

## GROUP 17

# ENGINE AND EMISSION CONTROL

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#### WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

##### **WARNING**

- *Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).*
- *Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.*
- *MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.*

##### NOTE

The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (\*).

## ENGINE CONTROL

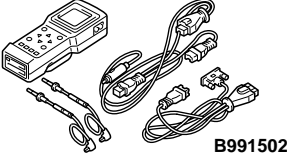
### GENERAL DESCRIPTION

M1171000100211

The accelerator cable has been discontinued, because the electronic-controlled throttle actuator control system has been adopted.

### SPECIAL TOOL

M1171000600023

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 <p>B991502</p>	MB991502 Scan tool (MUT-II)	MB991496-OD	Checking diagnostic trouble codes

### ENGINE CONTROL SYSTEM DIAGNOSIS

#### INTRODUCTION TO ENGINE CONTROL SYSTEM DIAGNOSIS

M1171002000209

If there is a malfunction in the engine control system, the accelerator pedal or throttle body may be faulty.

#### ENGINE CONTROL SYSTEM DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1171002100228

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.

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>Gather information from the customer.</li> </ol> | <ol style="list-style-type: none"> <li>Verify that the condition described by the customer exists.</li> <li>Find the malfunction by following the Symptom Chart.</li> <li>Verify that the malfunction is eliminated.</li> </ol> |
|---|---|

### SYMPTOM CHART

M1171002200236

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Throttle valve will not fully open or close	1	<a href="#">P.17-3</a>
Accelerator pedal operation not smooth (over acceleration)	2	<a href="#">P.17-4</a>

### SYMPTOM PROCEDURES

#### INSPECTION PROCEDURE 1: Throttle Valve Will Not Fully Open or Close

#### DIAGNOSIS

##### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

##### STEP 1. Check the accelerator pedal arm return spring.

**Q:** Is the accelerator pedal arm return spring damaged or deformed?

**YES :** Go to Step 2.

**NO :** Replace, then go to Step 4.

**STEP 2. Clean the throttle body. (Refer to GROUP 13A, On-vehicle Service – Throttle Body Cleaning P.13Aa-11.)**

**Q: Does the throttle valve fully open and close?**

**YES :** The procedure is complete.

**NO :** Go to Step 3.

**STEP 3. Using scan tool MB991502, read the diagnostic trouble code.**

**⚠ CAUTION**

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

(1) Connect scan tool MB991502 to the data link connector.

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

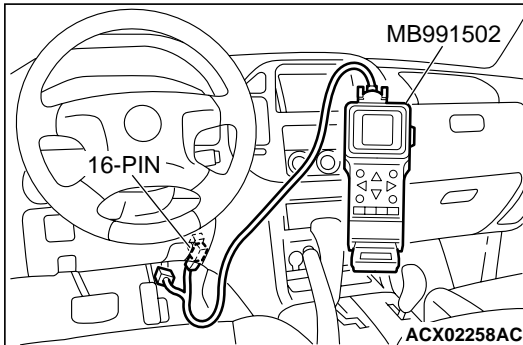
(3) Check for MFI system diagnostic trouble code.

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

**Q: Is any DTC set?**

**YES :** Refer to GROUP 13A, Diagnosis – Diagnostic Trouble Code Chart P.13Ab-22.

**NO :** Go to Step 4.



**STEP 4. 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)**

**DIAGNOSIS**

**Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Check the accelerator pedal.**

**Q: Is the accelerator pedal loose?**

**YES :** Tighten, then go to Step 4.

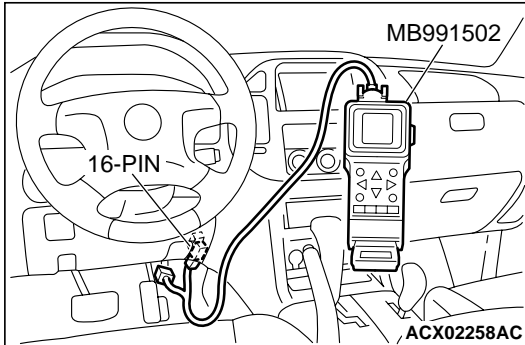
**NO :** Go to Step 2.

**STEP 2. Clean the throttle body. (Refer to GROUP 13A, On-vehicle Service – Throttle Body Cleaning P.13Aa-11.)**

**Q: Does the accelerator pedal work normally?**

**YES :** The procedure is complete.

**NO :** Go to Step 3.



**STEP 3. Using scan tool MB991502, read the diagnostic trouble code.**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check for MFI system diagnostic trouble code.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is any DTC set?**

**YES :** Refer to GROUP 13A, Diagnosis – Diagnostic Trouble Code Chart [P.13Ab-22](#).

**NO :** Go to Step 4.

**STEP 4. Retest the system.**

**Q: Does the accelerator pedal work normally?**

**YES :** The procedure is complete.

**NO :** Go to Step 1.

## ON-VEHICLE SERVICE

### ACCELERATOR PEDAL POSITION SENSOR ADJUSTMENT

M1171002600018

Refer to GROUP 13A, On-vehicle Service – Accelerator Pedal Position Sensor Adjustment [P.13Aa-12](#).

### ACCELERATOR PEDAL POSITION SENSOR CHECK

M1171001900027

Refer to GROUP 13A, On-vehicle Service – Accelerator Pedal Position Sensor Check [P.13Aa-18](#).

### ACCELERATOR PEDAL POSITION SWITCH CHECK

M1171002700015

Refer to GROUP 13A, On-vehicle Service – Accelerator Pedal Position Switch Check [P.13Aa-19](#).

## ACCELERATOR CABLE AND PEDAL

## REMOVAL AND INSTALLATION

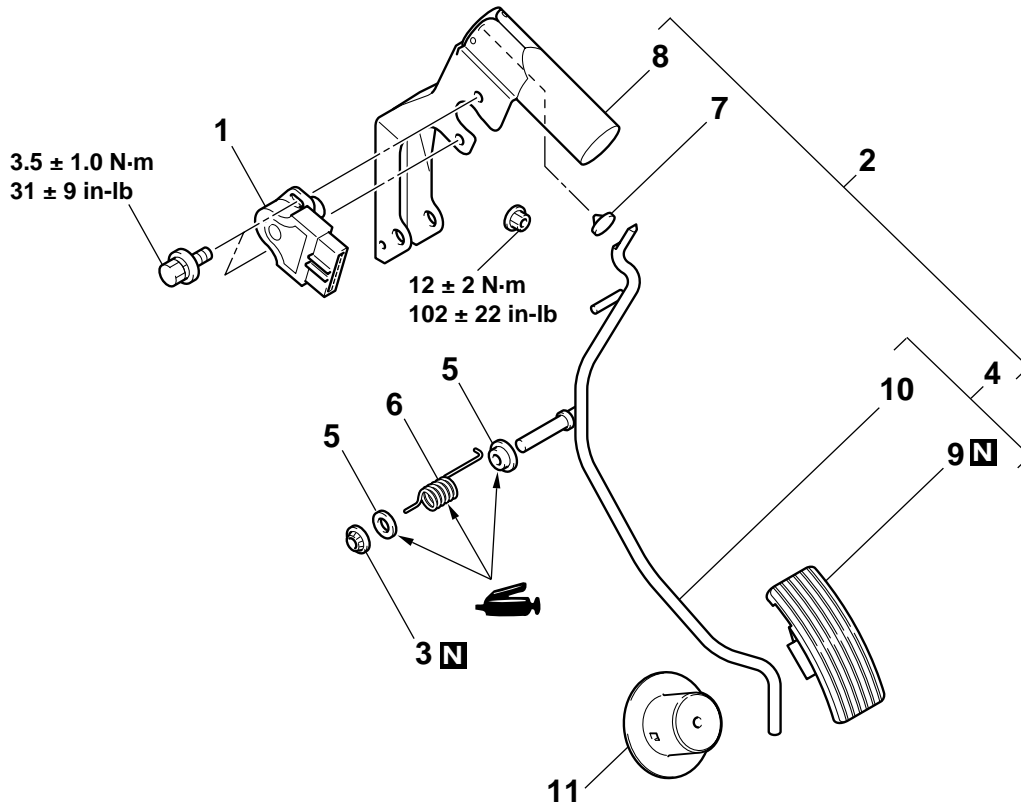
M1171001200277

**CAUTION**

The accelerator pedal position sensor is preadjusted precisely at factory. Whenever the accelerator pedal position sensor is removed and installed, it should be adjusted.

**Post-installation Operation**

Accelerator Pedal Position Sensor Adjustment (Refer to GROUP 13A, On-vehicle Service P.13Aa-12.)



AC204064AB

**REMOVAL STEPS**

1. ACCELERATOR PEDAL POSITION SENSOR
2. ACCELERATOR PEDAL ASSEMBLY
3. PUSH-ON SPRING NUT
4. ACCELERATOR PEDAL PAD AND ACCELERATOR ARM ASSEMBLY
5. BUSHING

**REMOVAL STEPS (Continued)**

6. SPRING
7. STOPPER
8. ACCELERATOR PEDAL BRACKET
- >>A<< 9. ACCELERATOR PEDAL PAD
10. ACCELERATOR ARM
11. ACCELERATOR STOPPER

**INSTALLATION SERVICE POINT****>>A<< ACCELERATOR PEDAL PAD INSTALLATION****CAUTION**

To prevent damages to the accelerator pedal pad, warm the thumb area of the accelerator pedal pad with a dryer, etc. prior to assembling it.

*NOTE: If it is difficult to assemble, apply soapy water to the thumb area to enhance the assembling process.*

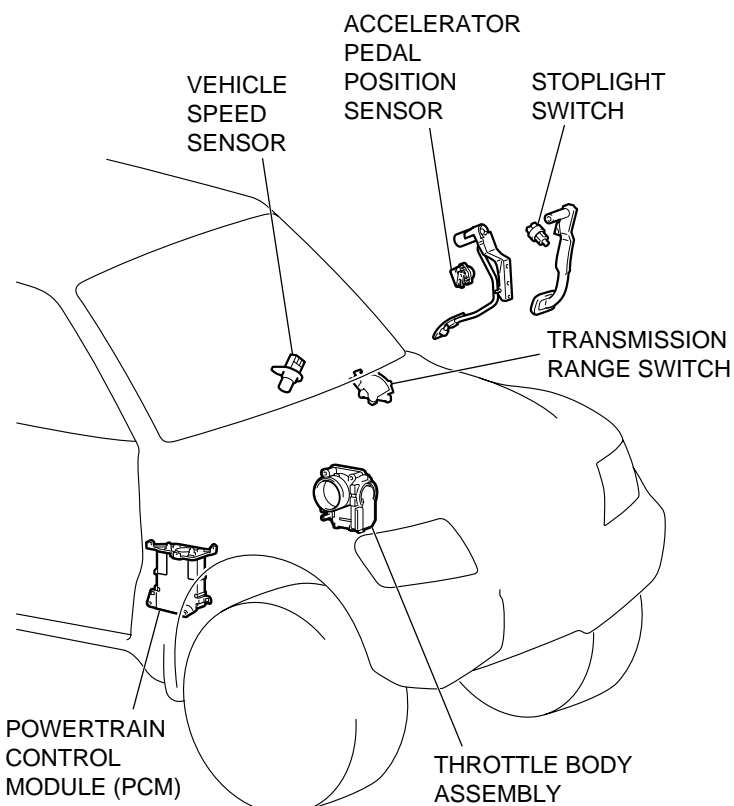
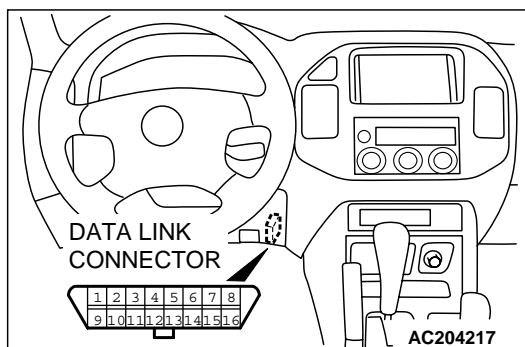
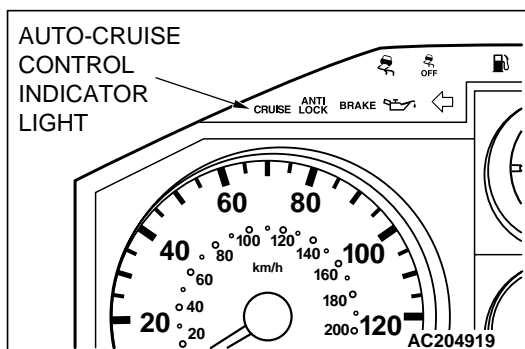
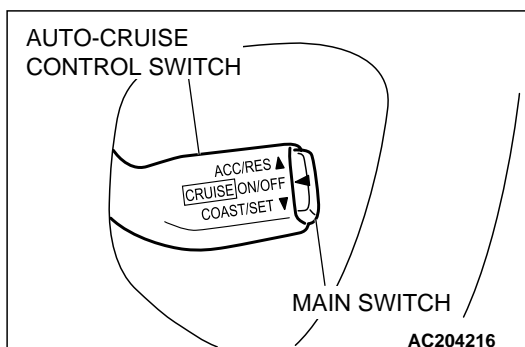
# AUTO-CRUISE CONTROL

## GENERAL DESCRIPTION

M1172000100225

By using the auto-cruise control, the driver can select and maintain a desired cruising speed [approximately 40 km/h (25 mph) or more] without depressing the accelerator pedal.

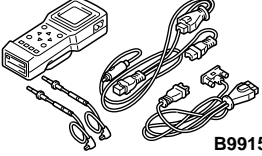
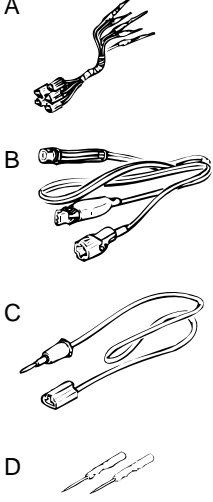

## CONSTRUCTION DIAGRAM



AC204447AB

## SPECIAL TOOLS

M1172000600220

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	Reading diagnostic trouble codes
 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
 MB991348	MB991348 Test harness set	MB991348-01	Checking throttle position sensor

## AUTO-CRUISE CONTROL SYSTEM DIAGNOSIS

## INTRODUCTION TO AUTO-CRUISE CONTROL SYSTEM DIAGNOSIS

M1172003300217

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.

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 output a diagnostic trouble code. Diagnostic trouble codes cover the auto-cruise control switch, stoplight switch and PCM.

## 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

## AUTO-CRUISE CONTROL SYSTEM DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1172002000224

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.
4. If you can verify the condition but no auto-cruise control system 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.00-6.
5. If you can verify the condition but there are no auto-cruise control system DTCs, or the system cannot communicate with scan tool MB991502, refer to Symptom Chart P.17-35 and find the fault.
6. If there is an auto-cruise control system DTC, record the number of the code, then erase the code from vehicle memory using the scan tool.
7. Re-create the auto-cruise control system DTC set conditions to see if the same Auto-cruise Control System DTC will set again.
  - If the same Auto-cruise Control System DTC sets again, perform the diagnostic procedures for the set code. Refer to P.17-12, Auto-cruise Control System Diagnostic Trouble Code Chart.

## AUTO-CRUISE CONTROL SYSTEM DIAGNOSTIC TROUBLE CODE DIAGNOSIS

M1172002100210

### Retrieving Auto-cruise Control System Diagnostic Trouble Codes.

#### Using scan tool MB991502

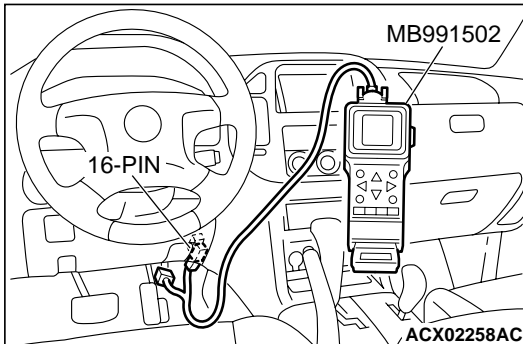
##### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

##### **CAUTION**

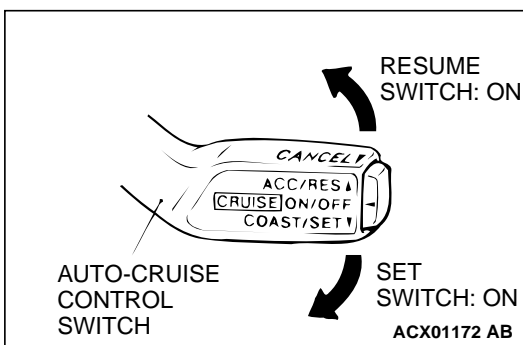
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Depress the auto-cruise control main switch to illuminate the auto-cruise control indicator light in the combination meter.
4. Use scan tool MB991502 to check for auto-cruise control system diagnostic trouble codes.
5. Turn the ignition switch to the "LOCK" (OFF) position.
6. Disconnect scan tool MB991502.

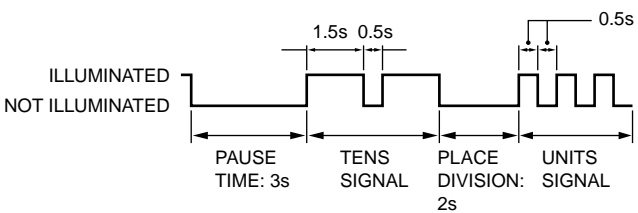
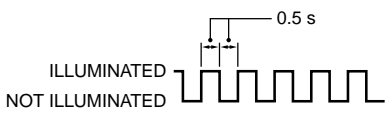


#### Using a Auto-cruise Control Indicator Light

1. Turn the ignition switch to the "ON" position while holding the auto-cruise control switch in the "SET" position (down). Then, within one second, move the cruise control switch up to the "RES" position.
2. Read a diagnostic trouble code by observing the flash display pattern of the auto-cruise control indicator light in the combination meter.



DIAGNOSTIC RESULT DISPLAY METHOD WHEN USING THE AUTO-CRUISE  
CONTROL INDICATOR LIGHT

WHEN THE DIAGNOSTIC TROUBLE CODE NO.23 IS SET	WHEN NO DIAGNOSTIC TROUBLE CODE IS SET
 <p>ILLUMINATED NOT ILLUMINATED</p> <p>PAUSE TIME: 3s</p> <p>TENS SIGNAL 1.5s</p> <p>PLACE DIVISION: 2s 0.5s</p> <p>UNITS SIGNAL 0.5s</p> <p>AC204251AB</p>	 <p>ILLUMINATED NOT ILLUMINATED</p> <p>CONTINUOUS ON AND OFF SIGNALS AT INTERVALS OF 0.5 s</p> <p>AC204252AB</p>

*NOTE: Other on-board diagnostic items are also output as voltage waveforms corresponding to diagnostic trouble code numbers.*

## Erasing Diagnostic Trouble Codes

The diagnostic trouble codes can be erased by the following procedure.

*NOTE: The diagnostic trouble code will not be erased even if the negative battery terminal is disconnected.*

## Using scan tool MB991502

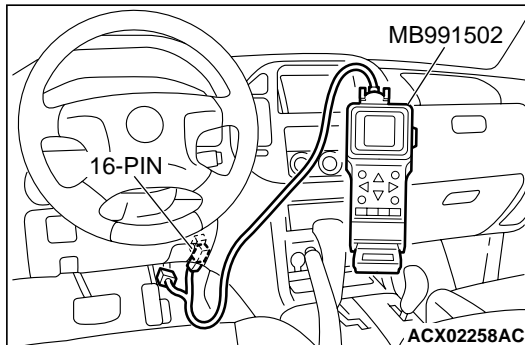
## Required Special Tool:

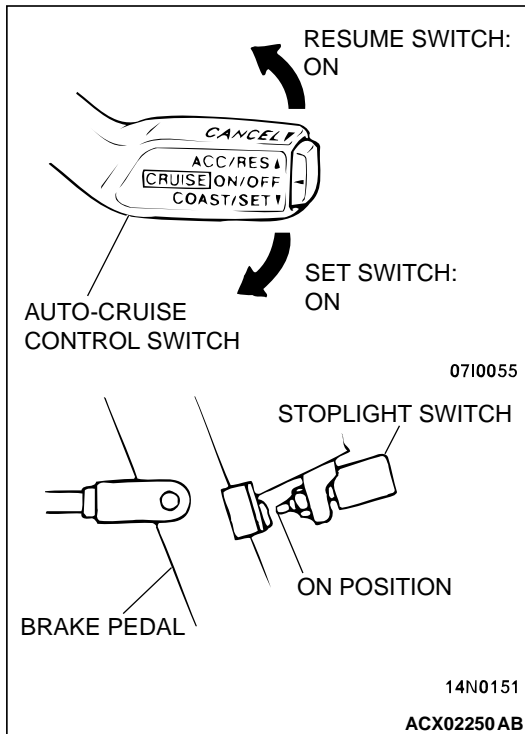
- MB991502: Scan Tool (MUT-II)

**CAUTION**

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

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Use scan tool MB991502 to check for auto-cruise control system diagnostic trouble codes.
4. Turn the ignition switch to the "LOCK" (OFF) position.
5. Disconnect scan tool MB991502.





**Without using scan tool MB991502**

1. Turn the ignition switch to the "ON" position while holding the auto-cruise control switch in the "SET" (down) position.
2. Check to make sure the "CRUISE" light on the instrument panel is flashing.
3. Put the auto-cruise control switch in the "SET" (down) position. Depress the brake pedal and hold for five seconds or more. Release the brake pedal, auto-cruise control switch, then turn the ignition switch to the "LOCK" (OFF) position. The DTC(s) are now erased.

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

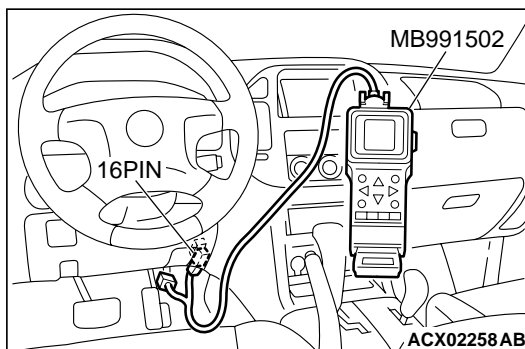
**Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**CAUTION**

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

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Carry out inspection by means of the data list. If there is an abnormality, check and repair the chassis harnesses and components. (Refer to P.17-46, Data List Reference Table.)
4. Re-check using scan tool MB991502 and check to be sure that the abnormal input and output have returned to normal because of the repairs.
5. Erase the diagnostic trouble code(s).
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991502 from the data link connector.
8. Start the engine again and do a test drive to confirm that the problem is eliminated.



