8 <5A/T> and 10) and solenoid valve connectors B-108-4, B-108-5 and B-108-6 <5A/T>.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : Replace the harness wire.

DTC P1774 (P0758): Underdrive Solenoid Valve System

SOLENOID VALVE SYSTEM CIRCUIT

Refer to P.23A-172.

CIRCUIT OPERATION

Refer to P.23A-172.

DESCRIPTIONS OF MONITOR METHODS

- If solenoid terminal voltage is below specified value when shift control is not in progress, PCM judges that underdrive solenoid valve 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 P1779 (P0731): 1st gear incorrect ratio
- DTC P1780 (P0732): 2nd gear incorrect ratio
- DTC P1781 (P0733): 3rd gear incorrect ratio
- DTC P1782 (P0734): 4th gear incorrect ratio
- DTC P1783 (P0735): 5th gear incorrect ratio <5A/T>
- DTC P1784 (P0736): Reverse gear incorrect ratio
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

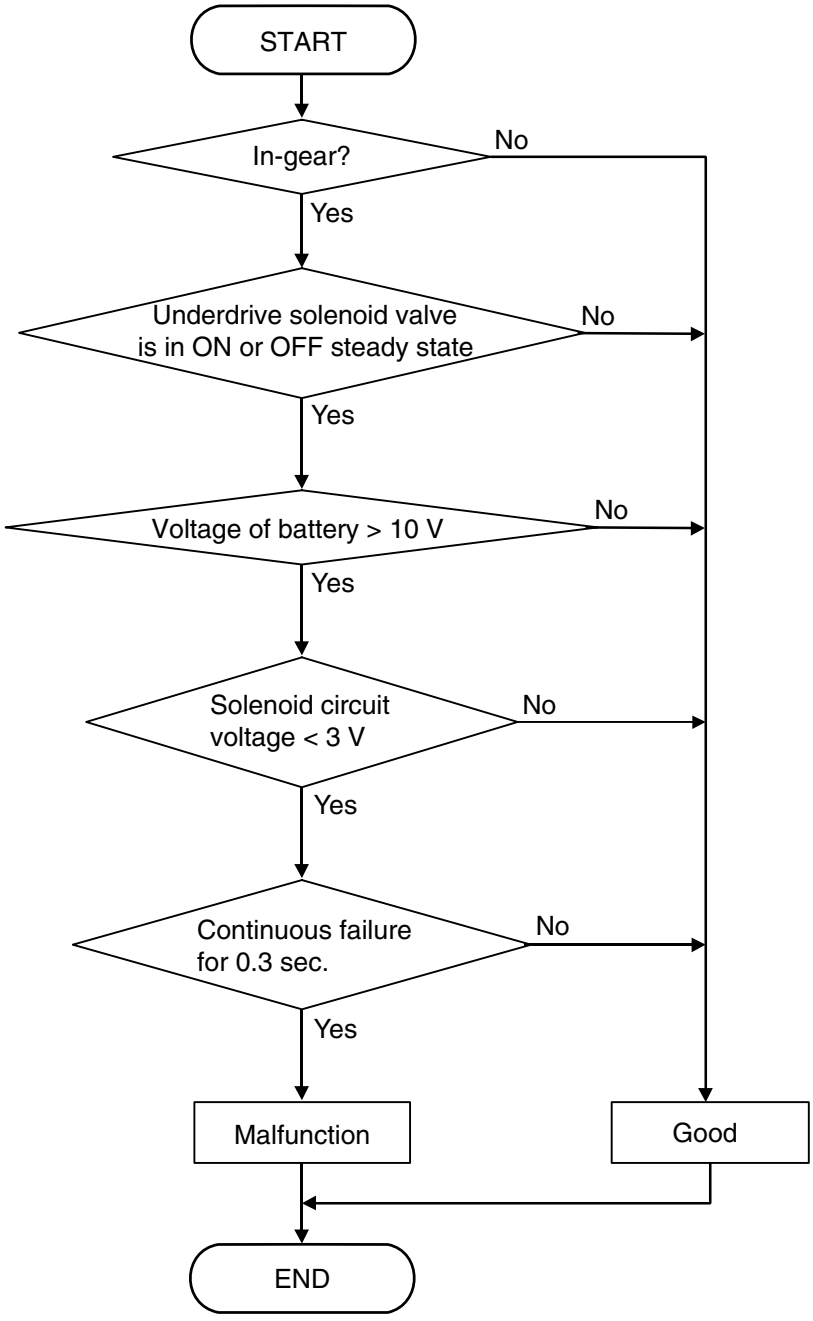
Sensor (The sensor below is determined to be normal)

- Torque converter clutch solenoid

TSB Revision

- Low-reverse solenoid
- Second solenoid
- Reduction solenoid <5A/T>
- Overdrive solenoid
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence)



AC205282AB

DTC SET CONDITIONS

Check Conditions

- Solenoid status: either solid ON or OFF.
- Shift status: in-gear.
- Voltage of battery: 10 volts or more.

Judgement Criteria

- Solenoid voltage: 3 volts or less. (0.3 second)
- If DTC P1774 (P0758) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN

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

TSB Revision

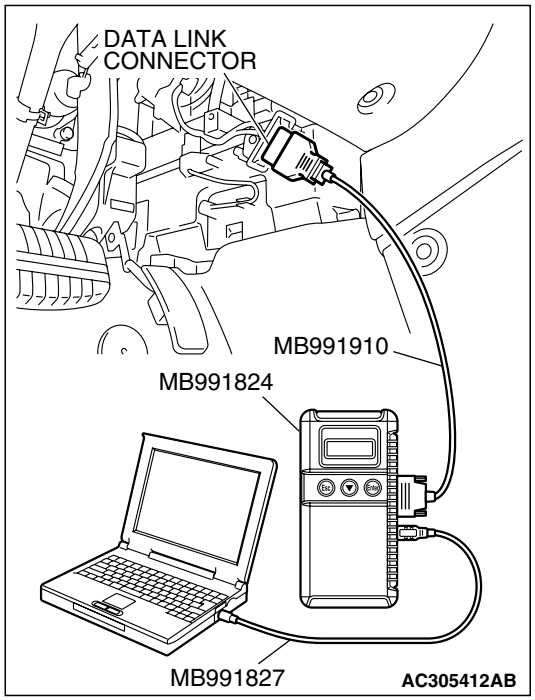
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the underdrive solenoid valve
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check actuator test item 2: Underdrive Solenoid Valve.

⚠ 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.

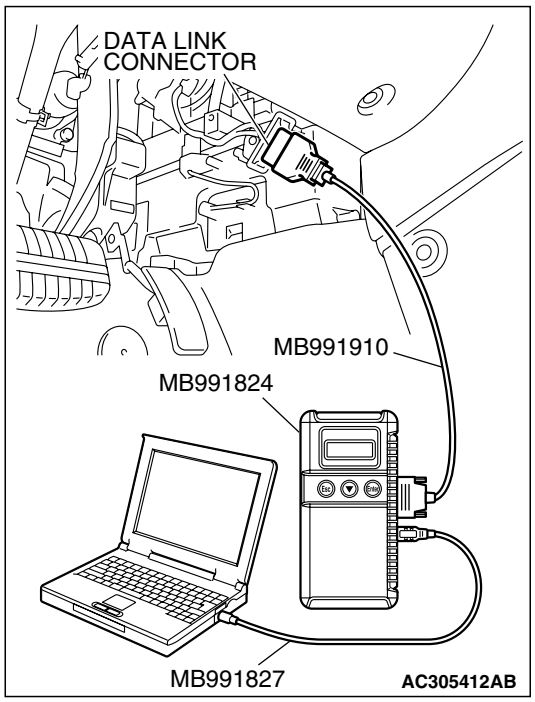
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode.
  - Item 2: Underdrive Solenoid Valve.
    - An audible clicking or buzzing should be heard when the underdrive solenoid valve is energized.

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

Q: Is the solenoid valve 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 Malfunctions P.00-14.

NO : Go to Step 2.

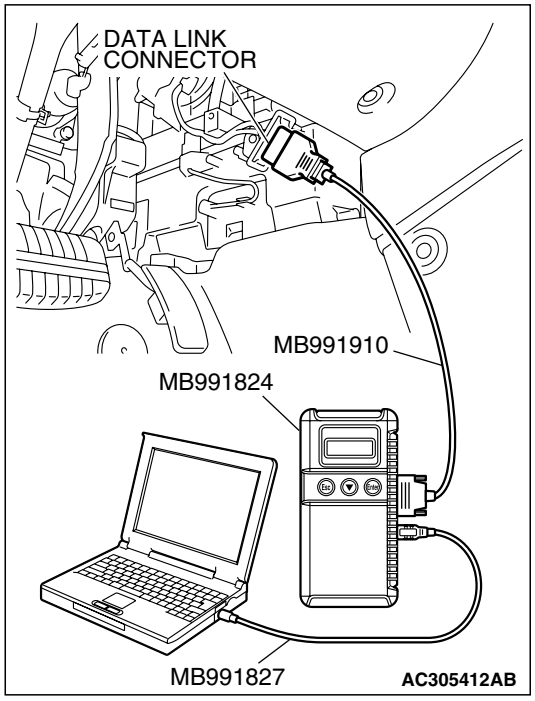


STEP 2. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1788 (P1751) set? (DTC P1788 (P1751) may be set along with multiple DTCs).

YES : Refer to P.23A-265 DTC P1788 (P1751): A/T Control Relay System.
NO : Go to Step 3.



STEP 3. Using scan tool MB991958, read the A/T diagnostic trouble code.

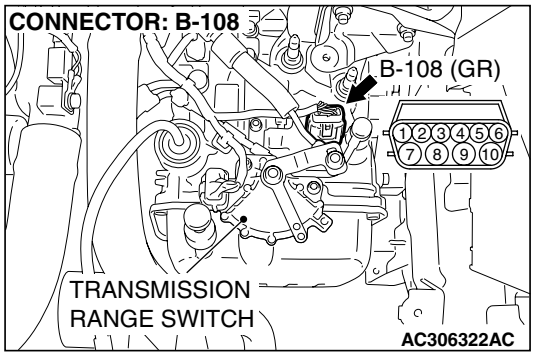
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

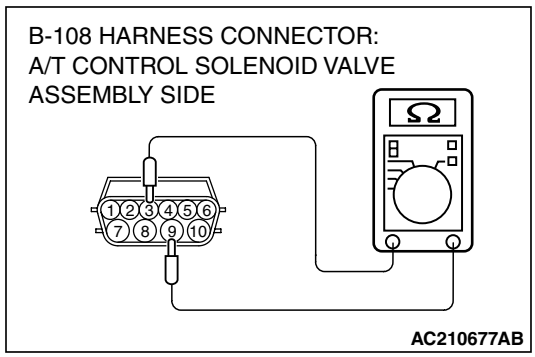
Q: Are DTC P1775 (P0763) and DTC P1776 (P0768) set? (Multiple DTCs may be set).

YES : Go to Step 8.
NO : Go to Step 4.

STEP 4. Measure the underdrive solenoid valve resistance at A/T control solenoid valve assembly connector B-108.

(1) Disconnect connector B-108 and measure at the solenoid valve side.





(2) Measure the resistance between solenoid valve assembly connector B-108 terminals 3 and 9.

Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

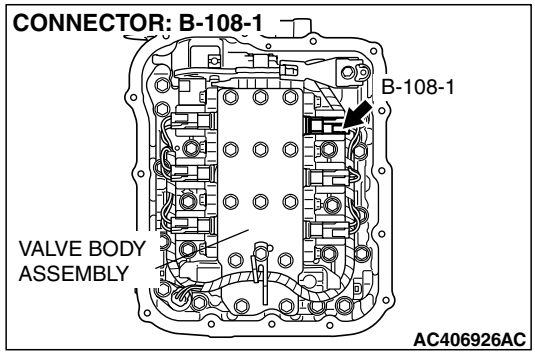
Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)]?

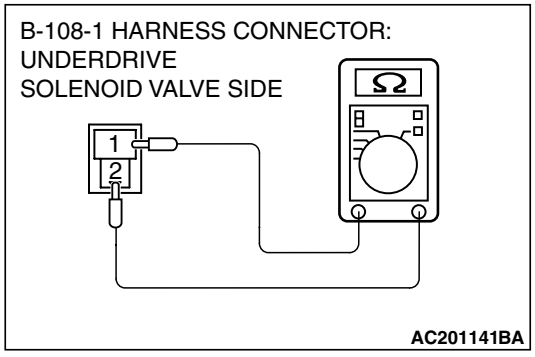
YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Measure the solenoid valve resistance at the underdrive solenoid valve assembly inside the transaxle.

(1) Disconnect connector B-108-1 and measure at the solenoid valve side.





(2) Measure the resistance between Underdrive solenoid valve terminals 1 and 2.

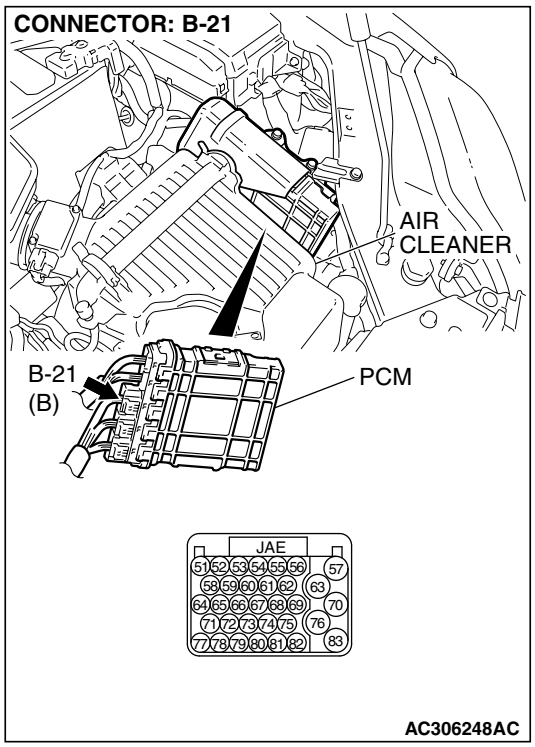
Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

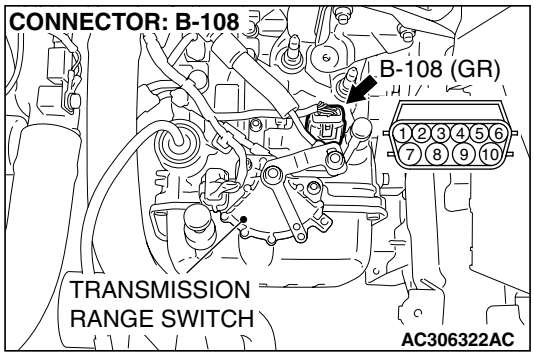
Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)?

YES : Replace the harness wire between A/T control solenoid valve assembly connector B-108 and the solenoid valves.

NO : Replace the Underdrive solenoid valve. Refer to GROUP 23B, P.23B-67 Valve Body <4A/T> or Refer to GROUP 23C, P.23C-77 Valve Body <5A/T>.

TSB Revision



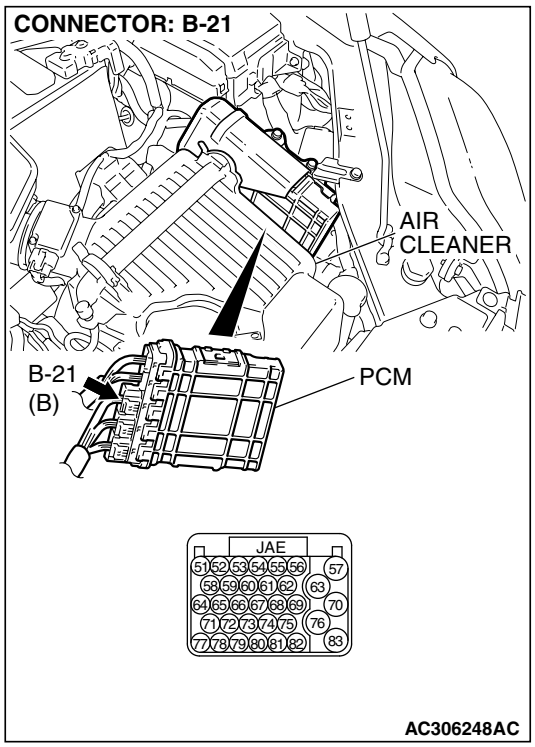


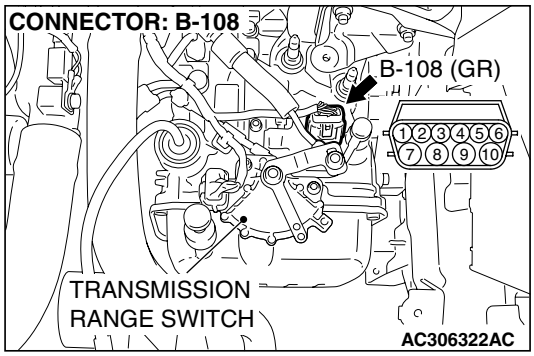
STEP 6. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

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



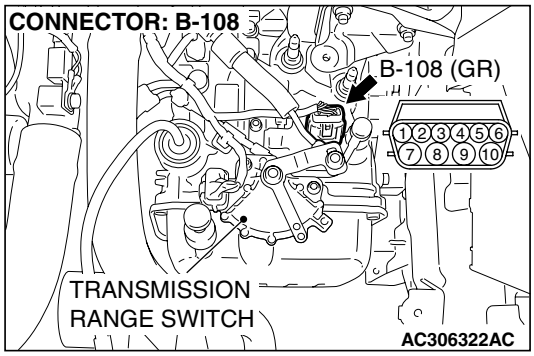


STEP 7. Check the harness for an open or short circuit to ground between PCM connector B-21 terminal 65 and A/T control solenoid valve assembly connector B-108 terminal 3.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

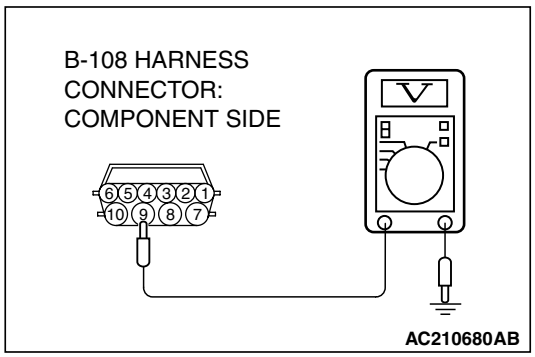
NO : Repair or replace the harness wire.



STEP 8. Measure the supply voltage at A/T control solenoid valve assembly connector B-108.

(1) Disconnect solenoid valve assembly harness connector B-108.

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



(3) Measure the voltage between harness connector B-108 terminal 9 and ground.
- The voltage should equal 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 11.

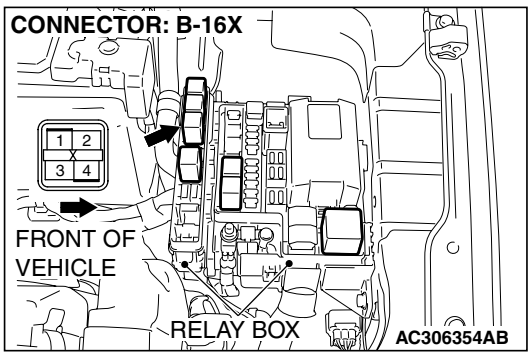
NO : Go to Step 9.

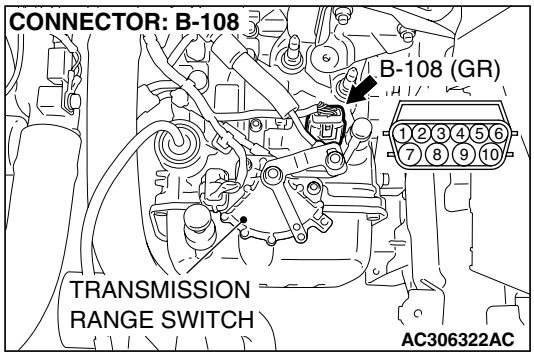
STEP 9. Check A/T control relay connector B-16X in the engine component relay box and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

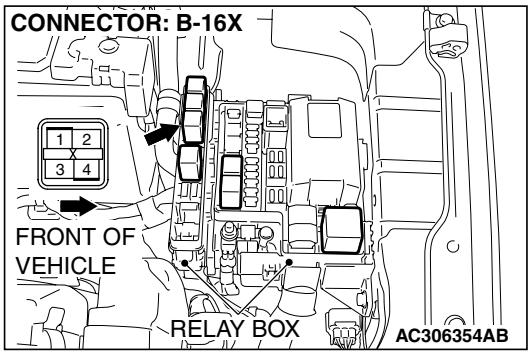
Q: Are the connectors and terminals in good condition?

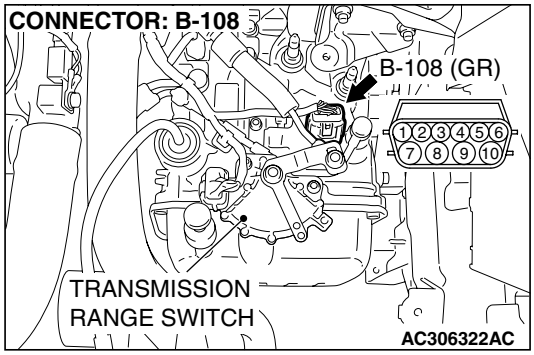
YES : Go to Step 10.

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







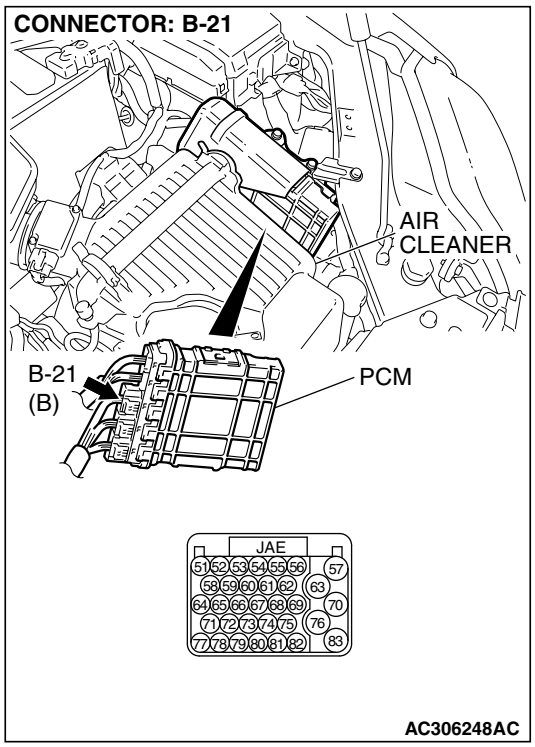


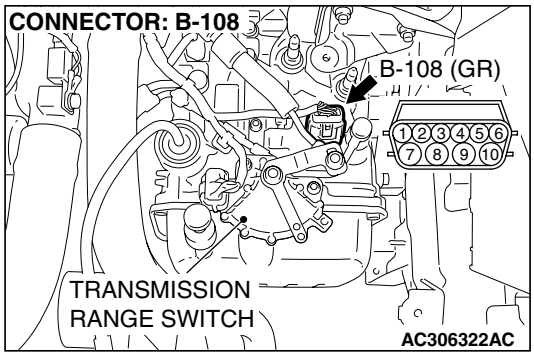
STEP 10. Check the harness for an open circuit or short circuit to ground between A/T control relay connector B-16X terminal 4 in the engine component relay box and A/T control solenoid valve assembly connector B-108 terminal 9.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair or replace the harness wire.



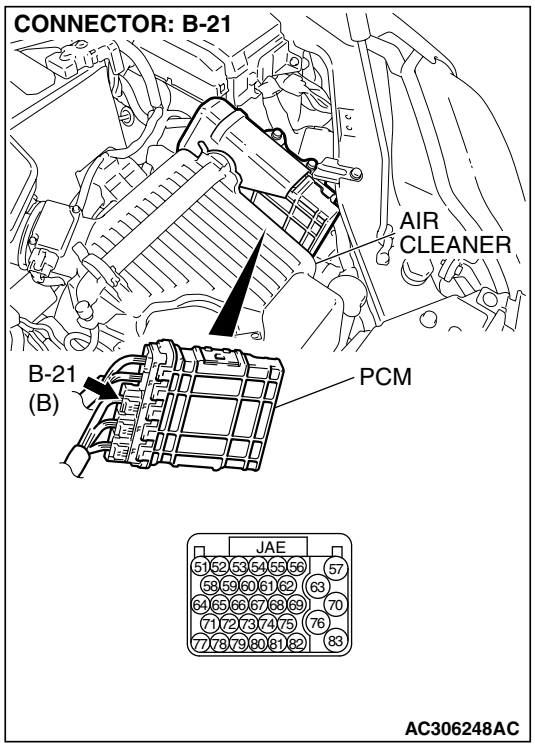


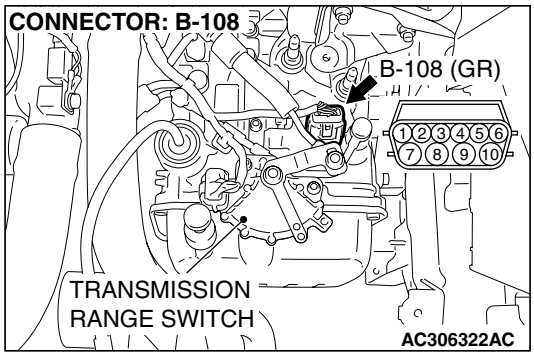
STEP 11. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.



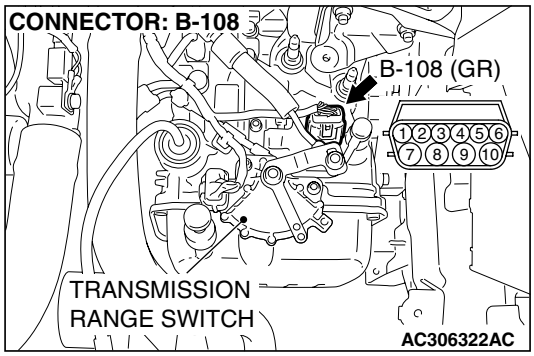


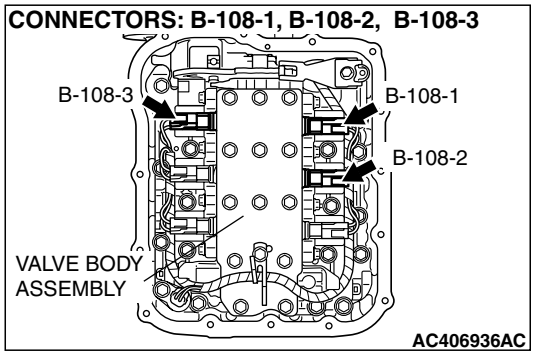
STEP 12. Check the harness for an open or short circuit to ground between PCM connector B-21 (terminals 65, 66 and 55) and A/T control solenoid valve assembly connector B-108 (terminals 3, 4 and 5).

Q: Are the harness wires in good condition?

YES : Go to Step 13.

NO : Repair or replace the harness wire.





STEP 13. Check the harness for an open or short circuit to ground between A/T control solenoid valve assembly connector B-108 (terminals 3, 4, 5, and 9) and solenoid valve connectors B-108-1, B-108-2 and B-108-3.
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : Replace the harness wire.

DTC P1775 (P0763): Second Solenoid Valve System

SOLENOID VALVE SYSTEM CIRCUIT
Refer to P.23A-172.

CIRCUIT OPERATION
Refer to P.23A-172.

DESCRIPTIONS OF MONITOR METHODS
- If solenoid terminal voltage is below specified value when shift control is not in progress, PCM judges that second solenoid valve has a failure.

MONITOR EXECUTION
- Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

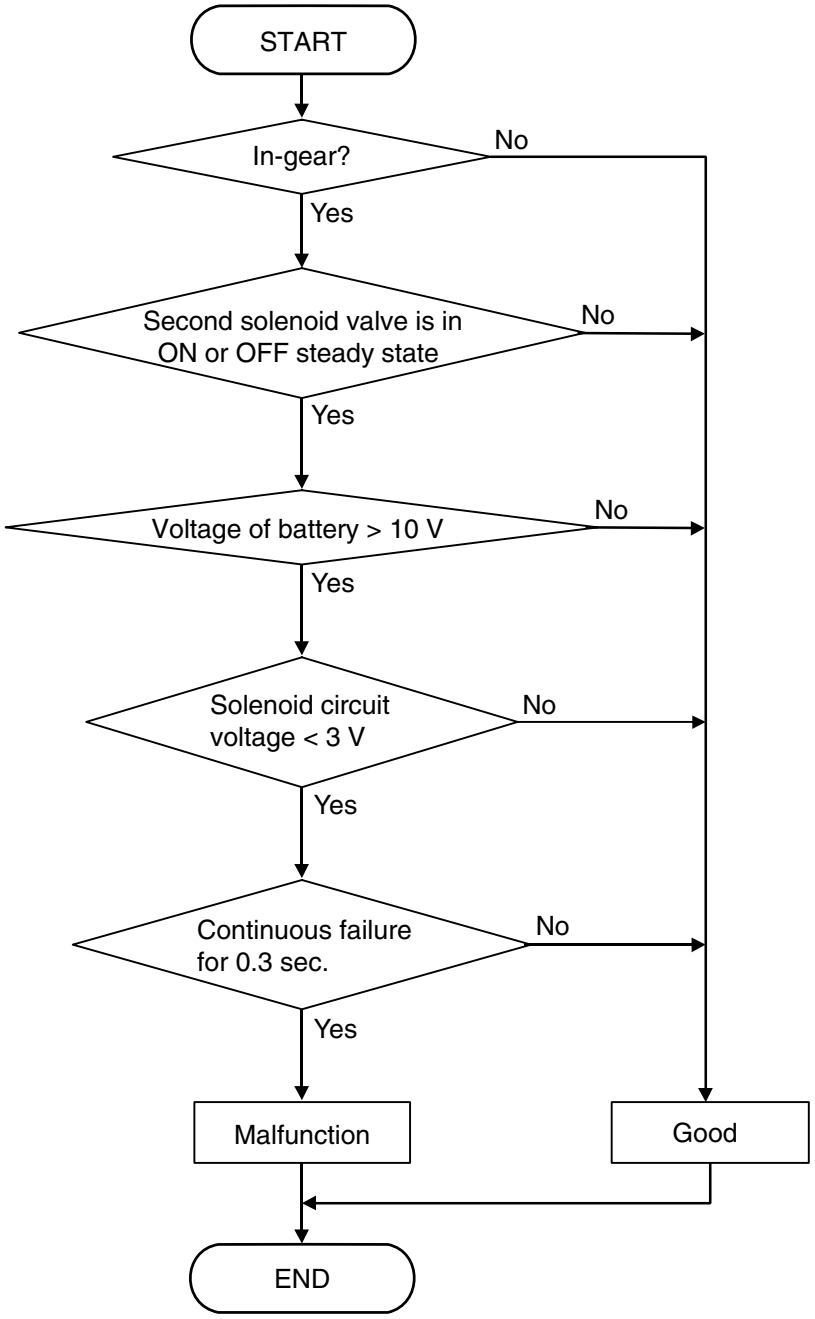
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- DTC P1779 (P0731): 1st gear incorrect ratio
- DTC P1780 (P0732): 2nd gear incorrect ratio
- DTC P1781 (P0733): 3rd gear incorrect ratio
- DTC P1782 (P0734): 4th gear incorrect ratio
- DTC P1783 (P0735): 5th gear incorrect ratio <5A/T>
- DTC P1784 (P0736): Reverse gear incorrect ratio
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)
- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Reduction solenoid <5A/T>

TSB Revision

- Overdrive solenoid
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence)



AC205283AB

DTC SET CONDITIONS

Check Conditions

- Solenoid status: either solid ON or OFF.
- Shift status: in-gear.
- Voltage of battery: 10 volts or more.

Judgement Criteria

- Solenoid voltage: 3 volts or less. (0.3 second)
- If DTC P1775 (P0763) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN

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

TSB Revision

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

- Malfunction of the second solenoid valve
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, check actuator test item 3: Second Solenoid Valve.

⚠ 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.

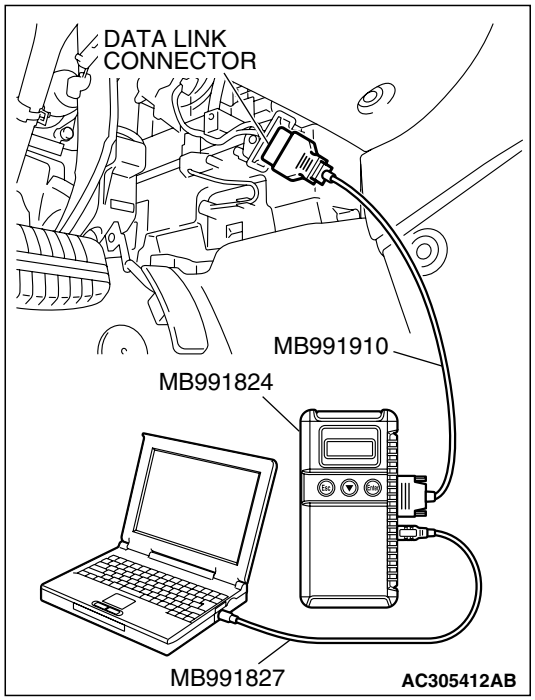
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode.
  - Item 3: Second Solenoid Valve.
    - An audible clicking or buzzing should be heard when the second solenoid valve is energized.

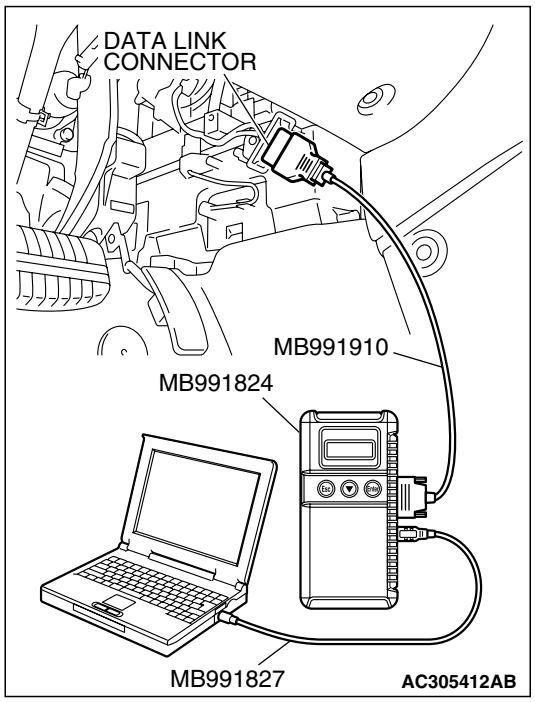
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve 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 Malfunctions P.00-14.

NO : Go to Step 2.



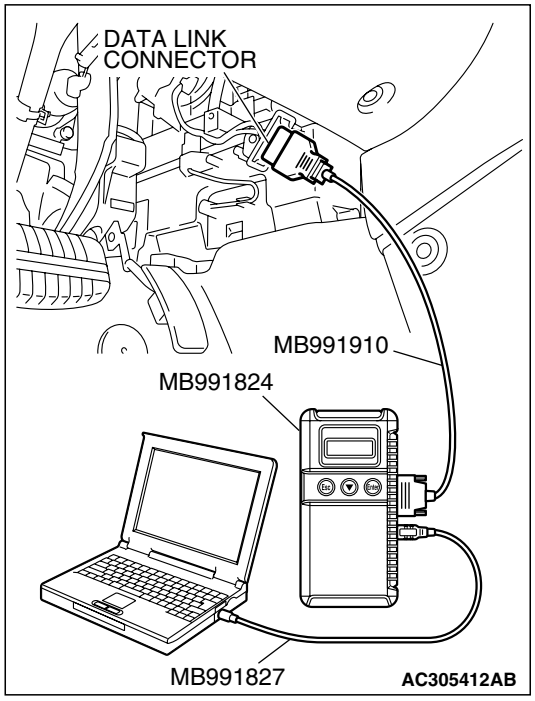


STEP 2. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1788 (P1751) set? (DTC P1788 (P1751) may be set along with multiple DTCs).

YES : Refer to P.23A-265 DTC P1788 (P1751): A/T Control Relay System.
NO : Go to Step 3.



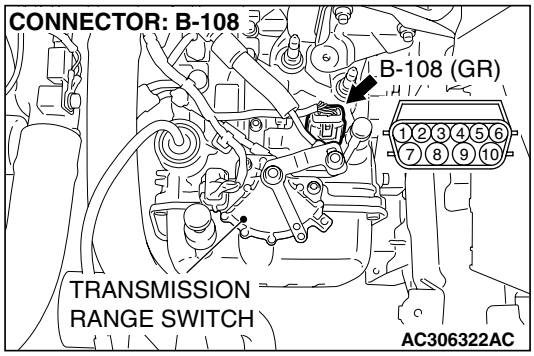
STEP 3. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

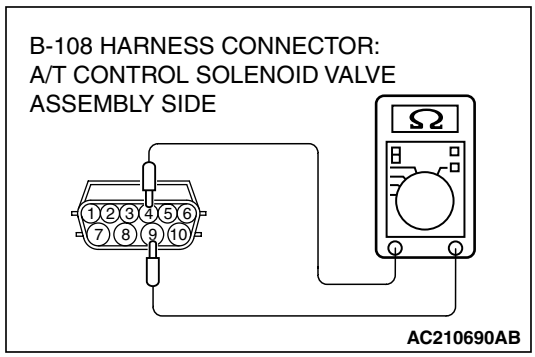
Q: Are DTC P1774 (P0758) and DTC P1776 (P0768) set? (Multiple DTCs may be set).

YES : Go to Step 8.
NO : Go to Step 4.

STEP 4. Measure the Second solenoid valve resistance at A/T control solenoid valve assembly connector B-108.



(1) Disconnect connector B-108 and measure at the solenoid valve side.



(2) Measure the resistance between solenoid valve assembly connector B-108 terminals 4 and 9.

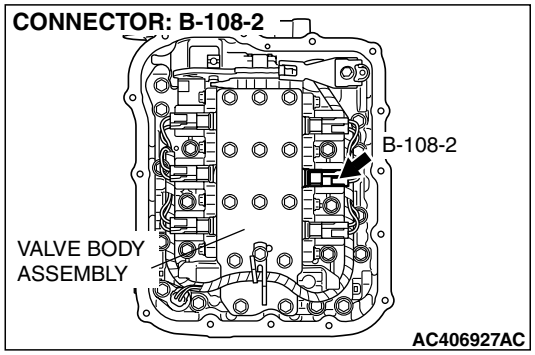
Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)]?

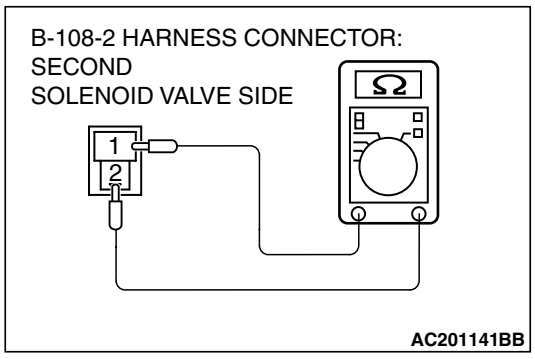
YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Measure the solenoid valve resistance at the second solenoid valve assembly inside the transaxle.



(1) Disconnect connector B-108-2 and measure at the solenoid valve side.



(2) Measure the resistance between Second solenoid valve terminals 1 and 2.

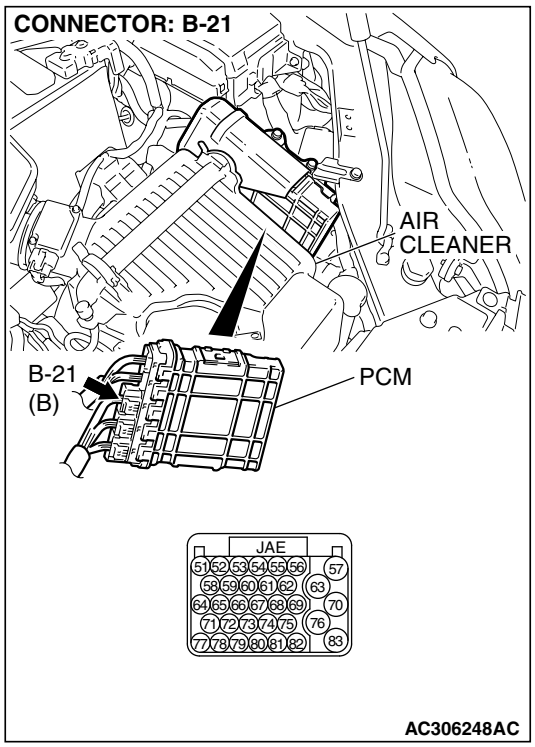
Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

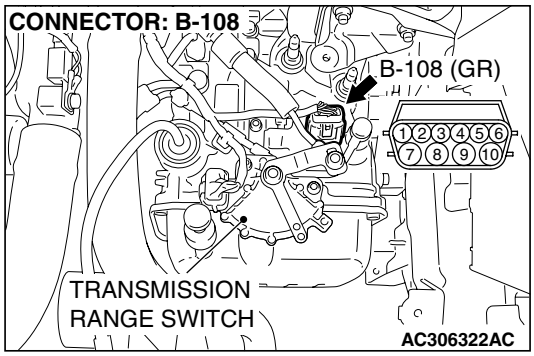
Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)?

YES : Replace the harness wire between A/T control solenoid valve assembly connector B-108 and the solenoid valves.

NO : Replace the Second solenoid valve. Refer to GROUP 23B, P.23B-67 Valve Body <4A/T> or Refer to GROUP 23C, P.23C-77 Valve Body <5A/T>.

TSB Revision



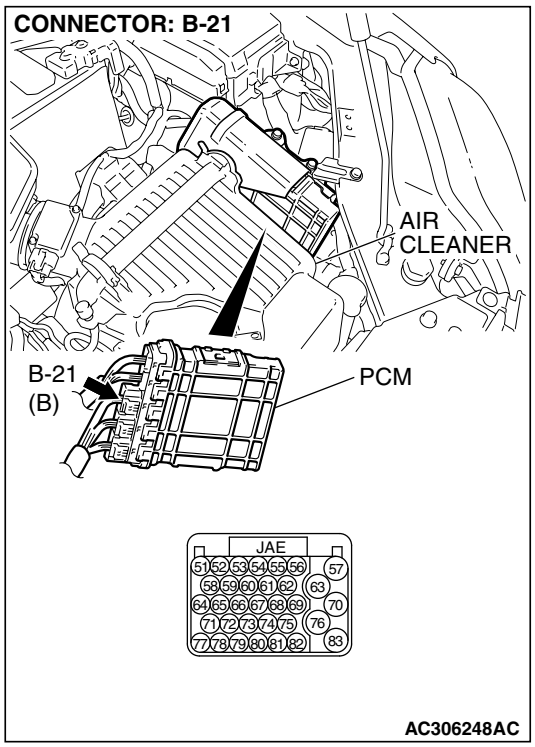


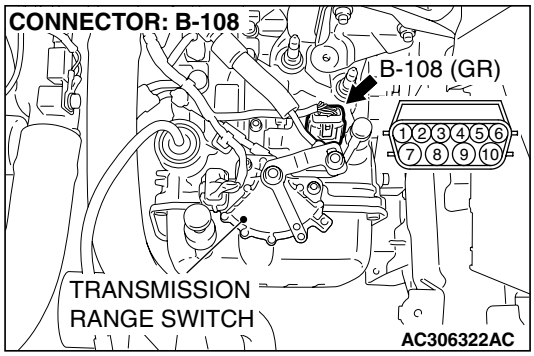
STEP 6. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

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



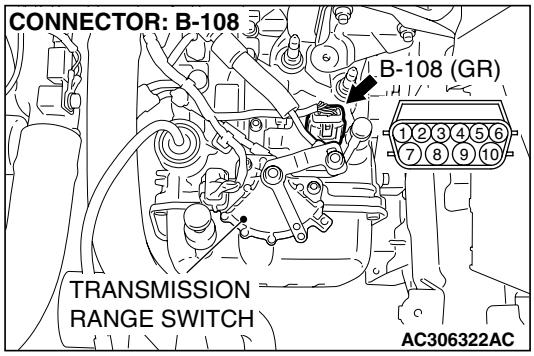


STEP 7. Check the harness for an open or short circuit to ground between PCM connector B-21 terminal 66 and A/T control solenoid valve assembly connector B-108 terminal 4.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

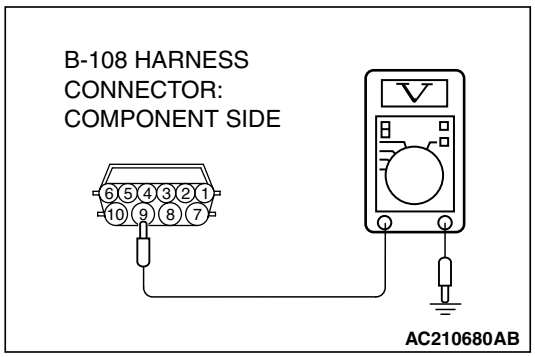
NO : Repair or replace the harness wire.



STEP 8. Measure the supply voltage at A/T control solenoid valve assembly connector B-108.

(1) Disconnect solenoid valve assembly harness connector B-108.

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



(3) Measure the voltage between harness connector B-108 terminal 9 and ground.

- The voltage should equal 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 11.

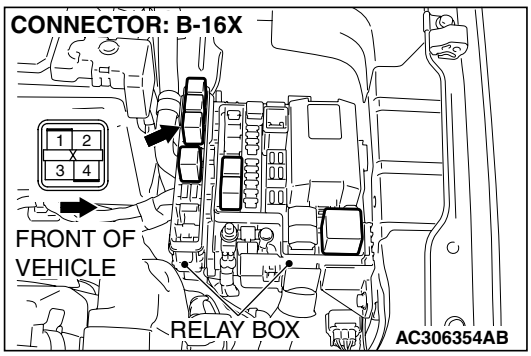
NO : Go to Step 9.

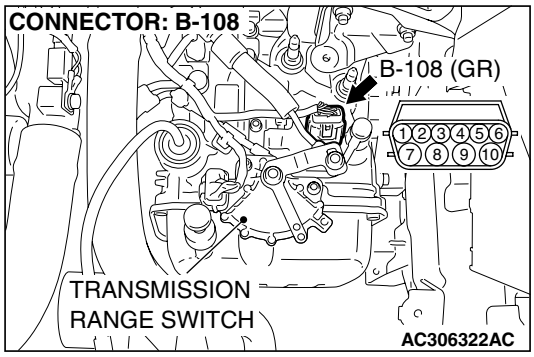
STEP 9. Check A/T control relay connector B-16X in the engine component relay box and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

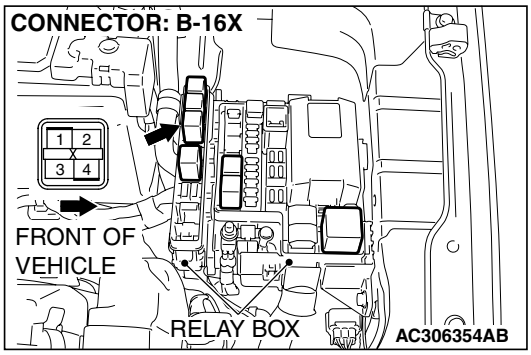
Q: Are the connectors and terminals in good condition?

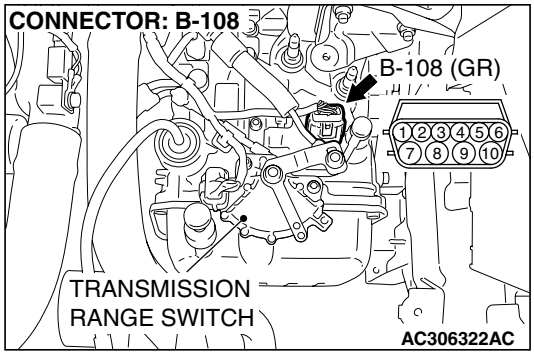
YES : Go to Step 10.

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







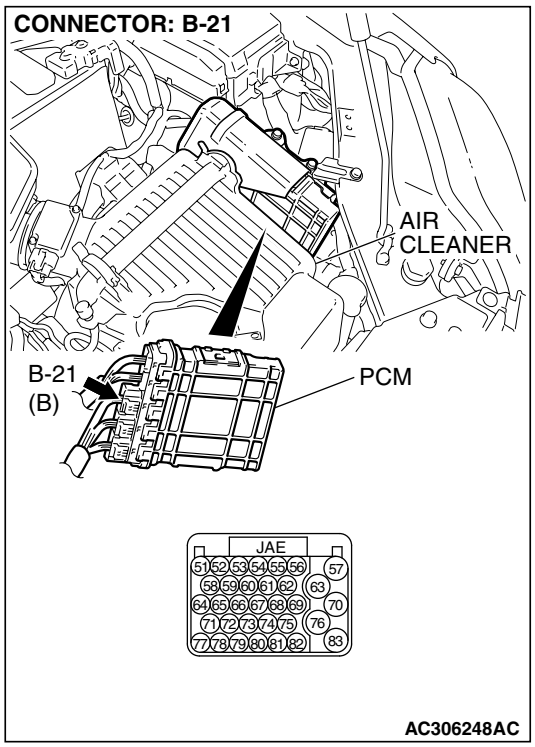


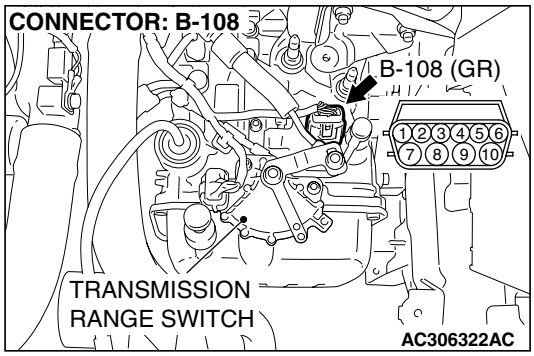
STEP 10. Check the harness for an open circuit or short circuit to ground between A/T control relay connector B-16X terminal 4 in the engine component relay box and A/T control solenoid valve assembly connector B-108 terminal 9.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair or replace the harness wire.



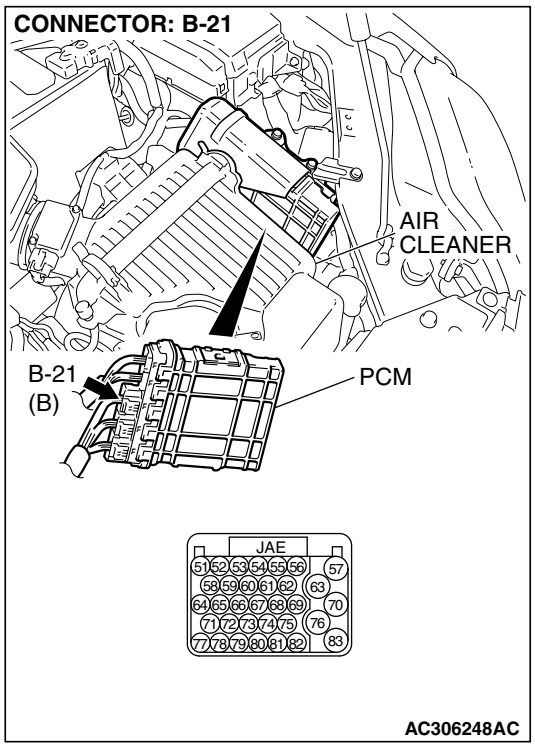


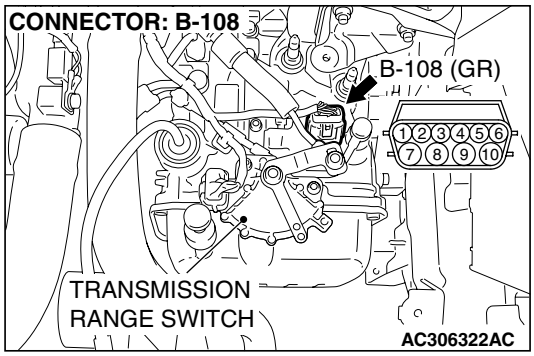
STEP 11. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.



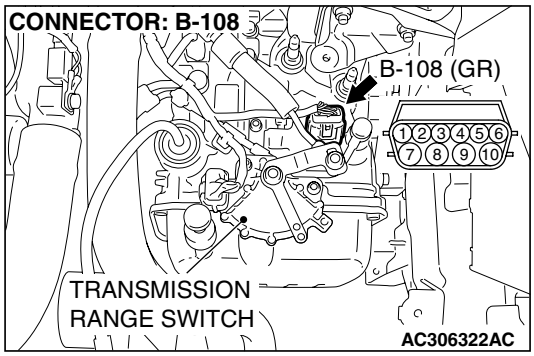


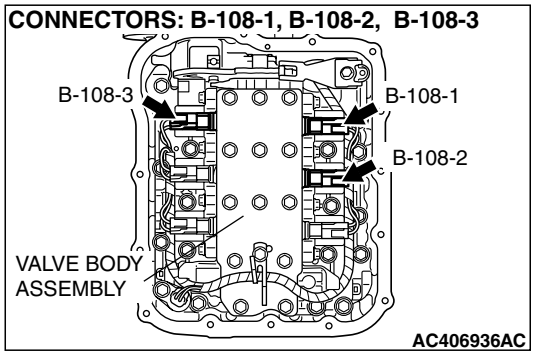
STEP 12. Check the harness for an open or short circuit to ground between PCM connector B-21 (terminals 65, 66 and 55) and A/T control solenoid valve assembly connector B-108 (terminals 3, 4 and 5).

Q: Are the harness wires in good condition?

YES : Go to Step 13.

NO : Repair or replace the harness wire.





STEP 13. Check the harness for an open or short circuit to ground between A/T control solenoid valve assembly connector B-108 (terminals 3, 4, 5, and 9) and solenoid valve connectors B-108-1, B-108-2 and B-108-3.
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : Replace the harness wire.

DTC P1776 (P0768): Overdrive Solenoid Valve System

SOLENOID VALVE SYSTEM CIRCUIT
Refer to P.23A-172.

CIRCUIT OPERATION
Refer to P.23A-172.

DESCRIPTIONS OF MONITOR METHODS
- If solenoid terminal voltage is below specified value when shift control is not in progress, PCM judges that overdrive solenoid valve has a failure.

MONITOR EXECUTION
- Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

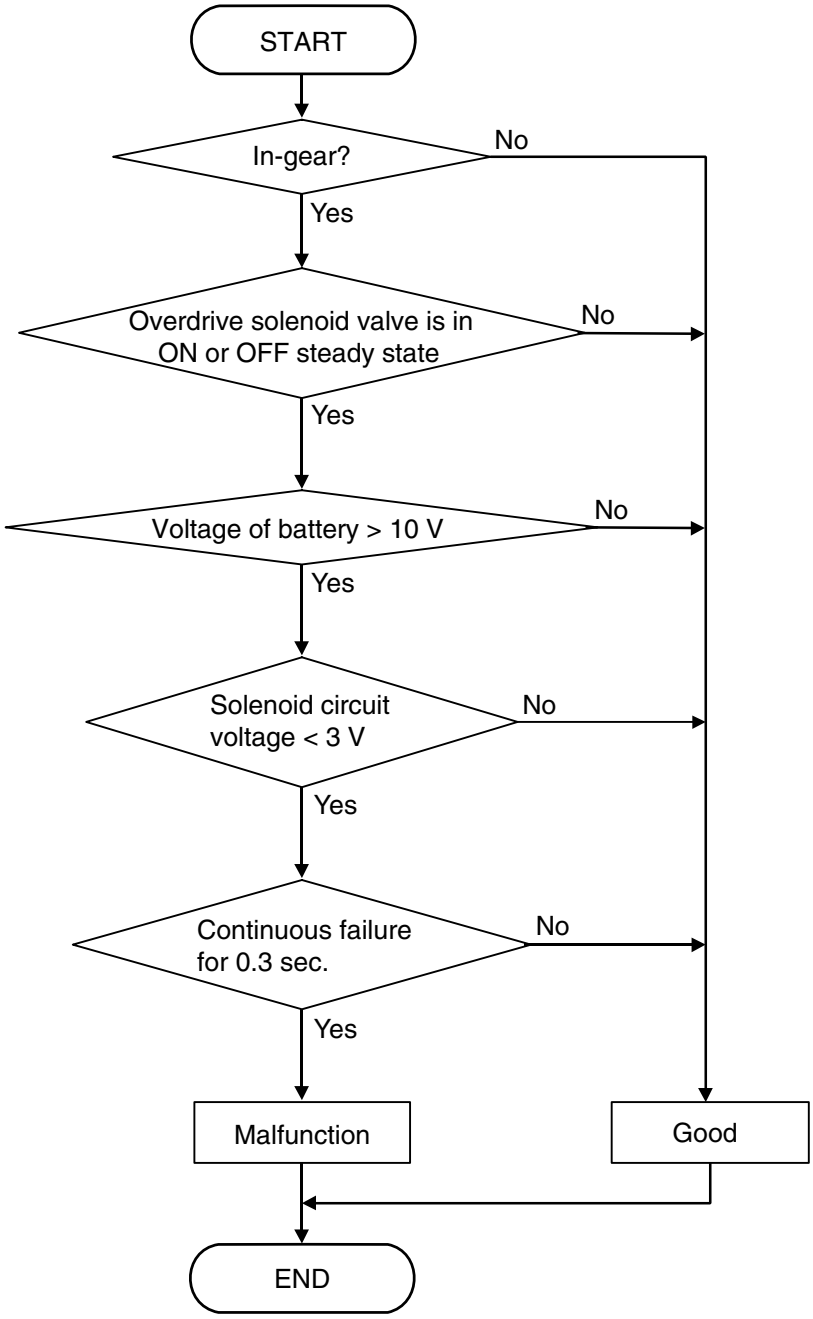
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- DTC P1779 (P0731): 1st gear incorrect ratio
- DTC P1780 (P0732): 2nd gear incorrect ratio
- DTC P1781 (P0733): 3rd gear incorrect ratio
- DTC P1782 (P0734): 4th gear incorrect ratio
- DTC P1783 (P0735): 5th gear incorrect ratio <5A/T>
- DTC P1784 (P0736): Reverse gear incorrect ratio
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)
- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid

TSB Revision

- Reduction solenoid <5A/T>
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence)



AC205284AB

DTC SET CONDITIONS

Check Conditions

- Solenoid status: either solid ON or OFF.
- Shift status: in-gear.
- Voltage of battery: 10 volts or more.

Judgement Criteria

- Solenoid voltage: 3 volts or less. (0.3 second)
- If DTC P1776 (P0768) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN

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

TSB Revision

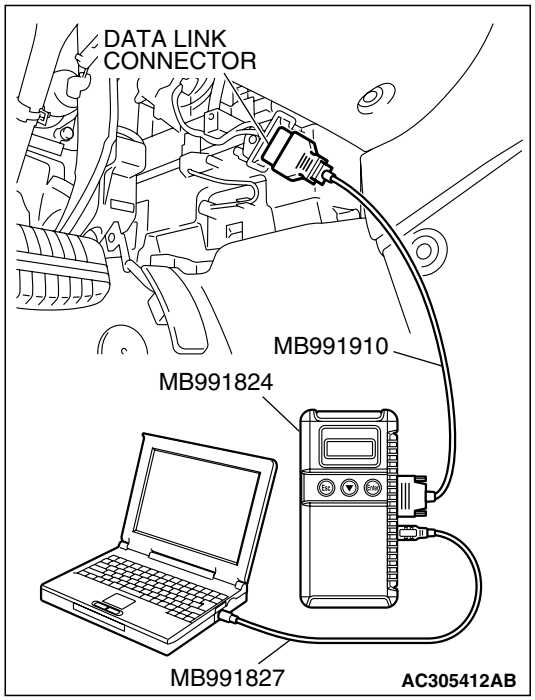
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Malfunction of the overdrive solenoid valve
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check actuator test item 4: Overdrive Solenoid Valve.

⚠ 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.

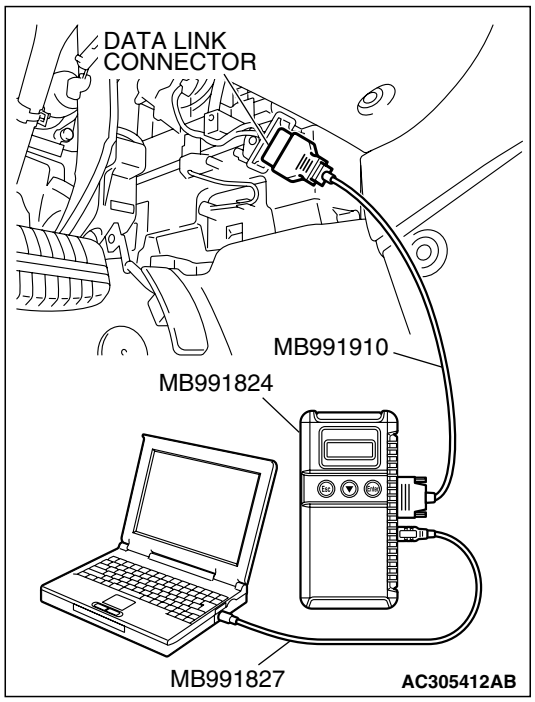
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode.
  - Item 4: Overdrive Solenoid Valve.
    - An audible clicking or buzzing should be heard when the overdrive solenoid valve is energized.

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

Q: Is the solenoid valve 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 Malfunctions P.00-14.

NO : Go to Step 2.

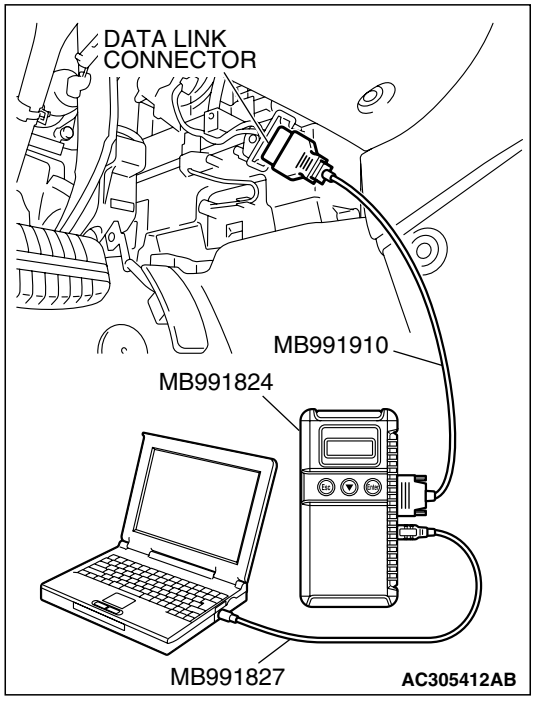


STEP 2. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1788 (P1751) set? (DTC P1788 (P1751) may be set along with multiple DTCs).

YES : Refer to P.23A-265 DTC P1788 (P1571): A/T Control Relay System.
NO : Go to Step 3.



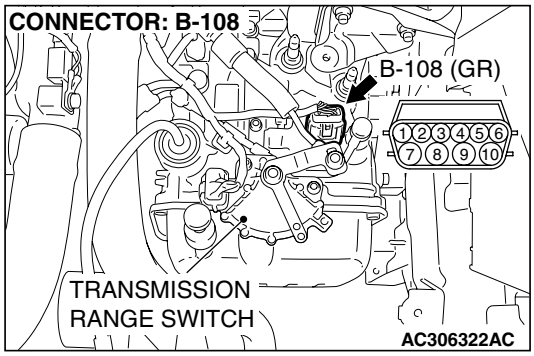
STEP 3. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

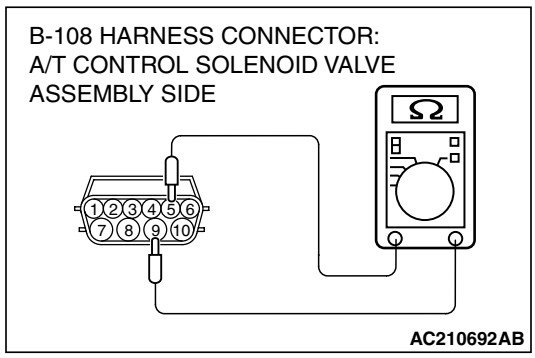
Q: Are DTC P1774 (P0758) and DTC P1775 (P0763) set? (Multiple DTCs may be set).

YES : Go to Step 8.
NO : Go to Step 4.

STEP 4. Measure the Overdrive solenoid valve resistance at A/T control solenoid valve assembly connector B-108.



(1) Disconnect connector B-108 and measure at the solenoid valve side.



(2) Measure the resistance between solenoid valve assembly connector B-108 terminals 5 and 9.

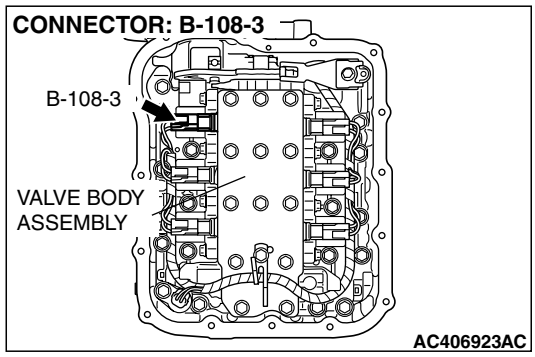
Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)]?

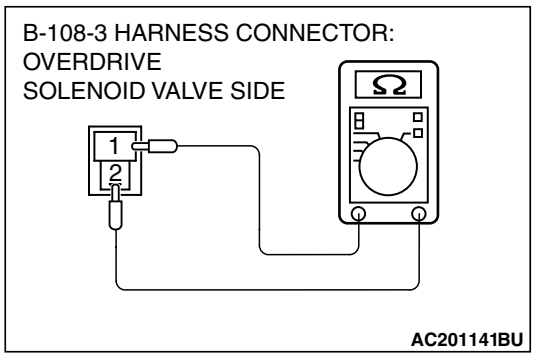
YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Measure the solenoid valve resistance at the overdrive solenoid valve assembly inside the transaxle.



(1) Disconnect connector B-108-3 and measure at the solenoid valve side.



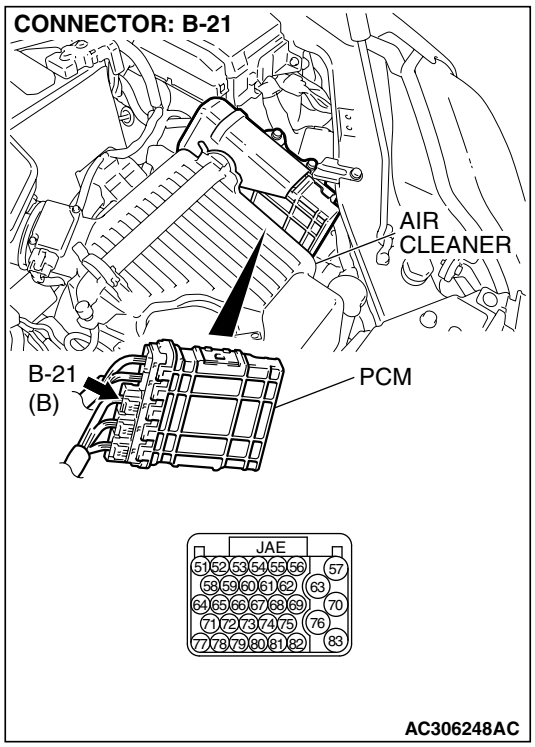
(2) Measure the resistance between Overdrive solenoid valve terminals 1 and 2.

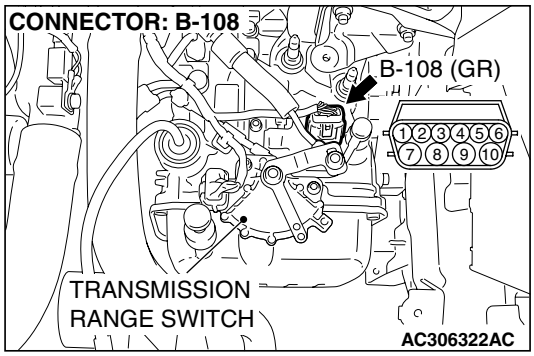
Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)?

YES : Replace the harness wire between A/T control solenoid valve assembly connector B-108 and the solenoid valves.

NO : Replace the Overdrive solenoid valve. Refer to GROUP 23B, P.23B-67 Valve Body <4A/T> or Refer to GROUP 23C, P.23C-77 Valve Body <5A/T>.



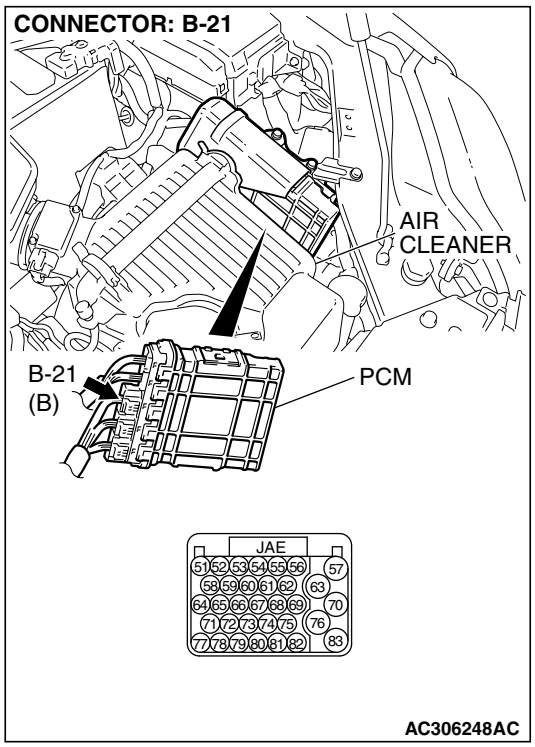


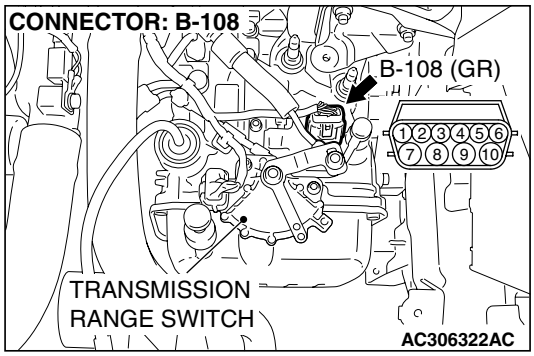
STEP 6. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

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



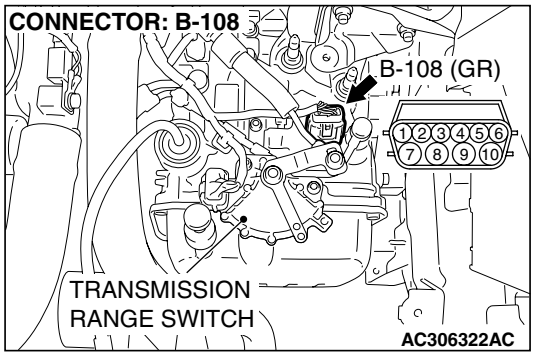


STEP 7. Check the harness for an open or short circuit to ground between PCM connector B-20 terminal 55 and A/T control solenoid valve assembly connector B-108 terminal 5.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

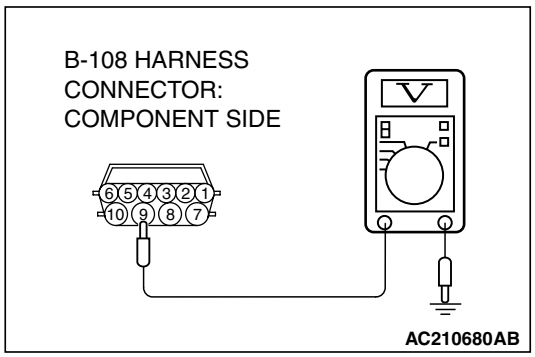
NO : Repair or replace the harness wire.



STEP 8. Measure the supply voltage at A/T control solenoid valve assembly connector B-108.

(1) Disconnect solenoid valve assembly harness connector B-108.

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



(3) Measure the voltage between harness connector B-108 terminal 9 and ground.
- The voltage should equal 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 11.

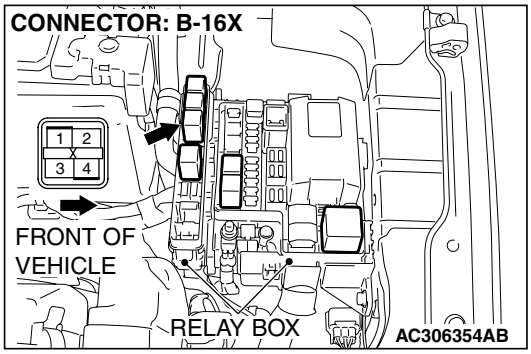
NO : Go to Step 9.

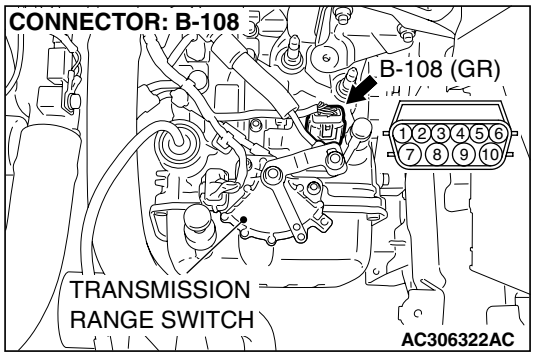
STEP 9. Check A/T control relay connector B-16X in the engine component relay box and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

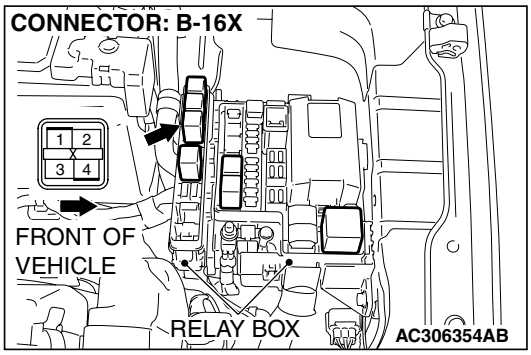
Q: Are the connectors and terminals in good condition?

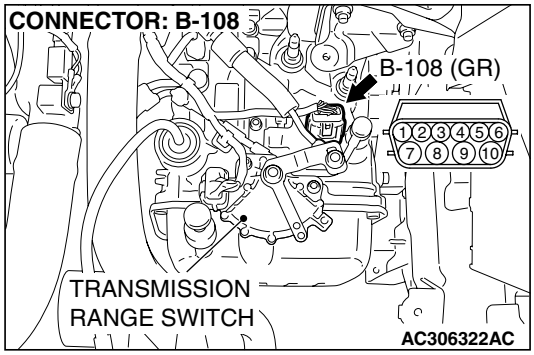
YES : Go to Step 10.

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







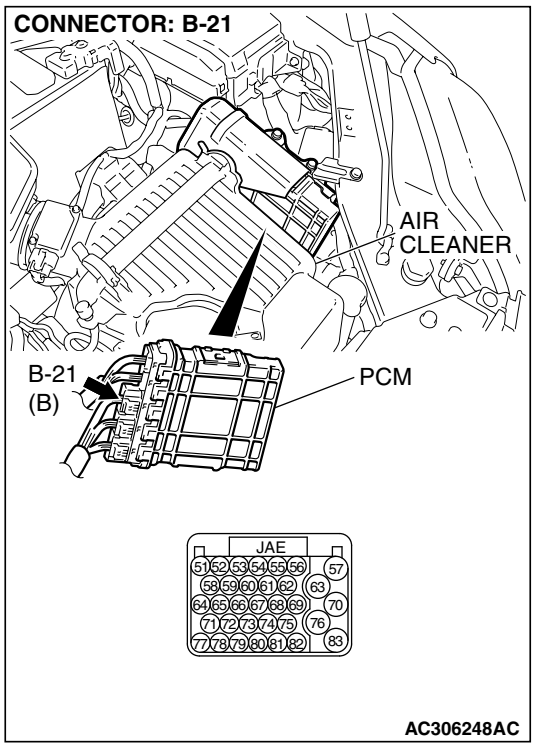


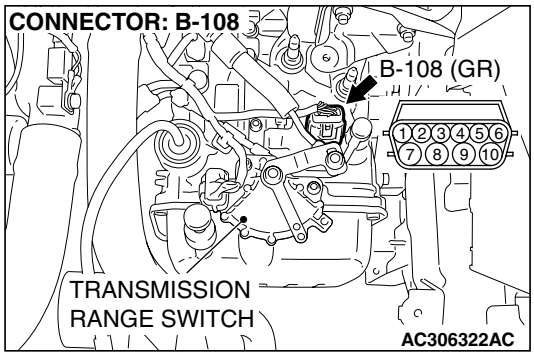
STEP 10. Check the harness for an open circuit or short circuit to ground between A/T control relay connector B-16X terminal 4 in the engine component relay box and A/T control solenoid valve assembly connector B-108 terminal 9.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair or replace the harness wire.





STEP 11. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 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.

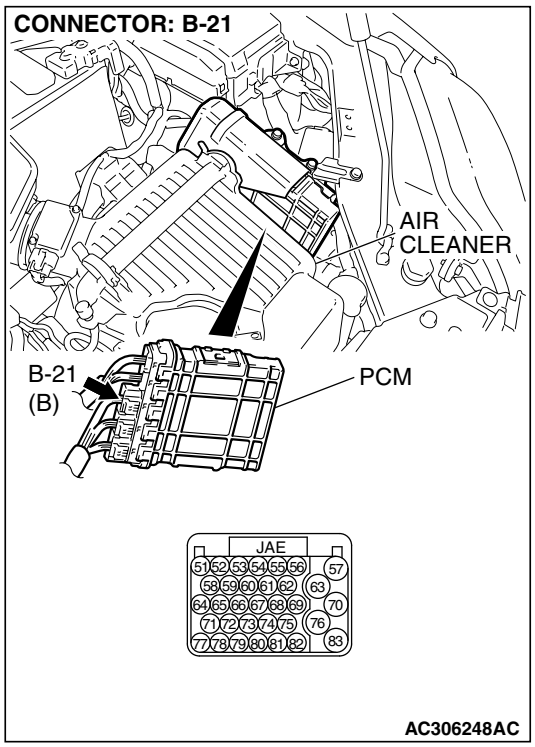
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

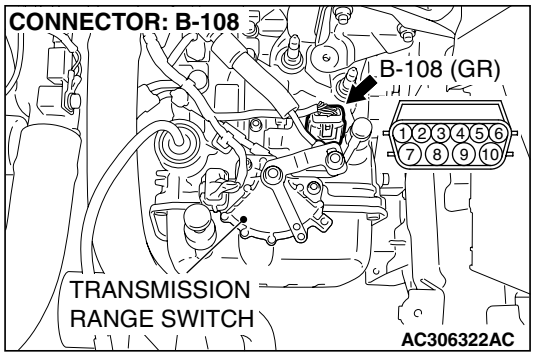
STEP 12. Check the harness for an open or short circuit to ground between PCM connector B-21 (terminals 65, 66 and 55) and A/T control solenoid valve assembly connector B-108 (terminals 3, 4 and 5).

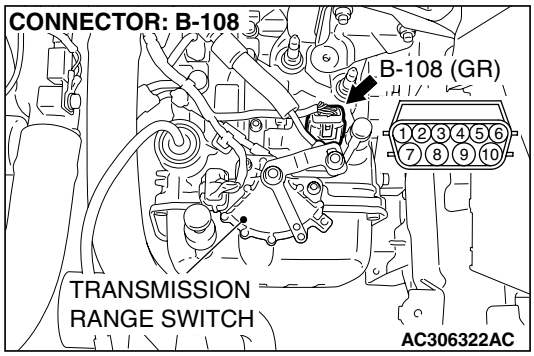
Q: Are the harness wires in good condition?

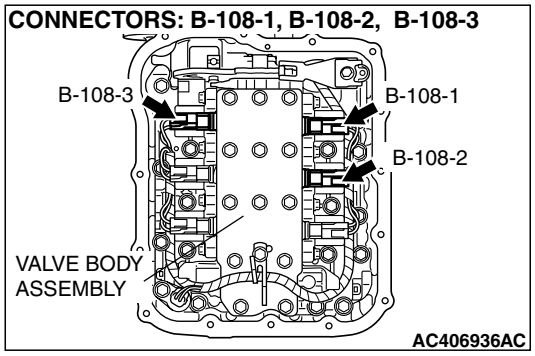
YES : Go to Step 13.

NO : Repair or replace the harness wire.









STEP 13. Check the harness for an open or short circuit to ground between A/T control solenoid valve assembly connector B-108 (terminals 3, 4, 5, and 9) and solenoid valve connectors B-108-1, B-108-2 and B-108-3.
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : Replace the harness wire.

DTC P1777 (P0773): Reduction solenoid valve system <5A/T>

SOLENOID VALVE SYSTEM CIRCUIT
Refer to P.23A-172.

CIRCUIT OPERATION
Refer to P.23A-172.

DESCRIPTIONS OF MONITOR METHODS
- If solenoid terminal voltage is below specified value when shift control is not in progress, PCM judges that reduction solenoid valve has a failure.

MONITOR EXECUTION
- Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

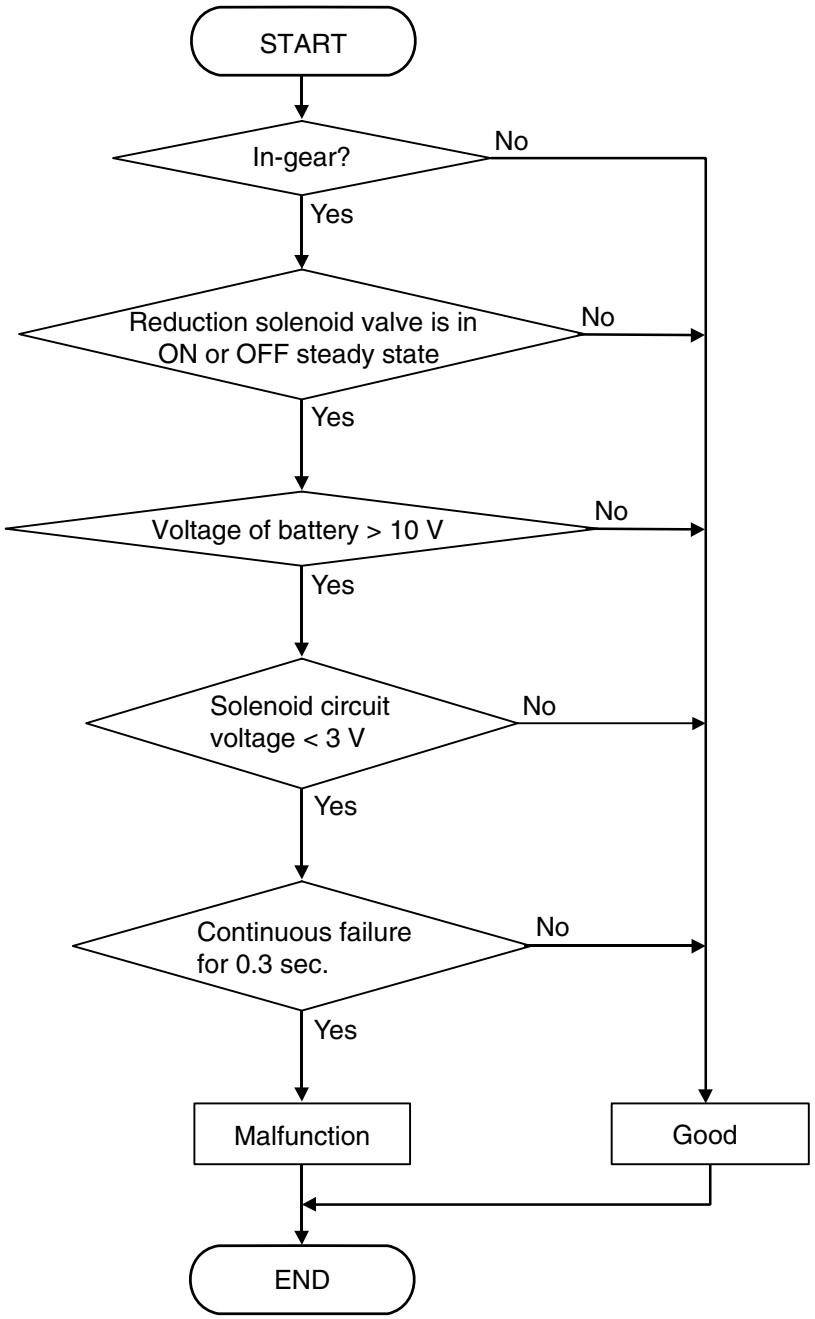
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- DTC P1779 (P0731): 1st gear incorrect ratio
- DTC P1780 (P0732): 2nd gear incorrect ratio
- DTC P1781 (P0733): 3rd gear incorrect ratio
- DTC P1782 (P0734): 4th gear incorrect ratio
- DTC P1783 (P0735): 5th gear incorrect ratio
- DTC P1784 (P0736): Reverse gear incorrect ratio
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)
- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid
- Overdrive solenoid

TSB Revision

- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence)



AC501721

DTC SET CONDITIONS

Check Conditions

- Solenoid status: either solid ON or OFF.
- Shift status: in-gear.
- Voltage of battery: 10 volts or more.

Judgement Criteria

- Solenoid voltage: 3 volts or less. (0.3 second)
- If DTC P1777 (P0773) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN

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

TSB Revision

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

- Malfunction of the reduction solenoid valve
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, check actuator test item 5: Reduction Solenoid Valve.

⚠ 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.

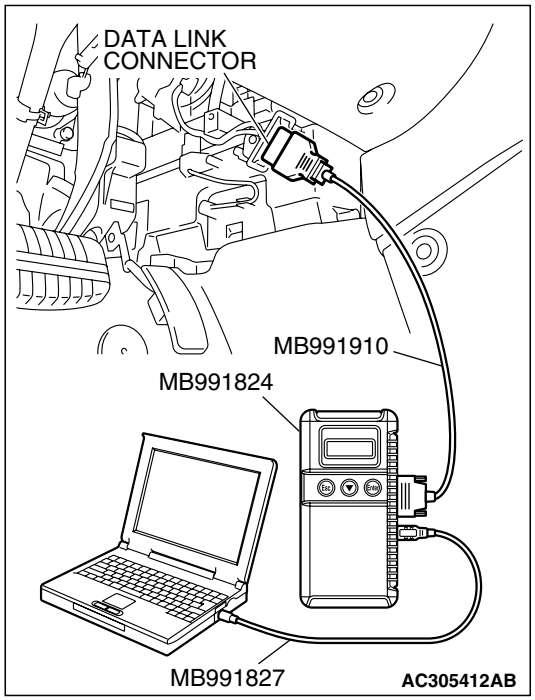
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode.
  - Item 5: Reduction Solenoid Valve.
    - An audible clicking or buzzing should be heard when the reduction solenoid valve is energized.

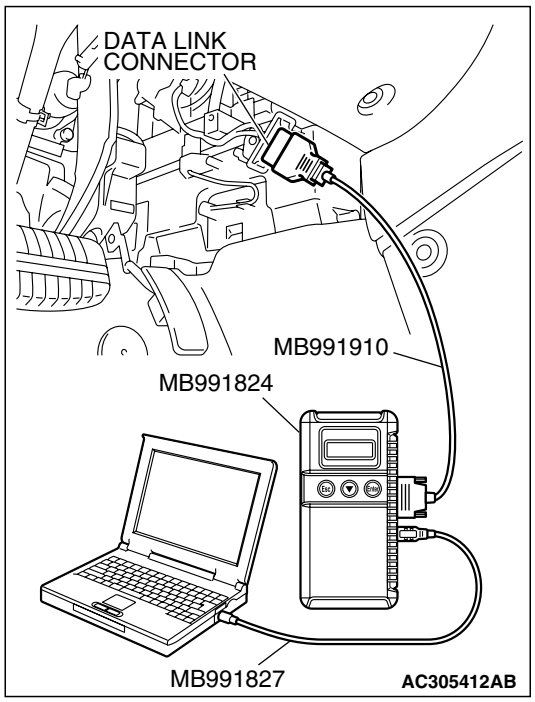
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid valve 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 Malfunctions P.00-14.

NO : Go to Step 2.



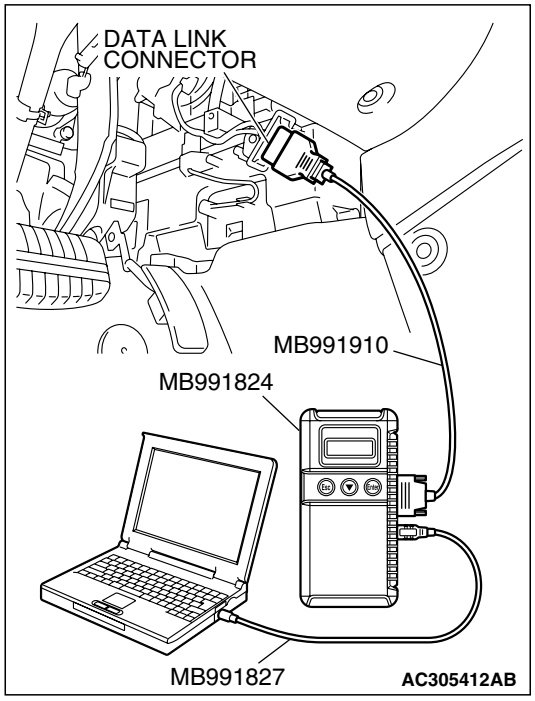


STEP 2. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1788 (P1751) set? (DTC P1788 (P1751) may be set along with multiple DTCs).

YES : Refer to P.23A-265 DTC P1788 (P1751): A/T Control Relay System.
NO : Go to Step 3.



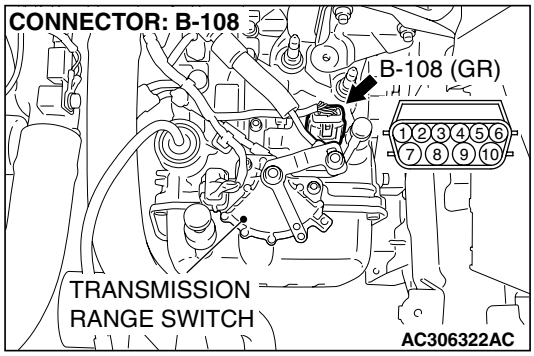
STEP 3. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

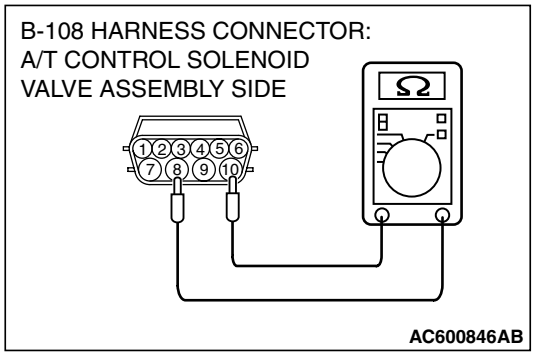
Q: Are DTC P1778 (P0743) and DTC P1773 (P0753) set? (Multiple DTCs may be set).

YES : Go to Step 8.
NO : Go to Step 4.

STEP 4. Measure the Reduction solenoid valve resistance at A/T control solenoid valve assembly connector B-108.



(1) Disconnect connector B-108 and measure at the solenoid valve side.



(2) Measure the resistance between solenoid valve assembly connector B-108 terminals 8 and 10.

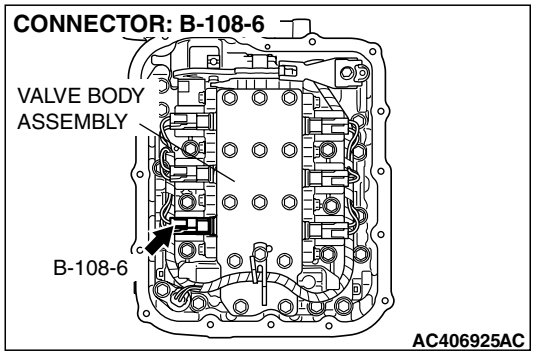
Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)]?

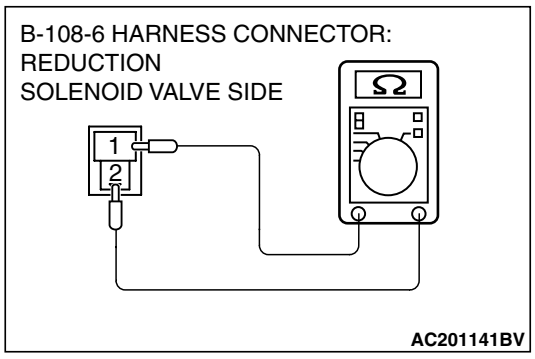
YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Measure the solenoid valve resistance at the reduction solenoid valve assembly inside the transaxle.



(1) Disconnect connector B-108-6 and measure at the solenoid valve side.



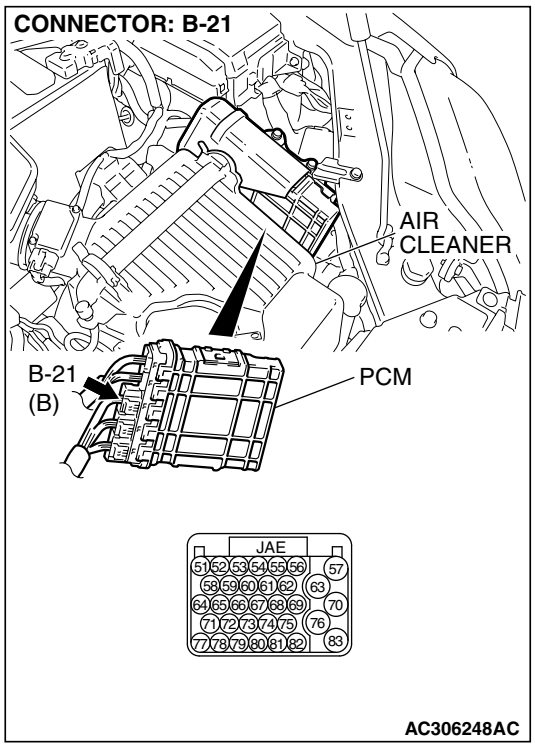
(2) Measure the resistance between Reduction solenoid valve terminals 1 and 2.

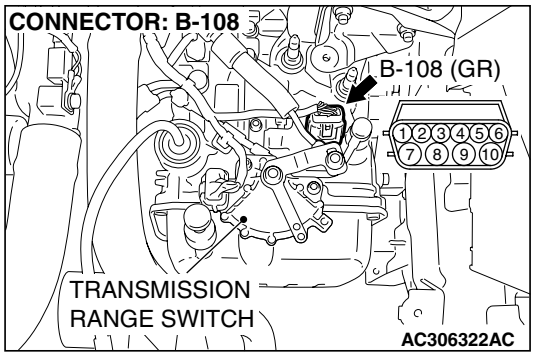
Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)?

YES : Replace the harness wire between A/T control solenoid valve assembly connector B-108 and the solenoid valves.

NO : Replace the Reduction solenoid valve. Refer to GROUP 23C, P.23C-77 Valve Body.



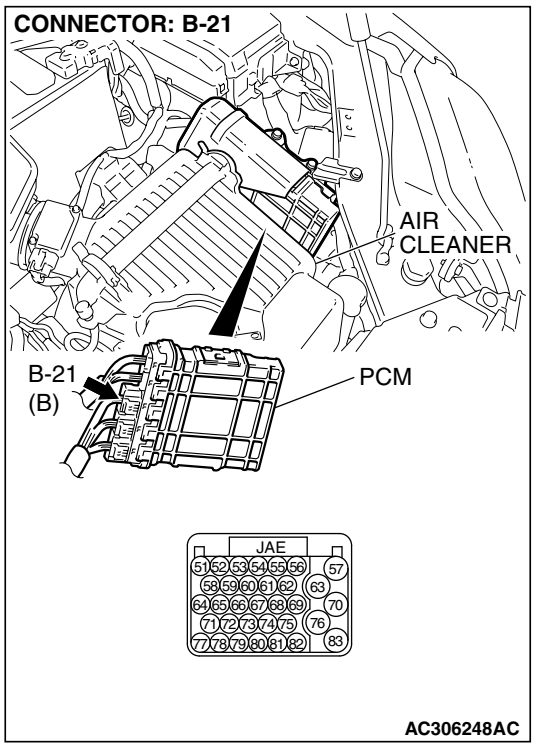


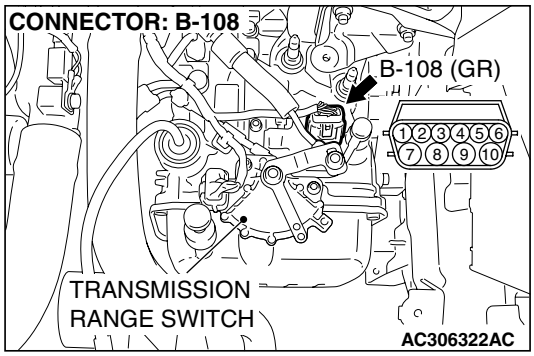
STEP 6. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

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



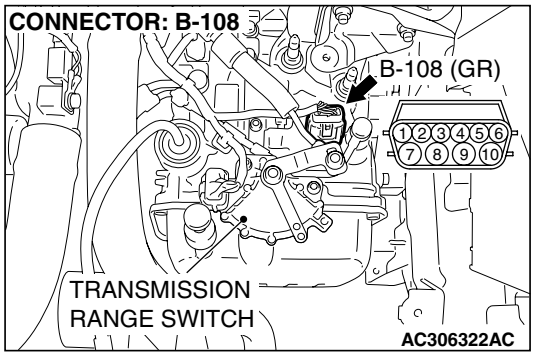


STEP 7. Check the harness for an open or short circuit to ground between PCM connector B-21 terminal 55 and A/T control solenoid valve assembly connector B-108 terminal 5.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

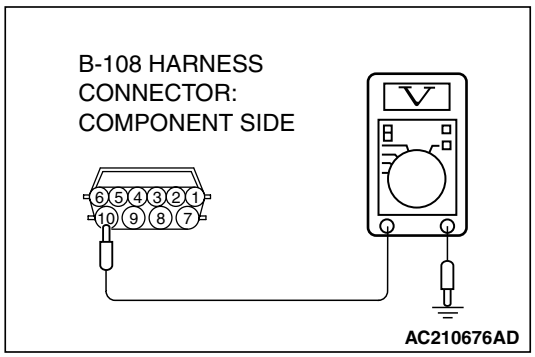
NO : Repair or replace the harness wire.



STEP 8. Measure the supply voltage at A/T control solenoid valve assembly connector B-108.

(1) Disconnect solenoid valve assembly harness connector B-108.

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



(3) Measure the voltage between harness connector B-108 terminal 10 and ground.

- The voltage should equal 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 11.

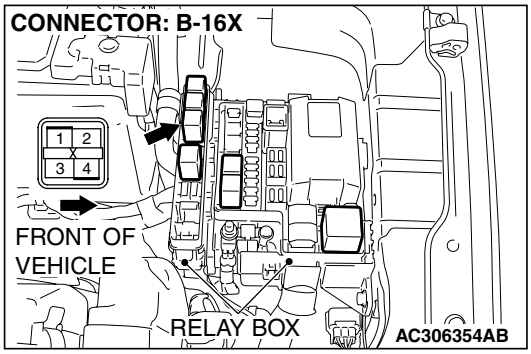
NO : Go to Step 9.

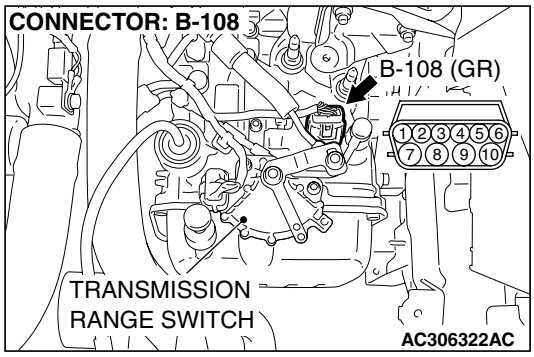
STEP 9. Check A/T control relay connector B-16X in the engine component relay box and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

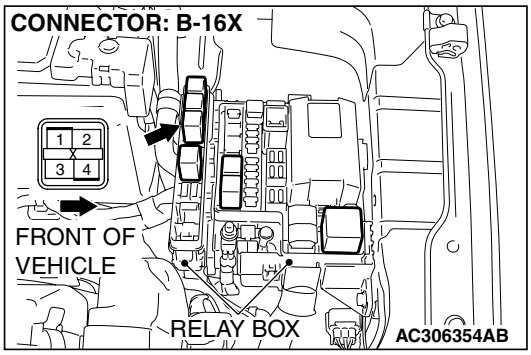
Q: Are the connectors and terminals in good condition?

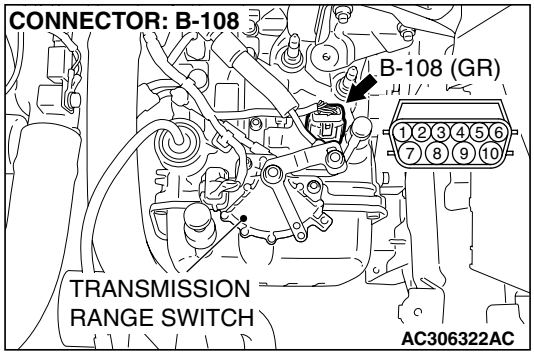
YES : Go to Step 10.

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







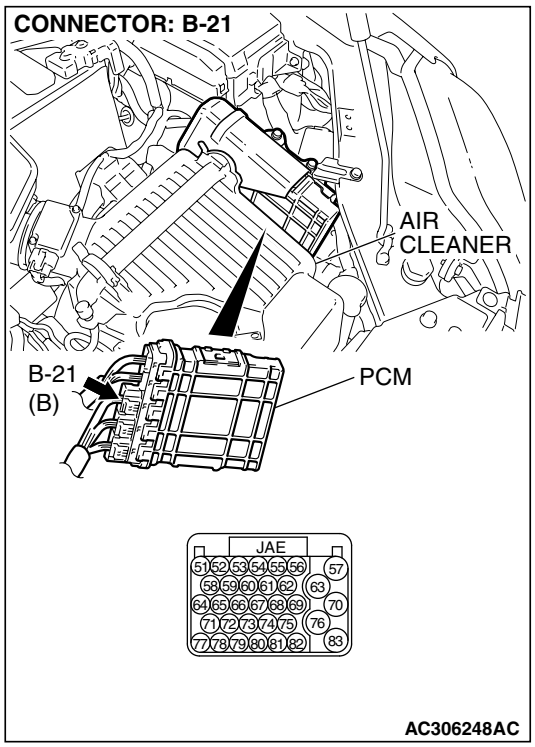


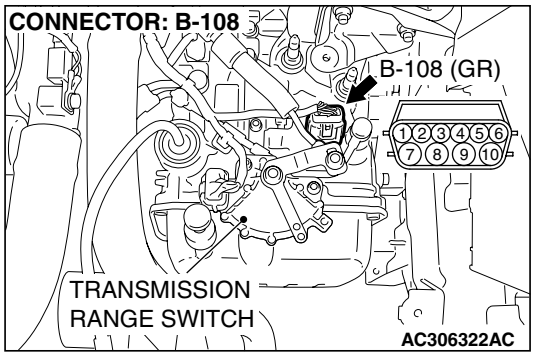
STEP 10. Check the harness for an open circuit or short circuit to ground between A/T control relay connector B-16X terminal 4 in the engine component relay box and A/T control solenoid valve assembly connector B-108 terminal 10.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair or replace the harness wire.



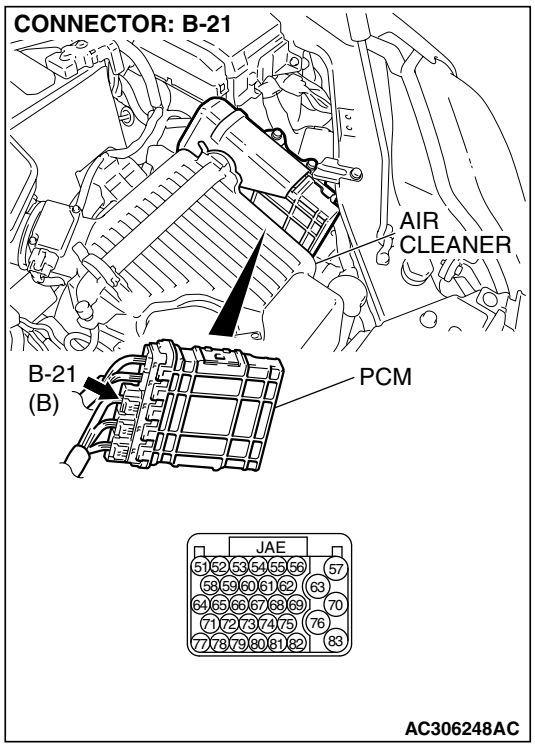


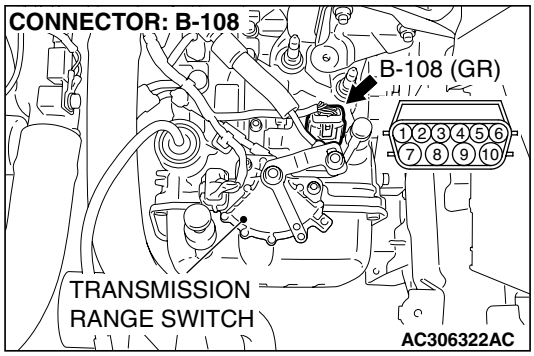
STEP 11. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

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.



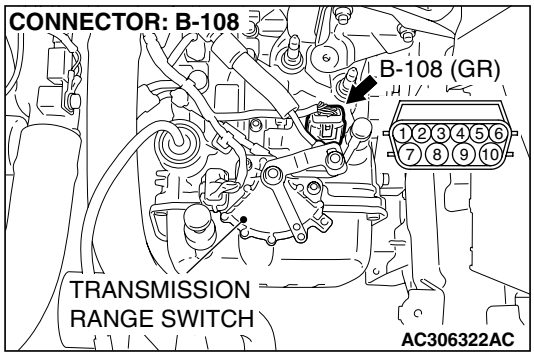


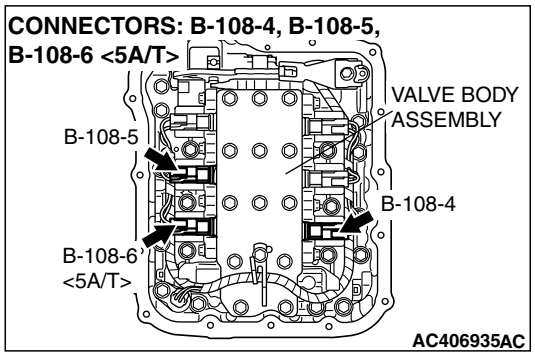
STEP 12. Check the harness for an open or short circuit to ground between PCM connector B-21 (terminals 54, 56 and 53) and A/T control solenoid valve assembly connector B-108 (terminals 7, 6 and 8).

Q: Are the harness wires in good condition?

YES : Go to Step 13.

NO : Repair or replace the harness wire.





STEP 13. Check the harness for an open or short circuit to ground between A/T control solenoid valve assembly connector B-108 (terminals 7, 6, 8, and 10) and solenoid valve connectors B-108-4, B-108-5 and B-108-6.
Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : Replace the harness wire.

DTC P1778 (P0743): Torque Converter Clutch Solenoid Valve System

SOLENOID VALVE SYSTEM CIRCUIT

Refer to P.23A-172.

CIRCUIT OPERATION

Refer to P.23A-172.

DESCRIPTIONS OF MONITOR METHODS

- If lock-up is not engaged, and solenoid terminal voltage is below specified value, PCM judges that torque converter clutch solenoid valve 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 P1779 (P0731): 1st gear incorrect ratio
- DTC P1780 (P0732): 2nd gear incorrect ratio
- DTC P1781 (P0733): 3rd gear incorrect ratio
- DTC P1782 (P0734): 4th gear incorrect ratio
- DTC P1783 (P0735): 5th gear incorrect ratio <5A/T>
- DTC P1784 (P0736): Reverse gear incorrect ratio
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

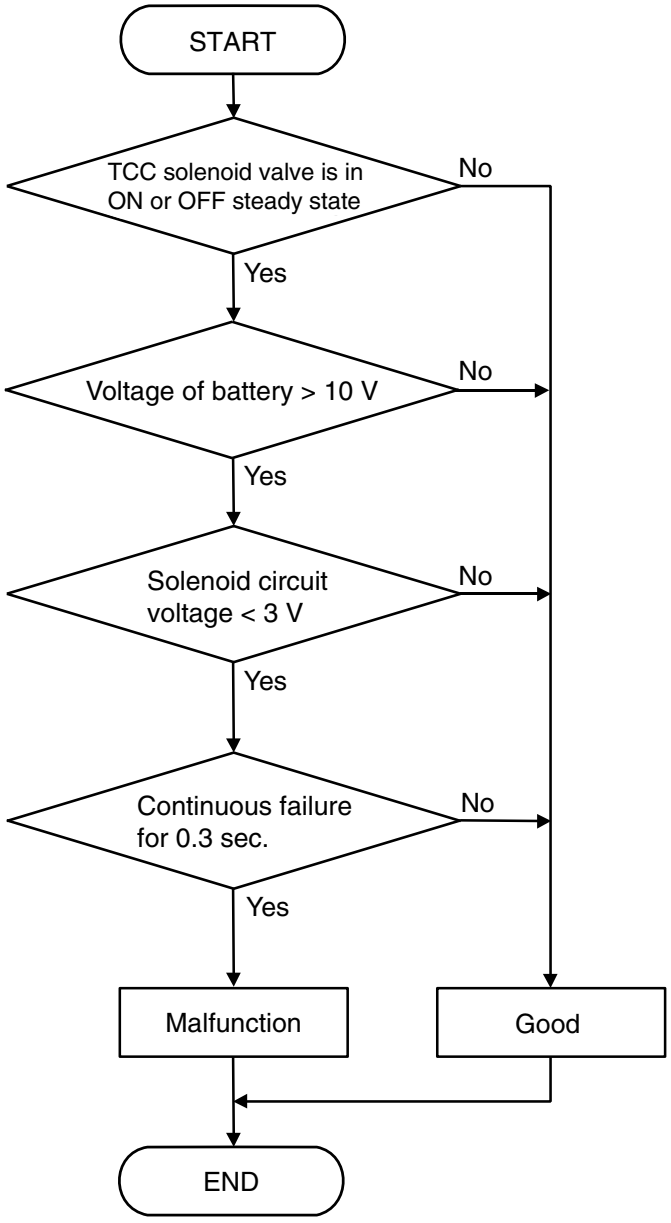
Sensor (The sensor below is determined to be normal)

- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid

TSB Revision

- Overdrive solenoid
- Reduction solenoid <5A/T>
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence)



AC205240AC

DTC SET CONDITIONS

Check Conditions

- Solenoid status: either solid ON or OFF.
- Voltage of battery: 10 volts or more.

Judgement Criteria

- Solenoid voltage: 3 volts or less. (0.3 second)
- If DTC P1778 (P0743) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN

Start the engine, and 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 torque converter clutch solenoid valve
- Damaged harness or connector
- Malfunction of the PCM

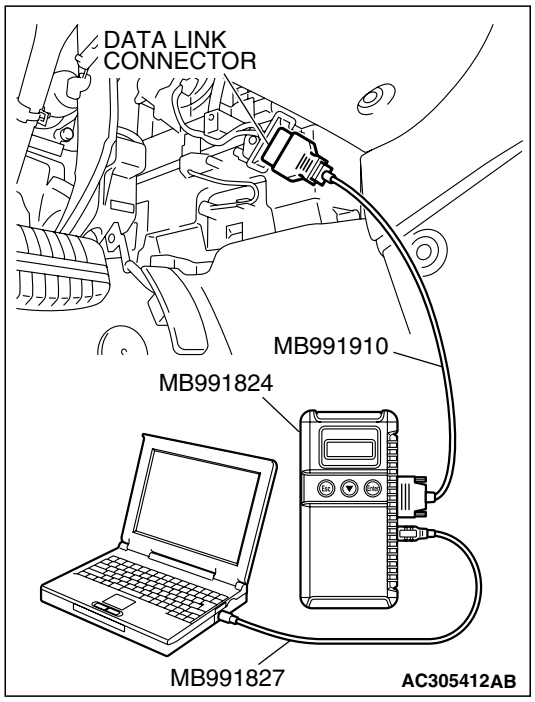
TSB Revision

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, check actuator test item 6: Torque Converter Clutch Solenoid Valve.



⚠ 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.

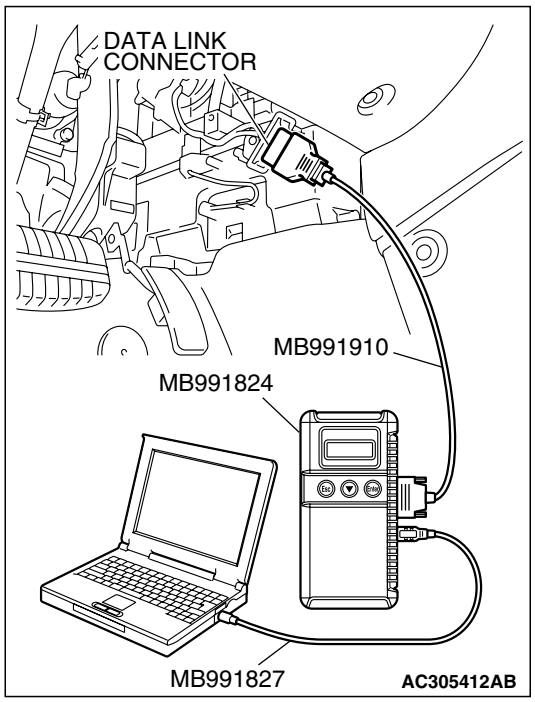
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode.
  - Item 6: Torque Converter Clutch Solenoid Valve.
    - An audible clicking or buzzing should be heard when the torque converter clutch solenoid valve is energized.

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

Q: Is the solenoid valve 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 Malfunctions P.00-14.

NO : Go to Step 2.

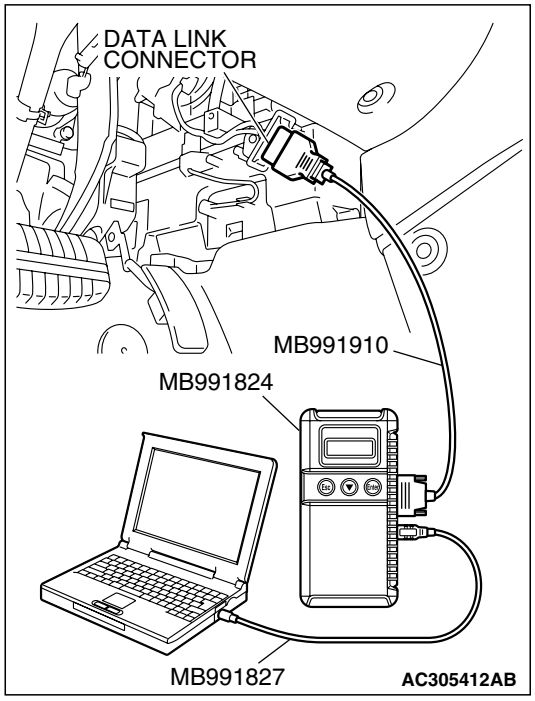


STEP 2. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1788 (P1751) set? (DTC P1788 (P1751) may be set along with multiple DTCs).

YES : Refer to P.23A-265 DTC P1788 (P1751): A/T Control Relay System.
NO : Go to Step 3.



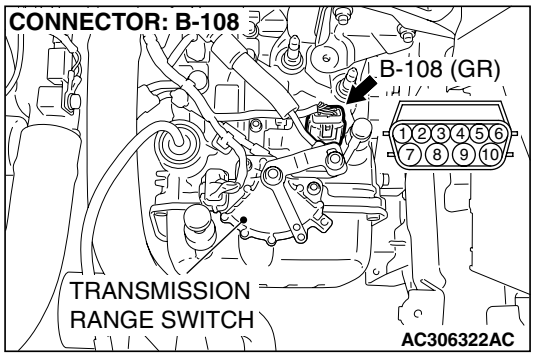
STEP 3. Using scan tool MB991958, read the A/T diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

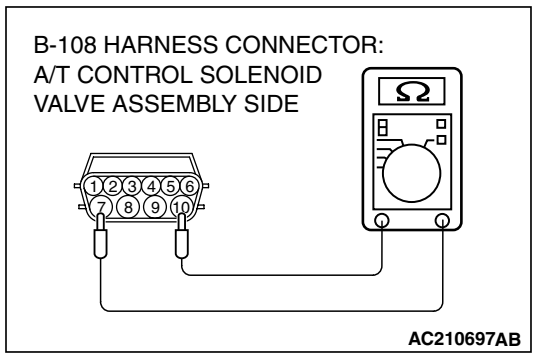
Q: Is DTC P1773 set?

YES : Go to Step 8.
NO : Go to Step 4.

STEP 4. Measure the torque converter clutch solenoid valve resistance at A/T control solenoid valve assembly connector B-108.



(1) Disconnect connector B-108 and measure at the solenoid valve side.



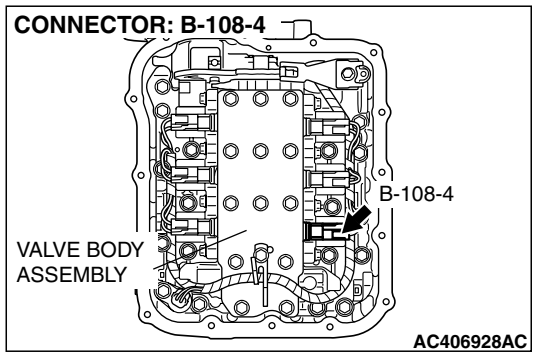
(2) Measure the resistance between solenoid valve assembly connector B-108 terminals 7 and 10.

Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

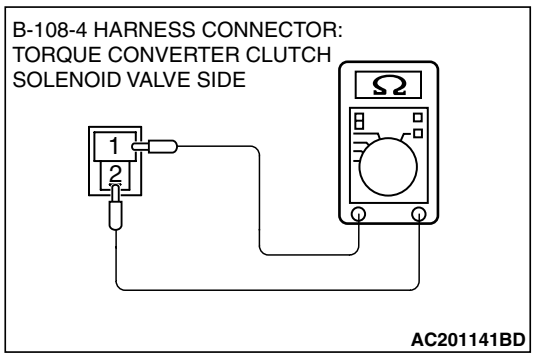
Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)]?

YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Measure the solenoid valve resistance at the torque converter clutch solenoid valve assembly inside the transaxle.



(1) Disconnect connector B-108-4 and measure at the solenoid valve side.



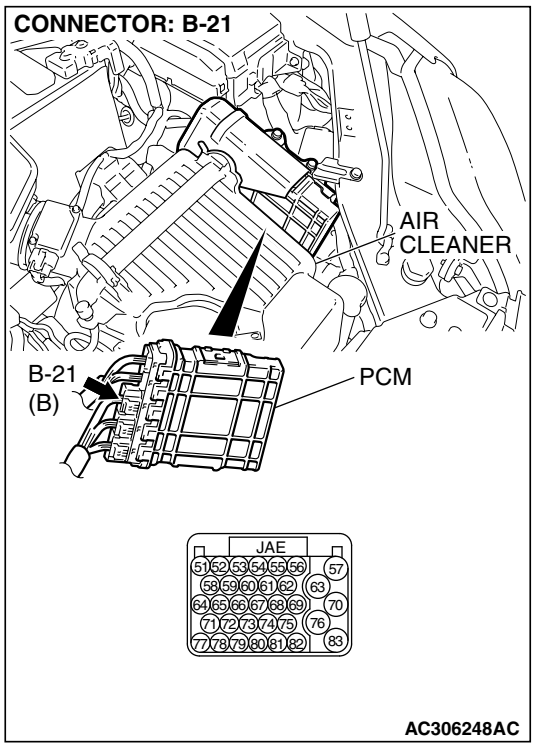
(2) Measure the resistance between torque converter clutch solenoid valve terminals 1 and 2.

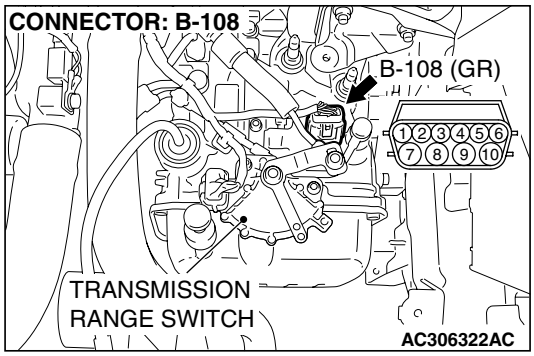
Resistance value: 2.7–3.4 Ω [at 20°C (68°F)]

Q: Is the measured resistance 2.7–3.4 Ω [at 20°C (68°F)?

YES : Replace the harness wire between A/T control solenoid valve assembly connector B-108 and the solenoid valves.
NO : Replace the torque converter clutch solenoid valve. Refer to GROUP 23B, P.23B-67 Valve Body <4A/T> or Refer to GROUP 23C, P.23C-77 Valve Body <5A/T>.

TSB Revision



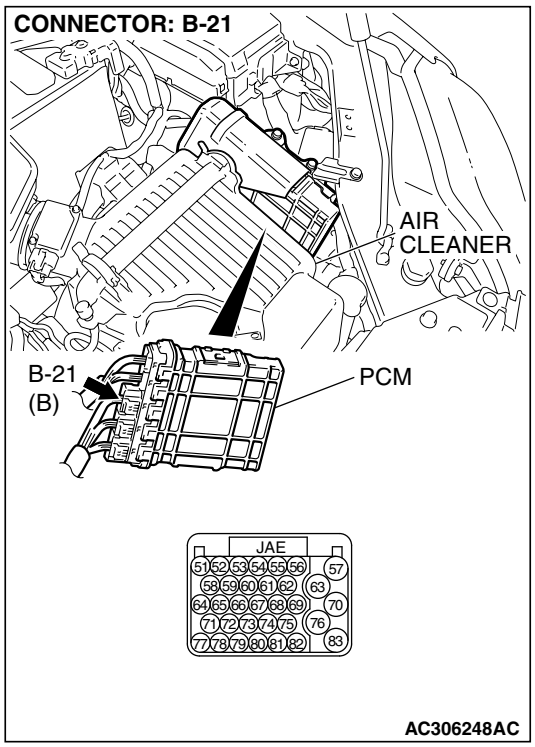


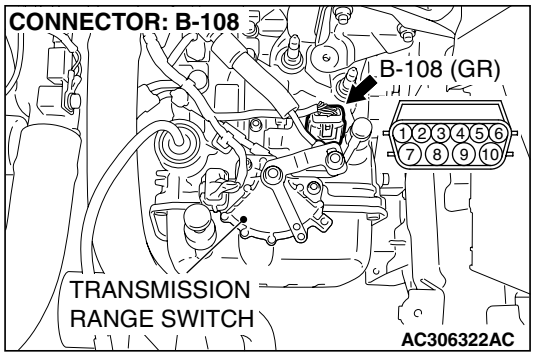
STEP 6. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

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





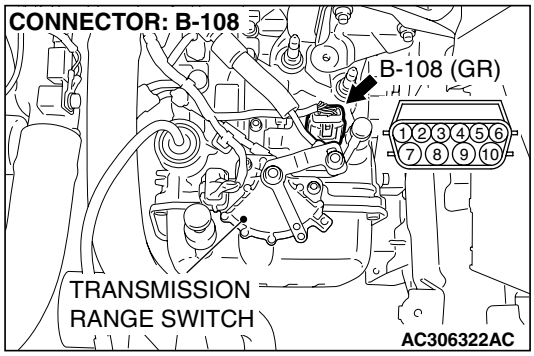
STEP 7. Check the harness for an open or short circuit to ground between PCM connector B-21 terminal 54 and A/T control solenoid valve assembly connector B-108 terminal 7.

Q: Is the harness wire in good condition?

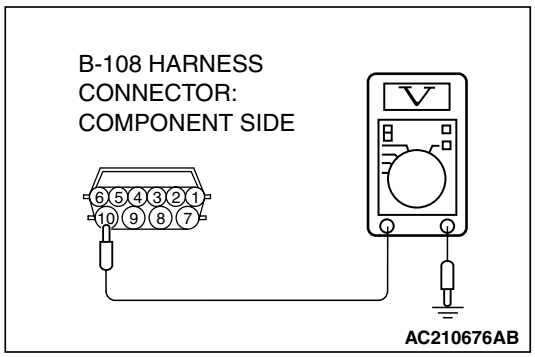
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : Repair or replace the harness wire.

STEP 8. Measure the supply voltage at A/T control solenoid valve assembly connector B-108.



(1) Disconnect solenoid valve assembly harness connector B-108.
(2) Turn the ignition switch to the "ON" position.



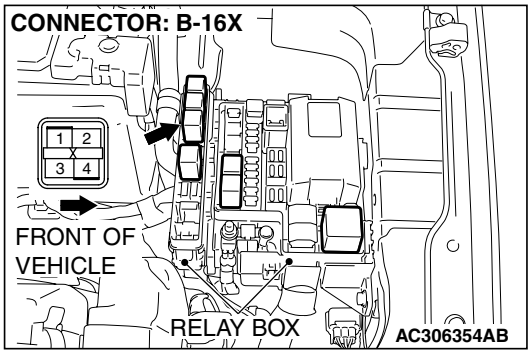
(3) Measure the voltage between harness connector B-108 terminal 10 and ground.
- The voltage should equal battery positive voltage.

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

Q: Is the measured voltage battery positive voltage?

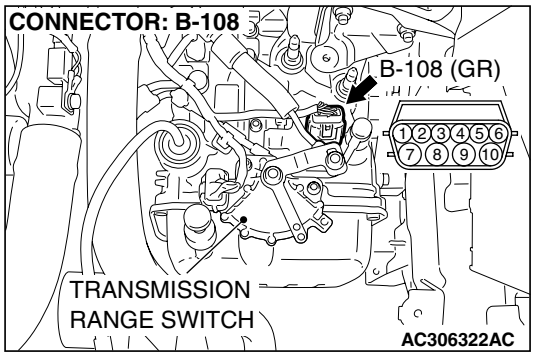
YES : Go to Step 11.
NO : Go to Step 9.

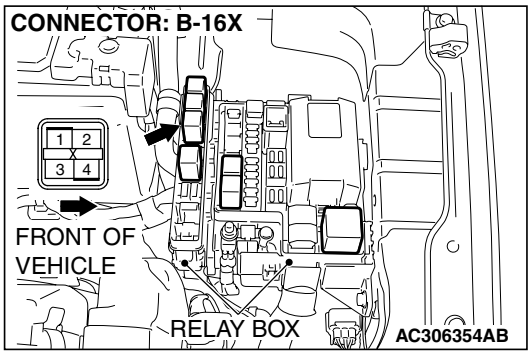
STEP 9. Check A/T control relay connector B-16X in the engine component relay box and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

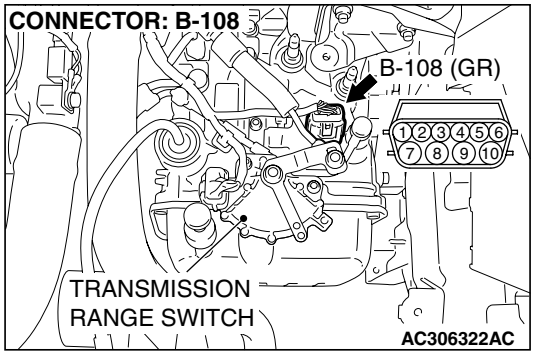


Q: Are the connectors and terminals in good condition?

YES : Go to Step 10.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





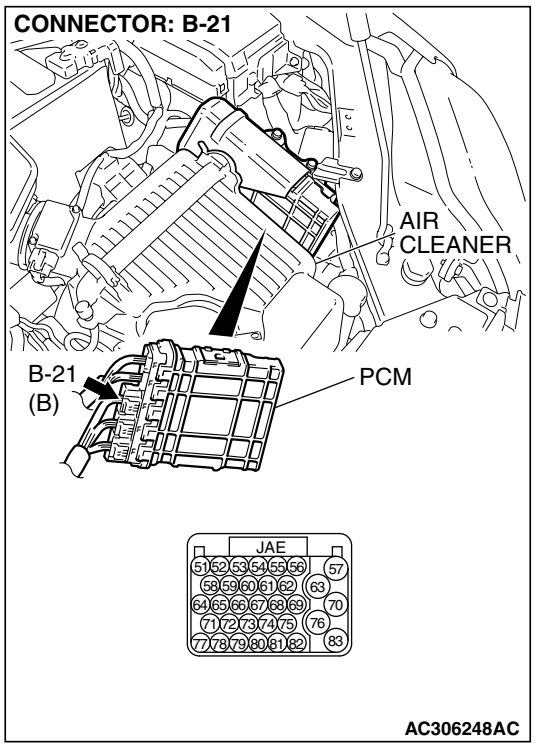


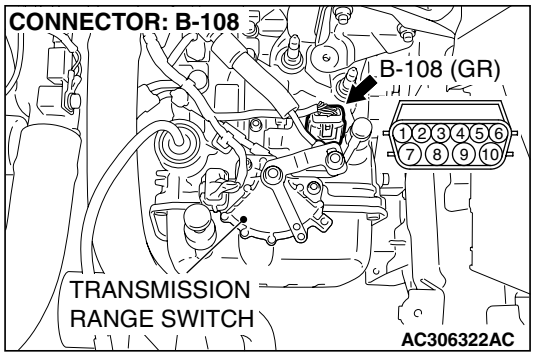
STEP 10. Check the harness for an open circuit or short circuit to ground between A/T control relay connector B-16X terminal 4 in the engine component relay box and A/T control solenoid valve assembly connector B-108 terminal 10.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair or replace the harness wire.





STEP 11. Check PCM connector B-21 and A/T control solenoid valve assembly connector B-108 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

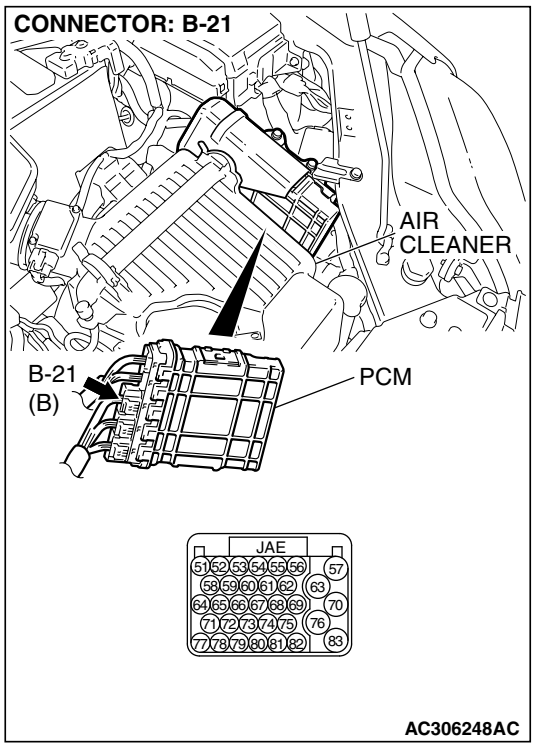
Q: Are the connectors and terminals in good condition?

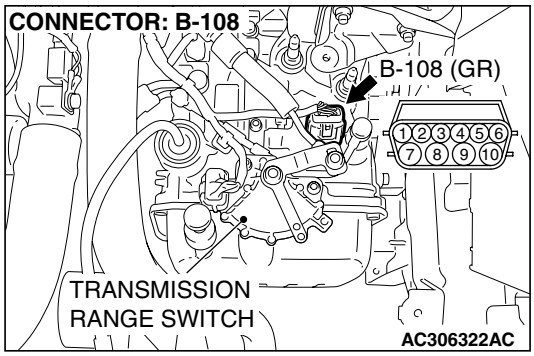
YES : Go to Step 12.

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

STEP 12. Check the harness for an open or short circuit to ground between PCM connector B-21 (terminals 54, 56 and 53 <5A/T>) and A/T control solenoid valve assembly connector B-108 (terminals 6, 7 and 8 <5A/T>).
Q: Are the harness wires in good condition?

YES : Go to Step 13.
NO : Repair or replace the harness wire.



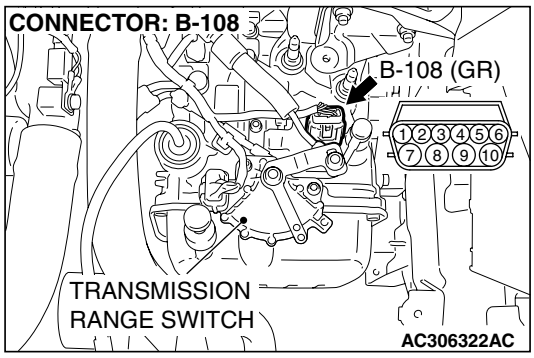


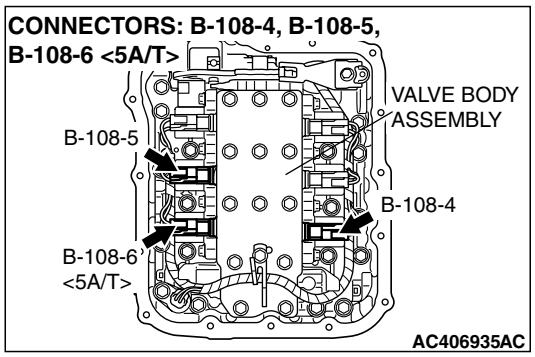
STEP 13. Check the harness for an open or short circuit to ground between A/T control solenoid valve assembly connector B-108 (terminals 6, 7, 8 <5A/T> and 10) and solenoid valve connectors B-108-4 and B-108-5 and B-108-6 <5A/T>.

Q: Is the harness wire in good condition?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

NO : Replace the harness wire.





DTC P1779 (P0731): 1st Gear Incorrect Ratio
DTC P1780 (P0732): 2nd Gear Incorrect Ratio
DTC P1781 (P0733): 3rd Gear Incorrect Ratio
DTC P1782 (P0734): 4th Gear Incorrect Ratio
DTC P1783 (P0735): 5th Gear Incorrect Ratio <5A/T>
DTC P1784 (P0736): Reverse Gear Incorrect Ratio

CIRCUIT OPERATION

- The input shaft speed sensor generates a pulsed signal of 0 ⇔ 5 volts. The pulsed signal frequency increases with an increase in the input shaft speed.
- The PCM continuously monitors the input shaft speed signal.
- The output shaft speed sensor generates a pulsed signal of 0 ⇔ 5 volts. The pulsed signal frequency increases with an increase in the output shaft speed.
- The PCM continuously monitors the output shaft speed signal.

DESCRIPTIONS OF MONITOR METHODS <DTC P1779 (P0731)>

- In 1st gear, if a difference between turbine revolution and that value calculated from output revolution equals or exceeds specified value, PCM judges that step-out in 1st gear has occurred.

MONITOR EXECUTION <DTC P1779 (P0731)>

- Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR) <DTC P1779 (P0731)>

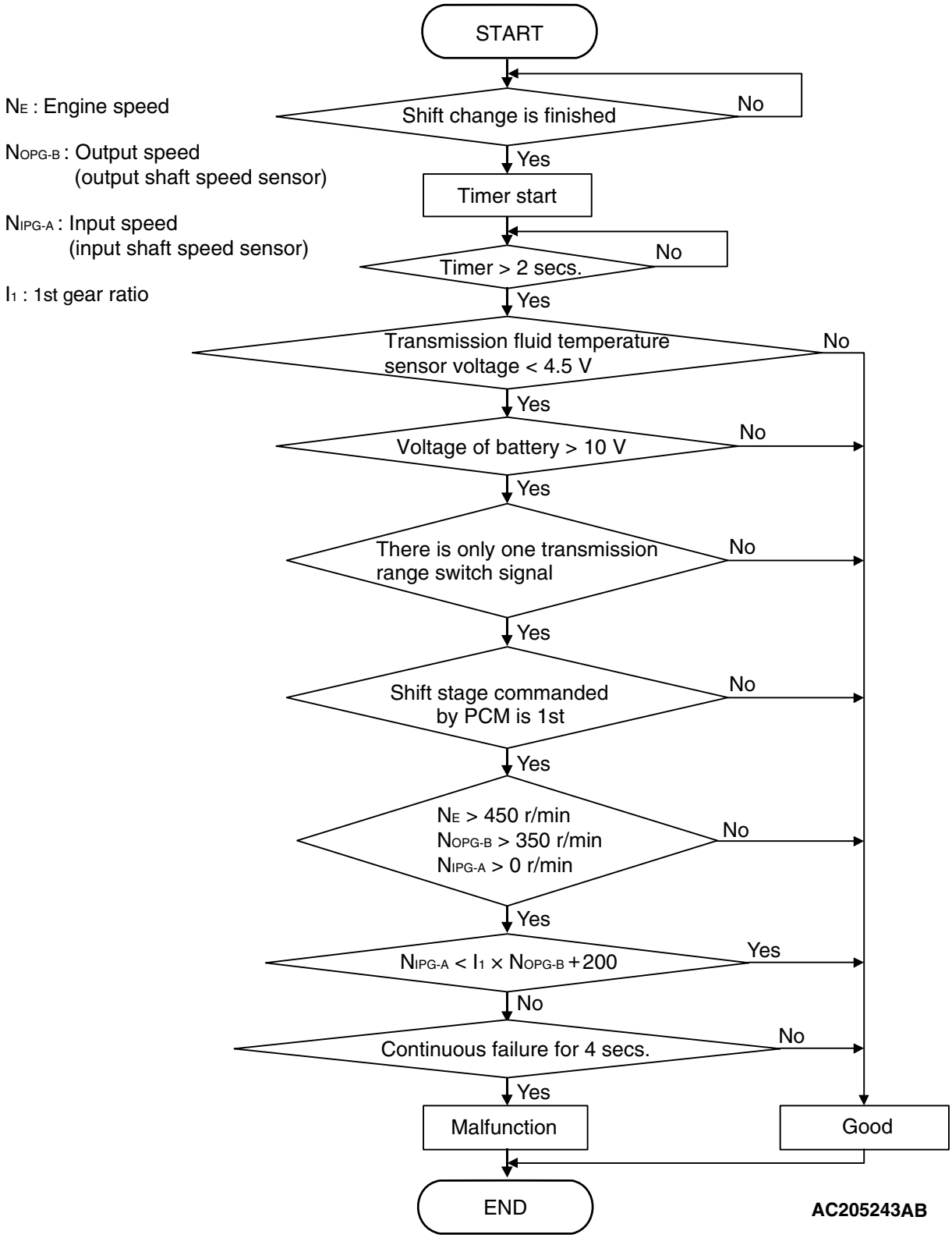
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- DTC P1770, P1771 (P0705): Transmission range switch malfunction
- DTC P1766 (P0715): Input shaft speed sensor malfunction
- DTC P1767 (P0720): Output shaft speed sensor malfunction
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)

- Input shaft speed sensor
- Output shaft speed sensor
- Transmission range switch
- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid
- Overdrive solenoid
- Reduction solenoid <5A/T>
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence) <DTC P1779 (P0731)>



DTC SET CONDITIONS <DTC P1779 (P0731)>

Check Conditions

- Engine speed: 450 r/min or more.
- Output speed: 350 r/min or more.
- Shift stage: 1st gear.
- Input speed: more than 0 r/min.
- Transmission fluid temperature sensor voltage: 4.5 volts or less.
- Voltage of battery: 10 volts or more.

TSB Revision

- Transmission range switch rationality: only one signal.
- Time after shift changing finish: 2 seconds or more.

Judgement Criteria

- Output speed: [(input speed - 200 r/min) / 1st gear ratio] or less. (4 seconds)

DESCRIPTIONS OF MONITOR METHODS <DTC P1780 (P0732)>

- In 2nd gear, if a difference between turbine revolution and that value calculated from output revolution equals or exceeds specified value, PCM judges that step-out in 2nd gear has occurred.

MONITOR EXECUTION <DTC P1780 (P0732)>

- Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR) <DTC P1780 (P0732)>

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

- DTC P1770, P1771 (P0705): Transmission range switch malfunction
- DTC P1766 (P0715): Input shaft speed sensor malfunction
- DTC P1767 (P0720): Output shaft speed sensor malfunction
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- If DTC P1779 (P0731) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN <DTC P1779 (P0731)>

Start the engine, and drive at 20 km/h (12 mph) or more for 10 seconds, with 1st gear fixed (1st gear in sport mode).

- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)

- Input shaft speed sensor
- Output shaft speed sensor
- Transmission range switch
- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid
- Overdrive solenoid
- Reduction solenoid <5A/T>
- A/T control relay

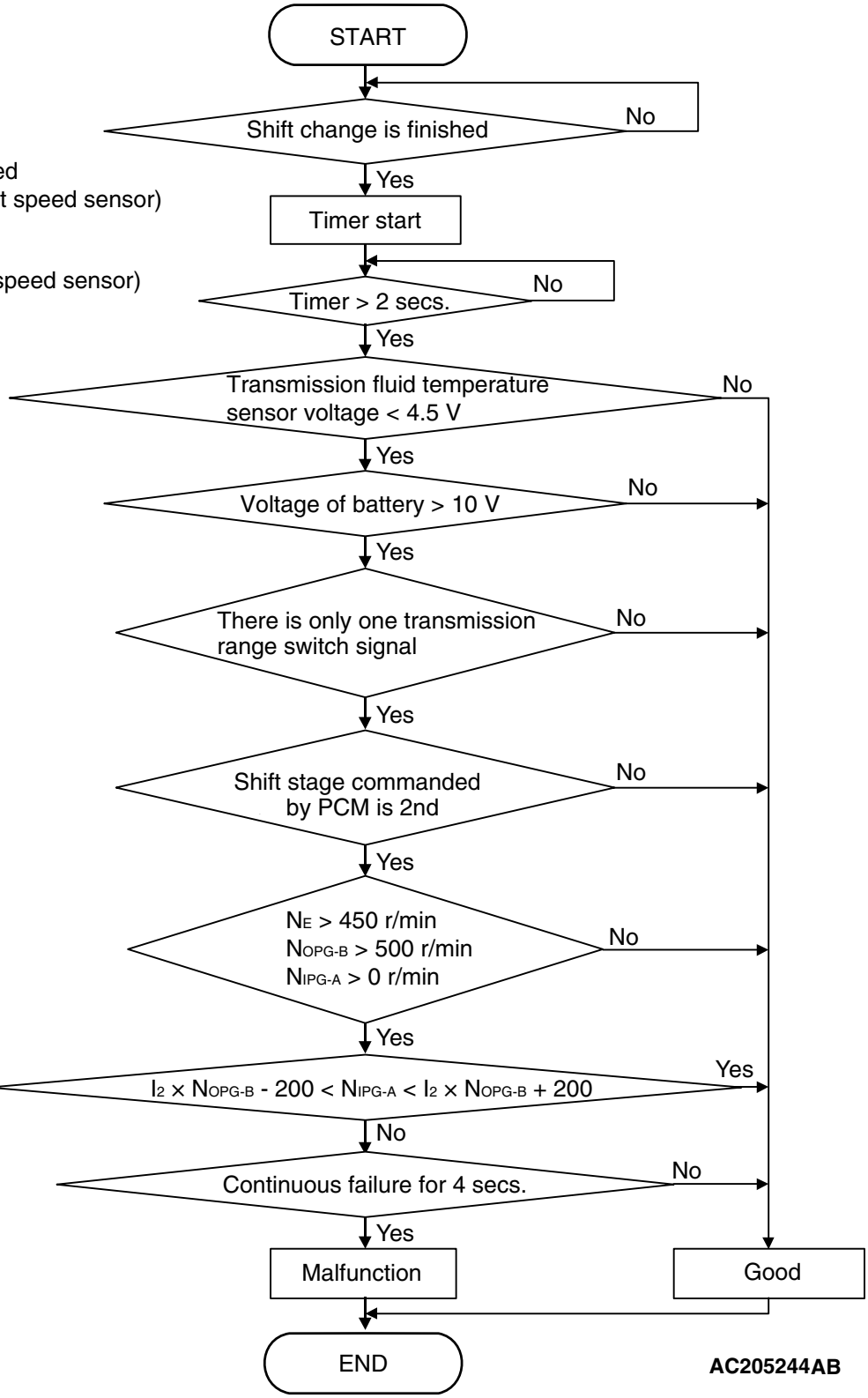
LOGIC FLOW CHARTS (Monitor Sequence) <DTC P1780 (P0732)>

N_E : Engine speed

N_{OPG-B} : Output speed (output shaft speed sensor)

N_{IPG-A} : Input speed (input shaft speed sensor)

I_2 : 2nd gear ratio



DTC SET CONDITIONS <DTC P1780 (P0732)>

Check Conditions

- Engine speed: 450 r/min or more.
- Output speed: 500 r/min or more.
- Shift stage: 2nd gear.
- Input speed: more than 0 r/min.
- Transmission fluid temperature sensor voltage: 4.5 volts or less.
- Voltage of battery: 10 volts or more.

TSB Revision

- Transmission range switch rationality: only one signal.
- Time after shift changing finish: 2 seconds or more.

Judgement Criteria
- Output speed: [(input speed + 200 r/min) / 2nd gear ratio] or more. (4 seconds)
- Output speed: [(input speed - 200 r/min) / 2nd gear ratio] or less. (4 seconds)

DESCRIPTIONS OF MONITOR METHODS <DTC P1781 (P0733)>
- In 3rd gear, if a difference between turbine revolution and that value calculated from output revolution equals or exceeds specified value, PCM judges that step-out in 3rd gear has occurred.

MONITOR EXECUTION <DTC P1781 (P0733)>
- Continuous

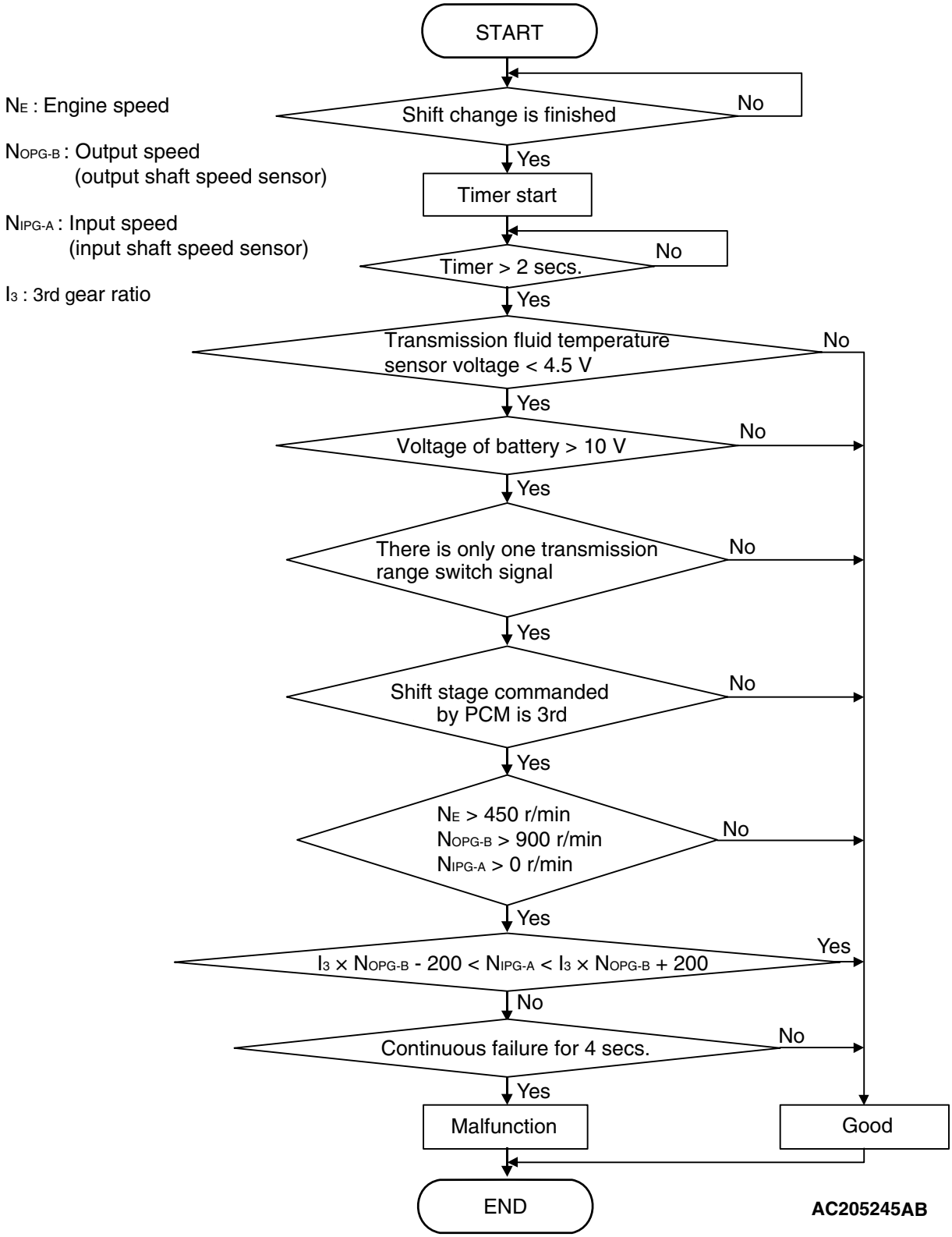
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR) <DTC P1781 (P0733)>

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- DTC P1770, P1771 (P0705): Transmission range switch malfunction
- DTC P1766 (P0715): Input shaft speed sensor malfunction
- DTC P1767 (P0720): Output shaft speed sensor malfunction
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- If DTC P1780 (P0732) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN <DTC P1780 (P0732)>
Start the engine, and drive at 30 km/h (19 mph) or more for 10 seconds, with 2nd gear fixed (2nd gear in sport mode).
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)
- Input shaft speed sensor
- Output shaft speed sensor
- Transmission range switch
- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid
- Overdrive solenoid
- Reduction solenoid <5A/T>
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence) <DTC P1781 (P0733)>



DTC SET CONDITIONS <DTC P1781 (P0733)>

Check Conditions

- Engine speed: 450 r/min or more.
- Output speed: 900 r/min or more.
- Shift stage: 3rd gear.
- Input speed: more than 0 r/min.
- Transmission fluid temperature sensor voltage: 4.5 volts or less.
- Voltage of battery: 10 volts or more.

TSB Revision

- Transmission range switch rationality: only one signal.
- Time after shift changing finish: 2 seconds or more.

Judgement Criteria
- Output speed: [(input speed + 200 r/min) / 3rd gear ratio] or more. (4 seconds)
- Output speed: [(input speed - 200 r/min) / 3rd gear ratio] or less. (4 seconds)

DESCRIPTIONS OF MONITOR METHODS <DTC P1782 (P0734)>
- In 4th gear, if a difference between turbine revolution and that value calculated from output revolution equals or exceeds specified value, PCM judges that step-out in 4th gear has occurred.

MONITOR EXECUTION <DTC P1782 (P0734)>
- Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR) <DTC P1782 (P0734)>

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- DTC P1770, P1771 (P0705): Transmission range switch malfunction
- DTC P1766 (P0715): Input shaft speed sensor malfunction
- DTC P1767 (P0720): Output shaft speed sensor malfunction
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- If DTC P1781 (P0733) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN <DTC P1781 (P0733)>
Start the engine, and drive at 40 km/h (25 mph) or more for 10 seconds, with 3rd gear fixed (3rd gear in sport mode).
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)
- Input shaft speed sensor
- Output shaft speed sensor
- Transmission range switch
- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid
- Overdrive solenoid
- Reduction solenoid <5A/T>
- A/T control relay

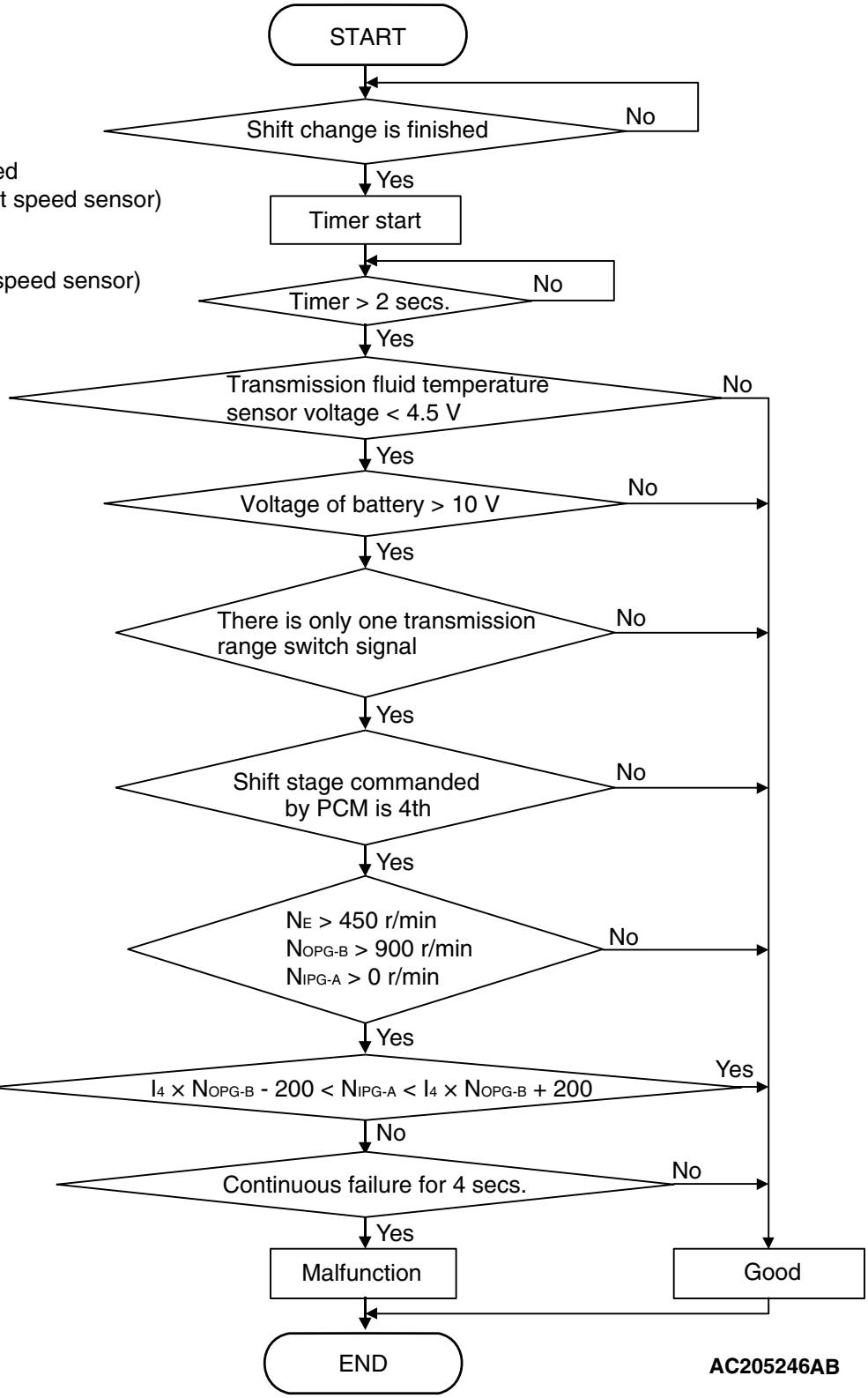
LOGIC FLOW CHARTS (Monitor Sequence) <DTC P1782 (P0734)>

N_E : Engine speed

N_{OPG-B} : Output speed (output shaft speed sensor)

N_{IPG-A} : Input speed (input shaft speed sensor)

I_4 : 4th gear ratio



DTC SET CONDITIONS <DTC P1782 (P0734)>

Check Conditions

- Engine speed: 450 r/min or more.
- Output speed: 900 r/min or more.
- Shift stage: 4th gear.
- Input speed: more than 0 r/min.
- Transmission fluid temperature sensor voltage: 4.5 volts or less.
- Voltage of battery: 10 volts or more.

TSB Revision

- Transmission range switch rationality: only one signal.
- Time after shift changing finish: 2 seconds or more.

Judgement Criteria
- Output speed: [(input speed + 200 r/min) / 4th gear ratio] or more. (4 seconds)
- Output speed: [(input speed - 200 r/min) / 4th gear ratio] or less. (4 seconds)

DESCRIPTIONS OF MONITOR METHODS <DTC P1783 (P0735)> <5A/T>
- In 5th gear, if a difference between turbine revolution and that value calculated from output revolution equals or exceeds specified value, PCM judges that step-out in reverse gear has occurred.

MONITOR EXECUTION <DTC P1783 (P0735)> <5A/T>
- Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR) <DTC P1783 (P0735)> <5A/T>

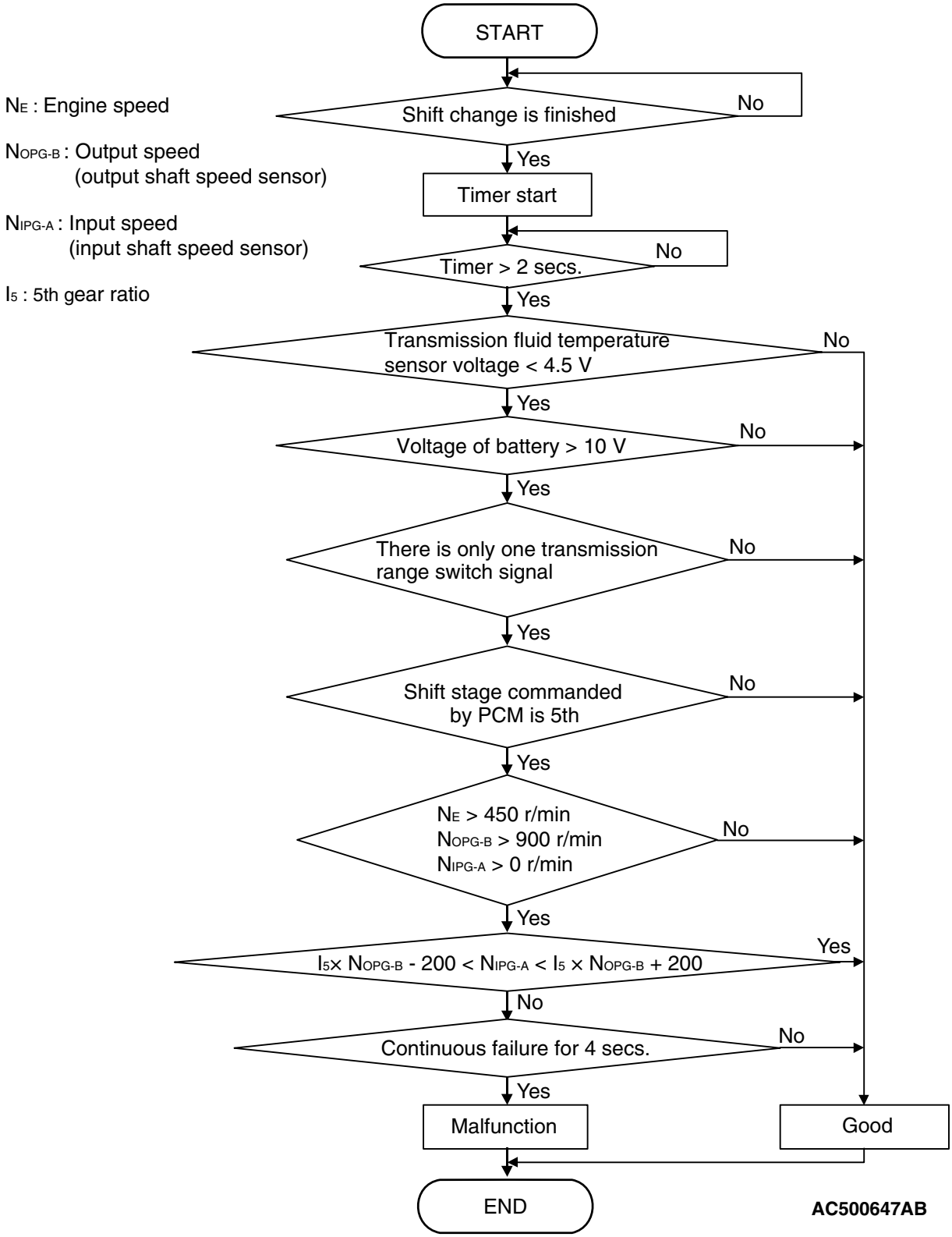
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- DTC P1770 (P0705): Transmission range switch malfunction (Open circuit)
- DTC P1771 (P0705): Transmission range switch malfunction (Short circuit)
- DTC P1766 (P0715): Input shaft speed sensor malfunction
- DTC P1767 (P0720): Output shaft speed sensor malfunction
- If DTC P1782 (P0734) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN <DTC P1782 (P0734)>
Start the engine, and drive at 40 km/h (25 mph) or more for 10 seconds, with 4th gear fixed (4th gear in sport mode).

- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)
- Input shaft speed sensor
- Output shaft speed sensor
- Transmission range switch
- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid
- Overdrive solenoid
- Reduction solenoid
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence) <DTC P1783 (P0735)> <5A/T>



DTC SET CONDITIONS <DTC P1783 (P0735)> <5A/T>

Check Conditions

- Engine speed: 450 r/min or more.
- Output speed: 900 r/min or more.
- Shift stage: 5th gear.
- Input speed: more than 0 r/min.
- Transmission fluid temperature sensor voltage: 4.5 volts or less.

TSB Revision

- Voltage of battery: 10 volts or more.
- Transmission range switch rationality: only one signal.
- Time after shift changing finish: 2 seconds or more.

Judgement Criteria
- Output speed: [(input speed + 200 r/min) / 5th gear ratio] or more. (4 seconds)
- Output speed: [(input speed - 200 r/min) / 5th gear ratio] or less. (4 seconds)

DESCRIPTIONS OF MONITOR METHODS <DTC P1784 (P0736)>
- In reverse gear, if a difference between turbine revolution and that value calculated from output revolution equals or exceeds specified value, PCM judges that step-out in reverse gear has occurred.

MONITOR EXECUTION <DTC P1784 (P0736)>
- Continuous

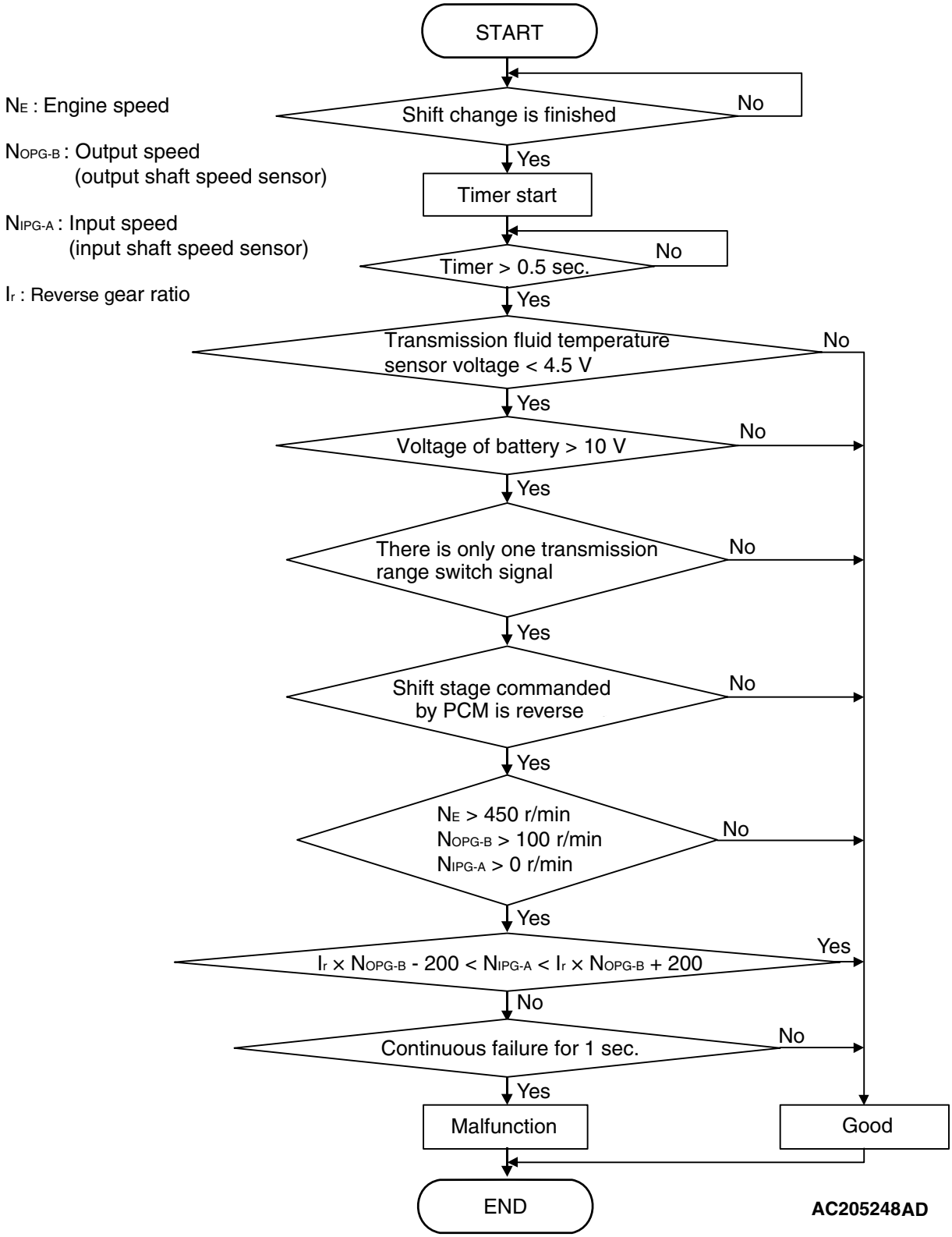
MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR) <DTC P1784 (P0736)>

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- DTC P1770, P1771 (P0705): Transmission range switch malfunction
- DTC P1766 (P0715): Input shaft speed sensor malfunction
- DTC P1767 (P0720): Output shaft speed sensor malfunction
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- If DTC P1782 (P0734) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the selector lever position indicator light (D, 1 through 4 or 5) flashes once per second.

OBD-II DRIVE CYCLE PATTERN <DTC P1783 (P0735)> <5A/T>
Start the engine, and drive at 50 km/h (31 mph) or more for 10 seconds, with 5th gear fixed (5th gear in sport mode).
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)
- Input shaft speed sensor
- Output shaft speed sensor
- Transmission range switch
- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid
- Overdrive solenoid
- Reduction solenoid <5A/T>
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence) <DTC P1784 (P0736)>



DTC SET CONDITIONS <DTC P1784 (P0736)>

Check Conditions

- Engine speed: 450 r/min or more.
- Output speed: 100 r/min or more.
- Shift stage: reverse gear.
- Input speed: more than 0 r/min.
- Transmission fluid temperature sensor voltage: 4.5 volts or less.
- Voltage of battery: 10 volts or more.

TSB Revision

- Transmission range switch rationality: only one signal.
- Time after shift changing finish: 0.5 second or more.

Judgement Criteria

- Output speed: [(input speed + 200 r/min) / reverse gear ratio] or more. (1 second)
- Output speed: [(input speed - 200 r/min) / reverse gear ratio] or less. (1 second)

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

- Malfunction of the input shaft speed sensor
- Malfunction of the output shaft speed sensor
- Malfunction of the PCM
- Malfunction of the underdrive clutch retainer
- Malfunction of the transfer drive gear or driven gear <4A/T>
- If DTC P1784 (P0736) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN <DTC P1784 (P0736)>

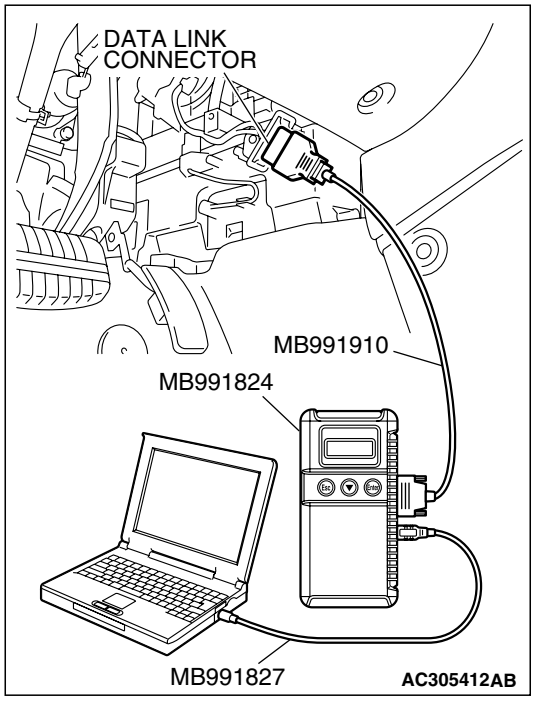
Start the engine, and drive in "R" range at 15 km/h (9 mph) or more for 10 seconds.

- Malfunction of the direct planetary carriers <5A/T>
- Malfunction of clutch system and / or brake system
- Malfunction of the valve body
- Malfunction of the accumrator
- Electrical noise generated

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, read the A/T diagnostic trouble code.

⚠ 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) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC set?

YES <DTC P1766 set> : Refer to P.23A-75, DTC P1766: Input Shaft Speed Sensor System.
YES <DTC P1767 set> : Refer to P.23A-96, DTC P1767: Output Shaft Speed Sensor System.
YES <DTC P1773 set> : Refer to P.23A-172, DTC P1773: Low-Reverse Solenoid Valve System.
YES <DTC P1774 set> : Refer to P.23A-185, DTC P1774: Underdrive Solenoid Valve System.
YES <DTC P1775 set> : Refer to P.23A-196, DTC P1775: Second Solenoid Valve System.
YES <DTC P1776 set> : Refer to P.23A-207, DTC P1776: Overdrive Solenoid Valve System.
YES <DTC P1777 (P0773) set> : Refer to P.23A-218, DTC P1777 (P0773): Reduction Solenoid Valve System <5A/T>.
NO : Go to Step 2.

TSB Revision

STEP 2. Check the hydraulic pressure.

Each hydraulic pressure of the elements below, which DTCs indicate, should be within the standard value. P.23A-37.

- DTC P1779 (P0731): Underdrive clutch, low-reverse brake and reduction brake <5A/T>
- DTC P1780 (P0732): Underdrive clutch, second brake and reduction brake <5A/T>
- DTC P1781 (P0733): Underdrive clutch, overdrive clutch and reduction brake <5A/T>
- DTC P1782 (P0734): Overdrive clutch, underdrive clutch <5A/T> second brake <4A/T> and direct clutch <5A/T>
- DTC P1783 (P0735) <5A/T>: Overdrive clutch, second brake and direct clutch
- DTC P1784 (P0736): Reverse clutch and low-reverse brake

Q: Are the hydraulic pressures within the standard value range?

YES : Go to Step 5.
NO <out of the range in one place> : Go to Step 4.
NO <out of the range in all places> : Go to Step 3.

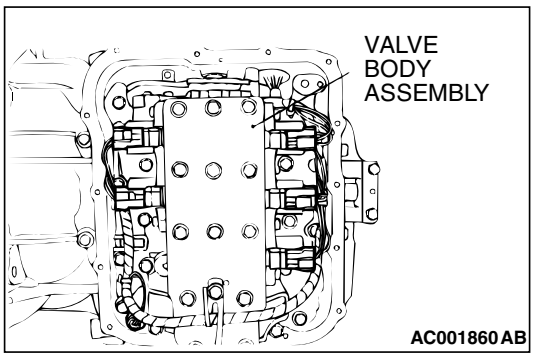
STEP 3. Adjust the line pressure.

Adjust the line pressure. Refer to P.23A-47, Line Pressure Adjustment. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 4.

STEP 4. Disassemble and clean the valve body.



Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, P.23B-67 Valve Body <4A/T> or Refer to GROUP 23C, P.23C-77 Valve Body <5A/T>.
Replace the valve body assembly if the damage is too extensive. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 6.

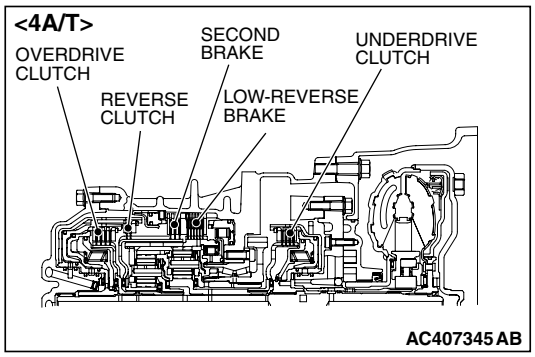
STEP 5. Replace the PCM.

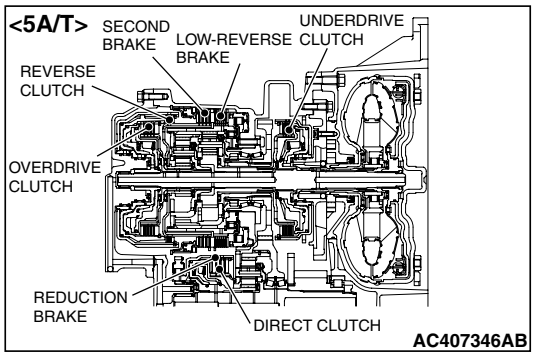
(1) Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Were any A/T DTCs set?

YES : Go to Step 6.
NO : The procedure is complete.

TSB Revision





STEP 6. Overhaul the A/T.

(1) Replace the following parts.

- If DTC P1779 (P0731), DTC P1780 (P0732), or DTC P1781 (P0733) are set individually or in a group, replace the underdrive clutch. Refer to GROUP 23B, P.23B-51 Underdrive Clutch and Input Shaft <4A/T> or Refer to GROUP 23C, P.23C-56 Underdrive Clutch and Input Shaft <5A/T>.
- If DTC P1781 (P0733), DTC P1782 (P0734) or DTC P1783 (P0735) <5A/T> are set individually or in a group, replace the overdrive clutch. Refer to GROUP 23B, P.23B-53 Reverse and Overdrive Clutch <4A/T> or Refer to GROUP 23C, P.23C-58 Reverse and Overdrive Clutch <5A/T>.
- If DTC P1784 (P0736) is set, replace the reverse clutch. Refer to GROUP 23B, P.23B-53 Reverse and Overdrive Clutch <4A/T> or Refer to GROUP 23C, P.23C-58 Reverse and Overdrive Clutch <5A/T>.
- If DTC P1779 (P0731) or DTC P1784 (P0736) are set individually or in a group, replace the low-reverse brake. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.
- If DTC P1780 (P0732), DTC P1782 (P0734) <4A/T> or DTC P1783 (P0735) <5A/T> are set individually or in a group, replace the second brake. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.
- If DTC P1779 (P0731), DTC P1780 (P0732) <5A/T> or DTC P1781 (P0733) <5A/T> are set, replace the one-way clutch. Refer to GROUP 23B, P.23B-58 Planetary Gear <4A/T> or Refer to GROUP 23C, P.23C-66 Planetary Gear <5A/T>.
- If DTC P1782 (P0734) or DTC P1783 (P0735) are set individually or in a group, replace the direct clutch. Refer to GROUP 23B, P.23B-8 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-8 Transaxle <5A/T>.
- If DTC P1779 (P0731), DTC P1780 (P0732), DTC P1781 (P0733) or DTC P1784 (P0736) are set individually or in a group, replace the reduction brake <5A/T>. Refer to GROUP 23C, P.23C-8 Transaxle.

(2) Test drive the vehicle.

(3) Check for A/T diagnostic trouble code.

Q: Are any A/T DTCs set again?

YES : An A/T DTC may have set due to external radio frequency interference (RFI) possibly caused by cellular phone activity, or aftermarket components installed on the vehicle.

NO : The procedure is complete.

DTC P1786 (P0741): Torque Converter Clutch System (Stuck Off)

DESCRIPTIONS OF MONITOR METHODS

- At start of lock-up operation, if lock-up clutch cannot be engaged even when duty ratio of torque converter clutch solenoid remains 100% for more than specified time, PCM judges that torque converter clutch is stuck OFF.

MONITOR EXECUTION

- Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

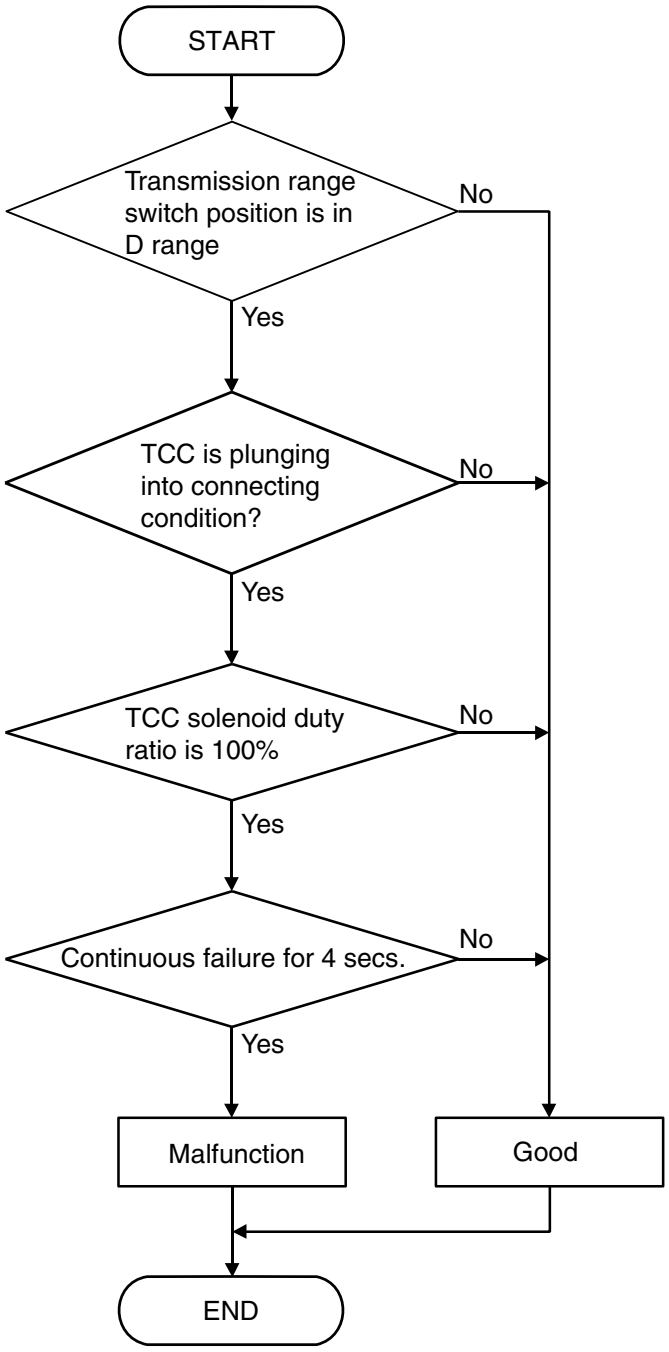
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- DTC P0335: Crankshaft position sensor malfunction
- DTC P1766 (P0715): Input shaft speed sensor malfunction
- DTC P1767 (P0720): Output shaft speed sensor malfunction
- DTC P1787 (P0742): Torque converter clutch system malfunction (Stuck ON)
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>
- DTC P1788 (P1751): A/T control relay malfunction

Sensor (The sensor below is determined to be normal)

- Input shaft speed sensor
- Output shaft speed sensor
- Crankshaft position sensor
- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid
- Overdrive solenoid
- Reduction solenoid <5A/T>
- A/T control relay

LOGIC FLOW CHARTS (Monitor Sequence)



AC500369

DTC SET CONDITIONS

Check Conditions

- Solenoid status: plunging into connecting condition.
- Transmission range switch position: D.

Judgement Criteria

- Time during 100% duty: 4 seconds or more.

OBD-II DRIVE CYCLE PATTERN

Start the engine, and drive at 100 km/h (62 mph) for 10 seconds. Then stop the vehicle, and turn OFF the ignition switch. After that, restart the engine, and drive again at 100 km/h (62 mph) for 10 seconds.

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

- Malfunction of the torque converter clutch solenoid valve
- Malfunction of the input shaft speed sensor
- Malfunction of the valve body

TSB Revision

- Damaged harness or connector
- Malfunction of the PCM
- Malfunction of the torque converter

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, read the A/T diagnostic trouble code.

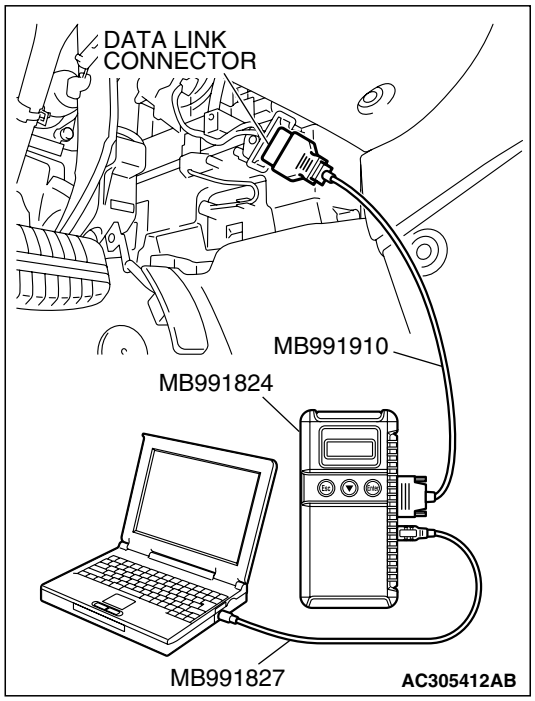
⚠ CAUTION

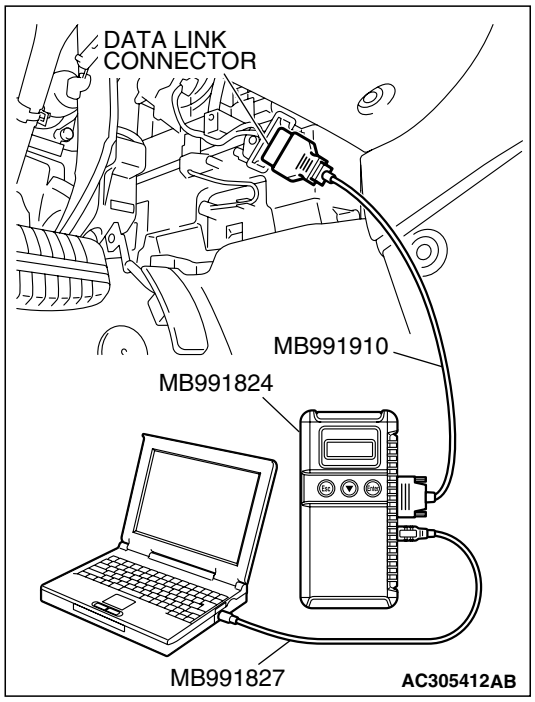
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1766 (P0715) or P1778 (P0743) set?

YES <DTC P1766 (P0715) set> : Refer to P.23A-75, DTC P1766 (P0715): Input Shaft Speed Sensor System.
YES <DTC P1778 (P0743) set> : Refer to P.23A-229, DTC P1778 (P0743): Torque Converter Clutch Solenoid Valve System.
NO : Go to Step 2.





STEP 2. Using scan tool MB991958, check data list item 17: Torque Converter Clutch Solenoid Valve Duty%.

⚠ CAUTION

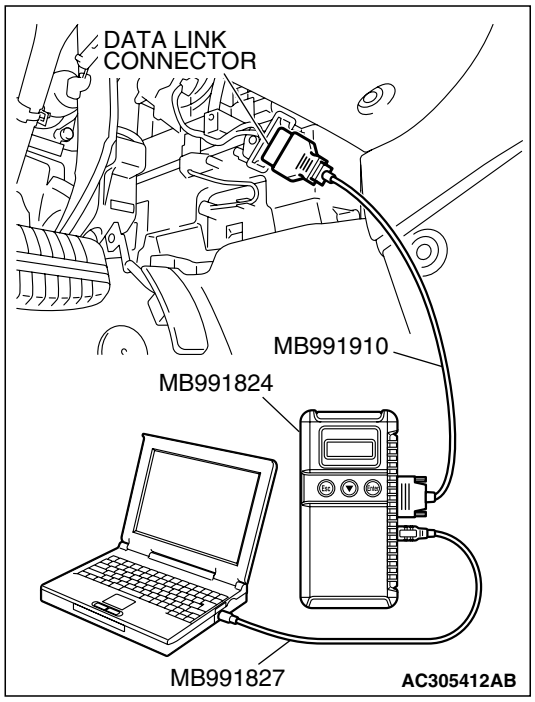
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine. (Warming up engine)
(3) Set scan tool MB991958 to the data reading mode.
- Item 17: Torque Converter Clutch Solenoid Valve Duty%.
  - When driving at constant speed of 60 km/h (37 mph), the display should be "70 – 99.6%" (Gear range: 3rd gear <4A/T>, 4th gear <5A/T>).
  - When the accelerator pedal is released [at less than 50 km/h (31 mph)], the display should be "70 – 99.6% → 0%" (decreases gradually as the vehicle speed decreases) (Gear range: 3rd gear <4A/T>, 4th gear <5A/T>).

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

Q: Is the solenoid valve operating properly?

YES : Go to Step 3.
NO : Go to Step 5.



STEP 3. Using scan tool MB991958, check data list item 10: Torque Converter Clutch Amount of Slippage.

⚠ CAUTION

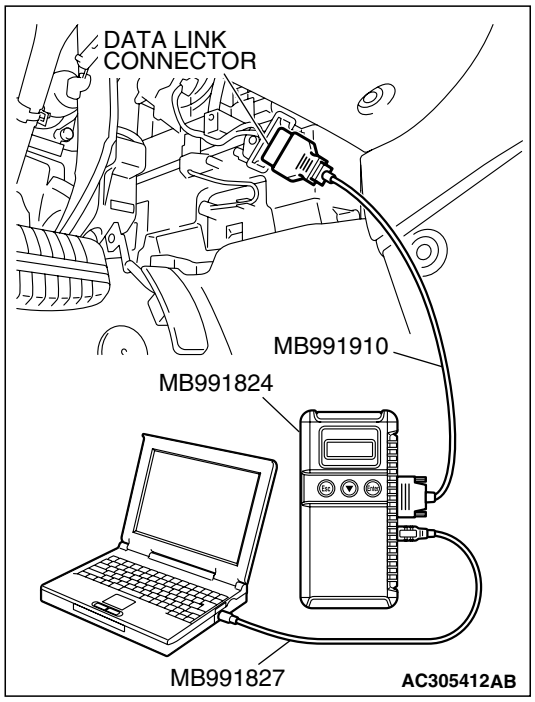
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine. (Warming up engine)
(3) Set scan tool MB991958 to the data reading mode.
- Item 10: Torque Converter Clutch Amount of Slippage.
  - Driving at a constant speed of 60 km/h (37 mph), the display should be "–10 to 10 r/min."
  - If the accelerator pedal is released, the display on the scan tool changes (50 km/h (31 mph) and less).

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

Q: Is the clutch operating properly?

YES : Go to Step 4.
NO : Go to Step 5.



STEP 4. Using scan tool MB991958, read the A/T diagnostic trouble code.

⚠ 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) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1786 (P0741) set?

YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.
NO : The procedure is complete.

STEP 5. Check the hydraulic pressure (for torque converter).

Measure the hydraulic pressure for torque converter. Check if the hydraulic pressure is within the standard value. Refer to P.23A-37, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?

YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Adjust line pressure.

Adjust line pressure. Refer to P.23A-47, Line Pressure Adjustment. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 8.

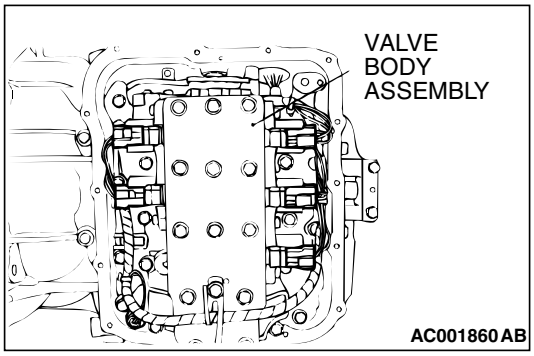
STEP 7. Replace the PCM.

When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 8.

TSB Revision



STEP 8. Replace the valve body.

(1) Replace the valve body. Refer to GROUP 23B, P.23B-67 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-77 Transaxle <5A/T>.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is DTC P1786 set?

YES : Replace the torque converter. Refer to GROUP 23B, P.23B-67 Transaxle <4A/T> or Refer to GROUP 23C, P.23C-77 Transaxle <5A/T>.
NO : The procedure is complete.

DTC P1787 (P0742): Torque Converter Clutch System (Stuck On)

DESCRIPTIONS OF MONITOR METHODS

- With PCM signal for no lock-up engagement, if vehicle speed equals or exceeds specified value, accelerator is ON, and torque converter slip amount is below specified value, PCM judges that torque converter clutch is stuck ON.

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)

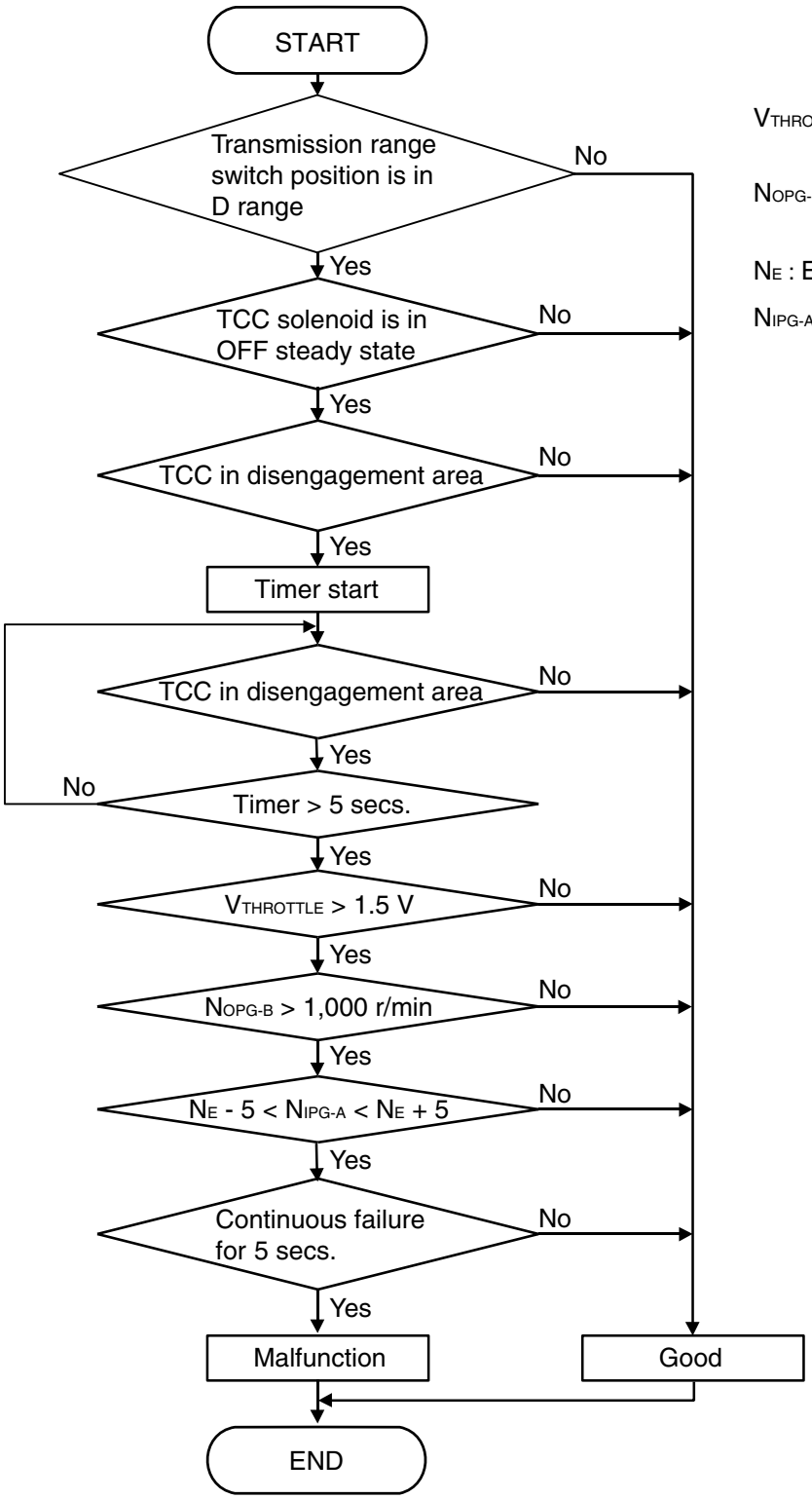
- DTC P0335: Crankshaft position sensor malfunction
- DTC P1766 (P0715): Input shaft speed sensor malfunction
- DTC P1767 (P0720): Output shaft speed sensor malfunction
- DTC P1786 (P0741): Torque converter clutch system malfunction (Stuck OFF)
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- P0122: Throttle position sensor (main) malfunction (Low input)
- P0123: Throttle position sensor (main) malfunction (High input)
- P0222: Throttle position sensor (sub) malfunction (Low input)
- P0223: Throttle position sensor (sub) malfunction (High input)
- P2135: Throttle position sensor (main and sub) range/performance problem
- P0638: Throttle actuator control motor circuit range/performance problem
- P0642: Throttle position sensor power supply
- P1601: Communication malfunction (Between PCM and throttle actuator control module)
- P0606: PCM main processor malfunction
- P2108: Throttle actuator control module processor malfunction
- P2100: Throttle actuator control motor circuit (Open)
- P2101: Throttle actuator control motor magneto malfunction
- P2102: Throttle actuator control motor circuit (Shorted low)
- P2103: Throttle actuator control motor circuit (Shorted high)
- P2122: Accelerator pedal position sensor (main) circuit low input
- P2123: Accelerator pedal position sensor (main) circuit high input
- P2127: Accelerator pedal position sensor (sub) circuit low input
- P2128: Accelerator pedal position sensor (sub) circuit high input
- P2138: Accelerator pedal position sensor (main and sub) range/performance problem

Sensor (The sensor below is determined to be normal)

- Input shaft speed sensor
- Output shaft speed sensor
- Crankshaft position sensor
- Torque converter clutch solenoid
- Throttle position sensor
- Accelerator pedal position sensor

TSB Revision

LOGIC FLOW CHARTS (Monitor Sequence)



$V_{THROTTLE}$: Throttle position sensor output voltage

N_{OPG-B} : Output speed (output shaft speed sensor)

N_E : Engine speed

N_{IPG-A} : Input speed (input shaft speed sensor)

AC500371

DTC SET CONDITIONS

Check Conditions

- Throttle position sensor voltage: 1.5 volts or more.
- Output speed: 1,000 r/min or more.
- Solenoid status: OFF.
- Transmission range switch position: D.
- Time after lock up clutch release: 5 seconds or more.

Judgement Criteria

- Calculated slip (engine speed - input speed): 5 r/min or less. (5 seconds)

TSB Revision

- Calculated slip (engine speed - input speed): -5 r/min or more. (5 seconds)

OBD-II DRIVE CYCLE PATTERN

Start the engine, and drive at 30 km/h (19 mph) for 30 seconds. Then stop the vehicle, and turn "LOCK" (OFF) the ignition switch. After that, restart the engine, and drive again at 30 km/h (19 mph) for 30 seconds.

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

- Malfunction of the torque converter clutch solenoid valve
- Malfunction of the valve body
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, read the A/T diagnostic trouble code.

⚠ CAUTION

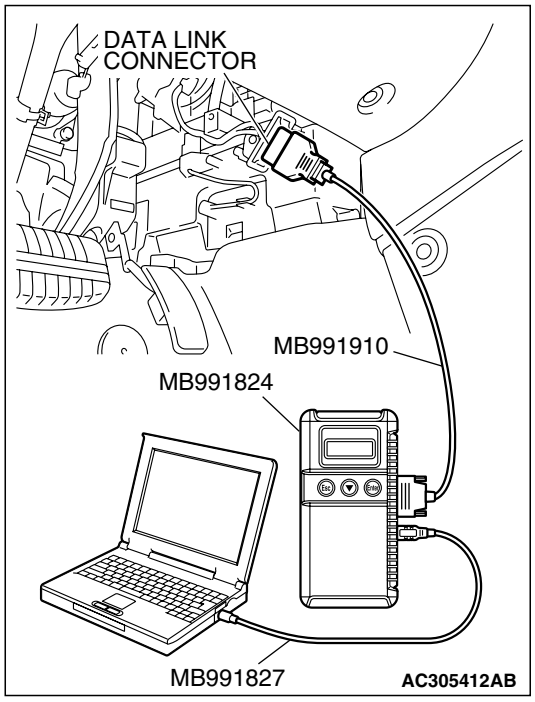
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

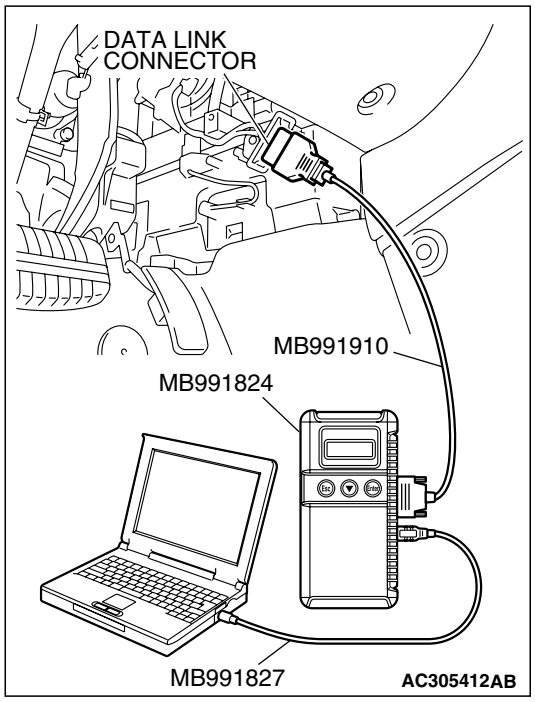
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1778 (P0743) set?

YES : Refer to P.23A-229, DTC P1778 (P0743): Torque Converter Clutch Solenoid Valve System.

NO : Go to Step 2.





STEP 2. Using scan tool MB991958, check data list item 10: Amount of Torque Converter Clutch Slippage.

⚠ 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. (Warming up engine)
(3) Set scan tool MB991958 to the data reading mode.
- Item 10: Torque Converter Clutch Amount of Slippage.
  - Driving at a constant speed of 60 km/h (37 mph), the display should be "–10 to 10 r/min."
  - If the accelerator pedal is released, the display on the scan tool changes (50 km/h (31 mph) and less).

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

Q: Is the torque converter clutch slippage within the specified range?

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.00-14.

NO : Go to Step 3.

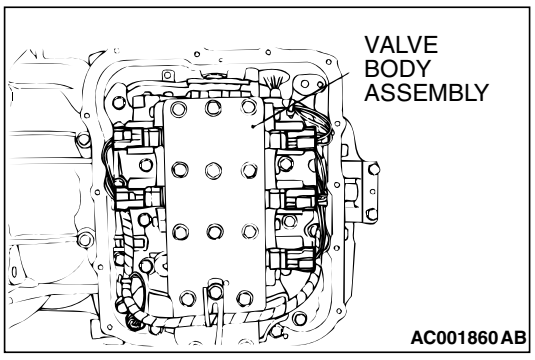
STEP 3. Replace the PCM.

(1) Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is DTC P1787 (P0742) set?

YES : Go to Step 4.

NO : The procedure is complete.



STEP 4. Replace the valve body.

(1) Replace the valve body. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>.
(2) Test drive the vehicle.
(3) Check for A/T diagnostic trouble code.

Q: Is DTC P1787 (P0742) set?

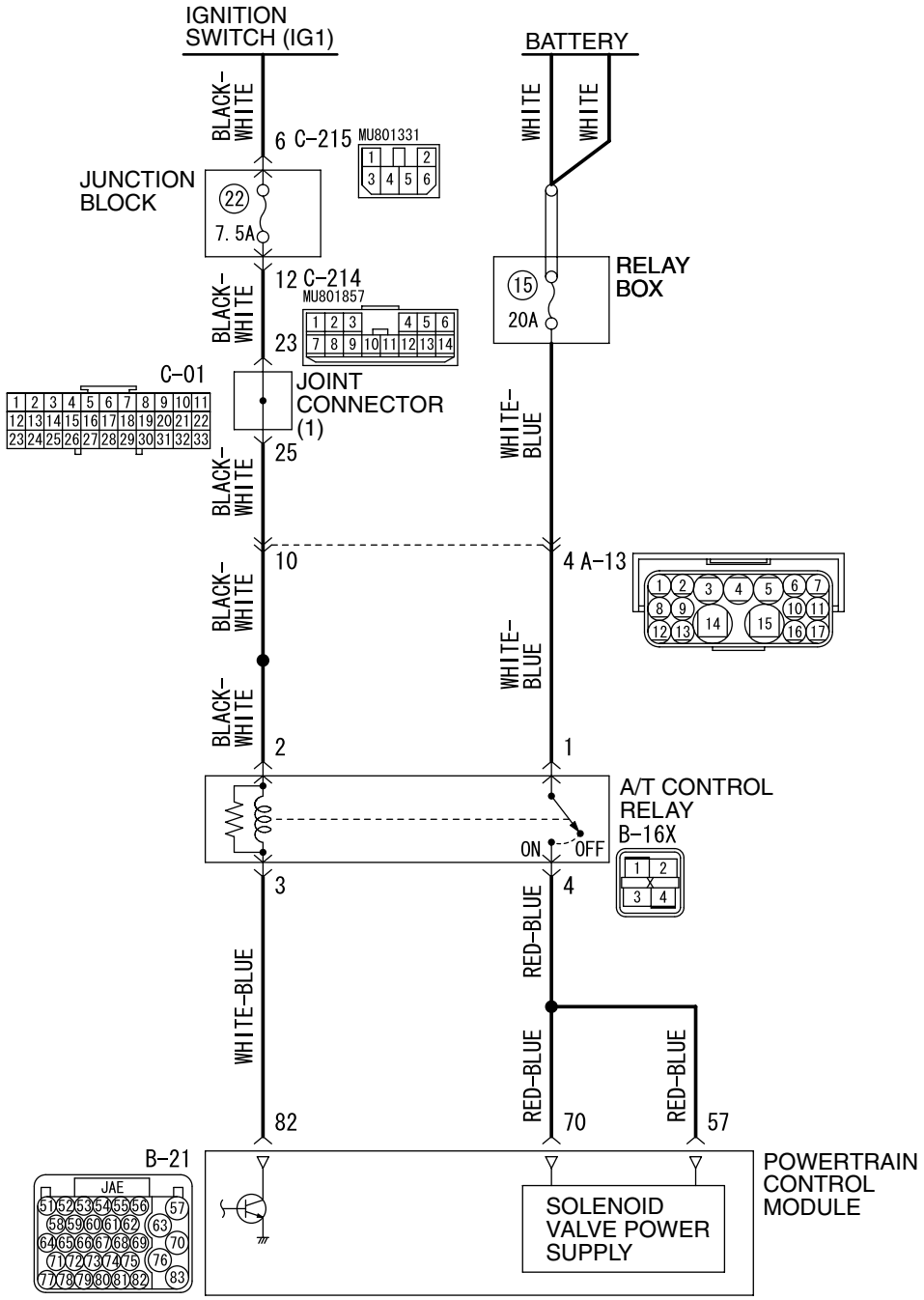
YES : Replace the Torque Converter. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>.

NO : The procedure is complete.

TSB Revision

DTC P1788 (P1751): A/T Control Relay System

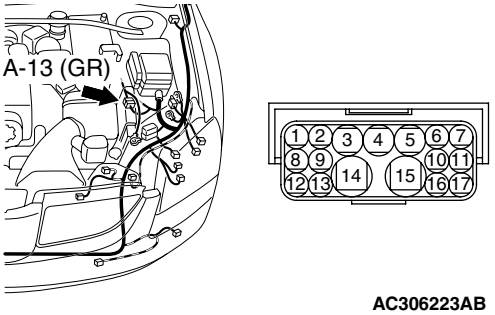
A/T Control Relay System Circuit



W4P06M08AA
AC209761AC

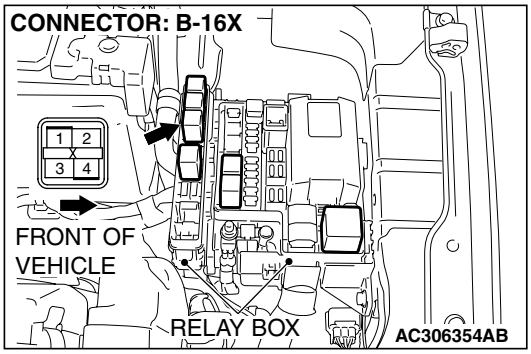
TSB Revision

CONNECTOR: A-13



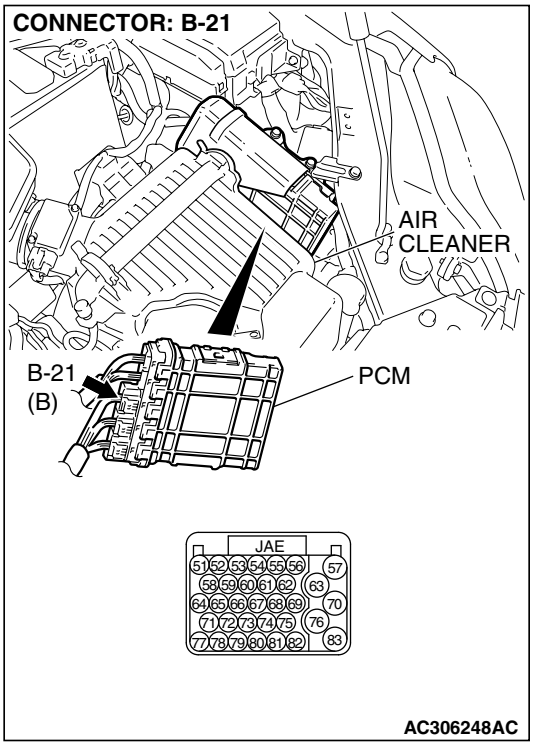
AC306223AB

CONNECTOR: B-16X



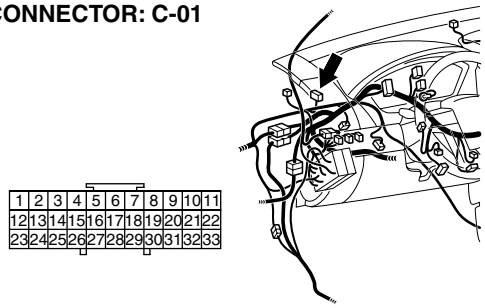
AC306354AB

CONNECTOR: B-21



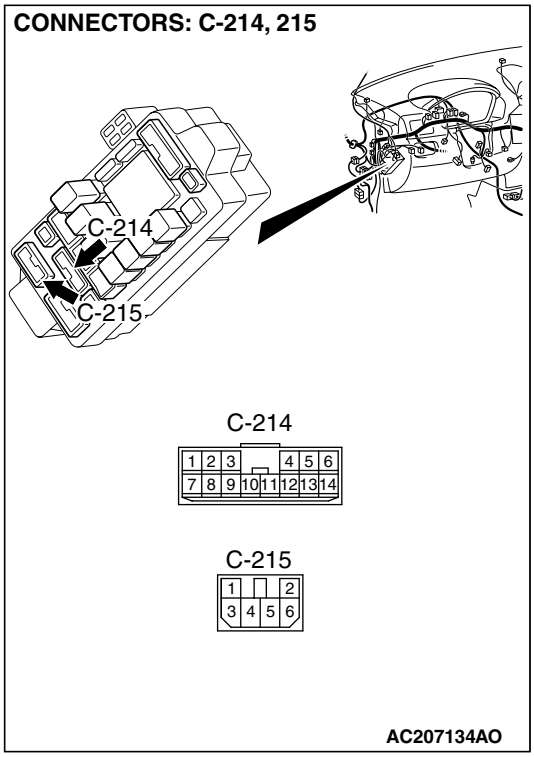
AC306248AC

CONNECTOR: C-01



AC305231AS

TSB Revision



CIRCUIT OPERATION

- A/T control relay (terminal 1) receives the battery positive voltage through a dedicated 20 amp fuse.
- When the ignition switch is turned to the "ON" position, the PCM (terminal 82) receives battery voltage from the ignition switch. The PCM (terminal 82) applies voltage to energize the A/T control relay (terminal 3). With the A/T control relay energized, system voltage is applied to the PCM (terminals 70 and 57).

DESCRIPTIONS OF MONITOR METHODS

- If relay output voltage is below specified value, PCM judges that A/T control relay has a failure.

MONITOR EXECUTION

- Continuous

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

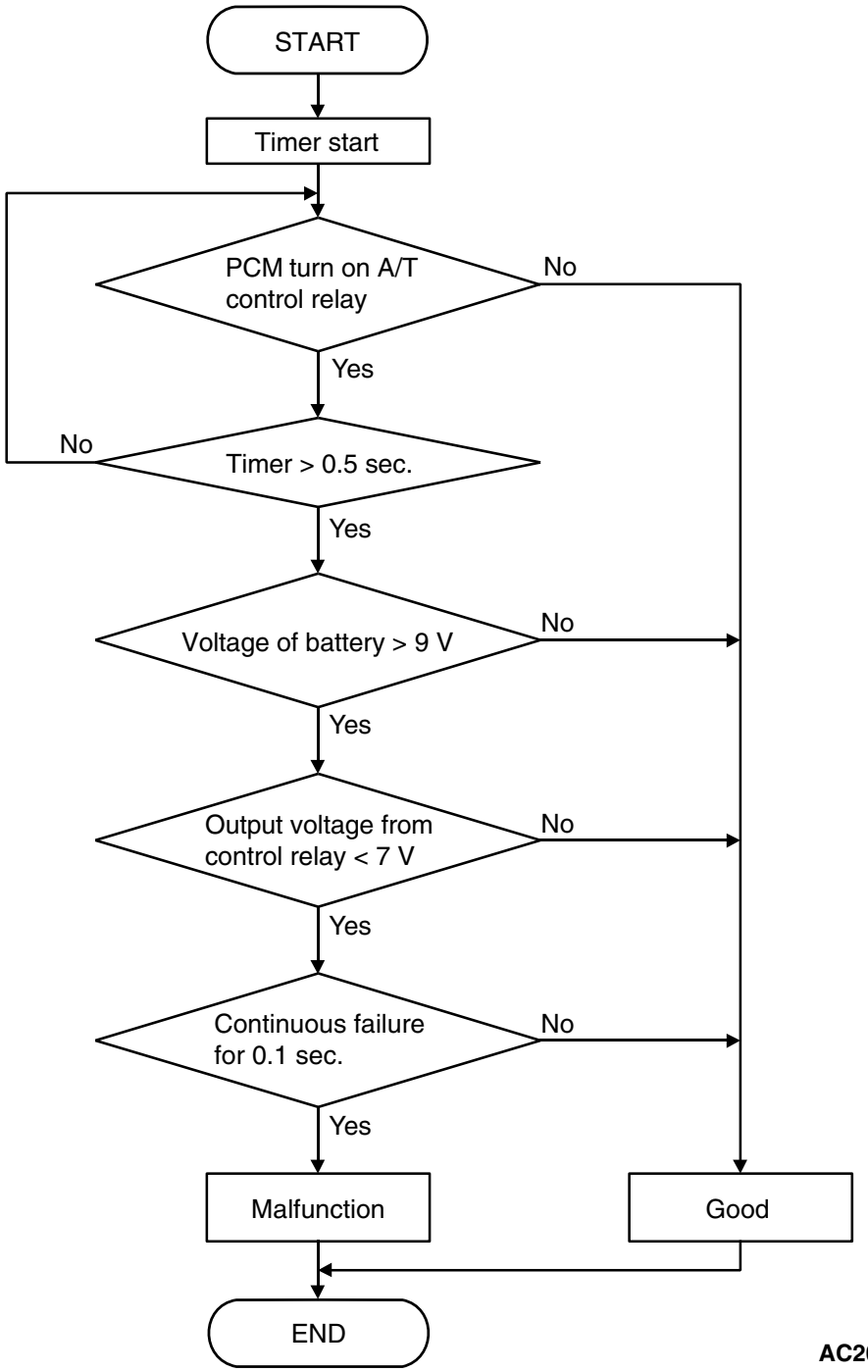
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- DTC P1779 (P0731): 1st gear incorrect ratio
- DTC P1780 (P0732): 2nd gear incorrect ratio
- DTC P1781 (P0733): 3rd gear incorrect ratio
- DTC P1782 (P0734): 4th gear incorrect ratio
- DTC P1783 (P0735): 5th gear incorrect ratio <5A/T>
- DTC P1784 (P0736): Reverse gear incorrect ratio
- DTC P1778 (P0743): Torque converter clutch solenoid malfunction
- DTC P1773 (P0753): Low-reverse solenoid malfunction
- DTC P1774 (P0758): Underdrive solenoid malfunction
- DTC P1775 (P0763): Second solenoid malfunction
- DTC P1776 (P0768): Overdrive solenoid malfunction
- DTC P1777 (P0773): Reduction solenoid malfunction <5A/T>

Sensor (The sensor below is determined to be normal)

- Torque converter clutch solenoid
- Low-reverse solenoid
- Underdrive solenoid
- Second solenoid
- Overdrive solenoid
- Reduction solenoid <5A/T>

LOGIC FLOW CHARTS (Monitor Sequence)



AC205241AB

DTC SET CONDITIONS

Check Conditions

- Voltage of battery: 9 volts or more.
- Time after PCM turns on A/T control relay: 0.5 second or more.

Judgement Criteria

- A/T control relay output voltage: 7 volts or less. (0.1 second)
- If DTC P1788 (P1751) is set consecutively four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the "N" range light flashes once per second.

OBD-II DRIVE CYCLE PATTERN

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

TSB Revision

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

- Malfunction of the A/T control relay
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, check data list item 8: A/T Control Relay Output Voltage.

⚠ 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.

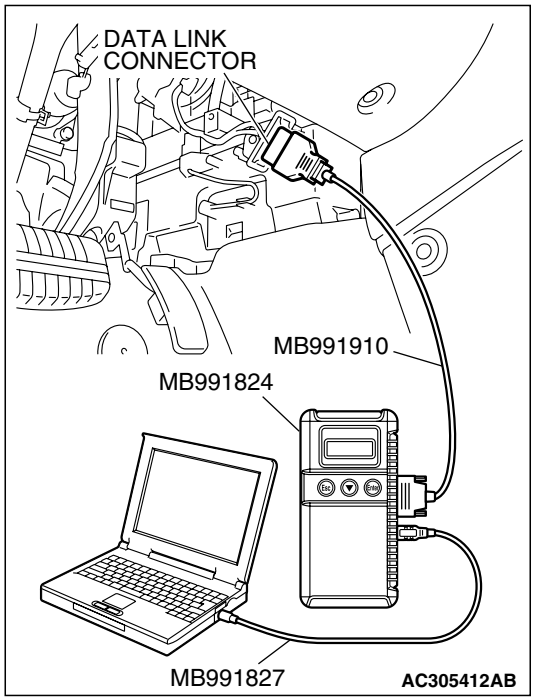
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
  - Item 8: A/T Control Relay Output Voltage.
    - The voltage should equal battery positive voltage.

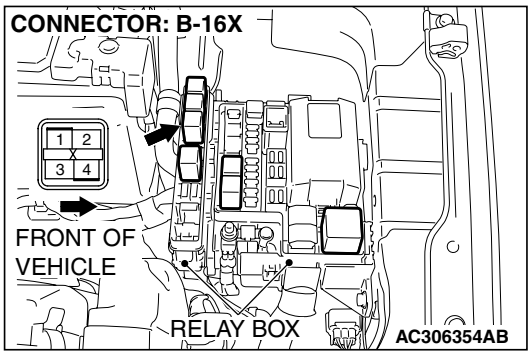
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Does the measured voltage equal battery positive voltage?

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.00-14.

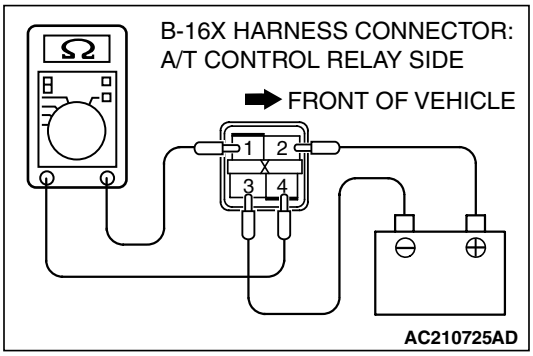
NO : Go to Step 2.





STEP 2. Check the A/T control relay.

(1) Remove the A/T control relay from the engine component relay box connector B-16X.



(2) Using jumper wires, connect terminal 2 to the positive battery terminal, and terminal 3 to the negative battery terminal.

(3) Measure the resistance between terminals 1 and 4 of the A/T control relay.
- The resistance should be measured less than 2 ohms.
- Disconnect the jumper wires. The resistance between terminals 1 and 4 should measure over limits (open circuit).

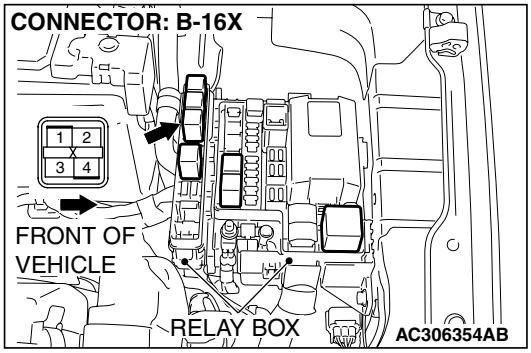
Q: Is the measured resistance less than 2 ohms when the relay is energized, and open circuit when the relay is de-energized?

YES : Go to Step 3.
NO : Replace the A/T control relay.

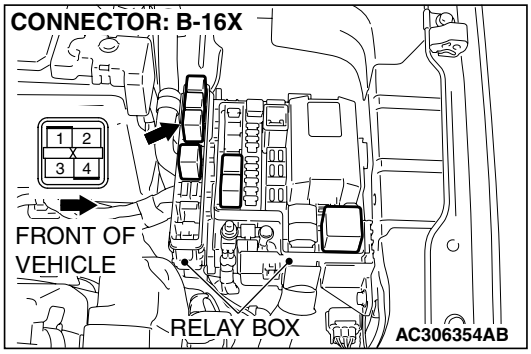
STEP 3. Check A/T control relay socket B-16X in the engine compartment relay box for loose, corroded or damaged terminals, or terminals pushed back in the socket.

Q: Is the relay connector in good condition?

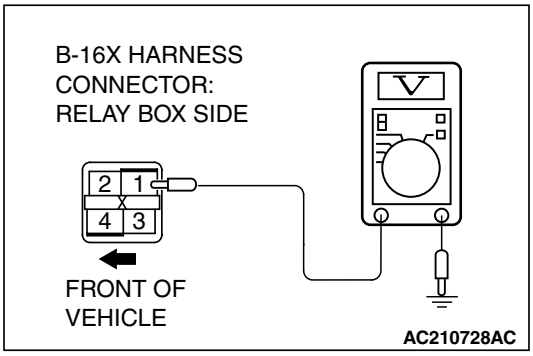
YES : Go to Step 4.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 4. Measure the supply voltage at A/T control relay connector B-16X in the engine component relay box.



(1) Disconnect the A/T control relay.

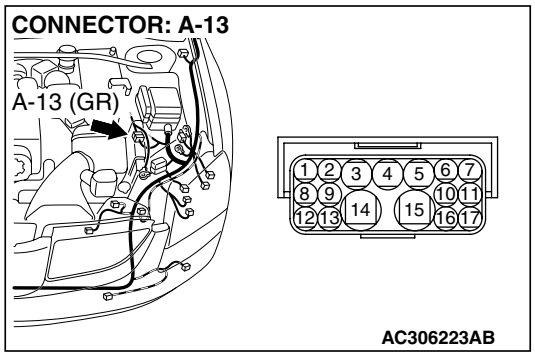


(2) Measure the voltage between terminal 1 and ground.
- The measured voltage should equal battery positive voltage.

Q: Is the measured voltage equal to battery positive voltage?

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

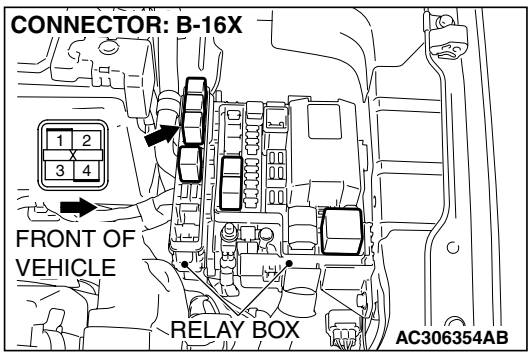
STEP 5. Check intermediate connector A-13 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



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 the harness for open circuit or short circuit to ground between A/T control relay connector B-16X terminal 1 in the engine component relay box and battery.

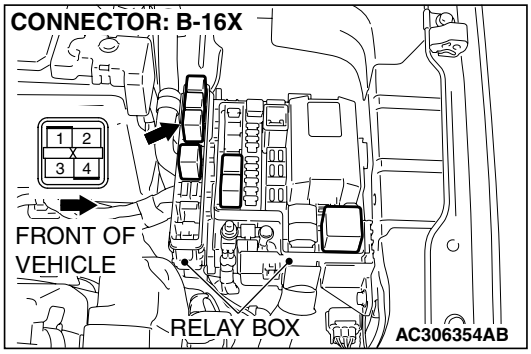


Q: Is the harness wire in good condition?

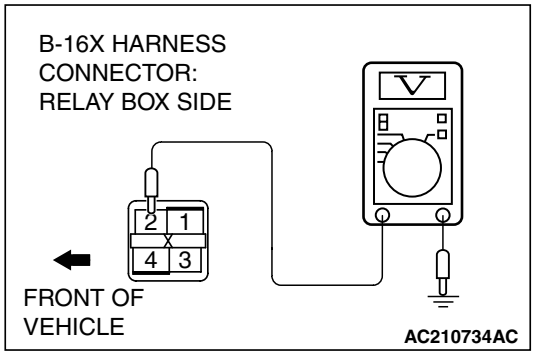
YES : Go to Step 15.
NO : Repair or replace the harness wire.

TSB Revision

STEP 7. Measure the supply voltage at A/T control relay connector B-16X in the engine component relay box.



(1) Disconnect the A/T control relay.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 2 and ground.
- The measured voltage should equal battery positive voltage.

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

Q: Is the measured voltage equal to battery positive voltage?

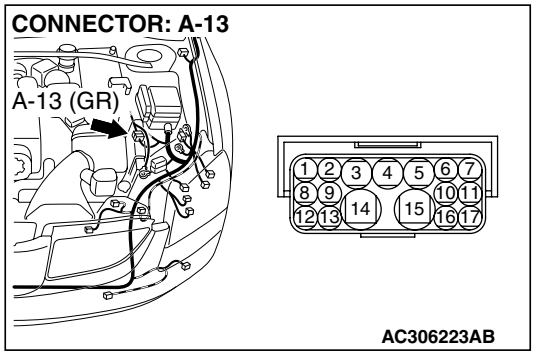
YES : Go to Step 10.
NO : Go to Step 8.

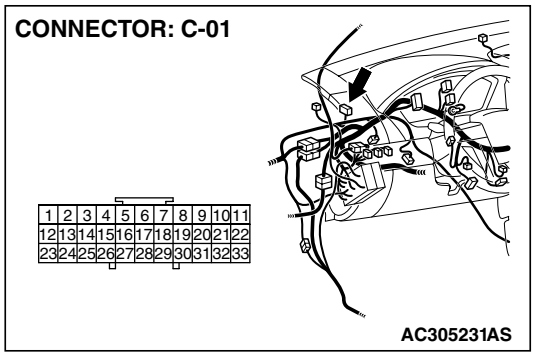
STEP 8. Check intermediate connector A-13, joint connector (1) C-01 and junction block connector C-214 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

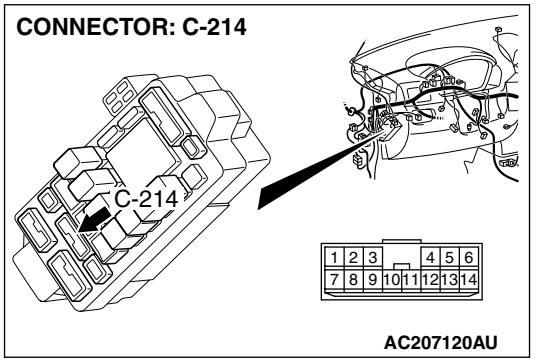
Q: Are the connectors in good condition?

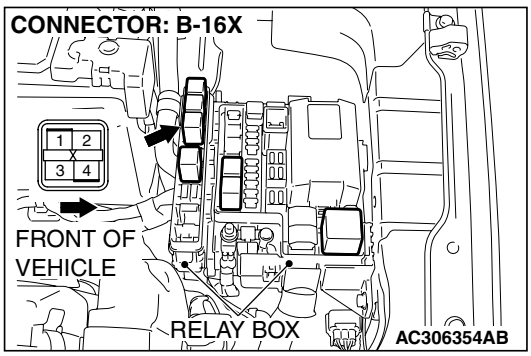
YES : Go to Step 9.

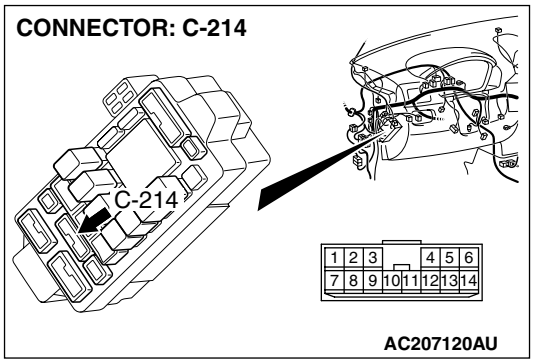
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.











STEP 9. Check the harness for open circuit or short circuit to ground between A/T control relay connector B-16X terminal 2 in the engine component relay box and junction block connector C-214 terminal 12.

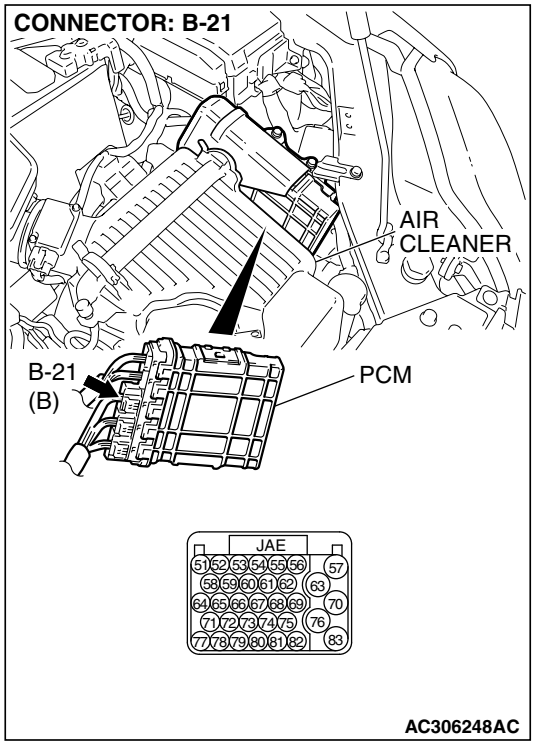
Q: Is the harness wire in good condition?

YES : Go to Step 15.

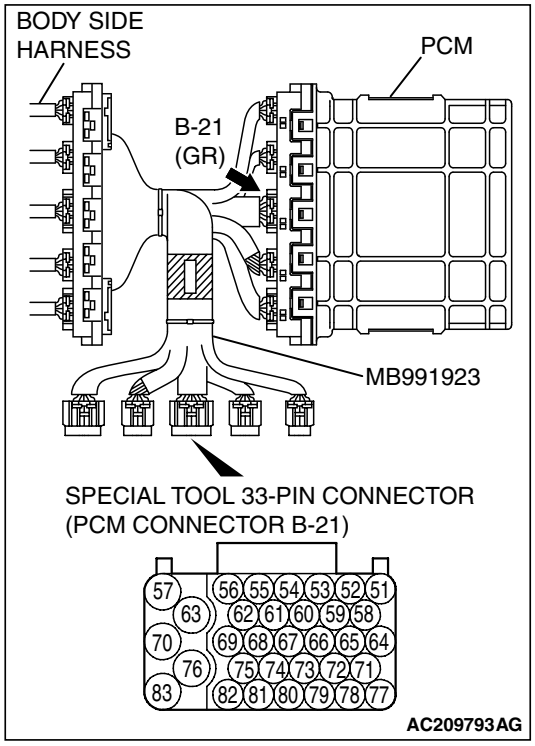
NO : Repair or replace the harness wire.

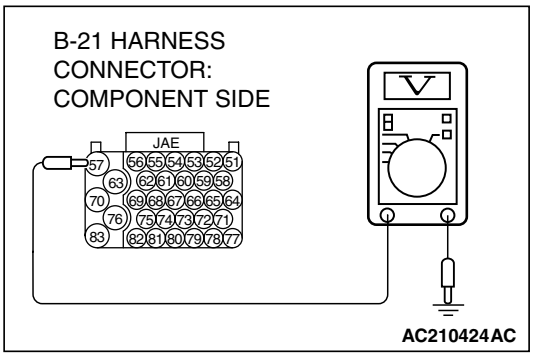
STEP 10. Measure the A/T control relay output voltage at PCM connector B-21 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.

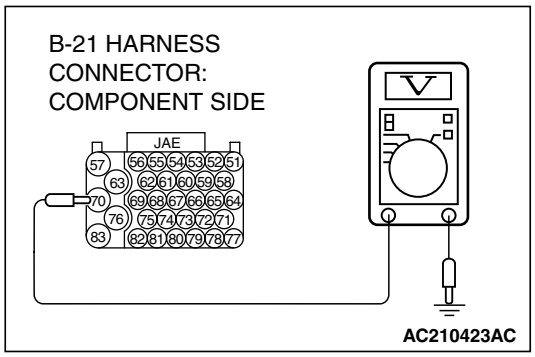


(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal 57 and ground.
- The measured voltage should equal battery positive voltage.



(5) Measure the voltage between terminal 70 and ground.
- The measured voltage should equal battery positive voltage.

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

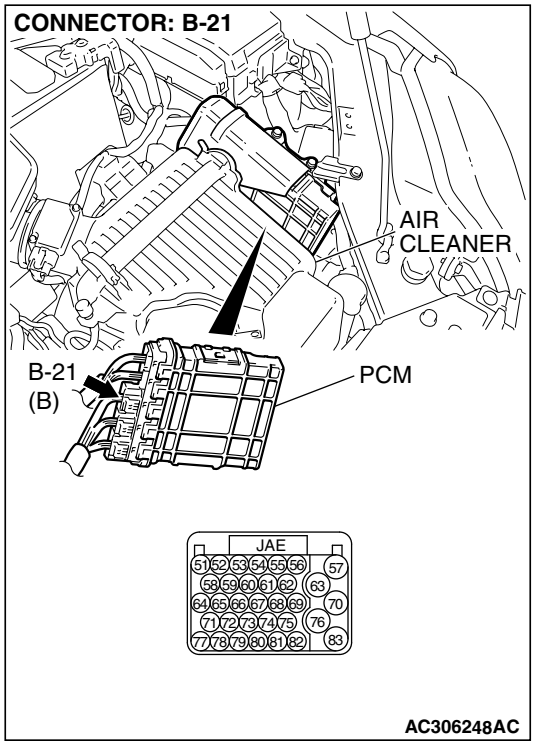
Q: Is the measured voltage equal to battery positive voltage between terminal 57 and ground, and between terminal 70 and ground?

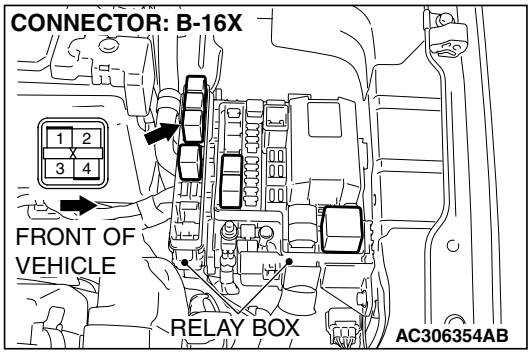
YES : Go to Step 13.
NO : Go to Step 11.

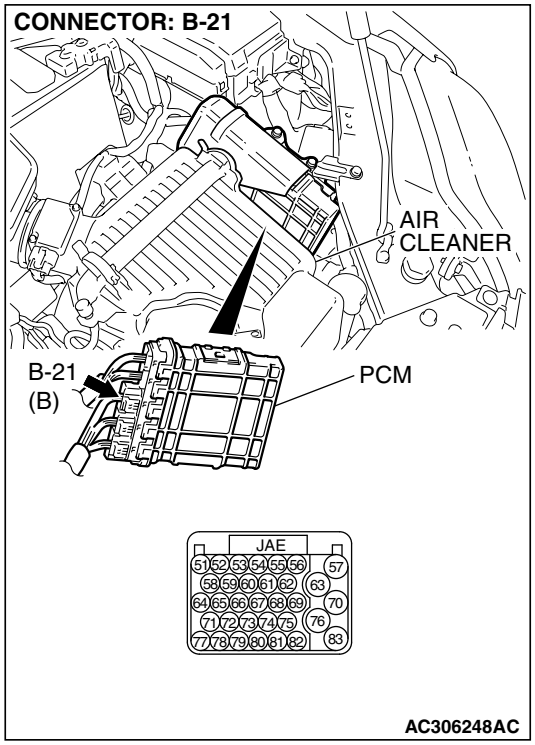
STEP 11. Check PCM connector B-21 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 12.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





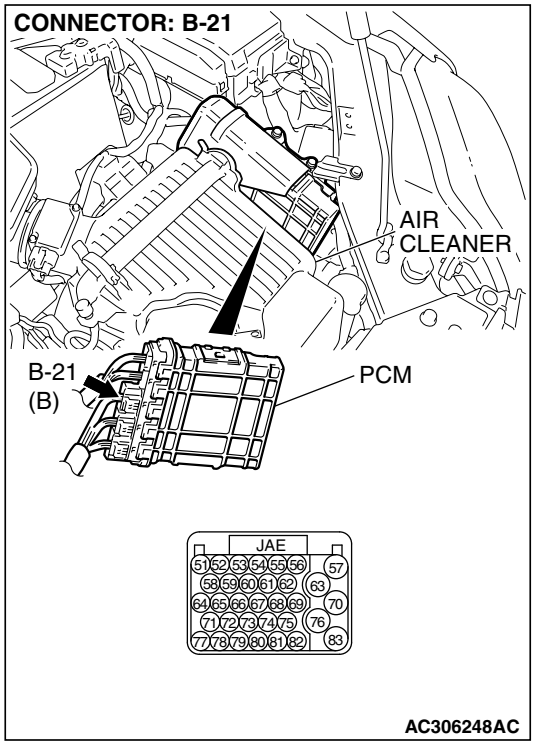


STEP 12. Check harness for open circuit or short circuit to ground between A/T control relay connector B-16X (terminal 4) in the engine component relay box and PCM connector B-21 (terminals 57 and 70).

Q: Is the harness wire in good condition?

YES : Go to Step 15.

NO : Repair or replace the harness wire.

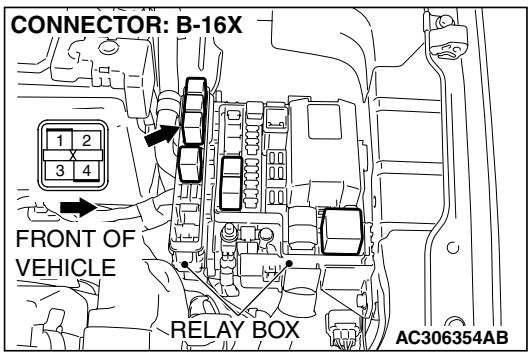


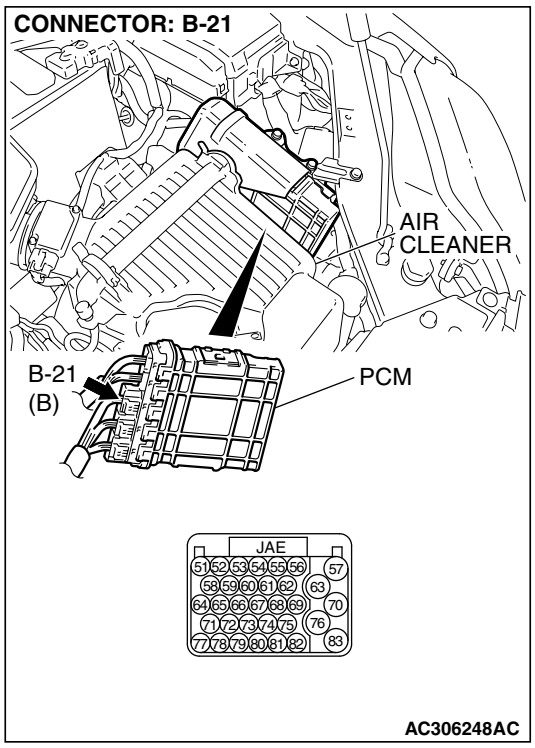
STEP 13. Check PCM connector B-21 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 14.

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



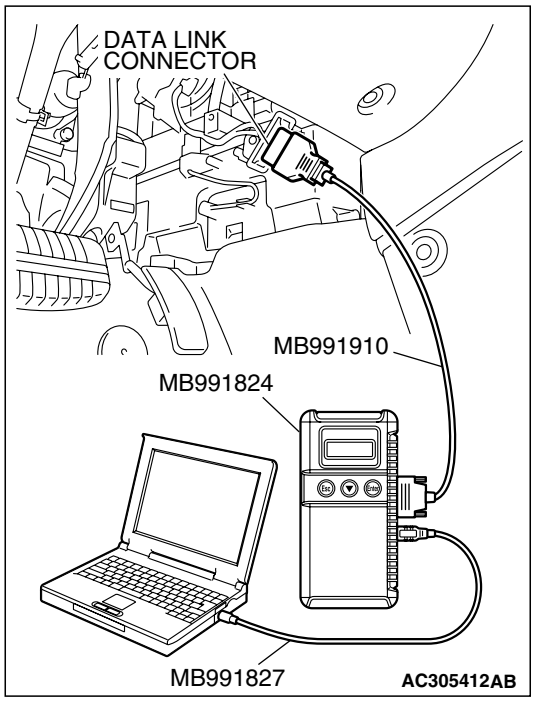


STEP 14. Check harness for open circuit or short circuit to ground between A/T control relay connector B-16X terminal 3 in the engine component relay box and PCM connector B-21 terminal 82.

Q: Is the harness wire in good condition?

YES : Go to Step 15.

NO : Repair or replace the harness wire.



STEP 15. Using scan tool MB991958, check data list item 8: A/T control relay output Voltage.

⚠ 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 8: A/T Control Relay Output Voltage.
  - The voltage should equal battery positive voltage.

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

Q: Is the measured voltage equal battery positive voltage?

YES : It can be that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-14.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

SYMPTOM PROCEDURES

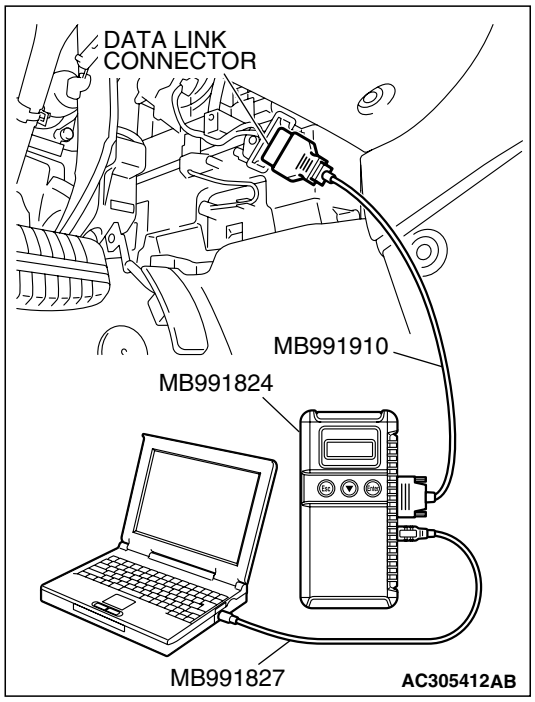
INSPECTION PROCEDURE 1: Engine does not Crank

COMMENT
If the engine does not crank when the selector lever is placed in the "P" or "N" position, the cause is probably a malfunction of the transmission range switch system, transaxle control cable assembly, engine system, torque converter or transaxle oil pump.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Malfunction of the transmission range switch
- Malfunction of the transaxle control cable assembly
- Malfunction of the engine system
- Malfunction of the torque converter
- Malfunction of the transaxle oil pump
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, read the A/T diagnostic trouble code.

⚠ 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.

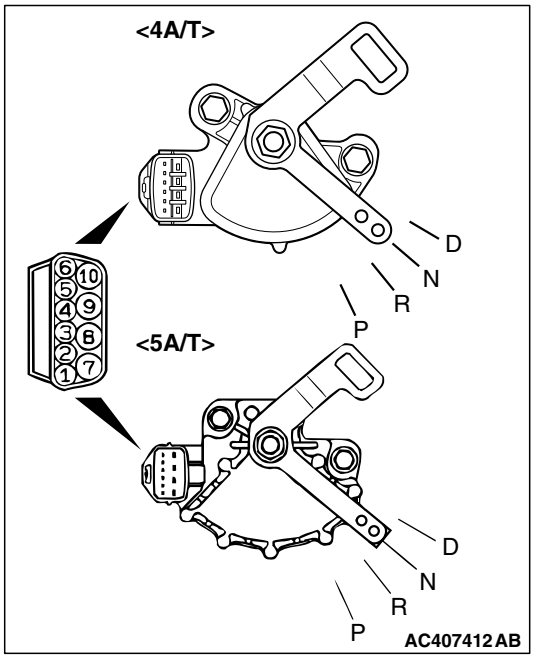
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is A/T DTC P1770 (P0705) or P1771 (P0705) set?

YES <DTC P1770 (P0705) set> : Refer to P.23A-125, DTC P1770 (P0705): Transmission Range Switch System (Open Circuit).

YES <DTC P1771 (P0705) set> : Refer to P.23A-157, DTC P1771 (P0705): Transmission Range Switch System (Short Circuit).

NO : Go to Step 2.



STEP 2. Check the transaxle control cable assembly.

Move the selector lever to each position. The manual control lever position of the transmission range switch should match the transmission range.

Q: Is the manual control lever position correct?

YES : Go to Step 3.

NO : Repair the transaxle control cable. Refer to P.23A-378, Transmission Range Switch and Control Cable Adjustment. Retest the system to verify the repair.

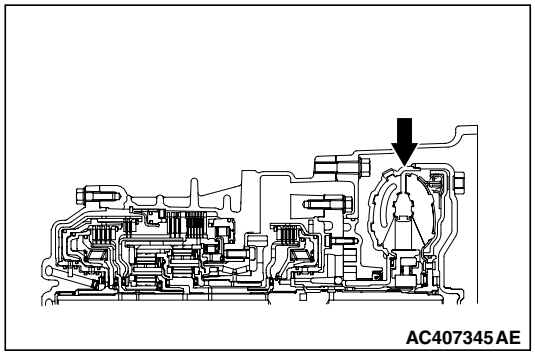
STEP 3. Check the engine.
Refer to GROUP 13A <2.4L Engine>, Diagnosis – Trouble Symptom Chart – Starting P.13A-50.
Refer to GROUP 13B <3.8L Engine>, Diagnosis – Trouble Symptom Chart – Starting P.13B-52.

Q: Is the inspection result good?

YES : Go to Step 4.
NO : Repair or replace the appropriate engine components.

STEP 4. Check the torque converter.
(1) Remove the starter.
(2) Turn the torque converter and check for a binding or sticking condition. Check the ring gear for damaged or missing teeth.

NOTE: Since the torque converter drives the oil pump, turning the torque converter also check for a binding oil pump. If either of these components are damaged the transaxle will need to be removed for inspection.


AC407345 AE

Q: Does the torque converter turn freely without any missing or damaged teeth?

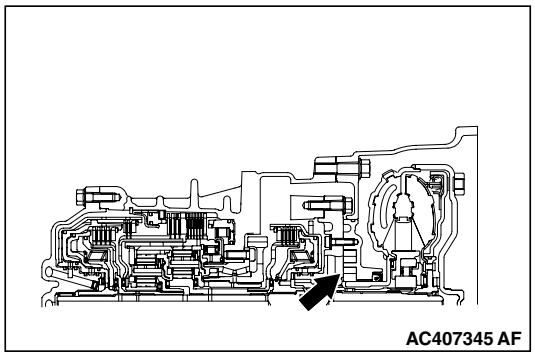
YES : Go to Step 5.
NO : Replace the torque converter. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>.

STEP 5. Repair or replace the starter.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 6.

STEP 6. Check the oil pump.
(1) Remove the transaxle assembly.
(2) Check the oil pump (incorrect installation, damage and etc.) and replace the oil pump assembly if necessary (The oil pump cannot be disassembly).Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>. Confirm that the malfunction symptom is eliminated.


AC407345 AF

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 7.

STEP 7. Replace the PCM.
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Does the engine crank when the selector lever is placed in the "P" or "N" position?
YES : The procedure is complete.
NO : Start over at Step 1.

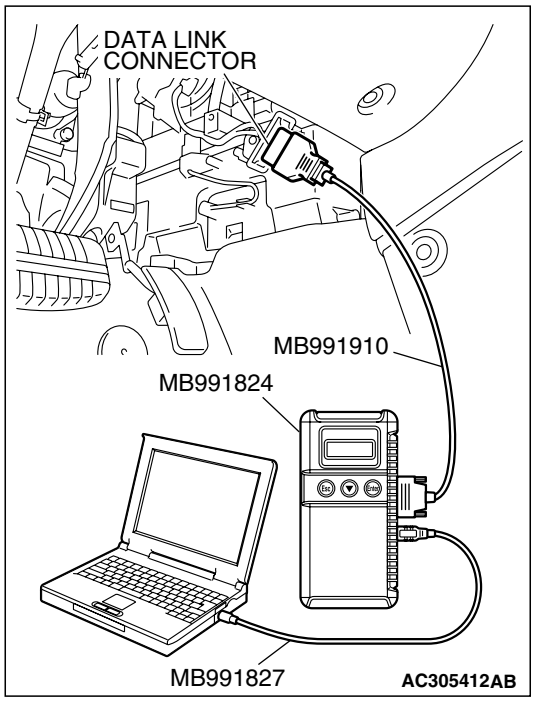
INSPECTION PROCEDURE 2: Does not Move Forward

COMMENT
If the engine is idling and the selector lever is shifted from "N" to "D" range and the vehicle does not drive forward then the cause is due to line pressure defect, under drive clutch or valve body malfunction.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Abnormal line pressure
- Malfunction of the underdrive solenoid valve
- Malfunction of the underdrive clutch
- Malfunction of the oil pump
- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check actuator test item 2: Underdrive Solenoid Valve.

⚠ 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 actuator test mode.
- Item 2: Underdrive Solenoid Valve.
  - An audible clicking or buzzing should be heard when the underdrive solenoid valve is energized.

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

Q: Is the solenoid valve operating properly?

YES : Go to Step 2.
NO : Replace the torque converter. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>.

STEP 2. Check the hydraulic pressure.

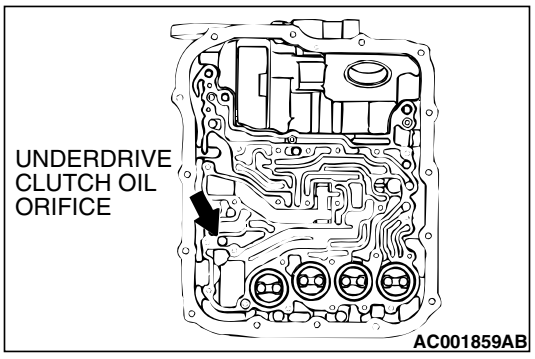
Shift the selector lever to the sport mode then measure the hydraulic pressure of each element in 1st speed to check and see if each respective hydraulic pressure is within the range of standard pressure. Refer to P.23A-37, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?

YES : Go to Step 3.
NO : Go to Step 4.

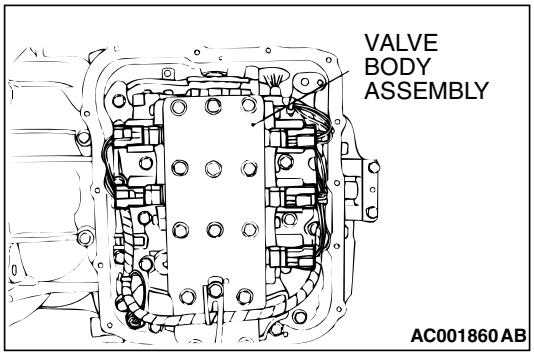
STEP 3. Check the underdrive clutch system.

(1) Remove the valve body cover and valve body. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>.
(2) Blow 108 kPa (15psi) compressed air into the underdrive clutch oil orifice of the transaxle case, and check if the underdrive clutch piston moves and air pressure is maintained in that condition.



Q: Is the air pressure maintained?

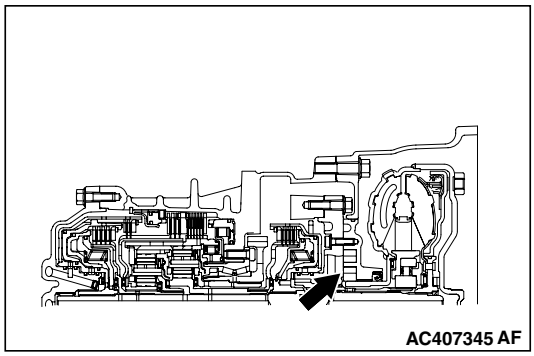
YES : Go to Step 4.
NO : Go to Step 6.



STEP 4. Disassemble and clean the valve body.
Check the O-ring installation bolts for looseness and valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or Refer to GROUP 23C, Valve Body P.23C-77 <5A/T>.
Replace the valve body assembly if the damages are thought to be irreparable. Then check the symptom.

Q: Is the symptom eliminated?

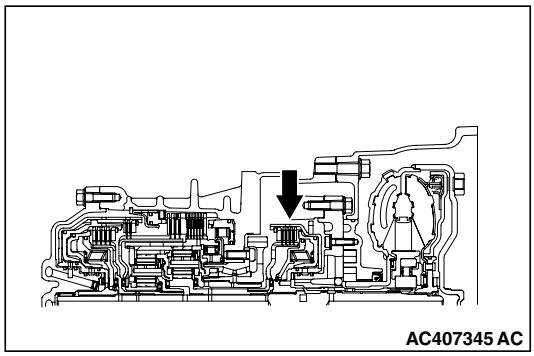
YES : The procedure is complete.
NO : Go to Step 5.



STEP 5. Check the oil pump.
(1) Remove the transaxle assembly.
(2) Check the oil pump (incorrect installation, damage and etc.) and replace the oil pump assembly if necessary (The oil pump cannot be disassembled). Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 7.



STEP 6. Check the underdrive clutch.
(1) Remove the transaxle assembly.
(2) Check the facing for seizure and the piston seal ring for damage and interference with the retainer. Repair or replace the faulty parts. Refer to GROUP 23B, Underdrive Clutch and Input Shaft P.23B-51 <4A/T> or Refer to GROUP 23C, Underdrive Clutch and Input Shaft P.23C-56 <5A/T>. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 7.

STEP 7. Replace the PCM.
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 3: Does not Move Backward

TSB Revision

COMMENT
If the vehicle does not move backward when the selector lever is shifted from "N" to "R" range while the engine is idling, the cause is probably abnormal pressure or a malfunction of the reverse clutch, low-reverse brake, or valve body.

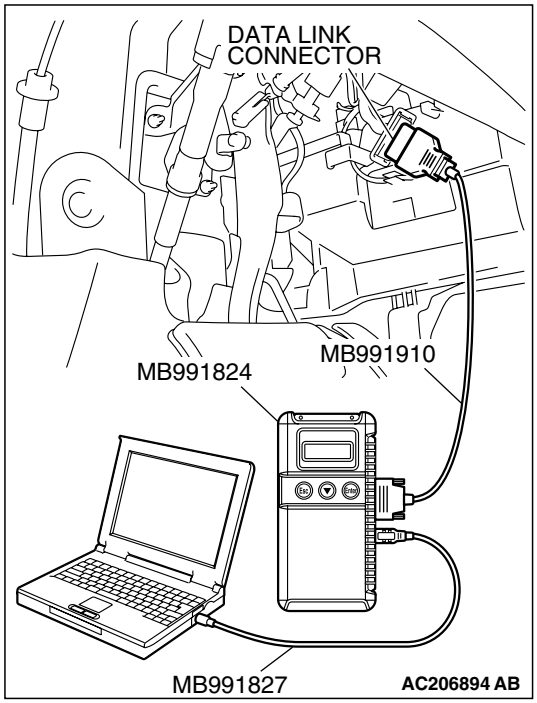
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Abnormal reverse clutch pressure
- Abnormal low-reverse brake pressure
- Malfunction of the low-reverse solenoid valve
- Malfunction of the reverse clutch
- Malfunction of the low-reverse brake
- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, check actuator test item 1: Low-Reverse Solenoid Valve.

⚠ 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 actuator test mode.
- Item 1: Low-Reverse Solenoid Valve.
  - An audible clicking or buzzing should be heard when the low-reverse solenoid valve is energized.

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

Q: Is the solenoid valve operating properly?

YES : Go to Step 2.
NO : Repair or replace the low-reverse solenoid valve. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or Refer to GROUP 23C, Valve Body P.23C-77 <5A/T>. Then confirm that the symptom is eliminated.

STEP 2. Check the hydraulic pressure (for reverse clutch).
Measure the hydraulic pressure for the reverse clutch when the selector lever is at the "R" range, and check if the hydraulic pressure is within the standard value. Refer to P.23A-37, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?

YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check the hydraulic pressure (for low-reverse brake).

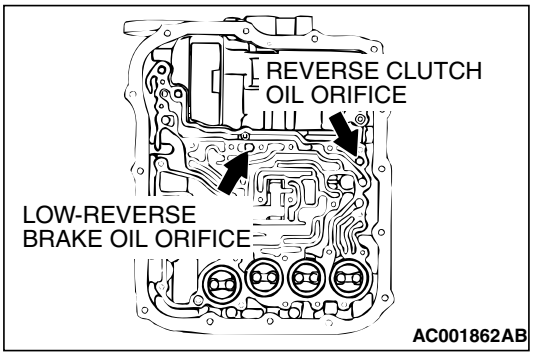
Measure the hydraulic pressure for the low-reverse brake when the selector lever is at the "R" range, and check if the hydraulic pressure is within the standard value. Refer to P.23A-37, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?

YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. Check the reverse clutch system and low-reverse brake system.

(1) Remove the valve body cover and valve body. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>.
(2) Blow 108 kPa (15psi) compressed air into the reverse clutch oil orifice of the transaxle case. Then check if the reverse clutch piston moves and air pressures are maintained in that condition. Repeat for the low-reverse brake.

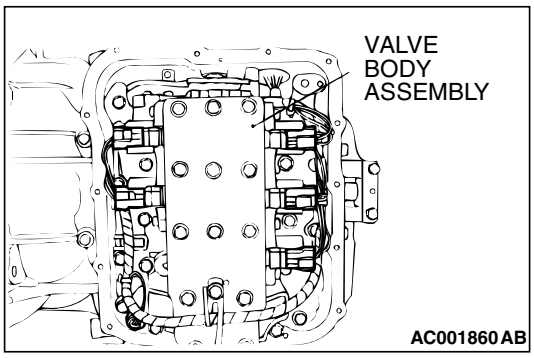


Q: Are the reverse clutch, low-reverse brake or both air pressures maintained?

YES : Go to Step 5.
NO : Go to Step 6.

STEP 5. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or Refer to GROUP 23C, Valve Body P.23C-77 <5A/T>.
Replace the valve body assembly if the damages are thought to be irreparable. Then check the symptom.

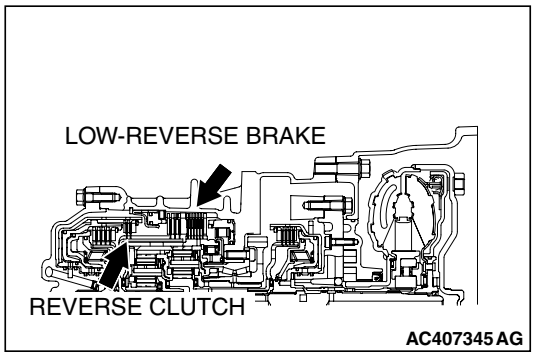


Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 7.

STEP 6. Check the reverse clutch, low-reverse brake or both. Remove the transaxle.

Check the facing for seizure and the piston seal ring for damage and interference with the retainer. Repair or replace the faulty parts. Refer to GROUP 23B, Transaxle P.23B-8, Reverse and Overdrive Clutch P.23B-53 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8, Reverse and Overdrive Clutch P.23C-58 <5A/T>. Then check the symptom.



Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 7.

TSB Revision

STEP 7. Replace the PCM.
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 4: Does not Move (Forward or Backward)

COMMENT
If the vehicle does not move forward or backward when the selector lever is shifted to any position while the engine is idling, the cause is probably abnormal line pressure, or a malfunction of the powertrain, oil pump or valve body.

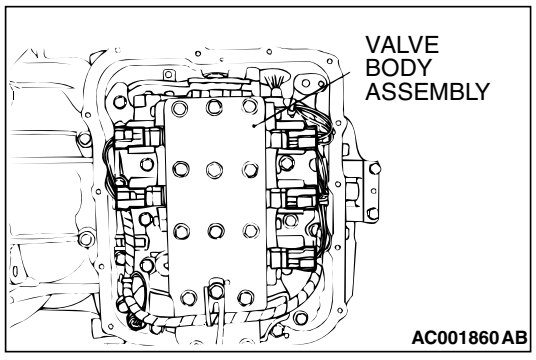
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Abnormal line pressure
- Malfunction of the powertrain
- Malfunction of the oil pump
- Malfunction of the valve body
- Low transmission fluid level
- Malfunction of the PCM

DIAGNOSIS

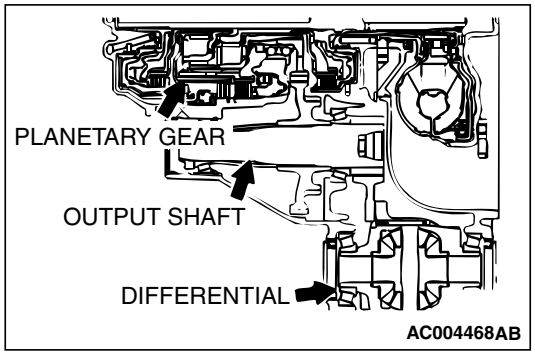
STEP 1. Check the hydraulic pressure.
Measure the hydraulic pressure of each element when the transaxle is in 1st, 2nd or reverse. Check if each hydraulic pressure is within the standard value. Refer to P.23A-37, Hydraulic Pressure Test. If some elements pressures are within the standard value and some are not, recheck the symptom.

Q: Are all pressures within the standard value?
YES : Check transmission fluid level and condition. If not OK, repair or replace as necessary, then retest the system. If OK, go to Step 3.
NO : Go to Step 2.

STEP 2. Disassemble and clean the valve body.
Check the O-ring installation bolts for looseness and valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or Refer to GROUP 23C, Valve Body P.23C-77 <5A/T>.
Replace the valve body assembly if the damages are thought to be irreparable. Then retest the symptom.



Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Go to Step 4.



STEP 3. Check the transaxle powertrain components.
Disassemble the transaxle and check the planetary gear and output shaft, etc. Repair or replace the damaged parts. Refer to GROUP 23B, Transaxle P.23B-8, Planetary Gear P.23B-58, Output Shaft P.23B-62, Differential P.23B-64 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8, Planetary Gear P.23C-66, Direct Planetary Carrier P.23C-70, Differential P.23C-74 <5A/T>. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 5.

STEP 4. Check the oil pump.
(1) Remove the transaxle.
(2) Check the oil pump (incorrect installation, damage and etc.) and replace the oil pump assembly if necessary (The oil pump cannot be disassembled).Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>. Confirm that the malfunction symptom is eliminated.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 5.

STEP 5. Replace the PCM.
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 5: Engine Stalls when Moving Selector Lever from "N" to "D" or "N" to "R"

COMMENT
If the engine stalls when the selector lever is shifted from "N" to "D" or "R" range while the engine is idling, the cause is probably a malfunction of the engine system, torque converter clutch solenoid valve, valve body or torque converter (torque converter clutch malfunction).

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Malfunction of the engine system
- Malfunction of the torque converter clutch solenoid
- Malfunction of the valve body
- Malfunction of the torque converter (Malfunction of the torque converter clutch)
- Malfunction of the PCM

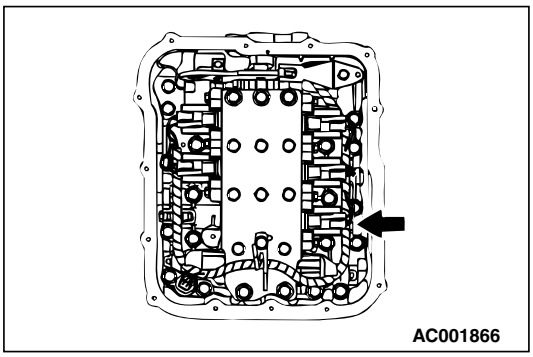
DIAGNOSIS

STEP 1. Check the engine system.
Refer to GROUP 13A <2.4L Engine>, Diagnosis – Trouble Symptom Chart – When the engine is hot, it stalls at idle P.13A-50.
Refer to GROUP 13B <3.8L Engine>, Diagnosis – Trouble Symptom Chart – When the engine is hot, it stalls at idle P.13B-52.

Q: Is the inspection result good?

YES : Go to Step 2.
NO : Repair or replace the engine components.

STEP 2. Replace the torque converter clutch solenoid valve.

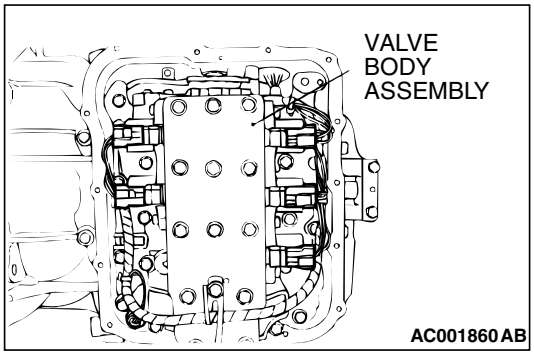

AC001866

Replace the torque converter clutch solenoid valve. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or Refer to GROUP 23C, Valve Body P.23C-77 <5A/T>. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 3.

STEP 3. Disassemble and clean the valve body.



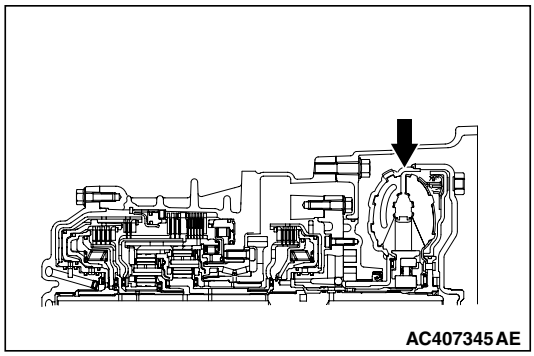
AC001860AB

Check the O-ring installation bolts for looseness and valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or Refer to GROUP 23C, Valve Body P.23C-77 <5A/T>.
Replace the valve body assembly if the damages are thought to be irreparable. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 4.

STEP 4. Replace the torque converter assembly.


AC407345AE

(1) Remove the transaxle.
(2) Replace the torque converter assembly. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 5.

STEP 5. Replace the PCM.
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 6: Shift Shock when Shifting from "N" to "D" and Long Delay

COMMENT
If abnormal shock or delay of two seconds or more occurs when the selector lever is shifted from "N" to "D" range while the engine is idling, the cause is probably abnormal underdrive clutch pressure or a malfunction of the underdrive clutch, valve body or TP sensor.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Abnormal underdrive clutch pressure
- Malfunction of the underdrive solenoid valve
- Malfunction of the underdrive clutch
- Malfunction of the valve body
- Malfunction of the TP sensor
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

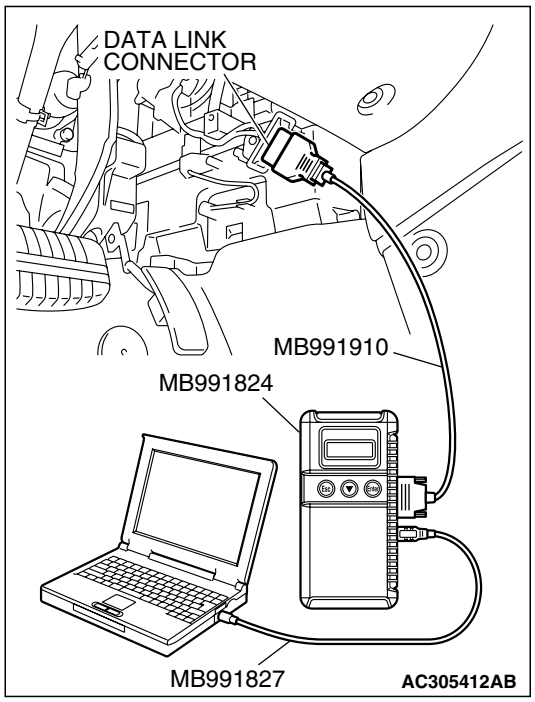
STEP 1. Using scan tool MB991958, check actuator test item 2: Underdrive Solenoid Valve.

⚠ 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 actuator test mode.
- Item 2: Underdrive Solenoid Valve.
  - An audible clicking or buzzing should be heard when the underdrive solenoid valve is energized.

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

Q: Is the solenoid valve operating properly?
YES : Go to Step 2.
NO : Repair or replace the underdrive solenoid valve. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or Refer to GROUP 23C, Valve Body P.23C-77 <5A/T>. Then confirm that the symptom is eliminated.



TSB Revision

STEP 2. Check when shift shock occurs.

Q: When does the shift shock occur?

When engaging from "N" to "D" : Go to Step 3.
When the vehicle starts moving : Go to Step 6.

STEP 3. Check the hydraulic pressure (for underdrive clutch).

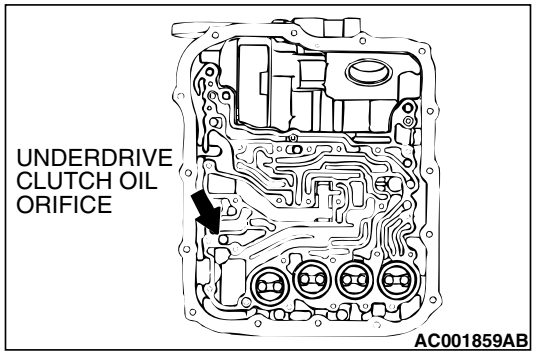
Measure the hydraulic pressure for underdrive clutch when the selector lever is shifted from "N" to "D" range. Check if the hydraulic pressure is within the standard value. Refer to P.23A-37, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?

YES : Go to Step 4.
NO : Go to Step 8.

STEP 4. Check the underdrive clutch system.

(1) Remove the valve body cover and valve body. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or GROUP 23C, Transaxle P.23C-8 <5A/T>.
(2) Blow 108 kPa (15 psi) compressed air into the underdrive clutch oil orifice of the transaxle case, and check if the underdrive clutch piston moves and air pressure is maintained in that condition.