DIAGNOSTIC TROUBLE CODE CHART

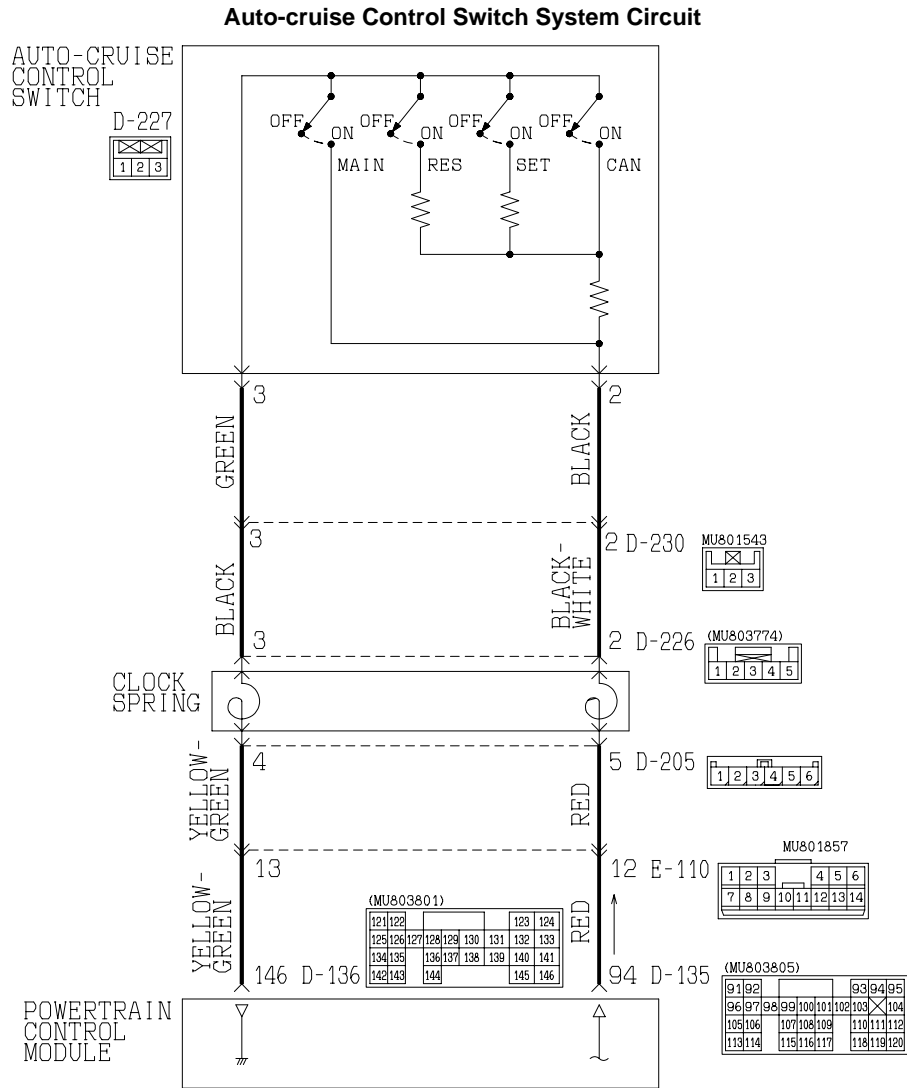
M1172002200240

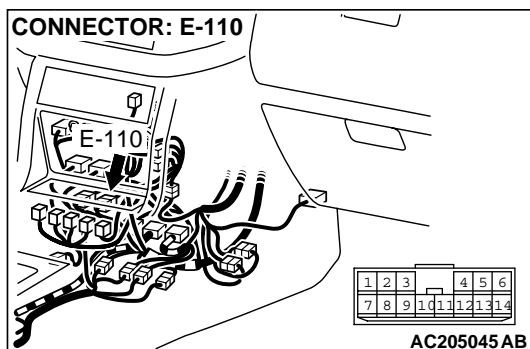
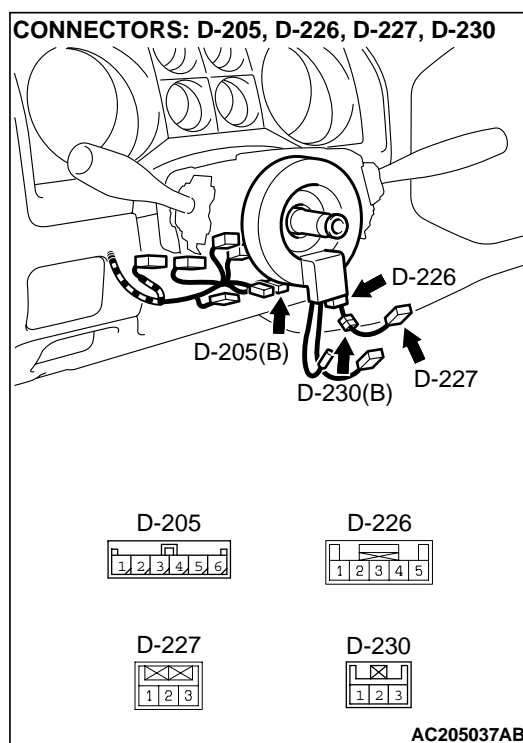
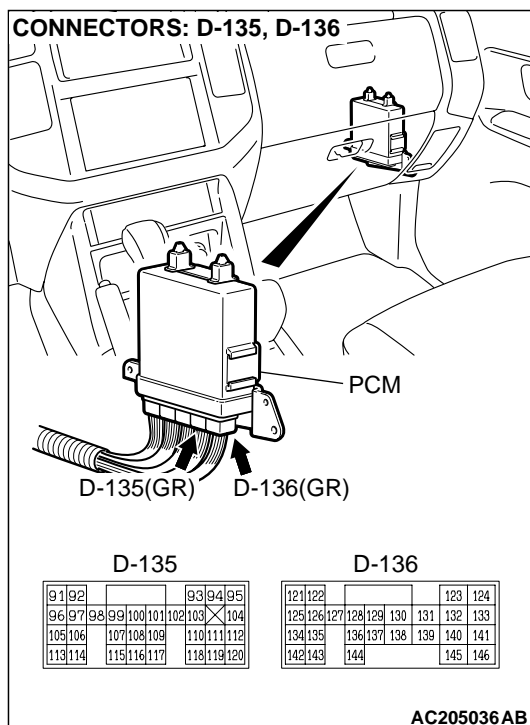
Check according to the inspection chart that is appropriate for the diagnostic trouble code.

DIAGNOSTIC TROUBLE CODE NO.	INSPECTION ITEM	REFERENCE PAGE
15	Auto-cruise control switch system	P.17-12
21	Cancel latch signal system	P.17-23
22	Stoplight switch system	P.17-24
23	Powertrain control module (PCM) and its related components	P.17-34

DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC15 : Auto-cruise Control Switch System





### CIRCUIT OPERATION

This circuit judges the signals of each switch ("SET," "RESUME" 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 – 5.3 volts
- When the "MAIN" switch is ON: 0 – 0.3 volt
- When the "SET" switch is ON: 2.1 – 2.7 volts
- When the "RESUME" switch is ON: 3.3 – 4.0 volts
- When the "CANCEL" switch is ON: 0.8 – 1.5 volts

### DTC SET CONDITIONS

#### Check Condition

- The auto-cruise control indicator light illuminates.

#### Judgement Criteria

- The "SET" or "RESUME" switch remains on for 60 seconds.

### 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:**

- MB991223: Harness Set
- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 02: Set Switch, item 03: Resume Switch.**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to data reading mode for auto-cruise control system item 02, Set Switch.
  - When "SET" switch is at the ON position, the display on scan tool MB991502 should be "ON."
  - When "SET" switch is at the OFF position, the display on scan tool MB991502 should be "OFF."
- (4) Set scan tool MB991502 to data reading mode for auto-cruise control system item 03, Resume Switch.
  - When "RESUME" switch is at the ON position, the display on scan tool MB991502 should be "ON."
  - When "RESUME" switch is at the OFF position, the display on scan tool MB991502 should be "OFF."
- (5) 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.00-6](#).

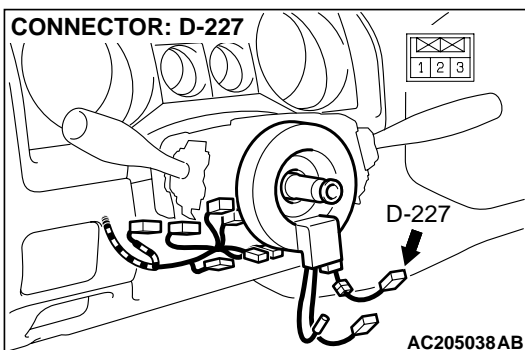
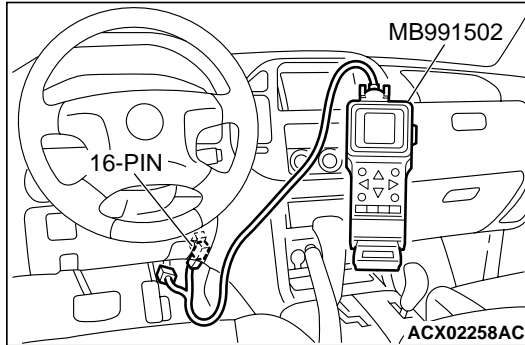
**NO :** Go to Step 2.

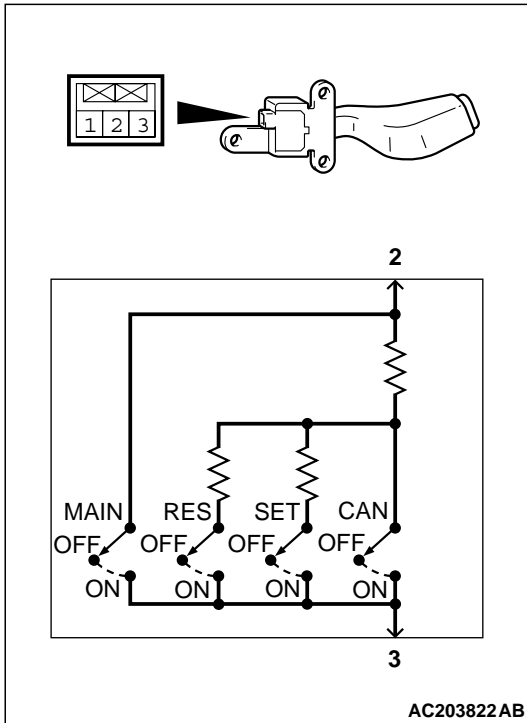
**STEP 2. Check auto-cruise control switch connector D-227 for looser, corroded or damaged terminals, or terminals pushed back in the connector.**

**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 the auto-cruise control switch.**

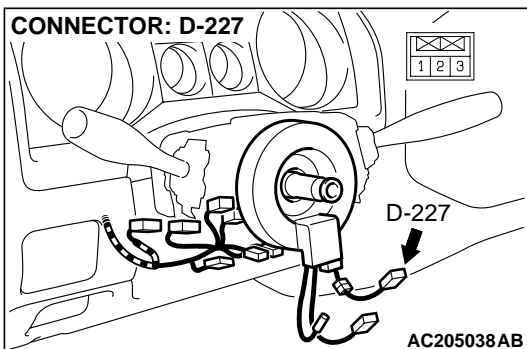
- (1) Disconnect auto-cruise control switch P.17-54.
- (2) Measure the resistance between terminal 2 and terminal 3 when each of the "SET", "RESUME", "CANCEL" and MAIN switch is pressed.

SWITCH POSITION	SPECIFIED CONDITION
MAIN switch "OFF"	Open circuit
MAIN switch "ON"	Less than 2 ohms
"CANCEL" switch ON	Approximately 100 $\Omega$
"RESUME" switch ON	Approximately 887 $\Omega$
"SET" switch ON	Approximately 300 $\Omega$

**Q: Is the resistance within specifications?**

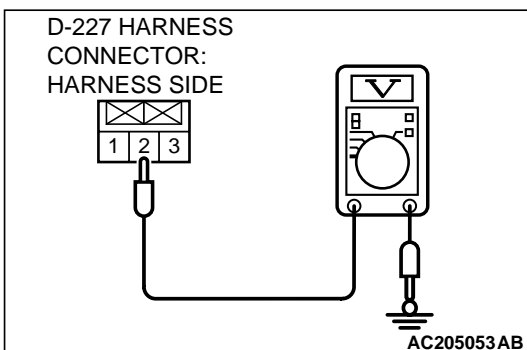
**YES :** Go to Step 4.

**NO :** Replace the auto-cruise control switch. Refer to P.17-54, Auto-cruise Control.



**STEP 4. Measure the auto-cruise control switch power supply voltage at connector D-227 by backprobing.**

- (1) Do not disconnect connector D-227.
- (2) Turn the ignition switch to the "ON" position.

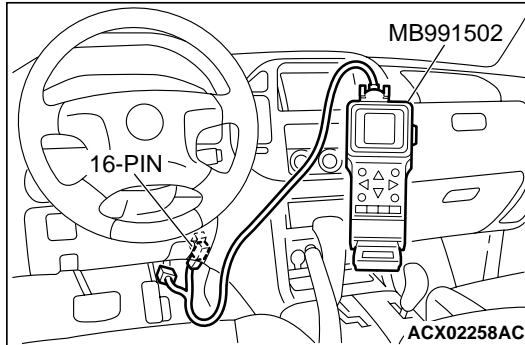


- (3) Measure the voltage between terminal 2 and ground by backprobing.
  - When "SET" switch is at the ON position, voltage should measure between 2.1 and 2.7 volts.
  - When "RESUME" switch is at the ON position, voltage should measure between 3.3 and 4.0 volts.

**Q: Is the measured voltage within specifications?**

**YES :** Go to Step 5.

**NO :** Go to step 6.



**STEP 5. Using scan tool MB991502, check data list item 02: Set Switch, item 03: Resume Switch.**

**⚠ CAUTION**

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

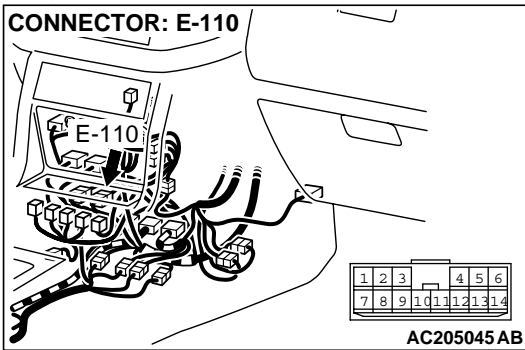
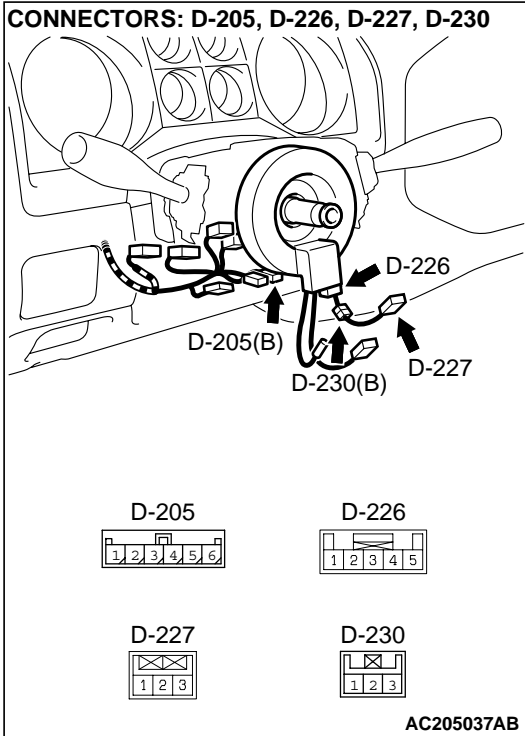
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to data reading mode for auto-cruise control system item 02, Set Switch.
  - When "SET" switch is at the ON position, the display on scan tool MB991502 should be "ON."
  - When "SET" switch is at the OFF position, the display on scan tool MB991502 should be "OFF."
- (4) Set scan tool MB991502 to data reading mode for auto-cruise control system item 03, Resume Switch.
  - When "RESUME" switch is at the ON position, the display on scan tool MB991502 should be "ON."
  - When "RESUME" switch is at the OFF position, the display on scan tool MB991502 should be "OFF."
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

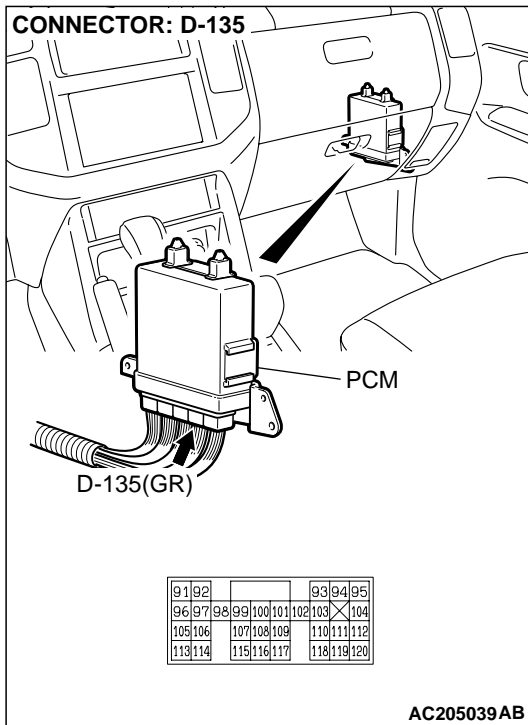
**Q: Is the switch operating properly?**

- 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.00-6](#).
- NO :** Replace the PCM. Refer to [P.17-54](#), Auto-cruise Control.



**STEP 6.** Check auto-cruise control switch connector D-227, intermediate connector D-230, clock spring connector D-226, clock spring connector D-205, intermediate connector E-110 and PCM connector D-135 for looser, 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 clock spring.**

Refer to GROUP 52B, Air Bag Modules and Clock Spring [P.52Ba-40](#).

**Q: Is the clock spring operating properly?**

**YES :** Go to Step 8.

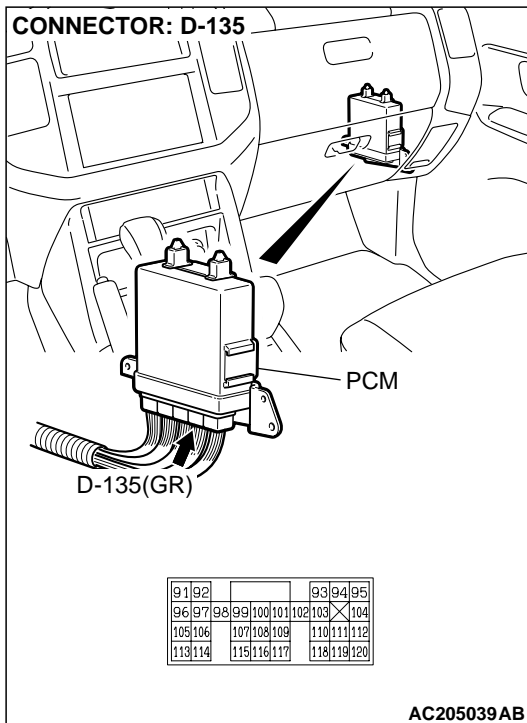
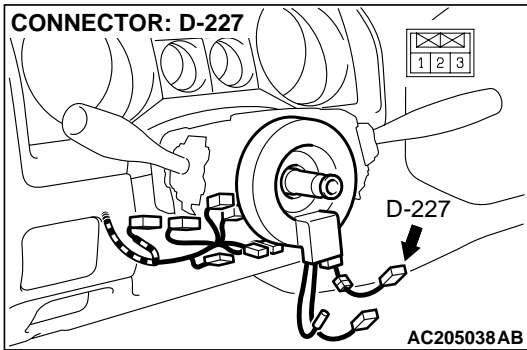
**NO :** Replace the clock spring. Refer to GROUP 52B, Air Bag Modules and Clock Spring [P.52Ba-33](#).

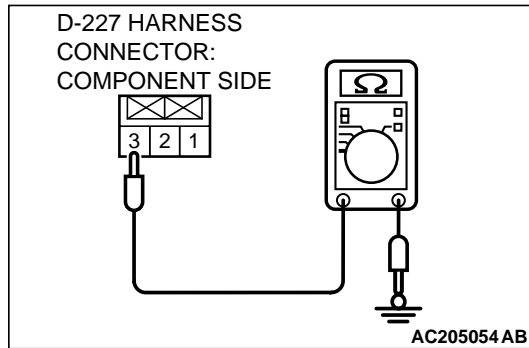
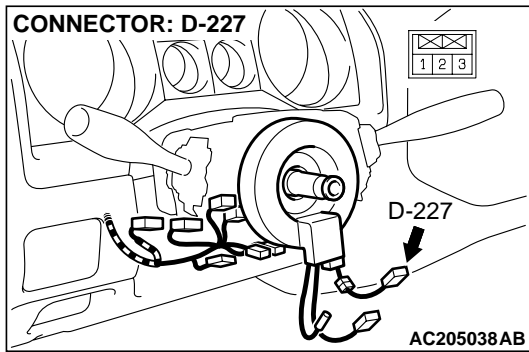
**STEP 8. Check the harness for damage between auto-cruise control switch connector D-227 terminal 2 and PCM connector D-135 terminal 94.**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 9.

**NO :** Repair or replace the harness wire.





**STEP 9. Check the resistance of the ground circuit at auto-cruise control switch connector D-227.**

- (1) Disconnect auto-cruise control switch connector D-227 and measure at the harness side.