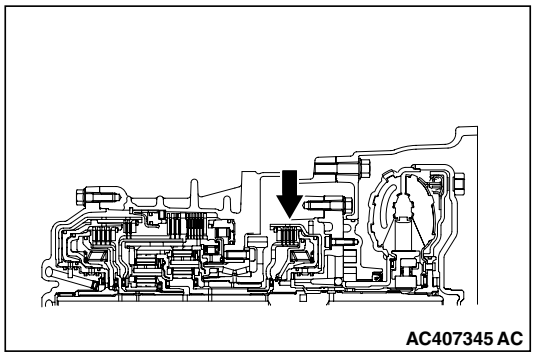


Q: Is the air pressure maintained?

YES : Go to Step 8.
NO : Go to Step 5.

STEP 5. Check the underdrive clutch.

(1) Remove the transaxle assembly.
(2) Check the facing for seizure and the piston seal ring for damage and interference with the retainer. Repair or replace the faulty parts. Refer to GROUP 23B P.23B-51, Underdrive Clutch and Input Shaft <4A/T> or Refer to GROUP 23C P.23C-56, Underdrive Clutch and Input Shaft <5A/T>. Then check the symptom.



Q: Is the symptom eliminated?

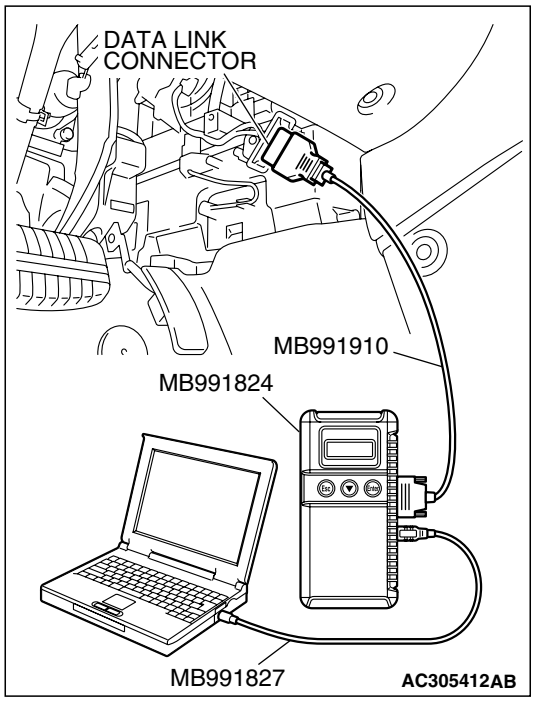
YES : The procedure is complete.
NO : Go to Step 9.

STEP 6. Check shift shock.

Q: Does shift shock occur?

YES : Go to Step 7.
NO : Go to Step 8.

TSB Revision



STEP 7. Using scan tool MB991958, check data list item 2: TP Sensor.

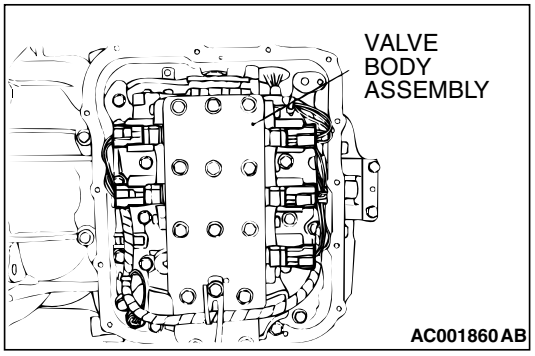
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 2: TP Sensor.
  - With the throttle valve in idle position, voltage should measure between 300 and 700 mV.
  - With the throttle valve in full-open position, voltage should measure 4,000 mV or more.

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

Q: Is the measured voltage between 300 and 700 mV at idle, and 4,000 mV or more at the full-open position?

YES : Go to Step 8.
NO : Check the TP sensor. Refer to GROUP13A <2.4L Engine>, Diagnostic Trouble Code Procedures P.13A-244, P.13A-255, DTCs P0122, P0123: TP Sensor System or refer to GROUP13B <3.8L Engine>, Diagnostic Trouble Code Procedures P.13B-262, P.13B-275, DTCs P0122, P0123: TP Sensor System. Then check the symptom.



STEP 8. Disassemble and clean the valve body.
Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or Refer to GROUP 23C, Valve Body P.23C-77 <5A/T>.
Replace the valve body assembly if the damages are thought to be irreparable. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Replace the valve body assembly. Then check the symptom. Go to Step 9.

STEP 9. Replace the PCM.
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 7: Shift Shock when Shifting from "N" to "R" and Long Delay

TSB Revision

COMMENT

If abnormal shock or delay of two seconds or more occurs when the selector lever is shifted from "N" to "R" range while the engine is idling, the cause is probably abnormal reverse clutch pressure or low-reverse brake pressure, or a malfunction of the reverse clutch, low-reverse brake, valve body or TP sensor.

TROUBLESHOOTING HINTS (The most likely causes for this condition:)

- Abnormal reverse clutch pressure
- Abnormal low-reverse brake pressure
- Malfunction of the low-reverse solenoid valve
- Malfunction of the reverse clutch
- Malfunction of the low-reverse brake
- Malfunction of the valve body
- Malfunction of the TP sensor
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

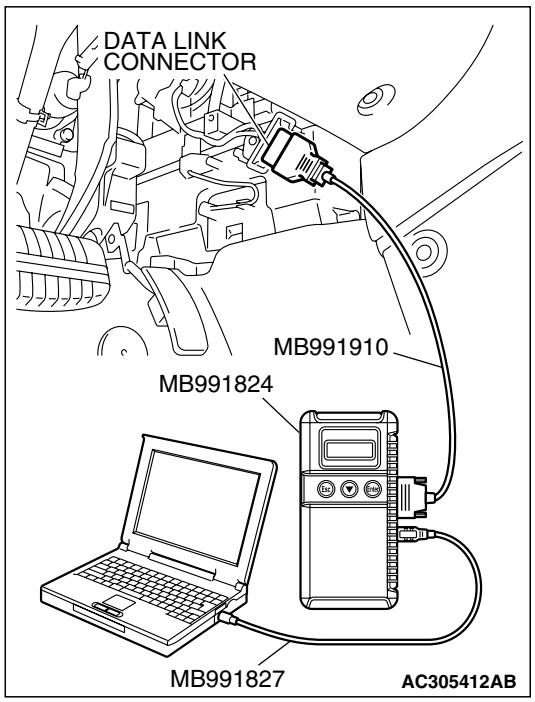
STEP 1. Using scan tool MB991958, check actuator test item 1: Low-Reverse Solenoid Valve.

⚠ 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 actuator test mode.
  - Item 1: Low-Reverse Solenoid Valve.
    - An audible clicking or buzzing should be heard when the low-reverse solenoid valve is energized.

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



Q: Is the solenoid valve operating properly?

YES : Go to Step 2.
NO : Repair or replace the low-reverse solenoid valve. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or Refer to GROUP 23C, Valve Body P.23C-77 <5A/T>. Then confirm that the symptom is eliminated.

STEP 2. Check when shift shock occurs.

Q: When does the shift shock occur?

When engaging from "N" to "R" : Go to Step 3.
When the vehicle starts moving : Go to Step 7.

STEP 3. Check the hydraulic pressure (for reverse clutch).
Measure the hydraulic pressure for reverse clutch when the selector lever is at the "R" range. Check if the hydraulic pressure is within the standard value. Refer to P.23A-37, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?

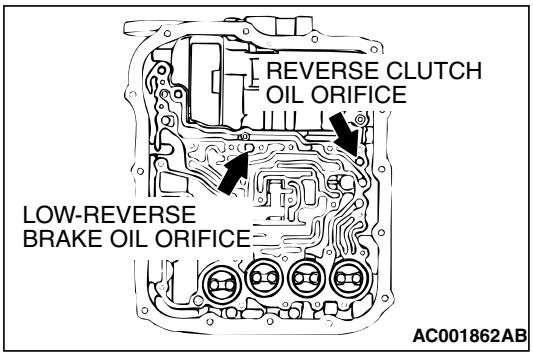
YES : Go to Step 4.
NO : Go to Step 9.

STEP 4. Check the hydraulic pressure (for low-reverse brake).
Measure the hydraulic pressure for low-reverse brake when the selector lever is at the "R" range. Check if the hydraulic pressure is within the standard value. Refer to P.23A-37, Hydraulic Pressure Test.

Q: Is the hydraulic pressure within the standard value?

YES : Go to Step 5.
NO : Go to Step 9.

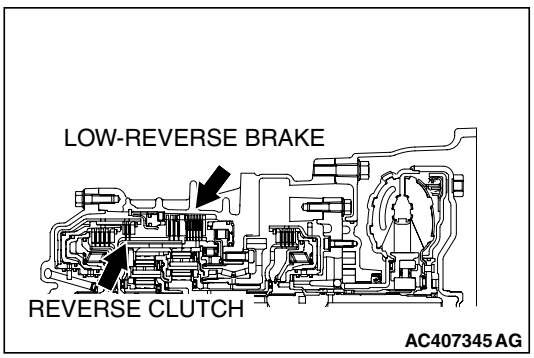
STEP 5. Check the reverse clutch system and low-reverse brake system.
(1) Remove the valve body cover and valve body. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or GROUP 23C, Transaxle P.23C-8 <5A/T>.
(2) Blow 108 kPa (15 psi) compressed air into the reverse clutch oil orifice of the transaxle case, and check if the reverse clutch piston moves and air pressures are maintained in that condition. Repeat for the low-reverse brake.



Q: Are both air pressures maintained?

YES : Go to Step 6.
NO : Go to Step 9.

STEP 6. Check the reverse clutch and low-reverse brake.
(1) Remove the transaxle assembly.
(2) Check the facing for seizure and the piston seal ring for damage and interference with the retainer. Repair or replace the faulty parts. Refer to GROUP 23B, Transaxle P.23B-8, Reverse and Overdrive Clutch P.23B-53 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8, Reverse and Overdrive Clutch P.23C-58 <5A/T>. Then Retest the system.



Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 10.

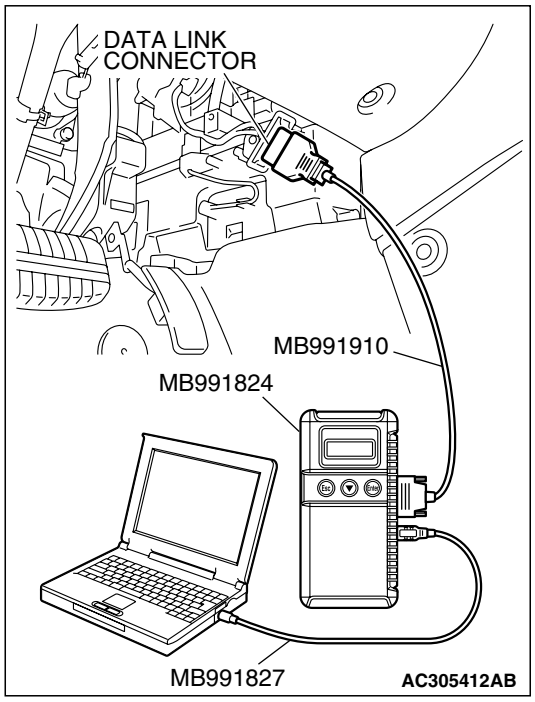
STEP 7. Check shift shock.

Q: Does shift shock occur sometimes?

YES : Go to Step 8.
NO : Go to Step 9.

STEP 8. Using scan tool MB991958, check data list item 2: TP 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.



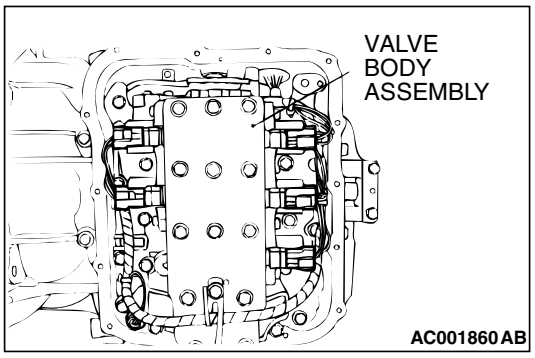
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 2: TP Sensor.
  - With the throttle valve in idle position, voltage should measure between 300 and 700 mV.
  - With the throttle valve in full-open position, voltage should measure 4,000 mV or more.

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

Q: Is the measured voltage between 300 and 700 mV at idle, and 4,000 mV or more at the full-open position?

YES : Go to Step 9.
NO : Check the TP sensor. Refer to GROUP13A <2.4L Engine>, Diagnostic Trouble Code Procedures P.13A-244, P.13A-255, DTCs P0122, P0123: TP Sensor System or refer to GROUP13B <3.8L Engine>, Diagnostic Trouble Code Procedures P.13B-262, P.13B-275, DTCs P0122, P0123: TP Sensor System. Then check the symptom.

STEP 9. Disassemble and clean the valve body.



Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or GROUP 23C, Valve Body P.23C-77 <5A/T>.
Replace the valve body assembly if the damages are thought to be irreparable. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 10.

STEP 10. Replace the PCM.

When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Start over at Step 1.

TSB Revision

INSPECTION PROCEDURE 8: Shift Shock when Shifting from "N" to "D," "N" to "R" and Long Delay

COMMENT
If abnormal shock or delay of two seconds or more occurs when the selector lever is moved from "N" to "D" range or from "N" to "R" range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the oil pump or valve body.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Abnormal line pressure
- Malfunction of the oil pump
- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

STEP 1. Check the hydraulic pressure.
(1) Measure the hydraulic pressure of each element when the transaxle is in 1st, 2nd or reverse. Check if each hydraulic pressure is within the standard value. Refer to P.23A-37, Hydraulic Pressure Test.
(2) If some elements pressures are within the standard value and some are not, recheck the symptom.

Q: Are all hydraulic pressures within the standard value?
YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Adjust line pressure.
Adjust line pressure. Refer to P.23A-47, Line Pressure Adjustment. Then check the symptom.

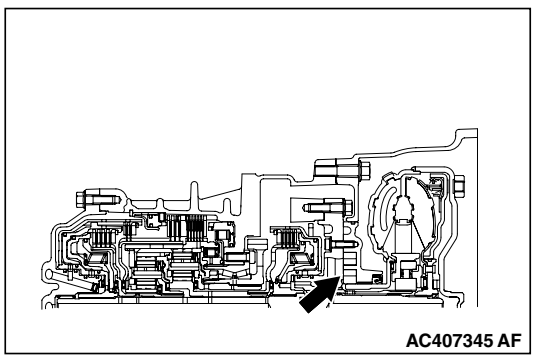
Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Go to Step 3.

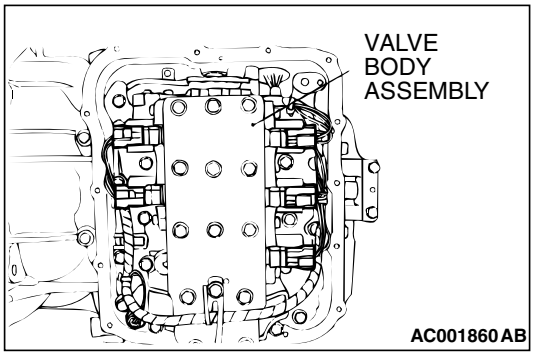
STEP 3. Check when shift shock occurs.

Q: When does the shift shock occur?
When engaging from "N" to "D" and "N" to "R" : Go to Step 4.
When the vehicle starts moving : Go to Step 5.

STEP 4. Check the oil pump.
(1) Remove the transaxle.
(2) Check the oil pump (incorrect installation, damage and etc.) and replace the oil pump assembly if necessary (The oil pump cannot be disassembly).Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or Refer to GROUP 23C, Transaxle P.23C-8 <5A/T>. Confirm that the malfunction symptom is eliminated.

Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Go to Step 6.


AC407345 AF



STEP 5. Disassemble and clean the valve body.
Check the installation bolts for looseness and the O-ring, valves and valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or GROUP 23C, Valve Body P.23C-77 <5A/T>.
Replace the valve body assembly if the damages are thought to be irreparable. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 6.

STEP 6. Replace the PCM.
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Start over at Step 1.

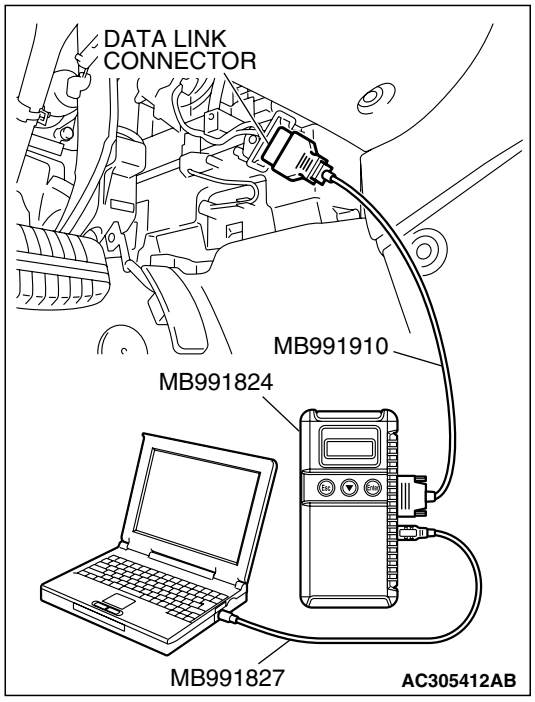
INSPECTION PROCEDURE 9: Shift Shock and Slipping

COMMENT
If shift shock when driving is due to upshifting or downshifting and the transaxle speed become higher than the engine speed, the cause is probably abnormal line pressure or a malfunction of a solenoid valve, oil pump, valve body or of a brake or clutch.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITON:)
- Abnormal line pressure
- Malfunction of each solenoid valve
- Malfunction of the oil pump
- Malfunction of the valve body
- Malfunction of each brake or each clutch
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check actuator test.

⚠ 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 actuator test mode for following items.
  a. Item 1: Low-reverse solenoid valve
  b. Item 2: Underdrive solenoid valve
  c. Item 3: Second solenoid valve
  d. Item 4: Overdrive solenoid valve
  e. Item 5: Reduction solenoid valve <5A/T>
    - An audible clicking or buzzing should be heard when the solenoid valves are energized.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are the solenoid valves operating properly?

YES : Go to Step 2.
NO : Repair or replace the solenoid valves. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or GROUP 23C, Valve Body P.23C-77 <5A/T>. Then confirm that the symptom is eliminated.

STEP 2. Check the hydraulic pressure.

(1) Measure the hydraulic pressure of each element. Check if each hydraulic pressure is within the standard value. Refer to P.23A-37, Hydraulic Pressure Test.
(2) If some elements pressure are within the standard value and some are not, recheck the symptom.

Q: Are all hydraulic pressures within the standard value?

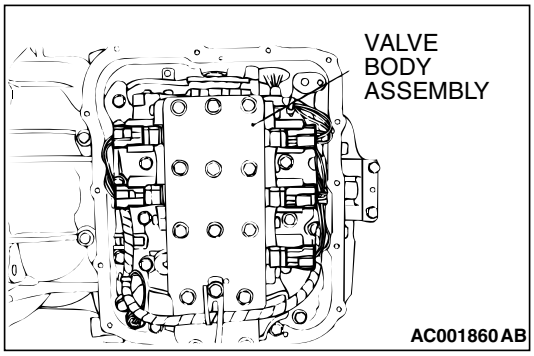
YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Adjust the line pressure.

Adjust the line pressure. Refer to P.23A-47, Line Pressure Adjustment. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 4.



STEP 4. Disassemble and clean the valve body.

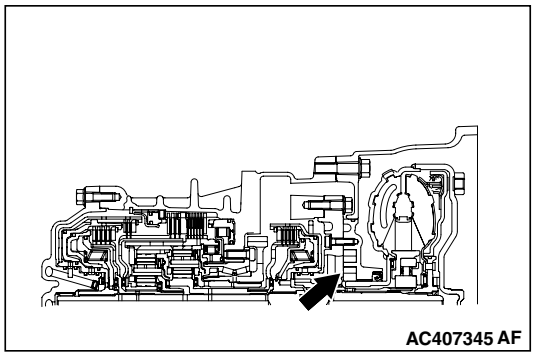
Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or GROUP 23C, Valve Body P.23C-77 <5A/T>.

Replace the valve body assembly if the damages are thought to be irreparable. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.

NO : Go to Step 5.



STEP 5. Check the oil pump.

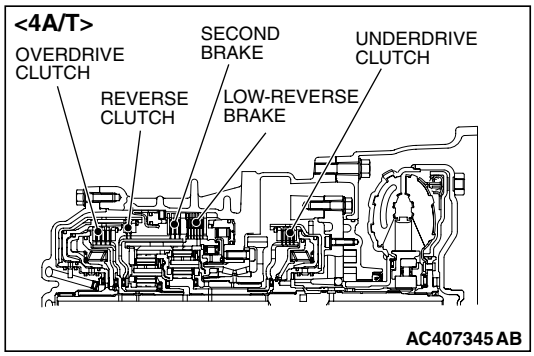
(1) Remove the transaxle.

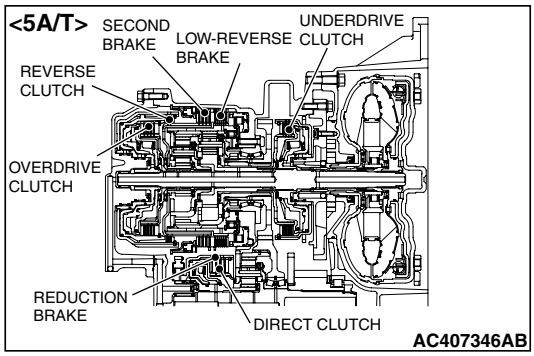
(2) Check the oil pump (incorrect installation, damage and etc.) and replace the oil pump assembly if necessary (The oil pump cannot be disassembly).Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or GROUP 23C, Transaxle P.23C-8 <5A/T>. Confirm that the malfunction symptom is eliminated.

Q: Is the symptom eliminated?

YES : The procedure is complete.

NO : Go to Step 7.





STEP 6. Check each brake and clutch.

(1) Remove the transaxle.

(2) Check the facing for seizure and piston seal ring for damage and interference with retainer. Repair or replace the faulty parts. Refer to GROUP 23B, Transaxle P.23B-8, Underdrive Clutch and Input Shaft P.23B-51, Reverse and Overdrive Clutch P.23B-53 <4A/T> or GROUP 23C, Transaxle P.23C-8, Underdrive Clutch and Input Shaft P.23C-56, Reverse and Overdrive Clutch P.23C-58 <5A/T>. Then Retest the system.

Q: Is the symptom eliminated?

YES : The procedure is complete.

NO : Go to Step 7.

STEP 7. Replace the PCM.
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 10: Early or Late Shifting in All Gears

COMMENT
If all shift points are early or late while driving, the cause is probably a malfunction of the output shaft speed sensor, TP sensor or a solenoid valve.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Malfunction of the output shaft speed sensor
- Malfunction of the TP sensor
- Malfunction of each solenoid valve
- Abnormal line pressure
- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

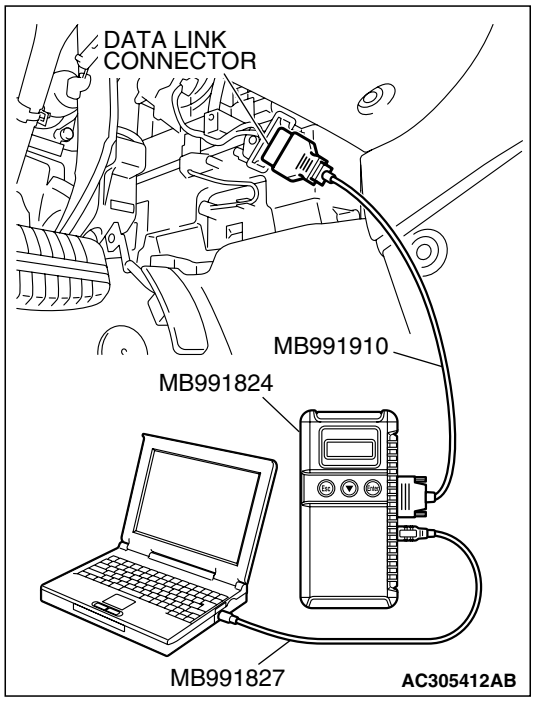
STEP 1. Using scan tool MB991958, check data list item 6: Output Shaft Speed Sensor.

⚠ 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.

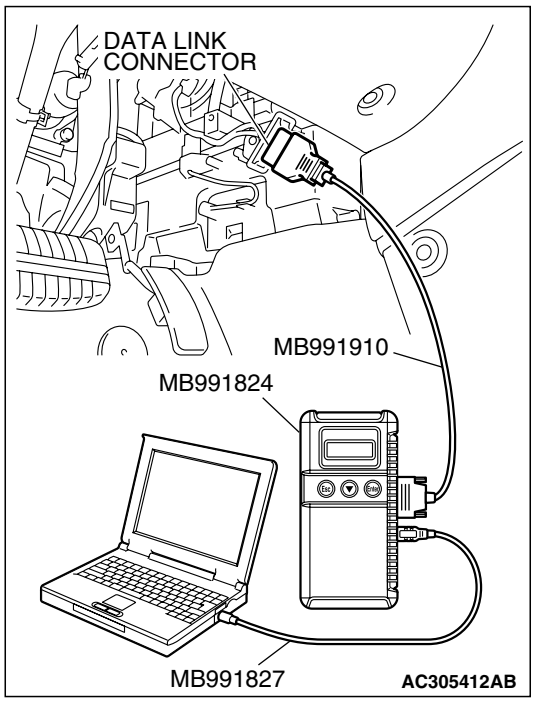
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode.
- Item 6: Output Shaft Speed Sensor.
  - When driving at constant speed of 50km/h (31mph), the display should be "1,400 – 1,700 r/min" (Gear range: 3rd gear <4A/T>).
  - When driving at constant speed of 60km/h (37mph), the display should be "1,400 – 1,700 r/min" (Gear range: 4th gear <5A/T>).

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

Q: Is the sensor operating properly?
YES : Go to Step 2.
NO : Refer to P.23A-96, DTC P1767 (P0720): Output shaft speed sensor system.



TSB Revision



STEP 2. Using scan tool MB991958, check data list item 2: TP Sensor.

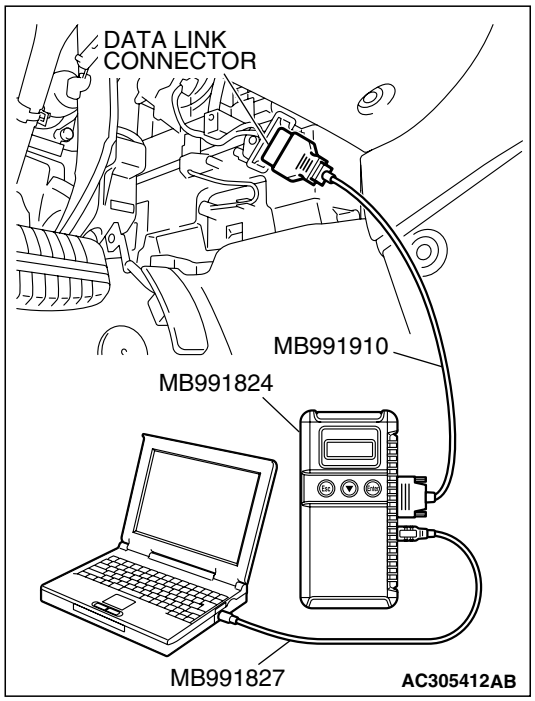
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode.
- Item 2: TP Sensor.
  - With the throttle valve in idle position, voltage should measure between 300 and 700 mV.
  - With the throttle valve in full-open position, voltage should measure 4,000 mV or more.

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

Q: Is the measured voltage between 300 and 700 mV at idle, and 4,000 mV or more at the full-open position?

YES : Go to Step 3.

NO : Check the TP sensor. Refer to GROUP13A <2.4L Engine>, Diagnostic Trouble Code Procedures P.13A-244, P.13A-255, DTCs P0122, P0123: TP Sensor System or refer to GROUP13B <3.8L Engine>, Diagnostic Trouble Code Procedures P.13B-262, P.13B-275, DTCs P0122, P0123: TP Sensor System. Then check the symptom.



STEP 3. Using scan tool MB991958, check data list.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode for following items.
   a. Item 12: Low-Reverse Solenoid Valve Duty Percent
   b. Item 13: Underdrive Solenoid Valve Duty Percent
   c. Item 14: Second Solenoid Valve Duty Percent
   d. Item 15: Overdrive Solenoid Valve Duty Percent
   e. Item 16: Reduction Solenoid Valve Duty Percent <5A/T>
      - Check that the values shown below are displayed when each data list item is entered.

<4A/T>

DRIVING CONDITION	DATA LIST ITEM			
	12	13	14	15
Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0%	0%	100%	100%
Driving at constant speed of 30 km/h (19 mph) in 2nd gear	100%	0%	0%	100%
Driving at constant speed of 50 km/h (31 mph) in 3rd gear	100%	0%	100%	0%
Driving at constant speed of 50 km/h (31 mph) in 4th gear	100%	100%	0%	0%

TSB Revision

<5A/T>

DRIVING CONDITION	DATA LIST ITEM				
	12	13	14	15	16
Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0%	0%	100%	100%	0%
Driving at constant speed of 30 km/h (19 mph) in 2nd gear	100%	0%	0%	100%	0%
Driving at constant speed of 50 km/h (31 mph) in 3rd gear	100%	0%	100%	0%	0%
Driving at constant speed of 50 km/h (31 mph) in 4th gear	0%	0%	100%	0%	100%
Driving at constant speed of 70 km/h (36 mph) in 5th gear	0%	100%	0%	0%	100%

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

Q: Are the solenoid valves operating properly?

YES : Go to Step 4.
NO : Go to Step 6.

STEP 4. Adjust the line pressure.

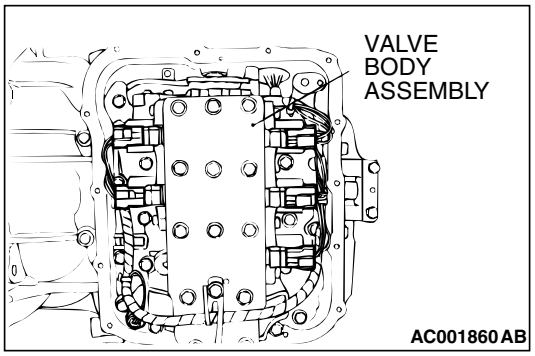
Adjust the line pressure. Refer to P.23A-47, Line Pressure Adjustment. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 5.

STEP 5. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or GROUP 23C, Valve Body P.23C-77 <5A/T>.
Replace the valve body assembly if the damages are thought to be irreparable. Then check the symptom.

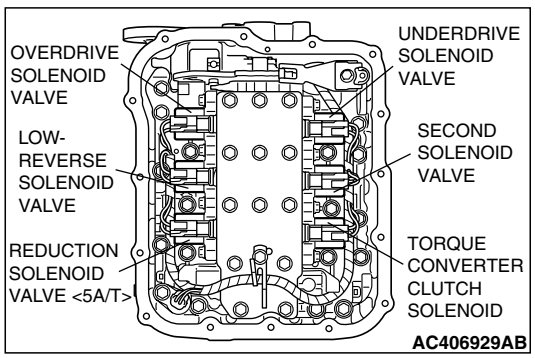


Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 7.

STEP 6. Replace each solenoid valve.

Replace the faulty solenoid valve with a new one.



Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 7.

STEP 7. Replace the PCM.
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Start over at Step 1.

INSPECTION PROCEDURE 11: Early or Late Shifting in Some Gears

COMMENT
If some of the shift points are early or late when driving, the cause is probably a malfunction of the valve body, or it is due to the characteristics of the INVECS-II system but is not an abnormality.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

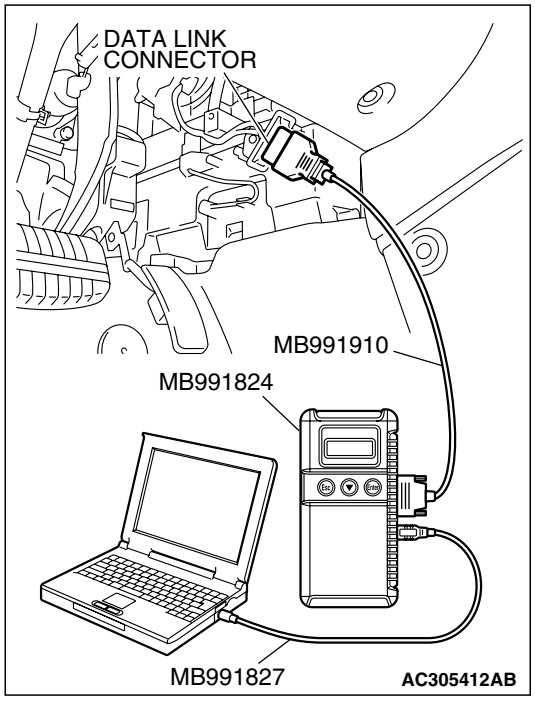
STEP 1. Using scan tool MB991958, check special function: INVECS-II Control Stop.

⚠ 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 special function mode.
- Special function: INVECS-II Control Stop.
  - Drive the vehicle and confirm the gear shifting correspond to the standard shift line of the shift pattern diagram. Refer to P.23A-4.

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

Q: Does the gear shifting correspond to the standard shift line of the shift pattern diagram?
YES : The symptom is due to characteristics of the INVECS-II system, but is not abnormal.
NO : Go to Step 2.



STEP 2. Check the shift points.

Q: Are the shift points early or late only when transmission fluid is -29°C (84°F) or less (early), or 125°C (257°F) or more (late)?

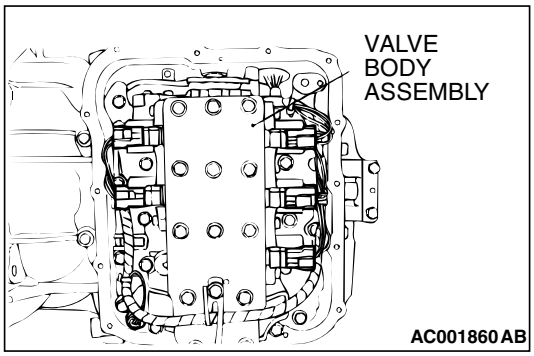
YES : The symptom is due to characteristics of the INVECS-II system, but is not abnormal.

NO : Go to Step 3.

STEP 3. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or GROUP 23C, Valve Body P.23C-77 <5A/T>.

Replace the valve body assembly if the damages are thought to be irreparable. Then check the symptom.



Q: Is the symptom eliminated?

YES : The procedure is complete.

NO : Go to Step 4.

STEP 4. Replace the PCM.

When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

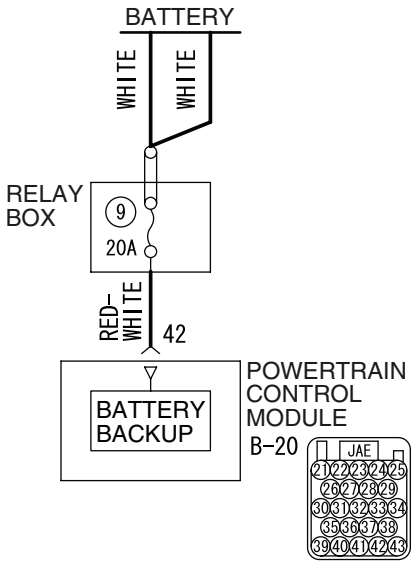
Q: Is the symptom eliminated?

YES : The procedure is complete.

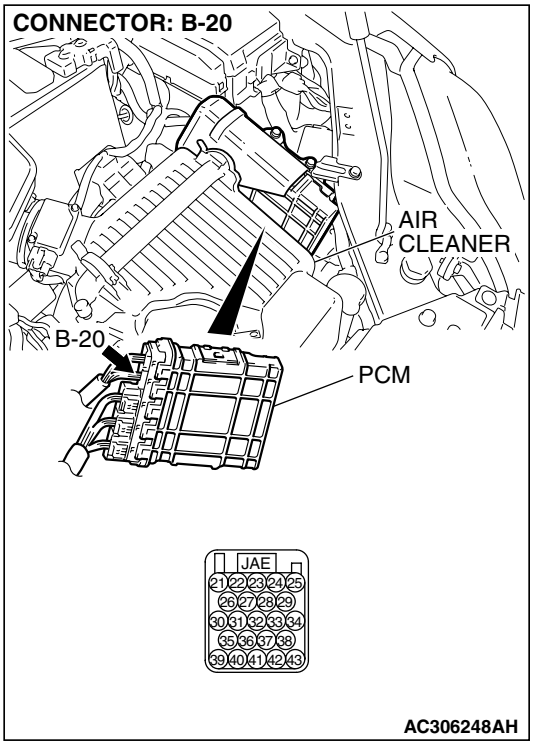
NO : Start over at Step 1.

INSPECTION PROCEDURE 12: No Diagnostic Trouble Codes (Does not Shift)

Backup Power Supply System Circuit



W4P13M01AA
AC210058AC



CIRCUIT OPERATION
PCM (terminal number 42) receives battery positive voltage from the battery.

COMMENT
If shifting does not occur while driving and no diagnostic trouble codes are output, a malfunction of the transmission range switch, or PCM may exist.

TSB Revision

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)

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

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

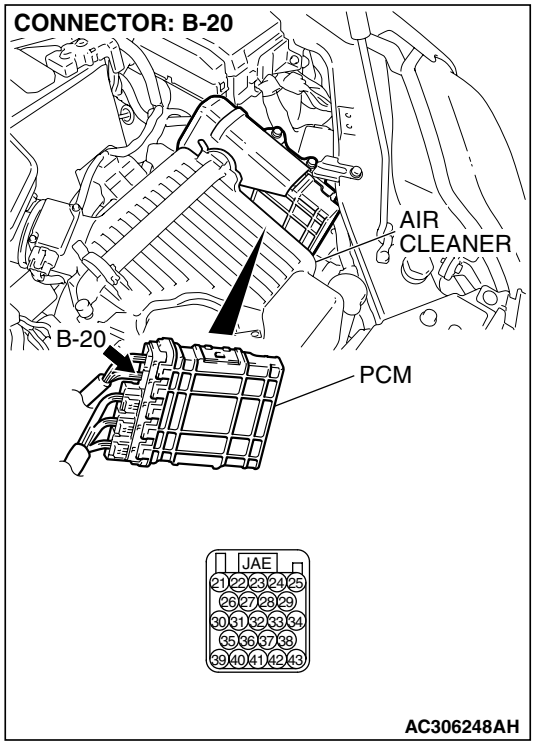
STEP 1. Check the vehicle acceleration.

Q: Does the vehicle accelerate poorly (transaxle stays in 3rd gear) when starting from a stop with the selector lever in "D" range?

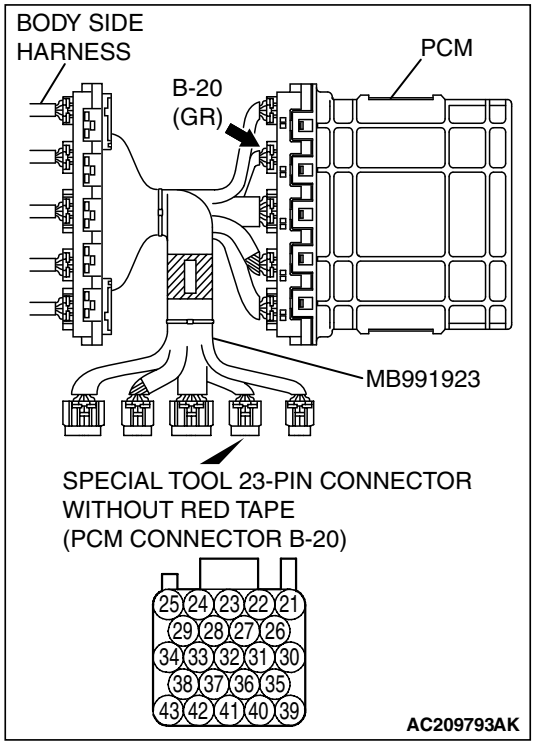
YES : Go to Step 2.
NO : Go to Step 5.

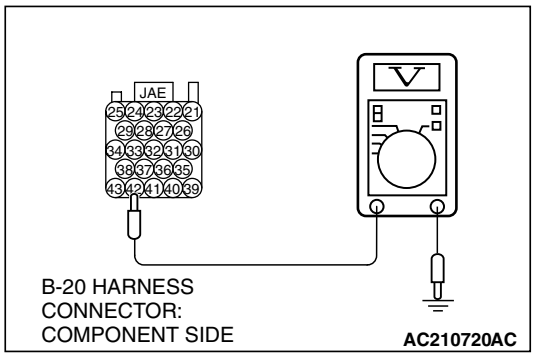
STEP 2. Measure the backup power supply voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal 42 and ground.
- The voltage should measure battery positive voltage.

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

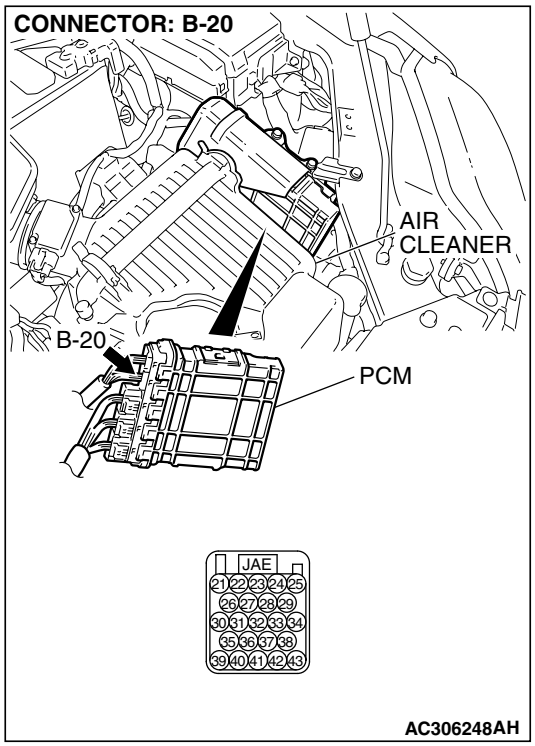
Q: Is the measured voltage battery positive voltage?

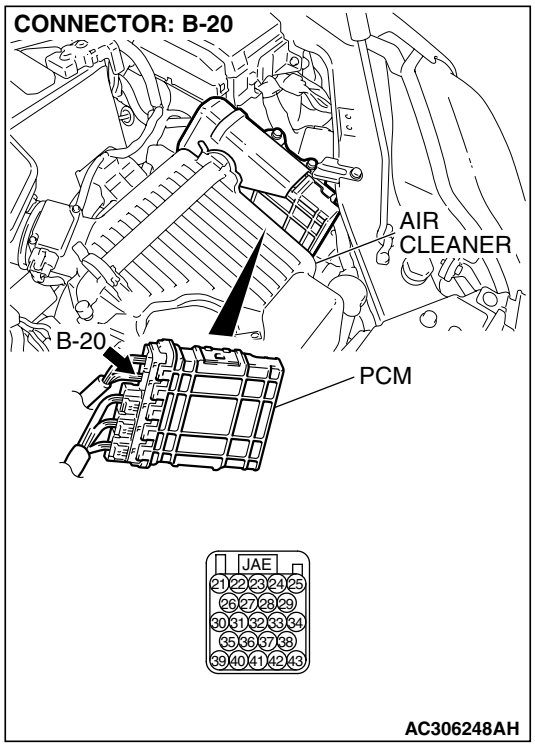
YES : Go to Step 5.
NO : Go to Step 3.

STEP 3. Check PCM connector B-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is the connector 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. Then retest the system.



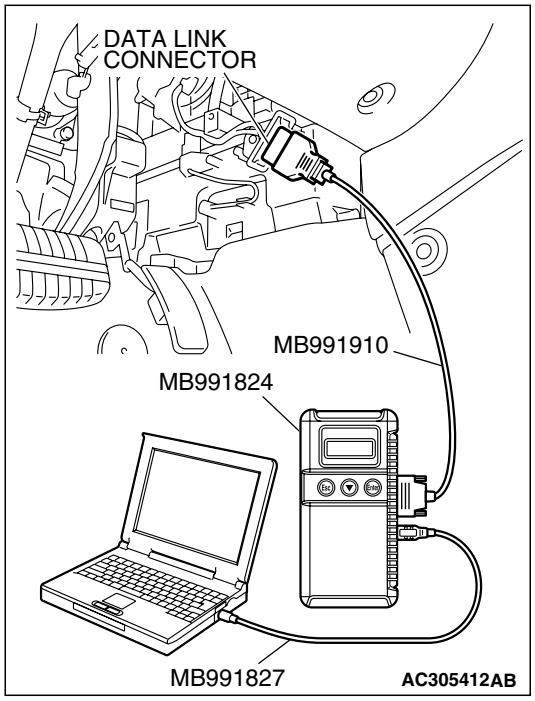


STEP 4. Check the harness for open circuit between PCM connector B-20 terminal 42 and battery.

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 34: 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 34: Transmission Range Switch.
  - Move the selector lever to "P," "R," "N," "D" positions and confirm that the selected transmission range match the positions shown on scan tool MB991958 (The scan tool displays "D" range when the selector lever is shifted to the sport mode).

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

Q: Is the switch operating properly?

YES : Check for the symptom. If the symptom is not eliminated, replace the PCM.

NO : Adjust the transmission range switch and control cable. Refer to P.23A-372.

INSPECTION PROCEDURE 13: Poor Acceleration

COMMENT
If acceleration is poor when downshifting occurs while driving, a malfunction of the engine system or a brake or clutch may exist.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Malfunction of the engine system
- Malfunction of the clutch system and brake system
- Malfunction of the PCM

DIAGNOSIS

STEP 1. Check the engine system.
Refer to GROUP 13A <2.4L Engine>, Diagnosis – Symptom Chart – Poor acceleration P.13A-1048.
Refer to GROUP 13B <3.8L Engine>, Diagnosis – Symptom Chart – Poor acceleration P.13B-1304.

Q: Is the inspection result good?

YES : Go to Step 2.
NO : Repair or replace the engine component(s).

STEP 2. Check each brake and clutch.
Perform the torque converter stall test. Refer to P.23A-36, Torque Converter Stall Test. Then retest the system.

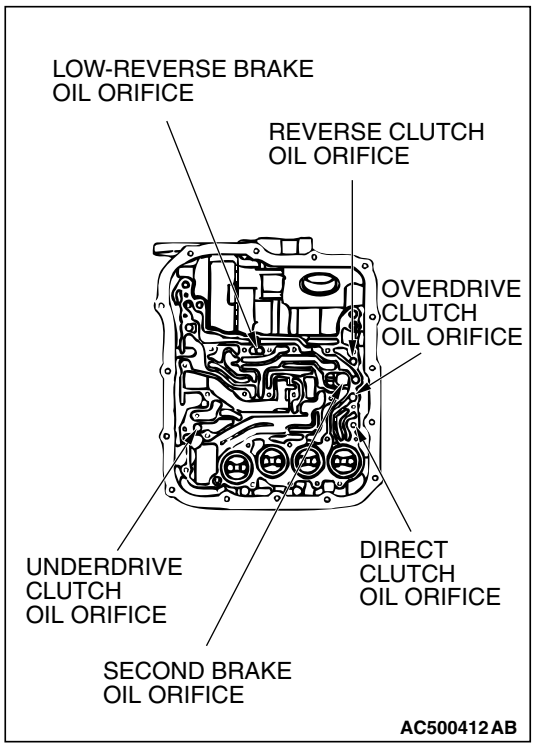
Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 3.

STEP 3. Perform the hydraulic pressure test.
Perform the hydraulic pressure test. Refer to P.23A-37, Hydraulic Pressure Test. Then retest the system.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 4.



STEP 4. Check each brake system and each clutch system.

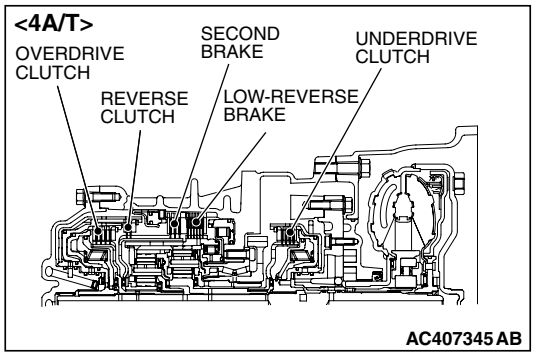
(1) Remove the valve body cover and valve body. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or GROUP 23C, Transaxle P.23C-8 <5A/T>.

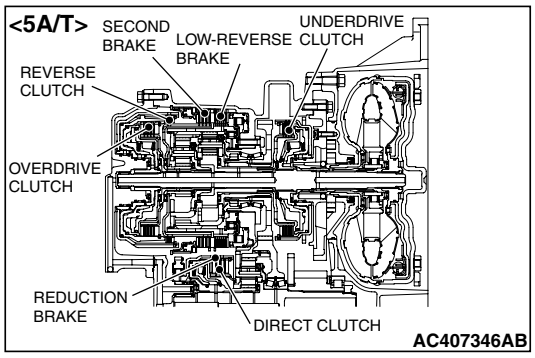
(2) Blow 108 kPa (15 psi) compressed air into the each brake oil orifice and clutch oil orifice of the transaxle case, and check if each brake and each clutch piston move and air pressure is maintained.

Q: Is the air pressure maintained?

YES : The procedure is complete.

NO : Go to Step 5.





STEP 5. Check each brake system and clutch system.

(1) Remove the transaxle.

(2) Check the facings for seizure and piston seal ring for damage and interference with retainer. Repair or replace the faulty parts. Refer to GROUP 23B, Transaxle P.23B-8, Underdrive Clutch and Input Shaft P.23B-51, Reverse and Overdrive Clutch P.23B-53 <4A/T> GROUP 23C, Transaxle P.23C-8, Underdrive Clutch and Input Shaft P.23C-56, Reverse and Overdrive Clutch P.23C-58 <5A/T>. Then retest the system.

Q: Is the symptom eliminated?

YES : The procedure is complete.

NO : Go to Step 6.

STEP 6. Replace the PCM.
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Start over at Step 1.

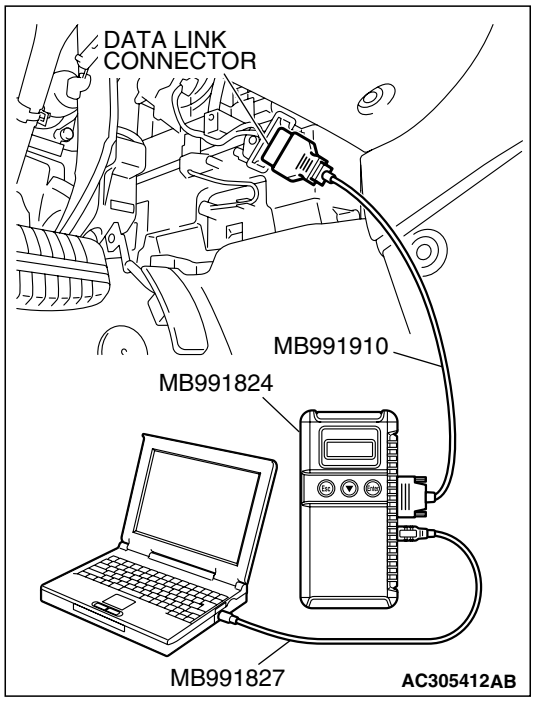
INSPECTION PROCEDURE 14: Vibration

COMMENT
If vibration occurs when driving at constant speed or when accelerating in 4th gear, abnormal torque converter clutch pressure a malfunction of the engine system, torque converter clutch solenoid, torque converter or valve body may exist.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)
- Abnormal torque converter clutch pressure
- Malfunction of the engine system
- Malfunction of the torque converter clutch solenoid
- Malfunction of the torque converter
- Malfunction of the valve body
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check actuator test item 6: Torque Converter Clutch Solenoid Valve.

⚠ 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 actuator test mode.
- Item 6: Torque Converter Clutch Solenoid Valve.
  - An audible clicking or buzzing should be heard when the torque converter clutch solenoid valve is energized.

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

Q: Is the solenoid valve operating properly?

YES : Go to Step 2.
NO : Repair or replace the torque converter clutch solenoid valve. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or GROUP 23C, Valve Body P.23C-77 <5A/T>. Then confirm that the symptom is eliminated.

STEP 2. Check the vibration.

Q: Does the vibration occur when the transmission fluid temperature sensor connector has been disconnected?

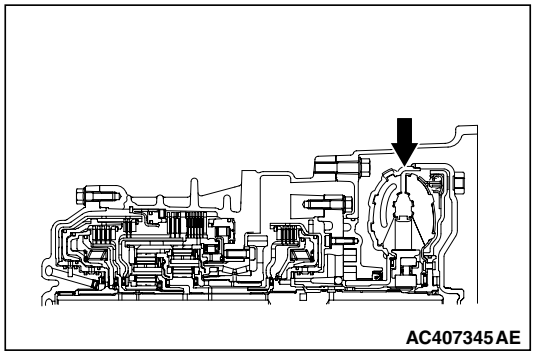
YES : Check the engine system. Refer to GROUP 13A <2.4L Engibe>, Diagnosis – Symptom Chart – Driving P.13A-50 or refer to GROUP 13B <3.8L Engine>, Diagnosis – Symptom Chart – Driving P.13B-52. If the inspection result is not good, diagnose, repair, and/or replace the engine component(s).
NO : Go to Step 3.

STEP 3. Check the torque converter hydraulic pressure.

Measure the torque converter hydraulic pressure. Then check if the torque converter hydraulic pressure is within the standard value. Refer to P.23A-37, Hydraulic Pressure Test.

Q: Is the torque converter hydraulic pressure within the standard value?

YES : Go to Step 4.
NO : Go to Step 5.

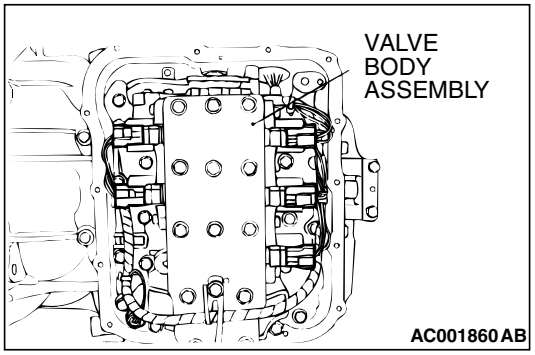

AC407345AE

STEP 4. Replace the torque converter assembly.

(1) Remove the transaxle.
(2) Replace the torque converter assembly. Refer to GROUP 23B, Transaxle P.23B-8 <4A/T> or GROUP 23C, Transaxle P.23C-8 <5A/T>. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 6.



AC001860AB

STEP 5. Disassemble and clean the valve body.

Check the O-ring installation bolts for looseness and the valve body for damage. Repair or replace the faulty parts. Refer to GROUP 23B, Valve Body P.23B-67 <4A/T> or GROUP 23C, Valve Body P.23C-77 <5A/T>.
Replace the valve body assembly if the damages are thought to be irreparable. Then check the symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Go to Step 6.

STEP 6. Replace the PCM.

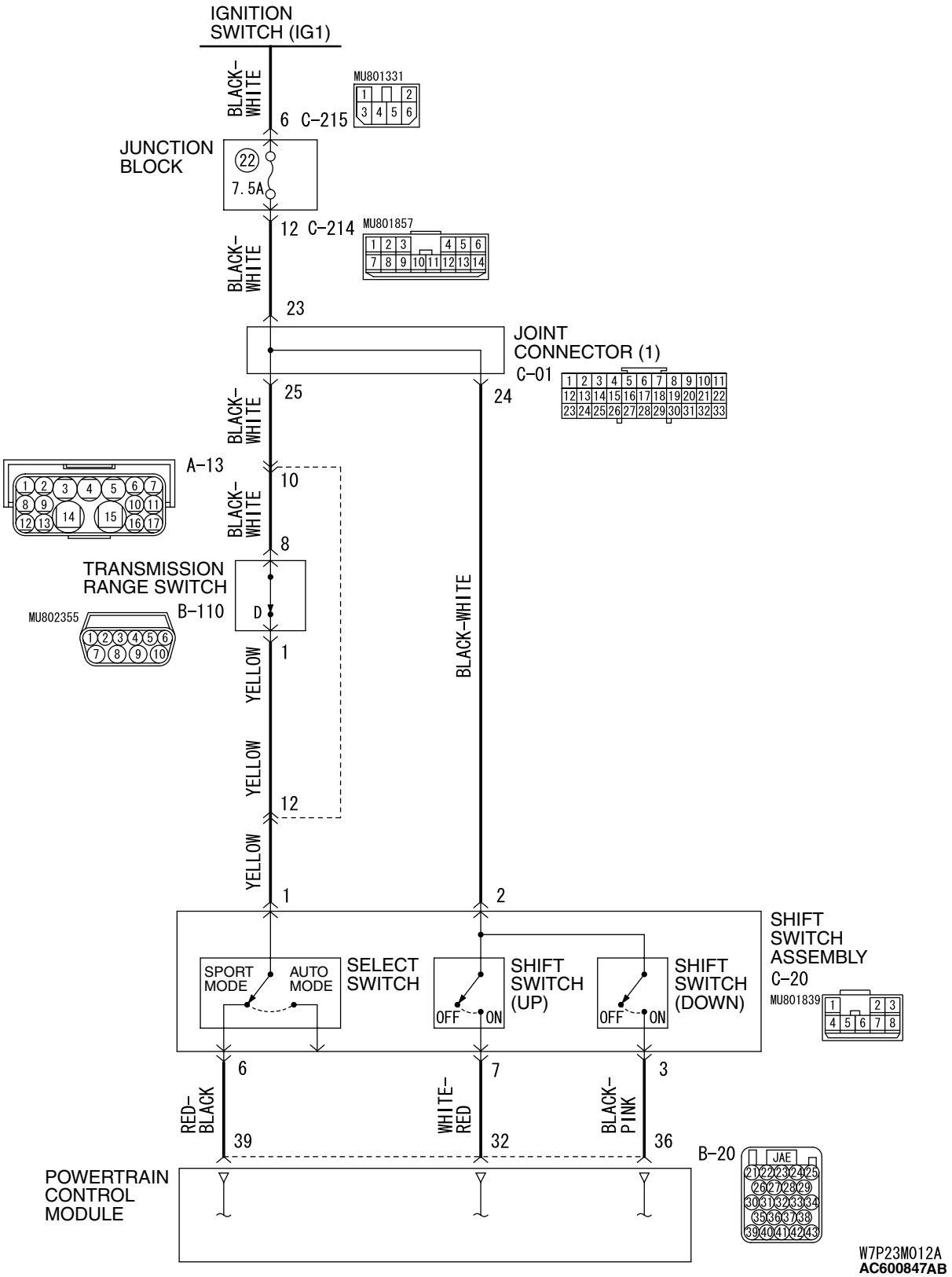
When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Start over at Step 1.

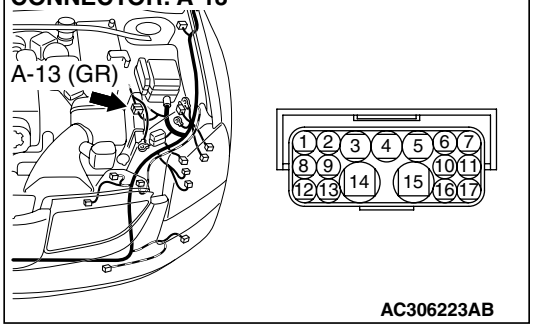
INSPECTION PROCEDURE 15: Shift Switch Assembly System

Shift Switch Assembly System Circuit

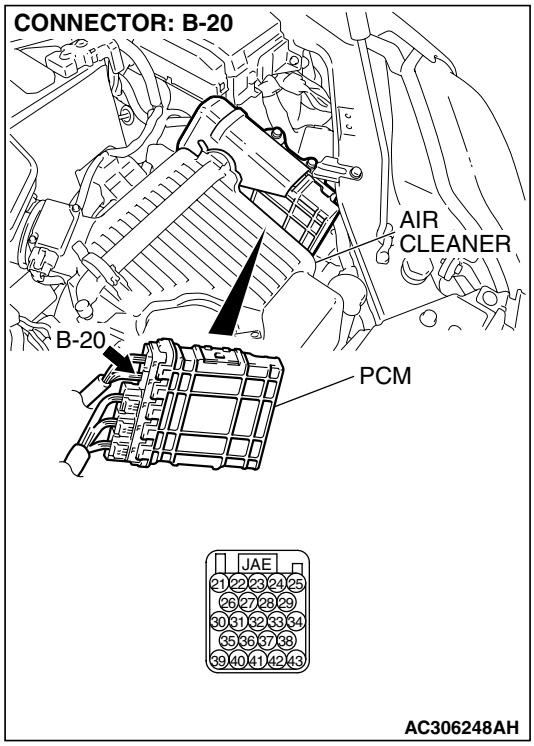


TSB Revision

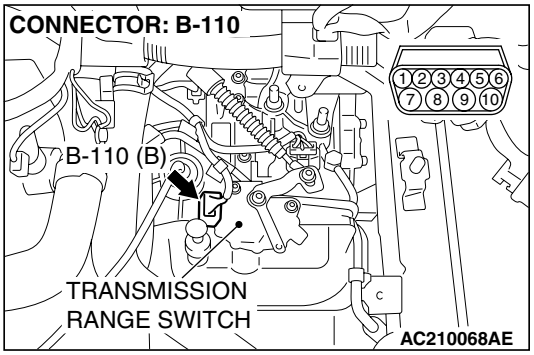
CONNECTOR: A-13



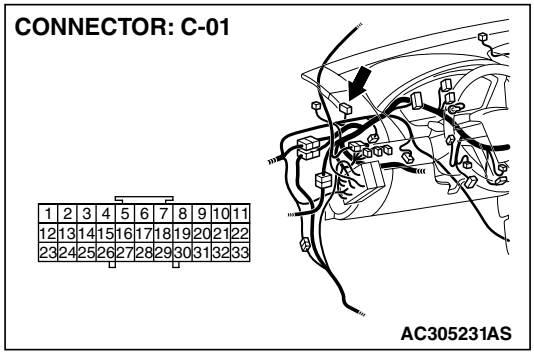
CONNECTOR: B-20



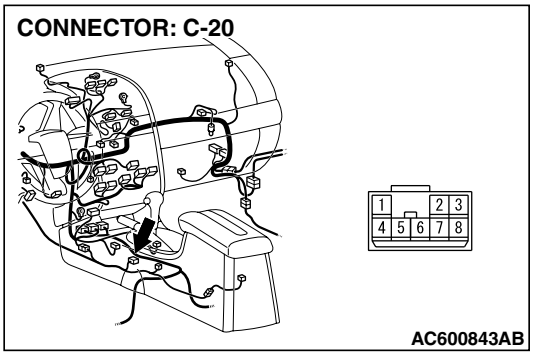
CONNECTOR: B-110



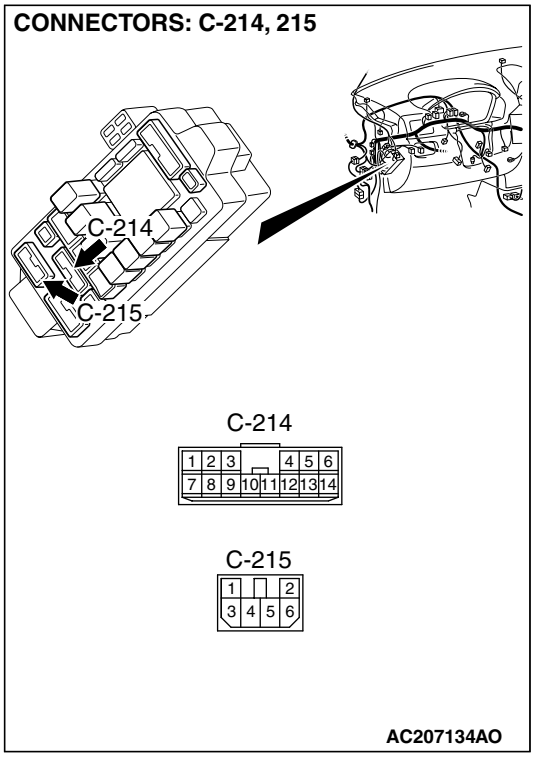
CONNECTOR: C-01



CONNECTOR: C-20



TSB Revision



CIRCUIT OPERATION

If the select switch of the shift switch assembly is set to the sport mode, battery positive voltage will be applied to the PCM (terminal 39). If the shift switch of the shift switch assembly is set to "UP" or "DOWN" position, battery positive voltage will be applied to the PCM (terminal 32, 36).

COMMENT

When sport mode shift does not operate the cause is probably a malfunction of the transmission range switch circuit, shift switch assembly circuit or a defective PCM.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)

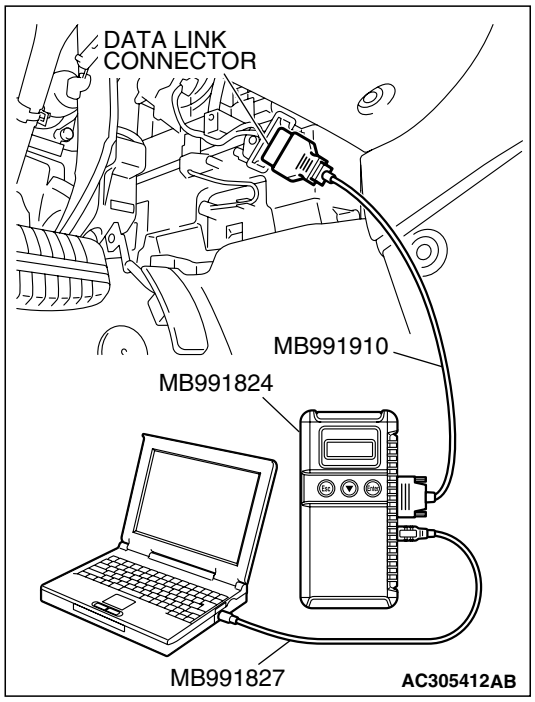
- Malfunction of the transmission range switch
- Malfunction of the shift switch assembly select switch
- Malfunction of the shift switch assembly shift switch (Up)
- Malfunction of the shift switch assembly shift switch (Down)
- Damaged harness or connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

TSB Revision



STEP 1. Using scan tool MB991958, read the A/T diagnostic trouble code.

⚠ 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.

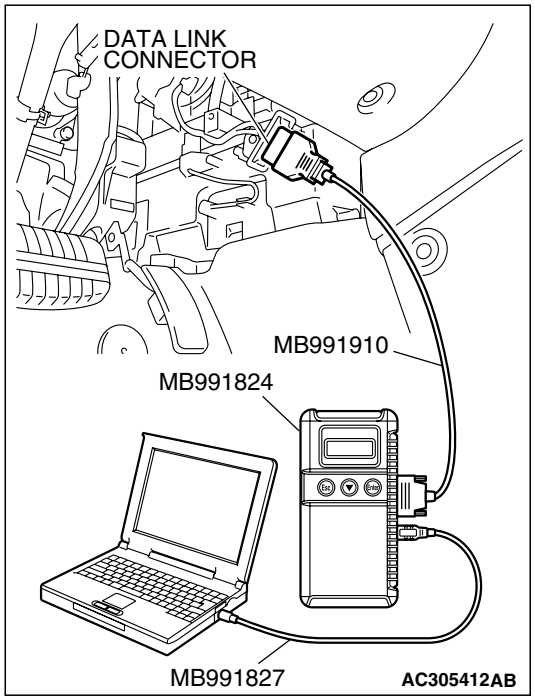
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for A/T diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1770 (P0705) or P1771 (P0705) set?

YES <DTC P1770 (P0705) set> : Refer to P.23A-125, DTC P1770 (P0705): Transmission Range Switch System (Open Circuit).

YES <DTC P1771 (P0705) set> : Refer to P.23A-157, DTC P1771 (P0705): Transmission Range Switch System (Short Circuit).

NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check data list item 27: Select Switch, item 28: Shift Switch (Up), item 29: Shift Switch (Down).

(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 for following items.
  a. Item 27: Select Switch
  b. Item 28: Shift Switch (Up)
  c. Item 29: Shift Switch (Down)

SELECTOR LEVER OPERATION	DATA LIST ITEM		
	27	28	29
D range	OFF	OFF	OFF
Sport mode	ON	OFF	OFF
Upshift and hold the selector lever	ON	ON	OFF
Downshift and hold the selector lever	ON	OFF	ON

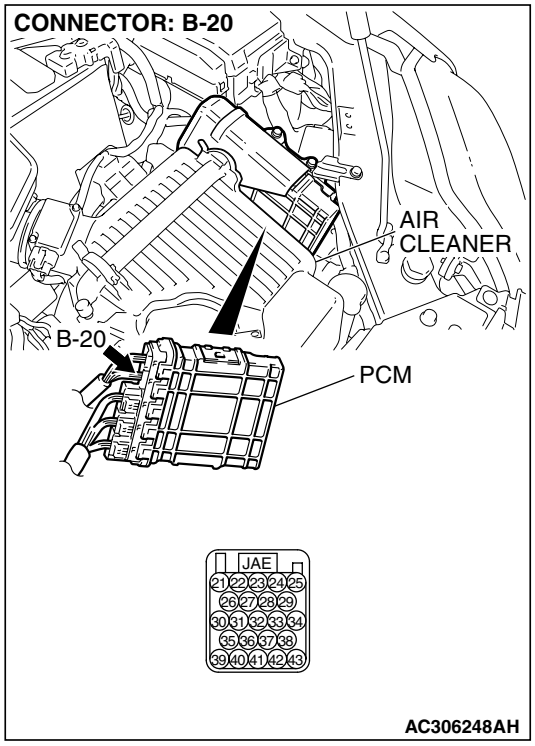
NOTE: The switches above are displayed, depending on the selector lever condition as shown in the table.

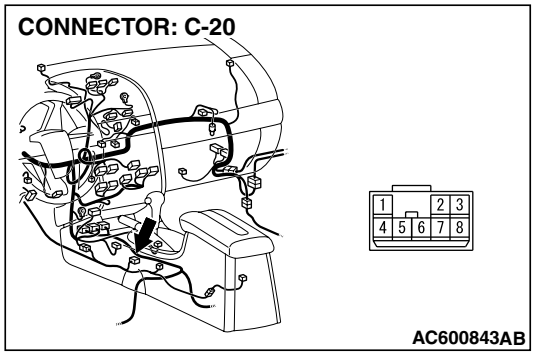
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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.00-14.

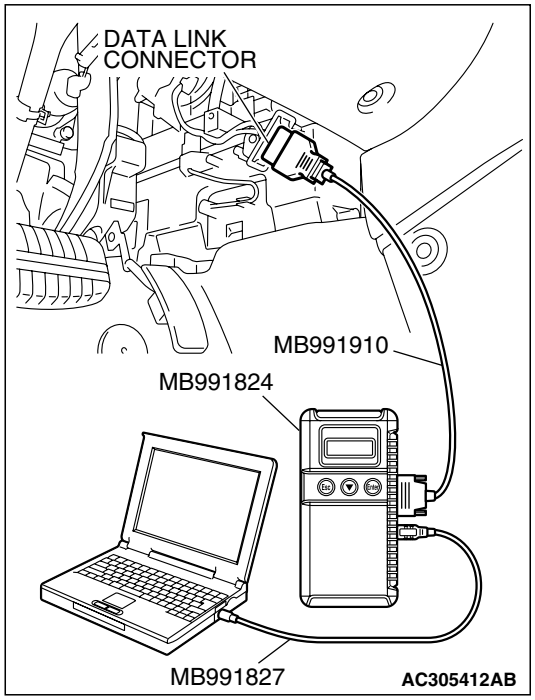
NO <If completely NG> : Go to Step 3.
NO <If item 28 and item 29 both are NG> : Go to Step 5.
NO <If only item 27 is NG> : Go to Step 9.
NO <If only item 28 is NG> : Go to Step 17.
NO <If only item 29 is NG> : Go to Step 22.





STEP 3. Check PCM connector B-20 and shift switch assembly connector C-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.
Q: Are the connectors 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. Using scan tool MB991958, check data list item 27: Select Switch, item 28: Shift Switch (Up), item 29: Shift Switch (Down).

⚠ 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 for following items.
  a. Item 27: Select Switch
  b. Item 28: Shift Switch (Up)
  c. Item 29: Shift Switch (Down)

SELECTOR LEVER OPERATION	DATA LIST ITEM		
	27	28	29
D range	OFF	OFF	OFF
Sport mode	ON	OFF	OFF
Upshift and hold the selector lever	ON	ON	OFF
Downshift and hold the selector lever	ON	OFF	ON

NOTE: The switches above are displayed, depending on the selector lever condition as shown in the table.

(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.00-14.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

STEP 5. Check the shift switch assembly.

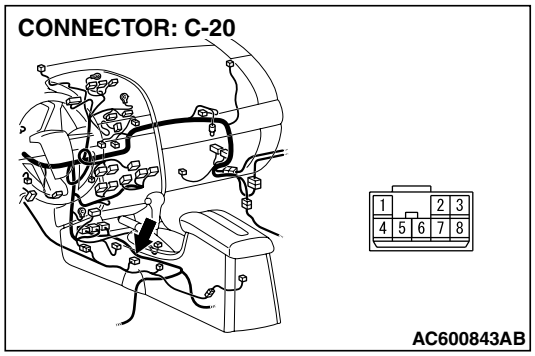
Refer to P.23A-383, Transaxle Control.

Q: Is the switch operating properly?

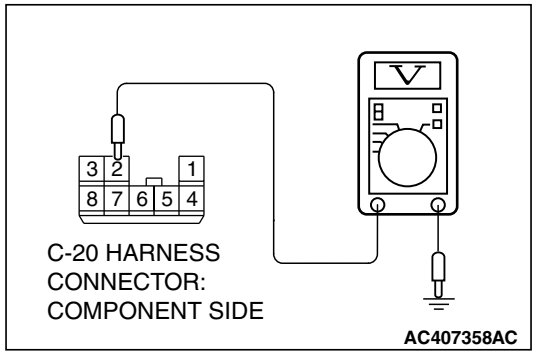
YES : Go to Step 6.

NO : Replace the shift switch assembly. Refer to P.23A-382, Transaxle Control.

STEP 6. Measure the power supply voltage at shift switch assembly connector C-20.



(1) Disconnect connector C-20 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



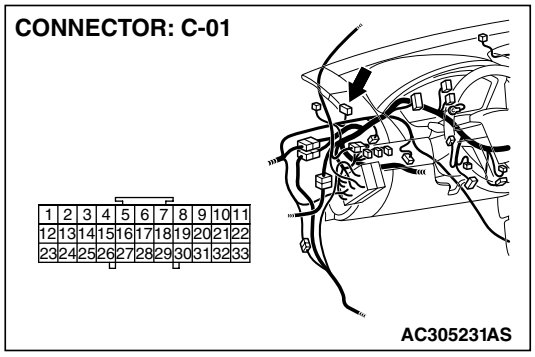
(3) Measure the voltage between terminal 2 and ground.
- The voltage should measure battery positive voltage.

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

Q: Is the measured voltage battery positive voltage?

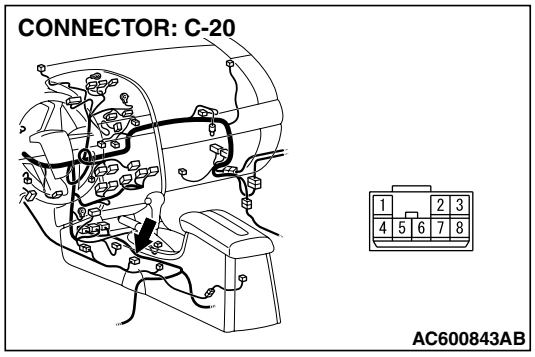
YES : Go to Step 4.
NO : Go to Step 7.

STEP 7. Check joint connector (1) C-01 and shift switch assembly connector C-20 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.

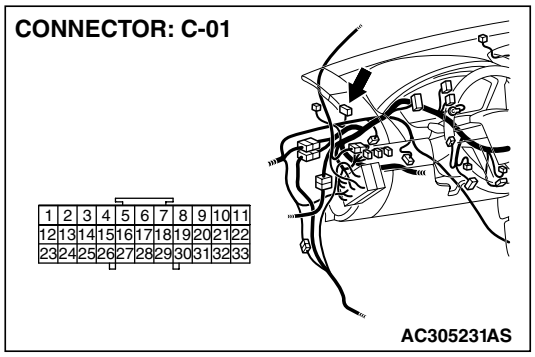


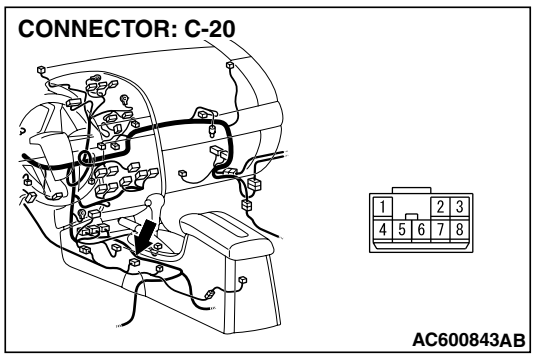
STEP 8. Check the harness for open circuit or short circuit to ground between joint connector (1) C-01 terminal 24 and shift switch assembly connector C-20 terminal 2.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair or replace the harness wire.



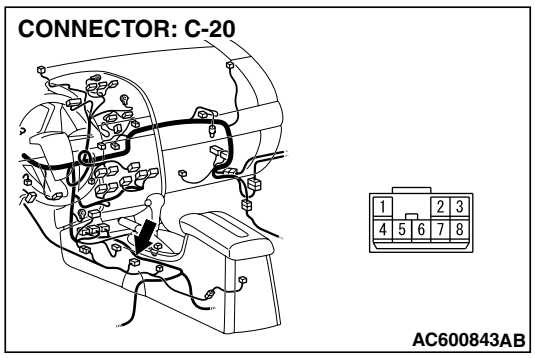


STEP 9. Measure the power supply voltage at shift switch assembly connector C-20.

(1) Disconnect connector C-20 and measure at the harness side.

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

(3) Move the selector lever to the "D" position.



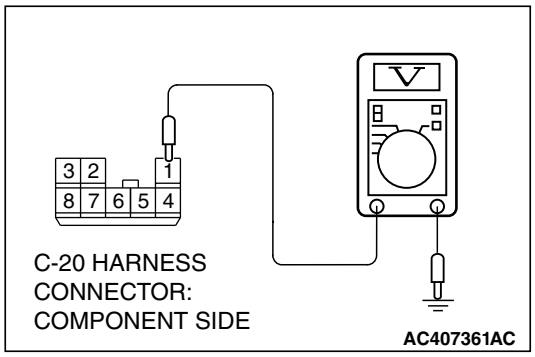
(4) Measure the voltage between terminal 1 and ground.
- The voltage should measure battery positive voltage.

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

Q: Is the measured voltage battery positive voltage?

YES : Go to Step 12.

NO : Go to Step 10.

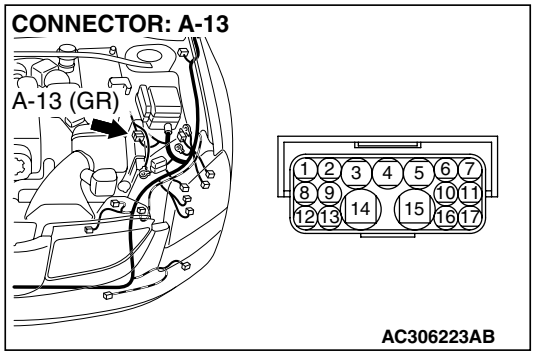


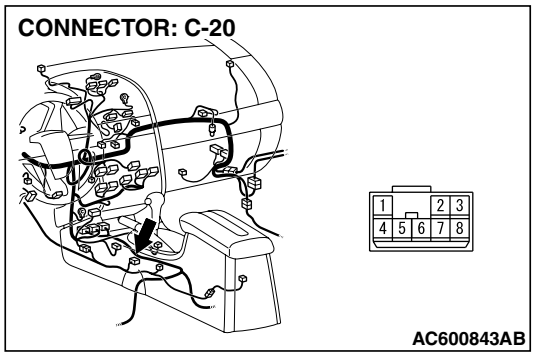
STEP 10. Check intermediate connector A-13 and shift switch assembly connector C-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 11.

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



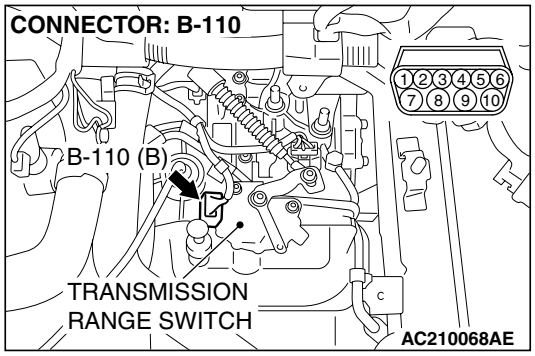


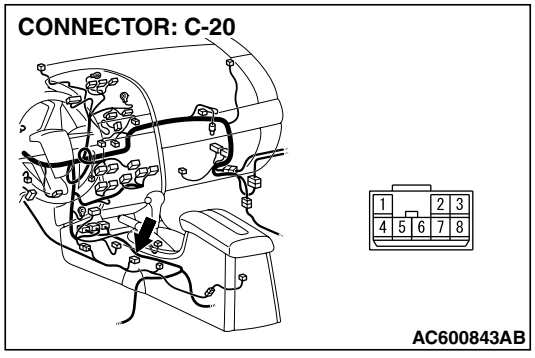
STEP 11. Check harness for open circuit or short circuit to ground between transmission range switch connector B-110 terminal 1 and shift switch assembly connector C-20 terminal 1.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair or replace the harness wire.





STEP 12. Check the shift switch assembly.
Refer to P.23A-383, Transaxle Control.

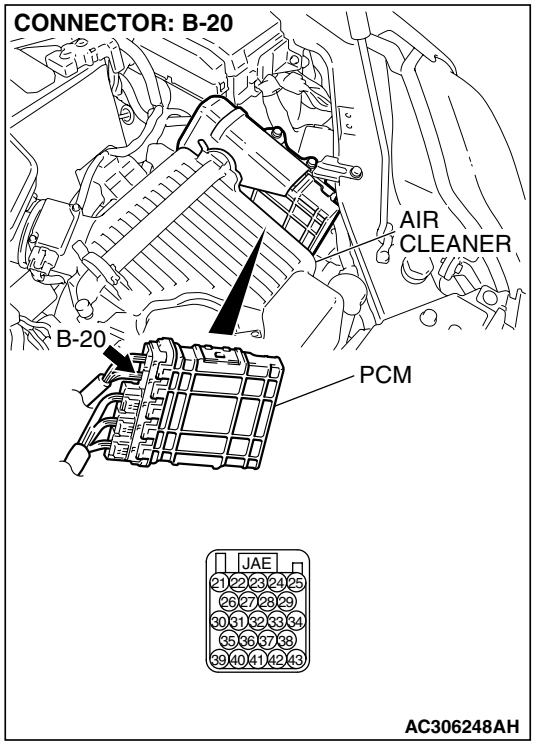
Q: Is the switch operating properly?

YES : Go to Step 13.

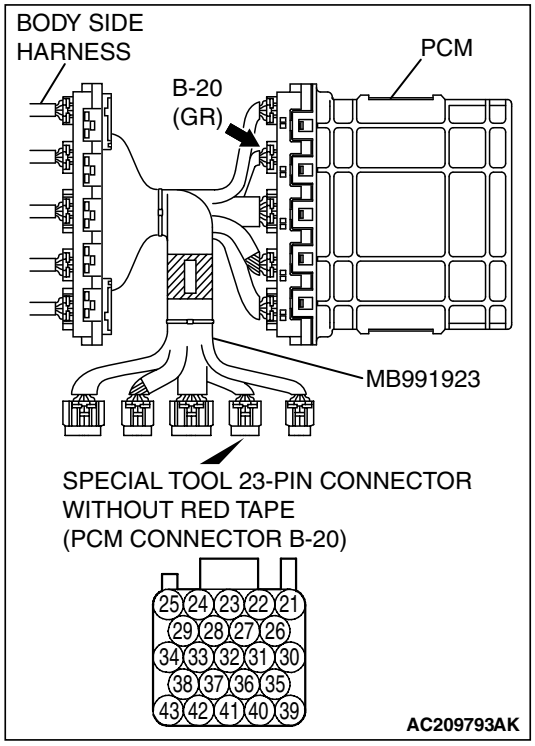
NO : Replace the shift switch assembly. Refer to P.23A-382, Transaxle Control.

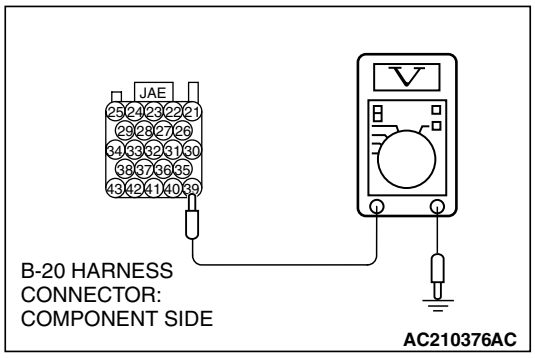
STEP 13. Measure the switch output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Move the selector lever to the sport mode.





(5) Measure the voltage between terminal 39 and ground.
- The voltage should measure battery positive voltage.

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

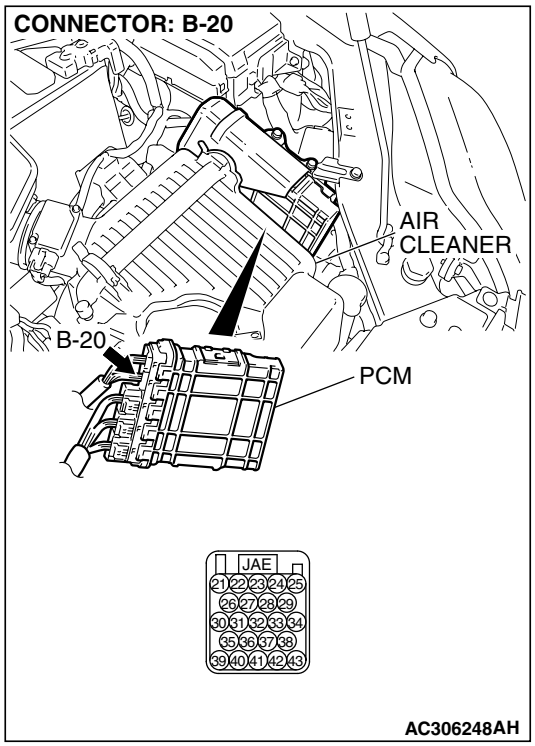
Q: Is the measured voltage battery positive voltage?

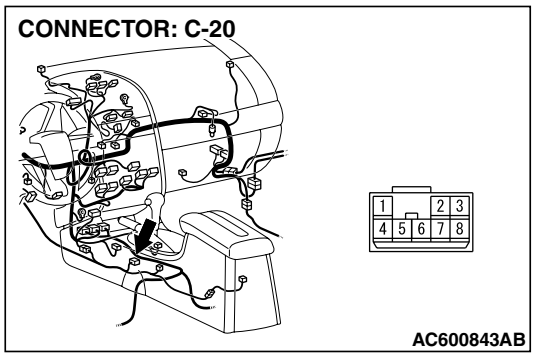
YES : Go to Step 16.
NO : Go to Step 14.

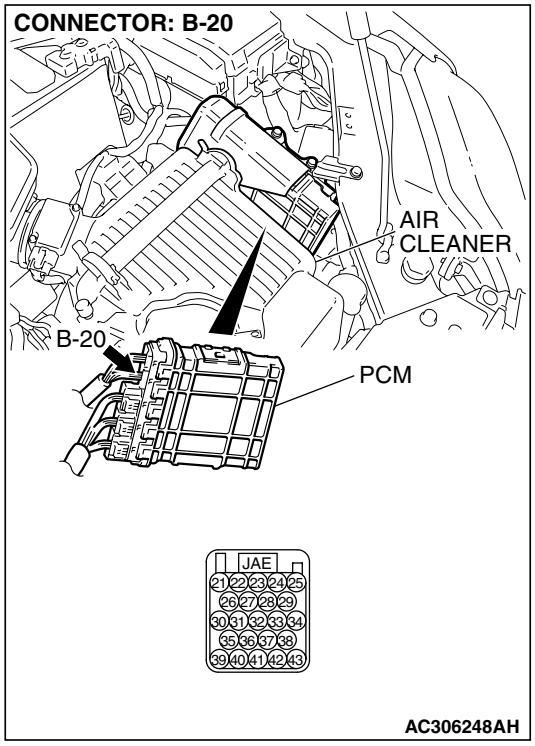
STEP 14. Check PCM connector B-20 and shift switch assembly connector C-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

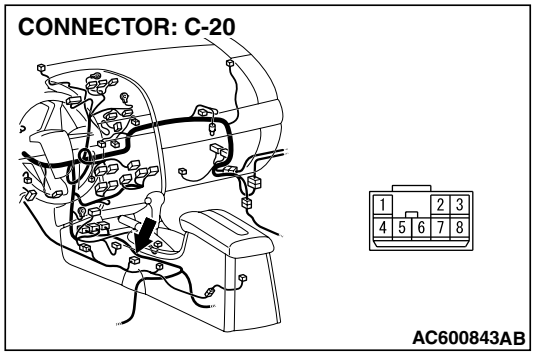
Q: Are the connectors and terminals in good condition?

YES : Go to Step 15.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







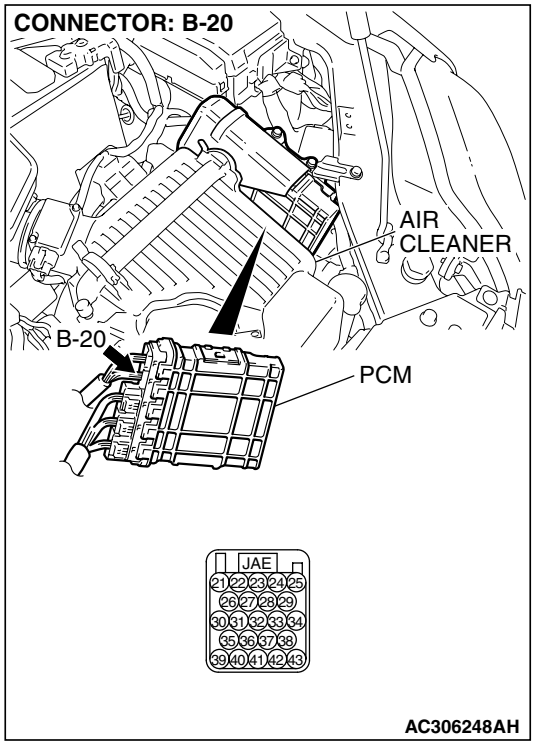


STEP 15. Check the harness for open circuit or short circuit to ground between PCM connector B-20 terminal 39 and shift switch assembly connector C-20 terminal 6.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair or replace the harness wire.



STEP 16. Check PCM connector B-20 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 17. Check the shift switch assembly.

Refer to P.23A-383, Transaxle Control.

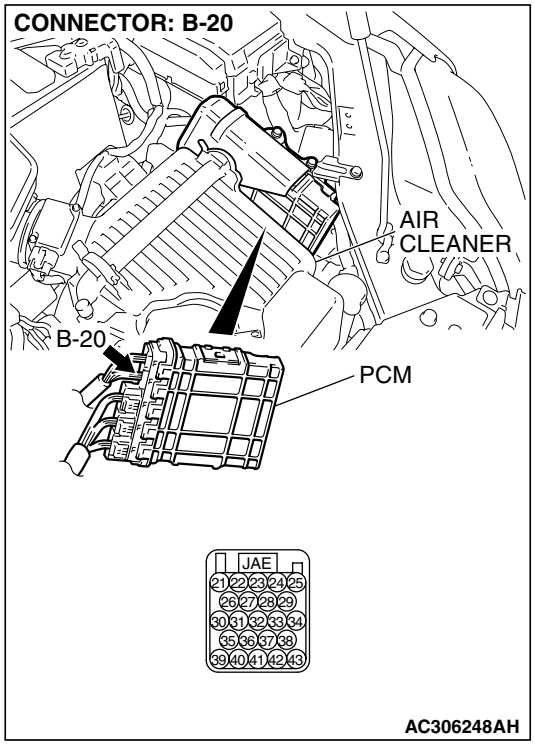
Q: Is the switch operating properly?

YES : Go to Step 18.

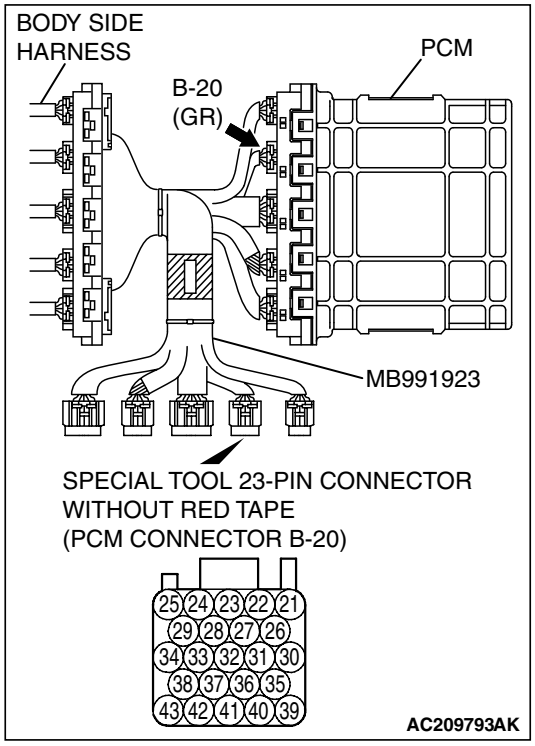
NO : Replace the shift switch assembly. Refer to P.23A-382, Transaxle Control.

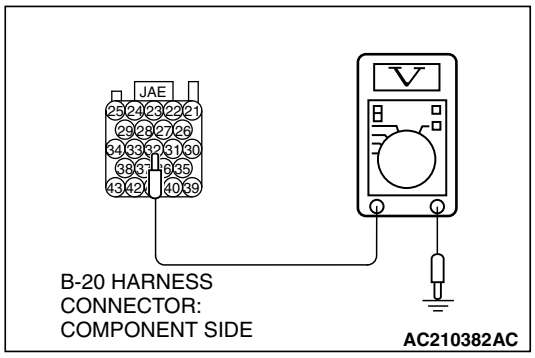
STEP 18. Measure the switch output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal 32 and ground.
- The voltage should measure battery positive voltage when the selector lever is upshift and hold.

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

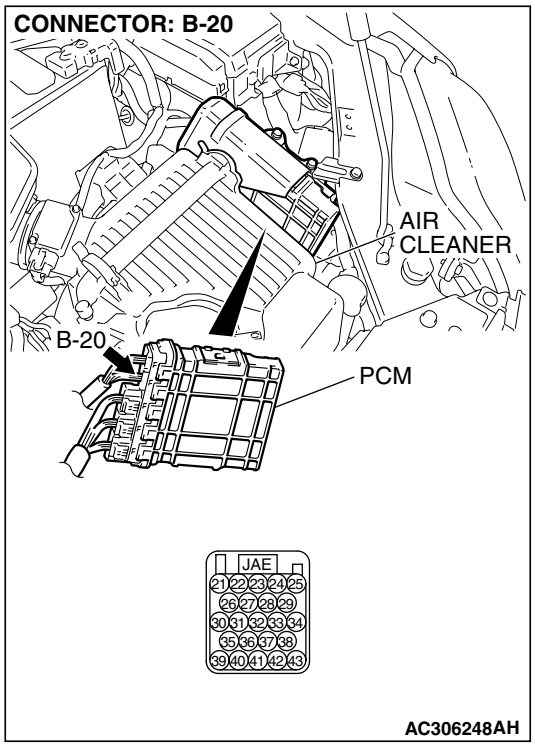
Q: Is the measured voltage battery positive voltage?

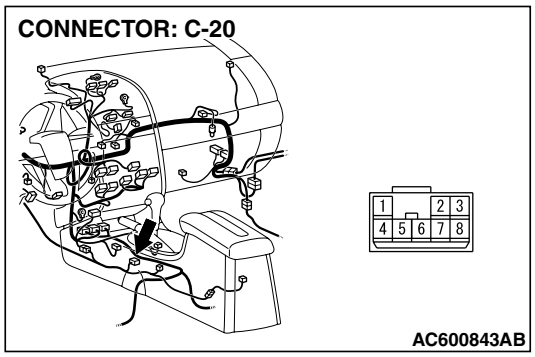
YES : Go to Step 21.
NO : Go to Step 19.

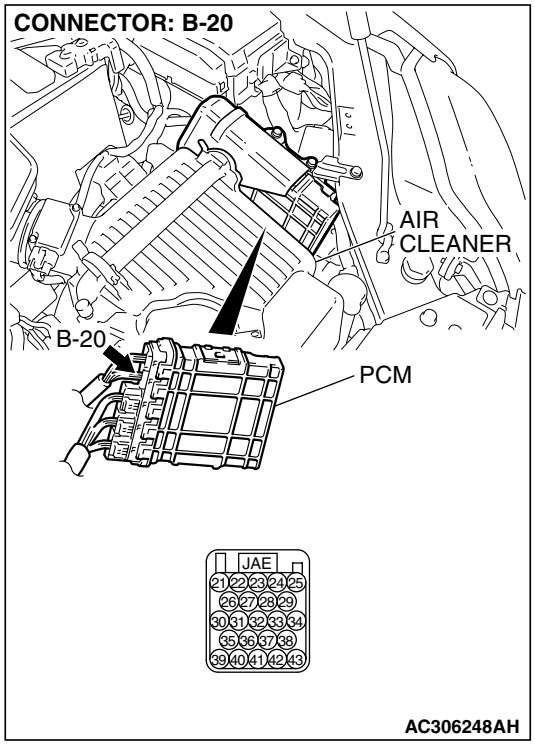
STEP 19. Check PCM connector B-20 and shift switch assembly connector C-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

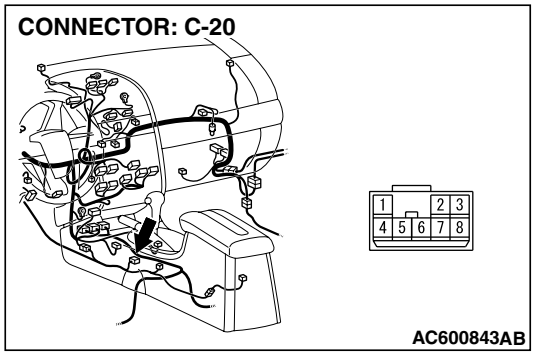
Q: Are the connectors and terminals in good condition?

YES : Go to Step 20.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







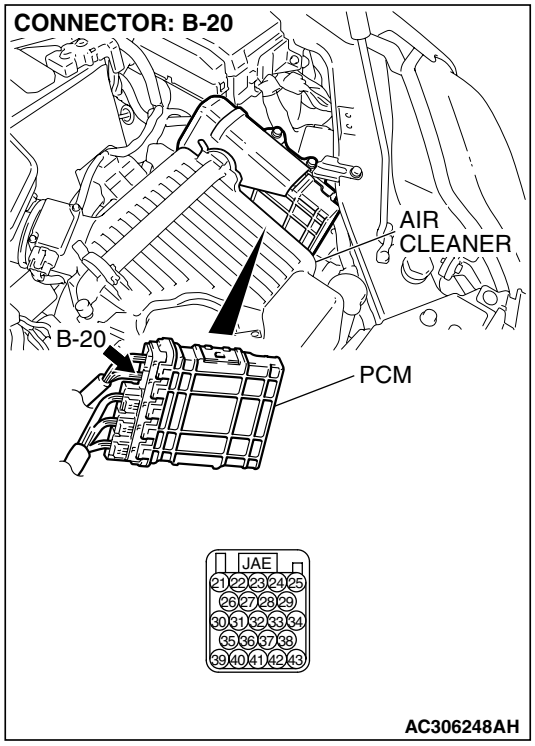


STEP 20. Check the harness for open circuit or short circuit to ground between PCM connector B-20 terminal 32 and shift switch assembly connector C-20 terminal 7.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair or replace the harness wire.



STEP 21. Check PCM connector B-20 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 22. Check the shift switch assembly.

Refer to P.23A-383, Transaxle Control.

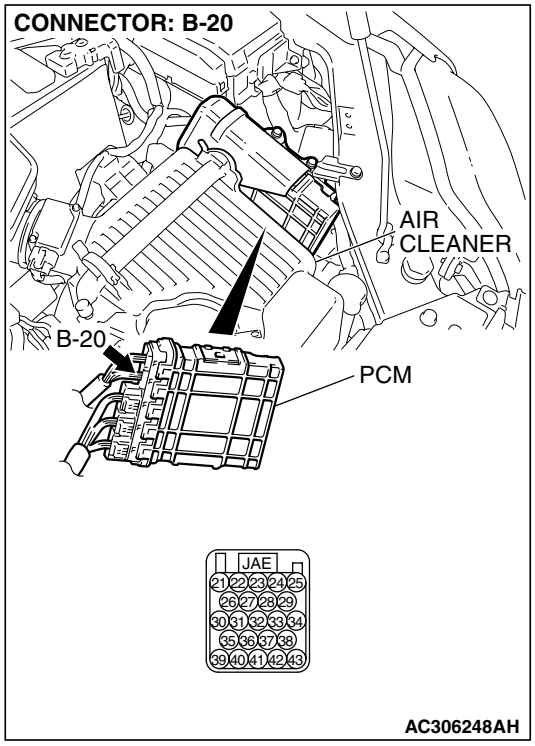
Q: Is the switch operating properly?

YES : Go to Step 23.

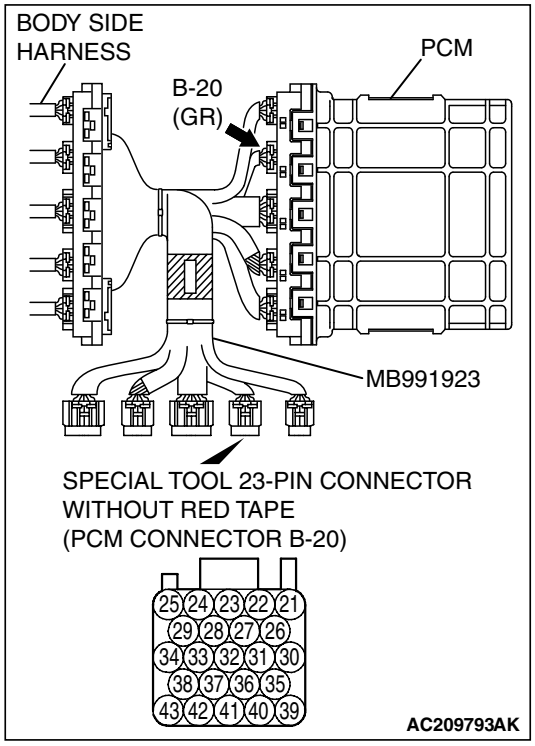
NO : Replace the shift switch assembly. Refer to P.23A-382, Transaxle Control.

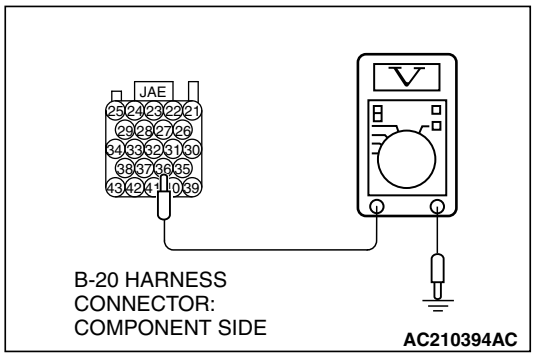
STEP 23. Measure the switch output voltage at PCM connector B-20 by using check harness special tool MB991923.

(1) Disconnect all the connectors from the PCM.



(2) Connect special tool MB991923 (check harness) between the PCM and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.





(4) Measure the voltage between terminal 36 and ground.
- The voltage should measure battery positive voltage when the selector lever is downshift and hold.

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

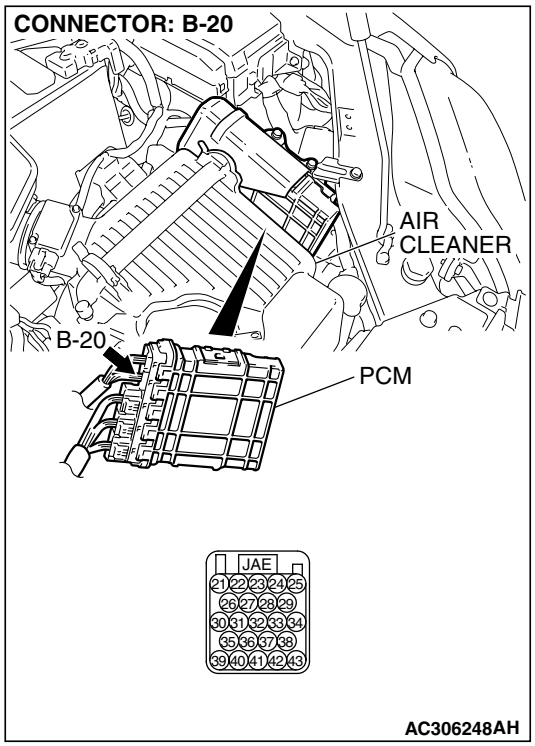
Q: Is the measured voltage battery positive voltage?

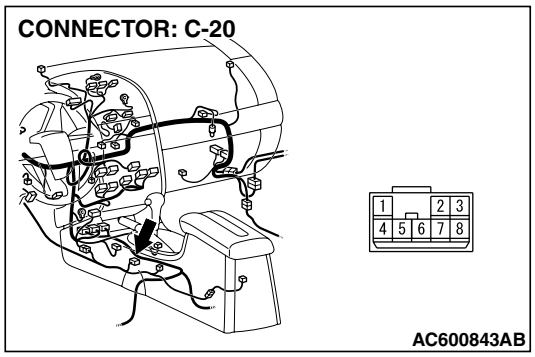
YES : Go to Step 26.
NO : Go to Step 24.

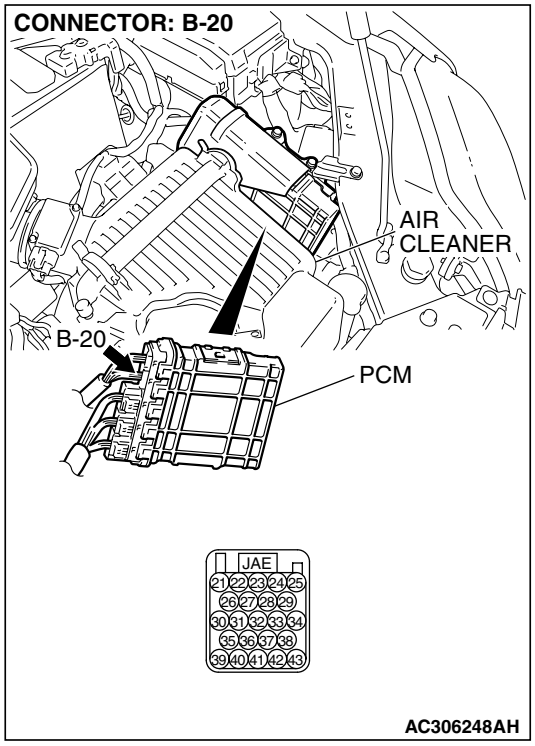
STEP 24. Check PCM connector B-20 and shift switch assembly connector C-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

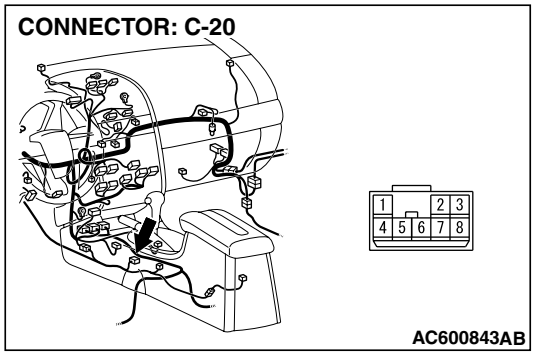
Q: Are the connectors and terminals in good condition?

YES : Go to Step 25.
NO : Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.







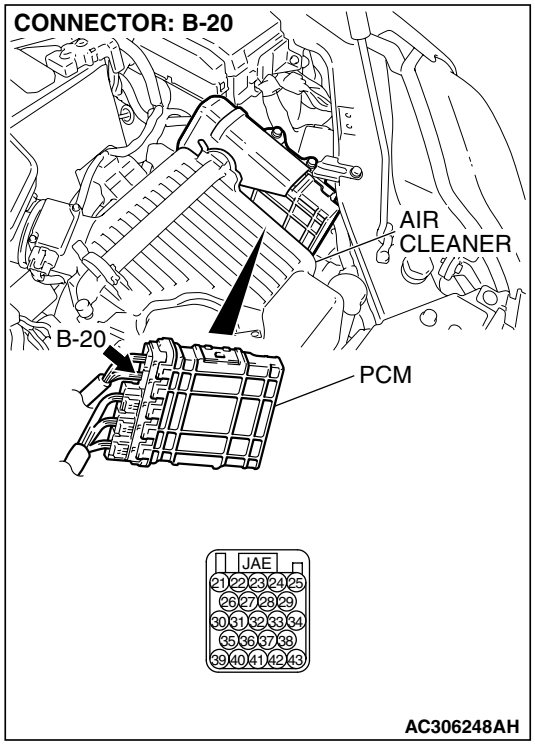


STEP 25. Check the harness for open circuit or short circuit to ground between PCM connector B-20 terminal 36 and shift switch assembly connector C-20 terminal 3.

Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair or replace the harness wire.



STEP 26. Check PCM connector B-20 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

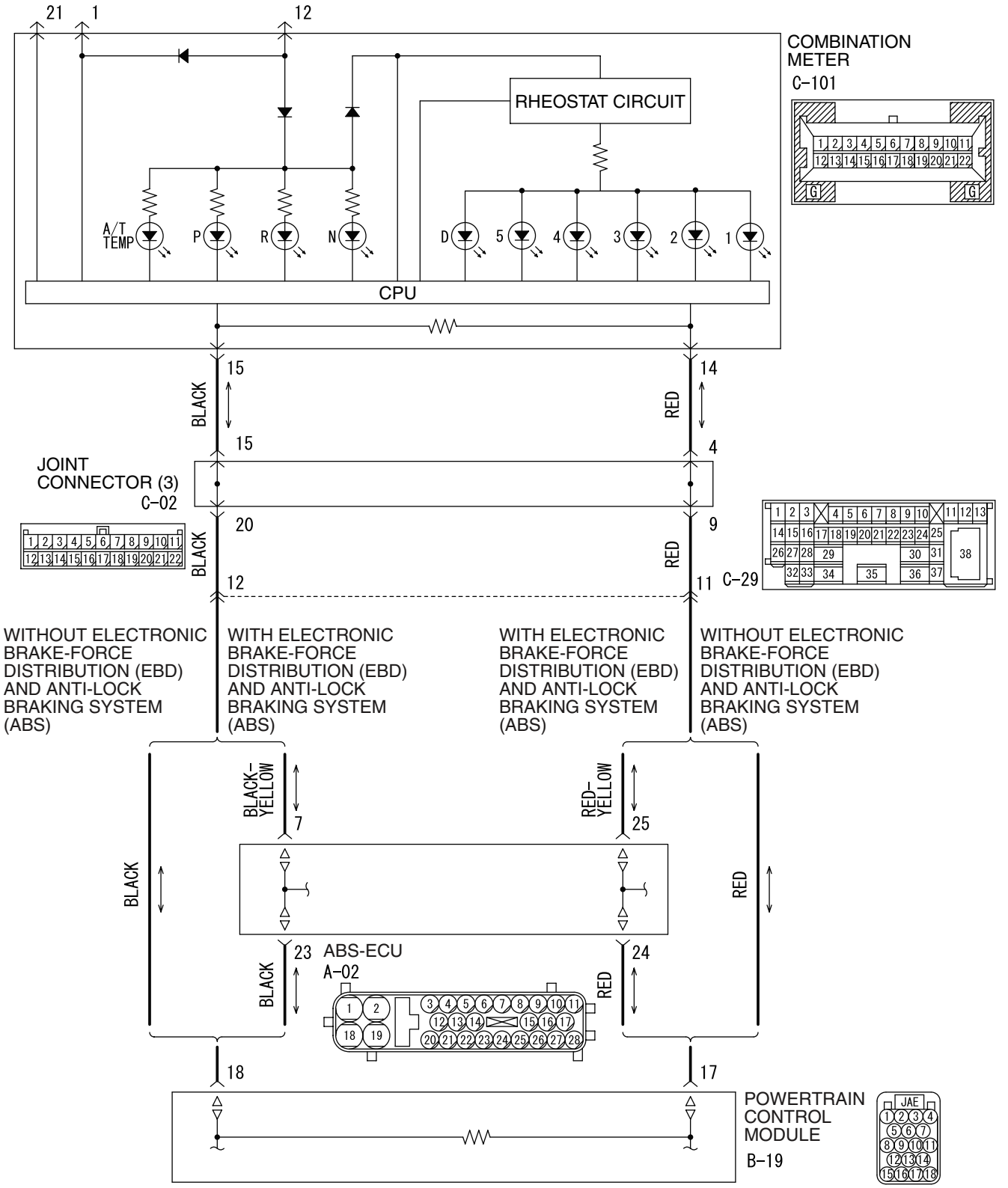
Q: Are the connector and terminals in good condition?

YES : Go to Step 4.

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

INSPECTION PROCEDURE 16: Shift Position Indicator Light System

Communication circuit (CAN Communcation Line) between PCM and Combination Meter



W7P23M013A
AC600848AB

TSB Revision

CIRCUIT OPERATION

- The PCM detects the transmission range ("P," "R," "N," "D," sport mode "5 <5A/T>," "4," "3," "2," or "1"), and display it on the combination meter.

COMMENT

Connector(s), wiring harness in the CAN bus line between the PCM and the combination meter, power supply to the PCM, the combination meter, the PCM may be defective.

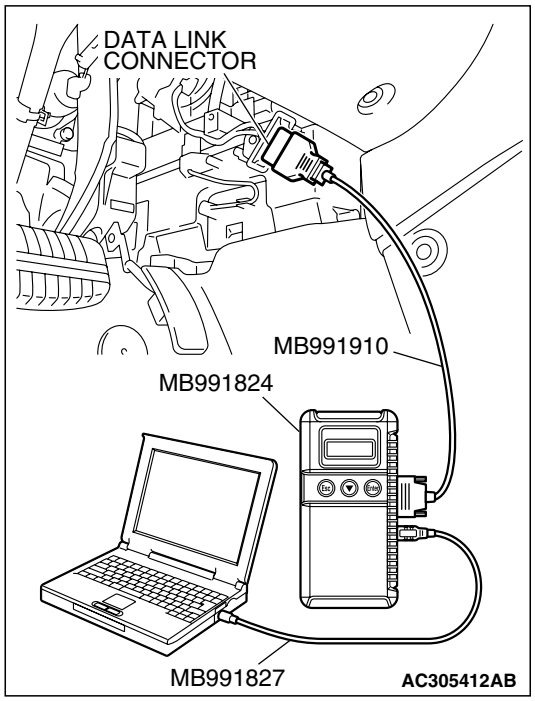
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CONDITION:)

- Malfunction of the combination meter
- Damaged harness, connector
- Malfunction of the PCM

DIAGNOSIS

Required Special Tool:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

⚠ CAUTION

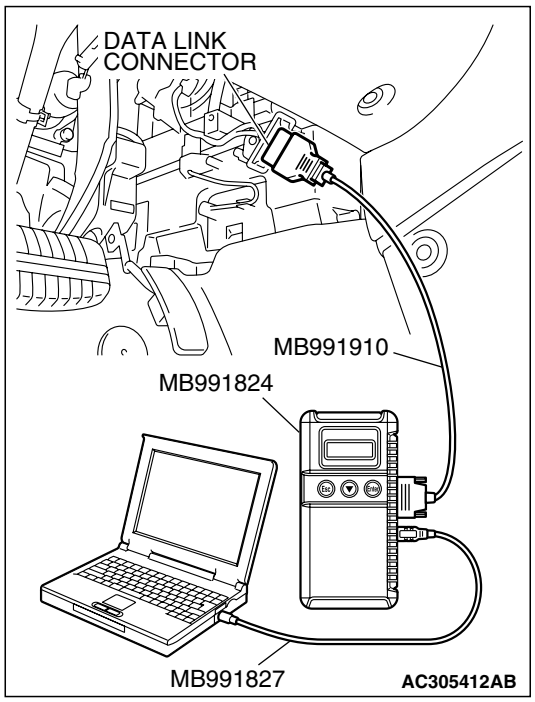
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

Use scan tool MB991958 to diagnose the CAN bus lines.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result properly?

YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C, Diagnosis-CAN Bus Diagnostic Chart P.54C-16).



STEP 2. Using scan tool MB991958, read the MFI diagnostic trouble code.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for MFI diagnostic trouble code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1108 set?

YES : Refer to GROUP 13A <2.4L Engine>, Diagnostic Trouble Code Procedures P.13A-984 DTC U1108: Combination Meter-ECU CAN Communication Time Out or refer to GROUP 13B <3.8L Engine>, Diagnostic Trouble Code Procedures P.13B-1235 DTC U1108: Combination Meter-ECU CAN Communication Time Out.

NO : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

DATA LIST REFERENCE TABLE

M1231008100650

ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
8	A/T control relay output voltage	Ignition switch: ON		Battery positive voltage
3	Engine load	• Engine: Idling • Transmission range: P, N	Accelerator pedal: Release → depressed	Data changes
1	Engine speed	• Engine: Idling (after the warming up) • Transmission range: P	Accelerator pedal: Release	600 – 900 r/min
			Accelerator pedal: Depressed	Gradually rises from the above value
21	Dual pressure switch	• Engine: Idling • Transmission range: P, N	A/C switch: ON (while the A/C compressor is in operation)	ON
			A/C switch: OFF	OFF
33	INVECS-II control stop	Ignition switch: ON	Cancel INVECS-II.	ON
			Release INVECS-II cancel command.	OFF
5	Input shaft speed sensor	Gear range: 3rd <4A/T> or 4th <5A/T> gear	Driving at constant speed of 50 km/h (31 mph) <4A/T> or 60 km/h (37mph) <5A/T>	1,400 – 1,700 r/min

TSB Revision

ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
12	Low-reverse solenoid valve duty	Transmission range: Sport mode	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0%
			Driving at constant speed of 30 km/h (19 mph) in 2nd gear	100%
			Driving at constant speed of 50 km/h (31 mph) in 3rd gear	100%
			Driving at constant speed of 60 km/h (37 mph) in 4th gear	100% <4A/T> 0% <5A/T>
			Driving at constant speed of 70 km/h (43 mph) in 5th gear <5A/T>	0%
15	Overdrive solenoid valve duty	Transmission range: Sport mode	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	100%
			Driving at constant speed of 30 km/h (19 mph) in 2nd gear	100%
			Driving at constant speed of 50 km/h (31 mph) in 3rd gear	0%
			Driving at constant speed of 60 km/h (37 mph) in 4th gear	0%
			Driving at constant speed of 70 km/h (43 mph) in 5th gear <5A/T>	0%
22	Overdrive off signal	While auto-cruise is engaged	Level road	OFF
			Uphill grade	ON
6	Output shaft speed sensor	Gear range: 3rd <4A/T> or 4th <5A/T> gear	Driving at constant speed of 50 km/h (31 mph) <4A/T> or 60 km/h (37mph) <5A/T>	1,400 – 1,700 r/min

ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
16	Reduction solenoid valve duty <5A/T>	Transmission range: Sport mode <5A/T>	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0%
			Driving at constant speed of 30 km/h (19 mph) in 2nd gear	0%
			Driving at constant speed of 50 km/h (31 mph) in 3rd gear	0%
			Driving at constant speed of 60 km/h (37 mph) in 4th gear	100%
			Driving at constant speed of 70 km/h (43 mph) in 5th gear	100%
14	Second solenoid valve duty	Transmission range: Sport mode	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	100%
			Driving at constant speed of 30 km/h (19 mph) in 2nd gear	0%
			Driving at constant speed of 50 km/h (31 mph) in 3rd gear	100%
			Driving at constant speed of 60 km/h (37 mph) in 4th gear	0% <4A/T> 100% <5A/T>
			Driving at constant speed of 70 km/h (43 mph) in 5th gear <5A/T>	0%
27	Select switch	Ignition switch: ON	Transmission range: D	OFF
			Selector lever operation: Select sport mode	ON
			Selector lever operation: Upshift and hold the selector lever	ON
			Selector lever operation: Downshift and hold the selector lever	ON

ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
11	Shift position	Transmission range: Sport mode	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	1st
			Driving at constant speed of 30 km/h (19 mph) in 2nd gear	2nd
			Driving at constant speed of 50 km/h (31 mph) in 3rd gear	3rd
			Driving at constant speed of 60 km/h (37 mph) in 4th gear	4th
			Driving at constant speed of 70 km/h (43 mph) in 5th gear <5A/T>	5th
		Transmission range: R	Driving at constant speed of 5 km/h (3.1 mph) in reverse gear	REV
		Transmission range: P, N		NP
29	Shift switch (Down)	Ignition switch: ON	Transmission range: D	OFF
			Selector lever operation: Select sport mode	OFF
			Selector lever operation: Upshift and hold the selector lever	OFF
			Selector lever operation: Downshift and hold the selector lever	ON
28	Shift switch (Up)	Ignition switch: ON	Transmission range: D	OFF
			Selector lever operation: Select sport mode	OFF
			Selector lever operation: Upshift and hold the selector lever	ON
			Selector lever operation: Downshift and hold the selector lever	OFF
19	Stoplight switch	Ignition switch: ON	Brake pedal: Depressed	ON
			Brake pedal: Released	OFF
10	Torque converter clutch amount of slippage	• Warmed up • Transmission range: Sport mode • Driving at speed of 60 km/h (37 mph) in 3rd gear	Driving at constant speed of 60 km/h (37 mph)	−10 to 10 r/min
			Release accelerator pedal (at less than 50 km/h (31 mph)	The value should fluctuate when the accelerator is released.

TSB Revision

ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION
17	Torque converter clutch solenoid valve duty	• Warmed up • Transmission range: Sport mode • Driving at speed of 60 km/h (37 mph) in 3rd gear	Driving at constant speed of 60 km/h (37 mph)	70 – 99.6%
			Release accelerator pedal (at less than 50 km/h (31 mph))	70 – 99.6% → 0% Decreases gradually as the vehicle speed decreases
7	Transmission fluid temperature sensor	Warmed up	Drive for 15 minutes or more so that the transmission fluid temperature becomes 70 – 80°C (158 – 176°F)	Gradually rises to 70 – 80°C (158 – 176°F)
2	Throttle position sensor	• Ignition switch: ON • Engine: Stopped • Transmission range: P	Accelerator pedal: Release	300 – 700 mV
			Accelerator pedal: Depressed	Gradually rises from the above value
			Accelerator pedal: Fully depressed	4,000 mV or more
34	Transmission range switch	Ignition switch: ON	Transmission range: P	P
			Transmission range: R	R
			Transmission range: N	N
			Transmission range: D	D
13	Underdrive solenoid valve duty	Transmission range: Sport mode	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	0%
			Driving at constant speed of 30 km/h (19 mph) in 2nd gear	0%
			Driving at constant speed of 50 km/h (31 mph) in 3rd gear	0%
			Driving at constant speed of 60 km/h (37 mph) in 4th gear	100% <4A/T> 0% <5A/T>
			Driving at constant speed of 70 km/h (43 mph) in 5th gear <5A/T>	100%

ACTUATOR TEST REFERENCE TABLE

M1231008200527

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	TEST CONTENT	INSPECTION REQUIREMENT	NORMAL CONDITION
1st SIFT LMP	7	Shift position indicator light (1st)	Illuminate each indicator light for three seconds to the signal from the scan tool MB991958 (M.U.T.-III sub assembly).	• Ignition switch: ON • Transmission range: P • Engine: stopped • Throttle opening voltage: Less than one volt	Shift indicator light illuminates.
2nd SIFT LMP	8	Shift position indicator light (2 nd)			
2ND SOL	3	Second solenoid valve	Drive the solenoid valve specified by the scan tool MB991958 (M.U.T.-III sub assembly) at 50% duty for five seconds. No other solenoid valve should be energized.		The solenoid should click when activated
3rd SIFT LMP	9	Shift position indicator light (3rd)	illuminate each indicator light for three seconds to the signal from the scan tool MB991958 (M.U.T.-III sub assembly).		Shift indicator light illuminates.
4th SIFT LMP	10	Shift position indicator light (4th)			
5th SIFT LMP	11	Shift position indicator light (5th)			
A/T RELAY	12	A/T control relay	Actuator test in scope mode, data list No.8. Control relay is OFF for three seconds.		Data list No.8 • During test: 0 V • Normal: Battery positive voltage [12 V]
L/R SOL	1	Low-reverse solenoid valve	Drive the solenoid valve specified by the scan tool MB991958 (M.U.T.-III sub assembly) at 50% duty for five seconds. No other solenoid valve should be energized.		The solenoid should click when activated
O/D SOL	4	Overdrive solenoid valve			

TSB Revision

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	TEST CONTENT	INSPECTION REQUIREMENT	NORMAL CONDITION
RE SOL	5	Reduction solenoid valve <5A/T>			
TCC SOL	6	Torque converter clutch solenoid valve			
U/D SOL	2	Underdrive solenoid valve			

INVECS-II CANCEL COMMAND (SPECIAL FUNCTION)

M1231009500402

ITEM	CONTENT	REMARKS
INVECS-II control stop	Stops the INVECS-II control and shifts gears according to the standard shift pattern.	Use this function when performing procedure 8 in the road tests. (Refer to P.23A-22) The INVECS-II cancel command will last until the ignition switch is turned from "ON" to "LOCK"(OFF) or vice versa.

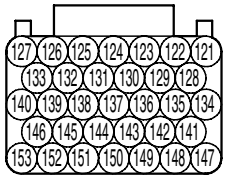
PCM TERMINAL VOLTAGE REFERENCE CHART FOR TRANSAXLE OPERATION

M1231008400565

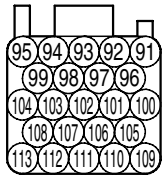
1. Disconnect the PCM connectors, and connect special tool MB991923 in between.
2. Measure the voltages between each check connector terminals of special tool MB991923 and ground terminals 4 or 7.

SPECIAL TOOL-POWER PLANT ECU CHECK HARNESS (MB991923) CONNECTOR: COMPONENT SIDE

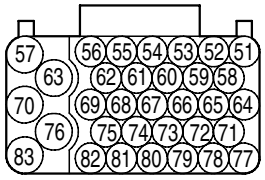
33-PIN CONNECTOR (PCM CONNECTOR B-23)



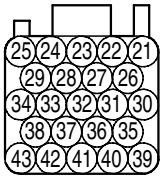
23-PIN CONNECTOR WITH RED TAPE (PCM CONNECTOR B-22)



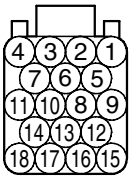
33-PIN CONNECTOR (PCM CONNECTOR B-21)



23-PIN CONNECTOR WITHOUT RED TAPE (PCM CONNECTOR B-20)



18-PIN CONNECTOR (PCM CONNECTOR B-19)



AC209259AC

TERMINAL NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION
4	Ground	Always	1 V or less
7	Ground	Always	1 V or less
9	Stoplight switch	• Ignition switch: ON • Brake pedal: Depressed	Battery positive voltage
		• Ignition switch: ON • Brake pedal: Released	1 V or less
14	Vehicle speed signal	• Measure between terminal 14 and 4 with an oscilloscope. • Engine: 2,000 r/min • Gear range: 3rd gear	Refer to P.23A-350, Inspection Procedure Using an Oscilloscope.

TERMINAL NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION
32	Shift switch (up)	• Ignition switch: ON • Selector lever operation: Upshift and hold the selector lever	Battery positive voltage
		• Ignition switch: ON • Selector lever operation: Other than above	1 V or less
36	Shift switch (down)	• Ignition switch: ON • Selector lever operation: Downshift and hold the selector lever	Battery positive voltage
		• Ignition switch: ON • Selector lever operation: Other than above	1 V or less
39	Select switch	• Ignition switch: ON • Transmission range: Sport mode	Battery positive voltage
		• Ignition switch: ON • Transmission range: Other than above	1 V or less
53	Reduction solenoid valve <5A/T>	• Engine: idling • Gear range: 5th gear	Battery positive voltage
		• Engine: idling • Transmission range: P	6 – 9 V
54	Torque converter clutch solenoid valve	• Engine: idling • Gear range: 1st gear	Battery positive voltage
55	Overdrive solenoid valve	• Engine: idling • Gear range: 3rd gear	Battery positive voltage
		• Engine: idling • Transmission range: P	6 – 9 V
56	Low-reverse solenoid valve	• Engine: idling • Transmission range: P	Battery positive voltage
		• Engine: idling • Gear range: 2nd gear	6 – 9 V
57	Solenoid valve power supply	Ignition switch: LOCK (OFF)	1V or less
		Ignition switch: ON	Battery positive voltage
61	Transmission range switch: R	• Ignition switch: ON • Transmission range: R	Battery positive voltage
		• Ignition switch: ON • Transmission range: Other than above	1 V or less
65	Underdrive solenoid valve	• Engine: idling • Gear range: 1st gear	Battery positive voltage
		• Engine: idling • Transmission range: P	6 – 9 V
66	Second solenoid valve	• Engine: idling • Gear range: 2nd gear	Battery positive voltage
		• Engine: idling • Transmission range: P	6 – 9 V

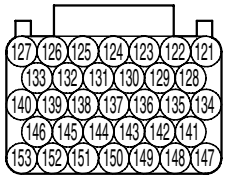
TSB Revision

TERMINAL NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION
67	Transmission range switch: P	• Ignition switch: ON • Transmission range: P	Battery positive voltage
		• Ignition switch: ON • Transmission range: Other than above	1 V or less
70	Solenoid valve power supply	Ignition switch: LOCK (OFF)	1 V or less
		Ignition switch: ON	Battery positive voltage
73	Transmission range switch: D	• Ignition switch: ON • Transmission range: D	Battery positive voltage
		• Ignition switch: ON • Transmission range: Other than above	1 V or less
74	Transmission fluid temperature sensor	• Ignition switch: ON • Transmission fluid temperature: 20°C (68°F)	3.8 – 4.0 V
		• Ignition switch: ON • Transmission fluid temperature: 40°C (104°F)	3.2 – 3.4 V
		• Ignition switch: ON • Transmission fluid temperature: 80°C (176°F)	1.7 – 1.9 V
77	Transmission range switch: N	• Ignition switch: ON • Transmission range: N	Battery positive voltage
		• Ignition switch: ON • Transmission range: Other than above	1 V or less
82	A/T control relay	Always	1 V or less
111	Input shaft speed sensor	• Measure between terminal 111 and 4 with an oscilloscope. • Engine: 2,000 r/min • Gear range: 3rd gear <4A/T> or 4th gear <5A/T>	Refer to P.23A-350, Inspection Procedure Using an Oscilloscope.
112	Output shaft speed sensor	• Measure between terminal 112 and 4 with an oscilloscope. • Engine: 2,000 r/min • Gear range: 3rd gear <4A/T> or 4th gear <5A/T>	Refer to P.23A-350, Inspection Procedure Using an Oscilloscope.

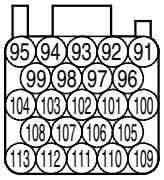
PCM TERMINAL RESISTANCE AND CONTINUITY INSPECTION CHART

M1231013400204

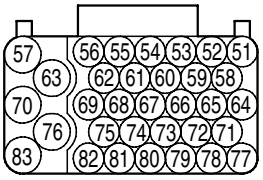
33-PIN CONNECTOR (PCM CONNECTOR B-23)



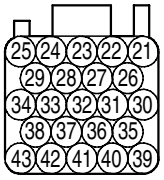
23-PIN CONNECTOR WITH RED TAPE (PCM CONNECTOR B-22)



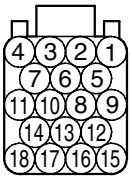
33-PIN CONNECTOR (PCM CONNECTOR B-21)



23-PIN CONNECTOR WITHOUT RED TAPE (PCM CONNECTOR B-20)



18-PIN CONNECTOR (PCM CONNECTOR B-19)



AC209259AD

NOTE: The PCM connectors should be disconnected for this inspection.

TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (CHECK CONDITION)
69 – 74	Transmission fluid temperature sensor	16.7 – 20.5 kΩ [at 0°C (32°F)]
		7.3 – 8.9 kΩ [at 20°C (68°F)]
		3.4 – 4.2 kΩ [at 40°C (104°F)]
		1.9 – 2.2 kΩ [at 60°C (140°F)]
		1.0 – 1.2 kΩ [at 80°C (176°F)]
		0.57 – 0.69 kΩ [at 100°C (212°F)]

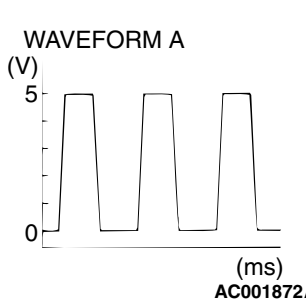
INSPECTION PROCEDURE USING AN OSCILLOSCOPE

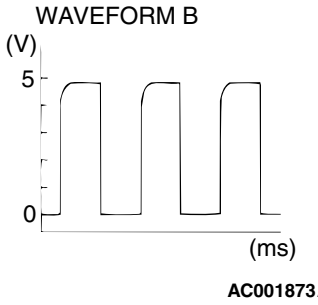
M1231008500540

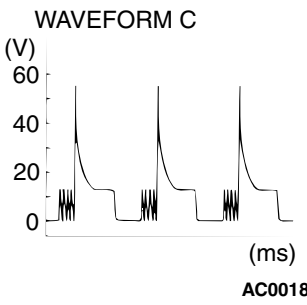
TERMINAL NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION (WAVEFORM SAMPLE)
103	Crankshaft position sensor	Transmission range: N	Idling (Vehicle stopped)	Waveform A
111	Input shaft speed sensor	Gear range: 3rd gear <4A/T> or 4th gear <5A/T>	Driving at constant speed of 50 km/h (31 mph) in 3rd gear (1,400 – 1,700 r/min) <4A/T> or 60 km/h (37 mph) in 4th gear (1,400 – 1,700 r/min) <5A/T>	Waveform B
112	Output shaft speed sensor			

TERMINAL NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION (WAVEFORM SAMPLE)
53	Reduction solenoid valve <5A/T>	• Ignition switch: ON • Transmission range: P • Engine: Stopped • Throttle (Accelerator) opening voltage: 1 V or less	Force drive each solenoid valve (Actuator test)	Waveform C
54	Torque converter clutch control solenoid			
55	Overdrive solenoid valve			
56	Low-reverse solenoid valve			
65	Underdrive solenoid valve			

Waveform sample







A/T FAULTY OPERATION PREVENTION MECHANISM DIAGNOSIS

INTRODUCTION TO A/T KEY INTERLOCK AND SHIFT LOCK MECHANISMS

M1232001600226

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

A/T KEY INTERLOCK AND SHIFT LOCK MECHANISMS DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1232001700223

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

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

SYMPTOM CHART

M1232001800413

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Selector lever can be moved from "P" to "R" position without depressing brake pedal when ignition key is at any position other than "LOCK" (OFF) position.	1	P.23A-352
Selector lever cannot be moved from "P" to "R" position with brake pedal depressed when ignition key is at any position other than "LOCK" (OFF) position.	2	P.23A-353
Selector lever can be moved from "P" to "R" position with brake pedal depressed when ignition key is at "LOCK" (OFF) position.	3	P.23A-354
Selector lever cannot be moved from "P" to "R" position smoothly.	4	P.23A-355
Selector lever cannot be moved from "P" to "R" position.	5	P.23A-356
Ignition key cannot be turned to "LOCK" (OFF) position when selector lever is at "P" position.	6	P.23A-357
Ignition key can be turned to "LOCK" (OFF) position when selector lever is at any position other than "P" position.	7	P.23A-358

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Selector Lever can be Moved from "P" to "R" Position without Depressing Brake Pedal when Ignition Key is at any Position Other than "LOCK" (OFF) Position.

TECHNICAL DESCRIPTION (COMMENT)
Lock cam or shift lock cable may be defective.

TROUBLESHOOTING HINTS
- Malfunction of lock cam
- Malfunction of shift lock cable

DIAGNOSIS

STEP 1. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 2.
NO : Install the lock cam correctly. Refer to P.23A-382. When the brake pedal is released with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 2. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 3.
NO : Replace the lock cam. Refer to P.23A-382. When the brake pedal is released with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 3. Check the fit of the shift lock cable.

Q: Is the shift lock cable installed correctly?
YES : Go to Step 4.
NO : Install the shift lock cable correctly. Refer to P.23A-384. When the brake pedal is released with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 4. Check the shift lock cable.

Q: Is the shift lock cable in good condition?
YES : No action to be taken.
NO : Replace the shift lock cable. Refer to P.23A-384. When the brake pedal is released with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

INSPECTION PROCEDURE 2: Selector Lever cannot be Moved from "P" to "R" Position with Brake Pedal Depressed when Ignition Key is at any Position Other than "LOCK" (OFF) Position.

TECHNICAL DESCRIPTION (COMMENT)
Selector lever assembly, shift lock cable, key interlock cable, transaxle control cable, or lock cam may be defective.

TROUBLESHOOTING HINTS
- Malfunction of selector lever assembly
- Malfunction of shift lock cable
- Malfunction of key interlock cable
- Malfunction of transaxle control cable
- Malfunction of lock cam

DIAGNOSIS

STEP 1. Check the connection of lock cam and key interlock cable.

Q: Is the connection of lock cam and key interlock cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of lock cam. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 2. Check the connection of selector lever assembly and transaxle control cable.

Q: Is the connection of selector lever assembly and shift transaxle control cable in good condition?
YES : Go to Step 3.
NO : Repair the connection of selector lever assembly and transaxle control cable. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 3. Check the fit of the shift lock cable.

Q: Is the shift lock cable installed correctly?
YES : Go to Step 4.
NO : Install the shift lock cable correctly. Refer to P.23A-384. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 4. Check the shift lock cable.

Q: Is the shift lock cable in good condition?
YES : Go to Step 5.
NO : Replace the shift lock cable. Refer to P.23A-384. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 5. Check the fit of the key interlock cable.

Q: Is the key interlock cable installed correctly?
YES : Go to Step 6.
NO : Install the key interlock cable correctly. Refer to P.23A-384. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 6. Check the key interlock cable.

Q: Is the key interlock cable in good condition?
YES : Go to Step 7.
NO : Replace the key interlock cable. Refer to P.23A-384. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 7. Check the fit of the transaxle control cable.

Q: Is the transaxle control cable installed correctly?
YES : Go to Step 8.
NO : Install the transaxle control cable correctly. Refer to P.23A-380. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

STEP 8. Check the transaxle control cable.

Q: Is the transaxle control cable in good condition?
YES : Repair or replace the selector lever assembly. Refer to P.23A-380 and P.23A-382. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.
NO : Replace the transaxle control cable. Refer to P.23A-380. When the brake pedal is depressed with the ignition key at other positions than "LOCK" (OFF) position, check that the selector lever can be moved from "P" position to "R" position.

INSPECTION PROCEDURE 3: Selector Lever can be Moved from "P" to "R" Position with Brake Pedal Depressed when Ignition Key is at "LOCK" (OFF) Position.

TECHNICAL DESCRIPTION (COMMENT)
Key interlock cable or lock cam may be defective.

TROUBLESHOOTING HINTS
- Malfunction of lock cam
- Malfunction of key interlock cable

DIAGNOSIS

STEP 1. Check the connection of lock cam and key interlock cable.

Q: Is the connection of lock cam and key interlock cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of lock cam. When the brake pedal is depressed with the ignition key at the "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 2. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 3.
NO : Install the lock cam correctly. Refer to P.23A-382. When the brake pedal is depressed with the ignition key at the "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 3. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 4.
NO : Replace the lock cam. Refer to P.23A-382. When the brake pedal is depressed with the ignition key at the "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 4. Check the fit of the key interlock cable.

Q: Is the key interlock cable installed correctly?
YES : Go to Step 5.
NO : Install the key interlock cable correctly. Refer to P.23A-384. When the brake pedal is depressed with the ignition key at the "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

STEP 5. Check the key interlock cable.

Q: Is the key interlock cable in good condition?
YES : No action to be taken.
NO : Replace the key interlock cable. Refer to P.23A-384. When the brake pedal is depressed with the ignition key at the "LOCK" (OFF) position, check that the selector lever can not be moved from "P" position to "R" position.

INSPECTION PROCEDURE 4: Selector Lever cannot be Moved from "P" to "R" Position Smoothly.

TECHNICAL DESCRIPTION (COMMENT)
Key interlock cable, shift lock cable, transaxle control cable, lock cam, or selector lever assembly may be defective.

TROUBLESHOOTING HINTS
- Malfunction of key interlock cable
- Malfunction of shift lock cable
- Malfunction of transaxle control cable
- Malfunction of lock cam
- Malfunction of selector lever assembly

DIAGNOSIS

STEP 1. Check the connection of lock cam and key interlock cable.

Q: Is the connection of lock cam and key interlock cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of lock cam and shift lock cable. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 2. Check the connection of selector lever assembly and transaxle control cable.

Q: Is the connection of selector lever assembly and transaxle control cable in good condition?
YES : Go to Step 3.
NO : Repair the connection of selector lever assembly and transaxle control cable. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 3. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 4.
NO : Install the lock cam correctly. Refer to P.23A-382. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 4. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 5.
NO : Replace the lock cam. Refer to P.23A-382. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 5. Check the fit of the shift lock cable.

Q: Is the shift lock cable installed correctly?
YES : Go to Step 6.
NO : Install the shift lock cable correctly. Refer to P.23A-384. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 6. Check the shift lock cable.

Q: Is the shift lock cable in good condition?
YES : Go to Step 7.
NO : Replace the shift lock cable. Refer to P.23A-384. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 7. Check the fit of the key interlock cable.

Q: Is the key interlock cable installed correctly?
YES : Go to Step 8.
NO : Install the key interlock cable correctly. Refer to P.23A-384. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 8. Check the key interlock cable.

Q: Is the key interlock cable in good condition?
YES : Go to Step 9.
NO : Replace the key interlock cable. Refer to P.23A-384. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 9. Check the fit of the transaxle control cable.

Q: Is the transaxle control cable installed correctly?
YES : Go to Step 10.
NO : Install the transaxle control cable correctly. Refer to P.23A-380. Check that the selector lever can be moved from "P" position to "R" position smoothly.

STEP 10. Check the transaxle control cable.

Q: Is the transaxle control cable in good condition?
YES : Repair or replace the selector lever assembly. Refer to P.23A-380 and P.23A-382. Check that the selector lever can be moved from "P" position to "R" position smoothly.
NO : Replace the transaxle control cable. Refer to P.23A-380. Check that the selector lever can be moved from "P" position to "R" position smoothly.

INSPECTION PROCEDURE 5: Selector Lever cannot be Moved from "R" to "P" Position.

TECHNICAL DESCRIPTION (COMMENT)
Selector lever assembly, transaxle control cable, or lock cam may be defective.

TROUBLESHOOTING HINTS
- Malfunction of selector lever assembly
- Malfunction of transaxle control cable
- Malfunction of lock cam

DIAGNOSIS

STEP 1. Check the connection of selector lever assembly and transaxle control cable.

Q: Is the connection of selector lever assembly and transaxle control cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of selector lever assembly and transaxle control cable. Check that the selector lever can be moved from "R" position to "P" position.

STEP 2. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 3.
NO : Install the lock cam correctly. Refer to P.23A-382. Check that the selector lever can be moved from "R" position to "P" position.

STEP 3. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 4.
NO : Replace the lock cam. Refer to P.23A-382. Check that the selector lever can be moved from "R" position to "P" position.

STEP 4. Check the fit of the transaxle control cable.

Q: Is the transaxle control cable installed correctly?
YES : Go to Step 5.
NO : Install the transaxle control cable correctly. Refer to P.23A-380. Check that the selector lever can be moved from "R" position to "P" position.

STEP 5. Check the transaxle control cable.

Q: Is the transaxle control cable in good condition?
YES : Repair or replace the selector lever assembly. Refer to P.23A-380 and P.23A-382. Check that the selector lever can be moved from "R" position to "P" position smoothly.
NO : Replace the transaxle control cable. Refer to P.23A-380. Check that the selector lever can be moved from "R" position to "P" position.

INSPECTION PROCEDURE 6: Ignition Key cannot be Turned to the "LOCK" (OFF) Position when Selector Lever is at "P" Position.

TECHNICAL DESCRIPTION (COMMENT)
Lock cam, steering lock cylinder assembly, transaxle control cable, or key interlock cable may be defective.

TROUBLESHOOTING HINTS
- Malfunction of lock cam
- Malfunction of key interlock cable
- Malfunction of transaxle control cable
- Malfunction of steering lock cylinder assembly

DIAGNOSIS

STEP 1. Check the connection of lock cam and key interlock cable.

Q: Is the connection of lock cam and key interlock cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of lock cam. Check that the ignition key can be turned to the "LOCK" (OFF) position with the selector lever at "P" position.

STEP 2. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 3.
NO : Install the lock cam correctly. Refer to P.23A-382. Check that the ignition key can be turned to the "LOCK" (OFF) position with the selector lever at "P" position.

STEP 3. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 4.
NO : Replace the lock cam. Refer to P.23A-382. Check that the ignition key can be turned to the "LOCK" (OFF) position with the selector lever at "P" position.

STEP 4. Check the fit of the key interlock cable.

Q: Is the key interlock cable installed correctly?
YES : Go to Step 5.
NO : Install the key interlock cable correctly. Refer to P.23A-384. Check that the ignition key can be turned to the "LOCK" (OFF) position with the selector lever at "P" position.

STEP 5. Check the key interlock cable.

Q: Is the key interlock cable in good condition?
YES : Go to Step 6.
NO : Replace the key interlock cable. Refer to P.23A-384. Check that the ignition key can be turned to the "LOCK" (OFF) position with the selector lever at "P" position.

STEP 6. Check the fit of the transaxle control cable.

Q: Is the transaxle control cable installed correctly?
YES : Replace the engine starting switch assembly. Refer to P.37-26 and P.37-29. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at "P" position.
NO : Install the transaxle control cable correctly. Refer to P.23A-380. Check that the ignition key can be turned to the "LOCK" (OFF) position with the selector lever at "P" position.

INSPECTION PROCEDURE 7: Ignition Key can be Turned to the "LOCK" (OFF) Position when Selector Lever is at any Position Other than "P" Position.

TECHNICAL DESCRIPTION (COMMENT)
Lock cam, steering lock cylinder assembly, transaxle control cable, or key interlock cable may be defective.

TROUBLESHOOTING HINTS
- Malfunction of lock cam
- Malfunction of steering lock cylinder assembly
- Malfunction of transaxle control cable
- Malfunction of key interlock cable

DIAGNOSIS

STEP 1. Check the connection of lock cam and key interlock cable.

Q: Is the connection of lock cam and key interlock cable in good condition?
YES : Go to Step 2.
NO : Repair the connection of lock cam. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

STEP 2. Check the fit of the lock cam.

Q: Is the lock cam installed correctly?
YES : Go to Step 3.
NO : Install the lock cam correctly. Refer to P.23A-382. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

STEP 3. Check the lock cam.

Q: Is the lock cam in good condition?
YES : Go to Step 4.
NO : Replace the lock cam. Refer to P.23A-382. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

STEP 4. Check the fit of the key interlock cable.

Q: Is the key interlock cable installed correctly?
YES : Go to Step 5.
NO : Install the key interlock cable correctly. Refer to P.23A-384. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

STEP 5. Check the key interlock cable.

Q: Is the key interlock cable in good condition?
YES : Go to Step 6.
NO : Replace the key interlock cable. Refer to P.23A-384. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

STEP 6. Check the fit of the transaxle control cable.

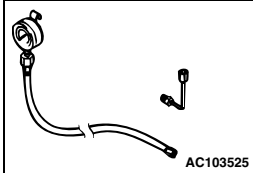
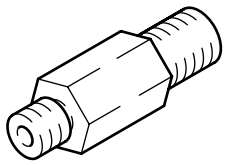
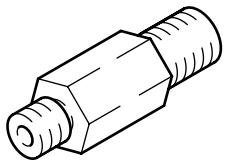
Q: Is the transaxle control cable installed correctly?

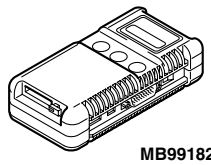
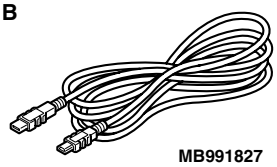
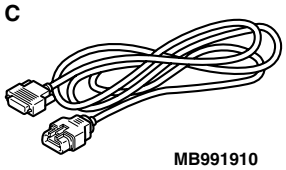
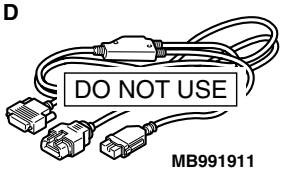
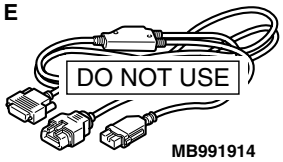
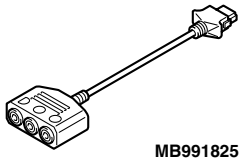
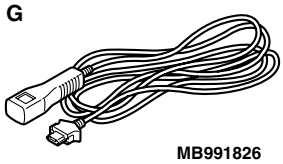
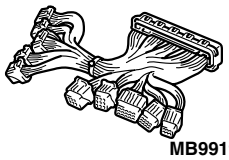
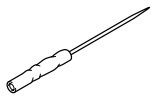
YES : Replace the engine starting switch assembly. Refer to P.37-26 and P.37-29. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

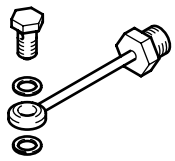
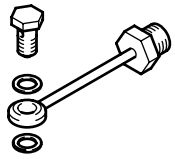
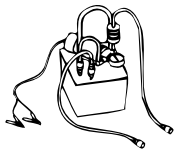
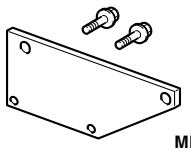
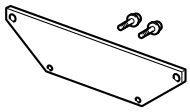
NO : Install the transaxle control cable correctly. Refer to P.23A-380. Check that the ignition key can not be turned to the "LOCK" (OFF) position with the selector lever at any position other than "P" position.

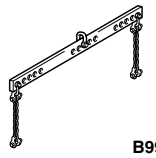
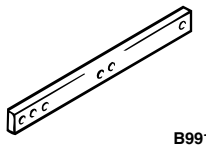
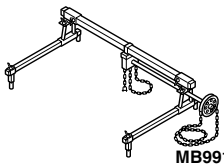
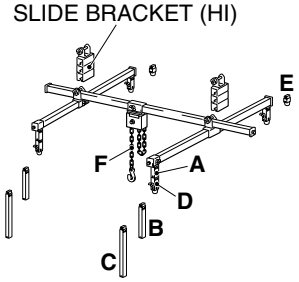
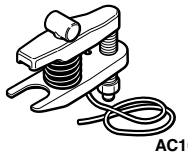
SPECIAL TOOLS

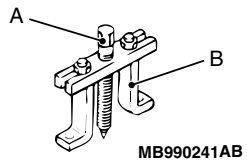
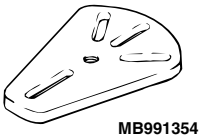
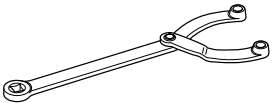
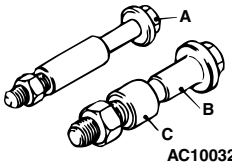
M1231000600781

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 AC103525	MD998330 (Includes MD998331) Oil pressure gauge (3.0 MPa, 427 psi)	MD998330-01	Measurement of hydraulic pressure
	MD998332 Adapter	MD998332-01	Connection for oil pressure gauge
	MD998268 Adapter	–	Connection for oil pressure gauge <5A/T>

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III sub assembly A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III main harness C (for Daimler Chrysler models only) F: M.U.T.-III measurement adapter G: M.U.T.-III trigger harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III trigger harness is not necessary when pushing V.C.I. ENTER key.*	Checking diagnostic trouble codes **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**
 MB991923	MB991923 Test harness (3 pin, triangle)	MD998478-01	Measurement of PCM terminal voltage
 MB992006	MB992006 Extra fine probe	–	Making voltage and resistance measurement during troubleshooting

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998900 Adapter	MIT220433	Connection for oil pressure gauge
	MB992018 Adapter	–	Connection for oil pressure gauge <5A/T>
	MB995062 Flushing tool	MLR-6906B or Equivalent	Flushing cooler and tube
 MB992012	MB992012 Engine hanger plate A	General Service Tool	Supporting the engine assembly during removal and installation of the transaxle assembly <5A/T>
 MB992013	MB992013 Engine hanger plate B	General Service Tool	

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991454	MB991454 Engine hanger balancer	MZ203827-01	When the engine hanger is used: Supporting the engine assembly during removal and installation of the transaxle assembly *NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.*
 B991527	MB991527 Hanger	–	
 MB991895	MB991895 Engine hanger	–	
 B991928	MB991928 Engine hanger A: MB991929 Joint (50) ×2 B: MB991930 Joint (90) ×2 C: MB991931 Joint (140) ×2 D: MB991932 Foot (standard) ×4 E: MB991933 Foot (short) ×2 F: MB991934 Chain and hook assembly	–	
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or general service tool	Knuckle and tie rod end ball joint breakaway torque check *NOTE: Steering linkage puller(MB990635 or MB991113)is also used to disconnect knuckle and tie rod end ball joint.*

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB990241 Axle shaft puller A: MB990242 Puller shaft B: MB990244 Puller bar	MB990241-01 or General service tool	Removal of the drive shaft
	MB991354 Puller body	General service tool	
	MB990767 End yoke holder	MB990767-01	Fixing of the hub
	A: MB991017 B: MB990998 C: MB991000 A, B: Front hub remover and installer C: Spacer	MB990998-01	• Removal of the hub • Provisional holding of the wheel bearing • Measurement of hub starting torque • Measurement of wheel bearing end play *NOTE: MB991000, which belongs to MB990998, should be used as a spacer.*

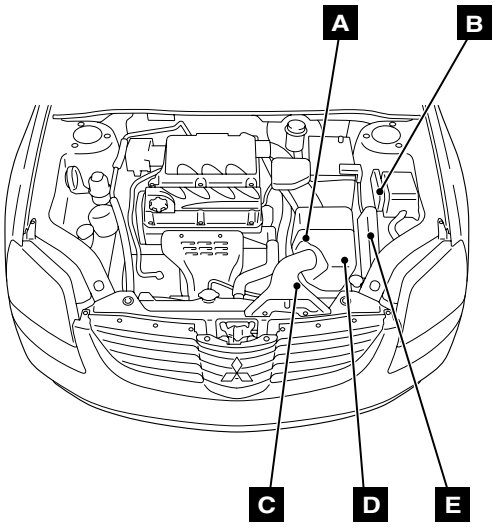
ON-VEHICLE SERVICE

A/T CONTROL COMPONENT LAYOUT

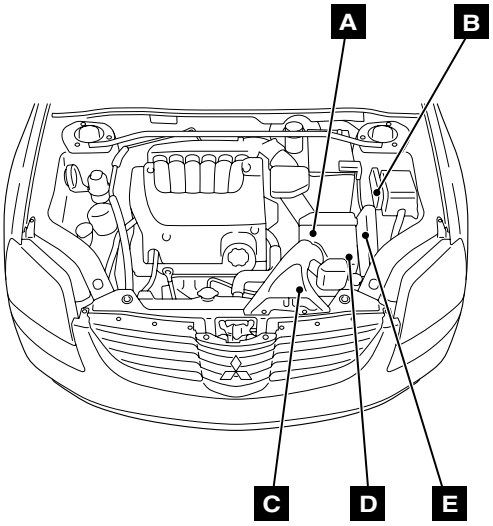
M1231008600569

NAME	SYMBOL	NAME	SYMBOL
A/T control relay	B	Powertrain control module (PCM)	E
A/T control solenoid valves	D	Stoplight switch	F
Data link connector	G	Shift switch	H
Input shaft speed sensor	A	Transmission fluid temperature sensor	D
Output shaft speed sensor	A	Transmission range switch	C

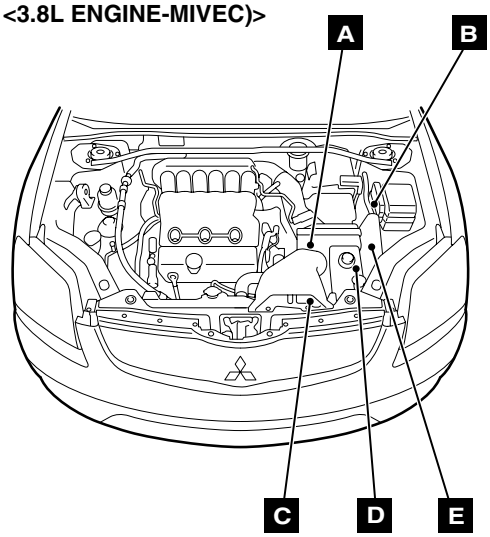
<2.4L ENGINE>

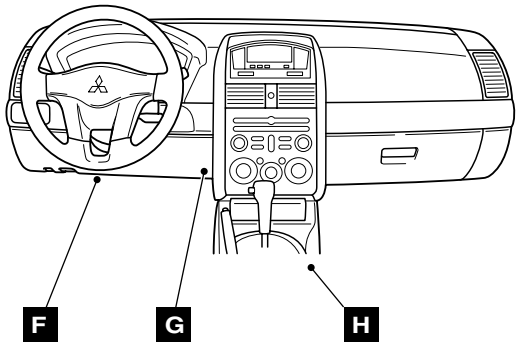


<3.8L ENGINE (EXCEPT MIVEC)>

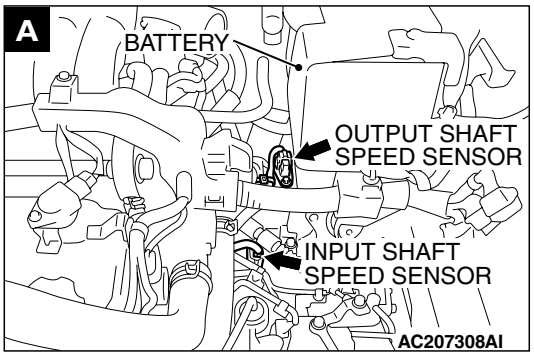


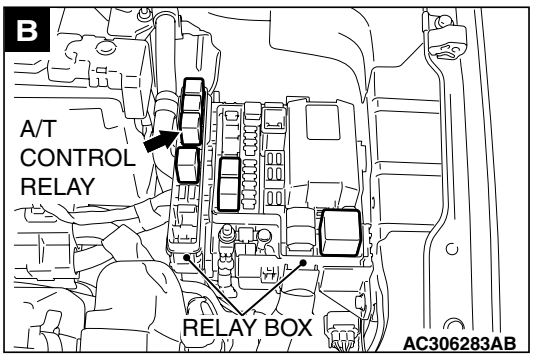
<3.8L ENGINE-MIVEC)>





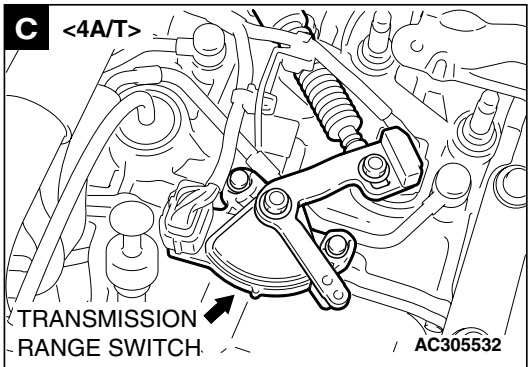
AC601772AB



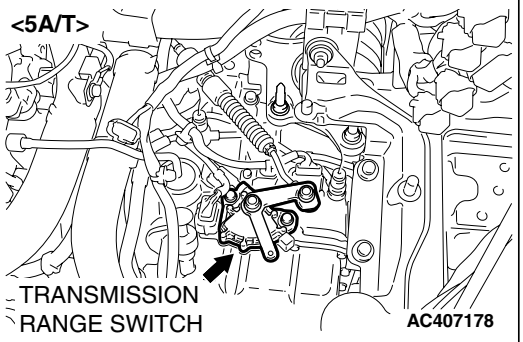


TSB Revision

C <4A/T>

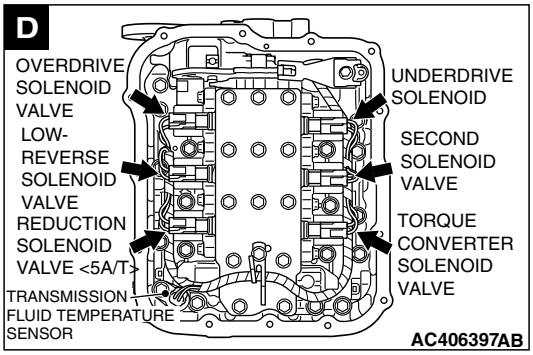


<5A/T>

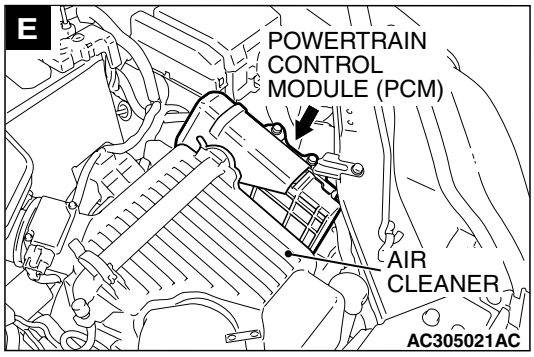


AC600844AC

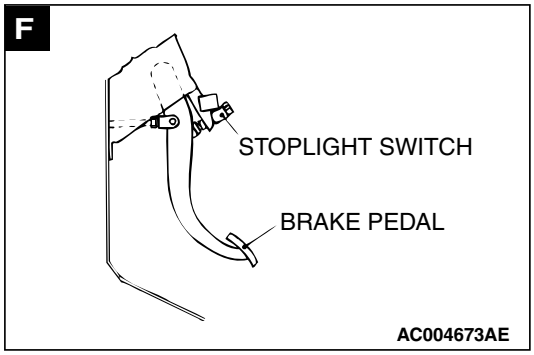
D



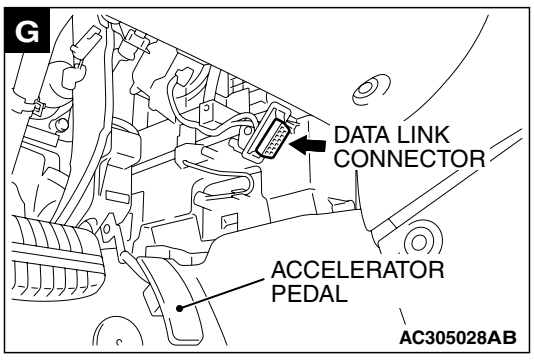
E



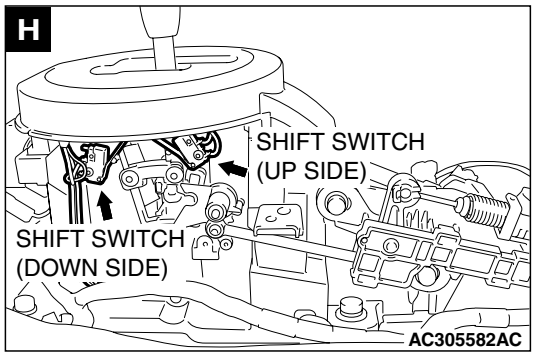
F



G



H



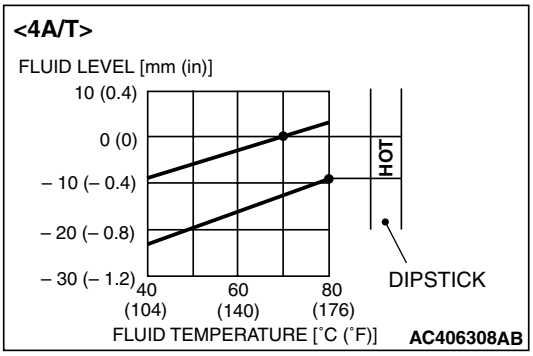
ESSENTIAL SERVICE

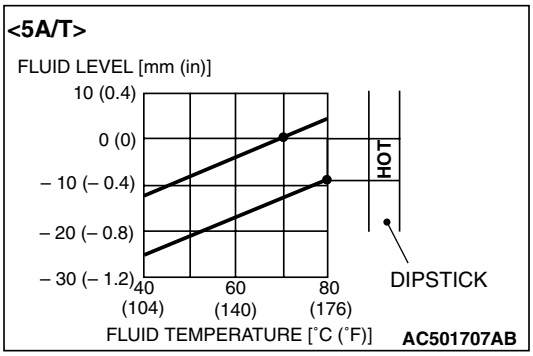
TRANSMISSION FLUID CHECK

M1231021400157

1. Drive the vehicle until the transmission fluid temperature rises to the normal operating temperature [70 – 80°C (158 – 176°F)].

TSB Revision



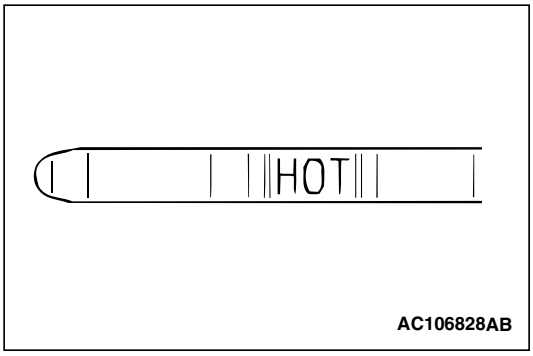


NOTE: The transmission fluid temperature is measured with scan tool MB991958 (M.U.T.-III sub assembly).

NOTE: If it takes some amount of time until the transmission fluid reaches its normal operating temperature [70 – 80°C (158 – 176°F)], check the transmission fluid level by referring to the left diagram.

2. Park the vehicle on a level surface.
3. Move the selector lever through all positions to fill the torque converter and the hydraulic circuits with fluid, and then move the selector lever to the "N" position.
4. After wiping off any dirt around the dipstick, remove the dipstick and check the condition of the transmission fluid.

   NOTE: If the transmission fluid smells as if it is burnt, it means that the transmission fluid has been contaminated by fine particles from the bushings and friction materials. Transaxle overhaul and cooler line flushing may be necessary.



5. Check transmission fluid level is at the "HOT" mark on the dipstick. If the transmission fluid level is less than this, add DIAMOND ATF SP III until the level reaches the "HOT" mark.

   NOTE: If the transmission fluid level is too low, the oil pump will draw in air along with the transmission fluid, which will cause to form bubbles. If the transmission fluid level is too high, rotating components inside the transaxle will churn the fluid and air into a foamy liquid. Both conditions (level too low or too high) will cause the hydraulic pressure to drop, which will result in late shifting and slipping of the clutches and brakes.

   NOTE: In either case, air bubbles can interfere with normal valve, clutch, and brake operation. Also, foaming can cause transmission fluid to escape from the transaxle vent where it may be mistaken for a leak.
6. Securely insert the dipstick.

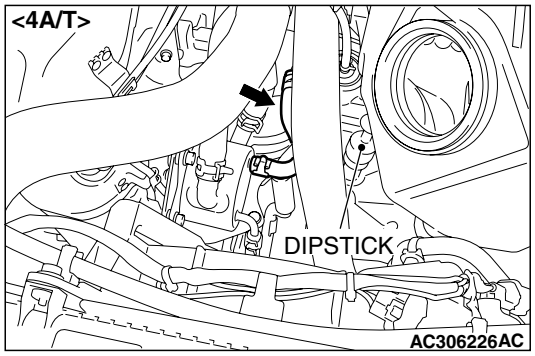
   NOTE: The transmission fluid should always be replaced under the following conditions:

   - *When troubleshooting the transaxle.*
   - *When overhauling the transaxle.*
   - *When the transmission fluid is noticeably dirty or burnt (driving under severe conditions).*

TRANSMISSION FLUID CHANGE

M1231021500154

If you have an transmission fluid changer, use this changer to replace the transmission fluid. If you do not have an transmission fluid changer, replace the transmission fluid by the following procedure.



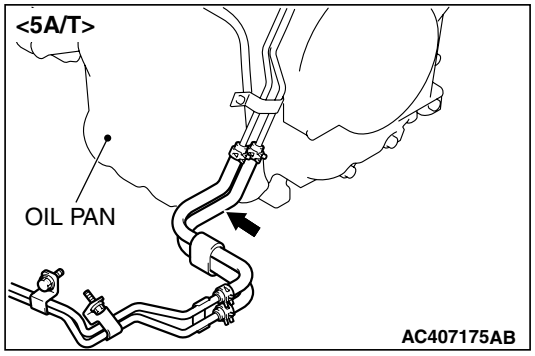
1. Disconnect the hose shown in the illustration which connects the transaxle and the oil cooler (inside the radiator). Place a container under the hose to collect the discharge.

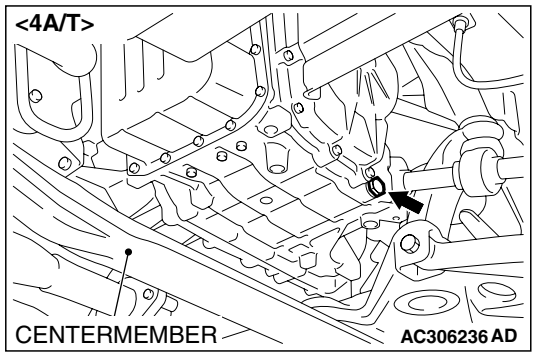
⚠ CAUTION

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

2. Start the engine and let the transmission fluid drain out.
   (Running conditions: "N" range with engine idling)

   Approximately 3.5 dm^3 (3.7 quarts) of transmission fluid should be removed.



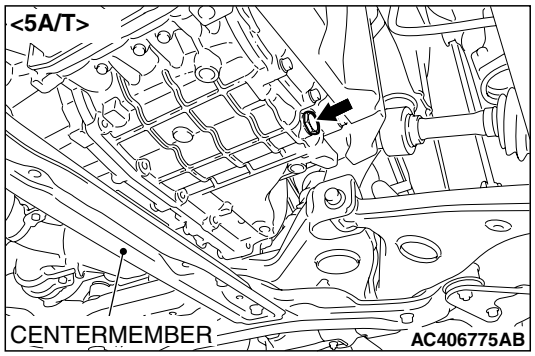


3. Remove the drain plug from the bottom of the transaxle case to drain the transmission fluid.

   Approximately 2.0 dm^3 (2.1 quarts) of transmission fluid should be removed.

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

   Tightening torque: 32 ± 2 N·m (23 ± 2 ft-lb)



⚠ CAUTION

Stop pouring if the full volume of transmission fluid can not be added.

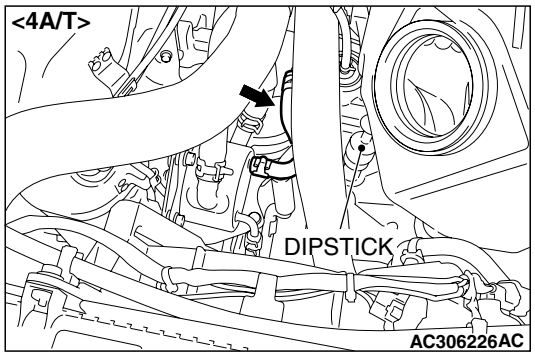
5. Add new transmission fluid (DIAMOND ATF SP III) through the oil filter tube.

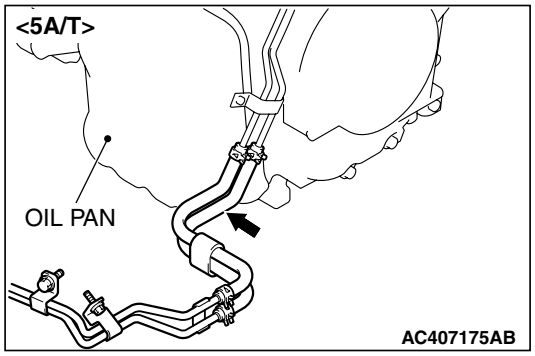
   Approximately 5.5 dm^3 (5.8 quarts) of transmission fluid should be added.

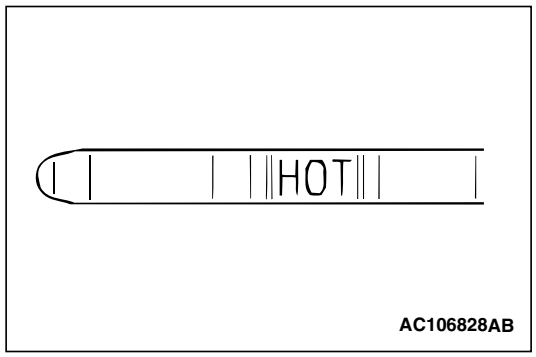
6. Repeat the procedure in Step 2. (to pump out the rest of the contaminated transmission fluid)
7. Add new transmission fluid (DIAMOND ATF SP III) through the oil filter tube.

   Approximately 3.5 dm^3 (3.7 quarts) of transmission fluid should be added.

   NOTE: Check for contamination or a burnt odor. If the transmission fluid is still contaminated or burnt, repeat Steps 6 and 7 before proceeding to Step 8.



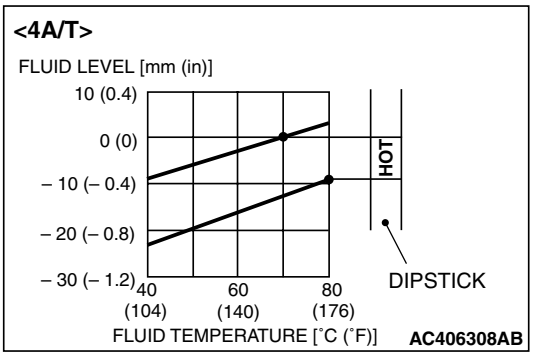


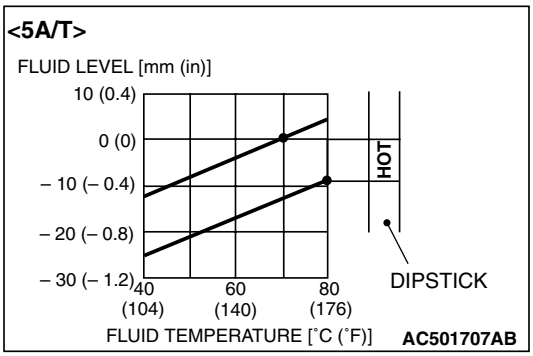


8. Reconnect the hose which was disconnected in step 1 above, and firmly replace the dipstick.
9. Start the engine and run it at idle for one to two minutes.
10. Move the selector lever through all positions, and then move it to the "N" position.
11. Check that the transmission fluid level is at the "COLD" mark on the dipstick. If the level is less than this, add transmission fluid.
12. Drive the vehicle until the transmission fluid temperature rises to the normal operating temperature [70 – 80°C (158 – 176°F)], and then check the transmission fluid level again. The transmission fluid level must be at the "HOT" mark.

    NOTE: The transmission fluid temperature is measured with scan tool MB991958 (M.U.T.-III sub assembly).

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





NOTE: If it takes some amount of time until the transmission fluid reaches its normal operating temperature [70 – 80°C (158 – 176°F)], check the transmission fluid level by referring to the left diagram.

13. When the transmission fluid is less than the specified level, add transmission fluid.
    When the transmission fluid is greater than the specified level, drain the excess fluid through the drain plug to adjust the transmission fluid to the specified level.
14. Firmly insert the dipstick into the oil filler tube.

FLUSHING COOLERS AND TUBES

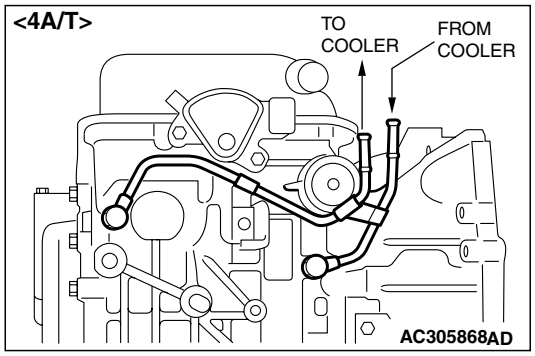
M1231013000541

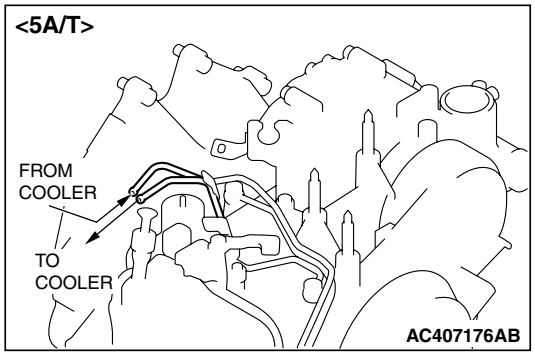
Required Special Tool:
MB995062: Flushing Tool

⚠ WARNING

- ***Wear protective eyewear that meets the requirements of ANSI Z87.1 – 1968 and OSHA. Wear standard industrial rubber gloves.***
- ***Keep lighted cigarettes, sparks, flames, and other ignition sources away from the area to prevent the ignition of combustible liquids and gases. Keep a class B fire extinguisher in the area where the flushing tool will be used. Keep the area well ventilated. Do not let flushing solvent come in contact with eyes or skin. If it does, flush with water for 15 to 20 seconds. Remove contaminated clothing and wash affected skin with soap and water. Seek medical attention.***

When a transaxle failure has contaminated the transmission fluid, the oil cooler(s) must be flushed. The cooler by-pass valve in the transaxle must also be replaced. The torque converter must also be replaced with an exchange unit. This will ensure that metal particles or sludged transmission fluid are not later transferred back into the reconditioned (or replaced) transaxle. There are two different procedures for flushing coolers and lines. The recommended procedure is to use special tool MB995062 Flushing Tool. The other procedure is to use a hand suction gun and mineral spirits.





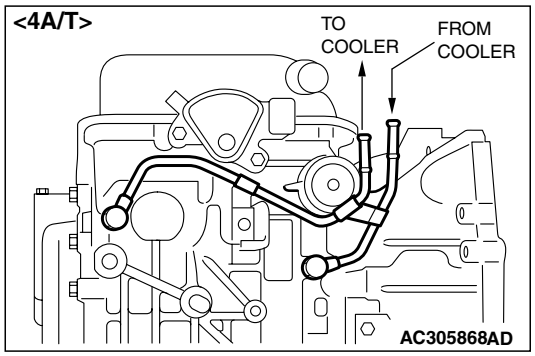
1. Remove the cover plate filler plug on special tool MB995062. Fill the reservoir 1/2 to 3/4 full with fresh flushing solution. Flushing solvents are petroleum based solutions generally used to clean transaxle components. Do not use solvents containing acids, water, gasoline, or any other corrosive liquids.
2. Reinstall the filler plug on special tool MB995062.
3. Verify that the pump power switch is turned "OFF." Connect the red alligator clip to the positive battery terminal. Connect the black alligator clip to a good ground.
4. Disconnect the cooler lines at the transaxle.

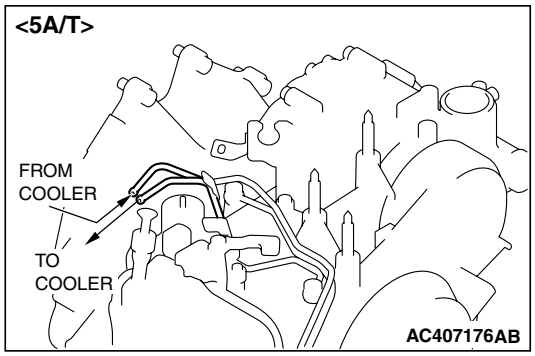
   NOTE: When flushing the transaxle cooler and lines, always reverse flush.
5. Connect the pressure line to the OUTLET line (from cooler).
6. Connect the return line to the INLET line (to cooler).
7. Turn the pump "ON" for two to three minutes to flush the cooler(s) and lines. Monitor the pressure readings. Clear the return lines. Pressure readings should stabilize below 138 kPa (20 psi) for vehicles equipped with a single cooler and 208 kPa (30 psi) for vehicles equipped with dual coolers. If flow is intermittent or exceeds these pressures, replace the cooler(s).
8. Turn the pump "OFF."
9. Disconnect the suction line from the reservoir at the cover plate. Disconnect the return line at the cover plate and place it in a drain pan.
10. Turn the pump "ON" for 30 seconds to purge flushing solution from the cooler(s) and lines. Turn the pump "OFF."
11. Place the suction line into a one quart container of DIAMOND ATF SP III transmission fluid.
12. Turn the pump "ON" until all transmission fluid is removed from the one quart container and lines. This purges any residual cleaning solvent from the transaxle cooler(s) and lines. Turn the pump "OFF."
13. Disconnect the alligator clips from the battery. Reconnect the flusher lines to the cover plate, and remove the flushing adapters from the cooler lines. Reconnect the cooler lines.

OIL COOLER FLOW CHECK

M1231013100281

After the new or repaired transaxle has been installed, fill to the proper level with DIAMOND ATF SP III. The flow should be checked using the following procedure:





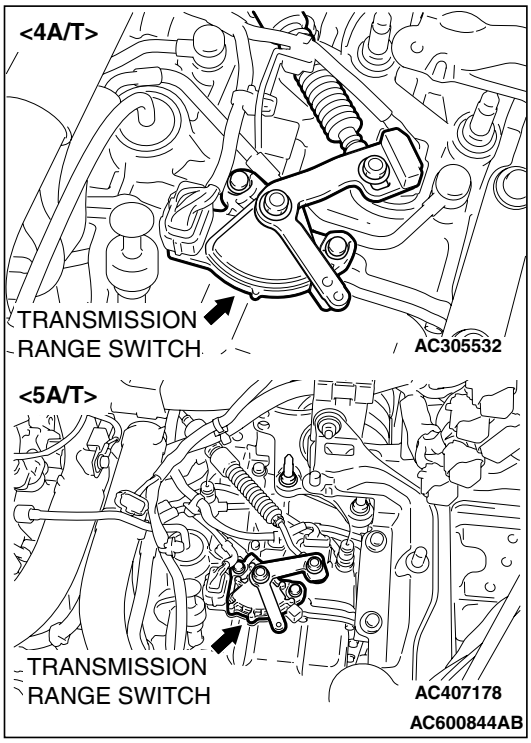
⚠ CAUTION

With the fluid set at the proper level, transmission fluid collection should not exceed one quart or internal damage to the transaxle may occur.

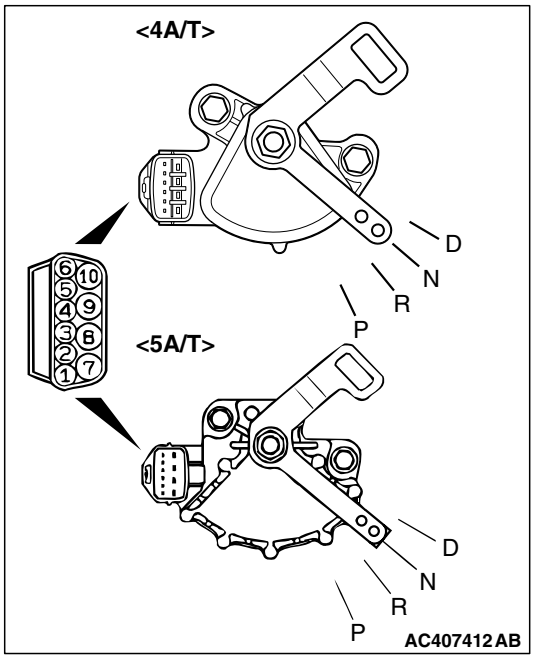
1. Disconnect the OUTLET line (from cooler) at the transaxle and place a collecting container under the disconnected line.
2. Run the engine at curb idle speed with the shift selector in neutral.
3. If transmission fluid flow is intermittent or it takes more than 20 seconds to collect one quart of transmission fluid, replace the cooler.
4. If flow is within acceptable limits, reconnect the cooler line. Then fill the transaxle to the proper level, using DIAMOND ATF SP III.

TRANSMISSION RANGE SWITCH CHECK

M1231021600281



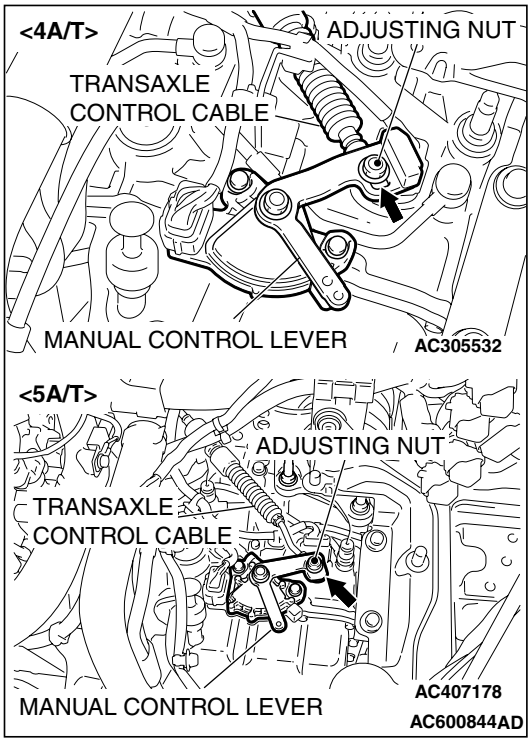
TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohms.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	



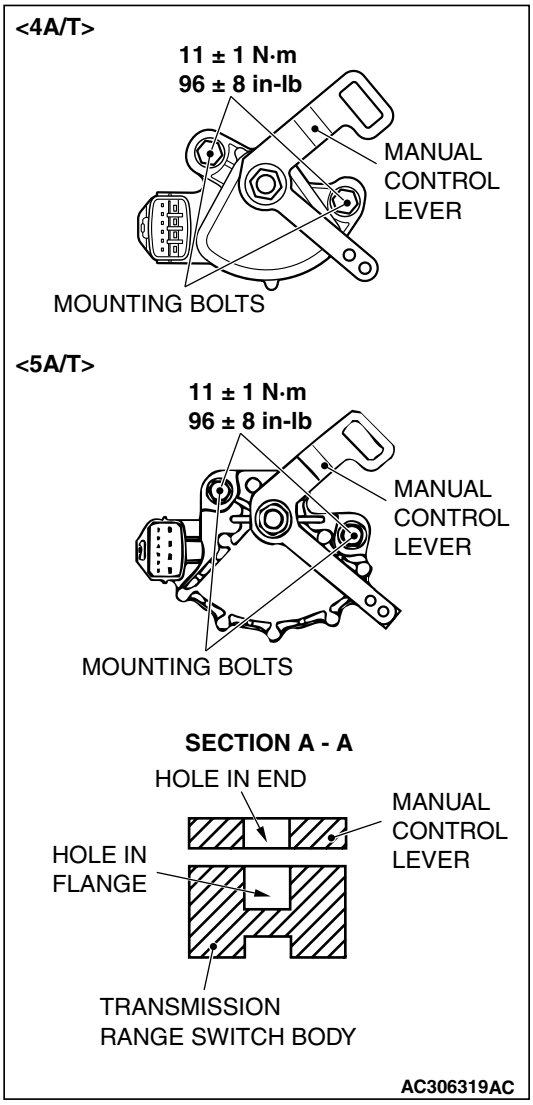
TRANSMISSION RANGE SWITCH AND CONTROL CABLE ADJUSTMENT

M1231021700170

1. Set the selector lever to the "N" position.



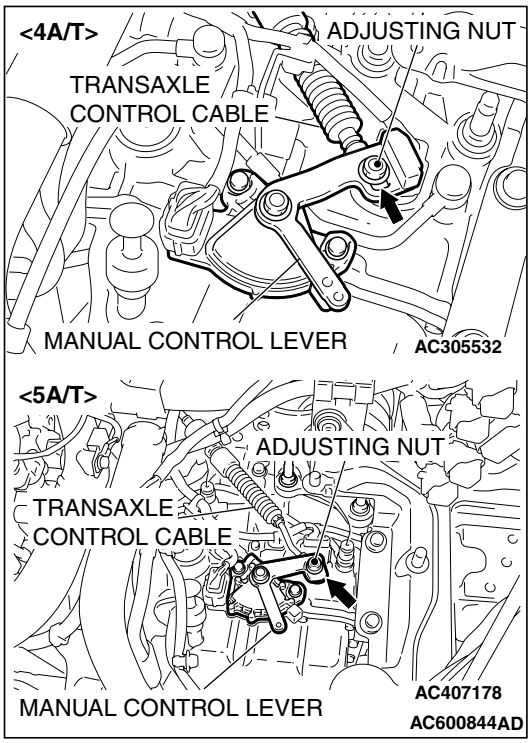
2. Loosen the control cable to the manual control lever coupling nut to free the cable and lever.
3. Set the manual control lever to the neutral position.



4. Loosen the transmission range switch body mounting bolts and turn the park/neutral position switch body so the hole in the end of the manual control lever and the hole (section A – A in the figure on the left) in the flange of the transmission range switch body flange are aligned.

   NOTE: The transmission range switch body can be aligned by inserting a 5-mm diameter steel bar into the end hole of the manual control lever and the flange hole of the transmission range switch body.
5. Tighten the transmission range switch body mounting bolts to the specified torque. Be careful at this time that the switch body does not move.

   Tightening torque: 11 ± 1 N·m (96 ± 8 in-lb)



6. Gently push the transaxle control cable in the direction of the arrow, until the cable is taut. Tighten the adjusting nut.
   Tightening torque: 12 ± 2 N·m (107 ± 17 in-lb)
7. Check that the selector lever is in the "N" position.
8. Check that each position of the manual control lever matches each position of the selector lever using scan tool MB991958 (M.U.T.-III sub assembly).

AUTOMATIC TRANSAXLE CONTROL COMPONENT CHECK

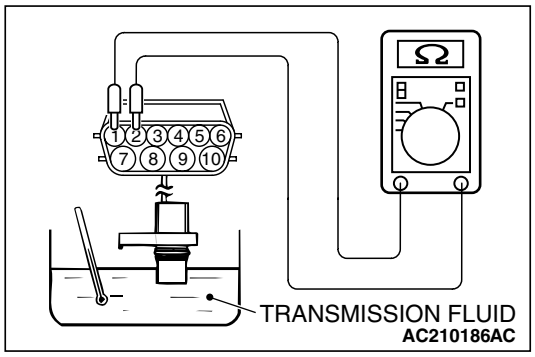
CRANKSHAFT POSITION SENSOR CHECK

M1231009000355

Refer to GROUP 13A <2.4L Engine>, Diagnosis – Inspection Procedure Using an Oscilloscope P.13A-1146.
Refer to GROUP 13B <3.8L Engine>, Diagnosis – Inspection Procedure Using an Oscilloscope P.13B-1407.

TRANSMISSION FLUID TEMPERATURE SENSOR CHECK

M1231021800133



1. Remove the transmission fluid temperature sensor.
2. Measure the resistance between terminals 1 and 2 of the transmission fluid temperature sensor connector.
   Standard value:

TRANSMISSION FLUID TEMPERATURE	RESISTANCE
0°C (32°F)	16.7 – 20.5 kΩ
20°C (68°F)	7.3 – 8.9 kΩ
40°C (104°F)	3.4 – 4.2 kΩ
60°C (140°F)	1.9 – 2.2 kΩ
80°C (176°F)	1.0 – 1.2 kΩ
100°C (212°F)	0.57 – 0.69 kΩ

3. If the transmission fluid temperature sensor resistance is outside the specified range and the "N" range indicator light is flashing, replace the transmission fluid temperature sensor.

   NOTE: The "N" range indicator light on the combination meter flashes when the temperature reaches approximately 125°C (257°F) or greater, and then stops flashing when the temperature drops below approximately 115°C (238°F).

TRANSMISSION RANGE SWITCH CHECK

M1231021600117

Refer to P.23A-372.

STOPLIGHT SWITCH CHECK

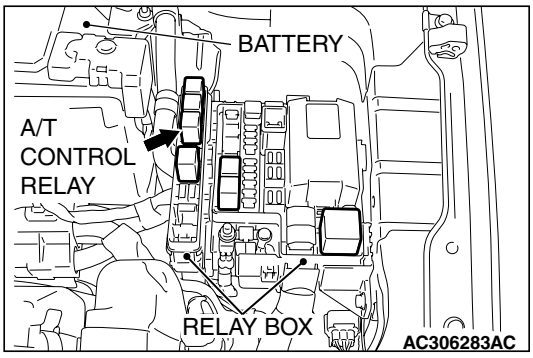
M1231009100192

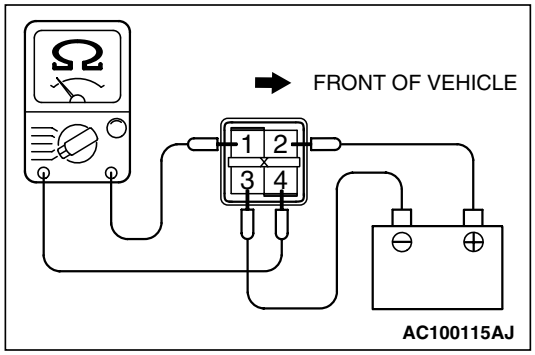
Refer to GROUP 35A, Brake Pedal – Brake Pedal Inspection P.35A-24.

A/T CONTROL RELAY CHECK

M1231009300248

1. Remove the A/T control relay.





2. Use jumper wires to connect A/T control relay terminal 3 to the negative battery terminal and terminal 2 to the positive battery terminal.
3. Check for continuity between A/T control relay terminals 1 and 4 when the jumper wires are connected to and disconnected from the battery.

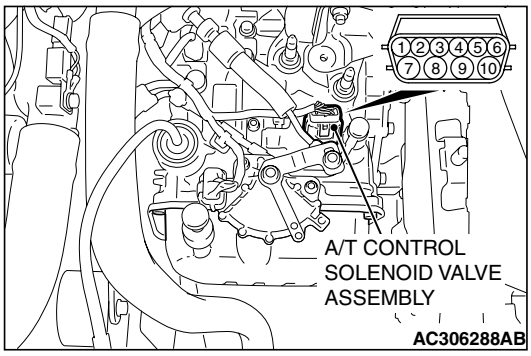
JUMPER WIRE	CONTINUITY BETWEEN TERMINALS NO.1 AND NO.4
Connected	Continuity
Disconnected	No continuity

4. If there is any problem with the A/T control relay, replace it.

SOLENOID VALVE CHECK

M1231009400405

1. Use scan tool MB991958 (M.U.T.-III sub assembly) to check the transmission fluid temperature. The desired transmission fluid temperature setting for performing the solenoid valve check is 20°C (68°F).

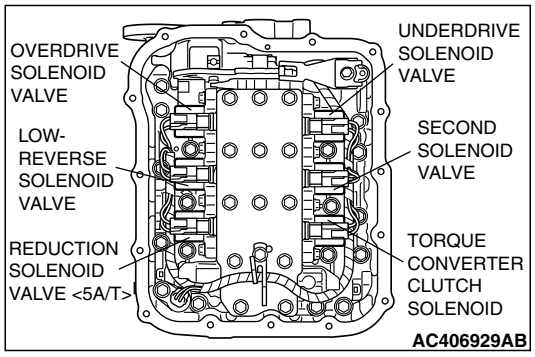


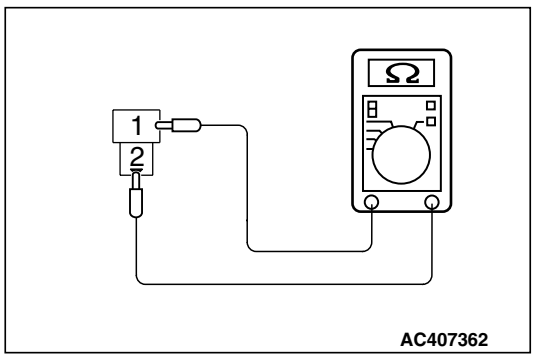
2. Remove the A/T control solenoid valve assembly connector.
3. Measure the resistance between the solenoid valve terminals.
4. The measured resistance of the solenoid valve when the transmission fluid temperature is 20°C (68°F) should match the specified resistance on the chart below.

Specified resistance:

TERMINAL NO.	NAME	RESISTANCE
7 - 10	Torque converter clutch solenoid valve	2.7 – 3.4 Ω [at 20°C (68°F)]
6 - 10	Low-reverse solenoid valve	
4 - 9	Second solenoid valve	
3 - 9	Underdrive solenoid valve	
5 - 9	Overdrive solenoid valve	
8 - 9	Reduction solenoid valve <5A/T>	

5. If the solenoid valve resistance is within the specified range, check the power supply and the ground circuits.
6. If the solenoid valve resistance is not within the specified range, drain the transmission fluid and remove the valve body cover.
7. Disconnect the connector of any solenoid valves that are not within the specified range.





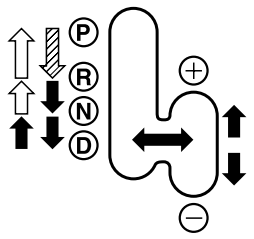
8. Measure the resistance between terminals 1 and 2 of any solenoid valve that was not within the specified range.

Specified resistance: 2.7 – 3.4 Ω [at 20°C (68°F)]

9. If the resistance is not within the specified range, replace the solenoid valve.
10. If the resistance is within the specified range, check the wiring harness between the affected A/T control solenoid valve assembly and the solenoid valve. If a problem is not found in the above steps, check the solenoid valve O-rings and replace them if necessary.

SELECTOR LEVER OPERATION CHECK

M1231001300631



⇦: THE SELECTOR LEVER MOVES WHEN THE BRAKE PEDAL IS DEPRESSED AND THE BUTTON IS PUSHED IN WITH THE IGNITION KEY IN ANY POSITION OTHER THAN THE "LOCK" (OFF) POSITION.

⇦: THE SELECTOR LEVER MOVES WITHOUT PUSHING THE BUTTON.

⇦: THE SELECTOR LEVER MOVES WHEN THE BUTTON IS PUSHED.

AC406520AB

1. Apply the parking brake, and check that the selector lever moves smoothly and accurately to each position.
2. Check that the engine starts when the selector lever is at the "N" or "P" position, and that it does not start when the selector lever is in any other position.
3. Start the engine, release the parking brake, and check that the vehicle moves forward when the selector lever is moved from "N" position to "D" or 1st to 4th gear in Sports mode, and that the vehicle reverses when the selector lever is moved to "R" position.
4. Stop the engine.
5. Turn the ignition switch to the "ON" position, and check that the backup light illuminates when the selector lever is shifted from "P" position to "R" position.

   NOTE: The A/T mis-operation prevention mechanism is provided so that the selector lever cannot be moved from the "P" position if the ignition switch is at a position other than the "LOCK" (OFF) position and the brake pedal is not depressed.

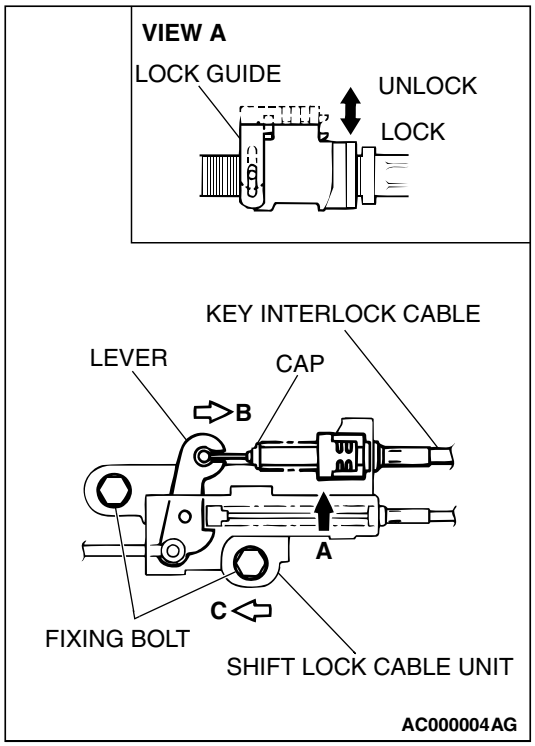
KEY INTERLOCK AND SHIFT LOCK MECHANISM CHECK

M1232003100647

1. Carry out the following inspection.

KEY INTERLOCK SIDE			
INSPECTION PROCEDURE	**INSPECTION REQUIREMENT**	**INSPECTION ITEM (NORMAL CONDITION)**	
1	Brake pedal: Depressed	Ignition key position: "LOCK" (OFF) or removed	Unable to push in the selector lever push button and move the lever out of the "P" position.
2		Ignition key position: "ACC"	Able to push in the selector lever push button, move the lever out of the "P" position, and shift to any position.
3	Brake pedal: Not depressed	Selector lever: Other than "P" position	Unable to turn the ignition key to the "LOCK" (OFF) position.
4		Selector lever: "P" position	Able to turn the ignition key to the "LOCK" (OFF) position.

SHIFT LOCK SIDE			
INSPECTION PROCEDURE	**INSPECTION CONTENTS**		**CHECK DETAILS (NORMAL CONDITION)**
1	Brake pedal: Not depressed	Ignition key position: "ACC"	When the selector lever push button is depressed, the selector lever can not be shifted out of the "P" position.
2	Brake pedal: Depressed		When the selector lever push button is depressed, the selector lever can be shifted smoothly to another position.
3	Brake pedal: Not depressed		When the selector lever push button is depressed, the selector lever can be shifted smoothly from the "R" position to the "P" position.



2. When any of the above checks are not normal, adjust the key interlock cable and shift lock cable unit in following procedure.
   (1) Remove the front floor console. (Refer to GROUP 52A – Floor Console Assembly P.52A-22).
   (2) Shift selector lever to "P" position.
   (3) Turn the ignition key to "LOCK" (OFF) position.
   (4) Loosen the bolt fixing the shift lock cable unit, push the lever in direction B and the unit in direction C and tighten the bolt at the standard torque.

   Tightening torque: 5.0 ± 1.0 N·m (44 ± 9 in-lb)

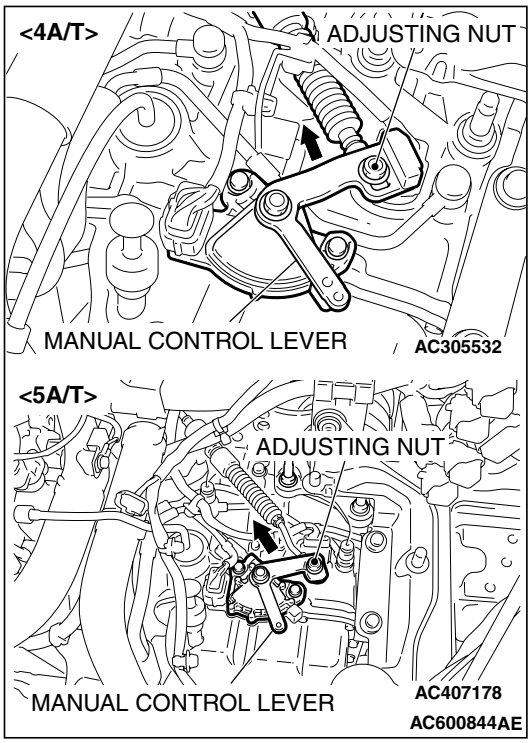
   (5) Lift the lock guide of the key interlock cable to unlock it.
   (6) Lower the lock guide of the key interlock cable and then lock it.

   NOTE: The key interlock cable is adjusted according to the lock position (cap push state) at this time. Readjust the lock position if the key interlock still does not operate correctly.
3. After adjustment, re-check the operations. Replace the key interlock cable and shift lock cable unit if operations are defective. (Refer to P.23A-384).

TRANSAXLE CONTROL CABLE ADJUSTMENT

M1231028000116

1. Move the selector lever to the "N" position.



2. Loosen the upper control lever adjusting nut.
3. Gently push the transaxle control cable in the direction of the arrow, and then tighten the adjusting nut.

   Tightening torque: 12 ± 2 N·m (107 ± 17 in-lb)
4. Check that the transaxle shifts to the correct range corresponding to the position of the selector lever, and that it functions correctly in that range.

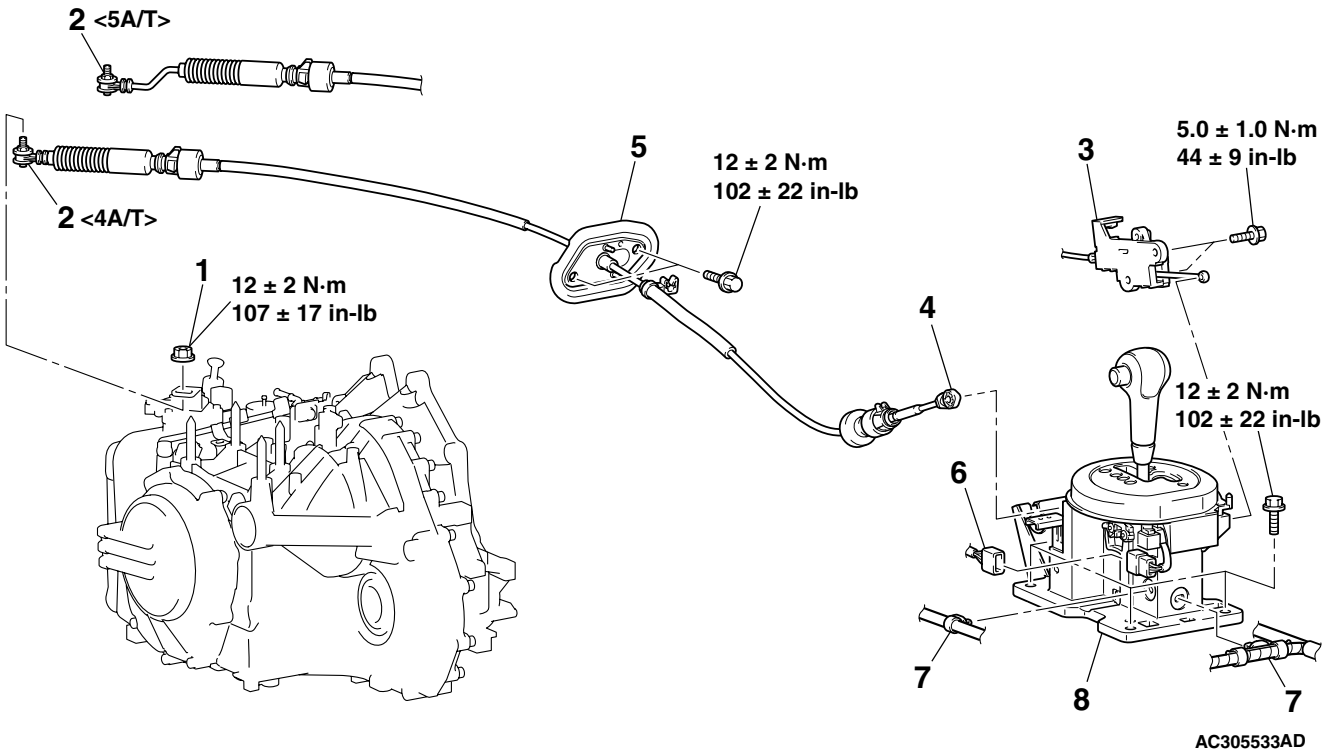
TRANSAXLE CONTROL

REMOVAL AND INSTALLATION

M1231006600819

⚠ WARNING

- ***When removing and installing the transaxle control cable and shift lock cable unit, be careful not to hit the SRS-ECU.***
- ***When removing and installing the front passenger seat, be sure to carry out accuracy check occupant classification sensor after the seat has been installed in the vehicle. (Refer to GROUP 52B, On-Vehicle Service P.52B-396.)***



AC305533AD

TRANSAXLE CONTROL CABLE ASSEMBLY REMOVAL STEPS

- AIR DUCT AND AIR CLEANER ASSEMBLY (REFER TO GROUP 15, AIR CLEANER P.15-4.)
- BATTERY AND BATTERY TRAY
- POWERTRAIN CONTROL MODULE (PCM) (REFER TO GROUP 13A <2.4L ENGINE>, PCM P.13A-1180 OR GROUP 13B <3.8L ENGINE>, PCM P.13B-1447 .)
- HEATER UNIT AND DECK CROSSMEMBER ASSEMBLY (REFER TO GROUP 55, HEATER UNIT, HEATER CORE, BLOWER ASSEMBLY AND EVAPORATOR UNIT P.55A-267.)

>>B<< 1. ADJUSTING NUT

TRANSAXLE CONTROL CABLE ASSEMBLY REMOVAL STEPS (Continued)

>>B<< 2. TRANSAXLE CONTROL CABLE ASSEMBLY CONNECTION (TRANSAXLE SIDE)

>>A<< 3. SHIFT LOCK CABLE UNIT

4. TRANSAXLE CONTROL CABLE ASSEMBLY CONNECTION (SELECTOR LEVER ASSEMBLY SIDE)

5. TRANSAXLE CONTROL CABLE ASSEMBLY

SELECTOR LEVER ASSEMBLY ASSEMBLY REMOVAL STEPS

- FLOOR CONSOLE (REFER TO GROUP 52A, FLOOR CONSOL ASSEMBLY P.52A-22)

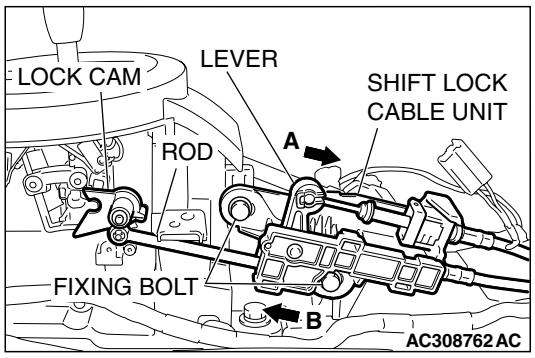
>>A<< 3. SHIFT LOCK CABLE UNIT

TSB Revision

SELECTOR LEVER ASSEMBLY
ASSEMBLY REMOVAL STEPS
4. TRANSAXLE CONTROL CABLE ASSEMBLY CONNECTION (SELECTOR LEVER ASSEMBLY SIDE)
6. SHIFT SWITCH ASSEMBLY HARNESS CONNECTOR
7. HARNESS CILP CONNECTION
8. SELECTOR LEVER ASSEMBLY

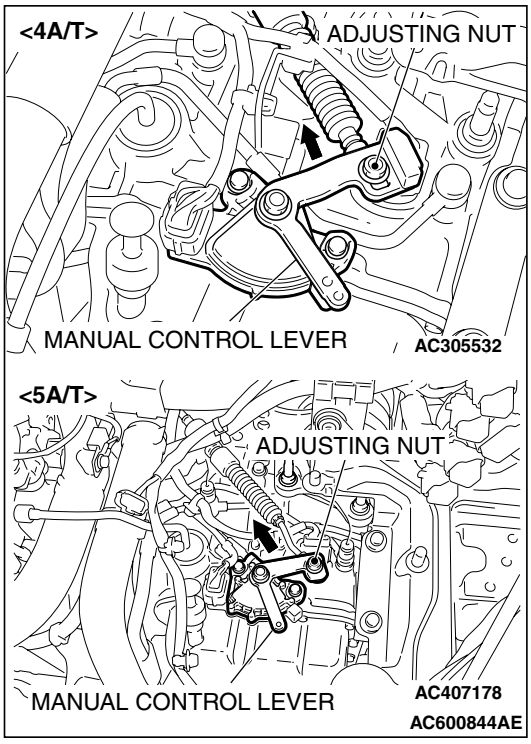
INSTALLATION SERVICE POINTS

>>A<< SHIFT LOCK CABLE UNIT INSTALLATION



1. Place the selector lever in "P" position.
2. Turn the ignition key to "LOCK" (OFF) position.
3. Install the rod of the shift lock cable unit to the lock cam, push the lever in direction A, push the shift lock cable unit in direction B and tighten the fixing bolt at the standard torque.
   Tightening torque: 5.0 ± 1.0 N·m (44 ± 9 in-lb)
4. Check the selector lever operation.(Refer to P.23A-377).

>>B<< TRANSAXLE CONTROL CABLE ASSEMBLY (TRANSAXLE SIDE)/ADJUSTING NUT INSTALLATION



1. Place the selector lever and manual control lever in the "N" position.
2. Place the cable stud into the manual control lever slot and install the nut loosely. Gently push the transaxle control cable into the manual control lever slot until the cable is taut. Tighten the nut to the specified torque.
   Tightening torque: 12 ± 2 N·m (107 ± 17 in-lb)

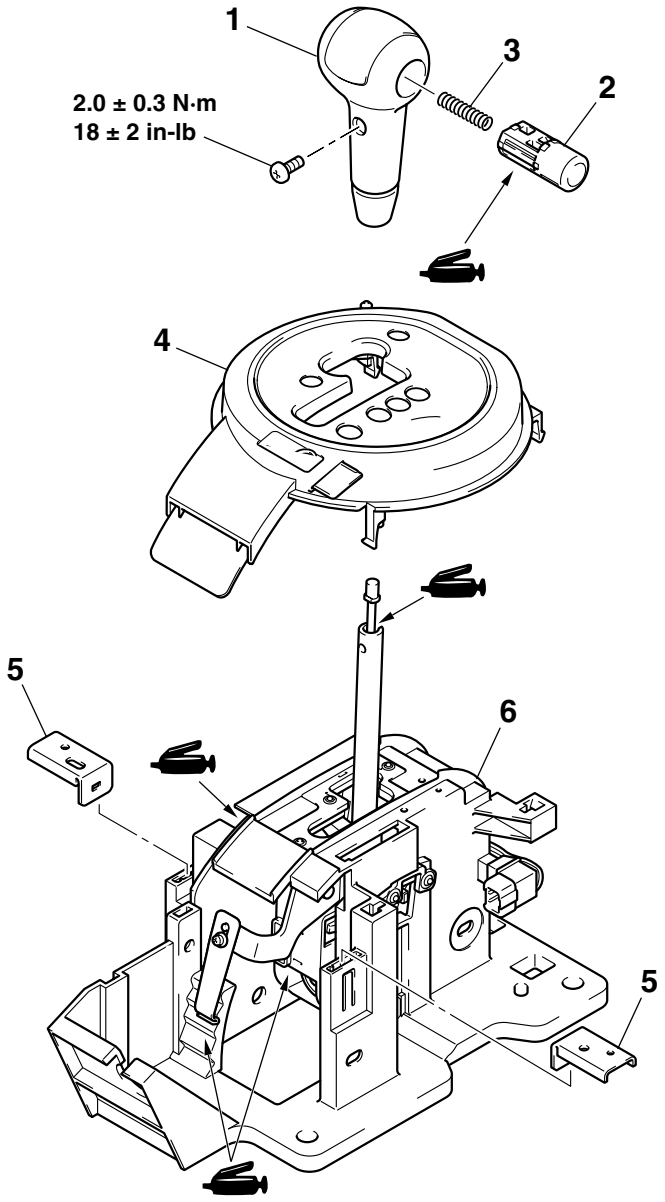
INSPECTION

M1231030000094

Check the cable assembly for function and for damage.

DISASSEMBLY AND ASSEMBLY

M1231006800578



AC305576AB

DISASSEMBLY STEPS

1. SHIFT KNOB
2. PUSH BUTTON
3. SPRING

DISASSEMBLY STEPS

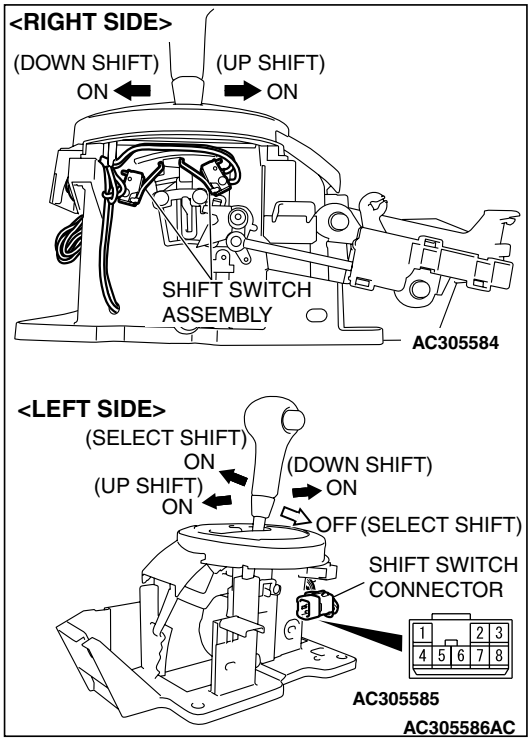
4. INDICATOR PANEL
5. BRACKET STAY
6. SHIFT LEVER ASSEMBLY

TSB Revision

INSPECTION

M1231006900304

SHIFT SWITCH ASSEMBLY CONTINUITY CHECK



SWITCH POSITION		TERMINAL NO.
Select switch (select shift)	ON	1 – 6
	OFF	1 – 8
Shift switch (up shift)	ON	2 – 7
	OFF	–
Shift switch (down shift)	ON	2 – 3
	OFF	–

A/T KEY INTERLOCK AND SHIFT LOCK MECHANISMS

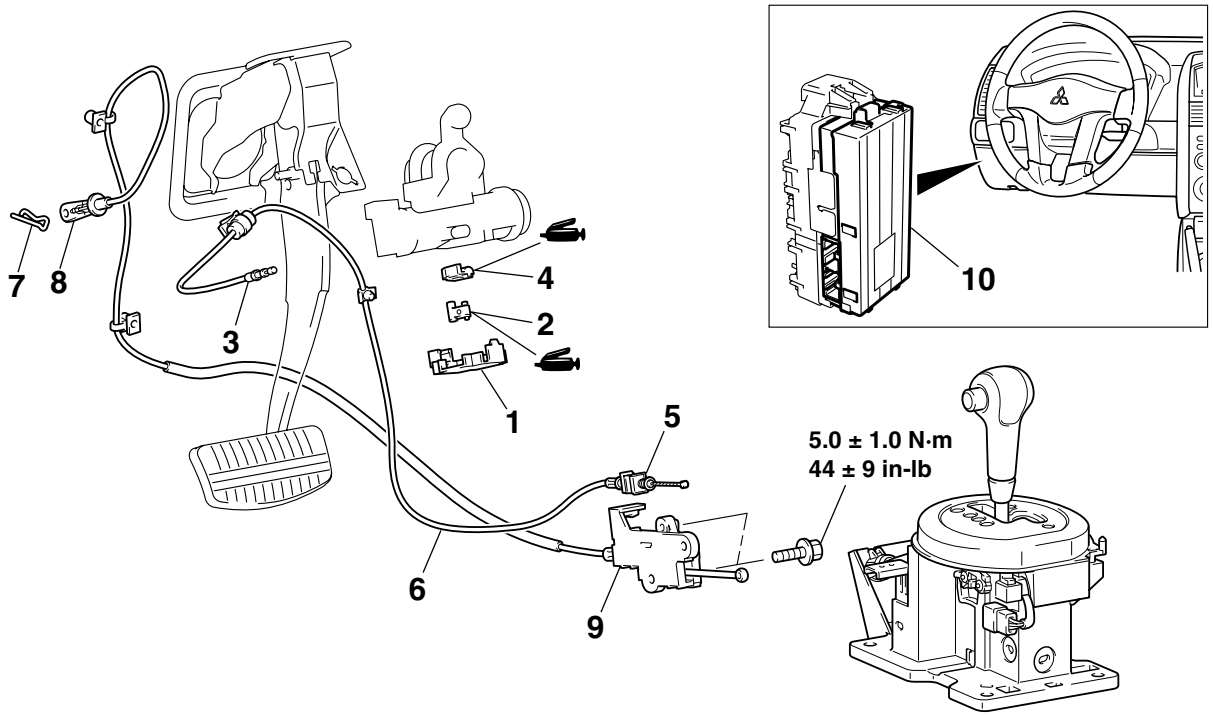
REMOVAL AND INSTALLATION

M1232001200961

⚠ ***WARNING***

- ***When removing and installing the shift lock cable unit and key interlock cable, be careful not to hit the SRS-ECU.***
- ***When removing and installing the front passenger seat, be sure to carry out accuracy check occupant classification sensor after the seat has been installed in the vehicle. (Refer to GROUP 52B, On-Vehicle Service P.52B-396.)***

Pre-removal Operation	Post-installation Operation
• Floor Console Removal (Refer to GROUP 52A, Floor Console Assembly P.52A-22.) • Center Console Assembly Removal (Refer to GROUP 52A, Instrument Panel Assembly P.52A-15.) • Lower Column Cover Removal (Refer to GROUP 37, Steering Shaft P.37-26.) • Accelerator Pedal Assembly Removal (Refer to GROUP 17, Accelerator Cable and Pedal P.17-8.)	• Accelerator Pedal Assembly Installation (Refer to GROUP 17, Accelerator Cable and Pedal P.17-8.) • Center Console Assembly Installation (Refer to GROUP 52A, Instrument Panel Assembly P.52A-15.) • Floor Console Installation (Refer to GROUP 52A, Floor Console Assembly P.52A-22.) • Lower Column Cover Installation (Refer to GROUP 37, Steering Shaft P.37-26.) • Key Interlock and Shift Lock Mechanism Check (Refer to P.23A-377.)



AC601018AB

KEY INTERLOCK CABLE REMOVAL STEPS

1. COVER
2. ROCK CAM (STEERING LOCK CYLINDER SIDE)
3. KEY INTERLOCK CABLE (STEERING LOCK CYLINDER SIDE) CONNECTION
4. SLIDER

KEY INTERLOCK CABLE REMOVAL STEPS (Continued)

5. KEY INTERLOCK CABLE (SELECTOR LEVER SIDE) CONNECTION
6. KEY INTERLOCK CABLE

SHIFT LOCK CABLE UNIT REMOVAL STEPS

7. COTTER PIN

TSB Revision

SHIFT LOCK CABLE UNIT
REMOVAL STEPS (Continued)

>>**B**<< 8. SHIFT LOCK CABLE UNIT (BRAKE PEDAL SIDE) CONNECTION

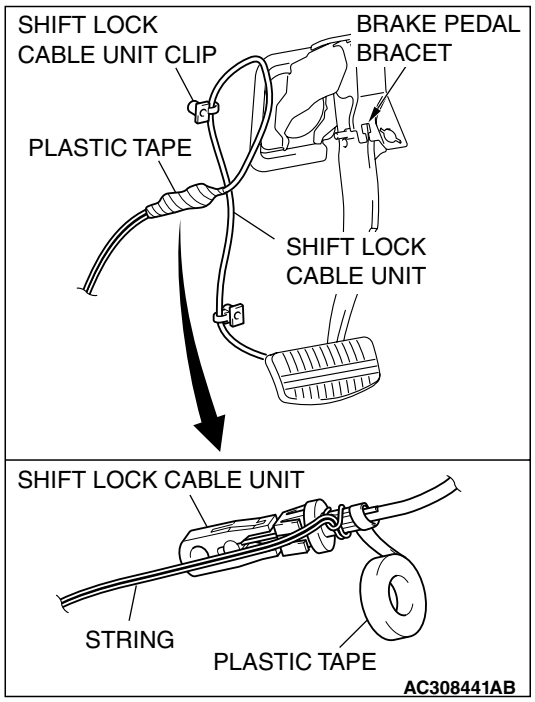
<<**A**>> >>**A**<< 9. SHIFT LOCK CABLE UNIT

ETACS-ECU REMOVAL

- INSTRUMENT LOWER PANEL (REFER TO GROUP 52A P.52A-15.)

10. ETACS-ECU

REMOVAL SERVICE POINTS



<<A>> SHIFT LOCK CABLE UNIT REMOVAL

Remove the shift lock cable from vehicles as follows to configure it easily upon assembling.

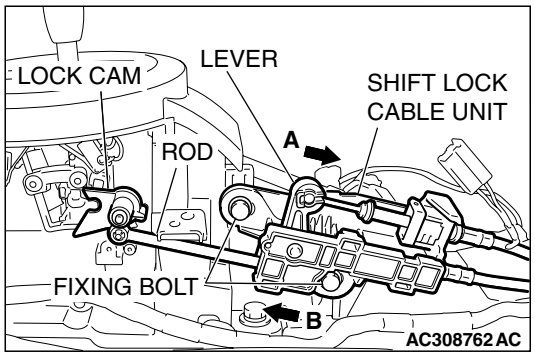
1. Remove the shift lock cable unit from the brake pedal bracket.
2. Remove the shift lock cable unit clip.
3. Bind up the cap of shift lock cable unit with a string.

⚠ CAUTION

Bind up it securely so that the string will not loosen.

4. Wind a plastic tape around the string bound to the shift lock cable unit.
5. To remove the shift lock cable unit pull it slowly and thread the string behind the heater unit.

INSTALLATION SERVICE POINTS

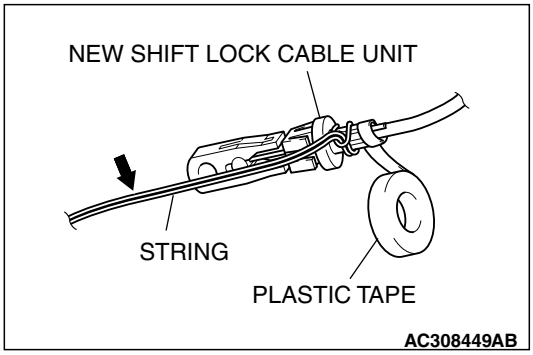


>>A<< SHIFT LOCK CABLE UNIT INSTALLATION

1. Selector lever to "P" position.
2. Turn the ignition key to "LOCK" (OFF) position.
3. Install the rod of the shift lock cable unit to the lock cam, push the lever in direction A, push the shift lock cable unit in direction B and tighten the fixing bolt at the standard torque.

   Tightening torque: 5.0 ± 1.0 N·m (44 ± 9 in-lb)

4. Check the selector lever operation. (Refer to P.23A-377)



>>B<< SHIFT LOCK CABLE UNIT (BRAKE PEDAL SIDE) INSTALLATION

⚠ CAUTION

When threading the shift lock cable unit behind the heater unit, wind a plastic tape around it up to the arrow as shown so that the shift lock cable unit will not be bent.

1. Bind up the cap of new shift lock cable unit with the string threaded behind the heater unit when removing and wind a plastic tape around it.
2. Pull the string slowly and thread the shift lock cable unit behind the heater unit.
3. Install the shift lock cable unit clip.
4. Remove the string and the plastic tape from the shift lock cable unit, and then install the shift lock cable unit to the brake pedal bracket.

INSPECTION

M1231030000102

Check the cable assembly for function and for damage.

TRANSAXLE ASSEMBLY

REMOVAL AND INSTALLATION

M1231005701140

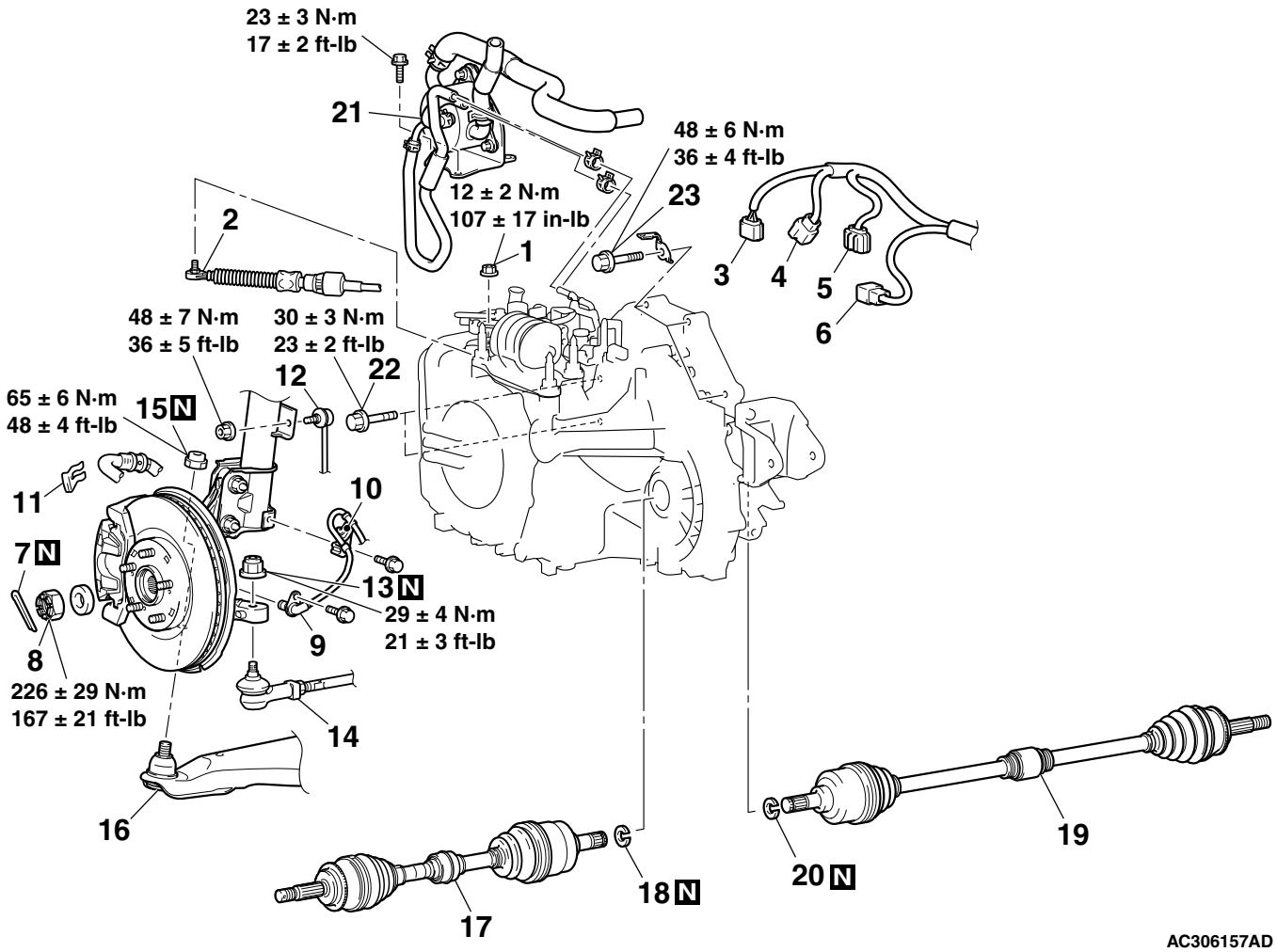
<4A/T>

⚠ CAUTION

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

Pre-installation Operation	Post-installation Operation
• Front Under Cover, Side Under Cover Removal • Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service P.14-7.) • Transmission Fluid Draining (Refer to GROUP 00, Maintenance Service – Automatic Transaxle P.00-60.) • Air Cleaner Assembly Removal (Refer to GROUP 15, Air Cleaner P.15-4.) • Powertrain Control Module (PCM) Removal (Refer to GROUP 13A P.13A-1180.) • Battery and Battery Tray Removal • Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32.)	• Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32.) • Battery and Battery Tray Installation • Powertrain Control Module (PCM) Installation (Refer to GROUP 13A P.13A-1180.) • Air Cleaner Assembly Installation (Refer to GROUP 15, Air Cleaner P.15-4.) • Transmission Fluid Supplying (Refer to GROUP 00, Maintenance Service – Automatic Transaxle P.00-60.) • Engine Coolant Supplying (Refer to GROUP 14, On-vehicle Service P.14-7.) • Front Under Cover, Side Under Cover Installation • Selector Lever Operation Check (Refer to P.23A-377.) • Speedometer Operation Check (Refer to GROUP 54A, Combination Meter – On-vehicle Service – Speedometer Check P.54A-119.) • Front Wheel Alignment Check and Adjustment (Refer to GROUP 33, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33-6.)

TSB Revision



AC306157AD

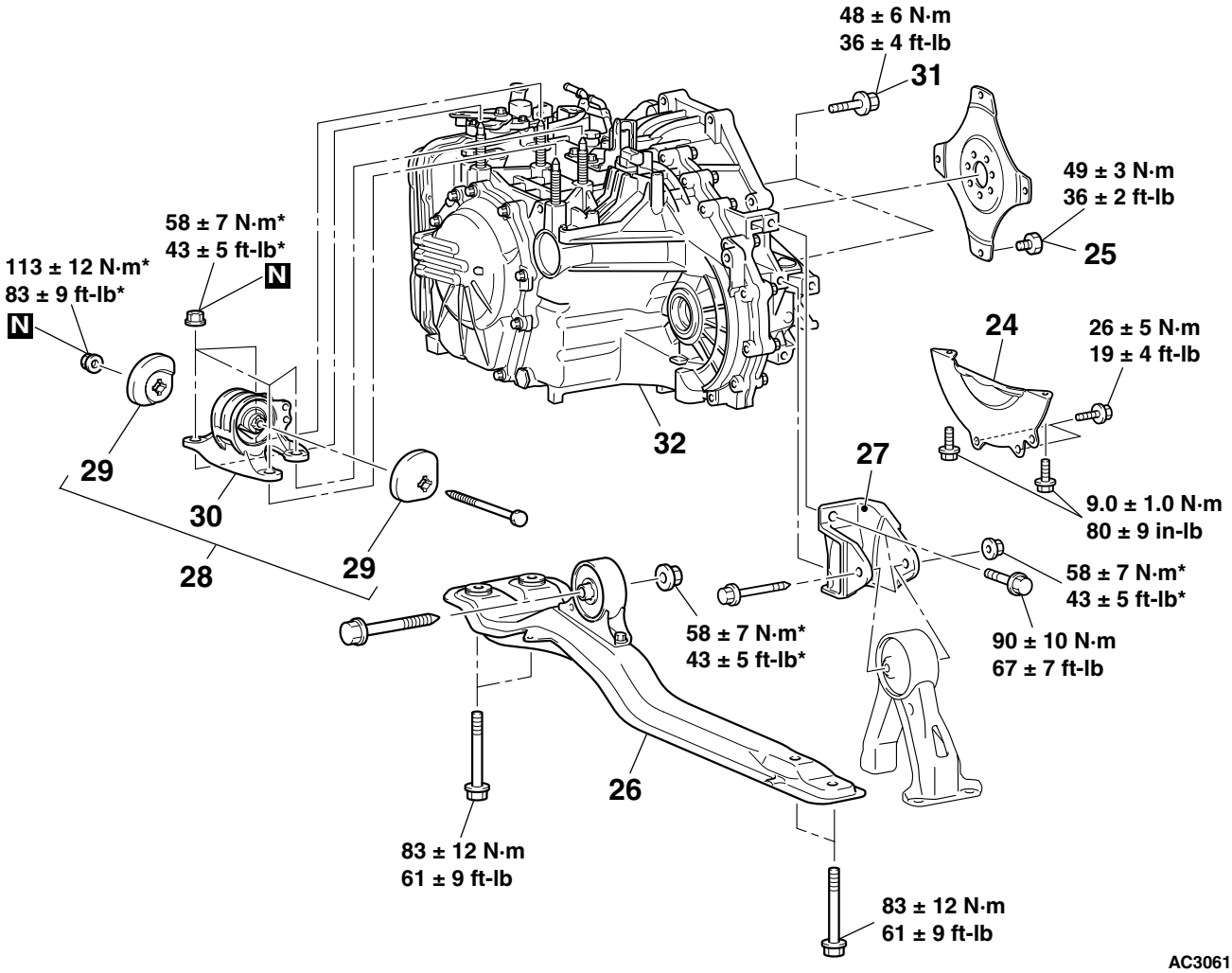
REMOVAL STEPS

>>**E**<< 1. ADJUSTING NUT
>>**E**<< 2. TRANSAXLE CONTROL CABLE CONNECTION
3. INHIBITOR SWITCH SENSOR CONNECTOR
4. A/T CONTROL SOLENOID VALVE ASSEMBLY CONNECTOR
5. INPUT SHAFT SPEED SENSOR CONNECTOR
6. OUTPUT SHAFT SPEED SENSOR CONNECTOR
7. SPLIT PIN
<<**A**>> >>**D**<< 8. DRIVE SHAFT NUT
9. WHEEL SPEED SENSOR
10. WHEEL SPEED SENSOR BRACKET
11. BRAKE HOSE CLAMP
12. STABILIZER LINK CONNECTION <STRUT SIDE>

REMOVAL STEPS (Continued)

13. SELF-LOCKING NUT (CONNECTION FOR TIE ROD END)
<<**B**>> 14. TIE ROD END CONNECTION
15. SELF-LOCKING NUT (CONNECTION FOR LOWER ARM BALL JOINT)
<<**B**>> 16. LOWER ARM BALL JOINT CONNECTION
<<**C**>> >>**C**<< 17. DRIVE SHAFT <LH>
18. CIRCLIP
<<**C**>> >>**C**<< 19. DRIVE SHAFT <RH>
20. CIRCLIP
21. ATF WARMER (TRANSMISSION FLUID COOLER) ASSEMBLY
22. STARTER MOTOR ATTACHING BOLTS
23. TRANSAXLE ASSEMBLY UPPER PART COUPLING BOLTS

TSB Revision



AC306158AF

REMOVAL STEPS

24. BELL HOUSING COVER
<<D>> 25. TORQUE CONVERTER AND DRIVE PLATE COUPLING BOLTS
26. CENTER MEMBER ASSEMBLY
- FRONT No.1 EXHAUST PIPE AND FRONT No.2 EXHAUST PIPE CONNECTION (REFER TO GROUP 15, EXHAUST PIPE AND MAIN MUFFLER P.15-32.)

27. REAR ROLL STOPPER BRACKET
- AIR CLEANER BRACKET

REMOVAL STEPS (Continued)

28. TRANSAXLE MOUNT BRACKET ASSEMBLY
>>B<< 29. TRANSAXLE MOUNT STOPPER
30. TRANSAXLE MOUNT BRACKET
<<E>>
- ENGINE ASSEMBLY SUPPORTING
- LIFTING UP OF THE VEHICLE
- SUPPORT THE TRANSAXLE WITH A TRANSAXLE JACK

31. TRANSAXLE ASSEMBLY LOWER PART COUPLING BOLTS
>>A<< 32. TRANSAXLE ASSEMBLY

Required Special Tools:

- MB990767: End Yoke Holder
- MB991897: Ball Joint Remover
- MB990242: Puller Shaft Puller
- MB990244: Puller Bar
- MB991354: Puller Body
- MB990998: Front Hub Remover and Installer
- MB991000: Spacer
- MB991527: Hanger
- MB991454: Engine Hanger Balancer (chain)
- MB991895: Engine Hanger
- MB991928: Engine Hanger
- MB991932: Foot (standard)
- MB991933: Foot (short)
- MB991930: Joint (90)
- MB991934: Chain and Hook Assembly

TSB Revision

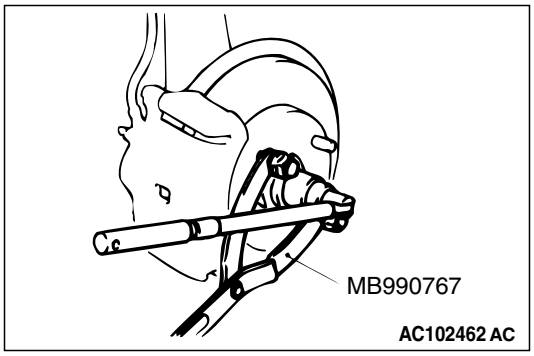
REMOVAL SERVICE POINTS

<<A>> DRIVE SHAFT NUT REMOVAL

⚠ CAUTION

Do not apply pressure to the wheel bearing by the vehicle weight to avoid possible damage when the drive shaft nut is loosened.

Use special tool MB990767 to fix the hub and remove the drive shaft nut.

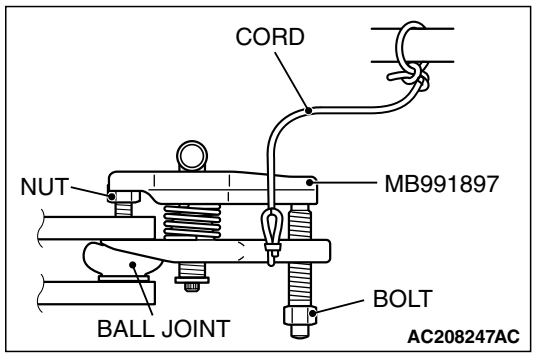


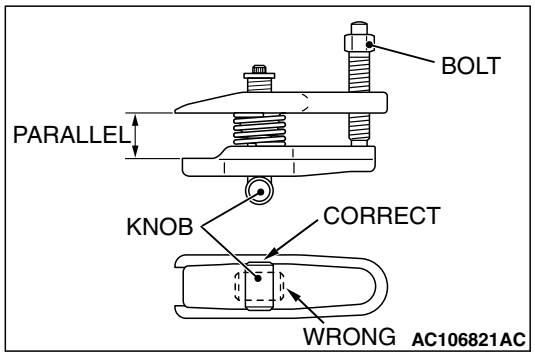
<<B>> TIE ROD END CONNECTION/LOWER ARM BALL JOINT CONNECTION REMOVAL

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use the special tool to avoid possible damage to ball joint threads.**
- **Hang the special tool with cord to prevent it from falling.**

1. Replace the self locking nut with a regular nut, because the original one is a little bit large to install the special tool. Install special tool MB991897 as shown in the figure.

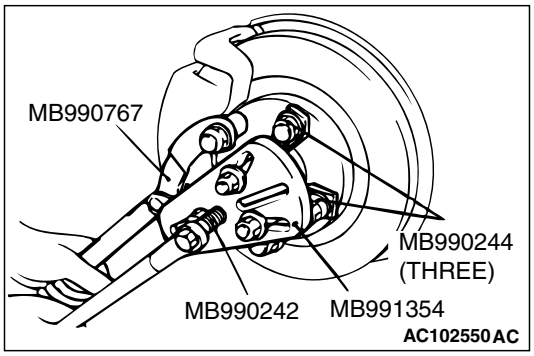




2. Turn the bolt and knob as necessary to make the jaws of special tool MB991897 parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

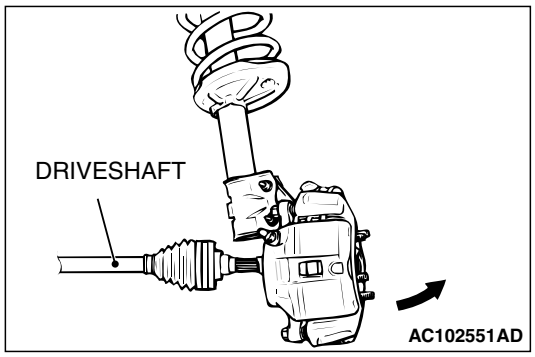
   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the tie rod end and remove the self locking nut.



<<C>> DRIVE SHAFT REMOVAL

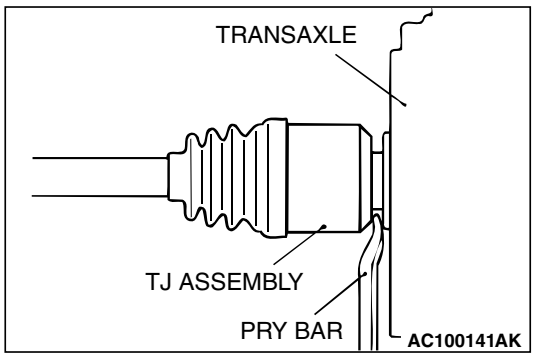
1. Use special tools MB990242, MB990244, MB991354 and MB990767 to push out the drive shaft or the drive shaft and inner shaft assembly from the hub.



2. Remove the drive shaft from the hub by pulling the bottom of the brake disc towards you.

⚠ CAUTION

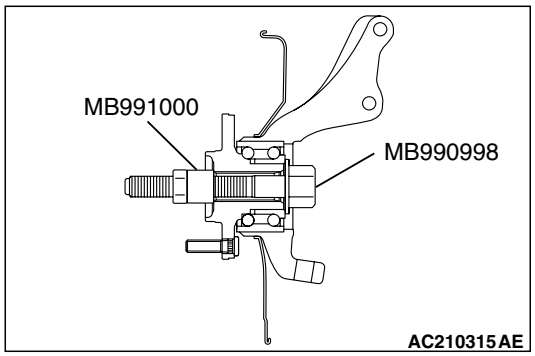
- **Do not pull on the drive shaft; doing so will damage the TJ; be sure to use the pry bar.**
- **When pulling the drive shaft out from the transaxle, be careful that the spline part of the drive shaft does not damage the oil seal.**



3. Remove the drive shaft from the transaxle by the following procedure. Insert a pry bar between the transaxle case and the drive shaft, and then pry the drive shaft from the transaxle.

⚠ CAUTION

Do not apply pressure to the wheel bearing by the vehicle weight to avoid possible damage when the drive shaft is removed. If, however, vehicle weight must be applied to the bearing to move the vehicle, temporarily secure the wheel bearing by using special tools MB991000 and MB990998.

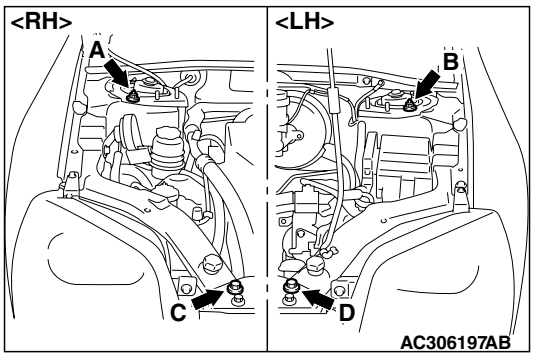


<<D>> TORQUE CONVERTEER AND DRIVE PLATE COUPLING BOLTS REMOVAL

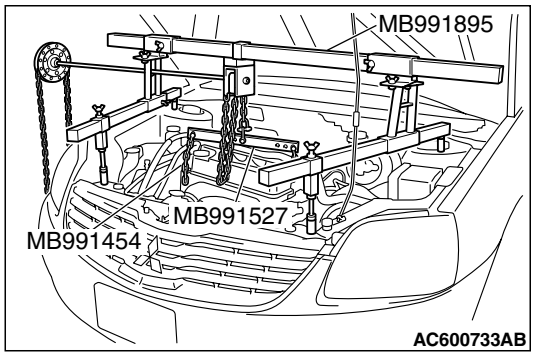
1. Remove the drive plate coupling bolts while turning the crank shaft.
2. Pry the torque converter towards the transaxle side. Remove the torque converter with the transaxle.

<<E>> ENGINE ASSEMBLY SUPPORTING

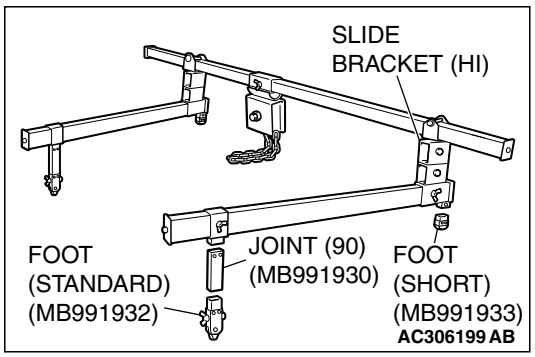
1. <Engine hanger (special tool MB991895) is used>
   (1) Set special tool MB991895 (engine hanger) to the front fender assembling bolts (A and B) and (C and D) as shown.



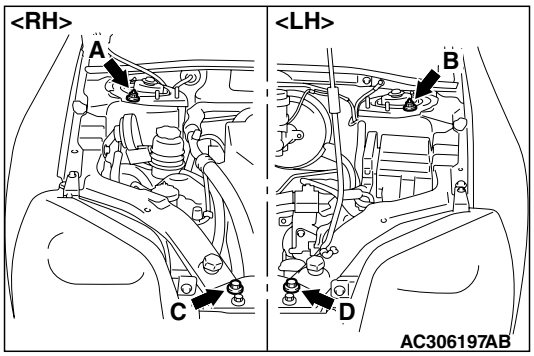
   (2) Set special tool MB991527 and MB991454 (chain) to hold the engine/transaxle assembly.

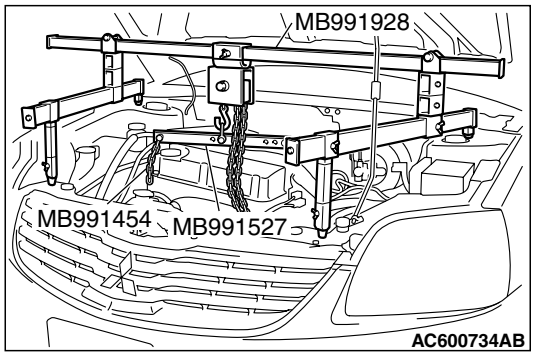


2. <Engine hanger (special tool MB991928) is used>
   (1) Assemble the engine hanger (special tool MB991928). Set following parts to the base hanger.)
   - SLIDE BRACKET (HI)
   - FOOT (STANDARD) (MB991932) <FRONT SIDE>
   - JOINT (90) (MB991930)
   - FOOT (SHORT) (MB991933) <REAR SIDE>



   (2) Set special tool MB991928 (engine hanger) to the front fender assembling bolts (A and B) and (C and D) as shown.





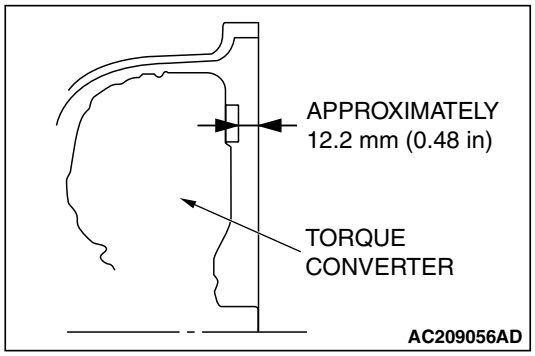
(3) Position special tool MB991527 and MB991454 (chain) to hold the engine/transaxle assembly.

NOTE: Adjust the engine hanger balance by sliding the slide bracket (HI).

INSTALLATION SERVICE POINT

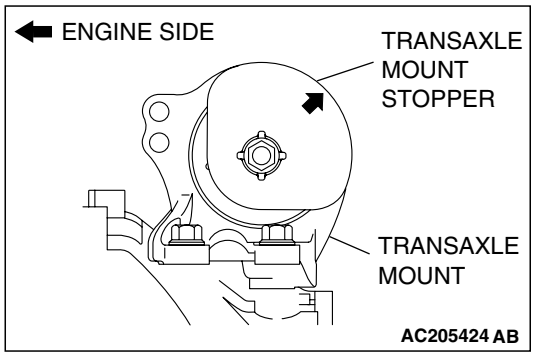
>>A<< TRANSAXLE ASSEMBLY INSTALLATION

Engage the torque converter into the transaxle side securely, and then assemble the transaxle assembly on the engine.



>>B<< TRANSAXLE MOUNT STOPPER INSTALLATION

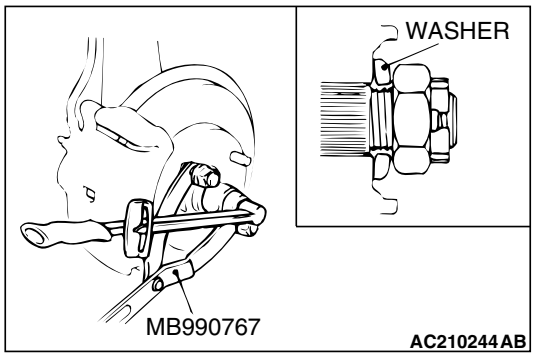
Install the transaxle mount stopper so that its arrow points upward.



>>C<< DRIVE SHAFT INSTALLATION

⚠ CAUTION

When installing the drive shaft, be careful that the spline part of the drive shaft do not damage the oil seal.



>>D<< DRIVE SHAFT NUT INSTALLATION

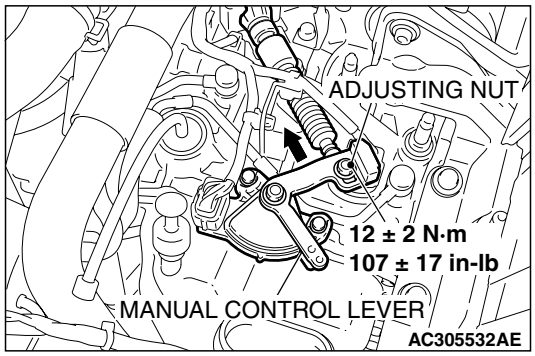
1. Be sure to install the drive shaft washer in the specified direction.

⚠ CAUTION

Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings. Otherwise the wheel bearing will be damaged.

2. Using special tool MB990767, tighten the drive shaft nut to the specified torque.

   Tightening torque: 226 ± 29 N·m (167 ± 21 ft-lb)



>>E<< TRANSAXLE CONTROL CABLE/ADJUSTING NUT INSTALLATION

1. Place the selector lever and manual control lever in the “N” position.
2. Place the cable stud into the manual control lever slot and install the nut loosely. Gently push the transaxle control cable into the manual control lever slot until the cable is taut. Tighten the nut to the specified torque.

   Tightening torque: 12 ± 2 N·m (107 ± 17 in-lb)

REMOVAL AND INSTALLATION

M1231005701139

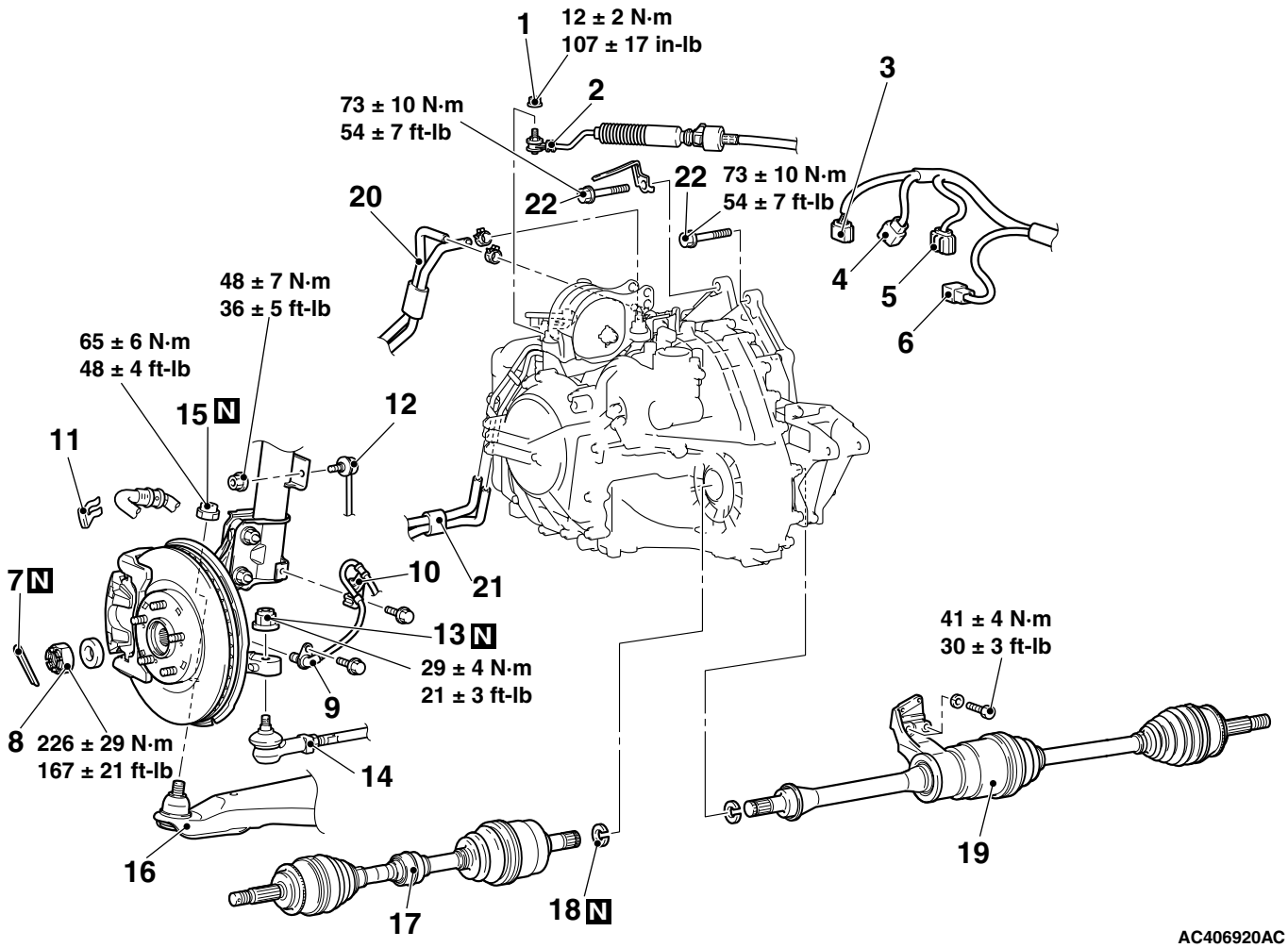
<5A/T>

⚠ CAUTION

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

Pre-installation Operation	Post-installation Operation
• Front Under Cover, Side Under Cover Removal (Refer to GROUP 51, Under Cover P.51-12). • Transmission Fluid Draining (Refer to GROUP 00, Maintenance Service – Automatic Transaxle P.00-60.) • Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Engine Cover Removal (Refer to GROUP 11C, Engine Assembly P.11C-22.) • Air Cleaner Assembly and Air Cleaner Resonator Removal (Refer to GROUP 15, Air Cleaner P.15-4). • Powertrain Control Module (PCM) Removal (Refer to GROUP 13B P.13B-1447.) • Battery and Battery Tray Removal • Front No.1 Exhaust Pipe and Front No.2 Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32). • Starter Assembly Removal (Refer to GROUP 16, Starter Motor Assembly P.16-27). • Radiator Upper Hose Removal (Refer to GROUP 14, Radiator P.14-12). • Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service P.14-7). • Intake Manifold Plenum Removal (Refer to GROUP 15 P.15-8). • Left Bank Heated Oxygen Sensor (Front, Rear) connector and Right Bank Heated Oxygen Sensor (Front, Rear) connector Removal (Refer to GROUP 15, Exhaust Manifold P.15-8). • Engine Oil Dipstick Removal	• Engine Oil Dipstick Installation • Front No.1 Exhaust Pipe and Front No.2 Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-32). • Starter Assembly Installation (Refer to GROUP 16, Starter Motor Assembly P.16-27). • Radiator Upper Hose Installation (Refer to GROUP 14, Radiator P.14-12). • Intake Manifold Plenum Installation (Refer to GROUP 15 P.15-8). • Battery and Battery Tray Installation • Powertrain Control Module (PCM) Installation (Refer to GROUP 13B P.13B-1447.) • Air Cleaner Assembly and Air Cleaner Resonator Installation (Refer to GROUP 15, Air Cleaner P.15-4). • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11.) • Transmission Fluid Supplying (Refer to GROUP 00, Maintenance Service – Automatic Transaxle P.00-60.) • Side Under Cover (LH) Installation (Refer to GROUP 51, Under Cover P.51-12). • Engine Cover Installation (Refer to GROUP 11C, Engine Assembly P.11C-22.) • Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service P.14-7). • Left Bank Heated Oxygen Sensor (Front, Rear) connector and Right Bank Heated Oxygen Sensor (Front, Rear) connector Installation (Refer to GROUP 15, Exhaust Manifold P.15-8). • Selector Lever Operation Check (Refer to P.23A-377.) • Speedometer Operation Check (Refer to GROUP 54A, Combination Meter – On-vehicle Service – Speedometer Check P.54A-119.) • Front Wheel Alignment Check and Adjustment (Refer to GROUP 33, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33-6.)

TSB Revision



AC406920AC

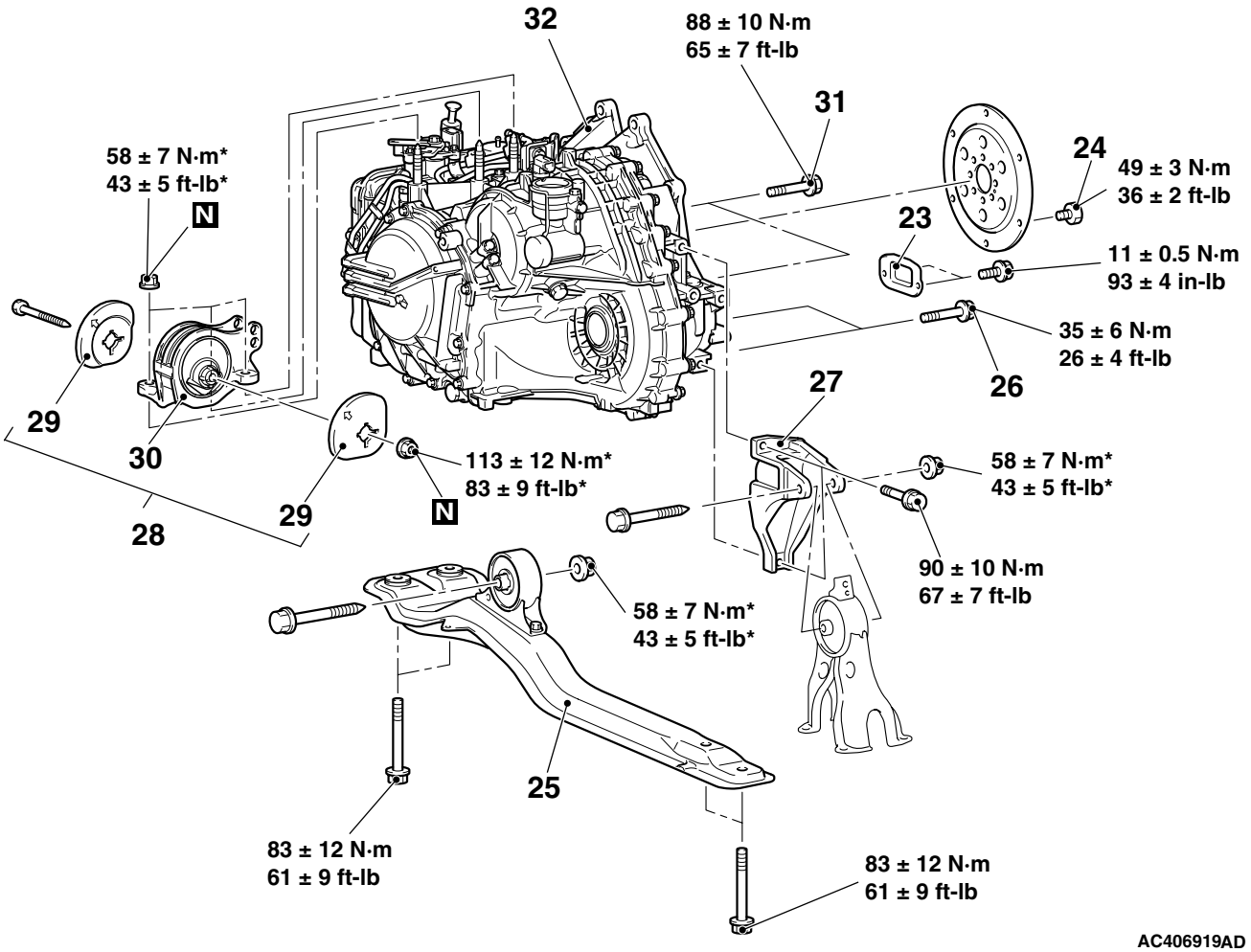
REMOVAL STEPS

>>**E**<< 1. ADJUSTING NUT
>>**E**<< 2. TRANSAXLE CONTROL CABLE CONNECTION
3. INHIBITOR SWITCH SENSOR CONNECTOR
4. A/T CONTROL SOLENOID VALVE ASSEMBLY CONNECTOR
5. INPUT SHAFT SPEED SENSOR CONNECTOR
6. OUTPUT SHAFT SPEED SENSOR CONNECTOR
7. SPLIT PIN
<<**A**>> >>**D**<< 8. DRIVE SHAFT NUT
9. WHEEL SPEED SENSOR
10. WHEEL SPEED SENSOR BRACKET
11. BRAKE HOSE CLAMP
12. STABILIZER LINK CONNECTION <STRUT SIDE>

REMOVAL STEPS (Continued)

13. SELF-LOCKING NUT (CONNECTION FOR TIE ROD END)
<<**B**>> 14. TIE ROD END CONNECTION
15. SELF-LOCKING NUT (CONNECTION FOR LOWER ARM BALL JOINT)
<<**B**>> 16. LOWER ARM BALL JOINT CONNECTION
<<**C**>> >>**C**<< 17. DRIVE SHAFT <LH>
18. CIRCLIP
<<**C**>> >>**C**<< 19. DRIVE SHAFT AND INNER SHAFT ASSEMBLY <RH>
20. TRANSMISSION FLUID COOLER LINE HOSE ASSEMBLY C
21. TRANSMISSION FLUID COOLER LINE HOSE ASSEMBLY B
22. TRANSAXLE ASSEMBLY UPPER PART COUPLING BOLTS

TSB Revision



AC406919AD

REMOVAL STEPS

23. COVER
<<**D**>> 24. TORQUE CONVERTER AND DRIVE PLATE BOLTS
25. CENTERMEMBER ASSEMBLY
26. ENGINE OIL PAN AND TRANSAXLE COUPLING BOLTS
27. REAR ROLL STOPPER BRACKET
- AIR CLEANER BRACKET

28. TRANSAXLE MOUNTING BRACKET ASSEMBLY
>>**B**<< 29. TRANSAXLE MOUNTING STOPPER

REMOVAL STEPS (Continued)

30. TRANSAXLE MOUNTING BODY SIDE BRACKET
<<**E**>>
- ENGINE ASSEMBLY SUPPORTING
- LIFTING UP OF THE VEHICLE
- SUPPORT THE TRANSAXLE WITH A TRANSAXLE JACK

31. TRANSAXLE ASSEMBLY LOWER PART COUPLING BOLTS
>>**A**<< 32. TRANSAXLE ASSEMBLY

Required Special Tools:

- MB990242: Puller Shaft Puller
- MB990244: Puller Bar
- MB990767: End Yoke Holder
- MB990998: Front Hub Remover and Installer
- MB991000: Spacer
- MB991354: Puller Body
- MB991454: Engine Hanger Balancer
- MB991895: Engine Hanger
- MB991897: Ball Joint Remover
- MB991928: Engine Hanger
- MB991929: Joint (50)
- MB991931: Joint (140)
- MB991932: Foot (standard)
- MB991934: Chain and Hook Assembly
- MB992012: Engine hanger plate A
- MB992013: Engine hanger plate B

TSB Revision

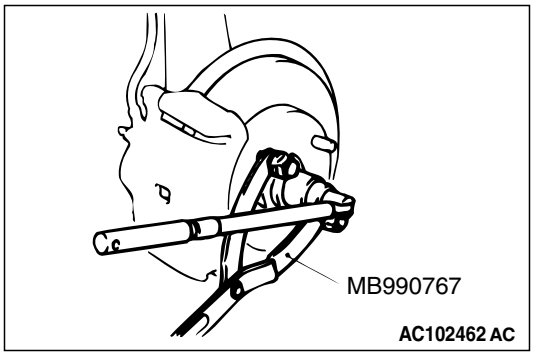
REMOVAL SERVICE POINTS

<<A>> DRIVE SHAFT NUT REMOVAL

⚠ CAUTION

Do not apply pressure to the wheel bearing by the vehicle weight to avoid possible damage when the drive shaft nut is loosened.

Use special tool MB990767 to fix the hub and remove the drive shaft nut.

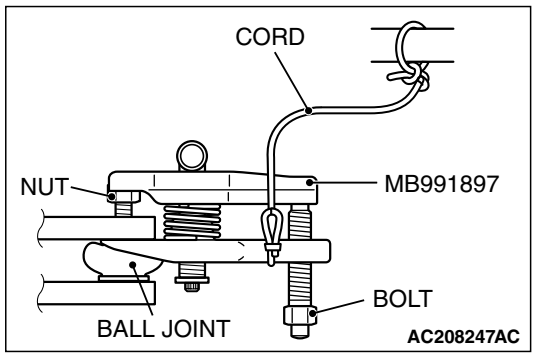


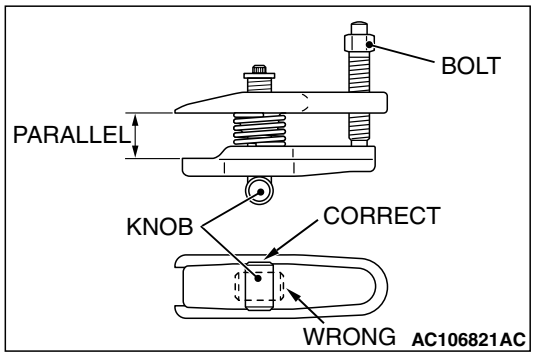
<<B>> TIE ROD END CONNECTION/LOWER ARM BALL JOINT CONNECTION REMOVAL

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use the special tool to avoid possible damage to ball joint threads.**
- **Hang the special tool with cord to prevent it from falling.**

1. Replace the self locking nut with a regular nut, because the original one is a little bit large to install the special tool. Install special tool MB991897 as shown in the figure.



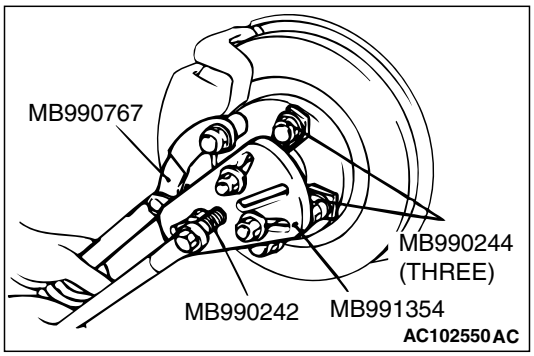


2. Turn the bolt and knob as necessary to make the jaws of special tool MB991897 parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

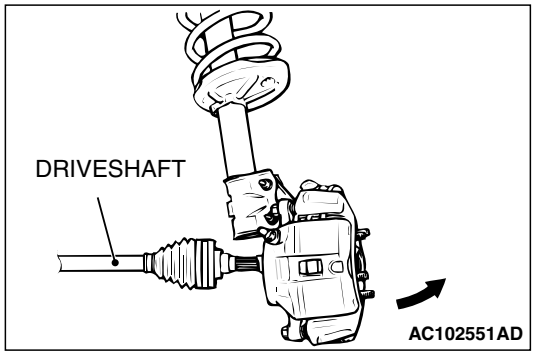
   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the tie rod end and remove the self locking nut.

<<C>> DRIVE SHAFT <LH>/DRIVE SHAFT AND INNER SHAFT ASSEMBLY <RH> REMOVAL



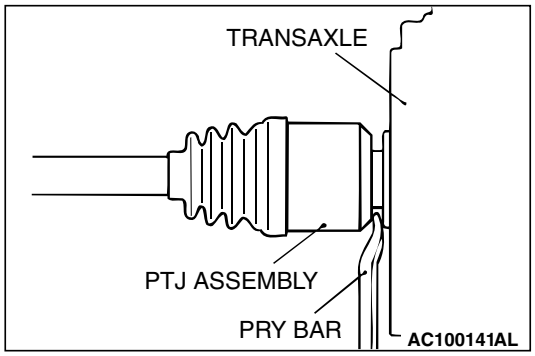
1. Use special tools MB990242, MB990244, MB991354 and MB990767 to push out the drive shaft or the drive shaft and inner shaft assembly from the hub.



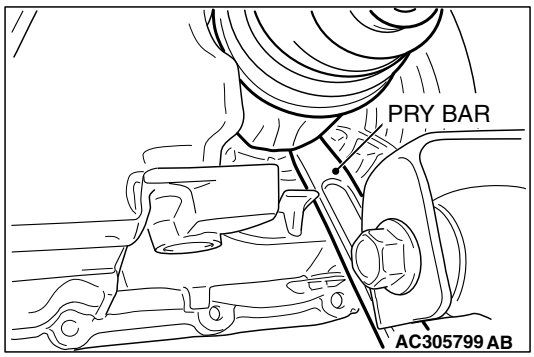
2. Remove the drive shaft from the hub by pulling the bottom of the brake disc towards you.

⚠ CAUTION

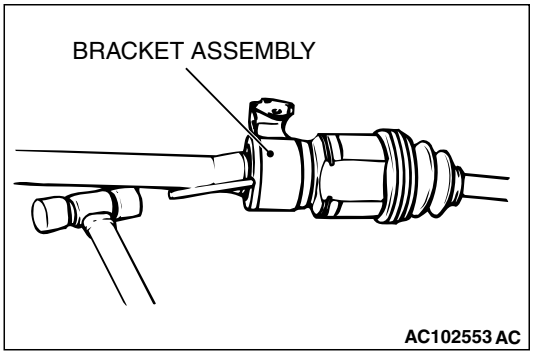
- **Do not pull on the drive shaft; doing so will damage the PTJ; be sure to use the pry bar.**
- **When pulling the drive shaft out from the transaxle, be careful that the spline part of the drive shaft does not damage the oil seal.**



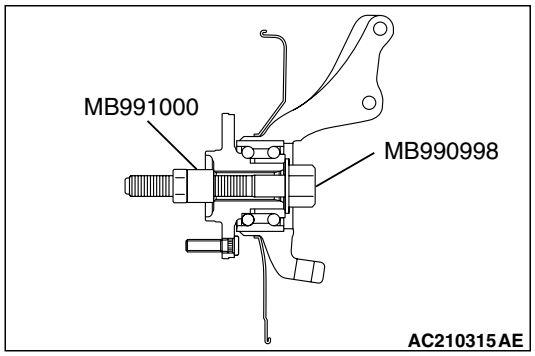
3. Insert a pry bar between the transaxle case and the drive shaft, and then pry and remove the drive shaft from the transaxle.



NOTE: Insert a pry bar, taking care not to damage the protrusion of transaxle case when removing the drive shaft LH.



4. If the inner shaft is hard to remove from the transaxle, strike the bracket assembly lightly with a plastic hammer and remove the inner shaft.



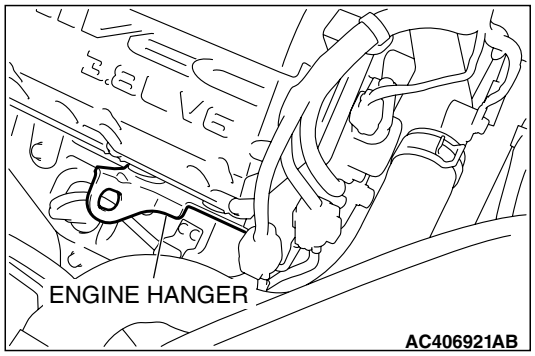
⚠ CAUTION
Do not apply pressure to the wheel bearing by the vehicle weight to avoid possible damage when the drive shaft is removed. If, however, vehicle weight must be applied to the bearing to move the vehicle, temporarily secure the wheel bearing by using special tools MB991000 and MB990998.

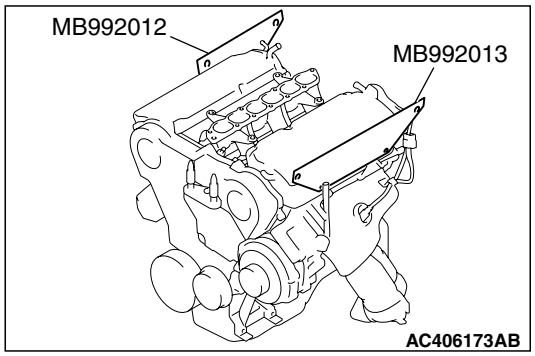
<<D>> TORQUE CONVERTER AND DRIVE PLATE COUPLING BOLTS REMOVAL

1. Remove the drive plate coupling bolts while turning the crankshaft.
2. Pry the torque converter towards the transaxle side. Remove the torque converter with the transaxle.

<<E>> ENGINE ASSEMBLY SUPPORTING

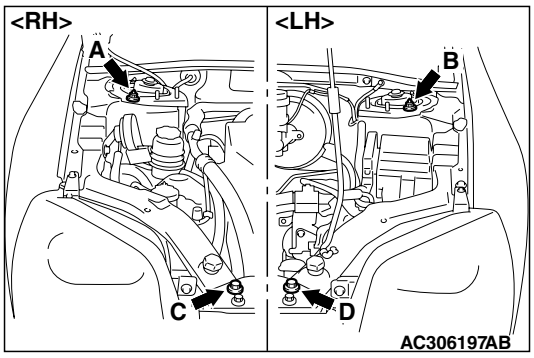
1. Remove the engine hanger.



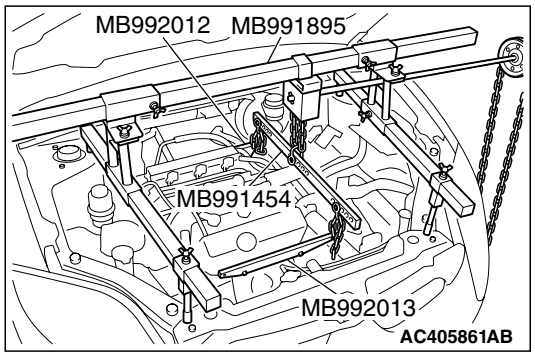


2. After removing the intake manifold plenum stay (rear) and the engine hanger, set special tool MB992012 and MB992013 to each cylinder head.

3. <If engine hanger MB991895 is used>



(1) Set special tool MB991895 (engine hanger) to the front fender assembling bolts (A and B) and (C and D), which are located in the engine compartment, as shown.

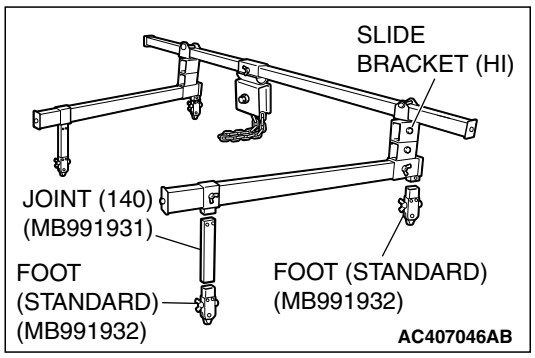


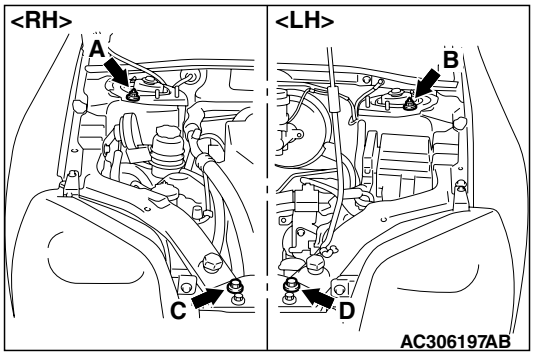
(2) Set special tool MB991454 to hold the engine/transaxle assembly.

4. <If engine hanger MB991928 is used>

(1) Assembly the engine hanger (special tool MB991928). Set the following parts to the base hanger.

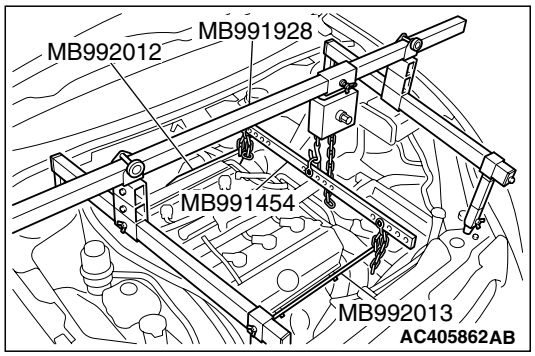
- SLIDE BRACKET (HI)
- FOOT (STANDARD) (MB991932)
- JOINT (140) (MB991931)





(2) Set the engine hanger (special tool MB991928) to the front fender mounting bolts (A and B) and (C and D), which are located in the engine compartment, as shown.

NOTE: Adjust the engine hanger balance by sliding the slide bracket (HI).

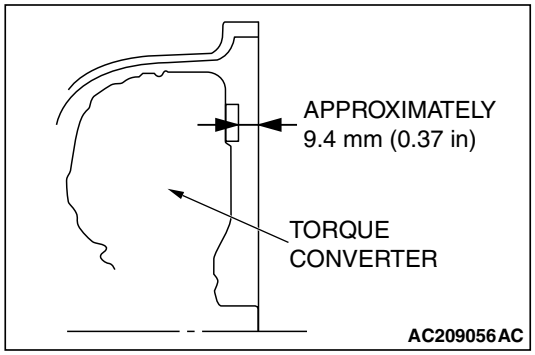


(3) Set special tool MB991454 to hold the engine/transaxle assembly.

INSTALLATION SERVICE POINT

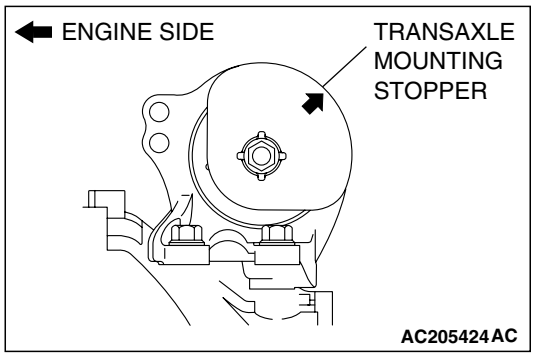
>>A<< TRANSAXLE ASSEMBLY INSTALLATION

Engage the torque converter into the transaxle side securely, and then assemble the transmission assembly on the engine.



>>B<< TRANSAXLE MOUNTING STOPPER INSTALLATION

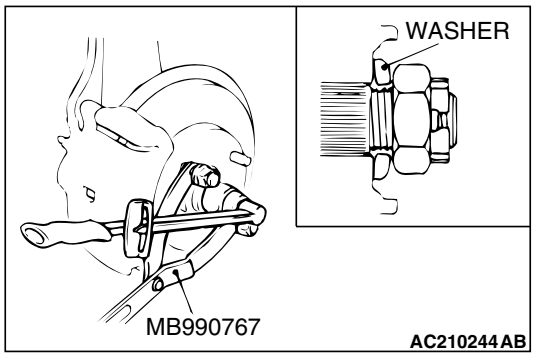
Install the transaxle mounting stopper so that its arrow points upward.



>>C<< DRIVE SHAFT AND INNER SHAFT ASSEMBLY <RH>/DRIVE SHAFT <LH> INSTALLATION

⚠ CAUTION

When installing the drive shaft or the drive shaft and inner shaft assembly, be careful that the spline part of the drive shaft or the drive shaft and inner shaft assembly do not damage the oil seal.



>>D<< DRIVE SHAFT NUT INSTALLATION

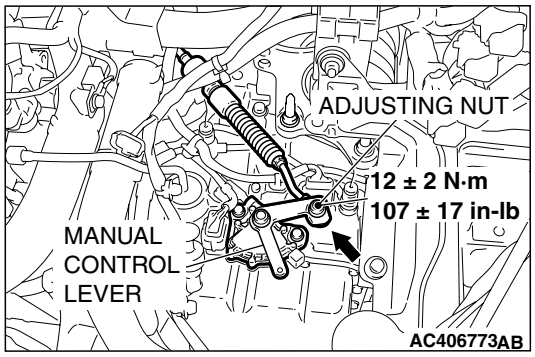
1. Be sure to install the drive shaft washer in the specified direction.

⚠ CAUTION

Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings. Otherwise the wheel bearing will be damaged.

2. Using special tool MB990767, tighten the drive shaft nut to the specified torque.

   Tightening torque: 226 ± 29 N·m (167 ± 21 ft-lb)



>>E<< TRANSAXLE CONTROL CABLE/ADJUSTING NUT INSTALLATION

1. Place the selector lever and manual control lever in the “N” position.
2. Place the cable stud into the manual control lever slot and install the nut loosely. Gently push the transaxle control cable into the manual control lever slot until the cable is taut. Tighten the nut to the specified torque.

   Tightening torque: 12 ± 2 N·m (107 ± 17 in-lb)

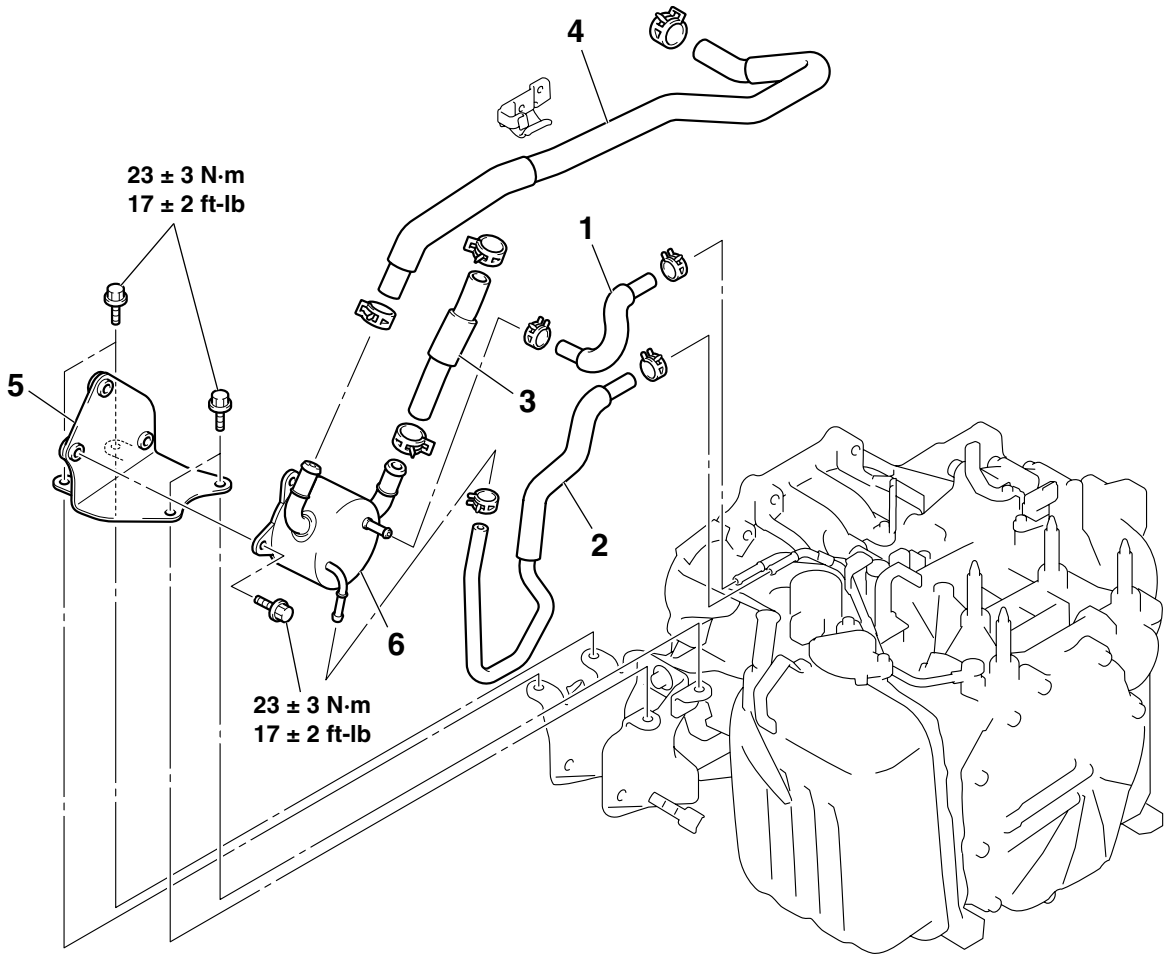
TRANSMISSION FLUID COOLER, HOSE AND PIPE

REMOVAL AND INSTALLATION

M1231021900163

<4A/T>

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to GROUP 00 – Maintenance ServiceP.00-63.)
- Transmission Fluid Draining and Supplying (Refer to GROUP 00, Maintenance Service – Automatic Transmission Fluid P.00-60.)
- Air Cleaner Intake Duct Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4.)



AC306185AB

REMOVAL STEPS

<<A>> 1. TRANSMISSION FLUID COOLER RETURN HOSE
<<A>> 2. TRANSMISSION FLUID COOLER FEED HOSE
<<A>> 3. WATER COOLER FEED HOSE
<<A>> 4. WATER COOLER RETURN HOSE

REMOVAL STEPS (Continued)

<<A>>
- ATF WARMER (TRANSMISSION FLUID COOLER) AND ATF WARMER (TRANSMISSION FLUID COOLER) BRACKET

5. ATF WARMER (TRANSMISSION FLUID COOLER) BRACKET
6. ATF WARMER (TRANSMISSION FLUID COOLER)

TSB Revision

REMOVAL SERVICE POINTS

<<A>> TRANSMISSION FLUID COOLER RETURN HOSE/ TRANSMISSION FLUID COOLER FEED HOSE/WATER COOLER FEED HOSE/WATER COOLER RETURN HOSE/ ATF WARMER (TRANSMISSION FLUID COOLER) REMOVAL

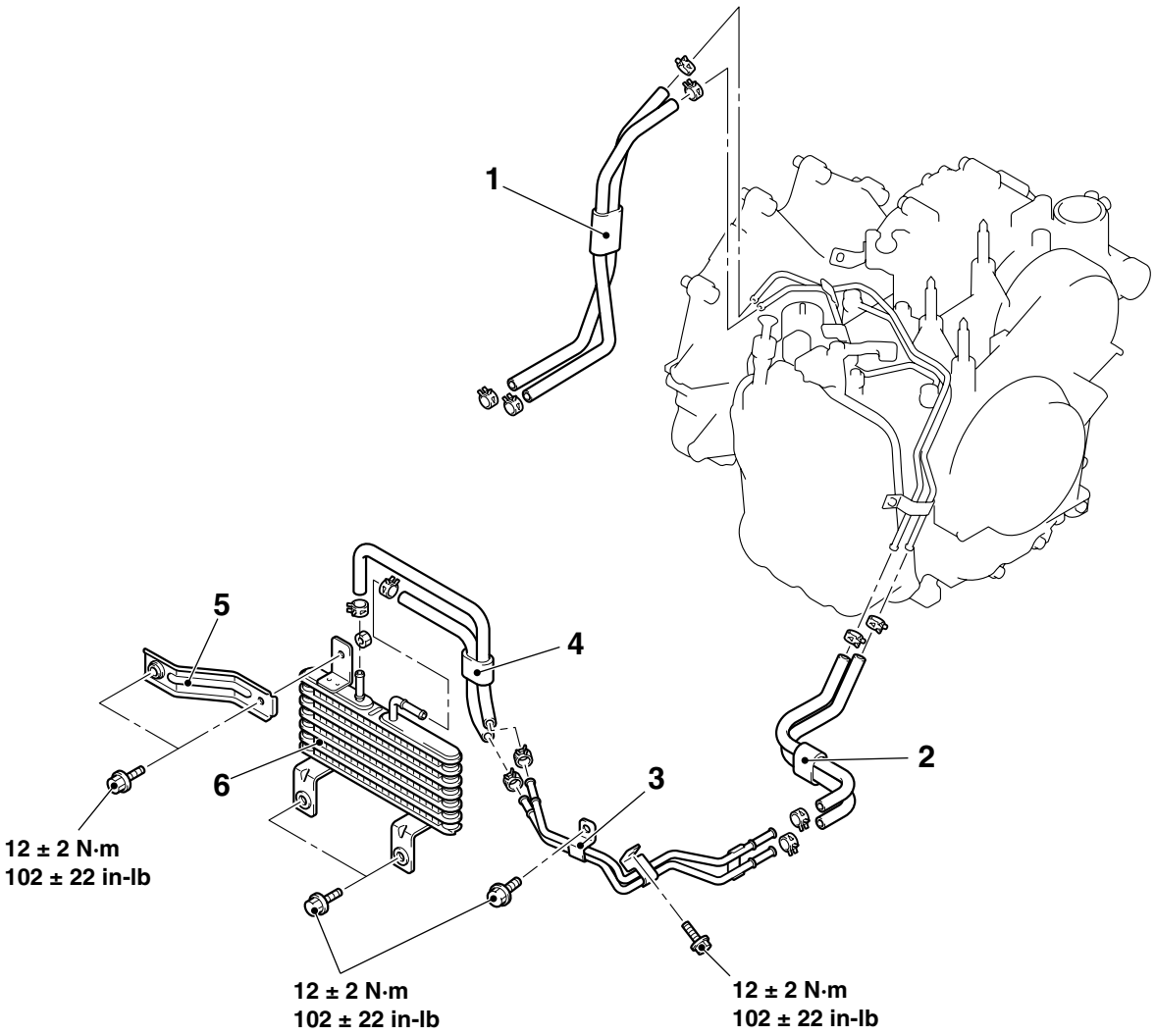
Drain the transmission fluid and engine coolant, which still remained in the hoses and the ATF warmer (transmission fluid cooler).

REMOVAL AND INSTALLATION

M1231021900174

<5A/T>

Pre-removal and Post-installation Operation
- Side Under Cover <LH> (Refer to GROUP 51, Under Cover P.51-12.)
- Transmission Fluid Draining and Supplying (Refer to GROUP 00, Maintenance Service – Automatic Transmission Fluid P.00-60.)
- Air Cleaner Intake Duct Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4.)



TSB Revision

REMOVAL STEPS

<<**A**>> 1. TRANSMISSION FLUID COOLER LINE HOSE ASSEMBLY C

<<**A**>> 2. TRANSMISSION FLUID COOLER LINE HOSE ASSEMBLY B
- FRONT BUMPER ASSEMBLY (REFER TO GROUP 51, FRONT BUMPER ASSEMBLY P.51-2)

<<**A**>> 3. TRANSMISSION FLUID COOLER LINE TUBE

<<**A**>> 4. TRANSMISSION FLUID COOLER LINE HOSE ASSEMBLY A

REMOVAL STEPS (Continued)

5. TRANSMISSION FLUID COOLER BRACKET
- POWER STEERING COOLER TUBE ASSEMBLY (REFER TO GROUP 37, POWER STEERING P.37-54)
- AIR GUIDE PANEL CENTER (REFER TO GROUP 42, LOOSE PANEL P.42-85)

<<**A**>> 6. TRANSMISSION FLUID COOLER

REMOVAL SERVICE POINTS

<<A>> TRANSMISSION FLUID COOLER LINE HOSE A, B, C/TRANSMISSION FLUID COOLER LINE TUBE/TRANSMISSION FLUID COOLER REMOVAL

Drain the transmission fluid and engine coolant, which still remain in the hoses and the transmission fluid cooler.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1231012400364

ITEM	SPECIFICATION
Transmission range switch	
Transmission range switch body mounting bolt	11 ± 1 N·m (96 ± 8 in-lb)
Transaxle control	
Adjusting nut	12 ± 2 N·m (107 ± 17 in-lb)
Shift knob attaching screw	2.0 ± 0.3 N·m (18 ± 2 in-lb)
Selector lever assembly attaching bolt	12 ± 2 N·m (102 ± 22 in-lb)
Shift lock cable unit fixing bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Transaxle control cable attaching bolt	12 ± 2 N·m (102 ± 22 in-lb)
A/T Key interlock and shift lock mechanisms	
Shift lock cable unit fixing bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Transaxle assembly <4A/T>	
Adjusting nut	12 ± 2 N·m (107 ± 17 in-lb)
ATF warmer (transmission fluid cooler) bracket attaching bolt	23 ± 3 N·m (17 ± 2 ft-lb)
Bell housing cover attaching bolt (engine side)	9.0 ± 1.0 N·m (80 ± 9 in-lb)
Bell housing cover attaching bolt (transaxle side)	26 ± 5 N·m (19 ± 4 ft-lb)
Center member attaching bolt	83 ± 12 N·m (61 ± 9 ft-lb)
Drive plate bolt	49 ± 3 N·m (36 ± 2 ft-lb)
Drive shaft nut	226 ± 29 N·m (167 ± 21 ft-lb)
Front roll stopper bracket retainer nut	58 ± 7 N·m (43 ± 5 ft-lb)
Rear roll stopper bracket attaching bolt	90 ± 10 N·m (67 ± 7 ft-lb)
Rear roll stopper bracket retainer nut	58 ± 7 N·m (43 ± 5 ft-lb)
Self-locking nut (lower arm ball joint connection)	65 ± 6 N·m (48 ± 4 ft-lb)
Self-locking nut (tie rod end connection)	29 ± 4 N·m (21 ± 3 ft-lb)
Stabilizer link to strut connecting nut	48 ± 7 N·m (36 ± 5 ft-lb)
Starter motor attaching bolt	30 ± 3 N·m (23 ± 2 ft-lb)
Transaxle assembly upper part coupling bolt	48 ± 6 N·m (36 ± 4 ft-lb)
Transaxle assembly lower part coupling bolt	48 ± 6 N·m (36 ± 4 ft-lb)
Transaxle mounting body side bracket attaching nut	58 ± 7 N·m (43 ± 5 ft-lb)
Transaxle mounting stopper attaching nut	113 ± 12 N·m (83 ± 9 ft-lb)
Transmission fluid drain plug	32 ± 2 N·m (23 ± 2 ft-lb)

TSB Revision

ITEM	SPECIFICATION
Transaxle assembly <5A/T>	
Adjusting nut	12 ± 2 N·m (107 ± 17 in-lb)
Center member attaching bolt	83 ± 12 N·m (61 ± 9 ft-lb)
Cover attaching bolt	11 ± 0.5 N·m (93 ± 4 in-lb)
Drive shaft and inner shaft assembly bolt (RH)	41± 4 N·m (30 ± 3 ft-lb)
Drive shaft nut	226 ± 29 N·m (167 ± 21 ft-lb)
Engine oil pan and transaxle coupling bolt	35 ± 6 N·m (26 ± 4 ft-lb)
Front roll stopper bracket retainer nut	58 ± 7 N·m (43 ± 5 ft-lb)
Rear roll stopper bracket attaching bolt	90 ± 10 N·m (67 ± 7 ft-lb)
Rear roll stopper bracket retainer nut	58 ± 7 N·m (43 ± 5 ft-lb)
Self-locking nut (lower arm ball joint connection)	65 ± 6 N·m (48 ± 4 ft-lb)
Self-locking nut (tie rod end connection)	29 ± 4 N·m (21 ± 3 ft-lb)
Stabilizer link to strut connecting nut	48 ± 7 N·m (36 ± 5 ft-lb)
Starter motor attaching bolt	30 ± 3 N·m (23 ± 2 ft-lb)
Starter terminal nut	12 ± 2 N·m (102 ± 22 in-lb)
Torque converter and drive plate bolt	49 ± 3 N·m (36 ± 2 ft-lb)
Transaxle assembly upper part coupling bolt	73 ± 10 N·m (54 ± 7 ft-lb)
Transaxle assembly lower part coupling bolt	88 ± 10 N·m (65 ± 7 ft-lb)
Transaxle mounting body side bracket attaching nut	58 ± 7 N·m (43 ± 5 ft-lb)
Transaxle mounting stopper attaching nut	113 ± 12 N·m (83 ± 9 ft-lb)
Transmission fluid drain plug	32 ± 2 N·m (23 ± 2 ft-lb)
Transmission Fluid Cooler <4A/T>	
ATF warmer (transmission fluid cooler) bracket attaching bolt	23 ± 3 N·m (17 ± 2 ft-lb)
ATF warmer (transmission fluid cooler) attaching bolt	23 ± 3 N·m (17 ± 2 ft-lb)
Transmission Fluid Cooler <5A/T>	
Transmission fluid cooler attaching bolt	12 ± 2 N·m (102 ± 22 in-lb)
Transmission fluid cooler bracket attaching bolt	12 ± 2 N·m (102 ± 22 in-lb)
Transmission fluid cooler line tube attaching bolt	12 ± 2 N·m (102 ± 22 in-lb)

SERVICE SPECIFICATIONS

M1231000300627

ITEM		STANDARD VALUE
Transmission fluid temperature sensor kΩ	at 0°C (32°F)	16.7 – 20.5
	at 20°C (68°F)	7.3 – 8.9
	at 40°C (104°F)	3.4 – 4.2
	at 60°C (140°F)	1.9 – 2.2
	at 80°C (176°F)	1.0 – 1.2
	at 100°C (212°F)	0.57 – 0.69
Line pressure MPa (psi)		0.98 – 1.05 (142 – 152)
Resistance of torque converter clutch control solenoid valve coil [at 20°C (68°F)] Ω		2.7 – 3.4
Resistance of low-reverse solenoid valve coil [at 20°C (68°F)] Ω		2.7 – 3.4

TSB Revision

ITEM	STANDARD VALUE
Resistance of overdrive solenoid valve coil [at 20°C (68°F)] Ω	2.7 – 3.4
Resistance of second solenoid valve coil [at 20°C (68°F)] Ω	2.7 – 3.4
Resistance of underdrive solenoid valve coil [at 20°C (68°F)] Ω	2.7 – 3.4
Resistance of reduction solenoid valve coil [at 20°C (68°F)] Ω <5A/T>	2.7 – 3.4
Stall speed r/min	2,200 – 2,700

LUBRICANT

M1231000400646

ITEM		SPECIFIED LUBRICANT	QUANTITY
Transmission fluid dm^3 (qt)	4A/T	DIAMOND ATF SP III	7.7 (8.1)
	5A/T		8.4 (8.9)

GROUP 26

FRONT AXLE

CONTENTS

GENERAL DESCRIPTION

M1261000100756

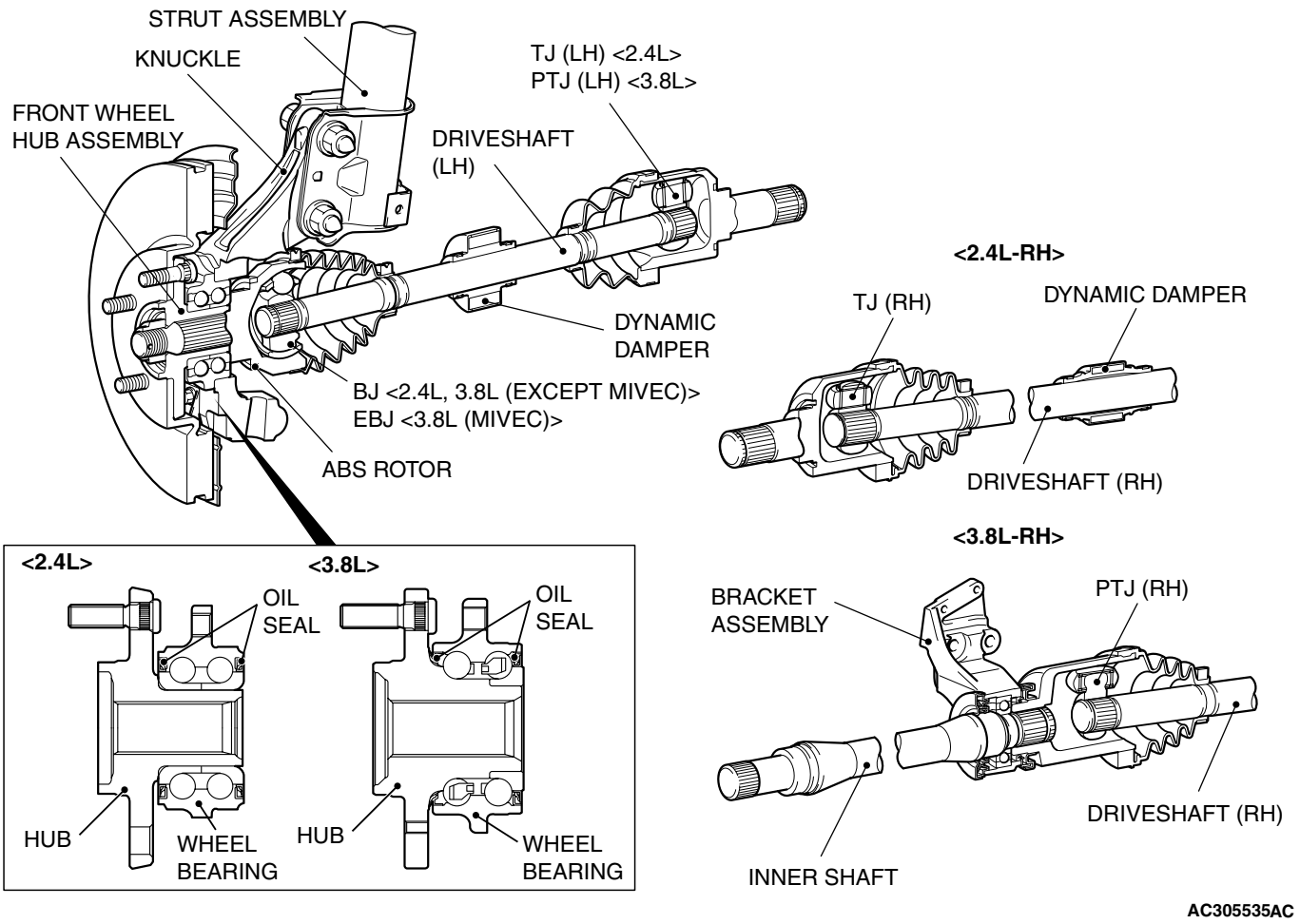
The front axle consists of front hubs, knuckles, wheel bearings and driveshafts, and has the following features:

- The wheel bearing incorporates double-row angular contact ball bearing <2.4L>, a unit ball bearing (double-row angular contact ball bearing) <3.8L>for reduced friction.
- The front wheel hub assembly combines the hub, wheel bearing, and oil seal in a single unit for fewer parts, better durability, improved assembly precision, and better structural organization. <3.8L>
- The driveshaft incorporates BJ-TJ type constant velocity joints <2.4L> and BJ-PTJ type constant velocity joints <3.8L (Except MIVEC)> and EBJ-PTJ type constant velocity joints <3.8L (MIVEC)> with high transmission efficiency for low vibration and noise.
- Due to the use of the inner shaft and bracket assembly, the right and left driveshafts are approximately the same in length. This reduces noise, vibration and torque steer.<3.8L-RH>
- The dynamic damper is mounted on the LH driveshaft <2.4L, 3.8L> and on the RH driveshaft <2.4L> to reduce differential gear noise.
- ABS rotor for detecting the wheel speed is press-fitted to the BJ <2.4L, 3.8L (Except MIVEC)> and EBJ <3.8L (MIVEC)>.

NOTE:

- *BJ: Birfield Joint*
- *TJ: Tripod Joint*
- *EBJ (Eight Ball Fixed Joint): The use of the smaller size eight balls inside the Joint achieves weight saving and compact size compared with BJ.*
- *PTJ: Pillow Tripod Joint*

CONSTRUCTION DIAGRAM



FRONT AXLE DIAGNOSIS

TROUBLESHOOTING STRATEGY

M1261005600240

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a front axle fault.

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

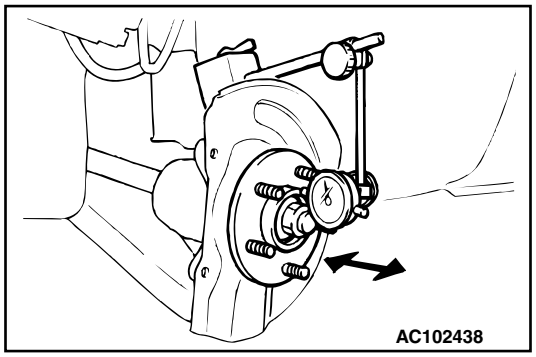
SYMPTOM CHART

M1261005700269

SYMPTOM		INSPECTION PROCEDURE	REFERENCE PAGE
Driveshaft	Noise during wheel rotation	1	P.26-4
	Noise due to excessive play of wheel in turning direction	2	P.26-5

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Noise during Wheel Rotation



DIAGNOSIS

STEP 1. Check the wheel bearing end play.

(1) Remove the caliper assembly and suspend it with a wire.
(2) Remove the brake disc from the front hub.
(3) Attach a dial gauge as shown in the illustration, and then measure the end play while moving the hub in the axial direction.

Limit: 0.05 mm (0.002 inch)

Q: Is the wheel bearing end play within the limit?

YES : Go to step 2.
NO : Replace the part, then go to Step 5.

STEP 2. Check the driveshaft and inner shaft for bending.

Q: Is the driveshaft and inner shaft bent?

YES : Replace the part. Then go to Step 5.
NO : Go to step 3.

STEP 3. Check the center bearing for wear.

Q: Is the center bearing worn?

YES : Replace the bearing. Then go to Step 5.
NO : Go to step 4.

STEP4. Check the driveshaft assembly for wear or damage.

Q: Is the driveshaft assembly worn or damaged?

YES : Replace the driveshaft assembly. Then go to Step 5.
NO : There is no action to be taken.

STEP 5. Retest the system.

Q: Is the abnormal noise eliminated?

YES : The procedure is complete.
NO : Repeat from Step 1.

INSPECTION PROCEDURE 2: Noise Due to Excessive Play of Wheel in Turning Direction

DIAGNOSIS

STEP 1. Check for play in the inner shaft and side gear serration, the drive shaft and side gear serration, or the drive shaft and front hub serration.

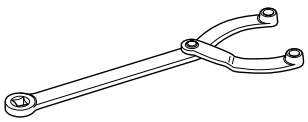
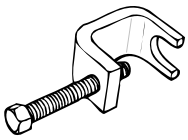
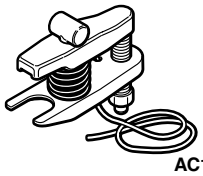
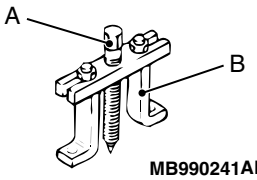
Q: Is the play found?
YES : Replace the part. Then go to Step 2.
NO : The procedure is complete.

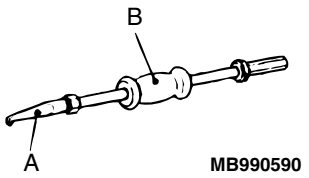
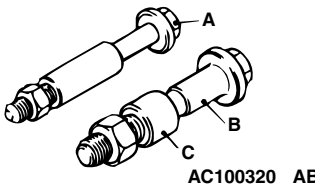
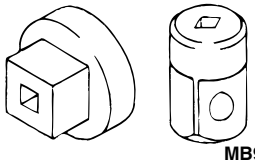
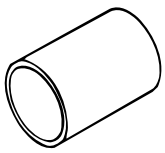
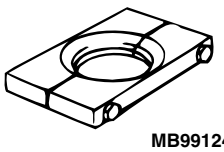
STEP 2. Retest the system.

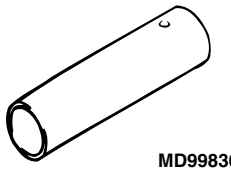
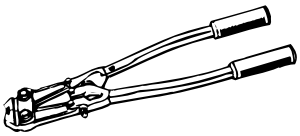
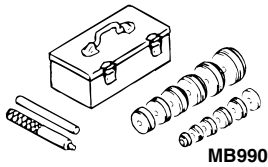
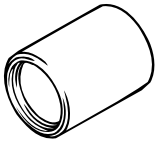
Q: Is the abnormal noise eliminated?
YES : The procedure is complete.
NO : Repeat from Step 1.

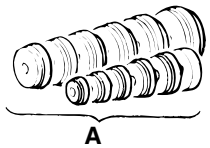
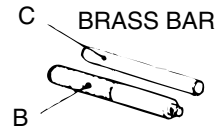
SPECIAL TOOLS

M1261000600977

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B990767	MB990767 Front hub and flange yoke holder	MB990767-01	Fixing of the hub
 MB991618	MB991618 Hub bolt remover	General service tool	Removal of the hub bolt
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or General service tool	Knuckle and tie rod end ball joint disconnection *NOTE: Steering linkage puller (MB990635 or MB991113)is also used to disconnect knuckle and tie rod end ball joint.*
 MB990241AB	MB990241 Axle shaft puller A: MB990242 Puller shaft B: MB990244 Puller bar	MB990241-01 or General service tool	Removal of the driveshaft
 MB991354	MB991354 Puller body	General service tool	

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB990590 Rear axle shaft oil seal remover A: MB990212 Adapter B: MB990211 Slide hammer	MB990211-01	Removal of the front wheel hub
	A: MB991017 B: MB990998 C: MB991000 A, B: Front hub remover and installer C: Spacer	MB990998-01	• Removal of the hub • Provisional holding of the wheel bearing • Measurement of hub starting torque • Measurement of wheel bearing end play *NOTE: MB991000, which belongs to MB990998, should be used as a spacer.*
	MB990685 Torque wrench	General service tool	Measurement of hub starting torque
	MB990326 Preload socket	General service tool	
	MB990810 Side bearing puller	General service tool	• Removal of the center bearing bracket • Removal of the wheel bearing inner race (outside)
	MB991172 Inner shaft installer base	–	Press-fitting of the inner shaft
	MB991248 Inner shaft remover	MD998348-01 or General service tool	Removal of the inner shaft

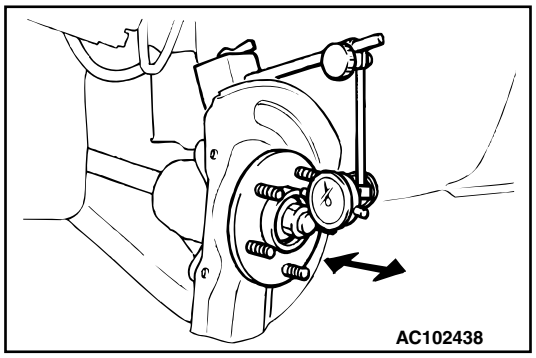
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MD998369	MD998369 Bearing installer	–	Installation of the seal plate
 MB991561	MB991561 Boot band crimping tool	MB991561	BJ boot (resin boot) band installation
 MB990925	MB990925 Bearing and oil seal installer set	MB990925-01 or General service tool	• Removal and installation of the center bearing • Press-fitting of the dust seal outer, inner
 MB990890	MB990890 Rear suspension bushing base	MB990890-01	Press-fitting of the dust seal outer, inner

TOOL	TYPE	TOOL NUMBER	O D mm (in)
MB990925  A INSTALLER ADAPTER  C BRASS BAR B BAR (SNAP-IN TYPE)  TOOL BOX ACX02372AC	A	MB990926	39.0 (1.54)
		MB990927	45.0 (1.77)
		MB990928	49.5 (1.95)
		MB990929	51.0 (2.00)
		MB990930	54.0 (2.13)
		MB990931	57.0 (2.24)
		MB990932	61.0 (2.40)
		MB990933	63.5 (2.50)
		MB990934	67.5 (2.66)
		MB990935	71.5 (2.81)
		MB990936	75.5 (2.97)
		MB990937	79.0 (3.11)
	B	MB990938	–
	C	MB990939	–

ON-VEHICLE SERVICE

WHEEL BEARING END PLAY CHECK

M1261000900246



1. Remove the caliper assembly and suspend it with a wire.
2. Remove the brake disc from the front hub.
3. Attach a dial gauge as shown in the illustration, and then measure the end play while moving the hub in the axial direction.

   Limit: 0.05 mm (0.002 inch)
4. If end play exceeds the limit, disassemble the front hub assembly and check the parts.
5. Install the brake disc, caliper assembly and tighten the caliper assembly mounting bolts to the specified torque.

   Tightening torque: 100 ± 10 N·m (74 ± 7 ft-lb)

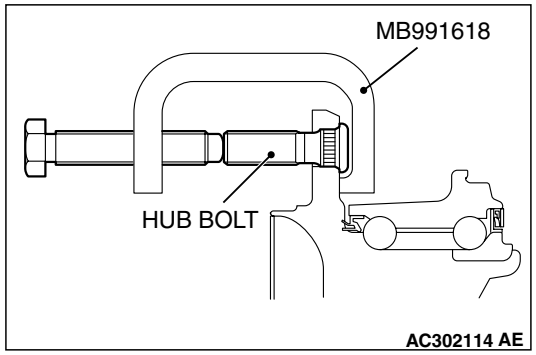
HUB BOLT REPLACEMENT

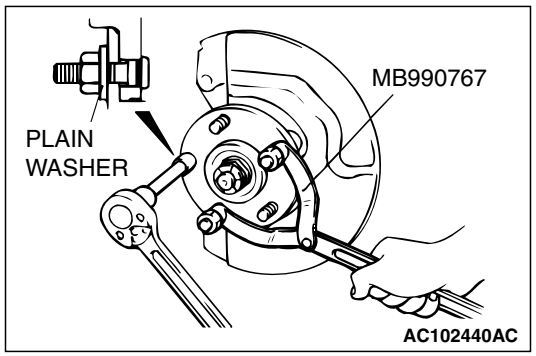
M1261001000310

Required Special Tools:

- MB990767: Front Hub and Flange Yoke Holder
- MB991618: Hub Bolt Remover

1. Remove the caliper assembly and suspend it with wire so that it does not fall.
2. Remove the brake disc.
3. Use special tool MB991618 to remove the hub bolts.





4. Install the plain washer to the new hub bolt, and install the bolt with a nut while holding the hub with special tool MB990767.
5. Install the brake disc, caliper assembly and tighten the caliper assembly mounting bolts to the specified torque.

   Tightening torque: 100 ± 10 N·m (74 ± 7 ft-lb)

FRONT AXLE HUB ASSEMBLY

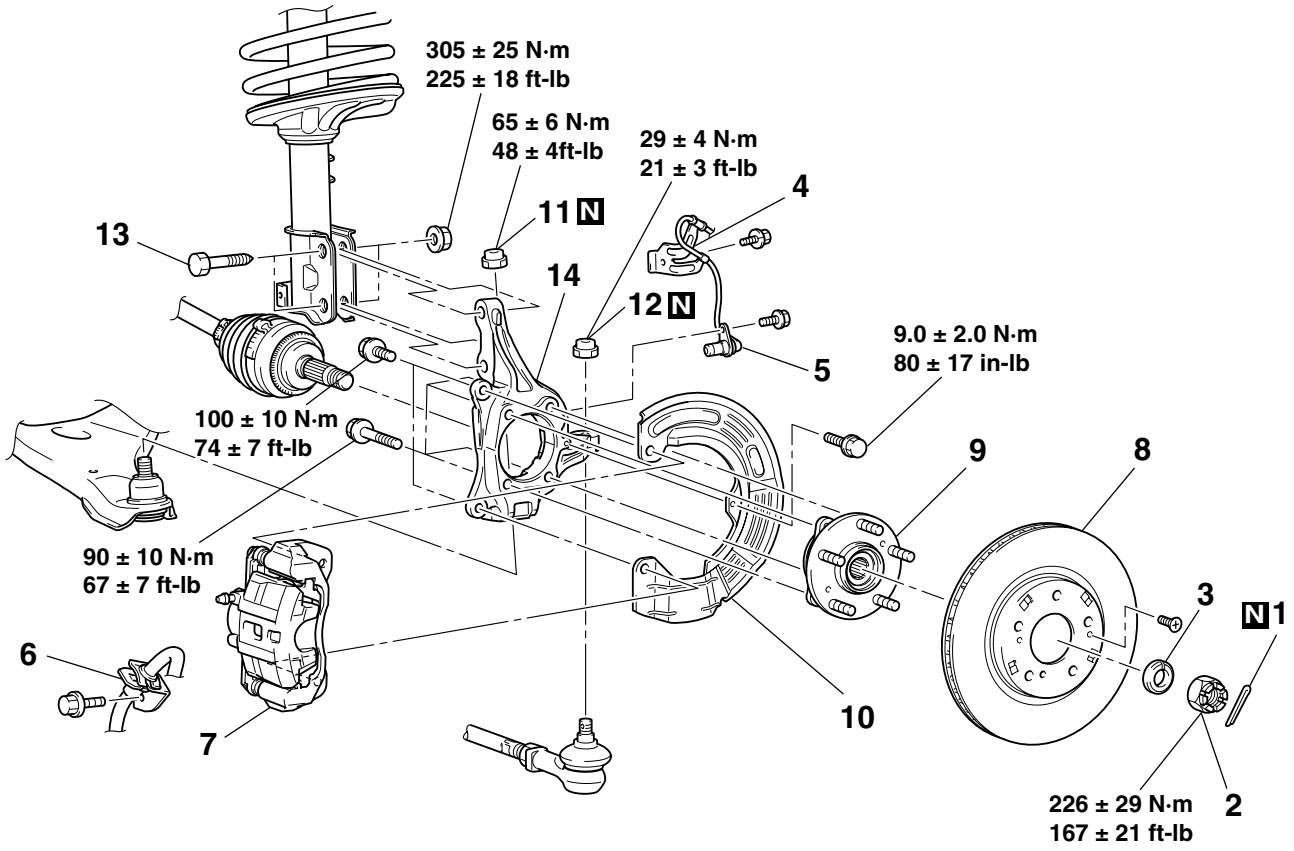
REMOVAL AND INSTALLATION

M1261001701044

⚠ CAUTION

- **For vehicles with ABS, do not strike the ABS rotors installed to the BJ or EBJ outer race of driveshaft against other parts when removing or installing the driveshaft. Otherwise the ABS rotors will be damaged.**
- **For vehicles with ABS, be careful not to strike the pole piece at the tip of the front wheel speed sensor with tools during servicing work.**

Post-installation Operation
Check the dust cover for cracks or damage by pushing it with your finger.



AC305336 AC

REMOVAL STEPS

1. SPLIT PIN
<<A>> >>A<< 2. DRIVESHAFT NUT
>>A<< 3. WASHER
4. FRONT WHEEL SPEED SENSOR BRACKET <VEHICLES WITH ABS>
5. FRONT WHEEL SPEED SENSOR <VEHICLES WITH ABS>
6. BRAKE HOSE BRACKET
<<B>> 7. CALIPER ASSEMBLY
<<C>> 8. BRAKE DISC

REMOVAL STEPS (Continued)

<<E>> 9. FRONT WHEEL HUB ASSEMBLY
10. DUST COVER
<<D>> 11. SELF LOCKING NUT (CONNECTION FOR LOWER ARM BALL JOINT)
<<D>> 12. SELF LOCKING NUT (CONNECTION FOR TIE ROD END)
13. FRONT STRUT TO KNUCKLE MOUNTING BOLT AND NUT
14. KNUCKLE

Required Special Tools:

- MB990211: Slide Hammer
- MB990242: Puller Shaft
- MB990244: Puller Bar

TSB Revision

- MB990767: Front Hub and Flange Yoke Holder
- MB991354: Puller Body
- MB991897:Ball Joint Remover

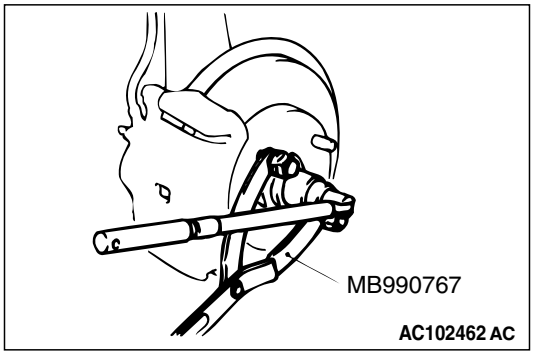
REMOVAL SERVICE POINTS

<<A>> DRIVESHAFT NUT REMOVAL

⚠ CAUTION

Do not apply pressure to wheel bearing by the vehicle weight to avoid possible damage when driveshaft nut is loosened.

Use special tool MB990767 to fix the hub and remove the driveshaft nut.

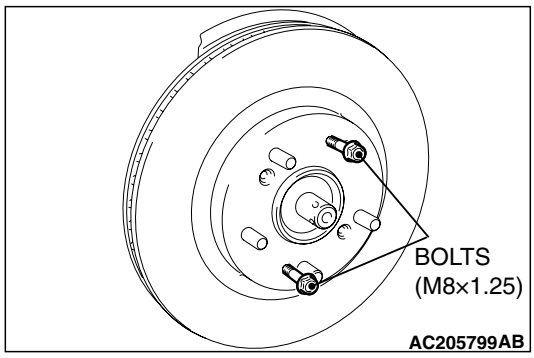


<<B>> CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with wire, etc.

<<C>> BRAKE DISC REMOVAL

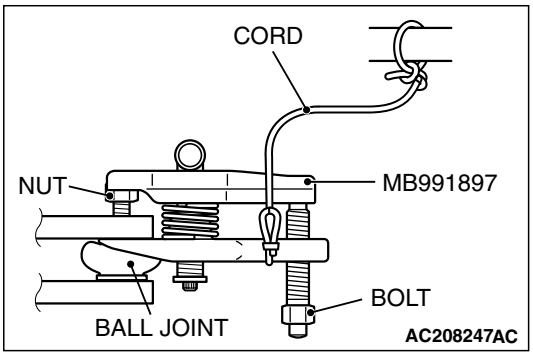
If the brake disc is seized, install a M8 x 1.25 bolts as shown, and remove the disc by tightening the bolts evenly and gradually.



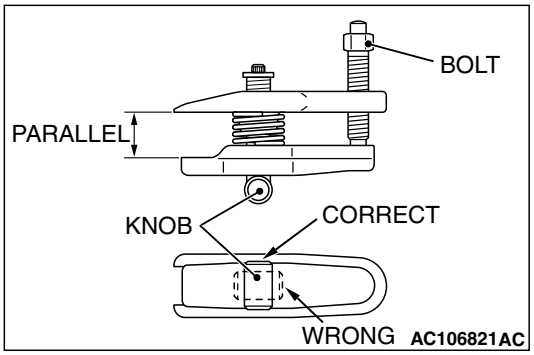
<<D>> SELF LOCKING NUT (CONNECTION FOR LOWER ARM BALL JOINT AND TIE ROD END) REMOVAL

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use the special tool to avoid possible damage to ball joint threads.**
- **Hang the special tool with cord to prevent it from falling.**



1. Replace the self locking nut for lower arm ball joint with a regular nut, because the original one is a little bit large to install the special tool. Install special tool MB991897 as shown in the figure.

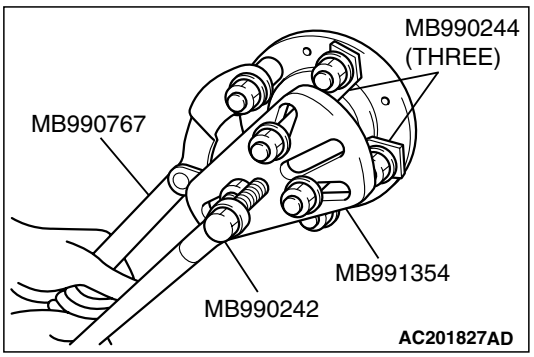


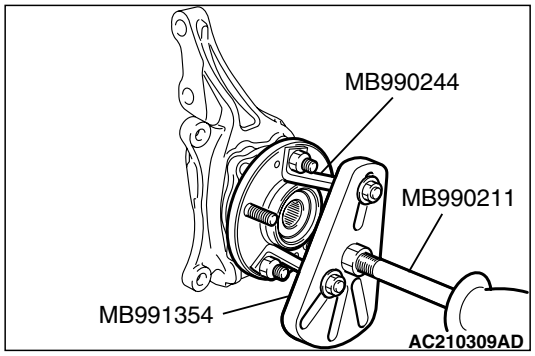
2. Turn the bolt and knob as necessary to make the jaws of special tool parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.
3. Tighten the bolt with a wrench to disconnect the lower arm ball joint, tie rod end and remove the self locking nut.

<<E>> FRONT WHEEL HUB ASSEMBLY REMOVAL

1. Remove the front wheel hub mounting bolts while pushing out the driveshaft by hand.
2. If it is difficult to push out the driveshaft by hand, use special tools MB990242, MB990244, MB991354 and MB990767 to push out the driveshaft from the hub and knuckle.
3. If the front wheel hub is seized, remove the knuckle together with front wheel hub and fix them with a vise.
4. Hang the driveshaft on the vehicle body with a rope.





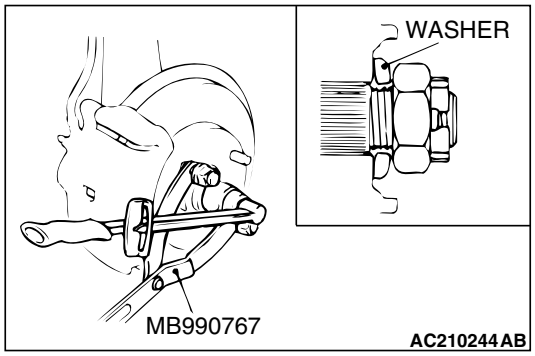
5. Use special tools MB990244, MB991354 and MB990211 to pull out the front wheel hub from the knuckle.

INSTALLATION SERVICE POINT

>>A<<WASHER/ DRIVESHAFT NUT INSTALLATION

⚠ CAUTION

Before securely tightening the driveshaft nuts, make sure there is no load on the wheel bearings. Otherwise the wheel bearings will be damaged.



1. Be sure to install the driveshaft washer in the specified direction.
2. Using special tool MB990767, tighten the driveshaft nut to the specified torque.

   Tightening torque: 226 ± 29 N·m (167 ± 21 ft-lb)

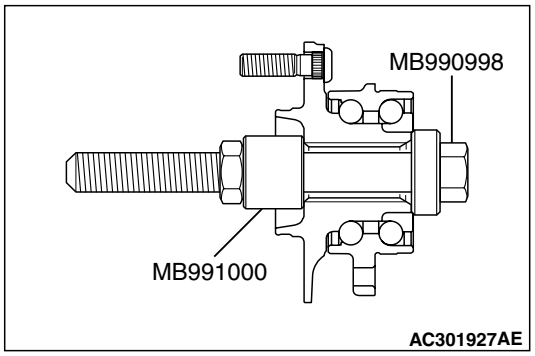
INSPECTION

M1261001800264

WHEEL BEARING ROTATION STARTING TORQUE AND END PLAY CHECK

Required Special Tools:

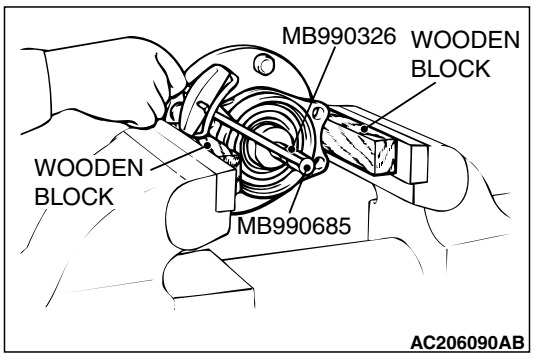
- MB990998: Front Hub Remover and Installer
- MB991000: Spacer
- MB990326: Preload Socket
- MB990685: Torque Wrench



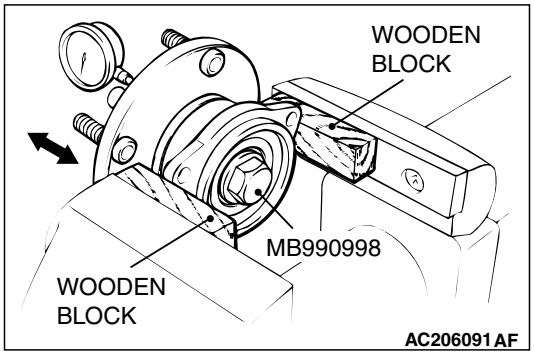
1. Install special tools MB991000, MB990998 and tighten them to the specified torque.

   Tightening torque: 226 ± 29 N·m (167 ± 21 ft-lb)

2. Hold front wheel hub assembly in a vice, using wooden blocks.
3. Rotate the hub in order to seat the bearing.



4. Measure the wheel bearing rotation starting torque by using the special tools MB990326 and MB990685.
   Limit: 1.4 N·m (12 in-lb)
5. If the rotation starting torque is not within the limit when the nut is tightened to 226 ± 29 N·m (167 ± 21 ft-lb), replace the front wheel bearing assembly. If there is any signs of binding or tight spots when the wheel bearing turns, replace it.



6. Measure to determine whether the wheel bearing end play is within the specified limit or not.
   Limit: 0.05 mm (0.002 inch)
7. If the play exceeds the limit when the nut is tightened to 226 ± 29 N·m (167 ± 21 ft-lb), replace the front wheel hub assembly.

DRIVESHAFT ASSEMBLY

REMOVAL AND INSTALLATION

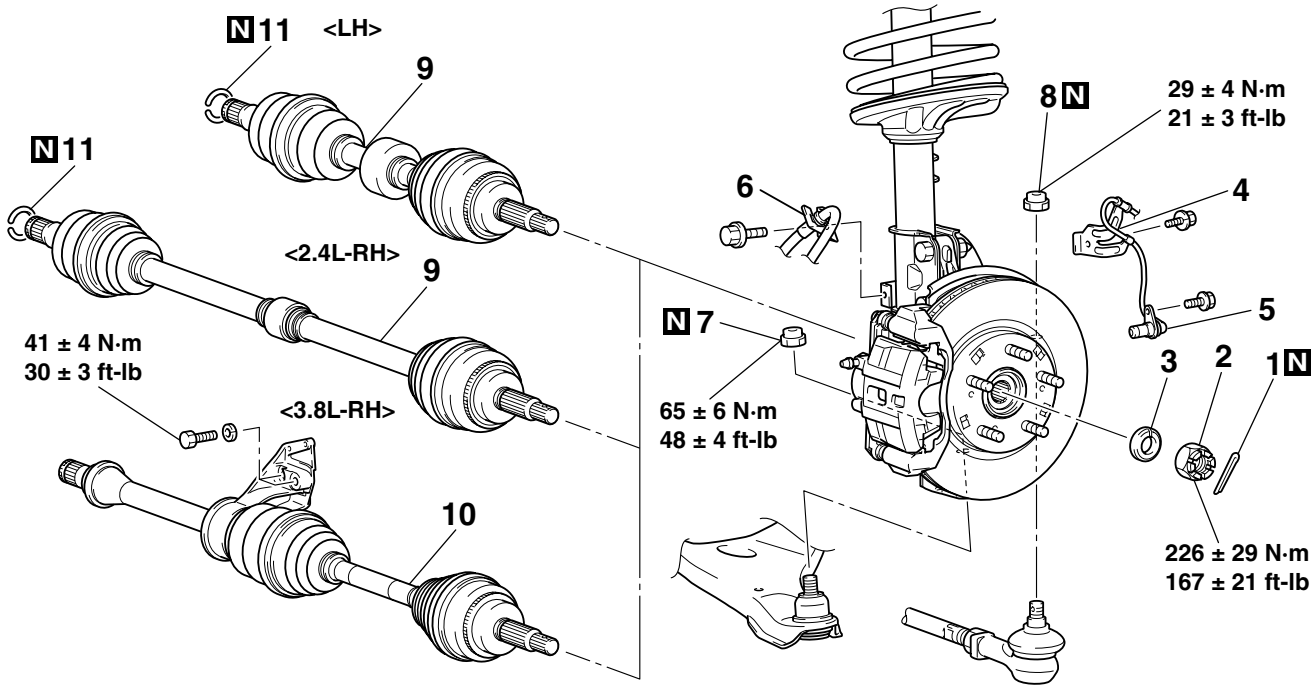
M1261003501068

⚠ CAUTION

- **For vehicles with ABS, do not strike the ABS rotors installed to the BJ or EBJ outer race of driveshaft against other parts when removing or installing the driveshaft. Otherwise the ABS rotors will be damaged.**
- **For vehicles with ABS, be careful not to strike the pole piece at the tip of the front wheel speed sensor with tools during servicing work.**

Pre-installation Operation	Post-installation Operation
• Front Under Cover, Side Under Cover Removal (Refer to GROUP 51, Under Cover P.51-12). • Transmission Fluid Draining (Refer to GROUP 23A, On-vehicle Service – Transmission Fluid Change P.23A-367). • Front Exhaust Pipe Removal <3.8L-RH side> (Refer to GROUP 15, Exhaust Pipe and Muffler P.15-32).	• Front Exhaust Pipe Installation <3.8L-RH side> (Refer to GROUP 15, Exhaust Pipe and Muffler P.15-32). • Check the ball joint dust cover for cracks or damage by pushing it with your finger. • Transmission Fluid Filling (Refer to GROUP 23A, On-vehicle Service – Transmission Fluid Change P.23A-367). • Front Under Cover, Side Under Cover Installation (Refer to GROUP 51, Under Cover P.51-12).

TSB Revision



AC401226AB

REMOVAL STEPS

<<**A**>> >>**B**<< 1. SPLIT PIN
<<**A**>> >>**B**<< 2. DRIVESHAFT NUT
3. WASHER
4. FRONT WHEEL SPEED SENSOR BRACKET <VEHICLES WITH ABS>
5. FRONT WHEEL SPEED SENSOR <VEHICLES WITH ABS>
6. BRAKE HOSE BRACKET

REMOVAL STEPS (Continued)

<<**B**>> 7. SELF LOCKING NUT (LOWER ARM BALL JOINT CONNECTION)
<<**B**>> 8. SELF LOCKING NUT (TIE ROD END CONNECTION)
<<**C**>> >>**A**<< 9. DRIVESHAFT
<<**C**>> >>**A**<< 10. DRIVESHAFT AND INNER SHAFT ASSEMBLY<3.8L-RH>
11. CIRCLIP

Required Special Tools:

- MB990242: Puller Shaft Puller
- MB990244: Puller Bar
- MB990767: Front Hub and Flange Yoke Holder
- MB990998: Front Hub Remover and Installer
- MB991000: Spacer
- MB991354: Puller Body
- MB991897: Ball Joint Remover

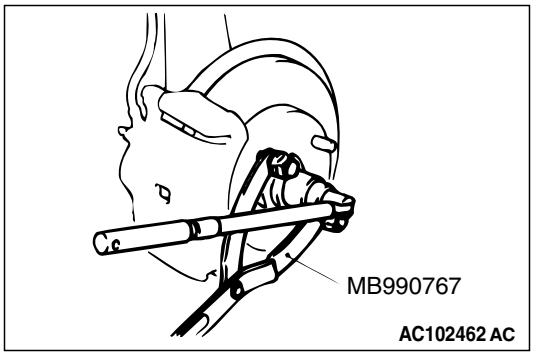
TSB Revision

REMOVAL SERVICE POINTS

<<A>> DRIVESHAFT NUT REMOVAL

⚠ CAUTION

Do not apply pressure to the wheel bearing by the vehicle weight to avoid possible damage when the driveshaft nut is loosened.

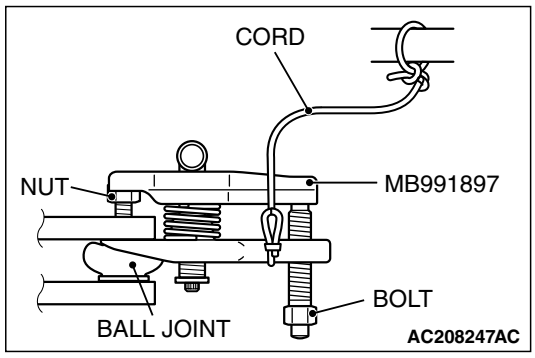


Use special tool MB990767 to fix the hub and remove the driveshaft nut.

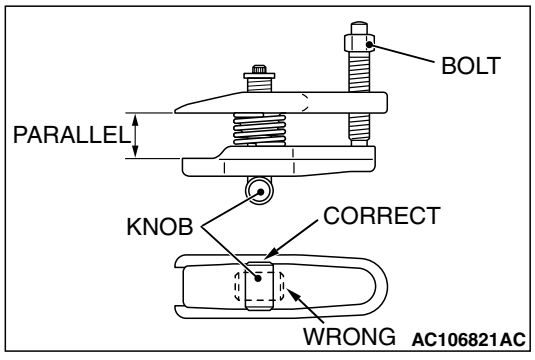
<<B>SELF LOCKING NUT (LOWER ARM BALL JOINT/TIE ROD END CONNECTION) REMOVAL

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use the special tool to avoid possible damage to ball joint threads.**
- **Hang the special tool with cord to prevent it from falling.**



1. Replace the self locking nut with a regular nut, because the original one is a little bit large to install the special tool. Install special tool MB991897 as shown in the figure.

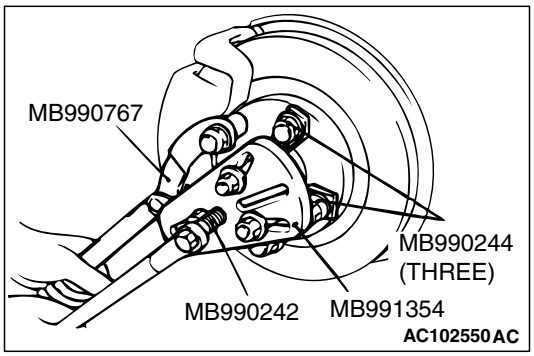


2. Turn the bolt and knob as necessary to make the jaws of special tool MB991897 parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

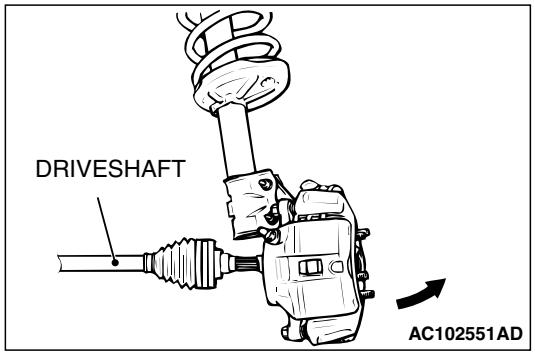
   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the tie rod end and remove the self locking nut.

<<C>> DRIVESHAFT/DRIVESHAFT AND INNER SHAFT ASSEMBLY <3.8L-RH> REMOVAL



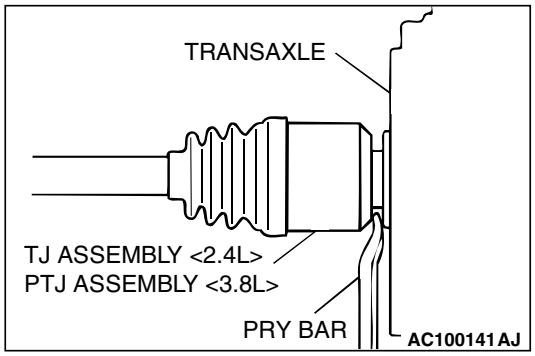
1. Use special tools MB990242, MB990244, MB991354 and MB990767 to push out the driveshaft or the driveshaft and inner shaft assembly from the hub.



2. Remove the driveshaft from the hub by pulling the bottom of the brake disc towards you.

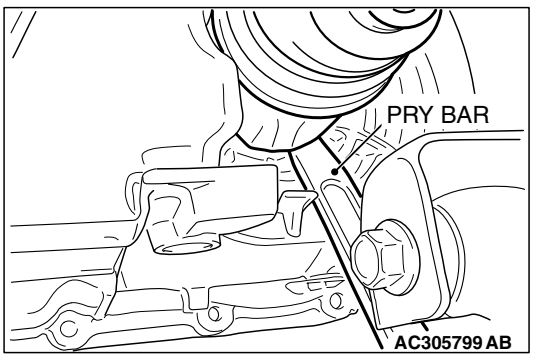
⚠ CAUTION

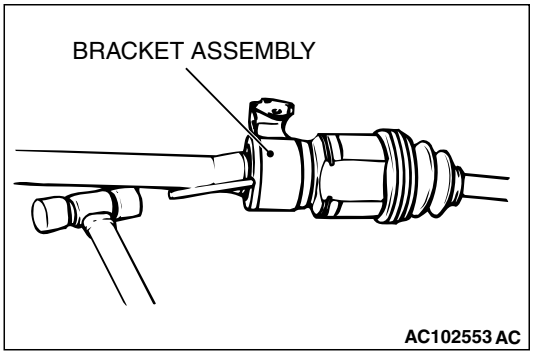
- **Do not pull on the driveshaft; doing so will damage the TJ or PTJ; be sure to use the pry bar.**
- **When pulling the driveshaft out from the transaxle, be careful that the spline part of the driveshaft does not damage the oil seal.**



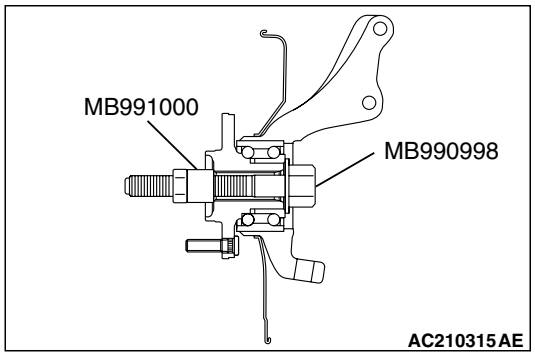
3. Insert a pry bar between the transaxle case and the driveshaft, and then pry and remove the driveshaft from the transaxle.

   NOTE: Insert a pry bar, taking care not to damage the protrusion of transaxle case when removing the driveshaft LH.





4. If the inner shaft is hard to remove from the transaxle, strike the bracket assembly lightly with a plastic hammer and remove the inner shaft.



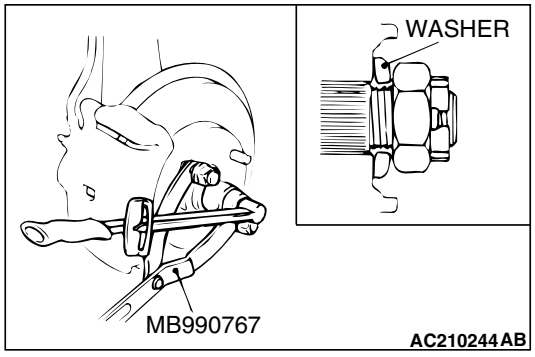
⚠ CAUTION
Do not apply pressure to the wheel bearing by the vehicle weight to avoid possible damage when the driveshaft is removed. If, however, vehicle weight must be applied to the bearing to move the vehicle, temporarily secure the wheel bearing by using special tools MB991000 and MB990998.

INSTALLATION SERVICE POINTS

>>A<< DRIVESHAFT AND INNER SHAFT ASSEMBLY <3.8L-RH>/DRIVESHAFT INSTALLATION

⚠ CAUTION
When installing the driveshaft or the driveshaft and inner shaft assembly, be careful that the spline part of the driveshaft or the driveshaft and inner shaft assembly do not damage the oil seal.

>>B<< DRIVESHAFT NUT INSTALLATION



1. Be sure to install the driveshaft washer in the specified direction.

⚠ CAUTION
Before securely tightening the driveshaft nuts, make sure there is no load on the wheel bearings. Otherwise the wheel bearing will be damaged.

2. Using special tool MB990767, tighten the driveshaft nut to the specified torque.

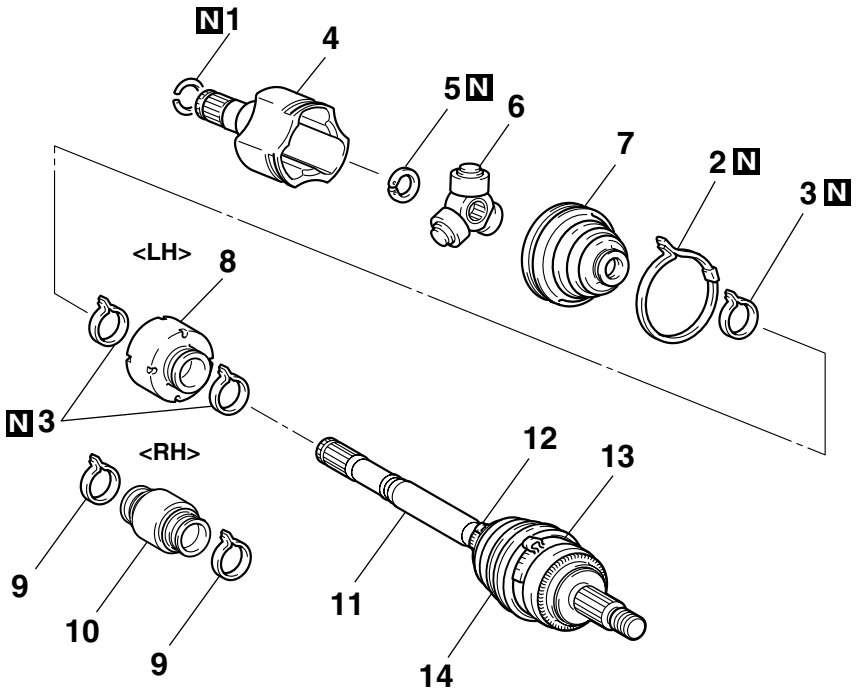
Tightening torque: 226 ± 29 N·m (167 ± 21 ft-lb)

DISASSEMBLY AND ASSEMBLY <2.4L>

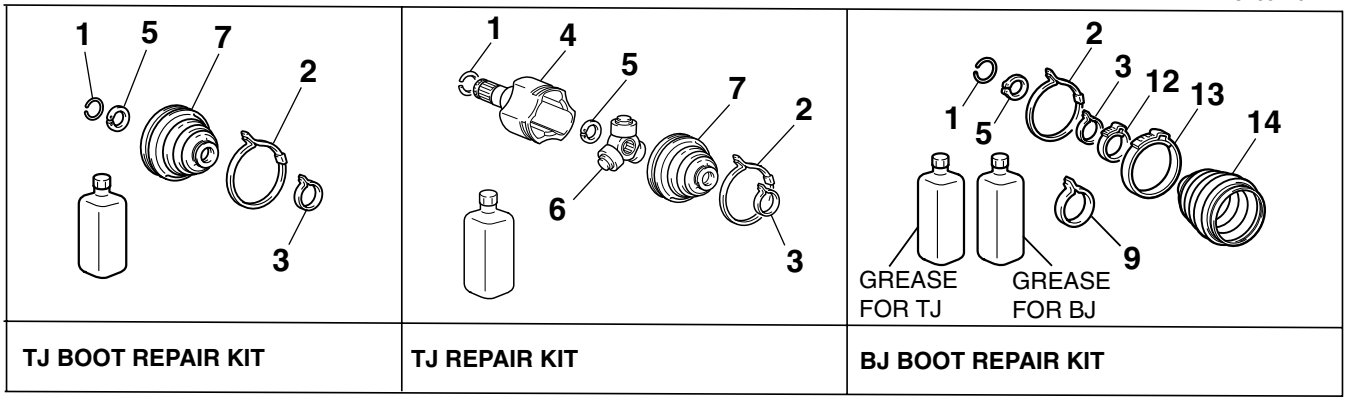
M1261003701266

⚠ CAUTION

- **For vehicles with ABS, be careful not to damage the ABS rotor, which is attached to the BJ outer race during disassembly and reassembly.**
- **Never disassemble the BJ assembly except when replacing the BJ boot.**



AC405415 AB



TJ BOOT REPAIR KIT	TJ REPAIR KIT	BJ BOOT REPAIR KIT

DISASSEMBLY STEPS

		1.	CIRCLIP
	>>D<<	2.	TJ BOOT BAND (LARGE)
	>>D<<	3.	TJ BOOT BAND (SMALL)
<<A>>	>>C<<	4.	TJ CASE
		5.	SNAP RING
<<A>>	>>B<<	6.	SPIDER ASSEMBLY
<<B>>	>>A<<	7.	TJ BOOT
	>>A<<	8.	DYNAMIC DAMPER <LH>
	>>A<<	9.	DAMPER BAND <RH>

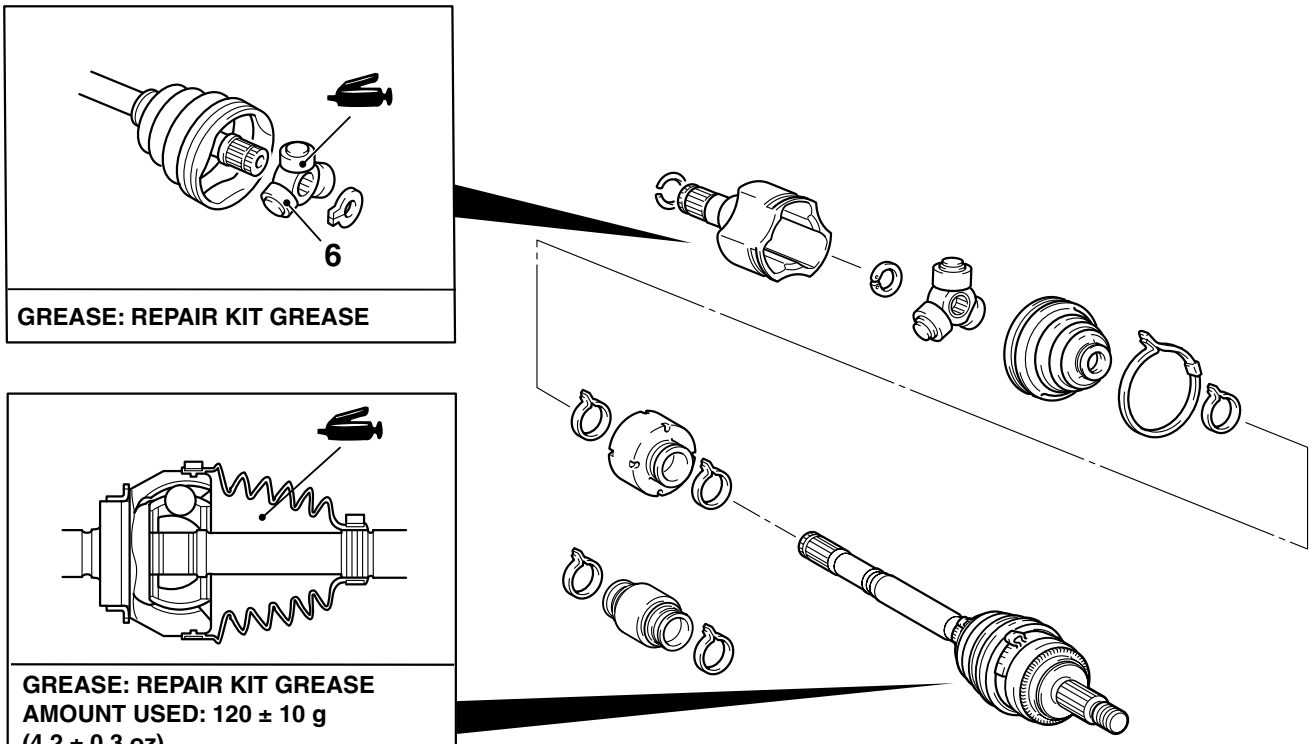
DISASSEMBLY STEPS

>>A<<	10.	DYNAMIC DAMPER <RH>
	11.	BJ ASSEMBLY
	12.	BJ BOOT BAND (SMALL)
	13.	BJ BOOT BAND (LARGE)
	14.	BJ BOOT

NOTE:
For BJ boot removal and installation, refer to P.26-30.

TSB Revision

LUBRICATION POINTS



AC405441AC

DISASSEMBLY SERVICE POINTS

<<A>> TJ CASE/SPIDER ASSEMBLY REMOVAL

⚠ CAUTION

Do not disassemble the spider assembly.

1. Wipe off grease from the spider assembly and the inside of the TJ case.
2. Clean the spider assembly if water or foreign material is observed.

<<B>> TJ BOOT REMOVAL

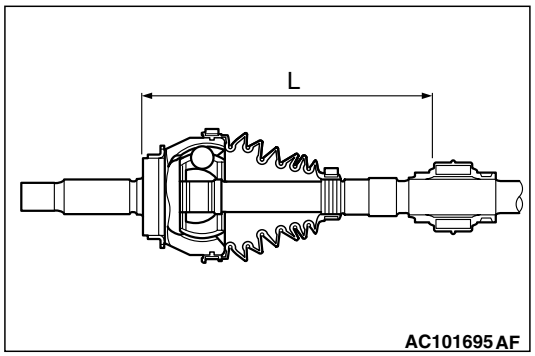
1. Wipe off grease from the shaft spline.
2. When reusing the TJ boot, wrap plastic tape around the shaft spline to avoid damaging the boot.

ASSEMBLY SERVICE POINTS

>>A<< DYNAMIC DAMPER <LH/RH>/DAMPER BAND <RH>/TJ BOOT INSTALLATION

⚠ CAUTION

There should be no grease adhered to the rubber part of the dynamic damper.



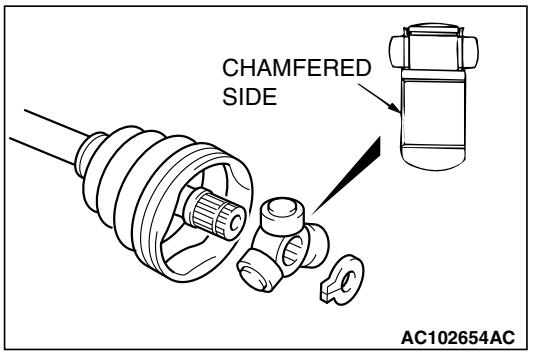
1. Install the dynamic damper in the position (L) shown in the illustration.
   L: 260 ± 3 mm (10.2 ± 0.12 inches) <LH>
   L: 406 ± 3 mm (16.0 ± 0.12 inches) <RH>
2. Secure the damper bands.
3. Wrap plastic tape around the shaft spline, and then install the TJ boot band (small) and TJ boot.

>>B<< SPIDER ASSEMBLY INSTALLATION

⚠ CAUTION

- **The driveshaft joint use special grease. Do not mix old and new or different types of grease.**
- **If the spider assembly has been cleaned, take special care to apply the specified grease.**

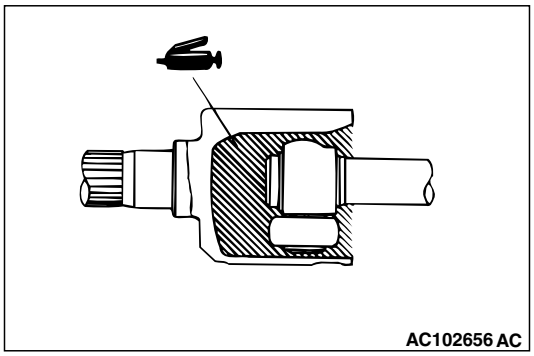
1. Apply the specified grease furnished in the repair kit to the spider assembly between the spider axle and the roller.
   Specified grease: Repair kit grease
2. Install the spider assembly to the shaft from the direction of the spline chamfered side.



>>C<< TJ CASE INSTALLATION

⚠ CAUTION

The driveshaft joint use special grease. Do not mix old and new or different types of grease.

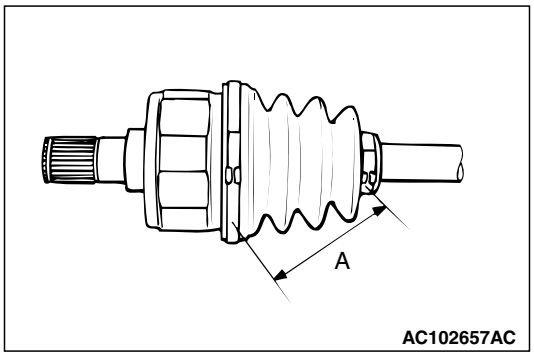


After applying the specified grease to the TJ case or PTJ case, insert the driveshaft and apply grease again.

Specified grease: Repair kit grease
Amount to use <LH>: 140 ± 10 g (4.9 ± 0.3 ounces)
Amount to use <RH>: 130 ± 10 g (4.6 ± 0.3 ounces)

NOTE: The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

>>D<< TJ BOOT BAND (SMALL) /TJ BOOT BAND (LARGE) INSTALLATION



Set the TJ boot bands at the specified distance in order to adjust the amount of air inside the TJ boot, and then tighten the TJ boot band (small), TJ boot band (large) securely.

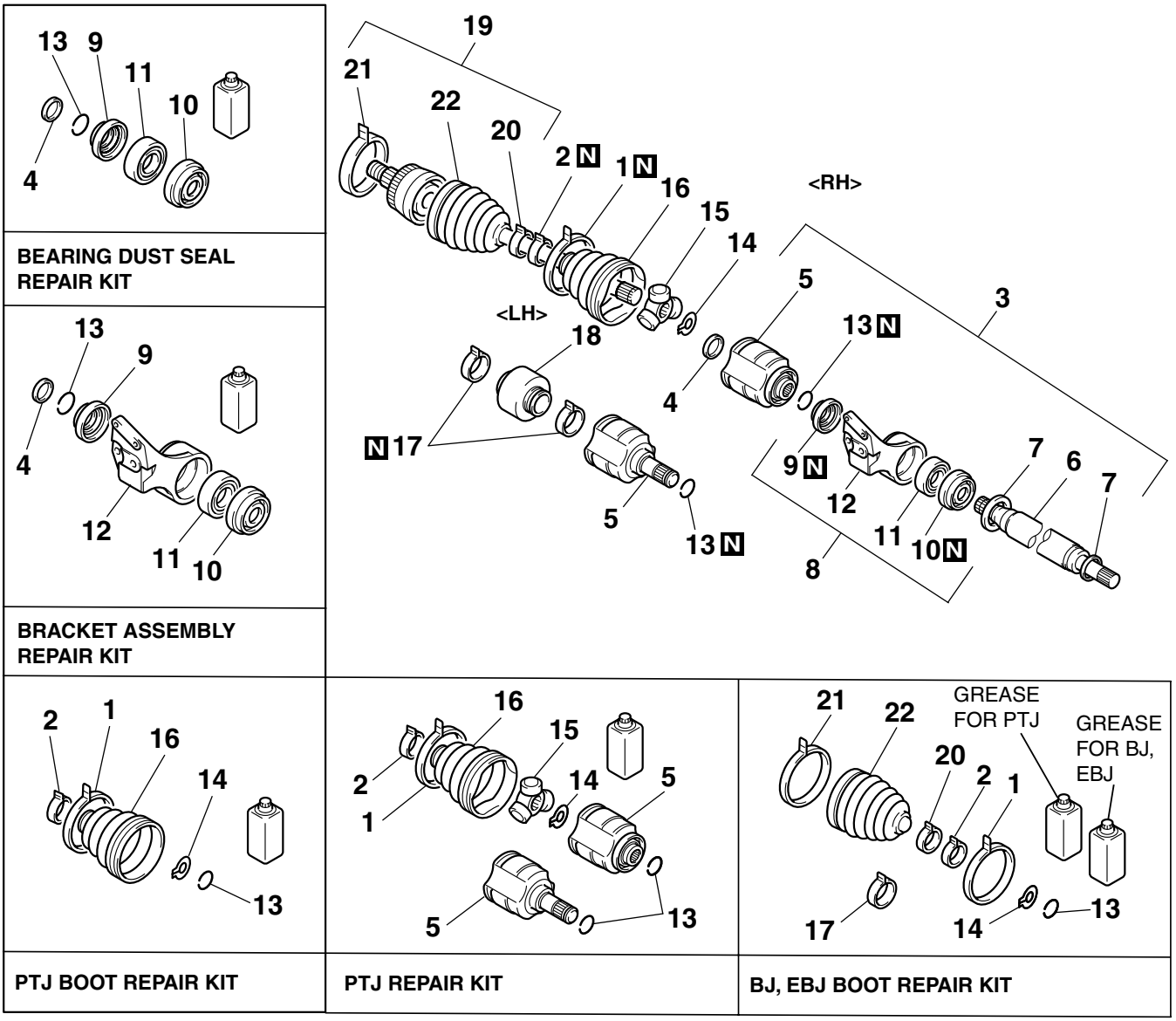
Standard value (A): 85 ± 3 mm (3.35 ± 0.12 inches)

DISASSEMBLY AND ASSEMBLY <3.8L>

M1261003701277

⚠ CAUTION

- **Be careful not to damage the ABS rotor, which is attached to the BJ or EBJ outer race during disassembly and reassembly.**
- **Never disassemble the BJ or EBJ assembly except when replacing the BJ or EBJ boot.**



AC405627AC

			DISASSEMBLY STEPS
	>>H<<	1.	PTJ BOOT BAND (LARGE)
	>>H<<	2.	PTJ BOOT BAND (SMALL)
	>>F<<	3.	PTJ CASE AND INNER SHAFT ASSEMBLY
<<A>>	>>F<<	4.	SEAL PLATE
<<B>>	>>G<<	5.	PTJ CASE
<<C>>	>>E<<	6.	INNER SHAFT
		7.	DUST COVER
		8.	BRACKET ASSEMBLY
	>>D<<	9.	DUST SEAL OUTER
	>>D<<	10.	DUST SEAL INNER
<<D>>	>>C<<	11.	CENTER BEARING
		12.	CENTER BEARING BRACKET
		13.	CIRCLIP
		14.	SNAP RING
<<B>>	>>B<<	15.	SPIDER ASSEMBLY
<<E>>	>>A<<	16.	PTJ BOOT
	>>A<<	17.	DAMPER BAND
	>>A<<	18.	DYNAMIC DAMPER
		19.	BJ ASSEMBLY <EXCEPT MIVEC>, EBJ ASSEMBLY <MIVEC>

TSB Revision

DISASSEMBLY STEPS

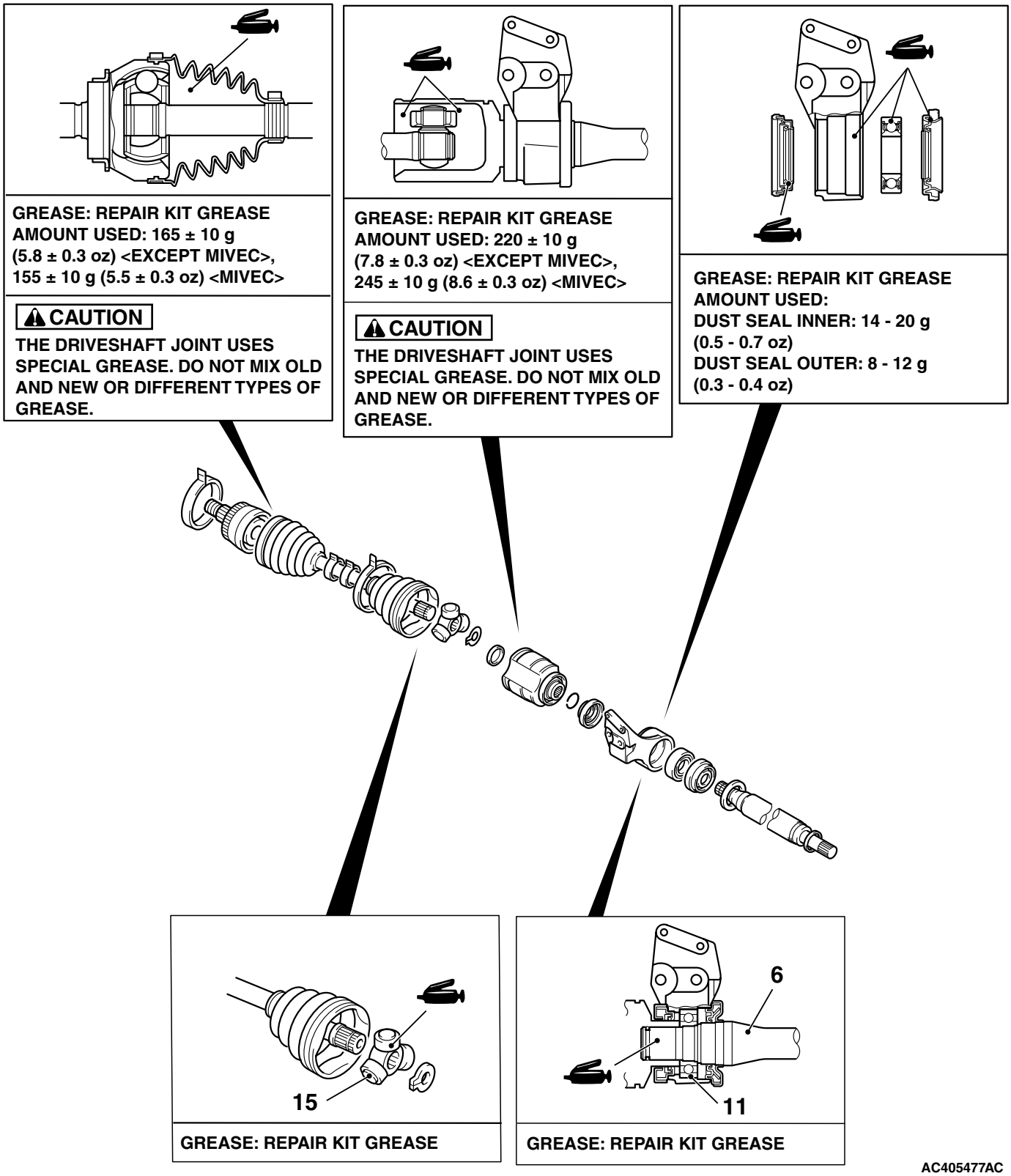
20. BJ BOOT BAND (SMALL) <EXCEPT MIVEC>, EBJ BOOT BAND (SMALL) <MIVEC>
21. BJ BOOT BAND (LARGE) <EXCEPT MIVEC>, EBJ BOOT BAND (LARGE) <MIVEC>
22. BJ BOOT <EXCEPT MIVEC>, EBJ BOOT <MIVEC>

NOTE:
For BJ/EBJ boot removal and installation, refer to *P.26-30**.*

Required Special Tools:

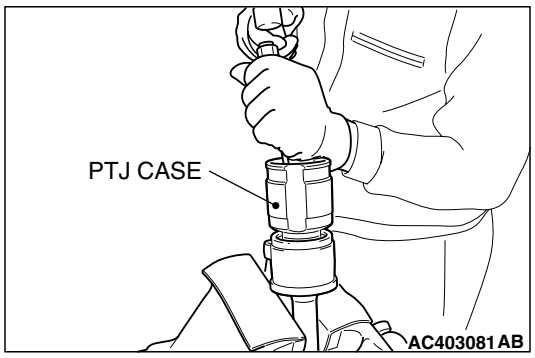
- MB990810: Side Bearing Puller
- MB990890: Rear Suspension Bushing Base
- MB990930: Installer Adapter
- MB990932: Installer Adapter
- MB990934: Installer Adapter
- MB990938: Bar (snap-in type)
- MB991172: Inner Shaft Installer Base
- MB991248: Inner Shaft Remover
- MD998369: Bearing Installer

LUBRICATION POINTS



TSB Revision

DISASSEMBLY SERVICE POINTS



<<A>> SEAL PLATE REMOVAL

Use a slotted screwdriver to make a hole in the seal plate inside the PTJ case, and remove it.

<<B>> PTJ CASE/SPIDER ASSEMBLY REMOVAL

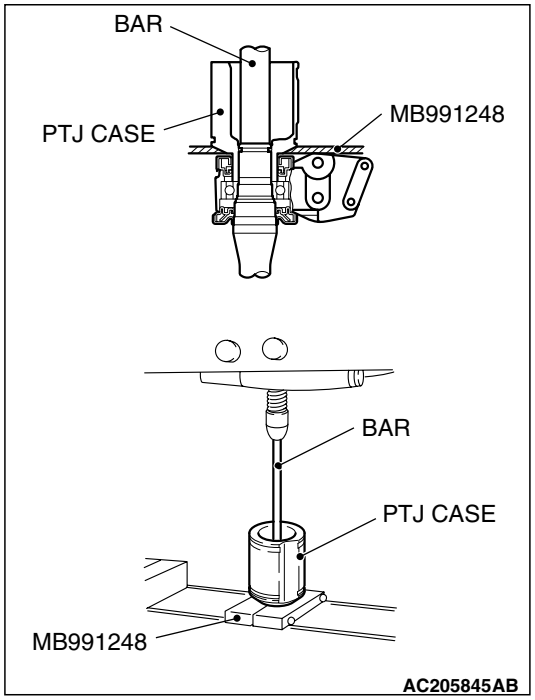
⚠ CAUTION

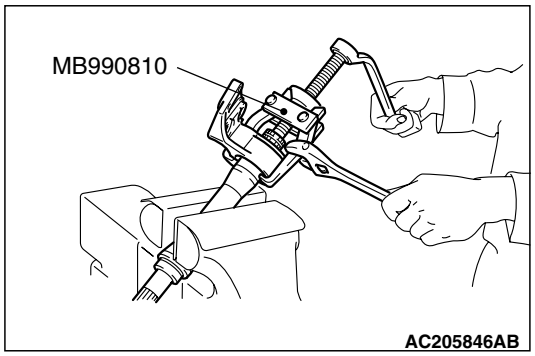
Do not disassemble the spider assembly.

1. Wipe off grease from the spider assembly and the inside of the PTJ case.
2. Clean the spider assembly if water or foreign material is observed.

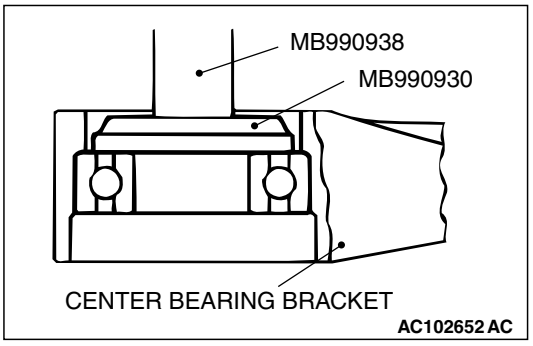
<<C>>INNER SHAFT REMOVAL

1. Use special tool MB991248 to remove the inner shaft assembly from the PTJ case.





2. Use special tool MB990810 to remove the center bearing bracket from the inner shaft.



<<D>>CENTER BEARING REMOVAL

Use special tools MB990938 and MB990930 to remove the center bearing from the center bearing bracket.

<<E>> PTJ BOOT REMOVAL

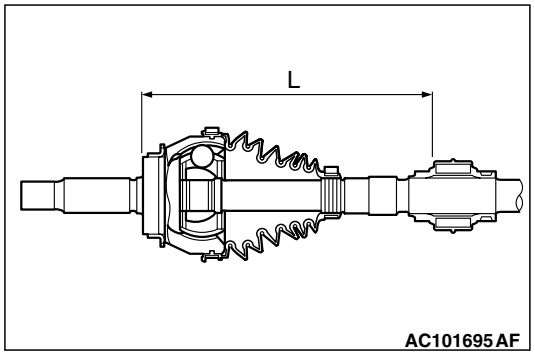
1. Wipe off grease from the shaft spline.
2. When reusing the TJ boot or PTJ boot, wrap plastic tape around the shaft spline to avoid damaging the boot.

ASSEMBLY SERVICE POINTS

>>A<< DYNAMIC DAMPER/DAMPER BAND/PTJ BOOT INSTALLATION

⚠ CAUTION

There should be no grease adhered to the rubber part of the dynamic damper.



1. Install the dynamic damper in the position (L) shown in the illustration.

   L: 260.5 ± 3 mm (10.3 ± 0.12 inches)

2. Secure the damper bands.
3. Wrap plastic tape around the shaft spline, and then install the PTJ boot band (small) and PTJ boot.

>>B<< SPIDER ASSEMBLY INSTALLATION

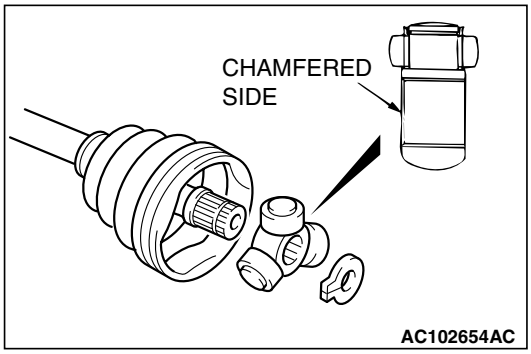
⚠ CAUTION

- **The drive shaft joint use special grease. Do not mix old and new or different types of grease.**
- **If the spider assembly has been cleaned, take special care to apply the specified grease.**

1. Apply the specified grease furnished in the repair kit to the spider assembly between the spider axle and the roller.

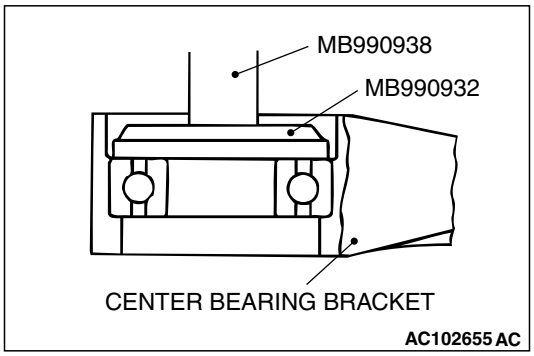
   Specified grease: Repair kit grease

2. Install the spider assembly to the shaft from the direction of the spline chamfered side.



>>C<<CENTER BEARING INSTALLATION

Use special tools MB990938 and MB990932 to press-fit the center bearing into the center bearing bracket.



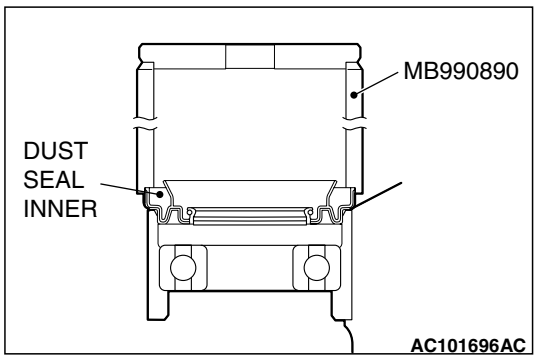
>>D<<DUST SEAL INNER/DUST SEAL OUTER INSTALLATION

⚠ CAUTION

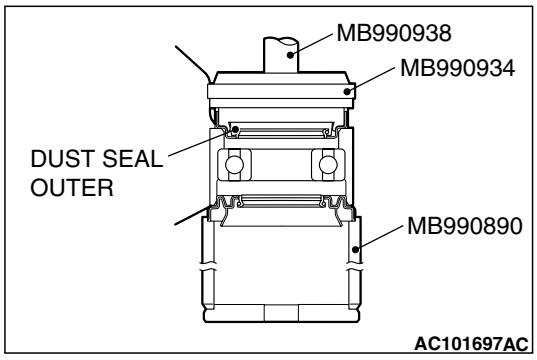
When applying grease, make sure that it does not adhere to anything outside the lip.

1. Apply the specified grease to the rear surface of all dust seals.

   Specified grease: Repair kit grease
   Amount used (Dust seal inner): 14 – 20 g (0.5 – 0.7 ounce)
   Amount used (Dust seal outer): 8 – 12 g (0.3 – 0.4 ounce)

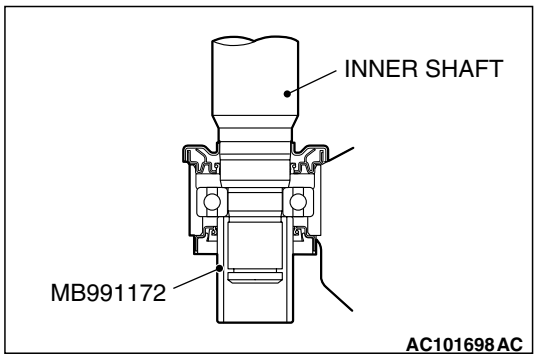


2. Use special tools MB990890, MB990938, and MB990934 to press the dust seals into the center bearing bracket until they are flush with each other.
3. Apply repair kit grease to the lip of each dust seal.



>>E<<INNER SHAFT INSTALLATION

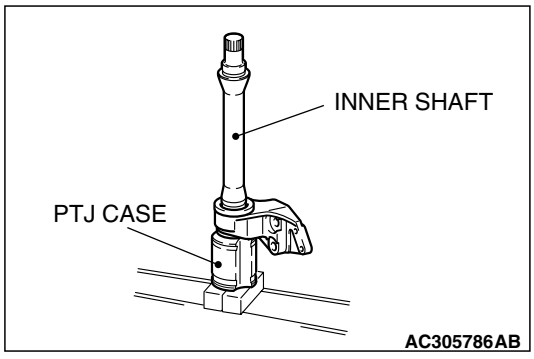
Use special tool MB991172 to hold the center bearing inner race, and then press-in the inner shaft.

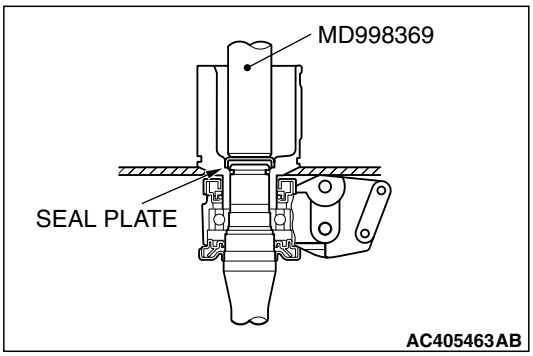


>>F<<SEAL PLATE/PTJ CASE AND INNER SHAFT ASSEMBLY INSTALLATION

1. Apply repair kit grease to the inner shaft spline, then press fit it into the PTJ case.

   NOTE: When press-fitting the inner shaft into the PTJ case, apply a thin coat of repair kit grease to the dust seal outer lip part and the outside edge of the PTJ axial part.





2. Use special tool MD998369 to press in the seal plate.

>>G<< PTJ CASE INSTALLATION

⚠ CAUTION

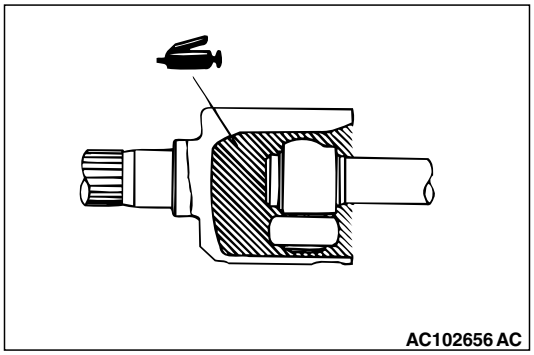
The driveshaft joint uses special grease. Do not mix old and new or different types of grease.

After applying the specified grease to the PTJ case, insert the driveshaft and apply grease again.

Specified grease: Repair kit grease

Amount to use: 245 ± 10 g (8.6 ± 0.3 ounces)

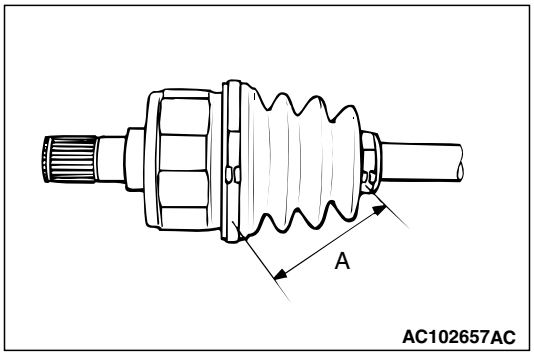
NOTE: The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.



>>H<< PTJ BOOT BAND (SMALL)/PTJ BOOT BAND (LARGE) INSTALLATION

Set the PTJ boot bands at the specified distance in order to adjust the amount of air inside the PTJ boot, and then tighten the PTJ boot band (small), PTJ boot band (large) securely.

Standard value (A): 85 ± 3 mm (3.35 ± 0.12 inches)



INSPECTION

M1261003800163

- Check the driveshaft for damage, bending or corrosion.
- Check the inner shaft for damage, bending or corrosion.
- Check the driveshaft spline part for wear or damage.
- Check the inner shaft spline part for wear or damage.
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside TJ case or PTJ case for wear or corrosion.
- Check the boots for deterioration, damage or cracking.
- Check the center bearing for seizure, discoloration or roughness of rolling surface.

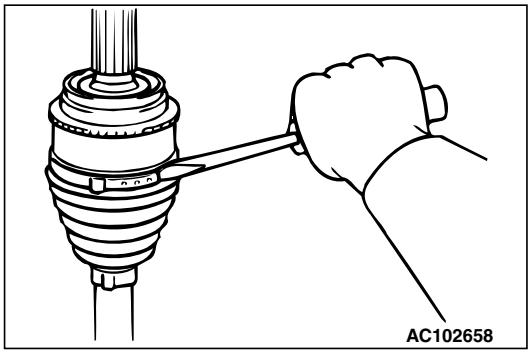
TSB Revision

- Check the dust cover for damage or deterioration.

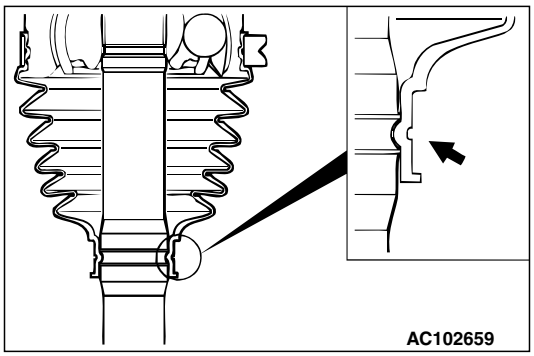
BJ/EBJ BOOT REPLACEMENT

M1261005200640

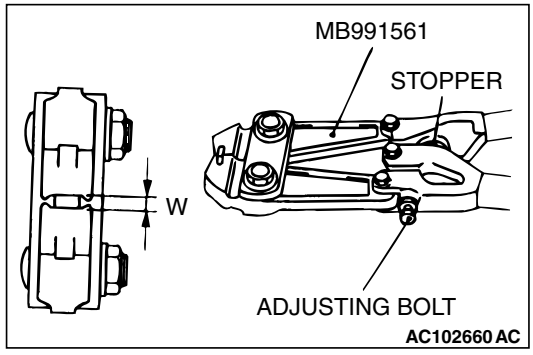
Required Special Tool:
MB991561:Boot Band Crimping Tool



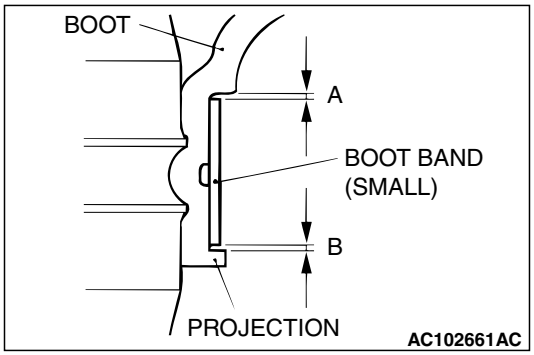
1. Remove the boot bands (large and small).
   NOTE: The boot bands cannot be re-used.
2. Remove the BJ/EBJ boot.
3. Wrap a plastic tape around the shaft spline, and assemble the boot band and BJ/EBJ boot.



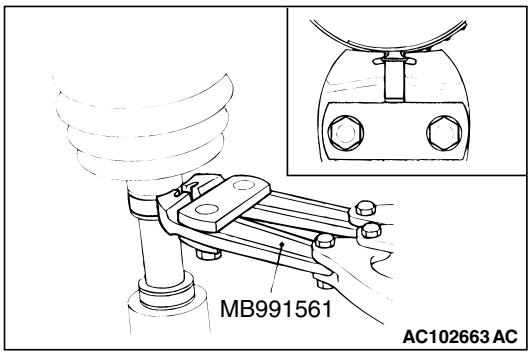
4. Align the center groove on the BJ/EBJ boot small end with the shaft groove.



5. Turn the adjusting bolt on special tool MB991561 so that the size of the opening (W) is at the standard value.
   Standard value (W): 2.9 mm (0.11 inch)
   <If it is larger than 2.9 mm (0.11 inch)> Tighten the adjusting bolt.
   <If it is smaller than 2.9 mm (0.11 inch)> Loosen the adjusting bolt.
   NOTE: The value of W will change by approximately 0.7 mm (0.03 inch) for each turn of the adjusting bolt.
   NOTE: The adjusting bolt should not be turned more than once.



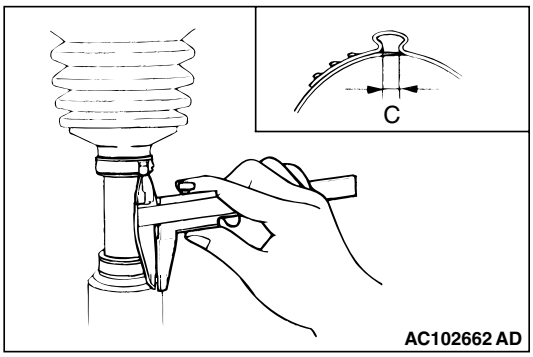
6. Position the BJ/EBJ boot band (small) so that there is even clearance at either end (A and B).



⚠ CAUTION

- **Secure the driveshaft in an upright position and clamp part of the boot band to be crimped securely in the jaws of special tool MB991561.**
- **Crimp the boot band until the special tool touches the stopper.**

7. Use special tool MB991561 to crimp the boot band (small).



8. Check that the crimping amount (C) of the boot band is at the standard value.

   Standard value (D): 2.4 – 2.8 mm (0.09 – 0.11 inch)

   <If the crimping amount is larger than 2.8 mm (0.11 inch)>

   Readjust the value of (W) in step 5 according to the following formula, and then repeat the operation in step 7.

   W = 5.5 mm (0.22 inch) – D

   Example: If D = 2.9 mm (0.11 inch), then W = 2.6 mm (0.10 inch).

   <If the crimping amount is smaller than 2.4 mm (0.09 inch)>

   Remove the BJ/EBJ boot band, readjust the value of (W) in step 5 according to the following formula, and then repeat the operations in steps 6 and 7 using a new BJ/EBJ boot band.

   W = 5.5 mm (0.22 inch) – D

   Example: If D = 2.3 mm (0.09 inch), then W = 3.2 mm (0.13 inch).

9. Check that the boot band does not stick out past the place where it has been installed. If the boot band sticks out, remove it and then repeat steps 6 to 8, using a new boot band.

⚠ CAUTION

The driveshaft joint uses special grease. Do not mix old and new or different types of grease.

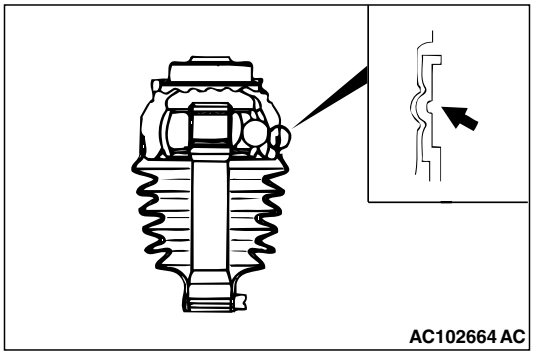
10. Fill the inside of the boot with the specified amount of the specified grease.

    Specified grease: Repair kit grease

    Amount to use (BJ) <2.4L>: 120 ± 10 g (4.2 ± 0.3 ounces)

    Amount to use (BJ) <3.8L (EXCEPT MIVEC)>: 155 ± 10 g (5.5 ± 0.3 ounces)

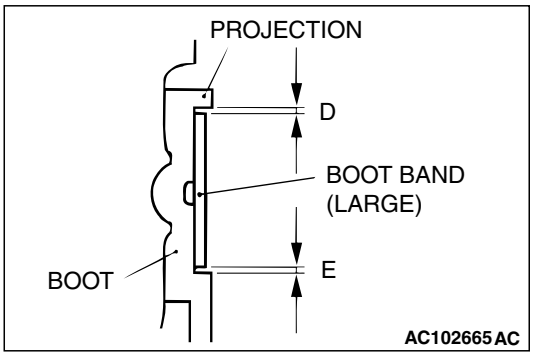
    Amount to use (EBJ) <3.8L (MIVEC)>: 165 ± 10 g (5.8 ± 0.3 ounces)



11. Align the center groove on the BJ/EBJ boot big end with the BJ/EBJ case groove.

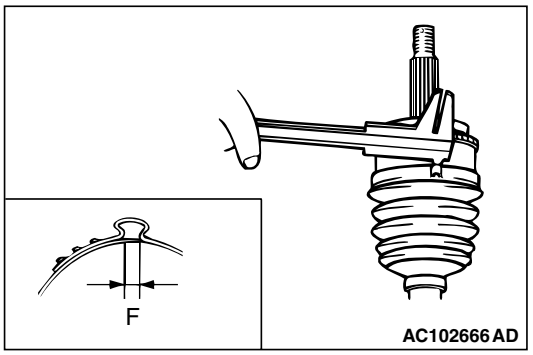
12. Follow the same procedure as in step 5 to adjust the size of the opening (W) on special tool so that it is at the standard value.

Standard value (W): 2.9 mm (0.11 inch)



13. Position the BJ/EBJ boot band (large) so that there is even clearance at either end (D and E).

14. Use special tool to crimp the BJ/EBJ boot band (large) in the same way as in step 7.



15. Check that the crimping amount (F) of the boot band is at the standard value.

Standard value (F): 2.4 – 2.8 mm (0.09 – 0.11 inch)

<If the crimping amount is larger than 2.8 mm (0.11 inch)>

Readjust the value of (W) in step 12 according to the following formula, and then repeat the operation in step 14.

W = 5.8 mm (0.23 inch) – F

Example: If F = 2.9 mm (0.11 inch), then W = 2.9 mm (0.11 inch).

<If the crimping amount is smaller than 2.4 mm (0.09 inch)>

Remove the EBJ/EBJ boot band, readjust the value of (W) in step 12 according to the following formula, and then repeat the operations in steps 13 and 14 using a new EBJ/EBJ boot band.

W = 5.8 mm (0.23 inch) – F

Example: If F = 2.3 mm (0.09 inch), then W = 3.5 mm (0.14 inch).

16. Check that the boot band does not stick out past the place where it has been installed. If the boot band sticks out, remove it and then repeat steps 13 to 15, using a new boot band.

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1261005400309

ITEM	SPECIFICATION
Caliper assembly bolt	100 ± 10 N·m (74 ± 7 ft-lb)
Center bearing bracket bolt <3.8L-RH>	41± 4 N·m (30 ± 3 ft-lb)
Driveshaft nut	226 ± 29 N·m (167 ± 21 ft-lb)
Dust cover bolt	9.0 ± 2.0 N·m (80 ± 17 in-lb)
Front strut nut	305 ± 25 N·m (225 ± 18 ft-lb)
Front wheel hub bolt	90 ± 10 N·m (67 ± 7 ft-lb)
Jam nut (lower arm ball joint connection)	65 ± 6 N·m (48 ± 4 ft-lb)
Jam nut (tie rod end connection)	29 ± 4 N·m (21 ± 3 ft-lb)

GENERAL SPECIFICATIONS

M1261000200388

ITEM			SPECIFICATION
Wheel bearing	Type		Double-row angular contact ball bearing <2.4L>, Unit ball bearing (Double-row angular contact ball bearing) <3.8L>
Driveshaft	Joint type	Outer	BJ (Birfield Joint) <2.4L, 3.8L (Except MIVEC)>, EBJ (Eight Ball Fixed Joint) <3.8L (MIVEC)>
		Inner	TJ (Tripod Joint) <2.4L>, PTJ (Pillow Tripod Joint) <3.8L>

SERVICE SPECIFICATIONS

M1261000300794

ITEM		STANDARD VALUE	LIMIT
Wheel bearing end play mm (in)		–	0.05 (0.002)
Wheel bearing rotation starting torque N·m (in-lb)		–	1.4 (12)
Setting of TJ boot length mm (in)	2.4L	85 ± 3 (3.35 ± 0.12)	–
Setting of PTJ boot length mm (in)	3.8L	85 ± 3 (3.35 ± 0.12)	–
Opening dimension of the special tool (MB991561) mm (in)	When the BJ/EBJ boot band (small) is crimped	2.9 (0.11)	–
	When the BJ/EBJ boot band (large) is crimped	2.9 (0.11)	–
Crimped width of the BJ/EBJ boot band mm (in)		2.4 – 2.8 (0.09 – 0.11)	–

LUBRICANTS

M1261000400832

ITEM	SPECIFIED LUBRICANT		QUANTITY
TJ boot grease	Repair kit grease	2.4L-LH	140 ± 10 g (4.9 ± 0.3 oz)
		2.4L-RH	130 ± 10 g (4.6 ± 0.3 oz)
PTJ boot grease	Repair kit grease	3.8L (Except MIVEC)	220 ± 10 g (7.8 ± 0.3 oz)
		3.8L (MIVEC)	245 ± 10 g (8.6 ± 0.3 oz)

ITEM	SPECIFIED LUBRICANT		QUANTITY
BJ boot grease	Repair kit grease	2.4L	120 ± 10 g (4.2 ± 0.3 oz)
		3.8L (Except MIVEC)	165 ± 10 g (5.8 ± 0.3 oz)
EBJ boot grease	Repair kit grease	3.8L (MIVEC)	155 ± 10 g (5.5 ± 0.3 oz)
Dust seal inner grease	Repair kit grease		14 – 20 g (0.5 – 0.7 oz)
Dust seal outer grease	Repair kit grease		8 – 12 g (0.3 – 0.4 oz)

GROUP 27

REAR AXLE

CONTENTS

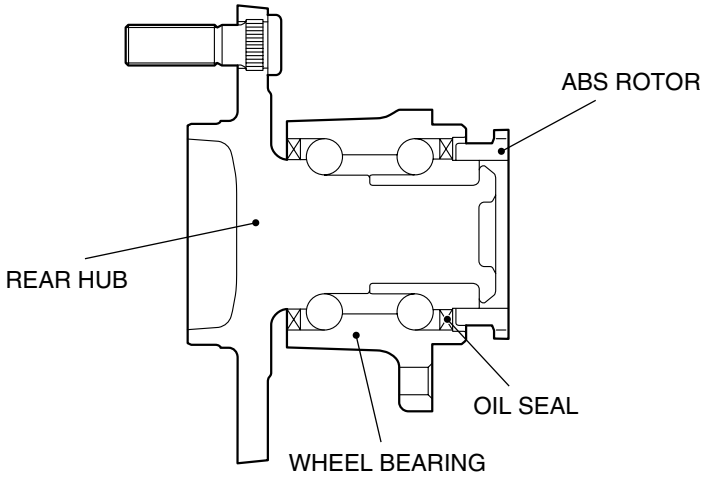
GENERAL DESCRIPTION

M1271000100326

The rear axle has the following features:

- The wheel bearing incorporates a unit ball bearing (double-row angular contact ball bearing) for reduced friction.
- The rear wheel hub assembly combines the hub, wheel bearing, and oil seal in a single unit for fewer parts, better durability, improved assembly precision, and better structural organization.
- ABS rotor for detecting the wheel speeds is press-fitted to the rear hub in vehicles with ABS.

CONSTRUCTION DIAGRAM



AC305169 AB

REAR AXLE DIAGNOSIS

INTRODUCTION TO REAR AXLE DIAGNOSIS

M1271004100254

Noise from the rear axle may be caused by defects in the components.

REAR AXLE DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1271004200273

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a rear axle fault.

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

SYMPTOM PROCEDURES

M1271004400222

INSPECTION PROCEDURE 1: Abnormal Noise

DIAGNOSIS

STEP 1. Check the rear hub assembly installation bolts for looseness.

Q: Are the rear hub assembly installation bolts loosened?

YES : Tighten the rear hub assembly installation bolts to the specified torque 73 ± 7 N·m (54 ± 5 ft-lb). Then go to Step 4.

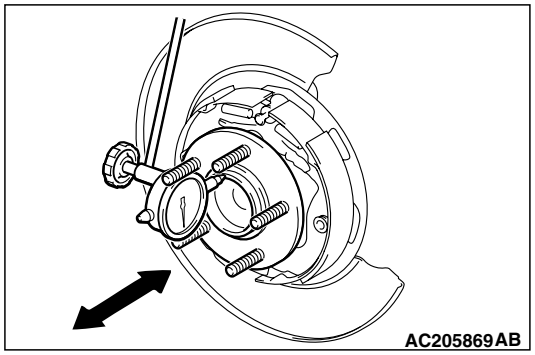
NO : Go to Step 2.

STEP 2. Check the wheel bearing end play.

(1) Remove the caliper assembly, and suspend the caliper assembly with a wire and remove the brake disc.

(2) Check the bearing's end play. Place a dial gauge against the hub surface; then move the hub in the axial direction and check whether or not there is end play.

Limit: 0.05 mm (0.002 inch)


AC205869AB

Q: Is the wheel bearing end play within the limit?

YES : Go to Step 3.

NO : Replace the rear hub assembly, then go to Step 4.

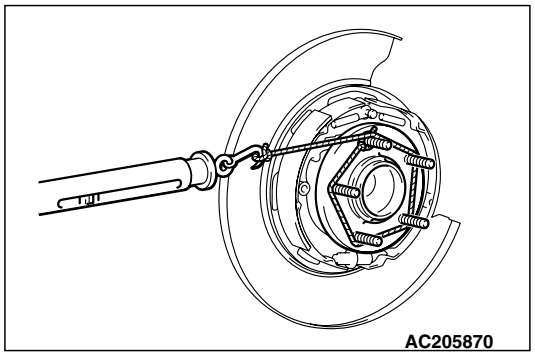
STEP 3. Check the rear hub rotary-sliding resistance.

(1) Remove the caliper assembly, and suspend the caliper assembly with a wire and remove the brake disc.

(2) Turn the hub a few times to seat the bearing.

(3) Wind a rope around the hub bolt and turn the hub by pulling at a 90 degree angle with a spring balance. Measure to determine whether or not the rotary-sliding resistance of the rear hub is within the limit value.

Limit: 24 N (5.4 pounds)


AC205870

Q: Is the rear hub rotary-sliding resistance within the limit?

YES : Go to Step 4.

NO : Replace the rear hub assembly, then go to Step 4 .

STEP 4. Retest the systems.

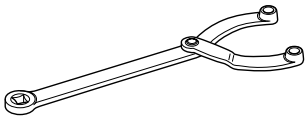
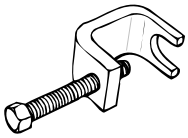
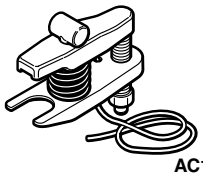
Q: Are abnormal noises generated?

YES : Return to Step 1.

NO : The procedure is complete.

SPECIAL TOOLS

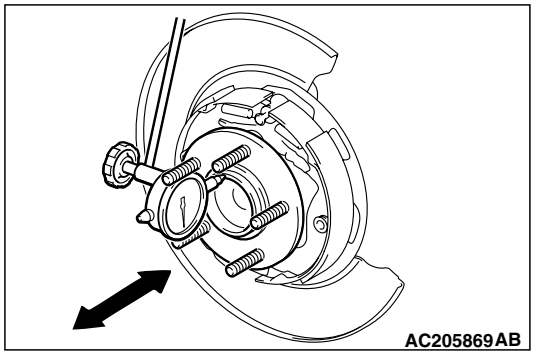
M1271000600525

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B990767	MB990767 Front hub and flange yoke Holder	MB990767-01	Hub fixing
 MB991618	MB991618 Hub bolt remover	General service tool	Hub bolt removal
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or general service tool	Ball joint disconnection *NOTE: Steering linkage puller(MB990635 or MB991113)is also used to disconnect knuckle and toe control arm ball joint.*

ON-VEHICLE SERVICE

WHEEL BEARING END PLAY CHECK

M1271000900474


AC205869AB

1. Remove the caliper assembly, and suspend the caliper assembly with a wire and remove the brake disc.
2. Check the bearing's end play. Place a dial gauge against the hub surface; then move the hub in the axial direction and check whether or not there is end play.

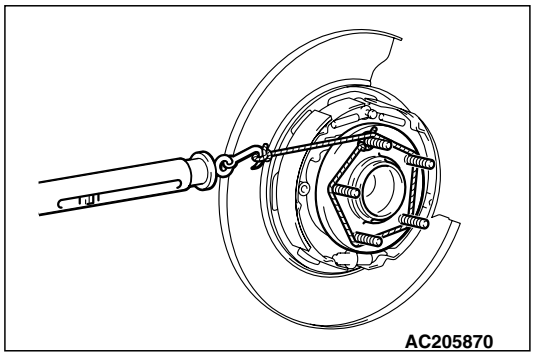
   Limit: 0.05 mm (0.002 inch)
3. If the play exceeds the limit, replace the rear hub assembly.
4. After having finished the inspection, install the brake disc, caliper assembly and tighten the caliper assembly mounting bolts to the specified torque.

   Tightening torque: 60 ± 5 N·m (45 ± 3 ft-lb)

REAR HUB ROTARY-SLIDING RESISTANCE CHECK

M1271001100266

1. Remove the caliper assembly, and suspend the caliper assembly with a wire and remove the brake disc.
2. Turn the hub a few times to seat the bearing.


AC205870

3. Wind a rope around the hub bolt and turn the hub by pulling at a 90 degree angle with a spring balance. Measure to determine whether or not the rotary-sliding resistance of the rear hub is within the limit value.

   Limit: 24 N (5.4 pounds)

4. If the rotary–sliding resistance exceeds the limit value, replace the rear hub assembly.
5. After having finished the inspection, install the brake disc, caliper assembly and tighten the caliper assembly mounting bolts to the specified torque.

   Tightening torque: 60 ± 5 N·m (45 ± 3 ft-lb)

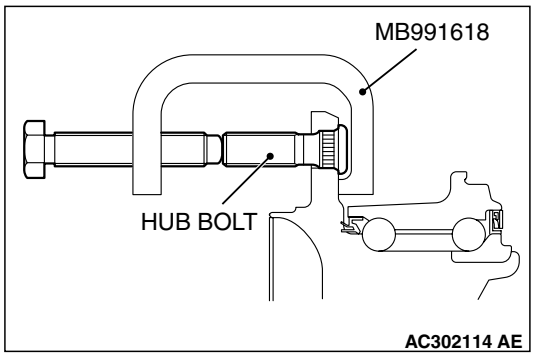
HUB BOLT REPLACEMENT

M1271001000270

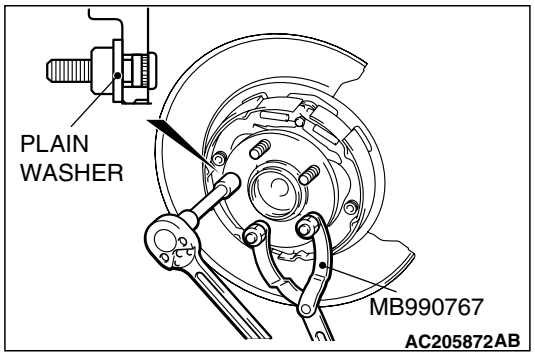
Required Special Tools:

- MB990767: Front Hub and Flange Yoke Holder
- MB991618: Hub Bolt Remover

1. Remove the caliper assembly, and suspend the caliper assembly with a wire and remove the brake disc.
2. Use special tool MB991618 to remove the hub bolts.



AC302114 AE



AC205872AB

3. Install the plain washer to the new hub bolt, and install the bolt with a nut while holding the hub with special tool MB990767.
4. Install the brake disc, caliper assembly and tighten the caliper assembly mounting bolts to the specified torque.

   Tightening torque: 60 ± 5 N·m (45 ± 3 ft-lb)

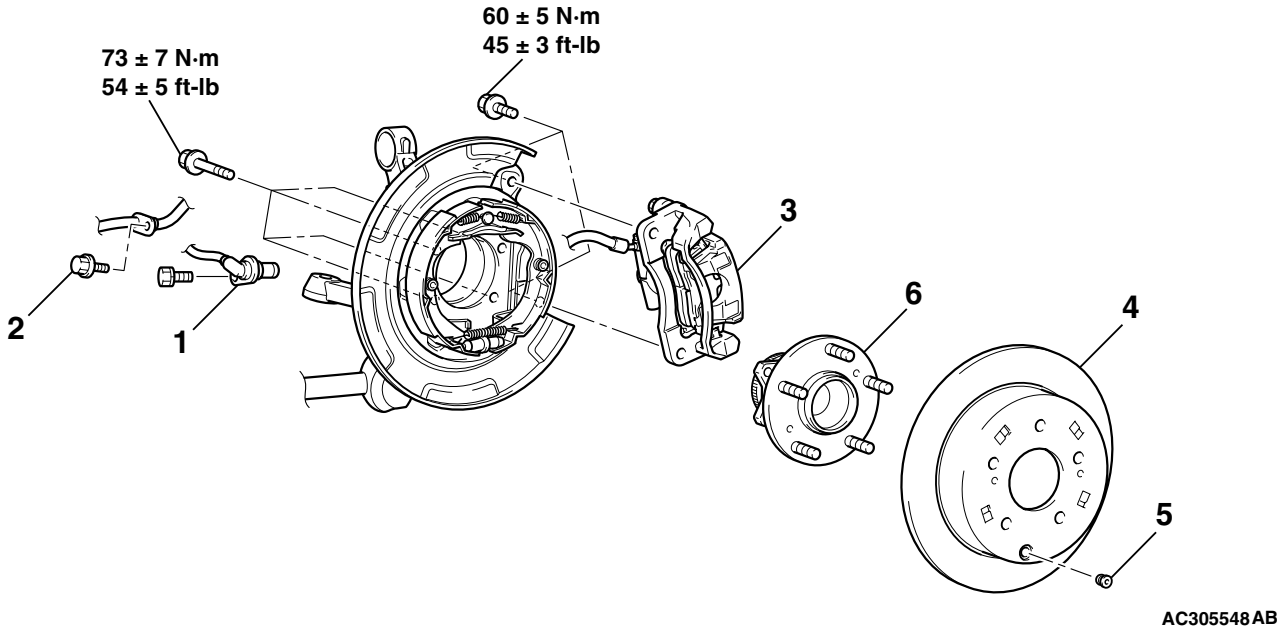
REAR AXLE HUB ASSEMBLY

REMOVAL AND INSTALLATION

M1271002000411

⚠ CAUTION

- **For vehicles with ABS, be careful not to strike the pole piece at the tip of the rear wheel speed sensor with tools during servicing work.**
- **The rear hub assembly should not be dismantled.**



REMOVAL STEPS

1. REAR WHEEL SPEED SENSOR <VEHICLES WITH ABS>
2. BRAKE HOSE CLAMP BOLT

<<**A**>> 3. CALIPER ASSEMBLY

REMOVAL STEPS (Continued)

<<**B**>> 4. BRAKE DISC

5. PLUG

<<**C**>> 6. REAR HUB ASSEMBLY

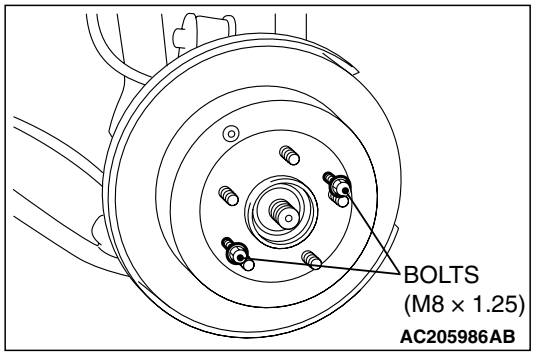
REMOVAL SERVICE POINTS

<<A>> CALIPER ASSEMBLY REMOVAL

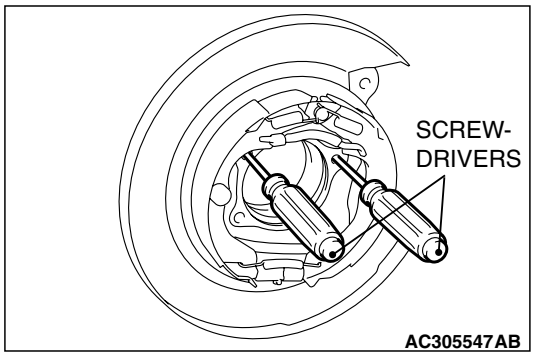
Secure the removed caliper assembly with wire, etc.

<<B>> BRAKE DISC REMOVAL

If the brake disc is seized, install M8 × 1.25 bolts as shown, and remove the disc by tightening the bolts evenly and gradually.



TSB Revision

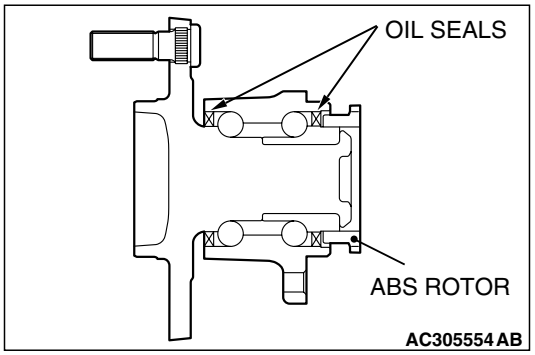


<<C>> REAR HUB ASSEMBLY REMOVAL

Insert flat-tipped screwdrivers into the mounting holes of knuckle hub to prevent the rear brake shoe and backing plate from falling down after the rear hub assembly has been removed from the knuckle.

INSPECTION

M1271002100270



- Check the ABS rotor for chipped teeth.

KNUCKLE

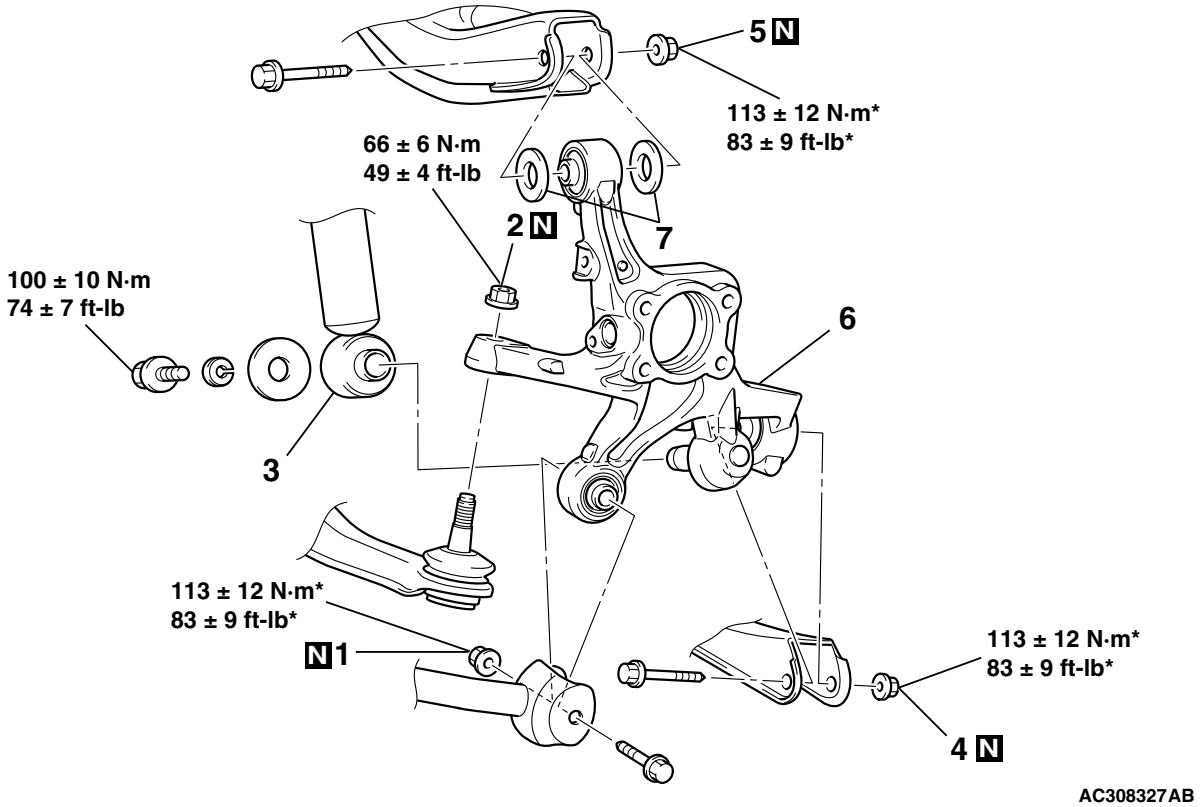
REMOVAL AND INSTALLATION

M1271003000191

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

Pre-removal Operation	Post-installation Operation
• Rear Axle Hub Assembly Removal (Refer to P.27-6). • Parking Brake Assembly Removal (Refer to GROUP 36, Parking Brake Lining and Drum P.36-8).	• Check the ball joint dust cover for cracks or damage by pushing it with your finger. • Parking Brake Assembly Installation (Refer to GROUP 36, Parking Brake Lining and Drum P.36-8). • Rear Axle Hub Assembly Installation (Refer to P.27-6).



AC308327AB

REMOVAL STEPS

1. JAM NUT (TRAILING ARM CONNECTION)
2. JAM NUT (TOE CONTROL ARM CONNECTION)
3. SHOCK ABSORBER CONNECTION
4. JAM NUT (LOWER ARM CONNECTION)

REMOVAL STEPS (Continued)

5. JAM NUT (UPPER ARM CONNECTION)
6. KNUCKLE
7. UPPER ARM STOPPER

<<A>>

Required Special Tool:
MB991897: Ball Joint Remover

TSB Revision

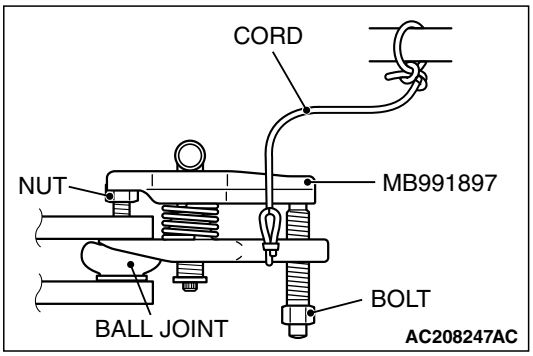
REMOVAL SERVICE POINT

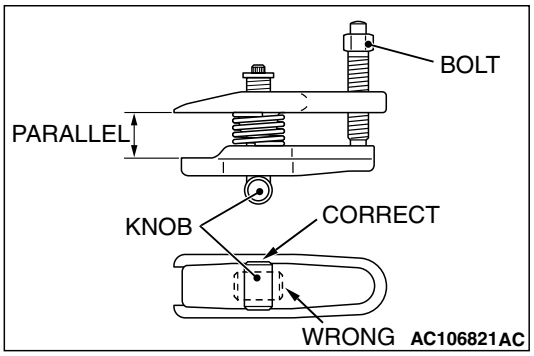
<<A>> JAM NUT (TOE CONTROL ARM CONNECTION) REMOVAL

⚠ CAUTION

- **Do not remove the nut from the ball joint. Loosen it and use the special tool to avoid possible damage to ball joint threads.**
- **Hang the special tool with a cord to prevent from falling.**

1. Install special tool MB991897 as shown in the figure.





2. After turning the bolt and knob to adjust the arms of special tool MB991897 in parallel, tighten the bolt by hand and confirm that the arms are parallel.

   NOTE: When adjusting the arms in parallel, turn the knob in the direction shown in the figure.

3. Tighten the bolt with a wrench to disconnect the ball joint and remove the jam nut.

INSPECTION

M1271003100143

Check the knuckle for wear or cracks.

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1271004000332

ITEM		SPECIFICATION
Knuckle	Lower arm assembly to knuckle nut	113 ± 12 N·m (83 ± 9 ft-lb)
	Shock absorber assembly to knuckle bolt	100 ± 10 N·m (74 ± 7 ft-lb)
	Jam nut (toe control arm connection)	66 ± 6 N·m (49 ± 4 ft-lb)
	Trailing arm assembly to knuckle nut	113 ± 12 N·m (83 ± 9 ft-lb)
	Upper arm assembly to knuckle nut	113 ± 12 N·m (83 ± 9 ft-lb)
Rear axle hub assembly	Brake caliper assembly bolt	60 ± 5 N·m (45 ± 3 ft-lb)
	Rear hub assembly bolt	73 ± 7 N·m (54 ± 5 ft-lb)

TSB Revision

SERVICE SPECIFICATIONS

M1271000300502

ITEM	LIMIT
Wheel bearing end play mm (in)	0.05 (0.002)
Rear hub rotary-sliding resistance N (lb)	24 (5.4)

GROUP 31

WHEEL AND TIRE

CONTENTS

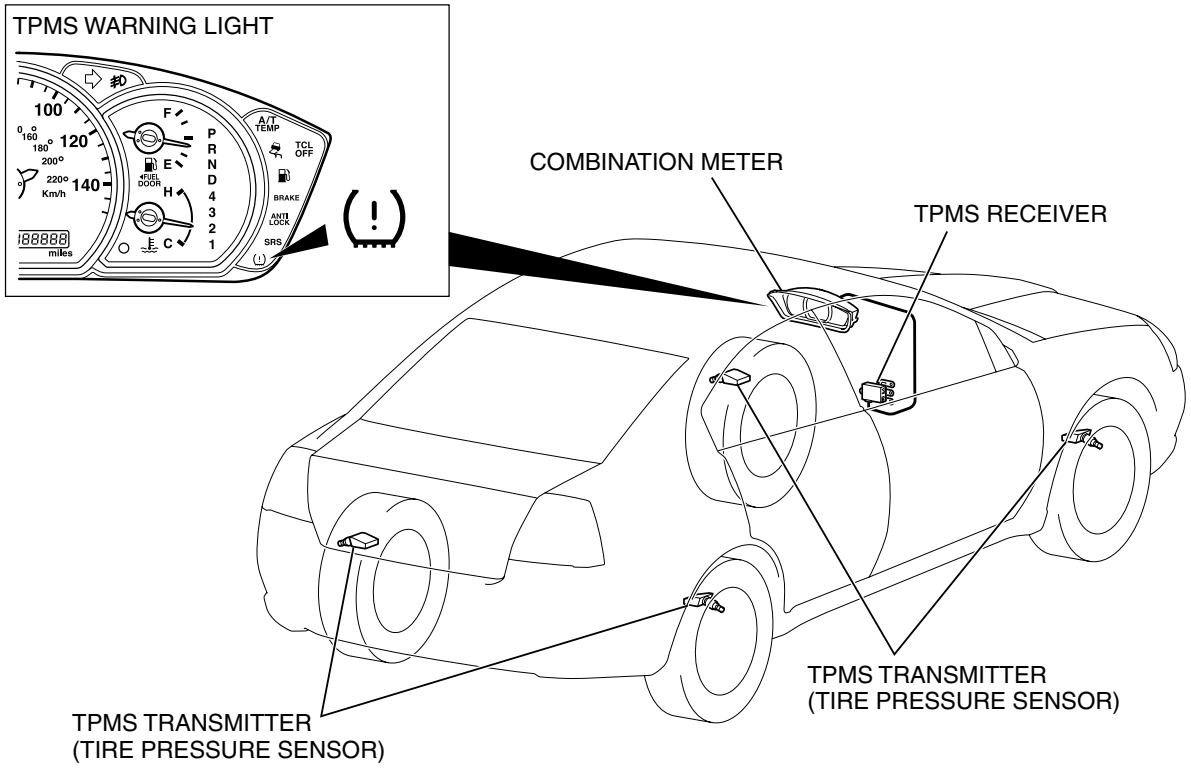
GENERAL DESCRIPTION

M1311000100491

FEATURE

- Warns driver of low tire pressure by illuminating the TPMS warning light on the combination meter
- Warns driver of TPMS problems by flashing the TPMS warning light on the combination meter

TPMS CONSTRUCTION DIAGRAM



AC601020AB

The Tire Pressure Monitoring System (TPMS) consists of TPMS transmitters (tire pressure sensors) installed in tires, TPMS antenna built in the TPMS receiver, and a TPMS warning light on the combination meter. The TPMS antenna receives radio frequency signal output from the TPMS transmitters, the TPMS receiver interprets the signals and detects abnormality of tire pressure and/or the system, and the TPMS warning light illuminates or flashes to alert.

TPMS OPERATIONAL CHARACTERISTICS

- The TPMS receiver monitors the tire pressure of road tires except compact spare tire.
- The TPMS transmitter includes a driving G sensor that senses tire rotation. The TPMS receiver can determine which tires are rotating (road tire) and stationary (spare tire).
- The recommended cold tire pressure at normal condition for Endeavor is 220 kPa (32 psi). The TPMS warning light will turn ON and DTC C1912/C1922/C1932/C1942 will be stored in memory when the air pressure in any road tire is below 174 kPa (25.3 psi).
- The TPMS warning light will turn OFF and the DTC C1912/C1922/C1932/C1942 in memory will be eliminated when the tire pressure is increased to at least 190 kPa (27.5 psi).
- Customers may experience what appears to be an "intermittent" tire pressure warning light because the air pressure in the tires normally fluctuates under various operating conditions:
  - In cold weather, tire pressure will become lower due to the ambient temperature, and the TPMS warning light will turn ON if tire pressure drops below 174 kPa (25.3 psi). The tire pressure will increase after driving (tires warm up), and the TPMS warning light will turn OFF.

Regardless of the ambient temperature, set the tire pressure to 220 kPa (32 psi) with the tires cold [vehicle has been parked for at least three hours or driven less than 1.6 kilometers (one mile) after having been parked for three hours].

NOTE: Tire pressure changes at slightly less than 6.9 kPa (1 psi) per 5.5°C (10°F) of ambient temperature change.

For example, climates with seasonal temperatures that vary from 32°C (90°F) in the summer to –12°C (10°F) in the winter have a 44 degree Celsius (80 degrees Fahrenheit) temperature change. This can result in an approximate 55 kPa (8 psi) change in tire pressure. In this example:

- If the tire pressure was set when the ambient temperature was 32°C (90°F) in the summer, it can be about 165 kPa (24 psi) on the coldest day in the winter. This will cause the TPMS warning light to turn on.
- If the tire pressure was set when the ambient temperature was –12°C (10°F) in the winter, it can be about 275 kPa (40 psi) on the hottest day of the summer. This will create a rougher ride.

The important point is that customers should have their tire pressure seasonally adjusted.

TIRE PRESSURE MONITORING SYSTEM (TPMS) SERVICE PRECAUTIONS

M1311004300044

- Do not use an aerosol puncture-repair spray. Such a spray could damage the tire pressure sensor (TPMS transmitter).
- Whenever the TPMS transmitters and/or TPMS receiver are replaced with new ones, the tire pressure sensor IDs must be registered into the TPMS.
- The use of non-genuine wheels may cause the improper installation of the TPMS transmitters, possibly resulting in air leakage and damage to the TPMS transmitter.
- When the tire is removed from the wheel, a special procedure must be observed to avoid the TPMS transmitter damage. Refer to "TPMS transmitter Removal and Installation (P.31-62)".
- The grommet at base of valve stem should be replaced with a new one every five years or when the tire is replaced. For the replacement procedure, refer to "TPMS transmitter Removal and Installation (P.31-62)".
- After the TPMS transmitter is replaced and the tires are inflated, retighten the valve nut (TPMS transmitter mounting nut) to the specified torque, refer to "TPMS transmitter Removal and Installation (P.31-62)".
- Replace the TPMS transmitter when the TPMS transmitter battery is discharged. The battery cannot be removed from the TPMS transmitter. Nominal service life of the battery is 10 years or 160,000 km (100,000 miles).
- If the valve core and valve cap are replaced, use a genuine replacement part. The valve core is similar to a conventional one, but nickel plating was applied to avoid electric corrosion.
- TPMS may not work normally in the following circumstances:
  - A wireless facility or device using the same frequency with the TPMS transmitter is near the vehicle.
  - Snow or ice is stuck inside the fenders and/or on the wheels.
  - The TPMS transmitter's battery is discharged.
  - Wheels other than Mitsubishi genuine wheels are being used.
  - Wheels that are not fitted with TPMS transmitters are being used.
  - Wheels whose tire pressure sensor IDs are not registered by the vehicle are being used.

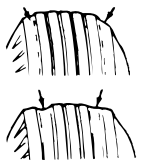
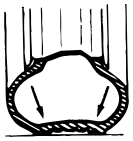
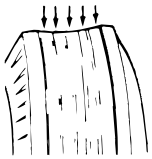
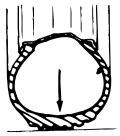
NOTE: Tire inflation pressures vary with the ambient temperature. If the vehicle is subjected to large variations in ambient temperature, the tire inflation pressures may be under-inflated (causing the TPMS warning light to come on) when the ambient temperature is relatively low. If the TPMS warning light comes on, adjust the tire inflation pressure.

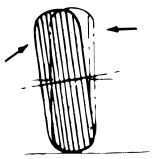
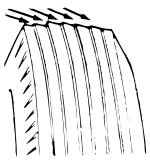
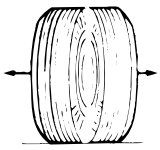
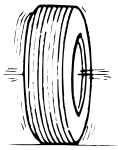
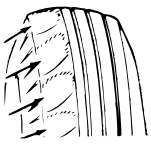
NOTE: If any of the road wheel tires do not contain a TPMS transmitter, and the customer continues driving, the TPMS warning light will flash.

WHEEL AND TIRE DIAGNOSIS

WHEEL AND TIRE DIAGNOSIS

M1311000700705

SYMPTOM		PROBABLE CAUSE		REMEDY	REFERENCE PAGE
Rapid wear at shoulders	 ACX00923AB	Under-inflation or lack of rotation	 ACX00924AE	Adjust the tire pressure.	For tire inflation pressure, refer to the label on the driver's side center pillar.
Rapid wear at center	 ACX00925AE	Over-inflation or lack of rotation	 ACX00926AI		
Cracked treads	 ACX00927AB	Under-inflation		Adjust the tire pressure.	For tire inflation pressure, refer to the label on the driver's side center pillar.

SYMPTOM		PROBABLE CAUSE		REMEDY	REFERENCE PAGE
Wear on one side	 ACX00928AB	Excessive camber	 ACX00929AB	Check the camber.	Refer to GROUP 33, On-vehicle service – Front wheel alignment check and adjustment P.33-6.
Feathered edge	 ACX00930AB	Incorrect toe-in	 ACX00931AB	Adjust the toe-in.	
Bald spots	 ACX00932AB	Unbalanced wheel	 ACX00933AB	Balance the wheels.	–
Scalloped wear	 ACX00934	Lack of rotation of tires or worn or out-of-alignment suspension		Rotate the tires, and check the front suspension alignment.	Refer to GROUP 33, On-vehicle service – Front wheel alignment check and adjustment P.33-6.

WHEEL BALANCE ACCURACY

M1311001700559

PURPOSE

This section contains tips and procedures for achieving accurate wheel balance. Steering wheel vibration and/or body shake can result if any of these procedures are not carefully observed.

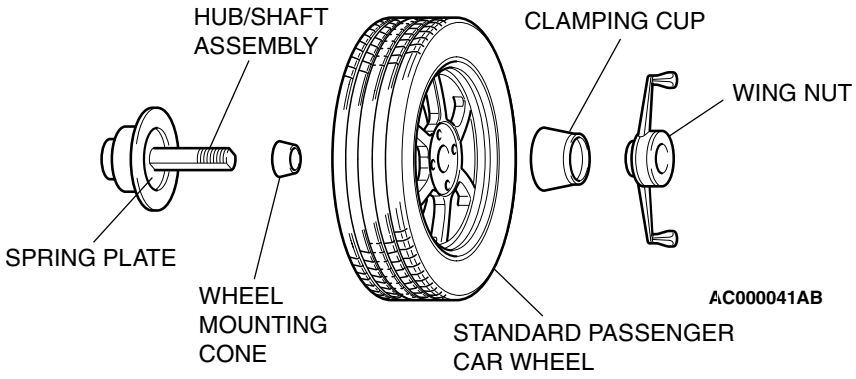
1. Wheels and tires must be properly mounted on a balancer in order to achieve correct balance. Centering the wheel on the shaft of the balancer is essential for proper mounting.
2. Off-the-car wheel balancers must be calibrated periodically to ensure good balancing results. An inaccurately calibrated balancer could cause unnecessary replacement of tires, shocks, suspension components, or steering components.

Check your balancer's calibration approximately every 100 balances. Your wheel balancer's instruction manual should include calibration procedures. If the calibration procedures specifically for your balancer are missing, use the generic steps in this section for zero calibration, static balance, and dynamic balance checks. The wheel balancer calibration checks are also described in the flowchart (Refer to P.31-9).

PROCEDURE <BALANCING TIPS>

1. Confirm that the balancer's cone and the wheel mounting cone are undamaged and free of dirt and rust.
2. On this vehicle, the wheel's center hole on the hub side has a chamfered edge. Use a back-mounting cone on your wheel balancer to center the wheel on the balancer shaft.

3. Install a wheel mounting cone. The appropriate size cone for this vehicle is 67.0 mm (2.64 inches).
4. Before balancing the wheel, remove any wheel weights from both sides. Also check both sides for any damage.
5. When installing wheel weights, hammer them at a straight (not diagonal) angle.



<CONFIRMING PROPER BALANCE>

1. After balancing the wheel, loosen the wing nut and turn the wheel 180 degree angle against the balancer's hub. Then re-tighten the wing nut and check the balance again. Repeat wheel balance if necessary.
2. Turn the wheel again 180 degree angle against the balancer's hub. If the wheel becomes out-of-balance each time it is turned against the balancer's hub, the wheel balancer may require calibration.

<WHEEL BALANCER CALIBRATION CHECKS>

1. Mount an undamaged original-equipment alloy rim and tire assembly (wheel) onto your off-the-car wheel balancer. Balance the wheel.
2. <<Zero Calibration Check>>

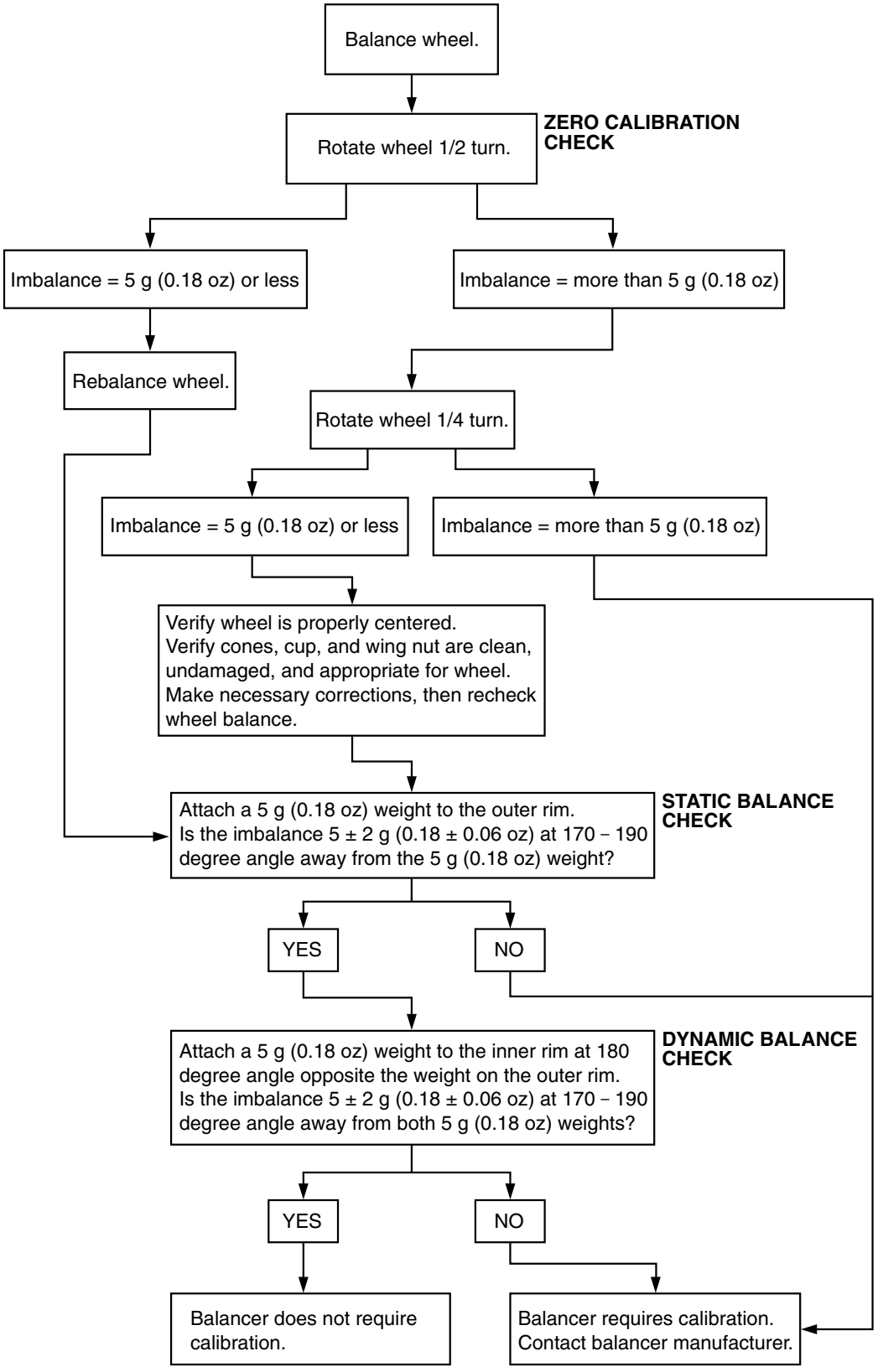
   Loosen the balancer wing nut, rotate the wheel a half-turn (180 degree angle), and retighten the nut. Recheck the balance.
   - If the imbalance is 5 g (0.18 ounce) or less, the zero calibration is OK. Rebalance the wheel, then go to Step 4 to check static balance.
   - If the imbalance is more than 5 g (0.18 ounce), go to Step 3.
3. Loosen the balancer wing nut, rotate the wheel 1/4 turn (90 degree angle), and retighten the nut. Recheck the wheel balance.
   - If the imbalance is 5 g (0.18 ounce) or less, the wheel may not be centered on the balancer, or the balancing cones, the cup, and/or wing nut are damaged, dirty, or inappropriate for the wheel. You may need to refer to the balancer manufacturer's instructions to verify the correct attachments. After making the necessary corrections, recheck the wheel balance. If OK, then go to Step 4.
   - If the imbalance is more than 5 g (0.18 ounce), the balancer requires calibration. Contact the balancer manufacturer for calibration by their repair representative.
4. <<Static Balance Check>>

   Attach a 5 g (0.18 ounce) weight to the outer rim. Recheck the balancer. The balancer should detect 5 ± 2 g (0.18 ± 0.06 ounce) of imbalance 170 to 190 degree angle away from the 5 g (0.18 ounce) weight.
   - If the imbalance is within specification, the static balance calibration is correct. Go to Step 5 to check the dynamic balance.
   - If the imbalance is out of specification, the balancer requires calibration. Contact the balancer manufacturer for calibration by their repair representative.
5. <<Dynamic Balance Check>>

   Attach a 5 g (0.18 ounce) weight to the inner rim 180 degree angle opposite the 5 g (0.18 ounce) weight that was added in Step 4. Recheck the balance. The balancer should detect 5 ± 2 g (0.18 ± 0.06 ounce) of imbalance 170 to 190 degree angle away from both the inner and outer 5 g (0.18 ounce) weights.

- If the imbalance is within specification, the dynamic balance calibration is correct. The balancer calibration checks are complete.
- If the imbalance is out of specification, the balancer requires calibration. Contact the balancer manufacturer for calibration by their repair representative.

WHEEL BALANCER CALIBRATION CHECKING FLOW CHART



AC403557AC

TSB Revision

TIRE PRESSURE MONITORING SYSTEM (TPMS) DIAGNOSIS

INTRODUCTION TO DIAGNOSIS

M1311002300060

TPMS MAY NOT WORK NORMALLY IN THE FOLLOWING CIRCUMSTANCES:

- A wireless facility or device using the same frequency with the TPMS transmitter is near the vehicle.
- Snow or ice is stuck inside the fenders and/or on the wheels.
- The TPMS transmitter's battery is discharged.
- Wheels other than Mitsubishi genuine wheels are being used.
- Wheels that are not fitted with TPMS transmitters are being used.
- Wheels whose tire pressure sensor IDs are not registered by the vehicle are being used.

WHEN THE TPMS WARNING LIGHT IS ON

- If the TPMS warning light illuminates, check the inflation pressure of all the tires and adjust if necessary. If the TPMS warning light still remains illuminated, a flat tire or a defective TPMS transmitter is suspected.
- If a road tire does not contain a TPMS transmitter, the TPMS warning light will flash and the TPMS will not work normally. Replace the tire with one containing a TPMS transmitter.

AFTER REPLACING TPMS COMPONENTS

- Whenever the TPMS transmitter and/or TPMS receiver are replaced, register the tire pressure sensor ID of all the TPMS transmitter-contained tires.
- Whenever any TPMS component (transmitter and receiver) is removed and installed, confirm that no TPMS DTC is set.

TPMS TROUBLESHOOTING STRATEGY

M1311002400067

Use these steps to plan your diagnostic strategy. If you follow them thoroughly, you will be sure that you have exhausted most of the possible ways to find a TPMS fault.

1. Gather information about the problem from the customer.
2. Verify that the condition described by the customer exists. If the condition matches a symptom listed in the TPMS Symptom Chart (Refer to P.31-26), execute an inspection procedure for the symptom.
3. Check the vehicle for any TPMS DTC.
4. If you cannot verify the condition and there are no TPMS DTCs, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.
5. If there is an TPMS DTC, record the number of the DTC, then erase the DTC from the memory using the scan tool.
6. Recreate the TPMS DTC set conditions to see if the same TPMS DTC will set again.
   - If the same TPMS DTC sets again, perform the TPMS diagnostic trouble code procedures for the DTC. Refer to P.31-14.
   - If you cannot get the same TPMS DTC to set again, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

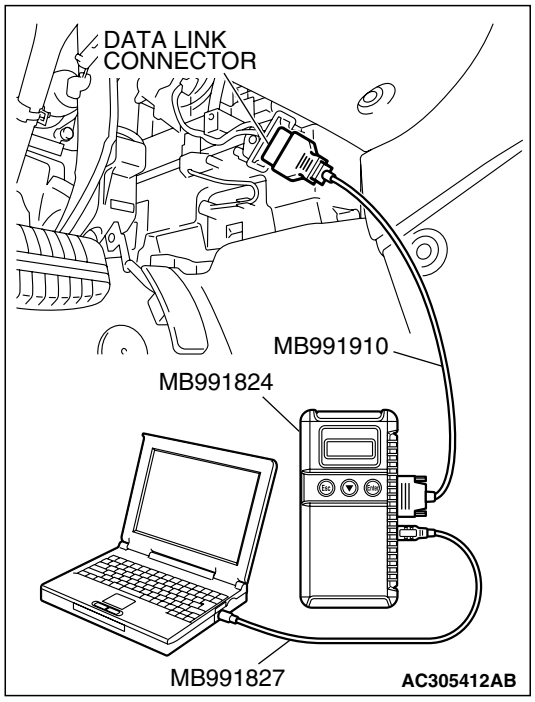
TPMS DIAGNOSTIC FUNCTION

M1311002600050

HOW TO CONNECT THE SCAN TOOL (M.U.T.-III)

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable



- MB991910: M.U.T.-III Main Harness A

⚠ 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. Turn on the personal computer.
3. Connect special tool MB991827 to special tool MB991824 and the personal computer.
4. Connect special tool MB991910 to special tool MB991824.
5. Connect special tool MB991910 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 green color.
7. Start the M.U.T.-III system on the personal computer.

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

HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES

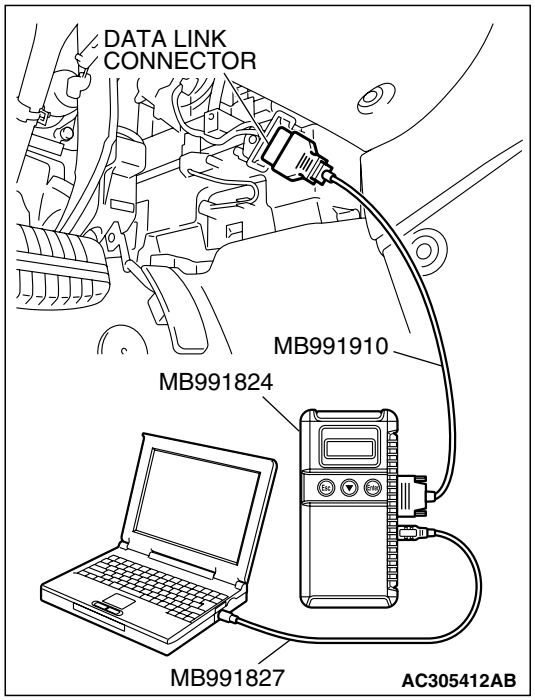
Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

⚠ 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 vehicle battery voltage is low, diagnostic trouble codes will not be set. Check the vehicle 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 "TPMS" from the "CHASSIS" 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.

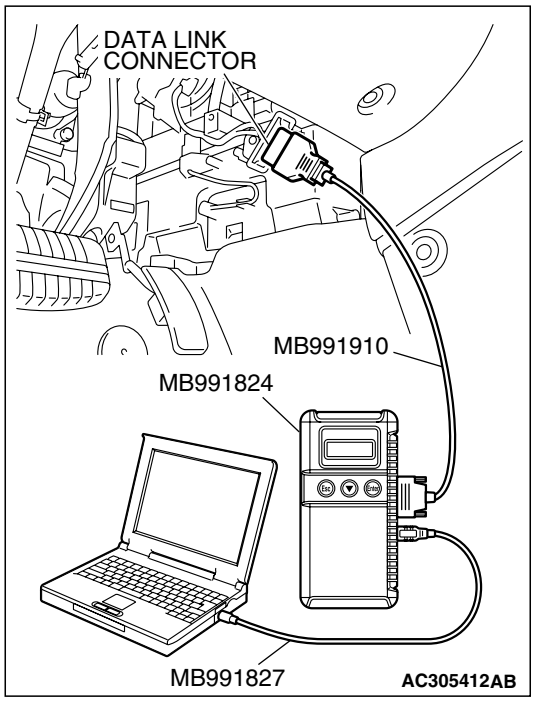
HOW TO READ DATA LIST

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

⚠ 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 "TPMS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Data List."
8. Choose an appropriate item and select the "OK" button.

TSB Revision

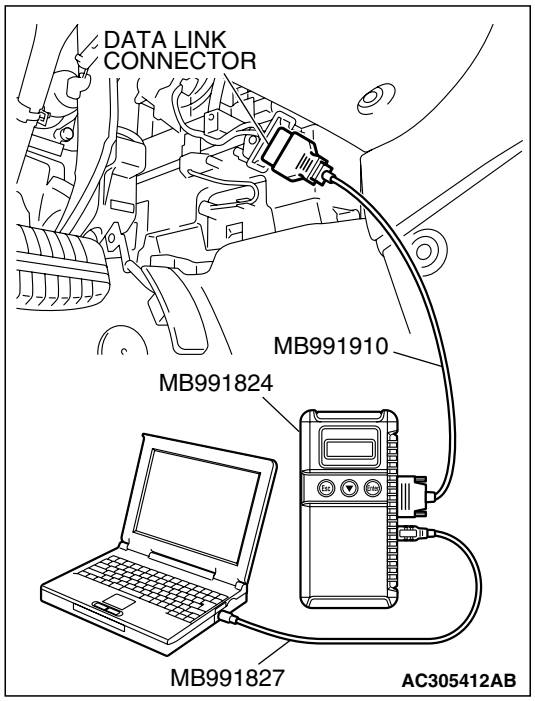
HOW TO PERFORM ACTUATOR TEST

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

⚠ CAUTION

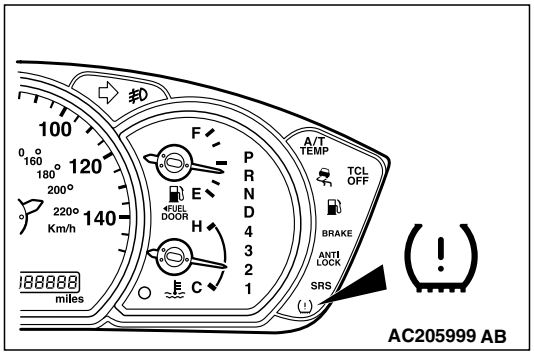
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



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 "TPMS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Actuator Test."
8. Choose an appropriate item and select the "OK" button.

TPMS WARNING LIGHT CHECK

M1311002500042



1. Check that the TPMS warning light illuminates for approximately three seconds when the ignition switch is turned to the "ON" position. (If it does not illuminate, perform troubleshooting for TPMS Inspection Procedure No.3. Refer to P.31-37).
2. Check that it illuminates for approximately three seconds and then goes out (If the warning light does not turn off and stays on, perform troubleshooting for TPMS Inspection Procedure No.1. Refer to P.31-27) (If the warning light does not turn off and flashes, perform troubleshooting for TPMS Inspection Procedure No.2. Refer to P.31-33).

DIAGNOSTIC TROUBLE CODE CHART

M1311002700068

⚠ CAUTION

- **During diagnosis, a DTC code associated with another system may be set when the ignition switch is turned to the "ON" position with connector(s) disconnected. When diagnosis is finished, check all systems for DTC code(s). If DTC code(s) are set, erase them all.**
- **Tire pressure sensor ID registration must be done before any diagnosis.**

DTC	DIAGNOSTIC CONTENT		REFERENCE PAGE
C1900	TPMS abnormality	ID code not registered	P.31-14
C1608		EEPROM failure	P.31-16
C1901		Vehicle Speed Signal	P.31-17
C1910	TPMS transmitter 1 abnormality	Transmitter battery voltage	P.31-20
C1911		Tire pressure sensor ID reception failure	P.31-21
C1912		Tire air pressure low	P.31-24
C1920	TPMS transmitter 2 abnormality	Transmitter battery voltage	P.31-20
C1921		Tire pressure sensor ID reception failure	P.31-21
C1922		Tire air pressure low	P.31-24
C1930	TPMS transmitter 3 abnormality	Transmitter battery voltage	P.31-20
C1931		Tire pressure sensor ID reception failure	P.31-21
C1932		Tire air pressure low	P.31-24
C1940	TPMS transmitter 4 abnormality	Transmitter battery voltage	P.31-20
C1941		Tire pressure sensor ID reception failure	P.31-21
C1942		Tire air pressure low	P.31-24

TPMS DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC C1900: TPMS Abnormality (ID Code Not Registered)

TPMS DTC SET CONDITION

DTC C1900 will be set if the tire pressure sensor IDs are not registered correctly in the TPMS receiver. At the same time this DTC is set, the TPMS warning light flashes.

TROUBLESHOOTING HINT

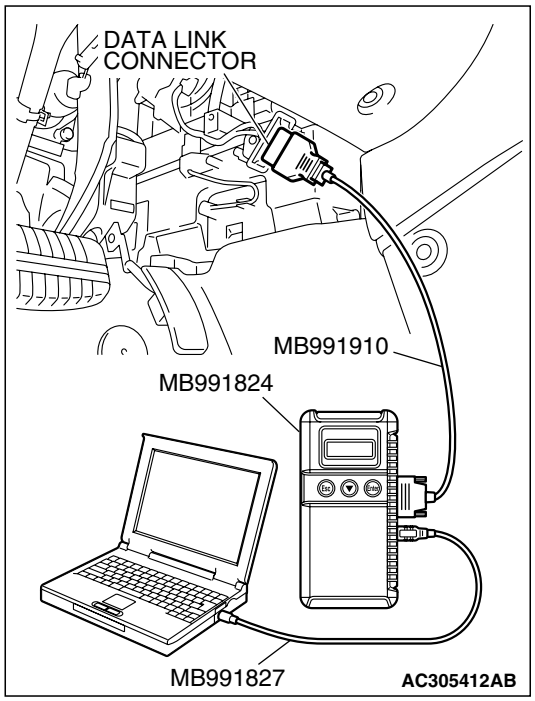
Execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function."

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

TSB Revision



STEP 1. Execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function."

⚠ 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) Execute "Tire Pressure Sensor ID Registration" (Refer to P.31-57).

Q: Is the "Tire Pressure Sensor ID Registration" complete?

YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check the diagnostic trouble code.

NOTE: If the "Tire Pressure Sensor ID Registration" has been completed successfully, the DTC will be erased automatically.

Q: Does diagnostic trouble code C1900 reset?

YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Execute "Tire Pressure Sensor ID Check" on scan tool MB991958 "Special Function."

All the tire pressure sensor IDs, which have been registered in Step 1, should be displayed on scan tool MB991958.

Q: Are all the registered tire pressure sensor IDs displayed?

YES : Replace the TPMS receiver (Refer to P.31-61). Then go to Step 1.
NO : Repeat the troubleshooting from Step 1.

TSB Revision

STEP 4. Execute "Tire Pressure Sensor Check" on scan tool MB991958 "Special Function."

Q: Are all tire pressure sensor IDs displayed?

YES : Repeat the troubleshooting from Step 1.

NO : Carry out troubleshooting for DTC C1911/C1921/C1931/C1941 (tire pressure sensor ID reception failure) from Step 3 (Refer to P.31-21).

DTC C1608: TPMS Abnormality (EEPROM Failure)

TPMS DTC SET CONDITION

DTC C1608 will be set if there is any fault in the TPMS receiver's EEPROM. At the same time this DTC is set, the TPMS warning light flashes.

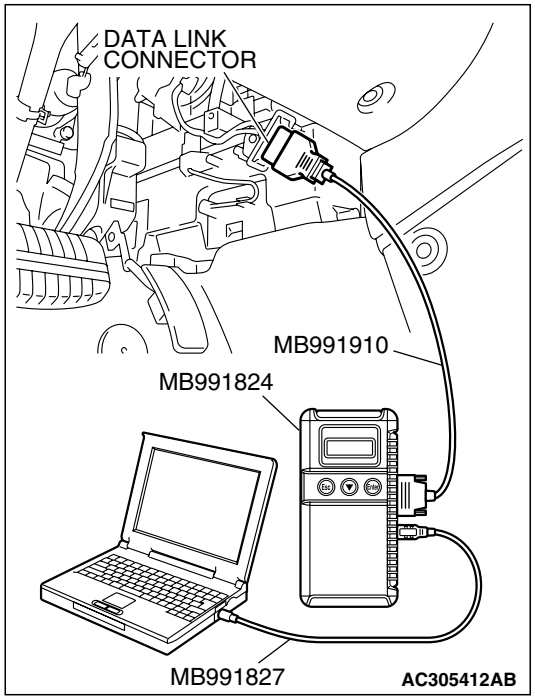
TROUBLESHOOTING HINT

Replace the TPMS receiver.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Check the illumination condition of the TPMS warning light after the following procedures.

(1) Replace the TPMS receiver (Refer to P.31-61).

⚠ 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.

(2) Connect scan tool MB991958 to the data link connector.
(3) Turn the ignition switch to the "ON" position.
(4) Execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function" (Refer to P.31-57).
(5) Check the illumination condition of the TPMS warning light.

Q: Is the TPMS warning light still flashing?

YES : Go to Step 2.
NO : Go to Step 2.

STEP 2.Recheck for diagnostic trouble code.

Q: Does diagnostic trouble code C1608 reset?

YES : Repeat the troubleshooting from Step 1.
NO : The procedure is complete.

DTC C1901: TPMS Abnormality (Vehicle Speed Signal)

CIRCUIT OPERATION

The TPMS receiver receives the vehicle speed signal from the powertrain control module.

TPMS DTC SET CONDITION

DTC C1901 will be set if the TPMS receiver does not receive vehicle speed signal of 5 km/h (3 mph) or more during driving. At the same time this DTC is set, the TPMS warning light flashes. TPMS receiver senses the vehicle's driving state by a driving G sensor inside the TPMS transmitter.

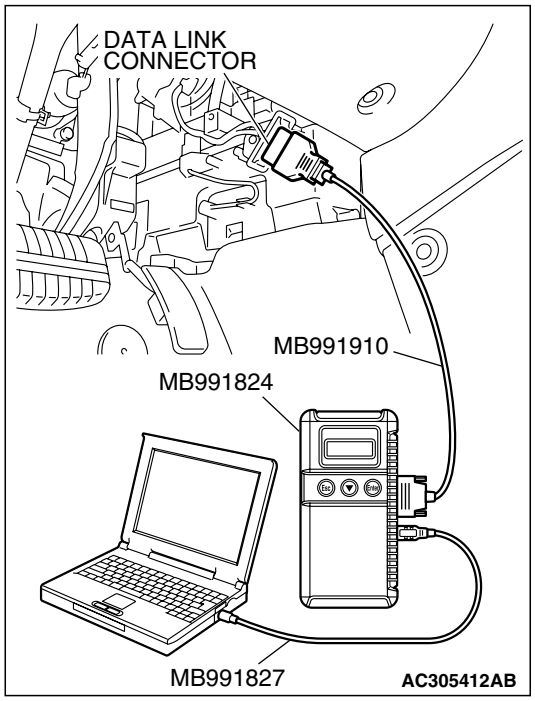
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS DTC TO SET ARE:)

- Damaged wiring harness or connector
- Malfunction of the powertrain control module
- Malfunction of the TPMS receiver

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, read the MFI system diagnostic trouble code.

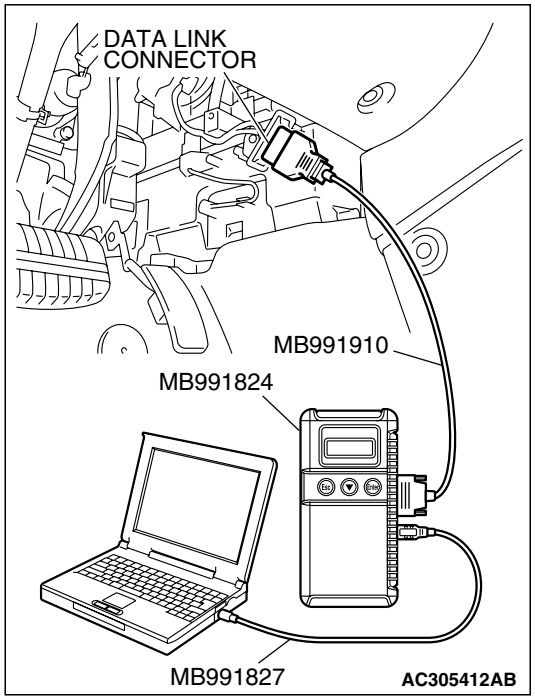
Check if an MFI system diagnostic trouble code is set.

(1) Turn the ignition switch to "ON" position.
(2) Read the diagnostic trouble code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC set?

YES : Diagnose the MFI system by referring to GROUP 13A, MFI Diagnosis – Diagnostic Trouble Code Chart P.13A-45 <2.4L ENGINE> or GROUP 13B, MFI Diagnosis – Diagnostic Trouble Code Chart P.13B-46 <3.8L ENGINE>.

NO : Go to Step 2.



STEP 2. Using scan tool MB991958, diagnose the CAN bus line.

Use scan tool MB991958 to diagnose the CAN bus lines.

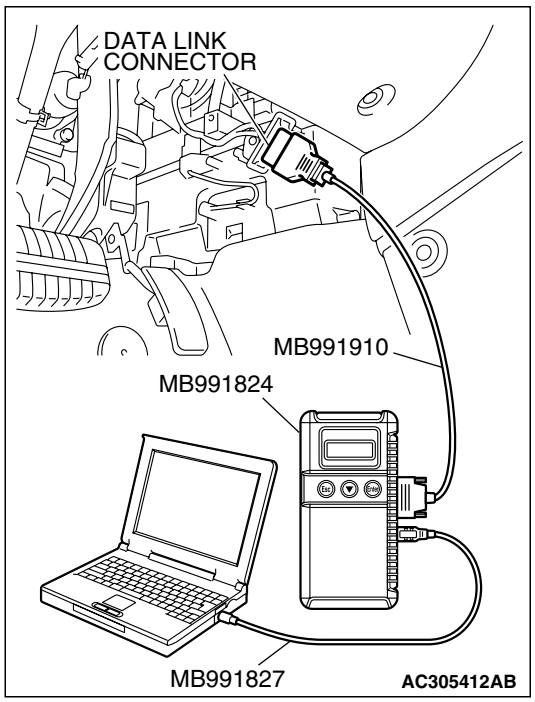
⚠ CAUTION

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 "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result satisfactory?

YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C, Diagnosis – Can Bus Diagnostic Chart P.54C-16).



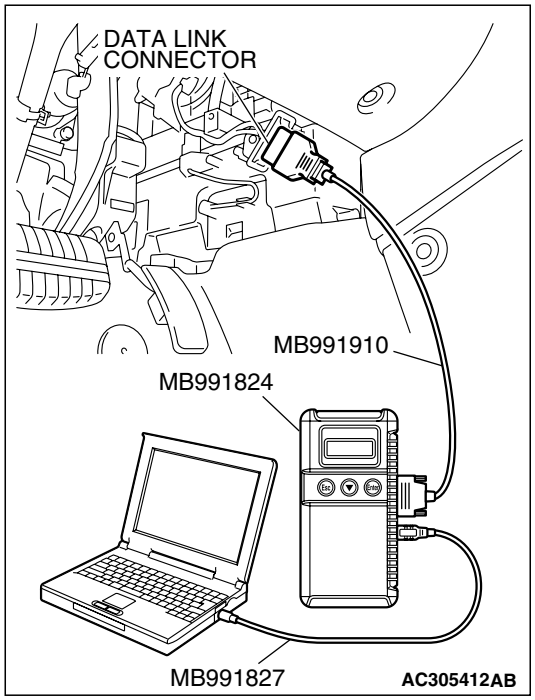
STEP 3. Using scan tool MB991958, read the TPMS diagnostic trouble code.

Check that the TPMS-ECU sets a diagnostic trouble code.

(1) Turn the ignition switch to "ON" position.
(2) Read the diagnostic trouble code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC set?

YES : Replace the TPMS receiver.
NO : Go to Step 4.



STEP 4. Recheck for diagnostic trouble code.

Replace the TPMS receiver, and then check that the diagnostic trouble code is not reset.

(1) Turn the ignition switch to "ON" position.
(2) Erase the diagnostic trouble code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to "ON" position.
(5) Check if the diagnostic trouble code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result normally?

YES : A poor connection, open circuit or other intermittent malfunction is present in the lines between the TPMS receiver and the powertrain control module (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent MalfunctionP.00-14).

NO : Replace the powertrain control module.

DTC C1910/C1920/C1930/C1940: TPMS Transmitter Abnormality (Transmitter Battery Voltage)

TPMS DTC SET CONDITION

DTC C1910, C1920, C1930 or C1940 is set if the battery in the TPMS transmitter is discharged. At the same time this DTC is set, the TPMS warning light flashes.

TROUBLESHOOTING HINT

Replace the TPMS transmitter if its battery is discharged.

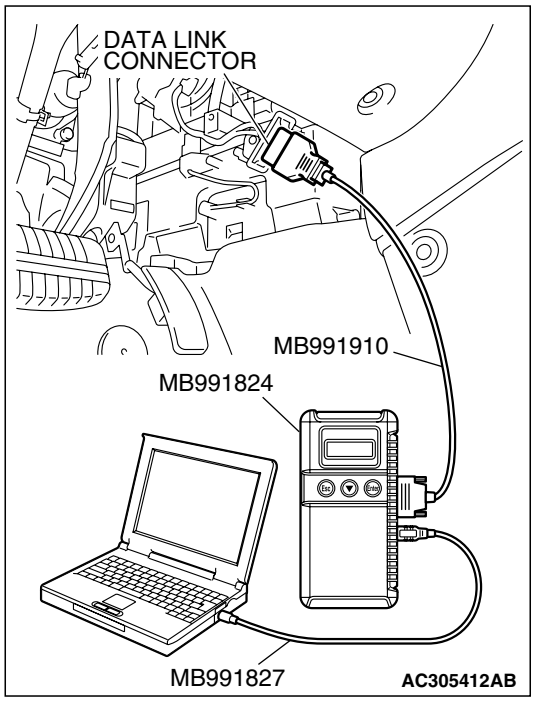
NOTE: The battery cannot be removed from the TPMS transmitter. Nominal service life of the battery is 10 years or 160,000 km (100,000 miles).

DIAGNOSIS

NOTE: To help determine which TPMS transmitter is defective, make a note of the tire pressure sensor ID, which the DTC indicates, prior to the troubleshooting.

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Execute "Tire Pressure Sensor Check" on scan tool MB991958 "Special Function."

⚠ 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) Execute "Tire Pressure Sensor Check" for all the TPMS transmitter-fitted tires (Refer to P.31-59).

Q: Is information on the tire pressure sensor displayed on scan tool MB991958 after the TPMS transmitter is activated?

YES : Determine which TPMS transmitter is defective by using scan tool MB991958, and replace its TPMS transmitter. Then execute "Tire Pressure Sensor ID Registration" (Refer to P.31-57). And then go to Step 2.

NO : Replace the TPMS transmitter, which is not activated. Then execute "Tire Pressure Sensor ID Registration" (Refer to P.31-57). Then go to Step 2. (If the TPMS transmitter is not activated and no data is displayed, the TPMS transmitter battery is completely flat).

STEP 2. Recheck for the diagnostic trouble code.

Q: Does diagnostic trouble code C1910, C1920, C1930 or C1940 reset?

YES : Repeat the troubleshooting from Step 1.
NO : The procedure is complete.

DTC C1911/C1921/C1931/C1941: TPMS Transmitter Abnormality (Tire Pressure Sensor ID Reception Failure)

CIRCUIT OPERATION
The TPMS receiver receives data from the TPMS transmitters through the TPMS antenna.

TPMS DTC SET CONDITION
DTC C1911, C1921, C1931 or C1941 is set if the TPMS receiver cannot receive data from the TPMS transmitters normally, even when the tire pressure sensor IDs have been registered. At the same time this DTC is set, the TPMS warning light flashes.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS DTC TO SET ARE:)
- Installing a tire/wheel that does not contain the TPMS transmitter
- Tire pressure sensor ID is not registered yet
- Damaged feeder cable or connector
- Malfunction of the TPMS transmitter
- Malfunction of the TPMS receiver

TSB Revision

DIAGNOSIS

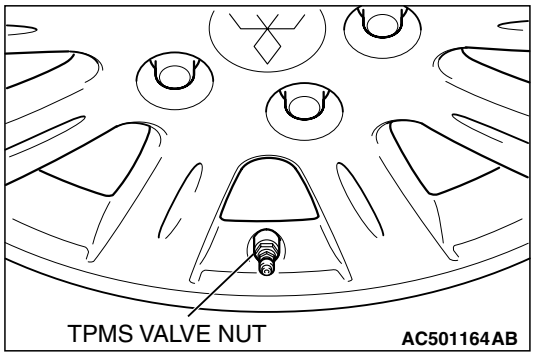
NOTE: To help determine which TPMS transmitter is defective, make a note of the tire pressure sensor ID and tire number, which the DTC indicates, prior to the troubleshooting. Also execute "Tire Pressure Sensor ID Check" or "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function", and make a note for the registered tire pressure sensor IDs.

NOTE: Before troubleshooting, be sure to execute "Tire Pressure Sensor ID Registration".

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Visually check whether the wheels contain the TPMS transmitter.

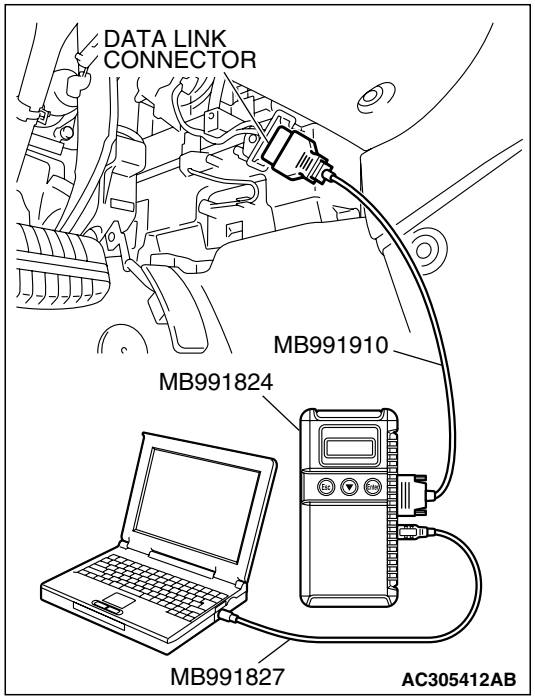


On TPMS transmitter-fitted tires, the TPMS transmitter is secured using a valve nut. Check for the valve nut.

Q: Are the wheels fitted with the TPMS transmitter?

YES : Go to Step 2.

NO : Install a TPMS transmitter-fitted wheel. Then execute "Tire Pressure Sensor ID Registration" (Refer to P.31-57). Then go to Step 6.



STEP 2. Check each tire pressure sensor ID by executing "Tire Pressure Sensor Check" on scan tool MB991958 "Special Function."

⚠ 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) Execute "Tire Pressure Sensor Check" for all the TPMS transmitter-fitted tires to check each tire pressure sensor ID (Refer to P.31-59).

Q: Is the tire pressure sensor ID, which DTC indicates, shown on the scan tool?

YES : Data can be received from the TPMS transmitters normally. Therefore, it is judged that the DTC is set due to a defective TPMS transmitter driving G sensor. Replace the TPMS transmitter of the road wheel, which the DTC indicates (Refer to P.31-62). Then go to Step 3.

NO <when the recognized tire pressure sensor ID does not correspond to the registered one> : Execute "Tire Pressure Sensor ID Registration" (Refer to P.31-57). Then go to Step 6.

NO <when one (or more) of the tire pressure sensor IDs cannot be recognized> : Replace the relevant TPMS transmitter (Refer to P.31-62). Then go to Step 3.

STEP 3. Execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function."

Q: Is the "Tire Pressure Sensor ID Registration" complete (Have the tire pressure sensor IDs been registered)?

YES : Go to Step 6.

NO <none of the tire pressure sensor IDs can be recognized> : Replace the TPMS receiver (Refer to P.31-61). Then go to Step 4.

STEP 4. Execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function."

Q: Is the "Tire Pressure Sensor ID Registration" complete?

YES : Go to Step 6.

NO : Replace the TPMS receiver (Refer to P.31-61). Then go to Step 5.

STEP 5. Execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function."

Q: Is the "Tire Pressure Sensor ID Registration" complete?

YES : Go to Step 6.

NO : Repeat the troubleshooting from Step 1.

TSB Revision

STEP 6. Recheck for diagnostic trouble code.

Q: Does diagnostic trouble code C1911, C1921, C1931 or C1941 reset?

YES : Repeat the troubleshooting from Step 1.
NO : The procedure is complete.

DTC C1912/C1922/C1932/C1942: TPMS Transmitter Abnormality (Tire Air Pressure Low)

TPMS DTC SET CONDITION

DTC C1912, C1922, C1932 or C1942 is set when the TPMS receiver recognized a low tire pressure from one or more of the TPMS transmitters. At the same time this DTC is set, the TPMS warning light illuminates.

TIRE PRESSURE THRESHOLD VALUES

ITEM	TIRE PRESSURE kPa (psi)
Standard pressure at cold (reference)	220 (32)
Alarm ON pressure	174 (25) or less
Alarm OFF pressure	190 (28) or more

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

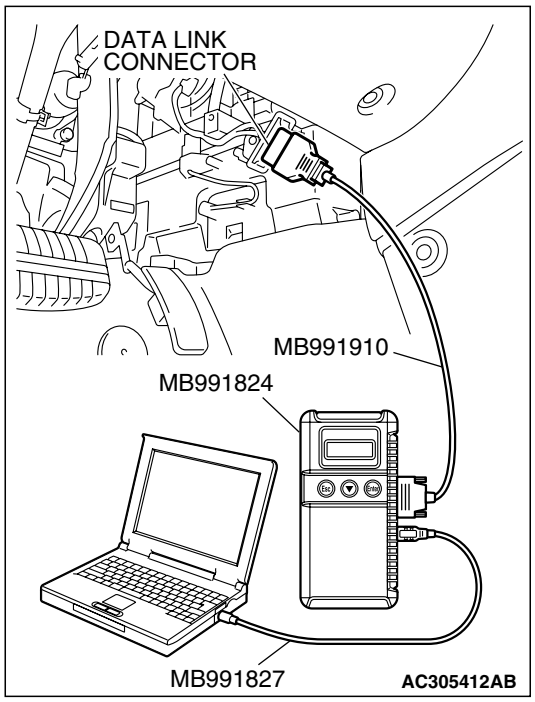
- Low tire inflation pressure
- Punctured tire
- Damaged tire valve grommet and/or valve core
- Defective TPMS transmitter
- Malfunction of the TPMS receiver

DIAGNOSIS

NOTE: Prior to performing troubleshooting for DTC C1912, C1922, C1932 or C1942, first carry out "TPMS Inspection Procedure No.1: The TPMS Warning Light Stays On" (Refer to P.31-27). If the troubleshooting is not complete and DTC C1912, C1922, C1932 or C1942 is set, carry out troubleshooting as described below.

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Use a tire pressure gauge to measure the tire inflation pressure of the TPMS transmitter-fitted tires. Then execute "Tire Pressure Sensor Check" on scan tool MB991958 "Special Function."

(1) Use an accurate tire pressure gauge to measure the tire inflation pressure of the TPMS transmitter-fitted tires, and note the inflation pressures.

⚠ 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.

(2) Connect scan tool MB991958 to the data link connector.
(3) Turn the ignition switch to the "ON" position.
(4) Execute "Tire Pressure Sensor Check" for all the TPMS transmitter-fitted tires (Refer to P.31-59).

Q: Is the tire inflation pressure shown on scan tool MB991958 within ± 10 kPa (1.5 psi) from the actual inflation pressure? <Ambient temperature during measurement must be 0 – 50°C (32 – 122°F)>

YES : Adjust the tire inflation pressures to the value specified on the tire pressure label. Then execute "Tire Pressure Sensor Check" on scan tool MB991958 "Special Function" (Refer to P.31-59) to update the tire inflation pressure data on scan tool MB991958. Make sure that the pressures displayed on scan tool MB991958 correspond to the value specified on the tire pressure label. Then go to Step 2.

NO : Replace the TPMS transmitter, where the tire pressure sensor is inaccurate. Then execute "Tire Pressure Sensor ID Registration" (Refer to P.31-57). Then go to Step 3.

STEP 2. Recheck for the diagnostic trouble code.

Q: Does diagnostic trouble code C1912, C1922, C1932 or C1942 reset?

YES : Replace the TPMS receiver (Refer to P.31-61). On completion, execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function" (Refer to P.31-57). Then go to Step 3.

NO : The procedure is complete.

STEP 3.Recheck for diagnostic trouble code.

Q: Does diagnostic trouble code C1912, C1922, C1932 or C1942 reset?

YES : Repeat the troubleshooting from Step 1.

NO : The procedure is complete.

TSB Revision

TPMS SYMPTOM CHART

M1311003100047

⚠ CAUTION

During diagnosis, a DTC code associated with another system may be set when the ignition switch is turned to the "ON" position with connector(s) disconnected. when diagnosis is finished, check all systems for DTC codes. If DTC code(s) are set, erase them all.

SYMPTOM	INSPECTION PROCEDURE NO.	REFERENCE PAGE
The TPMS warning light stays on.	1	P.31-27
The TPMS warning light flashes.	2	P.31-33
The TPMS warning light does not illuminate as a bulb check for three seconds when the ignition switch is turned to the "ON" position.	3	P.31-37
In spite of abnormally low tire pressure at a road wheel, the TPMS warning light does not illuminate.	4	P.31-46
Communication between the scan tool and the TPMS is not possible.	5	P.31-50

NOTE: Whenever the TPMS transmitters and/or TPMS receiver are replaced with new ones, the tire pressure sensor IDs must be registered into the TPMS.

NOTE: The use of non-genuine wheels will cause the improper installation of the TPMS transmitters, possibly resulting in air leakage and damage to the TPMS transmitter.

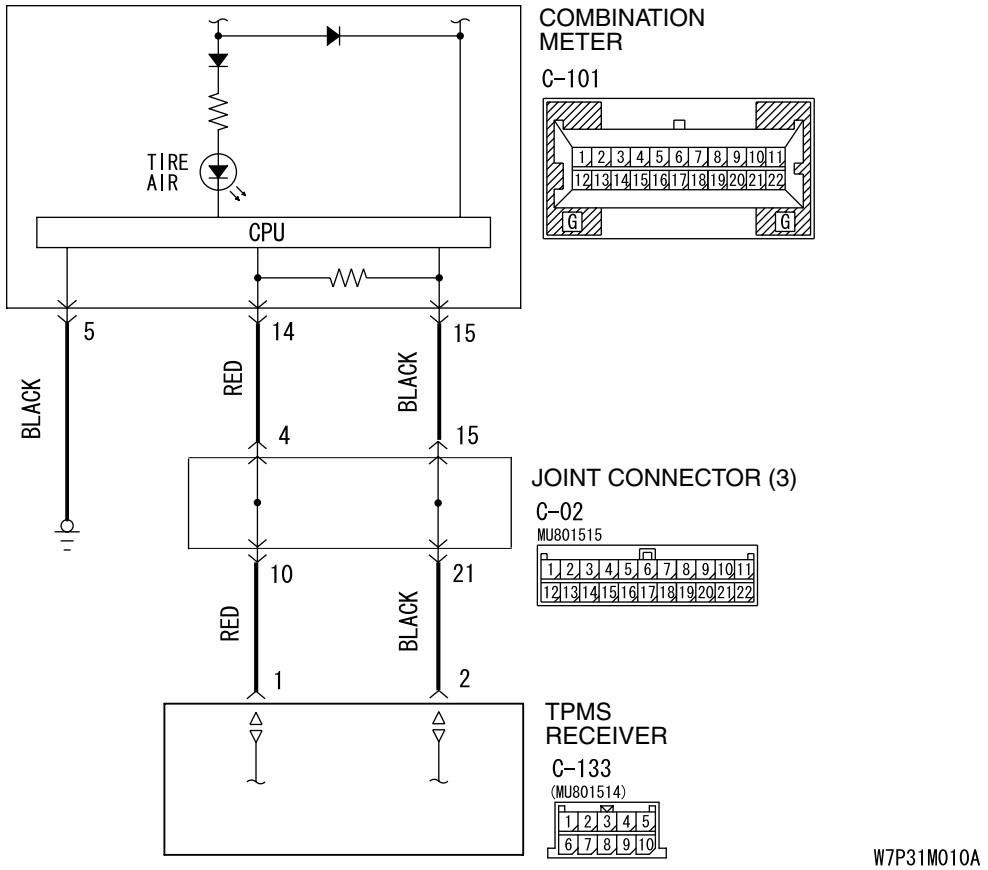
NOTE: TPMS may not work normally in the following circumstances:

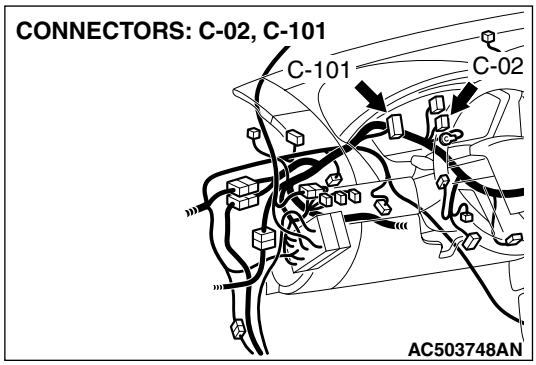
- *A wireless facility or device using the same frequency with the TPMS transmitter is near the vehicle.*
- *Snow or ice is stuck inside the fenders and/or on the wheels.*
- *The TPMS transmitter's battery is discharged.*
- *Wheels other than Mitsubishi genuine wheels are being used.*
- *Wheels that are not fitted with TPMS transmitters are being used.*
- *Wheels whose tire pressure sensor IDs are not registered by the vehicle are being used.*

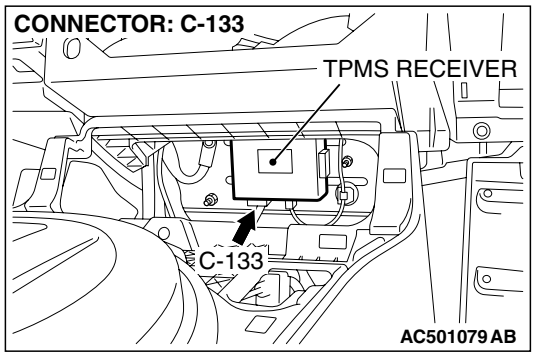
TPMS SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: The TPMS Warning Light Stays On.

TPMS Warning Light Signal Circuit







CIRCUIT OPERATION

- The TPMS warning light will illuminate when the tire inflation pressure of any road wheel is below 174 kPa (25.3 psi).
- Furthermore, the TPMS warning light illuminates for three seconds immediately after the ignition switch is turned to the "ON" position. This is a bulb check of the TPMS warning light.

TSB Revision

TECHNICAL DESCRIPTION (COMMENT)

If the TPMS warning light illuminates for three seconds after the ignition switch is turned to the "ON" position, and does not go out, diagnose the signal circuit of the TPMS warning light as follows (from Step 6).

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)

- Low tire inflation pressure
- Punctured tire
- Damaged tire valve grommet and/or valve core
- Inaccurate tire pressure sensor of the TPMS transmitter
- TPMS warning light signal harness wire shorted to ground
- Malfunction of the combination meter
- Malfunction of the TPMS receiver

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Inspect the all tires.

Visually check road tires for any sign of air leak or puncture.

Q: Are road tires in good condition?

YES : Go to Step 2.

NO : Replace the valve grommet or valve core, or repair the flat tire. Replace the tire if necessary. Then go to Step 2.

STEP 2. After the tire inflation pressure is adjusted and the TPMS transmitter sends inflation pressure information on it, check the TPMS warning light.

(1) Wait until the tires cool down, and adjust road tire inflation pressures to the value specified on the tire pressure label.

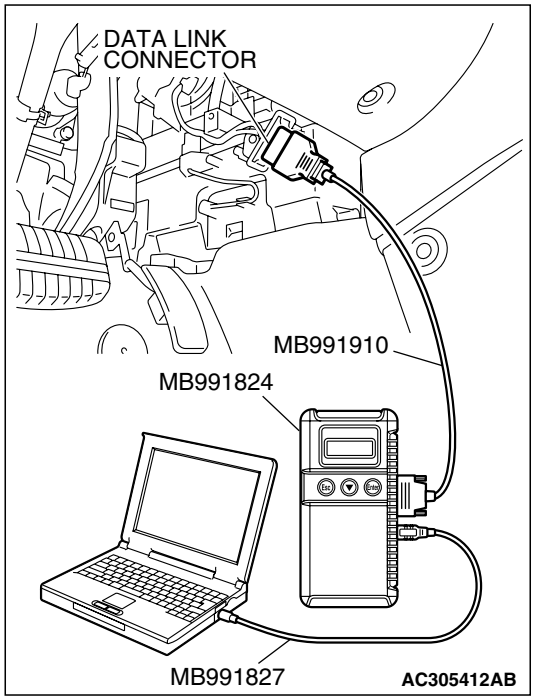
⚠ CAUTION

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

(2) Connect scan tool MB991958 to the data link connector.
(3) Turn the ignition switch to the "ON" position.
(4) Execute "Tire Pressure Sensor Check" on scan tool MB991958 "Special Function" (Refer to P.31-59).
(5) Check the TPMS warning light.

Q: Is the TPMS warning light turned off?

YES : The procedure is complete.
NO : Go to Step 3.



STEP 3. Check the tire inflation pressure again.

Use a tire pressure gauge to check that road tire inflation pressures meet the value specified on the tire pressure label.

Q: Are road tires in good condition?

YES : Go to Step 4.
NO : Replace the valve grommet or valve core, or repair the damaged tire. Replace the tire if necessary. Then return to Step 2.

STEP 4. Check the TPMS warning light.

Turn the ignition switch to the "ON" position. The TPMS warning light should illuminate for three seconds, and then go out momentarily.

NOTE: If the TPMS warning light goes out momentarily, the TPMS warning light signal circuit is correct. However, as DTC C1912, C1922, C1932 or C1942 (TPMS transmitter abnormality – Tire air pressure low) has been set, the TPMS warning light illuminated.

Q: Turn the ignition switch to the "ON" position. Does the TPMS warning light illuminate for three seconds, and then go out momentarily?

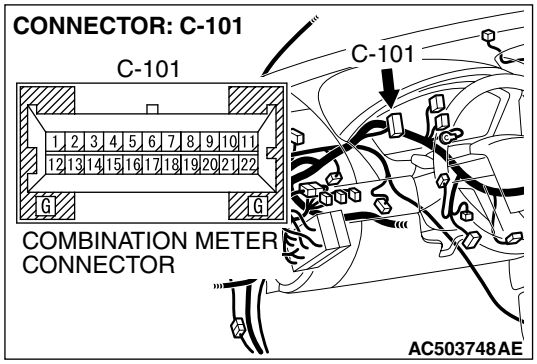
YES : Go to Step 5.
NO : Go to Step 6.

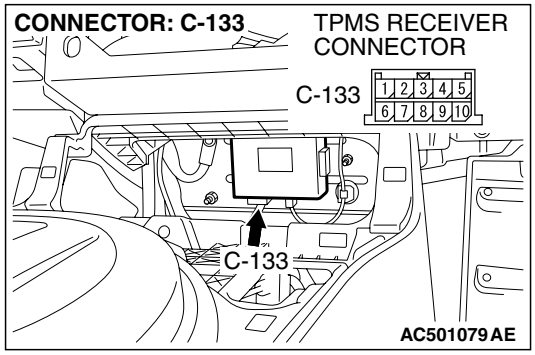
STEP 5. Using scan tool MB991958, read the diagnostic trouble code.

Use scan tool MB991958 to check whether DTC C1912, C1922, C1932 or C1942 (TPMS transmitter abnormality – Tire air pressure low) is set.

Q: Is DTC C1912, C1922, C1932 or C1942 set?

YES : Carry out troubleshooting for DTC C1912/C1922/C1932/C1942 (TPMS transmitter abnormality – Tire air pressure low) (Refer to P.31-24).
NO : Replace the TPMS receiver (Refer to P.31-61) and execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function" (Refer to P.31-57). Then go to Step 9.



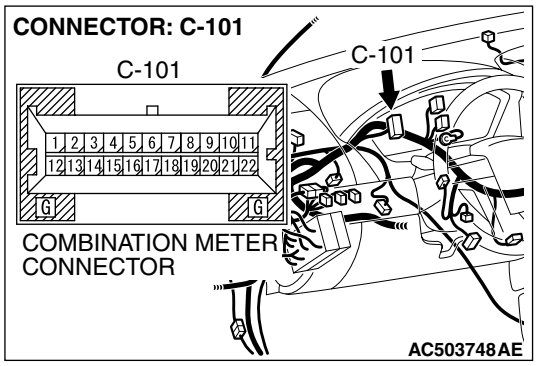


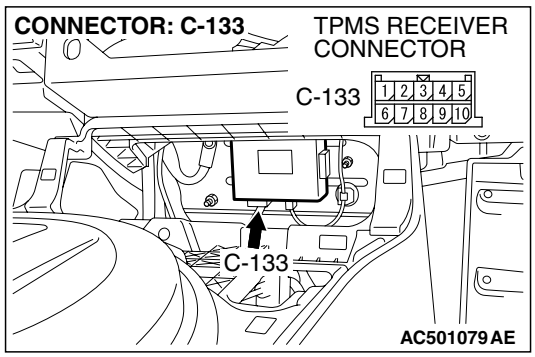
STEP 6. Check TPMS receiver connector C-133 and combination meter connector C-101 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are TPMS receiver connector C-133 and combination meter connector C-101 in good condition?

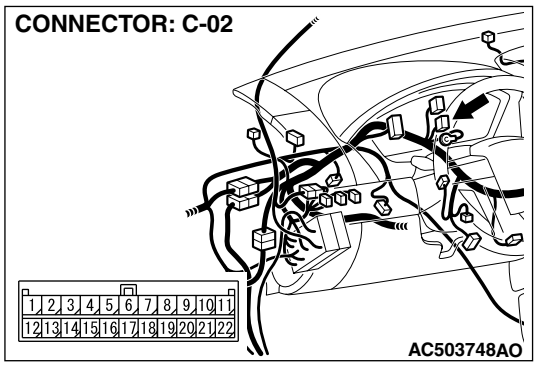
YES : Go to Step 7.

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





STEP 7. Check the wiring harness between TPMS receiver connector C-133 (terminal 1 and 2) and combination meter connector C-101 (terminal 14 and 15).



NOTE: Also check joint connector (3) C-02 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If joint connector (3) C-02 is damaged, repair or replace the connector as described in GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Are the wiring harness TPMS receiver connector C-133 (terminal 1 and 2) and combination meter connector C-101 (terminal 14 and 15) in good condition?

YES : Repair or replace it. Then go to Step 9.
NO : Go to Step 8.

STEP 8. Check the combination meter.

Check that the combination meter warning lights and indicators other than TPMS warning light illuminate normally.

Q: Are there any faults on the combination meter?

YES : Replace the meter assembly (Refer to P.54A-123). Then go to Step 9.
NO : Replace the TPMS receiver (Refer to P.31-61) and execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function" (Refer to P.31-57). Then go to Step 9.

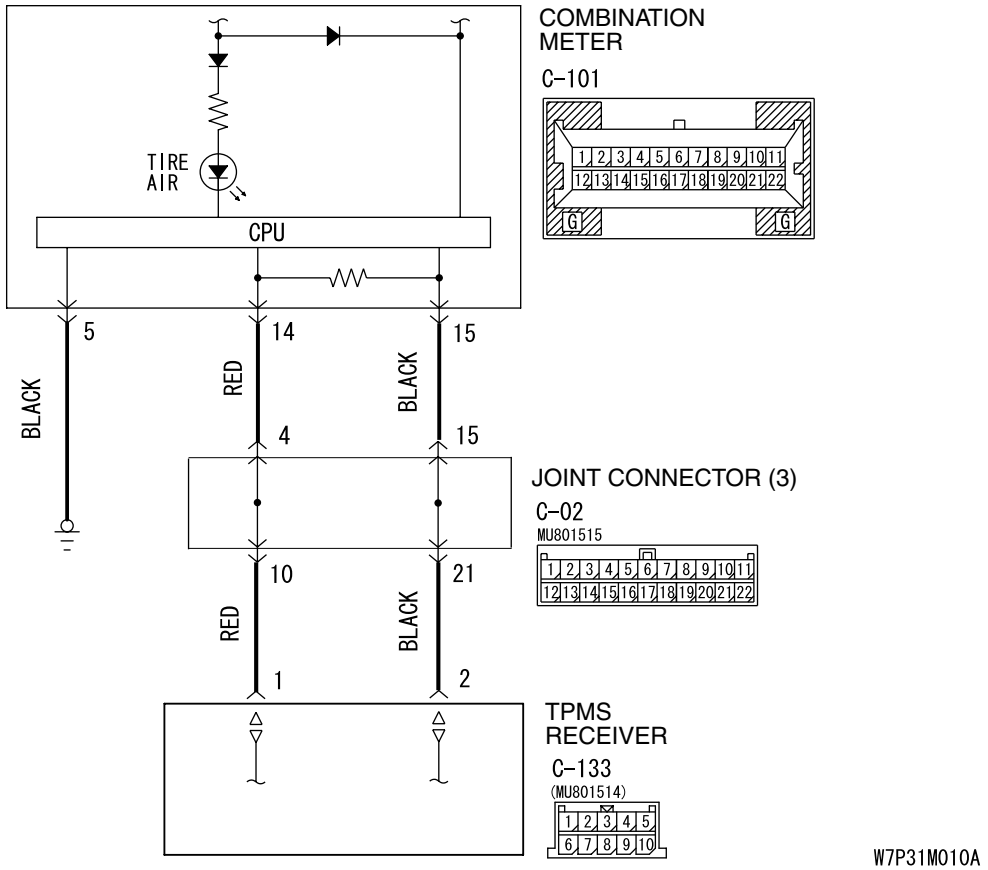
STEP 9. Retest the system.

Q: Turn the ignition switch to the "ON" position. Does the TPMS warning light illuminate for three seconds, and then go out?

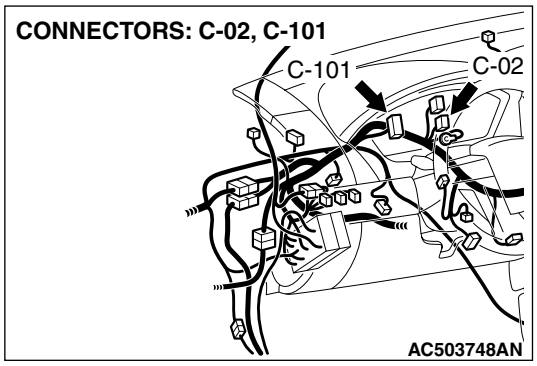
YES : The procedure is complete.
NO : Repeat the troubleshooting from Step 1.

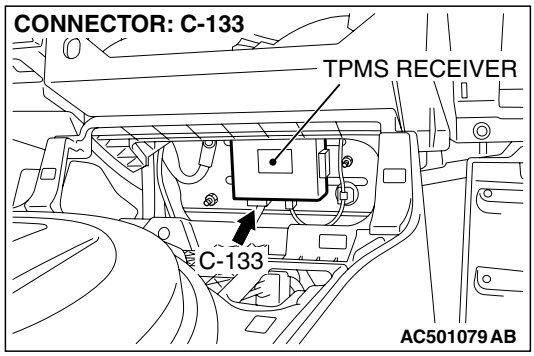
INSPECTION PROCEDURE 2: The TPMS Warning Light Flashes.

TPMS Warning Light Signal Circuit



W7P31M010A
AC601021AB





CIRCUIT OPERATION

- The TPMS warning light will flash when a fault has occurred in the TPMS.
- The TPMS warning light may also flash when a fault has occurred in the TPMS warning light signal circuit (including open circuit and shorted circuit).

TECHNICAL DESCRIPTION (COMMENT)

- If any TPMS DTCs are set, carry out the relevant troubleshooting.
- If no TPMS DTC is set, carry out the trouble-shooting for the TPMS warning light signal circuit.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)

- A fault has occurred in the TPMS.

TSB Revision

- Damaged harness wire or connector in the TPMS warning light signal circuit
- Malfunction of the combination meter
- Malfunction of the TPMS receiver

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code.

⚠ CAUTION

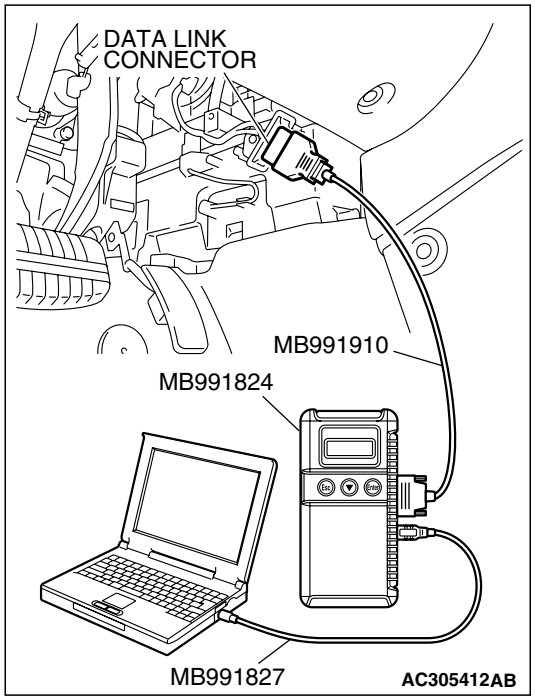
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check whether any TPMS DTC is set.

Q: Is any TPMS DTC set?

YES : Carry out the relevant TPMS troubleshooting (Refer to P.31-14).

NO : Go to Step 2.

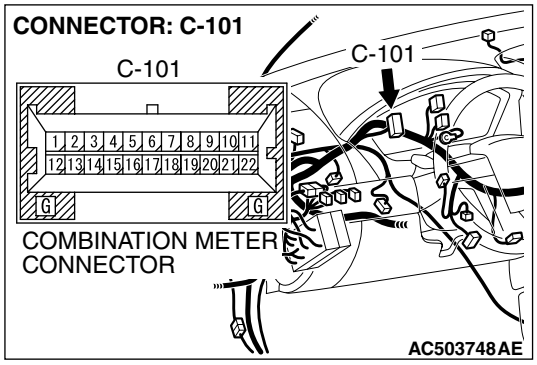


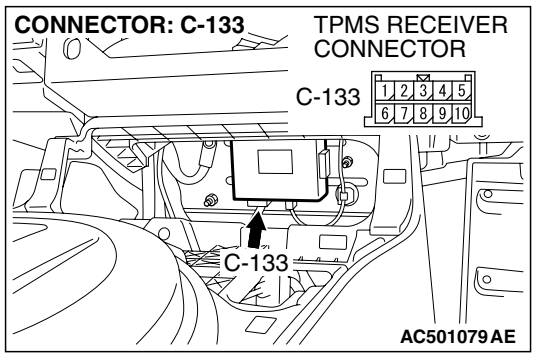
STEP 2. Check TPMS receiver connector C-133 and combination meter connector C-101 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are TPMS receiver connector C-133 and combination meter connector C-101 in good condition?

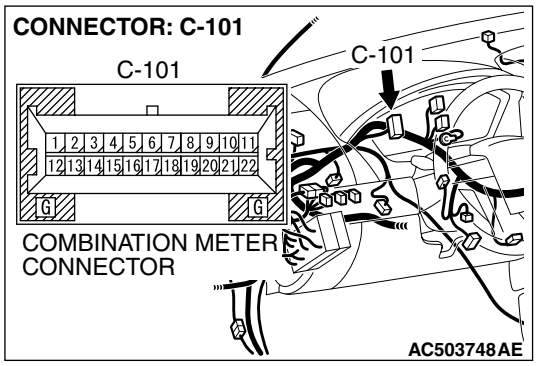
YES : Go to Step 3.

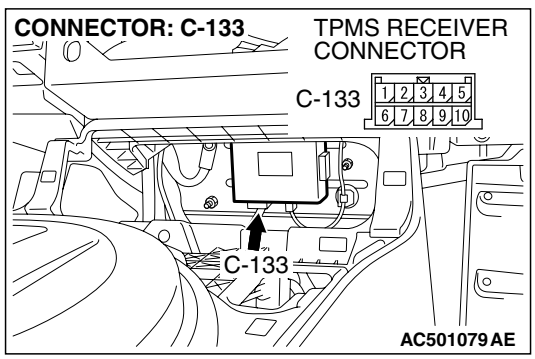
NO : Repair it. Then go to Step 5.

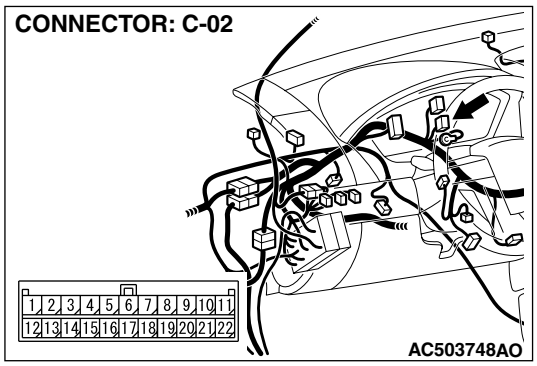




STEP 3. Check the wiring harness between TPMS receiver connector C-133 (terminal 1 and 2) and combination meter connector C-101 (terminal 14 and 15).







NOTE: Also check joint connector (3) C-02 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If joint connector (3) C-02 is damaged, repair or replace the connector as described in GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Are the wiring harness TPMS receiver connector C-133 (terminal 1 and 2) and combination meter connector C-101 (terminal 14 and 15) in good condition?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the combination meter.

Check that the combination meter warning lights and indicators other than TPMS warning light illuminate normally.

Q: Are there any faults on the combination meter?

YES : Replace the combination meter assembly (Refer to P.54A-123). Then go to Step 5.
NO : Replace the TPMS receiver (Refer to P.31-61) and execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function" (Refer to P.31-57). Then go to Step 5.

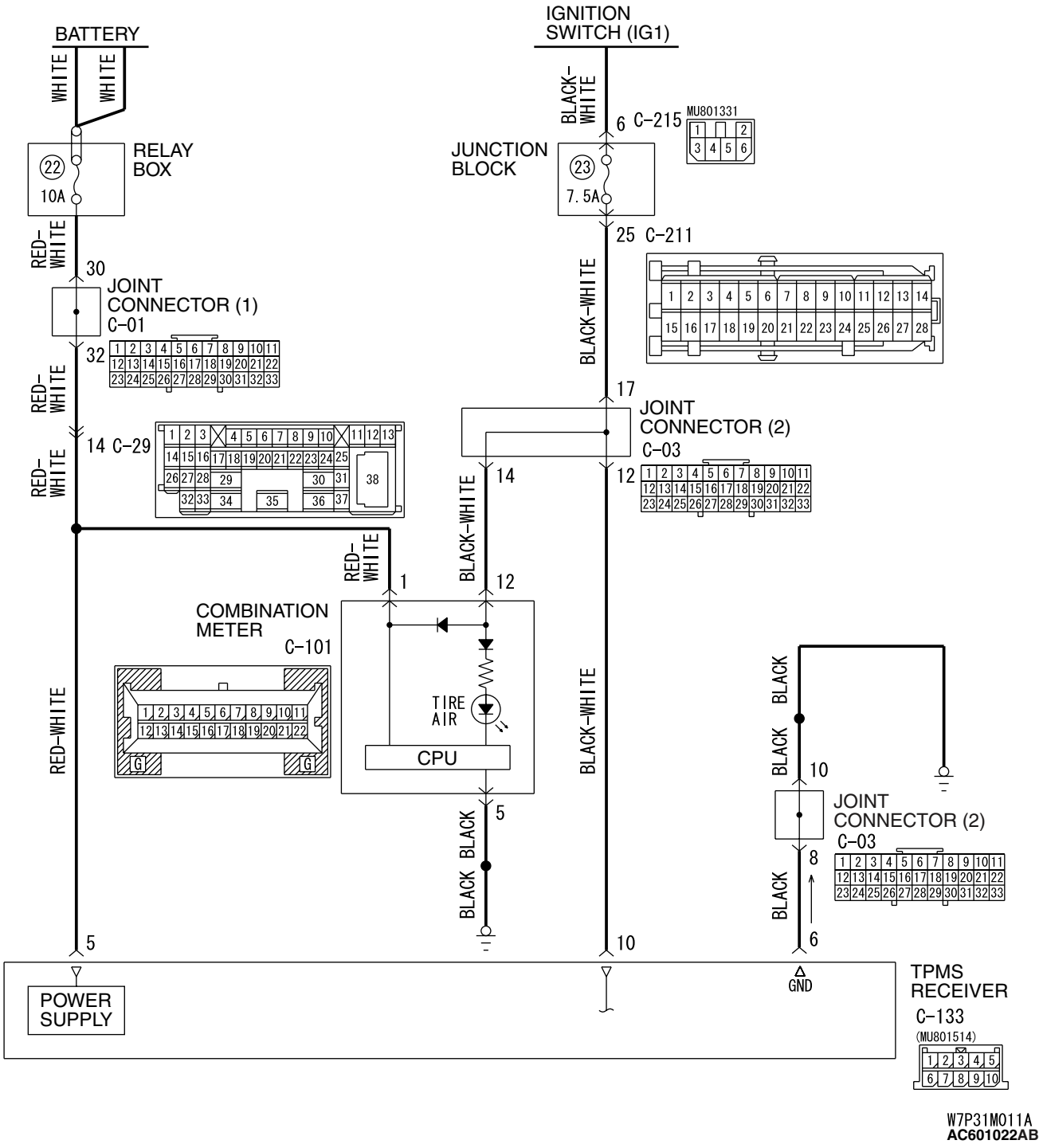
STEP 5. Retest the system.

Q: Turn the ignition switch to the "ON" position. Does the TPMS warning light illuminate for three seconds, and then go out?

YES : The procedure is complete.
NO : Repeat the troubleshooting from Step 1.

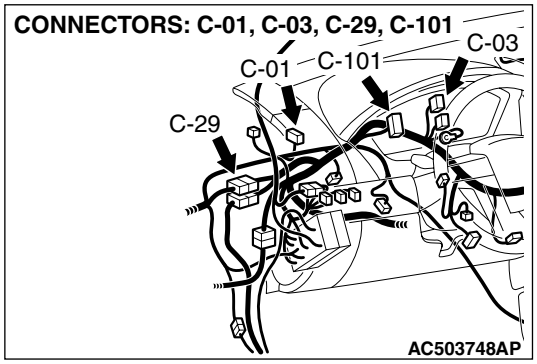
INSPECTION PROCEDURE 3: The TPMS Warning Light does not Illuminate as a Bulb Check for Three Seconds when the Ignition Switch is Turned to the "ON" Position.

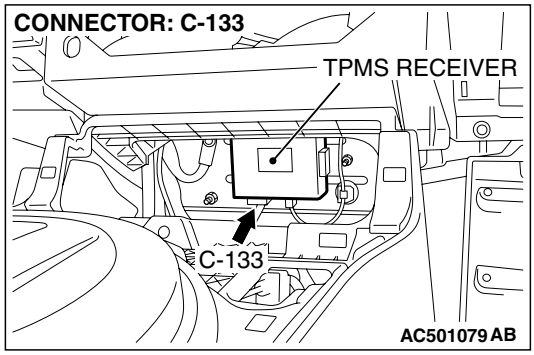
TPMS Receiver Power Supply and Ground, Ignition Signal Input and TPMS Warning Light Circuit

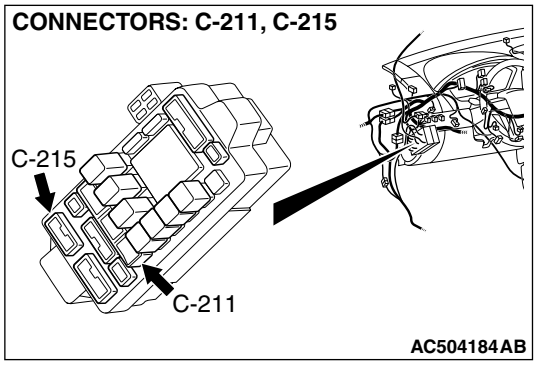


W7P31M011A
AC601022AB

TSB Revision







CIRCUIT OPERATION

For three seconds after the ignition switch is turned to the "ON" position, the TPMS receiver illuminates the TPMS warning light to check any breaks in the TPMS warning light circuit.

TECHNICAL DESCRIPTION (COMMENT)

If the TPMS warning light does not illuminate for three seconds when the ignition switch is turned to the "ON" position, diagnose the TPMS warning light signal circuit, power supply to the TPMS receiver, ignition signal, and/or ground circuit.

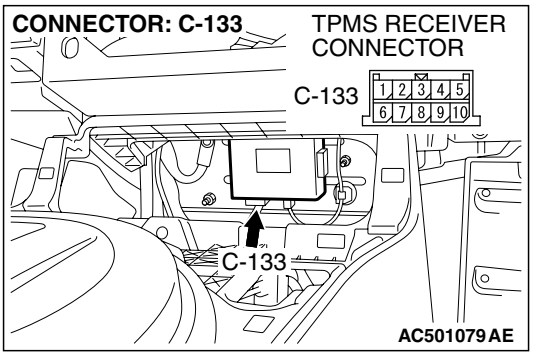
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)

- TPMS warning light signal harness wire open circuit
- Ignition signal harness wire of the TPMS receiver or battery power supply harness wire open circuit
- Ground harness wire of the TPMS receiver open circuit
- Malfunction of the combination meter
- Malfunction of the TPMS receiver

DIAGNOSIS

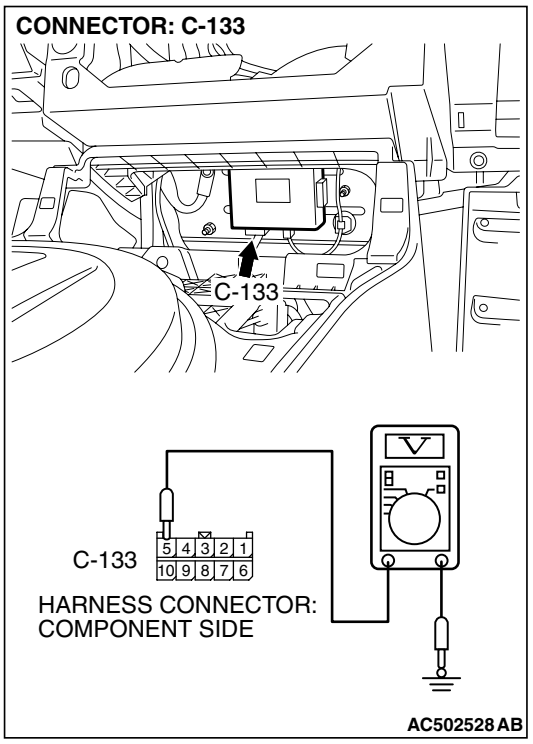
Required Special Tool:

- MB991223: Harness Set

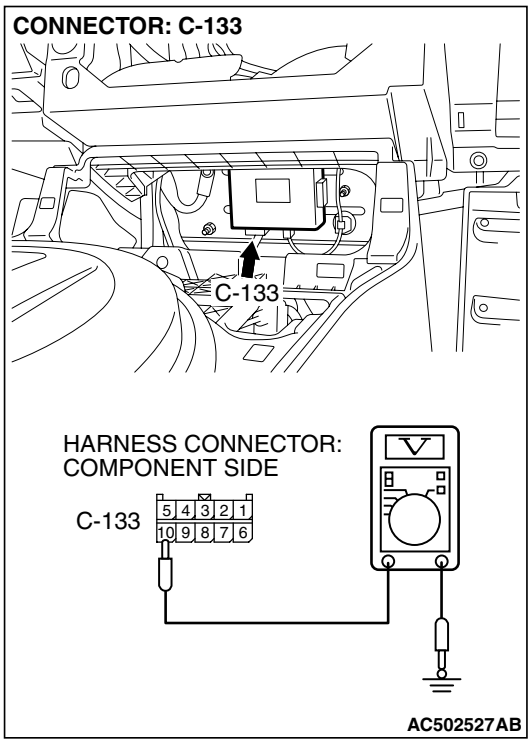


STEP 1. Measure the voltage at C-133 TPMS receiver connector.

(1) Disconnect TPMS receiver connector C-133, and check at the harness connector (component side).



(2) Measure the voltage between terminal 5 and ground. It should measure battery positive voltage (approximately 12 volts).
(3) Turn the ignition switch to the "ON" position.

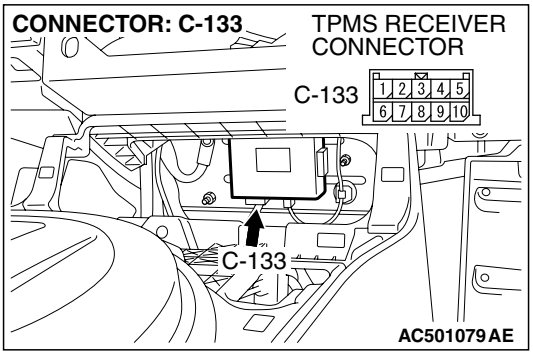


(4) Measure the voltage between terminal 10 and ground. It should measure battery positive voltage (approximately 12 volts).

Q: Is battery positive voltage (approximately 12 volts) present?

YES <all the measured voltages are equivalent to battery positive voltage> : Go to Step 6.
NO <voltage between terminal 5 and ground is not battery positive voltage> : Go to Step 2.
NO <voltage between terminal 10 and ground is not battery positive voltage> : Go to Step 4.

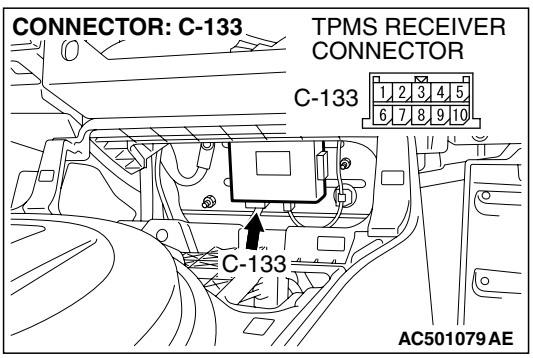
STEP 2. Check TPMS receiver connector C-133 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

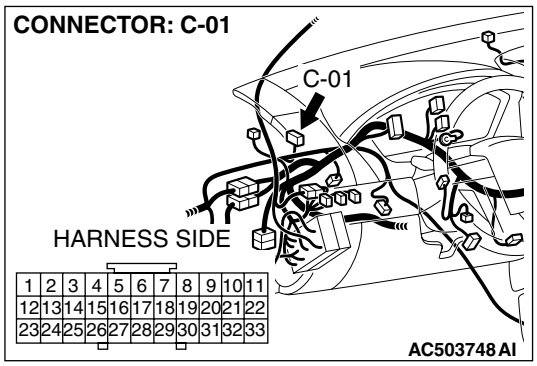


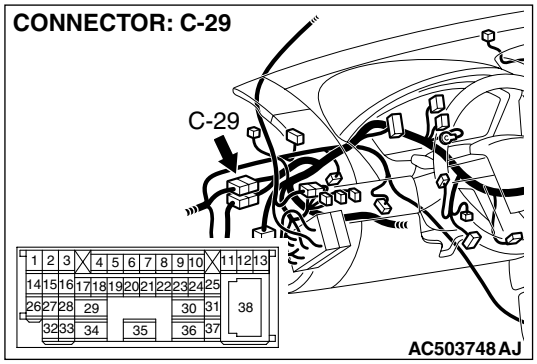
Q: Is the TPMS receiver connector C-133 in good condition?

YES : Go to Step 3.
NO : Repair it. Then go to Step 12.

STEP 3. Check the wiring harness between TPMS receiver connector C-133 (terminal 5) and the battery.





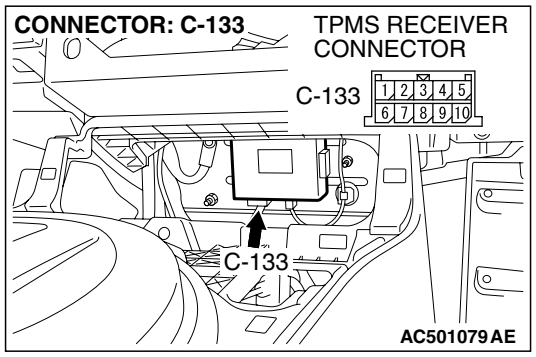


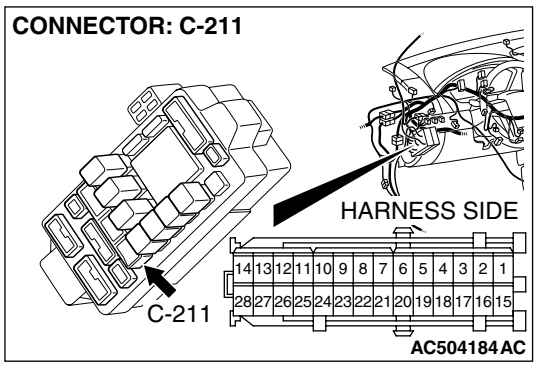
NOTE: Also check intermediate connector C-29 and joint connector C-01 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If intermediate connector C-29 and joint connector C-01 is damaged, repair or replace the connector as described in GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is the wiring harness between TPMS receiver connector C-133 (terminal 5) and the battery in good condition?

YES : Repair or replace it. Then go to Step 12.
NO : Repeat the troubleshooting from Step 1.

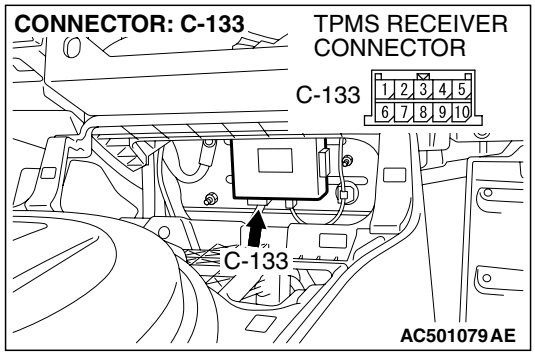
STEP 4. Check TPMS receiver connector C-133 and junction block connector C-211 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

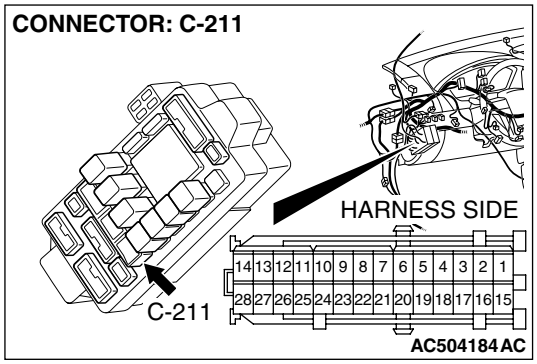




Q: Are TPMS receiver connector C-133 and junction block connector C-211 in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 12.



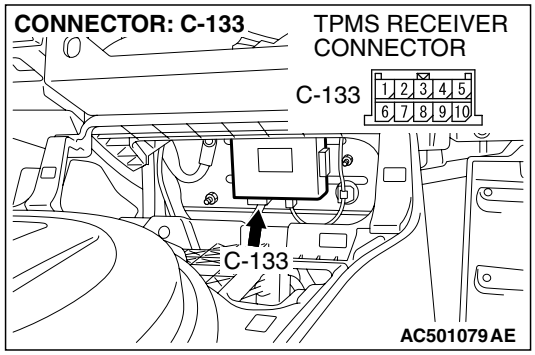


STEP 5. Check the wiring harness between TPMS receiver connector C-133 (terminal 10) and junction block connector C-211 (terminal 25).

Q: Is the wiring harness between TPMS receiver connector C-133 (terminal 10) and junction block connector C-211 (terminal 25) in good condition?

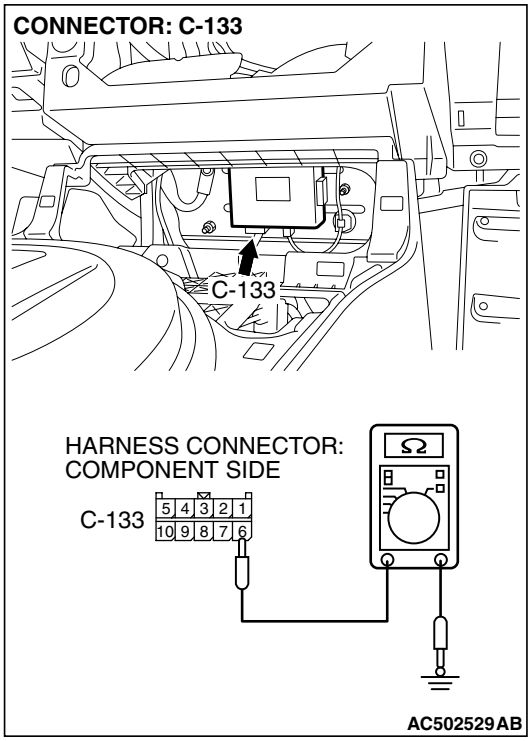
YES : Repair or replace it. Then go to Step 12.

NO : Repeat the troubleshooting from Step 1.



STEP 6. Check the wiring harness for open circuit.

(1) Disconnect TPMS receiver connector C-133, and measure the resistance at the harness side.



(2) Measure the resistance between terminal 6 and ground.

OK: Less than 2 ohms

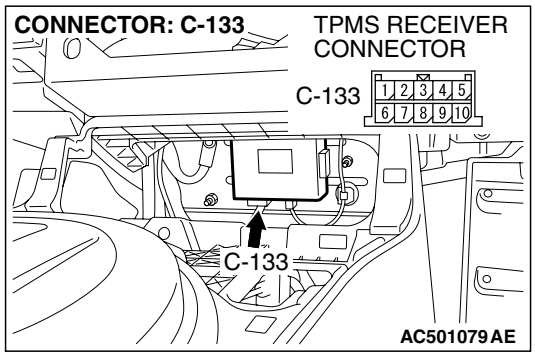
Q: Is the check result normal?

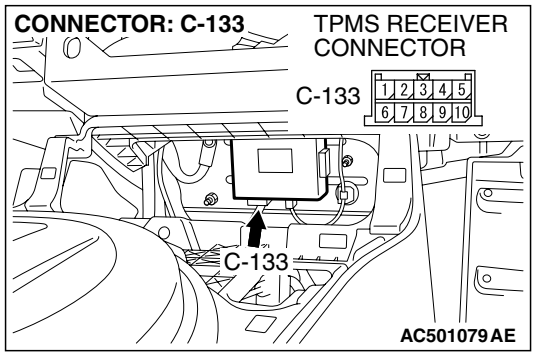
YES : Go to Step 9.
NO : Go to Step 7.

STEP 7. Check TPMS receiver connector C-133 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is TPMS receiver connector C-133 in good condition?

YES : Go to Step 8.
NO : Repair it. Then go to Step 12.



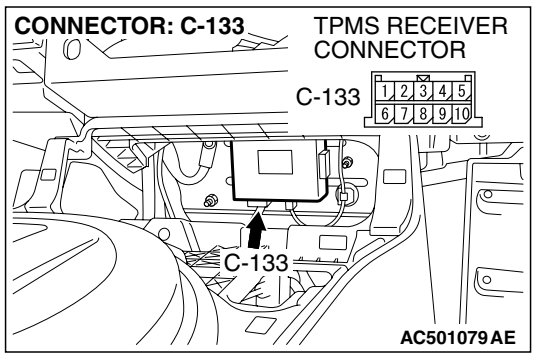


STEP 8. Check the wiring harness between TPMS receiver connector C-133 (terminal 6) and ground.

Q: Is the wiring harness between TPMS receiver connector C-133 (terminal 6) and ground in good condition?

YES : Repair or replace it. Then go to Step 12.

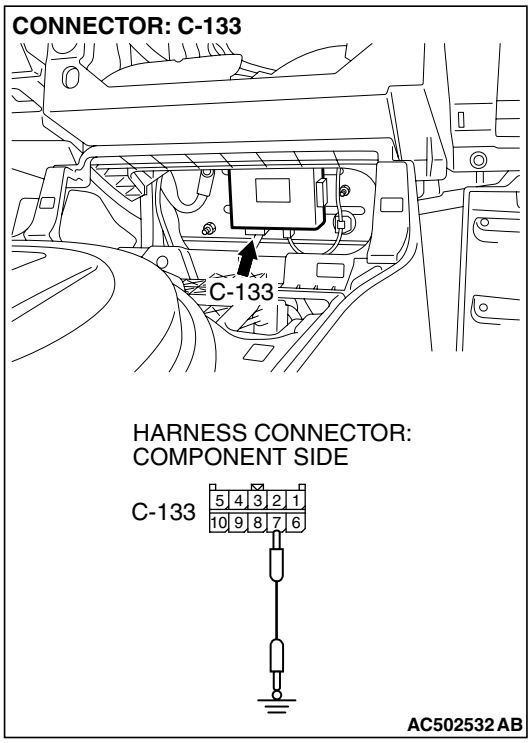
NO : Return to Step 6.



STEP 9. Check the TPMS warning light circuit at TPMS receiver connector C-133.

(1) Disconnect TPMS receiver connector C-133.

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

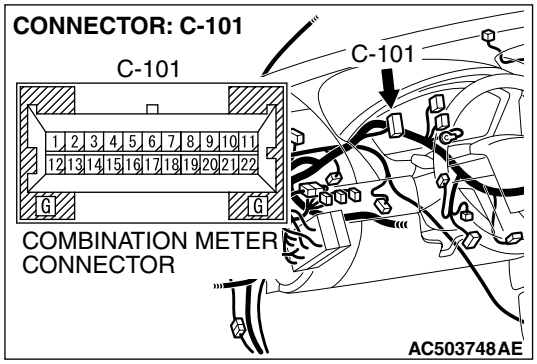


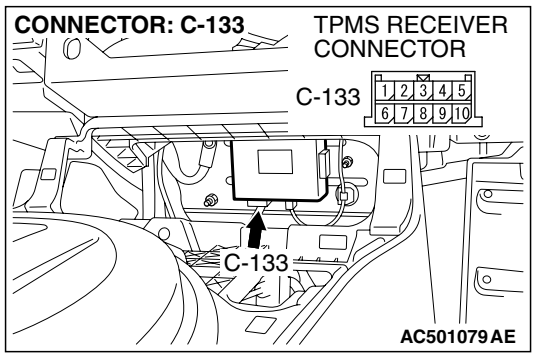
(3) Terminal 10 of disconnected connector C-133 from the TPMS receiver. The TPMS warning light should illuminate.

Q: Does the TPMS warning light illuminate?

YES : Replace the TPMS receiver (Refer to P.31-61) and execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function" (Refer to P.31-57). Then go to Step 12.

NO : Go to Step 10.



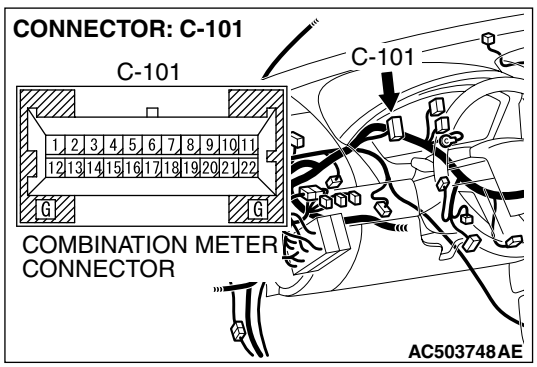


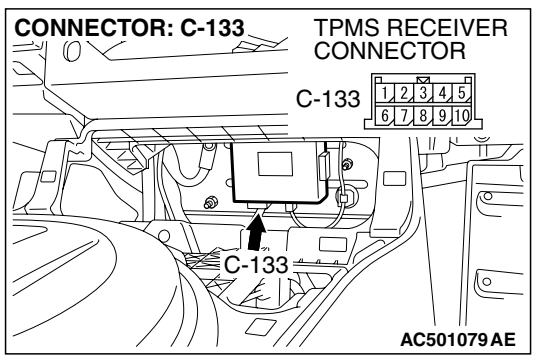
STEP 10. Check TPMS receiver connector C-133 and combination meter connector C-101 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are TPMS receiver connector C-133 and combination meter connector C-101 in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 12.





STEP 11. Check the wiring harness between TPMS receiver connector C-133 (terminal 10) and combination meter connector C-101 (terminal 12).

Q: Is the wiring harness between TPMS receiver connector C-133 (terminal 10) and combination meter connector C-101 (terminal 12) in good condition?

YES : Repair or replace it. Then go to Step 12.

NO : Replace the combination meter assembly (Refer to P.54A-123). Then go to Step 12.

STEP 12. Retest the system.

Q: Turn the ignition switch to the "ON" position. Does the TPMS warning light illuminate for three seconds, and then go out?

YES : The procedure is complete.
NO : Repeat the troubleshooting from Step 1.

INSPECTION PROCEDURE 4: In Spite of Abnormally Low Tire Pressure at a Road Wheel, the TPMS Warning Light does not Illuminate.

SYSTEM OPERATION
The TPMS warning light will illuminate when the ignition switch is turned to the "ON" position if tire pressure of any road wheel is low.

TECHNICAL DESCRIPTION (COMMENT)
- The TPMS may not detect a failure if the TPMS transmitter does not send timely information or there is any interference with the antenna.
- The tire pressure sensor or driving G sensor inside the TPMS transmitter may be inaccurate or defective. In this case, the TPMS may not detect a failure.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)
- The TPMS transmitter does not send timely information or there is any interference with the antenna.
- Damaged harness wire or connector
- Malfunction of the combination meter
- Malfunction of the TPMS transmitter
- Malfunction of the TPMS receiver

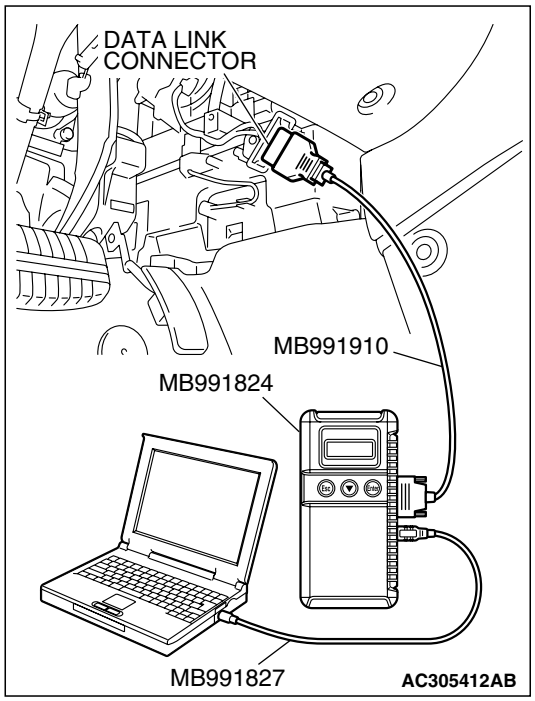
DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Check the TPMS warning light.
Check whether the TPMS warning light illuminates for three seconds after the ignition switch is turned to the "ON" position.

Q: Does the TPMS warning light illuminate for three seconds?

YES : Check that the TPMS warning light illuminates for three seconds and then go out. Then go to Step 2.
NO : Go to TPMS Inspection Procedure No.3 "The TPMS Warning Light does not Illuminate as a Bulb Check for Three Seconds when the Ignition Switch is Turned to the "ON" Position" (Refer to P.31-37).



STEP 2. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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) Check whether DTC C1912, C1922, C1932 or C1942 (TPMS transmitter abnormality – Tire air pressure low) is set.

NOTE: If DTC C1912, C1922, C1932 or C1942 is set, the TPMS receiver is defective. In Step 1, the TPMS warning light illuminated for three seconds and then went out. However, the DTC is set. This means that a contradiction has arisen in the receiver operation.

Q: Is DTC C1912, C1922, C1932 or C1942 (TPMS transmitter abnormality – Tire air pressure low) set?

YES : Replace the TPMS receiver (Refer to P.31-61). Then go to Step 10.
NO : Go to Step 3.

STEP 3. Execute "Tire Pressure Sensor ID Check" and "Tire Pressure Sensor Check" on scan tool MB991958 "Special Function."

(1) Execute "Tire Pressure Sensor ID Check" on scan tool MB991958 "Special Function" (Refer to P.31-58), and make a note of all the registered tire pressure sensor IDs.

NOTE: This note is needed when you check the registered IDs.

(2) Execute "Tire Pressure Sensor Check" on scan tool MB991958 "Special Function" for the relevant tire (Refer to P.31-59).
(3) Confirm the tire inflation pressure and tire pressure sensor ID, which are shown on scan tool MB991958 display.

Q: Are the tire inflation pressure and tire pressure sensor ID displayed?

YES : Go to Step 4.
NO : It is judged that the TPMS could not detect abnormal reception due to a defective TPMS transmitter. Replace the relevant TPMS transmitter (Refer to P.31-62). Then go to Step 10.

STEP 4. Check the tire pressure sensor ID, which is shown on scan tool MB991958 display.

Compare the tire pressure sensor ID shown on scan tool MB991958 with the tire pressure sensor ID noted at Step 3.

Q: Is the tire pressure sensor ID shown on scan tool MB991958 the same as the noted ID?

YES : Go to Step 5.
NO : Go to Step 10.

STEP 5. Check the tire pressure, which is shown on scan tool MB991958 display.

Q: Is the shown tire inflation pressure less than the threshold value (174 kPa, 25.3 psi)?

YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Use an accurate tire pressure gauge to measure the relevant tire inflation pressure.

Compare the actually measured value with the value shown on scan tool MB991958 to determine whether the TPMS transmitter pressure sensor is inaccurate.

NOTE: In areas where atmospheric pressure is low (such as high altitude), scan tool MB991958 value will reduce accordingly. This is not a failure. For your reference, the value reduces approximately 3.5 kPa (0.5 psi) for every 305 m (1,000 feet).

Q: Is the tire inflation pressure shown on scan tool MB991958 within ± 10 kPa (1.5 psi) from the actual inflation pressure? <Ambient temperature during measurement must be 0 – 50°C (32 – 122°F)>

YES : The procedure is complete.
NO : Replace the TPMS transmitter of the relevant tire (Refer to P.31-62). Then go to Step 10.

STEP 7. Check the illumination condition of the TPMS warning light.

Turn the ignition switch to the "ON" position. Check that the TPMS warning light illuminates for three seconds, goes out momentarily, and then illuminates again.

Q: Does the TPMS warning light illuminate again?

YES : Go to Step 8.
NO : Go to Step 9.

STEP 8. Check the relevant tire for improper inflation pressure or any other problems, and make necessary repairs. Then drive the vehicle and check if the TPMS warning light comes on.

(1) If the relevant tire has been punctured, repair it. If the valve grommet or valve core is defective, replace it (Refer to P.31-62).
(2) Adjust the relevant tire inflation pressure to the value specified on the tire pressure label.
(3) Drive the vehicle, and check that the TPMS warning light goes out within 10 minutes after the vehicle speed reaches 30 km/h (19 mph).

Q: Does the TPMS warning light go out?

YES : The procedure is complete. (For some reason, the TPMS transmitter could not communicate with the TPMS receiver momentarily).
NO : The driving G sensor of the TPMS transmitter may be defective. Replace the TPMS transmitter of the relevant tire (Refer to P.31-62). Then go to Step 10.

STEP 9. Using scan tool MB991958, read the diagnostic trouble code.

Check whether DTC C1912, C1922, C1932 or C1942 (TPMS transmitter abnormality – Tire air pressure low) is set.

Q: Is DTC C1912, C1922, C1932 or C1942 (TPMS transmitter abnormality – Tire air pressure low) set?

YES : Replace the TPMS receiver (Refer to P.31-61). Then go to Step 10.
NO : Replace the TPMS receiver (Refer to P.31-61). Then go to Step 10.

STEP 10. Tire pressure sensor ID registration and TPMS check

(1) Execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function" when the relevant tire inflation pressure is lower than 154 kPa (22.3 psi) (Refer to P.31-57).
(2) Check whether the TPMS warning light illuminates and DTC C1912, C1922, C1932 or C1942 (TPMS transmitter abnormality – Tire air pressure low) is set.
(3) If the relevant tire has been punctured, repair it. If the valve grommet or valve core is defective, replace it (Refer to P.31-62).
(4) Wait until the tires cool down, and adjust the relevant tire inflation pressure to the value specified on the tire pressure label.
(5) Use a magnet to force the TPMS transmitter to send a signal. The signal sending procedure is the same as executing "Tire Pressure Sensor Check" on scan tool MB991958 "Special Function" (Refer to P.31-59).

NOTE: By forcing the TPMS transmitter to send a signal, the transmitter informs the TPMS receiver of the correct tire inflation pressure. Then the warning light should go off.

(6) Check that the TPMS warning light is off.

Q: Does the TPMS warning light remain off?

YES : The procedure is complete.
NO : Repeat this Step.

INSPECTION PROCEDURE 5: Communication between the Scan Tool and the TPMS is not Possible.

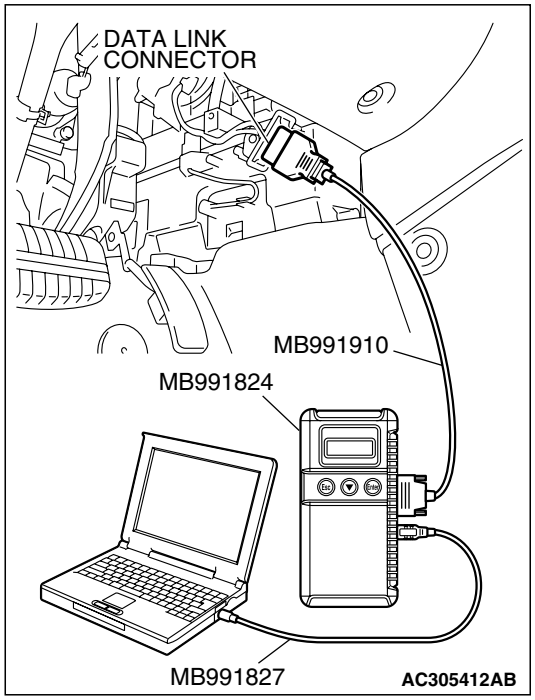
CIRCUIT OPERATION
The TPMS receiver is linked to the data link connector via CAN bus line to communicate with the scan tool.

TECHNICAL DESCRIPTION (COMMENT)
If the system does not communicate with scan tool, power supply to data link connector or CAN bus lines may be defective.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CASE:)
- Malfunction of the TPMS receiver
- The wiring harness or connectors may have loose, corroded, or damaged terminals, or terminals pushed back in the connector.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

Use scan tool MB991958 to diagnose the CAN bus lines.

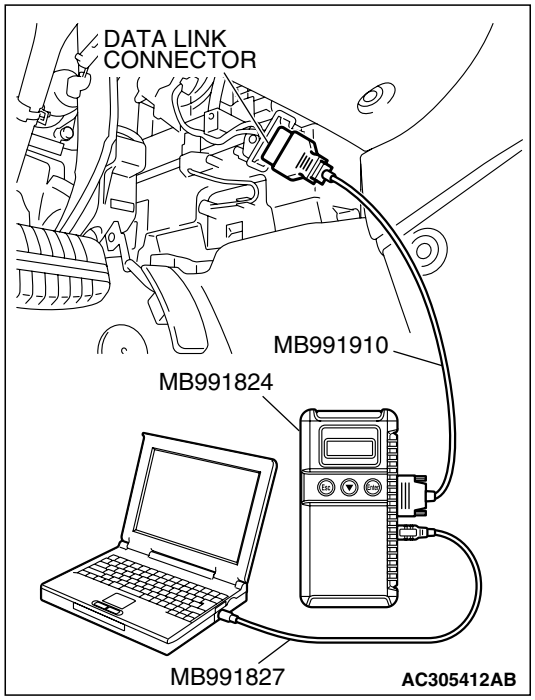
⚠ CAUTION

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 "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result satisfactory?

YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C, Diagnosis – Can Bus Diagnostic Chart P.54C-16).



STEP 2. Check that the TPMS receiver communicates with the scan tool.

(1) Turn the ignition switch to "ON" position.
(2) Check if scan tool MB991958 can communicate with the TPMS receiver.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result satisfactory?

YES : Diagnose the power supply circuit. (Refer to GROUP 54A, Combination meter assembly – Power Supply Circuit P.54A-88).
NO : Replace the TPMS receiver.

TPMS SERVICE DATA LIST

M1311003300074

The following items can be read by the scan tool from the TPMS receiver input data.

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	DISPLAY TEXT OR UNIT
VSS	01	Vehicle speed signal data	Km/h or mph
Air Pressure, Tire 1	02	Air pressure data 1	kPa or in. Hg
Air Pressure, Tire 2	03	Air pressure data 2	kPa or in. Hg
Air Pressure, Tire 3	04	Air pressure data 3	kPa or in. Hg
Air Pressure, Tire 4	05	Air pressure data 4	kPa or in. Hg
Pressure rising threshold level	07	Tire pressure warning threshold level set for pressure rising	kPa or in. Hg
Pressure reducing threshold level	08	Tire pressure warning threshold level set for pressure reduction	kPa or in. Hg
Number of ID (registered)	09	Number of ID codes currently registered	–
Ignition Signal (CAN data)	10	Ignition ON	IG ON/IG OFF
Ignition Signal (port input)	11	Ignition ON	IG ON/IG OFF

TPMS SPECIAL FUNCTION DATA LIST

M1311006300062

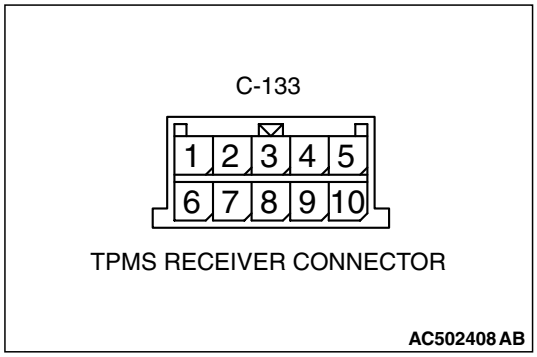
When the TPMS "Special Function" is executed, the TPMS receiver uses the data below.

TPMS SPECIAL FUNCTION DATA LIST

FUNCTION	M.U.T.-III SCAN TOOL DISPLAY	ITEM		DISPLAY TEXT OR UNIT
Tire Pressure Sensor ID Registration	4 tires PRES SNSR ID Registration	4 tires pressure sensor ID registration		–
	–	ID registration flag (tire 1)		OK/ –
	–	ID registration flag (tire 2)		OK/ –
	–	ID registration flag (tire 3)		OK/ –
	–	ID registration flag (tire 4)		OK/ –
Tire Pressure Sensor ID Check	1st	Tire pressure sensor ID	Not checked	FFFFF
			Checked	e.g. 4B9B45
	2nd	Tire pressure sensor ID	Not checked	FFFFF
			Checked	e.g. 4B9B46
	3rd	Tire pressure sensor ID	Not checked	FFFFF
			Checked	e.g. 4B9B47
	4th	Tire pressure sensor ID	Not checked	FFFFF
			Checked	e.g. 4B9B48
Tire Pressure Sensor Check	Tire pressure sensor ID	Tire pressure sensor ID	Not checked	FFFFF
			Checked	e.g. 4B9B45
	Tire Pressure	Tire pressure data		kPa or in. Hg

CHECK AT TPMS RECEIVER

M1311003400060



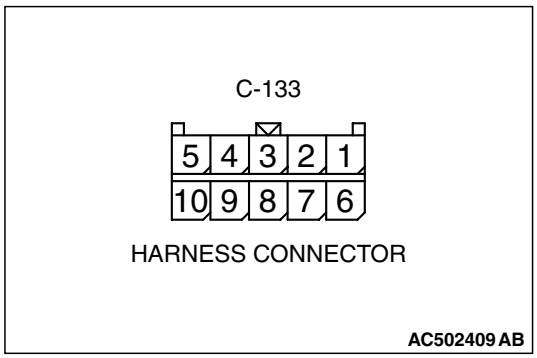
TERMINAL VOLTAGE CHECK CHART

Measure the voltages between terminal 6 (ground terminal) and each respective terminal.

CONNECTOR TERMINAL NO	SIGNAL	CHECKING REQUIREMENT	NORMAL CONDITION
5	TPMS receiver power supply	Always	Battery positive voltage
10	Ignition signal	Ignition switch: "ON"	Battery positive voltage

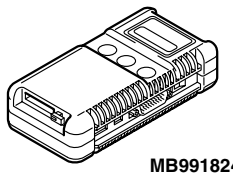
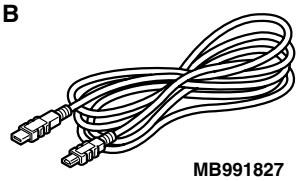
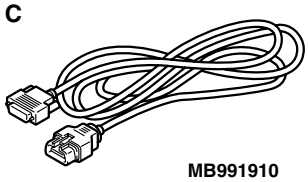
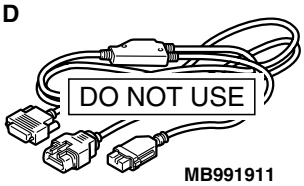
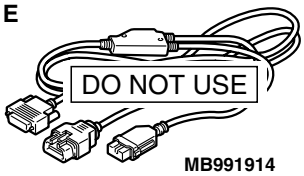
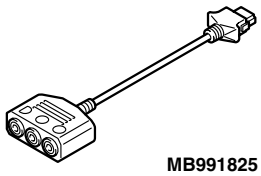
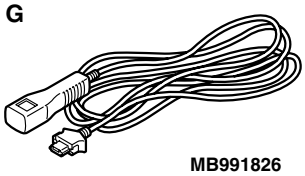
TPMS RECEIVER GROUND CHECK

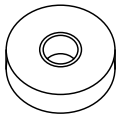
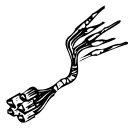
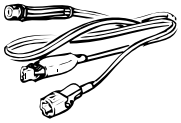
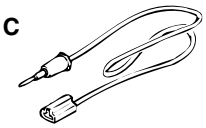
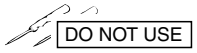
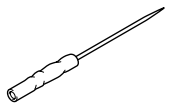
1. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the TPMS receiver connector.
2. Check the resistance and continuity between terminal 6 of the harness connector and body ground. The resistance should measure less than 2 ohms.



SPECIAL TOOLS

M1311000600065

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III sub assembly A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III main harness C (for Daimler Chrysler models only) F: M.U.T.-III measurement adapter G: M.U.T.-III trigger harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III trigger harness is not necessary when pushing V.C.I. ENTER key.*	For communication with TPMS receiver • Diagnostic trouble code reading • Service data reading • Actuator testing • Executing TPMS special function **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 AC308883	–	MIT46716 #8821 (Miller tool) PT30B (Snap-on tool) or general moderately strong magnet	TPMS transmitter data transmission
A  B  C  D  DO NOT USE MB991223AZ	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222 Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	General service tools	Checking the continuity and measuring the voltage at the TPMS receiver harness connector
 MB992006	MB992006 Extra fine probe	General service tool	Making voltage and resistance measurement during troubleshooting

ON-VEHICLE SERVICE

TIRE INFLATION PRESSURE CHECK

M1311000900550

NOTE: For information on tire inflation pressure, refer to the label attached to the center pillar on the driver's side.

NOTE: The TPMS is not a substitute for regular checks of the tire inflation pressure. Be sure to check the tire inflation pressure as usual.

TIRE WEAR CHECK

M1311001000668

Measure the tread depth of the tires.

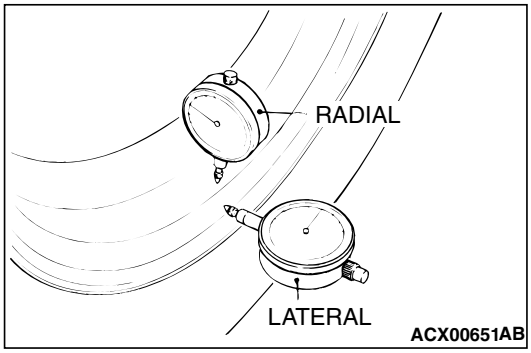
Minimum limit: 1.6 mm (0.06 inch)

If the remaining tread depth is less than the minimum limit, replace the tire.

NOTE: When the tread depth of the tires is reduced to 1.6 mm (0.06 inch) or less, wear indicators will appear.

WHEEL RUNOUT CHECK

M1311001100278



Jack up the vehicle so that the wheels are clear of the floor. While slowly turning the wheel, measure wheel runout with a dial indicator.

Limit:

ITEM	STEEL WHEEL	ALUMINUM WHEEL
Radial runout	1.2 mm (0.05 inch) or less	1.0 mm (0.04 inch) or less
Lateral runout	1.2 mm (0.05 inch) or less	1.0 mm (0.04 inch) or less

If wheel runout exceeds the limit, replace the wheel.

TPMS SPECIAL FUNCTION

TIRE PRESSURE SENSOR ID REGISTRATION

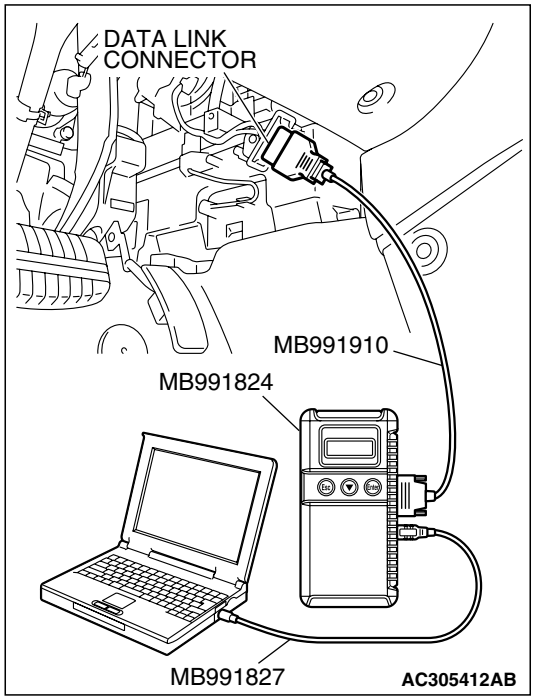
M1311003900076

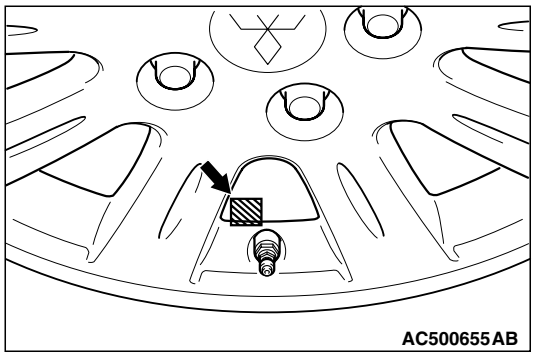
When the TPMS transmitter and TPMS receiver are replaced, execute "Tire Pressure Sensor ID Registration." The TPMS won't function until the "Tire Pressure Sensor ID Registration" has been complete.

Required Special Tools:

- MIT46716: TPMS Magnet
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

Register the tire pressure sensor IDs as described in the procedure below.





⚠ 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 "TPMS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Special Function."
8. Select "Tire Pressure Sensor ID Registration."

⚠ CAUTION

Register all tire pressure sensor IDs within five minutes.

9. Select "4tires PRES SNSR ID Registration (COMPACT SPARE TIRE)" and start the tire pressure sensor ID registration.
10. Emit signal from a TPMS transmitter as follows:

    NOTE: You can start out the following operations from any TPMS transmitter. The tire pressure sensor ID registration has no order.

    (1) Clean the TPMS transmitter location on the wheel rim.

    (2) Position MIT46716 or a strong magnet as shown, and hold it there for 5 seconds or more.

    NOTE: By doing this work, the reed switch (incorporated in the TPMS transmitter) will activate the TPMS transmitter to send the tire pressure sensor ID.

    NOTE: If the TPMS transmitter is not activated, slide the magnet until it is activated. If the TPMS transmitter is still not activated, move the vehicle (turn the tire) by approximately half a turn of the tire. Then attempt to activate the TPMS transmitter.

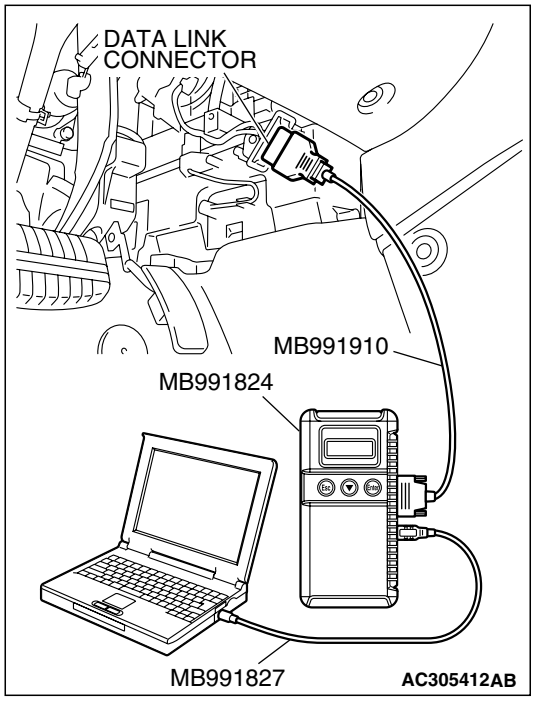
11. Check completion of the above through scan tool MB991958.
12. Repeat the above steps 8 and 9 for all TPMS transmitter-fitted tires.
13. Check the completion of the tire pressure sensor ID registration (display on the screen).
14. After tire pressure sensor ID registration, turn the ignition switch to the "LOCK" (OFF) position.
15. Remove scan tool MB991958.

TIRE PRESSURE SENSOR ID CHECK

M1311004100051

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



Check the tire pressure sensor IDs, which is registered in the TPMS receiver, as described below.

⚠ 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 "TPMS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Special Function."
8. Select "Tire Pressure Sensor ID Check."
9. Check the tire pressure sensor IDs on the PC display.
10. After tire pressure sensor ID check, turn the ignition switch to the "LOCK" (OFF) position.
11. Remove scan tool MB991958.

FROM SCAN TOOL MB99158 DIAGNOSIS SCREEN

You can check the tire pressure sensor ID on the diagnosis screen as described below.

1. Operate scan tool MB991958 as follows:
   - Press "Special" button on the diagnosis screen.
   - Select "Tire Pressure Sensor ID Check" from the "Special Function" menu.
2. Check the tire pressure sensor IDs on the PC display.
3. After tire pressure sensor ID check, turn the ignition switch to the "LOCK" (OFF) position.
4. Remove scan tool MB991958.

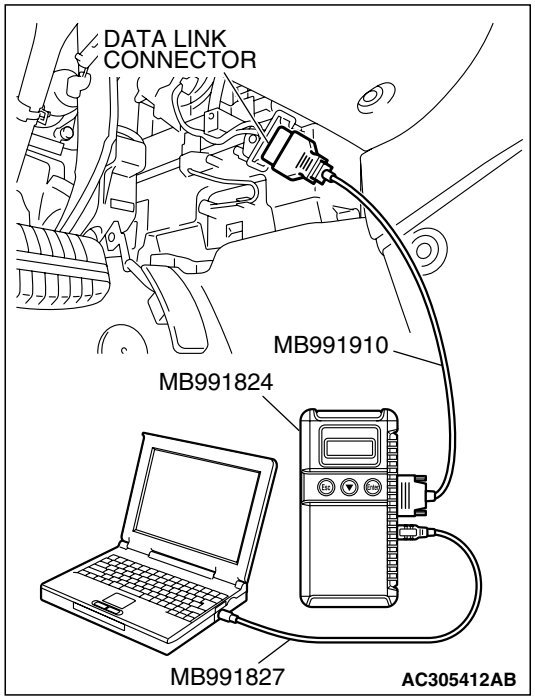
TIRE PRESSURE SENSOR CHECK

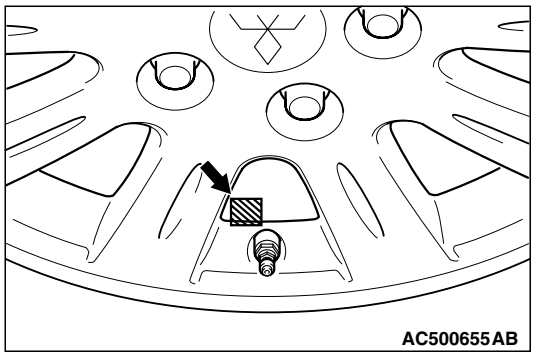
M1311004000054

Required Special Tools:

- MIT46716: TPMS Magnet
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

Check the condition of the tire pressure sensor as described below.





⚠ 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 "TPMS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Special Function."
8. Select "Tire Pressure Sensor Check."
9. Send the signal from an intended transmitter as follows:
   (1) Clean the TPMS transmitter location on the wheel rim.
   (2) Position MIT46716 or a strong magnet as shown, and hold it there for 5 seconds or more.

   NOTE: By doing this work, the reed switch (incorporated in the TPMS transmitter) will activate the TPMS transmitter to send the pressure sensor data.

   NOTE: If the TPMS transmitter is not activated, slide the magnet until it is activated. If the TPMS transmitter is still not activated, move the vehicle (turn the tire) by approximately half a turn of the tire. Then attempt to activate the TPMS transmitter.
10. Check the data on the PC display.
11. After tire pressure sensor check, turn the ignition switch to the "LOCK" (OFF) position.
12. Remove scan tool MB991958.

WHEEL AND TIRE

INSTALLATION SERVICE POINT

M1311001300238

Tighten the wheel nuts to the specified torque.

Tightening torque: 98 ± 10 N·m (73 ± 7 ft-lb)

WHEEL AND TIRE REPLACEMENT <TPMS>

M1311005800019

⚠ CAUTION

Do not use non-genuine wheels. The use of non-genuine wheels may cause the improper installation of the TPMS transmitters, possibly resulting in air leakage and damage to the TPMS transmitter.

- When the tire is removed from the wheel, a special procedure must be observed to avoid the TPMS transmitter damage. Refer to TPMS transmitter Removal and Installation (P.31-62).
- When the TPMS transmitter-fitted tire is replaced, always replace the rubber grommet. Refer to TPMS transmitter Removal and Installation (P.31-62).

TIRE PRESSURE MONITORING SYSTEM (TPMS)

TPMS RECEIVER

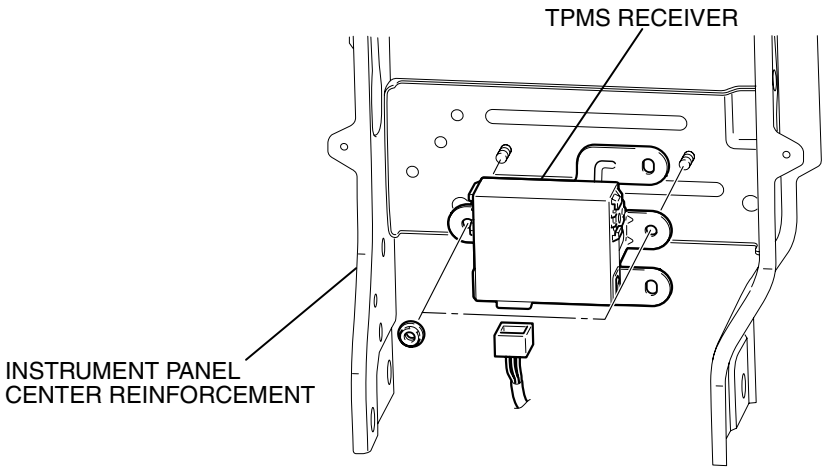
REMOVAL AND INSTALLATION

M1311003700083

⚠ CAUTION

- **Do not drop the TPMS receiver.**
- **TPMS receiver should not be exposed to temperatures above 85°C (185°F).**
- **If the TPMS receiver is replaced, execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function."**

Pre-removal Operation	Post-installation Operation
• Gear Shift Lever Panel and Front Box Removal (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Center Console Assembly Removal (Refer to GROUP 52A, Instrument Panel Assembly P.52A-22).	• Gear Shift Lever Panel and Front Box Removal (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Center Console Assembly Removal (Refer to GROUP 52A, Instrument Panel Assembly P.52A-22). • Tire Pressure Sensor ID Registration <If a new TPMS receiver is installed> (Refer to P.31-57). • After the tire pressure sensor ID registration, check that the TPMS warning light does not illuminate or flash.



AC601023AB

TSB Revision

TPMS TRANSMITTER

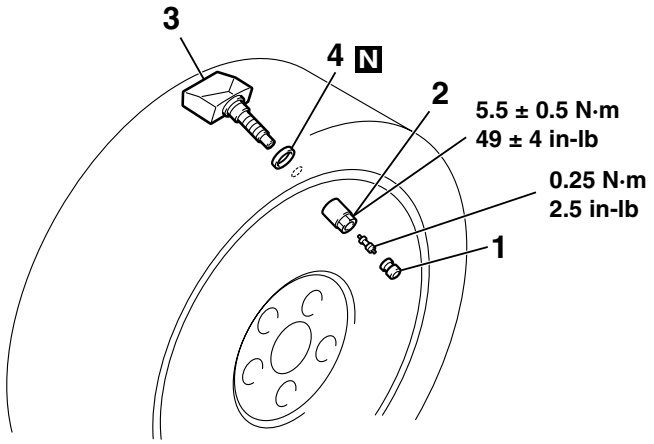
REMOVAL AND INSTALLATION

M1311003800091

⚠ CAUTION

- **Ensure valve cap is always in place except when adjusting tire pressure.**
- **If the valve core and valve cap are replaced, use a genuine replacement part. The valve core is similar to a conventional one, but uses nickel plating to avoid corrosion.**
- **Relieve tire pressure by removing the valve nut rather than by removing the valve core.**
- **Replace the valve stem grommet with a new one every five years or when the tire is replaced.**
- **If you shake the TPMS transmitter, you can hear a rattle, but this is not a failure. It is normal.**
- **Do not drop the TPMS transmitter from height greater than 1 meter (3.3 feet).**
- **Do not expose the TPMS transmitter to extraneous magnetic fields.**
- **TPMS transmitter should not be stored at temperatures above 80°C (176°F).**
- **TPMS transmitter should not be exposed to temperatures above 100°C (212°F).**
- **If the TPMS transmitter is replaced, execute "Tire Pressure Sensor ID Registration" on scan tool MB991958 "Special Function."**

Pre-removal Operation	Post-installation Operation
• Wheel and Tire Removal (Refer to P.31-60).	• Wheel and Tire Installation (Refer to P.31-60). • Tire Pressure Sensor ID Registration <If a new TPMS transmitter is installed> (Refer to P.31-57). • After the tire pressure sensor ID registration, check that the TPMS warning light does not illuminate or flash.



AC205717 AB

REMOVAL STEPS

<<A>> 1. VALVE CAP
<<A>> 2. VALVE NUT
• LET TPMS TRANSMITTER FALL INTO TIRE
• TIRE BEAD
<<B>> 3. TPMS TRANSMITTER
<<C>> 4. GROMMET

INSTALLATION STEPS

>>A<< 4. GROMMET
>>A<< 3. TPMS TRANSMITTER
>>A<< 2. VALVE NUT
>>B<< • TIRE BEAD MOUNTING
>>C<< • TIRE PRESSURE INFLATION
>>C<< • VALVE NUT RETIGHTENING
1. VALVE CAP

TSB Revision

REMOVAL SERVICE POINTS

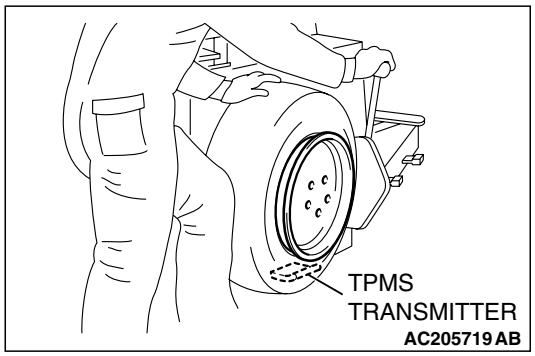
<<A>> VALVE CAP/VALVE NUT REMOVAL

⚠ CAUTION

Ensure valve cap is always in place except when adjusting tire pressure.

1. Remove the valve cap.
2. Rotate tire so that valve stem is in the 6 o'clock position.
3. Use a long-reach 17.2 mm (0.68 inch) socket to unscrew the valve nut a few turns. Slowly push valve stem into tire so that tire pressure is relieved.
4. Once tire pressure is relieved, remove the valve nut.

<<B>> TPMS TRANSMITTER REMOVAL



1. Place on tire changing machine and break both tire beads ensuring that the transmitter remains in the bottom of the tire.

⚠ CAUTION

Be careful not to damage the TPMS transmitter.

2. Lubricate tire well and remove outer side of the tire.
3. Reach inside the tire and remove the TPMS transmitter.
4. Remove tire from rim using proper tire changing equipment procedures.

<<C>> GROMMET REMOVAL

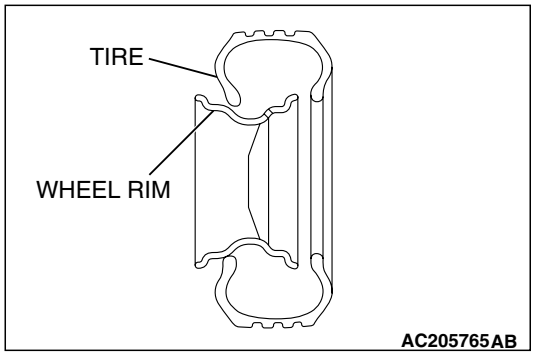
⚠ CAUTION

Use a soft tool to remove the grommet to prevent scratching the valve of the TPMS transmitter.

Remove the grommet from the TPMS transmitter.

INSTALLATION SERVICE POINTS

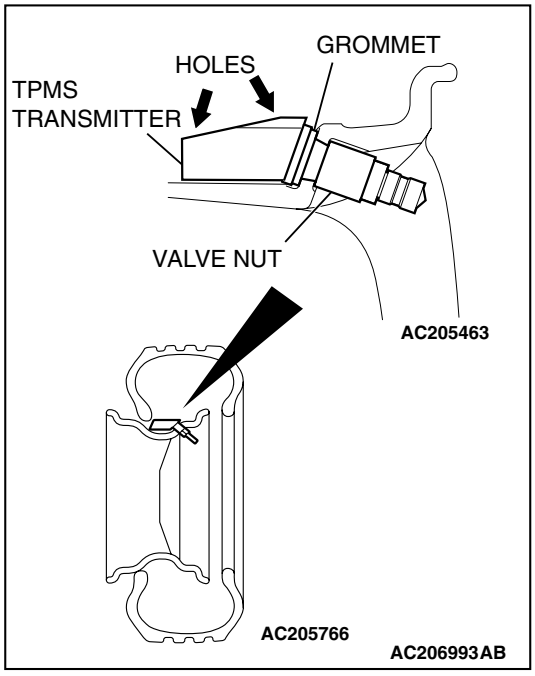
>>A<< GROMMET/TPMS TRANSMITTER/VALVE NUT INSTALLATION



1. Slide inner tire bead over rim face. Use lubricant, as normal procedures require.
2. Install a new grommet to the TPMS transmitter.

⚠ CAUTION

- **Visually check that TPMS transmitter is not deformed or damaged.**
- **When installing the TPMS transmitter, be sure the rim, grommet and valve nut are clean.**
- **Ensure the grommet is located inside the valve hole before installing the valve nut.**
- **While installing the valve nut, hold the valve and grommet firmly in contact with the rim.**
- **While installing the valve nut, ensure the tool is kept aligned to the valve and the valve hole.**
- **After installing the valve nut, check that the grommet is compressed.**

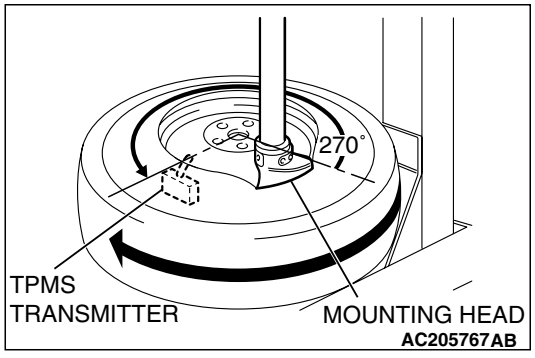


3. Mount TPMS transmitter valve through rim hole as illustrated. Both holes in the transmitter case should face away from center of rim. Tighten valve nut finger tight, then slowly torque the valve nut to 5.5 ± 0.5 N·m (49 ± 4 in-lb).

⚠ CAUTION

Install the TPMS transmitter correctly. If the TPMS transmitter is installed incorrectly, it may not work correctly, or become damaged when the tire is installed.

4. Check that the TPMS transmitter is correctly assembled (Refer to illustration).
   - One side of lower lip of the TPMS transmitter case can touch the rim after torquing.
   - Except for the grommet, valve nut and lower lip of the TPMS transmitter, no other part of the front of the TPMS transmitter case should be touching the rim.



>>B<< TIRE BEAD MOUNTING

1. Place wheel and tire on turntable of tire mounting machine. Ensure that transmitter is 270 degree angle (3 o'clock position) from mounting head when the outer tire bead is mounted as illustrated.
2. Lubricate tire well and mount outer tire bead as normal. Ensure that tire does not rotate during mounting.

>>C<< TIRE PRESSURE INFLATION/VALVE NUT RETIGHTENING

⚠ CAUTION

After tire inflation, retighten the valve nut 5.5 ± 0.5 N·m (49 ± 4 in-lb). This is necessary, because the TPMS transmitter is secured to the wheel with the valve nut and rubber grommet. The rubber grommet will be depressed by tire pressure or deteriorate over a period of time, which requires the valve nut to be retightened.

Inflate tire to required pressure, then retorque the valve nut to 5.5 ± 0.5 N·m (49 ± 4 in-lb).

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATION

M1311001600381

ITEM	SPECIFICATION
Valve core	0.25 N·m (2.5 in-lb)
Valve nut (TPMS transmitter mounting nut)	5.5 ± 0.5 N·m (49 ± 4 in-lb)
Wheel nut	98 ± 10 N·m (73 ± 7 ft-lb)

GENERAL SPECIFICATIONS

M1311000200487

<2.4L ENGINE>

ITEM		DJ1ASRJYL4M DJ1ASRJYSL9M DJ1ASRJYL5M	DJ1ASRHYL4M DJ1ASRHYSL9M DJ1ASRHYL5M	DJ1ASRXYL4M DJ1ASRXYSL9M DJ1ASRPYL5M
TPMS warning pressure kPa (psi)	Warning ON	174 (25) or less		
	Warning OFF	190 (28) or more		
Wheel	Type	Steel type	Steel type or Aluminum type*	Aluminum type
	Size	16 × 6 1/2JJ		
	Amount of wheel offset mm (in)	46 (1.8)		
	Pitch circle diameter (PCD) mm (in)	114.3 (4.50)		
Tire	Size	P215/60 R16 94H		
Spare wheel	Type	Steel type		
	Size	16 × 4T		
	Amount of wheel offset mm (in)	40 (1.5)		
	Pitch circle diameter (PCD) mm (in)	114.3 (4.50)		
Spare tire	Size	T125/70 D16		

NOTE:

- *The * mark indicates optional item.*
- *PCD (Pitch Circle Diameter) indicates the pitch circle diameter of the wheel installation holes.*

TSB Revision

<3.8L ENGINE>

ITEM		DJ3ASYHEL4M DJ3ASYHEL5M DJ3ASYPEL4M DJ3ASYGEL4M	DJ5ASYXYL4M DJ5ASYXYL5M
TPMS warning pressure kPa (psi)	Warning ON	174 (25) or less	
	Warning OFF	190 (28) or more	
Wheel	Type	Aluminum type	
	Size	17× 7JJ	18× 8 JJ
	Amount of wheel offset mm (in)	46 (1.8)	
	Pitch circle diameter (PCD) mm (in)	114.3 (4.50)	
Tire	Size	P215/55 R17 93V	P235/45 R18 94V
Spare wheel	Type	Steel type	
	Size	16 × 4T	
	Amount of wheel offset mm (in)	40 (1.5)	
	Pitch circle diameter (PCD) mm (in)	114.3 (4.50)	
Spare tire	Size	T125/70 D16	

NOTE:

- *PCD (Pitch Circle Diameter) indicates the pitch circle diameter of the wheel installation holes.*

SERVICE SPECIFICATIONS

M1311000300310

ITEM		LIMIT
Tread depth of tire mm (in)		Minimum 1.6 (0.06)
Wheel runout <Aluminum wheel>	Radial runout mm (in)	1.0 (0.04) or less
	Lateral runout mm (in)	1.0 (0.04) or less
Wheel runout <Steel wheel>	Radial runout mm (in)	1.2 (0.05) or less
	Lateral runout mm (in)	1.2 (0.05) or less

GROUP 32

POWER PLANT MOUNT

CONTENTS

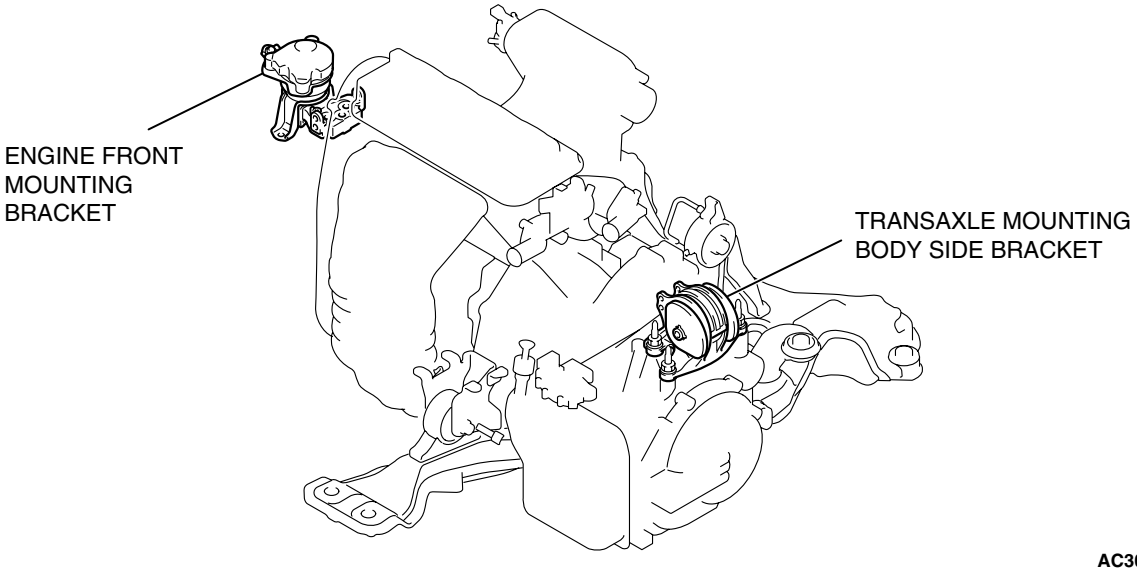
GENERAL DESCRIPTION

M1321000100373

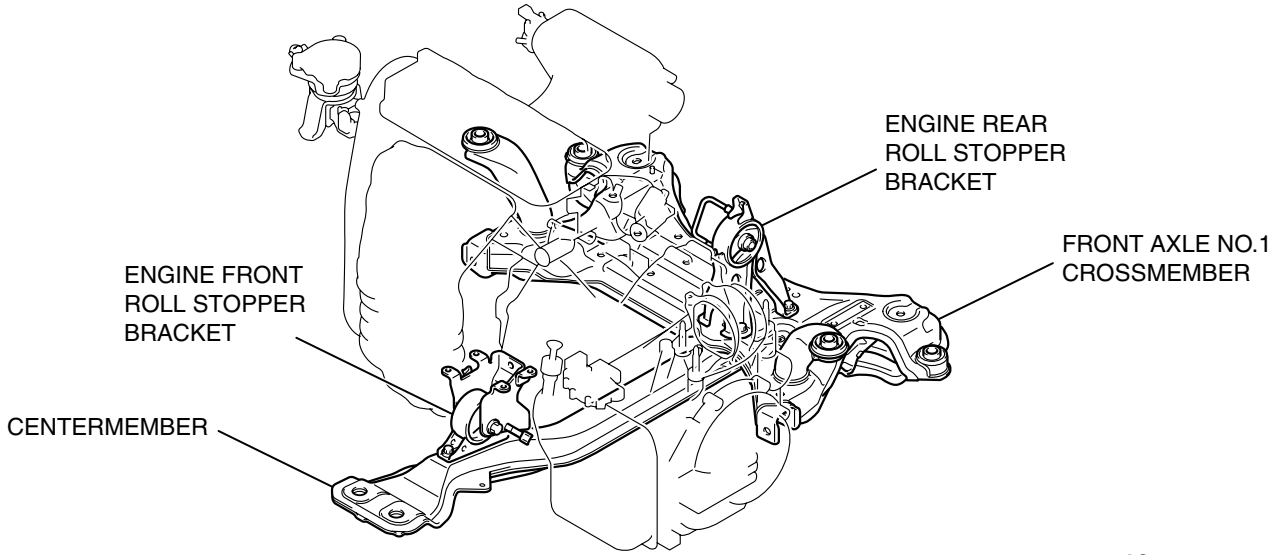
- The engine front mounting bracket is a dome-shaped fluid-filled mount for improved responsiveness during acceleration and more stable vehicle performance against road disturbances.
- The liquid-filled transaxle mounting body side bracket improves riding comfort by its refined insulator.
- A roll stopper bracket in the upper area limits engine rolling. Furthermore, large diameter insulator reduces idle vibration.

CONSTRUCTION DIAGRAM

<2.4L ENGINE>

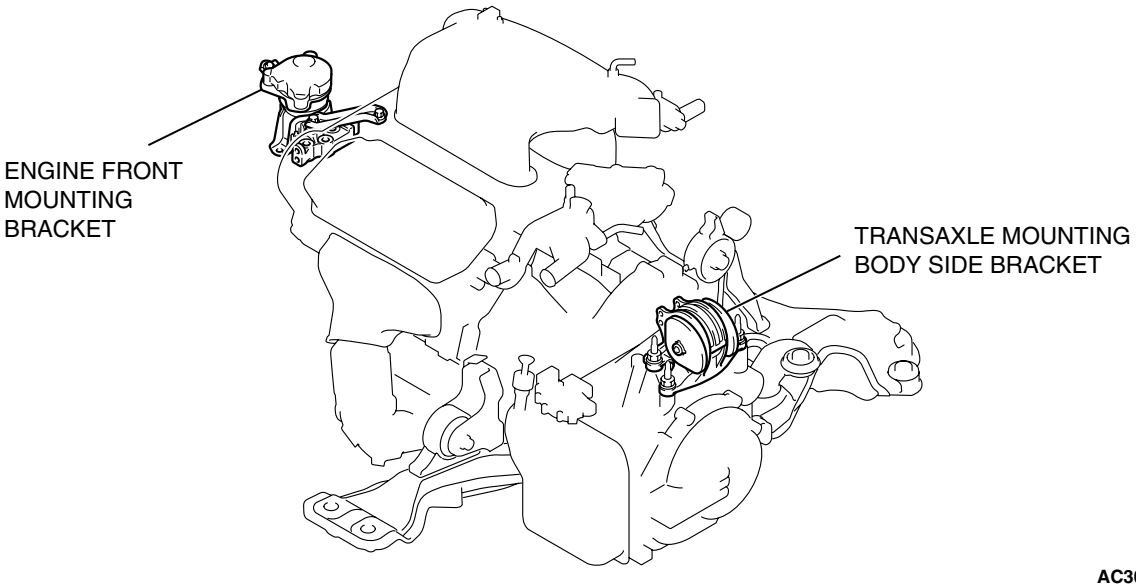


AC305857

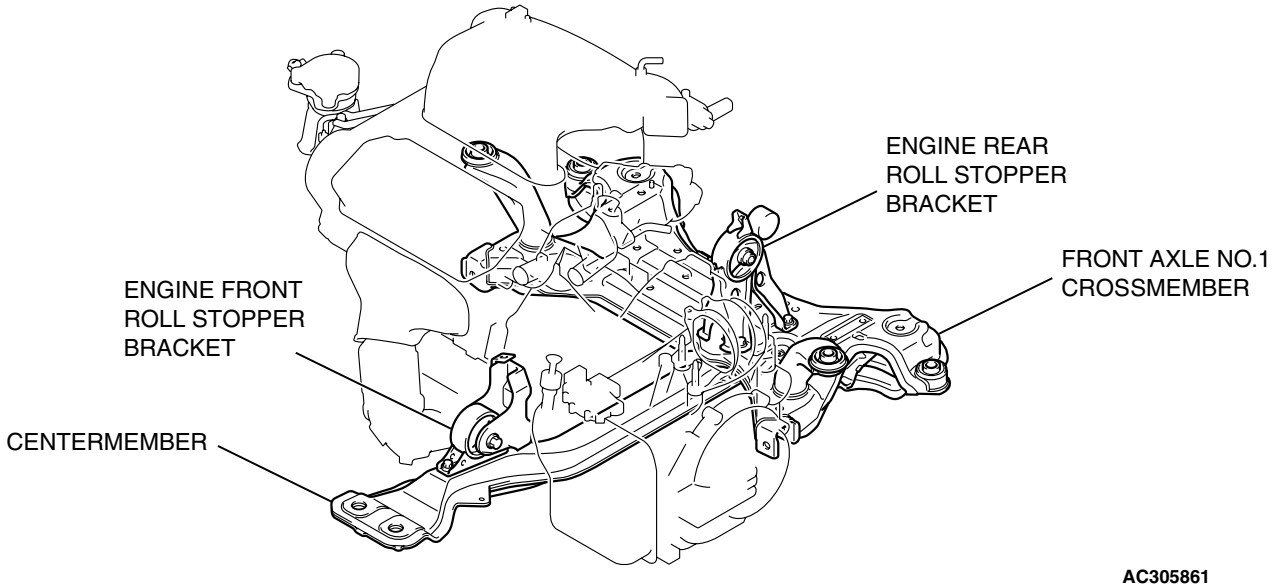


AC305858
AC305859AB

<3.8L ENGINE>



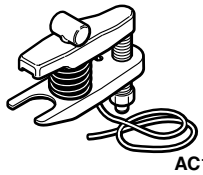
AC305860



AC305861
AC305862AB

SPECIAL TOOL

M1321000600390

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or General service tool	Knuckle and tie rod end ball joint disconnection *NOTE: Steering linkage puller (MB990635 or MB991113)is also used to disconnect the knuckle and tie rod end ball joint.*

TSB Revision

ENGINE MOUNTING

REMOVAL AND INSTALLATION

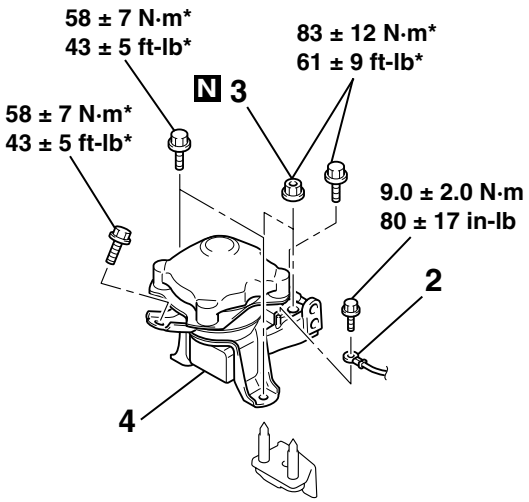
M1321001101324

⚠ CAUTION

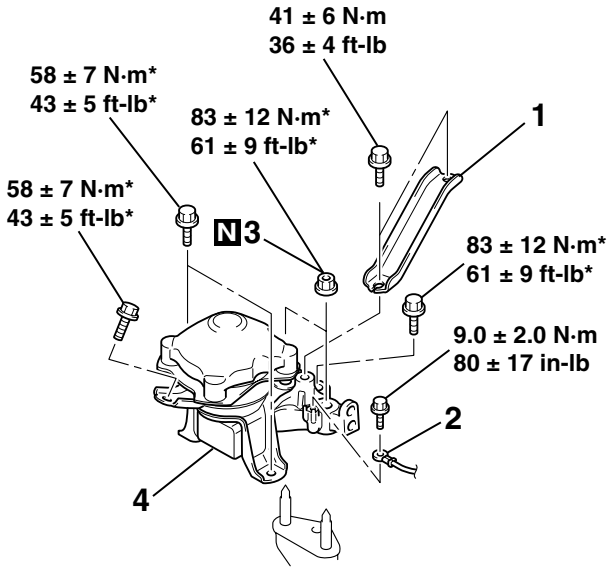
***: Indicates parts which should be initially tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**

Pre-removal Operation
Raise the engine and transaxle assembly until its weight is not applied to the insulator, and support it securely.

<2.4L ENGINE>



<3.8L ENGINE>



AC307311AC

REMOVAL STEPS
1. ENGINE MOUNTING STAY <3.8L ENGINE>
2. GROUNDING CABLE CONNECTION

<<A>>

REMOVAL STEPS (Continued)
- POWER STEERING OIL RESERVOIR
3. SELF-LOCKING NUTS
4. ENGINE FRONT MOUNTING BRACKET

REMOVAL SERVICE POINT

<<A>> POWER STEERING OIL RESERVOIR REMOVAL
With the hose installed, remove the power steering oil reservoir from the vehicle. (Refer to GROUP 37, Power Steering Hoses P.37-54).

NOTE: After removing the power steering oil reservoir, secure it with a cord in the location where the removal and installation of the engine front mounting bracket cannot be hindered.

TSB Revision

TRANSAXLE (TRANSMISSION) MOUNTING

REMOVAL AND INSTALLATION

M1321001401143

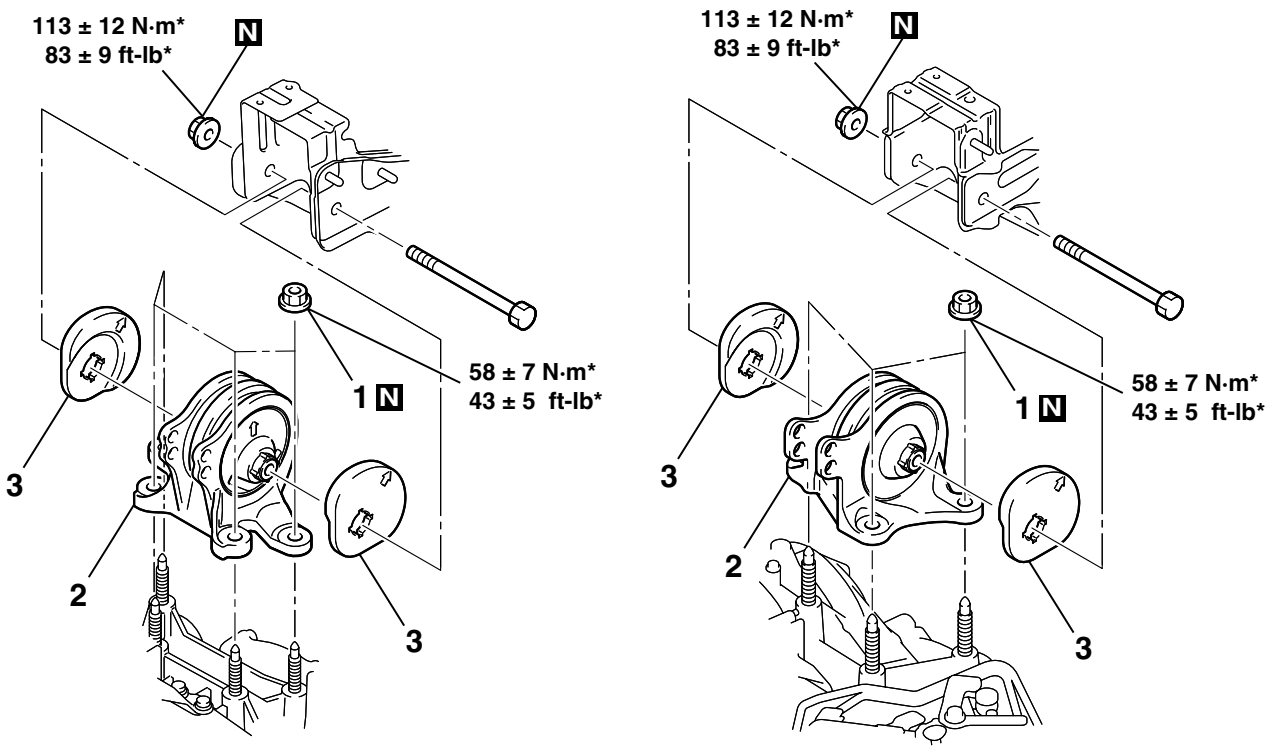
⚠ CAUTION

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

Pre-removal Operation	Post-installation Operation
• Powertrain Control Module (PCM) Removal (2.4L ENGINE: Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180, 3.8L ENGINE: Refer to GROUP 13B, Powertrain Control Module (PCM) P.13B-1447). • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-4). • Battery and Battery Tray Removal • Centermember Removal (Refer to P.32-7). • Engine Rear Roll Stopper Bracket Removal (Refer to P.32-7). • Raise the engine and transaxle assembly until its weight is not applied to the insulator, and support it securely.	• Engine Rear Roll Stopper Bracket Installation (Refer to P.32-7). • Centermember Installation (Refer to P.32-7). • Battery and Battery Tray Installation • Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-4). • Powertrain Control Module (PCM) Installation (2.4L ENGINE: Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180, 3.8L ENGINE: Refer to GROUP 13B, Powertrain Control Module (PCM) P.13B-1447).

<4A/T>

<5A/T>



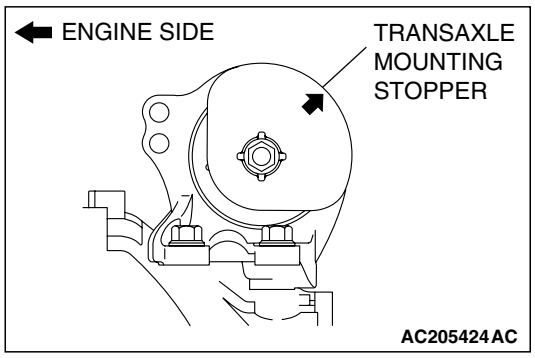
AC601024AB

REMOVAL STEPS
1. SELF-LOCKING NUTS

REMOVAL STEPS (Continued)
2. TRANSAXLE MOUNTING BODY SIDE BRACKET
>>A<< 3. TRANSAXLE MOUNTING STOPPER

TSB Revision

INSTALLATION SERVICE POINT



>>A<< TRANSAXLE MOUNTING STOPPER INSTALLATION
Install the transaxle mounting stopper so that its arrow points upward.

ENGINE ROLL STOPPER AND CENTERMEMBER

REMOVAL AND INSTALLATION

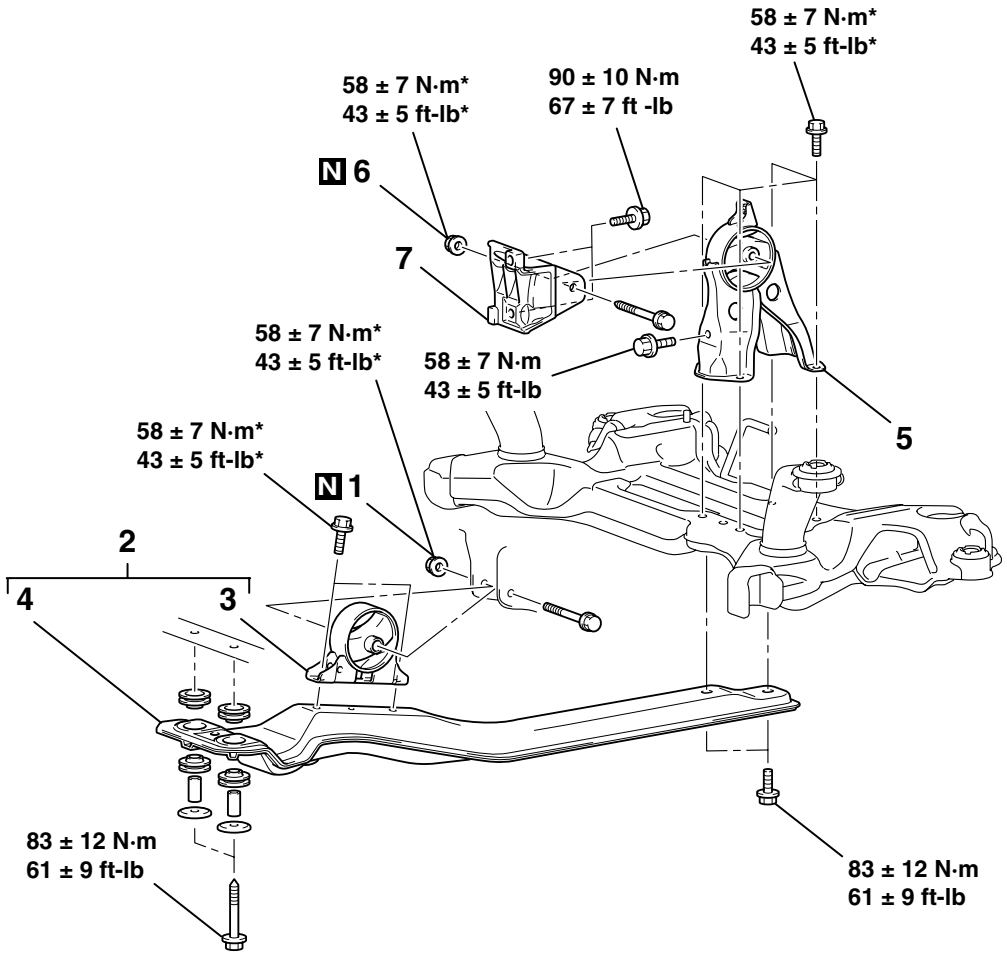
M1321002300641

<2.4L ENGINE>

⚠ CAUTION

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

Pre-removal and Post-installation Operation
Side Under Cover Removal and Installation (Refer to GROUP 51, Under Cover P.51-12).



AC306905AB

FRONT ROLL STOPPER AND CENTERMEMBER REMOVAL STEPS

1. SELF-LOCKING NUT
2. ENGINE FRONT ROLL STOPPER BRACKET AND CENTERMEMBER

>>**B**<< 3. ENGINE FRONT ROLL STOPPER BRACKET

4. CENTERMEMBER

REAR ROLL STOPPER REMOVAL STEPS

- FRONT AXLE NO.1 CROSSMEMBER ASSEMBLY (REFER TO P.32-10).

>>**A**<< 5. ENGINE REAR ROLL STOPPER BRACKET

TSB Revision

REAR ROLL STOPPER BRACKET REMOVAL STEPS

- FRONT NO.1 EXHAUST PIPE AND FRONT NO.2 EXHAUST PIPE CONNECTION (REFER TO GROUP 15, EXHAUST PIPE AND MAIN MUFFLER P.15-32).

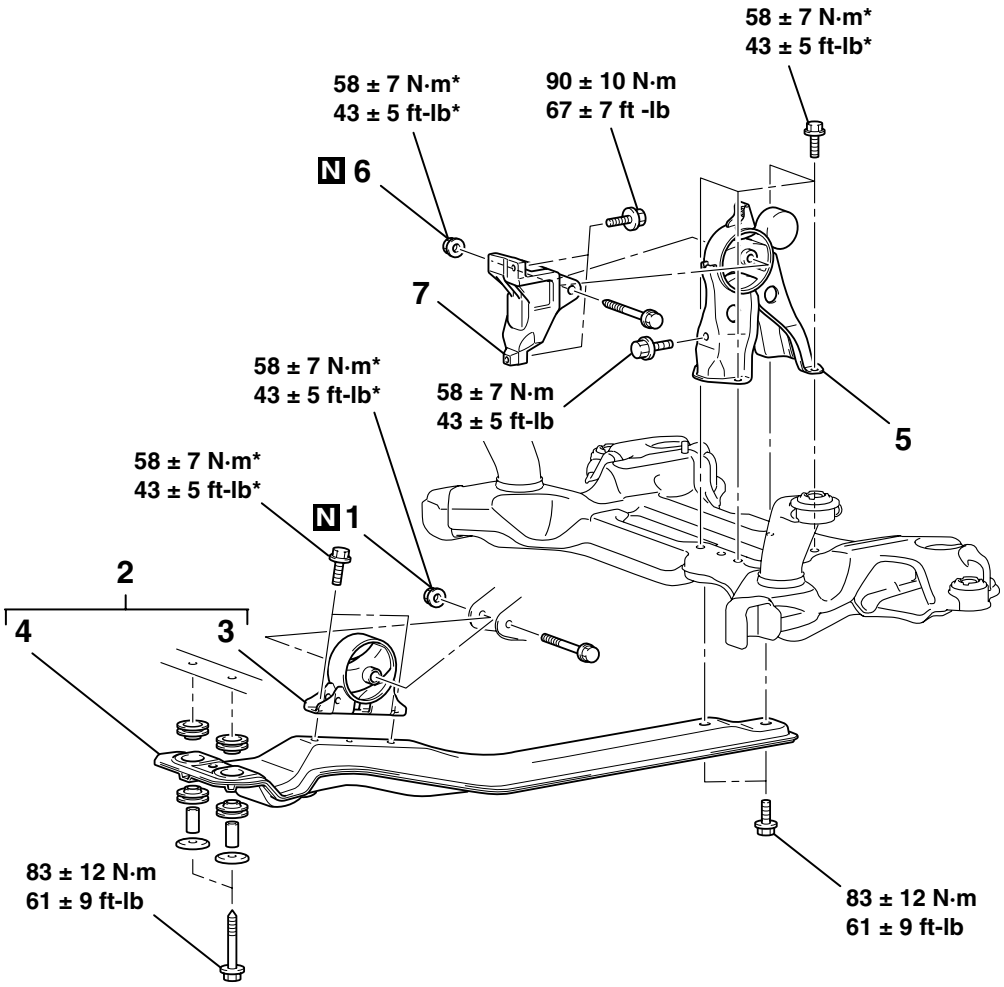
1. SELF-LOCKING NUT
2. ENGINE FRONT ROLL STOPPER BRACKET AND CENTERMEMBER
6. SELF-LOCKING NUT
7. TRANSAXLE CASE REAR ROLL STOPPER BRACKET

<3.8L ENGINE>

⚠ CAUTION

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

Pre-removal and Post-installation Operation
Side Under Cover Removal and Installation (Refer to GROUP 51, Under Cover P.51-12).



AC306906AB

TSB Revision

FRONT ROLL STOPPER AND CENTERMEMBER REMOVAL STEPS

1. SELF-LOCKING NUT
2. ENGINE FRONT ROLL STOPPER BRACKET AND CENTERMEMBER

>>**B**<< 3. ENGINE FRONT ROLL STOPPER BRACKET

4. CENTERMEMBER

REAR ROLL STOPPER REMOVAL STEPS

- FRONT AXLE NO.1 CROSSMEMBER ASSEMBLY (REFER TO P.32-10).

>>**A**<< 5. ENGINE REAR ROLL STOPPER BRACKET

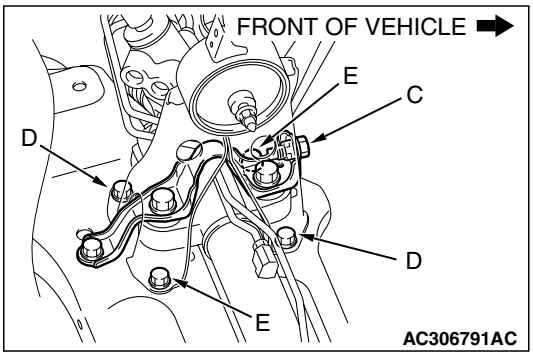
REAR ROLL STOPPER BRACKET REMOVAL STEPS

- FRONT NO.1 EXHAUST PIPE (REFER TO GROUP 15, EXHAUST PIPE AND MAIN MUFFLER P.15-32).

1. SELF-LOCKING NUT
2. ENGINE FRONT ROLL STOPPER BRACKET AND CENTERMEMBER
6. SELF-LOCKING NUT
7. TRANSAXLE CASE REAR ROLL STOPPER BRACKET

INSTALLATION SERVICE POINTS

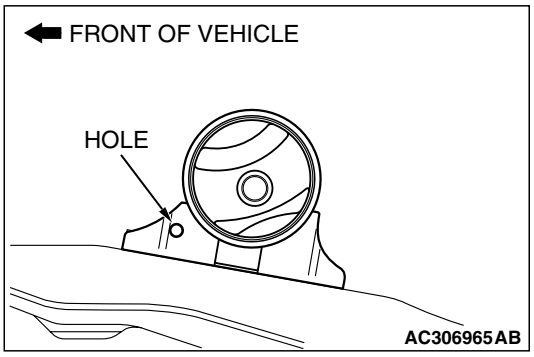
>>A<< ENGINE REAR ROLL STOPPER BRACKET INSTALLATION



Tighten the bolts in the following sequence:

1. Tighten bolts E finger tight.
2. Tighten bolt C and then tighten bolts D.
3. Tighten bolts E.

>>B<< ENGINE FRONT ROLL STOPPER BRACKET INSTALLATION



Install the engine front roll stopper bracket so that its hole points towards the front side of the vehicle.

CROSSMEMBER

REMOVAL AND INSTALLATION

M1321003200852

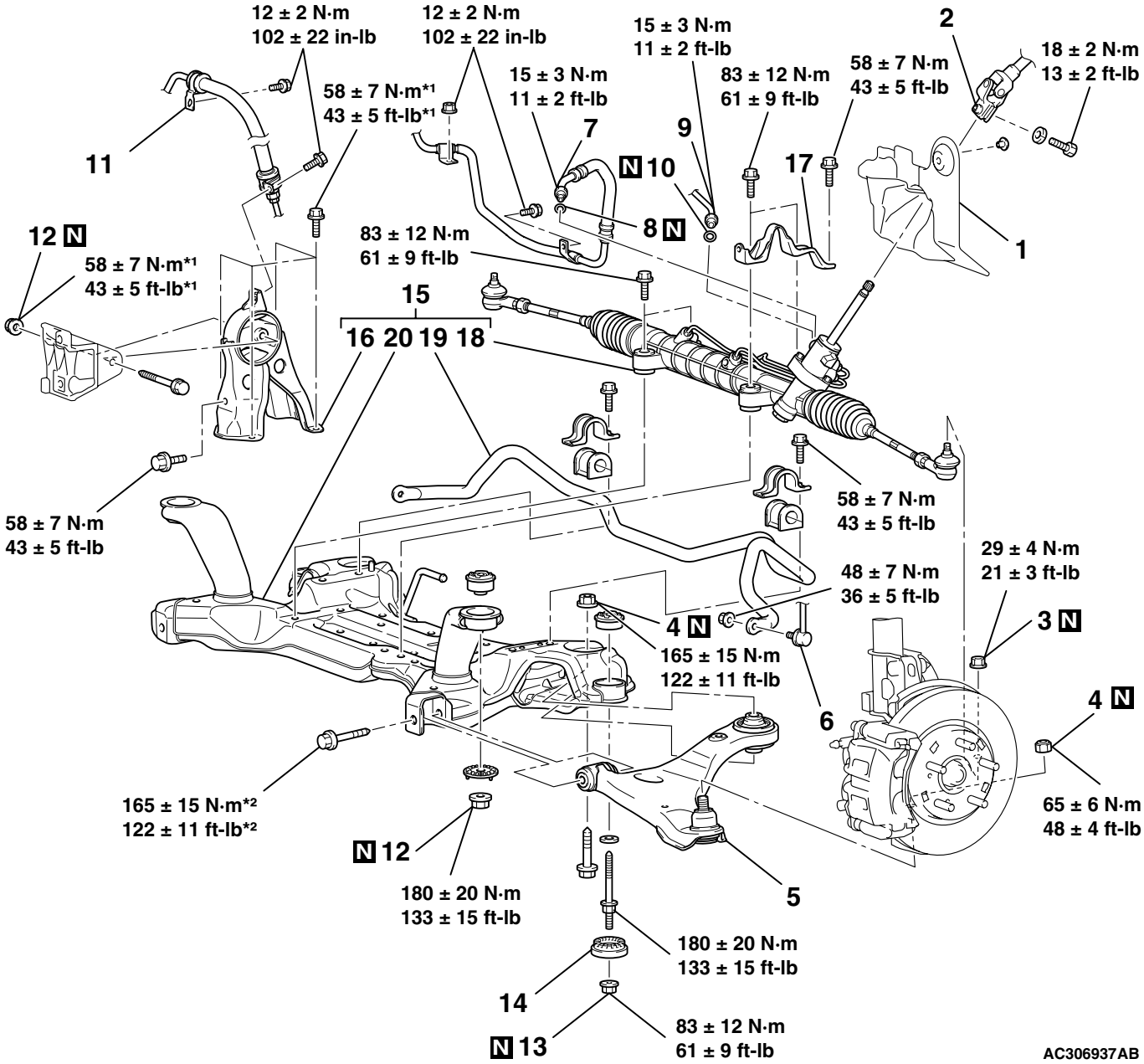
<2.4L ENGINE>

⚠ CAUTION

- **Before removing the steering wheel and air bag module assembly, always refer to GROUP 52B - Service Precautions (P.52B-29), Air bag Module and Clock Spring (P.52B-408). Also, set the front wheels so that they are facing straight forward, and remove the ignition key. If you fail to do this, the SRS clock spring will be damaged, causing the SRS air bag to be inoperative and serious injury.**
- ***1: Indicates parts which should be initially tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**
- ***2: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

Pre-removal Operation	Post-installation Operation
• Power Steering Fluid Draining (Refer to GROUP 37, On-vehicle Service – Fluid Replacement P.37-20). • Air Bag Module and Steering Wheel Assembly Removal (Refer to GROUP 37, Steering Wheel P.37-24). • Clock Spring Removal (Refer to GROUP 52B, Air Bag Module and Clock Spring P.52B-408). • Floor Console Assembly Removal (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Front Scuff Plate (LH) and Cowl Side Trim (LH) Removal (Refer to GROUP 52A, Trims P.52A-23). • Trunk Lid Release Handle Cover Removal (Refer to GROUP 42, Trunk Lid P.42-62). • Accelerator Stopper Removal (Refer to GROUP 17, Accelerator Pedal P.17-8). • Front Floor Carpet Removal • Centermember Removal (Refer to P.32-7).	• Centermember Installation (Refer to P.32-7). • Front Floor Carpet Installation • Accelerator Stopper Installation (Refer to GROUP 17, Accelerator Pedal P.17-8). • Trunk Lid Release Handle Cover Installation (Refer to GROUP 42, Trunk Lid P.42-62). • Front Scuff Plate (LH) and Cowl Side Trim (LH) Installation (Refer to GROUP 52A, Trims P.52A-23). • Floor Console Assembly Installation (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Clock Spring Installation (Refer to GROUP 52B, Air Bag Module and Clock Spring P.52B-408). • Steering Wheel Assembly and Air Bag Module Installation (Refer to GROUP 37, Steering Wheel P.37-24). • Check the dust cover for cracks or damage by pushing it with your finger. • Power Steering Fluid Supplying (Refer to GROUP 37, On-vehicle Service – Fluid Replacement P.37-20). • Power Steering Fluid Line Bleeding (Refer to GROUP 37, On-vehicle Service – Power Steering System Air Bleeding P.37-20). • Checking Steering Wheel Position with Wheels Straight Ahead. • Front Wheel Alignment Adjustment (Refer to GROUP 33, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33-6).

TSB Revision



AC306937AB

REMOVAL STEPS

1. STEERING SHAFT PAD
<<A>> 2. STEERING COLUMN ASSEMBLY AND STEERING GEAR CONNECTION
<<B>> 3. SELF-LOCKING NUTS (CONNECTION FOR TIE ROD END)
<<B>> 4. SELF-LOCKING NUTS (CONNECTION FOR LOWER ARM BALL JOINT)
5. LOWER ARM ASSEMBLY
6. STABILIZER LINK CONNECTION
7. RETURN TUBE CONNECTION
8. O-RING
9. PRESSURE HOSE CONNECTION
10. O-RING
11. PRESSURE HOSE CLAMP

REMOVAL STEPS (Continued)

- FRONT NO.2 EXHAUST PIPE HANGER (REFER TO GROUP 15, EXHAUST PIPE AND MAIN MUFFLER P.15-32).

12. SELF-LOCKING NUTS
>>E<< 13. SELF-LOCKING NUTS
<<C>> >>E<< 14. FRONT AXLE CROSSMEMBER STOPPER
<<E>> >>C<< 15. ENGINE REAR ROLL STOPPER BRACKET, POWER STEERING GEAR AND LINKAGE, STABILIZER BAR AND FRONT AXLE NO.1 CROSSMEMBER ASSEMBLY
>>B<< 16. ENGINE REAR ROLL STOPPER BRACKET

TSB Revision

REMOVAL STEPS (Continued)

>>**B**<< 17. POWER STEERING GEAR BRACKET
18. POWER STEERING GEAR AND LINKAGE
>>**A**<< 19. STABILIZER BAR
20. FRONT AXLE NO.1 CROSSMEMBER

Required Special Tool:

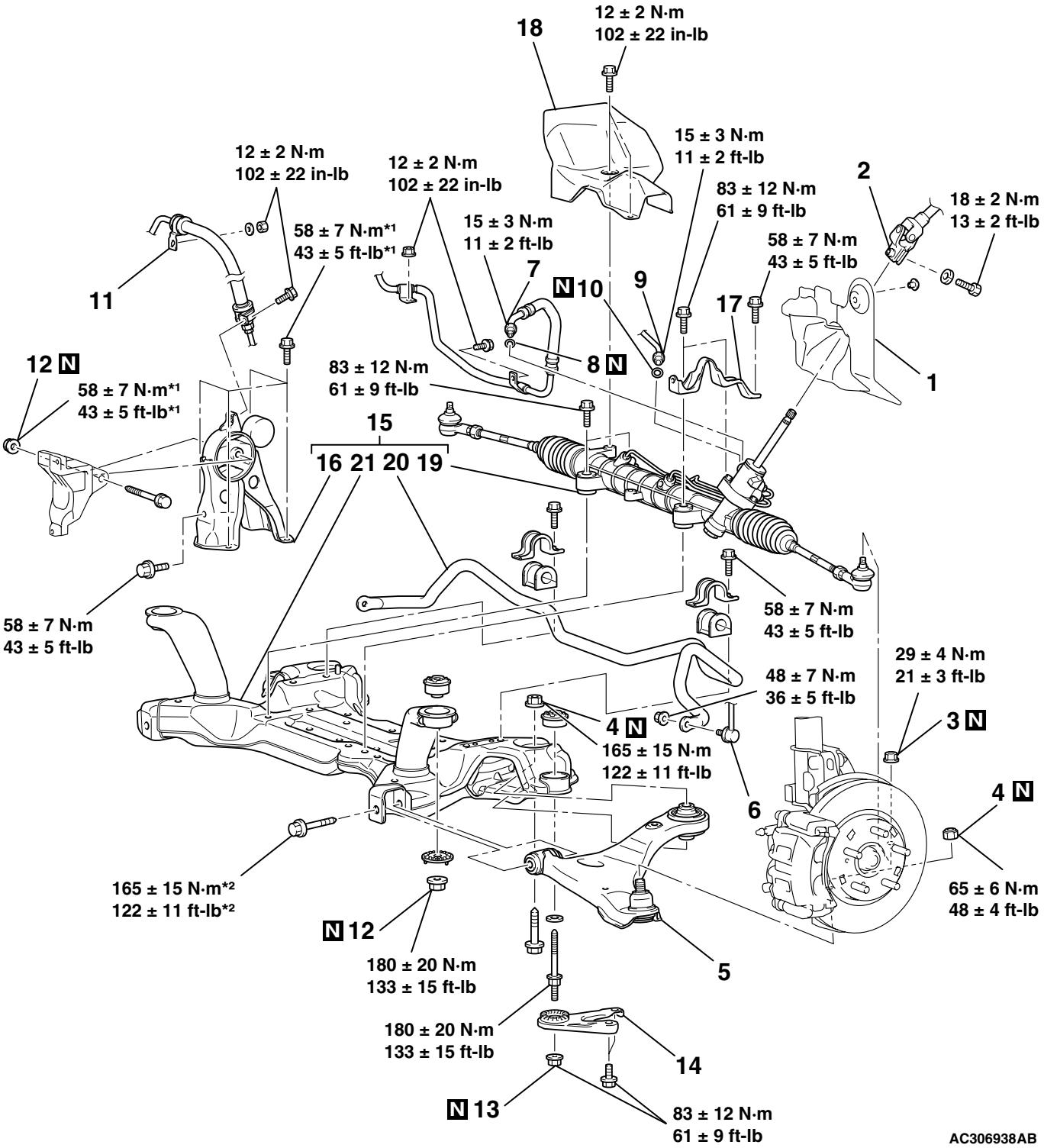
- MB991897: Ball Joint Remover

<3.8L ENGINE>

⚠ CAUTION

- **Before removing the steering wheel and air bag module assembly, always refer to GROUP 52B - Service Precautions (P.52B-29), Air bag Module and Clock Spring (P.52B-408). Also, set the front wheels so that they are facing straight forward, and remove the ignition key. If you fail to do this, the SRS clock spring will be damaged, causing the SRS air bag to be inoperative and serious injury.**
- ***1: Indicates parts which should be initially tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**
- ***2: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

Pre-removal Operation	Post-installation Operation
• Power Steering Fluid Draining (Refer to GROUP 37, On-vehicle Service – Fluid Replacement P.37-20). • Air Bag Module and Steering Wheel Assembly Removal (Refer to GROUP 37, Steering Wheel P.37-24). • Clock Spring Removal (Refer to GROUP 52B, Air Bag Module and Clock Spring P.52B-408). • Floor Console Assembly Removal (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Front Scuff Plate (LH) and Cowl Side Trim (LH) Removal (Refer to GROUP 52A, Trims P.52A-23). • Trunk Lid Release Handle Cover Removal (Refer to GROUP 42, Trunk Lid P.42-62). • Accelerator Stopper Removal (Refer to GROUP 17, Accelerator Pedal P.17-8). • Front Floor Carpet Removal • Centermember Removal (Refer to P.32-7).	• Centermember Installation (Refer to P.32-7). • Front Floor Carpet Installation • Accelerator Stopper Installation (Refer to GROUP 17, Accelerator Pedal P.17-8). • Trunk Lid Release Handle Cover Installation (Refer to GROUP 42, Trunk Lid P.42-62). • Front Scuff Plate (LH) and Cowl Side Trim (LH) Installation (Refer to GROUP 52A, Trims P.52A-23). • Floor Console Assembly Installation (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Clock Spring Installation (Refer to GROUP 52B, Air Bag Module and Clock Spring P.52B-408). • Steering Wheel Assembly and Air Bag Module Installation (Refer to GROUP 37, Steering Wheel P.37-24). • Check the dust cover for cracks or damage by pushing it with your finger. • Power Steering Fluid Supplying (Refer to GROUP 37, On-vehicle Service – Fluid Replacement P.37-20). • Power Steering Fluid Line Bleeding (Refer to GROUP 37, On-vehicle Service – Power Steering System Air Bleeding P.37-20). • Checking Steering Wheel Position with Wheels Straight Ahead. • Front Wheel Alignment Adjustment (Refer to GROUP 33, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33-6).



REMOVAL STEPS

1. STEERING SHAFT PAD
<<**A**>> 2. STEERING COLUMN ASSEMBLY AND STEERING GEAR CONNECTION
<<**B**>> 3. SELF-LOCKING NUTS (CONNECTION FOR TIE ROD END)
<<**B**>> 4. SELF-LOCKING NUTS (CONNECTION FOR LOWER ARM BALL JOINT)

REMOVAL STEPS (Continued)

5. LOWER ARM ASSEMBLY
6. STABILIZER LINK CONNECTION
7. RETURN TUBE CONNECTION
8. O-RING
9. PRESSURE HOSE CONNECTION
10. O-RING
11. PRESSURE HOSE CLAMP
12. SELF-LOCKING NUTS
>>**D**<< 13. SELF-LOCKING NUTS

TSB Revision

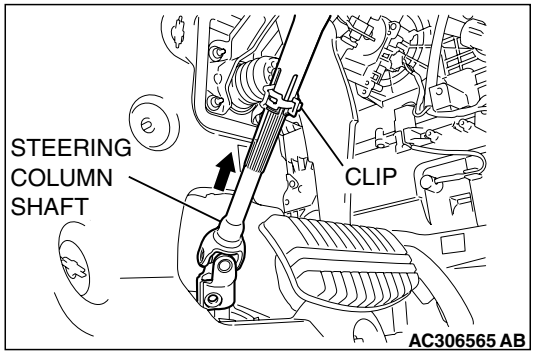
REMOVAL STEPS (Continued)

<<**D**>> >>**D**<< 14. FRONT AXLE CROSSMEMBER STAY
<<**E**>> >>**C**<< 15. ENGINE REAR ROLL STOPPER BRACKET, POWER STEERING GEAR AND LINKAGE, STABILIZER BAR AND FRONT AXLE NO.1 CROSSMEMBER ASSEMBLY
>>**B**<< 16. ENGINE REAR ROLL STOPPER BRACKET
>>**B**<< 17. POWER STEERING GEAR BRACKET
18. STEERING GEAR AND LINKAGE PROTECTOR
19. POWER STEERING GEAR AND LINKAGE
>>**A**<< 20. STABILIZER BAR
21. FRONT AXLE NO.1 CROSSMEMBER

Required Special Tool:

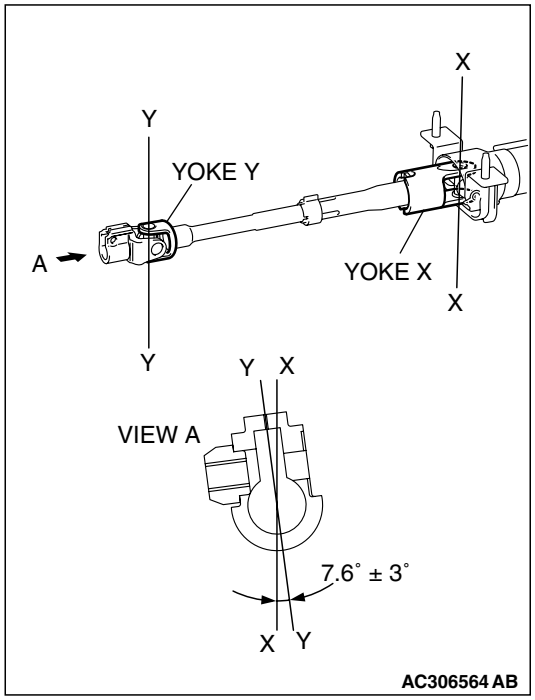
- MB991897: Ball Joint Remover

REMOVAL SERVICE POINTS



<<A>> STEERING COLUMN ASSEMBLY AND STEERING GEAR DISCONNECTION

Pinch the steering column shaft clip with pliers, and pull up the shaft in the direction shown to disengage the steering column assembly.



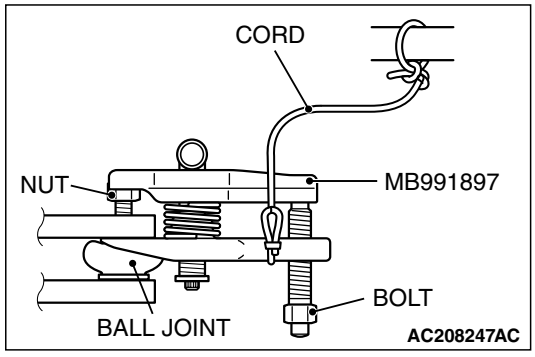
NOTE: If the steering column shaft is removed accidentally, remove the steering column assembly and be sure to insert the steering column shaft into the steering column as shown in the figure.

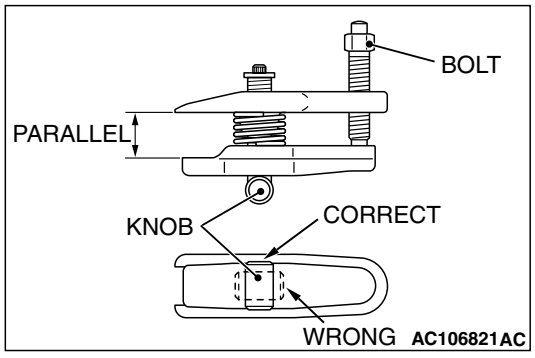
<<B>> SELF-LOCKING NUTS (CONNECTION FOR TIE ROD END AND LOWER ARM BALL JOINT) REMOVAL

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.**
- **Hang special tool MB991897 with a cord to prevent it from falling.**

1. Replace the self-locking nut for lower arm ball joint with a regular nut, because the original one is a little bit large to install special tool MB991897. Install special tool MB991897 as shown in the figure.

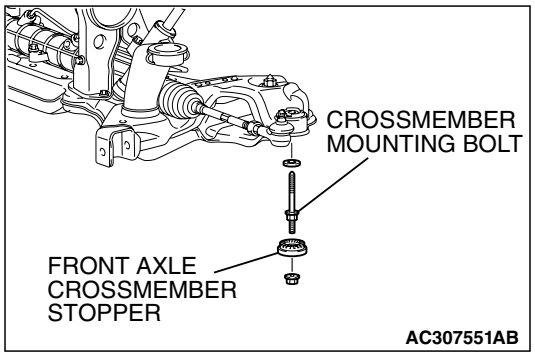




2. Turn the bolt and knob as necessary to make the jaws of special tool parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

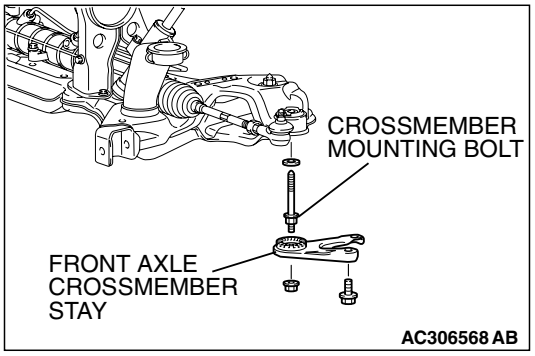
   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.
3. Tighten the bolt with a wrench to disconnect the lower arm ball joint, tie rod end and remove the self-locking nut.

TSB Revision



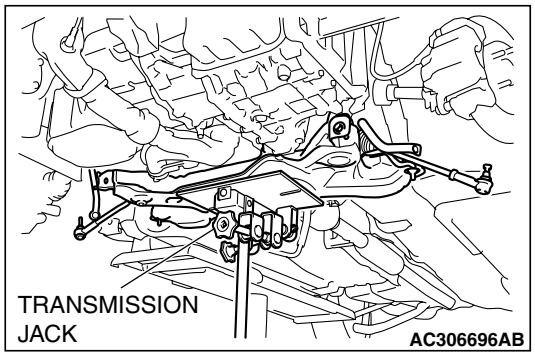
<<C>> FRONT AXLE CROSSMEMBER STOPPER REMOVAL

The crossmember mounting bolts need not be unscrewed when the front axle crossmember stopper is replaced. However, the bolts may become loosened when the front axle crossmember stopper is removed. Retighten the bolts to 180 ± 20 N·m (133 ± 15 ft-lb).



<<D>> FRONT AXLE CROSSMEMBER STAY REMOVAL

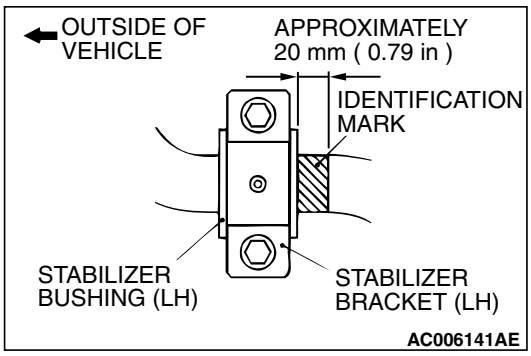
The crossmember mounting bolts need not be unscrewed when the front axle crossmember stay is replaced. However, the bolts may become loosened when the front axle crossmember stay is removed. Retighten the bolts to 180 ± 20 N·m (133 ± 15 ft-lb).



<<E>> ENGINE REAR ROLL STOPPER BRACKET, POWER STEERING GEAR AND LINKAGE, STABILIZER BAR AND FRONT AXLE NO.1 CROSSMEMBER ASSEMBLY REMOVAL

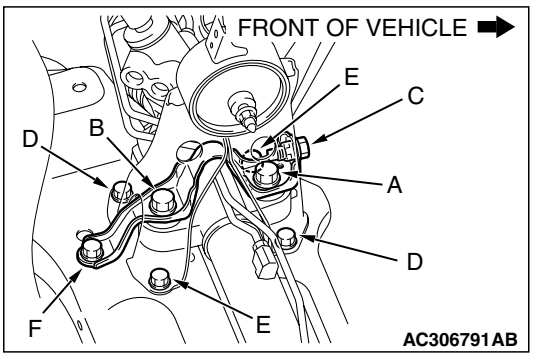
Support the front axle number 1 crossmember with a transmission jack, and then remove the crossmember mounting nuts and bolts.

INSTALLATION SERVICE POINTS



>>A<< STABILIZER BAR INSTALLATION

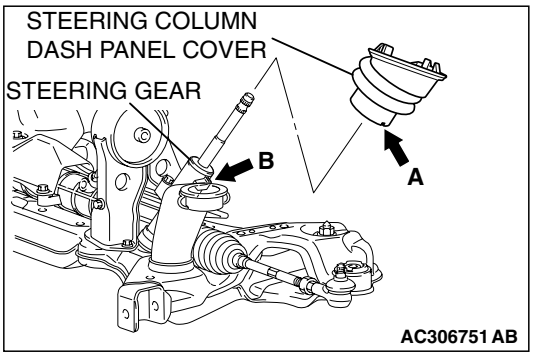
Align the stabilizer bar identification mark with the right end of the bushing (LH).



>>B<< POWER STEERING GEAR BRACKET/ENGINE REAR ROLL STOPPER BRACKET INSTALLATION

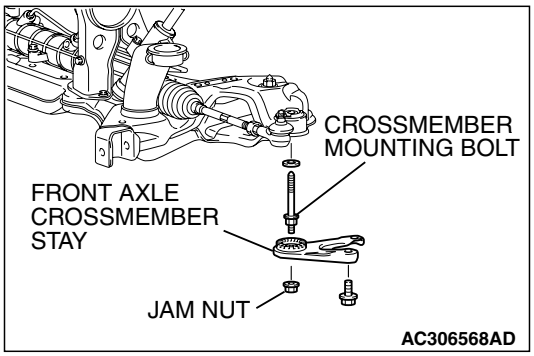
Tighten the bolts in the following sequence:

1. Tighten bolt A and then tighten bolt B.
2. Tighten bolts E finger tight.
3. Tighten bolt C and then tighten bolts D.
4. Tighten bolts E and then tighten bolt F.



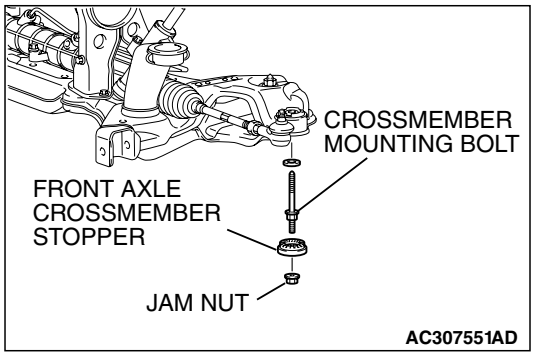
>>C<< ENGINE REAR ROLL STOPPER BRACKET, POWER STEERING GEAR AND LINKAGE, STABILIZER BAR AND FRONT AXLE NO.1 CROSSMEMBER ASSEMBLY INSTALLATION

Align the steering column dash panel cover notch (arrow A) with the steering gear lug (arrow B), and install the engine rear roll stopper bracket, power steering gear and linkage, stabilizer bar and front axle number 1 crossmember assembly.



>>D<< FRONT AXLE CROSSMEMBER STAY/SELF-LOCKING NUTS INSTALLATION

Ensure that the crossmember mounting bolts have been tightened to 180 ± 20 N·m (133 ± 15 ft-lb), and then install the front crossmember stay with the self-locking nut.



>>E<< FRONT AXLE CROSSMEMBER STOPPER/SELF-LOCKING NUTS INSTALLATION

Ensure that the crossmember mounting bolts have been tightened to 180 ± 20 N·m (133 ± 15 ft-lb), and then install the front crossmember stopper with the self-locking nut.

INSPECTION

M1321003300194

- Check the crossmembers for cracks or damage.

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1321004100450

ITEM		SPECIFICATION
Crossmember		
Engine rear roll stopper bracket bolt and nut		58 ± 7 N·m (43 ± 5 ft-lb)
Front axle crossmember stay bolt and nut <3.8L ENGINE>		83 ± 12 N·m (61 ± 9 ft-lb)
Front axle crossmember stopper nut <2.4L ENGINE>		83 ± 12 N·m (61 ± 9 ft-lb)
Front axle No.1 crossmember bolt and nut		180 ± 20 N·m (133 ± 15 ft-lb)
Lower arm assembly bolt		165 ± 15 N·m (122 ± 11 ft-lb)
Lower arm assembly nut (flange nut, jam)	M14	165 ± 15 N·m (122 ± 11 ft-lb)
Lower arm assembly nut (nut, jam)	M14	65 ± 6 N·m (48 ± 4 ft-lb)
Power steering gear and linkage bolt		83 ± 12 N·m (61 ± 9 ft-lb)
Power steering gear bracket bolt	M10	58 ± 7 N·m (43 ± 5 ft-lb)
	M12	83 ± 12 N·m (61 ± 9 ft-lb)
Pressure hose clamp bolt and nut		12 ± 2 N·m (102 ± 22 in-lb)

TSB Revision

ITEM		SPECIFICATION
Pressure hose nut		15 ± 3 N·m (11 ± 2 ft-lb)
Return tube clamp bolt and nut		12 ± 2 N·m (102 ± 22 in-lb)
Return tube nut		15 ± 3 N·m (11 ± 2 ft-lb)
Stabilizer bracket bolt		58 ± 7 N·m (43 ± 5 ft-lb)
Stabilizer link nut		48 ± 7 N·m (36 ± 5 ft-lb)
Steering column assembly bolt		18 ± 2 N·m (13 ± 2 ft-lb)
Steering gear and linkage protector bolt <3.8L ENGINE>		12 ± 2 N·m (102 ± 22 in-lb)
Tie rod end nut		29 ± 4 N·m (21 ± 3 ft-lb)
Engine mounting		
Engine front mounting bracket bolt	M10	58 ± 7 N·m (43 ± 5 ft-lb)
Engine front mounting bracket bolt and nut	M12	83 ± 12 N·m (61 ± 9 ft-lb)
Engine mounting stay bolt <3.8L ENGINE>		41 ± 6 N·m (31 ± 4 ft-lb)
Grounding cable bolt		9.0 ± 2.0 N·m (80 ± 17 in-lb)
Engine roll stopper and centermember		
Centermember bolt		83 ± 12 N·m (61 ± 9 ft-lb)
Engine front roll stopper bracket bolt and nut		58 ± 7 N·m (43 ± 5 ft-lb)
Engine rear roll stopper bracket bolt and nut		58 ± 7 N·m (43 ± 5 ft-lb)
Transaxle case rear roll stopper bracket bolt		90 ± 10 N·m (67 ± 7 ft-lb)
Transaxle mounting		
Transaxle mounting body side bracket nut (nut, flange)	M12	113 ± 12 N·m (83 ± 9 ft-lb)
Transaxle mounting body side bracket nut (nut, jam)	M12	58 ± 7 N·m (43 ± 5 ft-lb)

GROUP 33

FRONT SUSPENSION

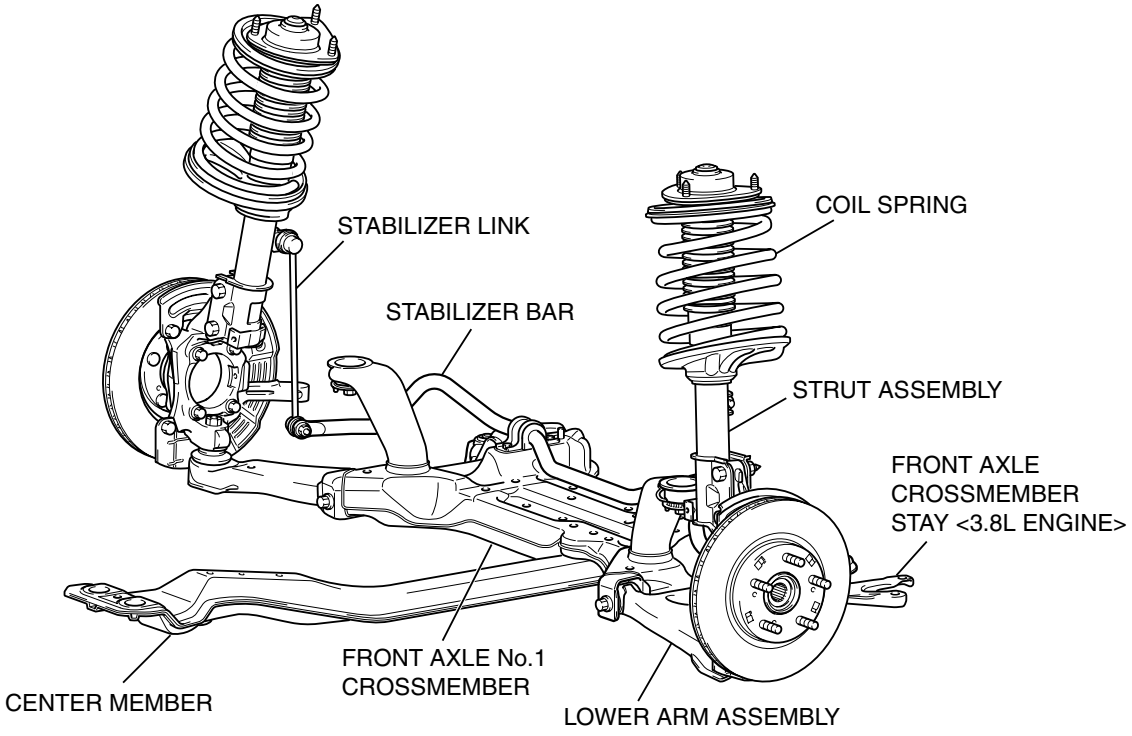
CONTENTS

GENERAL DESCRIPTION

M1332000100270

The front suspension is a MacPherson strut with coil spring. The shock absorber is gas-filled hydraulic double-tube type.

CONSTRUCTION DIAGRAM



AC305733 AB

FRONT SUSPENSION DIAGNOSIS

INTRODUCTION TO FRONT SUSPENSION DIAGNOSIS

M1332009000269

If the front suspension is faulty, the vehicle will not run straightforward or noise will occur. Incorrect wheel alignment, malfunction of strut assembly, stabilizer bar, coil spring, or worn or out-of-balance tires can cause these problems.

FRONT SUSPENSION DIAGNOSIS TROUBLESHOOTING STRATEGY

M1332009100255

Use these steps to plan your diagnostic strategy. If you follow them thoroughly, you will be sure that you have exhausted most of the possible ways to find a front suspension fault.

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

SYMPTOM CHART

M1332009400290

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Steering wheel is heavy, vibrates or pulls to one side	1	P.33-3
Excessive body rolling	2	P.33-3
Poor ride	3	P.33-4
Unequal ride height	4	P.33-4
Noise	5	P.33-4

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Steering Wheel is Heavy, Vibrates or Pulls to One Side

DIAGNOSIS

STEP 1. Check the tires.
Check for the tire pressure, the tire pressure balance between left and right tires, and the tire condition. Refer to GROUP 31, Diagnosis P.31-5.

Q: Are the tires in normal condition?
YES : Go to Step 2.
NO : If out of pressure, adjust the tire pressure. If out of balance, balance the tires as necessary. If excessively worn, replace the tires as necessary and then go to Step 5.

STEP 2. Check the wheel alignment.
Refer to P.33-6.

Q: Is the wheel alignment correct?
YES : Go to Step 3.
NO : Adjust it, and then go to Step 5.

STEP 3. Check the lower arm ball joint.

Q: Is the ball joint in good condition?
YES : Go to Step 4.
NO : Replace the lower arm assembly, and then go to Step 5.

STEP 4. Check the coil spring.

Q: Is the coil spring in good condition?
YES : Go to Step 5.
NO : Replace it, and then go to Step 5.

STEP 5. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Excessive Body Rolling

DIAGNOSIS

STEP 1. Check for broken or deteriorated stabilizer bar.

Q: Is the stabilizer bar in good condition?
YES : Go to Step 2.
NO : Replace it, and then go to Step 3.

STEP 2. Check the strut assembly for damage.

Q: Is the strut assembly in good condition?
YES : Go to Step 3.
NO : Replace it, and then go to Step 3.

STEP 3. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Poor Ride

DIAGNOSIS

STEP 1. Check for improper tire inflation pressure.
Refer to GROUP 31, On-vehicle Service – Tire Inflation Pressure Check P.31-56.

Q: Is the tire inflation correct?
YES : Go to Step 2.
NO : Adjust it, and then go to Step 4.

STEP 2. Check for broken or deteriorated coil spring(s).

Q: Are the coil spring(s) broken or deteriorated?
YES : Replace the coil spring(s), and then go to Step 4.
NO : Go to Step 3.

STEP 3. Check for strut assembly damage.

Q: Is the strut assembly damaged?
YES : Replace it, and then go to Step 4.
NO : Go to Step 4.

STEP 4. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 4: Unequal Ride Height

DIAGNOSIS

STEP 1. Check for broken or deteriorated coil spring(s).

Q: Is the coil spring(s) broken or deteriorated?
YES : Replace it, and then go to Step 2.
NO : Go to Step 2.

STEP 2. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 5: Noise

DIAGNOSIS

STEP 1. Check for lack of lubrication.

Q: Is lubrication inadequate?
YES : Lubricate it, and then go to Step 5.
NO : Go to Step 2.

STEP 2. Check the tightened parts for looseness and check the bushings for wear.

Q: Are the tightened parts and bushings in good condition?
YES : Go to Step 3.
NO : Tighten or replace as necessary, then go to Step 5.

STEP 3. Check for broken coil springs.

Q: Is the coil spring broken?
YES : Replace it, and then go to Step 5.
NO : Go to Step 4.

STEP 4. Check for strut assembly damage.

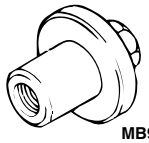
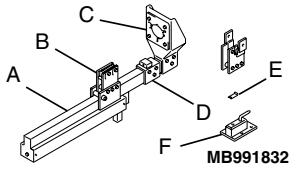
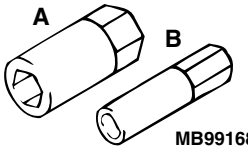
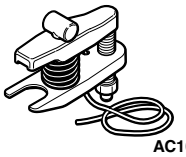
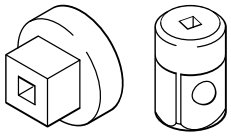
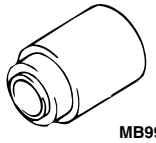
Q: Is the strut assembly damaged?
YES : Replace it, and then go to Step 5.
NO : Go to Step 5.

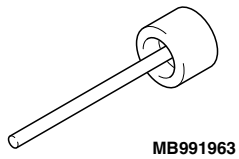
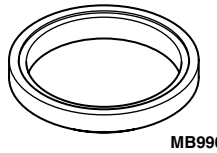
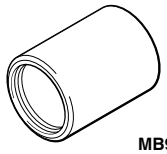
STEP 5. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

SPECIAL TOOLS

M1332000600327

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991004	MB991004 Wheel alignment gauge attachment	MB991004-01 or General service tool	Wheel alignment measurement
 MB991832	MB991832 Spring compressor set A: MB991793 Spring compressor B: MB991795 Attachment A C: MB991794 Upper plate D: MB991829 Arm bracket E: MB991831 Spacer F: MB991830 Fixture	General service tool	Front coil spring compression *NOTE: The coil spring can not be compressed by following conventional special tools.* • *MB991237 Spring compressor body* • *MB991238 Arm set*
 MB991680	MB991680 Wrench set A: MB991681 Wrench B: MB991682 Socket	–	Strut assembly disassembly and assembly
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or General service tool	Knuckle and ball joint disconnection *NOTE: Steering linkage puller (MB990635 or MB991113) is also available to disconnect knuckle and ball joint.*
 MB990326	MB990326 Preload socket	General service tool	Ball joint breakaway torque check
 MB990776	MB990776 Front axle base	MB990776-01	Lower arm ball joint dust cover installation

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991963	MB991963 Suspension bushing arbor	–	Lower arm bushing removal and press-fitting
 MB990889	MB990889 Rear suspension bushing ring	–	
 MB990890	MB990890 Rear suspension bushing base	MB990890-01 or general service tool	

ON-VEHICLE SERVICE

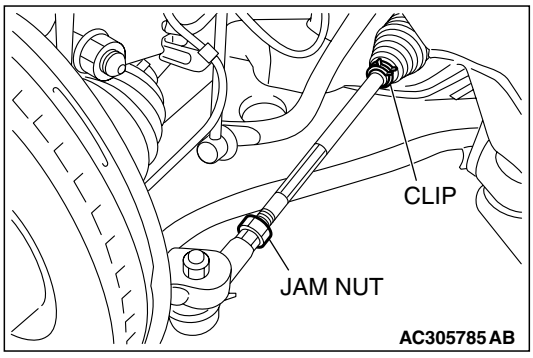
FRONT WHEEL ALIGNMENT CHECK AND ADJUSTMENT

M1331000901038

Measure wheel alignment with alignment equipment on a level surface. The front suspension, steering system and tires should be serviced to normal condition before measuring wheel alignment.

TOE-IN

Standard value: 0 ± 3 mm (0 ± 0.12 inch)



1. Adjust the toe-in by undoing the clip and jam nut, and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

   NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.
2. Install the clip and tighten the jam nut to the specified torque.

   Tightening torque: 52 ± 2 N·m (38 ± 2 ft-lb)
3. Confirm that the toe-in is at the standard value.
4. Use a turning radius gauge to check that the steering angle is at the standard value.

   STEERING ANGLE
   Standard value:

ITEM	VEHICLES WITH 16-INCH WHEELS	VEHICLES WITH 17-INCH WHEELS	VEHICLES WITH 18-INCH WHEELS
Inner wheel	37°12' ± 2°00'	33°48' ± 2°00'	32°54' ± 2°00'
Outer wheel (reference)	30°18'	28°18'	27°48'

CAMBER, CASTER AND KINGPIN INCLINATION

Required Special Tool:

- MB991004: Wheel Alignment Gauge Attachment

Standard value:

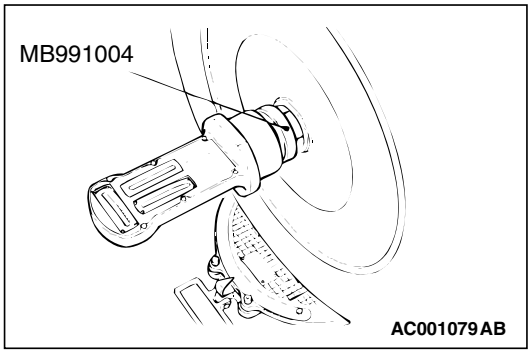
Camber: 0°00' ± 0°30' (Left/right deviation within 30')
Caster: 3°00' ± 0°30' (Left/right deviation within 30')
Kingpin inclination: 12°54' ± 1°30'

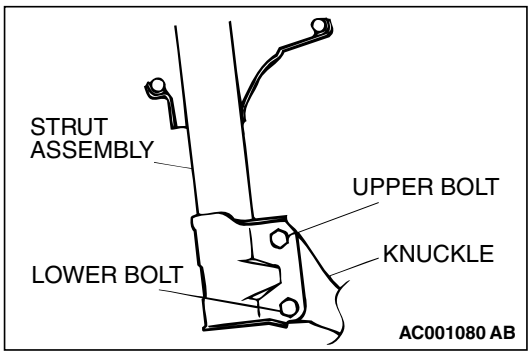
NOTE: Caster are preset at the factory and cannot be adjusted.

⚠ CAUTION

Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosened.

NOTE: Attach the camber/caster/kingpin gauge to the drive-shaft by using special tool MB991004. Tighten special tool MB991004 to the same torque 226 ± 29 N·m (167 ± 21 ft-lb) as the drive shaft nut.





If the camber is outside of the standard value, perform the following adjustment procedures.

1. Estimate how much additional camber adjustment is required. Using the table below, select the camber adjusting bolt, and then replace the knuckle and strut assembly connection bolts (upper bolt, lower bolt) with the selected bolts.

BOLT DIAMETER mm (in)		CAMBER ADJUSTING VALUE					
		0°00'	0°15'	0°30'	0°45'	1°00'	1°15'
Upper bolt	16.0 (0.63)	•	•				
	14.9 (0.59)			•	•		
	14.1 (0.56)					•	
	13.6 (0.54)						•

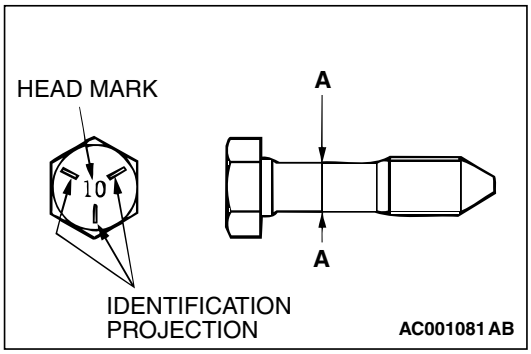
BOLT DIAMETER mm (in)		CAMBER ADJUSTING VALUE					
		0°00'	0°15'	0°30'	0°45'	1°00'	1°15'
Lower bolt	16.0 (0.63)	•					
	14.9 (0.59)		•	•			
	14.1 (0.56)				•	•	
	13.6 (0.54)						•

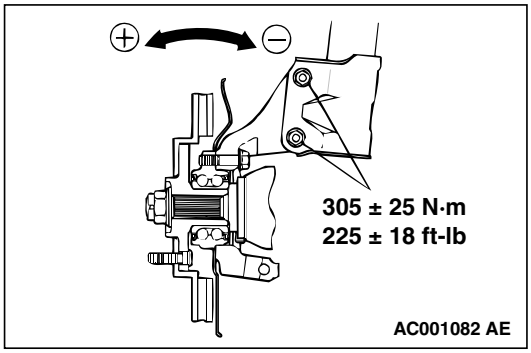
NOTE: If the camber adjusting value that is required is greater than 1° 30', check for bent or damaged parts and replace as necessary.

Bolts are identified in the following table:

DIAMETER A mm (in)		NUMBER OF IDENTIFICATION PROJECTION
Set bolt	16.0 (0.63)	0
Adjusting bolt	14.9 (0.59)	1
	14.1 (0.59)	2
	13.6 (0.54)	3

NOTE: Set bolt is the bolt installed at factory. "10" embossed on bolt head is head mark.





2. Tighten the nuts temporarily, and then pull or push the front axle to adjust the camber.

   NOTE: Pulling the upper side of the front axle to the outside of the vehicle will increase the camber. Pushing it to the inside of the vehicle will decrease the camber.
3. Tighten the nuts to 305 ± 25 N·m (225 ± 18 ft-lb).
4. Recheck the camber.

LOWER ARM BALL JOINT END PLAY CHECK

M1332011300085

1. Raise the vehicle.
2. Move the lower arm up and down with your hands to check for excessive play in the axial direction of the ball joint. If there is excessive play, replace the lower arm assembly.

BALL JOINT DUST COVER CHECK

M1332008600354

1. Press the dust cover with your finger to check that there are no cracks or damage in the dust cover.
2. If the dust cover is cracked or damaged, replace the lower arm assembly or the stabilizer link.

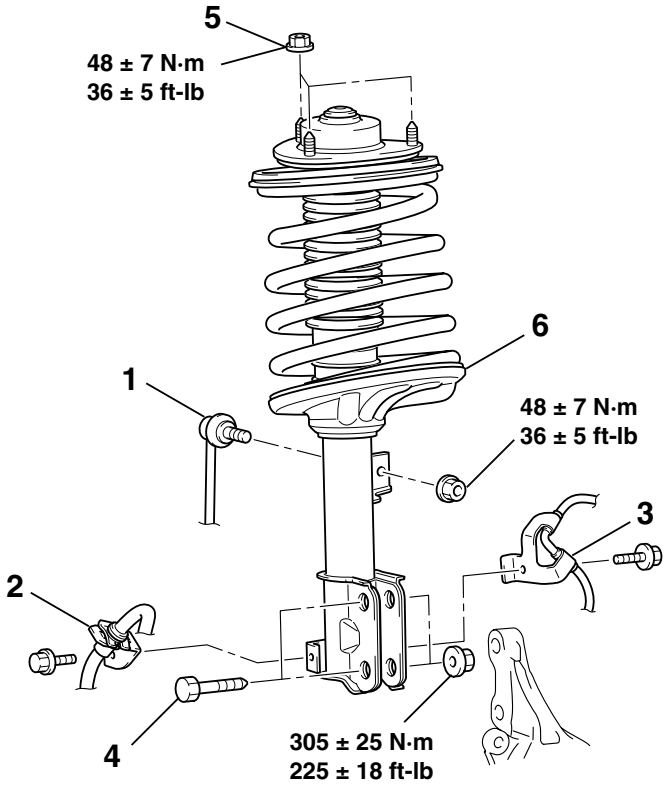
   NOTE: If the dust cover is cracked or damaged, it is possible that there may also be damage to the ball joint.

STRUT ASSEMBLY

REMOVAL AND INSTALLATION

M1332001100789

Post-installation Operation
- Front Wheel Alignment Check and Adjustment (Refer to P.33-6).



AC205769AC

REMOVAL STEPS
1. STABILIZER LINK
2. BRAKE HOSE BRACKET
3. FRONT WHEEL SPEED SENSOR CLAMP <VEHICLES WITH ABS>
4. STRUT BOLT

REMOVAL STEPS (Continued)
5. STRUT NUT
- STRUT TOWER BAR BRACKET <RALLIART> (REFER TO GROUP 42, STRUT TOWER BAR P.42-11).
6. STRUT ASSEMBLY

INSPECTION

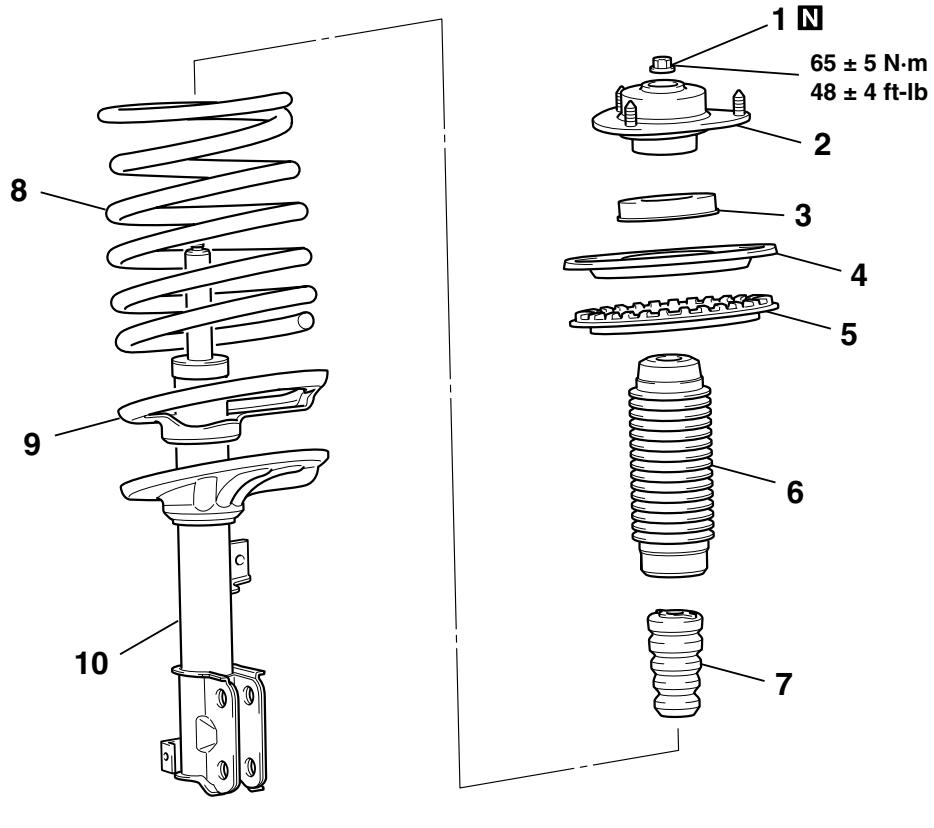
M1332001200281

- Check for oil leaks from the strut assembly.
- Check the strut assembly for damage or deformation.

TSB Revision

DISASSEMBLY AND ASSEMBLY

M1332001300352



AC305783 AB

DISASSEMBLY STEPS

<<**A**>>>>**C**<<1. STRUT NUT (JAM NUT)
>>**B**<<2. STRUT INSULATOR
3. STRUT BEARING
4. SPRING UPPER SEAT
5. SPRING UPPER PAD
6. STRUT COVER
7. STRUT DAMPER
8. COIL SPRING
>>**A**<<9. SPRING LOWER PAD
<<**B**>> 10. FRONT SUSPENSION STRUT

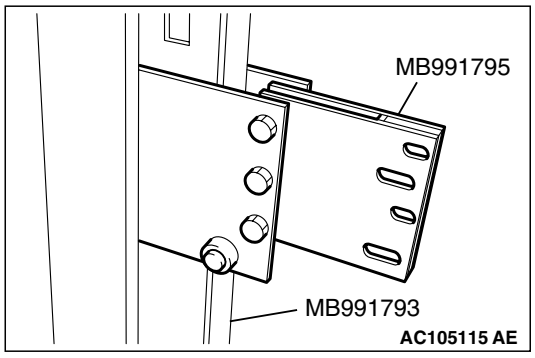
Required Special Tools:

- MB991680: Wrench Set
  - MB991681: Wrench
  - MB991682: Socket
- MB991832: Spring Compressor Set
  - MB991793: Spring Compressor
  - MB991794: Upper Plate
  - MB991795: Attachment A
  - MB991829: Arm Bracket
  - MB991830: Fixture
  - MB991831: Spacer

DISASSEMBLY SERVICE POINTS

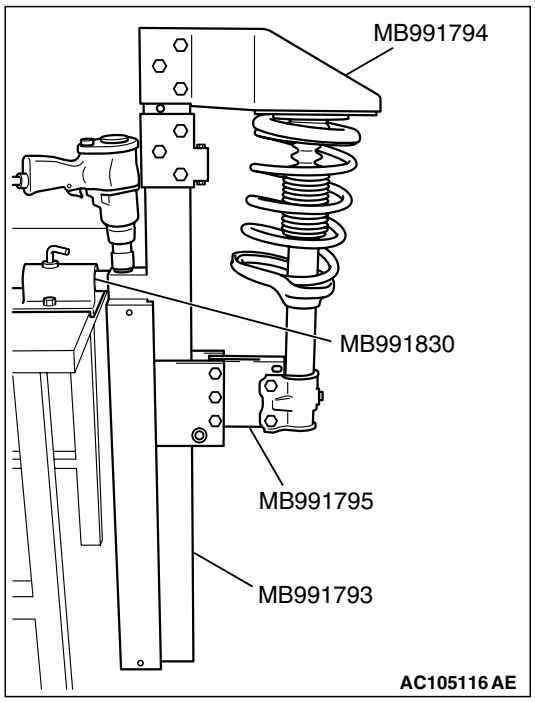
<<A>> STRUT NUT (JAM NUT) REMOVAL

1. Install special tool MB991795 to special tool MB991793 as shown in the illustration.



AC105115 AE

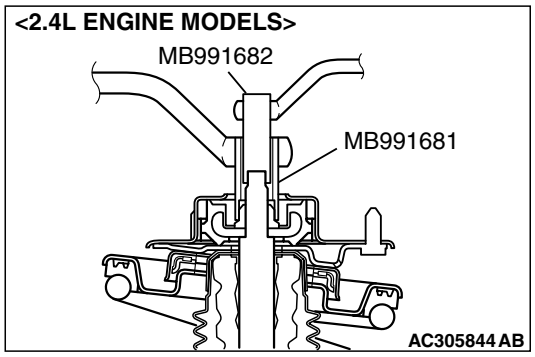
TSB Revision



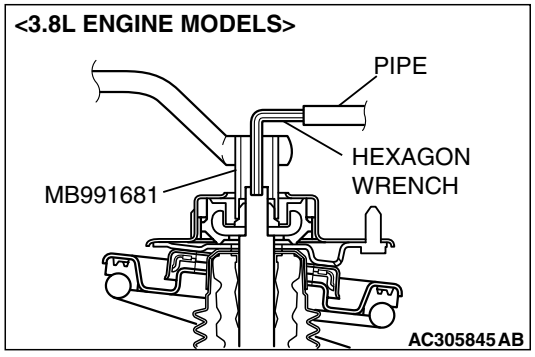
2. Set the strut assembly to the following special tools.
   - MB991793: Spring Compressor
   - MB991794: Upper Plate
   - MB991795: Attachment A
   - MB991830: Fixture

   NOTE: Set the strut assembly by using the bolt and nut that are removed from the vehicle. When installing the bolt and nut, lightly tighten them by hand.
3. Compress the coil spring approximately 5 mm (0.20 inch) using the spring compressor.

⚠ CAUTION
Do not use an impact wrench to tighten the strut nut, otherwise the strut nut will be damaged. Vibration of the impact wrench will cause the valve inside the strut to drop out.



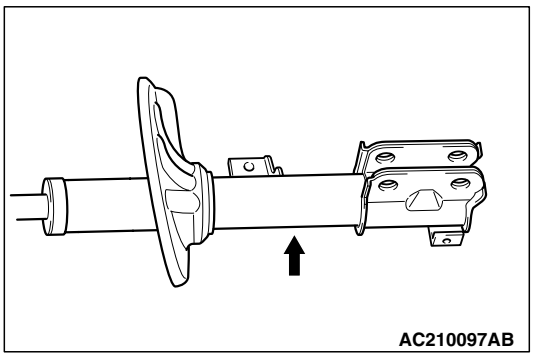
4. For 2.4L engine models, use special tool MB991682 to secure the strut, and then remove the strut nut (jam nut) using special tool MB991681.



For 3.8L engine models, use a hexagon wrench and a pipe to secure the strut, and then remove the strut nut (jam nut) using special tool MB991681.

<<B>> FRONT SUSPENSION STRUT DISPOSAL

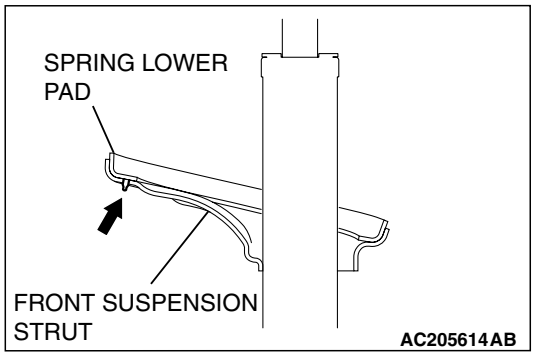
⚠ WARNING
Wear goggles when drilling to protect your eyes from flying metal debris.


AC210097AB

The gas must be discharged from the strut before discarding it. Place the strut horizontally with its piston rod extended. Then drill a hole of approximately 3 mm (0.1 inch) in diameter at the location shown in the illustration and discharge the gas.

ASSEMBLY SERVICE POINTS

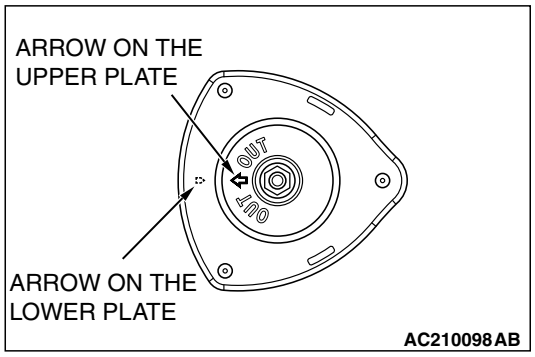
>>A<< SPRING LOWER PAD INSTALLATION



AC205614AB

Engage the three lugs of the spring lower pad into the holes on the front suspension strut as shown.

>>B<< STRUT INSULATOR INSTALLATION



AC210098AB

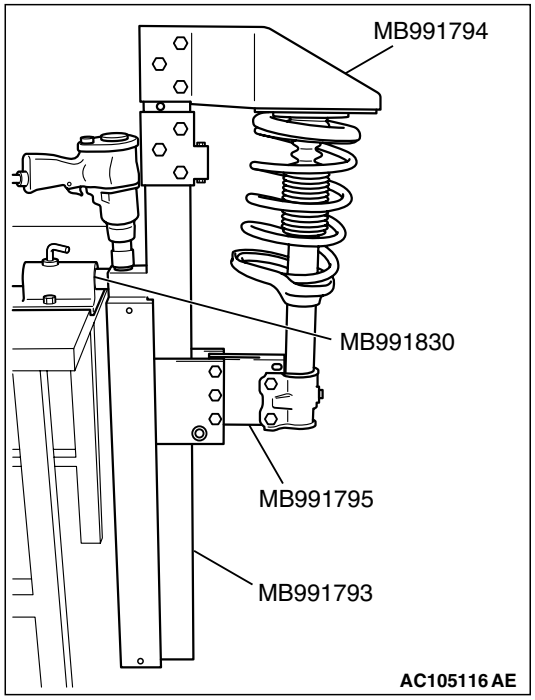
If the upper plate and lower plate of the strut insulator have been disassembled, assemble them as shown.

>>C<< STRUT NUT (JAM NUT) INSTALLATION

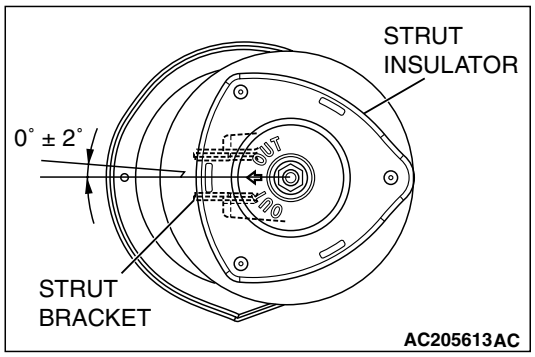
1. Ensure that the bearing is seated correctly.

⚠ ***WARNING***

When the strut piston rod is positioned to the hole of strut insulator with compressing the coil spring, be careful not that your hand is jammed by the coil spring.



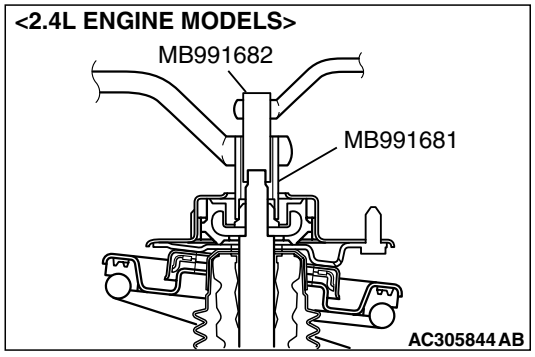
2. Compress the coil spring slowly using the following special tools, penetrating the strut piston rod to the hole of strut insulator.
   - MB991793: Spring Compressor
   - MB991794: Upper Plate
   - MB991795: Attachment A
   - MB991830: Fixture
3. While the coil spring is being compressed by the special tools, temporarily tighten the strut nut (jam nut).



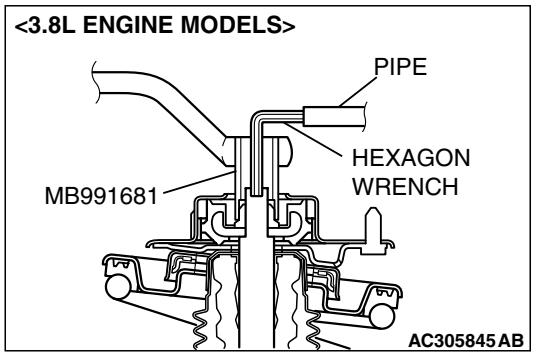
4. Ensure that the arrows on the strut bracket center and the strut insulator are positioned as shown.

⚠ **CAUTION**

Do not use an impact wrench to tighten the strut nut, otherwise the strut nut will be damaged. Vibration of the impact wrench will cause the valve inside the strut to drop out.



5. For 2.4L engine models, using special tools MB991681 and MB991682, tighten the strut nut (jam nut) to 65 ± 5 N·m (48 ± 4 ft-lb).



For 3.8L engine models, using special tool MB991681, a hexagon wrench and a pipe, tighten the strut nut (jam nut) to 65 ± 5 N·m (48 ± 4 ft-lb).

INSPECTION

M1332001400207

- Check the strut bearing for wear.
- Check the rubber parts for damage or deterioration.
- Check the coil spring for deformation, deterioration or damage.
- Check the front suspension strut for deformation.

LOWER ARM

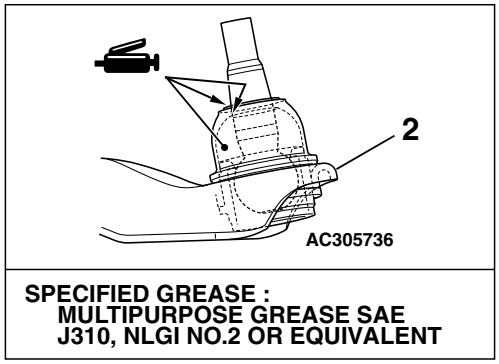
REMOVAL AND INSTALLATION

M1332001600364

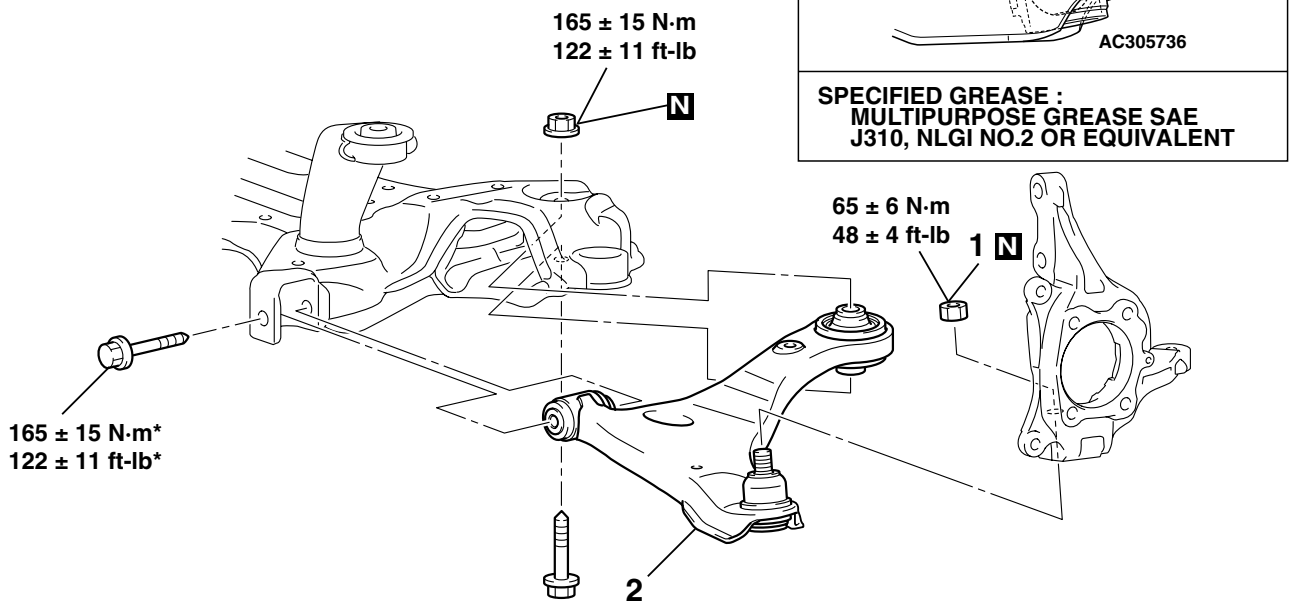
⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

Post-installation Operation
- Check the dust cover for cracks or damage by pushing it with your finger.
- Front Wheel Alignment Check and Adjustment (Refer to P.33-6).



**SPECIFIED GREASE :
MULTIPURPOSE GREASE SAE J310, NLGI NO.2 OR EQUIVALENT**



AC305734 AB

REMOVAL STEPS

<<**A**>> 1. LOWER ARM AND KNUCKLE CONNECTION
2. LOWER ARM ASSEMBLY

Required Special Tool:
- MB991897: Ball Joint Remover

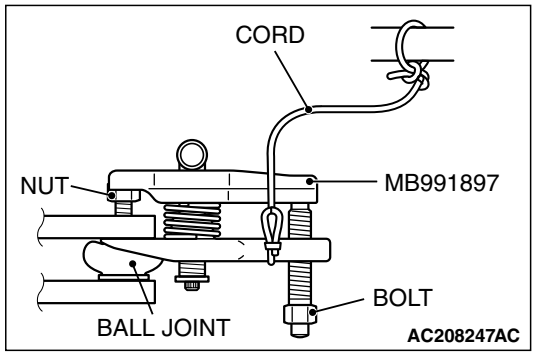
TSB Revision

REMOVAL SERVICE POINT

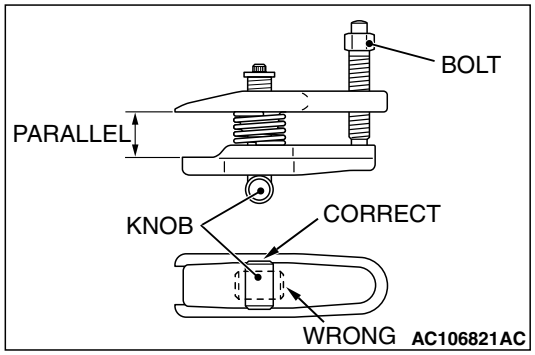
<<A>> LOWER ARM AND KNUCKLE DISCONNECTION

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.**
- **Hang special tool MB991897 with a cord to prevent it from falling.**



1. Replace the jam nut for lower arm ball joint with a regular nut, because the original one is a little bit large to install the special tool. And then install special tool MB991897 as shown in the figure.



2. Turn the bolt and knob as necessary to make the jaws of special tool MB991897 parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the ball joint.

INSPECTION

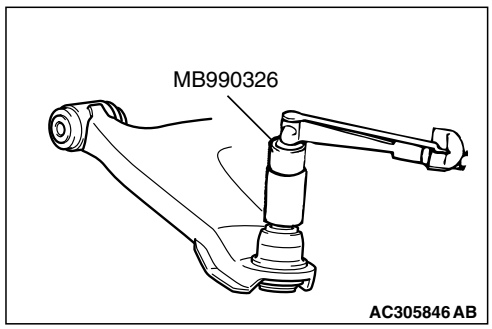
M1332001700316

- Check the bushing for wear and deterioration.
- Check the lower arm assembly for bending or breakage.
- Check all bolts for condition and straightness.

LOWER ARM BALL JOINT BREAKAWAY TORQUE CHECK

Required Special Tool:

- MB990326: Preload Socket



1. Move the ball joint stud several times and install the lower arm nut on the stud. Using special tool MB990326, measure the ball joint breakaway torque.

   Standard value: 3.5 – 6.9 N·m (31 – 61 in-lb)

2. If the measured value is not within the standard value, or if the ball joint is difficult to turn or does not turn smoothly, replace the lower arm assembly.

LOWER ARM BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the lower arm assembly.

   NOTE: Cracks or damage to the dust cover may cause damage to the ball joint. When it is damaged during service work, replace the dust cover.

LOWER ARM BALL JOINT DUST COVER REPLACEMENT

M1332008200282

Required Special Tool:

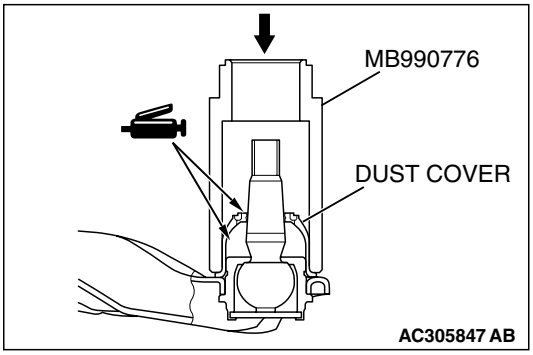
- MB990776: Front Axle Base

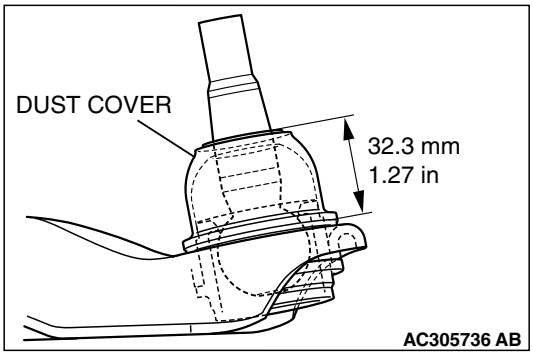
If the dust cover is damaged accidentally during service work, replace the dust cover as follows:

1. Remove the dust cover.
2. Apply the multipurpose grease SAE J310, NLGI No.2 or equivalent to the lip and the inside of a new dust cover.

   Grease amount for the inside the dust cover (reference): 13 ± 0.5 g (0.45 ± 0.02 oz)

3. Using special tool MB990776, drive in the dust cover until it is fully seated.





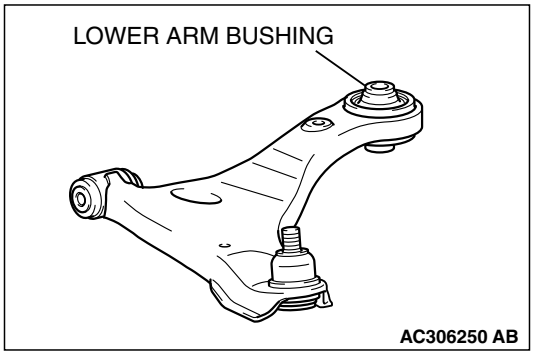
4. Position the dust cover as shown in the illustration. Make sure that there is no abnormal bulge or pressure applied to the dust cover.
5. Check the dust cover for cracks or damage by pushing it with your finger.

LOWER ARM BUSHING (REAR) REPLACEMENT

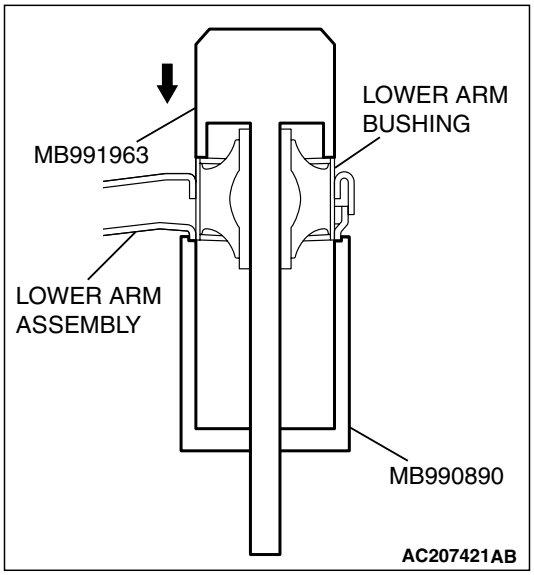
M1332008100371

Required Special Tools:

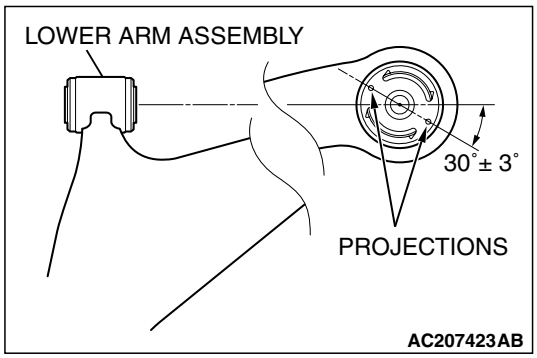
- MB991963: Suspension Bushing Arbor
- MB990889: Rear Suspension Bushing Ring
- MB990890: Rear Suspension Bushing Base

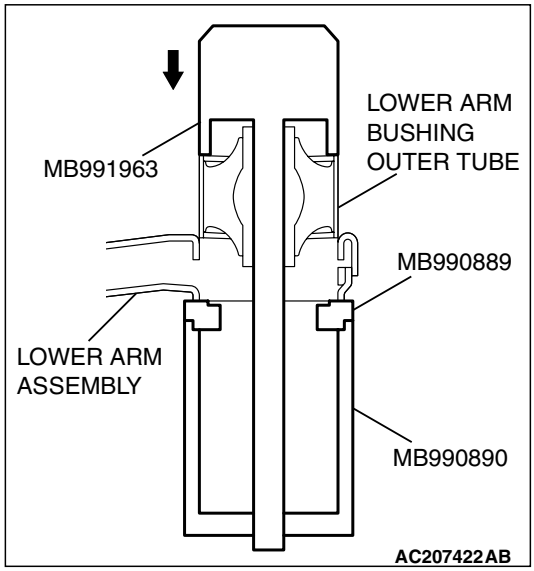


Replace the lower arm bushing as follows:



1. Use special tools MB991963 and MB990890 to drive out the lower arm bushing.





2. Position the lower arm bushing so that its projections are positioned as shown, and then use special tools MB991963, MB990889 and MB990890 to press in the lower arm bushing.

⚠ CAUTION

When pressing in the lower arm bushing, take care not to deform the lower arm.

3. Press the lower arm bushing until its outer tube is flush with the lower arm assembly surface while checking that the press-in pressure is at the standard value. If the press-in pressure is lower than the standard value, replace the lower arm assembly.

   Standard value: 10 kN (2,248 pounds) or more

STABILIZER BAR

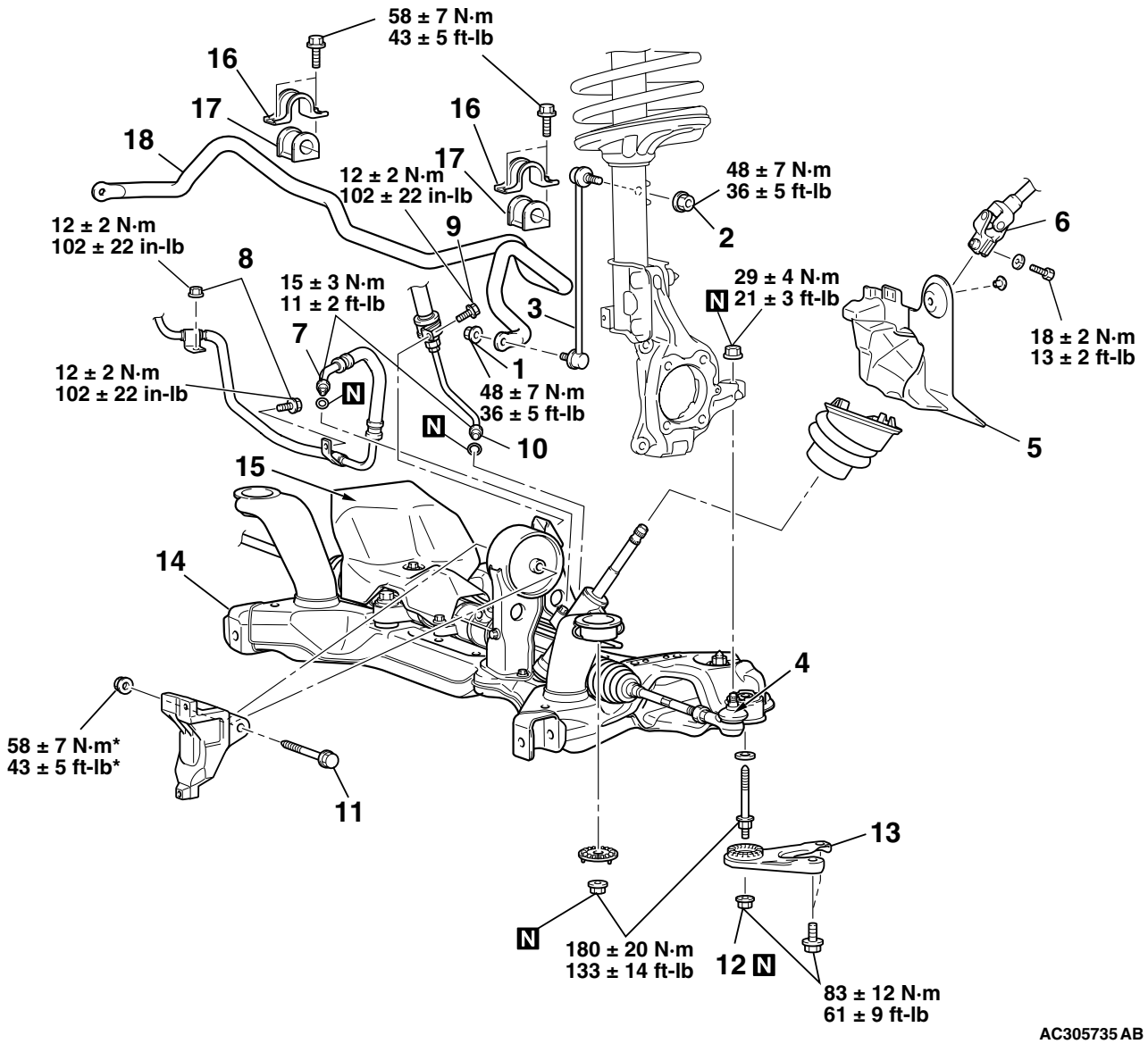
REMOVAL AND INSTALLATION

M1332004000297

⚠ CAUTION

- **Before removing the steering wheel and air bag module assembly, refer to GROUP 52B – Service Precautions (P.52B-29) and Air Bag Module and Clock Spring (P.52B-408). Also, put the front wheels in straight-ahead position. Failure to do so may damage the SRS clock spring and render the SRS air bag inoperative, which results in serious driver injury.**
- ***: Indicates parts which should be initially tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**

Stabilizer Bar Pre-removal Operation	Stabilizer Bar Post-installation Operation
• Power Steering Fluid Draining (Refer to GROUP 37, On-Vehicle Service – Fluid Replacement P.37-20). • Front Under Cover Removal. • Centermember Removal (Refer to GROUP 32, Engine Roll Stopper, Centermember P.32-7). • Lower Arm Assembly Removal (Refer to P.33-15). • Air Bag Module Assembly, Steering Damper and Steering Wheel Assembly Removal (Refer to GROUP 37, Steering Wheel P.37-24). • Floor Console Assembly Removal (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Front Scuff Plate and Cowl Side Trim Removal (Refer to GROUP 52A, Trims P.52A-23). • Trunk Lid Opener Cover Removal • Accelerator Pedal Stopper Removal • Floor Carpet Removal	• Check the dust covers for cracks or damage by pushing it with your finger. • Floor Carpet Installation • Trunk Lid Opener Cover Installation • Accelerator Pedal Stopper Installation • Cowl Side Trim and Front Scuff Plate Removal (Refer to GROUP 52A, Trims P.52A-23). • Floor Console Assembly Installation (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Steering Wheel Assembly, Steering Damper and Air Bag Module Assembly Installation (Refer to GROUP 37, Steering Wheel P.37-24). • Checking Steering Wheel Position with Wheels Straight Ahead • Lower Arm Assembly Installation (Refer to P.33-15). • Centermember Installation (Refer to GROUP 32, Engine Roll Stopper, Centermember P.32-7). • Front Wheel Alignment Check and Adjustment (Refer to P.33-6). • Front Under Cover Installation. • Power Steering Fluid Supplying (Refer to GROUP 37, On-Vehicle Service – Fluid Replacement P.37-20). • Power Steering Fluid Line Bleeding (Refer to GROUP 37, On-Vehicle Service – Power Steering System Air Bleeding P.37-20).



AC305735 AB

STABILIZER LINK REMOVAL STEPS

1. STABILIZER NUT
2. STABILIZER NUT
3. STABILIZER LINK

STABILIZER BUSHING REMOVAL STEPS

1. STABILIZER NUT
15. STEERING GEAR AND LINKAGE PROTECTOR <3.8L ENGINE> (REFER TO GROUP 32, CROSSMEMBER P.32-10).

>>A<< 16. STABILIZER BRACKET

>>A<< 17. STABILIZER BUSHING

STABILIZER BAR REMOVAL STEPS

1. STABILIZER NUT

<<A>> 4. TIE ROD END AND KNUCKLE CONNECTION

5. STEERING SHAFT PAD

<<B>> 6. STEERING GEAR AND STEERING COLUMN ASSEMBLY CONNECTION

7. STEERING GEAR AND RETURN TUBE CONNECTION

8. RETURN TUBE CLAMP NUT AND BOLT

9. PRESSURE HOSE CLAMP BOLT

10. STEERING GEAR AND PRESSURE TUBE CONNECTION

11. REAR ROLL STOPPER CONNECTION BOLT

>>C<< 12. JAM NUT

<<C>> >>C<< 13. FRONT AXLE CROSSMEMBER STAY

TSB Revision

STABILIZER BAR REMOVAL STEPS (Continued)

>>**B**<< 14. FRONT AXLE NO.1 CROSSMEMBER, REAR ROLL STOPPER AND STEERING GEAR ASSEMBLY
15. STEERING GEAR AND LINKAGE PROTECTOR <3.8L ENGINE> (REFER TO GROUP 32, CROSSMEMBER P.32-10).
>>**A**<< 16. STABILIZER BRACKET

STABILIZER BAR REMOVAL STEPS (Continued)

>>**A**<< 17. STABILIZER BUSHING
>>**A**<< 18. STABILIZER BAR

Required Special Tool:

- MB991897: Ball Joint Remover

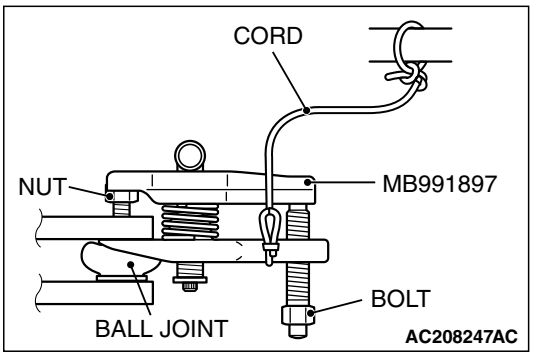
REMOVAL SERVICE POINTS

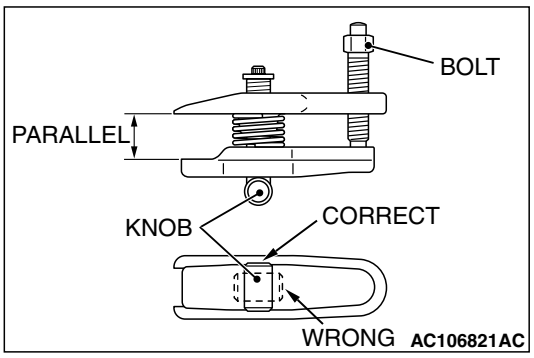
<<A>> TIE ROD END AND KNUCKLE DISCONNECTION

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.**
- **Hang special tool MB991897 with a cord to prevent it from falling.**

1. Install special tool MB991897 as shown in the figure.



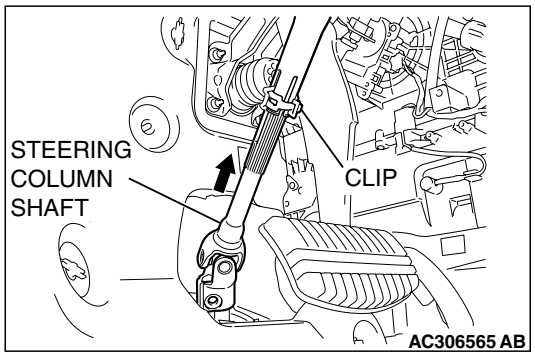


2. Turn the bolt and knob as necessary to make the jaws of special tool MB991897 parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

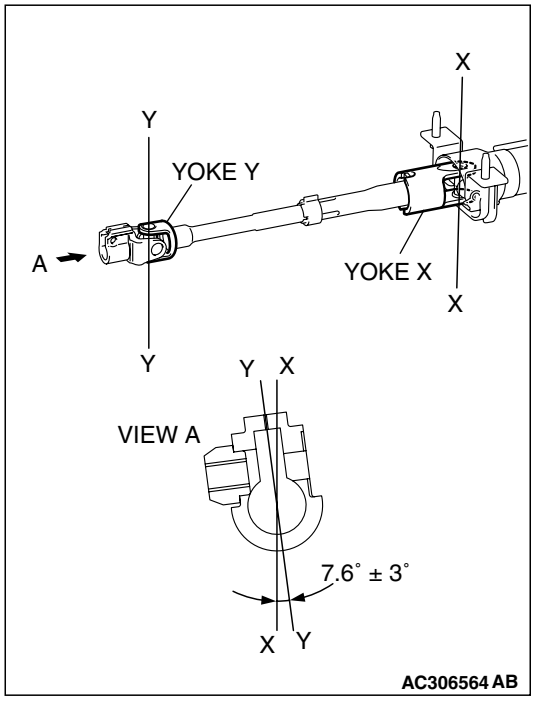
   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.
3. Tighten the bolt with a wrench to disconnect the tie rod end.

<<B>> STEERING GEAR AND STEERING COLUMN ASSEMBLY DISCONNECTION

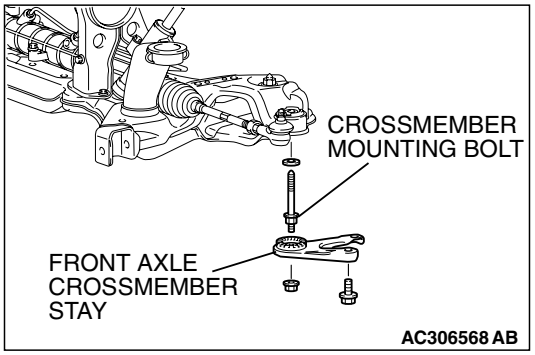
1. Remove the steering gear and steering column assembly connecting bolt.



2. Pinch the steering column shaft clip with pliers, and pull up the shaft in the direction shown to disengage the steering column assembly.

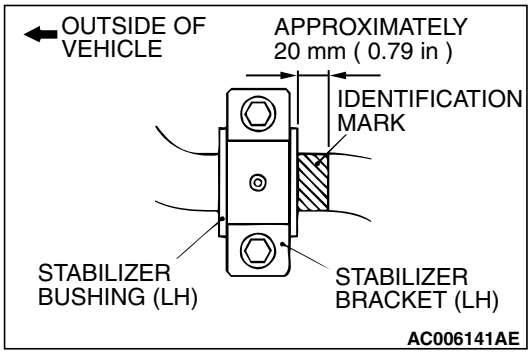


NOTE: If the steering column shaft is removed accidentally, remove the steering column assembly and be sure to insert the steering column shaft into the steering column as shown in the figure.



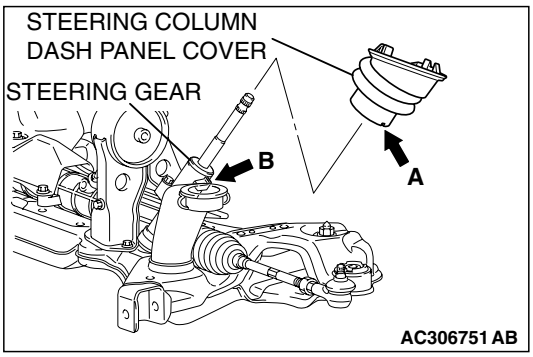
<<C>> FRONT AXLE CROSSMEMBER STAY REMOVAL
The crossmember mounting bolts need not be unscrewed when the front axle crossmember stay is replaced. However, the bolts may be loosened while the front axle crossmember stay is removed. It is recommended that you retighten the bolts to 180 ± 20 N·m (133 ± 14 ft-lb).

INSTALLATION SERVICE POINTS



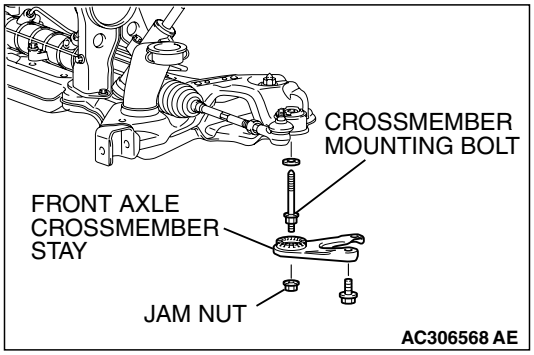
>>A<< STABILIZER BAR/STABILIZER BUSHING/STABILIZER BRACKET INSTALLATION

Align the stabilizer bar identification mark with the right end of the bushing (LH).



>>B<< FRONT AXLE NO.1 CROSSMEMBER, REAR ROLL STOPPER AND STEERING GEAR ASSEMBLY INSTALLATION

Align the steering column dash panel cover notch (arrow A) with the steering gear lug (arrow B), and install the front axle number 1 crossmember, the rear roll stopper and steering gear assembly.



>>C<< FRONT AXLE CROSSMEMBER STAY/JAM NUT INSTALLATION

Ensure that the crossmember mounting bolts have been tightened to 180 ± 20 N·m (133 ± 14 ft-lb), and then install the front crossmember stay with the jam nut.

INSPECTION

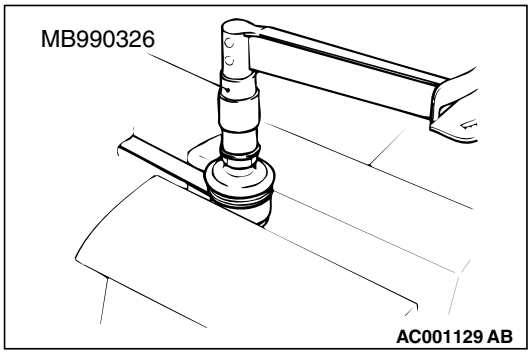
M1332002000291

- Check the stabilizer bushings for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check all bolts for condition and straightness.

STABILIZER LINK BALL JOINT BREAKAWAY TORQUE CHECK

Required Special Tool:

- MB990326: Preload Socket



1. After shaking the ball joint stud several times, install the nut to the stud and use special tool MB990326 to measure the breakaway torque of the ball joint.

   Standard value: 3.4 – 9.0 N·m (30 – 80 in-lb)
2. When the measured value exceeds the standard value, replace the stabilizer link.
3. When the measured value is lower than the standard value, check that the ball joint turns smoothly without excessive play. If so, it is possible to re-use that ball joint.

STABILIZER LINK BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the stabilizer link.

   NOTE: Cracks or damage of the dust cover may cause damage to the ball joint.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1332008500227

ITEM	SPECIFICATION
Lower arm assembly	
Lower arm to crossmember connection bolt	165 ± 15 N·m (122 ± 11 ft-lb)
Lower arm to crossmember connection nut (jam nut)	165 ± 15 N·m (122 ± 11 ft-lb)
Lower arm to knuckle connection nut (jam nut)	65 ± 6 N·m (48 ± 4 ft-lb)
Stabilizer bar	
Crossmember to body connection bolt and nut	180 ± 20 N·m (133 ± 14 ft-lb)
Front axle crossmember stay bolt and nut	83 ± 12 N·m (61 ± 9 ft-lb)
Pressure hose clamp bolt	12 ± 2 N·m (102 ± 22 in-lb)
Rear roll stopper connection nut	58 ± 7 N·m (43 ± 5 ft-lb)
Return tube clamp bolt and nut	12 ± 2 N·m (102 ± 22 in-lb)
Stabilizer bracket bolt	58 ± 7 N·m (43 ± 5 ft-lb)
Stabilizer link nut	48 ± 7 N·m (36 ± 5 ft-lb)
Steering gear and joint connecting bolt	18 ± 2 N·m (13 ± 2 ft-lb)
Steering gear and pressure tube flare nut	15 ± 3 N·m (11 ± 2 ft-lb)
Steering gear and return tube flare nut	15 ± 3 N·m (11 ± 2 ft-lb)
Tie rod to knuckle connection nut	29 ± 4 N·m (21 ± 3 ft-lb)
Strut assembly	
Stabilizer link nut	48 ± 7 N·m (36 ± 5 ft-lb)
Strut assembly to body connection nut	48 ± 7 N·m (36 ± 5 ft-lb)
Strut assembly to knuckle connection nut	305 ± 25 N·m (225 ± 18 ft-lb)
Strut nut (jam nut)	65 ± 5 N·m (48 ± 4 ft-lb)

TSB Revision

GENERAL SPECIFICATIONS

M1332000200318

COIL SPRING

ITEM	2.4L ENGINE	3.8L ENGINE
Wire diameter mm (in)	15.3 (0.60)	15.0 (0.59) <Except RALLIART> 15.1 (0.59) <RALLIART>
Average diameter mm (in)	170 – 180 (6.7 – 7.1)	170 – 180 (6.7 – 7.1)
Free length mm (in)	348.0 (13.70)	333.5 (13.13)

SERVICE SPECIFICATIONS

M1332000300876

ITEM		STANDARD VALUE
Toe-in mm (in)		0 ± 3 (0 ± 0.12)
Steering angle	Inner wheel	37°12' ± 2°00' <vehicles with 16-inch wheels> 33°48' ± 2°00' <vehicles with 17-inch wheels> 32°54' ± 2°00' <vehicles with 18-inch wheels>
	Outer wheel (reference)	30°18' <vehicles with 16-inch wheels> 28°18' <vehicles with 17-inch wheels> 27°48' <vehicles with 18-inch wheels>
Camber		0°00' ± 0°30' (Left/right deviation within 30')
Caster		3°00' ± 0°30' (Left/right deviation within 30')
Kingpin inclination		12°54' ± 1°30'
Lower arm ball joint breakaway torque N·m (in-lb)		3.5 – 6.9 (31 – 61)
Lower arm bushing press-in pressure kN (lb)		10 (2,248) or more
Stabilizer link ball joint breakaway torque N·m (in-lb)		3.4 – 9.0 (30 – 80)

LUBRICANT

M1332000400163

ITEM		SPECIFIED LUBRICANT	QUANTITY
Lower arm ball joint	Lip portion of dust cover	Multipurpose grease SAE J310, NLGI No.2 or equivalent	As required
	Inside of dust cover		13 ± 0.5 g (0.45 ± 0.02 oz)

GROUP 34

REAR SUSPENSION

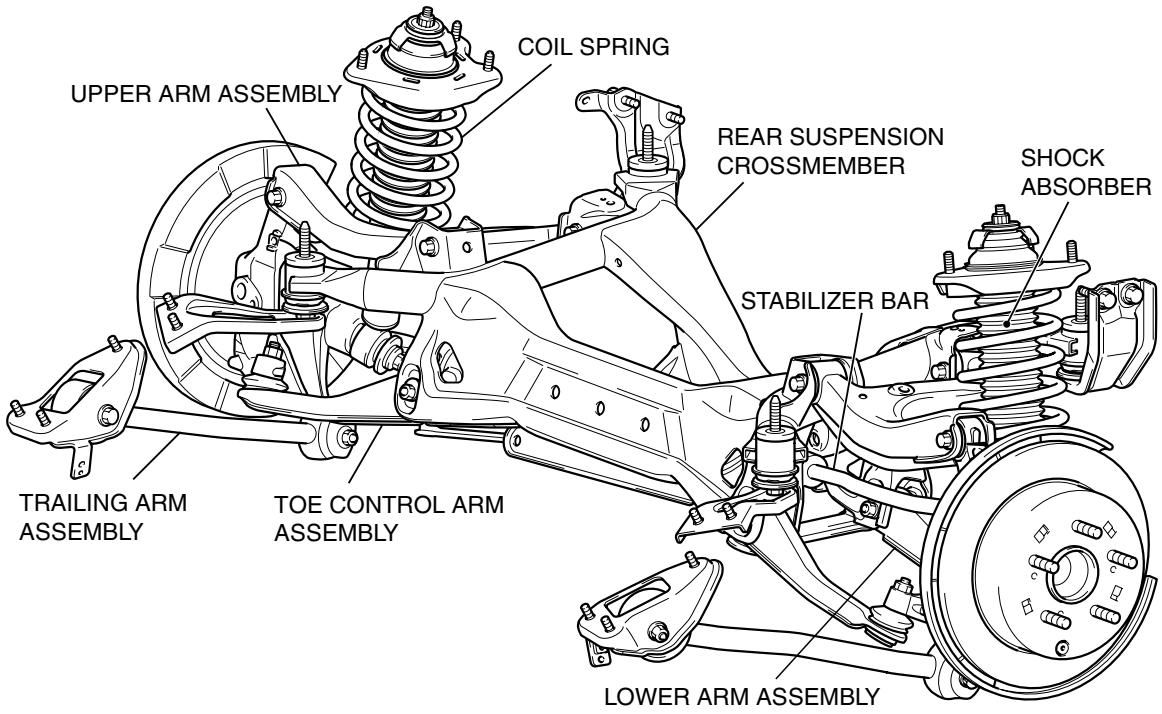
CONTENTS

GENERAL DESCRIPTION

M1341000100375

A low-mount multilink suspension system is used to reduce road noise, making the vehicle quieter by all suspension arms except a trailing arm connected to the crossmembers with an elastic structure.

CONSTRUCTION DIAGRAM



AC305738AB

REAR SUSPENSION DIAGNOSIS

INTRODUCTION TO REAR SUSPENSION DIAGNOSIS

M1341013100245

If the rear suspension is faulty, the vehicle will not run straightforward or noise will occur. Incorrect wheel alignment, malfunction of shock absorber, stabilizer bar, coil spring, control arms or worn or out-of-balance will cause these problems.

REAR SUSPENSION DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1341013200242

Use these steps to plan your diagnostic strategy. If you follow them thoroughly, you will be sure that you have exhausted most of the possible ways to find a rear suspension fault.

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

SYMPTOM CHART

M1341013500276

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Squeaks or other abnormal noise	1	P.34-3
Poor ride	2	P.34-3
Body tilting	3	P.34-4

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Squeaks or other Abnormal Noise

DIAGNOSIS

STEP 1. Check for loose rear suspension installation bolts and nuts.

Q: Are the rear suspension installation bolts and nuts loose?
YES : Retighten them, and then go to Step 5.
NO : Go to Step 2.

STEP 2. Check the condition of the shock absorbers (worn bushings).

Q: Are the shock absorbers (bushings) in good condition?
YES : Go to Step 3.
NO : Replace the faulty part, and then go to Step 5.

STEP 3. Check the upper arms and/or lower arms and/or toe control arms for deformity or damage.

Q: Are the upper arms and/or lower arms and/or toe control arms in good condition?
YES : Go to Step 4.
NO : Replace the faulty part, and then go to Step 5.

STEP 4. Check the trailing arms for deformity or damage.

Q: Are the trailing arms in good condition?
YES : Go to Step 5.
NO : Replace the faulty part, and then go to Step 5.

STEP 5. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Poor Ride

DIAGNOSIS

STEP 1. Check for excessive tire inflation pressure.
Refer to GROUP 31, On-vehicle Service – Tire Inflation Pressure Check P.31-56.

Q: Is the tire inflation pressure correct?
YES : Go to Step 2.
NO : Adjust the pressure, and then go to Step 4.

STEP 2. Check the condition of the shock absorbers (weak or broken springs).

Q: Are the shock absorbers in good condition?
YES : Go to Step 3.
NO : Replace the faulty part, and then go to Step 4.

STEP 3. Check the stabilizer bar and/or stabilizer bar links for deformity or damage.

Q: Are the stabilizer bar and/or stabilizer bar links deformed or damaged?
YES : Replace the faulty part, and then go to Step 4.
NO : Go to Step 4.

TSB Revision

STEP 4. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Body Tilting

DIAGNOSIS

STEP 1. Check for weak or deteriorated bushings.

Q: Are the bushings in good condition?
YES : Go to Step 2.
NO : Replace the faulty part, and then go to Step 5.

STEP 2. Check for weak or broken coil springs.

Q: Are the coil springs in good condition?
YES : Go to Step 3.
NO : Replace the faulty part, and then go to Step 5.

STEP 3. Check the upper arms and/or lower arms and/or toe control arms for deformity or damage.

Q: Are the upper arms and/or lower arms and/or toe control arms deformed or damaged?
YES : Replace the faulty part, and then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trailing arms for deformity or damage.

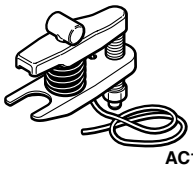
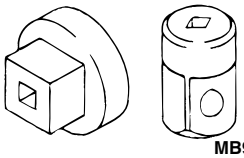
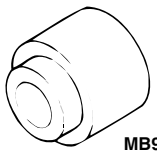
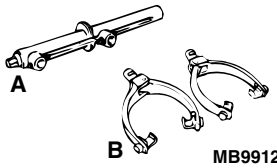
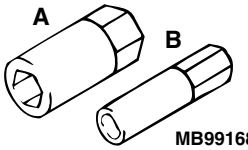
Q: Are the trailing arms deformed or damaged?
YES : Replace the faulty part, and then go to Step 5.
NO : Go to Step 5.

STEP 5. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

SPECIAL TOOLS

M1341000600433

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or General service tool	Knuckle and toe control arm ball joint disconnection *NOTE: Steering linkage puller (MB990635 or MB991113) is also available to disconnect knuckle and tie rod end ball joint.*
 MB990326	MB990326 Preload socket	General service tool	• Toe control arm ball joint turning torque check • Stabilizer bar link ball joint breakaway torque check
 MB990800	MB990800 Ball joint dust cover installer	MB990800-01or General service tool	Toe control arm ball joint dust cover installation
 A B MB991237	A: MB991237 Spring compressor body B: MB991239 Arm set	MIT221369 or general service tool	Coil spring removal and installation *NOTE: Spring compressor set (MB991832) is also available to compress coil spring (refer to GROUP 33, Special Tools P.33-5).*
 A B MB991680	MB991680 Wrench set A: MB991681 Wrench B: MB991682 Socket	–	Shock absorber disassembly and assembly

ON-VEHICLE SERVICE

REAR WHEEL ALIGNMENT CHECK AND ADJUSTMENT

M1341011000394

Measure wheel alignment with an alignment equipment on level ground.
The rear suspension and tires should be serviced to the normal condition prior to wheel alignment measurement.

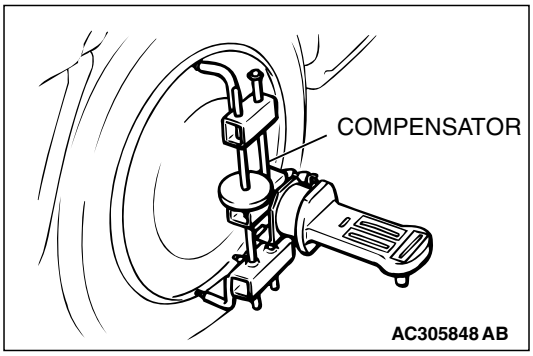
TSB Revision

CAMBER

Standard value:

– 0°50' ± 0°30' (Left/right deviation within 30')

NOTE: For vehicles with aluminum wheels, attach the camber/caster/kingpin gauge by using a compensator.



TOE-IN

Standard value: 3 ± 3 mm (0.12 ± 0.12 inch)

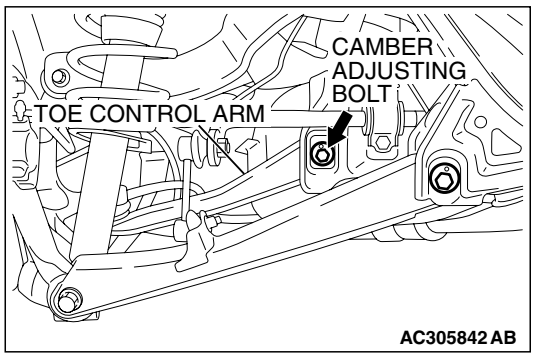
If camber and/or toe-in is not within the standard value, adjust by the following procedures.

⚠ CAUTION

- **When adjusting the camber, tighten the lower arm assembly and the trailing arm assembly, not the toe control arm.**
- **After adjusting the camber, be sure to adjust the toe.**

1. Carry out camber adjustment by turning the camber adjusting bolt.

   NOTE:
   - *LH: Clockwise viewed from the rear → (–) camber*
   - *RH: Clockwise viewed from the rear → (+) camber*
   - *If either the camber or toe is adjusted, both should fluctuate. For the relationship between the two, refer to CAMBER AND TOE REFERENCE TABLE (Refer to P.34-6).*

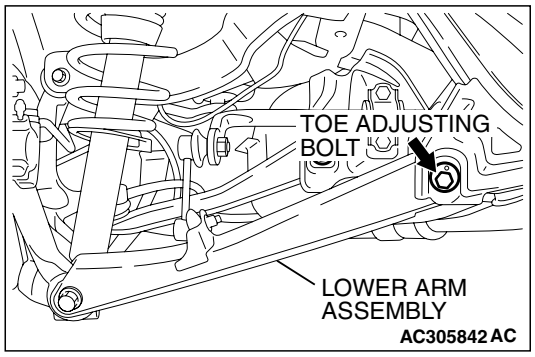


⚠ CAUTION

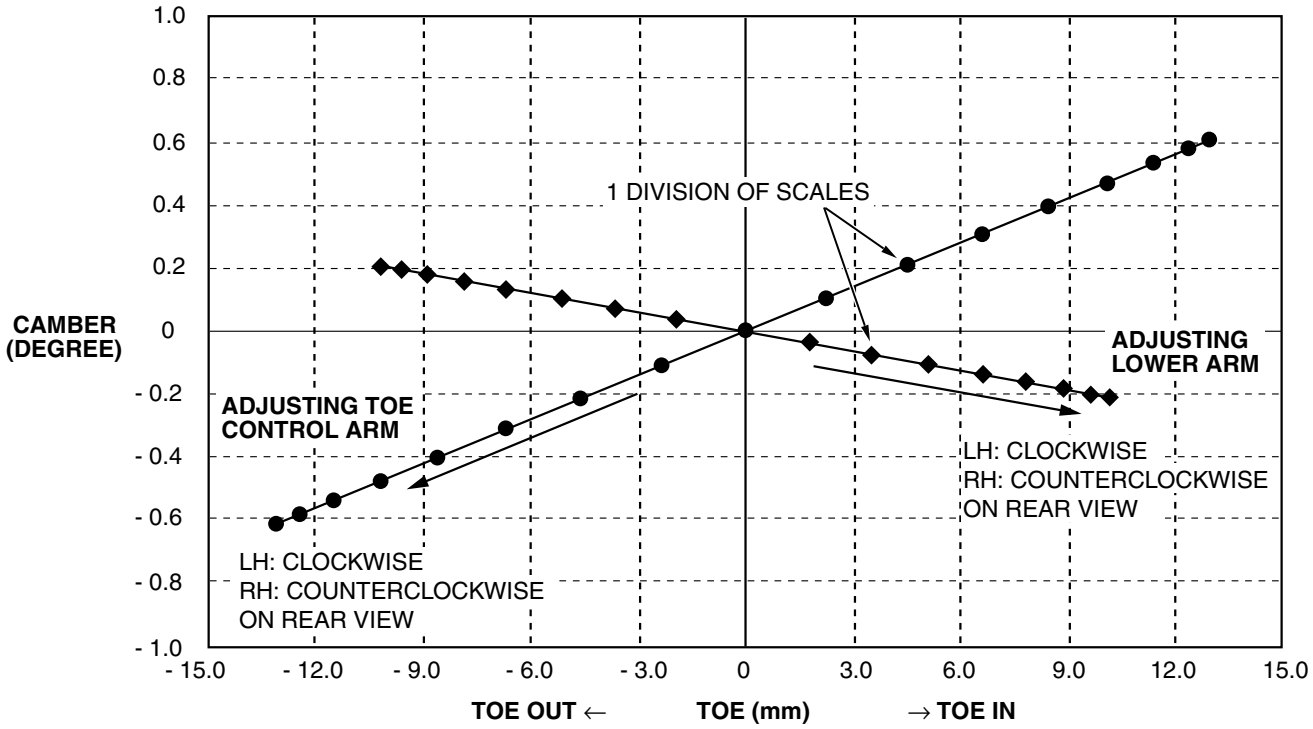
When adjusting the toe, tighten the toe control arm and the trailing arm assembly, not the lower arm assembly.

2. Carry out toe adjustment by turning the toe adjusting bolt.

   NOTE:
   - *LH: Clockwise viewed from the rear → Toe-in*
   - *RH: Clockwise viewed from the rear → Toe-out*
   - *If either the camber or toe is adjusted, both should fluctuate. For the relationship between the two, refer to CAMBER AND TOE REFERENCE TABLE (Refer to P.34-6).*



CAMBER AND TOE REFERENCE TABLE



AC205691AB

LOWER ARM PILLOW BALL BUSHING END PLAY CHECK

M1341016900143

1. Raise the vehicle.
2. Remove the stabilizer bar link assembly from the lower arm assembly.
3. Move the lower arm up and down with your hands to check for excessive play in the axial direction of the pillow ball bushing. If there is excessive play, replace the knuckle assembly. (Refer to GROUP 27, Knuckle P.27-8).
4. After inspection, install the stabilizer bar link assembly to the lower arm assembly, and tighten the mounting nuts to 40 ± 5 N·m (30 ± 3 ft-lb).

TOE CONTROL ARM BALL JOINT END PLAY CHECK

M1341015800080

1. Raise the vehicle.
2. Move the toe control arm up and down with your hands to check for excessive play in the axial direction of the ball joint. If there is excessive play, replace the toe control arm assembly.

BALL JOINT DUST COVER INSPECTION

M1341012800296

Check the ball joint dust cover of the toe control arm assembly and the stabilizer bar link assembly as follows.

TSB Revision

1. Check dust cover for cracks or damage by pushing it with your finger.
2. If a dust cover is cracked or damaged, replace the toe control arm assembly or the stabilizer bar link assembly.

NOTE: Cracks or damage to the dust cover may cause damage to the ball joint.

UPPER ARM ASSEMBLY

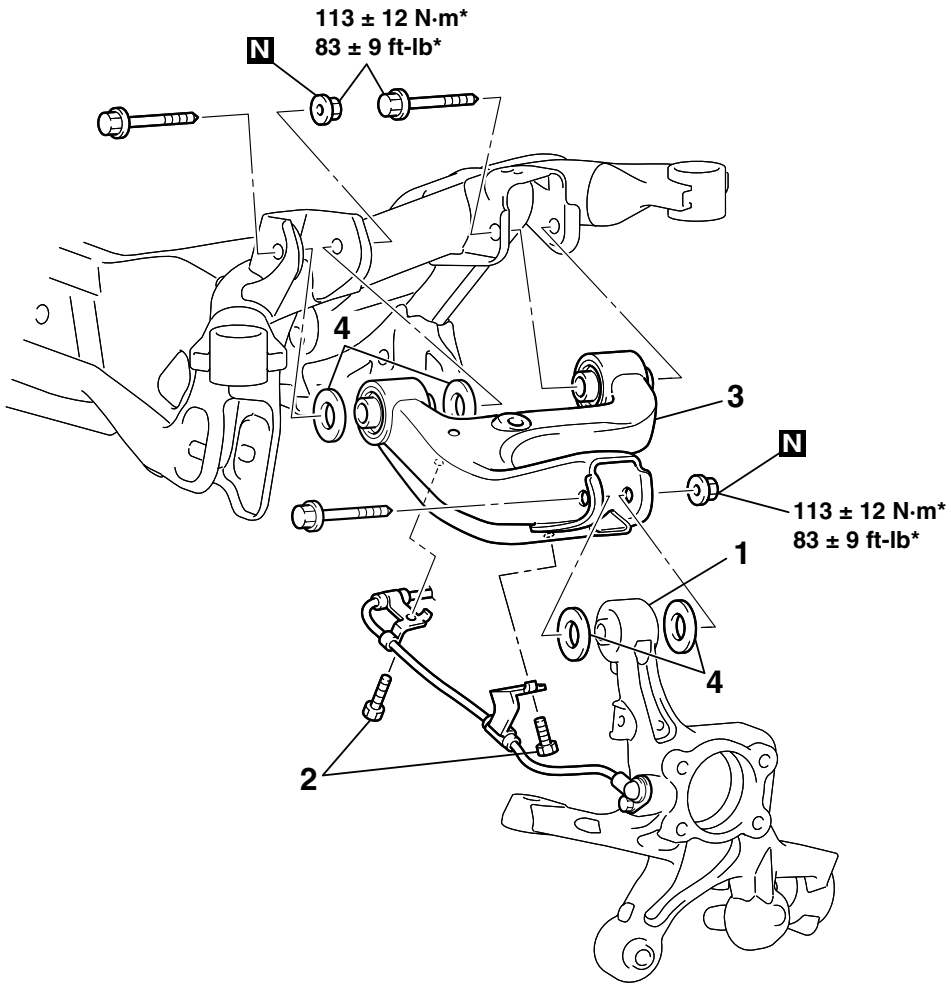
REMOVAL AND INSTALLATION

M1341003600216

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

Post-installation Operation
- Rear Wheel Alignment Check and Adjustment (Refer to P.34-5).



AC305776 AB

REMOVAL STEPS
1. UPPER ARM ASSEMBLY AND KNUCKLE CONNECTION
2. ABS EQUIPMENT BOLT <VEHICLES WITH ABS>

REMOVAL STEPS (Continued)
3. UPPER ARM ASSEMBLY
4. UPPER ARM STOPPER

TSB Revision

INSPECTION

M1341003700194

- Check the bushings for wear and deterioration.
- Check the upper arm for bending or breakage.
- Check all bolts for condition and straightness.

LOWER ARM

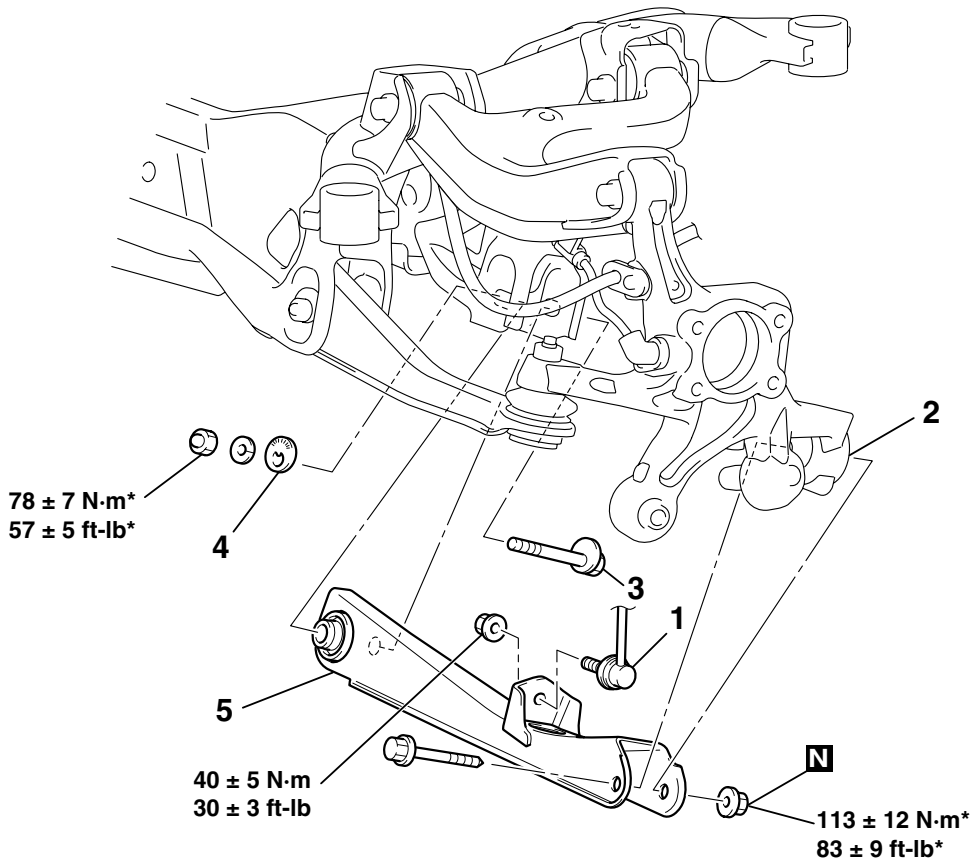
REMOVAL AND INSTALLATION

M1341006500047

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

Post-installation Operation
- Rear Wheel Alignment Check and Adjustment (Refer to P.34-5).



AC305777AB

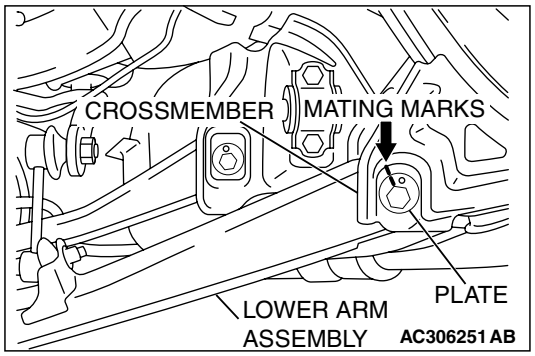
REMOVAL STEPS
- SHOCK ABSORBER ASSEMBLY AND KNUCKLE CONNECTION (REFER TO P.34-15).
1. LOWER ARM ASSEMBLY AND STABILIZER BAR LINK ASSEMBLY CONNECTION

<<A>>

REMOVAL STEPS (Continued)
2. LOWER ARM ASSEMBLY AND KNUCKLE CONNECTION
3. LOWER ARM BOLT
4. LOWER ARM PLATE
5. LOWER ARM ASSEMBLY

TSB Revision

REMOVAL SERVICE POINT



<<A>> LOWER ARM BOLT REMOVAL

Place mating marks on the crossmember and the plate before removing the lower arm bolt.

INSPECTION

M1341006600055

- Check the bushings for wear and deterioration.
- Check the lower arm for bending or breakage.
- Check all bolts for condition and straightness.

TRAILING ARM

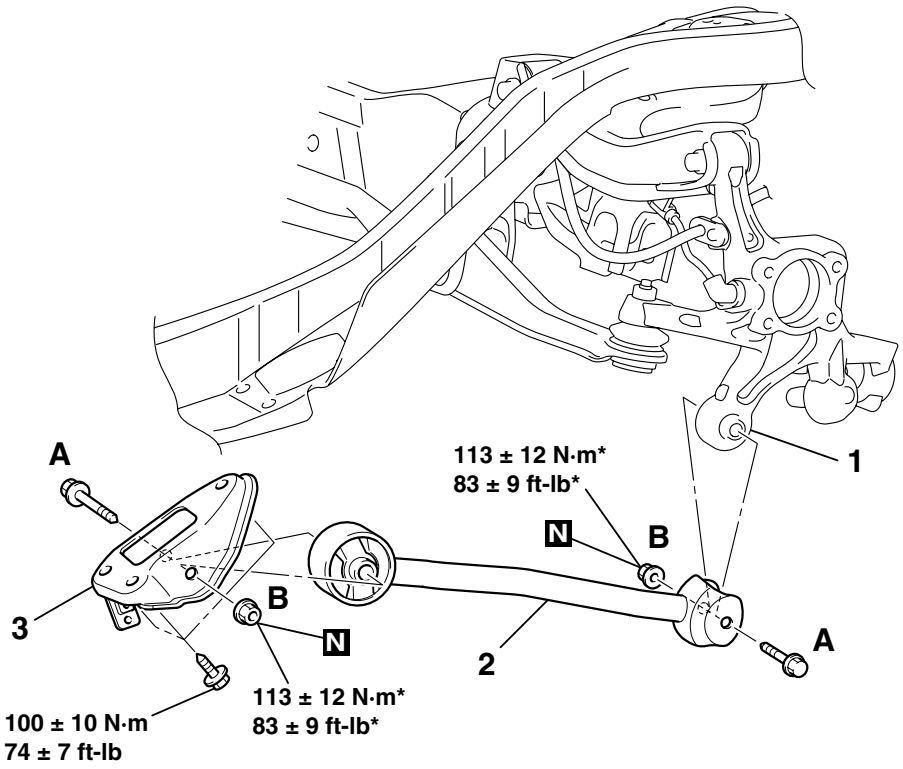
REMOVAL AND INSTALLATION

M1341002200390

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

Post-installation Operation
- Rear Wheel Alignment Check and Adjustment (Refer to P.34-5).



AC305778AB

REMOVAL STEPS
1. TRAILING ARM ASSEMBLY AND KNUCKLE CONNECTION

REMOVAL STEPS (Continued)
2. TRAILING ARM ASSEMBLY
3. TRAILING ARM BRACKET

NOTE: Bolt A and nut B are interchangeable.

INSPECTION

M1341002300201

- Check the bushings for wear and deterioration.
- Check the trailing arm for bending or breakage.
- Check all bolts for condition and straightness.

TSB Revision

TOE CONTROL ARM

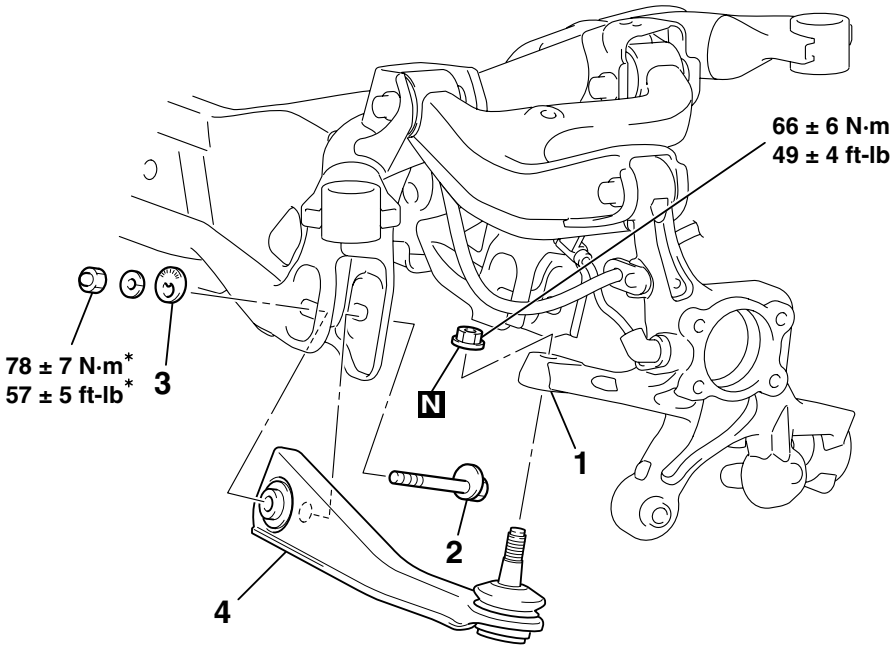
REMOVAL AND INSTALLATION

M1341016600045

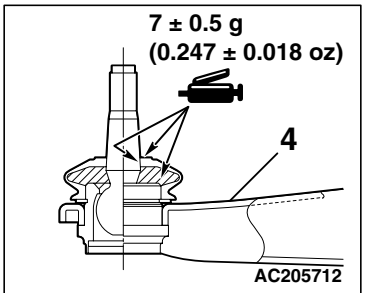
⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

Post-installation Operation
- Press the dust cover with your finger to check that there are no cracks or damage in the dust cover.
- Rear Wheel Alignment Check and Adjustment (Refer to P.34-5).



AC305779AB



MULTIPURPOSE GREASE
SAE J310, NLGI No.2
OR EQUIVALENT

REMOVAL STEPS
- TRAILING ARM ASSEMBLY AND KNUCKLE CONNECTION (REFER TO P.34-11).

<<A>> 1. TOE CONTROL ARM ASSEMBLY AND KNUCKLE CONNECTION

<<B>> 2. ASSIST LINK BOLT

REMOVAL STEPS (Continued)

3. ASSIST LINK PLATE
4. TOE CONTROL ARM ASSEMBLY

Required Special Tool:
- MB991897: Ball Joint Remover

TSB Revision

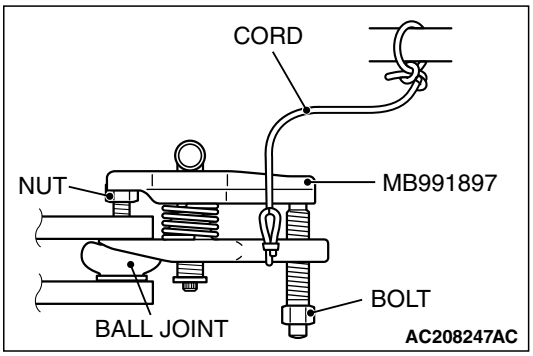
REMOVAL SERVICE POINTS

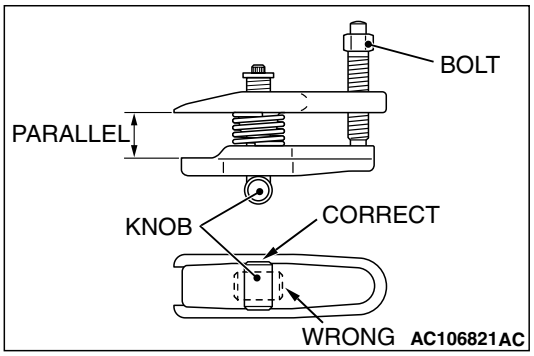
<<A>> TOE CONTROL ARM ASSEMBLY AND KNUCKLE DISCONNECTION

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.**
- **Hang special tool MB991897 with a cord to prevent it from falling.**

1. Install special tool MB991897 as shown in the figure.





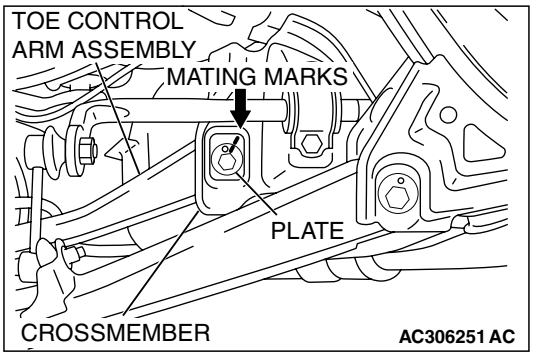
2. Turn the bolt and knob as necessary to make the jaws of the special tool MB991897 parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the toe control arm assembly and the knuckle.

<<B>> ASSIST LINK BOLT REMOVAL

Place mating marks on the crossmember and the plate before removing the assist link bolt.

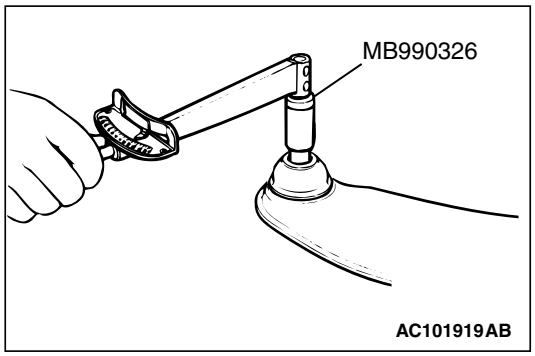


INSPECTION

M1341016800049

- Check the bushings for wear and deterioration.
- Check the toe control arm for bending or breakage.
- Check all bolts for condition and straightness.

TOE CONTROL ARM BALL JOINT TURNING TORQUE CHECK

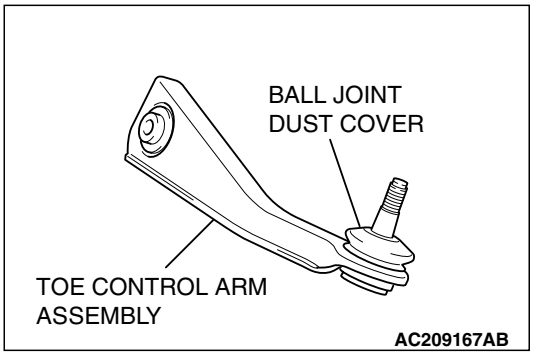


Required Special Tool:
- MB990326: Preload Socket

1. After shaking the ball joint stud several times, in order to make the ball joint turn smoothly, install the nut to the stud and use special tool MB990326 to measure the turning torque of the ball joint.

   Standard value: 1.0 – 2.6 N·m (8.9 – 23 in-lb)
2. If the measured value exceeds the standard value, replace the toe control arm assembly.
3. If the measured value is lower than the standard value, check that the ball joint turns smoothly without excessive play. If so, it is possible to re-use that ball joint.

TOE CONTROL ARM BALL JOINT DUST COVER CHECK

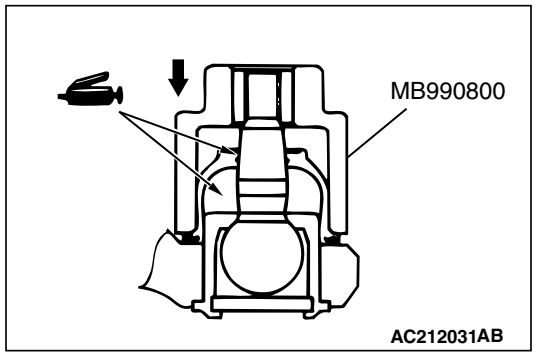


1. Check the toe control arm ball joint dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the toe control arm assembly.

   NOTE: Cracks or damage of the dust cover may cause damage to the ball joint. When it is damaged during service work, replace the dust cover.

TOE CONTROL ARM BALL JOINT DUST COVER REPLACEMENT

M1341010900264



Required Special Tool:
- MB990800: Ball Joint Remover and Installer

Only when the dust cover is damaged accidentally during service work, replace the dust cover as follows:

1. Remove the dust cover.
2. Fill the new dust cover with multipurpose grease and lubricate the lip [Amount of grease in the dust cover: approximately 7 g (0.247 ounce)].
3. Using special tool MB990800, punch the dust cover until it contacts the snap ring.
4. Press the dust cover with your finger to check that there are no cracks or damage in the dust cover.

SHOCK ABSORBER ASSEMBLY

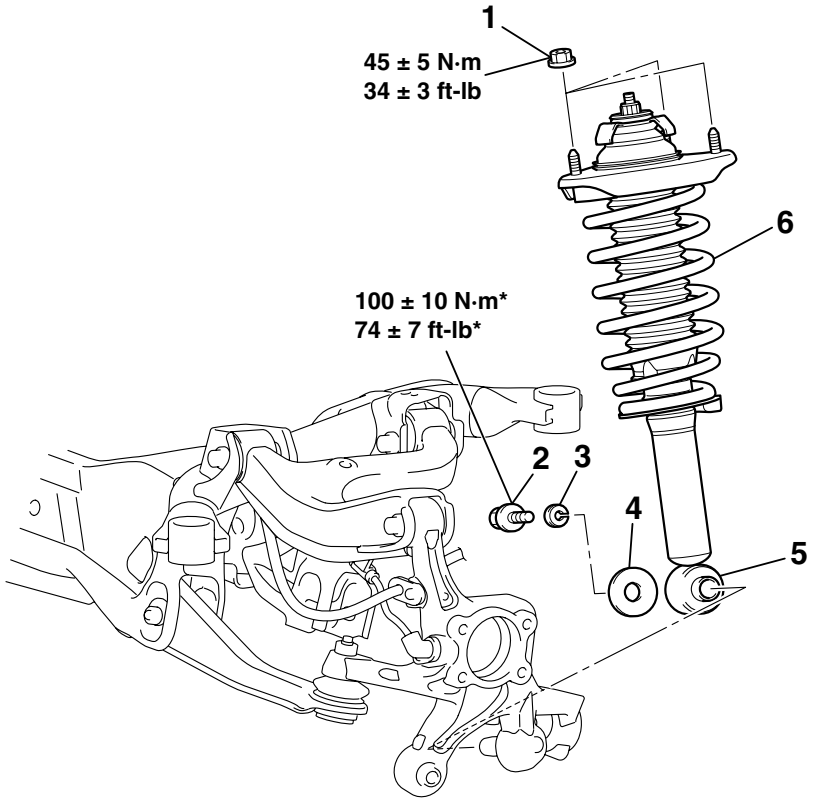
REMOVAL AND INSTALLATION

M1341002500283

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

Pre-removal and Post-installation Operation
- Trunk Room Trim (front side) Removal and Installation (Refer to GROUP 52A, Trims P.52A-23).



AC305780 AB

REMOVAL STEPS
1. COIL SPRING NUT
2. COIL SPRING BOLT
3. COIL SPRING WASHER
4. COIL SPRING WASHER

REMOVAL STEPS (Continued)
5. SHOCK ABSORBER ASSEMBLY AND KNUCKLE CONNECTION
6. SHOCK ABSORBER ASSEMBLY

INSPECTION

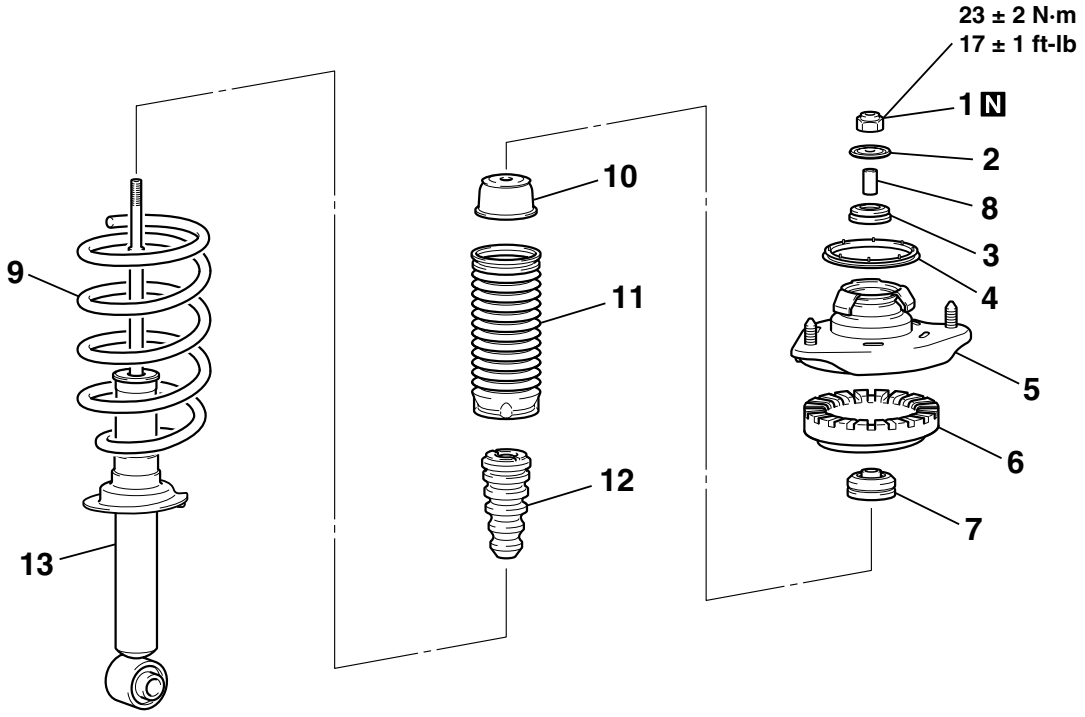
M1341002600172

- Check the rubber parts for cracks and wear.
- Check the shock absorber for malfunctions, oil leakage, or abnormal noise.

TSB Revision

DISASSEMBLY AND ASSEMBLY

M1341005300266



AC305784AB

DISASSEMBLY STEPS

<<**A**>> >>**C**<< 1. COIL SPRING NUT (JAM NUT)
2. COIL SPRING WASHER
3. COIL SPRING BUSHING
4. SHOCK ABSORBER GASKET
>>**B**<< 5. SHOCK ABSORBER INSULATOR
6. SPRING UPPER PAD
7. COIL SPRING BUSHING
8. COIL SPRING COLLAR
>>**A**<< 9. COIL SPRING
10. SHOCK ABSORBER CUP
11. SHOCK ABSORBER COVER

DISASSEMBLY STEPS (Continued)

12. SHOCK ABSORBER DAMPER
13. SHOCK ABSORBER

Required Special Tools:

- MB991237: Spring Compressor Body
- MB991239: Arm Set
- MB991680: Wrench Set
  - MB991681: Wrench
  - MB991682: Socket

TSB Revision

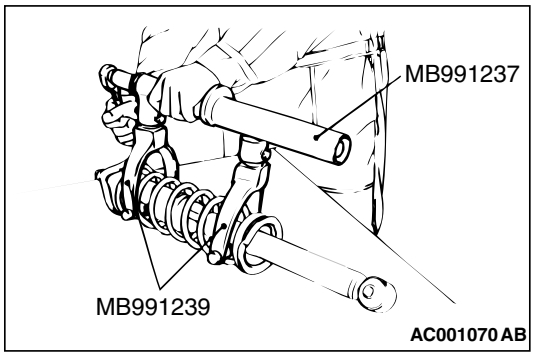
DISASSEMBLY SERVICE POINT

<<A>> COIL SPRING NUT (JAM NUT) REMOVAL

⚠ CAUTION

- **To hold the coil spring securely, install special tools MB991237 and MB991239 evenly, and so that the space between both arms of the special tool will be maximum within the installation range.**
- **Do not use an impact wrench to tighten the bolt of special tool MB991237. The usage of impact wrench will break the special tool.**

1. Use special tools MB991237 and MB991239 to compress the coil spring.

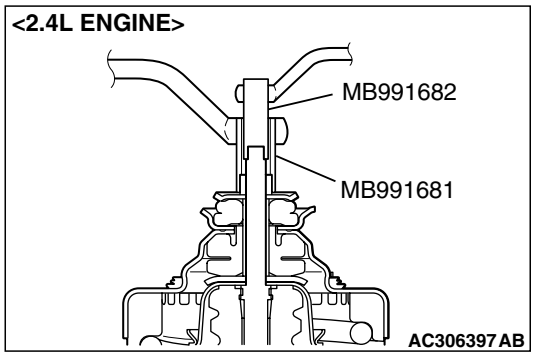


⚠ WARNING

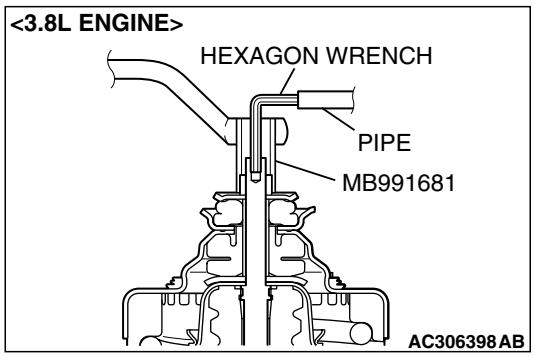
Do not use an impact wrench to remove the coil spring nut (jam nut).

- ***Vibration of the impact wrench will cause special tools MB991237 and MB991239 to slip and cause personal injury.***
- ***Vibration of the impact wrench will cause the valve inside the shock absorber to drop out.***

2. For 2.4L engine models, use special tool MB991682 to secure the piston rod, and then remove the coil spring nut (jam nut) using special tool MB991681.



For 3.8L engine models, use a hexagon wrench and a pipe to secure the piston rod, and then remove the coil spring nut (jam nut) using special tool MB991681.

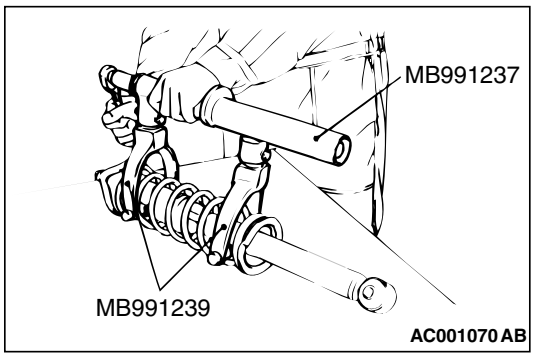


ASSEMBLY SERVICE POINTS

>>A<< COIL SPRING INSTALLATION

⚠ CAUTION

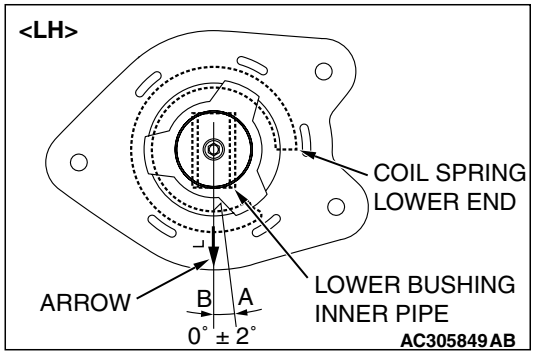
Do not use an impact wrench to tighten the bolt of special tool MB991237. It will break the special tool.



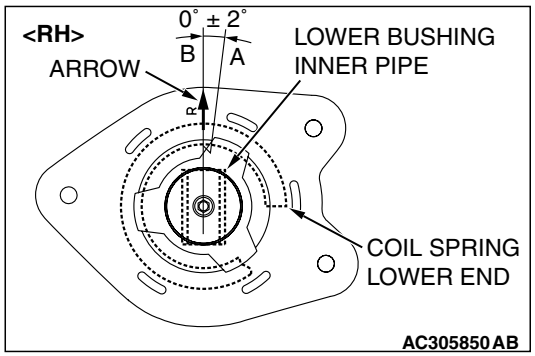
1. Use special tools MB991237 and MB991239 to compress the coil spring, and install it to the spring seat of the shock absorber.
2. Align the end of the coil spring with the stepped section of the spring seat of the shock absorber.

>>B<< SHOCK ABSORBER INSULATOR INSTALLATION

Install the shock absorber insulator as follows.



1. Position the coil spring lower end as shown.
2. Position a center line (A) of the shock absorber lower bushing inner pipe as shown from the arrow (B) on the shock absorber insulator.



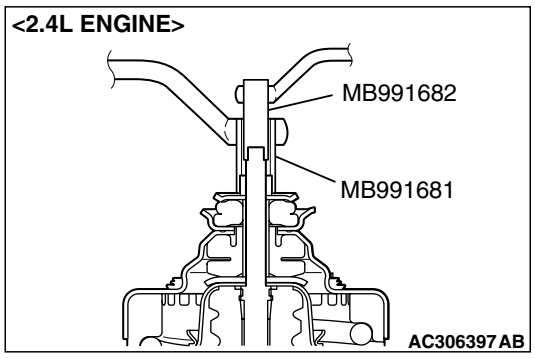
>>C<< COIL SPRING NUT (JAM NUT) INSTALLATION

1. Temporarily tighten the coil spring nut (jam nut).

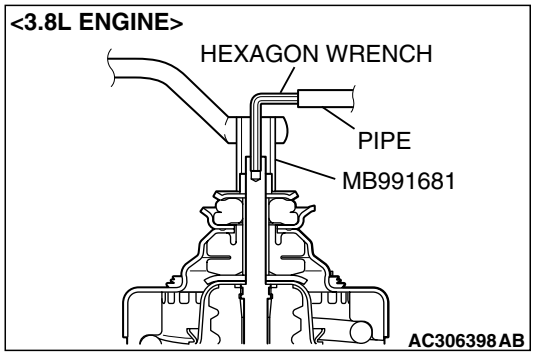
⚠ CAUTION

Do not use an impact wrench to tighten the bolt of special tool MB991237. It will break the special tool. Vibration of the impact wrench will cause the valve inside the shock absorber to drop out.

2. Remove special tools MB991237 and MB991239.



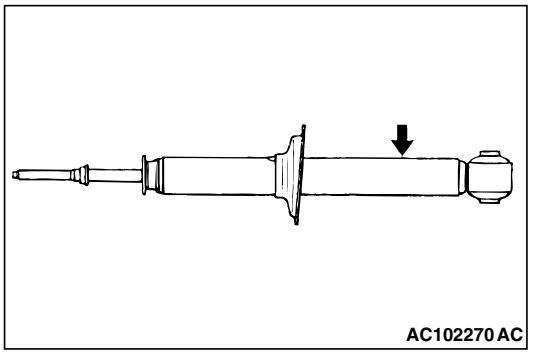
3. For 2.4L engine models, using special tools MB991681 and MB991682, tighten the coil spring nut (jam nut) to 23 ± 2 N·m (17 ± 1 ft-lb).



For 3.8L engine models, using special tool MB991681, a hexagon wrench and a pipe, tighten the coil spring nut (jam nut) to 23 ± 2 N·m (17 ± 1 ft-lb).

SHOCK ABSORBER DISPOSAL

⚠ ***WARNING***
Wear goggles when drilling to protect your eyes from flying metal debris.



The gas must be discharged from the shock absorber before discarding it. Place the shock absorber horizontally with its piston rod extended. Then drill a hole of approximately 3 mm (0.1 inch) in diameter at the location shown in the illustration and discharge the gas.

INSPECTION

M1341002800024

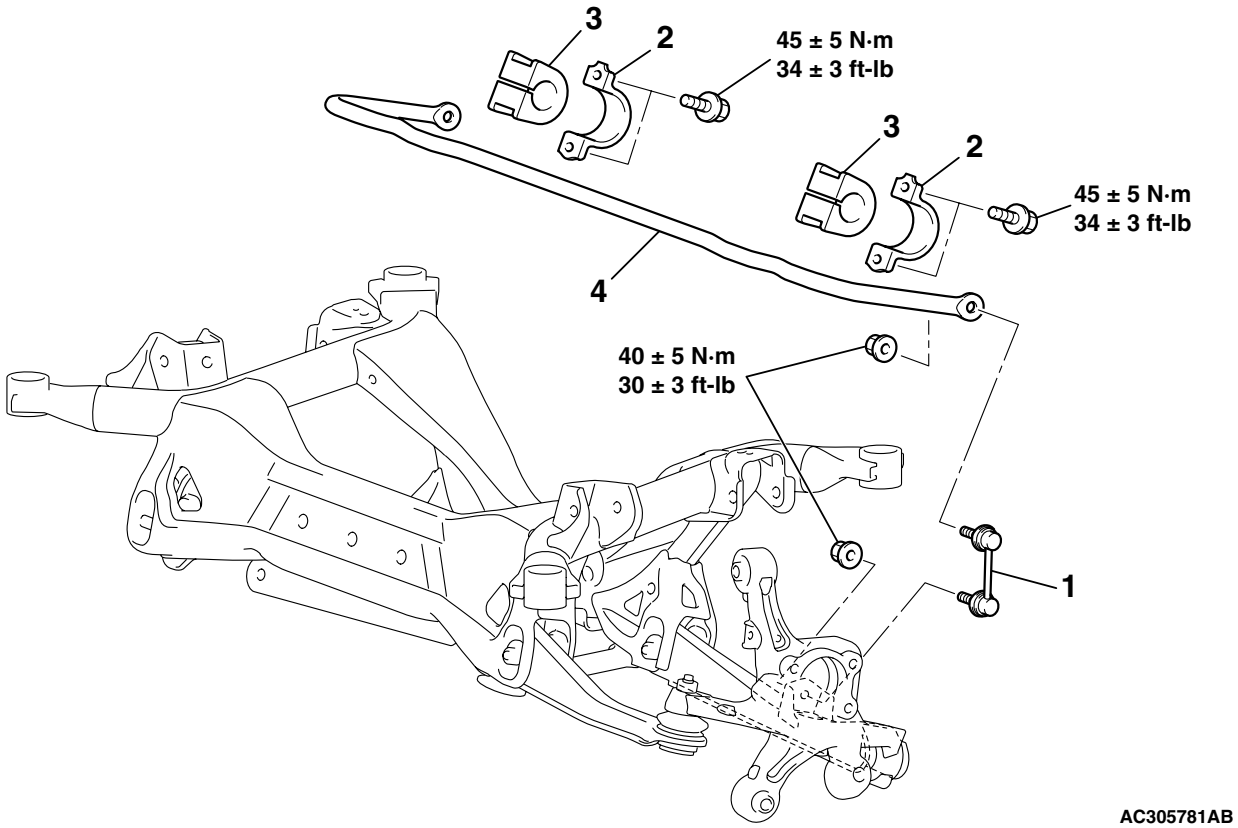
- Check the rubber parts for damage or deterioration.
- Check the coil spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.

STABILIZER BAR <RALLIART>

REMOVAL AND INSTALLATION

M1341003000270

Post-installation Operation
- Press the dust cover with your finger to check that there are no cracks or damage in the dust cover.



REMOVAL STEPS
1. STABILIZER BAR LINK ASSEMBLY
>>**A**<< 2. STABILIZER BAR BRACKET

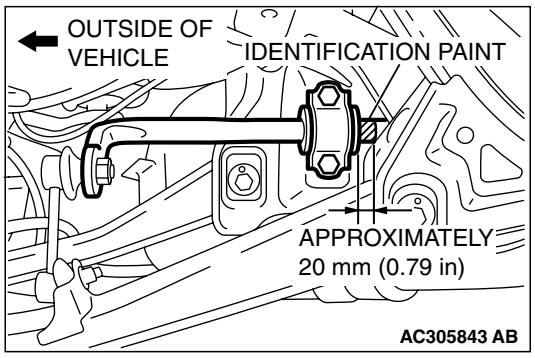
REMOVAL STEPS (Continued)
>>**A**<< 3. STABILIZER BUSHING
>>**A**<< 4. STABILIZER BAR

INSTALLATION SERVICE POINT

>>A<< STABILIZER BAR/STABILIZER BUSHING/STABILIZER BAR BRACKET INSTALLATION

1. Position the stabilizer bar identification paint to the left side.

TSB Revision



2. Adjust the identification paint position as shown in the figure, and tighten the stabilizer bolt.

INSPECTION

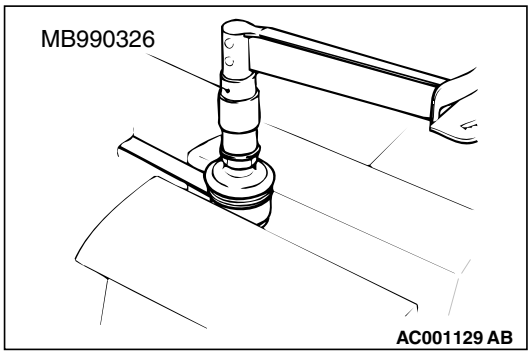
M1341001400313

- Check the stabilizer bushings for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check all bolts for condition and straightness.

STABILIZER BAR LINK BALL JOINT BREAKAWAY TORQUE CHECK

Required Special Tool:

- MB990326: Preload Socket



1. After shaking the ball joint stud several times, install the nut to the stud and use special tool MB990326 to measure the breakaway torque of the ball joint.

   Standard value: 3.4 – 9.0 N·m (30 – 80 in-lb)

2. When the measured value exceeds the standard value, replace the stabilizer bar link assembly.
3. When the measured value is lower than the standard value, check that the ball joint turns smoothly without excessive play. If so, it is possible to re-use that ball joint.

STABILIZER BAR LINK BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the stabilizer bar link assembly.

   NOTE: Cracks or damage of the dust cover may cause damage to the ball joint.

REAR SUSPENSION CROSSMEMBER

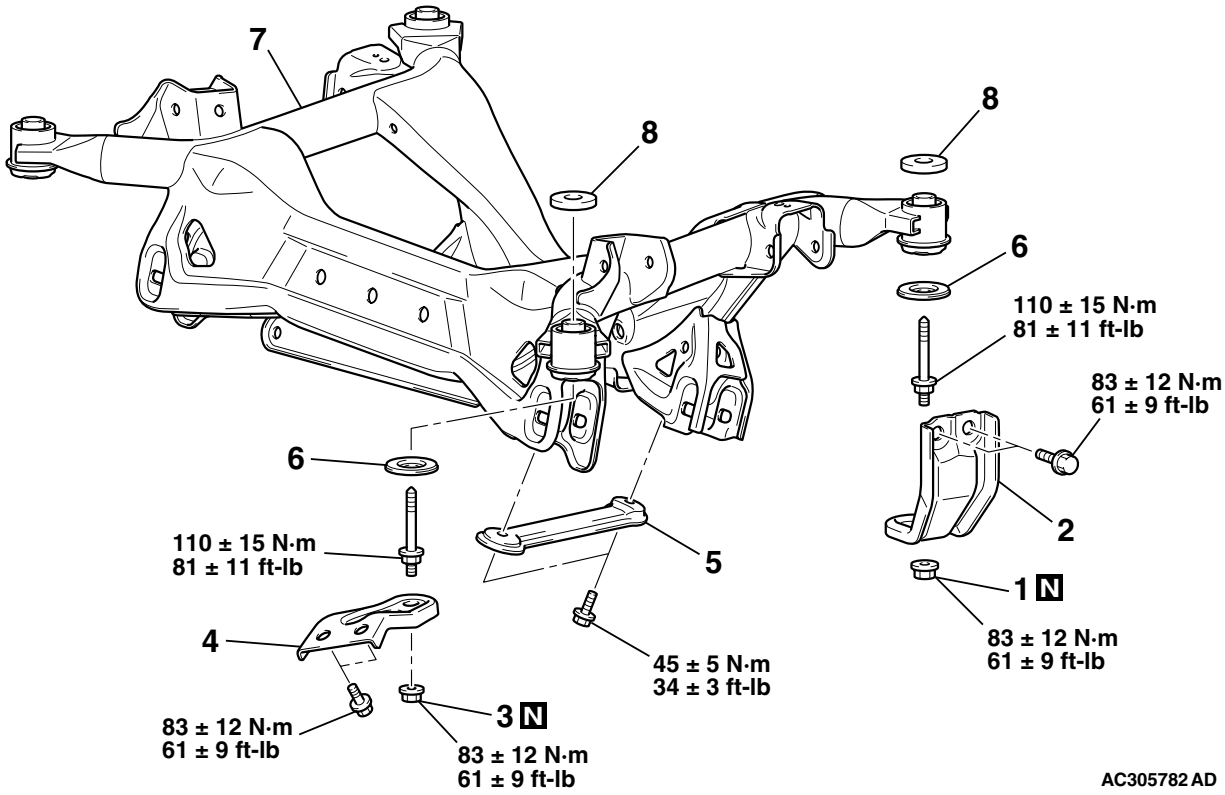
REMOVAL AND INSTALLATION

M1341006800297

⚠ CAUTION

For vehicles with ABS, be careful when handling the pole piece at the tip of the wheel speed sensor so as not to damage it by striking against other parts.

Pre-removal Operation	Post-installation Operation
• Main Muffler, Center Exhaust Pipe Removal (Refer to GROUP 15, Exhaust pipe and Main Muffler P.15-32). • Rear Splash Shield Removal (Refer to GROUP 51, Rear Bumper Assembly P.51-4).	• Rear Splash Shield Installation (Refer to GROUP 51, Rear Bumper Assembly P.51-4). • Main Muffler, Center Exhaust Pipe Installation (Refer to GROUP 15, Exhaust pipe and Main Muffler P.15-32). • Rear Wheel Alignment Check and Adjustment (Refer to P.34-5).



REMOVAL STEPS

<<A>>
- REAR WHEEL SPEED SENSOR <VEHICLES WITH ABS>
- STABILIZER BAR LINK ASSEMBLY (REFER TO P.34-20).
- LOWER ARM ASSEMBLY (REFER TO P.34-9).

<<B>>
- TOE CONTROL ARM ASSEMBLY (REFER TO P.34-12).
- UPPER ARM ASSEMBLY (REFER TO P.34-8).
- STABILIZER BAR (REFER TO P.34-20).

REMOVAL STEPS (Continued)

>>C<< 1. CROSSMEMBER NUT
<<C>> >>C<< 2. CROSSMEMBER STAY (REAR)
>>B<< 3. CROSSMEMBER NUT
<<D>> >>B<< 4. CROSSMEMBER BRACKET
>>A<< 5. CROSSMEMBER STAY (FRONT)
6. CROSSMEMBER PLATE
7. REAR SUSPENSION CROSSMEMBER
8. CROSSMEMBER UPPER STOPPER

TSB Revision

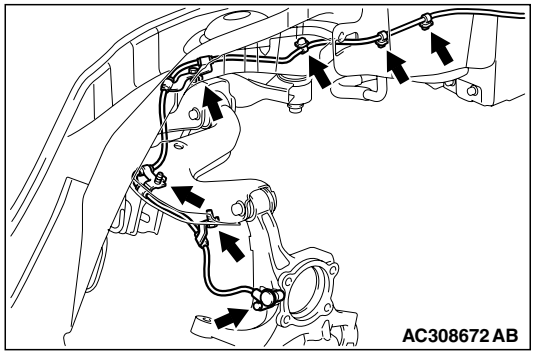
REMOVAL SERVICE POINTS

<<A>> REAR WHEEL SPEED SENSOR REMOVAL <VEHICLES WITH ABS>

⚠ CAUTION

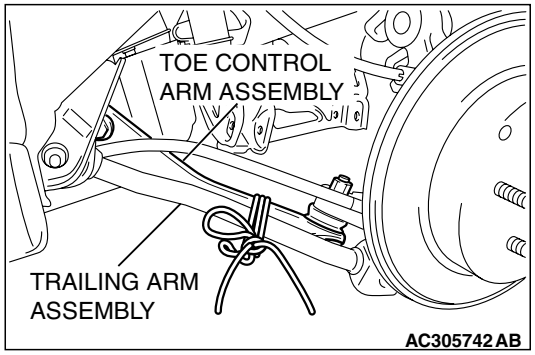
For vehicles with ABS, be careful when handling the pole piece at the tip of the wheel speed sensor so as not to damage it by striking against other parts.

The rear wheel speed sensor can be damaged during service work. Unclamp the rear wheel speed sensor cable as shown, and use a cord to tie it out of the way.



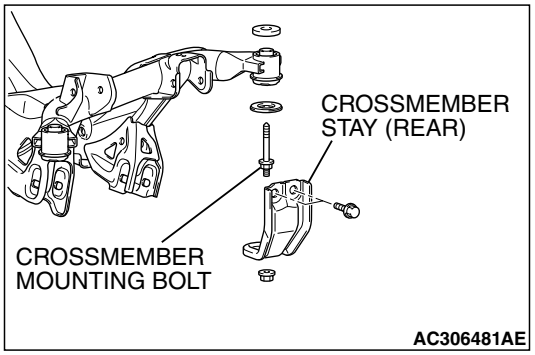
<<B>> TOE CONTROL ARM ASSEMBLY REMOVAL

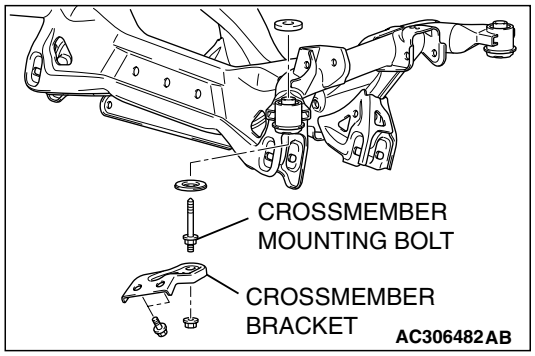
Disconnect the toe control arm only from its rear suspension crossmember side, and use a cord to tie it to the trailing arm assembly as shown.



<<C>> CROSSMEMBER STAY (REAR) REMOVAL

The crossmember mounting bolts need not be unscrewed when the crossmember stay is replaced. However, the bolts may be loosened while the crossmember stay is removed. It is recommended that you should retighten the bolts to 110 ± 15 N·m (81 ± 11 ft-lb).

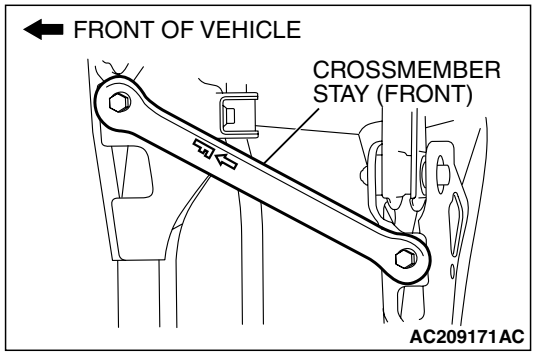




<<D>> CROSSMEMBER BRACKET REMOVAL

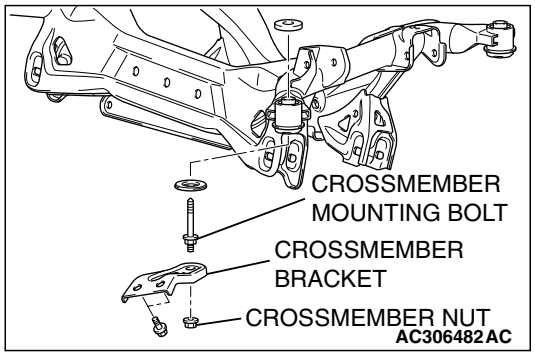
The crossmember mounting bolts need not be unscrewed when the crossmember bracket is replaced. However, the bolts may be loosened while the crossmember bracket is removed. It is recommended that you retighten the bolts to 110 ± 15 N·m (81 ± 11 ft-lb).

INSTALLATION SERVICE POINTS



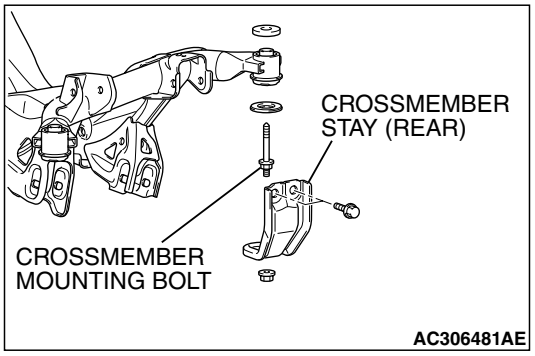
>>A<< CROSSMEMBER STAY (FRONT) INSTALLATION

Install the crossmember stay with its arrow facing the front of vehicle.



>>B<< CROSSMEMBER BRACKET/CROSSMEMBER NUT INSTALLATION

Ensure that the crossmember mounting bolts have been tightened to 110 ± 15 N·m (81 ± 11 ft-lb), and then install the crossmember bracket with the crossmember nut.



>>C<< CROSSMEMBER STAY (REAR)/CROSSMEMBER NUT INSTALLATION

Ensure that the crossmember mounting bolts have been tightened to 110 ± 15 N·m (81 ± 11 ft-lb), and then install the crossmember stay with the crossmember nut.

INSPECTION

M1341006900089

- Check the crossmember for cracks or deformation.
- Check all bolts for condition and straightness.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1341012700330

ITEM	SPECIFICATION
Lower arm assembly	
Lower arm assembly to crossmember nut	78 ± 7 N·m (57 ± 5 ft-lb)
Lower arm assembly to knuckle nut (Jam nut)	113 ± 12 N·m (83 ± 9 ft-lb)
Lower arm assembly to stabilizer bar link assembly nut	40 ± 5 N·m (30 ± 3 ft-lb)
Rear suspension crossmember	
Crossmember bracket mounting bolt and nut (Jam nut)	83 ± 12 N·m (61 ± 9 ft-lb)
Crossmember stay (front) mounting bolt	45 ± 5 N·m (34 ± 3 ft-lb)
Crossmember stay (rear) mounting bolt and nut (Jam nut)	83 ± 12 N·m (61 ± 9 ft-lb)
Rear suspension crossmember to body bolt	110 ± 15 N·m (81 ± 11 ft-lb)
Shock absorber assembly	
Shock absorber assembly to body nut	45 ± 5 N·m (34 ± 3 ft-lb)
Shock absorber assembly to knuckle bolt	100 ± 10 N·m (74 ± 7 ft-lb)
Coil spring nut (Jam nut)	23 ± 2 N·m (17 ± 1 ft-lb)
Stabilizer bar	
Stabilizer bar link assembly nut	40 ± 5 N·m (30 ± 3 ft-lb)
Stabilizer bracket bolt	45 ± 5 N·m (34 ± 3 ft-lb)
Toe control arm assembly	
Toe control arm assembly to crossmember nut	78 ± 7 N·m (57 ± 5 ft-lb)
Toe control arm assembly to knuckle nut (Jam nut)	66 ± 6 N·m (49 ± 4 ft-lb)
Trailing arm assembly	
Trailing arm assembly to knuckle nut (Jam nut)	113 ± 12 N·m (83 ± 9 ft-lb)
Trailing arm assembly to trailing arm bracket nut (Jam nut)	113 ± 12 N·m (83 ± 9 ft-lb)
Trailing arm bracket to body bolt	100 ± 10 N·m (74 ± 7 ft-lb)
Upper arm assembly	
Upper arm assembly to crossmember bolt and nut (Jam nut)	113 ± 12 N·m (83 ± 9 ft-lb)
Upper arm assembly to knuckle nut (Jam nut)	113 ± 12 N·m (83 ± 9 ft-lb)

GENERAL SPECIFICATIONS

M1341000200413

COIL SPRING

ITEM	SPECIFICATION
Wire diameter mm (in)	12.0 (0.47)
Average diameter mm (in)	86.0 – 112.0 (3.39 – 4.40)
Free length mm (in)	352.0 (13.86)

TSB Revision

SERVICE SPECIFICATIONS

M1341000300421

ITEM	STANDARD VALUE
Camber	–0°50' ± 0°30' (Difference between right and left within 30')
Toe-in mm (in)	3 ± 3 (0.12 ± 0.12)
Toe control arm ball joint turning torque N·m (in-lb)	1.0 – 2.6 (8.9 – 23)
Stabilizer bar link ball joint breakaway torque N·m (in-lb)	3.4 – 9.0 (30 – 80)

LUBRICANT

M1341000400183

ITEM	SPECIFIED LUBRICANT	QUANTITY
Toe control arm ball joint (lip and inside of dust cover)	Multipurpose grease SAE J310, NLGI No.2 or equivalent	7 ± 0.5 g (0.247 ± 0.018 oz)

GROUP 35

SERVICE BRAKES

CONTENTS

GROUP 35A

BASIC BRAKE SYSTEM

CONTENTS

GENERAL DESCRIPTION

M1351000100848

The brake system has been designed to give greater reliability and durability and to provide excellent braking performance.

FEATURES

Improved braking performance

1. An 8+9 inch tandem brake booster provides sufficient braking force in sudden braking range.
2. 15-inch front ventilated disc brakes provide stable braking force and improved braking feel. <2.4L engine>
3. 16-inch front ventilated disc brakes provide stable braking force and improved braking feel. <3.8L engine>
4. 14-inch rear solid disc brakes are used. <Except RALLIART>
5. 15-inch rear ventilated disc brakes are used. <RALLIART>

Improved stability

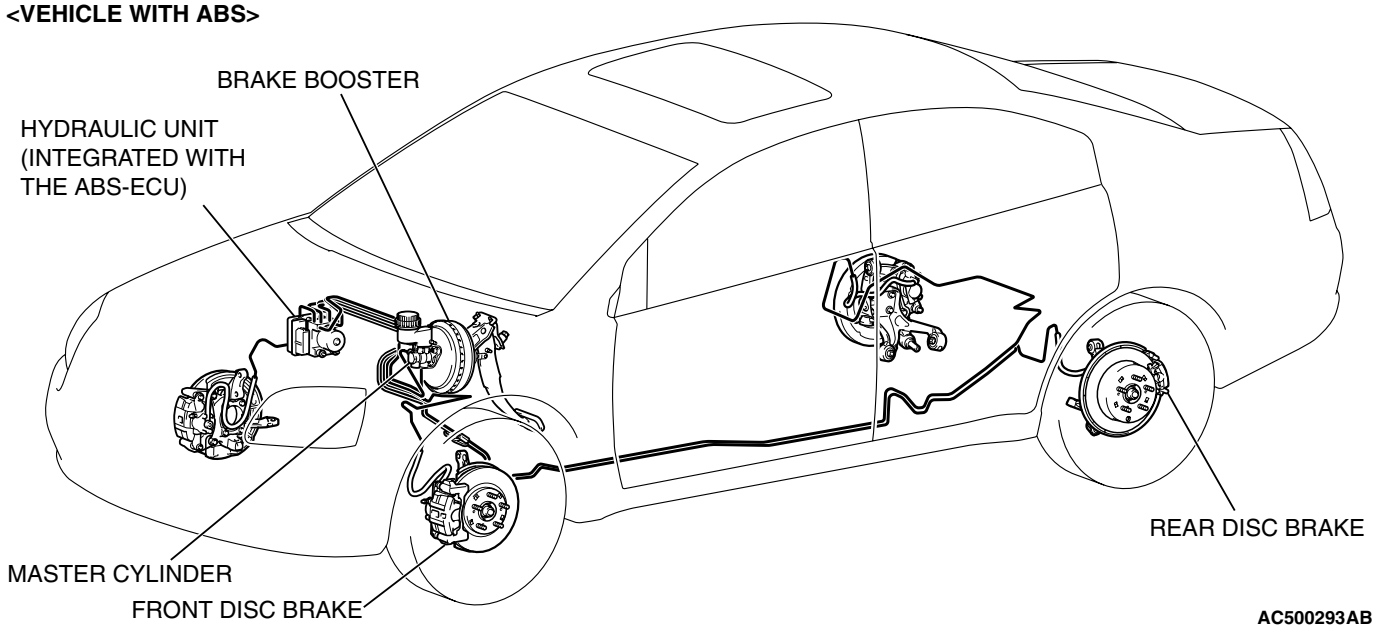
1. A 4-wheel anti-lock braking system (4ABS) prevents slipping caused by the vehicle wheels locking up, in order to maintain a stable vehicle posture and steering performance.
2. An electronic brake-force distribution (EBD) makes it possible to maintain the maximum amount of braking force even when the vehicle's load is unevenly distributed. <Vehicles with ABS>
3. A rear wheel early lock-prevention proportioning valve are used. <Vehicles without ABS>
4. Front- and rear-wheel X-type brake line layout are used.
5. Ventilated discs on the front brakes improve anti-fading performance.

Improved serviceability

1. A diagnosis function for the ABS system makes inspection easier.
2. An outer disc separated hub and rotor make removal and installation easier.
3. The master cylinder reservoir tank cap is colored white to make identification easier.
4. The ABS-ECU and hydraulic unit are integrated to make them more compact and light weight.

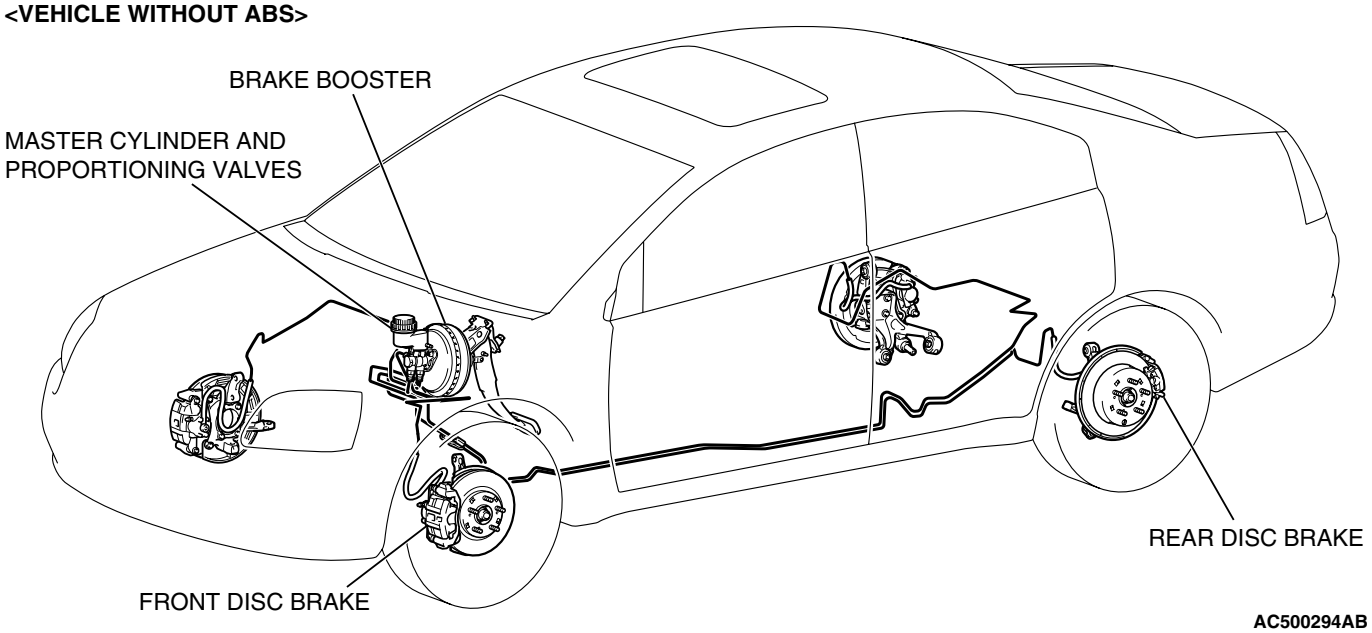
CONSTRUCTION DIAGRAM

<VEHICLE WITH ABS>



AC500293AB

<VEHICLE WITHOUT ABS>



AC500294AB

BASIC BRAKE SYSTEM DIAGNOSIS

INTRODUCTION TO BASIC BRAKE SYSTEM DIAGNOSIS

M1351009700319

Hydraulic brakes are composed of the brake pedal, master cylinder, brake booster and disc brakes. Malfunctions such as insufficient braking power or the generation of noise may occur due to wear, damage or incorrect adjustment of these components.

BASIC BRAKE SYSTEM DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1351009800316

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a basic brake system fault.

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

SYMPTOM CHART

M1351009900324

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Vehicle pulls to one side when brakes are applied	1	P.35A-4
Insufficient braking power	2	P.35A-4
Increased pedal stroke (Reduced pedal-to-floor board clearance)	3	P.35A-5
Brake drag	4	P.35A-6
Scraping or grinding noise when brake are applied	5	P.35A-7
Squealing, groaning or chattering noise when brake are applied	6	P.35A-8
Squealing noise when brakes are not applied	7	P.35A-9
Groaning, clicking or rattling noise when brakes are not applied	8	P.35A-10

TSB Revision

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Vehicle Pulls to One Side when Brakes are Applied

DIAGNOSIS

STEP 1. Check for oil, water, etc., on the pad contact surface of all brakes.

Q: Is oil, water, etc., on the pad contact surface?
YES : Replace the part and determine the source/cause of foreign material. Then go to Step 5.
NO : Go to Step 2.

STEP 2. Check disc brake pistons for smooth operation.

(1) With engine not running, depress the brake pedal rapidly several times to deplete booster vacuum reserves.
(2) Test each disc brake assembly one at a time.
  a. Remove the lower caliper bolt, then remove caliper from mount.
  b. Have an assistant slowly depress the brake pedal. Confirm piston(s) extend slowly and smoothly with no jumpiness. Repeat for each disc brake assembly.

Q: Do (does) the piston(s) move correctly?
YES : Go to Step 3.
NO : Disassemble and inspect the brake assembly (Front: refer to P.35A-31, Rear: refer to P.35A-34). Then go to Step 5.

STEP 3. Check brake disc(s) for runout.

Refer to P.35A-20.

Q: Is runout outside of specifications?
YES : Repair or replace the brake disc(s) as necessary. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check brake discs for correct thickness.

Refer to P.35A-20.

Q: Is the thickness outside of specifications?
YES : Repair or replace the brake disc(s) as necessary. Then go to Step 5.
NO : Perform the brake line bleeding. Then go to Step 5.

STEP 5. Retest the system.

Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Start over at Step 1. If a new symptom appears, refer to the appropriate symptom chart.

INSPECTION PROCEDURE 2: Insufficient Braking Power

DIAGNOSIS

STEP 1. Check that the specified brake fluid is used, its level is correct, and no contamination is found.

Q: Is there a fault?
YES : Refill or replace with the specified brake fluid DOT 3 or DOT 4. Bleed the brakes if necessary (Refer to P.35A-16). Then go to Step 7.
NO : Go to Step 2.

STEP 2. Check for spongy (not firm) brakes.

(1) With engine not running, depress the brake pedal rapidly several times to deplete the booster vacuum reserve.
(2) With the brake pedal fully released, depress the brake pedal slowly until it stops.
(3) With a measuring device (ruler, etc.) next to the brake pedal, depress the pedal firmly and measure the distance the pedal traveled.

Q: Is the distance greater than 20 mm (0.8 inch)?
YES : Bleed the brakes to remove air in the fluid (Refer to P.35A-16). Then go to Step 7.
NO : Go to Step 3.

STEP 3. Check the brake booster function.
Refer to P.35A-14.

Q: Is there a fault?
YES : Replace the brake booster. Then go to Step 7.
NO : Go to Step 4.

STEP 4. Check for pinched or restricted brake tube or hose.

Q: Is there a pinched or restricted brake tube or hose?
YES : Replace that complete section of brake tube or brake hose. Then go to Step 7.
NO : Go to Step 5.

STEP 5. Check for oil, water, etc., on the pad contact surfaces of all brakes.

Q: Is oil, water, etc., on the pad contact surface?
YES : Replace the part and determine the source/cause of foreign material. Recheck symptom. Then go to Step 7.
NO : The procedure is complete. If condition persists for vehicles without ABS, go to Step 6.

STEP 6. Check the proportioning valve operation. <Vehicles without ABS>
Refer to P.35A-15.

Q: Is there a fault?
YES : Replace the proportioning valve. Then go to Step 7.
NO : Go to Step 7.

STEP 7. Recheck symptom.

Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the appropriate symptom chart.

INSPECTION PROCEDURE 3: Increased Pedal Stroke (Reduced Pedal-to-Floor Board Clearance)

DIAGNOSIS

STEP 1. Check for spongy (not firm) brakes.
(1) With engine not running, depress the brake pedal rapidly several times to deplete booster vacuum reserve.
(2) With the brake pedal fully released, depress the brake pedal slowly until it stops.
(3) With a measuring device (ruler, etc.) next to the brake pedal, depress the pedal firmly and measure the distance the pedal traveled.

Q: Is the distance greater than 20 mm (0.8 inch)?
YES : Bleed the brakes to remove air in the fluid (Refer to P.35A-16). Then go to Step 7.
NO : Go to Step 2.

STEP 2. Check the pad for wear.
Refer to P.35A-18.

Q: Is the pad thickness outside of specifications?
YES : Replace the part. Then go to Step 7.
NO : Go to Step 3.

STEP 3. Check the vacuum hose and check valve for damage.
Refer to P.35A-15.

Q: Is there a damage?
YES : Replace the part. Then go to Step 7.
NO : Go to Step 4.

STEP 4. Check the master cylinder function.
Refer to P.35A-23.

Q: Is there a fault?
YES : Repair it. Then go to Step 7.
NO : Go to Step 5.

STEP 5. Check for brake fluid leaks.

Q: Is there a leak?
YES : Check the connection for looseness, corrosion, etc. Clean and repair as necessary. If leaking in any tube or hose section, replace the complete tube or hose. Then go to Step 7 .
NO : Go to Step 6.

STEP 6. Check for excessive clearance between the push rod and primary piston.
Refer to P.35A-26.

Q: Is the clearance outside of specifications?
YES : Adjust the clearance. Then go to Step 7.
NO : Go to Step 7.

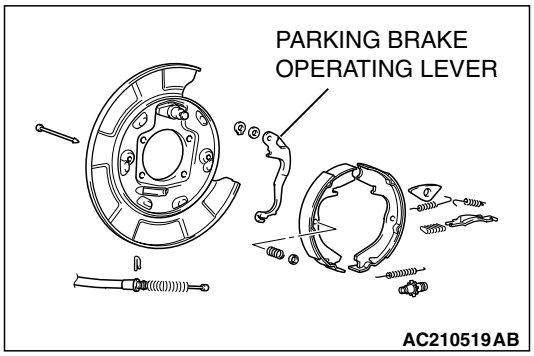
STEP 7. Recheck symptom.

Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

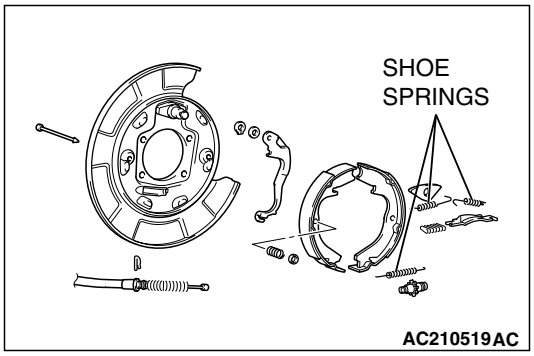
INSPECTION PROCEDURE 4: Brake Drag

DIAGNOSIS

STEP 1. Check the parking brake operating lever return.
Q: Is the operation faulty?
YES : Repair it. Then go to Step 9.
NO : Go to Step 2.



STEP 2. Check the brake shoe springs for breakage.
Q: Are the brake shoe springs broken?
YES : Replace the spring. Then go to Step 9.
NO : Go to Step 3.



STEP 3. Check the amount of grease at each sliding section.
Refer to GROUP 36, Parking Brake Lining and Drum P.36-8.

Q: Is the grease amount low?
YES : Apply grease. Then go to Step 9.
NO : Go to Step 4.

STEP 4. Check the parking brake pull amount.
Refer to GROUP 36, On-vehicle Service – Parking Brake lever Stroke Check and Adjustment P.36-3.

Q: Is there a fault?
YES : Adjust it. Then go to Step 9.
NO : Go to Step 5.

TSB Revision

STEP 5. Check for insufficient clearance between the push rod and primary piston.
Refer to P.35A-26.

Q: Is there a fault?

YES : Adjust the clearance. Then go to Step 9.
NO : Go to Step 6.

STEP 6. Check the master cylinder piston return spring for damage and return port for clogging.
Refer to P.35A-26.

Q: Is there damage?

YES : Replace the part. Then go to Step 9.
NO : Go to Step 7.

STEP 7. Check port for clogging.

Q: Is the port clogged?

YES : Repair it. Then go to Step 9.
NO : Go to Step 8.

STEP 8. Check disc brake pistons for sticking.
Depress the brake pedal, then release. Confirm each wheel spins freely.

Q: Does any wheel stick?

YES : Inspect that brake assembly. Then go to Step 9.
NO : Go to Step 9.

STEP 9. Recheck symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 5: Scraping or Grinding Noise when Brakes are Applied

DIAGNOSIS

STEP 1. Check the front brakes, then rear brakes, for metal-to-metal condition.

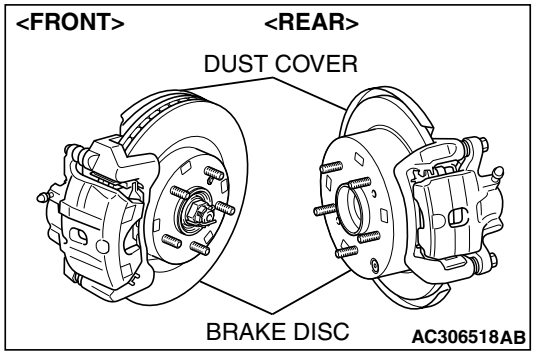
Q: Is any metal-to-metal contact evident?

YES : Repair or replace the components. Then go to Step 6.
NO : Go to Step 2.

STEP 2. Check for interference between the caliper and wheel.

Q: Is there any interference?

YES : Repair or replace the part. Then go to Step 6.
NO : Go to Step 3.



STEP 3. Check for interference between the dust cover and brake disc.

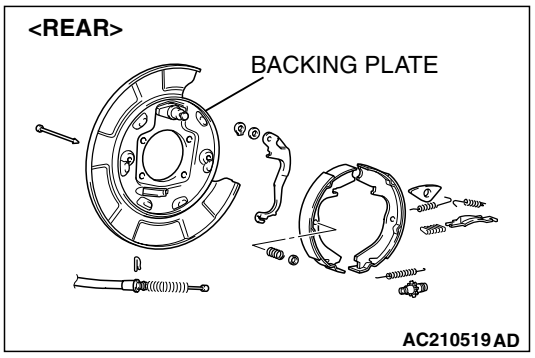
Q: Is there any interference?

YES : Repair or replace the part. Then go to Step 6.
NO : Go to Step 4.

STEP 4. Check the brake drums or discs for cracks.

Q: Are there cracks?

YES : Repair or replace the part. Then go to Step 6.
NO : Go to Step 5.



STEP 5. Check for bent backing plate(s).

Q: Is (Are) the backing plate(s) bent?

YES : Repair or replace the part. Then go to Step 6.
NO : Go to Step 6.

STEP 6. Recheck symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE6: Squealing, Groaning or Chattering Noise when Brakes are Applied

DIAGNOSIS

STEP 1. Check the brake disc and pads for wear or cutting.

Q: Is there wear or cutting?

YES : Repair or replace the part. Then go to Step 4.
NO : Go to Step 2.

STEP 2. Check the calipers for rust.

Q: Is there any rust?

YES : Remove the rust. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Adjust the brake pedal or brake booster pushrod.
Refer to P.35A-12 or P.35A-26.

Q: Are the brake pedal and the brake booster pushrod adjusted correctly?
YES : Go to Step 4.
NO : Adjust the brake pedal or the brake booster pushrod. Then go to Step 4.

STEP 4. Recheck symptom.

Q: Is the symptom eliminated?
YES : The procedure is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 7: Squealing Noise when Brakes are not Applied

DIAGNOSIS

STEP 1. Check whether the backing plate is bent or loose and interfering with the drum.

Q: Is there a fault?
YES : Replace the part. Then go to Step 10.
NO : Go to Step 2.

STEP 2. Check whether the drum is damaged due to interference with the backing plate or shoe.

Q: Is there any damage?
YES : Replace the part. Then go to Step 10.
NO : Go to Step 3.

STEP 3. Check the brake drum for wear and the shoe spring for damage.

Q: Is there any wear or damage?
YES : Replace the part. Then go to Step 10.
NO : Go to Step 4.

STEP 4. Check the brake discs for rust.

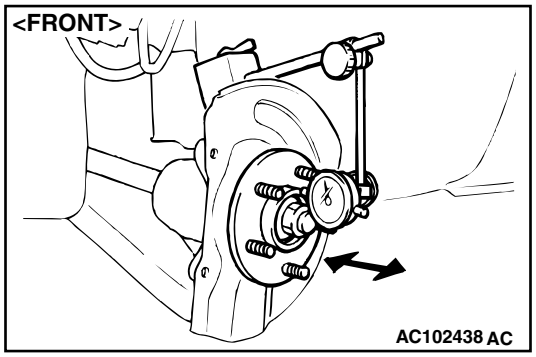
Q: Are the brake discs rusted?
YES : Remove the rust by using sand paper. If still rusted, turn the rotors with an on-the-car brake lathe. Then go to Step 10.
NO : Go to Step 5.

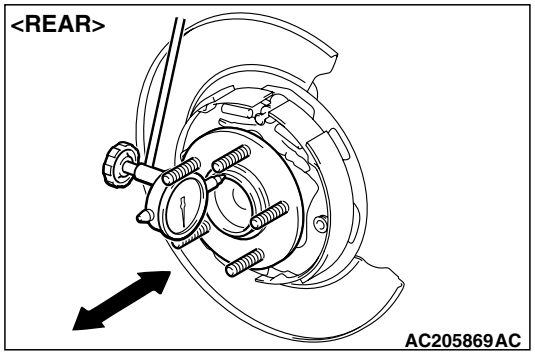
STEP 5. Check the brake pads for correct installation.

Q: Are the pads installed incorrectly?
YES : Repair the pads. Then go to Step 10.
NO : Go to Step 6.

STEP 6. Check the calipers for correct installation.

Q: Are the calipers installed incorrectly?
YES : Repair the calipers. Then go to Step 10.
NO : Go to Step 7.





STEP 7. Check the wheel bearings for end play.

(1) Remove the brake discs.
(2) Place a dial gauge as shown, and measure the end play while moving the hub in the axial direction.

Limit: 0.05 mm (0.002 inch)

Q: Does the measured end play exceed the limit?

YES : Replace the faulty hub assembly. Then go to Step 10.
NO : Go to Step 8.

STEP 8. Check whether the brake booster or master cylinder return is insufficient.

Q: Is the brake booster or master cylinder return insufficient?

YES : Replace the part. Then go to Step 10.
NO : Go to Step 9.

STEP 9. Adjust the brake pedal or brake booster pushrod.

Refer to P.35A-12 or P.35A-26.

Q: Are the brake pedal and the brake booster pushrod adjusted correctly?

YES : Go to Step 10.
NO : Adjust the brake pedal or the brake booster pushrod. Then go to Step 10.

STEP 10. Recheck symptom.

Q: Is the symptom eliminated?

YES : The procedure is complete.
NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 8: Groaning, Clicking or Rattling Noise when Brakes are not Applied.

DIAGNOSIS

TSB Revision

STEP 1. Check whether foreign material has entered the wheel covers.

Q: Is there any foreign material?

YES : Remove it. Then go to Step 5.
NO : Go to Step 2.

STEP 2. Check for looseness of the wheel nuts.

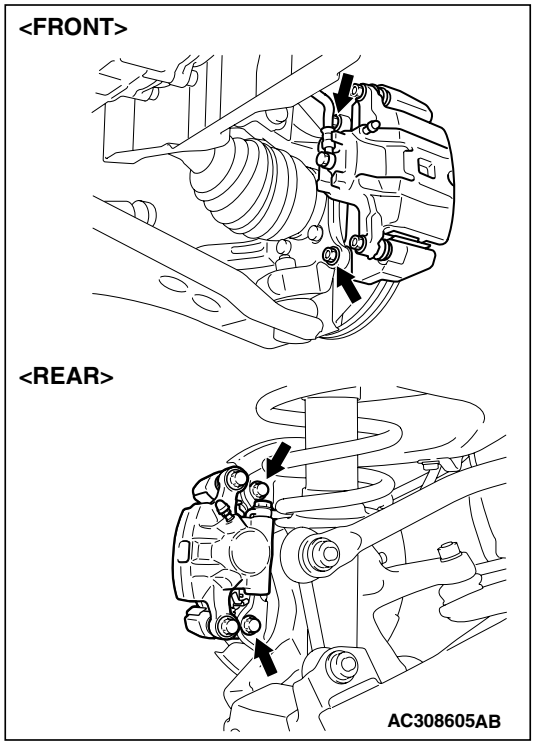
Q: Are the wheel nuts loose?

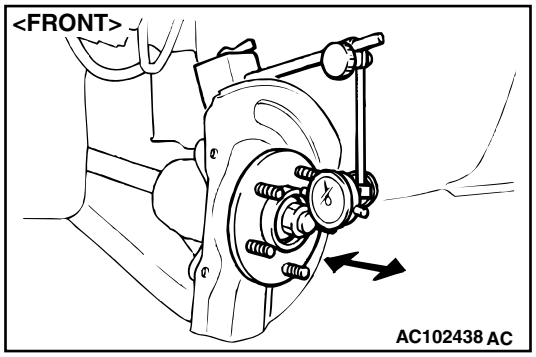
YES : Tighten to 98 ± 10 N·m (73 ± 7 ft-lb). Then go to Step 5 .
NO : Go to Step 3.

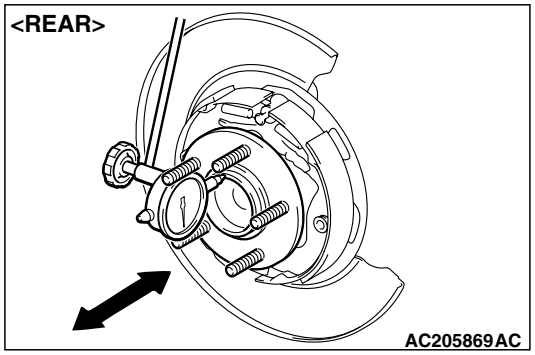
STEP 3. Check for looseness of the caliper installation bolt.

Q: Is the caliper installation bolt loose?

YES : Tighten to 100 ± 10 N·m (74 ± 7 ft-lb) for the front caliper. Tighten to 60 ± 5 N·m (45 ± 3 ft-lb) for the rear caliper. Then go to Step 5.
NO : Go to Step 4.







STEP 4. Check the wheel bearings for end play.

(1) Remove the brake discs.

(2) Place a dial gauge as shown, and measure the end play while moving the hub in the axial direction.

Limit: 0.05 mm (0.002 inch)

Q: Does the measured end play exceed the limit?

YES : Replace the faulty hub assembly. Then go to Step 5.

NO : Go to Step 5.

STEP 5. Recheck symptom.

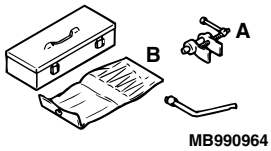
Q: Is the symptom eliminated?

YES : The procedure is complete.

NO : Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

SPECIAL TOOLS

M1351000600638

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB990964 Brake tool set A: MB990520 Disc brake piston expander	MB990620-01 or general service tool	Pushing-in of the disc brake piston

ON-VEHICLE SERVICE

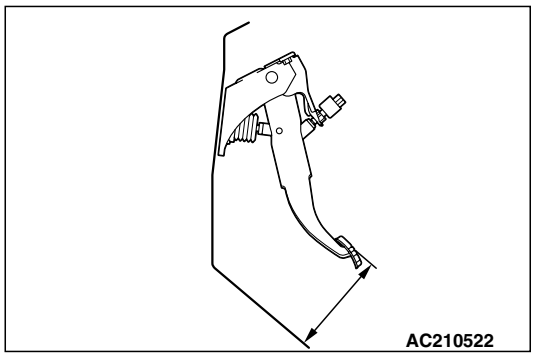
BRAKE PEDAL CHECK AND ADJUSTMENT

M1351000900446

BRAKE PEDAL HEIGHT

1. Turn up the carpet, etc. under the brake pedal.

TSB Revision


AC210522

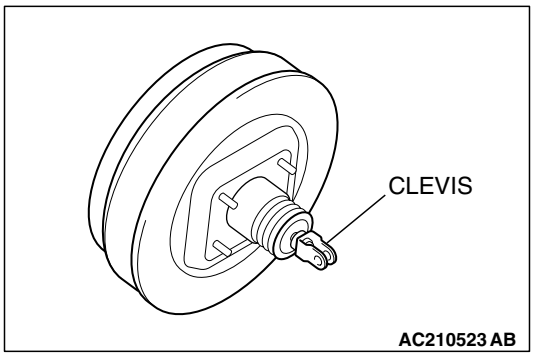
2. Measure the brake pedal height as illustrated.

   Standard value: 169.8 – 172.8 mm (6.69 – 6.80 inches) [From the surface of dash panel to the face of pedal pad]

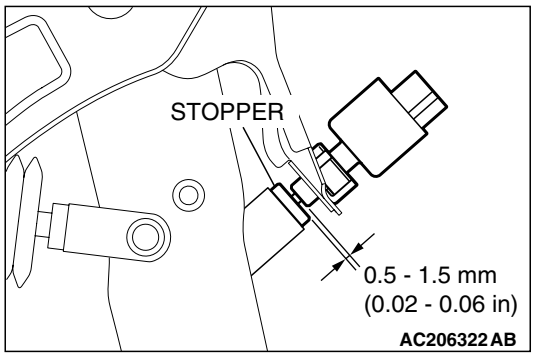
3. If the brake pedal height is not within the standard value, follow the procedure below.
   (1) Disconnect the stoplight switch connector.
   (2) Remove the brake booster (Refer to P.35A-26).

   NOTE: With the master cylinder and brake pipe connected, remove the brake booster only.
   (3) Adjust the brake pedal height by turning the clevis.

   NOTE: When the clevis is turned 180 degrees, the pedal height is changed by approximately 2.2 mm (0.09 in).
   (4) Install the brake booster (Refer to P.35A-26).
   (5) Measure the brake pedal height, and ensure that the measured value is within the specified value. If it is out of the specified value, repeat Step (3) - (6).



AC210523 AB



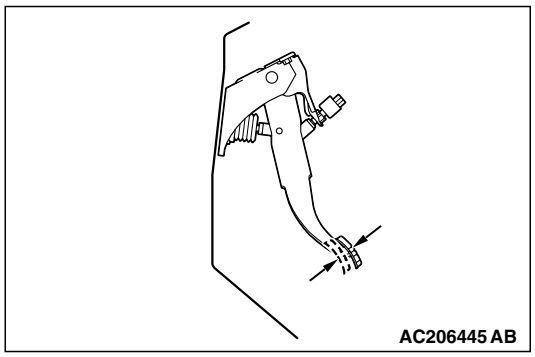
AC206322 AB

   (6) Screw in the stop light switch until its thread contacts the stopper, and fix the stop light switch by turning it approximately one quarter of a turn clockwise.
   (7) Check that the clearance between the stop light switch and the stopper is as shown.

⚠ CAUTION
Check that the stop light does not illuminate when the brake pedal is not depressed.

   (8) Connect the connector at the stop light switch.
4. Check the key interlock and shift lock mechanisms. (Refer to GROUP 23A, On-vehicle Service – Key Interlock and Shift Lock Mechanism Check P.23A-377).
5. Return the carpet, etc. to its original position.

BRAKE PEDAL FREE PLAY

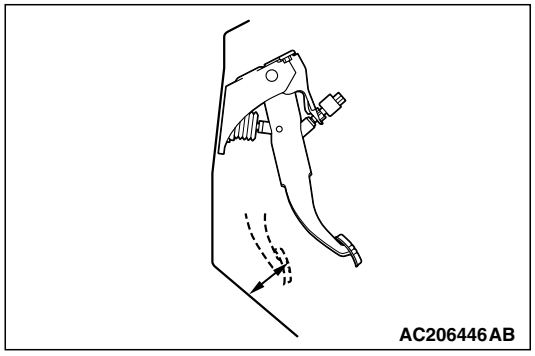

AC206445 AB

1. Turn the ignition switch to the "LOCK" (OFF) position, and depress the brake pedal two or three times. After eliminating the vacuum in the brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (free play) is within the standard value range.

   Standard value: 3 – 8 mm (0.12 – 0.31 inch)

2. If the brake pedal play is not within the standard value, check the following, and adjust or replace if necessary:
   - Excessive play between the brake pedal and the clevis pin, or between the clevis pin and the brake booster operating rod
   - Brake pedal height
   - Installation position of the stop light switch, etc.

CLEARANCE BETWEEN BRAKE PEDAL AND DASH PANEL

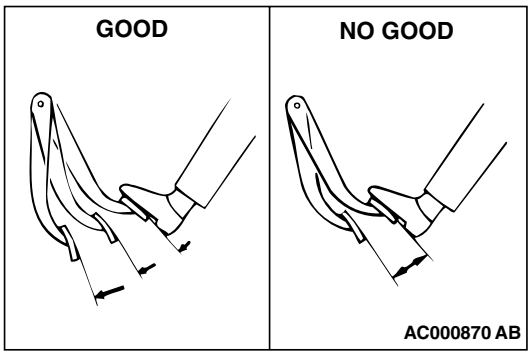

AC206446AB

1. Turn up the carpet, etc. under the brake pedal.
2. Start the engine, depress the brake pedal with approximately 500 N (112 pounds) of force, and measure the clearance between the brake pedal and the dash panel.
   Standard value: 110 mm (4.33 inches) or more [From the surface of dash panel to the face of pedal pad]
3. If the clearance is outside the standard value, check for air trapped in the brake line and check the thickness of the disc brake pad. Andjust and replace defective parts as required.
4. Return the carpet etc. to its original position.

BRAKE BOOSTER OPERATING TEST

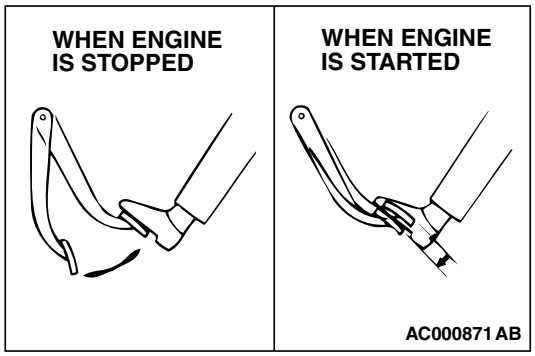
M1351001000372

1. For simple checking of the brake booster operation, carry out the following tests:
   (1) Run the engine for one or two minutes, and then stop it. If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly. If the pedal height remains unchanged, the booster is defective. Go to step 2.



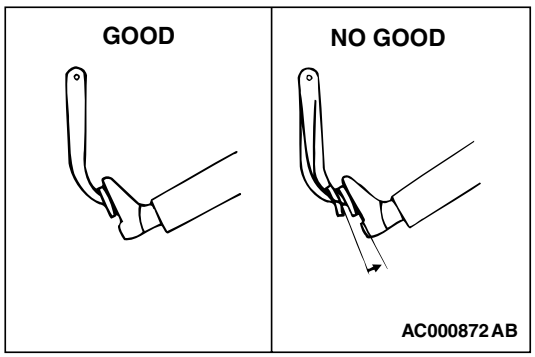
AC000870AB

   (2) With the engine stopped, step on the brake pedal several times. Then step on the brake pedal and start the engine. If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective. Go to step 3.



AC000871AB

   (3) With the engine running, step on the brake pedal and then stop the engine. Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.



AC000872AB

2. If the above three tests are okay, the booster is OK. If one of the above three tests is not okay, the check valve, vacuum hose, or booster is defective. Check the check valve (Refer to P.35A-15), vacuum hose for leaks, high volume engine vacuum applied to booster. Repair or replace as necessary. If these are OK, replace booster and repeat this test starting at Step 1.

CHECK VALVE OPERATION CHECK

M1351009000376

⚠ CAUTION

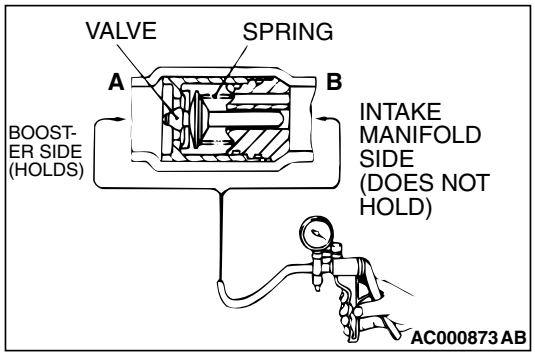
The check valve should not be removed from the vacuum hose.

1. Remove the vacuum hose. (Refer to P.35A-26).

⚠ CAUTION

If the check valve is defective, replace it as an assembly together with the vacuum hose.

2. Check the operation of the check valve by using a vacuum pump.



VACUUM PUMP CONNECTION	CRITERIA
Connection at the brake booster side (A)	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side (B)	A negative pressure (vacuum) is not created.

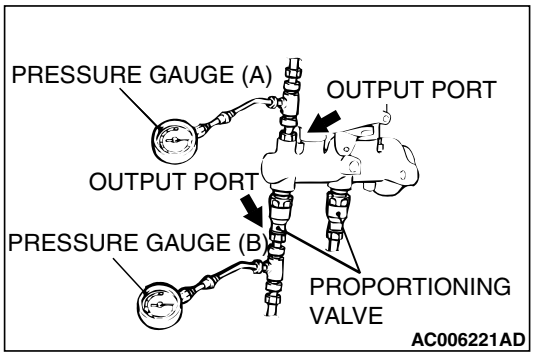
PROPORTIONING VALVE FUNCTION TEST <VEHICLES WITHOUT ABS>

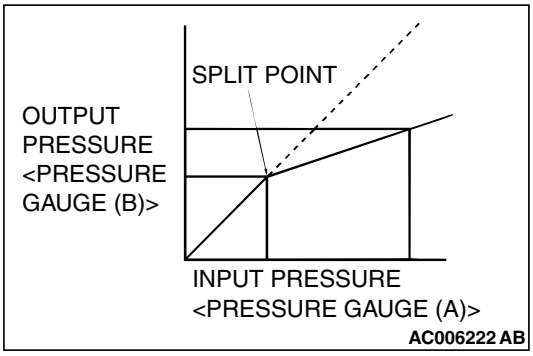
M1351001100346

⚠ CAUTION

The proportioning valves are installed independently for the right and left brake lines. Always measure each valve.

1. Connect two pressure gauges to the output port of the master cylinder and output port of the proportioning valve.
2. Bleed the brake line and the pressure gauges (Refer to P.35A-16).





3. Depress the brake pedal gradually. Then check that the split point, where the output fluid pressure begins to drop in proportion to the output fluid pressure, is at the standard value.

   Standard value: 3.68 – 4.17 MPa (534 – 605 psi)

4. Depress the brake pedal more strongly than at the above step. Then check that the output fluid pressure is at the standard value when the input fluid pressure is 7.85 MPa (1,139 psi).

   Standard value: 5.24 – 5.74 MPa (760 – 833 psi)

5. Measure each output fluid pressure at both valves, and check that the difference between the two is at the limit value or less.