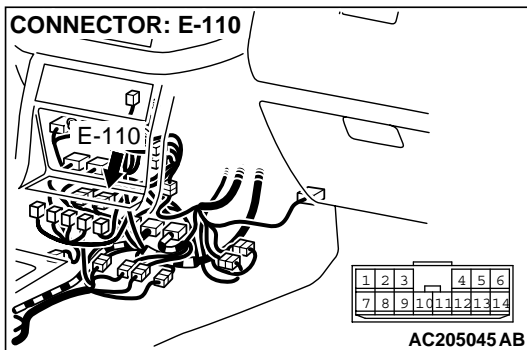
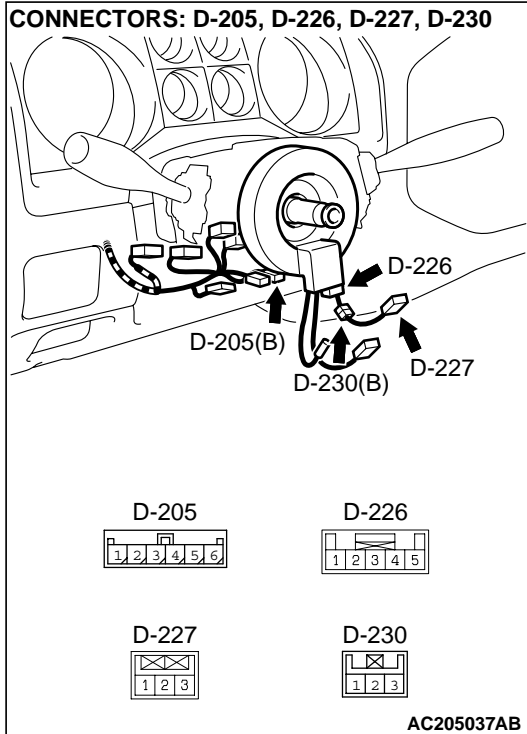
- (2) Check the resistance between terminal 3 and ground.
- The resistance should measure less than 2 ohms.

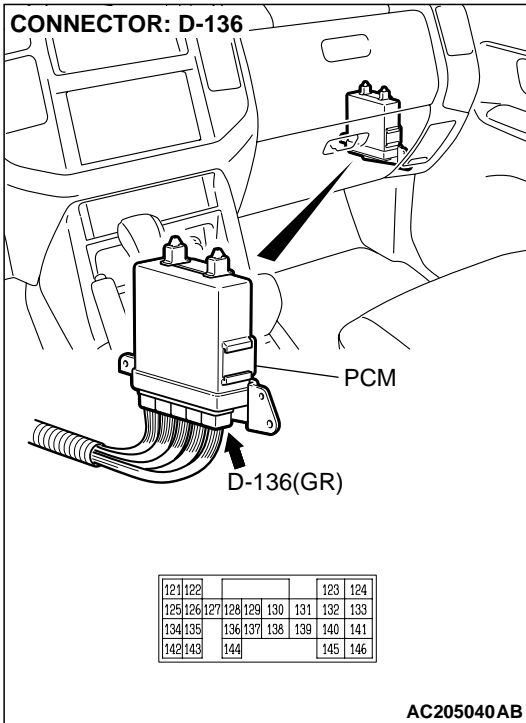
**Q: Is the resistance less than 2 ohms?**

**YES :** Go to Step 5.

**NO :** Go to Step 10.

**STEP 10.** Check auto-cruise control switch connector D-227, intermediate connector D-230, clock spring connector D-226, clock spring connector D-205, intermediate connector E-110 and PCM connector D-136 for looser, 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.

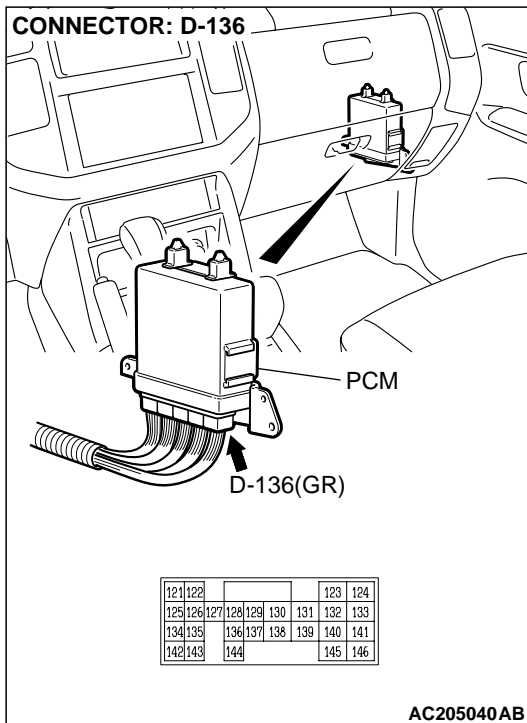
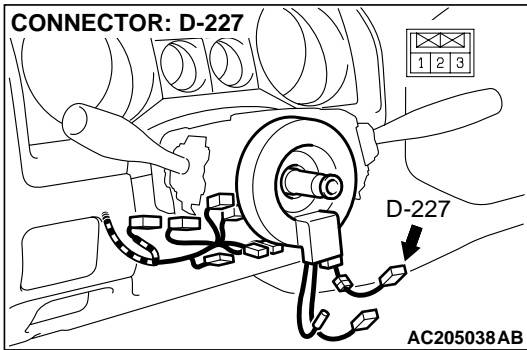
**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#).

**STEP 11. Check the harness for damage between auto-cruise control switch connector D-227 terminal 3 and PCM connector D-136 terminal 146.**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 5.

**NO :** Repair or replace the harness wire.



## DTC 21: Cancel Latch Signal 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:)**

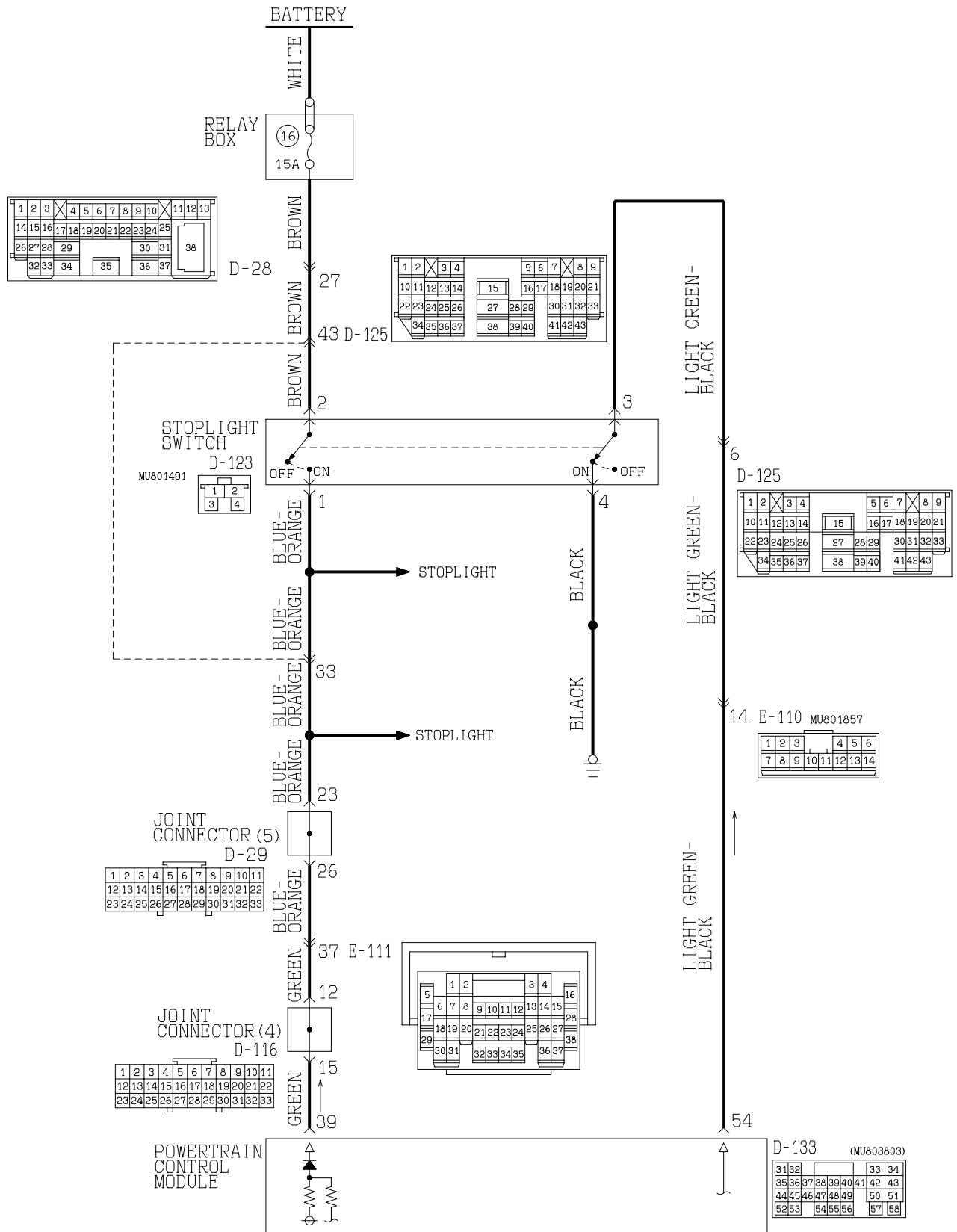
Malfunction of the PCM.

### DIAGNOSIS

Replace the PCM. (Refer to [P.17-54](#).) Check that diagnostic trouble code 21 is not set.

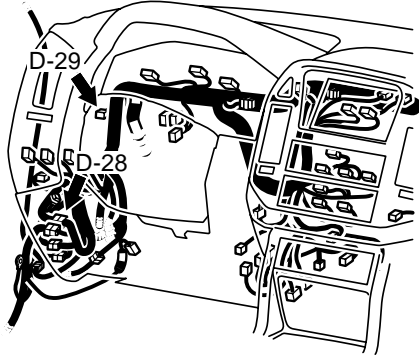
DTC 22: Stoplight Switch System

Stoplight Switch System Circuit





CONNECTORS: D-28, D-29



D-28

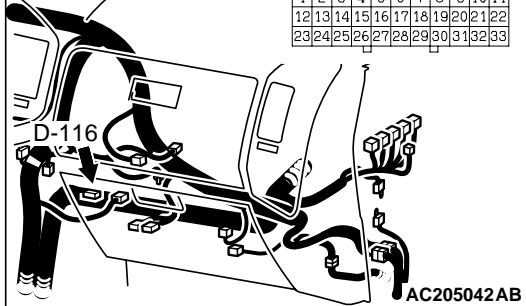
1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	
26	27	28	29					30	31		38	
32	33	34		35				36	37			

D-29

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

AC205041AB

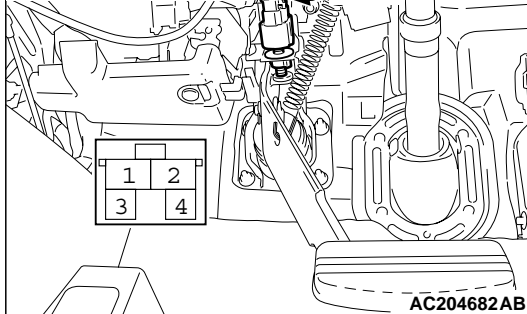
CONNECTOR: D-116



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

AC205042AB

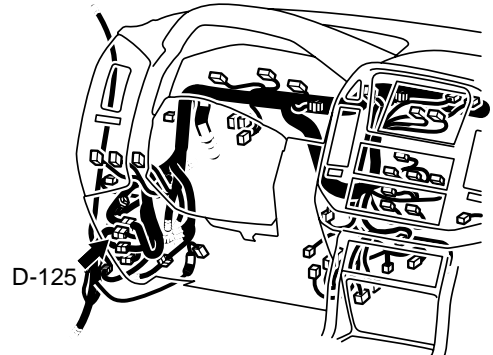
CONNECTOR: D-123



1	2
3	4

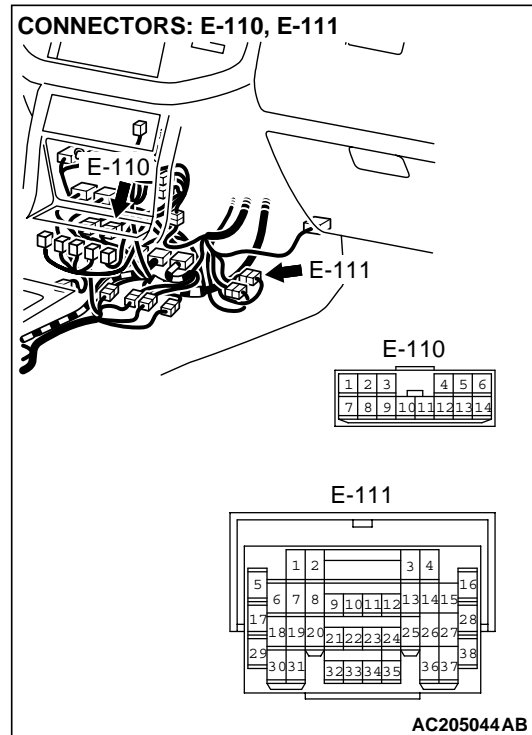
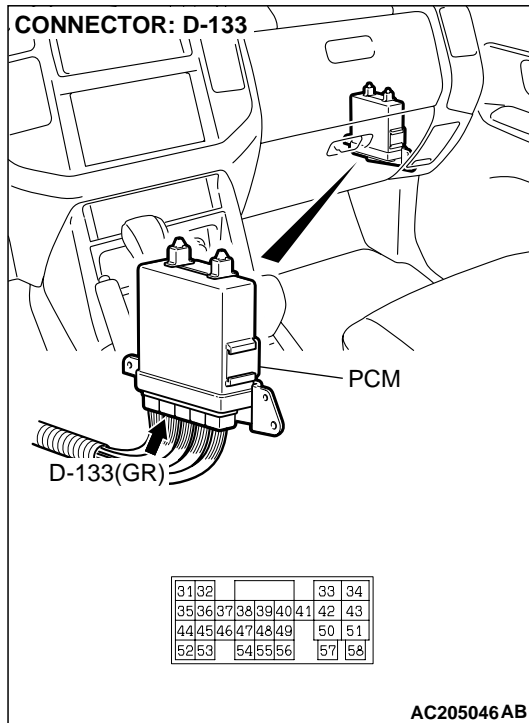
AC204682AB

CONNECTOR: D-125



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
34	35	36	37		38	39	40	41	42	43	

AC205043AB



**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 39 and 54).

**DTC SET CONDITIONS**

**Check Condition**

- The auto-cruise control indicator light illuminates.

**Judgement Criteria**

- Short in stop light switch circuit
- Open circuit in the brake switch circuit (between PCM terminal 54 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:**

- MB991223: Harness Set
- MB991502: Scan Tool (MUT-II)

**STEP 1. Check the brake pedal height.**

Refer to GROUP 35A, On-vehicle Service – Brake Pedal Check and Adjustment [P.35A-115](#).

**Q: Is the height adjusted properly?**

**YES :** Go to Step 2.

**NO :** Adjust the brake pedal to the proper height.

**STEP 2. Using scan tool MB991502, read the diagnostic trouble code.**

**⚠ CAUTION**

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

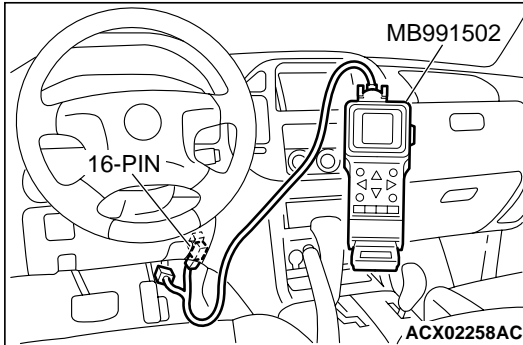
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check for A/T system diagnostic trouble code.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is DTC 26 set?**

**YES :** Refer to GROUP 23A, Diagnostic Trouble Code Procedures – DTC 26: Stoplight Switch System

[P.23Ac-83.](#)

**NO :** Go to Step 3.



**STEP 3. Using scan tool MB991502, check data list item 06: Stoplight Switch.**

**⚠ CAUTION**

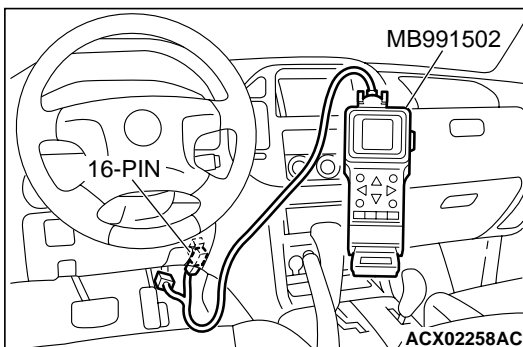
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to data reading mode for auto-cruise control system item 06, Stoplight Switch.
  - When the brake pedal is depressed, the display on scan tool MB991502 should be "ON."
  - When the brake pedal is not depressed, the display on scan tool MB991502 should be "OFF."
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the switch operating properly?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-6.](#)

**NO :** Go to Step 4.

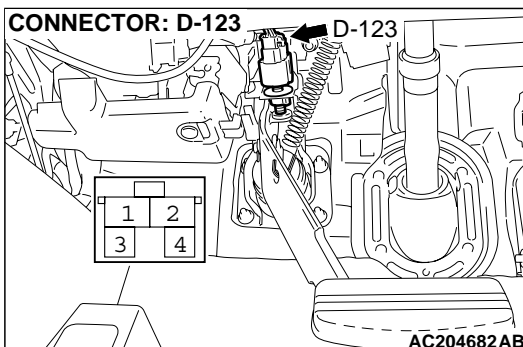


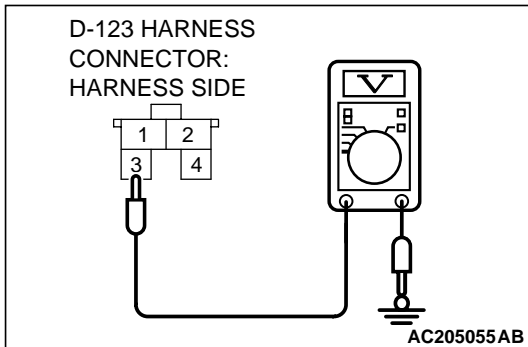
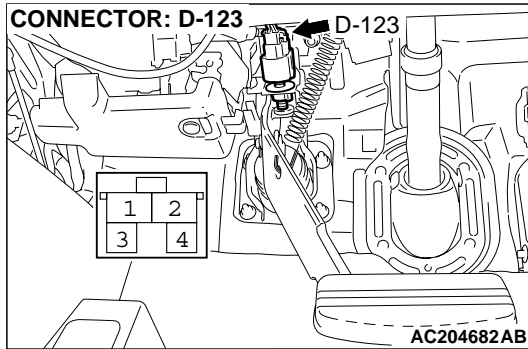
**STEP 4. Check stoplight switch connector D-123 for looser, corroded or damaged terminals, or terminals pushed back in the connector.**

**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 5. Measure the stoplight switch power supply voltage at connector D-123 by backprobing.**

- (1) Do not disconnect connector D-123.
- (2) Turn the ignition switch to the "ON" position.

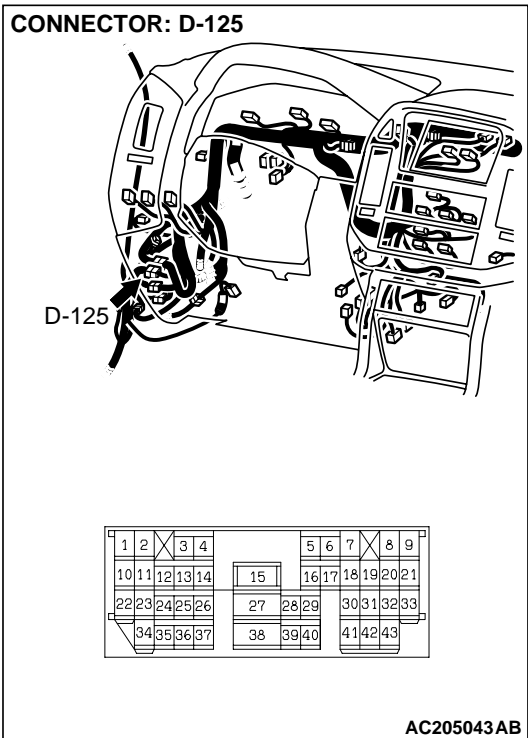
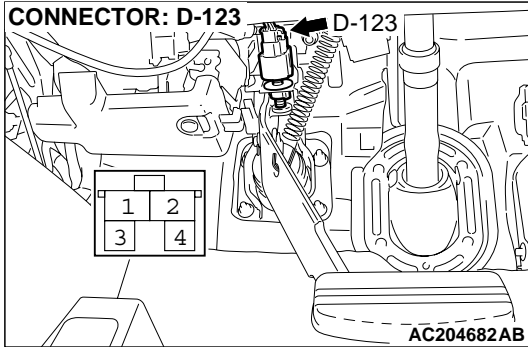
- (3) Measure the voltage between terminal 3 and ground by backprobing.
  - When the brake pedal is depressed, voltage should measure battery positive voltage.
  - When the brake pedal is not depressed, voltage should measure less than 1 volt.

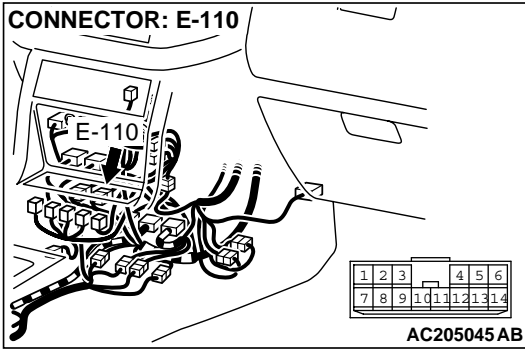
**Q: Does the voltage measure the battery positive voltage when the brake pedal is depressed, and measure one volt or less when the pedal is released?**

**YES :** Go to Step 8.

**NO :** Go to Step 6.

**STEP 6.** Check stoplight switch connector D-123, intermediate connector D-125, intermediate connector E-110 and PCM connector D-133 for looser, corroded or damaged terminals, or terminals pushed back in the connector.