   Limit: 0.5 MPa (73 psi)

6. If the measured pressure exceeds the limit, replace the proportioning valve.

BLEEDING

M1351001400455

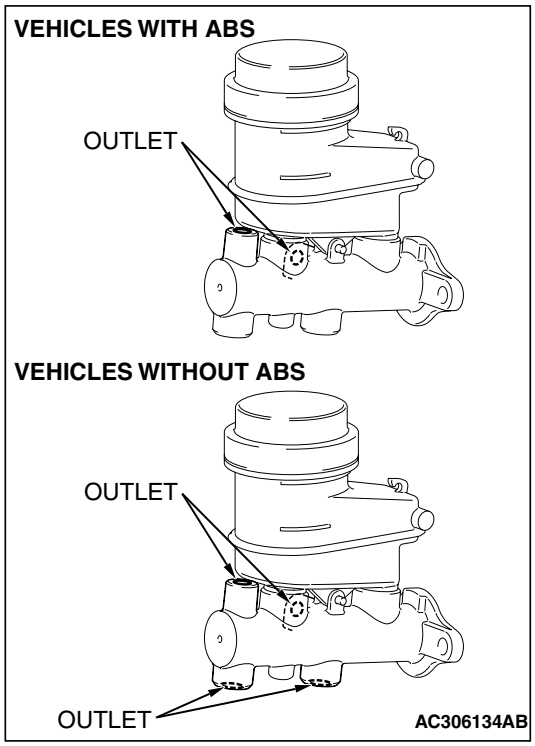
⚠ CAUTION

Use only brake fluid DOT 3 or DOT 4. Never mix the specified brake fluid with other fluid as it will influence the braking performance significantly.

MASTER CYLINDER BLEEDING

The master cylinder used has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake pipeline will become easier. (When brake fluid is not contained in the master cylinder).

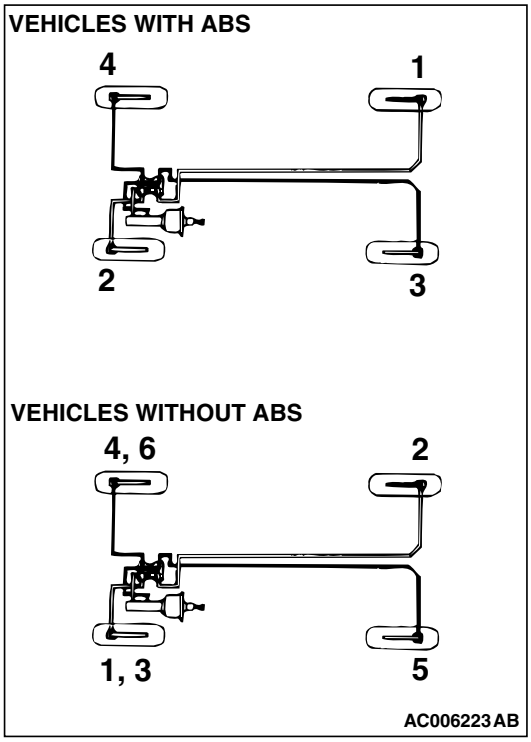
1. Fill the reserve tank with brake fluid.
2. Keep the brake pedal depressed.



3. Have another person cover the master cylinder outlet with a finger.
4. With the outlet still closed, release the brake pedal.
5. Repeat steps 2 – 4 three or four times to fill the inside of the master cylinder with brake fluid.

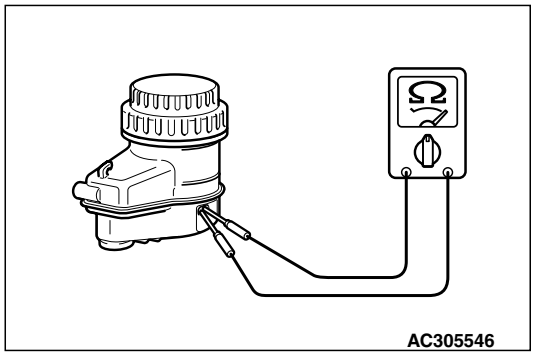
BRAKE LINE BLEEDING

Start the engine and bleed the air in the sequence shown in the figure.



BRAKE FLUID LEVEL SENSOR CHECK

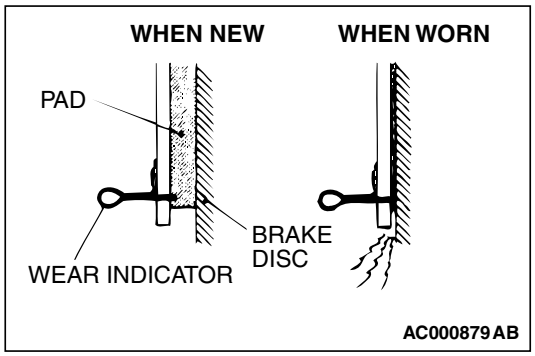
M1351009100403



The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "MIN" and if there is continuity when the float surface is below "MIN".

DISC BRAKE PAD CHECK AND REPLACEMENT

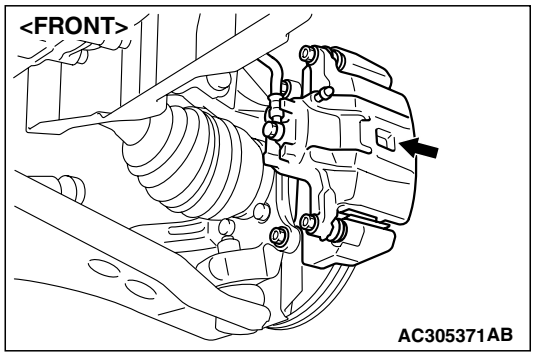
M1351002300398



NOTE: The brake pads (LH wheel) have indicators that contact the brake disc when the brake pad thickness becomes 2 mm (0.08 inch), and emit a squealing sound to warn the driver.

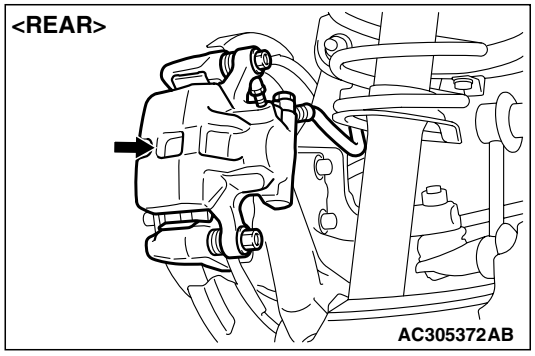
⚠ CAUTION

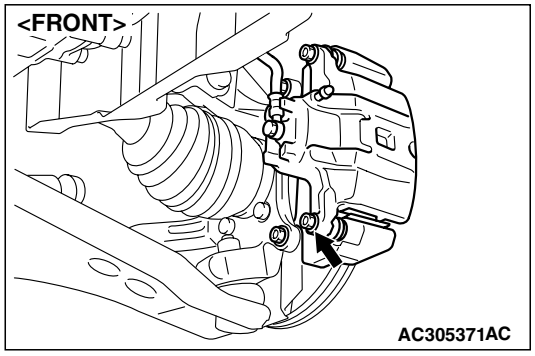
- **Whenever a pad must be replaced, replace both LH and RH wheel pads as a set to prevent the vehicle from pulling to one side when braking.**
- **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston and slide pins.**

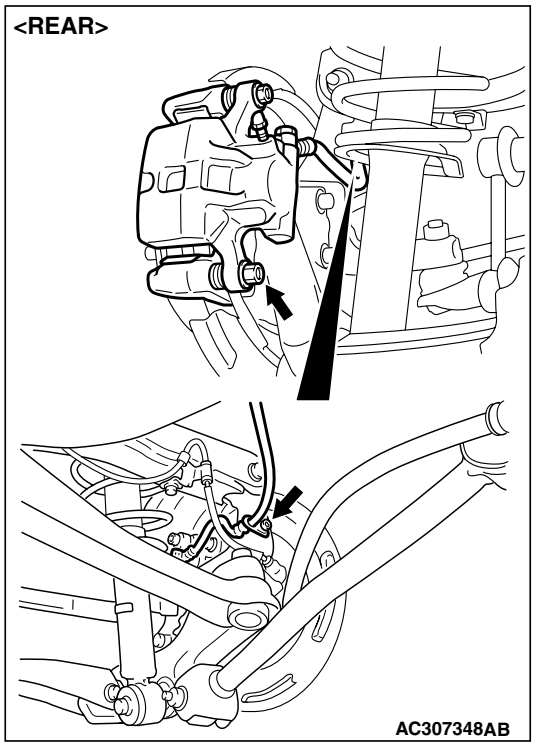


1. Check the brake pad thickness through the caliper body check port.

   Standard value: 10.0 mm (0.39 inch)
   Minimum limit: 2.0 mm (0.08 inch)



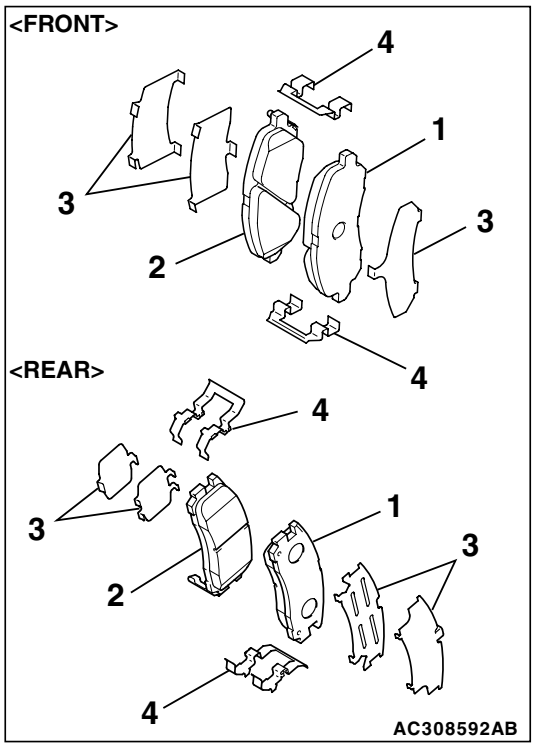




⚠ CAUTION

Do not wipe off the special grease that is on the lock pin.
Do not contaminate the lock pin.

2. Remove the lock pin bolt <Front> or lock pin and brake hose clamp <Rear>. Pivot the caliper assembly and hold it with wires.



3. Remove the following parts from the caliper support.
   (1) Pad assembly
   (2) Pad and wear indicator assembly or Pad assembly
   (3) Shim
   (4) Clip
4. In order to measure the brake drag force after pad installation, measure the rotary-sliding resistance of the hub with the pads removed (Refer to P.35A-28).
5. Install the pads and caliper assembly, and then check the brake drag force (Refer to P.35A-28).

DISC BRAKE ROTOR CHECK

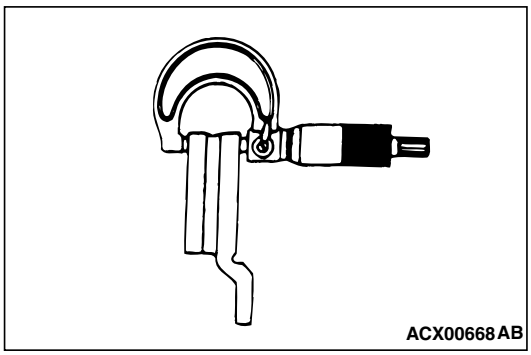
M1351002900334

⚠ CAUTION

Disc brakes must be kept within the allowable service values in order to maintain normal brake operation.

Before turning the brake disc, the following conditions should be checked.

INSPECTION ITEM	REMARK
Scratches, rust, saturated lining materials and wear	• If the vehicle is not driven for a long period of time, sections of the discs that are not in contact with the pads will become rusty, causing noise and shuddering. • If grooves and scratches resulting from excessive disc wear are not removed prior to installing a new pad assembly, there will be inadequate contact between the disc and the lining (pad) until the pads conform to the disc.
Run-out	Excessive run-out of the discs will increase the pedal depression resistance due to piston kick-back.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Inset or warping (flatness)	Overheating and improper handling while servicing will cause warping or distortion.



BRAKE DISC THICKNESS CHECK

1. Using a micrometer, measure disc thickness at eight positions, approximately 45 degrees apart and 10 mm (0.4 inch) in from the outer edge of the disc.

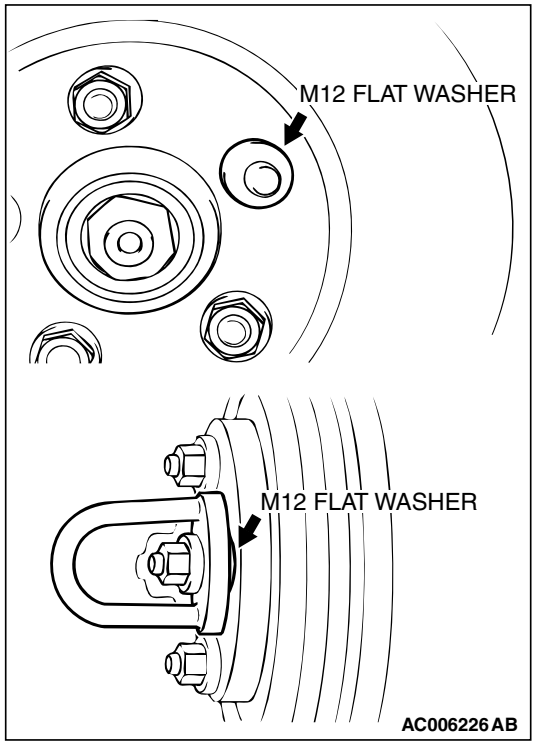
   FRONT BRAKE DISC
   Standard value: 26.0 mm (1.02 inches)
   Minimum limit: 24.4 mm (0.96 inch)

   REAR BRAKE DISC
   Standard value: 10.0 mm (0.39 inch)
   Minimum limit: 8.4 mm (0.33 inch)

   NOTE: Thickness variation (at least 8 positions) should not be more than 0.015 mm (0.0006 inch).

⚠ CAUTION

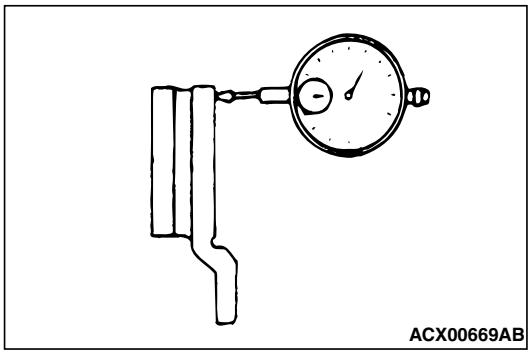
- **After a new brake disc is installed, always grind the brake disc with an on-the-car type brake lathe. If this step is not carried out, the brake disc run-out exceeds the specified value, resulting in judder.**
- **When the on-the-car type lathe is used, first install a M12 flat washer on the stud bolt in the brake disc side according to the figure, and then install the adapter. If the adapter is installed with M12 flat washer not seated, the brake disc rotor may be deformed, resulting in inaccurate grinding.**
- **Grind the brake disc with all wheel nuts diagonally and equally tightened to the specified torque 100 N·m (74 ft-lb). If all of the wheel nuts are not used, or the tightening torque is excessive or not equal, the brake disc rotor or drum may be deformed, resulting in judder.**



2. If the disc thickness is less than the limit, replace it with a new one. If thickness variation exceeds the specification, turn rotor with an on-the-car type brake lathe ("Accuturn-8750" or equivalent). If the calculated final thickness after turning the rotor is less than the standard value, replace the disc.

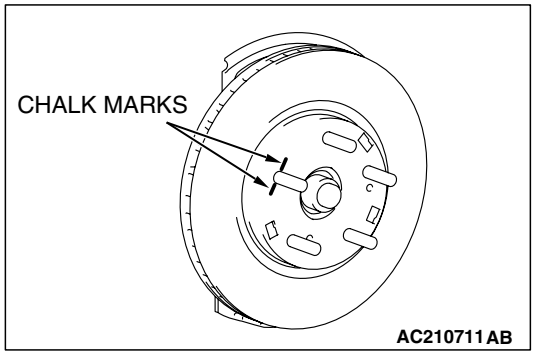
BRAKE DISC RUN-OUT CHECK AND CORRECTION

1. Remove the brake assembly, and then hold it with wire.
2. Temporarily install the disc with the hub nut.


ACX00669AB

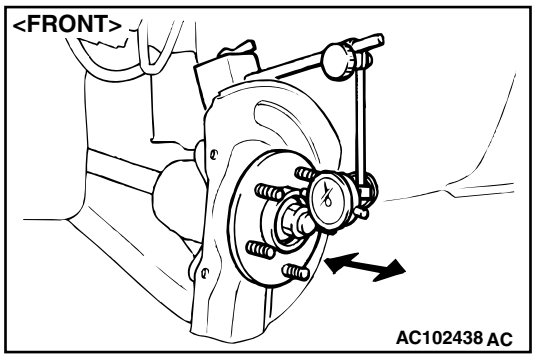
3. Place a dial gauge approximately 5 mm (0.2 inch) from the outer circumference of the brake disc, and measure the run-out of the disc.

   Limit:
   <Front brake disc>: 0.10 mm (0.0039 inch)
   <Rear brake disc>: 0.04 mm (0.0016 inch)



AC210711AB

4. If the brake disc run-out exceeds the limit, correct it as follows:
   (1) Chalk phase marks on the wheel stud and the brake disc as shown.

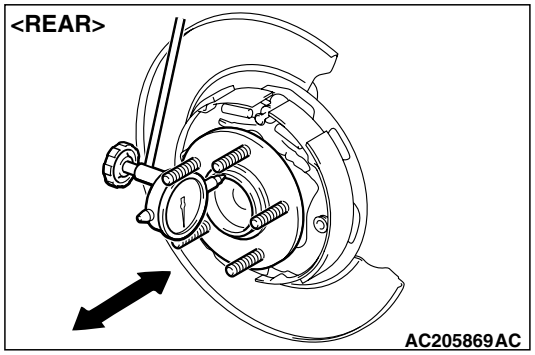


AC102438AC

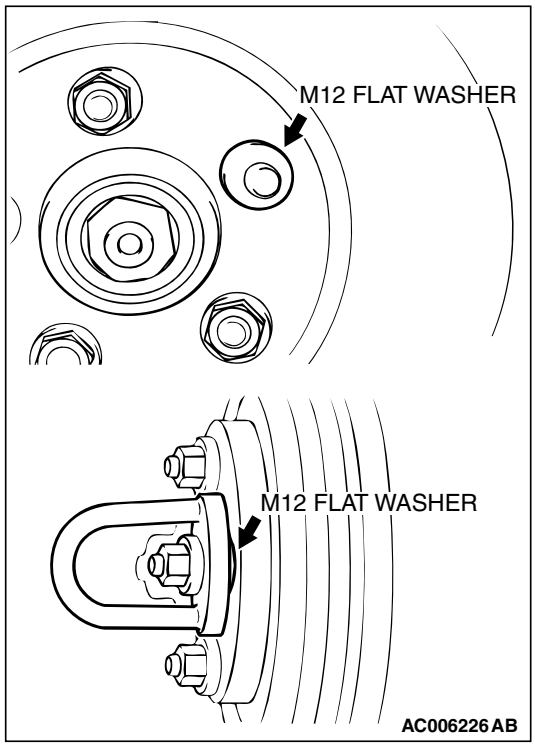
   (2) Remove the brake disc. Then place a dial gauge as shown, and measure the end play while moving the hub in the axial direction.

   Limit: 0.05 mm (0.002 inch)

   (3) If the end play exceeds the limit, replace the hub assembly.
   (4) If the end play does not exceed the limit, dephase the brake disc and secure it. Then recheck the brake disc run-out.



AC205869AC



⚠ CAUTION

- **After a new brake disc is installed, always grind the brake disc with an on-the-car type brake lathe. If this step is not carried out, the brake disc run-out exceeds the specified value, resulting in judder.**
- **When the on-the-car type lathe is used, first install a M12 flat washer on the stud bolt in the brake disc side according to the figure, and then install the adapter. If the adapter is installed with M12 flat washer not seated, the brake disc rotor may be deformed, resulting in inaccurate grinding.**
- **Grind the brake disc with all wheel nuts diagonally and equally tightened to the specified torque 100 N·m (74 ft-lb). If all of the wheel nuts are not used, or the tightening torque is excessive or not equal, the brake disc rotor or drum may be deformed, resulting in judder.**

5. If the run-out cannot be corrected by changing the phase of the brake disc, replace the brake disc or grind it with the on-the-car type brake lathe ("MAD, DL-8700PF" or equivalent).

MASTER CYLINDER FUNCTION CHECK

M1351010200266

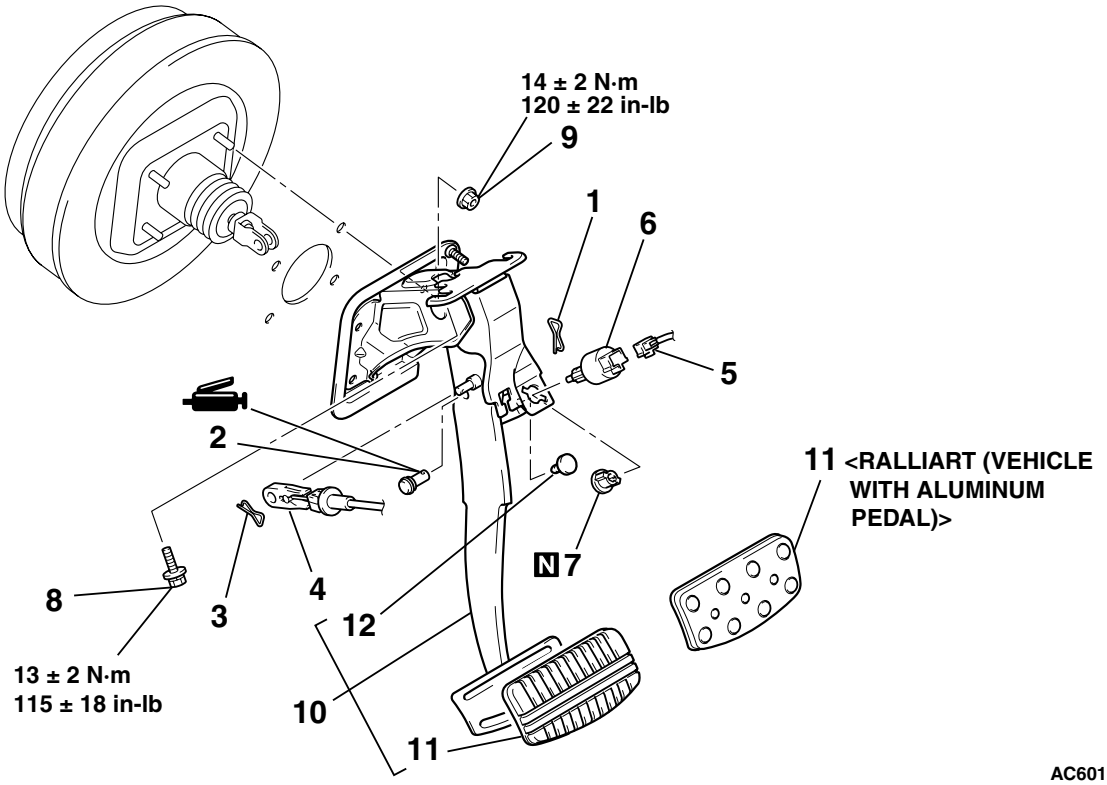
1. Remove the reservoir cap.
2. While watching the open reservoir from a distance of 50 cm (20 inches), have an assistant depress the brake pedal. If there was a stream of brake fluid rising from the reservoir, proceed to Step 3. If there was no stream of brake fluid rising from the reservoir, repair or replace the master cylinder.
3. While watching the open reservoir from a distance of 50 cm (20 inches), have the assistant release the brake pedal. If there was a small amount of air bubbles rising through the brake fluid, master cylinder function is normal. If there were no bubbles rising through the brake fluid, repair or replace the master cylinder.

BRAKE PEDAL

REMOVAL AND INSTALLATION

M1351003400752

Post-installation Operation
- Brake Pedal Adjustment (Refer to P.35A-12).



AC601025AB

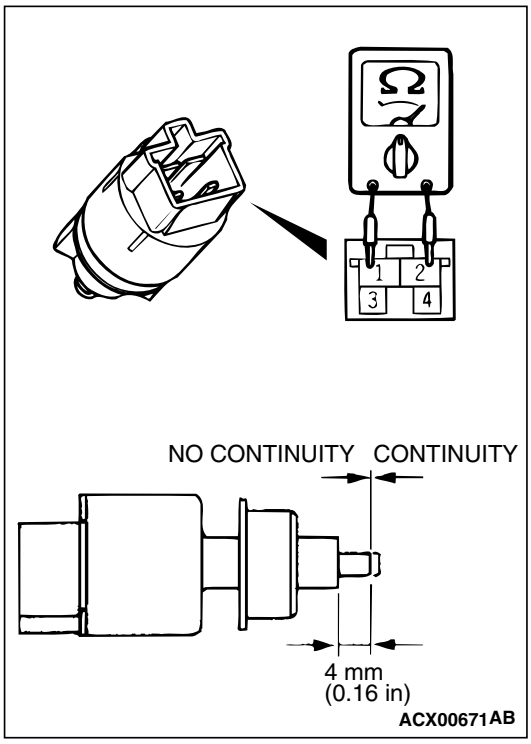
REMOVAL STEPS
1. SNAP PIN
2. BRAKE BOOSTER PIN ASSEMBLY
3. SNAP PIN
4. SHIFT LOCK CABLE CONNECTION
5. STOPLIGHT SWITCH CONNECTOR
6. STOPLIGHT SWITCH
7. BRAKE PEDAL CLIP

REMOVAL STEPS (Continued)
- WIRING HARNESSES CLAMPED ON BRAKE PEDAL ASSEMBLY
8. BRAKE PEDAL BOLT
9. BRAKE BOOSTER NUT
10. BRAKE PEDAL ASSEMBLY
11. BRAKE PEDAL PAD
12. BRAKE PEDAL STOPPER

INSPECTION

M1351003500221

TSB Revision



STOPLIGHT SWITCH CHECK

1. Connect an ohmmeter between the stoplight switch connector terminals.
2. There should be no continuity between the terminals when the plunger is pushed in as shown. There should be continuity when it is released.

TESTER CONNECTION	PLUNGER	SPECIFIED CONDITION
1 – 2	IN	Open circuit
	OUT	Less than 2Ω

MASTER CYLINDER ASSEMBLY AND BRAKE BOOSTER

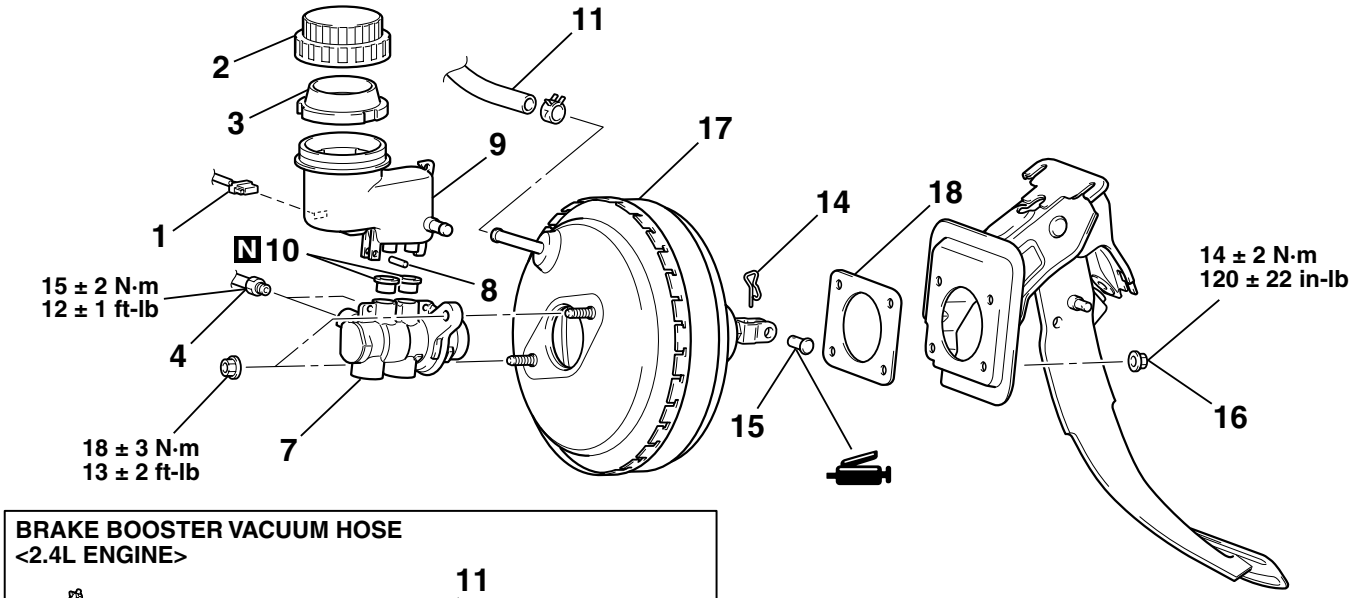
REMOVAL AND INSTALLATION

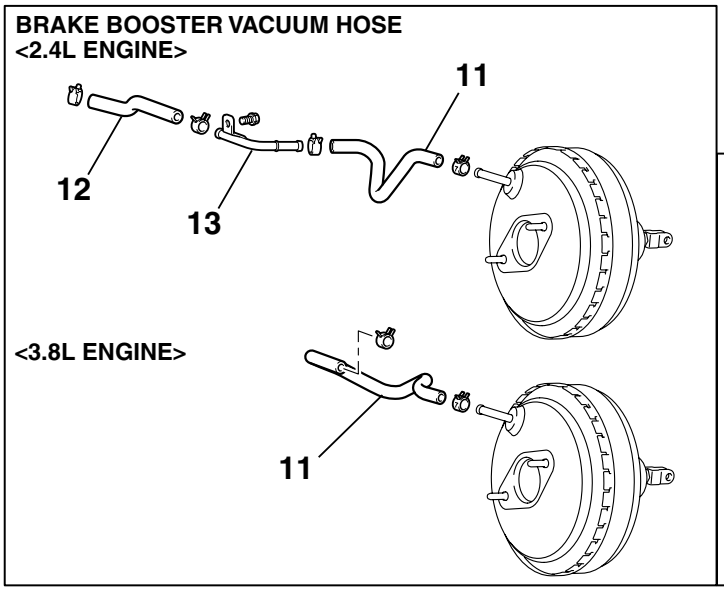
M1351003701110

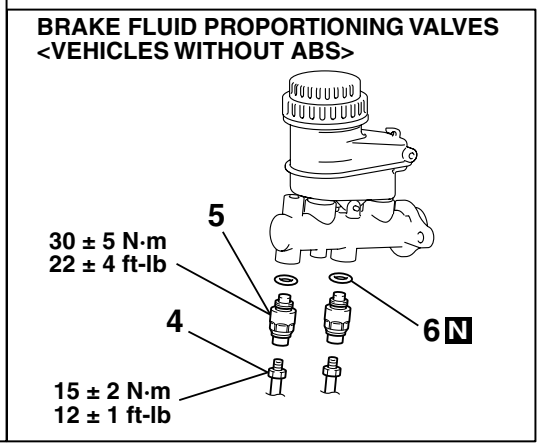
⚠ CAUTION

Do not touch thr push lod in the brake booster because it is already adjusted.

Pre-removal Operation	Post-installation Operation
• Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-11)<RALLIART>. • Battery Removal • Brake Fluid Draining	• Brake Fluid Supplying and Air Bleeding (Refer to P.35A-16). • Brake Pedal Adjustment (Refer to P.35A-12). • Battery Installation • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11)<RALLIART>.







AC500614AC

BRAKE MASTER CYLINDER ASSEMBLY REMOVAL STEPS

1. BRAKE FLUID LEVEL INDICATOR SWITCH CONNECTOR
2. BRAKE FLUID RESERVOIR CAP
3. BRAKE FLUID RESERVOIR FILTER
4. BRAKE TUBE CONNECTION

BRAKE MASTER CYLINDER ASSEMBLY REMOVAL STEPS

5. BRAKE FLUID PROPORTIONING VALVE <VEHICLES WITHOUT ABS>
6. O-RING
7. BRAKE MASTER CYLINDER ASSEMBLY
8. BRAKE MASTER CYLINDER PIN

TSB Revision

BRAKE MASTER CYLINDER ASSEMBLY REMOVAL STEPS

9. BRAKE FLUID RESERVOIR
10. BRAKE MASTER CYLINDER RESERVOIR SEAL

BRAKE BOOSTER VACUUM HOSE AND BRAKE BOOSTER VACUUM PIPE REMOVAL STEP

>>**A**<< 11. BRAKE BOOSTER VACUUM HOSE (WITH BUILT-IN CHECK VALVE)
>>**A**<< 12. BRAKE BOOSTER VACUUM HOSE <2.4L>
>>**A**<< 13. BRAKE BOOSTER VACUUM PIPE <2.4L>

BRAKE BOOSTER ASSEMBLY REMOVAL STEPS

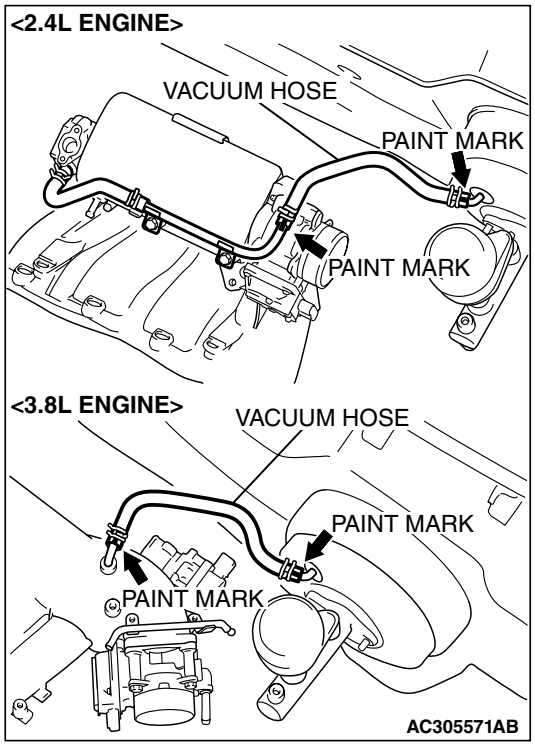
1. BRAKE FLUID LEVEL INDICATOR SWITCH CONNECTOR
4. BRAKE TUBE CONNECTION
7. BRAKE MASTER CYLINDER ASSEMBLY

>>**A**<< 11. BRAKE BOOSTER VACUUM HOSE (WITH BUILT-IN CHECK VALVE)
>>**A**<< 12. BRAKE BOOSTER VACUUM HOSE <2.4L>
>>**A**<< 13. BRAKE BOOSTER VACUUM PIPE <2.4L>

14. BRAKE BOOSTER PIN
15. BRAKE BOOSTER PIN ASSEMBLY
16. BRAKE BOOSTER NUT
17. BRAKE BOOSTER ASSEMBLY
18. BRAKE BOOSTER BODY SEAL

INSTALLATION SERVICE POINTS

>>A<< BRAKE BOOSTER VACUUM HOSE CONNECTION
Insert vacuum hose with its paint mark facing upward.



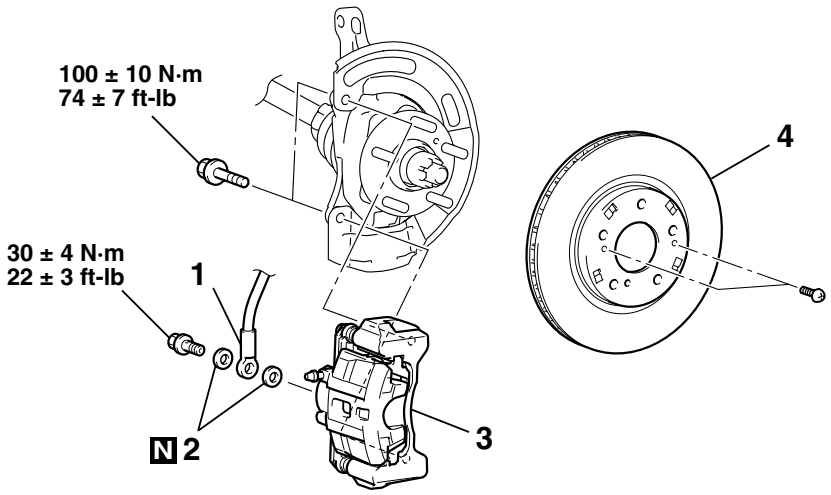
DISC BRAKE ASSEMBLY

REMOVAL AND INSTALLATION

M1351008000083

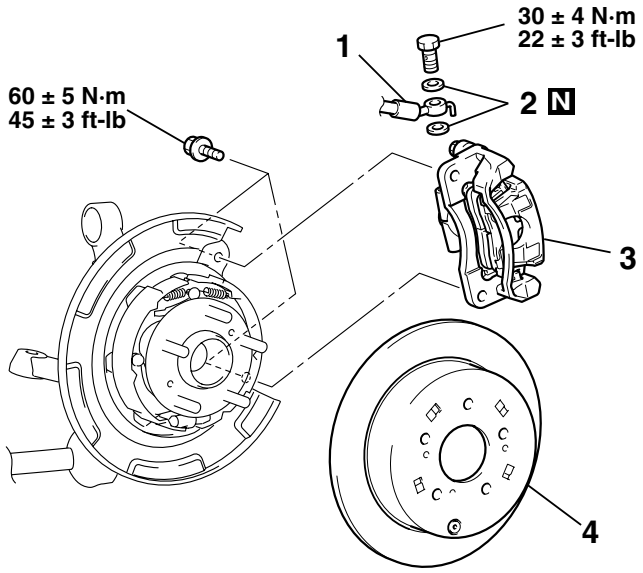
Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Fluid Supplying and Air Bleeding (Refer to P.35A-16).

<FRONT>



TSB Revision

<REAR>



AC305578AB

REMOVAL STEPS
1. BRAKE HOSE CONNECTION
2. GASKET
3. BRAKE CALIPER ASSEMBLY
4. BRAKE DISC

INSTALLATION STEPS
4. BRAKE DISC
3. BRAKE CALIPER ASSEMBLY

INSTALLATION STEPS (Continued)
2. GASKET
1. BRAKE HOSE CONNECTION
>>A<< • BRAKE DRAG FORCE CHECK

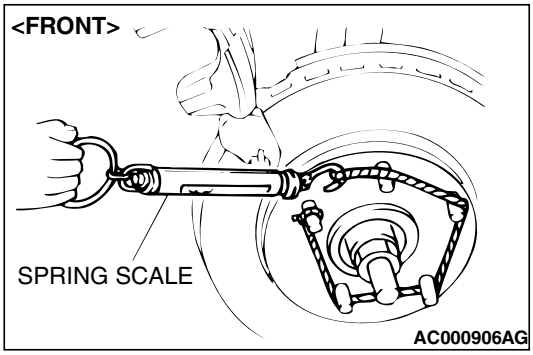
Required Special Tool:
- MB990520: Disc Brake Piston Expander

INSTALLATION SERVICE POINT

>>A<< BRAKE DRAG FORCE CHECK

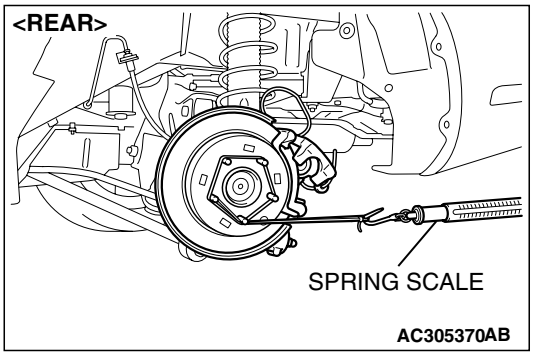
1. In order to measure the brake drag force, measure the hub torque with the pads removed by the following procedure. Use a spring scale to measure the hub torque in the forward direction. Record hub torque with pads removed.

<FRONT>



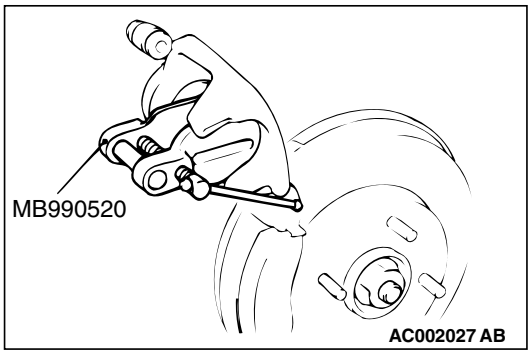
AC000906AG

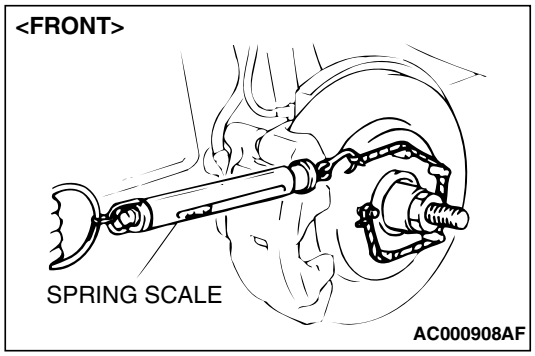
<REAR>

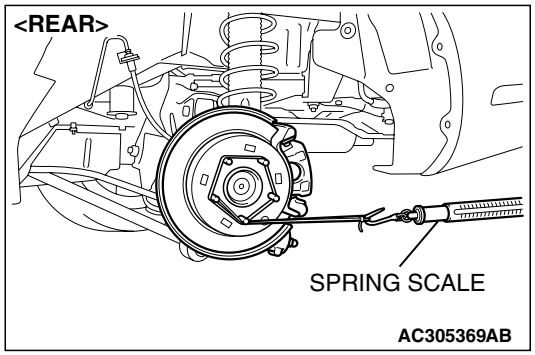


AC305370AB

TSB Revision







⚠ CAUTION

Do not let any oil, grease or other contamination get onto the friction surfaces of the pads and brake discs.

2. After re-installing the caliper support to the knuckle, install the pad clips and the pads to the caliper support.
3. Clean the piston and insert into cylinder with special tool MB990520.
4. Be careful that the piston boot does not become caught, when lowering the caliper assembly and installing the lock pin bolt.
5. Check the brake drag force as follows.
   (1) Start the engine and hold the brake pedal down for 5 seconds. [Pedal depression force: approximately 200 N (45 pound)]
   (2) Stop the engine.
   (3) Turn the brake disc forward 10 times.
   (4) Use a spring scale to measure the hub torque with pads installed in the same direction as earlier.
   (5) Calculate the drag force of the disc brake [difference between hub torque with pads installed and hub torque with pads removed].

   Standard value:
   <Front–2.4L engine> 54 N (12 pounds) or less
   <Front–3.8L engine> 64 N (14 pounds) or less
   <Rear> 54 N (12 pounds) or less
6. If the brake drag force exceeds the standard value, disassemble and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.

INSPECTION

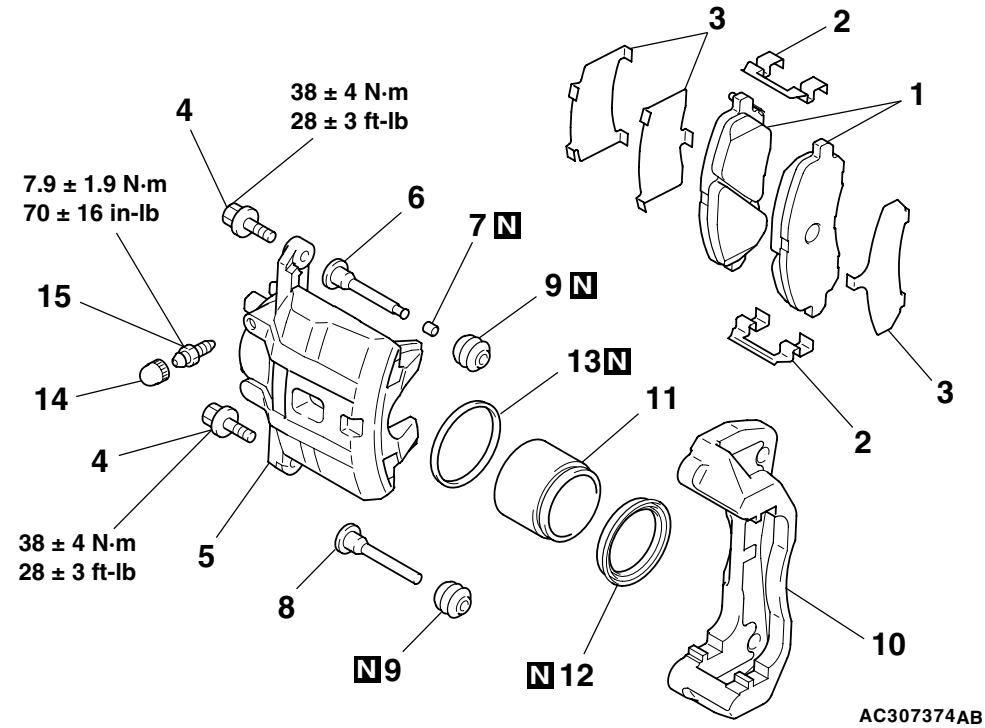
M1351008100046

BRAKE DISC CHECK

- Disc wear (Refer to P.35A-20).
- Disc run-out (Refer to P.35A-20).

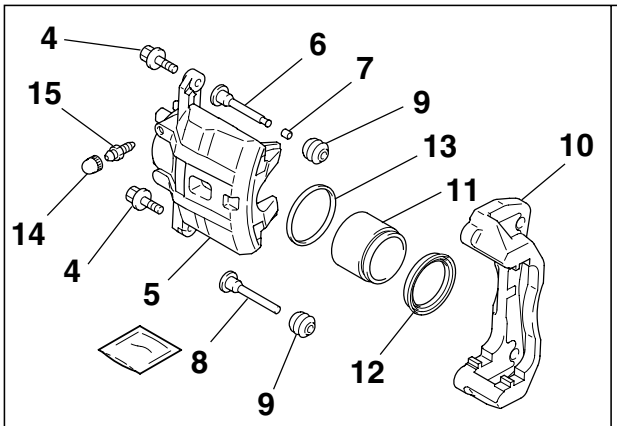
DISASSEMBLY AND ASSEMBLY <FRONT>

M1351008200065

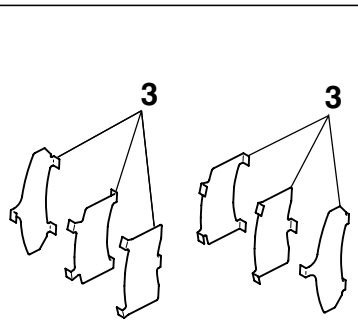


CLIP SET

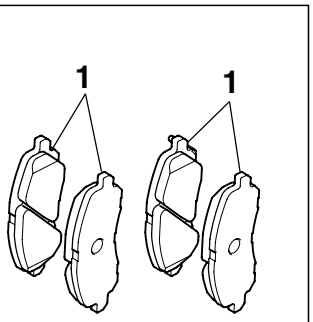
CALIPER SEAL KIT



CALIPER KIT



SHIM SET



PAD SET

DISASSEMBLY STEPS

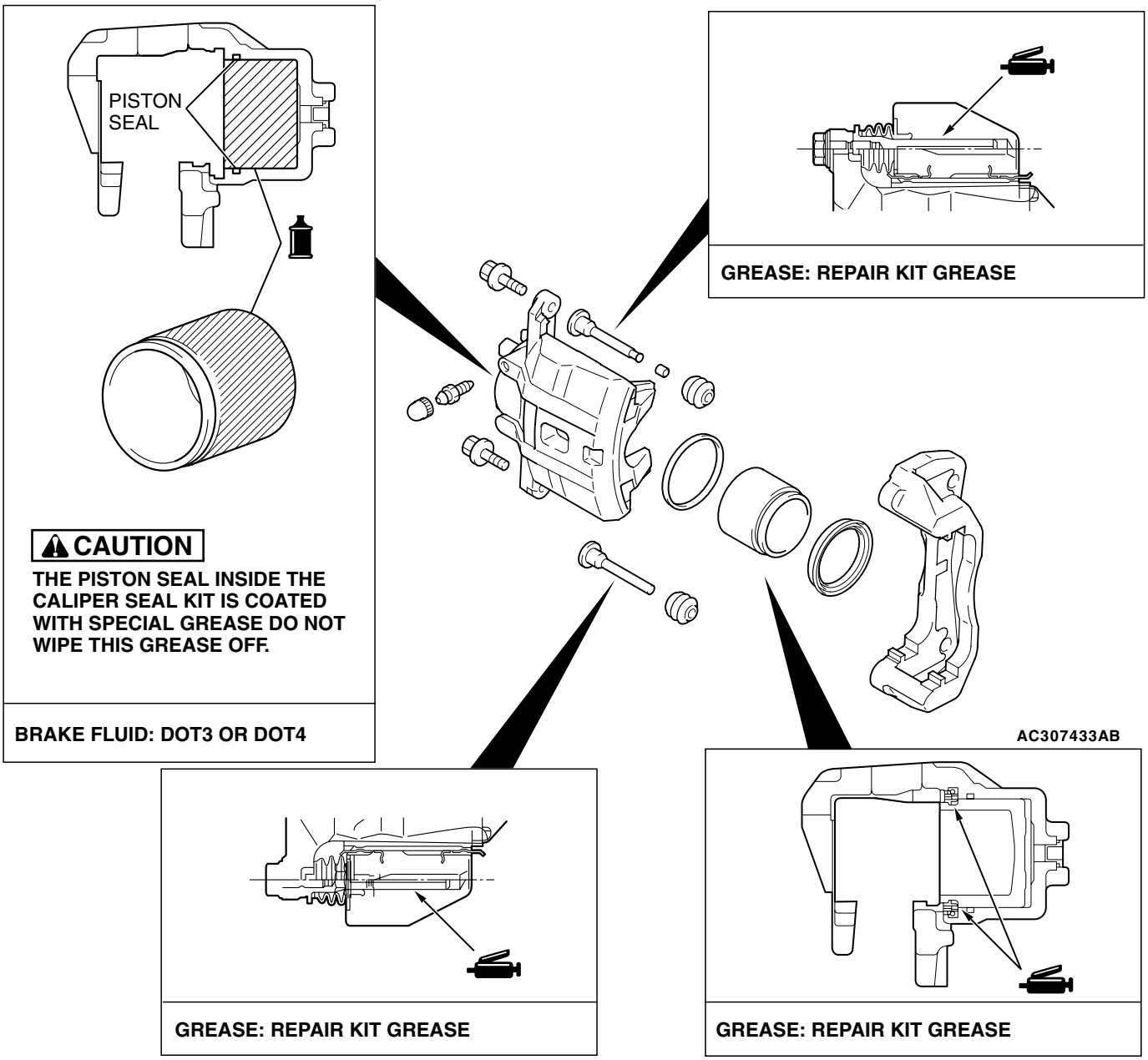
1. PAD (AND WEAR INDICATOR) ASSEMBLY
2. CLIP
3. SHIM
4. FRONT BRAKE BOLT
5. CALIPER BODY
6. LOCK PIN
7. BUSH

DISASSEMBLY STEPS (Continued)

8. GUIDE PIN
9. BOOT
10. CALIPER SUPPORT
11. CALIPER PISTON <<A>>
12. PISTON BOOT <<A>>
13. PISTON SEAL <<B>>
14. CALIPER BLEEDER CAP
15. CALIPER BLEEDER

TSB Revision

LUBRICATION POINTS



DISASSEMBLY SERVICE POINTS

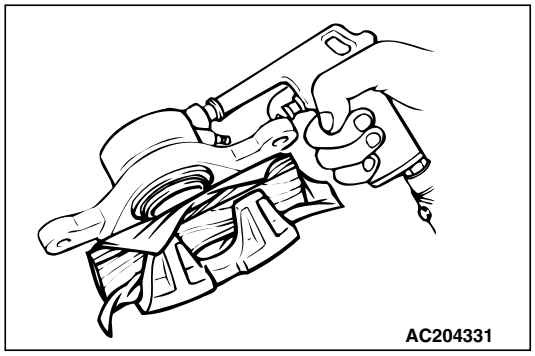
⚠ CAUTION

When disassembling the front disc brakes, disassemble both sides (left and right wheels) as a set.

<<A>> CALIPER PISTON/PISTON BOOT REMOVAL

⚠ CAUTION

Blow air little by little to remove the piston. The piston will pop out if a force of air is applied suddenly.

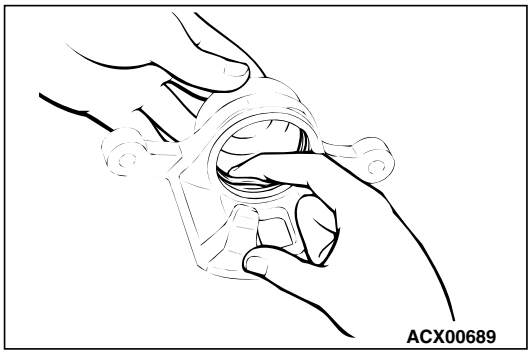

AC204331

Place a piece of wood, etc. against the caliper body as shown. Blow compressed air through the brake hose connection hole to remove the piston boot and piston.

<<B>> PISTON SEAL REMOVAL

⚠ CAUTION

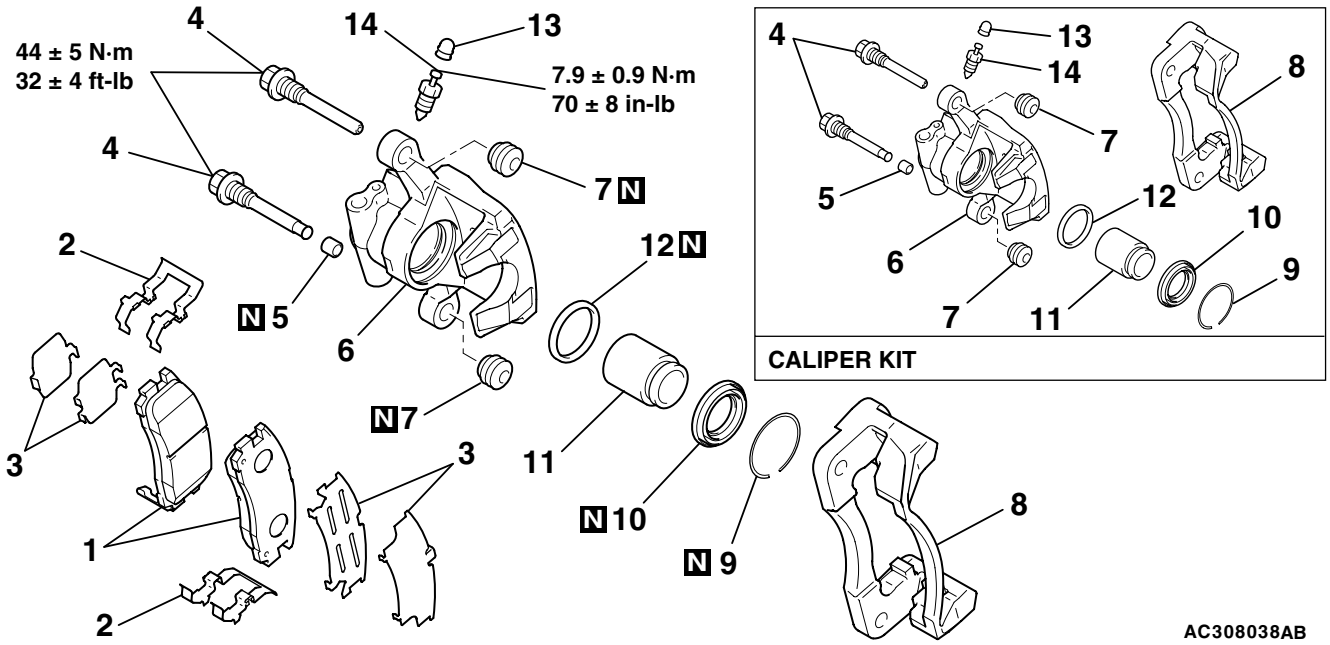
Do not use a flat-tipped screwdriver or similar tool to remove the piston seal. These may damage the inner side of the cylinder.


ACX00689

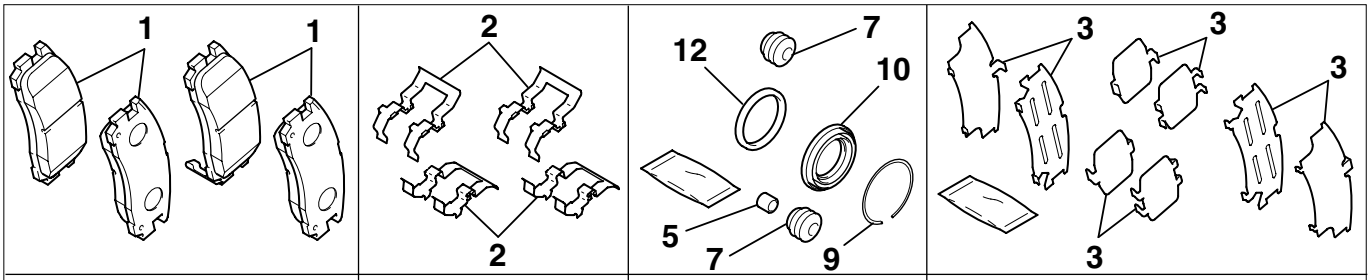
1. Remove the piston seal with your finger tip.
2. Clean the piston surface and inner cylinder with alcohol brake fluid DOT 3 or DOT 4.

DISASSEMBLY AND ASSEMBLY <REAR>

M1351008200076



CALIPER KIT



PAD SET	CLIP SET	CALIPER SEAL KIT	SHIM SET

DISASSEMBLY STEPS

1. PAD (AND WEAR INDICATOR) ASSEMBLY
2. CLIP
3. SHIM

>>**A**<< 4. REAR BRAKE PIN

5. REAR BRAKE BUSHING
6. CALIPER BODY
7. PIN BOOT

DISASSEMBLY STEPS (Continued)

8. CALIPER SUPPORT
9. BOOT RING

<<**A**>> 10. PISTON BOOT

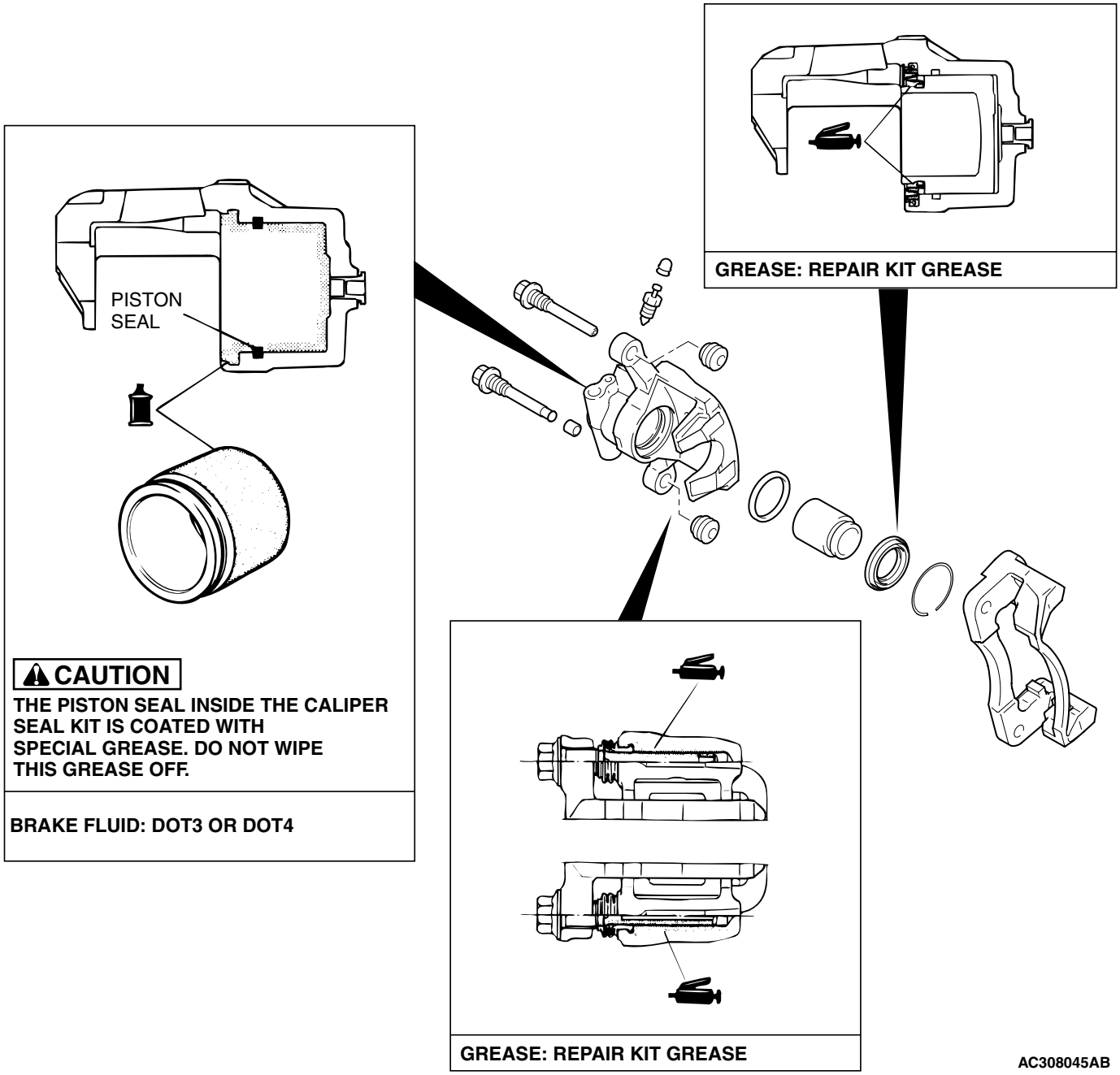
<<**A**>> 11. CALIPER PISTON

<<**B**>> 12. PISTON SEAL

13. REAR BRAKE CAP
14. CALIPER BLEEDER

TSB Revision

LUBRICATION POINTS



DISASSEMBLY SERVICE POINTS

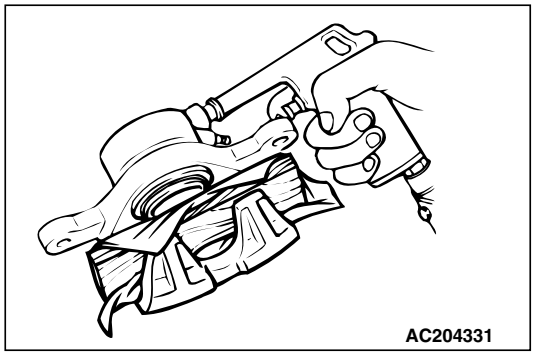
⚠ CAUTION

When disassembling the disc brakes, disassemble both sides (left and right) as a set.

<<A>> PISTON BOOT/CALIPER PISTON REMOVAL

⚠ CAUTION

Blow air little by little to remove the piston. The piston will pop out if a force of air is applied suddenly.

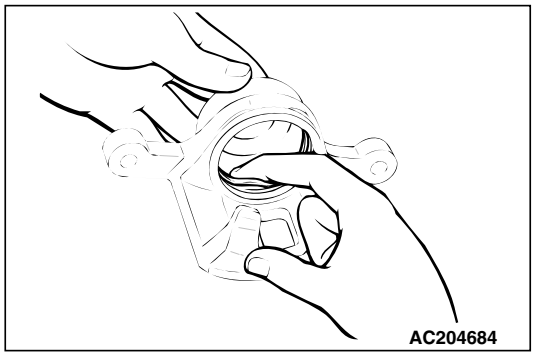

AC204331

Place a piece of wood, etc. against the caliper body as shown. Blow compressed air through the brake hose connection hole to remove the piston boot and piston.

<<B>> PISTON SEAL REMOVAL

⚠ CAUTION

Do not use a flat-tipped screwdriver or similar tool to remove piston seal. These may damage the inner side of the cylinder.


AC204684

1. Remove the piston seal with your finger tip.
2. Clean piston surface and inner cylinder with alcohol or brake fluid DOT 3 or DOT 4.

ASSEMBLY SERVICE POINT

>>A<< REAR BRAKE PIN INSTALLATION

Attach a guide pin (with "g" on the bolt head) at the bleeder nipple side of the caliper body and a lock pin (with "l" on the bolt head) at the opposite side.

INSPECTION

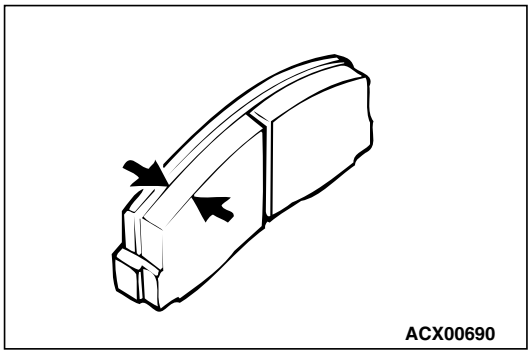
M1351008300039

- Check the cylinder for wear, damage or rust.
- Check the piston surface for wear, damage or rust.
- Check the caliper body or sleeve for wear.
- Check the pad for damage or adhesion of grease, check the backing metal for damage.

PAD WEAR CHECK

⚠ ***WARNING***

- ***Always replace both brake pads on each wheel as a set (both front wheels or both rear wheels). Failure to do so will result in uneven braking, which may cause unreliable brake operation.***
- ***If there is significant difference in the thickness of the pads on the left and right sides, check the sliding condition of the piston and slide pins.***



1. Measure thickness at the thinnest and most worn area of the pad.

   Standard value: 10 mm (0.39 inch)
   Minimum limit: 2.0 mm (0.08 inch)

2. Replace the pad assembly if pad thickness is less than the limit value.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1351009600594

ITEM	SPECIFICATION
Brake line	
Brake tube flare nut	15 ± 2 N·m (12 ± 1 ft-lb)
Brake pedal	
Brake booster nut	14 ± 2 N·m (120 ± 22 in-lb)
Brake pedal bolt	13 ± 2 N·m (115 ± 18 in-lb)
Front disc brake	
Brake hose connector bolt	30 ± 4 N·m (22 ± 3 ft-lb)
Caliper bleeder	7.9 ± 1.9 N·m (70 ± 16 in-lb)
Front brake assembly mounting bolt	100 ± 10 N·m (74 ± 7 ft-lb)
Front brake bolt (guide pin bolt)	38 ± 4 N·m (28 ± 3 ft-lb)
Front brake bolt (lock pin bolt)	38 ± 4 N·m (28 ± 3 ft-lb)
Master cylinder assembly and brake booster	
Brake booster nut	14 ± 2 N·m (120 ± 22 in-lb)
Brake fluid proportioning valve <Vehicles without ABS>	30 ± 5 N·m (22 ± 4 ft-lb)
Brake master cylinder mounting nut	18 ± 3 N·m (13 ± 2 ft-lb)
Rear disc brake	
Brake hose connector bolt	30 ± 4 N·m (22 ± 3 ft-lb)
Caliper bleeder	7.9 ± 0.9 N·m (70 ± 8 in-lb)

TSB Revision

ITEM	SPECIFICATION
Rear brake assembly mounting bolt	60 ± 5 N·m (45 ± 3 ft-lb)
Rear brake pin (guide pin bolt)	44 ± 5 N·m (32 ± 4 ft-lb)
Rear brake pin (lock pin bolt)	44 ± 5 N·m (32 ± 4 ft-lb)

GENERAL SPECIFICATIONS

M1351000200555

ITEM		SPECIFICATION
Master cylinder	Type	Tandem type
	I.D. mm (in)	25.4 (1.0)
Brake booster	Type	Vacuum type, tandem
	Effective dia. of power cylinder mm (in)	205 + 230 (8 + 9)
	Boosting ratio	8.3
Rear wheel hydraulic control method		Electronic brake-force distribution (EBD) <Vehicles with ABS> Proportioning valves <Vehicles without ABS>
Front brakes	Type	Floating caliper, 1 piston, ventilated disc
	Disc effective dia × thickness mm (in)	222 × 26.0 (8.7 × 1.02) <2.4L engine> 241 × 26.0 (9.5 × 1.02) <3.8L engine>
	Wheel cylinder I.D. mm (in)	60.33 (2.38)
	Pad thickness mm (in)	10.0 (0.39)
	Clearance adjustment	Automatic
Rear brakes	Type	Floating caliper, 1 piston, solid disc <Except RALLIART> Floating caliper, 1 piston, ventilated disc <RALLIART>
	Disc effective dia × thickness mm (in)	222 × 10 (8.7 × 0.39) <Except RALLIART> 237 × 20 (9.3 × 0.79) <RALLIART>
	Wheel cylinder I.D. mm (in)	34.9 (1.38)
	Pad thickness mm (in)	10.0 (0.39)
	Clearance adjustment	Automatic

SERVICE SPECIFICATIONS

M1351000301016

ITEM		STANDARD VALUE	LIMIT
Brake pedal height mm (in)		169.8 – 172.8 (6.69 – 6.80)	–
Brake pedal free play mm (in)		3 – 8 (0.12 – 0.31)	–
Brake pedal to floor board clearance mm (in)		110 (4.33) or more	–
Proportioning valve output fluid pressure MPa (psi) <Vehicles without ABS>	Split point	3.68 – 4.17 (534 – 605)	–
	When input fluid pressure is 7.85 MPa (1,139 psi).	5.24 – 5.74 (760 – 833)	–
Proportioning valve output fluid pressure difference between left and right MPa (psi) <Vehicles without ABS>		–	0.5 (73)
Disc brake pad thickness mm (in)		10.0 (0.39)	Minimum 2.0 (0.08)

ITEM		STANDARD VALUE	LIMIT
Disc brake disc thickness mm (in)	Front	26.0 (1.02)	Minimum 24.4 (0.96)
	Rear	10.0 (0.39)	Minimum 8.4 (0.33)
Disc brake disc run-out mm (in)	Front	–	0.1 (0.0039)
	Rear	–	0.04 (0.0016)
Disc brake drag force N (lb)	Front–2.4L engine	54 (12) or less	–
	Front–3.8L engine	64 (14) or less	–
	Rear	54 (12) or less	–
Hub end play mm (in)		–	0.05 (0.002)

LUBRICANTS

M1351000400429

ITEM	SPECIFIED LUBRICANT
Brake fluid	DOT3 or DOT4
Piston boot, piston seal	Repair kit grease
Front brake pin, rear brake pin (guide pin, lock pin)	

GROUP 35B

ANTI-LOCK BRAKING SYSTEM (ABS)

CONTENTS

GENERAL DESCRIPTION

M1352000100454

FEATURES

The 4ABS ensures directional stability and control during hard braking.
This ABS uses a 4-sensor 4-channel system that controls all four wheels independently of each other. The basic system is the same as that for the Lancer.

- EBD (Electronic Brake-force Distribution system) control provides the ideal braking force for the rear wheels.
- To shorten the harness wires and enhance data transmission reliability, communication with other ECU is performed over a CAN (Controller Area Network).

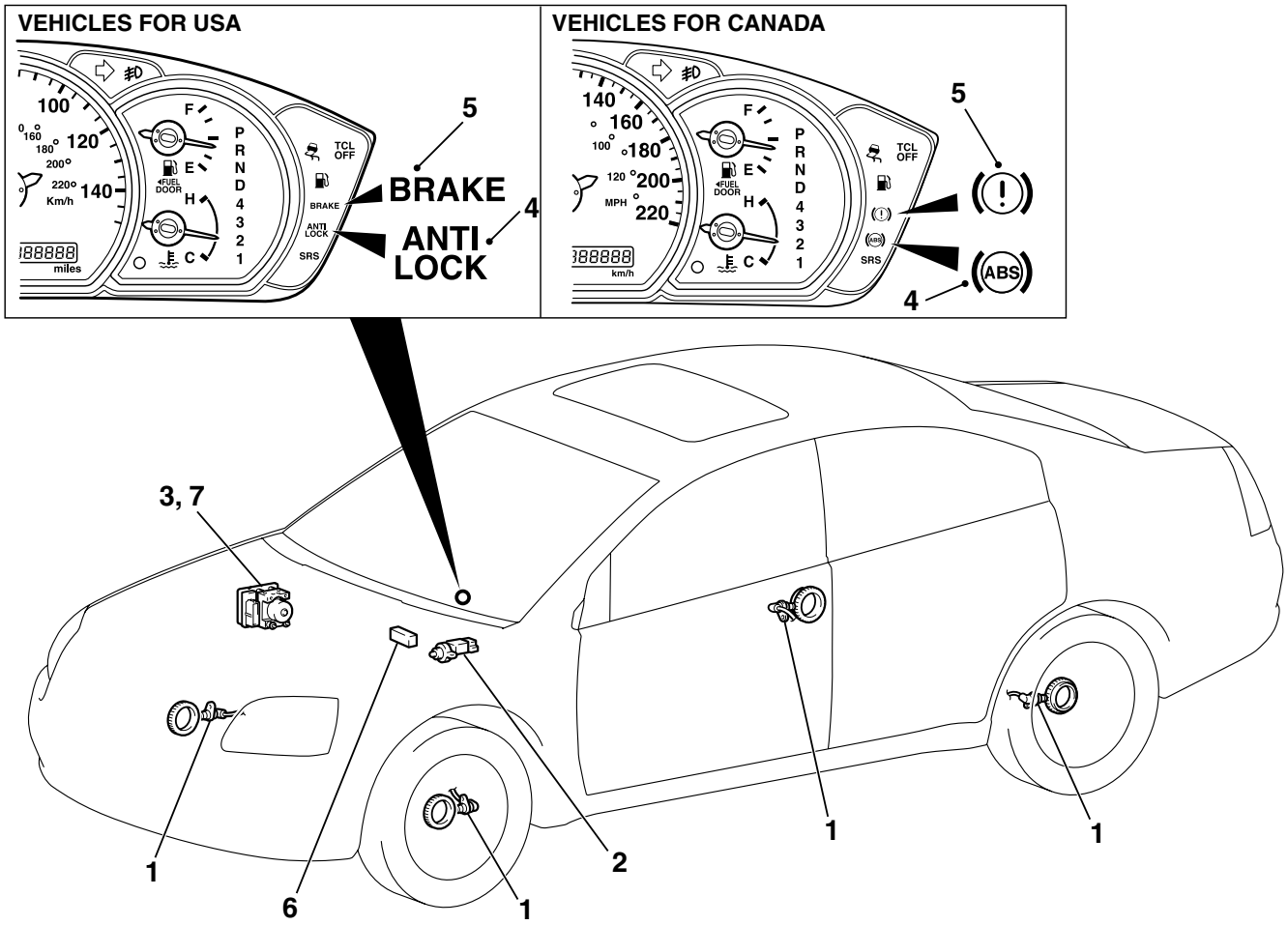
  NOTE: For further details on CAN communication, refer to GROUP 54C, CAN.
- Fail-safe function ensures that safety is maintained.
- Diagnostic function provides improved serviceability.

EBD CONTROL

In ABS, electronic control is used so the rear wheel brake hydraulic pressure during braking is regulated by rear wheel control solenoid valves in accordance with the vehicle's rate of deceleration. The front and rear wheel slippage are calculated from the signals received from the various wheel sensors. EBD control provides a high level of control for both vehicle braking force and vehicle stability. The system has the following features:

- Because the system provides the optimum rear wheel braking force regardless of vehicle load and the condition of the road surface, the system reduces the required pedal depression force, particularly when the vehicle is heavily loaded.
- Because the duty placed on the front brakes is reduced, the increases in pad temperature can be controlled during front brake application to improve pad wear.
- Control valves such as the proportioning valve are not required.

CONSTRUCTION DIAGRAM



NAME OF PART		NUMBER	OUTLINE OF FUNCTION
Sensor	Wheel speed sensor	1	Sends alternating current signals at frequencies which are proportional to the rotation speeds of each wheel to the ABS-ECU.
	Stoplight switch	2	Sends a signal to the ABS-ECU to indicate whether the brake pedal is depressed or not.
Actuator	Hydraulic unit	3	Drives the solenoid valves according to signals from the ABS-ECU in order to control the brake hydraulic pressure for each wheel.
	ABS warning light	4	Illuminates in response to signals from the ABS-ECU when a problem develops in the ABS system.
	Brake warning light	5	Illuminates in response to signals from the ABS-ECU when a problem develops in the EBD system.
Data link connector		6	Outputs the diagnostic trouble codes and allows communication with the scan tool.
ABS-ECU		7	Controls actuators (described above) based on the signals coming from each sensor.
			Controls the self-diagnosis and fail-safe functions.
			Controls the diagnostic function (scan tool compatible).

TSB Revision

SYSTEM CHECK SOUND

When the vehicle speed reaches 10 km/h after ignition switch ON, a thudding sound can sometimes be heard coming from the engine compartment. This is a normal sound during the ABS self-check.

ABS OPERATION SOUNDS AND SENSATIONS

During normal operation, the ABS makes several sounds that may seem unusual at first:

- A whining sound is caused by the ABS hydraulic unit motor.
- When pressure is applied to the brake pedal, the pulsation of the pedal causes a scraping sound.
- When the brakes are applied firmly, the ABS operates, rapidly applying and releasing the brakes many times per second. This repeated application and release of braking forces can cause the suspension to make a thumping sound and the tires to squeak.

LONG STOPPING DISTANCES ON LOOSE ROAD SURFACES

When braking on loose surfaces like snow-covered or gravel roads, the stopping distance can be longer for an ABS-equipped vehicle than the stopping distance for a vehicle with a conventional brake system.

SHOCK AT STARTING CHECK

Shock may be felt when the brake pedal is lightly pressed while driving at a low speed. This is a normal characteristic because the ABS system operation check is carried out when vehicle speed is 8 km/h (5 mph) or less.

ABS DIAGNOSIS

INTRODUCTION TO ANTI-LOCK BRAKING SYSTEM DIAGNOSIS

M1352012500396

The anti-lock braking system (ABS) operates differently from conventional brake systems. These differences include sounds, sensations, and vehicle performance that owners and service technicians who are not familiar with ABS may not be used to. Some operational characteristics may seem to be malfunctions, but they are simply signs of normal ABS operation. When diagnosing the ABS system, keep these operational characteristics in mind. Inform the owner of the kind of performance characteristics to expect from an ABS-equipped vehicle.

ABS Diagnostic Trouble Code Detection Conditions

ABS diagnostic trouble codes (ABS DTCs) are set under different conditions, depending on the malfunction detected. Most ABS DTCs will only be set during vehicle operation. Some ABS DTCs will also be set during the ABS self-check immediately after the engine is started.
When you check if an ABS DTC will be displayed again after the DTC has been erased, you should duplicate the ABS DTC set conditions. Depending on the detection timing and set conditions for the specific ABS DTC, you must either drive the vehicle or turn the engine off and restart it. To set the proper conditions for that DTC again, refer to "ABS DTC SET CONDITIONS" for each ABS DTC that you are trying to reset.

ABS DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1352011100771

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an ABS fault.

1. Gather information about the problem from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any ABS DTC.
4. If you cannot verify the condition and there are no ABS DTCs, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

5. If you can verify the condition but there are no ABS DTCs, or the system cannot communicate with the scan tool, check that the basic brake system is operating properly.
   - If the basic brake system is not operating properly, refer to the GROUP 35A, Basic Brake System Diagnosis P.35A-3.
   - If the basic brake system is operating properly, refer to P.35B-72.
6. If there is an ABS DTC, record the number of the DTC, then erase the DTC from the memory using the scan tool.

NOTE: Any DTCs stored in the ABS-ECU cannot be erased if there is a malfunction.

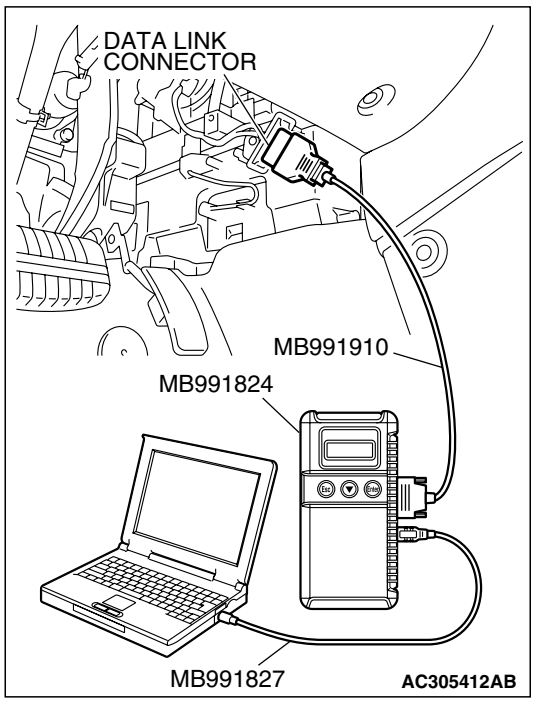
7. Duplicate the ABS DTC set conditions to see if the same ABS DTC will set again.
   - If the same ABS DTC sets again or the ABS DTC cannot be erased, perform the diagnostic procedures for the DTC. Refer to P.35B-8.
   - If you cannot get the same ABS DTC to set again, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

DIAGNOSTIC FUNCTION

ON-BOARD DIAGNOSTICS

M1352011200596

If the ABS-ECU detects any problem in the CAN communication line or the ECUs, which the ABS-ECU is communicating with, it stores a diagnostic trouble code. The DTCs have 26 items. The DTCs can be confirmed by connecting scan tool MB991958 (M.U.T.-III sub assembly.) The stored DTCs are not erased even after the ignition switch has been turned to the LOCK (OFF) position, or the battery has been disconnected. The DTCs can be erased by operating scan tool MB991958 (M.U.T.-III sub assembly.)



HOW TO CONNECT THE SCAN TOOL (M.U.T.-III)

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

⚠ 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 MB991910 to the special tool MB991824.
5. Connect special tool MB991910 to the data link connector.
6. Turn the power switch special tool MB991824 to the "ON" position.

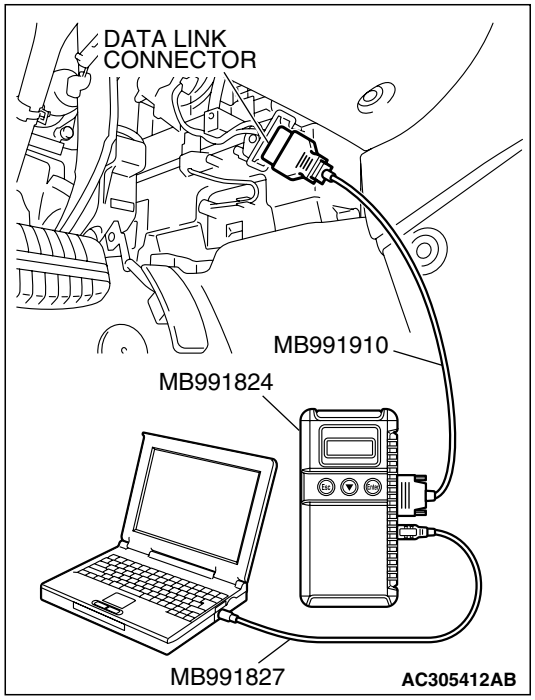
   NOTE: When the special tool MB991824 is energized, the special tool MB991824 indicator light will be illuminated in a green color.
7. Start the M.U.T.-III system on the personal computer.

NOTE: Disconnect the scan tool MB991958 in the reverse order 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 (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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.

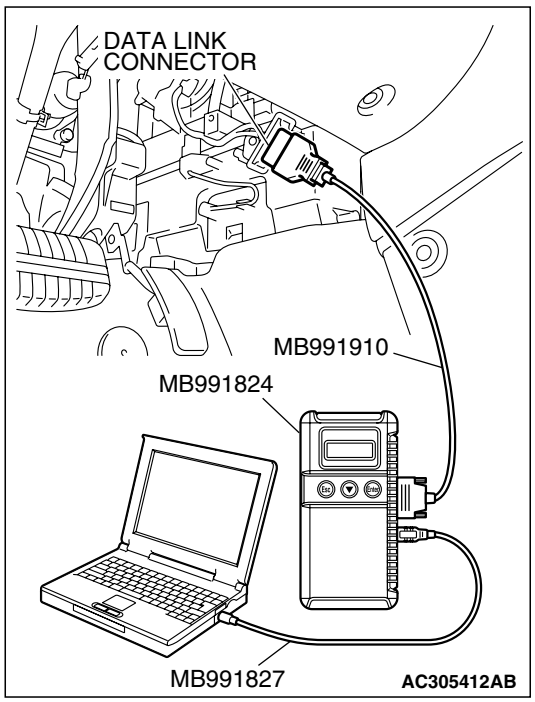
NOTE: If the battery voltage is low, diagnostic trouble codes will not be set. Check the battery if scan tool MB991958 does not display.

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 "ABS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Diagnostic Trouble Code."
8. If a DTC is set, it is shown.
9. Choose "DTC erase" to erase the DTC.

HOW TO READ DATA LIST

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ CAUTION

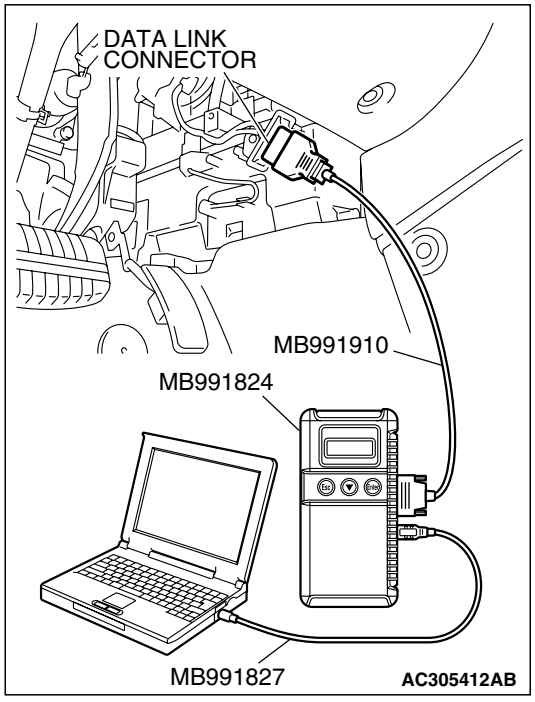
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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 "ABS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Data List."
8. Choose an appropriate item and select the "OK" button.

HOW TO PERFORM ACTUATOR TEST

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ CAUTION

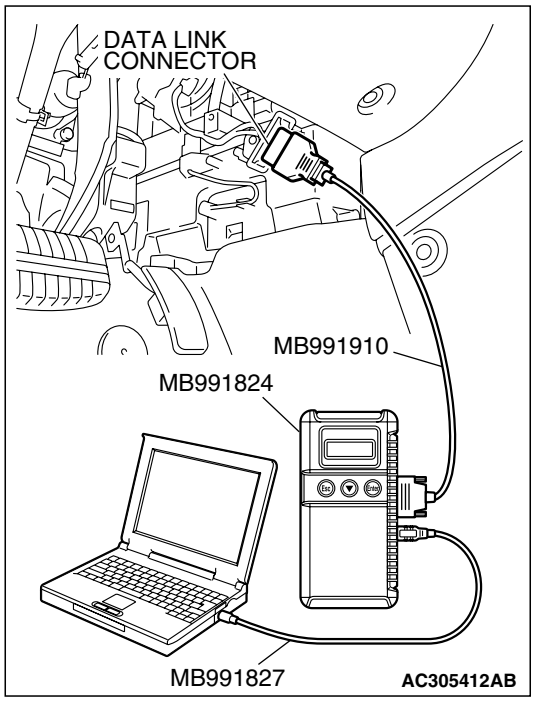
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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 "ABS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Choose "Actuator Test" from "ABS" screen.
8. Choose an appropriate item and select the "OK" button.

HOW TO DIAGNOSE THE CAN BUS LINE

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



⚠ 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 "CAN bus diagnosis" from the start-up screen.
4. When the vehicle information is displayed, confirm that it matches the vehicle whose CAN bus lines will be diagnosed.
   - If they match, go to step 8.
   - If not, go to step 5.
5. Select "view vehicle information" button.
6. When the vehicle information is displayed, confirm again that it matches the vehicle which is being diagnosed.
   - If they match, go to step 8.
   - If not, go to step 5.
7. Press the "OK" button.
8. When the options are displayed, choose the options (mark the check) and then select "OK".

DIAGNOSTIC TROUBLE CODE CHART

M1352011301109

⚠ CAUTION

During diagnosis, a DTC code associated with another system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for DTCs. If DTC code(s) are set, erase them all.

Follow the inspection chart that is appropriate for the diagnostic trouble code.

DTC	INSPECTION ITEM	DIAGNOSTIC CONTENT	REFERENCE PAGE
C1200	Front right wheel speed sensor	Open circuit or short circuit	P.35B-10
C1201	Front right wheel speed sensor	Abnormal output signal	P.35B-26
C1205	Front left wheel speed sensor	Open circuit or short circuit	P.35B-10
C1206	Front left wheel speed sensor	Abnormal output signal	P.35B-26
C1210	Rear right wheel speed sensor	Open circuit or short circuit	P.35B-10
C1211	Rear right wheel speed sensor	Abnormal output signal	P.35B-26
C1215	Rear left wheel speed sensor	Open circuit or short circuit	P.35B-10
C1216	Rear left wheel speed sensor	Abnormal output signal	P.35B-26
C1226	ABS front right solenoid valve (pressure holding system)		P.35B-39
C1231	ABS front right solenoid valve (depressurizing system)		P.35B-39

TSB Revision

DTC	INSPECTION ITEM	DIAGNOSTIC CONTENT	REFERENCE PAGE
C1236	ABS front left solenoid valve (pressure holding system)		P.35B-39
C1241	ABS front left solenoid valve (depressurizing system)		P.35B-39
C1246	ABS rear right solenoid valve (pressure holding system)		P.35B-39
C1251	ABS rear right solenoid valve (depressurizing system)		P.35B-39
C1256	ABS rear left solenoid valve (pressure holding system)		P.35B-39
C1261	ABS rear left solenoid valve (depressurizing system)		P.35B-39
C1266	Motor system (seizure)		P.35B-47
C1273	Motor relay problem (stays off)		P.35B-47
C1274	Motor relay problem (stays on)		P.35B-47
C1278	Valve relay problem (stays off) or ABS-ECU power supply system problem		P.35B-55
C1279	Valve relay problem (stays on)		P.35B-55
C1396*	Engine torque input refusal		GROUP 13D, Diagnostic Trouble Code Procedures P.13D-9
C1397*	Transmission range switch input refusal		GROUP 13D, Diagnostic Trouble Code Procedures P.13D-11
C1607	Trouble in ABS-ECU		P.35B-62
C1860	Power supply system	Abnormal rise in voltage	P.35B-64
C1861	Power supply system	Abnormal drop in voltage	P.35B-64
U1073	Bus off		P.35B-70
U1100*	CAN communications system time out error engine related data		GROUP 13D, Diagnostic Trouble Code Procedures P.13D-13
U1101*	CAN communications system time out error A/T related data		GROUP 13D, Diagnostic Trouble Code Procedures P.13D-17
U1120*	CAN communications system TCL uncontrollable by engine malfunction		GROUP 13D, Diagnostic Trouble Code Procedures P.13D-21
U1400*	Dynamic range error APS1		GROUP 13D, Diagnostic Trouble Code Procedures P.13D-25

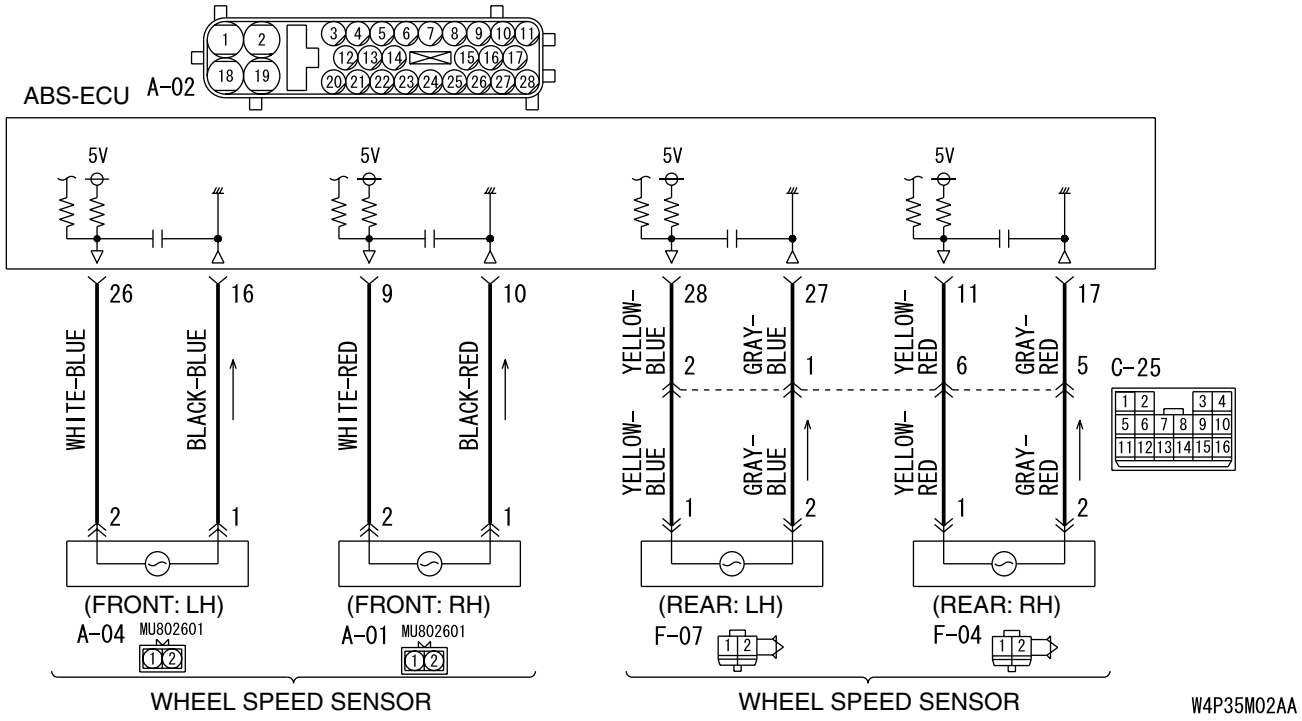
*NOTE: Since the ABS system is controlled with the same ABS/TCL-ECU used to control the TCL system, the codes (with a *) used only for the ABS system also appear.*

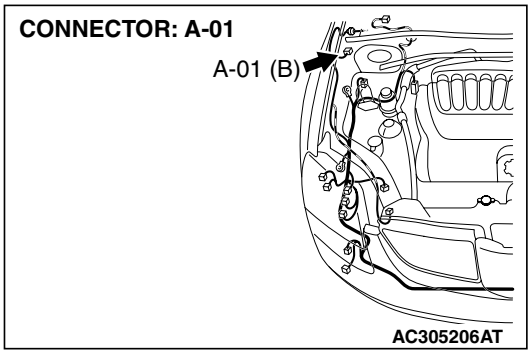
*The inspection contents for the codes (with a *) used only for the TCL system do not described in this group.*

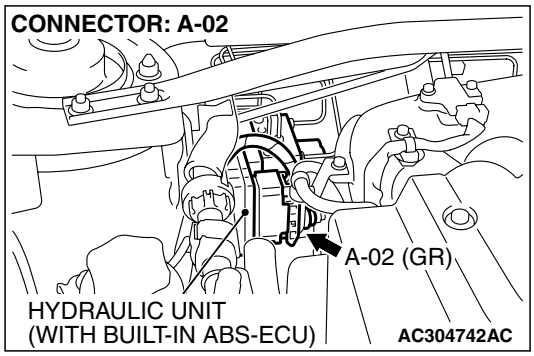
DIAGNOSTIC TROUBLE CODE PROCEDURES

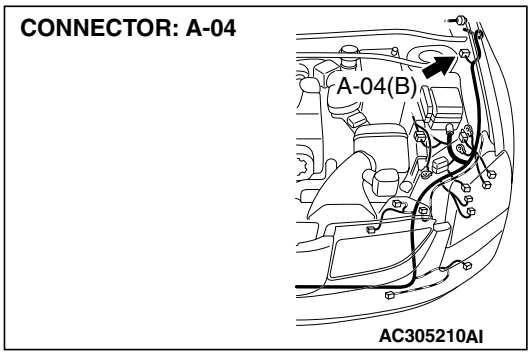
DTC C1200/C1205/C1210/1215 Wheel Speed Sensor (Open circuit or short circuit)

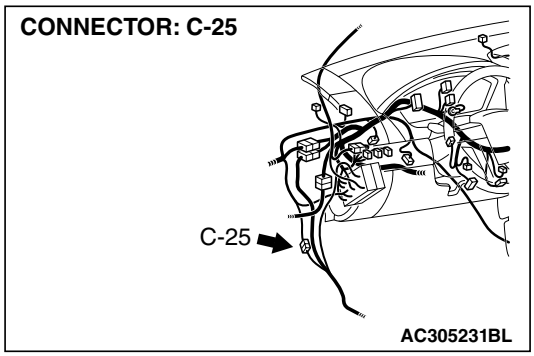
Wheel Speed Sensor Circuit



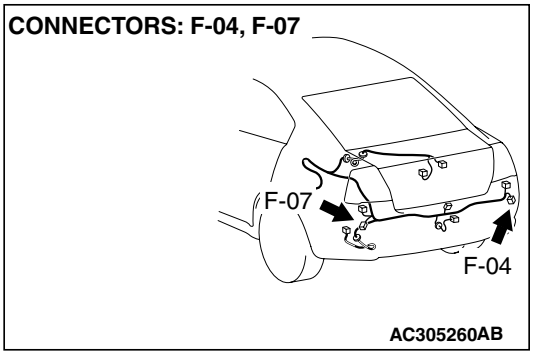








TSB Revision



⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Diagnose the CAN bus lines before the DTC (Refer to GROUP 54C, Trouble code diagnosisP.54C-14).

CIRCUIT OPERATION

- A toothed wheel speed rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The amount of voltage generated at each wheel is determined by the clearance between the wheel speed rotor teeth and the wheel speed sensor, and by the speed of rotation.
- Sends alternating current signals at frequencies which are proportional to the rotation speeds of each wheel to the ABS electronic control unit (ABS-ECU).
- The ABS hydraulic unit modulates the amount of braking force individually applied to each wheel cylinder.

ABS DTC SET CONDITIONS

The ABS-ECU monitors voltage fluctuation in each wheel speed sensor circuit. If the ECU detects a short or open circuit in the circuit, it will set a diagnostic trouble code.

TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

Current trouble

- Malfunction of the wheel speed sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

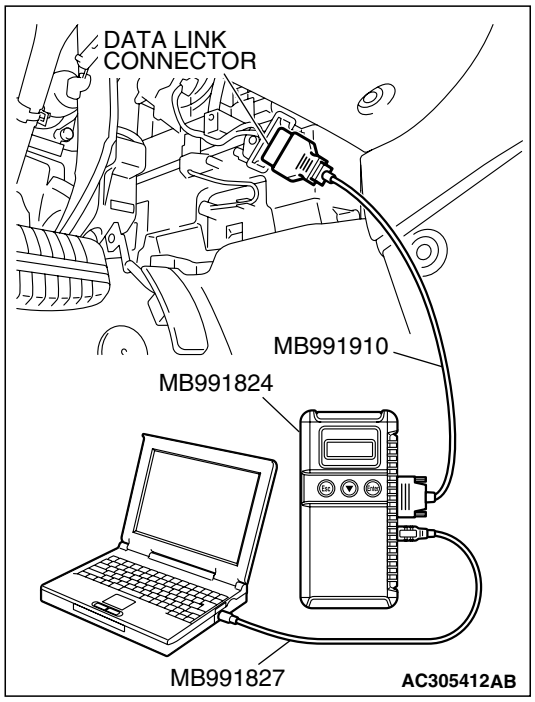
Past trouble

- Carry out diagnosis with particular emphasis on connector(s) or wiring harness in wheel speed sensor circuit. For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to use Troubleshooting/Inspection Service PointsP.00-16).

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991970: ABS Check Harness



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

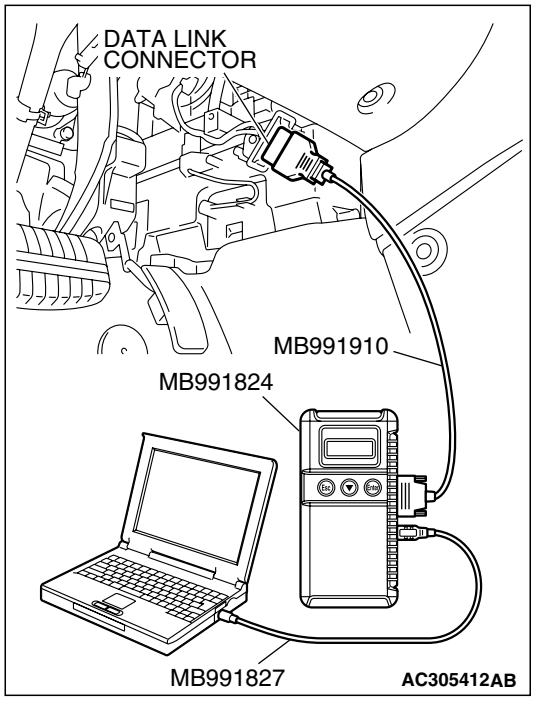
⚠ CAUTION

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) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 3
NO : Repair the CAN bus line (Refer to GROUP 54C, Diagnosis P.54C-16). Then go to Step 2.



STEP 2. Recheck for diagnostic trouble code.

⚠ CAUTION

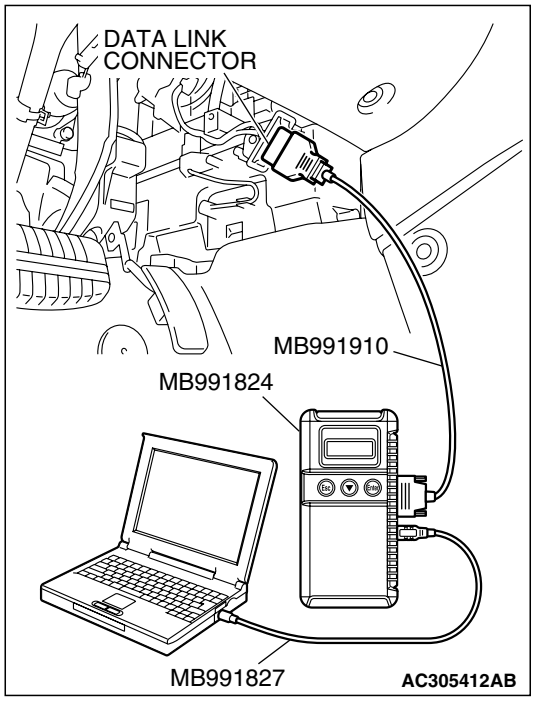
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1200, C1205, C1210 or C1215 set?

YES : Go to Step 3
NO : The procedure is complete.

TSB Revision



STEP 3. Using scan tool MB991958, check data list.

⚠ 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.

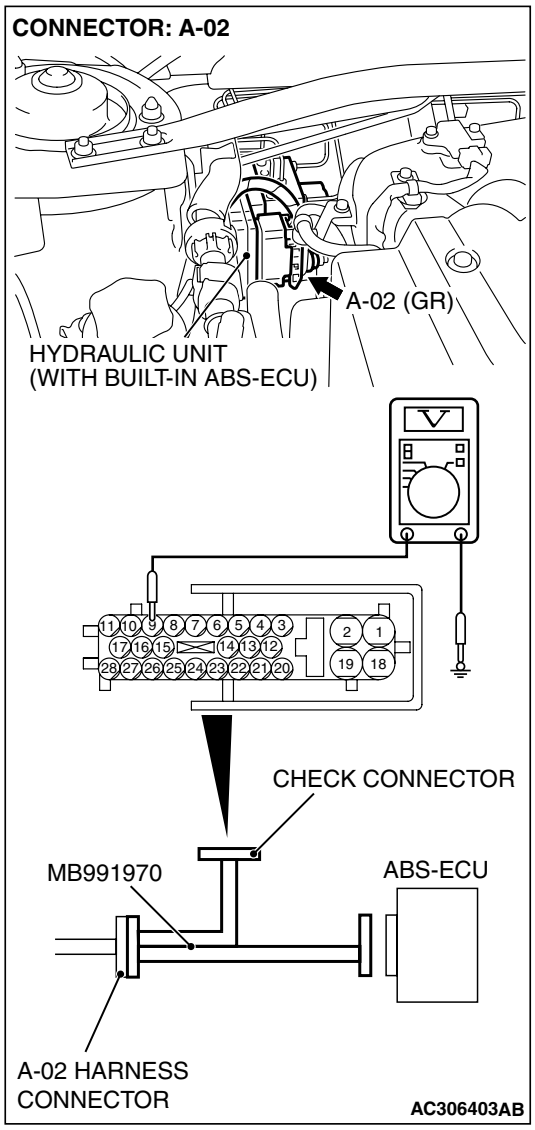
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode, and check the data list items by driving the vehicle.
- Item 01 (DTC C1200 is set): Front right wheel speed sensor
- Item 02 (DTC C1205 is set): Front left wheel speed sensor
- Item 03 (DTC C1210 is set): Rear right wheel speed sensor
- Item 04 (DTC C1215 is set): Rear left wheel speed sensor

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

Q: Does the speedometer indication match the scan tool indication?

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.00-14.

NO : Go to Step 4.



STEP 4. Measure the voltage at ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

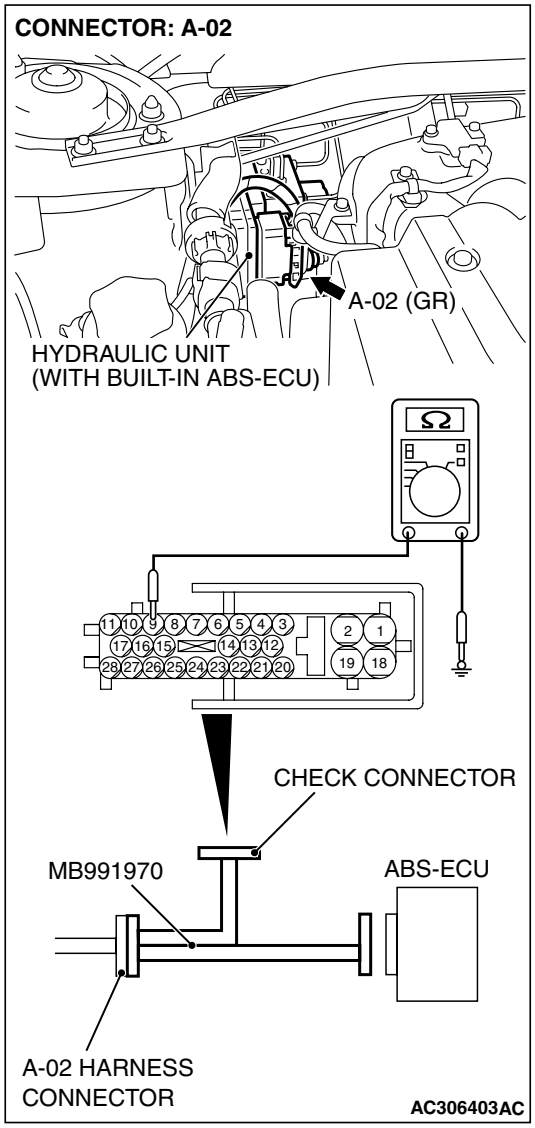
(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between the relevant signal and ground terminals in the wheel speed sensor circuit and body ground. It should be less than 1V.

- DTC C1201 is set: Between signal terminal 9 and body ground, and between ground terminal 10 and body ground
- DTC C1206 is set: Between signal terminal 26 and body ground, and between ground terminal 16 and body ground
- DTC C1211 is set: Between signal terminal 11 and body ground, and between ground terminal 17 and body ground
- DTC C1216 is set: Between signal terminal 28 and body ground, and between ground terminal 27 and body ground

Q: Does the voltage measure 1 V or less?

YES : Go to Step 5.
NO (When the voltage between terminal 9 or 10 – and body ground measures more than 1 V) : Go to Step 7.
NO (When the voltage between terminal 26 or 16 – and body ground measures more than 1 V) : Go to Step 9.
NO (When the voltage between terminal 11 or 17 – and body ground measures more than 1 V) : Go to Step 11.
NO (When the voltage between terminal 28 or 27 – and body ground measures more than 1 V) : Go to Step 13.



STEP 5. Measure the resistance at ABS-ECU connector A-02.

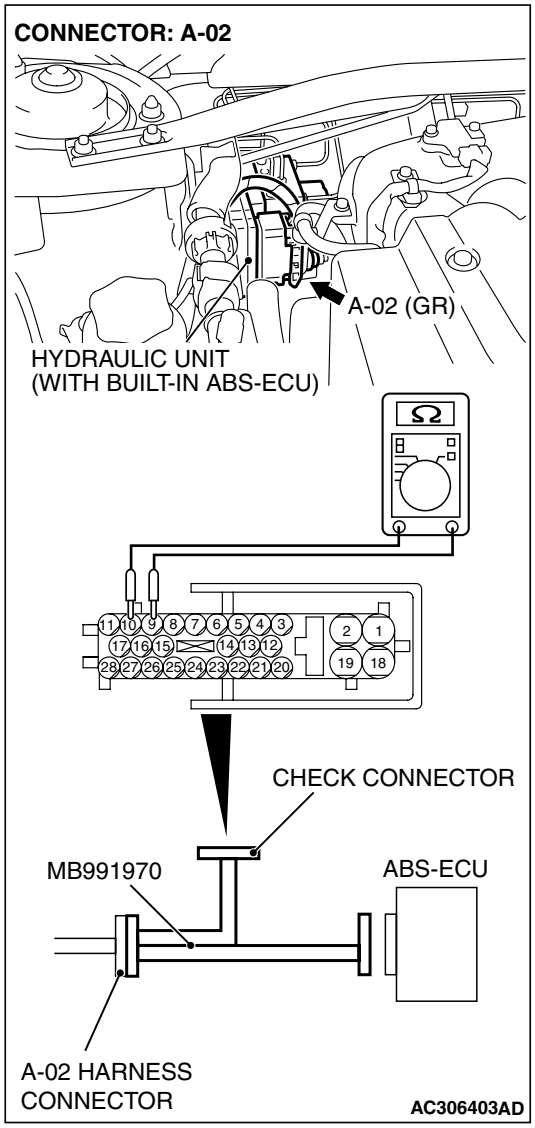
(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

(2) Measure the resistance between the relevant signal and ground terminals in the wheel speed sensor circuit and body ground. There should be no continuity.
- DTC C1201 is set: Between signal terminal 9 and body ground, and between ground terminal 10 and body ground
- DTC C1206 is set: Between signal terminal 26 and body ground, and between ground terminal 16 and body ground
- DTC C1211 is set: Between signal terminal 11 and body ground, and between ground terminal 17 and body ground
- DTC C1216 is set: Between signal terminal 28 and body ground, and between ground terminal 27 and body ground

Q: Does continuity exist?

YES (Continuity exists between terminal 9 or terminal 10 and body ground) : Go to Step 7.
YES (Continuity exists between terminal 26 or terminal 16 and body ground) : Go to Step 9.
YES (Continuity exists between terminal 11 or terminal 17 and body ground) : Go to Step 11.
YES (Continuity exists between terminal 28 or terminal 27 and body ground) : Go to Step 13.
NO : Go to Step 6.



STEP 6. Measure the resistance at the ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

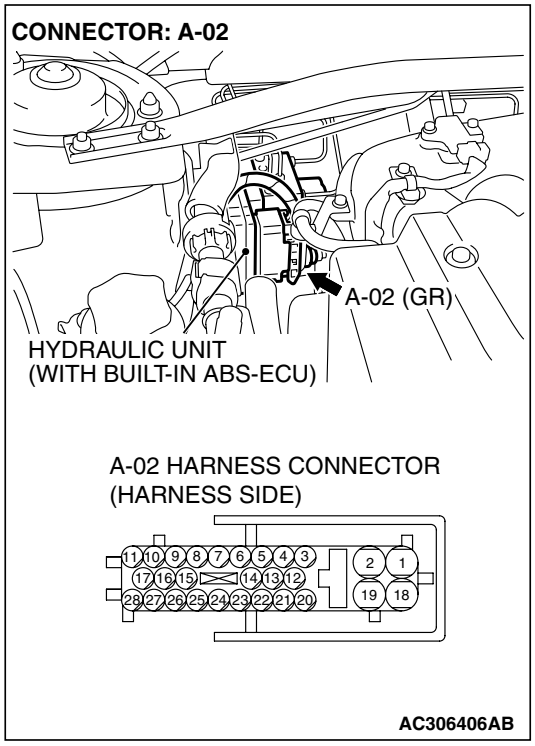
NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

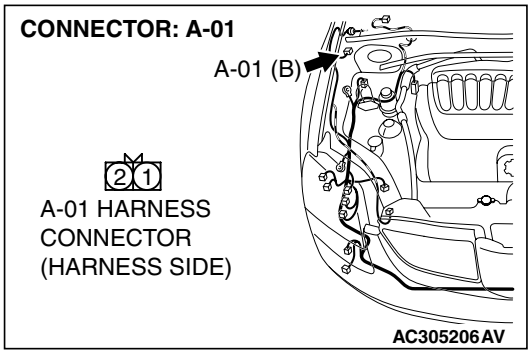
(2) Measure the resistance between the ABS-ECU connector terminals.
- DTC C1200 is set: Between terminal 9 and terminal 10
- DTC C1205 is set: Between terminal 26 and terminal 16
- DTC C1210 is set: Between terminal 11 and terminal 17
- DTC C1215 is set: Between terminal 28 and terminal 27

Standard Value: 1.24 – 1.64 kΩ

Q: Is the resistance between terminals 16 and 26, 9 and 10, 27 and 28, or 11 and 17 within the standard value?

YES (When resistances between all terminals are within the standard value) : Go to Step 16.
NO (When resistance between terminals 9 and 10 is not within the standard value) : Go to Step 7.
NO (When resistance between terminals 16 and 26 is not within the standard value) : Go to Step 9.
NO (When resistance between terminals 11 and 17 is not within the standard value) : Go to Step 11.
NO (When resistance between terminals 27 and 28 is not within the standard value) : Go to Step 13.



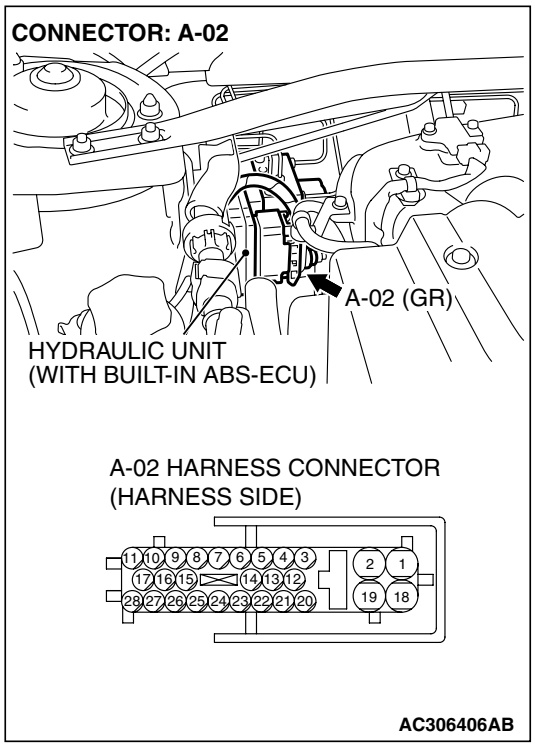


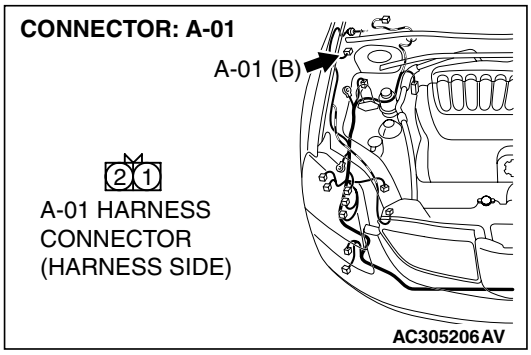
STEP 7. Check ABS-ECU connector A-02 and wheel speed sensor <front: RH> connector A-01 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are ABS-ECU connector A-02 and wheel speed sensor <front: RH> connector A-01 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

NO : Go to Step 8.





STEP 8. Check the harness wires between ABS-ECU connector A-02 (terminal 9, 10) and wheel speed sensor <front: RH> connector A-01 (terminal 2, 1).

Q: Is the harness wire between ABS-ECU connector A-02 (terminal 9, 10) and wheel speed sensor <front: RH> connector A-01 (terminal 1, 2) damaged?

YES : Repair the wiring harness. Then go to Step 17.

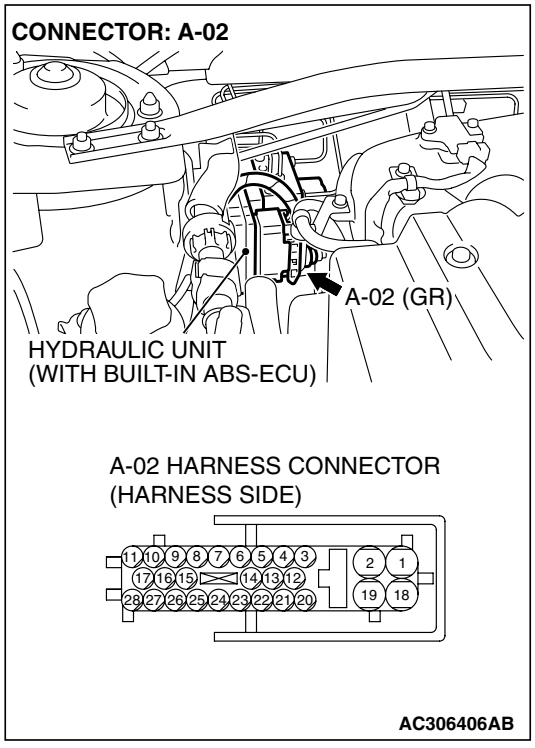
NO : Go to Step 15.

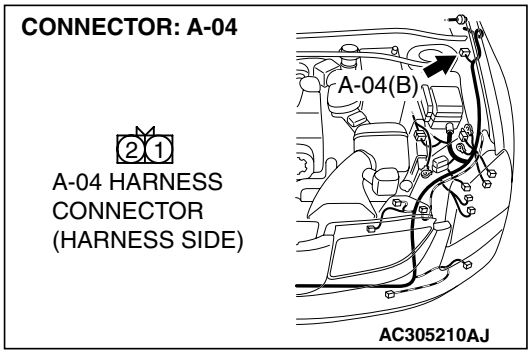
STEP 9. Check ABS-ECU connector A-02 and wheel speed sensor <front: LH> connector A-04 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

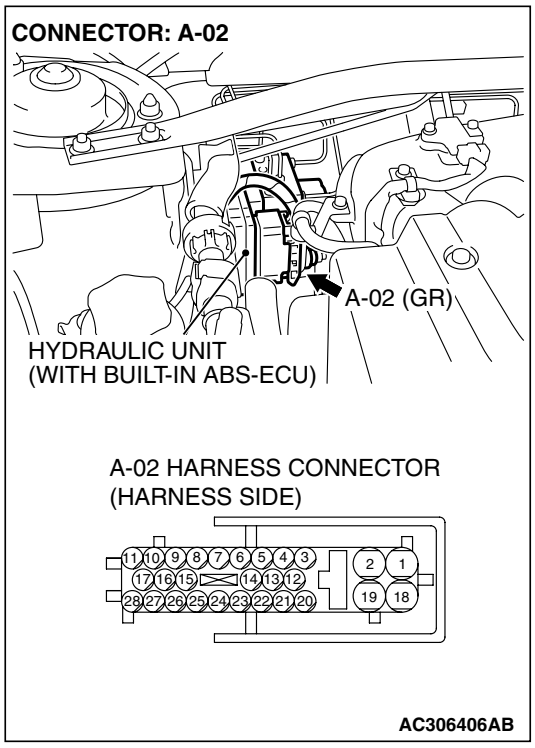
Q: Are ABS-ECU connector A-02 and wheel speed sensor <front: LH> connector A-04 damaged?

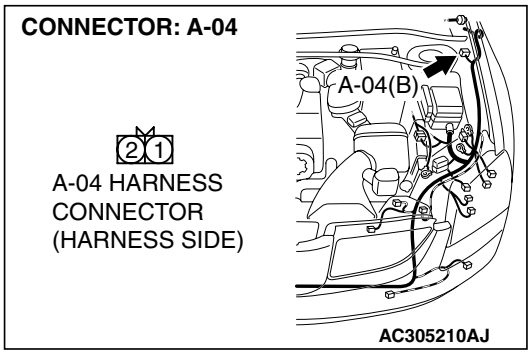
YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

NO : Go to Step 10.









STEP 10. Check the harness wires between ABS-ECU connector A-02 (terminal 16, 26) and wheel speed sensor <front: LH> connector A-04 (terminal 1, 2).

Q: Is the harness wire between ABS-ECU connector A-02 (terminal 16, 26) and wheel speed sensor <front: LH> connector A-04 (terminal 1, 2) damaged?

YES : Repair the wiring harness. Then go to Step 17.

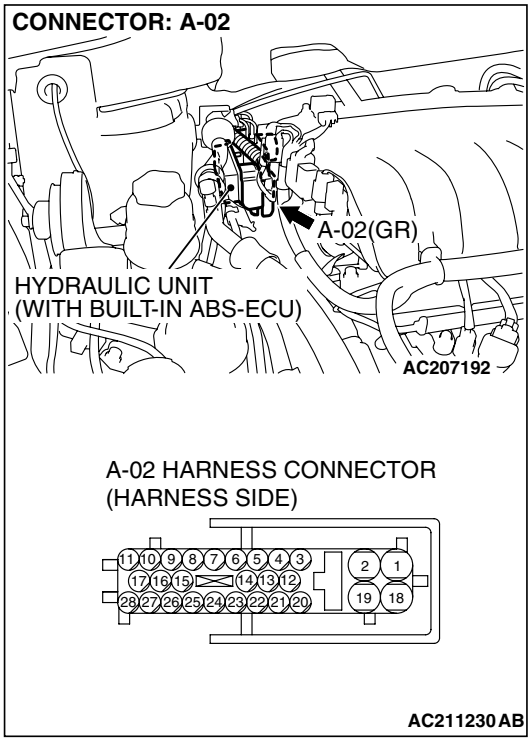
NO : Go to Step 15.

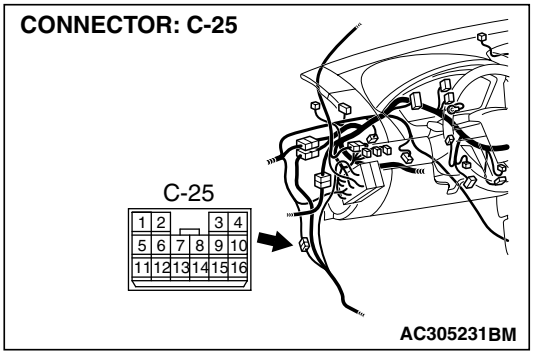
STEP 11. Check ABS-ECU connector A-02, intermediate connector C-25 and wheel speed sensor <rear: RH> connector F-04 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

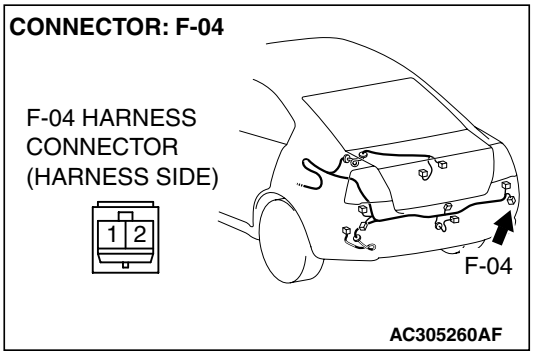
Q: Are ABS-ECU connector A-02, intermediate connector C-25 and wheel speed sensor <rear: RH> connector F-04 damaged?

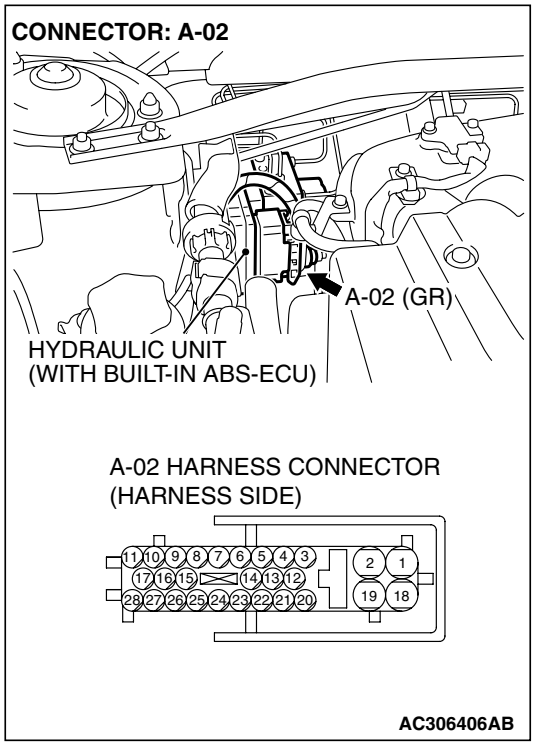
YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

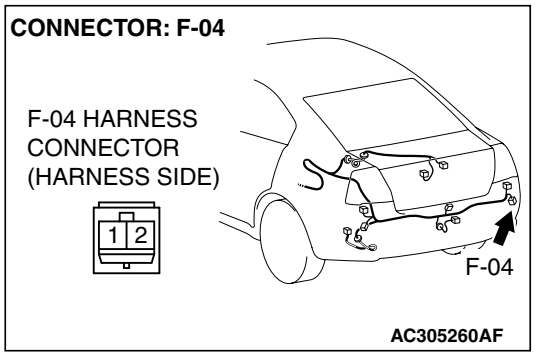
NO : Go to Step 12.











STEP 12. Check the harness wires between ABS-ECU connector A-02 (terminal 11, 17) and wheel speed sensor <rear: RH> connector F-04 (terminal 1, 2).

Q: Is the harness wire between ABS-ECU connector A-02 (terminal 11, 17) and wheel speed sensor <rear: RH> connector F-04 (terminal 1, 2) damaged?

YES : Repair the wiring harness. Then go to Step 17.

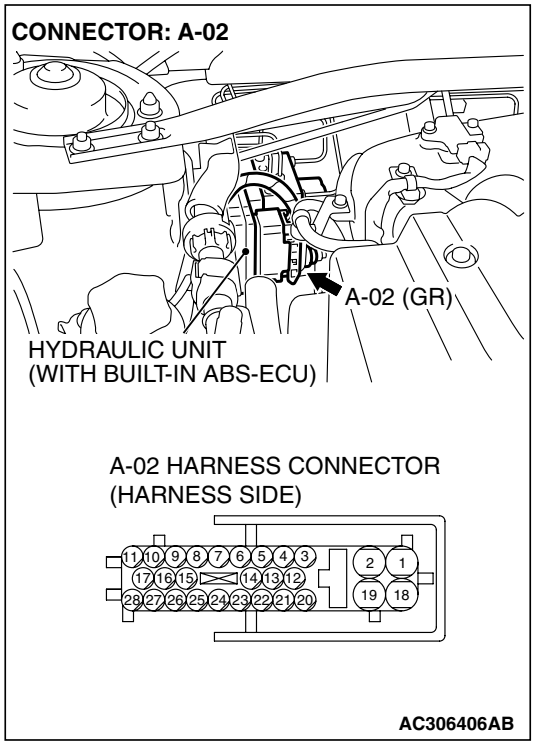
NO : Go to Step 15.

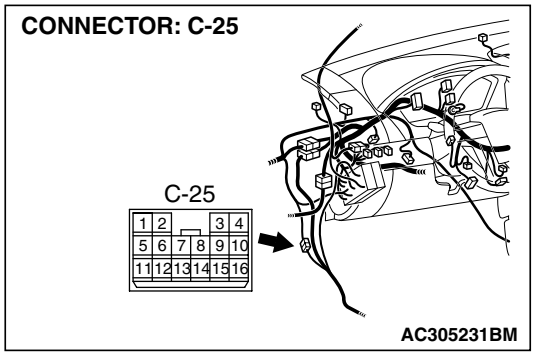
STEP 13. Check ABS-ECU connector A-02, intermediate connector C-25 and wheel speed sensor <rear: LH> connector F-07 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

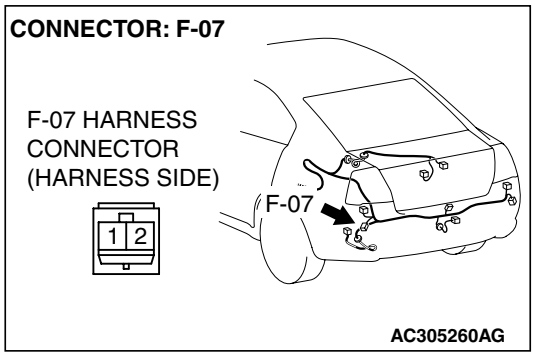
Q: Are ABS-ECU connector A-02, intermediate connector C-32 and wheel speed sensor <rear: LH> connector F-07 damaged?

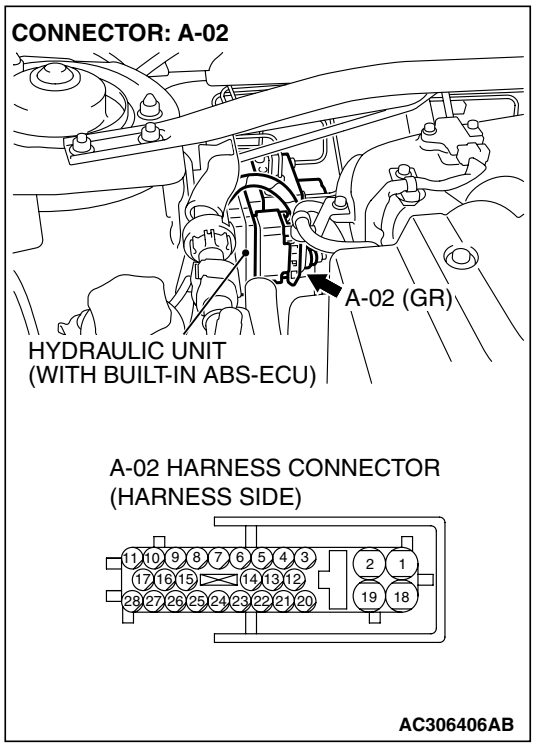
YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

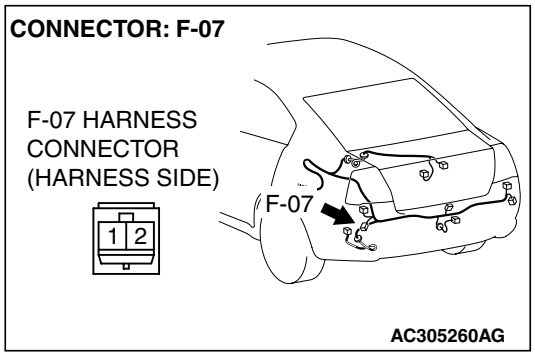
NO : Go to Step 14.











STEP 14. Check the harness wires between ABS-ECU connector A-02 (terminal 28, 27) and wheel speed sensor <rear: LH> connector F-07 (terminal 1, 2).

Q: Is the harness wire between ABS-ECU connector A-02 (terminal 28, 27) and wheel speed sensor <rear: LH> connector F-07 (terminal 1, 2) damaged?

YES : Repair the wiring harness. Then go to Step 17.

NO : Go to Step 15.

STEP 15. Inspect the wheel speed sensor.

Check the wheel speed sensor relevant to the DTC code. For the applicable inspection procedure, refer to P.35B-99.

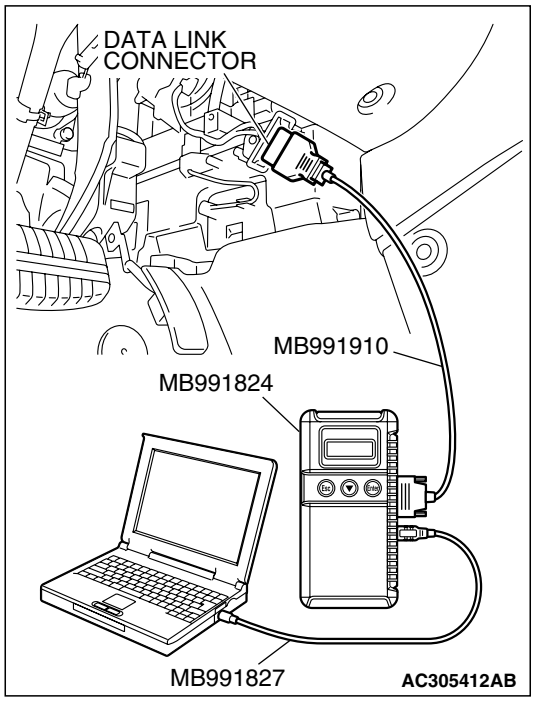
- When DTC code C1200 is set: Front right wheel speed sensor
- When DTC code C1205 is set: Front left wheel speed sensor
- When DTC code C1210 is set: Rear right wheel speed sensor
- When DTC code C1215 is set: Rear left wheel speed sensor

Q: Is the wheel speed sensor damaged?

YES : Replace the wheel speed sensor. Then go to Step 17.

NO : Go to Step 4.

TSB Revision



STEP 16. Recheck for diagnostic trouble code.

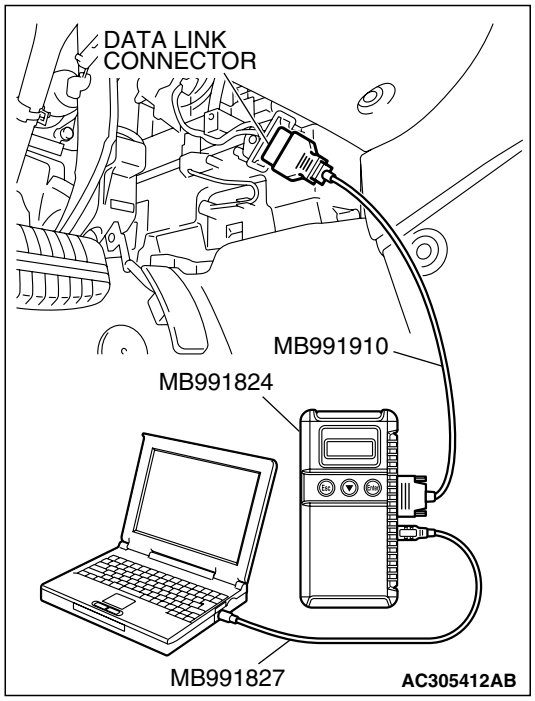
Check again if the DTC is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is reset.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1200, C1205, C1210 or C1215 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 17.

NO : 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.00-14.



STEP 17. Recheck for diagnostic trouble code.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

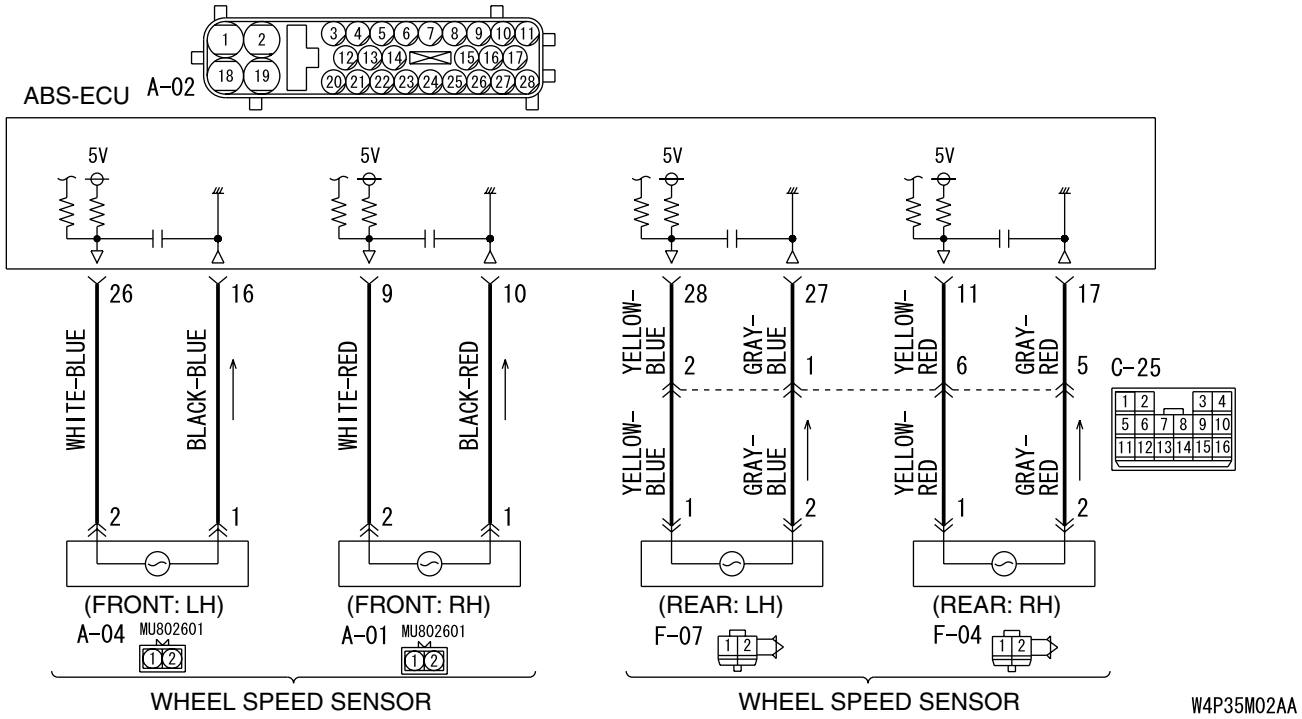
Q: Is DTC C1200, C1205, C1210 or C1215 set?

YES : Repeat the troubleshooting from Step 1.

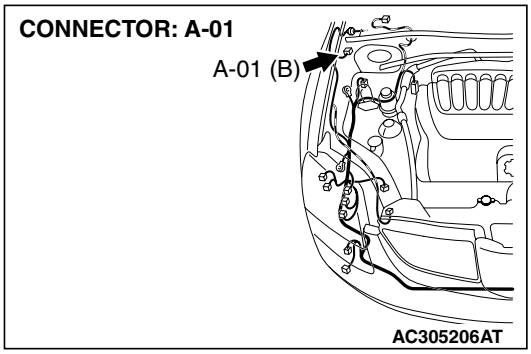
NO : The procedure is complete.

DTC C1201/C1206/C1211/1216 Wheel Speed Sensor (Abnormal Output Signal)

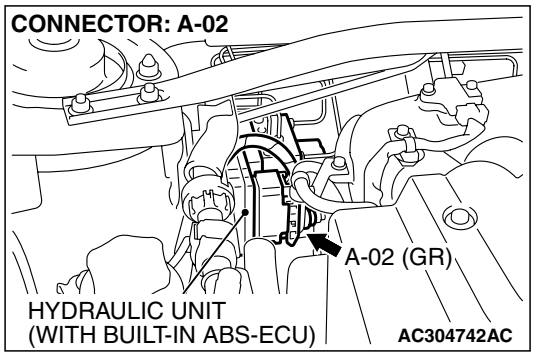
Wheel Speed Sensor Circuit



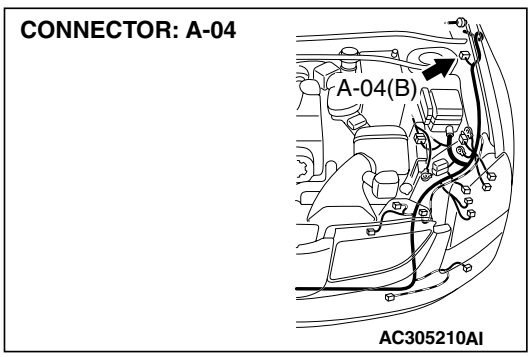
CONNECTOR: A-01



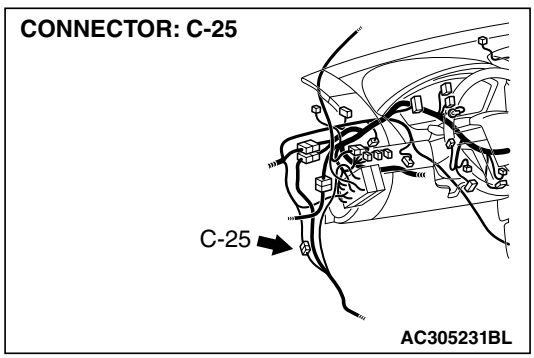
CONNECTOR: A-02



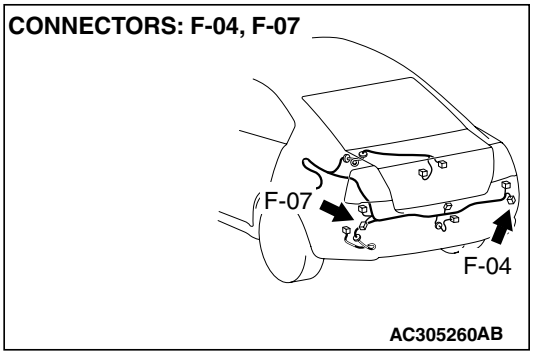
CONNECTOR: A-04



CONNECTOR: C-25



TSB Revision



⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines.

CIRCUIT OPERATION

- A toothed wheel speed rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The amount of voltage generated at each wheel is determined by the clearance between the wheel speed rotor teeth and the wheel speed sensor, and by the speed of rotation.
- Sends alternating current signals at frequencies which are proportional to the rotation speeds of each wheel to the ABS electronic control unit (ABS-ECU).
- The ABS hydraulic unit modulates the amount of braking force individually applied to each wheel cylinder.

ABS DTC SET CONDITIONS

The ABS-ECU monitors the signals from each wheel speed sensor while the vehicle is being driven. If any fault below is found in these sensor signals, the ECU will set the relevant diagnostic trouble code.

- Missing sensor signal
- Sensor signal, which will not be created under normal operation
- Significant difference among the wheel speed sensor signals

TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

Current trouble

- Malfunction of the wheel speed sensor or wheel speed rotor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

Past trouble

- Carry out diagnosis with particular emphasis on connector(s) or wiring harness in wheel speed sensor circuit. For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to use Troubleshooting/Inspection Service PointsP.00-16).

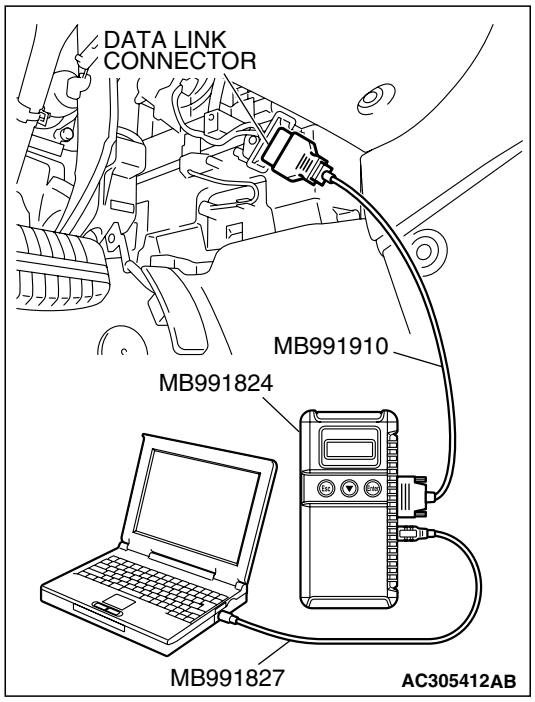
Past trouble

For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting P.00-16).

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991970: ABS Check Harness



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

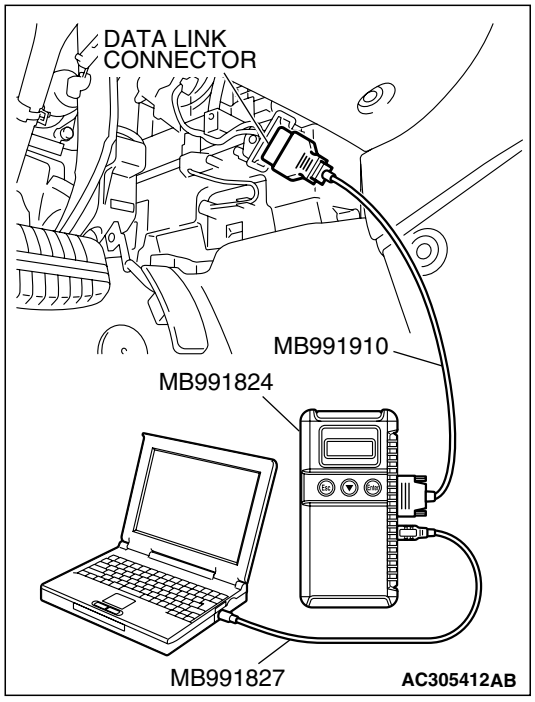
⚠ CAUTION

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) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 3
NO : Repair the CAN bus line (Refer to GROUP 54C, Diagnosis P.54C-16). Then go to Step 2.



STEP 2. Recheck for diagnostic trouble code.

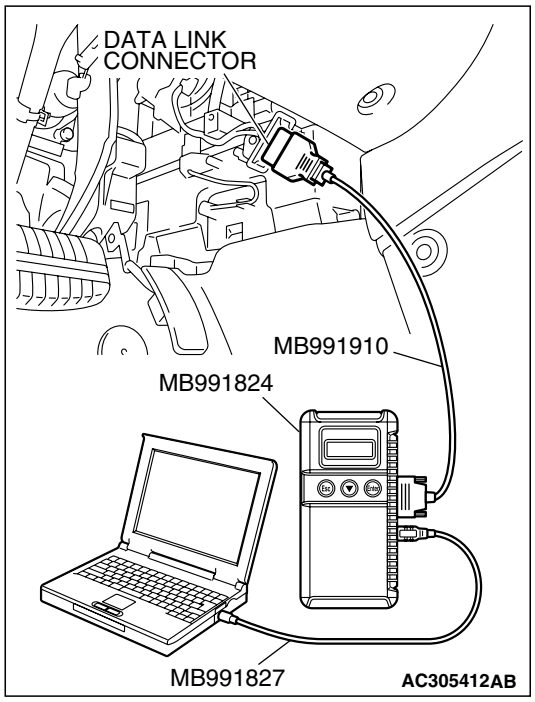
⚠ CAUTION

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) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1201, C1206, C1211 or C1216 set?

YES : Go to Step 3
NO : The procedure is complete.



STEP 3. Using scan tool MB991958, read the diagnostic trouble code.

⚠ 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.

Use scan tool MB991958 to check whether DTC codes C1200, C1205, C1210 and C1215 have been set simultaneously.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check whether DTC C1200, C1205, C1210 or C1215 have been set.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1200, C1205, C1210 or C1215 set?

YES : Carry out diagnosis relevant to DTC C1200, C1205, C1210 or C1215 (Refer to P.35B-10).
NO : Go to Step 4.

STEP 4. Check the installation condition of the wheel speed sensors.

For the wheel speed sensor, which the DTC code indicates, check whether the sensor or its mounting bolts are loosened.

- DTC C1201 is set: Front right wheel speed sensor
- DTC C1206 is set: Front left wheel speed sensor
- DTC C1211 is set: Rear right wheel speed sensor
- DTC C1216 is set: Rear left wheel speed sensor

Q: Is the wheel speed sensor installed correctly?

YES : Go to Step 5.
NO : Reinstall the wheel speed sensor correctly. Then go to Step 16.

STEP 5. Check the wheel speed sensor after it is removed from the vehicle.

Check the wheel speed sensor which the DTC code indicates (Refer to P.35B-99).

- DTC C1201 is set: Front right wheel speed sensor
- DTC C1206 is set: Front left wheel speed sensor
- DTC C1211 is set: Rear right wheel speed sensor
- DTC C1216 is set: Rear left wheel speed sensor

Q: Is the wheel speed sensor in good condition?

YES : Go to Step 6.
NO : Replace the wheel speed sensor (Refer to P.35B-98). Then go to Step 16.

STEP 6. Check the wheel bearing for looseness.

NOTE: If the wheel bearing is loose, the gap between the wheel speed sensor and rotor may become excessive. Check the wheel bearing, which DTC code indicates, for looseness.

- DTC C1201 is set: Check the front right wheel bearing (Refer to GROUP 26, On-vehicle service – Wheel bearing end play check P.26-8).
- DTC C1206 is set: Check the front left wheel bearing (Refer to GROUP 26, On-vehicle service – Wheel bearing end play check P.26-8).
- DTC C1211 is set: Check the rear right wheel bearing (Refer to GROUP 27, On-vehicle service – Wheel bearing end play check P.27-4).
- DTC C1216 is set: Check the rear left wheel bearing (Refer to GROUP 27, On-vehicle service – Wheel bearing end play check P.27-4)

Q: Is the wheel bearing end play within the standard value?

YES : Go to Step 7.
NO (front bearing end play is not within the standard value) : Replace the front hub assembly (Refer to GROUP 26, Front axle hub assembly P.26-9).
NO (rear bearing end play is not within the standard value) : Replace the rear hub assembly (Refer to GROUP 27, Rear axle hub assembly P.27-4).

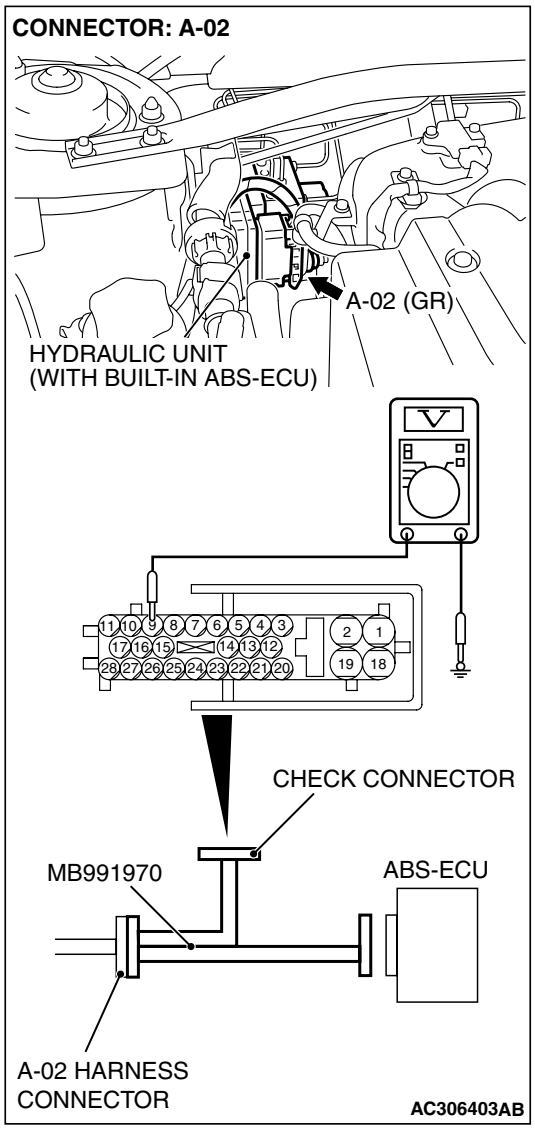
STEP 7. Check the wheel speed rotor.

Check the wheel speed rotor, which DTC code indicates, for foreign material or deformation.

- DTC C1201 is set: Front right wheel speed sensor
- DTC C1206 is set: Front left wheel speed sensor
- DTC C1211 is set: Rear right wheel speed sensor
- DTC C1216 is set: Rear left wheel speed sensor

Q: Is the wheel speed rotor in good condition?

YES : Go to Step 8.
NO (front bearing end play is not within the standard value) : If the wheel speed rotor is contaminated with foreign material, clean it. If the driveshaft is deformed, replace it (Refer to GROUP 26, Drive shaft assembly P.26-13).
NO (rear bearing end play is not within the standard value) : If the wheel speed rotor is contaminated with foreign material, clean it. If the wheel speed rotor is deformed, replace it (Refer to GROUP 27, Rear axle hub assembly P.27-6).



STEP 8. Measure the voltage at ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

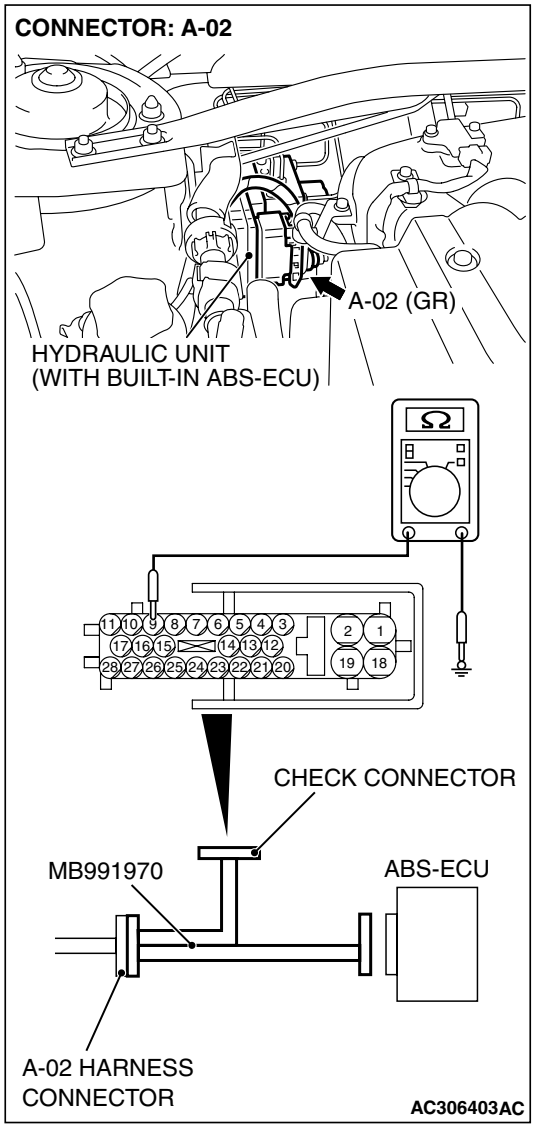
(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between the relevant signal and ground terminals in the wheel speed sensor circuit and body ground. It should be less than 1V.

- DTC C1201 is set: Between signal terminal 9 and body ground, and between ground terminal 10 and body ground
- DTC C1206 is set: Between signal terminal 26 and body ground, and between ground terminal 16 and body ground
- DTC C1211 is set: Between signal terminal 11 and body ground, and between ground terminal 17 and body ground
- DTC C1216 is set: Between signal terminal 28 and body ground, and between ground terminal 27 and body ground

Q: Does the voltage measure 1 V or less?

YES : Go to Step 9.
NO (When the voltage between terminal 9 or 10 – and body ground measures more than 1 V) : Go to Step 11.
NO (When the voltage between terminal 26 or 16 – and body ground measures more than 1 V) : Go to Step 12.
NO (When the voltage between terminal 11 or 17 – and body ground measures more than 1 V) : Go to Step 13.
NO (When the voltage between terminal 28 or 27 – and body ground measures more than 1 V) : Go to Step 14.



STEP 9. Measure the resistance at ABS-ECU connector A-02.

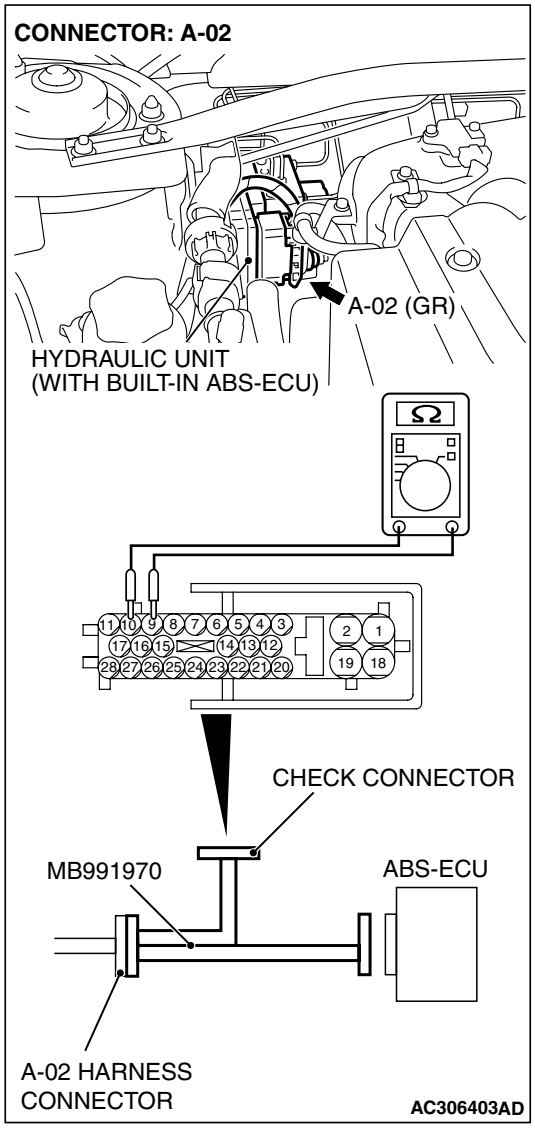
(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

(2) Measure the resistance between the relevant signal and ground terminals in the wheel speed sensor circuit and body ground. OK if there is no continuity.
- DTC C1201 is set: Between signal terminal 9 and body ground, and between ground terminal 10 and body ground
- DTC C1206 is set: Between signal terminal 26 and body ground, and between ground terminal 16 and body ground
- DTC C1211 is set: Between signal terminal 11 and body ground, and between ground terminal 17 and body ground
- DTC C1216 is set: Between signal terminal 28 and body ground, and between ground terminal 27 and body ground

Q: Does continuity exist?

YES (Continuity exists between terminal 9 or terminal 10 and body ground) : Go to Step 11.
YES (Continuity exists between terminal 26 or terminal 16 and body ground) : Go to Step 12.
YES (Continuity exists between terminal 11 or terminal 17 and body ground) : Go to Step 13.
YES (Continuity exists between terminal 28 or terminal 27 and body ground) : Go to Step 14.
NO : Go to Step 10.



STEP 10. Measure the resistance at ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

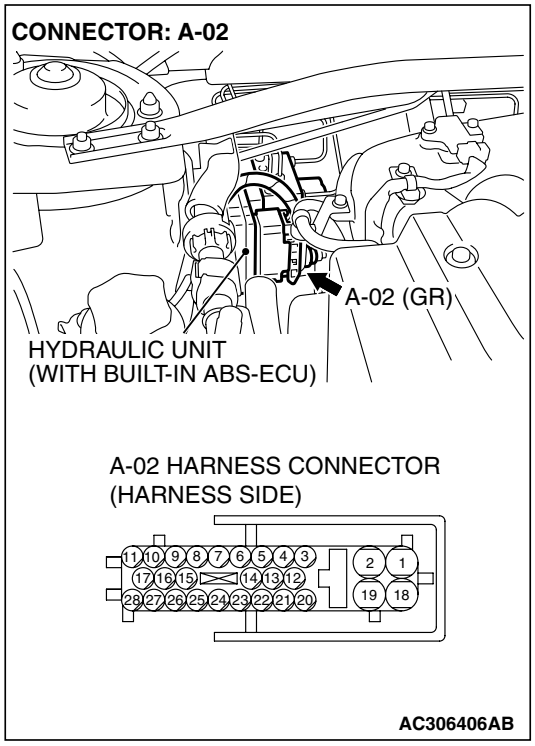
NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

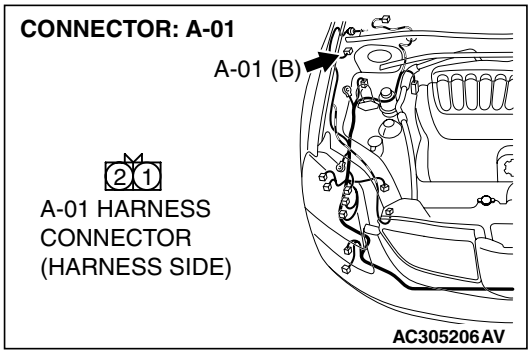
(2) Measure the resistance between the relevant signal and ground terminals in the wheel speed sensor circuit.
- DTC C1201 is set: Between signal terminal 9 and ground terminal 10
- DTC C1206 is set: Between signal terminal 26 and ground terminal 16
- DTC C1211 is set: Between signal terminal 11 and ground terminal 17
- DTC C1216 is set: Between signal terminal 28 and ground terminal 27

Standard Value: 1.24 – 1.64 kΩ

Q: Is the resistance between terminals 16 and 26, 9 and 10, 27 and 28, or 11 and 17 within the standard value?

YES (When resistances between all terminals are within the standard value) : Go to Step 15.
NO (When resistance between terminals 9 and 10 is not within the standard value) : Go to Step 11.
NO (When resistance between terminals 16 and 26 is not within the standard value) : Go to Step 12.
NO (When resistance between terminals 11 and 17 is not within the standard value) : Go to Step 13.
NO (When resistance between terminals 27 and 28 is not within the standard value) : Go to Step 14.





STEP 11. Check ABS-ECU connector A-02 and wheel speed sensor <front: RH> connector A-01 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are ABS-ECU connector A-02 and wheel speed sensor <front: RH> connector A-01 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

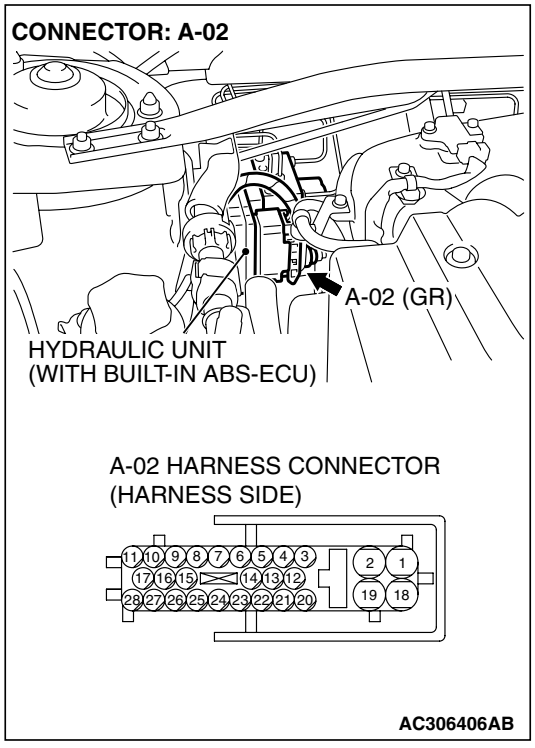
NO : Open or short circuit may be present in the front right wheel speed sensor circuit. Repair the wiring harness between ABS-ECU connector A-02 (terminals 9 and 10) and front right wheel speed sensor A-01 (terminals 2 and 1).Then go to Step 16.

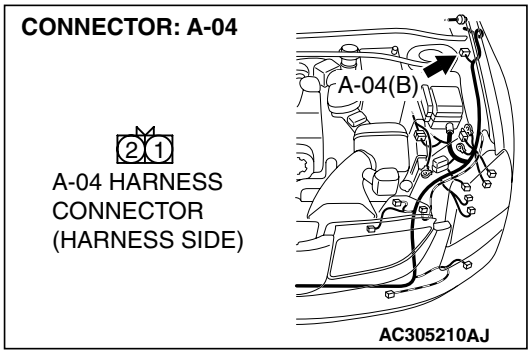
STEP 12. Check ABS-ECU connector A-02 and wheel speed sensor <front: RH> connector A-04 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are ABS-ECU connector A-02 and wheel speed sensor <front: LH> connector A-04 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

NO : Open or short circuit may be present in the front right wheel speed sensor circuit. Repair the wiring harness between ABS-ECU connector A-02 (terminals 16 and 26) and front left wheel speed sensor A-04 (terminals 1 and 2).Then go to Step 16.





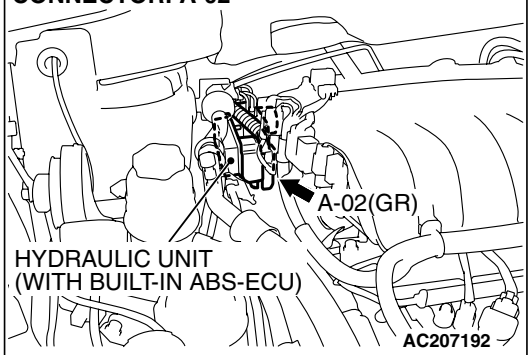
STEP 13. Check ABS-ECU connector A-02, intermediate connector C-25 and wheel speed sensor <Rear: RH> connector F-04 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are ABS-ECU connector A-02, intermediate connector C-25 and wheel speed sensor <Rear: RH> connector F-04 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

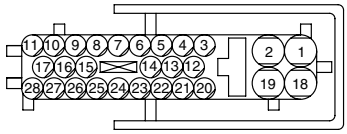
NO : Open or short circuit may be present in the rear right wheel speed sensor circuit. Repair the wiring harness between ABS-ECU connector A-02 (terminals 11 and 17) and rear right wheel speed sensor F-04 (terminals 1 and 2).Then go to Step 16.

CONNECTOR: A-02



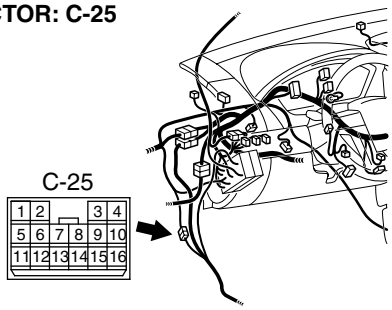
AC207192

A-02 HARNESS CONNECTOR
(HARNESS SIDE)



AC211230AB

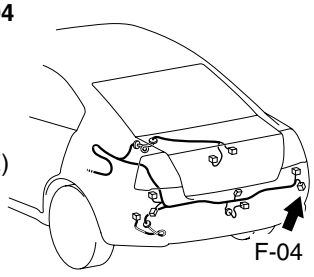
CONNECTOR: C-25



AC305231BM

CONNECTOR: F-04

F-04 HARNESS
CONNECTOR
(HARNESS SIDE)



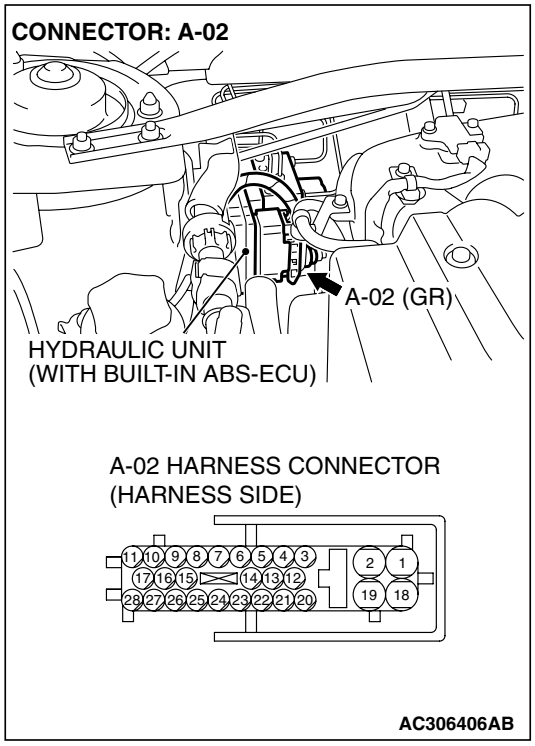
AC305260AF

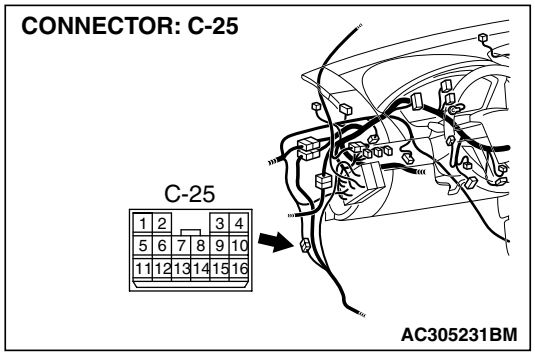
STEP 14. Check ABS-ECU connector A-02, intermediate connector C-25 and wheel speed sensor <rear: LH> connector F-07 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

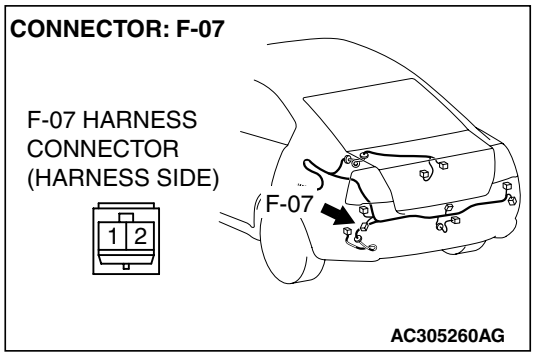
Q: Are ABS-ECU connector A-02, intermediate connector C-25 and wheel speed sensor <rear: LH> connector F-07 damaged?

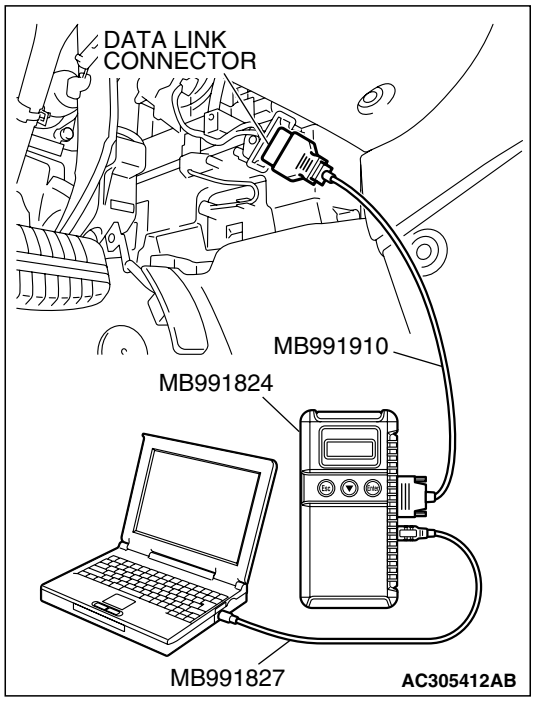
YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

NO : Open or short circuit may be present in the rear left wheel speed sensor circuit. Repair the wiring harness between ABS-ECU connector A-02 (terminals 27 and 28) and rear left wheel speed sensor F-07 (terminals 2 and 1).Then go to Step 16.







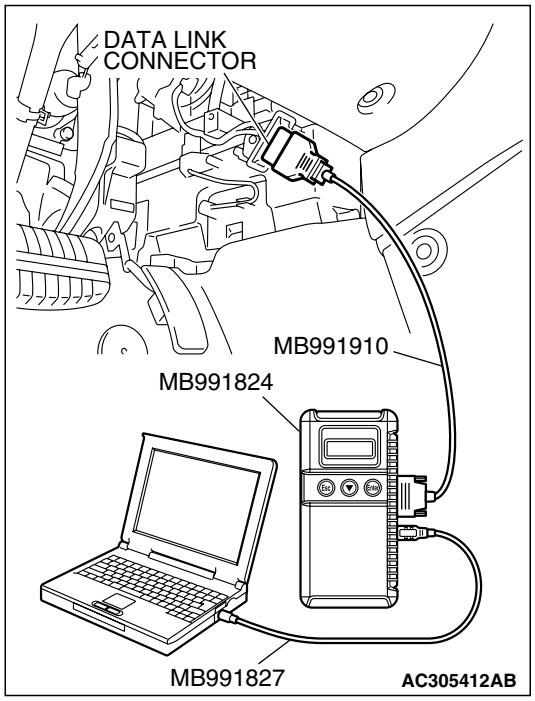


STEP 15. Recheck for diagnostic trouble code.

Check again if the DTC is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1201, C1206, C1211 or C1216 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 16.
NO : 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.00-14.



STEP 16. Recheck for diagnostic trouble code.

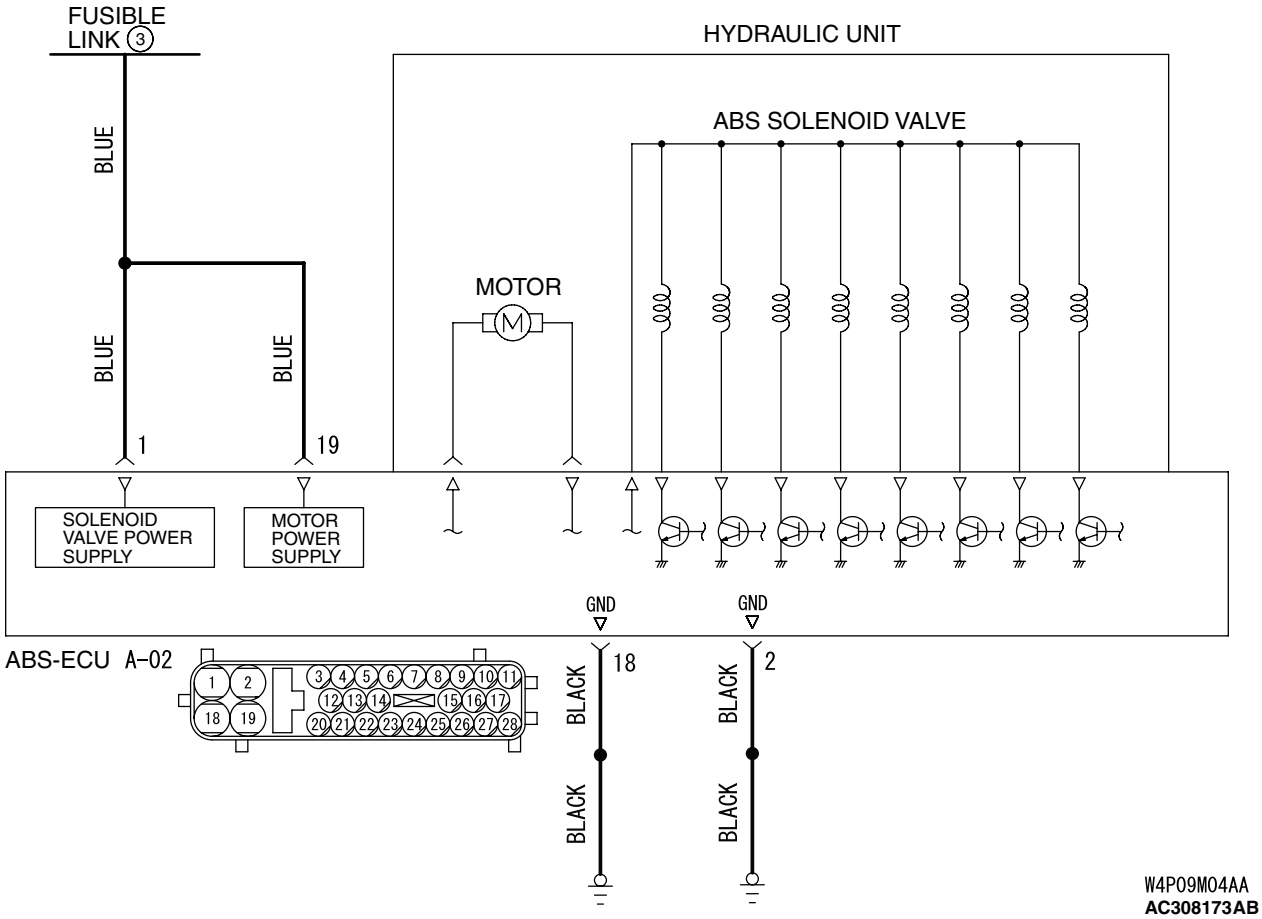
Check again if the DTC is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

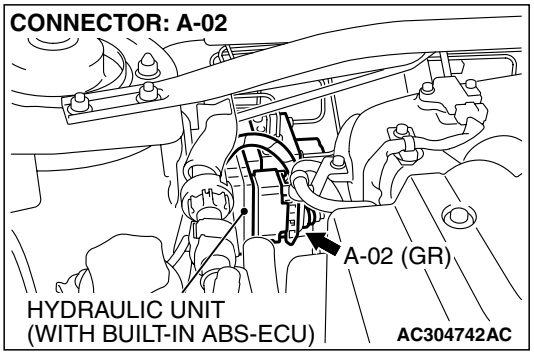
Q: Is DTC C1201, C1206, C1211 or C1216 set?

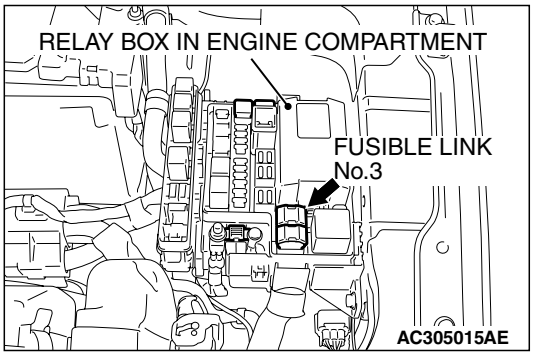
YES : Go to Step 1.
NO : The procedure is complete.

DTC C1226/C1231/C1236/C1241/C1246/C1251/C1256/C1261: ABS Solenoid Valve

Solenoid Valve and Motor Power Supply Circuit







⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines.

CIRCUIT OPERATION

- The ABS-ECU contains the power supply circuit (terminal 1) for the solenoid valve. The solenoid valve is energized by the valve relay, which is integrated in the ABS-ECU.
- The valve relay, which is integrated in the ABS-ECU, is always energizing the solenoid valve unless the initial check is in progress when the ignition switch is turned on.
- The ABS-ECU activates the solenoid valve by turning on its driving transistor.

ABS DTC SET CONDITIONS

These diagnostic trouble codes will be set under the cases below.

TSB Revision

- The solenoid valve is not energized even after the ABS-ECU has turned on the driving transistor (Open circuit is present in the power supply circuit to the ABS-ECU solenoid valve, or the valve relay has failed).
- The solenoid valve is not energized even after the ABS-ECU has turned on the driving transistor (Open circuit is present in the solenoid valve circuit inside the ABS-ECU, or the valve relay has failed).
- After the ABS-ECU has turned off the driving transistor, the solenoid valve still remains energized (short in the solenoid valve circuit).
- When a solenoid valve failure is detected

TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

Current trouble

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

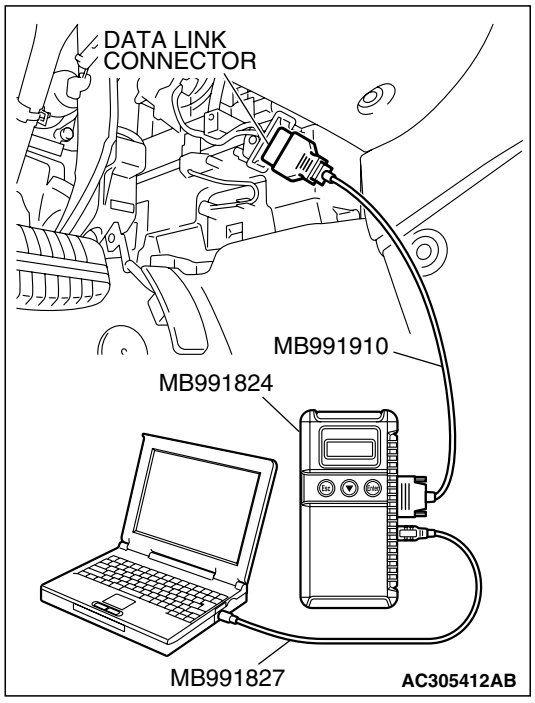
Past trouble

- Carry out diagnosis with particular emphasis on connector(s) or wiring harness between the power supply circuit (terminal 1) to the ABS-ECU solenoid valve or ground circuit (terminal 2) . For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-16).

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991970: ABS Check Harness



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

⚠ CAUTION

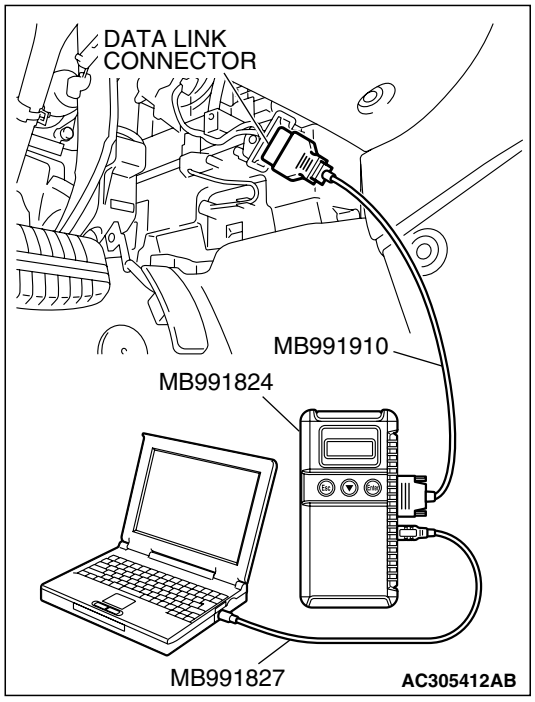
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54C, Diagnosis P.54C-16). Then go to Step 2.

TSB Revision



STEP 2. Recheck for diagnostic trouble code.

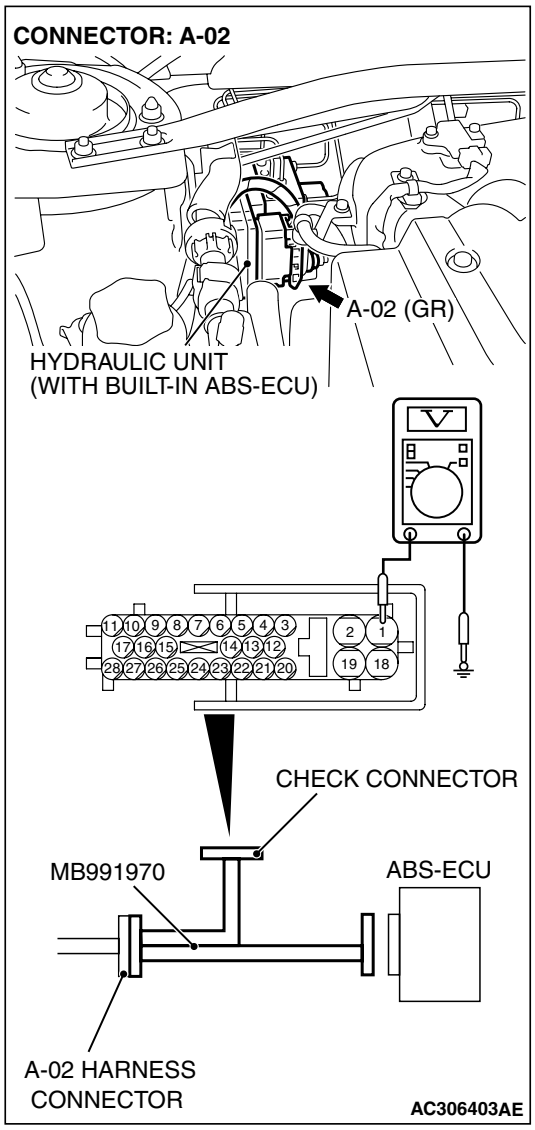
⚠ CAUTION

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) Erase the DTC.
(2) Turn the ignition switch to the "ON" position.
(3) Check if the DTC is set.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1226, C1231, C1236, C1241, C1246, C1251, C1256 or C1261 set?

YES : Go to Step 3.
NO : The procedure is complete.



STEP 3. Measure the voltage at ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

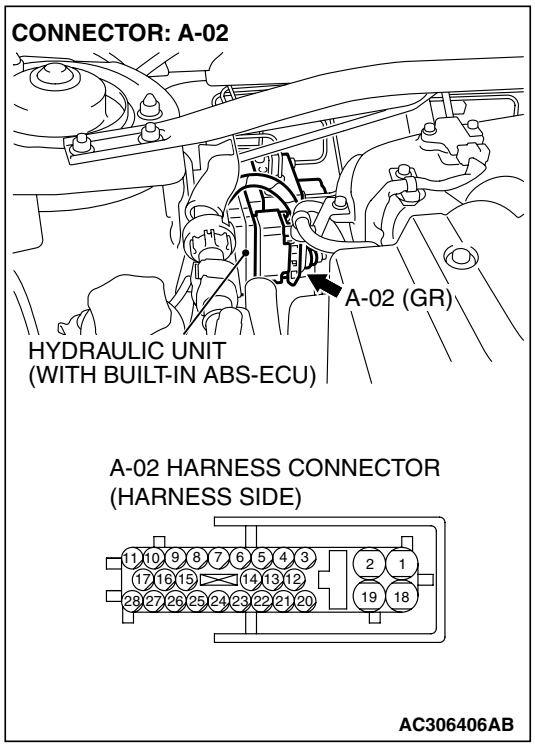
(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground. It should be approximately 12 volts (battery positive voltage).

Q: Is the voltage approximately 12 volts (battery positive voltage)?

YES : Go to Step 5.

NO : Go to Step 4.

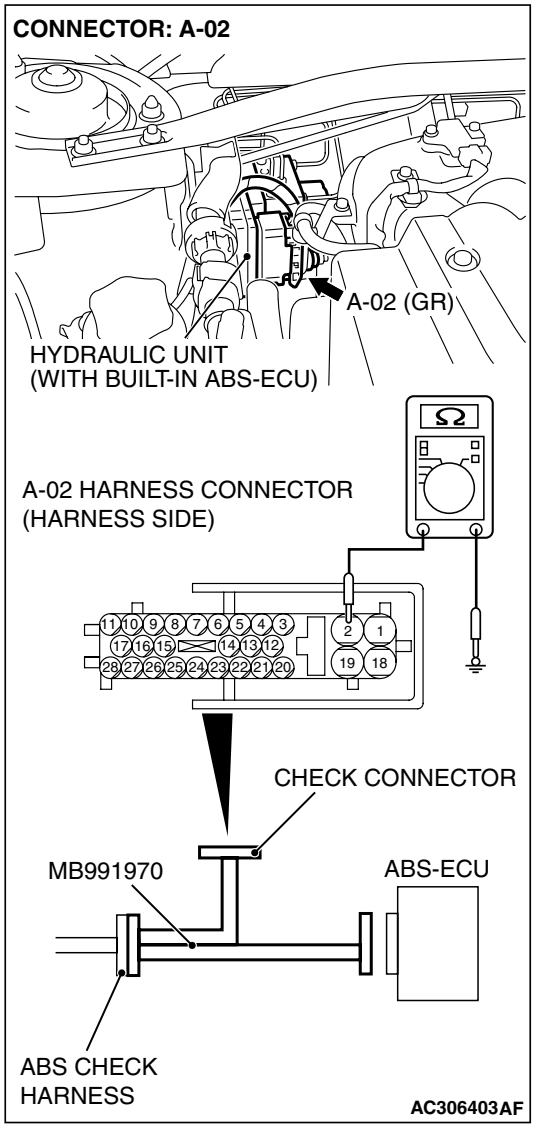


STEP 4. Check ABS-ECU connector A-02 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is ABS-ECU connector A-02 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

NO : An open or short circuit may be present in the solenoid valve power supply circuit. Repair the wiring harness between ABS-ECU connector A-02 terminal 1 and fusible link No.3.Then go to Step 8.



STEP 5. Measure the resistance at ABS-ECU connector A-02.

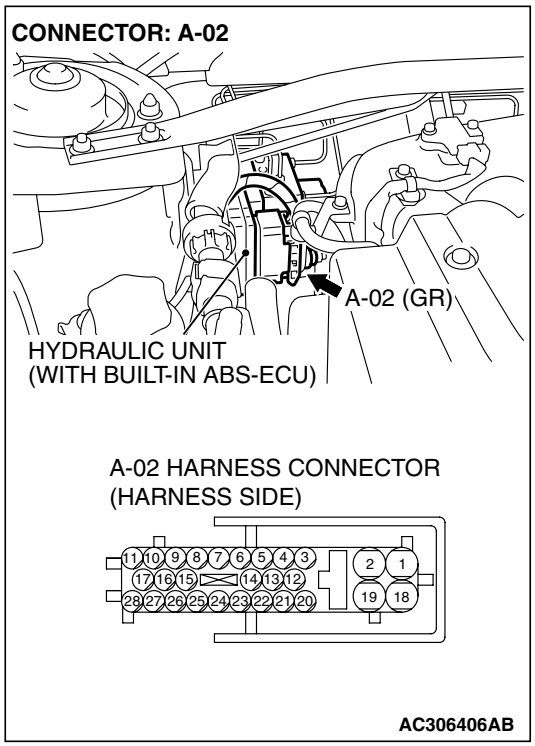
(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

(2) Measure the resistance between terminal 2 and ground. It should be 2 ohms or less.

Q: Is the measured resistance 2 ohms or less?

YES : Go to Step 7.
NO : Go to Step 6.

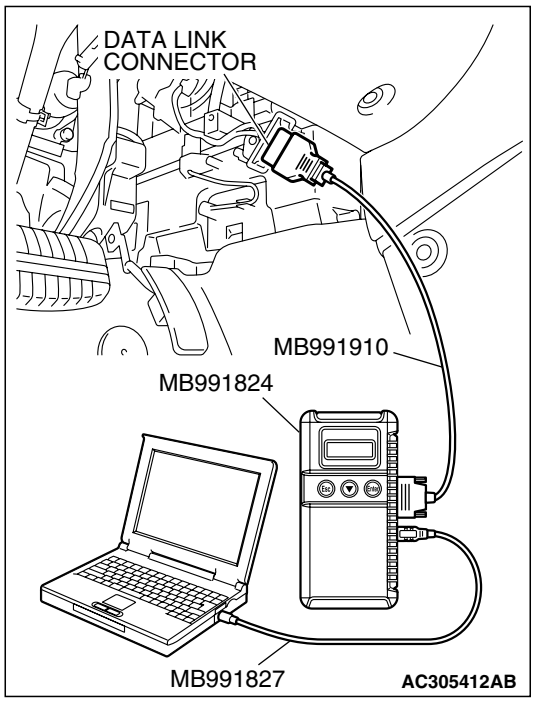


STEP 6. Check ABS-ECU connector A-02 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is ABS-ECU connector A-02 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

NO : An open circuit may be present in the ground circuit. Repair the wiring harness between ABS-ECU connector A-02 terminal 2 and the body ground. Then go to Step 8.



STEP 7. Recheck for diagnostic trouble code.

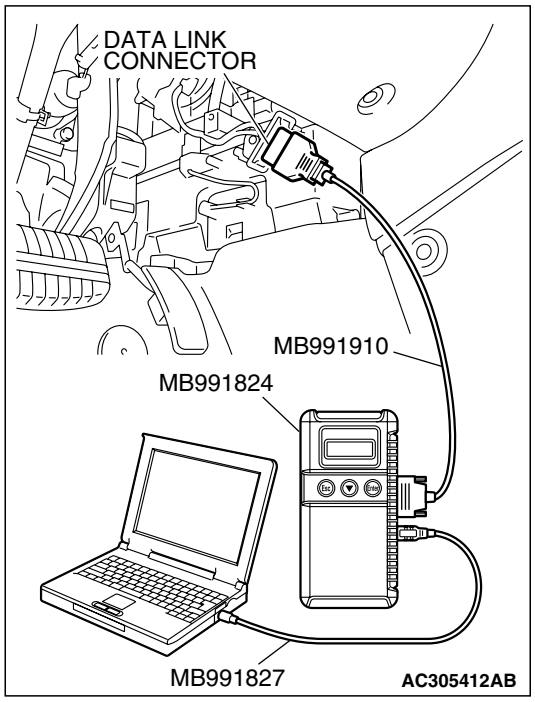
Check again if the DTC is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1226, C1231, C1236, C1241, C1246, C1251, C1256 or C1261 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 8.

NO : 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.00-14.



STEP 8. Recheck for diagnostic trouble code.

Check again if the DTC is set.

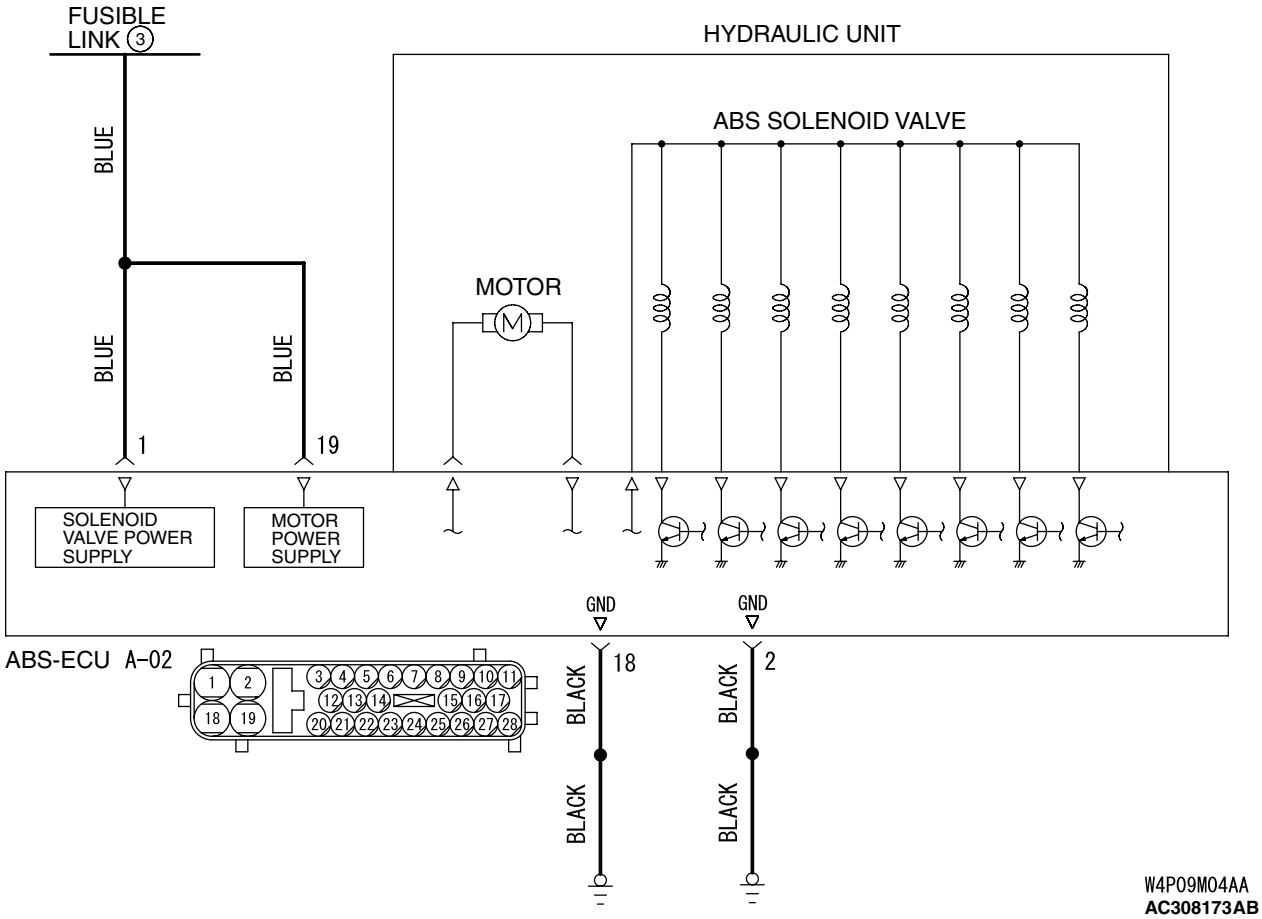
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

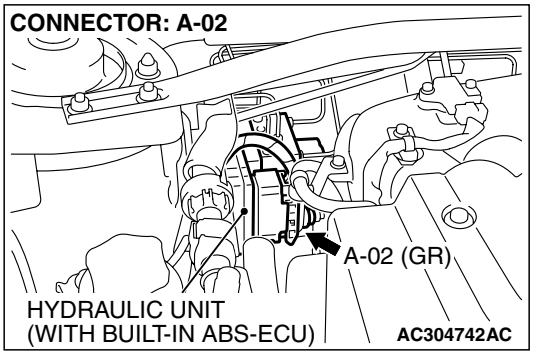
Q: Is DTC C1226, C1231, C1236, C1241, C1246, C1251, C1256 or C1261 set?

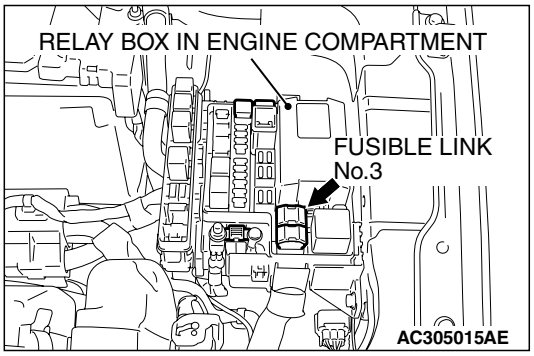
YES : Go to Step 1.
NO : The procedure is complete.

DTC C1266/C1273/C1274: Motor system

Solenoid Valve and Motor Power Supply Circuit







⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines.

CIRCUIT OPERATION

- The ABS-ECU contains the power supply circuit (terminal 19) for the pump motor. The pump motor is energized by the motor relay, which is integrated in the ABS-ECU.
- The motor relay, which is integrated in the ABS-ECU, is always off unless the motor solenoid valve check is activated when the vehicle is started.
- The ABS-ECU activates the pump motor by turning on the ECU built-in motor relay when the ABS is working.

TSB Revision

ABS DTC SET CONDITIONS

These diagnostic trouble codes will be set under the cases below.

DTC C1266: Motor system (seizure)

- This DTC is set when the ECU determines the pump motor is not running smoothly (i.e. motor seizure) by the motor relay ON/OFF.

DTC C1273: Motor relay problem (stuck off)

- If the ABS-ECU determines that the motor is not running after the motor relay is turned on, the ECU determines that the motor relay is stuck off, and sets this DTC.

DTC C1274: Motor relay problem (stuck on)

- If the ABS-ECU determines that the motor is running after the motor relay is turned off, the ECU determines that the motor relay is stuck on, and sets this DTC.

TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

Current trouble

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

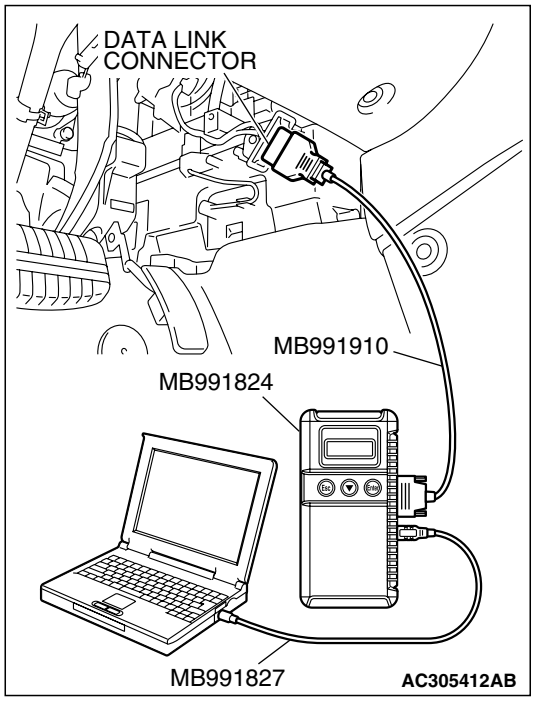
Past trouble

- Carry out diagnosis with particular emphasis on connector(s) or wiring harness between the power supply circuit (terminal 19) to the ABS-ECU motor or ground circuit (terminal 18). For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-16).

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991970: ABS Check Harness



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

⚠ CAUTION

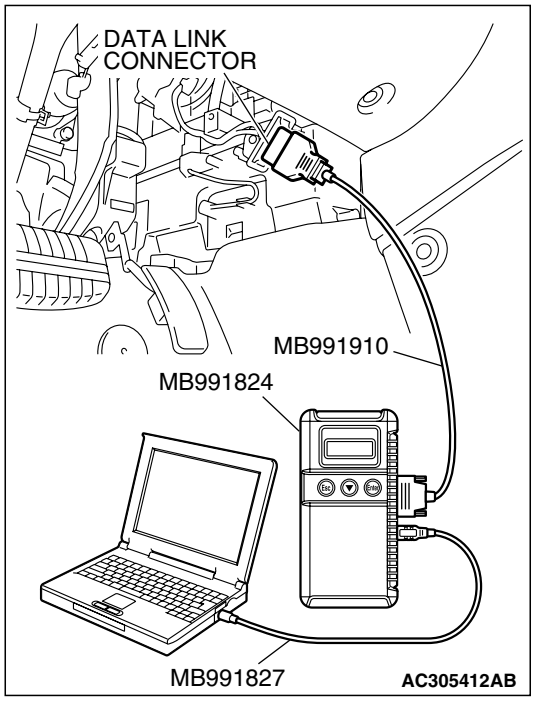
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54C, Diagnosis P.54C-16). Then go to Step 2.

TSB Revision



STEP 2. Recheck for diagnostic trouble code.

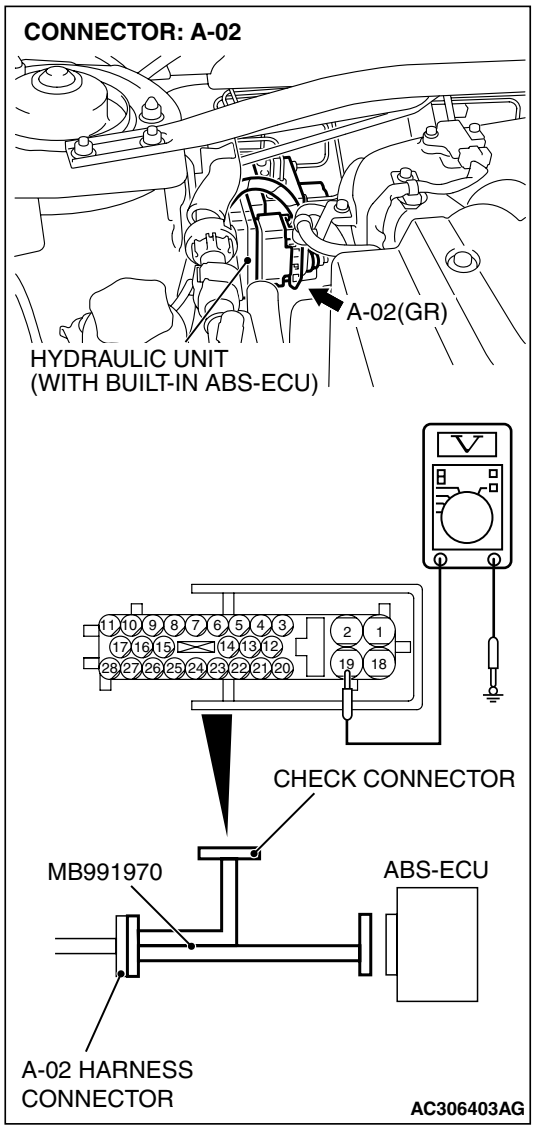
⚠ CAUTION

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) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1266, C1273 or C1274 set?

YES : Go to Step 3.
NO : The procedure is complete.



STEP 3. Measure the voltage at ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

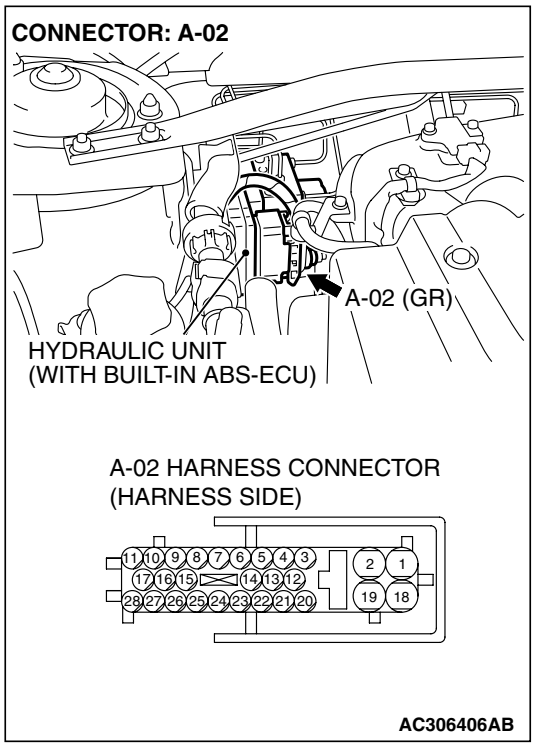
(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 19 and ground. It should be approximately 12 volts (battery positive voltage).

Q: Is the voltage approximately 12 volts (battery positive voltage)?

YES : Go to Step 5.

NO : Go to Step 4.

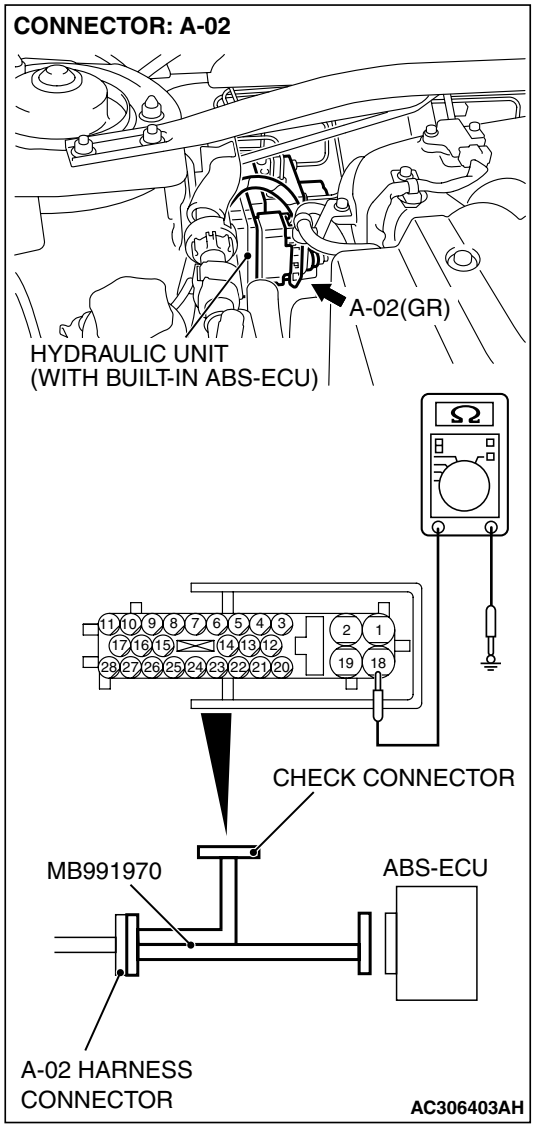


STEP 4. Check ABS-ECU connector A-02 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is ABS-ECU connector A-02 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

NO : An open or short circuit may be present in the solenoid valve power supply circuit. Repair the wiring harness between ABS-ECU connector A-02 terminal 19 and fusible link No.3.Then go to Step 8.



STEP 5. Measure the resistance at ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

(2) Measure the resistance between terminal 18 and ground. It should be 2 ohms or less.

Q: Is the measured resistance 2 ohms or less?

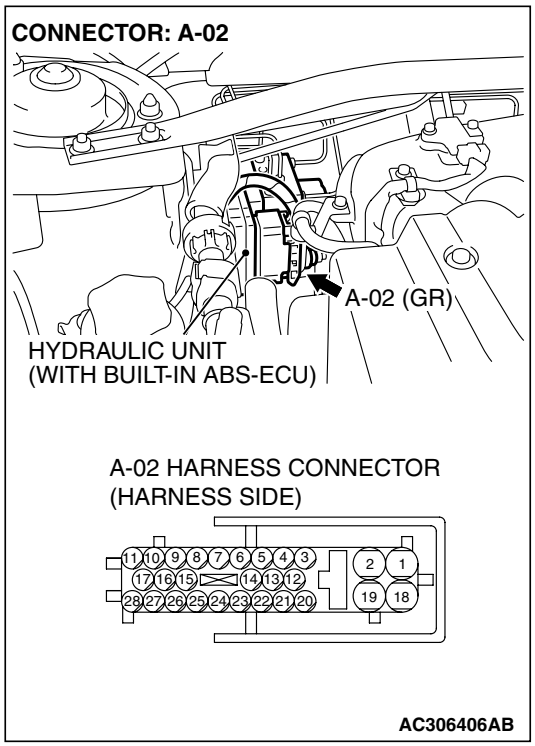
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check ABS-ECU connector A-02 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is ABS-ECU connector A-02 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

NO : An open circuit may be present in the ground circuit. Repair the wiring harness between ABS-ECU connector A-02 terminal 18 and the body ground. Then go to Step 8.



STEP 7. Recheck for diagnostic trouble code.

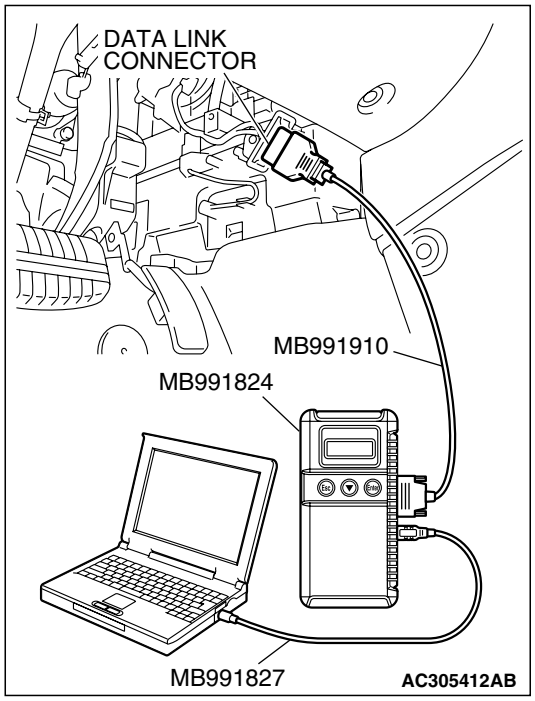
Check again if the DTC is set.

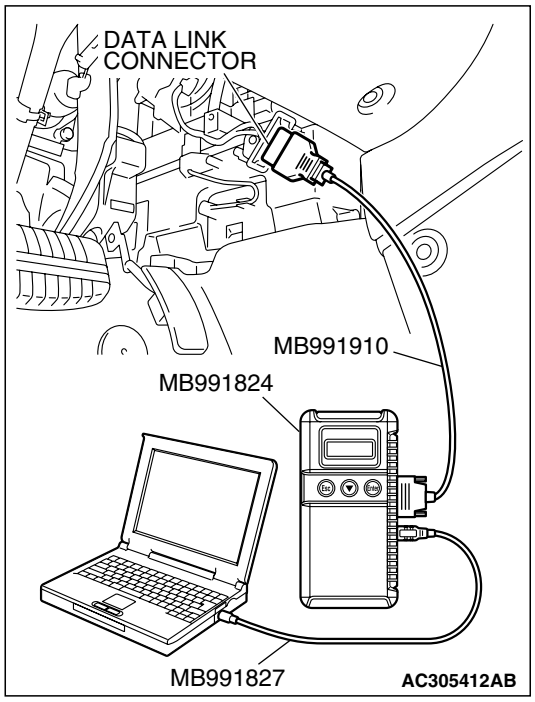
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1266, C1273 or C1274 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 8.

NO : 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.00-14.





STEP 8. Recheck for diagnostic trouble code.

Check again if the DTC is set.

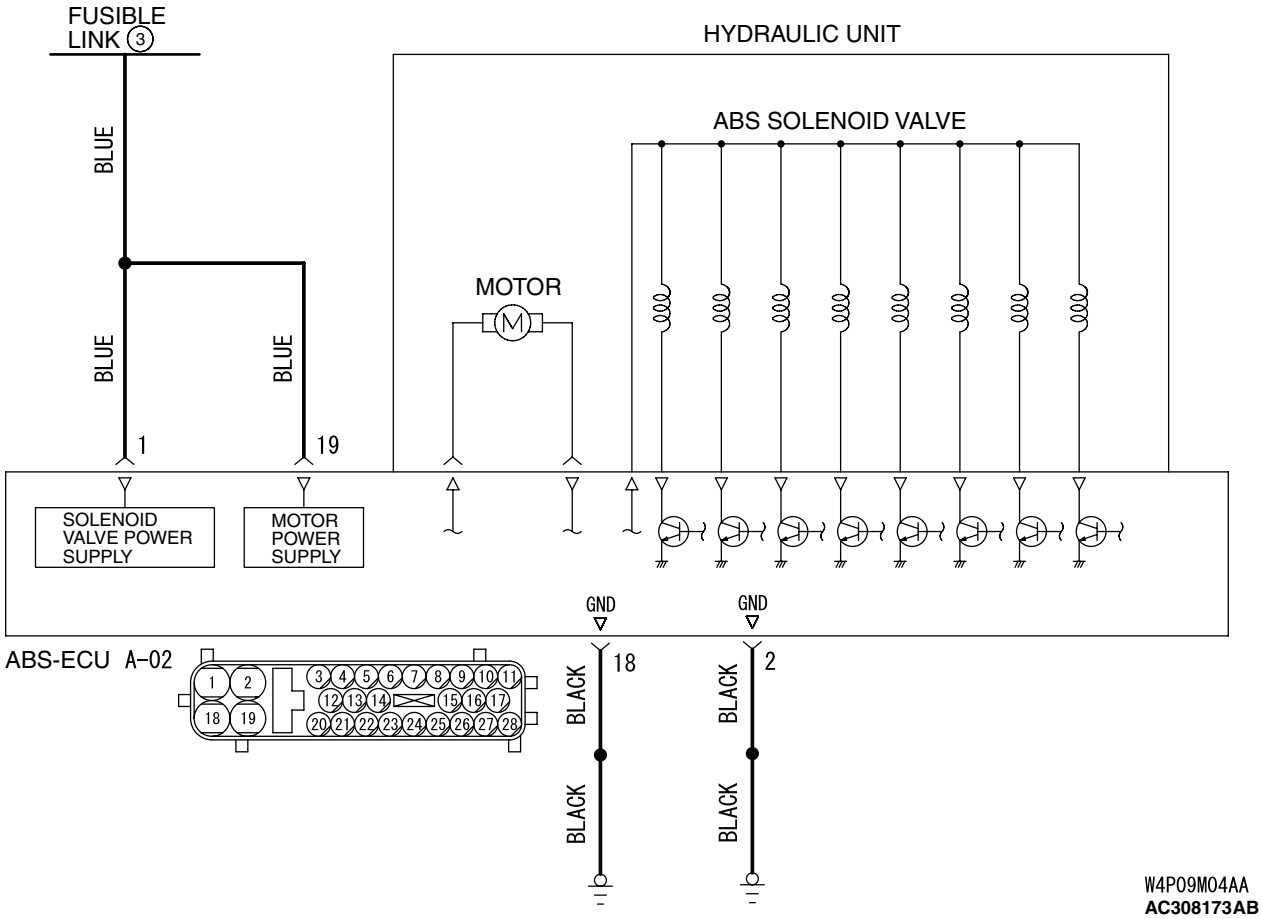
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

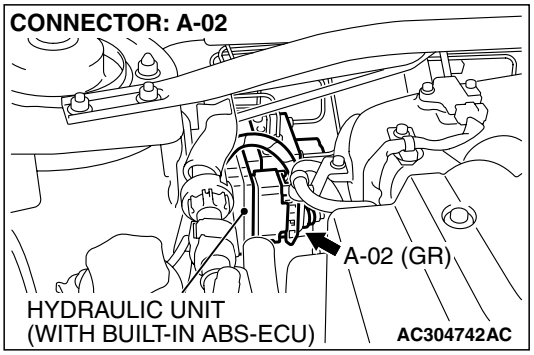
Q: Is DTC C1266, C1273 or C1274 set?

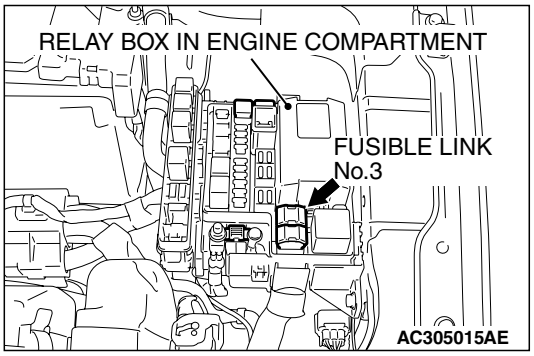
YES : Go to Step 1.
NO : The procedure is complete.

DTC C1278/C1279 Valve Relay System

Solenoid Valve and Motor Power Supply Circuit







⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines.

CIRCUIT OPERATION

- The ABS-ECU contains the power supply circuit (terminal 1) for the solenoid valve. The solenoid valve is energized by the valve relay, which is integrated in the ABS-ECU.
- The valve relay, which is integrated in the ABS-ECU, is always energizing the solenoid valve unless the initial check is in progress when the ignition switch is turned on.

ABS DTC SET CONDITIONS

These diagnostic trouble codes will be set under the cases below.

TSB Revision

DTC C1278 (Valve relay OFF failure)
- After the ABS-ECU turned on the valve relay, the solenoid valve is not energized (valve relay OFF failure).

DTC C1278 (Valve relay ON failure)
- After the ABS-ECU turned off the valve relay, the solenoid valve still remains energized (valve relay ON failure).

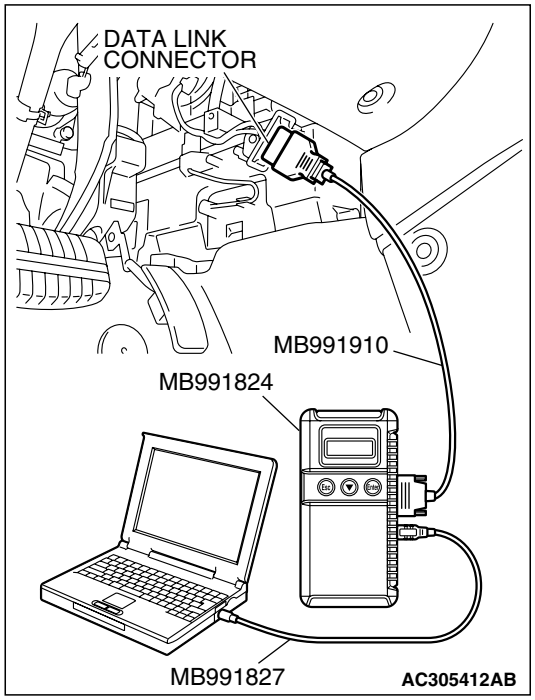
TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

Currect trouble
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

Past trouble
Carry out diagnosis with particular emphasis on connector(s) or wiring harness between the power supply circuit (terminal 1) to the ABS-ECU solenoid valve or ground circuit (terminal 2) . For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-16).

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991970: ABS Check Harness

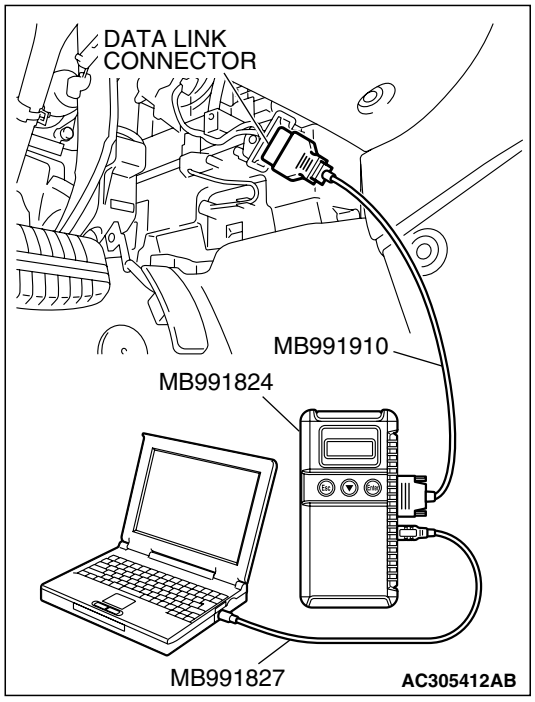


STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

⚠ 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) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54C, Diagnosis P.54C-16). Then go to Step 2.



STEP 2. Recheck for diagnostic trouble code.

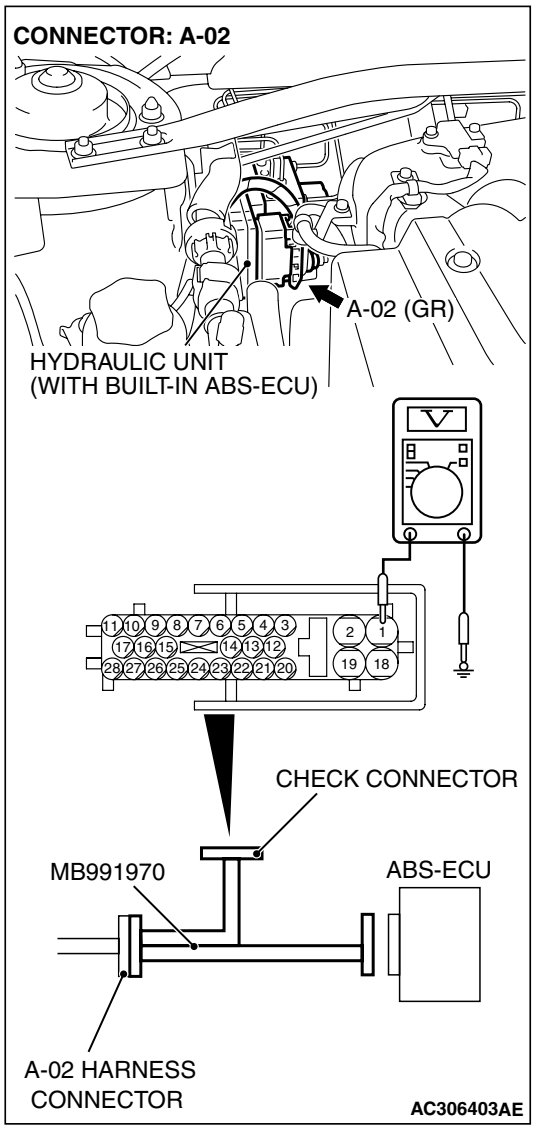
⚠ CAUTION

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) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1278 or C1279 set?

YES : Go to Step 3.
NO : The procedure is complete.



STEP 3. Measure the voltage at ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

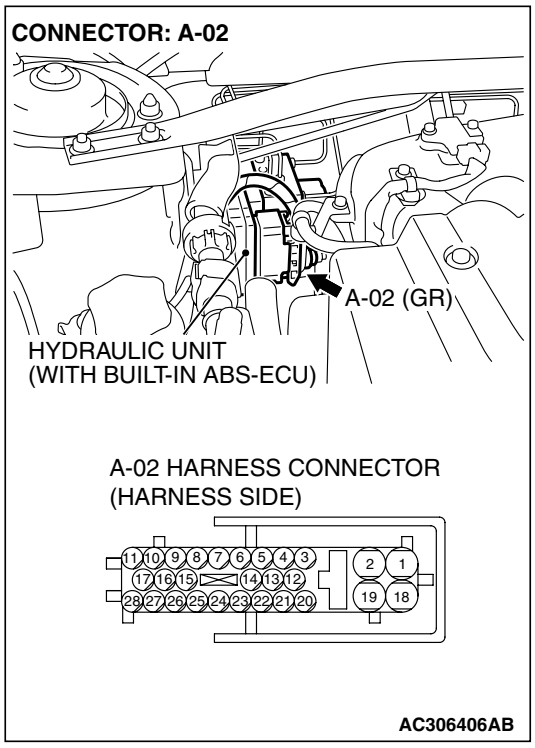
(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 1 and ground. It should be approximately 12 volts (battery positive voltage).

Q: Is the voltage approximately 12 volts (battery positive voltage)?

YES : Go to Step 5.

NO : Go to Step 4.

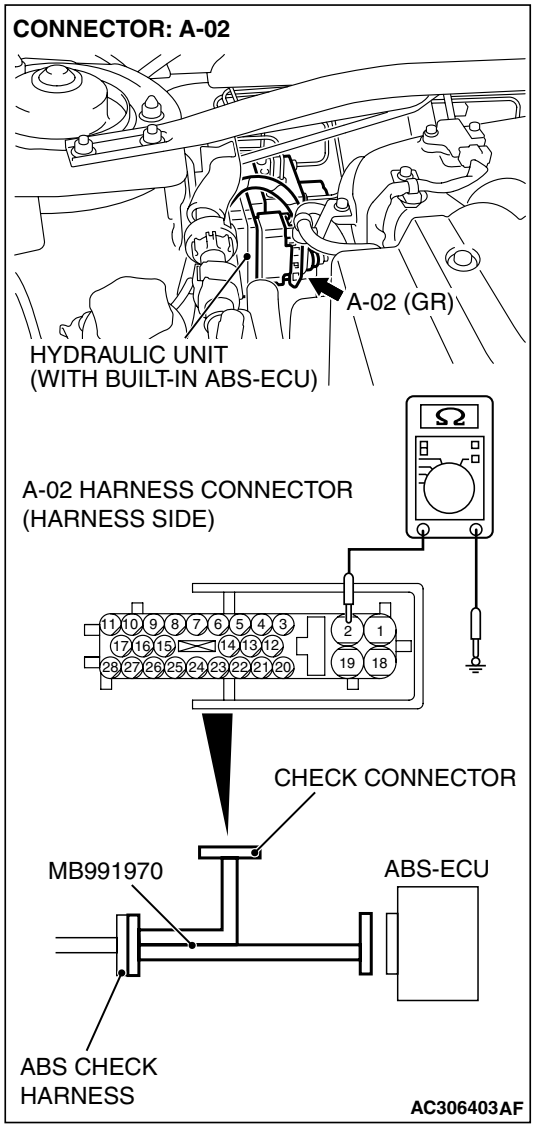


STEP 4. Check ABS-ECU connector A-02 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is ABS-ECU connector A-02 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

NO : An open or short circuit may be present in the solenoid valve power supply circuit. Repair the wiring harness between ABS-ECU connector A-02 terminal 1 and fusible link No.3. Then go to Step 8.



STEP 5. Measure the resistance at ABS-ECU connector A-02.

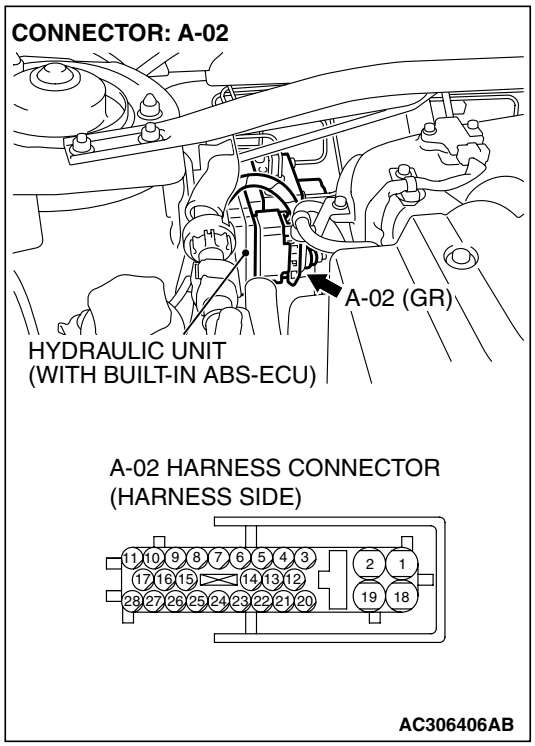
(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

(2) Measure the resistance between terminal 2 and ground. It should be 2 ohms or less.

Q: Is the measured resistance 2 ohms or less?

YES : Go to Step 7.
NO : Go to Step 6.

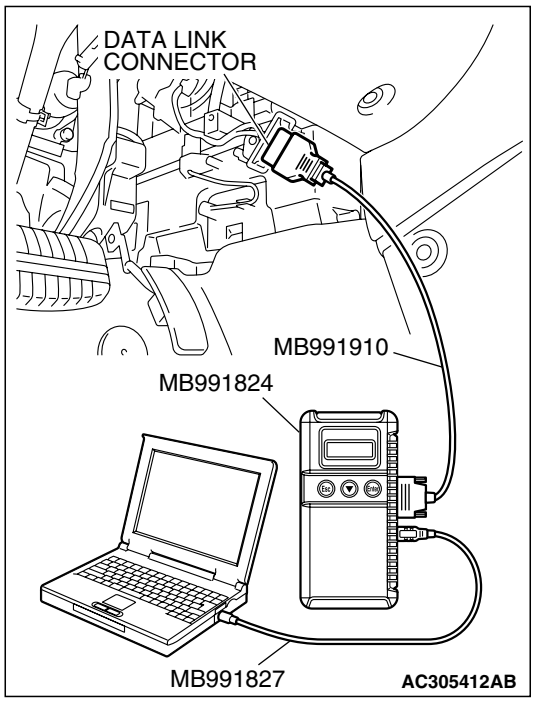


STEP 6. Check ABS-ECU connector A-02 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is ABS-ECU connector A-02 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

NO : An open circuit may be present in the ground circuit. Repair the wiring harness between ABS-ECU connector A-02 terminal 2 and the body ground. Then go to Step 8.



STEP 7. Recheck for diagnostic trouble code.

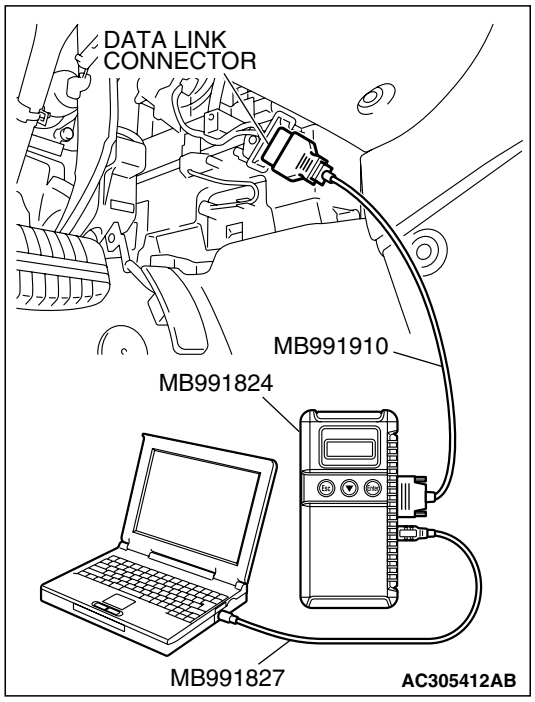
Check again if the DTC is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1278 or C1279 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 8.

NO : 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.00-14.



STEP 8. Recheck for diagnostic trouble code.

Check again if the DTC is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1278 or C1279 set?

YES : Go to Step 1.
NO : The procedure is complete.

DTC C1607: Trouble in ABS-ECU

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the CAN bus lines are normal.

ABS DTC SET CONDITIONS

The ABS-ECU always monitors itself while the system is working. If the ECU detects any faults, it will set this DTC.

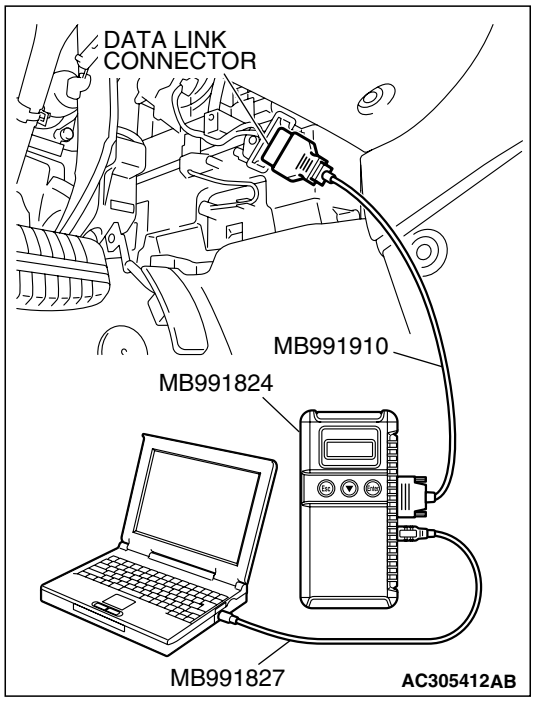
TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

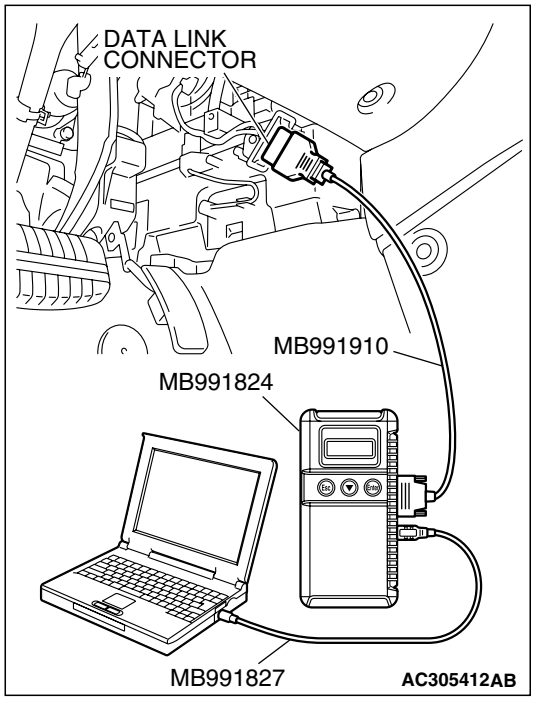
⚠ CAUTION

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) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C, Diagnosis P.54C-16). Then go to Step 2.



STEP 2. Recheck for diagnostic trouble code.

⚠ 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.

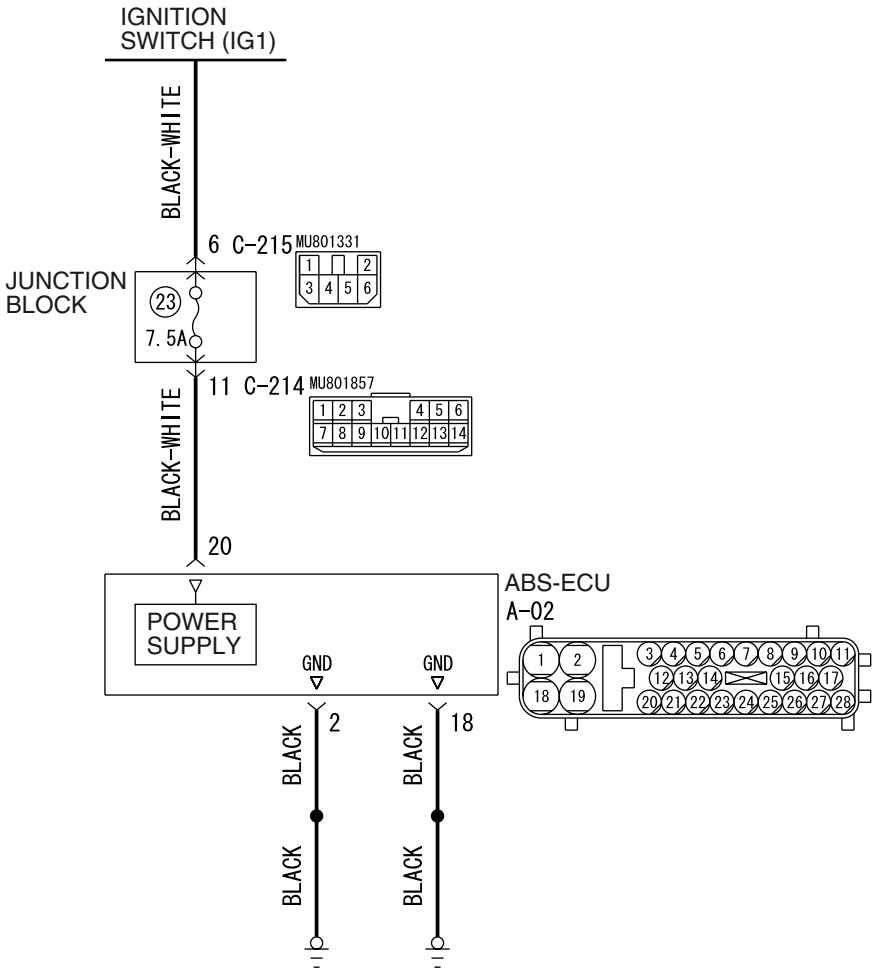
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1607 set?

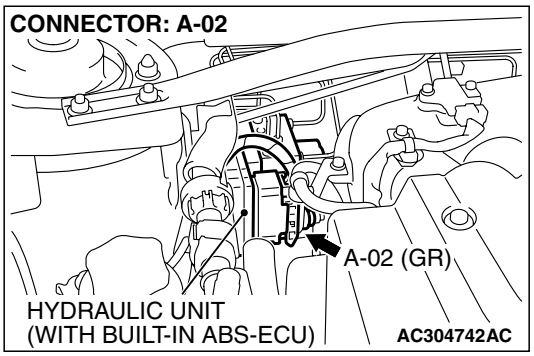
YES : Replace the hydraulic unit (integrated with ABS-ECU).
NO : The procedure is complete.

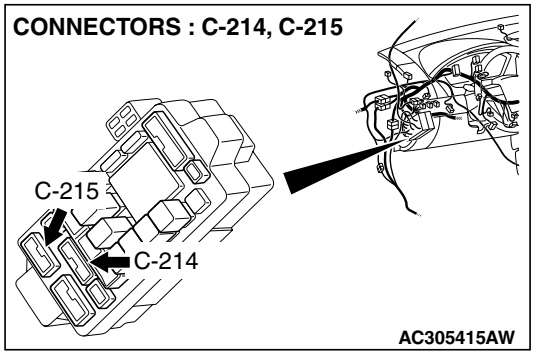
DTC C1860/C1861: Power supply system (abnormal decrease or increase in voltage)

ABS-ECU Power Supply and Ground Circuit



W4P35M00AA





⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines.

CIRCUIT OPERATION

The ABS-ECU is energized by the ignition switch (IG1) through multi-purpose fuse 23 and the ABS-ECU terminal 20.

TSB Revision

ABS DTC SET CONDITIONS

C1861 will be set when the power supply voltage to the ABS-ECU has decreased to a predetermined value or lower. C1860 will be set when the power supply voltage to the ABS-ECU has increased to a predetermined value or higher.

TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

Currect trouble

- Excessive electrical load
- Defective battery
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)
- Charging system failed

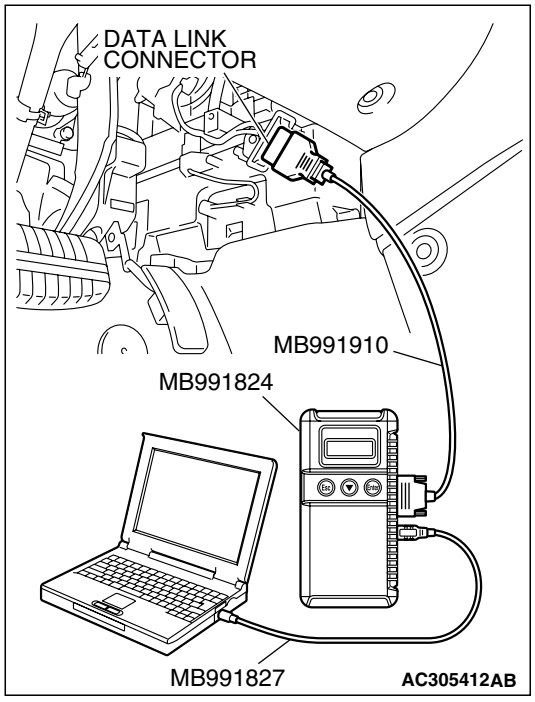
Past trouble

Carry out diagnosis with particular emphasis on connector(s) or wiring harness in the power supply circuit (terminal 20) to the ABS-ECU. For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points P.00-16).

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991970: ABS Check Harness



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

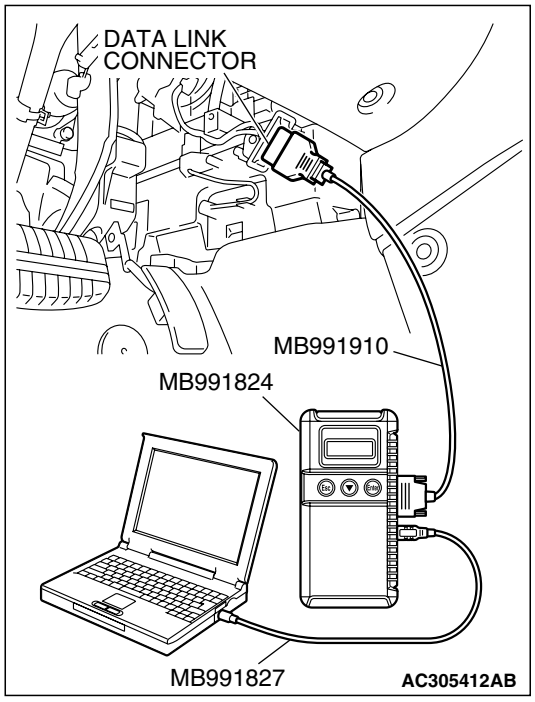
⚠ CAUTION

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) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54C, Diagnosis P.54C-16). Then go to Step 2.



STEP 2. Recheck for diagnostic trouble code.

⚠ 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) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1860 or C1861 set?

YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Check the battery.

Check the battery (Refer to GROUP 54A, Battery test P.54A-7).

Q: Is the battery in good condition?

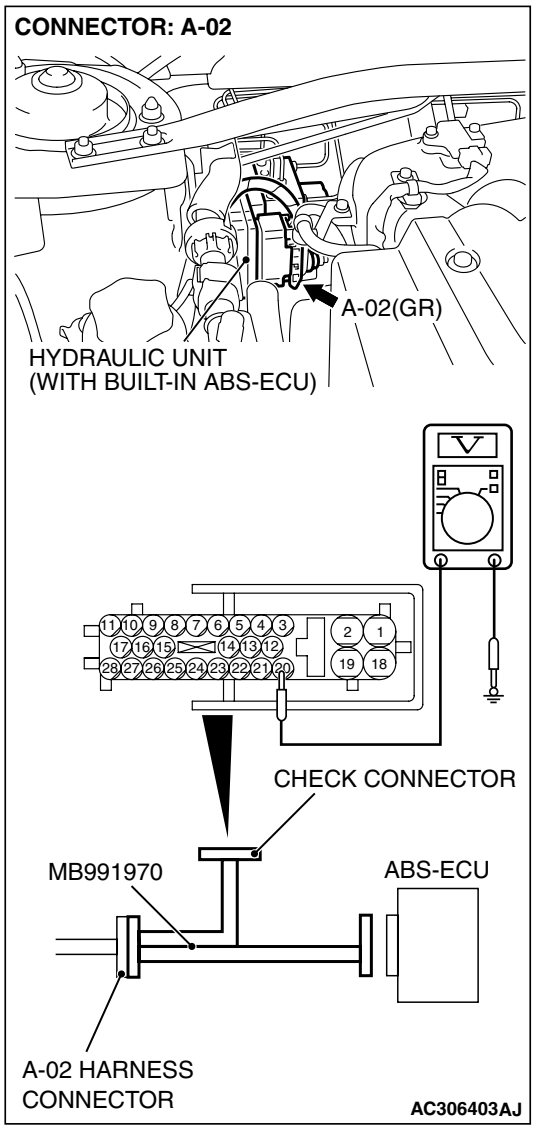
YES : Go to Step 4.
NO : Charge or replace the battery. Then go to Step 8.

STEP 4. Check the charging system.

Check the charging system (Refer to GROUP 16, Charging system diagnosis P.16-3).

Q: Is the charging system in good condition?

YES : Go to Step 5.
NO : Repair or replace the charging system component(s). Then go to Step 8.



STEP 5. Measure the voltage at ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

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

(3) Measure the voltage between terminal 20 and ground. It should be approximately 12 volts (battery positive voltage).

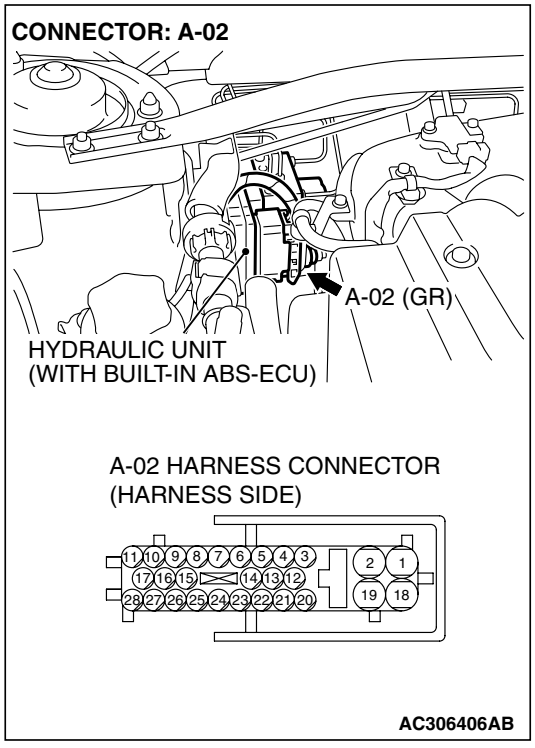
Q: Is the voltage approximately 12 volts (battery positive voltage)?

YES : Go to Step 7.

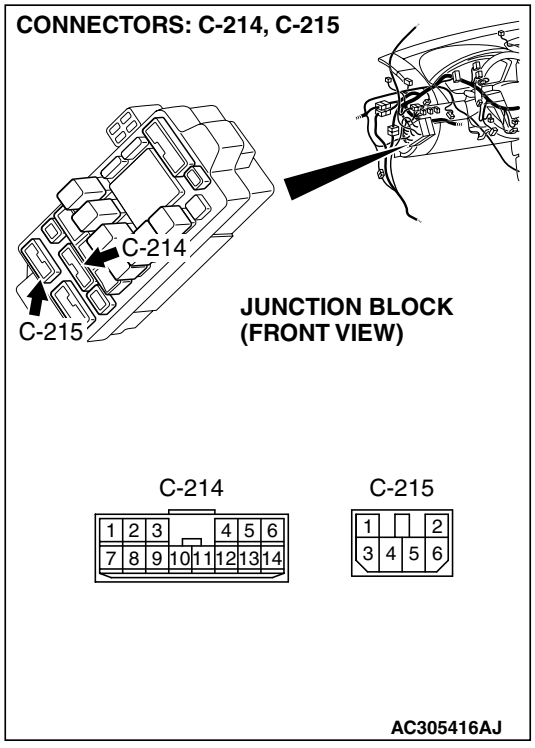
NO : Go to Step 6.

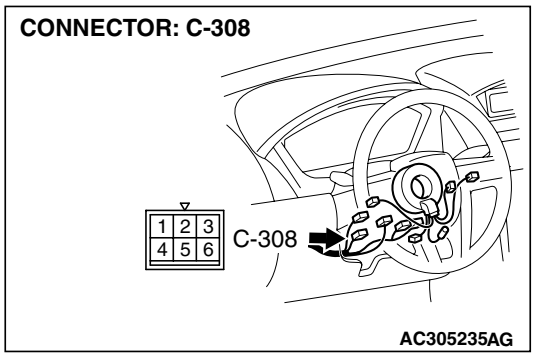
STEP 6. Check ABS-ECU connector A-02, junction block connectors C-214, C-215 and ignition switch connector C-318 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

- ABS-ECU connector A-02



- Junction block connectors C-214 and C-215



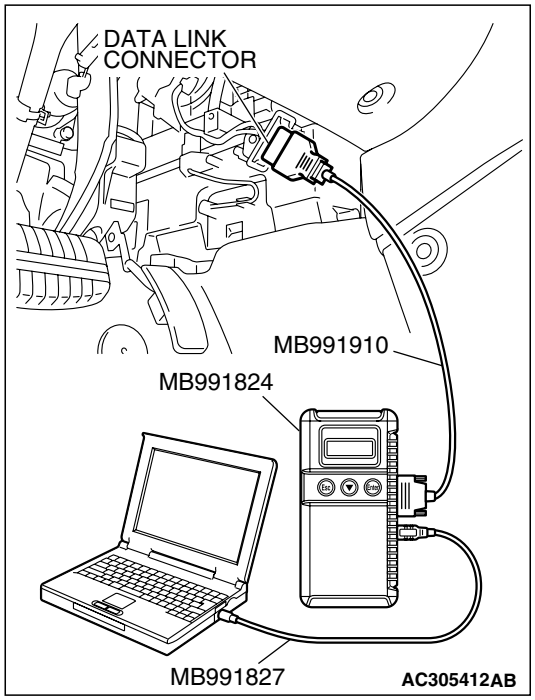


- Ignition switch connector C-308

Q: Are the connectors and terminals in good condition?

YES : An open or short circuit may be present in the power supply line to the ABS-ECU. Repair the wiring harness between ABS-ECU connector A-02 terminal 20 and ignition switch connector C-308 terminal 4. Go to Step 8.

NO : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 7. Recheck for diagnostic trouble code.

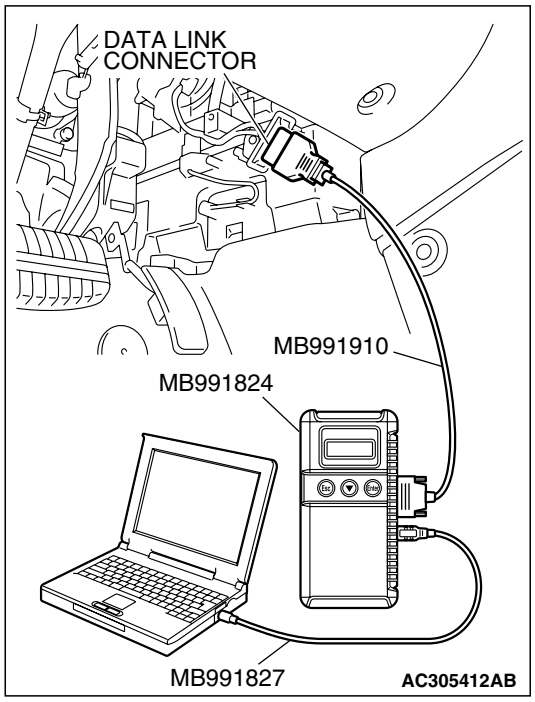
Check again if the DTC is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1860 or C1861 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 8.

NO : 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.00-14.



STEP 8. Recheck for diagnostic trouble code.

Check again if the DTC is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC C1860 or C1861 set?

YES : Go to Step 1.
NO : The procedure is complete.

DTC U1073: Bus off

⚠ CAUTION

- **If DTC U1073 is set in the ABS-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect DTC may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

TROUBLE JUDGMENT

This code is stored when the ABS-ECU has ceased the CAN communication (bus off). Then, if a penalty mode is entered after approximately five minutes, the regular data transmission from the ABS-ECU will be cancelled.

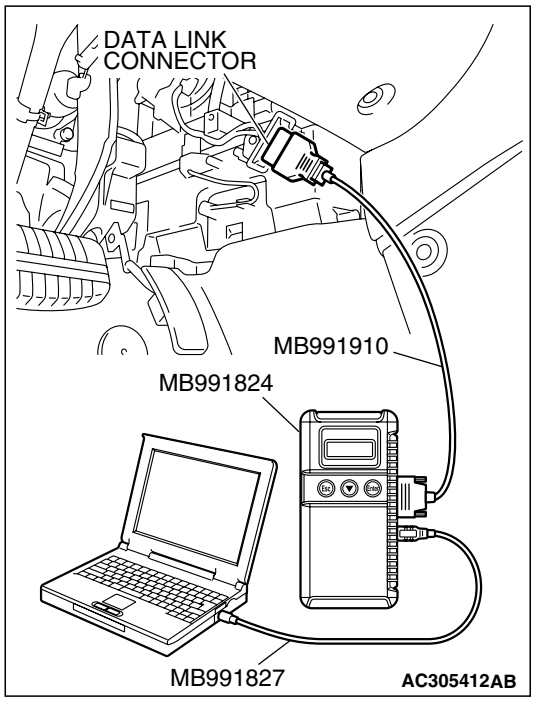
TROUBLESHOOTING HINTS (The most likely causes for these DTCs are to set are:)

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

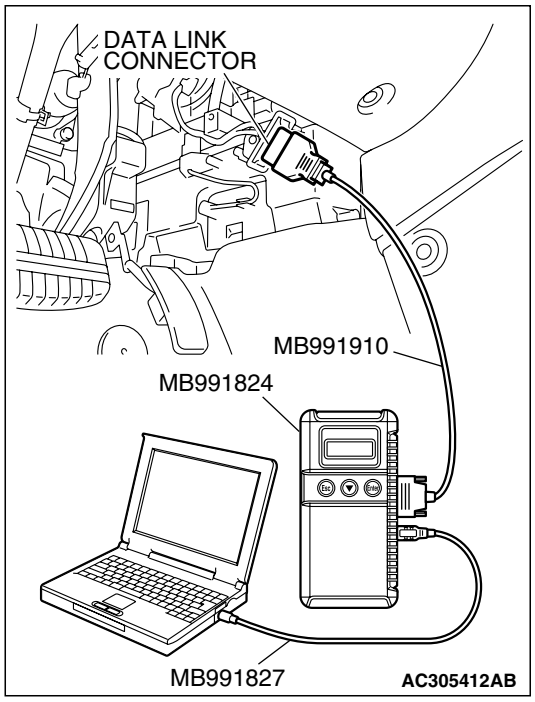
⚠ CAUTION

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) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line found to be normal?

YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C, Diagnosis P.54C-16). Then go to Step 2.

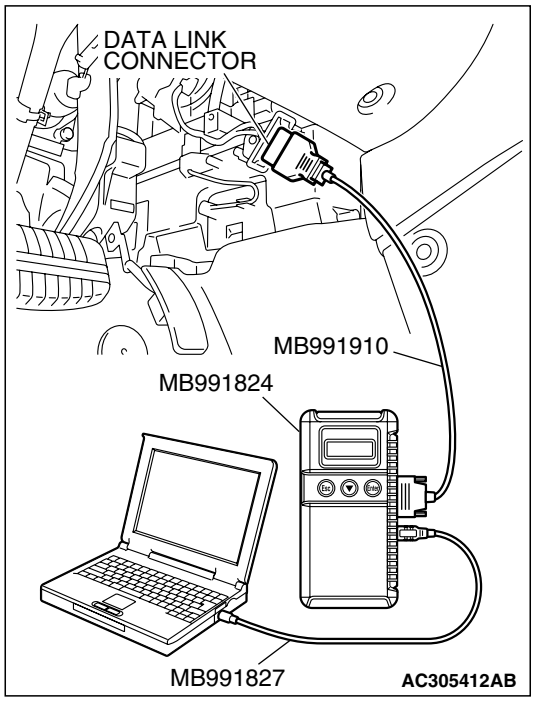


STEP 2. Recheck for diagnostic trouble code.

Check again if the DTC is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1073 set?

YES : Replace the ABS-ECU. Then go to Step 3.
NO : 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.00-14.



STEP 3. Recheck for diagnostic trouble code.
Check again if the DTC is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the DTC is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1073 set?

YES : Go to Step 1.
NO : The procedure is complete.

SYMPTOM CHART

M1352011400619

⚠ CAUTION
During diagnosis, a DTC code associated with another system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for DTC code(s). If DTC code(s) are set, erase them all.

NOTE: If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate although sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem occurred while driving under such conditions as these.

NOTE: During ABS operation, the brake pedal may vibrate a little or may not be able to be pressed. Such conditions are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking. This is normal.

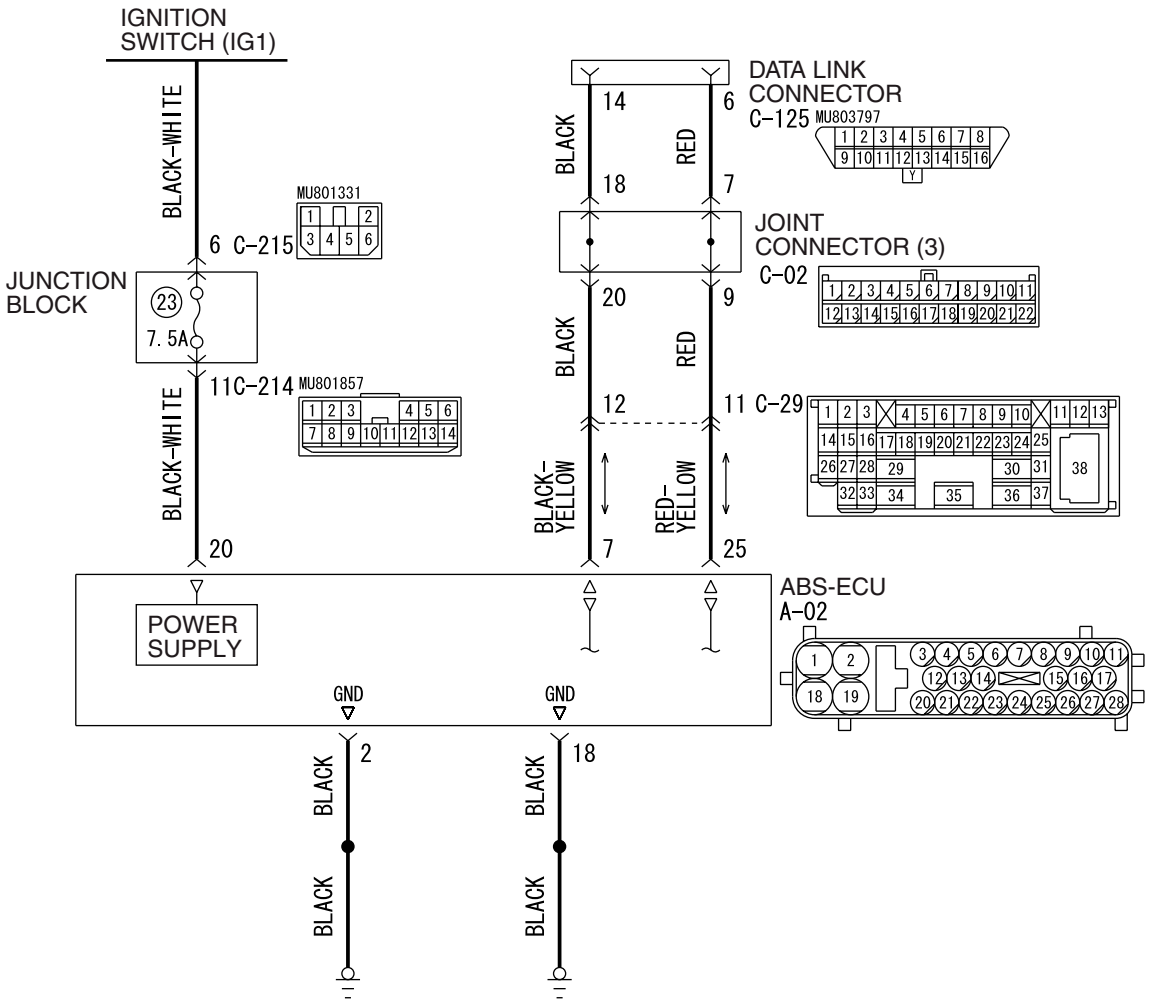
SYMPTOMS	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication between the scan tool and the ABS-ECU is not possible.	1	P.35B-73
Power supply circuit system	2	P.35B-75
When the ignition key is turned to "ON" (Engine stopped), the ABS warning light does not illuminate.	3	P.35B-81
The ABS warning light remains illuminated after the engine is started.	4	P.35B-81
Faulty ABS operation	5	P.35B-84

TSB Revision

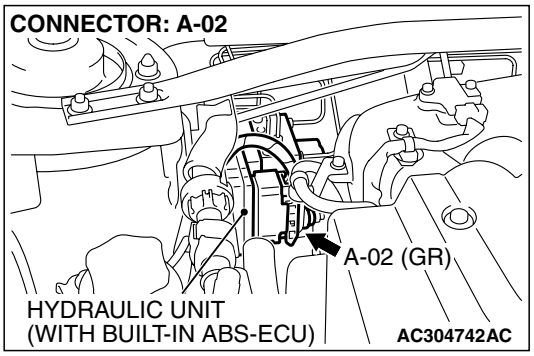
SYMPTOM PROCEDURES

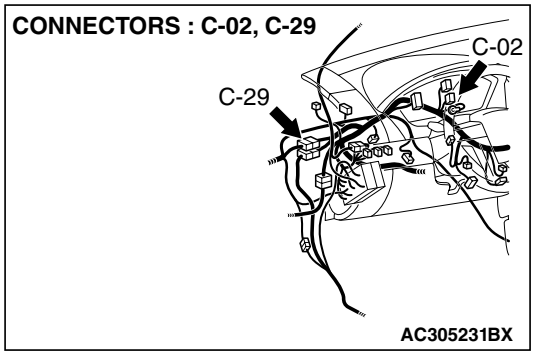
INSPECTION PROCEDURE 1: Communication between Scan Tool and the ABS-ECU is not possible.

Data Link Connector Circuit

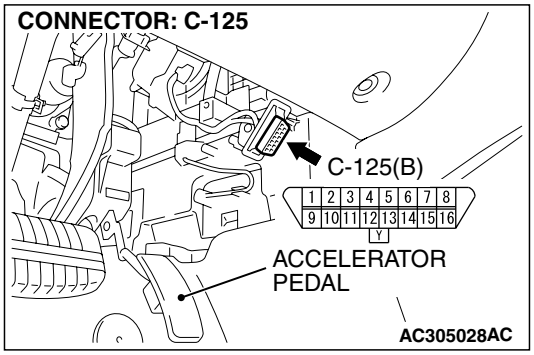


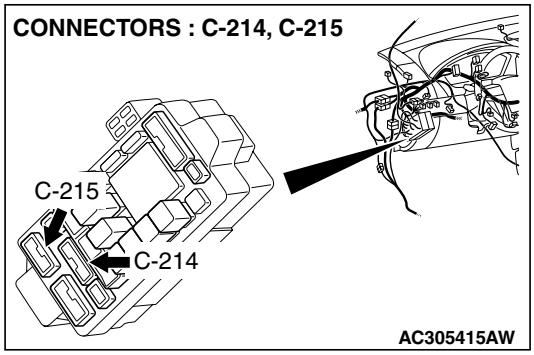
W4P35M01AA





TSB Revision





TECHNICAL DESCRIPTION (COMMENT)

If the scan tool (M.U.T.-III Sub Assembly) cannot communicate with the ABS system, the CAN bus lines may be defective. If the ABS system does not work, the ABS-ECU or its power supply circuit may be defective.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (Integrated with ABS-ECU)

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

⚠ 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.

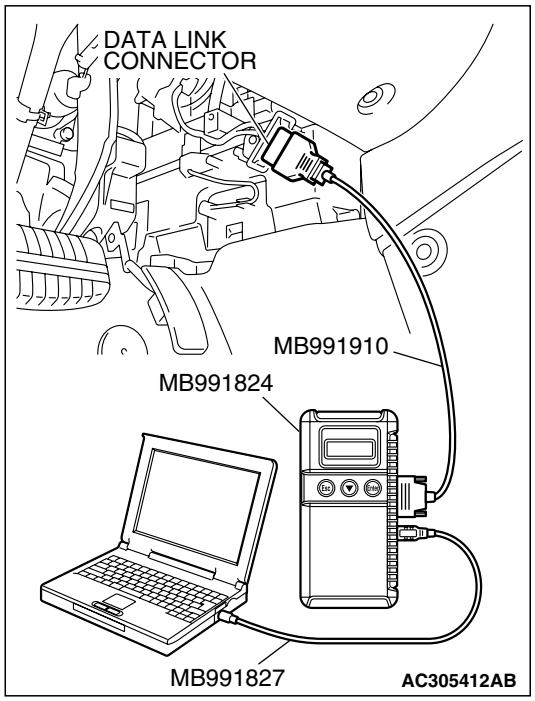
Use scan tool MB991958 to diagnose the CAN bus lines.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.

Q: Is the check result satisfactory?

YES : Check and repair the power supply circuit system (Refer to P.35B-75).

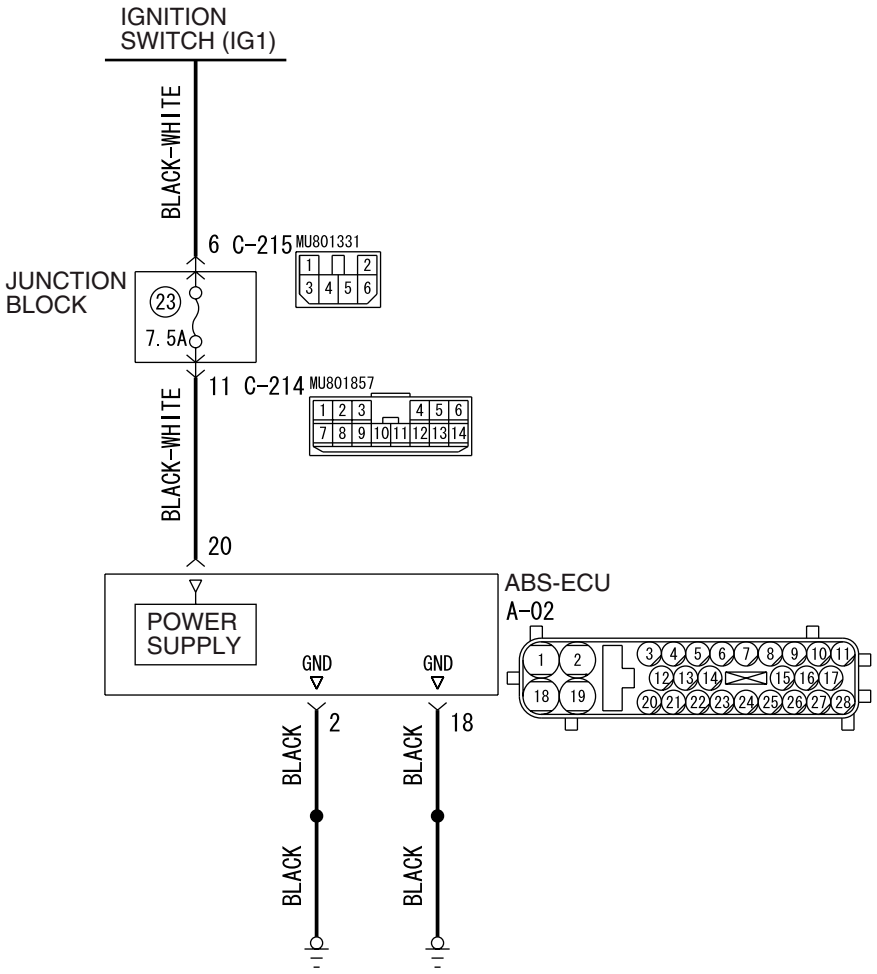
NO : Repair the CAN bus lines (Refer to GROUP 54C, Diagnosis-CAN Bus Diagnostic Chart P.54C-16).