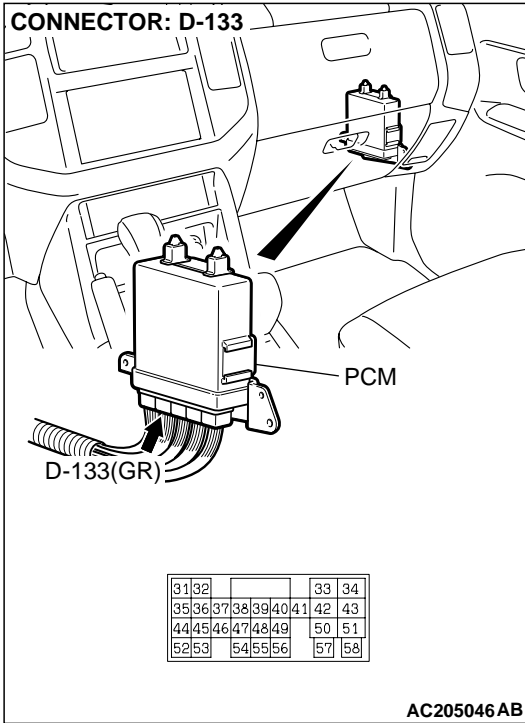




**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 7.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#).

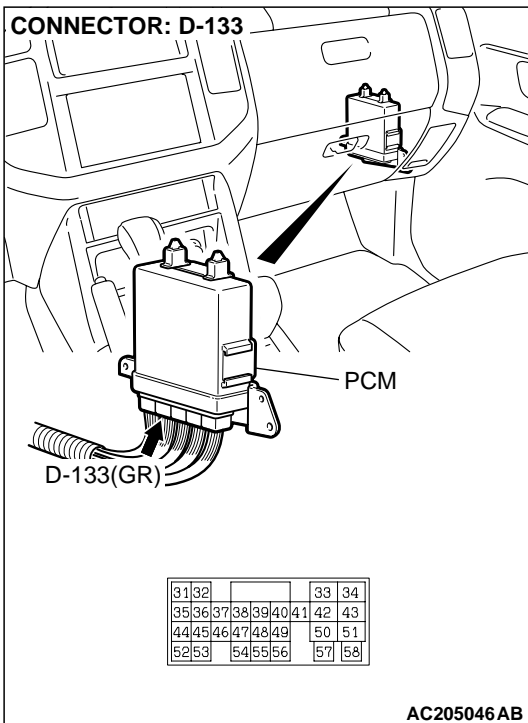
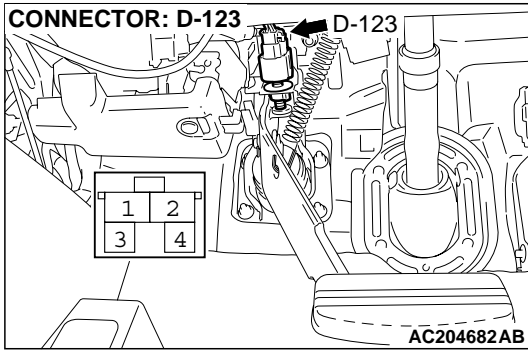


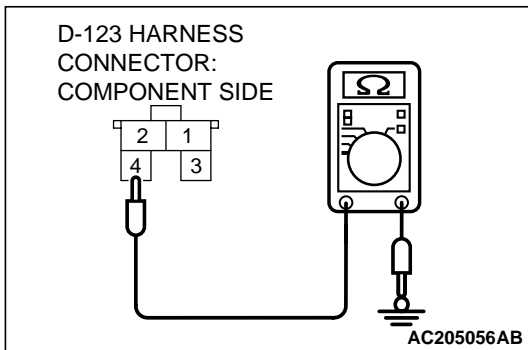
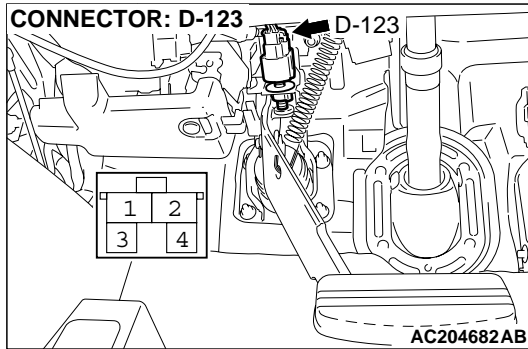
**STEP 7. Check the harness for an open circuit or damage between stoplight switch connector D-123 terminal 3 and PCM connector D-133 terminal 54.**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 8.

**NO :** Repair or replace the harness wire.





**STEP 8. Check the resistance of the ground circuit at stoplight switch connector D-123.**

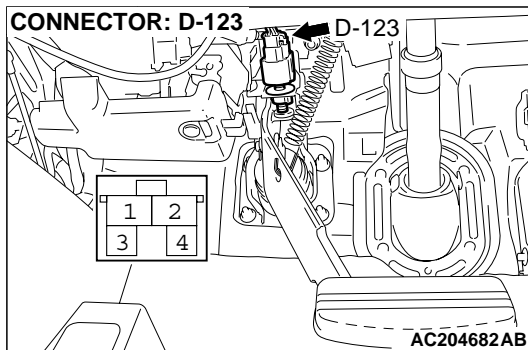
- (1) Disconnect stoplight switch connector D-123 and measure at the harness side.

- (2) Check the resistance between terminal 4 and ground.
- The resistance should measure less than 2 ohms.

**Q: Is the resistance less than 2 ohms?**

**YES :** Go to Step 10.

**NO :** Go to Step 9.



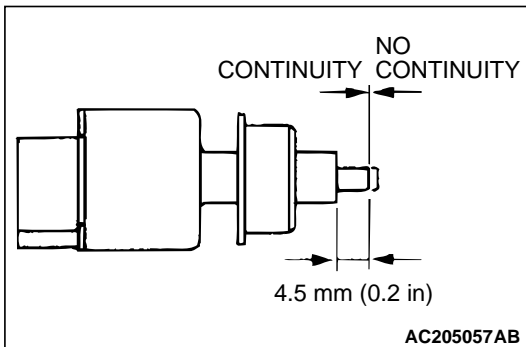
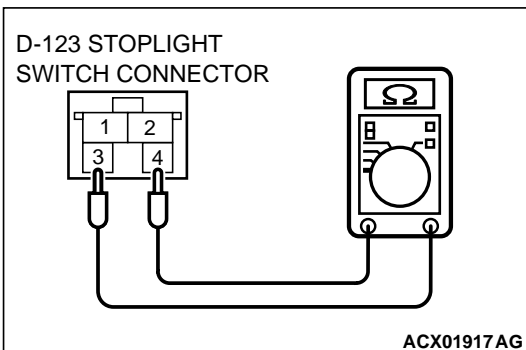
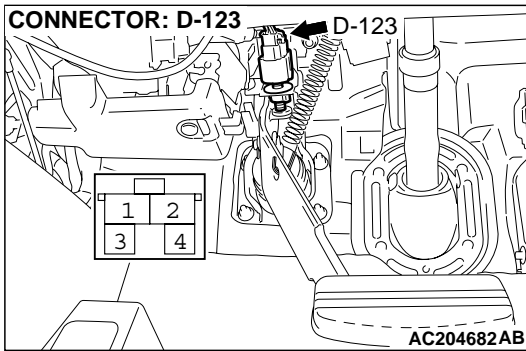
**STEP 9. Check the harness for an open circuit or damage between stoplight switch connector D-123 terminal 4 and ground.**

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 10.

**NO :** Repair or replace the harness wire.





**STEP 10. Check the stoplight switch.**

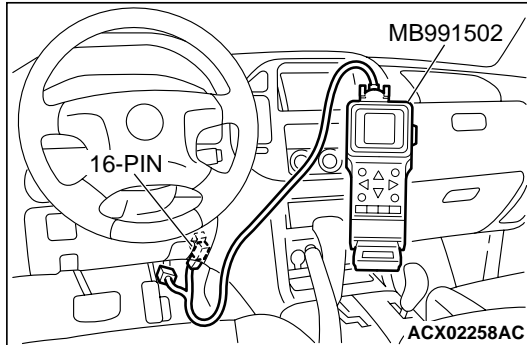
- (1) Disconnect stoplight switch connector D-123.
- (2) Remove the stoplight switch and measure at the stoplight switch side.

- (3) Measure the resistance value between terminals 3 and 4.
  - The resistance value should measure two ohms or less when the plunger is pushed within 4.5 mm (0.2 inch) from the outer case end.

**Q: Does the resistance value measure two ohms or less when the plunger is pushed within 4.5 mm (0.2 inch) from the outer case end?**

**YES :** Go to Step 11.

**NO :** Replace the stoplight switch. Refer to GROUP 35A, Brake Pedal [P.35A-132](#).



**STEP 11.** Using scan tool MB991502, check data list item 06: Stoplight Switch.

**⚠ CAUTION**

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

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to data reading mode for auto-cruise control system item 06, Stoplight Switch.
  - When the brake pedal is depressed, the display on scan tool MB991502 should be "ON."
  - When the brake pedal is not depressed, the display on scan tool MB991502 should be "OFF."
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the switch operating properly?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-6](#).

**NO :** Replace the PCM. Refer to [P.17-54](#), Auto-cruise Control.

## DTC 23: Powertrain Control module (PCM) and Its Related Components

### 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 Tool:

- MB991502: Scan Tool (MUT-II)

**STEP 1.** Using scan tool MB991502, read the diagnostic trouble code.

**⚠ CAUTION**

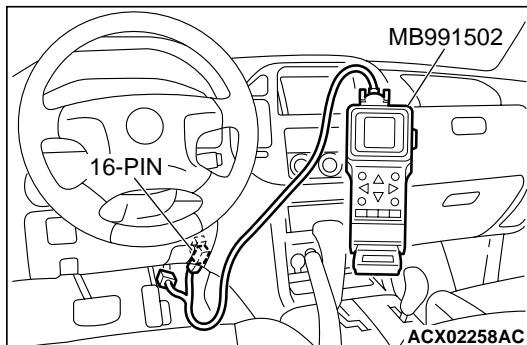
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check for MFI system diagnostic trouble code.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is any DTC set?**

**YES :** Refer to GROUP 13A, Diagnosis – Diagnostic Trouble Code Chart [P.13Ab-22](#).

**NO :** Go to Step 2.



**STEP 2.** Using scan tool MB991502, read the diagnostic trouble code.

**⚠ CAUTION**

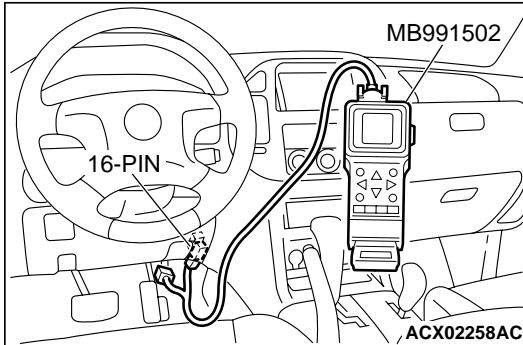
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check for A/T system diagnostic trouble code.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is any DTC set?**

**YES :** Refer to GROUP 23A, Diagnosis – Diagnostic Trouble Code Chart [P.23Ab-31](#).

**NO :** Replace the PCM. (Refer to [P.17-54](#).) Check that diagnostic trouble code 23 is not set.



**SYMPTOM CHART**

M1172002300281

SYMPTOM		INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication with scan tool is not possible	Communication with all systems is impossible	-	Group 13A, diagnosis <a href="#">P.13Ad-2</a> .
	Communication with the PCM only is impossible	-	Group 13A, diagnosis <a href="#">P.13Ad-5</a> .
Auto-cruise control is not cancelled.	When brake pedal is depressed	1	<a href="#">P.17-36</a>
	When selector lever is moved to "N" range	2	<a href="#">P.17-36</a>
	When "CANCEL" switch is turned ON	3	<a href="#">P.17-36</a>
Auto-cruise control cannot be set.		4	<a href="#">P.17-37</a>
Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.		5	<a href="#">P.17-38</a>
Auto-cruise control indicator light inside combination meter does not illuminate. (However, auto-cruise control is normal.)		6	<a href="#">P.17-39</a>

**SYMPTOM PROCEDURES**

---

**INSPECTION PROCEDURE 1: When the Brake Pedal is Depressed, Auto-cruise Control is not Cancelled.**

---

**COMMENT**

The stop light 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.17-24](#), Diagnostic Trouble Code Procedures – DTC 22: Stoplight Switch System.

---

**INSPECTION PROCEDURE 2: When the Selector Lever is Moved to "N" Range, Auto-cruise Control is not Cancelled.**

---

**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.

**DIAGNOSIS**

Refer to GROUP 23A, Diagnostic Trouble Code Procedures – DTC 27: Transmission Range Switch System (Open Circuit) [P.23Ac-93](#), DTC 28: Transmission Range Switch System (Short Circuit) [P.23Ac-123](#).

---

**INSPECTION PROCEDURE 3: When the Auto-cruise Control "CANCEL" Switch is Set to ON, Auto-cruise Control 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.

**DIAGNOSIS**

Replace the auto-cruise control switch. Refer to [P.17-54](#), Auto-cruise Control.

---

**INSPECTION PROCEDURE 4: Auto-cruise Control cannot be Set.**

---

**COMMENT**

The fail-safe function is probably cancelling auto-cruise control. In this case, scan tool MB991502 can be used to check the trouble symptoms in 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 PCM.

**DIAGNOSIS**

**Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

---

**STEP 1. Using scan tool MB991502, read the diagnostic trouble code.**

**⚠ CAUTION**

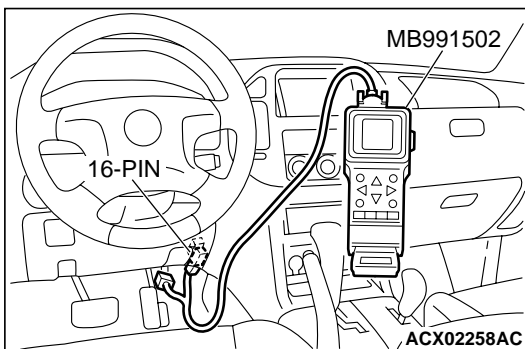
**To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**

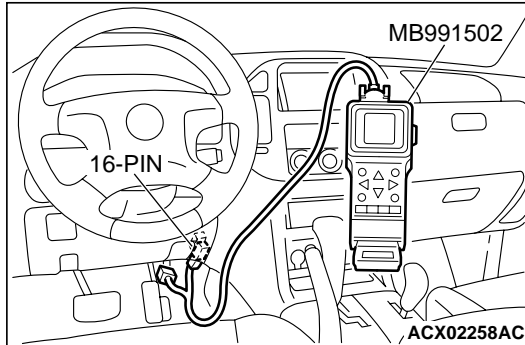
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check for auto-cruise control system diagnostic trouble code.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is DTC set?**

**YES :** Refer to [P.17-12](#), Diagnostic Trouble Code Chart.

**NO :** Go to Step 2.





**STEP 2. Using scan tool MB991502, check data list item 04: Cancel Switch, item 07: Transmission Range Switch.**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to data reading mode for auto-cruise control system item 04, Cancel Switch.
  - When "CANCEL" switch is at the ON position, the display on scan tool MB991502 should be "ON."
  - When "CANCEL" switch is at the OFF position, the display on scan tool MB991502 should be "OFF."
- (4) Set scan tool MB991502 to data reading mode for auto-cruise control system item 07, Transmission Range Switch.
  - When selector lever is at the "P" or "N" position, the display on scan tool MB991502 should be "ON."
  - When selector lever is at the "R" or "D" position, the display on scan tool MB991502 should be "OFF."
- (5) 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.00-6](#).
- NO :** Follow the symptom procedures below. • Item 04: Refer to [P.17-36](#), Symptom Procedures number 3. • Item 07: Refer to [P.17-36](#), Symptom Procedures number 2.

**INSPECTION PROCEDURE 5: Hunting (Repeated Acceleration and Deceleration) Occurs at the Set Vehicle Speed.**

**COMMENT**

The vehicle speed sensor or the throttle body is suspected.

**TROUBLESHOOTING HINTS (The most likely causes for this case:)**

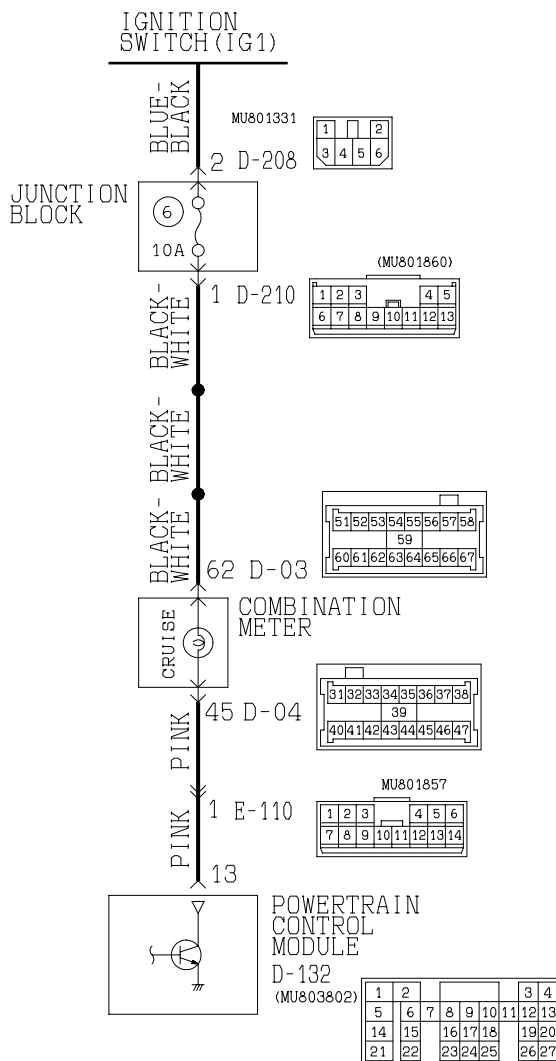
- Malfunction of the vehicle speed sensor.
- Malfunction of the throttle body.
- Malfunction of the PCM.

**DIAGNOSIS**

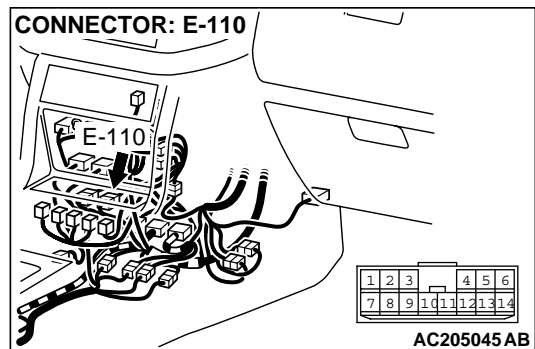
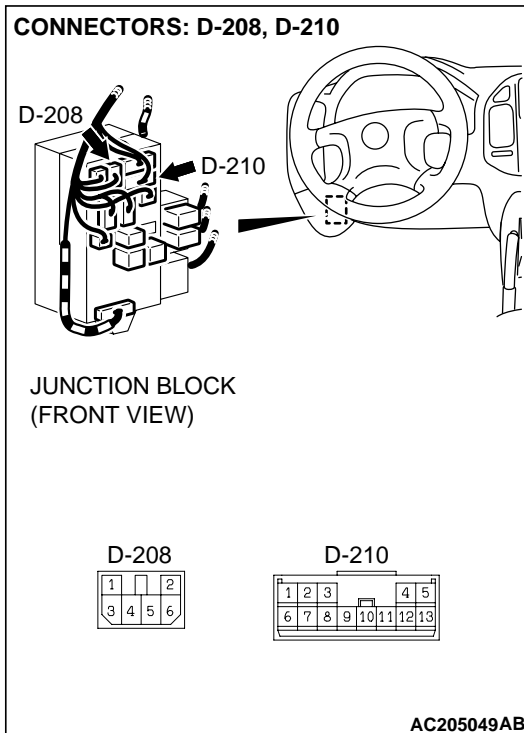
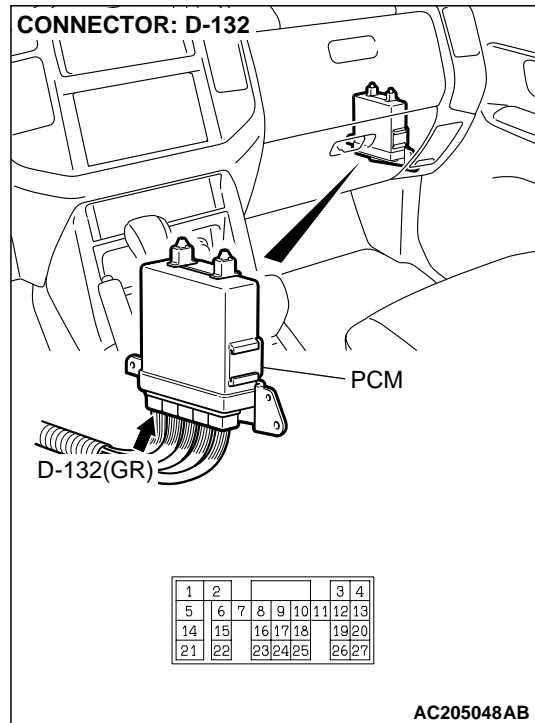
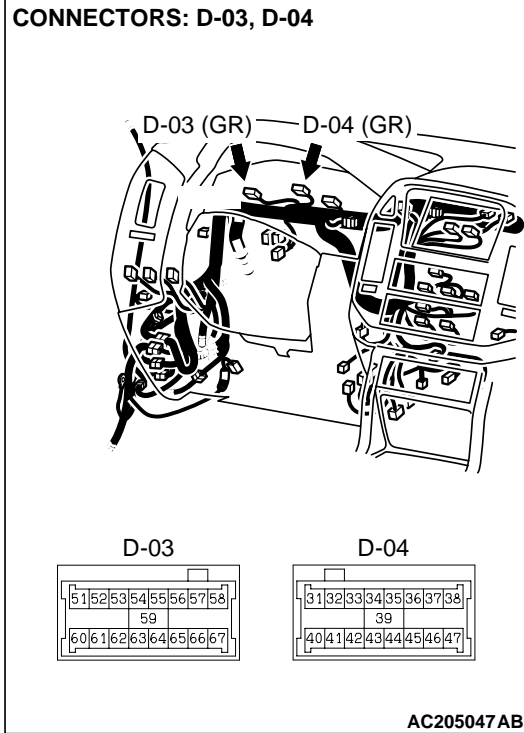
Check for MFI system diagnostic trouble code. Refer to GROUP 13A, Trouble Code Diagnosis [P.13Ab-2](#).