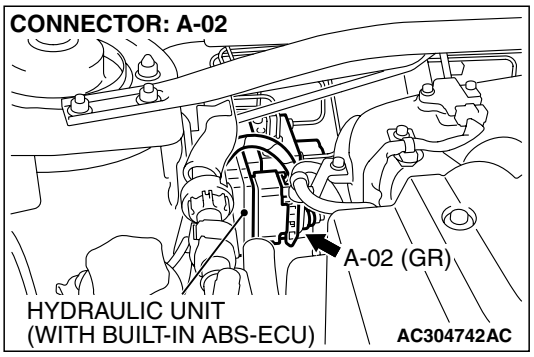
TSB Revision

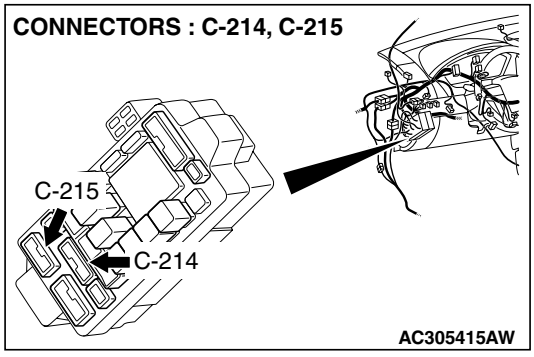
INSPECTION PROCEDURE 2: Power Supply Circuit System

ABS-ECU Power Supply and Ground Circuit



W4P35M00AA





CIRCUIT OPERATION

- The ABS-ECU is energized by the ignition switch (IG1) through multi-purpose fuse 23 and the ABS-ECU terminal 20.
- If the power supply to the ABS-ECU has failed, scan tool (M.U.T.-III Sub Assembly) will not be able to communicate with it.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

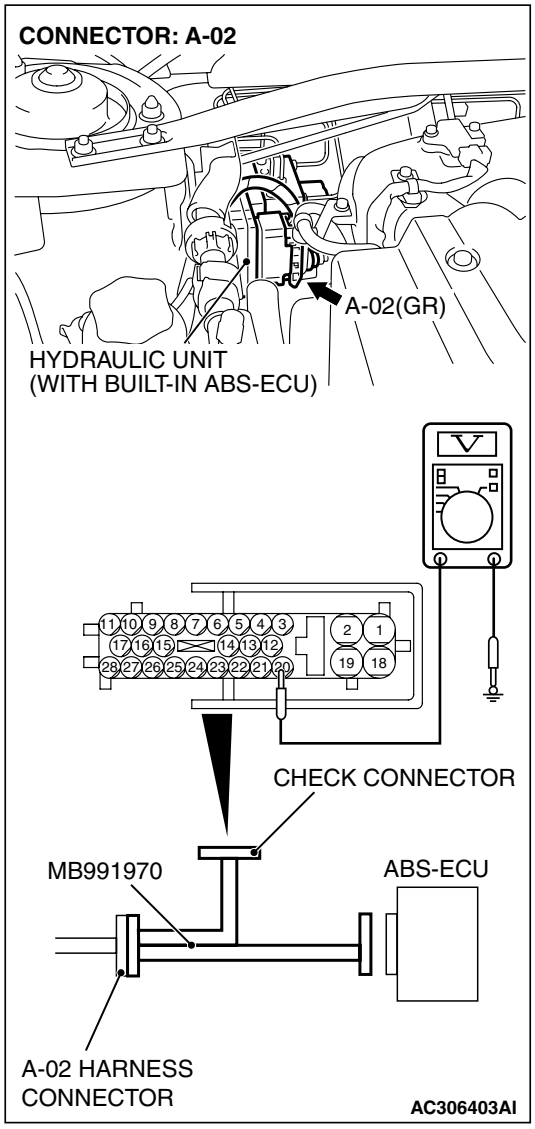
- Damaged wiring harness or connector
- Defective battery
- Charging system failed
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB991970: ABS Check Harness



STEP 1. Measure the voltage at ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

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

(3) Measure the voltage between terminal 20 and ground. It should measure approximately 12 volts (battery positive voltage).

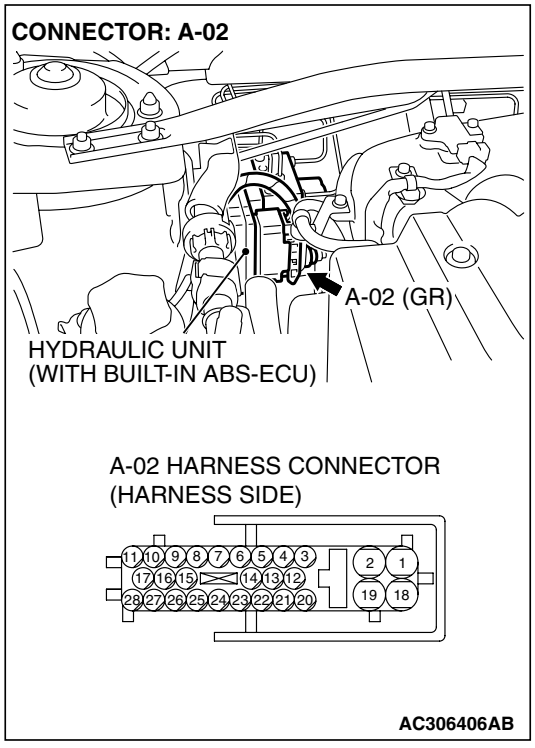
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 3.

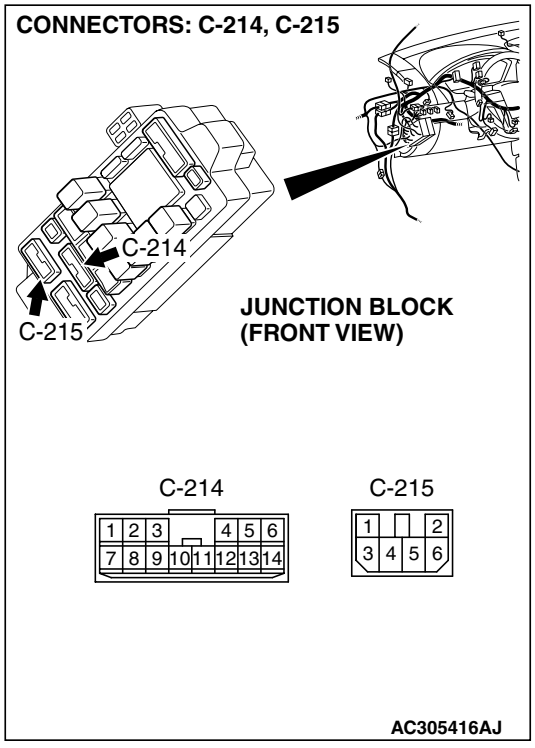
NO : Go to Step 2.

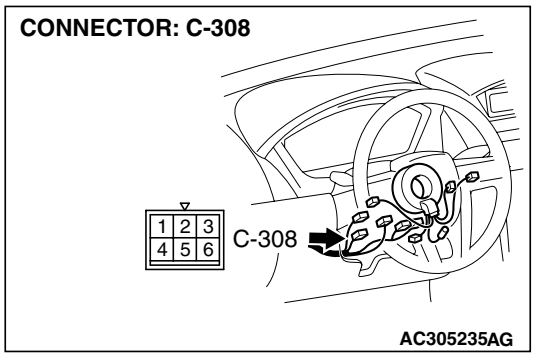
STEP 2. Check ABS-ECU connector A-02, junction block connectors C-214, C-215 and ignition switch connector C-308 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

- ABS-ECU connector A-02



- Junction block connectors C-214 and C-215



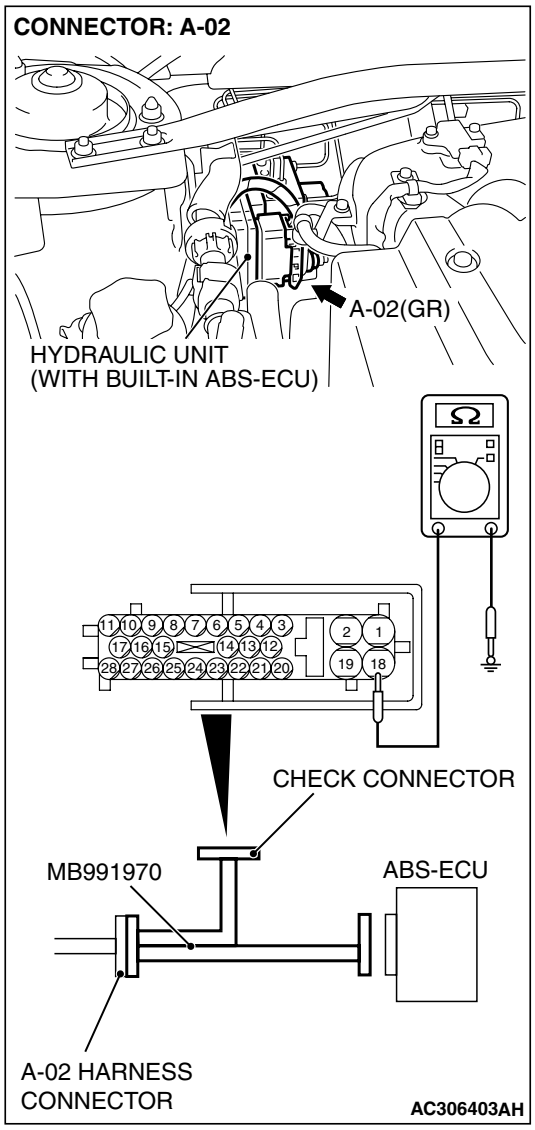


- Ignition switch connector C-308

Q: Are the connectors and terminals in good condition?

YES : An open or short circuit may be present in the power supply line to the ABS-ECU. Repair the wiring harness between ABS-ECU connector A-02 terminal 20 and ignition switch connector C-308 terminal 4. Then go to Step 8.

NO : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Measure the resistance at ABS-ECU connector A-02.

(1) Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

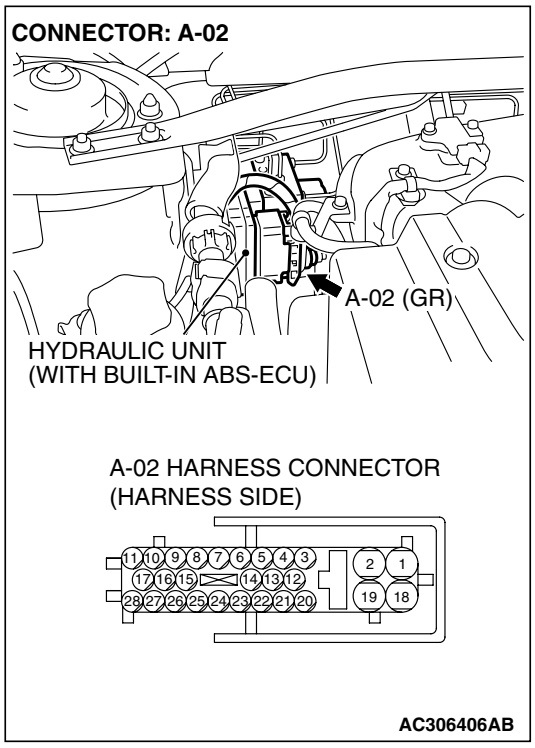
NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.

(2) Measure the resistance between terminal 2, 18 and ground. It should be 2 ohms or less.

Q: Is the measured resistance 2 ohms or less?

YES : Go to Step 5.

NO : Go to Step 4.



STEP 4. Check ABS-ECU connector A-02 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is ABS-ECU connector A-02 damaged?

YES : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

NO : An open circuit may be present in the ground circuit. Repair the wiring harness between ABS-ECU connector A-02 terminals 2, 18 and the body ground. Then go to Step 8.

STEP 5. Check the battery.

Check the battery (Refer to GROUP 54A, Battery test P.54A-7).

Q: Is the battery in good condition?

YES : Go to Step 6.

NO : Charge or replace the battery. Then go to Step 8.

STEP 6. Check the charging system.

Check the charging system (Refer to GROUP 16, Charging system diagnosis P.16-3).

Q: Is the charging system in good condition?

YES : Go to Step 7.

NO : Repair or replace the charging system component(s).Then go to Step 8.

STEP 7. Retest the system.

Q: Can the ABS-ECU communicate with the scan tool (M.U.T.-III Sub Assembly)?

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.00-14.

NO : Replace the ABS-ECU. Then go to Step 8.

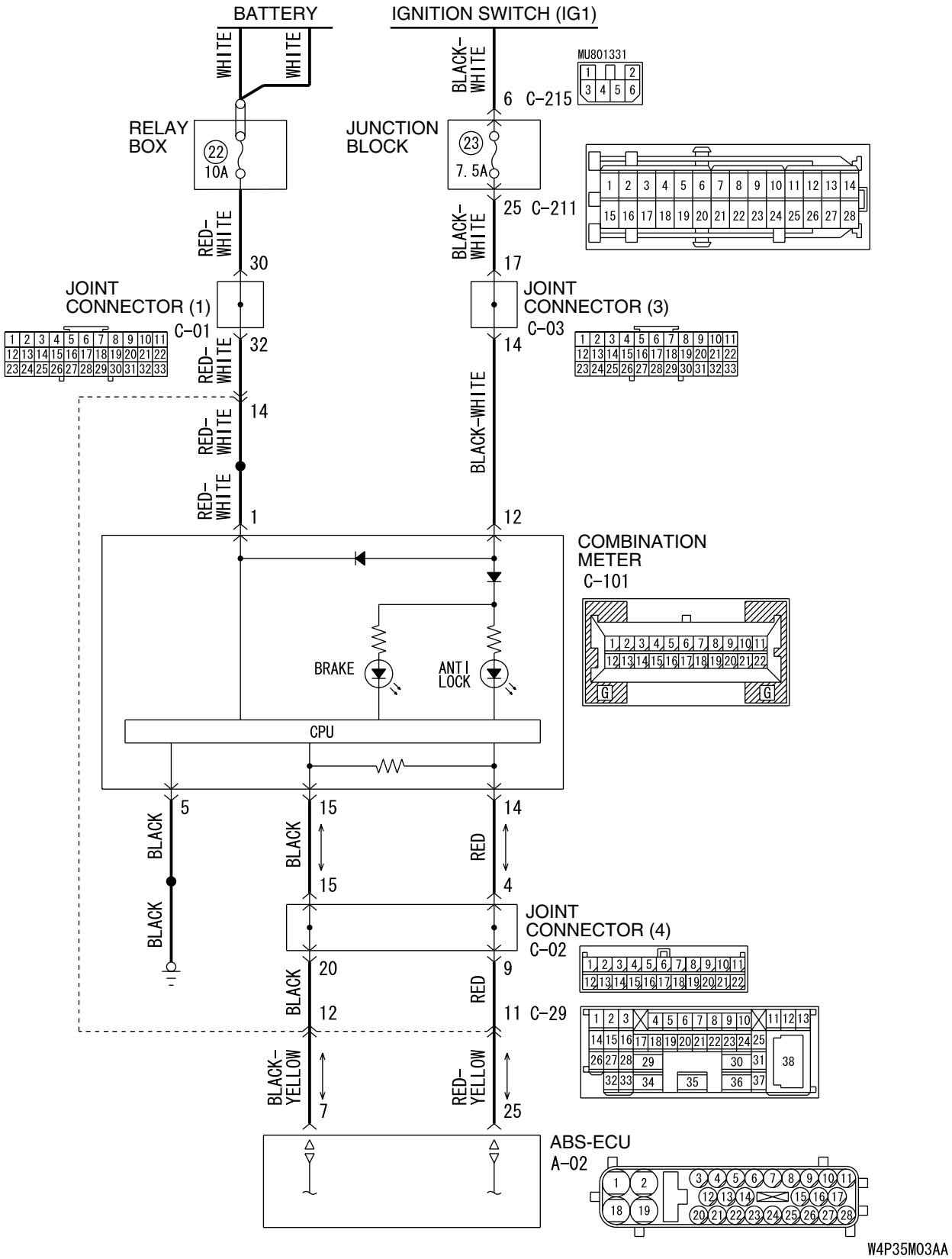
STEP 8. Retest the system.

Q: Can the ABS-ECU communicate with the scan tool (M.U.T.-III Sub Assembly)?

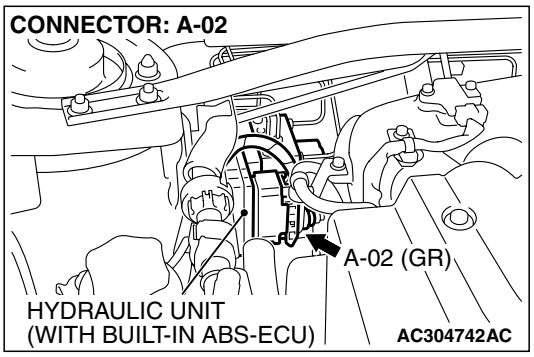
YES : The procedure is complete.

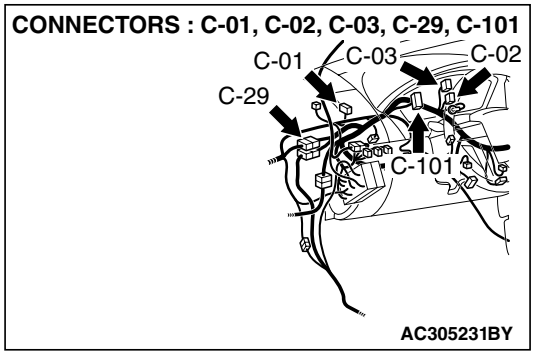
NO : Go to Step 1.

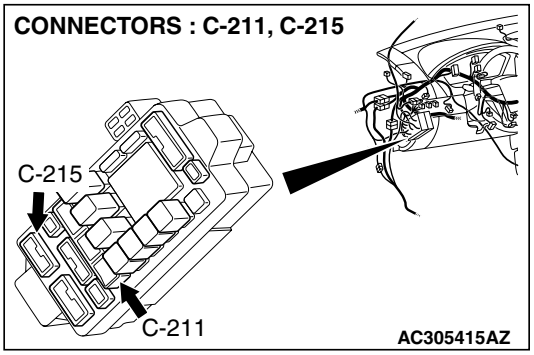
INSPECTION PROCEDURE 3: When the Ignition Key is Turned to "ON" (Engine Stopped), the BRAKE/ABS Warning Light does not Illuminate. INSPECTION PROCEDURE 4: The BRAKE/ABS Warning Light Remains Illuminated after the Engine is Started.



TSB Revision







TECHNICAL DESCRIPTION (COMMENT)

- The ABS-ECU sends the ABS warning light and the brake warning light signals to the combination meter via the CAN communication.
- This may be caused by faults in the CAN bus line, the combination meter, or the ABS-ECU.

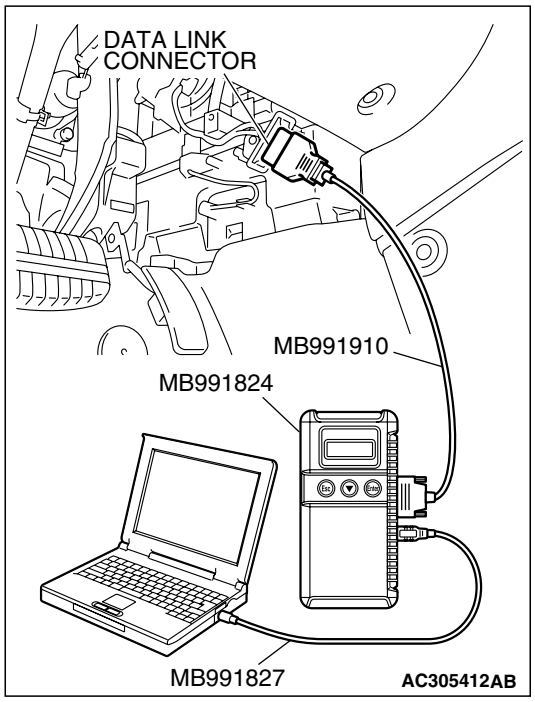
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Damaged wiring harness or connector
- Combination meter defective
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, diagnose the CAN bus line.

⚠ 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.

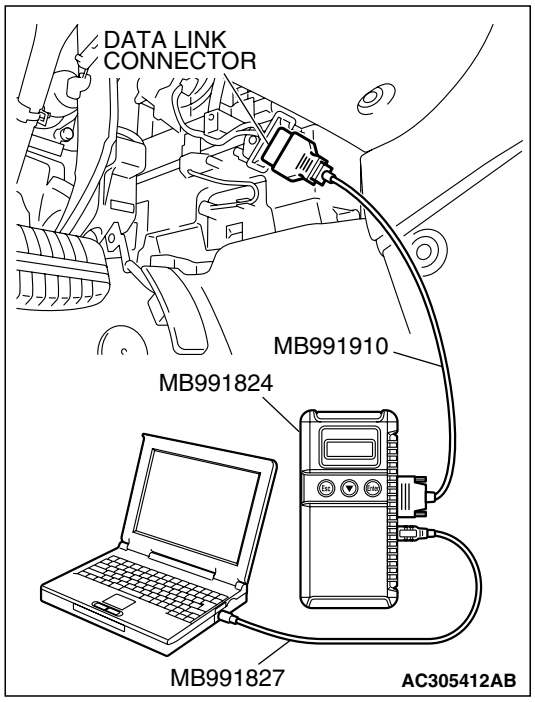
Use scan tool MB991958 to diagnose the CAN bus lines.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.

Q: Is the check result satisfactory?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C, Diagnosis-CAN Bus Diagnostic Chart P.54C-16). Repair the CAN bus lines, and then go to Step 2.



STEP 2. Using scan tool MB991958, read the combination meter diagnostic trouble code.

⚠ 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.

Use scan tool MB991958 to check whether combination meter DTC U1102 has been set.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check whether combination meter DTC U1102 has been set.

Q: Is combination meter DTC U1102 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU).

NO : Replace the combination meter.

INSPECTION PROCEDURE 5: Faulty ABS Operation

TECHNICAL DESCRIPTION (COMMENT)
The cause depends on driving and road surface conditions, so diagnosis may be difficult. However, if no diagnostic trouble code is displayed, carry out the following inspection.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the hydraulic unit

DIAGNOSIS

STEP 1. Hydraulic unit check
Refer to P.35B-92.

Q: Is the hydraulic unit normal?
YES : Go to Step 2.
NO : Connect the brake pipes correctly, repair the external brake lines, or replace the hydraulic unit.

STEP 2. Verify that the condition described by the customer exists.

Q: Can any faults be found with the brake operation?
YES : Check the brake system related components except the ABS system.
NO : The procedure is complete.

DATA LIST REFERENCE TABLE

M1352011500780

The following items can be read by the scan tool from the ABS-ECU input data.

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	CHECKING REQUIREMENTS	NORMAL VALUE
FR wheel speed sensor	01	Front-right wheel speed sensor	Drive the vehicle	Vehicle speeds displayed on the speedometer and scan tool are identical.
FL wheel speed sensor	02	Front-left wheel speed sensor		
RR wheel speed sensor	03	Rear-right wheel speed sensor		
RL wheel speed sensor	04	Rear-left wheel speed sensor		
Battery voltage	05	ABS-ECU power supply voltage	Ignition switch power supply voltage and valve monitor voltage	Battery positive voltage
Stop light switch	06	Stoplight switch	Depress the brake pedal.	ON
			Release the brake pedal.	OFF

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	CHECKING REQUIREMENTS	NORMAL VALUE
TCL mode	35	TCL operation	When the TCL outputs the operation permission signal during driving	ON
			When the TCL outputs the operation inhibition signal during driving	OFF
Under cranking	40	Engine cranking operation	When cranking an engine up	No
			When not cranking an engine up	Yes

ACTUATOR TEST REFERENCE TABLE

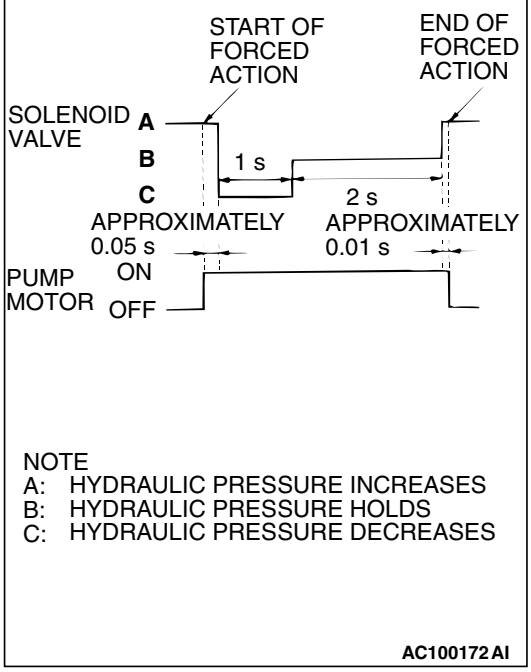
M1352011600765

The scan tool activates the following actuators for testing.

NOTE: If the ABS-ECU runs down, actuator testing cannot be carried out.

NOTE: Actuator testing is only possible when the vehicle is stationary.

ACTIVATION PATTERN



ACTUATOR TEST SPECIFICATIONS

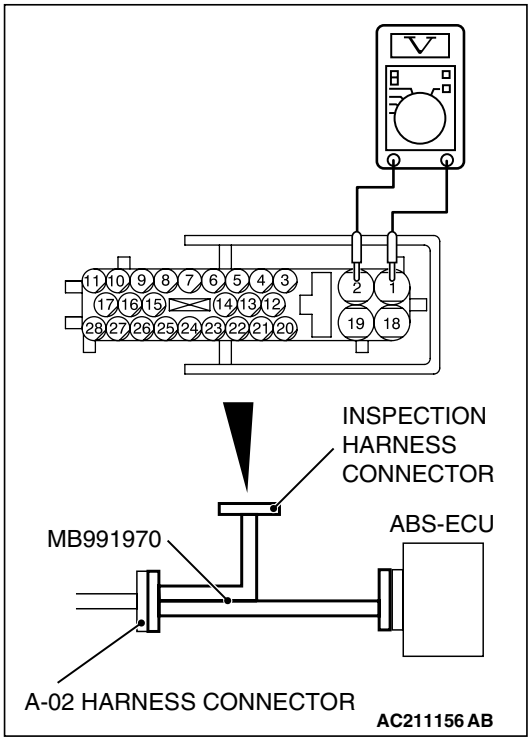
NO.	ITEM	PARTS TO BE ACTIVATED
01	FR wheel speed sensor	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	FL wheel speed sensor	
03	RR wheel speed sensor	
04	RL wheel speed sensor	
09	Engine TCL Drive	Outputs the engine torque control signal (engine torque = 0) to PCM for three seconds.

CHECK AT ABS-ECU

M1352011800769

TERMINAL VOLTAGE CHECK CHART

Required Special Tool:
MB991970: ABS Check Harness



1. Disconnect the ABS-ECU connector A-02, and then use special tool MB991970 to measure the voltages between terminals (2) and each terminal other than terminal (18). Also measure voltages between terminal (18) and each terminal other than terminal (2).

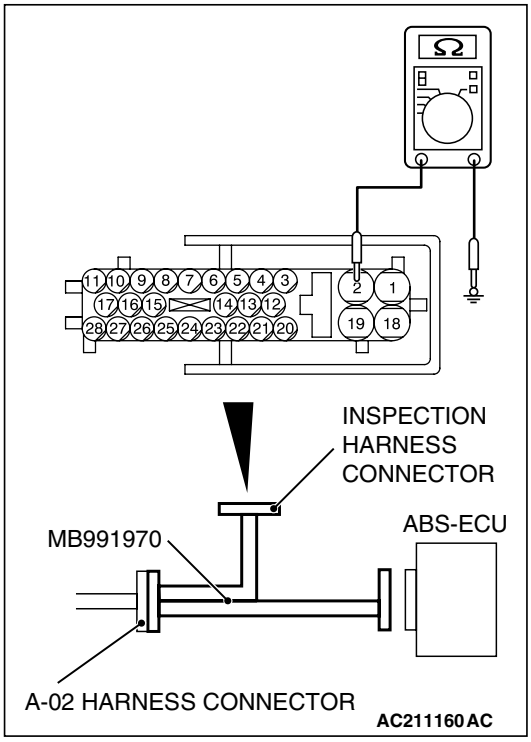
NOTE: Do not measure terminal voltage for approximately three seconds after the ignition switch is turned "ON." The ABS-ECU performs the initial check during that period.

2. The terminal layouts are shown in the illustrations below.

CONNECTOR TERMINAL NO	SIGNAL	CHECKING REQUIREMENT		NORMAL CONDITION
1	Solenoid valve power supply	Always		Battery positive voltage
3	Stop light switch input	Ignition switch: "ON"	Stop light switch: "ON"	Battery positive voltage
			Stop light switch: "OFF"	Approximately 0 V
19	Motor power supply	Always		Battery positive voltage
20	ABS-ECU power supply	Ignition switch: "ON"		Battery positive voltage
		Ignition switch: "START"		Approximately 0 V

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

Required Special Tool:
MB991970: ABS Check Harness

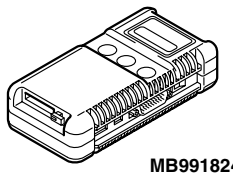
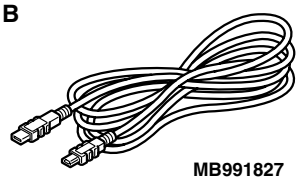
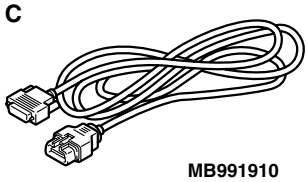
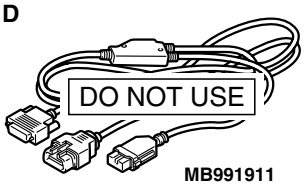
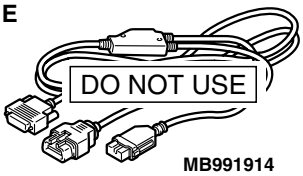
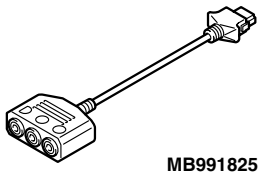
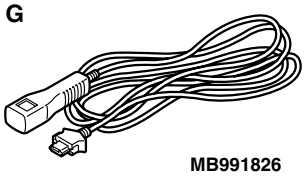
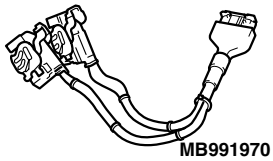


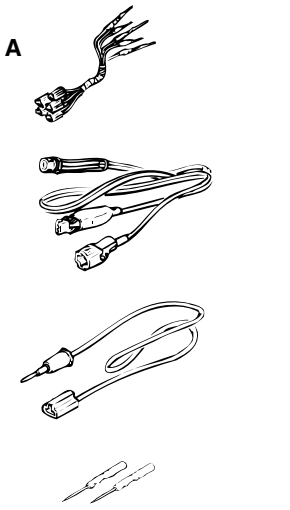
1. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the ABS-ECU connectors before checking resistance and continuity.
2. Check the resistance and continuity between the terminals indicated in the table below.
3. The terminal layout is shown in the illustration.

CONNECTOR TERMINAL NO.	SIGNAL	NORMAL CONDITION
9 – 10	Front-right wheel speed sensor	1.24 – 1.64 kΩ
11 – 17	Rear-right wheel speed sensor	1.24 – 1.64 kΩ
16 – 26	Front-left wheel speed sensor	1.24 – 1.64 kΩ
27 – 28	Rear-left wheel speed sensor	1.24 – 1.64 kΩ
2 – body ground	Ground	Less than 2 ohms
18 – body ground	Ground	Less than 2 ohms

SPECIAL TOOLS

M1352000600653

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III Sub Assembly A: Vehicle Communication Interface (V.C.I.) B: M.U.T.-III USB Cable C: M.U.T.-III Main Harness A (Vehicles with CAN communication system) D: M.U.T.-III Main Harness B (Vehicles without CAN communication system) E: M.U.T.-III Main Harness C (for Daimler Chrysler models only) F: M.U.T.-III Adapter Harness G: M.U.T.-III Trigger Harness	MB991824–KIT *NOTE: G: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.*	Checking diagnostic trouble codes **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**
 MB991970	MB991970 ABS check harness		ABS-ECU terminal voltage measurement

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991223AH	MB991223 Harness set A: MB991219 Inspection harness	General service tools	Wheel speed sensor output voltage measurement

ON-VEHICLE SERVICE

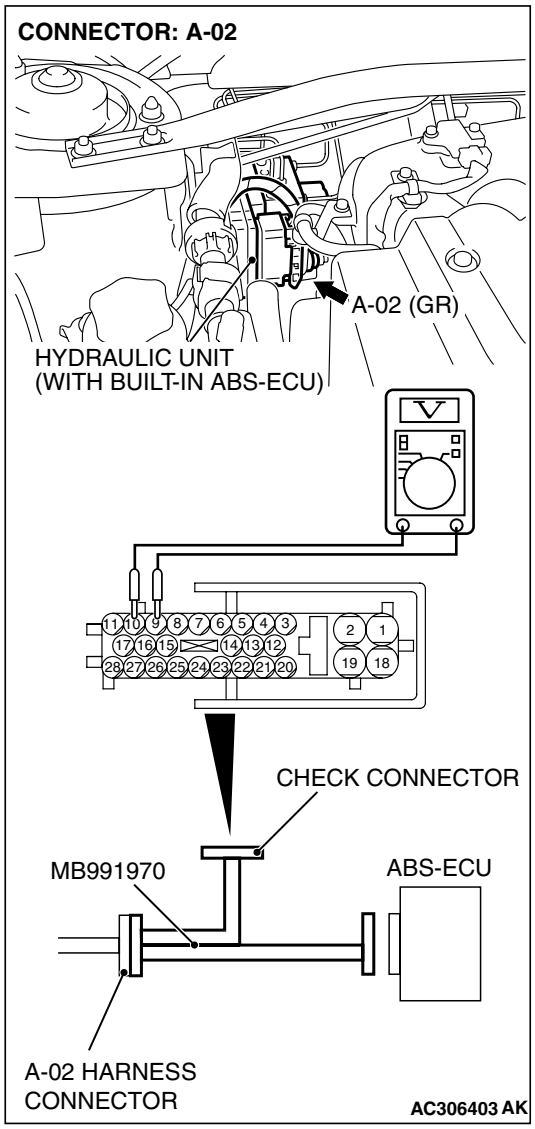
WHEEL SPEED SENSOR OUTPUT VOLTAGE MEASUREMENT

M1352001600667

Required Special Tool:
MB991970: ABS Check Harness

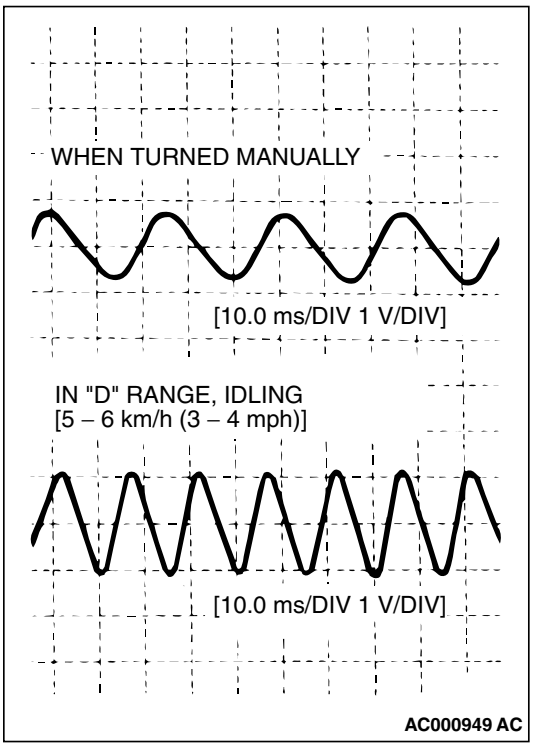
1. Release the parking brake and lift up the vehicle.
2. Disconnect the connector A-02, and connect special tool ABS Check Harness (MB991970) to the wiring harness-side connector.

   NOTE: Do not connect special tool ABS Check Harness (MB991970) to the ABS-ECU.
3. Turn the ignition switch to the "ON" position.



4. Measure the voltage between the relevant signal and ground terminals in the wheel speed sensor circuit and body ground.

TERMINAL NO.			
Front left	Front right	Rear left	Rear right
16	9	27	11
26	10	28	17



5. Manually turn the wheel to be measured 1/2 to 1 turn/second. Measure the output voltage with a voltmeter or oscilloscope.

   NOTE: Check the connection of the sensor harness and connector before using the oscilloscope.

Output voltage:
- Minimal voltmeter reading: 42 mV
- Maximum voltmeter reading: 300 mV
- Minimal oscilloscope reading: 120 mV
- Maximum oscilloscope reading: 600 mV

Probable causes of low output voltage
- Wheel speed sensor pole piece to wheel speed rotor clearance too large
- Faulty wheel speed sensor

6. To observe the waveform with an oscilloscope:
   - Front Wheels: Shift into "D" range and drive the wheels.
   - Rear Wheels: Turn the wheels manually at a constant speed

   NOTE: The output waveform is low when the wheel speed is low. Similarly, it will be higher as the wheel speed increases. Waveform may also be observed by driving the vehicle.

POINTS IN WAVEFORM MEASUREMENT

SYMPTOM	PROBABLE CAUSE	REMEDY
Too small or zero waveform amplitude	Faulty wheel speed sensor or excessive gap between it and the wheel speed rotor	Replace wheel speed sensor
Waveform amplitude fluctuates excessively (This is no problem if the minimum amplitude is 100 mV or more)	Axle hub eccentric or with large runout	Replace hub assembly
	Faulty ABS-ECU ground	Repair harness wires
Noisy or disturbed waveform	Open circuit in wheel speed sensor	Replace wheel speed sensor
	Open circuit in harness	Repair harness wire
	Incorrectly mounted wheel speed sensor	Mount wheel speed sensor correctly
	Wheel speed rotor with missing or damaged teeth	Replace wheel speed rotor

NOTE: The wheel speed sensor cable moves in relation to motion of the front or rear suspension. Therefore, it is likely that it has an open circuit only when driving on rough roads but it functions normally when driving on smooth roads. It is recommended to observe sensor output voltage waveform also under special conditions, such as driving on a rough road.

HYDRAULIC UNIT CHECK

M1352001700512

Required Special Tools:
- MB991958: M.U.T.-III Sub Assembly
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

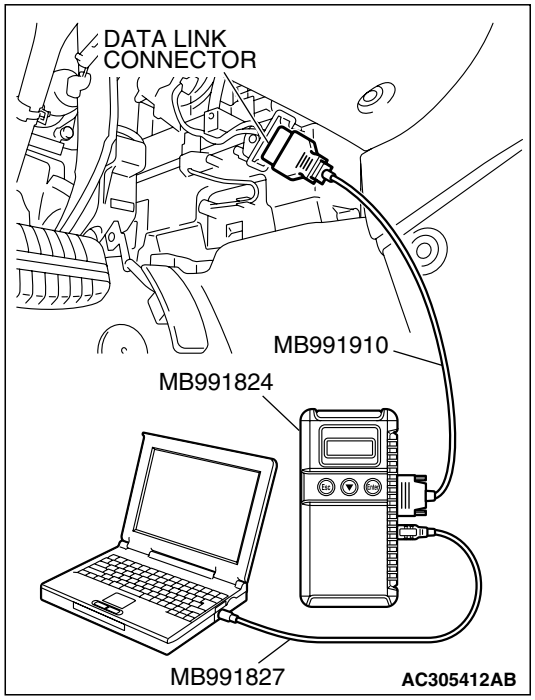
⚠ CAUTION

- **The roller of the braking force tester and the tire should be dry during testing.**
- **When testing the front brakes, apply the parking brake. When testing the rear brakes, stop the front wheels with chocks.**

1. Jack up the vehicle. Then support the vehicle with rigid racks at the specified jack-up points or place the front or rear wheels on the rollers of the braking force tester.
2. Release the parking brake, and feel the drag force (drag torque) on each road wheel. When using the braking force tester, take a reading of the brake drag force.

⚠ CAUTION

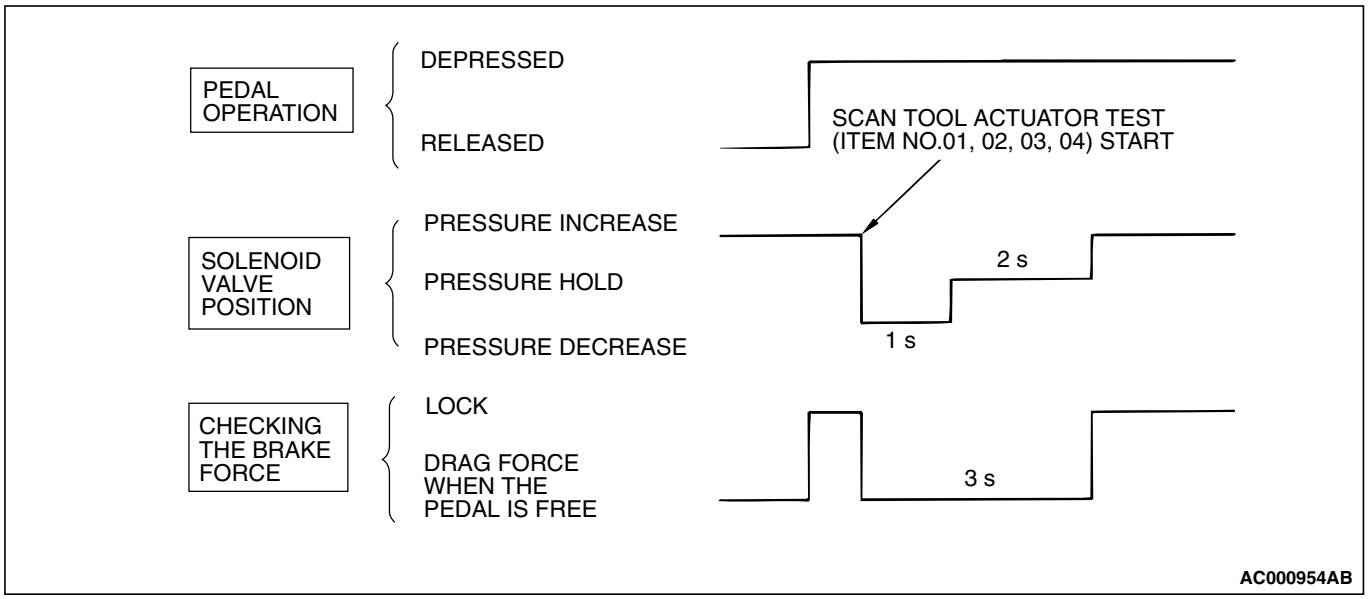
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



3. Connect scan tool MB991958 to the data link connector.
4. After checking that the selector lever is in "P" range, start the engine.
5. Select "Interactive Diagnosis" from the start-up screen.
6. Select "System Select."
7. Choose "ABS" from the "CHASSIS" tab.
8. Select "Actuator Test" from "ABS" screen
9. Choose an appropriate item for hydraulic unit check.

   NOTE: The ABS system will switch to the scan tool mode and the ABS warning light will illuminate.

   NOTE: When the ABS has been interrupted by the fail-safe function, scan tool MB991958 actuator testing cannot be used.



10. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed. When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check that the braking force changes to the brake drag force reading taken in step 2 when the actuator is force-driven. The result should be as shown in the diagram above.

Front wheel	785 – 981 N (176 – 220 lb.)
Rear wheel	588 – 784 N (132 – 176 lb.)

11. If the result of inspection is abnormal, repair according to the Diagnosis Table below.

DIAGNOSIS TABLE					
M.U.T.-III DISPLAY	**OPERATION**	**INSPECTION RESULT**	**JUDGMENT**	**PROBABLE CAUSE**	**REMEDY**
01 FR VALVE 02 FL VALVE 03 RR VALVE 04 RL VALVE	• Depress brake pedal to lock wheel. • Using scan tool MB991958, select the wheel to be checked and force the actuator to operate. • Turn the selected wheel manually to check the change of brake force.	Brake force is released for three seconds after wheels have been locked.	Normal	–	–
		Wheel does not lock when brake pedal is depressed.	Abnormal	Clogged brake line other than hydraulic unit	Check and clean brake line
				Clogged hydraulic circuit in hydraulic unit	Replace hydraulic unit assembly
		Brake force is not released	Abnormal	Incorrect hydraulic unit brake tube connection	Connect correctly
				Hydraulic unit solenoid valve not functioning correctly	Replace hydraulic unit assembly

12. After inspection, disconnect scan tool MB991958 immediately after turning the ignition switch to the "LOCK" (OFF) position.

IN THE EVENT OF A DISCHARGED BATTERY

M1352003500547

⚠ ***WARNING***

If the ABS is not operating, the vehicle will be unstable during braking, Do not drive the vehicle with the ABS-ECU connector disconnected or with the ABS not operating.

If the engine is started using a booster cable when the battery is completely flat, and the vehicle is then driven without waiting for the battery to be recharged, the engine may misfire and it may not be possible to drive the vehicle. This is because the ABS consumes a large amount of current when carrying out its initial checks. If this happens, recharge the battery fully.

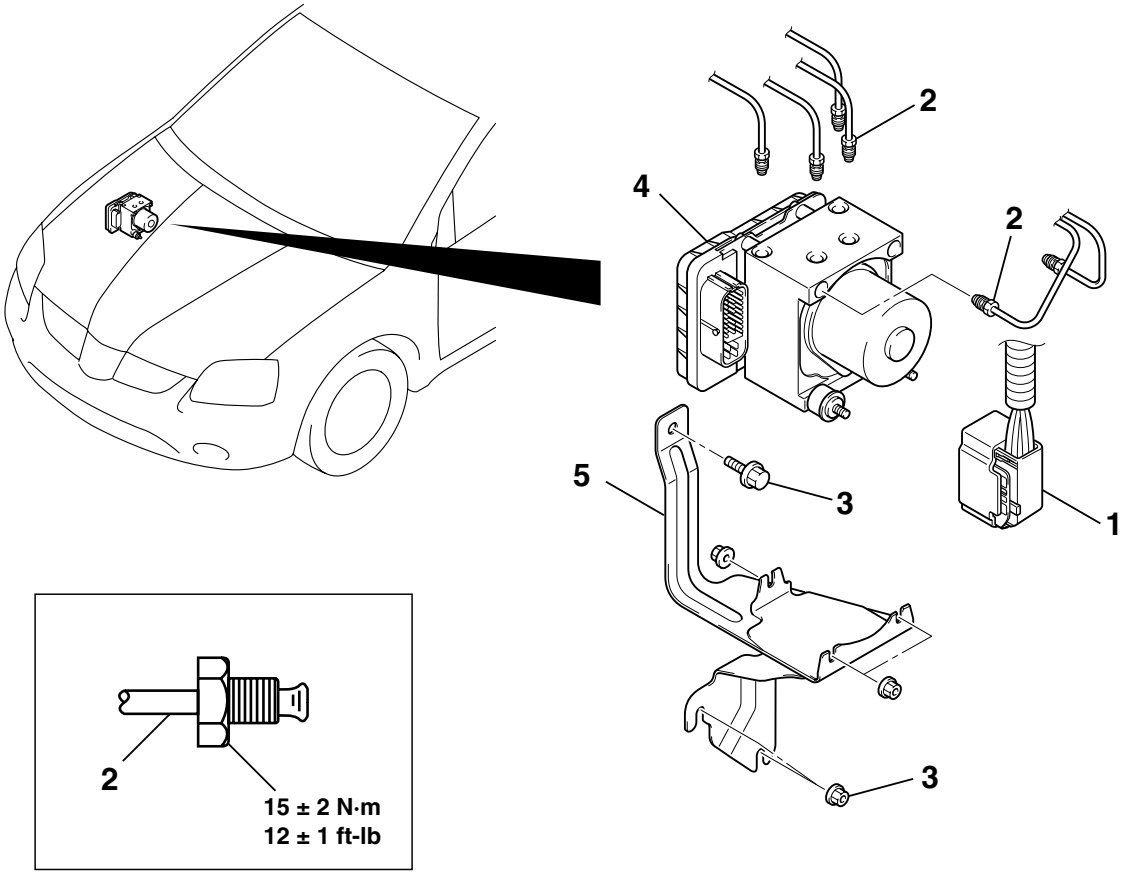
HYDRAULIC UNIT

REMOVAL AND INSTALLATION

M1352008600709

NOTE: The ABS-ECU or ABS/TCL-ECU is integrated in the hydraulic unit.

Pre-removal Operation	Post-installation Operation
• Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-11) <3.8L Engine (MIVEC)>. • Air Cleaner To Throttle Body Duct Removal (Refer to GROUP 15, Air Cleaner P.15-4) <3.8L Engine (MIVEC)>. • Intake Manifold Plenum Removal (Refer to GROUP 15, Intake Manifold Plenum P.15-8) <3.8L Engine (MIVEC)>. • Brake Fluid Draining	• Brake Fluid Filling • Brake Line Bleeding (Refer to GROUP 35A, On-vehicle Service – Bleeding P.35A-16). • Intake Manifold Plenum Installation (Refer to GROUP 15, Intake Manifold Plenum P.15-8) <3.8L Engine (MIVEC)>. • Hydraulic Unit Check (Refer to P.35B-92). • Air Cleaner To Throttle Body Duct Installation (Refer to GROUP 15, Air Cleaner P.15-4) <3.8L Engine (MIVEC)>. • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11) <3.8L Engine (MIVEC)>.



AC306183AB

REMOVAL STEPS

- ENGINE COVER <3.8L ENGINE (MIVEC)>
- POWER STEERING OIL RESERVOIR (REFER TO GROUP 37, POWER STEERING HOSES P.37-54). <3.8L ENGINE>
- HARNESS CONNECTORS AROUND THE ABS-ECU <3.8L ENGINE>
- HARNESS CLAMPS AROUND THE ABS-ECU <3.8L ENGINE>

REMOVAL STEPS (Continued)

- CONNECTOR BRACKETS AROUND THE ABS-ECU <3.8L ENGINE>

<<A>>
1. ABS-ECU HARNESS CONNECTOR

>>A<<
2. BRAKE TUBE CONNECTION

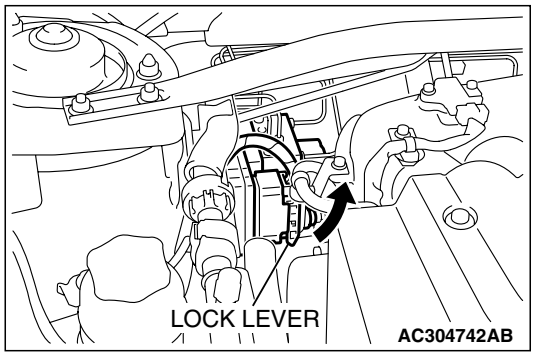
3. ABS EQUIPMENT BOLT AND NUTS

<<B>>
4. BRAKE MODULATOR HYDRAULIC UNIT <HYDRAULIC UNIT AND ABS-ECU OR ABS/TCL-ECU (3.8L ENGINE)>
5. BRAKE HYDRAULIC UNIT BRACKET

TSB Revision

REMOVAL SERVICE POINTS

<<A>> ABS-ECU HARNESS CONNECTOR DISCONNECTION



Move the lock lever of the ABS-ECU connector or ABS/TCL-ECU connector <3.8L Engine> as shown in the illustration, and then disconnect the harness connector.

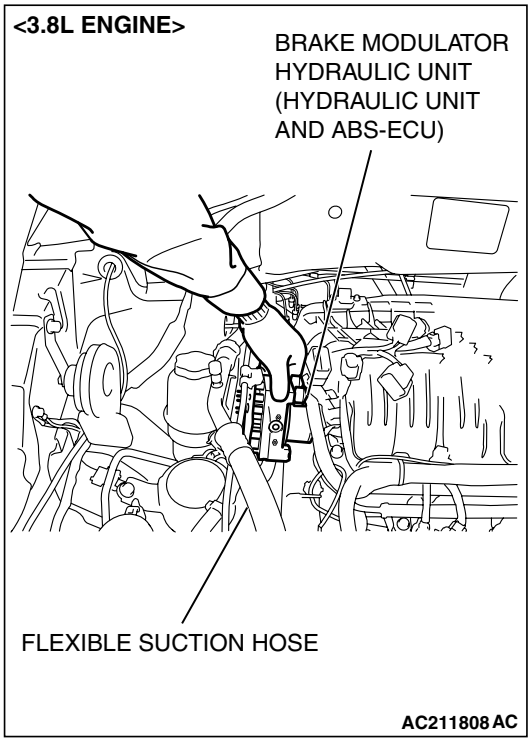
<<B>> BRAKE MODULATOR HYDRAULIC UNIT [HYDRAULIC UNIT AND ABS-ECU OR ABS/TCL-ECU <3.8L ENGINE>] REMOVAL

⚠ ***WARNING***

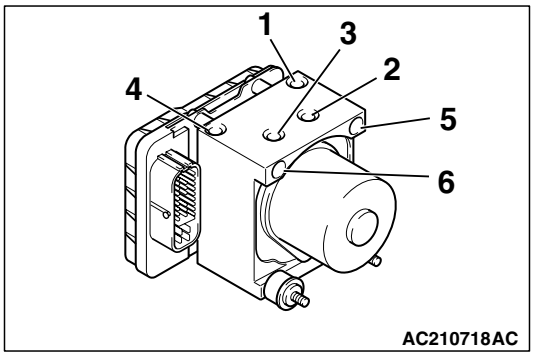
The hydraulic unit is heavy. Use care when removing it.

⚠ **CAUTION**

- **The hydraulic unit cannot be disassembled. Never loosen its nuts or bolts.**
- **Do not drop or shock the hydraulic unit.**
- **Do not turn the hydraulic unit upside down or lay it on its side.**



Remove the hydraulic unit as shown, taking care not to damage surrounding components such as the flexible suction hose <3.8L engine>.



INSTALLATION SERVICE POINT

>>A<< BRAKE TUBE CONNECTION

Connect the tubes to the hydraulic unit assembly as shown in the illustration.

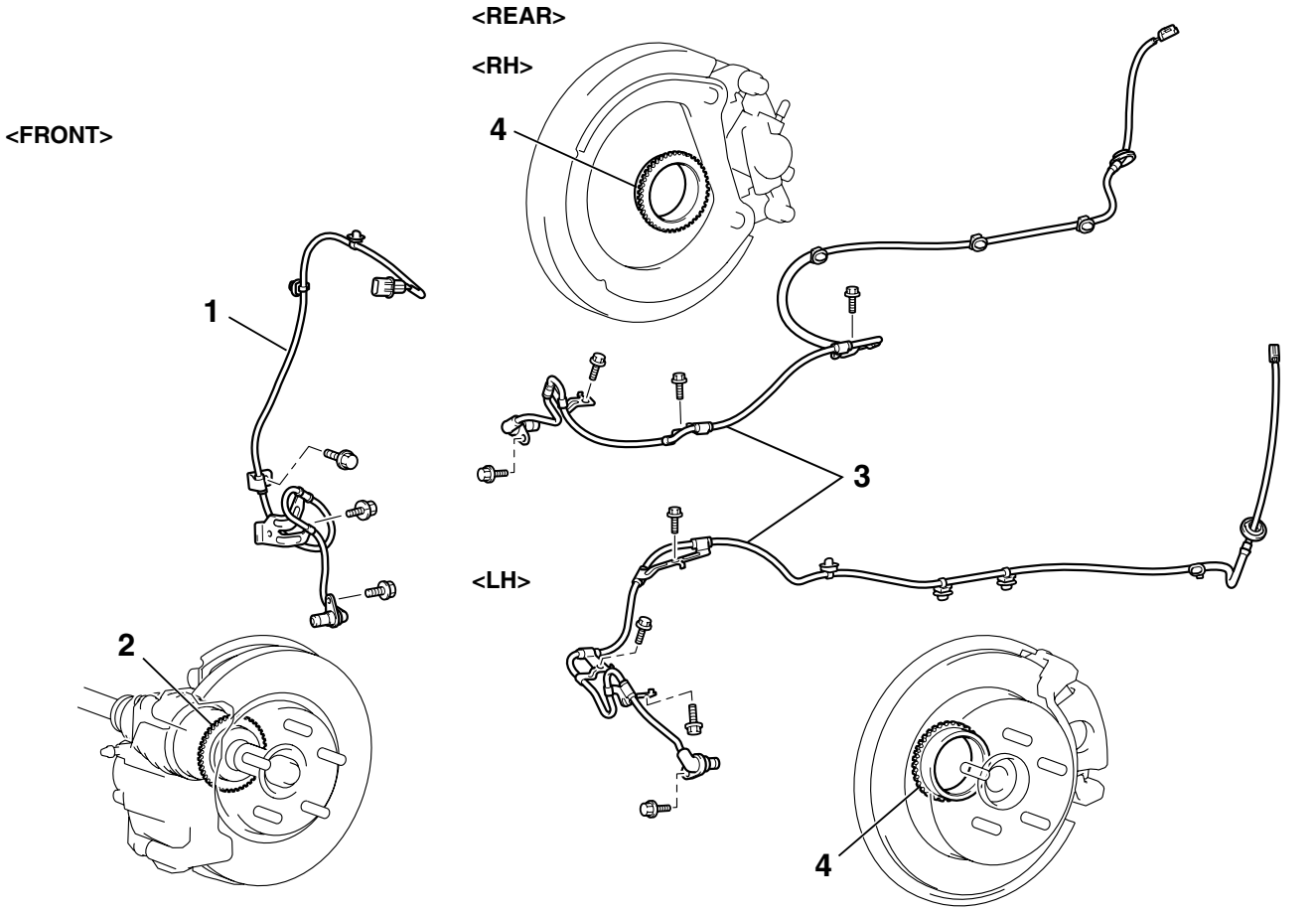
1. To the front brake (LH)
2. To the rear brake (RH)
3. To the rear brake (LH)
4. To the front brake (RH)
5. From the master cylinder (secondary)
6. From the master cylinder (primary)

WHEEL SPEED SENSOR

REMOVAL AND INSTALLATION

M1352008300548

Post-installation Operation
- Wheel Speed Sensor Output Voltage Measurement (Refer to P.35B-90).



TSB Revision

FRONT WHEEL SPEED SENSOR REMOVAL STEPS

- SPLASH SHIELD (REFER TO GROUP 42, FENDER P.42-9).

<<A>> 1. FRONT WHEEL SPEED SENSOR
2. FRONT WHEEL SPEED ROTOR (REFER TO GROUP 26, DRIVESHAFT ASSEMBLY P.26-13).

REAR WHEEL SPEED SENSOR REMOVAL STEPS

<<A>> 3. REAR WHEEL SPEED SENSOR
4. REAR WHEEL SPEED ROTOR (REFER TO GROUP 27, REAR AXLE HUB ASSEMBLY P.27-6).

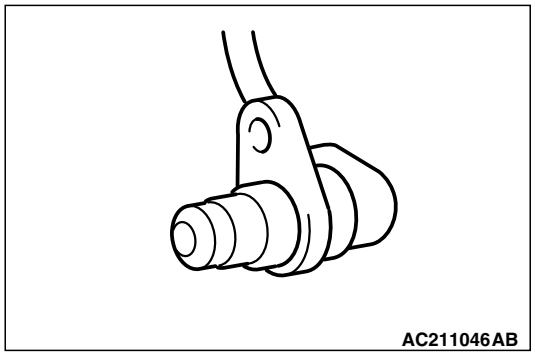
NOTE: Front wheel speed rotors are integrated with the BJ assembly of the drive shaft and cannot be disassembled.

NOTE: Rear wheel speed rotors are integrated with the rear hub assembly and cannot be disassembled.

REMOVAL SERVICE POINT

<<A>> FRONT WHEEL SPEED SENSOR/REAR WHEEL SPEED SENSOR REMOVAL

⚠ CAUTION
Be careful when handling the projection at the tip of the wheel speed sensor and the toothed edge of the wheel speed rotor so as not to damage them by contacting other parts.


AC211046AB

INSPECTION

M1352008400459

WHEEL SPEED SENSOR CHECK

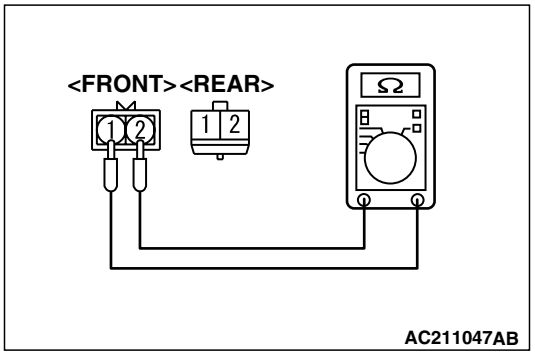
1. Check whether any metallic foreign material has adhered to the projection at the speed sensor tip. Remove any foreign material. Also check whether the pole piece is damaged. Replace it with a new one if it is damaged.

   NOTE: The projection can become magnetized due to the magnet inside the wheel speed sensor, causing foreign material to easily adhere to it. The projection may not be able to correctly sense the wheel rotation speed if foreign matter is on it or if it is damaged.

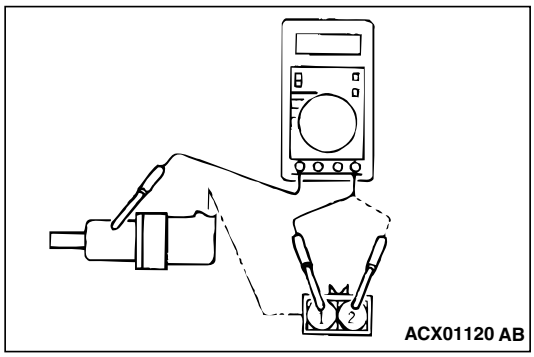
2. Measure the resistance between the wheel speed sensor terminals.

   Standard value: 1.24 – 1.64 kΩ

3. If the internal resistance of the wheel speed sensor is not within the standard value, replace it with a new wheel speed sensor.

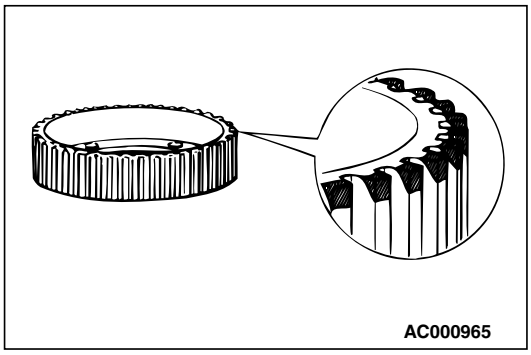


AC211047AB



4. Remove all connections from the wheel speed sensor. The circuit should be open between terminals (1) and (2) and the body of the wheel speed sensor. If the circuit is not open, replace with a new wheel speed sensor.
5. Check the wheel speed sensor cable for breakage, damage or disconnection. Replace with a new one if a problem is found.

   NOTE: When checking for cable damage, remove the cable clamp part from the body and then gently bend and pull the cable near the clamp.



TOOTHED WHEEL SPEED ROTOR CHECK

Check whether the wheel speed rotor teeth are broken or deformed. Replace the BJ assembly of the drive shaft, or the rear hub assembly, respectively, if the teeth are damaged or deformed.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATION

M1352012400377

ITEM	SPECIFICATION
Brake tube flare nut	15 ± 2 N·m (12 ± 1 ft-lb)

GENERAL SPECIFICATIONS

M1352000200075

ITEM		SPECIFICATION
ABS control method		4-sensor, 4-channel
Numbers of wheel speed rotor teeth	Front	43
	Rear	43
Wheel speed sensor	Type	Magnet coil type
	Gap between sensor and rotor mm (in)	0.2 – 0.5 (0.008 – 0.020) <Non-adjustable type>

SERVICE SPECIFICATION

M1352000300599

ITEM	STANDARD VALUE
Wheel speed sensor internal resistance kΩ	1.24 – 1.64

GROUP 36

PARKING BRAKES

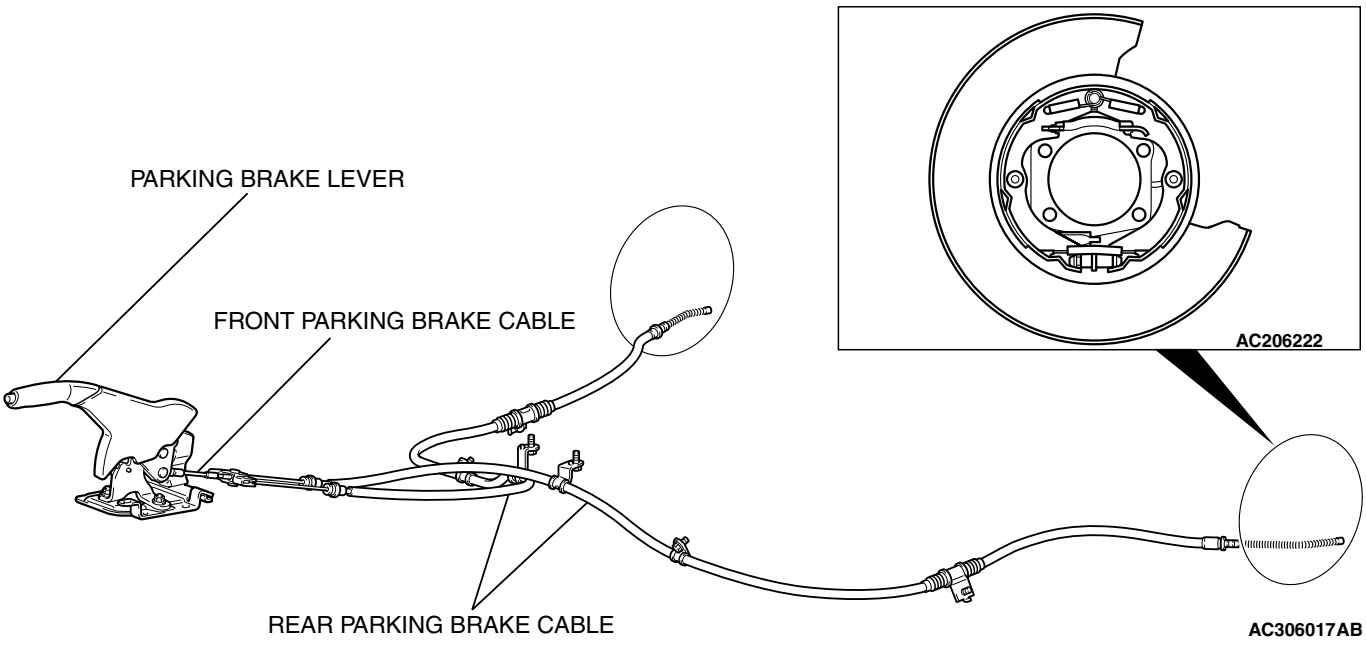
CONTENTS

GENERAL DESCRIPTION

M1361000100344

The parking brakes are a mechanical rear wheel brake design and controlled by a lever.

CONSTRUCTION DIAGRAM



PARKING BRAKE DIAGNOSIS

INTRODUCTION

M1361003700282

If the parking brake is faulty, parking brake effort will become insufficient. The cause may be a malfunction of parking brake parts or the parking brake pedal being out of adjustment.

TROUBLESHOOTING STRATEGY

M1361003800290

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a parking brakes fault.

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

SYMPTOM CHART

M1361004100302

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Brake drag	–	Refer to GROUP 35A, Basic Brake System Diagnosis – Symptom Chart P.35A-6.
Insufficient parking brake function	1	P.36-3

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Insufficient Parking Brake Function

DIAGNOSIS

STEP 1. Check the excessive parking brake lever stroke.
Refer to P.36-3.

Q: Is the parking brake lever stroke adjusted properly?
YES : Go to Step 2.
NO : Adjust the parking brake lever stroke or check the parking brake cable routing. Then go to Step 5.

STEP 2. Check the parking brake cable for sticking.

Q: Is the parking brake cable stuck?
YES : Replace the cable. Then go to Step 5.
NO : Go to Step 3.

STEP 3. Check the brake lining and brake drum for wear.
Refer to P.36-11.

Q: Is the brake lining thickness or brake drum inside diameter outside of specification?
YES : Replace the rear brake shoe assembly or rear brake disc (Refer to P.36-8). Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check for oil, water, etc., on the lining contact surfaces.

Q: Is oil, water, etc., on the lining contact surface?
YES : Replace the part and determine and repair source/cause of foreign material. Then go to Step 5.
NO : Carry out the parking brake lining seating (Refer to P.36-5) and then go to Step 5.

STEP 5. Retest the system.

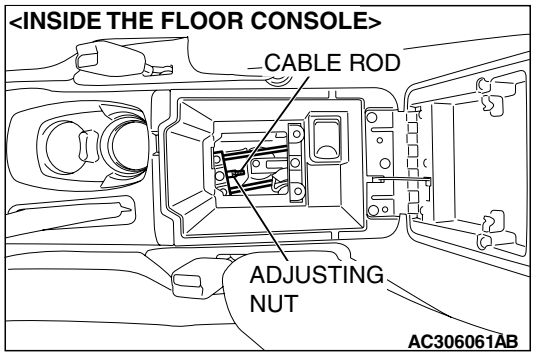
Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Recheck from Step 1.

ON-VEHICLE SERVICE

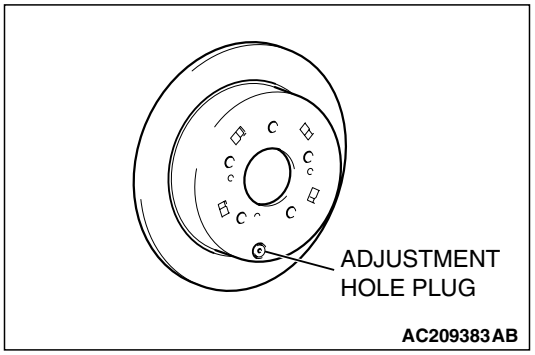
PARKING BRAKE LEVER STROKE CHECK AND ADJUSTMENT

M1361000900362

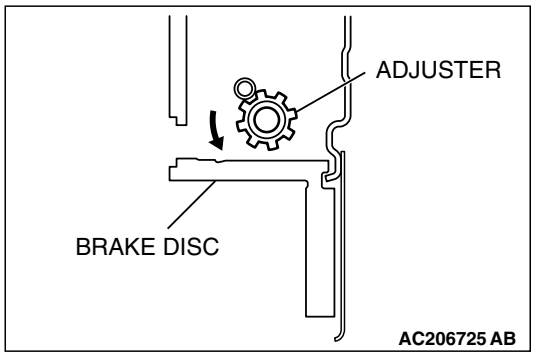
1. Pull the parking brake lever with a force of approximately 200 N (45 pounds) and count the number of notches.
   Standard value: 5 – 7 notches
2. If the parking brake lever stroke is not within the standard value, adjust as described below.
   (1) Release the parking brake.



(2) Remove the console inner box tray and plate (Refer to GROUP 52A, Floor Console Assembly P.52A-22), and then loosen the adjusting nut to move it to the cable rod end so that the cable will be free.



(3) Remove the rear wheels, and then remove the adjustment hole plug on the brake disc.



(4) Use a flat-tip screwdriver to turn the adjuster in the direction of the arrow (the direction which expands the shoe) so that the disc will not rotate by hand. Return the adjuster five notches in the direction opposite to the direction of the arrow.

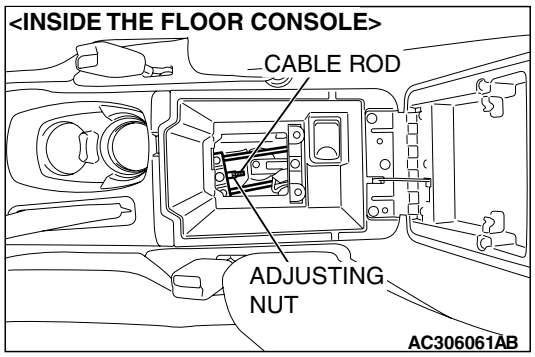
(5) Install the rear wheels, and then tighten the wheel nuts to 98 ± 10 Nm (73 ± 7 ft-lb).

⚠ CAUTION

Be careful that the parking brake lever stroke should be within the standard value. If the stroke is too short, brake dragging can be caused.

(6) Turn the adjusting nut to adjust the parking brake lever stroke to the standard value. After adjustment, check that the adjust nut and the cable rod is not loose.

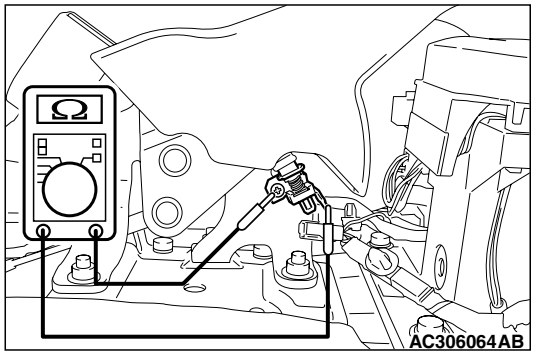
(7) Release the parking brake and turn the rear wheels to check that the rear brakes are not dragging.



3. If either of the parking brake cables is replaced, adjust the parking brake lever stroke as described previously, pull the parking brake lever 10 times with approximately 200 N (45 pounds) to eliminate the initial slack of the cable. Then adjust the parking brake lever stroke as described previously again.

PARKING BRAKE SWITCH CHECK

M1361003300411



1. Remove the floor console. (Refer to GROUP 52A, Floor Console P.52A-22.)
2. Check for continuity between the parking brake switch terminal and the switch mounting bolt.

When parking brake pedal is pulled	2 ohms or less
When parking brake pedal is released	Open circuit

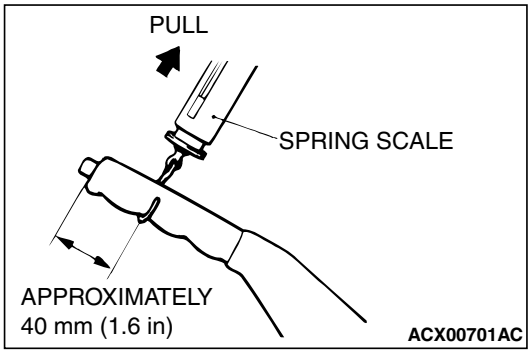
PARKING BRAKE LINING SEATING PROCEDURE

M1361001100262

⚠ CAUTION

Perform lining seating in a place with good visibility, and pay careful attention to safety.

Perform lining seating by the following procedure when replacing the parking brake shoe assemblies or the rear brake discs, or when brake performance is insufficient.



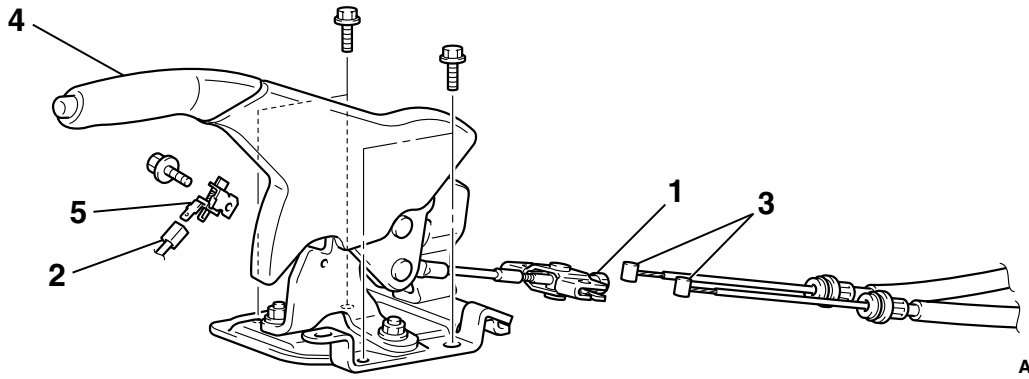
1. Adjust the parking brake lever stroke to the standard value (Refer to P.36-3).
2. Hook a spring scale onto the center of the parking brake lever grip and pull it with a force of 98 – 147 N (22 – 33 pounds) in a direction perpendicular to the handle.
3. Drive the vehicle at a constant speed of 35 – 50 km/h (22 – 31 mph) for 100 meters (328 feet).
4. Release the parking brake and let the brakes cool for five to ten minutes.
5. Repeat the procedure in steps 2. to 4. four to five times.

PARKING BRAKE LEVER

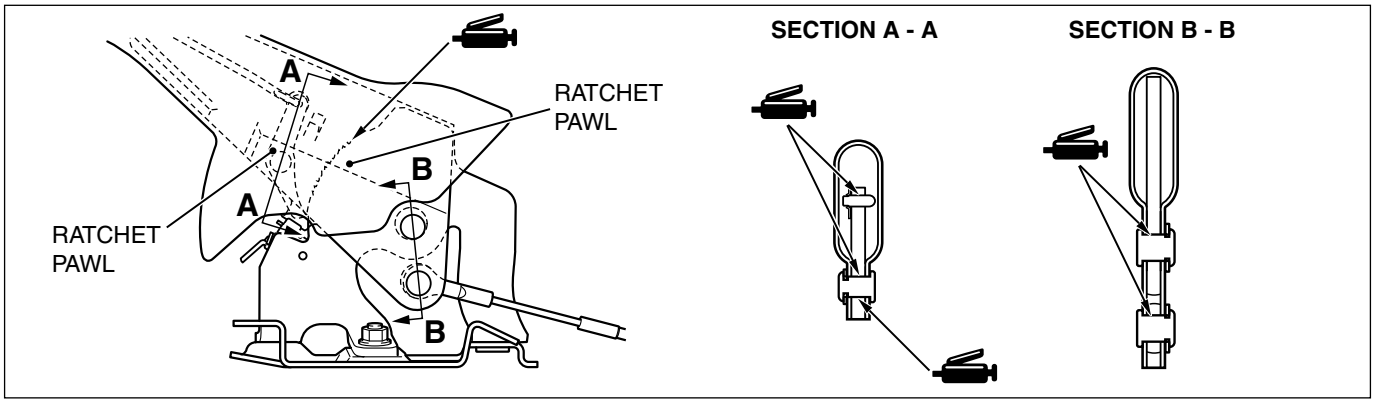
REMOVAL AND INSTALLATION

M1361001300363

Pre-removal Operation	Post-installation Operation
Rear Floor Console Assembly and Rear Console Bracket Removal (Refer to GROUP 52A, Floor Console P.52A-22.)	• Parking Brake Lever Stroke Adjustment (Refer to P.36-3.) • Rear Console Bracket and Rear Floor Console Assembly Installation (Refer to GROUP 52A, Floor Console P.52A-22.)



AC306274AB



REMOVAL STEPS

1. ADJUSTING NUT
2. PARKING BRAKE SWITCH CONNECTOR
3. PARKING BRAKE CABLE CONNECTION
4. PARKING BRAKE LEVER ASSEMBLY
5. PARKING BRAKE SWITCH

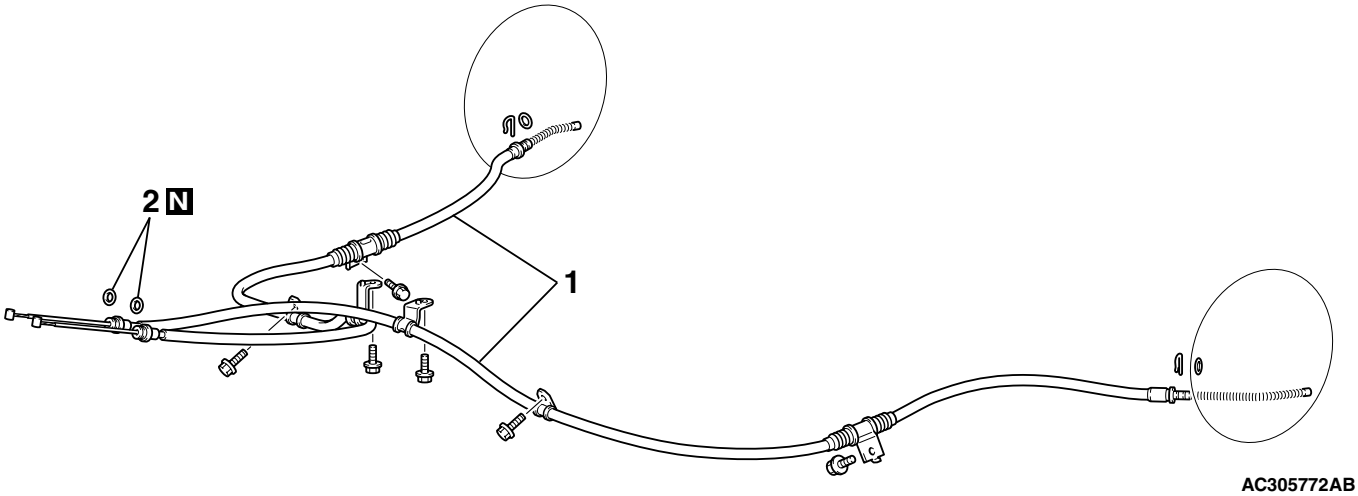
TSB Revision

PARKING BRAKE CABLE

REMOVAL AND INSTALLATION

M1361001900547

Pre-removal Operation	Post-installation Operation
• Floor Console Assembly Removal (Refer to GROUP 52A, Floor Console Assembly P.52A-22).	• Floor Console Assembly Installation (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Parking Brake Lever Stroke Check and Adjustment (Refer to P.36-3).



AC305772AB

REMOVAL STEPS

- SHOE ASSEMBLY (REFER TO P.36-8).
- REAR PARKING BRAKE CABLE TO BAKING PLATE CONNECTION (REFER TO P.36-8).
- FRONT PARKING BRAKE CABLE TO REAR PARKING BRAKE CABLE CONNECTION (REFER TO P.36-6).

1. REAR PARKING BRAKE CABLE
2. O-RING

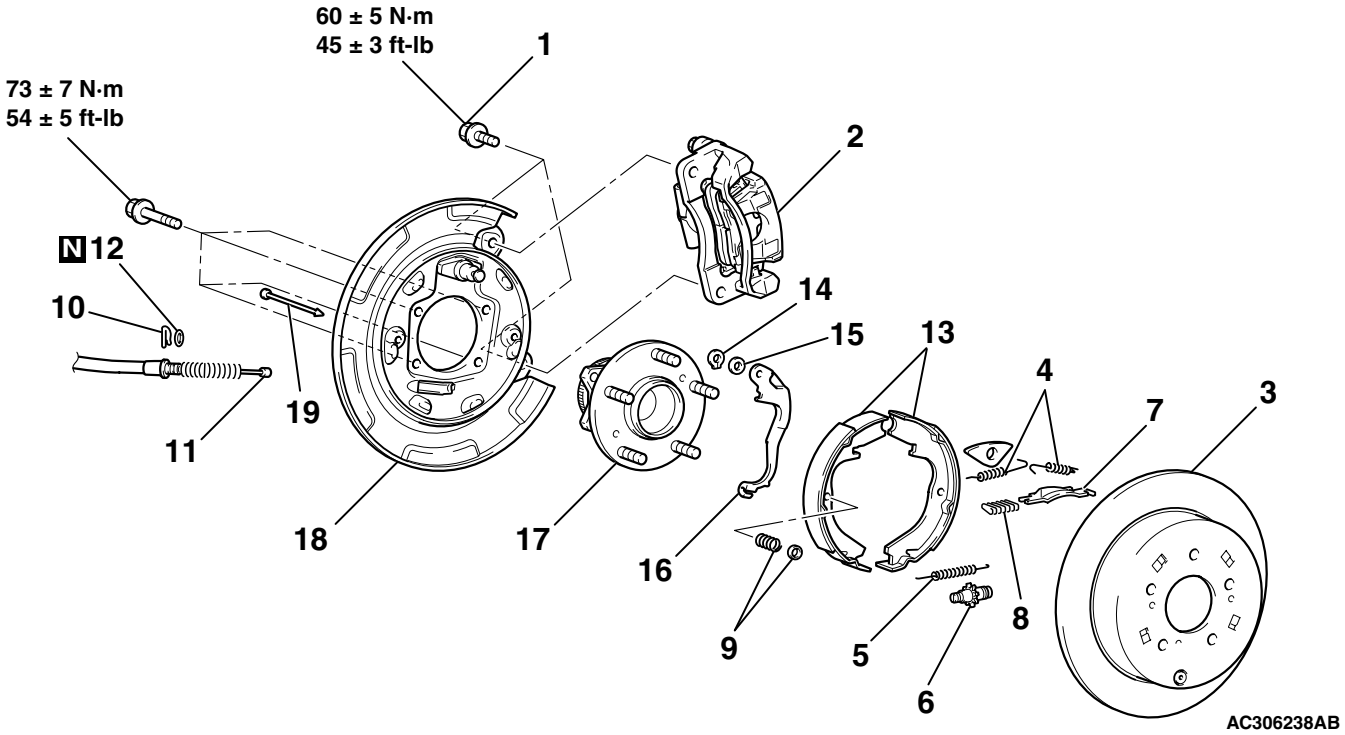
TSB Revision

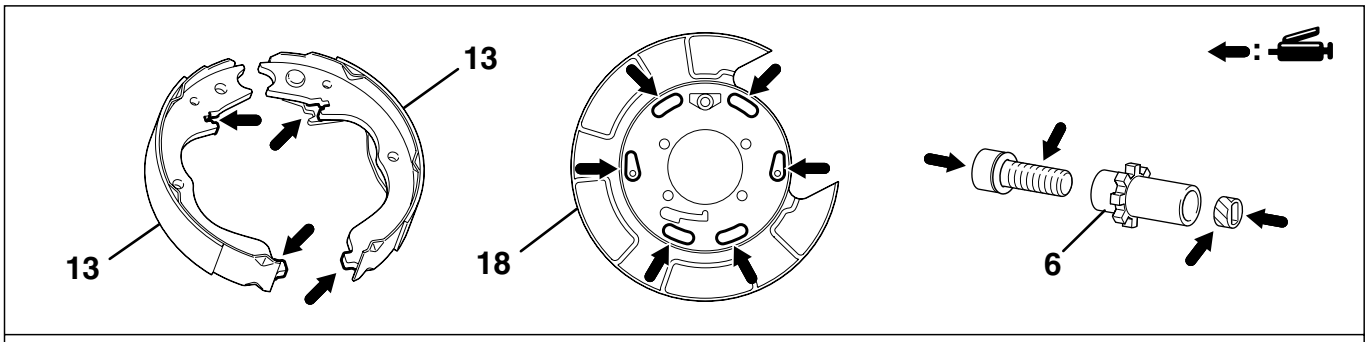
PARKING BRAKE LINING AND DRUM

REMOVAL AND INSTALLATION

M1361002500315

Post-installation Operation
- Parking Brake Lever Stroke Check and Adjustment (Refer to P.36-3).
- Parking Brake Lining Seating (Refer to P.36-5).





BRAKE GREASE: BRAKE GREASE SAE J310, NLGI No.1

REMOVAL STEPS

<<A>> 1. REAR BRAKE BOLT
<<A>> 2. REAR BRAKE CALIPER ASSEMBLY
<<B>> 3. REAR BRAKE DISC
>>C<< 4. SHOE-TO-ANCHOR SPRING
5. ADJUSTING WHEEL SPRING
>>B<< 6. REAR BRAKE SHOE SLACK ADJUSTER
7. PARKING BRAKE OPERATING LEVER STRUT
8. STRUT-TO- SHOE SPRING

REMOVAL STEPS (Continued)

9. REAR BRAKE SHOE SPRING CUP AND SHOE HOLD-DOWN SPRING
10. PARKING BRAKE CABLE CLIP
11. REAR PARKING BRAKE CABLE CONNECTION
12. O-RING
13. REAR BRAKE SHOE ASSEMBLY
<<C>> >>A<< 14. REAR BRAKE CHAMBER RETAINER
15. REAR BRAKE WASHER
16. PARKING BRAKE OPERATING LEVER

TSB Revision

REMOVAL STEPS (Continued)

- REAR WHEEL SPEED SENSOR <VEHICLES WITH ABS> (REFER TO GROUP 35B, WHEEL SPEED SENSOR P.35B-98).

17. REAR WHEEL HUB ASSEMBLY
18. BACKING PLATE
19. SHOE HOLD-DOWN PIN

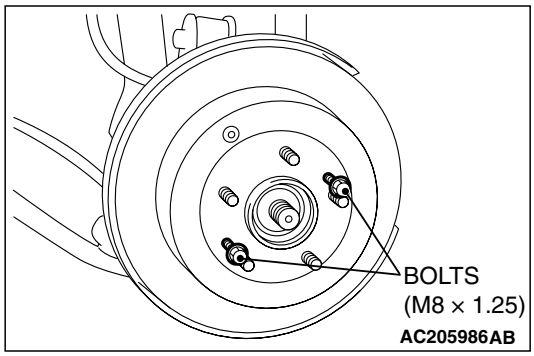
REMOVAL SERVICE POINTS

<<A>> REAR BRAKE BOLT/REAR BRAKE CALIPER ASSEMBLY REMOVAL

Remove the rear brake caliper assembly and support it with wire or something similar.

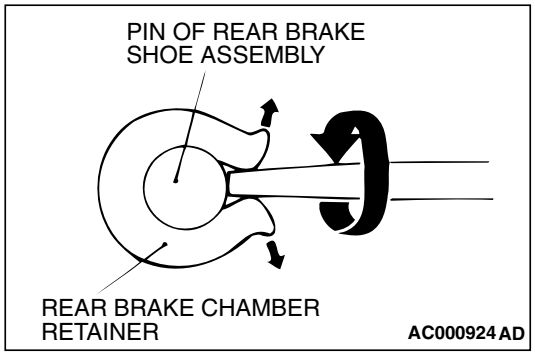
<<B>> REAR BRAKE DISC REMOVAL

If the rear brake disc is seized, install M8×1.25 bolts as shown, and remove the rear brake disc by tightening the bolts evenly and gradually.



<<C>> REAR BRAKE CHAMBER RETAINER REMOVAL

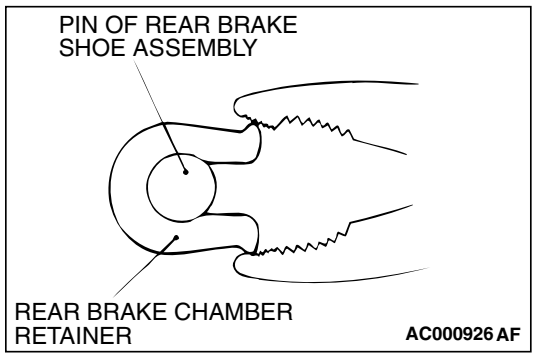
Use a flat-tipped screwdriver or a similar tool to open up the rear brake chamber retainer joint. Then remove the rear brake chamber retainer.



INSTALLATION SERVICE POINTS

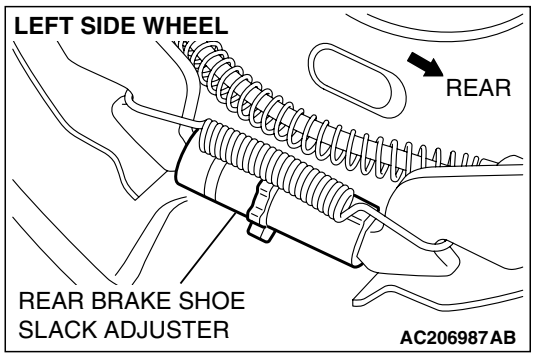
>>A<< REAR BRAKE CHAMBER RETAINER INSTALLATION

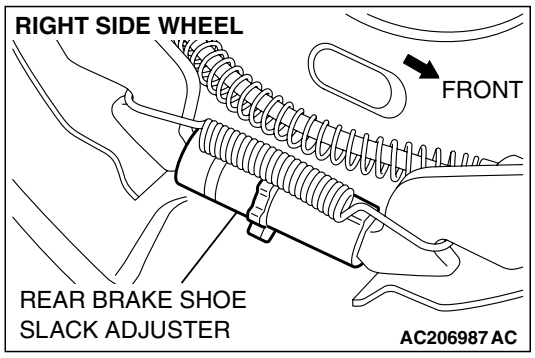
Use pliers or a similar tool to close the rear brake chamber retainer end onto the pin.



>>B<< REAR BRAKE SHOE SLACK ADJUSTER INSTALLATION

Install the rear brake shoe slack adjuster as shown.



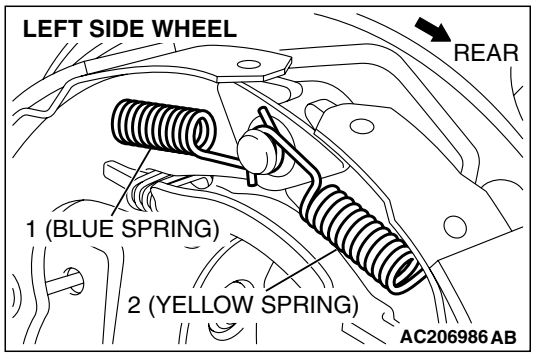


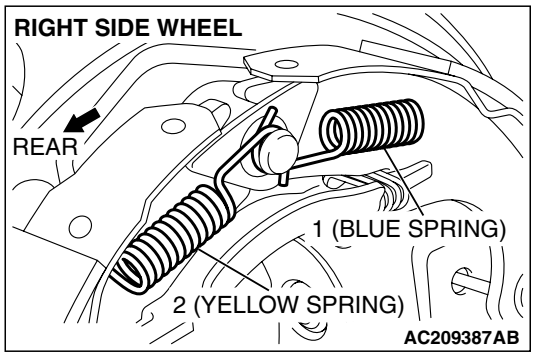
>>C<< SHOE-TO-ANCHOR SPRING INSTALLATION

⚠ CAUTION

The front and rear shoe-to-anchor springs are not interchangeable, so the blue spring must be installed at the front side and the yellow spring must be installed at the rear side.

Install the shoe-to-anchor springs in the order shown in the illustration.

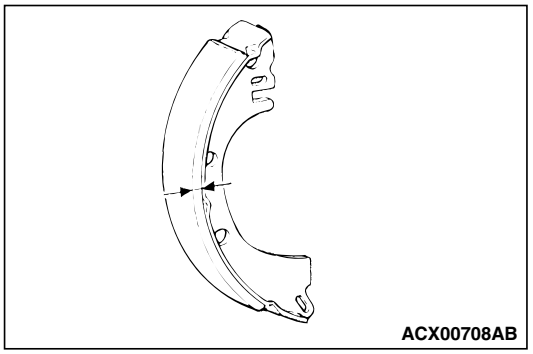




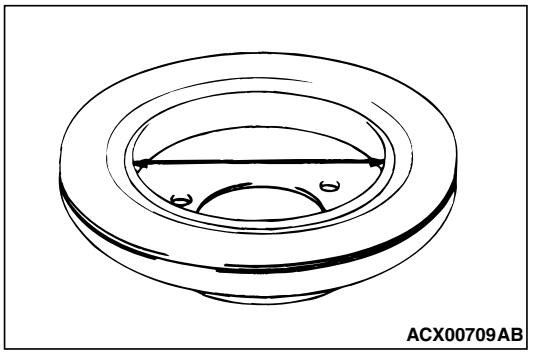
INSPECTION

M1361002600260

PARKING BRAKE LINING AND BRAKE DRUM CHECK



1. Measure the thickness of the brake lining at several places.
   Standard value: 2.8 mm (0.11 inch)
   Minimum Limit: 1.0 mm (0.04 inch)
2. If the thickness of the brake lining is below the limit, replace the shoe assemblies on both sides of the vehicle. Never replace only one side.



3. Measure the inside diameter of the brake disc in two places or more.
   Standard value: 168.0 mm (6.61 inches)
   Limit: 169.0 mm (6.65 inches)
4. If the inside diameter exceeds the limit, or if it is excessively worn on one side, replace the brake disc.

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1361003500266

ITEM	SPECIFICATION
Parking brake lining and drum	
Rear brake bolt (rear brake caliper assembly mounting bolt)	60 ± 5 N·m (45 ± 3 ft-lb)
Rear wheel hub assembly mounting bolt	73 ± 7 N·m (54 ± 5 ft-lb)

SERVICE SPECIFICATIONS

M1361000300412

ITEM	STANDARD VALUE	LIMIT
Parking brake lever stroke [Parking brake lever pull force: Approximately 200 N (45 pounds)]	5 – 7 notches	–
Rear brake lining thickness mm (in)	2.8 (0.11)	Minimum 1.0 (0.04)
Brake drum inside diameter mm (in)	168.0 (6.61)	169.0 (6.65)

LUBRICANT

M1361000400301

ITEM	SPECIFIED LUBRICANT
Rear brake shoe slack adjuster	Brake grease SAE J310, NLGI No.1
Backing plate	
Rear brake shoe assembly	

GROUP 37

POWER STEERING

CONTENTS

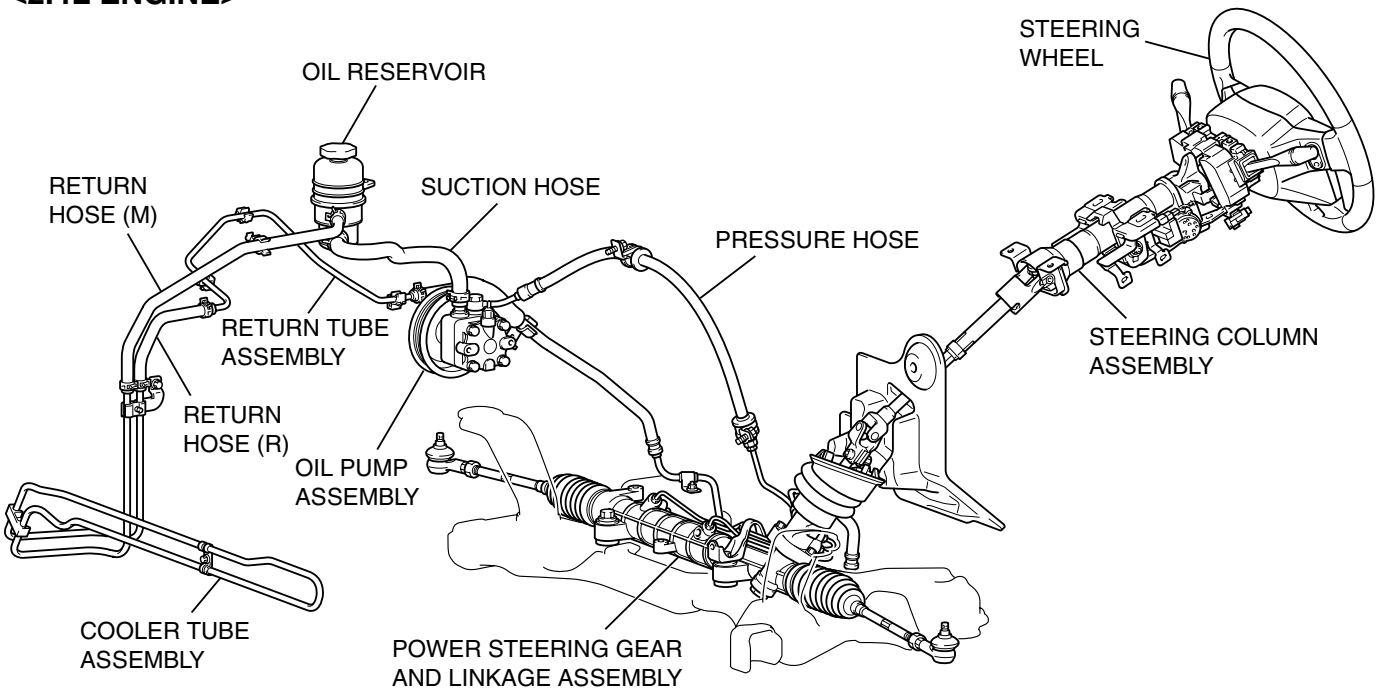
GENERAL DESCRIPTION

M1372000100360

Power steering has been adopted in all vehicles to make the steering system easier to handle.

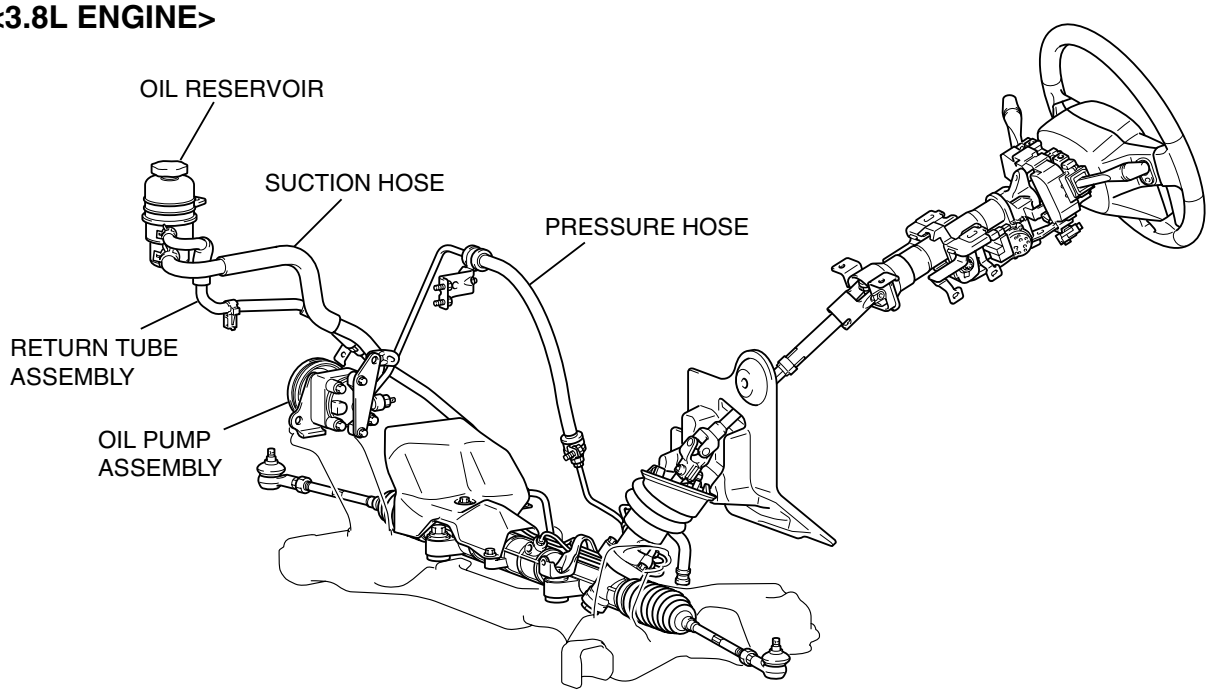
- A 4-spoke steering wheel is used.
- A steering column has a shock absorbing mechanism and a tilt steering mechanism.
- A rack and pinion steering gear is used.
- An oil pump responsive to engine RPM is used, to enhance steering stability at high speeds.
- The separate plastic resin oil reservoir is used to reduce weight and to make the fluid level checking easier.

<2.4L ENGINE>



AC306240AB

<3.8L ENGINE>



AC306241AB

TSB Revision

POWER STEERING DIAGNOSIS

INTRODUCTION TO POWER STEERING DIAGNOSIS

M1372008500209

Hydraulic power steering is used for all vehicles. Faults in the power steering can include excessive play of the steering wheel, difficult steering wheel operation, noise, vibration, and oil leaks, etc. Possible causes of these faults can include defects in the gear box, oil pump or steering linkage.

POWER STEERING DIAGNOSIS TROUBLESHOOTING STRATEGY

M1372007300202

Use these steps to plan your diagnostic strategy. If you follow them thoroughly, you will be sure that you have exhausted most of the possible ways to find a power steering fault.

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

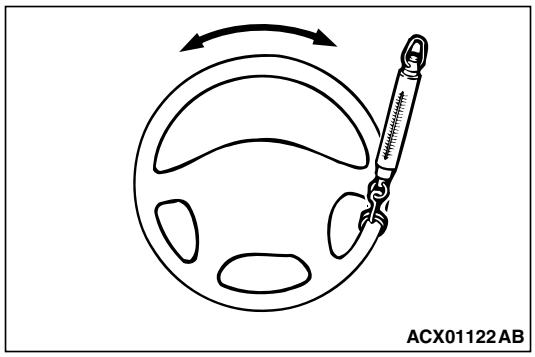
SYMPTOM CHART

M1372007600225

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Excessive play of steering wheel	1	P.37-5
Difficult steering wheel operation (insufficient power assist)	2	P.37-5
Rattling noise	3	P.37-7
Shrill noise	4	P.37-8
Squealing noise	5	P.37-8
Hissing noise	6	P.37-9
Droning noise	7	P.37-9
Squeaking noise	8	P.37-10
Vibration	9	P.37-11
Oil leakage from hose connection	10	P.37-12
Oil leakage from hose assembly	11	P.37-12
Oil leakage from oil reservoir	12	P.37-12
Oil leakage from oil pump	13	P.37-13
Oil leakage from steering gear	14	P.37-13

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Excessive Play of Steering Wheel


ACX01122AB

DIAGNOSIS

STEP 1. Check for looseness at the steering shaft coupling section and at the steering wheel linkage.

Q: Is there any looseness?

YES : Repair or replace the part. And then go to Step 3.
NO : Go to Step 2.

STEP 2. Check the steering wheel free play.

(1) With the engine running (hydraulic operation), set the front wheels straight ahead.
(2) Slightly move the steering wheel in both directions, and measure the play on the steering wheel circumference before the wheels start to move.

Limit: 30 mm (1.2 inches)

(3) If the free play exceeds the limit, set the steering wheel straight ahead with the engine stopped. Apply approximately 5 N (1.1 pound) to the steering circumference and check the play.

Standard value (steering wheel play with engine stopped): 10 mm (0.4 inch) or less

Q: Does the play exceed the standard value?

YES : Remove the steering gear box (refer to P.37-31) and check the total pinion torque (refer to P.37-38). And then go to Step 3.
NO : Go to Step 3.

STEP 3. Check the steering wheel play.

Verify that the steering wheel play is not excessive.

Q: Is the steering wheel play excessive?

YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 2: Difficult Steering Wheel Operation (Insufficient Power Assist)

DIAGNOSIS

STEP 1. Check the drive belt for damage.

Q: Is the drive belt damaged?

YES : Replace the drive belt. And then go to Step 9.
NO : Go to Step 2.

STEP 2. Check the power steering oil pump drive belt tension.

Refer to GROUP 00, Maintenance Service – Drive Belts P.00-52.

Q: Is the power steering oil pump drive belt tension within the standard value?

YES : Go to Step 3.

NO : Adjust the tension (refer to GROUP 00, Maintenance Service – Drive Belts P.00-52). And then go to Step 9.

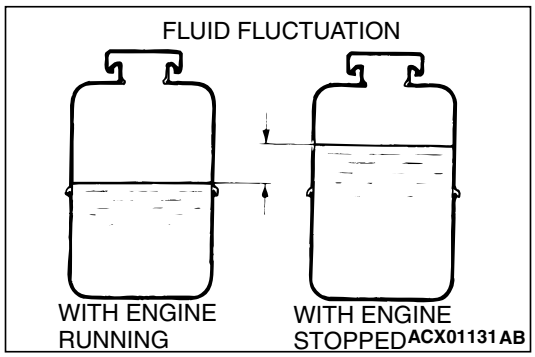
STEP 3. Check the fluid level.

(1) Park the vehicle on a flat, level surface, and then start the engine.

(2) Turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60°C (122 – 140°F).

(3) With the engine running, turn the wheel all the way to the left and right several times.

(4) Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running.



Q: Is the check result OK?

YES : Go to Step 4.

NO : Bleed the air (refer to P.37-20). And then go to Step 9 .

STEP 4. Check each hose for crushing or twisting.

Q: Is any hose crushed or twisted?

YES : Repair or replace the hose. And then go to Step 9.

NO : Go to Step 5.

STEP 5. Check for oil leaks.

Q: Are there oil leaks?

YES : Find the cause of the oil leakage and repair it. And then go to Step 9.

NO : Go to Step 6.

STEP 6. Check the wheel alignment (camber and caster).

Refer to GROUP 33, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33-6.

Q: Is the wheel alignment incorrect?

YES : Adjust wheel alignment. And then go to Step 9.

NO : Go to Step 7.

STEP 7. Check the gear box rack piston seal for damage.

Q: Is there damage?

YES : Replace it. And then go to Step 9.
NO : Go to Step 8.

STEP 8. Check for excessive tie rod end ball joint breakaway torque.

Refer to P.37-17.

Q: Is the breakaway torque out of specification?

YES : Replace the tie rod end. And then go to Step 9.
NO : Go to Step 9.

STEP 9. Check the steering wheel operation.

Verify that the steering wheel operation is not difficult.

Q: Is the steering wheel operation difficult?

YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 3: Rattling Noise

DIAGNOSIS

STEP 1. Check for proper oil pump and steering gear installation.

Q: Is the oil pump and the steering gear installation correct?

YES : Go to Step 2.
NO : Repair it. And then go to Step 4.

STEP 2. Check for interference of other parts with the steering column and the power steering hoses.

Q: Is there interference?

YES : Correct the interference. And then go to Step 4.
NO : Go to Step 3.

STEP 3. Check for noise from inside the oil pump or the steering gear.

Q: Is there noise?

YES : Replace the part. And then go to Step 4.
NO : Go to Step 4.

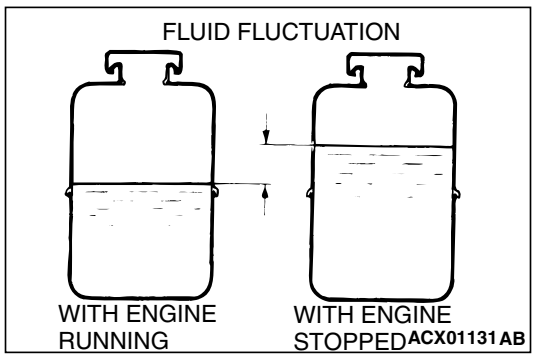
STEP 4. Check for rattling noise.

Confirm that no noise is generated.

Q: Is there noise?

YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 4: Shrill Noise



DIAGNOSIS

STEP 1. Check the fluid level.

(1) Park the vehicle on a flat, level surface, and then start the engine.
(2) Turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60°C (122 – 140°F).
(3) With the engine running, turn the wheel all the way to the left and right several times.
(4) Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running.

Q: Is the check result OK?

YES : Go to Step 2.
NO : Bleed the air (Refer to P.37-20). And then go to Step 3 .

STEP 2. Check for seizure in the oil pump.

Q: Is there seizure?

YES : Replace the part. And then go to Step 3.
NO : Go to Step 3.

STEP 3. Retest the system.

Confirm that no noise is generated.

Q: Is there noise?

YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 5: Squealing Noise

DIAGNOSIS

STEP 1. Check the drive belt tension.

Refer to GROUP 00, Maintenance Service – Drive Belts P.00-52.

Q: Is the drive belt tension incorrect?

YES : Adjust the belt tension. (Refer to GROUP 00, Maintenance Service – Drive Belts P.00-52). And then go to Step 3.
NO : Go to Step 2.

STEP 2. Check for seizure in the oil pump.

Q: Is there seizure?

YES : Replace the part. And then go to Step 3.
NO : Go to Step 3.

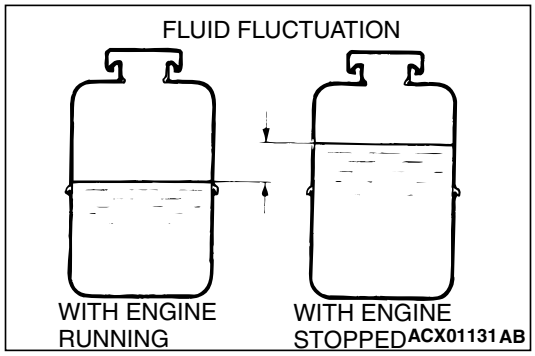
STEP 3. Retest the system.

Confirm that no noise is generated.

Q: Is there noise?

YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 6: Hissing Noise



DIAGNOSIS

STEP 1. Check the fluid level.

(1) Park the vehicle on a flat, level surface, and then start the engine.
(2) Turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60°C (122 – 140°F).
(3) With the engine running, turn the wheel all the way to the left and right several times.
(4) Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running.

Q: Is the check result OK?

YES : Go to Step 2.
NO : Bleed the air (Refer to P.37-20). And then go to Step 4 .

STEP 2. Check each hose for crushing or twisting.

Q: Is any hose crushed or twisted?

YES : Repair or replace the hose. And then go to Step 4.
NO : Go to Step 3.

STEP 3. Check the steering gear for damage.

Q: Is there damage?

YES : Repair or replace the part. And then go to Step 4.
NO : Go to Step 4.

STEP 4. Retest the system.

Confirm that no noise is generated.

Q: Is there noise?

YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 7: Droning Noise

NOTE: If a slight "beat noise" is produced by the oil pump when the steering wheel is turned fully and held in that position, this is normal.

DIAGNOSIS

STEP 1. Check the oil pump or oil pump bracket installation.

Q: Is the oil pump or the oil pump bracket installation correct?

YES : Go to Step 2.
NO : Repair it. And then go to Step 3.

TSB Revision

STEP 2. Check the oil pump for damage.

Q: Is there damage?

YES : Replace the oil pump. And then go to Step 3.

NO : Go to Step 3.

STEP 3. Retest the system.

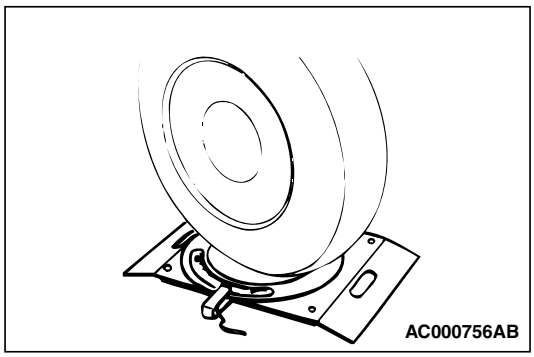
Confirm that no noise is generated.

Q: Is there noise?

YES : Repeat from Step 1.

NO : The procedure is complete.

INSPECTION PROCEDURE 8: Squeaking Noise


AC000756AB

DIAGNOSIS

STEP 1. Check for interference of the wheel and the vehicle body.

If interfering, adjust the steering angle.

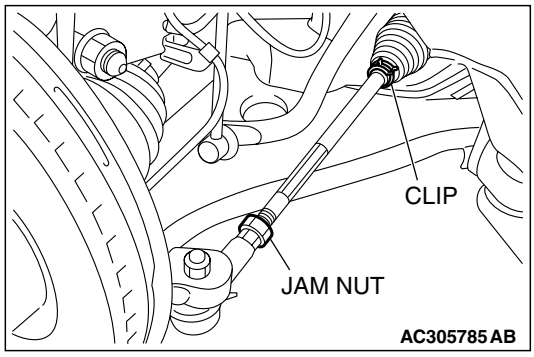
(1) Place the front wheel on a turning radius gauge and measure the steering angle.

Standard value:

ITEM	VEHICLES WITH 16-INCH WHEELS	VEHICLES WITH 17-INCH WHEELS	VEHICLES WITH 18-INCH WHEELS
Inner wheel	37°12' ± 2°00'	33°48' ± 2°00'	32°54' ± 2°00'
Outer wheel (reference)	30°18'	28°18'	27°48'

(2) If the steering angle is not within the standard value, adjust the toe.

Standard value: 0 ± 3 mm (0 ± 0.12 inch)



AC305785AB

(3) Adjust the toe by undoing the clip and jam nut, and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

Q: Is the steering angle normal?

YES : Go to Step 2.

NO : Repeat the toe adjustment. And then go to Step 3.

STEP 2. Check the steering gear for damage.

Q: Is there damage?

YES : Repair or replace the part. And then go to Step 3.

NO : Go to Step 3.

STEP 3. Retest the system.
Confirm that no noise is generated.

Q: Is there noise?

YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 9: Vibration

NOTE: A slight vibration may be felt when the stationary steering effort is made due to the condition of the road surface. To check whether the vibration actually exists or not, test-drive the vehicle on a dry concrete or asphalt surface. A very slight amount of vibration is not a malfunction.

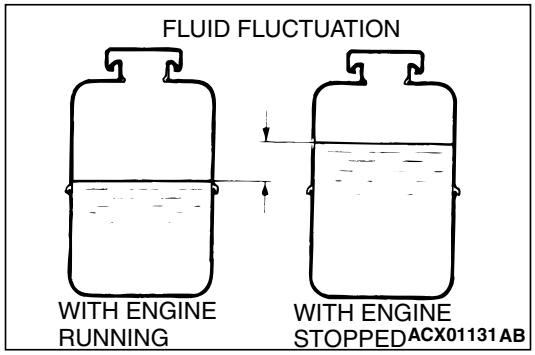
DIAGNOSIS

STEP1. Check the tires for out-of-balance.

Q: Is the check result OK?

YES : Go to Step 2.
NO : Balance the tires (Refer to GROUP 31, Wheel and Tire Diagnosis – Wheel Balance Accuracy P.31-6). And then go to Step 4.

STEP 2. Check the fluid level.
(1) Park the vehicle on a flat, level surface, and then start the engine.
(2) Turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60°C (122 – 140°F).
(3) With the engine running, turn the wheel all the way to the left and right several times.
(4) Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running.



Q: Is the check result OK?

YES : Go to Step 3.
NO : Bleed the air (Refer to P.37-20). And then go to Step 4 .

STEP 3. Check the steering gear for damage.

Q: Is there damage?

YES : Repair or replace the part. And then go to Step 4.
NO : Go to Step 4.

STEP 4. Retest the system.
Confirm that there is no steering wheel vibration.

Q: Is there vibration?
YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 10: Oil Leakage from Hose Connection

DIAGNOSIS

STEP 1. Check for loosening of the pressure/ return tube flare nut.

Q: Is the flare nut loose?
YES : Tighten it to 15 ± 3 N·m (11 ± 2 ft-lb). And then go to Step 3.
NO : Go to Step 2.

STEP 2. Check the hose connection and the clamp installation.
Refer to P.37-54.

Q: Are they correct?
YES : Go to Step 3.
NO : Correct hose connection and/or clamp installation. And then go to Step 3.

STEP 3. Retest the system.
Check that no oil is leaking.

Q: Is there oil leakage?
YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 11: Oil Leakage from Hose Assembly

DIAGNOSIS

STEP 1. Check the hose for damage or clogging.

Q: Is the hose damaged or clogged?
YES : Repair or replace it. And then go to Step 2.
NO : Go to Step 2.

STEP 2. Retest the system.
Check that no oil is leaking.

Q: Is there oil leakage?
YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 12: Oil Leakage from Oil Reservoir

DIAGNOSIS

STEP 1. Check the oil reservoir for damage.

Q: Is there damage?
YES : Repair or replace it. And then go to Step 3.
NO : Go to Step 2.

STEP 2. Check for overflowing.

Q: Is there oil overflowing from the reservoir?
YES : Adjust fluid level. And then go to Step 3.
NO : Go to Step 3.

STEP 3. Retest the system.

Q: Is there oil leakage?
YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 13: Oil Leakage from Oil Pump

DIAGNOSIS

STEP 1. Check the oil pump body for damage.

Q: Is there damage?
YES : Replace the part. And then go to Step 3.
NO : Go to Step 2.

STEP 2. Check the O-ring or oil seal for damage.

Q: Is there damage?
YES : Replace the part. And then go to Step 3.
NO : Go to Step 3.

STEP 3. Retest the system.
Check that no oil is leaking.

Q: Is there oil leakage?
YES : Repeat from Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 14: Oil Leakage from Steering Gear

DIAGNOSIS

STEP 1. Check the steering gear housing for damage.

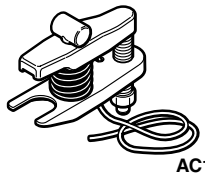
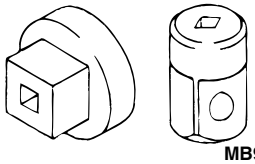
Q: Is there damage?
YES : Replace the part. And then go to Step 2.
NO : Go to Step 2.

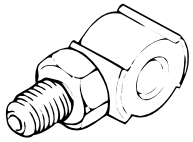
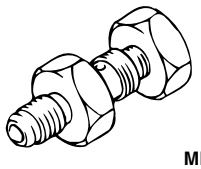
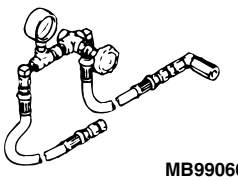
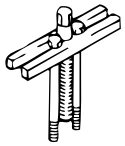
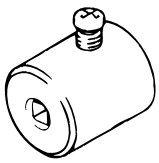
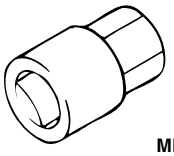
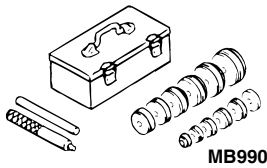
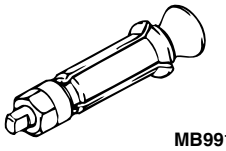
STEP 2. Retest the system.
Check that no oil is leaking.

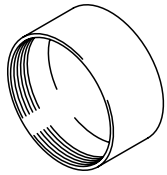
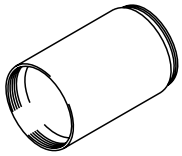
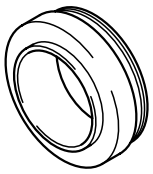
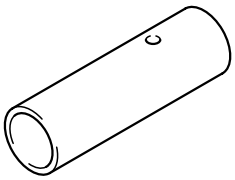
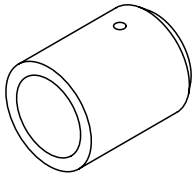
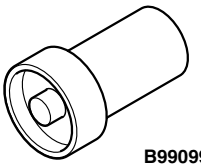
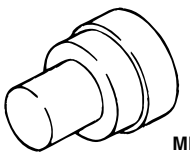
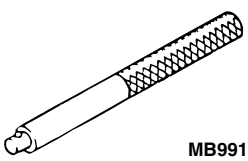
Q: Is there oil leakage?
YES : Repeat from Step 1.
NO : The procedure is complete.

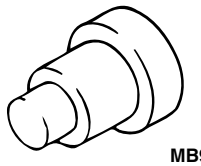
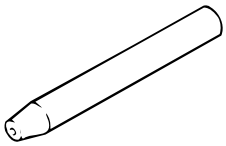
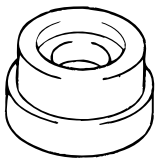
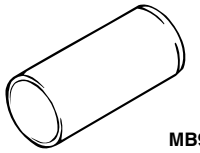
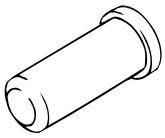
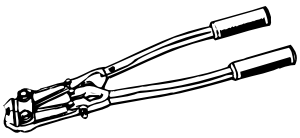
SPECIAL TOOLS

M1372000600387

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or General service tool	Knuckle and tie rod end ball joint disconnection *NOTE: Steering linkage puller (MB990635 or MB991113) is also available to disconnect knuckle and tie rod end ball joint.*
 MB990326	MB990326 Preload socket	General service tool	Tie rod end ball joint breakaway torque check

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991548	MB991548 Power steering oil pressure gauge adapter (Pump side)	MB991548-01	Oil pump pressure test
 MB991549	MB991549 Power steering oil pressure gauge adapter (Hose side)	MB991549-01	
 MB990662	MB990662 Power steering oil pressure gauge	MB990662-01	
 MB990803	MB990803 Steering wheel puller	-	Steering wheel removal
 MB991006	MB991006 Preload socket	MB990228-01	Steering gear total pinion torque check
 MB991204	MB991204 Torque wrench socket	General service tool	• Rack support adjustment • Rack support cover removal
 MB990925	MB990925 Bearing and oil seal installer set	MB990925-01 or general service tool	• Oil seal and bearing installation • MB990927, MB990938, MB990939 (For details, refer to GROUP 26, Special Tools P.26-5.)
 MB991120	MB991120 Needle bearing puller	Tool not available	Needle roller bearing removal

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998812 Installer cap	-	Gear housing mounting bushing removal
	MD998813 Installer 100	-	
	MD998822 Installer adapter	-	
	MD998368 Bearing installer	-	
	MD999569 Camshaft oil seal installer	-	Gear housing mounting bushing installation
 B990996	MB990996 Lower arm bushing arbor	-	
 MB991199	MB991199 Oil seal installer	General service tool	Oil seal installation
 MB991197	MB991197 Bar (long type)	General service tool	

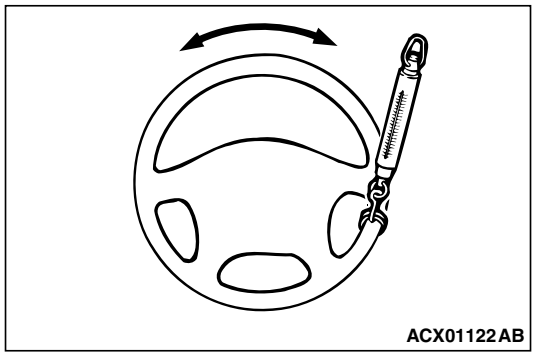
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991202	MB991202 Oil seal and bearing installer	General service tool	Needle roller bearing and ball bearing installation
 MB991212	MB991213 Rack installer	General service tool	Rack installation
 MB991203	MB991203 Oil seal and bearing installer	Tool not available	Oil seal and bearing installation
 MB991317	MB991317 Seal ring installer	Tool not available	Seal ring installation
 MB991152	MB991152 Dust cover installer	General service tool	Oil seal installation
 MB991561	MB991561 Boot band crimping tool	MB991561	Bellows band installation

ON-VEHICLE SERVICE

STEERING WHEEL FREE PLAY CHECK

M1372001000344

1. With the engine running (hydraulic operation), set the front wheels straight ahead.


ACX01122AB

2. Slightly move the steering wheel in both directions and measure the play on the steering wheel circumference before the wheels start to move.

   Limit: 30 mm (1.2 inch)

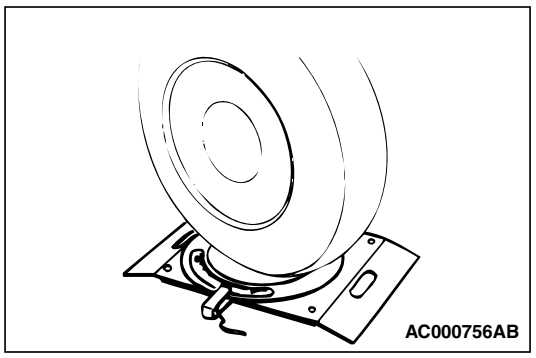
3. If the play exceeds the limit, check on the steering shaft and steering linkage connection. Correct or replace.
4. If the free play still exceeds the limit value, set the steering wheel straight ahead with the engine stopped. Apply 5 N (1.1 pound) towards the steering wheel circumference and check the play.

   Standard value (steering wheel play with the engine stopped): 10 mm (0.4 inch) or less

5. If the play exceeds the standard value, remove the steering gear (refer to P.37-31) and check the total pinion torque (refer to P.37-38).

STEERING ANGLE CHECK

M1372001100835


AC000756AB

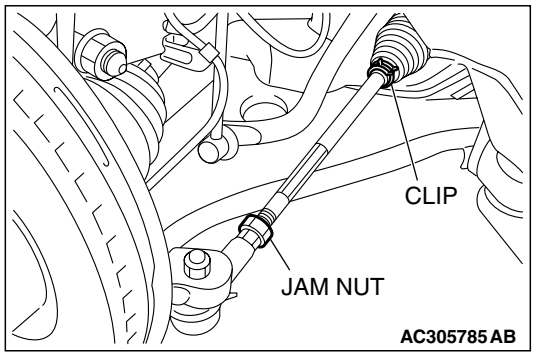
1. Place the front wheel on a turning radius gauge and measure the steering angle.

   Standard value:

ITEM	VEHICLES WITH 16-INCH WHEELS	VEHICLES WITH 17-INCH WHEELS	VEHICLES WITH 18-INCH WHEELS
Inner wheel	37°12' ± 2°00'	33°48' ± 2°00'	32°54' ± 2°00'
Outer wheel (reference)	30°18'	28°18'	27°48'

2. If the steering angle is not within the standard value, adjust the toe as follows.

   Standard value: 0 ± 3 mm (0 ± 0.12 inch)



AC305785AB

   (1) Loosen the jam nut, and unclip the bellows.
   (2) Adjust the toe by turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

   NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

   (3) Tighten the jam nut to the specified torque, and tighten the bellows by the clip.

   Tightening torque: 52 ± 2 N·m (38 ± 2 ft-lb)

3. Recheck the steering angle.

TIE ROD END BALL JOINT BREAKAWAY TORQUE CHECK

M1372001500305

Required Special Tools:

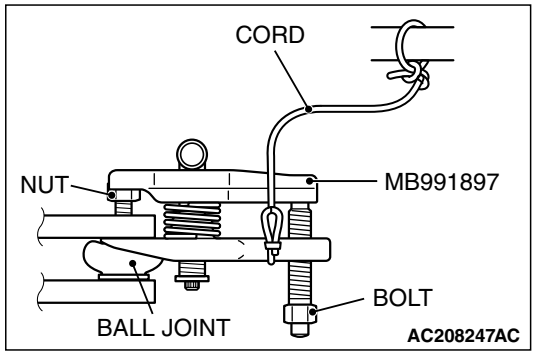
- MB990326: Preload Socket

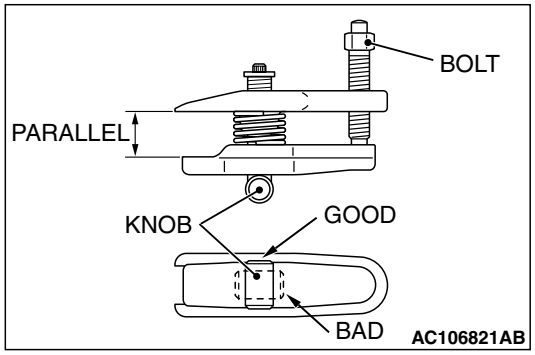
- MB991897: Ball Joint Remover

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to the ball joint threads.**
- **Hang special tool MB991897 with a cord to prevent it from falling.**

1. Install special tool MB991897 as shown in the figure.

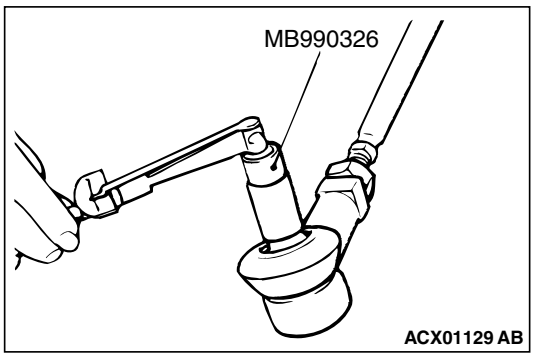




2. Turn the bolt and knob as necessary to make the jaws of special tool MB991897 parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the tie rod end.



4. Move the ball joint stud several times and install the nut on the stud. Using special tool MB990326, measure the ball joint breakaway torque.

   Standard value: 0.5 – 3.5 N·m (4.4 – 31.0 in-lb)

5. If the breakaway torque exceeds the standard value, replace the tie rod end assembly.
6. If the breakaway torque is under the standard value, check the ball joint for end play or ratcheting. If there is no end play or ratcheting, the ball joint can be re-used.

⚠ CAUTION

Always use a new ball joint nut, as it is a jam nut.

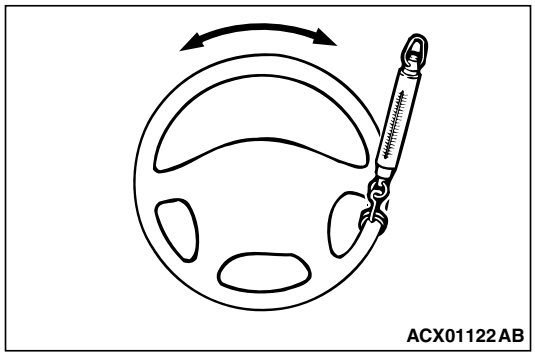
7. Install the tie rod end to the knuckle, then tighten a new jam nut to the specified torque.

   Tightening torque: 29 ± 4 N·m (21 ± 3 ft-lb)

STATIONARY STEERING EFFORT CHECK

M1372001700354

1. With the vehicle stopped on a flat and paved surface, turn the steering wheel to the straight ahead position.
2. Start the engine and allow to idle.


ACX01122AB

3. Attach a spring scale to the outer circumference of the steering wheel and measure the steering force required to turn the steering wheel from the straight ahead position to the left and right (within a range of 1.5 turns). Also check to be sure that there is no significant change in the required steering effort.

   Standard value:
   Steering effort: 30 N (6.7 pounds) or less
   Fluctuation allowance: 5.9 N (1.33 pounds) or less

4. If the measured value exceeds the standard value, refer to Inspection Procedure 2 "Difficult Steering Wheel Operation (Insufficient Power Assist)" P.37-5.

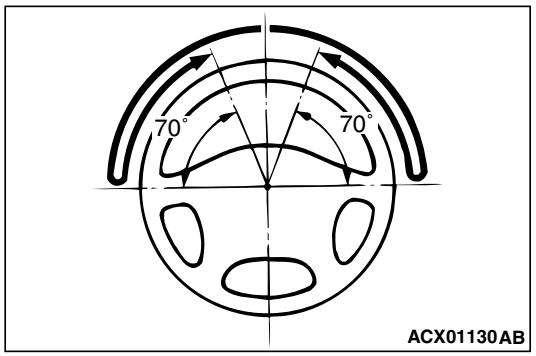
STEERING WHEEL RETURN TO CENTER CHECK

M1372001800339

Conduct a road test:

1. Make both gradual and sudden turns and check the steering wheel return.
2. At a vehicle speed of approximately 35 km/h (22 mph), turn the steering wheel 90 degrees, hold a few seconds, then release. If the steering wheel then returns 70 degrees or more, the return can be judged as satisfactory.

   NOTE: There will be a momentary feeling or "heaviness" when the wheel is turned quickly, but this is not abnormal. (Oil pump discharge amount is especially apt to be insufficient during idling.)



ACX01130AB

DRIVE BELT TENSION CHECK

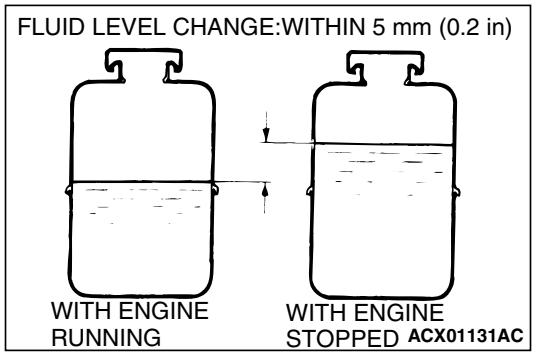
M1372001900284

Refer to GROUP 00, Maintenance Service – Drive Belts P.00-52.

FLUID LEVEL CHECK

M1372002000303

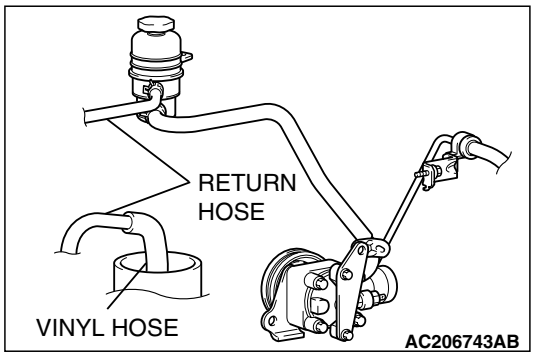
1. Park the vehicle on a flat, level surface.
2. Start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60°C (122 – 140°F).
3. With the engine running, turn the wheel all the way to the left and right several times.
4. Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running. If the fluid contains air or has milky appearance, or the fluid level fluctuate by 5 mm (0.2 inch) or more, power steering system air bleeding should be done.



ACX01131AC

FLUID REPLACEMENT

M1372002100366



1. Raise and support the front wheels.
2. Disconnect the return hose connection, and then connect a vinyl hose to the return hose, and drain the fluid into a container.
3. Disconnect the ignition coil connectors (refer to GROUP 16, Ignition Coil P.16-41 <2.4L ENGINE>, P.16-41 <3.8L ENGINE>).
4. While operating the starter motor intermittently, turn the steering wheel all the way to the left and right several times to drain all of the fluid.
5. Connect the return hose securely, and then secure with the clip.
6. Fill the oil reservoir with GENUINE MITSUBISHI POWER STEERING FLUID up to the lower mark of the reservoir, and then bleed the air.

POWER STEERING SYSTEM AIR BLEEDING

M1372002200352

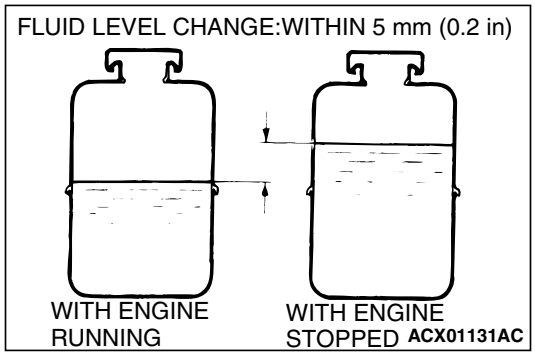
Perform air bleeding procedure as necessary after replacing the steering gear, oil pump or the steering fluid lines.

1. Raise and support the front wheels.
2. Disconnect the ignition coil connectors (Refer to GROUP 16, Ignition Coil P.16-41 <2.4L ENGINE>, P.16-41 <3.8L ENGINE>).

⚠ CAUTION

Perform air bleeding only while cranking the engine. Do not perform air bleeding while the engine is running. If you do so, air in the fluid will be increased and air bleeding will become more difficult. During air bleeding, refill the steering fluid so that the level never falls below the lower mark on the dipstick.

3. Turn the steering wheel all the way to the left and right five or six times while using the starter motor to crank the engine intermittently several times (for 15 to 20 seconds).
4. Connect the ignition coil connectors (Refer to GROUP 16, Ignition Coil P.16-41 <2.4L ENGINE>, P.16-41 <3.8L ENGINE>).
5. Start the engine and allow to idle.
6. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
7. Confirm that the fluid is not milky, and that the level is between the high and low dipstick marks.
8. Confirm that there is very little change in the fluid level when the steering wheel is turned left and right.



⚠ CAUTION

If the fluid level rises suddenly after the engine is stopped, the air has not been completely bled. If air bleeding is not complete, there will be abnormal noises from the pump and the flow-control valve, and this condition could reduce the life of the power steering components.

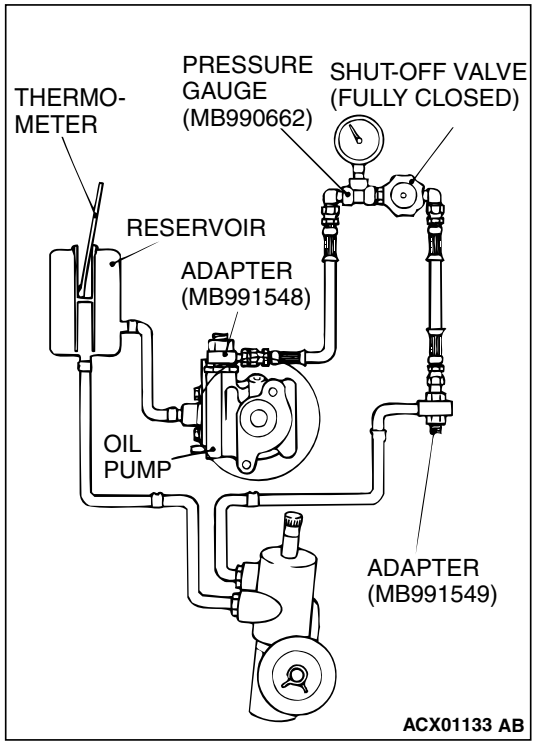
9. Confirm that the change in the fluid level is no more than 5 mm (0.2 inch) when the engine is stopped.
10. If the change of the fluid level is 5 mm (0.2 inch) or more, the air has not been completely bled from the system. The air bleeding procedure must be repeated.

OIL PUMP PRESSURE TEST

M1372002300337

Required Special Tools:

- MB990662: Power Steering Oil Pressure Gauge
- MB991548: Power Steering Oil Pressure Gauge Adapter (Pump Side)
- MB991549: Power Steering Oil Pressure Gauge Adapter (Hose Side)



1. Disconnect the pressure hose from the oil pump, and then connect special tools MB991548, MB990662 and MB991549.
2. Bleed air, then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50 – 60°C (122 – 140°F).
3. Start the engine and idle it.

⚠ CAUTION

The pressure gauge shut-off valve must not remain closed for more than 10 seconds.

4. Fully close the shut-off valve of the pressure gauge and measure the oil pump relief pressure to confirm that it is within the standard value range. Open it again immediately after checking the pressure.

   Standard value:
   2.4L engine: 8.3 – 8.8 MPa (1,204 – 1,276 psi)
   3.8L engine: 9.3 – 9.8 MPa (1,349 – 1,421 psi)

5. If it is not within the standard value, replace the oil pump.
6. Check whether or not the hydraulic pressure is the standard value when no-load conditions are created by fully opening the shut-off valve of the pressure gauge.

   Standard value: 0.8 – 1.0 MPa (116 – 145 psi)

7. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear, so check these parts and repair as necessary.

8. Turn the steering wheel all the way to the left or right; then check the retention hydraulic pressure.

   Standard value:
   2.4L engine: 8.3 – 8.8 MPa (1,204 – 1,276 psi)
   3.8L engine: 9.3 – 9.8 MPa (1,349 – 1,421 psi)

9. If not the standard value, overhaul or replace the steering gear. Remeasure fluid pressure.
10. Remove special tools MB991548, MB990662 and MB991549, connect the pressure hose to the oil pump, and then tighten the eye bolt to the specified torque.

    Tightening torque: 57 ± 7 N·m (42 ± 5 ft-lb)

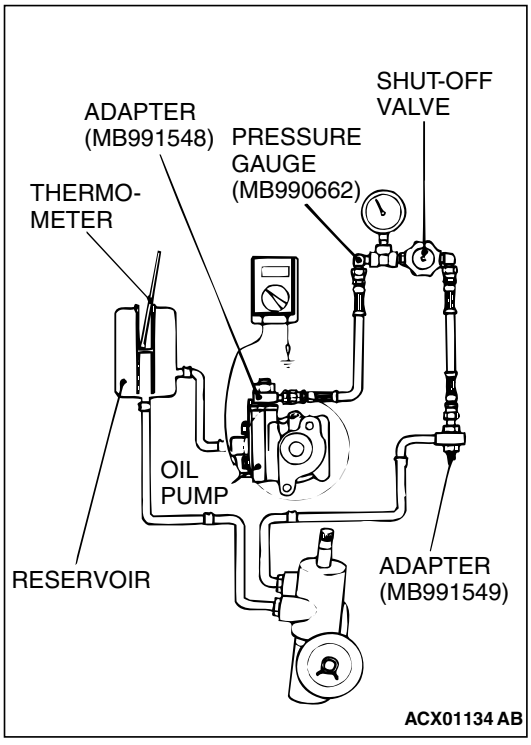
11. Bleed the system (Refer to P.37-20).

POWER STEERING PRESSURE SWITCH CHECK

M1372007200346

Required Special Tools:

- MB990662: Power Steering Oil Pressure Gauge
- MB991548: Power Steering Oil Pressure Gauge Adapter (Pump Side)
- MB991549: Power Steering Oil Pressure Gauge Adapter (Hose Side)



1. Disconnect the pressure hose from the oil pump, and then connect the special tools MB991548, MB990662 and MB991549.
2. Bleed air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50 – 60°C (122 – 140°F).
3. The engine should be idling.
4. Disconnect the connector for the oil pressure switch, and place an ohmmeter at the switch.
5. Gradually close the shut-off valve of the pressure gauge and increase the hydraulic pressure, then check whether or not the hydraulic pressure that activates the switch is the standard value.

   Standard value: 1.8 – 2.4 MPa (261 – 348 psi)

6. Gradually open the shut-off valve and reduce the hydraulic pressure; then check whether or not the hydraulic pressure that deactivates the switch is the standard value.

   Standard value: 0.8 – 2.4 MPa (116 – 348 psi)

7. Remove special tools MB991548, MB990662 and MB991549, connect the pressure hose to the oil pump, and then tighten the eye bolt to the specified torque.

   Tightening torque: 57 ± 7 N·m (42 ± 5 ft-lb)

8. Bleed the system. (Refer to P.37-20).

TIE ROD END BALL JOINT DUST COVER CHECK

M1372008600284

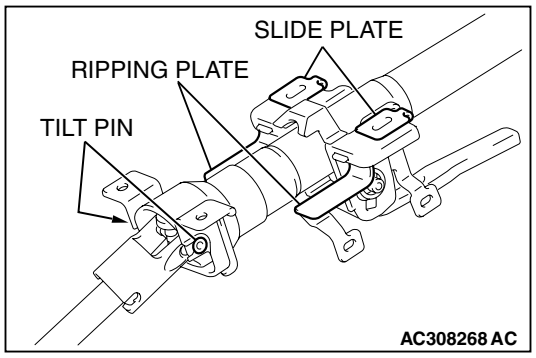
1. Press the dust cover with your finger to check whether the dust cover is cracked or damaged.

2. If the dust cover is cracked or damaged, replace the tie rod end.

   NOTE: If the dust cover is cracked or damaged, the ball joint could be damaged.

STEERING COLUMN SHAFT ASSEMBLY SHOCK ABSORBING MECHANISM CHECK

M1372013500131



- If a collision occurs or severe impact is applied to the steering wheel, the collision energy absorbing mechanism (slide plate, ripping plate, tilt pin) may have operated. Once the mechanism has operated, it will be inoperative even if there is no apparent damage. Determine if the steering column shaft can be reused by the following procedure. If the collision energy absorbing mechanism has already operated, replace the steering column assembly.
- If any excessive radial or axial free play on the steering wheel is found with the tilt lever in the lock position, always check the steering column assembly.

⚠ WARNING

1. ***If the vehicle continues to be driven after the collision absorbing mechanism has operated, the steering column shaft may be damaged while driving.***
2. ***If there is a slack in the slide plate, do not attempt to repair it. Replace the steering column assembly.***

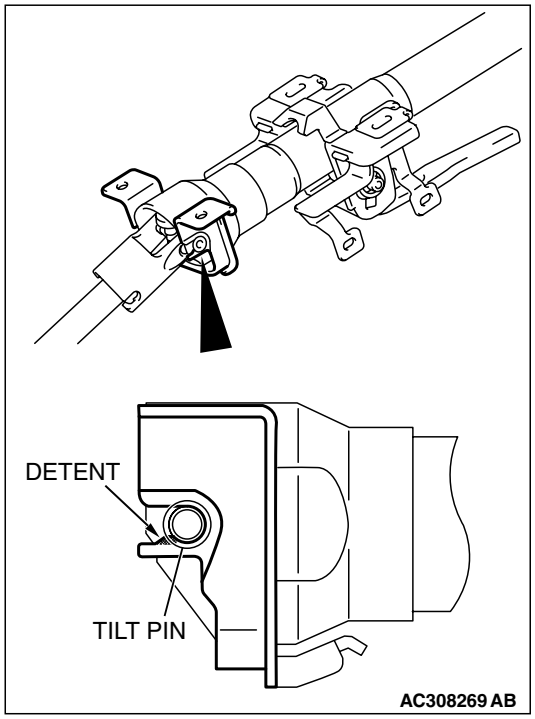
Inspection Procedure

1. Remove the steering column covers (lower and upper).

⚠ CAUTION

Do not release the tilt lever until the steering column has been installed to complete this inspection procedure.

2. Place the tilt lever in the locked position.
3. Loosen the two upper steering column mounting bolts by two turns.
4. Hold the steering wheel, and then try to rock it. If there is a radial or axial free play, replace the steering column assembly.



5. Check the tilt pin fixing detent of the lower bracket for deformation. If there is a deformation, replace the steering column assembly.

⚠ CAUTION

- **Be careful that nothing is pinched between the slide plate and the body.**
- **Do not release the tilt lever until the steering column has been installed to complete this inspection procedure.**

6. If no problem is found during the inspection, tighten the steering column assembly mounting bolts to the specified torque.

Tightening torque: 12 ± 2 N·m (102 ± 22 in-lb)

STEERING WHEEL

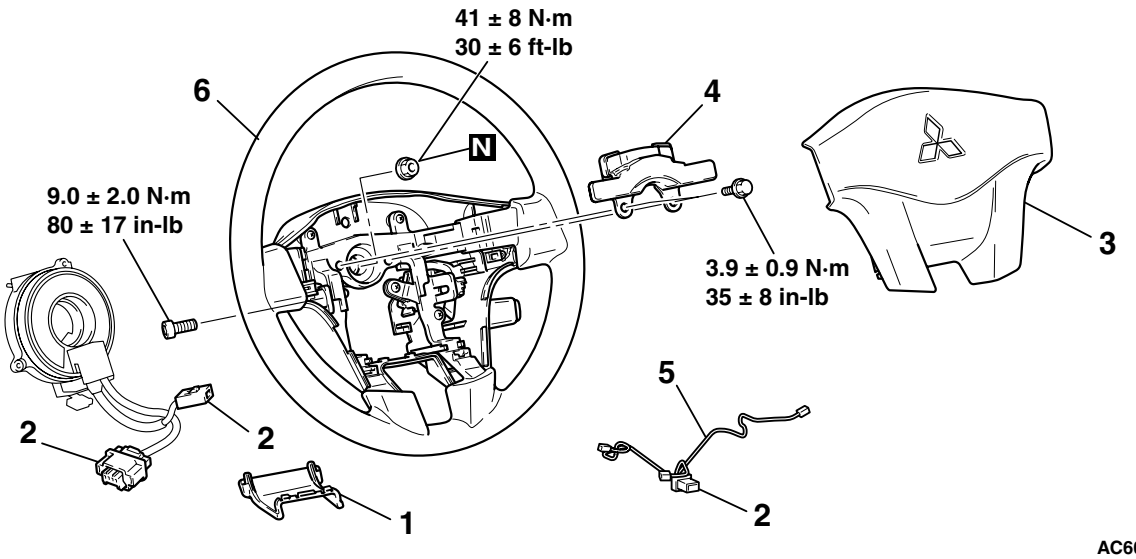
REMOVAL AND INSTALLATION

M1372011400666

⚠ WARNING

- ***Before removing the steering wheel and air bag module assembly, refer to GROUP 52B, Service Precautions (P.52B-29) and Air Bag Module and Clock Spring (P.52B-408).***
- ***When removing and installing the steering wheel, do not let it bump against the air bag module.***

Post-installation Operation
- Checking Steering Wheel Position with Wheels Straight Ahead



TSB Revision

REMOVAL STEPS

1. STEERING WHEEL LOWER COVER
<<A>> 2. CONNECTORS (FOR HORN, AIR BAG MODULE, AND STEERING WHEEL REMOTE CONTROL HARNESS)
3. AIR BAG MODULE
4. STEERING WHEEL DYNAMIC DAMPER
5. STEERING WHEEL REMOTE CONTROL HARNESS
<<B>> 6. STEERING WHEEL ASSEMBLY

INSTALLATION STEPS

- CLOCK SPRING MATING MARK ALIGNMENT (REFER TO GROUP 52B, AIR BAG MODULE AND CLOCK SPRING P.52B-408).

6. STEERING WHEEL ASSEMBLY

INSTALLATION STEPS

5. STEERING WHEEL REMOTE CONTROL HARNESS
4. STEERING WHEEL DYNAMIC DAMPER
3. AIR BAG MODULE
2. CONNECTORS (FOR HORN, AIR BAG MODULE, AND STEERING WHEEL REMOTE CONTROL HARNESS)
1. STEERING WHEEL LOWER COVER

NOTE: For air bag module removal, refer to GROUP 52B, Air Bag Module and Clock Spring P.52B-408.

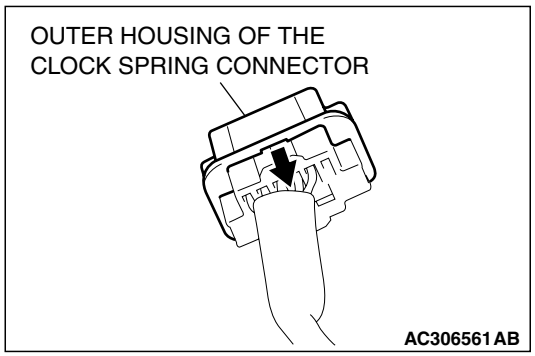
Required Special Tool:

- MB990803: Steering Wheel Puller

REMOVAL SERVICE POINTS

<<A>> CONNECTOR (FOR AIR BAG MODULE) REMOVAL

Slide the outer housing of the clock spring connector in the arrow direction shown, and disconnect the connector.

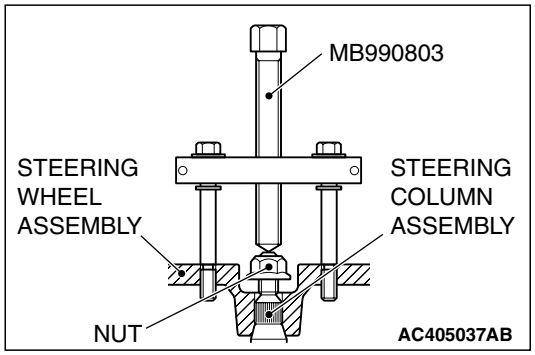


<<B>>STEERING WHEEL ASSEMBLY REMOVAL

⚠ CAUTION

Use the special tool to remove the steering wheel since the steering column collision absorbing mechanism may be damaged.

Use special tool MB990803 to remove the steering wheel.



STEERING COLUMN SHAFT ASSEMBLY

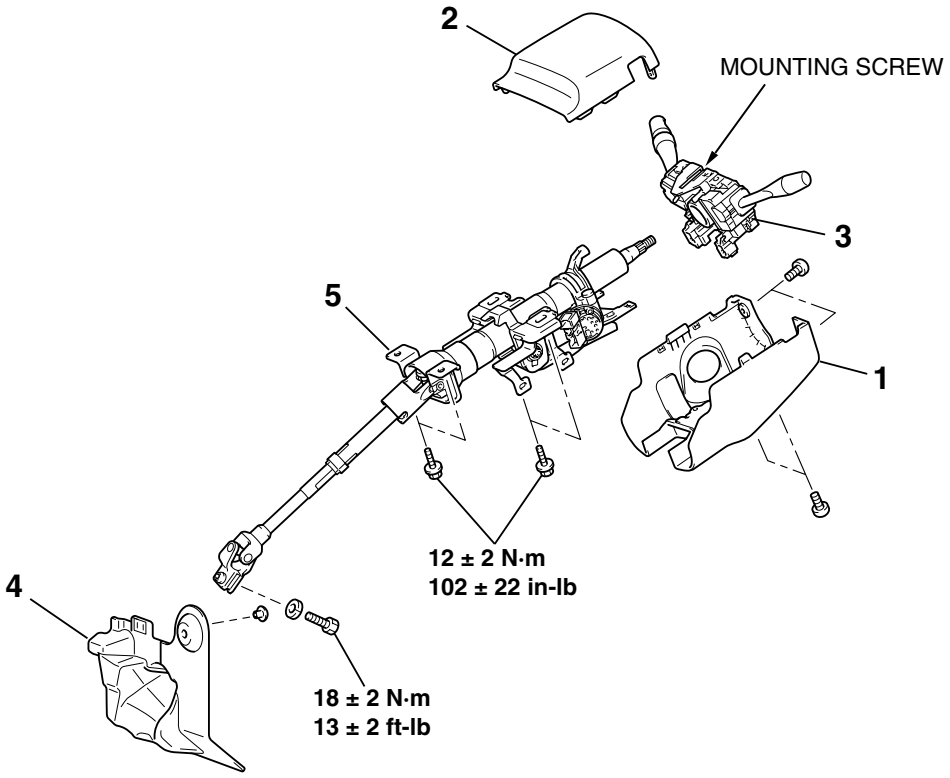
REMOVAL AND INSTALLATION

M1372003100024

⚠ WARNING

Before removing the air bag module and steering wheel assembly, refer to GROUP 52B, Service Precautions and Air Bag Module and Clock Spring (P.52B-29 and P.52B-408).

Pre-removal Operation	Post-installation Operation
• Air bag Module and Steering Wheel Assembly Removal (Refer to P.37-24). • Instrument Panel Lower Panel Removal (Refer to GROUP 52A, Instrument Panel P.52A-15). • Floor Console Assembly Removal (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Front Scuff Plate and Cowl Side Trim Removal (Refer to GROUP 52A, Trims P.52A-23). • Trunk Lid Opener Cover Removal • Accelerator Pedal Stopper Removal • Front Floor Carpet Removal	• Front Floor Carpet Installation • Accelerator Pedal Stopper Installation • Trunk Lid Opener Cover Installation • Front Scuff Plate and Cowl Side Trim Installation (Refer to GROUP 52A, Trims P.52A-23). • Floor Console Assembly Installation (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Instrument Panel Lower Panel Installation (Refer to GROUP 52A, Instrument Panel P.52A-15). • Steering Wheel Assembly and Air bag Module Installation (Refer to P.37-24).



AC306562 AB

REMOVAL STEPS

1. STEERING COLUMN LOWER COVER
2. STEERING COLUMN UPPER COVER
3. CLOCK SPRING AND COLUMN SWITCH ASSEMBLY (REFER TO GROUP 52B, AIR BAG MODULE AND CLOCK SPRING P.52B-408).

REMOVAL STEPS (Continued)

- KEY INTERLOCK CABLE CONNECTION (REFER TO GROUP 23, A/T KEY INTERLOCK AND SHIFT LOCK MECHANISM P.23A-384).

4. STEERING SHAFT PAD

<<A>> >>A<< 5. STEERING COLUMN SHAFT ASSEMBLY

TSB Revision

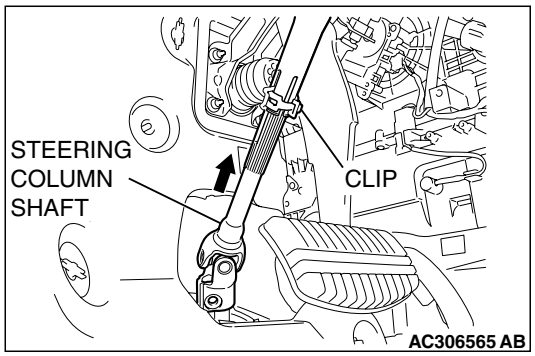
REMOVAL SERVICE POINT

<<A>> STEERING COLUMN SHAFT ASSEMBLY REMOVAL

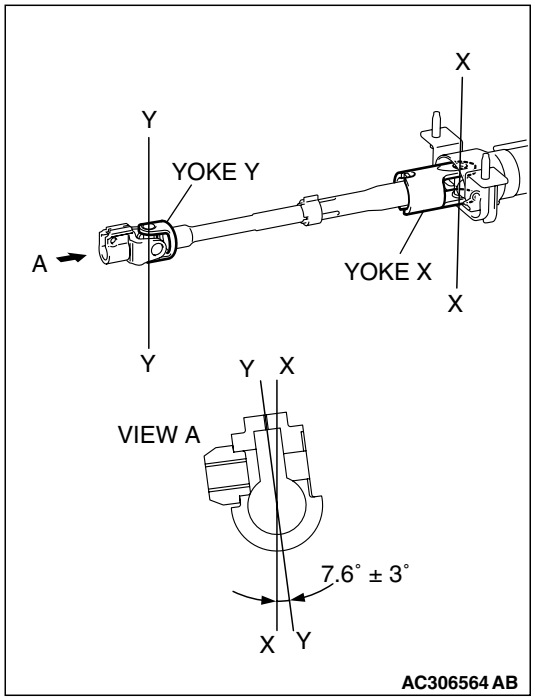
⚠ CAUTION

The tilt lever should be held in the lock position until the steering column shaft assembly is installed to the vehicle. If the steering column shaft assembly is removed with the tilt lever released, or the tilt lever is released after the steering column shaft assembly was removed from the vehicle, the steering column shaft assembly cannot be reinstalled correctly. If the steering column shaft assembly is installed incorrectly, the collision energy absorbing mechanism may be damaged.

1. Ensure that the tilt lever is in the lock position, and remove the steering column shaft assembly mounting bolts.
2. Pinch the steering column shaft clip with pliers, and pull up the shaft in the direction shown to disengage the steering column shaft assembly.



NOTE: If the steering column shaft is removed accidentally, remove the steering column shaft assembly and be sure to insert the steering column shaft into the steering column as shown in the figure.

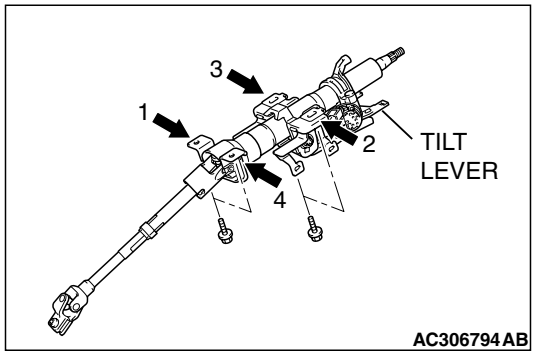


INSTALLATION SERVICE POINT

>>A<< STEERING COLUMN SHAFT ASSEMBLY INSTALLATION

⚠ CAUTION

1. **If reusing the steering column shaft assembly, do not release the tilt lever until the steering column shaft assembly has been installed.**
2. **If a new steering column shaft assembly is being installed, do not release the tilt lever until it has been installed. Do not remove the tilt lever fixing band until the installation is completed.**
3. **When installing the steering column shaft assembly, do not leave it fixed temporarily at only one point and make sure the steering column shaft assembly is not shaken strongly. If this happens, the collision absorbing mechanism at the steering column shaft assembly mounting location may be damaged.**



Ensure that the tilt lever is in the lock position, and install the steering column shaft assembly. Tighten the four bolts finger-tight in the order shown, and then tighten them to the specified torque in the order shown.

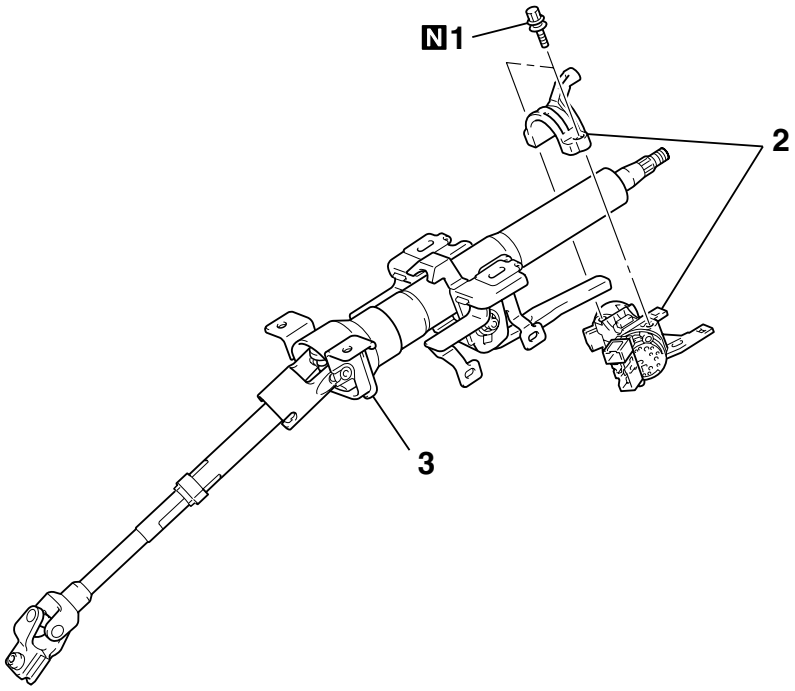
Tightening torque: 12 ± 2 N·m (102 ± 22 in-lb)

DISASSEMBLY AND ASSEMBLY

M1372015000013

⚠ ***WARNING***

Do not move the tilt lever from the lock position until the installation is completed. If you move it accidentally, the steering column cannot be reinstalled correctly.



AC306566 AB

DISASSEMBLY STEPS

<<**A**>> >>**A**<< 1. STEERING LOCK BOLT

DISASSEMBLY STEPS (Continued)

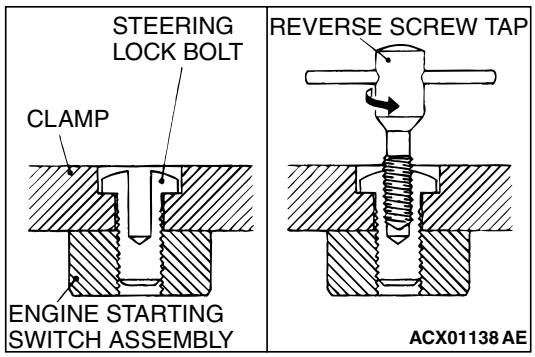
>>**A**<< 2. ENGINE STARTING SWITCH ASSEMBLY

3. STEERING COLUMN SHAFT ASSEMBLY

DISASSEMBLY SERVICE POINT

<<A>> STEERING LOCK BOLT REMOVAL

1. Drill in the steering lock bolt a hole deep enough for the tap to stand.
2. Remove the steering lock bolt with a left-hand tap.



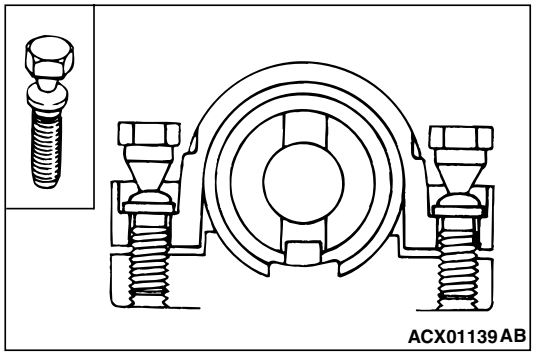
ASSEMBLY SERVICE POINT

>>A<< ENGINE STARTING SWITCH ASSEMBLY/STEERING LOCK BOLT INSTALLATION

⚠ CAUTION

The bolts must be replaced with new ones when the steering lock is installed.

1. When installing the engine starting switch assembly to the steering column shaft assembly, temporarily install the engine starting switch assembly in alignment with the column boss.
2. After checking that the lock works properly, tighten the steering lock bolts until the head is twisted off.



POWER STEERING GEAR BOX AND LINKAGE

REMOVAL AND INSTALLATION

M1372010900787

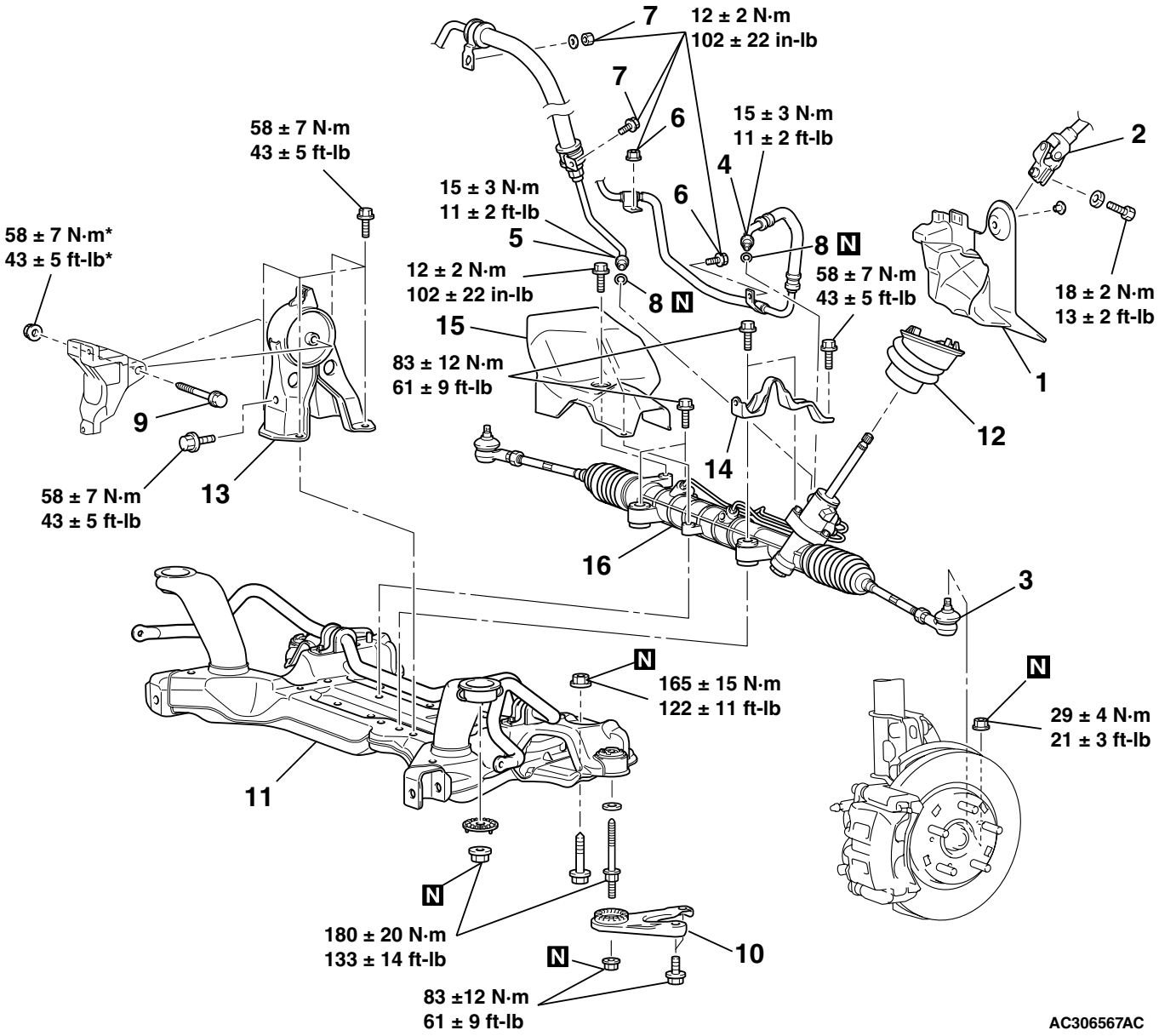
⚠ WARNING

- ***Before removing the power steering gear assembly, refer to GROUP 52B, Service Precautions and Air Bag Module and Clock Spring (P.52B-29 and P.52B-408).***
- ***Center the front wheels. Failure to do so may damage the SRS clock spring and render the SRS system inoperative, risking serious injury.***

⚠ CAUTION

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

Pre-removal Operation	Post-installation Operation
• Power Steering Fluid Draining (Refer to P.37-20). • Front Under Cover Removal • Centermember Removal (Refer to GROUP 32, Engine Roll Stopper and Centermember P.32-7). • Lower Arm Assembly Removal (Refer to GROUP 33, Lower Arm P.33-15). • Air Bag Module and Steering Wheel Assembly Removal (Refer to P.37-24). • Floor Console Assembly Removal (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Front Scuff Plate and Cowl Side Trim Removal (Refer to GROUP 52A, Trims P.52A-23). • Trunk Lid Opener Cover Removal • Accelerator Pedal Stopper Removal • Front Floor Carpet Removal • Stabilizer Link and Stabilizer Bar Disconnection (Refer to GROUP 33, Stabilizer Bar P.33-20).	• Check the dust cover for cracks or damage by pushing it with your finger. • Stabilizer Link and Stabilizer Bar Connection (Refer to GROUP 33, Stabilizer Bar P.33-20). • Front Floor Carpet Installation • Accelerator Pedal Stopper Installation • Trunk Lid Opener Cover Installation • Front Scuff Plate and Cowl Side Trim Removal (Refer to GROUP 52A, Trims P.52A-23). • Floor Console Assembly Installation (Refer to GROUP 52A, Floor Console Assembly P.52A-22). • Steering Wheel Assembly and Air Bag Module Installation (Refer to P.37-24). • Checking Steering Wheel Position with Wheels Straight Ahead. • Lower Arm Assembly Installation (Refer to GROUP 33, Lower Arm P.33-15). • Centermember Installation (Refer to GROUP 32, Engine Roll Stopper and Centermember P.32-7). • Front Under Cover Installation • Front Wheel Alignment Adjustment (Refer to GROUP 33, On-vehicle Service – Front Wheel Alignment Check and Adjustment P.33-6). • Power Steering Fluid Supplying (Refer to P.37-20). • Power Steering Fluid Line Bleeding (Refer to P.37-20).



AC306567AC

REMOVAL STEPS

1. STEERING SHAFT PAD
<<**A**>> 2. STEERING COLUMN SHAFT ASSEMBLY AND STEERING GEAR CONNECTION
<<**B**>> 3. TIE ROD END AND KNUCKLE CONNECTION
4. RETURN TUBE CONNECTION
5. PRESSURE HOSE CONNECTION
6. RETURN TUBE CLAMP
7. PRESSURE HOSE CLAMP
8. O-RING
9. REAR ROLL STOPPER CONNECTING BOLT
<<**C**>> >>**C**<< 10. FRONT AXLE CROSSMEMBER STAY
<<**D**>> >>**B**<< 11. CROSSMEMBER ASSEMBLY

REMOVAL STEPS (Continued)

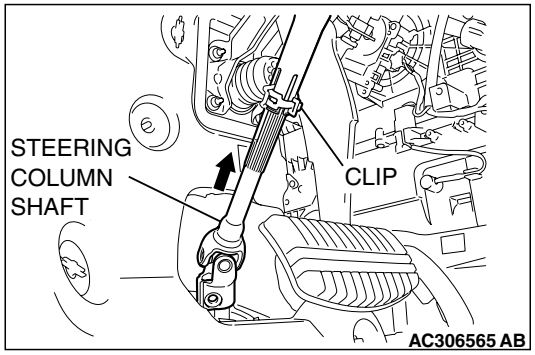
>>**B**<< 12. STEERING COLUMN DASH PANEL COVER
>>**A**<< 13. REAR ROLL STOPPER
>>**A**<< 14. POWER STEERING GEAR BRACKET
15. STEERING GEAR AND LINKAGE PROTECTOR <3.8L ENGINE>
16. POWER STEERING GEAR AND LINKAGE

Required Special Tool:

- MB991897: Ball Joint Remover

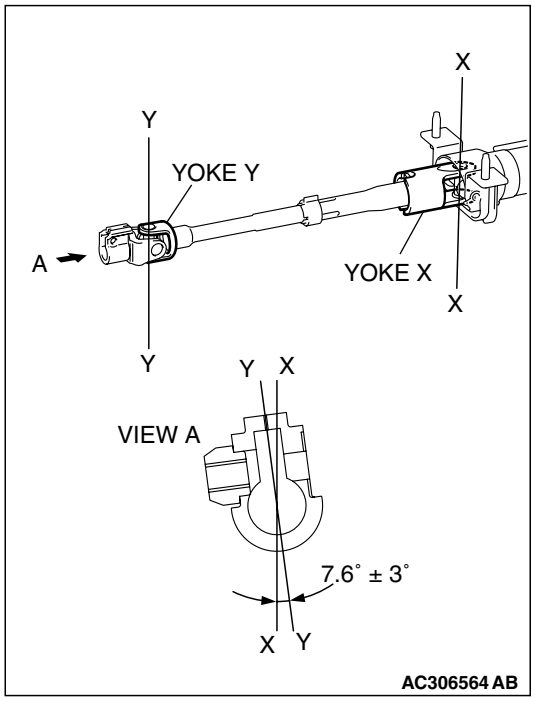
TSB Revision

REMOVAL SERVICE POINTS



<<A>> STEERING COLUMN SHAFT ASSEMBLY AND STEERING GEAR DISCONNECTION

1. Pinch the steering column shaft clip with pliers, and pull up the shaft in the direction shown to disengage the steering column shaft assembly.



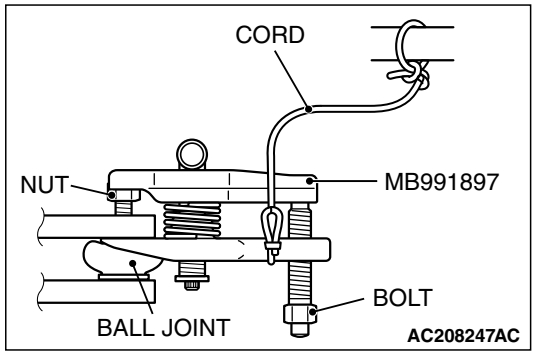
NOTE: If the steering column shaft is removed accidentally, remove the steering column shaft assembly and be sure to insert the steering column shaft into the steering column as shown in the figure.

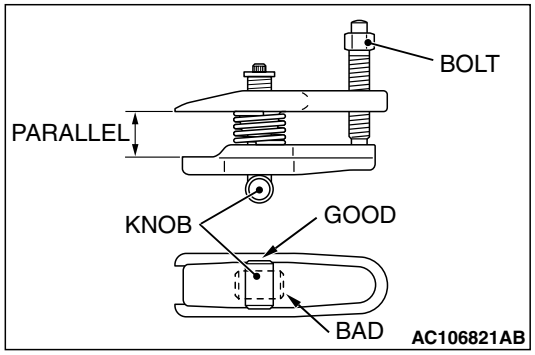
<<B>> TIE ROD END AND KNUCKLE DISCONNECTION

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.**
- **Hang special tool MB991897 with a cord to prevent it from falling.**

1. Install special tool MB991897 as shown in the figure.





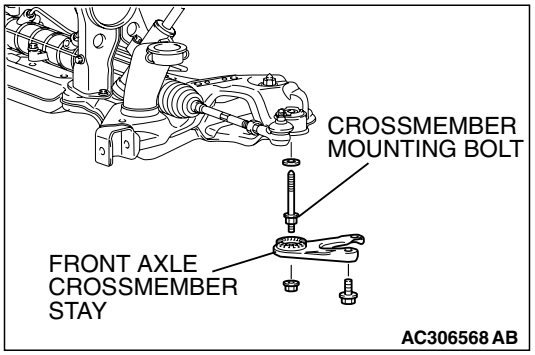
2. Turn the bolt and knob as necessary to make the jaws of special tool MB991897 parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the tie rod end.

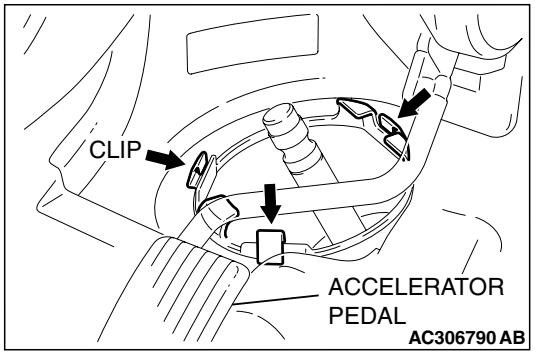
<<C>> FRONT AXLE CROSSMEMBER STAY REMOVAL

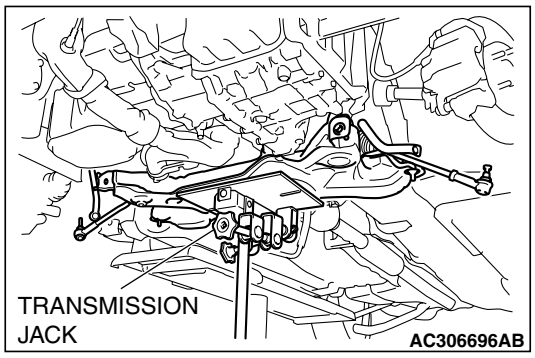
The crossmember mounting bolts need not be unscrewed when the front axle crossmember stay is replaced. However, the bolts may be loose while the front axle crossmember stay is removed. Retighten the bolts to 180 ± 20 N·m (133 ± 14 ft-lb).



<<D>> CROSSMEMBER ASSEMBLY REMOVAL

1. From inside the vehicle, loosen the 3 shown clips from the body panel.





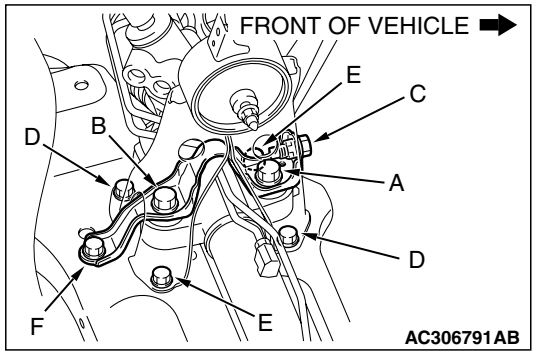
2. Use a transmission jack to hold the crossmember, and then remove the crossmember mounting nuts and bolts.
3. Lower the crossmember with the rear roll stopper, the stabilizer bar and the steering gear.

INSTALLATION SERVICE POINTS

>>A<< POWER STEERING GEAR BRACKET/REAR ROLL STOPPER INSTALLATION

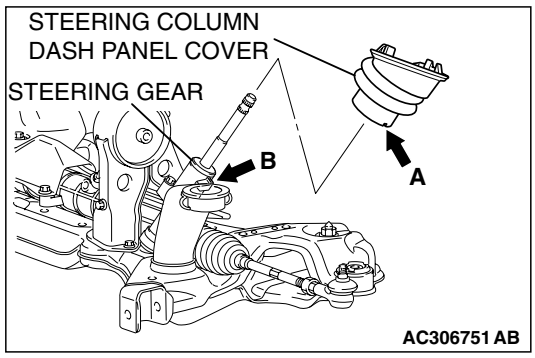
Tighten the bolts as follows:

1. Tighten the bolt A and then tighten the bolt B.
2. Tighten the bolts E with finger tight.
3. Tighten the bolt C and then tighten the bolts D.
4. Tighten the bolts E and then tighten the bolt F.

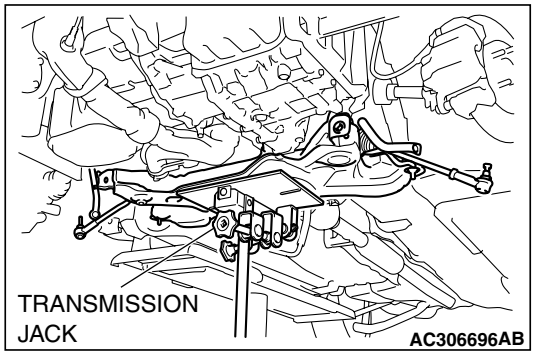


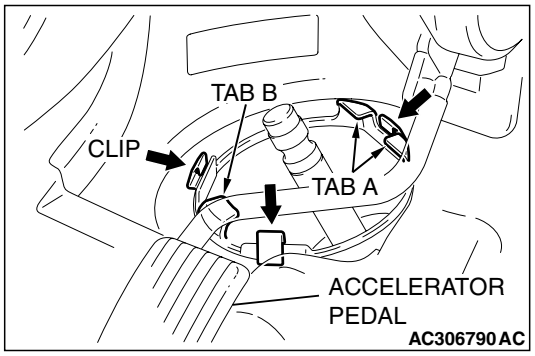
>>B<< STEERING COLUMN DASH PANEL COVER/ CROSSMEMBER ASSEMBLY INSTALLATION

1. Align the steering column dash panel cover notch (arrow A) with the steering gear lug (arrow B), and then install the steering column dash panel cover to the steering gear.



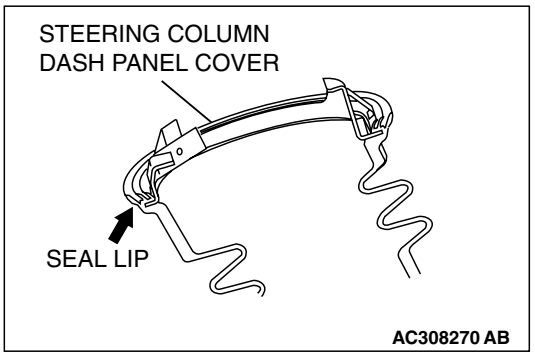
2. Use a transmission jack to lift the crossmember assembly.





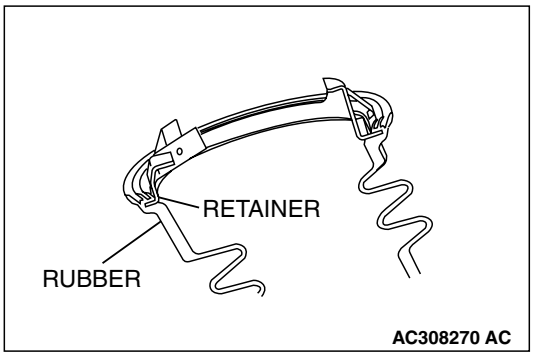
3. From inside the vehicle, pull tab A and then tab B to secure the three clips to the body panel.

   NOTE:

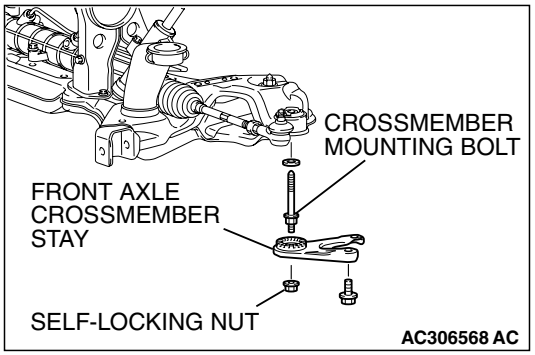


When securing the steering column dash panel cover to the body panel, be careful that the seal lip does not move backwards.

4. Check that it has been secured by pressing down the tip of the clips by your finger. Also check that the steering column dash panel cover is installed securely to the steering gear.



5. After installing the steering column dash panel cover, check that the steering column dash panel cover rubber is not disengaged from the retainer. If there is any doubt, release the clips from the body, engage the rubber again and reinstall to the body.
6. Tighten the crossmember mounting nuts and bolts.



>>C<< FRONT AXLE CROSSMEMBER STAY/SELF-LOCKING NUT INSTALLATION

Ensure that the crossmember mounting bolts have been tightened to 180 ± 20 N·m (133 ± 14 ft-lb), and then install the front crossmember stay with the self-locking nut.

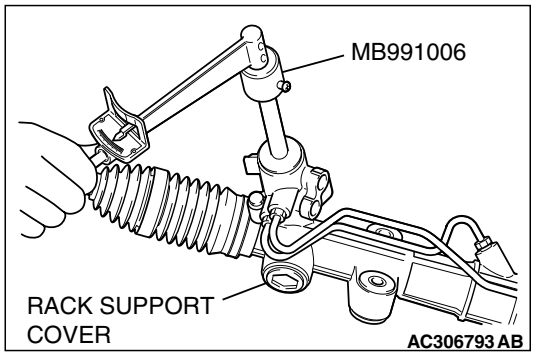
INSPECTION

M1372011000624

STEERING GEAR TOTAL PINION TORQUE CHECK

Required Special Tool:

- MB991006: Preload Socket



⚠ CAUTION

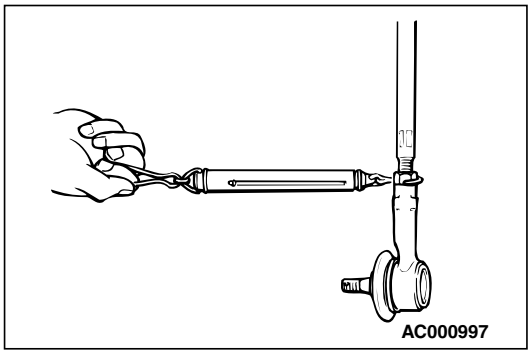
- **When holding the steering gear in a vice, secure its mounting positions. If it is secured in any other place, the gear housing may become deformed or damaged.**
- **Do not loosen the adjust screw more than 2 rotations.**
- **If the adjust screw is loosened more than 2 rotations, or if it is removed, replace the steering gear assembly.**

1. Using special tool MB991006, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

   Standard value: 0.8 – 1.9 N·m (7.1 – 16.8 in-lb)
   [Change in torque: 0.7 N·m (6.2 in-lb) or less]

   NOTE: When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.
2. If the total pinion torque or the change in torque is outside the standard value, loosen the rack support cover once and retighten it to the specified torque 12 ± 2 N·m (107 ± 17 in-lb). And then loosen the rack support cover 10 degrees, and check the pinion torque again.

   If the total pinion torque cannot be adjusted to within the standard range by adjusting the rack support cover, replace the power steering gear.



TIE ROD SWING RESISTANCE CHECK

1. Give 10 hard swings to the tie rod.
2. Measure the tie rod swing resistance with a spring scale.

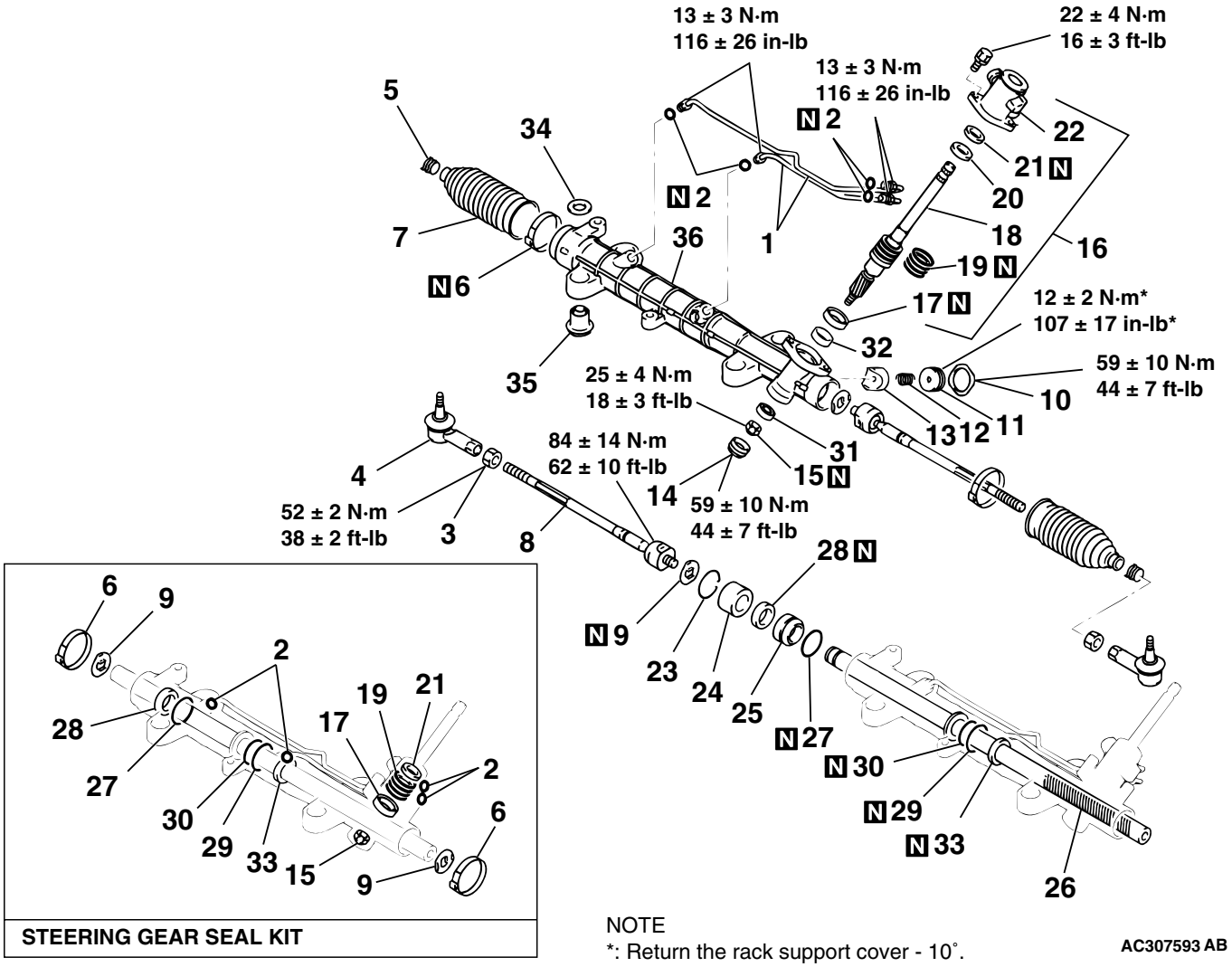
   Standard value:
   3.7 – 18.1 N (0.83 – 4.07 lb) <vehicles with 16-inch wheels>
   3.6 – 17.8 N (0.81 – 4.00 lb) <vehicles with 17-inch wheels>
   3.6 – 17.6 N (0.81 – 3.96 lb) <vehicles with 18-inch wheels>
   [Swing torque: 1.0 – 4.9 N·m (8.9 – 43.3 in-lb)]
3. If the measured value exceeds the standard value, replace the tie rod.
4. If the measured value is below the standard value, the tie rod can be re-used if it swings smoothly without excessive play.

TIE ROD END BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the tie rod end. (Refer to P.37-38).

DISASSEMBLY AND ASSEMBLY

M1372011100494



STEERING GEAR SEAL KIT

NOTE
*: Return the rack support cover - 10˚.

AC307593 AB

DISASSEMBLY STEPS

	1.	P/S OIL FEED TUBE ASSEMBLY
	2.	STEERING GEAR INNER O-RING
>>**P**<<	3.	STEERING GEAR NUT (TIE ROD END JAM NUT)
>>**P**<<	4.	TIE ROD END ASSEMBLY
	5.	STEERING GEAR INNER CLIP
>>**O**<<	6.	STEERING GEAR BAND (BELLOWS BAND)
	7.	STEERING GEAR BELLOWS
<<**A**>> >>**N**<<	8.	STEERING TIE ROD
<<**A**>> >>**N**<<	9.	STEERING GEAR WASHER (TAB WASHER)
>>**M**<<	•	TOTAL PINION TORQUE ADJUSTMENT
>>**L**<<	10.	STEERING GEAR INNER NUT (JAM NUT)
<<**B**>> >>**L**<<	11.	STEERING GEAR RACK SUPPORT COVER
	12.	STEERING GEAR RACK SUPPORT SPRING
	13.	STEERING GEAR RACK SUPPORT

DISASSEMBLY STEPS (Continued)

>>**K**<<	14.	STEERING GEAR PLUG (END PLUG)
	15.	STEERING GEAR INNER NUT
	16.	VALVE ASSEMBLY
<<**C**>> >>**J**<<	17.	OIL SEAL
<<**C**>>	18.	PINION AND VALVE ASSEMBLY
<<**D**>> >>**I**<<	19.	SEAL RING
<<**E**>> >>**H**<<	20.	SPECIAL BEARING
<<**E**>> >>**H**<<	21.	OIL SEAL
	22.	VALVE HOUSING
<<**F**>> >>**G**<<	23.	STEERING GEAR PISTON CLIP (CIRCLIP)
	24.	STEERING GEAR RACK STOPPER
>>**F**<<	25.	STEERING GEAR BUSHING (RACK BUSHING)
<<**G**>> >>**E**<<	26.	STEERING GEAR RACK
>>**D**<<	27.	O-RING
<<**H**>> >>**D**<<	28.	OIL SEAL
	29.	PISTON RING
	30.	O-RING
<<**I**>> >>**C**<<	31.	STEERING GEAR PINION BEARING (BALL BEARING)

TSB Revision

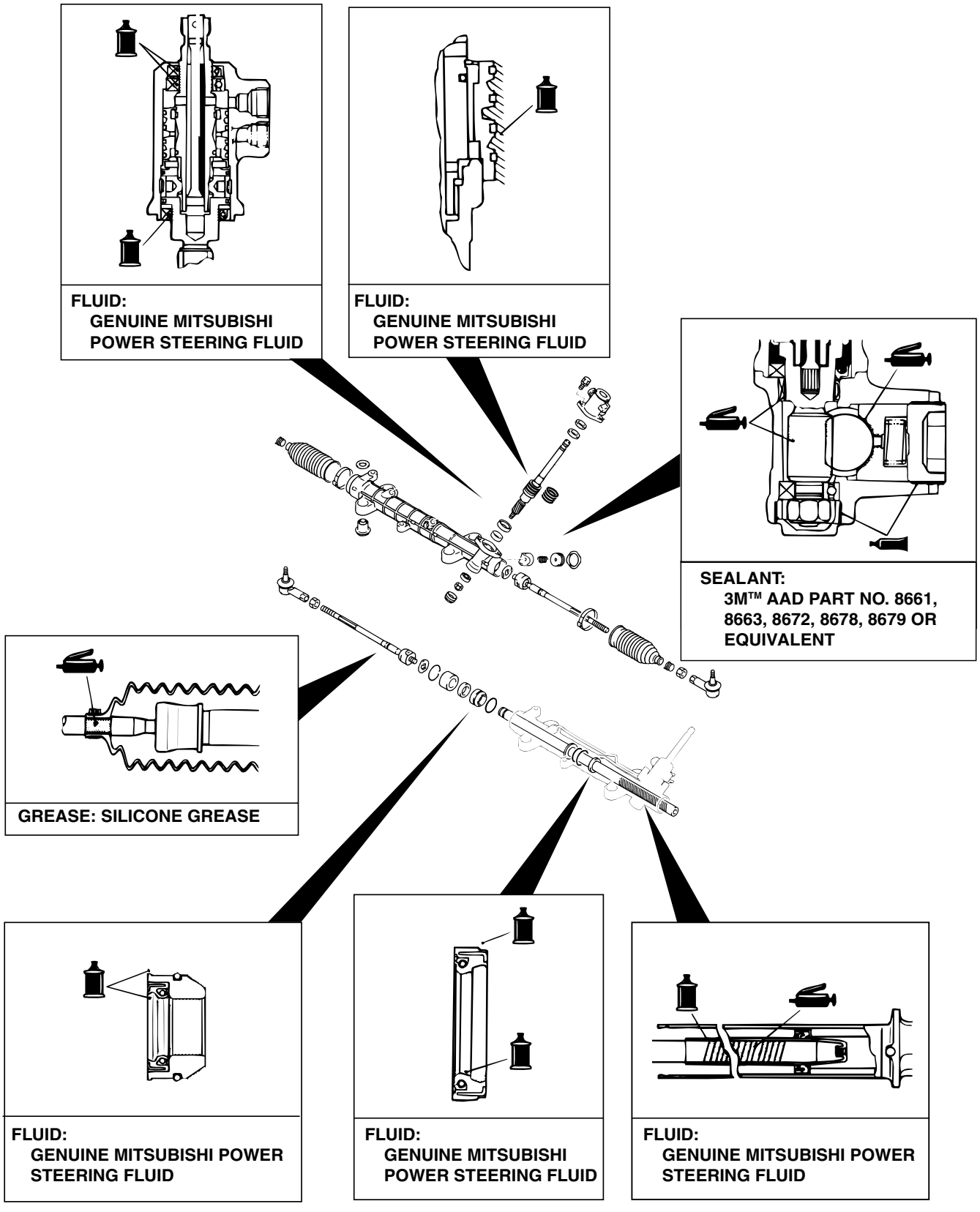
DISASSEMBLY STEPS (Continued)

<<**J**>> >>**C**<< 32. STEERING GEAR PINION SHAFT UPPER BEARING (NEEDLE ROLLER BEARING)
<<**K**>> >>**B**<< 33. OIL SEAL
34. STEERING GEAR CUSHION
<<**L**>> >>**A**<< 35. STEERING GEAR BUSHING
36. RACK HOUSING

Required Special Tools:

- MB990927: Installer Adapter
- MB990938: Bar (Snap-in type)
- MB990939: Brass Bar
- MB990996: Lower Arm Bushing Arbor
- MB991006: Preload Socket
- MB991120: Needle Bearing Puller
- MB991152: Dust Cover Installer
- MB991197: Bar (Long type)
- MB991199: Oil Seal Installer
- MB991202: Oil Seal and Bearing Installer
- MB991203: Oil Seal and Bearing Installer
- MB991204: Torque Wrench Socket
- MB991213: Rack Installer
- MB991317: Seal Ring Installer
- MB991561: Boot Band Crimping Tool
- MD998368: Bearing Installer
- MD998812: Installer Cap
- MD998813: Installer 100
- MD998822: Installer Adapter
- MD999569: Camshaft Oil Seal Installer

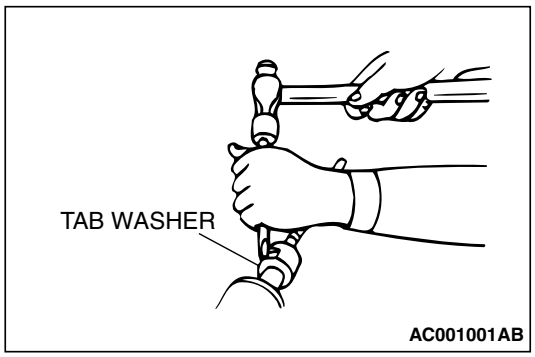
LUBRICATION AND SEALING POINTS



AC307346 AC

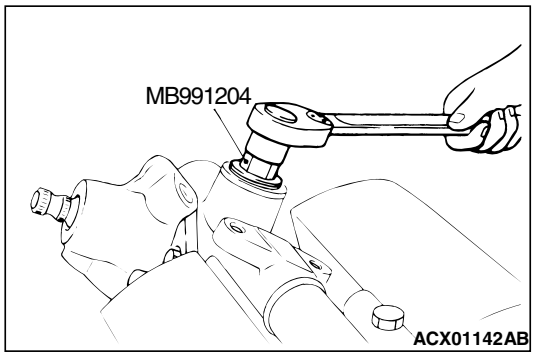
TSB Revision

DISASSEMBLY SERVICE POINTS



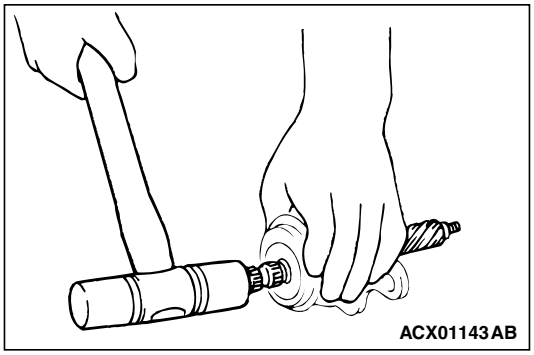
<<A>> STEERING TIE ROD/STEERING GEAR WASHER (TAB WASHER) REMOVAL

Unstake the tab washer which secures the tie rod and rack with a chisel.



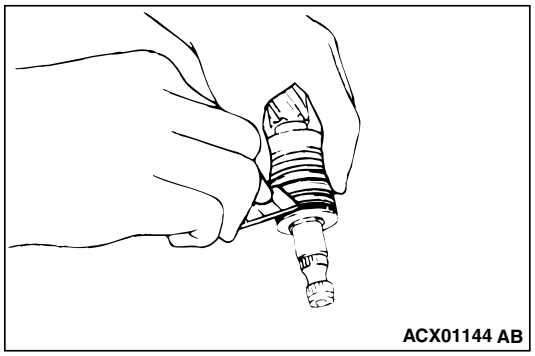
<<B>> STEERING GEAR RACK SUPPORT COVER REMOVAL

Using special tool MB991204, remove the rack support cover from the gear box.



<<C>> OIL SEAL/PINION AND VALVE ASSEMBLY REMOVAL

Using a plastic hammer, gently tap the pinion to remove it.

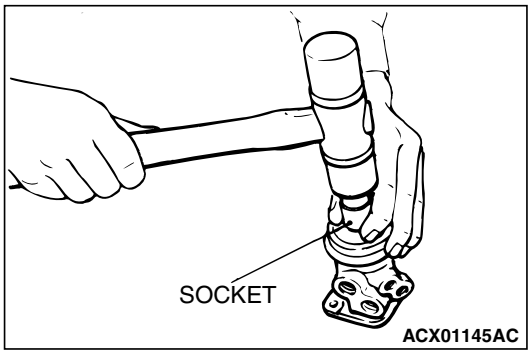

ACX01144 AB

<<D>> SEAL RING REMOVAL

⚠ CAUTION

When cutting the seal ring, be careful not to damage the pinion and valve assembly or the rack.

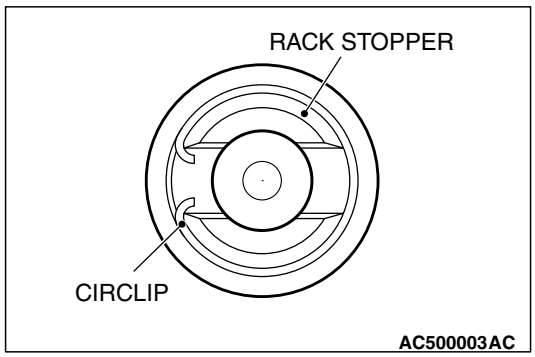
Cut the seal ring and remove it from the pinion and valve assembly and the rack.



ACX01145AC

<<E>> SPECIAL BEARING/OIL SEAL REMOVAL

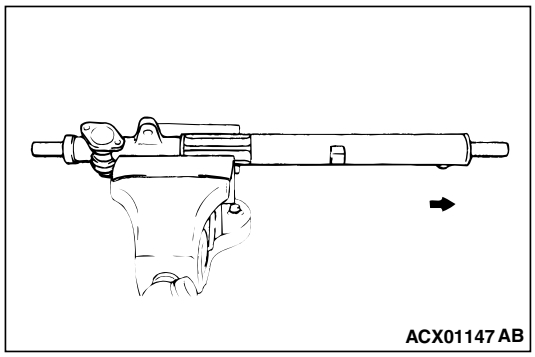
Using a socket, remove the oil seal and the special bearing from the valve housing simultaneously.



AC500003AC

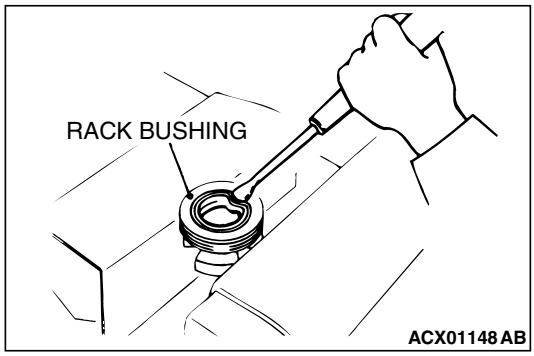
<<F>> STEERING GEAR PISTON CLIP (CIRCLIP) REMOVAL

Use a screwdriver to remove the circlip from slit of the rack stopper.


ACX01147 AB

<<G>> STEERING GEAR RACK REMOVAL

Pull out the rack slowly. Take out the rack stopper and the rack bushing at the same time.

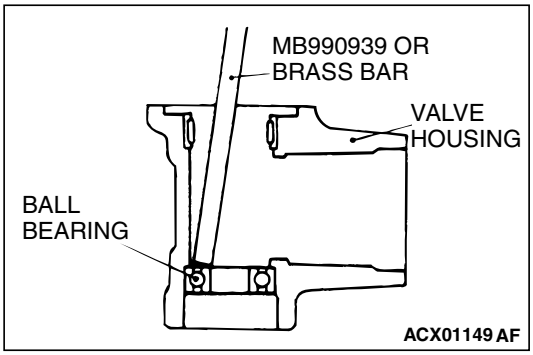


<<H>> OIL SEAL REMOVAL

⚠ CAUTION

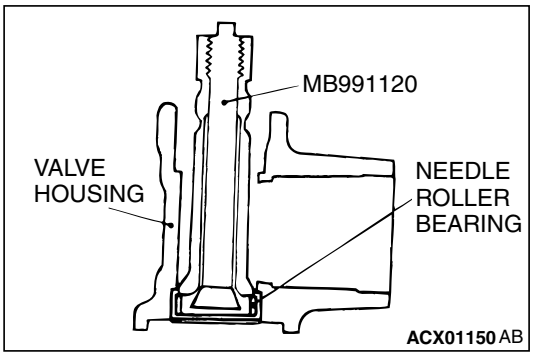
Do not damage oil seal press fitting surface.

Partially prize the oil seal and remove it from the rack bushing.



<<I>> STEERING GEAR PINION BEARING (BALL BEARING) REMOVAL

Use a brass bar or special tool MB990939 to remove the ball bearing from the gear housing.

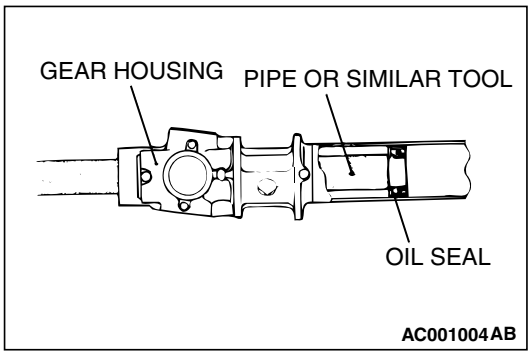


<<J>> STEERING GEAR PINION SHAFT UPPER BEARING (NEEDLE ROLLER BEARING) REMOVAL

⚠ CAUTION

Do not open special tool MB991120 excessively to prevent damaging housing interior.

Use special tool MB991120 to remove the needle roller bearing from the rack housing.

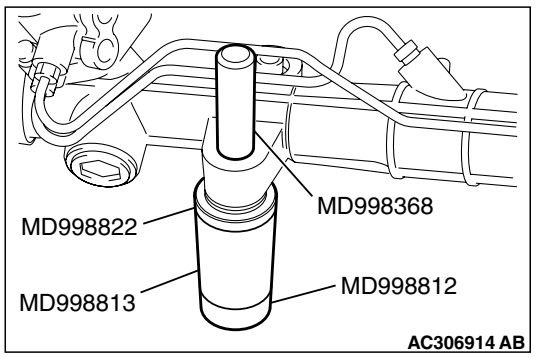


<<K>> OIL SEAL REMOVAL

⚠ CAUTION

Be careful not to damage the inner surface of the rack cylinder of the gear housing.

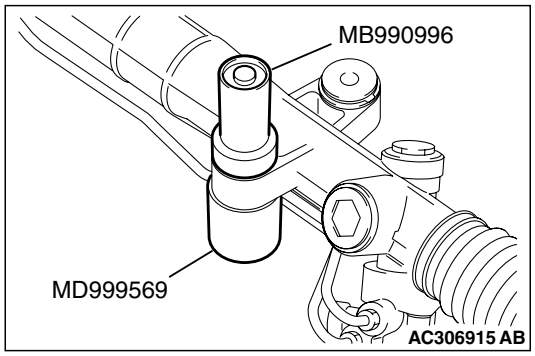
Use a piece of pipe or similar tool to remove the oil seal from the gear housing.



<<L>> STEERING GEAR BUSHING REMOVAL

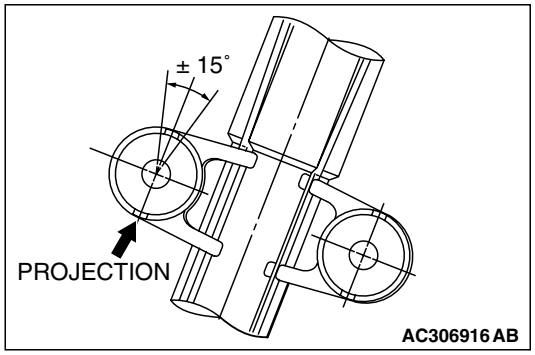
Use special tools MD998812, MD998813, MD998822 and MD998368 to remove the steering gear bushing.

ASSEMBLY SERVICE POINTS



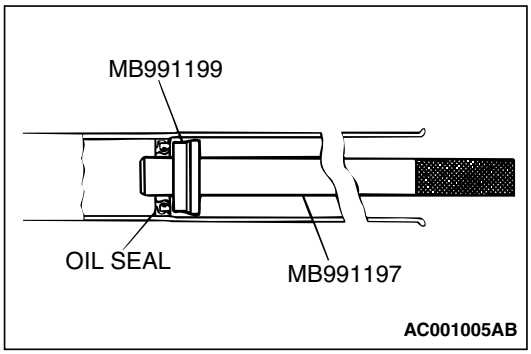
>>A<< STEERING GEAR BUSHING INSTALLATION

Use special tools MD999569 and MB990996 to press fit the steering gear bushing. The projections of the bushing should be positioned as illustrated.



>>B<< OIL SEAL INSTALLATION

1. Apply a coating of GENUINE MITSUBISHI POWER STEERING FLUID to the both sides of the oil seal.
2. Using special tools MB991199 and MB991197, press the oil seal into the rack housing.

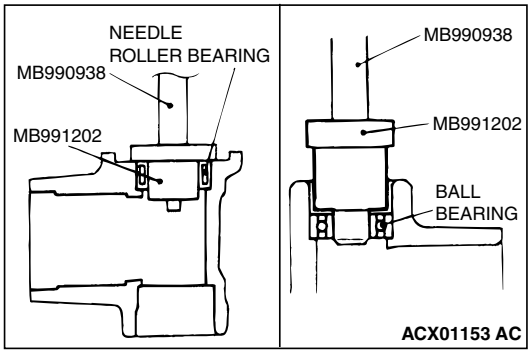


>>C<< STEERING GEAR PINION SHAFT UPPER BEARING (NEEDLE ROLLER BEARING)/STEERING GEAR PINION BEARING (BALL BEARING) INSTALLATION

⚠ CAUTION

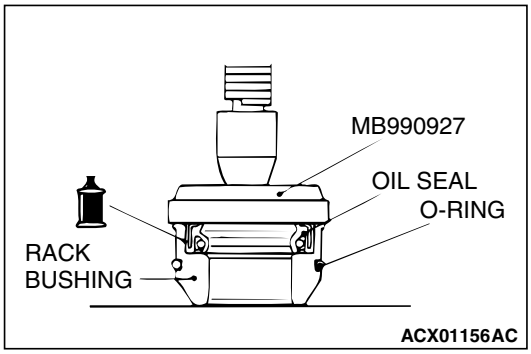
Press-fit the bearing straight. The valve housing is aluminum, and may become deformed if the bearing is press-fitted on an angle.

1. Apply GENUINE MITSUBISHI POWER STEERING FLUID to the housing, bearing and oil seal press fitting surface.
2. Press fit the needle roller bearing with special tools MB990938 and MB991202.



>>D<< OIL SEAL/O-RING INSTALLATION

1. Apply a coating of GENUINE MITSUBISHI POWER STEERING FLUID to the outside of the oil seal and O-ring.
2. Use special tool MB990927 to press fit oil seal until it touches the rack bush end.

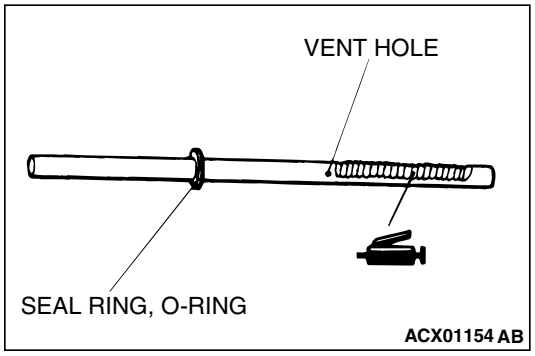


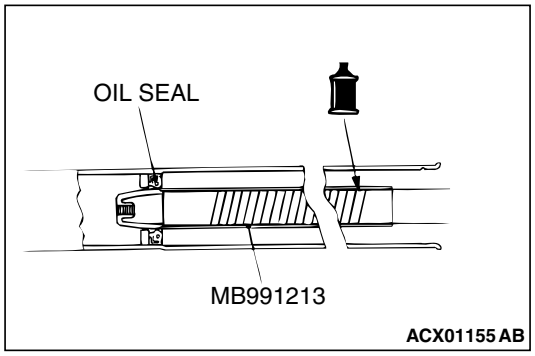
>>E<< STEERING GEAR RACK INSTALLATION

⚠ CAUTION

Do not close the vent hole in the rack with grease.

1. Apply a coating of multipurpose grease to the rack teeth face.





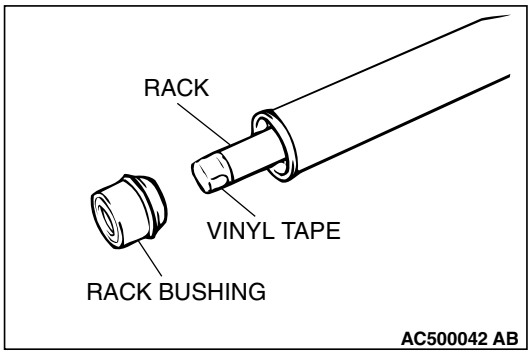
2. Cover the rack serrations with special tool MB991213.
3. Apply GENUINE MITSUBISHI POWER STEERING FLUID to special tool MB991213.
4. Align the center of the oil seal with the rack to prevent the retainer spring from slipping. Slowly insert the rack from power the cylinder side.

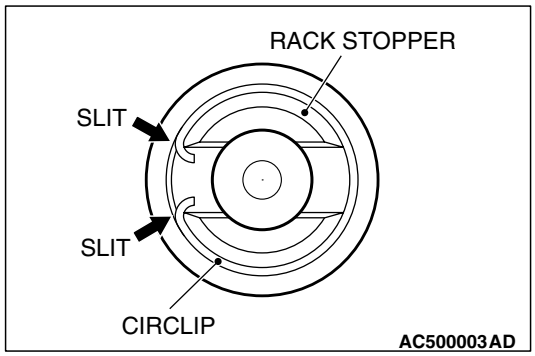
>>F<< STEERING GEAR BUSHING (RACK BUSHING) INSTALLATION

⚠ CAUTION

Do not allow oil seal retainer spring to slip out.

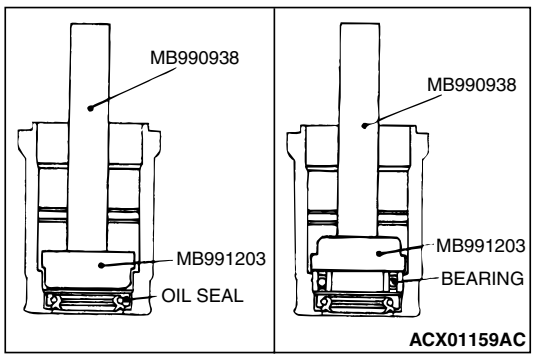
Wrap the rack end with vinyl tape, apply a coating of GENUINE MITSUBISHI POWER STEERING FLUID, and then install the rack bushing and rack stopper.





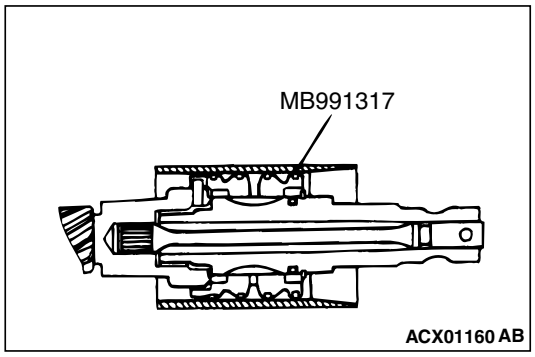
>>G<< STEERING GEAR PISTON CLIP (CIRCLIP) INSTALLATION

Insert claw of circlip in a slit of rack stopper. Then set firmly the circlip in a ditch of steering gear housing.



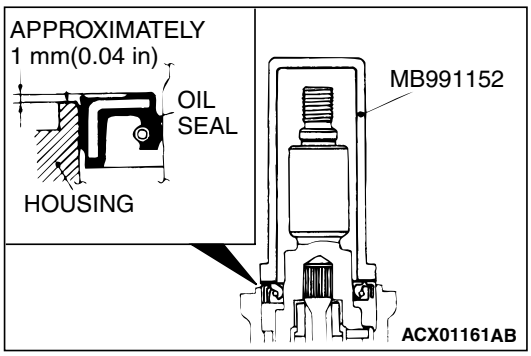
>>H<< OIL SEAL/SPECIAL BEARING INSTALLATION

Apply a coating of GENUINE MITSUBISHI POWER STEERING FLUID to the outside of the oil seal/special bearing. Using special tools MB990938 and MB991203, press the oil seal/special bearing into the valve housing.



>>I<< SEAL RING INSTALLATION

Because the seal rings expand after installation, tighten after installing by using special tool MB991317 to compress the seal rings, or press down by hand.

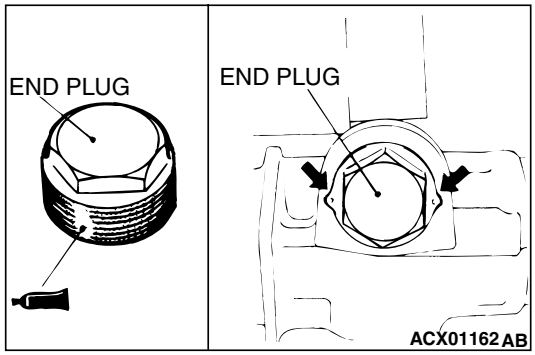


>>J<< OIL SEAL INSTALLATION

⚠ CAUTION

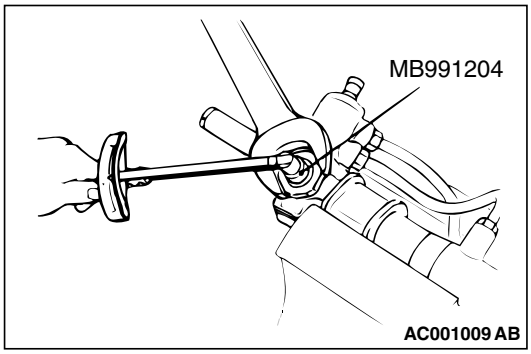
To eliminate a seal malfunction at the valve housing alignment surface, the upper surface of the oil seal should project outward approximately 1 mm (0.04 inch) from the housing edge surface.

Using special tool MB991152, press the oil seal into the valve housing.



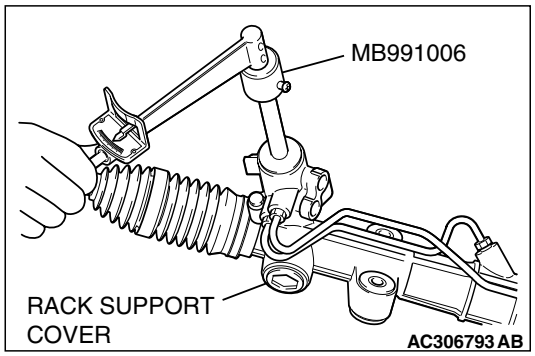
>>K<< STEERING GEAR PLUG (END PLUG) INSTALLATION

1. Apply 3M™ AAD Part number 8661, 8663, 8672, 8678, 8679 or equivalent to the threaded part of the end plug.
2. Secure the threaded portion of the end plug at two places by using a punch.



>>L<< STEERING GEAR RACK SUPPORT COVER/ STEERING GEAR INNER NUT (JAM NUT) INSTALLATION

1. Position the rack at its center.
2. Apply 3M™ AAD Part number 8661, 8663, 8672, 8678, 8679 or equivalent to the threaded part of the rack support cover.
3. Use special tool MB991204 to tighten the rack support cover to 12 ± 2 N·m (107 ± 17 in-lb).
4. Turn the rack support cover 10 degree angle counterclockwise.
5. Use special tool MB991204 to hold the rack support cover, and then tighten the jam nut to 59 ± 10 N·m (44 ± 7 ft-lb).



>>M<< TOTAL PINION TORQUE ADJUSTMENT

⚠ CAUTION

- **Be sure there is no ratcheting or catching when operating the rack towards the shaft.**
- **Measure the total pinion torque through the whole stroke of the rack.**

1. Using special tool MB991006, rotate the pinion shaft at the rate of one rotation in 4 to 6 seconds to check the total pinion torque and the change in torque.

   Standard value:
   Total pinion torque: 0.8 – 1.9 N·m (7.1 – 16.8 in-lb)
   [Change in torque: 0.7 N·m (6.2 in-lb) or less]

⚠ CAUTION

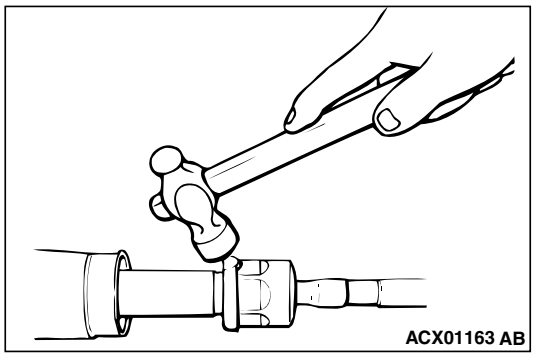
When adjusting, set at the highest value of the standard value range.

NOTE: If the total pinion toque cannot be adjusted to the standard value within the standard range, replace the power steering gear and linkage assembly.

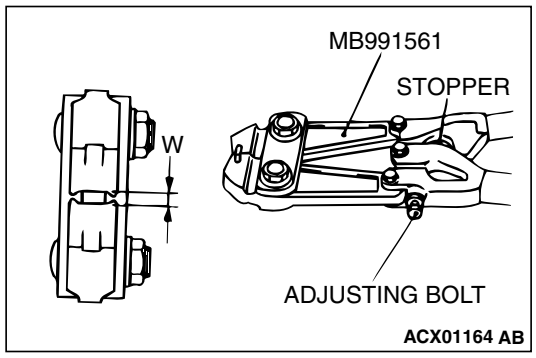
2. If the total pinion torque or the change in torque is outside the standard value, loosen the rack support cover once and retighten it to the specified torque 12 ± 2 N·m (107 ± 17 in-lb). And then loosen the rack support cover 10 degrees, and check the pinion torque again.

>>N<< STEERING GEAR WASHER (TAB WASHER)/ STEERING TIE ROD INSTALLATION

After installing the tie rod to the rack, fold tab washer end (two locations) to tie rod notch.


ACX01163 AB

>>O<< STEERING GEAR BAND (BELLOWS BAND) INSTALLATION



ACX01164 AB

1. Turn the adjusting bolt of special tool MB991561 to adjust the opening dimension (W) to the standard value.

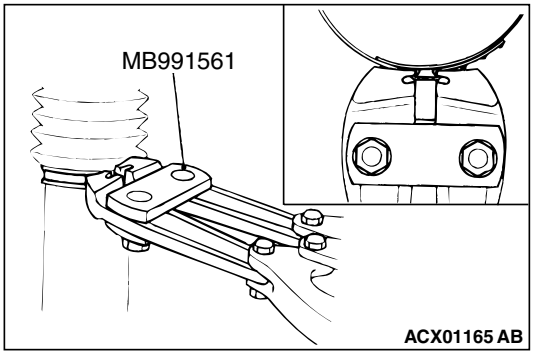
   NOTE: The dimension (W) is adjusted by approximately 0.7 mm (0.03 inch) per one turn.

   NOTE: Do not turn the adjusting bolt more than one turn.

   Standard value (W): 1.9 mm (0.07 inch)
   <When more than 1.9 mm (0.07 inch)>: Screw in the adjusting bolt.
   <When less than 1.9 mm (0.07 inch)>: Loosen the adjusting bolt.

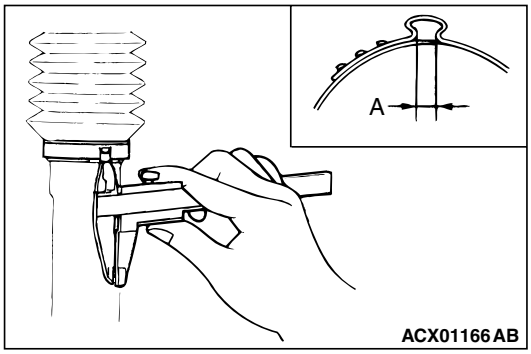
⚠ CAUTION

- **Hold the rack housing, and use special tool MB991561 to crimp the bellows band securely.**
- **Crimp the bellows band until special tool MB991561 touches the stopper.**



ACX01165 AB

2. Use special tool MB991561 to crimp the bellows band.



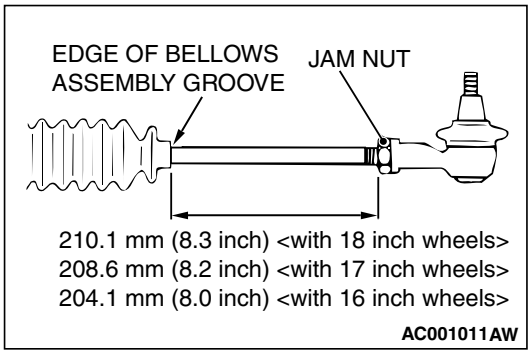
3. Check that crimped width (A) is within the standard value.

Standard value (A): 1.4 – 1.8 mm (0.06 – 0.07 inch)
<When more than 1.8 mm (0.07 inch)>: Readjust the dimension (W) of step (1) to the value calculated by the following equation, and repeat step (2).
W = 5.5 mm (0.22 inch) – A [Example: if (A) is 1.9 mm (0.07 inch), (W) is 3.6 mm (0.14 inch).]
<When less than 1.4 mm (0.06 inch)>: Remove the bellows band, readjust the dimension (W) of step (1) to the value calculated by the following equation, and use a new bellows band to repeat steps (2) to (3).
W = 5.5 mm (0.22 inch) – A [Example: if (A) is 1.3 mm (0.05 inch), (W) is 4.2 mm (0.17 inch).]

>>P<< TIE ROD END ASSEMBLY/STEERING GEAR NUT (TIE ROD END JAM NUT) INSTALLATION

Screw in the tie rod end to achieve the right and left length as illustrated. Lock with the jam nut.

NOTE: The locking nuts must be tightened securely only after the steering gear is installed and toe is adjusted.



INSPECTION

M1372004400114

RACK
- Check the rack tooth surfaces for damage or wear.
- Check the oil seal contact surfaces for uneven wear.
- Check the rack for bends.

PINION AND VALVE ASSEMBLY
- Check the pinion gear tooth surfaces for damage or wear.
- Check for worn or defective seal ring.

BEARING
- Check for roughness or abnormal noise during bearing operation.
- Check the bearing for play.
- Check the needle roller bearings for roller slip-off.

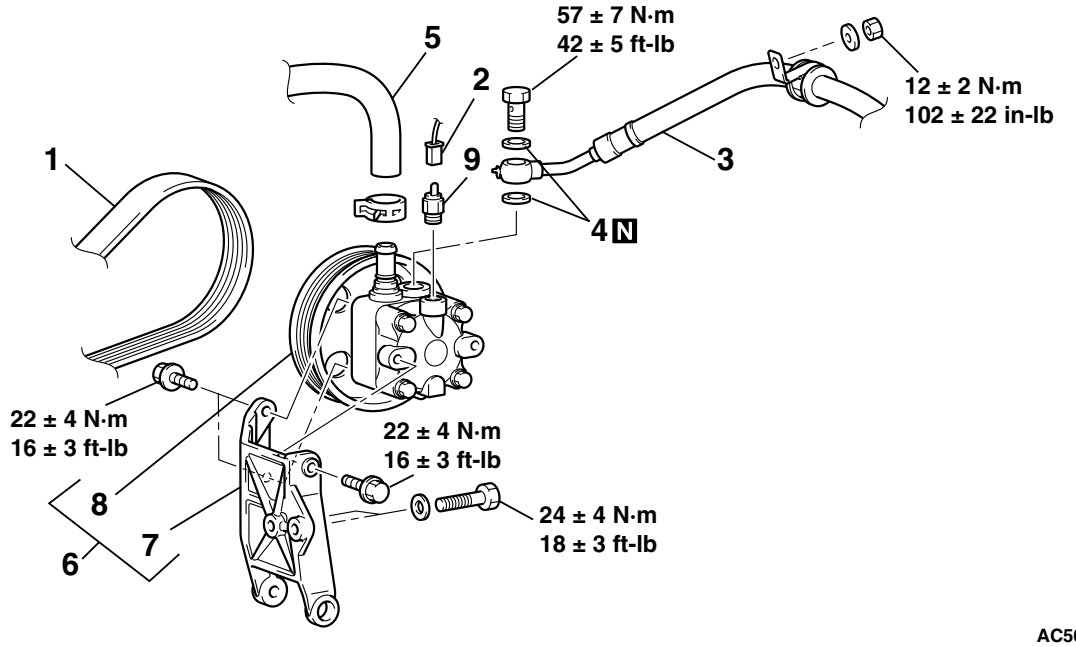
OTHERS
- Check the cylinder inner surface of the rack housing for damage.
- Check the boots for damage, cracking or deterioration.
- Check the rack support for uneven wear or dents.
- Check the rack bushing for uneven wear or damage.

POWER STEERING OIL PUMP ASSEMBLY

REMOVAL AND INSTALLATION <2.4L ENGINE>

M1372005200630

Pre-removal Operation	Post-installation Operation
• Side Under Cover (RH) Removal (Refer to GROUP 51, Under Cover P.51-12). • Power Steering Fluid Draining (Refer to P.37-20).	• Power Steering Fluid Supplying and Bleeding (Refer to P.37-20). • Drive Belt Tension Adjusting (Refer to GROUP 00, Maintenance Service – Drive Belts P.00-52). • Side Under Cover (RH) Installation (Refer to GROUP 51, Under Cover P.51-12).



AC500516 AB

REMOVAL STEPS

1. DRIVE BELT (REFER TO GROUP 11A, Engine Assembly P.11A-20)
2. PRESSURE SWITCH CONNECTOR
3. PRESSURE HOSE
4. GASKET
>>A<< 5. SUCTION HOSE
6. POWER STEERING OIL PUMP AND BRACKET ASSEMBLY

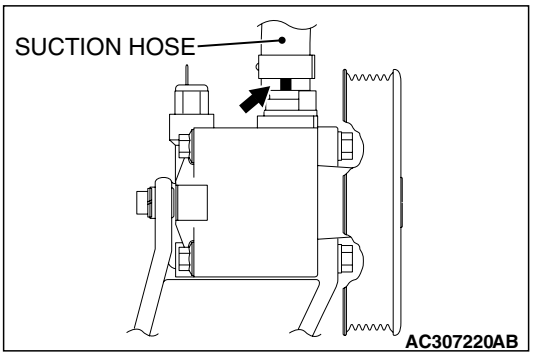
REMOVAL STEPS (Continued)

7. POWER STEERING OIL PUMP BRACKET
8. POWER STEERING OIL PUMP ASSEMBLY
9. POWER STEERING PRESSURE SWITCH

INSTALLATION SERVICE POINT

>>A<< SUCTION HOSE INSTALLATION

Install the suction hose so that the marking is positioned as shown in the illustration.



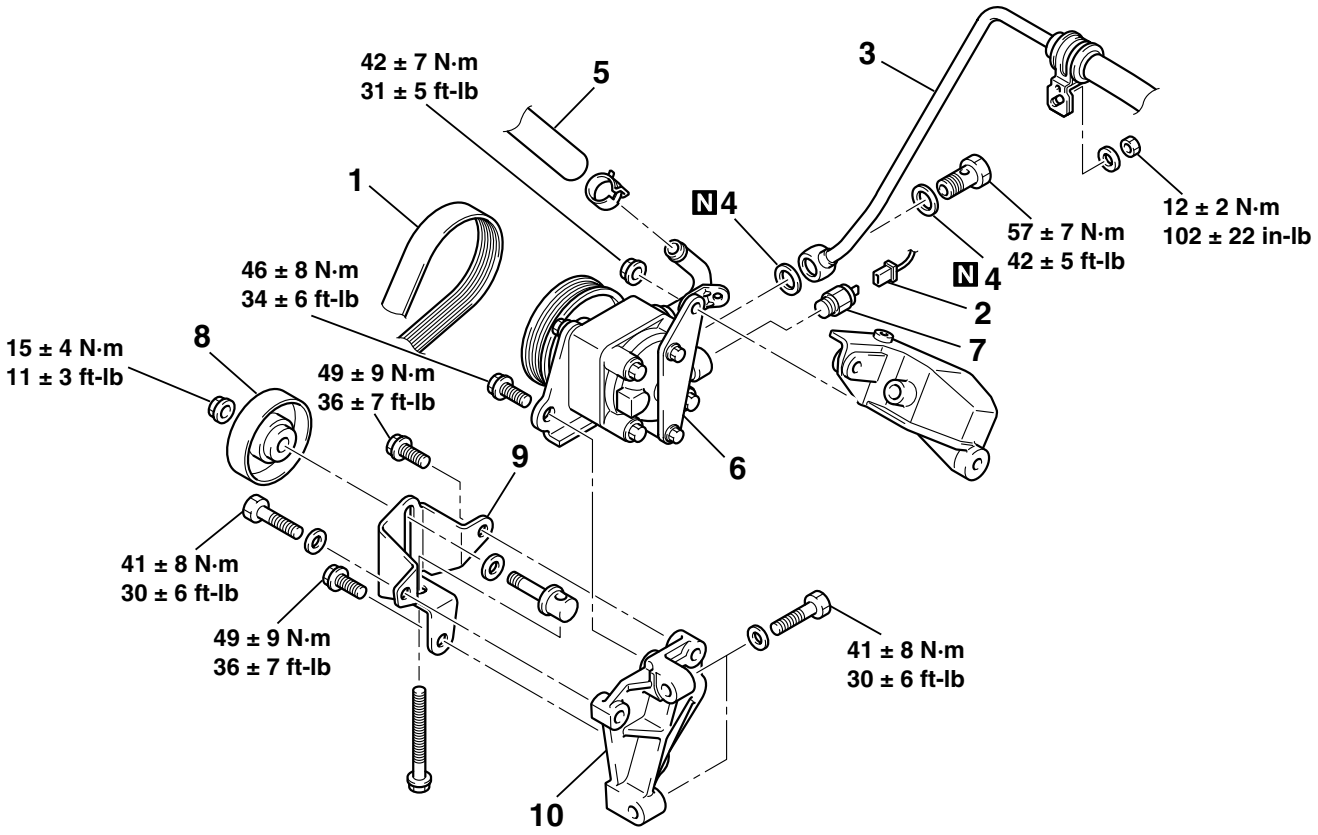
AC307220AB

TSB Revision

REMOVAL AND INSTALLATION <3.8L ENGINE>

M1372005200801

Pre-removal Operation	Post-installation Operation
• Side Under Cover (RH) Removal (Refer to GROUP 51, Under Cover P.51-12). • Strut Tower Bar (Refer to GROUP 42, Strut Tower Bar P.42-11) <RALLIART>. • Power Steering Fluid Draining (Refer to P.37-20).	• Power Steering Fluid Supplying and Bleeding (Refer to P.37-20). • Drive Belt Tension Adjusting (Refer to GROUP 00, Maintenance Service – Drive Belts P.00-52). • Strut Tower Bar (Refer to GROUP 42, Strut Tower Bar P.42-11) <RALLIART>. • Side Under Cover (RH) Installation (Refer to GROUP 51, Under Cover P.51-12).



AC500517AB

REMOVAL STEPS

1. DRIVE BELT (REFER TO GROUP 11C, Engine Assembly P.11C-22 or GROUP 11E, Engine Assembly P.11E-25).
2. PRESSURE SWITCH CONNECTOR
3. PRESSURE HOSE
4. GASKET
- >>**A**<< 5. SUCTION HOSE
  - CONNECTION OF STABILIZER BAR AND STABILIZER LINK (REFER TO GROUP 33, Stabilizer Bar P.33-20)

<<**A**>>

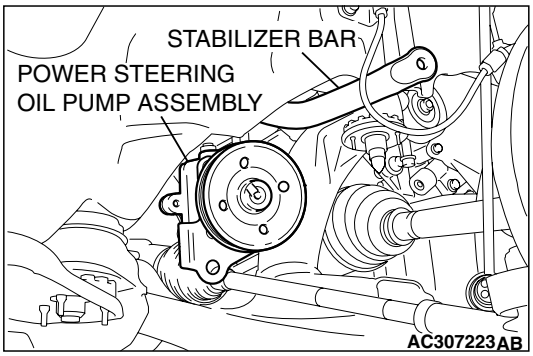
REMOVAL STEPS (Continued)

- STEERING GEAR AND LINKAGE PROTECTOR (REFER TO P.37-31)
6. POWER STEERING OIL PUMP ASSEMBLY
7. POWER STEERING PRESSURE SWITCH
8. BELT TENSIONER PULLEY
9. BELT TENSIONER BRACKET
10. POWER STEERING OIL PUMP BRACKET

TSB Revision

REMOVAL SERVICE POINT

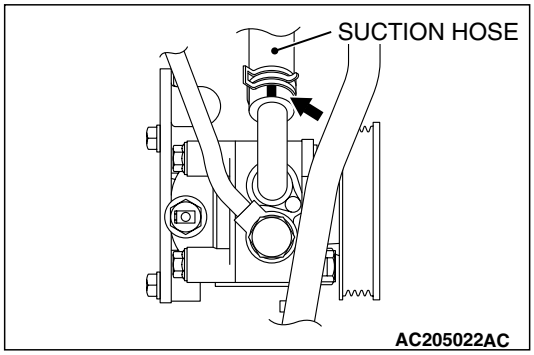
<<A>> POWER STEERING OIL PUMP ASSEMBLY REMOVAL



Turn up the stabilizer disconnected from the stabilizer link fully, and remove the power steering oil pump assembly after turning the steering wheel fully to left.

INSTALLATION SERVICE POINT

>>A<< SUCTION HOSE INSTALLATION



Install the suction hose so that the marking is positioned as shown in the illustration.

POWER STEERING PRESSURE SWITCH REPLACEMENT

M1372014900013

1. Before removing the switch, wipe the pump clean to prevent intrusion of contamination into the pump.
2. Disconnect the harness connector from the male terminal of the pressure switch.
3. Use a socket type wrench to loosen and remove the switch.
4. Hand start the new switch into the thread hole.
5. Using a socket type wrench, tighten the pressure switch to 19.6 ± 2.94 N·m(14.5±2.2ft-lb).
6. Connect the harness connector back to the pressure switch.
7. Test the vehicle to ensure the switch is working properly.

NOTE: Avoid making contact with the terminal portion of the switch during installation. This could damage the electrical performance of the switch.

INSPECTION

M1372005300206

- Check the drive belt for cracks.
- Check the pulley for uneven rotation.

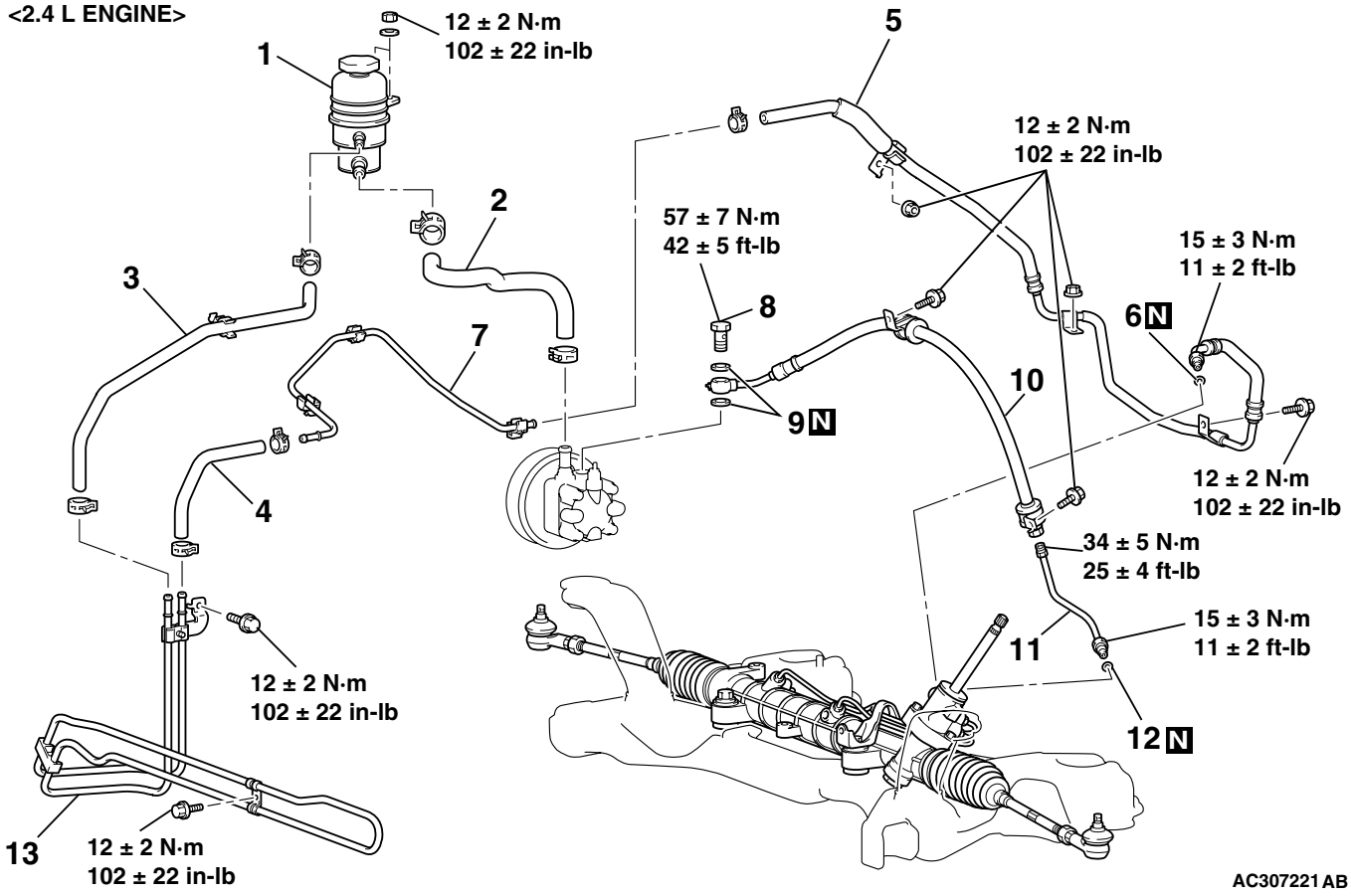
POWER STEERING HOSES

REMOVAL AND INSTALLATION

M1372005700431

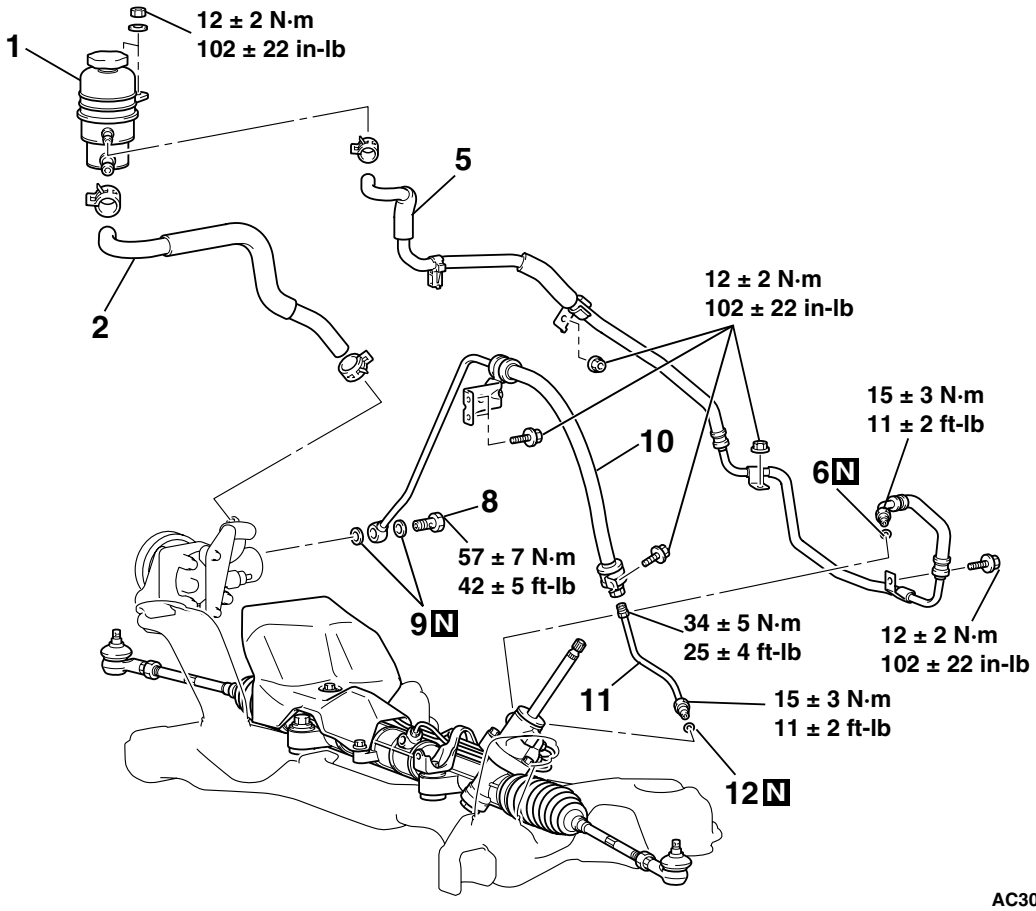
Pre-removal Operation	Post-installation Operation
• Side Under Cover (RH) Removal (Refer to GROUP 51, Under Cover P.51-12). • Power Steering Fluid Draining (Refer to P.37-20). • Front Bumper Removal (Refer to P.51-2). <2.4L ENGINE> • Radiator Grille Removal (Refer to P.51-6). <2.4L ENGINE>	• Radiator Grille Installation (Refer to P.51-6). <2.4L ENGINE> • Front Bumper Installation (Refer to P.51-2). <2.4L ENGINE> • Power Steering Fluid Supplying and Bleeding (Refer to P.37-20). • Side Under Cover (RH) Installation (Refer to GROUP 51, Under Cover P.51-12).

<2.4 L ENGINE>



TSB Revision

<3.8 L ENGINE>



AC307222 AC

REMOVAL STEPS

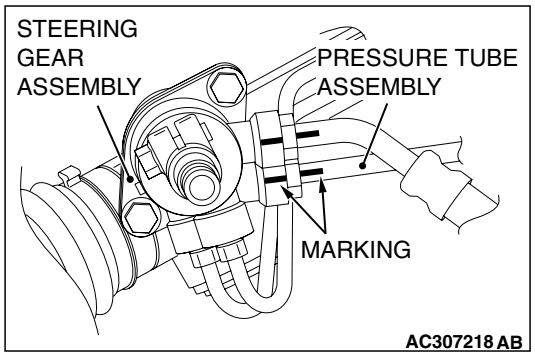
1. OIL RESERVOIR
>>**F**<< 2. SUCTION HOSE
>>**E**<< 3. RETURN HOSE (M)
>>**D**<< 4. RETURN HOSE (R)
>>**C**<< 5. RETURN TUBE ASSEMBLY
6. O-RING
>>**B**<< 7. RETURN TUBE (R)

REMOVAL STEPS (Continued)

8. EYE BOLT
9. GASKET
>>**A**<< 10. PRESSURE HOSE
>>**A**<< 11. PRESSURE TUBE ASSEMBLY
12. O-RING
13. COOLER TUBE ASSEMBLY

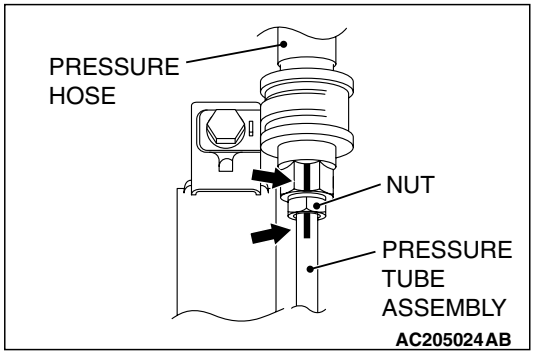
TSB Revision

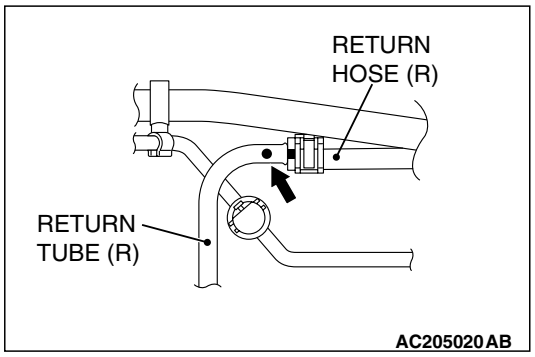
INSTALLATION SERVICE POINTS



>>A<< PRESSURE TUBE ASSEMBLY/PRESSURE HOSE INSTALLATION

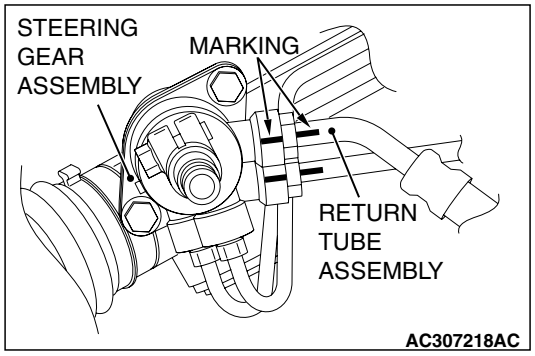
Align the markings as shown in the illustration and tighten the nut.





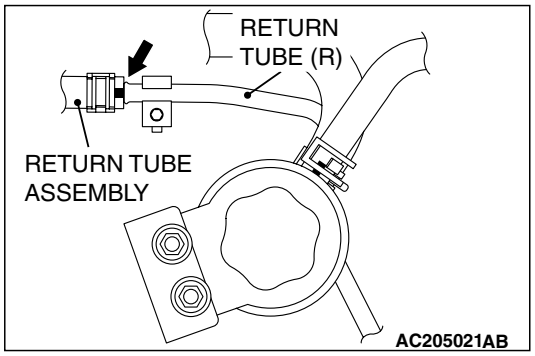
>>B<< RETURN TUBE (R) INSTALLATION

Install the return tube (R) so that the marking is positioned as shown in the illustration.



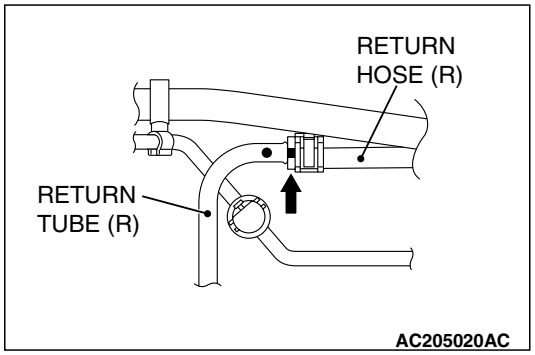
>>C<< RETURN TUBE ASSEMBLY INSTALLATION

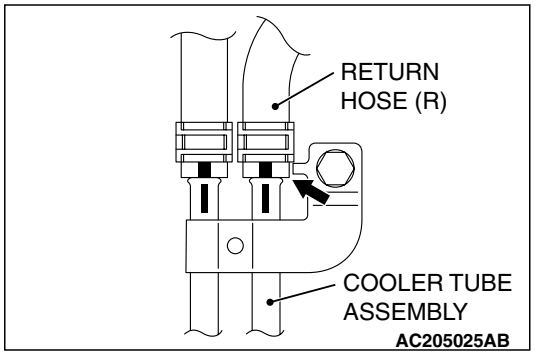
1. Install the return tube assembly so that the marking is positioned as shown in the illustration.
2. Align the markings as shown in the illustration and tighten the nut.

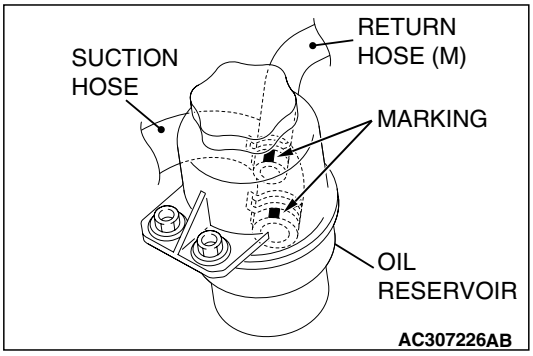


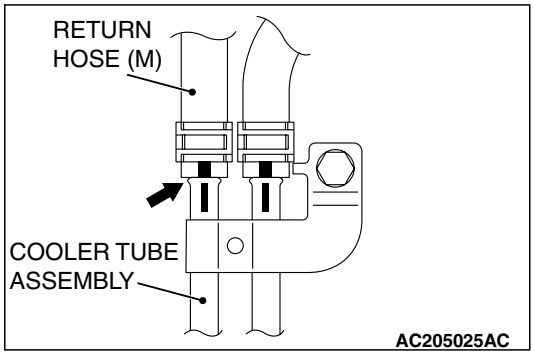
>>D<< RETURN HOSE (R) INSTALLATION

Install the return hose (R) so that the markings are positioned as shown in the illustration.



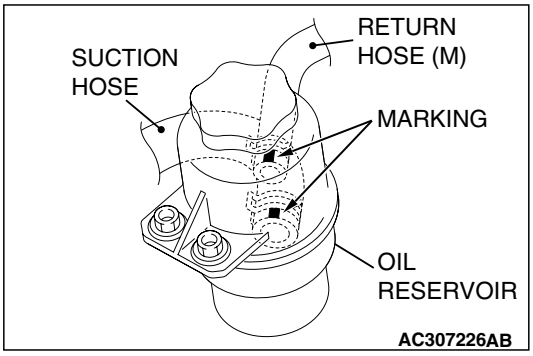






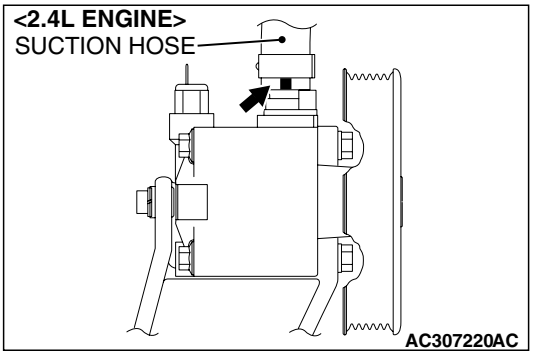
>>E<< RETURN HOSE (M) INSTALLATION

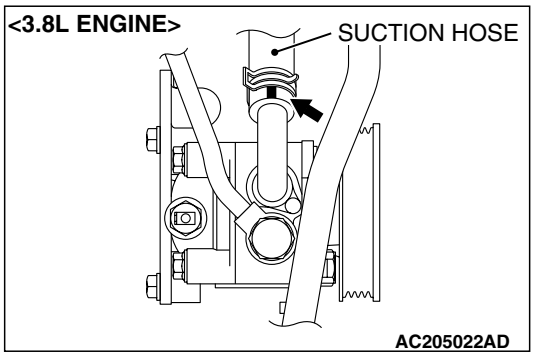
Install the return hose (M) so that the markings are positioned as shown in the illustration.



>>F<< SUCTION HOSE INSTALLATION

Install the suction hose so that the marking is positioned as shown in the illustration.





SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1372008400310

ITEM	SPECIFICATION
Power steering gear box and linkage (removal and installation)	
Crossmember mounting bolt and nut	180 ± 20 N·m (133 ± 14 ft-lb)
Front axle crossmember stay mounting bolt and nut	83 ± 12 N·m (61 ± 9 ft-lb)
Lower arm and crossmember connecting nut	165 ± 15 N·m (122 ± 11 ft-lb)
Power steering gear bracket mounting bolt	58 ± 7 N·m (43 ± 5 ft-lb)
Pressure tube flare nut	15 ± 3 N·m (11 ± 2 ft-lb)
Pressure hose mounting bolt and nut	12 ± 2 N·m (102 ± 22 in-lb)
Rear roll stopper mounting bolt	58 ± 7 N·m (43 ± 5 ft-lb)
Rear roll stopper to power steering gear bracket connecting bolt	58 ± 7 N·m (43 ± 5 ft-lb)
Rear roll stopper to rear roll stopper bracket connecting nut	58 ± 7 N·m (43 ± 5 ft-lb)

TSB Revision

ITEM	SPECIFICATION
Return tube flare nut	15 ± 3 N·m (11 ± 2 ft-lb)
Return tube mounting bolt and nut	12 ± 2 N·m (102 ± 22 in-lb)
Steering column shaft assembly and steering gear connecting bolt	18 ± 2 N·m (13 ± 2 ft-lb)
Steering gear and linkage mounting bolt	83 ± 12 N·m (61 ± 9 ft-lb)
Steering gear and linkage protector mounting bolt	12 ± 2 N·m (102 ± 22 in-lb)
Tie rod end jam nut	52 ± 2 N·m (38 ± 2 ft-lb)
Tie rod end to knuckle jam nut	29 ± 4 N·m (21 ± 3 ft-lb)
Power steering gear box and linkage (disassembly and assembly)	
P/S oil feed tube assembly flare nut	13 ± 3 N·m (116 ± 26 in-lb)
Steering gear inner nut (pinion and valve assembly jam nut)	25 ± 4 N·m (18 ± 3 ft-lb)
Steering gear inner nut (rack support cover jam nut)	59 ± 10 N·m (44 ± 7 ft-lb)
Steering gear nut (tie rod end jam nut)	52 ± 2 N·m (38 ± 2 ft-lb)
Steering gear plug (end plug)	59 ± 10 N·m (44 ± 7 ft-lb)
Steering gear rack support cover	12 ± 2 N·m (107 ± 17 in-lb)
Steering tie rod	84 ± 14 N·m (62 ± 10 ft-lb)
Valve housing bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Power steering hose	
Cooler tube clamp bolt <2.4L ENGINE>	12 ± 2 N·m (102 ± 22 in-lb)
Oil pump eye bolt	57 ± 7 N·m (42 ± 5 ft-lb)
Oil reservoir nut	12 ± 2 N·m (102 ± 22 in-lb)
Pressure hose, pressure tube, return tube clamp bolt	12 ± 2 N·m (102 ± 22 in-lb)
Pressure hose clamp nut <3.8L ENGINE>	12 ± 2 N·m (102 ± 22 in-lb)
Pressure tube flare nut (pressure hose side)	34 ± 5 N·m (25 ± 4 ft-lb)
Pressure tube (steering gear box side), return tube flare nut	15 ± 3 N·m (11 ± 2 ft-lb)
Return tube clamp nut	12 ± 2 N·m (102 ± 22 in-lb)
Power steering oil pump	
Belt tensioner bracket to power steering pump bracket connecting bolt (long) <3.8L ENGINE>	41 ± 8 N·m (30 ± 6 ft-lb)
Belt tensioner bracket to power steering pump bracket connecting bolt (short) <3.8L ENGINE>	49 ± 9 N·m (36 ± 7 ft-lb)
Belt tensioner pulley mounting nut <3.8L ENGINE>	15 ± 4 N·m (11 ± 3 ft-lb)
Oil pump eye bolt	57 ± 7 N·m (42 ± 5 ft-lb)
Power steering oil pump mounting bolt <2.4L ENGINE>	22 ± 4 N·m (16 ± 3 ft-lb)
Power steering oil pump mounting bolt <3.8L ENGINE>	46 ± 8 N·m (34 ± 6 ft-lb)
Power steering oil pump mounting nut <3.8L ENGINE>	42 ± 7 N·m (31 ± 5 ft-lb)
Power steering oil pump bracket mounting bolt <2.4L ENGINE>	24 ± 4 N·m (18 ± 3 ft-lb)
Power steering oil pump bracket mounting bolt <3.8L ENGINE>	41 ± 8 N·m (30 ± 6 ft-lb)
Pressure hose clamp bolt <2.4L ENGINE>	12 ± 2 N·m (102 ± 22 in-lb)
Pressure hose clamp nut <3.8L ENGINE>	12 ± 2 N·m (102 ± 22 in-lb)
Steering column shaft	

ITEM	SPECIFICATION
Steering column shaft assembly and steering gear connecting bolt	18 ± 2 N·m (13 ± 2 ft-lb)
Steering column shaft assembly mounting bolt	12 ± 2 N·m (102 ± 22 in-lb)
Steering wheel	
Steering wheel dynamic damper	3.9 ± 0.9 N·m (35 ± 8 in-lb)
Steering wheel mounting nut	41 ± 8 N·m (30 ± 6 ft-lb)
Torx screw	9.0 ± 2.0 N·m (80 ± 17 in-lb)

GENERAL SPECIFICATIONS

M1372000200334

ITEM		SPECIFICATION		
		2.4L ENGINE	3.8L ENGINE	
			17-INCH WHEELS	18-INCH WHEELS
Steering wheel	Type	4-spoke type	4-spoke type	4-spoke type
	Outside diameter mm (in)	380 (14.9)	380 (14.9)	380 (14.9)
	Maximum number of turns	2.94	2.76	2.64
Steering column	Column mechanism	Shock absorbing mechanism and Tilt steering mechanism		
Power steering type		Integral type	Integral type	Integral type
Oil pump	Type	vane pump	vane pump	vane pump
	Basic discharge amount cm^3/rev. (cu in/rev)	9.6 (0.59)	9.6 (0.59)	9.6 (0.59)
	Relief pressure MPa (psi)	8.8 (1,277)	9.8 (1,422)	9.8 (1,422)
	Reservoir type	Separate type (plastic)		
	Pressure switch	Equipped	Equipped	Equipped
Steering gear	Type	Rack and pinion	Rack and pinion	Rack and pinion
	Stroke ratio (Rack stroke/ Steering wheel Maximum turning radius)	49.62	49.62	49.62
	Rack stroke mm (in)	146 (5.7)	137 (5.4)	131 (5.1)

SERVICE SPECIFICATIONS

M1372000300922

ITEM		STANDARD VALUE	LIMIT
Steering wheel free play mm (in)	With engine running	–	30 (1.2)
	With engine stopped	10 (0.4) or less	–
Steering angle	Inside wheel	37°12' ± 2°00' <vehicles with 16-inch wheels> 33°48' ± 2°00' <vehicles with 17-inch wheels> 32°54' ± 2°00' <vehicles with 18-inch wheels>	–
	Outside wheel (reference)	30°18' <vehicles with 16-inch wheels> 28°18' <vehicles with 17-inch wheels> 27°48' <vehicles with 18-inch wheels>	–

ITEM			STANDARD VALUE	LIMIT
Toe-in mm (in)			0 ± 3 (0 ± 0.12)	–
Tie rod end ball joint breakaway torque N·m (in-lb)			0.5 – 3.5 (4.4 – 31.0)	–
Tie rod swing resistance N (lb) [Tie rod swing torque N·m (in-lb)]			3.7 – 18.1 (0.83 – 4.07) <vehicles with 16-inch wheels> 3.6 – 17.8 (0.81 – 4.00) <vehicles with 17-inch wheels> 3.6 – 17.6 (0.81 – 3.96) <vehicles with 18-inch wheels> [1.0 – 4.9 (8.8 – 43.4)]	–
Stationary steering effort N (lb) [Fluctuation allowance N (lb)]			30 (6.7) or less [5.9 (1.33) or less]	–
Oil pump pressure MPa (psi)	Oil pump relief pressure		8.3 – 8.8 (1,204 – 1,276) <2.4L engine> 9.3 – 9.8 (1,349 – 1,421) <3.8L engine>	–
	Pressure under no-load conditions		0.8 – 1.0 (116 – 145) <2.4L engine> 0.8 – 1.0 (116 – 145) <3.8L engine>	–
	Steering gear retention hydraulic pressure		8.3 – 8.8 (1,204 – 1,276) <2.4L engine> 9.3 – 9.8 (1,349 – 1,421) <3.8L engine>	–
Oil pressure switch operating pressure MPa (psi)		OFF → ON	1.8 – 2.4 (261 – 348)	–
		ON → OFF	0.8 – 2.4 (116 – 348)	–
Steering gear total pinion torque N·m (in-lb) [Change in torque N·m (in-lb)]			0.8 – 1.9 (7.1 – 16.8) [0.7 (6.2) or less]	–
Opening dimension of special tool MB991561 mm (in)			1.9 (0.07)	–
Band crimped width mm (in)			1.4 – 1.8 (0.06 – 0.07)	–

LUBRICANTS

M1372000400372

ITEM		SPECIFIED LUBRICANT	QUANTITY dm^3 (qt)
Power steering fluid		GENUINE MITSUBISHI POWER STEERING FLUID	1.2 (1.3)
Gear box	Bearing	GENUINE MITSUBISHI POWER STEERING FLUID	As required
	O-ring		
	Oil seal		
	Special tool (MB991213)		
	Pinion and valve assembly seal ring part		
	Bellows	Silicon grease	As required
Oil pump	Power steering fluid	GENUINE MITSUBISHI POWER STEERING FLUID	0.8 (0.85)

SEALANT

M1372000500379

ITEM		SPECIFIED SEALANT
Power steering gear box	End plug	3M™ AAD Part No.8661, 8663, 8672, 8678, 8679 or equivalent
	Rack support cover	

GROUP 42

BODY

CONTENTS

HOOD

BODY DIAGNOSIS

INTRODUCTION TO HOOD DIAGNOSIS

M1421005800363

Wind noise at the hood may be caused by improper hood adjustment.

HOOD DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1421005900337

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a hood fault.

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

SYMPTOM CHART

M1421006000371

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Difficult locking and unlocking	1	P.42-3
Uneven body clearance	2	P.42-4
Uneven height	3	P.42-4

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Difficult Locking and Unlocking

DIAGNOSIS

STEP 1. Check that the release cable is routed correctly.

Q: Is the release cable routed correctly?
YES : Go to Step 2.
NO : Re-route the release cable. Then go to Step 4.

STEP 2. Check the engagement of the hood latch and hood striker.

Q: Are the hood latch and hood striker engaged correctly?
YES : Go to Step 3.
NO : Adjust the hood latch (Refer to P.42-5). Then go to Step 4.

STEP 3. Check for proper lubrication of release cable.

Q: Is the release cable properly lubricated?
YES : Go to Step 4.
NO : Lubricate, then go to Step 4.

STEP 4. Retest the system.

Q: Does the hood lock operate easily?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Uneven Body Clearance

DIAGNOSIS

STEP 1. Check the clearance around the hood.

Q: Is the clearance around the hood even?
YES : Go to Step 2.
NO : Adjust the hood (Refer to P.42-4). Then go to Step 2 .

STEP 2. Retest the system.

Q: Are the clearances between body panels even?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Uneven Height

DIAGNOSIS

STEP 1. Check the hood damper height.

Q: Is the hood damper height proper?
YES : Go to Step 2.
NO : Adjust the hood damper (Refer to P.42-6). Then go to Step2.

STEP 2. Retest the system.

Q: Are the hood and body height even?
YES : The procedure is complete.
NO : Return to Step 1.