**INSPECTION PROCEDURE 6: Auto-cruise Control Indicator Light inside Combination Meter does not Illuminate. (However, Auto-cruise Control is Normal.)**

Auto-cruise Control Indicator Light Drive Circuit



W3Q13M02AA  
 AC204905AB



**CIRCUIT OPERATION**

The power for the auto-cruise indicator in the combination meter is supplied from the ignition switch (IG1). When the auto-cruise control system is operating, the transistor inside the PCM illuminates the auto-cruise indicator through PCM terminal number 13.

**COMMENT**

The cause is probably the malfunction of the indicator bulb or the malfunction of the connector or harness.

**TROUBLESHOOTING HINTS**

- Malfunction of the indicator bulb.
- Damaged harness or connector.
- Malfunction of the PCM.



**DIAGNOSIS**

**Required Special Tool:**

- MB991223: Harness Set

**STEP 1. Check the auto-cruise control indicator bulb.**

- (1) Remove the combination meter. Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-65.
- (2) Check the auto-cruise control indicator bulb.

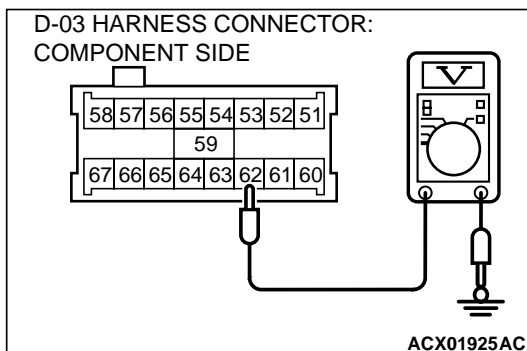
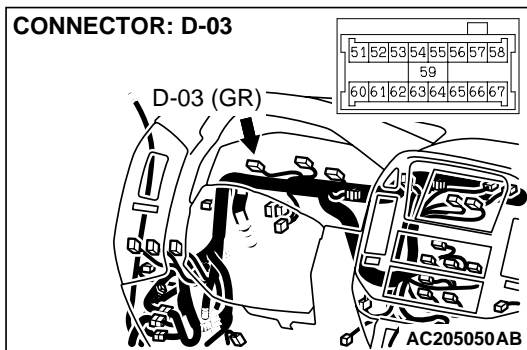
**Q: Is the bulb blown?**

**YES :** Replace the bulb. Then check that the malfunction is eliminated.

**NO :** Go to Step 2.

**STEP 2. Measure the power supply voltage at combination meter connector D-03.**

- (1) Disconnect connector D-03 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Switch "ON" the auto-cruise control main switch.

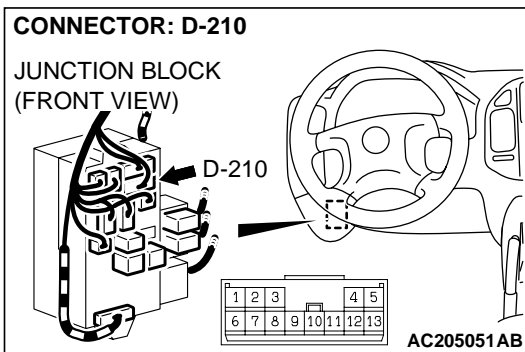
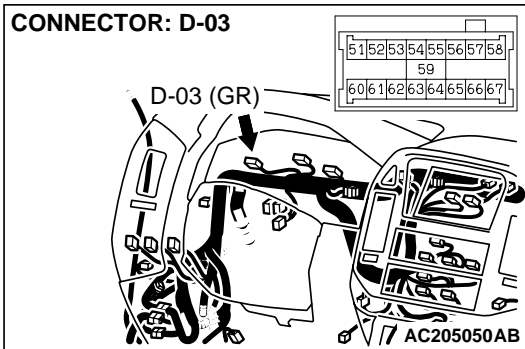


- (4) Measure the voltage between terminal 62 and ground.
  - The voltage should measure battery positive voltage.

**Q: Is the measured voltage battery positive voltage?**

**YES :** Go to Step 5.

**NO :** Go to Step 3.

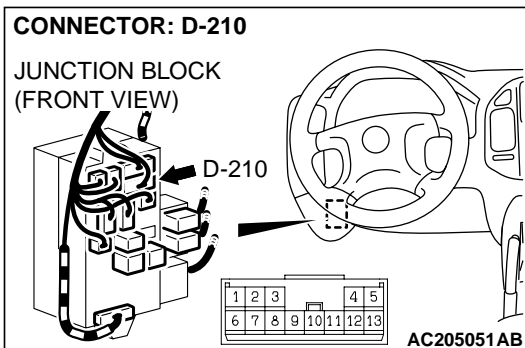
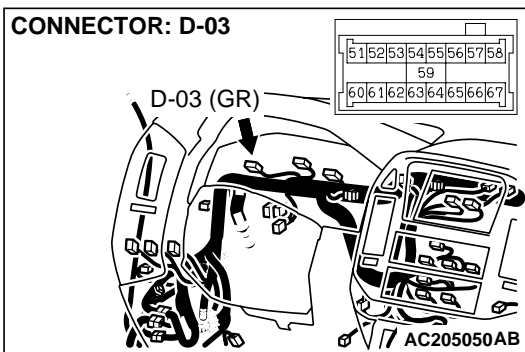


**STEP 3. Check combination meter connector D-03 and junction block connector D-210 for looser, corroded or damaged terminals, or terminals pushed back in the connector.**

**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](#).

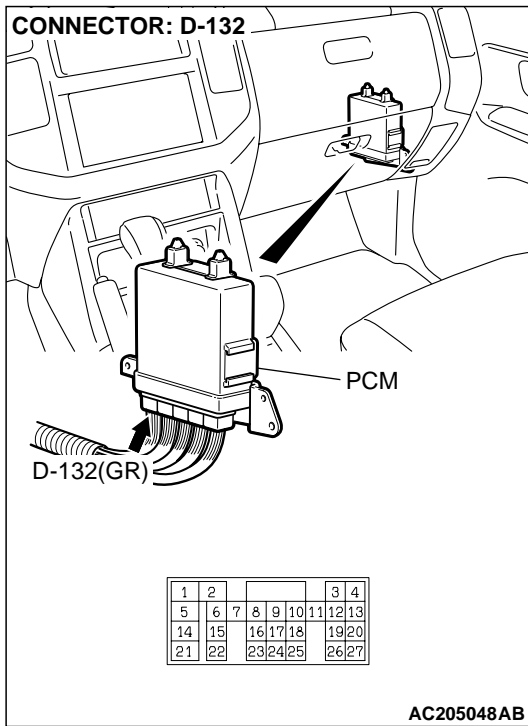


**STEP 4. Check the harness for open circuit or short circuit to ground between combination meter connector D-03 terminal 62 and junction block connector D-210 terminal 1.**

**Q: Is the harness wire in good condition?**

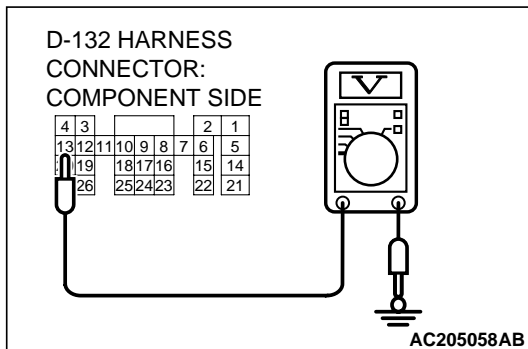
**YES :** Go to Step 5.

**NO :** Repair or replace the harness wire.



**STEP 5. Measure the power supply voltage at PCM connector D-132.**

- (1) Disconnect connector D-132 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Switch "ON" the auto-cruise control main switch.



- (4) Measure the voltage between terminal 13 and ground.
  - The voltage should measure battery positive voltage.

**Q: Is the measured voltage battery positive voltage?**

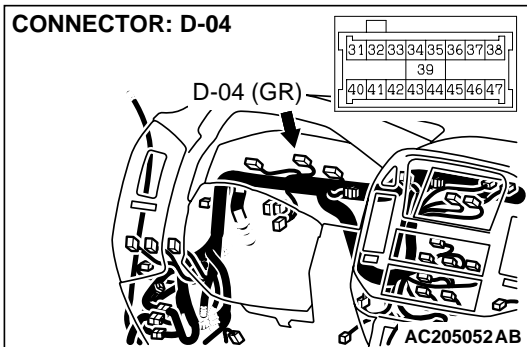
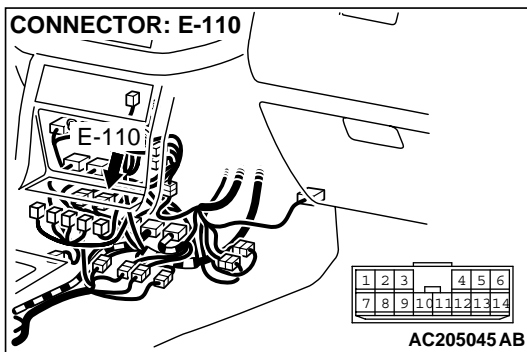
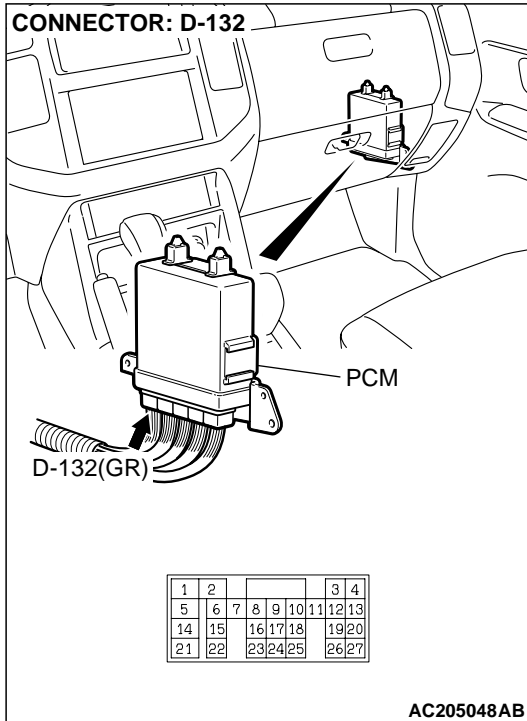
- YES :** Replace the PCM. Refer to [P.17-54](#), Auto-cruise Control.
- NO :** Go to Step 6.

**STEP 6. Check PCM connector D-132, intermediate connector E-110 and combination meter connector D-04 for looser, 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](#).

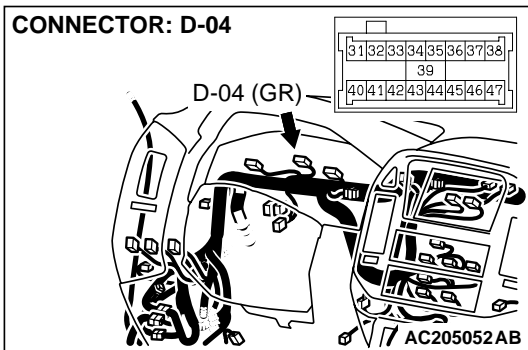
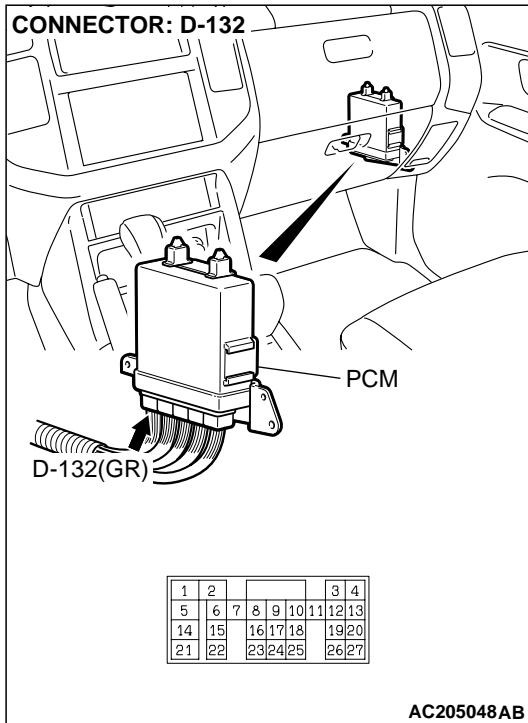


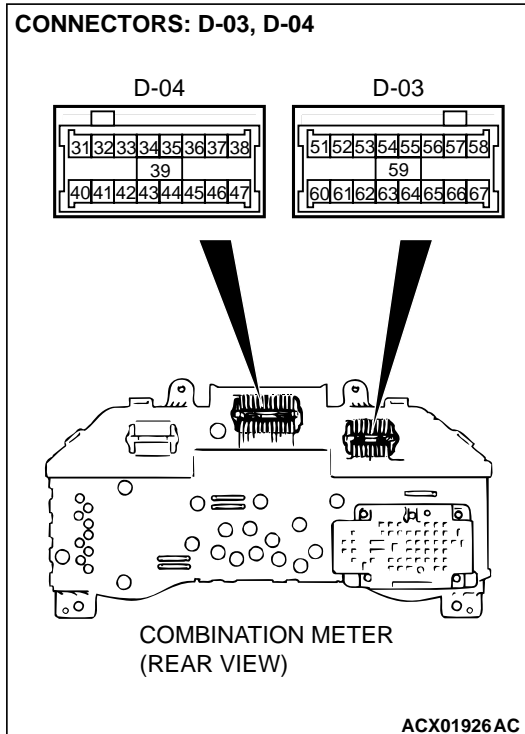
**STEP 7.** Check the harness for open circuit or short circuit to ground between PCM connector D-132 terminal 13 and combination meter connector D-04 terminal 45.

**Q:** Is the harness wire in good condition?

**YES :** Go to Step 8.

**NO :** Repair or replace the harness wire.





**STEP 8. Check the combination meter.**

- (1) Remove the combination meter and measure at the combination meter side. (Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-65.)
- (2) Measure the continuity between combination meter connector D-03 terminal 62 and combination meter connector D-04 terminal 45.
  - The resistance should measure less than 2 ohms.

**Q: Is the resistance less than 2 ohms?**

- YES :** Replace the PCM. Refer to P.17-54, Auto-cruise Control.
- NO :** Replace the combination meter. Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-65.

**DATA LIST REFERENCE TABLE**

M1172002400244

**⚠ CAUTION**

- When shifting the selector lever to D range, 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: \*:Disconnect the throttle position sensor connector, and then delete the diagnostic trouble code that was recorded during the inspection with the use of the MB991502 scan tool after the inspection has been completed.*

MUT-II SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	
APP SNS (MAIN)	12	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Accelerator pedal: Released	905 – 1,165 mV
				Accelerator pedal: Gradually depressed	Increases in response to the pedal depression stroke
				Accelerator pedal: Fully depressed	4,035 mV or more
BRAKE SW	06	Stoplight switch	Brake pedal: Depressed	ON	
			Brake pedal: Released	OFF	

<b>MUT-II SCAN TOOL DISPLAY</b>	<b>ITEM NO.</b>	<b>INSPECTION ITEM</b>		<b>INSPECTION REQUIREMENT</b>	<b>NORMAL CONDITION</b>	
CANCEL SWITCH	04	Auto-cruise control switch	CANCEL	"CANCEL" switch: ON	ON	
				"CANCEL" switch: OFF	OFF	
CRUISE	09	Auto-cruise control operation		Auto-cruise control: Active	ON	
				Auto-cruise control: Inactive	OFF	
IDLE SW SIG	08	Accelerator pedal position switch		Accelerator pedal: Depressed	OFF	
				Accelerator pedal: Released	ON	
MAIN SW	01	Auto-cruise control switch	MAIN	MAIN switch: "ON"	ON	
				MAIN switch: "OFF"	OFF	
RESUME SWITCH	03	Auto-cruise control switch	RESUME	"RESUME" switch: ON	ON	
				"RESUME" switch: OFF	OFF	
SET SWITCH	02	Auto-cruise control switch	SET	"SET" switch: ON	ON	
				"SET" switch: OFF	OFF	
STOPLIGHT SW	05	Stoplight switch		Brake pedal: Depressed	ON	
				Brake pedal: Released	OFF	
TP SNSR (MAIN)	11	Throttle position sensor (main)*		<ul style="list-style-type: none"> <li>Remove the intake air hose at the throttle body</li> <li>Disconnect the throttle position sensor connector, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991348.</li> <li>Ignition switch: ON</li> </ul>	Fully close the throttle valve with your finger	200 – 800 mV
					Fully open the throttle valve with your finger	3,800 – 4,900 mV
				No load		450 – 1,000 mV
				A/C switch: "OFF" to "ON"		Voltage rises
				<ul style="list-style-type: none"> <li>A/C switch: "OFF"</li> <li>Selector lever: "N" to "D"</li> </ul>		
CLUTCH SW	07	Transmission range switch		Selector lever: "P" or "N" position	ON	
				Selector lever: "R" or "D" position	OFF	
VSS	10	Vehicle speed sensor		Road test the vehicle	The speedometer and scan tool MB991502 display the same value.	

PCM TERMINAL VOLTAGE REFERENCE CHART FOR AUTO-CRUISE CONTROL SYSTEM OPERATION

M1172004800022

D-132				D-133				D-134				D-135				D-136																																	
1	2			3	4	31	32			33	34	61	62			63	64	91	92			93	94	95	121	122			123	124																			
5	6	7	8	9	10	11	12	13	35	36	37	38	39	40	41	42	43	65	66	67	68	69	70	71	72	73	96	97	98	99	100	101	102	103	104	125	126	127	128	129	130	131	132	133					
14	15	16	17	18	19	20	21	22	44	45	46	47	48	49	50	51	74	75	76	77	78	79	80	81	82	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	134	135	136	137	138	139	140	141
23	24	25	26	27	52	53	54	55	56	57	58	83	84	85	86	87	88	89	113	114	115	116	117	118	119	120	142	143	144	145	146																		

AC103663AC

TERMINAL NO.	CHECK ITEM	CHECK CONDITION	NORMAL CONDITION
13	Indicator light (inside combination meter)	Ignition switch: "ON"	Indicator light: Illuminated
			Indicator light: Switch off
38	Accelerator pedal position switch	Ignition switch: "ON"	Closed throttle
			Open throttle slightly
39	Stoplight switch	Ignition switch: "ON"	Depress the brake pedal
			Release the brake pedal
54	Stoplight switch	Ignition switch: "ON"	Depress the brake pedal
			Release the brake pedal
66	Transmission range switch: P	Ignition switch: "ON"	Transmission range: P
			Transmission range: Other than above
75	Transmission range switch: N	Ignition switch: "ON"	Transmission range: N
			Transmission range: Other than above
79	Vehicle speed sensor	<ul style="list-style-type: none"> <li>Measure between terminal 79 and ground with an oscilloscope.</li> <li>Engine: 2,000 r/min</li> <li>Gear range: 4th gear</li> </ul>	Refer to GROUP 23A, Inspection Procedure Using an Oscilloscope <a href="#">P.23Ab-42</a> .
91	Accelerator pedal position sensor (main) ground	Always	0.5 V or less
92	Accelerator pedal position sensor (main) power supply	Ignition switch: "ON"	4.5 – 5.5 V
94	Auto-cruise control switch power supply	Ignition switch: "ON"	All switches: OFF
			"MAIN" switch: ON
			"SET" switch: ON
			"RESUME" switch: ON
			"CANCEL" switch: ON



<b>TERMINAL NO.</b>	<b>CHECK ITEM</b>	<b>CHECK CONDITION</b>		<b>NORMAL CONDITION</b>
96	Sensor ground	Always		0.5 V or less
97	Sensor power supply	Ignition switch: "ON"		4.5 – 5.5 V
105	Throttle position sensor ground	Always		0.5 V or less
106	Throttle position sensor power supply	Ignition switch: "ON"		4.5 – 5.5 V
107	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	905 – 1,165 mV
			Depress the accelerator pedal fully	4.035 V or more
113	Throttle position sensor (sub)	<ul style="list-style-type: none"> <li>• Remove the intake air hose at the throttle body</li> <li>• Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991348.</li> <li>• Ignition switch: ON</li> </ul>	Fully close the throttle valve with your finger	2.2 – 2.8 V
			Fully open the throttle valve with your finger	3.8 – 4.9 V
114	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	905 – 1,165 mV
			Depress the accelerator pedal fully	4.035 V or more
115	Throttle position sensor (main)	<ul style="list-style-type: none"> <li>• Remove the intake air hose at the throttle body</li> <li>• Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991348.</li> <li>• Ignition switch: ON</li> </ul>	Fully close the throttle valve with your finger	200 – 800 mV
			Fully open the throttle valve with your finger	3.8 – 4.9 V
133	Throttle actuator control motor (+)	<ul style="list-style-type: none"> <li>• Ignition switch: ON</li> <li>• Accelerator pedal: fully opened to fully closed</li> </ul>		Decreases slightly (approx. 2V) from battery voltage.
141	Throttle actuator control motor (-)	<ul style="list-style-type: none"> <li>• Ignition switch: ON</li> <li>• Accelerator pedal: fully closed to fully opened</li> </ul>		Decreases slightly (approx. 2V) from battery voltage.
146	Auto-cruise control switch ground	Always		0.5 V or less

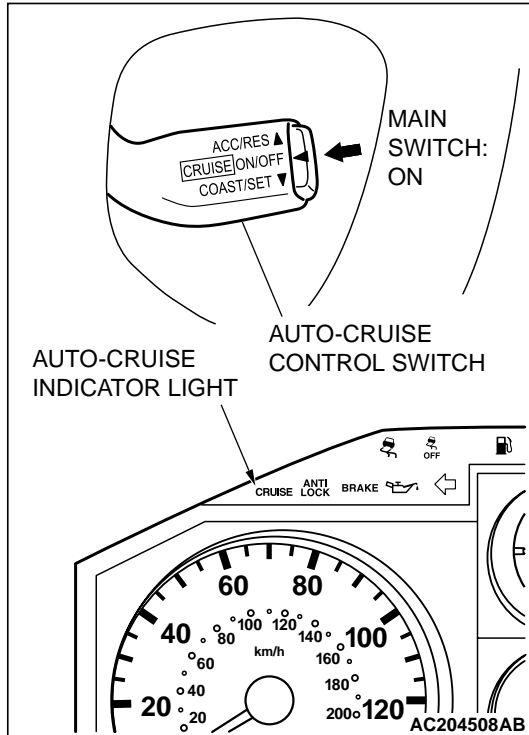
## ON-VEHICLE SERVICE

## AUTO-CRUISE CONTROL SWITCH CHECK

M1172001100228

## AUTO-CRUISE CONTROL MAIN SWITCH CHECK

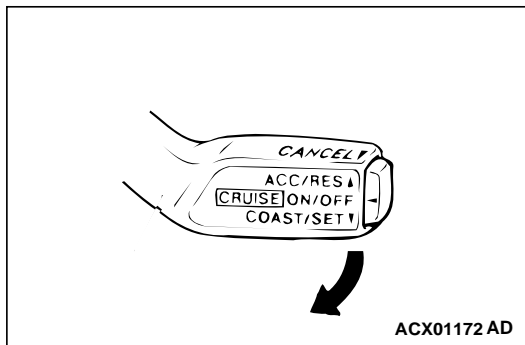
1. Turn the ignition switch to the "ON" position.
2. Check that the indicator light within the combination meter illuminates when the main switch is switched "ON".