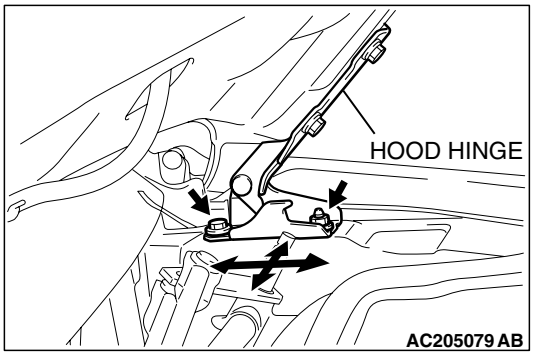
ON-VEHICLE SERVICE

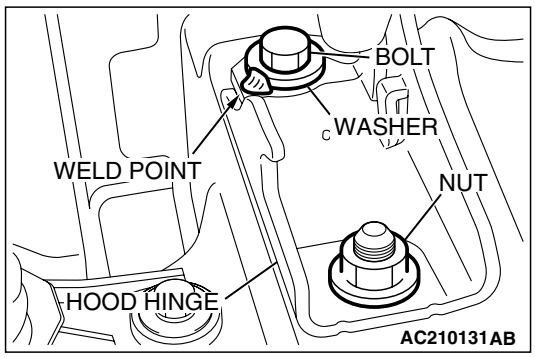
ADJUSTMENT OF CLEARANCE AROUND HOOD

M1421007200130

Detach the front deck garnish (Refer to GROUP 51, Windshield Wiper P.51-16). Then loosen the hood hinge mounting nuts and bolts as shown, and adjust the hood by moving it until the clearance around it is even.

NOTE:



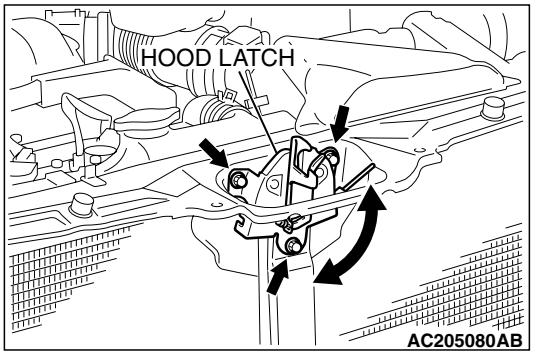


If the hood hinge mounting bolt washers are welded, grind off the welding according to the procedure below beforehand.

1. *Remove the hood hinge (Refer P.42-7).*
2. *Use a chisel or grinder to release the hood hinge mounting bolt washer, which is welded to the hood hinge.*
3. *On completion, paint the affected area with a suitable touch-up brush to prevent corrosion.*
4. *Install the hood hinge (Refer P.42-7).*

ALIGNMENT OF HOOD LATCH AND STRIKER

M1421008500026



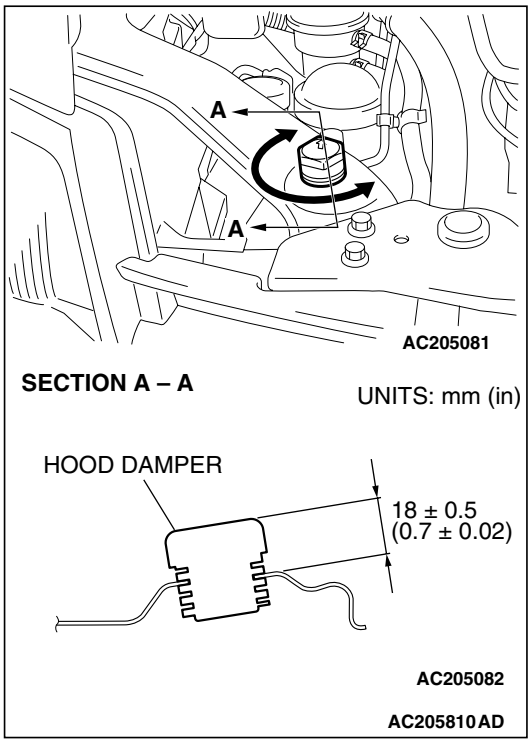
Note the routing of the hood release cable, and then loosen the hood latch mounting bolts. Then align the latch with the striker by moving the hood latch. After alignment, ensure that the hood can be locked and unlocked correctly.

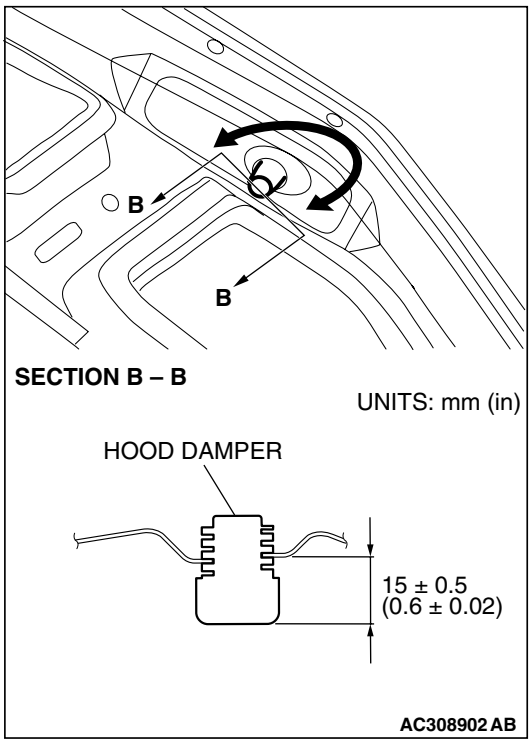
ADJUSTMENT OF HOOD HEIGHT

M1421007400145

Turn the hood damper until its height is as shown. If the hood height is still not even at the left and right sides, turn the hood damper further until the hood height is even.

NOTE: Turning a new hood damper one full turn will increase/ decrease the hood height by approximately 3 mm (0.1 inch).



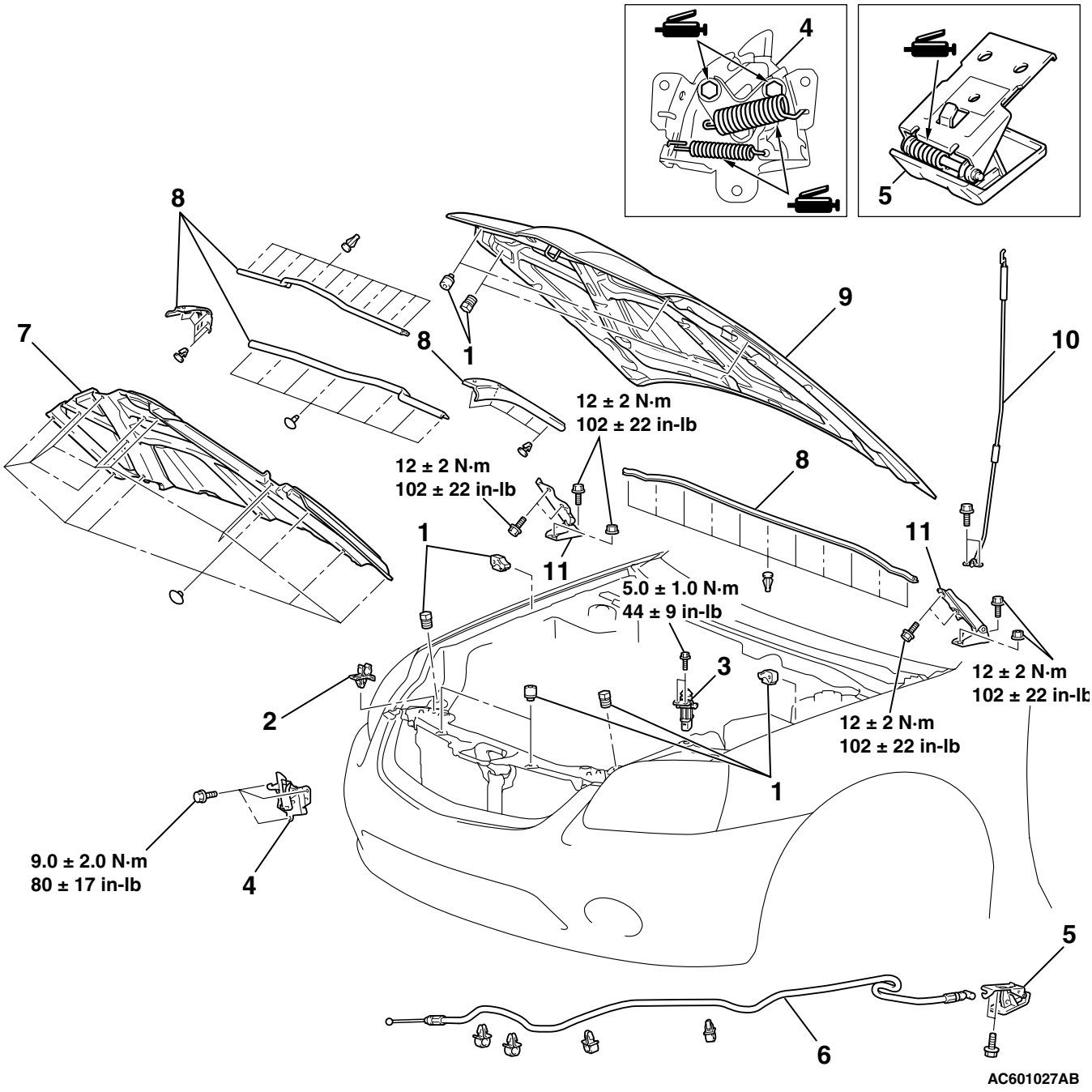


HOOD

REMOVAL AND INSTALLATION

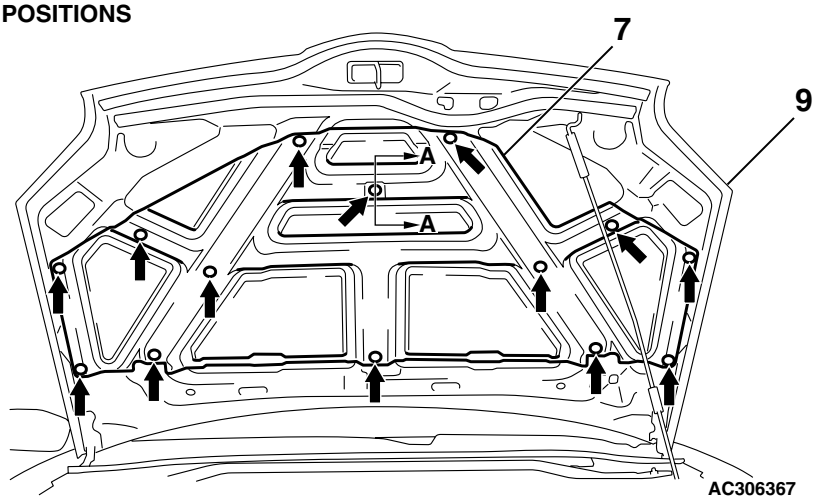
M1421001601155

Post-installation Operation
- Adjustment of Clearance Around Hood (Refer to P.42-4).
- Alignment of Hood Latch and Striker (Refer to P.42-5).
- Hood Height Adjustment (Refer to P.42-6).

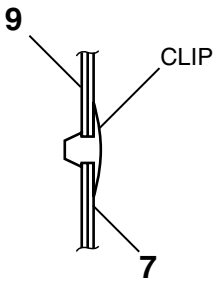


TSB Revision

CLIP POSITIONS



SECTION A – A



NOTE
: CLIP POSITIONS

AC306171AE

REMOVAL
1. HOOD DAMPER
2. CLIP
3. HOOD SWITCH

HOOD LATCH AND HOOD LOCK RELEASE CABLE REMOVAL STEPS
- RADIATOR GRILLE (REFER TO GROUP 51, RADIATOR GRILLE P.51-6).

4. HOOD LATCH
- SPLASH SHIELD (REFER TO P.42-9).
- FRONT BUMPER ASSEMBLY (REFER TO GROUP 51, FRONT BUMPER P.51-2).
- HEADLIGHT ASSEMBLY <LH> (REFER TO GROUP 54A, HEADLIGHT AND FRONT COMBINATION LIGHT P.54A-130).
- FRONT END STRUCTURE BAR (REFER TO P.42-85).

<<A>>

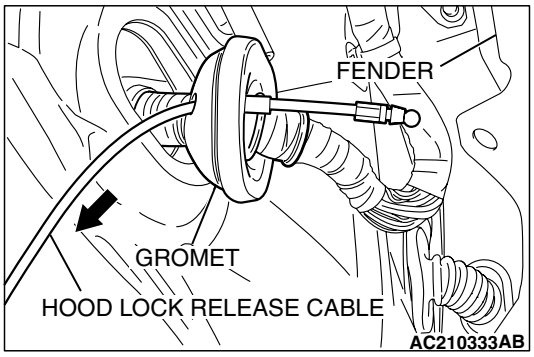
HOOD LATCH AND HOOD LOCK RELEASE CABLE REMOVAL STEPS (Continued)
5. HOOD LOCK RELEASE HANDLE
6. HOOD LOCK RELEASE CABLE

HOOD AND HOOD HINGE REMOVAL STEPS
7. HOOD INSULATOR
8. HOOD WEATHERSTRIP
- WINDSHIELD WASHER HOSE, WINDSHIELD WASHER NOZZLE (REFER TO GROUP 51, WINDSHIELD WASHER P.51-22).

9. HOOD
10. HOOD SUPPORT ROD
- FRONT DECK GARNISH (REFER TO GROUP 51, WINDSHIELD WIPER P.51-16).

11. HOOD HINGE

REMOVAL SERVICE POINT



<<A>> HOOD LOCK RELEASE CABLE REMOVAL

Release the grommet as shown, and pull out the hood lock release cable in the arrow direction (passenger compartment side).

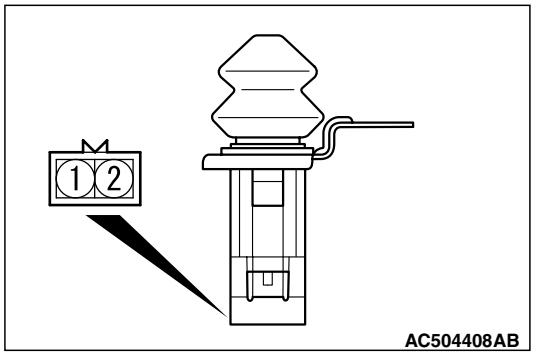
NOTE: If you attempt to pull out the hood lock release cable in the opposite direction, the end of the hood lock release cable will engage the grommet and prevent cable removal.

TSB Revision

INSPECTION

M1421001700267

HOOD SWITCH CHECK



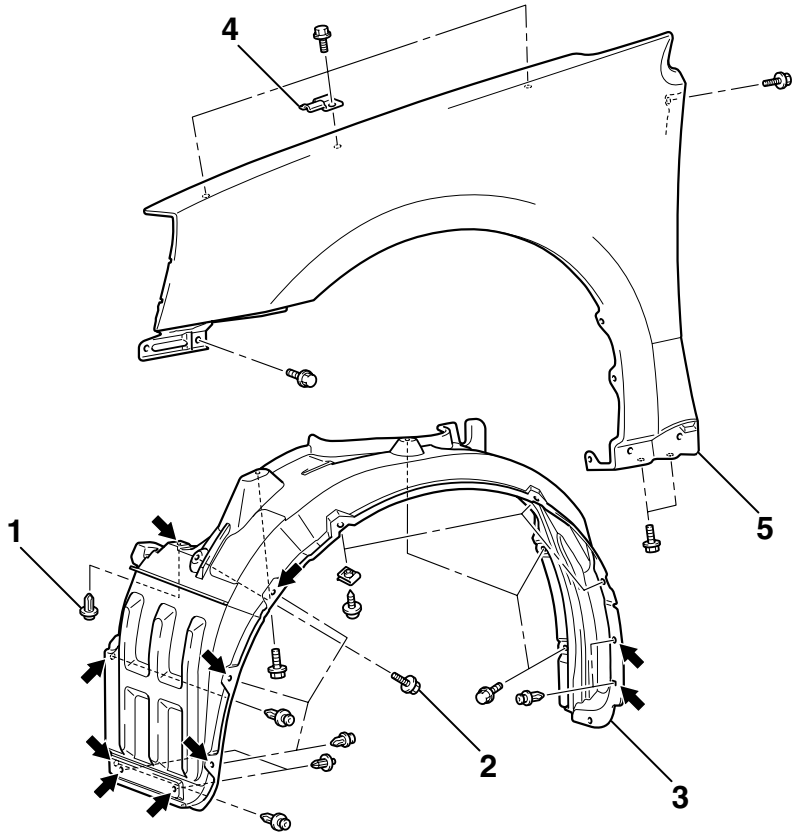
SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
Released (ON)	1 – 2	Less than 2 ohms
Depressed (OFF)	1 – 2	Open circuit

FENDER

REMOVAL AND INSTALLATION

M1421001900313

Pre-removal and Post-installation Operation
- Front Bumper Assembly Removal and Installation (Refer to GROUP 51, Front Bumper P.51-2).
- Front Mud Guard Removal and Installation (Refer to GROUP 51, Mud Guard P.51-10).
- Headlight Removal and Installation (Refer to GROUP 54A, Headlight and Front Combination Light P.54A-130).



NOTE
◄ : CLIP POSITIONS

AC305815AB

TSB Revision

REMOVAL STEPS
1. SPLASH SHIELD MOUNTING CLIP <DRIVER SIDE ONLY>
2. SPLASH SHIELD MOUNTING BOLT <PASSENGER SIDE ONLY>
3. SPLASH SHIELD
4. HOOD DAMPER BRACKET

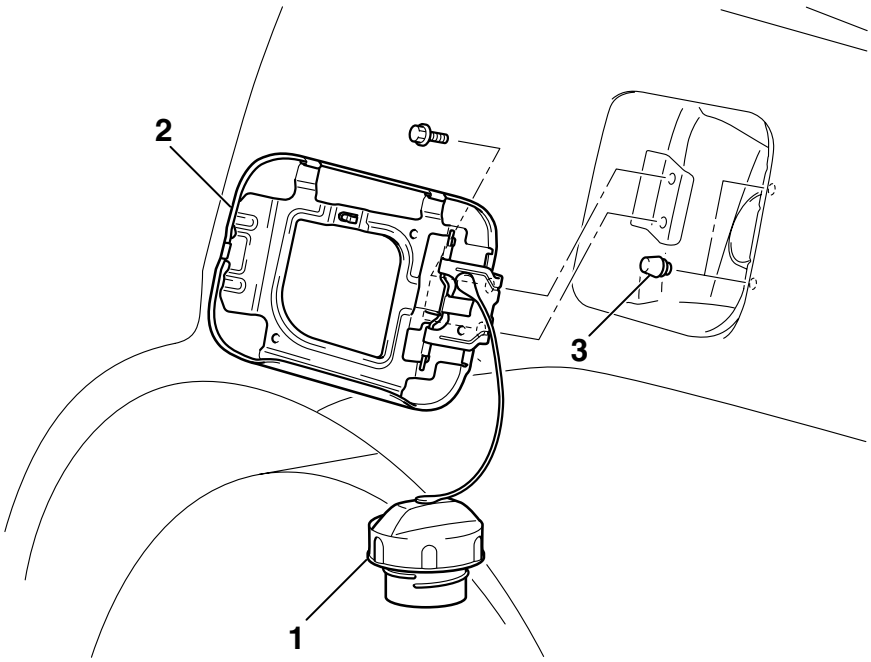
REMOVAL STEPS (Continued)
- DOOR MIRROR COVER (REFER TO GROUP 51, DOOR MIRROR P.51-43).
- FRONT DELTA GARNISH (REFER TO GROUP 51, GARNISHES AND MOLDING P.51-7).

5. FENDER

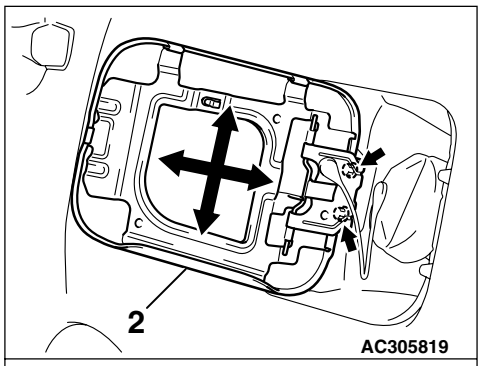
FUEL FILLER LID

REMOVAL AND INSTALLATION

M1421002500288



AC305818



AC305819

FUEL FILLER LID HEIGHT AND CLEARANCE ADJUSTMENT

AC306167AB

REMOVAL
1. FUEL FILLER CAP

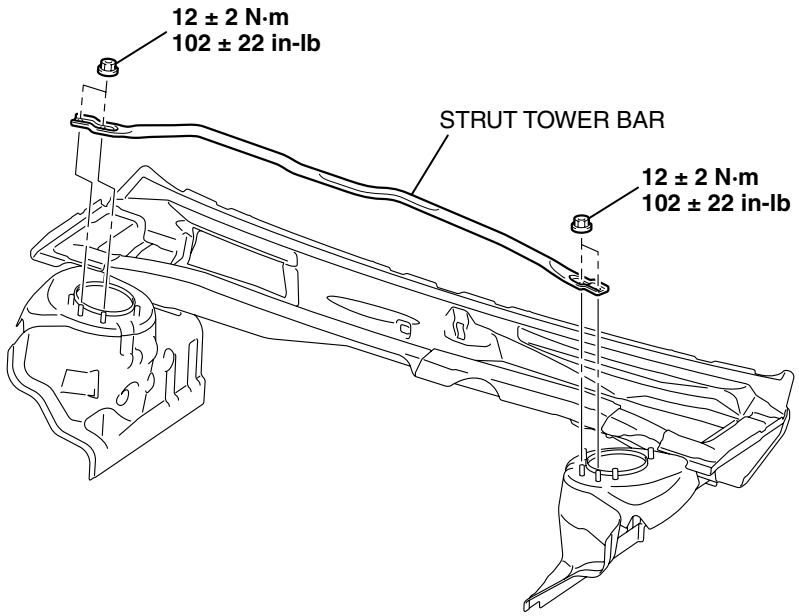
REMOVAL (Continued)
2. FUEL FILLER LID
3. FUEL FILLER LID DAMPER

TSB Revision

STRUT TOWER BAR

REMOVAL AND INSTALLATION

M1421005600217



AC601196AB

WINDOW GLASS

GENERAL

M1422000100384

The windshield and rear window glass are attached by an urethane-base adhesive to the window frame. This adhesive provides improved glass holding and sealing, and also gives body openings a greater structural strength.

ITEMS

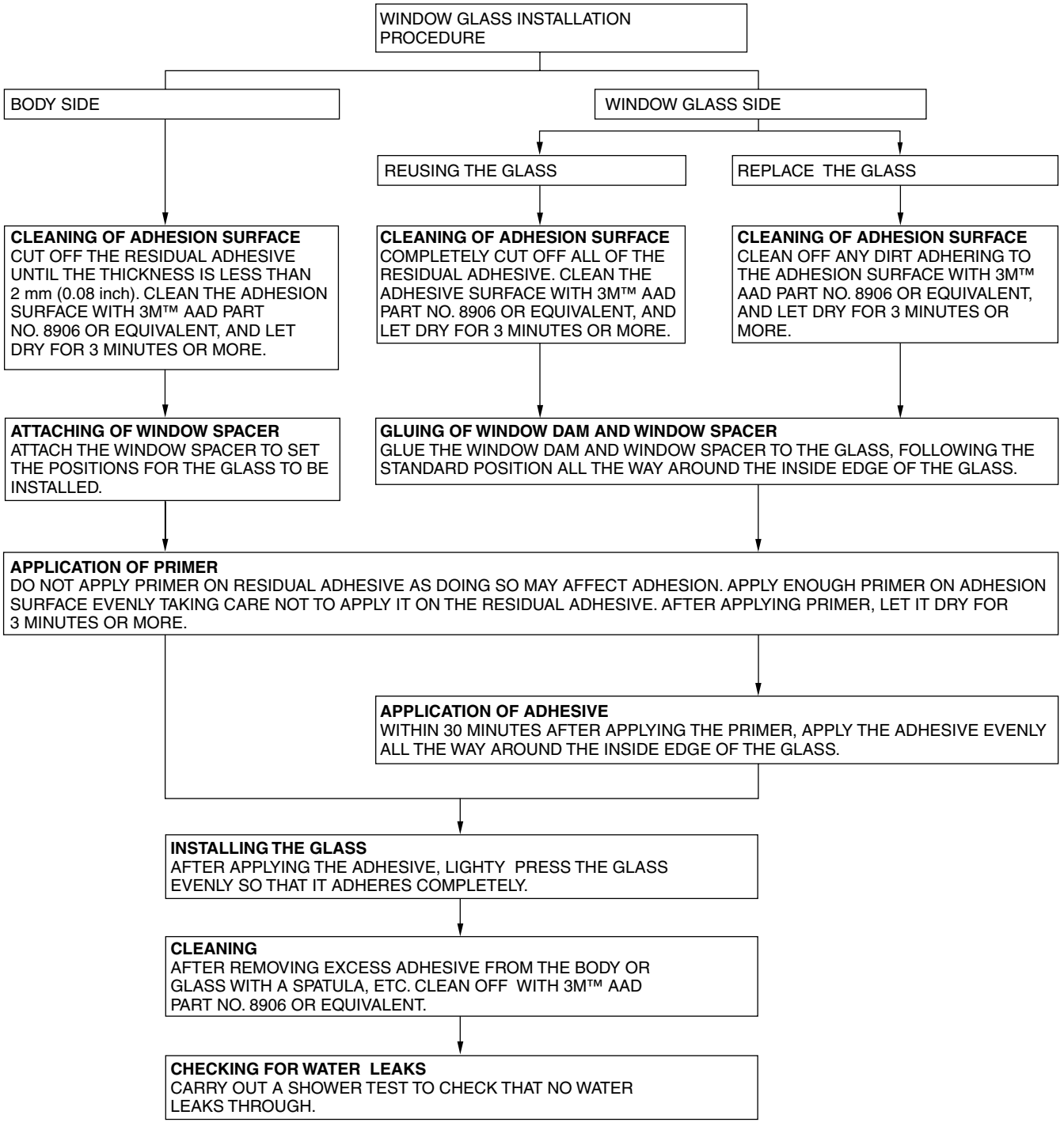
ITEM	APPLICATION	QUANTITY
Wire (diameter × length)	For cutting adhesive	Five pieces of wire 0.6 mm × 1 m (0.02 in × 3.3 ft)
Glass adhesive knife	For cutting adhesive	One
Sealant gun	For adhesive application	One
Wiping shop towels	-	As required
Sealer	For prevention of water and wind leaks after adhesive application	As required
3M AAD™ Part No. 8906 or equivalent	For cleaning	As required
Glass holder MB990480	For securing of window glass	Two

TSB Revision

WINDOW GLASS INSTALLATION

⚠ CAUTION

Do not apply the primer on the adhesive remained as the adhesion may be reduced.



AC306636AB

WINDOW GLASS DIAGNOSIS

INTRODUCTION TO WINDOW GLASS DIAGNOSIS

M1422006700254

If water emerges from the following points, there is a problem in the seal or body flange.

- Windshield
- Rear window glass

TSB Revision

WINDOW GLASS DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1422006800240

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a window glass fault.

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

WINDOW GLASS DIAGNOSTIC TROUBLE SYMPTOM CHART

M1422006900281

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Water leak through windshield	1	P.42-13
Water leak through rear window glass		

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Water Leak Through Windshield/Rear Window Glass

DIAGNOSIS

STEP 1. Check if the seal is faulty.

Q: Is the seal faulty?
YES : Repair the seal, then go to Step 3.
NO : Go to Step 2.

STEP 2. Check if the body flange is deformed.

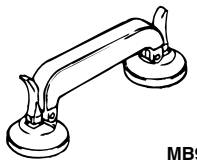
Q: Is the body flange deformed?
YES : Replay the body flange, then go to Step 3.
NO : Go to Step 3.

STEP 3. Retest the system.

Q: Is any water leaking?
YES : Return to Step 1.
NO : This diagnosis complete.

SPECIAL TOOL

M1422000600301

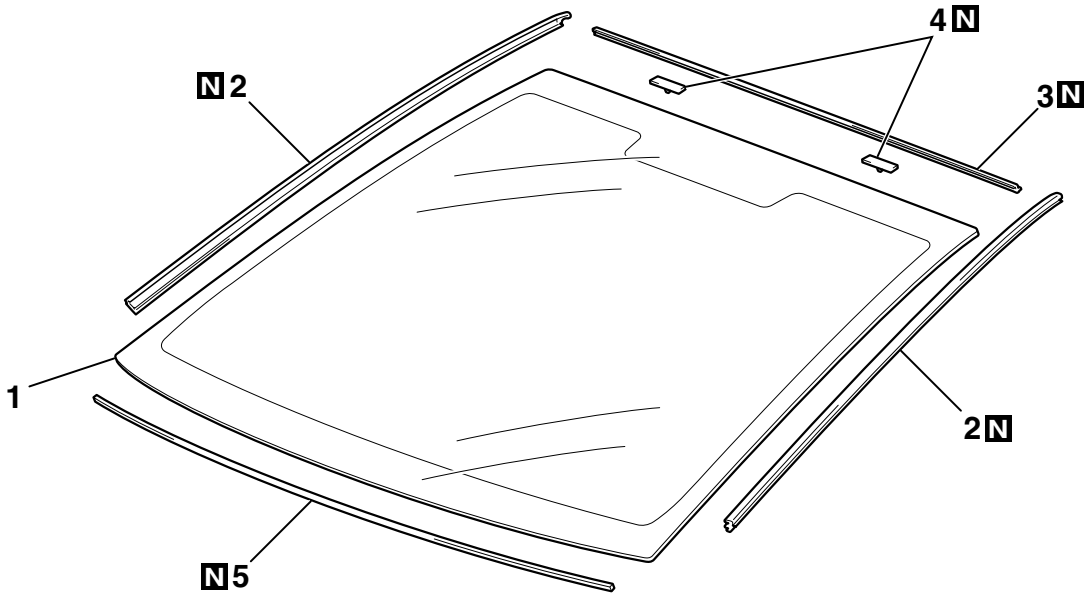
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990480	MB990480 Glass holder	General service tool	Removal and installation of window glass

WINDSHIELD

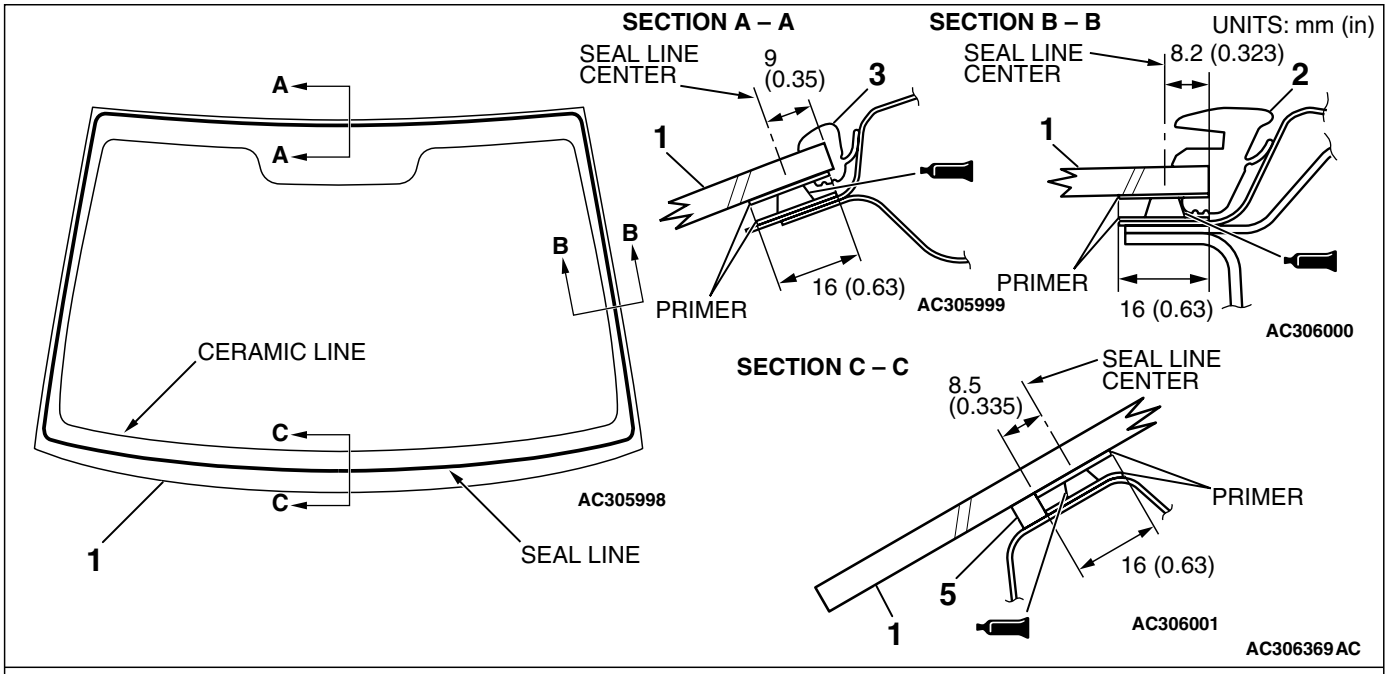
REMOVAL AND INSTALLATION

M1422001000829

Pre-removal and Post-installation Operation
- Front Deck Garnish Removal and Installation (Refer to GROUP 51, Windshield Wiper and Washer P.51-16).
- Roof Drip Molding Removal and Installation (Refer to GROUP 51, Garnish and Molding P.51-7).
- Front Pillar Trim Removal and Installation (Refer to GROUP 52A, Trims P.52A-23).
- Instrument Panel Front End Garnish Removal and Installation (Refer to GROUP 52A, Instrument Panel Assembly P.52A-15).
- Inside Rear View Mirror Removal and Installation (Refer to GROUP 52A, Inside Rear View Mirror P.52A-32).



AC305559AB



ADHESIVE: 3M™ AAD PART NO. 8609 SUPER FAST URETHANE AND 3M™ AAD PART NO. 8608 SUPER FAST URETHANE PRIMER OR EQUIVALENT

REMOVAL STEPS

<<**A**>> >>**B**<< 1. WINDSHIELD
>>**A**<< 2. WINDSHIELD SIDE MOLDING
>>**A**<< 3. WINDSHIELD UPPER MOLDING
>>**A**<< 4. GLASS STOPPER
>>**A**<< 5. WINDSHIELD SPACER

Required Special Tool:

- MB990480: Glass Holder

REMOVAL SERVICE POINT

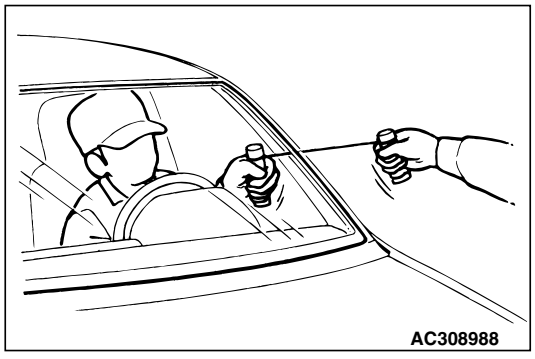
<<A>> WINDSHIELD REMOVAL

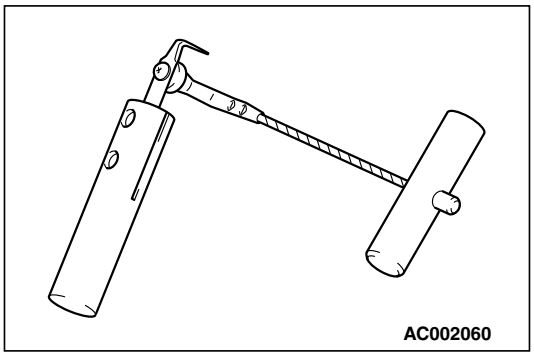
1. To protect the body (paint surface), apply cloth tape to all body areas around the installed windshield.
2. Make mating marks on the windshield and body.
3. Using piano wire.
   (1) Using a sharp-point drill, make a hole in the windshield adhesive.
   (2) Pass the piano wire from the inside of the vehicle through the hole.

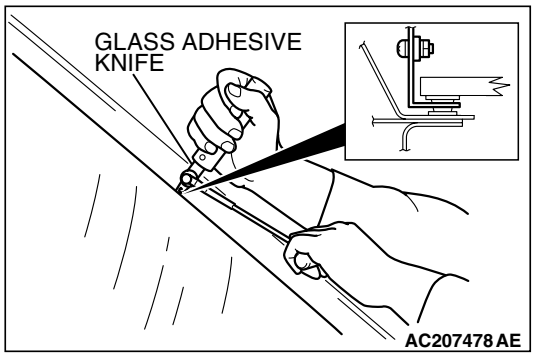
⚠ CAUTION

Do not let the piano wire touch the edge of the windshield.

   (3) Pull the piano wire alternately from the inside and outside along the windshield to cut the adhesive.




AC002060

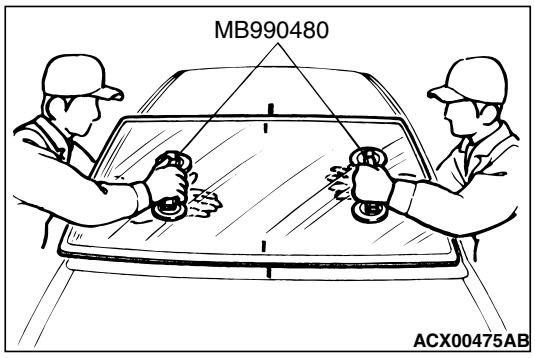


AC207478 AE

⚠ CAUTION

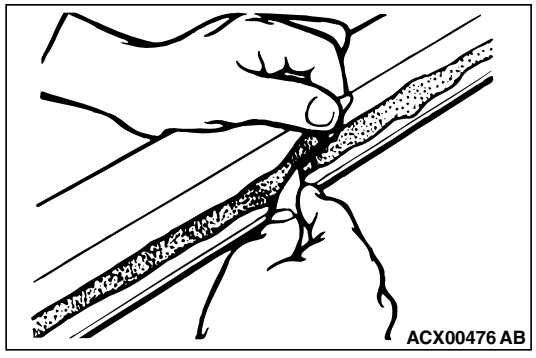
Inserting the glass adhesive knife too deeply into windshield adhesive may damage windshield.

4. Using glass adhesive knife
   Keep glass adhesive knife at right angles with the windshield edge, and put the blade at windshield edge and surface. Then cut away adhesive along the windshield edge.



ACX00475AB

5. Use special tool MB990480 to remove the windshield.


ACX00476 AB

⚠ CAUTION

- **Be careful not to remove more adhesive than is necessary.**
- **Be careful also not to damage the paint on the body surface with the knife. If the paint is damaged, repair the damaged area with touch-up paint.**

6. Use a knife to cut away the remaining adhesive so that the thickness is within 2 mm (0.08 inch) around the entire circumference of the body flange.
7. Finish the flange surfaces so that they are smooth.

⚠ CAUTION

Allow the cleaned area to dry for at least three minutes. Do not touch any surface that has been cleaned.

8. When reusing the windshield, remove the adhesive still adhering to the windshield, and clean with 3M™ AAD Part number 8906 or equivalent.
9. Clean the body side in the same way.

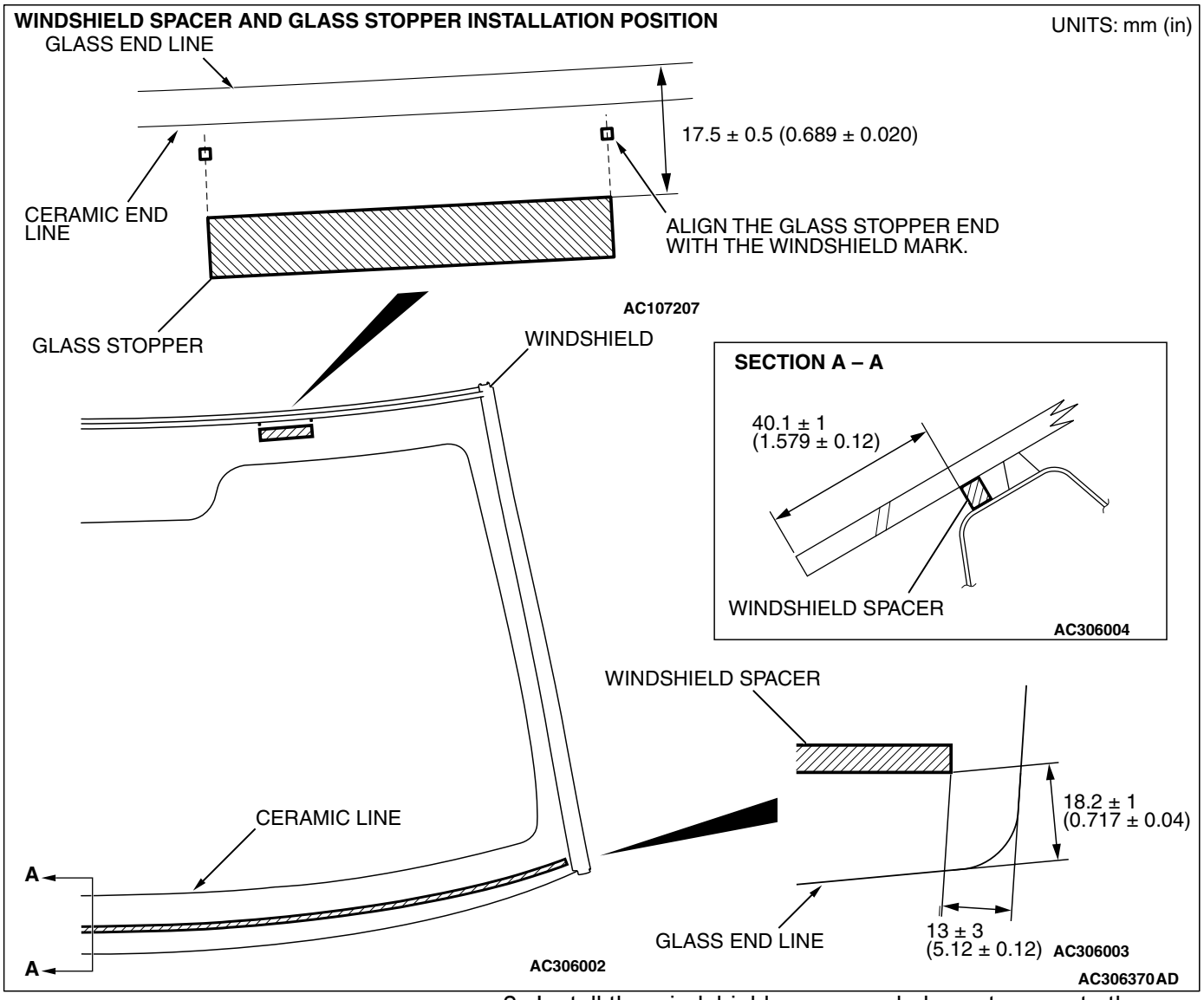
INSTALLATION SERVICE POINTS

>>A<< WINDSHIELD SPACER/GLASS STOPPER/WINDSHIELD UPPER MOLDING/WINDSHIELD SIDE MOLDING INSTALLATION

⚠ CAUTION

Leave the degreased parts for 3 or more minutes to dry well, before starting on the next step. Do not touch the degreased parts.

1. Use 3M™ AAD Part number 8906 or equivalent to degrease the inside and outside of the windshield and the body flanges.



2. Install the windshield spacer and glass stoppers to the specified positions so that there are no adrift or warped surfaces inside the windshield.
3. Install the windshield upper and side moldings to the windshield.

>>B<<WINDSHIELD INSTALLATION

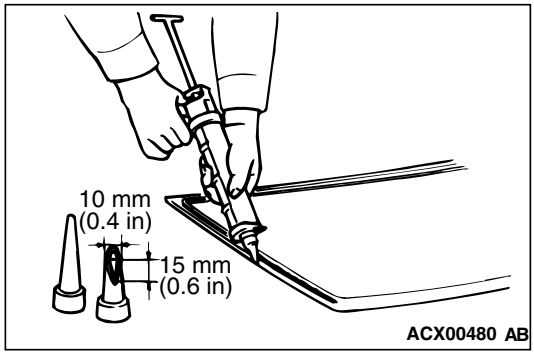
1. When replacing the windshield, temporarily set the windshield against the body, and place a mating mark on the windshield and body.

⚠ CAUTION

- **The primer strengthens the adhesive, so be sure to apply it evenly around the entire circumference. However, a too thick application will weaken the adhesive.**
- **Do not touch the coated surface.**
- **Do not apply the primer on the remaining adhesive because of weakening the adhesive.**

2. Soak a sponge in the primer, and apply evenly to the windshield and the body in the specified places.
3. Allow the windshield to dry for at least three minutes after applying primer.
4. Fill a sealant gun with adhesive. Then apply the adhesive evenly around the windshield within 30 minutes after applying the primer.

   NOTE: Cut the tip of the sealant gun nozzle into a V shape to simplify adhesive application.
5. Align the mating marks on the windshield and the body, and lightly press the windshield evenly so that it adheres completely.
6. Use a spatula or similar tool to remove any excessive adhesive. Clean the surface with 3M™AAD Part number 8906 or equivalent. Avoid moving the vehicle until the adhesive sets.



⚠ CAUTION

- **Do not move the vehicle unless absolutely necessary.**
- **When testing for water leakage, do not apply strong water pressure.**

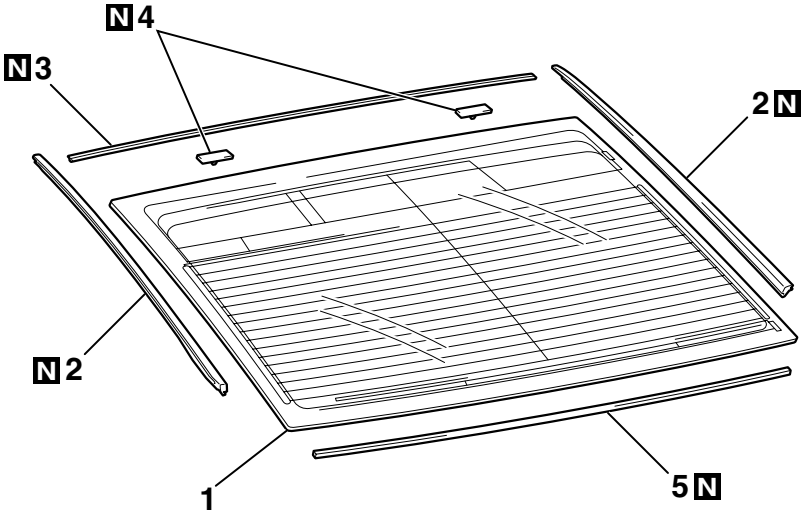
7. Wait 30 minutes or more, and then test for water leakage.

REAR WINDOW GLASS

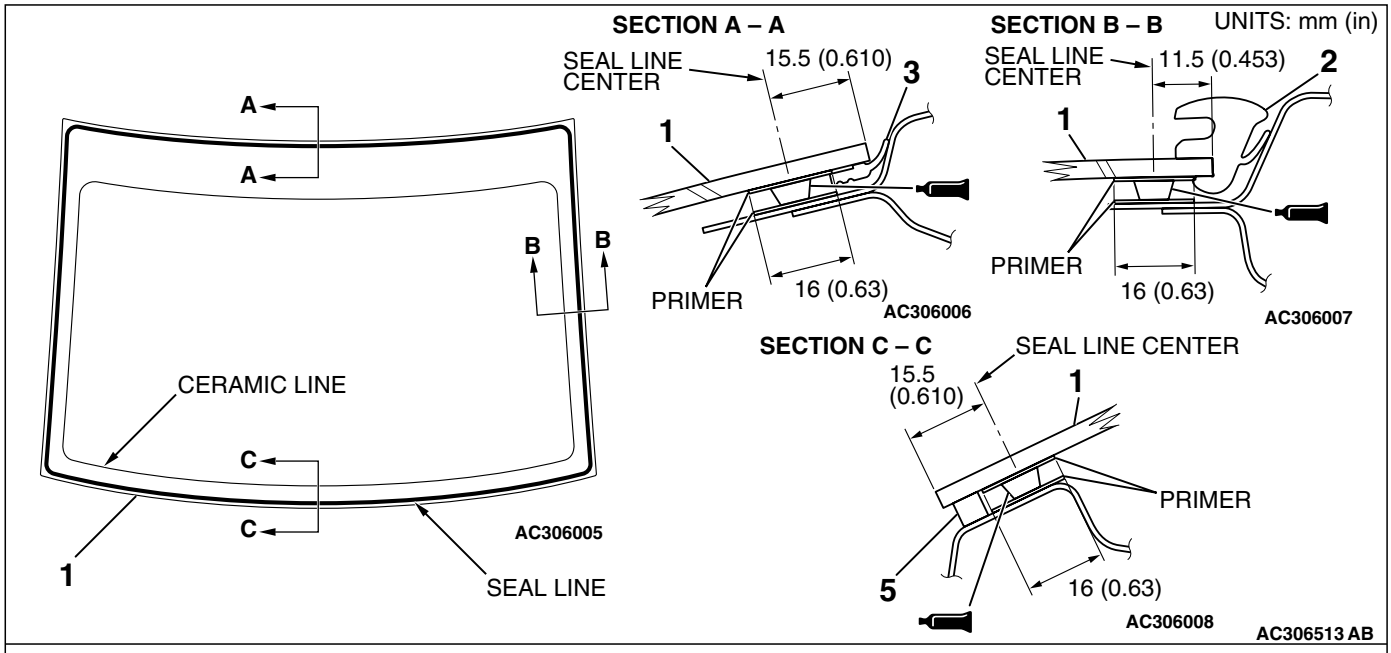
REMOVAL AND INSTALLATION

M1422001600122

Pre-removal and Post-installation Operation
- Roof Drip Moulding Removal and Installation (Refer to GROUP 51, Garnishes and Moulding P.51-7.)
- Rear Pillar Trim and Rear Shelf Trim Removal and Installation (Refer to GROUP 52A, Trims P.52A-23.)



AC305560AB



ADHESIVE: 3M™ AAD PART NO. 8609 SUPER FAST URETHANE AND 3M™ AAD PART NO. 8608 SUPER FAST URETHANE PRIMER OR EQUIVALENT

REMOVAL STEPS

<<**A**>> >>**B**<< 1. REAR WINDOW GLASS
>>**A**<< 2. REAR WINDOW SIDE MOLDING
>>**A**<< 3. REAR WINDOW UPPER MOLDING
>>**A**<< 4. GLASS STOPPER
>>**A**<< 5. REAR WINDOW SPACER

Required Special Tool:
- MB990480: Glass Holder

TSB Revision

REMOVAL SERVICE POINT

<<A>> REAR WINDOW GLASS REMOVAL

Remove the rear window glass using the same procedure as for the windshield (Refer to P.42-14).

INSTALLATION SERVICE POINTS

>>A<< REAR WINDOW SPACER/GLASS STOPPER/REAR WINDOW UPPER MOLDING/REAR WINDOW SIDE MOLDING INSTALLATION

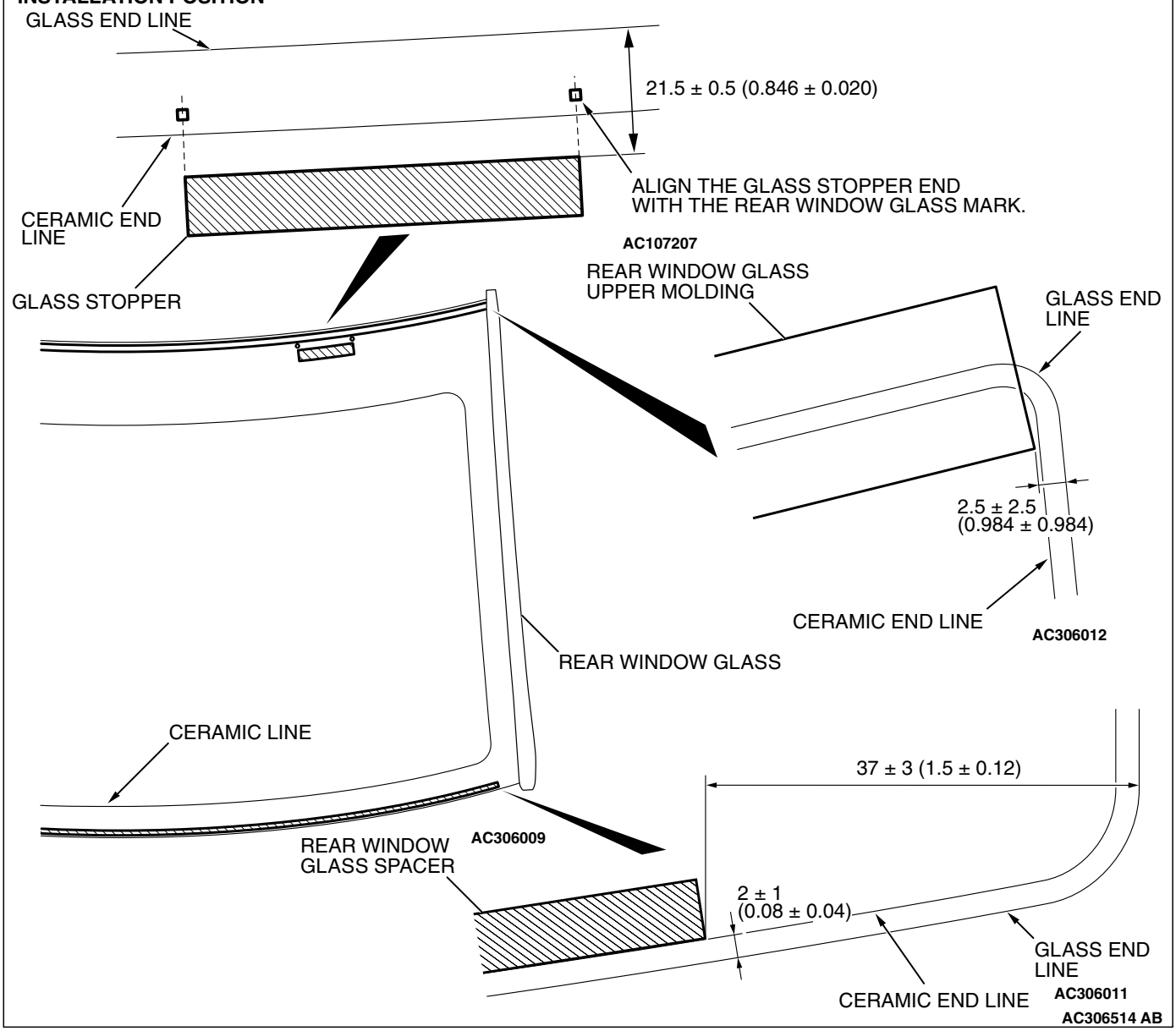
⚠ CAUTION

Leave the degreased parts for 3 or more minutes to dry well, before starting on the next step. Do not touch the degreased parts.

1. Use 3M™ AAD Part number 8906 or equivalent. to degrease the inside and outside edges of the rear window glass and the surface of the body flange.

REAR WINDOW GLASS SPACER, GLASS STOPPER AND REAR WINDOW GLASS MOLDING INSTALLATION POSITION

UNITS: mm (in)



2. Install the rear window spacer and glass stopper to the specified positions so that there are no adrift or bent surfaces inside the rear window glass.
3. Install the rear window upper molding and side molding to the rear window glass.

>>B<< REAR WINDOW GLASS INSTALLATION

Install the rear window glass in the same way as for the windshield installation (Refer to P.42-14).

TSB Revision

DOOR

GENERAL DESCRIPTION

M1423000100246

OPERATION

CENTRAL DOOR LOCKING SYSTEM

The central door locking system operates the door lock actuator to lock or unlock the doors using the door lock switch built into the front power window (main or sub) switch or key cylinder built into the driver's side door outside handle. The system has the following operations and features:

- All doors can be locked using the door lock switch built into the front power window (main or sub <RH>) switch.
- Insert the key into the driver's key cylinder and turn once to the unlock side to unlock the driver's door. Turn the key once again to the unlock side to unlock all doors.
- The key reminder function automatically unlocks all doors when door lock operation is performed and the front doors are opened while the key is inserted into the ignition switch.

POWER WINDOWS

When the power window (main or sub) switch is operated, the door windows will open or close. This system has the following operations and features:

- A power window lock switch on the power window main switch prevents the door window glass from opening/closing with the front passenger's and rear power window sub switch.
- The power window of the door window glass can be opened/closed for 30 seconds with the timer function after the ignition switch is turned OFF. (The timer expires if the front door <LH or RH> is opened when the timer is in operation).
- The power window main switch contains a one-touch down switch that will automatically open the driver's side door window only.

CENTRAL DOOR LOCKING SYSTEM DIAGNOSIS

M1427000700217

The central door locking system is controlled by the simplified wiring system (SWS). Refer to GROUP 54B, SWS Diagnosis P.54B-61.

POWER WINDOW DIAGNOSIS

M1429000700224

The power window is controlled by the simplified wiring system (SWS). Refer to GROUP 54B, SWS Diagnosis P.54B-61.

DOOR DIAGNOSIS

INTRODUCTION TO GLASS AND DOOR DIAGNOSIS

M1423007300241

Glass and door faults include water leaks and improper opening and closing. Causes for these faults can include faults in the glass, weatherstrip, drain hole, waterproof film or door installation.

GLASS AND DOOR DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1423006700246

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a glass and door fault.

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

SYMPTOM CHART

M1423007000303

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Water leak through door window glass	1	P.42-23
Door window glass malfunction	2	P.42-23
Water leak through door edge	3	P.42-24
Water leak from door center	4	P.42-24
Door hard to open	5	P.42-24
Door does not open or close completely	6	P.42-25
Uneven gap between body	7	P.42-25
Wind noise around door	8	P.42-25

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Water Leak Through Door Window Glass

DIAGNOSIS

STEP 1. Check the window glass runchannel.

Q: Is the window glass runchannel in good condition?
YES : Go to Step 2.
NO : Replace the runchannel, then go to Step 4.

STEP 2. Check the door window glass installation.

Q: Is the door window glass installed correctly?
YES : Go to Step 3.
NO : Reinstall the door window glass. (Refer to P.42-38). Then go to Step 4.

STEP 3. Check the clearance at the top of the door window glass.

Q: Is the clearance at the top of the door window glass correct?
YES : Go to Step 4.
NO : Adjust the door window glass. Refer to P.42-30. Then go to Step 4.

STEP 4. Retest the system.

Q: Is any water leaking?
YES : Return to Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 2: Door Window Glass Malfunction

DIAGNOSIS

STEP 1. Check the door window glass installation condition.

Q: Is the door window installed correctly?
YES : Go to Step 2.
NO : Reinstall the door window glass. (Refer to P.42-38). Then go to Step 4.

STEP 2. Check the door sash.

Q: Is the door sash in good condition?
YES : Go to Step 3.
NO : Repair or replace door sash, then go to Step 4.

STEP 3. Inspect the window regulator assembly.

Q: Is the window regulator assembly in good condition?
YES : Go to Step 4.
NO : Repair or replace the window regulator assembly, then go to Step 4.

STEP 4. Retest the system.

Q: Does the door window operate correctly?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Water Leak Through Door Edge

DIAGNOSIS

STEP 1. Check the weatherstrip.

Q: Is the weatherstrip in good condition?
YES : Go to Step 2.
NO : Replace the weatherstrip, then go to Step 3.

STEP 2. Check the door fit (alignment).

Q: Is the door fit (alignment) correct?
YES : Go to Step 3.
NO : Adjust the door fit (Refer to P.42-28). Then go to Step 3.

STEP 3. Retest the system.

Q: Is any water leaking?
YES : Return to Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 4: Water Leak from Door Center

DIAGNOSIS

STEP 1. Check the drain hole.

Q: Is the drain hole clogged?
YES : Clean the drain hole, then go to Step 3.
NO : Go to Step 2.

STEP 2. Check the weatherstrip.

Q: Is the weatherstrip in good condition?
YES : Go to Step 3.
NO : Repair or replace the weatherstrip, then go to Step 3.

STEP 3. Retest the system.

Q: Is any water leaking?
YES : Return to Step 1.
NO : The procedure is complete.

INSPECTION PROCEDURE 5: Door Hard to Open

DIAGNOSIS

STEP 1. Adjust the latch and striker engagement.
Refer to P.42-28.

Q: Is the latch and striker engagement adjusted?
YES : Go to Step 2.
NO : Adjust the latch and striker. (Refer to P.42-28). Then go to Step 4.

STEP 2. Check for lock cable damage.

Q: Is the lock rod damaged?
YES : Repair or replace the lock cable, then go to Step 4.
NO : Go to Step 3.

STEP 3. Check the door handle flexibility (amount of movement of handle required to open door).

Q: Is the door handle flexibility good?
YES : Go to Step 4.
NO : Check the door outside handle and inside handle (Refer to P.42-33 and P.42-34). Then go to Step 4.

STEP 4. Retest the system.

Q: Does the door open easily?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 6: Door Does Not Open or Close Completely

DIAGNOSIS

STEP 1. Check the door hinge position.

Q: Is the door hinge correct?
YES : Go to Step 2.
NO : Adjust the door hinge (Refer to P.42-28). Then go to Step 4.

STEP 2. Check the door for damage.

Q: Is the door in good condition?
YES : Go to Step 3.
NO : Repair or replace the door, then go to Step 4.

STEP 3. Check lubrication.

Q: Are the door check and door hinge sufficiently lubricated?
YES : Go to Step 4.
NO : Apply grease, then go to Step 4.

STEP 4. Retest the system.

Q: Does the door open and close completely?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 7: Uneven Gap Between Body

DIAGNOSIS
Adjust the door fit (Refer to P.42-28). Then check that the gap has been improved.

INSPECTION PROCEDURE 8: Wind Noise Around Door

DIAGNOSIS

STEP 1. Check the weatherstrip for holding condition.

Q: Is the weatherstrip holding firmly?
YES : Go to Step 2.
NO : Adjust fit of door (Refer to P.42-30). Then go to Step 5.

STEP 2. Check the weatherstrip for installation condition.

Q: Is the weatherstrip installed properly?
YES : Go to Step 3.
NO : Repair or replace the weatherstrip. Then go to Step 5.

STEP 3. Check the clearance.

Q: Are the door glass and door weatherstrip holder installed properly?
YES : Go to Step 4.
NO : Adjust the door glass and the weatherstrip holder (Refer to P.42-30). Then go to Step 5.

STEP 4. Check the door for deformation.

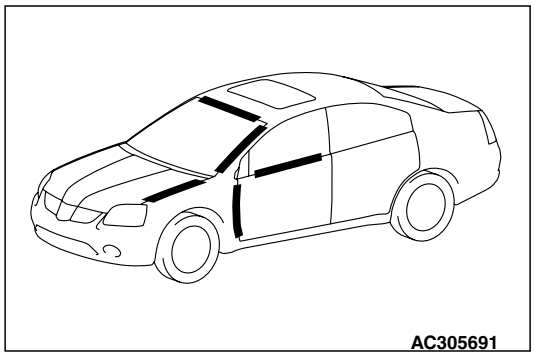
Q: Is the door deformed?
YES : Replace the door. then go to Step 5.
NO : Go to Step 5.

STEP 5. Retest the system.

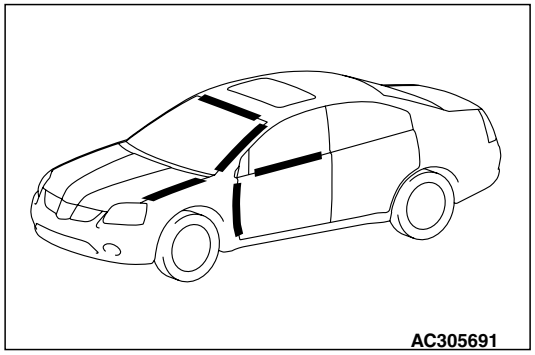
Q: Has the wind noise been improved?
YES : Return to Step 1.
NO : This diagnosis complete.

HOW TO LOCATE WIND NOISE

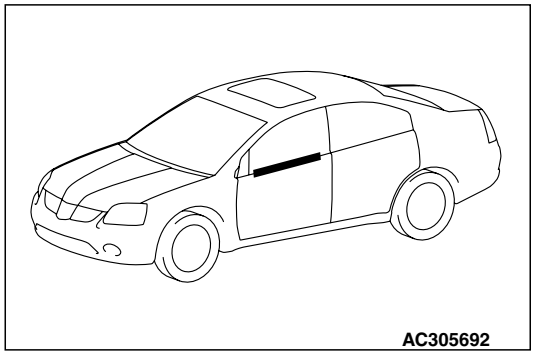
M1421004200227


AC305691

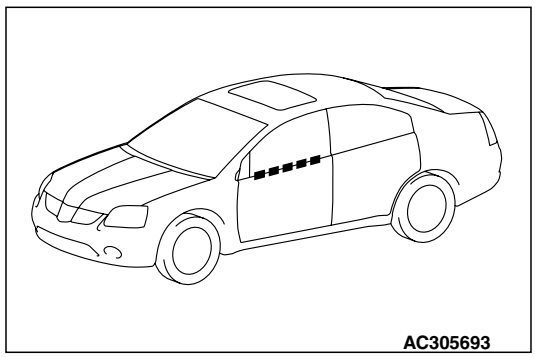
1. Attach cloth tape to every place, such as panel seams, projections, molding seams, glass and body seams, etc. which might conceivably be the source of wind noise.
2. Then make a road test to check that the places not covered by tape are not sources of wind noise.


AC305691

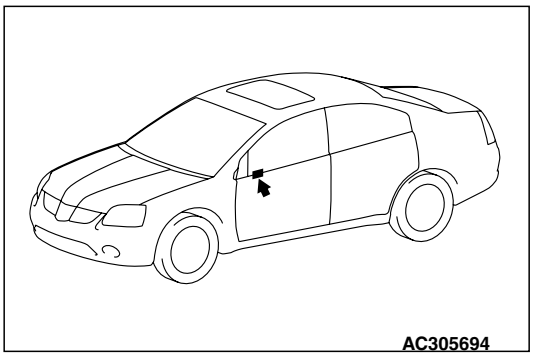
3. Remove the strips of tape one by one, making a road test after each is removed, until a wind noise source is discovered.


AC305692

4. When such a place is found, cover it again and repeat the procedure to check if there are any other noise source.
5. If no others are found, the last remaining tape is the only source.


AC305693

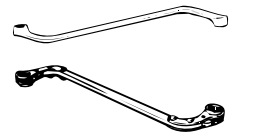
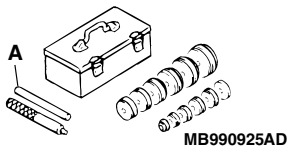
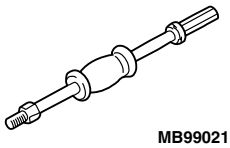
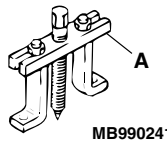
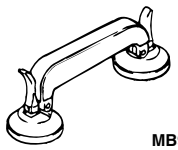
6. Cut the remaining piece of tape into smaller pieces, attach it again as it was before, and then remove the pieces one by one to narrow down the source.

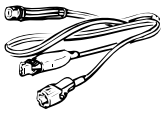
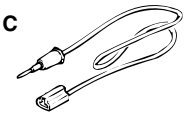
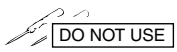
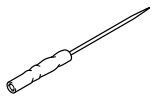
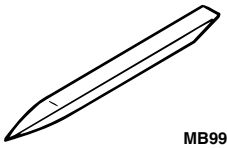

AC305694

7. Check that wind noise occurs when the last remaining tape is removed, and that noise does not occur when it is re-attached.
8. When the source(s) of the wind noise is finally located, attach butyl tape, body sealer or similar material to obstruct this source as much as possible.

SPECIAL TOOLS

M1423000600616

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990900	MB990900 or MB991164 Door adjusting wrench	MB990900-01	Adjustment of door fit
 MB990925AD	MB990925 Bearing and oil seal installer set A: MB990939 Remover bar	MB990925-01 or General service tool	Adjustment of door striker
 MB990211	MB990211 Slider hammer	MB990211-01	
 MB990241AC	MB990241 Axle shaft puller A: MB990243 Body puller	MB990241-01 or General service tool	
 MB990480	MB990480 Glass holder	General service tool	Removal of power window regulator assembly

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  B  C  D  MB991223AZ	MB991223 Harness set A: MB991219 Test harness B: MB991220 LED harness C: MB991221 LED harness adapter D: MB991222 Probe	General service tools	Measurement of terminal voltage and resistance A: Connector pin contact pressure inspection B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection
 MB992006	MB992006 Extra fine probe	–	Measurement of terminal voltage and resistance
 MB990784	MB990784 Ornament remover	General service tool	Removal of power window switch panel assembly

ON-VEHICLE SERVICE

DOOR FIT ADJUSTMENT

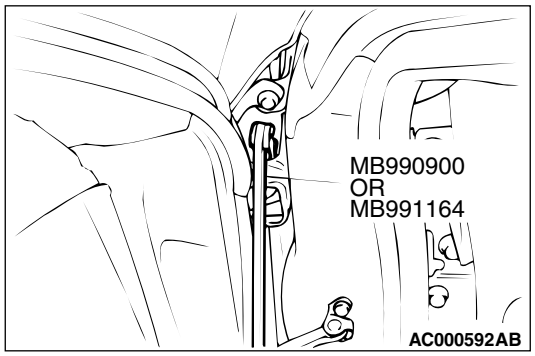
M1423001100380

Required Special Tools:

- MB990211: Slide Hammer
- MB990243: Body Puller
- MB990900 or MB991164: Door adjusting Wrench
- MB990939: Brass Bar

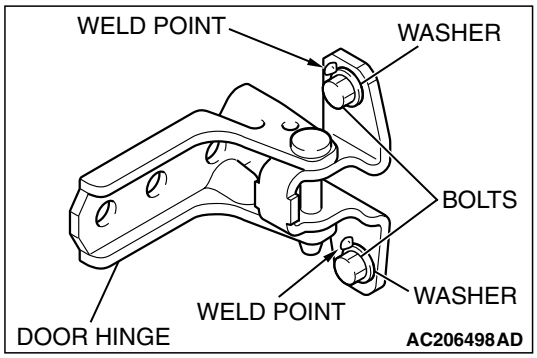
⚠ CAUTION

- **Attach protection tape to the fender and door edges where the hinge is installed.**
- **Do not rotate special tool MB991164 with a torque of over 98 N·m (72 ft-lb).**



1. Use special tool MB990900 or MB991164 to loosen the hinge mounting bolts on the body side, and then adjust the clearance around the door so that it is uniform on all sides.
2. If a door is not flush with its surrounding panels, loosen the door-side door hinge mounting bolts and adjust the door as necessary.

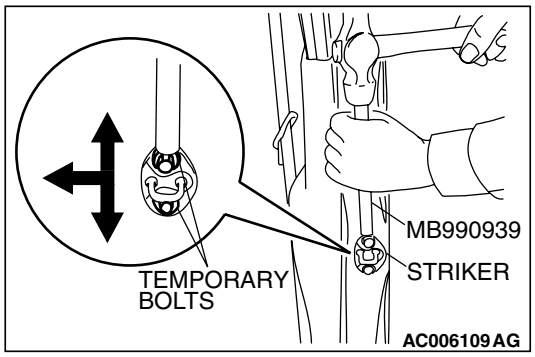
NOTE:



If the door hinge mounting bolt washers are welded, grind off the welding according to the procedure below beforehand.

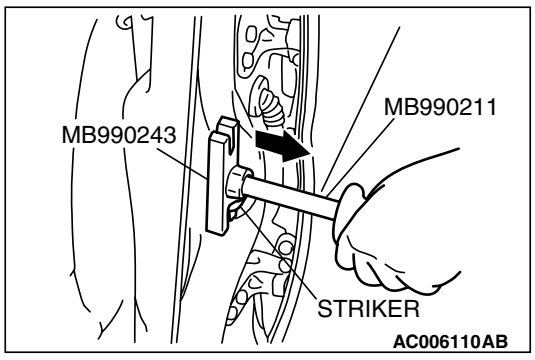
1. *Remove the door hinge. (Refer P.42-36.)*
2. *Use a chisel or grinder to release the door hinge mounting bolt washer, which is welded to the door hinge.*
3. *On completion, paint the affected area with touch-up paint to prevent corrosion.*
4. *Install the door hinge. (Refer P.42-36.)*

3. If the door is stiff to lock and unlock:



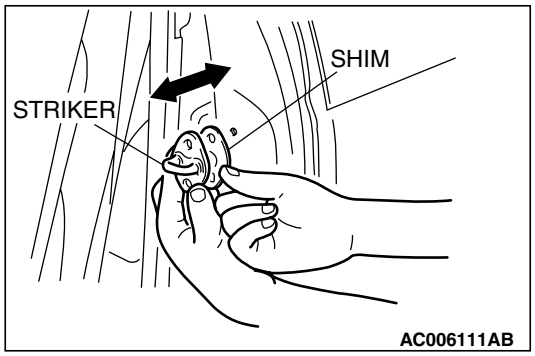
(1) Adjustment by using the striker (vertically or toward the inside of the vehicle)

Install an temporary bolts instead of the striker mounting bolt, and use special tool MB990939 and a hammer to tap the bolt in the desired direction.



(2) Adjustment by using the striker (toward the outside of the vehicle)

Use special tools MB990211 and MB990243 to pull the striker toward the outside of the vehicle.



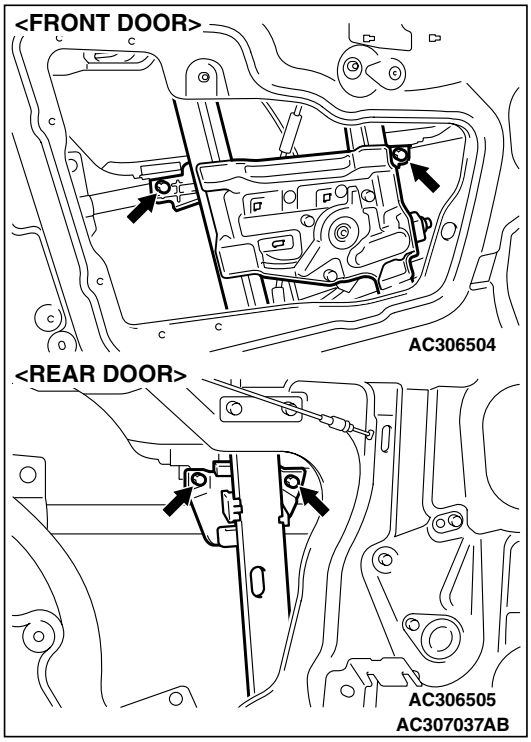
(3) Adjustment by using shims (forward and rearward)
Increase or decrease the number of shims so that the striker engages with the door latch properly.

DOOR WINDOW GLASS ADJUSTMENT

M1423001000349

Check that the door glass moves while contacting the door glass channel when it is raised and lowered fully. If not, adjust the door window according to the following procedures.

1. Remove the door trim assembly (Refer to GROUP 52A, Door trim P.52A-26).
2. Remove the waterproof film (Refer to P.42-52).
3. Loosen the door window glass mounting bolts.
4. Adjust the position of the door window glass so that it is aligned with the runchannel. On completion, tighten the door window glass mounting bolts.

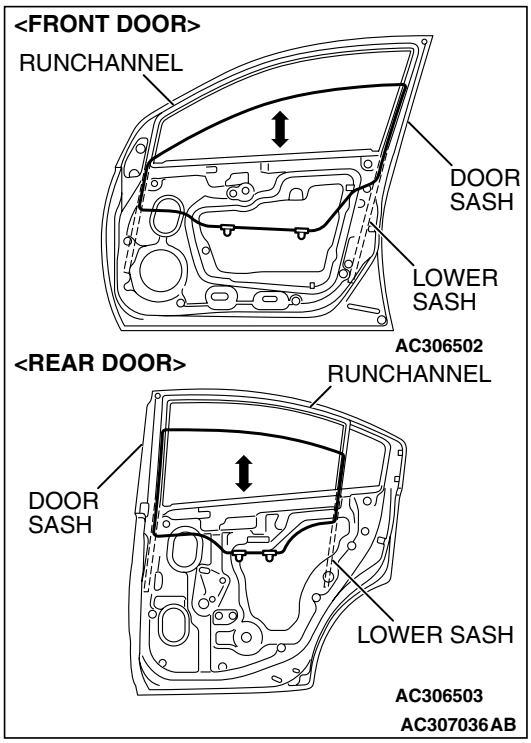


GLASS SLIDING MECHANISM CHECK AND ADJUSTMENT

M1429000900109

If the window glass automatically starts moving downwards at the wrong time while it is being raised, carry out the following adjustment or replacement procedures.

1. Remove the door trim assembly (Refer to GROUP 52A, Door trim P.52A-26).
2. Remove the waterproof film (Refer to P.42-52).



⚠ CAUTION
Insert a cushion or similar object to prevent damage to the glass if it should fall.

3. Remove the window regulator assembly from the door window glass, and then raise and lower the door window glass by hand to check the operation force.
4. If the door window glass does not move up and down smoothly, check or repair the following points:
   - Check the installation condition of the runchannel.
   - Repair any twisting in the door sash.
   - Check the installation condition of the lower sash.

   NOTE: To align the lower sash, loosen the lower sash mounting bolts, and move the lower sash along the oblong mounting holes.
5. If repair or adjustment is not possible, replace the door assembly.

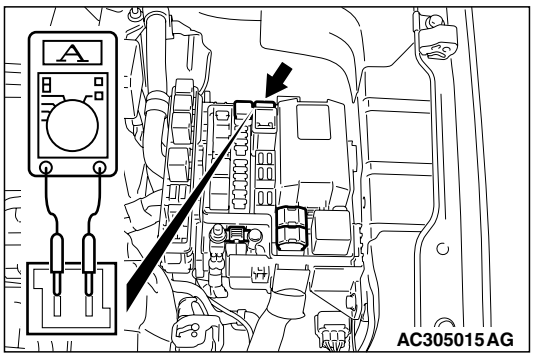
POWER WINDOW TIMER FUNCTION CHECK

M1429004300154

After the doors are closed and the ignition switch is turned to the "LOCK" (OFF) position, the power windows should work within 30 seconds. The timer expires if the front door is opened during that 30 seconds. If it does not, carry out the timer trouble-shooting in GROUP 54B, SWS Diagnosis P.54B-61.

POWER WINDOW OPERATING CURRENT CHECK

M1429001100195

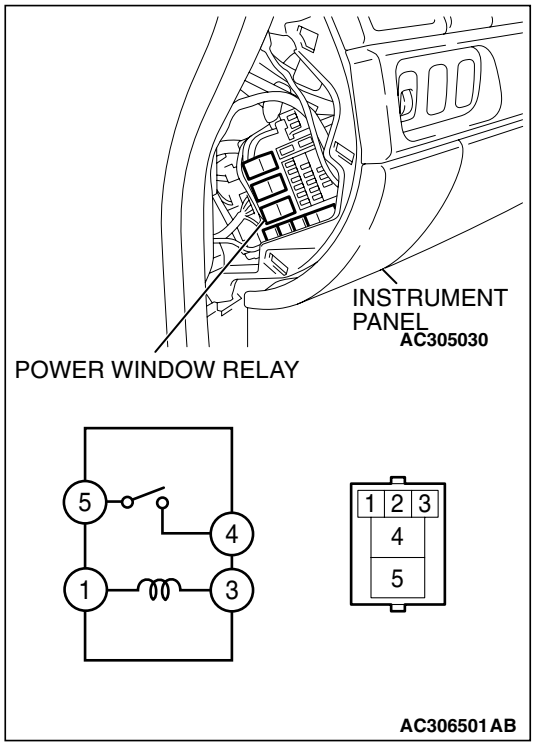


1. Remove the power window fuse and connect an ammeter as shown in the illustration.
2. When the power window switch is pressed in the “UP” position, a large amount of current flows from the time the window starts to close until it is fully closed, Measure the current during this time

   Standard value (A): 5 ± 1A [Power supply voltage 14.5 ± 0.5V, 25°C (77°F)]
3. If the operation current is outside the standard value, refer to GROUP 54B, SWS Diagnosis P.54B-65.

POWER WINDOW RELAY CHECK

M1429001800213



BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	4 – 5	Open circuit
• Connect terminal No. 3 and the negative battery terminal. • Connect terminal No. 1 and the positive battery terminal.	4 – 5	Less than 2 ohms

CIRCUIT BREAKER (INCORPORATED IN THE POWER WINDOW MOTOR) INSPECTION

M1429001000284

1. Pull the power window switch to the UP position to fully close the door window glass, and keep pulling the switch for an additional ten seconds.
2. Release the power window switch from the UP position and immediately press it to the DOWN position. The condition of the circuit breaker is good if the door window glass starts to move downwards within about 60 seconds.

POWER WINDOW CHECK

M1429004400214

1. Operate the power window switch of each door to verify that the power windows operate properly. If they don't, then troubleshoot as described in GROUP 54B, SWS Diagnosis P.54B-61.
2. Turn ON the power window lock switch of the power window main switch. Then operate the passenger's door and rear door power window sub-switches to ensure that they do not operate. If they do, replace the power window main switch (Refer to P.42-38).

CENTRAL DOOR LOCKING SYSTEM INSPECTION

M1427001100144

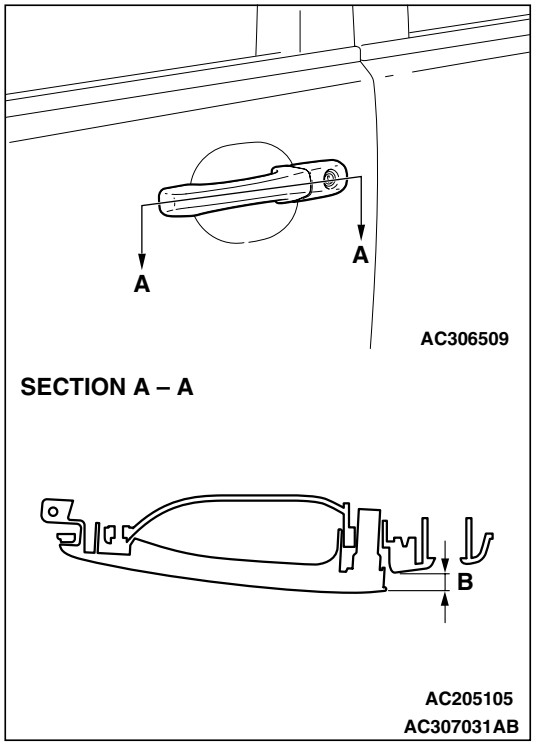
Check the following. Troubleshoot if operations malfunction (Refer to GROUP 54B, SWS Diagnosis P.54B-61).

TSB Revision

- Insert the key into the driver's key cylinder and turn once to the unlock side to unlock the driver's door. Turn the key once again to the unlock side to unlock all doors.
- All doors can be locked using the door lock switch built into the front power window (main or sub <RH>) switch.

DOOR OUTSIDE HANDLE PLAY CHECK

M1423001600288



1. Check that the door outside handle play is within the standard value range.

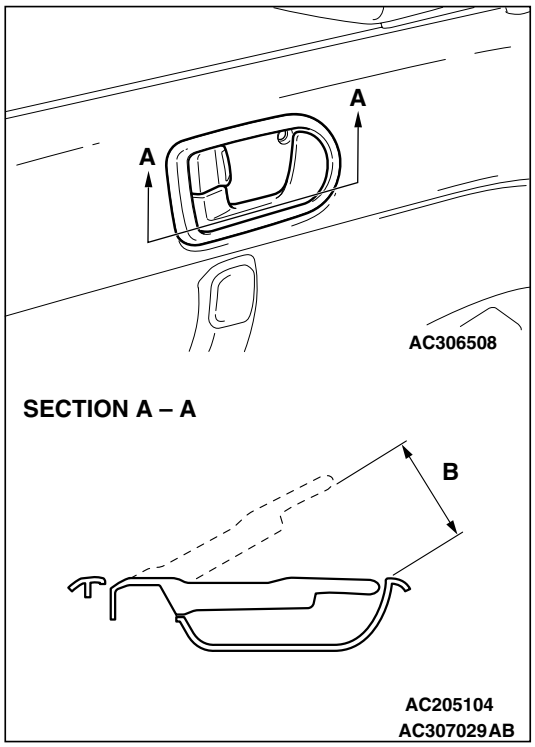
   Standard value (B):
   Front door: 10 ± 3.5 mm (0.39 ± 0.138 inch)
   Rear door: 11.2 ± 4 mm (0.441 ± 0.16 inch)

2. If the door outside handle play is not within the standard value range, check the door outside handle or the door latch assembly. Replace if necessary.

DOOR INSIDE HANDLE PLAY CHECK

M1423009400028

DOOR INSIDE HANDLE KNOB PLAY CHECK

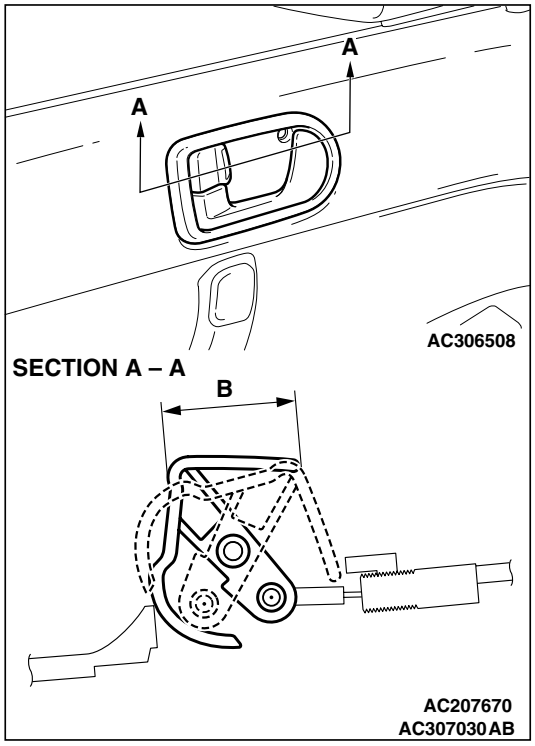


1. Check that the door inside handle play is within the standard value range.

   Standard value (B):
   Front door: 26.1 –58.1 mm (1.028 –2.287 inches) [Target value 41 mm (1.61inches)]
   Rear door: 30.3 –58.1 mm (1.193 –2.287 inches) [Target value 41 mm (1.61inches)]

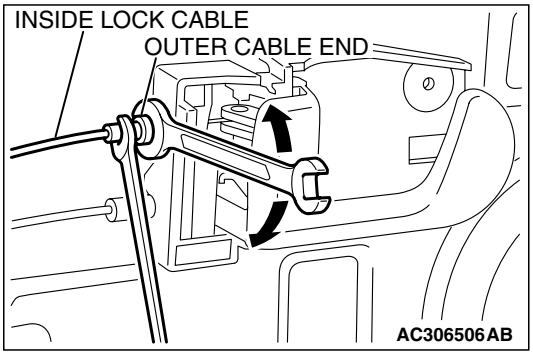
2. If the door inside handle play is not within the standard value range, check the door inside handle or the inside handle cable. Replace if necessary.

DOOR INSIDE HANDLE LOCK KNOB STROKE CHECK



1. Remove the door trim assembly (Refer to GROUP 52A, Door Trim P.52A-26).
2. Check that the door inside handle lock knob stroke is within the standard value.

   Standard value (B): 21.6 mm (0.850 inch)



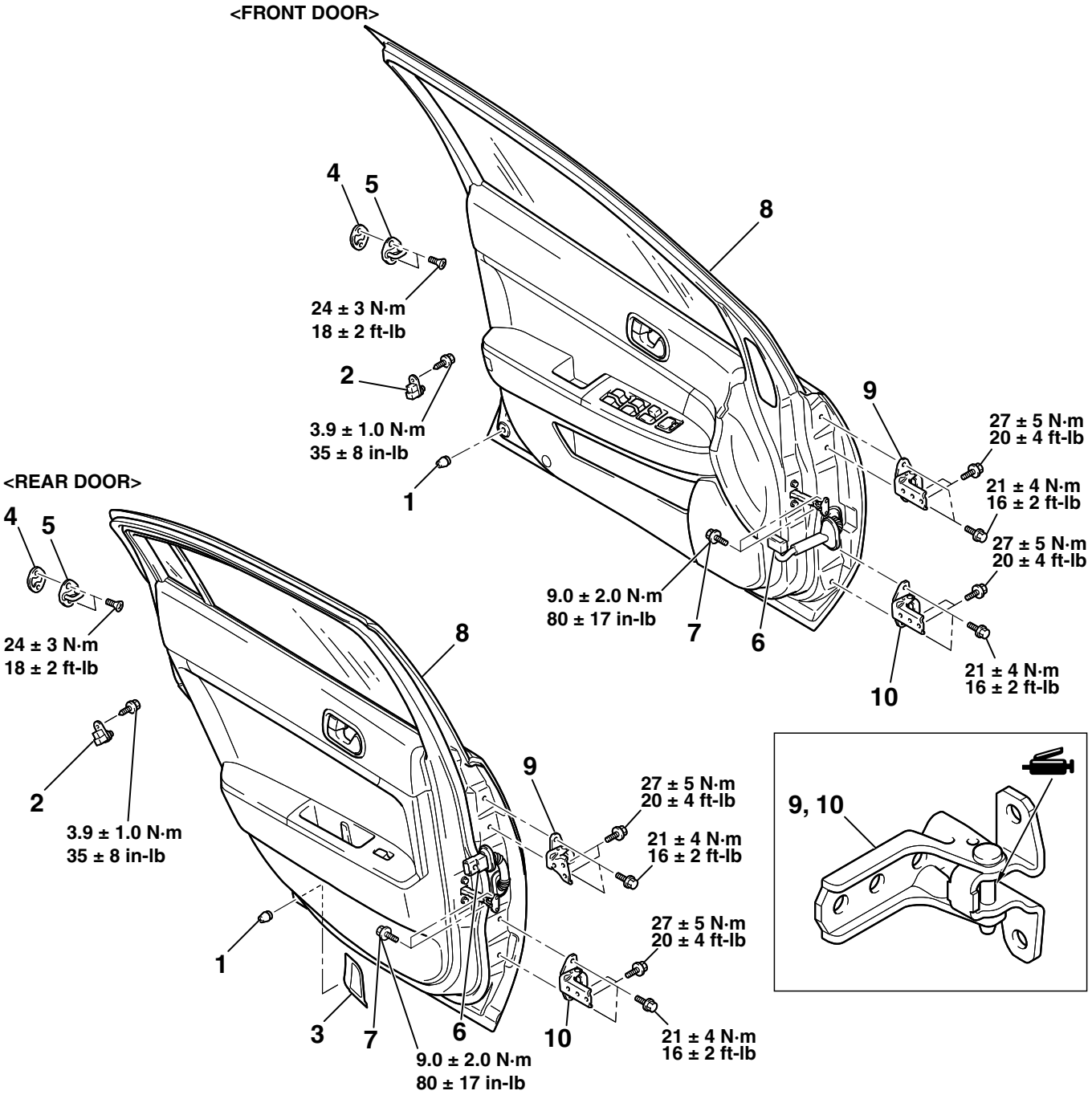
3. If not within the standard value, adjust the inside handle lock knob stroke with the outer cable end connecting the inside handle lock knob and inside lock cable.

DOOR ASSEMBLY

REMOVAL AND INSTALLATION

M1423002200669

Post-installation Operation
- Door Fit Adjustment (Refer to P.42-28).



AC601197AB

REMOVAL
1. DAMPER
2. DOOR SWITCH

>>B<< 3. REAR DOOR PROTECTOR FILM

STRIKER REMOVAL STEPS

>>A<< 4. STRIKER
5. STRIKER SHIM

DOOR ASSEMBLY REMOVAL STEPS
- COWL SIDE TRIM <FRONT DOOR> (REFER TO GROUP 52A, TRIMS P.52A-23).

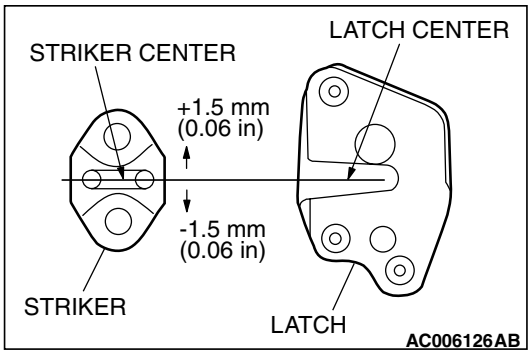
6. HARNESS CONNECTOR
7. DOOR CHECK MOUNTING BOLT

TSB Revision

DOOR ASSEMBLY REMOVAL STEPS (Continued)

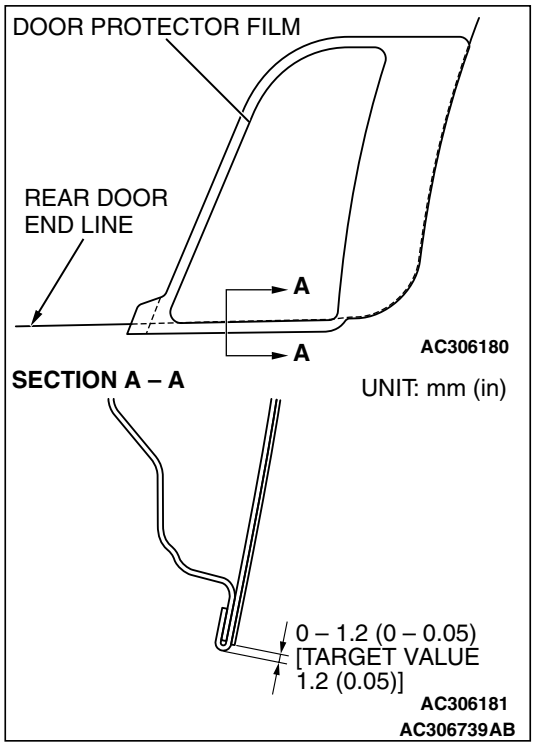
8. DOOR ASSEMBLY
9. DOOR UPPER HINGE
10. DOOR LOWER HINGE

INSTALLATION SERVICE POINTS



>>A<< STRIKER INSTALLATION

Align the center of the striker and latch within ± 1.5 mm (0.06 inch), and install.



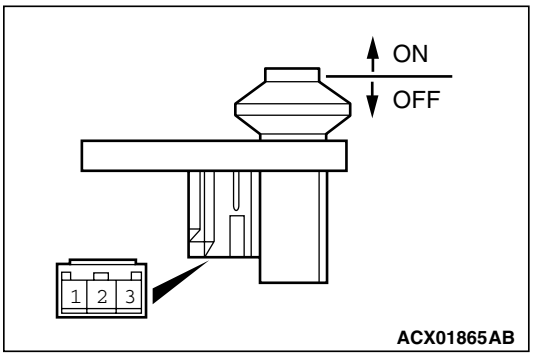
>>B<< REAR DOOR PROTECTOR FILM INSTALLATION

Install the rear door protector film as shown.

INSPECTION

M1423006000333

DOOR SWITCH CHECK



Check continuity between the switch terminals and body ground.

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
Released (ON)	1 – body ground	Less than 2 ohms
Depressed (OFF)	1 – body ground	Open circuit

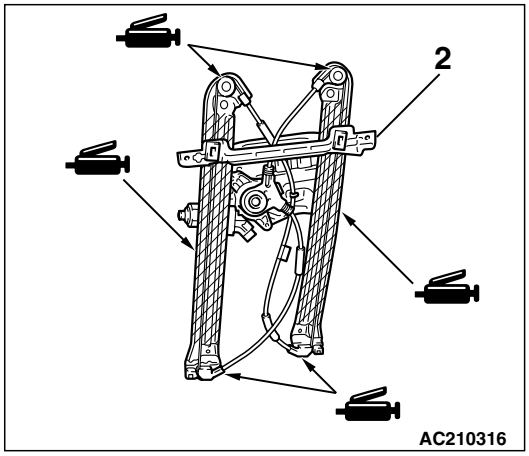
DOOR GLASS AND REGULATOR

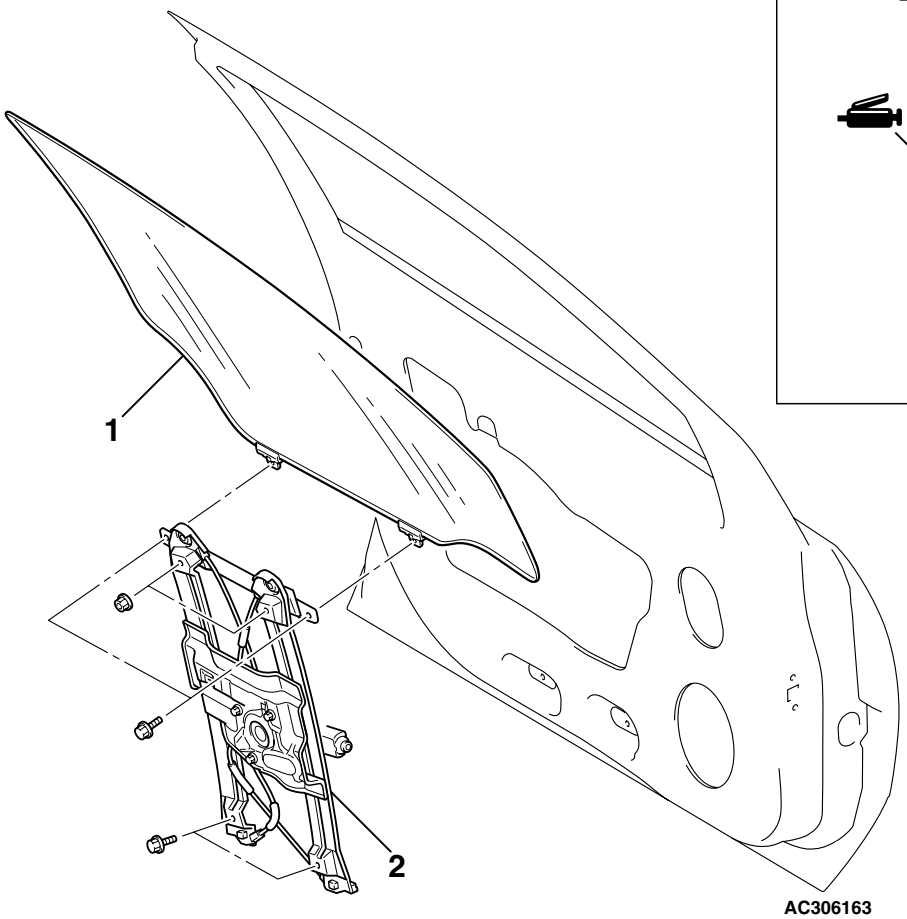
REMOVAL AND INSTALLATION

M1429001300898

Pre-removal Operation	Post-installation Operation
• Door Trim Assembly Removal (Refer to GROUP 52A Door Trim P.52A-26). • Waterproof Film Removal (Refer to P.42-52).	• Door Window Glass Adjustment (Refer to P.42-30). • Waterproof Film Installation (Refer to P.42-52). • Door Trim Assembly Installation (Refer to GROUP 52A, Door Trim P.52A-26).

<FRONT DOOR WINDOW REGULATOR ASSEMBLY>





AC306511AB

TSB Revision

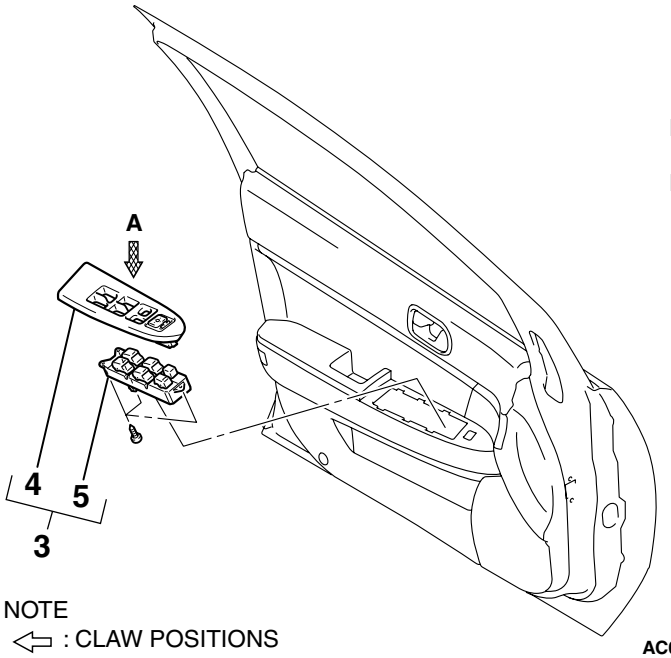
DOOR WINDOW REGULATOR ASSEMBLY REMOVAL STEPS

- DOOR BELTLINE MOLDING (REFER TO P.42-52).

DOOR WINDOW REGULATOR ASSEMBLY REMOVAL STEPS

1. DOOR WINDOW GLASS
2. WINDOW REGULATOR ASSEMBLY

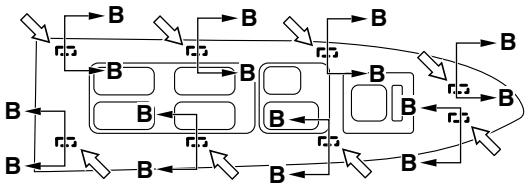
<FRONT DOOR POWER WINDOW SWITCH>



NOTE
⇦ : CLAW POSITIONS

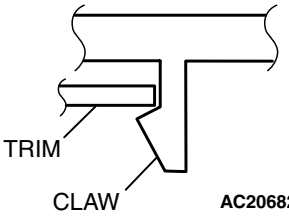
AC601198

VIEW A



AC601199

SECTION B – B



AC206827

AC601275AB

POWER WINDOW SWITCH REMOVAL STEPS

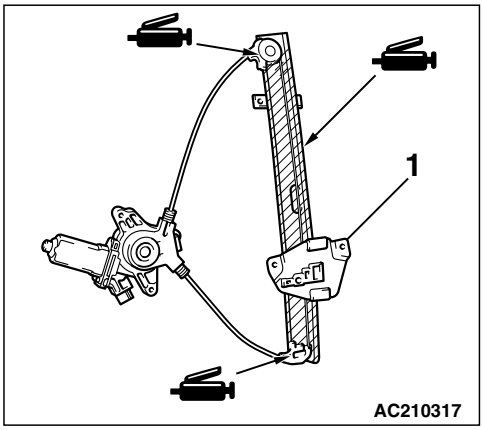
<<C>>

3. POWER WINDOW SWITCH PANEL ASSEMBLY
4. POWER WINDOW SWITCH PANEL
5. POWER WINDOW MAIN SWITCH (LH), POWER WINDOW SUB SWITCH (RH)

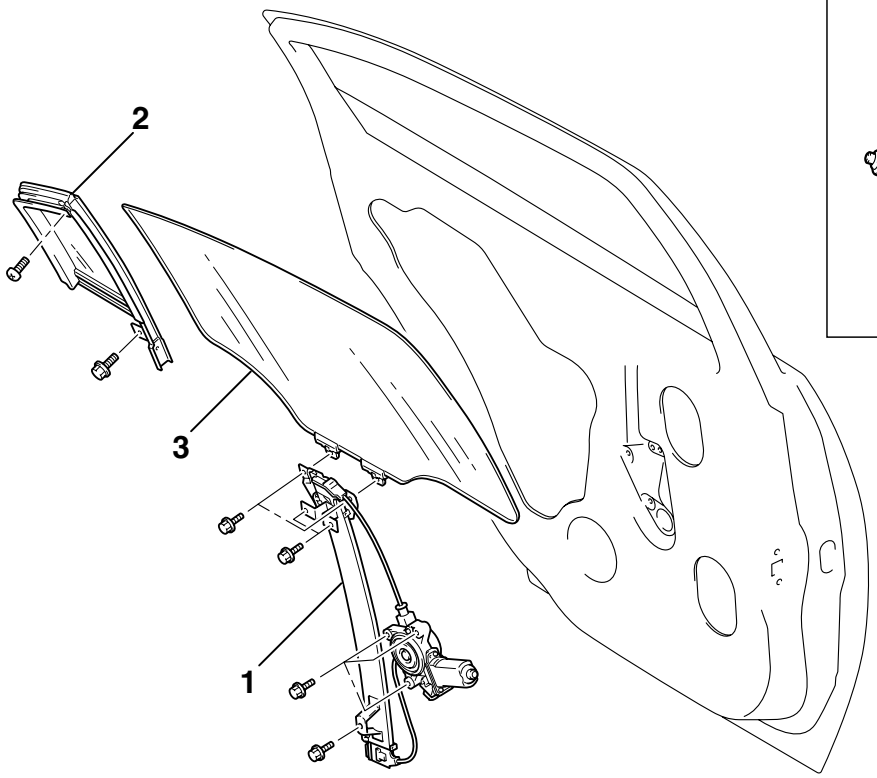
Required Special Tool:

- MB990784: Ornament Remover

<REAR DOOR WINDOW REGULATOR ASSEMBLY>



AC210317



AC306164

AC306512 AB

DOOR WINDOW REGULATOR ASSEMBLY REMOVAL

<<A>>

1. WINDOW REGULATOR ASSEMBLY

DOOR WINDOW GLASS REMOVAL STEPS

- DOOR WINDOW GLASS RUNCHANNEL (REFER TO P.42-52).
- DOOR BELTLINE MOLDING (REFER TO P.42-52).

DOOR WINDOW GLASS REMOVAL STEPS (Continued)

- LOWER SASH (REFER TO P.42-45).

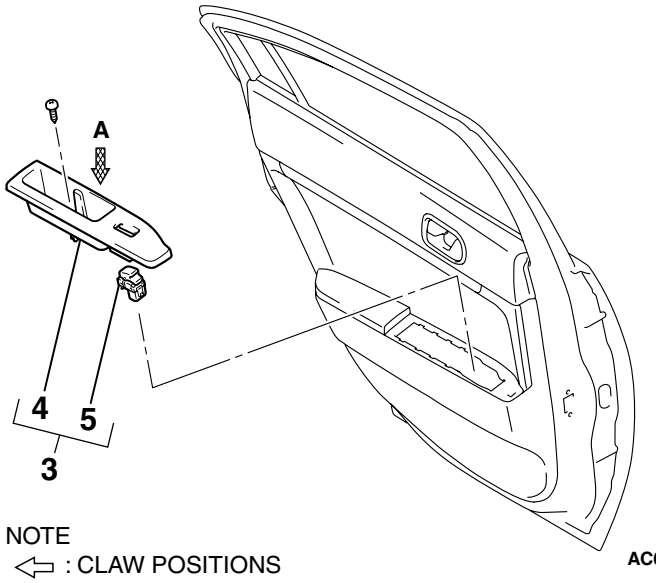
<<B>>

2. REAR DOOR STATIONARY WINDOW GLASS ASSEMBLY
3. DOOR WINDOW GLASS

Required Special Tool:

- MB990480: Window Glass Holder

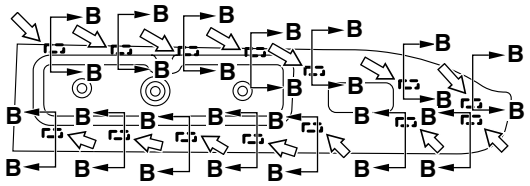
<REAR DOOR POWER WINDOW SWITCH>



NOTE
⇦ : CLAW POSITIONS

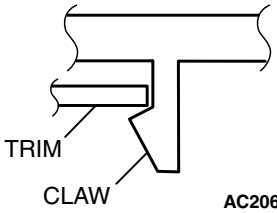
AC601200

VIEW A



AC601201

SECTION B – B



AC206827

AC601276AB

POWER WINDOW SWITCH REMOVAL STEPS

<<C>> 4. POWER WINDOW SWITCH PANEL ASSEMBLY
5. POWER WINDOW SWITCH PANEL
6. POWER WINDOW SUB SWITCH

Required Special Tool:
- MB990784: Ornament Remover

REMOVAL SERVICE POINTS

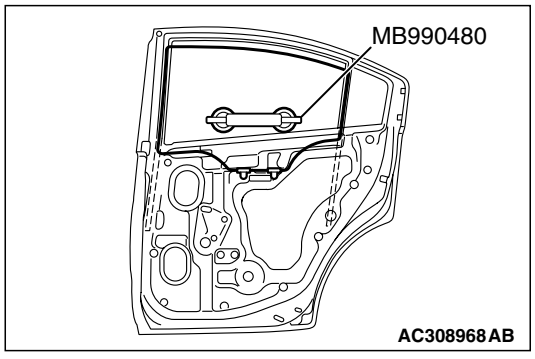
<<A>> WINDOW REGULATOR ASSEMBLY REMOVAL

1. Remove the door window glass installation bolts.

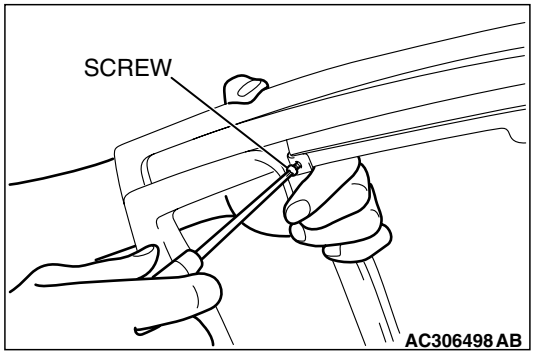
⚠ CAUTION

If tinting film is adhered to the door window glass, attach special tool MB990480 to the outside of the glass to prevent the film from peeling off.

2. Lift the door window glass, and attach special tool MB990480 to the glass as shown to prevent the glass from falling.
3. Remove the window regulator assembly and power window motor assembly.

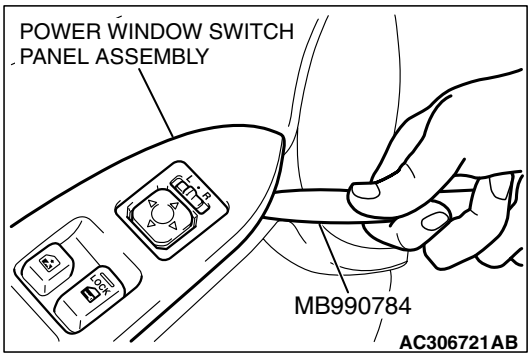


AC308968AB



<<B>> REAR DOOR STATIONARY WINDOW GLASS ASSEMBLY REMOVAL

Remove the mounting screw of the top of the rear door stationary window glass assembly (the screw is hidden by the molding).



<<C>> POWER WINDOW SWITCH PANEL ASSEMBLY REMOVAL

Insert special tool MB990784 as shown to remove the power window switch panel assembly.

INSPECTION

M1429001400732

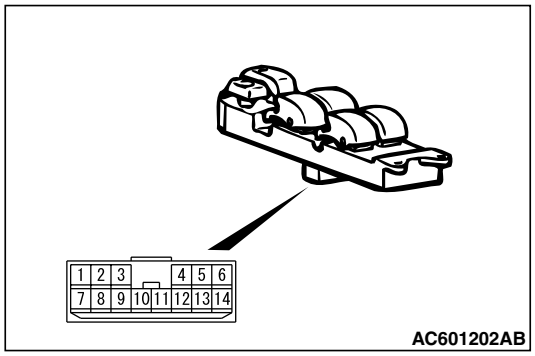
POWER WINDOW SWITCH CONTINUITY CHECK

Remove the power window switch. (Refer to P.42-38.)

Power window main switch's front <LH> switch check

Connect terminal number 13 to the battery positive (+) post, and connect terminal number 12 to the battery negative (–) post.

Main switch

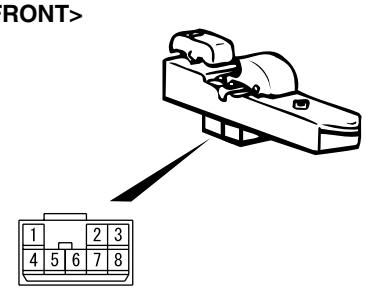


SWITCH POSITION		TESTER CONNECTION	SPECIFIED CONDITION
FRONT (LH)	UP	7 – 10, 8 – 9,	Continuity exists (2 Ω or less)
	OFF	7 – 8, 8 – 9	Continuity exists (2 Ω or less)
	DOWN	7 – 8, 9 – 10	Continuity exists (2 Ω or less)

SWITCH POSITION		TESTER CONNECTION	SPECIFIED CONDITION
FRONT (RH)	UP	10 – 12, 8* – 14	Continuity exists (2 Ω or less)
	OFF	8* – 12, 8* – 14, 12 – 14	Continuity exists (2 Ω or less)
	DOWN	8* – 12, 10– 14	Continuity exists (2 Ω or less)
REAR (LH)	UP	1 – 10, 3 – 8*	Continuity exists (2 Ω or less)
	OFF	1 – 3, 1 – 8*, 3 – 8*	Continuity exists (2 Ω or less)
	DOWN	1 – 8* , 3 – 10	Continuity exists (2 Ω or less)
REAR (RH)	UP	4 – 10 , 6 – 8*	Continuity exists (2 Ω or less)
	OFF	4 – 6, 4 – 8*, 6 – 8*	Continuity exists (2 Ω or less)
	DOWN	4 – 8* , 6 – 10	Continuity exists (2 Ω or less)

*NOTE: *: Set the window lock switch to UNLOCK position.*

<FRONT>

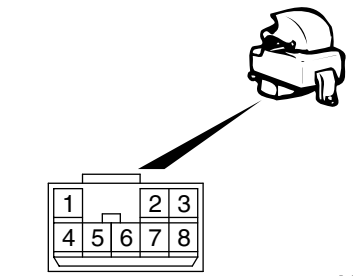


AC601203AC

Sub switch <Front>

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
UP	4 – 5, 6 – 7	Continuity exists (2 Ω or less)
OFF	4 – 5, 7 – 8	Continuity exists (2 Ω or less)
DOWN	4 – 6, 7 – 8	Continuity exists (2 Ω or less)

<REAR>



AC210747AB

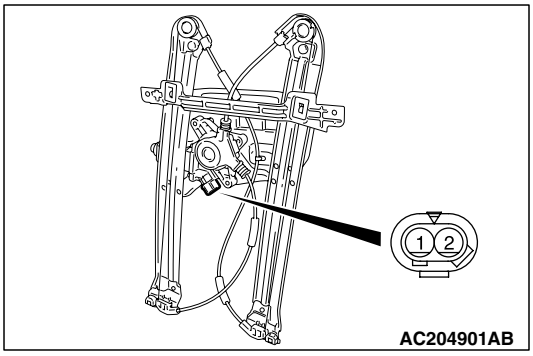
Sub switch <Rear>

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
UP	4 – 5, 6 – 7	Continuity exists (2 Ω or less)
OFF	4 – 5, 7 – 8	Continuity exists (2 Ω or less)
DOWN	4 – 6, 7 – 8	Continuity exists (2 Ω or less)

DOOR WINDOW REGULATOR CHECK

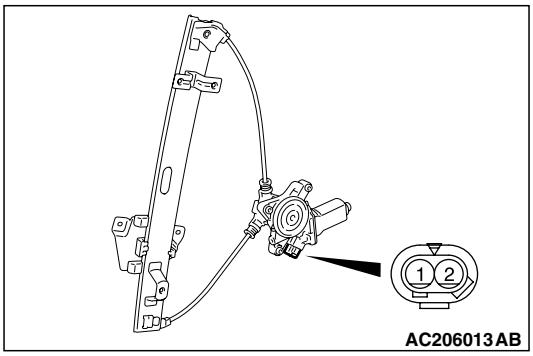
TSB Revision

1. Connect a battery directly to the motor terminals and check that the motor runs smoothly.
2. Check that the motor runs in the opposite direction when the battery is connected with the polarity reversed.
3. If a defect is found, replace the window regulator as an assembly.



<Front door>

BATTERY CONNECTION	SLIDER POSITION
• Connect terminal No. 1 and the negative battery terminal. • Connect terminal No. 2 and the positive battery terminal.	UP
• Connect terminal No. 2 and the negative battery terminal. • Connect terminal No. 1 and the positive battery terminal.	DOWN



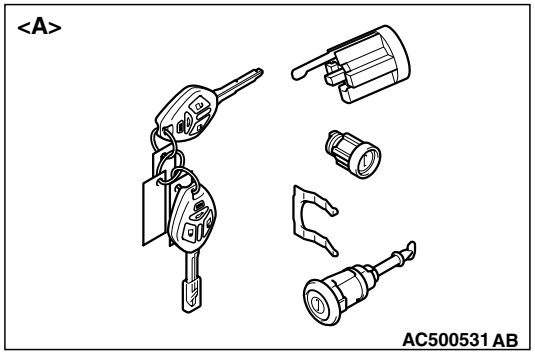
<Rear door>

BATTERY CONNECTION	SLIDER POSITION
• Connect terminal No. 1 and the negative battery terminal. • Connect terminal No. 2 and the positive battery terminal.	UP
• Connect terminal No. 2 and the negative battery terminal. • Connect terminal No. 1 and the positive battery terminal.	DOWN

DOOR HANDLE AND LATCH

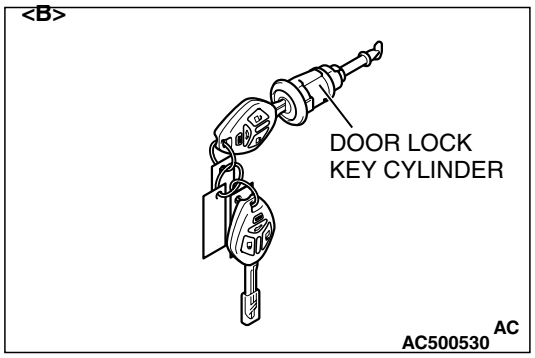
REMOVAL AND INSTALLATION

M1423004600760



⚠ CAUTION

- **When the door lock key cylinder is replaced by key set of illustration <A>, register the encrypted code with the bar code on the ignition key in the key set.Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.**

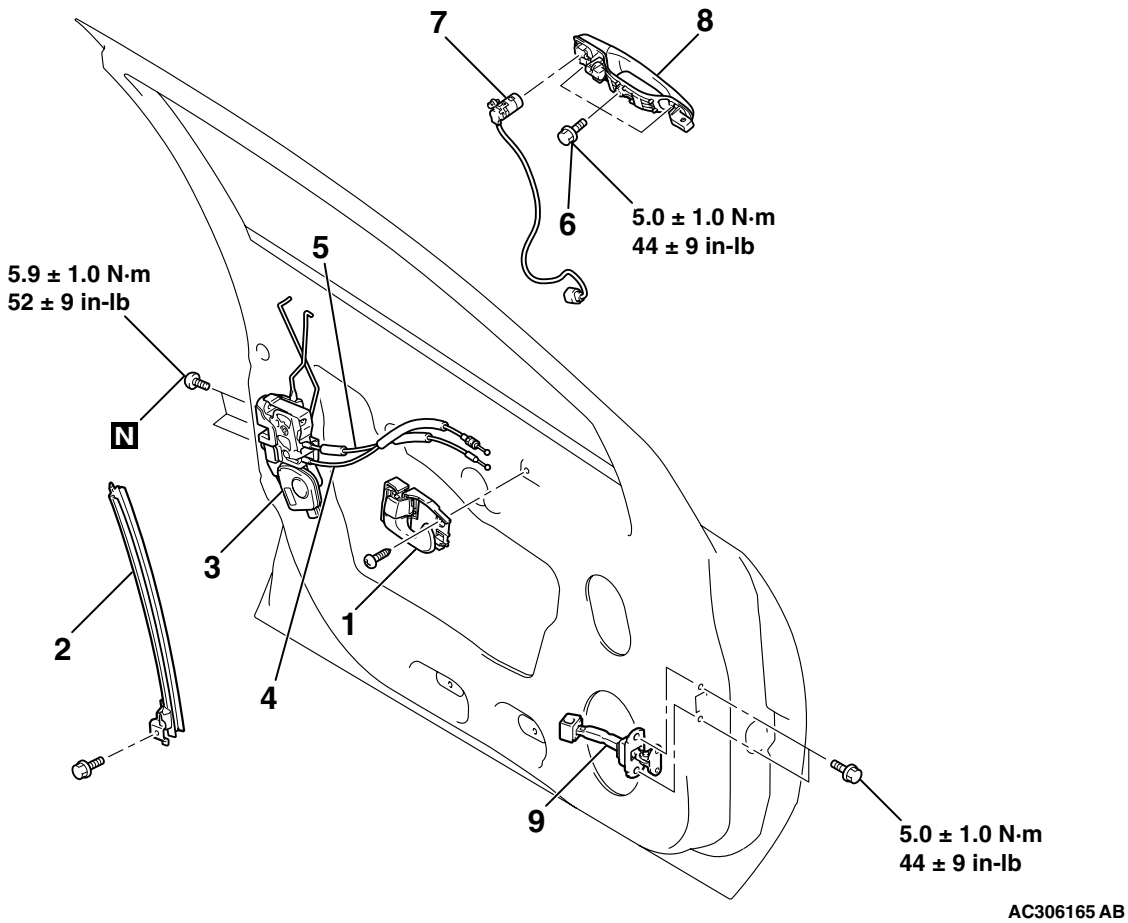


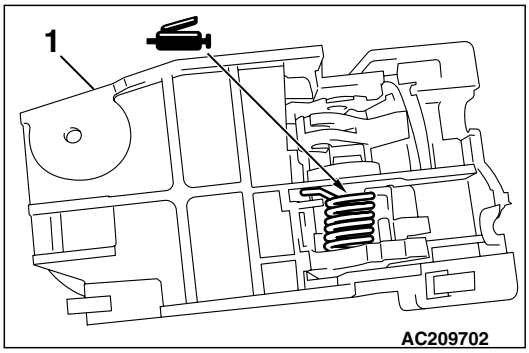
- **When replacing by the door lock key cylinder of illustration <B>, do not register the encrypted code with the bar code on the ignition key supplied simultaneously.**

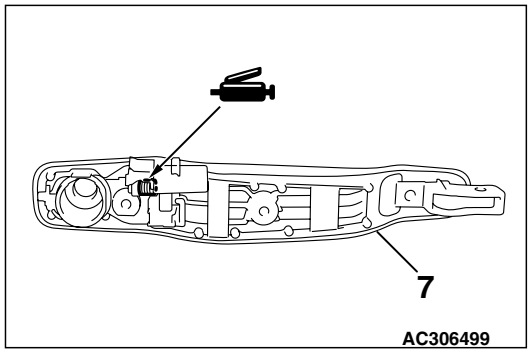
Pre-removal Operation	Post-installation Operation
• Door Trim Assembly Removal (Refer to GROUP 52A Door Trim P.52A-26).	• Door Inside Handle Play Check (Refer to P.42-34). • Door Outside Handle Play Check (Refer to P.42-33). • Door Trim Assembly Installation (Refer to GROUP 52A, Door Trim P.52A-26).

TSB Revision

<FRONT DOOR>







AC306729AB

DOOR HANDLE AND DOOR LATCH ASSEMBLY REMOVAL STEPS

1. DOOR INSIDE HANDLE
   - WATERPROOF FILM (REFER TO P.42-52).
>>**B**<< 2. LOWER SASH
3. DOOR LATCH ASSEMBLY
4. INSIDE LOCK CABLE
5. INSIDE HANDLE CABLE
6. DOOR OUTSIDE HANDLE MOUNTING BOLT

<<**A**>> 7. DOOR LOCK KEY CYLINDER ASSEMBLY (LH)

8. DOOR OUTSIDE HANDLE

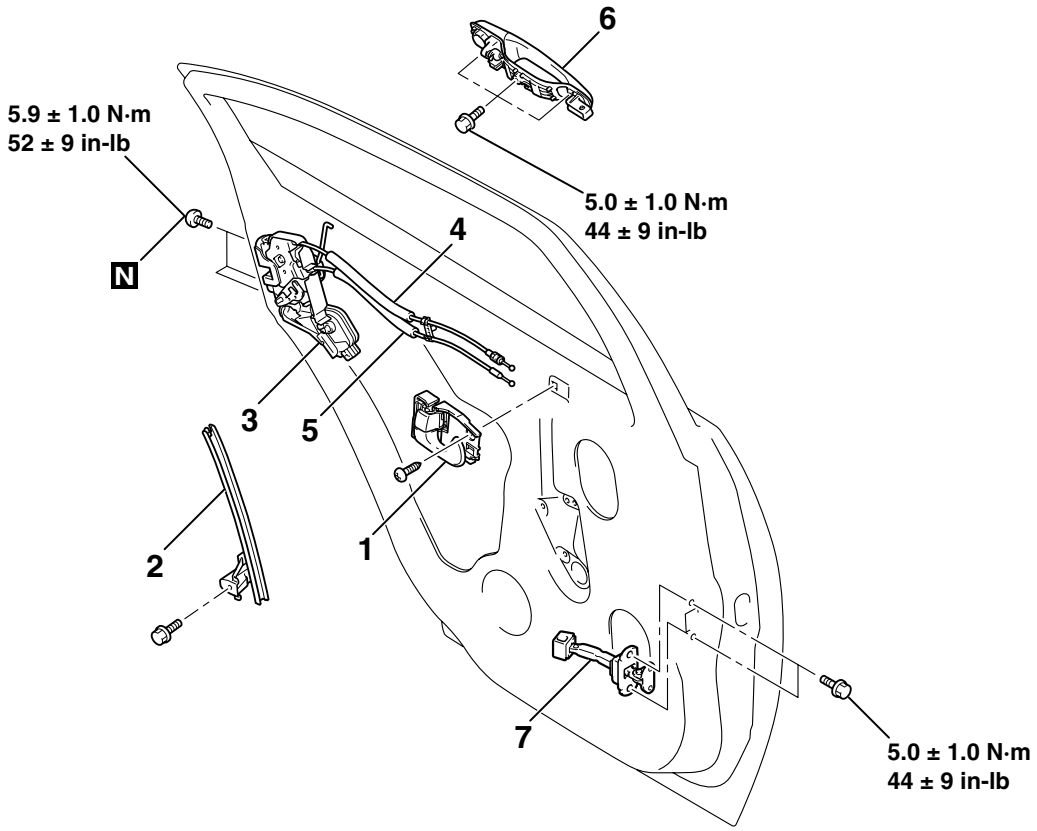
DOOR CHECK REMOVAL

>>**A**<< 9. DOOR CHECK

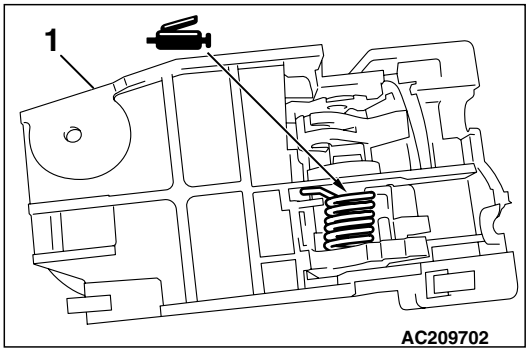
TSB Revision

Required Special Tool:
- MB991223: Harness Set

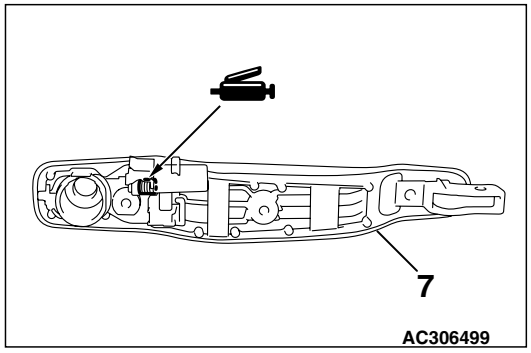
<REAR DOOR>



AC306166AB



AC209702



AC306499

AC306729AB

DOOR HANDLE AND DOOR LATCH ASSEMBLY REMOVAL STEPS

1. DOOR INSIDE HANDLE
   - WATERPROOF FILM (REFER TO P.42-52).

>>**B**<< 2. LOWER SASH

3. DOOR LATCH ASSEMBLY
4. INSIDE LOCK CABLE
5. INSIDE HANDLE CABLE
6. DOOR OUTSIDE HANDLE

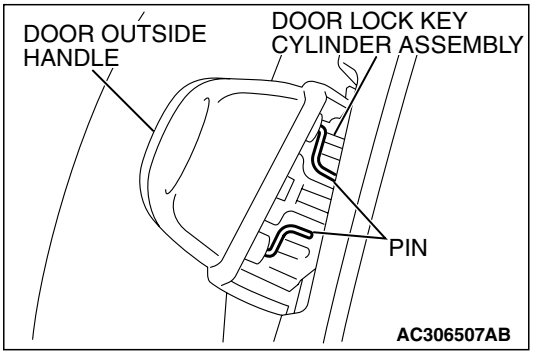
DOOR CHECK REMOVAL

>>**A**<< 7. DOOR CHECK

Required Special Tool:
- MB991223: Harness Set

TSB Revision

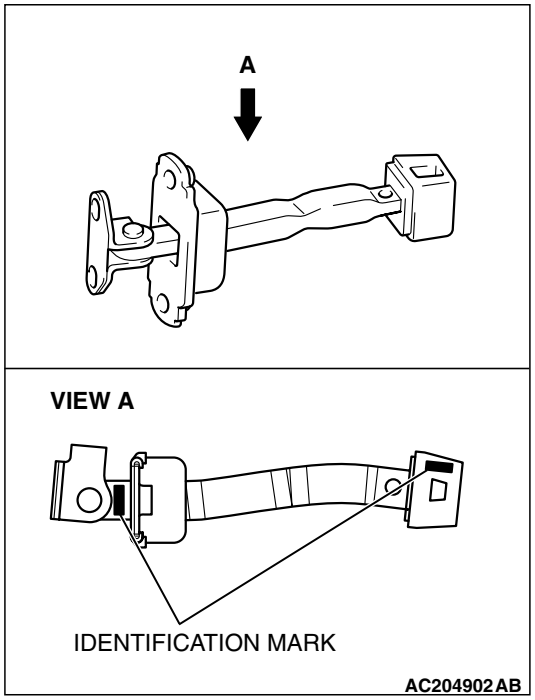
REMOVAL SERVICE POINT



<<A>> DOOR LOCK KEY CYLINDER ASSEMBLY REMOVAL

1. Create clearance between the door panel and the door outside handle to access the pin.
2. Open the pin and remove the door lock key cylinder assembly.

INSTALLATION SERVICE POINTS



>>A<< DOOR CHECK INSTALLATION

Install the door check so that the identification mark faces upwards.

ITEM		IDENTIFICATION MARK
Front Door	Left door	P4FL
	Right door	P4FR
Rear Door	Left door	P4RL
	Right door	P4RR

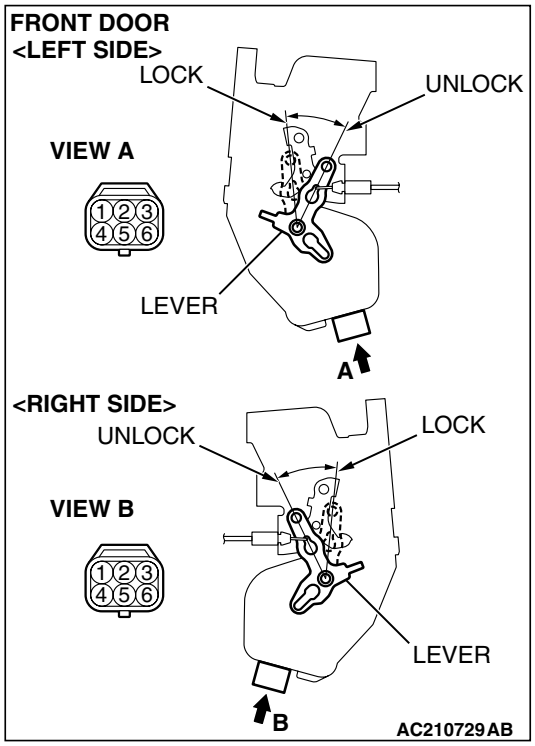
>>B<< LOWER SASH INSTALLATION

Securely insert the lower sash into the window rear sash.

INSPECTION

M1423004700972

FRONT DOOR LATCH CHECK



The illustration shows when the door lock actuator is viewed from inside the door.

DOOR LOCK ACTUATOR CHECK <LEFT SIDE>

LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the "LOCK" position	• Connect terminal No. 6 and the negative battery terminal. • Connect terminal No. 4 and the positive battery terminal.	The lever moves from the "LOCK" position to the "UNLOCK" position.
At the "UNLOCK" position	• Connect terminal No. 4 and the negative battery terminal. • Connect terminal No. 6 and the positive battery terminal.	The lever moves from the "UNLOCK" position to the "LOCK" position.

DOOR LOCK ACTUATOR SWITCH CHECK <LEFT SIDE>

LEVER POSITION	TESTER CONNECTION	SPECIFIED CONDITION
At the "LOCK" position	1 – 2	Open circuit
At the "UNLOCK" position	1 – 2	Continuity exists (2 Ω or less)

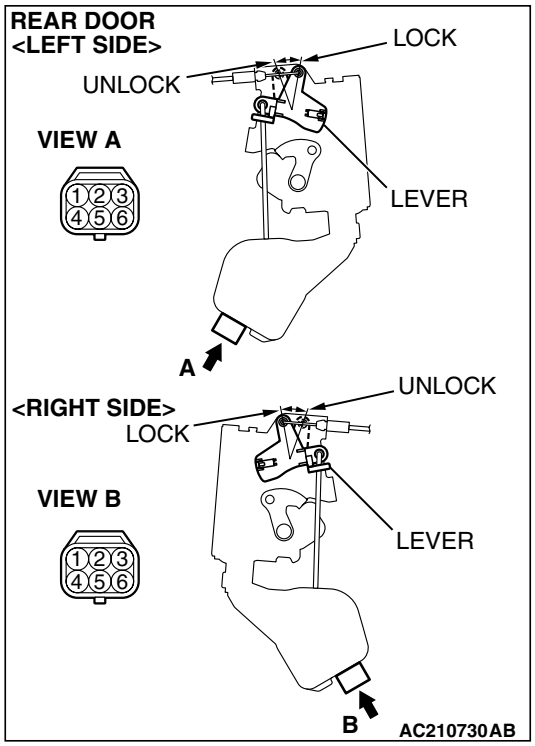
DOOR LOCK ACTUATOR CHECK <RIGHT SIDE>

LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the "LOCK" position	• Connect terminal No. 4 and the negative battery terminal. • Connect terminal No. 6 and the positive battery terminal.	The lever moves from the "LOCK" position to the "UNLOCK" position.
At the "UNLOCK" position	• Connect terminal No. 6 and the negative battery terminal. • Connect terminal No. 4 and the positive battery terminal.	The lever moves from the "UNLOCK" position to the "LOCK" position.

DOOR LOCK ACTUATOR SWITCH CHECK <RIGHT SIDE>

LEVER POSITION	TESTER CONNECTION	SPECIFIED CONDITION
At the "LOCK" position	2 – 3	Open circuit
At the "UNLOCK" position	2 – 3	Continuity exists (2 Ω or less)

REAR DOOR LOCK ACTUATOR CHECK



The illustration shows when the door lock actuator is viewed from outside the door.

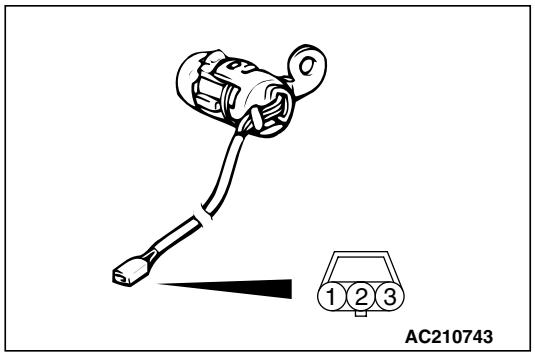
DOOR LOCK ACTUATOR CHECK <LEFT SIDE>

LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the "LOCK" position	• Connect terminal No. 4 and the negative battery terminal. • Connect terminal No. 6 and the positive battery terminal.	The lever moves from the "LOCK" position to the "UNLOCK" position.
At the "UNLOCK" position	• Connect terminal No. 6 and the negative battery terminal. • Connect terminal No. 4 and the positive battery terminal.	The lever moves from the "UNLOCK" position to the "LOCK" position.

DOOR LOCK ACTUATOR CHECK <RIGHT SIDE>

LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the "LOCK" position	• Connect terminal No. 6 and the negative battery terminal. • Connect terminal No. 4 and the positive battery terminal.	The lever moves from the "LOCK" position to the "UNLOCK" position.
At the "UNLOCK" position	• Connect terminal No. 4 and the negative battery terminal. • Connect terminal No. 6 and the positive battery terminal.	The lever moves from the "UNLOCK" position to the "LOCK" position.

DOOR LOCK KEY CYLINDER SWITCH CHECK

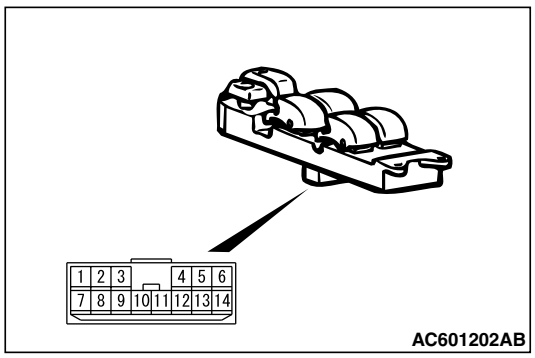


SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
LOCK	2 – 3	Continuity exists (2 Ω or less)
NEUTRAL (OFF)	1 – 2, 2 – 3	Open circuit
UNLOCK	1 – 2	Continuity exists (2 Ω or less)

CENTRAL DOOR LOCK SWITCH CONTINUITY CHECK

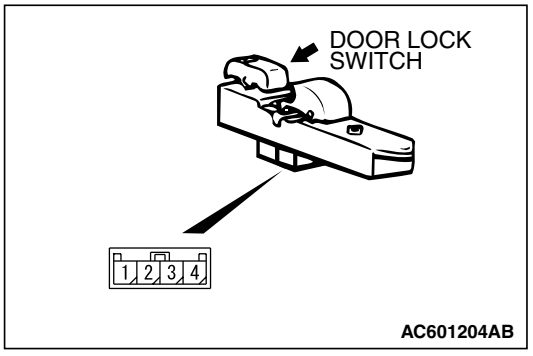
Remove the power window switch (Refer to P.42-38).

<DRIVER'S SIDE>



SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
LOCK	5 – 8	Continuity exists (2 Ω or less)
OFF	5 – 8, 8– 13	Open circuit
UNLOCK	8 – 13	Continuity exists (2 Ω or less)

<PASSENGER'S SIDE>

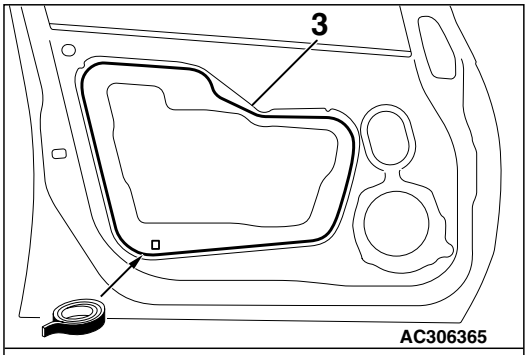


SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
LOCK	3 – 4	Continuity exists (2 Ω or less)
OFF	2 – 4, 3 – 4	Open circuit
UNLOCK	2 – 4	Continuity exists (2 Ω or less)

WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP

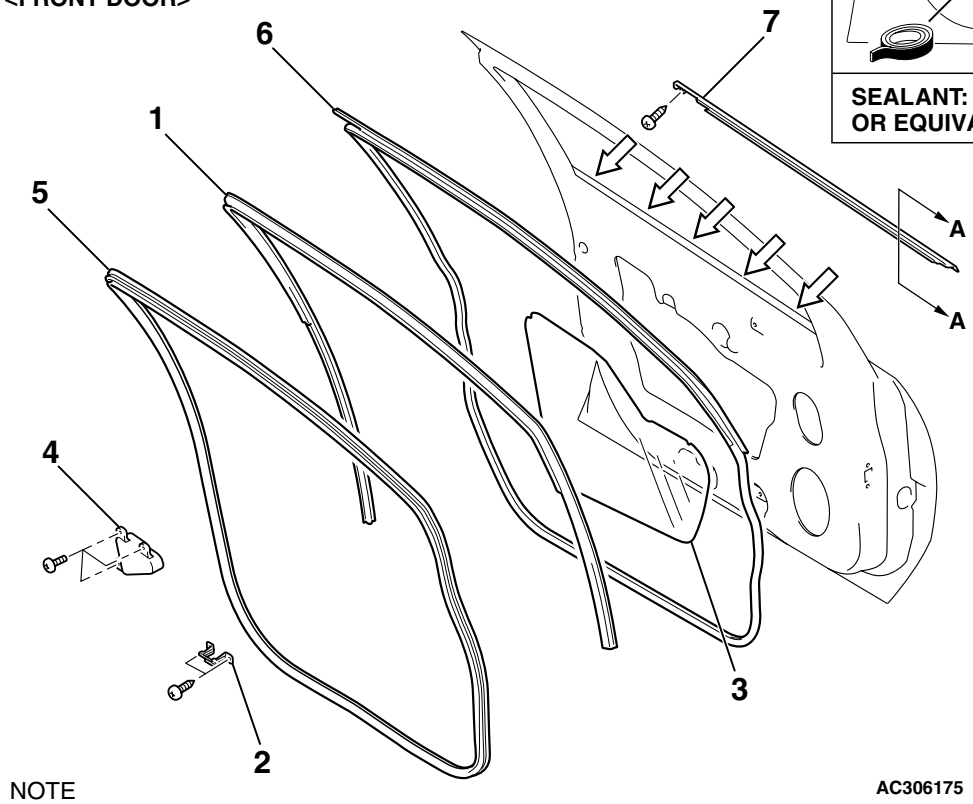
REMOVAL AND INSTALLATION

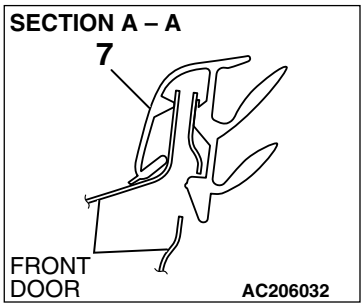
M1423003100319



SEALANT: 3M™ AAD PART NO. 8633 OR EQUIVALENT

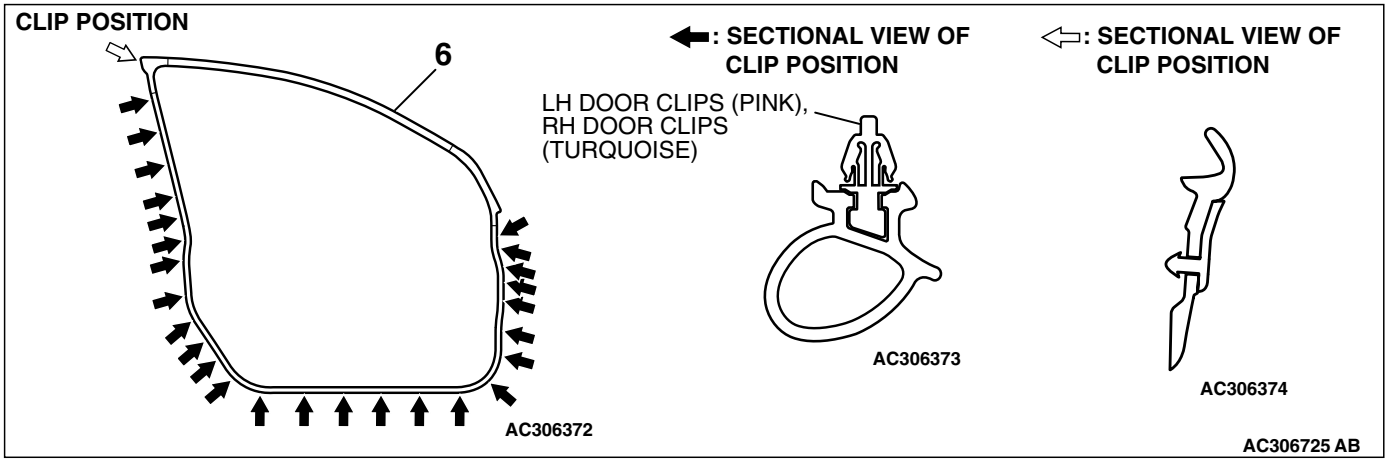
<FRONT DOOR>





NOTE
⇦ : THE CONVEX POSITION OF THE DOOR

AC306732 AB



REMOVAL

>>**D**<< 1. DOOR WINDOW GLASS RUNCHANNEL

TSB Revision

WATERPROOF FILM AND DOOR PANEL CORE REMOVAL STEPS

- DOOR TRIM ASSEMBLY (REFER TO GROUP 52A, DOOR TRIM P.52A-26).
- DOOR INSIDE HANDLE (REFER TO P.42-45).

2. DOOR ARMREST BRACKET
>>**A**<< 3. WATERPROOF FILM
4. DOOR PANEL CORE

DOOR OPENING INNER WEATHERSTRIP REMOVAL STEPS

- FRONT SCUFF PLATE (REFER TO GROUP 52A, TRIMS P.52A-23).

>>**C**<< 5. DOOR OPENING INNER WEATHERSTRIP (BODY SIDE)

DOOR OPENING OUTER WEATHERSTRIP REMOVAL STEPS

- DOOR CHECK MOUNTING BOLT (BODY SIDE) (REFER TO P.42-36).

>>**B**<< 6. DOOR OPENING OUTER WEATHERSTRIP

DOOR BELTLINE MOLDING REMOVAL STEPS

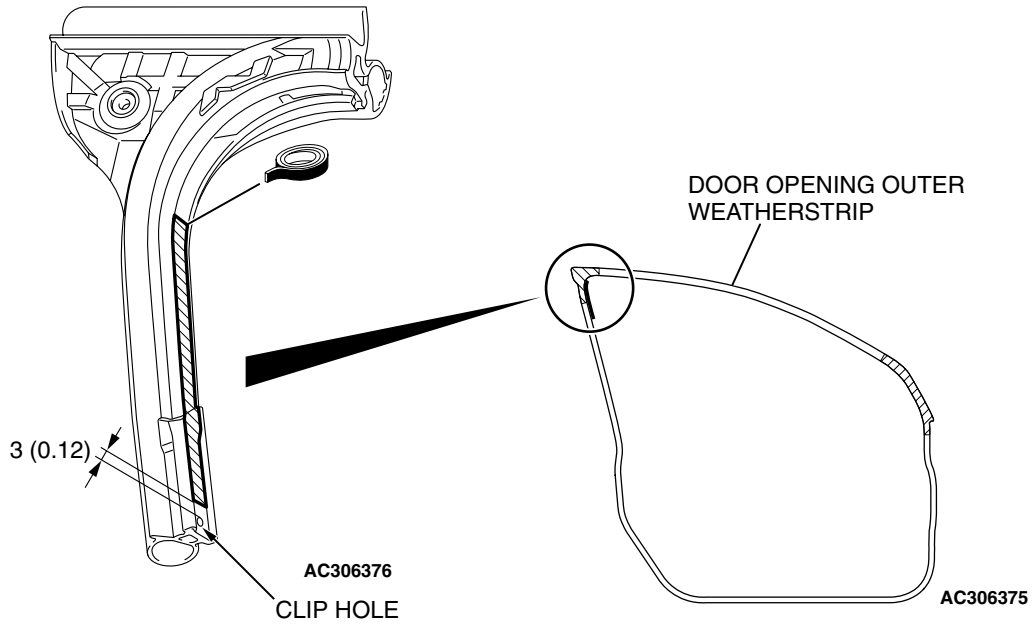
- DOOR TRIM ASSEMBLY (REFER TO GROUP 52A, DOOR TRIM P.52A-26).
- REMOTE CONTROLLED MIRROR ASSEMBLY (REFER TO GROUP 51, DOOR MIRROR P.51-43).

7. DOOR BELTLINE MOLDING

DOUBLE-SIDED TAPE POSITION

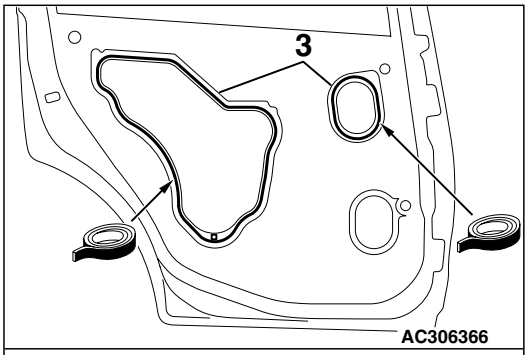
<FRONT DOOR>

UNITS: mm (in)



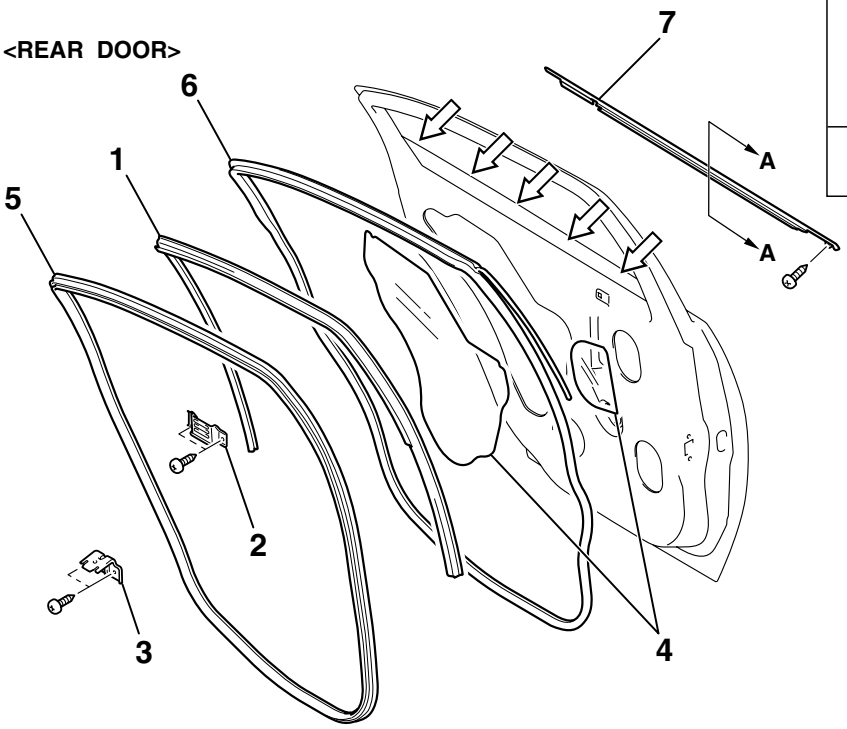
AC306726AB

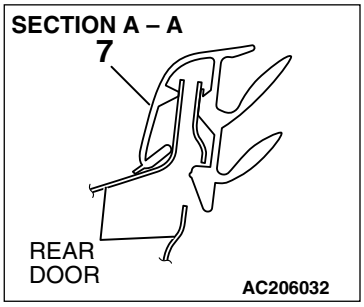
ADHESIVE TAPE: DOUBLE-SIDED TAPE [7 mm (0.28 in) WIDTH, 85 mm (3.35 in) LENGTH AND 0.8 mm (0.031 in) THICKNESS]



SEALANT: 3M™ AAD PART NO. 8633 OR EQUIVALENT

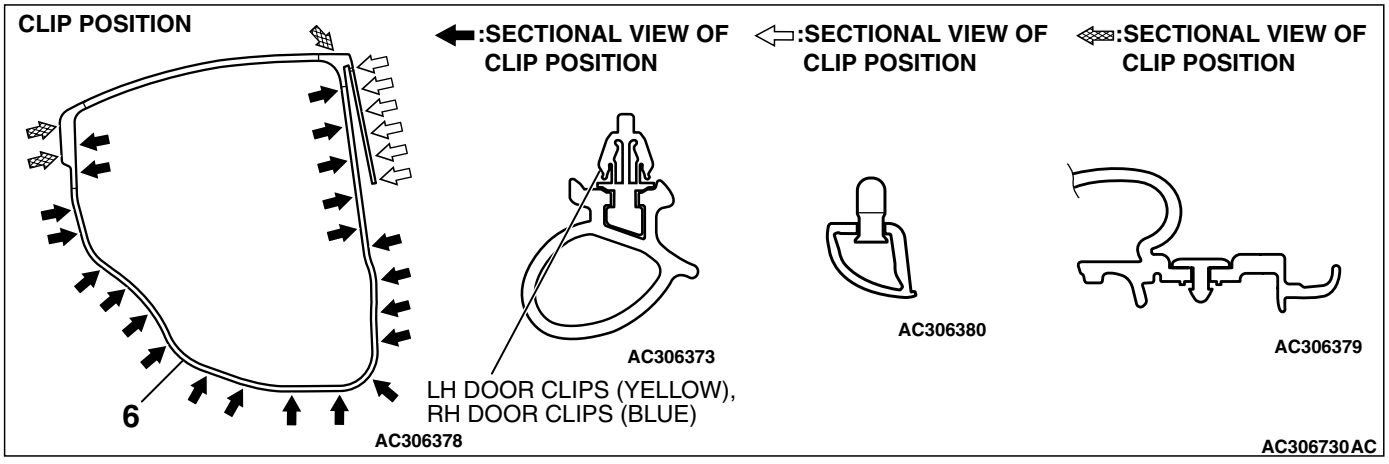
<REAR DOOR>





NOTE
⇦ : THE CONVEX POSITION OF THE DOOR

AC306733 AB



REMOVAL

>>**D**<< 1. DOOR WINDOW GLASS RUNCHANNEL

DOOR PANEL BRACKET REMOVAL STEPS

- DOOR TRIM ASSEMBLY (REFER TO GROUP 52A, DOOR TRIM P.52A-26).

2. DOOR PANEL BRACKET

DOOR ARMREST BRACKET REMOVAL STEPS

- DOOR TRIM ASSEMBLY (REFER TO GROUP 52A, DOOR TRIM P.52A-26).

3. DOOR ARMREST BRACKET

TSB Revision

WATERPROOF FILM REMOVAL STEPS
- DOOR TRIM ASSEMBLY (REFER TO GROUP 52A, DOOR TRIM P.52A-26).
- DOOR INSIDE HANDLE (REFER TO P.42-45).

>>**A**<< 4. WATERPROOF FILM

DOOR OPENING INNER WEATHERSTRIP REMOVAL STEPS
- REAR SCUFF PLATE (REFER TO GROUP 52A, TRIMS P.52A-23).

>>**C**<< 5. DOOR OPENING INNER WEATHERSTRIP (BODY SIDE)

DOOR OPENING OUTER WEATHERSTRIP REMOVAL STEPS
- DOOR CHECK MOUNTING BOLT (BODY SIDE) (REFER TO P.42-36).

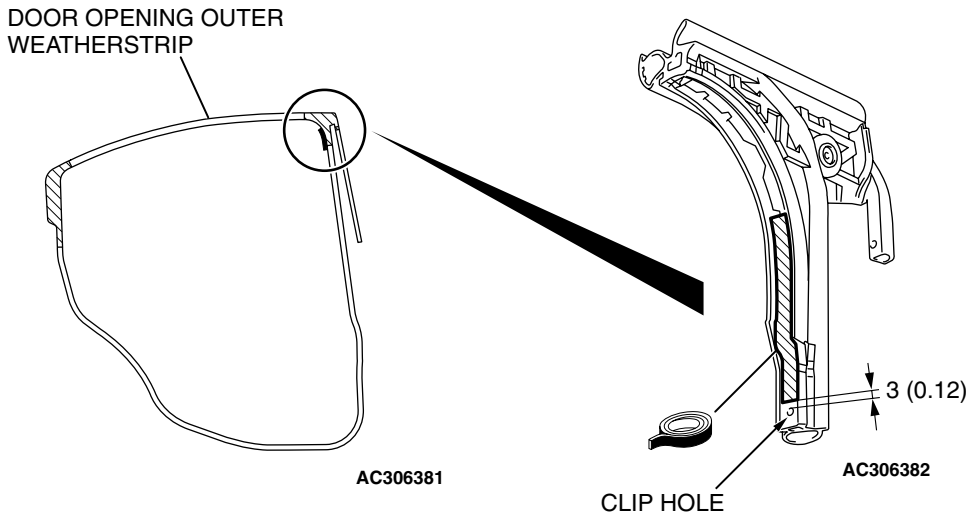
>>**B**<< 6. DOOR OPENING OUTER WEATHERSTRIP

DOOR BELTLINE MOLDING REMOVAL STEPS
- DOOR TRIM ASSEMBLY (REFER TO GROUP 52A, DOOR TRIM P.52A-26).

7. DOOR BELTLINE MOLDING

DOUBLE-SIDED TAPE POSITION

<REAR DOOR> UNITS: mm (in)

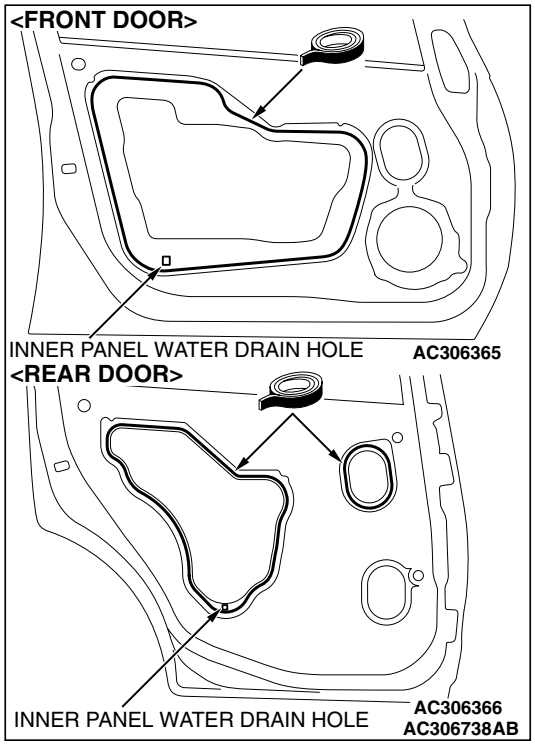


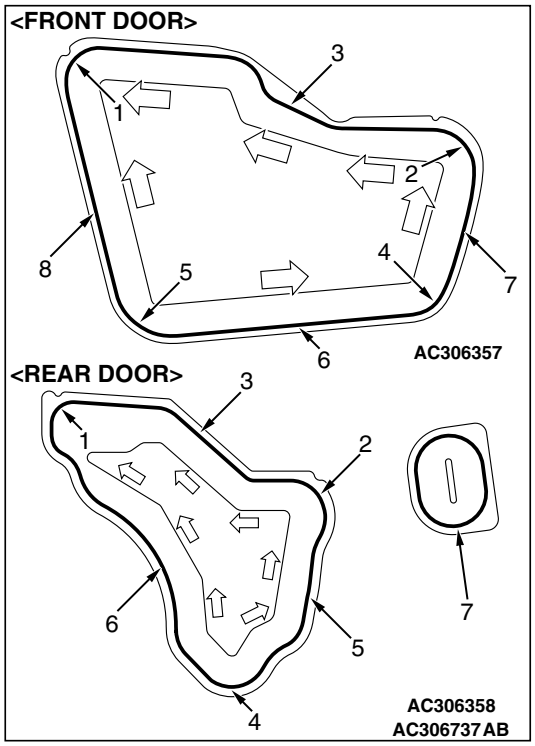
ADHESIVE TAPE: DOUBLE-SIDED TAPE [7 mm (0.28 in) WIDTH, 50 mm (1.97 in) LENGTH AND 0.8 mm (0.031 in) THICKNESS]

INSTALLATION SERVICE POINTS

>>A<< WATERPROOF FILM INSTALLATION

⚠ CAUTION
When the waterproof film is adhered, be careful that 3M™AAD Part number 8633 or equivalent can pass under the inner panel water drain hole.

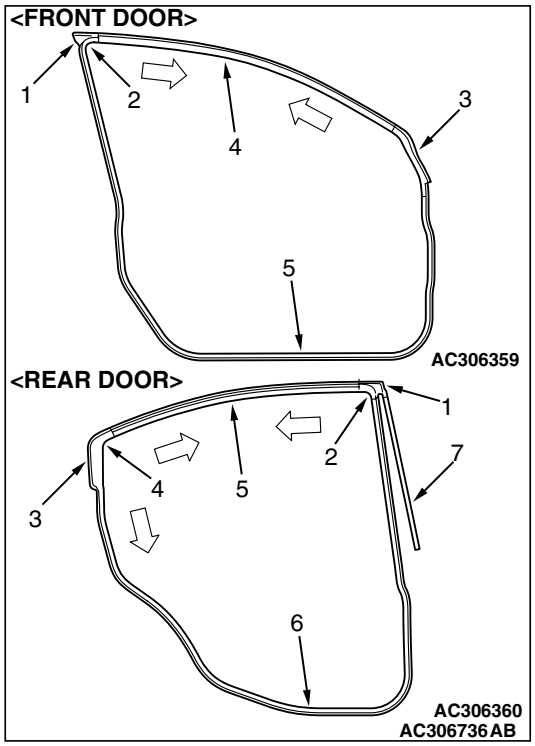




1. Stick the waterproof film to the door in sequence as shown.
2. Press the waterproof film toward the arrow in the illustration.

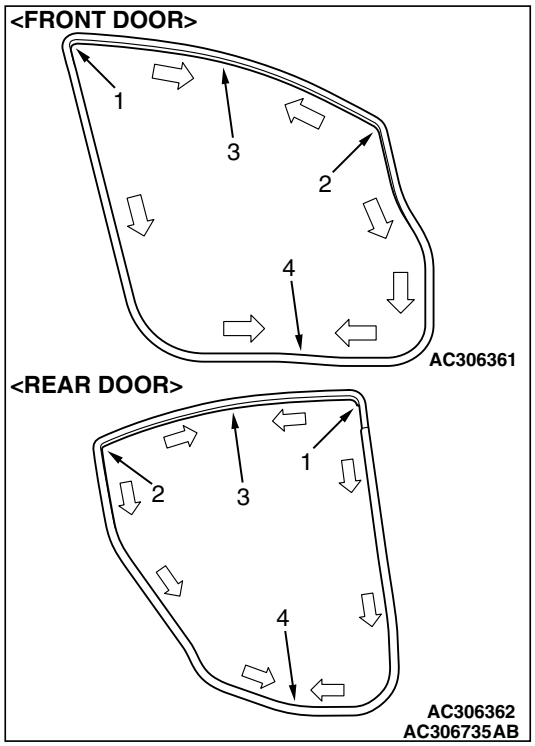
>>B<< DOOR OPENING OUTER WEATHERSTRIP INSTALLATION

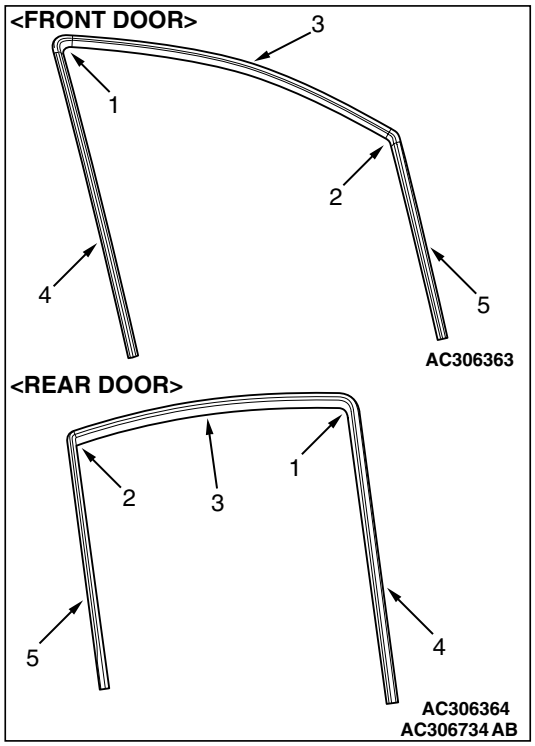
Install the door opening outer weatherstrip in the sequence shown.



>>C<< DOOR OPENING INNER WEATHERSTRIP INSTALLATION

Install the door opening inner weatherstrip in the sequence shown.





>>D<< DOOR WINDOW GLASS RUNCHANNEL INSTALLATION

Install the door window glass runchannel in the sequence shown.

TRUNK LID

TRUNK LID DIAGNOSIS

INTRODUCTION TO TRUNK LID DIAGNOSIS

M1421005800374

Difficult locking and unlocking, uneven clearance and height, and wind noise from the trunk lid may be caused by improper adjustment of the trunk lid.

TRUNK LID DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1421005900348

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a trunk lid fault.

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

SYMPTOM CHART

M1421006000382

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Difficult locking and unlocking	1	P.42-60
Uneven body clearance	2	P.42-60
Uneven height	3	P.42-60

TSB Revision

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Difficult Locking and Unlocking

DIAGNOSIS

STEP 1. Check the release cable routing condition.

Q: Is the release cable routing condition good?
YES : Go to Step 3.
NO : Repair the release cable routing, then go to Step 2.

STEP 2. Check the engagement of the trunk lid latch and trunk lid striker.

Q: Are the trunk lid latch and trunk lid striker engaged correctly?
YES : Then go to Step 3.
NO : Adjust the trunk lid latch. Refer to P.42-61.

STEP 3. Retest the system.

Q: Does the trunk lid lock operate easily?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Uneven Body Clearance

DIAGNOSIS

STEP 1. Check the clearance around the trunk lid..

Q: Are the apertures between the trunk lid and the adjacent body panels aligned correctly?
YES : Then go to Step 2.
NO : Adjust the trunk lid panel assembly. Refer to P.42-61.

STEP 2. Retest the system.

Q: Are the clearances between the body panels even?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Uneven Height

DIAGNOSIS

STEP 1. Check the trunk lid bumper height.

Q: Is the trunk lid bumper height proper?
YES : Then go to Step 2.
NO : Adjust the trunk lid bumper. Refer to P.42-61.

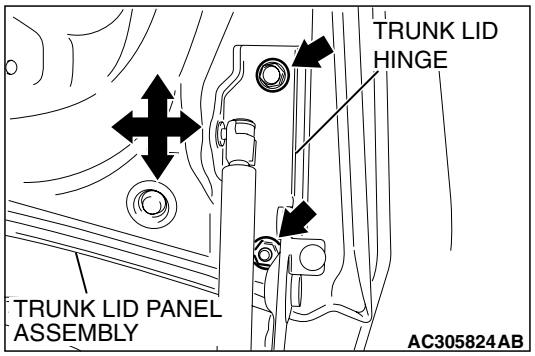
STEP 2. Retest the system.

Q: Are the trunk lid and body height even?
YES : The procedure is complete.
NO : Return to Step 1.

ON-VEHICLE SERVICE

ADJUSTMENT OF CLEARANCE AROUND TRUNK LID

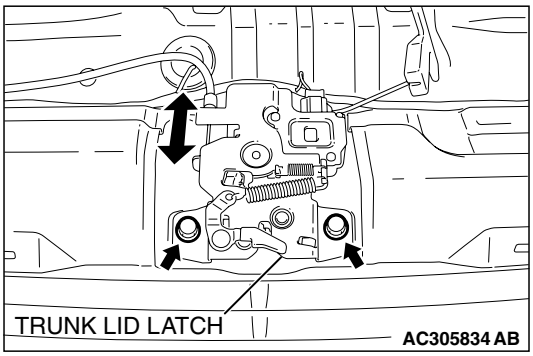
M1421008100040



Loosen the trunk lid panel assembly mounting bolt and nut, and move the trunk lid panel assembly to make the clearance around the trunk lid even.

TRUNK LID LATCH ADJUSTMENT

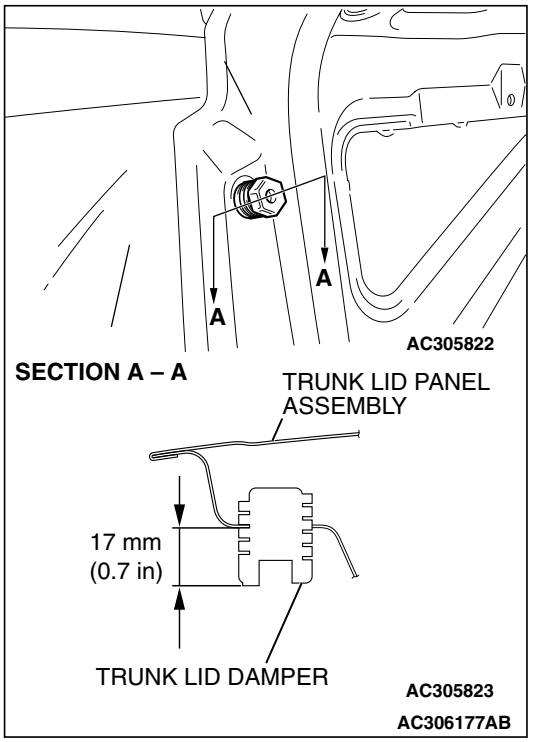
M1421008600012



After checking the trunk lid release cable for proper routing, loosen the trunk lid latch mounting bolts. Change the position of the trunk lid latch relative to the trunk lid striker so that trunk lid locking and unlocking effort is correct.

TRUNK LID HEIGHT ADJUSTMENT

M1421008300044



Turn each trunk lid damper to achieve the height shown in the drawing is reached. If the trunk lid panel height on one side is different from that on the other side (even after the trunk lid dampers have been adjusted to the height indicated in the drawing), turn the trunk lid damper(s) slightly to make fine adjustments to the trunk lid panel height.

NOTE: When the damper is new, one full turn of the trunk lid damper changes the height approximately 3 mm. Turn it clockwise to reduce height. Turn it counterclockwise to increase height.

TRUNK LID

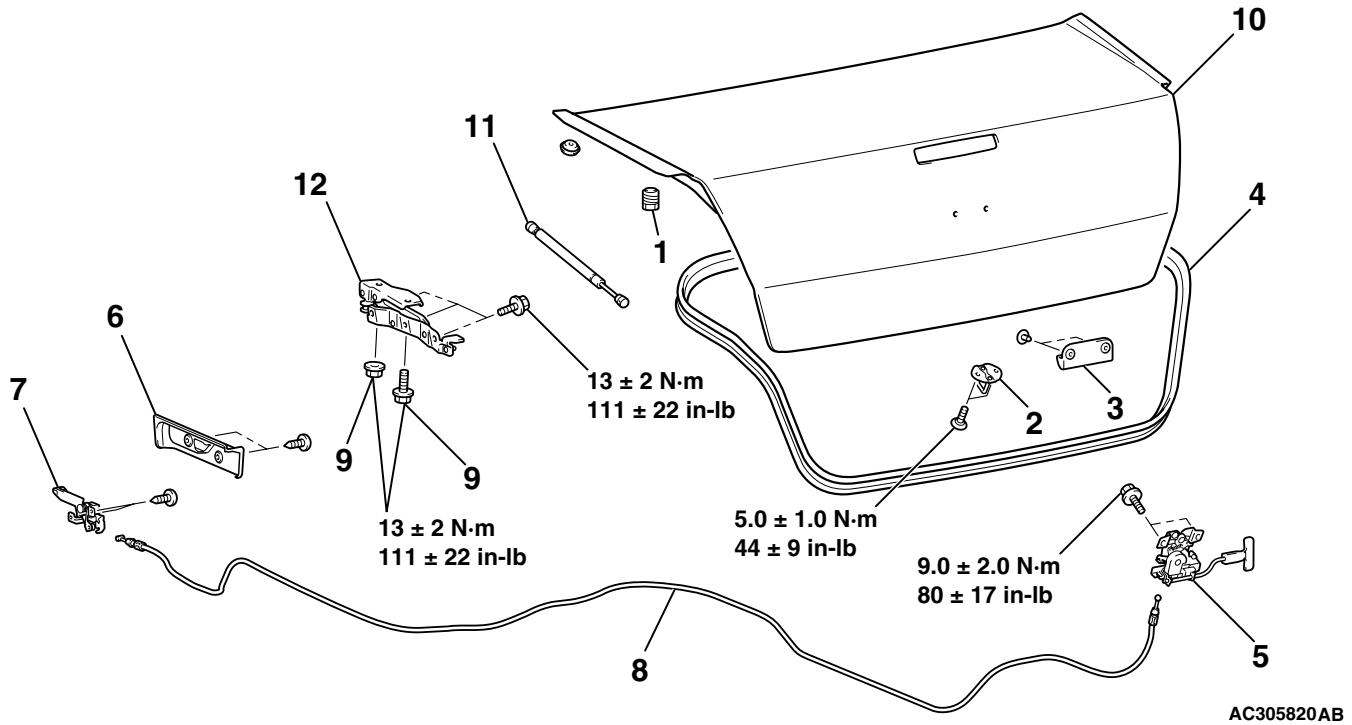
REMOVAL AND INSTALLATION

M1421002200191

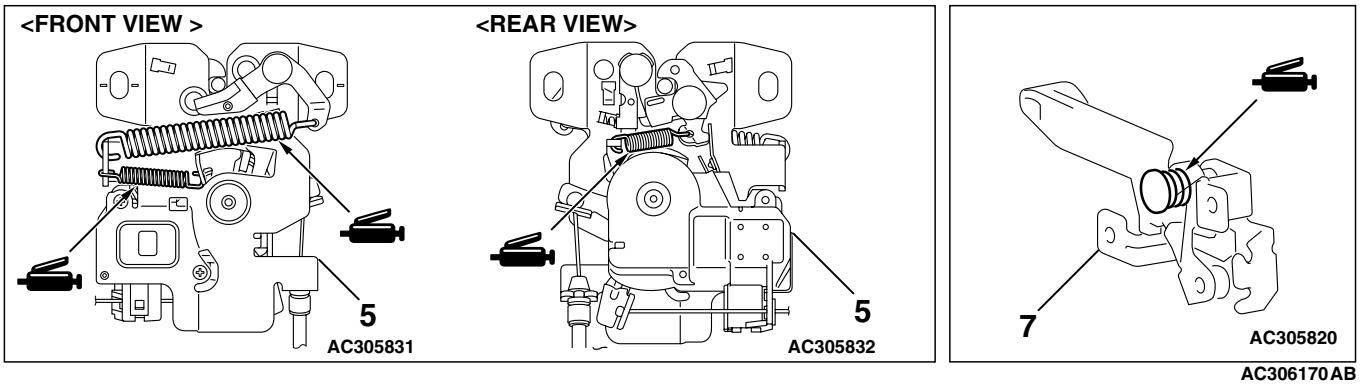
⚠ CAUTION

- **Do not disassemble or throw the trunk lid gas spring into fire.**
- **Punch a hole in the trunk lid gas spring before disposal to release the gas inside.**
- **Ensure the trunk lid gas spring piston rod does not come into contact with foreign material.**

Post-installation Operation
- Adjustment of Clearance Around Trunk Lid (Refer to P.42-61).
- Trunk Lid Latch Adjustment (Refer to P.42-61).
- Trunk Lid Height Adjustment (Refer to P.42-61).

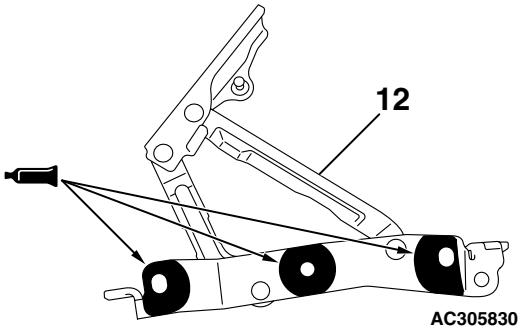


AC305820AB



AC306170AB

TSB Revision



ADHESIVE: 3M™ AAD PART NO.8531 HEAVY DRIP CHECK SEALER, 3M™ AAD PART NO.8646 AUTOMOTIVE JOINT AND SEAM SEALER OR EQUIVALENT

AC306174 AB

REMOVAL

1. TRUNK LID DAMPER
2. TRUNK LID STRIKER
3. TRUNK LID INSIDE HANDLE

TRUNK LID WEATHERSTRIP REMOVAL STEPS

- REAR END TRIM (REFER TO GROUP 52A, TRIMS P.52A-23.)

>>**A**<< 4. TRUNK LID WEATHERSTRIP

TRUNK LID LATCH REMOVAL STEPS

- REAR END TRIM (REFER TO GROUP 52A, TRIMS P.52A-23.)

5. TRUNK LID LATCH ASSEMBLY

TRUNK LID RELEASE CABLE AND TRUNK LID RELEASE HANDLE REMOVAL STEPS

- REAR END TRIM (REFER TO GROUP 52A, TRIMS P.52A-23.)
- TRUNK TRIM ASSEMBLY (REFER TO GROUP 52A, TRIMS P.52A-23.)
- REAR SEAT (REFER TO GROUP 52A, SEAT P.52A-45.)
- CENTER PILLAR LOWER TRIM (REFER TO GROUP 52A, TRIMS P.52A-23.)
- COWL SIDE TRIM (REFER TO GROUP 52A, TRIMS P.52A-23.)

6. TRUNK LID RELEASE HANDLE COVER

TRUNK LID RELEASE CABLE AND TRUNK LID RELEASE HANDLE REMOVAL STEPS (Continued)

7. TRUNK LID RELEASE HANDLE
8. TRUNK LID RELEASE CABLE

TRUNK LID PANEL ASSEMBLY REMOVAL STEPS

1. TRUNK LID DAMPER
2. TRUNK LID STRIKER
3. TRUNK LID INSIDE HANDLE

- THREE-DIAMOND MARK (REFER TO GROUP 51 MARKS P.51-24.)
- HIGH MOUNT STOPLIGHT <VEHICLES WITHOUT REAR SPOILER> (REFER TO GROUP 54A, HIGH-MOUNTED STOPLIGHT P.54A-140.)
- REAR SPOILER ASSEMBLY <VEHICLES WITH REAR SPOILER> (REFER TO GROUP 51, REAR SPOILER P.51-9.)

9. TRUNK LID PANEL ASSEMBLY MOUNTING BOLT AND NUT
10. TRUNK LID PANEL ASSEMBLY

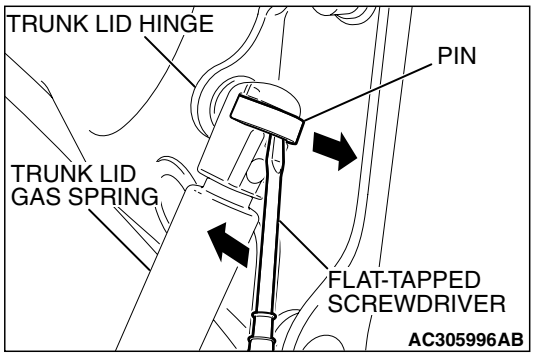
TRUNK LID HINGE REMOVAL STEPS

10. TRUNK LID PANEL ASSEMBLY

<<**A**>>

11. TRUNK LID GAS SPRING
12. TRUNK LID HINGE

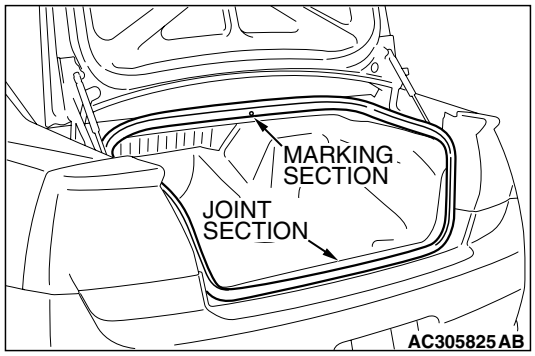
REMOVAL SERVICE POINT



<<A>> TRUNK LID GAS SPRING REMOVAL

As shown in the figure, slide the pin upward, then remove the trunk lid gas spring in the direction of the arrow to unscrew the trunk lid hinge.

INSTALLATION SERVICE POINT



>>A<< TRUNK LID WEATHERSTRIP INSTALLATION

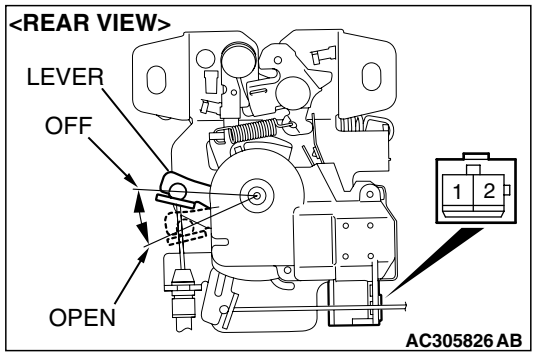
Install the trunk lid weatherstrip so that the marking and the joint are aligned with the body center line,

INSPECTION

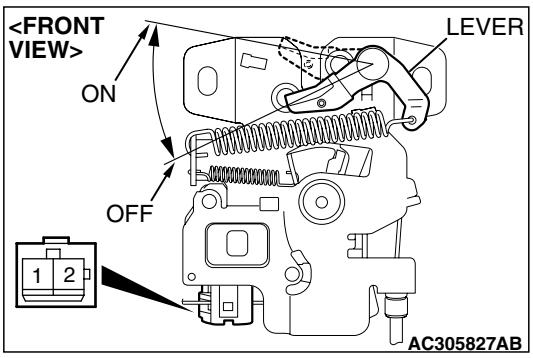
M1421004800144

TRUNK LID LATCH ASSEMBLY CHECK

TRUNK LID LATCH ACTUATOR CHECK



LEVER POSITION	BATTERY CONNECTION	LEVER OPERATION
At the "OFF" position	• Connect ground and the negative battery terminal. • Connect terminal No. 1 and the positive battery terminal.	The lever moves from the "OFF" position to the "OPEN" position.



TRUNK LID LATCH SWITCH CONTINUITY CHECK

LEVER POSITION	TESTER CONNECTION	SPECIFIED CONDITION
ON (Latch open)	2 – Ground	Less than 2 ohms
OFF (Latch shut)	2 – Ground	Open circuit

KEYLESS ENTRY SYSTEM

GENERAL DESCRIPTION

M1428000100393

- Antenna and receiver are incorporated in the ETACS-ECU.
- ID code can be registered by using scan tool MB991958 (M.U.T.-III sub assembly).
- Transmitter is integrated into the master key, which incorporates lock button, unlock button, trunk button and panic button.
- When the transmitter unlock button is pressed once, the driver's door will be unlocked. If the button is pressed twice, all the doors will be unlocked. The adjustment function also allows you to open all the doors by pressing the unlock button only once. For further details on using the multi-center display (middle grade type) to adjust the unlock operation, refer to GROUP 54B, On-vehicle Service P.54B-587.
- When the transmitter is operated, the answerback function will work as follows:

ITEM	OPERATION	
	DOORS LOCKED	DOORS UNLOCKED
Dome light	Flashes once	Illuminates for 15 seconds
Turn-signal lights (RH and LH)	Flashes once	Flashes twice
Horn	Sounds once when the lock button is pressed with all the doors locked	-

- The answerback operation can be altered as follows:

NOTE: Enabling/disabling the hazard warning light flashing, the horn sounding in accordance with the answerback function. For further details on using the transmitter to adjust answerback, P.42-69 see the section below. For further details on using the multi-center display (middle grade type) to adjust answerback, refer to GROUP 54B, On-vehicle Service P.54B-587.

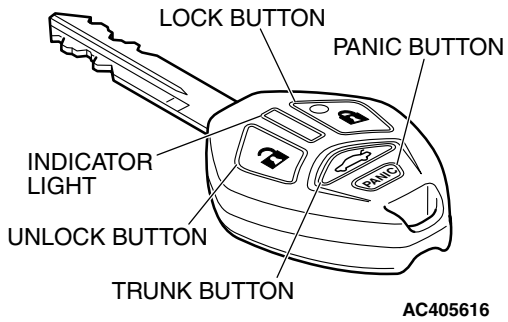
ITEM	ADJUSTMENT ITEM	ADJUSTMENT DETAIL
Keyless entry system confirmation by turn signal lights	Adjustment of hazard answerback when the transmitter is used to lock doors	When adjusting hazard answerback after the doors are locked with the transmitter, the following flashing conditions can be selected. a. Flash (default) b. No flash
	Adjustment of hazard answerback when the transmitter is used to unlock doors	When adjusting hazard answerback after the doors are unlocked with the transmitter, the following flashing conditions can be selected. a. Flash (default) b. No flash
Keyless entry system confirmation by horn	Adjustment of horn answerback when the transmitter is used to lock doors	When adjusting horn answerback after the doors are locked with the transmitter, the following horn conditions can be selected. a. Horn sounds b. Horn sounds if doors are already locked (default) c. Horn does not sound

- If none of the doors is opened or the ignition key is not inserted in the ignition switch within 30 seconds after the doors are unlocked using the transmitter, the ETACS-ECU will relock the doors automatically. This is called "Timer lock function." This timer lock function prevents accidental unlocking of doors. The adjustment function allows you to change the timer lock period from 30 seconds (default setting) to 60, 120 or 180 seconds. For further details on using the multi-center display (middle grade type) to adjust the timer lock period, refer to GROUP 54B, On-vehicle Service P.54B-587.

NOTE: The timer lock period begins when the doors are unlocked, and ends when the doors is relocked automatically.

TRANSMITTER

<FRONT VIEW >



<REAR VIEW>

AC601205AB

The transmitter integrated into the key is used instead of the key holder type.The transmitter integrated into the key offer the following advantages.

- The transmitter is integrated into the master key. The 4-knob button is used, and the specific secret code is transmitted as a radio wave signal.
- A brilliant silver Three-diamond mark is stamped on the back side of the key grip.
- An indicator light, which illuminates when signals are received, is added on the key grip. This indicator lamp informs you of the signal transmission status and warns you of a flat battery in the transmitter.

- A signal transmission circuit (printed circuit) and a battery are housed in one case. The case is housed in the key grip, thus improving resistance to water intrusion.
- The functions of the immobilizer system are integrated.

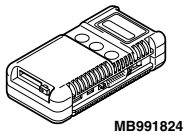
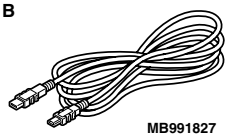
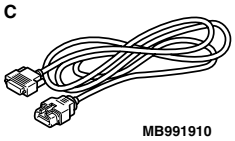
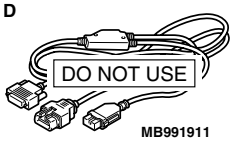
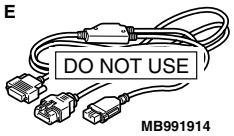
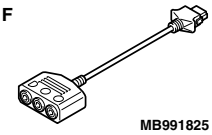
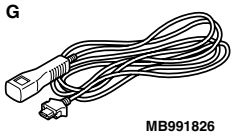
KEYLESS ENTRY SYSTEM DIAGNOSIS

M1428000700298

The keyless entry system is controlled by the Simplified Wiring System (SWS). Refer to GROUP 54B, SWS Diagnosis P.54B-61.

SPECIAL TOOL

M1428000600291

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III Sub Assembly A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III main harness C (for Daimler Chrysler models only) F: M.U.T.-III measurement adapter G: M.U.T.-III trigger harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.*	For registration of secret code **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**

ON-VEHICLE SERVICE

KEYLESS ENTRY SYSTEM INSPECTION

M1428001400104

Check the following items. If defective, refer to GROUP 54B, SWS Diagnosis P.54B-14).

1. Operate the transmitter to check that the doors can be locked and unlocked.

TSB Revision

NOTE: The adjustment function allows you to change the unlock operation setting as follows. Prior to that check, confirm which setting is activated.

a. *When the unlock button is pressed once, the driver's door will be unlocked. Then when the button is pressed once again, all the doors will be opened (initial setting).*
b. *When the unlock button is pressed only once, all the doors will be opened.*

2. Press the trunk lid button of transmitter twice (press once, and then press again within 5 seconds) and confirm that the trunk lid opens.
3. Operate the transmitter to check that the answerback function works in response to doors locking/unlocking.

NOTE: The adjustment function allows you to change the hazard answerback setting as follows. Prior to that check, confirm which setting is activated.

a. *Turn-signal lights: Flash once when doors are locked, and twice when unlocked (initial setting)*
b. *Turn-signal lights: Flash once when doors are locked, but does not flash when unlocked.*
c. *Turn-signal lights: Do not flash when doors are locked, but flash twice when unlocked.*
d. *Turn-signal lights: Do not flash when doors are locked and unlocked.*

NOTE: The adjustment function allows you to change the horn answerback setting as follows. Prior to that check, confirm which setting is activated.

a. *Horn: Sounds once when the lock button is pressed.*
b. *Horn: Sounds once when the lock button is pressed (initial setting).*
c. *Horn: Does not sound.*

KEYLESS ENTRY SYSTEM TIMER LOCK FUNCTION INSPECTION

M1428004000149

If the doors are not locked within 30 seconds after the unlock button is pressed, refer to GROUP 54B, SWS Diagnosis P.54B-14.

NOTE: If either of the doors is opened or the key is inserted in the ignition switch within that 30-second period, the timer lock function will be cancelled.

NOTE: The adjustment function allows you to change the timer lock period from 30 seconds (initial setting) to 60, 120 or 180 seconds. Prior to this inspection, confirm which setting is activated.

ENABLING/DISABLING THE ANSWERBACK FUNCTION

M1428003200225

When the doors are locked or unlocked by using the transmitter, the dome light will flash/illuminate, the turn-signal lights will flash (hazard answerback), or the horn will sound (horn answerback) to inform the driver.
The hazard answerback and horn answerback functions can be enabled or disabled according to the following procedure:

ENABLING/DISABLING THE HAZARD ANSWERBACK FUNCTION

How to adjust hazard answerback when the transmitter is used to lock doors

1. Remove the ignition key.
2. Push the ”unlock” button and then push the ”lock“ button after 4 seconds to 10 seconds.
3. Release the "lock" button and then release the "unlock" button within 10 seconds after Step 2. The ETACS-ECU tone alarm will sound, indicating that the hazard answerback function can be enabled or disabled when the doors are locked.
    - **Enable the hazard answerback function when the doors are locked: The ETACS-ECU tone alarm will sound once.**
    - **Disable the hazard answerback function when the doors are locked: The ETACS-ECU tone alarm will sound twice.**

How to adjust hazard answerback when the transmitter is used to unlock doors

1. Remove the ignition key.
2. Push the ”unlock” button and then push the ”lock“ button after 4 seconds to 10 seconds.
3. Release the "unlock" button and then release the "lock" button within 10 seconds after Step 2. The ETACS-ECU tone alarm will sound, indicating that the hazard answerback function can be enabled or disabled when the door are unlocked.
    - **Enable the hazard answerback function when the doors are unlocked: The ETACS-ECU tone alarm will sound once.**
    - **Disable the hazard answerback function when the doors are unlocked: The ETACS-ECU tone alarm will sound twice.**

ENABLING/DISABLING THE HORN ANSWERBACK FUNCTION

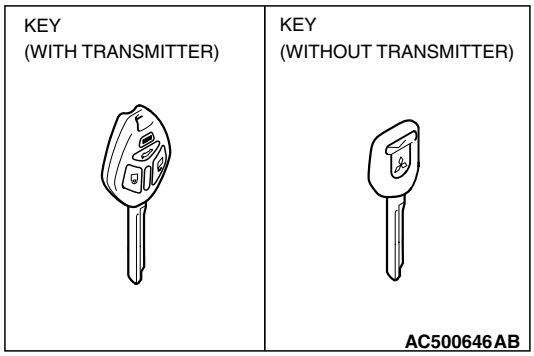
1. Remove the ignition key.
2. Push the "lock" button and then push the "unlock" button after 4 seconds and 10 seconds.

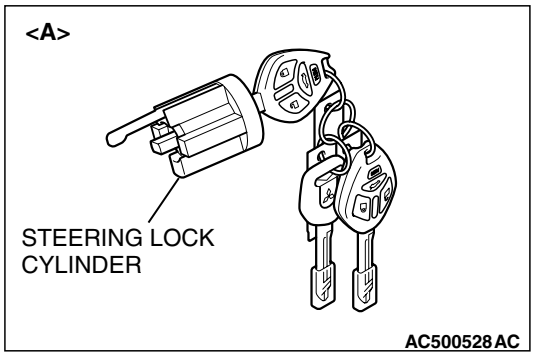
3. Release the "lock" or "unlock" button and then release the "unlock" or "lock" button within 10 seconds after Step 2. The ETACS-ECU tone alarm will sound, indicating that the horn answerback function can be enabled or disabled.
   - **Enable the horn answerback function*: The ETACS-ECU tone alarm will sound once.**
   - **Disable the horn answerback function: The ETACS-ECU tone alarm will sound twice.**
   - **Enable the horn answerback function**: The ETACS-ECU tone alarm will sound three times.**

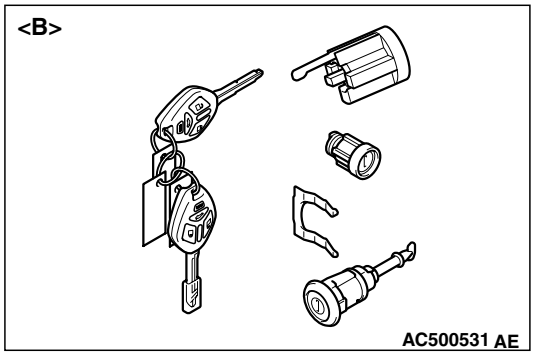
   NOTE:
   **: The horn will sound if "lock" button is pressed with the doors locked.*
   ***: The horn will sound if the doors are locked with the keyless entry system.*

HOW TO REGISTER SECRET CODE

M1428001000849



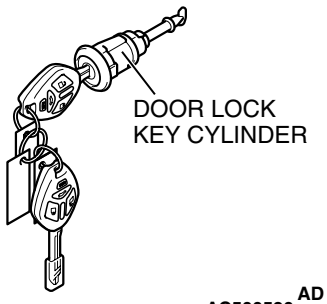




⚠ CAUTION

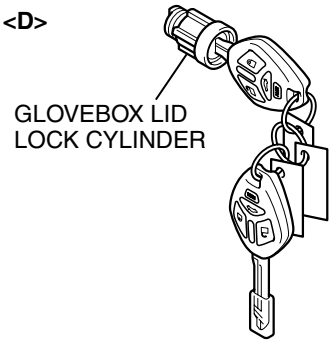
- **When adding the ignition key separately, or replacing the components by the steering lock cylinder of illustration <A> (the ignition key is simultaneously supplied) or the key set of illustration <B>, register the encrypted code.Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.**

<C>



AC500530 AD

<D>



AC500529 AC

- **When replacing the components by the door lock key cylinder of illustration <C> or the glove box lid lock cylinder of illustration <D>, do not register the encrypted code with the bar code on the ignition key which is supplied to each lock cylinder simultaneously.**

Required Special Tools:

- MB991958: M.U.T.-III Sub Assembly
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991910: M.U.T.-III Main harness A

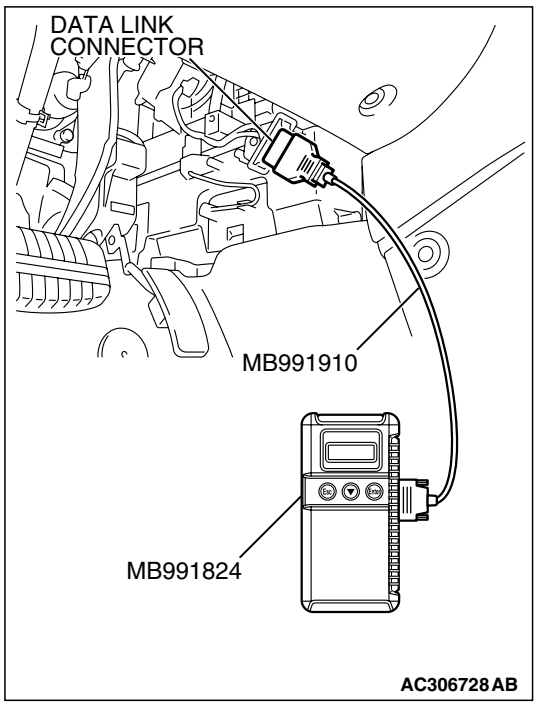
Each individual secret code is registered inside the transmitter, and so it is necessary to resister these codes with the EEPROM inside the receiver in the following cases.

- When the transmitter or ETACS-ECU is replaced
- If more transmitters are to be used
- If it appears that a problem is occurring because of faulty registration of a code.

A maximum of four different codes can be stored in the EEPROM memory (four different transmitters can be used). When the code for the first transmitter is registered, the previously registered codes for all transmitters are cleared. Therefore, if you are using four transmitters or are adding more transmitters, the codes for all transmitters must be registered at the same time.

WHEN SPECIAL TOOL MB991824 (V.C.I.) IS USED

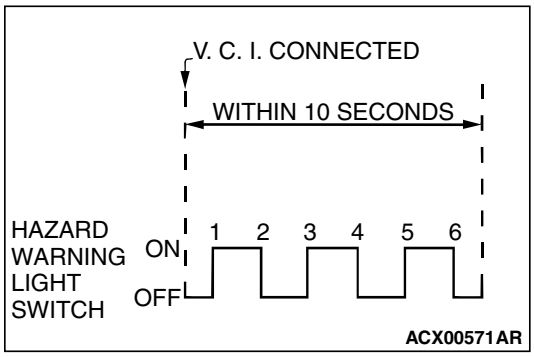
1. Check that the doors lock normally when the key is used.
2. Insert the ignition key.



⚠ CAUTION

To prevent damage to special tool MB991824 (V.C.I.), always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting special tool MB991824 (V.C.I.).

3. Connect special tool MB991824 (V.C.I.) to the data link connector.



4. Press the hazard warning light switch six times within 10 seconds.

   NOTE: When the hazard warning light switch has been pressed six times, the ETACS-ECU locks and unlocks the doors automatically once. The ETACS-ECU is ready to register an encrypted code.

   NOTE: The hazard warning light switch is a toggle switch.
5. Press the transmitter button, and then press it two times within 10 seconds of the first press. This will register the code.
6. When the encrypted code has been registered, the ETACS-ECU locks and unlocks the doors automatically once.
7. If you are using two or more transmitters or have added a second transmitter, the next transmitter should be registered within one minute after registering the code for the previous transmitter. The registration procedure is common for all the transmitter.
8. Registration mode will be canceled under the following conditions:
   - When the secret code for four transmitters has been registered;
   - When passing one minute after finishing the registration of all transmitters;
   - When special tool MB991824 (V.C.I.) is disconnected;
   - When the key is removed from the key cylinder;
9. After the registration is completed, remove the ignition key and close all the doors, and then check that the keyless entry system operates normally.

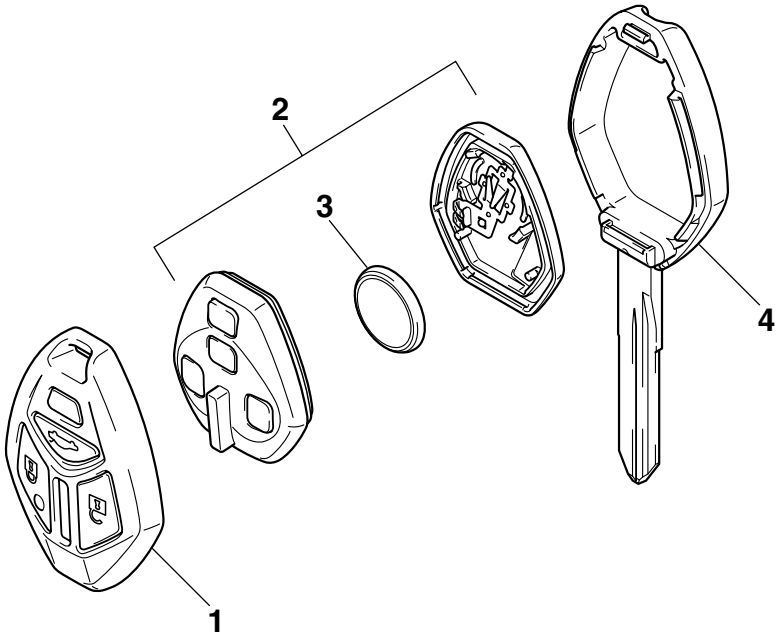
TSB Revision

TRANSMITTER

DISASSEMBLY AND ASSEMBLY

M1428002800321

Post-installation operation
- Transmitter operation check



AC405679AB

	DISASSEMBLY STEPS		DISASSEMBLY STEPS
<<**A**>>	1. UPPER COVER	<<**B**>> >>**A**<<	3. BATTERY
	2. TRANSMITTER ASSEMBLY		4. MASTER KEY

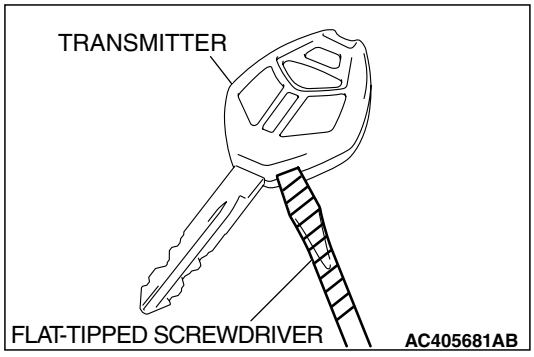
DISASSEMBLY SERVICE POINTS

<<A>> UPPER COVER REMOVAL

⚠ CAUTION

To prevent damage to the transmitter, wrap a flat-tipped screwdriver with protective tape before prying.

Insert a flat-tipped screwdriver in the area shown, and remove the upper cover by prying it with the screwdriver.



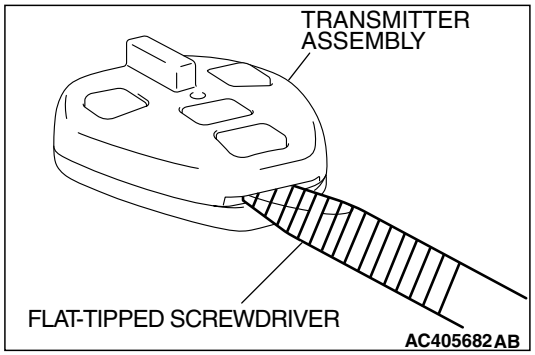
AC405681AB

TSB Revision

<<B>> BATTERY REMOVAL

⚠ CAUTION

- **Do not allow water or dust to enter the inside of the transmitter assembly when it is open. Also, do not touch the precision electronic device.**
- **To prevent damage to the transmitter assembly, wrap a flat-tipped screwdriver with protective tape before prying.**



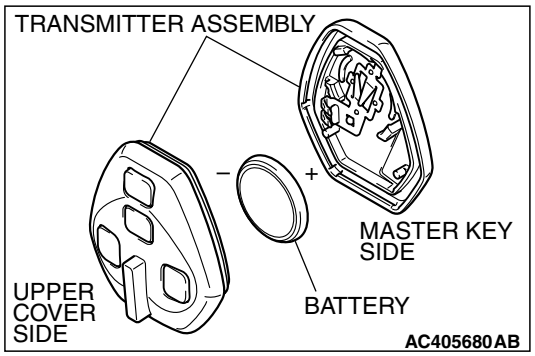
Insert a flat-tipped screwdriver in the area shown, and remove the battery by prying it with the screwdriver.

ASSEMBLY SERVICE POINT

>>A<< BATTERY INSTALLATION

⚠ CAUTION

Do not allow water or dust to enter the inside of the transmitter assembly when it is open. Also, do not touch the precision electronic device.



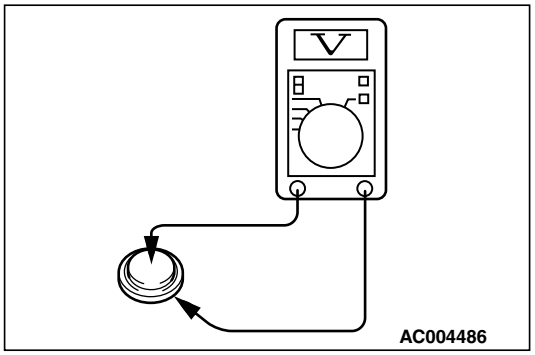
Install a new battery to the transmitter assembly with its (+) side facing towards the master key side.

Battery required for replacement: Coin type battery CR1620

INSPECTION

M1428003800205

TRANSMITTER BATTERY CHECK



Measure the voltage of the battery. If the voltage of the battery is not within the standard value, replace the battery.

Standard value:2.5 – 3.2 V

SUNROOF ASSEMBLY

GENERAL DESCRIPTION

M1426000100234

A motor-driven inner slide-type glass sunroof with a tilt-up mechanism is available in some models as a standard or optional equipment. Even when the sunroof is fully closed, a sufficient amount of lighting and a feeling of openness can still be obtained by opening the sunroof sunshade.

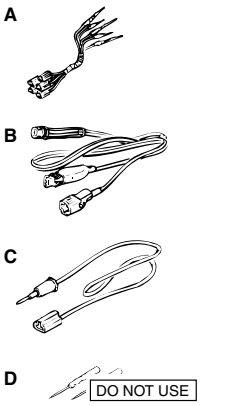
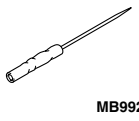
SUNROOF DIAGNOSIS

M1426000700311

The sunroof system is controlled by the Simplified Wiring System (SWS). Refer to GROUP 54B, SWS Diagnosis P.54B-61.

SPECIAL TOOL

M1426000600303

TOOL	TOOL NUMBER AND NAME	SUPER SESSION	APPLICATION
	MB991223 Harness set A: MB991219 Test harness B: MB991220 LED harness C: MB991221 LED harness adapter D: MB991222 Probe	General service tools	Measurement of terminal voltage and resistance A: Connector pin contact pressure inspection B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection
	MB992006 Extra fine probe	–	Measurement of terminal voltage and resistance

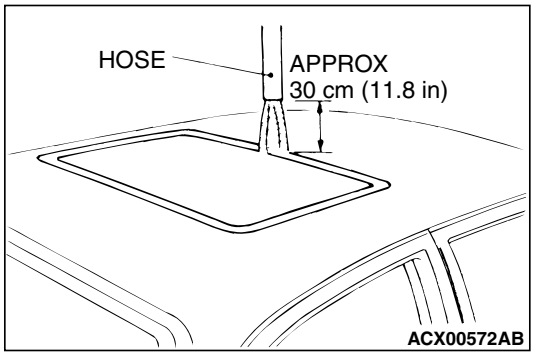
ON-VEHICLE SERVICE

WATER TEST

M1426000900274

Check if there are any leaks in the sunroof by the following procedure.

1. Fully close the roof lid glass.
2. Adjust the water pressure so that water comes out of the hose to a height of approximately 50 cm (19.7 inches) when the hose is held vertically facing upwards.



3. Hold the end of the hose approximately 30 cm (11.8 inches) above the roof and let the water run onto the weatherstrip for 5 minutes or more.
4. Check if any water leaks can be found in the room while watering. Even though there are any water leaks around the roof lid glass, it can be acceptable as long as water is caught in the drip area.

SUNROOF TIMER FUNCTION CHECK

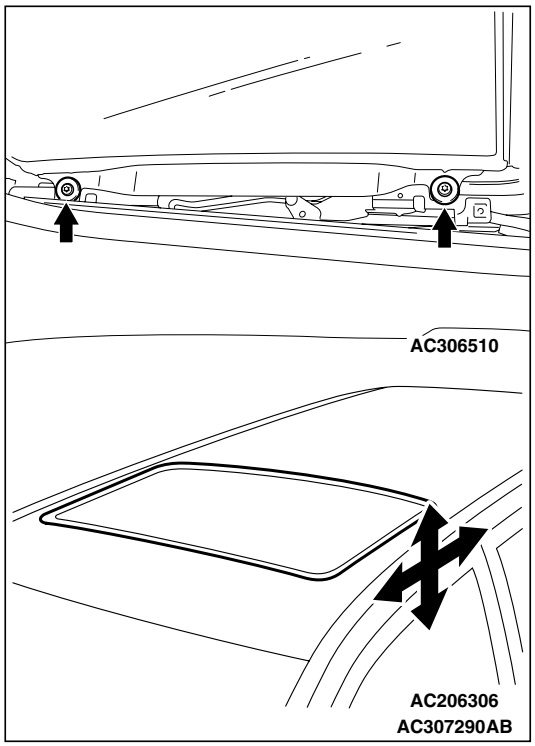
M1426004300100

Keep the door closed, turn OFF the ignition switch and check to see if the sunroof can be operated for 30 seconds after that. If not, perform troubleshooting (Refer to GROUP 54B, SWS Diagnosis P.54B-61).

SUNROOF FIT ADJUSTMENT

M1426001000285

1. Fully close the roof lid glass.
2. Fully open the sunshade.
3. Loosen the roof lid glass assembly mounting screws. Align the roof lid glass by moving it backward, forward, up or down along the guide oblong hole so that the clearance between the glass and the vehicle body is even.
4. Check to be sure that the roof lid glass is flush with the roof panel at corner areas.
5. Check to be sure that the sunroof operates smoothly.



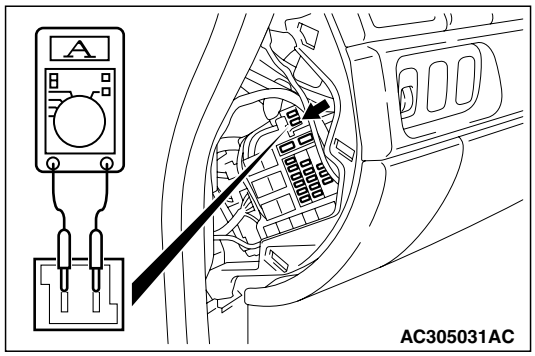
SUNROOF CHECK

M1426004700119

Check to see that the sunroof operates by pressing the sunroof switch. Perform troubleshooting if operations malfunction (Refer to GROUP 54B, SWS Diagnosis P.54B-61).

ROOF LID GLASS OPERATION CURRENT CHECK

M1426003200166



1. Remove the fuse of the sunroof, then connect the circuit tester as shown in the Figure.
2. Turn ON the sunroof switch, then measure the operating current when the roof lid glass is halfway opened.

   Standard value: 7 A or less [at 20 °C (68 °F)]

3. Check the following areas if the operating current of exceeds the standard value:
   - Sunroof installation, deformation and appearance of any foreign substances.
   - Drive cable installation.
   - Tilting of roof lid glass.

SUNROOF INITIALIZATION

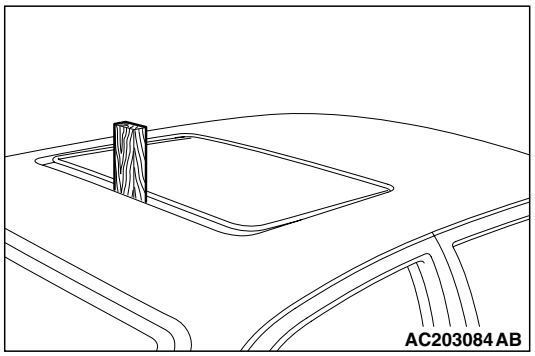
M1426004600123

The sunroof should be initialized when any of the following components are replaced, the sunroof position is miss timed.

- Roof lid glass assembly
- Sunroof motor assembly

1. Ensure the components are correctly assembled. Ensure all the connectors are connected securely.
2. If the sunroof is already in learn mode, go to step 3. If the sunroof is not in learn mode, enter learn mode by (1) or (2) below.
   (1) Disconnect the sunroof motor assembly connector while the sunroof is operating.
   (2) Stop the sunroof operation by fitting the block (board etc.). Then press and hold the sunroof close switch for 10 seconds with the sunroof stopped.
3. Press the sunroof Close switch repeatedly until the sunroof is tilted up fully.
4. Press and hold the sunroof Close switch for at least three seconds.
5. Press the sunroof Close switch until the sunroof closes fully.
6. The sunroof should work normally.

NOTE: Do not stop the sunroof before it reaches the fully closed position during operations in steps 5 above. If the sunroof has stopped accidentally, repeat the procedure from step 1.



SUNROOF OPERATION CHECK

M1426002600332

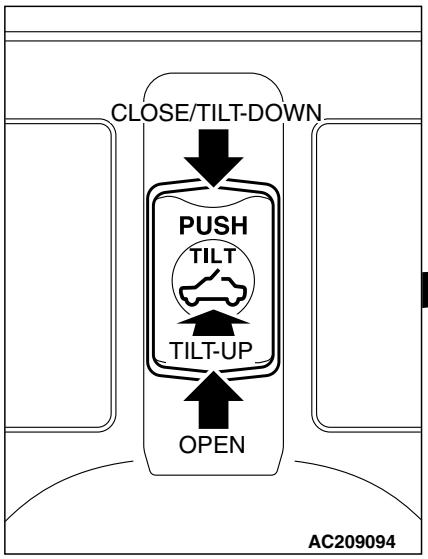
⚠ CAUTION

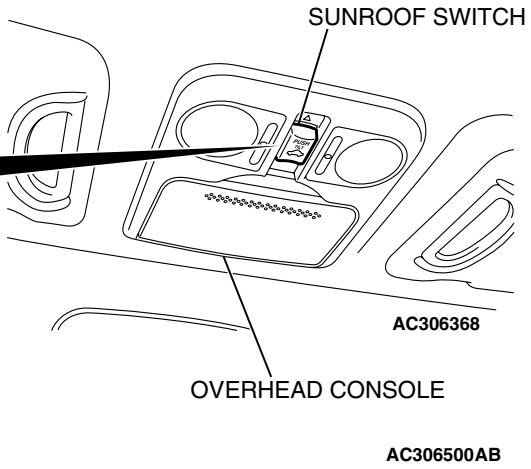
Check that the following items are normal before carrying out this operation check.

- **Installation condition of the sunroof assembly**
- **Installation condition, deformation and contamination of the sunroof drive cable**
- **Installation of sunroof lid glass**
- **Sunroof switch and sunroof motor assembly**

Check that the following items. If faulty, replace the sunroof motor assembly.

TSB Revision





Basic operation

NO.	SUNROOF FUNCTION	REQUIREMENTS FOR THE SUNROOF TO FUNCTION	NORMAL OPERATION
01	OPEN	1. Ignition switch: ON 2. Sunroof switch: OPEN	The sunroof opens fully and automatically and stops several centimeters forward of the fully open position (position for less wind noise). Then, when the sunroof switch is operated again, the sunroof opens further to fully open position.
02	CLOSE	1. Ignition switch: ON 2. Sunroof switch: CLOSE/TILT-DOWN	The sunroof closes while the sunroof switch is pushed to the CLOSE/TILT-DOWN position.
03	TILT-UP	1. Ignition switch: ON 2. Sunroof switch: TILT-UP	The sunroof tilts up fully and automatically.
04	TILT-DOWN	1. Ignition switch: ON 2. Sunroof switch: CLOSE/TILT-DOWN	The sunroof closes while the sunroof switch is pushed to the CLOSE/TILT-DOWN position.

NO.	SUNROOF FUNCTION	REQUIREMENTS FOR THE SUNROOF TO FUNCTION		NORMAL OPERATION
05	AUTOMATIC OPERATION INTERRUPTION (OPEN)	A	1. Ignition switch: ON 2. Sunroof switch: OPEN or TILT-UP	The sunroof stops the automatic opening operation.
		B	1. Ignition switch: ON 2. Sunroof switch: CLOSE/TILT DOWN (Push the sunroof switch to the CLOSE/TILT-DOWN position while the sunroof is automatically opening and release the switch within two seconds)	The sunroof stops the automatic opening operation.
		C	1. Ignition switch: ON 2. Sunroof switch: CLOSE/TILT DOWN (Push the sunroof switch to the CLOSE/TILT-DOWN position more than two seconds while the sunroof is automatically opening)	The sunroof stops the automatic opening operation, and the sunroof closes while the sunroof switch is pushed to the CLOSE/TILT-DOWN position.
06	AUTOMATIC OPERATION INTERRUPTION (TILT-UP)	1. Ignition switch: ON 2. Sunroof switch: OPEN or TILT-UP, CLOSE/TILT DOWN		The sunroof stops the automatic opening operation.

Sunroof timer mechanism

In cases except the following, the basic operation and jam preventing mechanism will be maintained for thirty seconds after the ignition switch is turned to the LOCK (OFF) position. (Sunroof timer function)

- If you open a door within that period (i.e. a door switch is on), the sunroof timer function will be cancelled immediately.
- If you turn the ignition switch to the LOCK (OFF) position while the timer is working, the sunroof will continue moving until it closes fully, regardless of the time-out period.

SUNROOF ASSEMBLY

REMOVAL AND INSTALLATION

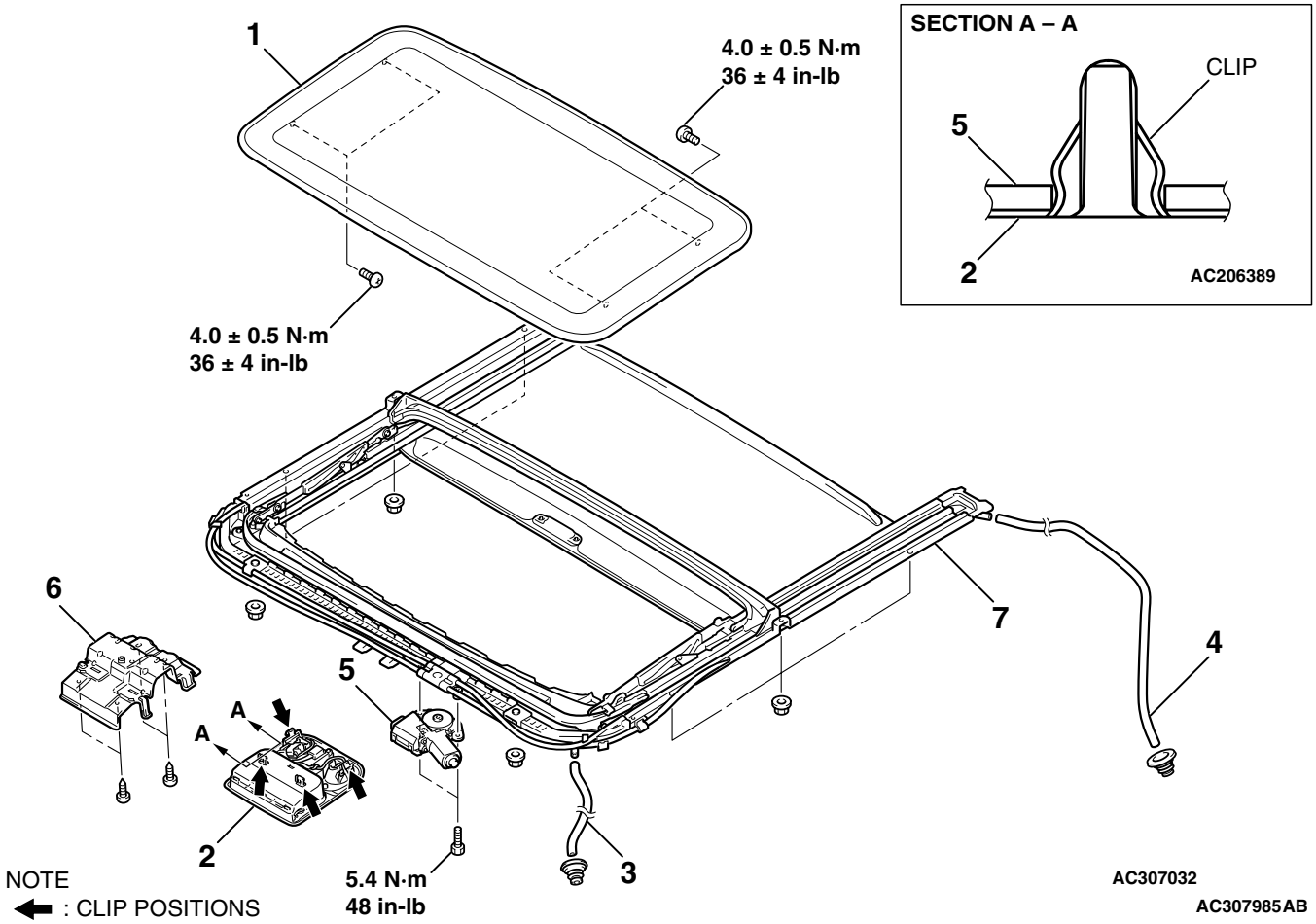
M1426001200308

⚠ WARNING

When removing and installing the front passenger seat, be sure to carry out accuracy check occupant classification sensor after the seat has been installed in the vehicle. (Refer to GROUP 52B, On-Vehicle Service P.52B-396.)

Post-installation Operation <Roof lid glass assembly, Sunroof assembly>
- Sunroof Water Test (Refer to P.42-76).
- Sunroof Fit Adjustment (Refer to P.42-77).

Post-installation Operation <Roof lid glass assembly, Sunroof motor assembly>
- Sunroof Initializing Adjustment (Refer to P.42-78).



REMOVAL
1. ROOF LID GLASS ASSEMBLY
2. OVERHEAD CONSOLE ASSEMBLY

DRAIN PIPE REMOVAL STEPS
- FRONT HEADLINING PAD (REFER TO GROUP 52A, HEADLINING P.52A-31).
- FRONT SPLASH SHIELD (REFER TO P.42-9).
- UPPER FRAME TO FRONT PILLAR BRACE (FRONT DRAIN PIPE <LH>) (REFER TO P.42-85).
- INSTRUMENT PANEL PARCEL BOX (FRONT DRAIN PIPE <RH>) (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-15).

>>A<< 3. FRONT DRAIN PIPE

- REAR HEADLINING PAD (REFER TO GROUP 52A, HEADLINING P.52A-31).
- TRUNK TRIM ASSEMBLY (REFER TO GROUP 52A, TRIMS P.52A-23).

TSB Revision

DRAIN PIPE REMOVAL STEPS
- REAR SPLASH SHIELD (REFER TO GROUP 51, REAR BUMPER P.51-4).

>>A<< 4. REAR DRAIN PIPE

SUNROOF MOTOR ASSEMBLY REMOVAL STEPS
- HEADLINING (REFER TO GROUP 52A, HEADLINING P.52A-31).

5. SUNROOF MOTOR ASSEMBLY

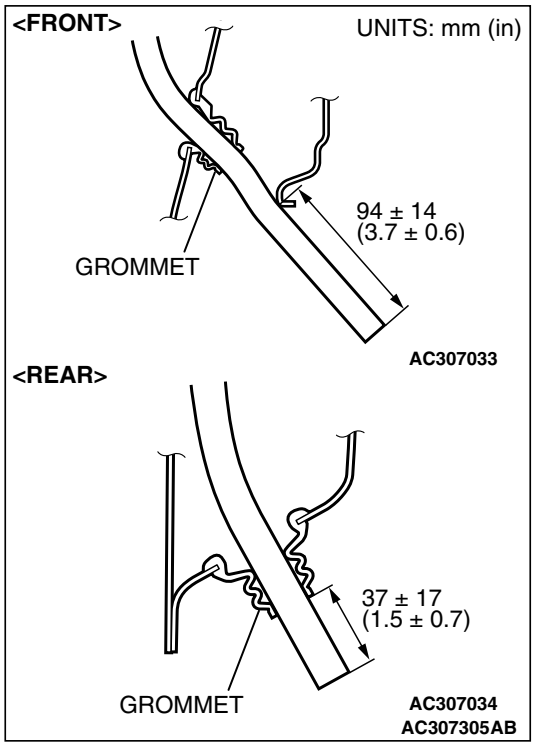
SUNROOF ASSEMBLY REMOVAL STEPS

1. ROOF LID GLASS ASSEMBLY
- HEADLINING (REFER TO GROUP 52A, HEADLINING P.52A-31).

SUNROOF ASSEMBLY REMOVAL STEPS (Continued)
- DRAIN PIPE CONNECTION

5. SUNROOF MOTOR ASSEMBLY
6. OVERHEAD CONSOLE BRACKET
7. SUNROOF ASSEMBLY

Required Special Tool:
- MB991223: Harness set



INSTALLATION SERVICE POINT

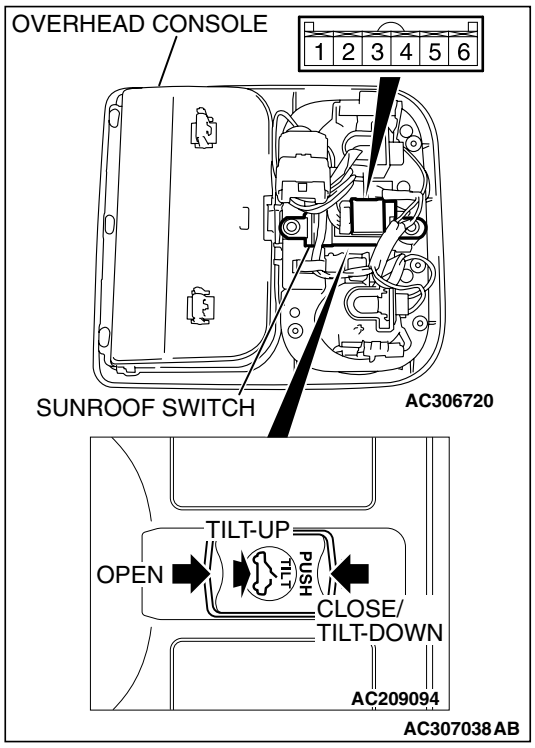
>>A<< REAR DRAIN PIPE/FRONT DRAIN PIPE INSTALLATION

Install the grommet, and then position the drain pipe so that it protrudes from the grommet as shown in the illustration.

INSPECTION

M1421007600440

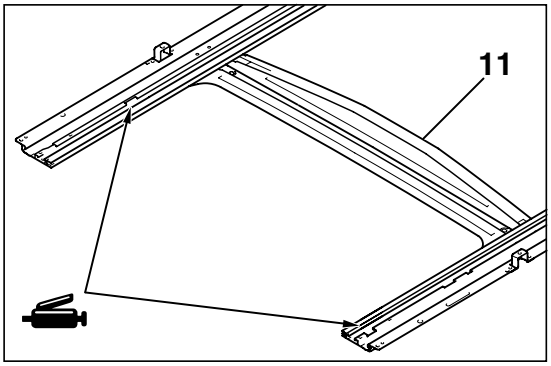
SUNROOF SWITCH CONTINUITY CHECK

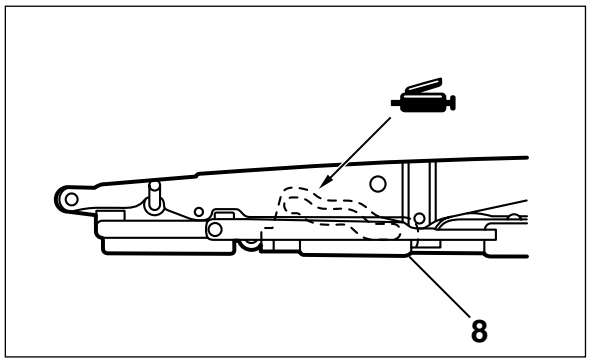


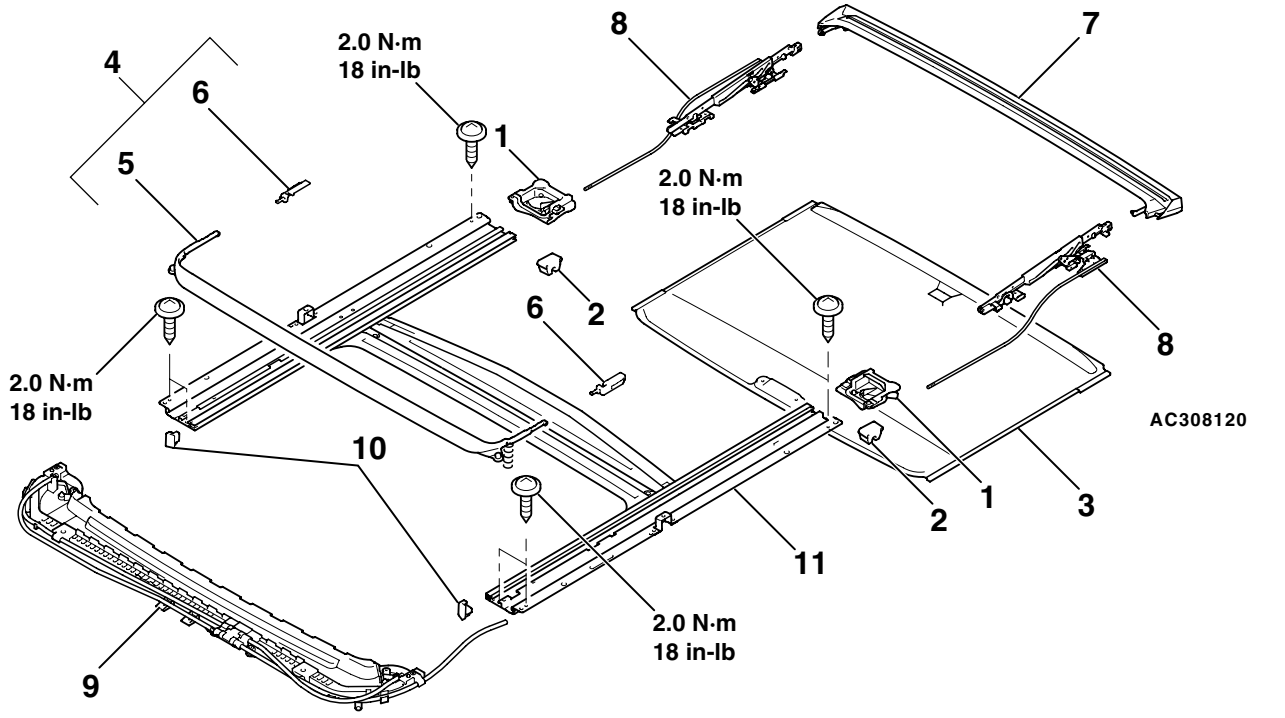
SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
Open	4 – 5	Less than 2 ohms
Off	3 – 4, 3 – 5, 3 – 6, 4 – 5, 4 – 6, 5 – 6	Open circuit
Tilt-up	3 – 4	Less than 2 ohms
Close/Tilt-down	4 – 6	Less than 2 ohms

DISASSEMBLY AND ASSEMBLY

M1426001400294







AC309052AB

DISASSEMBLY STEPS

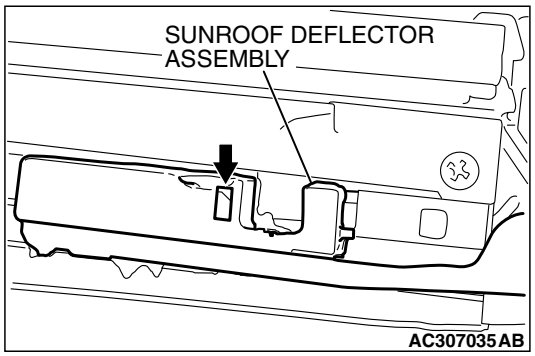
1. SUNROOF DRIP PLATE
2. SUNROOF SUNSHADE STOPPER
3. SUNROOF SUNSHADE
4. <<**A**>> SUNROOF DEFLECTOR ASSEMBLY
5. SUNROOF DEFLECTOR

DISASSEMBLY STEPS

6. SUNROOF GUIDE RAIL ROD HOLDER
7. SUNROOF DRIP RAIL
8. ROOF LID SLIDER
9. SLIDING ROOF OPERATING UNIT
10. ROOF BLIND STOPPER
11. SUNROOF HOUSING

TSB Revision

DISASSEMBLY SERVICE POINT

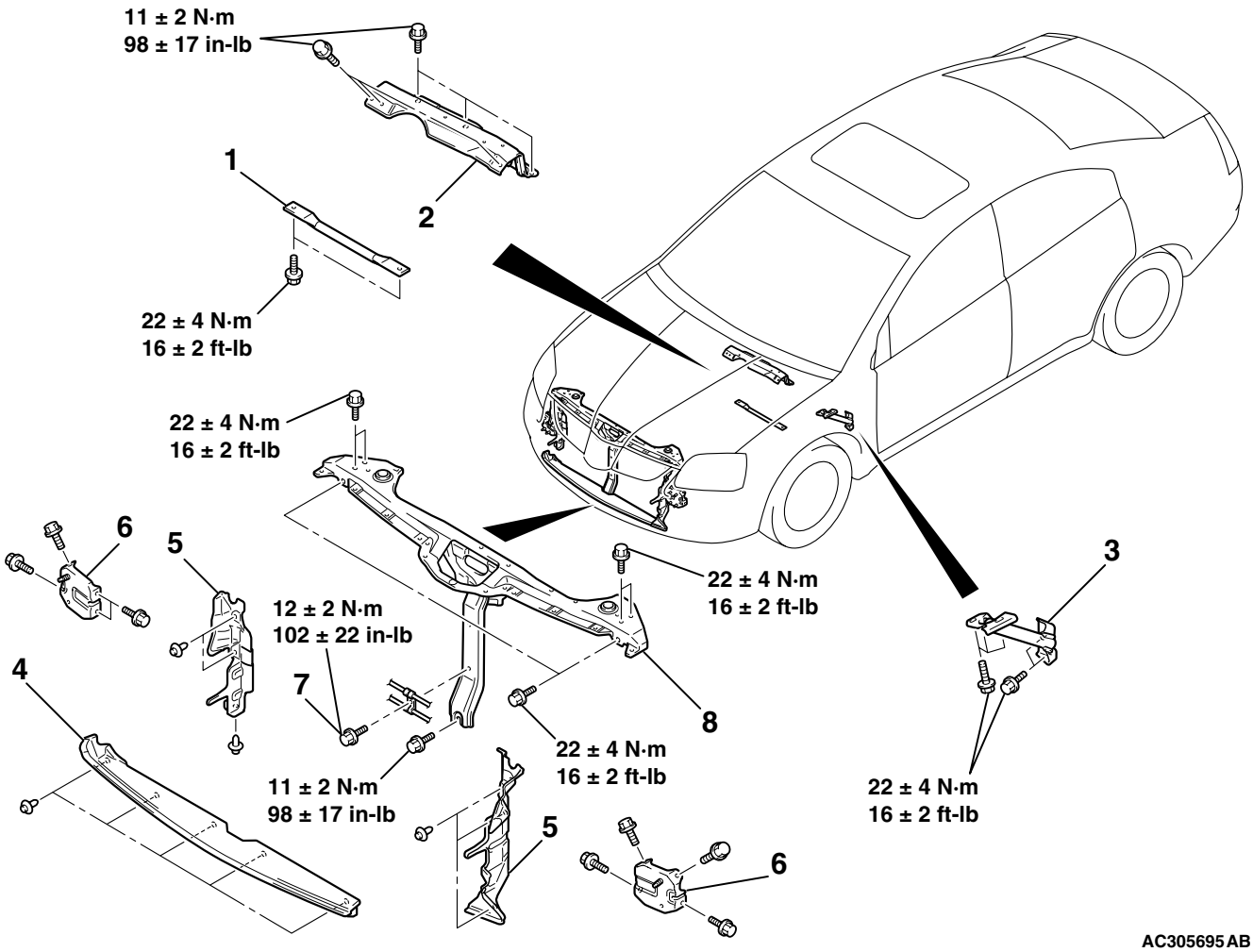


<<A>> SUNROOF DEFLECTOR ASSEMBLY REMOVAL
Slide the sunroof deflector assembly to the front of the vehicle by holding the arrow area shown in the illustration with a flat-tipped screwdriver, and remove it.

LOOSE PANEL

REMOVAL AND INSTALLATION

M1421003100056



REMOVAL

1. FRONT FLOOR BACKBONE BRACE

COWL TOP COVER OUTER REMOVAL STEPS

- FRONT DECK GARNISH (REFER TO GROUP 51, WINDSHIELD WIPER P.51-16.)

2. COWL TOP COVER OUTER

UPPER FRAME TO FRONT PILLAR BRACE REMOVAL STEPS

- SPLASH SHIELD (REFER TO P.42-9.)

3. UPPER FRAME TO FRONT PILLAR BRACE

AIR GUIDE PANEL REMOVAL STEPS

- FRONT BUMPER ASSEMBLY (REFER TO GROUP 51, FRONT BUMPER P.51-2.)

4. AIR GUIDE PANEL CENTER

- FRONT BUMPER REINFORCEMENT ASSEMBLY (REFER TO GROUP 51, FRONT BUMPER P.51-2.)

5. AIR GUIDE PANEL SIDE

FRONT BUMPER REINFORCEMENT BRACKET REMOVAL STEPS

- FRONT BUMPER REINFORCEMENT ASSEMBLY (REFER TO GROUP 51, FRONT BUMPER P.51-2.)

5. AIR GUIDE PANEL SIDE
6. FRONT BUMPER REINFORCEMENT BRACKET

FRONT END STRUCTURE BAR REMOVAL STEPS

- RADIATOR GRILLE (REFER TO GROUP 51, RADIATOR GRILLE P.51-6.)
- FRONT BUMPER MOUNTING CLIPS UPPER (REFER TO GROUP 51, FRONT BUMPER P.51-2.)
- HOOD DAMPER AND HOOD LATCH (REFER TO P.42-7.)

7. COOLER TUBE ASSEMBLY MOUNTING BOLT <2.4L ENGINE>
8. FRONT END STRUCTURE BAR

SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1421005300324

ITEM	SPECIFICATION
Hood	
Hood hinge bolt (body side)	12 ± 2 N·m (102 ± 22 in-lb)
Hood hinge bolt (hood side)	12 ± 2 N·m (102 ± 22 in-lb)

TSB Revision

ITEM	SPECIFICATION
Hood hinge nut (body side)	12 ± 2 N·m (102 ± 22 in-lb)
Hood latch bolt	9.0 ± 2.0 N·m (80 ± 17 in-lb)
Hood switch bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Strut tower bar	
Strut tower bar nut	12 ± 2 N·m (102 ± 22 in-lb)
Door	
Door check bolt (body side)	9.0 ± 2.0 N·m (80 ± 17 in-lb)
Door check bolt (door side)	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Door hinge bolt (body side)	27 ± 5 N·m (20 ± 4 ft-lb)
Door hinge bolt (door side)	21 ± 4 N·m (16 ± 2 ft-lb)
Door outside handle bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Door latch assembly screw	5.9 ± 1.0 N·m (52 ± 9 in-lb)
Door switch screw	3.9 ± 1.0 N·m (35 ± 8 in-lb)
Striker screw	24 ± 3 N·m (18 ± 2 ft-lb)
Trunk lid	
Trunk lid hinge bolt (body side)	13 ± 2 N·m (111 ± 22 in-lb)
Trunk lid hinge bolt (trunk lid side)	13 ± 2 N·m (111 ± 22 in-lb)
Trunk lid hinge nut (trunk lid side)	13 ± 2 N·m (111 ± 22 in-lb)
Trunk lid latch bolt	9.0 ± 2.0 N·m (80 ± 17 in-lb)
Trunk lid striker bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Sunroof	
Roof lid glass screw	4.0 ± 0.5 N·m (36 ± 4 in-lb)
Sunroof drip plate screw	2.0 N·m (18 in-lb)
Sunroof housing screw	2.0 N·m (18 in-lb)
Sunroof motor bolt	5.4 N·m (48 in-lb)
Loose panel	
Cowl top cover outer bolt	11 ± 2 N·m (98 ± 17 in-lb)
Front end structure bar bolt	22 ± 4 N·m (16 ± 2 ft-lb)
	12 ± 2 N·m (102 ± 22 in-lb)
	11 ± 2 N·m (98 ± 17 in-lb)
Front floor backbone brace bolt	22 ± 4 N·m (16 ± 2 ft-lb)
Upper frame to front pillar brace bolt	22 ± 4 N·m (16 ± 2 ft-lb)

SERVICE SPECIFICATIONS

M1421000300523

<DOOR>

ITEM		STANDARD VALUE
Door inside handle knob play mm (in)	Front	26.1 – 58.1 (1.028 – 2.287) [Target value 41 (1.61)]
	Rear	30.3 – 58.1 (1.193 – 2.287) [Target value 41 (1.61)]
Door inside handle lock knob stroke mm (in)		21.6 (0.850)

ITEM		STANDARD VALUE
Door outside handle play mm (in)	Front	10 ± 3.5 (0.39 ± 0.138)
	Rear	11.2 ± 4 (0.441 ± 0.16)
Power window operation current A		5 ± 1 [Power supply voltage 14.5 ± 0.5V 25°C (77°F)]

<KEYLESS ENTRY SYSTEM>

ITEM	STANDARD VALUE
Transmitter battery V	2.5 – 3.2

<SUNROOF>

ITEM	STANDARD VALUE
Roof lid glass operation current A	7 or less [at 20°C(68°F)]

SEALANT AND ADHESIVES

M1421000500204

<WINDOW GLASS>

ITEM	SPECIFIED ADHESIVE
Rear window glass	3 M™ AAD part No. 8609 super fast urethane and 3 M™ AAD part No. 8608 super fast urethane primer or equivalent
Windshield	

<DOOR>

ITEM	SPECIFIED SEALANT	REMARK
Waterproof film	3 M™AAD Part No. 8633 or equivalent	Ribbon sealer

ITEM	SPECIFIED ADHESIVE TAPE
Front door opening outer weatherstrip	Adhesive tape: Double-sided tape [7 mm (0.28 in) width, 85 mm (3.35 in) length and 0.8 mm (0.031 in) thickness]
Rear door opening outer weatherstrip	Adhesive tape: Double-sided tape [7 mm (0.28 in) width, 50 mm (1.97 in) length and 0.8 mm (0.031 in) thickness]

<TRUNK LID>

ITEM	SPECIFIED SEALANT	REMARK
Trunk lid hinge	3 M™AAD part No. 8531 Heavy drip check sealer, 3 M™AAD part No. 8646 Automotive joint and seam sealer or equivalent	Body sealer

COMPONENT IDENTIFICATIONS

M1421005400246

<DOOR CHECK>

APPLICABLE LOCATION		IDENTIFICATION MARK
LH	Front door	P4FL
	Rear door	P4RL
RH	Front door	P4FR
	Rear door	P4RR

<DOOR OPENING OUTER WEATHERSTRIP>

APPLICABLE SIDE		IDENTIFICATION CLIP COLOR
LH	Front door	Pink
	Rear door	Yellow
RH	Front door	Turquoise
	Rear door	Blue

GROUP 51

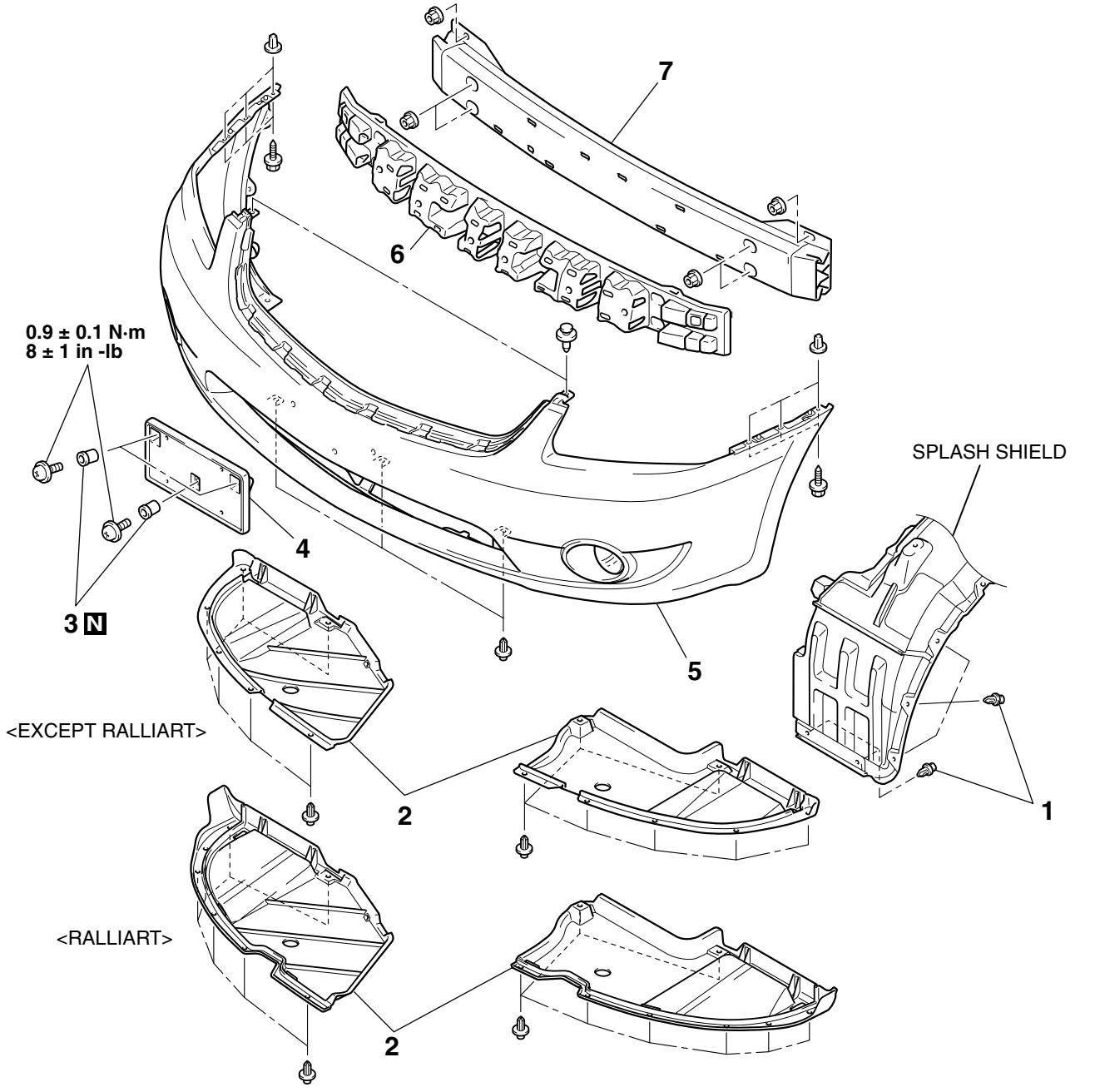
EXTERIOR

CONTENTS

FRONT BUMPER ASSEMBLY

REMOVAL AND INSTALLATION

M1511001401328



AC601228AB

REMOVAL STEPS

- RADIATOR GRILLE (REFER TO P.51-6).

1. SPLASH SHIELD MOUNTING CLIPS
2. FRONT BUMPER UNDER COVER
3. RUBBER NUT
4. LICENSE PLATE GARNISH

REMOVAL STEPS (Continued)

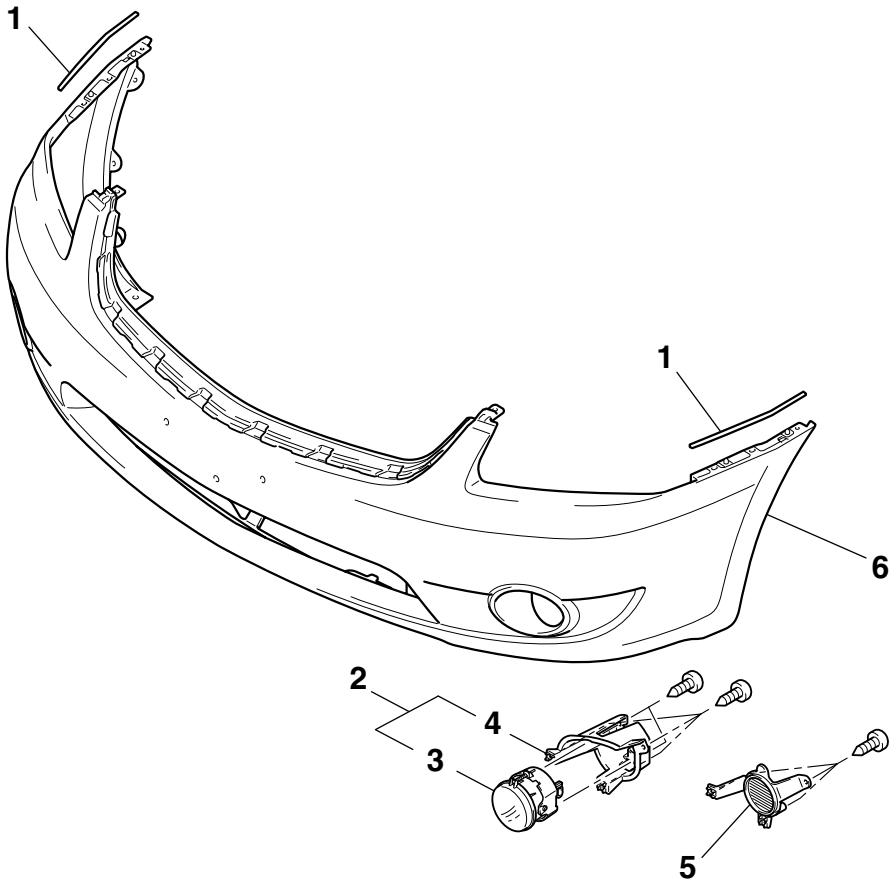
- FOG LIGHT CONNECTOR CONNECTION

5. FRONT BUMPER ASSEMBLY
6. FRONT BUMPER CORE
7. FRONT BUMPER REINFORCEMENT ASSEMBLY

TSB Revision

DISASSEMBLY AND ASSEMBLY

M1511001601366



AC601229AB

DISASSEMBLY STEPS

1. PAD
2. FOG LIGHT ASSEMBLY
3. FOG LIGHT
4. FOG LIGHT BRACKET

DISASSEMBLY STEPS (Continued)

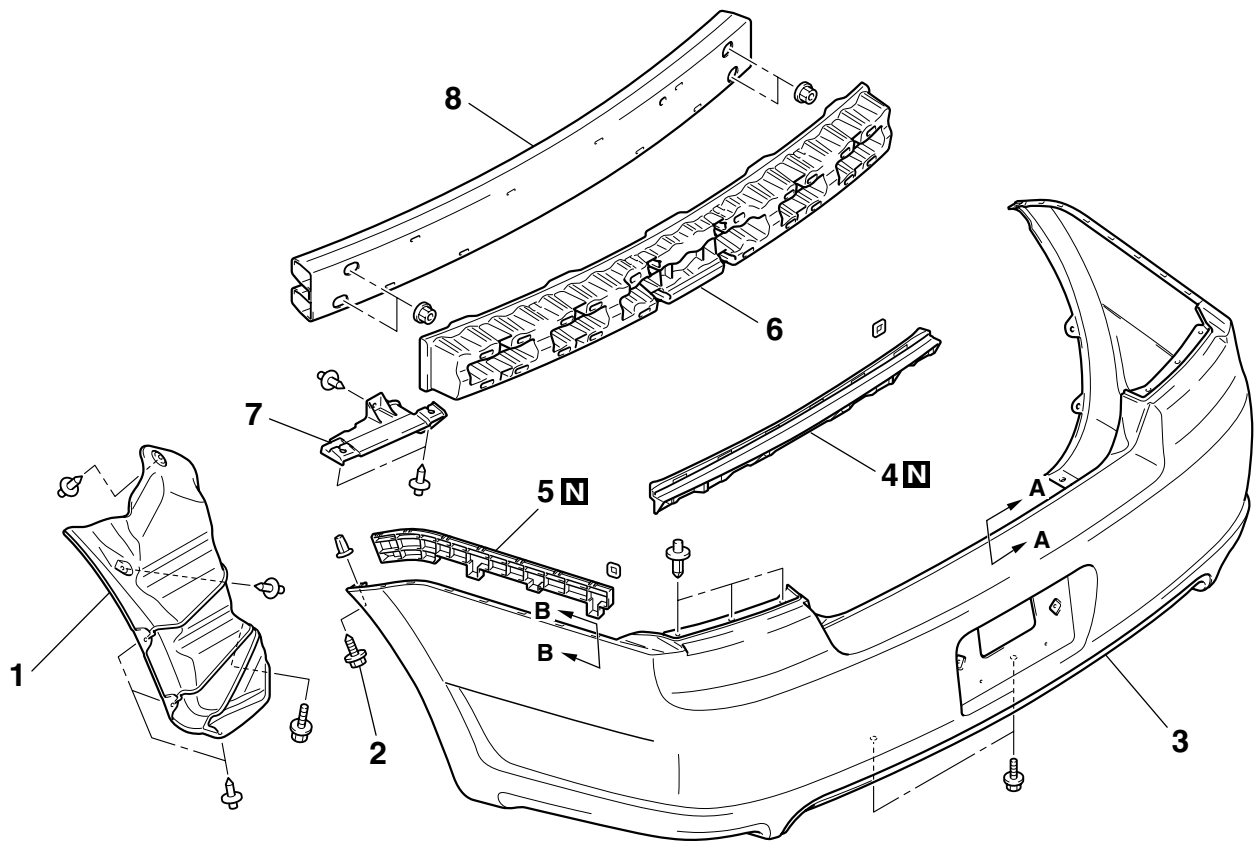
5. FOG LIGHT HOLE COVER (VEHICLES WITHOUT FOG LIGHTS)
6. FRONT BUMPER FACE

TSB Revision

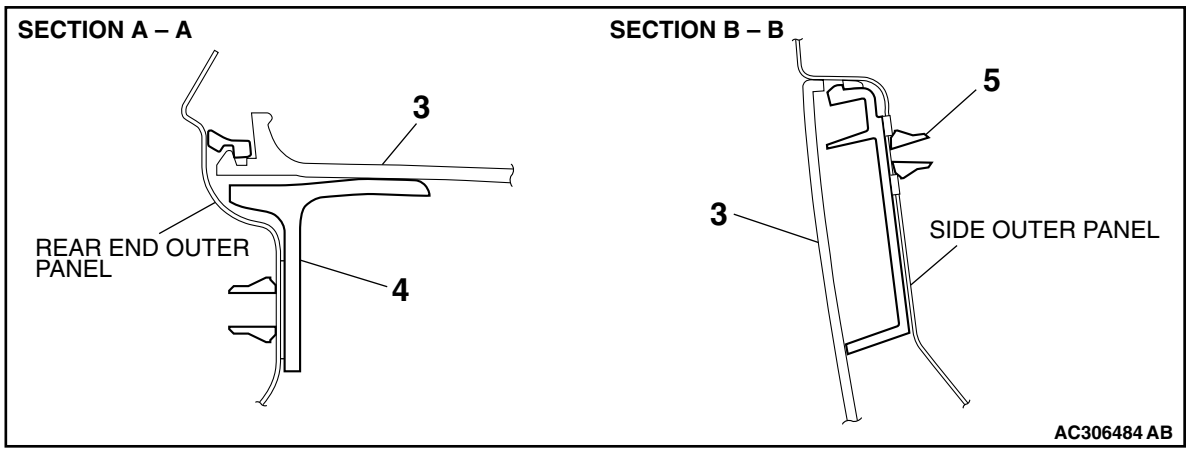
REAR BUMPER ASSEMBLY

REMOVAL AND INSTALLATION

M1511001901301



AC601230AB



AC306484 AB

REMOVAL STEPS

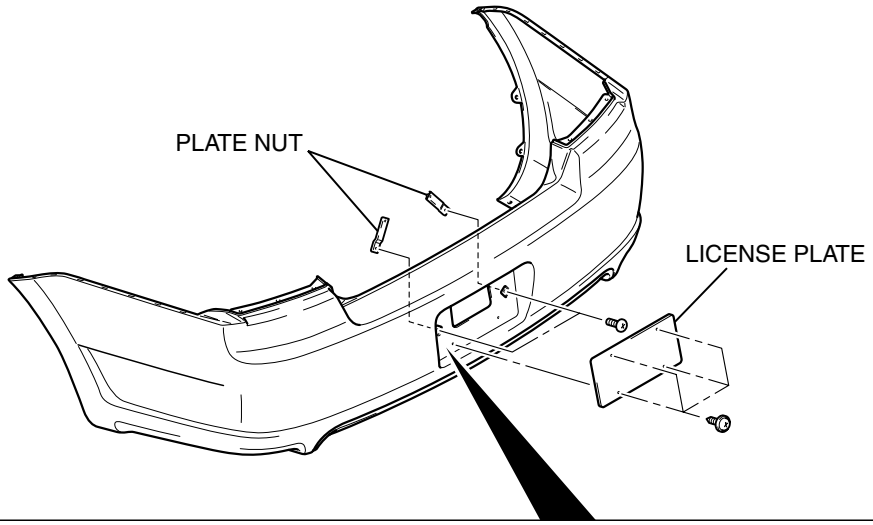
- REAR COMBINATION LIGHT (REFER TO GROUP 54A, REAR COMBINATION LIGHT P.54A-136).
- REAR END TRIM REFER TO GROUP 52A, TRIMS P.52A-23).

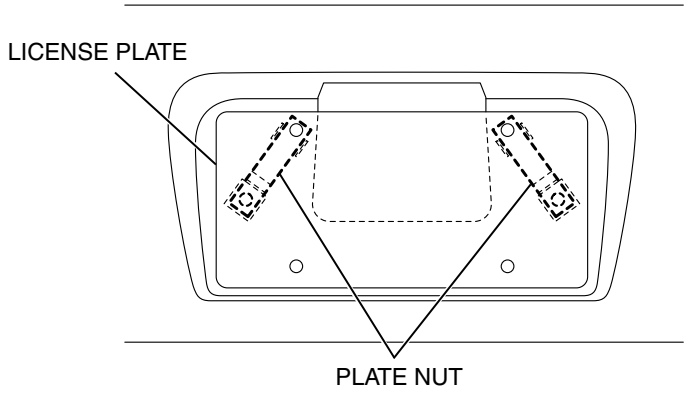
1. REAR SPLASH SHIELD
2. TAPPING SCREW

REMOVAL STEPS (Continued)

3. REAR BUMPER ASSEMBLY
4. REAR BUMPER CENTER BRACKET
5. REAR BUMPER SIDE BRACKET
6. REAR BUMPER CORE
7. REAR END OUTER PLATE
8. REAR BUMPER REINFORCEMENT

TSB Revision





⚠ CAUTION

IF THE REAR LICENSE PLATE IS REMOVED FOR THE FIRST TIME, INSTALL THE PLATE NUT OF REPAIR KIT IN THE REAR BUMPER AS SHOWN WHEN REASSEMBLING, RESTORING THE REAR LICENSE PLATE.

PLATE NUT: REPAIR KIT

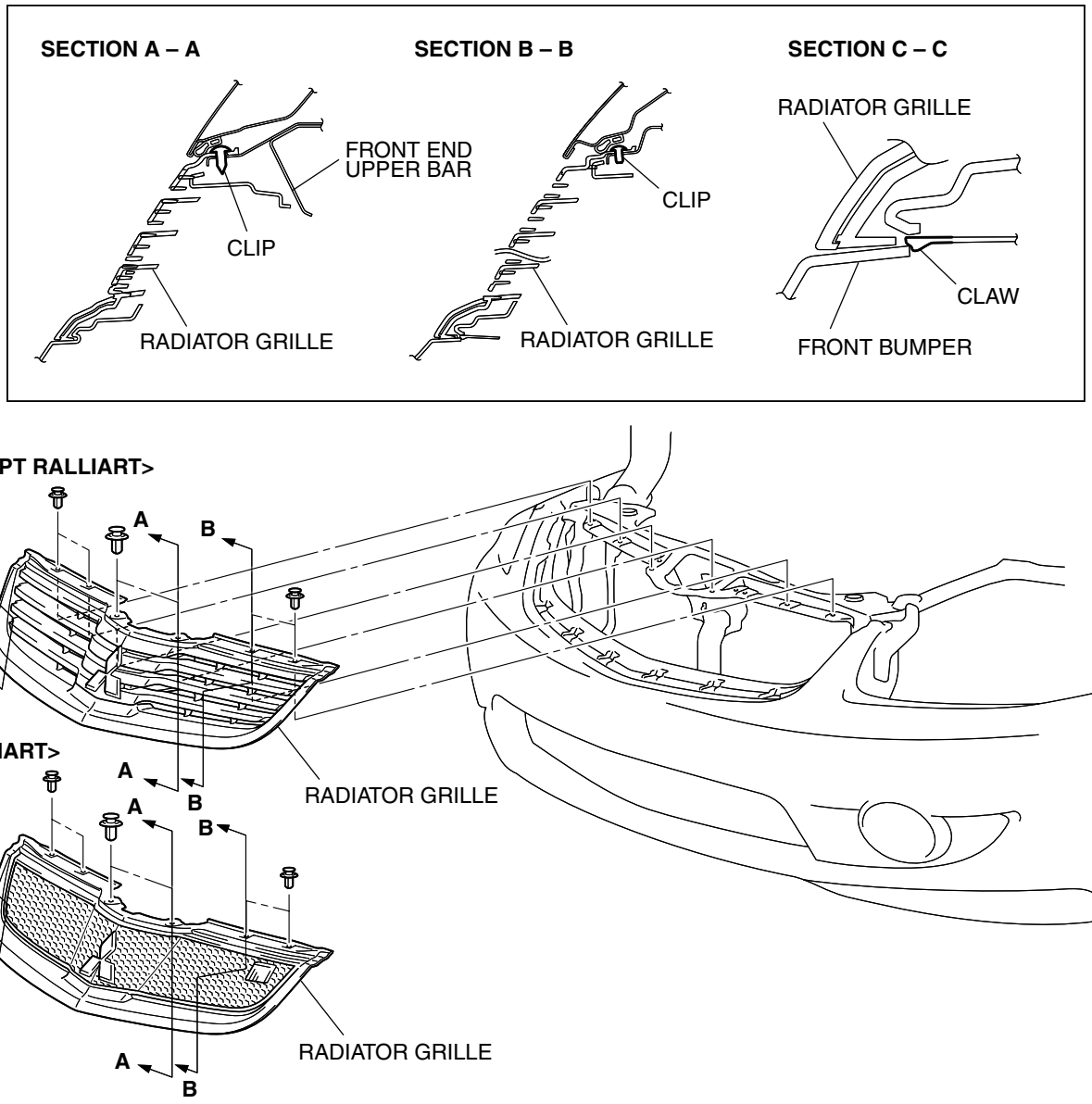
AC601231AB

TSB Revision

RADIATOR GRILLE

REMOVAL AND INSTALLATION

M1511002900709

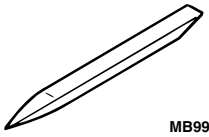


AC601232AB

GARNISHES AND MOLDINGS

SPECIAL TOOLS

M1511000601965

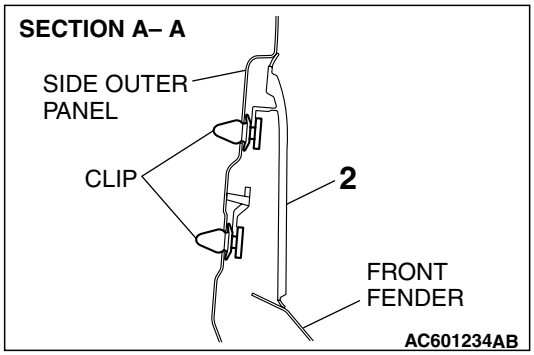
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990784	MB990784 Ornament remover	General service tool	Removal of roof drip molding

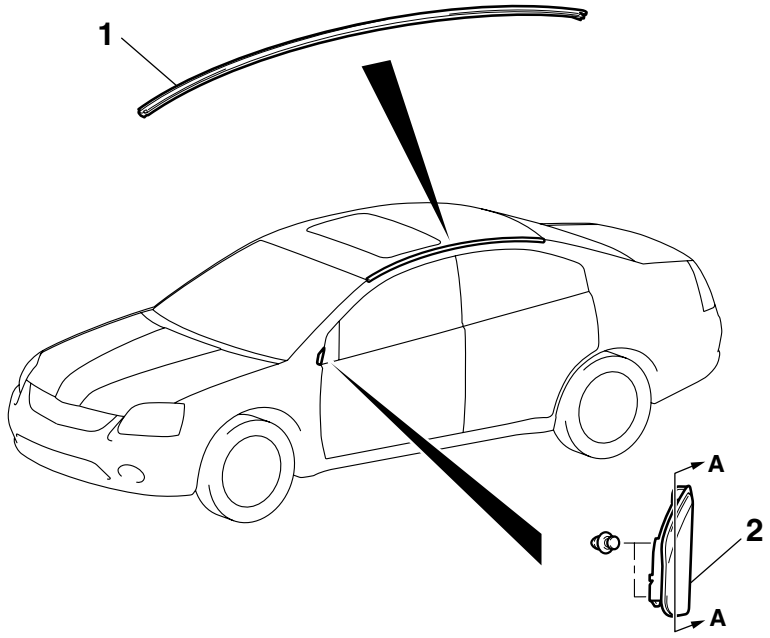
TSB Revision

MOLDINGS

REMOVAL AND INSTALLATION

M1511004700682





ROOF DRIP MOLDING REMOVAL STEPS

<<**A**>> >>**A**<< 1. ROOF DRIP MOLDING

FRONT DELTA GARNISH REMOVAL STEPS

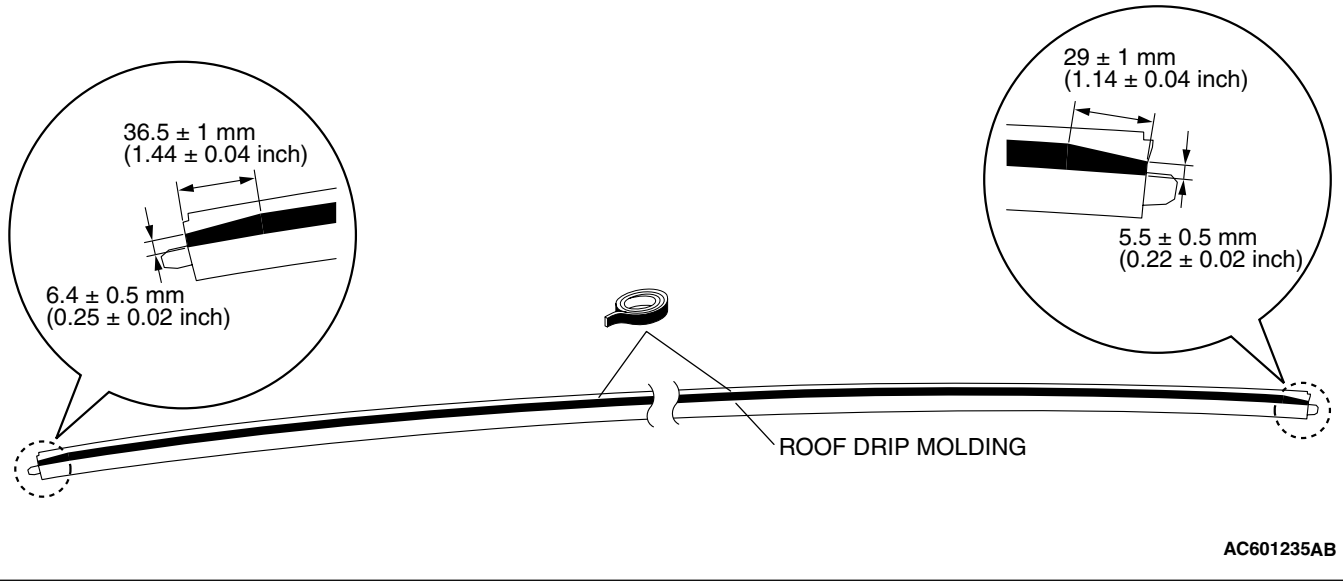
2. FRONT DELTA GARNISH

Required Special Tools:

- MB990784: Ornament Remover

TSB Revision

ADHESIVE TAPE POSITION



ADHESIVE TAPE: DOUBLE-SIDED TAPE: 10.0 mm (0.39 in) WIDTH AND 1.52 mm (0.06 in) THICKNESS

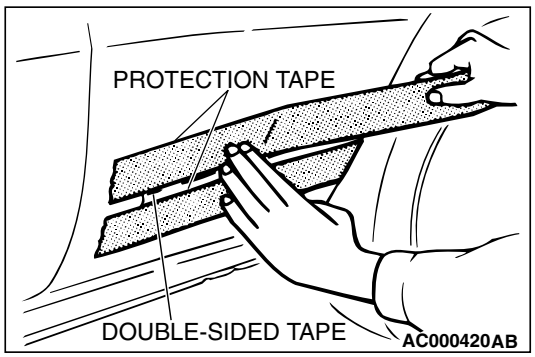
REMOVAL SERVICE POINTS

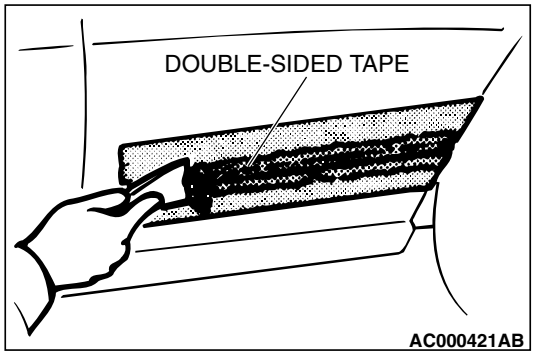
<<A>> ROOF DRIP MOLDING REMOVAL

Gently lift and remove the roof drip molding. If there is any double-sided tape remaining on the roof drip molding, remove according to the following instructions.