## AUTO-CRUISE CONTROL SETTING

1. Switch "ON" the 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 arrow.
4. Check to be sure that when the switch is released the speed is the desired constant speed.

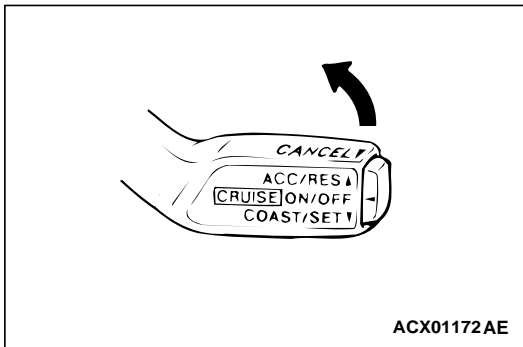
*NOTE: If the vehicles speed decreases to approximately 15 km/h (9 mph) below the set speed because of climbing a hill for example, the auto-cruise control will be cancelled.*



### SPEED-INCREASE SETTING

1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of 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.

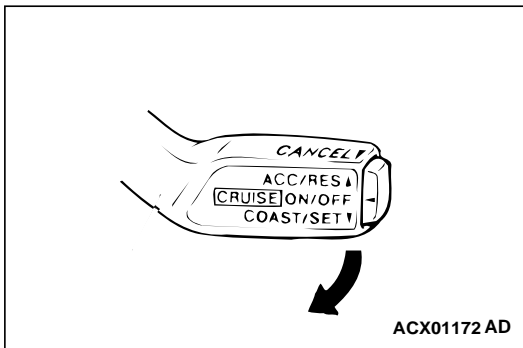
*NOTE: Acceleration can be continued even if the vehicle speed has passed the high-speed limit [approximately 200 km/h (124 mph)]. But the speed when the auto-cruise control switch is released will be recorded as the high-speed limit.*



### SPEED-REDUCTION SETTING

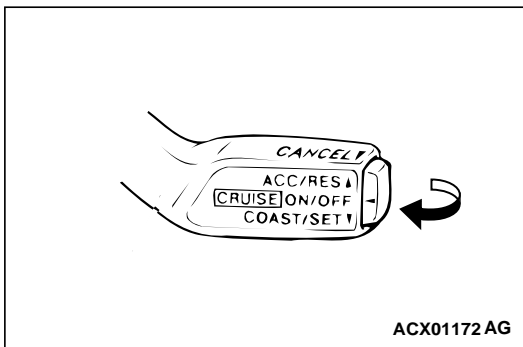
1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of arrow.
3. Check to be sure that deceleration continues while the switch is pressed, and that after it is released the constant speed at the time when it was released becomes the driving speed.

*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

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 pushed in the direction of 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 "RESUME" 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 main switch is turned to the "OFF" while driving at constant speed, check if normal driving is resumed and deceleration occurs.

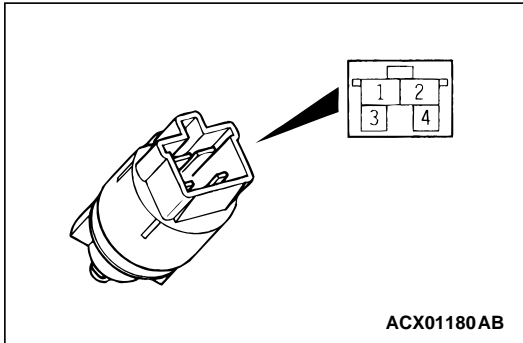


**AUTO-CRUISE CONTROL SYSTEM COMPONENT CHECK**

M1172001700231

**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. (for stoplight circuit)	1 – 2	Less than 2 ohms
	3 – 4	Open circuit
When brake pedal is not depressed. (for auto-cruise control circuit)	1 – 2	Open circuit
	3 – 4	Less than 2 ohms

**TRANSMISSION RANGE SWITCH ("N" POSITIN)**

Refer to GROUP 23A, On-vehicle Service – Essential Service [P.23Aa-20](#).

**THROTTLE POSITION SENSOR**

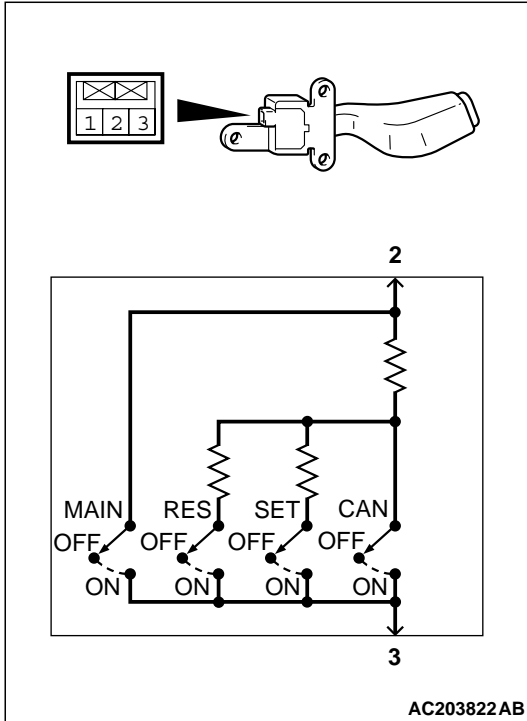
Refer to GROUP 13A, On-vehicle Service – Throttle Position Sensor Check [P.13Aa-18](#).

**ACCELERATOR PEDAL POSITION SENSOR**

Refer to GROUP 13A, On-vehicle Service – Accelerator Pedal Position Sensor Check [P.13Aa-18](#).

### AUTO-CRUISE CONTROL SWITCH CHECK

Measure the resistance between terminal 2 and terminal 3 when each of the "SET," "RESUME," "CANCEL" and MAIN switches is pressed. If the values measured at the time correspond to those in the table below, the resistance values are correct.



SWITCH POSITION	SPECIFIED CONDITION
MAIN switch "OFF"	Open circuit
MAIN switch "ON"	Less than 2 ohms
"CANCEL" switch ON	Approximately 100 $\Omega$
"RESUME" switch ON	Approximately 887 $\Omega$
"SET" switch ON	Approximately 300 $\Omega$

### VEHICLE SPEED SENSOR CHECK

Refer to GROUP 54A, Combination Meters Assembly and Vehicle Speed Sensor [P.54A-66](#).

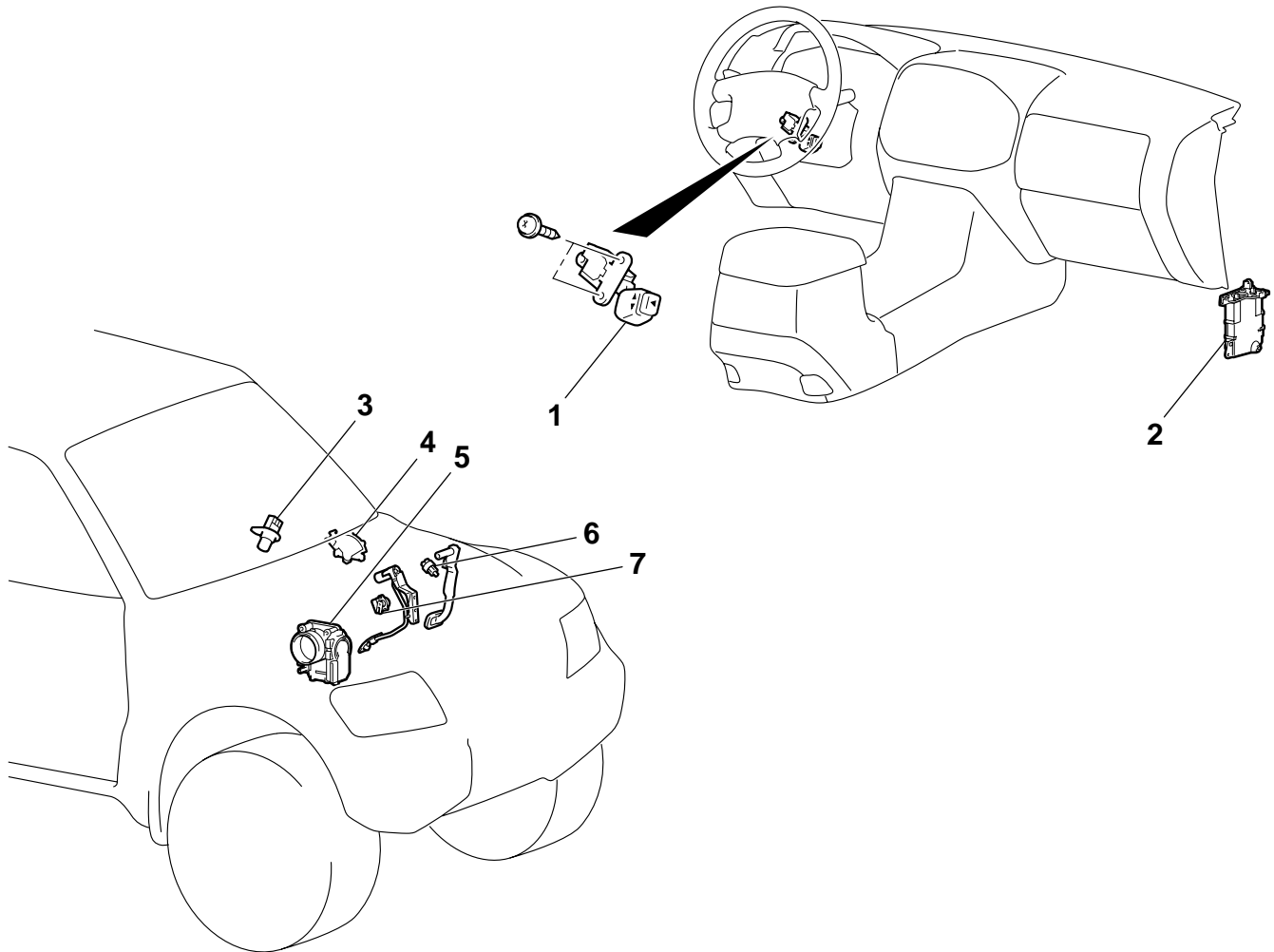
## AUTO-CRUISE CONTROL

### REMOVAL AND INSTALLATION

M1172001400218

#### **⚠ WARNING**

Before removal of the air bag module, refer to **GROUP 52B, SRS Service Precautions P.52Ba-18** and **GROUP 52B, Air Bag Module and Clock Spring P.52Ba-33**.



AC204448AB

#### **CONTROL SWITCH REMOVAL STEPS**

- AIR BAG MODULE <DRIVERS SIDE> (REFER TO GROUP 52B, AIR BAG MODULES AND CLOCK SPRING P.52Ba-33.)
  - 1. AUTO-CRUISE CONTROL SWITCH
- #### **CONTROL UNIT REMOVAL**
2. POWERTRAIN CONTROL MODULE (PCM) [REFER TO GROUP 23A, POWERTRAIN CONTROL MODULE (PCM) P.23Aa-44.]

#### **SENSOR REMOVAL STEPS**

3. VEHICLE SPEED SENSOR (REFER TO GROUP 52A, COMBINATION METERS ASSEMBLY AND VEHICLE SPEED SENSOR P.54A-65.)
4. TRANSMISSION RANGE SWITCH (REFER TO GROUP 23B, TRANSMISSION P.23B-18.)
5. THROTTLE POSITION SENSOR (REFER TO GROUP 13A, THROTTLE BODY P.13Aa-27.)
6. STOPLIGHT SWITCH (REFER TO GROUP 35A, BRAKE PEDAL P.35A-132.)
7. ACCELERATOR PEDAL POSITION SENSOR (REFER TO P.17-6.)

## EMISSION CONTROL

### GENERAL DESCRIPTION

M1173000100228

The emission control system consists of the following subsystems:

- Positive crankcase ventilation system
- Evaporative emission system
- Exhaust emission control system

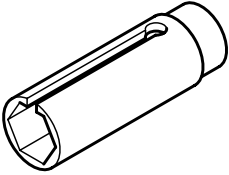
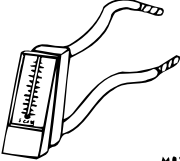
### DIAGNOSIS

M1173000700026

SYMPTOM	PROBABLE CAUSE	REMEDY
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	The EGR valve is not closed.	Repair or replace
	Malfunction of the evaporative emission purge solenoid	Repair or replace
Rough idle or engine stalls	The EGR valve 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

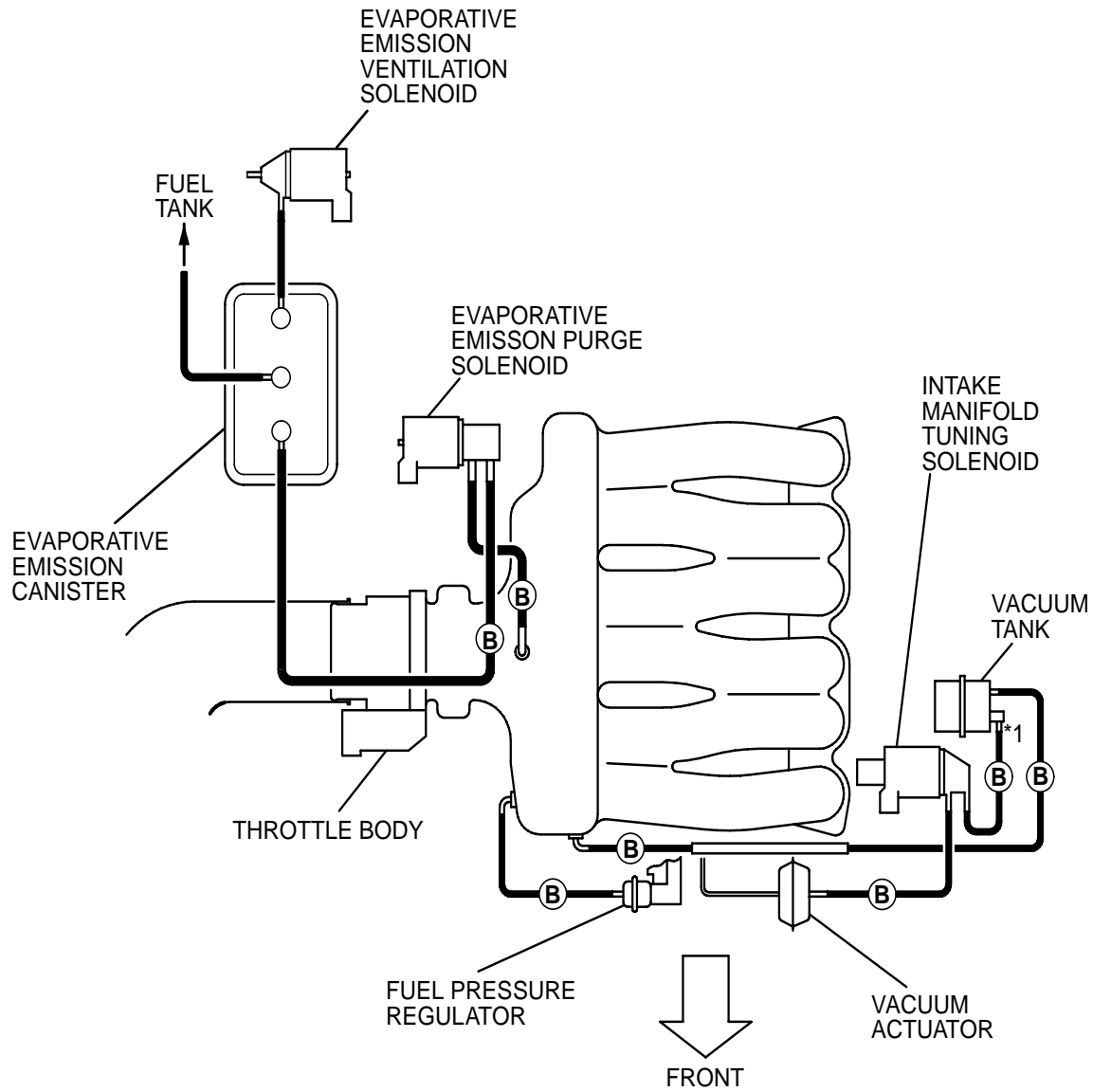
M1173000600029

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998770 Oxygen sensor wrench	MD998770-01 or General service tool	Removal/installation of heated oxygen sensor
 <small>MB991700</small>	MB995061 Purge flow indicator	MLR6890A	Inspection of purge control system

VACUUM HOSES

VACUUM HOSE ROUTING

M1173000900246



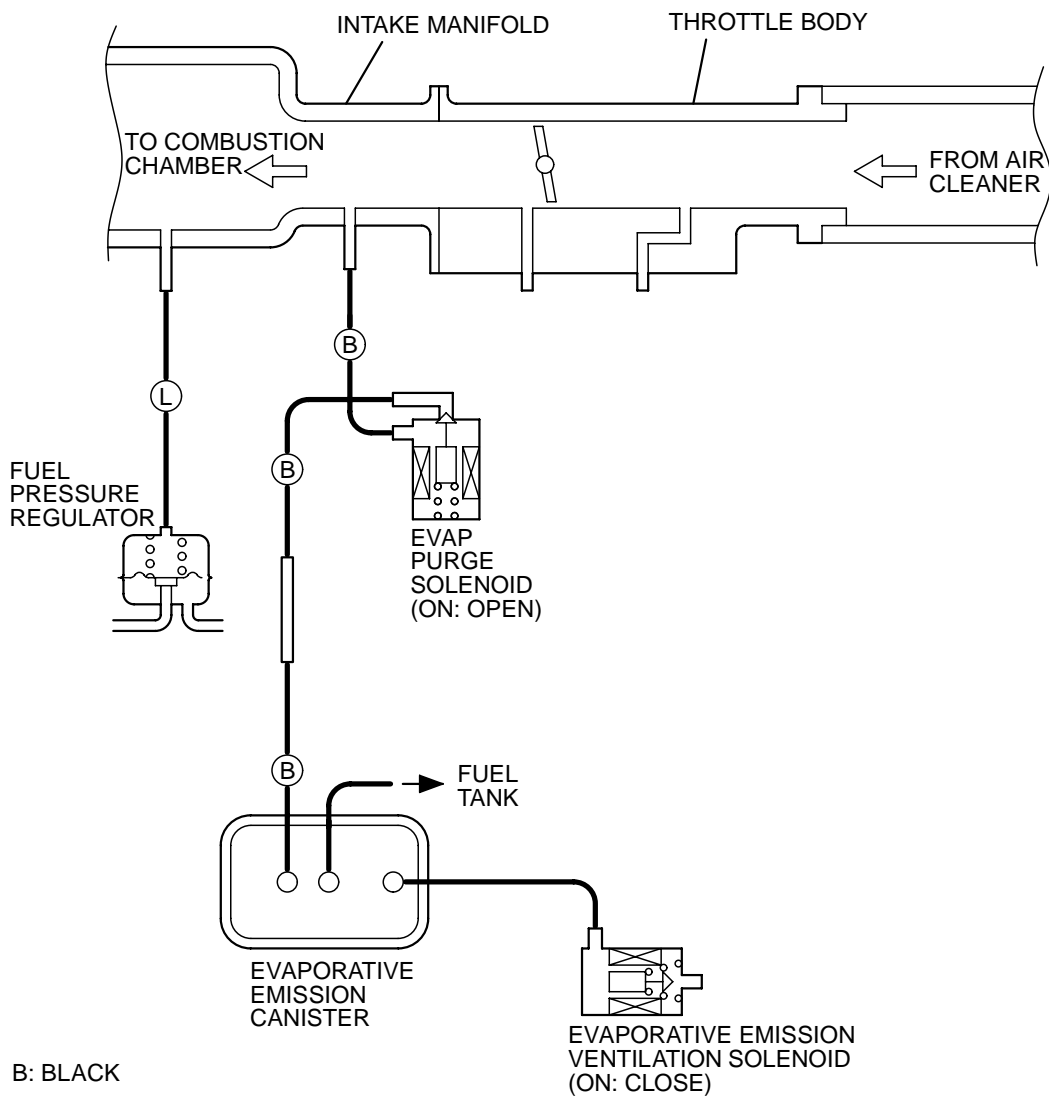
B: BLACK  
\*1: WHITE PAINT MARK

AK200798AB



VACUUM CIRCUIT DIAGRAM

M1173007100166



AK200799 AB

VACUUM HOSE INSTALLATION

M1173007200011

1. When connecting the vacuum hoses, they should be securely inserted onto the nipples.
2. Connect the hoses correctly, using the VACUUM HOSE ROUTING as a guide.

**VACUUM HOSE CHECK**

M1173007300018

1. Using the VACUUM HOSE ROUTING as a guide, check that the vacuum hoses are correctly connected.
2. Check the connection of the vacuum hoses, (removed, loose, etc.) and check that there are no sharp bends or damage.

**POSITIVE CRANKCASE VENTILATION SYSTEM****GENERAL DESCRIPTION (POSITIVE CRANKCASE VENTILATION SYSTEM)**

M1173005000174

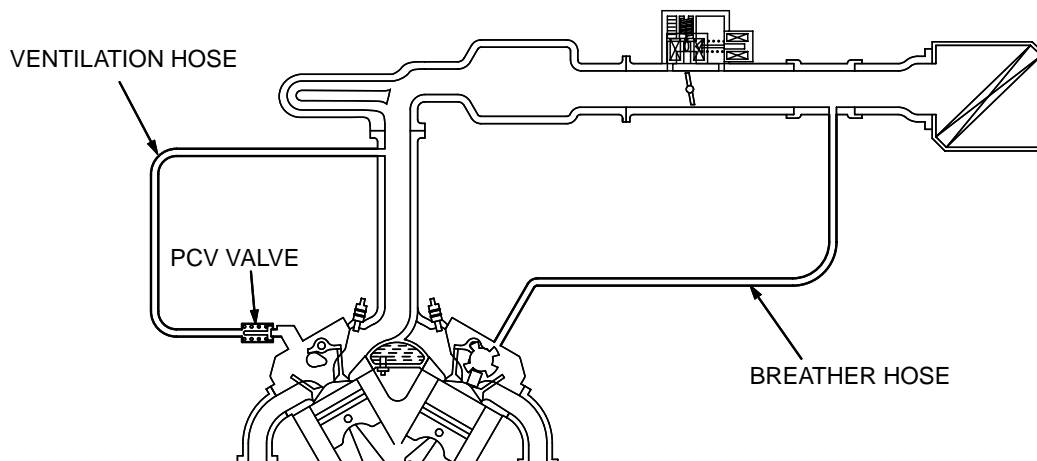
The positive crankcase ventilation system is a system for preventing the escape of blow-by gases from inside the crankcase into the atmosphere.

Fresh air is sent from the 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 positive crankcase ventilation (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.

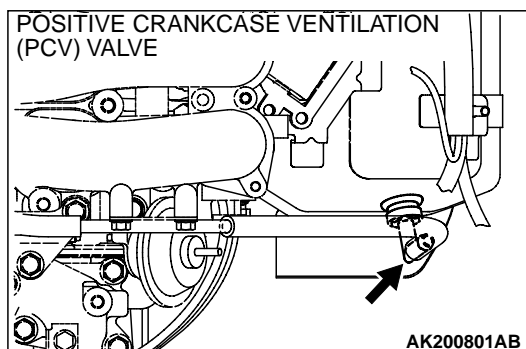
In other words, the blow-by gas flow is regulated during low load engine operation to maintain engine stability, while the flow is increased during high load operation to improve the ventilation performance.

**SYSTEM DIAGRAM**

AK200800AB

**COMPONENT LOCATION**

M1173007400112



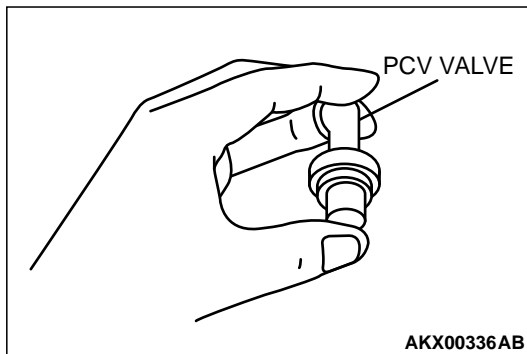
## CRANKCASE VENTILATION SYSTEM CHECK

M1173001100027

1. Remove the positive crankcase ventilation (PCV) valve from the rocker cover, then reconnect the PCV valve to the vacuum supply hose.
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.*

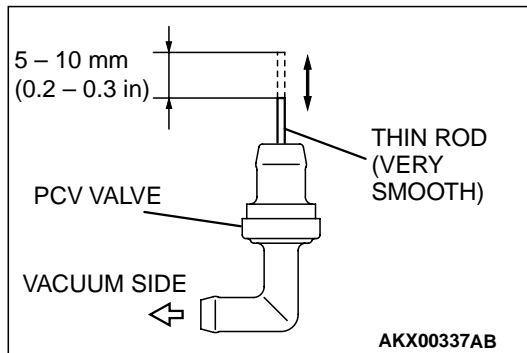
3. If negative pressure is not felt, clean or replace the PCV valve. Inspect the vacuum supply hose and vacuum supply hose port for restriction or plugged condition.



## POSITIVE CRANKCASE VENTILATION (PCV) VALVE CHECK

M1173001200024

1. Hold the 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

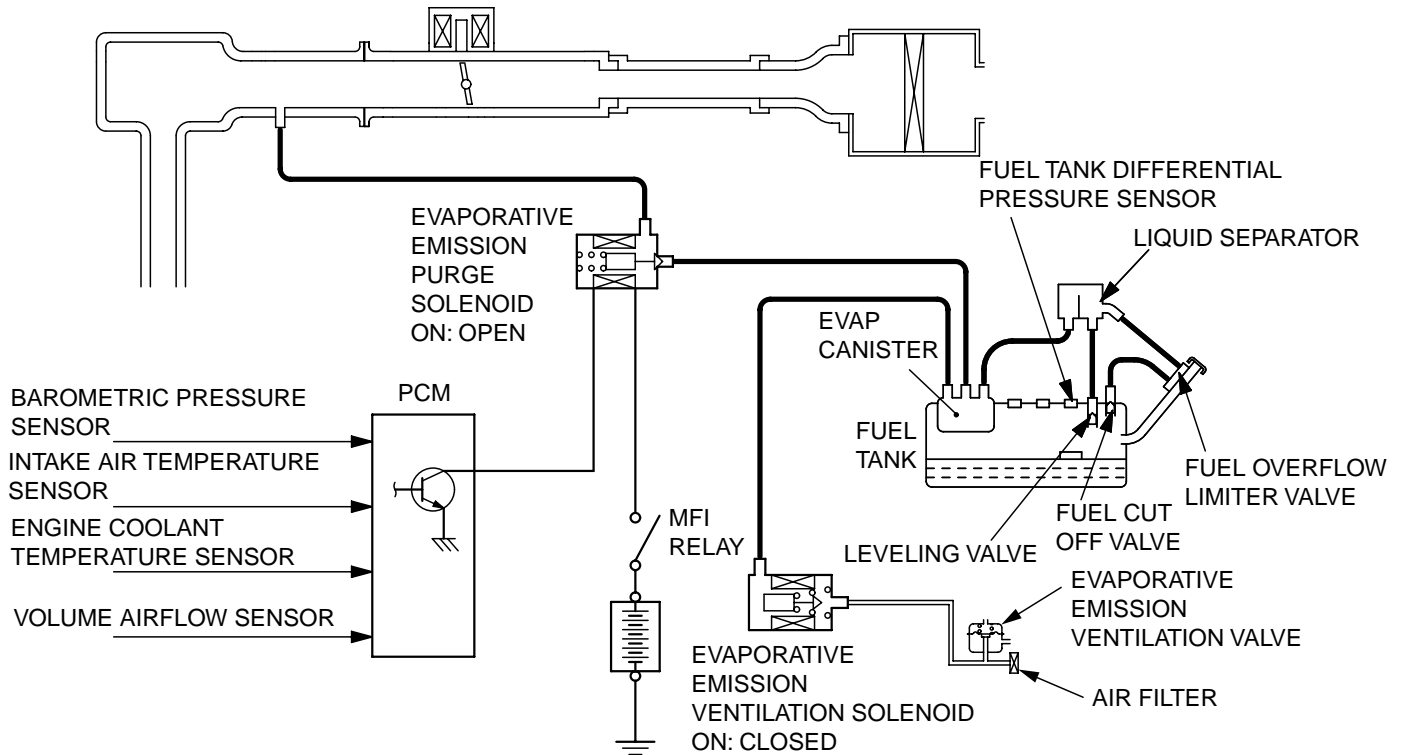
### GENERAL DESCRIPTION (EVAPORATIVE EMISSION CONTROL SYSTEM)

M1173005100234

The evaporative control system prevents fuel vapors generated in the fuel tank from escaping into the atmosphere. Fuel vapors from the fuel tank flow through the fuel tank pressure control valve and 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 PCM brings the EVAP purge solenoid into the OFF state to shut off the fuel vapor flow to the intake manifold plenum. This ensures the

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, and used 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 prevents fuel from being overfilled. The fuel cut off valve prevents fuel leaks just if the vehicle is rolled over in an accident.

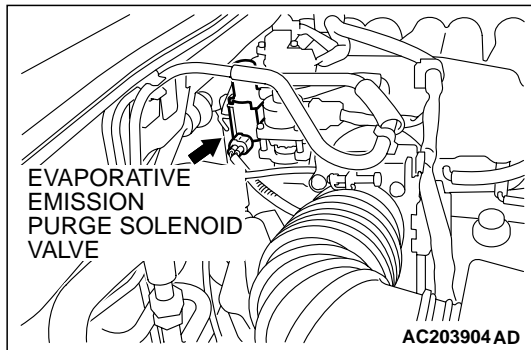
SYSTEM DIAGRAM



AK200802 AB

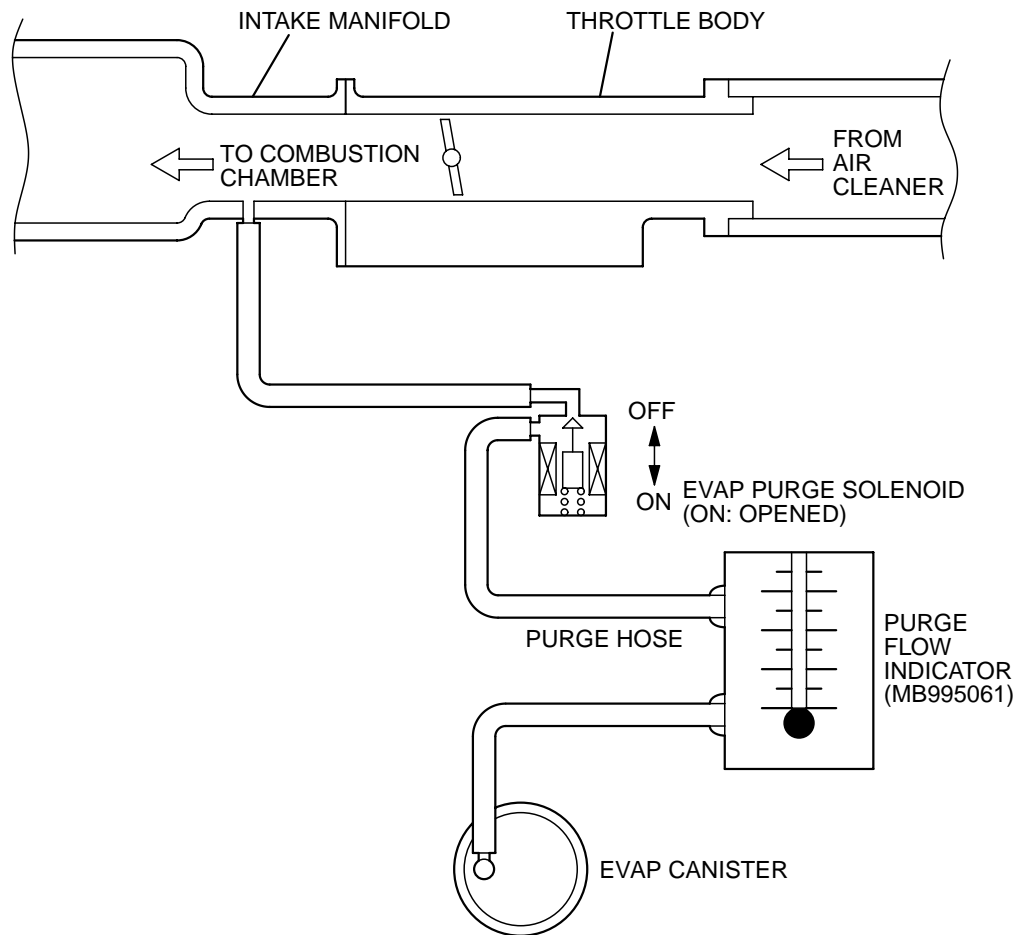
COMPONENT LOCATION

M1173007500120



PURGE CONTROL SYSTEM CHECK (PURGE FLOW CHECK)

M1173001400028



AKX00340AB

**Required Special Tool:**

MB995061: Purge flow indicator

1. Disconnect the purge hose from the evaporative emission (EVAP) purge solenoid, and connect the special tool MB995061 between the EVAP purge solenoid and the purge hose.
2. Before inspection and adjustment, set the vehicle in the following conditions:
  - Engine coolant temperature: 80 – 95°C (176 – 203°F)
  - Lights and accessories: OFF
  - Transmission: P range
3. Run the engine at idle for more than four minutes.
4. Check the purge flow volume when the engine is revved several times.

**Standard value: Momentarily 20 cm<sup>3</sup>/sec. (2.5 SCFH) or more.**

- 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 evaporative emission purge solenoid. If the purge flow volume is at the standard value, replace the EVAP canister.

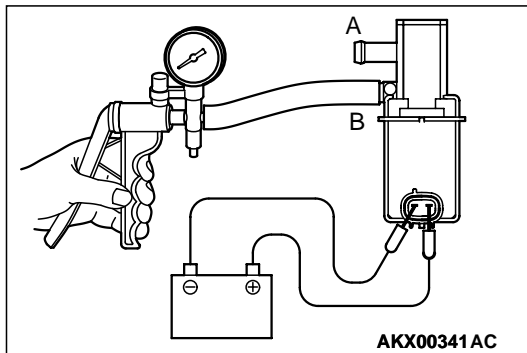
## EVAPORATIVE EMISSION PURGE SOLENOID CHECK

M1173001700159

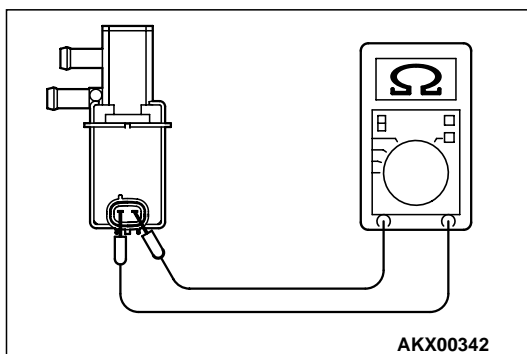
- Disconnect the vacuum hose (black, black with red paint mark) from the EVAP purge solenoid valve.

*NOTE: When disconnecting the vacuum hose, always place an identification mark so that it can be reconnected at its original position.*

- Disconnect the harness connector.
- Connect a hand vacuum pump to nipple (B) of the EVAP purge solenoid valve (refer to the illustration at left).
- 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



- Measure the resistance between the terminals of the EVAP purge solenoid valve.

**Standard value: 30 – 34  $\Omega$  [at 20°C (68°F)]**

- Replace solenoid if resistance is out of specification.

## VOLUME AIRFLOW SENSOR CHECK

M1173007900430

To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart [P.13Ab-22](#).

## BAROMETRIC PRESSURE SENSOR CHECK

M1173008000214

To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart [P.13Ab-22](#).

## ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1173008100426

To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code chart [P.13Ab-22](#).

## INTAKE AIR TEMPERATURE SENSOR CHECK

M1173008200218

To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart [P.13Ab-22](#).

## FUEL TANK DIFFERENTIAL PRESSURE SENSOR CHECK

M1173007700027

To inspect the sensor, refer to GROUP 13B, Fuel tank – Fuel tank inspection [P.13B-10](#).

## EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

M1173007800080

Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve – Fuel tank pressure relief valve inspection [P.17-69](#).

## EXHAUST GAS RECIRCULATION (EGR) SYSTEM

### GENERAL DESCRIPTION (EGR SYSTEM)

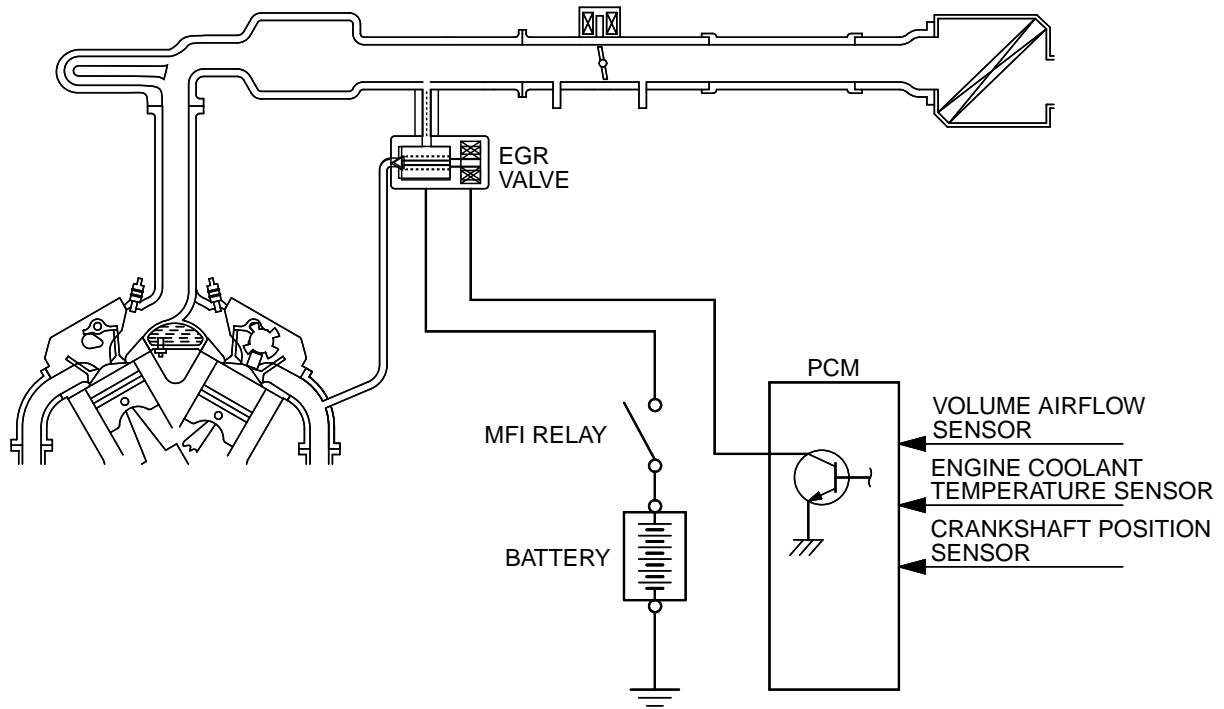
The exhaust gas recirculation (EGR) system lowers the nitrogen oxide (NOx) emission level. When the air/fuel mixture combustion temperature is high, a large quantity of NOx is generated in the combustion chamber. Therefore, this system recirculates part of exhaust gas from the exhaust port of the cylinder 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) so as not to decrease the driveability.

### 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. The powertrain control module monitors the EGR system and illuminates the check engine/malfunction indicator lamp to indicate that there is a malfunction.

M1173005200189

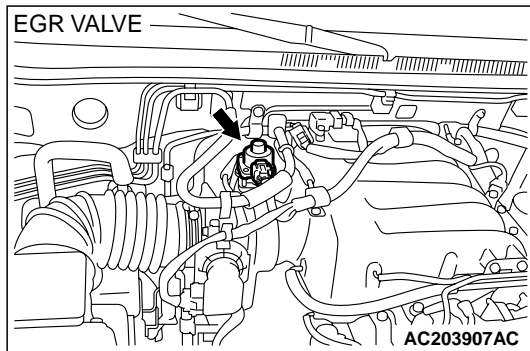
SYSTEM DIAGRAM



AK200803AB

COMPONENT LOCATION

M1173007600138



EGR VALVE (STEPPER MOTOR) CHECK

M1173050200026

Required Special Tool:

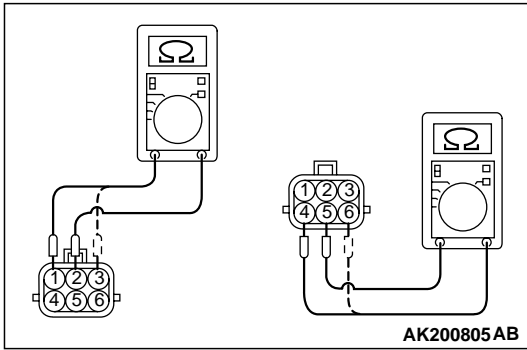
- MB991658: Test Harness Set

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 circuit is normal, either the stepper motor or the engine A/T-ECU may have failed.*





**Checking the Coil Resistance**

1. Remove the EGR valve.
2. Measure the resistance between terminal 2 and either terminal 1 or terminal 3 of the connector at the EGR valve.

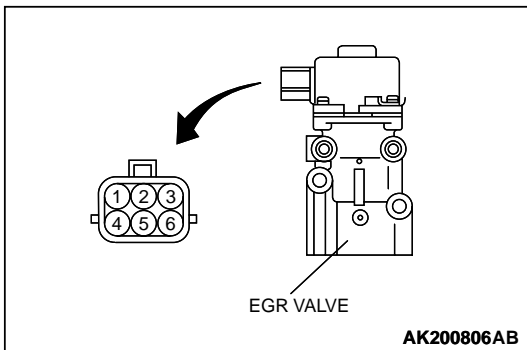
**Standard value: 10 – 20 Ω [at 20°C (68°F)]**

3. If the resistance is not within the standards, replace the EGR valve.

4. Measure the resistance between terminal 5 and either terminal 6 or terminal 4 of the connector at the EGR valve.

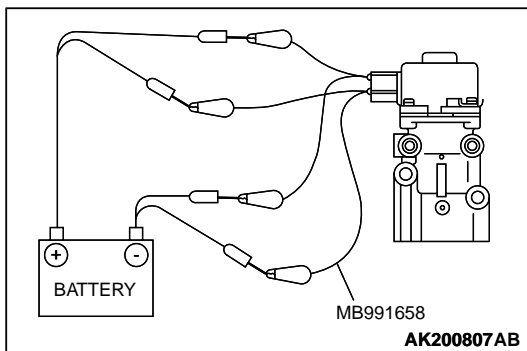
**Standard value: 10 – 20 Ω [at 20°C (68°F)]**

5. If the resistance is not within the standards, 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 2.
4. Connect terminal 1 or terminal 3 to the negative (-) terminal of the battery to test the presence of vibrations that result from the operation of the stepper motor (by feeling it's slight vibrations).

5. Connect the positive (+) terminal the battery to terminal 5.

6. Connect terminal 4 or terminal 6 to the negative (-) terminal of the battery to test the presence of vibrations that result from the operation of the stepper motor (by feeling it's slight vibrations).

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: If 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.

**VOLUME AIRFLOW SENSOR CHECK**

M1173007900441

To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13Ab-22.

**ENGINE COOLANT TEMPERATURE SENSOR CHECK**

M1173008100437

To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13Ab-22.