<Remove double-sided tape remaining on the body surface>

1. Attach protection tape all the way along the edges of the double-sided tape which is still adhering to the body.

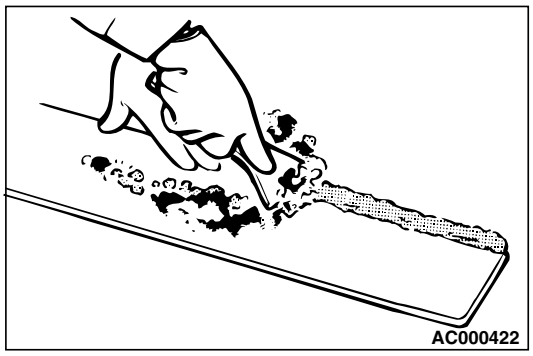




2. Scrape off the double-sided tape with a resin spatula as much as possible.
3. Peel off the protection tape.
4. Use a shop towel moistened with 3M™ AAD Part number 8906 or equivalent to wipe the body.

<Remove double-sided tape remaining on ROOF DRIP MOLDING and adhere double-sided tape (when re-using ROOF DRIP MOLDING)>

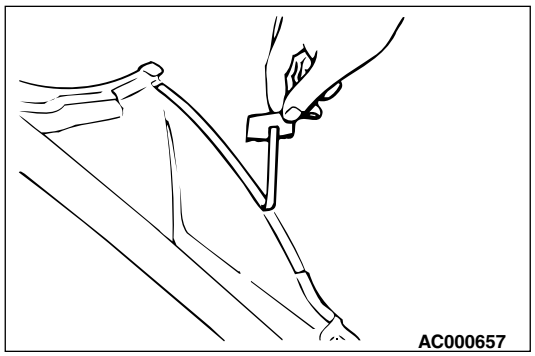
TSB Revision


AC000422

1. Scrape off the double-sided tape on the roof drip molding with a resin spatula as much as possible.
2. Use a shop towel moistened with 3M™ AAD Part number 8906 or equivalent to wipe the roof drip molding surface.
3. Remove only a small portion of the residual adhesive.
4. Apply primer to adherence area of the roof drip molding, then adhere the double-sided tape as specified on the roof drip molding (Refer to double-sided tape adherence location).

INSTALLATION SERVICE POINT

>>A<< ROOF DRIP MOLDING INSTALLATION.


AC000657

1. Tear off the double-sided tape backing paper.

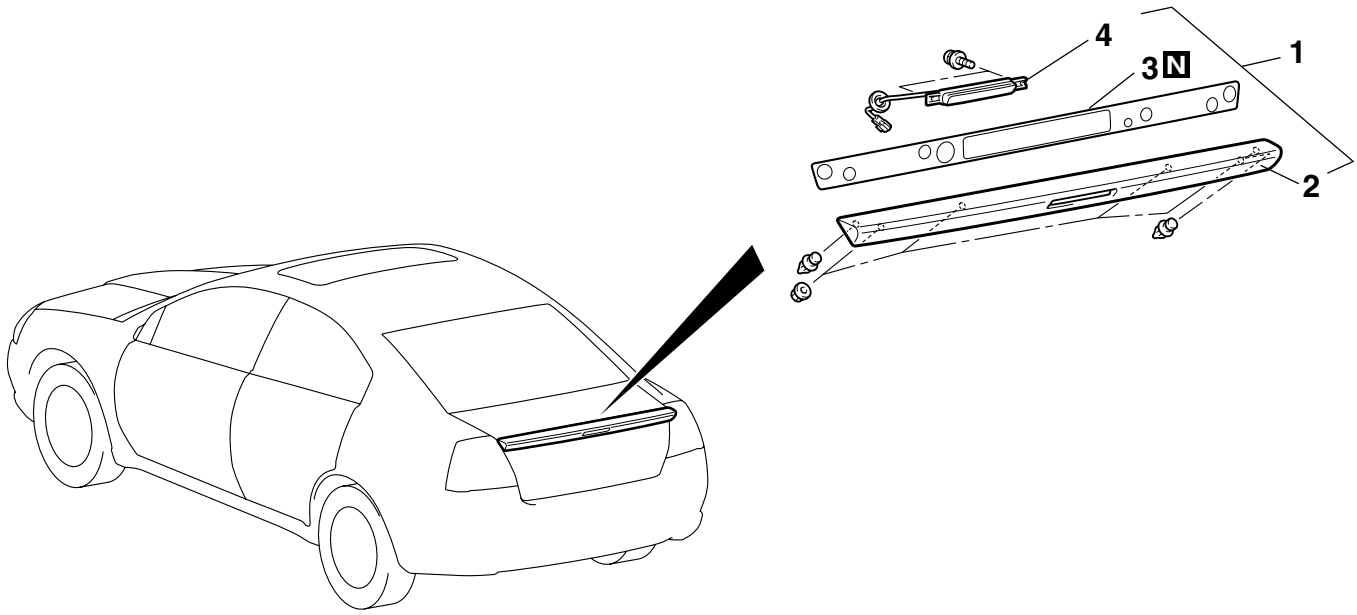
   NOTE: If you attach the adhesive tape to the edge of the backing paper, it will be easy to tear off.
2. Install the roof drip molding.

   NOTE: If the double-sided tape is difficult to affix in cold temperature, etc., warm the bonding surfaces of the body and roof drip molding to about 40 – 60°C (104 – 140°F) before affixing the tape.
3. Firmly press in the roof drip molding.

REAR SPOILER

REMOVAL AND INSTALLATION

M1511006100147



AC306525AC

TSB Revision

REMOVAL STEPS
- TRUNK LID BUMPER (REFER TO GROUP 42, TRUNK LID P.42-62).

1. REAR SPOILER ASSEMBLY
2. REAR SPOILER

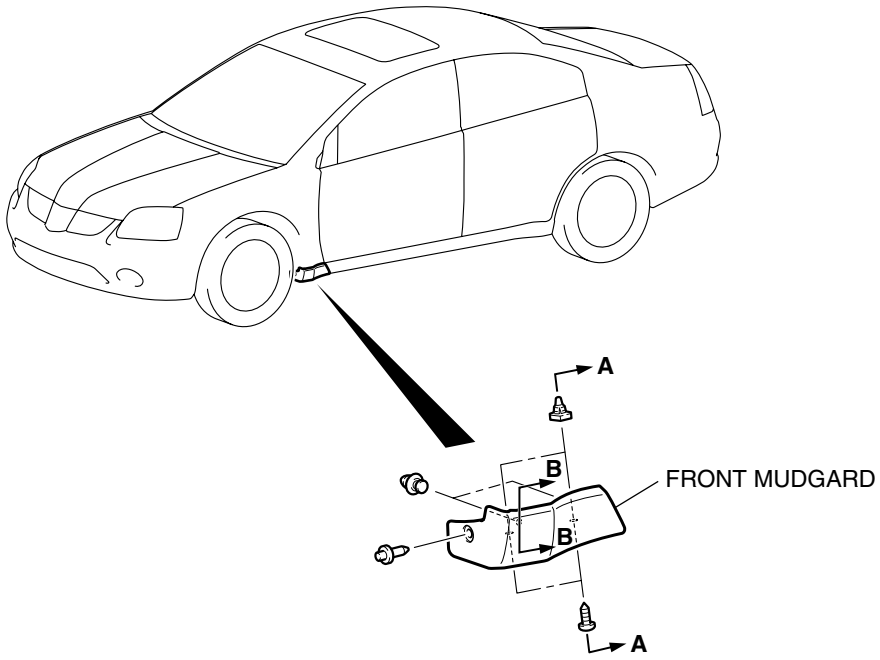
REMOVAL STEPS (Continued)

3 PACKING
4 HIGH-MOUNTED STOPLIGHT (REFER TO GROUP 54A, HIGH-MOUNTED STOPLIGHT P.54A-140.)

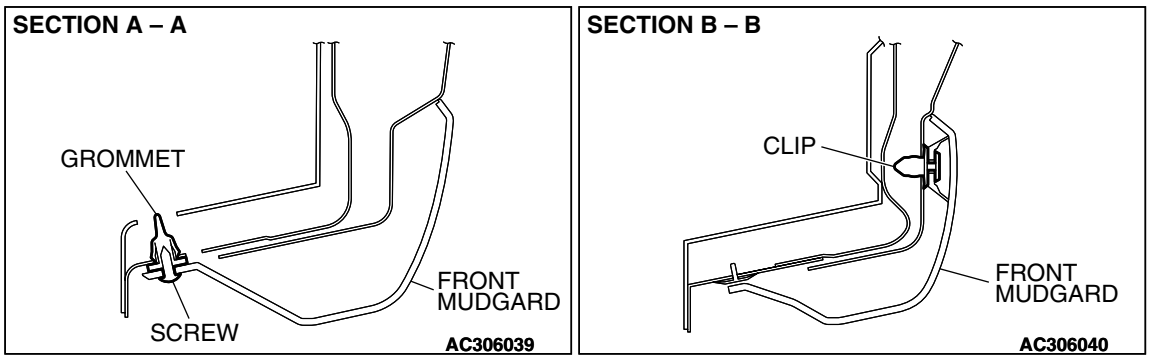
MUD GUARD

REMOVAL AND INSTALLATION

M1511011200065



AC306037AB



AC306470AB

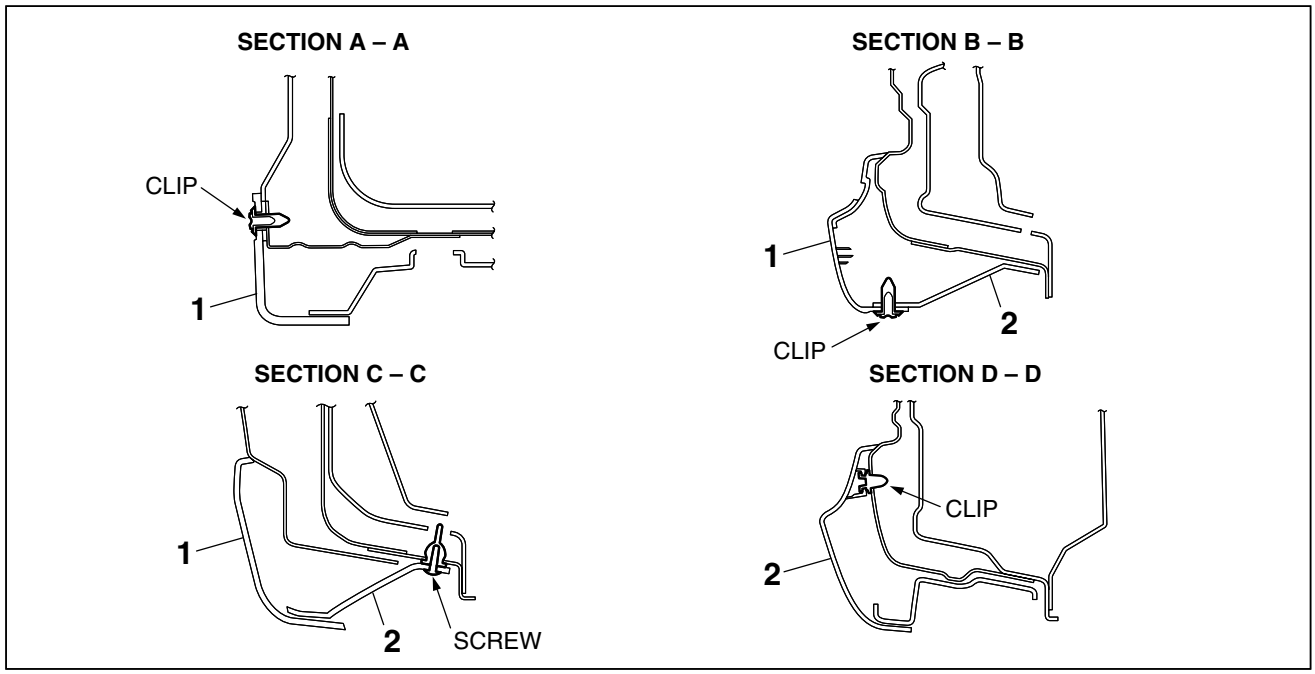
Required Special Tools:
- MB990784: Ornament Remover

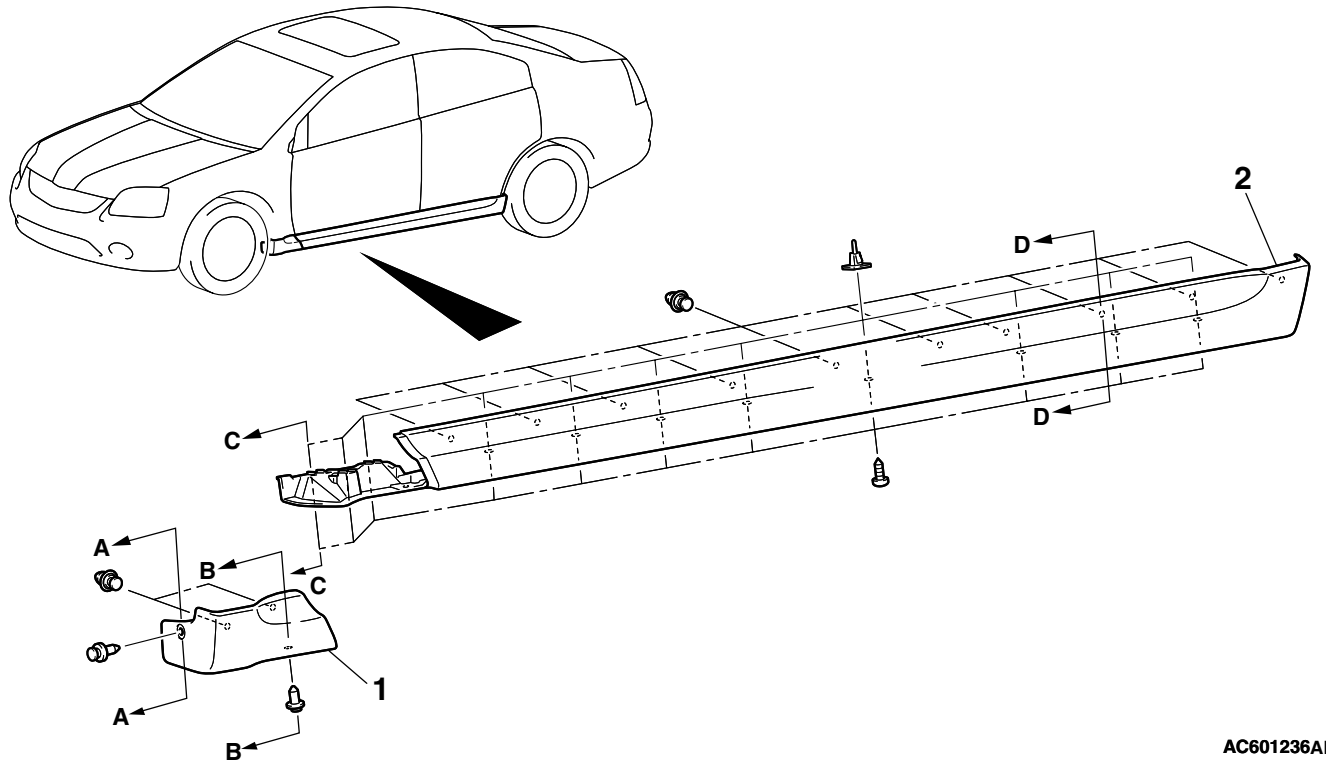
TSB Revision

SIDE AIR DAM

REMOVAL AND INSTALLATION

M1511005500443





AC601236AB

REMOVAL STEPS

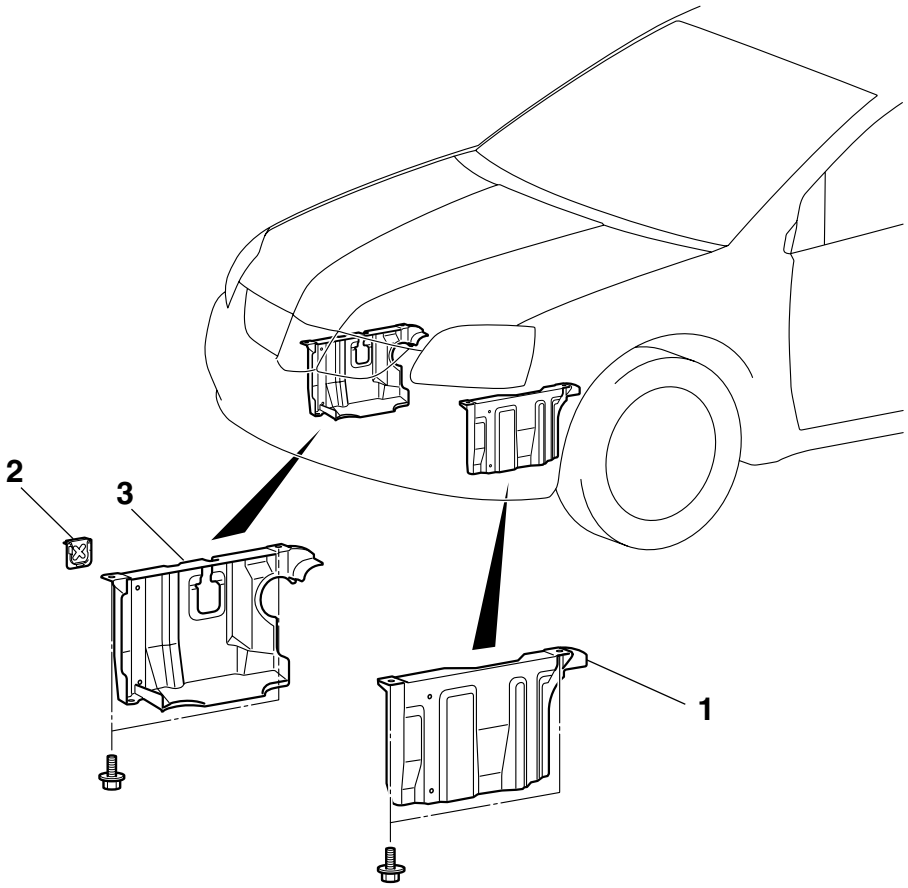
1. FRONT SIDE AIR DAM <RALLIART>
2. REAR SIDE AIR DAM <RALLIART>

TSB Revision

UNDER COVER

REMOVAL AND INSTALLATION

M1511019600119



AC306125 AB

REMOVAL STEPS
- FRONT BUMPER UNDER COVER (REFER TO P.51-2).

1. SIDE UNDER COVER (LH)

REMOVAL STEPS (Continued)
2. PLUG
3. SIDE UNDER COVER (RH)

WINDSHIELD WIPER AND WASHER

GENERAL DESCRIPTION

M1511000100558

WINDSHIELD WIPER AND WASHER OPERATION

WINDSHIELD LOW-SPEED (AND HIGH-SPEED) WIPER OPERATION

- If the windshield low-speed wiper switch is turned to the ON position with the ignition switch at the "ACC" or "ON" position, the column switch sends a low-speed wiper ON and high-speed wiper OFF signals to the front-ECU. This turns the wiper signal on and the wiper speed control relay off (low-speed), causing the wipers to operate at low-speed.
- If the windshield high-speed wiper switch is turned to the ON position, the column switch sends a low-speed wiper OFF and high-speed wiper ON signals to the front-ECU. This turns both the wiper signal and the wiper speed control relay on (high-speed), causing the wipers to operate at high-speed.

TSB Revision

NOTE: The windshield wiper speed is adjustable with the built-in wiper speed control relay. High-speed operations take place when the wiper speed control relay is set to "ON" and low-speed operations take place when the wiper speed control relay is set to "OFF".

WINDSHIELD INTERMITTENT WIPER OPERATION

The ETACS-ECU calculates the wiper operation interval according to the voltage signal sent from the column switch. Then the ETACS-ECU sends a signal to the front-ECU. The front-ECU determines the wiper operation interval and turns on the wiper relay signal relay. This causes the wiper auto stop relay to turn on. Then the wiper auto stop relay will turn off after the wipers reach the park position. This causes the wiper signal relay and then the wipers to turn off. If the wiper signal relay remains off for the wiper operation interval, the relay turns on again, causing the wipers to operate in intermittent mode.

WINDSHIELD MIST WIPER OPERATION

- If the windshield mist wiper switch is turned to the ON position with the ignition switch at the "ACC" or "ON" position, the mist wiper high-speed operation signal is sent to the front-ECU. This signal turns on the wiper speed control relay, causing the wipers to work at high-speed while the mist switch is on.
- While the windshield mist wiper switch remains turned on when the intermittent mode is still working, the wipers work as the mist wiper. However, the wipers return to the intermittent mode again when the switch is changed back to "INT" position.
- To prevent the windshield mist wiper from operating when the windshield wiper switch is turned OFF, the windshield mist wiper does not work for 0.5 second after the windshield intermittent wiper switch, the windshield low-speed wiper switch and the windshield high-speed wiper switch are turned OFF.

WINDSHIELD WASHER OPERATION

- If the windshield washer switch is turned to the ON position with the ignition switch at "ACC" or "ON" position, the windshield washer ON signal is sent to the front-ECU. After 0.3 second, the windshield wiper signal turns on. After the windshield washer switch signal turns off, the windshield wiper signal turns off in three seconds.
- If the windshield washer switch is turned on while the windshield wiper is at intermittent mode, and the windshield washer switch is turned OFF within 0.2 second, the wiper works only once to perform mist operation. When the windshield washer switch is turned on for more than 0.2 second, the wiper performs the same movement as normal condition from the time when 0.2 second has elapsed, and then returns to intermittent operation.

WINDSHIELD WIPER AND WASHER DIAGNOSIS

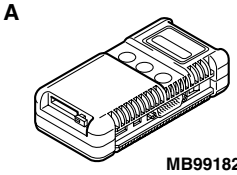
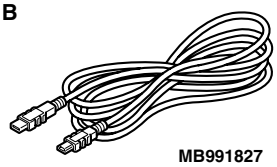
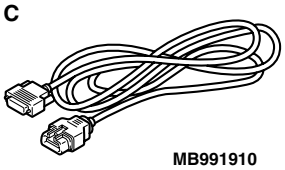
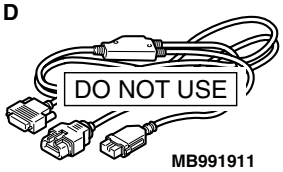
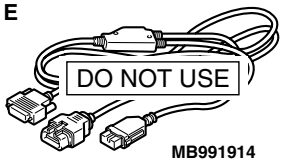
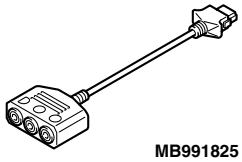
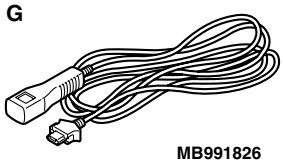
M1511000700389

The windshield wiper and washer are controlled by the Simplified Wiring System (SWS). For trouble-shooting, refer to GROUP 54B, SWS Diagnosis P.54B-14.

NOTE: Even when the ETACS-ECU has failed, the windshield wiper can work at low speed as fail-safe mode. (Normally, the windshield wiper operates when the ignition switch is at the "ACC" position. But, if it enters the fail-safe mode, the wiper can operate only when the ignition switch is at the "ON" position.)

SPECIAL TOOLS

M1511000601738

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III sub assembly A: Vehicle Communication Interface (V.C.I.) B: M.U.T.-III USB Cable C: M.U.T.-III Main Harness A (Vehicles with CAN communication system) D: M.U.T.-III Main Harness B (Vehicles without CAN communication system) E: M.U.T.-III Main Harness C (for Daimler Chrysler models only) F: M.U.T.-III Measurement Adapter G: M.U.T.-III Trigger Harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.*	Windshield intermittent wiper check **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**

ON-VEHICLE SERVICE

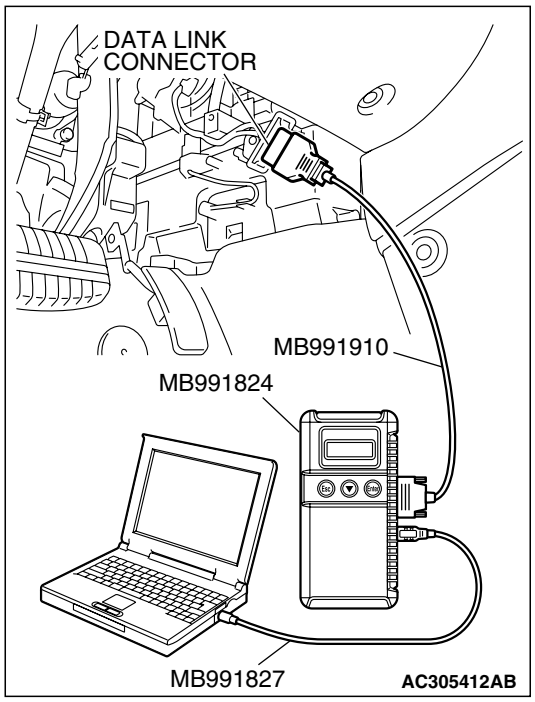
WINDSHIELD INTERMITTENT WIPER VOLUME CHECK

M1511018900043

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

TSB Revision



If the windshield intermittent wiper interval control is operated, the wiper interval should change.

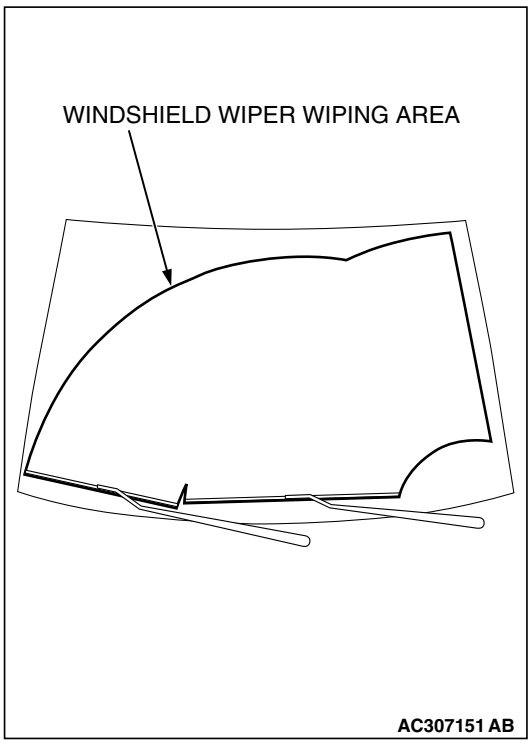
⚠ CAUTION

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. Operate scan tool MB991958 according to the procedure below to display "Simulated Vehicle Speed Output."
   (1) Select "SYSTEM SELECT."
   (2) Select "SWS."
   (3) Select "Simulated Vehicle Speed Output."
4. Holding the windshield intermittent wiper interval control, input the simulated vehicle speed with scan tool MB991958 and check that the wiper interval changes as the vehicle speed changes.
5. If not, carry out the troubleshooting (Refer to GROUP 54B, SWS Diagnosis P.54B-61).

WINDSHIELD WASHER FLUID EJECTION CHECK

M1511018400060



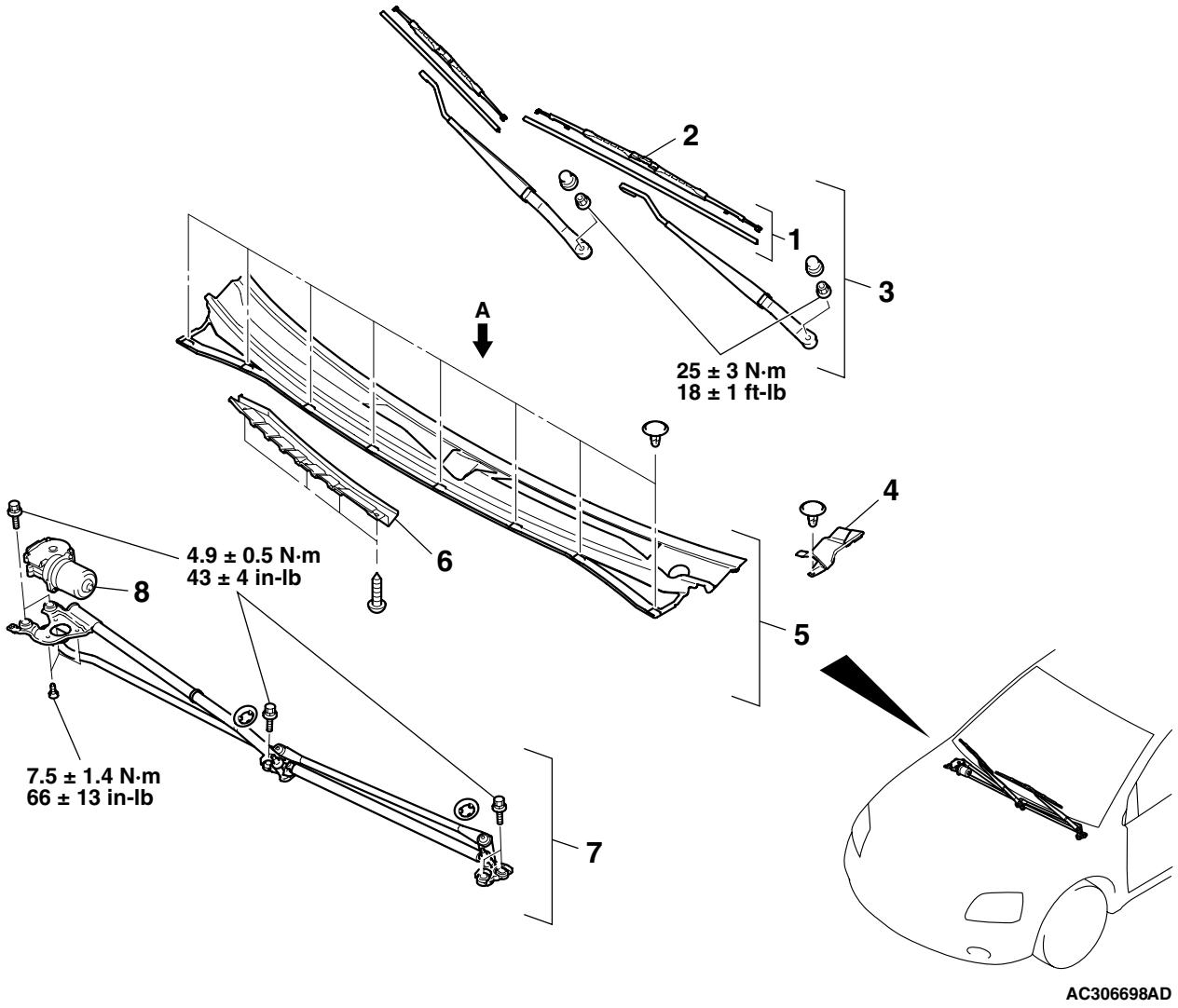
The windshield washer nozzle aiming cannot be adjusted. If the washer nozzles do not spray washer fluid within the windshield wiper wiping area, check the nozzles as follows:

1. Check that the windshield washer nozzles are fitted on the hood correctly, and reinstall them if necessary.
2. If the windshield washer nozzles are damaged, replace them (Refer to P.51-22).

WINDSHIELD WIPER

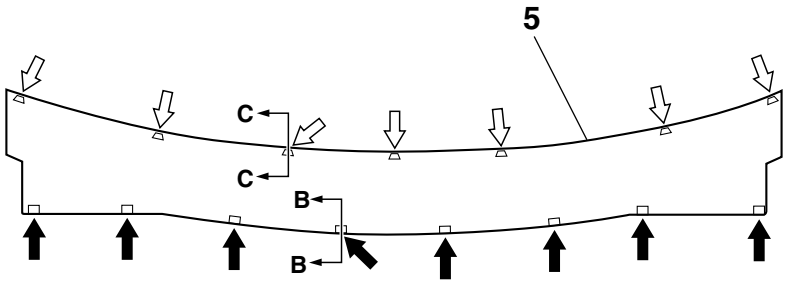
REMOVAL AND INSTALLATION

M1511007900168

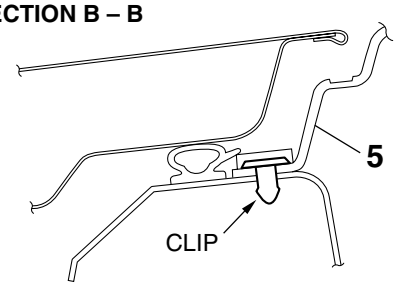


TSB Revision

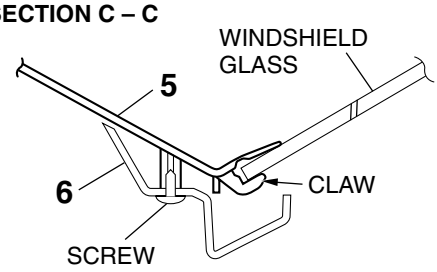
VIEW A



SECTION B – B



SECTION C – C



AC306703AC

NOTE
◀ : CLIP POSITIONS
⇦ : CLAW POSITIONS

WIPER BLADE REMOVAL STEPS
>>**B**<< 1. WIPER BLADE ASSEMBLY
>>**B**<< 2. WIPER BLADE RUBBER
>>**A**<< 3. WIPER ARM AND BLADE ASSEMBLY

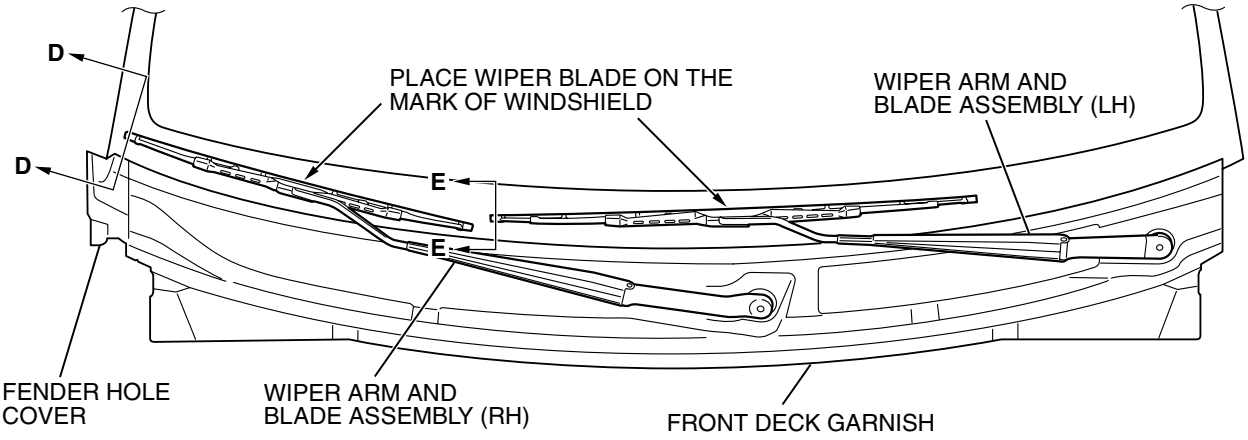
WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY REMOVAL STEPS
4. FENDER HOLE COVER
5. FRONT DECK GARNISH ASSEMBLY

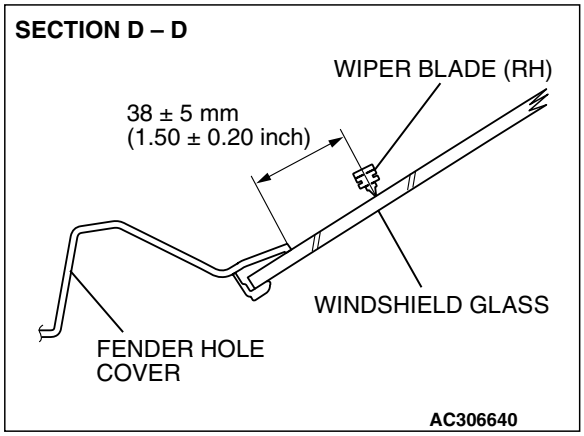
WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY REMOVAL STEPS
6. GUTTER
7. WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY
8. FENDER COVER

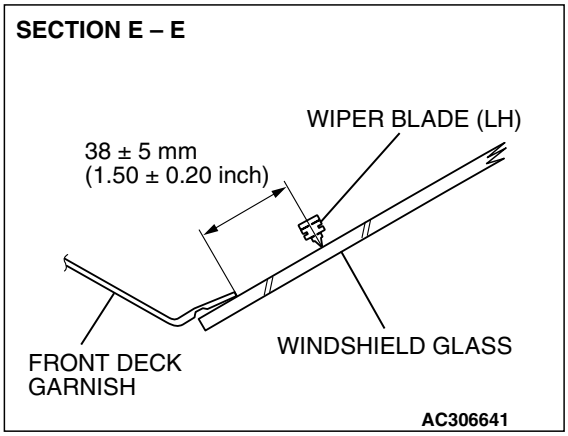
NOTE: For removal and installation of the wiper and washer switch, refer to GROUP 54A, Column switch *P.54A-144.*

INSTALLATION SERVICE POINTS

>>A<< WIPER ARM AND BLADE ASSEMBLY INSTALLATION

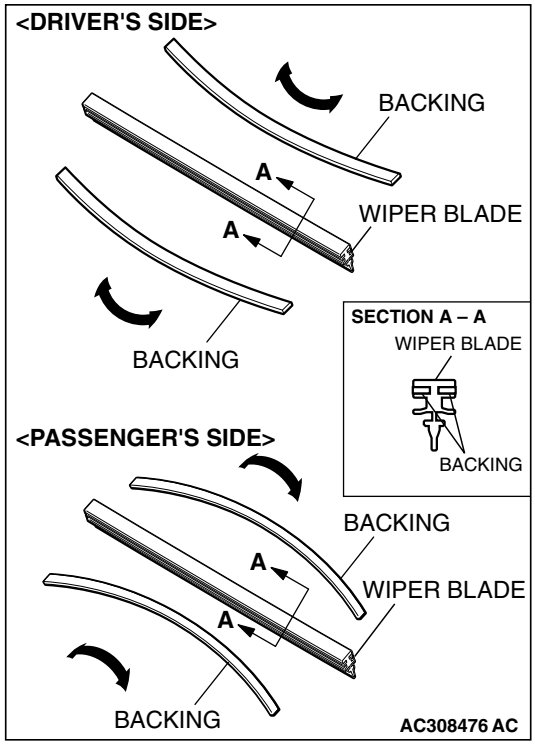






AC307178AC

Install the wiper blade at the position specified above.



>>B<< WIPER BLADE RUBBER/ WIPER BLADE ASSEMBLY INSTALLATION

⚠ CAUTION

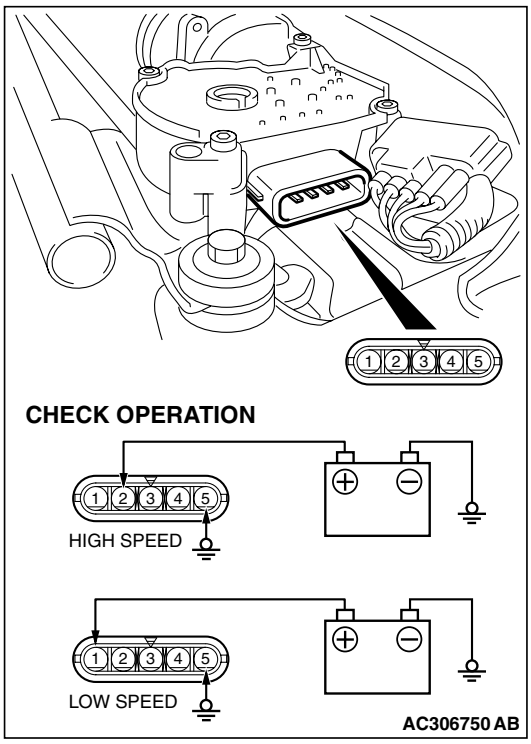
Ensure that the backings are bent in the direction indicated, and then install the backings to the wiper blade rubber.

INSPECTION

M1511008000146

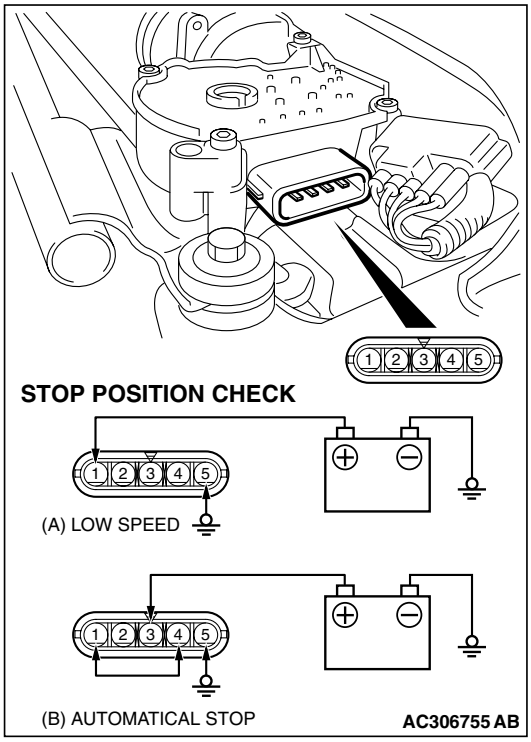
WINDSHIELD WIPER MOTOR CHECK

Inspect the windshield wiper motor by removing the harness connector with the motor attached to the vehicle.



WIPER MOTOR AT LOW OR HIGH SPEED OPERATION

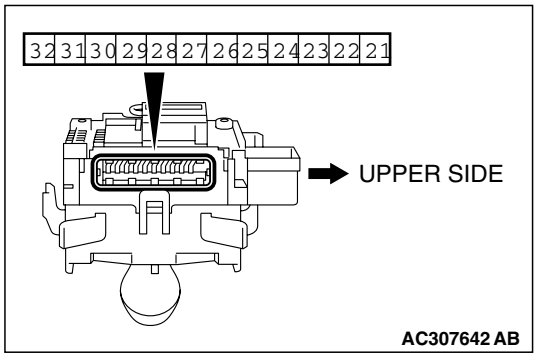
Connect the battery to the windshield wiper motor to inspect the operation of motor rotation in low or high speed.



WIPER MOTOR AT STOP POSITION OPERATION

1. Connect the battery to the windshield wiper motor as shown in the illustration (A).
2. Run the windshield wiper motor at low speed, then disconnect the battery in the middle of the motor turning and check to see that the motor stops.
3. As shown in the illustration (B), connect the terminals of the windshield wiper motor connectors.
4. Check to see that the windshield wiper motor runs at low speed and then stops at the automatic stop position.

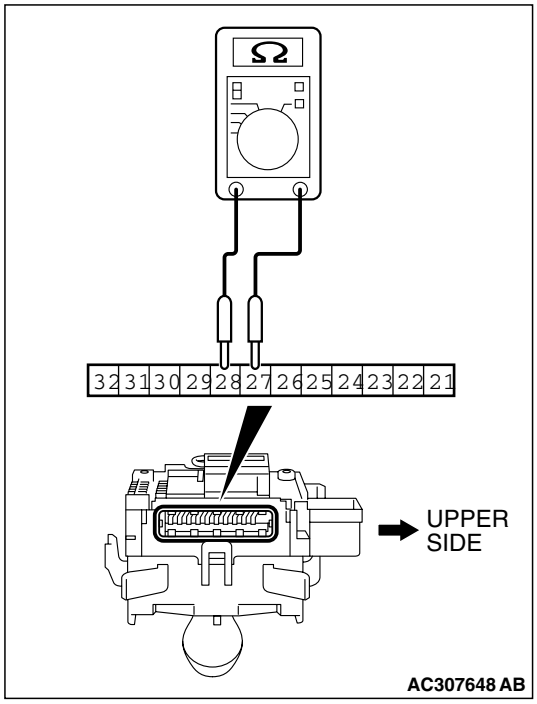
WINDSHIELD WIPER SWITCH CHECK



Check continuity between the switch terminals.

SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
OFF	23 – 32, 23 – 31, 23 – 30, 23 – 21	Open circuit
Windshield mist wiper switch	23 – 32	Less than 2 ohms
Windshield intermittent wiper switch	23 – 31	
Windshield low-speed wiper switch	23 – 30	
Windshield high-speed wiper switch	21 – 23	

WINDSHIELD INTERMITTENT WIPER INTERVAL CHECK

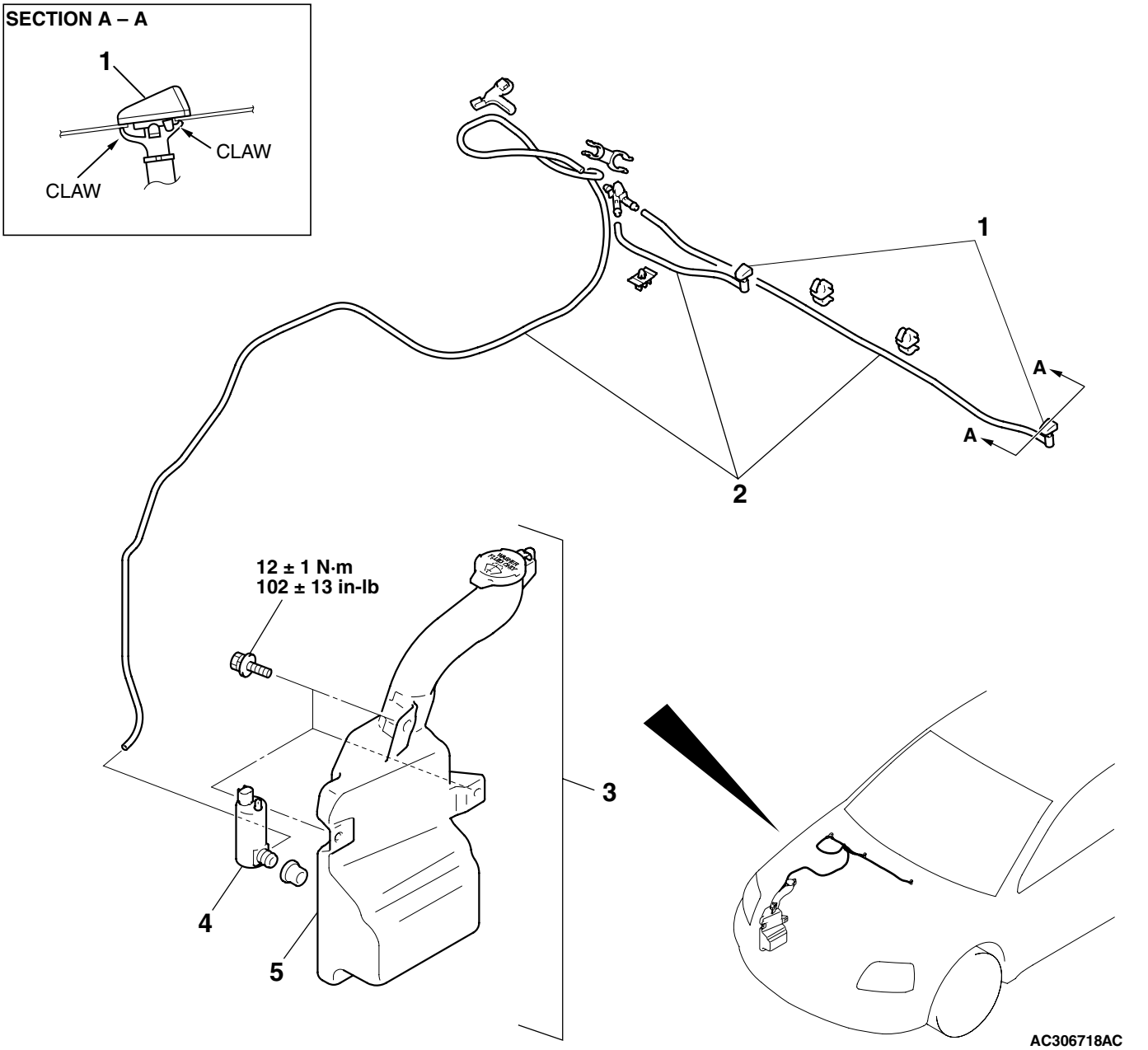


Check that the resistance varies between 0 and 1 kΩ when the windshield intermittent interval is turned from FAST to SLOW by after measuring resistance between connector terminals 27 and 28 at the column switch.

WINDSHIELD WASHER

REMOVAL AND INSTALLATION

M1511008200270



WINDSHIELD WASHER NOZZLE REMOVAL STEPS

- WINDSHIELD WASHER HOSE CONNECTION

1. WINDSHIELD WASHER NOZZLE

WASHER HOSE REMOVAL STEPS

- WINDSHIELD WASHER NOZZLE CONNECTION

2. WINDSHIELD WASHER HOSE

WASHER TANK REMOVAL STEPS

- FRONT UNDER COVER RH (REFER TO P.51-2).
- FRONT SPLASH SHIELD RH MOUNTING CLIPS (REFER TO GROUP 42, FENDER P.42-9).
- FRONT BUMPER (REFER TO P.51-2).
- HEAD LIGHT (REFER TO GROUP 54A, HEADLIGHT P.54A-130).
- FRONT WASHER HOSE CONNECTIONS

3. WASHER TANK ASSEMBLY

TSB Revision

WASHER TANK REMOVAL STEPS
4. WINDSHIELD WASHER MOTOR
5. WASHER TANK

WASHER MOTOR REMOVAL STEPS
- FRONT UNDER COVER RH (REFER TO P.51-2).
- FRONT WASHER HOSE CONNECTIONS

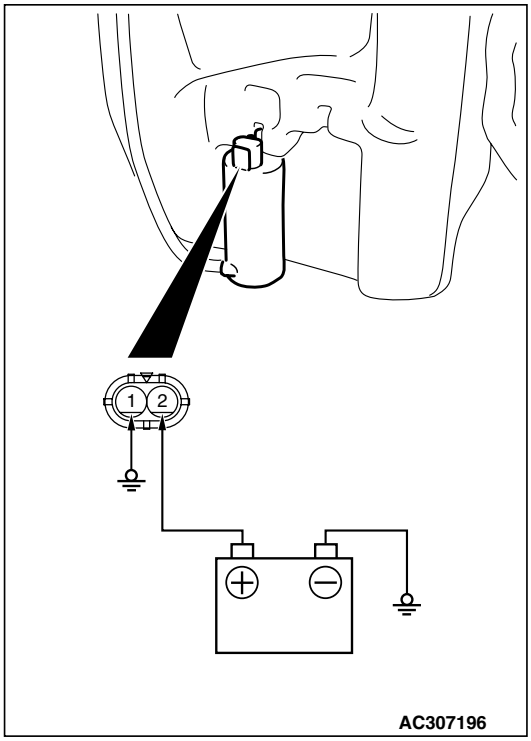
4. WINDSHIELD WASHER MOTOR

NOTE: For removal and installation of the wiper and washer switch, refer to GROUP 54A, Column switch P.54A-144.

INSPECTION

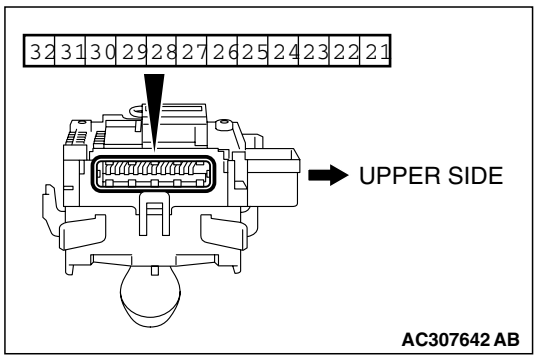
M1511008300147

WINDSHIELD WASHER MOTOR CHECK



1. Remove the washer tank assembly with the washer hose attached. Then fill the washer tank with water.
2. Check to see that the water is vigorously sprayed when connecting the positive battery terminal to terminal number 2 and terminal number 1 to ground.

WINDSHIELD WASHER SWITCH CHECK

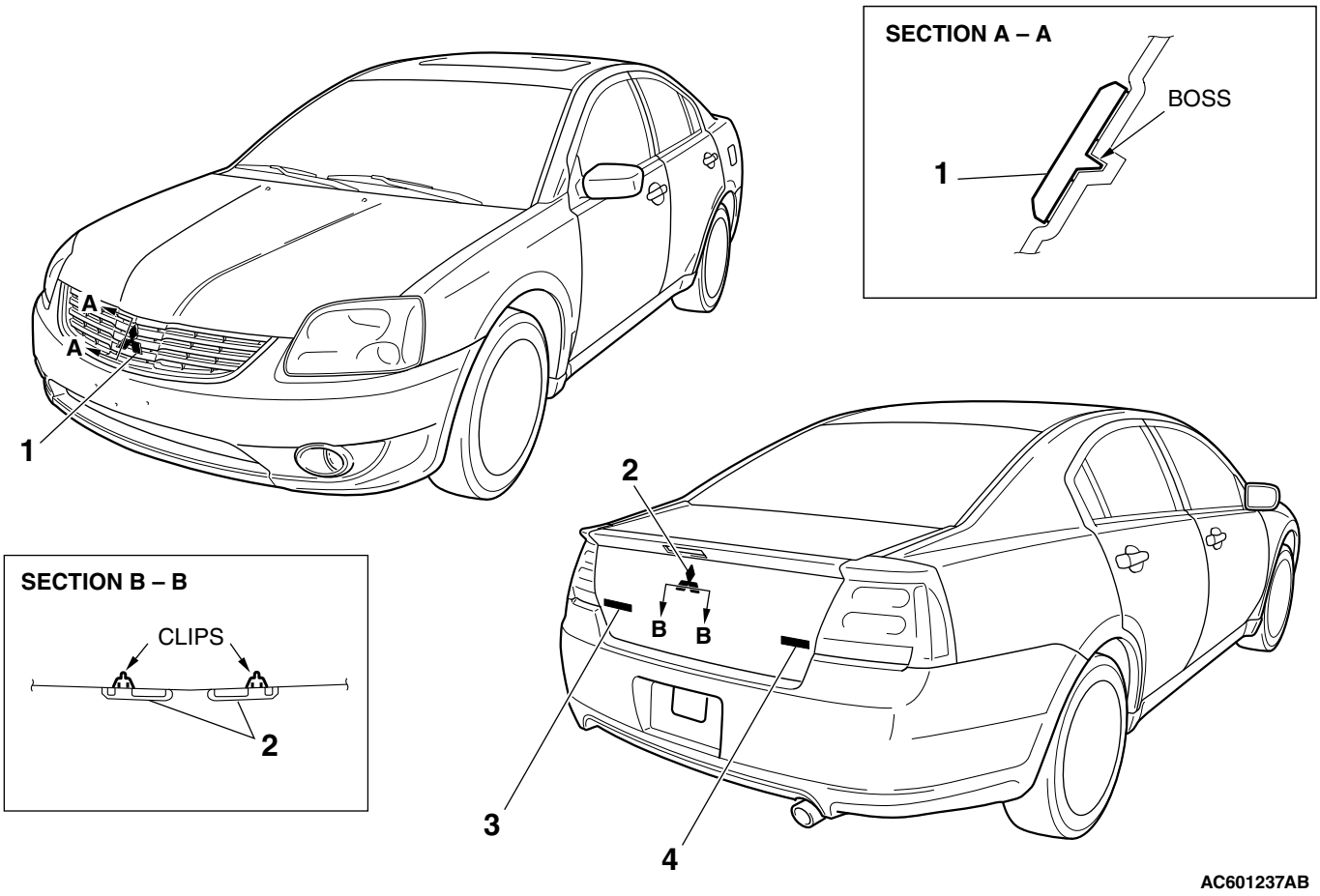


SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
OFF	22 – 23	Open circuit
Windshield washer switch ON	22 – 23	Less than 2 ohms

MARK

REMOVAL AND INSTALLATION

M1511011801811



AC601237AB

1. FRONT THREE-DIAMOND MARK
2. REAR THREE-DIAMOND MARK

>>**A**<< 3. GALANT MARK
>>**A**<< 4. 3.8 V6 MARK <3.8L ENGINE (EXCEPT MIVEC)> OR RALLIART MARK <3.8L ENGINE-MIVEC>

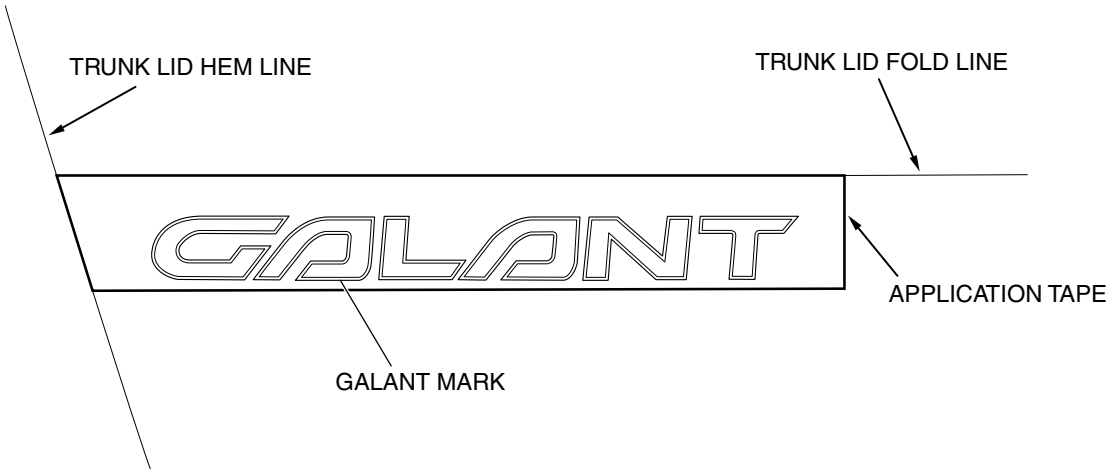
INSTALLATION SERVICE POINT

>>A<< MARK INSTALLATION

1. Installation position
   Attach each mark to the position shown in the illustration.

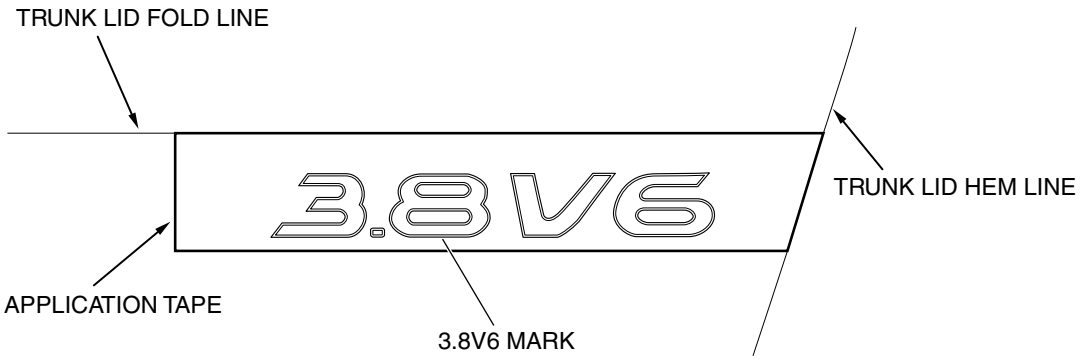
TSB Revision

3. GALANT MARK



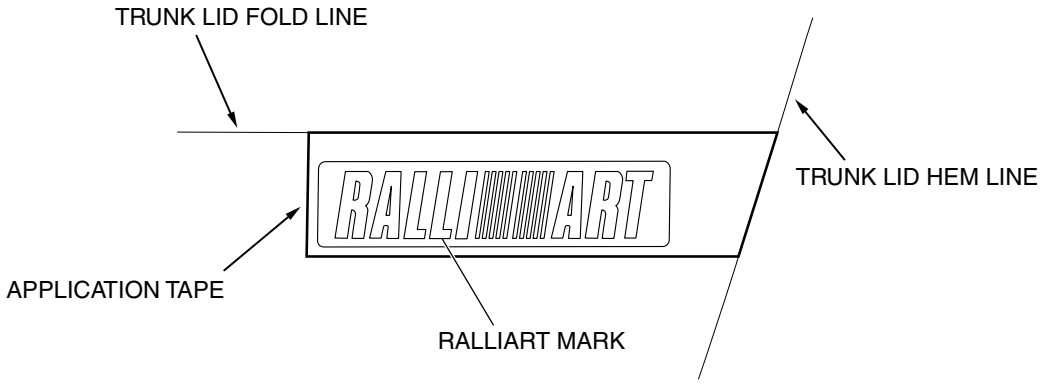
AC601267AB

4. 3.8 V6 MARK <3.8L ENGINE (EXCEPT MIVEC)>



AC601268AB

4. RALLIART MARK <3.8L ENGINE-MIVEC>



AC601269AB

2. Installation procedure
   (1) Use 3M™ AAD Part number 8906 or equivalent to clean the mark installation surfaces on the body.

⚠ CAUTION
When attaching the marks, the ambient temperature should be 20 – 38°C (60 – 100°F) and the air should be completely free of dust. If the ambient temperature is lower than 20°C (60°F), the marks and the places on the vehicle body where the marks are to be attached should be heated to 20 – 38°C (60 – 100°F).

(2) Peel off the protection sheet on the back of the marks to affix it in position.

DOOR MIRROR

GENERAL DESCRIPTION

M1511000100570

OPERATION DOOR MIRROR

Remote Controlled Mirror Operation

- The mirror on the door mirror moves up/down and left/right by operating the remote controlled door mirror switch when the ignition switch is in the "ON" or "ACC" position.

Heated Door Mirror operation

- The rear window defogger relay switch is activated (ON) by turning on the A/C-ECU built-in rear window defogger switch when the ignition switch is in the "ON" position. When the rear window defogger relay is turned ON, power is supplied to the rear window defogger and door mirror, and the heater of the door mirror (heated door mirror) starts operations. The rear window defogger comes with a timer function and will automatically turn OFF the switch approximately 16 minutes after the rear window defogger switch is turned ON. The heated door mirror operations are also terminated along with the rear window defogger, at this time.

HEATED DOOR MIRROR DIAGNOSIS

TROUBLESHOOTING STRATEGY

M1511014600170

Diagnosis should be carried out by the following procedures.

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

SYMPTOM CHART

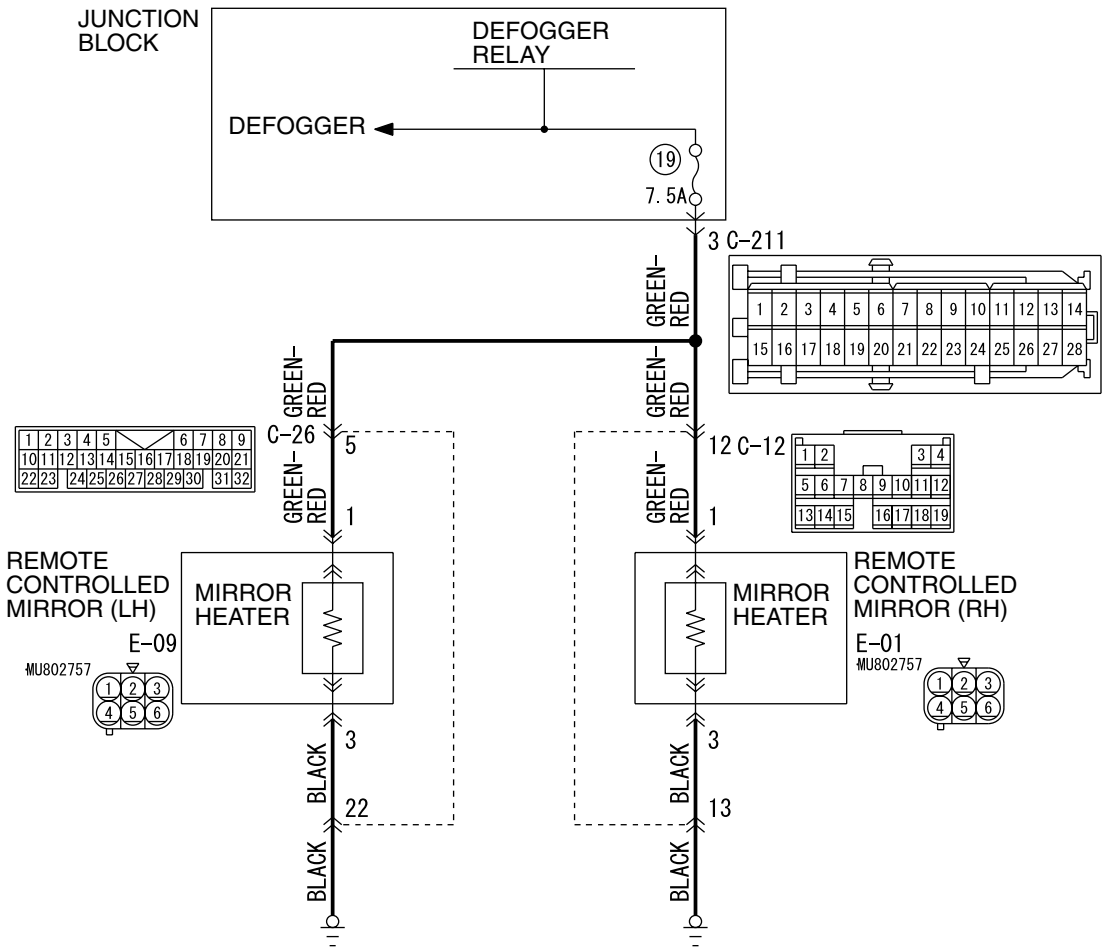
M1511015000171

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
All heated door mirrors do not operate	1	P.51-27
The right or left heated door mirror does not operate	2	P.51-32

SYMPTOM PROCEDURES

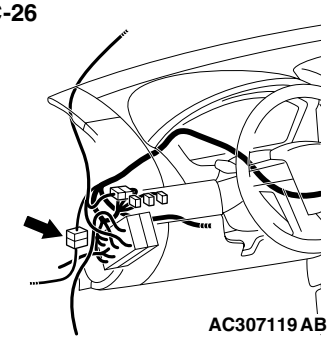
INSPECTION PROCEDURE 1: All Heated Door Mirrors do not Operate

Heated door mirror Circuit



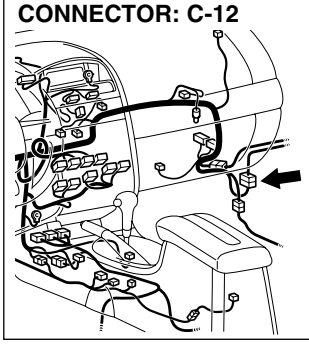
W4P51M00AA

CONNECTOR: C-26



AC307119 AB

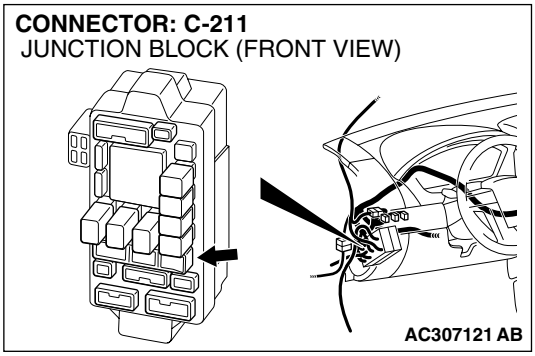
CONNECTOR: C-12



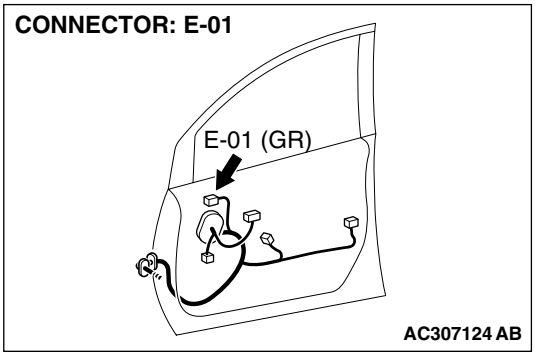
AC307118 AB

TSB Revision

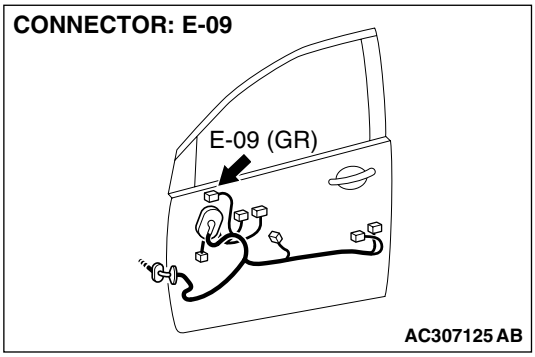
CONNECTOR: C-211
JUNCTION BLOCK (FRONT VIEW)



CONNECTOR: E-01



CONNECTOR: E-09



CIRCUIT OPERATION

If both of the door mirror heaters do not operate normally it may be due to a malfunction in the rear window defogger system.

TROUBLESHOOTING HINTS

- Malfunction of the rear window defogger system
- The wiring harness or connectors may have loose, corroded or damaged terminals, or terminals pushed back in the connector.

DIAGNOSIS

Required Special Tools:

- MB991223: Test Harness Set

STEP 1. Check the rear window defogger.

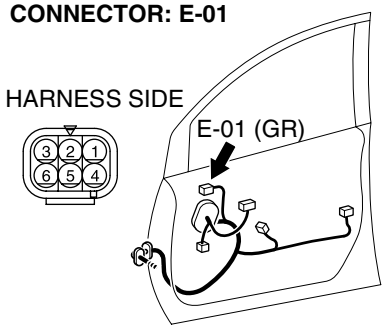
Check that the rear window defogger works normally as follows.

(1) Turn the ignition switch to the "ON" position.
(2) Push the rear window defogger switch to operate the defogger.

Q: Does the defogger work normally?

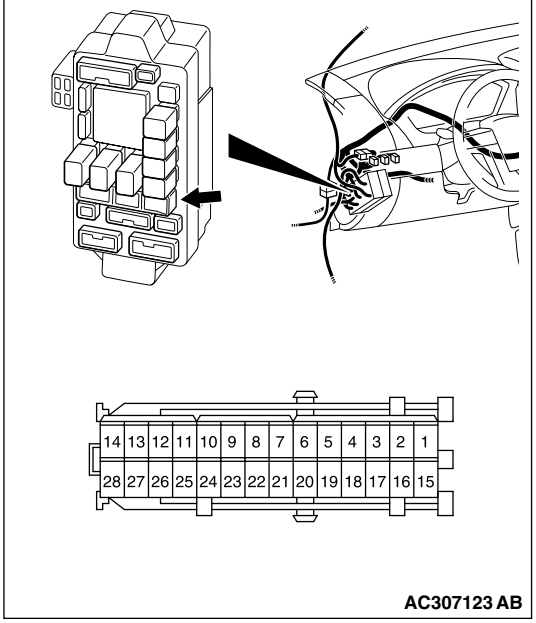
YES : Go to Step 2.
NO : Because of malfunction of the rear window defogger, carry out the troubleshooting (Refer to GROUP 55A, Manual A/C Diagnosis P.55A-178).

CONNECTOR: E-01



AC307124 AC

CONNECTOR: C-211
JUNCTION BLOCK (FRONT VIEW)



AC307123 AB

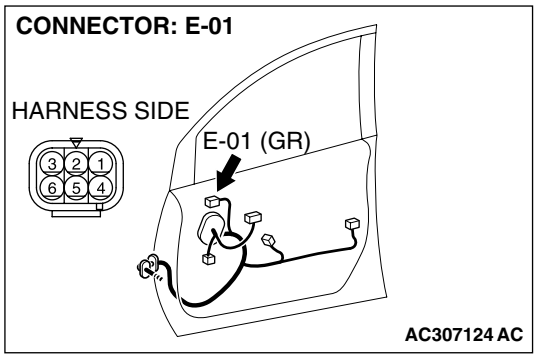
STEP 2. Check the remote controlled mirror (RH) connector E-01 and junction block connector C-211 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

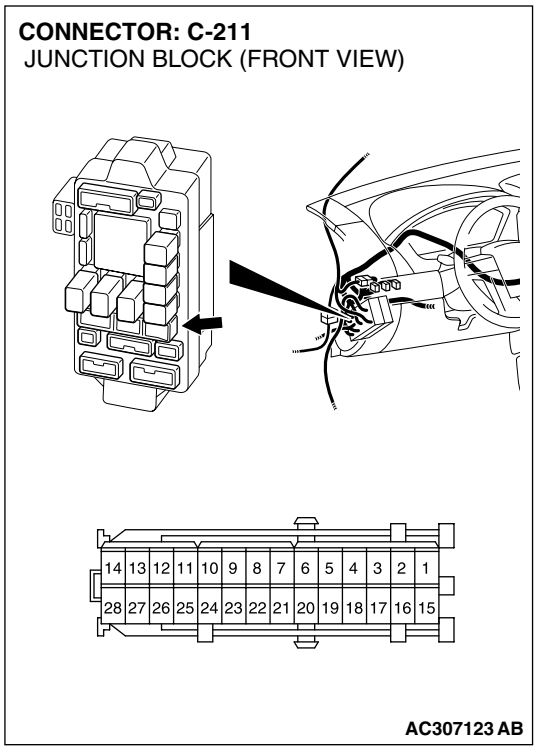
Q: Are the remote controlled mirror (RH) connector E-01 and junction block connector C-211 in good condition?

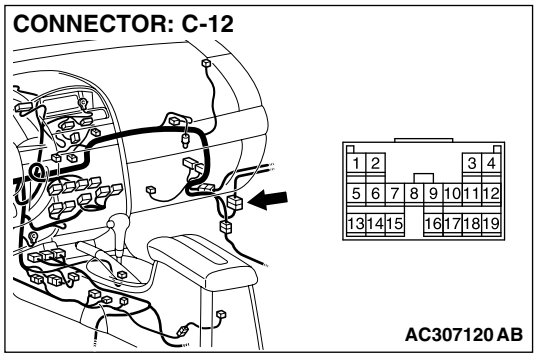
YES : Go to Step 3.

NO : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Check if the door mirrors works normally.

STEP 3. Check the wiring harness between the remote controlled mirror (RH) connector E-01 (terminal 1) and junction block connector C-211 (terminal 3).







NOTE: Also check intermediate connector C-12 for loose, corroded or damaged terminals, or terminals pushed back in the connector. If intermediate connector C-12 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is the wiring harness between remote controlled mirror (RH) connector E-01 (terminal 1) and junction block connector C-211 (terminal 3) in good condition?

YES : Go to step 4.

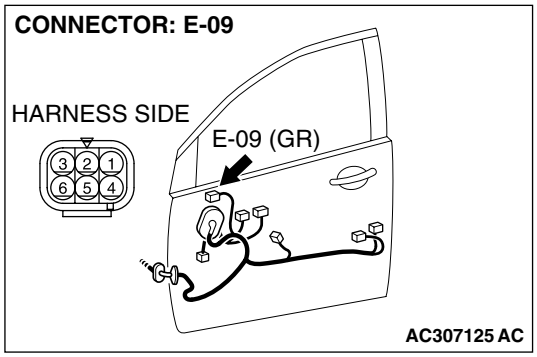
NO : Repair the wiring harness as necessary. Check if the all heated door mirrors work normally.

STEP 4. Check remote controlled mirror (LH) connector E-09.

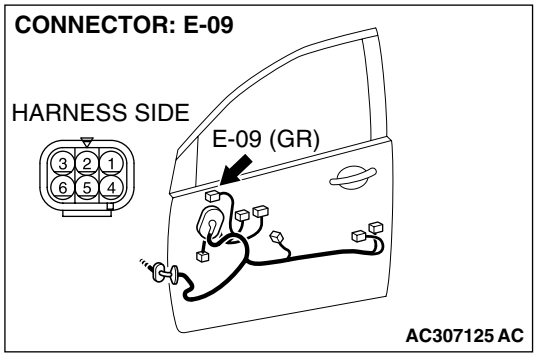
Q: Is remote controlled mirror (LH) connector E-09 in good condition?

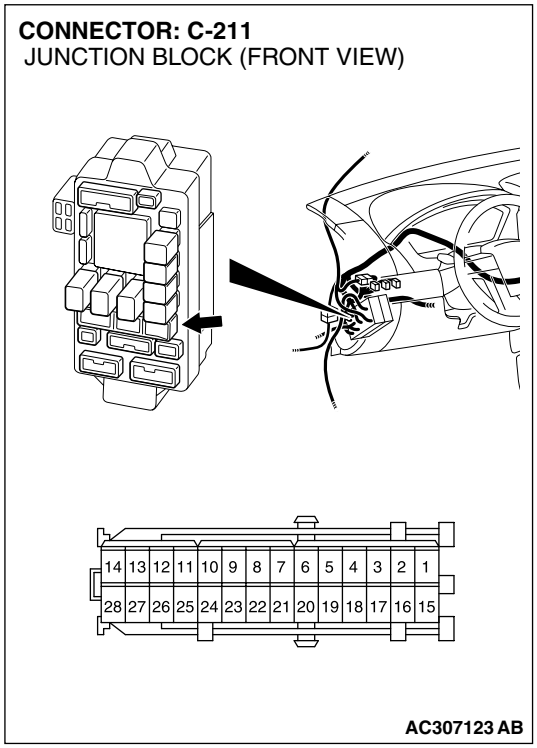
YES : Go to Step 5.

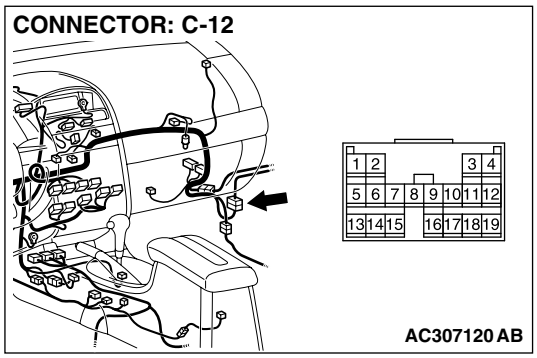
NO : Repair or replace the damaged component(s). Check if the all heated door mirrors works normally.



STEP 5. Check the wiring harness between remote controlled mirror (LH) connector E-09 (terminal 1) and junction block connector C-211 (terminal 3).







NOTE: Also check intermediate connector C-26 for loose, corroded or damaged terminals, or terminals pushed back in the connector. If intermediate connector C-26 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2.

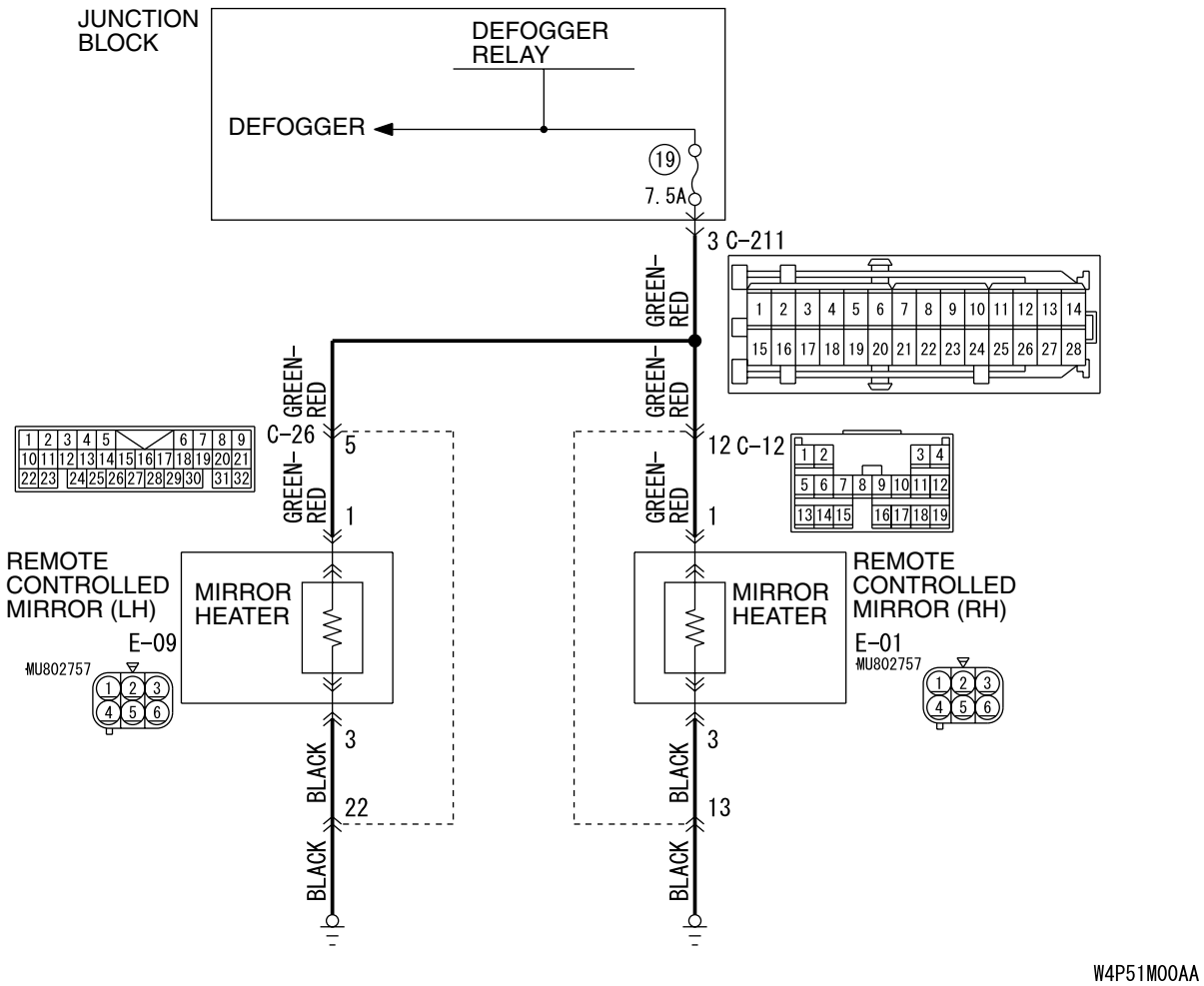
Q: Is the wiring harness between remote controlled mirror (RH) connector E-09 (terminal 1) and junction block connector C-211 (terminal 3) in good condition?

YES : The procedure is complete.

NO : Repair the wiring harness as necessary. Check if the all heated door mirrors work normally.

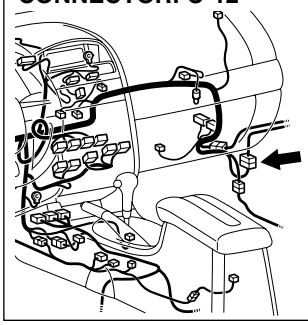
INSPECTION PROCEDURE 2: Right or Left Heated Door Mirror does not Operate

Heated door mirror Circuit



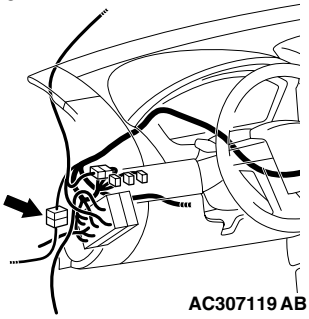
W4P51M00AA

CONNECTOR: C-12



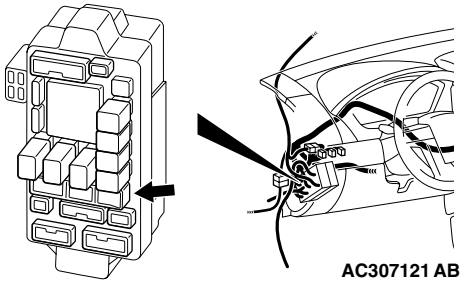
AC307118 AB

CONNECTOR: C-26



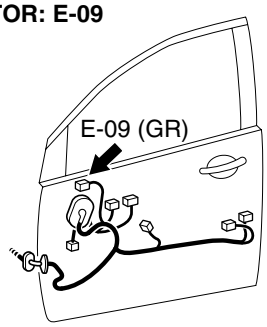
AC307119 AB

CONNECTOR: C-211
JUNCTION BLOCK (FRONT VIEW)



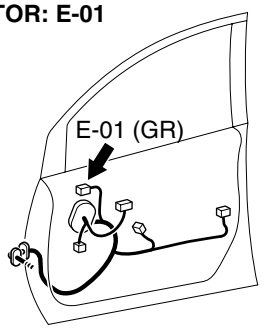
AC307121 AB

CONNECTOR: E-09



AC307125 AB

CONNECTOR: E-01



AC307124 AB

CIRCUIT OPERATION

If either of the heated door mirrors do not operate normally, it may be due to malfunctions in the heated door mirror circuit or door mirror.

TROUBLESHOOTING HINTS

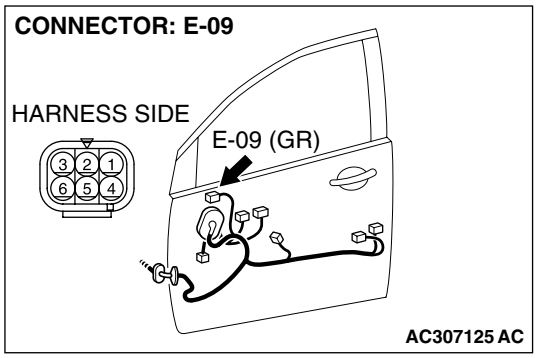
- Malfunction of the heated door mirror circuit
- Malfunction of the door mirror
- The wiring harness or connectors may have loose, corroded, or damaged terminals, or terminals pushed back in the connector.

DIAGNOSIS

STEP 1. Verify the operation of each heated door mirror.

Q: Which door mirror does not heat?

Door mirror (LH) : Go to Step 2.
Door mirror (RH) : Go to Step 8.



STEP 2. Check remote controlled mirror (LH) connector E-09 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is remote controlled mirror (LH) connector E-09 in good condition?

YES : Go to Step 3.

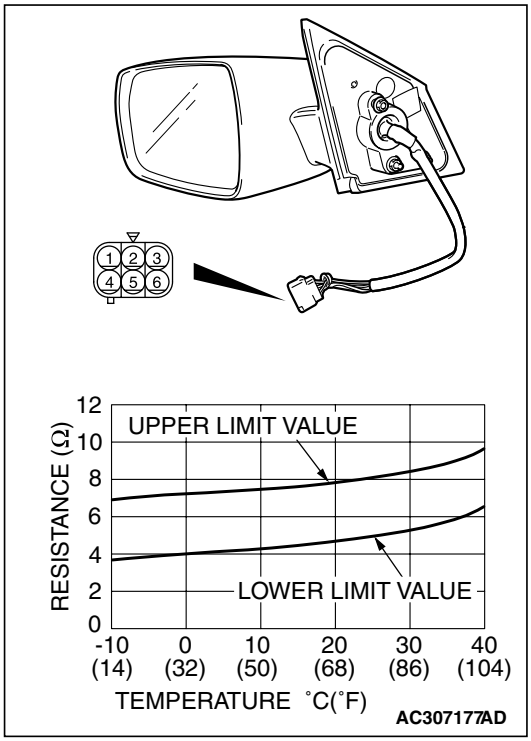
NO : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. And then check to see that the heater function of the door mirror (LH) operates normally.

STEP 3. Check the heater of the door mirror (LH).

⚠ CAUTION

When relocating the car between locations of extremely different temperatures (warm and cold), leave the car in the location for a while to adapt to the temperature prior to checking it.

Check to see that the resistance shown in the graph is almost satisfied when measuring the resistance between terminal 1 and 3 of the remote controlled mirror (LH) connector E-09.

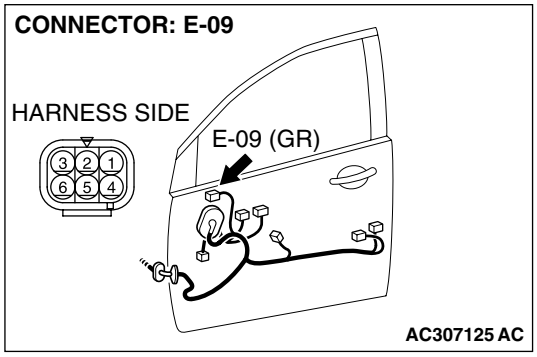


Q: Is the resistance normal?

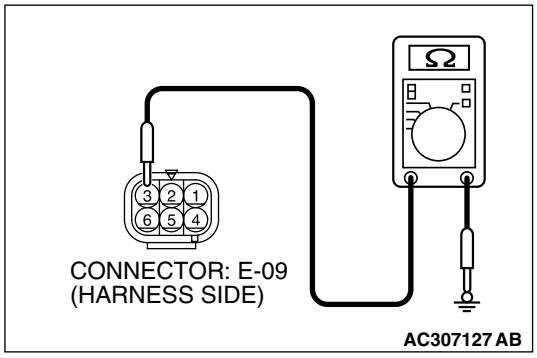
YES : Go to Step 4.

NO : Replace the door mirror (LH). And then check to see that the heater function of the door mirror (LH) is operating normally.

STEP 4. Check the ground circuit to between remote controlled mirror (LH) connector E-09 and ground for open circuit. Measure the resistance at remote controlled mirror (LH) connector E-09.



(1) Disconnect remote controlled mirror (LH) connector E-09 and check at the wiring harness side connector.

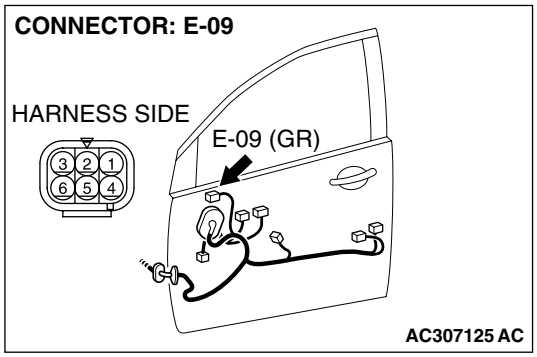


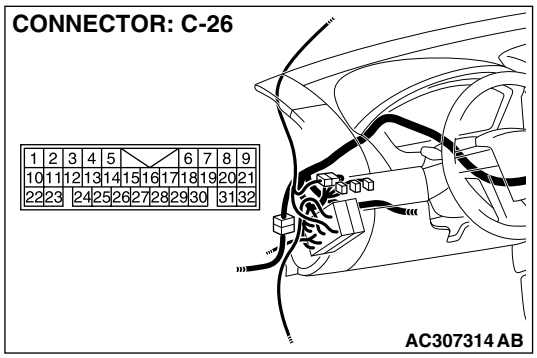
(2) Measure the resistance value between terminal 3 and ground.
- The resistance should equal 2 ohms or less.

Q: Is the measured resistance 2 ohms or less?

YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check the wiring harness between remote controlled mirror (LH) connector E-09 (terminal 3) and ground.





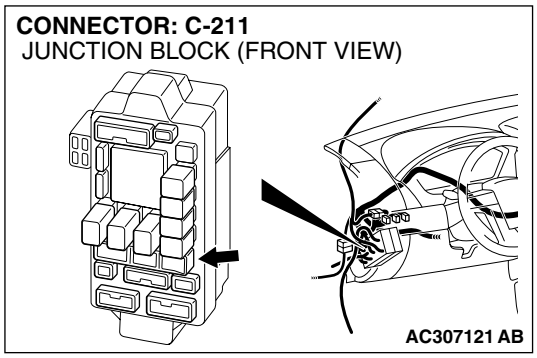
NOTE: Also check intermediate connector C-26 for loose, corroded or damaged terminals, or terminals pushed back in the connector. If intermediate connector C-26 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is the wiring harness between remote controlled mirror (LH) connector E-09 (terminal 3) and ground in good condition?

YES : No action is necessary and testing is complete.

NO : The wiring harness may be damaged. Repair the wiring harness as necessary. And then check to see that the heater function of the door mirror (LH) operates normally.

STEP 6. Check junction block C-211 for loose, corroded damaged terminal, or terminals pushed back in the connector.

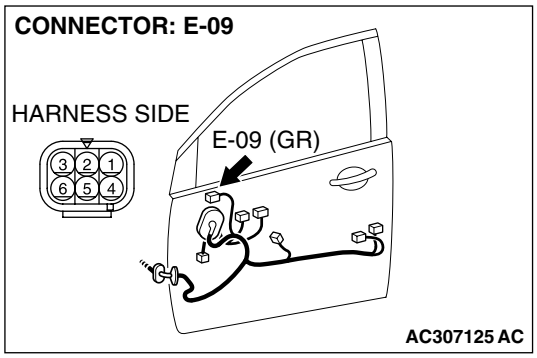


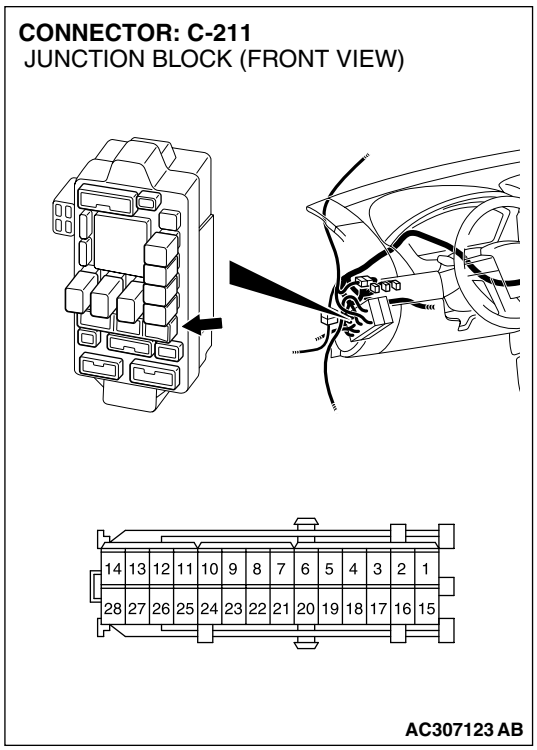
Q: Is junction block C-211 in good condition?

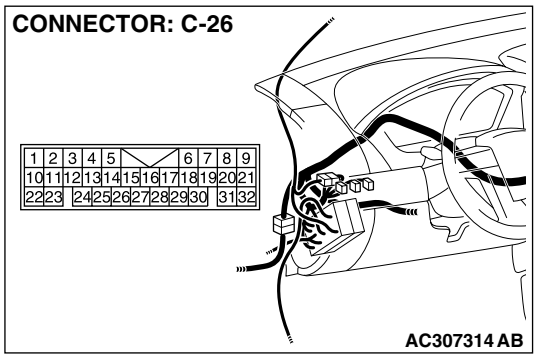
YES : Go to Step 7.

NO : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. And then check to see that the heater function of the door mirror (LH) operates normally.

STEP 7. Check the wiring harness between remote controlled mirror (LH) connector E-09 (terminal 1) and junction block connector C-211 (terminal 3).





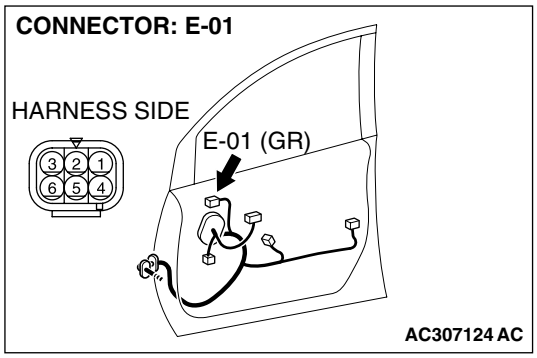


NOTE: Also check intermediate connector C-26 for loose, corroded or damaged terminals, or terminals pushed back in the connector. If intermediate connector C-26 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is the wiring harness between remote controlled mirror (LH) connector E-09 (terminal 1) and junction block connector C-211 (terminal 3) in good condition?

YES : No action is necessary and testing is complete.

NO : Repair the wiring harness as necessary. And then check to see that the heater function of the door mirror (LH) operates normally.



STEP 8. Check the remote controlled mirror (RH) connector E-01 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is the remote controlled mirror (RH) connector E-01 in good condition?

YES : Go to Step 9.

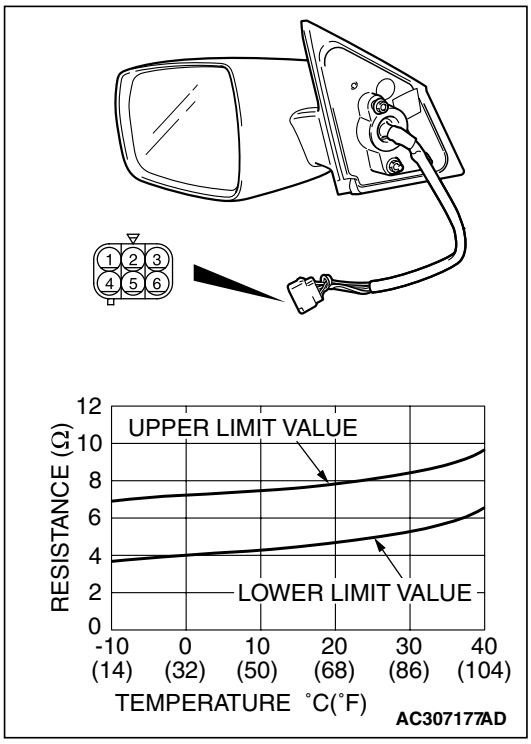
NO : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. And then check to see that the heater function of the door mirror (RH) operates normally.

STEP 9. Check the heater function of the door mirror (RH).

⚠ CAUTION

When relocating the car between locations of extremely different temperatures (warm and cold), leave the car in the location for a while to adapt to the temperature prior to checking it.

Check to see that the resistance shown in the graph is almost satisfied when measuring the resistance between terminal 1 and 3 of the door mirror (RH) connector E-01.

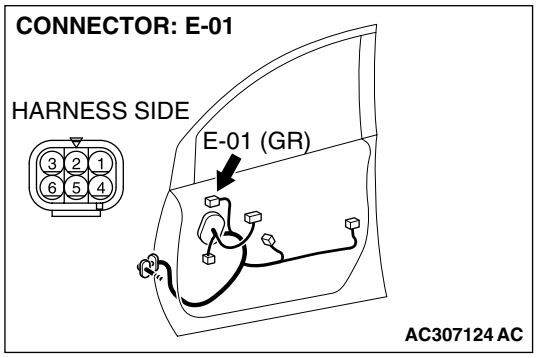


Q: Is the resistance normal?

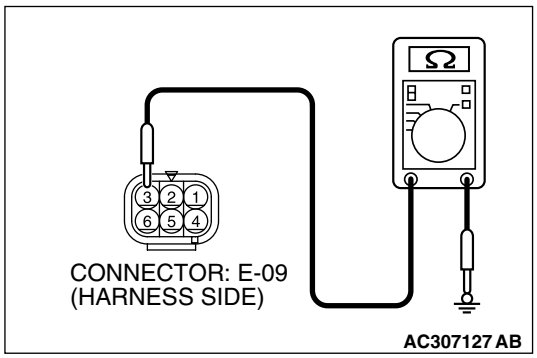
YES : Go to Step 10.

NO : Replace the door mirror (RH). And then check to see that the heater function of the door mirror (RH) operates normally.

STEP 10. Check the ground circuit between remote controlled mirror (RH) connector E-01 and ground for open circuit. Measure the resistance at remote controlled mirror (RH) connector E-01.



(1) Disconnect remote controlled mirror (RH) connector E-01, and check at the wiring harness side connector.

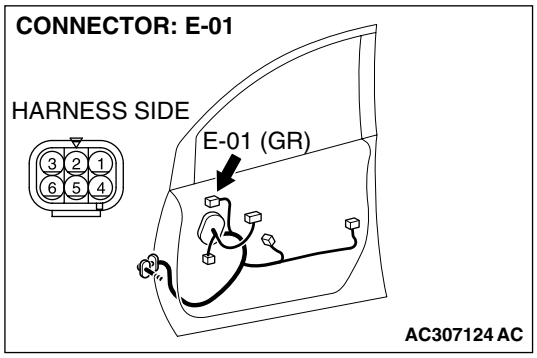


(2) Measure the resistance value between terminal 3 and ground.
- The resistance should equal 2 ohms or less.

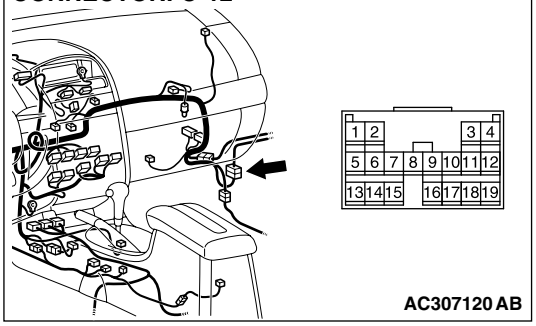
Q: Is the measured resistance 2 ohms or less?

YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check the wiring harness between remote controlled mirror (RH) connector E-01 (terminal 3) and ground.



CONNECTOR: C-12



NOTE: Also check intermediate connector C-12 for loose, corroded or damaged terminals, or terminals pushed back in the connector. If intermediate connector C-12 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is the wiring harness between remote controlled mirror (RH) connector E-01 (terminal 3) and ground in good condition?

YES : No action is necessary and testing is complete.

NO : The wiring harness may be damaged. Repair the wiring harness as necessary. And then check to see that the heater function of the door mirror (RH) operates normally.

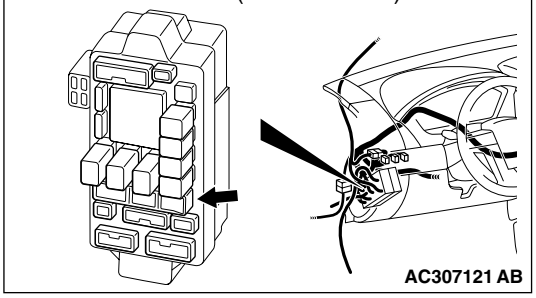
STEP 12. Check junction block C-211 for loose, corroded damaged terminal, or terminals pushed back in the connector.

Q: Is junction block C-211 in good condition?

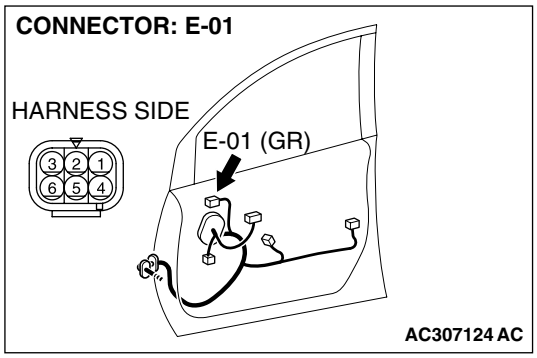
YES : Go to Step 13.

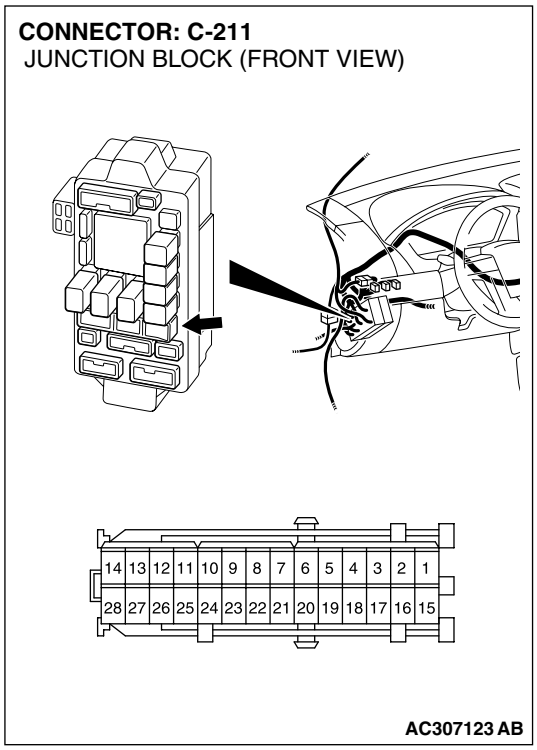
NO : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2. And then check to see that the heater function of the door mirror (RH) operates normally.

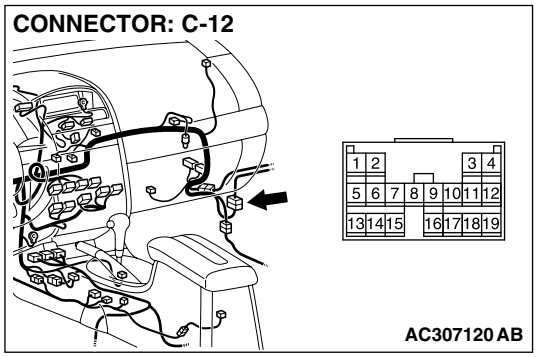
CONNECTOR: C-211
JUNCTION BLOCK (FRONT VIEW)



STEP 13. Check the wiring harness between remote controlled mirror (RH) connector E-01 (terminal 1) and junction block connector C-211 (terminal 3).







NOTE: Also check intermediate connector C-12 for loose, corroded or damaged terminals, or terminals pushed back in the connector. If intermediate connector C-12 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2.

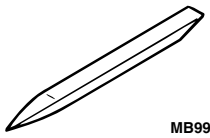
Q: Is the wiring harness between remote controlled mirror (RH) connector E-01 (terminal 1) and junction block connector C-211 (terminal 3) in good condition?

YES : No action is necessary and testing is complete.

NO : Repair the wiring harness as necessary. And then check to see that the heater function of the door mirror (RH) operates normally.

SPECIAL TOOLS

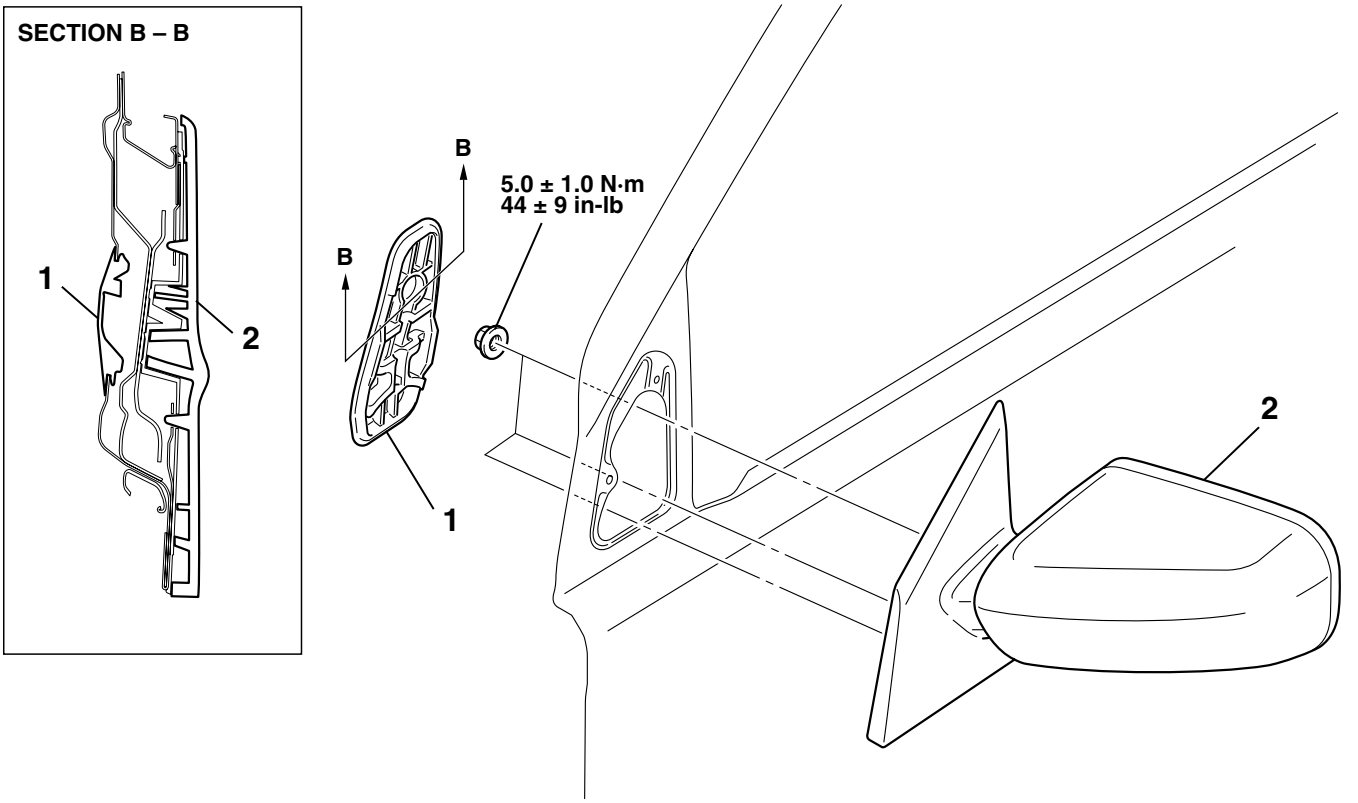
M1511000601772

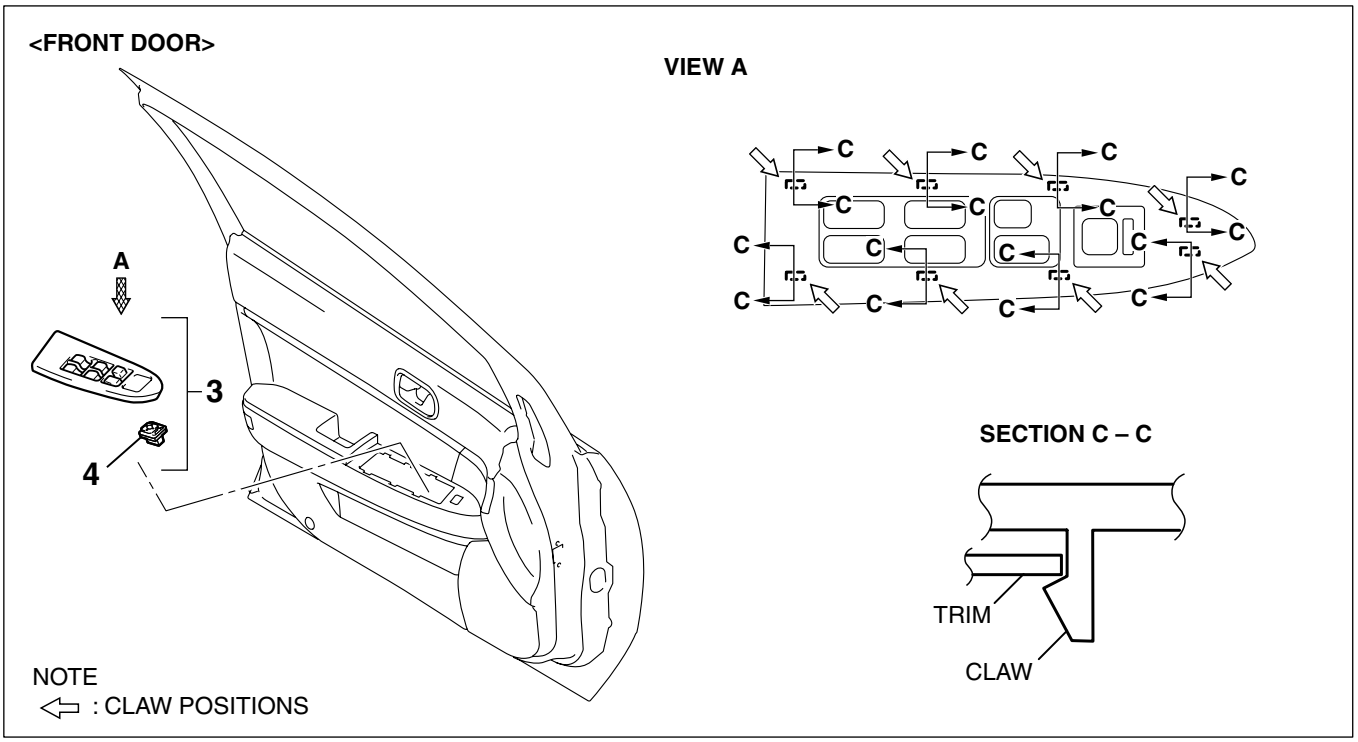
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990784	MB990784 Ornament remover	General service tool	Removal of power window switch panel assembly

DOOR MIRROR

REMOVAL AND INSTALLATION

M1511006400773





AC601344AB

TSB Revision

REMOTE CONTROLLED MIRROR REMOVAL STEPS

- FRONT DOOR TRIM (REFER TO GROUP 52A, DOOR TRIMS P.52A-26).

1. DOOR MIRROR COVER
2. REMOTE CONTROLLED MIRROR ASSEMBLY

<<A>>

REMOTE CONTROLLED MIRROR SWITCH REMOVAL STEPS

3. POWER WINDOW SWITCH PANEL ASSEMBLY
4. REMOTE CONTROLLED MIRROR SWITCH

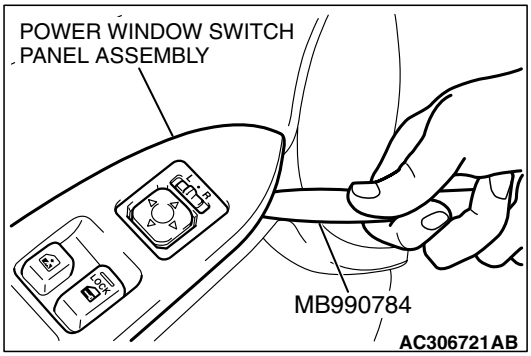
Required Special Tools:

- MB990784: Ornament Remover

REMOVAL SERVICE POINT

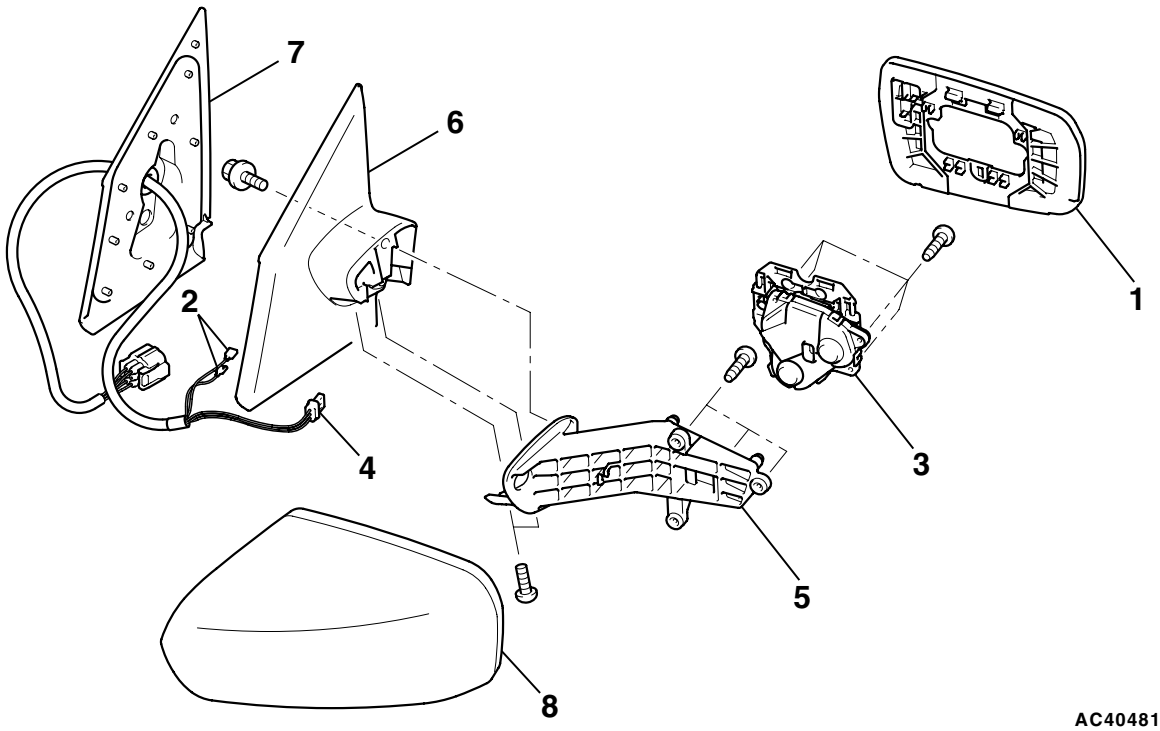
<<A>> POWER WINDOW SWITCH PANEL ASSEMBLY REMOVAL

Insert the special tool ornament remover (MB990784) as shown to remove the power window switch panel assembly.



DISASSEMBLY AND ASSEMBLY

M1511025600011



DOOR MIRROR DISASSEMBLY STEPS

<<A>>

1. MIRROR
2. HEATER TERMINAL (VEHICLES WITH HEATED DOOR MIRROR)
3. ACTUATOR
4. ACTUATOR CONNECTOR

DOOR MIRROR DISASSEMBLY STEPS (Continued)

5. DOOR MIRROR BRACKET
6. DOOR MIRROR BASE
7. GASKET
8. DOOR MIRROR BODY

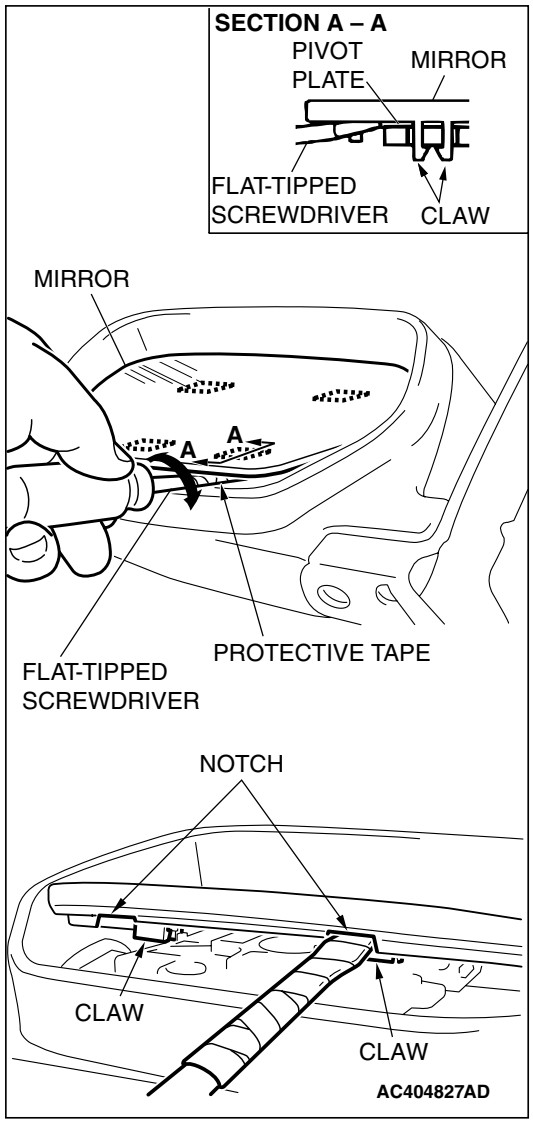
DISASSEMBLY SERVICE POINT

<<A>> MIRROR REMOVAL

⚠ CAUTION

The claws of the mirror are prone to breakage when working in cold temperatures. Always warm up the mirror claws and their periphery to 20°C(60°F) or higher before handling.

Slant the mirror upward with your hands. Then insert a flat-tipped screwdriver wrapped with protective tape between the pivot plate and mirror through the notch from behind the mirror. Now pry off the mirror claws and remove mirror as shown.

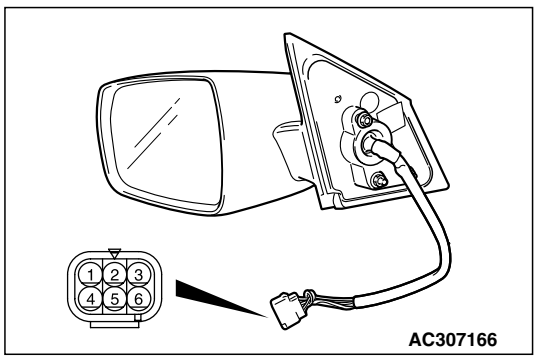


INSPECTION

M1511006500305

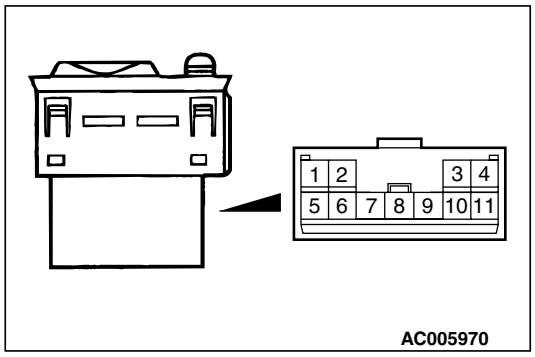
ELECTRIC REMOTE CONTROL MIRROR OPERATION CHECK

Check that the mirror moves as described in the table when each terminal is connected to the battery.



BATTERY CONNECTION	DIRECTION OPERATION
• Connect terminal 6 to the negative battery terminal. • Connect terminal 4 to the positive battery terminal.	Up
• Connect terminal 6 to the positive battery terminal. • Connect terminal 4 to the negative battery terminal.	Down
• Connect terminal 6 to the negative battery terminal. • Connect terminal 5 to the positive battery terminal.	Right
• Connect terminal 6 to the positive battery terminal. • Connect terminal 5 to the negative battery terminal.	Left

DOOR MIRROR CONTROL SWITCH CONTINUITY CHECK



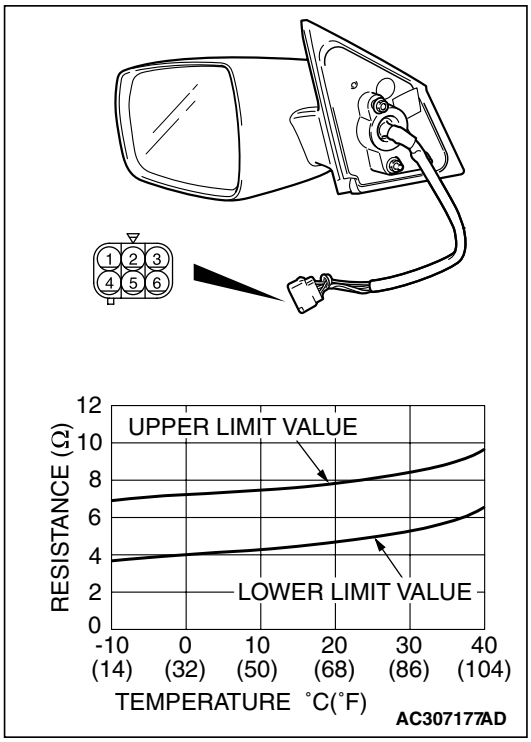
SWITCH POSITION		TESTER CONNECTION	SPECIFIED CONDITION
OFF		9 – 2, 9 – 3, 9 – 6, 9 – 10, 9 – 11, 1 – 2, 1 – 3, 1 – 6, 1 – 10, 1 – 11	Open circuit
Left side	OFF	9 – 6, 9 – 10, 9 – 11, 1 – 6, 1 – 10, 1 – 11	Open circuit
	Up	1 – 6, 9 – 11	Less than 2 ohms
	Down	1 – 11, 6 – 9	
	Right	1 – 6, 9 – 10	
	Left	1 – 10, 6 – 9	
Right side	OFF	9 – 2, 9 – 3, 9 – 6, 1 – 2, 1 – 3, 1 – 6	Open circuit
	Up	1 – 6, 3 – 9	Less than 2 ohms
	Down	1 – 3, 6 – 9	
	Right	1 – 6, 2 – 9	
	Left	1 – 2, 6 – 9	

HEATED DOOR MIRROR CHECK

⚠ CAUTION

When relocating the car between locations with extremely different temperatures (warm and cold), leave the car in the location for a while to adapt to the temperature prior to checking it.

Check to see that the resistance shown in the graph is almost satisfied when measuring the resistance of terminal 1 and 3 of the door mirror connectors.



SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1511015300279

ITEM	SPECIFICATION
Front bumper	
License plate screw	0.9 ± 0.1 N·m (8 ± 1 in-lb)
Windshield wiper and washer	
Wiper arm and blade assembly nut	25 ± 3 N·m (18 ± 1 ft-lb)
Wiper link assembly bolt	4.9 ± 0.5 N·m (43 ± 4 in-lb)
Wiper motor screw	7.5 ± 1.4 N·m (66 ± 13 in-lb)
Washer tank bolt	12 ± 1 N·m (102 ± 13 in-lb)
Door mirror	
Remote controlled mirror assembly bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)

SERVICE SPECIFICATIONS

M1511000300358

ITEM	STANDARD VALUE
Windshield wiper blade (RH) park position	38 ± 5 mm (1.50 ± 0.20 inches)
Windshield wiper blade (LH) park position	38 ± 5 mm (1.50 ± 0.20 inches)

TSB Revision

ADHESIVE

M1511000501515

ITEM	SPECIFICATION
Roof drip molding	Adhesive tape: Double-sided tape 10.0 mm (0.39 inch) width and 1.52 mm (0.06 inch) thickness

GROUP 52

INTERIOR AND SUPPLEMENTAL RESTRAINT SYSTEM(SRS)

CONTENTS

GROUP 52A

INTERIOR

CONTENTS

GENERAL DESCRIPTION

M1521000100184

OPERATION

Seat belt warning system
If the driver turn the ignition switch to the "ON" position without fastening the seat belt, the seat belt warning light illuminates.

SEAT BELT DIAGNOSIS

M1523000700182

The seat belt warning system is controlled by the Simplified Wiring System (SWS). For troubleshooting, refer to GROUP 54B, SWS diagnosis P.54B-119.

INSIDE REAR VIEW MIRROR DIAGNOSIS

INTRODUCTION TO INSIDE REAR VIEW MIRROR DIAGNOSIS

M1521004200138

If the inside rear view mirror does not operate, the power supply system or the inside rear view mirror circuit may be defective.

INSIDE REAR VIEW MIRROR DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1524003100717

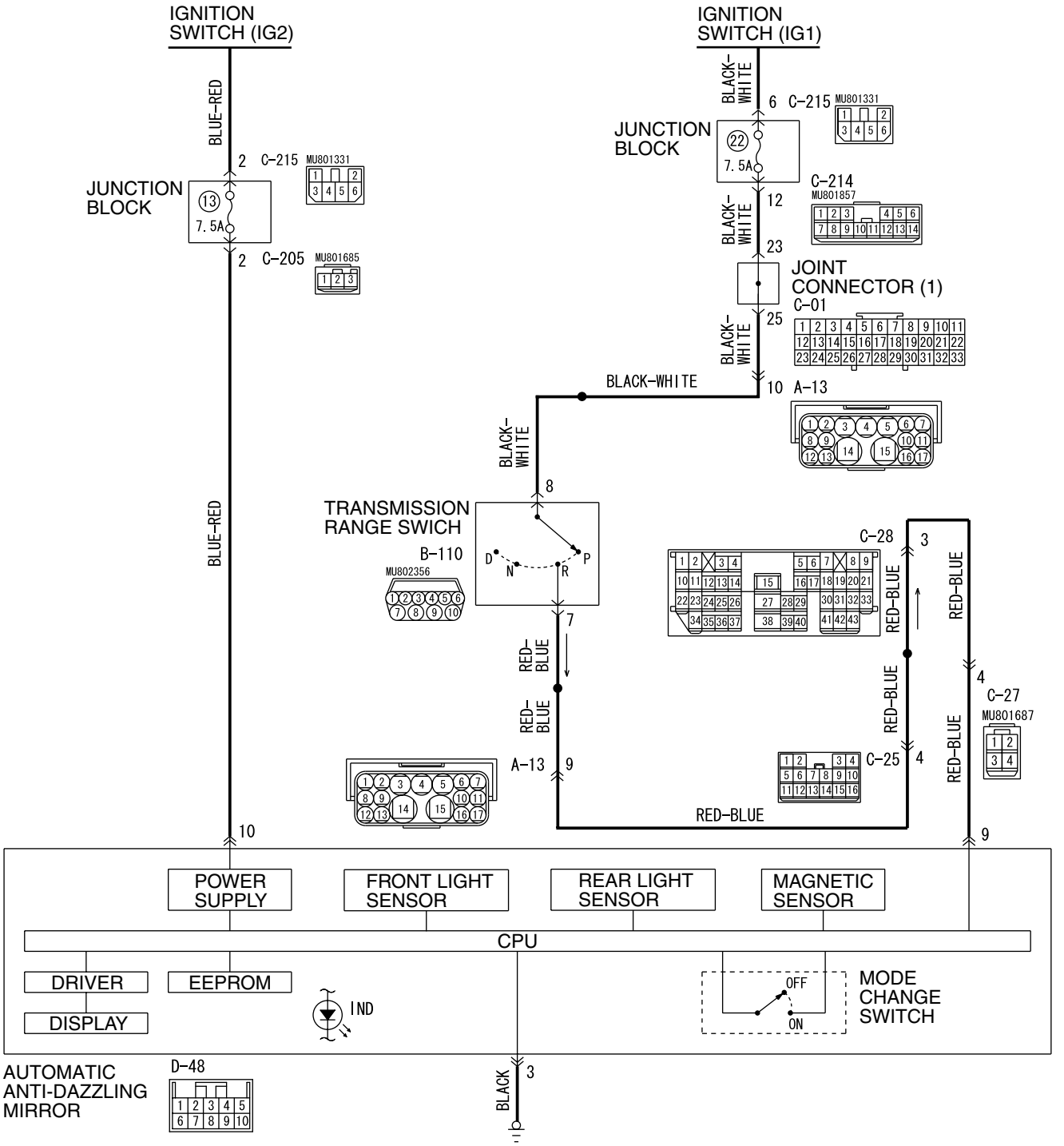
Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a inside rear view mirror fault.

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

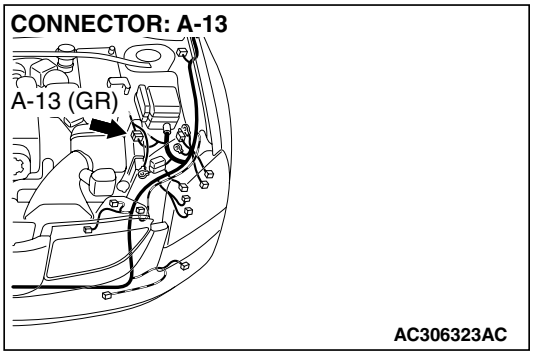
SYMPTOM PROCEDURES

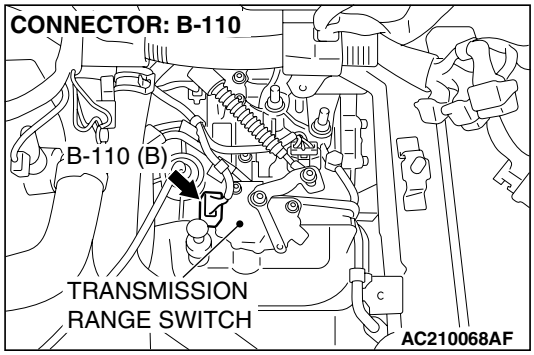
The Inside Rear View Mirror can't be Set to Night Mode

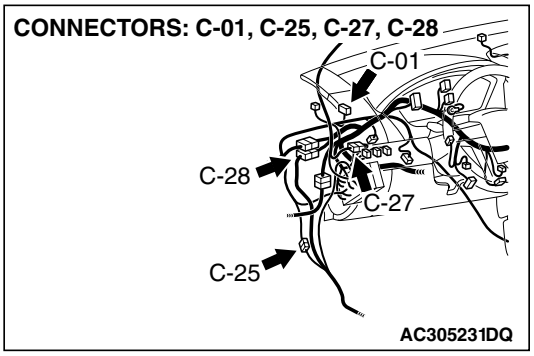
Automatic Anti-Dazzling Mirror Circuit

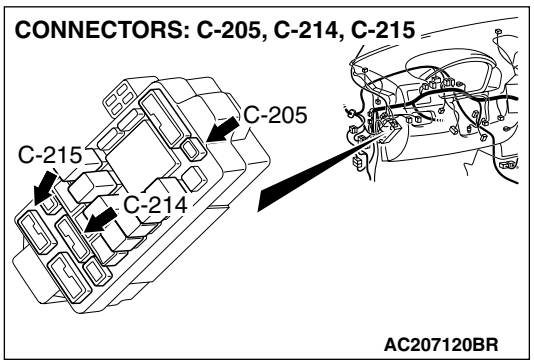


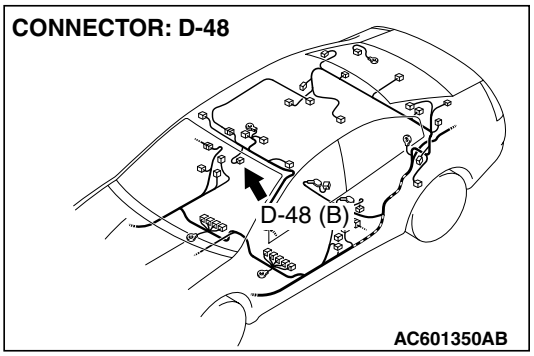
TSB Revision











FUNCTION

When the mirror switch is set to "AUTO", the anti-glare function is activated automatically.

TROUBLESHOOTING HINTS

- Malfunction of connector.
- Malfunction of the inside rear view mirror assembly

DIAGNOSIS

Required Special Tools:

- MB991223: Harness Set
- MB992006: Extra Fine Probe

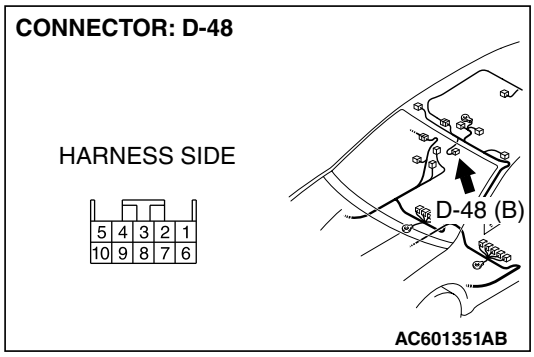
TSB Revision

STEP 1. Check inside rear view mirror assembly connector D-48 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is inside rear view mirror assembly connector D-48 in good condition?

YES : Go to Step 2.

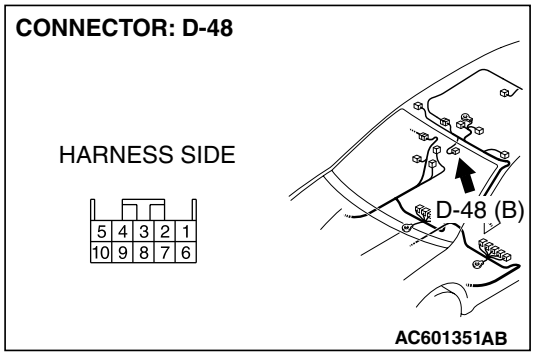
NO : Repair or replace the connector. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



STEP 2. Measure the voltage at inside rear view mirror assembly connector D-48.

(1) Disconnect inside rear view mirror assembly connector D-48, and measure the voltage at the wiring harness side.

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



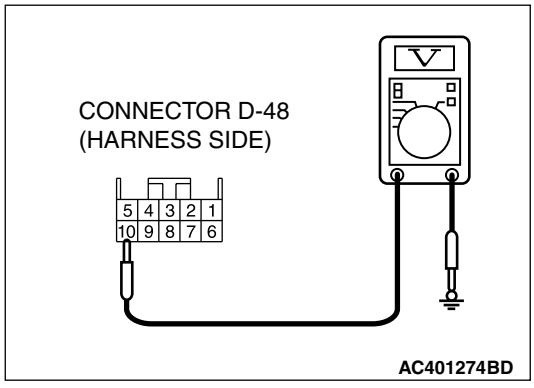
(3) Measure the voltage between terminal 10 and ground.

- The measured value should be approximately 12 volts (battery positive voltage).

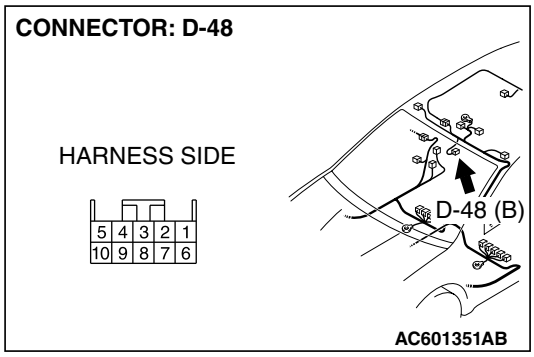
Q: Is the measured voltage approximately 12 volts?

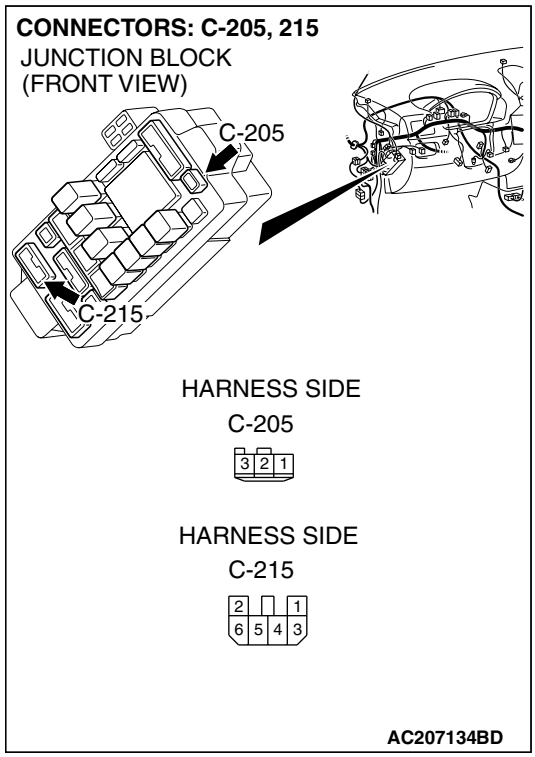
YES : Go to Step 4.

NO : Go to Step 3.



STEP 3. Check the wiring harness between inside rear view mirror assembly connector D-48 (terminal 10) and the ignition switch (IG2).





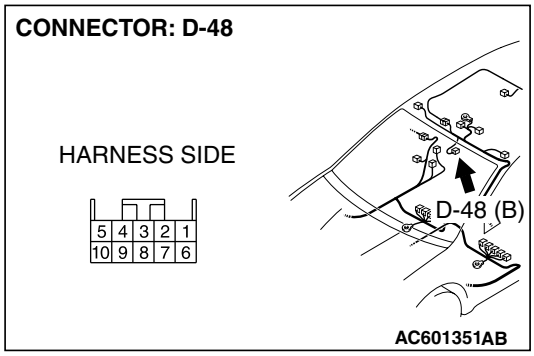
NOTE: Also check junction block connector C-205 and C-215 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If junction block connector C-205 and C-215 is damaged, repair or replace the connector as described in GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is the wiring harness between inside rear view mirror assembly connector D-48 (terminal 10) and the ignition switch (IG2) in good condition?

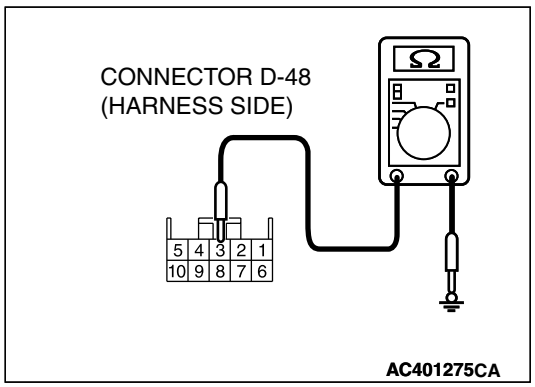
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-14.

NO : Repair the wiring harness.

STEP 4. Measure the resistance at inside rear view mirror assembly connector D-48.



(1) Disconnect inside rear view mirror assembly connector D-48, and measure the resistance at the wiring harness side.

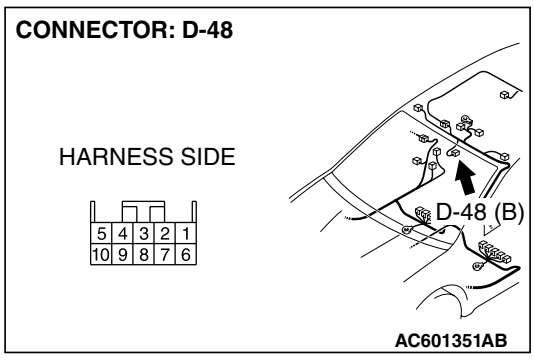


(2) Measure the resistance value between terminal 3 and ground.
- The measured value should be 2 ohms or less.

Q: Does the measured resistance value correspond with this range?

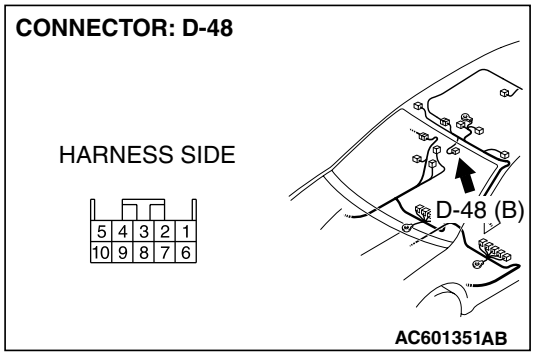
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check the wiring harness between inside rear view mirror assembly connector D-48 (terminal 3) and ground.



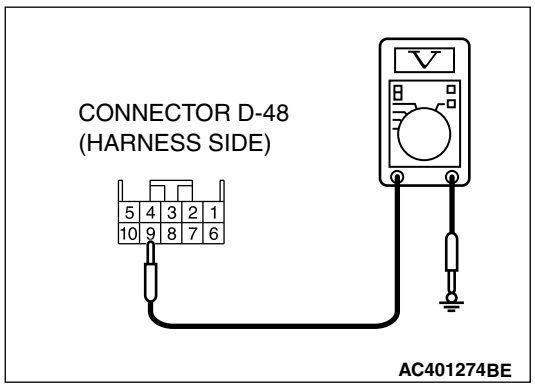
Q: Is the wiring harness between inside rear view mirror assembly connector D-48 (terminal 3) and ground in good condition?

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 Malfunctions P.00-14.
NO : Repair the wiring harness.



STEP 6. Measure the voltage at inside rear view mirror assembly connector D-48.

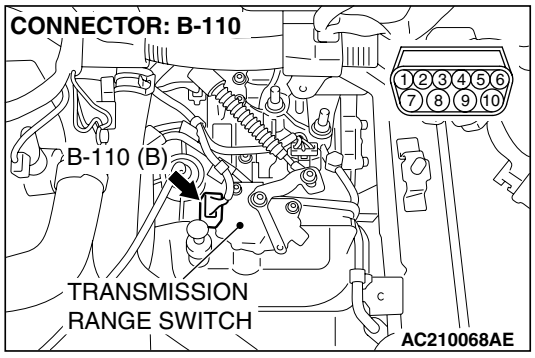
(1) Disconnect inside rear view mirror assembly connector D-48, and measure the voltage at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Shift the selector lever to the "R" range.



(4) Measure the voltage between terminal 9 and ground.
- The measured value should be approximately 12 volts (battery positive voltage).

Q: Is the measured voltage approximately 12 volts?

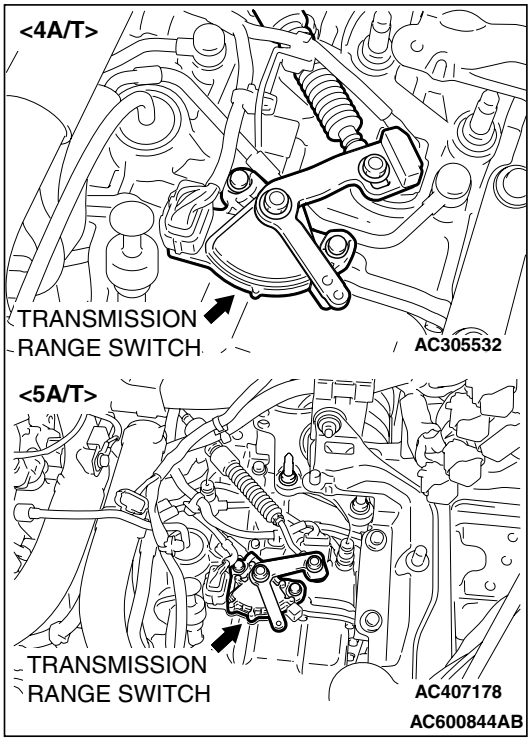
YES : Go to Step 12.
NO : Go to Step 7.

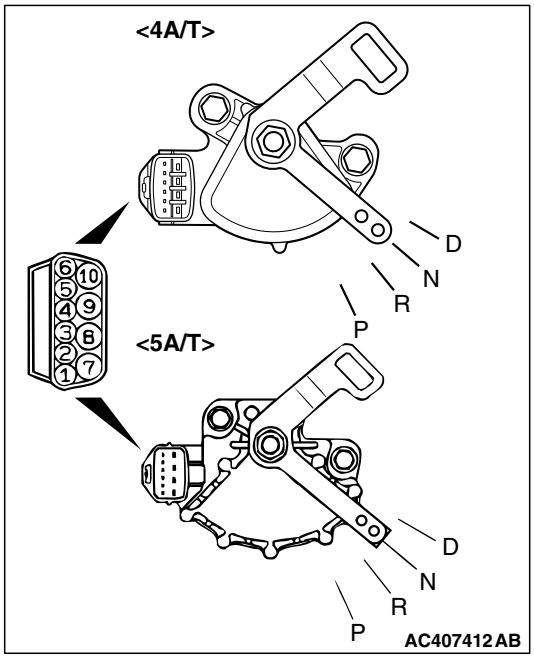


STEP 7. Check transmission range switch connector B-110 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is the transmission range switch connector B-110 in good condition?

YES : Go to Step 8.
NO : Repair or replace the damaged component(s). Refer to GROUP 00E, Harness Connector Inspection P.00E-2.





STEP 8. Check the transmission range switch.

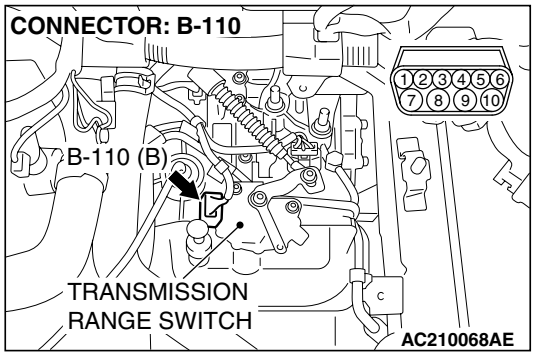
TRANSMISSION RANGE	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohms.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	

Q: Is the transmission range switch in good condition?

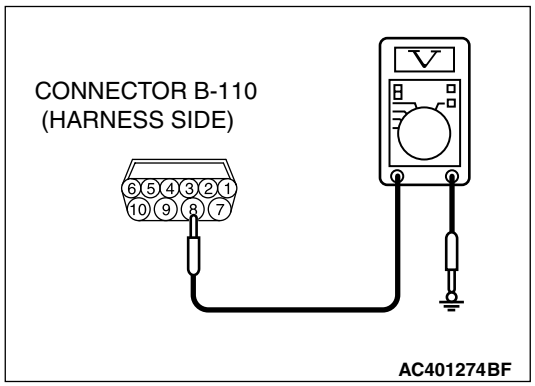
YES : Go to Step 9.

NO : Replace the transmission range switch.

STEP 9. Check the ignition switch (IG1) circuit to the backup light switch. Measure the voltage at transmission range switch connector B-110.



(1) Disconnect transmission range switch connector B-110 and measure the voltage available at the wiring harness side of the connector.
(2) Turn the ignition switch to the "ON" position.

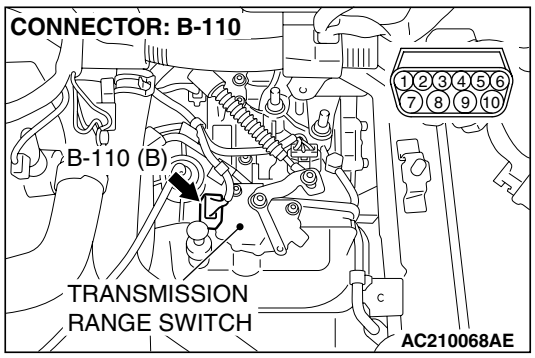


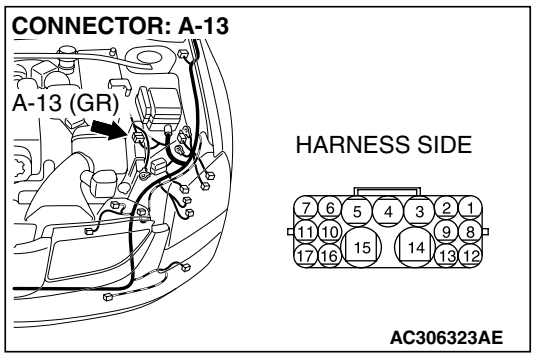
(3) Measure the voltage between terminal 8 and ground.
- The voltage should equal approximately 12 volts (battery positive voltage).

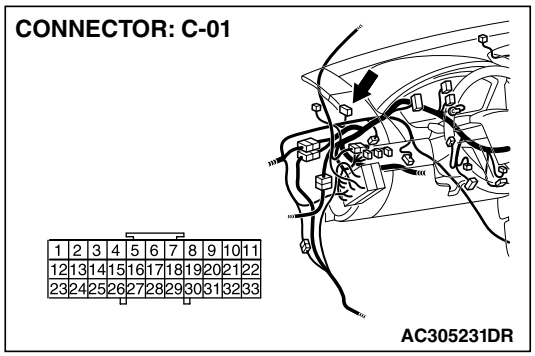
Q: Is the measured voltage approximately 12 volts (battery positive voltage)?

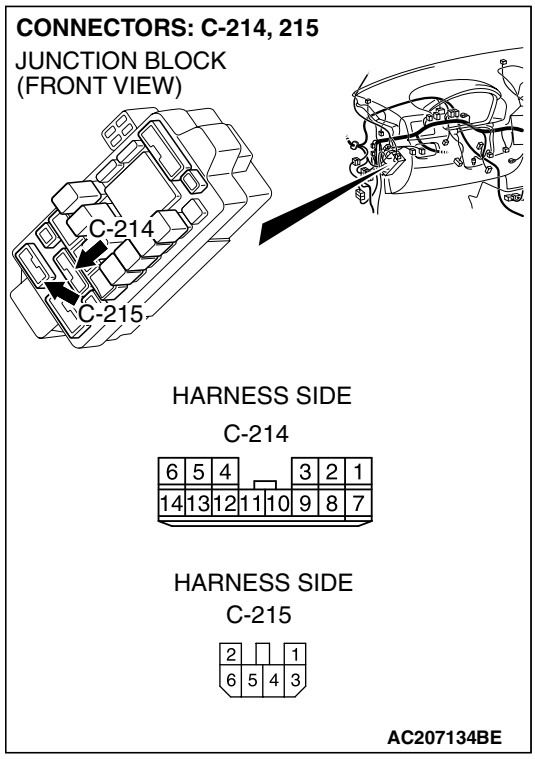
YES : Go to Step 11.
NO : Go to Step 10.

STEP 10. Check the wiring harness between transmission range switch connector B-110 (terminal 8) and the ignition switch (IG1).









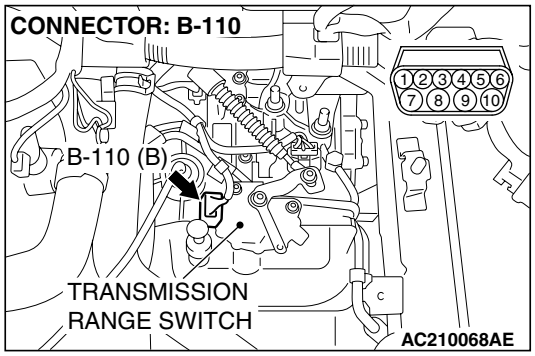
NOTE: Also check junction block connectors C-214, C-215, joint connector C-01, intermediate connector A-13 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If junction block connectors C-214, C-215, joint connector C-01, intermediate connector A-13 are damaged, Repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2.

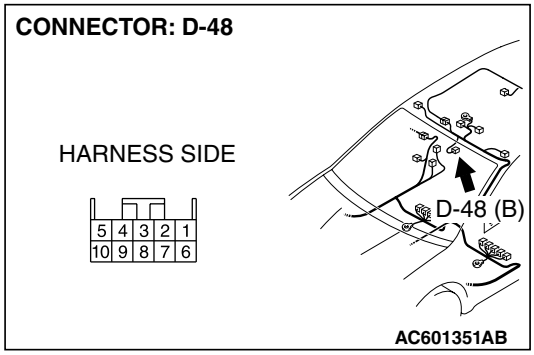
Q: Is the wiring harness between transmission range switch connector B-110 (terminal 8) and the ignition switch (IG1) in good condition?

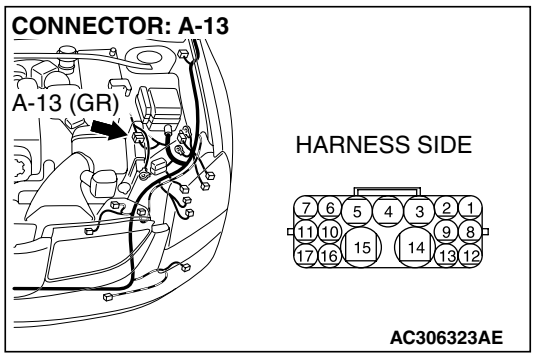
YES : No action is necessary and testing is complete.

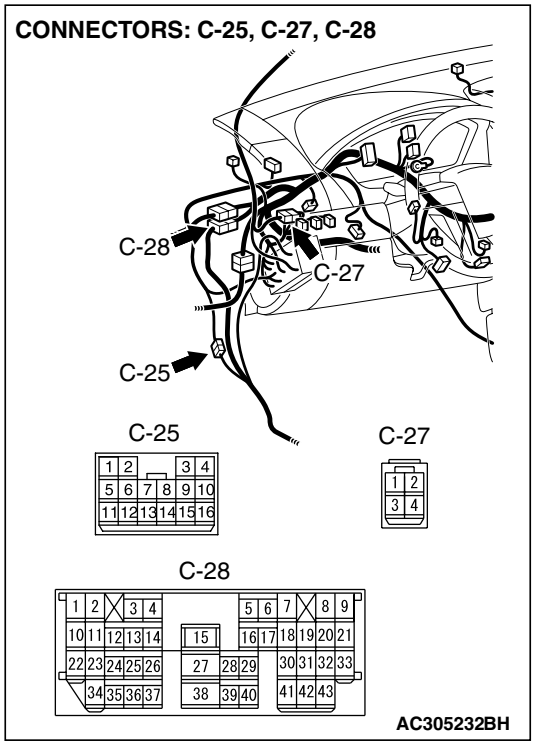
NO : The wiring harness may be damaged or the connector(s) may have loose, corroded or damaged terminals, or terminals pushed back in the connector. Repair the wiring harness as necessary.

STEP 11. Check the wiring harness between inside rear view mirror assembly connector D-48 (terminal 9) and transmission range switch connector B-110 (terminal 7).









NOTE: Also check intermediate connectors C-25, C-27, C-28 and A-13 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If intermediate connectors C-25, C-27, C-28 and A-13 is damaged, repair or replace the connector as described in GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Is the wiring harness between inside rear view mirror assembly connector D-48 (terminal 9) and transmission range switch connector B-110 (terminal 7) in good condition?

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 Malfunctions P.00-14.

NO : Repair the wiring harness.

STEP 12. Check the inside rear view mirror assembly.
Refer to P.52A-13.

Q: Is the check result normal?

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 Malfunctions P.00-14.

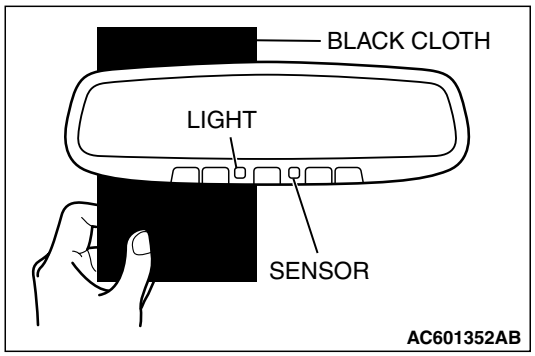
NO : Replace the inside rear view mirror assembly.

ON-VEHICLE SERVICE

AUTO-DIMMING FEATURE TEST

M1524012500070

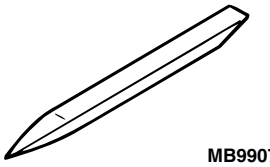
1. Be sure the ignition is on and that the mirror is on. The green LED light to the right of the main display switch will be lit when the mirror is on. If it's not, depress the "TEMP" side of the main display switch for 15 seconds.



2. Cover the forward-facing light sensor on the back of the mirror with a black cloth.
3. While in a well-lit area, make sure light strikes the sensor on the front of the mirror, simulating glare from vehicles behind you. The mirror will dim within 2 minutes if testing for the first time. If the mirror does not dim, replace the inside rear view mirror.

SPECIAL TOOLS

M1521000600327

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB990784	MB990784 Ornament remover	General service tool	Removal of switch, trim, etc.

INSTRUMENT PANEL ASSEMBLY

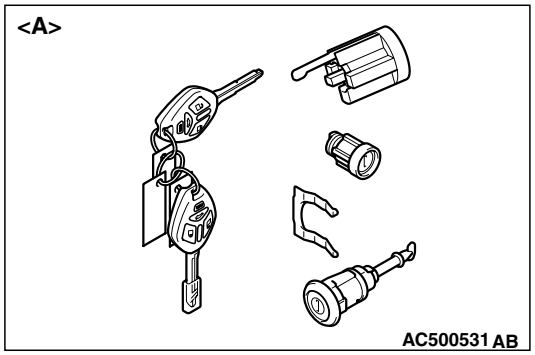
REMOVAL AND INSTALLATION

M1521001701438

⚠ CAUTION

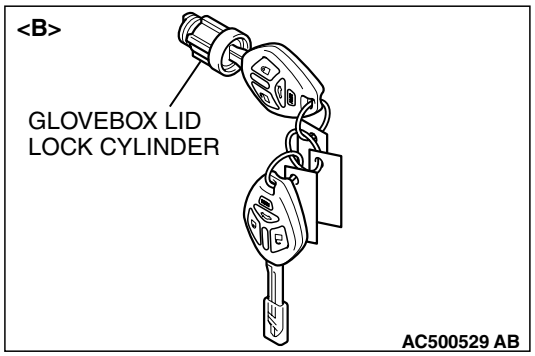
- **Refer to GROUP 52B, SRS Service Precautions P.52B-29 and Air bag Module and Clock Spring P.52B-408 before removing the passenger's (front) air bag module.**
- **Do not subject the SRS-ECU to any shocks when removing or installing the instrument panel.**

<A>



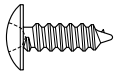
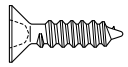
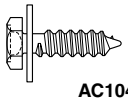
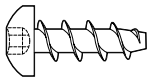
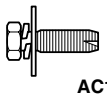
•When the glove box lid lock cylinder is replaced by key set of illustration <A>, register the encrypted code with the bar code on the ignition key in the key set.Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-11.

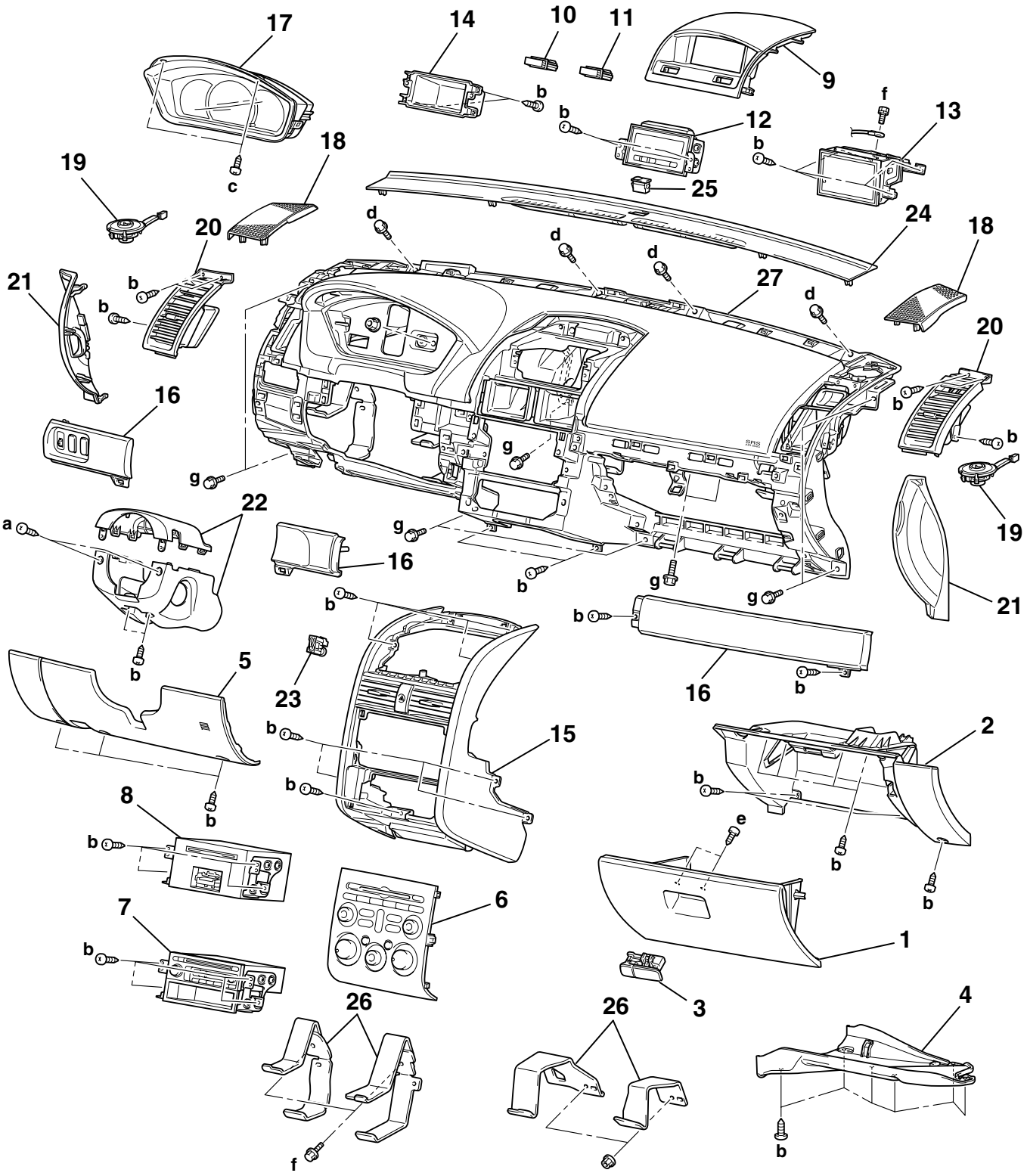
<B>



•When replacing by the glove box lid lock cylinder of illustration <B>, do not register the encrypted code with the bar code on the ignition key supplied simultaneously.

The following bolts and screws are used for installing the instrument panel. Bolts and screws are indicated as marks shown in the illustration in the sections of "Removal and Installation" and "Disassembly and Assembly."

NAME	SYMBOL	SIZE (D × L) mm	COLOR	SHAPE
TAPPING SCREW	a	5 × 12	BLACK	 AC104450
	b	5 × 16	-	
	c	5 × 20	BLACK	 AC104448
	d	6 × 16	GREEN	 AC104426
	e	8 × 15	-	 AC307531
WASHER ASSEMBLY BOLT	f	6 × 25	-	 AC104416
	g	6 × 16	-	 AC104417



REMOVAL STEPS

1. GLOVEBOX ASSEMBLY
2. INSTRUMENT PANEL PARCEL BOX
3. GLOVEBOX LOCK

REMOVAL STEPS (Continued)

- HOOD LOCK RELEASE HANDLE (REFER TO GROUP 42, HOOD P.42-7.)
4. INSTRUMENT PANEL UNDER PASSENGER SIDE COVER
5. INSTRUMEN LOWER PANEL

TSB Revision

REMOVAL STEPS (Continued)

6. INSTURMENT CENTER PANEL ASSEMBLY
7. RADIO AND CD PLAYER, ACCESSORY BOX ASSEMBLY
8. RADIO, CD PLAYER AND CD CHANGER ASSEMBLY
9. CONSOLE METER HOOD
10. PASSENGER'S AIR BAG OFF INDICATOR LIGHT
11. PASSENGER'S SEAT BELT WARNING LIGHT
12. MULTI-CENTER DISPLAY ASSEMBLY <VEHICLES WITH MULTI-CENTER DISPLAY>
13. MULTI DISPLAY UNIT <VEHICLES WITH MITSUBISHI MULTI-COMMUNICATION SYSTEM>
14. INSTRUMENT PANEL CLOCK HOLE BOX <VEHICLES WITHOUT MULTI-CENTER DISPLAY OR MITSUBISHI MULTI-COMMUNICATION SYSTEM>
15. CENTER CONSOLE ASSEMBLY
16. INSTRUMENT PANEL GARNISH
17. COMBINATION METER ASSEMBLY
    - FRONT PILLAR TRIM (REFER TO P.52A-23.)
18. FRONT SPEAKER GARNISH
19. TWEETER
20. INSTRUMENT PANEL SIDE COVER
21. INSTRUMENT PANEL SIDE AIR OUTLET
    - AIR BAG MODULE ASSEMBLY <DRIVER'S> (REFER TO GROUP 52B, AIR BAG MODULE AND CLOCK SPRING P.52B-408.)
    - STEERING WHEEL ASSEMBLY (REFER TO GROUP 37, STEERING WHEEL P.37-24.)
22. STEERING COLUMN COVER

<<**A**>>
- CLOCK SPRING CONNECTOR

<<**A**>>
- COLUMN SWITHC CONNECTOR
- CLOCK SPRING AND COLUMN SWITCH ASSEMBLY (REFER TO GROUP 37, STEERING COLUMN SHAFT P.37-26.)

23. INTERIOR TEMPERATURE SENSOR <VEHICLES WITH AUTOMATIC AIR CONDITIONING> (GROUP 55B, SENSORS P.55B-27.)
24. INSTRUMENT PANEL FRONT END GARNISH

REMOVAL STEPS (Continued)

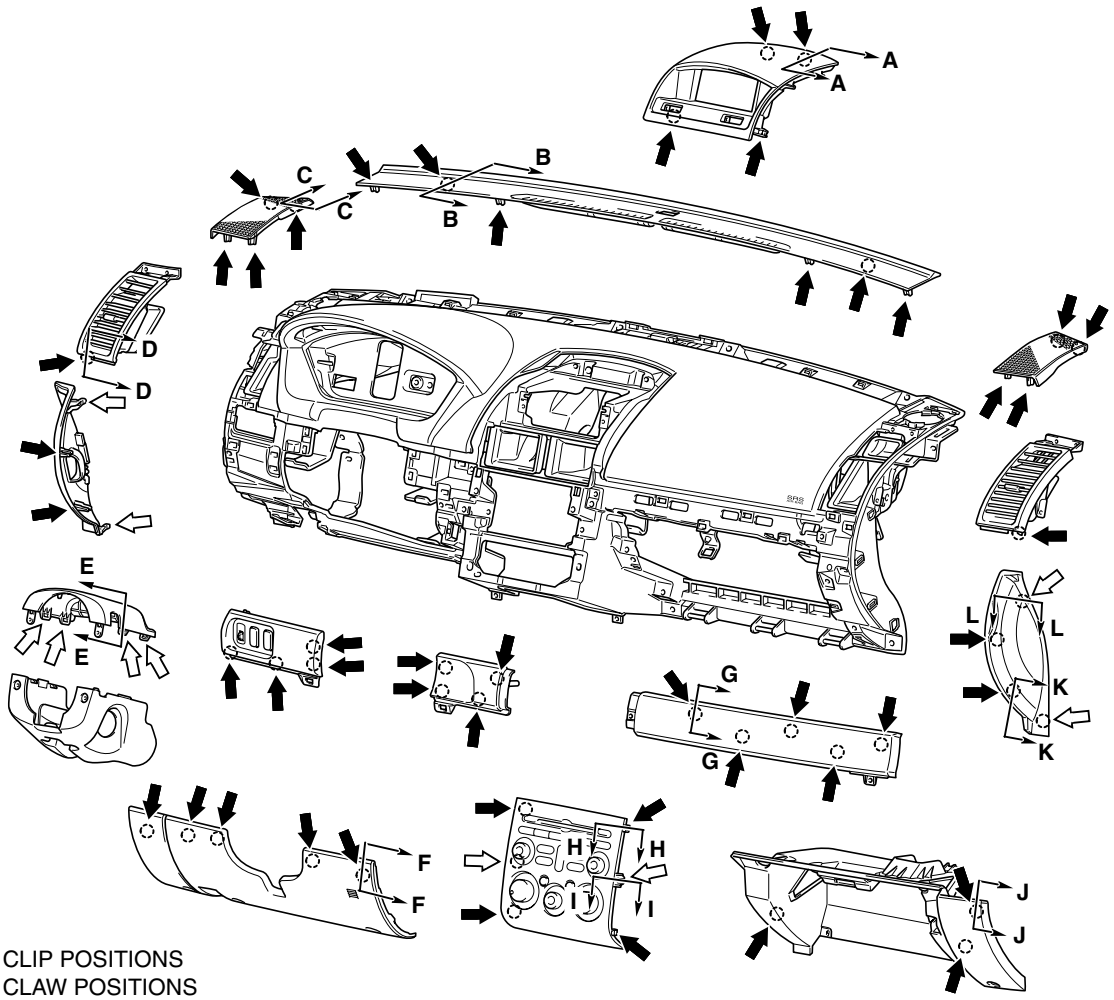
25. PHOTO SENSOR <VEHICLES WITH AUTOMATIC AIR CONDITIONING> (GROUP 55B, SENSORS P.55B-27.)
26. STAY
    - FLOOR CONSOLE ASSEMBLY (REFER TO P.52A-22.)
    - COWL SIDE TRIM (REFER TO P.52A-23.)

<<**A**>>
- AIR BAG MODULE CONNECTOR <PASSENGER'S (FRONT)> (REFER TO GROUP 52B, AIR BAG MODULE AND CLOCK SPRING P.52B-408.)

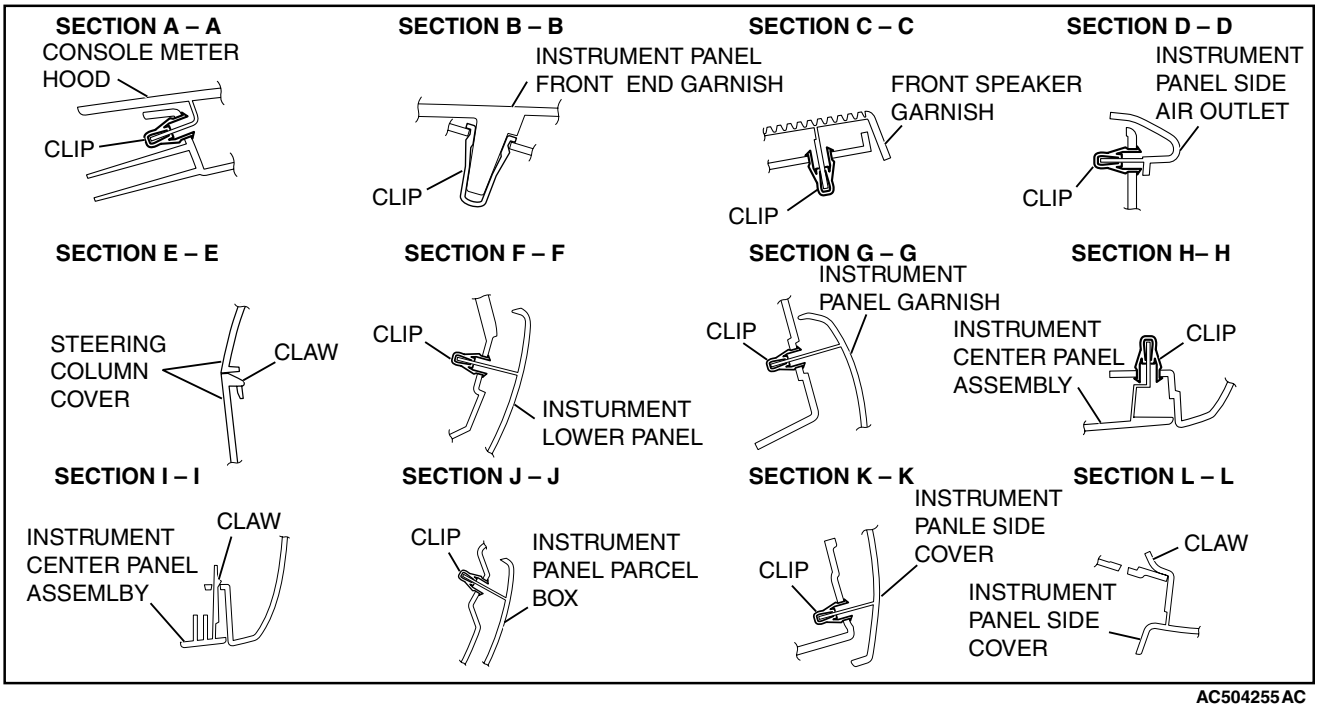
27. INSTRUMENT PANEL ASSEMBLY

TSB Revision

CLIP AND CLAW POSITIONS



NOTE
(1) ⬅ : CLIP POSITIONS
(2) ⇦ : CLAW POSITIONS



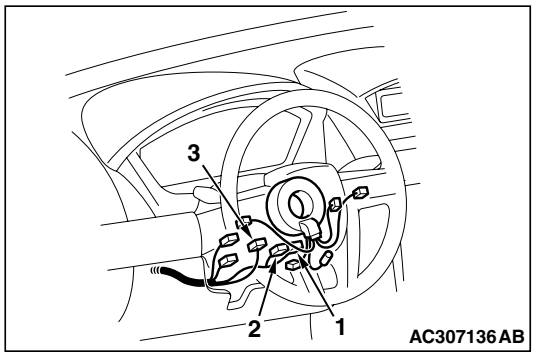
AC504255 AC

TSB Revision

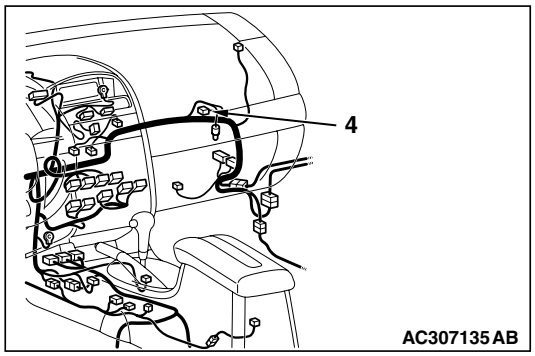
REMOVAL SERVICE POINT

<<A>> CONNECTOR DISCONNECTION

Disconnect the connectors shown in the illustration.



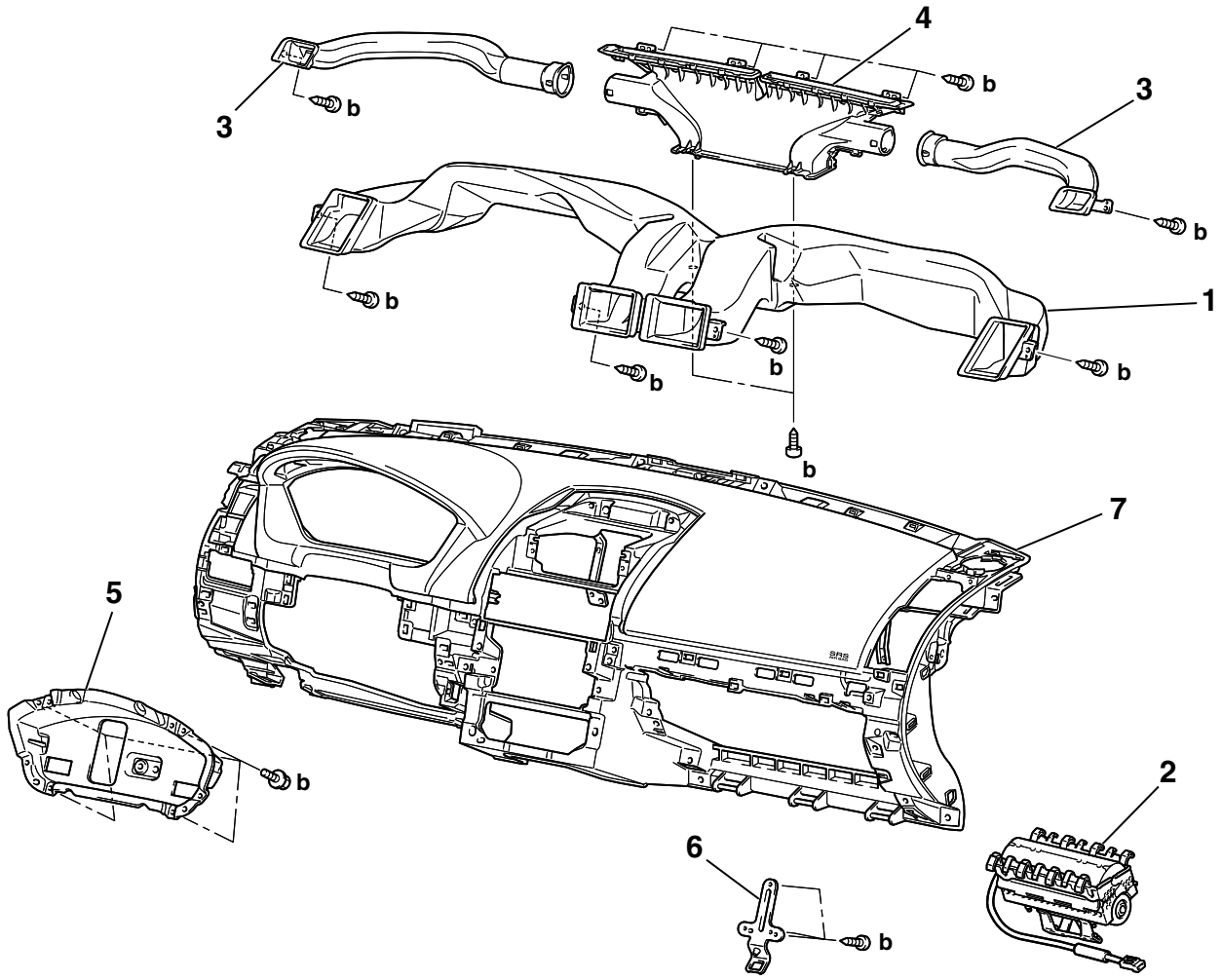
1. CLOCK SPRING CONNECTOR (6)
2. CLOCK SPRING CONNECTOR (4-Y)
3. COLUMN SWITCH CONNECTOR (10)



4. PASSENGER'S (FRONT) AIR BAG MODULE CONNECTOR (4-Y)

DISASSEMBLY AND ASSEMBLY

M1521001900592



AC501497AB

DISASSEMBLY STEPS

1. DISTRIBUTION DUCT
2. PASSENGER'S (FRONT) AIR BAG MODULE ASSEMBLY (REFER TO GROUP 52B, AIR BAG MODULE(S) AND CLOCK SPRING P.52B-408.)

DISASSEMBLY STEPS

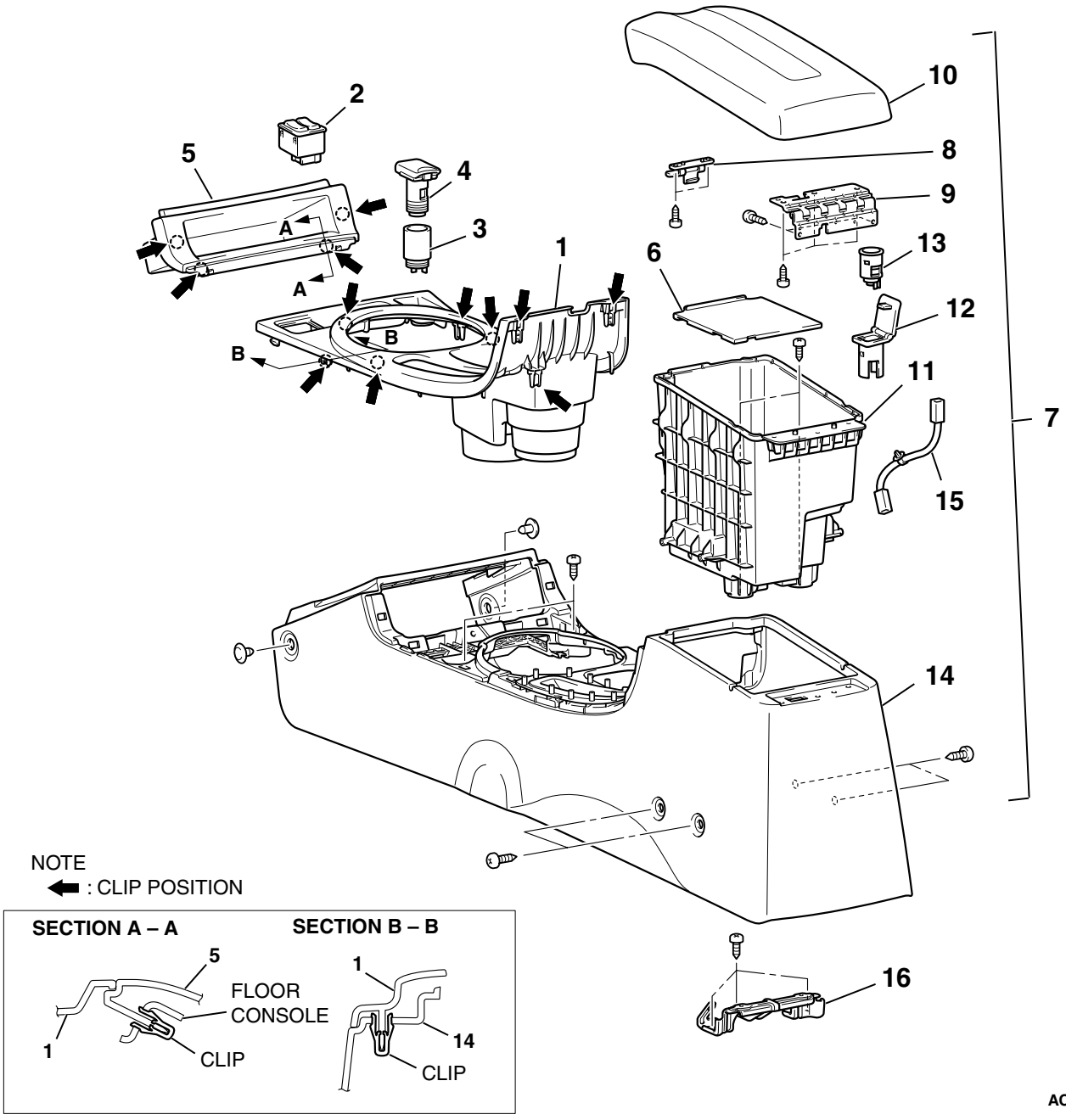
3. SIDE DEFROSTER DUCT
4. DEFROSTER NOZZLE
5. COMBINATION METER BRACKET
6. GLOVEBOX STRIKER
7. INSTRUMENT PANEL

TSB Revision

FLOOR CONSOLE ASSEMBLY

REMOVAL AND INSTALLATION

M1521002200314



AC307567 AB

REMOVAL STEPS

1. GEARSHIFT LEVER PANEL
2. HEATED SEAT SWITCH <VEHICLES WITH HEATED SEAT>
3. ACCESSORY SOCKET (ACC) (REFER TO GROUP 54A, ACCESSORY SOCKET P.54A-147.)
4. ACCESSORY SOCKET COVER
5. FRONT BOX
6. PLATE

REMOVAL STEPS (Continued)

7. FLOOR CONSOLE ASSEMBLY
8. LID LOCK LEVER
9. HINGE
10. LID
11. INNER BOX
12. ACCESSORY SOCKET (+B) (REFER TO GROUP 54A, ACCESSORY SOCKET P.54A-147.)
13. ACCESSORY SOCKET COVER
14. FLOOR CONSOLE

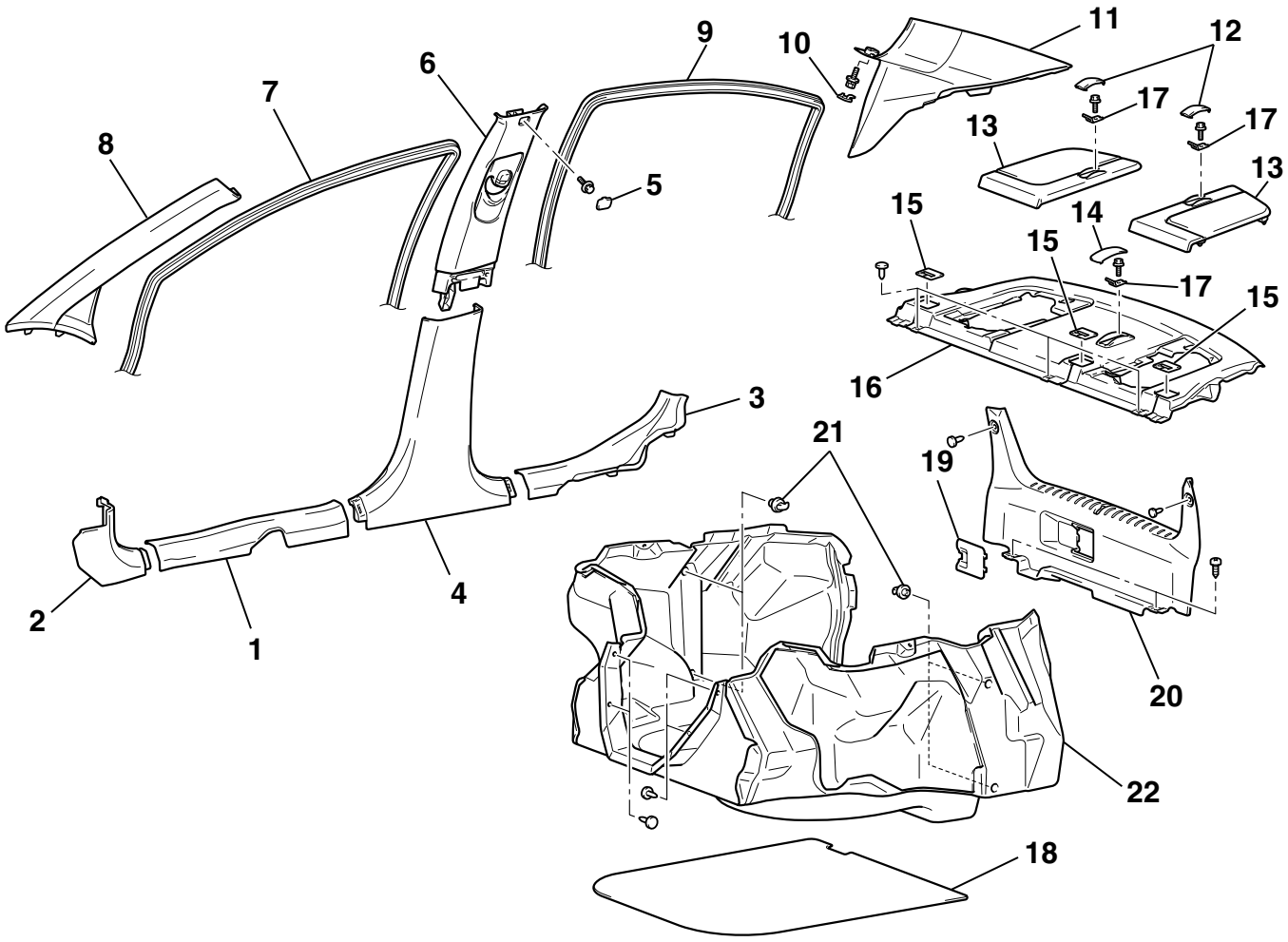
TSB Revision

REMOVAL STEPS (Continued)
15. ACCESSORY SOCKET HARNESS
16. REAR BRACKET

TRIMS

REMOVAL AND INSTALLATION

M1521001100905

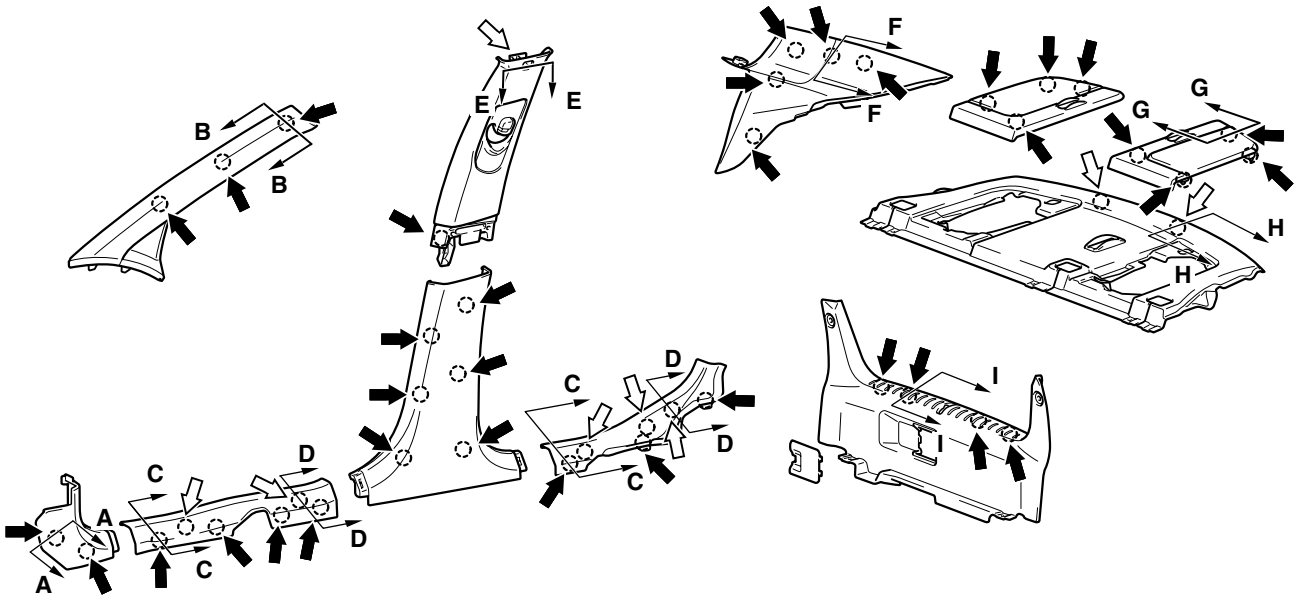


AC601273AB

1. FRONT SCUFF PLATE
2. COWL SIDE TRIM
   - REAR SEAT CUSHION (REFER TO P.52A-45.)
3. REAR SCUFF PLATE
   - FRONT SEAT BELT LOWER ANCHOR BOLT
4. CENTER PILLAR TRIM LOWER
5. SCREW CAP
6. CENTER PILLAR TRIM UPPER
7. FRONT DOOR OPENING TRIM
<<**A**>> 8. FRONT PILLAR TRIM
9. REAR DOOR OPENING TRIM
10. SCREW CAP
    - REAR SEATBACK ASSEMBLY (REFER TO P.52A-45.)
11. REAR PILLAR TRIM
12. CHILD RESTRAINT LID
13. REAR SHELF SPEAKER GARNISH
14. CHILD RESTRAINT LID
15. SEAT BELT GARNISH
16. REAR SHELF TRIM
17. CHILD RESTRAINT FITTING
18. TRUNK ROOM FLOOR BOARD
19. REAR END TRIM COVER
20. REAR END TRIM
21. PARCEL NET ANCHOR
22. TRUNK ROOM TRIM

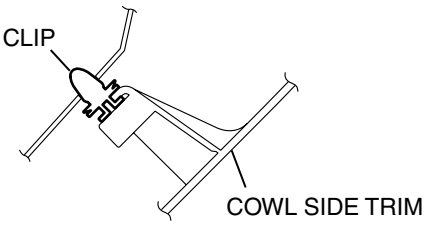
TSB Revision

CLIP AND CLAW POSITION

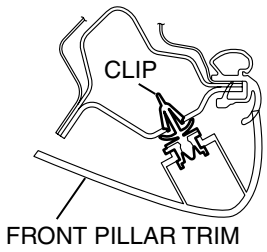


NOTE
(1) ⬅ : CLIP POSITIONS
(2) ⇦ : CLAW POSITIONS

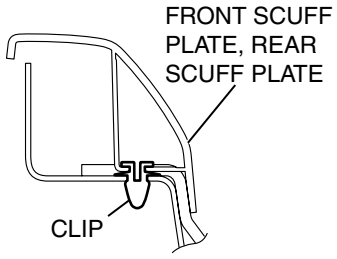
SECTION A – A



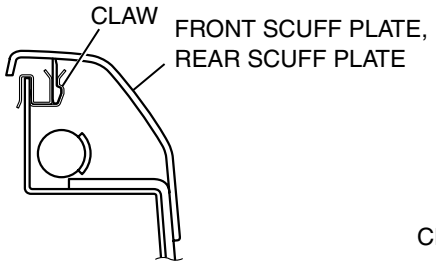
SECTION B – B



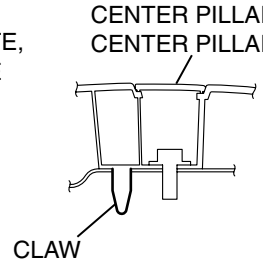
SECTION C – C



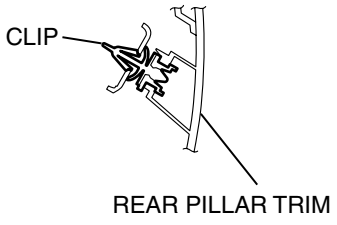
SECTION D – D



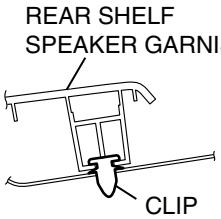
SECTION E – E



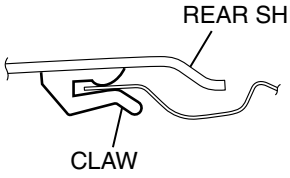
SECTION F – F



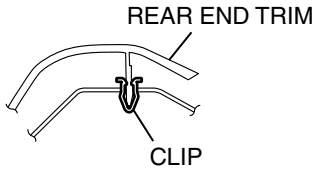
SECTION G – G



SECTION H – H



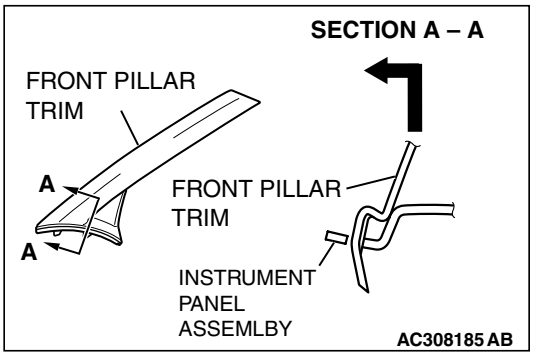
SECTION I – I



AC601274AB

TSB Revision

REMOVAL SERVICE POINT



<<A>> FRONT PILLAR TRIM REMOVAL

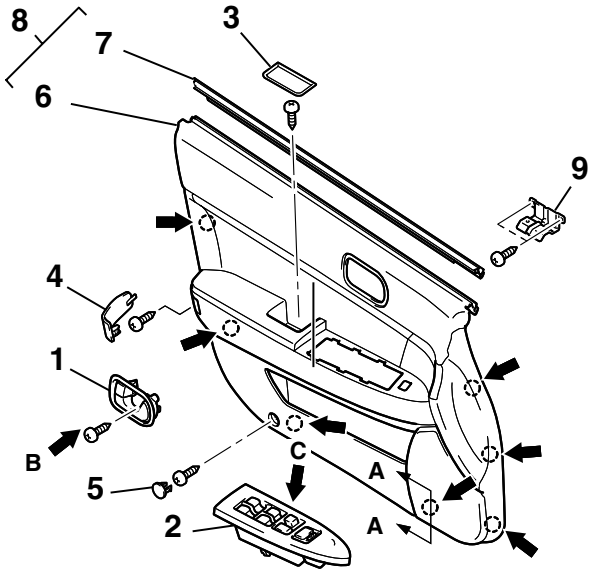
Release the clip and remove the front pillar trim by pulling it to the direction shown.

DOOR TRIM

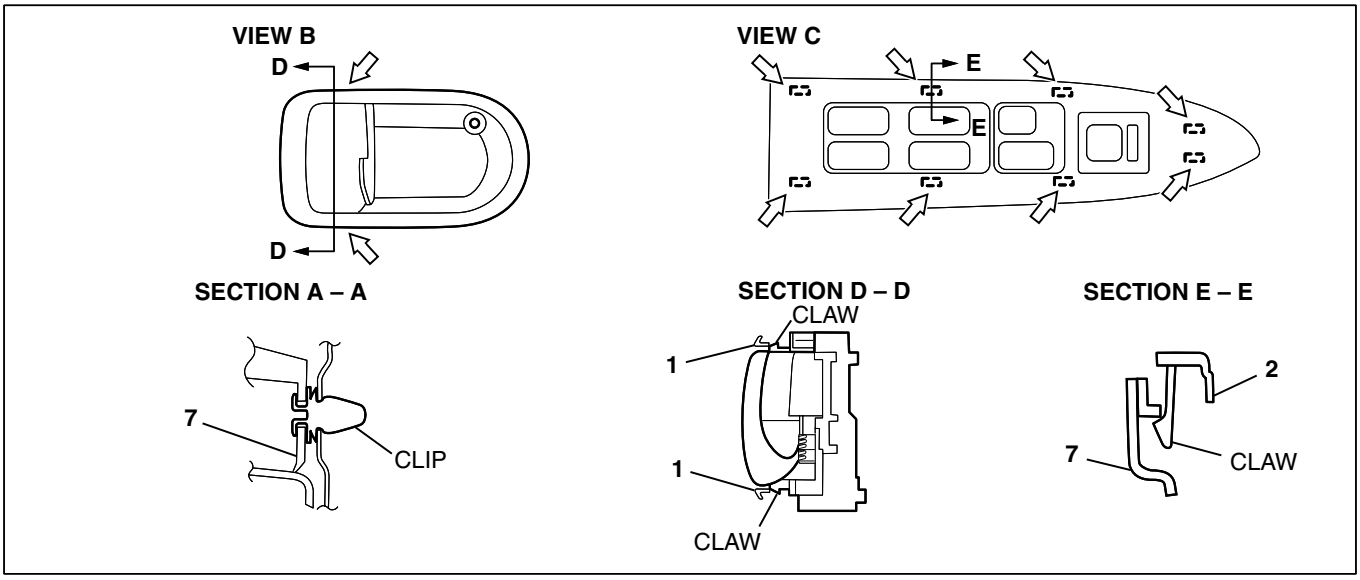
REMOVAL AND INSTALLATION

M1521006400644

<FRONT DOOR TRIM>



NOTE
(1) ⬅ : CLIP POSITIONS
(2) ⇦ : CLAW POSITIONS



AC601345AB

REMOVAL STEPS

<<**A**>> 1. INSIDE HANDLE COVER
<<**B**>> 2. POWER WINDOW SWITCH PANEL ASSEMBLY
3. PULL CUP COVER
4. REFLECTOR
5. CAP
6. FRONT DOOR TRIM ASSEMBLY
7. BELT LINE INNER WEATHERSTRIP
9. PULL CUP BRACKET

INSTALLATION STEPS

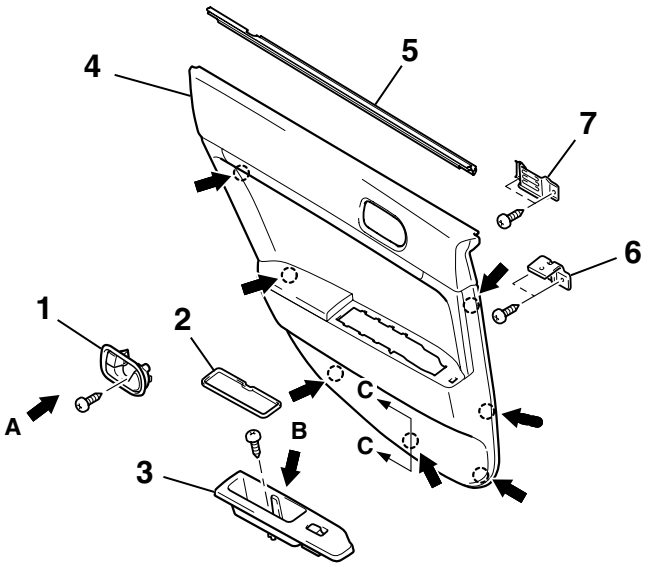
9. PULL CUP BRACKET
8. BELT LINE INNER WEATHERSTRIP AND FRONT DOOR TRIM ASSEMBLY
5. CAP
4. REFLECTOR
3. PULL CUP COVER
2. POWER WINDOW SWITCH PANEL ASSEMBLY
1. INSIDE HANDLE COVER

Required Special Tool:

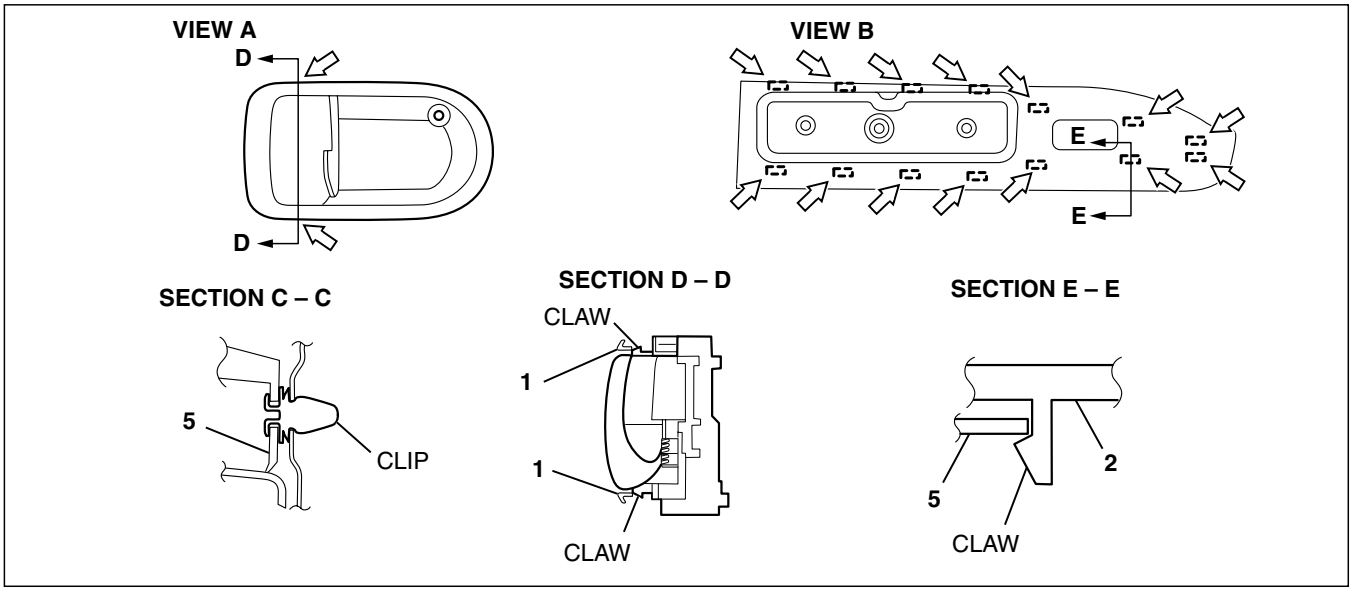
- MB990784: Ornament Remover

TSB Revision

<REAR DOOR TRIM>



NOTE
(1) ⬅ : CLIP POSITIONS
(2) ⇦ : CLAW POSITIONS



AC601346AB

REMOVAL STEPS

<<**A**>>
1. INSIDE HANDLE COVER
2. PULL CUP COVER

<<**B**>>
3. POWER WINDOW SWITCH PANEL ASSEMBLY
4. REAR DOOR TRIM ASSEMBLY
5. BELT LINE INNER WEATHERSTRIP

REMOVAL STEPS (Continued)

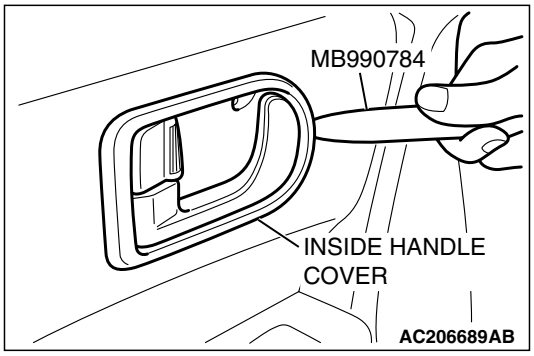
6. ARMREST BRACKET
7. REAR DOOR PANEL BRACKET

Required Special Tool:

- MB990784: Ornament Remover

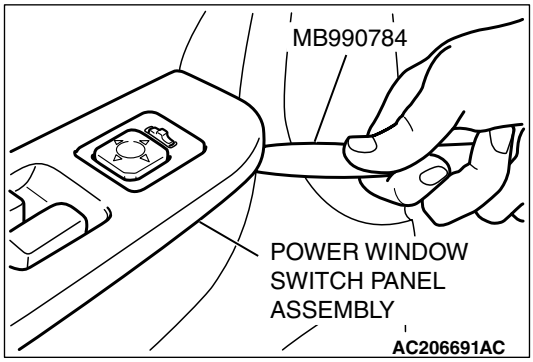
TSB Revision

REMOVAL SERVICE POINTS



<<A>> INSIDE HANDLE COVER REMOVAL

Insert special tool MB990784 as shown to remove the inside handle cover.



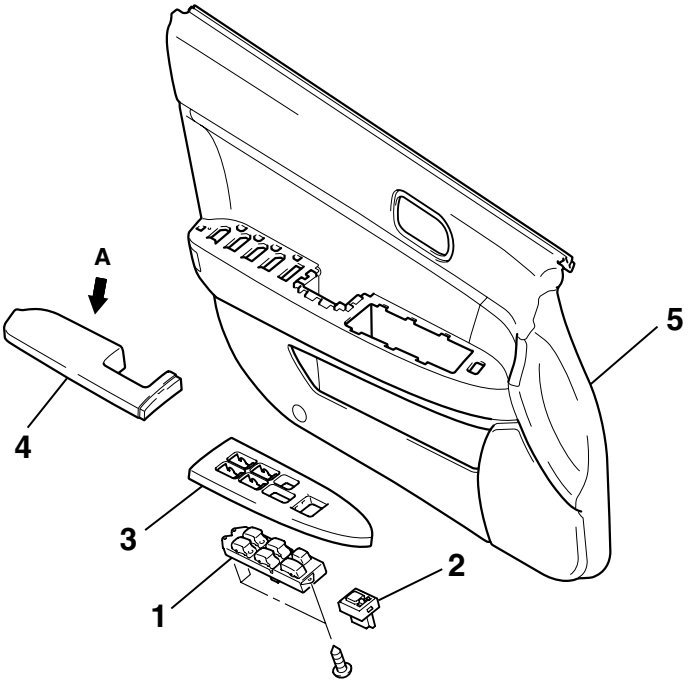
<<B>> POWER WINDOW SWITCH PANEL ASSEMBLY REMOVAL

Insert special tool MB990784 as shown to remove the power window switch panel assembly.

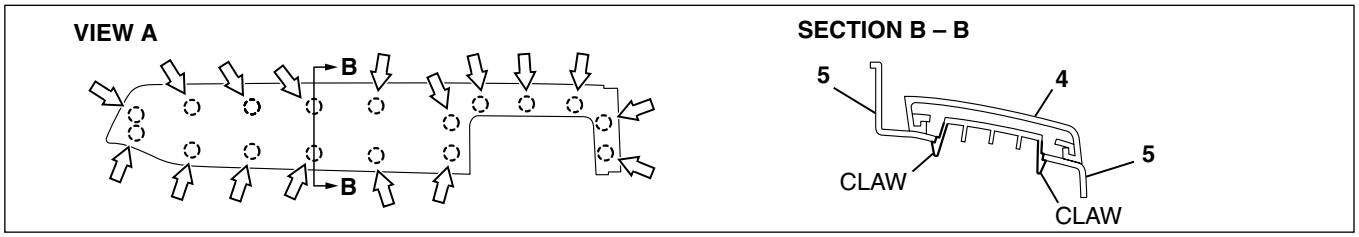
DISASSEMBLY AND ASSEMBLY

M1521006900155

<FRONT DOOR TIRM>



NOTE
⇦ : CLAW POSITIONS



AC601347AB

DISASSEMBLY STEPS

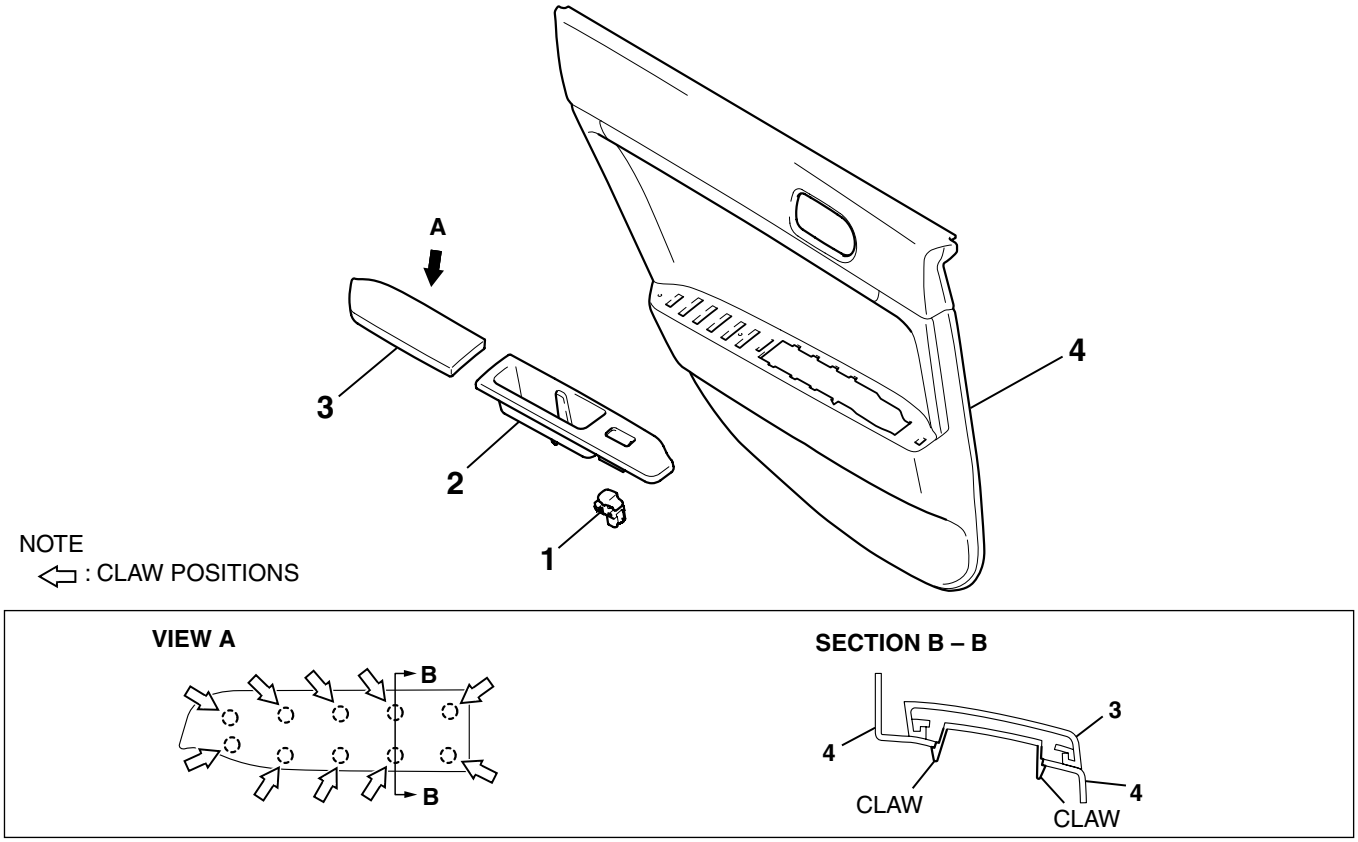
1. POWER WINDOW SWITCH
2. REMOTE CONTROLLED MIRROR SWITCH

DISASSEMBLY STEPS

3. POWER WINDOW SWITCH PANEL
4. ARMREST
5. FRONT DOOR TRIM

TSB Revision

<REAR DOOR TRIM>



DISASSEMBLY STEPS

1. POWER WINDOW SUB SWITCH
2. POWER WINDOW SWITCH PANEL

DISASSEMBLY STEPS

3. ARMREST
4. REAR DOOR TRIM

TSB Revision

HEADLINING

REMOVAL AND INSTALLATION

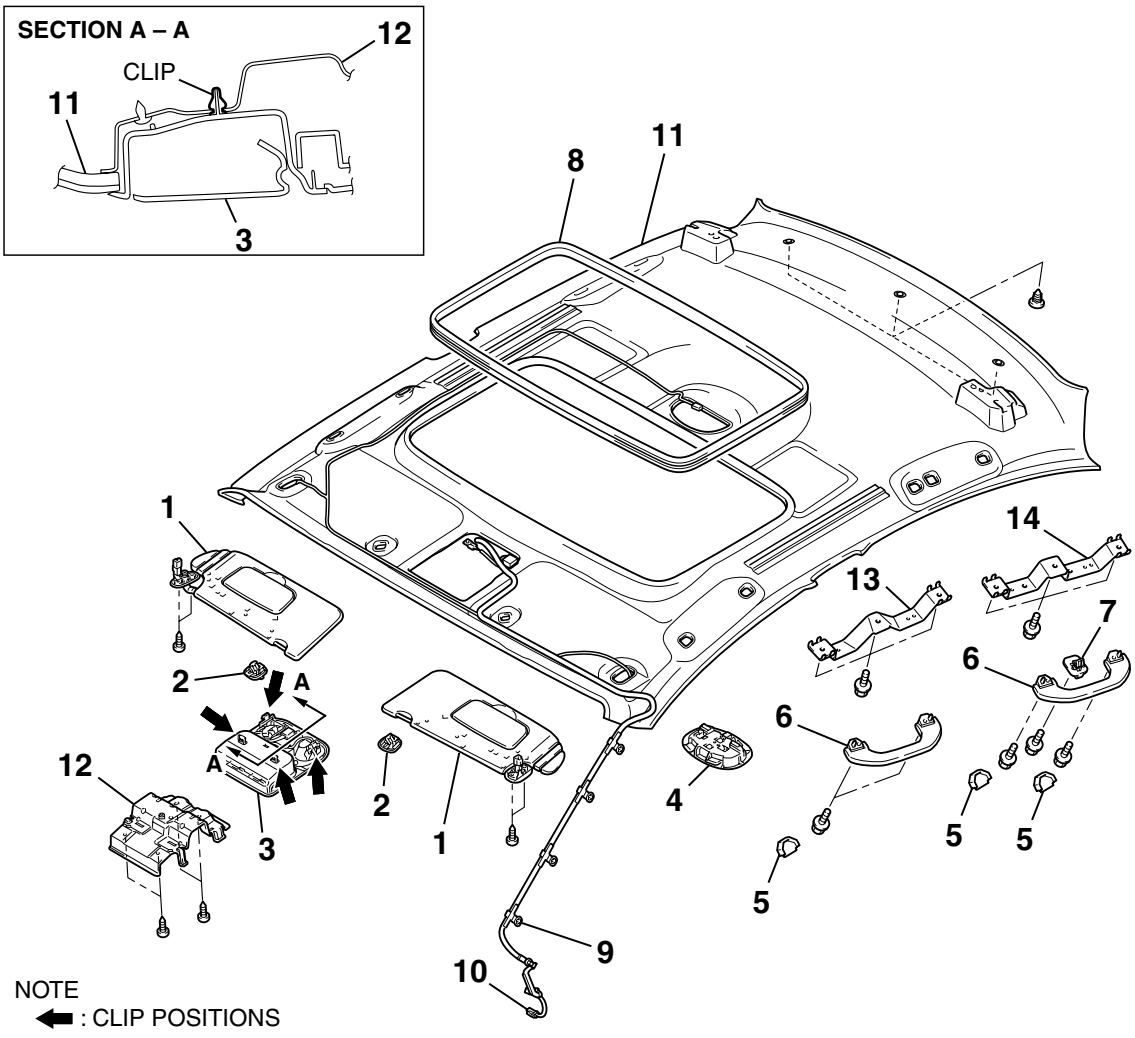
M1521001400843

⚠ ***WARNING***

When removing and installing the front passenger seat, be sure to carry out accuracy check occupant classification sensor after the seat has been installed in the vehicle. (Refer to GROUP 52B, On-Vehicle Service P.52B-396.)

Pre-removal and Post-installation Operation

- Removal and Installation of Front Seat Assembly (Refer to P.52A-34.)
- Removal and Installation of Rear Seat Cushion Assembly and Rear Seatback Assembly (Refer to P.52A-45.)
- Removal and Installation of Front Pillar Trim, Center Pillar Trim Upper and Rear Pillar Trim (Refer to P.52A-23.)



AC601349AB

REMOVAL STEPS

1. SUN VISOR
2. SUN VISOR HOLDER
3. OVERHEAD CONSOLE ASSEMBLY

REMOVAL STEPS (Continued)

4. DOME LIGHT ASSEMBLY (REFER TO GROUP 54A, DOME LIGHT P.54A-137.)
5. ASSIST GRIP PLUG
6. ASSIST GRIP
7. COAT HANGER

TSB Revision

REMOVAL STEPS (Continued)

8. SUNROOF OPENING TRIM <VEHICLES WITH SUNROOF>
9. ROOF HARNESS CLAMP
- INSTRUMENT PANEL SIDE COVER (REFER TO P.52A-15.)

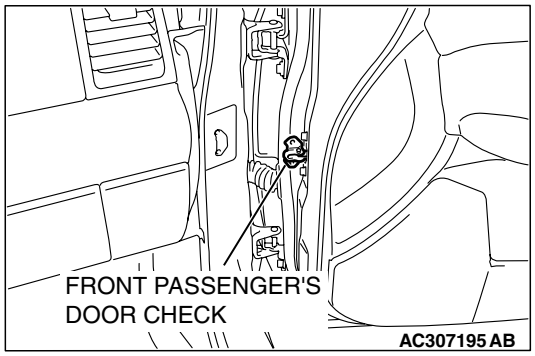
10. ROOF HARNESS CONNECTOR
- FLOOR CONSOLE ASSEMBLY (REFER TO P.52A-22.)
- PARKING BRAKE LEVER ASSEMBLY MOUNTING BOLT (REFER TO GROUP 36, PARKING BRAKE LEVER P.36-6.)

<<A>> 11. HEADLINING ASSEMBLY
12. OVERHEAD CONSOLE BRACKET
13. ASSIST GRIP BRACKET <FRONT>
14. ASSIST GRIP BRACKET <REAR>

REMOVAL SERVICE POINT

<<A>> HEADLINING ASSEMBLY REMOVAL

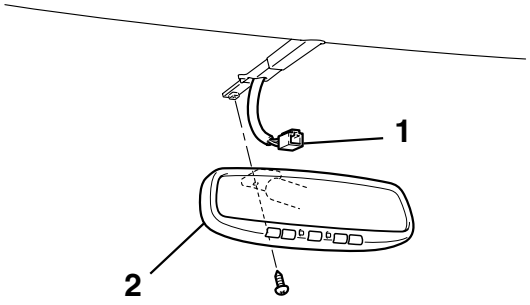
Remove the front passenger's door check (body side mounting bolt), open the front passenger's door and remove the headlining assembly. (Refer to GROUP 42, Door Assembly P.42-36.)



INSIDE REAR VIEW MIRROR

REMOVAL AND INSTALLATION

M1521002700289



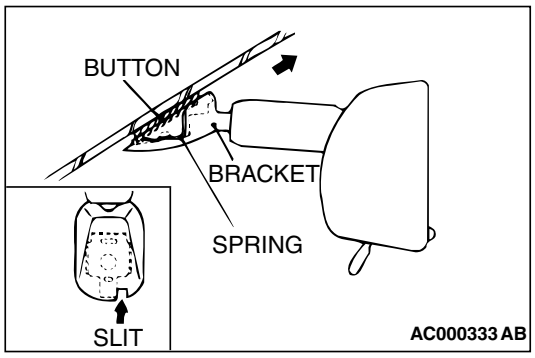
REMOVAL STEP

1. HARNESS CONNECTOR <WITH AUTOMATIC ANTI-DAZZLING MIRROR>

<<A>> 2. INSIDE REAR VIEW MIRROR

TSB Revision

REMOVAL SERVICE POINT



<<A>> INSIDE REAR VIEW MIRROR REMOVAL

Insert a narrow flat-tip screwdriver into the slit in the inside rear view mirror bracket, keep the spring pushed in and remove the inside rear view mirror in the direction of the arrow in the illustration.

NOTE: While the spring is pushed in, the connection between the spring and the pawl of the button is released.

FRONT SEAT ASSEMBLY

REMOVAL AND INSTALLATION

M1522001300560

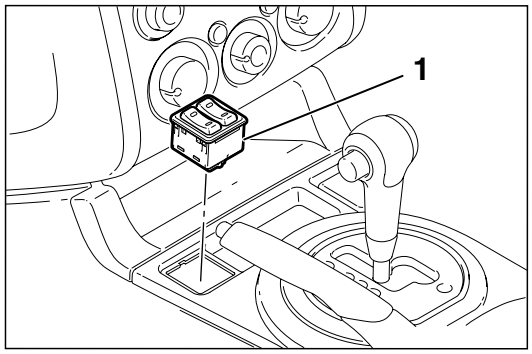
⚠ ***WARNING***

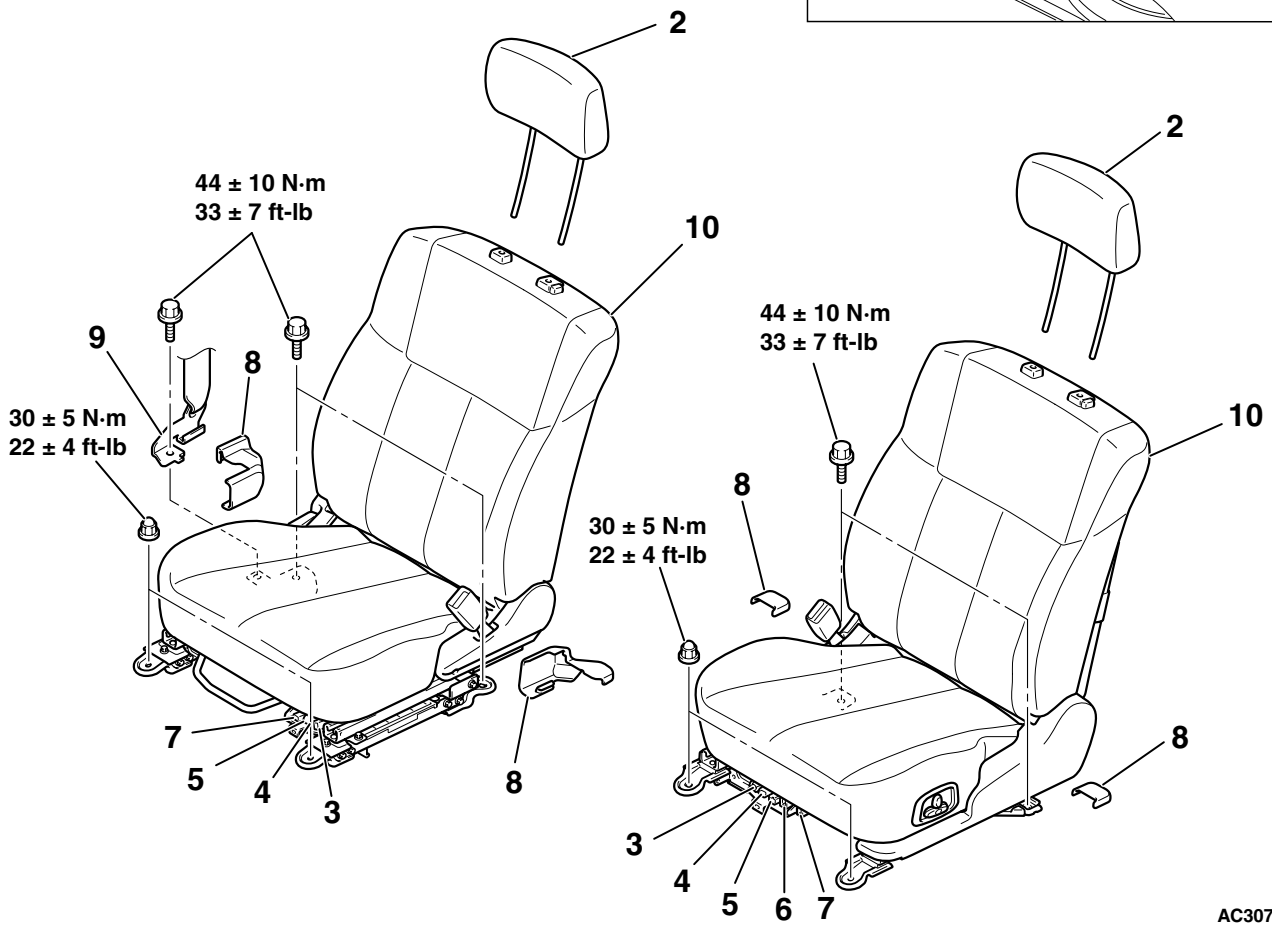
- ***Before removing the front seat assembly, refer to GROUP 52B, Service Precautions P.52B-29 and Air Bag Module and Clock Spring P.52B-408.***
- ***When removing and installing the front passenger seat, be sure to carry out accuracy check occupant classification sensor after the seat has been installed in the vehicle. (Refer to GROUP 52B, On-vehicle Service P.52B-396.)***

⚠ **CAUTION**

Do not impact the seat. If the impact (falling etc.) is applied on the seat with occupant classification sensor, the occupant classification sensor transmitting error may be occurred.)

Post-installation Operation
Adjustment Procedures of Special Function (refer to GROUP 52B, On-vehicle Service P.52B-396.)





AC307257AB

1. HEATED SEAT SWITCH <VEHICLES WITH HEATED SEAT>
2. HEADRESTRAINT

FRONT SEAT ASSEMBLY REMOVAL STEPS

3. SEAT BELT SWITCH CONNECTOR
4. SEAT SLIDE SENSOR (DRIVER'S SIDE), OCCUPANT CLASSIFICATION SENSOR (PASSENGER'S SIDE)
5. HEATED SEAT CONNECTOR <VEHICLES WITH HEATED SEAT>

FRONT SEAT ASSEMBLY REMOVAL STEPS (Continued)

6. POWER SEAT CONNECTOR <VEHICLES WITH POWER SEAT>
7. SIDE-AIR BAG MODULE CONNECTOR <VEHICLES WITH SIDE-AIR BAG>
8. FRONT SEAT REAR ANCHOR COVER
9. OUTER SEAT BELT (PASSENGER'S SIDE)

>>**A**<< 10. FRONT SEAT ASSEMBLY

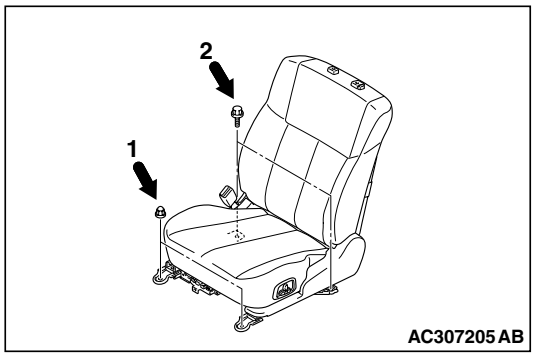
TSB Revision

INSTALLATION SERCIVE POINT

>>A<< FRONT SEAT ASSEMBLY INSTALLATION

⚠ CAUTION

Install the front passenger's seat assembly before installing the outer seat belt.



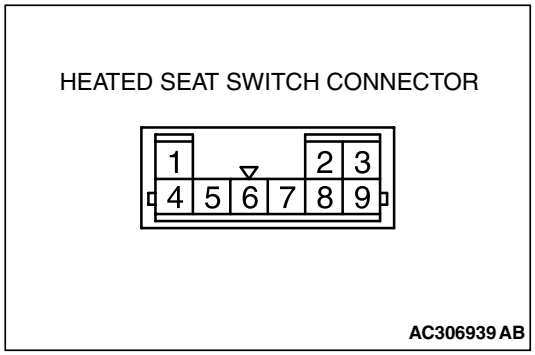
1. Temporarily tighten the nuts in mounting locations shown in the illustration with no weight on the front seat cushion and check the operation of the seat slide.
2. Temporarily tighten the bolts in mounting locations shown in the illustration with no weight on the front seat cushion.
3. Tighten the nuts and bolts in all mounting locations to the specified torque.

INSPECTION

M1522005500113

HEATED SEAT SWITCH CHECK

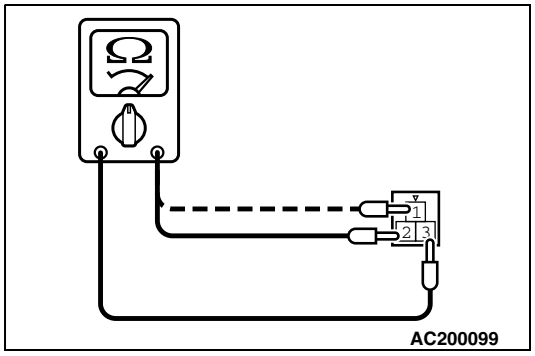
CONTINUITY TEST OF HEATED SEAT SWITCH



1. Check for continuity between terminals.

ITEM	SWITCH POSITION	TESTER CONNECTION	SPECIFIED CONDITION
Driver's seat side	HI	1 –– 3, 1– 5, 1 – 8, 3 – 5, 3 – 8, 5 – 8	Less than 2 ohms
	OFF	1 – 3, 1 – 5, 1 – 8, 3 – 5, 3 – 8, 5 – 8	Open circuit
	LO	3 – 5, 3 – 8, 5 – 8	Less than 2 ohms
Front passenger's seat side	HI	4 – 5, 4 – 8, 4 – 9, 5 – 8, 5 – 9, 8 – 9	Less than 2 ohms
	OFF	4 – 5, 4 – 8, 4 – 9, 5 – 8, 5 – 9, 8 – 9	Open circuit
	LO	5 – 8, 5 – 9, 8 – 9	Less than 2 ohms

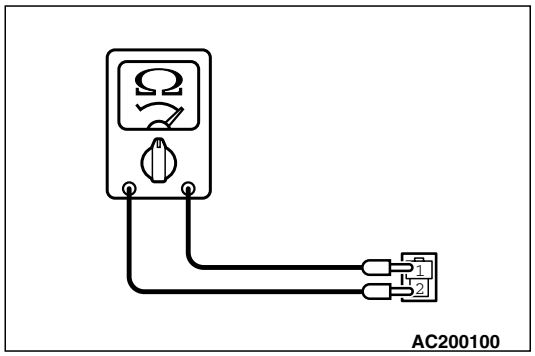
2. Check that the indicator is lighted at HI or LO when battery voltage is supplied to terminal 5 and terminal 8 is grounded.
3. Check that indicator is lighted when battery voltage is supplied to terminals 2 and terminal 6.



SEAT CUSHION HEATER CHECK

Measure the resistance between terminals.

Standard value: At room temperature 20 °C (68 °F)
Between terminals 2 and terminal 3: Approximately 4.0 ohms ± 9%
Between terminals 1 and terminal 3: 4.1 ohms ± 9%

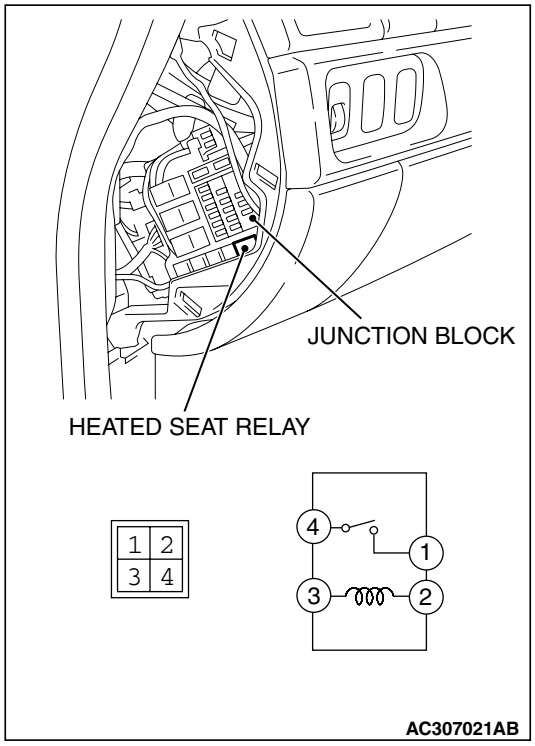


SEATBACK HEATER CHECK

Measure the resistance between terminals.

Standard value: At room temperature 20 °C (68 °F)
Approximately 3.6 ohms ± 9%

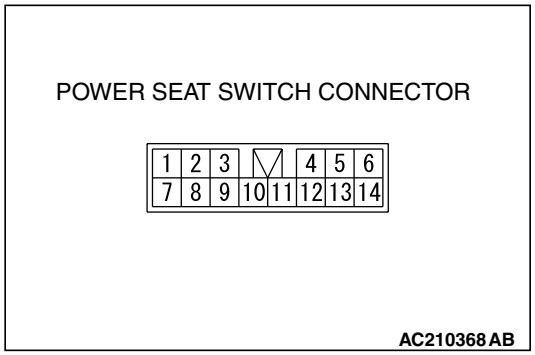
HEATED SEAT RELAY CONTINUITY CHECK



1. Remove the instrument lower cover.
2. Remove the junction block mounting and slide the junction block to check the heated seat.

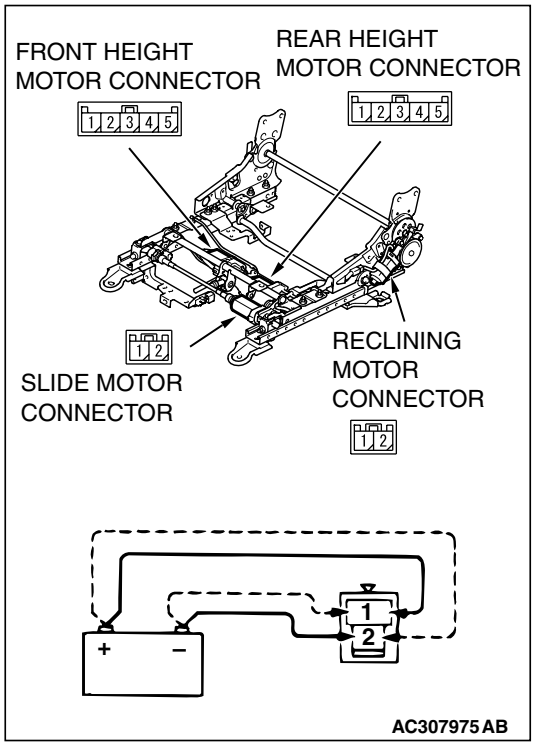
BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	1 – 4	Open circuit
• Connect terminal 2 to the positive battery terminal • Connect terminal 3 to the negative battery terminal	1 – 4	Less than 2 ohms

POWER SEAT MANUAL SWITCH CONTINUITY CHECK



SWITCH POSITION		TESTER CONNECTION	SPECIFIED CONDITION
Reclining switch	FRONT	2 – 9, 1 – 12	Less than 2 ohms
	REAR	1 – 9, 2 – 12	Less than 2 ohms
Slide switch	FRONT	1 – 5, 2 – 6	Less than 2 ohms
	REAR	2 – 5, 1 – 6	Less than 2 ohms
Front height switch	UP	1 – 7, 2 – 8	Less than 2 ohms
	DOWN	2 – 7, 1 – 8	Less than 2 ohms
Rear height switch	UP	2 – 13, 1 – 14	Less than 2 ohms
	DOWN	1 – 13, 2 – 14	Less than 2 ohms

OPERATION CHECK OF POWER SEAT MOTOR



1. Disconnect the connector of each motor.
2. Check that when the battery is directly connected to the motor terminal, the motor turns smoothly and each adjusting mechanism operates as stated below for each motor:
   (1) Connect the battery power supply to the terminal 1 and ground the terminal 2 for the rear reclining side, front slide side.
   (2) Connect the battery power supply to the terminal 2 and ground the terminal 1 for the front reclining side, rear slide side.
   (3) Connect the battery power supply to the terminal 2 and ground the terminal 3 for the front height down side and connect the battery power supply to the terminal 3 and ground the terminal 2 for the front height up side.
   (4) Connect the battery power supply to the terminal 3 and ground the terminal 4 for the rear height up side and connect the battery power supply to the terminal 4 and ground the terminal 3 for the rear height down side.
3. If abnormality was found, check the power seat adjuster assembly.

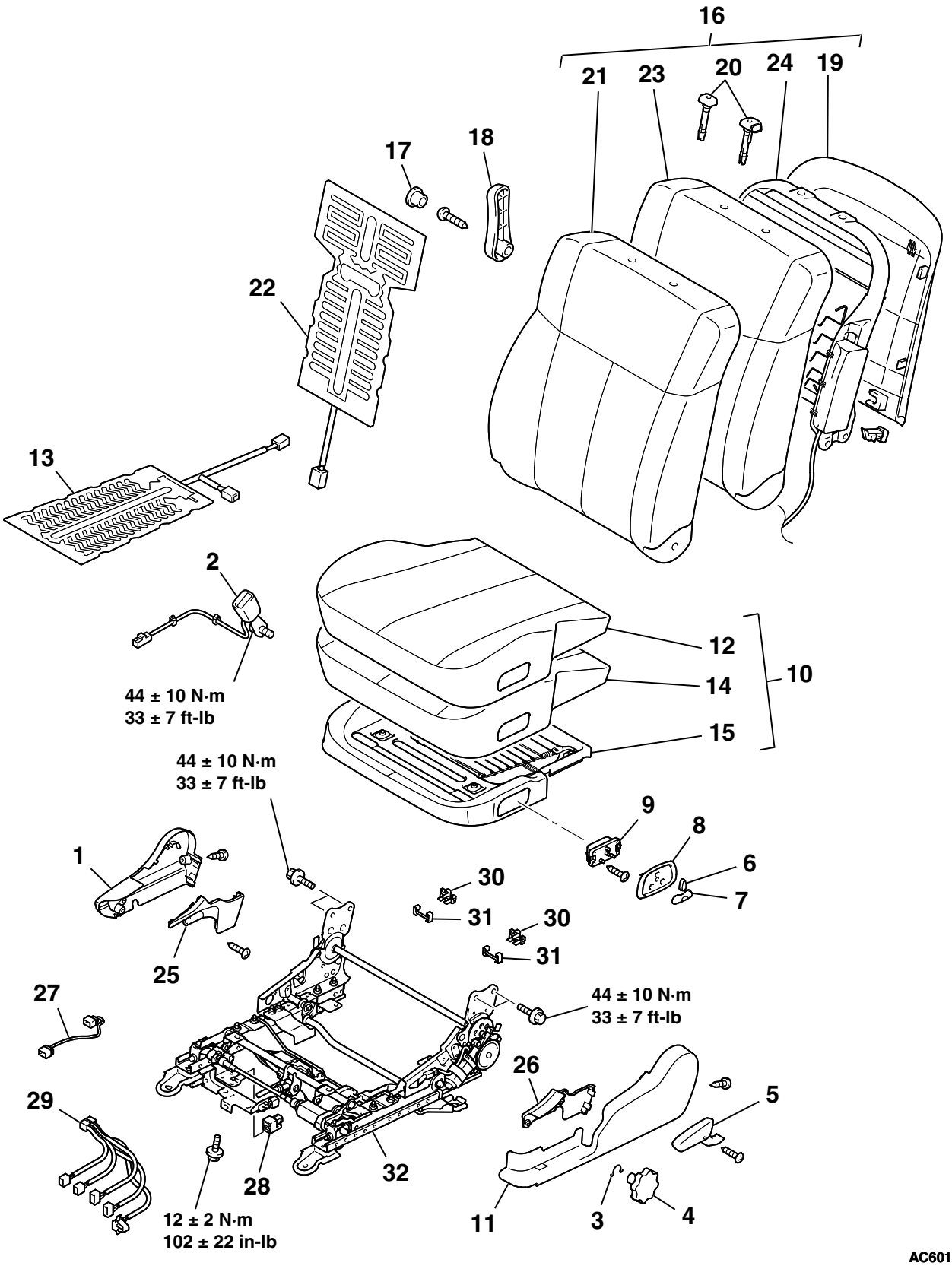
DISASSEMBLY AND ASSEMBLY

M1522001501062

<LH SIDE>

⚠ ***WARNING***

Never attempt to disassemble or repair the seat slide sensor. If faulty, replace it.



AC601458AB

DISASSEMBLY STEPS

1. HINGE COVER
2. INNER SEAT BELT
3. SNAP RING <VEHICELS WITHOUT POWER SEAT>

DISASSEMBLY STEPS

4. HIGHT ADJUSTER KNOB <VEHICELS WITHOUT POWER SEAT>

TSB Revision

DISASSEMBLY STEPS

5. RECLINING ADJUSTER LEVER <VEHICELS WITHOUT POWER SEAT>
6. RECLINING KNOB <VEHICELS WITH POWER SEAT>
7. SLIDE ADJUSTER KNOB <VEHICELS WITH POWER SEAT>
8. POWER SEAT SWITCH GARNISH <VEHICELS WITH POWER SEAT>
9. POWER SEAT SWICH <VEHICELS WITH POWER SEAT>
10. SEAT CUHION ASSEMBLY
11. SIDE SHIELD COVER
12. SEAT CUSHION COVER
13. SEAT CUSHION HEATER <VEHICLES WITH HEATED SEAT>
14. SEAT CUSHION PAD
15. SEAT CUSHION FRAME
16. SEATBACK ASSEMBLY
17. LUMBAR SUPPORT LEVER CAP <VEHICLES WITH POWER SEAT>
18. LUMBAR SUPPORT LEVER <VEHICLES WITH POWER SEAT>
19. SEATBACK PANEL

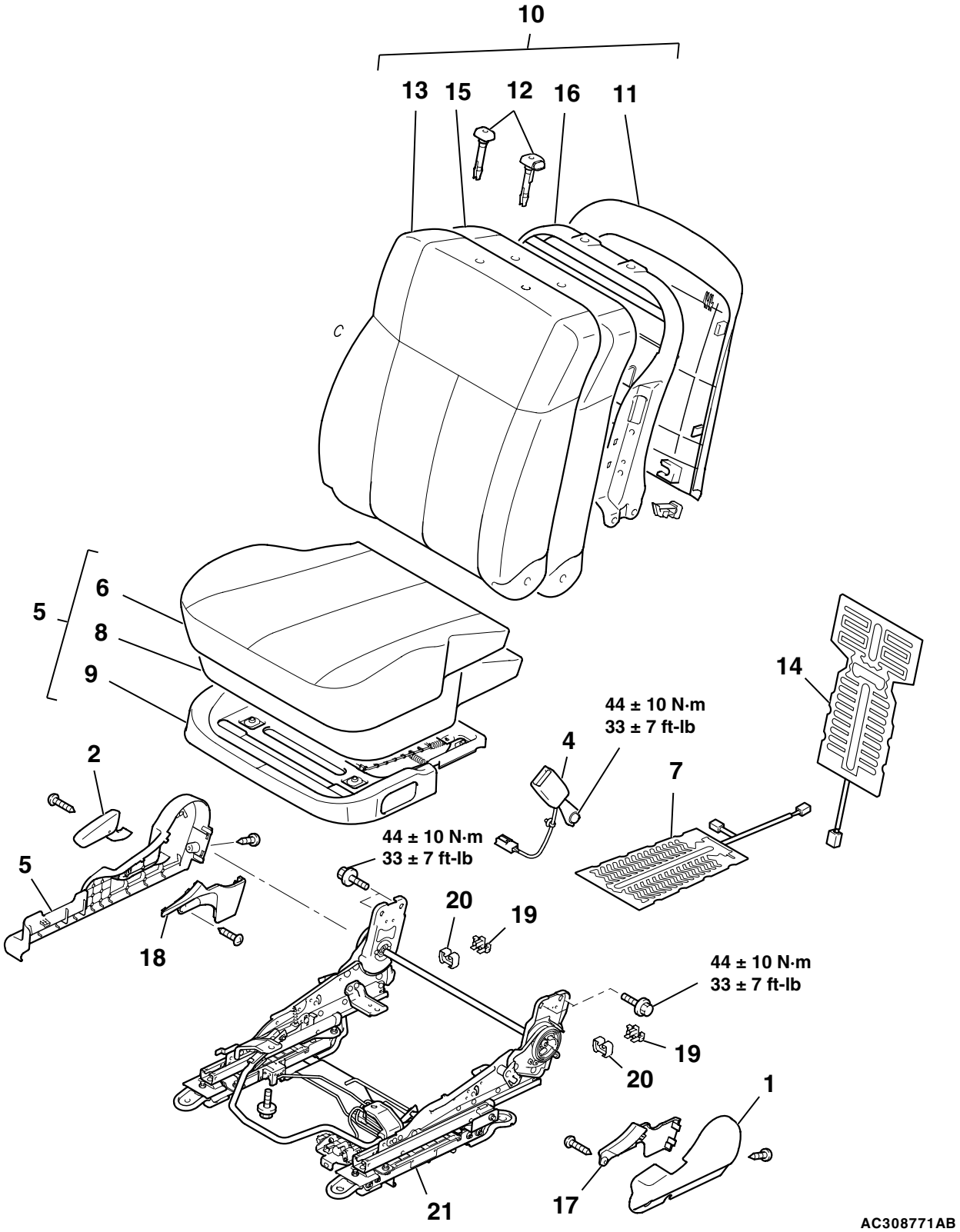
<<**A**>> 20. HEADRESTRAINT GUIDE

21. SEATBACK COVER
22. SEATBACK HEATER <VEHICELES WITH HEATED SEAT>
23. SEATBACK PAD
24. SEATBACK FRAME
25. SIDE SHIELD COVER INNER (RH)
26. SIDE SHIELD COVER INNER (LH)
27. SLIDE SENSOR HARNESS
28. SLIDE SENSOR
29. POWER SEAT HARNESS <VEHICLES WITH POWER SEAT>
30. SLIDE ADJUSTER CAP A
31. SLIDE ADJUSTER CAP B
32. SLIDE ADJUSTER

<RH SIDE>

⚠ WARNING

- ***Never attempt to disassemble or repair the occupant classification-ECU or the occupant classification sensor. If faulty, replace it.***
- ***Do not drop or subject the occupant classification-ECU and occupant classification sensor to impact or vibration. If denting, cracking, deformation, or rust are discovered in the occupant classification-ECU or the occupant classification sensor, replace it with a new occupant classification-ECU or the occupant classification sensor.***



REMOVAL STEPS

1. HINGE COVER
2. RECLINING ADJUSTER LEVER
3. SIDE SHIELD COVER
4. INNER SEAT BELT
5. SEAT CUSHION ASSEMBLY
6. SEAT CUSHION COVER

REMOVAL STEPS (Continued)

7. SEAT CUSHION HEATER <VEHICLES WITH HEATED SEAT>
8. SEAT CUSHION PAD
9. SEAT CUSHION FRAME
10. SEATBACK ASSEMBLY

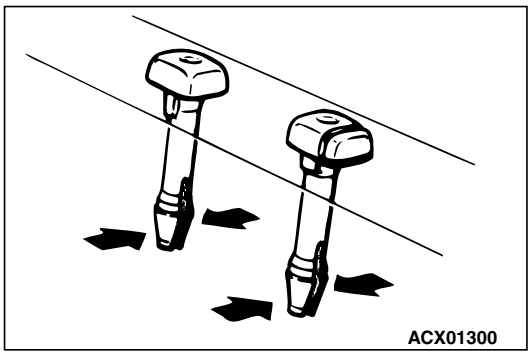
TSB Revision

REMOVAL STEPS (Continued)

11. SEATBACK PANEL
<<**A**>> 12. HEADRESTRAINT GUIDE
13. SEATBACK COVER
14. SEATBACK HEATER <VEHICLES WITH HEATED SEAT>
15. SEATBACK PAD
16. SEATBACK FRAME
17. SIDE SHIELD COVER INNER (RH)
18. SIDE EHIELD COVER INNER (LH)
19. SLIDE ADJUSTER CAP A
20. SLIDE ADJUSTER CAP B
<<**B**>> 21. SLIDE ADJUSTER

REMOVAL SERVICE POINT

<<A>> HEADRESTRAINT GUIDE REMOVAL



<<B>> SLIDE ADJUSTER REMOVAL

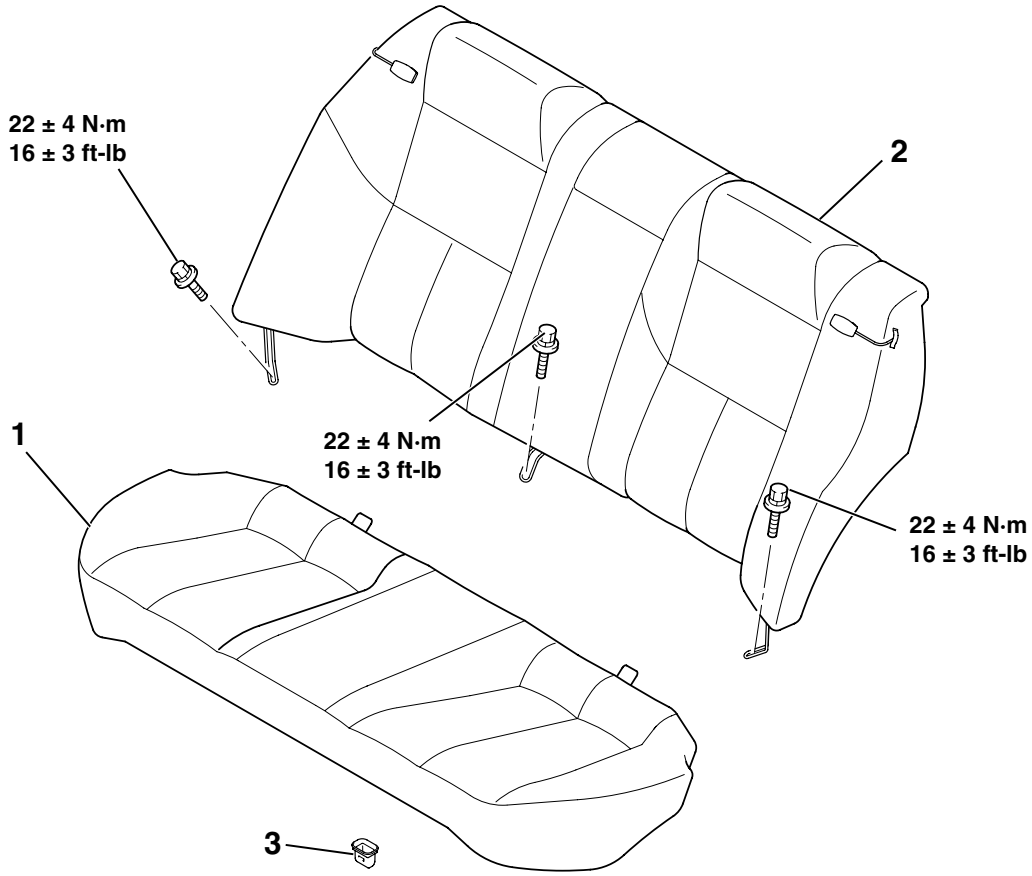
⚠ WARNING

Do not remove the occupant classification-ECU and the occupant classification sensor from the slide adjuster.

REAR SEAT ASSEMBLY

REMOVAL AND INSTALLATION

M1522001800297



REMOVAL STEPS

>>**B**<< 1. REAR SEAT CUSHION ASSEMBLY

REMOVAL STEPS (Continued)

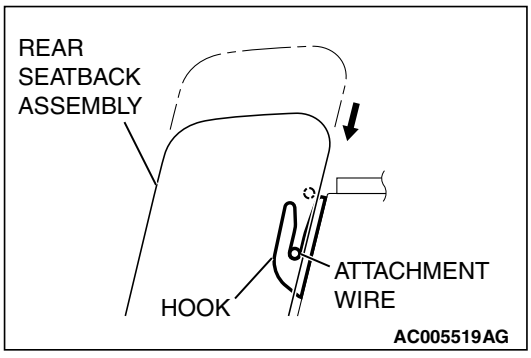
>>**A**<< 2. REAR SEATBACK ASSEMBLY

3. REAR SEAT HOOK

INSTALLATION SERVICE POINTS

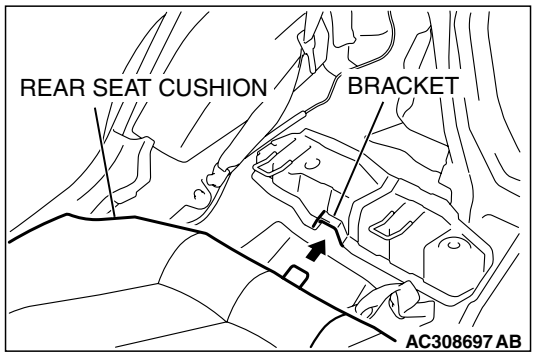
>>A<< INSTALLATION OF REAR SEATBACK ASSEMBLY

Press the rear seatback assembly in the direction shown in the illustration and fit the attachment wire into the hook securely to install the rear seatback assembly.

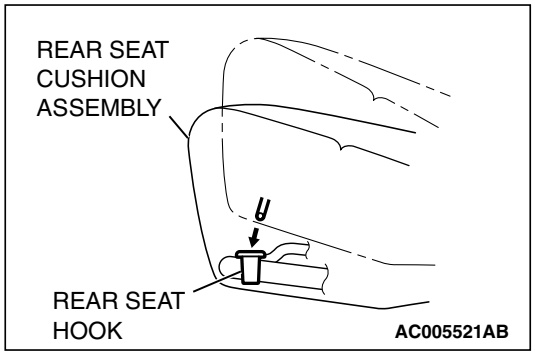


TSB Revision

>>B<< INSTALLATION OF REAR SEAT CUSHION ASSEMBLY



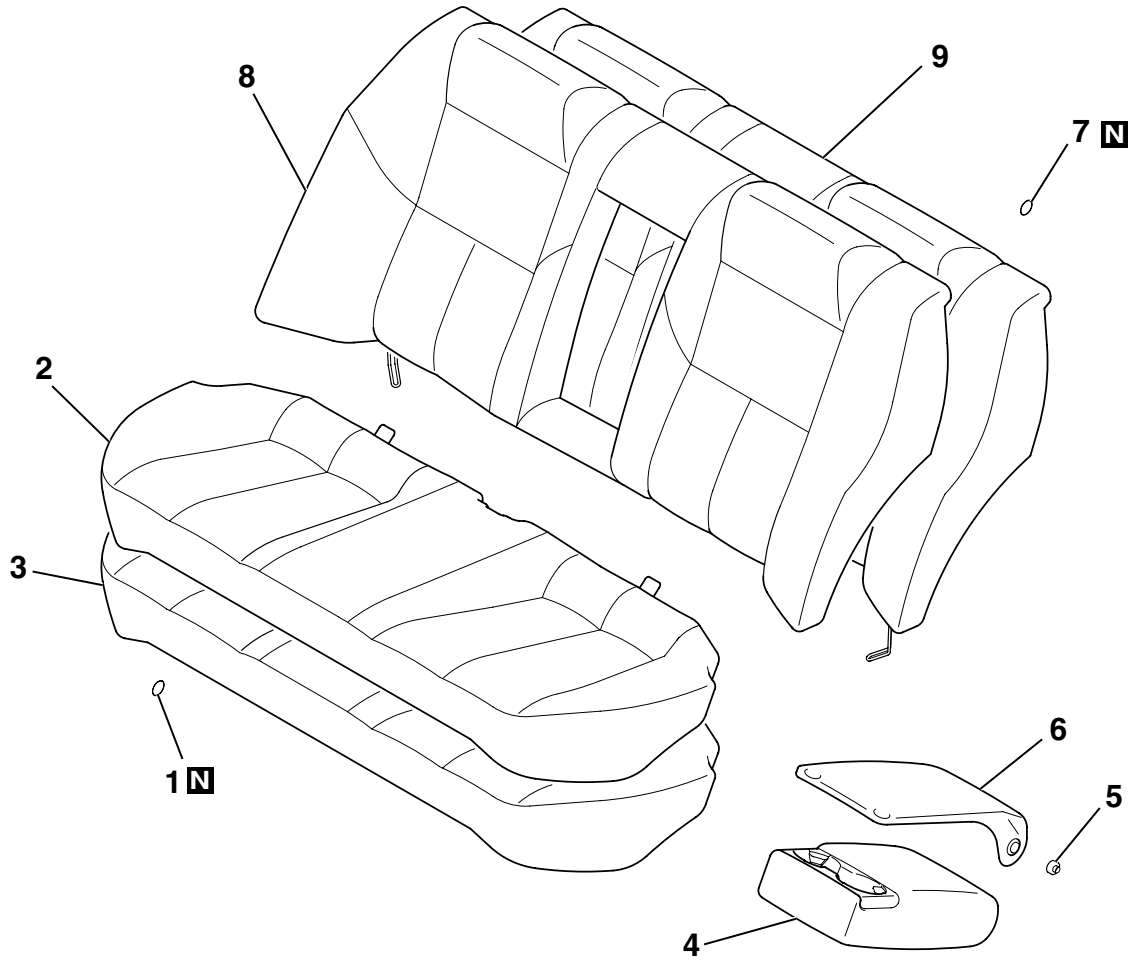
1. Fit the rear seat cushion into the bracket securely.



2. Fit the rear seat cushion into the rear seat hook securely.

DISASSEMBLY AND ASSEMBLY

M1522002000357



AC306949AB

DISASSEMBLY STEPS

1. HOG RING
2. SEAT CUSHION COVER
3. SEAT CUSHION PAD
4. ARMREST
5. BUSH

DISASSEMBLY STEPS

6. ARMREST PAD
7. HOG RING
8. SEATBACK COVER
9. SEATBACK PAD

TSB Revision

FRONT SEAT BELT

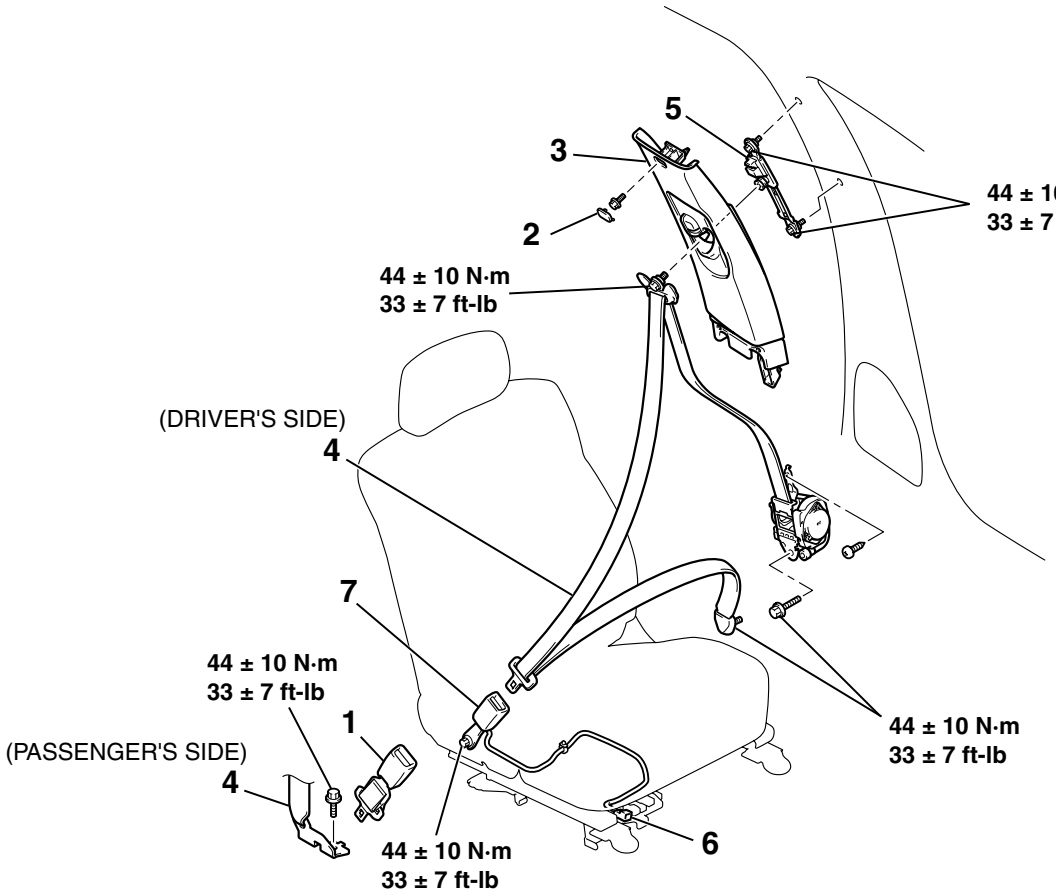
REMOVAL AND INSTALLATION

M1523001300853

⚠ CAUTION

- **When removing and installing the inner seat belt, be sure to carry out accuracy check occupant classification sensor after the seat has been installed in the vehicle. (Refer to GROUP 52B, On-vehicle Service P.52B-396.)**
- **SRS: Before removing and installing the seat belts with pre-tensioner, refer to GROUP 52B, Seat Belt with Pre-tensioner P.52B-424.**

Pre-removal Operation	Post-installation Operation
• Turn the ignition key to the LOCK (OFF) position. • Disconnect the negative battery terminal.	• Adjustment Procedures of Special Function (refer to GROUP 52B, On-vehicle Service P.52B-424.) • Turn the ignition key to the LOCK (OFF) position. • Disconnect the negative battery terminal.



AC601418AB

1. EXTENDER SEAT BELT ASSEMBLY*

OUTER SEAT BELT REMOVAL STEPS

- CENTER PILLAR TRIM LOWER (REFER TO P.52A-23.)
2. SCREW CAP
3. CENTER PILLAR TRIM UPPER (REFER TO P.52A-23.)

OUTER SEAT BELT REMOVAL STEPS (Continued)

4. OUTER SEAT BELT (REFER TO GROUP 52B, SEAT BELTS WITH PRE-TENSIONER P.52B-424.)
5. ADJUSTABLE SEAT BELT ANCOR

INNER SEAT BELT

6. SEAT BELT SWITCH CONNECTOR

TSB Revision

INNER SEAT BELT (Continued)

- SHIELD COVER (REFER TO P.52A-39.)

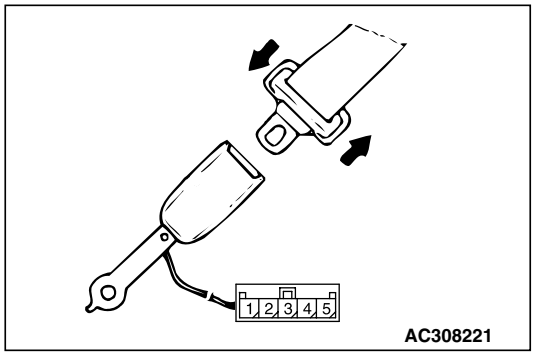
7. INNER SEAT BELT

*NOTE: *If so equipped*

INSPECTION

M1523004400116

SEAT BELT SWITCH CONTINUITY CHECK

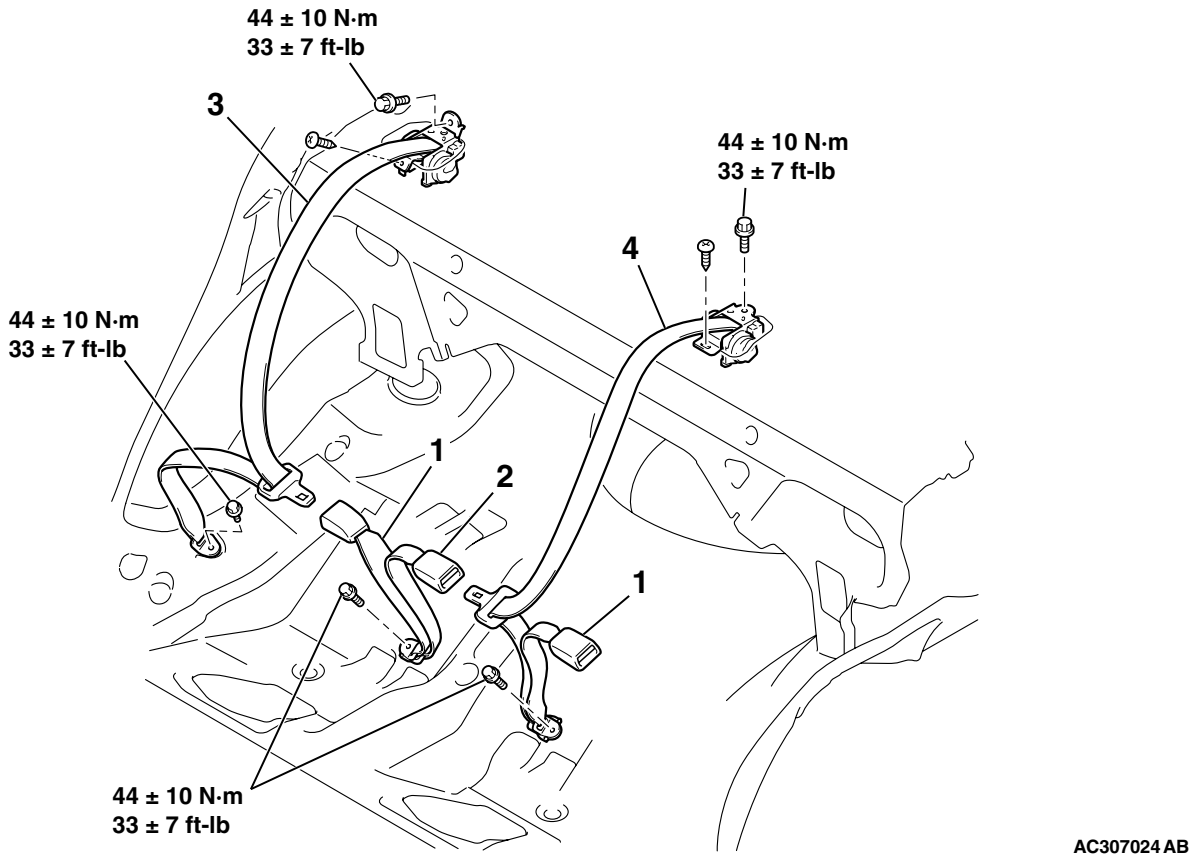


ITEM	TESTER CONNECTION	SPECIFIED CONDITION
Fastened seat belt	1 – 2	Open circuit
Unfastened seat belt	1 – 2	Less than 2 ohms

REAR SEAT BELT

REMOVAL AND INSTALLATION

M1523001600371



TSB Revision

REMOVAL STEPS
- REAR SEAT CUSHION ASSEMBLY (REFER TO P.52A-45.)

1. INNER SEAT BELT
2. CENTER SEAT BELT INNER

REMOVAL STEPS (Continued)
- REAR SHELF TRIM (REFER TO P.52A-23.)

3. OUTER SEAT BELT
4. CENTER SEAT BELT OUTER

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1521004100227

ITEM	SPECIFICATION
FRONT SEAT	
Front seatback assembly bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Front seat cushion assembly bolt	12 ± 2 N·m (102 ± 22 in-lb)
Front seat bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Front seat nut	30 ± 5 N·m (22 ± 4 ft-lb)
REAR SEAT	
Seatback assembly bolt	22 ± 4 N·m (16 ± 3 ft-lb)
FRONT SEAT BELT	
Adjustable seat belt anchor bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Inner seat belt bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Outer seat belt bolt	44 ± 10 N·m (33 ± 7 ft-lb)
REAR SEAT BELT	
Center seat belt outer and inner seat belt bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Inner seat belt bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Seat belt shoulder anchor bolt	44 ± 10 N·m (33 ± 7 ft-lb)
Seat belt lower anchor bolt	44 ± 10 N·m (33 ± 7 ft-lb)

SERVICE SPECIFICATIONS

M1521000300070

ITEM	MEASURED TERMINALS	STANDARD VALUE
Seat cushion heater (At room temperature 20°C)	1 – 2	Approximately 4.16 Ω ± 9 %
	1 – 3	Approximately 0.2 Ω ± 9 %
Seatback heater (At room temperature 20°C)	1 – 2	Approximately 5.2 Ω ± 9 %