**CRANKSHAFT POSITION SENSOR CHECK**

M1173008300226

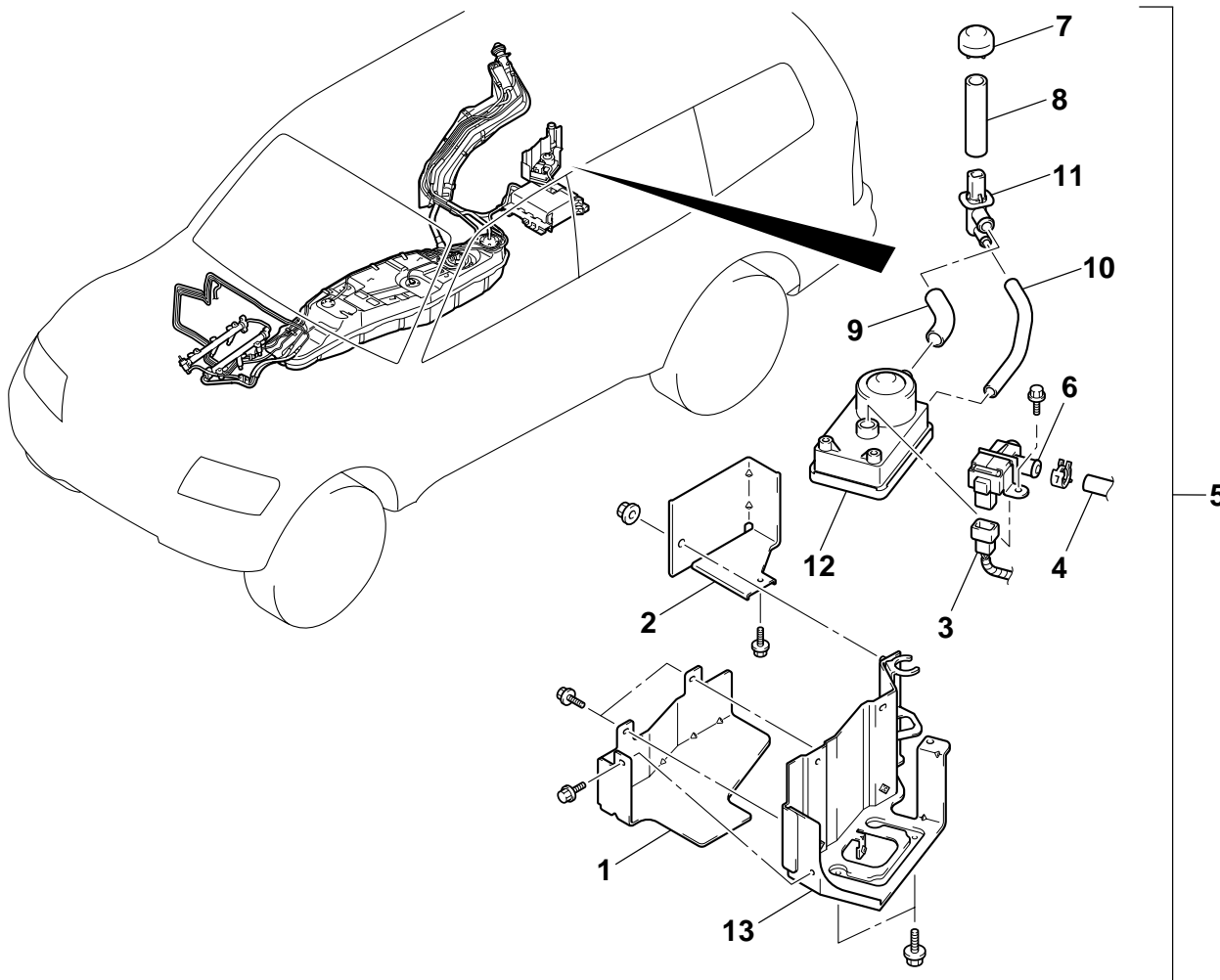
To inspect these parts, refer to GROUP 13A, Multiport Fuel Injection (MFI) Diagnosis – Diagnostic Trouble Code Chart P.13Ab-22.

**EVAPORATIVE EMISSION CANISTER AND FUEL TANK PRESSURE RELIEF VALVE**

**REMOVAL AND INSTALLATION**

M1173004800252

**<EVAPORATIVE EMISSION VENTILATION SOLENOID, ONBOARD REFUELING VAPOR RECOVERY(ORVR) VENT VALVE MODULE>**



AC204036AB

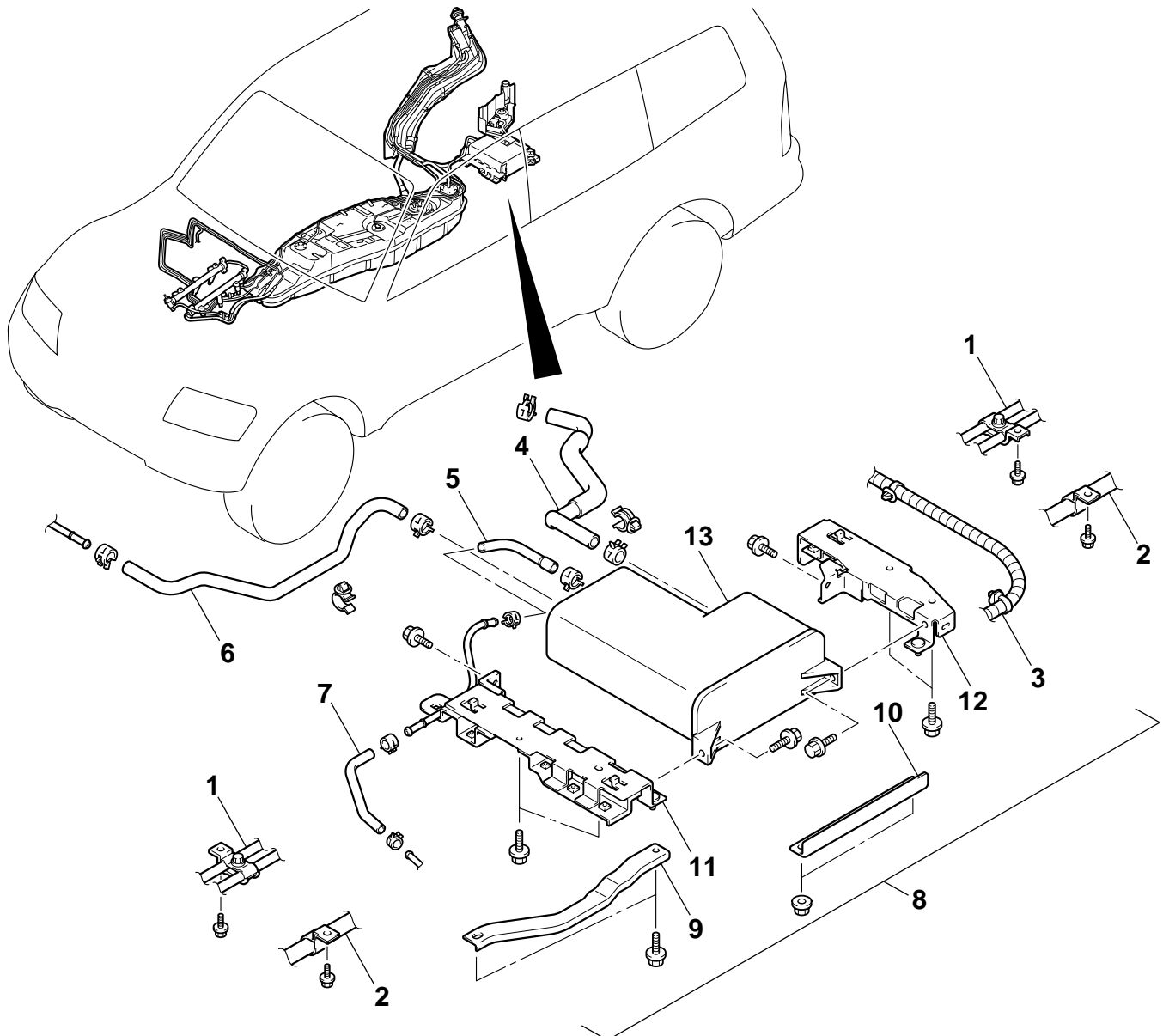
**REMOVAL STEPS**

1. ORVR VENT VALVE MODULE COVER A
2. ORVR VENT VALVE MODULE COVER B <VEHICLES WITHOUT REAR HEATER OR REAR A/C>
3. EVAPORATIVE EMISSION VENTILATION SOLENOID CONNECTOR
4. VENT HOSE A CONNECTION
5. ORVR VENT VALVE MODULE, CAP, VENT HOSE, VENT PIPE AND BRACKET ASSEMBLY

**REMOVAL STEPS (Continued)**

6. EVAPORATIVE EMISSION VENTILATION SOLENOID
7. CAP
8. VENT HOSE D
9. VENT HOSE B
10. VENT HOSE C
11. VENT PIPE
12. ORVR VENT VALVE MODULE
13. ORVR VENT VALVE MODULE BRACKET

**<EVAPORATIVE EMISSION CANISTER>**



**REMOVAL STEPS**

- REAR SUSPENSION ASSEMBLY (REFER TO GROUP 34, REAR SUSPENSION ASSEMBLY P.34-8.)
- 1. REAR HEATER PIPE CONNECTION <VEHICLES WITH REAR HEATER>
- 2. REAR A/C PIPE CONNECTION <VEHICLES WITH REAR A/C>
- 3. FRAME WIRING HARNESS CONNECTION
- 4. VENT HOSE A
- 5. PURGE HOSE B
- 6. VAPOR HOSE
- 7. PURGE HOSE A

**REMOVAL STEPS (Continued)**

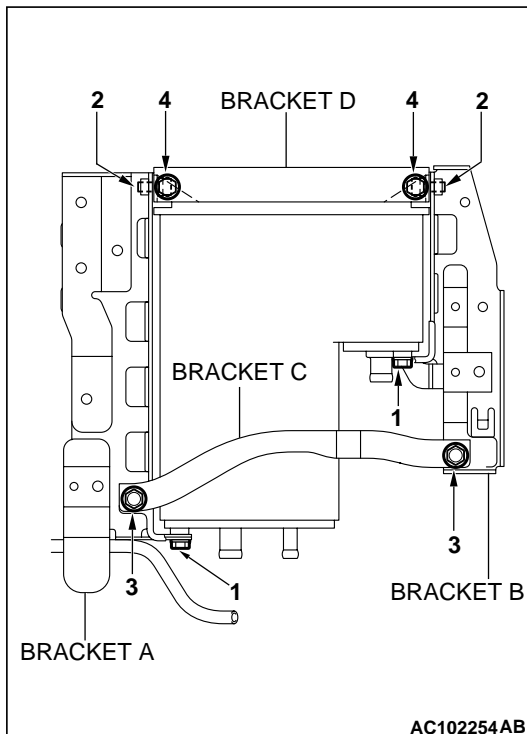
- >>A<< 8. EVAPORATIVE EMISSION CANISTER AND BRACKET ASSEMBLY
- >>A<< 9. EVAPORATIVE EMISSION CANISTER BRACKET C
- >>A<< 10. EVAPORATIVE EMISSION CANISTER BRACKET D
- >>A<< 11. EVAPORATIVE EMISSION CANISTER BRACKET A
- >>A<< 12. EVAPORATIVE EMISSION CANISTER BRACKET B
- >>A<< 13. EVAPORATIVE EMISSION CANISTER

**INSTALLATION SERVICE POINT**

**>>A<< EVAPORATIVE EMISSION CANISTER/EVAPORATIVE EMISSION CANISTER BRACKET B/EVAPORATIVE EMISSION CANISTER BRACKET A/EVAPORATIVE EMISSION CANISTER BRACKET D/EVAPORATIVE EMISSION CANISTER BRACKET C/EVAPORATIVE EMISSION CANISTER AND BRACKET ASSEMBLY INSTALLATION**

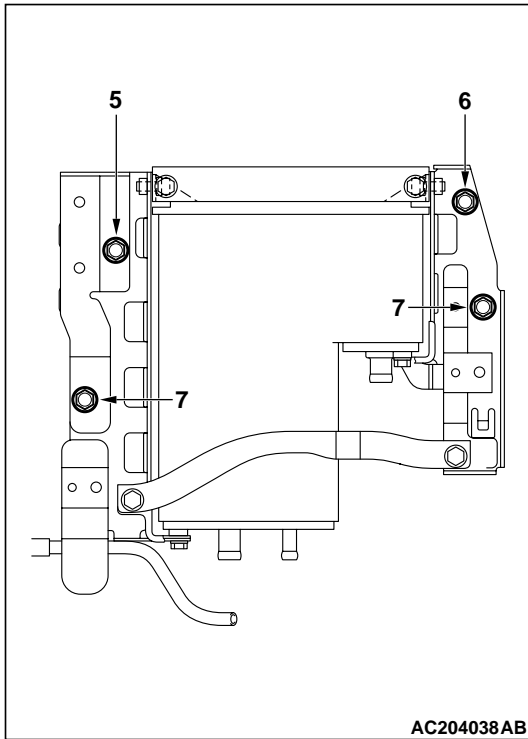
Follow the procedure below, taking care not to apply excessive force to the evaporative emission canister.

1. Temporarily install the evaporative emission canister brackets A and B to the evaporative emission canister with mounting bolts 1 and 2.
2. Tighten mounting bolt 2 securely.
3. Install the evaporative emission canister brackets C and D to the evaporative emission canister brackets A and B with mounting bolt 3 and nut 4.
4. Tighten mounting bolt 1 securely, and install the evaporative emission canister and bracket assembly to the vehicle.



NAME	SYMBOL	QUANTITY	SIZE mm (D × L)
Bolt, washer assembled	1	2	M8 × 14
	2, 3	4	M8 × 18
Nut, washer assembled	4	2	M8

NOTE: D: Nominal diameter, L: Nominal length



5. Tighten mounting bolt 5 by hand.
6. Tighten mounting bolt 6 by hand.
7. Tighten mounting bolts 7 to the specified torque.
8. Tighten mounting bolts 5 and 6 to the specified torque.

NAME	SYMBOL	QUANTITY	SIZE mm (D × L)
Bolt, washer assembled	5, 6, 7	4	M8 × 18

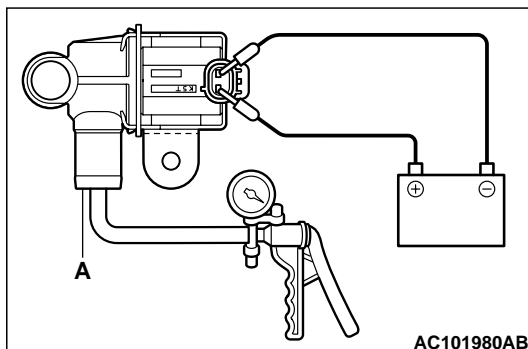
NOTE: D: Nominal diameter, L: Nominal length

## INSPECTION

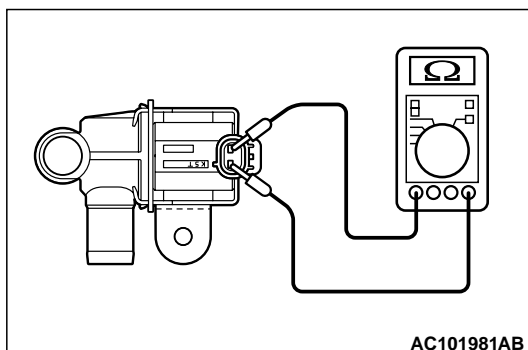
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### EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

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 INFORMATION (CATALYTIC CONVERTER)

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) and reduces nitrogen oxides (NOx).

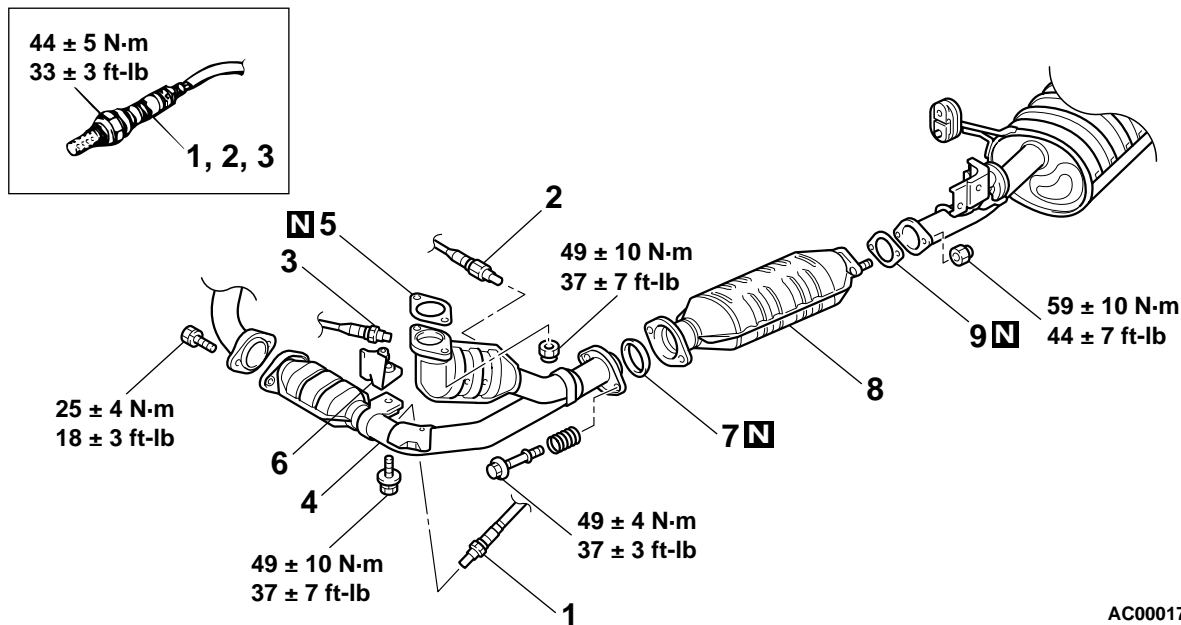
When the mixture is controlled at stoichiometric air-fuel ratio, the three-way catalytic converter provides the highest purification against the three constituents, namely, CO, HC and NOx.

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## REMOVAL AND INSTALLATION

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**Pre-removal and Post-installation Operation**  
Front Under Cover Removal and Installation



AC000176 AC

**REMOVAL STEPS**

- <<A>> >>A<< 1. RIGHT BANK HEATED OXYGEN SENSOR (REAR)  
<<A>> >>A<< 2. LEFT BANK HEATED OXYGEN SENSOR (REAR)  
<<A>> >>A<< 3. LEFT BANK HEATED OXYGEN SENSOR (FRONT)

**REMOVAL STEPS (Continued)**

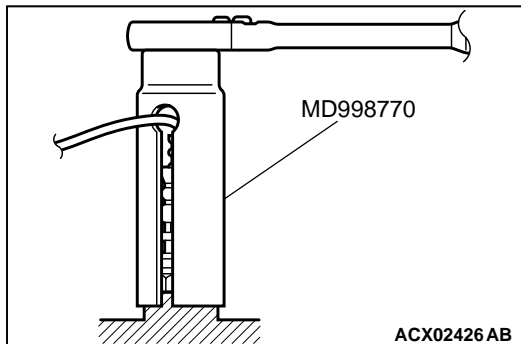
4. WARM UP THREE WAY CATALYTIC CONVERTER  
5. GASKET  
6. BRACKET  
7. SEAL RING  
8. CATALYTIC CONVERTER  
9. GASKET

**Required Special Tool:**

- MD998770: Oxygen Sensor Wrench

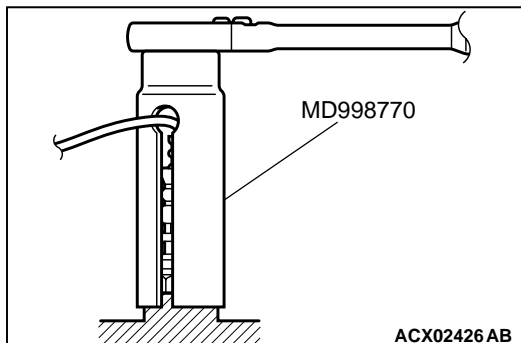
**REMOVAL SERVICE POINT**

**<<A>> RIGHT BANK HEATED OXYGEN SENSOR (REAR)/  
LEFT BANK HEATED OXYGEN SENSOR (REAR)/LEFT  
BANK HEATED OXYGEN SENSOR (FRONT) REMOVAL**  
Use special tool MD998770 to remove the oxygen sensor.



**INSTALLATION SERVICE POINT**

**>>A<< LEFT BANK HEATED OXYGEN SENSOR (FRONT)/  
LEFT BANK HEATED OXYGEN SENSOR (REAR)/RIGHT  
BANK HEATED OXYGEN SENSOR (REAR) INSTALLATION**  
Use special tool MD998770 to install the oxygen sensor.



**SPECIFICATIONS****FASTENER TIGHTENING SPECIFICATIONS**

M1173006400249

ITEM	SPECIFICATION
<b>Emission control system</b>	
Bracket bolt	49 ± 10 N·m (37 ± 7 ft-lb)
EGR valve bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Front exhaust pipe bolt	25 ± 4 N·m (18 ± 3 ft-lb)
Heated oxygen sensor	44 ± 5 N·m (33 ± 3 ft-lb)
Main muffler nut	59 ± 10 N·m (44 ± 7 ft-lb)
Warm up three way catalytic converter bolt	49 ± 4 N·m (37 ± 3 ft-lb)
Warm up three way catalytic converter nut	49 ± 10 N·m (37 ± 7 ft-lb)
<b>Engine control system</b>	
Accelerator pedal bracket nut	12 ± 2 N·m (102 ± 22 in-lb)
Accelerator pedal position sensor bolt	3.5 ± 1.0 N·m (31 ± 9 in-lb)

**SERVICE SPECIFICATIONS**

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ITEMS		STANDARD VALUE
Emission control system	Exhaust gas recirculation vacuum regulator solenoid valve coil resistance [at 20°C (68°F)] Ω	29 – 35
	Evaporative emission purge solenoid coil resistance [at 20°C (68°F)] Ω	30 – 34
	Evaporative emission ventilation solenoid coil resistance [at 20°C (68°F)] Ω	17 – 21